Modeller
Version 1.00

Seven:Twelve Engineering LLC

1 Introduction

Welcome to the Crossbeams Modeller! This manual shows you how to assemble virtual Crossbeams designs and generate instructions on your computer.

2 Installation

Follow the directions in the `README` file that came with this distribution.

2.1 Running

If you installed from a binary distribution, shortcuts to cbmodel should already be available on your desktop. You may also run cbmodel from the command line with `cbmodel` or `./cbmodel` from within the cbmodel install directory.

The Crossbeams Modeller allows the following command-line arguments:

Short Form	Long Form	Description
`-h`	`--help`	Displays the possible options and exits
`-i`	`--indirect`	Forces indirect (software-driven, not graphics-card driven) drawing. Slow but useful for generating instruction sets that go off-screen on some graphics cards.
`-p`	`--printkeys`	Displays the key code of the key pressed in the *Status Bar*. Useful for creating custom key shortcuts.
`-a`	`--alpha`	Uses alpha-numeric keys for navigation instead of the numeric keypad.

3 The Main Screen

The Crossbeams Modeller shows four main parts (see Figure 1): a menu bar, an editing window, a piece selector, and a status bar.

Menu Bar: Allows pull-down menu commands.

Editing Window: Shows the model that is being created (drawn in white) and the current piece that is being added (drawn in green).

Piece Selector: Allows you to change the current piece.

Status Bar: Displays status messages at the left and refresh time at the right.

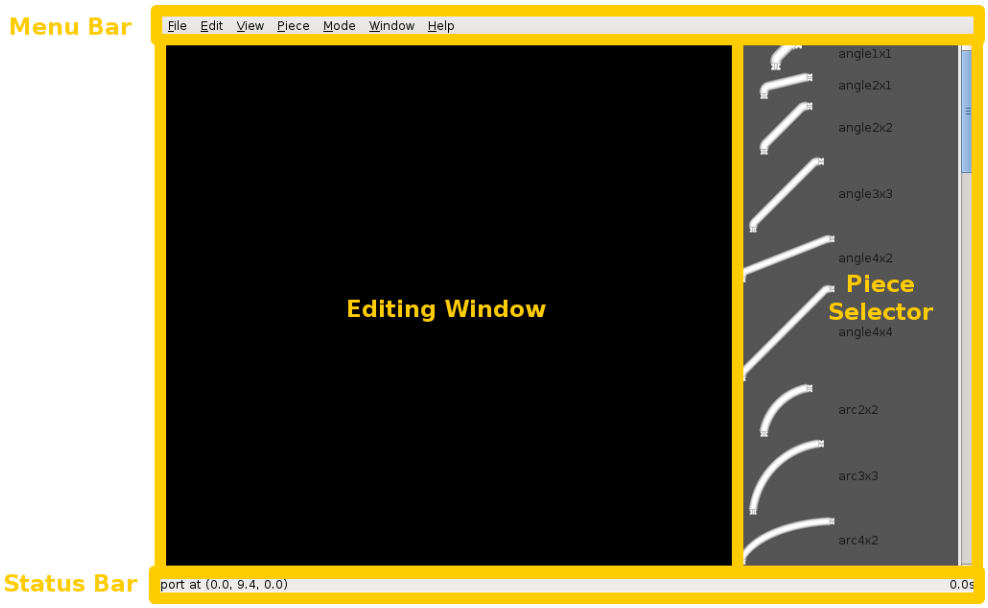

Figure 1: Crossbeams Modeller Main Screen

4 Building

Ready to begin? To begin connecting pieces, choose a piece from the piece selector by clicking on it. That piece (the *current piece*) will be green in the editing window (Figure 2). When starting a new design, the first piece is `attached` to an invisible cross-hair (like a '+' sign) in the center of the editing window. To `attach` that initial piece to a different part of the cross-hair, click a little left, up, down, or right of center.

When you have the piece you want, press `c`[1] (for connect) to connect it. You've just established the first piece of your design (or *model*). Notice it is no longer green but white (Figure 3). A new current piece (green) appears automatically.

Often, the automatic piece is not the next one you want to connect. Choose a different piece by clicking on it in the piece selector.

Every piece has at least one place to connect to other pieces. These connection points are called *piece ports*. Likewise, every model has zero or more unconnected ports (Figure 4) called *model ports*. Left-click on the model port where you want the piece to connect. You'll see the current piece move to the model port.

You can choose a different piece port to connect to the model port by pressing `p` (for port).

You can rotate the piece in 90° increments by pressing `f` (for flip).

Once the piece is where you want it, press `c` to connect. The piece changes from green to white when it is connected, and a new current piece (in green) attaches itself to another model port.

The Crossbeams Modeller knows joints can only be connected to beams and beams

[1]Nearly all key commands have pull-down menu equivalents. The key commands may be customized.

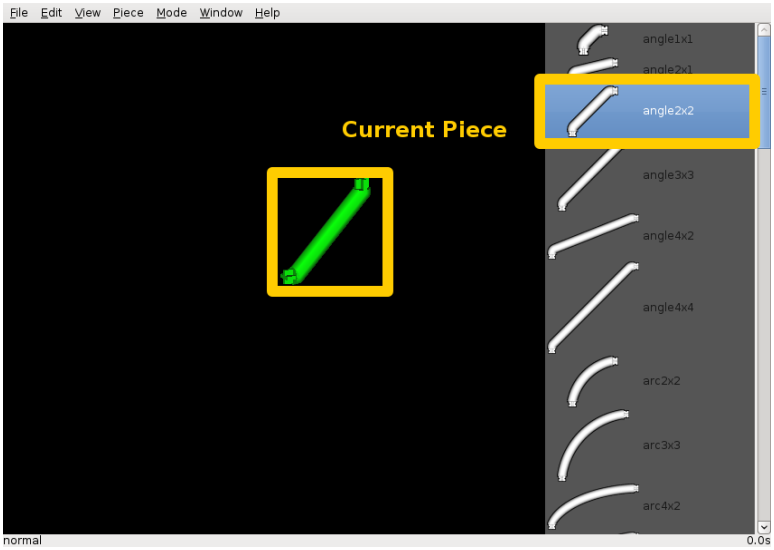

Figure 2: Choosing a Piece

can only be connected to joints. (The main pieces are either *beams* or *joints*.) After you connect a piece, the system will automatically attach the most recent beam or joint to a new model port.

Continue building in the same way:

1. Click on the current piece you want (in the piece selector).
2. Left-click on the model port where you want the piece to connect.
3. Choose the correct piece port by pressing `p`.
4. Choose the correct piece rotation by pressing `f`.
5. Press `c` to connect.

4.1 Definitions

Model: the total design being built and displayed.

Current piece: the piece which is currently selected (but not yet connected). The current piece is always in green.

Piece port: the part of the piece which connects with other pieces.

Model port: an unconnected port in the model.

