



# **CADdoctor SX**

## **Tutorial -Geometry Simplification-**

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# 1. Preface

## 1.1. About this Tutorial

This tutorial is composed of two parts: "[3, Recognize and Remove Feature](#)" and "[4, Other Simplification Functions](#)". You can learn how to operate CADdoctor SX (Simplification mode) step by step.



Simplification mode is a function that performs geometry simplification by removing characteristic shapes such as fillets, holes, bosses, ribs, and chamfers.

Furthermore, the features described in this tutorial are just a part of CADdoctor SX (Simplification Mode). Please refer to the online help for other features.

### About Help

For CADdoctor SX help, select [Help] > [Help Index] from CADdoctor SX menu. The help provides details about the content, how to operate, options, and things to keep in mind.

Another way to open the corresponding page of help, select [Help] > [Context Help], and a question mark appears next to the cursor so either click the menu or the icon.



Go through CADdoctor SX "Tutorial -Standard function-" to learn the basic functions of CADdoctor SX before starting this tutorial.



CADdoctor SX FEM package is required to use CADdoctor SX (Simplification Mode).

## 1.2. About the Notations of Menus and Icons

Each menu item button or dialog is represented by [Menu Name] and icon image. Right angle bracket (>) is used in sub menu.

For example:

The function of fit is described as [View] > [Fit] (  ).

In this tutorial, the folder containing sample data is referred to as <tutorial>.



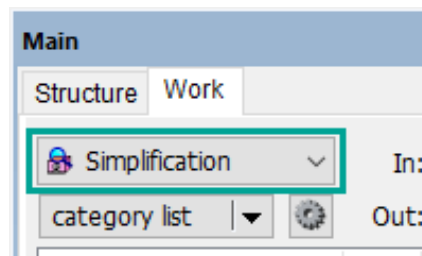
If the toolbar of Simplification is not displayed in the CADdoctor SX, select [View] > [Toolbar] > [Simplification].

## 1.3. About Sample Data

The sample data to be used is located in the folder "\\document\tutorial\_models\simplification" inside the folder where CADdoctor SX is installed.



Please note that sample models are in drfx\_sx format, and stores the CADdoctor SX settings, so that CADdoctor SX will switch to Simplification Mode automatically when opening those sample models. Switch to Simplification Mode manually from the pull-down list in [Main (Work)] panel when importing CAD models.



## 1.4. About Images

The images in this document may include slight differences from the ones actually displayed on your CADdoctor SX depending on your specific computer hardware and CADdoctor SX version.

## 2. Operation Flow

This tutorial will review the standard flow through the use of the simplification tools. As seen in the table below, this process follows the standard CADdoctor SX sequence of operations with new capabilities defined in steps 4, 5 and 6.

|   | Operation                           | Mode           |
|---|-------------------------------------|----------------|
| 1 | File Import                         | Translation    |
| 2 | Model Check                         |                |
| 3 | Stitch (if free edges exist)        |                |
| 4 | Recognize and Remove Feature        | Simplification |
| 5 | Additional Simplification Functions |                |
| 6 | Auto Heal                           | Translation    |
| 7 | Manual Heal                         |                |
| 8 | Export File                         |                |

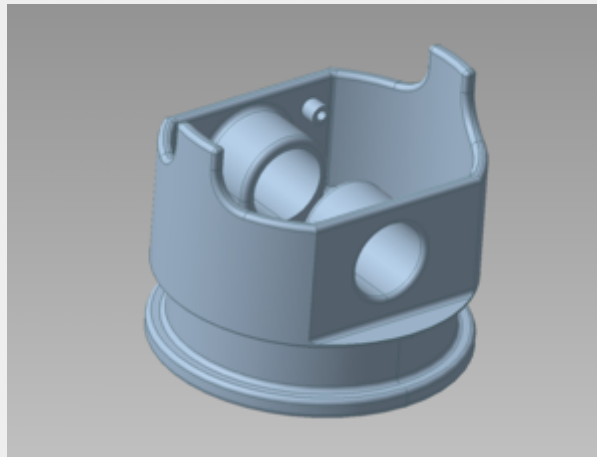
The following will explain how to use Simplification mode (Steps 4~5 in the above flow) using sample files. Please refer to the help if you see any unknown terms during the tutorial.

### 3. Recognize and Remove Feature

This chapter explains the procedure to simplify the geometry by recognizing and removing geometry features such as fillets, holes, bosses, and ribs. Most operations are automatic; therefore Simplification can be done very easily.

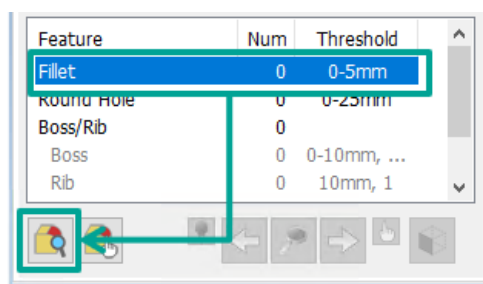
#### Preparation

Select [File] > [Open] from the menu or click [Open] (📁) on the toolbar. In "Open" dialog, open " **feature.drxf\_sx** " in <tutorial> folder.



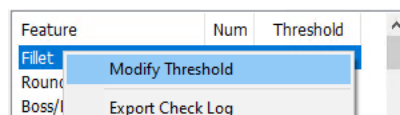
#### 3.1. Recognize and Remove Fillets

1. Select "Fillet" from the feature list to display [Check All Fillets] (🔍) in [Main] panel. Press this icon to automatically recognize fillets(\*1).



[Check All Fillets] (\*1)

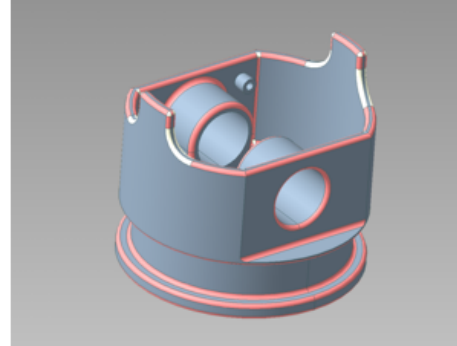
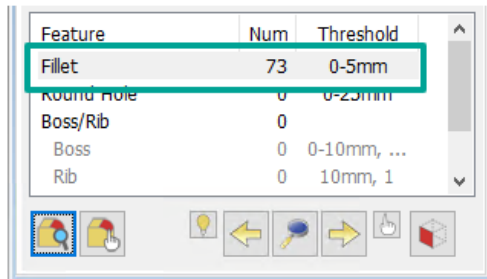
Fillet recognition is based on the threshold value displayed in the list. (This threshold can be changed by right-clicking "Fillet" and selecting "Modify Threshold" from the context menu.)





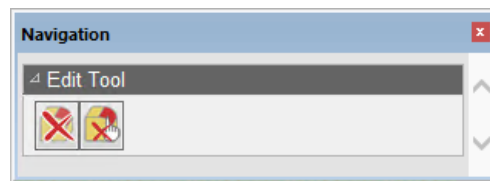
You can also run [Check All Fillets] by double-clicking "Fillet" row in the feature list.

The number of "Fillet" will be updated in the feature list, and the recognized fillets will be highlighted in "3D View" window once the fillet recognition is completed.

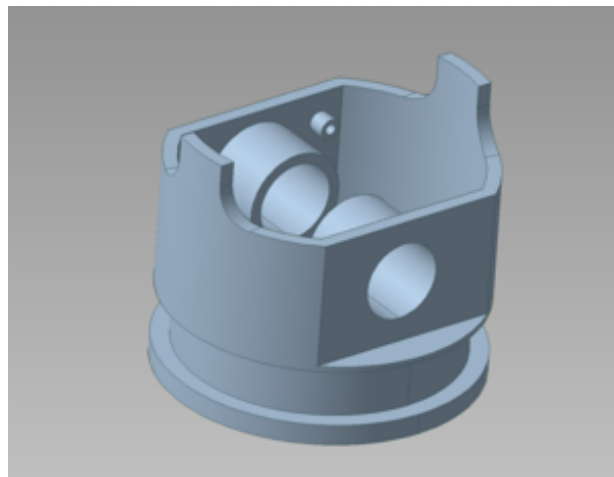


In this tutorial, all fillets whose fillet radius is 5 mm or smaller will be recognized as per the threshold. To recognize the large fillets of the model, change the maximum limit of the threshold value, and perform automatic recognition again.

