3DS Format (.3ds)

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                         .3DS File Format

                      3D Studio File Format  (3ds).
                             Autodesk Ltd.

Document Revision 0.8 -  December 1994.  First Public Release.

If you have any additions or comments to this file please e-mail me.

A lot of the chunks are still undocumented if you know what they
do please email me.  As I get more information of the file format
I will document it for everyone to see.  I will post this regularly
to alt.3d and I can be contacted there if my email does not work.

Disclaimer.
This document describes the file format of the 3ds files of 3D studio
by Autodesk.  By using the information contained within you agree not
to hold me liable if, from its use, you f^Hmuck something up. OK?

Oh and just to make it clear I DO NOT work for Autodesk if you have
any problems with their programs direct it to them not me!

Get to it!

Now with the joviality's aside all this info I have obtained with
lots of work hacking at 3ds files with a diskeditor and diff.
It has taken many months of hard work and piddling around with them
so I hope that it is appreciated.

Remember information wants to be free!

*  Jim Pitts.  -  18 December 1994

Contact me at jp5@ukc.ac.uk

1.

  The 3ds file format is made up of chunks.  They describe what information
  is to follow and what it is made up of, its ID and the location of
  the next main block.  If you don't understand a chuck you can quite simply
  skip it.  The next chunk pointer is relative to the start of the current
  chunk and in bytes.

  * A Chunk.

  start end  size  name
  0     1    2     Chunk ID
  2     5    4     Next Chunk

  Chunks have a hierarchy imposed on them that is identified by its ID.
  A 3ds file has the Primary chunk ID 4D4Dh.  This is always the first chunk
  of the file.  With in the primary chunk are the main chunks.

  * Main Chunks
```

id	Description
3D3D	Start of object mesh data.
B000	Start of keyframer data.

The Next Chunk pointer after the ID block points to the next Main chunk.

Directly after a Main chunk is another chunk. This could be any other type of chunk allowable within its main chunks scope.

For the Mesh description (3D3D) they could be any multiples of.

* Subchunks of 3D3D. - Mesh Block

id	Description
1100	unknown
1200	Background Colour.
1201	unknown
1300	unknown
1400	unknown
1420	unknown
1450	unknown
1500	unknown
2100	Ambient Colour Block
2200	fog?
2201	fog?
2210	fog?
2300	unknown
3000	unknown
4000	Object Block
7001	unknown
AFFF	unknown

* Subchunks of 4000 - Object Description Block

- first item of Subchunk 4000 is an ASCIIZ string of the objects name.

Remember an object can be a mesh, a light or a camera.

id	Description
4010	unknown
4012	shadow?
4100	Triangular Polygon Object
4600	Light
4700	Camera

* Subchunks of 4100 - Triangular Polygon Object

id	Description
4110	Vertex List
4111	unknown
4120	Points List
4160	Translation Matrix

* 4110 - Vertex List

start	end	size	type	name
0	1	2	short int	Total vertices in object
2	5	4	float	X value
6	9	4	float	Y value

```
10    13    4    float        Z value
..    ..    .     ..            ..
..    ..    .     ..            ..

bytes 2 .. 13 are repeated [Total vertices in object] times for
each vertex.


* 4111 - unknown

start end  size  type         name
 0     1    2    short int   Total vertices in object ?

 2     3    2    short int   unknown
 .     .    .      ..          ..
 .     .    .      ..          ..

 bytes 2..3 are repeated for X times as described by
 short int at start of record.


* 4120 - Points List

start end  size  type         name
 0     1    2    short int   Total polygons in object - numpoly

 2     3    2    short int   Point 1
 4     5    2    short int   Point 2
 6     7    2    short int   Point 3
 .     .    .     ..           ..
 .     .    .     ..           ..

 Repeats 'numpoly' times for each polygon.


 These points refer to the corresponding vertex of
 the triangular polygon from the vertex list.
 Points are organized in a clock-wise order.