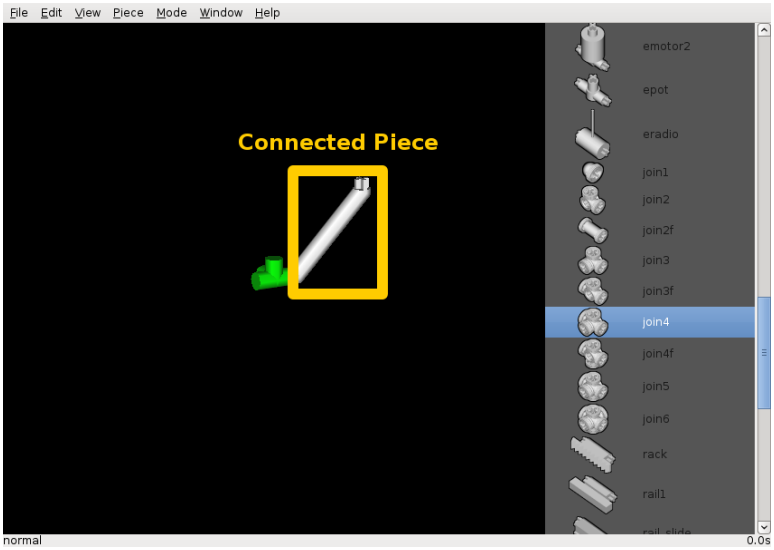

Figure 3: Connecting a Piece

4.2 Building Command Summary

To **select a different piece port**, press `p`.

To **rotate the current piece**, press `f`.

To **connect the current piece to the model**, press `c`.

5 Navigating

Both keyboard and mouse can control how you view your model, allowing you to "move around" (navigate) in the editing window by panning, orbiting and zooming.

5.1 By Keyboard

To navigate your view using the keyboard, use the following keys (remember to use the **numeric keypad** (NumPad)):

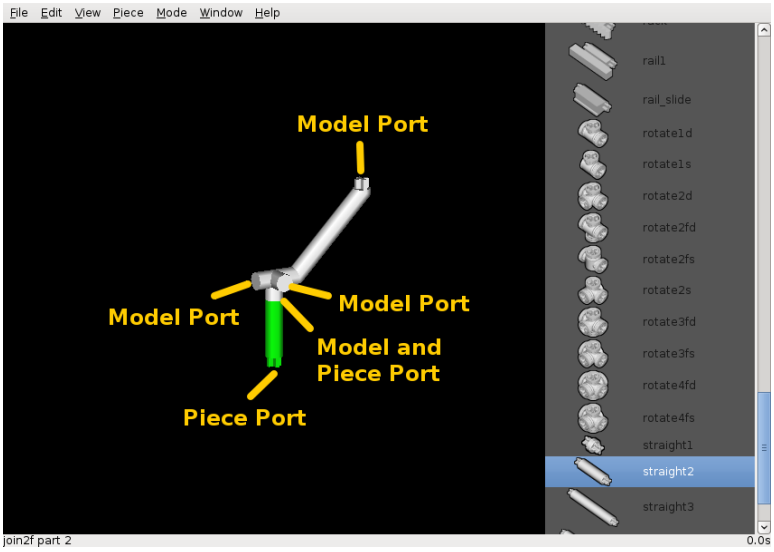

Figure 4: Ports

NumPad Key	Action	NumPad Key	Action
8	orbit up	Shift 8	pan up
2	orbit down	Shift 2	pan down
4	orbit left	Shift 4	pan left
6	orbit right	Shift 6	pan right
*	rotate clockwise	+	zoom in
/	rotate counterclockwise	-	zoom out
7	top view	Shift 7	bottom view
1	front view	Shift 1	back view
3	right-side view	Shift 3	left-side view

The direction is from your perspective. For example, *orbit up* means you *orbit up* while the model remains stationary.

What if you don't have a NumPad? You may start the Crossbeams Modeller with the `--alpha` option to force alpha (non-NumPad) keys. Alternatively, you may select alpha keys with `Options - Navigation with Alphas`. In the latter case, you must exit and restart the Crossbeams Modeller before the new keys are active. Then, use the following keys to navigate:

NumPad Key	Action	Key	Action
i	orbit up	Shift i	pan up
,	orbit down	Shift ,	pan down
j	orbit left	Shift j	pan left
l	orbit right	Shift l	pan right
8	rotate clockwise	+	zoom in
9	rotate counterclockwise	-	zoom out
u	top view	Shift u	bottom view
m	front view	Shift m	back view
.	right-side view	Shift .	left-side view

The rest of the manual assumes you use NumPad. If you don't, substitute the appropriate key from the table above.

5.2 By Mouse

You can also orbit or pan your view by using the mouse.

To **orbit**: move the mouse while holding down on the middle mouse button

To **pan**: press Shift and move the mouse while holding down on the middle mouse button.

On computers without a middle mouse button, holding down Control while holding down the left mouse button substitutes as a middle mouse button.

6 Editing

6.1 Undo/Redo

You can undo the last model change with Edit - Undo or Control z. You can redo the last model change with Edit - Redo or Control y.

6.2 Selecting

To select a piece, right-click on the center of the piece. The selected piece becomes blue. To select multiple pieces, hold Shift while right-clicking an unselected piece (Figure 5). Look around your model by navigating to make sure the selected piece is the one you really want. (For example, when other pieces lie exactly behind the piece you want, the Crossbeams Modeller may choose one of those instead.)

To border-select a group of pieces, press b (for box). Then, position the mouse at the upper-left corner of the box. Left-click on the upper-left corner, drag to the lower-right corner, and release. Pieces whose centers fall within the border are selected.

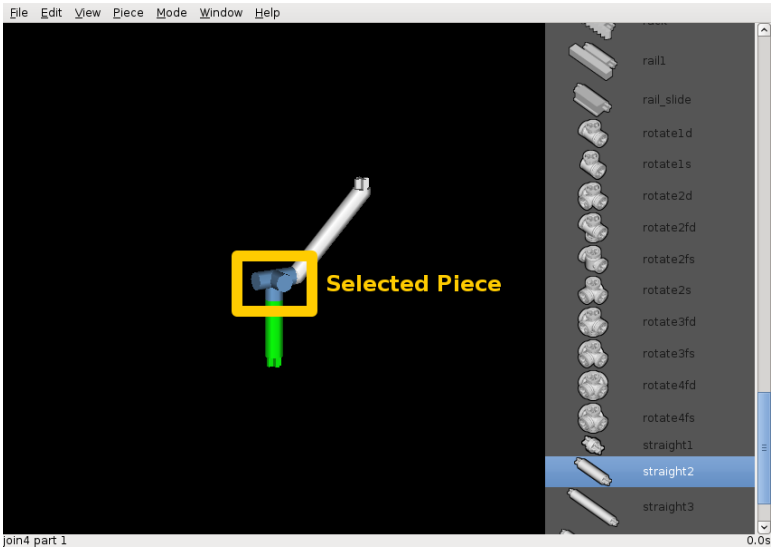

Figure 5: Selecting Pieces

To deselect a single piece from multiple pieces, hold `Shift` while right-clicking a selected piece. Press `a` (for all) to deselect all pieces when some are selected. Press `a` to select all pieces when none are selected.