Command(s) to remove Fillets will be listed in [Navigation] panel.

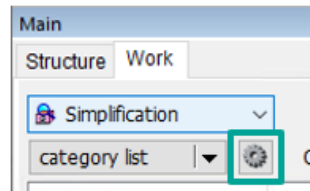


2. Press [Remove All (Fillets)] (  ) to remove recognized fillets.

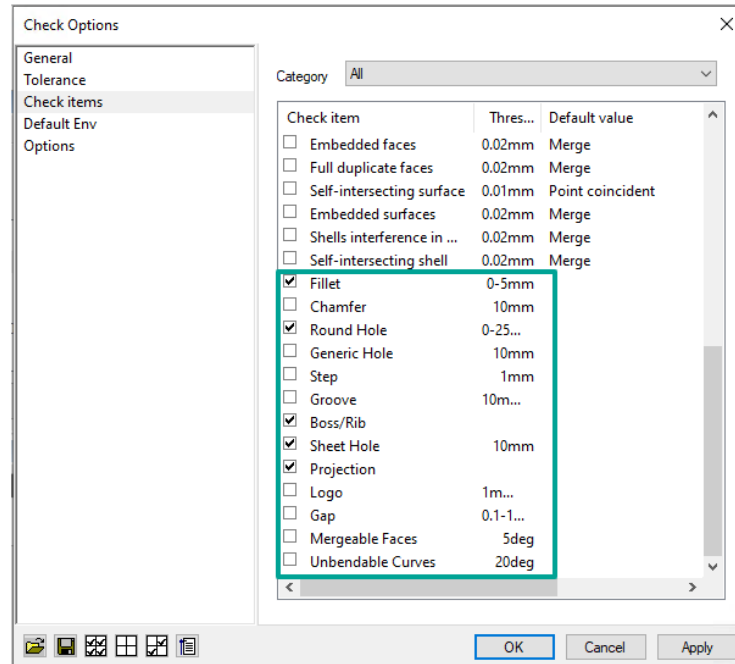


Click [Check Options]() to customize the features to show in the category list.



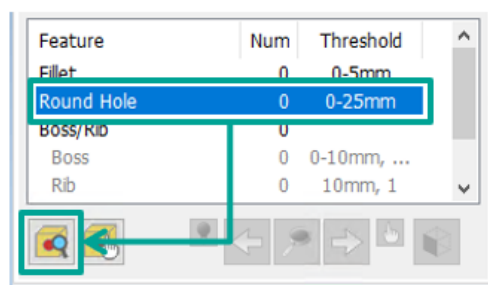


Check in the checkbox for the features in "Check Options" dialog > [Check items] page to show them in the category list in [Main (Work)] panel.



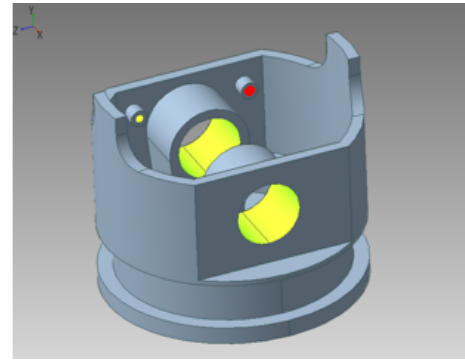
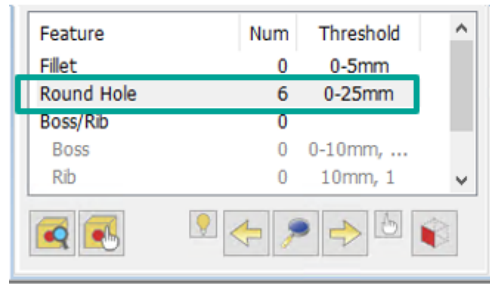
## 3.2. Recognize and Remove Holes

1. Select "Round Hole" from the feature list to display [Check All Round Holes] (🔍) in [Main] panel. Press this icon to automatically recognize holes.



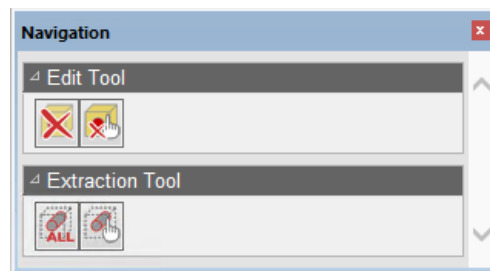
The number of recognized feature "Round Hole" is displayed, and the recognized areas are highlighted.



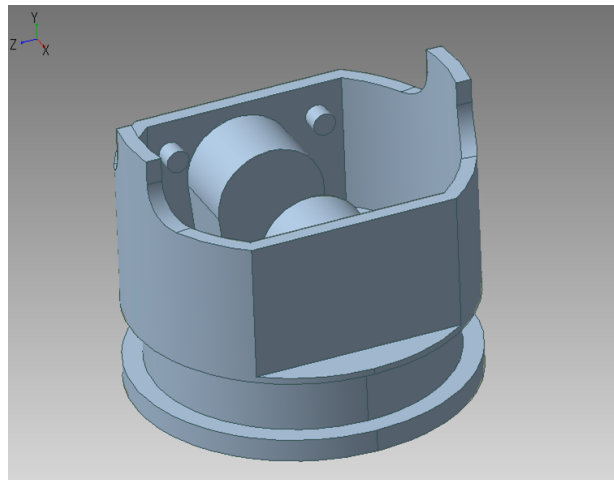


In this case, holes with a diameter of 25 mm or less are recognized.

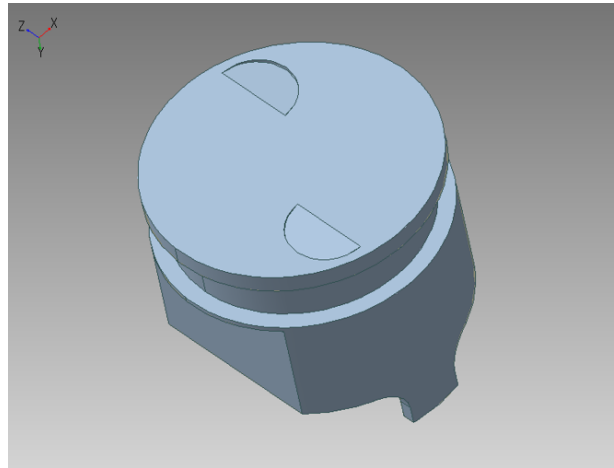
Command(s) to remove/extract Round Holes will be listed in [Navigation] panel.



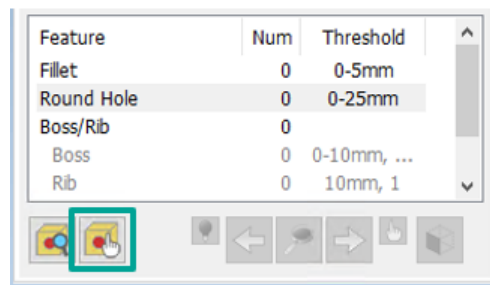
2. Press [Remove All (Round Holes)] (  ) on Navigation panel to remove recognized holes.




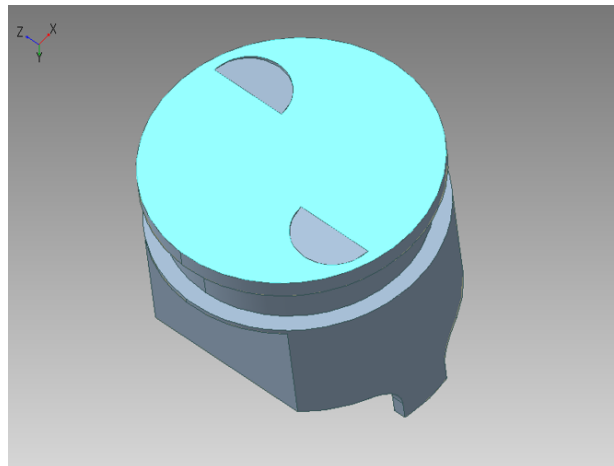
Rotate the model in "3D View" window, and you will find semicircle holes as shown in the image below. Such holes will not be recognized automatically, so mark and remove them manually.



