Getting Started for FRC Teams with SOLIDWORKS Electrical
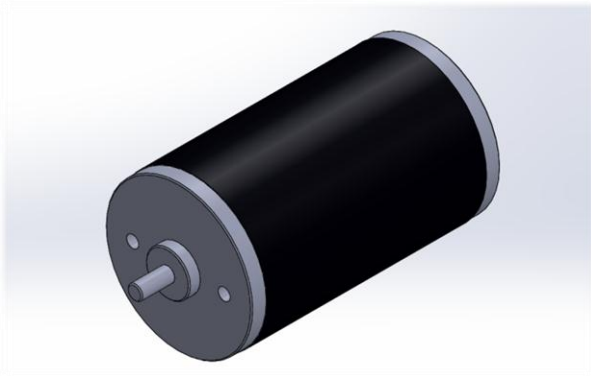
Apply for SOLIDWORKS and SOLIDWORKS Electrical at www.solidworks.com/FIRST

Download SOLIDWORKS Electrical KOP (Kit of Parts) at www.solidworks.com/FIRST

Post any questions/comments about SOLIDWORKS Electrical and Share your FRC SOLIDWORKS 3D Model Image on our Facebook Page.

SOLIDWORKS® Electrical simplifies electrical schematic creation with an intuitive interface for faster design of embedded electrical systems. Bidirectional integration in real time with SolidWorks 3D CAD provides better collaboration and productivity. Create schematic-driven electrical designs with powerful routing, flattening, and automated documentation.

SOLIDWORKS Electrical 3D™ technology enables faster development of schematically defined electrical systems that can be readily implemented in the 3D CAD model in a 3DEXPERIENCEenvironment synchronized between the electrical and mechanical design teams. Real-time synchronization of the electrical schematic and 3D CAD model enables unification of the bill of materials (BOM) between the electrical system and the mechanical design, eliminating errors from design changes.

SOLIDWORKS 3D Model
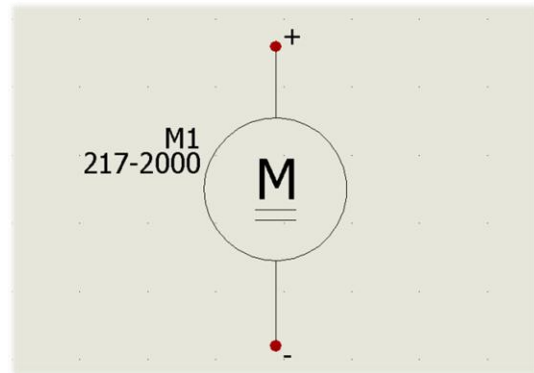
SOLIDWORKS Electrical 2D Schematic Symbol

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

The SOLIDWORKS Electrical Kit of Parts requires SOLIDWORKS Electrical Schematic for 2D and SOLIDWORKS for 3D. Both packages are included in your SOLIDWORKS download. SOLIDWORKS Electrical 2D is a standalone application, while SOLIDWORKS Electrical 3D is integrated into SOLIDWORKS. No other CAD system is required. **Using SOLIDWORKS Electrical Schematic allows your team to design your power and control systems through:**

• *Control System Line Diagrams*
• *Power System Schematics*

Downloading the SOLIDWORKS Electrical KOP

SOLIDWORKS Electrical is rapidly becoming widespread in industry. This year it is a part of the FRC sponsorship.

The SOLIDWORKS Electrical starter library has over 500,000 symbols, components, cable and wire types, title blocks, and 3D parts from industry. We defined all FIRST Robotics parts – both from NI and other manufacturers – for the 2014 Kit of Parts.

If you have received SOLIDWORKS, **your initial sponsorship email contains your SOLIDWORKS Electrical serial number**. You can use this number to activate SOLIDWORKS Electrical and begin designing your robot in an integrated electrical and mechanical environment.

Enabling SOLIDWORKS Electrical in SOLIDWORKS:

SOLIDWORKS Electrical 2D is a standalone application. SOLIDWORKS Electrical 3D is an add-in in SOLIDWORKS. To enable SOLIDWORKS Electrical, click **Tools>Add Ins**. Under both **Active Add-Ins** and **Start Up** check **SolidWorks Electrical.** Click **OK** to exit the menu.
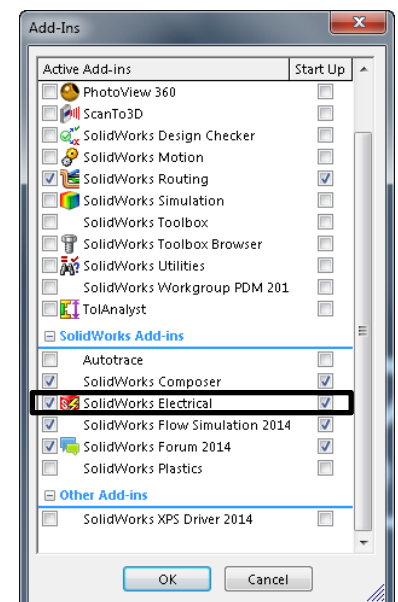
SOLIDWORKS Electrical KOP:

There are two parts to the SolidWorks Electrical Kit of Parts: the **Kit of Parts** and a **2014 FRC Template** for you to start your robot designs from, and an example robot. These are both included in the Kit of Parts download. SOLIDWORKS Electrical uses the file extension .tewzip.
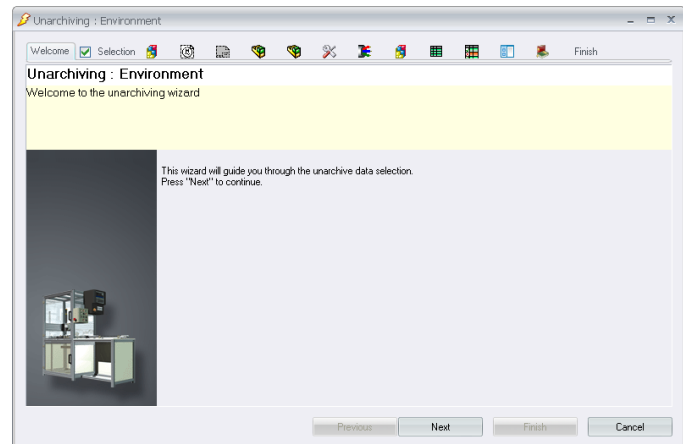
Electrical Kit of Parts:

Download and unarchive the SOLIDWORKS Electrical Kit of Parts.
1. **Download** the Electrical Kit of Parts from www.solidworks.com/FIRST
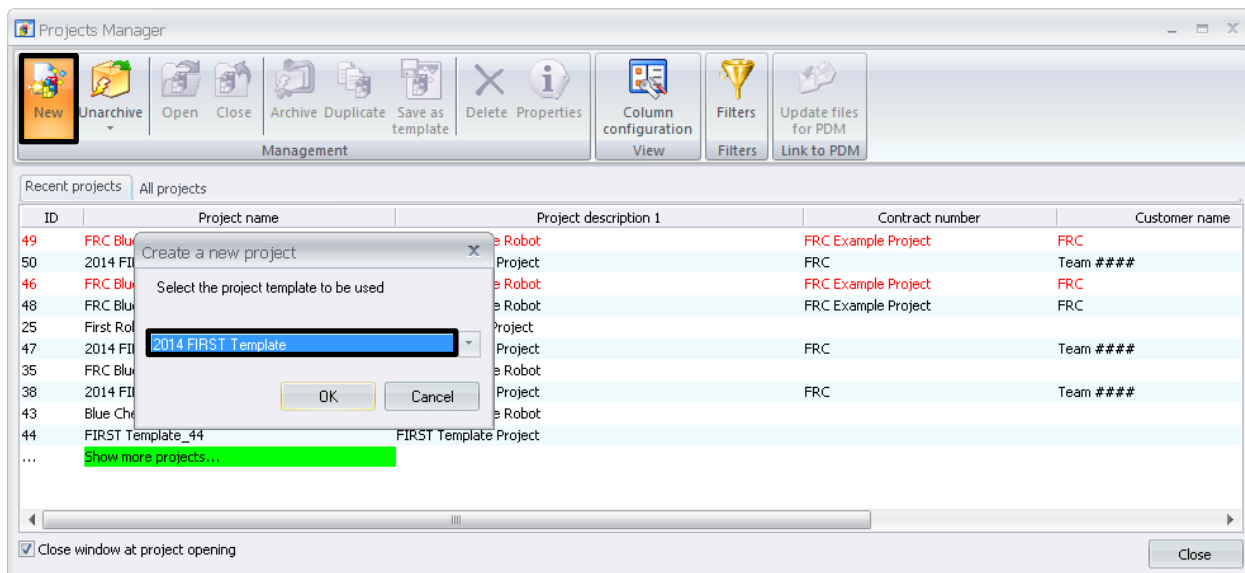
www.solidworks.com/FIRST

Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

2. Double click the file 2014FRCElectricalKitofPartsAndExample.tewzip to open it. SOLIDWORKS Electrical projects use the file extension .tewzip.

3. The **Import Wizard** will load. Press next nine times, followed by finish.

4. The Electrical Kit of Parts has been successfully loaded! To start a new project from the FIRST template, select **File > Projects Manager**. Click **New**. Select the **2014 FIRST Template**, and press Ok.

Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

5. A new project is created. You will be prompted to enter a name for the project and other information about the project, such as the team number and a brief description.
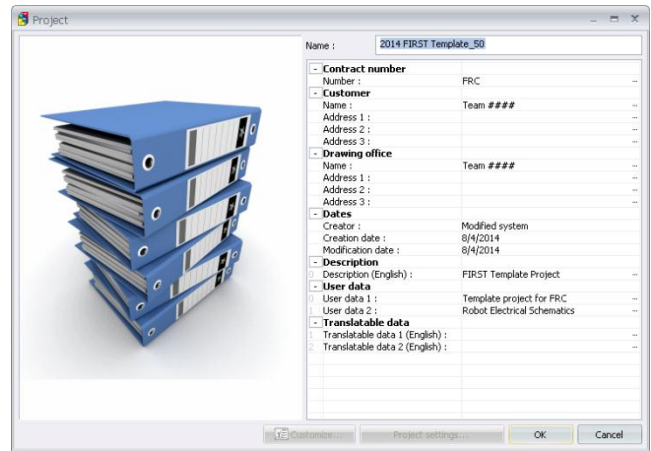
6. You are ready to go! The template includes separate (and labeled) drawings for power and control systems. It also filters parts from the database to only show you parts relevant to FRC.

Example Robot:

To show you the full power and potential of SOLIDWORKS and SOLIDWORKS Electrical, we created an example robot which showcases how 2D schematics can be directly translated into 3D models. The example robot model was provided courtesy of FRC Team 1086, Blue Cheese. Please note that parts of this model have been simplified to ensure ease of use.

