Designing Tactile Schematics

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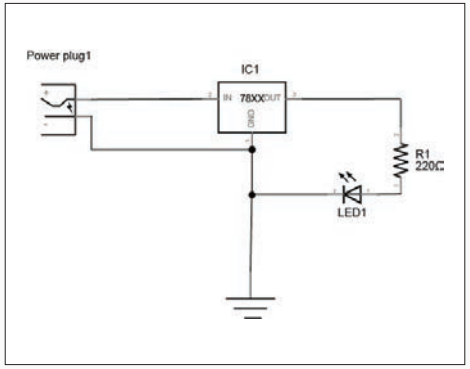
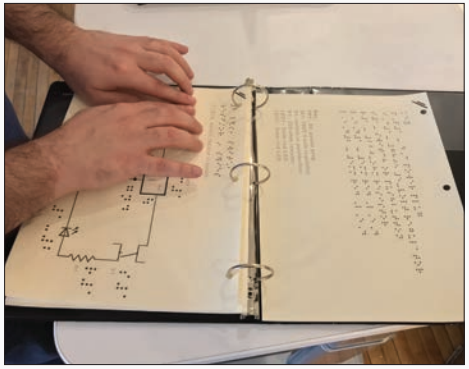
Why Tactile Schematics

Electronics schematics are relied upon to explain how circuits work. The problem is that they're visual and image descriptions, captions, and alt text can only go so far. With few non-visual options currently available for blind and low vision readers, this guide was developed to demonstrate how to design tactile schematics. It was developed by experts in physical computing, accessibility, and experience design.





Style Guide Tactile Schematics

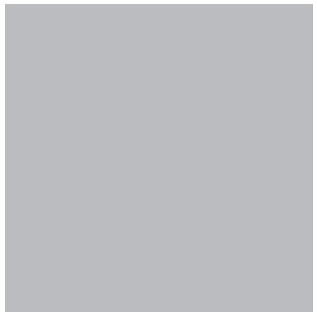
These are design standards and best practices for tactile schematics developed, using the human-centered design method, with feedback from six readers ranging in finger sensitivity and size, Braille literacy, learning style, electronics experience, and level of vision.

01 **Labeling:** Color palette

Braille

#000000

Text



#bbbdc0

Braille, set in black, will puff up. Translation text, set in gray, will not.

01 **Labeling:** Fonts

Font: Apple Braille - Font-size-maximum: 30pt - Font-weight: regular - Leading: 36pt - Color: #000000

Font: Apple Braille - Font-size-minimum: 24pt - Font-weight: regular - Leading: 30pt - Color: #000000

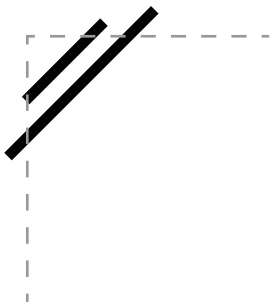
Text Label

Font: Arial - Font-size-maximum: 21pt - Font-weight: regular - Leading: 25pt - Color: #bbbdc0

Text Label

Font: Arial - Font-size-maximum: 14pt - Font-weight: regular - Leading: 17pt - Color: #bbbdc0

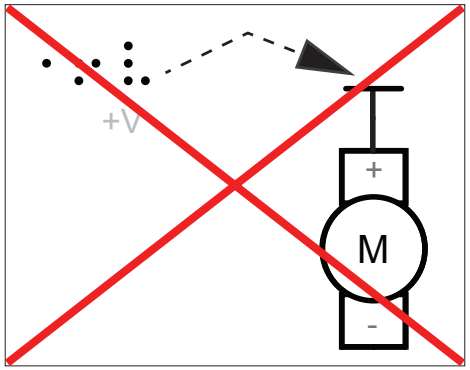
01 **Labeling:** Page orientation

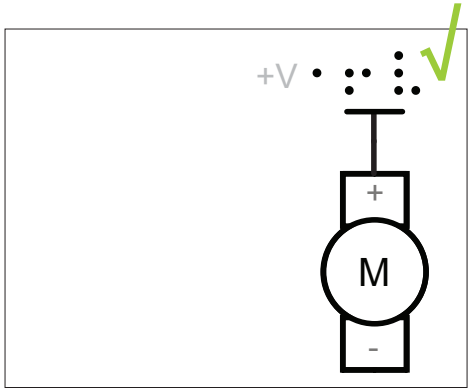


Double slash in the upper left-hand corner for page orientation.

