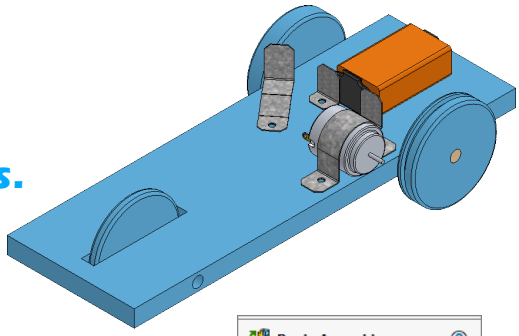
Chapter 9

Solar Car
Assembly



A. Insert Chassis and Sheet Metals Parts.

Step 1. Click File Menu > New, click **Assembly** and OK.

Step 2. Select your **CHASSIS** file and click Open from the Open dialog box.

Step 3. In the Begin Assembly Property Manager set:

click **Keep Visible** , **Fig. 1**.

Click OK . This will place Chassis origin at the assembly origin and fix the position so Chassis cannot move. This fixed component should have a **(f)** before its name in the Feature Manager (f) CHASSIS<1> .

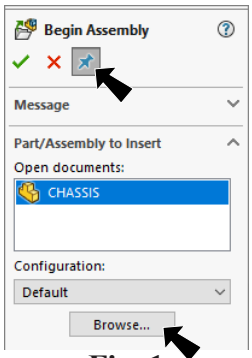


Fig. 1

Step 4. Click **Browse** in the Property Manager, **Fig. 1**.

Step 5. Select your **L-BRACKET** file and click Open.

Step 6. Position cursor **near rear screw hole** in Chassis, **Fig. 2**. When L-Bracket snaps into place and cursor changes to indicate a Concentric and Coincident mate , click to release L-Bracket.

Release part when cursor changes to

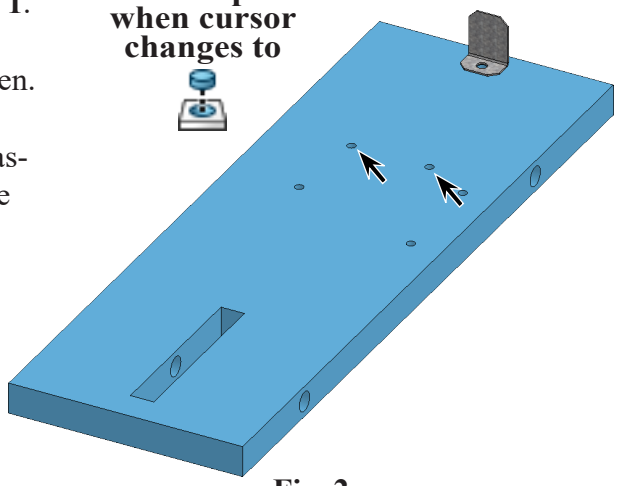


Fig. 2

Step 7. Place a L-Bracket at the **next two holes**, **Fig. 3**. To place L-Bracket, move cursor near hole and release L-Bracket when cursor changes to indicate a Concentric and Coincident mate .

Step 8. Click **Browse** in the Property Manager, **Fig. 1**.

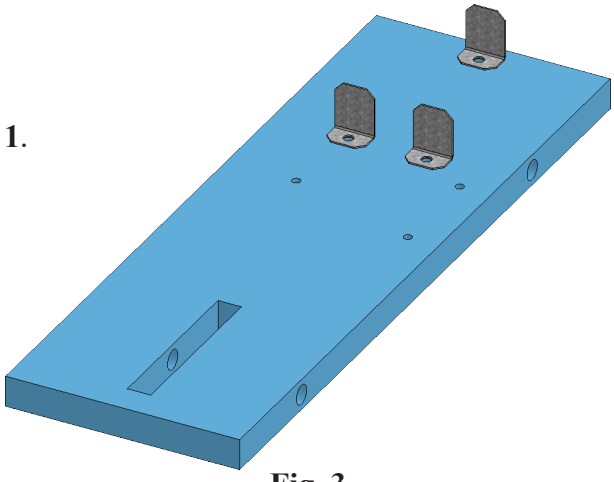


Fig. 3

Step 9. Select your **SWITCH** file and click Open.

Step 10. Position cursor near screw **hole on left side** of Chassis, **Fig. 4**. When Switch snaps into place and pointer (cursor) changes to indicate a Concentric and coincident mate, click to release Switch.

Step 11. Click **Browse** in the Property Manager.

Step 12. Select your **MOTOR MOUNT** file and click Open.

Step 13. Position Motor Mount near **front hole on right** of chassis, **Fig. 5**. Release Motor Mount when cursor changes to indicate a Concentric and coincident mate.

Step 14. Click OK in the Property Manager when done.

