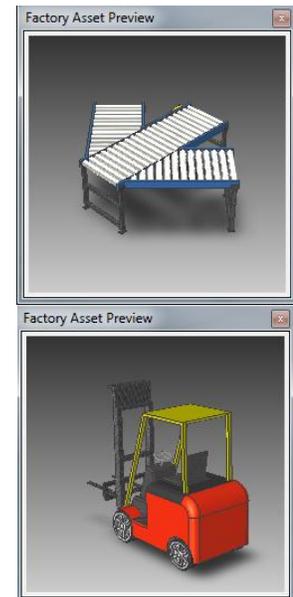


Creating Inventor Factory Assets

Autodesk® Factory Design Suite extends Digital Prototyping to the factory floor. It provides tools for integrating 2D layout data with 3D models of machine and facility components, creating digital factory models, and 3D factory-specific visualization and analysis to help teams collaborate and make better layout decisions before equipment is installed and commissioned.

A key component to fully utilizing the power and speed of the Autodesk Factory Design Suite is to create good factory assets that can be reused by everyone on the design team. By design, assets are very easy to create but to get the most out of them there are some rules that should be followed. In this paper we will explore Asset creation. Topics include...

- Determining Asset Geometry
- Asset Builder
 - Landing Surfaces and Insertion Points
 - Connectors
 - Parameters
 - Publishing
- Library Administration



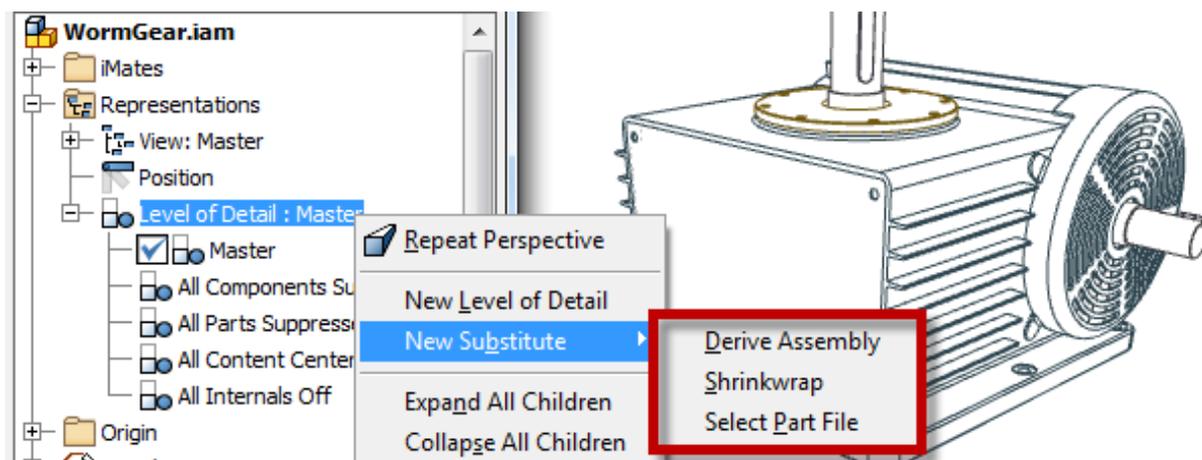
Determining Asset Geometry

Model simplification is just as important to the Asset creation process as the Asset information itself. Too large of a modeling file can and will bog Inventor down. The best practice is to keep your BIM models small, concise with connector information, and not too face and edge heavy.

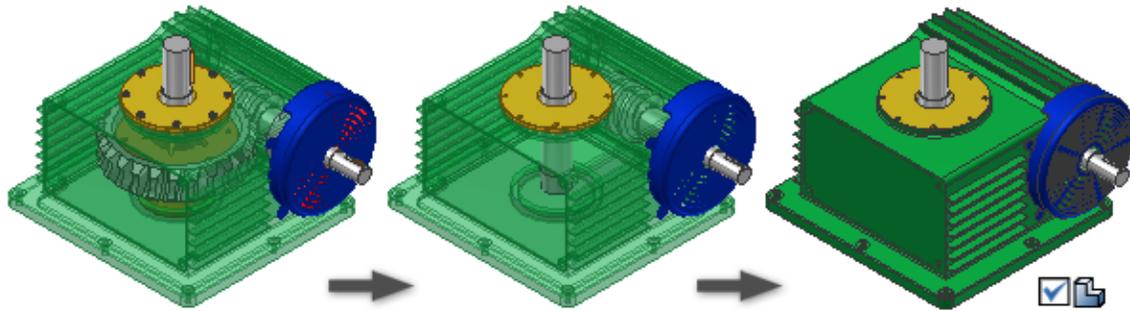
There are many ways to simplify models for Asset creation. We'll discuss a few of them here.