3. Press [Check/Uncheck Round Hole] (  ) from [Main] panel.

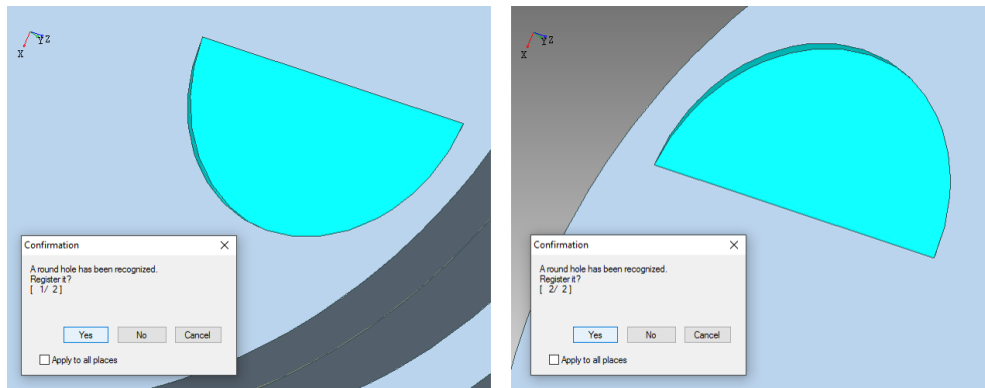


4. For manual recognition, pick the face around the hole (In the figure, the face is highlighted in blue) and press [Done](  ).

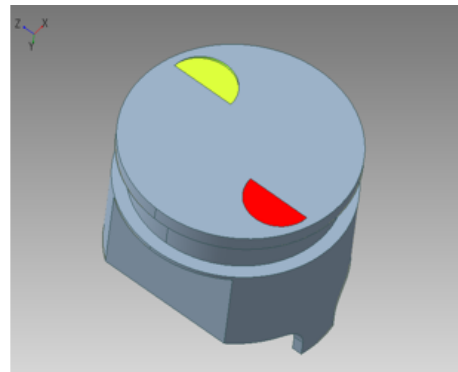
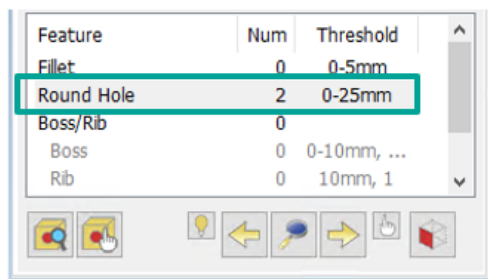


To recognize a through hole, pick the faces on both sides of the hole.

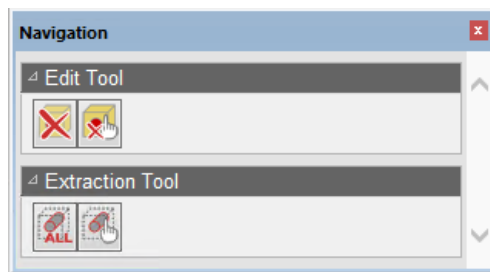
5. A confirmation dialog will appear. To recognize the area as a round hole, click [Yes].



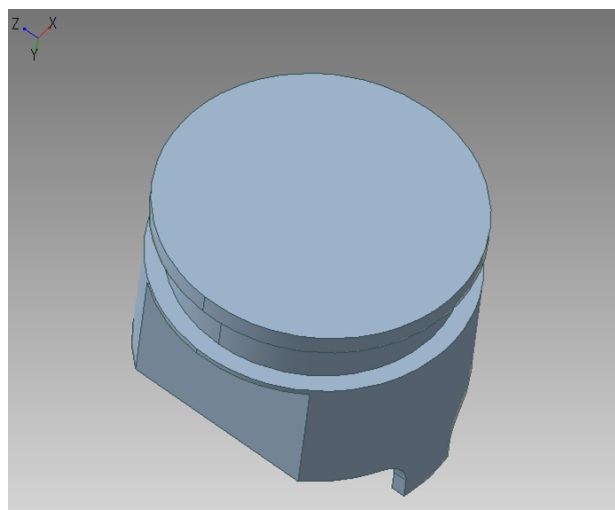
The number of recognized feature "Round Hole" is displayed, and the recognized areas are highlighted.



Command(s) to remove/extract Round Holes will be listed in [Navigation] panel.

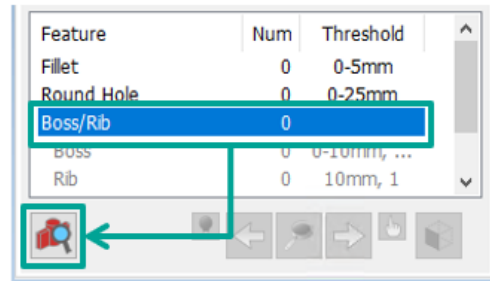


- Press [Remove All (Round Holes)] (  ) on Navigation panel to remove all recognized round holes.

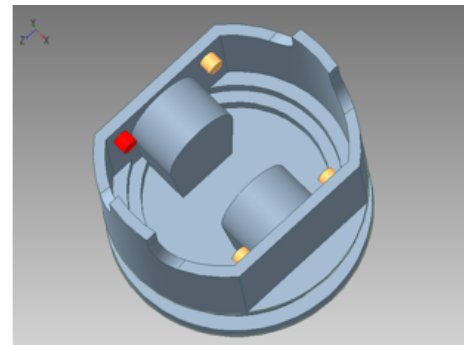
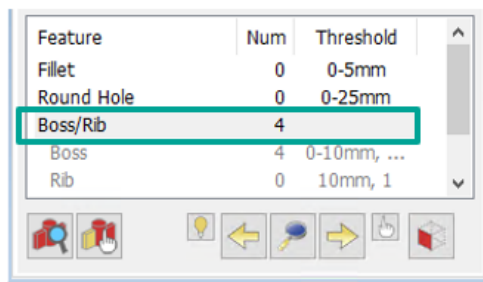


### 3.3. Recognize and Remove Boss/Ribs

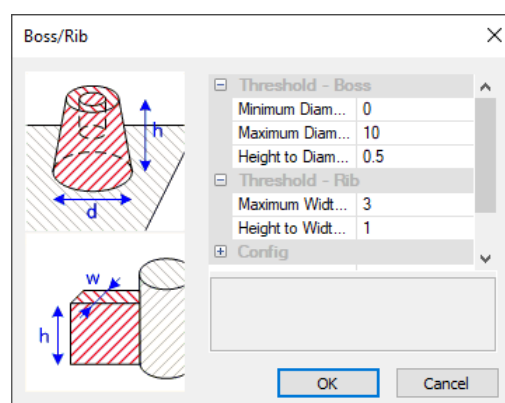
1. Select "Boss/Rib" from the feature list to display [Check All Bosses/Ribs] (🔍) in [Main] panel. Press this icon to automatically recognize Boss / Rib. (Double-click "Boss/Rib" from the feature list to automatically recognize as well.)



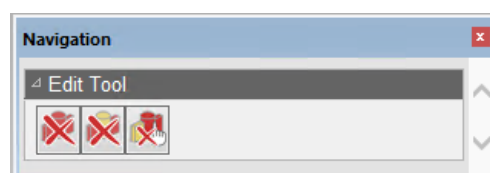
The number of recognized feature "Boss/Rib" is displayed, and the recognized areas are highlighted.




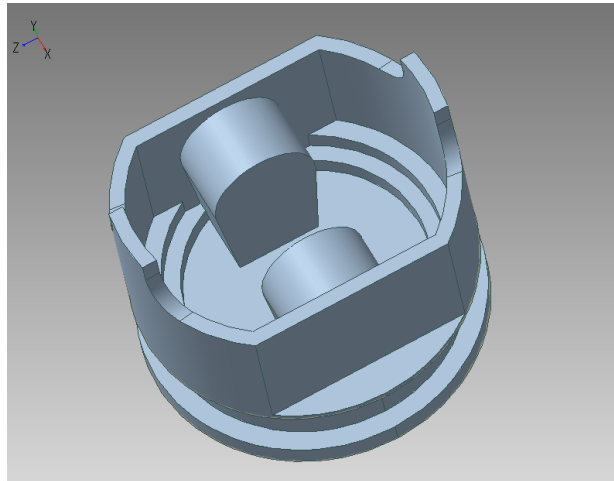
Boss/Rib recognition is performed based on the threshold value displayed in the list. Please refer to the help for more details about setting the threshold.



Command(s) to remove Bosses and Ribs will be listed in [Navigation] panel.