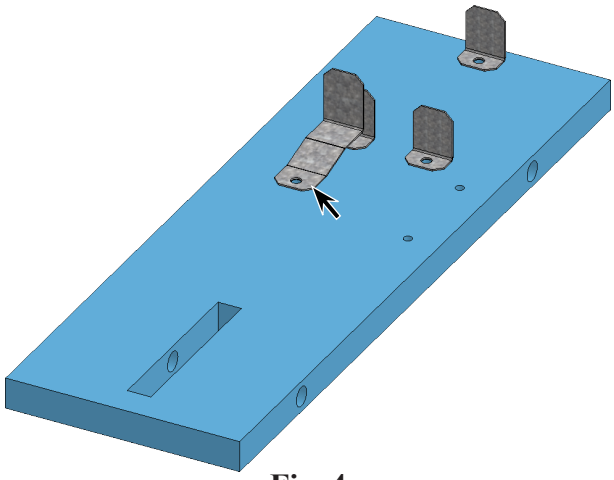


Fig. 4

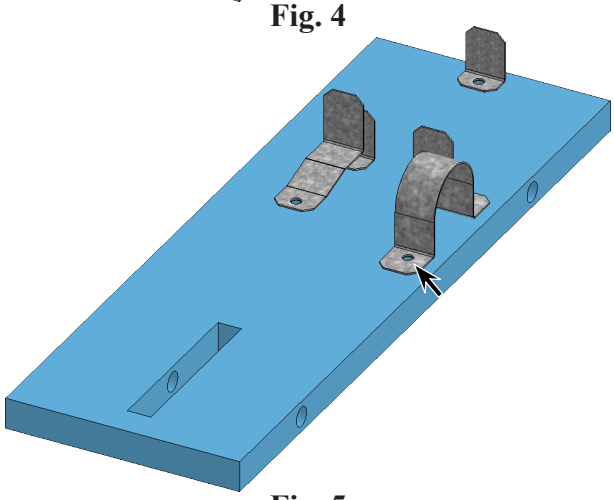


Fig. 5

B. Save as "SOLAR CAR ASSEMBLY".

Step 1. Click File Menu > Save As.

Step 2. Key-in **SOLAR CAR ASSEMBLY** for the filename and press ENTER.

C. Mate: Motor Mount 2nd Hole.

Step 1. Click **Filter Faces** (**X**) on the **Selection Filter toolbar** at the bottom of the display, **Fig. 6**. If necessary, use **F5** key to display the toolbar.

Fig. 6

Step 2. Rotate view to view **rear hole in Motor Mount**, hold down middle mouse button (wheel) and drag to rotate view, **Fig. 7**.

Step 3. The Motor Mount rotates on Mate Reference. Grab the Motor Mount and rotate it slightly off the hole in Chassis, **Fig. 7**.

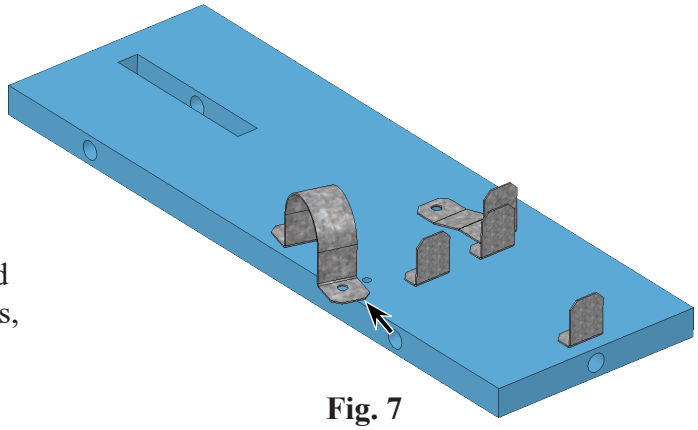


Fig. 7

Step 4. Click **Mate**

on the Assembly toolbar.

Step 5. Click **cylindrical face of rear hole on right side in Chassis** and **cylindrical face of rear hole in Motor Mount**, **Fig. 8**.

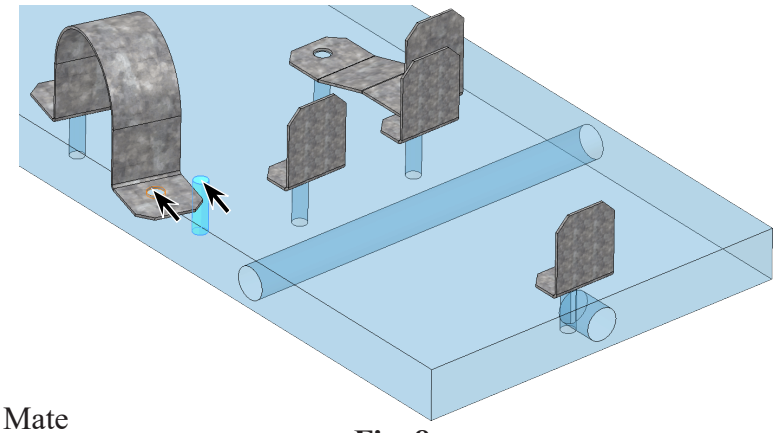


Fig. 8

Step 6. Click Add/Finish Mate in Mate pop-up toolbar to add a Concentric mate.

D. Mate: L-Brackets Parallel Mates.

Step 1. Click **front face of Chassis** and **front face of first L-Bracket**, **Fig. 9**.

Step 2. Click **Parallel** and click **Flip Mate Alignment** in Mate pop-up, **Fig. 10**. Click Add/Finish Mate to add Parallel mate.

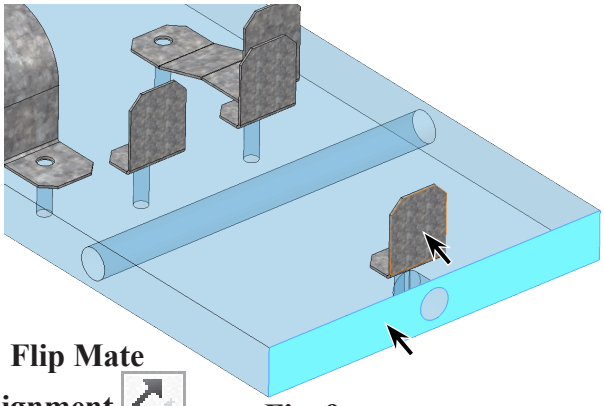


Fig. 9

Flip Mate Alignment **rotates L-Bracket around**

Fig. 10

Step 3. Click **front face of Chassis** and **front face of middle L-Bracket**, **Fig. 11**.

Step 4. Click **Parallel** in Mate pop-up, **Fig. 10**. Click Add/Finish Mate to add Parallel mate.

