

MSI SolidWorks Control Panel Design

By Edwin E Thompson

12/15/2015

Copyright 12/15/2015 (See Appendix B)

Index

- 1. Introduction**
 - 1.1. Description**
 - 1.2. No Special Training Required**
 - 1.3. System Requirements**
 - 1.4. The need to verify accuracy**
 - 1.5. The need to verify availability**
 - 1.6. General Comments**
 - 1.7. Please Do Not distribute MSI extended Library files (See EULA appendix B)**
- 2. Getting Started/ Installation of MSI Controls Library**
 - 2.1. Installing the MSI Controls Library**
 - 2.2. Setting up the Design Library for the Controls components**
 - 2.3. Save the Solidworks settings**
- 3. Using the MSI Controls Library**
 - 3.1. Using "Consumed" Components**
 - 3.2. Creating a consumable Control Cabinet**
 - 3.3. Adding Din Rails, Panduit and other components to the back panel**
 - 3.4. Adding Terminals**
 - 3.5. Adding Components to "holes" in Door and Cabinet surfaces**
 - 3.6. Adding Components (Instrumentation) to flat surfaces of Door and Cabinet**
 - 3.7. Operator Legends, General Legends, and ID Tags**
 - 3.8. Auxiliary components**
- 4. Expanding the Controls Library**
 - 4.1. Adding Configurations**
 - 4.2. Creating new components**
- 5. Summary**
 - 5.1. Step by Step summary, using the MSI Control Library**
 - 5.2. Common errors and solutions**
- 6. Setting up BOM's**
- 7. Summary**
- 8. Appendices**
 - A. MSI Library Rules**
 - B. End User License Agreement (EULA)**
 - C. Summary Description of Component files**
 - D. MSI Simplified Component Files**
 - E. Summary of Mate Reference Definitions**

Section 1, Introduction:

1.1 Description:

The MSI Controls Library is not just a collection of component files but forms a "system" to assist in the effective design of Control Cabinets and is an economical alternative to other Controls Design Packages and Add-ons.

1. Other than these instructions, 100% of the MSI Controls Library is built around standard Solidworks commands, making the Library easy to learn and use.
2. MSI electrical components are "simplified" shapes which allows for determining the physical relationships and spacing within Control Cabinet designs while minimizing file sizes.
3. MSI "simplified" component files can be copied and with minor modification can be transform into new component files.
4. MSI Control Library components extensively use design tables. When components are physically similar, new part numbers can easily be added into the library by editing the design tables. Instruction for extending the Controls Library are presented in Section 4. (Contact MSI for availability of additional Control Library components or to request specific components).
5. The custom property, "Description" is incorporated into all MSI electrical library components, saving time and promoting accuracy as Bill of Materials (BOM's).
6. Incorporation of Mate References for most components greatly enhances the efficiency of the MSI Controls Library. Components are designed to "snap" onto din rails, or various surfaces of control cabinets where they can be easily positioned into Control Cabinet Assemblies.
7. Appropriate MSI components include Smart Features that provide for the automatic placement of holes and cutouts into the surfaces of control panels. Library Features are provided for the mounting of components like 22.5mm Push Buttons and Lights.
8. Manufacturer Data Sheets, Catalogues, and PDF manuals are linked to most MSI Control Library components for easy reference. These links allows for technical information to be easily found and used during the design process. They also enhance the ability to add new part numbers when needed. Some hyperlinks to web locations.

The MSI Controls Library is not exhaustive but creates a foundation for building your own custom Solidworks library. This approach allows for a quick start and as your custom library is built it becomes your companies default standard of components that are reliable, available, and reasonably priced. (Appendix C is a brief summary of component types and their location.)

In summary, the goal of the MSI Library is to provide a competitive solution for the efficient development of 3D Control Panel Assembly models with Solidworks.

1.2 No special training required:

These instructions describe a few recommended practices that will streamline the design process, but since only standard Solidworks commands are needed, little or no additional special training is needed to use of the MSI Controls Library is necessary.

1.3 System Requirements:

The MSI Controls Library will work with **all** versions of Solidworks that uses standard Design Library components, version 2014 and above.

1.4 The need to verify accuracy:

MSI places a high value on quality, but due to large number of part numbers in the Controls Library, the user must verify all critical information. For a very high percentage of projects, the "simplified" files will have no effect on the design. However, the user should always evaluate if these simplifications are acceptable within all designs.

Note: Decals provide visual effect and help with identifying components but they are not critical for designs. They have been captured from Manufacturers literature and there is no guarantee of their accuracy.

Please contact MSI if you discover any errors, thank you.

1.5 The need to verify availability:

The price and delivery should be verified for all components before use.

1.6 General Comments:

No engineering advice is being offered for designs or for the use and selection of any of the extended library components.

All MSI Control library components use custom "Description" properties to automatically populate drawing BOM's. Description properties may need to be modified or added within the design tables of individual component BOM templates. It is recommended to include a design table column which references the custom property: \$PRP@Description

MSI extended library parts follow MSI's general guidelines (Appendix A).

Please Do Not distribute these directions or MSI Controls Library files:

The user is free to use these components during the course of normal engineering designs. A considerable amount of time and effort has been spent in developing the MSI Control Library. Therefore, the user is asked to respect the End User License Agreement, especially to not to distribute or upload any of the MSI Controls Library component files to websites or to non-licensed users (**please see Appendix B for details of the licensing agreement**).

Section 2, Getting Started/ Installation of MSI Controls Library:

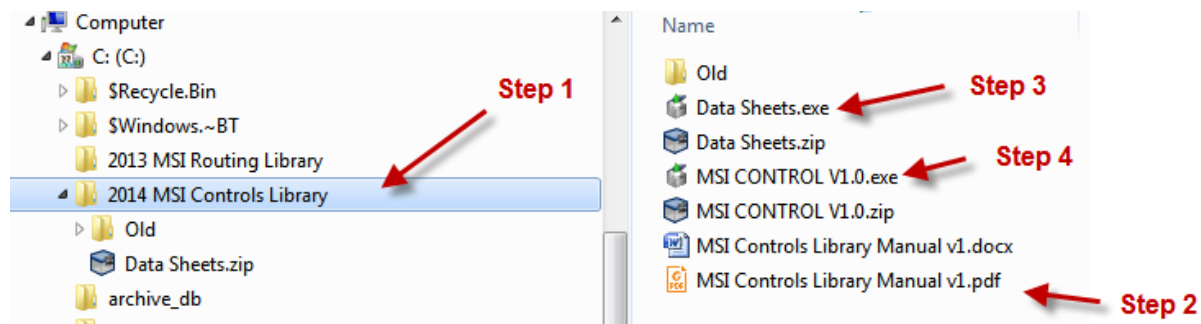
2.1 Installing the MSI Controls Library:

Step 1: It is recommended to download and open this file into a "**C:\2014 MSI Controls Library**" directory. (Note: This directory is not mandatory. The library files are 2014 but can be copied into later versions of Solidworks.)

The "**Data Sheet.exe**" should also be downloaded.

The "**MSI Control V1.0.exe**" file will need to be downloaded through the shopping cart.

The resulting directory should be similar as is shown below. (Note: SW 2014 is used as an example throughout this tutorial. Newer versions of Solidworks will need to be modified accordingly):



Step 2: This or similarly named PDF file should be opened and followed to complete the installation.

Step 3: Double Click on the "**Data Sheets.exe**" file which will begin the Unzip process. It is important to download the data sheets into the "**C:\Data Sheets**" directory. If the Data Sheet files are not located in this directory location, the Data Sheet references in every part file will be broken.

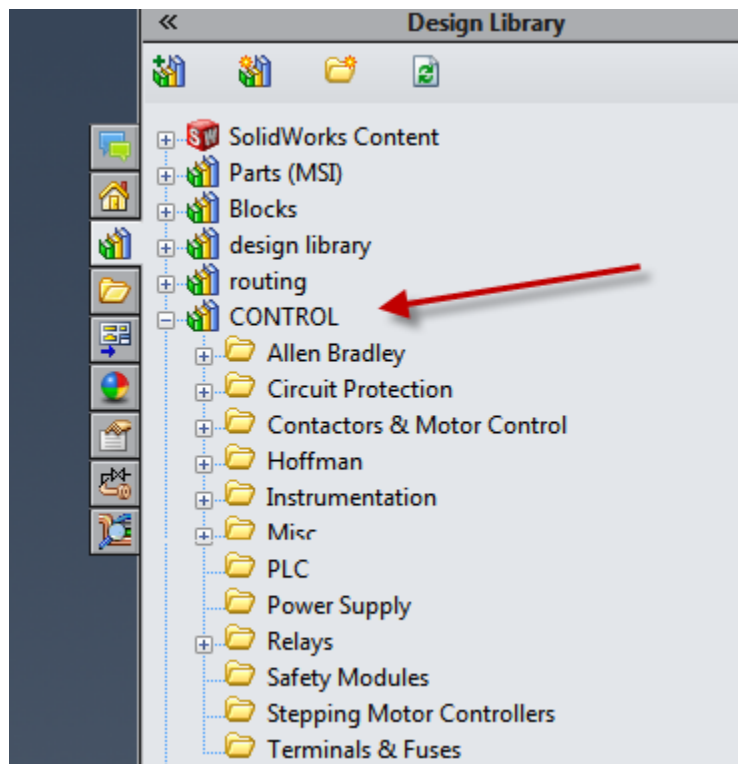
Step 4: Double Click on "**MSI Control V1.0.exe**" file which will begin the Unzip process for the MSI Controls Library. When the dialogue box opens, verify that the "Extract to" location is correct. This directory can be (probably should be) within your latest version of SW, such as **C:\Solidworks 2014\Design Library\Controls** or any other appropriate location. Wherever location is chosen, that directory will need to later be added to the Design Library. (See section 2.2 below for further details).

MSI has followed the practice to place all Design Library Part files under the various version directories. As an example for SW 2013, the directory would be something like: **C:\SolidWorks 2013\design library\Controls**. As an example for SW 2014, the directory would be something like: **C:\SolidWorks 2014\design library\Controls**. This practice prevents "cross contamination" of files between newer and older versions of Solidworks.

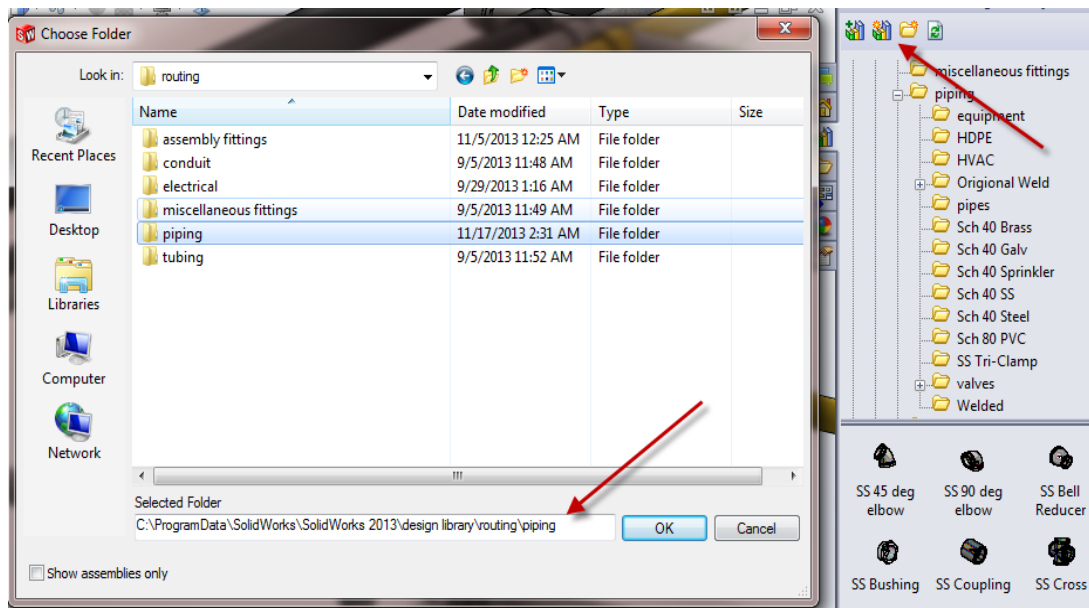
Note: There is no restriction on the location of where the Design Library can reference the MSI Controls Library files. However, if the location of the MSI Controls Library is changed after some of the components have been used within designs, it will be necessary to manually relocate each of the components for every project.

2.2 Setting up the Design Library for the Controls components:

Once the Controls Library is copied to the desired location, the library needs to be added to the Design Library. Once added to the "Design Library" there will be a shortcut to the MSI Control Library components.



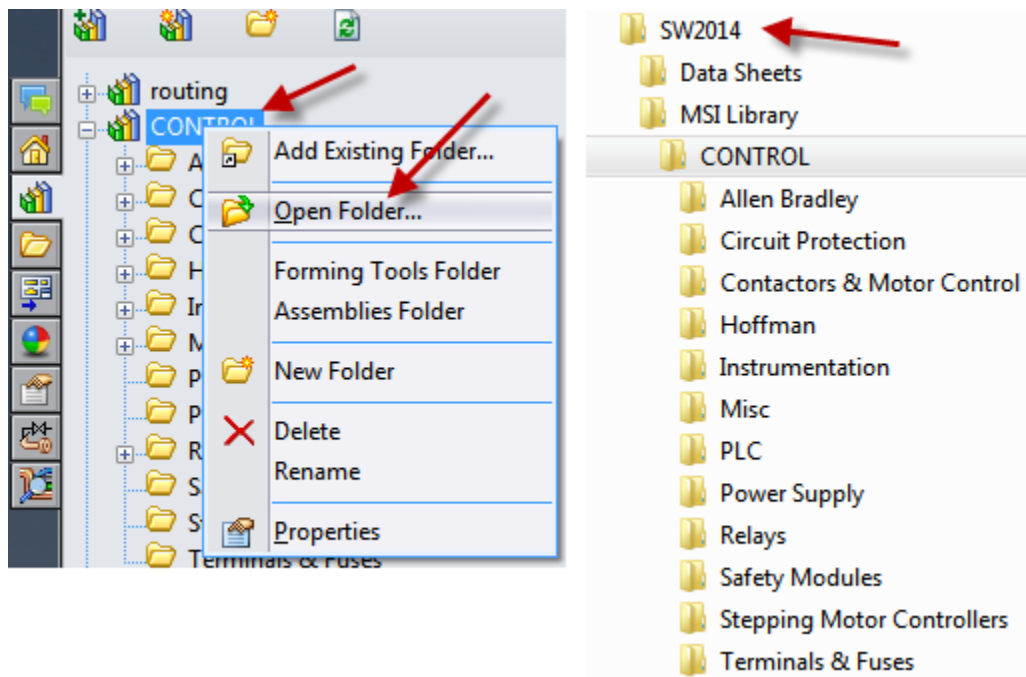
To add the MSI Controls Library (similar to shown above) select the <Add File Location> (the right arrow shown below). The dialogue box shown to the left below will appear. Search and select the location of the MSI Control Library: **C:\SolidWorks 2014\design library\Controls** When "OK" is selected the components in the MSI Control Library will be displayed in the Design Library.



Note: If the Controls component path is directed to the wrong version of SW, the Control component in the library will be updated and resaved to the newer version of SW. If this occurs, the saved components will not be useable for the older version of SW. If there are any warning messages about updating component files during an attempt to save an assembly or part file, **DO NOT** save. **The work will be lost**, but the file should be closed without saving and redone **after** the path has been corrected.

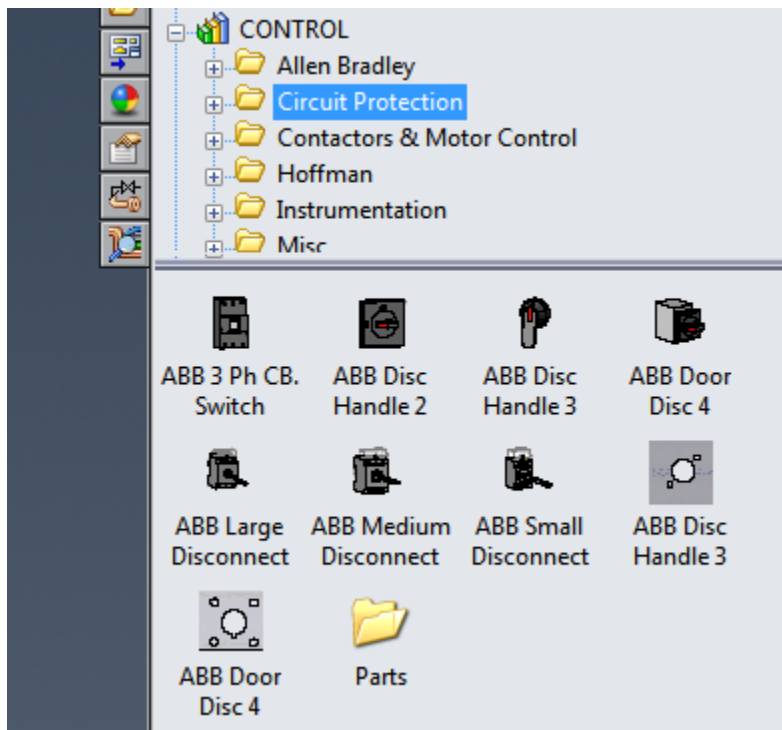
If even only some of the control components are updated to a newer version of SW, it is recommended that the appropriate Control Library modules be restored from the original download or from appropriate backup files to the appropriate version of SW. The Control Library files are in version 2014 and can be easily refreshed by following some of the installation steps in Section 2, to any version of SW 2014 or later.