2. Press [Remove All (Bosses/Ribs)] (  ) on Navigation panel to remove all recognized bosses/ribs.

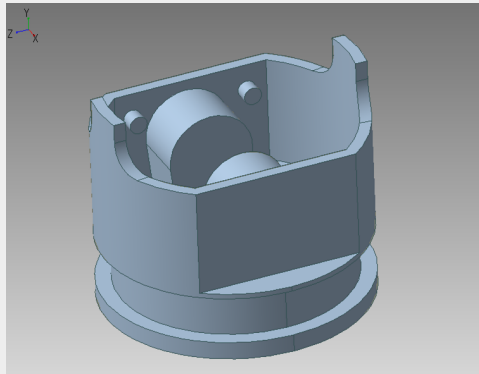



### 3.4. Recognize and Remove Projection

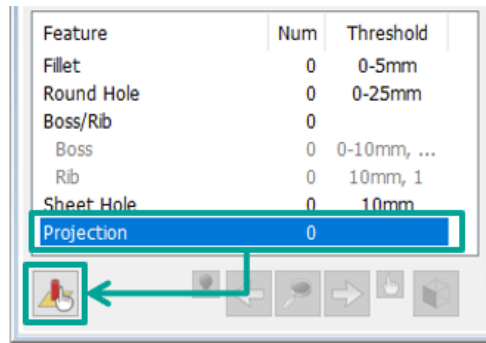
Shapes on the face such as bosses/ribs can also be recognized manually as projections. This section will explain how to recognize bosses/ribs as projections and remove them.

#### Preparation

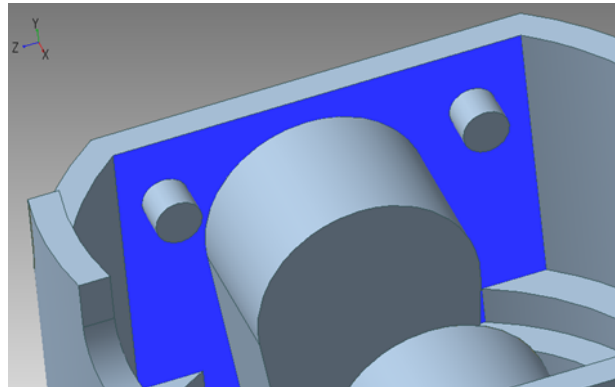
Select [File] > [Open] from the menu or click [Open] (  ) on the toolbar. In "Open" dialog, open " **feature2.drfx\_sx** " in <tutorial> folder.



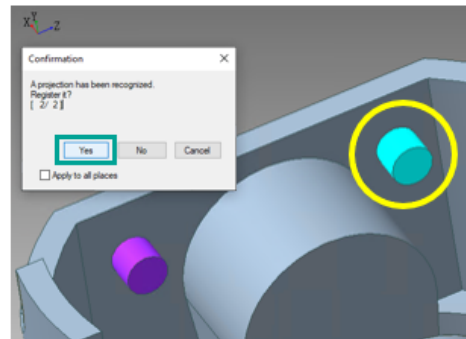
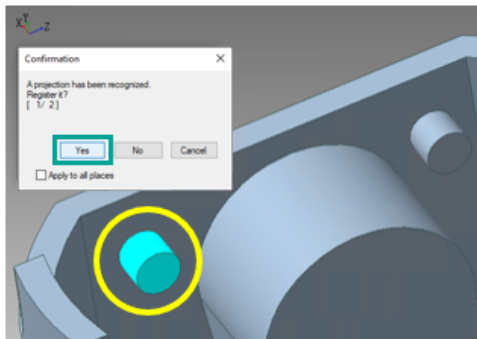
1. Select "Projection" from the feature list to display [Check/Uncheck Projection] (  ) in [Main] panel. Press this icon. CADdoctor SX will be in a waiting state for you to pick the face.



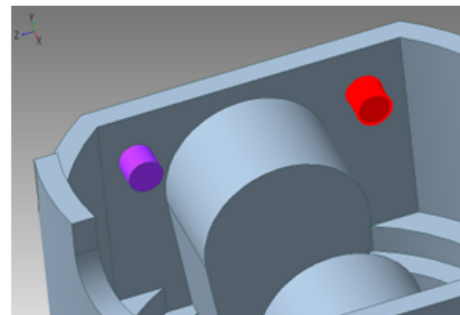
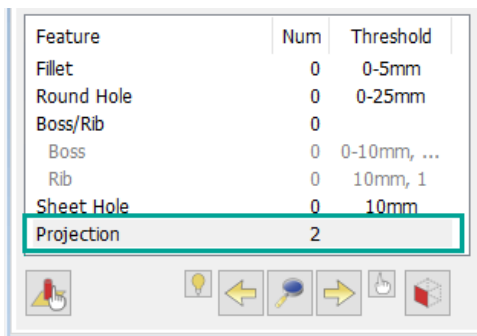
2. Pick the face around the projection (In the figure, the face is highlighted in blue.) and press [Done] (✓). For this model, pick one of the faces highlighted in cyan below.



3. A confirmation dialog will appear. To recognize the area as a projection, click [Yes].

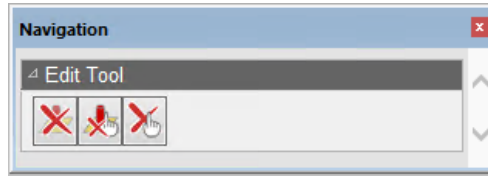


The number of recognized feature "Projection" is displayed, and the recognized areas are highlighted.



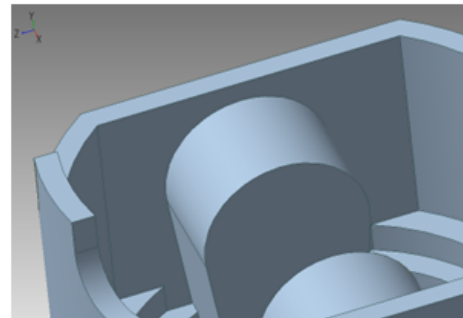
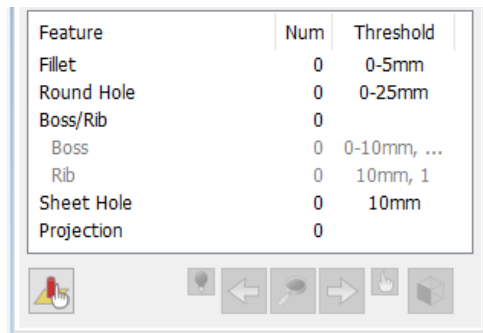
Mark other areas as Projection in the same procedure as required.

Command(s) to remove Projections will be listed in [Navigation] panel.



Once you complete marking all projection areas manually, click [Quit (Esc)] (✖) to exit the command.

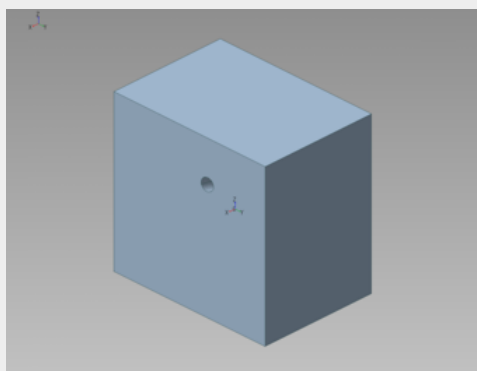
4. Press [Remove All (Projections)] (✖) on Navigation panel to remove all recognized projections.



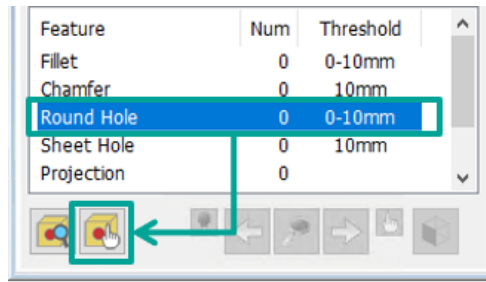
## 3.5. Recognize and Extract Holes

### Preparation

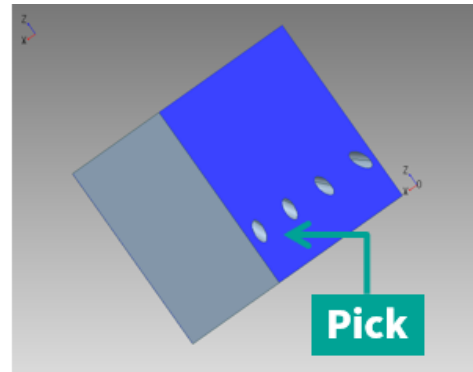
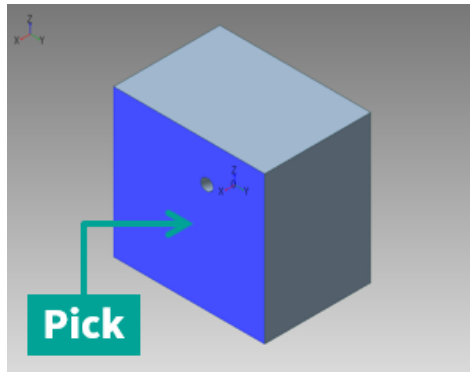
Select [File] > [Open] from the menu or click [Open] (📂) on the toolbar. In "Open" dialog, open " **hole.drxf\_sx** " in <tutorial> folder.



