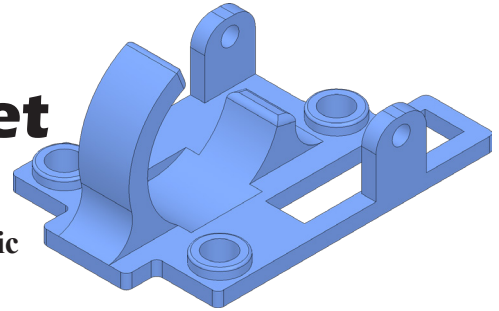




Chapter 12

Solar Train Motor Bracket



A. Extrude1 Sketch1.

Step 1. Click **New**  on the Standard toolbar, click **Part Metric**  and OK.

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

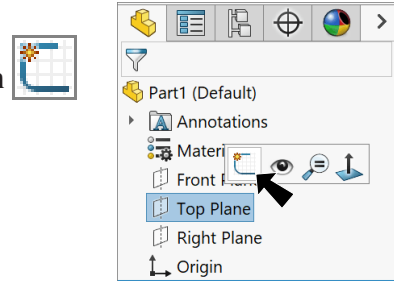


Fig. 1

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

Step 4. Sketch lines, **Fig. 2**.

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

Step 6. **Ctrl click the two horizontal line at bottom** to select both. Release Ctrl key and click **Make Collinear**  on the context toolbar, **Fig. 3**.

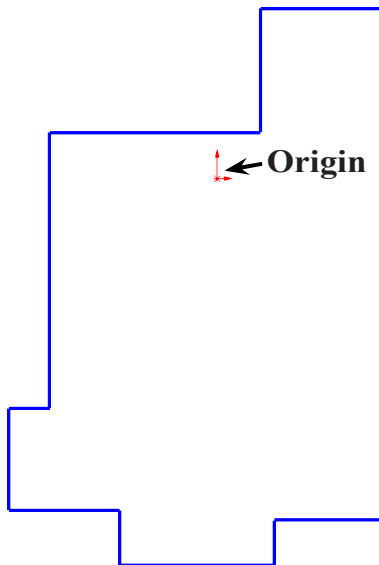


Fig. 2

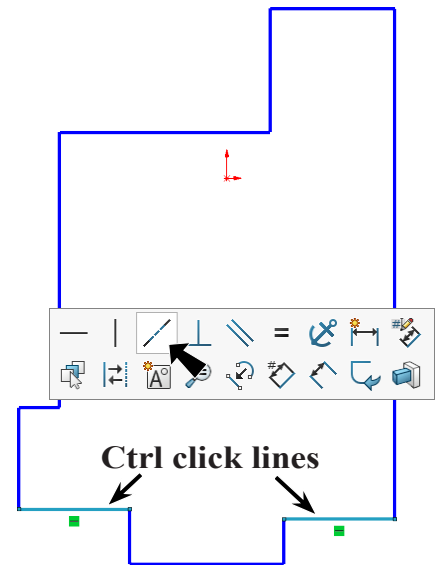


Fig. 3

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

Step 8. Add dimensions, **Fig. 4**.

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

Step 10. Sketch **circle above Origin** , **Fig. 5**.

Step 11. **Unselect Circle tool**. To unselect, right click graphics area and click **Select**  from menu.

Step 12. **Ctrl click centerpoint of circle and Origin**  to select both. Release Ctrl key and click **Make Vertical**  on the context toolbar, **Fig. 6**.

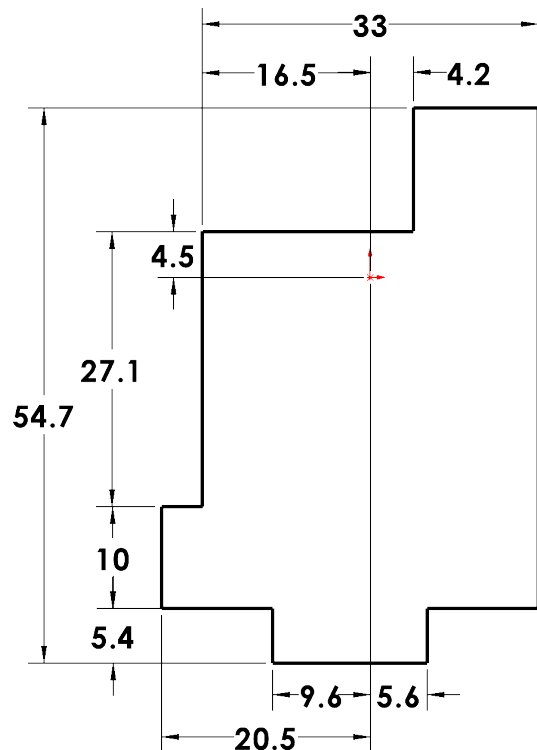


Fig. 4

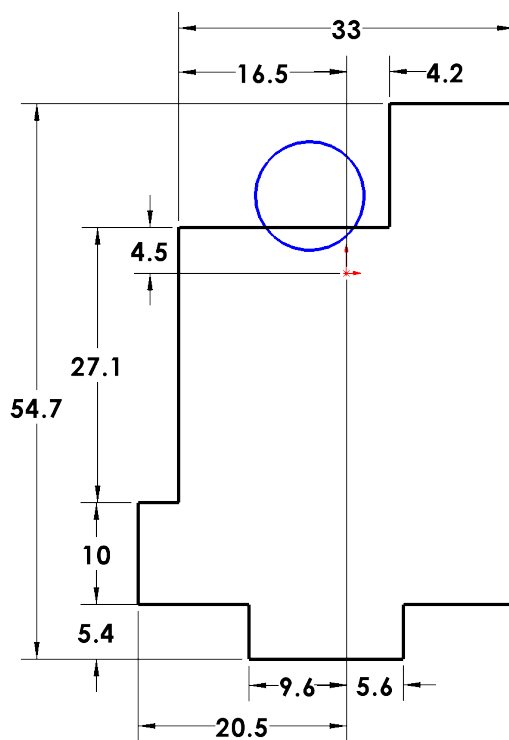


Fig. 5

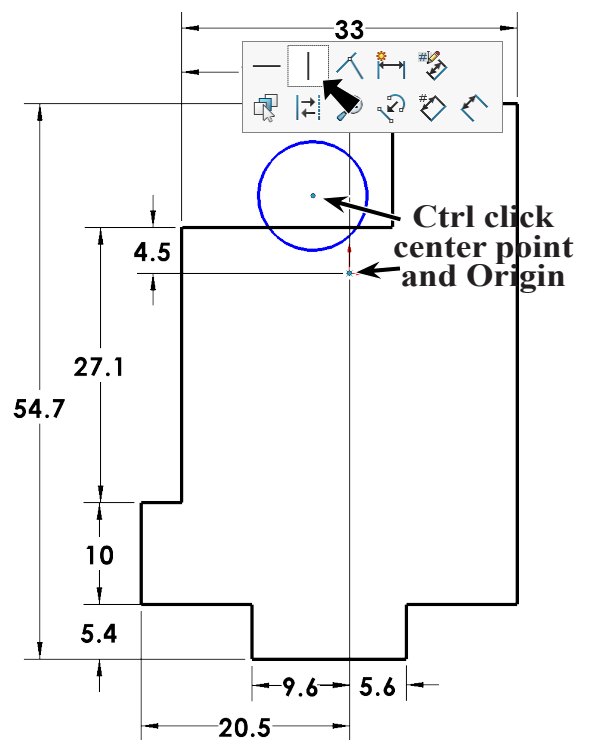
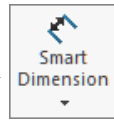


Fig. 6

Step 13. Click **Smart Dimension** (S) on the Sketch toolbar.

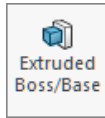


Step 14. Add dimensions, **Fig. 7**.

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



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



Step 17. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 8**
End Condition **Blind**

Depth **2.55**

under Selected Contours
click the **three contours**, **Fig. 9**
click OK .

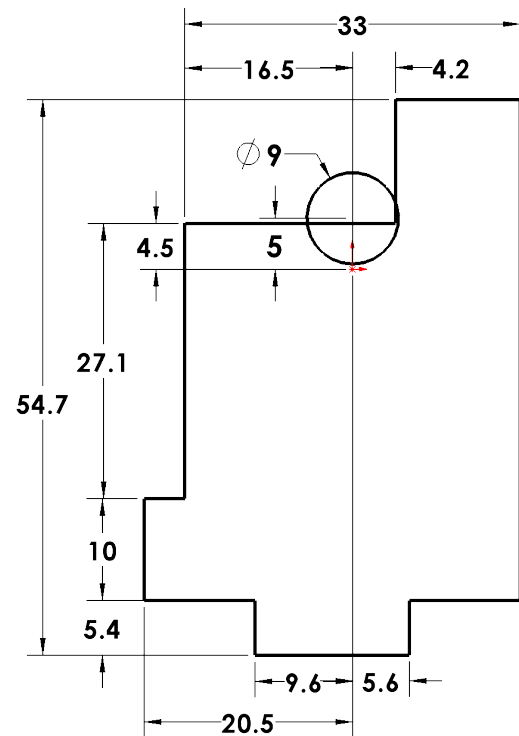


Fig. 7

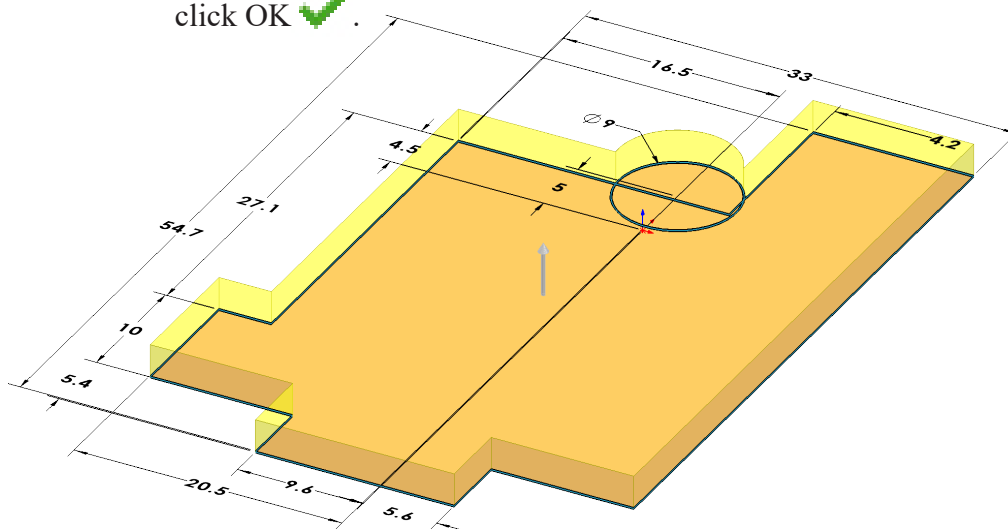


Fig. 9

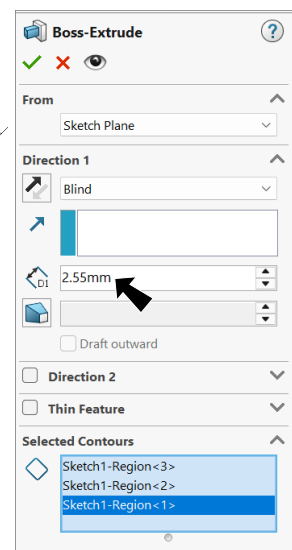


Fig. 8

B. Save as "MOTOR BRACKET".

Step 1. Click File Menu > Save As.