To select pieces of a specific type, choose a piece from the piece selector. Then use `Edit - Select by Type`.

The status bar displays the number of selected pieces.

6.3 Configuring

axlews and axlegs can be configured to have various numbers and types of wheels and gears on them. Rotating joints can be configured to have stiffens on them. To configure a piece, select it, and press `q` (for query). A Piece Query window pops up (Figure 6). Configure the piece by choosing the appropriate pulldowns. Click `OK` to accept or `Cancel` to cancel.

6.4 Deleting

To delete selected pieces, press `x`.

6.5 Moving

To move selected pieces, first grab them by pressing `g` (for grab). The grabbed pieces follow mouse movement. To cancel the grab, right-click the mouse. To accept and finish the grab, left-click the mouse. Grabbed pieces move in half unit increments.

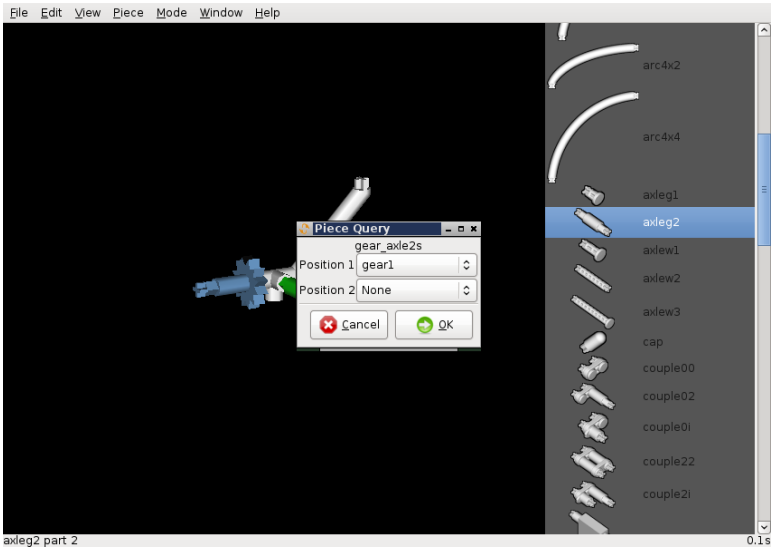

Figure 6: Configuring a Piece

6.6 Copying

To copy (duplicate) selected pieces, press `Shift d` (for duplicate). *Duplicate* copies the selected pieces, makes the new (copied) pieces the selected ones, and puts the new pieces in grab mode. The copied pieces must be moved for *duplicate* to work.

6.7 Rotating

To rotate selected pieces in $90°$ increments, position the mouse at the fulcrum (the point you want the pieces to rotate around), and press `r` (for rotate). Move the mouse to rotate. $0°$ is to the right. To cancel the rotate, right-click the mouse. To accept and finish the rotate, left-click the mouse.

6.8 Mirroring

To mirror selected pieces, choose a model port to be the fulcrum (the point you want the mirror image to mirror about). Position the mouse at that model port, and press `Control m` (for mirror).

Move the mouse across the plane you want to mirror the pieces in. To cancel the mirror, right click the mouse. To accept and finish the mirror, left click the mouse.

6.9 Nuances

To make the mouse motion more closely approximate what you're seeing, use orthogonal views (left, right, top, bottom, front, or back) during grab, duplicate, rotate, and mirror operations.

Grab, duplicate, rotate, and mirror have not been fully debugged for impossible edits (e.g., overlapping pieces). Therefore, to avoid bugs, make sure these edits are physically possible.

Some editing operations sever a model. The Crossbeams Modeller treats the severed models as one large model.

6.10 Fixing

Impossible edits sometimes corrupt a model. `Edit - Fix` can fix some corrupted models. Unfortunately, it cannot fix all of them.

6.11 Editing Command Summary

To **undo the last model change**, press `Control z`.

To **redo the last model change**, press `Control y`.

To **select a piece**, right-click on that piece.

To **select multiple pieces**, press `Shift` and right-click on each piece.

To **border-select a group of pieces**, press `b`. Then click-and-drag from upper-left to lower-right.

To **deselect a piece**, press `Shift` and right-click on that piece.

To **deselect all pieces** when some are selected, press `a`.

To **select all pieces** when none are selected, press `a`.

To **select a single piece type**, use `Edit - Select by Type`.

To **configure a piece**, press `q` while the axle is selected.

To **delete selected pieces**, press `x`.

To **move selected pieces**, press `g`.

To **copy selected pieces**, press `Shift d`.

To **rotate selected pieces**, press `r`.

To **mirror selected pieces**, press `Control m`.

To **fix a model**, use `Edit - Fix`.

7 Reporting

You can view a model's inventory, dimensions, mass, estimated price, or instruction page count with various `View` menu commands. Each one pops up a reporting window.

7.1 Inventory

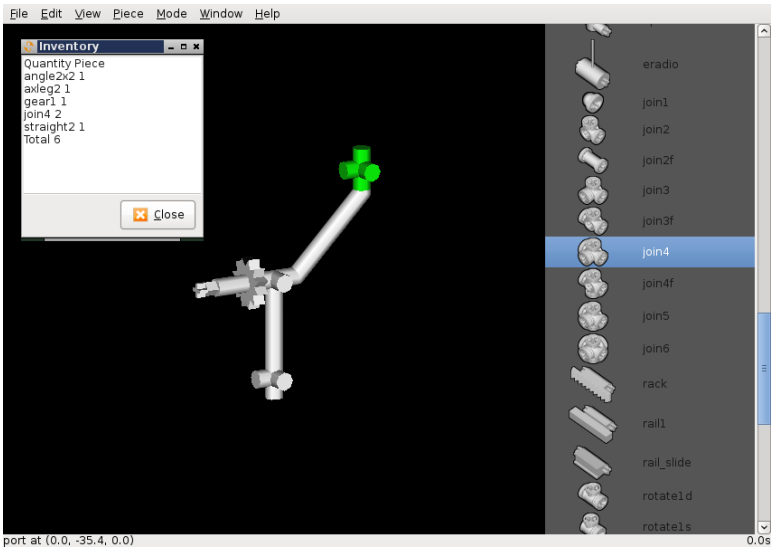

Figure 7: Reporting the Inventory

To view a list of pieces used in your model, use `View - Inventory`.

7.2 Dimensions

To view the size (dimensions) of your model, use `View - Dimensions`.

7.3 Mass

To view the mass or weight of your model, use `View - Mass`.

7.4 Price

To view an estimated price of your model, neglecting instruction set and packaging, use `View - Price`.

7.5 Instruction Page Count

To view the number of pages in your model's instruction set, use `View - Pages`. You will have zero pages until you add instructions.

8 Files

8.1 Normal File Changes

`New`, `Open`, `Save`, and `Save As` features can be found under the File menu. They operate similarly to most other programs. There is no query to save on exit, so make sure you save often.