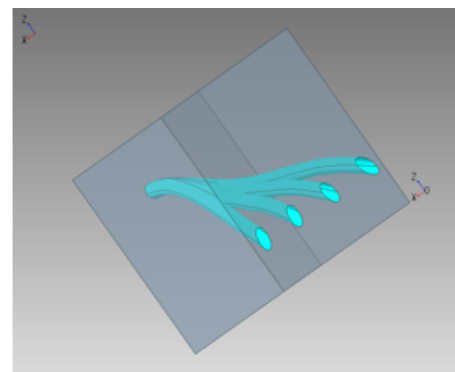
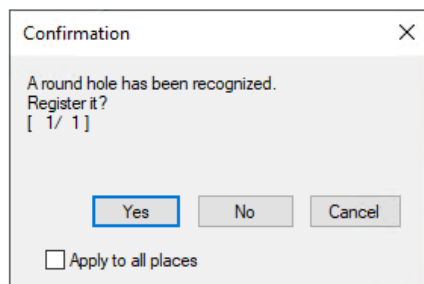
1. Select "Round Hole" from the feature list in [Main] panel, and press [Check/Uncheck Round Hole] (👉).



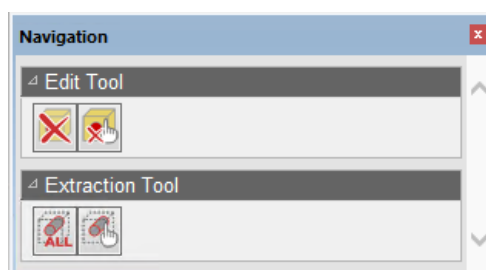
2. To recognize a through hole, pick the faces on both sides of the hole, and press [Done] (✓).



3. A confirmation dialog will appear. Click [Yes] to recognize the area as a round hole. (The image below is showing the result in Semi-transparent mode for better visibility.)

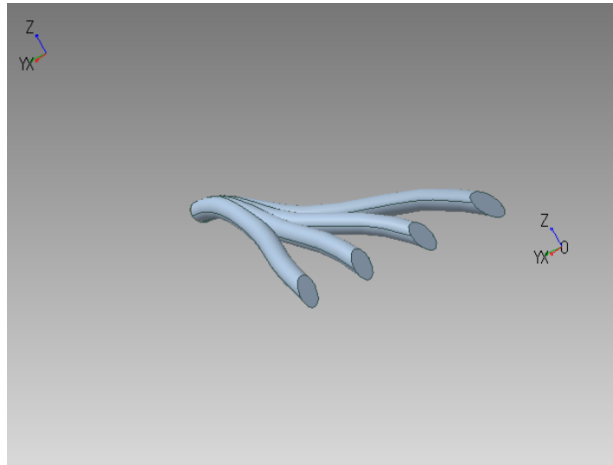


Command(s) to remove/extract Round Holes will be listed in [Navigation] panel.



4. Press [Extract All Round Holes] (ALL) to extract only the recognized holes as another solid part.

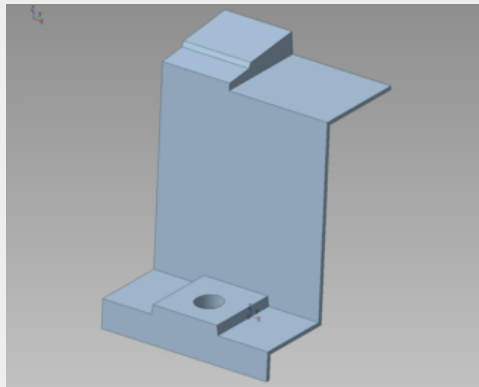




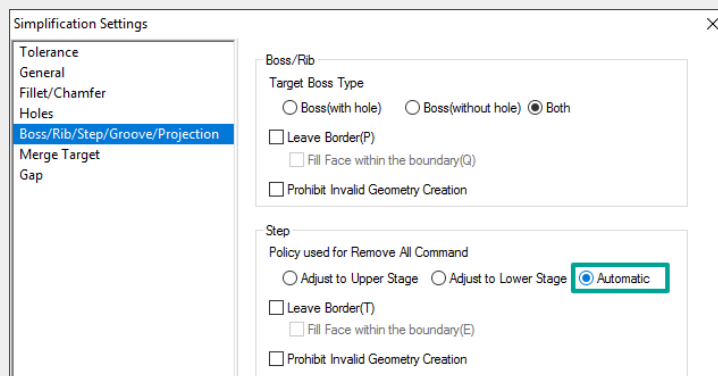
## 3.6. Recognize and Remove Steps

### Preparation

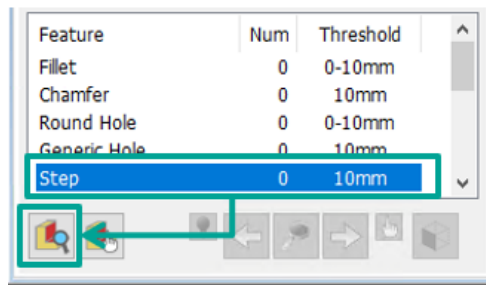
Select [File] > [Open] from the menu or click [Open] (📁) on the toolbar. In "Open" dialog, open " **remove\_step.drfx\_sx** " in <tutorial> folder.



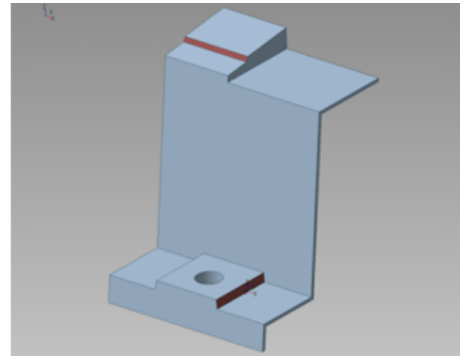
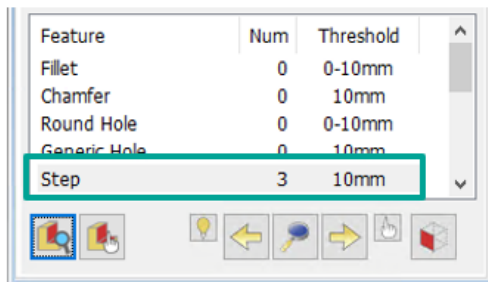
In this tutorial, set the following option for step ([Simplification] > [Options]). Please refer to the help for details about the settings.



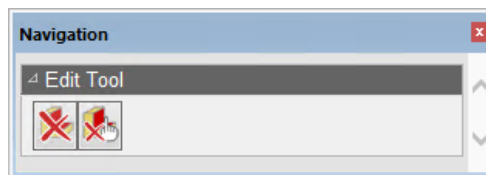
1. Select "Step" from the feature list in [Main] panel, and click [Check All Steps](🔍) to recognize Steps automatically.



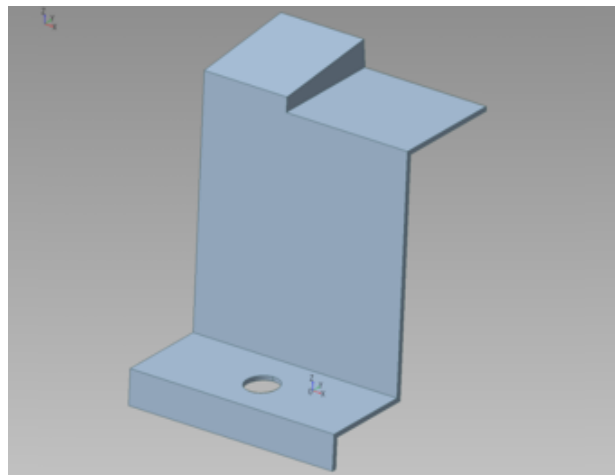
The number of recognized feature "Step" is displayed, and the recognized areas are highlighted.



