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# 1. THE BUILD EDITOR & BASIC LEVEL EDITING

This section gives detailed info on several ways to edit levels in Build. If you would like to see an index of everything you can do in Build, please see Section 10: Build Keys.

## 1.1 *Two Editing Modes: 2D and 3D*

There are two modes with which to make your cool Duke levels: 2D and 3D. 2D mode is a 2 dimensional view of your level and making a level in this mode is like drawing on grid paper. 3D mode is 3 dimensional and is similar to the game itself (switches, doors, some light effects, etc. don't work like in the game).

Switching between the two modes is done with the Enter key on the numeric pad (\*not\* the Enter key near all the regular keys). When in 2D mode, you're current position within the level is indicated by the white arrow. The brown arrow, if you can see it, is the player's starting position when the game begins (this is explained later).

NOTE: Your current location (white arrow) must be within a valid sector to enter 3D mode.

## 1.2 *Level Basics: Sectors, Walls, Vertices, and Sprites*

Your level will be made of a few basic elements: sectors, walls, vertices, and sprites. Sectors are like rooms and hallways and outside areas. Sectors are made up of a floor, a ceiling, and walls. Walls are just that - wall space between the floor and the ceiling of a sector. The two points on either side of the wall, as seen in 2D mode (seen as corners in 3D mode), are its vertices.

Sprites are used for bad guys, goodies, sector effectors, etc.. They can also be made to lay flat on walls, floors, and ceilings. These flatten sprites, called "rotated", can be used for switches, blood splats, and decorations.

### 1.2.1 *Sector, Wall, and Sprites Attributes*

You can see the attributes (shade, tags, tile number, etc.) of sectors in 2D mode by pointing at them and hitting the TAB key. You can do the same for walls and sprites with the Alt-TAB keys. Since walls can be double-sided, make sure you point on the exact side of the wall before hitting Alt-TAB.

## 1.3 *2D Editor Mode*

2D mode editing is used to lay out the basic level. It provides you with a top view of your level and shows your level's walls and sprites on a grid. It is very similar to a blueprint and most of a level's preliminary work done in this mode.

When editing in 2D mode, use the left mouse button to grab things (vertices, sprites) and move them around the map. Use the right mouse button to move your current position around the map.

You'll notice, in 2D mode, that the closest sprite, the closest vertex, and the closest wall to the white arrow will blink. This indicates that these particular objects will be acted upon by you. This will be more important later when you start using high and low tags, and hit scan/ blocking. For now, though, you need to know that the blinking vertex is the one you'll grab if the mouse's left button is used.

### 1.3.1 *2D Grid and Resizing the Grid*

There are seven gradations to the 2D mode's grid. The first six will actually display a grid of six varying sizes and a seventh with no grid at all. The six grid sizes give you varying control and accuracy on sector wall and sprite placement. Detailed work on very small spaces or tight sprite locations can be done at the sixth, finest grid size, while more grand, room-sized leveling can be done with the larger grid sizes. The seventh, gridless display is usually only used to capture screen shots of levels for printing and planning.

### 1.3.2 2D Grid Locking Feature

When drawing walls or placing sprites in 2D mode, you'll notice that the wall's vertices, and the sprites, are placed exactly on grid cross lines. This is very useful because almost everything you BUILD will be rectilinear (square-shaped). You will also want to keep areas symmetrical and proportioned with respect to sector sizes for rooms, doors, windows, etc..

I don't recommend turning Grid Lock Mode off until you feel comfortable with BUILD and level designing. When you want to make crazy shapes with your sectors, or place sprites so precisely that they need to be off the grid system, then use the "G" key to enable and disable the Grid Lock feature.

### 1.3.3 2D Zooming In and Out

You can zoom in and out within the 2D mode by using the "A" key to zoom in, and the "Z" key for zooming out. These two keys, along with grid resizing, can greatly help when trying to develop differently sized areas of your maps.

## 1.4 3D Editing

The 3D mode of editing is used to do most of your level's designing. This mode resembles the actual game and therefore is more intuitive. You will do your tile selections, shading, floor/ceiling elevations, etc. in 3D mode.

Holding the left mouse key after pointing at a sprite, wall, floor, or ceiling in 3D mode will hold it as selected, even if the sprite moves beyond the mouse's crosshair during an editing operation.

There three ways to control your altitude in 3D mode: Game Mode, Height Lock Mode, and Float Mode. Game Mode is just like the game; you will be effected by gravity. Height Lock Mode will let you move around the level with no gravity and always at the same height above the current floor. Float Mode will let you hover without gravity and your height will not be effected by the floor's height below.

You can switch between these modes by hitting the CapsLock key. You can change your altitude by hitting the "A" and "Z" keys.

## 2. BUILDING A BASIC LEVEL

### 2.1 Sectors and Walls

A sector is the simplest and most fundamental of structures in your level. It is made of walls, a floor, and a ceiling. You can control everything about each sector including its size and shape, the height of its floor and ceiling, the textures of its walls, and its shading and visibility.

### 2.2 Build a Simple Sector

#### 2.2.1 Start up BUILD

At the DOS prompt and within your Duke Nukem 3D directory, type the following: YOU MUST BE IN THE DIRECTORY BUILD IS IN TO DO THIS!

BUILD <map name>

If it's a new level, you'll start in 2D mode with an empty grid. If the level already exists, then you'll start in 3D mode at the player's start point.

### 2.2.2 Make Your First Sector

If you're not already there, go to 2D mode (numeric pad "ENTER" key). Make a square sector by pointing the mouse at a starting point for the first wall of the sector and hit the SPACE bar. You are now in Line Drawing Mode and you will notice that a white line is now following your mouse movements.

Drag the mouse to a second point where you want the first wall to end and hit the SPACE bar again. Continue in this fashion until a square is made with last point's position being exactly where the first point was put. Line Drawing Mode will automatically stop when the last point is connected to the first and your first sector is now complete! ...it's a milestone, so enjoy it ;)

Go ahead and check out your new sector by placing the mouse's white arrow inside the new sector and hit the numeric ENTER key. That's it, you new sector. Check the size of the 3D view and compare it to the 2D view so you can get a feel for the grid size in 2D relative to the actual area it creates.

The size of the sector can be changed (bigger, smaller) in 2D mode by grabbing the vertices with the left mouse button and dragging them. You can select more than one vertex by first positioning the mouse pointer and holding the ...

The walls will be an ugly (on purpose) brown stone tile if the map is a new one. The walls will be the last defaulted wall if the map is not new. Okay, okay, we'll change the textures later, right now it's back to 2D mode (numeric ENTER key)...

### 2.2.3 Backtracking in Line Draw Mode

If you make a mistake while in Line Draw Mode and want to backtrack a line or more, then simply hit the Backspace key. You'll see the last placed point erased and the line it made removed. You can complete undo all your lines and cancel Line Draw Mode by backspacing all the way back to the first point.

## 2.3 *Single-sided and Double-sided Walls*

You'll notice, upon returning to 2D mode, that your sector is made of white lines. These whites are single-sided walls. A single-sided wall only has player space on one side; the other side is "null" and can never be occupied by the player or anything else. Your new sector has player space on the inside, but not on the outside.

Double-sided walls are red in 2D mode and they have player space on both sides. Double-sided lines always separate two sectors. We'll add more sectors to our one-sector level in a bit.

## 2.4 *Placing the Player's Start Position (IMPORTANT)*

It is important to make sure that the player's start position, indicated by a brown arrow in 2D mode, is within a sector (user space). The game will behave very strangely if it tries to start the player in null space, and you will not think of this reason for the trouble at first and get all bummed that your level got corrupted and all that work is lost and oh, my... ...you've been warned.

Place the player's start position by putting the mouse, and the white arrow, where you want and hit "Scroll Lock". The brown arrow will now be there (you'll have to move the mouse a bit to see it). The player's starting direction will be the same as the brown arrow's.

## 2.5 *Quitting BUILD and Saving, Loading, Renaming Levels*

It's ALWAYS a good idea to test your level in stages as it grows. Don't try to take on too much in any one editing session. Let's stop here and load your new level into the game. Even this simple level will make you utter "Cooooo, I built this!" when you see it in the game.

Exit BUILD by hitting the "Esc" key in 2D mode. You can do a couple of things here. We want to quit with the "Q" key and save our level by hitting the "Y" key when it asks.

You can also simply save your level to disk with the “S” key and return immediately to BUILD. I recommend that you do this often as you BUILD more complicated levels. You will often want to backtrack away from an idea and reloading a previous version of your level is much easier than undoing the idea.

Although you don’t need to now, in the future you will want to load in different levels during a single BUILD session. This can be done by hitting the “L” key and selecting the level from the list.

Finally, you can rename your level by hitting the “A” key and providing the new name.

### **3. BUILDING A BETTER LEVEL**

Let’s make our single-sectored, ugly-textured level a little better. We can start adding rooms and splitting sectors but, first, let’s fix those textures.

#### **3.1 *Modifying Wall, Floor, and Ceiling Textures***

##### **3.1.1 Selecting Textures**

Go to 3D mode and point at a wall in your sector. Hit the “V” key and a screen will appear with textures. If this is your first level, then only that ugly, brown stone texture will be showing. This first screen of textures are all the ones that have been used in the current level. Hit the “V” key again and the screen will fill with the complete texture set.

Look for a texture that’s cool and one that fits the level’s motif. You can peruse the textures with the arrow keys and PgUp/PgDn keys. You can also go directly to a texture if you know its number. Hit the “G” key and enter the tile number. This will be more helpful later when you know where everything is.