Verify Design Library Path: To verify the path of the Design Library, right click on the Design Library, "Control" icon (as is shown below). The dialogue box should appear. Left Click on the "Open Folder". The Windows Explorer window should open and reveal the location/ version of SW that is associated with the Controls directory and components. If the Controls component directory is located "under" the correct version of SW (shown below, to the right) then Cancel out of the window (by selecting the "X" in the upper right corner of the Window Explorer window). If the version is not correct, then the "Controls" location in the Design Library tree should be "Deleted". This can easily be done by selecting "Delete" (also shown below to the left). Once deleted, the MSI Controls Library should then be re-added as previously described.



If the correct path was selected, the Design Library should have the MSI Controls directories and sub-categories, similar as what is shown below.

When each of the sub-directories are selected in the Design Library, the available components will be shown in the bottom pane (shown below). The components can then be used by "dragging-n-dropping" into the project assembly model:



If the components are designed to mount to a Din Rail, the rail should first be located to the back panel.

2.3 Save the Solidworks settings:

Once the above changes have been made it is recommended to save the Solidworks Settings:

Start/All programs/Solidworks 2014/Solidworks Tools/Copy Settings Wizard. Save the settings in a location where they can later be easily found to be restored. One possible location could be the "C:\2014 MSI Routing Library" directory.

Section 3, Using the MSI Controls Library:

Most of the parts in the MSI Control Library can be used as would any other Design Library component by dropping them into a Solidworks assembly. However, there are a few files that are "consumed" and therefore a slightly different procedure is recommended.

3.1 Using "Consumed" Components:

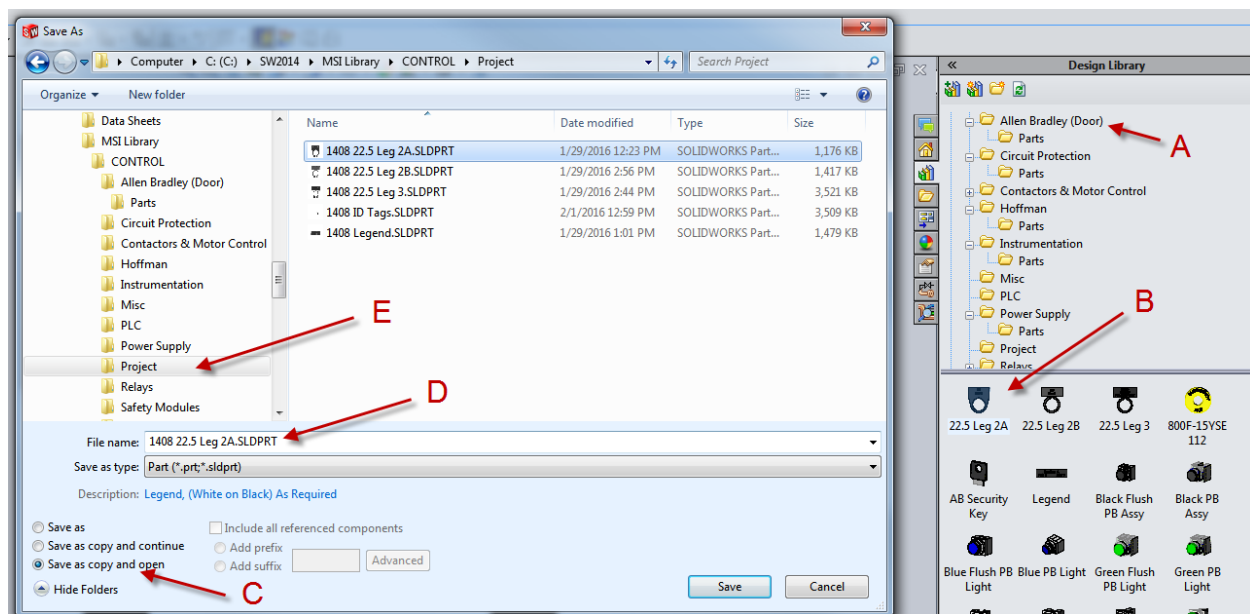
Control Cabinets, ID Tags, and Legends should generally be considered to be "Consumed" components because the actual files will usually be specifically modified per every project. If these types of files are left in the Design Library, any changes will overwrite the existing information from other projects.

Legends and ID Tags are consumed when the text is changed per project and control Cabinets are consumed when holes and cutouts are added.

In the case of ID Tag and Legend component file, these files can be copied/ saved for the specific project. If the files are saved to the current project directory, these components will need to be manually loaded into the assembly. If the files are saved to the "Project" directory in the Design Library, provided under the MSI Controls library structure, the saved files will be available for dragging and dropping into the design.

To copy/ save these files, open the file from the Design library by double Clicking on their Icon (A and B below). When opened, select the "Saved As Copy and open" option, (C below). An appropriate name should be designated (Note: A good practice is to include the project number into the file name), (D). It is recommended the file is saved to the MSI Controls Library "Project" directory (D below) and then saved, <Save>.

A relatively large number of texts can be saved inside of these Legend files. Overtime, all of the typical descriptions may result in a company "standard" legend file. At such point, legends would not need to be treated as consumable.

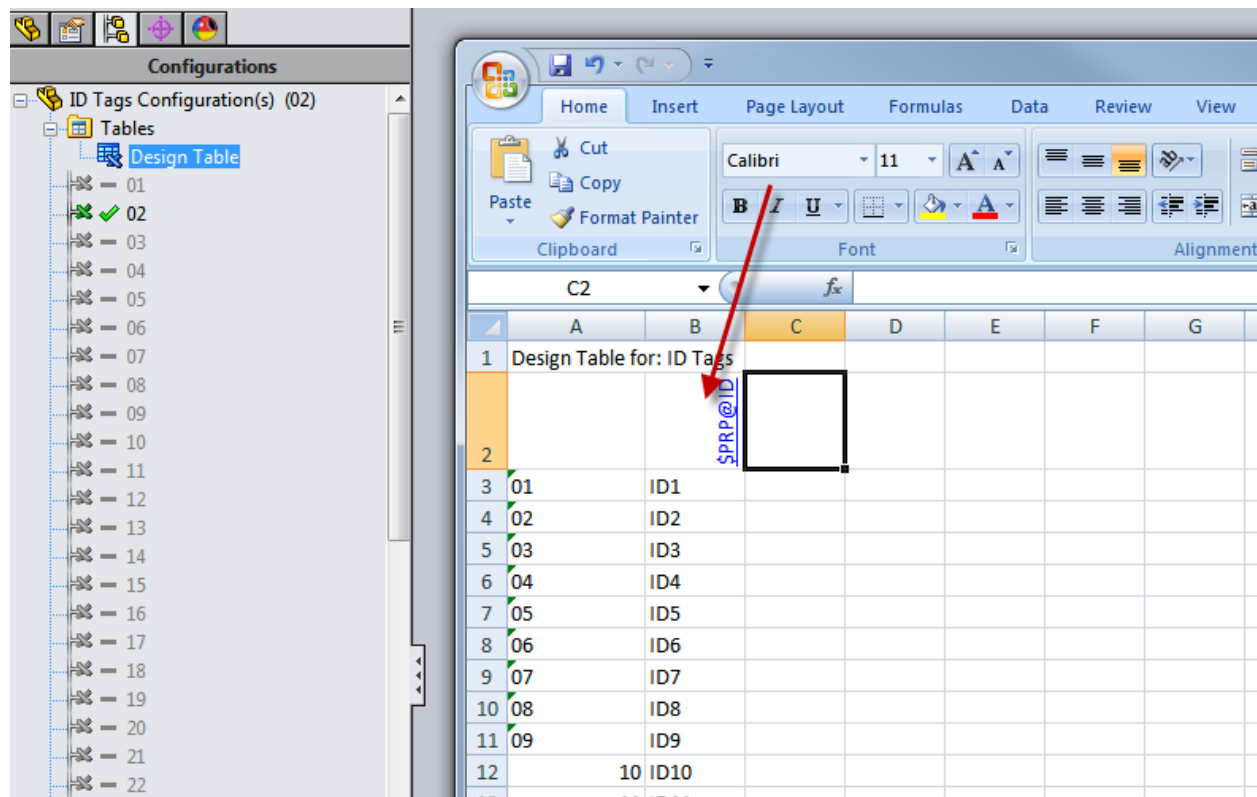


When the file is saved, the component files should initially be closed. After closing, the component can then be dropped from the Design Library Project directory into the project assembly. Note: If the newly named component does not appear in the Design Library may need to be "refreshed".

As the progress is made on the design, the text of individual instances of ID Tags and Legends will need to be modified. The individual descriptions can easily be modified by open the Design Table of the consumable component file and editing the "ID" column. The ID description can be edited before or after the various configurations are added into the assembly. When the Design Table is closed, the spacing and text should be displayed within the assembly and edited appropriately.

For legends, each of the lines can be entered. An error will be generated if no text is entered. If it is desired for a text to be blank, one option is to enter a period or dash.

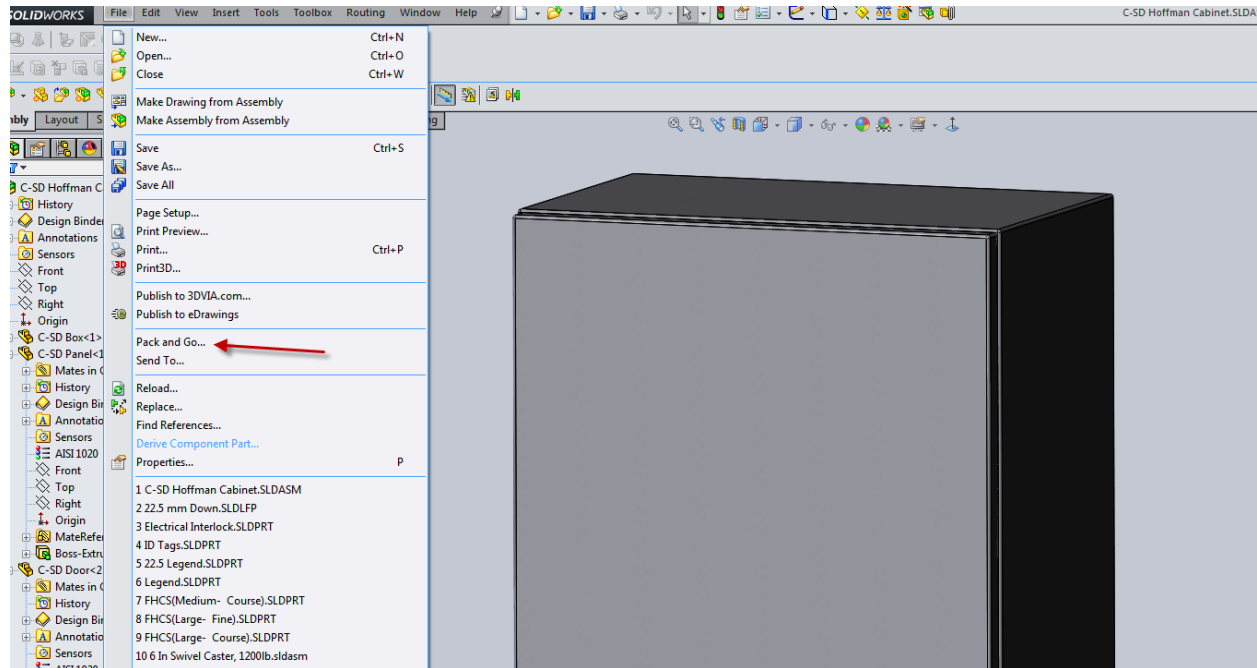
Note: If Solidworks does not update the Legend or ID Tag information, the new text can be forced by opening each of the configurations.



3.2 Creating a consumable Control Cabinet:

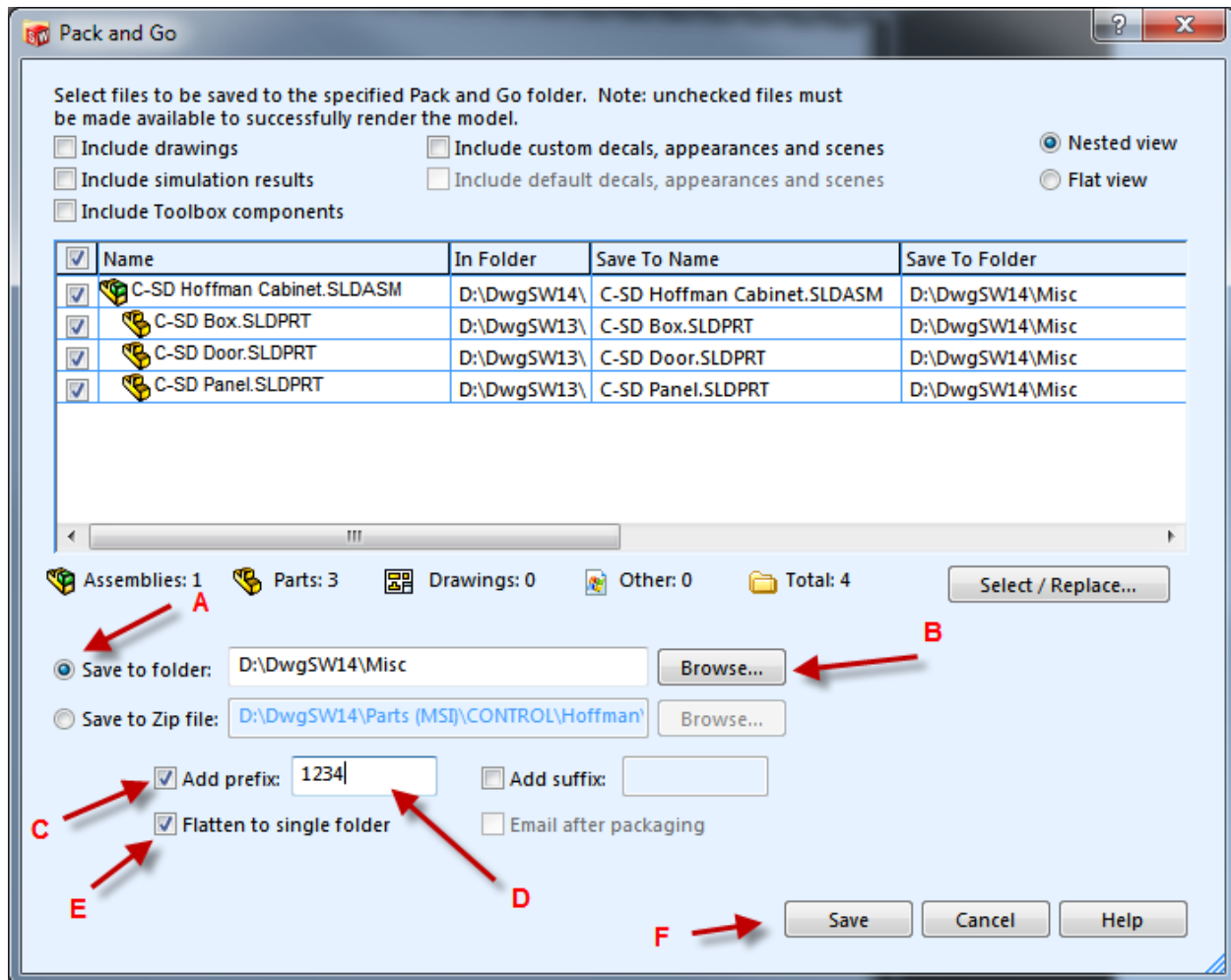
The procedure for "consumable" Control Cabinet files is slightly different. First, open the Control Cabinet Assembly file by double clicking the Icon in the Design Library under the Hoffman directory.

