2D Drawing - Advanced

This Web training task shows how to use the 2D-drawing environment in thinkdesign. You'll learn how to create and modify a large 2D assembly by following along with an example from the machinery industry. We'll also see how thinkdesign manages 2D assemblies using groups, visual bookmarks, balloons and the parts list.

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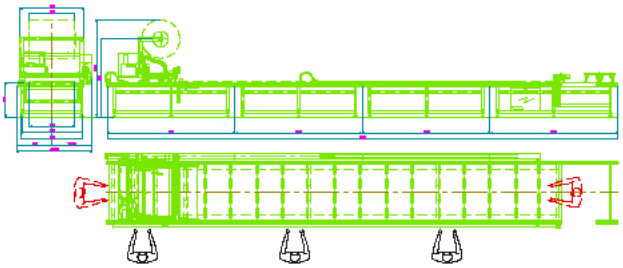
1. Step 1: The Backdrop to Drafting

Let's start by taking a good look at the drawing as in the image below:

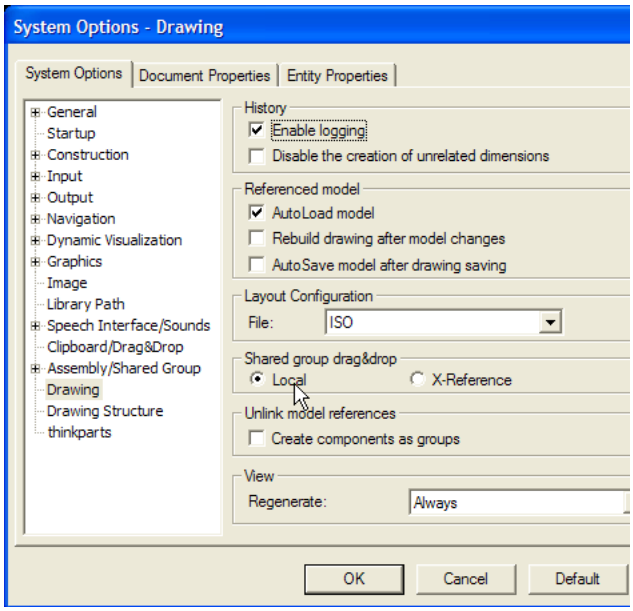
- **Open** drawing 1000057.e2 from the downloaded folder. This file will reside in the files folder inside the corresponding task folder whereever it is downloaded.



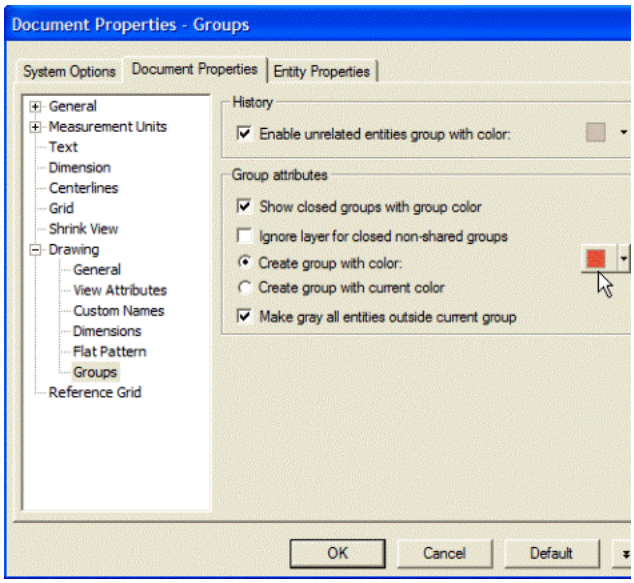
One of the primary ways of organizing 2D data in thinkdesign is through groups. The 2D environment uses groups to organize data, views, formats, title blocks and other data.

Specific settings are available to control how groups are created and visualized. The groups can be differentiated by changing their color. This is done by editing their individual Properties or by setting the "Global" Parameters that apply to groups. Let's take a look as how this is done:

- Go to **Tools**➪**Options/Properties**and select Drawing under System options.
- Set the options as shown in the image below.

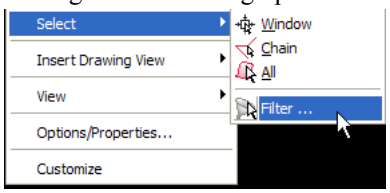


- Then click on Document Properties.
- Under Drawing -> Group Colors set the options as shown in the image below.
- Set Create Group color to red Red. This will be the color of new groups that we'll be creating.



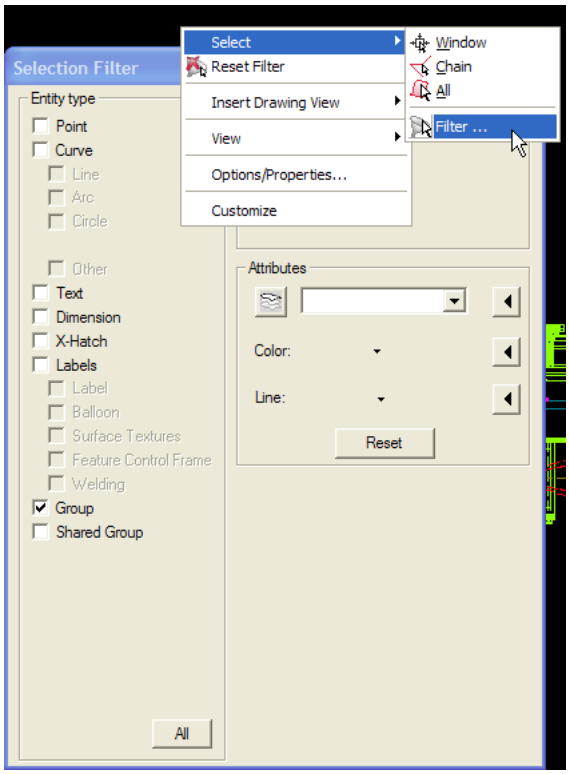
Let's use the **Select Filter** option to select all the groups and change their color.

- Right click on the graphic window and click **Select Filter**



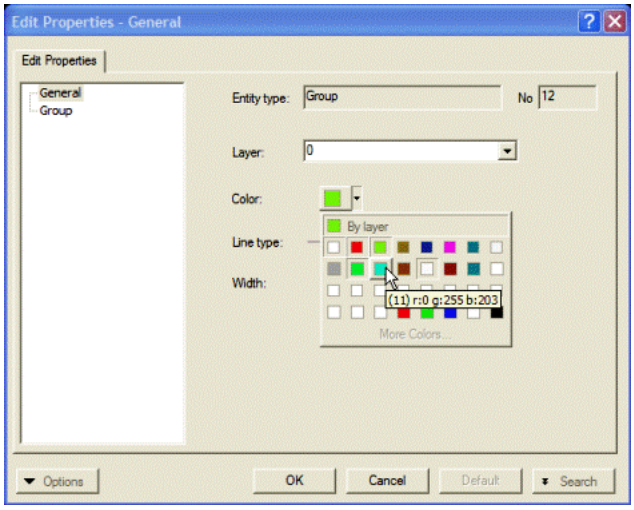
- In the Selection Filter dialog box, check the Group checkbox. This will uncheck all the other filter types.

- Right click on the graphic window and select,**Select All**



All the groups in the drawing will be selected.

- With the groups active, right click - keeping the cursor on any portion of the selected entities - and select Properties in the context menu.
- Notice the Entity Types: Only groups are selected. The "No." box indicates that 12 groups are currently selected.
- Change the color from color #3 to color #11 from the Selection Properties window. Then click the OK button.



What we have seen so far are the settings related to the 2D environment in thinkdesign. We'll look at more advanced concepts in future steps.

2. Step 2: Group Dynamics

In the 2D environment, it is often useful to be able to treat a set of entities as a single entity without losing the possibility of deleting, inserting or editing individual entities in the set.

In thinkdesign, this facility is provided by groups. A group is treated as a single entity identified by a name and a point of origin. It can contain entities of all supported types, including other groups, thus enabling you to create a hierarchical structure.

Now we'll see how to create a hierarchical structure of a group.