Do the same for the other walls; or, if the same texture is to be used on all four walls (do this for now), simply point at the first wall (3D mode), hit the TAB key, point at other walls, and hit the ENTER key on each.

Select a texture for the ceiling and floor by first pointing to each in 3D and then hitting the “V” key just as you did with the walls. Again, the first screen will be the ceiling/floor textures already used in this level and, by hitting the “V” key a second time, you can get to all the textures.

Floor and ceiling texture sizes \*most\* be a factor of 8 pixels in size to look right. Most floor and ceiling textures are 64x64 or 128x128 pixels in size. You’ll notice a weird effect after selecting a texture that’s not proportioned correctly.

##### **3.1.2 Shading Textures**

Walls, ceilings, and floors can be shaded individually by pointing at each and hitting the numeric pad’s “-” and “+” keys in 3D mode. Shading a level can take tons of time and it is crucial to any good level to have good shading. Don’t spend too much time with it right now; you can fine tune the level later ;)

##### **3.1.3 Resizing Textures**

The size of a texture can be changed (X and Y repeats for walls, “expansion” and “compression” for floors and ceilings). Like shading, you shouldn’t do much more than play with this feature for now.

To change the size of wall textures, point at each in 3D mode and hit the numeric pad’s 2, 4, 6, and 8. You can see the texture expand and shrink. If you want to go back to the default repeat value, point at the wall and hit the “/” key. This will reset most of the wall’s attributes to their defaults.

The effect of the numeric pad’s “2”, “4”, “6”, and “8” keys can be incremented by a factor of four by holding the numeric pad’s “5” key down while hitting these keys.

To change the size of floor and ceiling textures, point at each and hit the “E” key. Floors and ceilings only have two sizes: “expanded” and “compressed” (the numeric pad’s keys will not function).

### 3.1.4 Panning Textures

Textures can be panned by pointing at them in 3D mode and hitting the Shift key and the numeric pad's "2", "4", "6", and "8". You'll see the texture shifting along in the direction of the numeric key. Similar to texture sizing, you can hold the numeric pad's "5" key down while hitting these keys to resize texture in increments of four.

You shouldn't need to play with this feature too much for now and I really only mention it early in case you've accidentally hit the numeric pad without the "Shift" key (resizing texture) and wondered what the heck happened to the texture.

### 3.1.5 Relative Textures (Floors/Ceilings)

A floor's/ceiling's texture can be oriented relative to a specific wall. This can get a little confusing and I suggest you put it off until later. When you've finished this section, go ahead and make a triangular sector and play with the floor's relative alignment by pointing at the floor near one of the walls (in 3D mode) and hitting the Alt-F keys. Go over to another wall and hit Alt-F again. ...cool, eh?

### 3.1.6 Parallax Floors and Ceilings

To make a ceiling texture look like an arching sky, point at it in 3D mode and hit the "P" key. Parallax skies usually need more than one texture, so notice that most textures won't look good when set to parallaxing; it's best to use the textures intended for parallaxing. Floors can also be parallaxed for a weird effect.

Things can get a little tricky once a ceiling or floor has been set to parallaxing. When you start adding more sectors to your level, especially ones that involve parallaxed ceilings/floors, some walls will disappear or look weird in 3D mode. It's hard to explain in text here, but you'll see what I mean and you'll see what to do to muscle your way through.

### 3.1.7 Orienting Walls to the Floor or Ceiling

Walls will either be oriented to the sector's floor or its ceiling. You can change the wall's orientation by pointing at it and hit the "O" key. The orientation of the wall determines whether the wall's tile moves with the floor or the ceiling. To play with this, simply point at a floor in your map and watch the wall as you raise and lower the floor with the PgUp/PgDn keys. Now point at the wall and hit the "O" key. Change the floor's elevation again and watch the wall. Notice that the wall tile moved with the floor in one case and didn't in the other. This will be more important when you start using moving sectors.

## 3.2 *Splitting and Removing Walls*

You can split a wall into two, smaller walls (for texture changes, shading, etc.) in 2D mode. To split an existing wall into two walls, point at the desired location along the wall and hit the Insert key. A new vertex will be added along the wall.

A split in a wall can be removed by dragging the undesired vertex to one of its neighbor vertices with the mouse's left button. This will remove the vertex and thus make a single wall of the original two.

## 3.3 *Resizing and Moving Sectors*

Remember, you can resize the sectors of your level in 2D mode and the left mouse button. Also, you can grab more than one vertex when doing this. Position the white arrow above and to the left of the desired group of vertices. Hold the Right-Shift key down and you'll see a white box grow and shrink as you move the mouse. Make a box big enough to surround all of the desired vertices and release the Right-Shift key. The selected vertices will all blink now and you can move them all by moving one. To un-select the vertices, simply hit the Right-Shift key again. Multiple sprites can be selected and moved like this, too.



You can move entire sector groups by Right-Shifting them, but be careful to notice that this moves the sector(s) by the vertices. If not all vertices are selected, then some of the sectors can get deformed and twisted.

If you want to move sectors without regard to their vertices, then you can can them with the Right-Alt key. A box similar to the Right-Shift selection one will appear. This box will be green.

You will have to play with the two selection features, Right-Shift and Right-Alt, to get a feel for their differences. Save this for later.

### **3.4 *Altering Floor and Ceiling Heights ...and Textures again***

You can raise and lower floors and ceilings by pointing at each, in 3D mode, and hitting the PgUp/PgDn keys. You can also, now, change the texture of the different floors and ceilings with the “V” key.

### **3.5 *Splitting, Joining, Adding, and Deleting Sectors***

We’re now ready to split, add, and delete sectors. From here you will be able to add rooms, windows, doors, whatever to your level. Most of this designing will be in 2D mode and keep Grid Locking “ON”.

#### **3.5.1 Splitting Sectors**

Let’s split our single-sectored level into a two-sectored room. Add a vertex to two of the opposing walls in the sector; that is, split two of the walls. Point at either of these two, new vertices and hit the Space bar.

You are in Line Drawing mode and should point the mouse at the other new vertex and hit Space bar. Your original sector is now split into two. Go ahead into 3D mode for a moment and play with the two different floors and ceilings.

#### **3.5.2 Joining Sectors**

You can join the two, new sectors back into their original single sector by pointing at one of the sectors in 2D mode and hitting the “J” key. Then, point to the second sector and hit the “J” key again.

#### **3.5.3 Adding a Sector**

In effect, we added a sector when we split the original sector just before. There are a few more ways that we can add sectors to our level. We can create a new, stand-alone sector independent of an existing one, we can add a new sector along the outside of an existing one, and we can make a sector inside an existing one.

##### **3.5.3.1 Adding an Independent Sector**

To add a new, independent sector to your level, simply follow the stages that you did above. You can decide to connect independent sectors later, if you wish.

##### **3.5.3.2 Adding an Extension Sector**

You can add a new extension to your level by starting Line Drawing at one of the vertices in 2D mode. Draw three lines, outside the original sector, with the third ending at the vertex on the original sector such that a square is made by the three new lines and one of the lines in the original sector.

Notice the line between the two vertices of the first sector has turned red indicating that it now separates two sector. The original single-room sector is now bigger and made of two sectors.

### **3.5.3.3 Adding a Sector within a Sector (island)**

Draw a sector within an existing sector the same way you did with the original sector. When the four walls are connected and the inner sector is established, it will be made of single-sided (white) walls. This means that the space inside the new sector is null and the original sector is now doughnut-shaped.

If you want to make an actual sector-in-a-sector, then position the mouse cursor inside the inner sector and hit Alt-Insert. This will change the inner sector into valid player space.

### **3.5.3.4 Adding a Sector within a Sector (peninsula)**

You will probably need to insert connection points for the new sector. Add the new sector by starting at one of the newly inserted vertices and drawing 3 lines inside the original sector, ending at the other newly added vertex. This new sector will automatically be made of double-sided lines and the new sector will be a valid sector.

## **3.5.4 Deleting a Sector**

You can delete a sector, in 2D mode, by placing the white arrow in it and hitting the Ctrl-Delete keys. Be careful! There is no “undo” feature in BUILD, so I usually do a quick Esc-and-Save before I delete sectors.

## **3.6 Incremental Backups of Your Level**

As your level gets bigger and more complicated, I highly recommend that you quit and save it in it's growing versions as you go. That is, quit BUILD with a save and then copy your level to a temporary file (LEVEL.001, LEVEL.002, ..., etc.). I usually make progressive, incremental backup copies of my level about once an hour. With these backup copies, not only can I backtrack to previous versions of a level if an idea goes bad, but I can also try different variations of the same level.

You should play with sectors now and get a good feel for their basic layout. Try adding rooms and hallways. Change some floor and ceiling heights. Play with the textures. Next we'll start adding sprites (weapons, goodies, bad guys, etc.) and you can actually “play” your level.

## **4. SPRITES**

Sprites are used for bad guys, weapons, ammo, goodies, switches, and decoration. You probably noticed while you were looking for wall textures before, that the art work for these things were there, too. When you start adding sprites, take a look around within the textures again; there are lots of sprites and they're often good for inspiring ideas for the level.

In 2D mode, sprites will appear as little dots with a tail. If the sprite has a name assigned to it, such as “shotgun”, this will be displayed if you are zoomed in enough. The tail of the sprite tells you its orientation. The sprite will point in the direction of the tail when it's initiated by the game.

### **4.1 Adding Sprites**

You will usually use 2D mode for sprite placement because it's more accurate and seems more convenient with a top view. Go to 2D mode, point at a place for the sprite and hit the “S” key. The “S” key will work in 3D mode in the same way - point at the spot on the floor or ceiling where you want the sprite and hit “S”.