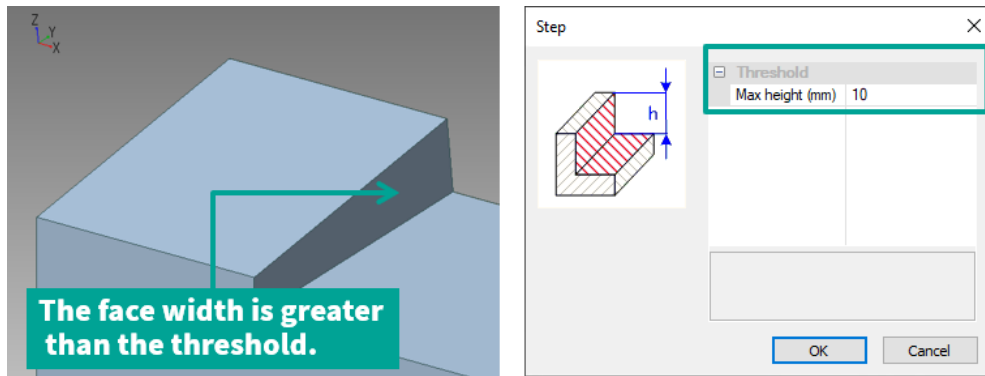
Command(s) to remove/extract Steps will be listed in [Navigation] panel.



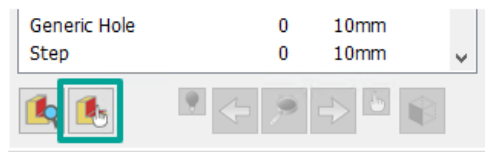
- Click [Remove All (Steps)](Remove All (Steps)) in [Navigation] panel to remove all Steps.




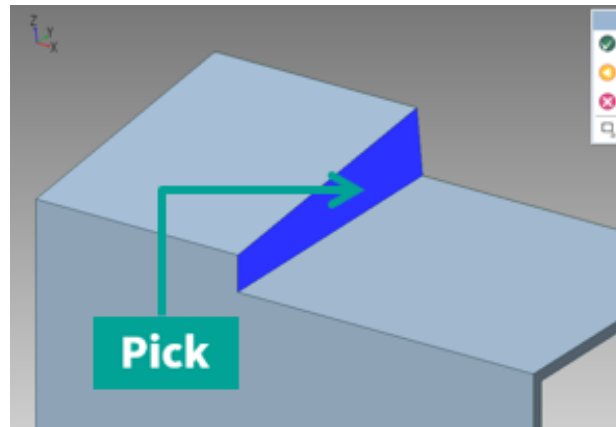
After the automatic removal, you will still find a step on the model as shown in the image below. The maximum height of this step is greater than the threshold and will not be recognized automatically, so mark and remove it manually.



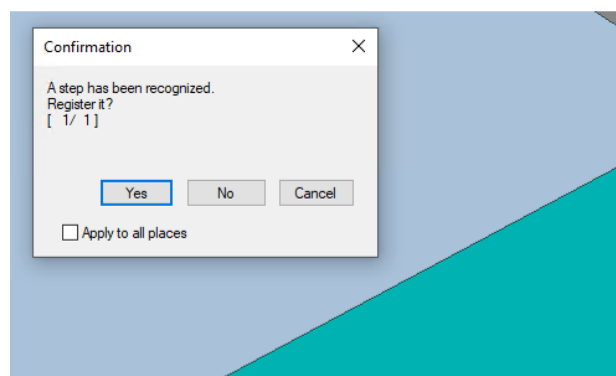
3. Press [Check/Uncheck Step] (  ) in [Main] panel.



4. Pick the face to be recognized as step, and press [Done] (  ).



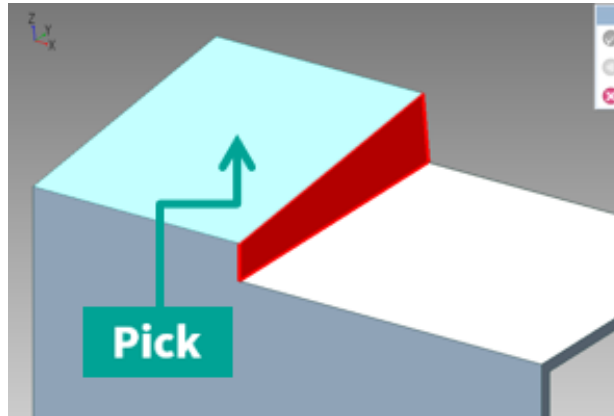
5. A confirmation dialog will appear. Click [Yes] to recognize the area as the step if you prefer.



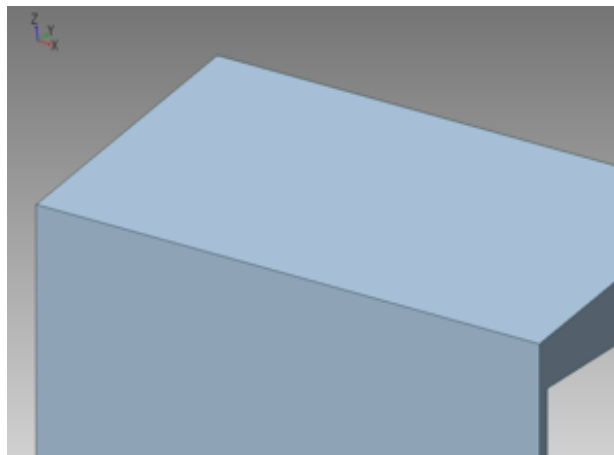
6. Press [Remove Step] (  ) on Navigation panel to remove the recognized step.



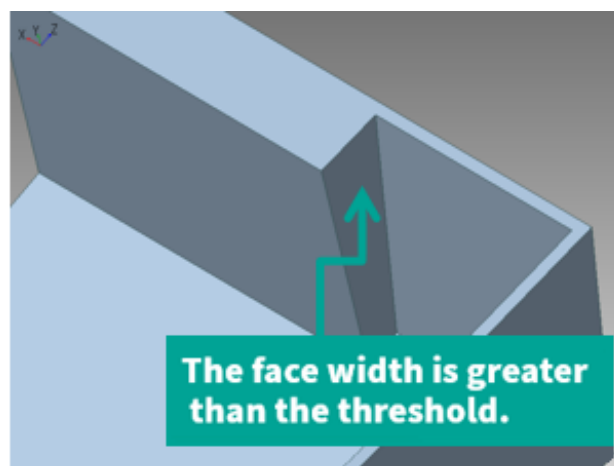
7. Select a face in "3D View" window to specify the resulting height after removing the step.



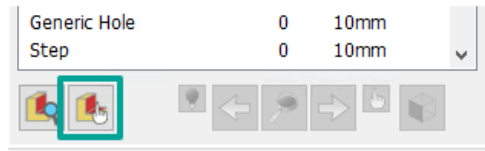
The step will be removed to make a flat face on the specified height.



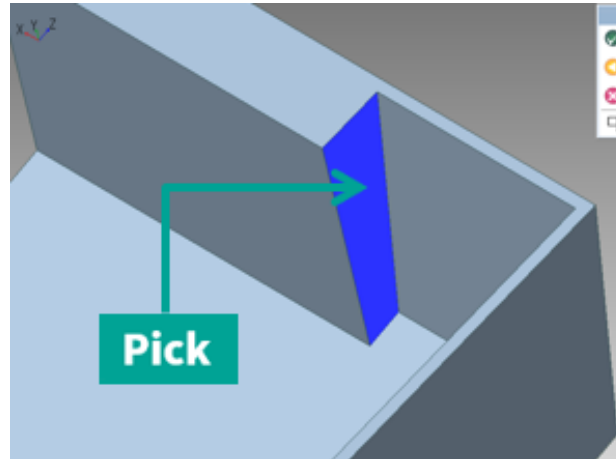
Rotate the model in "3D View" window, and you will find another step on the other side of the model as shown in the image below. This step is higher than the threshold and will not be recognized automatically, so mark and remove it manually.