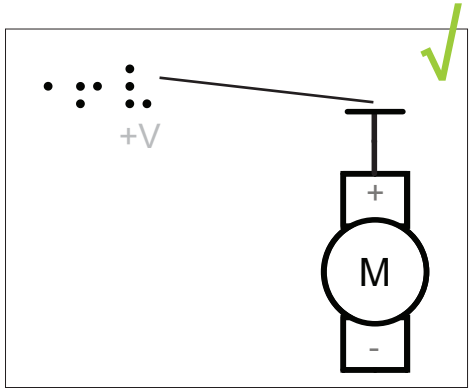
Stroke: 4pt - Rotation: 45º - Color: #000000 - Top-line-width: .4 in - Bottom-line-width: .8 in - Between-lines: .05 in - Alignment: Center

01 **Labeling:** Leader lines



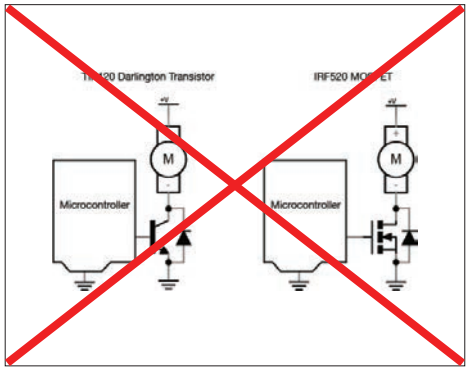


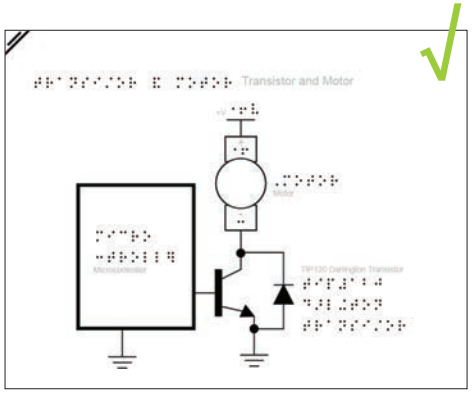
Place the label as close to the element as possible.

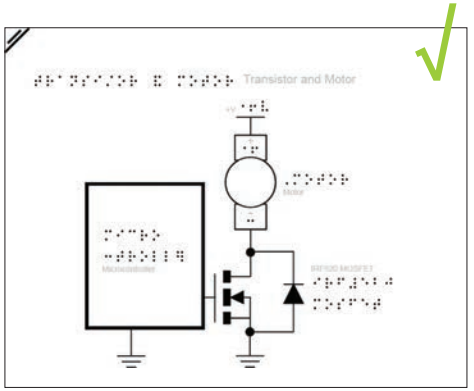


If you can't, use a leader line: 1-point stroke, solid, straight, and should avoid arrows.

02 **Scale:** Layout



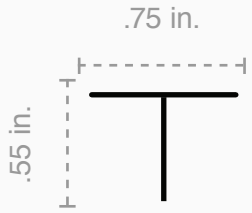




Only use one graphic per page. It should be scaled to take up as much of the page as possible.