Step 2. Key-in **MOTOR BRACKET** for the filename and press ENTER.

C. Extrude2 Sketch2 Legs.

Step 1. Click **Top Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 10**.

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.

Step 4. Sketch corner rectangle at **top corner of Extrude**, **Fig. 11**.

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

Step 6. Add dimensions, **Fig. 12**.

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

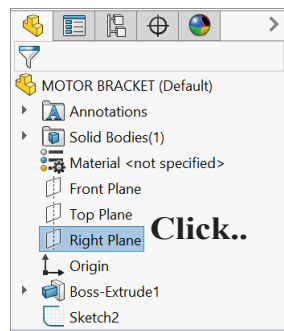


Fig. 13

Step 8. Click **Right Plane**  in the Feature Manager to select plane, **Fig. 13**.

Step 9. **Ctrl drag** a selection to **select rectangle**, **Fig. 14**.

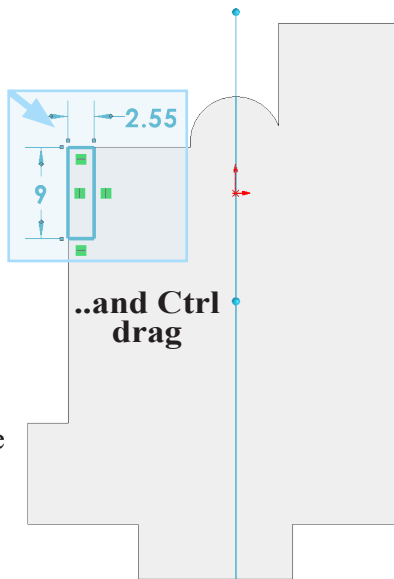


Fig. 14

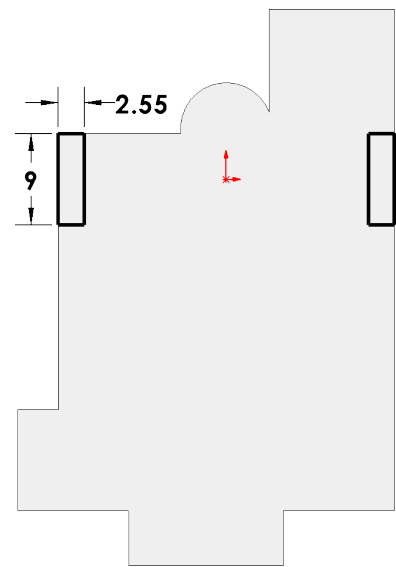
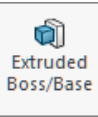


Fig. 15

Step 10. Click **Mirror Entities**  **Mirror Entities** on the Sketch toolbar, **Fig. 15**.

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

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

Step 13. Click **Extruded Boss/Base**  on the Features toolbar.

Step 14. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 16**

End Condition **Blind**

Depth  **13.55**

click OK .

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

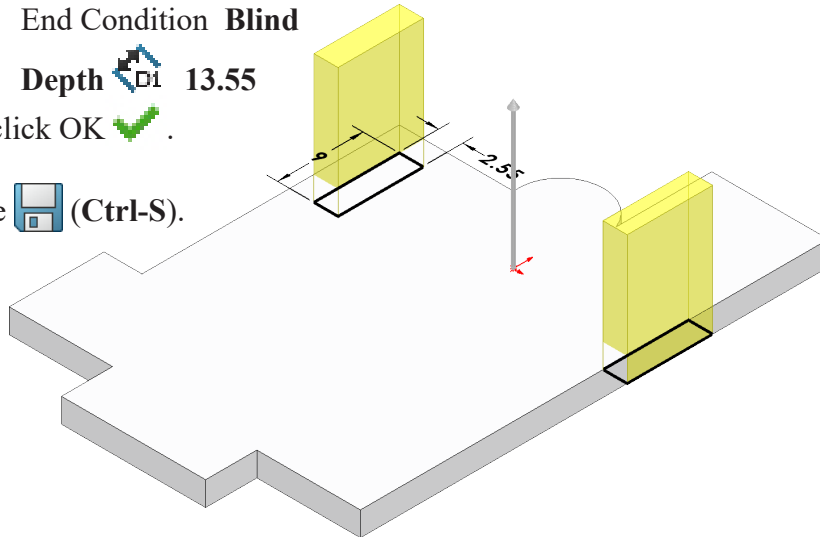


Fig. 17

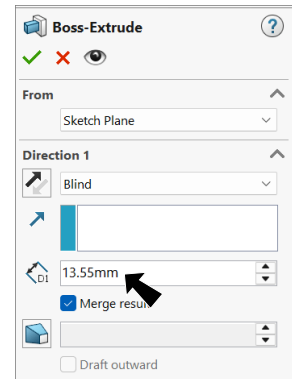


Fig. 16

D. Cut-Extrude1 Sketch3 Axle Hole.

Step 1. Click **Right Plane**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 18**.

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

Step 3. Sketch circle above Origin , **Fig. 19**.

Step 4. **Unselect Circle tool.** To unselect, right click graphics area and click **Select**  from menu.

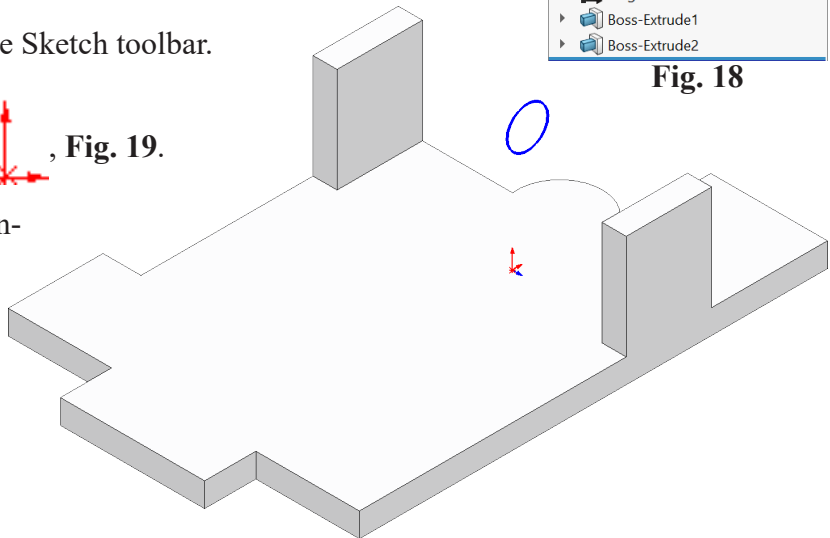


Fig. 19

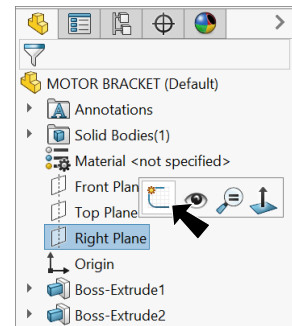


Fig. 18

Step 5. **Ctrl click centerpoint of circle and Origin**

 to select both. Release Ctrl key and click **Make Vertical**  on the context toolbar, **Fig. 20**.

Step 6. Click **Smart Dimension**

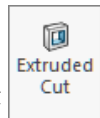


(S) on the Sketch toolbar.

Step 7. Dimension **diameter 3.2** **3** from top edge, **Fig. 21**.

Fig. 20

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

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

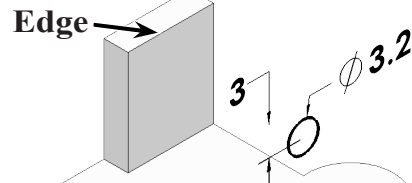


Fig. 21

Step 10. In the Cut-Extrude Property Manager set:
under Direction 1, **Fig. 22**
End Condition **Through All - Both**
click OK .

Step 11. Save  (Ctrl-S).

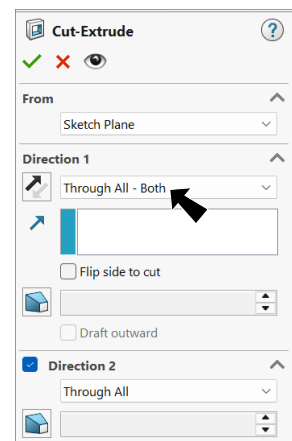


Fig. 22

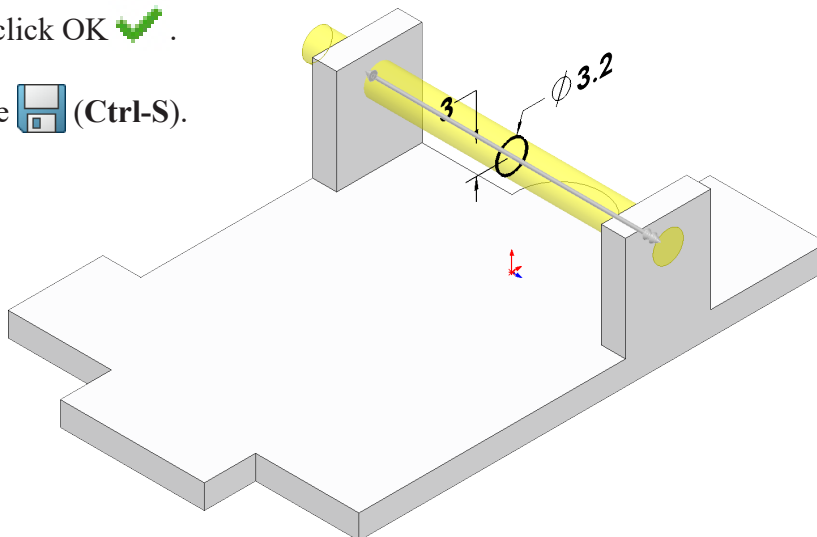


Fig. 23

E. Cut-Extrude2 Sketch4 Gear Cut.

Step 1. Click the **top face** and click **Sketch** on the context toolbar, **Fig. 24**.

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

Step 3. Click **Corner Rectangle** in the **Rectangle fly-out** on the Sketch toolbar.