The cabinet assembly should then be copied through the "Pack and Go" method. Select File/<Pack and Go>:

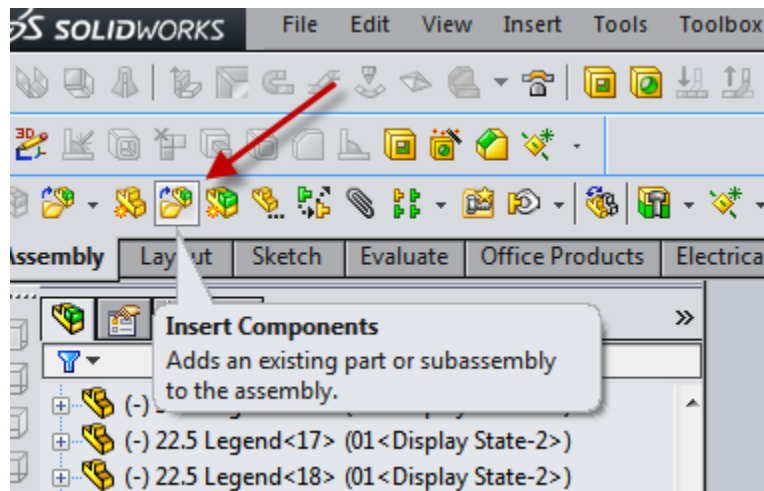


When the dialogue box shown below appears, select <Save to folder> (A), Browse to the desired folder. Unlike legends a recommended directory location for control cabinets is usually the working project directory (B). Select <Add Prefix> (C), Add the project or an appropriate number for the prefix (D), select <Flatten to single folder> (E), and select <Save> (F).

The result of these selections should be a consumable Control Cabinet Assembly file that can be modified as needed for the intended project.



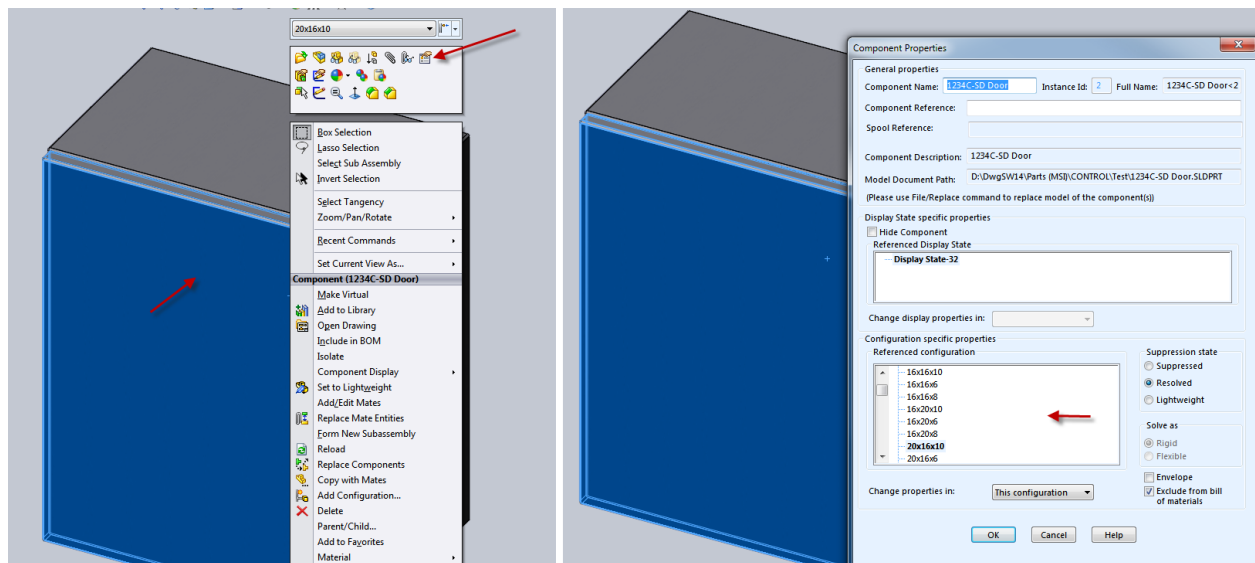
When a consumable control cabinet is saved, this is usually the first component that will be added to the Project Assembly file. The best way to accomplish this is to use the Insert Component command (shown below) and to locate the Control Cabinet Assembly that was just saved, (Note: Be sure to browse for Assemblies).



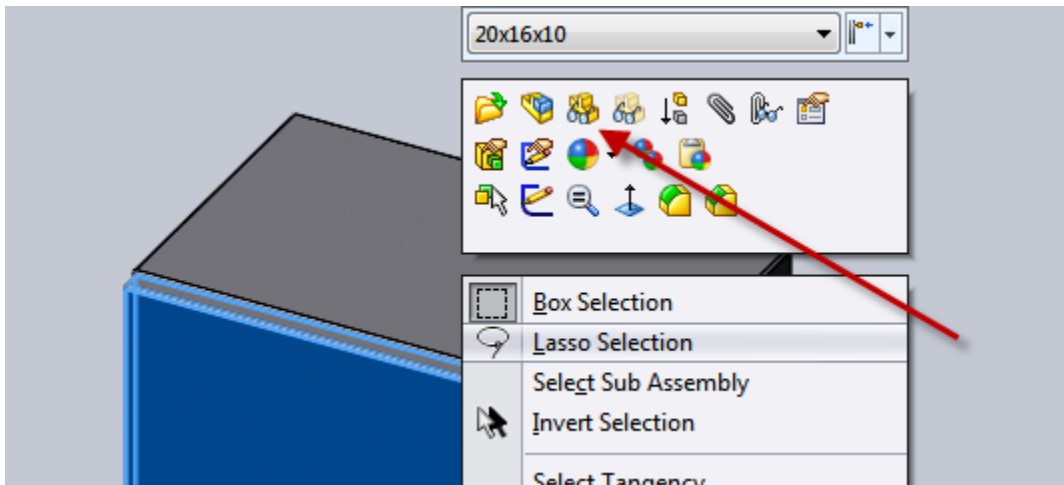
When a multi-configuration component is dropped from the Design Library, a dialogue box will allow for the desired configuration to be selected. However, if a consumable Control Cabinet is inserted into an assembly, the size will need to be selected manually.

To manually choose a configuration, right click on the control box and then select the "properties" icon (shown below left).

The properties dialogue box will allow for the desired size to be selected (shown above right):



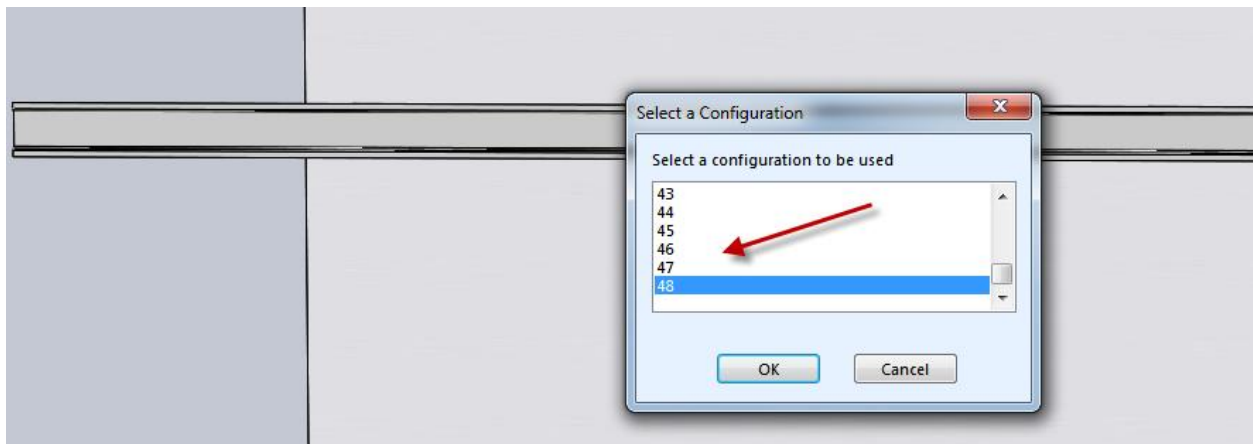
Since the initial items will usually need to be placed onto the back panel of the control cabinet, a good approach for this is to hide the Control Cabinet Door. Right click on the door and select the "hide" icon:



3.3 Adding Din Rails, Panduit and other components to the back panel:

Most components that are typically attached to the back panel will mate properly when dropped to the back panel. In the case of Din Rails, and Panduit there are two versions of each of these types of components, Vertical and Horizontal. Except for how the Mate References are defined, these two families components are identical with each other. The BOM is not affected but time is saved when Din Rails and Panduit automatically mated vertical or horizontal.

When the rails are "hovered" over a back plate, it will snap onto the surface and a dialogue box will allow for the length to be selected. Per standard Solidworks operations, the lengths of the Din Rails can be modified later through the Properties of the components.



After the Din Rail is located, standard mates and dimensions can be used to determine the X, Y position of the rail.

A large percentage of components will automatically snap to the Din Rail. These features are very efficient as a number of parts can be easily added to the design.

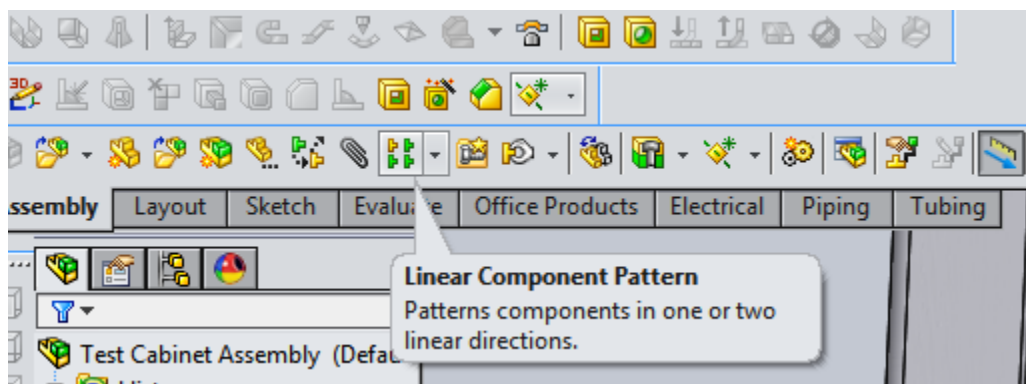
Note: Components usually snap to Din Rails every nicely. However, sometimes the angle of selection confuses Solidworks, which prevents some placements to fail. These problems can usually be remedied by zooming in and possibly rotating the view slightly.

Once a number of components are "attached" to a Rail, they can be mated to each other to prevent the components from "sliding" down the rail.

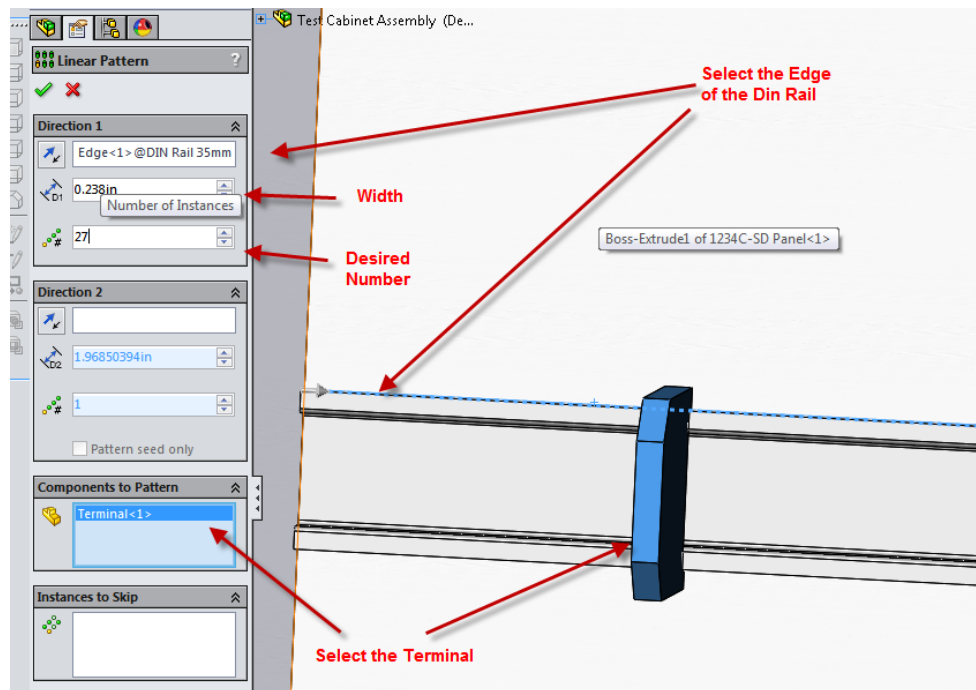
3.4 Adding Terminals:

Generally, adding terminals is similar to adding any other Din Rail component. However, in cases, such as terminals where there may be large numbers, it is recommended to use the Linear Component Pattern Command.

Note: It is recommended to first measure the width of the terminal before entering the Linear Component Pattern command.



The terminals will be nicely stacked together and the proper number of terminals will be displayed in the BOM of the assembly drawing of the Control Cabinet assembly.



3.5 Adding Components to "holes" in Door and Cabinet surfaces:

Operator components, such as lights, selector switches and push buttons are mounted through holes in the door of control cabinets. To expedite the placement of holes, 22.5 mm Library Features are included in the library (found in the Allen Bradley directory of the Design Library).

Once the appropriate holes are placed, the lights, selector switches and push buttons will snap into position when hovered over a target hole.

Note: Before a Door will accept Library Feature holes, the Door must first be in Edit Mode.

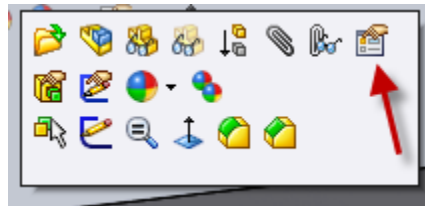
Three types of Library Feature holes are provided. A "Primary" hole should usually be placed first because the "Down" and the "Right" holes require a reference hole before placement. Using the Primary, Down and Right holes additional holes can be repeated or the Linear Component Pattern can be used. Any combination of standard SW approaches can be used until all of the required holes have been placed.

When the Primary hole has been placed, its final position can be easily modified by editing the sketch of the hole.

After the operators have been installed, the appropriate legends should be added.

Note: Apparently Solidworks does not accommodate the ability to propagate Mate References with Library Features. Therefore, after lights, buttons etc. are "mounted" to doors, a Parallel Mate should be added an appropriate edge of the door to prevent rotation.

