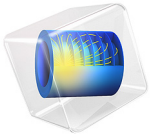

Electrical Heating in a Busbar with Terminals

For a description of this application, including detailed step-by-step instructions showing how to build it, see the book *Introduction to AC/DC Module*. The modeling instructions for the geometry is given in the appendix.

Application Library path: `ACDC_Module/Introductory_Electric_Currents/busbar_terminal`

From the **File** menu, choose **New**.

NEW

In the **New** window, click **Model Wizard**.

MODEL WIZARD

1 In the **Model Wizard** window, click **3D**.

2 Click **Done**.

GLOBAL DEFINITIONS

Parameters 1

1 In the **Model Builder** window, under **Global Definitions** click **Parameters 1**.

2 In the **Settings** window for **Parameters**, locate the **Parameters** section.

3 In the table, enter the following settings:

Name	Expression	Value	Description
L	9[cm]	0.09 m	Length
rad_1	6[mm]	0.006 m	Bolt radius
tbb	5[mm]	0.005 m	Thickness
wbb	5[cm]	0.05 m	Width

GEOMETRY 1

Work Plane 1 (wp1)

1 In the **Geometry** toolbar, click **Work Plane**.

2 In the **Settings** window for **Work Plane**, locate the **Plane Definition** section.

3 From the **Plane** list, choose **xz-plane**.

4 Click **Go to Plane Geometry**.

Axis

1 In the **Model Builder** window, expand the **Component 1 (comp1)>Geometry 1> Work Plane 1 (wp1)>View 2** node, then click **Axis**.

2 In the **Settings** window for **Axis**, locate the **Axis** section.

3 In the **x minimum** text field, type `-1e-2`.

4 In the **x maximum** text field, type `0.11`.

5 In the **y minimum** text field, type `-1e-2`.

6 In the **y maximum** text field, type `0.11`.

7 Locate the **Grid** section. Select the **Manual spacing** check box.

8 In the **x spacing** text field, type `5e-3`.

9 In the **y spacing** text field, type `5e-3`.

Work Plane 1 (wp1)>Rectangle 1 (r1)

1 In the **Work Plane** toolbar, click **Rectangle**.

2 In the **Settings** window for **Rectangle**, locate the **Size and Shape** section.

3 In the **Width** text field, type `L+2*tbb`.

4 In the **Height** text field, type `0.1[m]`.

Work Plane 1 (wp1)>Rectangle 2 (r2)

1 In the **Work Plane** toolbar, click **Rectangle**.

2 In the **Settings** window for **Rectangle**, locate the **Size and Shape** section.

3 In the **Width** text field, type `L+tbb`.

4 In the **Height** text field, type `0.1[m]-tbb`.

5 Locate the **Position** section. In the **yw** text field, type `tbb`.

6 Click **Build Selected**.

Work Plane 1 (wp1)>Difference 1 (dif1)

1 In the **Work Plane** toolbar, click **Booleans and Partitions** and choose **Difference**.

2 Select the object **r1** only to add it to the **Objects to add** list.

3 In the **Settings** window for **Difference**, locate the **Difference** section.

4 Click to select the **Activate Selection** toggle button for **Objects to subtract**.

5 Select the object **r2** only.

6 Click **Build Selected**.

Work Plane 1 (wp1)>Fillet 1 (fil1)

1 In the **Work Plane** toolbar, click **Fillet**.

2 On the object **dif1**, select Point 3 only.

3 In the **Settings** window for **Fillet**, locate the **Radius** section.

4 In the **Radius** text field, type `tbb`.

Work Plane 1 (wp1)>Fillet 2 (fil2)

1 In the **Work Plane** toolbar, click **Fillet**.

2 On the object **fil1**, select Point 6 only.

3 In the **Settings** window for **Fillet**, locate the **Radius** section.

4 In the **Radius** text field, type `2*tbb`.

5 Click **Build Selected**.

Extrude 1 (ext1)

1 In the **Model Builder** window, under **Component 1 (comp1)>Geometry 1** right-click **Work Plane 1 (wp1)** and choose **Extrude**.

2 In the **Settings** window for **Extrude**, locate the **Distances** section.

3 In the table, enter the following settings:

Distances (m)
wbb

4 Click **Build Selected**.

5 Click the **Zoom Extents** button in the **Graphics** toolbar.

Work Plane 2 (wp2)

1 In the **Geometry** toolbar, click **Work Plane**.

2 In the **Settings** window for **Work Plane**, locate the **Plane Definition** section.

3 From the **Plane type** list, choose **Face parallel**.

4 On the object **ext1**, select Boundary 8 only.

5 Click **Go to Plane Geometry**.

Work Plane 2 (wp2)>Plane Geometry

Click the **Zoom Extents** button in the **Graphics** toolbar.

Work Plane 2 (wp2)>Circle 1 (c1)

1 In the **Work Plane** toolbar, click **Circle**.

2 In the **Settings** window for **Circle**, locate the **Size and Shape** section.

3 In the **Radius** text field, type `rad_1`.

4 Click **Build Selected**.

Extrude 2 (ext2)

1 In the **Model Builder** window, under **Component 1 (comp1)>Geometry 1** right-click **Work Plane 2 (wp2)** and choose **Extrude**.

2 In the **Settings** window for **Extrude**, click **Build Selected**.

3 Locate the **Distances** section. In the table, enter the following settings:

Distances (m)
-2*tbb

Work Plane 3 (wp3)

1 In the **Geometry** toolbar, click **Work Plane**.

2 In the **Settings** window for **Work Plane**, locate the **Plane Definition** section.

3 From the **Plane type** list, choose **Face parallel**.

4 On the object **ext1**, select Boundary 4 only.

5 Click **Go to Plane Geometry**.

Work Plane 3 (wp3)>Plane Geometry

Click the **Zoom Extents** button in the **Graphics** toolbar.

Work Plane 3 (wp3)>Circle 1 (c1)

1 In the **Work Plane** toolbar, click **Circle**.

2 In the **Settings** window for **Circle**, locate the **Size and Shape** section.

3 In the **Radius** text field, type `rad_1`.

4 Locate the **Position** section. In the **xw** text field, type `-L/2+1.5[cm]`.

5 In the **yw** text field, type `-wbb/4`.

6 Click **Build Selected**.

Work Plane 3 (wp3)>Copy 1 (copy1)

1 In the **Work Plane** toolbar, click **Transforms** and choose **Copy**.

2 Select the object **c1** only.

3 In the **Settings** window for **Copy**, locate the **Displacement** section.

4 In the **yw** text field, type `wbb/2`.

5 Click **Build Selected**.

Extrude 3 (ext3)

1 In the **Model Builder** window, under **Component 1 (comp1)>Geometry 1** right-click **Work Plane 3 (wp3)** and choose **Extrude**.

2 In the **Settings** window for **Extrude**, locate the **Distances** section.

3 In the table, enter the following settings:

Distances (m)
-2*tbb

4 Click **Build Selected**.

5 Click the **Zoom Extents** button in the **Graphics** toolbar.

Form Union (fin)

1 In the **Model Builder** window, click **Form Union (fin)**.

2 In the **Settings** window for **Form Union/Assembly**, click **Build Selected**.