1. Download the SOLIDWORKS Electrical Kit of Parts from www.solidworks.com/FIRST and unarchive the file 2014FRCElectricalKitOfPartsAndExample.tewzip. For more information on how to unarchive this file, see the "Electrical Kit of Parts" section of this document.
2. In SOLIDWORKS Electrical open the Project Manager. Double click on **FRC Blue Cheese** to open the project.
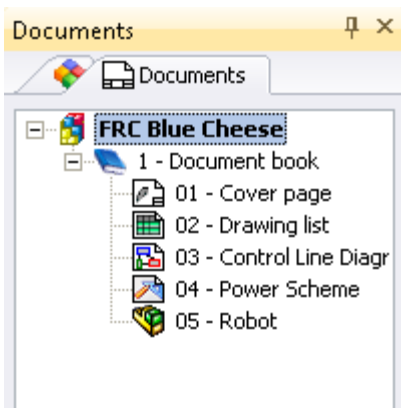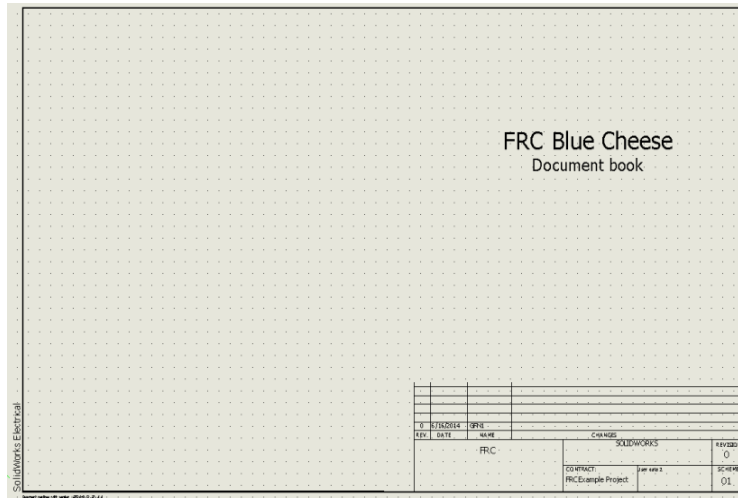
You have successfully loaded the project. Next is a breakdown of the documents and how they map to the 3D SOLIDWORKS assembly. The **Documents** tab is located in the menu on the right.

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

1. Open **Drawing 01: Cover Page**. This page provides information about the project.
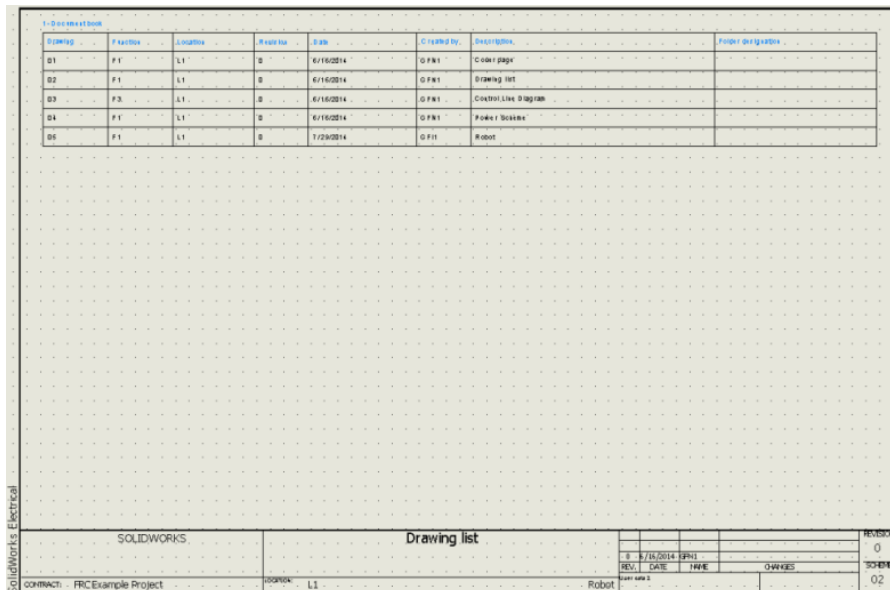