Crossbeams Modeller files are saved with a `.cbm` extension. `.cbm` is a text format, so you may view it in a text editor.

8.2 Saving Snapshots

Use `File - Save Snapshot` to save a Snapshot (or photo) of your model in `.png` format.

8.3 Saving an Inventory

You may also save a list of all pieces used and their quantity (an inventory) with `File - Save Inventory`. The file is saved with the same name and a `.csv` extension. `.csv` format is easy to read. A comma separates the piece quantity and piece name.

8.4 Merging Models

While every file only contains one model, you may merge models from another file into your current model. To do so, select the `File - Merge` menu option. Choose the other model's file name, and the other model will be imported and selected into your current model. Be careful. Usually the other model will overlap your current model somewhere. It's best to keep it selected and move it where it doesn't overlap before deselecting it.

9 Options

9.1 Detail

Various levels of detail are allowed in the model drawing. Solid detail draws pieces as simple intersecting cylinders. Render detail draws the actual piece. The better the detail, the slower the screen redraws. Choose solid detail with `z`. Choose render detail with `F12`. Detail can also be set with `Options - Detail`.

The first time a piece type is rendered takes a long time. Afterward, it renders faster. With a high-end graphics card, render redraws can be acceptably fast, even while building.

Render detail is currently disabled for public versions of the Crossbeams Modeller.

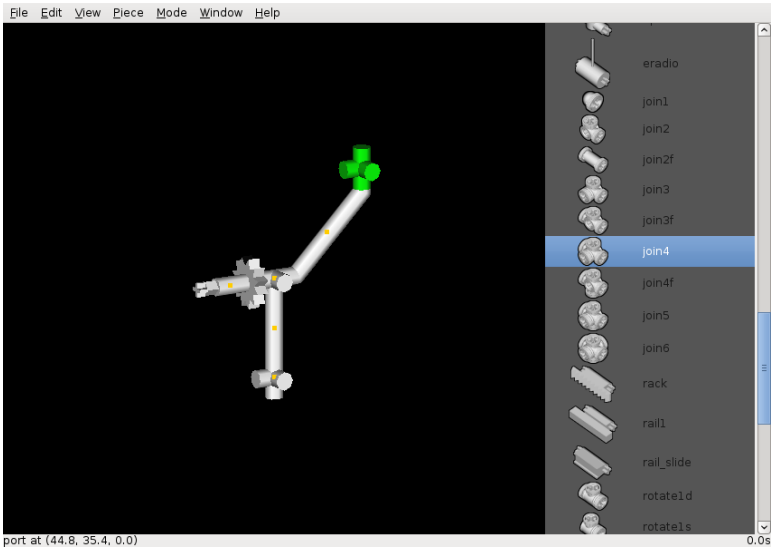

Figure 8: Draw Centers

9.2 Window Sizes

You may resize the window using the window manager. For instructions, however, the window must be at fixed sizes. Select one of the `Options - Window Size` menu options to change to a fixed size.

9.3 Colors

The Crossbeams Modeller lets you change between Screen (white on black) and Print (white on white) color schemes. Select the color with the `Options - Color` menu options. To more thickly outline the parts in black, particularly for white on white, use `Options - Draw Outlines`.

9.4 Draw Centers

For selection, the piece center is not always clear. `Options - Draw Centers` draws the center point of each piece in a highlighted color (Figure 8).

9.5 Navigation with NumPad or Alphas

You may set your navigation key settings to NumPad or Alphas (non-NumPad) keys with these two options. The change doesn't take effect until you restart. Be careful: selecting either of these options writes to your configuration file, overwriting custom key settings.

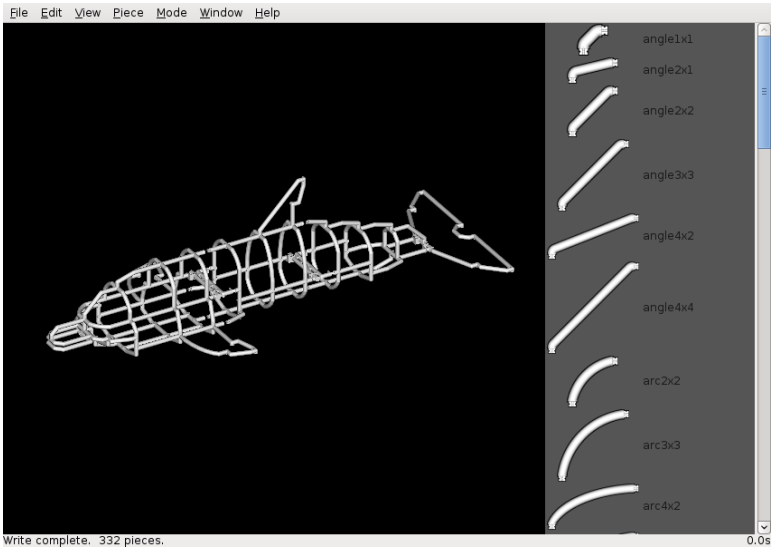

Figure 9: Model Ready for Instructions

10 Instructions

After you create a fine-looking model (Figure 9), you may want to share the idea through an instruction set. An instruction set consists of a cover photo of the model, poses of the model, and a sequence of frames. The first frame begins with a blank screen and a few added pieces. Subsequent frames add more pieces, until the final frame completes the model.

The Crossbeams Modeller has two main modes: *Modelling* and *Instructions*. Before choosing *Instructions* mode, make sure your model is nearly complete. *Modelling* changes often require large *Instructions* changes.

Choose *Instructions* mode with `Mode - Instructions`. The `Piece` menu will be replaced by an `Instructions` menu.

10.1 Cover

The first Instructions frame is a full-page cover. Use the Navigation keys to position the model for the cover photo. Use `Instructions - Set Title` to set the model's title and author. Once you are satisfied with the cover appearance (Figure 10), press the `Right` arrow to advance to Frame 1. If you want to edit the cover again, simply return to Frame 0 (the cover) with the `Left` arrow or use `Instructions - Go To Frame`.

10.2 Poses

Before the frames start, you may want to show off various features of your model: a zoom-in of a geared area, a top view, or a view with moving regions in a different position, for example. These are called `Pose` views, and they come before the frames start.