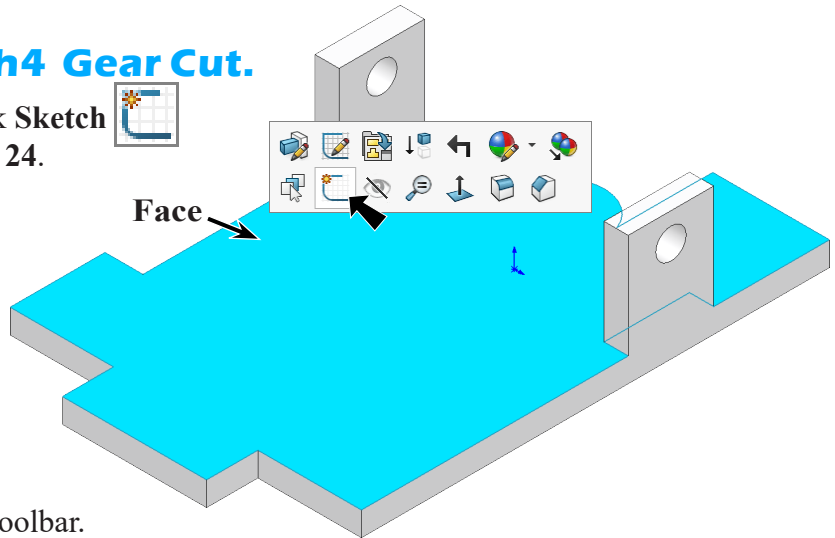


Fig. 24

Step 4. Sketch corner rectangle, **Fig. 25**.

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

Step 6. **Ctrl click Origin** and **midpoint of a vertical line** and to select both. Release Ctrl key and click **Make**

Horizontal on the context toolbar, **Fig. 26**.

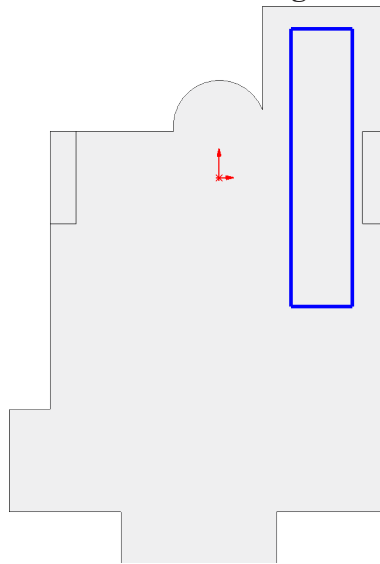


Fig. 25

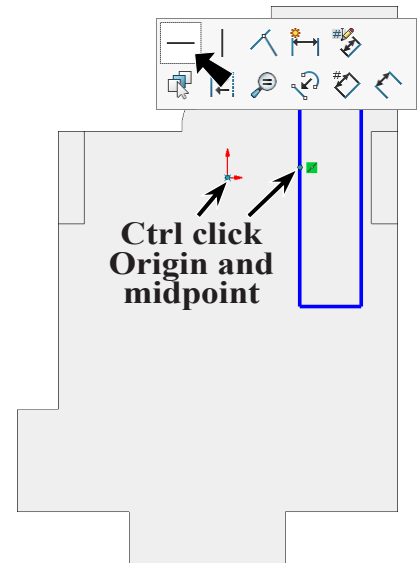


Fig. 26

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

Step 8. Add dimensions, **Fig. 27**.

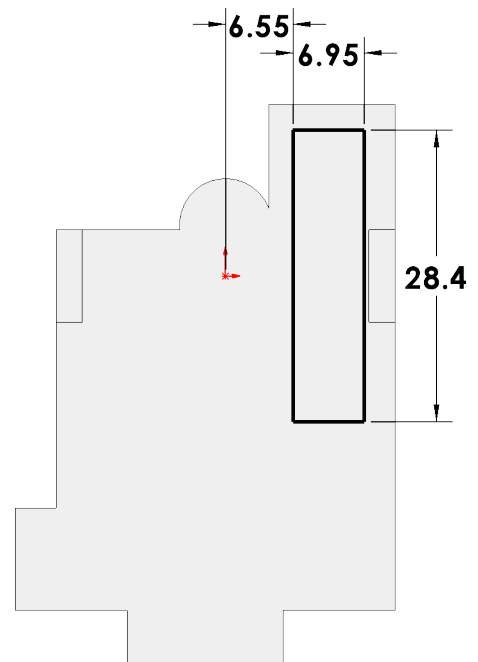
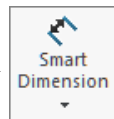
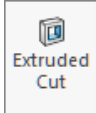


Fig. 27

Step 9. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 10. Click **Features**  on the Command Manager toolbar.

Step 11. Click **Extruded Cut**  on the Features toolbar.

Step 12. In the Cut-Extrude Property Manager set:
 under Direction 1, **Fig. 28**
 End Condition **Through All**
 click OK .

Step 13. Save  (**Ctrl-S**).

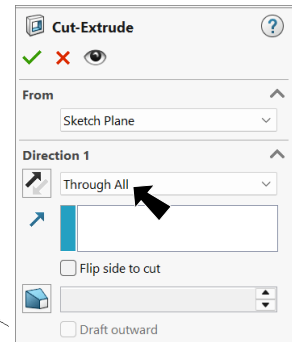


Fig. 28

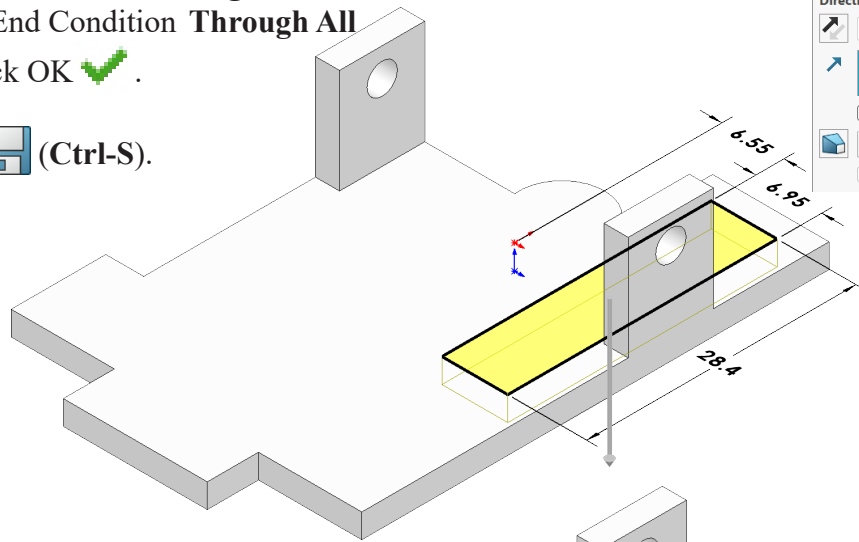


Fig. 29

F. Cut-Extrude3 Sketch5 Pin Hole.

Step 1. Click the **top face** and click **Sketch**  on the context toolbar, **Fig. 30**.

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

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

Step 4. Sketch a **circle at centerpoint of arc** and **two circles at bottom**, **Fig. 31**. To wake up centerpoint, hover cursor over circular edge.

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

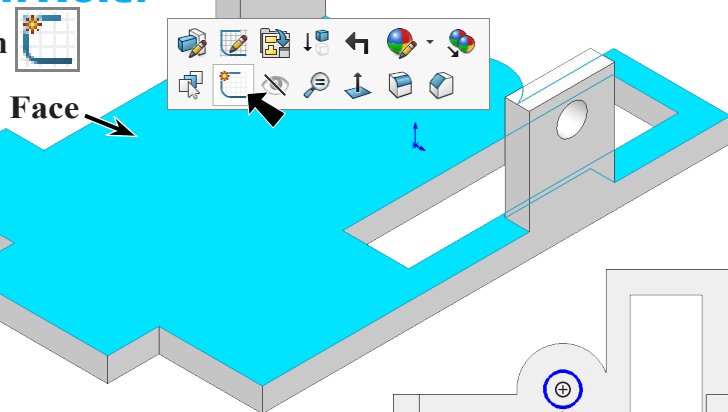


Fig. 30

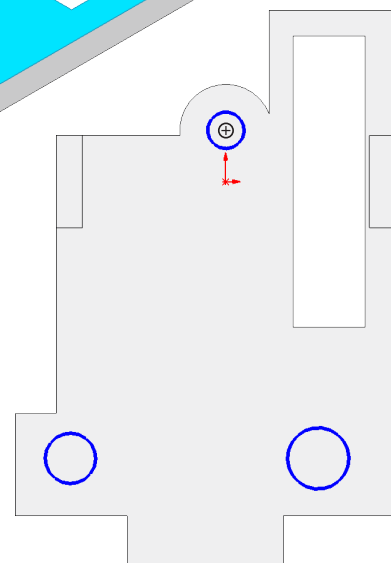


Fig. 31

Step 6. **Drag selection** to select **all circles** and click **Make**

Equal  on the context toolbar, **Fig. 32**.

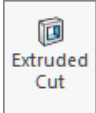
Step 7. **Ctrl click both bottom circle centerpoints** to select both. Release Ctrl key and click **Make Horizontal**  on the context toolbar, **Fig. 33**.

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

Step 9. Add dimensions, **Fig. 34**.

Step 10. Click **Isometric**  on the Standard Views toolbar. (Ctrl-7)

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. 35**
End Condition **Through All**
click OK .

Step 14. Save  (Ctrl-S).

