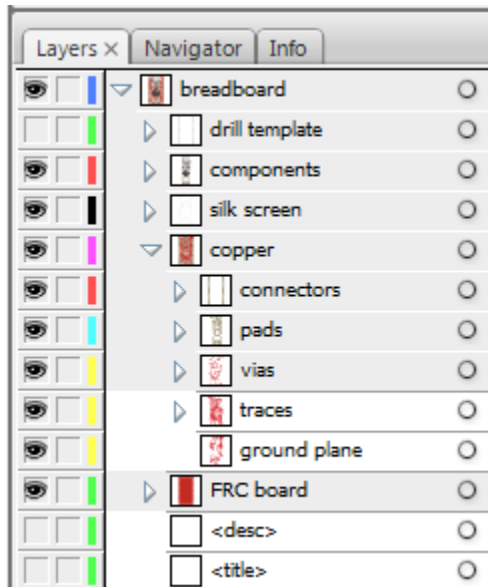
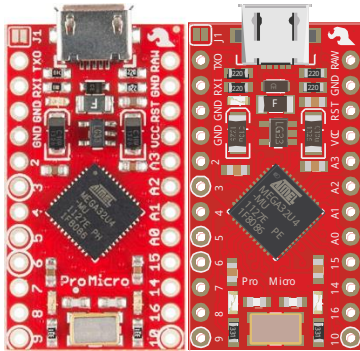



How to Make a Fritzing Diagram

My Step-by-Step Instructions

The Sparkfun ProMicro module on the left is a photo while the one on the right is a Fritzing part made by following the step-by-step instructions contained in this document.



Step 1 Create Breadboard Art

- Purchase breakout board where Eagle Files are provided (e.g. **Sparkfun**)
- Download Top View Photo (.jpg, .png) of the board and open in **Photoshop** or image viewer. You will use this image to help in the Illustrator design process.
- Download/Unzip all Eagle Files and open in **Eagle**
- In Show ground plane by clicking the rats nest icon 
- Turn on layers 1, 17 to 21, and 44.
- Run **Eagle** vector translation ulp (eagle2svg-1.2.ulp)
- Open in **Illustrator**



Nr	Name
1	Top
16	Bottom
17	Pads
18	Vias
19	Unrouted
20	Dimension
21	tPlace
22	bPlace
44	Drills

- If it is not already open, open the layers window and name the top layer **breadboard**

Make the Drill Template

- Create a new layer named **drill template**
- Ctrl-shift click enough connector drill holes on the board to determine layer locations.
- Move layers to top and open to locate connector drill holes. Give each layer a descriptive name like “pins 1 – 8” and “pins 9 – 16.” If drill paths are located just above the connector (typical), then make a copy of the drill paths and move copies into the drill template. You will drill holes in the connectors later.
- Make your connector layers (e.g., pins 1 – 8 and pins 9 – 16), sublayers by making a new layer named **connectors** and moving them inside.
- If your board includes mounting holes, locate (ctrl-shift click) them on the board and move into drill template.
- Turn off the layer


Make the Fiberglass Reinforced Composite (FRC board) Layer

- Click anywhere in the artwork to select all the art and note board dimensions. You should now also be able to see the four (4) lines defining the border. If you like you change the units to inches from the Edit – Preferences menu under general heading.
- If you cannot see the edges of the board when the art is not selected, find the four (4) lines defining the border edges of the board in the layers window and change to a light red color like Hex:F9B9BB, RGB: 249, 185, 187. If you like you can move these lines into a new layer named border and place in the FRC board layer (next series of steps).
- Using these lines as a guide use the rectangle tool  to define the perimeter of the board.
- Verify dimensions are correct and fill with Sparfun red Hex: C62717, RGB: 198, 39, 23. You can color the edges (stroke) a light red like the edges or set to none.
- Make a duplicate of the drill template layer and move above the newly created rectangle.
- Turn off the original drill template so you can verify that holes are drilled (next step)
- Select both the copy of the drill template and the rectangle and click on “Subtract from shape area” icon  in the Pathfinder window.
- You have now cut the holes in the board.
- If you like you can take the new compound shape layer out of the containing layer.
- You may see traces inside the holes of the board. Do not worry about them at this time. We will take care of them soon.
- Name the compound shape layer **FRC board**.
- Turn off the layer and save your work.