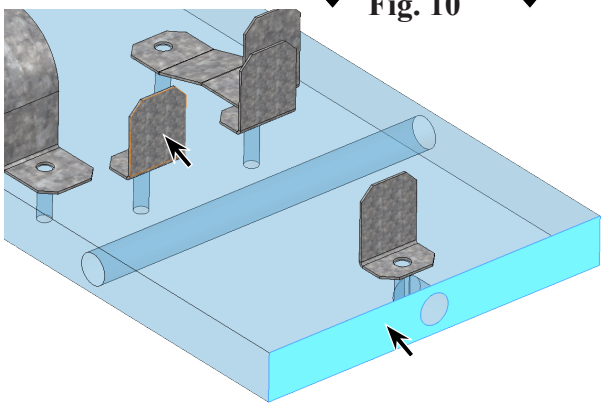


Fig. 11

Step 5. Click **front face of Chassis** and **front face of third L-Bracket**, **Fig. 12**.

Step 6. Click **Parallel** in Mate pop-up, **Fig. 10**. Click Add/Finish Mate to add Parallel mate.

Step 7. Click OK in the Property Manager.

Step 8. Save. Use **Ctrl-S**.

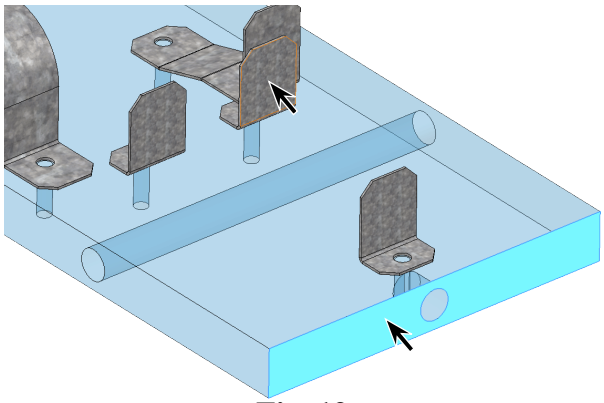
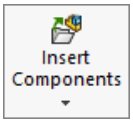


Fig. 12

E. Insert Motor and Motor Mount.

Step 1. Click **Trimetric** on the Standard Views toolbar.

Step 2. Click **Insert Components** 

on the Assembly toolbar.

Step 3. Select **MOTOR** file and click Open.

Step 4. Place Motor as positioned in **Fig. 13**.

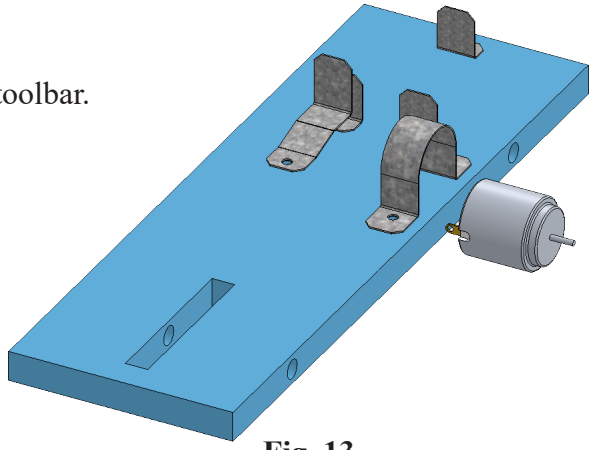


Fig. 13

F. Mate: Motor.

Step 1. Click **Mate**

on the Assembly toolbar.

Step 2. Click **cylindrical face of Motor** and **cylindrical face of Motor Mount**, **Fig. 14**.

Step 3. Check **Lock Rotation** and Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate, **Fig. 15**.

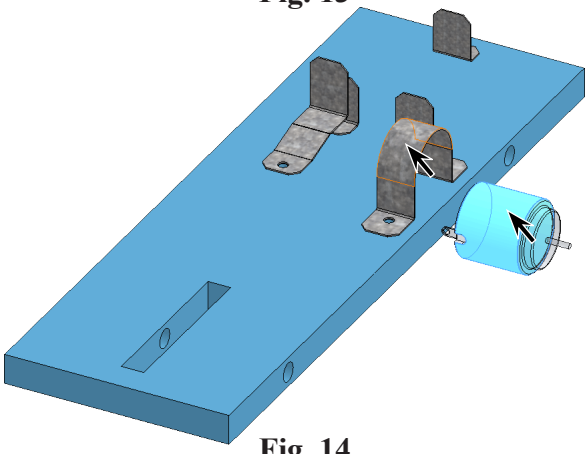


Fig. 14

Step 4. Click **end face of the Motor** and **side face of Chassis**, **Fig. 16**.

Fig. 15

Step 5. Click **Distance** in Mate pop-up, **Fig. 17**. Set **distance .1** and press ENTER. The Motor should **extent out** .1 from the side of the Chassis, **Fig. 18**. If positioned in opposite direction, click **Flip Dimension** in the Mate pop-up, **Fig. 17**. Click Add/Finish Mate to add Distance mate.

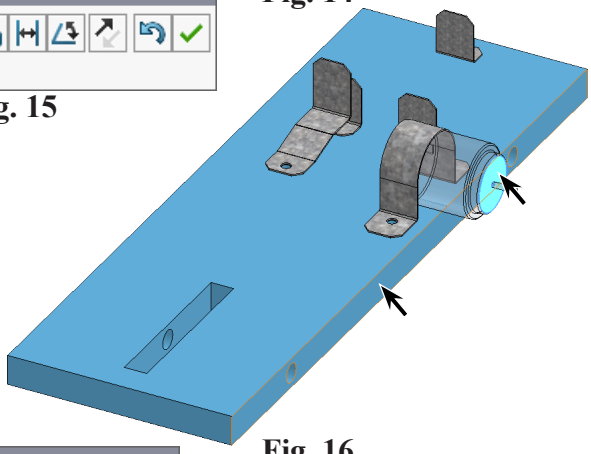


Fig. 16

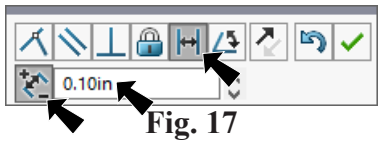


Fig. 17

Step 6. Click OK in the Property Manager.

