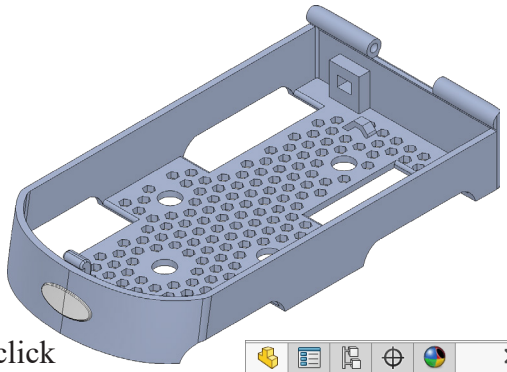
Chapter 18

Solar Train
Chassis



A. Extrude1 Sketch1 Hinge.

Step 1. Open your **Chassis part** file.

Step 2. Click **Right Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 1**.

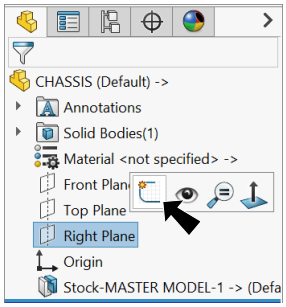


Fig. 1

Step 3. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 4. Zoom on **rear of body**, **Fig. 2**.

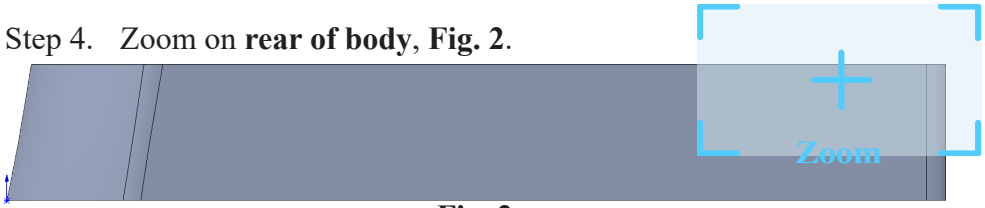


Fig. 2

Step 5. Click **Wireframe** on the View toolbar.

Step 6. Click **Circle** **(S)** on the Sketch toolbar.

Step 7. Sketch **circle on just above rear**, **Fig. 3**.

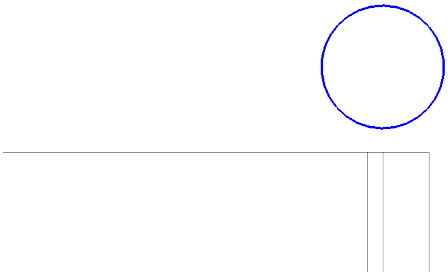


Fig. 3

Step 8. **Unselect Circle tool**. To unselect, right click graphics area and click Select from menu.

Step 9. **Ctrl click circle** and **top edge of body** to select both. Release Ctrl key and click **Make Tangent** on the context toolbar, **Fig. 4**.

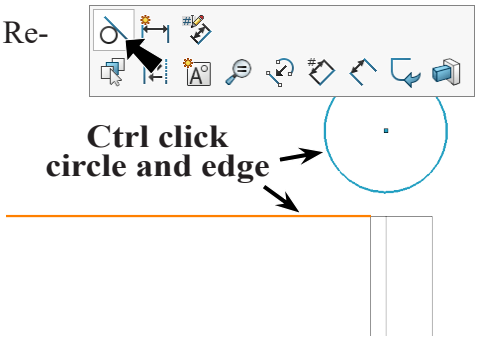


Fig. 4

Step 10. Click **Smart Dimension** **(S)** on the Sketch toolbar.

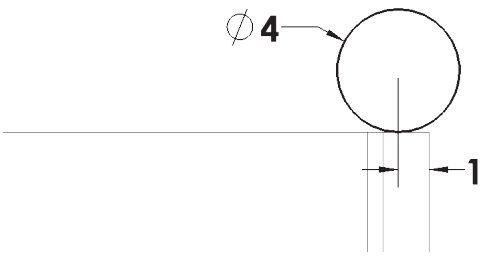


Fig. 5

Step 11. Add dimensions, **Fig. 5**.

Step 12. Click **Line** (**L**) on the Sketch toolbar.

Step 13. Start sketch from tangent point on top edge of body across to inside edge and down along edge. Autotransition to Tangent Arc tool and sketch arc up to circle, **Fig. 6**. To autotransition to arc, after sketching endpoint of line, move cursor away and back. The preview shows a tangent arc. Click to place the arc. Double click to terminate the line chain.

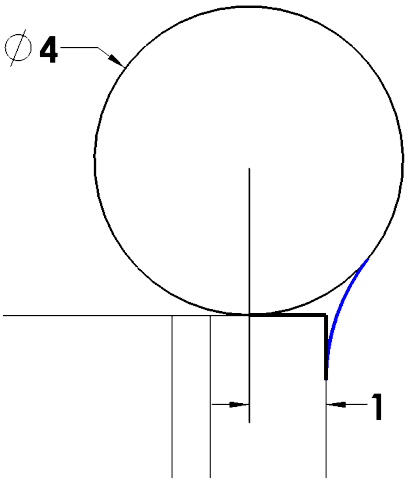


Fig. 6

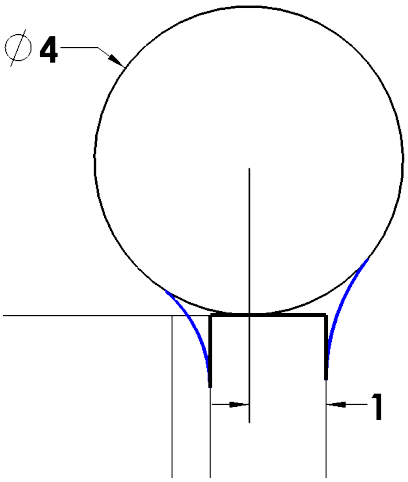


Fig. 7

Step 14. Start another line from tangent point on top edge of body across to outside edge and down along edge. Autotransition to Tangent Arc tool and sketch arc up to circle, **Fig. 7**. Click to place the arc.

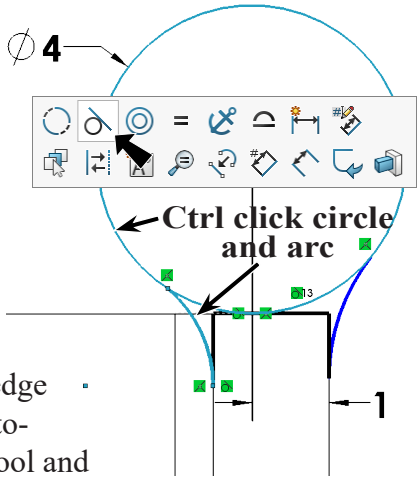


Fig. 8

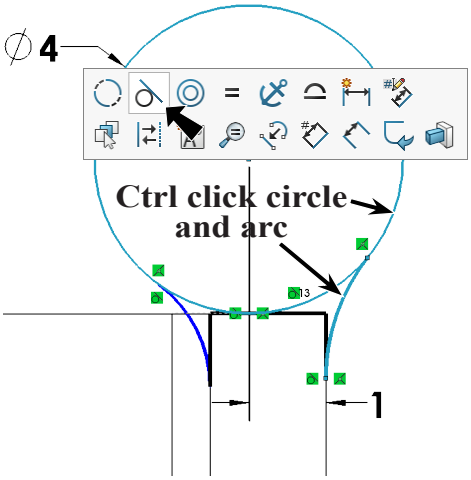


Fig. 9

Step 15. **Unselect Circle tool**. To unselect, right click graphics area and click Select from menu.

Step 16. **Ctrl click an arc and circle** to select both. Release Ctrl key and click **Make Tangent** on the context toolbar, **Fig. 8**.

Step 17. **Ctrl click other arc and circle** to select both. Release Ctrl key and click **Make Tangent** on the context toolbar, **Fig. 9**.

Step 18. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 19. Add the **.7** dimensions, **Fig. 10**.

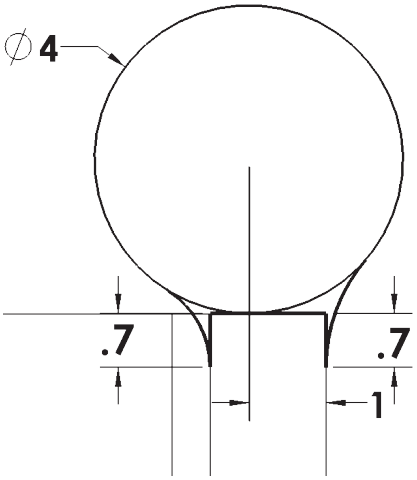


Fig. 10

Step 20. Click **Shaded With Edges** on the View toolbar.

Step 21. Rotate view to **hinge**, **Fig. 12**. Use **Left Arrow key** **once and Down Arrow key** **once**.

Step 22. Click **Features** Features on the Command Manager toolbar.

Step 23. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 24. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 11**
End Condition **Mid Plane**
Depth D1 **52**
under Selected Contours
click **3 contours**, **Fig. 12**
click OK .

Step 25. Save (**Ctrl-S**).

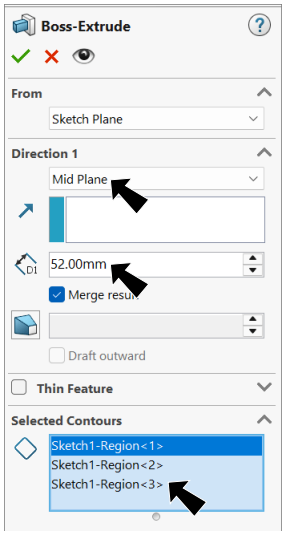


Fig. 11

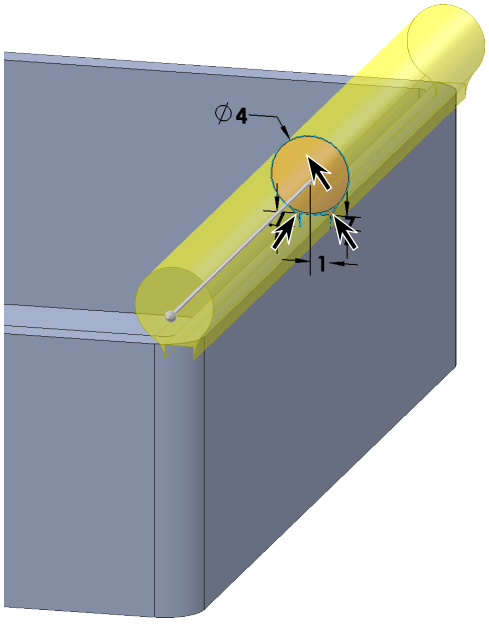


Fig. 12

B. Extruded Cut1 Sketch2 Hinge.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 13**.

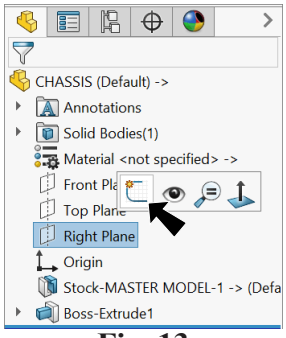


Fig. 13

Step 2. Click **Circle** **(S)** on the Sketch toolbar.

Step 3. Sketch **circle at centerpoint of hinge Extrude**, **Fig. 14**. To wake up centerpoint, hover cursor over circular edge.

Step 4. Click **Smart Dimension** **(S)** on the Sketch toolbar.

Step 5. Add **offset dimension .3 from circular edge**, **Fig. 15**.

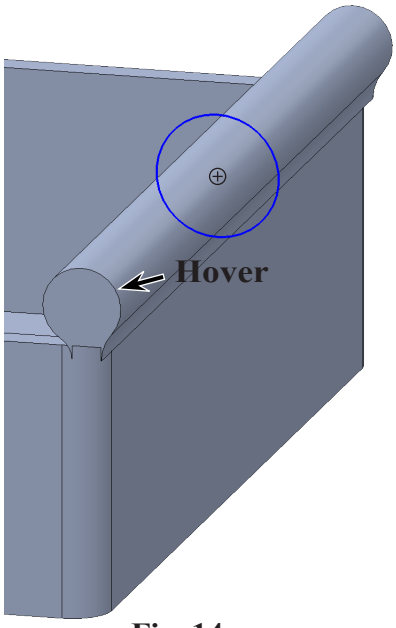


Fig. 14

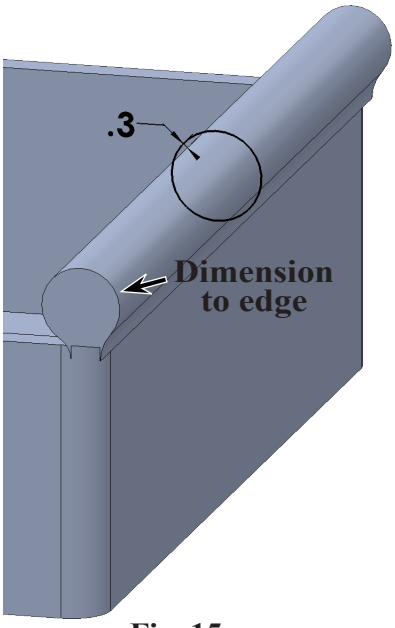


Fig. 15

Step 6. Click **Features** on the Command Manager toolbar.

Step 7. Click **Extruded Cut** on the Features toolbar.

Step 8. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 16**
End Condition **Mid Plane**
Depth **18.3**
click OK .

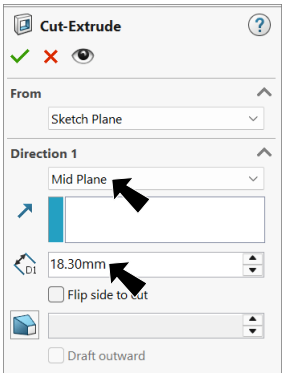


Fig. 16

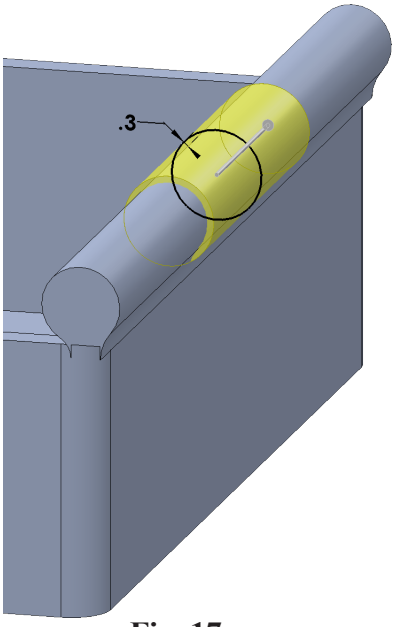


Fig. 17

Step 9. Save **(Ctrl-S)**.

C. Split Line and Dome Sketch3 Hinge.

Step 1. Click the **inside face of hinge** and click **Sketch** on the context toolbar, **Fig. 18**.

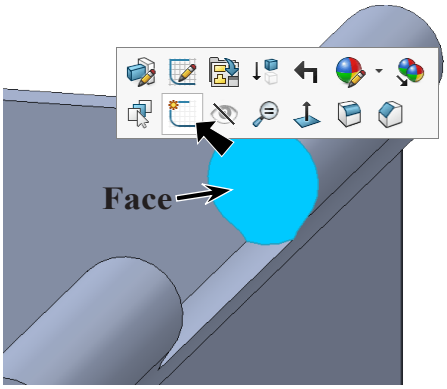


Fig. 18

Step 2. Click **Circle** (**S**) on the Sketch toolbar.

Step 3. Sketch **circle at centerpoint of cut**, **Fig. 19**. Wake up centerpoint.

Step 4. Click **Smart Dimension** (**S**) on the Sketch toolbar.

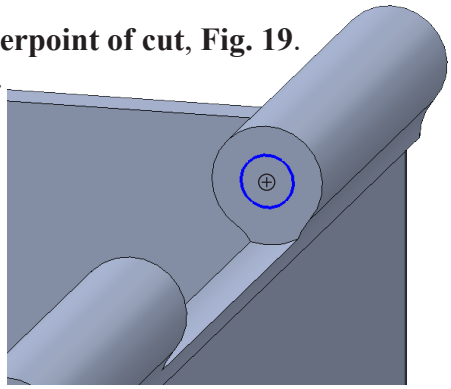


Fig. 19

Step 5. Dimension **diameter 2.1**, **Fig. 20**.