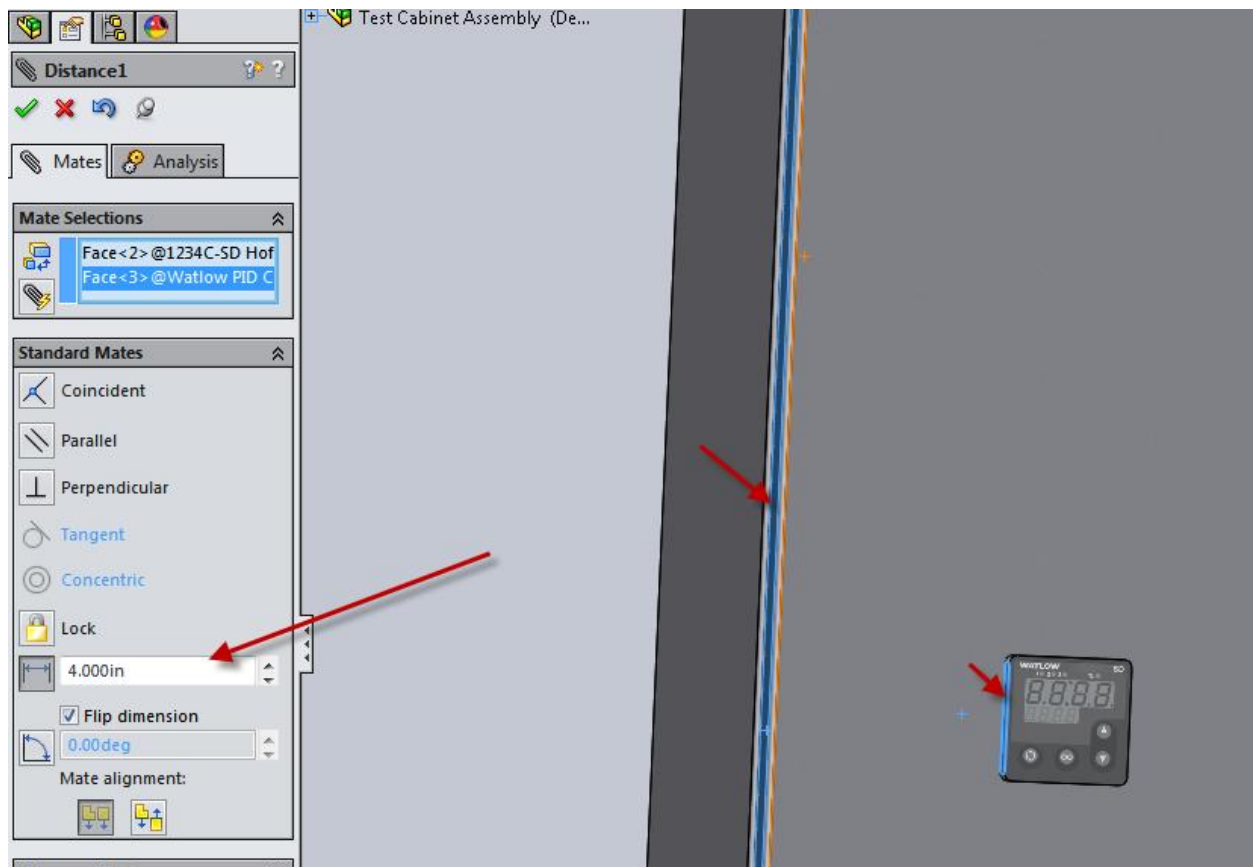
Note: If different configurations for lights and buttons, etc. are required, one approach is to press escape after each component has been placed. An alternative is to place all of the similar components first, (such as an extended black push button) and then to select the appropriate configuration through the properties of the component (right click on component and select the property icon):



3.6 Adding Components (Instrumentation) to flat surfaces of Door and Cabinet:

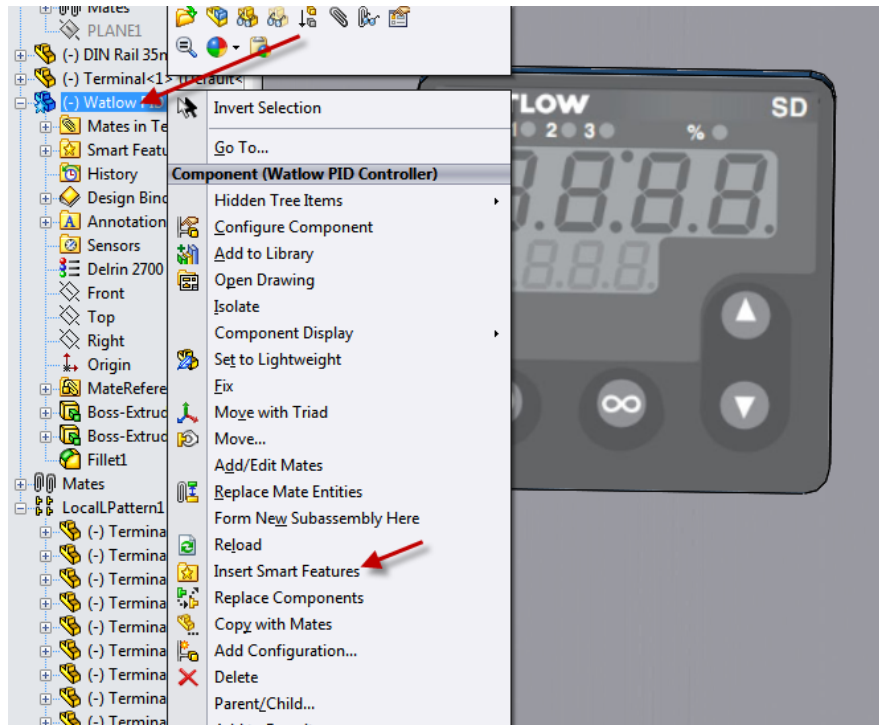
A number of components will be mounted to the face of the Door or to other surfaces of the Control Cabinet. An example of this is a PID Controller (found under Instrumentations).

With the Door visible, (but not in edit mode) most of the door mounted components will automatically snap to the surface of the door through the use of Mate References. Once "attached" additional constraints can be placed to restrain the components with the can be positioned by adding/ editing offset mates:

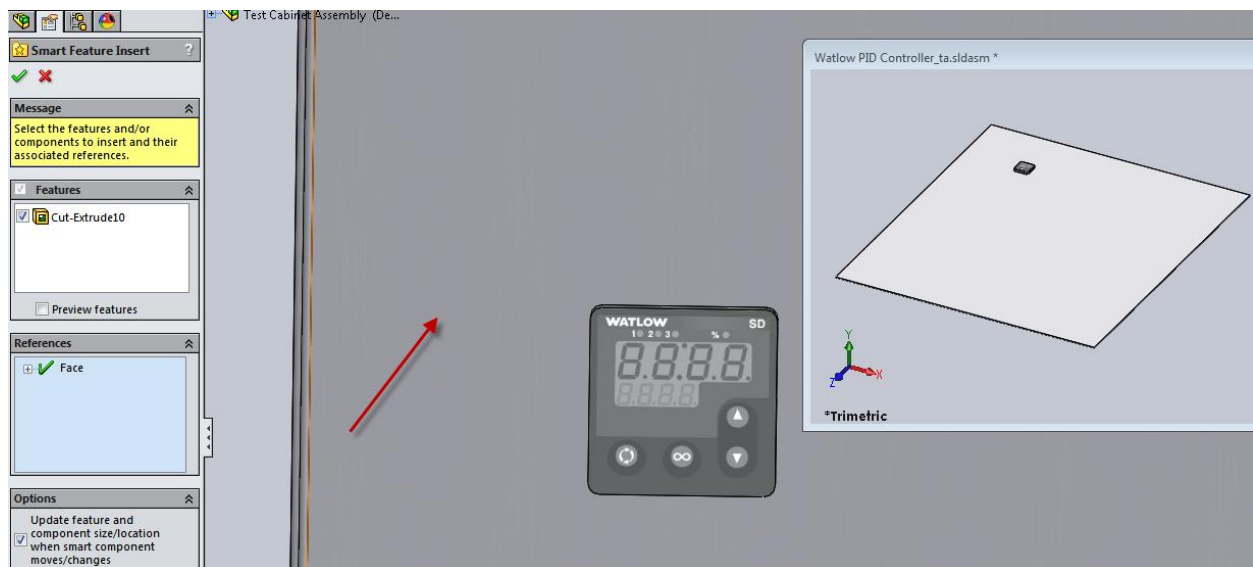


Once a component has been positioned, the cutout can be easily added through the use of Smart Features.

To add Smart Features, right click on the component and selecting <Insert Smart Features>



When the smart feature is started, a dialogue box will be displayed with an example of what needs to be selected to place the Smart Feature. In most cases the selection should be the front surface of the door.



The result of a successful operation will be the "smart" feature that was embed into the component.

3.7 Operator Legends, General Legends, and ID Tags:

There are a number of types of Legends. Text can be changed as required, by editing the appropriate columns in their design tables.

One major category of legends is for lights, buttons etc. Since these legends are associated with components that mount in 22.5 mm holes, they can be found under the Allen Bradley Directory in the Design Library. There are two styles of 22.5 mm legends.

These legends will "snap" into position when hovered over an appropriate light, or button.

A second type of legend is for general purpose. These Legends can be found under the Misc. directory in the Design Library. Once these Legends have been attached to the Door, additional offset mates may be necessary to accurately fix the legend into their final positions.

A third category is ID Tags. The intent of ID Tags is to identify components inside of the Control Cabinets. These tags assist in identifying which electrical components, such as relays, match what is illustrated on the electrical schematics. ID Tags will snap onto the surface of back panels. And similar to Legends, the texts can be changed through editing Design Tables.

3.8 Auxiliary components:

Auxiliary components in the MSI Control Library are components that are installed into other library components. Examples are a fuse that is placed into a fuse holder or a memory module that is inserted into a PLC.

The primary characteristic of Auxiliary components is that they don't require any additional physical space in the Control Cabinet, but it is important to include them into the BOM.

For simplicity, since the physical size and shape of auxiliary components is not important, auxiliary components in the MSI Control Library are usually small cylinder shapes which can be easily "inserted" into their intended components.

To assist with adding these components to designs, Mate References have been added, with matching Mate References in the receiving components. (Appendix D summarizes the Mate References used within the MSI Control Library).

Section 4, Expanding the Controls Library:

The MSI Controls library is not inclusive but is intended to be a foundation for expanding personal or company libraries.

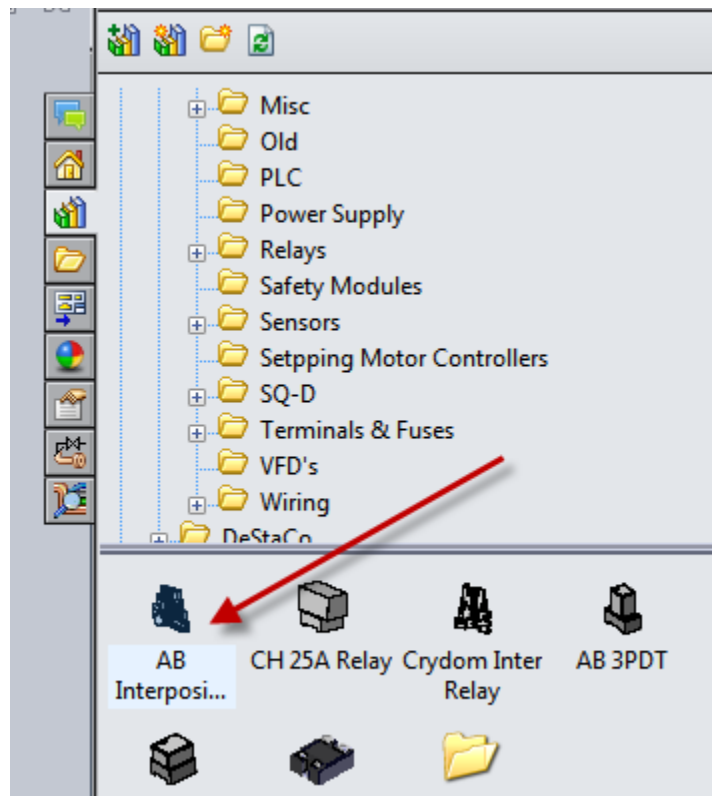
There are two basic methods for adding new components to libraries. First, is to add a new configuration to an existing component.

Second is to develop a new component. New Components can either be developed from scratch, but time can usually be saved by copying an appropriate existing component and then making the required changes.

4.1 Adding Configurations:

The process to develop new components by adding configurations is described below:

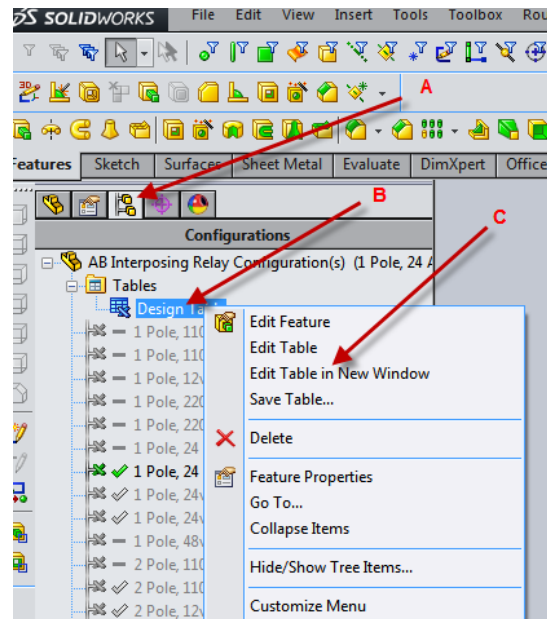
Step 1: Open the appropriate component file by double clicking on the icon in the Design Library:



Step 2: Select the Configuration Tab, (A) below:

Step 3: Right click on the Design Table, (B below):

Step 4: Select the "Edit Table in New Window", (C below):



Step 5: Select <Ok> when the Customization Dialogue Box appears.

Step 6: Use standard Excel editing practices when the spread sheet appears:

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D
1	Design Table for: AB Interposing Relay			
2		\$PRP@Description		
3	1 Pole, 12vdc	Relay, #700-HLT11Z12, Allen Bradley	0.275	
4	1 Pole, 24vdc	Relay, #700-HLT11Z24, Allen Bradley	0.275	
5	1 Pole, 48vdc	Relay, #700-HLT11Z48, Allen Bradley	0.275	
6	1 Pole, 24 AC-DC	Relay, #700-HLT11U24, Allen Bradley	0.275	
7	1 Pole, 110-125v AC-DC	Relay, #700-HLT11U1, Allen Bradley	0.275	
8	1 Pole, 220-240v AC-DC	Relay, #700-HLT11U2, Allen Bradley	0.275	
9	1 Pole, 24vdc, Gold Contact	Relay, #700-HLT11Z24X, Allen Bradley	0.275	
10	1 Pole, 24 AC-DC, Gold Contact	Relay, #700-HLT11U24X, Allen Bradley	0.275	

Red arrows point to the '1 Pole, 12vdc' cell in column A and the '\$PRP@Description' cell in column B.

Insert or add to the bottom of the table. (Note: if a blank line is inserted into the table, all of the components below the empty line will be removed from the "active" or available configurations. If the blank line is removed, the in-active configurations will be added into the configuration table.)

Step 7: Edit Column A with an appropriate description that will be descriptive enough for selecting the specific configuration. See example shown above.

When a component is placed into an assembly, a dialogue box will display the available components.

(Note: Care needs to be taken when describing individual part numbers. As an example, for a relay, the description could be something like, 24 VDC coil, 120VAC coil etc.)

Step 8: Edit the \$PRP@Description as needed. This information will be displayed in the BOM line information.

Step 9: Make any other appropriate changes, (Column C as an example) before closing the spreadsheet and saving the part file.

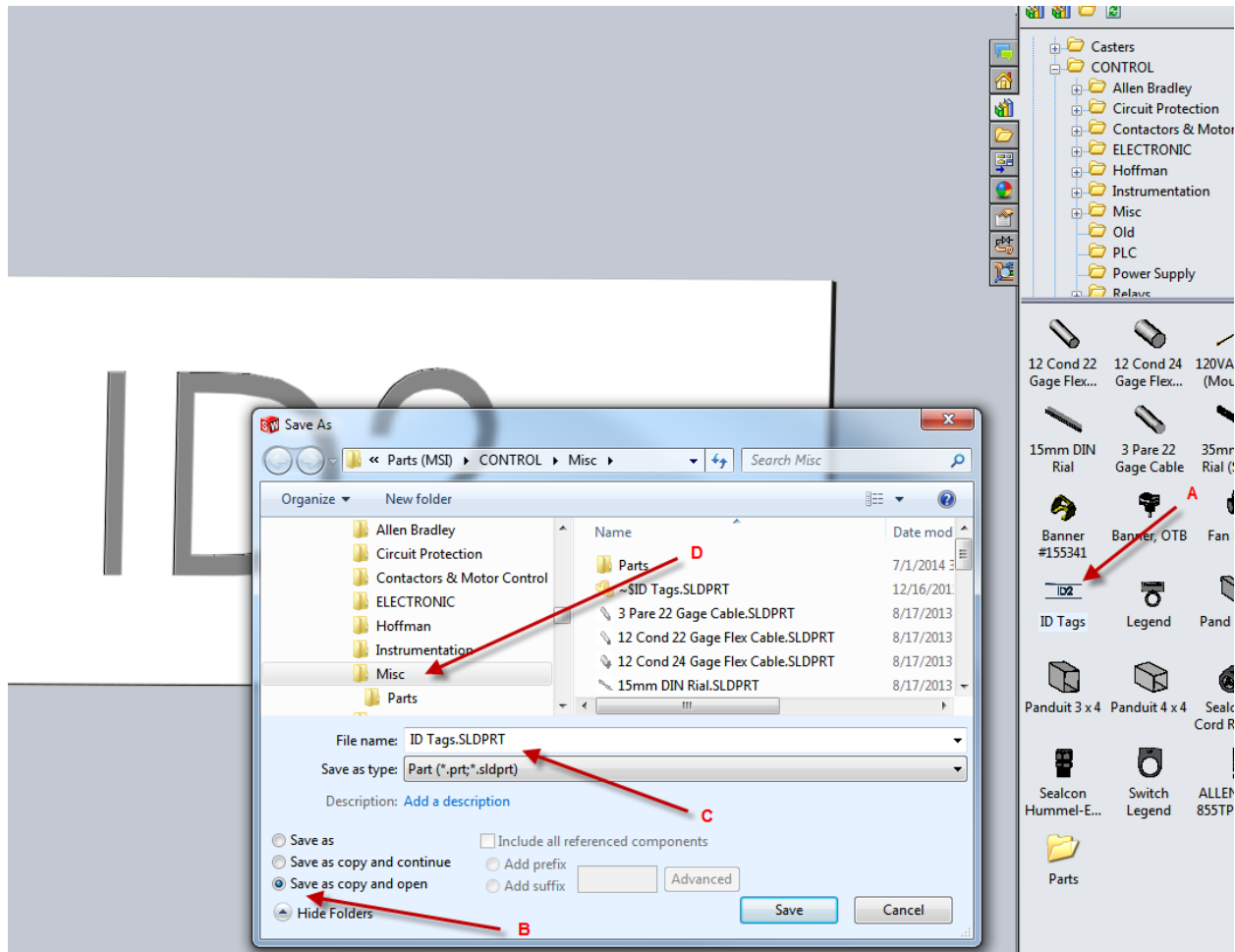
The new part can be tested by dragging and dropping the part into an assembly model. When the selection dialogue box is displayed, the new part number should appear on the list.