2. Click **Drawing 02: Drawing List**. This page lists the documents in the project. Note that here an assembly, called Robot, is in the drawings list.
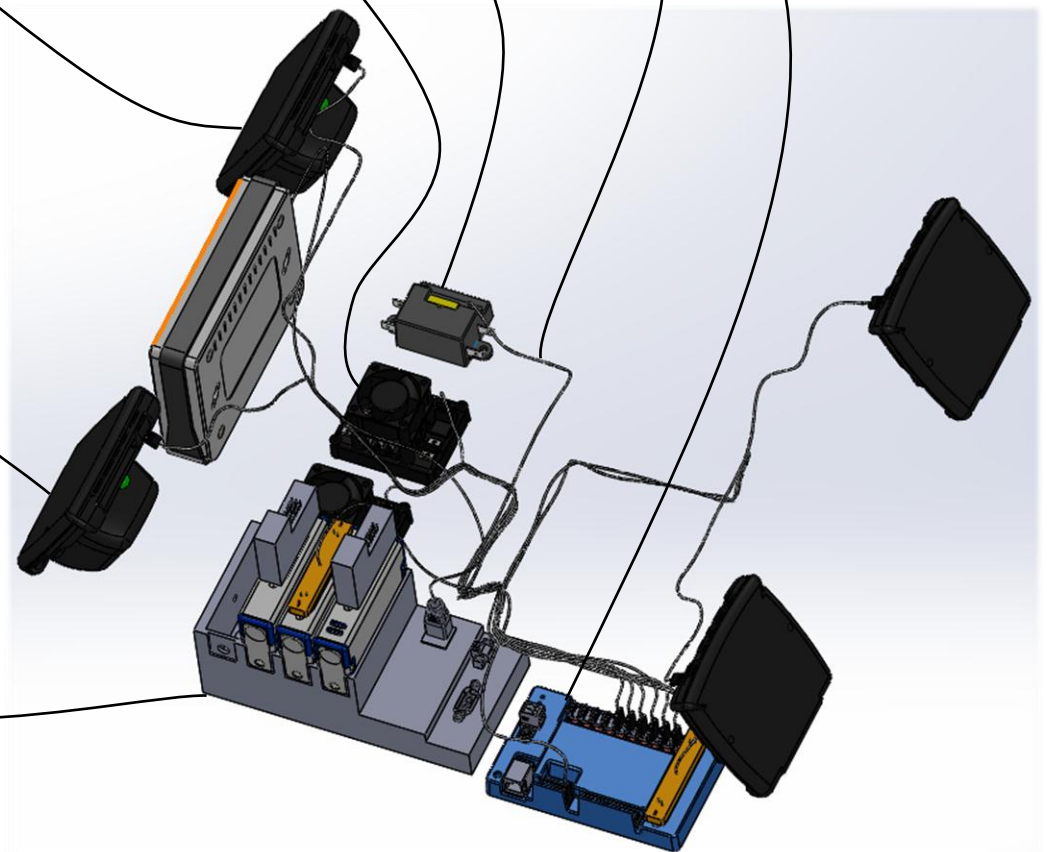
Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

3. Open **Drawing 03: Control Line Diagram**. This diagram shows the control system of the robot.
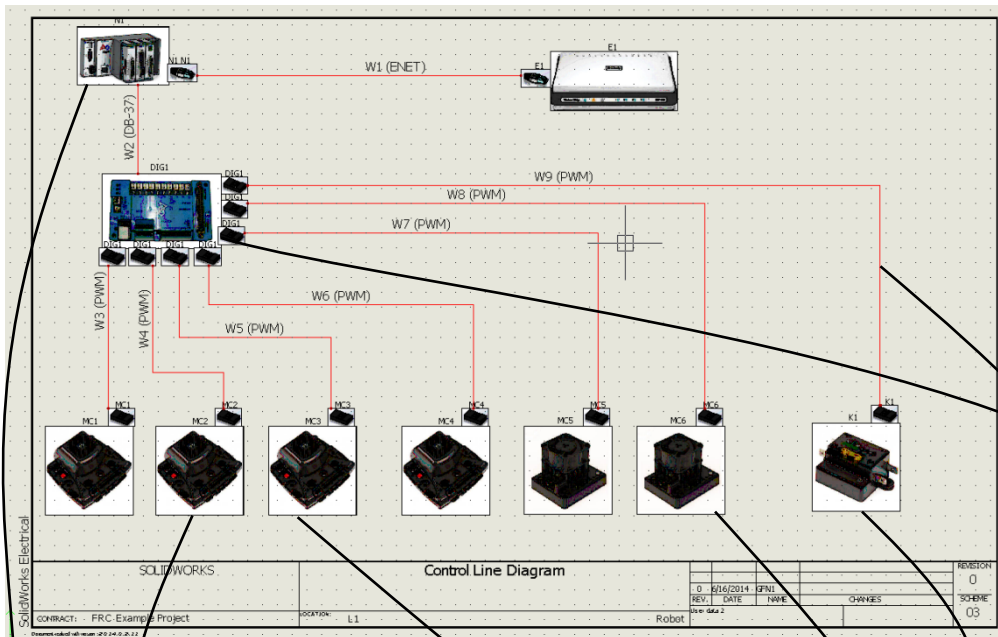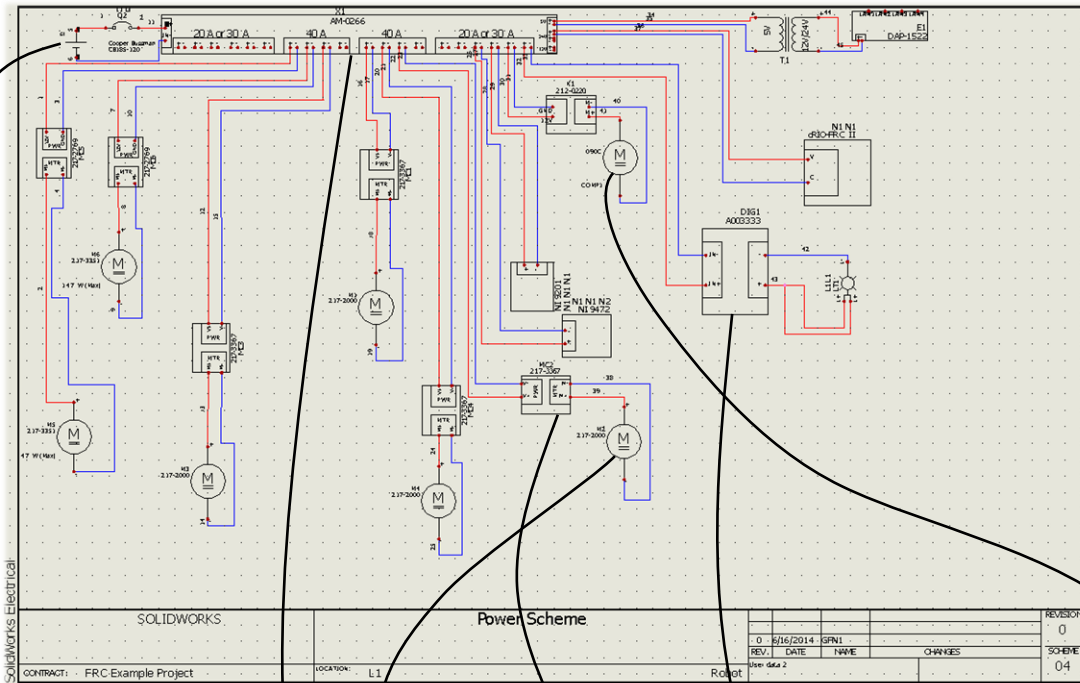