Go to 3D mode and look at the sprite. If this is a new map, or at least one without any sprites, you'll see that ugly, brown texture. You can select the right texture for the sprite in the same way that you selected wall textures.

Point at sprite hit the “V” key. The first screen are the sprites already used in current map and hitting the “V” key again will show all the textures.

Use the arrow keys and PgUp/PgDn to move around the textures and hit Enter when you see the one you want.

You can leave the sprite on the floor or move it up and down with the PgUp/PgDn keys in 3D mode. Ctrl-PgUp and Ctrl-PgDn, while pointing at the sprite, will put the sprite directly on the ceiling or floor, respectively.

#### **4.1.1 Adding Weapons and Goodies**

You'll find all of the weapons, ammo, and goodies near the beginning of the texture set. Select one of these.

#### **4.1.2 Adding Bad Guys**

All of the bad guys are near the end of the textures set. You'll notice, when you find them, that all of the poses of each character is there. When placing a bad guy, ALWAYS make sure that you've selected the specific texture with the bad guy's name ("pigcop"). You'll see texture names at the bottom, right of the screen while you're viewing them ("V" key from 3D mode).

##### **4.1.2.1 Bad Guy Poses**

You will usually select the first sprite texture (called a "frame" because these frames are used to animate the bad guy within the game) for the bad guy. Again, this texture will always have the generic name of the bad guy. There are other textures for the bad guy that can be used, though, that give you control over its initial attack style and roaming capabilities. The second frame of most bad guys is called its "stayput". If you use this frame for the bad guy's sprite, then the actual bad guy in the game will stay in its sector and never leave it. This is great for setting up sniper bad guys or keeping them on roof tops.

There are other poses for various bad guys and you should take the time to check them. For instance, the Troopers can be started in their crouching pose and Pig Cops in their prone pose (great for behind-the-counter encounters). Troopers can also be started in their jet pack mode (death from above) and Liz Troopers in their leaping pose (always good for a jolt to the player).

### **4.2 Modifying Sprites**

#### **4.2.1 Resizing and Shading Sprites**

The size of the sprite can be changed by pointing at it in 3D mode and hitting the "2", "4", "6", and "8" keys on the numeric pad just the way you did to resize wall textures. You will probably want to resize most of the sprites to what looks good to you, but beware, always be consistent and keep all similar sprites the same size throughout the level.

You can also shade the sprite in 3D mode with the "-" and "+" keys on the numeric pad. It's usually a good idea to keep the shade setting at zero and let the sector's shade take control during the game. Then again, I do like to set the shade on goodies and weapons to their max (-127) so the player can see them from far away.

#### **4.3 Making Copies of Sprites**

If you want to make exact copies of a sprite, you can point at it in 3D mode, hit the TAB key and now, each time you hit the "S" key to add a sprite, it will generate a copy (size, shading, and all).

#### **4.4 Moving Sprites**

Sprites can be moved around the level in 2D mode by pointing at the sprite and holding the left mouse button down. Remember that more than one sprite can be selected with the Right-Shift keys.

#### **4.5 Deleting Sprites**

Sprites can be deleted in either 2D or 3D mode by pointing at it and hitting the Delete key.

#### **4.6 Flipping Sprites and Sprite Angles**

You can flip the sprite's texture in 3D mode by pointing at it and hitting the "F" key.

### **5. ADVANCED SECTOR STUFF**

As you start trying more difficult level designing, keep in mind that many of the things you want to do are already done in other levels. You should load some of our levels into BUILD and see how we did things. There are tons of tricks and neat things in BUILD, and I can't mention most of them here.

#### **5.1 Cut-and-Pasting Sectors**

You can cut-and-paste a sector or group of sectors. This can save you lots of time when making multiple copies of doors, elevators, and other sector gizmos. You can also grab sections of other levels and copy them into your current level.

##### **5.1.1 Within the Same Level**

Sector-select (Right-Alt key in 2D mode) the group of sectors that you want to copy. While the desired sectors are blinking green, point the mouse within the group and hold the left button down. (Be careful not to move the group while holding the mouse button down.) Hit the Insert key and the group of sectors will be copied. Keep the left mouse button depressed and move the new group of sectors to their new location. When the new group is relocated, hit the Right-Alt key again to un-select the group.

Notice that everything was copied: sprites, walls, tags, everything. You may have to re-assign switch tags and check weapons and goodies.

##### **5.1.2 Between Different Levels**

You can also copy sectors from one level to another. Grab and copy the group of sectors the same way as described above (Right-Alt select group in 2D mode, hit Insert key while holding left mouse button down over sector group). While the new, copied sector group is still blinking green, hit the Escape key and load in the second level. When it is loaded into BUILD, the copied sector group will be overlaid and you can re-position it.

It's always a good idea to do a quick Escape/Save after copying a group of sectors into another level. After copying and positioning the group, unselect it (Right-Alt) and save the level.

#### **5.2 Overlapping Sectors**

BUILD will let you overlap sectors and you can do some really cool things by doing so. We didn't have time to finish this section of the document before release, but some of the restrictions are:

- 1) You can never see 2 overlapping floors/ceilings in 3d mode. The sectors can be cut to get around this
- 2) Overlapping sectors can never share a double-sided (red) wall

## 6. MISCELLEANOUS

### 6.1 *Sector's "First" Wall and Relative Floors/Ceilings.*

The wall between the first two points of a sector is the sector's first wall. You can select the sector's first wall by pointing at the floor or ceiling, in 3D mode, just in front of the desired wall and hitting the Alt-F keys. More times than not, you will not need to re-assign sector first walls.

If you want to align the floor/ceiling textures along a specific wall, usually to make the pattern in the texture match the direction of the wall, you can make the floor/ceiling texture "relative". To toggle between relatively aligned textures and normally aligned textures, point at the floor or ceiling in 3D mode and hit the "R" key.

You may also want to make floors/ceilings relative when you start playing with moving sectors.

### 6.2 *Slopes.*

can slope with the "[" and "]" keys

can make a perfect match with the next sector's floor or ceiling with the Alt-[ and Alt-] keys.

### 6.3 *Multi-Player/Co-Op Start Points.*

Place Duke's first frame for each multi-player and co-op start position. There needs to be seven of each; the single-play start position will be used as one of the multi-play and one of the co-op start positions. That makes a total of eight start positions for each.

To identify co-op start positions from multi-play ones, give the co-op Duke sprites a low tag of 1.

For multiplayer, spread the starting positions around the level in good places where none of the players will have an advantage over the others (near a good weapon, etc.). For co-op, place all the player starts right near the single-play start position (brown arrow in 2D mode) so that the co-op team will be together at the start of the game.

### 6.4 *Multi-Play Weapons.*

palette shift to palette #1 (blue)

## 7. SECTOR EFFECTOR REFERENCE GUIDE

- 0 ROTATED SECTOR
- 1 PIVOT SPRITE FOR SE 0
- 2 EARTHQUAKE
- 3 RANDOM LIGHTS AFTER SHOT OUT
- 4 RANDOM LIGHTS
- 6 SUBWAY
- 7 TRANSPORT (UNDERWATER ST 1 or 2)
- 8 UP OPEN DOOR LIGHTS
- 9 DOWN OPEN DOOR LIGHTS
- 10 DOOR AUTO CLOSE (H=DELAY)
- 11 ROTATE SECTOR DOOR
- 12 LIGHT SWITCH
- 13 C-9 EXPLOSIVE
- 14 SUBWAY CAR
- 15 SLIDE DOOR (ST 25)
- 16 ROTATE REACTOR SECTOR
- 17 ELEVATOR TRANSPORT (ST 15)
- 19 SHOT TOUCHPLATE CIELING DOWN
- 20 BRIDGE (ST 27)

- 21 DROP FLOOR (ST 28)
- 22 PRONG (ST 29)
- 24 CONVAIRBELT
- 25 ENGINE
- 27 CAMERA FOR PLAYBACK
- 29 FLOAT
- 30 2 WAY TRAIN (ST=31)
- 31 FLOOR RISE
- 32 CEILING FALL
- 33 SPAWN JIB W/QUAKE
- 36 SKRINK RAY SHOOTER

### ***SE 0 : Rotate Sector***

Used to rotate a sector around a pivot point.

Hitag : Set equal to Hitag of SE 1 as pivot point for sector.

Sector Lotag : none

Angle : up = Rotate all points around SE 1.

down = Rotate sector around SE 1.

Shade : none

Palette : none

Comment:

If Relative alignment is set on the floor,( the R key ), then all sprites and actors on the floor will rotate with the sector

### ***SE 1 : Pivot for Rotate SE 0***

Used as a pivot point for Sector Effector 0 to rotate a sector around.

Hitag : Set equal to Hitag of all SE 0 to rotate.

Sector Lotag : none

Angle : up = Rotate clockwise

down = Rotate counter-clockwise

Shade : none

Palette : none

Comment :

### ***SE 2 : Earthquake***

Used to set off an earthquake. During the earthquake the screen will shake for about 4 seconds. The sector will move in the direction that the SE sprite is pointing. If there is a slope, then it will rise during the earthquake.

Hitag : none

Sector Lotag : none

Angle : Direction to move sector during earthquake.

Shade : none

Palette : none

Comment :

Must activate with Masterswitch. If there is a slope, then it will be made flat at pre-map and raised during the earthquake to a maximum height of 4 clicks.