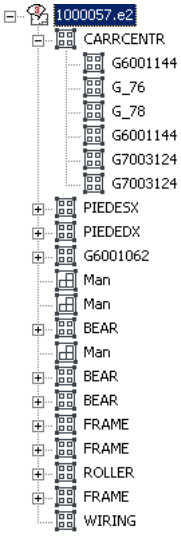
- Drag the left border of thinkdesign to open the Group Tree.

Instead of having a History Tree, as in the 3D modeling environment, the 2D environment will have a Group Tree to organize and manage data.

In the Group Tree, you'll find a list of all the groups that comprise the drawing. When you highlight the name of a group in the Group Tree, the graphical representation of the group is highlighted in the Graphics window. You can customize the way the Group Tree is displayed as described in Group Tree Options. You can observe that the groups are organized into a hierarchical structure.

- Select a group either from the Group Tree or from the Graphics window. Then right click and select **Open Group** in the context menu. This will open the group and allow access to the other groups or objects contained within.
- When you click on the "+" next to groups in the Group Tree, you are literally opening that group. Also notice that when you open a group, the subgroups or objects within that group revert to their original color.

See Introduction to groups for more properties and information.



Observe also that there are two different icons signifying groups. One is the non shared group and the other is the Shared Group. The differences between the two are described below:

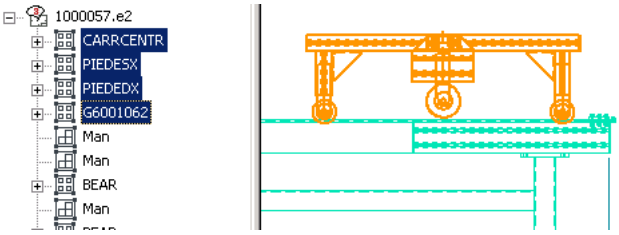
When you edit and modify an entity of a Shared Group that has been "Set Current," all the instances of that group will be modified as well. A non-shared group has no relations with other non-shared groups.

Shared groups with the same name will always consist of the same set of entities - like the 'MAN' group in our example. Non-shared groups with the same name may consist of different sets of entities - like the 'BEAR' group

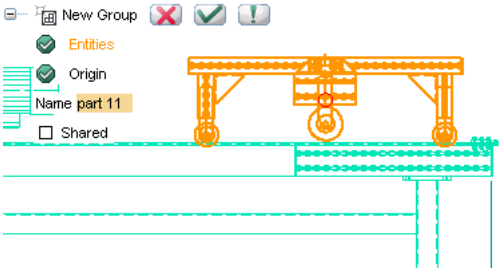
in our example.

Let's now create a **New Group** .

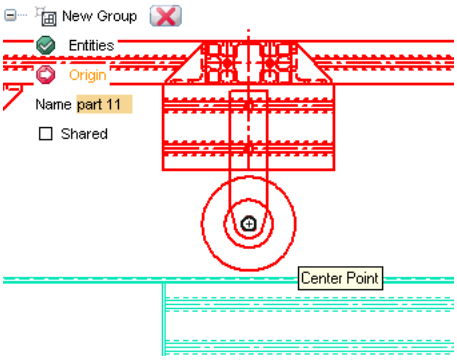
- Zoom to the right portion of the drawing and select the four groups that compose the cart. These groups are: CARRCENTR, PIEDESX, PIEDEDX, and G6001062.



- Next, click **Insert**➪**Group**➪**New**.
- In the Selection List uncheck the "Shared" switch.
- Enter the name of the group (PART11)

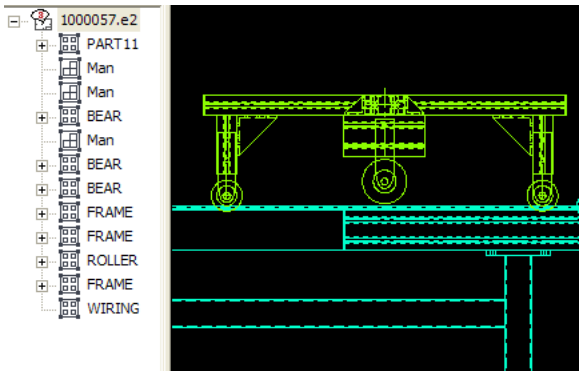


- thinkdesign sets the Origin to be in the center of the group. This is indicated by a small red circle when the group is created.
- In the Selection List click on "Origin" to enable it and then snap your cursor to the 'center' of the central wheel. This will reset the group origin to this point. You'll see the small red circle move to this location verifying the new origin.



- Select OK from the Selection List

The groups we selected are now nested in the new group 'Part11'.

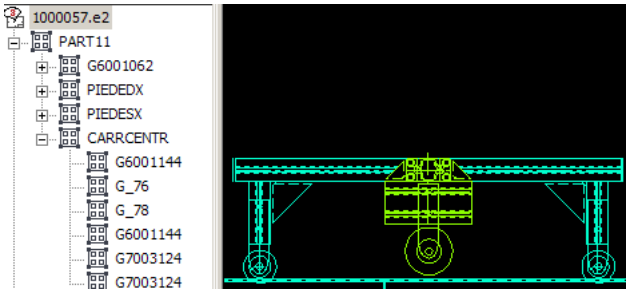


- Now use **Open Group** to open the group PART11 along with the group CARRCENTR.

Remember, you can also click on the '+' next to the group name in the Group Tree to open the group.

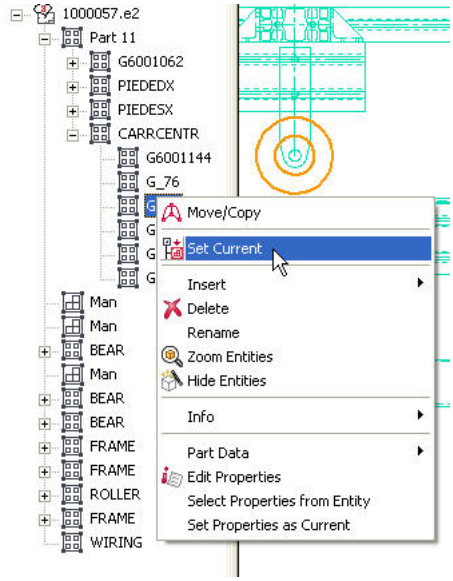
Observe the color change when a group is closed. The parent group overrides the color of the child group and this helps to visualize the group that is currently open.

To avoid ambiguity and confusion, thinkdesign allows you to add new entities only to one group at a time. The single group to which new entities are added is called the "Current Group".



Let's add center lines into group G_78.

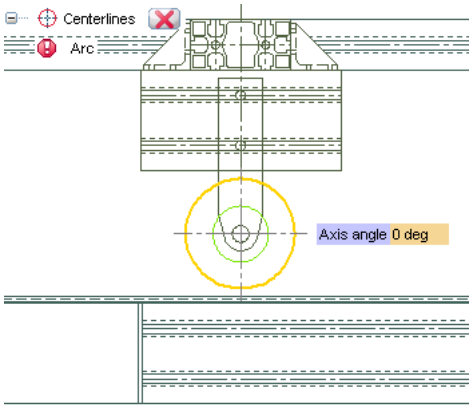
- Right click on the group G_78 and select **Set Current Group**



Note that the other group and entities become grayed out when a group is Set Current. Also take note that the Current Group in the group tree is now in Bold Text while all the other groups are in standard text.

All new entities created while a group is current become part of that Current Group (which may be also the drawing as a whole as the parent group at the highest level; see the **Top Level Group** command).

- Start Command **Centerlines** and select the circle representing the axle for the large wheel.