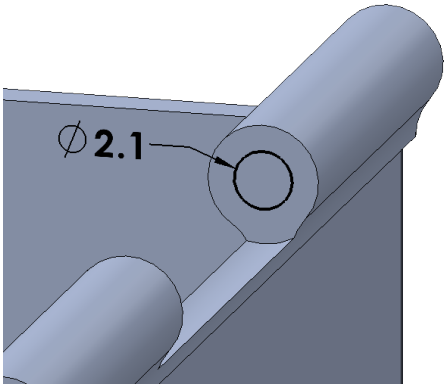


Fig. 20

Step 6. Click Insert Menu > Curve > Split Line.

Step 7. In the Split Line Property Manager:
under Type of Split, **Fig. 21**
select **Projection**
under Selections
Sketch is selected
in Faces to Split field
click **side face**, **Fig. 22**
click OK .

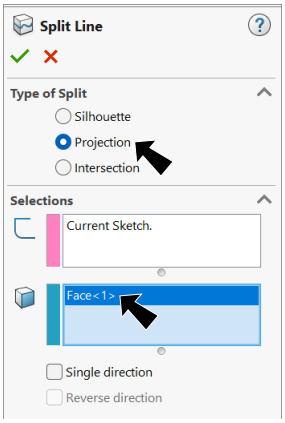


Fig. 21

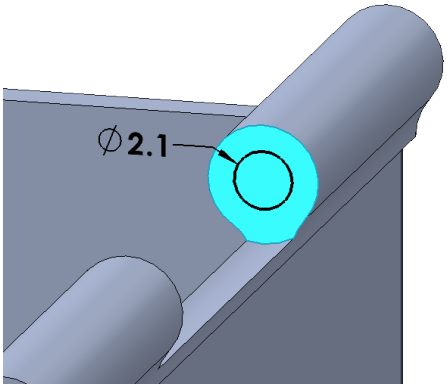


Fig. 22

Step 8. Click **Features** on the Command Manager toolbar.

Step 9. Click **Dome** on the Features toolbar.

Step 10. In Dome Property Manager set:
under Parameters, **Fig. 23**
click **split line face**, **Fig. 24**
Distance .7
Reverse Direction
Dome should be inward
click OK .

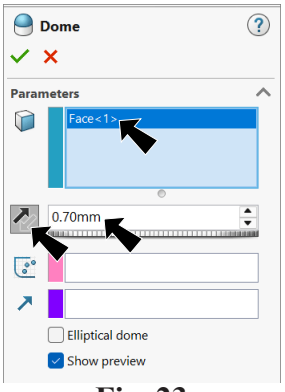


Fig. 23

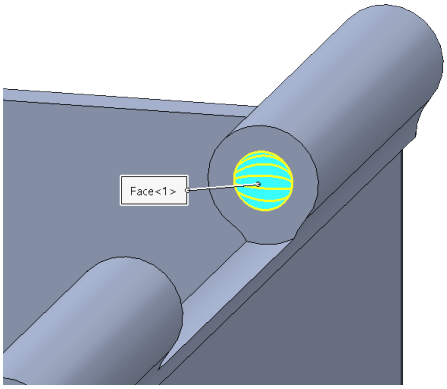


Fig. 24

Step 11. Save (**Ctrl-S**).

D. Mirror1 Dome.

Step 1. **Ctrl click Right Plane** and **Dome1** features to select plane and feature, **Fig. 25**.

Step 2. Click **Mirror** Mirror on the Features toolbar.

Step 3. In the Mirror Property Manager set:
under Options, **Fig. 26**
check **Geometry Pattern**
click OK ✔.

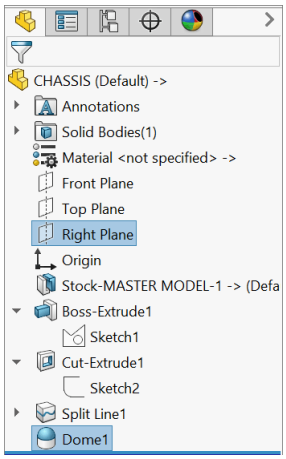


Fig. 25

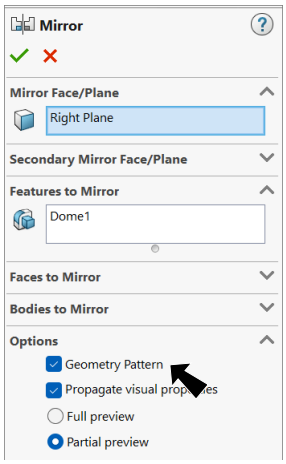


Fig. 26

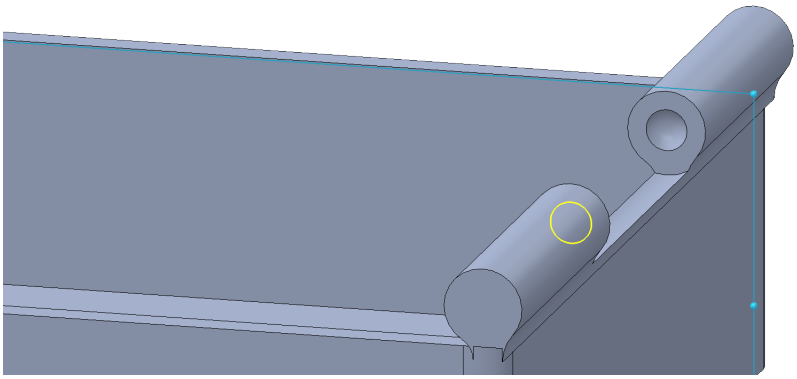


Fig. 27

E. Extruded Cut2 Sketch4 Hinge Cut.

Step 1. Click **Top Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 28**.

Step 2. Click **Bottom** on the Standard Views toolbar. (**Ctrl-6**)

Step 3. Zoom in on **rear right side**, **Fig. 29**.

Step 4. Click **Convert Entities** Convert Entities on the Sketch toolbar.

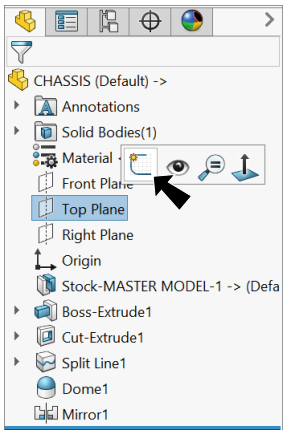


Fig. 28

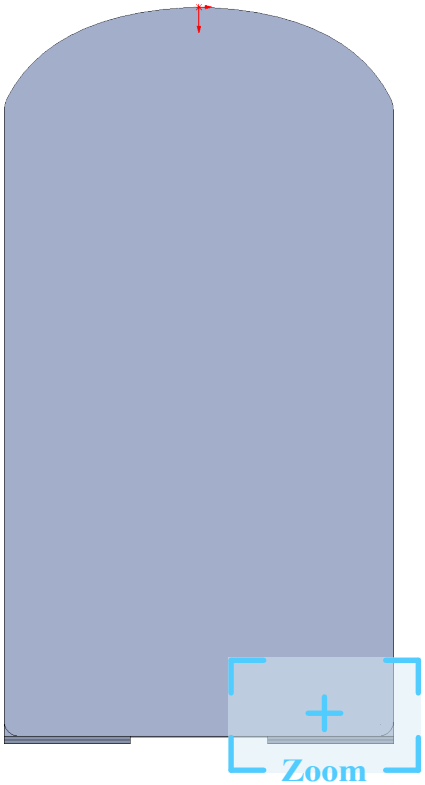


Fig. 29

Step 5. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 30**
click **fillet face, side edge and rear edge (3)**, **Fig. 31**
click OK ✔.

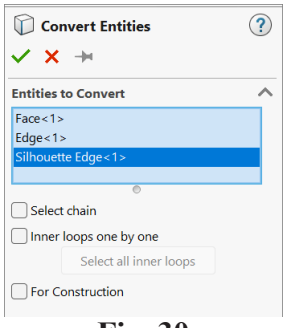


Fig. 30

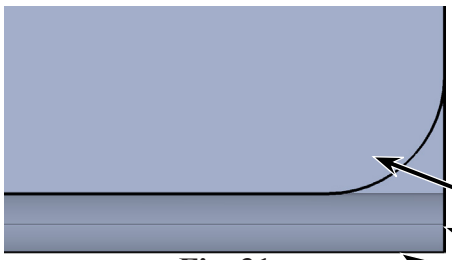


Fig. 31

Step 6. Click **Line** (**L**) on the Sketch toolbar.

Step 7. Sketch line from convert fillet **endpoint to converted silhouette rear edge** of body, **Fig. 32**

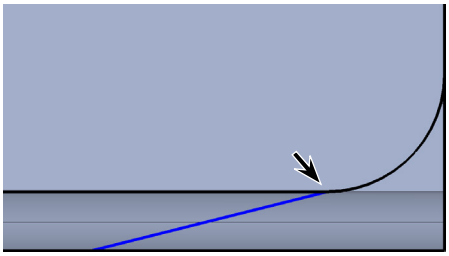


Fig. 31

Step 8. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 9. Add **6** dimension, **Fig. 33**.

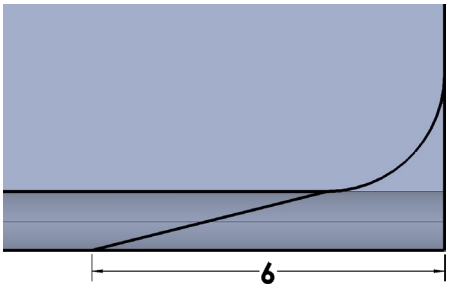


Fig. 33

Step 10. Rotate view to rear, **Fig. 35**. To rotate view, click **Iso-metric** on the Standard Views toolbar (**Ctrl-7**), then in bottom left corner of graphics area **Shift click the Y axis of the Reference Triad one time**.

Step 11. Click **Features** on the Command Manager toolbar.

Step 12. Click **Extruded Cut** on the Features toolbar.

Step 13. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 34**
End Condition **Through All**
Reverse Direction
under Selected Contours
click **contour**, **Fig. 35**
click OK .

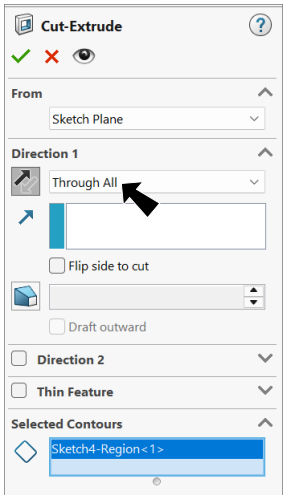


Fig. 34

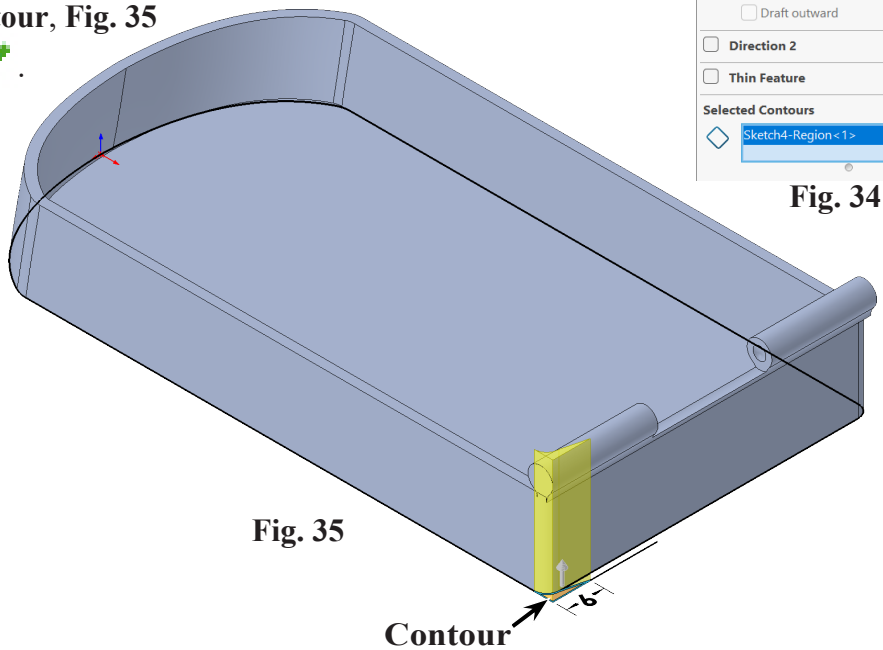


Fig. 35

F. Mirror2 Hinge Cut.

Step 1. **Ctrl click Right Plane** and **Cut-Extrude2** feature to select plane and feature, **Fig. 36**.

Step 2. Click **Mirror** Mirror on the Features toolbar.

Step 3. In the Mirror Property Manager click OK ✔, **Fig. 37**.

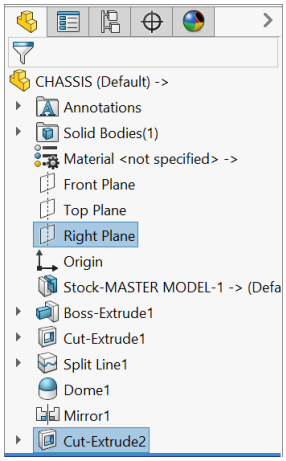


Fig. 36

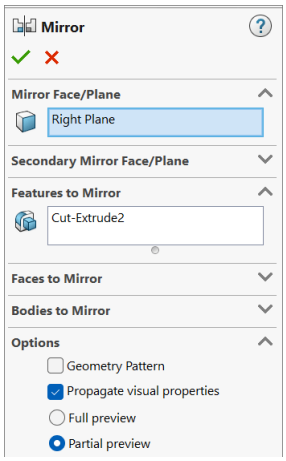


Fig. 37

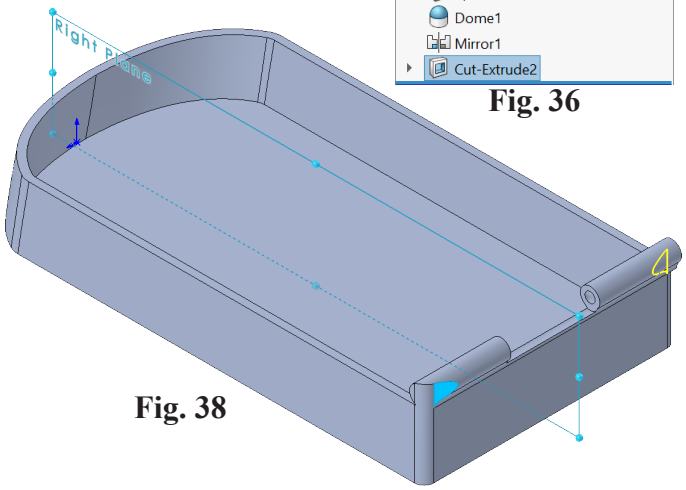


Fig. 38

G. Extruded Cut3 Sketch5 Gear Cut.

Step 1. Click the **top face** and click **Sketch** on the context toolbar, **Fig. 39**.

Step 2. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 3. Click **Corner Rectangle** in the **Rectangle flyout** on the Sketch toolbar.

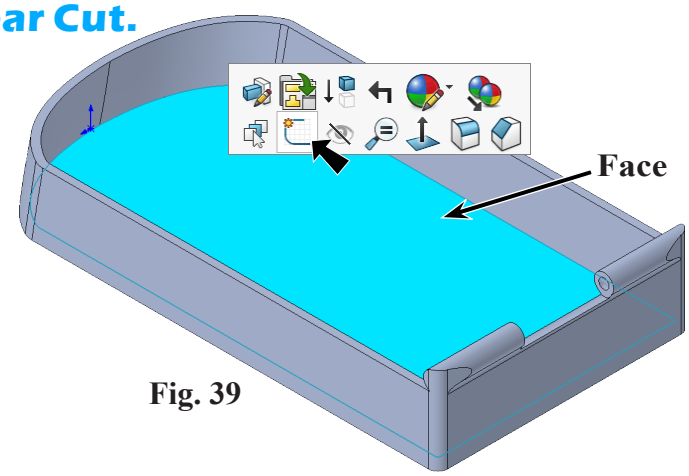


Fig. 39

Step 4. Sketch **corner rectangle**, **Fig. 40**.

Step 5. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 6. Add dimensions, **Fig. 41**.

Step 7. Click **Isometric** on the Standard Views toolbar. **(Ctrl-7)**

Step 8. Click **Features** on the Command Manager toolbar.

