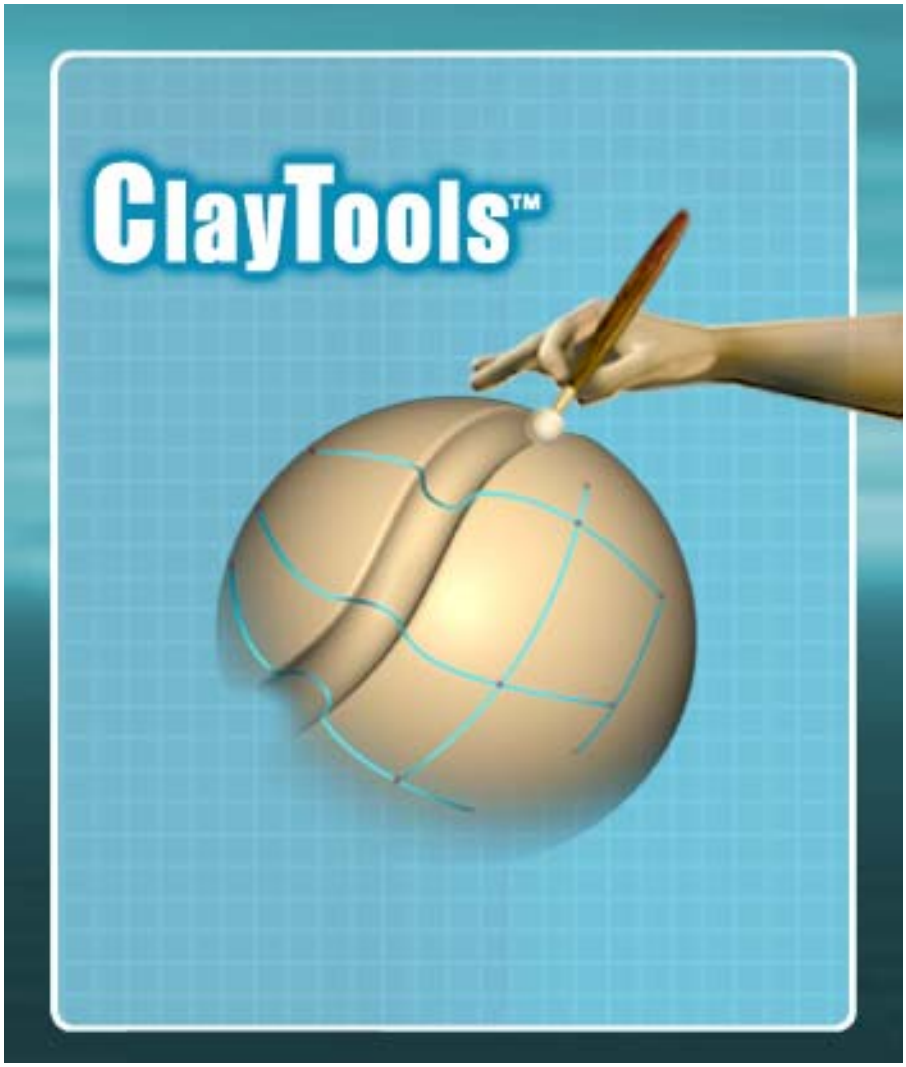

TUTORIAL

SensAble technologies

version **1.2**

ClayTools™ System
version 1.2

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Hardware usage guidelines are provided to assist the user in protecting the effectiveness and life of the device. They are not intended as recommendations for the prevention of repetitive stress injury, carpal tunnel syndrome or any other conditions, injuries or disorders; users should consult their own physicians. By using the PHANTOM device, the user acknowledges and agrees that SensAble shall have no liability for any disorder, condition or injury arising from any use of the device.

> **Warning** Do NOT open the PHANTOM device. Attempting to open or repair the device by anyone other than a certified authorized service center voids the manufacturer warranty and hardware maintenance contract.

Questions or Comments

If you have any questions for our technical support staff, please contact us at support@sensable.com. You can also phone 1-888-SENSABL (U.S.A. only) or 1-781-937-8315 (International).

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Preface

Congratulations on your purchase of the ClayTools system! This guide contains a lesson that will introduce you to some basic modeling tools within the ClayTools application and familiarize you with the ClayTools system.

Resources for Learning ClayTools

SensAble provides the following documentation and other materials for learning how to use the ClayTools system:

The *ClayTools Installation Guide* This printed and electronic document contains instructions on installing and setting-up the ClayTools system as well as troubleshooting tips.

The *ClayTools Online Help* At any time while working with the ClayTools system, you can use the system's online Help by pressing F1 on your keyboard, or by selecting "ClayTools Help" from the Help menu. You can also reach targeted help by double-clicking the active tool name in the dynabar.

The *ClayTools Quick Reference Card* An electronic document that provides an overview of Hotkey Shortcuts and Key Concepts for ClayTools as well as a glance at all the application palettes and their commands.

The *ClayTools Tutorial* An electronic document that provides a short lesson to help introduce some of the basic modeling tools available in the ClayTools software and familiarize the user with the system.

The *PHANTOM Omni User's Guide* A printed document that is shipped with your haptic device that describes the process of installing the device drivers and connecting the haptic device as well as how to work with the device including proper handling, troubleshooting, and device specifications. This can also be found in electronic form on the ClayTools product CD.

Product CD and Video CD Users may also find helpful files located on the ClayTools product and video CDs. These may include sample models, video clips that demonstrate how to use certain features, and other informational files.

Web/FAQ A variety of information is available via SensAble's Web site at http://www.sensable.com, including updated information, answers to Frequently Asked Questions, expert "tips and tricks," example models, and more.

Typographical Conventions

This guide uses the following typographical conventions:

Convention	Description	Example
Italics	First use of a new term; reference to another document or file.	A *Voxel* is...; see the *User Manual.*
Bold	Keywords, actual user input, or examples.	Click **Ok**.
Greater Than (>)	Indicates a menu pick, as in "select Options from the Tools menu".	**Tools** > **Options**

Contents

1

Modeling Basics with ClayTools

In the real world, there are a few stages to go through when creating a model with tools and materials such as pen, paper, sculpting tools, and blue foam or clay:

- Sketching the basic shape of the model
- Cutting out its shape
- Sculpting the material
- Adding details

The stages of creating a model in the ClayTools system can be much the same, only you're working on a computer, of course, which has its own benefits.

- You can draw perfectly straight lines, perfectly square boxes, or perfectly round circles.
- If you make a mistake when "cutting" your material, you can undo that mistake with the a few key strokes.
- You can switch back and forth between sketching and sculpting. In this way, you're working with the tools and materials that are most suited to the task at hand.
- You can easily add material to your model, or remove it.

This lesson concentrates more on what you can accomplish with the planes and 2D data such as images and sketches that are such an important part of ClayTools workflow. Additionally, in this lesson you will learn the following:

- Editing Curves on planes
- The Flip button
- Smoothing
- Selecting clay
- Copy and Paste
- Sculpting from the Inside
- Emboss with Image
- Measuring with the Ruler
- Scaling

This lesson will not repeat all the details of how to accomplish each step. If you find yourself needing instructions on how to do something, please refer to the online Help.

The Bug Model

In this lesson you will model a bug, very similar to an ant, which will be about 10 inches tall. The bug will be wearing a breastplate with an embossed decoration, the design for it is provided. A completed version of the bug, **bug.cly**, is located in the folder <***ClayTools Installation Directory***>**\Models**.

Beginning from a Sketch

This lesson begins with a sketch, drawn with pencil and paper, of a side view of the body and head of your bug, minus its appendages. This sketch is then scanned and saved as a bitmap (.bmp) file. You can use the provided file **bug.bmp**, located in the <***ClayTools installation directory***>/**Models** folder or create your own sketch to look something like the following, scan and save it:

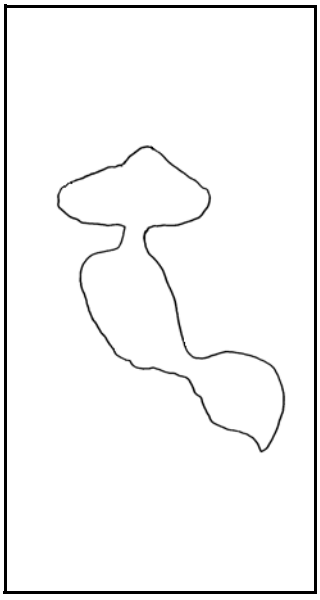


Figure 1-1: Bug.bmp

The Tools

Throughout the lesson directions to find a particular command are given as ***palette name*** > ***tool name***.

Starting the Model

1 If it isn't already up and running, start the ClayTools system.

2 Select **File > New**, and set the following:

- Select **Start with Empty Model**
- In the Model Properties area of the New Model dialog, verify or set the units to inches.
- Set the dimensions in Model Shape and Size area:
  - **5**" width
  - **7**" heights
  - **5**" depth
- In Model Properties set Clay coarseness to **Refine Shape.**

Sketch Planes

You are going to **Wire Cut** the basic shape of the bug model using the sketch in the bitmap as a guide. Wire Cutting is a mode of working in the ClayTools application in which you use a design on a sketch plane to cut or create a basic shape.

1 Click **Planes** > **Create Plane**. The ClayTools application displays a new plane and automatically brings up the Edit Plane dynabar.

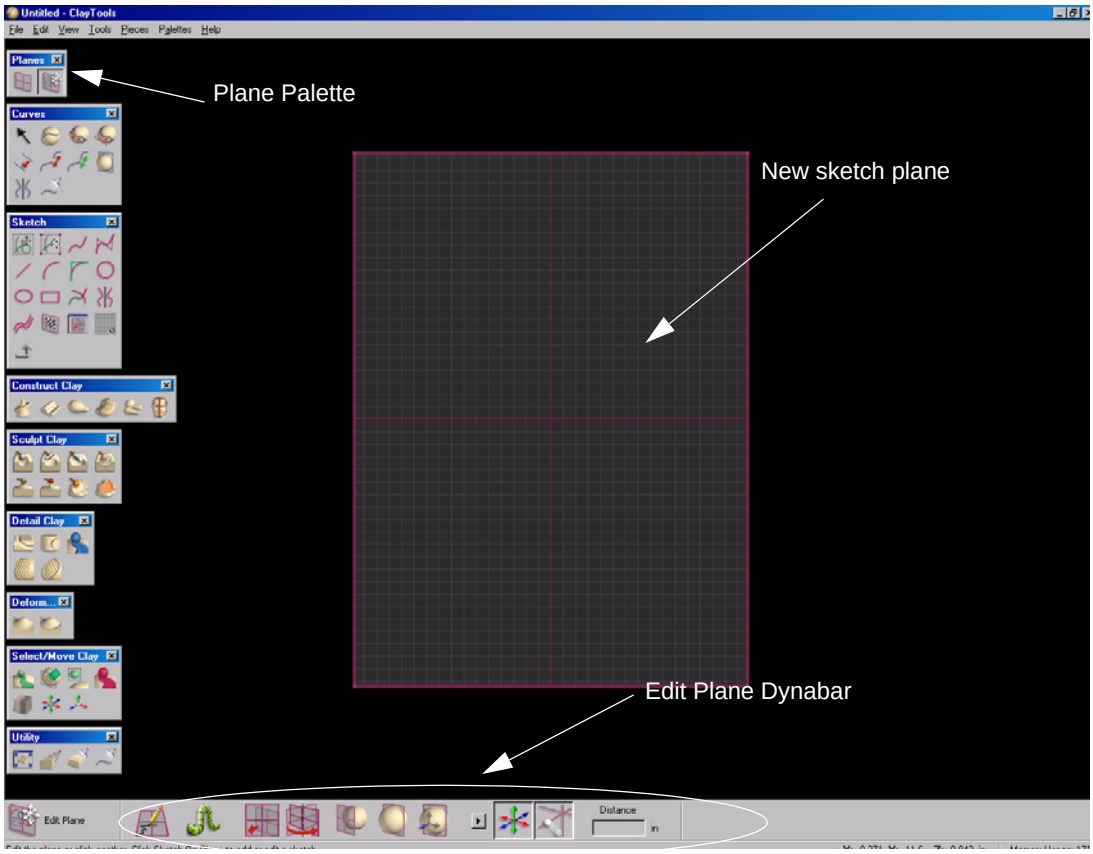


FIGURE 1-2. Creating a new sketch plane

(For a more comprehensive description of planes and how to manipulate them, refer to the "Working with Planes" topic in the *online Help*.)