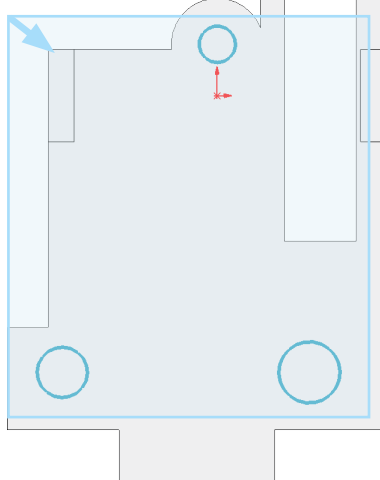


Fig. 32

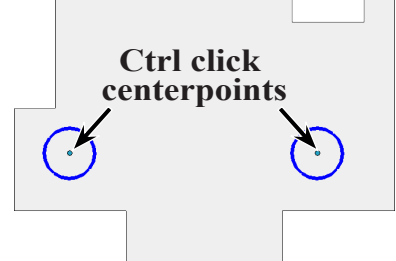
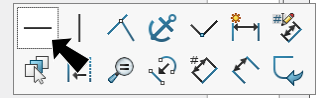


Fig. 33

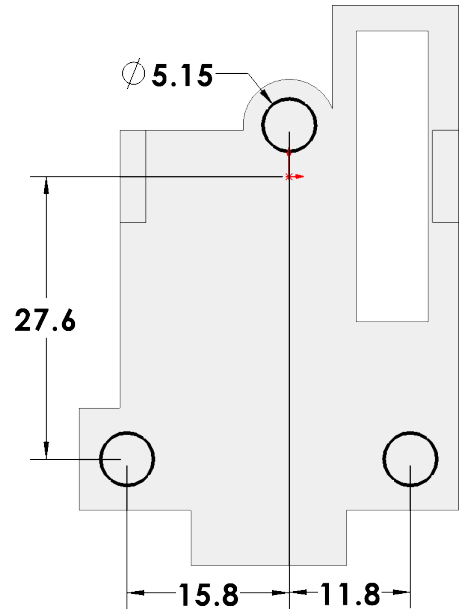


Fig. 34

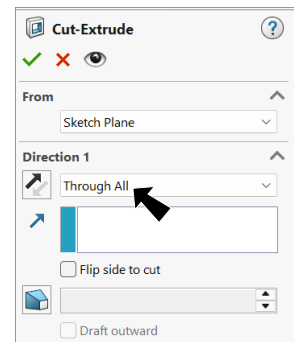


Fig. 35

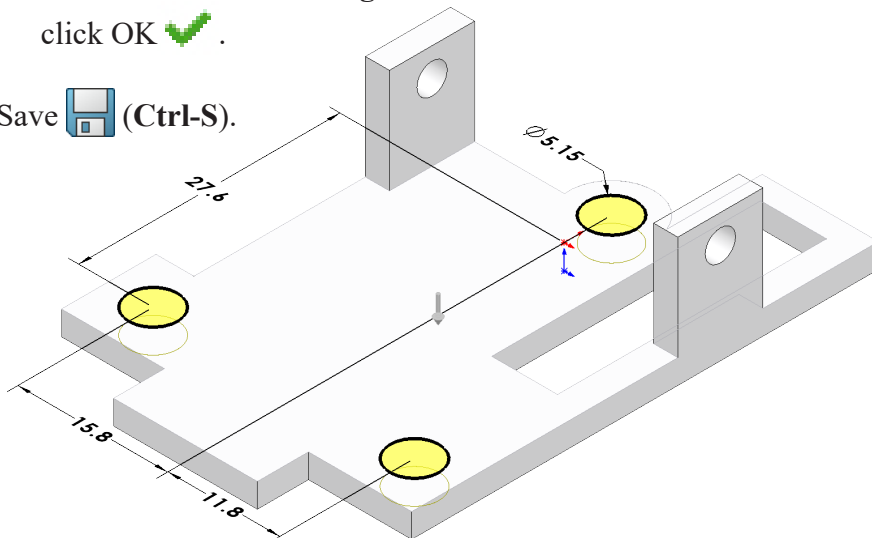


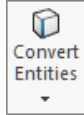
Fig. 36

G. Extrude3 Sketch6 Spacer for Pin.

Step 1. Click the **top face** and click **Sketch** on the context toolbar, **Fig. 37**.

Step 2. Unselect face.

Step 3. Click **Convert Entities**



on the Sketch toolbar.

Step 4. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 38**
click **edge of each Pin hole**, **Fig. 39**
click OK .

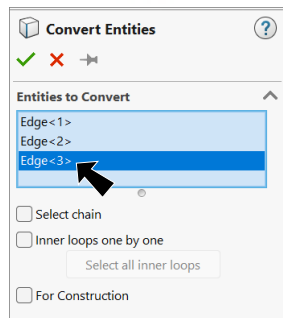


Fig. 38

Step 5. Click **Offset Entities** on the Sketch toolbar.

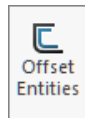


Fig. 39

Step 6. In the Offset Entities Property Manager set:
under Parameters, **Fig. 40**

Distance **1.5**

click **converted edge each hole**, **Fig. 41**

click OK .

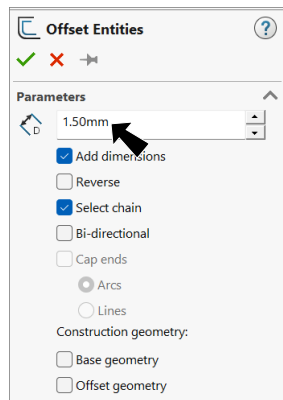


Fig. 40

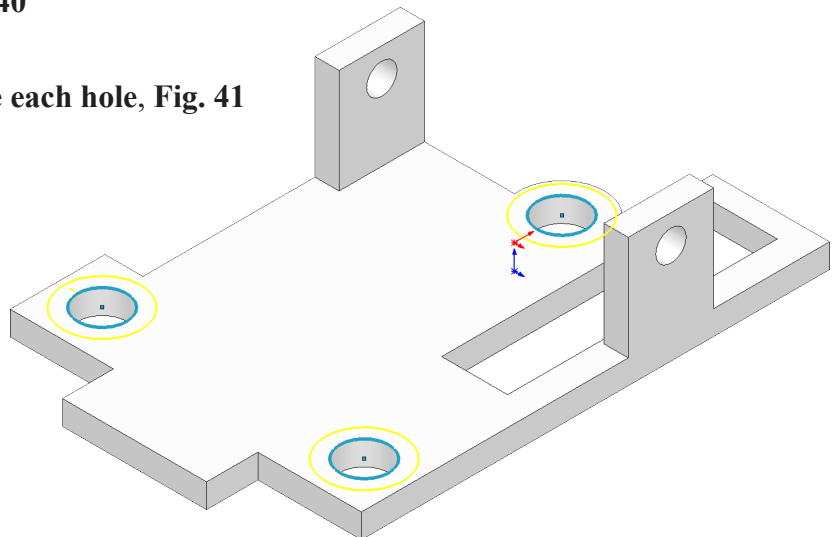


Fig. 41

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

SOLIDWORKS

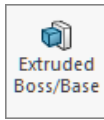
Features

FOR BRACKET

SOLAR TRAIN

PAGE 12-10

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



Step 9. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 42**

End Condition **Blind**

Depth **1.75**

click OK.

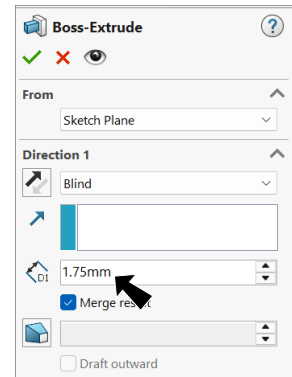


Fig. 42

Step 10. Save (Ctrl-S).

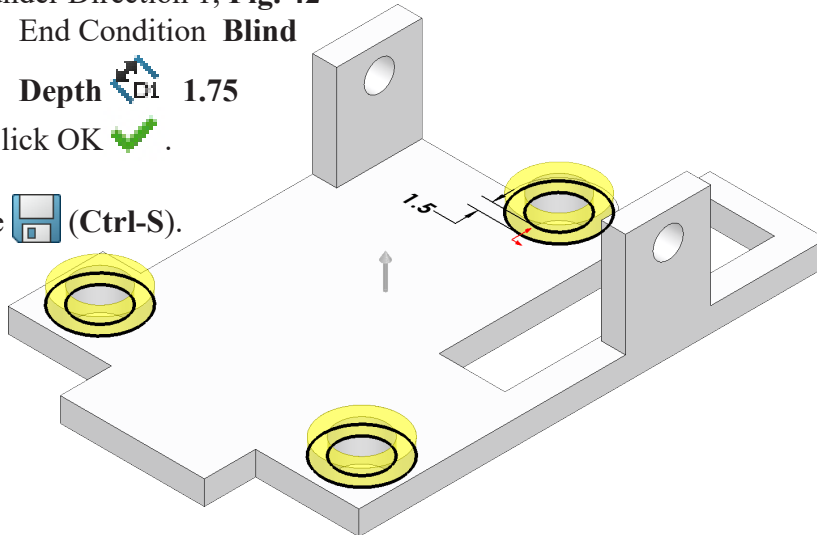


Fig. 43

H. Create Plane1.

Step 1. Click **Right Plane** in the Feature Manager to display Plane in graphics area, **Fig. 44**.

Step 2. In graphics area **Ctrl drag Right plane to right hand side of the vehicle** (passenger's side) and release, **Fig. 45**.

Step 3. In the Plane Property Manager set:
under First Reference, **Fig. 46**

Distance **2**

and press **ENTER**.

The new plane should be towards passenger's side of right plane, **Fig. 45**.

Click OK.

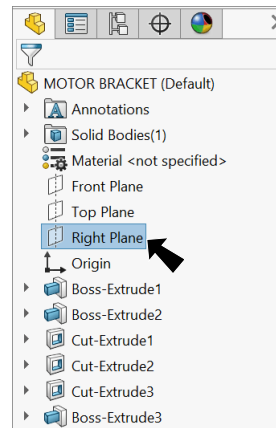


Fig. 44

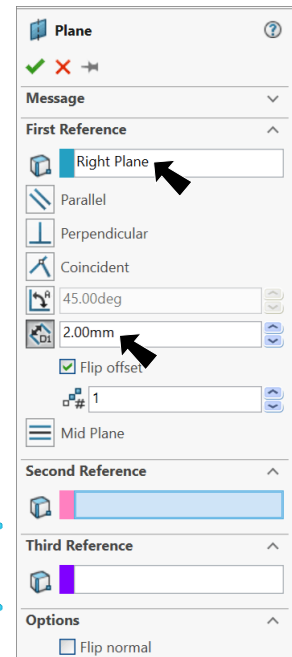


Fig. 46

Step 4. Save (Ctrl-S).

**Hold down Ctrl
drag plane to right
Set distance 2**

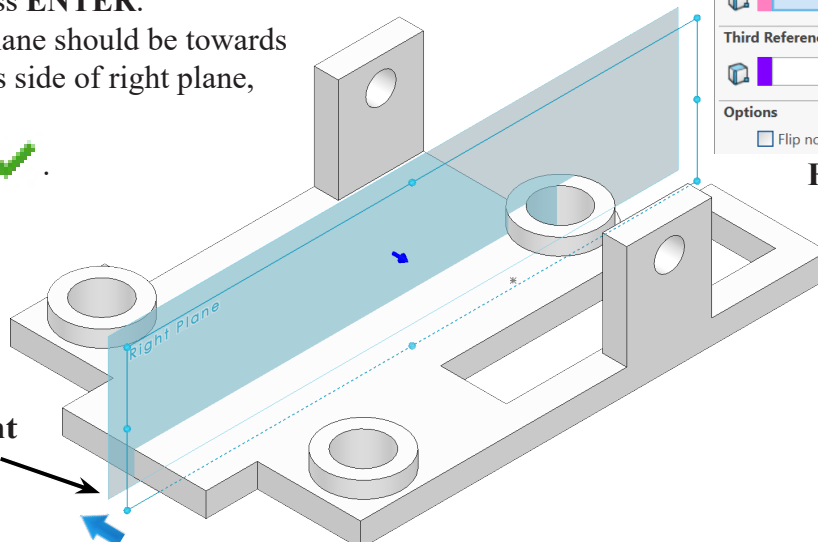


Fig. 45

I. Extrude2 Sketch7 Motor Mount

Step 1. **Hide Plane1** . To hide, click **Plane1**  in the Feature Manager and **Hide**  on the context toolbar, **Fig. 47**.

