

5.2.7 Modeling - Meshes - Vertex Groups

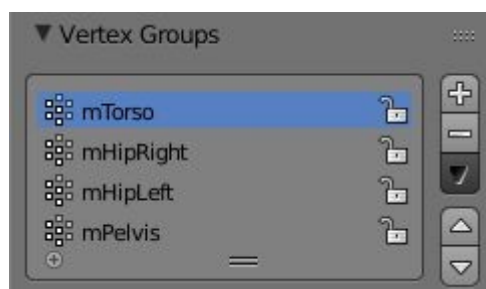
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Vertex Groups

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Vertex Groups



The Vertex Group Panel

Vertex Groups are mainly used to tag the vertices belonging to parts of a Mesh Object or Lattice. Think of the legs of a chair or the hinges of a door, or hands, arms, limbs, head, feet, etc. of a character. In addition you can assign different *weight values* (in the range [0.0, 1.0]) to the vertices within a Vertex Group. Hence Vertex Groups are sometimes also named *Weight Groups*.

Vertex Groups are most commonly used for Armatures (See also *Skinning Mesh Objects*). But they are also used in many other areas of Blender, like for example:

- Shape keys
- Modifiers
- Particle Generators
- Physics Simulations

Many more usage scenarios are possible. Actually you can use Vertex Groups for whatever makes sense to you. In some contexts Vertex Groups can also be automatically generated (i.e. for rigged objects). However in this section we will focus on manually created (user-defined) Vertex Groups.

Note

Vertex groups only apply to Mesh and Lattice Objects

Any other Object type has no vertices, hence it can not have Vertex Groups.

Typical usage scenarios for Vertex groups

Skinning an armature

If you want to animate your mesh and make it move, you will define an armature which consists of a bunch of bones. Vertex Groups are used to associate parts of the Mesh to Bones of the Armature, where you can specify an influence *weight* in the range [0.0 ... 1.0] for each vertex in the Vertex Group.

Working with Modifiers

Many modifiers contain the ability to control the modifier influence on each vertex separately. This is also done via Vertex Groups and the weight values associated to the vertices.

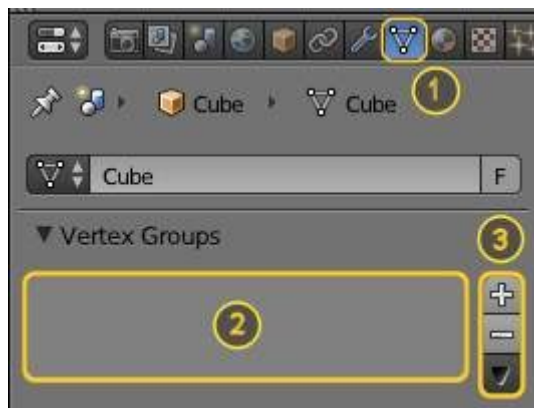
Quickly select/edit/hide parts of a mesh

By defining mesh regions with Vertex Groups you can easily select entire parts of your mesh with 3 clicks and work on them in isolation without having to create separate objects. With the hide function you can even remove a vertex group from the view (for later unhide).

Cull out and duplicate parts of a mesh

Consider modeling a Lego block. The most simple brick consists of a base and a stud (the bump to connect the bricks together). To create a four-stud block, you would want to be able to easily select the stud vertices, and, still in *Edit mode*, duplicate them and position them where you want them.

Creating Vertex Groups

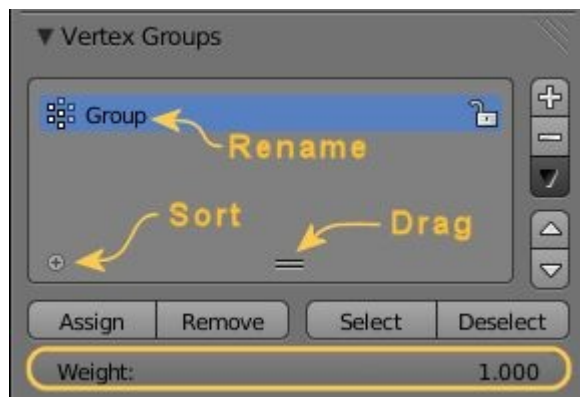


Empty Vertex Group Panel

Vertex Groups are maintained within the *Object Data Properties* window (1), and there in the *Vertex Groups* panel. As long as no Vertex groups are defined (the default for new Mesh Objects), the Panel is empty (2).

You create a vertex group by LMB + on the right Panel border (3). Initially the group is named *Group* (or *Group.nnn* when the name already exists) and gets displayed in the Panel (2) (see next image).