### ***SE 3 : Random lights after shot out***

Used to create lighting effect when lights are shot out. It will also set the color of light when the light is on. Make the sector shade dark when the light is out and make the SE sprite shade bright when the light is on.

Hitag : Set equal to Wall Lotag with graphic of Light or

Set equal to Cieling Hitag with graphic of Light.

Sector Lotag : none

Angle : none

Shade : Set to brightness when light is on, set sector brightness to when light is off.

Palette : Set to Palette Lookup number when light is on.

Comment :

Can be used with SE 12 to be turned on and off with a light switch until the lights are shot out. The lights color is taken from the SE sprites Palette when the light is on, and the sectors palette when the light is off. Default is no color. e.g. palette = 0. Both the SE sprite and the sector can have different palettes.

### ***SE 4 : Random lights***

Used to make sector randomly flash in brightness. It will also set the color of light when the light is on. Make the sector shade dark when the light is off and make the SE sprite shade bright when the light is on.

Hitag : Set for Random Flash number.

Sector Lotag : none

Angle : none

Shade : Set to brightness when light is on, set sector brightness to when light is off.

Palette : Set to when light is on.

Comment :

Can NOT be used with SE 12 to be turned on and off with a light switch. The lights color is taken from the SE sprites Palette when the light is on, and the sectors palette when the light is off. Default is no color. e.g. palette = 0. Both the SE sprite and the sector can have different palettes.

### ***SE 5 : Reserved***

### ***SE 6 : Subway Engine***

Used as the Engine for a Subway. Use with SE 14 for multiple subway cars. Must be used with Locator Sprite to set track.

Hitag : Set equal to Locator Lotag for starting position.

Sector Lotag : none

Sector Hitag : All sectors within Car sector must be equal.

Angle : Set for direction of Subway.

Shade : none

Palette : none

Comment :

Set relative align on sector floor, (R key), to make sprites move. If a Locator has a Hitag of 1, then the Subway will stop at that locator for 5 seconds then continue.

### ***SE 7 : Transport / Water***

Used as Teleporter and Water Effect.

Hitag : Set equal to one other SE 7 to Transport to.

Sector Lotag : 0 = Teleporter.

1 = On top of water.

2 = Underwater

Angle : none

Shade : none

Palette : 0 = Water

8 = Green Slime

Comment :

If the Sector Effector Sprite is off the ground, then you will only teleport when dukes waist is at the same height as the sprite and in the same sector. When using with Sector Lotag 1 and 2 as water, the two sectors must be exactly the same size or you will teleport to death.

### ***SE 8 : Up Open Door Lights***

Used to light up a room when a door is opened.

Hitag : Set equal to all other SE 8 used together.

Sector Lotag : Use with any that raises the ceiling. ex: Sector Lotag 20

Angle : none

Shade : Set to brightness when light is on, set sector brightness to when light is off.

Palette : none

Comment :

At least one SE 8 with equal Hitag must be in a sector in which the ceiling rises.

### ***SE 9 : Down Open Door Lights***

Used to light up a room when a light comes down from the ceiling.

Hitag : Set equal to all other SE 9 used together.

Sector Lotag : Use with any that lowers to floor. ex: Sector Lotag 21

Angle : none

Shade : Set to brightness when light is on, set sector brightness to when light is off.

Palette : none

Comment :

At least one SE 8 with equal Hitag must be in a sector in which the floor rises.

### ***SE 10 : Door Auto Close***

Used to automatically close a door after a set delay.

Hitag : Delay until door closes. ex: 128 equals 4 seconds.

Sector Lotag : Use with all door Sector Lotags

Angle : none

Shade : none

Palette : none

Comment :

### ***SE 11 : Rotate Sector Door***

Used as a door that rotates 90 degrees when activated.

Hitag : none

Sector Lotag : 23

Angle : none

Shade : none

Palette : 0 = clockwise

1 = Counter-clockwise

Comment :

Will also activate other SE 11 with equal Hitag values.

### ***SE 12 : Light Switch***

Used light up a sector when activated with a switch.

Hitag : Set equal to all other SE 12 used together

Sector Lotag : none

Angle : none

Shade : Set to brightness when light is on, set sector brightness to when light is off.

Palette : Set to when lights are on.

Comment :

The lights color is taken from the SE sprites Palette when the light is on, and the sectors palette when the light is off. Default is no color. e.g. palette = 0. Both the SE sprite and the sector can have different palettes.



### ***SE 13 : C-9 Explosive***

Used to blow apart the ceiling and floor of a sector to create holes in walls

Hitag : Set equal to SEENINE, OZCAN, or CRACK sprites to activate

Sector Lotag : none

Angle : up = both ceiling and floor come together at Pre-map.

down = Only the ceiling or the floor matches height with the

SE sprite depending on which one is closest.

Shade : none

Palette : none

Comment :

Can be activated by a Masterswitch with equal Hitags. If the ceiling has a Sky texture without Parallax set, then the tile will be replaced at Pre-map with the closest non-Sky texture. When it explodes, the sky will change to Parallax.

### ***SE 14 : Subway Car***

Used as the Car for a Subway. Use with SE 6 for Subway engine. Must be used with Locator Sprite to set track.

Hitag : Set equal to Locator Lotag for starting position.

Sector Lotag : none

Sector Hitag : All sectors within Car sector must be equal.

Angle : Set for direction of Subway.

Shade : none

Palette : none

Comment :

Set relative align on sector floor, (R key), to make sprites move. If a Locator has a Hitag of 1, then the Subway will stop at that locator for 5 seconds then continue.

### ***SE 15 : Slide Door***

Used as a door that slides when opened.

Hitag : Set equal to other doors to be opened at same time.

Sector Lotag : 25

Angle : Set to direction when door is closed.

Shade : none

Palette : none

Comment :

Speed Sprite sets distance to door to open. Check !SE.map on how to build. Use MusicSFX sprite for sound.

### ***SE 16 : Reserved***

### ***SE 17 : Elevator Transport***

Used as an Elevator that transports from one elevator shaft to another to simulate going straight up from one floor to another.

Hitag : Equal to one other SE 17.

Sector Lotag : 15

Sector Hitag : 0 = Bottom Floor

1 = Top Floor

Angle : none

Shade : Darkest shade of the two SE 17 with equal Hitag is the starting floor for the elevator.

Palette : none

Comment :

Top and Bottom floors must be physically built at proper height difference to work properly. Both Elevators must be Exactly the same size.

### ***SE 18 : Reserved***

### ***SE 19 : Shot Touchplate Ceiling Down***

Used to close ceiling when a shot or explosion hits within the sector.

Hitag : Equal to others to activate at same time.

Sector Lotag : none

Angle : none

Shade : none

Comment :

Does not check to when a shot or object passes through the sector. Use MusicSFX sprite for sound.

### ***SE 20 : Bridge***

Used to stretch a sector when activated.

Hitag : none

Sector Lotag : 27

Angle : Set to direction to stretch sector.

Shade : none

Comment :

Set relative alignment, (R key), on sector to move floor. Use Speed sprite for distance.

### ***SE 21 : Drop Floor***

Used to make a floor or ceiling drop to the height of the SE sprite when activated by a Masterswitch.

Hitag : Set equal to others that activate at same time.

Sector Lotag : 28

Angle : up = Drop Ceiling

down = Drop Floor

Shade : none

Comment:

Floor or Ceiling matches height of SE sprite at Pre-map then drops to set position when activated.

To do opposite, the SE sprite height must be put into sector.

### ***SE 22 : Prong***

Used as Door inside Teeth Prongs.

Hitag : Set equal to Hitag of Sector Lotaged 29.

Sector Lotag : 0, Outside Sector Lotag of 29

Angle : none

Shade : none

Comment:

This Effector was not tested in the, game so use at your own risk. It may cause problems in multi-play. :See !SE.MAP for usage.

### ***SE 23 : Reserved***

### ***SE 24 : Convairbelt***

Used to move sprites along the floor like a convairbelt.

Hitag : Set equal to a switch to turn on and off.

Sector Lotag : none

Angle : Set to direction to move sprites.

Shade : none

Comment:  
Set relative alignment (R key) on sector floor to move sprites.  
Set Speed sprite equal to rate of movement.

### ***SE 25 : Engine Piston***

Used as a Piston that only goes up and down.  
Hitag : none  
Sector Lotag : none  
Angle : none  
Shade : none  
Comment:  
Put SE sprite height to starting position of Piston.  
Speed sprite equals rate of movement.

### ***SE 26 : Reserved***

### ***SE 27 : Camera for Playback***

Used as a camera position to view playback of game Demos.  
Hitag : Set to maximum distance for the camera to view the action of other players. e.g. 2048 equals largest grid in build.  
Sector Lotag : none  
Angle : none  
Shade : none  
Comment:  
Camera does not always work well with extreme heights.

### ***SE 28 : Reserved***

### ***SE 29 : Floating Sector***

Used to make sector float like water or waves.  
Hitag : Set to starting height of sector. 0-2047  
Sector Lotag : none  
Angle : none  
Shade : none  
Comment:  
Use Speed sprite to set height of wave.  
To use as a wave, the sector must only be made of 4 lines. Set one wall as first wall (alt-f) next to another sector with a SE 29 sprite in it to create a wave.

### ***SE 30 : 2 Way Train***

Used as a Train car that only goes back and forth from point A to point B.  
Hitag : Set equal to a switch to activate.  
Sector Lotag : 31  
Angle : Set to direction of front of Car.  
Shade : none  
Comment:  
Use with 2 Locator sprites to define track.  
Activator with equal hitag+1 activates when car stops at point A. Activator with equal hitag+2 activates when car stops at point B.