Step 7. Save. Use **Ctrl-S**.

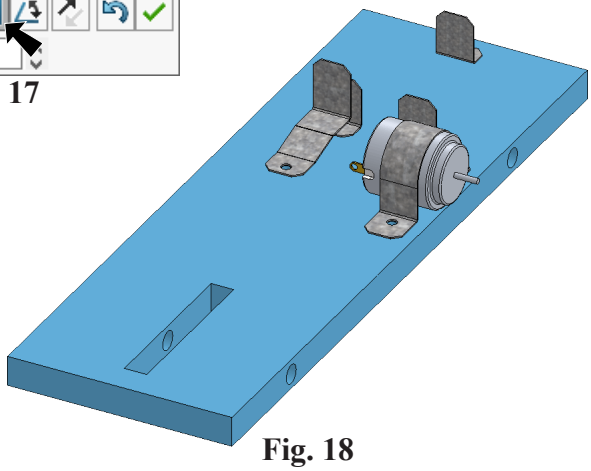
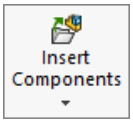


Fig. 18

G. Insert Battery 9 Volt and Battery Clip.

Step 1. The Switch swivels, all the other Parts are fixed with Mates, **Fig. 19**.

Step 2. Click **Insert Components** 

on the Assembly toolbar.

Step 3. Select **BATTERY 9 VOLT** file and click Open.

Step 4. Click **Keep Visible** in the Property Manager.

Step 5. Place Battery as positioned in **Fig. 19**. Browse and insert **BATTERY CLIP**.
Click OK in the Property Manager when done.

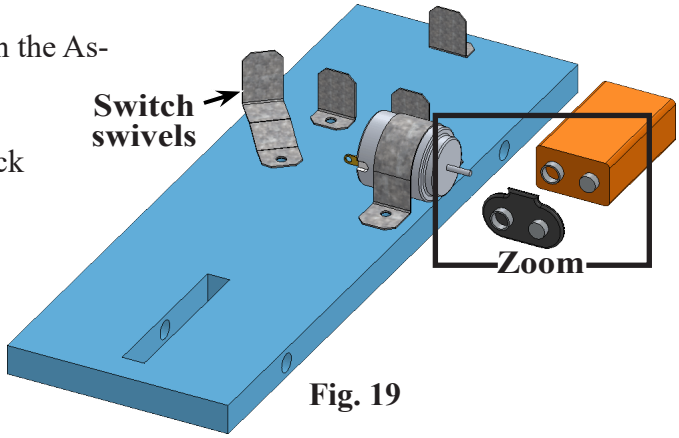


Fig. 19

H. Mate: Battery 9 Volt and Battery Clip.

Step 1. Zoom in around **Battery and Clip**, **Fig. 19**. To zoom, place the cursor over the Battery and Clip and spin the wheel on mouse back. While spinning the wheel keep cursor on the Battery/Clip.

Step 2. Click **Filter Faces** **(X)** to **turn OFF** and click **Filter Edges** **(E)** on the **Selection Filter toolbar** at the bottom of the display, **Fig. 20**. If necessary, use **F5** key to display the toolbar.

Fig. 20

Step 3. Click **Mate**

on the Assembly toolbar.

Step 4. Click the **bottom inside cylindrical edge of clip on Battery Clip** and **top cylindrical edge of the opposite clip on Battery**, **Fig. 21**. Click **Flip Alignment** in the Mate pop-up, **Fig. 22.**
Click Add/Finish Mate .

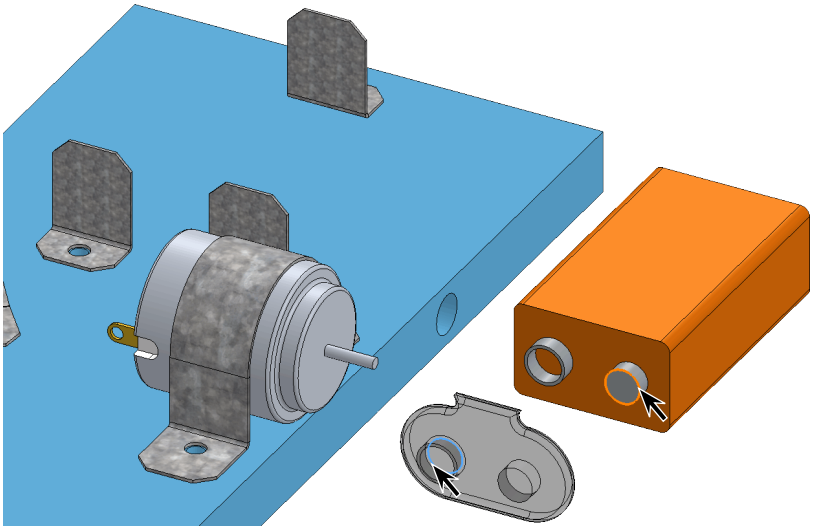


Fig. 21

Fig. 22

Step 5. Click **horizontal edge of Battery Clip** and **front horizontal edge of Battery**, **Fig. 23**.

Step 6. Click **Parallel** in Mate pop-up, **Fig. 24**. Click Add/Finish Mate to add Parallel mate.