Vertex Groups Panel Controls



One Vertex Group

Once a new Vertex Group has been added, the new Group appears in the vertex Groups panel. There you find 3 clickable elements:

Group Name

The Groupname can be changed by double clicking LMB on the name itself. Then you can edit the name as you like.

Plus Icon

When the little icon in the left lower corner can be clicked, a new row opens up where you can enter a search term. This becomes handy when the number of vertex groups gets big.

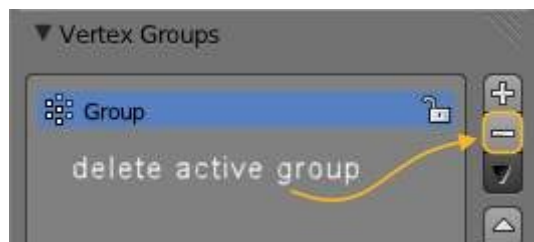
Drag Handle

If you have a large number of vertex groups and you want to see more then a few Groups, you can LMB on the small drag handle to tear the vertex groups list larger or smaller.

Active Group

When a Vertex Group is created, then it is also automatically marked as the *Active Group*. This is indicated by setting the background of the panel entry to a light blue color. If you have two or more groups in the list, then you can change the active group by LMB on the corresponding entry in the Vertex Group panel.

Deleting vertex Groups



Delete a Vertex Group

You delete a Vertex Group by first making it the active group (select it in the panel) and then LMB the - button at the right Panel border.

Deleting a Vertex Group only deletes the vertex assignments to the Group. The vertices themselves are not deleted.

Locking Vertex Groups

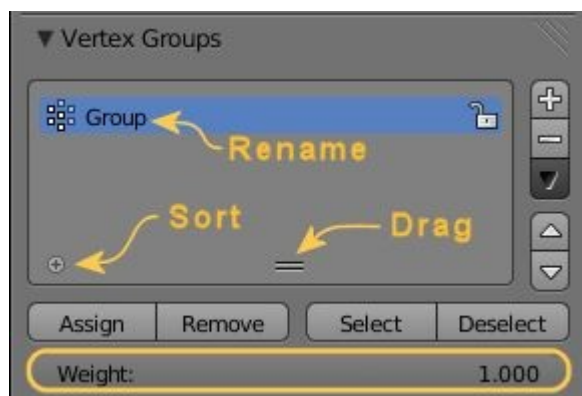


Lock a Vertex Group

Right after creation of a Vertex Group, an open lock icon shows up on the right side of the Vertex Group List entry. This icon indicates that the Vertex Group can be edited. You can add vertex assignments to the group or remove assignments from the group. And you can change it with the weight paint brushes, etc.

When you click on the icon, it changes to a closed lock icon and all vertex group modifications get disabled. You can only rename or delete the group, and unlock it again. No other operations are allowed on locked Vertex Groups, thus all corresponding function buttons become disabled for locked Vertex Groups.

Working with Content of Vertex Groups



Vertex Group Panel in Edit Mode

When you switch either to *Edit-Mode* or to *Weight-Paint* Vertex Selection Mode, then the Vertex Group panel expands and displays 2 more rows:

The first row contains 4 buttons for maintaining the Assign- and Select- status of vertices of the active Vertex Group:

Assign

To assign the Selected vertices to the Group with the weight as defined in the “Weight:” input field (see below)

Remove

To Remove the selected vertices from the Group (and thus also delete their weight values)

Select

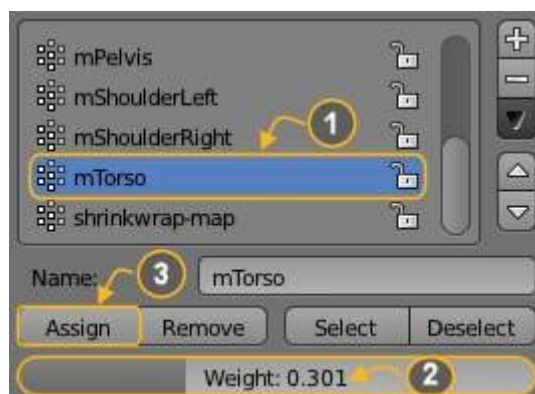
To Select all vertices contained in the Group

Deselect

To deselect all verts contained in the group

Below this row of buttons you see a numeric “Weight:” input field where you specify the weight value that gets assigned to the selected verts when you press the Assign Button.