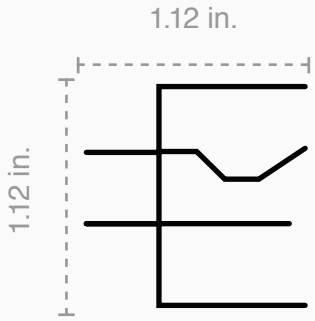
02 **Scale:** Components

Voltage Source

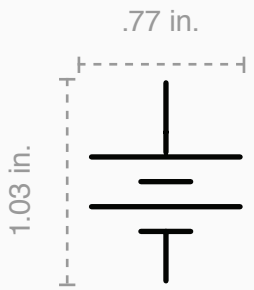


Connection Point

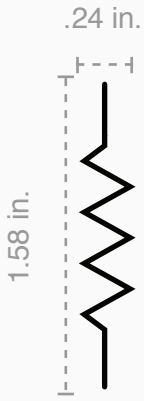
Power Plug



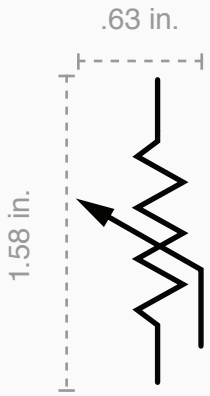
Battery



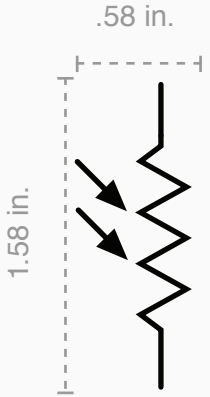
Resistor



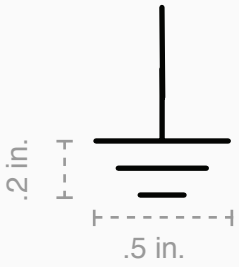
Variable Resistor



Light-Dependent Resistor

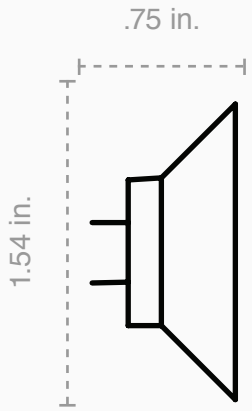


Ground

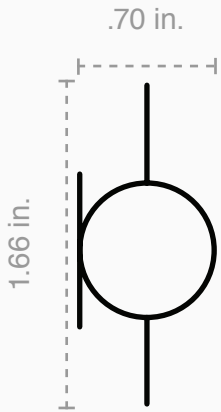


02 **Scale:** Components

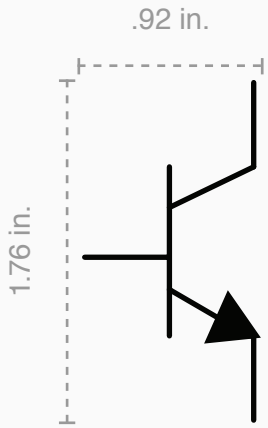
Speaker



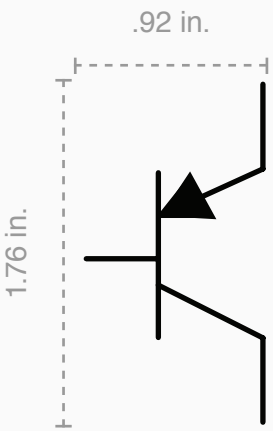
Microphone



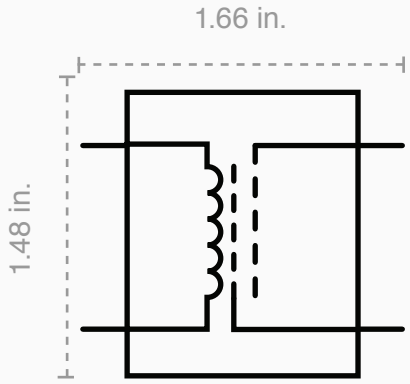
Transistor (NPN)



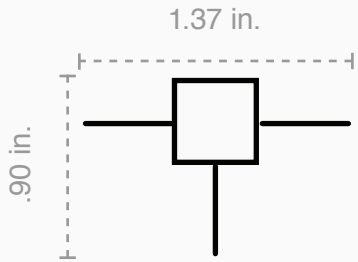
Transistor (PNP)



