

Lesson 13 Patterns and Weldments

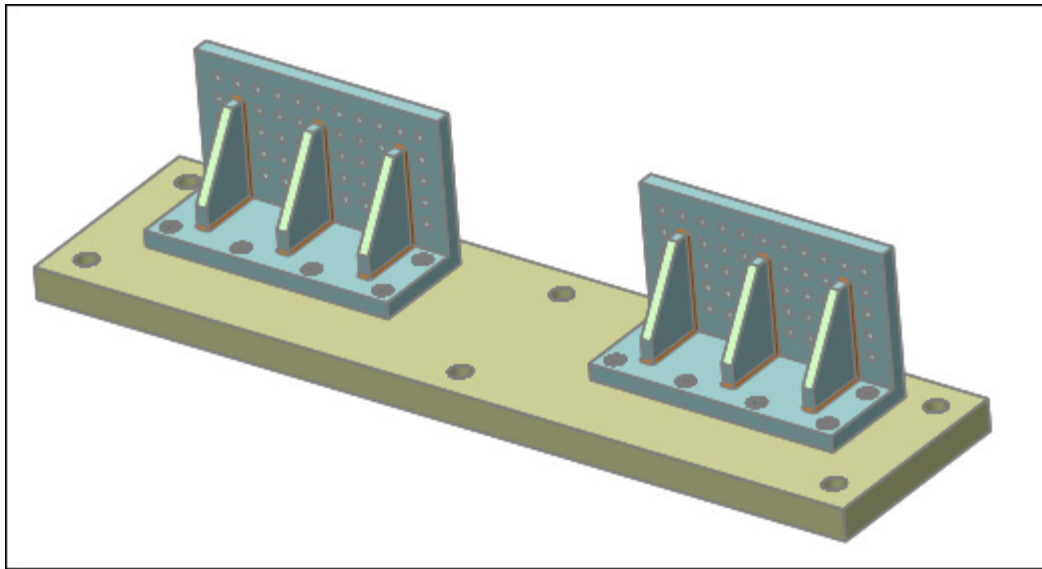


Figure 13.1 Mounting System Weldment

OBJECTIVES

- Create **directional patterns**
- Create **dimensional patterns**
- **Pattern components** on an assembly
- Insert multiple standard parts using a **reference pattern**
- Use **fill** to pattern a feature
- Insert **welds** on a model

REFERENCES AND RESOURCES

For **Resources** go to www.cad-resources.com > click on the Creo Parametric Book cover

- Lesson 13 Lecture
- Book Projects PDF
- Project Lectures
- Creo Parametric Quick Reference Card
http://www.cad-resources.com/Creo_Parametric_Quick_reference_cards.pdf
- Creo Parametric Configuration Options
http://www.cad-resources.com/Creo_1.0_configoptions.pdf

Patterns and Weldments

Creating a pattern is a quick way to reproduce a feature, or a component in an assembly (Fig. 13.1). A pattern is parametrically controlled. Therefore, you can modify a pattern by changing pattern parameters, such as the number of instances, spacing between instances, and original feature dimensions. Modifying patterns is more efficient than modifying individual features. In a pattern, when you change dimensions of the original feature, Creo Parametric automatically updates the whole pattern. This lesson will introduce you to variations of the **Pattern Tool**, and introduce the **Welding** application.

Mounting Bracket

For Lessons 13-18, step-by-step commands are limited to new software commands introduced or enhanced in that lesson. You are expected to do most of the modeling using commands and practices mastered from Lessons 1-12 without repeated detailed explanations. Refer to Figures 13.2(a-f) for the Bracket dimensions.

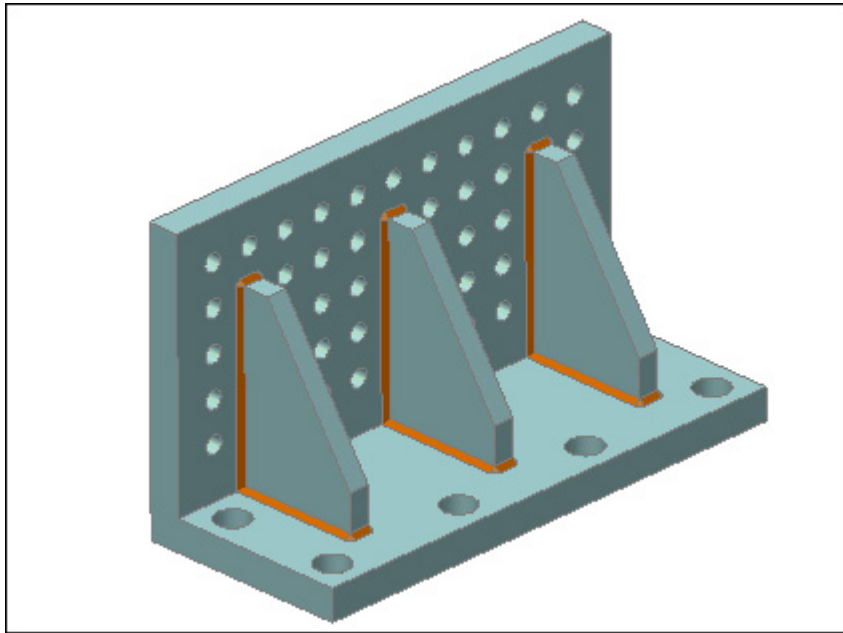


Figure 13.2(a) Mounting Bracket

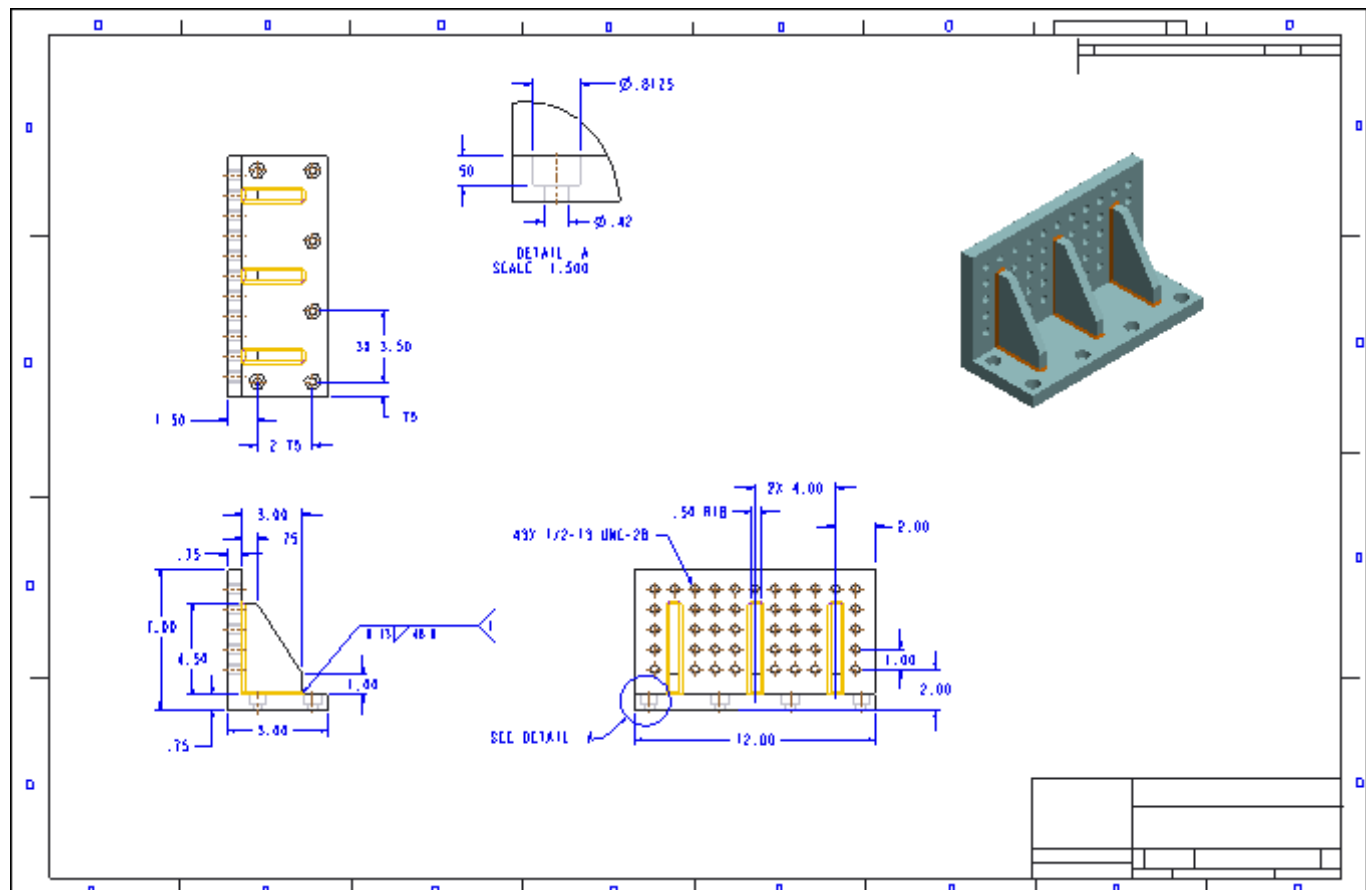
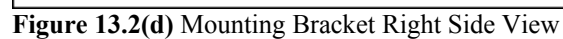
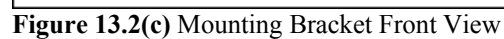
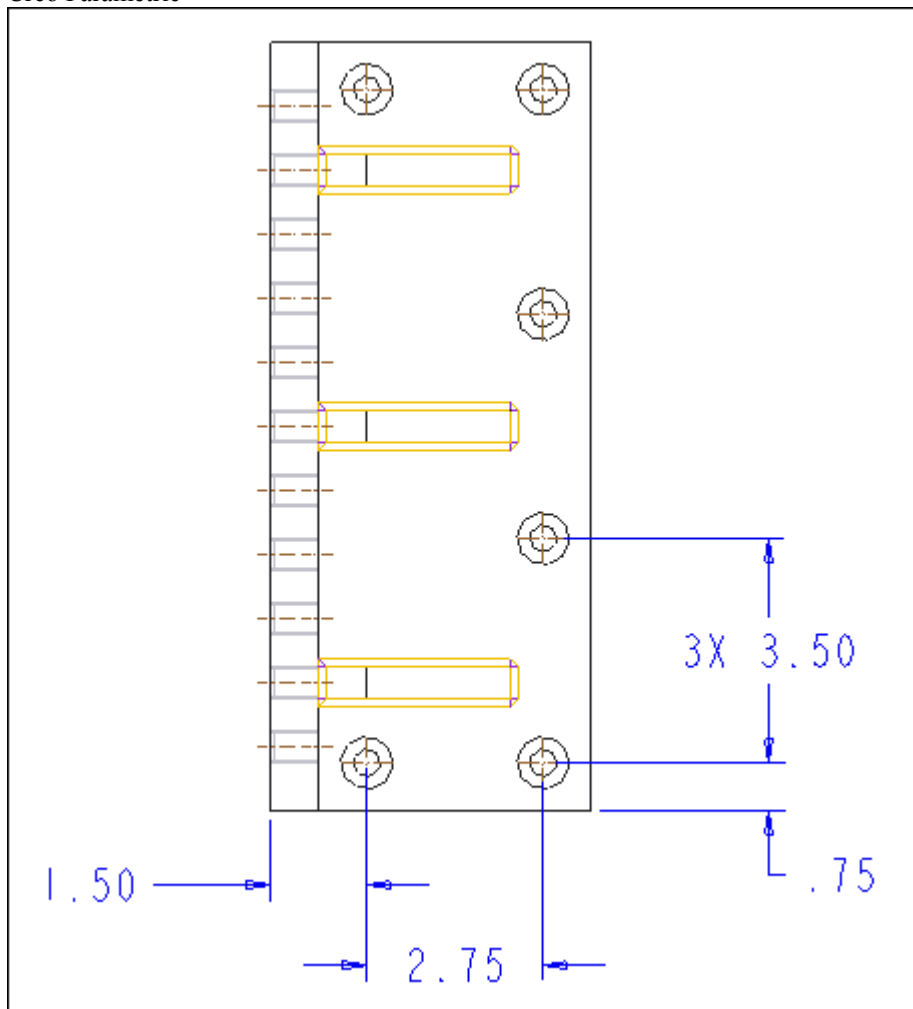
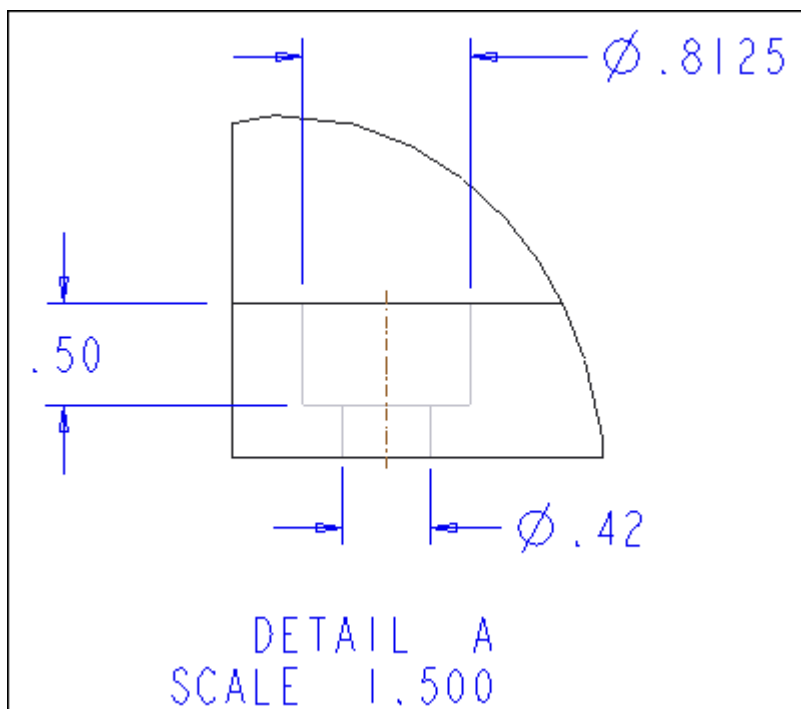


Figure 13.2(b) Mounting Bracket Detail



**Figure 13.2(e)** Mounting Bracket Top View**Figure 13.2(f)** Detail View A

Steps

Start a new part. Press: **Ctrl+N** > **mounting_bracket** > **OK** > **File** > **Prepare** > **Model Properties** > **Units** > **change** > **Inch lbm Second (Creo Parametric Default)** > **Close** > **Close** > **Extrude** > in the Graphics Window, press **RMB** > **Define Internal Sketch** > select the **FRONT** datum plane > **Sketch** >  > sketch the L-shaped section [Fig. 13.3(a)] >  > modify the length to **12** > **Ctrl+D** [Fig. 13.3(b)] >  >  > **OK**

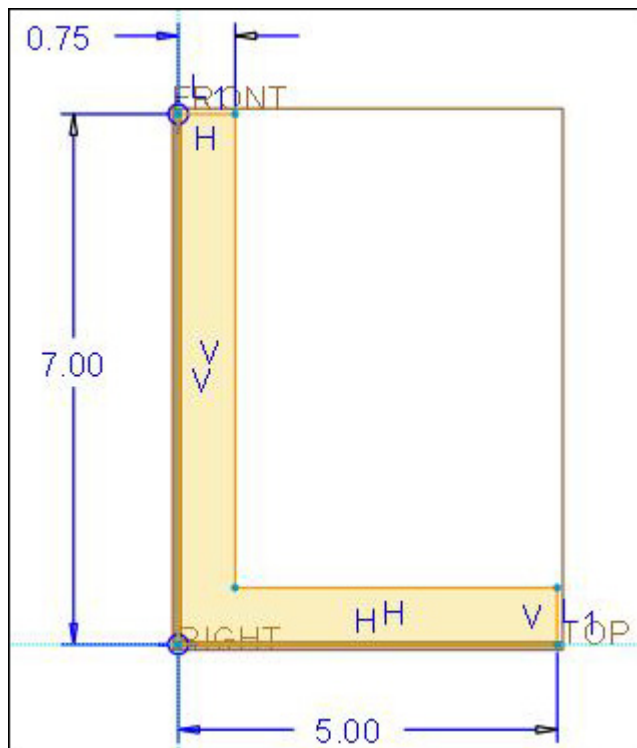


Figure 13.3(a) Sketch the L-shaped Section

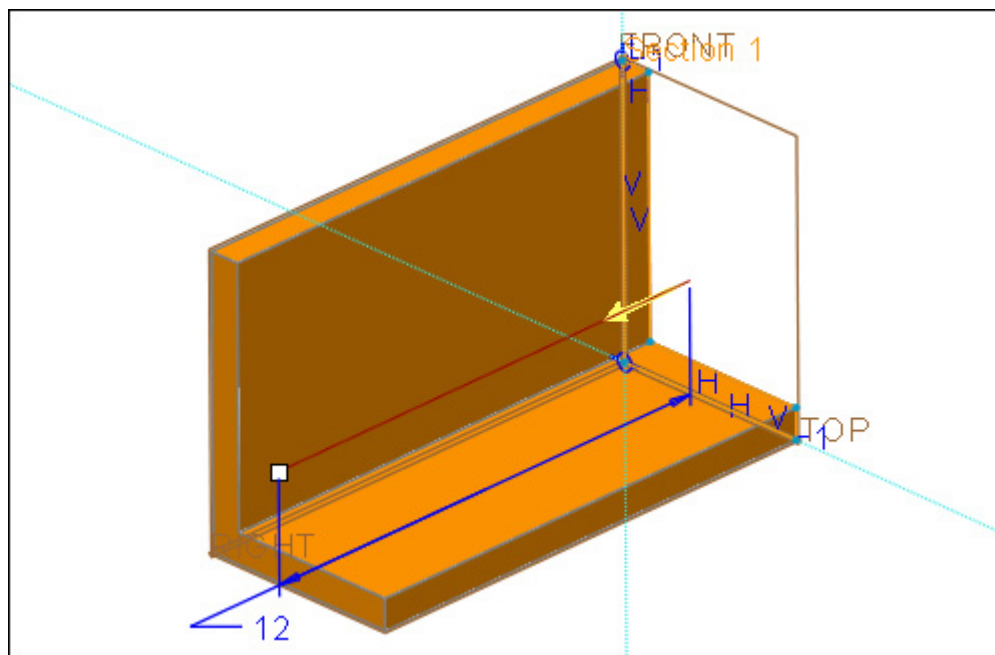
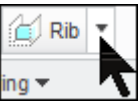
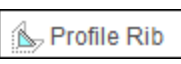


Figure 13.3(b) Mounting Bracket will be 12.00 in Length

Click:  >  >  >  > select the **FRONT** datum plane > double-click in the **Offset Translation** field > **2.00** [Fig. 13.3(c)] > **Enter** > **OK** >  **Resumes the previously paused tool** >  > sketch the three lines of the open section [Fig. 13.3(d)] > **Ctrl+D** >  [Fig. 13.3(e)] > in the Graphics Window, double-click on the rib thickness and modify to **0.5** > **Enter** > **Enter** > **Ctrl+S** > **OK**

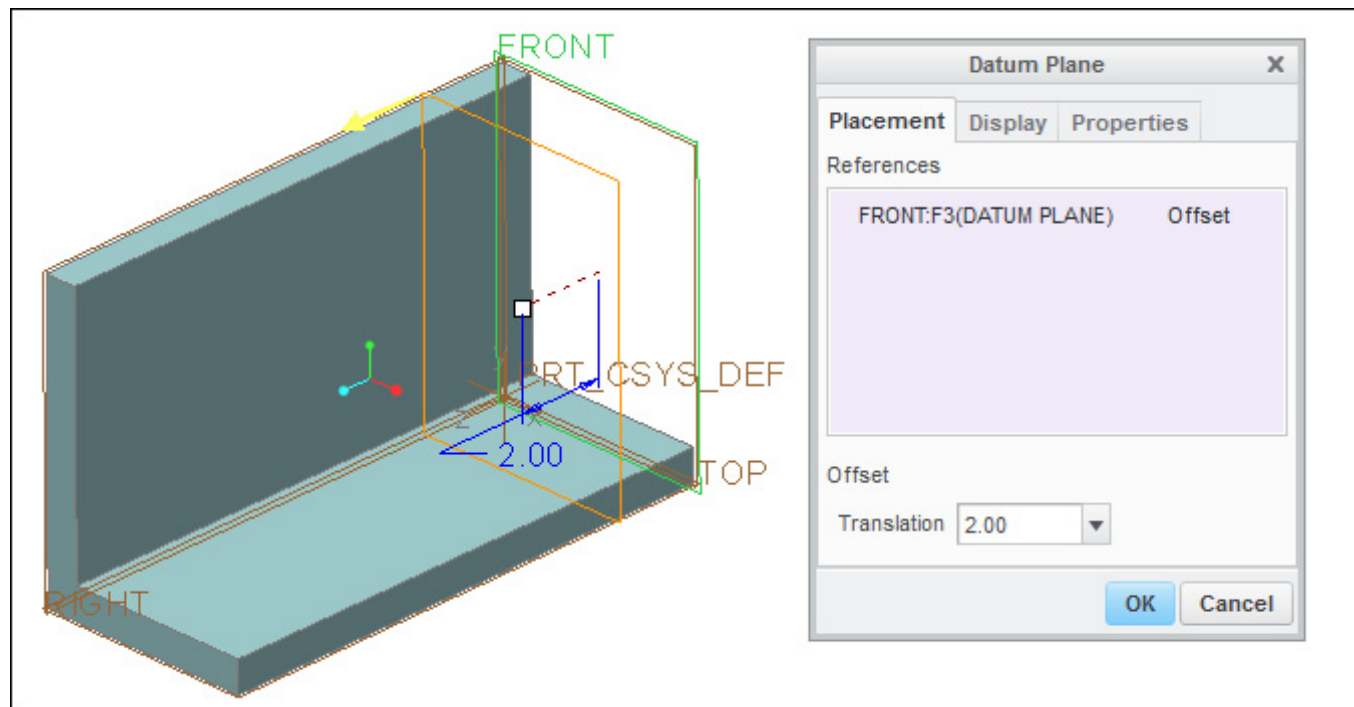


Figure 13.3(c) Offset Datum Plane (Note that you can also double-click on the value in the Graphics Window)

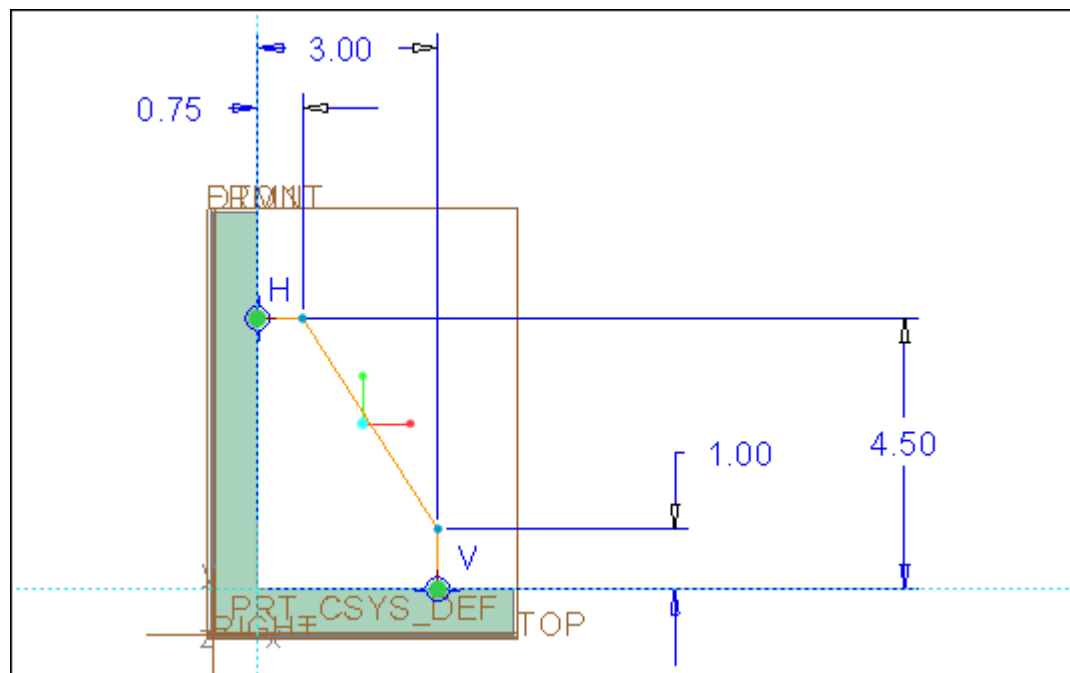


Figure 13.3(d) Open Section for the Rib (Note the Reference Lines)

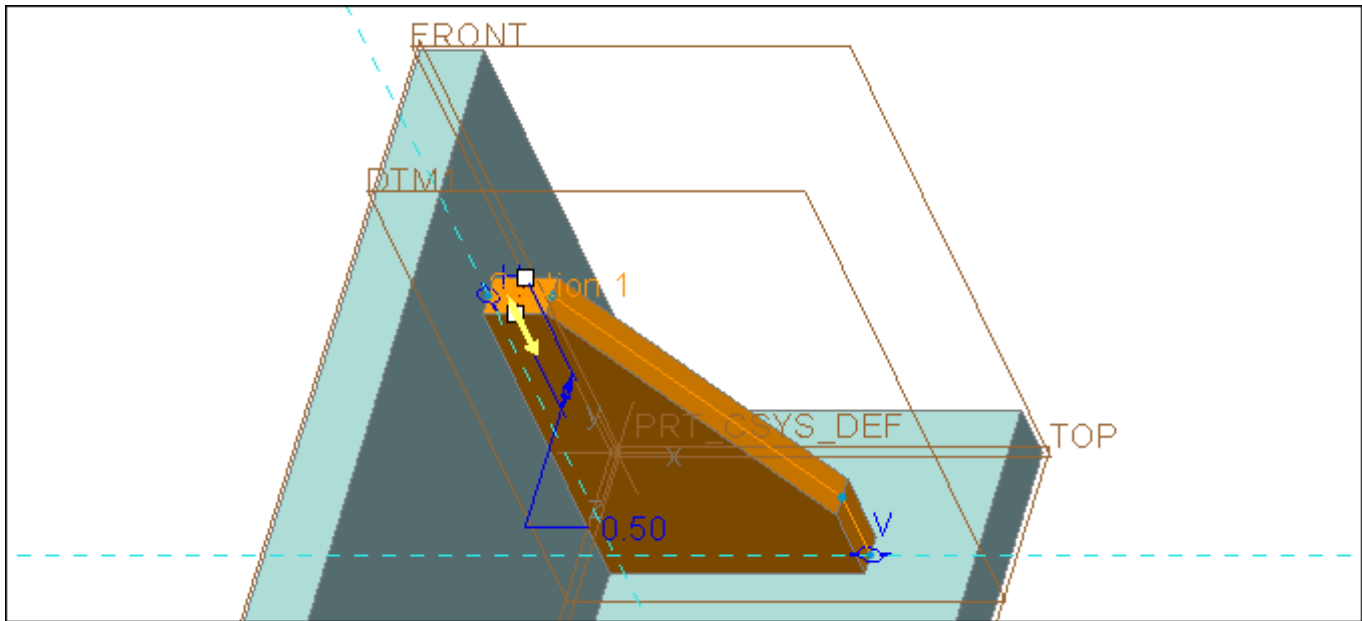


Figure 13.3(e) Rib Preview

With the rib still selected, press: **RMB** > **Pattern** >  > **Dimension** > **Dimensions** tab > in the Graphics Window, select **2.00** > type **4.00** > **Enter** > 1 item(s), type **3** > **Enter** [Fig. 13.3(f)] >  > **Ctrl+S** > **OK**

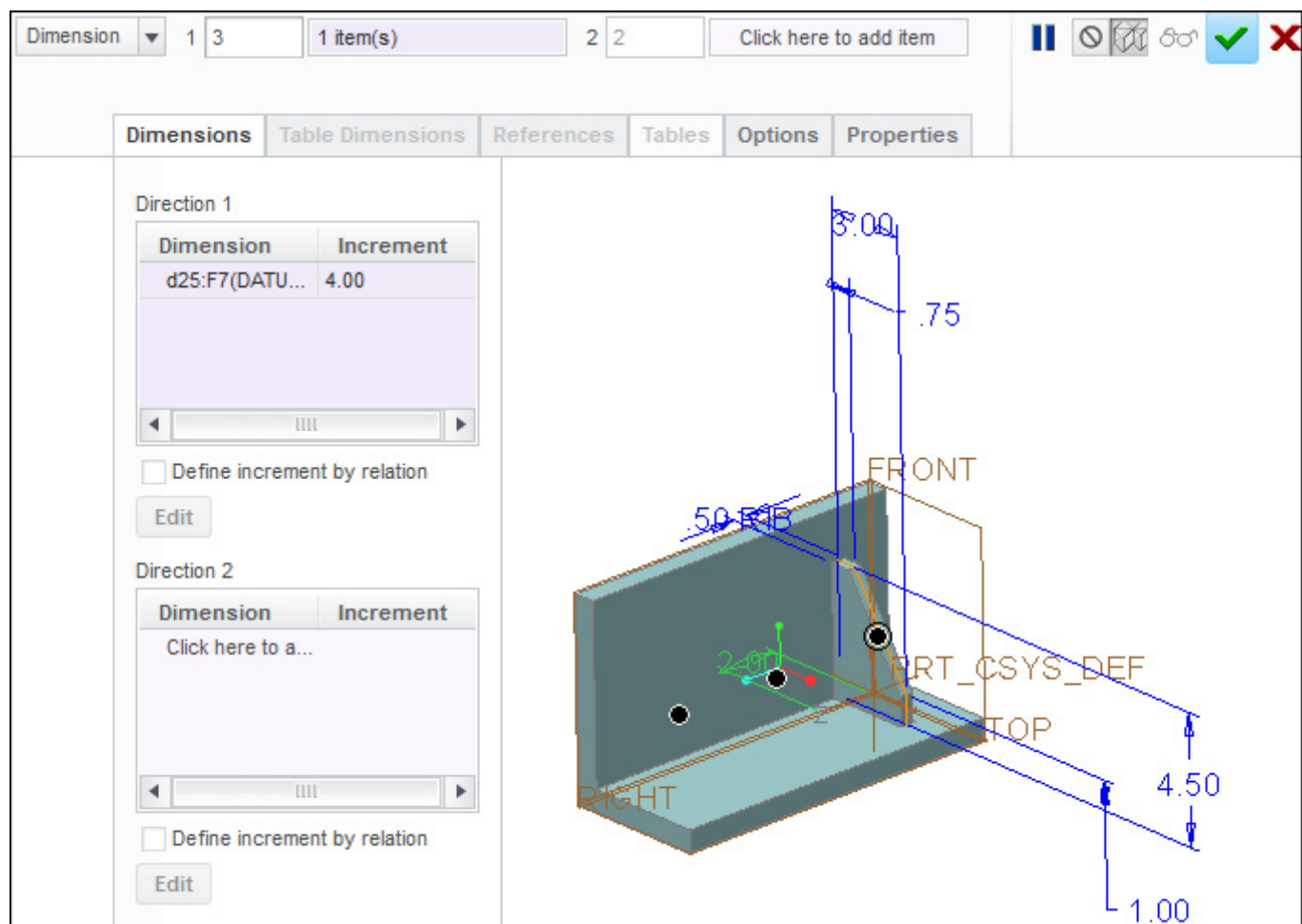


Figure 13.3(f) Dimensional Pattern

Click:  Hole > create the hole as per the Placement and Shape requirements [Figs. 13.3(g-h)] > 