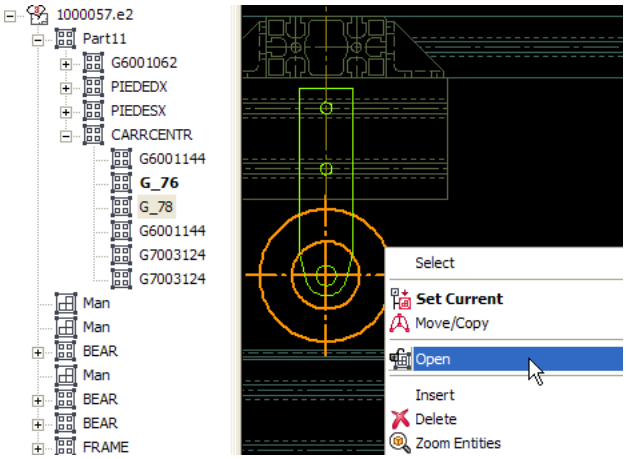
The Centerlines are created.

- Press Esc to terminate the command.

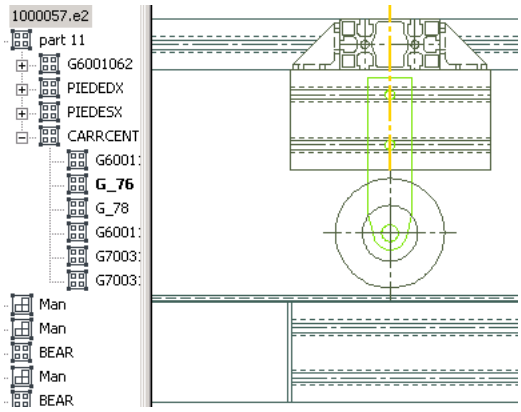
The difference between an **Open Group** and a **Set Current Group** is this: You can edit and delete items from an Open Group but you cannot add items. When a group is 'Current' you can edit, delete and ADD new entities into that group. Also, you can have as many groups as you like Open at one time. In contrast, only one group can be Set Current at a time.

Let's look at an Example: Let's transfer the 'centerline' that we just created from Group G_78 to Group G_76.

- Right click on group G_76 in the Group Tree and select **Set Current Group**.
- Next click on group G_78 in the Group Tree to activate.
- Then Right click on the workspace and select **Open Group** to open G_78 for editing.

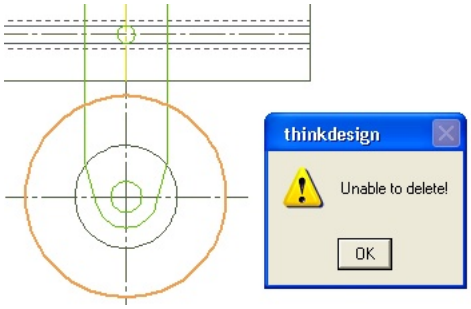


- Select the centerline and use **Transfer to Current Group** to transfer it into the Current group: G_76.



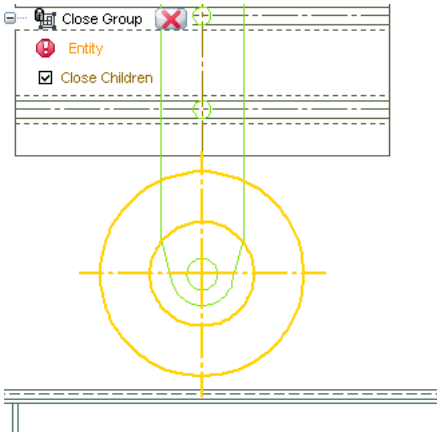
- Click on the outline of the wheel belonging to group G_78 and select Delete.

You will get the Warning message as shown.



Note that it is not possible to delete entities that do not belong to the Current group.

- Activate the **Close Group** command and select entities of group G_78 to close it.
- In the parameter area above the Group Tree, click the button **Close All Windows** to close all the open groups.
- If you get a warning message, it means that you have to reset a current group before closing all groups. You can Reset Current group either by double clicking in the parameter area or from command **Modify**➪**Group**➪**Top Level Group**



- Double Click inside the background of the graphics area to reset current group settings. Now all groups will appear in their group colors and group G_76 will no longer be in Bold text in the Group Tree.

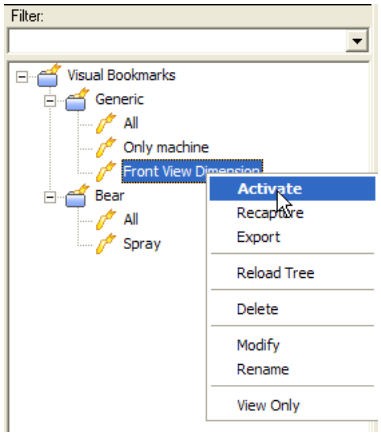
3. Step 3: Visual Bookmarks in 2D

Visual Bookmarks in thinkdesign provide a fast and simple way to save and restore the visual appearance of a document and manage the feature activation status.

When you create Visual Bookmarks, you specify a wide range of parameters to be captured, including view data, render mode, active layers, the visualization status of entities and components and the presence or absence of features. All this data is stored into the Visual Bookmark and saved when the file is saved. When you recall an existing Visual Bookmark, all the parameters it contains are also recalled. This returns the document back to it's status at the time that the Visual Bookmark was created.

Now let's check out the Visual Bookmarks tool and it's use in assembly drawings.

- Click on the Visual Bookmarks tab at the bottom of the Group Tree and take a look on bookmarks already created.
- Right click on the 'Front View Dimension' bookmark and in the context menu select Activate; as shown below. Say OK for the warning message.



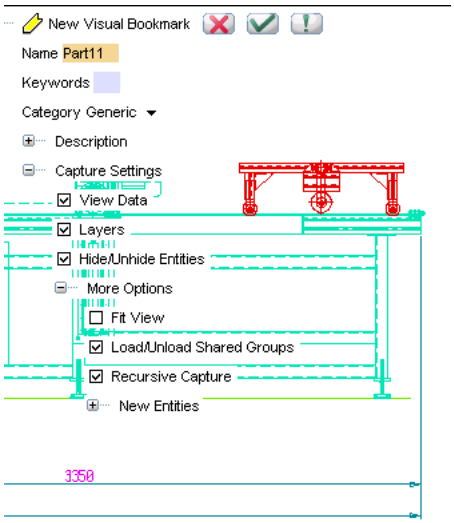
Your view will return to the status of when this Visual Bookmark was created.

Let's now create a **New Visual Bookmark**.

- Change your view and - using the Zoom command - enlarge the just created group PART11 as much as you like.
- In the Visual Bookmark window, right click on the Generic category and select **New Visual Bookmark** in context menu that pops up.

In the **New Visual Bookmark** Selection List, open the 'Capture Settings' and check:

- View Data
- Layers
- Hide/Unhide entities
- Click on the '+ More Options' to open them up.
- Load/Unload Shared Groups
- Recursive Capture

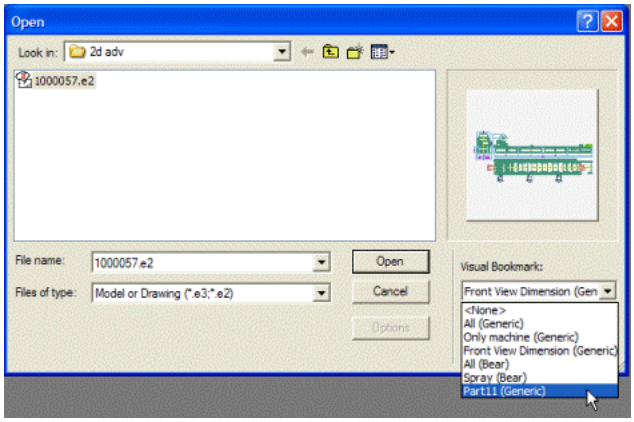


- Name the New Visual Bookmark: Part11
- Click OK to create the Visual Bookmark.
- Hit the F key on your keyboard to Fit all entities to your view.
- **Save** the file and **Close** it.

Open the file already saved with thinkdesign.

- Start the **Open** command.
- Select the file that we just saved

In Visual Bookmark area of the 'Open' dialog box, choose the bookmark Part11 that you just created.



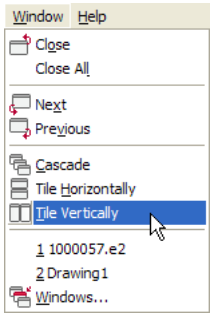
The drawing opens maintaining the settings as per the Part11 Visual Bookmark.