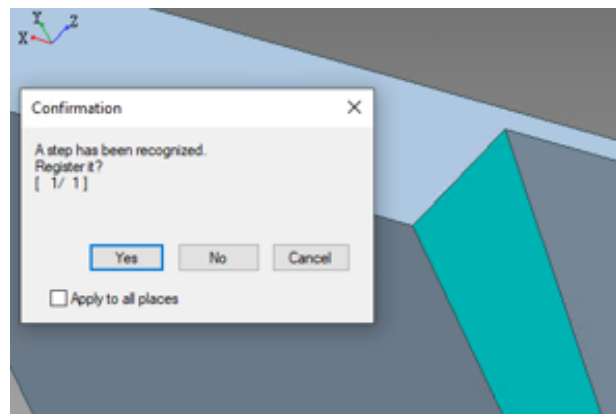
8. Press [Check/Uncheck Step] (  ) in [Main] panel.



9. Pick the face to be recognized as step, and press [Done] (  ).



10. A confirmation dialog will appear. Click [Yes] to recognize the area as the step if you prefer.

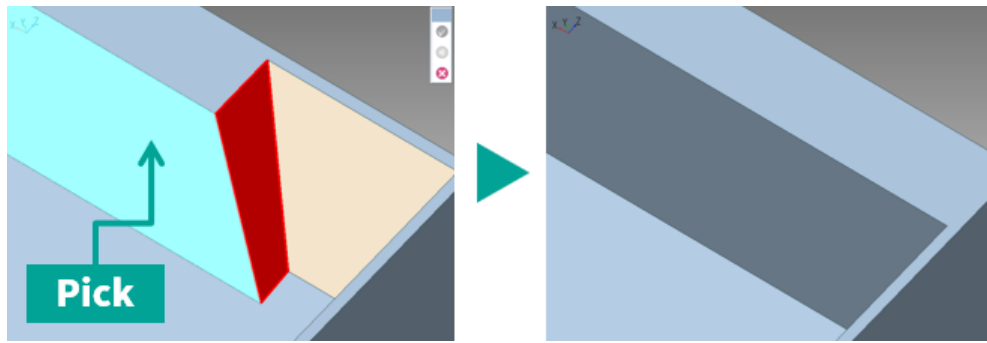


11. Press [Remove Step] (  ) on Navigation panel to remove the recognized step.

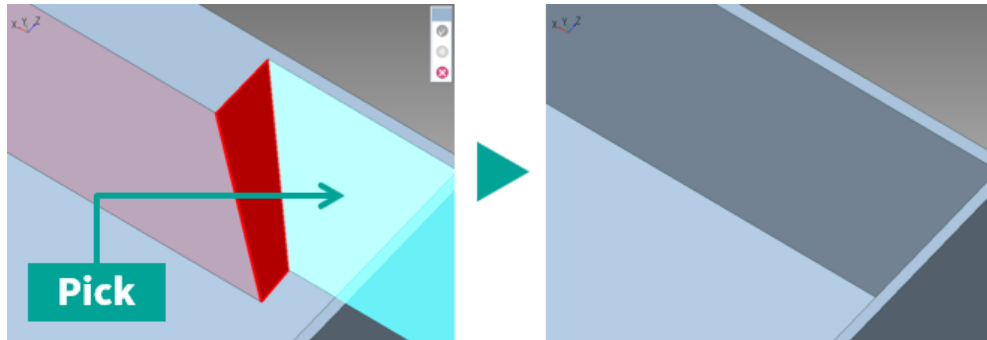


12. Select a face in "3D View" window to specify the resulting height after removing the step.  
The result will differ depending on it.

- Blending to the higher side



■ Blending to the lower side



## 4. Other Simplification Functions

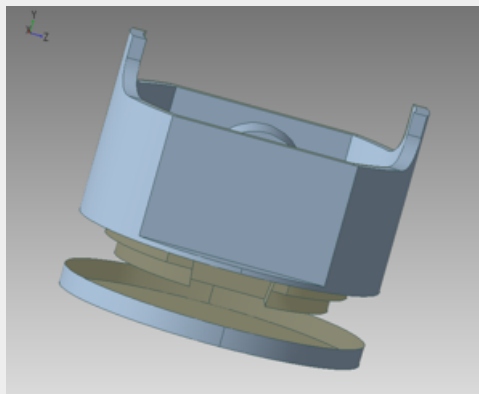
This chapter explains the procedure to manually simplify the geometry on the areas which cannot be simplified by feature (Filletlets, Holes, Bosses, Ribs, etc.) removal.

### 4.1. Fill Crack (Create surface between curve sets)

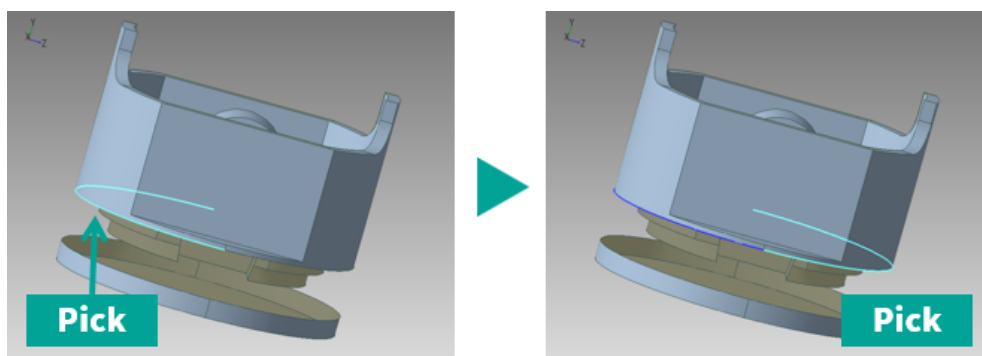
The command [Fill Crack] creates a new connecting face between the two specified edges.

#### Preparation

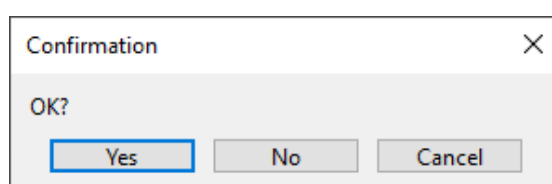
Select [File] > [Open] from the menu or click [Open] (📁) on the toolbar. In "Open" dialog, open " **others.drfx\_sx** " in <tutorial> folder.



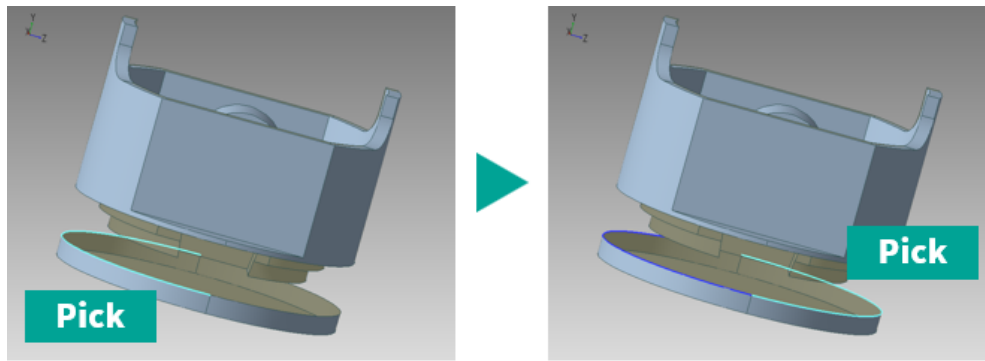
1. Select [Simplification] > [Fill Crack] from the menu, or click [Fill Crack] (🔧) in the toolbar.
2. Select free edges on the side to connect from.



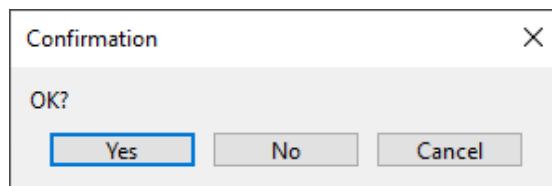
Click [Yes] in the confirmation dialog to use the selected free edges.