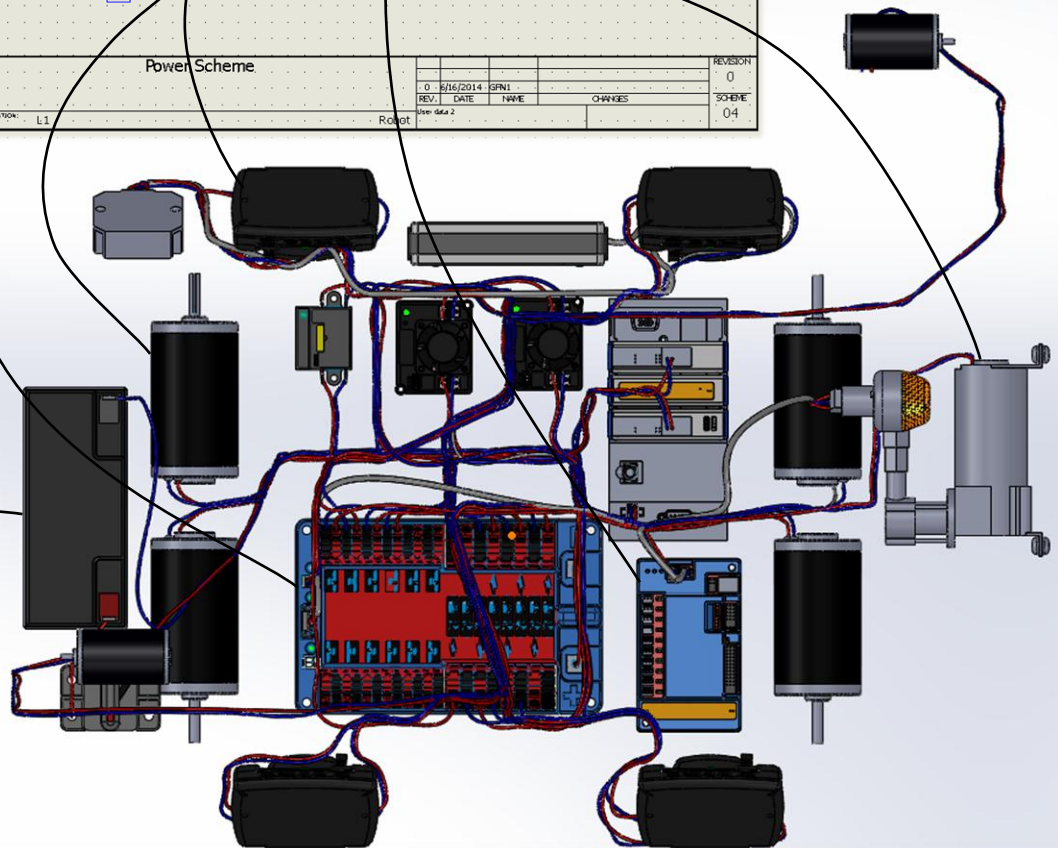These components in the diagrams correspond to these components on the 3D model.

Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

4. Click on **Drawing 04: Power Scheme**. This drawing shows the power system on the robot.


This drawing corresponds to these components on the robot. Note the red and blue wires in this diagram correlate to the red and blue wires connecting the components.