### ***SE 31 : Floor Rise***

Used to rise or lower sector floor when activated by an Activator or Masterswitch.

Hitag : none  
Sector Lotag : none  
Angle : up = Start sector heigth equal to SE sprite heigth at Pre-map.  
Down = Rise sector to SE sprite heigth when activated.  
Shade : none  
Comment:  
Use Speed to set rate of rise.  
Use MusicSFX sprite for sound.

### ***SE 32 : Ceiling Fall***

Used to rise or lower sector Ceiling when activated by an Activator or Masterswitch.  
Hitag : none  
Sector Lotag : none  
Angle : up = Rise sector to SE sprite heigth when activated.  
down = Start sector heigth equal to SE sprite heigth at Pre-map.  
Shade : none  
Comment:  
Use Speed to set rate of rise.  
Use MusicSFX sprite for sound.

### ***SE 33 : Spawn Earthquake Jibs***

Used to spawn pieces of metal and rock from SE sprite during an Earthquake.  
Hitag : none  
Sector Lotag : none  
Angle : none  
Shade : none  
Comment:  
Jibs will be spawned whenever a earthquake anywhere on the map.

### ***SE 34 : Reserved***

### ***SE 35 : Reserved***

### ***SE 36 : Spawn Shot***

Used to Spawn a shot every 5 seconds when activated by a Masterswitch.  
Hitag : none  
Sector Lotag : none  
Angle : Set to direction to shoot.  
Shade : none  
Comment:  
Once activated, it will never stop shooting.  
Use Speed sprite to set object to shoot. e.g. 2556=Shrink Ray, 2605=RPG, 1650=Morter,  
1625=Trooper Laser, 1636=Lizman Spit

## **8. SPECIAL SPRITE REFERENCE GUIDE**

SECTOREFFECTOR : Sprite #1  
ACTIVATOR : Sprite #2  
TOUCHPLATE : Sprite #3  
ACTIVATORLOCKED : Sprite #4  
MUSICANDSFX : Sprite #5  
LOCATORS : Sprite #6  
CYCLER : Sprite #7

MASTERSWITCH : Sprite #8  
RESPAWN : Sprite #9  
GPSPEED : Sprite #10  
ACCESSSWITCH : Sprite #130  
SWITCH : Sprite #132 and all other SWITCHs  
NUKEBUTTON : Sprite #142  
MULTISWITCH : Sprite #146  
DOORTILE5 : Tile #150 and all other DOORTILES  
DIPSWITCH : Sprite #162  
VIEWSCREEN : Sprite #502  
CRACK1 : Sprite #546 and all other CRACKs  
MIRROR : Tile #560  
CAMERA1 : Sprite #621  
CANWITHSOMETHING : Sprite #1232  
SEENINE : Sprite #1247  
FEMPIC1 : Sprite #1280  
APLAYER : Sprite #1405

### **SECTOREFFECTOR : Sprite #1**

The Sector Effector Sprite is used to create game effects and manipulate Sector attributes. The SE is the main tool to create effects such as Earthquakes, Explosions, and Lighting Effects. Place a Sprite #1 in the sector to effect.

Lotag : See !SE.TXT for details

Hitag : Set equal to other SE Sprites with same Lotag to activate together. See !SE.TXT for more details.

Comments:

Multiple SE Sprites can be used in a Sector to create different effects.

### **ACTIVATOR : Sprite #2**

The Activator Sprite is used with Switchs or the TOUCHPLATE Sprite to activate the Sector Lotag function or any Sector Effectors within the Sector.

Lotag : Set equal to a Switch Lotag or a TOUCHPLATE Lotag

Hitag : none

### **TOUCHPLATE : Sprite #3**

The Touchplate will activate an ACTIVATOR or a MASTERSWITCH Sprite when the player walks on the sector floor.

Lotag : Set equal to an ACTIVATOR or MASTERSWITCH Lotag.

Hitag : 0 = Activate touchplate everytime player walks on the sector.

HiTag >0 = The touchplate will only activate this many times when the player walks on the sector then never again.

### **ACTIVATORLOCKED : Sprite #4**

The Activatorlocked Sprite will lock the sectors Lotag function so it can not be activated by the player until it is unlocked with a switch.

Lotag : Set equal to a Switchs Lotag to be toggled Locked and Unlocked.

Hitag : none.

### **MUSICANDSFX : Sprite #5**

The Music and Sound Effects Sprite can be used 3 ways.

1. Activation Sound :

When used in a sector with a Lotag, it will play a sound when the sectors Lotag function is activated.

Lotag : Sound number.

Hitag : none.

2. Ambient Sound :

When used in a sector with no Lotag, it will play an ambient sound.

Lotag : Ambiente Sound.

Hitag : Max distance the sound can be heard. e.g. 1024 equals the largest grid square in build.

3. Echo Effect :

When used in a sector with no Lotag, it will cause all sounds to have a echo effect.

Lotag : 1000 + the amount of echo from 0-255.

Hitag : Max distance the sound can be heard. e.g. 1024 equals the largest grid square in build.

### **LOCATORS : Sprite #6**

The Locator Sprite can be used to define a track for a Subway (SE 6 & SE 14) or to define a path for PigCop Recon Cars but not both in the same map. Plus you can only have one path defined in a map.

Lotag : Set in an increasing order starting from 0 with no gaps in the count for all the LOCATOR Sprites in the map. When the Subway or PigCop Recon Car reaches the last LOCATOR Sprite, it will loop back to the LOCATOR Sprite with Lotag 0.

Hitag : If set to 1, then the Subway will stop the LOCATOR Sprite location for 5 seconds, then continue to the next LOCATOR. The PigCop Recon Car is not effected.

### **CYCLER : Sprite #7**

The Cycler Sprite is used to make the Sector Floor, Walls, and Ceiling pulsate in brightness.

Lotag : Set the offset of how bright it will start.

Hitag : none

Palette : Set to a color if needed.

Shade : Set to how bright the sector will get. Set the sector brightness to how dark it will get.

### **MASTERSWITCH : Sprite #8**

The Master Switch Sprite is used to activate a Sector Lotag or an Sector Effector Sprite after a time delay. This can only be activated by a TOUCHPLATE Sprite.

Lotag : Set equal to a TOUCHPLATE Sprite Lotag to be activated by.

Hitag : Set for time delay until activation of Sector Tag or Sector Effector Sprite.

### **RESPAWN : Sprite #9**

The Respawn Sprite is used to Teleport in Actors and Items when activated by a TOUCHPLATE Sprite.

Lotag : Set equal to TOUCHPLATE Sprite Lotag to be activated by.

Hitag : Set equal to any Sprite Number that have a name with it in Build or Editart.

### **GPSPEED : Sprite #10**

The GPSpeed Sprite is used to define the rate of movement for such things as Sector Tag 20 (Ceiling Door) and Sector Effector 0(Rotate Sector). See !SE.TXT and !ST.txt for more details.

Lotag : Set to rate.

Hitag : None.

### **ACCESSSWITCH : Sprite #130**

The Access Switch is used to unlock or activate something when used with a Key Card. Use the Palette to define what card to use.

Lotag : Set equal to ACTIVATOR or ACTIVATORLOCKED Sprite Lotag to use.

Hitag : Set to play sound when activated.

Palette : 0 = Blue card, 21 = Red card, 22 = Yellow card

### ***SWITCH : Sprite #132 and all other SWITCHs***

The Switch is used to unlock or activate something when activated by space key.

Lotag : Set equal to ACTIVATOR or ACTIVATORLOCKED Sprite Lotag to use.

Hitag : Set to play sound when activated.

Palette : 0 = Normal play, 1 = Multi-play only

### ***NUKEBUTTON : Sprite #142***

The Nuke Button is used to End a level and goto the stat screen. It can also be used to goto a bonus level.

Lotag : Set to 32767 to end a level and goto stat screen, Set to 1-11 to goto a bonus level in the same volume.

Hitag : none.

Palette : 0 = Default, 14 = Bonus Level.

### ***MULTISWITCH : Sprite #146***

The Multi Switch can activate 4 multiple ACTIVATOR Sprites. It uses 4 consecutive Lotags to activate each ACTIVATOR. When first switched, it activates ACTIVATOR Sprites A and D.

The next time it activates ACTIVATOR Sprites B and A. etc.. C and B.. D and C.. then A and D again.

Lotag : Set equal to ACTIVATOR Sprites A,B+1,C+2,D+3

Hitag : none.

### ***DOORTILE5 : Tile #150 and all other DOORTILEs***

The Door Tiles can be used to activate ACTIVATOR Sprites when the player presses upon the wall.

Wall Lotag : Set equal to ACTIVATOR Sprite Lotag to activate.

Wall Hitag : none.

### ***DIPSWITCH : Sprite #162***

The Dip Switch is used as a combination switch with a ACTIVATOR or ACTIVATORLOCKED Sprite. All DIPSWITCH Sprites with equal Lotags will be used for the combination.

Lotag : Set equal to ACTIVATOR or ACTIVATORLOCKED Sprite Lotag.

Hitag : 0 = set to off, 1 = set to on.

### ***VIEWSCREEN : Spirte #502***

The View Screen is used to view through Cameras (Sprite # 621) placed around the map. It will view through all Cameras with equal Lotags.

Lotag : none.

Hitag : Set equal to CAMERA1 Sprites #621.

### ***CRACK1 : Sprite #546 and all other CRACKs***

The Crack Sprite is used to activate explosions,(SE 13) and other effects.

Lotag : none.