Additionally, groups can be used to transfer all the entities that are contained in one drawing onto a new drawing, while maintaining the group structure.

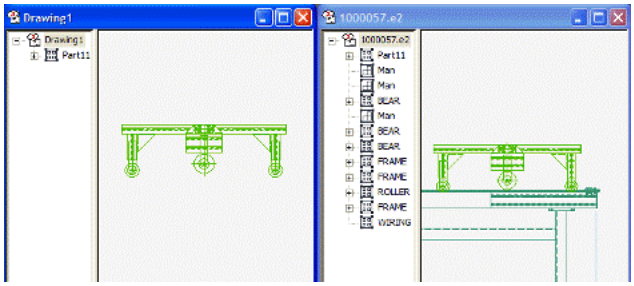
For example:

- Open **New Drawing**

- Go to Window then **Tile Windows Vertically** in the menu.



- Select the group Part11 from the Graphics Window and drag it into the new drawing window.



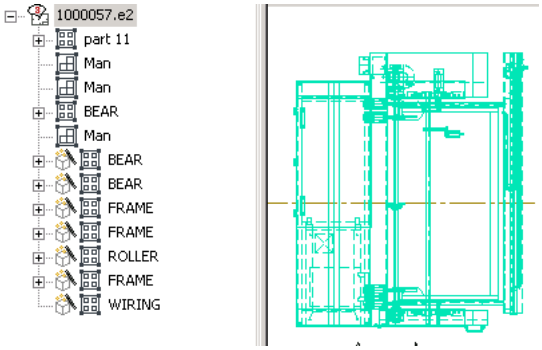
In the drawing structure panel you can find the structure you have created in the group Part11. Remember that if you only see the top level of the group in the new window, you can modify the Group Tree Options to view all the entities within groups.

- **Close** the new drawing (do not save it) and restore the original Drawing window.

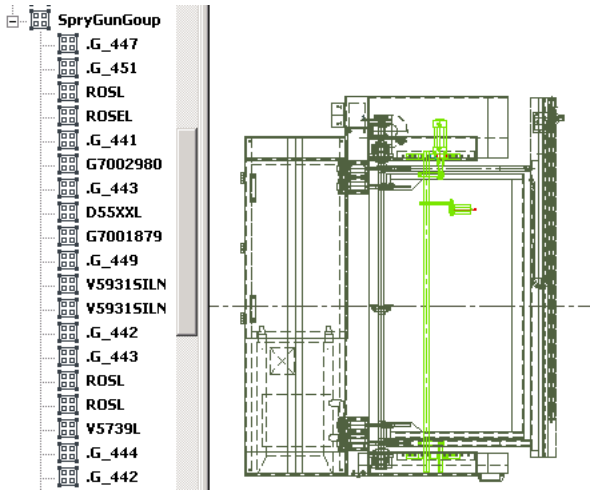
- Activate the 'Spray' Visual Bookmark, under the 'Bear' group.

- Return to the Group Tree window view.

- Expand the group 'Bear' that is visible on the screen. The other two 'Bear' groups are hidden in this Visual Bookmark view.



- **Set Current Group** the SpryGunGoup. Notice that the group automatically expands in anticipation of work being done in this group. All objects in the SpryGunGoup turns Bold in the Group Tree telling us that the group is Set Current.



4. Step 4:Parts Library in 2D

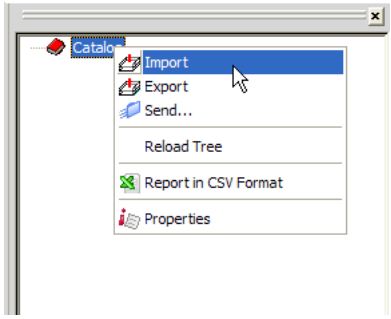
thinkparts is an application in thinkdesign that is used for creating and managing standard parts. It enables designers to quickly search for and find parts from inside a CAD system and to immediately use them, in different representations, inside 3D models or 2D drawings.

The thinkparts tools are comprised of a **Catalog Manager** and a **Catalog Browser** . For this exercise we will be focusing on the thinkparts Catalog Browser.

The library functionalities that are available in thinkparts are very useful for a company. Just as important is the ability to easily create part families (a.k.a. part libraries) and the ability to insert standard parts into a company's technical data management system.

Let's see how we can add a standard part into this assembly drawing. We will bring in a component from thinkdesign's standard parts catalog.

- Start the **Catalog Browser** command.
- Right click on the word Catalog at the top of the Catalog Browser window and select **Import Catalog** as shown below.



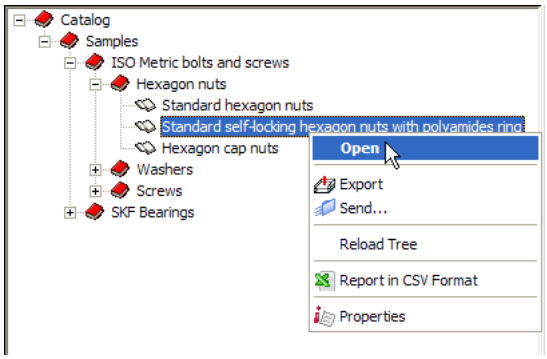
- Browse to 'thinkparts import' folder in thinkdesign's installation path.
- **Open** the file 'Sample.tpc'

Wait for the catalog browser to finish importing the catalog (this may take few seconds to few minutes depending on the speed of your PC). Next, we want to import parts into the SpryGunGoup.

- Let's make sure that the SpryGunGoup is **Set Current Group**. If it's not 'Current' then set it 'Current' by

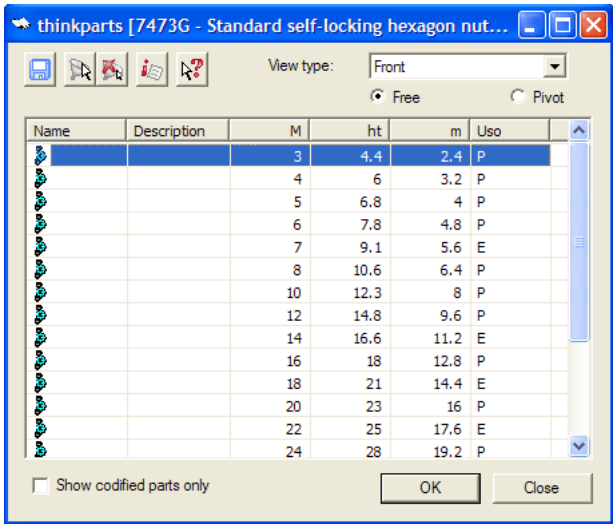
right clicking on it and selecting **Set Current Group**.

- Back to the Catalog Browser. Open the catalogs in the catalog browser until you get to the Hexagon nuts catalog. Then open the Hexagon nuts catalog.
- Under Hexagon nuts right click on "Standard self-locking hexagon nuts with polyamides ring" and and choose 'Open'...or double click on it to open it.



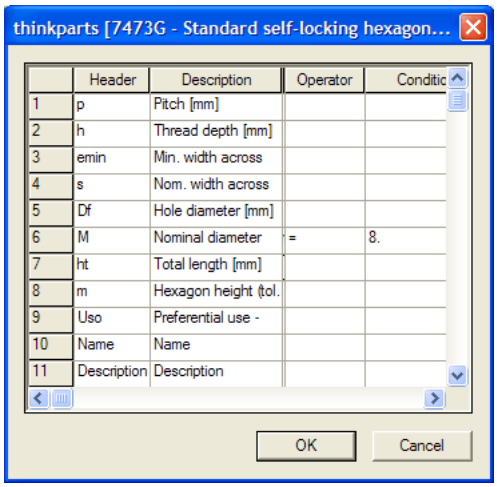
We need to use a specific 'nut'. To find it, we'll use the 'Filter By form' button.

- Click 'Filter By Form' button (Second from left) to open the filter window



The Filter form opens showing all of the expressions that are used in the "Standard self-locking hexagon nuts with polyamides ring" index.