2 Select **File** > **Import to Plane**. The Import Image dialog box is displayed.

3 Navigate to the bitmap file you created (or use **bug.bmp** in the **models** folder). Select the file and click **Open**.

The sketch is placed on the sketch plane, as in the next figure.

Tool Tip: Zooming

To easily zoom in or out on your model without repositioning it, move your mouse while holding down the right mouse button.

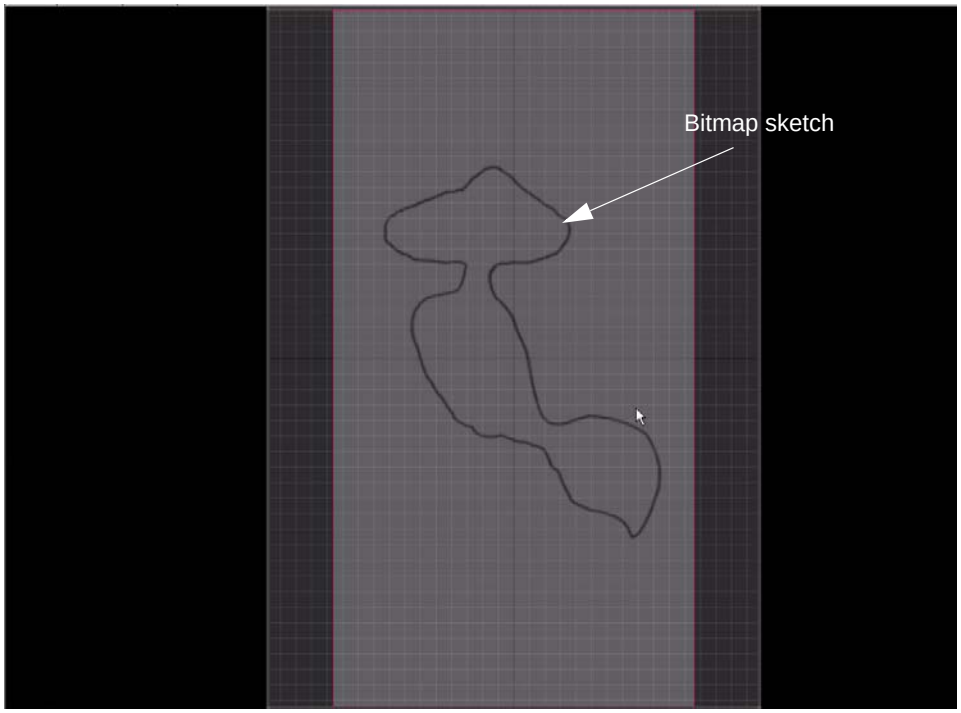


FIGURE 1-3. The bitmap image to be used for the Wire Cut

You now have a side view of the outline of the head and body of the bug to trace as you draw the bug profile on the sketch plane.

4 Select **Sketch > Freehand Curve**. Touch the cursor to the sketch plane and click the stylus button of the PHANTOM device at the place where you want to begin the sketch. Trace the bitmap image by dragging the PHANTOM device cursor across the plane, clicking the stylus button when you want to change the direction of the curve. Tip: See “Turning off Haptic Snap Temporarily” on page 1-6 for information about haptic snap.

If you make mistakes while sketching, press **Ctrl+z** to undo the last action. You can end the curve by pressing the **e** key or, in this case, by connecting the curve back to its starting point. See the following “How-to” for more information.

Quick How-to: Sketching

It's pretty straightforward, but it may take a few tries to get the hang of it:

1. While touching the sketch plane, click the PHANTOM device stylus button at the point where you want to begin drawing the line (or curve or box, etc.).
2. Drag the cursor to where you want to end the line or change its direction.
3. Click the stylus button again. ClayTools draws the line between the points you have created.

And, if you're using Freehand Curve  , click multiple points until the curve is finished, then end the curve by pressing the **e** key.

Have fun as you experiment. See online Help for more information.

Turning off Haptic Snap Temporarily

When you were sketching you probably noticed that, when the cursor came close to the plane's center lines or to the end point of the curve, you could feel the PHANTOM device tool sticking slightly at these locations. That's because the application utilizes *haptic snap*, to make it easier for you to draw curves and to close curves into a sketch profile. You can temporarily turn off the haptic snap by holding down the **Ctrl** key on your keyboard while sketching.

Sketch Profile

Make sure that the outline of the bug sketch forms a **closed loop** (also called a *profile)*. A loop is closed when its beginning and ending lines meet. If you have sketched a closed loop, the profile will be colored blue when you exit Sketching mode. If not, the profile will be red and the application will not allow you to select the profile in the Wire Cut. You will not be able to cut out the profile until you return to Sketch mode and close the loop by connecting the ends of the lines. See the next "How-to" for more information.

If you want to check to see that you created a closed profile. Click **Sketch** > **Exit Sketch Mode**.

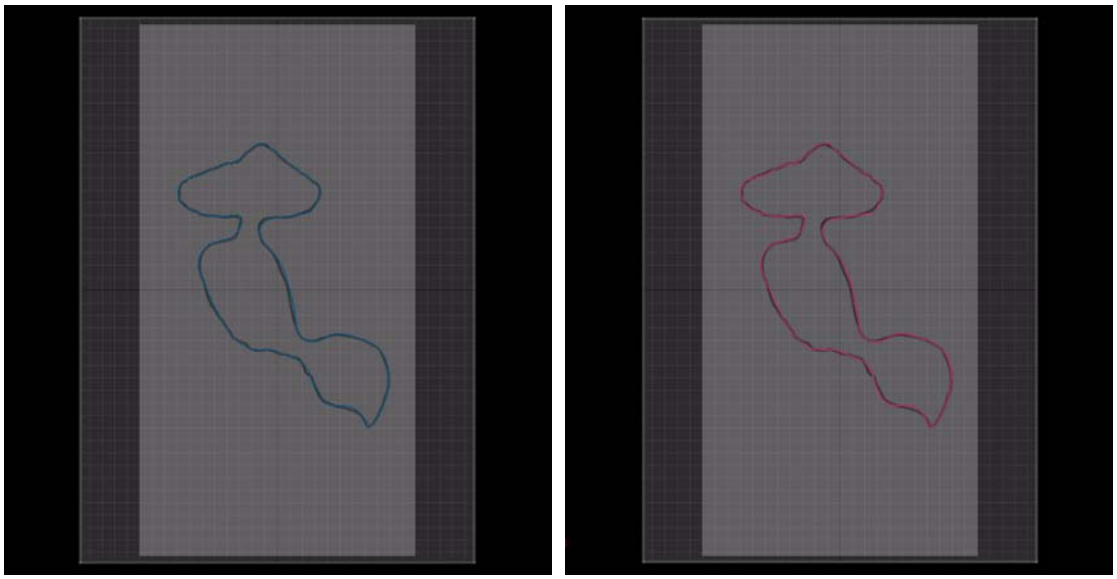


FIGURE 1-4. A closed sketch profile on the right displays as a blue curve; an open sketch curve, on the right, is displayed as red.

A close look at the sketch on the right (see reveals that the curve is not closed.

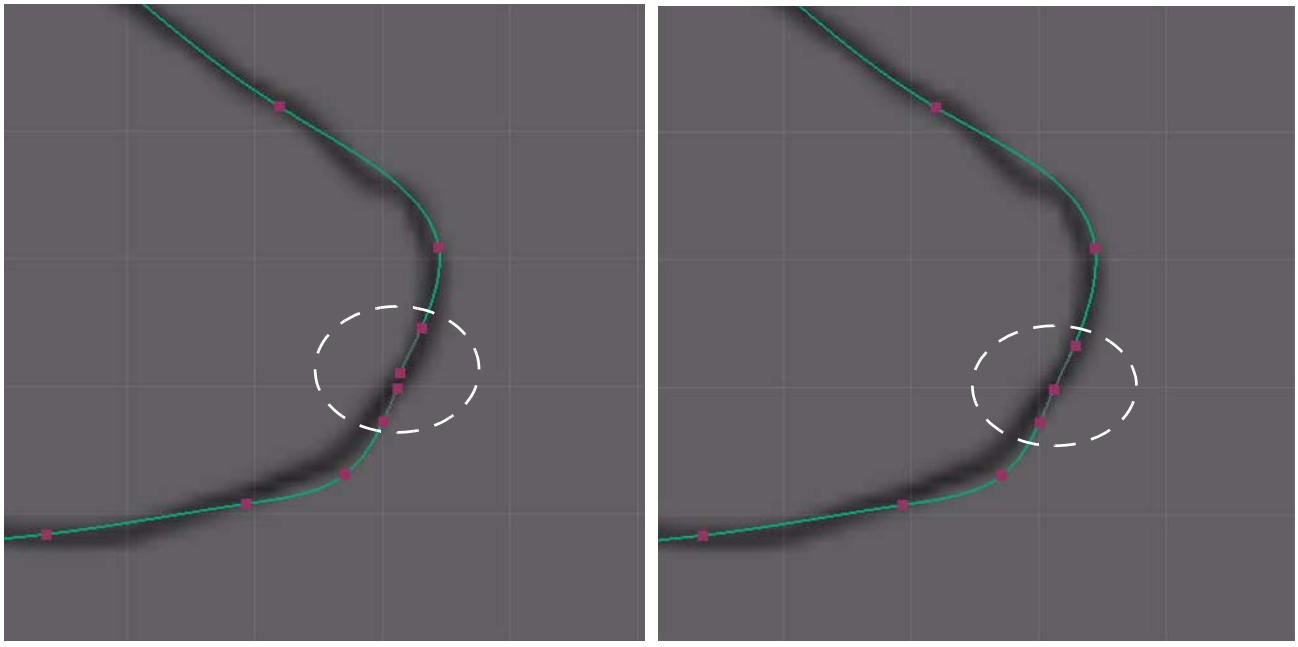


FIGURE 1-5. A zoom in on the sketch (left) shows the break in the curve; note the three edit points inside of the callout. The sketch on the right has had the middle edit point moved down to connect to the lower one to close the loop (right).