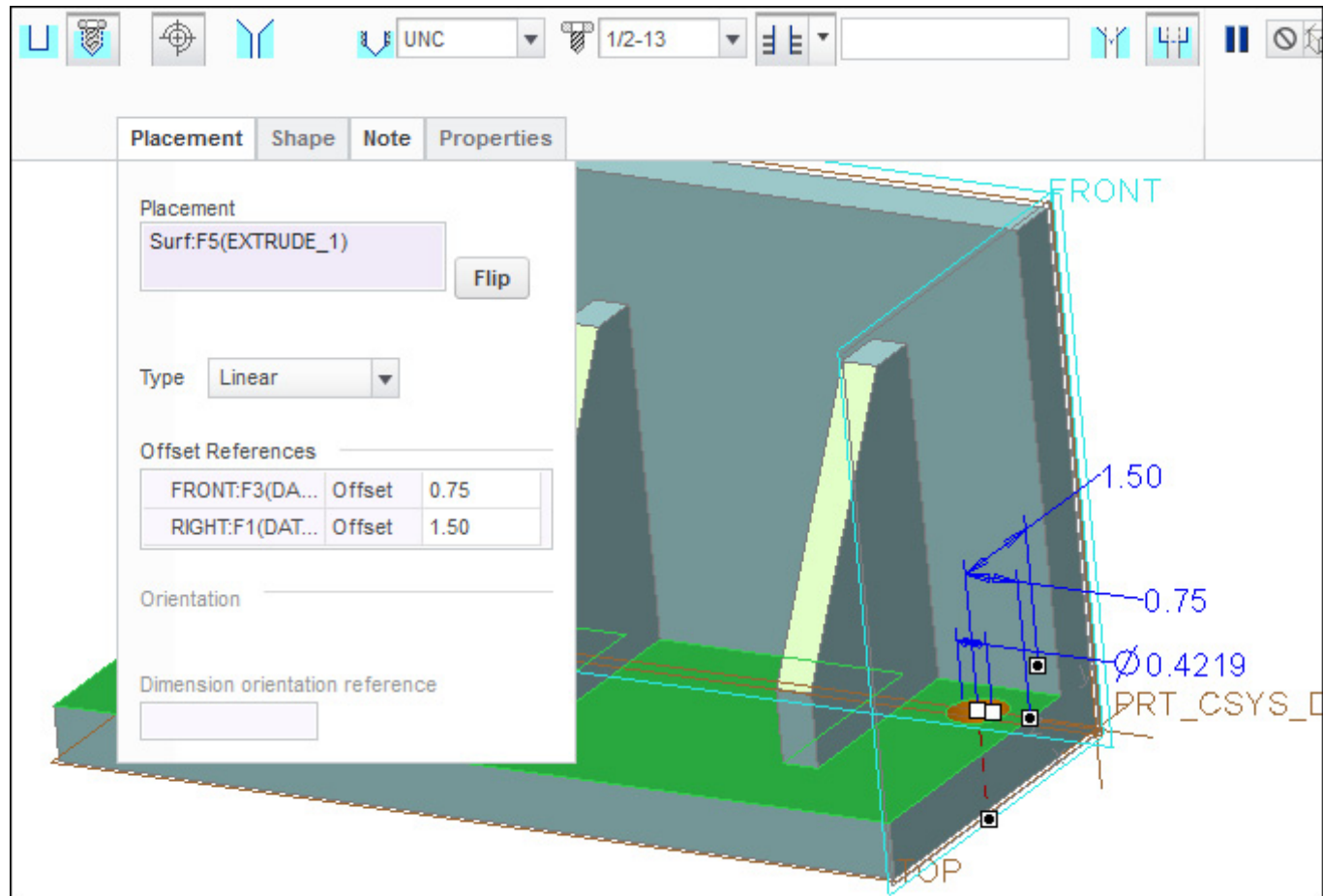


Figure 13.3(g) Hole Placement

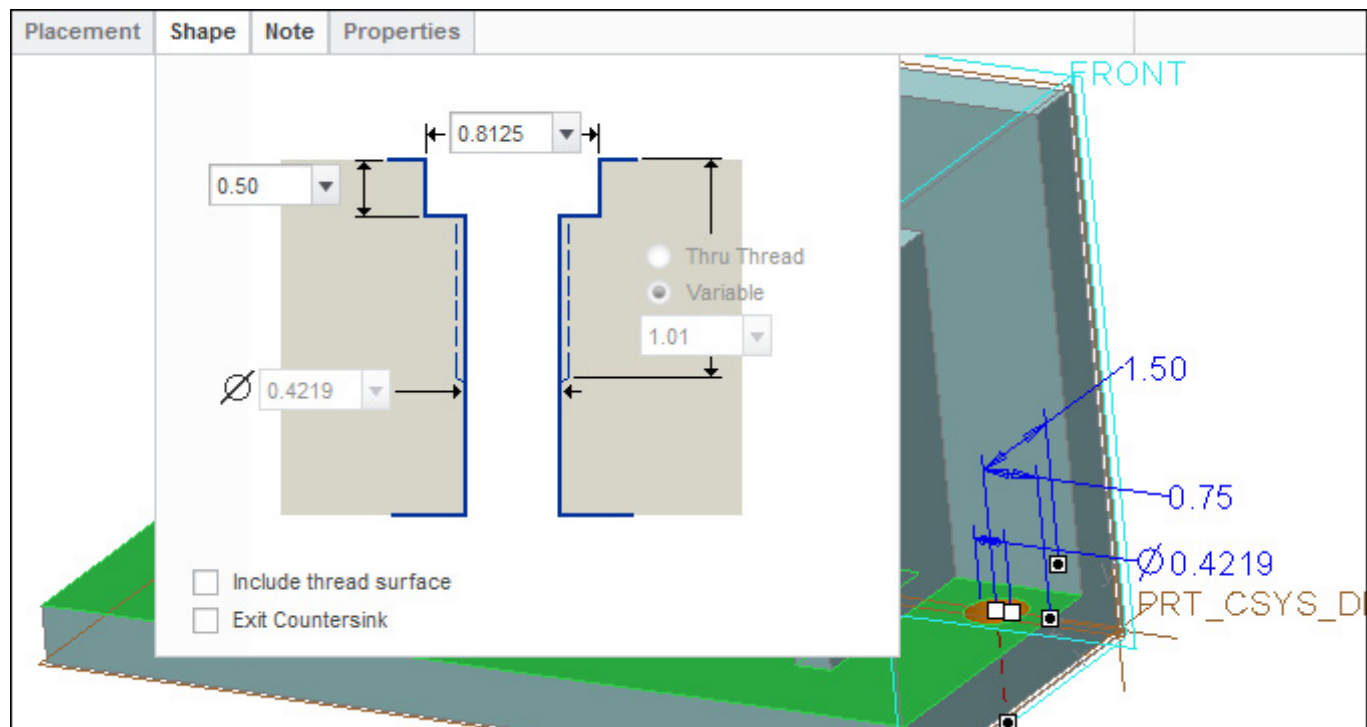
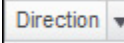


Figure 13.3(h) Hole Shape

With the new hole still selected (highlighted), press: **RMB** > **Pattern** >  > **Direction** >  1 <--> 1 Plane  2 2.75 <--> 2 <--> 1 Plane  4 3.50 <--> > remove the inner two pattern instances  [Fig. 13.3(i)] >  [Fig. 13.3(j)] > **Ctrl+S** > **OK**

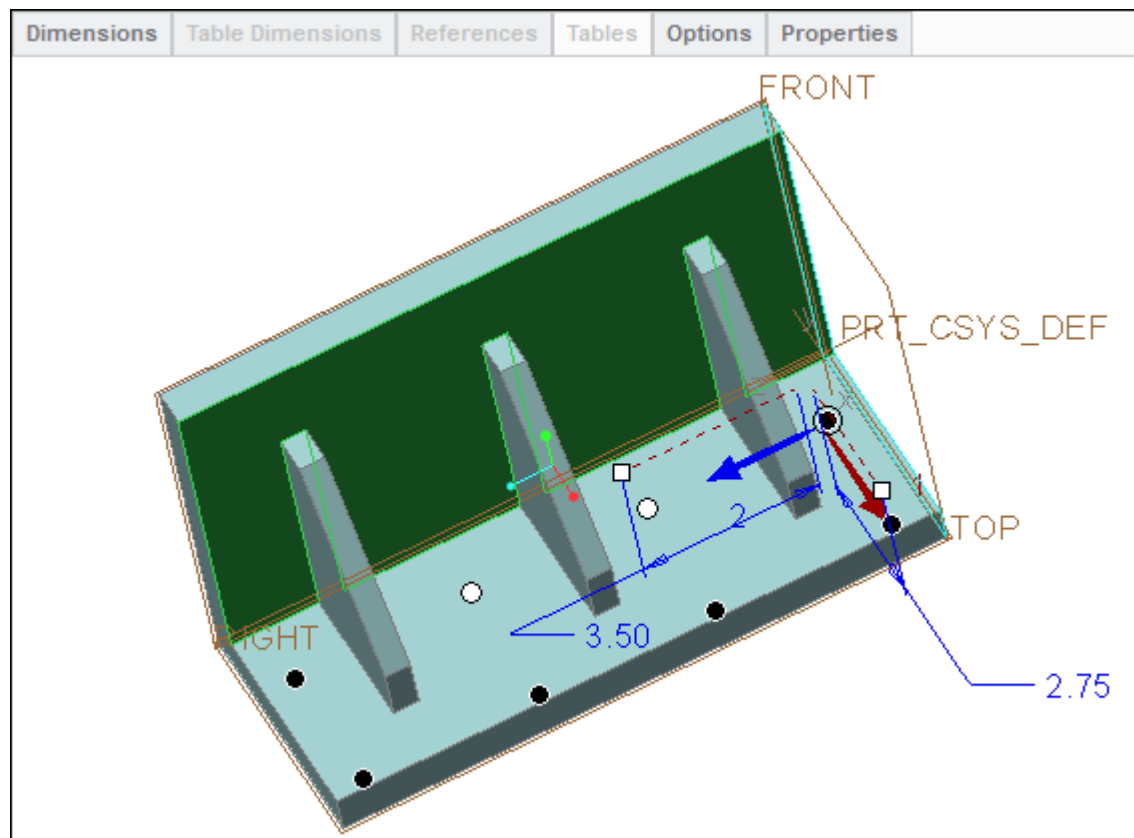


Figure 13.3(i) Directional Pattern

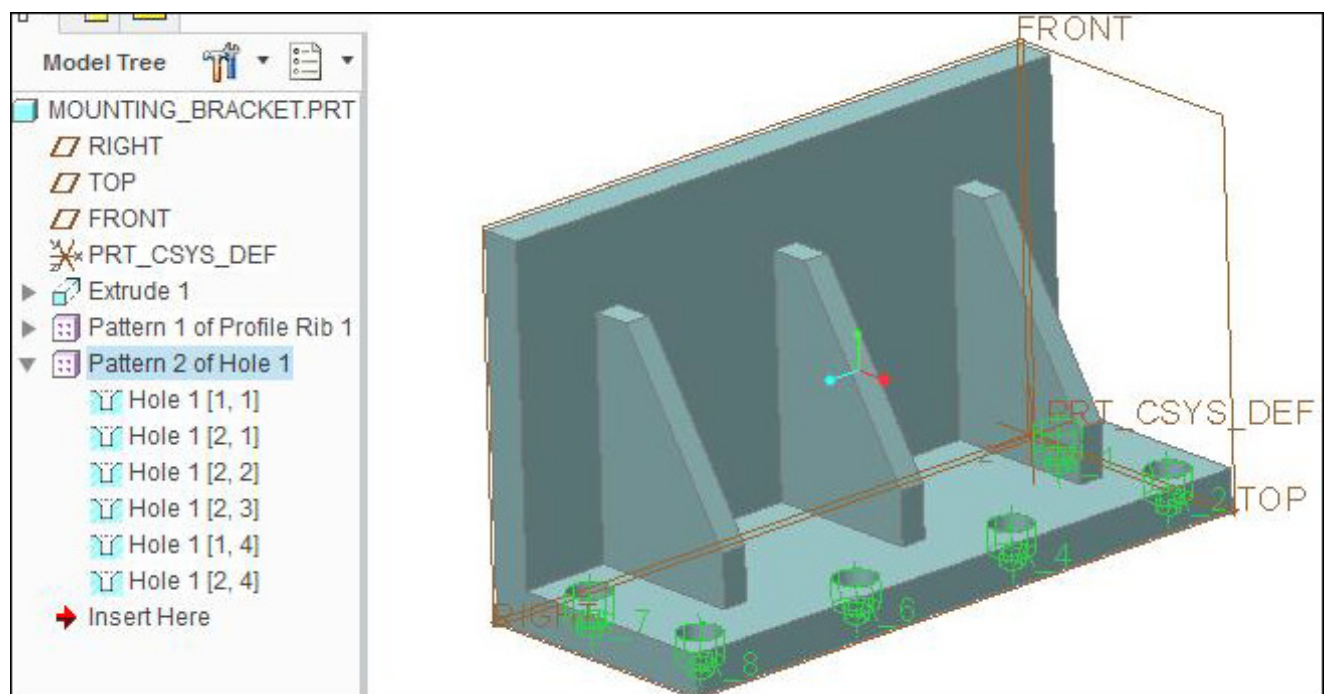


Figure 13.3(j) Counterbore Hole Pattern

Click:  Hole > add the **.500-13** hole, located per the Placement and Shape requirements [Figs. 13.3(k-l)]
 >  > **Ctrl+S** > **OK**

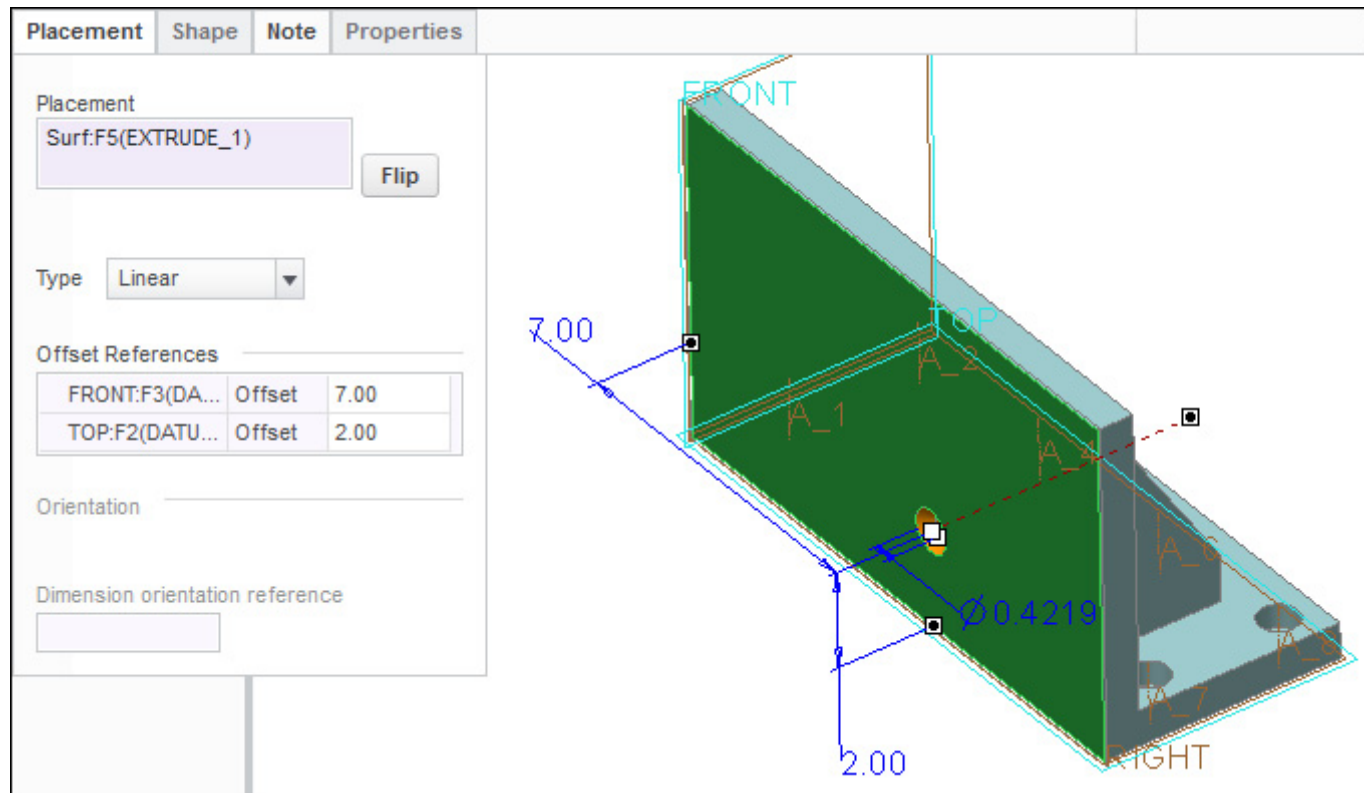


Figure 13.3(k) 7.00 from Datum FRONT and 2.00 from Datum TOP

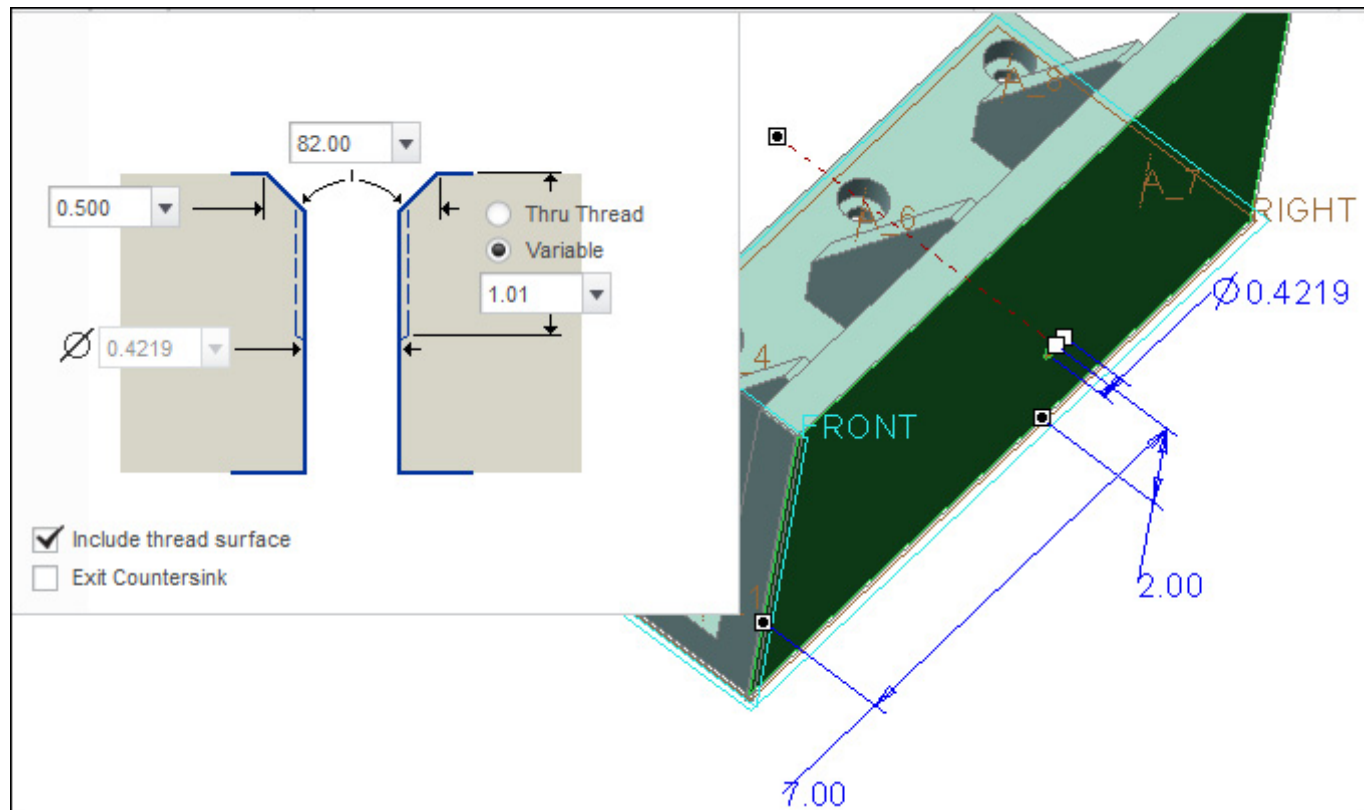


Figure 13.3(l) Shape of .500-13 Hole

With the new hole still selected (highlighted), press: **RMB** > **Pattern** >  > **Fill** > **References** tab > **Define** > select the left face of the part > **Sketch** >  >  **Offset** > **Loop** > select the left face > **-.3875** [Fig. 13.3(m)] > **Enter** [Fig. 13.3(n)] > **Close** >  > Sets the spacing between pattern member centers, type **1.00** > **Enter** >  >  Internal >  >  1.00 >  0.00 >  0.00 >  NOT DEF >

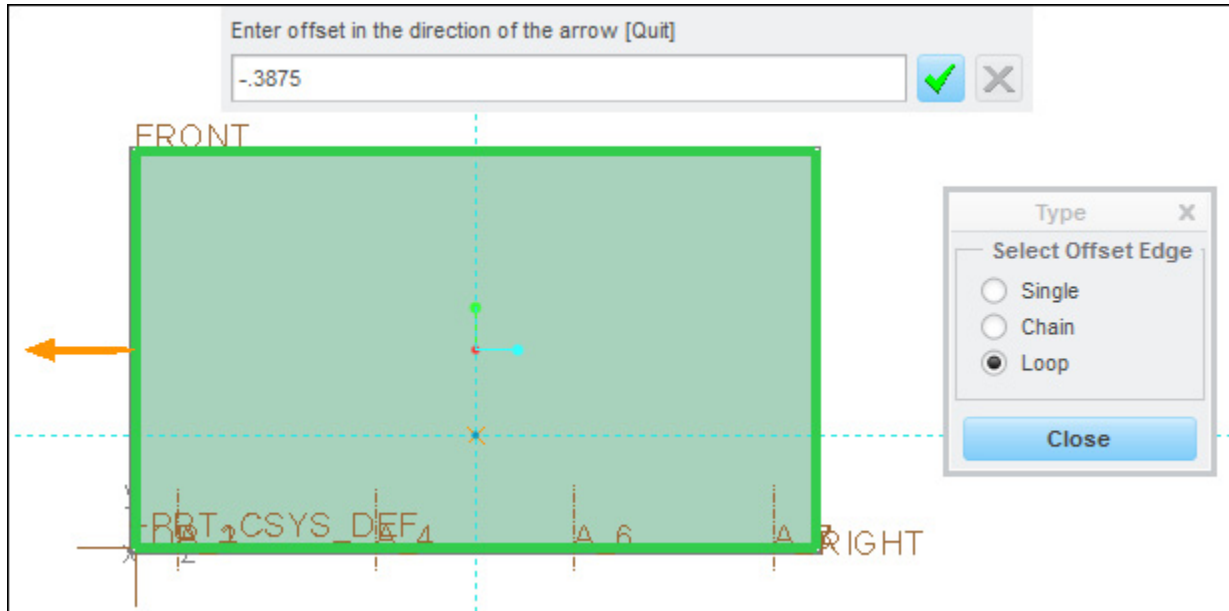


Figure 13.3(m) Offset **-.3875**

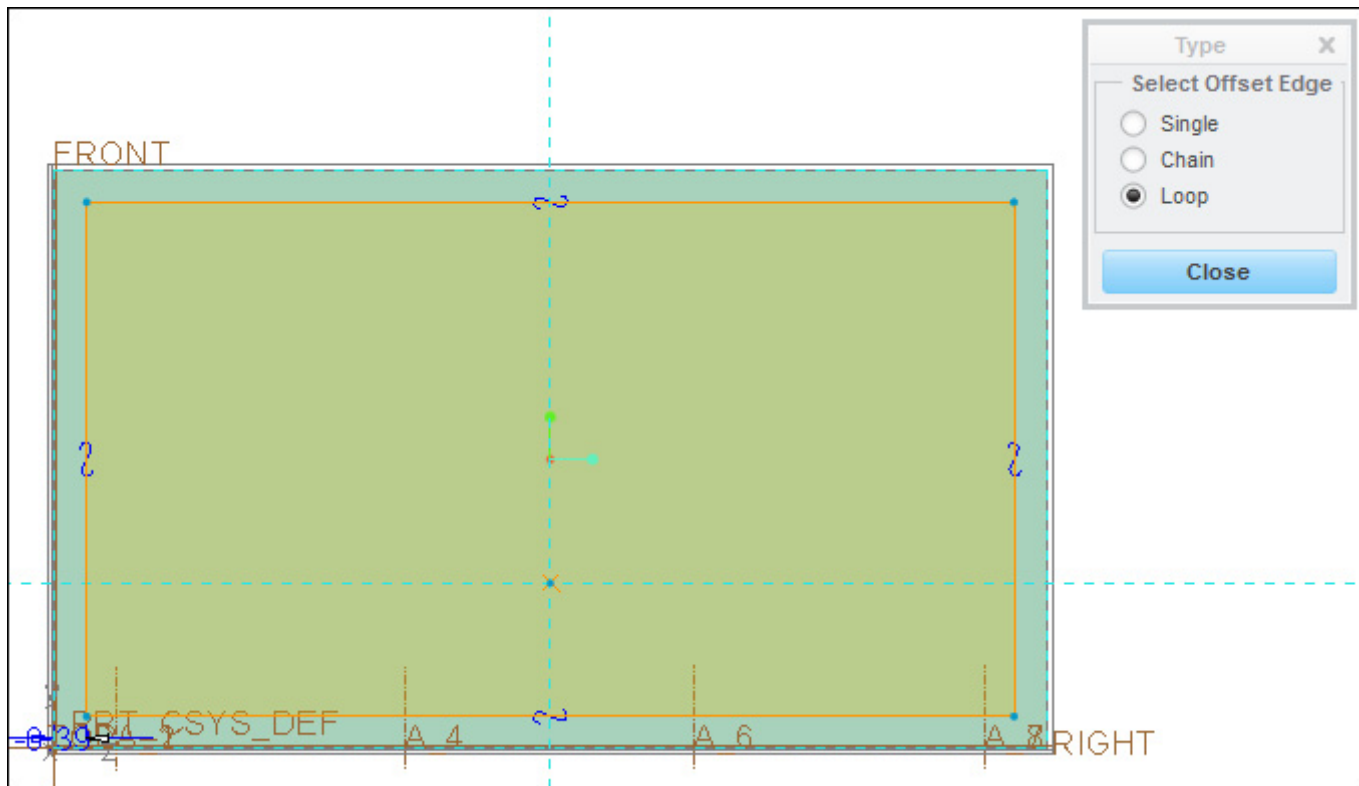


Figure 13.3(n) Offset Loop

Click:  to toggle off the unwanted instances [Fig. 13.3(o)] > spin the part [Fig. 13.3(p)] > 

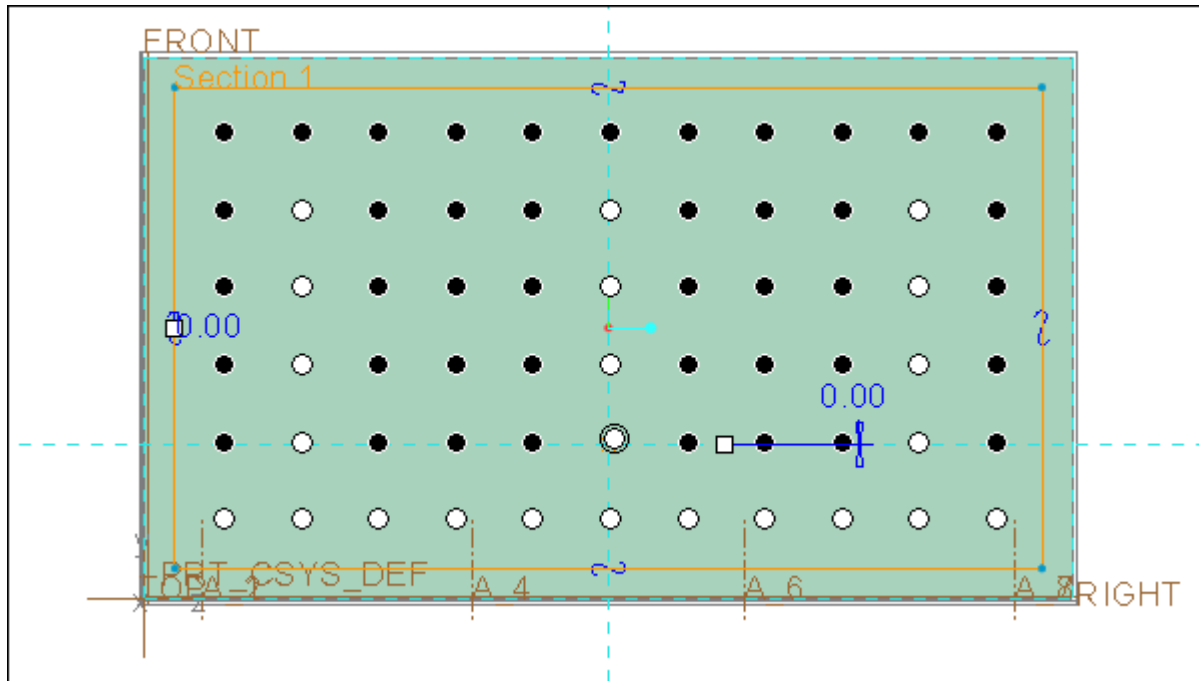


Figure 13.3(o) Toggle Off Unwanted Instances of the Pattern

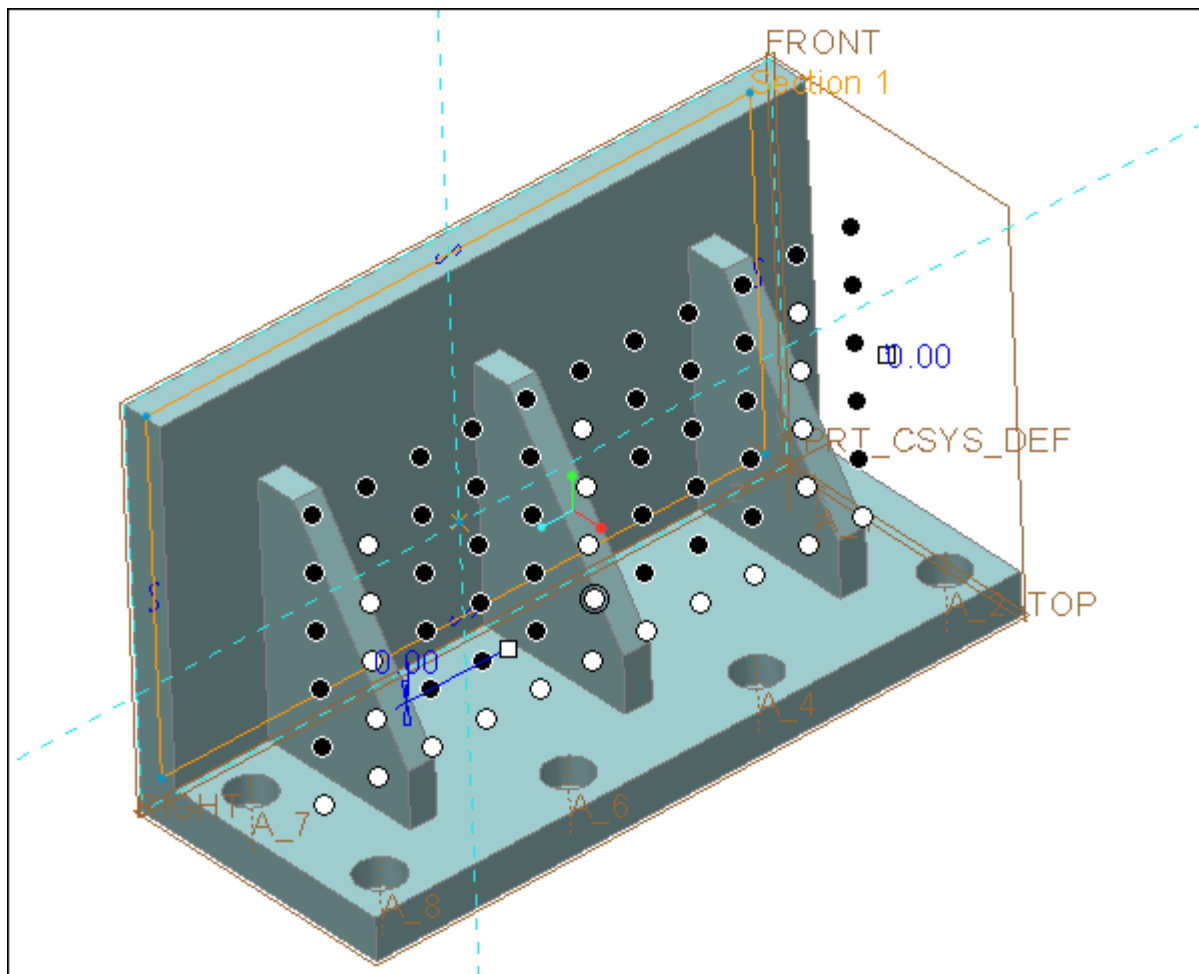
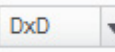