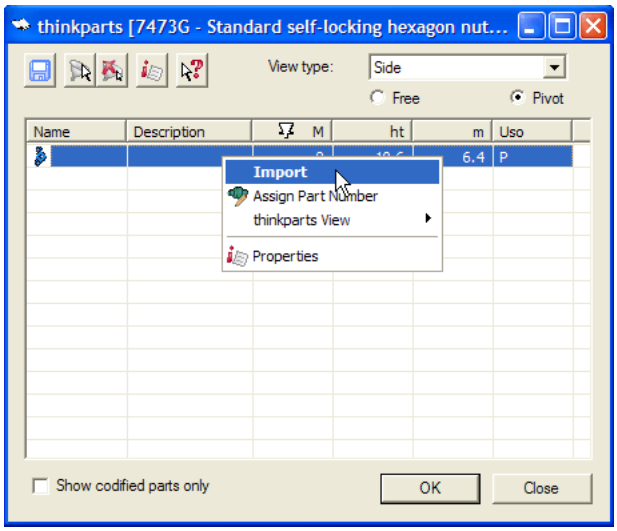
- In M row add the operator '='
- In the Condition Column for Row M, enter a value of '8'



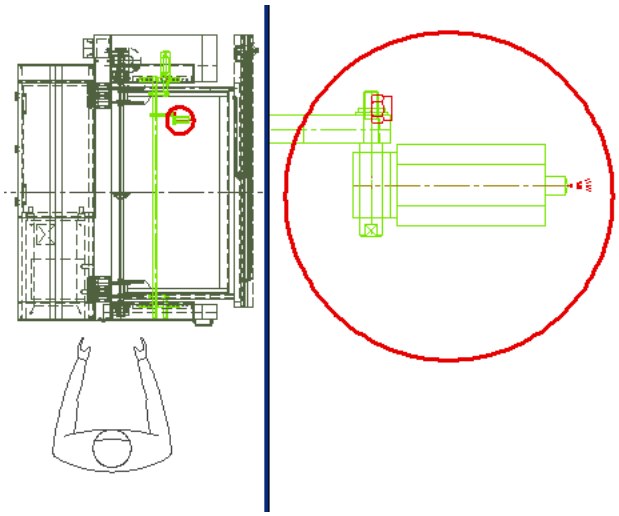
- Click the OK button for the filter to find our query.

You see that our Filter returns one item from the index that matches our criteria. Next, we need to insert this nut as a part of the SpryGunGoup.

1. In the thinkparts list dialog box, change the View type: to 'Side'.
2. Also change the radio button from 'Free' to 'Pivot'. This will allow us to locate the Nut and then rotate it into the orientation we need it in.
3. Then right click on the Nut from the part list and choose 'Import' to insert the nut into our drawing. You can also select the nut from the list and click on the OK button.

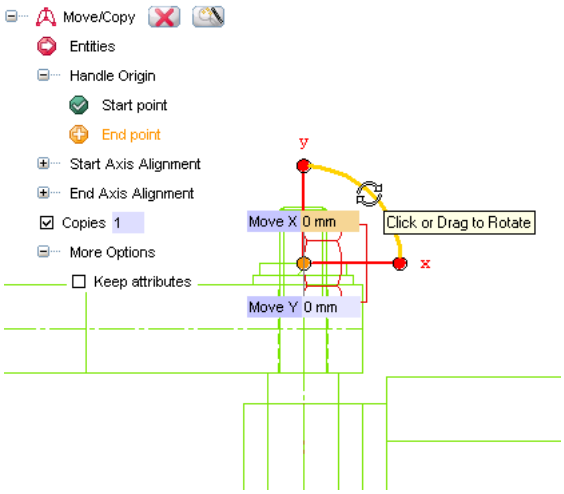


- In the graphics window right hand pane, Zoom into the area as shown below.
- Insert the nut into the position as shown, snapping to the 'Intersection Point'.



Let's re-orient the nut to its correct position.

- Start the **Move Copy Entities** command and select the nut, that we just inserted.
- Click on the circular handle to rotate the part.
- Insert Angle90 deg.
- OK to complete the re-orientation of the Nut.



- Right click in the background of the Group Tree panel and select 'Reload Tree'.

You will see a new group (7473G_6_LAT) has been added to the SpryGunGoup.

- Close the thinkparts Catalog Browser panel.

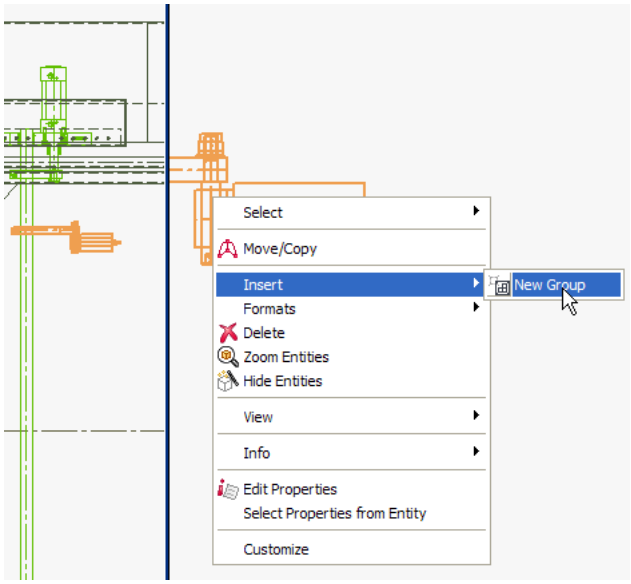
With a selection window, select the entities that compose the gun. See the image below.

Note:

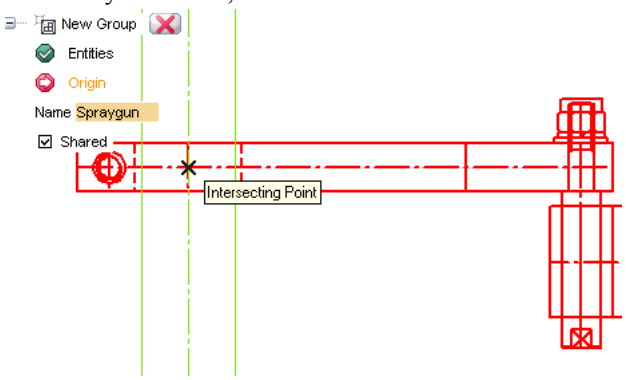
In thinkdesign when you drag a selection window with your cursor, the direction you drag the cursor tells thinkdesign what you would like to be selected. If you drag the cursor from right to left, everything that the se-

lection window touches will be selected. If the selection is from left to right, only objects that are entirely contained within the selection window will be selected.

- Select the group .G_447
- The group .G_451
- The group ROSL
- The group ROSEL
- The nut we just inserted and renamed: group SL_NUT
- The other entities that are not grouped.
- With the entities select as shown, right click and the context menu appears. From the menu **Insert**➪**Group**➪**New**start the **New Group** command.



- In the selection list, click on the word Origin. This will allow you to choose a new Origin location.
- With your cursor, set it at the intersection of centerlines as shown below.



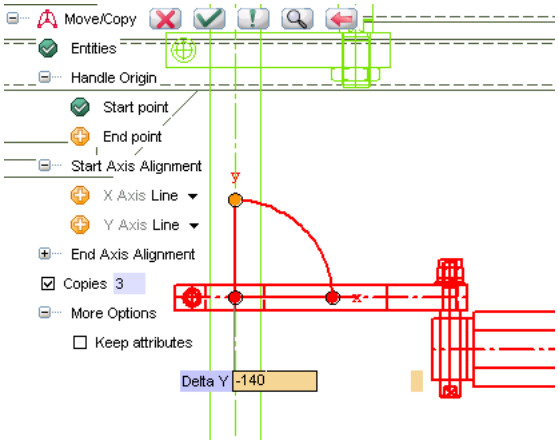
Click OK to complete the command and create the group.

Let's change our view so that we can focus better on the Sprygun group. We are going to do some extra operations in that area.

- Click on the Visual Bookmarks tab at the bottom of the Group Tree Window.
- Right click on the Bookmark 'All' under Generic and select Activate.

Next, we'll make some copies of the Sprygun group.