Step 7. Click **Filter Edges** (**E**) to **turn OFF** on the **Selection Filter toolbar** at the bottom of the display, **Fig. 25**. If necessary, use **F5** key to display the toolbar.

Step 8. Click **top face of Chassis**, **Fig. 26**.

Step 9. Rotate view to view **bottom face of Battery** as shown in **Fig. 27**. To rotate, hold down middle mouse button (wheel) and drag.

Step 10. Click **bottom face of Battery**, **Fig. 27**.

Step 11. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 12. Click **Previous View** on the Standard Views toolbar. (**Ctrl-Shift-Z**)

Fig. 24

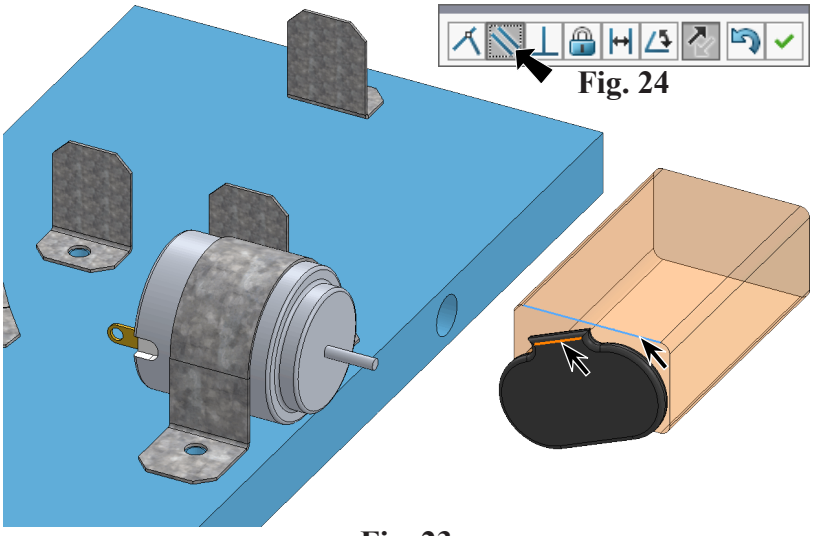


Fig. 23

Fig. 25

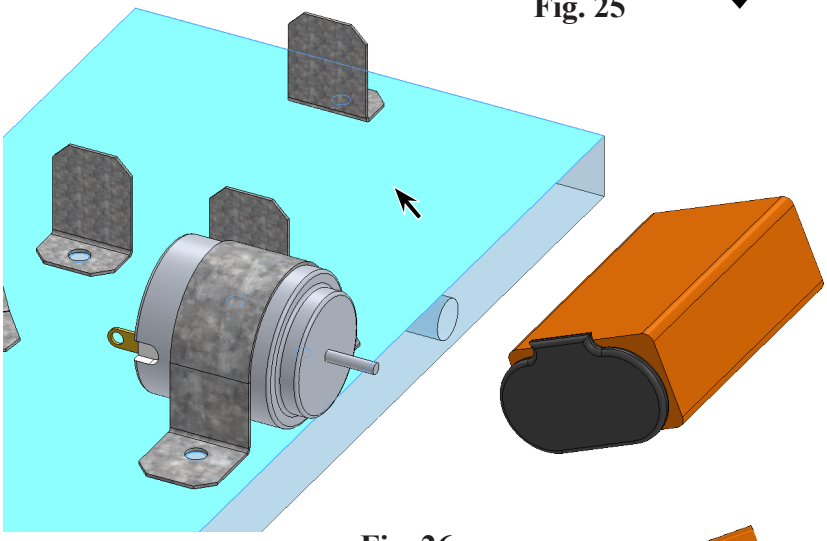


Fig. 26

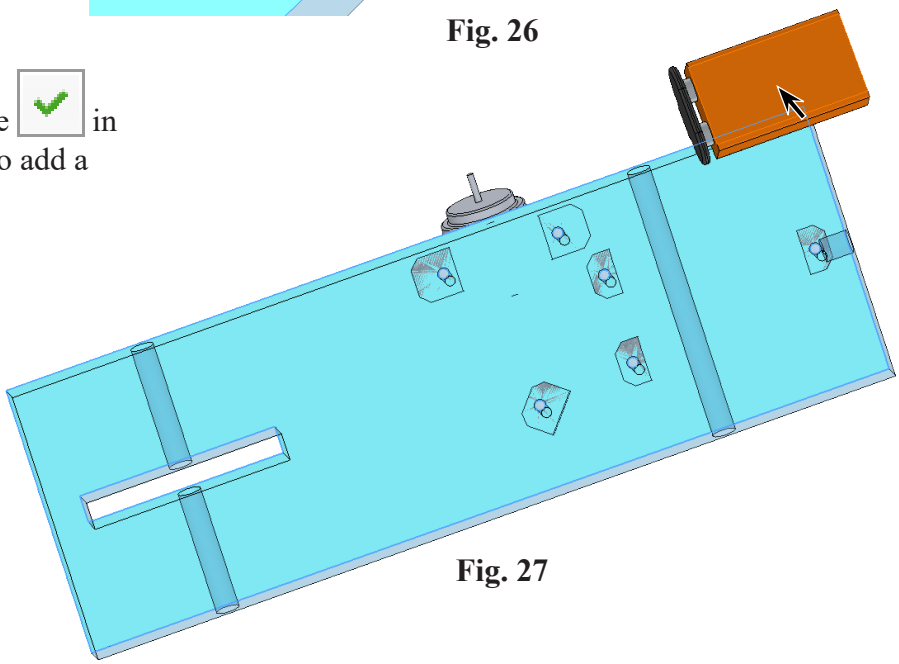


Fig. 27

Step 13. Click **front face of rear L-Bracket**, **Fig. 28**.