Figure 13.3(p) Pattern Preview

Click: **Applications** tab >  > ☐ (SelectAll) all off > **LMB** in the Graphics Window >  >  >  >  > DxD > D 0.125 > D2 NOT DEF >  > **Location** tab > select the surface as **Side 1** [Fig. 13.3(q)] > press **RMB** > **Side 2**

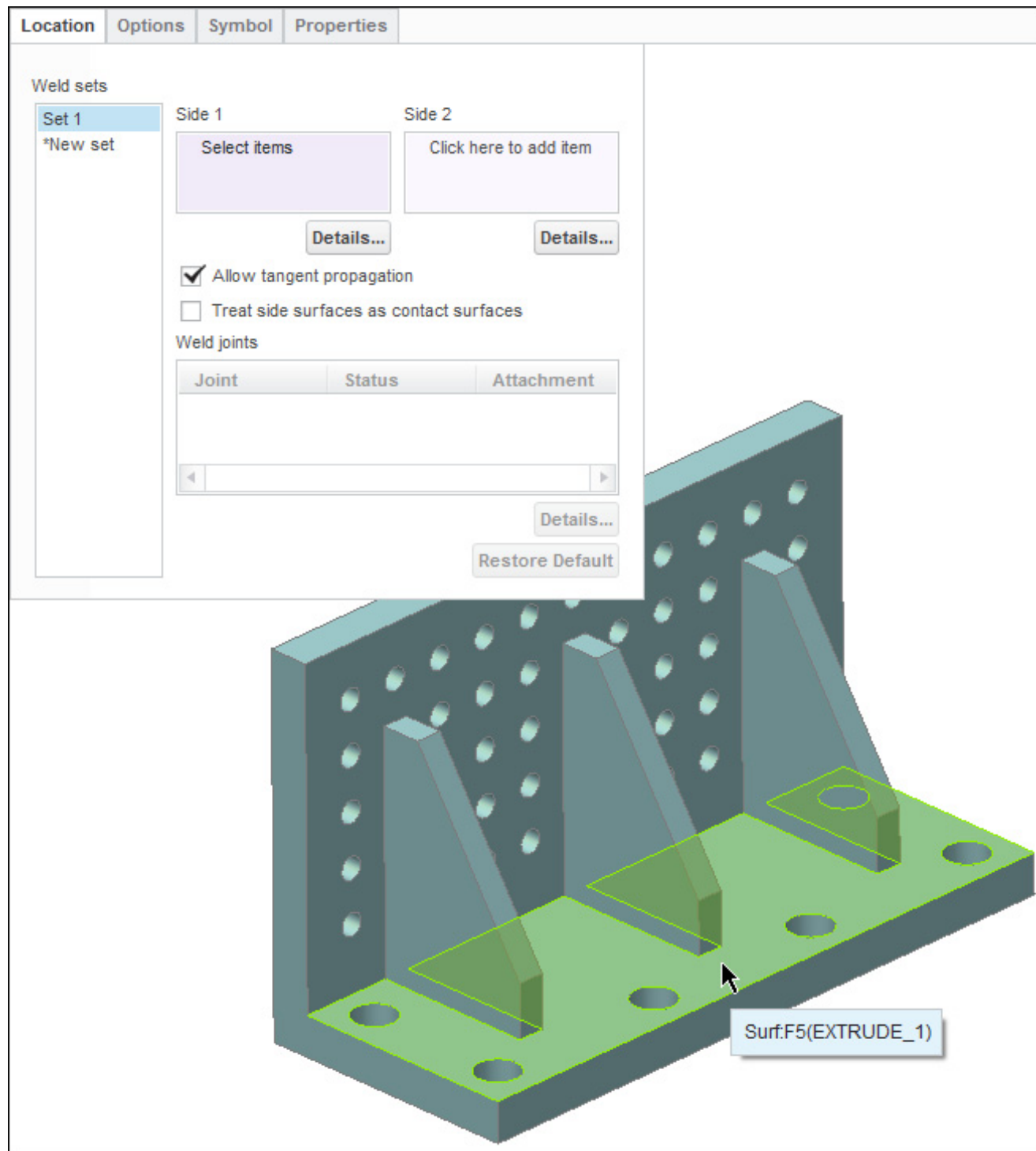


Figure 13.3(q) Select Side 1 of the Weld

Press and hold the **Ctrl** key and select the vertical surfaces of the ribs [Fig. 13.3(r)] > release the **Ctrl** key > press **RMB** > **New Set**

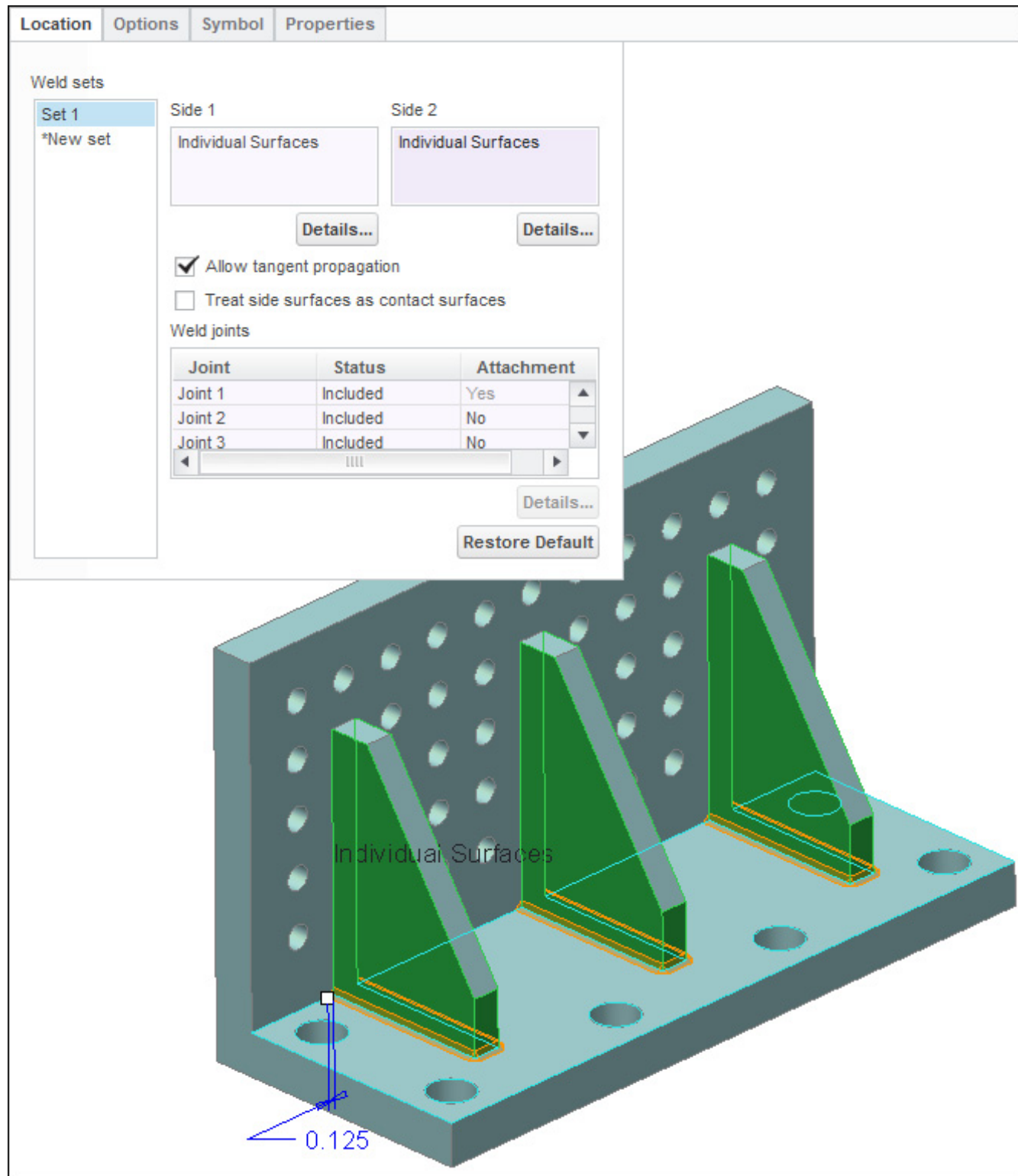


Figure 13.3(r) All Vertical Surfaces for Side 2 of the Weld

Press: **RMB** > **Side 1** > select the vertical surface as **Side 1** [Fig. 13.3(s)] > press **RMB** > **Side 2**

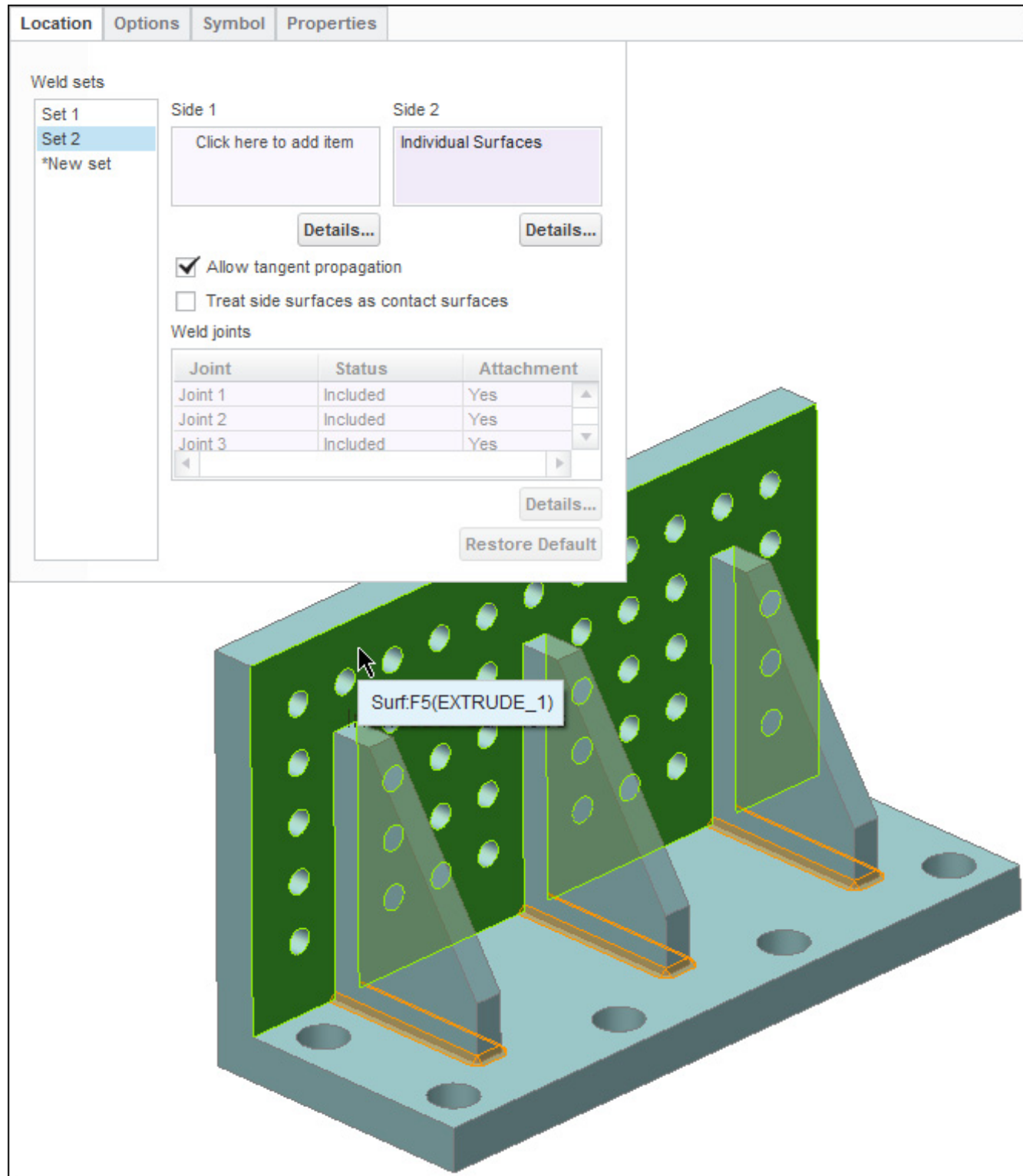


Figure 13.3(s) Select Side 1 of Set 2 Weld Sets

Press and hold the **Ctrl** key and select the surfaces of the ribs > release the **Ctrl** key >  on [Fig. 13.3(t)] >



If you select the wrong item, place the pointer over the item in the appropriate dialog box > press RMB > remove.

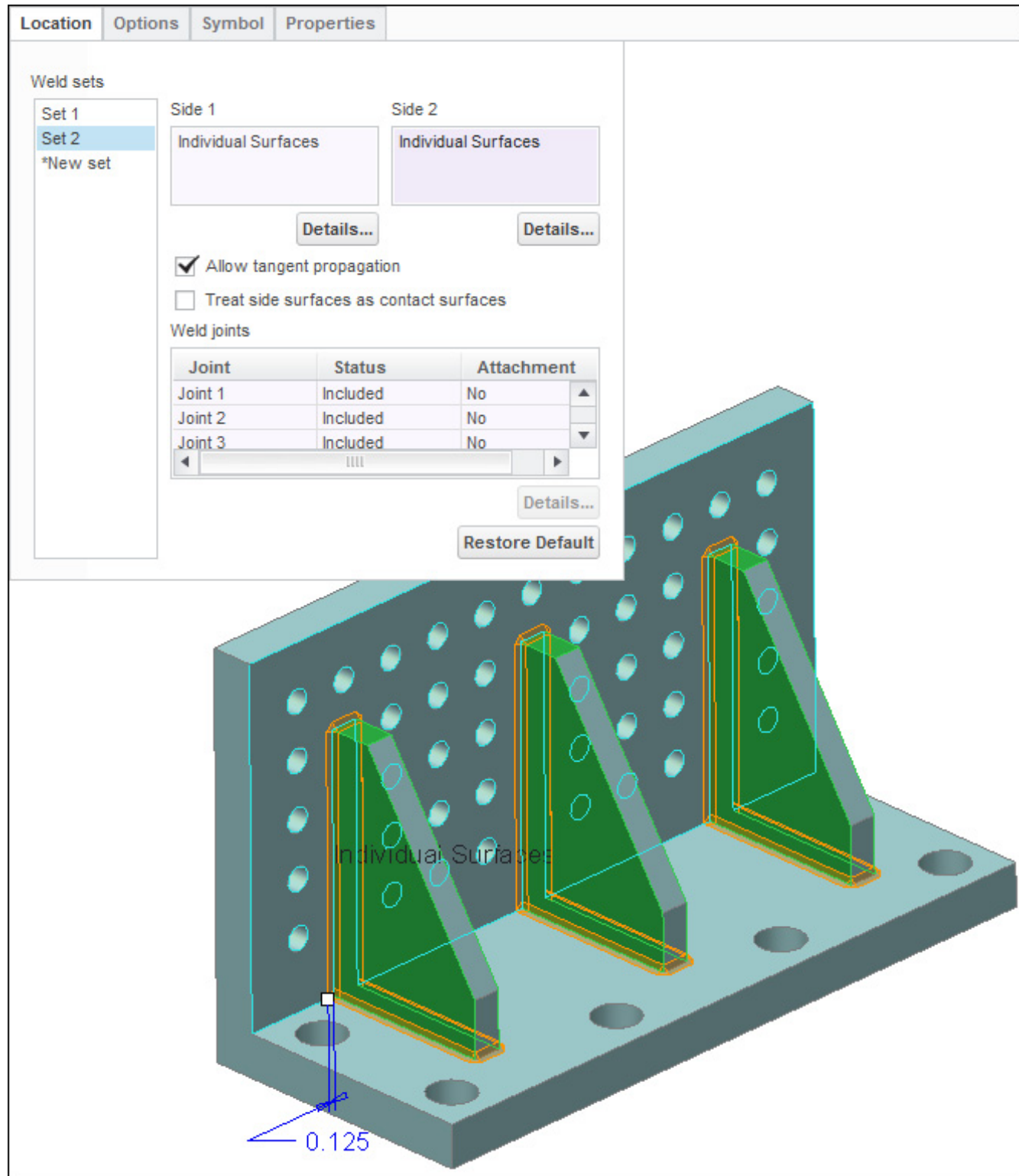


Figure 13.3(t) Select the Surfaces for Side 2 of the Weld Set 2

Click:  [Fig. 13.3(u)] > **Ctrl+S** > **OK** > **File** > **Manage File** > **Delete Old Versions** > **Enter** > **File** > **Save As** > Type >  > **Zip File (*.zip)** (scroll to the end of list) > **OK** > **upload** the zip file to your course interface or attach to an email and send to your instructor and/or yourself > **File** > **Close**

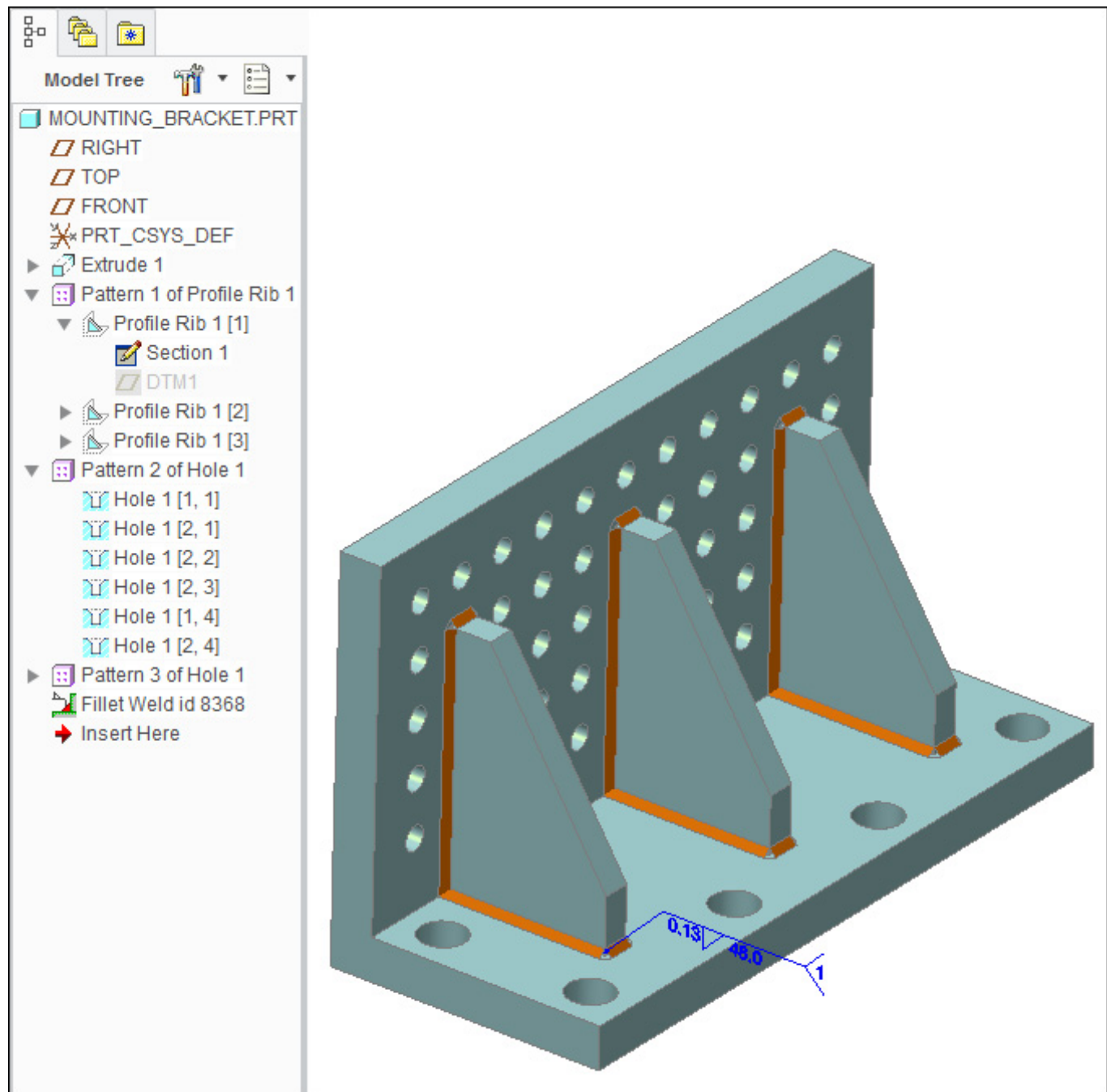


Figure 13.3(u) Completed Fillet Weld

Base Plate

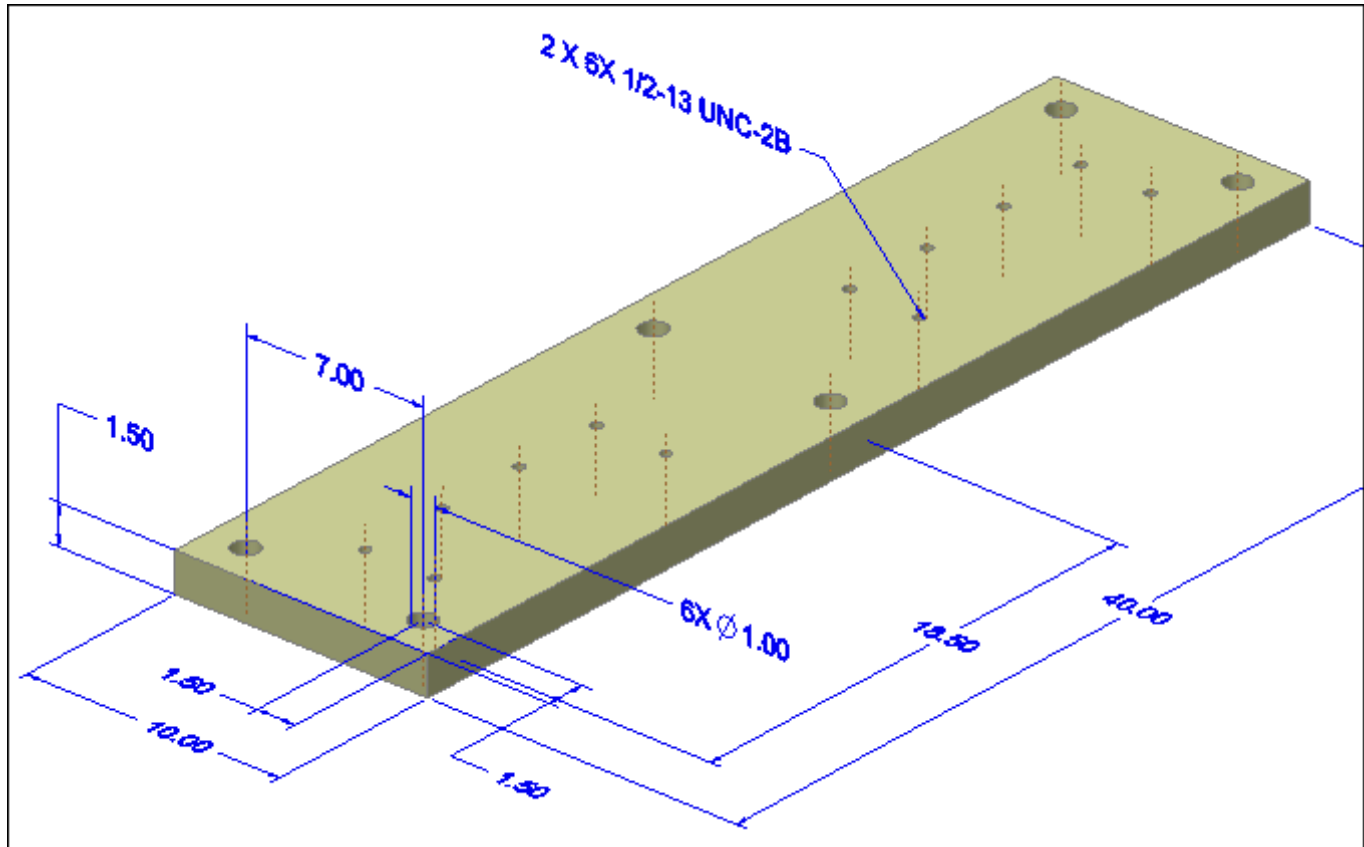


Figure 13.4(a) Base Plate

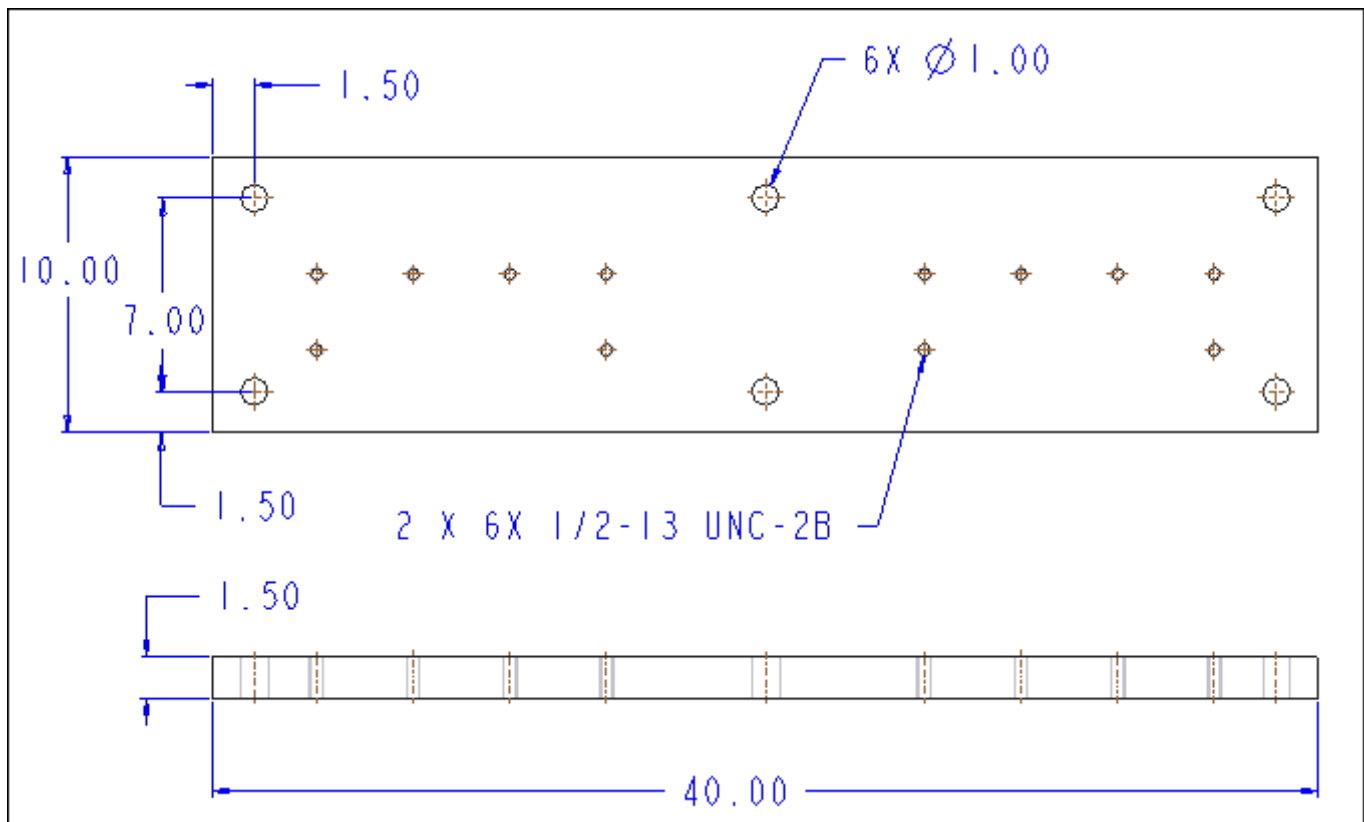
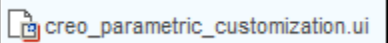


Figure 13.4(b) Base Plate Detail

Press: **Ctrl+N** > **base_plate** > **OK** > **File** > **Options** > **Customize Ribbon** > **Import/Export** > **Import customization file** > select your previously saved .ui file from Lesson 2 () > **Open** > **Import Mode Customizations** > **Configuration Editor** > **Import/Export** > **Import configuration file** > select your previously saved file from Lesson 2 (**CREO_textbook.pro**) > **Open** > **OK** > **No** >  >  all on > select the **TOP** datum plane >  >  > add vertical and horizontal centerlines > sketch the rectangular section [Fig. 13.5(a)] >  > **Standard Orientation** >  > modify the depth to **1.50** inches [Fig. 13.5(b)] > **Enter** >  > **Ctrl+S** > **OK**