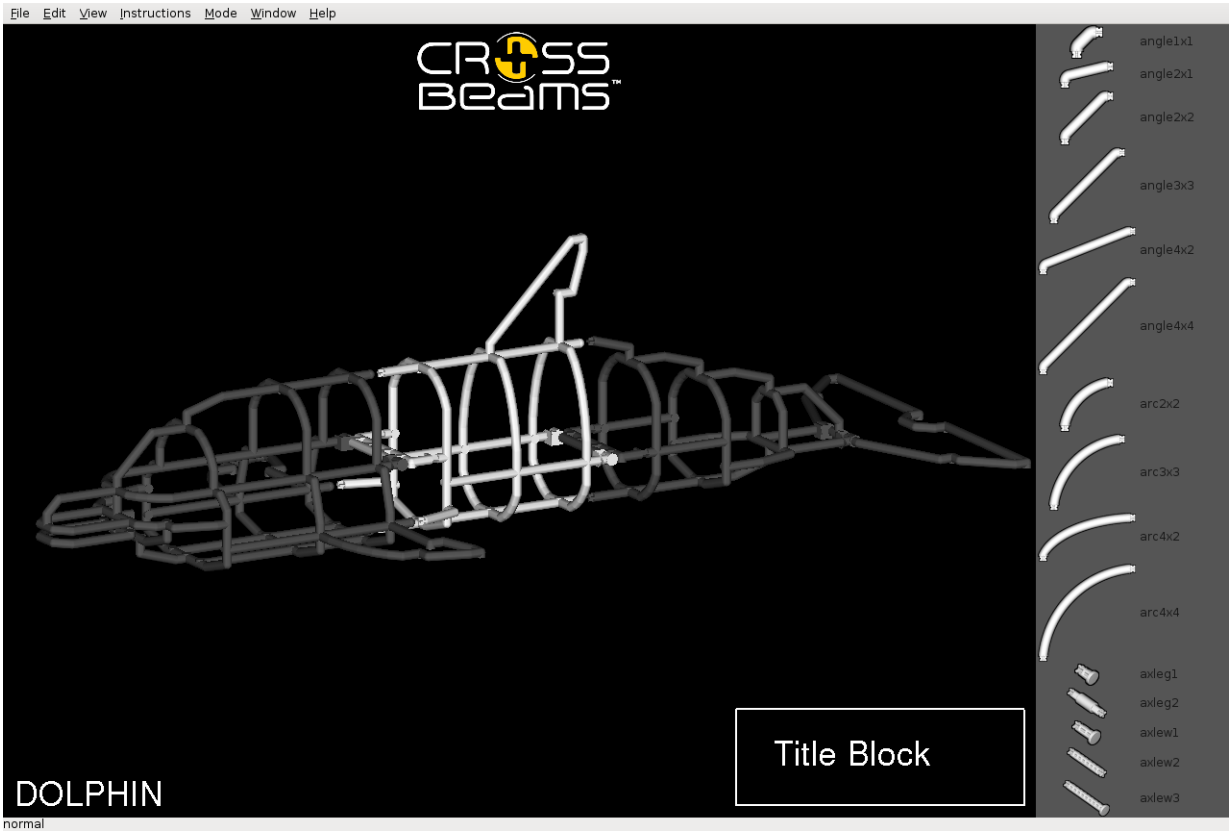

Figure 10: Cover

The cover frame is a Pose view. To add more Pose views after the cover, from the cover frame, use `Instructions - Insert After`. Now, press the `Right` arrow, and you will be in another Pose view. Use the Navigation keys to position the model in the new Pose. Add more Pose views with `Instructions - Insert After` from a Pose view.

You probably noticed our instruction cover colored parts of the model white and parts grey. Models with moving regions can move regions in a Pose view. For example, it might be nice to Pose an elephant's moving trunk, an eagle's flapping wings, a car's opening door, or, in this case, a dolphin's bending body. The modeller must always have one fixed region displayed in white. Moving regions are displayed in grey. Select a moving region by right-clicking at the center of a moving region. (The `Options - Draw Centers` option is helpful for finding the center of a region.) The region to be moved appears in blue. Now, position the mouse at the fulcrum and press `r` (for rotate). Move the mouse at various angles from the fulcrum to rotate. To cancel the rotate, right-click. To accept and finish the rotate, left-click.

Sometimes, the model will get messed up with a series of cascaded region rotates. The region can be restored to its original position by pressing `0` while rotating it.

The fixed region can change by choosing `Edit - Set Selected to Fixed`.

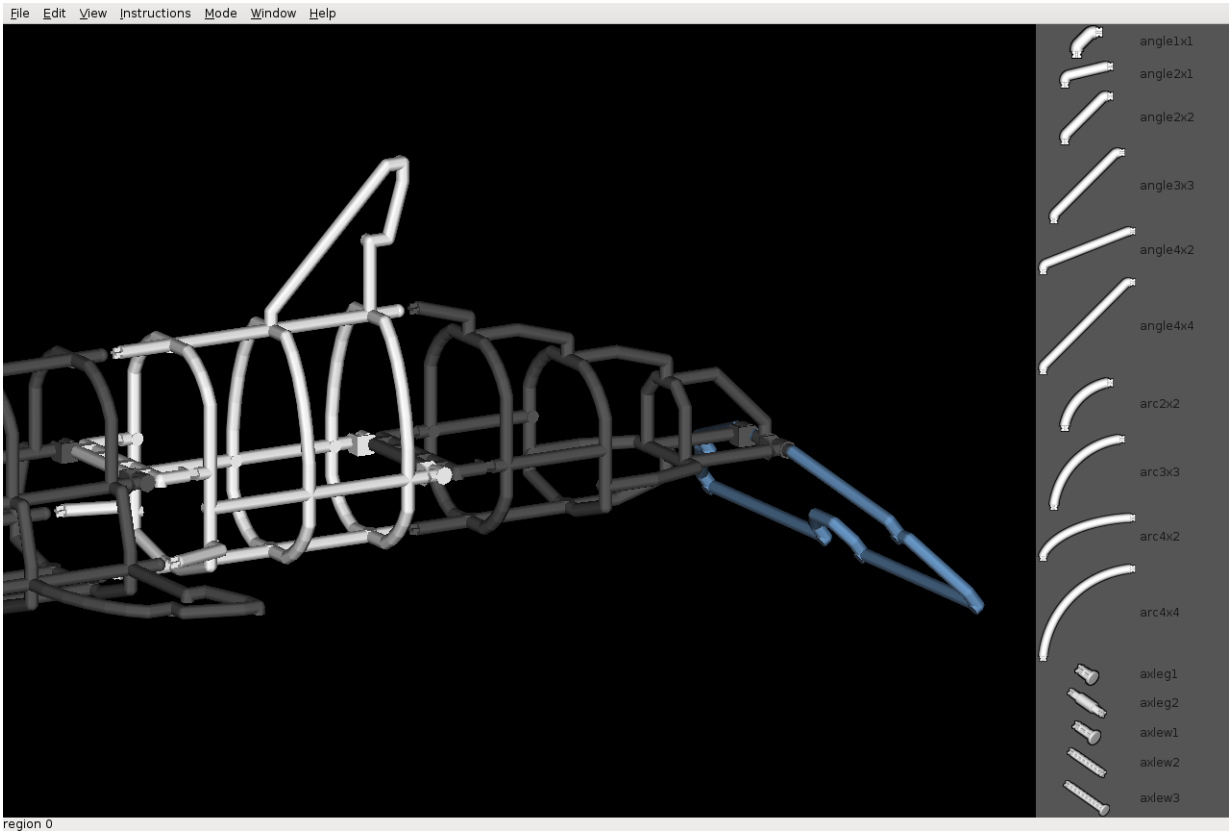

Figure 11: Pose

10.3 Frames

In Frame 1, you'll see an entirely grey version of your model. Grey pieces show pieces that haven't yet been added in any instruction frame. First, select a frame size from the Window menu. You may choose Full, FullR, Quarter, and Half. By default, the previous frame's size is used for new frames. Next, navigate to the region where you'd like to add pieces. Pieces added in this frame are shown blue. Select the added pieces the same way you select pieces while modelling.