Quick How-to: Selecting Planes

If you exit Sketching mode and find you need to return to it (for example if your profile is not closed), you must select the plane before you can return to sketching. To select a plane:

1. On the Sketch palette, select the Edit Plane icon  .
2. Touch and click the plane using the PHANTOM device.

After you have selected the plane, you can return to Sketching mode by:

- Pressing **k** on your keyboard, or
- Clicking on the Sketch on Plane icon in the Sketch Plane dynabar.

About silhouette points

When you draw a sketch in Sketch mode, the application creates touchable gravity wells, called silhouette points, along the sketch. Silhouette points are used to connect a profile to a 3D curve. For freehand curves, points are placed at the X and Y points of inflection. Silhouette points are also used in the Loft process. We will not use silhouette points in this lesson, but if you want to read more about them, refer to the *online Help*.

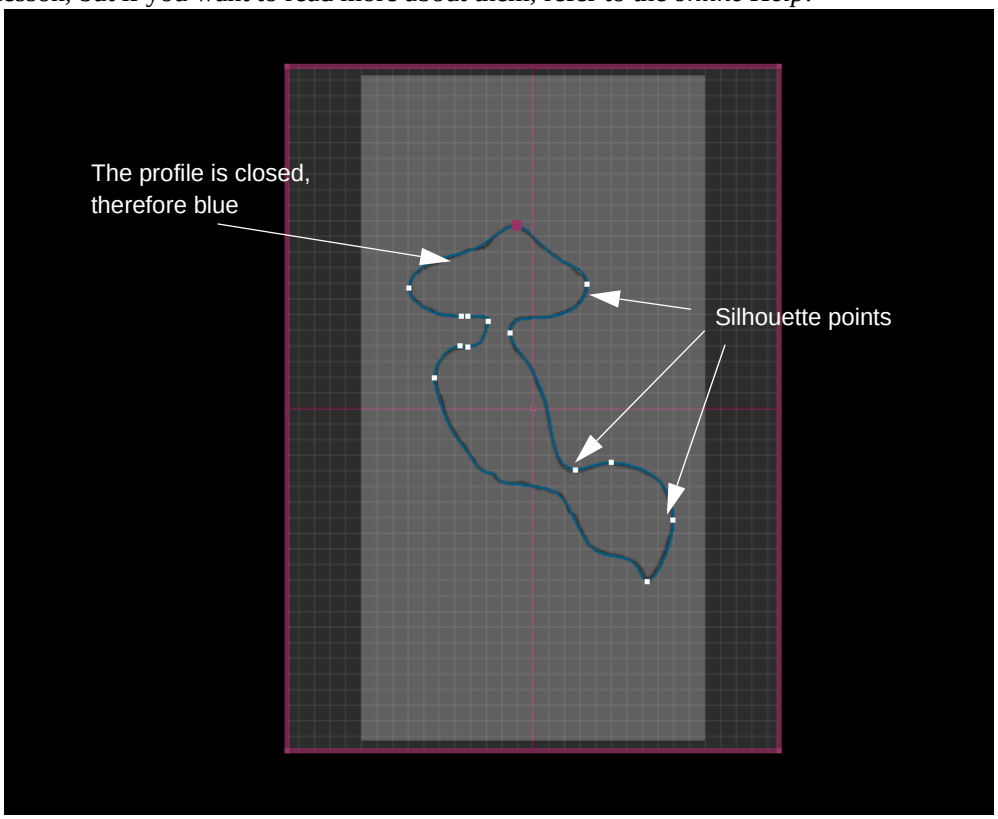


FIGURE 1-6. Bug outline sketched on the sketch plane

1 Click **Construct Clay** > **Wire Cut Clay**.

The dynabar offers two choices, to select profiles one by one or to select all the profiles on the plane. It doesn't matter in this case because there is only one profile, so you can proceed right to the next step.

2 Touch the profile with the PHANTOM, it turns green when you hover over it. Then click the stylus button to select the profile. It turns green once selected.

3 Click **Next Step**.

The ClayTools application creates another plane, called the **To Plane**. This is the plane to which the Wire Cut will extend, that is the thickness of the clay that will be created. A **From Plane** is also created. The From Plane shares a location with the sketch image and is therefore hidden until you move it. The dynabar has also changed.

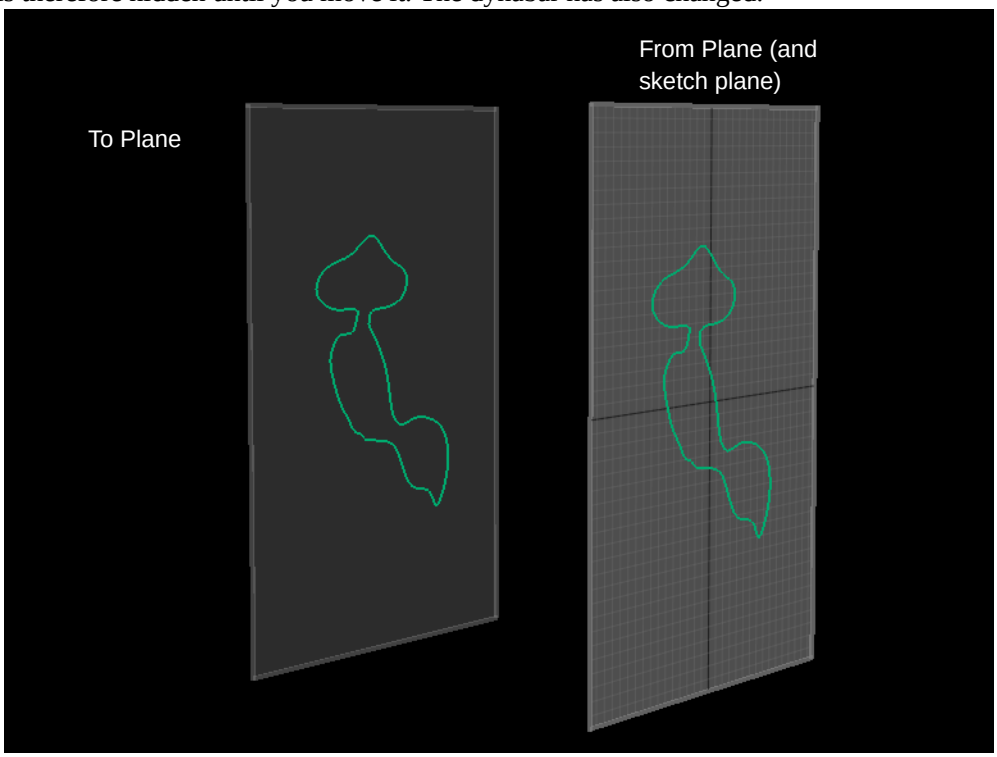


FIGURE 1-7. View is rotated and the "To Plane" is created

4 Rotate your view a bit to reveal a better angle on the planes.

5 You don't need such a "thick" bug so you want to move the planes closer together. There are a couple of ways to do this:

- Grab and drag each plane with the PHANTOM device cursor.
- For more precision, you can enter a number in the **Distance** box in the Dynabar and press **Enter**. In this procedure, the From Plane remains stationary and the To Plane moves.

You can also combine the two procedures, moving the planes manually with the PHANTOM device while eyeing the distance displayed in the Distance box.

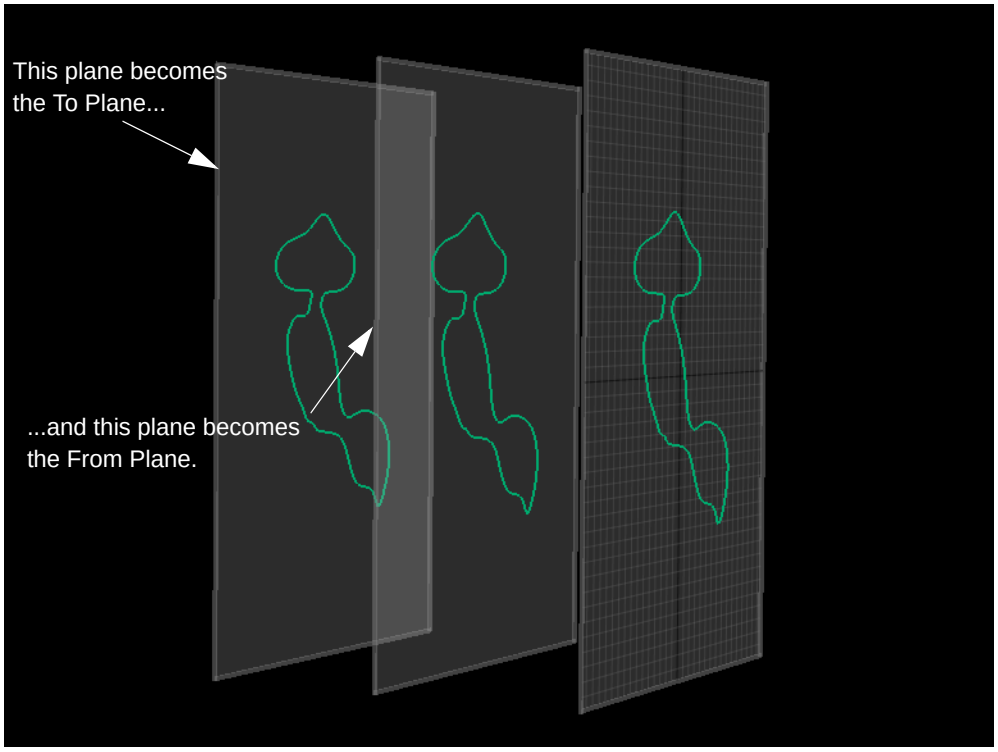


FIGURE 1-8. Moving the planes closer together

6 When the planes are the proper distance apart, approximately 3.3 inches, click on the **Create Inside** button on the Wire Cut dynabar.

The ClayTools system creates clay inside the profile between the two planes, and both the To and From planes disappear, leaving only the original sketch plane.