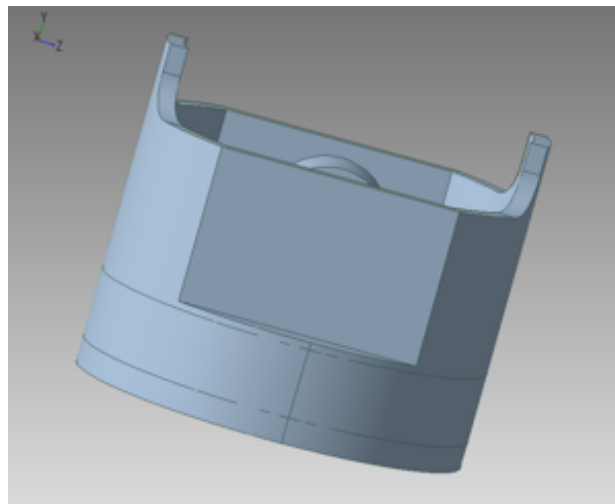
3. Select free edges on the side to connect to.



Click [Yes] in the confirmation dialog to use the selected free edges.





Face(s) which connect the selected free edges will be created.

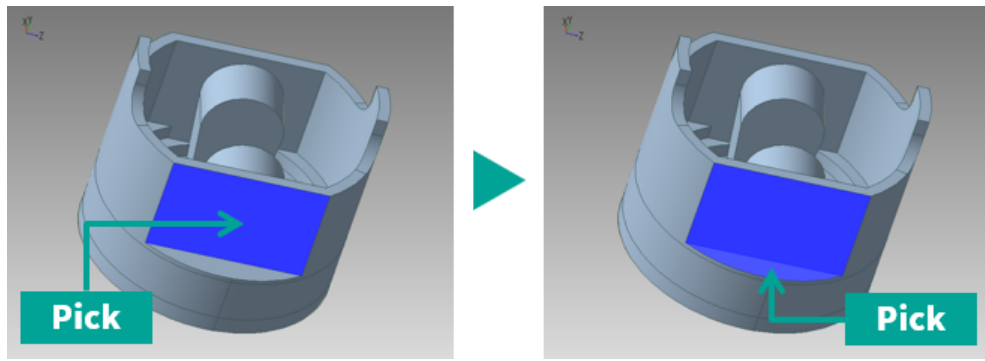


## 4.2. Remove Faces with Fix

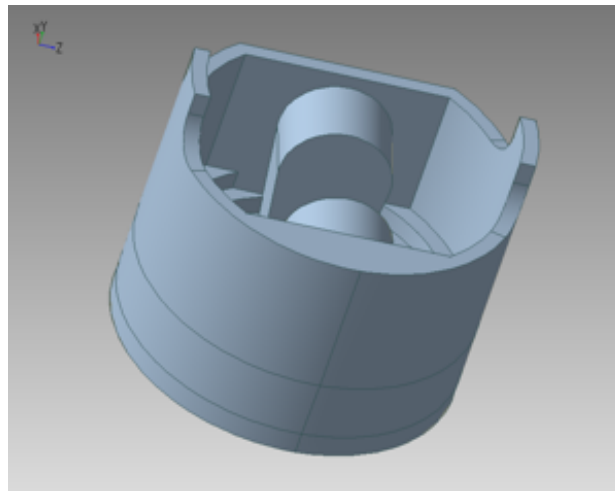
This section explains the procedure to simplify the geometry by deleting the selected faces, and then re-constructing that area by extending the adjacent faces, etc.

1. In this example, select [Simplification] > [Remove Faces with Fix] (  ).
2. Select two faces to delete in "3D View" window, and click [Done] (  ).

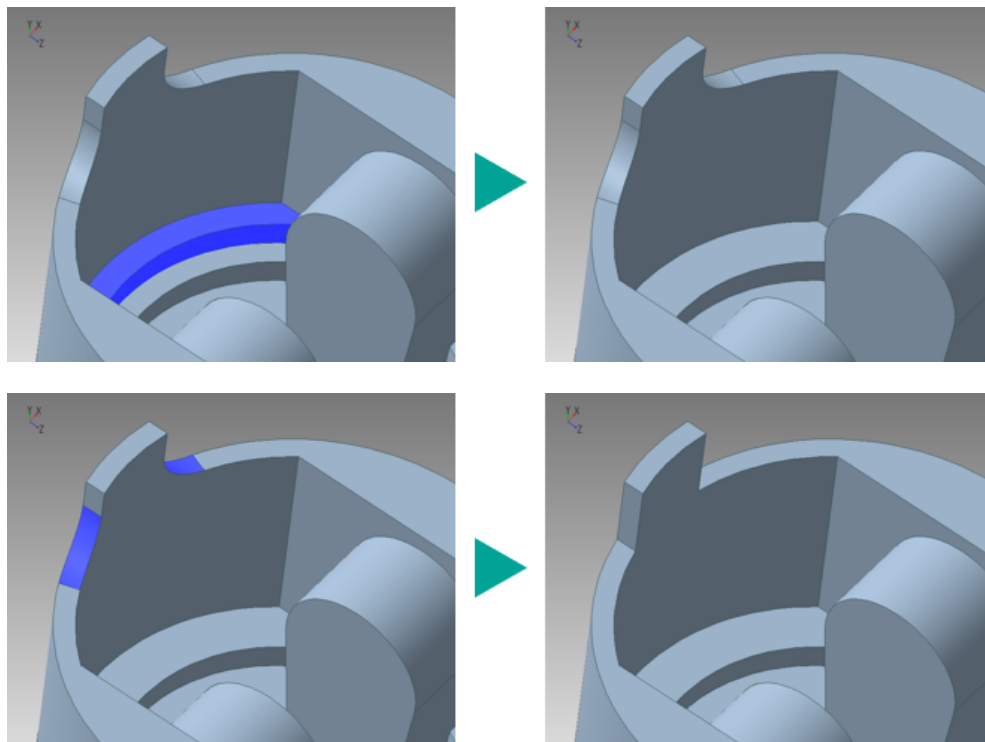




The selected faces will be deleted, and that area will be re-constructed referencing the adjacent faces.



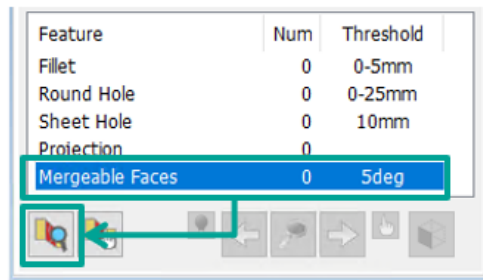
Repeat this step for the other side if desired as below.



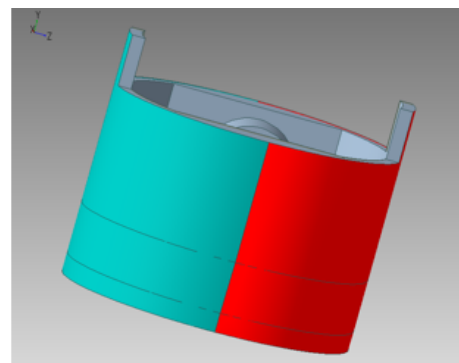
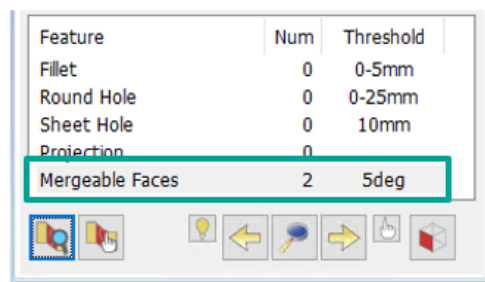
## 4.3. Merge Faces

This section explains the procedure to simplify the geometry by auto-detecting mergeable faces in the model, and then merging those faces.

1. Select "Mergeable Faces" in the feature list, and click [Check All Mergeable Faces] (🔍) in [Main (Work)] panel.



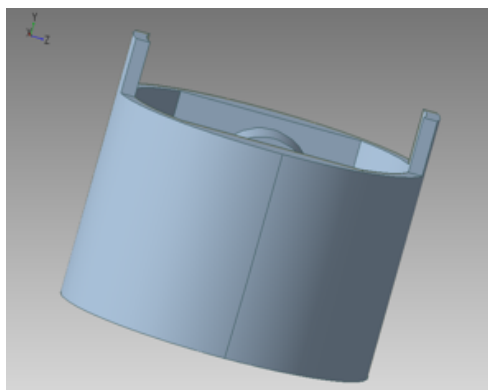
The number of recognized feature "Mergeable Faces" is displayed, and the recognized areas are highlighted.



Command(s) to merge detected Mergeable Faces will be listed in [Navigation] panel.



2. Press [Merge All Mergeable Faces] (🔗) on Navigation panel to connect (merge) the recognized connectable faces.



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