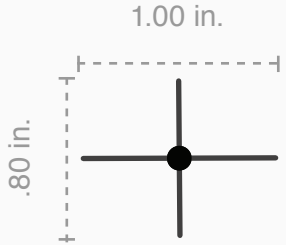
Relay



Voltage Regulator

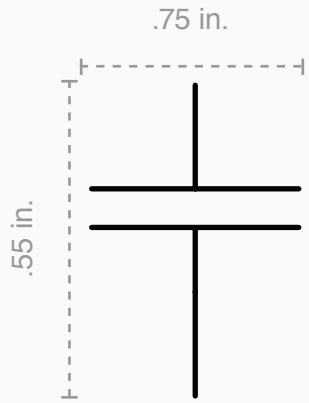


Junction Point

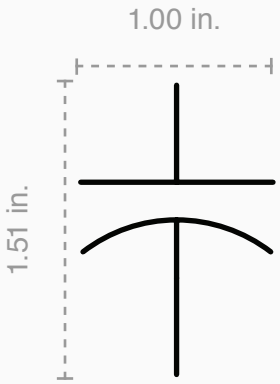


02 **Scale:** Components

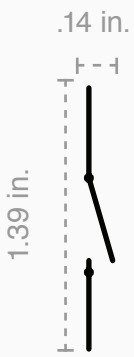
Capacitor



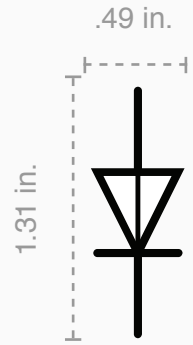
Polarized Capacitor



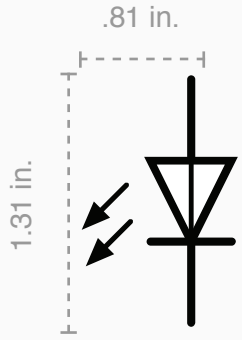
Switch



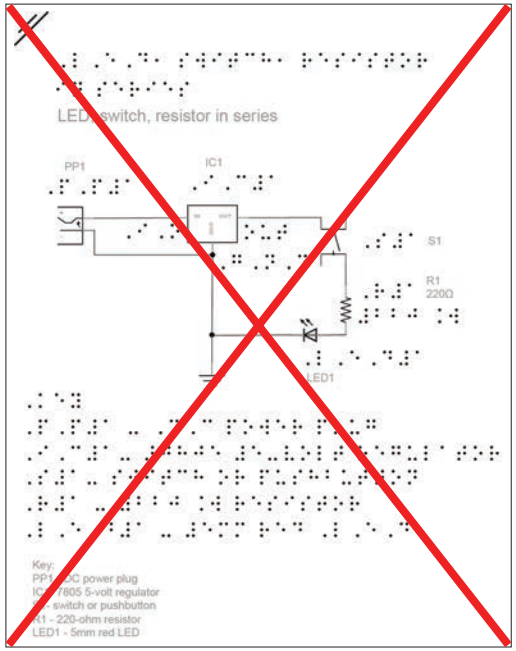
Diode



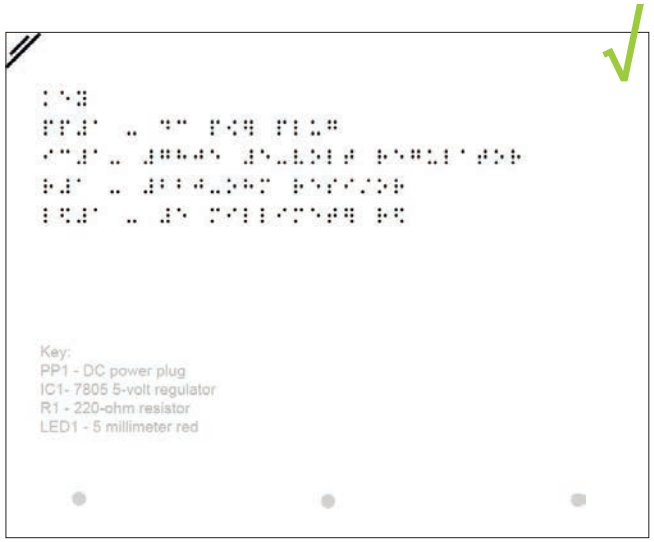
Light-emitting Diode