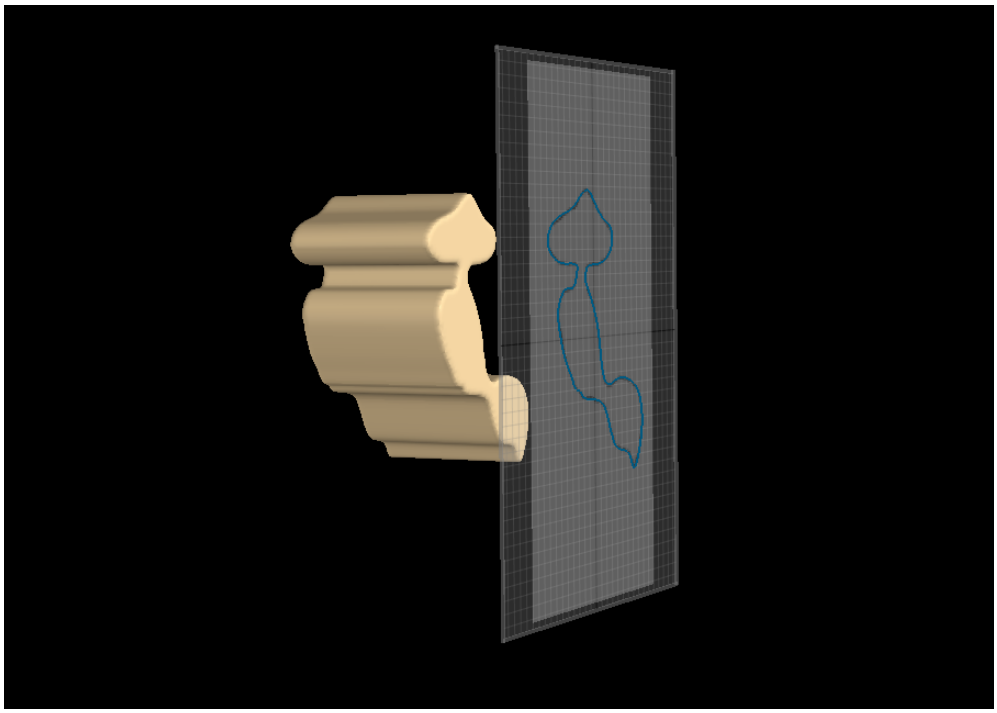


FIGURE 1-9. The shape after the first Wire Cut

You have the side view shape of the bug, but if you rotate your view, you'll see that it doesn't look too bug-like from the front. You'll need to make a cut from this angle.

7 Select **View** > **Standard Views** > **Left** (or simply press the **F4** hotkey).

A Note on Standard Views in ClayTools

ClayTools standard views are relative to the file when it was first created. In other words, the "Front" view displays the side of the model that faced the front when you first created it, regardless of what you may now consider to be the front of the model. So, if the Left View command doesn't produce a face-on view of the model, try the other standard view commands. (F2-F5)

8 Create a new sketch plane by clicking **Planes** > **Create Plane**. This places a new sketch plane on the left view of the model. If you call up the Object List (keyboard shortcut **o**), you can see the name for this new plane, “Left Plane 1.”

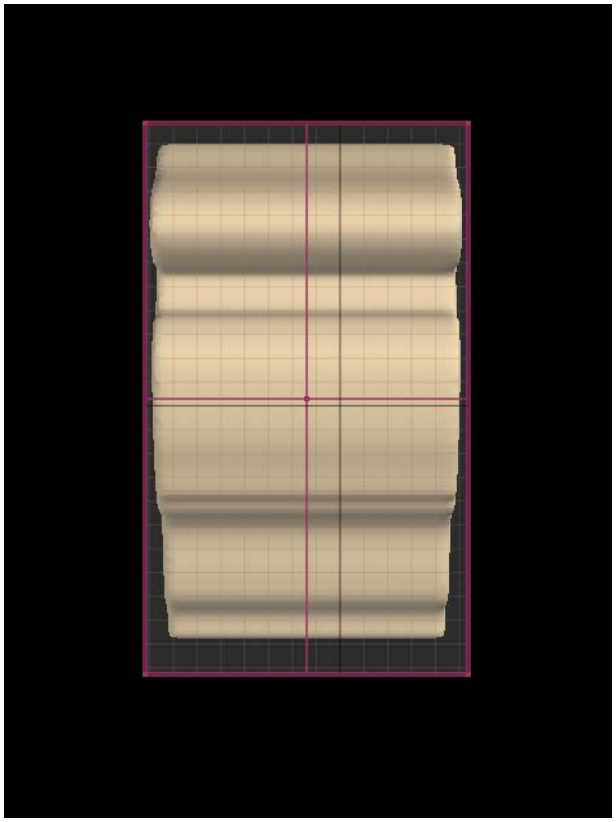


FIGURE 1-10. The new sketch plane

To get into sketch mode you can either click **Sketch on Plane** in the dynabar or select **Sketch > Freehand Curve**. Now draw on this new plane an outline that will define the front shape of the bug.

Time-Saving Tip

If you know you’re going to be mirroring the model after you create the profile – as we will in this example – you need to be careful only when drawing one side of the profile. The other side can be as rough as you want. Then later, when mirroring, you can choose to mirror the “good” side of the model to the other side. You can save a lot of sketching time this way.

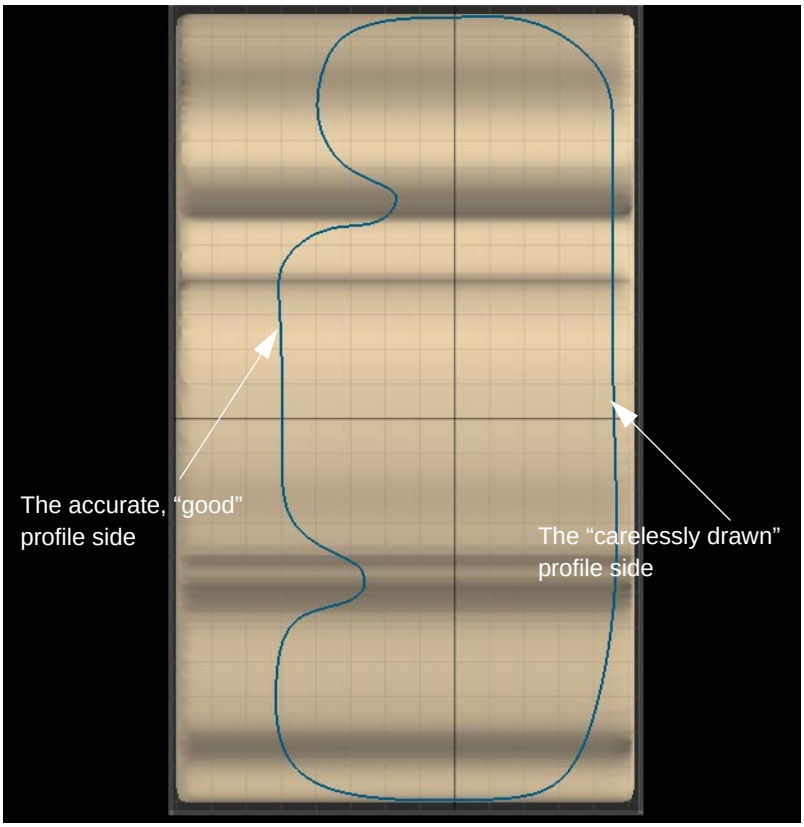


FIGURE 1-11. The profile for the front of the bug model

Editing a Curve

If the curve you've drawn for the outline isn't satisfactory, it's very easy to change without having to delete the curve and start all over again:

1 Click **Sketch** > **Select Sketch Object**, then select the curve. The ClayTools application displays all the points used to create the curve.

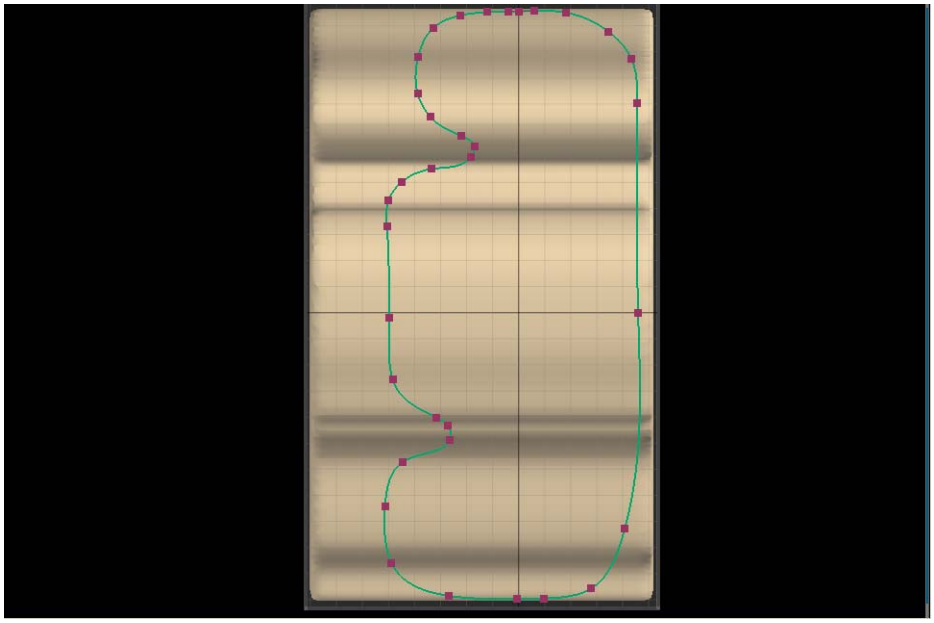


FIGURE 1-12. Editing the curve

2 To edit the curve, just grab any of the points and drag. When you're done, release the stylus button.

For more information on editing sketch curves, see "*Sketching on Planes*" in the *online Help*.

Make sure the profile is closed. Exit Sketch mode and prepare for the Wire Cut:

1 Click **Construct Clay** > **Wire Cut Clay**.

2 Select the profile by touching it with the PHANTOM device cursor and clicking the stylus button.Click **Next Step**.

3 Select the **Cut Outside** icon from the Wire Cut Clay dynabar to remove the clay that is outside the profile you have drawn.

4 After the ClayTools application makes the wire cut, press the **Hide/Show Plane** button in the Dynabar to hide **Left Plane 1**. If you have the Object List open, notice how the icon next to **Left Plane 1** has changed from an open eye, meaning the object is visible, to a closed eye, meaning it is hidden. The Object List is covered in more detail in the next chapter.

5 Hide **Front Plane 1** by clicking on its eye icon in the Object List.

Your work will look something like this illustration.