Assigning verts to a Group



Assign weights to active group

You add vertices to a group as follows:

- Select the group from the group list, thus make it the Active Group (1).
- From the 3D Viewport select **Shift - RMB** all vertices that you want to add to the group.
- Set the weight value that shall be assigned to all selected verts (2).
- LMB the *Assign* button to assign the selected verts to the active group using the given weight (3).

Note that weight Assignment is not available for locked Vertex Groups. The Assign button is grayed out in that case.

Note

Assign is additive

The *Assign* button only adds the currently selected vertices to the active group. Vertices already assigned to the group are not removed from the group.

Also keep in mind that a vertex can be assigned to multiple groups.

Checking Assignments

To be sure the selected verts are in the desired Vertex Group, you can try press the deselect button. If the vertices remain selected then they're not yet in the current Vertex Group.

At this point you may assign then, but take care since all selected vertices will have their weight set to the value in the *Weight:* field.

Removing assignments from a Group

You remove vertices from a group as follows:

- Select the group from the group list (make it the active group).
- Select all vertices that you want to remove from the group.
- Press the *Remove* button.

Note that Removing weight Assignments is not available for locked Vertex Groups. The Remove button is grayed out in that case.

Using groups for Selecting/Deselecting

You can quickly select all assigned vertices of a group:

- (optionally) press **A** once or twice to unselect all vertices.
- Select the group from the group list (make it the active group).
- When you now **LMB** click the *Select* button, then the vertices assigned to the active group will be selected and highlighted in the 3D Viewport.
- When you **LMB** click the *Deselect* button instead, then the vertices assigned to the active group will be deselected in the 3D Viewport.

Note

Selecting/Deselecting is additive

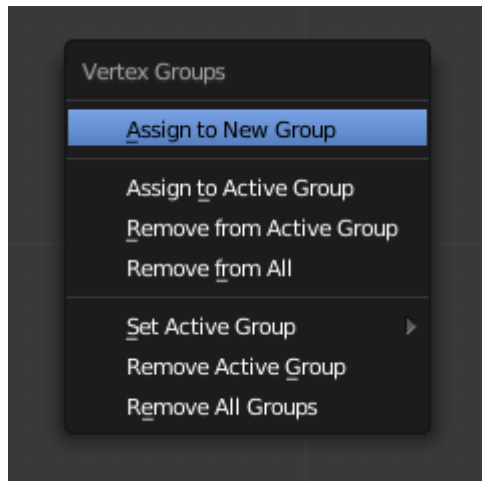
If you already have verts selected in the 3D View, then selecting the verts of a group will add the verts but also keep the already-selected verts selected. Vice versa, deselecting the verts of a vertex group will only deselect the verts assigned to the group and keep all other verts selected.

Finding ungrouped verts

You can find ungrouped vertices as follows:

- Press **A** once or twice to unselect all vertices.
- In the footer of the 3D Viewport: Navigate to **Select** → **Ungrouped verts**

Keyboard Shortcuts



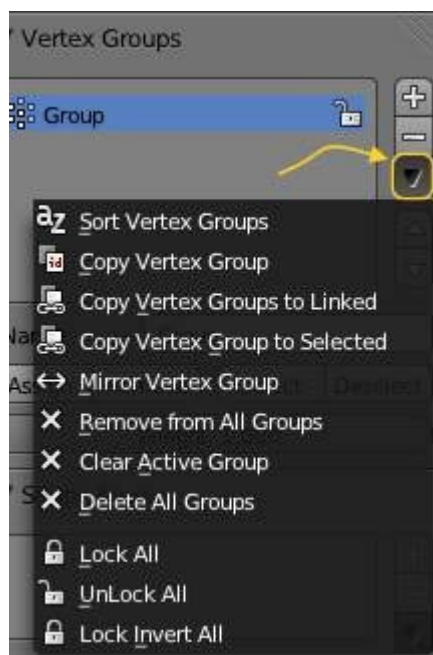
Vertex Groups pop-up menu

In Edit Mode you can press **Ctrl-G** to a shortcut Menu for adding/removing verts to/from groups. The pop-up menu provides the following functions with obvious functionality: (also available via **Mesh** ▸ **Vertices** ▸ **Vertex Groups**)

- Assign to New Group
- Assign to Active Group
- Remove from Active Group

- Remove from All

Vertex Group Management



Vertex groups panel's dropdown menu

Vertex Groups provide a more complex set of functions inside a Pull down menu. This menu is accessible from the Vertex Group Panel by clicking on the dark gray *arrow down* icon on the right panel border.