Method 1: Substitute Levels of Detail (LODs)

One of the easiest ways to control this is through Substitute LODs. Substitute LODs utilize a separate Inventor part file (.ipt) that is created explicitly for model representation. Having the simplified modeling file around is also an extra benefit for any outside collaboration to aid in proprietary information protection. Below is a brief overview of the three methods:



Derive Assembly – Identical to the *Derive* command when used on an Assembly

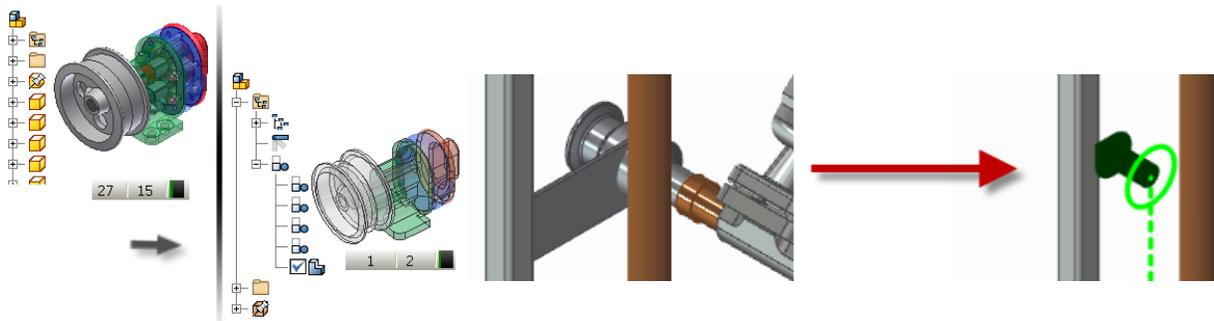


This method of creating an LOD allows you to remove data that is not important in the design and pull the remaining geometry into a single file which greatly reducing loading time. Derive Assembly also allows for removal of parts and bounding boxes for component rather than intense detail. Normally this simplification is used to help on very large assembly structures. It creates a simplification of the internal faces and edges as well as the option to remove non-essential parts completely.

Note: When Substitute parts are created for LODs, their references links are disabled and must be manually updated. *Assemble Tab* → *Productivity Panel* → *Update Substitutes*.

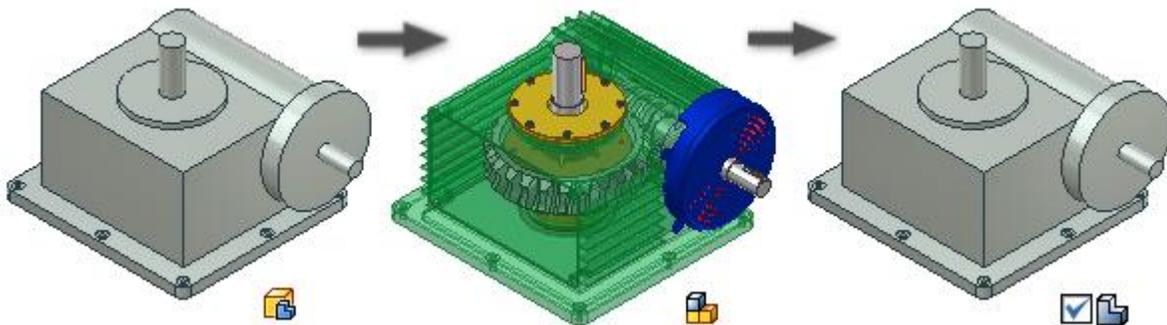
Shrinkwrap – Identical to the *Shrinkwrap Substitute* command.

A Shrinkwrap will remove parts by size, by visibility, and patch holes by circumference. Using the Composite surfaces option for output will create the smallest size Asset.