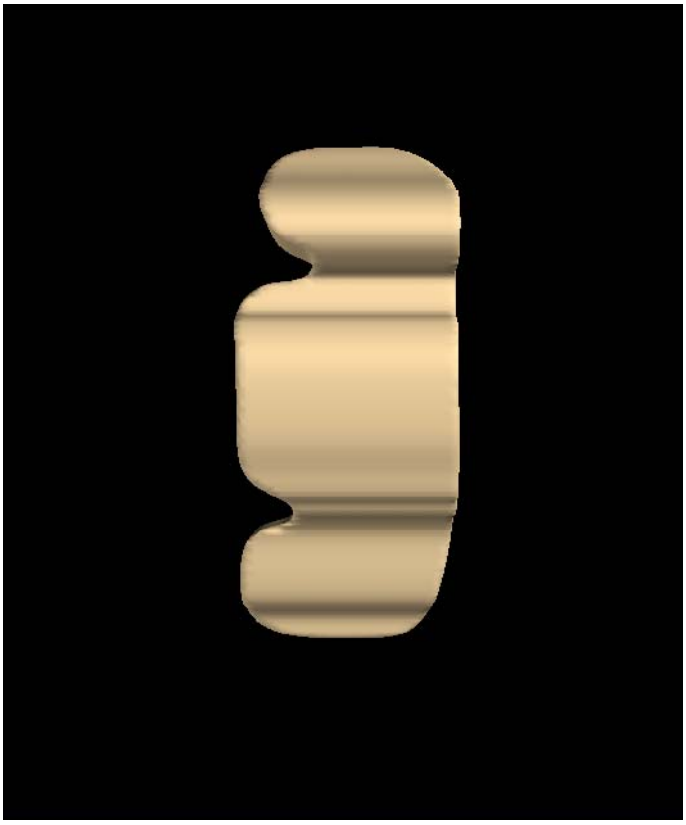


FIGURE 1-13. After the second Wire Cut

As we planned, one side of the shape has come out looking much better than the other side. Next you will use Mirror to correct this.

Mirroring to improve the shape and symmetry of the model:

1. Click **Construct Clay > Mirror Clay**. A mirror plane appear.
2. In the dynabar, set **Preview** to active. Depending on where your mirror plane is positioned your Bug may look a little funny once you hit **Preview.**

3 You want to mirror the better side of the model. To do this you will need to reposition the mirror plane. You can do this with dynabar tools or manually (see “How-to: Moving and Manipulating a Plane” on page 18). The mirror should end up bisecting the model in the XY plane similar to that shown in the following image.

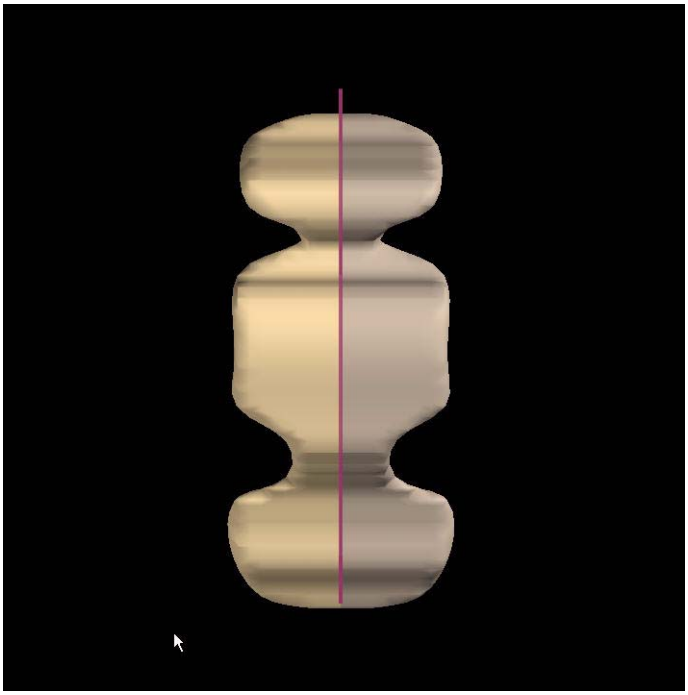


FIGURE 1-14. Mirror plane positioned in the xy plane with correct side mirrored.

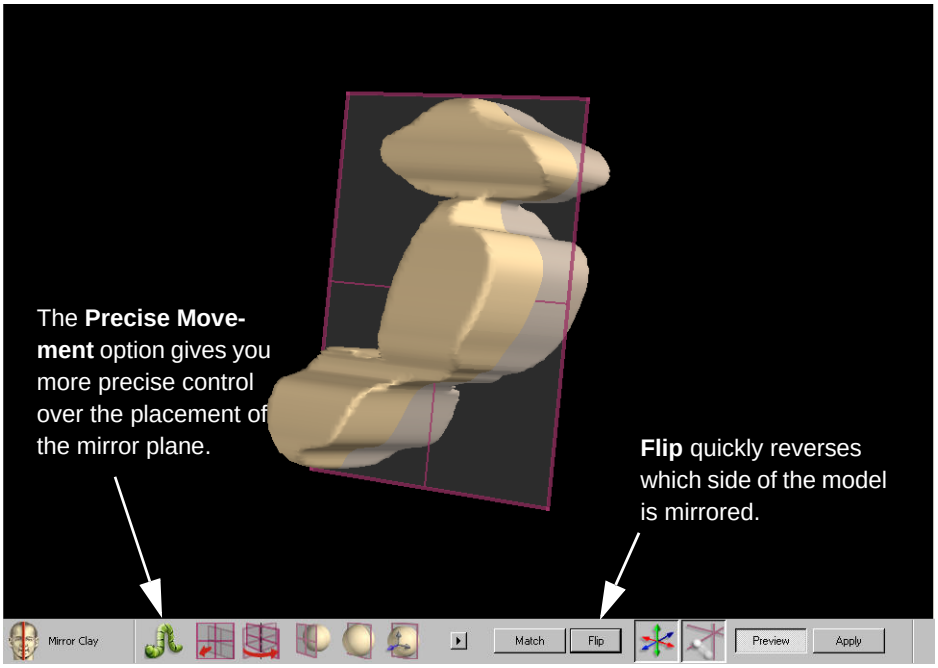


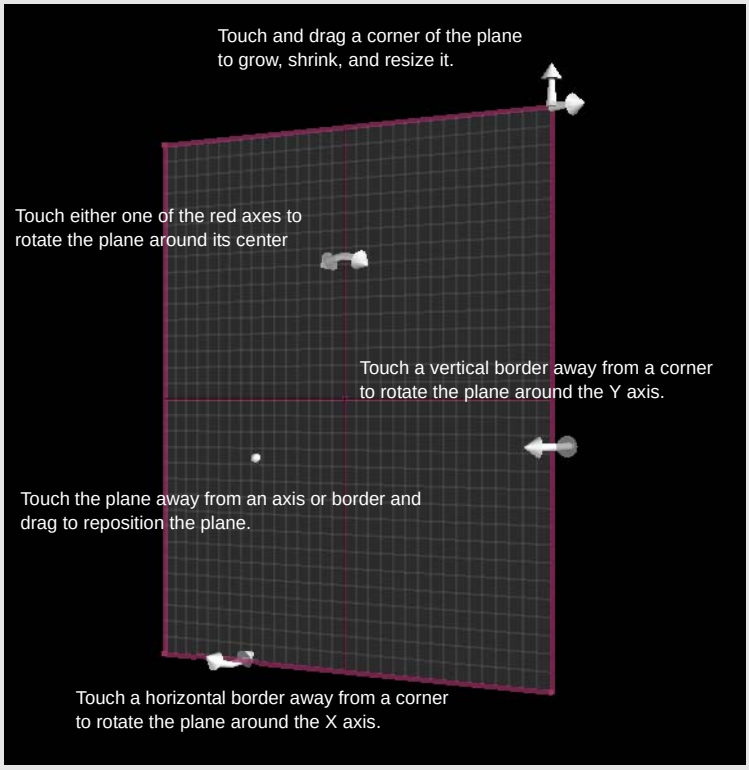
FIGURE 1-15. The shape of the model when mirroring

4 If necessary, click the **Flip** button to reverse which side of the model is mirrored.

5 When you're satisfied with the quality and symmetry of your shape, click **Apply**.

How-to: Moving and Manipulating a Plane

It's very easy to move a ClayTools plane in any direction or to any location you like. Displayed here are all the ways to move a plane. See the online Help for more information:



Smooth the Model

1 Now smooth the entire shape: Click **Sculpt Clay > Smooth Area** icon, then **Select All** on the Smooth Area dynabar. ClayTools highlights the model. Use the **Smooth Level** slider to adjust the level of smoothing (less smoothing to the left side of the slider, more to the right) then click on **Apply**. Use Ctrl+z to undo actions if you are not satisfied with the results.

Once smoothed, you'll need to round out and add some definition to the shape to make it more "bug-like".

2 Use **Sculpt Clay** > **Smudge** to round out the model from the inside. To save time, you may want to sculpt the clay on one half of the shape, then mirror that work to the other side. When you're done, smooth the entire model. Let the examples in the following figures act as a guide.

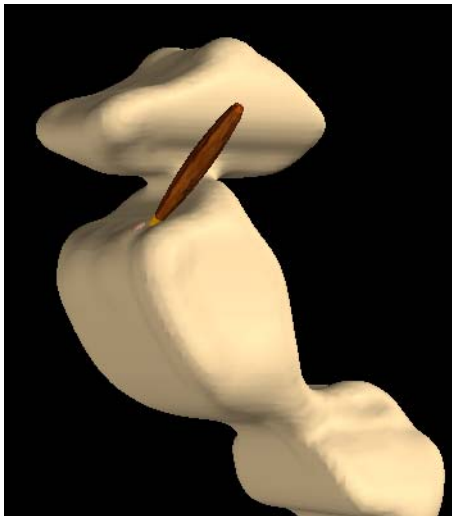


FIGURE 1-16. Using Smudge from the inside

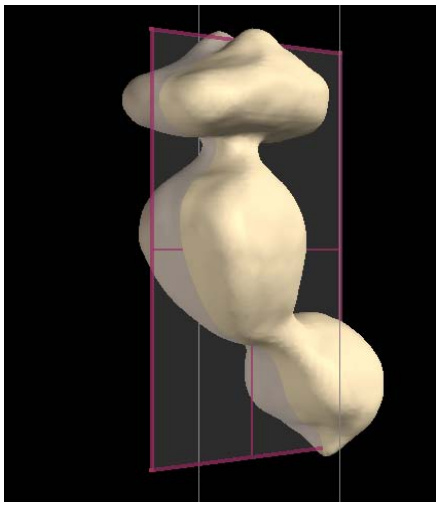


FIGURE 1-17. Mirroring the work from one side to the other

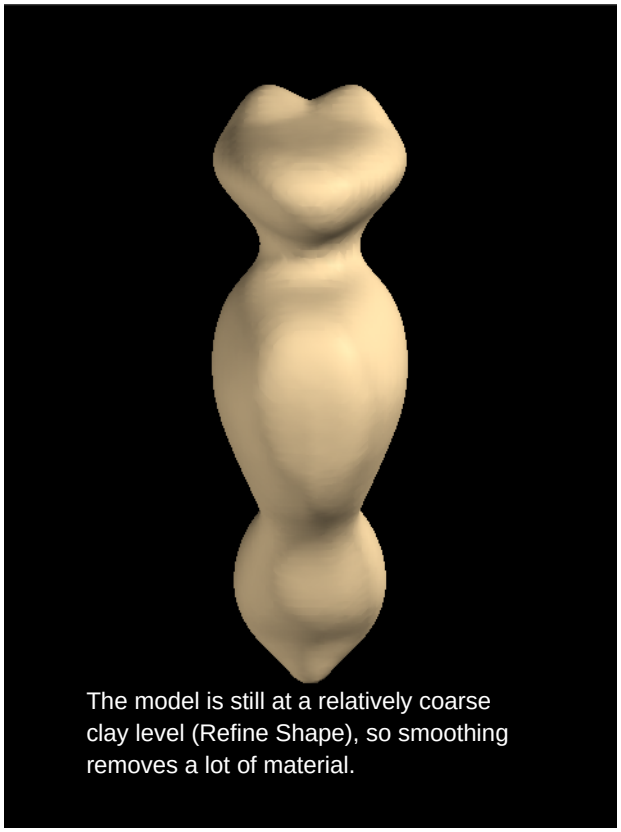


FIGURE 1-18. The results of smoothing the model

Add more clay

When your model looks similar to the one above, it's time to add the bug's arms and legs. First, let's call up a side view that will give you the most useful view when you go to create the first arm. (In our example, we used **From Left of Main View**, or **F8**.)