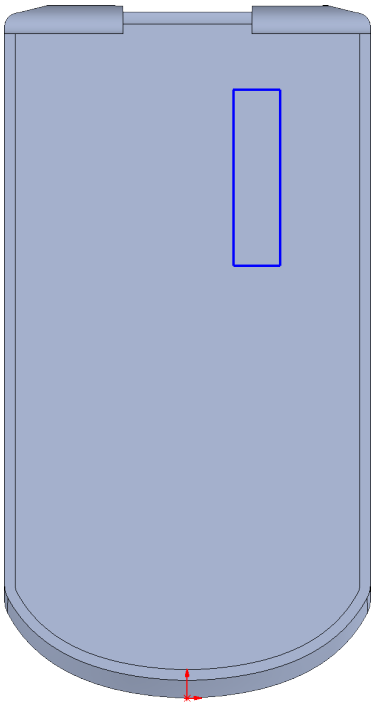


Fig. 40

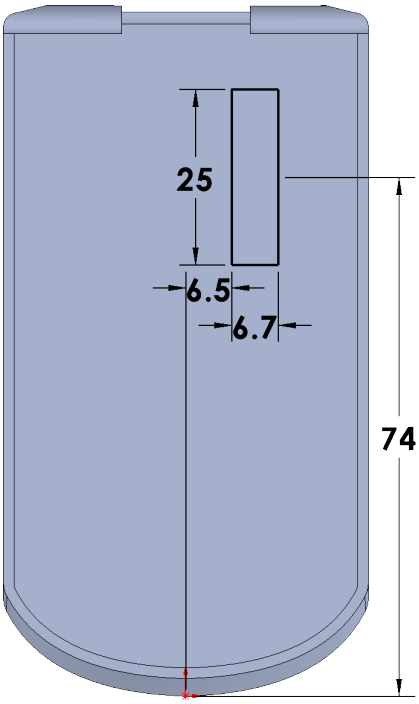


Fig. 41

Step 9. Click **Extruded Cut** on the Features toolbar.

Step 10. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 42**
End Condition **Through All**
click OK .

Step 11. Save **(Ctrl-S)**.

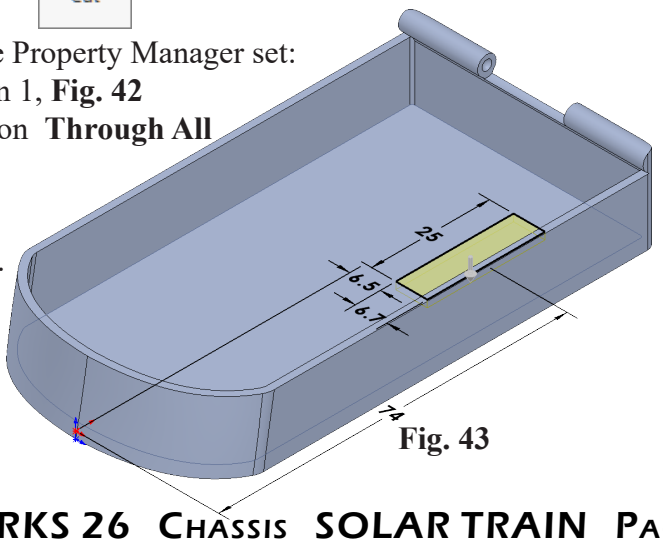


Fig. 43

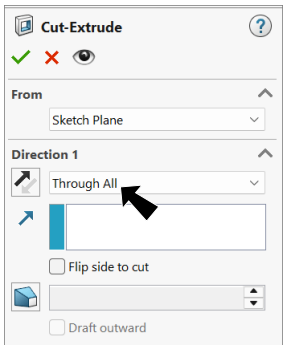


Fig. 42

H. Extruded Cut4 Sketch6 Pin Holes.

Step 1. Click the **top face** and click **Sketch** on the context toolbar, **Fig. 44**.

Step 2. Click **Normal To** on the Standard Views toolbar. (**Ctrl-8**)

Step 3. Click **Circle** (**S**) on the Sketch toolbar.

Step 4. Sketch **4 circles**, **Fig. 45**.

Step 5. **Unselect Circle tool**. To unselect, right click graphics area and click Select from menu.

Step 6. **Ctrl click centerpoint of two circles** and **Origin** to select the three. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 46**.

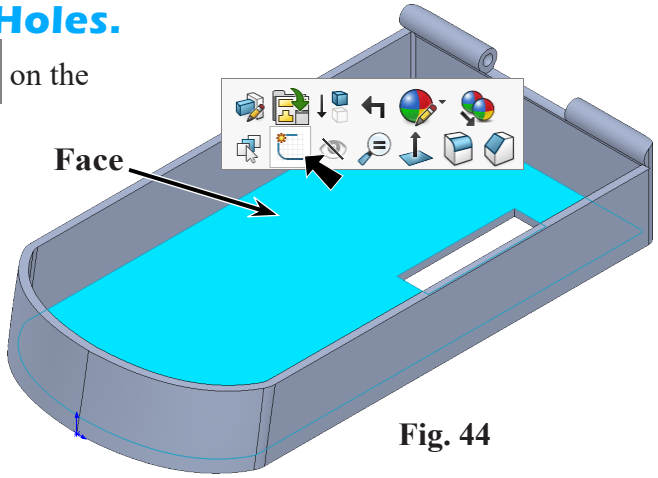


Fig. 44

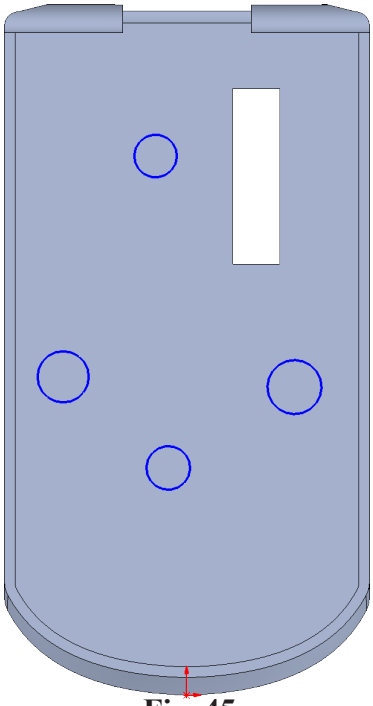


Fig. 45

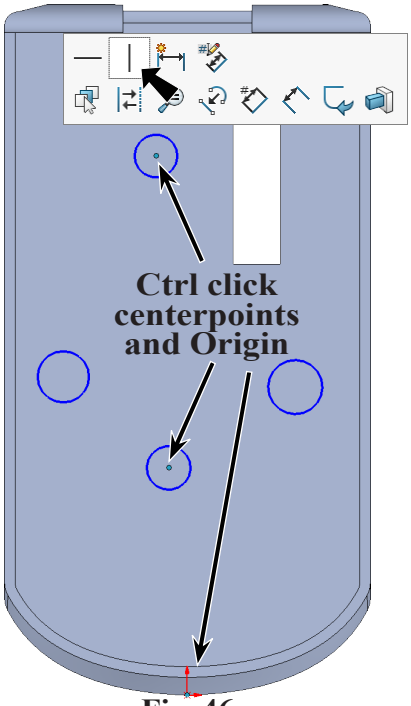


Fig. 46

Step 7. **Ctrl click centerpoint the two some what horizontal circles** to select both. Release Ctrl key and click **Make Horizontal** on the context toolbar, **Fig. 47**.

Step 8. **Drag a selection to select all circles**. Release Ctrl key and click **Make Equal** on the context toolbar, **Fig. 48**.

Step 9. Click **Smart Dimension** (**S**) on the Sketch toolbar.

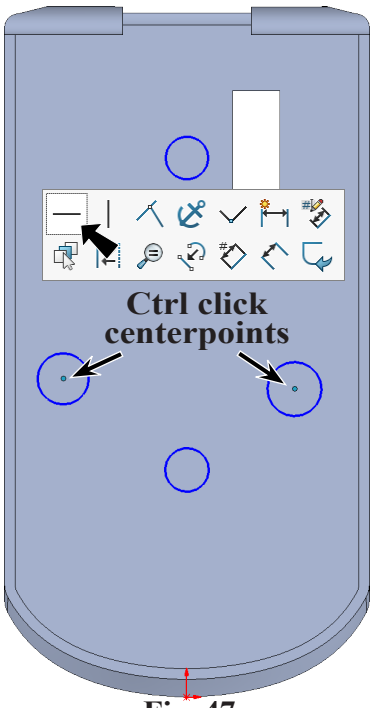


Fig. 47

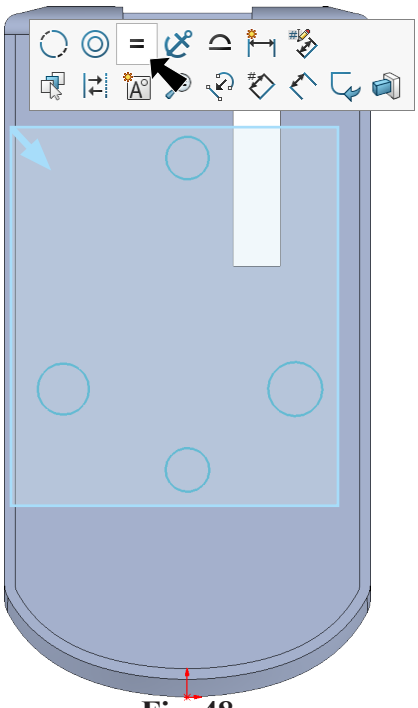


Fig. 48

Step 10. Add dimensions, **Fig. 49**.

Step 11. Click **Isometric** on the Standard Views toolbar.

Step 12. Click **Features** on the Command Manager toolbar.

Step 13. Click **Extruded Cut** on the Features toolbar.

Step 14. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 50**
End Condition **Through All**
click OK .

Step 15. Save (**Ctrl-S**).

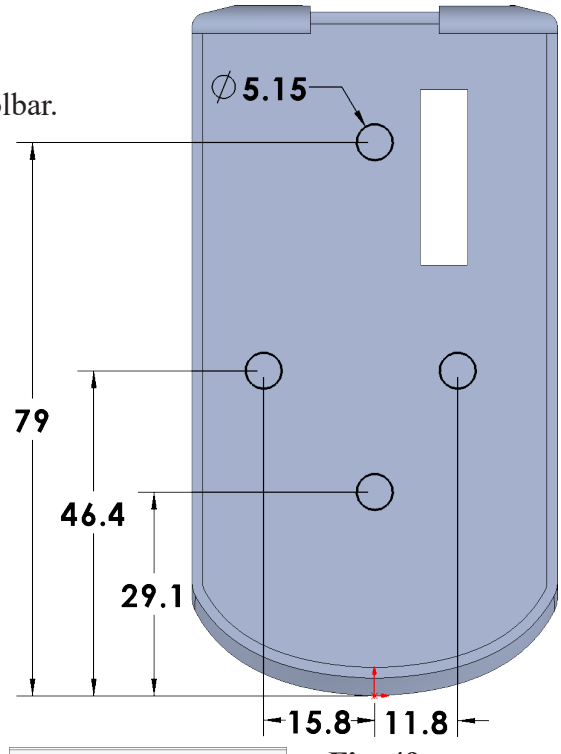


Fig. 49

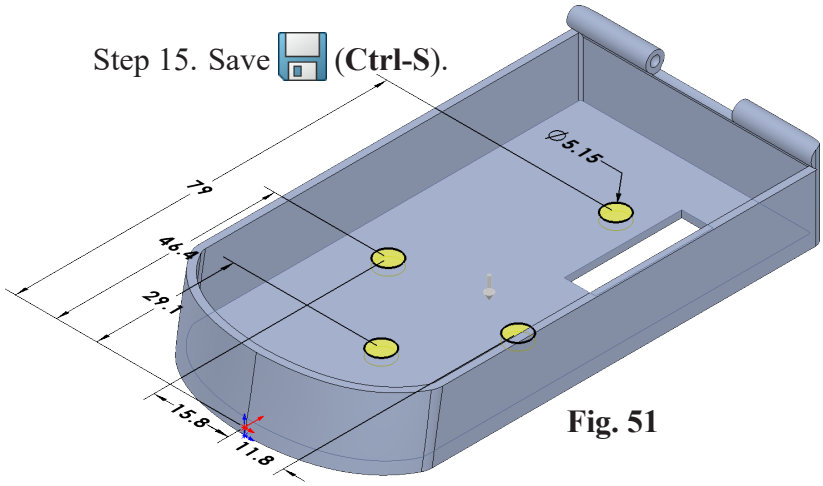


Fig. 51

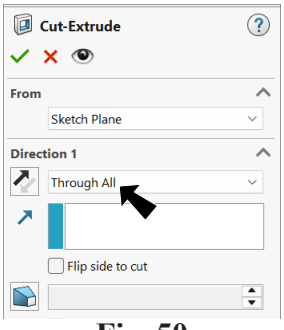


Fig. 50

I. Extruded Cut5 Sketch7 Front Wheel Well.

Step 1. Click the **side face** and click **Sketch** on the context toolbar, **Fig. 52**.

Step 2. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 3. Click **Line** **(L)** on the Sketch toolbar.

Step 4. Sketch the **3 lines**, **Fig. 53**.

Step 5. Click **3 Point Arc** **(S)** in the **Arc flyout** on the Sketch toolbar.

Step 6. Sketch **arc at endpoints and radius to left**, **Fig. 54**.

Step 7. **Unselect Arc tool**. To unselect, right click graphics area and click Select from menu.

Step 8. Click **vertical line** and click **Construction Geometry** on the context toolbar, **Fig. 55**.

Step 9. **Drag a selection to select all geometry**, **Fig. 56**.

Step 10. Click **Mirror Entities** on the Sketch toolbar.

Step 11. Click **Smart Dimension** **(S)** on the Sketch toolbar.

Step 12. Add dimensions, **Fig. 57**.

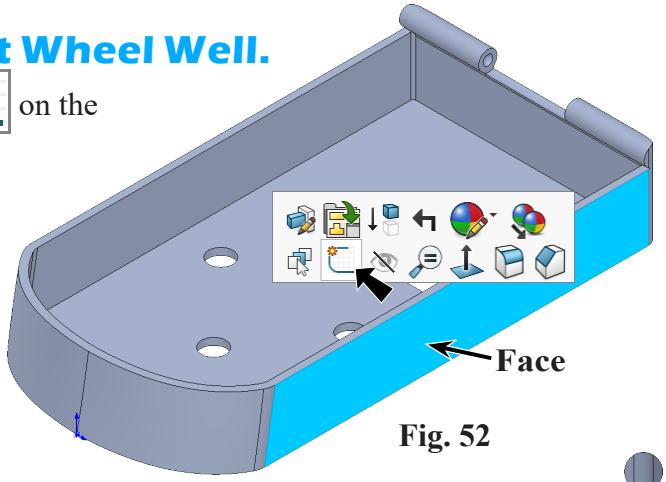


Fig. 52

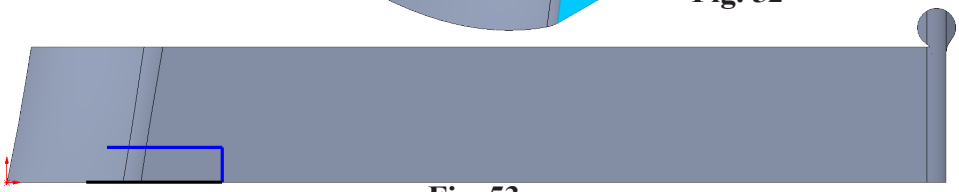


Fig. 53

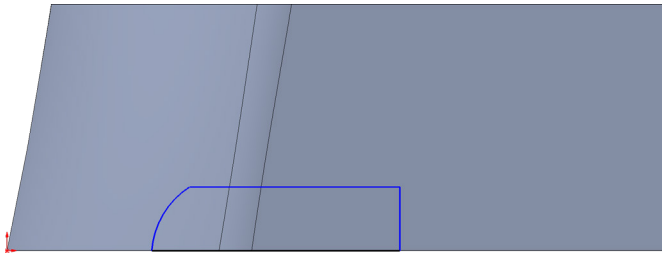


Fig. 54

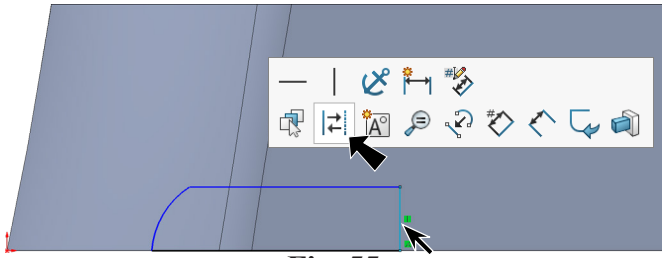


Fig. 55

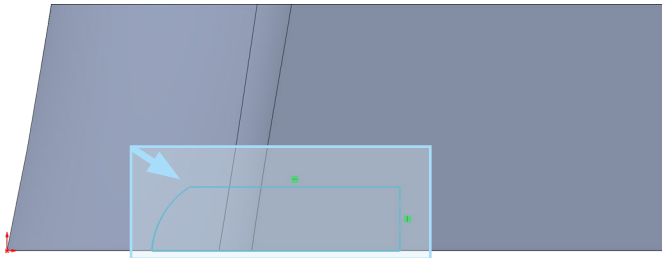


Fig. 56

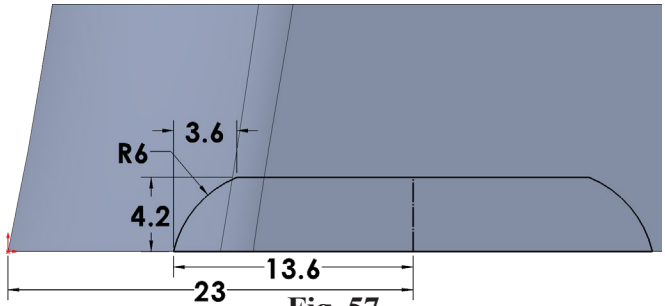


Fig. 57

Step 13. **Unselect Smart Dimension**. To unselect, right click graphics area and click Select from menu.