Make Solder Pads

- Create a new layer named **copper**

Connectors Sublayer

- In the “Make a drill template” you made a layer named connectors. It is time to drill holes in the **connectors**. Move the connectors layer so it is a sublayer of **copper**
- In layer window select a hole (ctrl click) and connector shape (ctrl-shift click).
- Click on “Subtract from shape area” icon  in the Pathfinder window. Repeat for each connector. We will color the connectors shortly.

Pads Sublayer

- Select (ctrl-shift click) top copper layer (brick red) pads and move them into a single layer.

Illustrator Layer Tip: If there are other shapes in this window you can give the pads their own layer by selecting all the shapes in the layer window and in the upper-right hand of layer window click on drop down menu and select collect in new layer.

- Name new layer **pads** and make a sublayer of copper.

Color the Solder Pads

- Select the **copper** layer containing the connectors and pads sublayers, open the color palette (double-click color chip). Set the fill color to Hex: 9A916C, RGB 154, 145, 108.
- Turn off layer and save your work

Silk Screen Layer

- Ctrl-shift click a few silk screen elements. Locate them in the layers window. They will typically be grouped together (they may be compound paths, paths, and text).
- Select other compound paths around these layers and verify they are also silk screen art. Drag and drop into a new silk screen subfolder (see New Layer Tip).

Line Art

- Open the new silk screen layer and select all line art. This is typically everything except the logo art and text. For more complex breakout boards you may want to place line art into a new sublayer named line art.
- Set *stroke* color to Hex: F0F0F0, RGB 240, 240, 240 and weight to 0.5 (or 0.65) pt. For logo art set fill to the same color.

Text and Logo Art

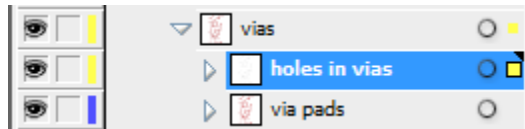
- Move all text into a new subfolder named text.
- Fritzing uses the [OCR-A](#) font for ICs. For all the other text you can use OCR-A and [Droid Sans fonts](#). Select the text folder and set the fonts to OCR-A or Droid Sans.
- Set *fill* color of **Text** and **Logo Art** to Hex: F0F0F0, RGB 240, 240, 240 and weight to 0.5 (or 0.65) pt. For logo art set fill to the same color.
- Turn off the layer and save your work.

Ground Plane Sublayer

- If you have not done so already, turn off all the layers you have created, the only thing left should be traces, vias, and the ground plane(s).
- Locate the ground plane(s). They are compound shapes so pretty easy to locate. If more than one, place them in a new layer named ground planes. Make **ground plane** compound path (or new folder) a sublayer of **copper**.
- Select layer and set stroke to 0.75 pt (no more lines). You will color the ground plane shortly.
- Ground planes can cover holes and otherwise cause havoc. We will deal with them shortly.
- Turn off the ground plane; you should now see vias with drill holes and traces.

Vias Sublayer

- Place all the vias and associated drill locations (gray circles) into a single subfolder named **vias** located in the **copper** folder. Separate the vias and drill locations and place in sublayers named **holes in vias** and **via pads**. Place holes in **vias sublayer** above the **via pads** layer.



- Select the **holes in vias** sublayer and fill with Sparfun red Hex: C62717, RGB: 198, 39, 23.
- Select the **via pads** sublayer and fill with the color Hex: DB1B1B, RGB: R=219, 27, 27.