The easiest way to create arms and legs for the bug model is with the Add Clay feature, which you used in a previous lesson.

1. Click **Construct Clay > Add Clay**.
2. Click the **Ice-cream Cone** on the dynabar.
3. The first step is to sculpt the bug's upper arm starting at the shoulder, so change the diameter of the sphere of clay to a size that would be appropriate for the bug's shoulder. See Figure 1-19 for a guide.
4. Place the sphere of clay at the location of the shoulder and click the stylus button.
5. Then move the PHANTOM device tool to where the elbow would be. Notice that clay is extended between the shoulder and the tool. Press the minus (-) key to decrease the size of the Add Clay sphere as you're positioning it. That automatically tapers the arm.
6. When you've reached the location for the elbow, click the stylus button again.

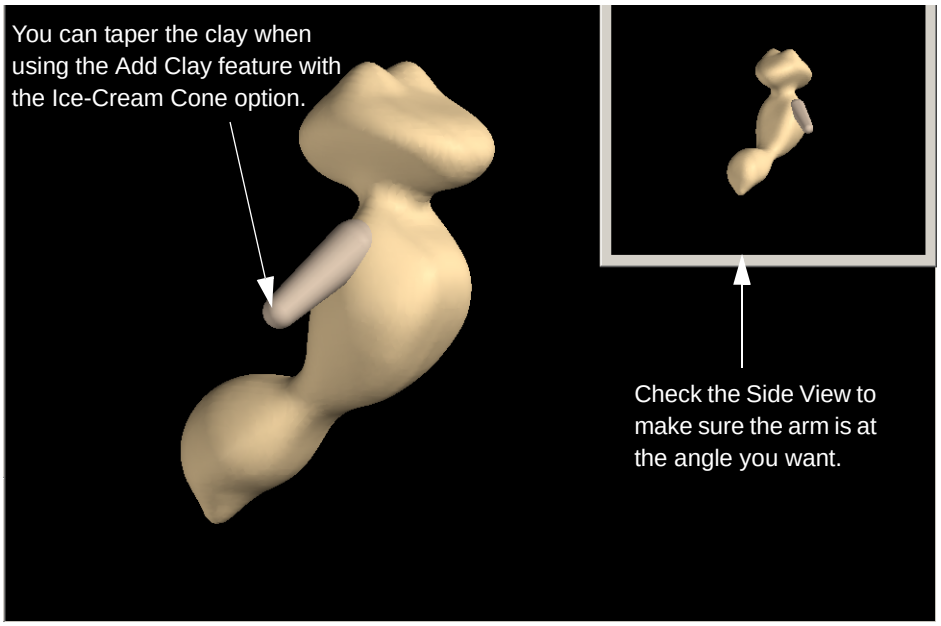


FIGURE 1-19. Creating the upper arm with Add Clay.

To create the forearm and hand, you can use Add Clay again.You will feel a haptic snap that will pull the tool into the groove of the elbow aiding with placement. Use Add Clay with the Ice-Cream Cone option to finish the arm and to create a leg – refer to Figure 1-20 – then go on to Selecting Clay.

Selecting Clay

The finished model of the bug has four legs, but so far you've only created one. You could create each leg individually, of course, but it would be faster and easier to take advantage of the work you've already done by using ClayTools' Copy and Paste functions. Before you do that, however, you must select what it is you want to Copy and Paste.

There are a few methods to select clay. Each one is explained in online Help, but for this lesson, you will learn how to selecting with a ball.

Selecting clay with a ball

To select clay with a ball, you "paint" the area of the model you want to select. Keep in mind that the depth of clay that will be selected is based on the diameter of the ball you're using. If you're selecting clay from a thick model, the clay will be selected only to the depth of the tool. Refer to Figure 1-20.

1. Click **Select/Move Clay** > **Select Clay with Ball**. The PHANTOM device tool turns into a green sphere (or your highlight color) with a small ball in its center.
2. Use the **Diameter** box in the dynabar or the + and - keys to make the ball larger or smaller.
3. Paint the clay you want to select with the Select Clay with Ball tool.

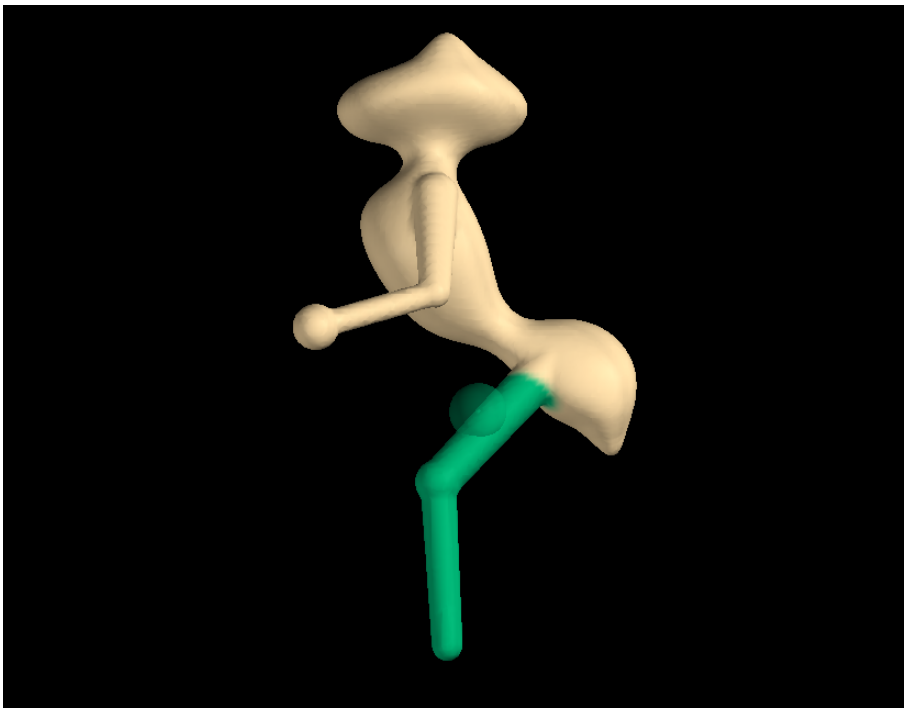


FIGURE 1-20. Selecting clay with a ball

Copying and Pasting

To copy and paste the leg:

1 Click **Copy** in the dynabar (or Select **Edit > Copy**).

2 Click **Paste** (or Select **Edit > Paste**). The Paste dynabar displays, as does the Triad, a representation of the X, Y and Z axes of the three-dimensional coordinate system underlying ClayTools.

3 Grab the copied leg with the PHANTOM device tool and position it to the rear of the first leg. (Use the next figure as a guide.)

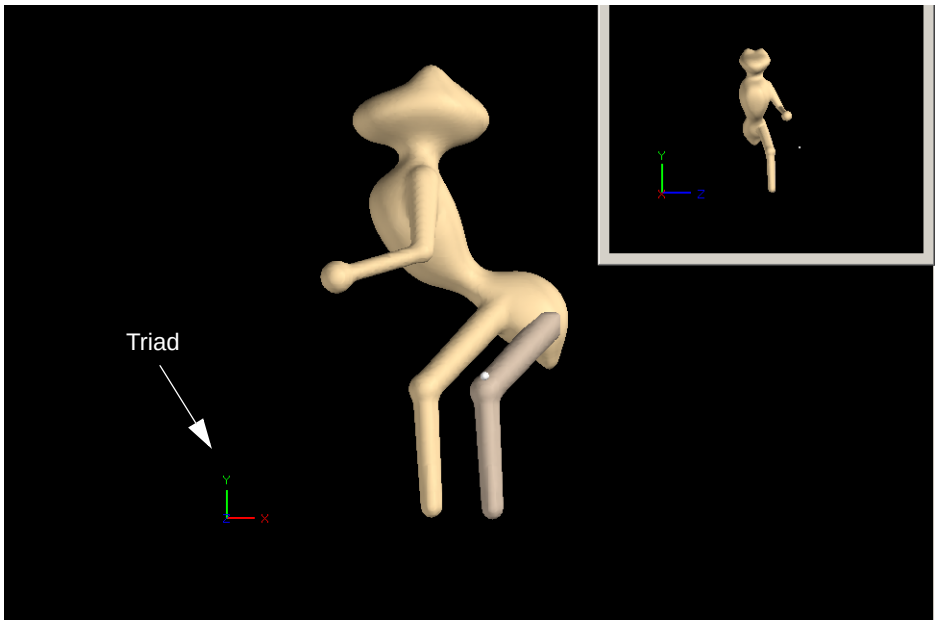


FIGURE 1-21. Positioning the copied leg

4 When the leg is positioned where you want it, click the **Add** button on the dynabar. The copied leg becomes part of the model.