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA
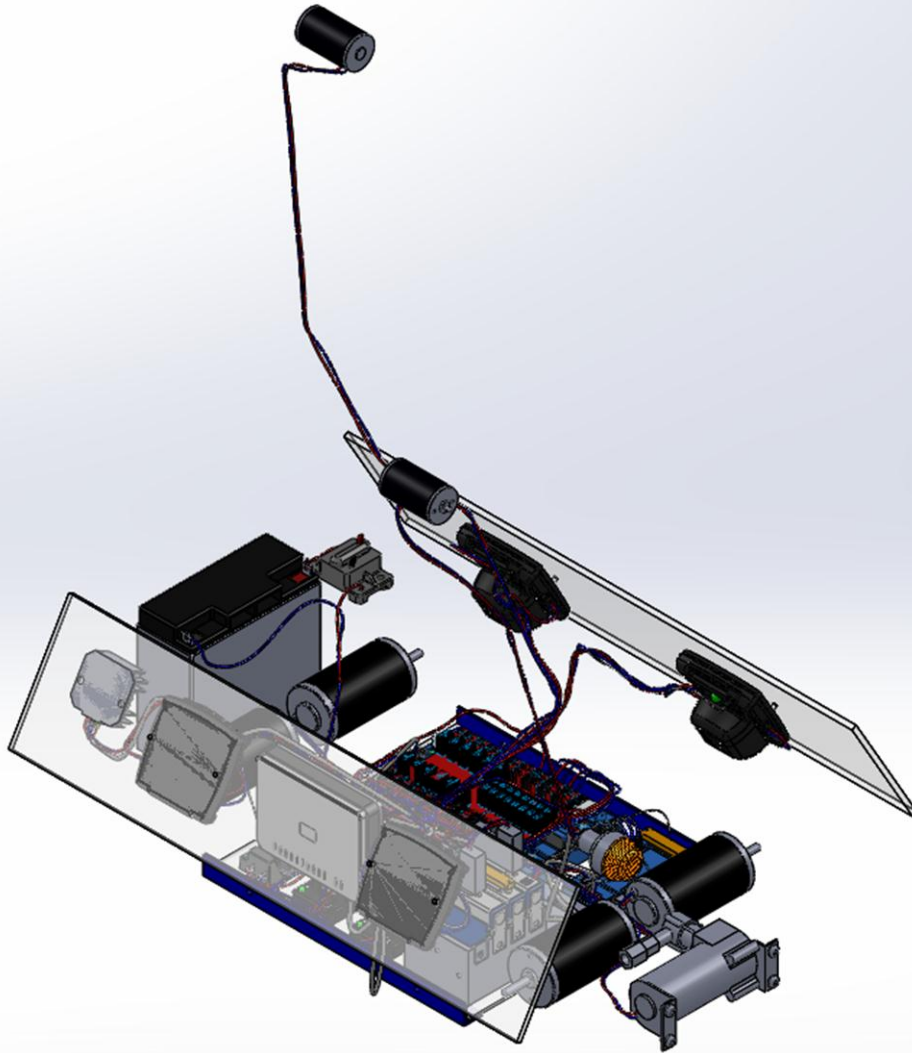
5. Click on **Drawing 05: Robot** (SOLIDWORKS required). The assembly opens. Select the **Basic Mechanical** configuration. This displays a fully routed Robot with a basic set of mechanical parts.
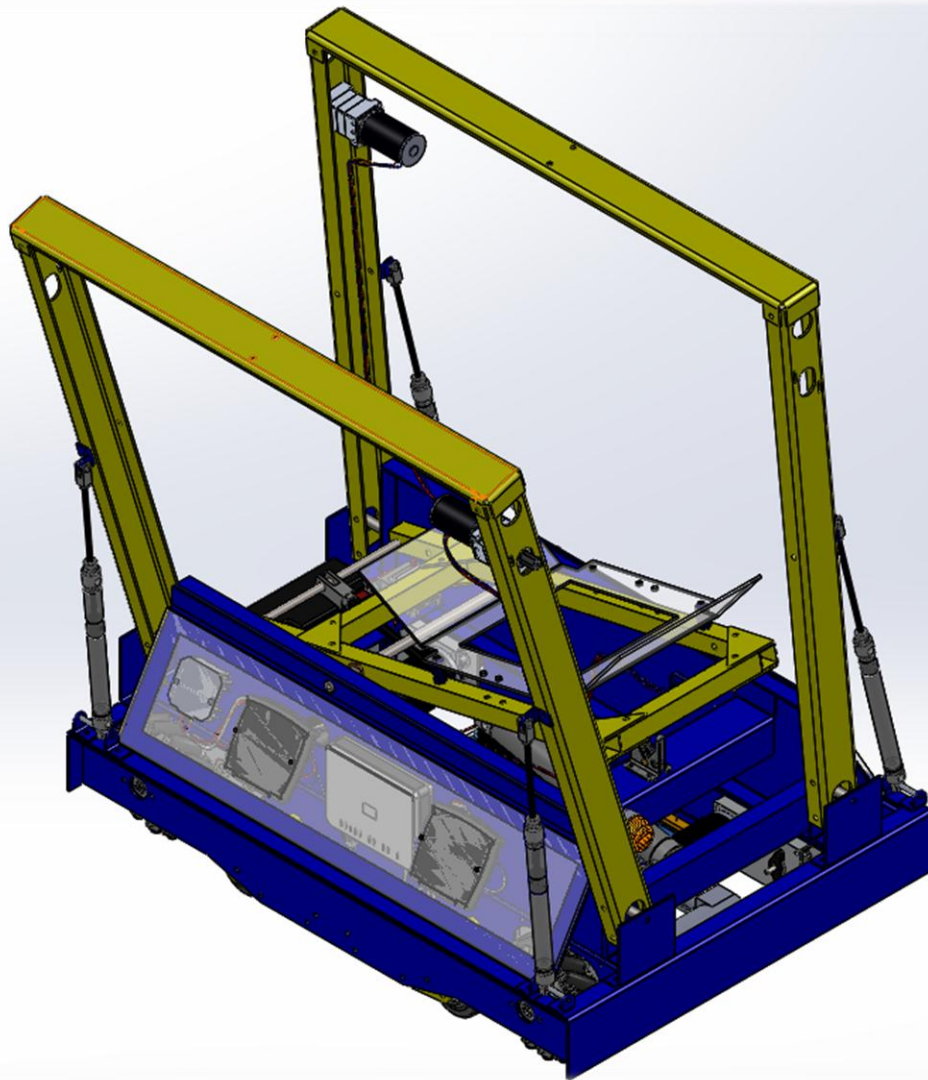
6. Select the **Electrical** configuration. This configuration shows only the electrical components and the routing elements.