Pieces added in previous frames are shown white. You won't see any of them in Frame 1, but you'll see them in the following frames (Figure 12).

Navigate to get a view that looks good, and advance to the next frame with the `Right` arrow. Continue creating instruction frames in the same way:

1. If necessary, choose a new window size.
2. Navigate to the region where you want to work.
3. Select the pieces you want to add in the frame.
4. Navigate to make the view look good.

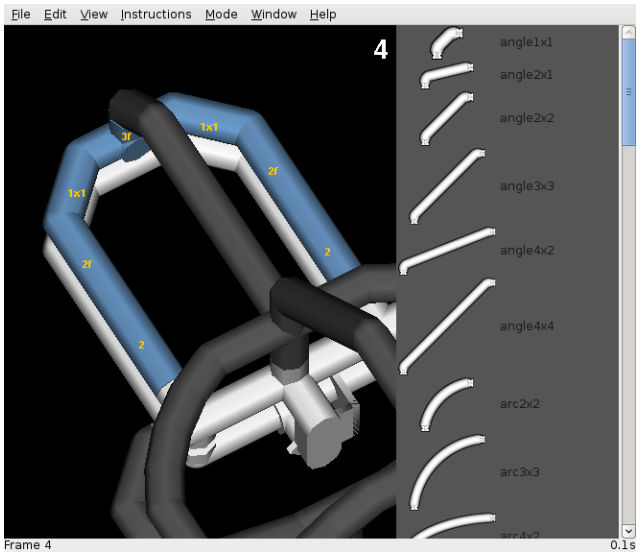

Figure 12: Frame

5. Store the frame and advance to the next frame by pressing `Right`.

The order up to the advance frame step is unimportant. For example, you may change the window size after selection. Find an order that works for you.

10.4 Frame Editing

Use the `Left` and `Right` arrows to move back and forward between frames. Each arrow press stores the displayed frame's state, so don't change anything as you navigate unless you want it changed.

Use `Instructions - Go To Frame` to move to any frame in the set. Use Frame 0 to move to the cover. Use a number equal to or larger than the number of frames to move to the last frame.

Use `Instructions - Insert Before` and `Instructions - Insert After` to insert a frame before or after the current frame. Use `Instructions - Delete Frame` to delete the current frame.

10.5 Cross Hair

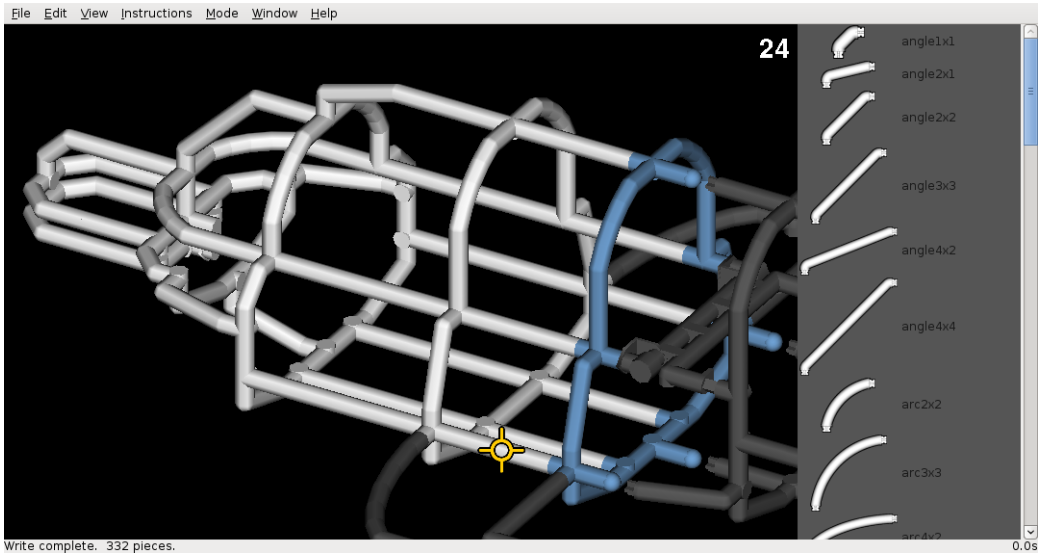

Figure 13: Cross Hair

When you navigate far between two frames, it's not always obvious where you are. You may use the cross hair icon to help. Use `Instructions - Show Cross Hair` to display a cross hair icon in your current frame. Drag the icon with the left mouse button over the next frame's center piece (Figure 13).

10.6 Hide/Unhide Parts

It can be difficult to select inner pieces in extremely dense models. You may hide exterior pieces to more easily see innexor pieces. Select the pieces you want to hide. Then, use `Edit - Hide Selected` pieces to hide them. Make sure you later reveal them with `Edit - Unhide` so your instructions include all pieces. The status bar displays the number of hidden pieces.

10.7 Mirror

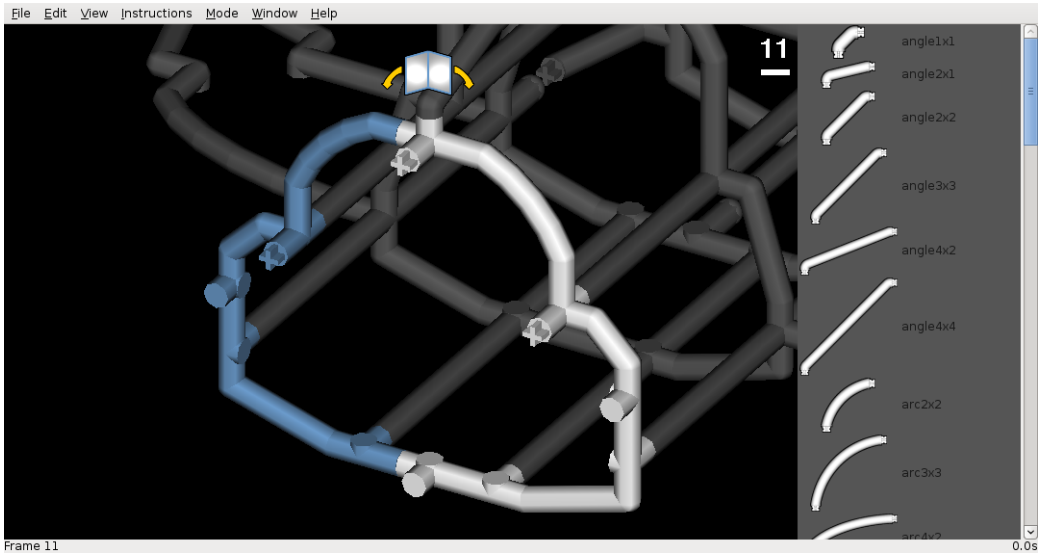

Figure 14: Mirror

Many models are symmetric. You can easily create a symmetric side without many additional frames in your instruction set. Use `Instructions - Show Mirror` to display a mirror icon in your current frame. Drag the icon with the left mouse button to a position on the frame's top between the symmetric sides. Then, select all symmetric pieces (Figure 14). By convention, hide the part labels when mirroring by using `Instructions - Hide Part Labels`. Modellers should know a symmetric section uses the same pieces.