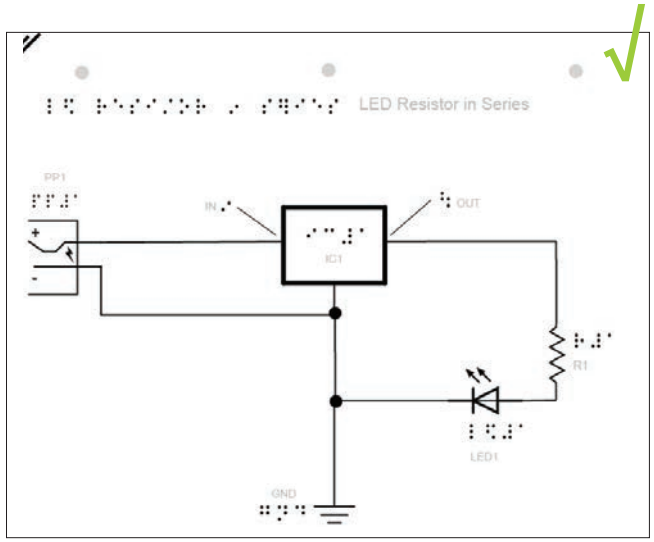


03 **Negative space:** Using a key



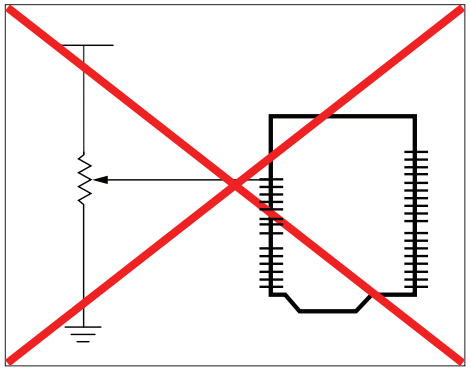
Clutter is the enemy.

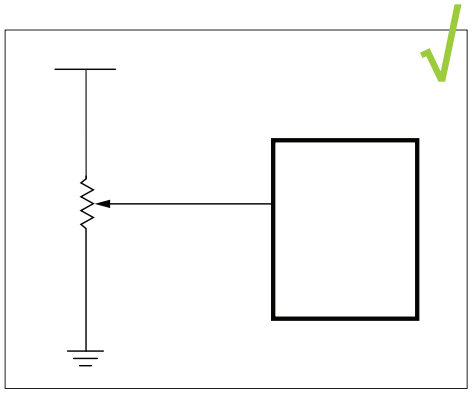




If labels take up more than about 20% of the page,
use a key on a facing page, using landscape orientation.

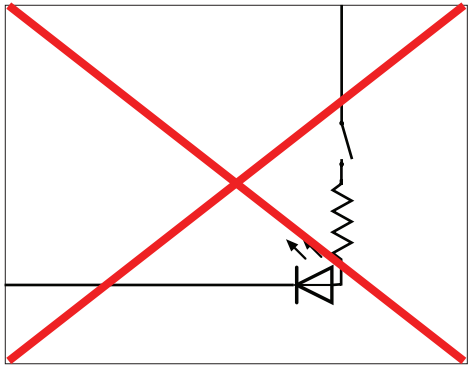
03 **Negative space:** Removing elements

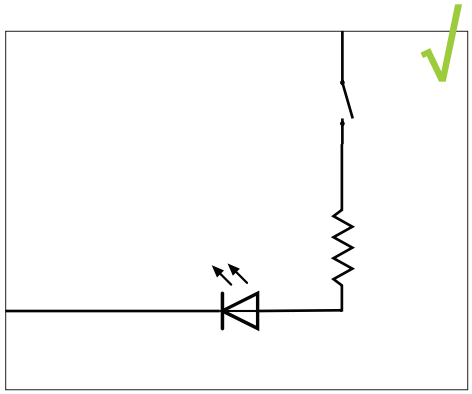




Remove unused pins or components. Make microcontrollers rectangular.