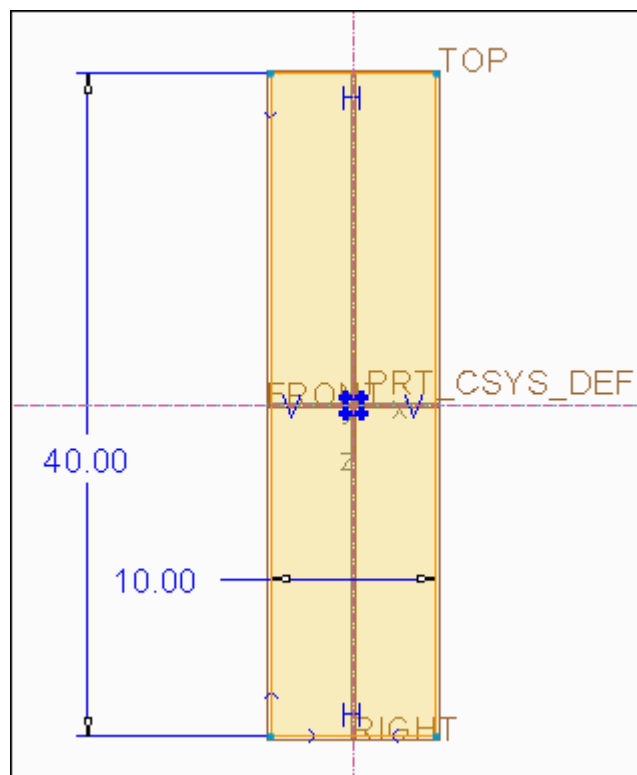


Figure 13.5(a) Sketch the Rectangular-shaped Section

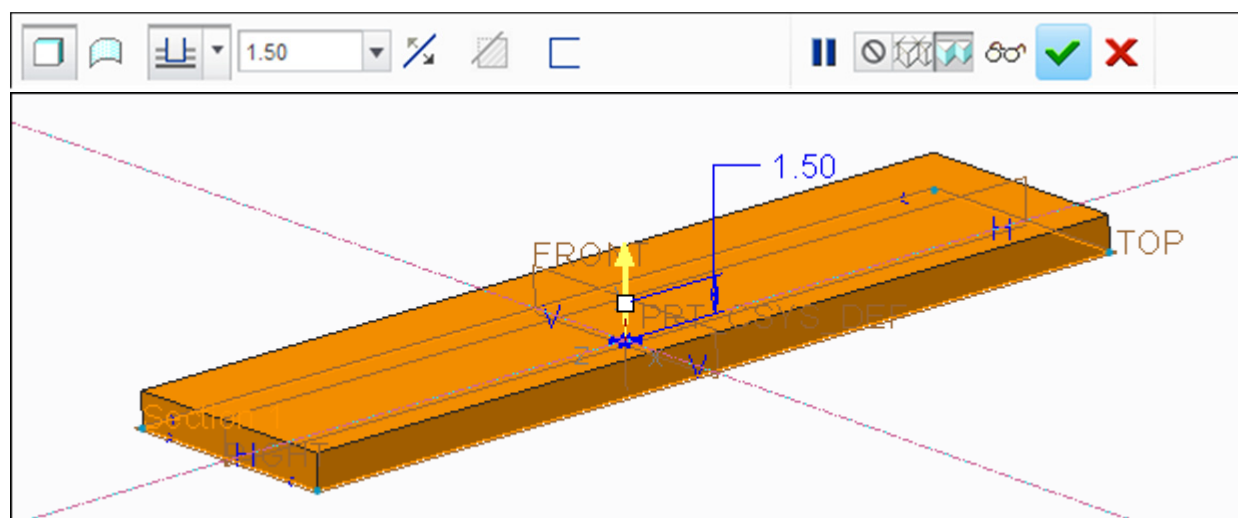


Figure 13.5(b) Depth of 1.50

Click:  Hole > create the hole as per the Placement and Shape requirements [Figs. 13.5(c-e)] >

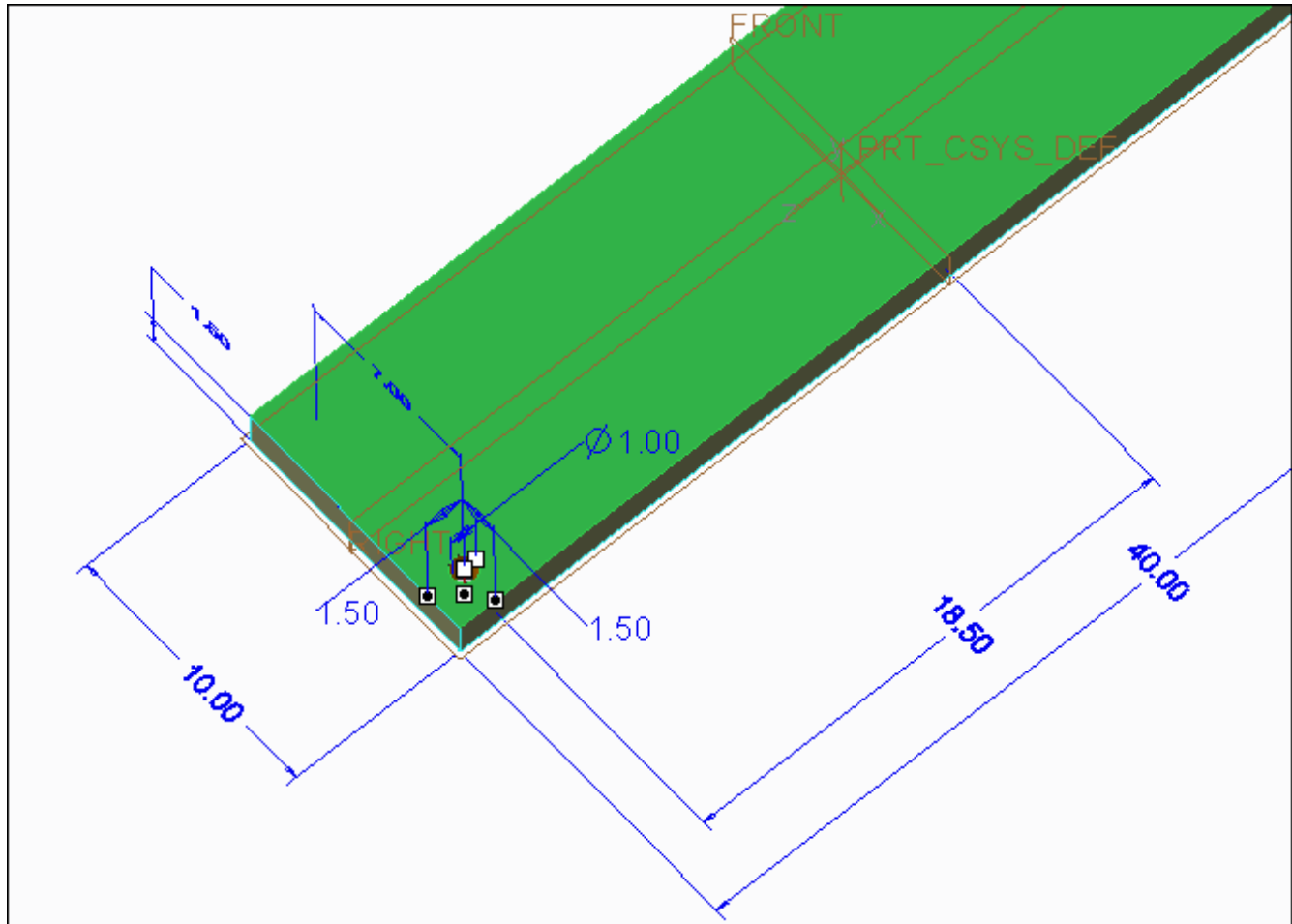
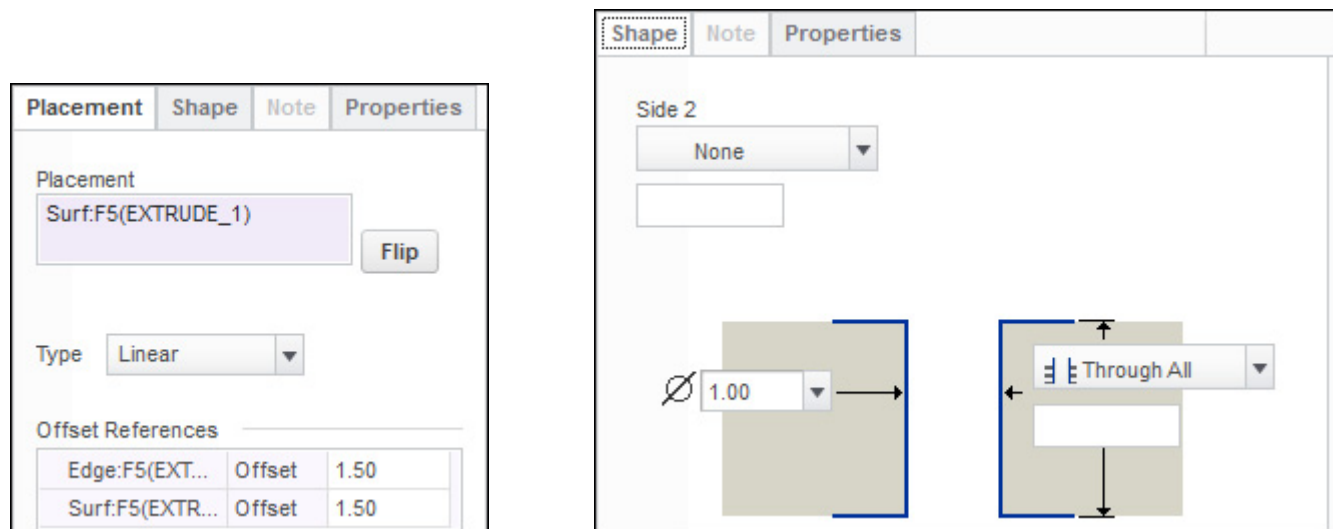


Figure 13.5(c) 1.00 Diameter Hole



With the hole still selected (highlighted), press: **RMB** > **Pattern** [Fig. 13.5(f)] >  > **Direction** > select two reference direction surfaces [Fig. 13.5(g)] >  > **Ctrl+S** > **OK** > **Annotate** tab > select the features in the Model Tree > **Show Annotations** >  tab >  > **Apply** > **Cancel** > pick on a dimension > press **RMB** > **Move** > pick a new position > reposition remaining dimensions as required > **LMB** to deselect > **Model** tab

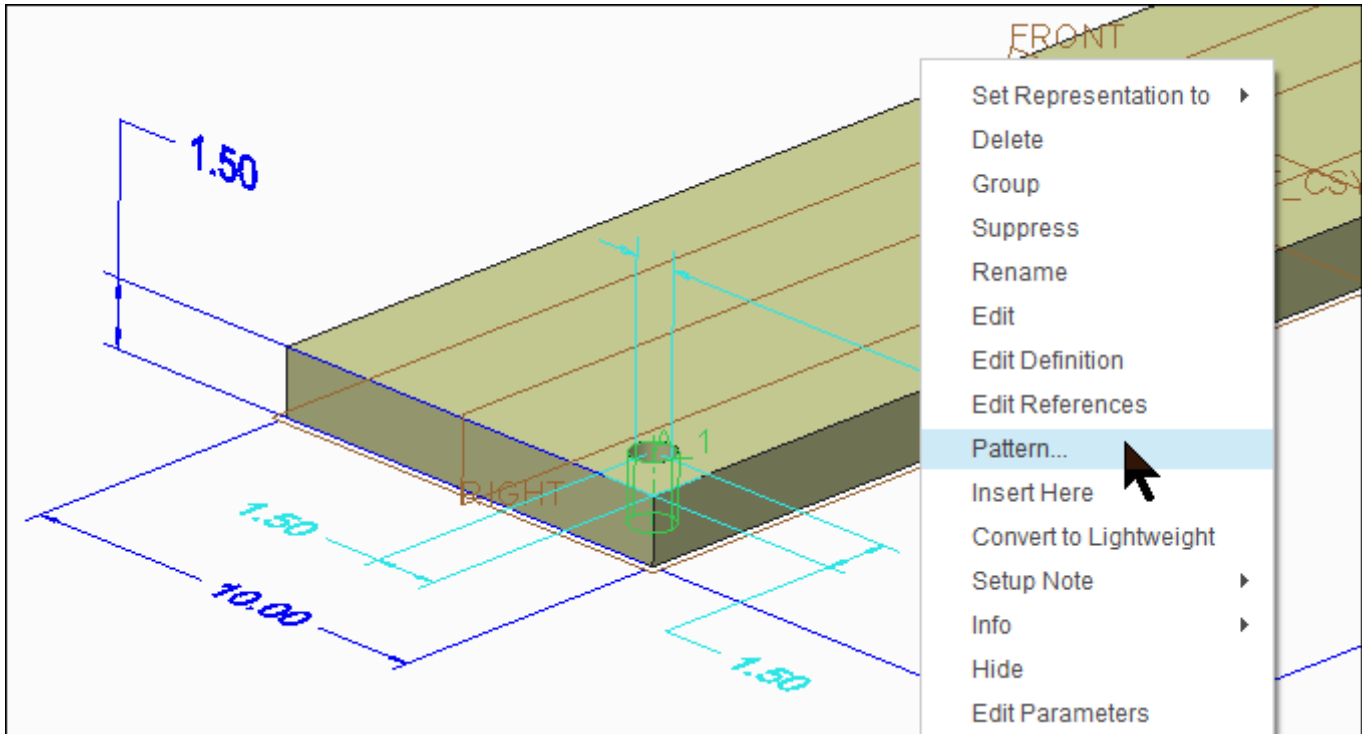


Figure 13.5(f) Pattern

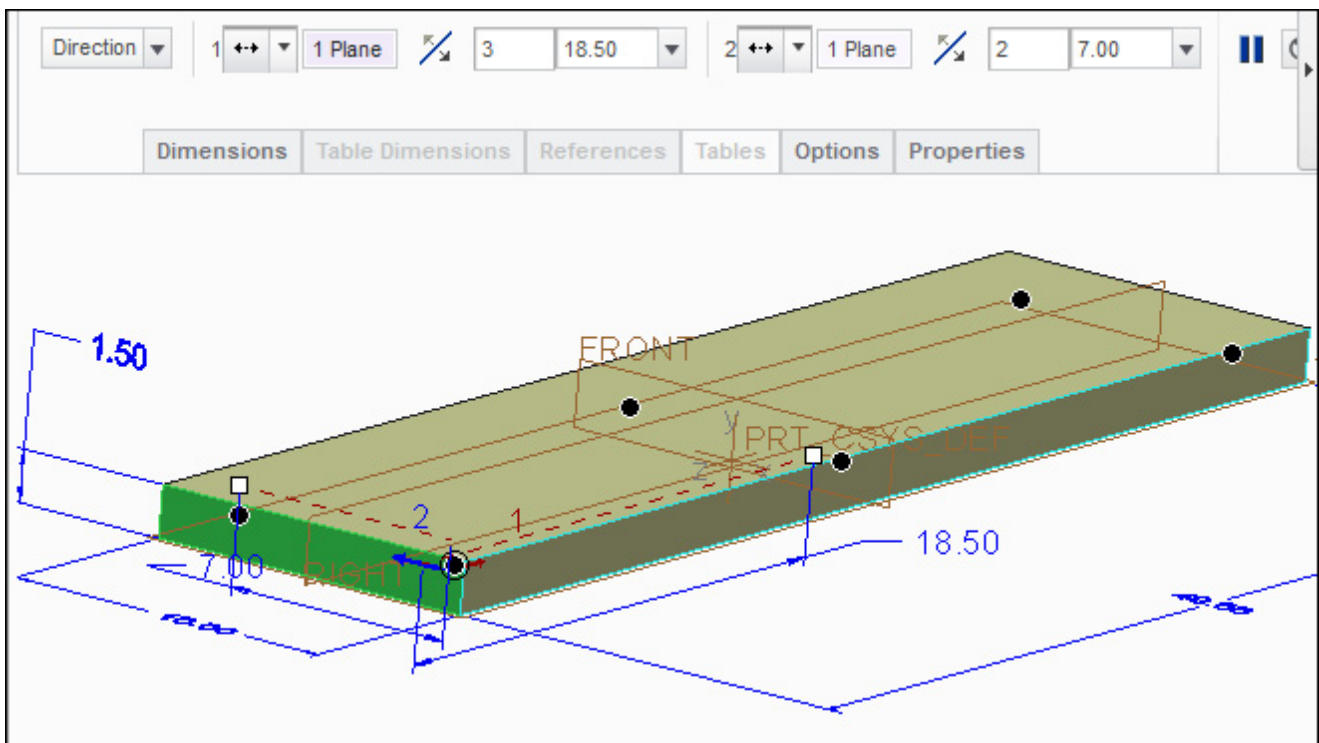


Figure 13.5(g) Pattern Preview (Enter Negative Spacing Values if Required)

Click: **Smart** > **Annotation** > select the **1.00** diameter dimension > press **RMB** > **Properties** > **Display** tab > **Prefix** **6X** [Fig. 13.5(h)] > **Move** > pick a new position > **OK** [Fig. 13.5(i)] > **LMB** > **Ctrl+D** > **Ctrl+S** > **OK** > **File** > **Save As** > **Type** > **Zip File (*.zip)** > **OK** > **upload** to your course interface or attach to an email and send to your instructor and/or yourself > **File** > **Close**

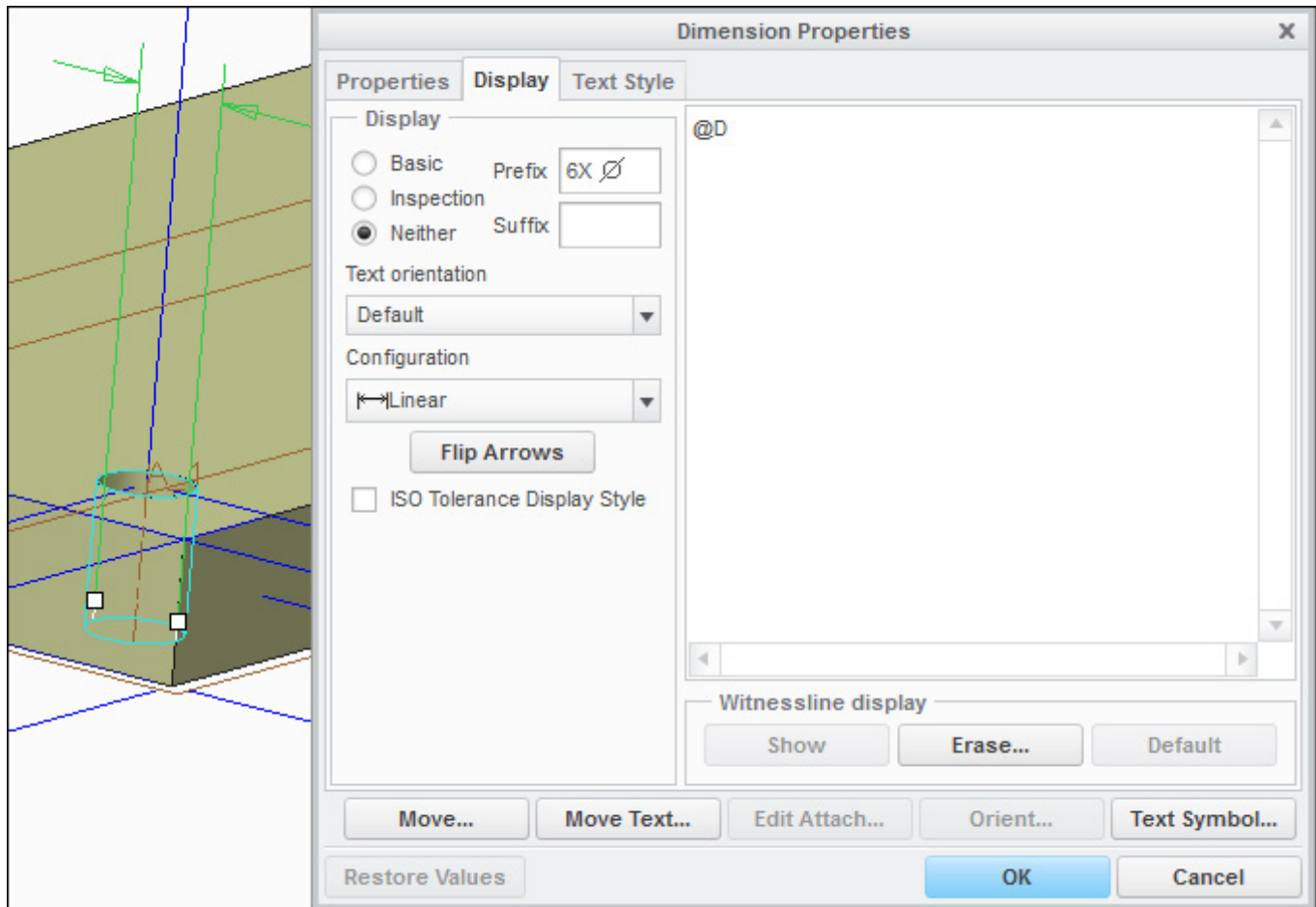


Figure 13.5(h) Dimension Properties

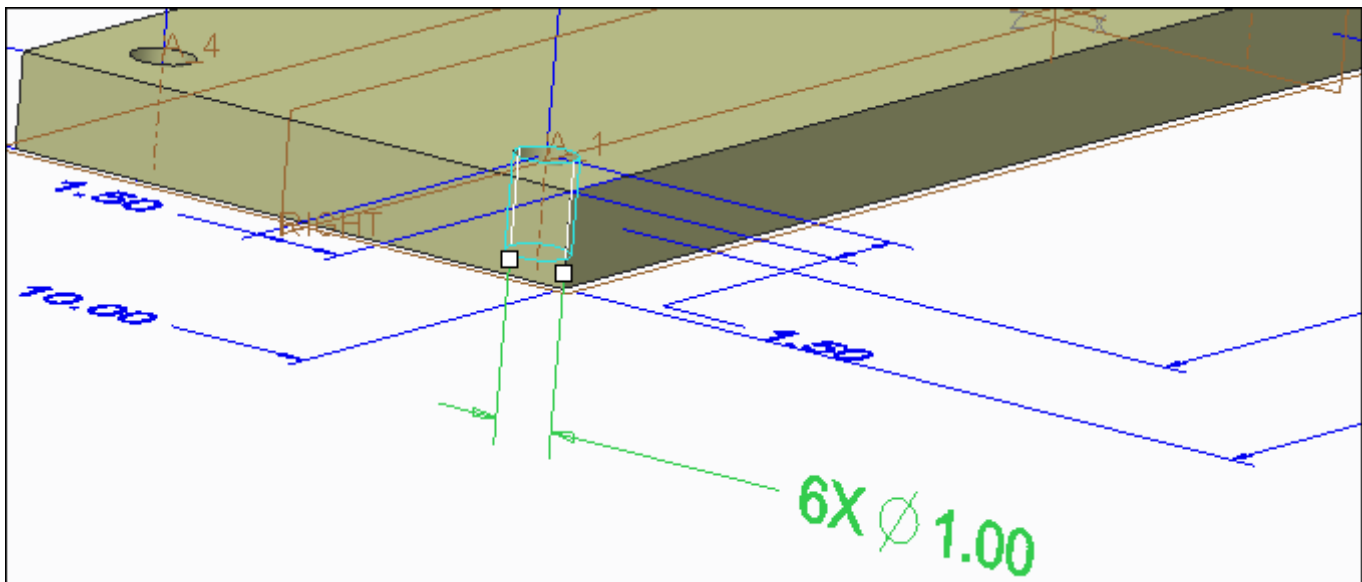


Figure 13.5(i) Edited Dimension Note (Your Note Orientation May Be Different)