Hitag : Set equal to SE 13 Hitag to activate. See !SE.TXT for more details.

Palette : Set to 1 for Multi-play mode only.

### ***MIRROR : Tile #560***

The Mirror tile is used to place a mirror in the map. To use it you must make a one-way wall (1 key in build). Put tile #560 on that wall. The sector behind the mirror must be the size of every space that can be seen in the mirror or problems will acure.

### ***CAMERA1 : Sprite #621***

The Camera Sprite is used to be able to view through using the VIEWSCREEN Sprite.

Lotag : Set equal to the VIEWSCREEN Sprite Lotag to be viewed through.

Hitag : Set to amount of turning radius. 0 equals none.

Shade : Set to angle of facing down.

Angle : Set to direction to point.

### ***CANWITHSOMETHING : Sprite #1232***

The Can with something is used to spawn an object when it is shot.

Lotag : Set to Sprite number with a name in build or editart to spawn when shot.

### ***SEENINE : Sprite #1247***

The Seenine Sprite is used to activate explosions,(SE 13) and other effects. It can also be used to time delay explosions.

Lotag : Set equal to time delay until explosion.

Hitag : Set equal to SE 13 Hitag to activate. See !SE.TXT for more details.

Size : If the Sprite is shrunk in the x direction, then the sprite will not be seen in the game, but the explosion will.

### ***FEMPIC1 : Sprite #1280***

The Fem Pics are used to activate the RESPAWN Sprite to spawn in any Sprite with a name in Build or Editart.

Lotag : none.

Hitag : Set equal to RESPAWN Sprite to activate.

### ***APLAYER : Sprite #1405***

The APlayer Sprite is used to define where all multi-players will start in the map. You must have a minimum of 7 Sprites in the map for an 8 player multi-play game and a minimum of 7 Sprites in the map for an 8 player Coop game.

Lotag : 0 = Multi-player start position, 1 = Coop-player start position

## **9. SECTOR TAGS REFERENCE GUIDE**

1	WATER (SE 7)
2	UNDERWATER (SE 7)
9	STAR TREK DOORS
15	ELEVATOR TRANSPORT (SE 17)
16	ELEVATOR PLATFORM DOWN
17	ELEVATOR PLATFORM UP
18	ELEVATOR DOWN
19	ELEVATOR UP
20	CEILING DOOR
21	FLOOR DOOR
22	SPLIT DOOR
23	SWING DOOR
25	SLIDE DOOR (SE 15)
26	SPLIT STAR TREK DOOR
27	BRIDGE (SE 20)
28	DROP FLOOR (SE 21)
29	TEETH DOOR (SE 22)
30	ROTATE RISE BRIDGE
31	2 WAY TRAIN (SE=30)
10000+	1TIME SOUND



32767     SECRET ROOM  
65535     END OF LEVEL

### ***ST 1 : Water***

Used as Water Effect when the player walks on sector. If used with a SE 7 (Transport) sprite, then it will move the player to the underwater sector with ST 2.

Definition : SE 7 : Transport Underwater

Hitag : Set equal to one other SE 7 to Transport to.

Sector Lotag : 0 = Teleporter, 1 = On top of water, 2 = Underwater

Angle : none

Shade : none

Palette : 0 = Water, 8 = Green Slime

When using with Sector Lotag 1 and 2 as water, the two sectors must be exactly the same size or you will teleport to death.

### ***ST 2 : Underwater***

Used as Underwater Effect when the player moves in sector. If used with a SE 7 (Transport) sprite, then it will move the player to the underwater sector with ST 1.

Definition : SE 7 : Transport Underwater

Hitag : Set equal to one other SE 7 to Transport to.

Sector Lotag : 0 = Teleporter, 1 = On top of water, 2 = Underwater

Angle : none

Shade : none

Palette : 0 = Water, 8 = Green Slime

When using with Sector Lotag 1 and 2 as water, the two sectors must be exactly the same size or you will teleport to death.

### ***ST 9 : Star Trek Doors***

Doors that spread apart when opened like on Star Trek. Note that the wall tile on the doors will squish when opened.

Use MUSICANDSFX Sprite Lotag for door open sound.

Use SPEED Sprite Lotag for opening speed.

### ***ST 15 : Elevator Transport***

Used as an Elevator that transports from one elevator shaft to another to simulate going stright up from one floor to another.

Maximum of 2 floors.

Sounds are set automatically

### ***Definition : SE 17 : Elevator Transport***

Hitag : Equal to one other SE 17.

Sector Lotag : 15

Sector Hitag : 0 = Bottom Floor

1 = Top Floor

Angle : none

Shade : Darkest shade of the two SE 17 with equal Hitag is the starting floor for the elevator.

Palette : none

Top and Bottom floors must be physically built at proper height difference to work properly.

Both Elevators must be Exactly the same size.

### ***ST 16 : Elevator Platform Down***

Used to Lower the Sector Floor from current Height Down to the next Sector of lower height. On next activation, the sector floor will rise up to the next Sector.

Use MUSICANDSFX Sprite Lotag for Sound.  
Lotag = Start sound.  
Hitag = Stop Sound.  
Use SPEED Sprite Lotag for rate of movement.

### ***ST 17 : Elevator Platform Up***

Used to Raise the Sector Floor from current Height Up to the next Sector of higher height. On next activation, the sector floor will drop down to the next Sector.

Comment:

Use MUSICANDSFX Sprite Lotag for Sound.  
Lotag = Start sound.  
Hitag = Stop Sound.  
Use SPEED Sprite Lotag for rate of movement.

### ***ST 18 : Elevator Down***

Used to Lower the Sector Floor and Ceiling from current Height Down to the next Sector of lower height. On next activation, the sector floor and ceiling will rise up to the next Sector.

Comment:

Use MUSICANDSFX Sprite Lotag sound.  
Lotag = Start sound.  
Hitag = Stop Sound.  
Use SPEED Sprite Lotag for rate of movement.

### ***ST 19 : Elevator Up***

Used to Raise the Sector Floor and Ceiling from current Height Up to the next Sector of higher height. On next activation, the sector floor and ceiling will drop down to the next Sector.

Comment:

Use MUSICANDSFX Sprite Lotag for Sound.  
Lotag = Start sound.  
Hitag = Stop Sound.  
Use SPEED Sprite Lotag for rate of movement.

### ***ST 20 : Ceiling Door***

Used to Raise and Lower the Sector Ceiling from level with the sector floor up to the height of the next sector ceiling height.

Comment:

Use MUSICANDSFX Sprite Lotag for Open and Close Sound.  
Use SPEED Sprite Lotag for rate of movement.  
Use SE 10 to make the door auto-close.

### ***ST 21 : Floor Door***

Used to Raise and Lower the Sector Floor from level with the sector ceiling down to the height of the next sector floor height.

Comment:

Use MUSICANDSFX Sprite Lotag for Open and Close Sound.  
Use SPEED Sprite Lotag for rate of movement.  
Use SE 10 to make the door auto-close.

### ***ST 22 : Split Door***

Used to Raise and Lower the Sector Floor and Ceiling from level with the next sector floor and ceiling, then together until the floor and ceiling match height.

Comment:

Use MUSICANDSFX Sprite Lotag for Open and Close Sound.

Use SPEED Sprite Lotag for rate of movement.  
Use SE 10 to make the door auto-close.

### ***ST 23 : Swing Door***

Used as doors that swing the sector 90 degrees when activated. Note that you can activate multiple ST 23 by giving the ST 11 Sprite Hitag equal values.

Comment:

Use MUSICANDSFX Sprite Lotag and Hitag to door open and close sound.

### ***Definition : SE 11 : Rotate Sector Door***

Hitag : none

Angle : up = clockwise

down = counter-clockwise

Shade : none

Palette : none

Comment :

Sector will also rise to height of Sector Effector Sprite if it is off the floor.

### ***ST 24 : Reserved***

### ***ST 25 : Slide Door***

Used as a door that slides when opened.

Definition : SE 15 : Slide Door

Hitag : Set equal to other doors to be opened at same time.

Angle : Set to direction when door is closed.

Shade : none

Palette : none

Comment :

Speed Sprite sets distance to door to open.

Check !SE.map on how to build.

Use MusicSFX sprite for sound.

### ***ST 26 : Split Star Trek Door***

Used to do the effects of both ST 9 (Star Trek Door) and ST 22 (Split Door). Doors will spread apart when opened like on Star Trek. Note that the wall tile on the doors will squish when opened. And will also Raise and Lower the Sector Floor and Ceiling from level with the next sector floor and ceiling, then together until the floor and ceiling match height.

Comment:

Use MUSICANDSFX Sprite Lotag for Open and Close Sound.

Use SPEED Sprite Lotag for rate of movement.

Use SE 10 to make the door auto-close.

### ***ST 27 : Bridge***

Used to stretch a sector when activated.

Hitag : none

Sector Lotag : 27

Angle : Set to direction to stretch sector.

Shade : none

Comment :

Set relative alignment, (R key), on sector to move floor.

Use Speed sprite for distance.

### ***ST 28 : Drop Floor***

Used to make a floor or ceiling drop to the height of the SE sprite when activated by a Masterswitch.

Hitag : Set equal to others that activate at same time.

Sector Lotag : 28

Angle : up = Drop Ceiling

down = Drop Floor

Shade : none

Comment:

Floor or Ceiling matches height of SE sprite at Pre-map then drops to set position when activated.

To do opposite, the SE sprite height must be put into sector.

### ***ST 29 : Teeth Door***

### ***ST 30 : Rotate Rise Door***

Used to rotate the sector floor 90 degrees and rise to the height of the SE 0 Sprite. Use SE 1 as the Pivot point for the sector.