Sometimes, models are repetitive. For example, the body of a rocket copies itself a number of times. Following the same mirror convention, you may use the mirror icon as a copying symbol too.

10.8 Submodels

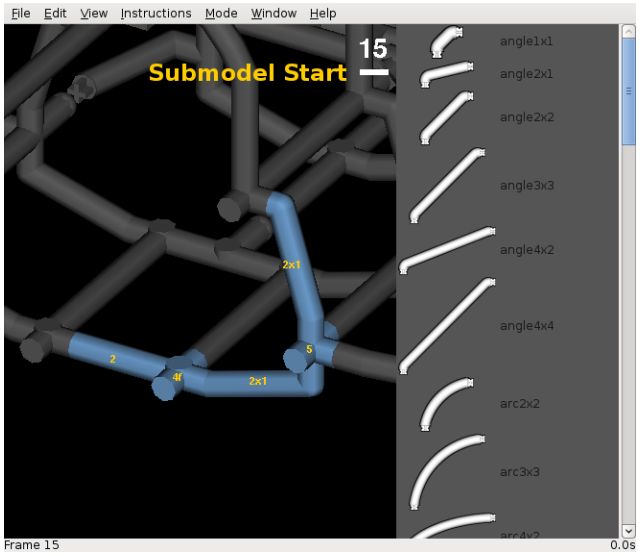

Figure 15: Submodel Start

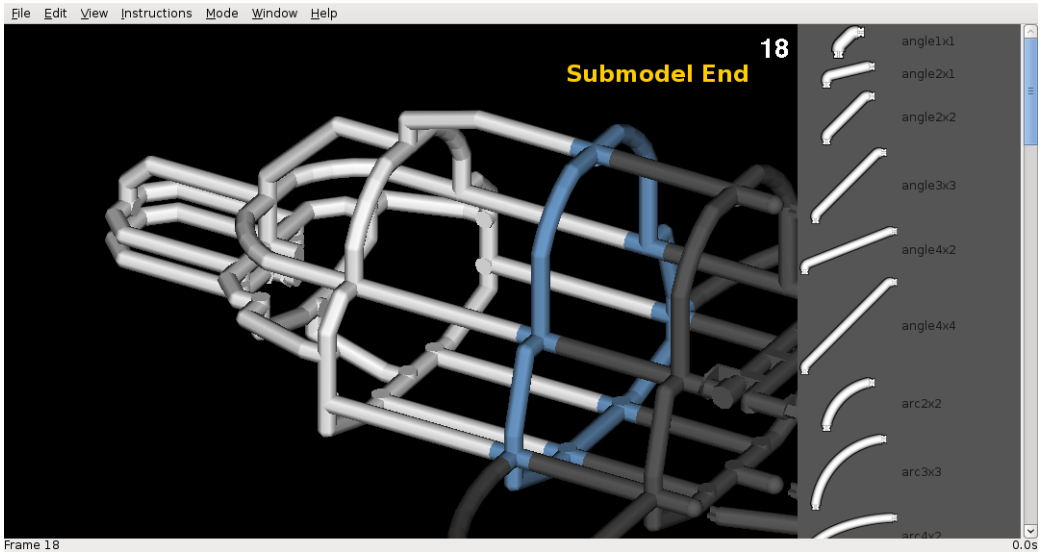

Figure 16: Submodel End

Sometimes it can be convenient or necessary to create a separate small model (a submodel) that later attaches to the main model. To begin a submodel, select the `Instructions - Start Submodel` menu option. You'll notice the previous frame's white pieces disapper and a bar beneath the frame number (Figure 15). The number of bars indicate the submodel depth. No bars indicate the main model.

Create the submodel the same way you create a main model: choose window size, navigate, select pieces, navigate, and advance each frame until you complete the submodel. Once you complete the submodel advance to the next frame, then use `Instructions – End Submodel`. You'll see the submodel in blue attached to the main model (Figure 16). Then, advance to the next frame and you may proceed with main model frame creation.

The Crossbeams Modeller currently allows any depth of submodelling, but watch out. Submodelling causes confusion.

10.9 Conventions

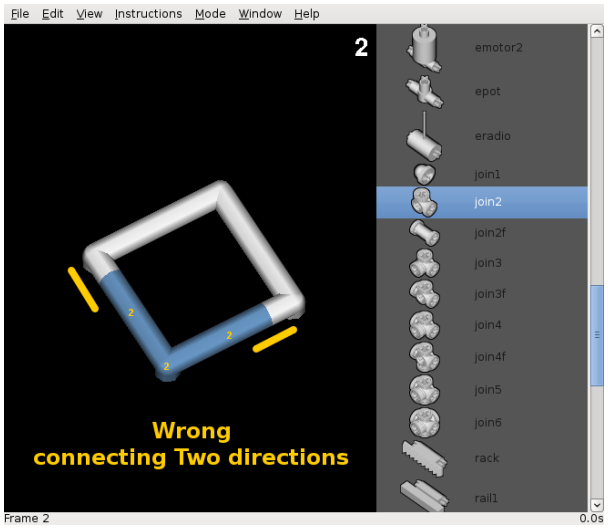

Figure 17: Wrong Loop Connection

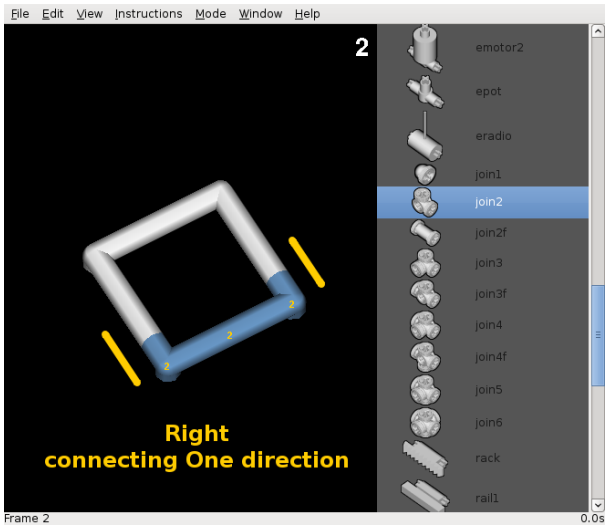

Figure 18: Right Loop Connection

When connecting loops (a connected set of pieces that close on itself), the order of piece connection is important. For example, you should not create a square by adding one piece at a time. Instead, you should create two square halves and attach the halves together to avoid straining the pieces (Figures 17 and 18). Make sure all new pieces in a frame can be assembled to each other one piece at a time. Then, make sure the new pieces can attach to the old pieces without strain.