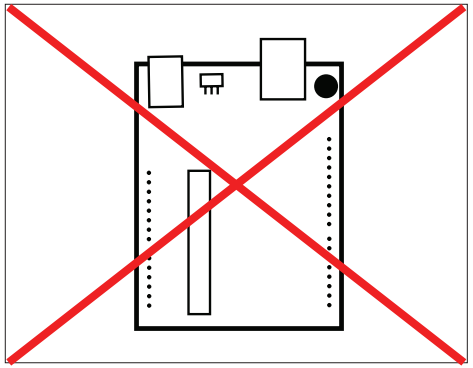
03 **Negative space:** Breathing room



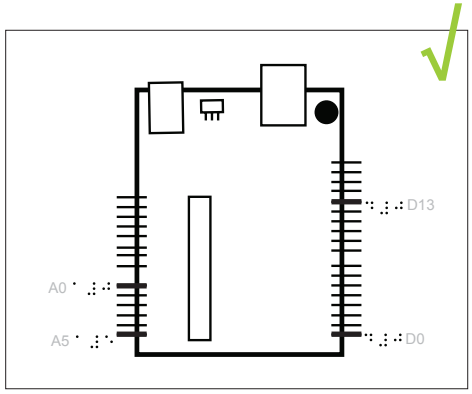


There should be plenty of breathing room around each component.

03 **Negative space:** Component pins

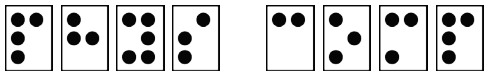


Don’t use dots for pins.



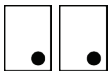
Use lines– label and bold the first and last pins in the group.

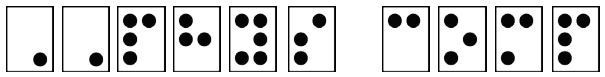
03 **Negative space:** Lowercase Braille



“phys comp”

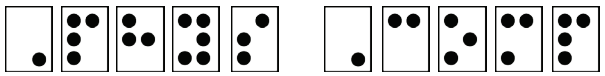
Use all lowercase Braille–
caps are clutter.

All caps: 



“PHYS COMP”

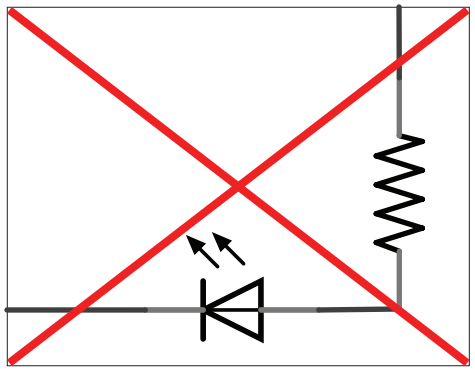
Caps: 

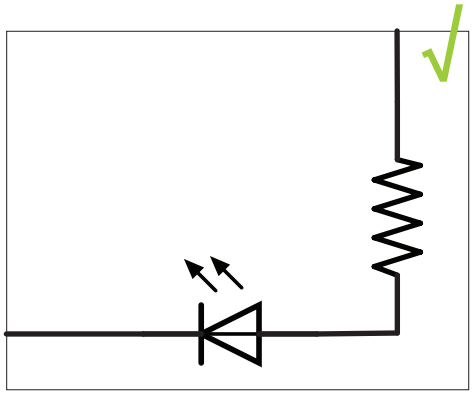


“Phys Comp”

Or use caps sparingly, only when it
changes the meaning of the word.

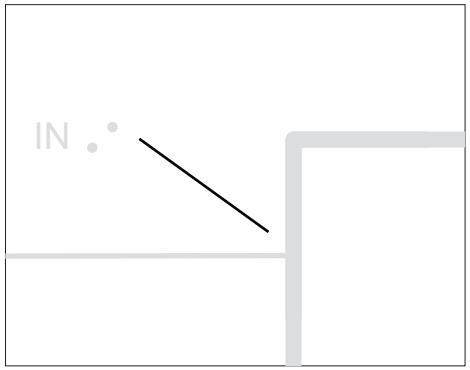
04 **Contrast:** Line consistency





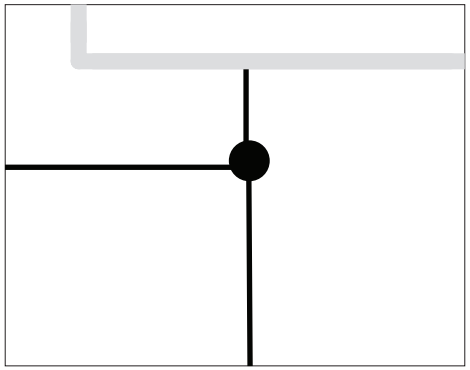
Make sure that all lines are 100% black and consistent thickness.