4.2 Creating new components:

Of course new parts can be developed from scratch but it is typically easier to start with an existing part file. Standard Solidworks procedures can be used to create new components from existing parts:

Step 1: Select an existing component that has similar features as the new part. If the beginning component is in the Design Library it can be opened by double clicking on the component icon.

Step 2: Save the file under the new target file name using "Save as Copy and Open" (B). Enter an appropriate name for the new part (C). Locate and select the appropriate directory (D). Select <Save>.



Step 3: Edit the new part as required, including part features and dimensions.

Step 4: Edit/ update the Design Table as necessary. Refer to section 4.1 for details.

Step 5: Save the changes to the new part file.

Again the new part can be tested by dragging and dropping the part into an assembly model. Verify that all configurations update correctly without any errors.

Section 5, Summary:

The library components selected for the MSI Controls Library are typical components that have used within a number of controls project. Your company may have used different brands and models of components, but in many cases only minor changes will need to be made (refer to section 4).

Additional MSI extended libraries may be developed in the future. Check back periodically for new library modules at: http://www.msioregon.com/SW_Products.html

If needed, please contact MSI for custom component development, availability, and pricing. Please contact MSI if any errors are discovered. MSI can be contacted at: MSI@MSIOregon.com

5.1 Step by Step summary, using the MSI Control Library:

Before a new control panel design is started it is recommended that the electrical schematic/s be completed. By systematically working through the schematic drawings, each electrical component can be easily accounted for.

Step 1: Create a new project directory and save a new assembly file with the appropriate description.

Step 2: Following the instructions of Section 3.2, Pack and Go the Control Cabinet assembly. Add the Consumable legends and ID tags as needed (Section 3.1).

Step 3: With the new Control Cabinet inserted into the appropriate assembly drawing, click on and hide the front door of the Control Cabinet. The back Panel should be visible. It is usually best to start by placing main disconnect components. Any other equipment that is not Din Rail mounted should be added to the back panel. The components do not need to be precisely placed at this time. The Din Rails (Section 3.3) and the appropriate components should then be added to the Din Rails(Section 3.4).

Step 4: When all of the components are "mounted" to the back panel, the Panduit may be added and all of the components arranged as necessary. Components can be constrained into position or "fixed".

Important: The size of the panel should be evaluated. To change the size of the Control Cabinet and the Back Panel, select the appropriate size through the "properties" icon of the Control Cabinet Assembly.

Step 5: With all of the components located onto the back panel, the next step is to add the components to the door and to the outside of the Cabinet.

Step 6: Following the instructions in Section 3.5 add the holes for the lights and buttons. Place the lights and operators into the appropriate holes, along with the Operator Legends.

Step 7: Per Section 3.6 place all instrumentation onto the door. Also place any fans and louvers to the outside of the Control Cabinet (Section 3.9).

Step 8: Add all custom Legends and ID tags (Section 3.7).

Step 9: Add all Auxiliary components per Section 3.8.

Step 10: When all work has been checked for accuracy, a drawing can be developed per standard Solidworks practices. Section 6 discusses features concerning the Bill of Material (BOM).

5.2 Common errors and solutions:

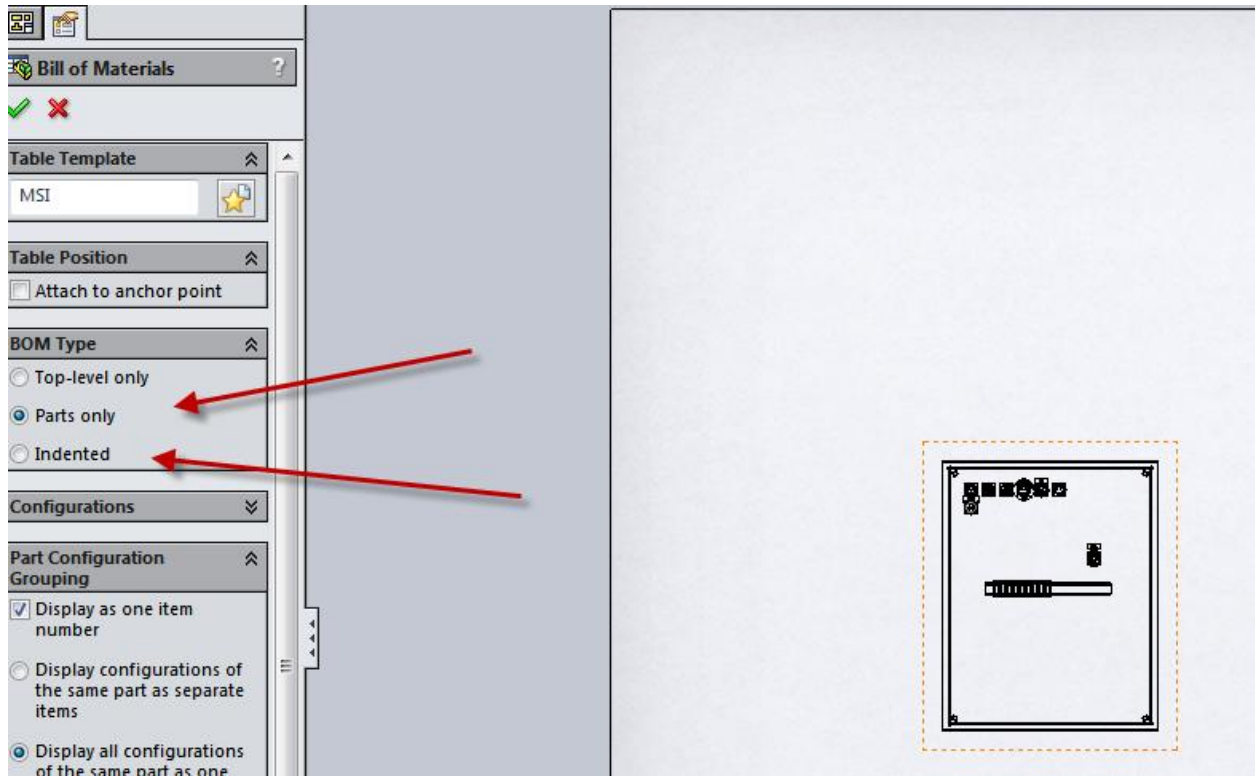
There are a few Solidworks errors that are worth mentioning.

1. **Mate References appears not to work:** When dragging and dropping Library components into positions, sometimes it appears that the Mate References are not functioning properly. This "apparent" problem is probably the result of Solidworks not being able to find the appropriate reference surfaces. The solution for these errors is to zoom in or slightly change the view angle.
2. **Placement of Components appears to fail:** When dragging and dropping Library components, there are times when the correct placement selection is made but the position of the component do not appear to be correct. The solution for these errors is to continue to make new selection or to exit the command. Most of the time, when the drag and drop command is exited the components will snap into the correct position.
3. **Deleting components:** If library components that are sub-assemblies (such as Allen Bradley switch assemblies) need to be deleted, care must to be made to select the entire component assembly. If the target components are selected from the model, only part of the sub-assembly will be deleted. The more positive approach is to select the component from the Design Tree. If only some of the components are deleted, the sub-assembly may be corrupted. If component corruption occurs, it is usually best to re-unzip and install the appropriate component/s.

Section 6, Setting up BOM's:

Developing drawings, with appropriate views, balloons and notes are accomplished with standard Solidworks procedures. BOM Templates can also be saved per standard procedures.

Top Only: An important topic is the "BOM Type". When using the MSI Controls Library, it is not recommended to select <Top-Level only>. This is because many of the components in the library are assemblies which will not reveal the individual components.



Parts Only: If "Parts only" is selected, the results will be as shown below. The advantage of this BOM type is that all of the components, regardless of the sub-assemblies will be tallied. An example of this is item #5 below, NC contacts. In this control panel example, a number of operator interface devices use these contacts. This BOM type sorts through all of the parts and provides an accurate total of each component for purchasing.

ITEM NO.	DESCRIPTION	Drawing	QTY.
1	Panel, #C-SD302410 LG, Hoffman		1
2	Panel, #CD3024, Hoffman	Dwg	1
3	Toggle Sw, "800FM-KR35, AB		2
4	Metal Ring, #800F-ALM, Allen Bradley		8
5	NC Contact, #800F-X01, AB		7
6	NO Contact Block, #800F-X10, Allen Bradley		7
7	Green Lens, "800FM-P3, AB		1
8	Yellow LED Block, #800F-N3Y, Allen Bradley		1
9	35mm DIN Rail x 14 In Long		1
10	Terminal, #115 116.07, Entrelec		27
11	Key #800F-AKR455		2
12	Flush Pilot Light, #800FM-LF6, AB		1
13	Red LED Block, #800F-N5R, Allen Bradley		3
14	Illum. Mushroom, "800FM-LMT44, AB		1
15	Legend Spacer		3
16	Mushroom Push Pull, #800FM-MM44, AB		1
17	800F-15YSE 112		1
18	Illum. Mushroom, "800FM-LMP44E3, AB		1
19	1.75 In W x 0.75 In H, Legend, E-Stop / Push OFF / Pull ON		1
20	Multi Fun PB, #800FM-U2EFFE, AB		1
21	1.5 In W x 0.625 In H, Legend, Main / Power		1
22	1.5 In W x 0.625 In H, Legend, E-Stop / Pull To Reset		1

Note: There is a potential drawing that is associated with the Hoffman Control Cabinet. Because this is a "consumable" component where various holes and cut outs will be needed, a drawing can be developed for fabrications purposes. No other items in the MSI Controls Library include the Drawing Custom Property because they are all purchased components.

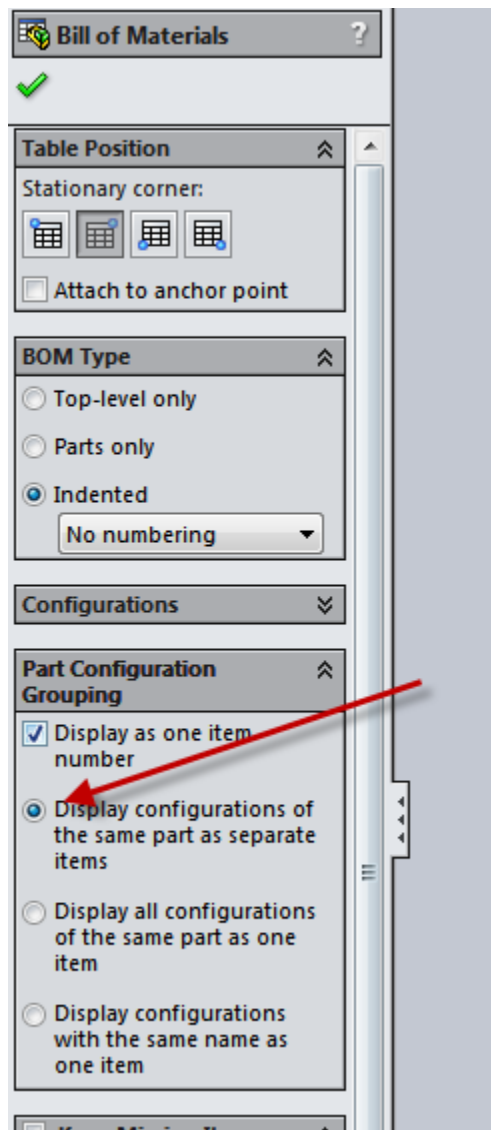
Indented: The third choice of BOM type is <Indented> (example shown below).

The Indented Bom type only places item numbers for every sub-assembly. Item #1 shows that the Control Cabinet is comprised of two Hoffman components, the Cabinet and the Back Panel.

Item #2 is an example of an Allen Bradley switch assembly which is comprised of 4 sub components. If the sub-assemblies, such as switches are to be purchased as a pre-assembled custom unit, the Indented BOM type is probably the best choice. However, if the components are purchased un-assembled, a better choice may be the <Parts only> BOM type where the total number of individual components are presented.

	A	B	C	D
1	ITEM NO.	DESCRIPTION	Drawing	QTY.
2	1	30x24x10 Cabinet		1
3		Panel, #C-SD302410 LG, Hoffman		1
4		Panel, #CD3024, Hoffman	Dwg	1
5	2	Key 3 Pos Switch Assembly		1
6		Toggle Sw, "800FM-KR35, AB		1
7		Metal Ring, #800F-ALM, Allen Bradley		1
8		NC Contact, #800F-X01, AB		1
9		NO Contact Block, #800F-X10, Allen Bradley		1
10	3	Key 3 Pos Switch Assembly		1
11		Toggle Sw, "800FM-KR35, AB		1
12		Metal Ring, #800F-ALM, Allen Bradley		1
13		NC Contact, #800F-X01, AB		1
14		NO Contact Block, #800F-X10, Allen Bradley		1
15	4	24V Green LED		1
16		Green Lens, "800FM-P3, AB		1
17		Metal Ring, #800F-ALM, Allen Bradley		1
18		Red LED Block, #800F-N3R, Allen Bradley		1

Configuration items in BOM: Several items in the MSI Control Library are multi-configuration assemblies that are comprised of various combinations of components. To display items properly in the BOM, the <Display configurations of the same part as separate items> selection should be made. This selection should be verified to be selected for both the <Parts only> and the <Indented> BOM Types.



Note: BOM's should always be checked for accuracy.

Section 7, Summary:

The MSI Control Library is certainly not all inclusive. However, the components that are included are the results of what has been typically used for a number of Control Cabinet Design projects. The components provided should be sufficient for most small to medium Control Panel Designs.

A fair amount of effort has been expended to increase to effectiveness of the MSI Control Library. While only "standard" Solidworks commands are required, the more experience there is with the Library, the greater the efficiency has been.

Please contact MSI if you have any suggestions or requests: MSI@MSIOregon.com

Section 8, Appendices:

Appendix A, MSI Library Rules:

1. Whenever reasonable part files should include multiple configurations of parts.
2. Design Tables should be used and a "Description" column for automatically filling in Bill of Material tables (\$PRP@Description).
3. The Custom Description Property is useful to identify if a part file is a single part or if it includes a number of configurations.
4. PDF's with catalog and or critical design information should be noted or linked in the Design Journal.
5. To allow for efficient use of library parts, the number of components per family should be kept in groups of about 20 components. Thus eliminating excessive scrolling. Where it is appropriate for assemblies to be in the library, all parts that are not usually individually used should be placed into a sub-folder under the "parent" folder. The number of parts in the "Parts" folder may be more than 20 since these individual parts are not commonly used.

Appendix B, End User License Agreement:

IMPORTANT INFORMATION – PLEASE READ CAREFULLY

The herein contained License Agreement ("License" or "EULA") shall be considered a legally binding agreement between You (as an individual or an entity, who then shall, within the constraints of this agreement, be referred to as "You" or "Your") and Manufacturing Systems Inc. for the use of the specified software application of MSI Routing Library And Manual, which may include related printed material, media and any other components and/or software modules, including but not limited to required drivers ("Product"). Other aspects of the Product may also include, but are not limited to, software updates and any upgrades necessary that Manufacturing Systems Inc. may supply to You or make available to You, or that You could obtain after the initial copy of the Product, and as such that said items are not accompanied by a separate license agreement or terms of use.

BY WAY OF THE INSTALLATION, COPYING, DOWNLOADING, ACCESSING OR OTHERWISE USE OF THIS PRODUCT, YOU ARE AGREEING TO BE LEGALLY BOUND BY THE HEREIN CONTAINED TERMS OF THIS LICENSE AGREEMENT. IF YOU DO NOT AGREE TO BE BOUND BY THE TERMS OF THIS EULA, YOU THEN HAVE NO RIGHTS TO THE PRODUCT AND SHOULD THEREFORE NOT INSTALL, COPY, DOWNLOAD, ACCESS NOR USE THE PRODUCT.

This Product is hereby protected by copyright laws, as well as any other intellectual property laws. This Product is licensed and not sold.

LICENSE GRANT

Manufacturing Systems Inc. shall grant to you a non-exclusive license for the use and installation of the Product subject to all the terms and conditions set forth herein. Furthermore, this EULA shall also govern any and all software upgrades provided by Manufacturing Systems Inc. that would replace, over write and/or supplement the original installed version of the Product, unless those other upgrades are covered under a separate license, at which those terms of that license will govern.