Step 14. **Drag a selection to select all**, **Fig. 58**.

Step 15. Click **Copy Entities** Copy Entities in the **Move Entities flyout** Move Entities on the Sketch toolbar.

Step 16. In the Copy Property Manager set:
under Entities to Copy, **Fig. 59**
preselected
check **Keep Relations**
under Parameters
select **X/Y**
Delta X ΔX 51
click OK .

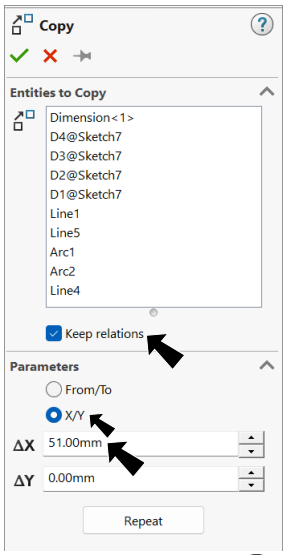


Fig. 59

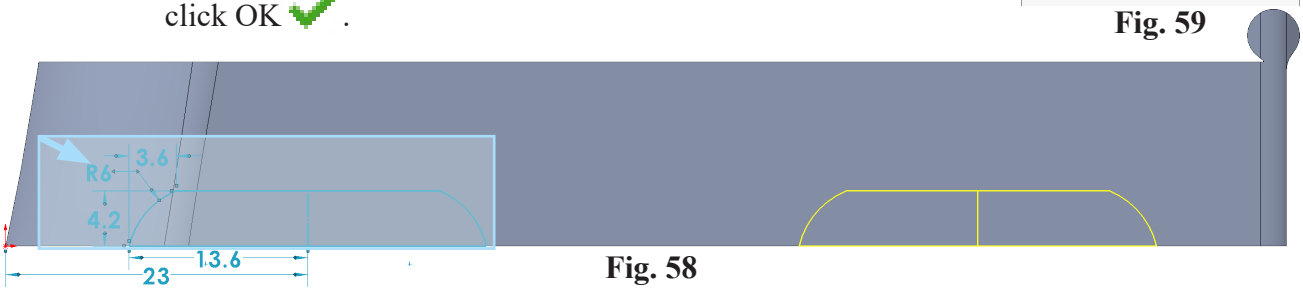


Fig. 58

Step 17. **Ctrl click bottom line of copied entity and bottom edge** to select both. Release Ctrl key and click **Make Collinear** on the context toolbar, **Fig. 60**.

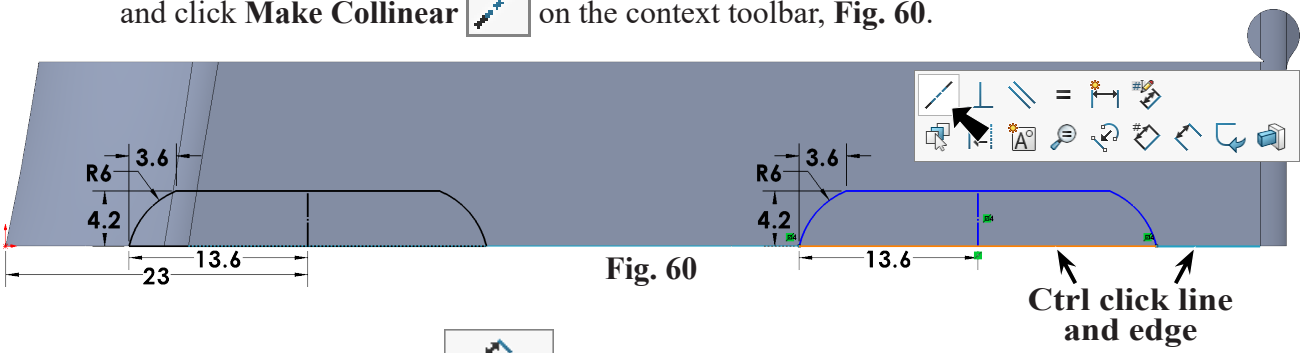


Fig. 60

Step 18. Click **Smart Dimension** Smart Dimension **(S)** on the Sketch toolbar.

Step 19. Add: **4.2 and 74 dimensions**. **Change length to 15.65**, **Fig. 61**.

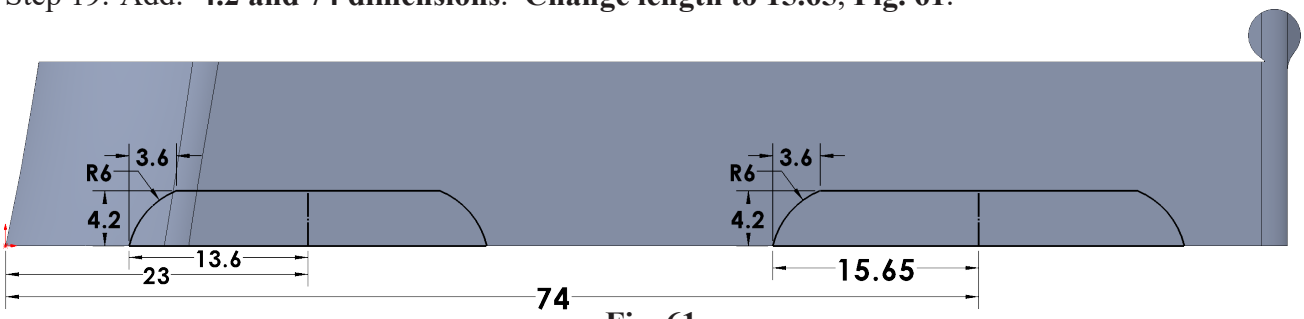
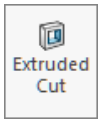


Fig. 61

Step 20. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 21. Click **Features**  on the Command Manager toolbar.

Step 22. Click **Extruded Cut**  on the Features toolbar.

Step 23. In the Cut-Extrude Property Manager set:

under Direction 1, **Fig. 62**

End Condition **Blind**

Depth  **11**

under Selected Contours

click **front wheel well 2 contours**, **Fig. 63**

click OK  .

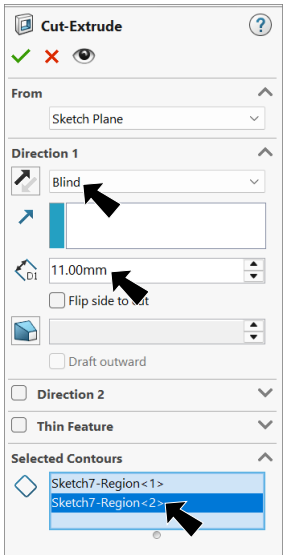


Fig. 62

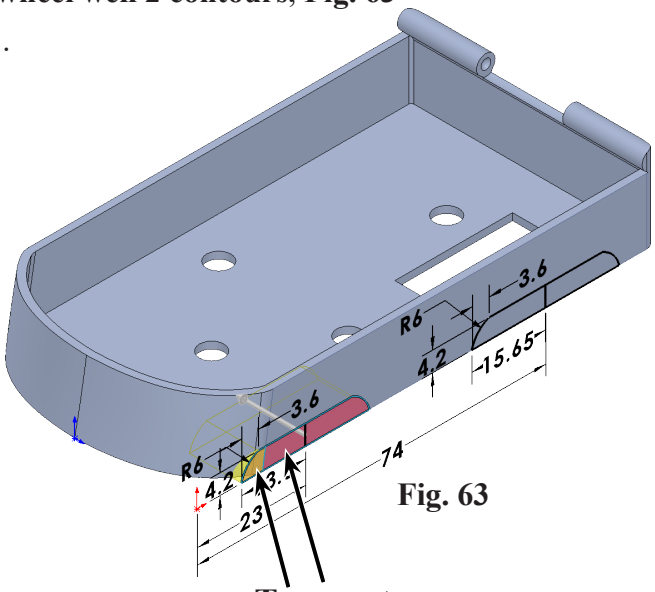


Fig. 63

J. Extruded Cut6 Sketch7 Rear Wheel Well.

Step 1. Expand **Cut-Extrude5** in the Feature Manager and select **Sketch7**, **Fig. 64**.

Step 2. Click **Extruded Cut** on the Features toolbar.

Step 3. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 65**
End Condition **Blind**
Depth **9.5**
under Selected Contours
unselect front well contour and click **rear well contour**, **Fig. 66**
click OK .

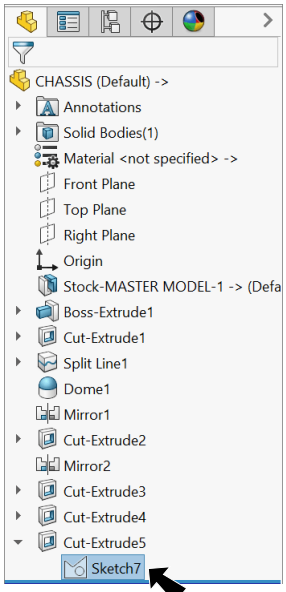


Fig. 64

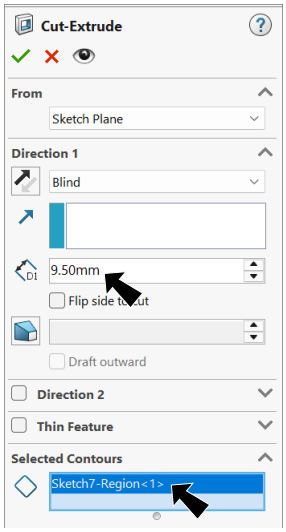


Fig. 65

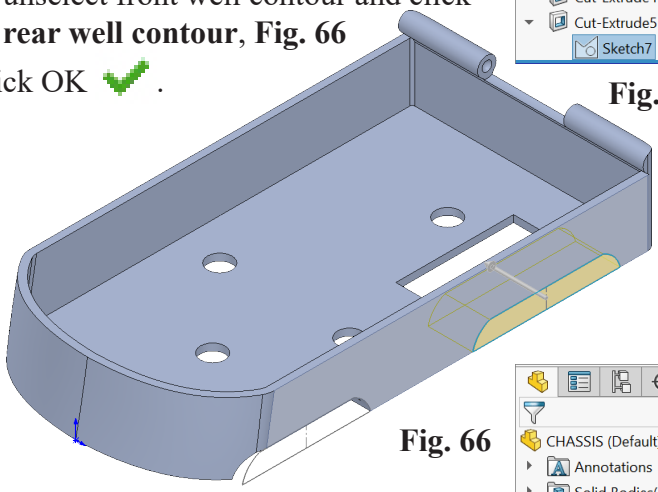


Fig. 66

K. Mirror2 Wheel Wells.

Step 1. **Ctrl click Right Plane**, **Cut-Extrude5** and **Cut-Extrude6** features to select plane and features, **Fig. 67**.

Step 2. Click **Mirror** on Features toolbar.

Step 3. In Mirror Property Manager click OK .

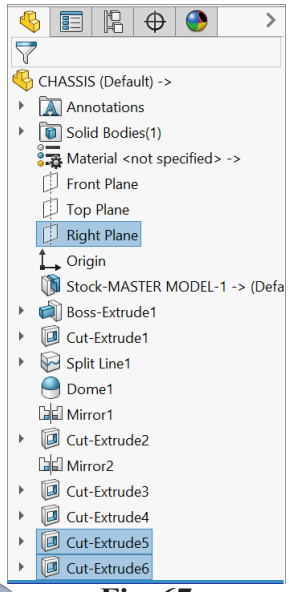


Fig. 67

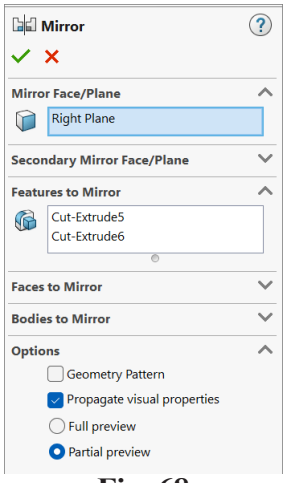


Fig. 68

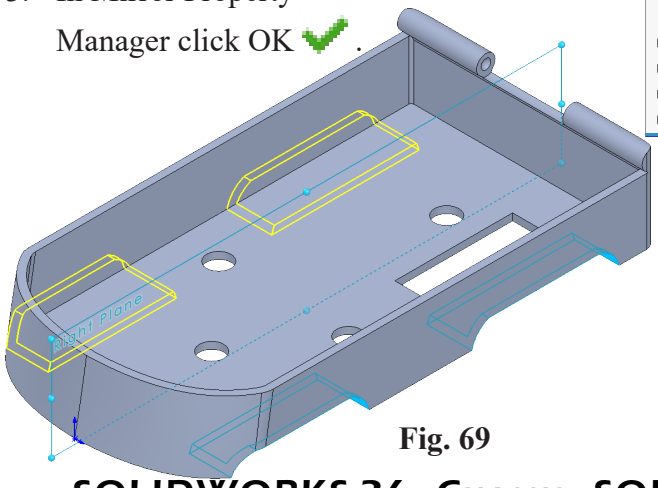


Fig. 69

L. Extrude2 Sketch8 Catch.

Step 1. Click **Right Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 70**.

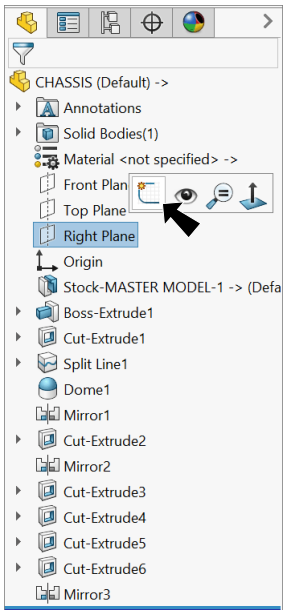


Fig. 70

Step 2. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 3. Zoom in on front, **Fig. 71**.

Fig. 71

Step 4. Click **Wireframe** on the View toolbar.

Step 5. Click **Circle** **(S)** on the Sketch toolbar.

Step 6. Sketch **circle above front inside edge**, **Fig. 72**.

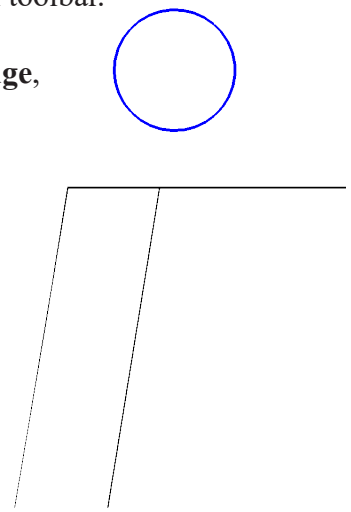


Fig. 72

Step 7. Click **Line** **(L)** on the Sketch toolbar.

Step 8. Sketch **6 lines**, **Fig. 73**. Start at top quadrant point ◆ of circle with a horizontal line. End with a non tangent line to circle.