Step 2. Click **Plane1**  in the Feature Manager and click **Sketch**  on the context toolbar, **Fig. 48**.

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

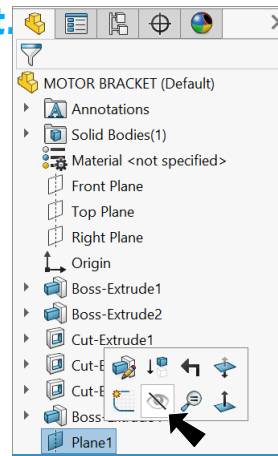


Fig. 47

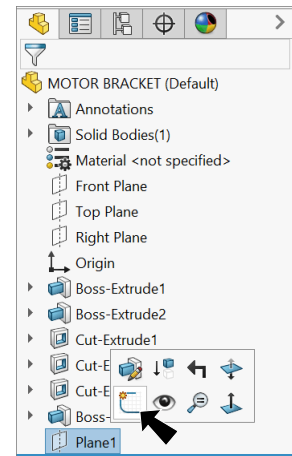


Fig. 48

Step 4. Click **Centerline**  in the **Line flyout**  on the Sketch toolbar.

Step 5. Sketch two centerlines. A **vertical centerline up from bottom edge and chained centerline to centerpoint of axle hole**, **Fig. 49**. To wake up centerpoint, hover cursor over circular edge.

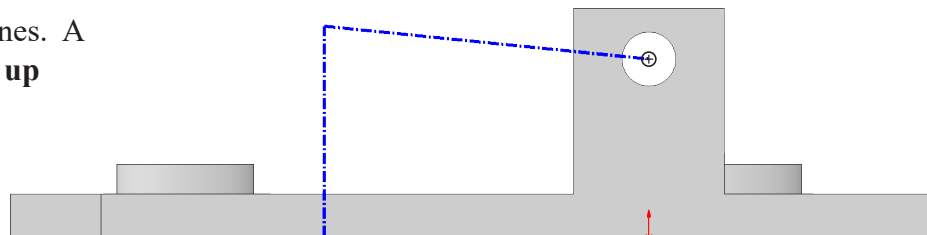


Fig. 49

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

Step 7. Sketch **circle at top endpoint of vertical centerline**, **Fig. 50**.

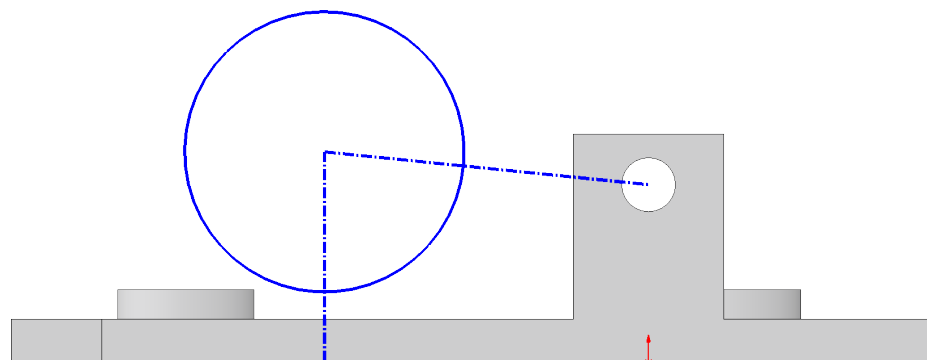


Fig. 50

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

Step 9. Add dimensions, **Fig. 51**.

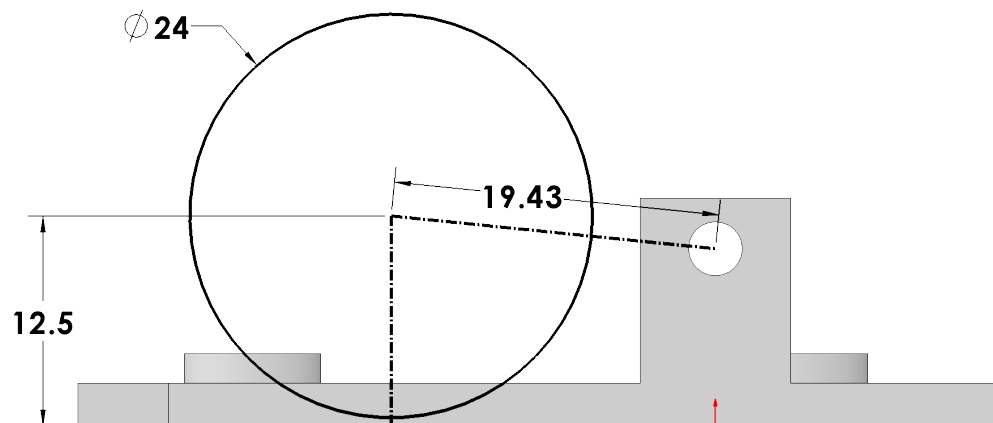
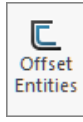


Fig. 51

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



Step 11. In the Offset Entities Property Manager set:
under Parameters, Fig. 52

Distance .2 (interference fit for Motor)

check **Reverse**

uncheck **Bi-directional**

under Construction geometry

check **Base geometry**

click **circle**, Fig. 53

Yellow offset circle on inside - base geometry (construction) on outside

Click **Keep Visible** and OK

✓. The Push Pin on allows selection of another offset.

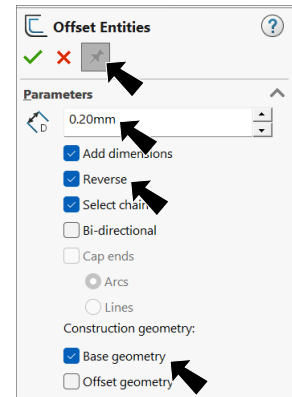


Fig. 52

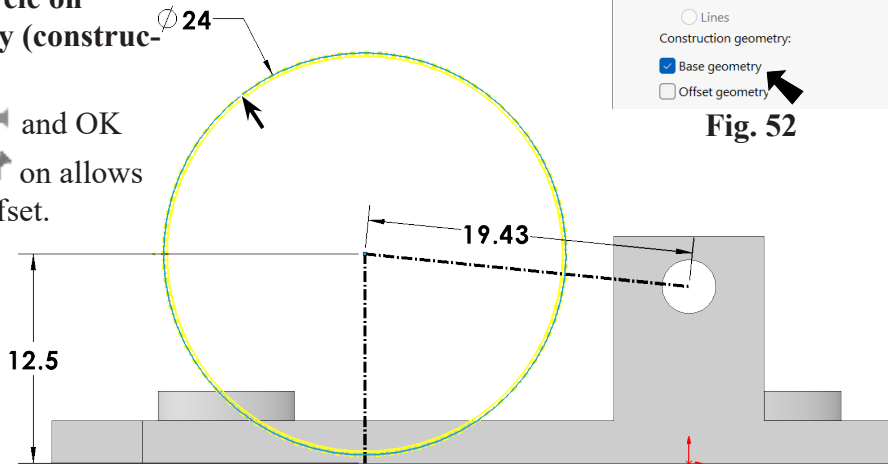


Fig. 53

under Parameters, Fig. 54

Distance 3.3

uncheck **Reverse**

under Construction geometry

uncheck **Base geometry**

click **offset circle**, Fig. 55

Yellow offset circle on outside

click OK twice.

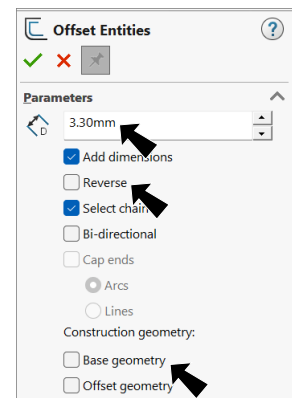


Fig. 54

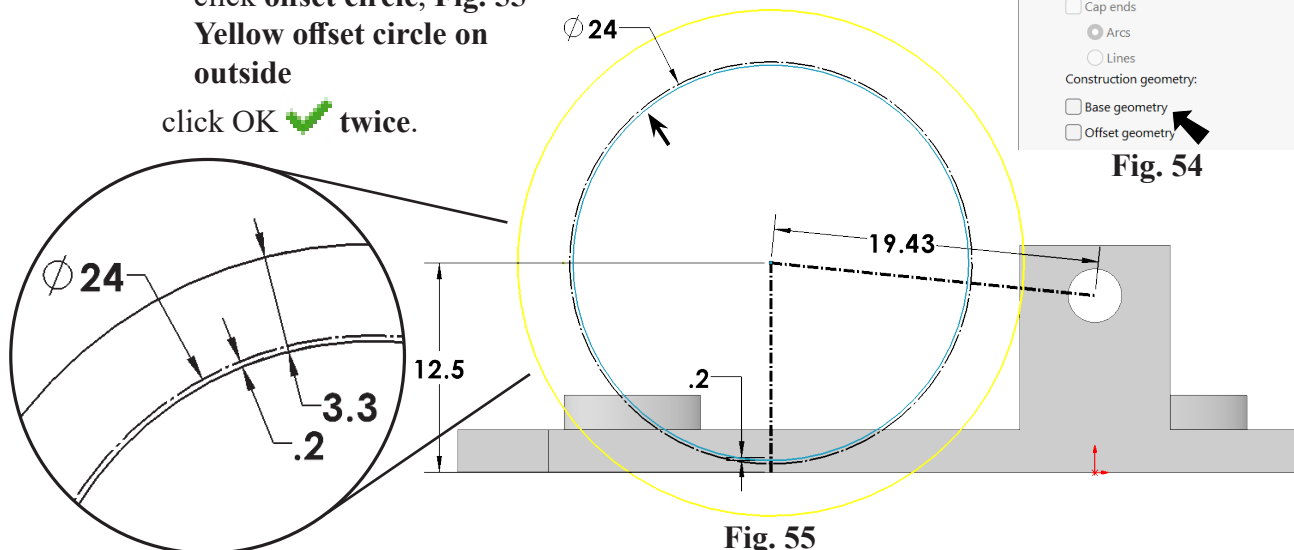
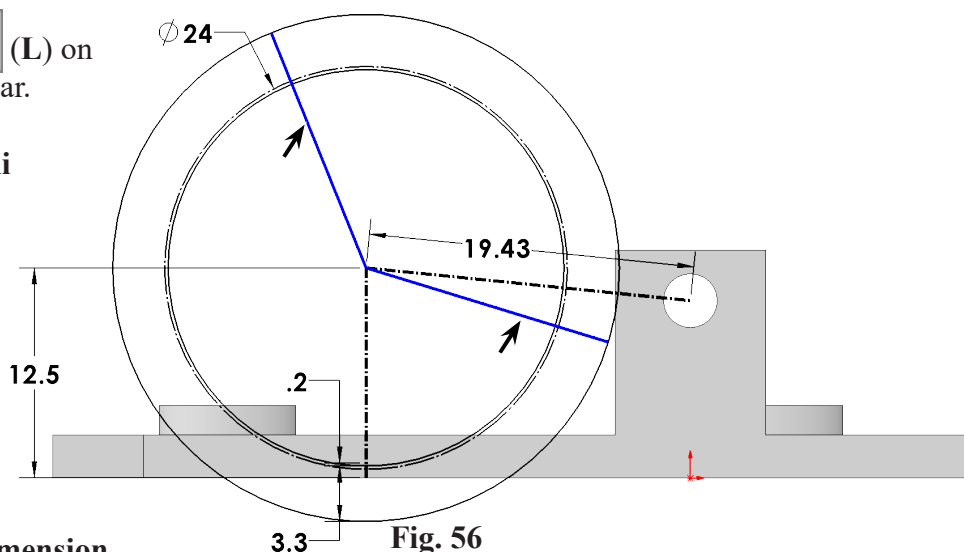


Fig. 55

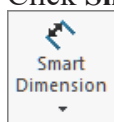
Step 12. Click **Line**  (L) on the Sketch toolbar.