TERMINATION

Should you breach this EULA at any time, your right to the use of the Product will then immediately terminate and shall terminate without any notice being given. However, all provisions of this EULA, with the exception of the License Grant , will remain in effect and thus shall survive termination. Upon termination of the License Grant, You MUST destroy any and all copies of the Product.

COPYRIGHT

The aforementioned Product is protected by copyright and other intellectual property laws and treaties, and as such all rights, title, and interest in and to the content offered, including but not limited to, any photographs, images, video animation, text, and music, that may be incorporated as part of the offered content. Such offered content is protected by copyright laws and international treaty provisions. Therefore, offered content must be treated as any other copyrighted material, with the exception that it is allowable for you to make copies as provided by the License. However, printed material, which may accompany any offered content, may not be copied.

RESTRICTIONS ON USE

As a Licensee, You may not:

- (a) Make use of the offered content on more than one computer at a time, without prior purchase of additional licenses;
- (b) You may not share, distribute, lend, lease, sublicense or otherwise make available, in any manner whatsoever, to any third party the offered content;
- (c) Modify, adapt, create derivative works from or translate any part of the offered content other than what may be used within Your work in accordance with this License;
- (d) Reverse engineer, decompile or disassemble the offered content, nor attempt to locate or obtain its source code;

- (e) Attempt to alter or remove any trademark, copyright or other proprietary notice contained within the offered content; or
- (f) Make use of any offered content in any manner not stipulated within this EULA or the documentation accompanying the offered content.

UPDATES

Manufacturing Systems Inc. may find the need from time to time to make available to all license holders updates for the offered content, in accordance with the herein contained terms and conditions of this EULA. It shall be at the sole discretion of Manufacturing Systems Inc. to make conditional releases of said upgrade to you upon your acceptance of another EULA or execution of another separate agreement. Should you elect to install and make use of these updates, you are therefore agreeing to be subject to all applicable license, terms and conditions of this EULA and/or any other agreement.

DISCLAIMER OF WARRANTY

With regard and with relationship to the maximum extent permitted by applicable law, Manufacturing Systems Inc., and, if applicable, related suppliers, shall provide the Product and any support services, if needed, related to the Product, and hereunto disclaim all warranties and conditions, either express, implied or statutory, which may include, but are not limited to, any implied warranties or conditions of merchantability, of suitability for a specified purpose, that it contains absolute accuracy or completeness of responses, of results, and of any lack of negligence or lack of workmanlike effort, all with respect to the Product, and the provision of or failure to provide Support Services. FURTHERMORE, THERE IS NO WARRANTY OR CONDITION OF TITLE, QUIET ENJOYMENT, QUIET POSSESSION, OR NON-INFRINGEMENT WITH REGARDS TO THE HEREIN CONTAINED PRODUCT. THE ENTIRE RISK AS TO THE QUALITY OF OR PERFORMANCE OF THE PRODUCT AND SUPPORT SERVICES, IF ANY, REST WITH YOU.

LIMITATION OF LIABILITY AND REMEDIES

In spite of any damages that you may or may not incur for any reason, which may include, but are not limited to, any and all direct or general damages, the entire liability of Manufacturing Systems Inc. and/or any of the aforementioned suppliers covered under the herein contained provisions of this EULA, along with Your exclusive remedy with regards to all of the foregoing, shall hereby be limited to the amount actually paid by you for this Product . Therefore, the aforementioned limitations, exclusions and any disclaimers shall apply to the maximum extent allowable by law, even should any proposed remedy fail its essential purpose.

EXPORT CONTROLS

By clicking on the install button, you hereby agree that you will comply with any and all applicable export laws, restrictions and all regulations of the U.S. Department of Commerce, U.S. Department of Treasury, and any other U.S. or foreign agency or authority with regards to this provision of the EULA. You expressly agree not to export or re-export, nor allow the export or re-export of the offered content in violation of any such law, restriction or regulation, including without limitation, export or re-export to any country subject to any and all applicable U.S. trade embargoes or to any prohibited destination, in any group specified in the current "Supplement No. 1 to Part 740 or the

Commerce Control List specified in the then current Supplement No. 1 to Part 738 of the U.S. Export Administration Regulations (or any successor supplement or regulations)."

U.S. GOVERNMENT END USERS

The offered content is licensed by the U.S. Government with RESTRICTED RIGHTS. The use, duplication of, or the disclosure by the U.S. Government, shall be subject to restrictions in accordance with DFARS 252.227-7013 of the Technical Data and Computer Software clause, and 48 DCR 52.227-19 of the Commercial Computer Software clause, as applicable.

MISCELLANEOUS

This EULA, in its entirety, shall be legally binding upon and inure to the benefit of Manufacturing Systems Inc. and you, our respective successors and permitted assigns. Should any of this provision be deemed invalid or unenforceable, such determination will not affect the validity or enforceability of any other provision contained herein. If there is any waiver of any breach or failure to enforce any of the provisions contained herein, it shall not be deemed as a future waiver of said terms or a waiver of any other provision of this EULA. Any waiver, supplementation, modification or amendment to any provision of this EULA, shall only be effective when done so in writing and signed off by Manufacturing Systems Inc. and you. This EULA shall be governed solely by the laws of the State of Oregon and of the United States. Should any action arise out of or in relation to this EULA, such action may be brought exclusively in the appropriate federal or state court in Tigard, Oregon, and as such, you and Manufacturing Systems Inc. irrevocably consent to the jurisdiction of said court and venue for Tigard, Oregon.

Appendix C, Summary Description of Directories and Component files:

Allen Bradley- Approximately 30 types of 22.5 mm lights and push buttons.

Circuit Protection- ABB Main Disconnect Switches, actuators and Rods.

Contactors & Motor Control- Minarik DC drives, ABB Contactors, ABB Motor Drive, and other miscellaneous components.

Hoffman- Various Consoles, Push Button enclosures, and C-SD enclosures.

Instrumentation- Signal Conditioners, Watlow Controllers, Keyence Counter, and other misc controllers.

Misc.- Various ID Tags, Legends, Panduit, Din Rail, Cord Assemblies, Cord Restraints, and other misc. components.

PLC- AB 800 Series PLC' and related modules, Keyence KV series PLC's, Mitsubishi FX2n series PLC's, Siemens S7-1200 series PLC's and components and other related components.

Power Supply- 24 VDC, AB Surge Protector, GE Transformer, Islatrol module and other misc. components.

Relays- AB Interposing Relays, CH Relay, AB 3PDT relay with base, CH 2PDT relay with base, Crydom SSR

Safety Modules- A number of Banner Safety Relays.

Stepping Motor Controllers- Anaheim Automation Controllers, Drivers, and Transformer.

Terminals & Fuses- A number of Entrelect Fuse Holders, fuses, Din mounted CB's, a number of Entrelect terminals and related components.

VFD's- AB PowerFlex 523, 525, and 527, ABB ACS355, and Siemens G120C series.

Note: Not all configuration for every component/ series has been implemented.

Appendix D, MSI Simplified Component Files:

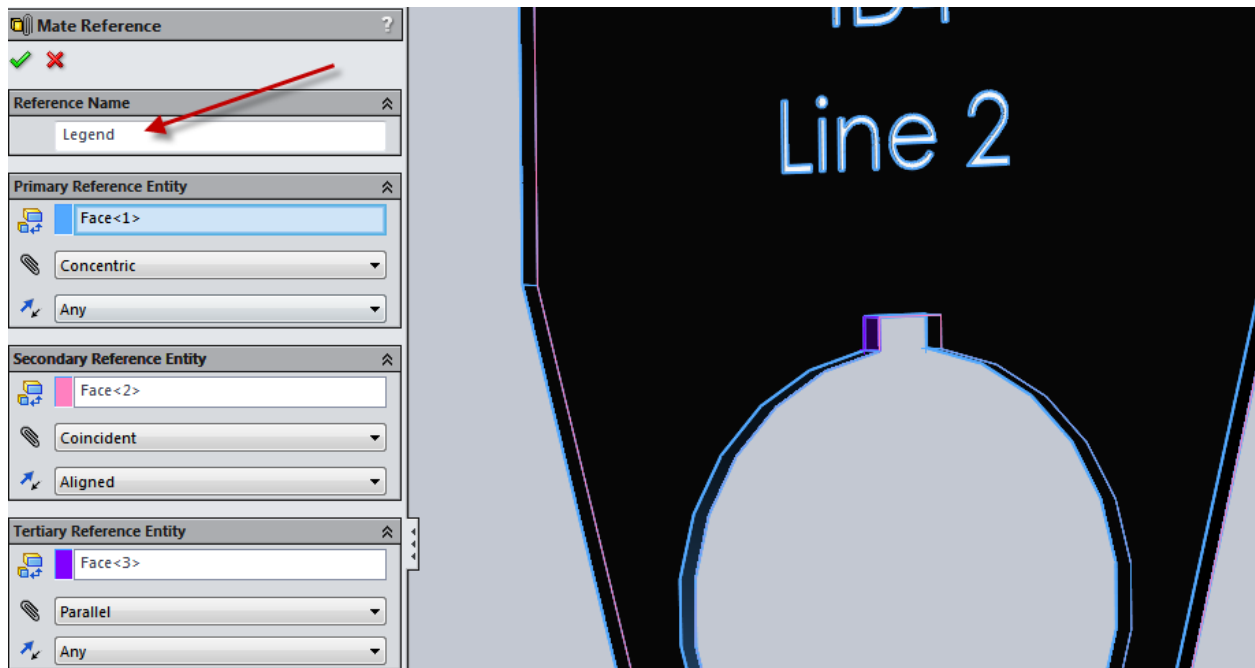
Unlike many mechanical components where many of the features may be important within designs, the mechanical aspects of Control components are considerably less. In many cases MSI Control Library components are functionally a block. The dimensions of the components are important, but what is more important are the descriptions that automatically populate the BOM's.

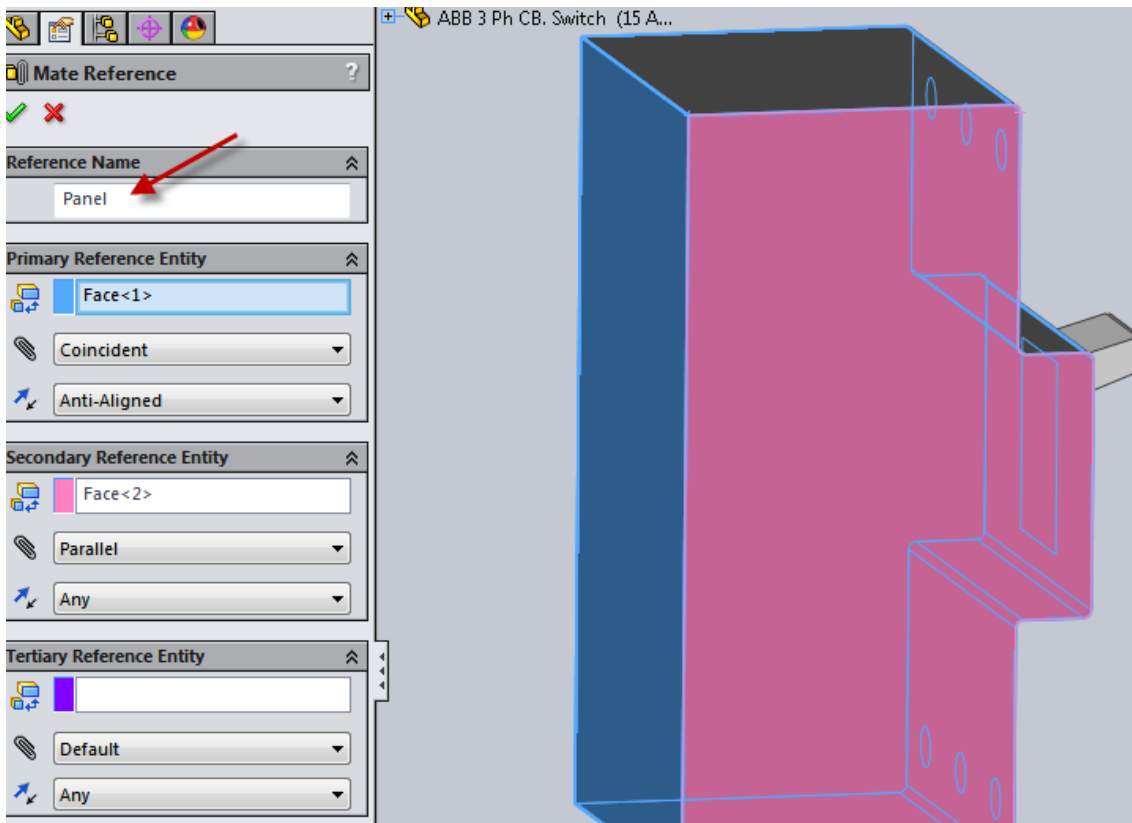
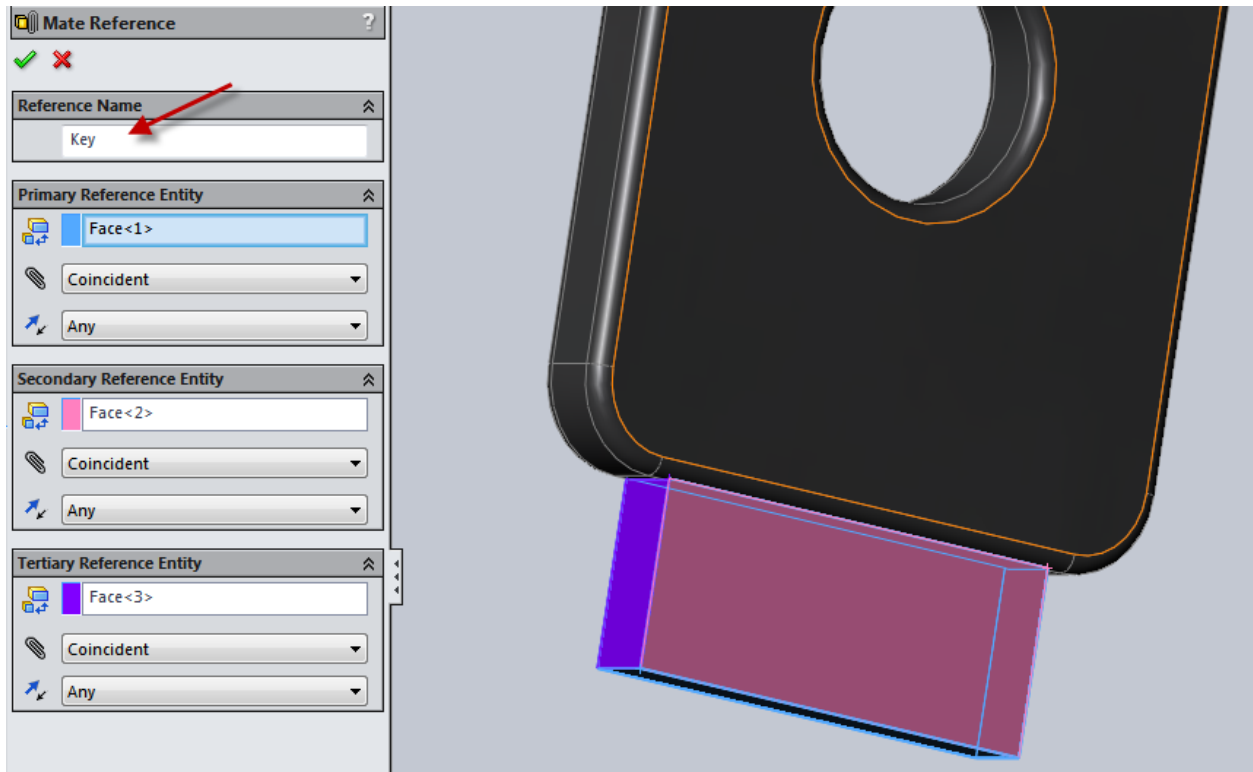
Note: A large percentage of MSI Control Library components have a decal. The purpose of the decal is to allow easy identification of the components. However, many of these decals have been captured from various web sources and it is important to understand that there is no guarantee of their accuracy.