The Electrical Kit Of Parts

The SOLIDWORKS Electrical Kit Of Parts contains a set of **electrical symbols** corresponding to the set of mechanical parts. These symbols are paired to **manufacturer's parts**, which represent a mechanical part.

The symbols are divided into two smaller sets of symbols: **single line symbols** for use in single line diagrams and **multiline symbols** for use in multiline schemes. Some parts, which are used in both the power and control systems, can be represented by multiple symbols in multiple drawings.
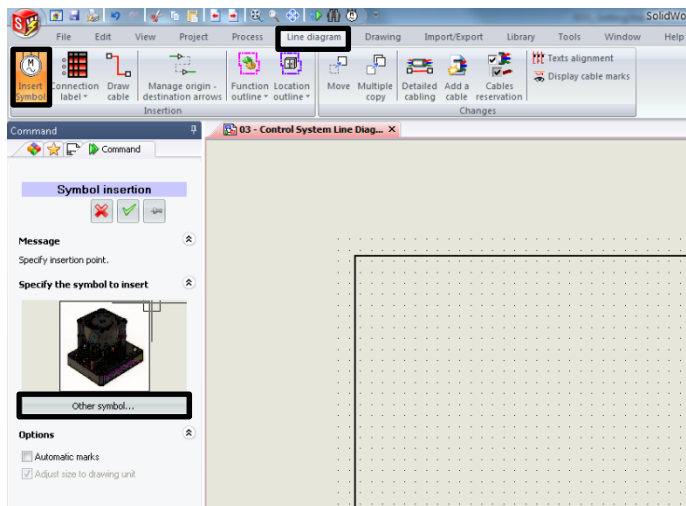

Single Line
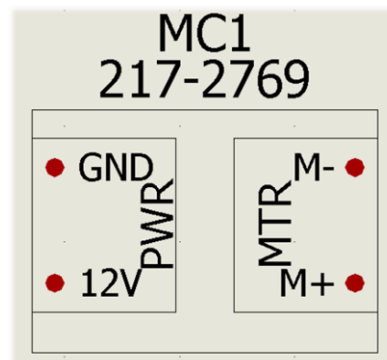
Multi Line

 Symbols are connected by **wires** and **cables**. Wires are single conductors used to connect multiline symbols at specific points called **terminals**. Cables are clusters of wires used to carry signals. They connect single line symbols.