5 Smooth the entire model to erase lines formed where the leg connects to the rest of the model.

6 Use the mirror function to copy the armed and legged side of the bug to its empty side, as in the next figure.

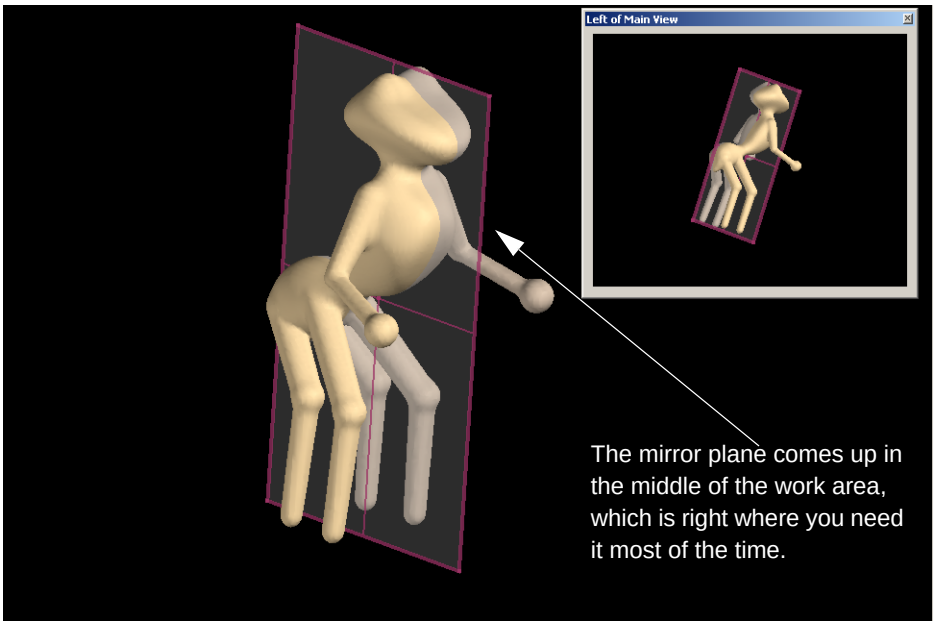


FIGURE 1-22. Mirroring the model

Sculpting Tip: Think ahead

You may notice in the above illustration that the model has two arms and four legs... but no feet. If we had created a foot at the same time we created the first leg, the mirroring feature would have given us four feet by now instead of none.

Adding Details to Your Model

Change clay coarseness

It's time for more detailed work on the model. Finer detailed work required finer clay. To change the clay coarseness, select **Tools > Clay Properties** > **Clay Coarseness**. Choose **Add Detail** for the new clay coarseness. Click **Ok**.

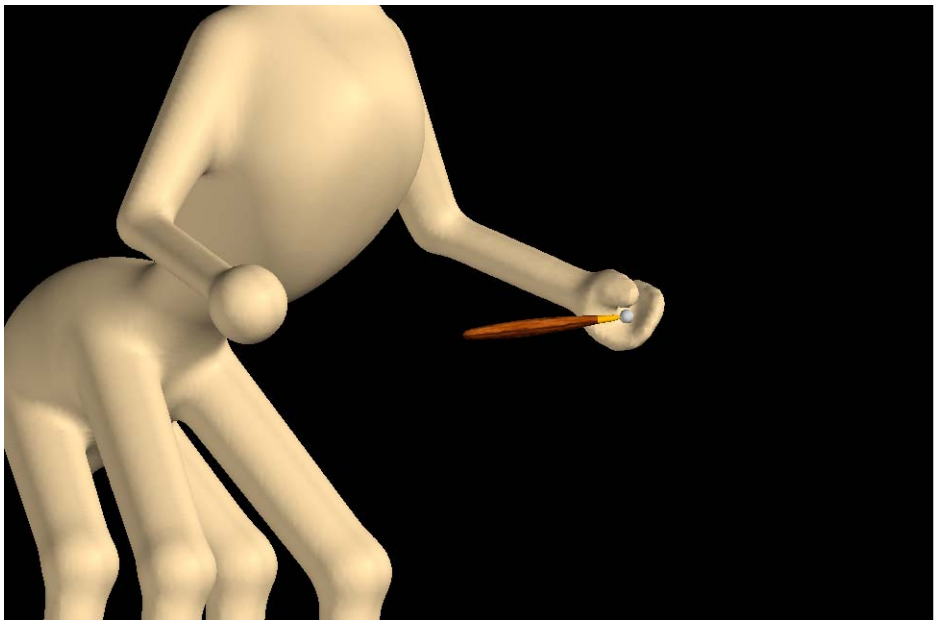


FIGURE 1-23. More detailed tools and finer clay

Now that you're in the Add Detail level of detail for your model, use the smaller tools and finer clay to sculpt details into the hands, toes, eyes and other details of the model. Refer to the illustrations of our model on the following pages as a guide.

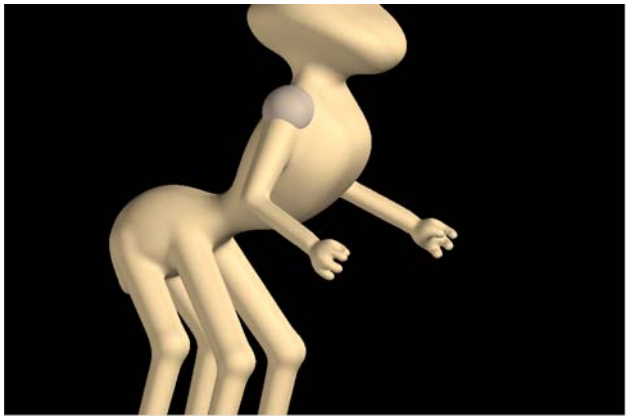


FIGURE 1-24. Adding clay (Sphere option) to build up the shoulders...

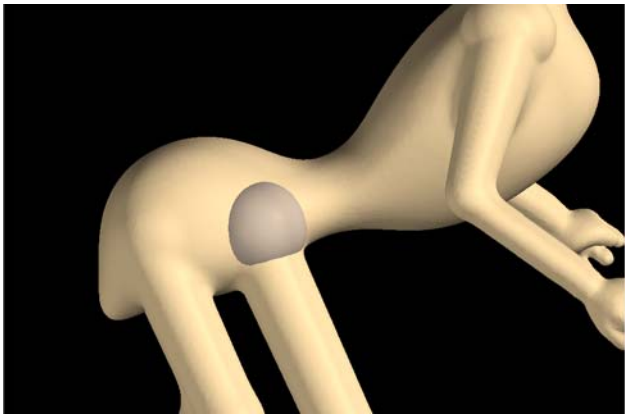


FIGURE 1-25. Add clay to detail the joints

FIGURE 1-26. Honing fingers with the Attract tool

FIGURE 1-27. Carving mouth and teeth with Interactive Mirror

Using Smooth

In addition to Smooth Area, which you used earlier, there is another way to smooth your model, which is similar to burnishing in “real life.” It is used to smooth (or burnish) specific parts of your model. In this example, we are using the ball-shaped Smooth tool to smooth the area of the bug’s eyes.

FIGURE 1-28. Smoothing the area of the eyes

Sculpting from the Inside

You've used both the Sphere and Ice-Cream Cone options of the Add Clay function. You can also add clay by pulling from inside the model.

To create an antenna for the bug:

1 Click **Sculpt Clay > Carve with Ball**.

2 Adjust the size of the tool to one that is appropriate for the bug's antenna.

3 Place the ball-shaped tool on the bug's head, and push through the head to pop to the inside of the model. Click and hold the stylus button, then slowly pull the tool away from the bug's head. A trail of clay extrudes from your tool, as shown in the following figure.

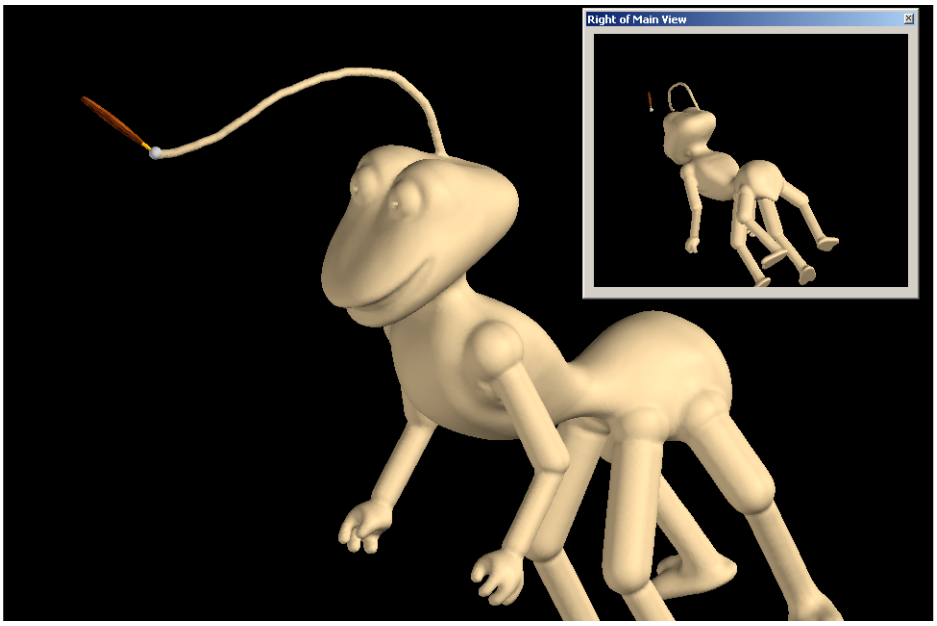


FIGURE 1-29. Work from the inside to extrude streams of clay

4 Release the stylus button when you're done.

5 Mirror the antenna to the other side of the model. (You'll probably need to **Flip** the mirror to reflect the proper side of the model.)

Modeling Tip

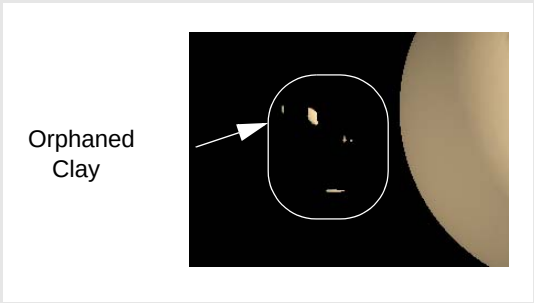
Whenever you mirror your model, any previous work you did on the mirrored side of the model is replaced by a duplicate of the original side. That makes for perfect symmetry, but what if you want the sides of the model to be different in some way from each other? The answer, generally, is to do all your symmetric work first and leave the asymmetric work for the end of the modeling process.

The model is nearly finished at this point. All that remains are adding the breastplate and some final tweaks. For the best, most detailed results, increase the resolution of the clay one more time to **Add Fine Detail**.

Note: Your tools are smaller and your work may be slower at this level of clay coarseness. That is why in most cases it's a good idea to wait until the end to work at such high resolutions.

Tip: "Orphaned" Clay

When using one of the carve tools, you may find that you have orphaned clay. That is, clay that is floating in space,. but any attempt to remove the clay fail because you cannot carve away or select it.



To remove this unwanted clay:

1. Using Select by Lump, select the clay you want to keep.
2. Next reverse the clay that is selected by selecting **Edit > Invert Selection.** The orphaned clay is now selected green.
3. Press delete. The orphaned clay is removed.

Using Emboss with Image

It is now time to create a decorative breastplate for the bug using the Emboss with Image feature. We have supplied an image for you to use. It is located in the same **models** folder as **bug.bmp**, and is called **breastplate_design.bmp.**

1 Click **Detail Clay > Emboss with Image**. A dialog box is displayed, asking you to select the image file to use for embossing.

2 Navigate to the models folder, select **Breastplate_design.bmp**, then click **Open**. Your screen will look like the one shown in the next figure.