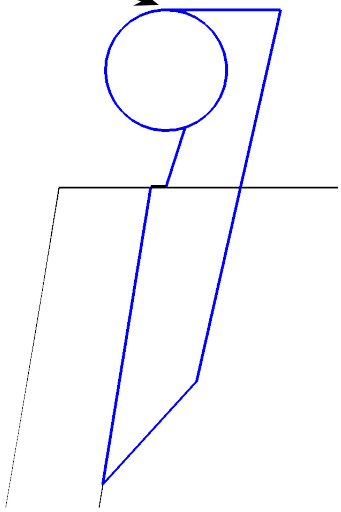


Fig. 73

Step 9. **Unselect Line tool**. To unselect, right click graphics area and click Select from menu.

Step 10. **Ctrl click the 3 lines** to select all three. Release Ctrl key and click **Make Parallel** on the context toolbar, **Fig. 74**.

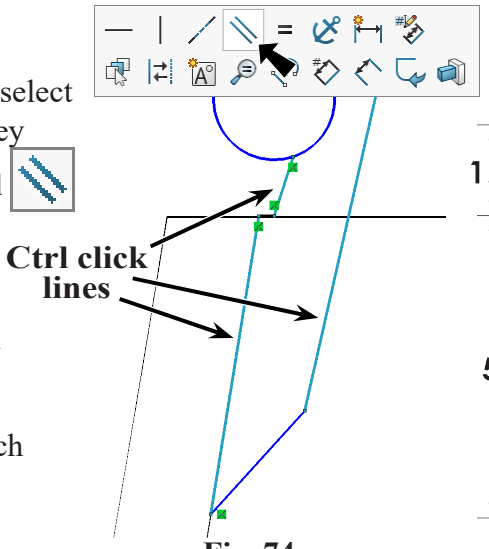


Fig. 74

Step 11. Click **Smart Dimension** **(S)** on the Sketch toolbar.

Step 12. Add dimensions, **Fig. 75**.

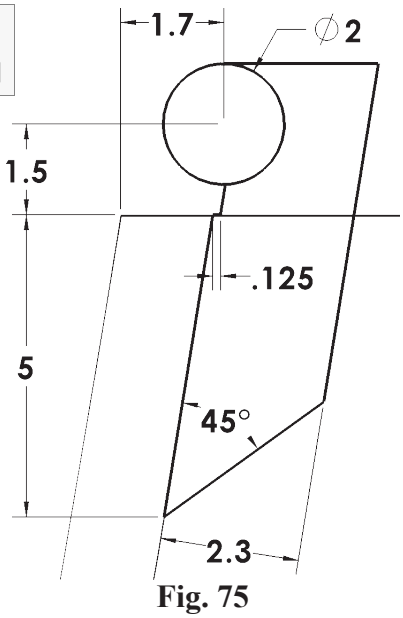


Fig. 75

Step 13. Click **Shaded With Edges** on the View toolbar.

Step 14. Rotate view to inside catch, **Fig. 77**. To rotate view, click **Isometric** on the Standard Views toolbar (**Ctrl-7**), then in bottom left corner of graphics area **Shift click the Y axis of the Reference Triad** **one time**.

Step 15. Click **Features** Features on the Command Manager toolbar.

Step 16. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 17. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 76**
End Condition **Mid Plane**
Depth D1 **5.2**
under Selected Contours
click the **2 contours**, **Fig. 77**
click OK .

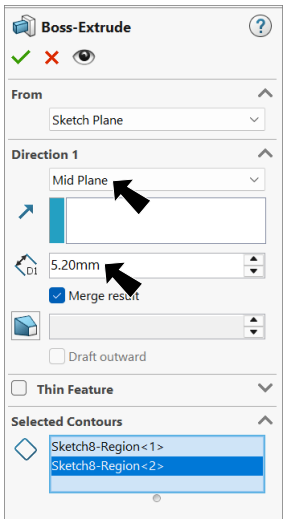


Fig. 76

Step 18. Save (**Ctrl-S**).

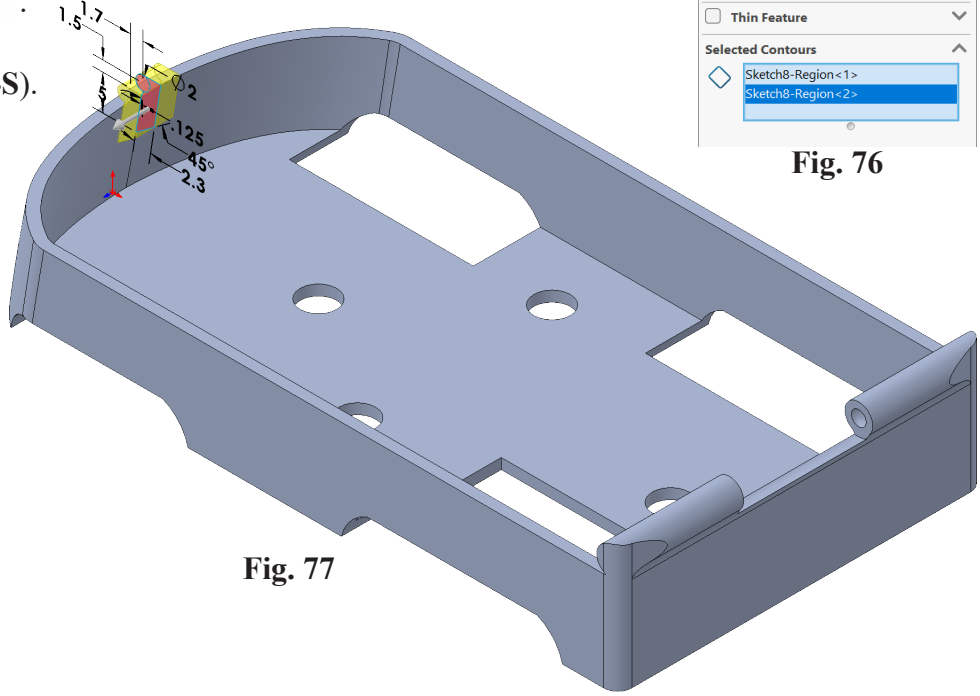


Fig. 77

M. Extrude3 Sketch9 JST Support.

Step 1. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click the **inside top face of body** and click **Sketch** on the context toolbar, **Fig. 78**.

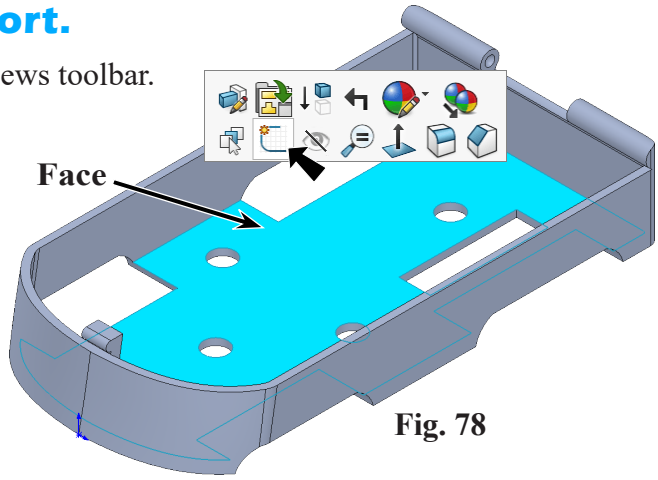


Fig. 78

Step 3. Click **Corner Rectangle** in the **Rectangle flyout** on the Sketch toolbar.

Step 4. Sketch corner rectangle coincident with rear inside edge of body, **Fig. 79**.

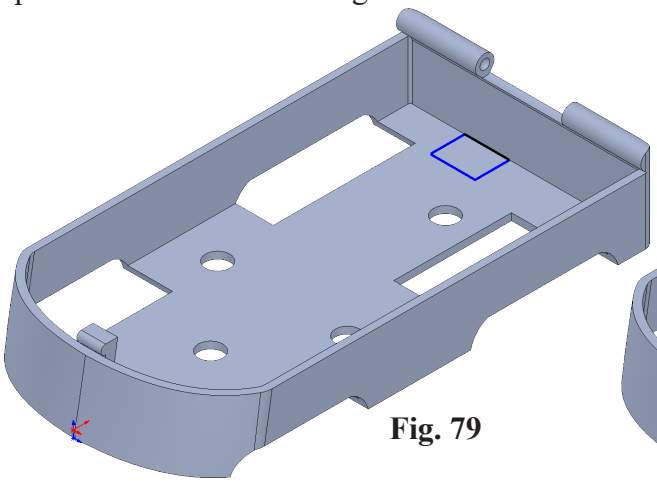


Fig. 79

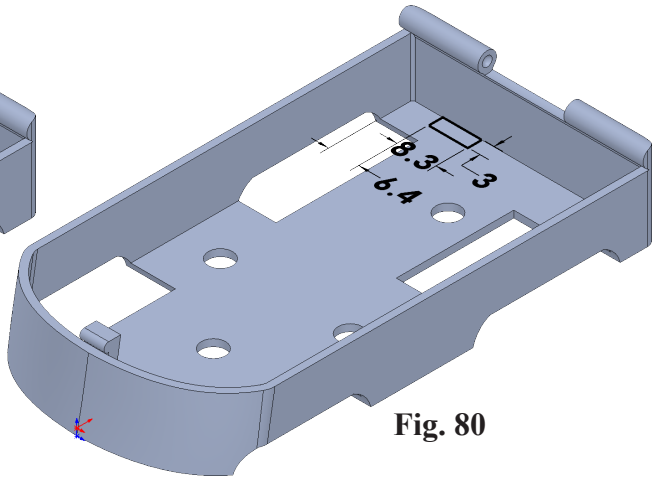


Fig. 80

Step 5. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 6. Add dimension, **Fig. 80**.

Step 7. Click **Features** on the Command Manager toolbar.

Step 8. Click **Extruded Boss/Base** on Features toolbar.

Step 9. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 81**
End Condition **Blind**
Depth D1 **8.9**
click OK .

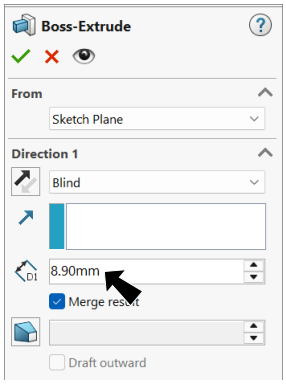


Fig. 81

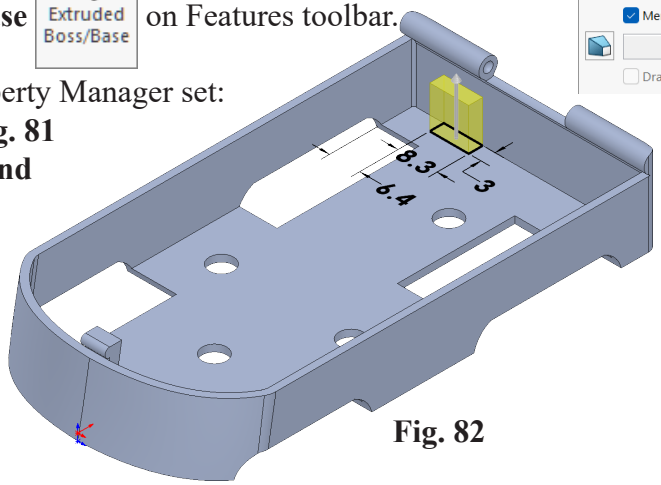


Fig. 82

N. Extruded Cut6 Sketch10 Cut JST.

Step 1. Click **Back** on the Standard Views toolbar. (**Ctrl-2**)

Step 2. Click the **rear face** and click **Sketch** on the context toolbar, **Fig. 83**.

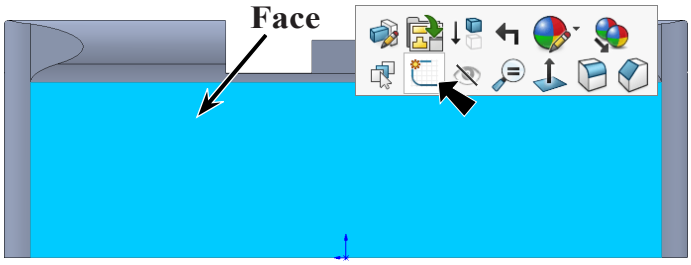


Fig. 83

Step 3. Click **Corner Rectangle** in the **Rectangle flyout** on the Sketch toolbar.

Step 4. Sketch corner rectangle, **Fig. 84**.

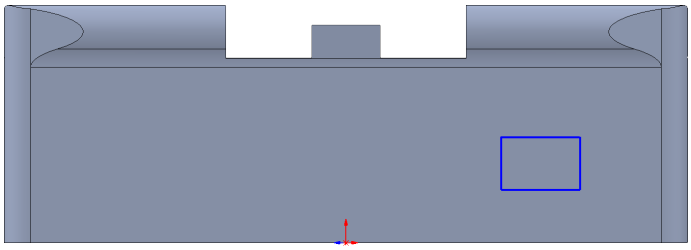


Fig. 84

Step 5. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 6. Add dimension, **Fig. 85**.

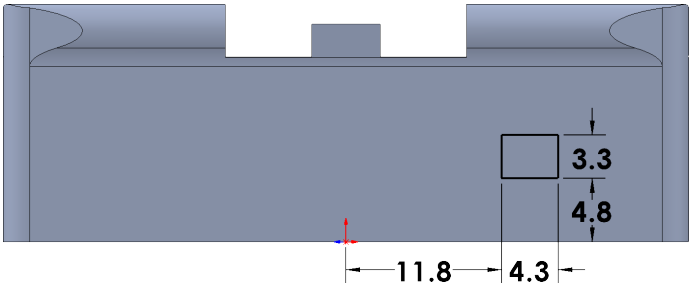


Fig. 85

Step 7. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 8. Click **Features** on the Command Manager toolbar.

Step 9. Click **Extruded Cut** on the Features toolbar.

Step 10. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 86**
End Condition **Up to surface**
click the **forward face of JST support**
click **Draft** **2.5º**
click OK .

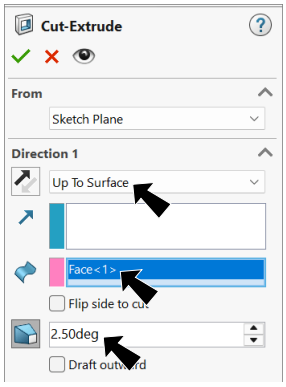


Fig. 86

Step 11. Save (**Ctrl-S**).

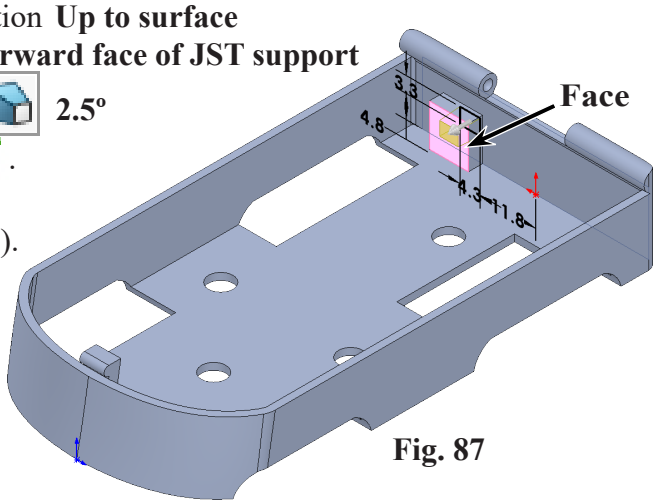


Fig. 87

O. Extrude4 Sketch12 Hitch Receiver.

Step 1. Rotate view to rear, **Fig. 89**. To rotate view, **Shift click the Y axis of the Reference Triad** .

Step 2. Click **Top Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 88**.

Step 3. Click **Corner Rectangle** in the **Rectangle flyout** on the Sketch toolbar.

Step 4. Sketch corner rectangle along rear edge, **Fig. 89**.

Step 5. Click **Circle** (**S**) on the Sketch toolbar.