Traces Sublayer

- Rename the original folder **traces** and make a sublayer of **copper**.
- Select the layer and change stroke to 0.75 pt.

Coloring and Cleanup

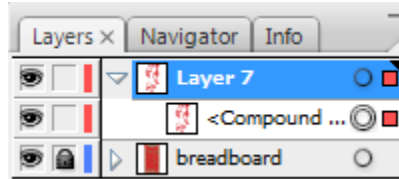
- Select the **traces**, and **ground plane** sublayers; change *stroke* color to Hex: DB1B1B, RGB: R=219, G = 27, B = 27.

Traces

- Temporarily move the **trace** sublayer above the **breadboard** layer.
- Lock the breadboard layer.
- Turn on the layers below the traces (solder pads, copper, and FRC board). Delete and/or move the end of traces so they do not enter into any holes in the **board** or **connector** layers and are under a pad.
- Once you have touched up the traces, move back into the **copper** layer below the vias **sublayer**. *By locating the traces under the vias layer we preserve the illusion of holes in the vias.*

Ground Plane

- Ground planes present a unique problem. Because they are compound paths (not shapes) you cannot easily move them or use the pathfinder tool to cut holes in them.
- Place the ground plane(s) into a **new** layer and move above the **breadboard** layer.
- Lock the **breadboard** layer.



- Release the compound object (Object – Compound Path – Release) now contained in its own folder. Select areas that you need to modify (ctrl-drag) and modify the selection (make sure the breadboard layer is locked)
- Remake the compound path (Object – Compound Path – Make).
- Once you have everything cleaned up set the **ground plane** as the last sublayer in the **copper** layer.
- Save your work

Components Sublayer

Tip: To avoid corrupting your SVG file; do not place any components outside the border of the bounding rectangle. If file becomes corrupted select all copy to a new Illustrator file and save as SVG.

- Steps to add Components
 - Move layer containing the remaining art elements to the top layer. These will be used for registration.
 - Using photo as a guide, from existing art (ex. fuel gauge) drag and drop art elements (chip capacitors, chip resistors, etc.) onto the board. Move into component layer.
 - For connectors create small circle objects at the end of the connector attaching wires (optional).
- Fritzing uses the [OCR-A](#) font for ICs. For all the other parts you can use OCR-A and [Droid Sans fonts](#).
- Art in Libraries (Paper Toys\Fritzing.0.8.7b.pc\parts\svg\core\breadboard)
 - **New** PaperToy Fritzing Parts Library (Paper Toys\Fritzing Files\Part Library.ai)
 - Snootlab: screw terminals push button, female header, connectors, LCD Display)
 - Lilypad: **2 pin battery connector**,
 - Sparkfun: LiPo USB charger (**battery connector**, micro usb)
 - Sparkfun – Connectors: USB B (2 versions), mini-usb, micro-usb-ab,chip capacitors
 - Sparkfun – Electromechanical: buttons, batteries, etc.
 - Sparkfun – Etc.: 7-Segments, discrete LEDs,
 - Sparkfun – Power IC: voltage regulators, Resettable fuse

- Sparkfun – RF: RFM22 (solder fillet surface mount pins)
- Sparkfun – Sensors: mems, ultrasonic, etc.

Clean-up

- Do not forget to **delete unused art** elements – hopefully you do not have any.
- Turn off drill template
- Save your work

Congratulations! You're done with Step One "The Board Art."

Step 2 Make a New Part

If you have problems – cropped image, then copy-paste to new illustrator file and again save as svg.

Source Material

1. [Sparkfun Fritzing Video and Article](#)
2. [Sparkfun Fritzing Parts on Github](#)
3. [Building-circuit tutorial](#)
⇒ [Using an IC as a Starting Point](#)
4. [Fritzing Breadboard View Graphic Standards](#)
⇒ Fritzing [Creating Custom Parts](#)
⇒ Sparkfun [Make Your Own Fritzing Parts](#)