Zoom-in to a point where the part labels are distinguishable. Use Half and Full pages when the location of your added pieces may not be clear. Every few frames zoom out so the context is clear.

Use keyboard navigation for orbitting. Preferably, begin with an orthogonal view, go two steps right (or left), and two steps up (or down). Panning may be done with the mouse or keyboard.

Do not use partial zooms (the zooms arrived at by holding `Control`). Use only + or – levels of zooming.

Models with 250 pieces or less are beginner models. Do not use mirrors. Try to hold to at most one submodel depth. Add at most 5 pieces per frame.

Models with 250 to 750 pieces are intermediate models. You may use mirrors and any submodel depth. Except for mirrors, add at most 7 pieces per frame. Always Hide Part Labels when using mirrors. Try to minimize submodel depth.

Models with more than 750 pieces are advanced models. You may use mirrors and any submodel depth. You may add as many pieces as you want per frame; however, keep the instructions clear. Always Hide Part Labels when using mirrors. Try to minimize submodel depth.

To create a good-looking instruction set, ask yourself the following questions after every frame:

- Have I closed loops from one direction only?
- Do the shown pieces take up most of the frame?
- Have I used large frames periodically to clearly know the position in the full model I'm currently working?
- Have I used keyboard poses and zooms?
- Do I have any labels overlapping?
- Do any labels go off the screen?
- Does my choice of frame sizes avoid blank frame space?
- Have I kept submodel depth minimum?

Many Crossbeams models are generated for a variety of skill levels. We suggest the following skill levels and naming conventions.

Level	Number of Pieces	Filename Suffix
1	up to 220	_l1
2	200-450	_l2
3	400-650	_l3
4	600-1300	_l4
5	1000 or more	_l5

10.10 Generating a PDF

Use `Instructions - Generate` to generate a `.pdf` form of your instructions for sharing or printing. Document generation takes a while; you can watch progress in the *Status Bar*. The `.pdf` file is placed in the same directory as your model. It does not *pop up* when done.

Instructions are usually generated in *Draft* mode, a 100 dots-per-inch (dpi) mode. Higher resolution 300dpi instructions can be achieved by unchecking `Instructions - Draft`. Watch out, though. High resolution instructions take longer to generate. Additionally, high resolution windows usually go off screen. Some graphics cards don't generate off-screen images, and you'll get junk. Start the Crossbeams Modeller using

the `-i` or `--indirect` option to guarantee proper off-screen instruction generation. Of course, indirect rendering is slower than direct rendering.

Some `.pdf` viewers filelock the `.pdf`. In that case, close the old `.pdf` before generating a new `.pdf` or use a viewer that doesn't filelock.

11 Nuances

The screen shots in this document show a `Windows` menu. It was renamed the `Options` menu, which better describes its content.

All software has bugs, and new software has new bugs. Losing your work can be frustrating. Save early, save often, and save revisions.

12 Customization

12.1 Key Commands

Where logical, key commands are similar to Blender. The default keyboard commands follow.

Key	Command	Python Call
p	Align the next part port with the model	`toggle_port()`
Shift p	Align the previous part port with the model	`toggle_port(-1)`
f	Rotate the part 90°	`flip_port()`
Shift f	Rotate the part −90°	`flip_port()`
c	Connect the part to the model	`connect_part()`
g	Grab and move selected parts	`grab()`
Shift d	Duplicate selected parts	`duplicate()`
r	Rotate selected parts	`rotate()`
Control m	Mirror selected parts	`mirror()`
b	Border select	`border_select()`
a	Deselect all parts or select all parts	`select_all()`
x	Delete selected parts	`delete_part()`
Control z	Undo the last model change	`undo()`
Contoy y	Redo the last undo	`redo()`
F2	Write model (same as File – Save As)	`write_file()`
F1	Read model (same as File – Open)	`read_file()`
z	Solid Detail (same as View – Detail – Solid)	`solid()`
F12	Render Detail (same as View – Detail – Render)	`render()`

Key	Command	Python Call
NumPad 7	Top View	`viewstandard("top")`
NumPad 1	Front View	`viewstandard("front")`
NumPad 3	Right View	`viewstandard("right")`
Shift NumPad 7	Bottom View	`viewstandard("bottom")`
Shift NumPad 1	Back View	`viewstandard("back")`
Shift NumPad 3	Left View	`viewstandard("left")`
NumPad 9	Redraw the screen	`redraw_screen()`
NumPad 8	Orbit up	`orbitup()`
NumPad 2	Orbit down	`orbitdown()`
NumPad 4	Orbit left	`orbitleft()`
NumPad 6	Orbit right	`orbitright()`
Shift NumPad 8	Pan up	`panup()`
Shift NumPad 2	Pan down	`pandown()`
Shift NumPad 4	Pan left	`panleft()`
Shift NumPad 6	Pan right	`panright()`
NumPad /	Rotate counter-clockwise	`rotateccw()`
NumPad *	Rotate clockwise	`rotatecw()`
NumPad +	Zoom in	`zoomin()`
Control NumPad +	Zoom in 0.25x	`zoomin(0.25)`
NumPad -	Zoom out	`zoomout()`
Control NumPad -	Zoom out 0.25x	`zoomout(0.25)`
Right Arrow	Next frame	`toggle_frame()`
Left Arrow	Previous frame	`toggle_frame(None,-1)`
Control q	Quit (same as File – Quit)	`quit()`

If you prefer a different key setup, edit (or create) a configuration file. For Linux and Mac users, the configuration file is `.cbmodelrc` in `HOME`, where `HOME` is an environment variable. For Windows users, the configuration file is `cbmodel.ini` in `USERPROFILE\AppData`, wher `USERPROFILE` is an environment variable.

12.2 Configuration File

The configuration file (`.cbmodelrc` or `cbmodel.ini`) contains user preferences. Lines beginning with `#` (comments) and blank lines are ignored. Key settings can be changed in the `[Keys]` section with `function() = key`, where `function()` is the Python call and `key` is the key name. Start the Crossbeams Modeller with the `-p` or `--printkeys` option to see the key names in the *Status Bar*.

An example configuration file follows:

```
# config file for users without a numeric keypad
```

```
[Keys]
redrawscreen() = o
orbitup() = i
panup() = <Shift>i
orbitdown() = comma
pandown() = <Shift>less
orbitleft() = j
panleft() = <Shift>j
orbitright() = l
panright() = <Shift>l
rotateccw() = 8
rotatecw() = 9

zoomin() = <Shift>plus
zoomin(0.25) = <Shift><Control>plus
zoomout() = minus
zoomout(0.25) = <Control>minus

viewstandard("top") = u
viewstandard("bottom") = <Shift>u
viewstandard("front") = m
viewstandard("back") = <Shift>m
viewstandard("right") = period
viewstandard("left") = <Shift>greater
```