04 **Contrast:** Component strokes



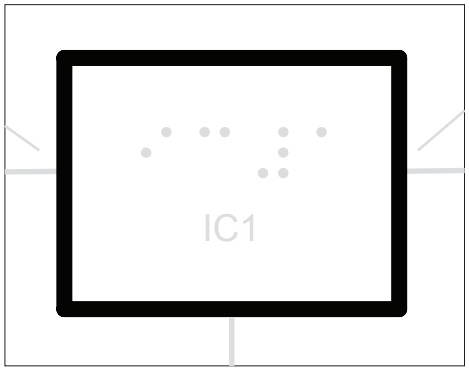
Leader Lines

Stroke: 1pt



Connection Lines

Stroke: 2pt

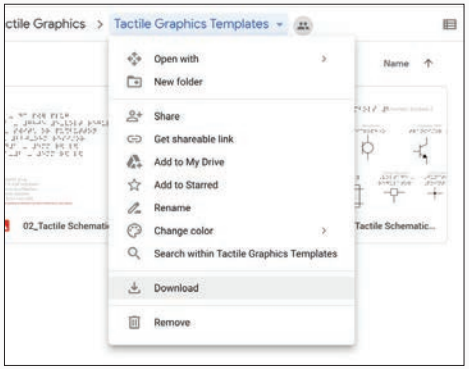


Microcontrollers

Stroke: 6pt

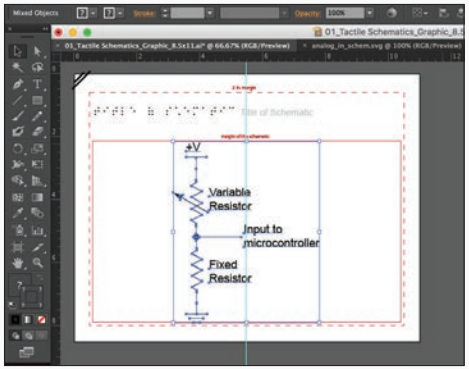
Workflow Guide Tactile Schematics

The guide assumes that you, or your collaborators, have a working knowledge of Adobe Illustrator, Sketch, or Inkscape, are familiar with schematics and terms like transistor, resistor, LED, and motor, and have access to Swell Touch Paper and a Swell Form Machine.



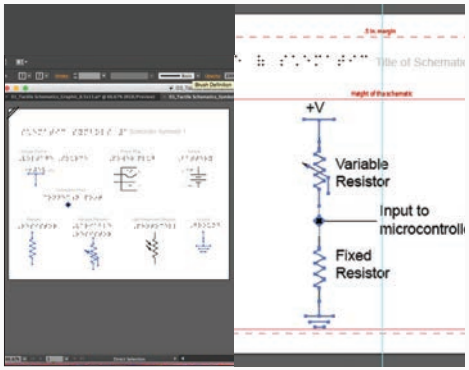
1. Download Tactile Graphics Templates.

- Open *01_Tactile Schematics_Graphic_8.5x11.svg* with Adobe Illustrator (or Sketch, Inkscape).
- Don't change the artboard size.



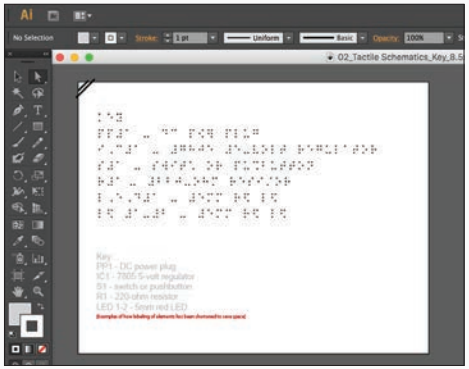
2. Open SVG schematic you want to convert, paste into template.

- Scale-to-fit in the height of the red box.
- Don't change the artboard size.

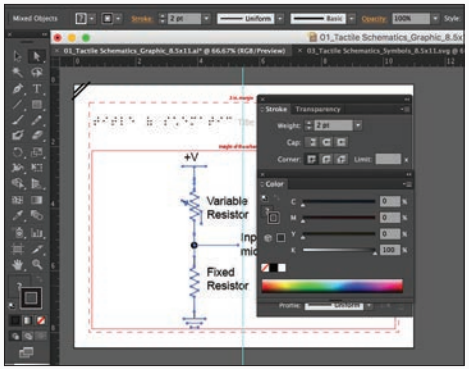


3. Replace schematic symbols with correct-sized versions.

- Copy/paste them from the Schematic Symbols in templates folder.