- Right Click on the Group
- Select **Move Copy Entities**. Notice how the Move tool's origin is at the origin of the group that we just created.
- Check the copy option and enter 3, for the number of copies to be made.
- Click on the Y handle of the Move tool in the graphics window. This will activate the mini-dialog for the Y axis. Enter -140 as the amount that we want to move (and copy) the groups.

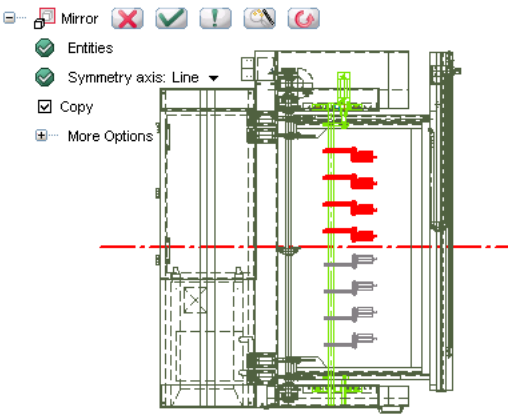


- Click OK to end the command

Now you have 3 more instances of the Group, at 140mm from each other.

Let's **Mirror Entities** the group about the horizontal axis.

- Select the 4 copies of the Sprygun and start the **Mirror Entities** command
- Set the Copy option
- Set Symmetry axis to Line
- Select the centerline of the BEAR. Look at the image below for more details.



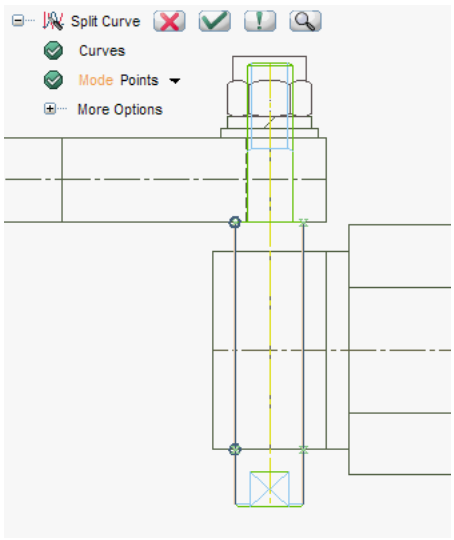
- Click OK to end the command

Now we have created 8 copies of the Sprygun shared group. Also notice that they all share the same name in the Group Tree and they all have the 'Shared' Group Icon next to them.

- Double click in graphic area background. This will exit out of the Current Group and return us to Top Level of the drawing.

We've done great so far, but there is a problem with the Sprygun group. The representation of hidden lines in the Sprygun is not correct. They are solid lines, while they should have been dashed lines. Let's correct it by setting the linetype to 2.

- **Set Current Group** any one instance of the 8 Sprygun groups.
- Open the Sprygun group and then open the group .G_451.
- In the Group Tree, select the group .G_451. It will become highlighted in the Graphics window.
- Zoom in on this part to see the details.
- Start the **Split Curve** command
- Select the 2 vertical lines of the .G_451 group as the curves to be split. Then Right click and select Continue
- Select the intersecting points to break the 2 lines as shown.



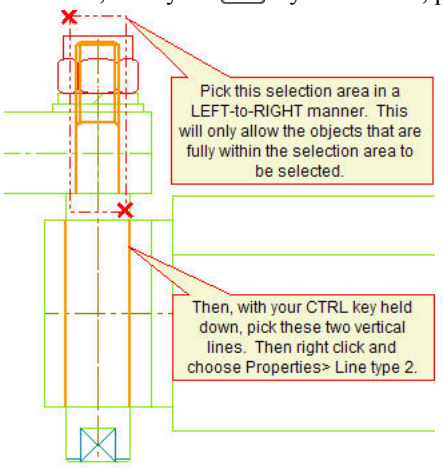
- Hit OK

Next we are going to select the items to be shown as hidden and change their line type.

- Click and drag a selection area from the end of the bolt threads to the shoulder of the bolt.

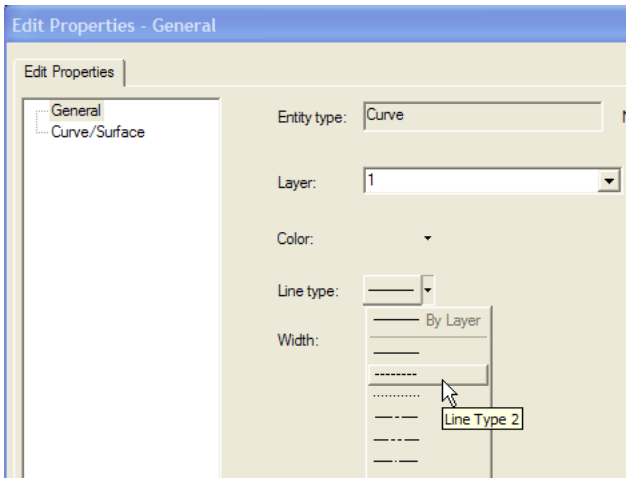
Pick this selection area in a LEFT-to-RIGHT manner. This will only allow the objects that are fully within the selection area to be selected.

- Then, with your Ctrl key held down, pick the two vertical lines.



- Right click and select Properties from the context menu.

- Then from the Entity properties dialog box, change the line type to 'Line Type 2'



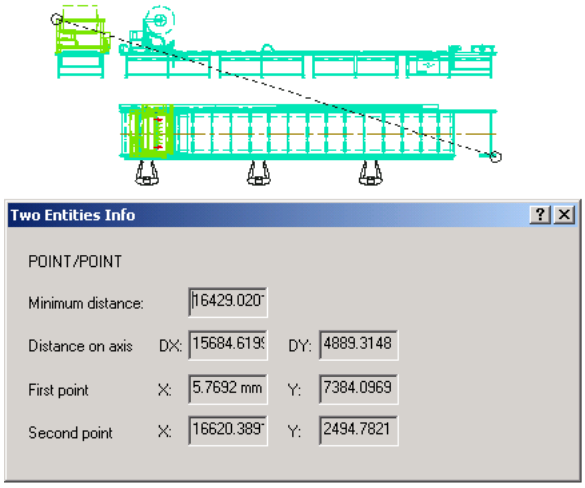
- Click the OK button to change the line type
- Double-click in the workspace to exit the Current Group and return to the **Top Level Group**.
- Zoom out to view all the Sprygun groups.

Notice that the hidden line modification that we just made is duplicated on all the other Sprygun groups.

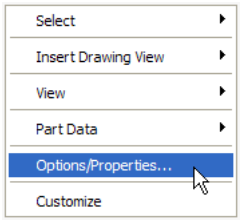
Let's now add the Title Block for the drawing.

- To know what format to use, check the size of the drawing. Click **Tools**⇨**Info**⇨**Two Entities**
- Select the two extreme points as shown.

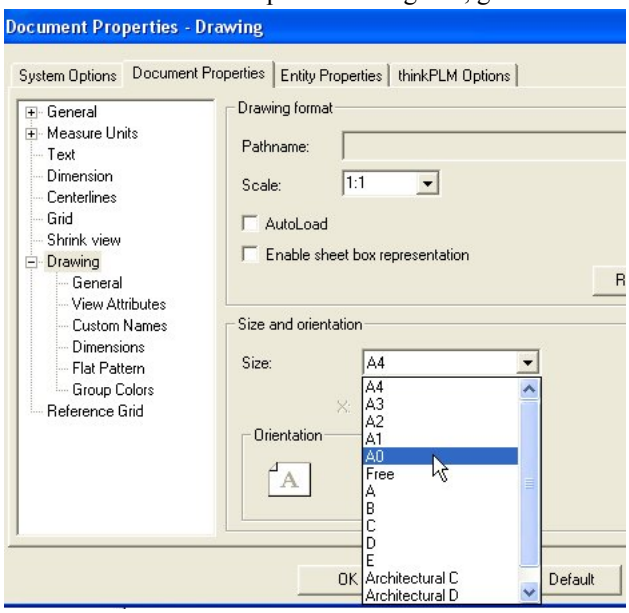
The drawing is very big, 15,687mm on the X axis. We want to leave our geometry at full scale and Scale-Up the drawing format and title block. To do this, we can plot it using an A0 (1188 x 840) format. This means, we must print with a document scale of about 15x ((15687/1188)=13.2) the original size of the format.