Select Part File – Selects an existing reference part in the file store for graphical use.

This method basically uses a pre-defined part to represent the design. The disadvantage of using this method for BIM ready models is if a connector changes location, you now have to change that location in two separate areas rather than one derived assembly.



All methods shown here still contain the entire Bill of Material information and can all still be used on a drawing. In summary a simplified model could have a significant impact on the performance of any CAD system. A 3 MB file compared to a 26 MB file is quite a difference inside a large commercial building or plant layout.

Method 2: Single Part (Non Associative)

This method is the similar of the two and allows for full Asset customization without the worry of associative linking to a production model. This ensures any changes made to the Asset do not carry back to the original assembly as well as the other way around. Full control can be done here regardless of assembly constraints and iLogic rules can be easier to setup here for design modification. The down side is if more detail is required, it cannot be as easily switched to like in the first method and if extreme enough design changes take place for a production model, a new separate Asset file or some rework is needed for this method.

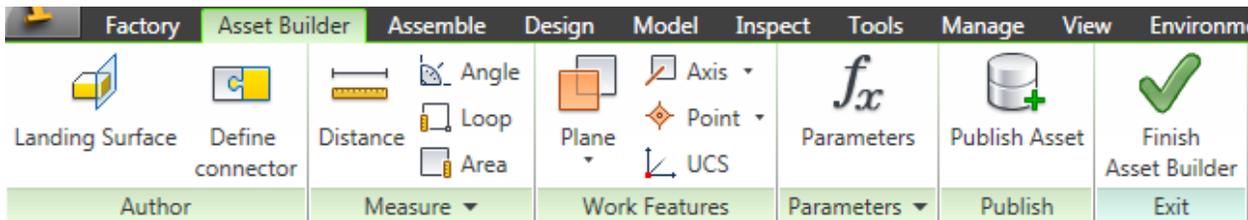
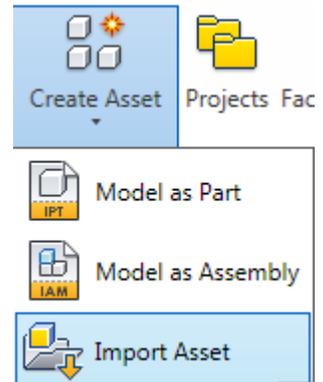
If an Assembly already exists, the standard versions of the tools listed above (*Derive* and *Shrinkwrap*) are sufficient for Asset geometry creation.

Note: Currently Inventor Factory 2011 does not support iParts and iAssemblies for Asset creation.

Asset Builder

There are two ways to start authoring an Asset. The first way is to start the command from the Getting Started Tab of the interface. The other way is directly from the *Factory* tab inside a layout.

Choose Model as Part or Model as Assembly to create a new Asset from scratch. Choose the Import Asset to use something that already exists and just needs authoring and publishing. Once inside the modeling file, use the Asset Builder command to start the process. This will launch a new Tab called *Asset Builder* with another subset of commands for Asset authoring and publishing.



Note: Use stable Work Feature references in conjunction with proper solid modeling and iLogic rules to create a very flexible and stable model for Factory use.

Landing Surface and Insertion Points

Landing surfaces provide a resting place for assets so that they are positioned properly in contact with the floor. Except in a few cases, their use is fairly straightforward. As an example:

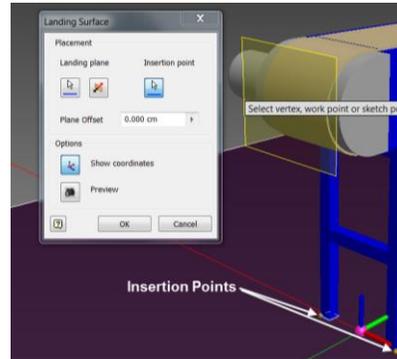
A user would like to place the landing surface of an asset on something that is non-planar (like the tire of a forklift, for example). Work planes can be used for this purpose. Place a work plane where appropriate, and select this as your landing surface.

You can also use work planes to represent the “floor” elevation for objects that are mounted above the floor (such as tool rails or anything suspended from above). Again, use an offset work plane at the appropriate distance above the floor. Adding a parameter allows the work plane to be placed at specified elevations.