Comment:

Use MUSICANDSFX Sprite Lotag for sound.

Use SPEED for rate of turning.

Use SE 0 Sprite Palette for direction.

Palette 0 = clockwise

Palette 1 = counter-clockwise

### ***ST 31 : 2 Way Train***

Used as a Train car that only goes back and forth from point A to point B.

Hitag : Set equal to a switch to activate.

Sector Lotag : 31

Angle : Set to direction of front of Car.

Shade : none

Comment:

Use with 2 Locator sprites to define track.

Activator with equal hitag+1 activates when car stops at point A.

Activator with equal hitag+2 activates when car stops at point B.

### ***ST 10000+ : 1 Time Sound***

Used to play a sound one time when the player walks on the sector floor. Tag the sector Lotag with (10000 + sound number).

### ***ST 32767 : Secret Room***

Use Sector Lotag of 32767 to tag as a secret place to be counted at the end of level stats.

### ***ST 65535 : End of Level***

Used to end the level when the player walks on the sector floor.

## **10. BUILD KEYBOARD COMMANDS**

### ***BUILD EDITOR INTRODUCTION:***

There are 2 modes in the BUILD editor:

- 3D EDIT MODE (Same as PLAY MODE but with a mouse cursor)

- 2D EDIT MODE (The overhead map of the board with an arrow showing your position and angle and a mouse cursor)

It is essential that you use both editor modes:

Use the 3D EDIT MODE to change the attributes of a sector, wall, or sprite such as:

Tile number	Tells which picture in the artwork file goes on the object. Press V to change.
Shade	The shade of the object. Press +/- to change.
Repeating	The “smooshiness” of a wall. Also for sprites. Press keypad 2,4,6,8 to change.
Panning	The starting offset into the tile graphics. Press Shift + keypad 2,4,6,8 to change.
Height	For ceilings, floors, and sprites. Press PGUP or PGDN to change.

and there are a few other special attributes.

Use the 2D EDIT MODE to add, delete, or change the shape of sectors.

To switch between the two EDIT MODES, press the keypad enter key.

### 3D EDIT MODE KEYS

ESC	Quit
keypad ENTER	Flip to the 2D overhead editor
Mouse	Move mouse cursor
Arrows	Move you in the appropriate directions
Caps Lock	switch between the 3 different Z coordinate modes: Game mode (default), Height lock mode, Float mode. A and Z move up and down for all 3 modes.

Note: For the following keys, it is important to move the mouse cursor to the right position before using them. Also, if you hold down the first mouse button, then the item under the mouse cursor will be locked as the highlighted object while the button is held down. This is useful for the PGUP/DN keys, when different objects come into view even without moving your coordinates or the mouse cursor.

There are 4 basic types of objects that can be worked with in this part of the editor: WALLS, CEILINGS, FLOORS, and SPRITES.

PGUP/DN	Raise or Lower a ceiling or floor. (If a wall is selected, the ceiling of that sector will move) Also, if you did a sector highlight in 2D EDIT MODE, you can raise / lower multiple sectors at a time.
Ctrl-PGUP/DN	For sprites only, puts sprites exactly on the floor or exactly on the ceiling.
V	Tile selection - use arrow keys to move around. Press ENTER to change the object to the highlighted piece of artwork, or press ESC to cancel without changes made.
ALT-V	Height selection - works just like V, but this selects the ground draw height map.
2,4,6,8 (keypad)	Repeat values (smooshiness of the sizes of pixels) - think of these keys as arrow keys controlling the bottom right corner of the bitmap. Normally, this is used for walls and sprites. If you select a floor or ceiling, all the walls in that sector will be affected. Perhaps this can be used to make sprites grow and shrink as they get healthy or hurt.
Shift +2,4,6,8 (keypad)	Panning values (offset into the tile) - These keys are useful when the you want a long wall to look continuous when they normally would not look continuous.
/	Use this key to reset the panning values (if you're lost!)
5 (keypad)	If you hold down this key down in addition to the 2,4,6,8 keys (keypad), the values will align at multiples of 8.
>	This key attempts to match up all the tiles along a wall. It scans along the walls towards the right as long as the picture number of the next wall is the same as the original picture number. Note that some walls may not work right, especially floor / ceiling steps.

F	Flip an object. For sprites and walls, this flips the object x-wise. For ceilings and floors, the objects are flipped in 8 possible ways. Just keep pressing 'F' to go through the 8 ways.
ALT-F	When you use relative alignment mode on ceiling and floor textures, you can press Alt-F on the ceiling or floor to choose a new wall to align to. It actually rotates the walls of a sector by 1.
O	Wall orientation (whether it starts from the top or bottom) Normally, walls are oriented from the top. For example, if you hold down 2/8 on the keypad in 3D EDIT MODE, the wall always starts from the top. Orientation works differently for white lines and red lines, so if a wall doesn't look right, just press 'O' anyway to see if it get fixed.

## COPY & PASTE

TAB	COPY. Copy the attributes of the highlighted objects into a temporary place. The attributes it remembers are: tile, shade, x-repeat, y-repeat, and cstat values.
Left ENTER	PASTE. Paste the stored attributes over the highlighted object. Whenever you press ENTER, the y-repeat values stay the same, and the x-repeat values are adjusted so the pixels of the bitmaps have a square-aspect ratio.
Ctrl+L.ENTER	Left ENTER with the ctrl key will paste the attributes to every wall in a loop (if a wall is highlighted).
Shift+L.ENTER	Left ENTER with the shift key also pressed copies the shade only.
Ctrl+Shift+L.ENTER	Auto-shade a sector. First make any wall of the loop as light as the lightest shade you want. Then make any other wall of the loop as dark as the darkest shade you want. Finally press Ctrl-Shift Enter on the wall that should be lightest. Now the loop should be smoothly shaded. If it is not smoothly shaded, you may need to insert more points on the walls.

## SECTOR FLAGS:

P	Make the ceiling of the given sector have a Parallaxing sky or just a normal ceiling.
G	Make the floor of the given sector have a Groudraw (floor with height mapping). I do not recommend using this attribute very extensively yet. (See the H key for selecting the height map)
E	An option for ceilings and floors. If for some reason, you want a tile to be smooshed into the normal 64*64 area, press E to unExpand the tile. Press E again, and the tile will be expanded, so the pixel size is the same as the normal 64*64 ceiling/floor.
R	Relative alignment - switch between relative alignment mode and normal mode. Allows floor / ceiling textures to align to the first 2 points of a sector. Textures will rotate/pan with moving sectors properly. Notice that bit 6 of both sector[].ceilingstat and sector[].floorstat are relative alignment bits.

## WALL FLAGS:

B	Make an invisible wall, such as a window, block you from going through. Since the wall is invisible, you can also highlight the ceiling right above the window or floor right below the window. You can block either the front or the back of the window. If you block the back only, you will be able to go onto the window sill.
T	Press to make a maskable wall 50/50 translucent. Press T again to put the masked wall back to normal mode.
M	Make a maskable wall. Press in the same place you press 'B'. The masking wall takes all its attributes from the front of the wall, so it must have the same repeat, panning, and cstat values as the walls above or below it (if you have a step). The masking picture number is stored in overpicnum. Also, the masking walls is also automatically added to the other side of the wall, with the picture flipped. (see the 'F' key description above)

Shift + M	Make a maskable wall just like 'M' described above, but only on the front side.
1	Make a 1-way wall.
2	Some walls have two different sections. One step on the ceiling and one step on the floor. Normally they always have the same attributes. It is possible though, to give both the top and bottom different attributes by pressing 2 on that wall. 2 simply makes the bottom wall's attributes separately editable. Press 2 on either the top or bottom wall.
O	Wall orientation (whether it starts from the top or bottom) Normally, walls are oriented from the top. For example, if you hold down 2/8 on the keypad in 3D EDIT MODE, the wall always starts from the top. Orientation works differently for white lines and red lines, so if a wall doesn't look right, just press 'O' anyway to see if it get fixed.
H	Toggle hitscan pass through bit. Default is pass through.

## SPRITE FLAGS:

B	When the mouse cursor is on a sprite, this makes a sprite block you from walking through. Also makes the sprite sensitive to hitscan. Sprites with the 'B' attribute will appear pink in 2D EDIT MODE
T	Press to make a sprite 50/50 translucent. Press T again to put sprite back to normal mode.

## 2D EDIT MODE KEYS:

ESC	Show a menu that says, "(N)ew, (L)oad, (S)ave, (Q)uit" Press ESC again to cancel the menu.
keypad ENTER	Flip back to the 3D edit mode
Mouse	Move mouse cursor
Left mouse button	If you hold down the left mouse button, you can drag existing points. To drag multiple points you can use the right shift key to first select a rectangular region of points to highlight, then just drag any of the highlighted points and the rest move with it.
Right mouse button	Moves the player's positions to the mouse cursor. This is useful when you accidentally get stuck somewhere in the board, or when you need to edit some part of a sector that is hard to access.
Right Shift	Select a bunch of points for use with dragging around. Selects all points inside a box. (Use the left mouse button to drag)
Ctrl+Right Shift	Select a bunch of points for use with dragging around. Selects all points on a loop. (Use the left mouse button to drag)
Right Alt	Select a bunch of sectors for either duplication or dragging around. (see left mouse button for dragging and the insert key for duplication).
Arrows	Move player position in the appropriate directions. The player will be clipped. To jump to a different part of the board, use the right mouse button.
Space	Press the space bar when drawing new sectors. There are several ways of drawing new sectors. The following three ways of drawing sectors can all be done by only using the space bar. The computer is smart enough to decide which method you are using: 1: Drawing a FULL LOOP - that is, whenever the new sector meets the old sector, draw over that line again. In full loop mode the new sector must not already be in another sector. The loop is done when you press the space bar at the first point again. 2: SPLITTING a sector - press space bar to draw points at which you want to split a sector. The computer knows you are done splitting when you end at another point that's on the edge of the sector you are splitting. 3: Drawing a sector COMPLETELY INSIDE another sector. (for example, columns) To do this, just press space bar at every point in the loop. The loop is done when you press the space bar at the first point again.