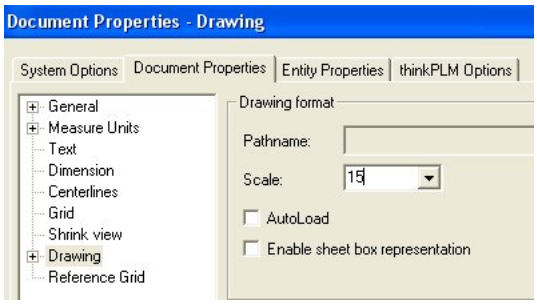
- Close this window and right click in the graphics area and select **Options/Properties**.



- In the Document Properties Dialog box, go to the Drawing and set the size to A0 as shown below.



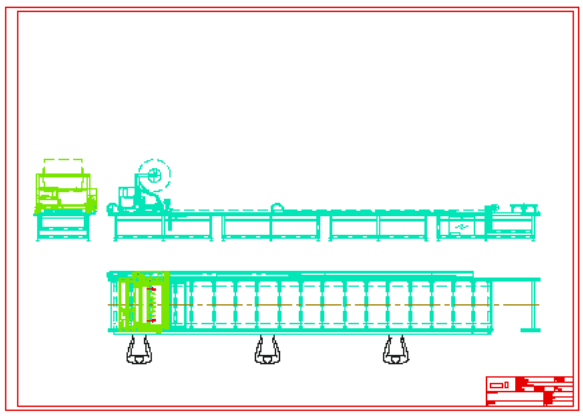
- Next, in same window set a Document Scale to 15. This will scale the drawing border and title block up 15X but will leave the geometry at full size.



- Click the OK button, or hit the Enter key to accept your changes.

Now that we've configured the layout of our drawing, let's insert it into the drawing.

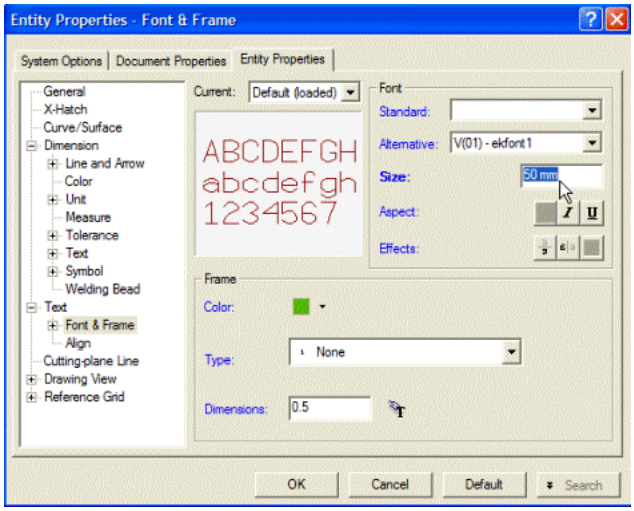
- Go to **Insert**→**Drawing Frame and Title Block** to place the Frame and Title Block on your drawing.



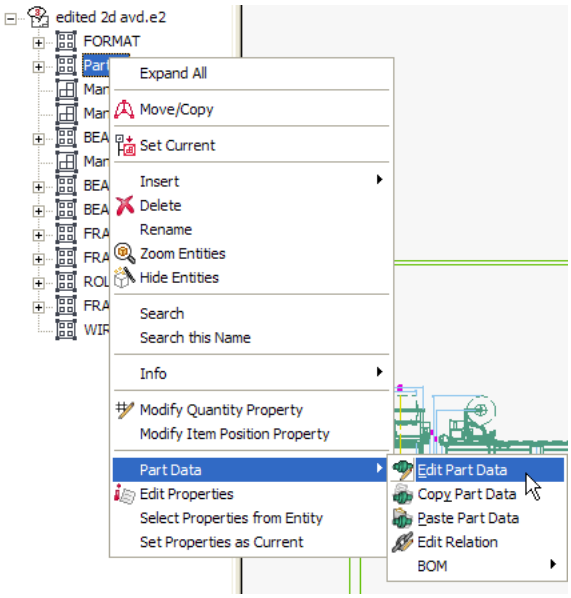
Next we are going to add balloon callouts as well as a **Part List**. Before we do that, let's modify some other settings and add info to the group PART11 that was previously created.

To print the drawing with a drawing scale of 15X, the font size must be big enough to be able to read the numbers inside the balloons.

- Right click in the background and select Options/Properties.
- Under the Text option of the Entity properties window, set the Character Size to 50, as shown below.



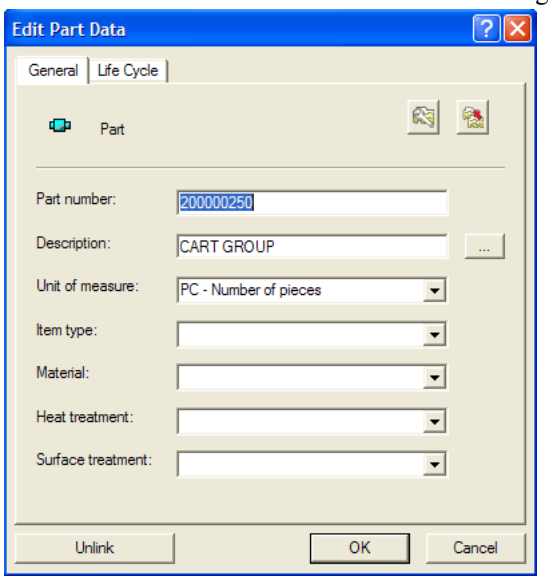
- Click the OK button, or hit the Enter key to accept your changes.
- Right click on the group 'PART11' from the Group Tree.
- From the context menu, select the **Edit Part Data** Command as shown below.



Fill in this info for the 'PART11' Cart.

- Part number 20000250
- Description CART GROUP
- Unit of measure PC

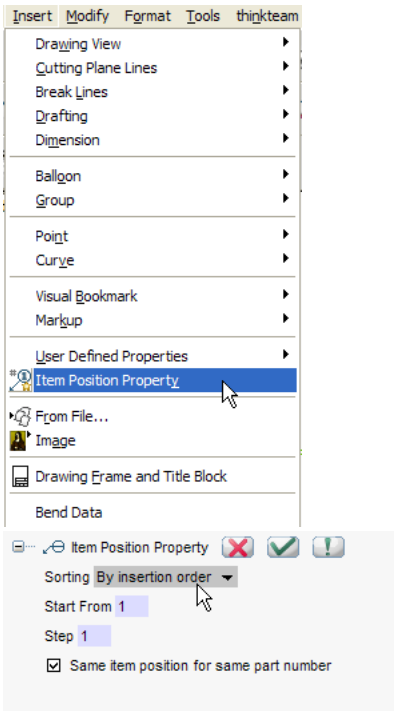
The rest of the parts and groups in our drawing already have part number information embedded in them. This Part Information is what is needed so that we can generate a parts list and balloon callouts.



- Click the OK button, or hit the Enter key to accept your changes.

Let's also set the sequence for the balloons.

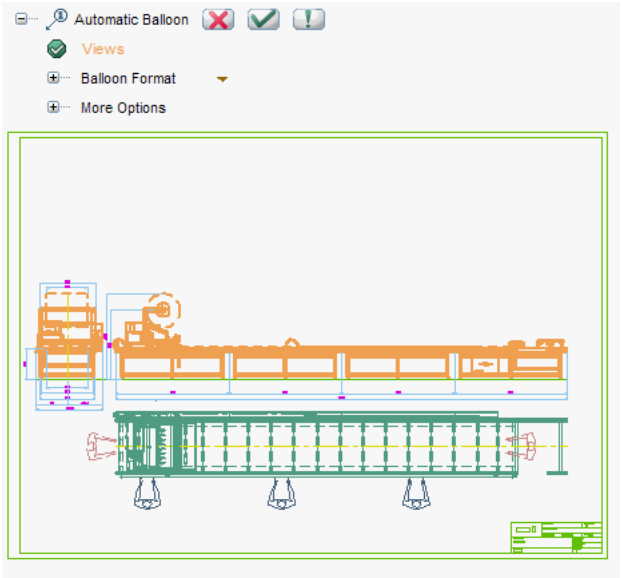
- Start the **Insert**⇨**Item Position Property**Command
- Modify the settings in the same way as shown below.