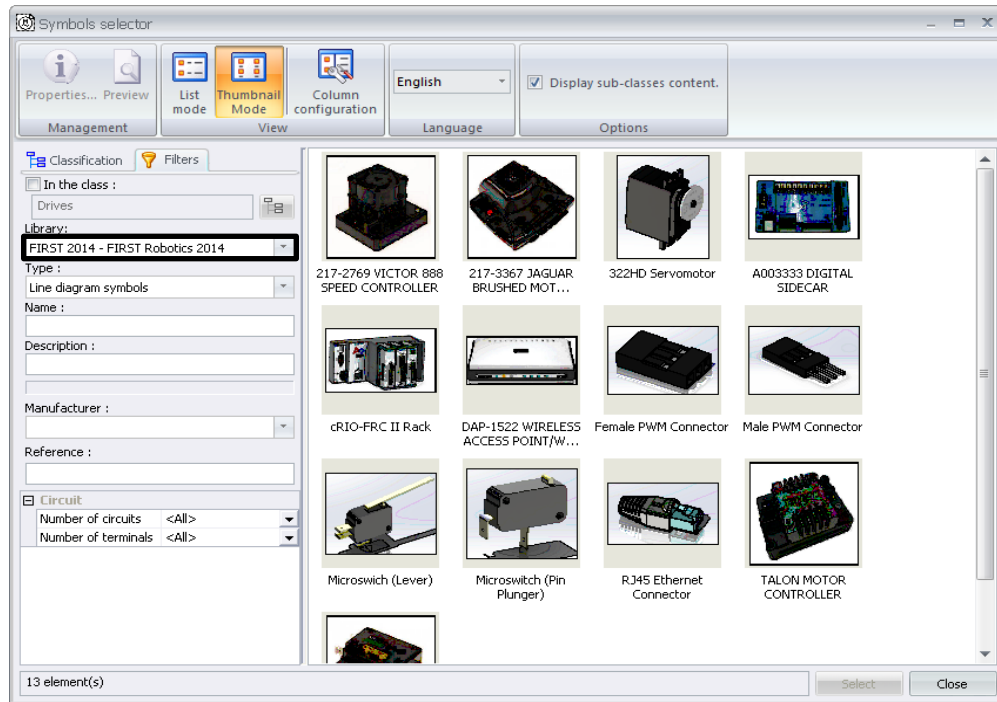**Symbol Insertion**

1.   Open a single line diagram. Open the **Line Diagram** tab and select **Insert Symbol>Other Symbol.**
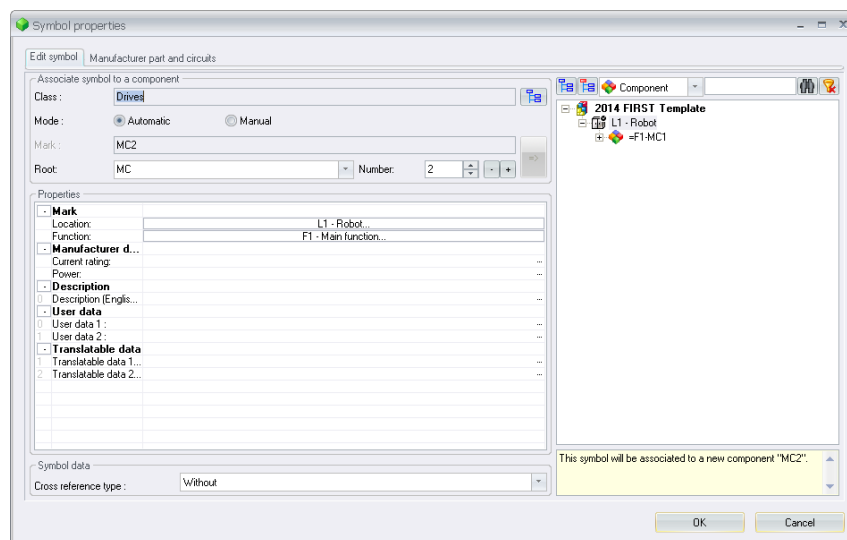

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

2. The symbols for the 2014 FRC Electrical Kit of Parts are located in a library called **FIRST 2014**. The symbols in this listing are usable in **single line diagrams**. Double click a symbol to select it.


3. Click on the diagram to place the symbol. The symbol properties menu will open. Press **ok** to add the symbol as a new component, or select a pre-existing component, such as MC1 in this image, to associate it to that component.

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

4. Open a multiline diagram. Open the **Schematic** tab and select **Insert Symbol>OtherSymbol**. The symbols for the 2014 FRC Electrical Kit of Parts are located in a library called FIRST 2014.

   The symbols in this listing are usable in **multi-line diagrams.**
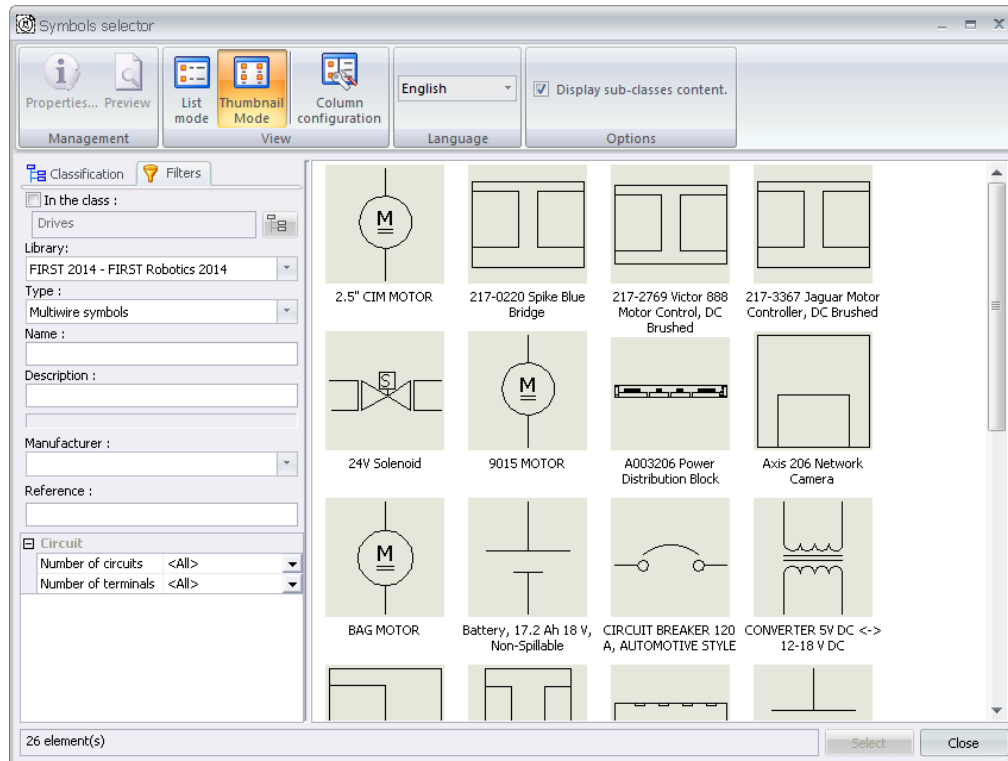
5. Follow the instructions under step 3 to add or associate the symbol to a component.

Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA

Tutorials and Documentation:

These tutorials and documents will give you an overview. Please note that they are not FIRST specific.
SOLIDWORKS Electrical Schematic
SOLIDWORKS Electrical Schematic: **Help>Getting Started>SOLIDWORKS Electrical**
SOLIDWORKS Electrical Schematic: **Help>Tutorial Panel>SOLIDWORKS Electrical 3D**
From SOLIDWORKS:
Click **SOLIDWORKS Electrical** from the Main Menu.
SOLIDWORKS Electrical 3D: **Help>Documentation>Getting Started>SOLIDWORKS Electrical**
SOLIDWORKS Electrical 3D: **Help>Tutorials>SOLIDWORKS Electrical 3D.**

Also be on the lookout for a set of **video tutorials** for SOLIDWORKS Electrical and FRC coming soon!

For more information please contact:

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Model courtesy of FRC Team 1086, Blue Cheese, Deep Run High School, Glen Allen, Virginia USA