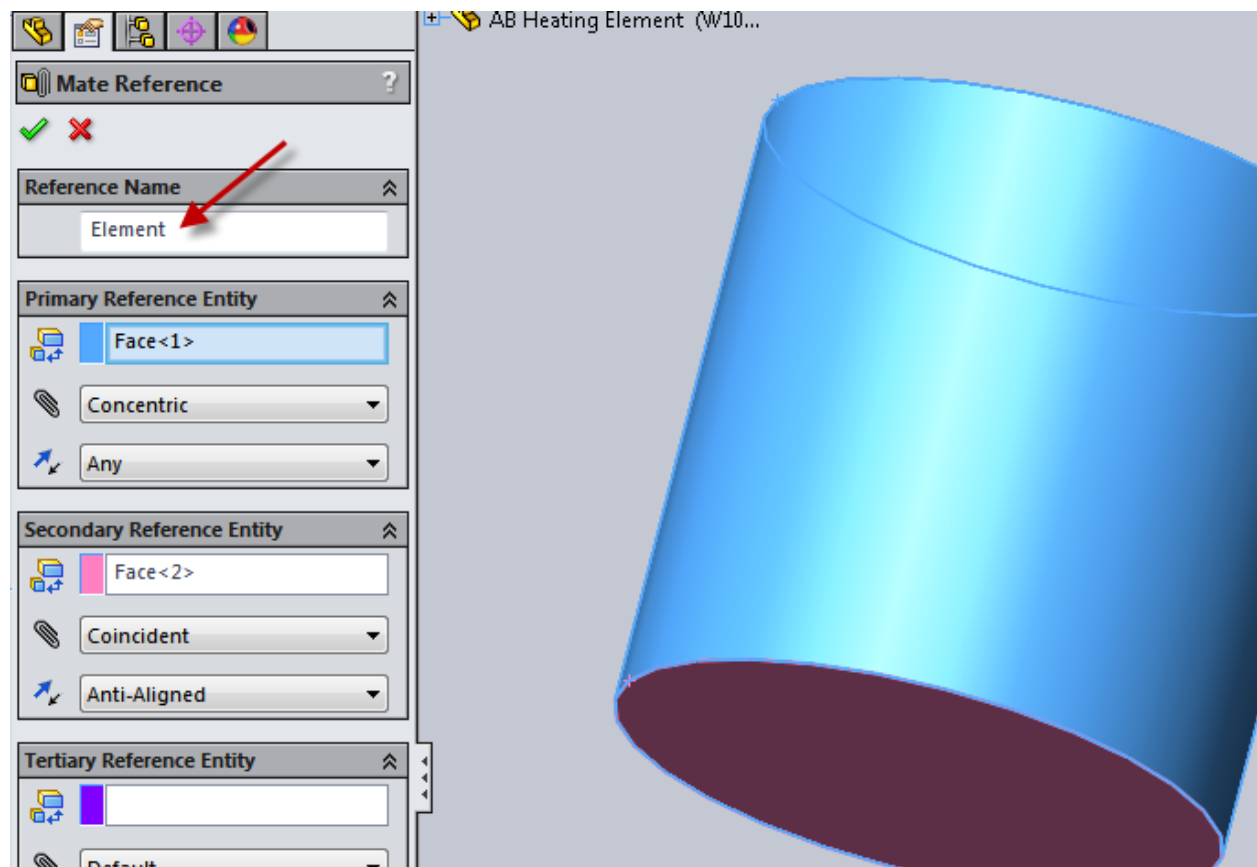
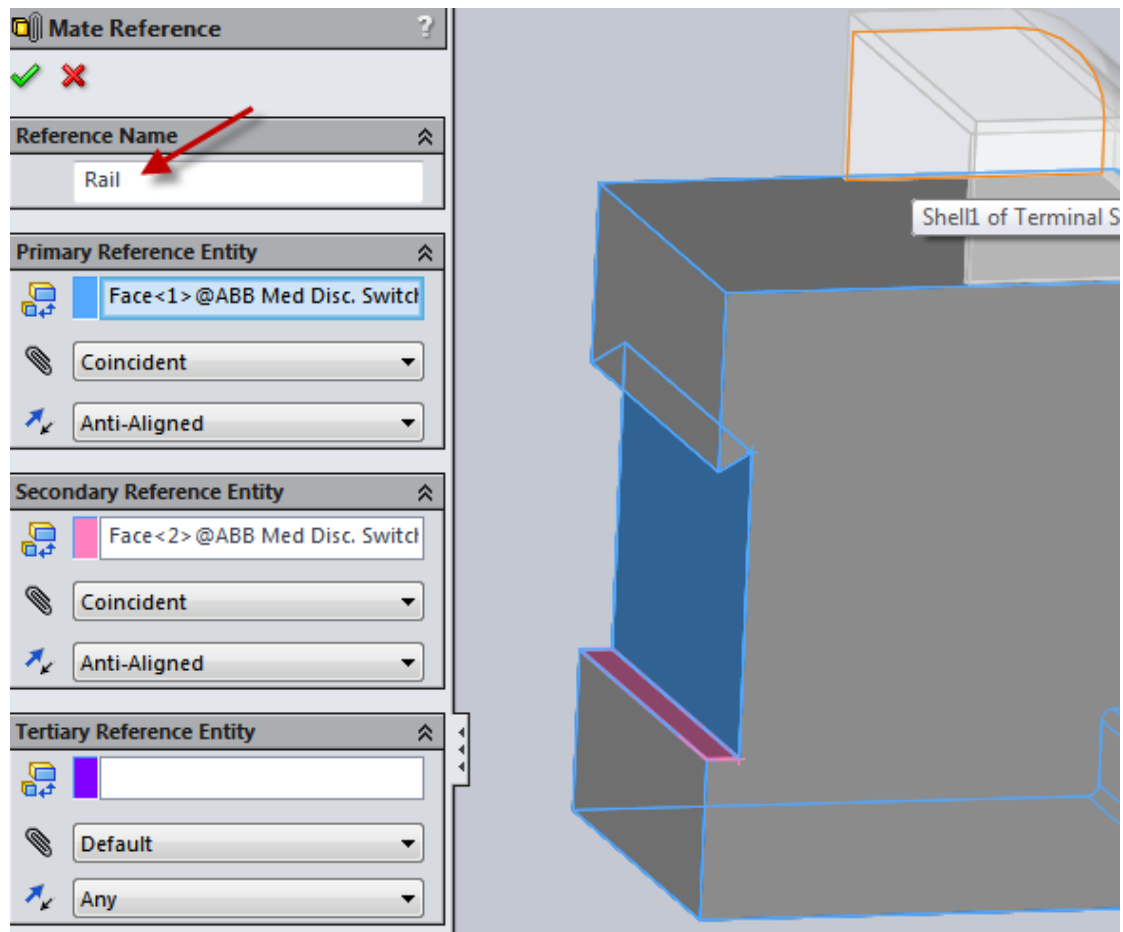
Appendix E, Summary of Mate Reference Definitions:

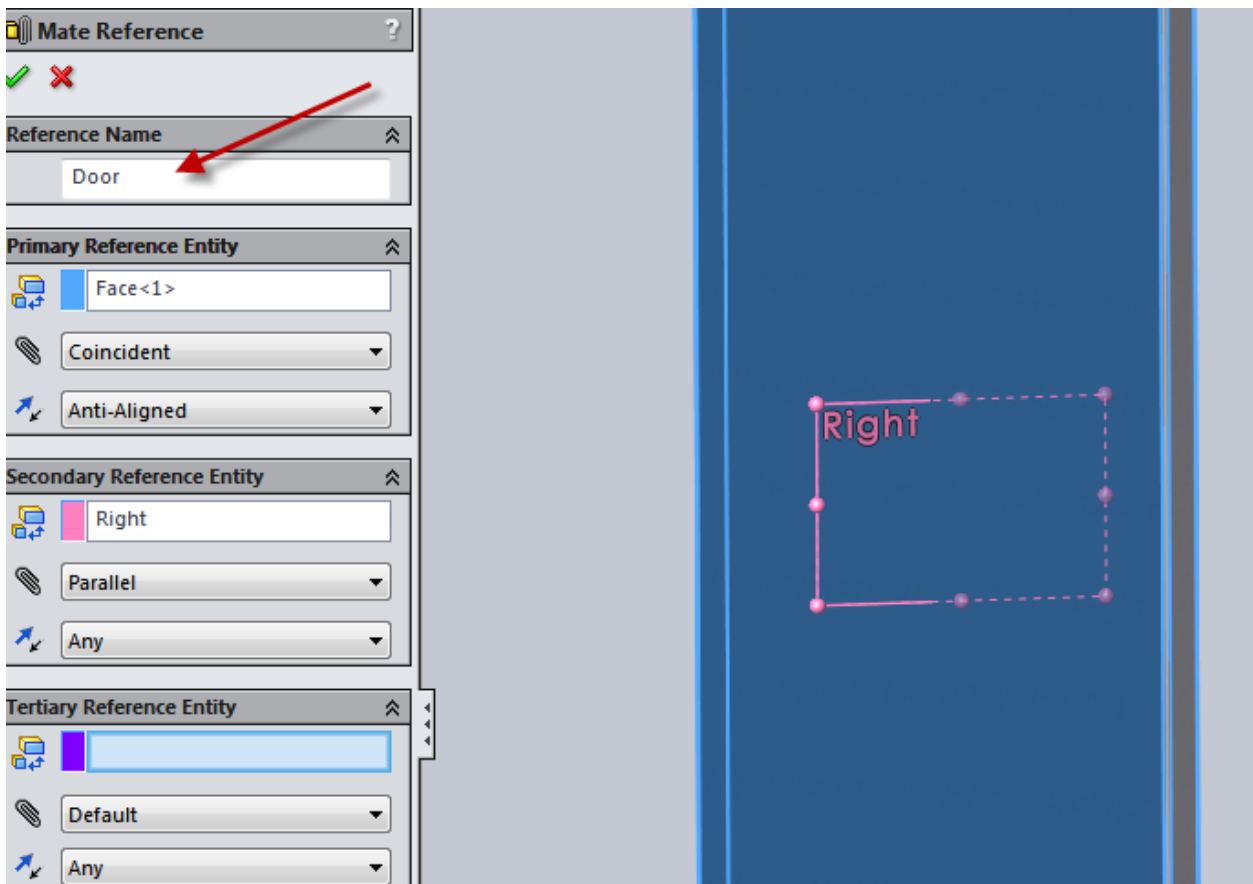
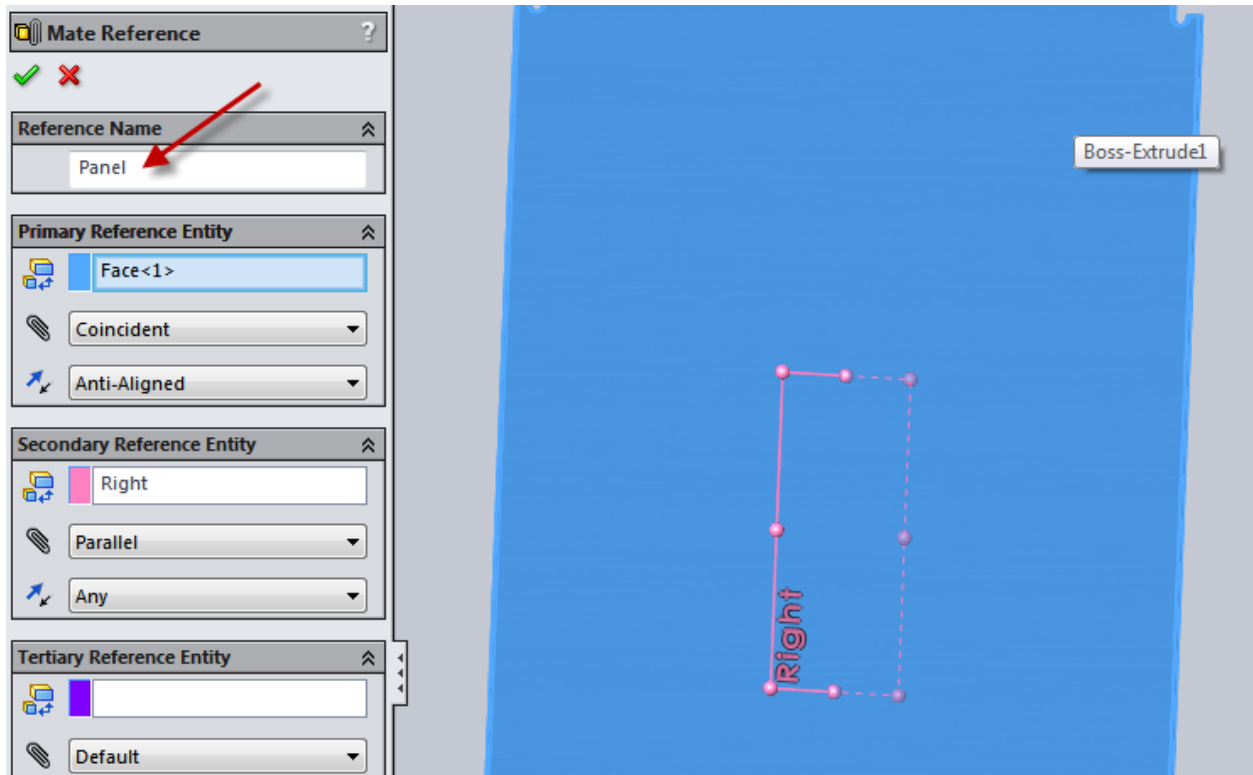
In the event that new components are added, below are the "standard" Mate Reference definitions:

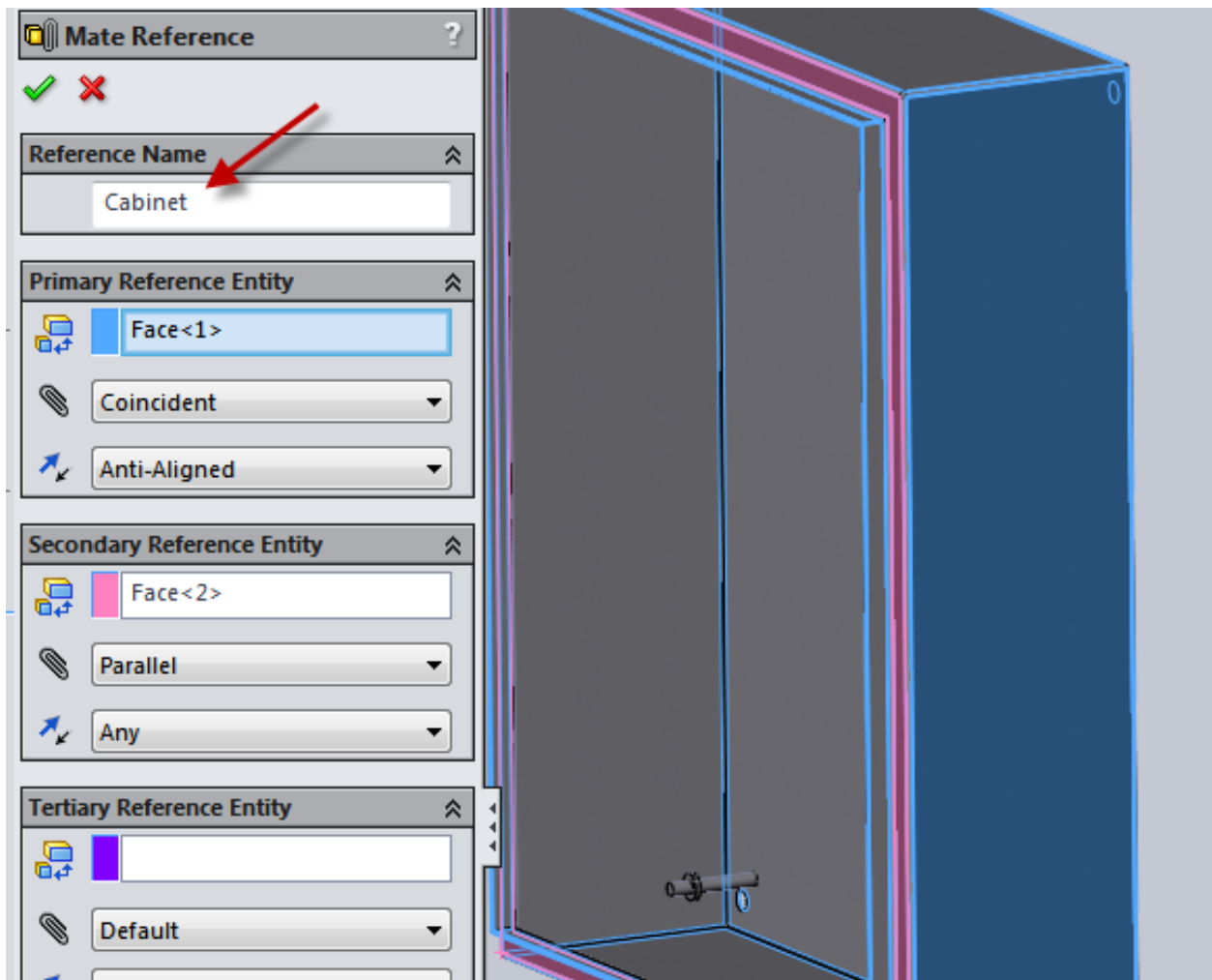
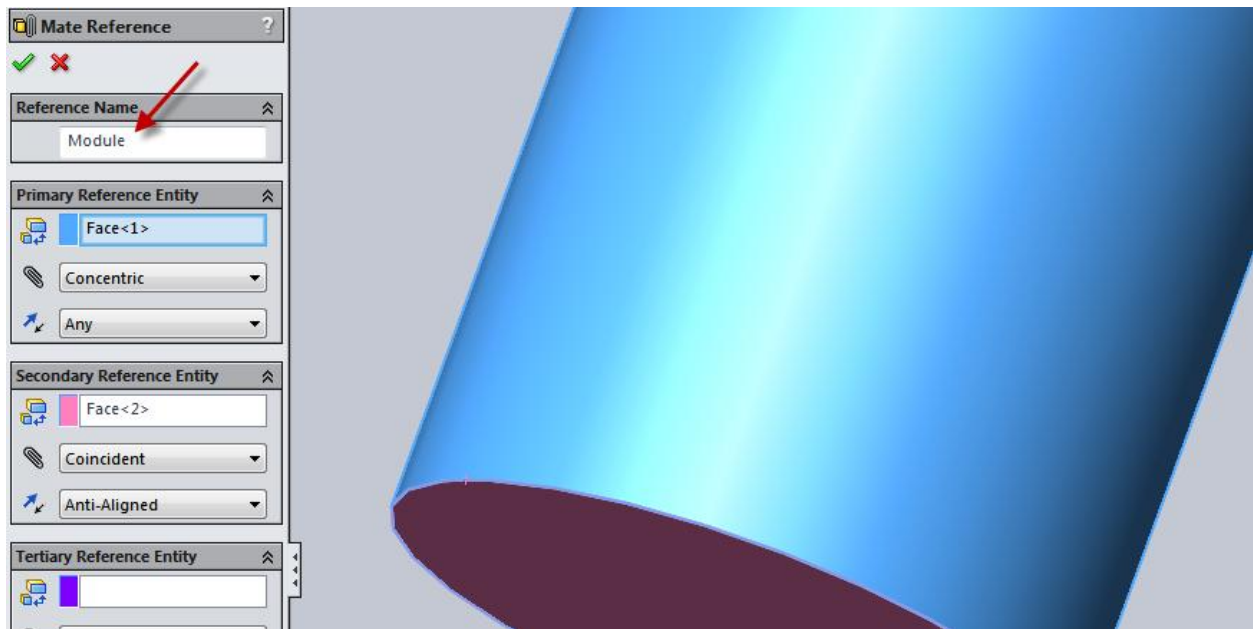
In order shown: Legend, Key, Panel, Rail, Element, Panel, Door, Module, Cabinet, Memory, Cable, Fuse, Fuse2, Fuse3, Fuse4.