Backspace	When plotting points with the space bar, you can use backspace to get rid of the last point plotted. You can press the backspace to get rid of all the points if you didn't want to start a sector at all.
Insert	Inserts a new point at the midpoint of the highlighted line. Then you can drag the point to wherever you like. (If you insert on a red line, the point will be inserted on both sides of the sector line.) If a bunch of sectors are selected (see right ALT) then instead of inserted points, the selected sector bunch will be duplicated (stamped). Don't forget to drag the selected sectors after stamping.
Delete	Use this to delete sprites (blue circles). To delete points of a sector border, don't press delete. Instead, drag the point into one of its 2 neighbor points on the sector. This is easiest done if grid locking is on (mouse cursor is pink). If 2 neighbor points are equal, one will automatically be deleted.
Right Ctrl-Delete	This deletes the whole sector that the mouse cursor is in. Note the right ctrl for protection. (Note: to delete a point of a sector, just drag that point into the next point and it will automatically be deleted. You should do this with grid-locking on)
J	Use to join two neighboring sectors. Press J when mouse cursor is over the first sector. Then press J again when the mouse cursor is over the neighboring sector. The attributes of the combined sector will be taken from the first sector selected.
ALT-S	When you have a white loop inside a sector, you can press ALT-S on it (highlight any of its lines) to turn the whole loop red.
S	Places a sprite at the location under the mouse cursor. A sprite looks like a blue circle in the overhead map.
B	Blocks / unblocks you from going through a wall or sprites. A blocked wall or sprite will appear pink in 2D EDIT MODE. See the description for 'B' in the 3D EDIT MODE section for more details.
C	Turn a line into a circle defined by short line segments. First press 'C' on a highlighted wall. Then move the mouse to the right place and press '+' or '-' if you want to change the number of points on the circle. Press 'C' again to cancel the circle drawing or press the Space bar to actually change the map.
+/-	Increase / Decrease the number of points on the circle.
T	Type in a LO-tag for a sector. Move the mouse cursor to the inside of a sector that you want to tag first.
ALT-T	Just like 'T' but for walls and sprites.
H	Type in a HI-tag for a sector. Move the mouse cursor to the inside of a sector that you want to tag first.
ALT-H	Just like 'H' but for walls and sprites.
E	Change a sprite's status list number.
< and >	Changes angle of sprite. Move the mouse cursor to a sprite first. You can hold down shift with the < and > to get more precise angles. If you did a sector highlight, then the selected sector will be rotated instead.
CTRL-T	Turn tag boxes on/off.
TAB	Move the mouse cursor to the inside of a sector that you want to see the attributes of. It will show them at the bottom of the status bar. To clear it, press TAB again at somewhere in the board that is not part of any sector. This is a useful key for debugging.
ALT-TAB	Works just like TAB, but here, you can see the attributes of highlighted walls or sprites. For red lines, the side the mouse cursor is on the line affects which line is highlighted, since red lines are actually defined as 2 walls (1 wall for each sector).
Scroll Lock	Set starting position (brown arrow) to your current position (white arrow).
A,Z	Zoom in and out.
G	Change grid resolution. The grid resolution cycles through this sequence: (off, 1x, 2x, 4x (default), 8x, 16x)
L	Turns grid locking on or off. If the mouse cursor is pink then grid locking is on. If it is white then grid locking is off. There is no grid locking if the grid is turned off. Also, grid locking will lock to nearby points.



## EDITART KEYS:

Keys you will need to know if you want to select from a section of a 320\*200\*256 picture file (.BMP and .PCX only) and put it into the BUILD engine.

U	Use this to import a section of a 320*200*256 .BMP, .PCX, or .GIF.
Enter	Convert the image that is inside the rectangular selection rectangle to the BUILD palette.
Space	Convert the image that is inside the rectangular selection rectangle without remapping the palette.
P	If in the picture selecting screen (after pressing U and loading the picture), you press P, then the palette of BUILD can be replaced by the palette of the displayed picture.
PgUp/PgDn	Select tile to edit (4096 tile maximum right now).
G	GOTO a tile by typing in the tile number.
S	Re-size tile. The X and Y sizes can be any unsigned short integer. X ranges from 0 to 1024, and Y ranges from 0 to 240.
Delete	short cut key to set both the X and Y sizes to 0.
+, -	Change the animation setting. (Default: NoAnm = 0.) To change the animation type, press - when the value is 0. Ex: If you want an object to have 4 tiles of animation, you can animate it in 4 different sequences: (0 is the current tile); NoAnm=4 sequence: 0,0,0,0,0,0,0,0,0,0,... (no animation); Osci=4 sequence: 0,1,2,3,2,1,0,1,2,3,2,... (oscillate); AnmFD=4 sequence: 0,1,2,3,0,1,2,3,0,1,2,... (forwards); AnmBK=4 sequence: 0,-1,-2,-3,0,-1,-2,-3,... (backwards)
A	Set the animation speed of the tile. Press + and - to change the animation speed. There are 16 different animation speeds. The animation speed set here set the speed for BUILD and your GAME also. (Speed is proportional to (totalclock>>animspeed))
~	The tilde key (located just above the TAB key) allows you to center a sprite. Simply use the arrow keys to get to the desired position.
N	Name a tile. Naming a tile simply changes the #define statement in NAMES.H. You should include NAMES.H when compiling so you can easily refer to sprites by name rather than by number.
O	Optimize the size of an individual piece of artwork. Use this for tiles with invisible pixels on the sides.
V	View and select a tile to edit.
Space	To swap 2 tiles simply press space bar on the first tile, then space bar on the second.
1,2,3	To swap a group of tiles, press 1 on the first tile, press 2 to remember the region between where you pressed 1 and 2. Press 3 at the place to where you want to swap all the tiles.
ALT+U	Re-grab artwork from original pictures according to the CAPFIL.TXT file. If you press ALT-U in the main screen, everything will be re-grabbed. If you press ALT-U in 'V' mode, then you should first select the range by pressing '1' and '2' on the range boundaries.
ALT+R	Generate a Tile frequency report by scanning all maps in directory. Use in 'V' mode only.
F12	Screen capture (saves image as a *.BMP file, starting as file name CAPTUR00.BMP and incrementing by 1 each time F12 is pressed.
ESC	Quit.

## Extra features:

(if you actually want to do the artwork in EDITART or if you want to touch-up some imported art.)

C	Change all pixels on the tile having the same color under the graphics cursor to to selected color.
Arrows/Mouse	Move graphics cursor.
Shift+Arrows	Select color. (on bottom right corner of screen)

Space	Plot a pixel with the selected color.
T	Turn drawing trail on / off.
Tab	Select the color under the graphics cursor.
BACKSPACE	Set the color to color 255 (transparent color).
F	Floodfill a region with the current color and with the current color as a boundary.
M,P	Use M to back up a tile into a temporary buffer in memory and P to restore it. It may be wise to press M before a floodfill (F) (because sometimes you miss encapsulating the region by 1 pixel, and the whole picture gets killed, etc...)
J	Randomly plots dots of current color over any pixels having the same color as the color under the tile cursor.
[	Random antialias of colors in color band under graphics cursor.
]	Non-random antialias of colors in color band under graphics cursor.
;	3-Dimensionalize an image. Makes colors in different rows of the color bar either appear to stick out or stick in to the wall.
‘	3-Dimensionalize the other way.
R	Rotate the tile in a specified direction.
	1 Mark the first corner of a rectangle for a copy/paste operation.
	2 Mark the other corner of a rectangle for a copy/paste operation.
	3 Paste the selected rectangle (Note: You must press 1 and 2 in that order first before pressing 3. Pretty simple 1-2-3 for copy & paste)
	4 Flip the copied rectangular region x-wise.
	5 Flip the copied rectangular region y-wise.
	6 Swap the x and y coordinates of the copied rectangular region.
.,◇	Change the shade of the selected region.
\	Move the cursor to the center of the tile.
	Get the coordinates of the cursor.

## 11. BUILD MAP FORMAT

(removed for brevity)

## 12. MAP AUTHORIZING TEMPLATE

(removed for brevity)

## 13. TIPS FROM THE LEVELORD

Here are a few closing comments from the Levelord:

- Don't let two mirrors "see" each other, this causes problems.
- Don't put two demo cameras where they are within each other's field of vision; this causes problems.
- Keep your maps simple, especially if they are for Dukematch.
- Your frame rate is directly related to your computer, so if you have a Pentium, don't make a map that won't run on a good 486.
- Use shadowing - Makes for more cool looking rooms/objects/whatever.
- In the simplest case - a square room should have two opposing sides darker (or lighter) than the other two.
- If your frame rate allows, subdivide sectors to look like shadows are being cast from buildings. etc.
- Select a "tile set" that fits your map's motif.
- Don't use too many tiles, especially in any one scene.
- Frame Rate is God! Keep this in mind at all times.

- Most of all, think deviously!