Do not define a landing surface if the object you are publishing is not attached to the floor (like a control cabinet mounted on the wall). This will make the asset easier to place using normal constraints.

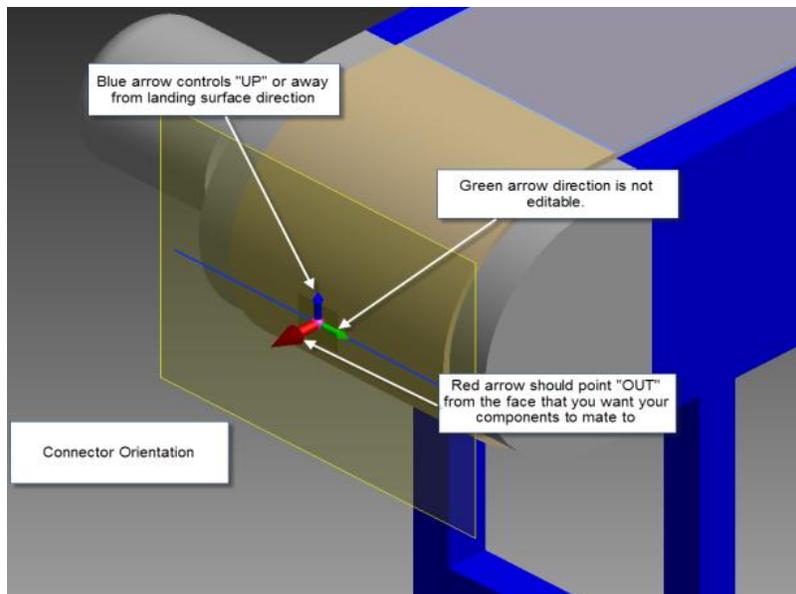
Insertion points are strictly optional when publishing an asset. But they can be used to more accurately determine where an object is going to be placed when you insert it. Some things to know

- Insertion points can be attached to any point and projected to the landing surface.
- Insertion points can snap to the 2D DWG overlay. Note that the object will not be constrained to the 2D DWG overlay. The insertion points are for placement purposes only.
- You can have multiple insertion points. Press the TAB key to cycle through multiple insertion points when placing the asset.

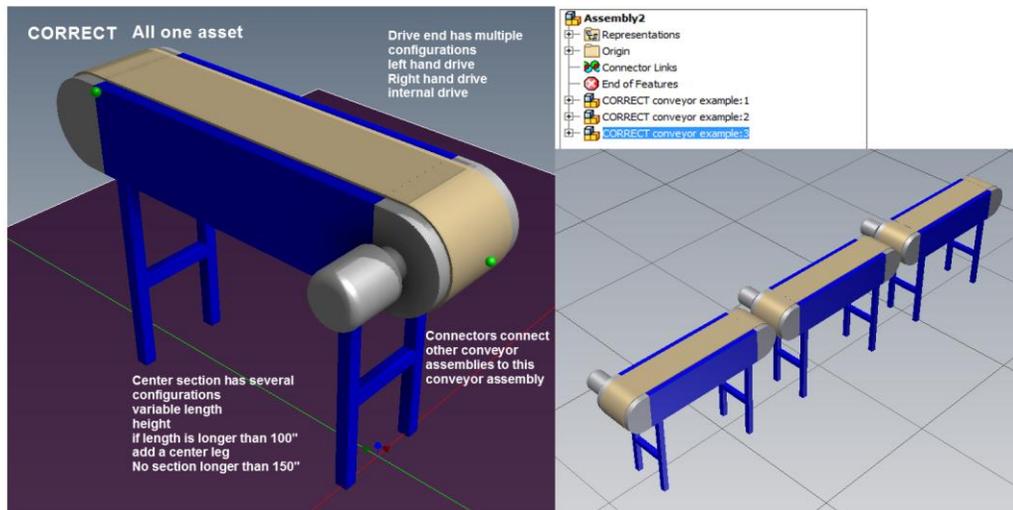


Connectors

Consistency is important with the orientation of the connections. The illustration below shows a best practice for orienting them.



Connectors are designed to chain assets together. They are not designed to hook sub components together. The example below illustrates three components comprising an assembly that represents an asset.