Mounting System Assembly

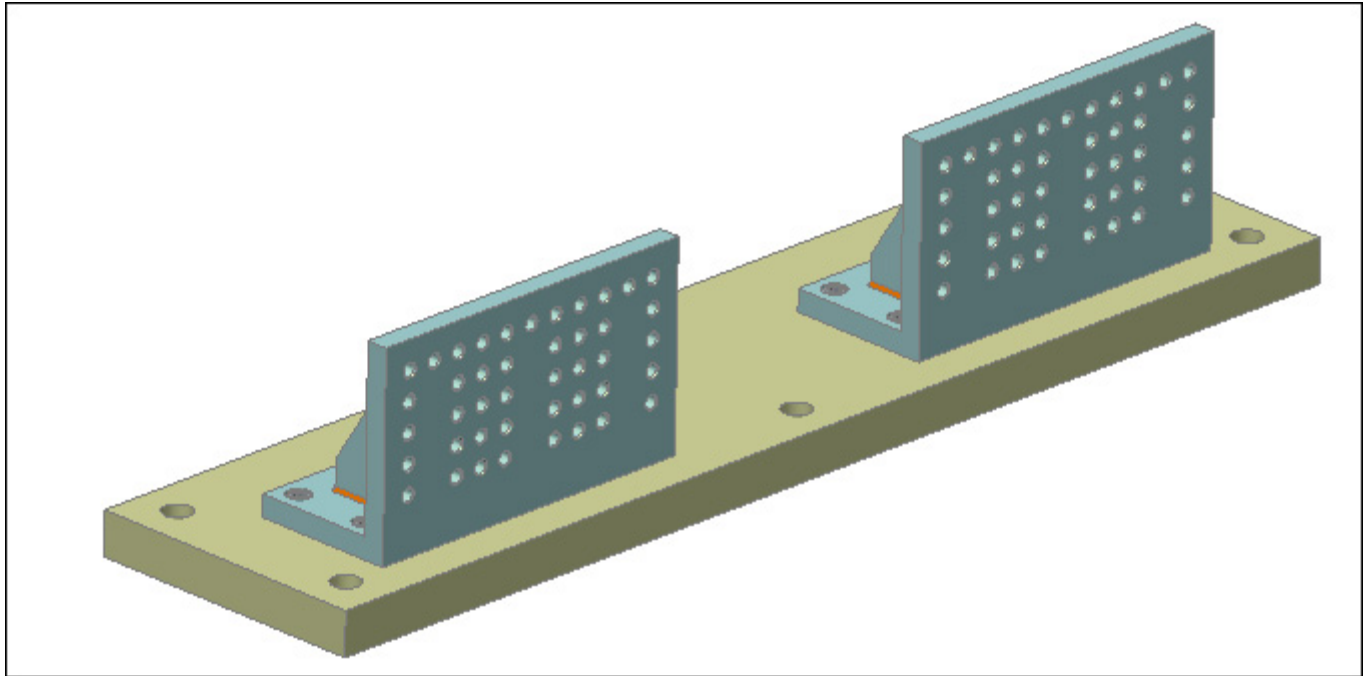


Figure 13.6(a) Mounting System Assembly

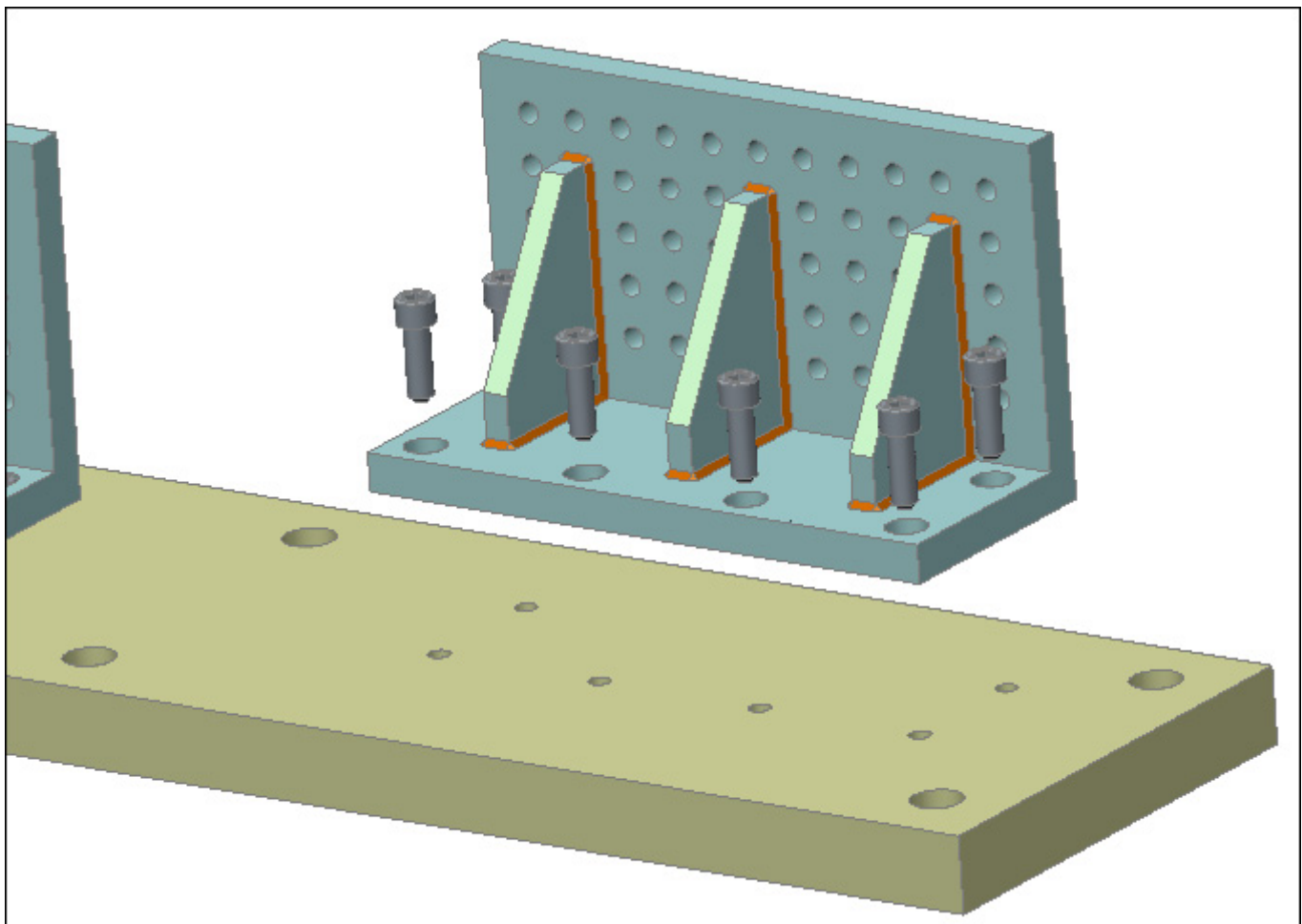


Figure 13.6(b) Mounting System Assembly Exploded

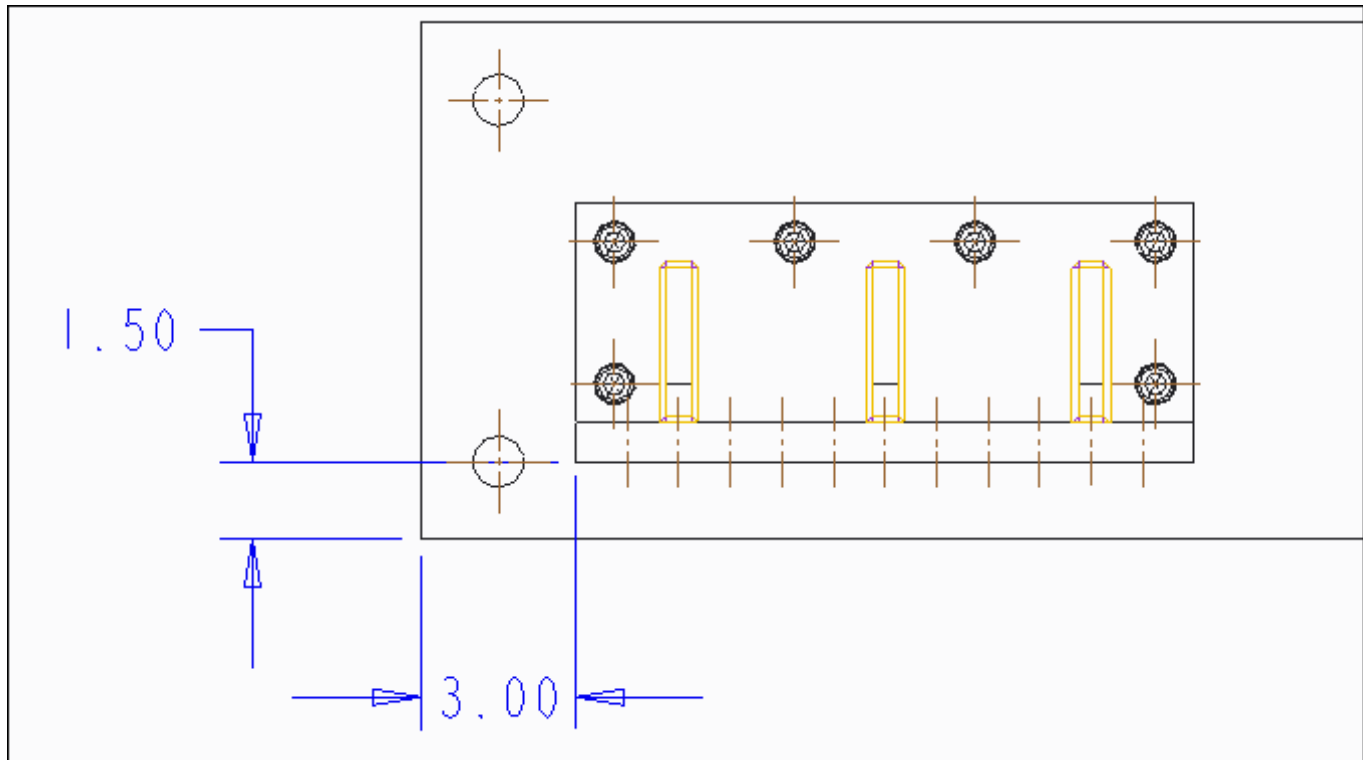


Figure 13.6(c) Placement Location Dimensions

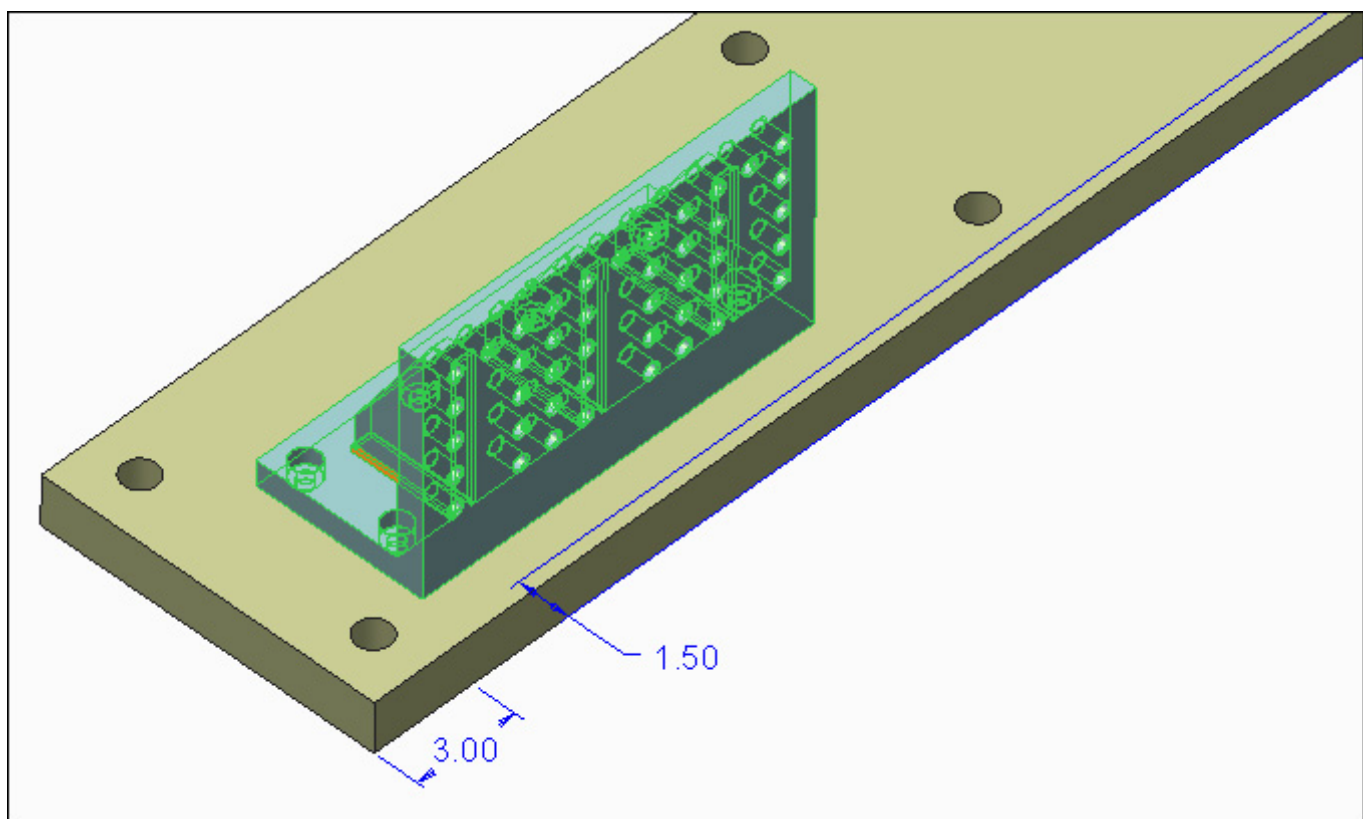


Figure 13.6(d) Placement Location in the Assembly Model

Click: > Assembly > **mounting_system** > OK > Assemble > **base_plate** > Open > press
RMB > **Default Constraint** > > Assemble > **mounting_bracket** > **Preview** > **Open** > use the 3D
 Dragger to initially orient and position the component > **Placement** tab > first constraint set [Fig. 13.7(a)]

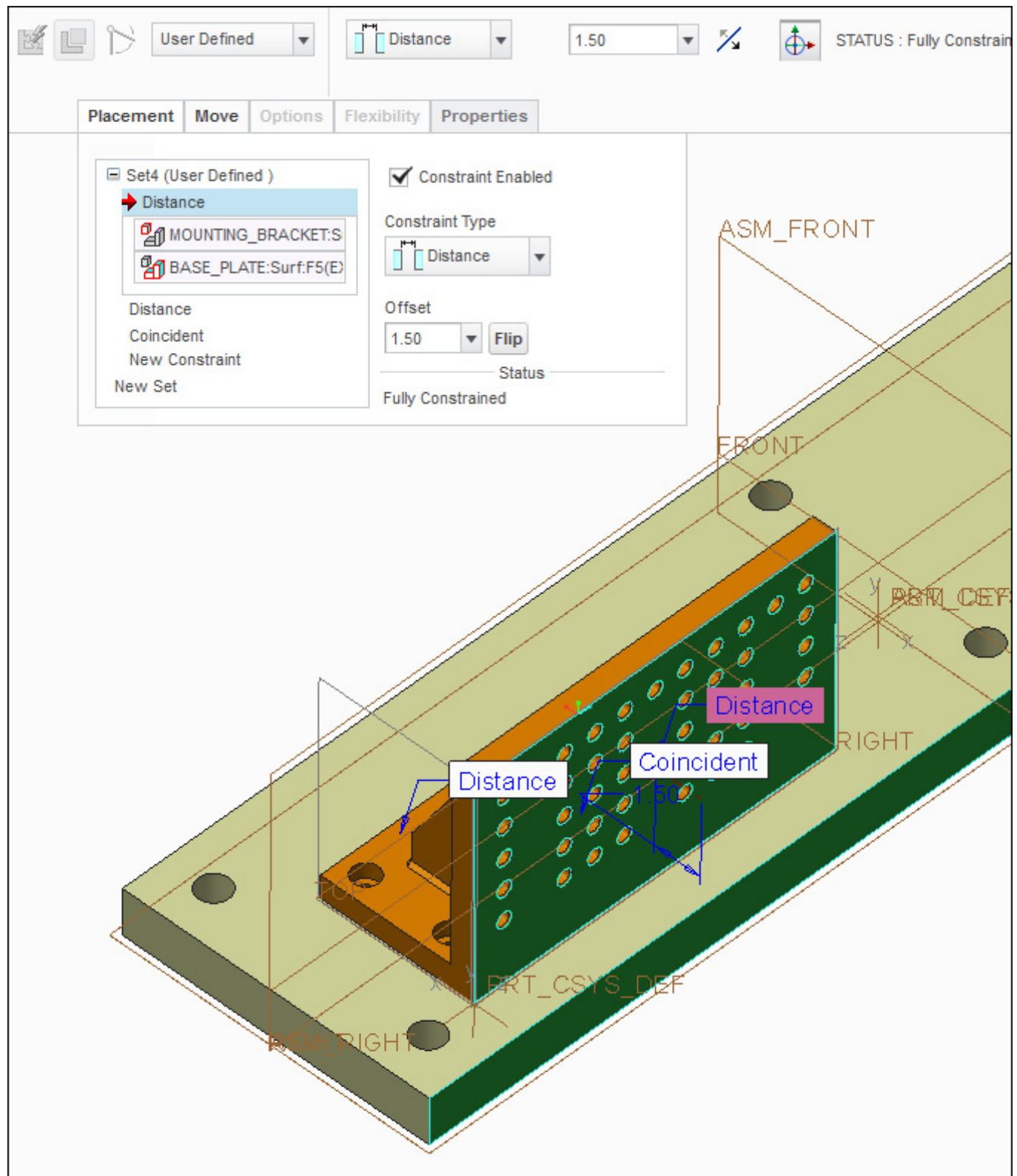


Figure 13.7(a) Distance Offset 1.50 (Enter a Negative Value if Required)

Press: **RMB** > **New Constraint** > second constraint set [Fig. 13.7(b)]

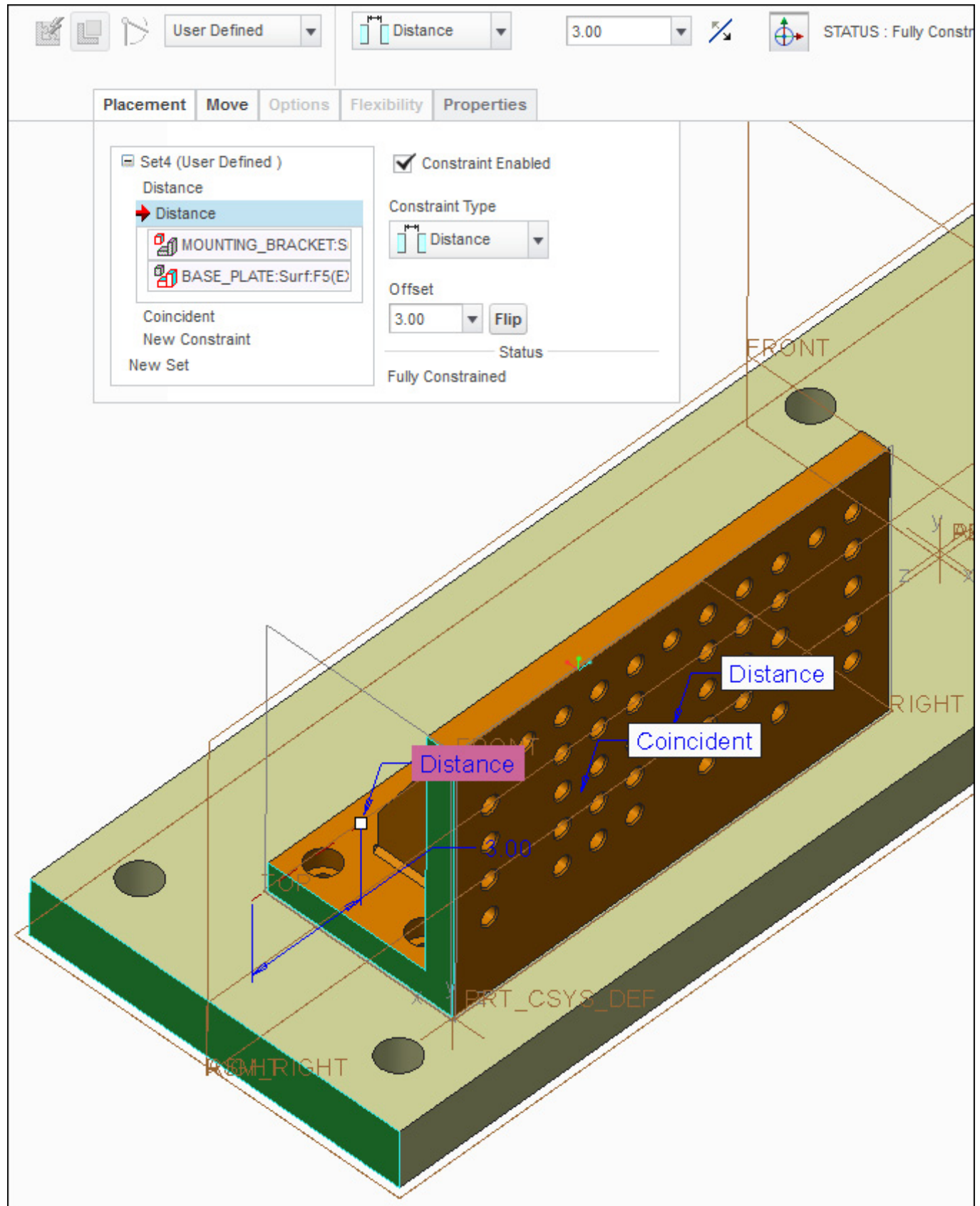


Figure 13.7(b) Distance Offset 3.00 (Enter a Negative Value if Required)

Press: **RMB** > **New Constraint** > third constraint set [Fig. 13.7(c)] >  > **Ctrl+S** > **OK**

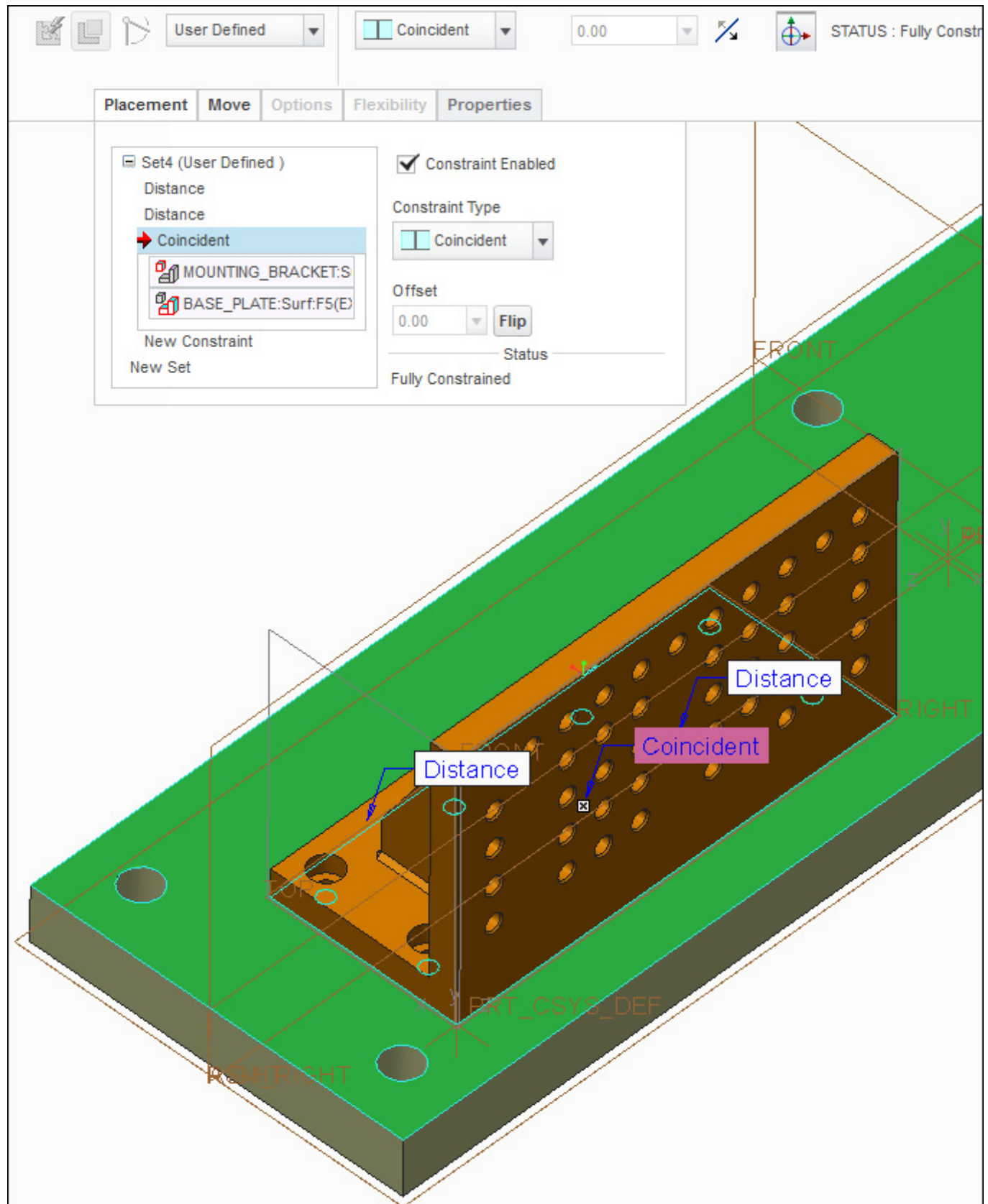


Figure 13.7(c) Coincident (Use your **RMB** and click through the features and select the bottom face of the Mounting Bracket)

Click:  >  **Axis Display** on (all others off) > **LMB** in the Graphics Window > from the Model Tree,  **BASE_PLATE.PRT** > **RMB** > **Activate** >  **Hole** >  > **1/2-13** >  > **Placement** tab > select the axis of the counterbore hole [Fig. 13.8(a)] > hold down the **Ctrl** key > select the top surface of the base plate [Fig. 13.8(b)] > release the **Ctrl** key > 

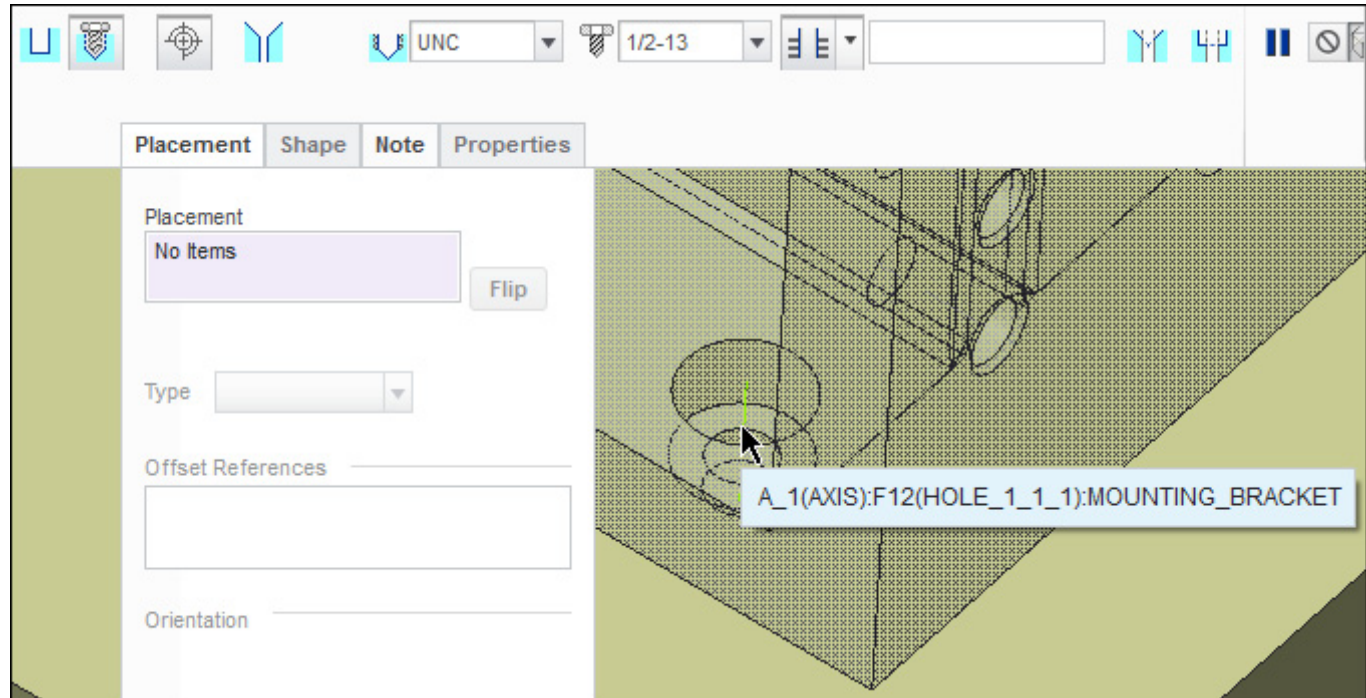


Figure 13.8(a) Select the Counterbore Hole Axis on the Mounting Bracket

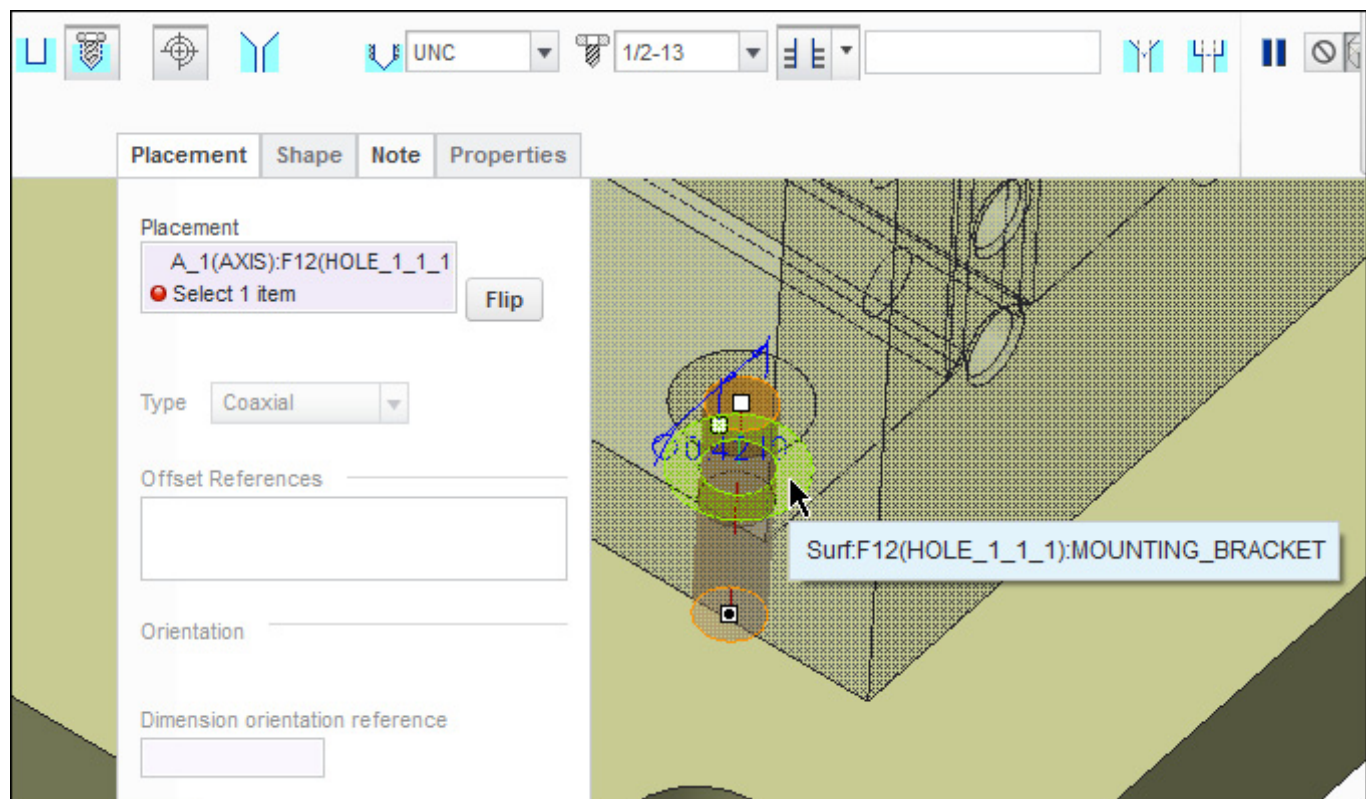


Figure 13.8(b) Select the Counterbore Hole Bearing Surface on the Mounting Bracket

With the new hole still selected, press: **RMB** > **Pattern** >  > **Reference** [Fig. 13.8(c)] >  [Fig. 13.8(d)]

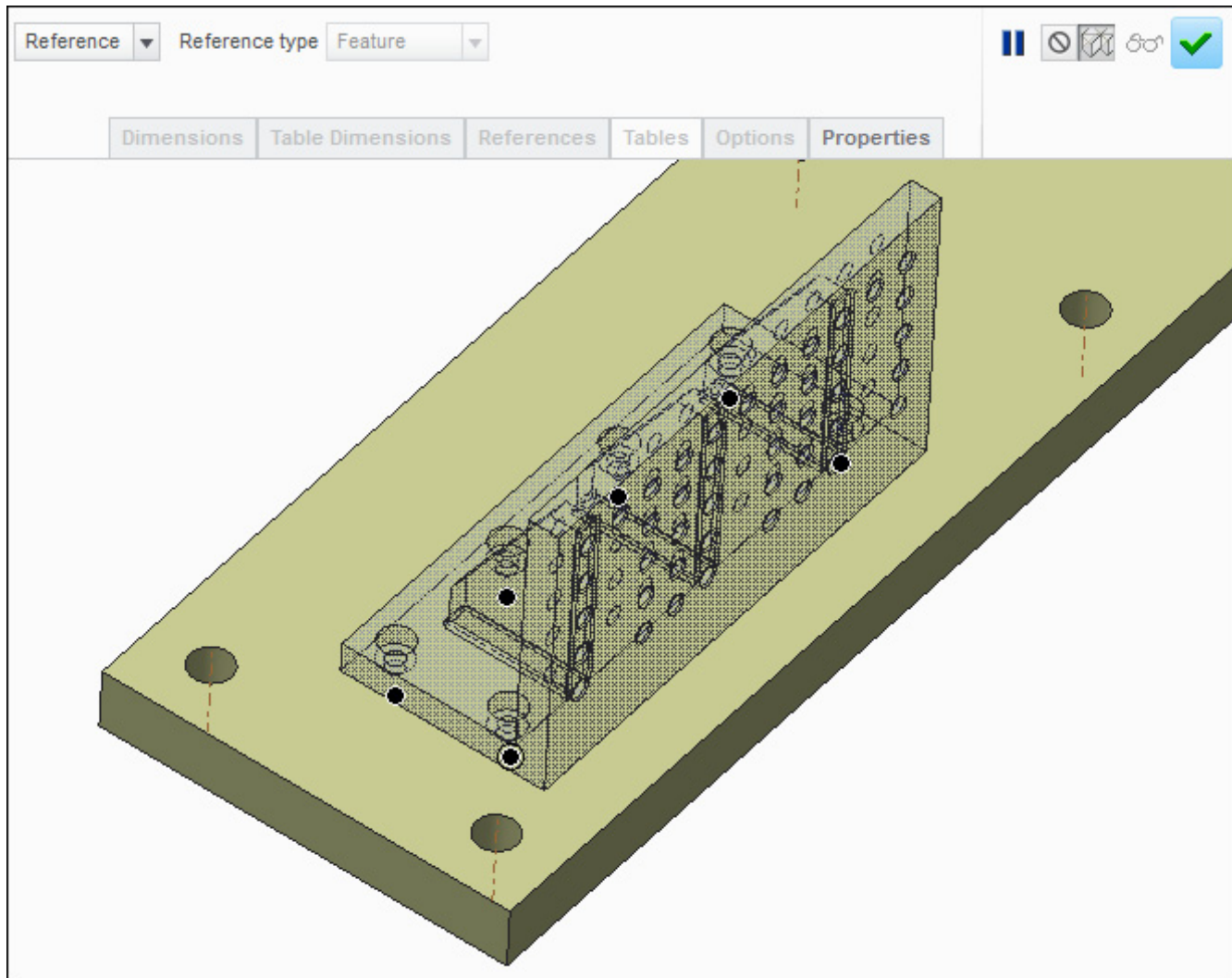


Figure 13.8(c) Pattern Preview

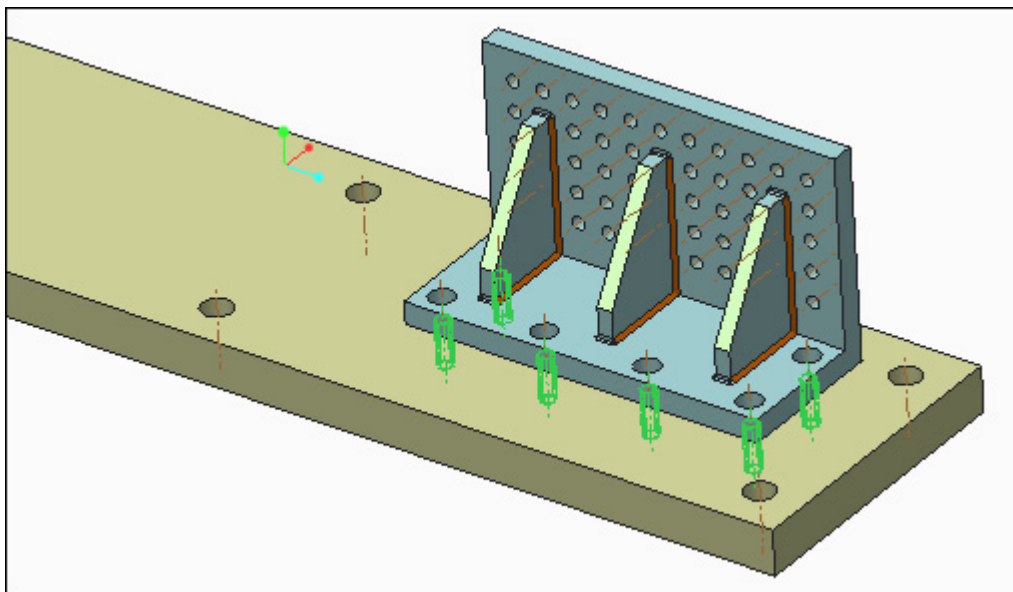
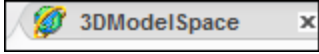
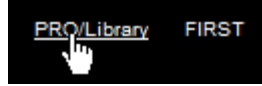
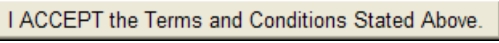


Figure 13.8(d) Completed Pattern

Click:  open browser panel >  >  > **ANSI ENGLISH** [Fig. 13.9(a)] > scroll to the bottom >  [Fig. 13.12(b)]