The following functions of the Pulldown Menu operate on the assigned vertices:

Sort Vertex Groups:

Sorts Vertex Groups Alphabetically

Copy Vertex Group:

Add a Copy of the active Vertex Group as a new Group. The new group will be named like the original group with “_copy” appended at the end of its name. And it will contain associations to exactly the same verts with the exact same weights as in the source vertex group.

Copy Vertex Groups to Linked:

Copy Vertex Groups of this Mesh to all linked Objects which use the same mesh data (all users of the data).

Copy Vertex Group to Selected:

Copy all Vertex Groups to other Selected Objects provided they have matching indices (typically this is true for copies of the mesh which are only deformed and not otherwise edited).

Mirror Vertex Group:

Mirror all Vertex Groups, flip weights and/or names, editing only selected vertices, flipping when both sides are selected; otherwise copy from unselected. Note this function will be reworked (and fully documented) in a future release.

Remove from All Groups:

(not available for locked groups) Unassigns the selected Vertices from all groups. After this operation has been performed, the verts will no longer be contained in any vertex group.

Clear Active group (not available for locked groups):

Remove all assigned vertices from the active Group. The group is made empty. Note that the vertices may still be assigned to other Vertex Groups of the Object.

Delete All Groups:

Remove all Vertex Groups from the Object.

The following functions operate only on the lock state settings:

Lock All

Lock all groups

Unlock All

Unlock all groups

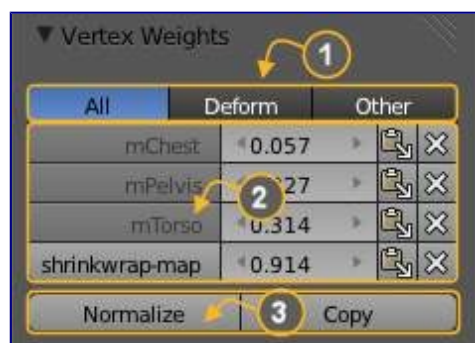
Lock_Invert All

Invert Group Locks

Hints

- Multiple objects sharing the same mesh data have the peculiar property that the group names are stored on the object, but the weights in the mesh. This allows you to name groups differently on each object, but take care because removing a vertex group will remove the group from all objects sharing this mesh.

Weight Editing



Vertex Weights Panel

As mentioned before in *Vertex Groups* each entry in a Vertex Group also contains a weight value in the range of [0.0,1.0]. Blender provides a *Vertex Weights* panel from where you can get (and edit) information about the weight values of each Vertex of a mesh. That is: to which Vertex Groups the vertex is assigned with which weight value.

The Vertex Weights panel can be found in the right property sidebar of the 3D Viewport. It is available in Edit mode and in Weight Paint mode (when Vertex Selection masking is enabled as well). The panel is separated into the sections

- Vertex Group Categories (1)
- Weight Table (2)
- function bar (3)

Vertex Group Categories

Actually we do not have any strict categories of Vertex Groups in Blender. Technically they all behave the same way. However we can identify 2 implicit categories of Vertex Groups:

The Deform Groups

These Vertex groups are sometimes also named *Weight Groups*. They are used for defining the weight tables of Armature bones. All Deform Groups of an Object are strictly related to each other via their weight values.

Strictly speaking, the sum of all deform weights for any vertex of a mesh should be exactly 1. 0. In Blender this constraint is a bit relaxed (see below). Nevertheless, Deform Groups should always be seen as related to each other. Hence we have provided a filter that allows restricting the Vertex Weight panel to display only the Deform bones of an Object.

The Other Groups

All other usages of Vertex Groups are summarized into the *Other* category. These vertex groups can be found within Shape keys, Modifiers, etc... There is really no good name for this category, so we kept it simple and named it *Other*.

The Weight Table









The Weight Table shows all weights associated to the *active vertex*. Note that a vertex does not necessarily have to be associated to any vertex groups. In that case the Vertex Weights Panel is not displayed.

Tip

The active Vertex

That is the most recently selected vertex. This vertex is always highlighted so that you can see it easily in the mesh. If the active Vertex does not have weights, or there is no active vertex selected at the moment, then the Vertex Weights Panel disappears.