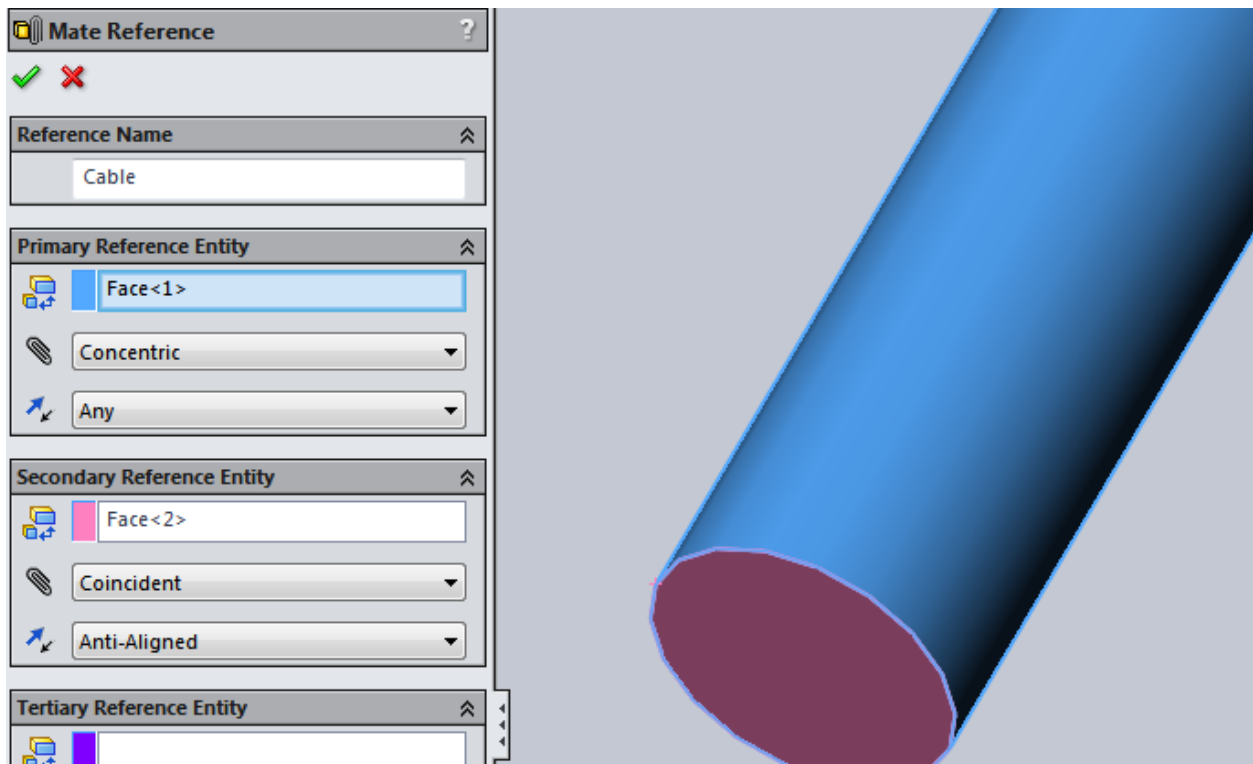
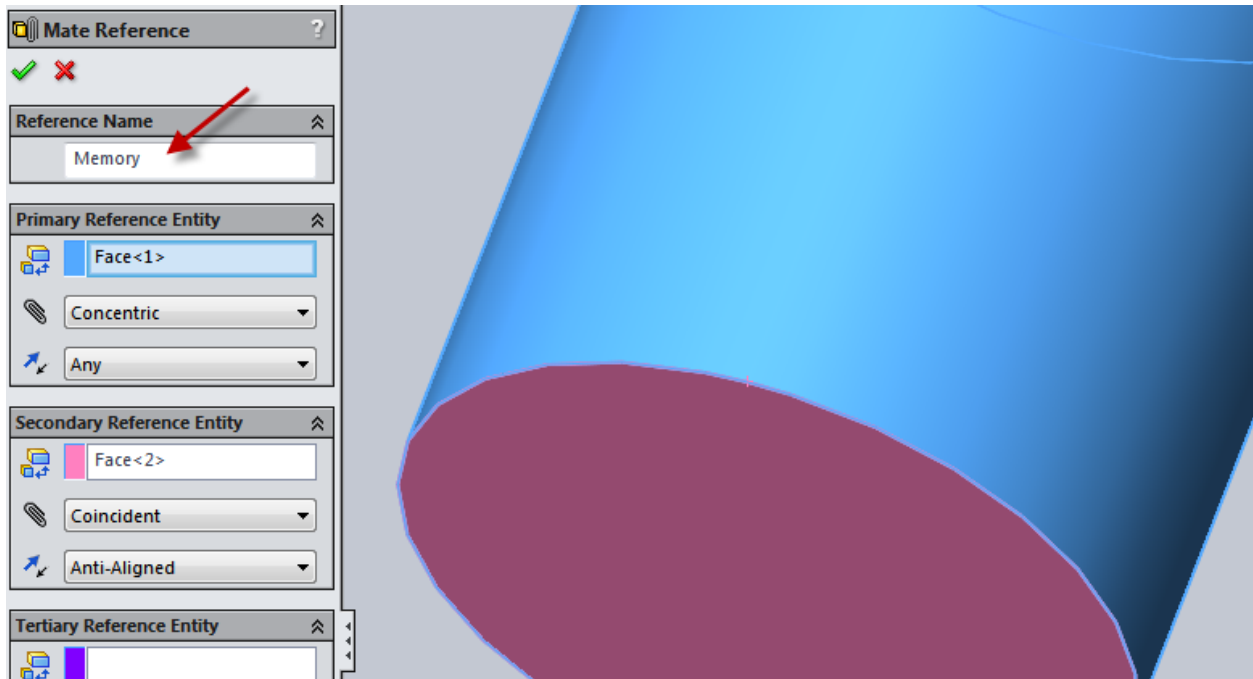


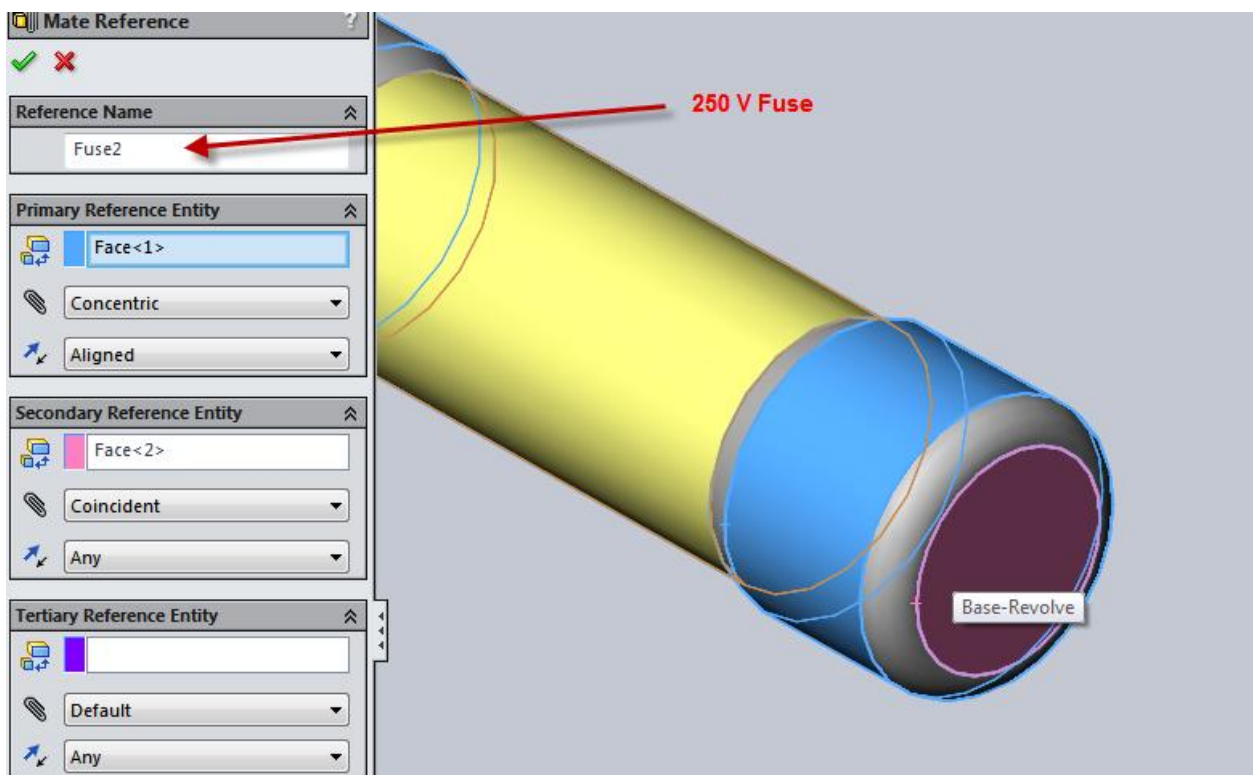
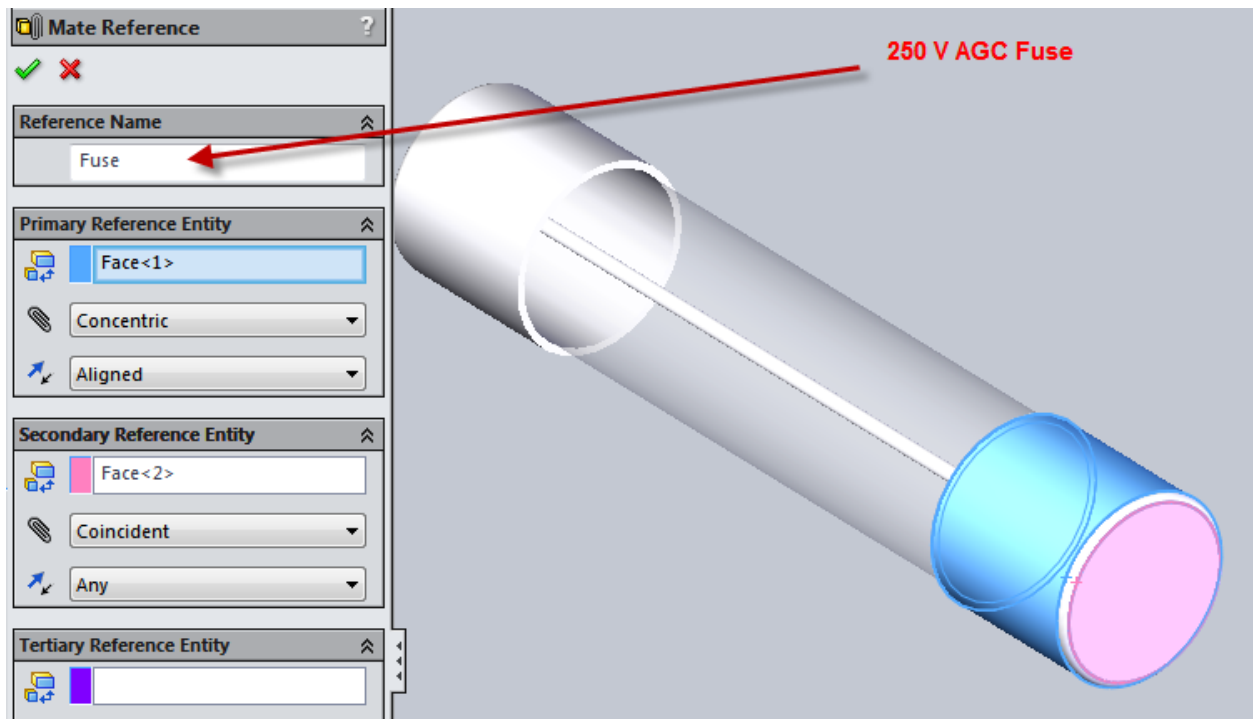


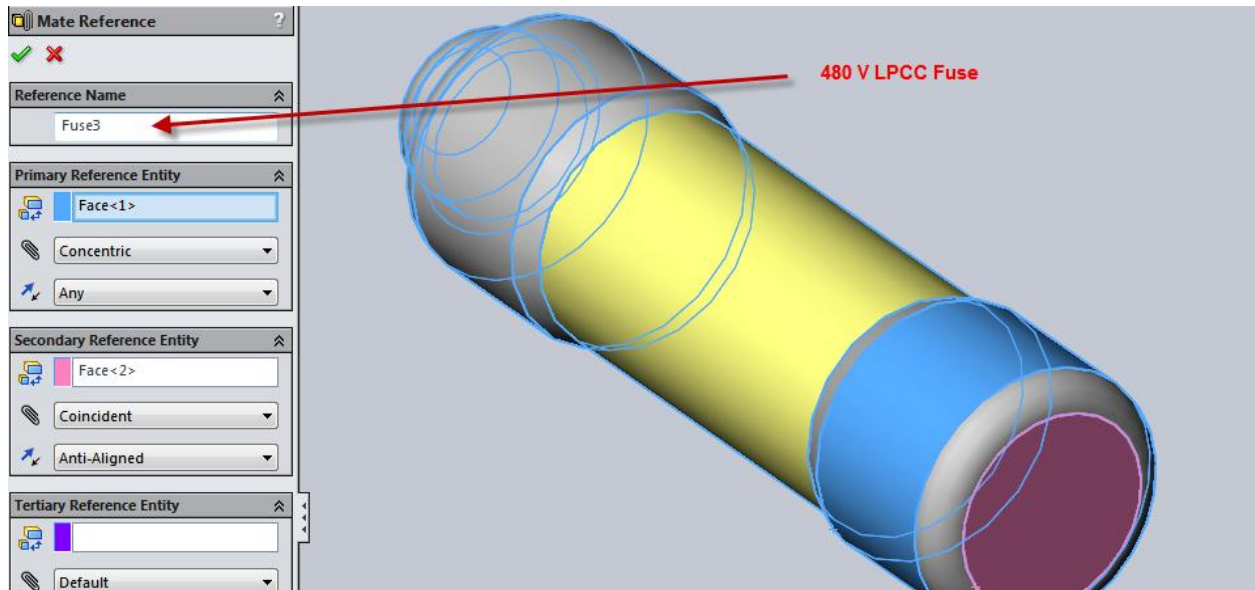












After the operators have been installed, the appropriate legends should be added.