Step 13. Sketch **two radii from Origin**

 **at angle to outside circle, Fig. 56.**
Double click to terminate chain of lines.



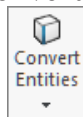
Step 14. Click **Smart Dimension**



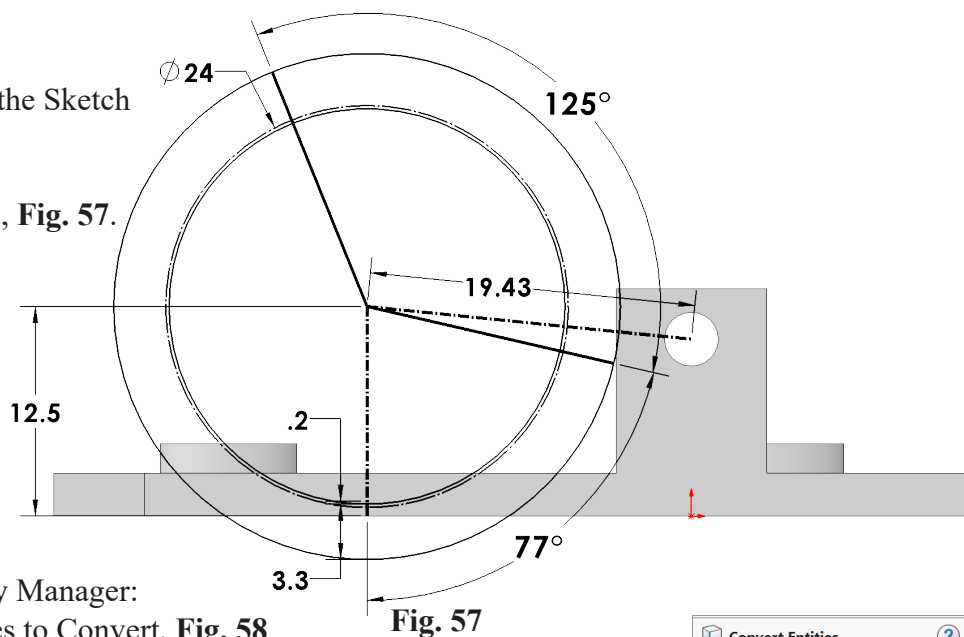
(S) on the Sketch toolbar.

Step 15. Add dimensions, **Fig. 57.**

Step 16. Click **Convert**



Entities on the Sketch toolbar.



Step 17. In the Convert Entities Property Manager:
under Entities to Convert, **Fig. 58**
click **bottom edge, Fig. 59**
click OK .

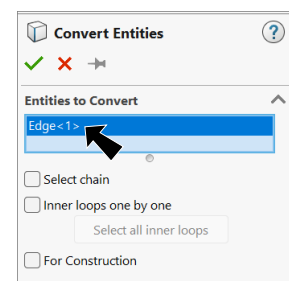


Fig. 58

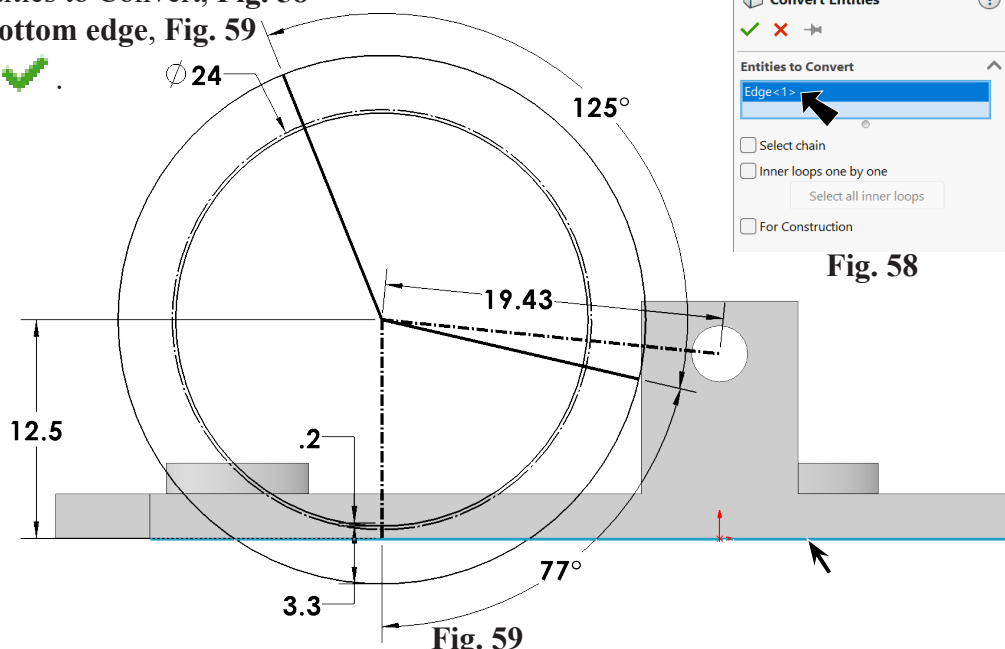
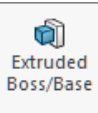


Fig. 59

Step 18. Click **Isometric**  on the Standard Views toolbar. (**Ctrl-7**)

Step 19. Click **Features**  on the Command Manager toolbar.

Step 20. Click **Extruded Boss/Base**  on the Features toolbar.

Step 21. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 60**

End Condition **Mid Plane**

Depth  **9**

under Selected Contours

click the **contour**, **Fig. 61**

click OK .

Step 22. Save  (**Ctrl-S**).

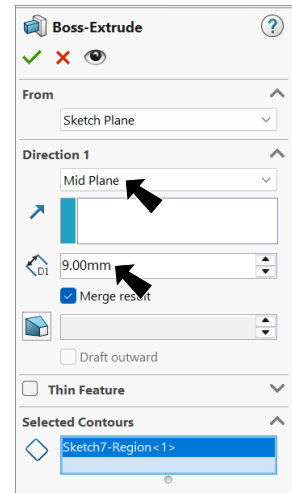


Fig. 60

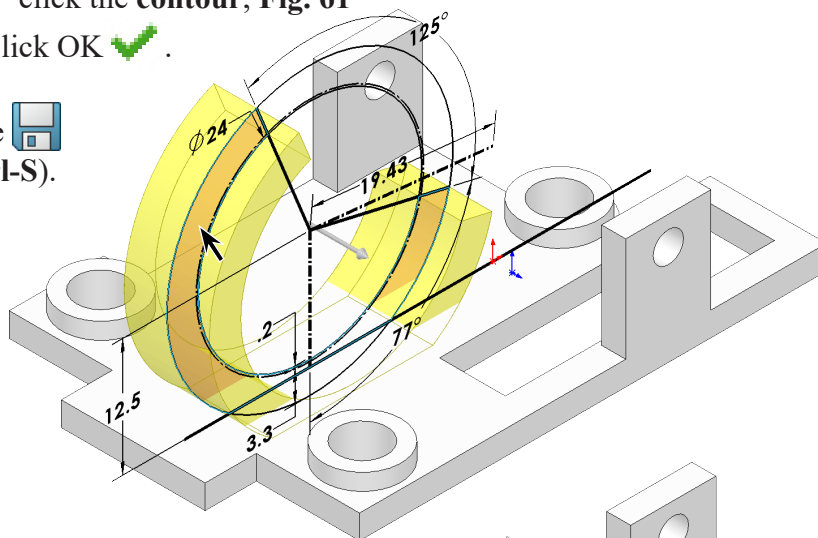


Fig. 61

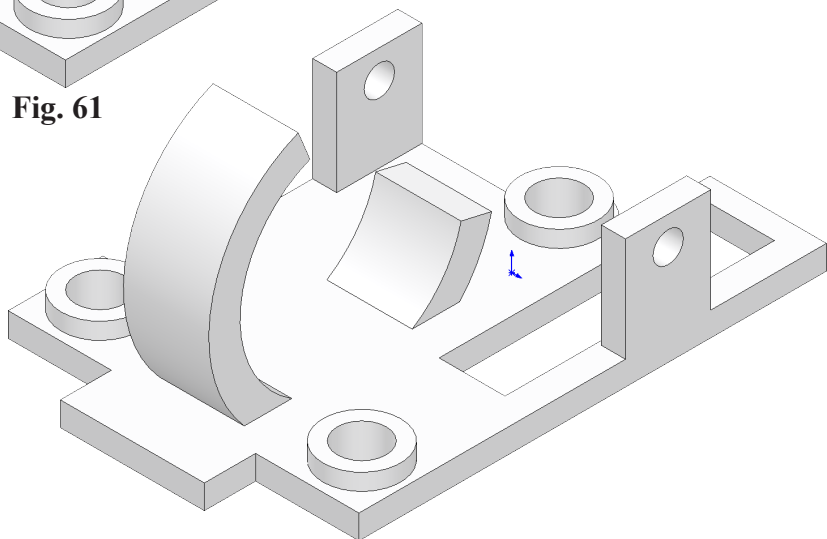


Fig. 62

J. Extruded Cut4 Sketch7 Cut Motor Mount.

Step 1. Expand **Boss-Extrude4** in the Feature Manager and click motor mount, **Sketch7** to select sketch, **Fig. 63**.