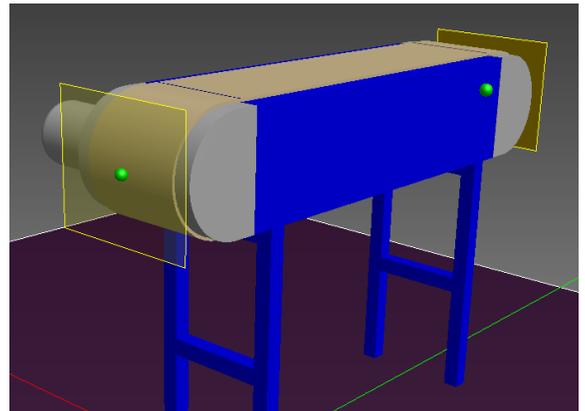


Connectors do not necessarily need to be tied directly to a geometry face. However, they do need sketch geometry as a minimum to attach to. In the case of the conveyor example shown above, there is no planar face on which to place the connector. We can add a work plane and a sketch to allow us to place a connector.

Begin by creating a work plane offset from a face that you *know* will not be deleted or changed. For example, when part replacements are done on assemblies, the face is gone because it is now a new part in the place of the old one. The same occurs when a part is suppressed in an assembly.

For this reason, we will use the center section for the parent of the work plane/connector. The end components of the conveyor are swapped out due to different configurations.

1. Activate the part where the connectors will reside.
2. Create an offset work plane. Offset it at a given distance that represents the correct connector location. Consider using origin features for stability.
3. Create a sketch on this work plane. Project the appropriate edges or work features to tie sketch geometry to.
4. Do the same on the other end of the part where appropriate (this is the other connector that will cause the asset to “chain” together.)
5. Select the appropriate landing surface and place connectors. Locate the connector on the sketch geometry as required, and set the direction as needed.



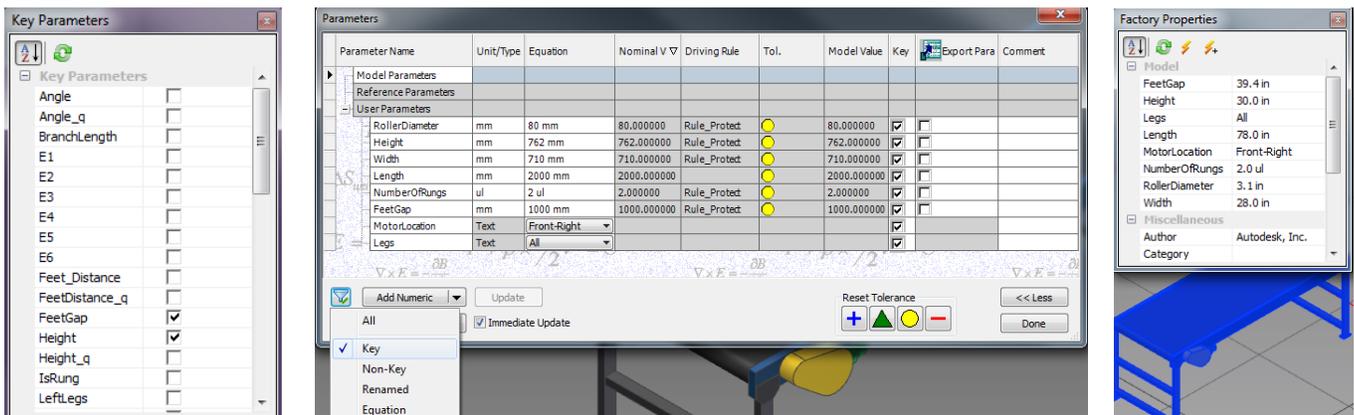
Note: Be sure to turn off visibility of the sketches and work planes or you will see these every time you place the asset.

6. Save the file.
7. Publish the asset.
8. Finish the Asset Builder.

Parameters

Any parameter that has been renamed from its original d* value will be present for Key selection in the *Key Parameters* palette in the Asset Builder. Once a parameter is listed as a key value it can be used in the *Factory Layout* to adjust that parameter in the *Factory Properties* palette.

These parameters can control simple modeling functions or more likely iLogic code and triggers to change the geometry to the desired configuration. Since iParts and iAssemblies are not available for use in Factory Asset creation, iLogic is an important addition to any configurable asset.