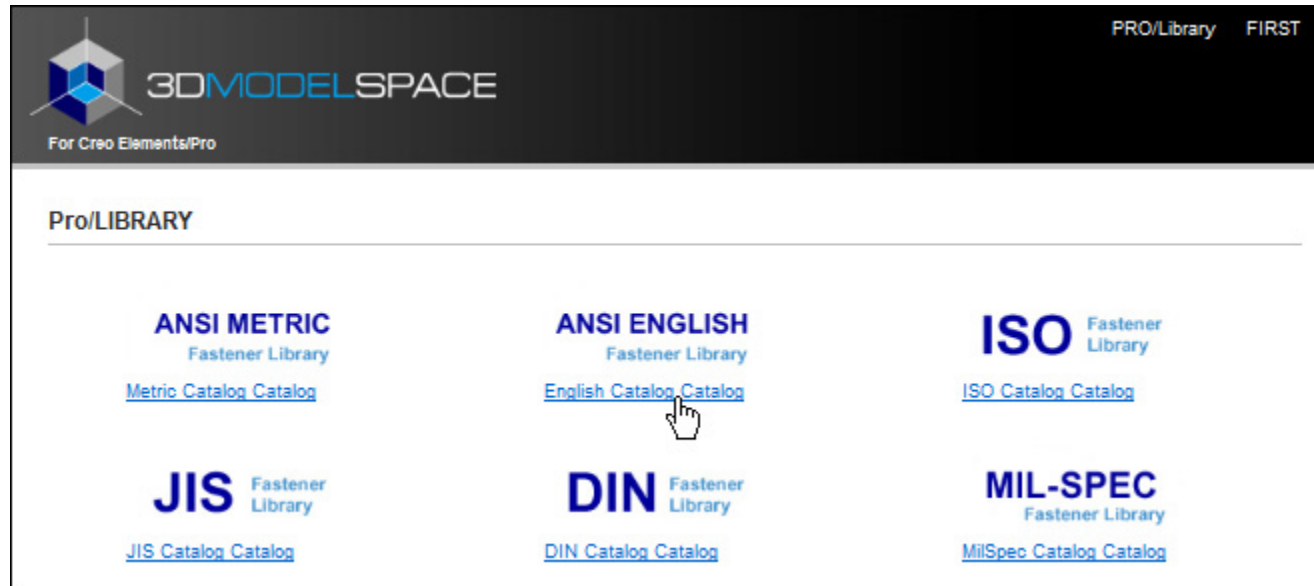


Figure 13.9(a) 3DModelSpace

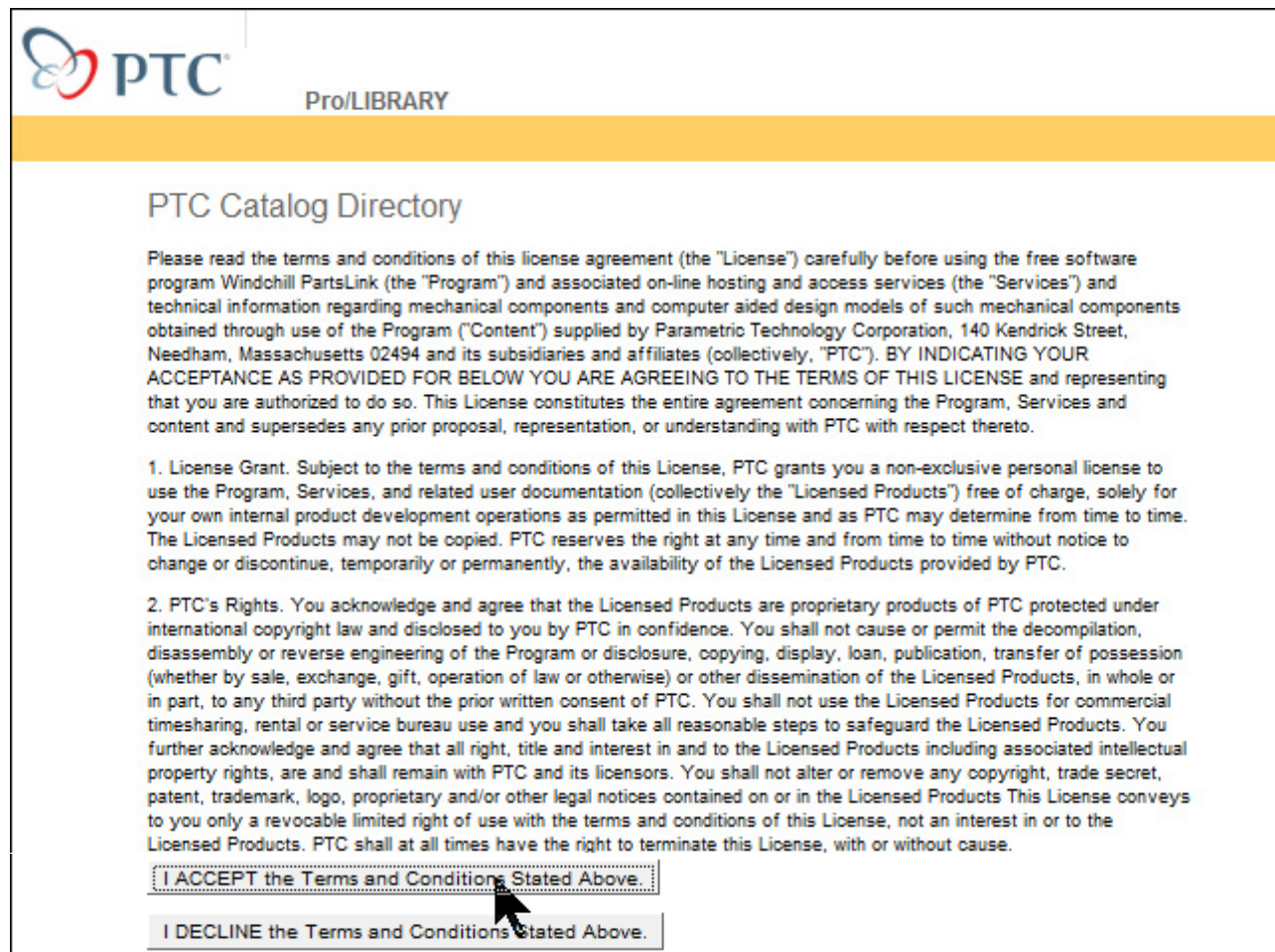


Figure 13.9(b) Accept the Terms

Click: **SOCKET CAP-SHOULDER- SET SCREWS** [Fig. 13.9(c)] > **HEXAGON SOCKET HEAD CAP SCREWS** [Fig. 13.9(d)]

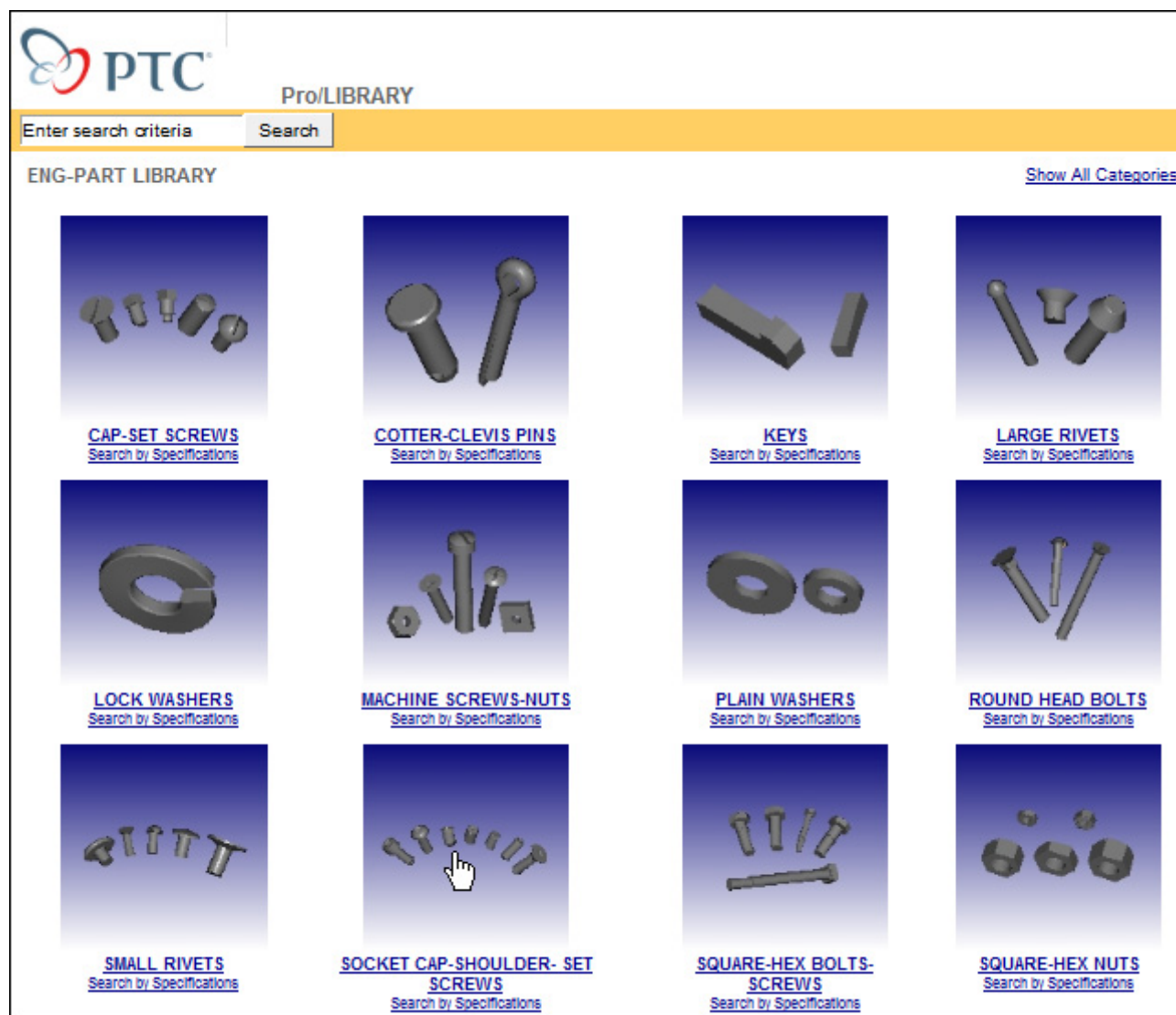


Figure 13.9(c) ENG-PART LIBRARY



Figure 13.9(d) Hexagon Socket Head Cap Screws

Click: **Nominal Size** [Fig. 13.9(e)] > **0.500** > **Length** > **1.500** [Fig. 13.9(f)] > Product Number **CSDD401**

PTC Pro/LIBRARY

Enter search criteria Search

ENG-PART LIBRARY > SOCKET CAP-SHOULDER- SET SCREWS > HEXAGON SOCKET HEAD CAP SCREWS



[View Next Page](#) Showing records 1 through 15 of 685 ☒ Metric ☐ English

Product Number	General Description	Manufacturer Name	Length (9)	Hexagonal Socket Size (9)	Head Types	Body Diameter (9)	Head Shape	Nominal Size
	Hexagon socket head cap screw	PTC	Select	Select	hex	Select	socket	Select
	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort
CSDD33	Hexagon socket head cap screws	PTC	0.125	0.051	hex	0.080	socket	NO.0
CSDD34	Hexagon socket head cap screws	PTC	0.188	0.051	hex	0.080	socket	NO.0
CSDD35	Hexagon socket head cap screws	PTC	0.250	0.051	hex	0.080	socket	NO.0
CSDD36	Hexagon socket head cap screws	PTC	0.375	0.051	hex	0.080	socket	NO.0
CSDD37	Hexagon socket head cap screws	PTC	0.500	0.051	hex	0.080	socket	NO.0
CSDD38	Hexagon socket head cap screws	PTC	0.625	0.051	hex	0.080	socket	NO.0
CSDD39	Hexagon socket head cap screws	PTC	0.750	0.051	hex	0.080	socket	NO.0
CSDD40	Hexagon socket head cap screws	PTC	0.875	0.051	hex	0.080	socket	NO.0
CSDD41	Hexagon socket head cap screws	PTC	1.000	0.051	hex	0.080	socket	NO.0
CSDD42	Hexagon socket head cap screws	PTC	1.250	0.051	hex	0.080	socket	NO.0
CSDD43	Hexagon socket head cap screws	PTC	1.500	0.051	hex	0.080	socket	NO.0
CSDD44	Hexagon socket head cap screws	PTC	1.750	0.051	hex	0.080	socket	NO.0
CSDD45	Hexagon socket head cap screws	PTC	2.000	0.051	hex	0.080	socket	NO.0
CSDD46	Hexagon socket head cap screws	PTC	2.250	0.051	hex	0.080	socket	NO.0
CSDD47	Hexagon socket head cap screws	PTC	2.500	0.051	hex	0.080	socket	NO.0

Figure 13.9(e) Product Number



Showing records 1 through 1 of 1 ☒ Metric ☐ English

Product Number	General Description	Manufacturer Name	Length (9)	Hexagonal Socket Size (9)	Head Types	Body Diameter (9)	Head Shape	Nominal Size
	Hexagon socket head cap screw	PTC	1.500	0.379	hex	0.500	socket	0.5
	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort	Reset Sort
CSDD401	Hexagon socket head cap screws	PTC	1.500	0.379	hex	0.500	socket	0.5

Figure 13.9(f) CSDD401

Click: **Choose Format > Creo Parametric Wildfire2.0 or later (.prt)** [or **Educational Models**] [Fig. 13.9(g)] > **Download 3D Model > here > Open > Extract > select *your* working directory > complete the steps to unzip the file > close your zip and folder windows >  close the browser > from the Model Tree, **MOUNTING_SYSTEM.ASM > RMB > Activate > Assemble > csdd.prt > Folder Tree** [Fig. 13.9(h)]**

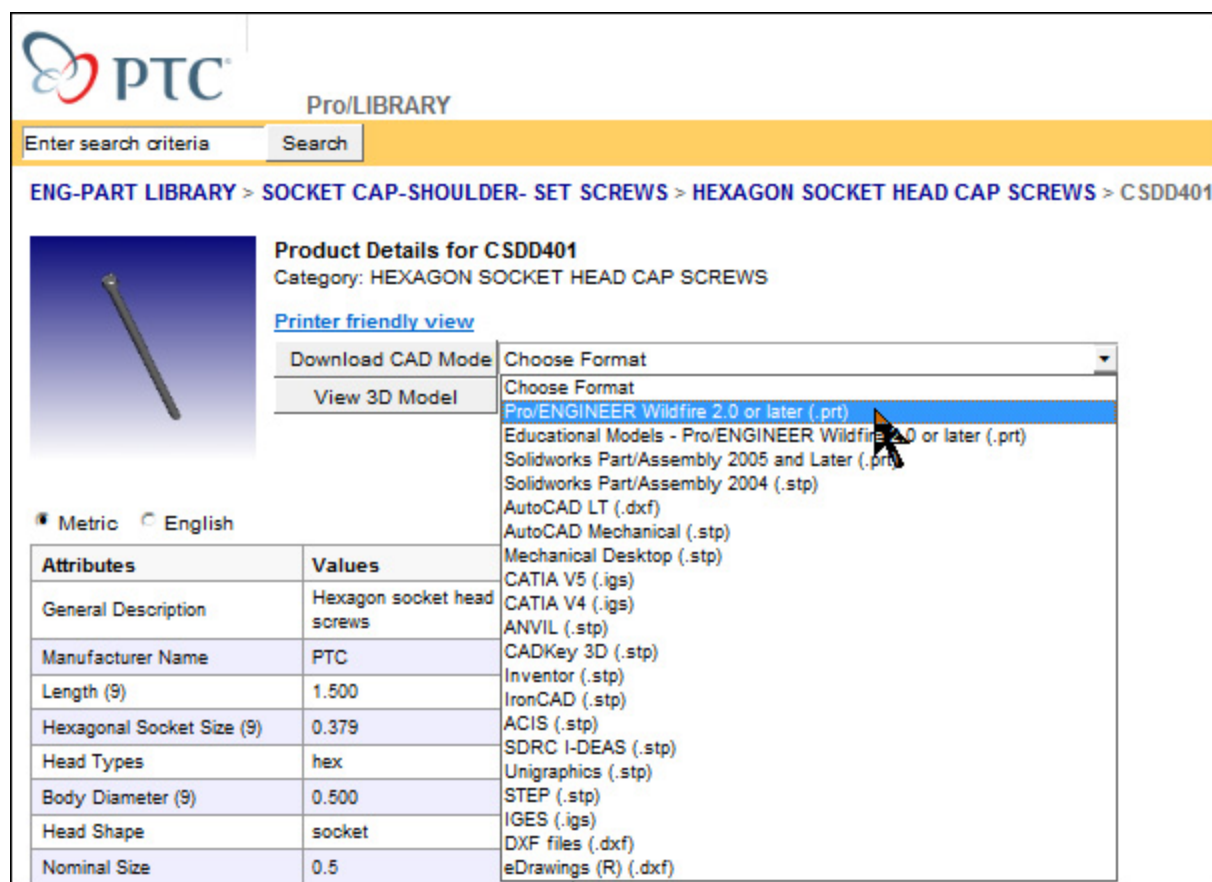


Figure 13.9(g) Hexagon

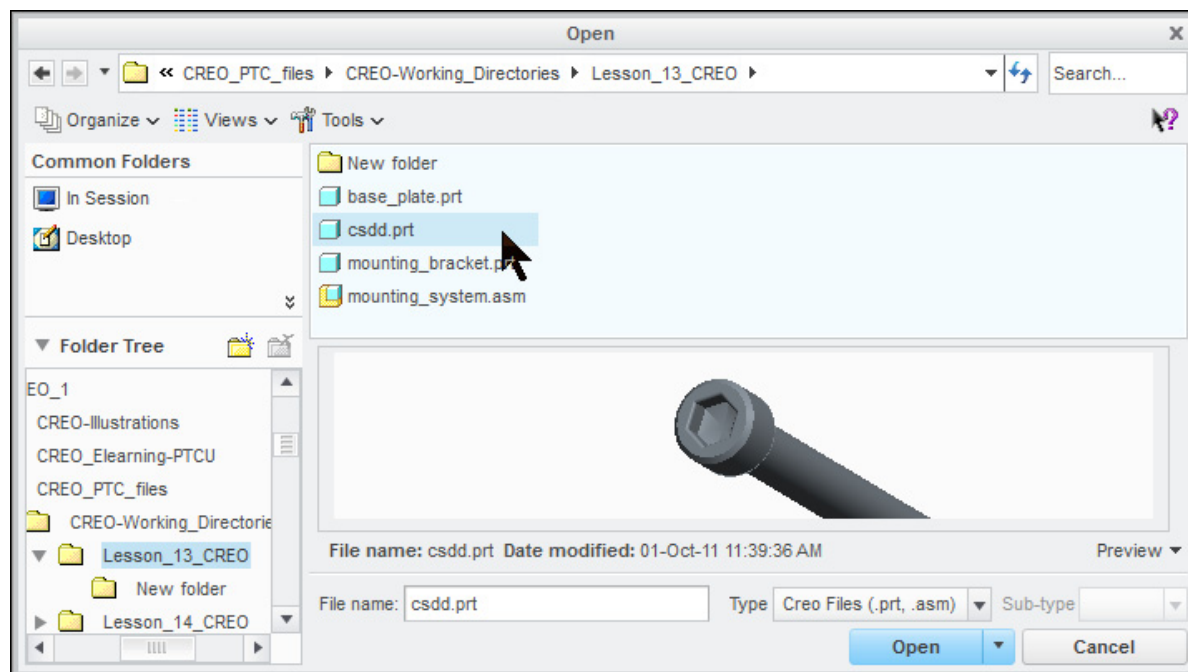


Figure 13.9(h) csdd.prt

Click: **Open** > [Fig. 13.9(i)] > **By Column** tab > **BASIC_DIA** > **0.5** [Fig. 13.9(j)] > **d4, L** > **1.500000** [Fig. 13.9(k)] > **Open** > if needed - select **Close** (from the Auto Place dialog box) > using your **RMB**, click through the features and select the **BASE_PLATE:Surf:F14(HOLE_2_1_1)** [Fig. 13.9(l)]

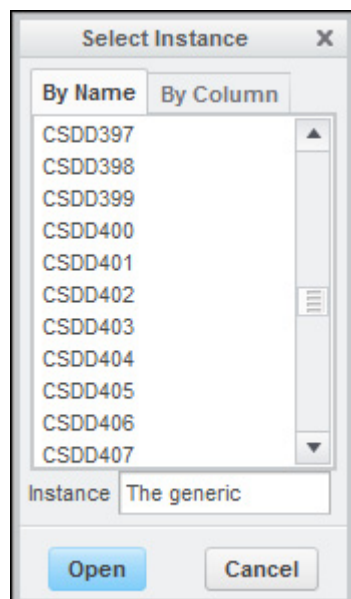


Figure 13.9(i) Select Instance

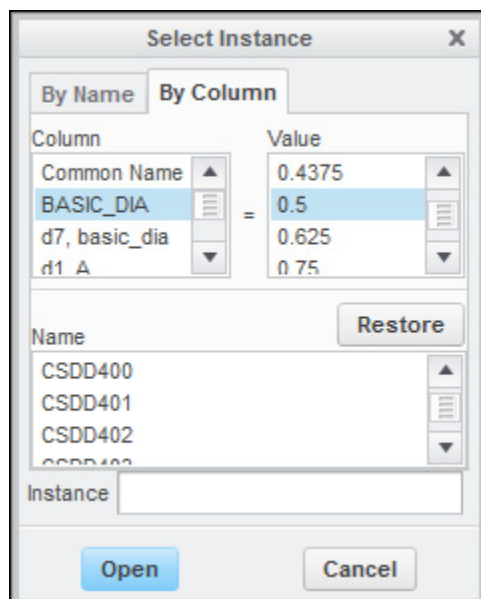


Figure 13.9(j) BASIC_DIA; 0.5

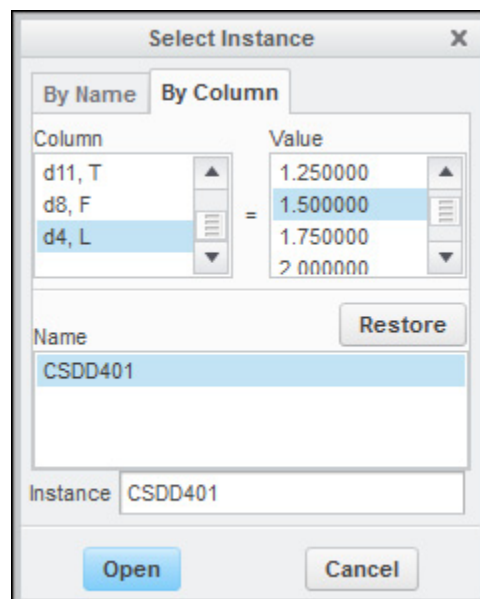


Figure 13.9(k) d4, L; 1.500000

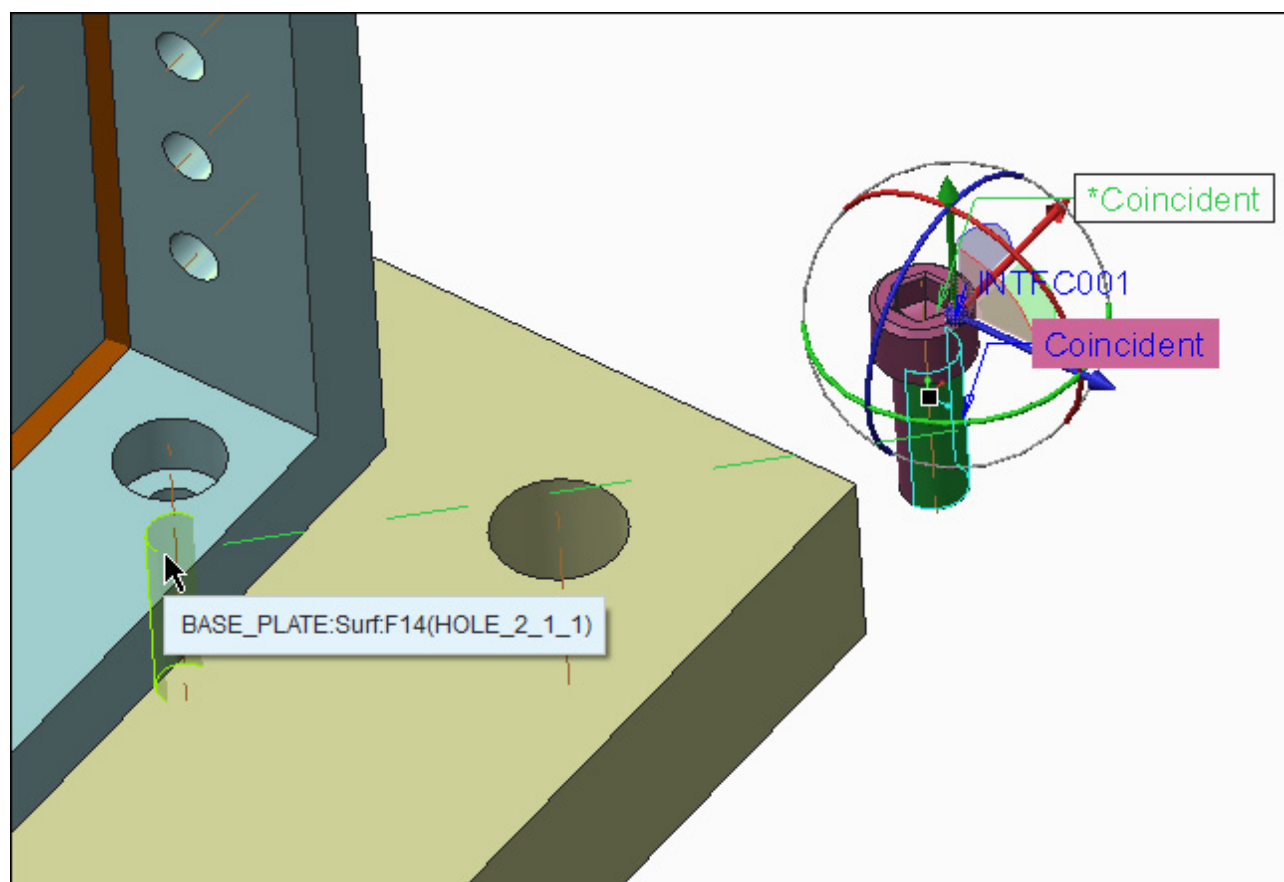


Figure 13.9(l) Select the Base Plate Hole's Surface (Your Feature Name May Be Different)

Click: **Placement** tab > place your pointer on the blue ball of the 3D Dragger > press the **LMB** and move the component up > release the **LMB** [Fig. 13.9(m)]

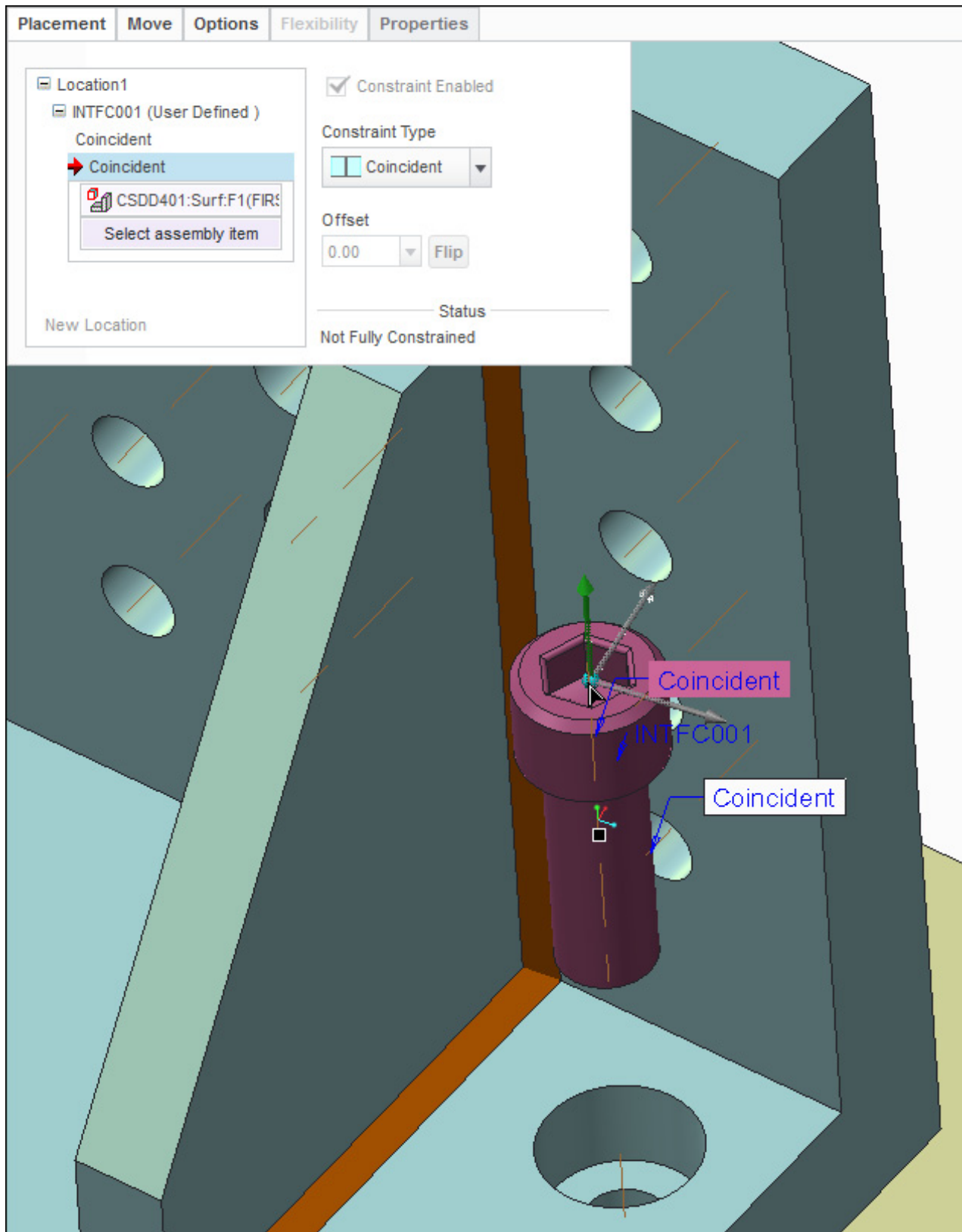


Figure 13.9(m) Using the 3D Dragger, Move the Component Away from the Hole

Select the **MOUNTING_BRACKET:Surf:F12(HOLE_1_1_1)** of the bearing surface of the counterbore hole [Fig. 13.9(n)]