* 4160 - Translation Matrix

 This structure describes a matrix for the object.
 It is stored as a 3 X 4 matrix because it is assumed that
 the right most column is 0,0,0,1

start end  size  type         name
 0      3    4    float       matrix 1,1
 4      7    4    float       matrix 1,2
 8     11    4    float       matrix 1,3
12     15    4    float       matrix 2,1
16     19    4    float       matrix 2,2
20     23    4    float       matrix 2,3
24     27    4    float       matrix 3,1
28     31    4    float       matrix 3,2
32     35    4    float       matrix 3,3
36     39    4    float       matrix 4,1
40     43    4    float       matrix 4,2
44     47    4    float       matrix 4,3

* 4600  - Light

start end  size  type         name
```

0	3	4	float	Light pos X
4	7	4	float	Light pos Y
8	11	4	float	Light pos Z

after this structure check for more chunks.

id	Description (full description later)
0010	RGB colour
0011	24 bit Colour
4610	Spot light
4620	Light is off (Boolean)

* 4610 - Spot Light

start	end	size	type	name
0	3	4	float	Target pos X
4	7	4	float	Target pos Y
8	11	4	float	Target pos Z
12	15	4	float	Hotspot
16	19	4	float	Falloff

* 0010 - RGB colour

start	end	size	type	name
0	3	4	float	Red
4	7	4	float	Green
8	11	4	float	Blue

* 0011 - RGB colour - 24 bit

start	end	size	type	name
0	0	1	byte	Red
1	1	1	byte	Green
2	2	1	byte	Blue

* 4700 - Camera

Describes the details of a camera in the scene.

start	end	size	type	name
0	3	4	float	Camera pos X
4	7	4	float	Camera pos Y
8	11	4	float	Camera pos Z
12	15	4	float	Target pos X
16	19	4	float	Target pos Y
20	23	4	float	Target pos Z
24	27	4	float	Camera Bank
28	31	4	float	Camera Lens

* 7001 - unknown chunk

nothing known about this chunk except for its Subchunks.
This chunk also exists as a Subchunk in chunk B000 (keyframer info).

id	Description
7011	unknown
7020	unknown

* B000 - Keyframer Main chunk.

Subchunks are

id	Description
B00A	unknown
7001	unknown
B008	Frames
B009	unknown
B002	Start object description

* B008 - Frame information

simple structure describing frame info.

start	end	size	type	name
0	3	4	integer	start frame
4	7	4	integer	end frame

* B002 - Start of Object info

Subchunks

id	Description
B010	Name & Hierarchy
B011*	Name Dummy object
B013	unknown
B014*	unknown
B015	unknown
B020	Objects pivot point?
B021	unknown
B022	unknown

(* only on dummy objects)

* B010 - Name & hierarchy descriptor

start	end	size	type	name
0	?	?	ASCIIZ	Object name
?	?	?	short int	unknown
?	?	?	short int	unknown
?	?	?	short int	Hierarchy of object

The object hierarchy is a bit complex but works like this.
Each object in the scene is given a number to identify its
order in the tree. Also each object is ordered in the 3ds
file as it would appear in the tree.
The root object is given the number -1 (FFFF).
As the file is read a counter of the object number
is kept.
Is the counter increments the object are children of the previous
objects. But when the pattern is broken by a number that will be
less than the current counter the hierarchy returns to that level.

for example.

object name	hierarchy
A	-1
B	0
C	1
D	2

This example is taken
from 50pman.3ds.

E	1
F	4
G	5
H	1
I	7
J	8
K	0
L	10
M	11
N	0
O	13
P	14

I would really recommend having a look at one of the example with the hierarchy numbers to help work it out.

(if you can describe it any better please let me know.)

```
                          A
       +-------------------+---------------+
       B                   K               N
   +---+---+               +               +
   C   E   H               L               O
   +   +   +               +               +
   D   F   I               M               P
       +   +
       G   J
```

Still not done with this chunk yet!

If the object name is $$$DUMMY then it is a dummy object and therefore you should expect a few extra chunks.

* B011   - Dummy objects name.

Names a dummy object. ASCIIZ string.

* B020 - Pivot Point?

The objects pivot point. Not quite sure what the first five floats do yet (ideas?).

start	end	size	type	name
0	3	4	float	unknown
4	7	4	float	unknown
8	11	4	float	unknown
12	15	4	float	unknown
16	19	4 27 4	float	Pivot Y
28	32	4	float	Pivot Z

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