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

Step 3. In Cut-Extrude Property Manager set:
under Direction 1, **Fig. 64**
End Condition **Mid Plane**

Depth  **13.6**
under Selected Contours
click **inside circle**, **Fig. 65**
click OK .

Step 4. Save  (Ctrl-S).

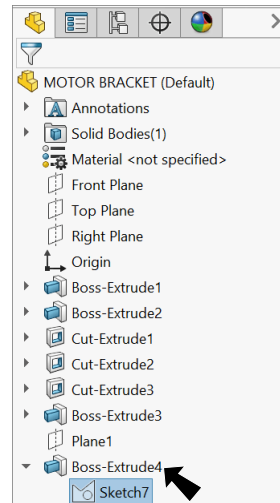


Fig. 63

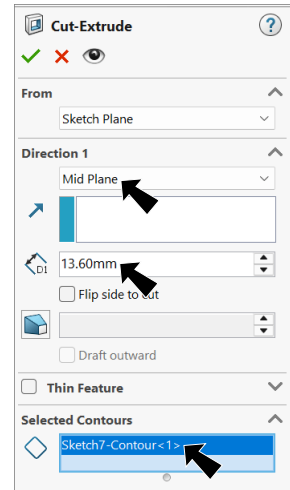


Fig. 64

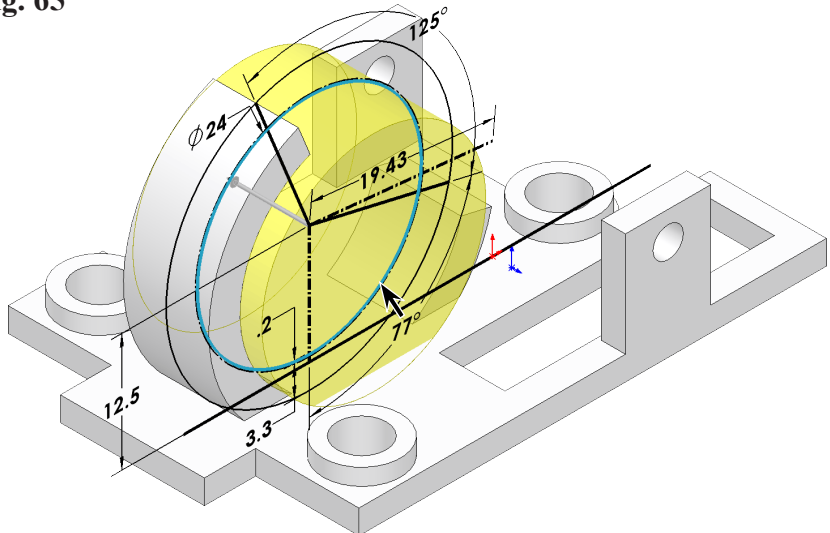


Fig. 65

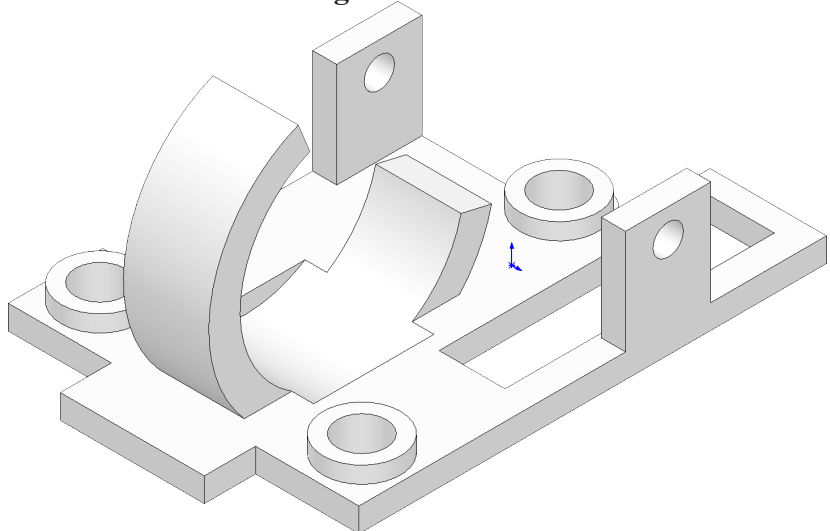


Fig. 66

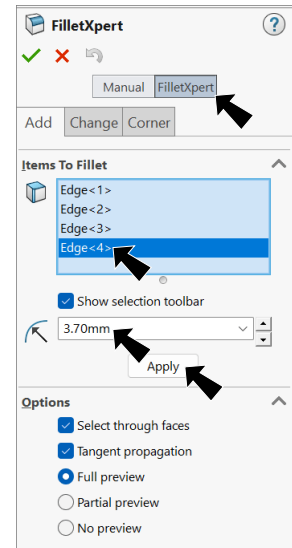
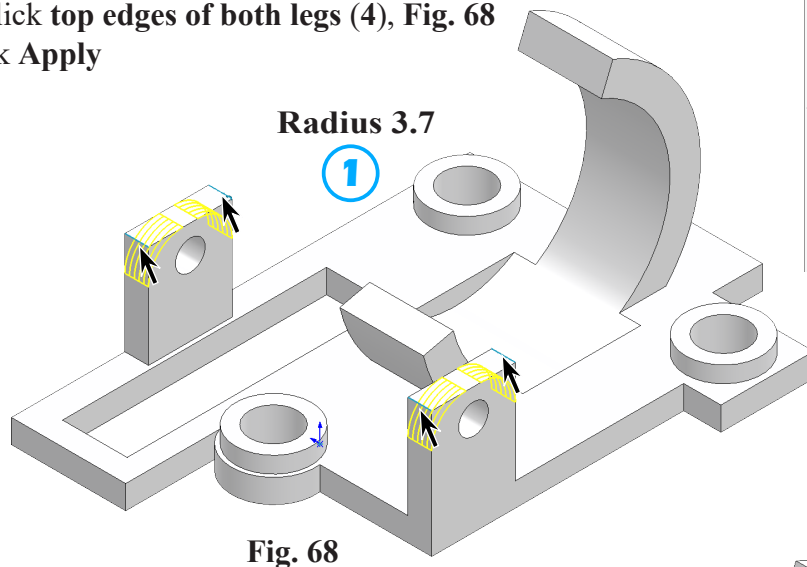
K. Fillets 1-6.

Step 1. Rotate view to back side, **Fig. 68**. To rotate view, in **Isometric** , **Shift** click the **Y** axis of the Reference Triad  twice.

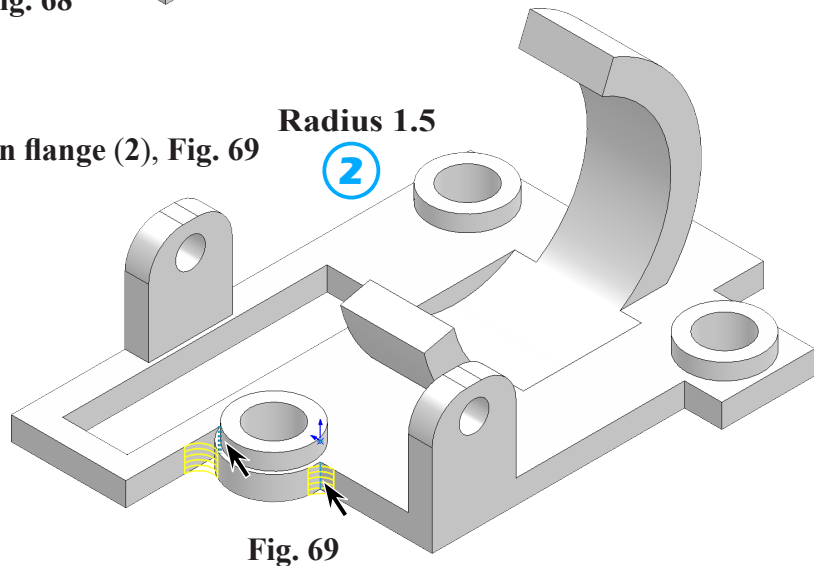
Step 2. Click **Fillet**  on the Features toolbar.

Step 3. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 67**

① **Radius**  **3.7**
click **top edges of both legs (4)**, **Fig. 68**
click **Apply**

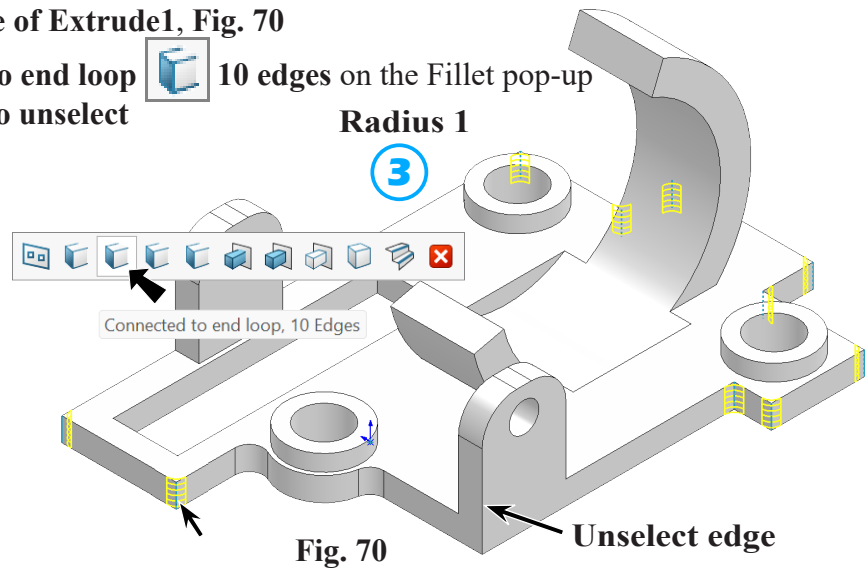


② **Radius**  **1.5**
click **both edges of pin flange (2)**, **Fig. 69**
click **Apply**