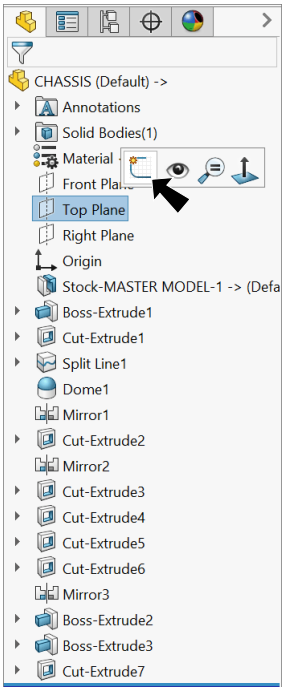


Fig. 88

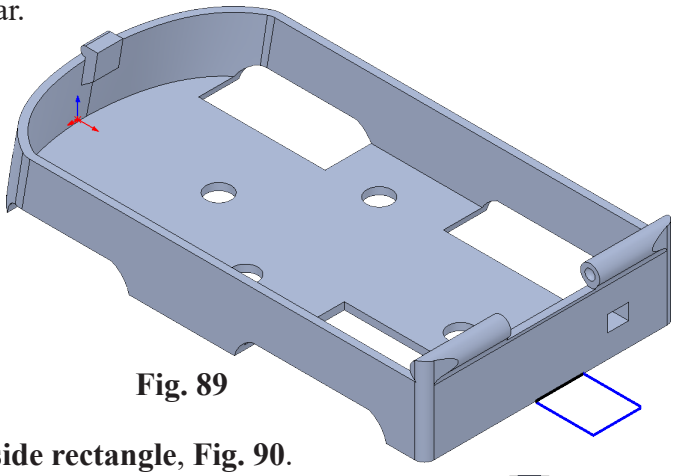


Fig. 89

Step 6. Sketch **circle inside rectangle**, **Fig. 90**.

Step 7. **Unselect Circle tool**. To unselect, right click graphics area and click Select from menu.

Step 8. **Ctrl click midpoint of a horizontal line**, **centerpoint of circle** and **Origin** to select all three. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 91**.

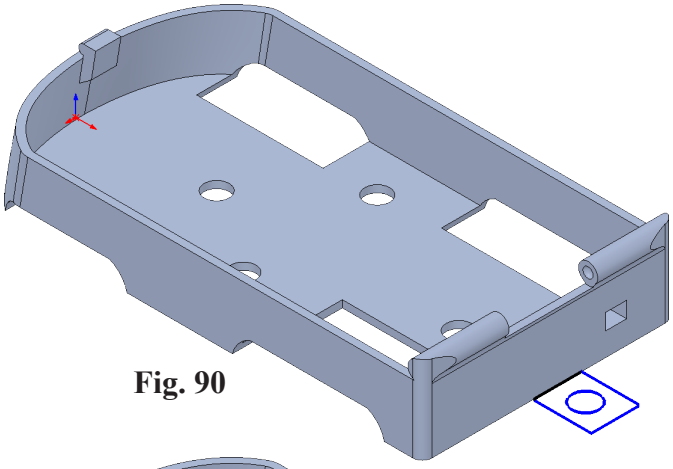


Fig. 90

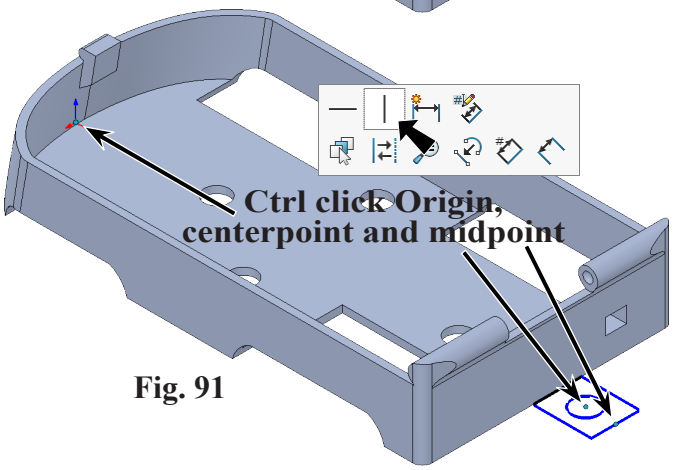


Fig. 91

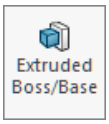
Step 9. Click **Smart Dimension** 

(**S**) on the Sketch toolbar.

Step 10. Add dimensions, **Fig. 92**.

Step 11. Click **Features** 

on the Command Manager toolbar.

Step 12. Click **Extruded Boss/Base** 

on the Features toolbar.

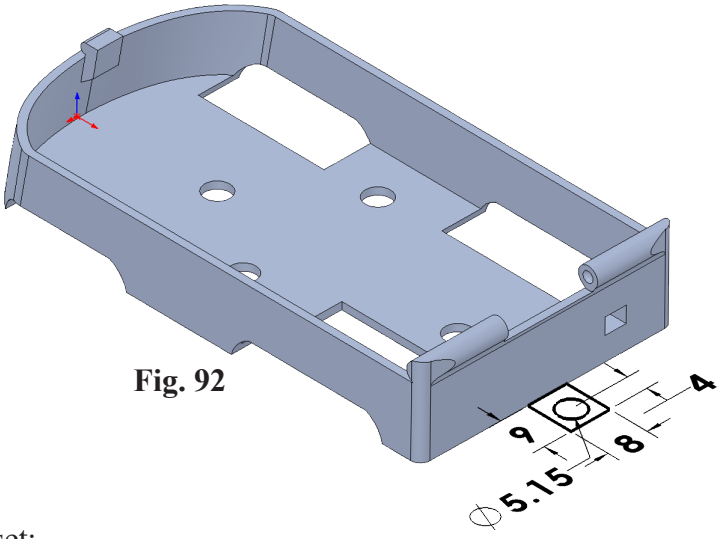


Fig. 92

Step 12. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 93**
End Condition **Blind**
Depth D1 **3**
click OK .

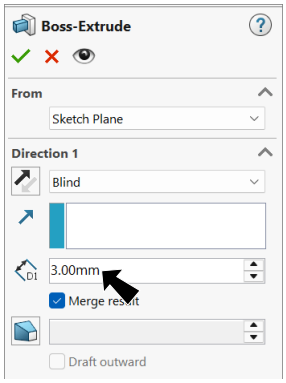


Fig. 93

Step 14. Save (**Ctrl-S**).

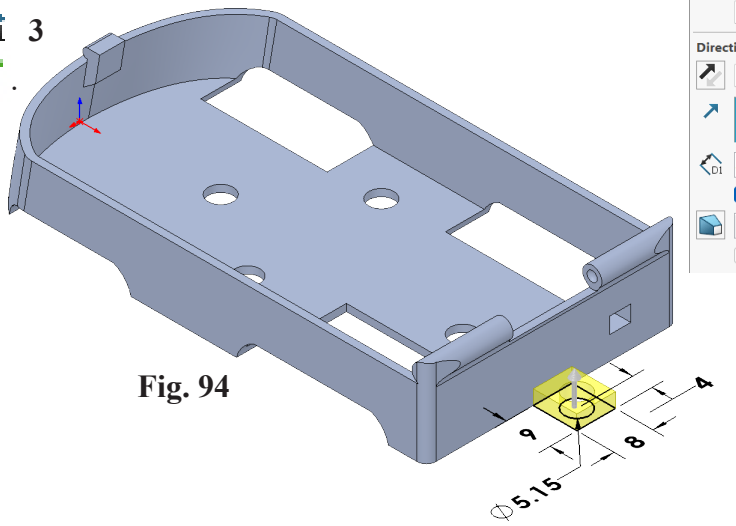


Fig. 94

P. Insert Wire Run Part into Part.

Step 1. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click Insert Menu > Part.

Step 3. In the Insert part Property Manger set:
click **Browse** button Browse..., **Fig. 95**
select your **WIRE RUN** and Open
under Transfer
check **Solid bodies**
under Locate Part
check **Locate with Move/Copy feature**
under Visual Properties
check **Propagate from original part**
click OK ✔ .

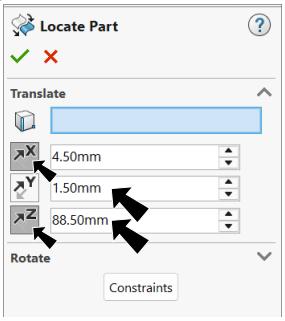


Fig. 96

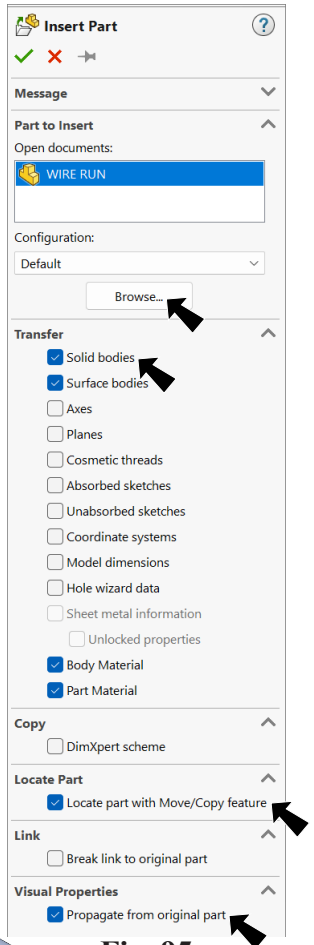


Fig. 95

Step 4. In the Locate Part Property Manger set:
under Translate, **Fig. 96**
Delta X 4.5
click **Reverse Direction** 
Delta Y 1.5
Delta Z 88.5
click **Reverse Direction** 
click OK ✔ .

Step 5. Save  (**Ctrl-S**).

Fig. 97

Q. Combine Bodies.

Step 1. Click Insert Menu > Features > Combine.

Step 2. In the Combine Property Manager:
under Operation Type, **Fig. 98**
select **Add**
use **Ctrl-A** to **select all**, **Fig. 99**
click OK ✔ .

Step 3. Save  (**Ctrl-S**).

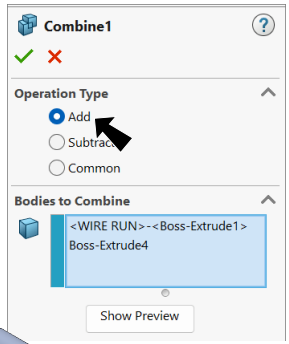


Fig. 98

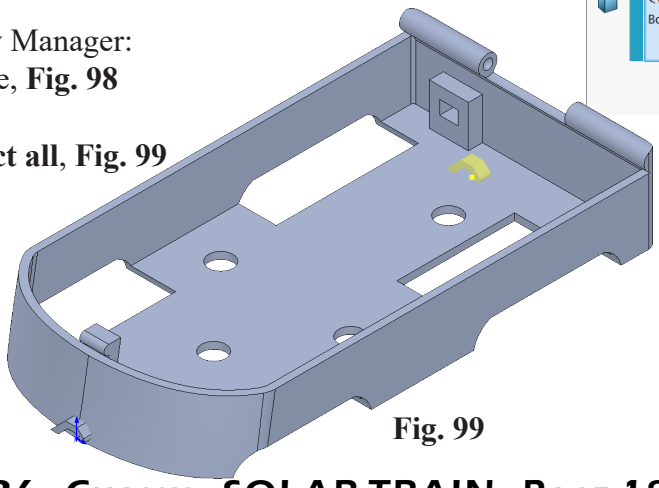


Fig. 99

R. Fill Pattern Cut.

Step 1. Click **Top** on the Standard Views toolbar. (**Ctrl-5**)

Step 2. Click **Fill Pattern** Fill Pattern in the **Linear Pattern flyout** Linear Pattern on the Features toolbar.

Step 3. In the Circular Pattern Property Manager set:
under Fill Boundary, **Fig. 100**
click **inside face**, **Fig. 101**
under Features and Faces
select **Create seed cut**
select **Polygon**
Polygon Sides 6
Outer Radius 1.35
Rotation 30
under Pattern Layout
select **Perforation**
Instance Spacing 3.8
Stagger Angle 60
Margins 1.4
in the graphics area confirm **Pattern Direction** is **top edge of face**
under Instances to Skip
in graphics area click **instances around holes and under Wire Run (9)**
click OK .

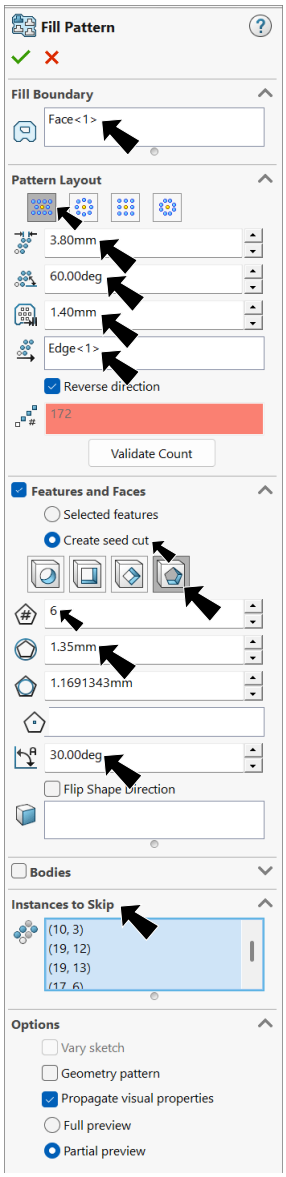


Fig. 100

Step 4. Click **Isometric** on the Standard Views toolbar.

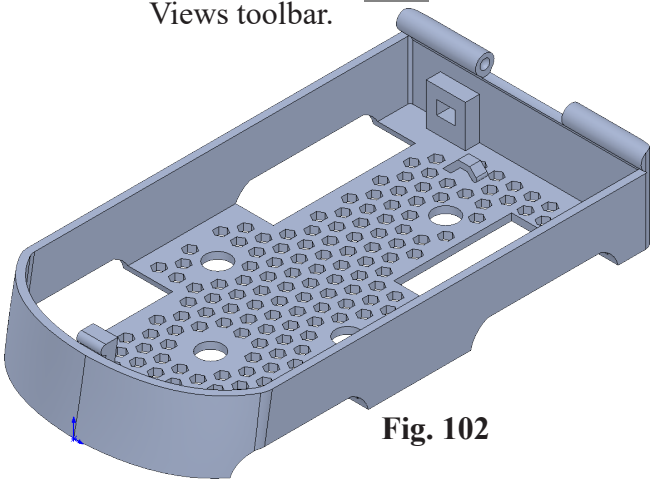


Fig. 102

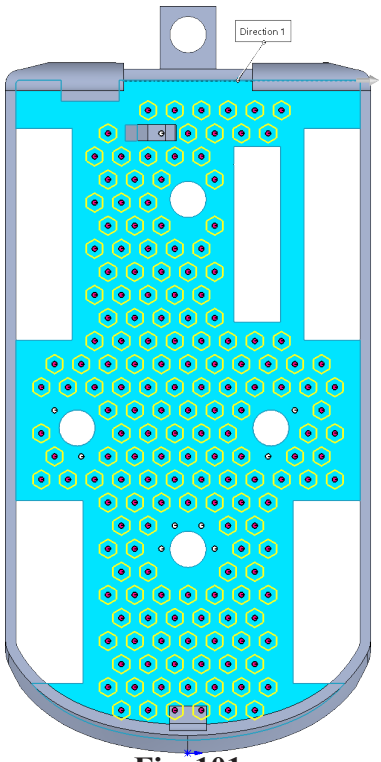


Fig. 101

S. Wrap Ellipse.

Step 1. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 103**.

Step 2. Click **Normal To** on the Standard Views toolbar. **(Ctrl-8)**

Step 3. Click **Ellipse** **(S)** in the **Ellipse flyout** on the Sketch toolbar.

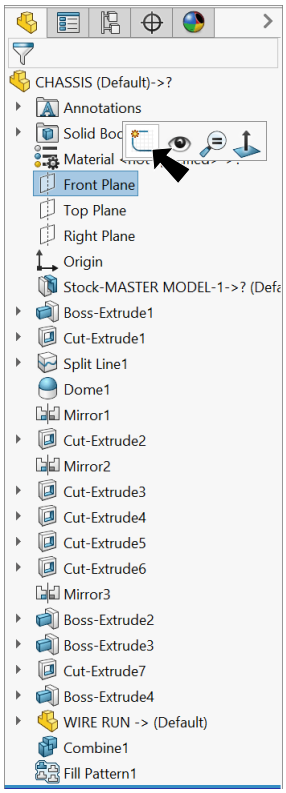


Fig. 103

Step 4. Sketch ellipse above **Origin**, **Fig. 104**.

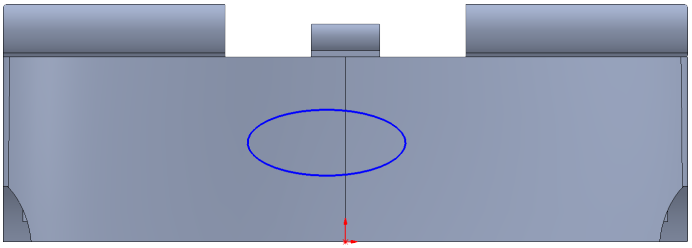


Fig. 104

Step 5. **Unselect Ellipse tool**. To unselect, right click graphics area and click Select from menu.