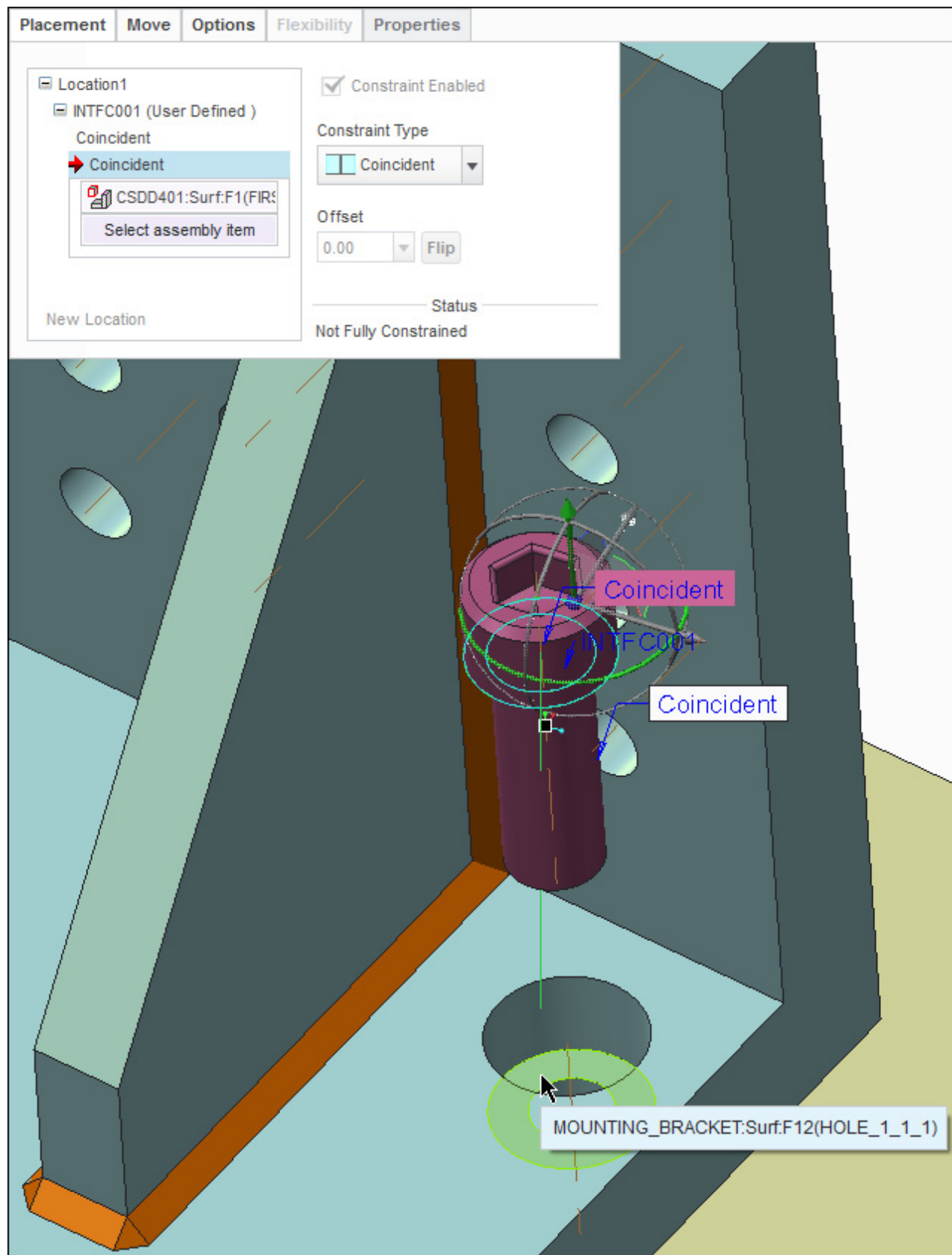


Figure 13.9(n) Select the Counterbore Hole's Bearing Surface

Socket head cap screw is now Fully Constrained [Fig. 13.9(o)]. Click:  [Fig. 13.9(p)]

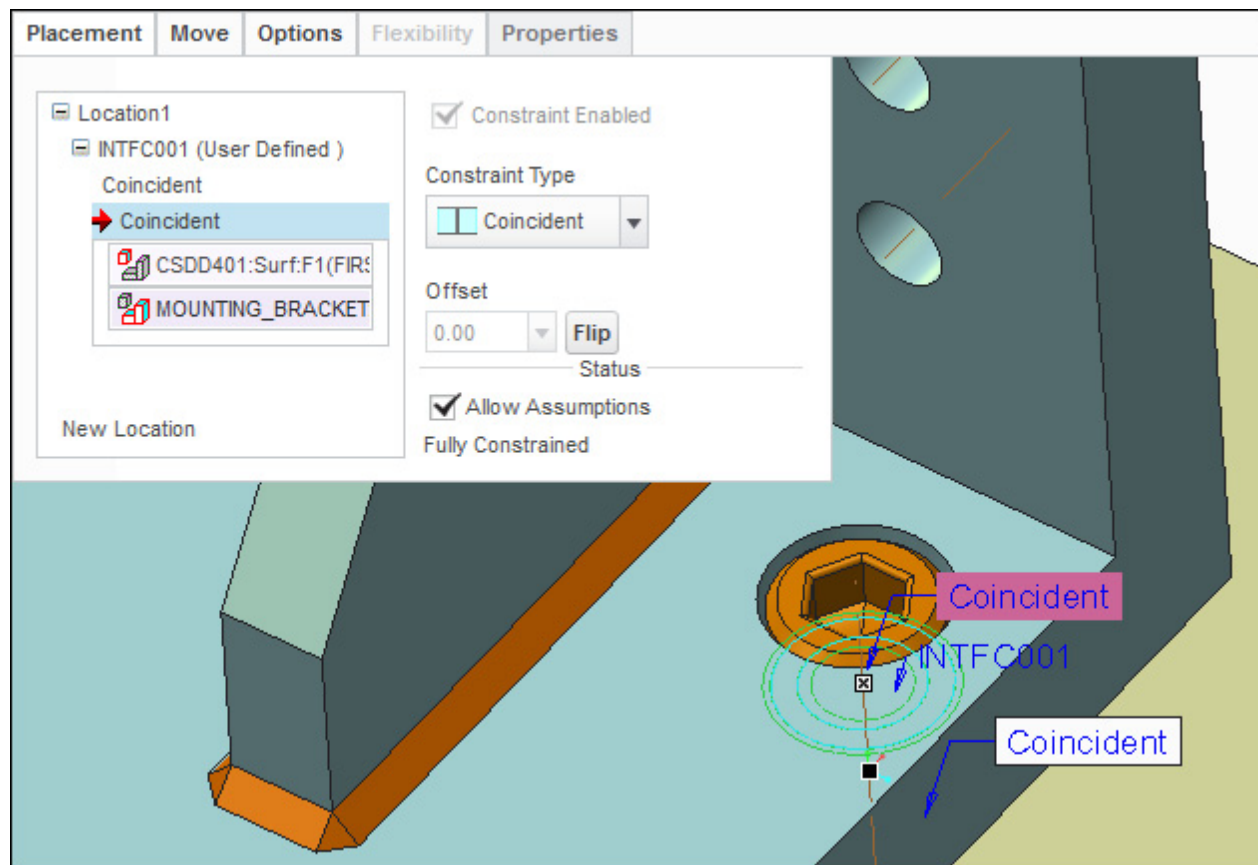


Figure 13.9(o) Fully Constrained Component

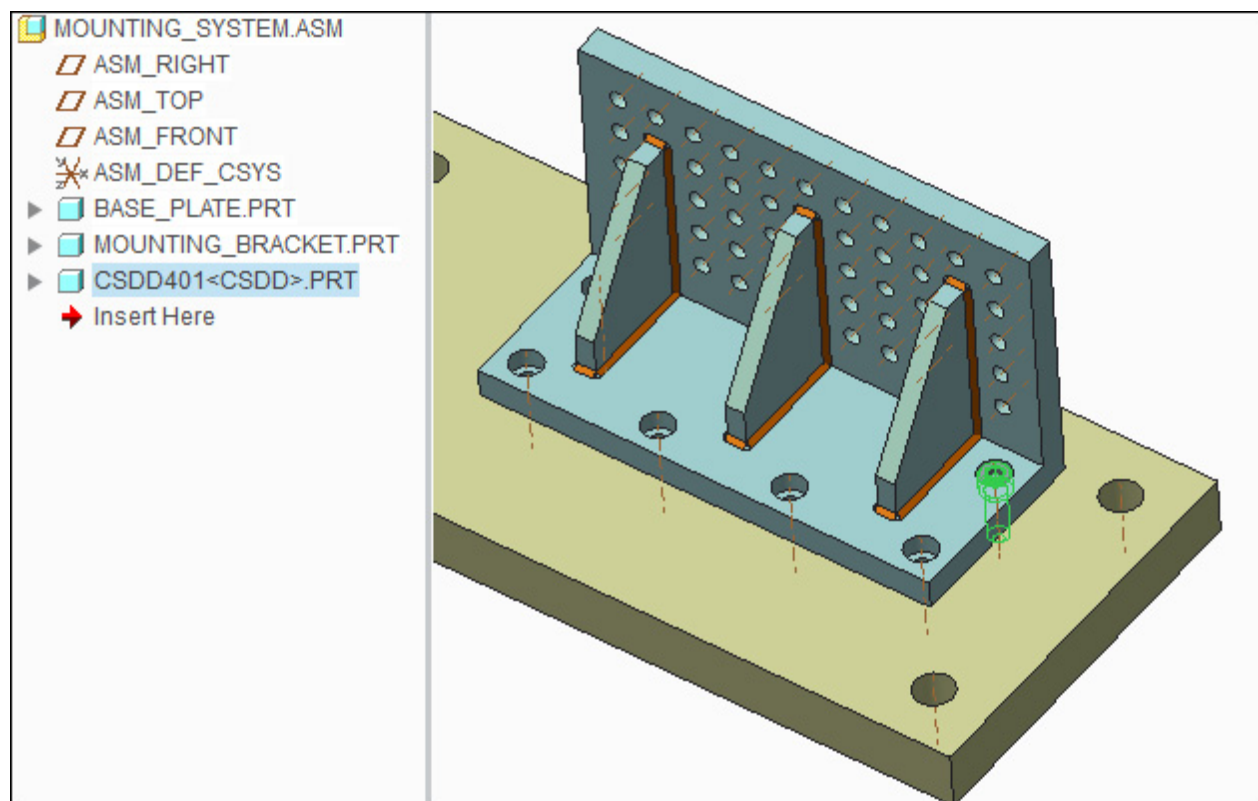


Figure 13.9(p) Placed Component (Note that the Socket Head Cap Screw had a predefined Component Interface)

With the screw still selected (highlighted) [if not, select the component from the Graphics Window or Model Tree], press: **RMB > Pattern > Reference** is the default since the hole's were patterned [Fig. 13.9(q)] >  [Fig. 13.9(r)] > **LMB** to deselect

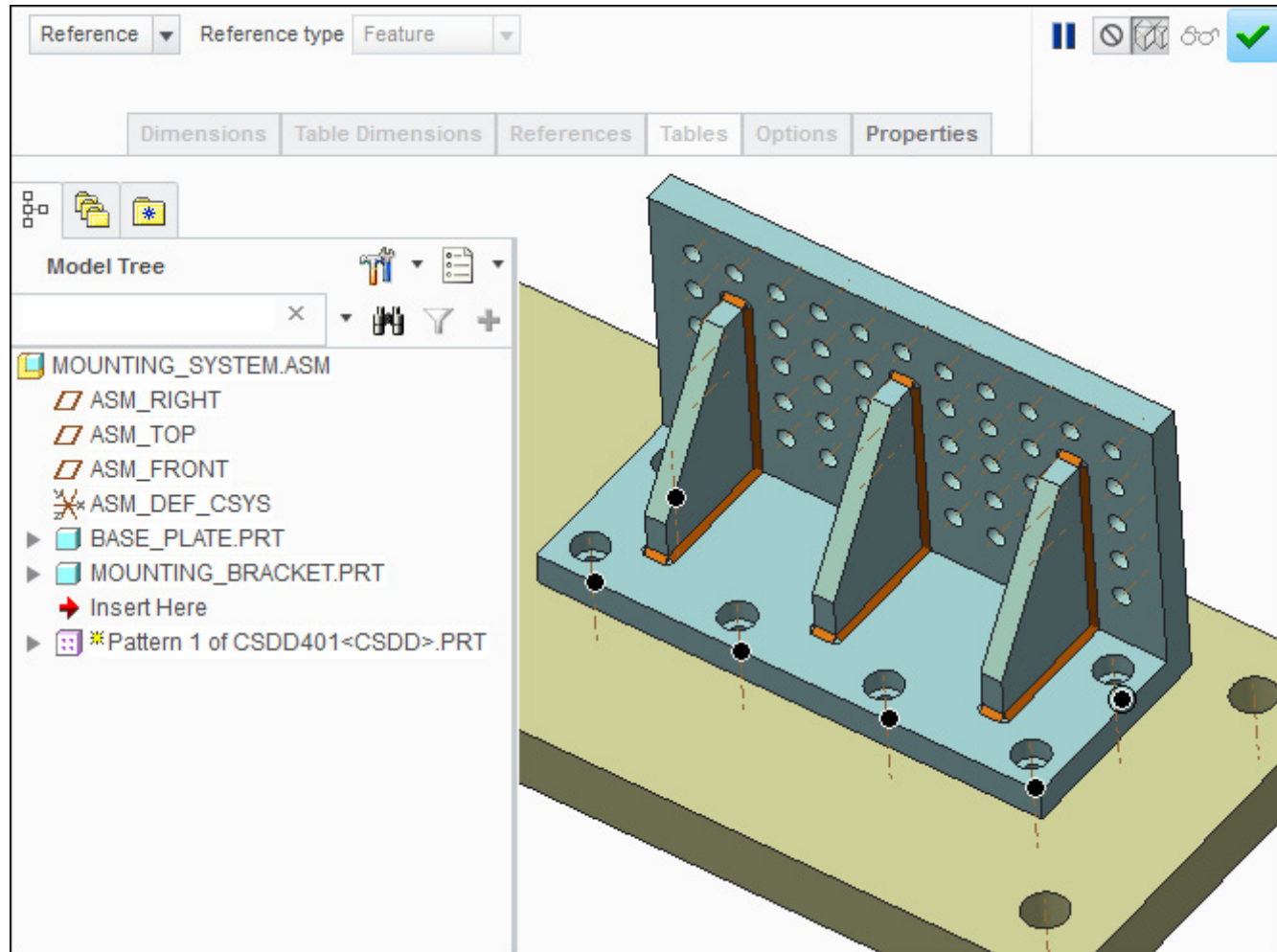


Figure 13.9(q) Patterning the Component

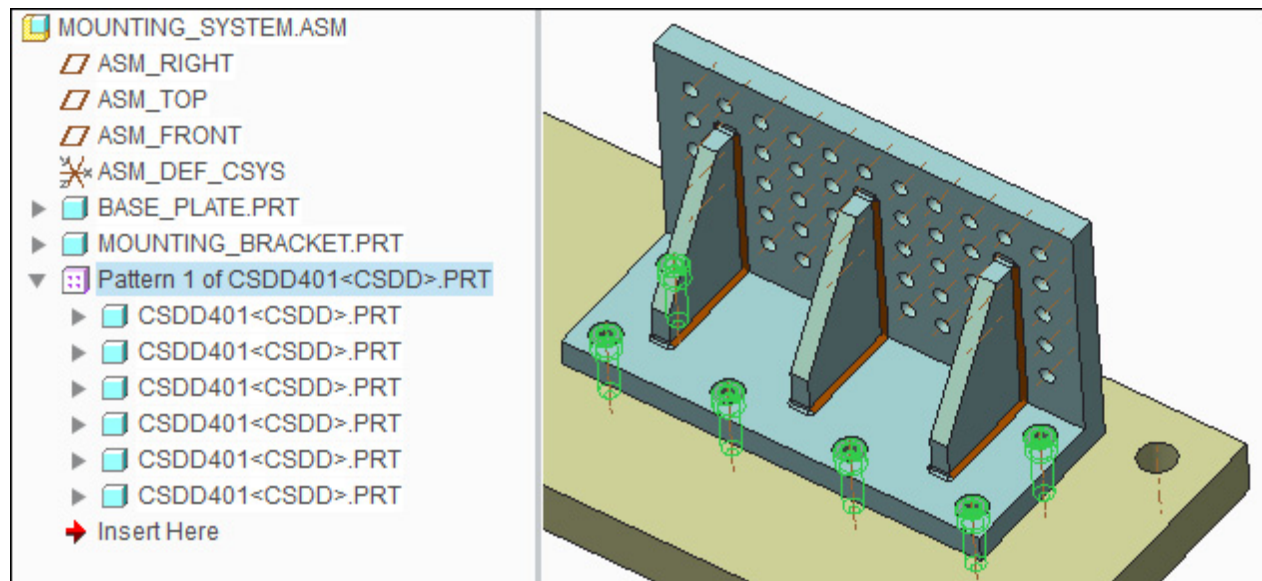


Figure 13.9(r) Patterned Component

In the Model Tree; using the **Ctrl** key, select the Mounting Bracket and the CSDD pattern > with the pointer within the Model Tree, **RMB** > **Group** [Fig. 13.10(a)]

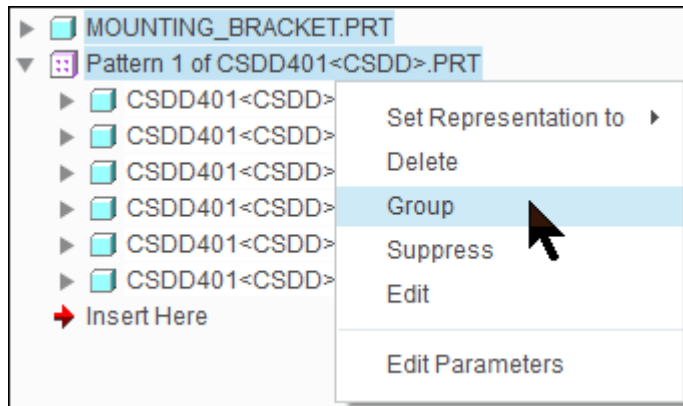


Figure 13.10(a) Group

The Group failed because of external references used to place the socket head cap screw. Note the message area located below the Graphics Window (if needed- expand the message area) *[your feat id # may be different]*

Including pattern (feat id 154) by reference must include its reference (feat id 250, model BASE_PLATE) or entire reference model.
Local group aborted.

> **LMB** to deselect > select the first instance of the screw pattern > press **RMB** > **Edit Definition** [Fig. 13.10(b)]

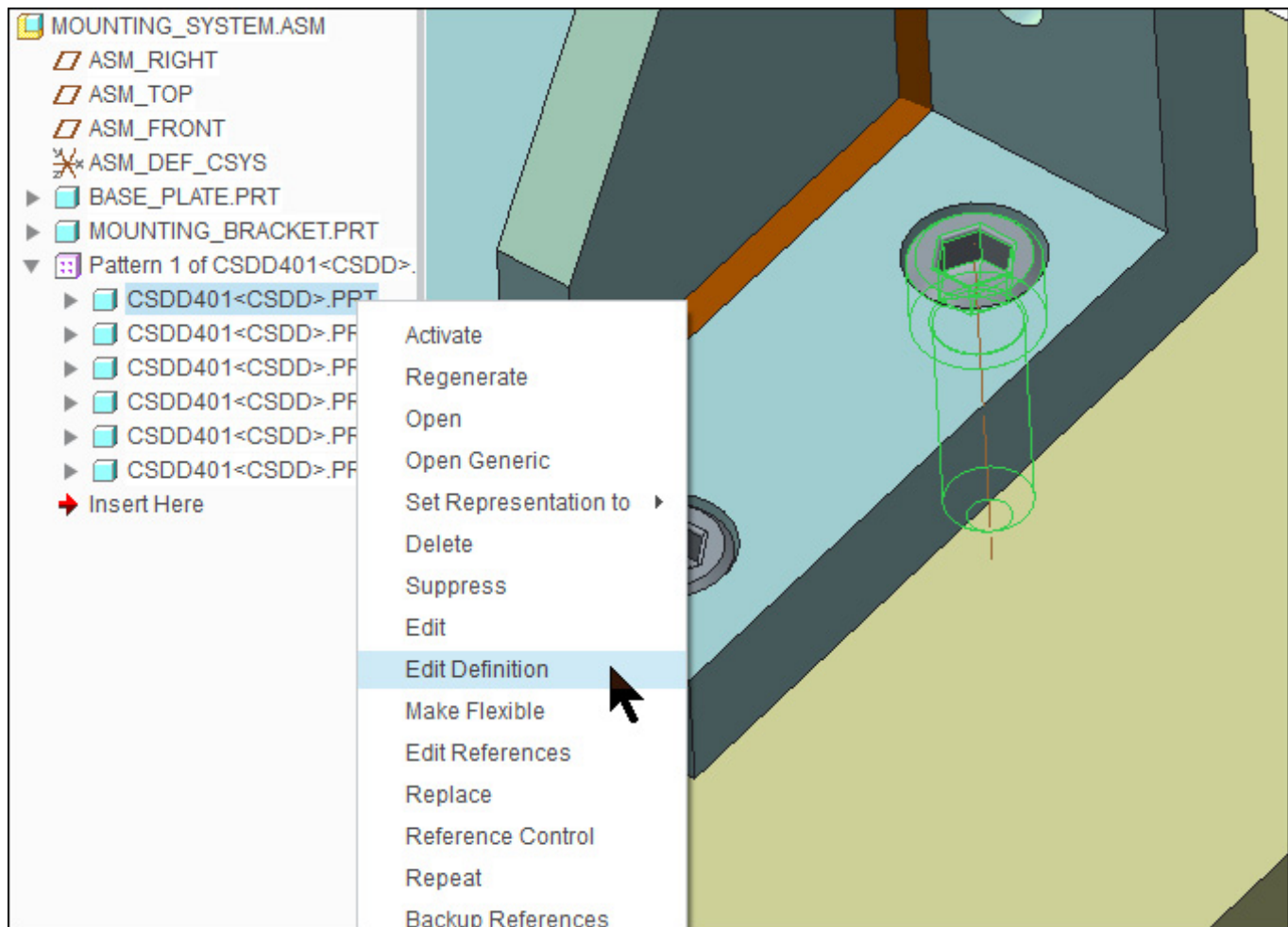


Figure 13.10(b) Edit Definition

Click:  **Place manually > Placement tab > Set71 (User Defined)** (your Set # may be different) > **RMB > Delete** [Fig. 13.10(c)] > move the component using the 3D Dragger [Fig. 13.10(d)]

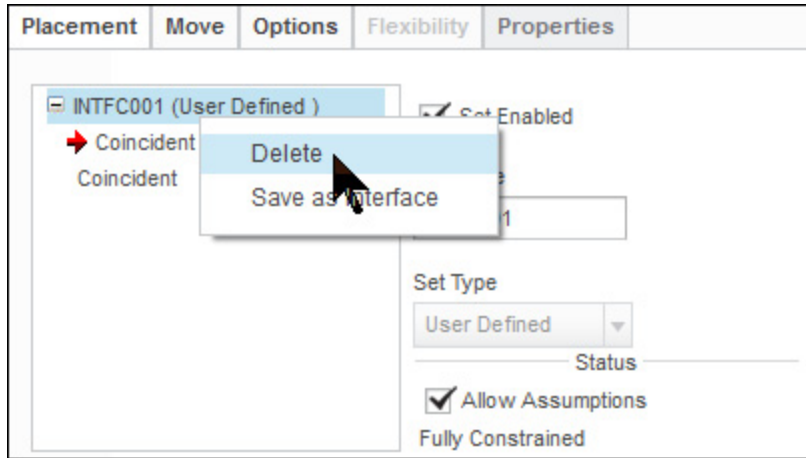


Figure 13.10(c) Delete INTFC001

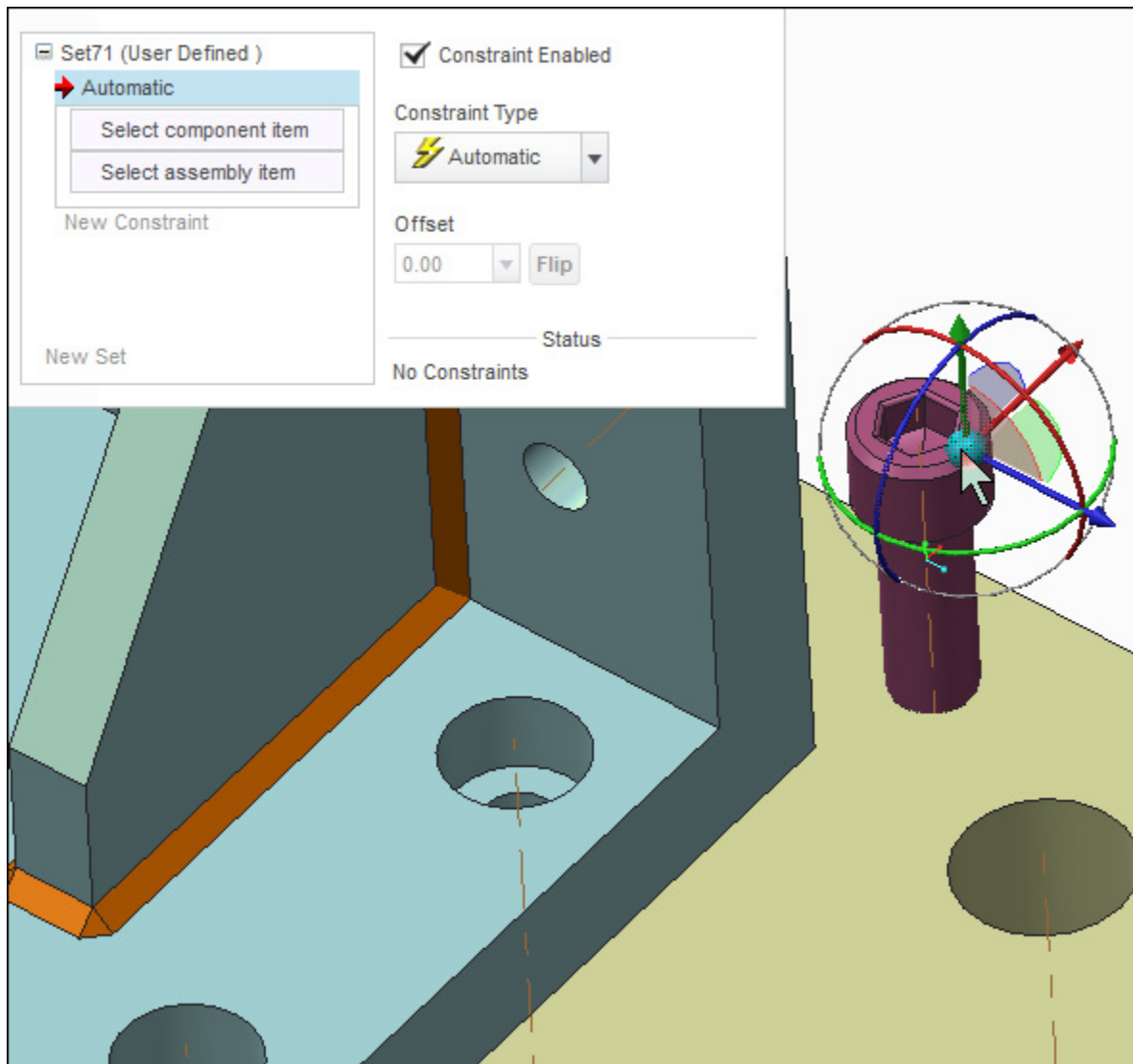


Figure 13.10(d) Move the Component Using the 3D Dragger

Click: **LMB** on the (shaft) surface of the socket head cap screw to select it [Fig. 13.10(e)] > select the counterbore hole's surface [Fig. 13.10(f)]

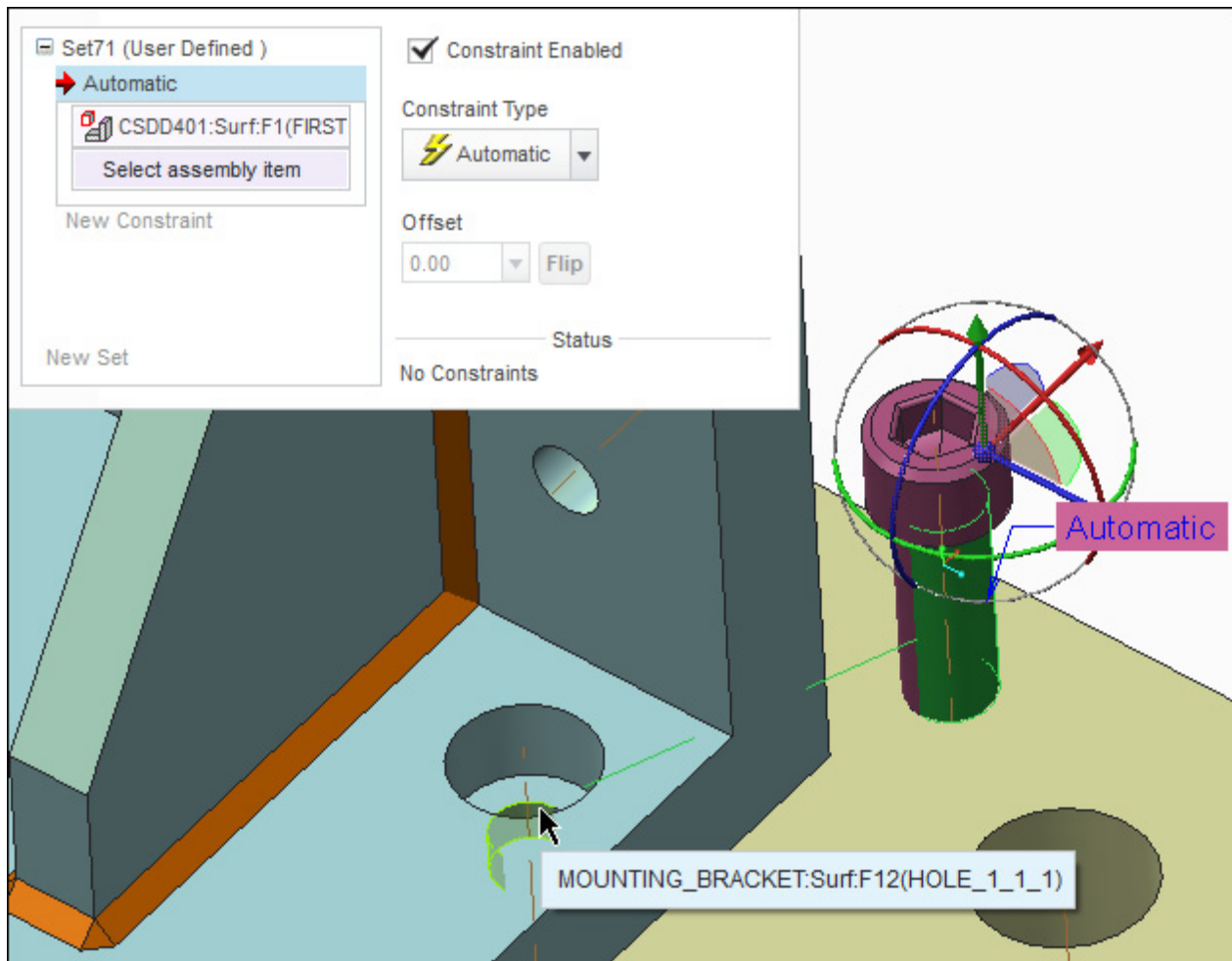


Figure 13.10(e) Select the Shaft of the Screw and the Hole's Surface

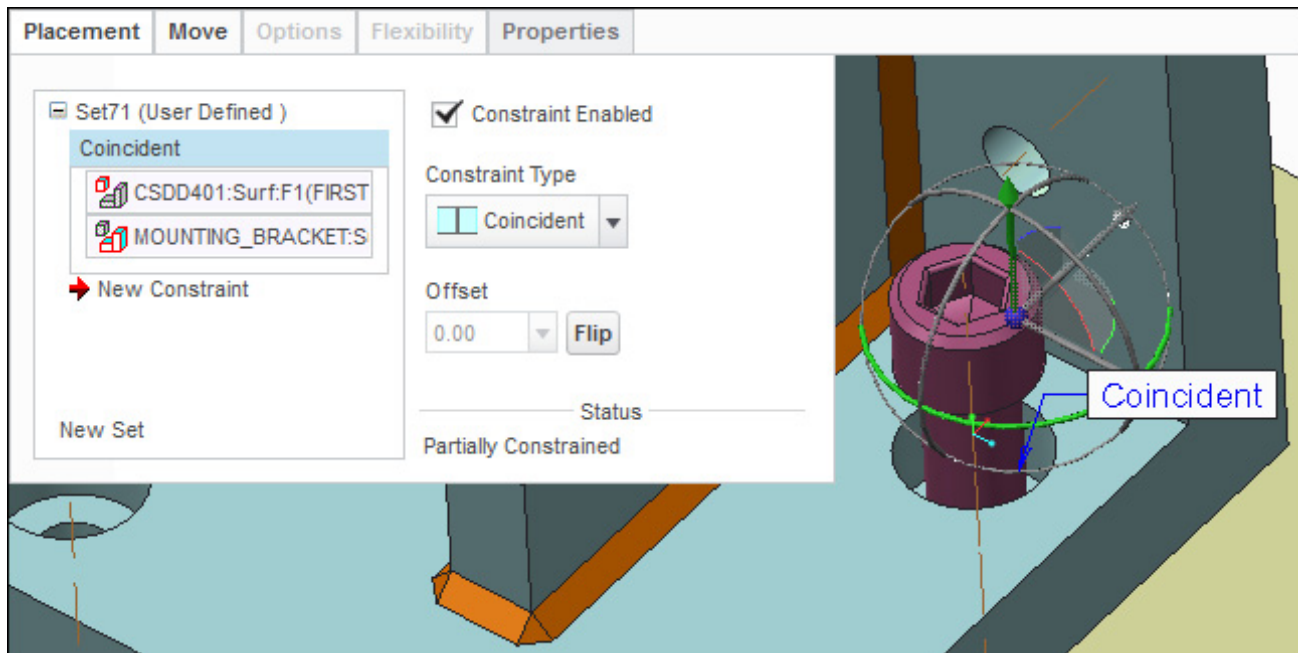


Figure 13.10(f) Coincident Constraint

Press: **RMB** > **New Constraint** > select the bearing surface of the socket head cap screw [Fig. 13.10(g)] > select the counterbore hole's bearing surface [Fig. 13.10(h)] >  Distance >  Coincident >  [Fig. 13.10(i)]