Step 14. Rotate view to view **rear face of Battery** as shown in **Fig. 29**. To rotate, hold down middle mouse button (wheel) and drag.

Step 15. Click **rear face of Battery**, **Fig. 30**.

Step 16. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 17. Click **Trimetric** on the Standard Views toolbar.

Step 18. Expand the flyout Feature Manager design tree (click ▸) in the top left corner of the graphics area and click **Right Plane** , **Fig. 30**.

Step 19. Expand **BATTERY 9 VOLT** and click **Right Plane** , **Fig. 30**.

Step 20. Click Add/Finish Mate to add a **Coincident** mate.

Step 21. Click OK in the Property Manager.

Step 22. Save. Use **Ctrl-S**.

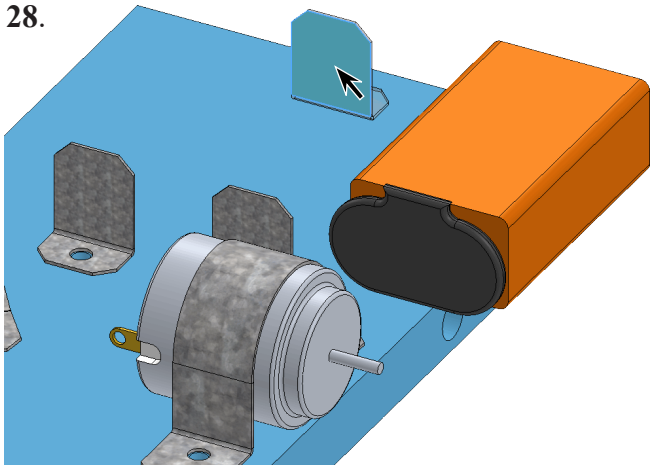


Fig. 28

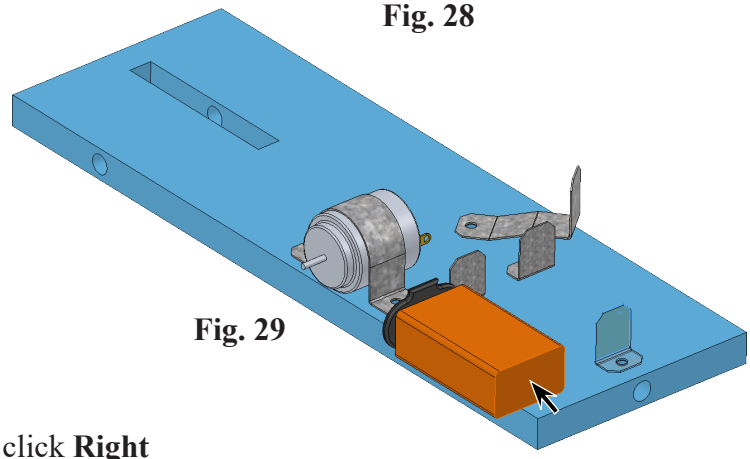


Fig. 29

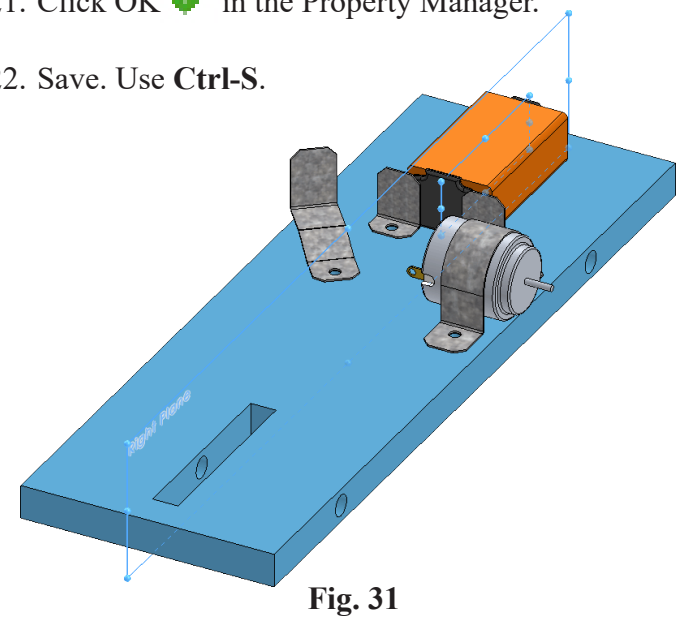


Fig. 31

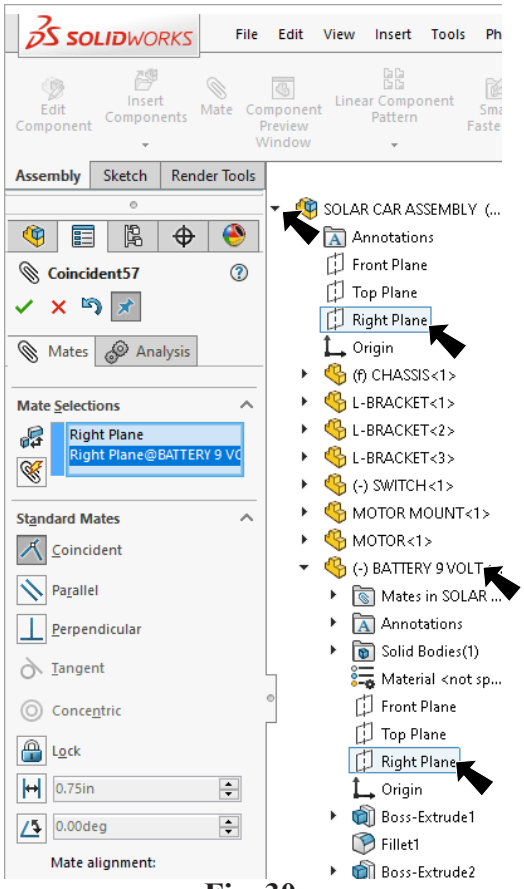
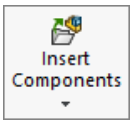


Fig. 30

I. Insert Axles and Wheels.

Step 1. Click **Insert Components** 

on the Assembly toolbar.