Step 6. **Ctrl click both minor axis** and **Origin** to select all three.. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 105**.

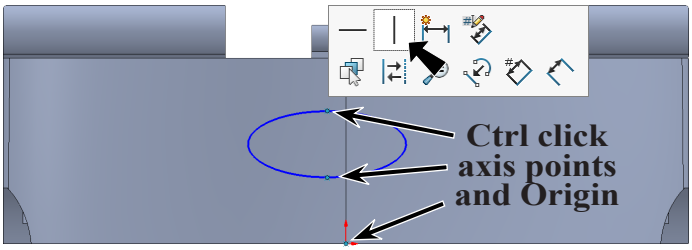


Fig. 105

Step 7. Click **Smart Dimension** **(S)** on the Sketch toolbar.

Step 8. Add dimensions, **Fig. 106**.

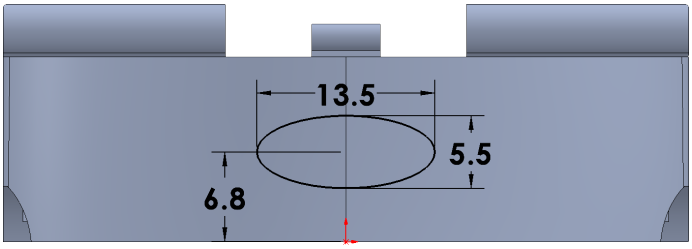


Fig. 106

Step 9. Click **Exit Sketch** on the Sketch toolbar.

Step 10. Click **Sketch12** in Feature Manager to select sketch, **Fig. 107**.

Step 11. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 12. Click **Features** on the Command Manager toolbar.

Step 13. Click **Wrap** on the Features toolbar.

Step 14. In the Wrap Property Manager:
under Wrap Type, **Fig. 108**
select **Emboss**
under Wrap Method
select **Spline Surface**
under Wrap Parameters
Source Sketch
Sketch13 was preselected
Face for Wrap Sketch
click **both front faces, Fig. 109**
Depth T1 **.35**
click OK .

Step 15. Save (**Ctrl-S**).

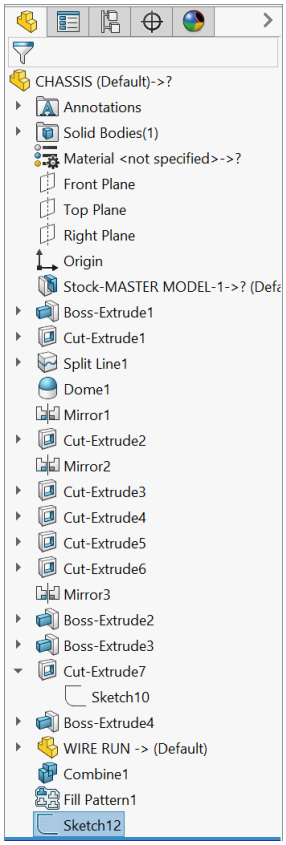


Fig. 107

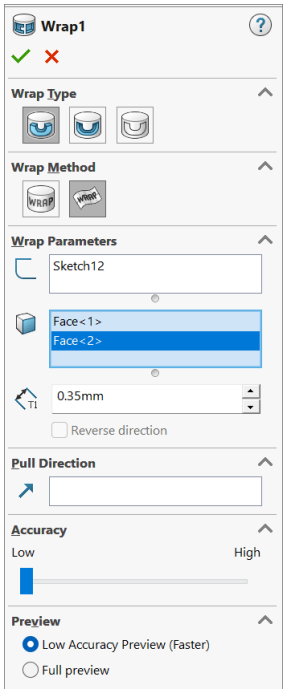


Fig. 108

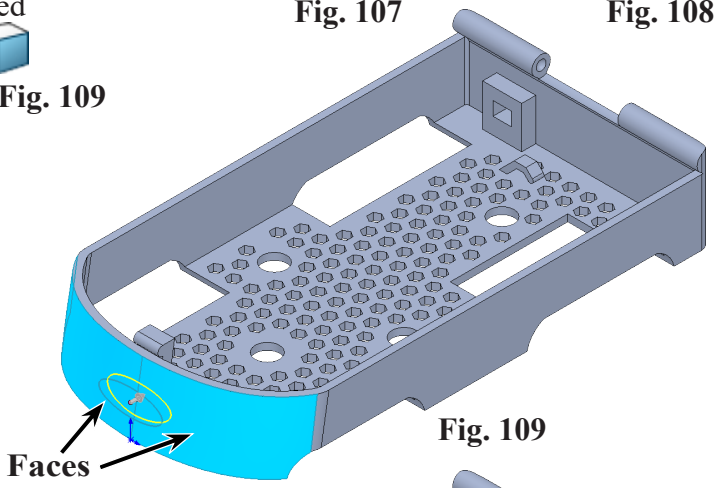


Fig. 109

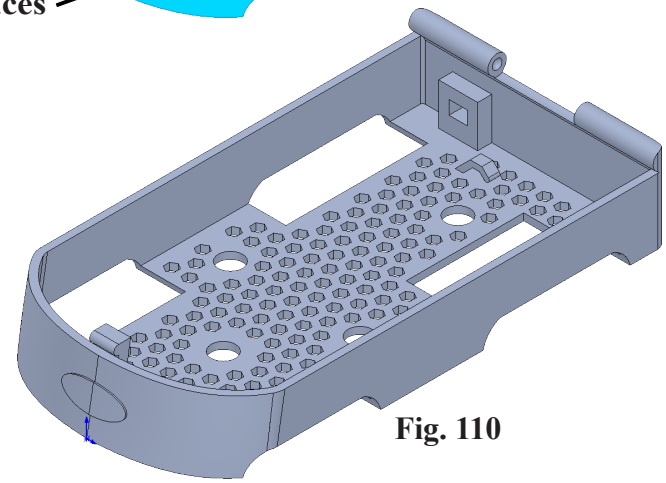
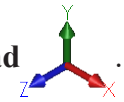


Fig. 110

T. Fillet1 Full Round

Step 1. Rotate view from rear, use **Shift click the Y**  **axis of the Reference Triad**  .

Step 2. Click **Fillet**  on the Features toolbar.

Step 3. In the Fillet Property Manager,
select **Manual**, **Fig. 111**
under Fillet Type
select **Full Round Fillet** 
click in  **Side Face Set 1**  box
click **side face of hitch**, **Fig. 112**

Tip: **Right click** in graphics area to advance cursor to next selection in Property Manager or...

click in  **Center Face Set**  box
click **rear face of hitch**
click in  **Side Face Set 2**  box
rotate view to view **other side face**

Shift click the Y  **axis of the Reference Triad**
click **side face**, **Fig. 113**

click OK  .

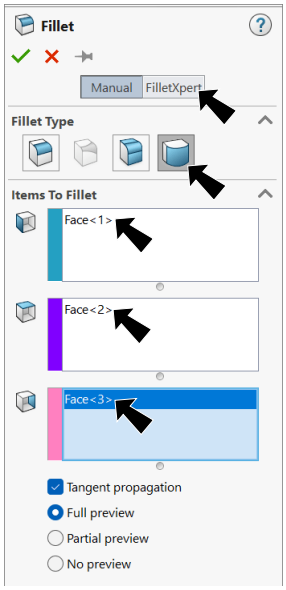


Fig. 111

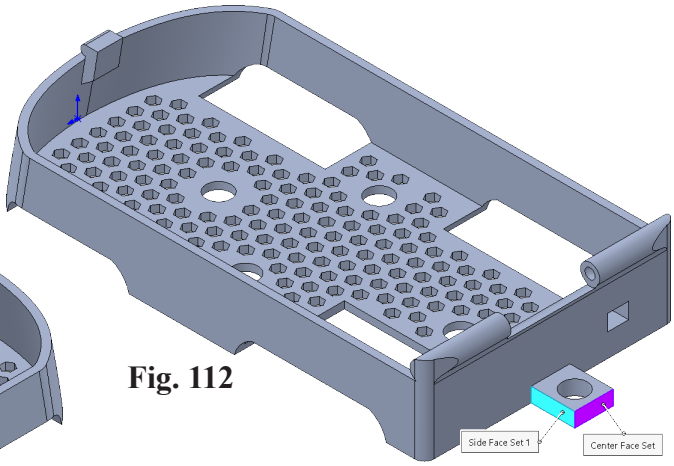


Fig. 112

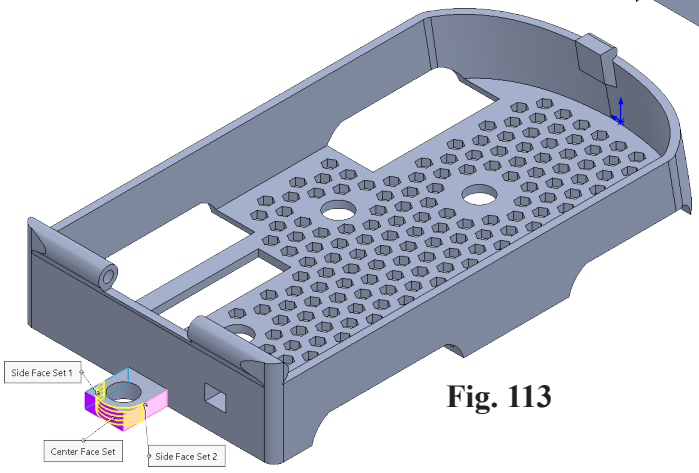


Fig. 113

U. Fillet2 Asymmetric.

Step 1. Use **Previous View** on the Standard Views toolbar. (**Ctrl-Shift-Z**) to return to previous view and zoom in on catch, **Fig. 114**.

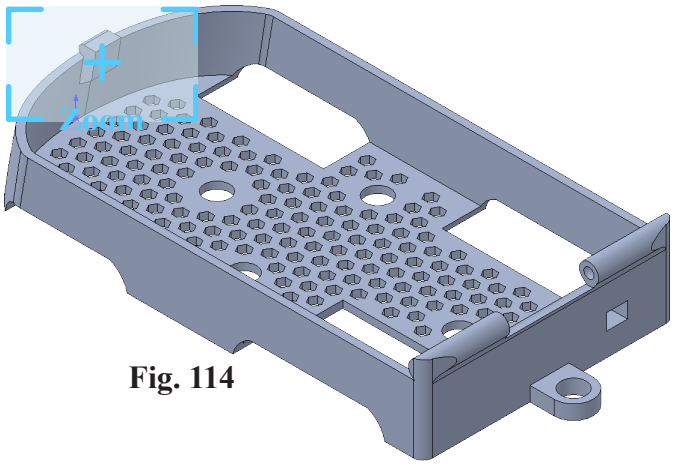


Fig. 114

Step 2. Click **Fillet** on the Features toolbar.

Step 3. In the Fillet Property Manager set:
select **Manual**, **Fig. 115**
under Fillet Type
select **Constant Size Fillet**
under Fillet Parameters
Fillet Method **Asymmetric**
Distance 1 **3**
Distance 2 **1.5**
under Items To Fillet
click **top rear edge of catch** (**1**), **Fig. 116**
1.5 should be across top face of Catch,
if opposite click **Reverse Direction**
click OK .

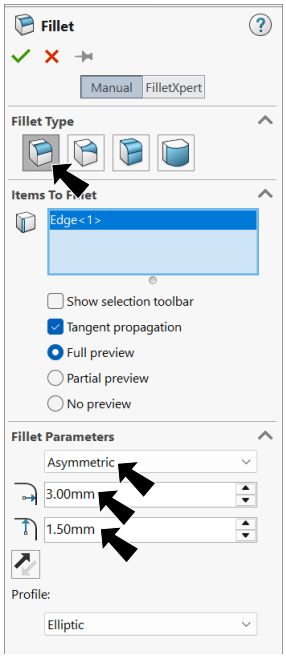


Fig. 115

Step 4. Save (**Ctrl-S**).

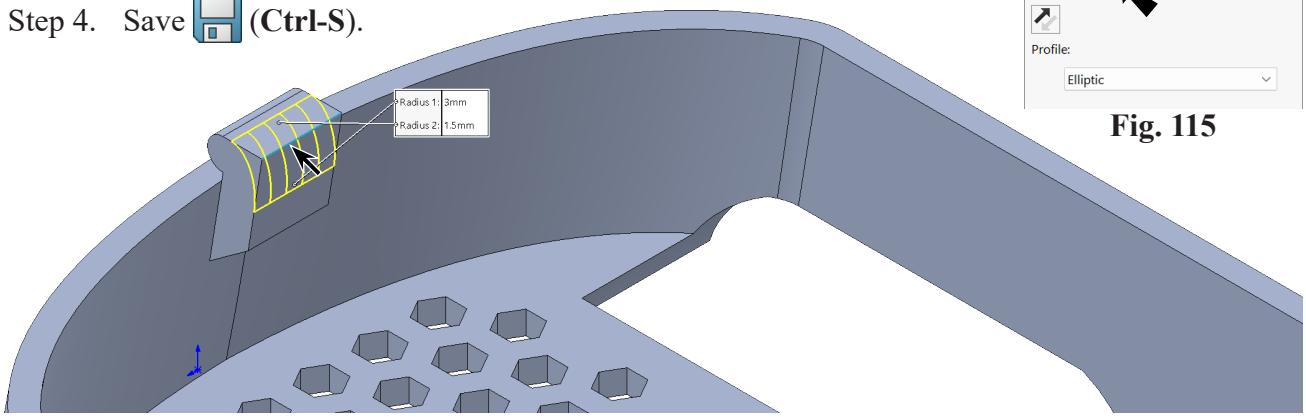


Fig. 116

V. Fillets 3-9.

Step 1. Click **Fillet** 

on the Features toolbar.

Step 2. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 117**

③ **Radius** **3**
click **bottom rear edge of catch (1)**, **Fig. 118**
click **Apply**

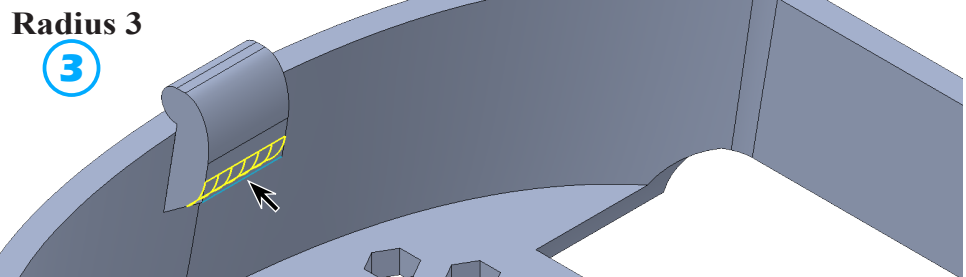


Fig. 117

Fig. 118

④ **Radius** **.4**
click **side edges of catch (2)**, **Fig. 119**
click **Apply**

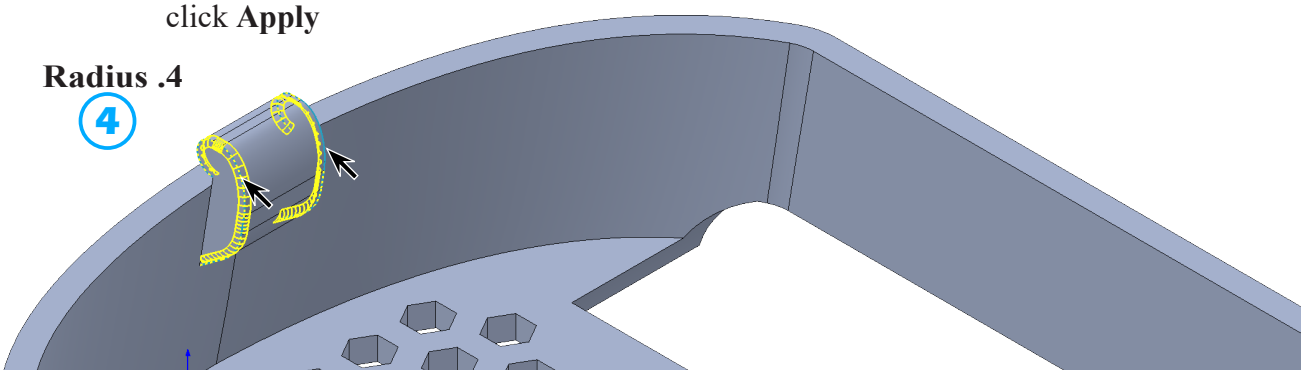


Fig. 119

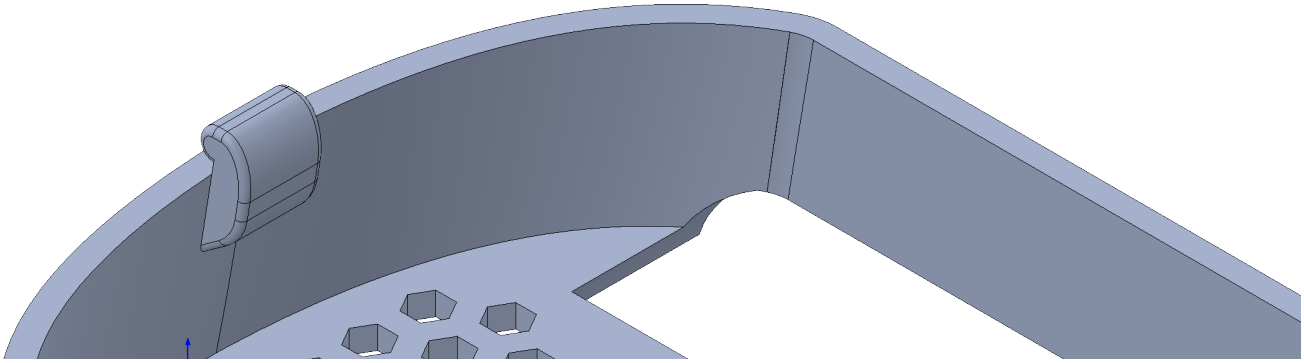


Fig. 120

Step 3. Click **Pan** on the Standard Views toolbar (**Mouse Wheel - Ctrl**) to rear.