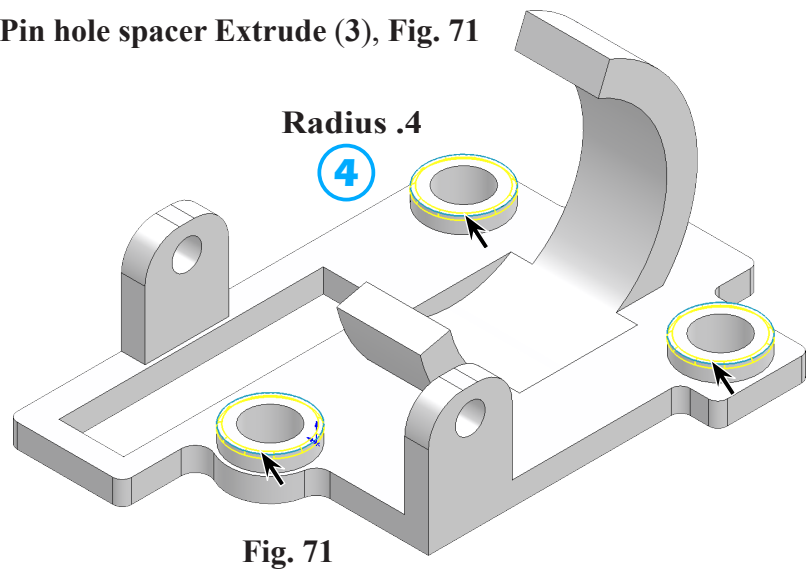


- ③ **Radius**  **1**
click vertical edge of Extrude1, Fig. 70

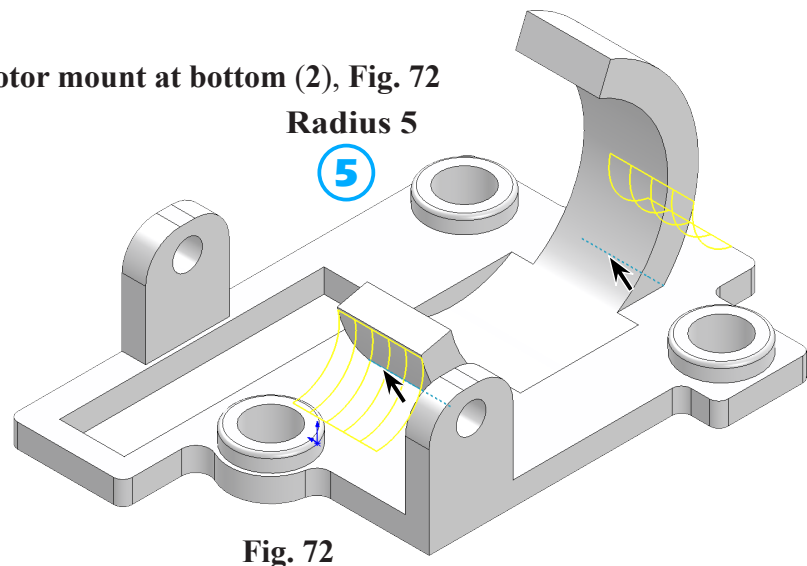
click **Connected to end loop**  **10 edges** on the Fillet pop-up
click edge at leg to unselect
click **Apply**



- ④ **Radius**  **.4**
click circular edge of Pin hole spacer Extrude (3), Fig. 71
click **Apply**



- ⑤ **Radius**  **5**
click both edges of motor mount at bottom (2), Fig. 72
click **Apply**



- ⑥ Radius  1
click both top faces of motor mount (2), Fig. 73
click OK .

Step 4. Save  (Ctrl-S).

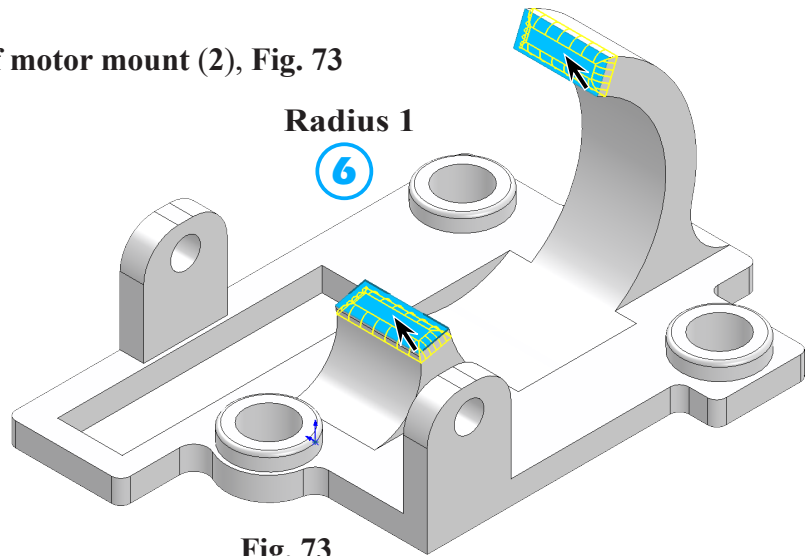


Fig. 73

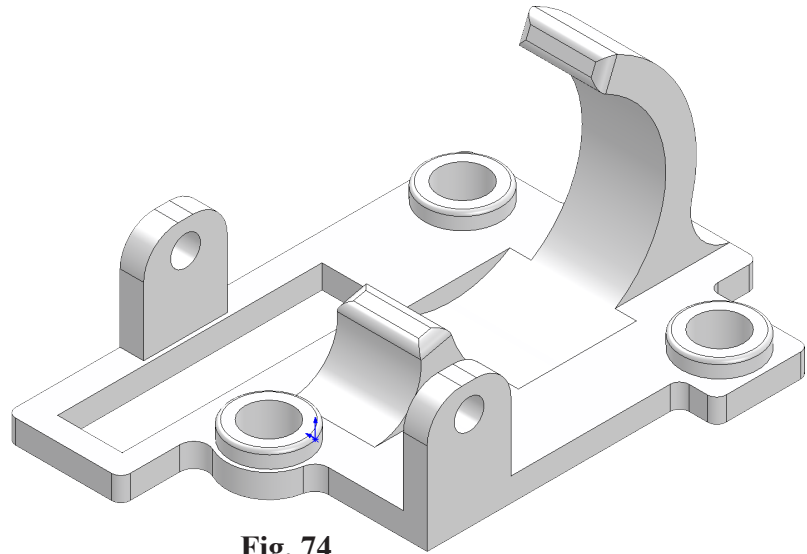


Fig. 74

L. Appearance: Blue Plastic.

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

Step 2. Click part, click **Appearance Callout**  on the context toolbar and click **MOTOR BRACKET** , Fig. 75.

Step 3. In the Appearances Task pane, expand **Plastic**, click **Medium Gloss** and in the lower pane select **blue medium gloss plastic**, Fig. 76.

Step 4. Over in Appearances Property Manager, under Color, Fig. 77 set RGB values
R 124
G 164
B 244
 click OK .

Step 5. Save  (Ctrl-S).

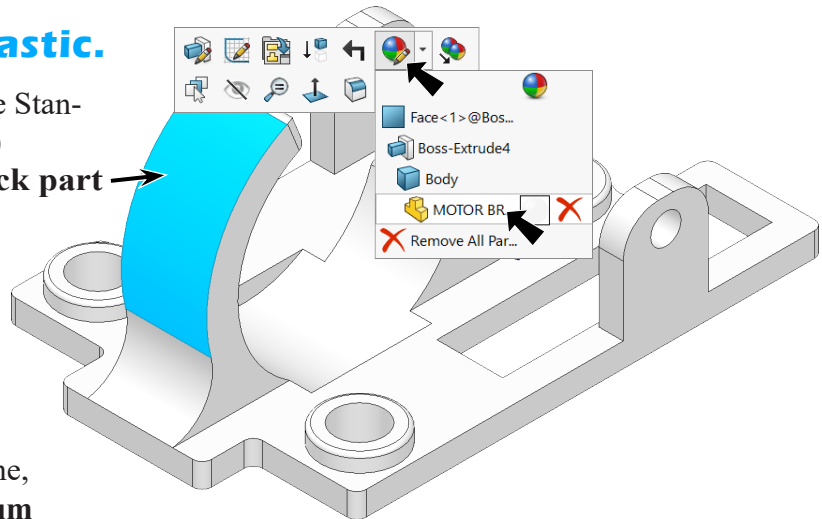


Fig. 75

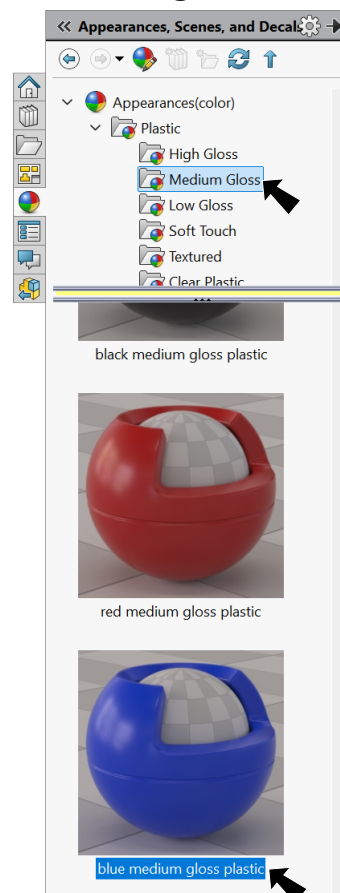


Fig. 76

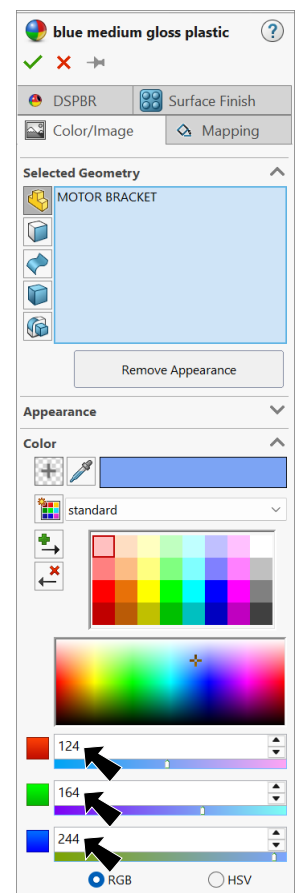


Fig. 77

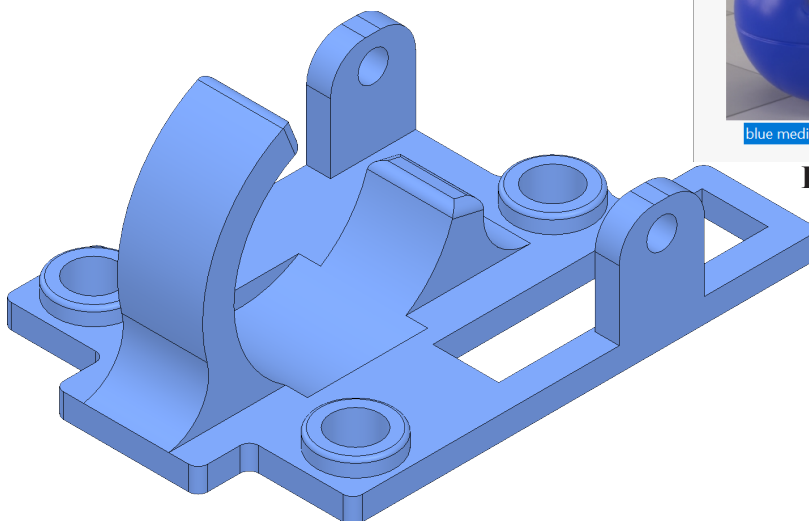


Fig. 78