Step 2. Select your **FRONT AXLE** file and click Open.

Step 3. Click **Keep Visible** in the Property Manager.

Step 4. Position **Front Axle** near Front Axle hole, **Fig. 32**. When Axle snaps into place and cursor changes to indicate a Concentric mate, click to release Axle.

Step 5. Click **Browse** in the Property Manager.

Step 6. Select your **REAR AXLE** file and click Open.

Step 7. Position **Rear Axle** near Rear Axle hole, **Fig. 33**. When Axle snaps into place and cursor changes to indicate a Concentric mate, click to release Axle.

Step 8. Repeat, Browse and place **FRONT WHEEL** at Front Axle, **REAR WHEEL** and **REAR WHEEL GROOVE** at Rear Axle, **Fig. 34**. Position Rear Wheel Groove over Rear Axle on Motor side of chassis. Release when Wheel snaps into place and cursor changes to indicate the Concentric mate.
For **Rear Wheel Groove** click **Flip Alignment** in the Mate pop-up, **Fig. 35.** Click Add/Finish Mate.

Step 9. Click OK in the Property Manager.

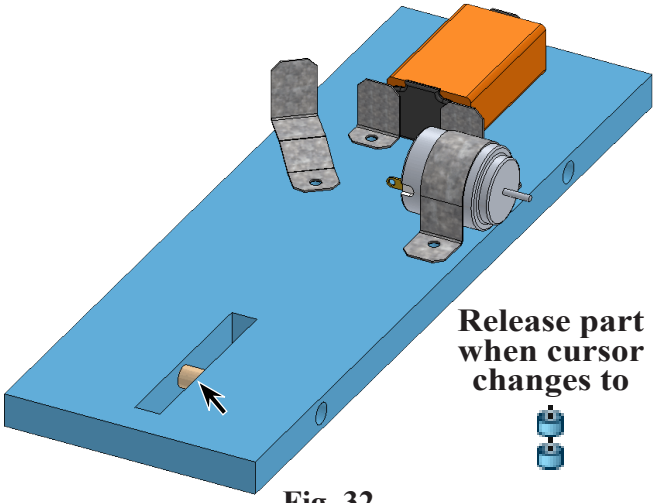


Fig. 32

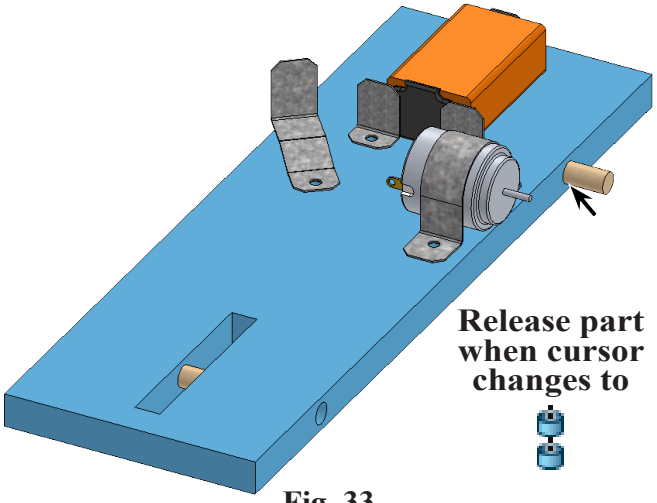


Fig. 33

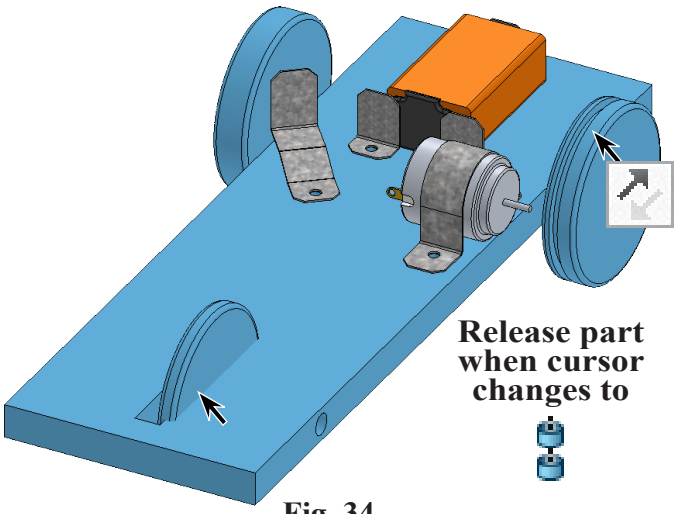


Fig. 34

Fig. 35

J. Mate: Wheels.

Step 1. Click **Mate**

on the Assembly toolbar.

Step 2. Expand the flyout Feature Manager design tree in the top left corner of the graphics area and click **Right Plane**, **Fig. 36**.