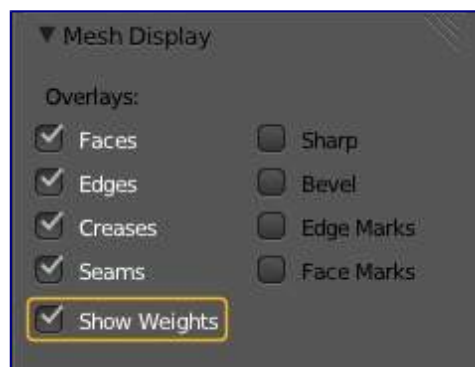
Each row in the Weight table contains 4 active elements:

All	Deform	Other
mChest	◀ 0.057 ▶	 
mPelvis	◀ 0.227 ▶	 
mTorso	◀ 0.314 ▶	 
shrinkwrap-map	◀ 0.716 ▶	 

Change Active Group

Set the Active Group

As soon as you select any of the Vertex Group Names in the Weight table, the referenced Vertex Group becomes the new Active group.

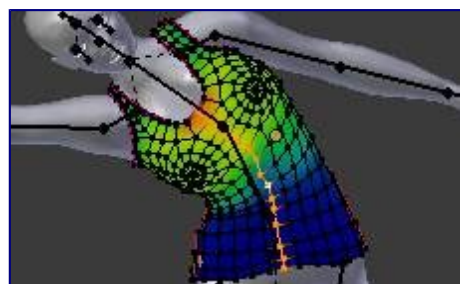


Enable display of Weights in Edit Mode

Display Weights in Edit Mode

When you are in edit mode, you can make the Weights of the active Group visible on the mesh:

Search the *Mesh Display* panel in the Properties sidebar. And there enable the *Show Weights* option. Now you can see the weights of the active Vertex Group displayed on the mesh surface.



Weights in Edit Mode

Edit Weights in Edit Mode









It is now very easy to work with weightmaps in Edit mode. All edit options of the mesh are available and you have direct visual control over how your Weights change when you edit the weight values.

All	Deform	Other
mChest	◀ 0.057 ▶	⬇ ⬆ ⬇
mPelvis	◀ 0.227 ▶	⬇ ⬆ ⬇
mTorso	◀ 0.314 ▶	⬇ ⬆ ⬇
shrinkwrap-map	◀ 0.716 ▶	⬇ ⬆ ⬇

Change Weight Value

Change a weight









You can either enter a new weight value manually (click on the number and edit the value), or you can change the weight by LMB and while holding down the mouse button, drag right or left to increase/decrease the weight value. You also can use the right/left arrows displayed around the weight value to change the weight in steps.

All	Deform	Other
mChest	◀0.057▶	 
mPelvis	◀0.227▶	 
mTorso	◀0.314▶	 
shrinkwrap-map	◀0.716▶	 

Paste weights

Paste a weight to other verts

LMB the Paste Icon allows you to forward a single weight of the active Vertex to all selected vertices. But note that weights are only pasted to verts which already have a weight value in the affected Vertex Group.







All	Deform	Other
mChest	◀0.057▶	 
mPelvis	◀0.227▶	 
mTorso	◀0.314▶	 
shrinkwrap-map	◀0.716▶	 

Delete weights

Delete a weight from a Group

LMB the Delete Icon will instantly remove the weight from the active vertex. Thus the entire row disappears when you click on the delete icon.

The Function bar

All	Deform	Other
mChest	◀0.563▶	 
mCollarRight	◀0.300▶	 
shrinkwrap-map	◀0.137▶	 
Normalize		Copy

Vertex Weights panel Function Bar

The function bar contains 2 functions:

Normalize

Normalizes the weights of the active Vertex. That is all weights of the active vertex are recalculated such that their relative weight is maintained and the weight sum is 1.0.

Copy

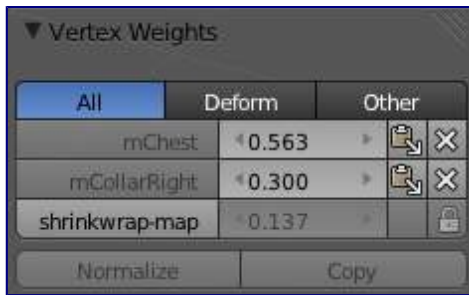
Copies all weights defined for the active Vertex to all selected Verts. Thus all previously defined weights are overwritten.

Tip

The filter setting is respected

Note that both functions only work on the Vertex Groups currently displayed in the Weights Table. So if for example only the *Deform weights* are displayed, then Normalize and Copy only affect the Deform bones.

About locked Vertex Groups



Vertex Weights panel Locked

Whenever a Weight Group is locked, all data changing functions get disabled:

- Normalize the vertex Weights.
- Copy the Vertex weights.
- Change the Weight of the active vert.
- Paste to selected verts.

Tip

The filter setting is respected

If you have for example all deform weight groups unlocked and all other vertex groups locked, then you can safely select *Deform* from the Filter row and use all available functions from the Weight table again.