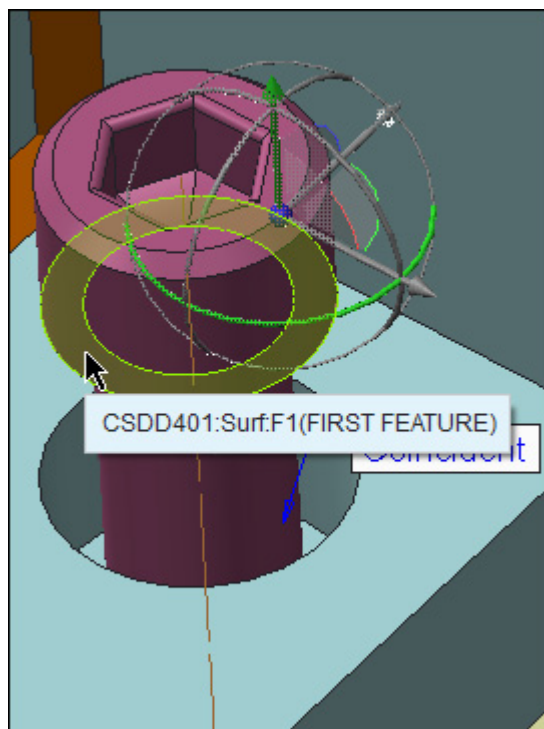


Figure 13.10(g) Select the Screw Bearing Surface

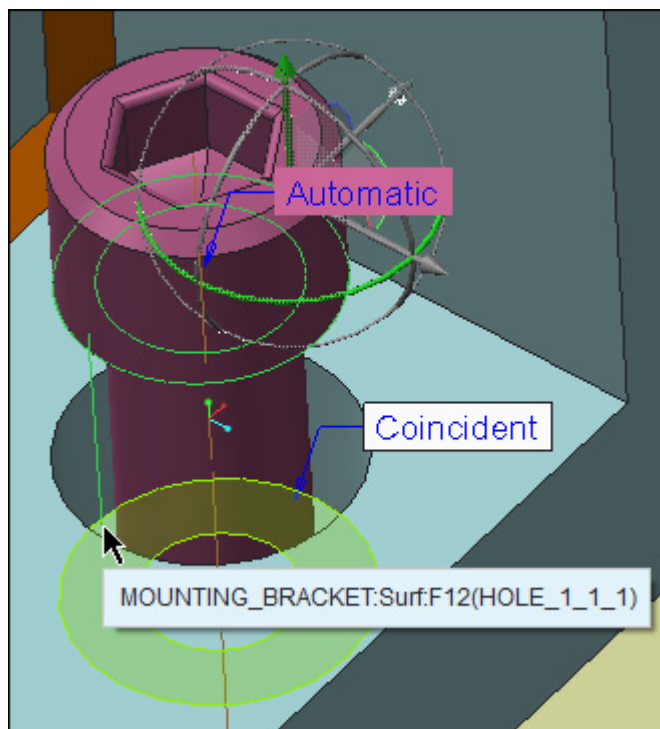


Figure 13.10(h) Select the Counterbore Hole Bearing Surface

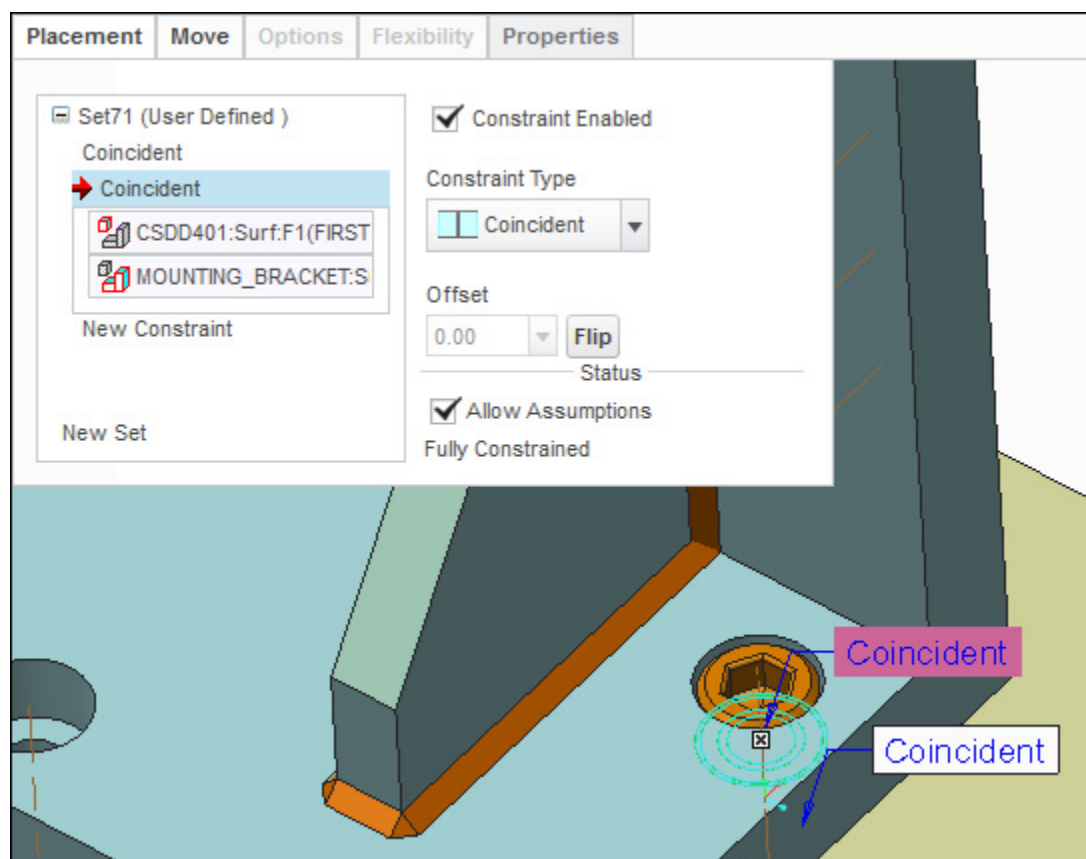


Figure 13.10(i) Fully Constrained Component

In the Model Tree; using the **Ctrl** key, select the Mounting Bracket and the CSDD pattern > **RMB** > **Group** [Fig. 13.11(a)] > press **RMB** > **Pattern** [Fig. 13.11(b)] >  >  **Plane Display** on > **LMB** in the Graphics Window

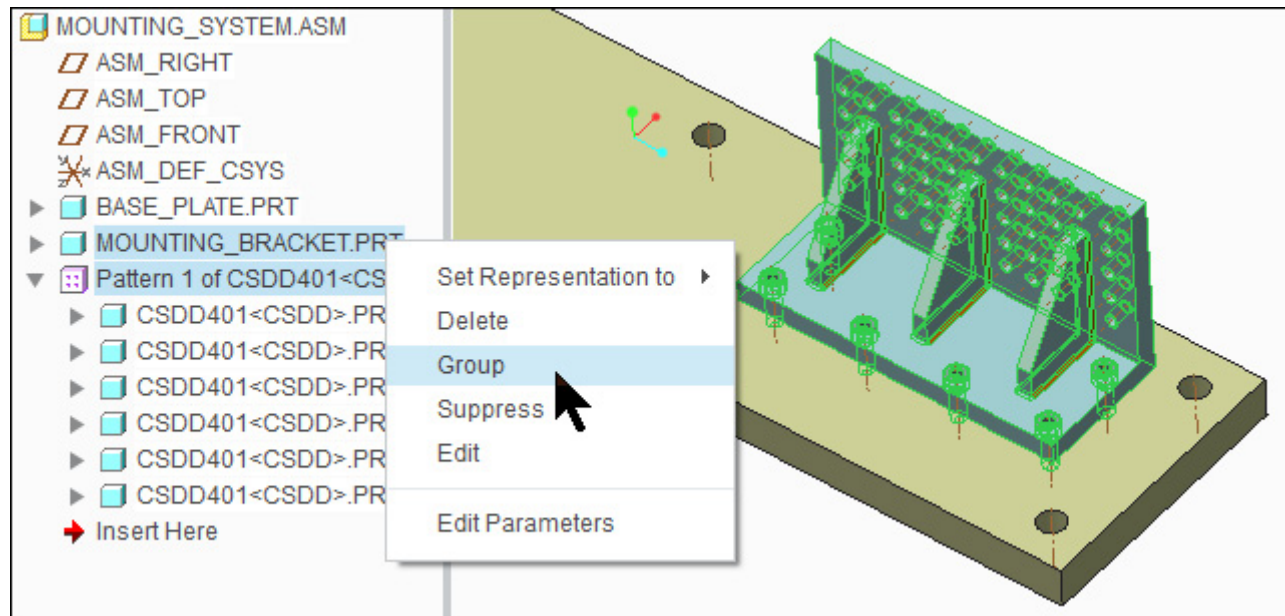


Figure 13.11(a) Group the Mounting Bracket and the Patterned Screws

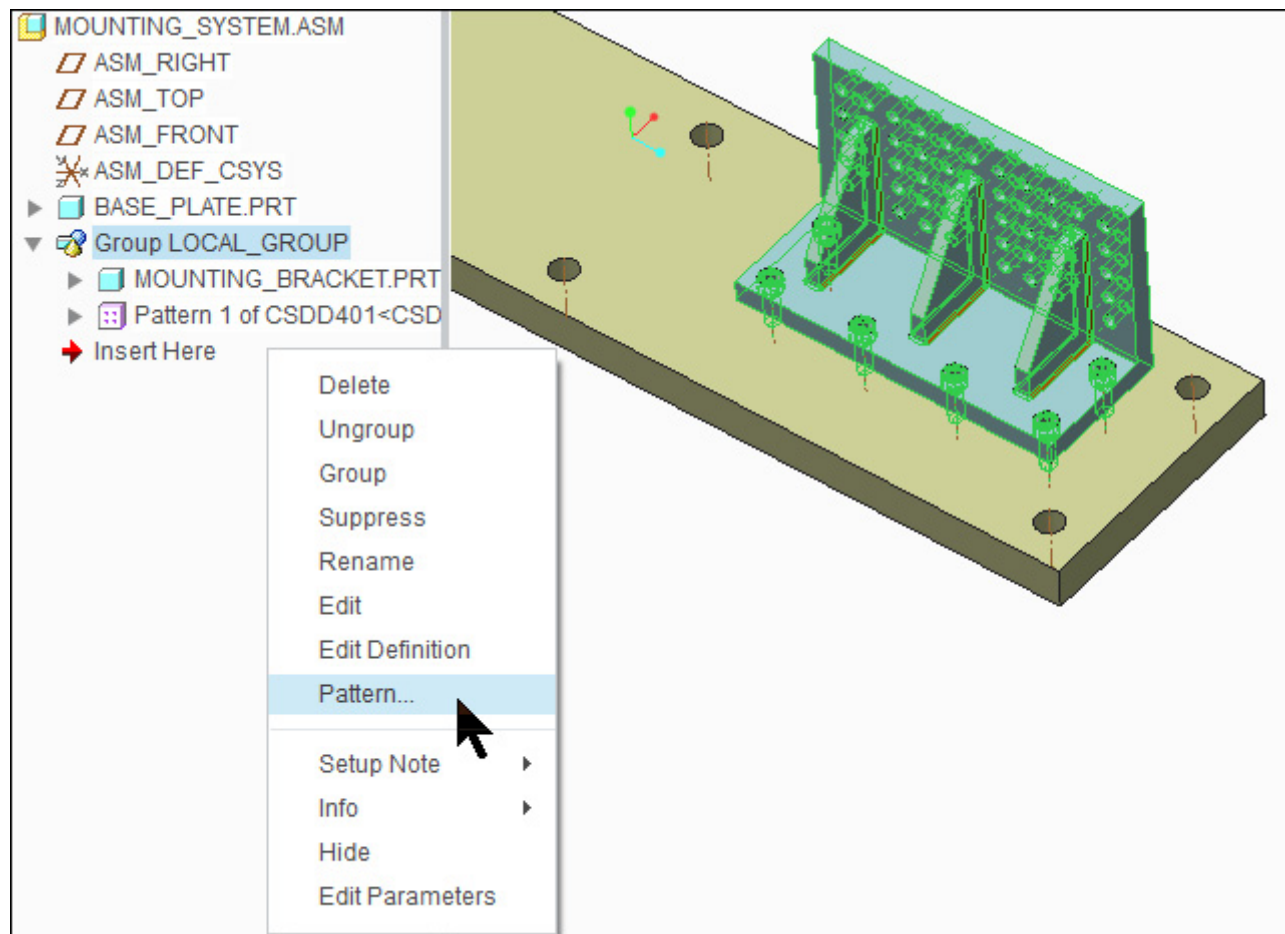


Figure 13.11(b) Pattern the Group

Click: > > select the end surface as the direction reference [Fig. 13.11(c)] > flip the direction arrow > instances > spacing > **Enter** > > **Regenerate** > > **Standard Orientation** [Fig. 13.11(d)] > **Ctrl+S** > **OK**

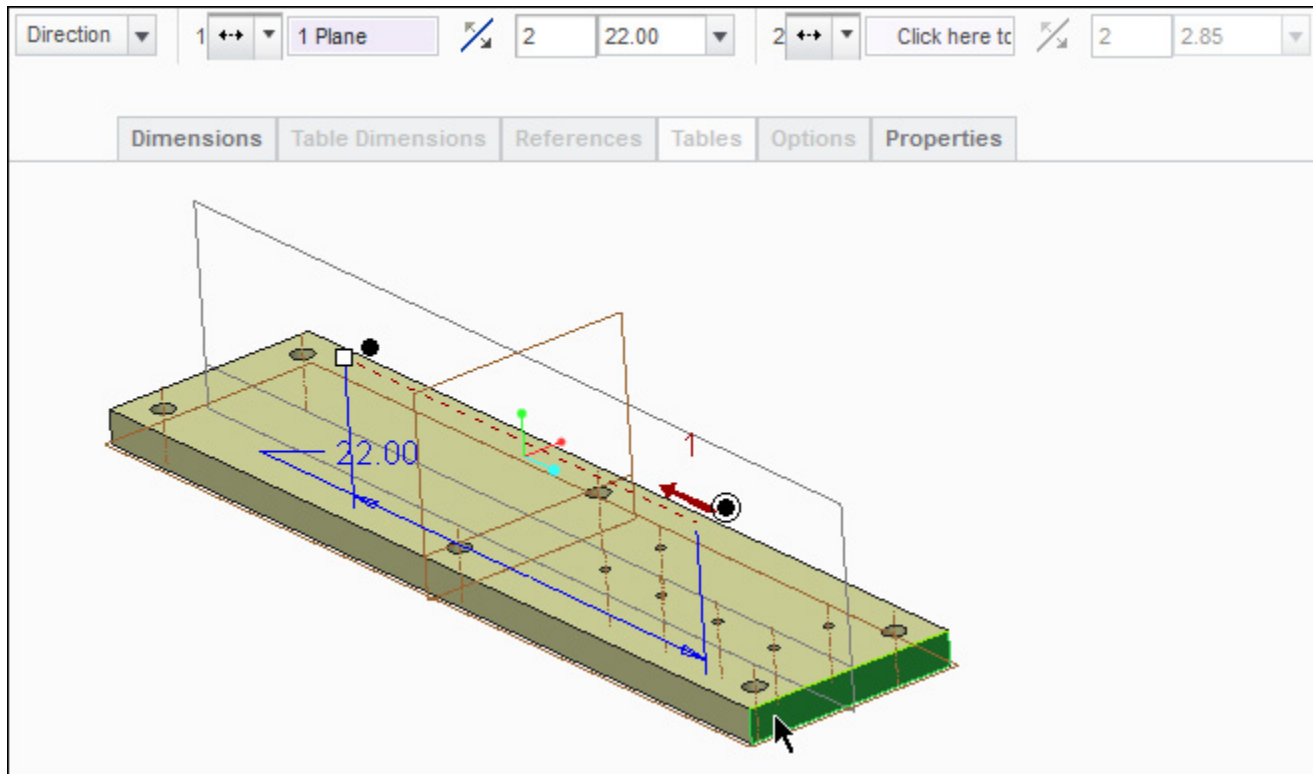


Figure 13.11(c) Two Instances Spaced 22.00 Apart

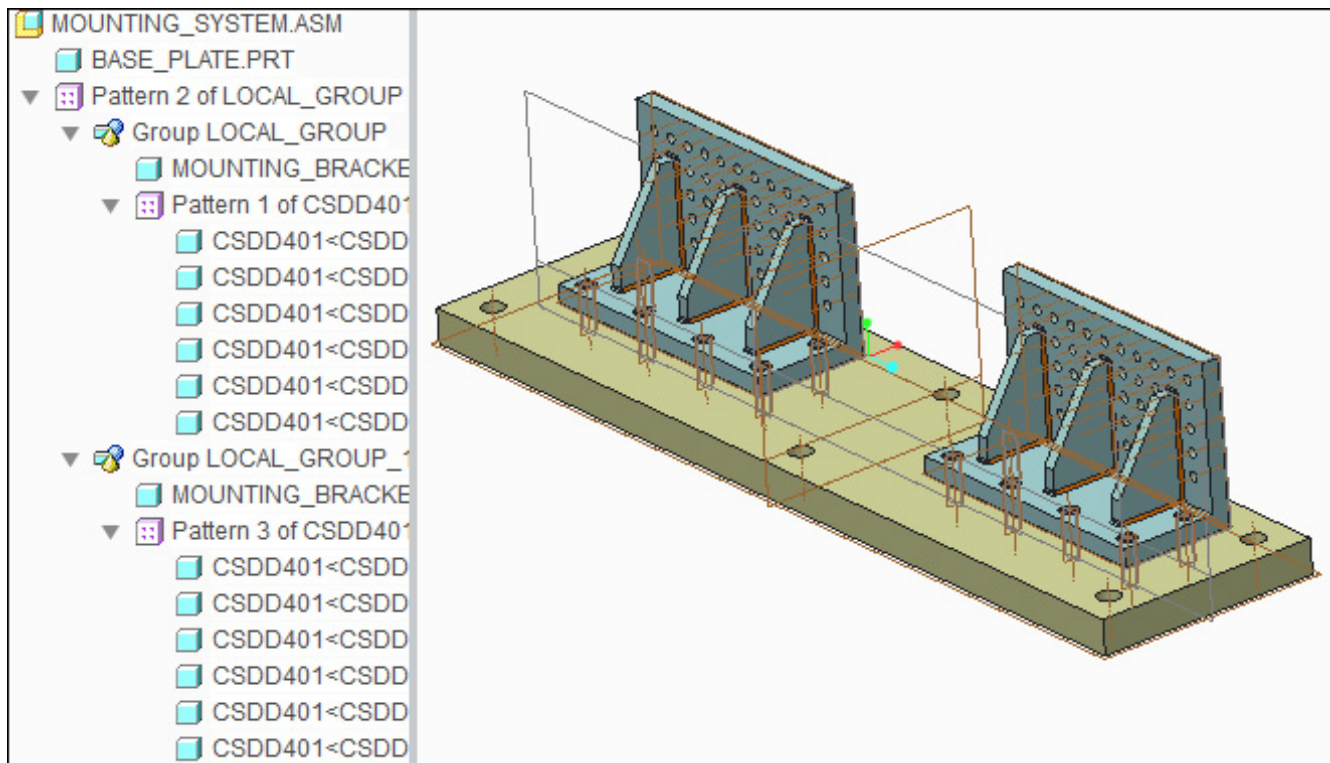


Figure 13.11(d) Completed Mounting System Assembly

Click: **Tools** tab > **Reference Viewer** >  **Dependencies** [Fig. 13.12(a)] > **Close** > **Bill of Materials** > **Top Level** > **OK** [Fig. 13.12(b)] >  close the Browser

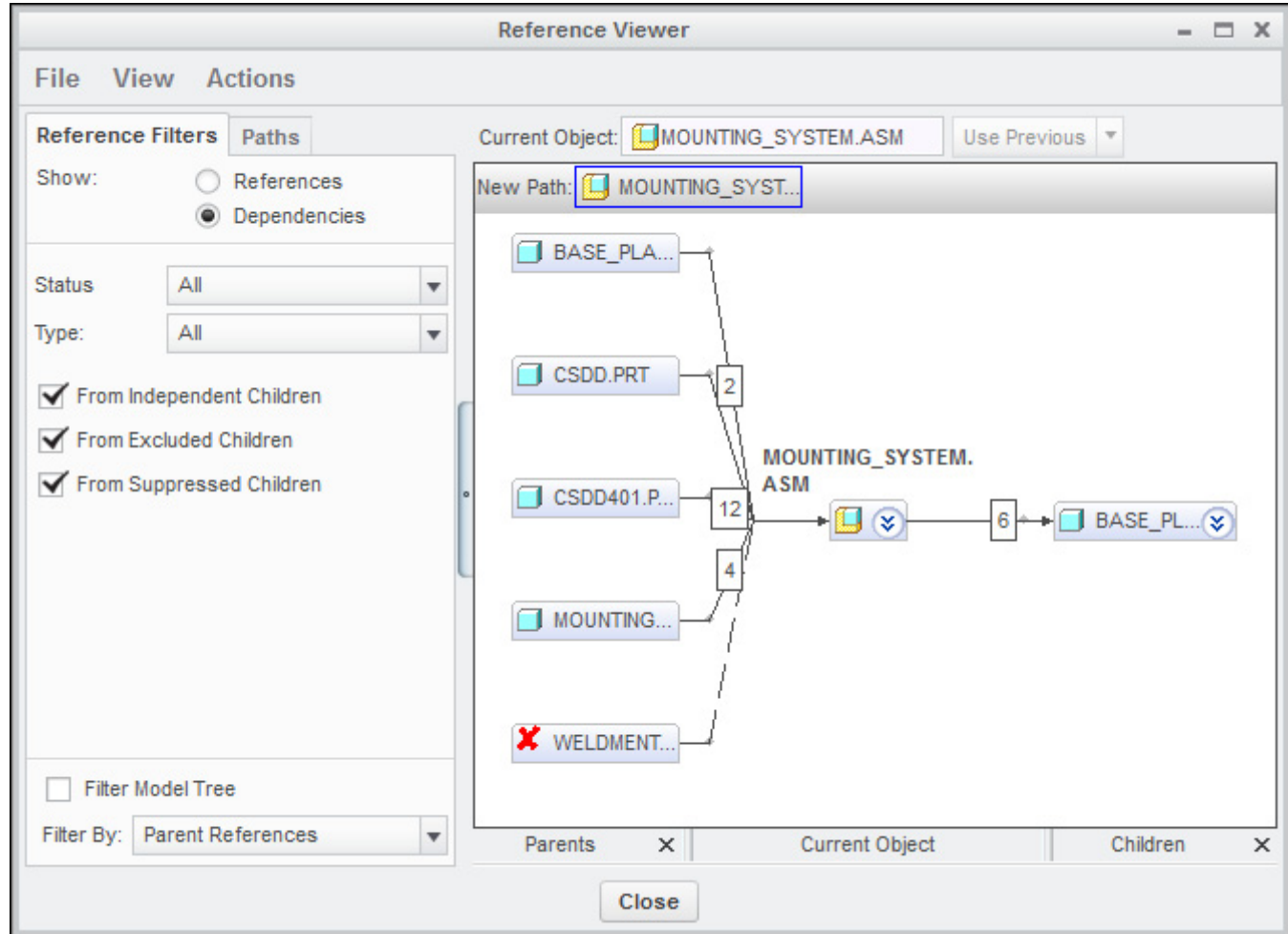


Figure 13.12(a) Reference Viewer

Assembly MOUNTING_SYSTEM contains:						
Quantity	Type	Name	Actions			
1	Part	BASE PLATE				
2	Part	MOUNTING BRACKET				
12	Part	CSDD401				

Summary of parts for assembly MOUNTING_SYSTEM:						
Quantity	Type	Name	Actions			
1	Part	BASE PLATE				
2	Part	MOUNTING BRACKET				
12	Part	CSDD401				

Figure 13.12(b) BOM

Click: **View** tab > **Model Display Group** > **Temporary Shade** [Fig. 13.12(c)] > **Ctrl+S** > **OK** > **File** > **Manage File** > **Delete Old Versions** > **Enter** > **File** > **Save As** > **Type** >  > **Zip File (*.zip)** > **OK** > **upload** the zip file to your course interface or attach to an email and send to your instructor and/or yourself > **File** > **Close** > **File** > **Exit** > **Yes**

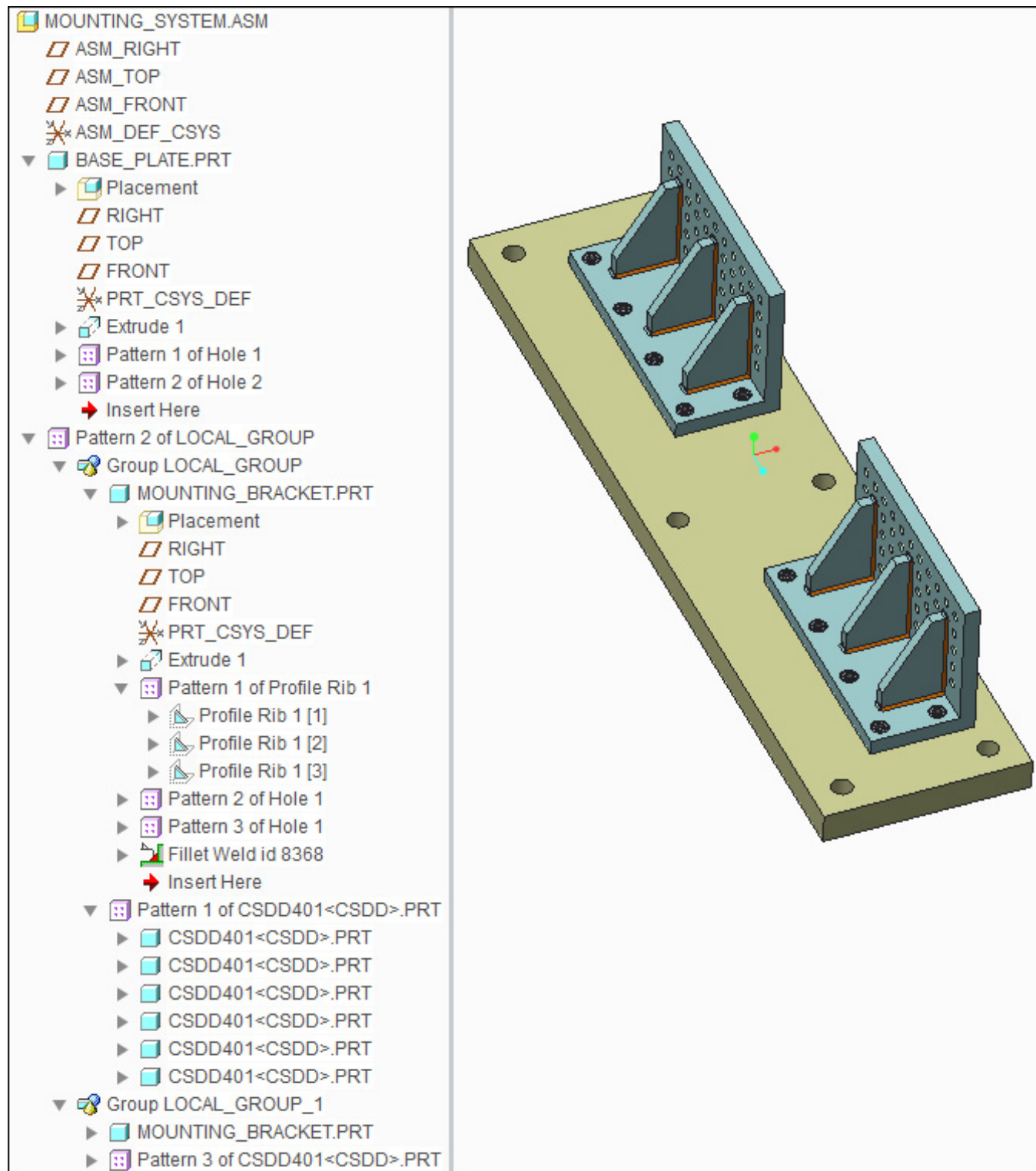


Figure 13.12(c) Mounting System Assembly with Temporary Shading (Note that the Datum Features are not displayed)

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