- Click the OK to accept your changes.

Now let's insert the **Automatic Balloons** into the drawing.

- Start the command **Insert→Balloons→Automatic**
- Select the front and side views with a selection window around both of these views as shown below.

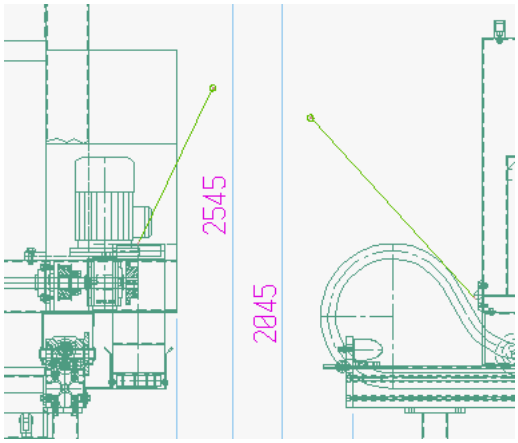


- Click OK to complete the command.

thinkdesign will automatically insert all the balloons for parts and groups that have part data associated with them.

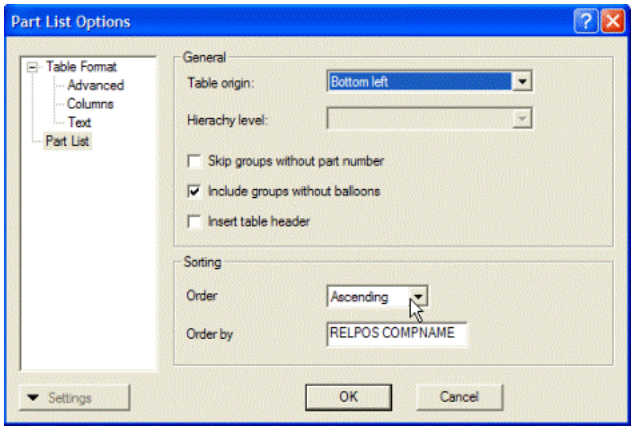
Some balloons may overlap the views of the geometry, this is normal.

- Zoom into the areas that the balloons were created and then click and drag the balloons to re-position them.

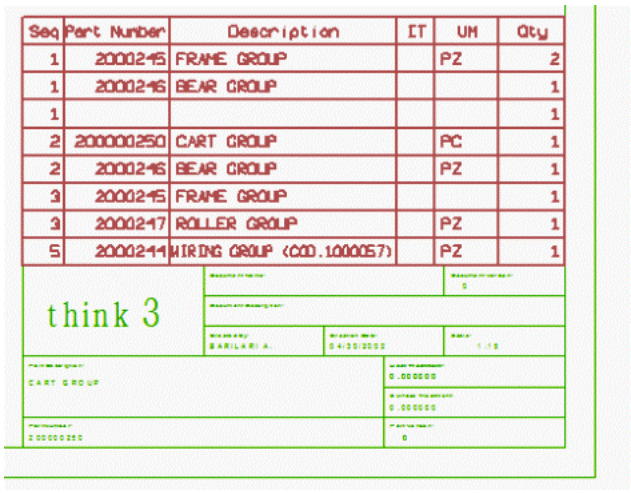


Now we need create the **Part List**. This list will be automatically generated by thinkdesign. The position, however, is up to you. By default the parts list is designed to fit snuggly on top of thinkdesign's default title block. Let's see how this happens:

- Zoom the drawing so that the lower right corner of the drawing is visible.
- Start **Tools**➪**Part List**
- Set order type Ascending



- Click the OK button to accept your changes.
- Snap the part list to the UPPER-LEFT corner of title block to position it.

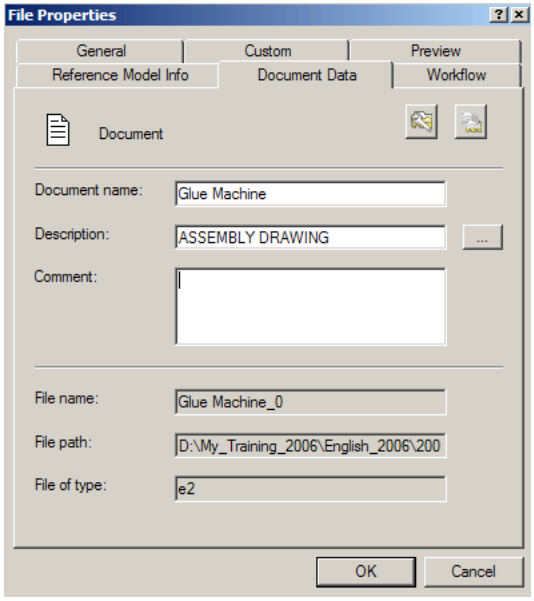


A glance at the Title Block reveals that some more info needs to be added like document name and document description.

- Open the Properties of the file by going to **File**➪**Properties**.

In Document Data tab fill in the following info:

- In Document name field insert 'GLUE MACHINE'
- For the Description, click on the button next to the Description field and select 'ASSEMBLY DRAWING'.

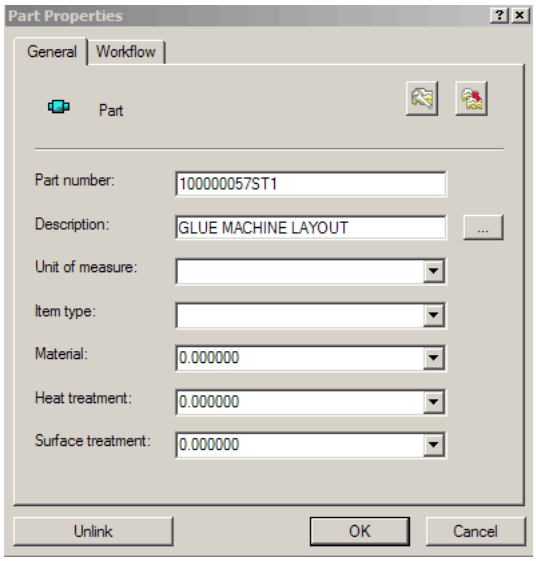


- Click the OK button to accept your changes.
- Right click on the drawing name, that is on top of the Group Tree.
- From the context menu, select Part Data> Edit.

Start the **Edit Part Data** command and fill in the fields as shown below:

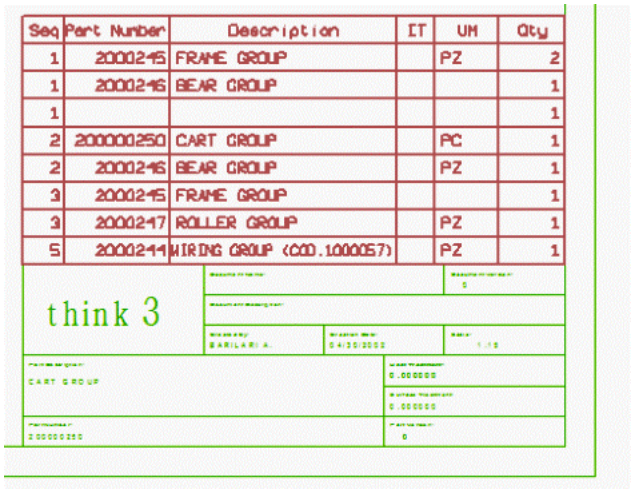
- Part number 1000057ST1

- Description GLUE MACHINE LAYOUT



- Click the OK button to accept your changes.

The fields in title block are filled for both the Document Name and Description as well as Part Number and description.



Congratulations! You have successfully completed this exercise!