⑤ **Radius** **1**
click **side and top edges of hitch** (**3**), **Fig. 121**
click **Apply**

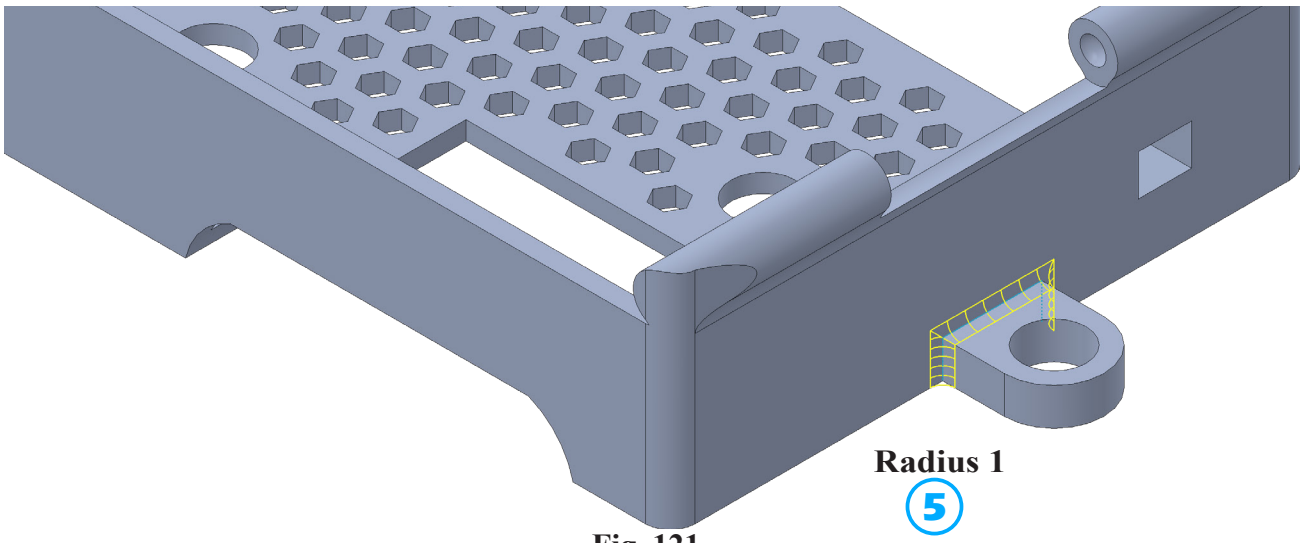


Fig. 121

⑥ **Radius** **.4**
click **edge between hinges** (**1**), **Fig. 122**
click **Apply**

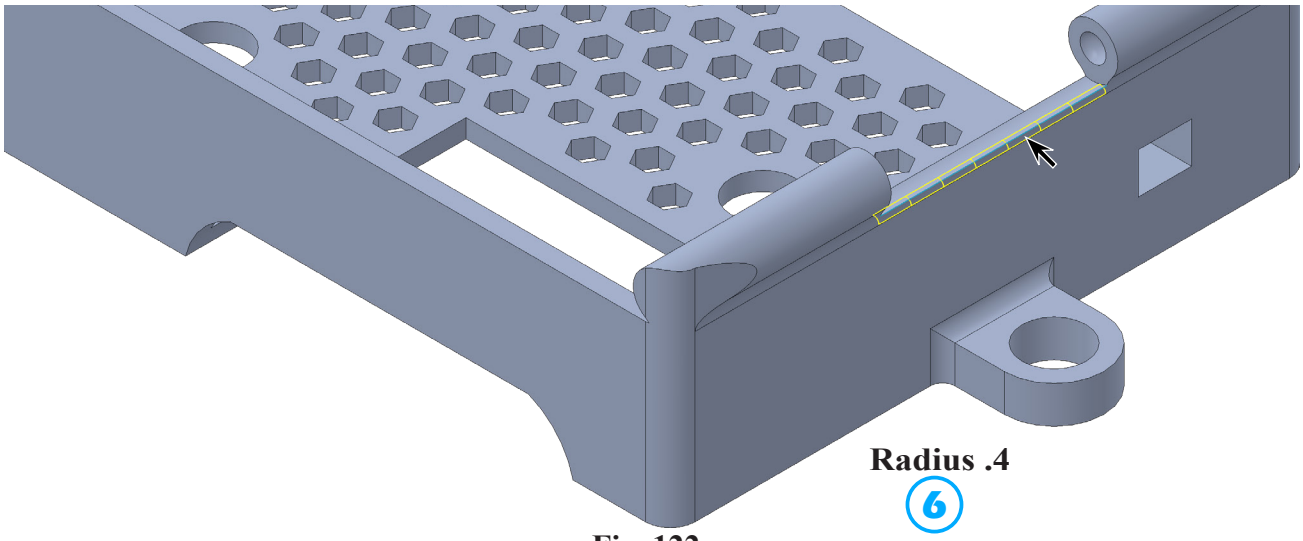


Fig. 122

Step 4. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

⑦ **Radius** .7
click **front and rear edges gear cut and wheel wells (10), Fig. 123**
click **Apply**

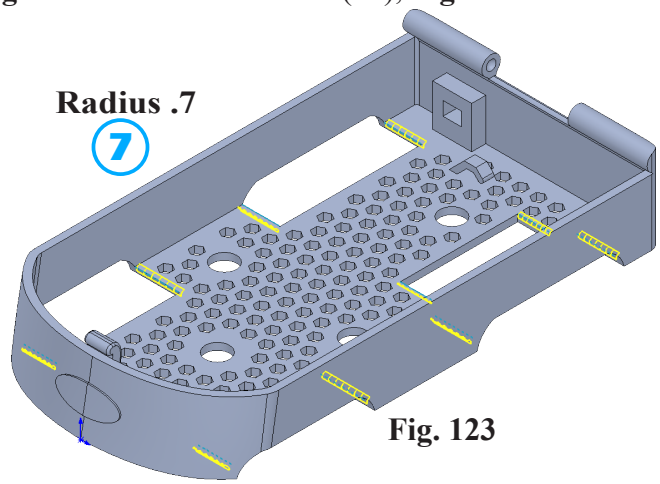


Fig. 123

⑧ **Radius** .175
click **both outside edges of Wrap1 (2), Fig. 124**
click **Apply**

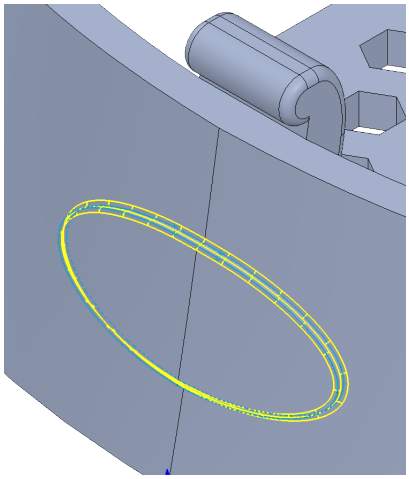


Fig. 124

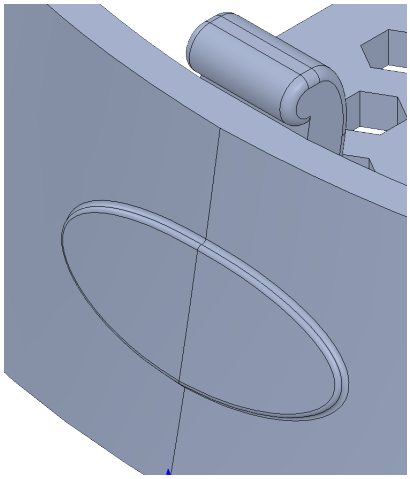


Fig. 125

⑨ **Radius** .15
click **edge at side and hinge - both hinges (2), Fig. 126**
click OK .

Step 5. Save (**Ctrl-S**).

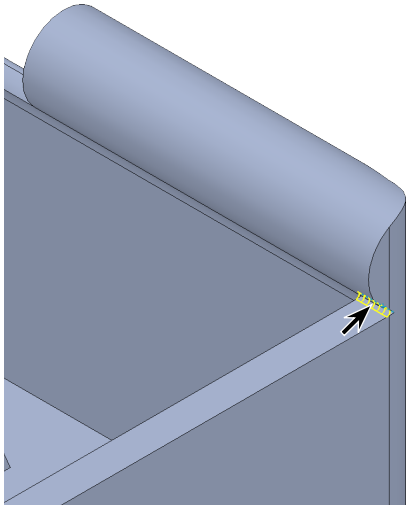


Fig. 126

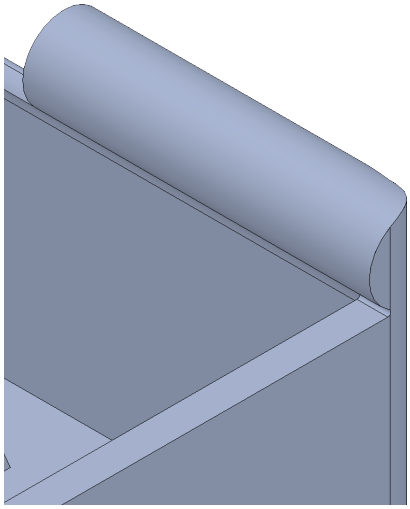


Fig. 127

W. Wrap Appearance: Gray Plastic.

Step 1. **Ctrl click Wrap** and **Fillet8** in Feature Manager to select both. Release Ctrl key and click **Appearance Callout** on the context toolbar then click **Fillet8**, **Fig. 128**.

Step 2. In the Appearances Task pane, expand **Plastic**, click **Medium Gloss** and in the lower pane select **light gray medium gloss plastic**, **Fig. 129**.

Step 3. In the Appearances Property Manager set:
under Color, **Fig. 130**
set **RGB values**
R 225
G 225
B 225
click OK .

Step 4. Save (**Ctrl-S**).

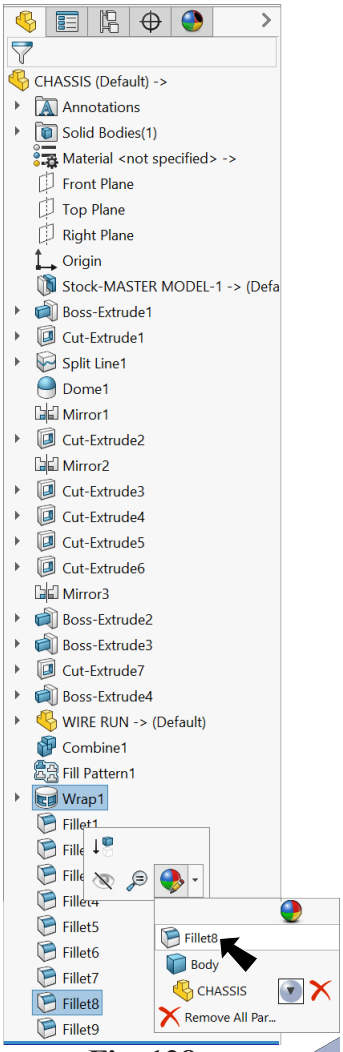


Fig. 128

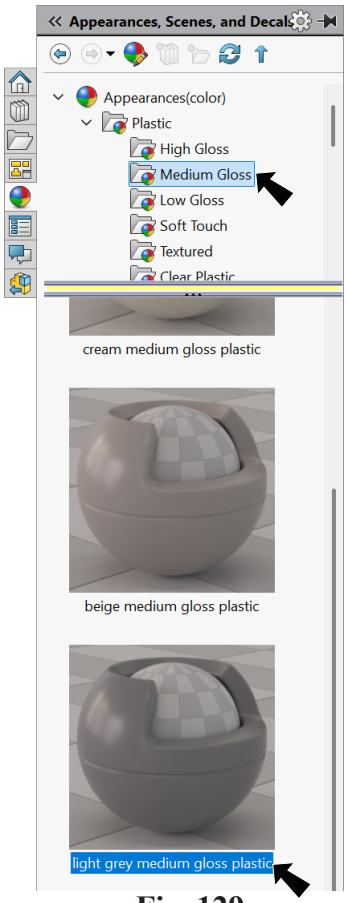


Fig. 129

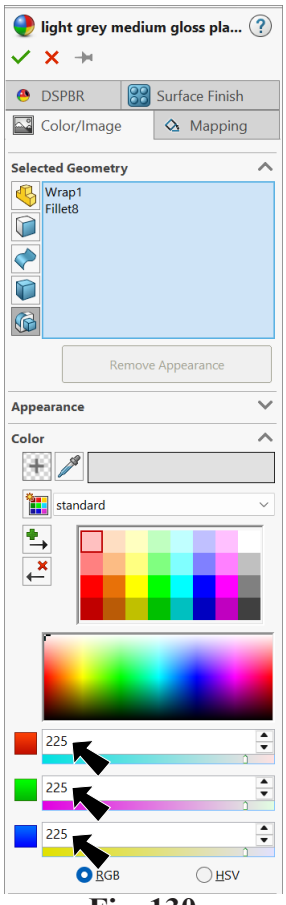


Fig. 130

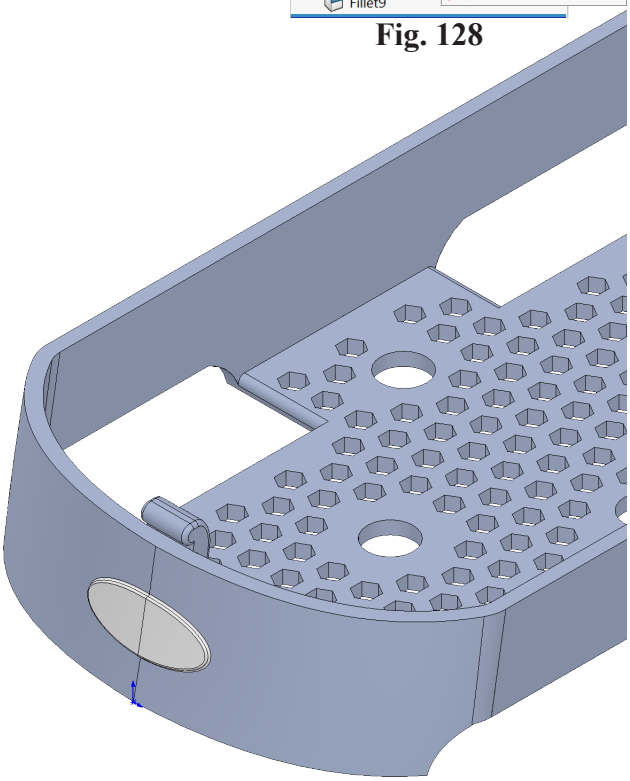


Fig. 131