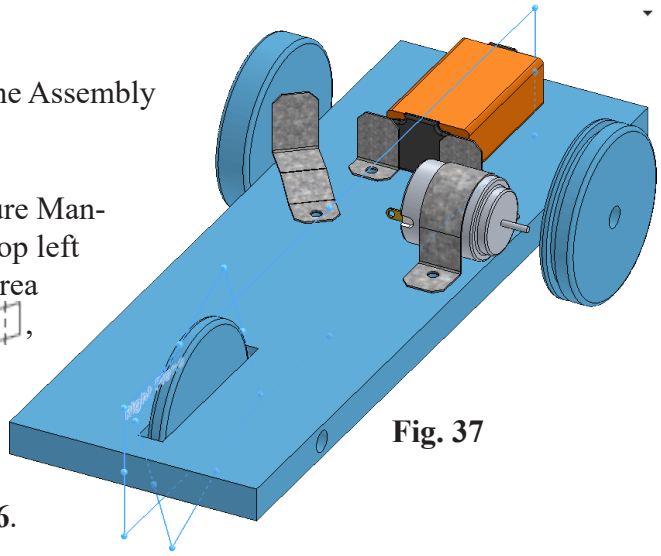


Fig. 37

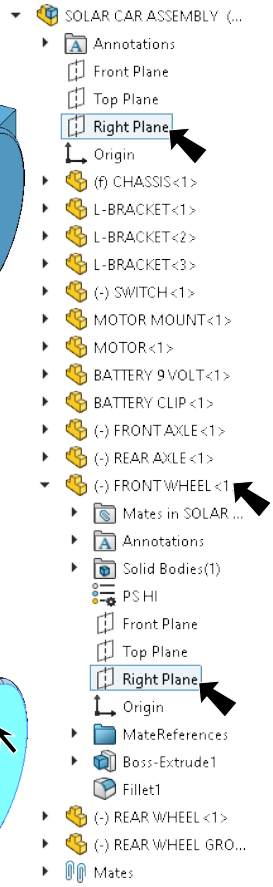


Fig. 36

Step 3. Expand **FRONT WHEEL** and click **Right Plane**, **Fig. 36**.

Step 4. Click Add/Finish Mate ✔ to add a **Coincident** mate.

Step 5. Grab the Rear Wheel Groove and pull Wheel off the Axle. Be careful not to click the Wheel, **Fig. 38**.

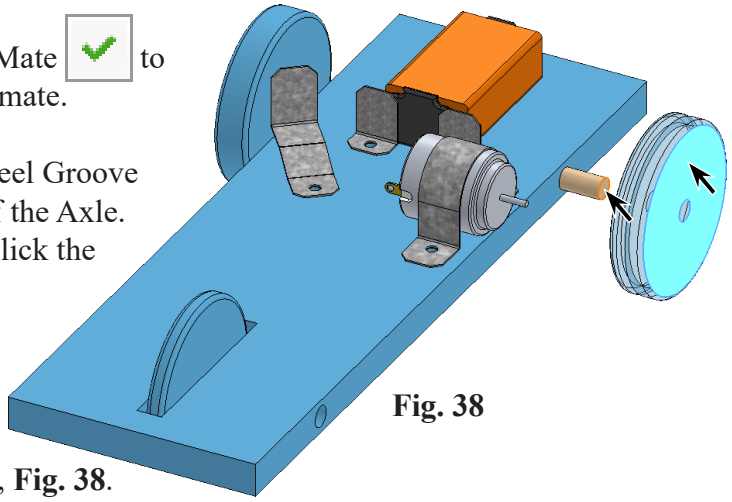


Fig. 38

Step 6. Click **side face of Rear Wheel Grove** and **end face of Rear Axle**, **Fig. 38**.

Step 7. Click Add/Finish Mate ✔ to add a **Coincident** mate.

Step 8. Rotate view to view **right end of Rear Axle, Fig. 39**. To rotate, hold down middle mouse button (wheel) and drag.

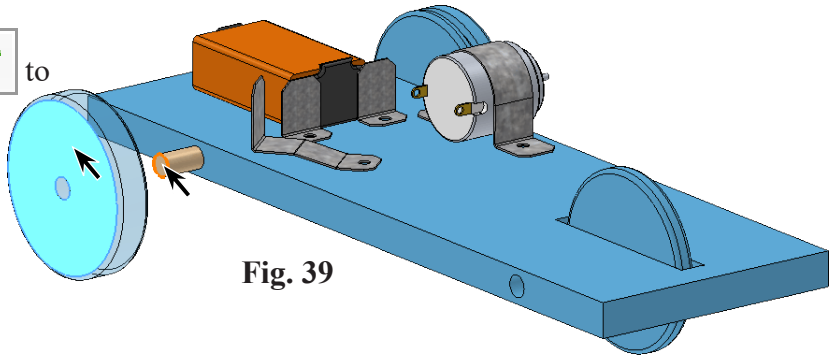


Fig. 39

Step 9. Click **side face of Rear Wheel** and **end face of Rear Axle**, **Fig. 39**.

Step 10. Click Add/Finish Mate ✔ to add a **Coincident** mate.

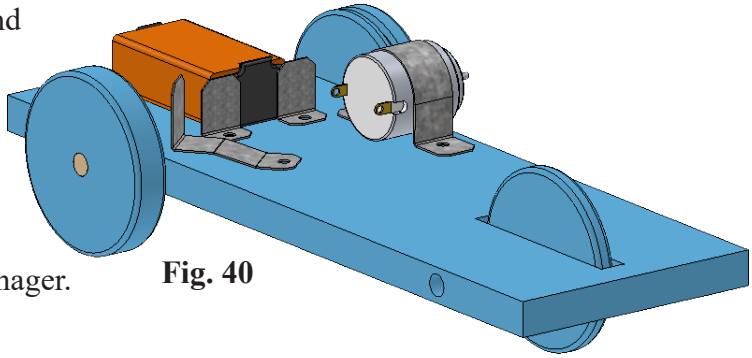


Fig. 40

Step 11. Click OK ✔ in the Property Manager.

Step 12. Save. Use **Ctrl-S**.