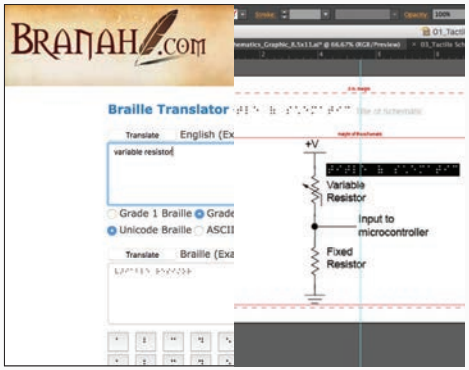


4. Decide if you need to use Key template to save space.



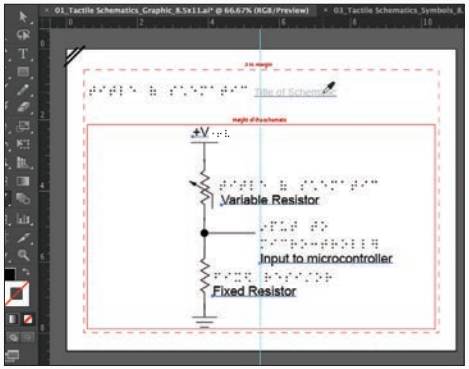
5. Alter the schematic.

- 1-point stroke leader lines (solid and straight) from component to label.
- 2-point stroke for connection lines.
- 6-point stroke for outlines of microcontrollers.
- Double check that all the lines are 100% black.



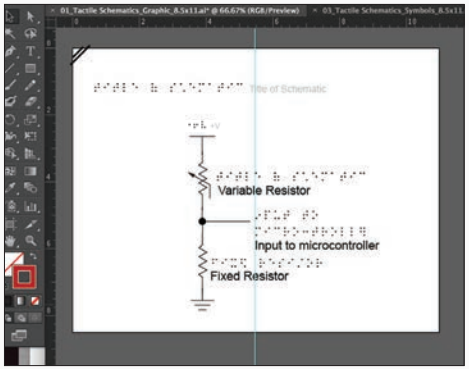
6. Translate the Braille.

- Use this online translator set to Grade 2 Braille, Unicode Braille.
- Use lowercase letters only.
- Duplicate Braille schematic title, paste Braille to create a label.
- You can do line breaks.
- Braille should be the closest thing to the element or end of leader line.

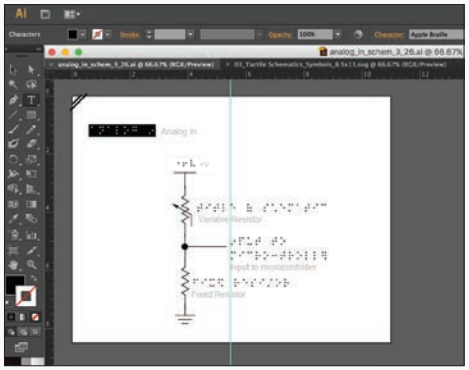


7. Convert the text.

- Hold shift to select all text (including “+V”). Use eyedropper to pick up attributes from title.
- Gray translation label stays under or next to Braille.



8. Delete red template text.



9. Name and save as an SVG.

- Lift schematic name from file name. (e.g. If your schematic is “analog_in.svg”, the title would be “Analog In”.)
- Save Key and matching schematic as separate files.

10. Print on 8.5x11 Swell Touch Paper.

- A laser printer works best.
- Print on the sticky, coated side of the paper, using the manual feed tray.

11. Feed through the Swell Form Machine.

- Medium to Medium-High is a safe bet, but you can test print to determine the best heat setting for the paper you're using.
- Allow it to heat up for a few minutes.
- Then insert, following the direction of the arrow.

Questions/Comments

Amy Hurst: amyhurst@nyu.edu

Tom Igoe: tom.igoe@nyu.edu

Lauren Race: lauren.race@nyu.edu

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