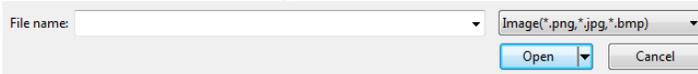
Publishing

Once the Landing Surface, Connectors Assignment, Parameter and iLogic controls are in place the Asset is ready for Publishing to the User Directory of the Factory Library.

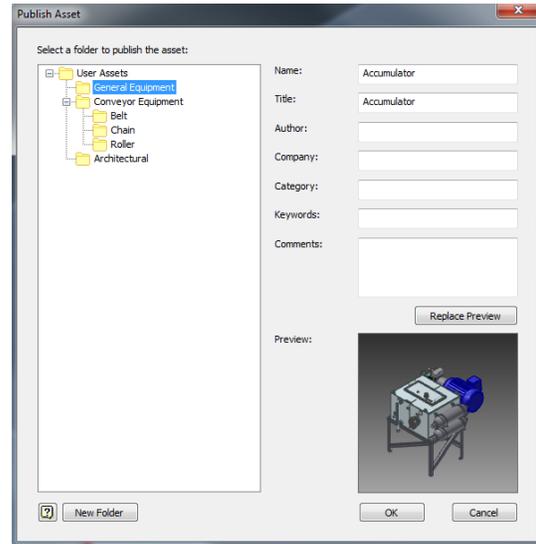
1. Start the Publish Asset command from the Ribbon.



2. Create a Folder structure for your Factory User Directory. Use the New Folder button on the corresponding node to create a child folder under it.
3. Fill out appropriate data for the model such as Name, Category, Comments, etc.
4. Replace the Preview image if desired (Inventor will automatically copy the image file to the correct directory in the User library)



5. Click OK to publish the fully authored Asset to the library



Library Administration

Inventor Factory will ship with two libraries for Factory Assets; a system library and a User library. The system library cannot be published to and is located in the programs install path. The user library is for publishing of any asset through the Asset Builder. For Vista and Win7 they are located here:

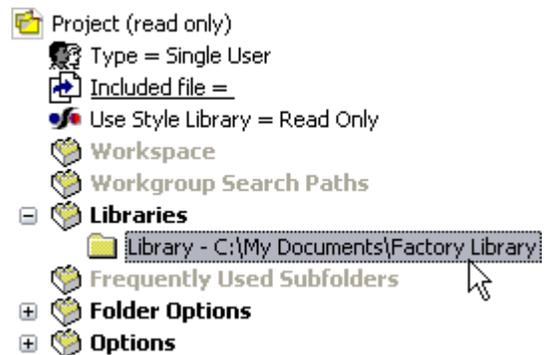
System Library: C:\Program Files\Autodesk\Inventor 2011\FactoryLibrary

User Library: C:\Users\mflayler\Documents\Factory Library

Multi-User Collaboration

These libraries are not customizable in their paths. Inventor Factory currently only supports local libraries of Factory Assets. In order to share the libraries and their content, they can be copied from one user station to another and their library structure, images, and content will automatically show up in the Factory Library palette in the software. However it is more practical to create a Library Folder which can be set up to Publish to and then Place from inside the Factory Layout.

Each user should also have this user directory as a Library Project path to prevent accidental editing of the files as well as maintain a proper search order for a project file in the event of a broken assembly or misplaced component.



About IMAGINiT Technologies:

IMAGINiT Technologies, a RAND Worldwide Company, is a leading provider of design and engineering solutions to the building, manufacturing and infrastructure, media and entertainment industries. With over 40 offices in North America and Asia-Pacific, IMAGINiT is a leading provider of Autodesk software solutions and the largest North American Autodesk Authorized Training Center (ATC) partner. IMAGINiT delivers knowledge, expertise and design processes to clients through proven technical support, training and consulting services. Our locations are supported by a vast pool of engineering resources that are focused on developing real-life business solutions for their local clients. For more information please visit www.rand.com/imaginit or email us at: whitepapers@rand.com.

All brand names, product names, or trademarks belong to their respective holders.
 Rand IMAGINiT Technologies, Inc. is not responsible for typographical or graphical errors that may appear in this document.
 © 2010 Rand IMAGINiT Technologies, Inc., All Rights Reserved.