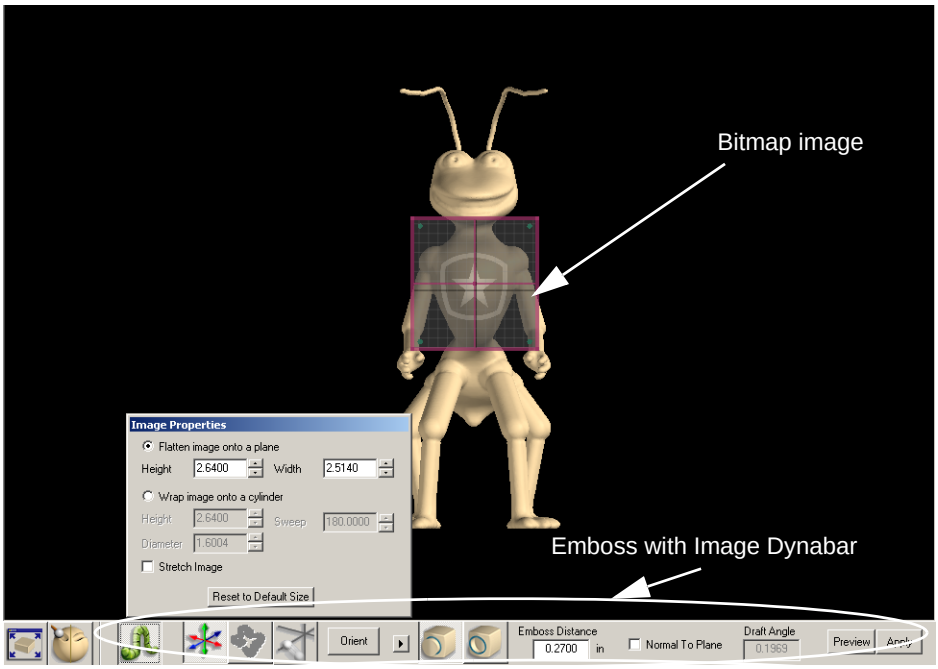


FIGURE 1-30. The bitmap image and the Image Properties dialog box

3 In the Image Properties dialog box, accept the default, **Flatten image onto a plane**.

4 Resize the image to fit your model by making changes to the **Height** and **Width** boxes or resizing the plane.

5 Use the PHANTOM device (and the positioning aids) to position the bitmap image to serve as the bug's breastplate.

6 You want to raise the star and outer ring rather than lower it. Click the **Raise** button.

7 Enter in the **Emboss Distance** box on the dynabar a distance of **.08** inches.

8 To get a preview of how the embossed clay will look, using the current image and the settings in the Emboss Image Properties dialog box, click on the **Preview** button.

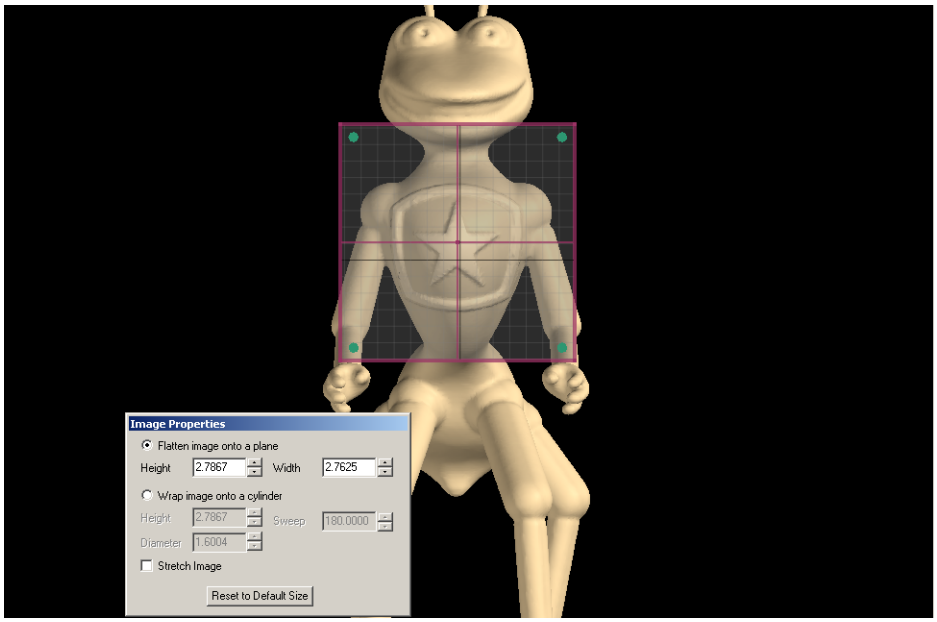


FIGURE 1-31. Previewing Emboss with Image

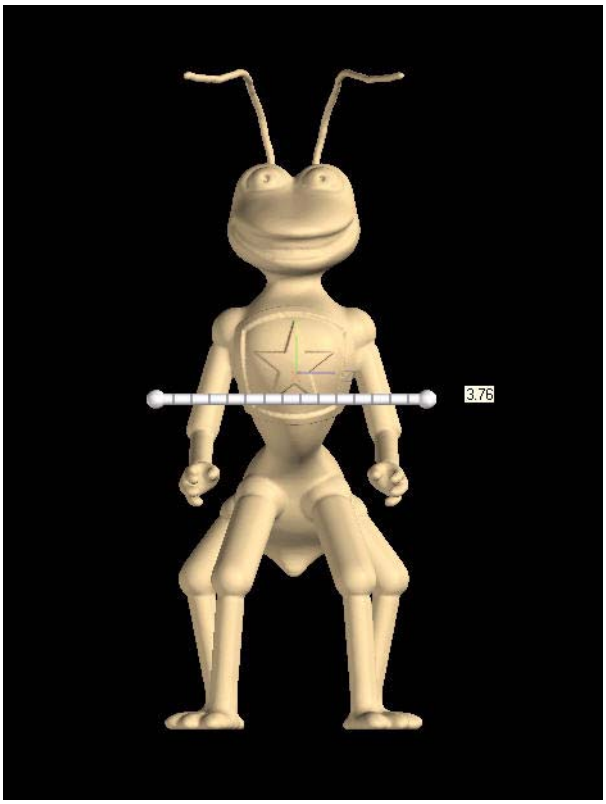
9 If you are not satisfied with your results, undo the preview and experiment with the embossing options if you want. When you are satisfied with how the breastplate looks in the preview, click **Apply**.

Measuring with the Ruler

To make sure your bug model has the proper dimensions, you can measure it with the Ruler Tool.

1 Select **Tools** > **Ruler**.

2 Click the **Ruler** option in the dynabar. The persistent ruler is displayed.



3 Grab the ruler with the PHANTOM device tool to move it. Grab the base end of the ruler (the one without a measurement display next to it) and relocate the ruler to the feet of the bug.

4 Then grab the other end of the ruler and drag it to the highest point of the model—the antennae. The height of the model is displayed both at the location of the PHANTOM device tool and in the **Along Y** box in dynabar.

5 To make it easier to align the ruler with the X, Y, Z axes of the work area, click on the **Axis Snap** option in the dynabar. That displays the axes when the rule is selected and provides for a haptic snap when moving the PHANTOM device tool. See the next figure.

The ClayTools application will display the ruler as you use other ClayTools commands. To delete the ruler, select Ruler from the Tools menu again (or use hotkey **R**), click the Ruler button on the dynabar, then touch the existing ruler and press the Delete key.

For more information see the online Help.

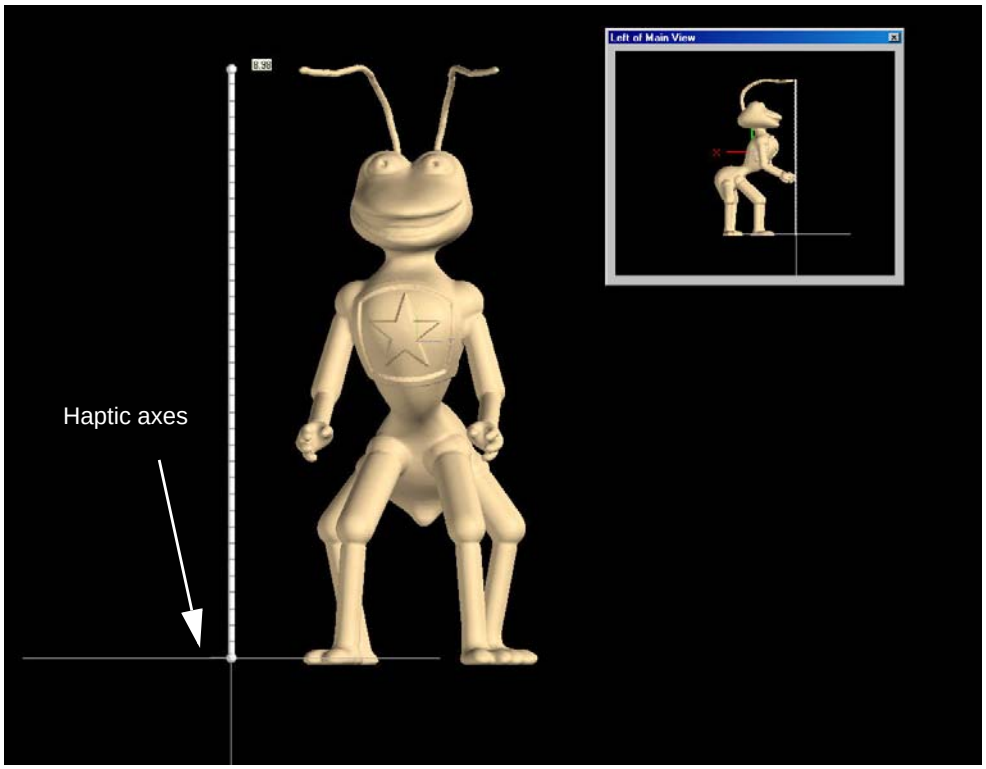


FIGURE 1-32. Measuring the final model

Measure the other dimensions of the model with the Ruler Tool. If you do need to change the size of the model:

1 Select **Tools**> **Clay Properties** > **Scale**. The Scale Model dialog box is displayed:

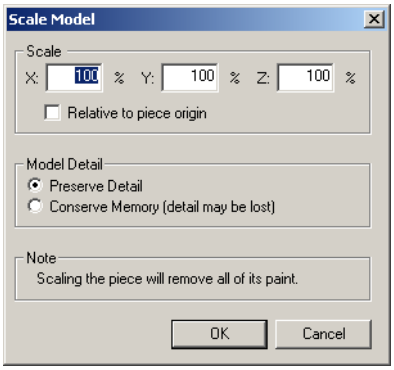


FIGURE 1-33. The Scale Model dialog box

2 Enter a percentage in any or all of the scale fields. (To scale the model uniformly, you need to enter the same number in each field.)

3 Choose either **Preserve Detail**, to maintain as much model detail as possible, or **Conserve Memory**, which may result in some loss of model detail.

4 Click **OK**.

END OF LESSON