



Techsplorers™

Engineers of Tomorrow™

BSA Electronics Merit Badge Report Guide

Updated Aug 2018

Merit Badge Procedure

- 1. Obtain Blue Card signed by your Scout Leader.**
Do not bring it to class unless requested by the instructor. You will mail it to us later.
- 2. Bring the Electronics Merit Badge Workbook and the Techsplorers Report Guide to class.**
Take good notes during class; you'll need them to prepare the report.
- 3. Perform additional activities at home, if necessary.**
All badge requirements must be satisfied. Contact us if you have questions about the requirements.
- 4. Write up a report.**
See the guide below for details and helpful hints.
- 5. Email the report to Wendy Candler for review (wcandler@techsplorers.com).**
Wendy will review the report and make sure all of the requirements have been satisfied. A phone call may be scheduled if clarification or discussion is needed.
- 6. Mail your Blue Card with a self-addressed stamped envelope to:**
Techsplorers
14460 Falls of Neuse Rd.
Suite 149-141
Raleigh, NC 27614

The blue card will be signed and returned to you. Congratulations on obtaining your badge!

Report Tips

1. You may write your answers in the BSA Workbook, but we recommend writing them in a separate document, as the Workbook may not contain enough space for complete answers. A typed report is preferable (easier to send, read, and edit).
2. Wendy will review your first draft but you might need to add more information in order to fully satisfy a requirement. Make sure you complete all of the required sections. The reason most first drafts are not accepted is because a section is forgotten.
3. Hand drawn sketches and diagrams are perfectly okay.
4. The report should be in your own words. Copying text from the internet or any other form of plagiarism will not be tolerated.
5. You are free to choose any of the items from the BSA's list of requirements. You don't have to do the ones recommended in the Workbook Guide below.
6. Remember it is okay to contact us if you have questions about your badge report (wcandler@techsplorers.com).

Workbook Guide

1. **Describe the safety precautions you must exercise when using, building, altering, or repairing electronic devices.**

Refer to class notes. Write a few paragraphs explaining.

2. **Do the following:**

- a. **Draw a simple schematic diagram. It must show resistors, capacitors, and transistors or integrated circuits, Use the correct symbols. Label all parts.**
- b. **Tell the purpose of each part.**

(2a) Redraw the Theremin Siren circuit by hand.

(2b) Explain what resistors, capacitors, transistors, and ICs do in general, not their specific function in the Theremin circuit (that comes later in item 4c).

3. **Do the following:**

- a. **Show the right way to solder and desolder.**
- b. **Show how to avoid heat damage to electronic components.**
- c. **Tell about the function of a printed circuit board. Tell what precautions should be observed when soldering printed circuit boards.**

Write a short paragraph describing what you learned in class about the right way to solder and the methods we used to desolder to fix mistakes.

4. **Do the following:**

- a. **Discuss each of the following with your merit badge counselor:**
 - i. **How to use electronics for a control purpose**
 - ii. **The basic principles of digital techniques**
 - iii. **How to use electronics for 3 different audio applications**
- b. **Show how to change three decimal numbers into binary numbers and three binary numbers into decimal numbers.**
- c. **Choose ONE of the following three projects. For your project, find or create a schematic diagram. To the best of your ability, explain to your counselor how the circuit you built operates.**
 - i. **A control device**
 - ii. **A digital circuit**
 - iii. **An audio circuit**

(4a) Research control circuits and digital circuits and write a few sentences summarizing each. Write about three audio applications that you see in your everyday life.

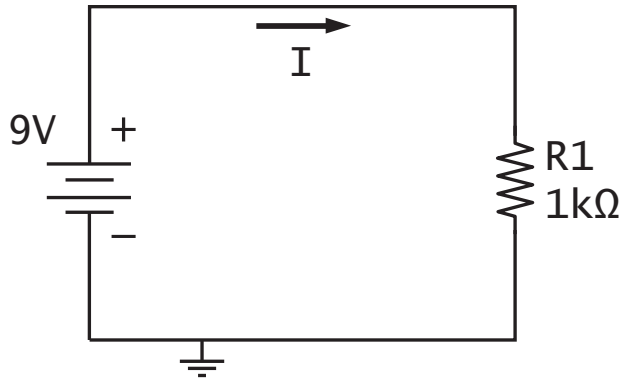
(4b) Check out this video for a handy easy way to convert binary to decimal and vice versa: <https://youtu.be/tfKe8PPI2zs>. Choose your own numbers and show your work.

(4c)(iii) The Theremin Siren is the audio circuit you built in class. Refer back to your class notes and try as best you can to describe how the Theremin Siren circuit works. It's okay if your description isn't perfect.

5. Do the following:

- a. Show how to solve a simple problem involving current, voltage, and resistance using Ohm's law.
- b. Tell about the need for and the use of test equipment in electronics. Name three types of test equipment. Tell how they operate.

(5a) Use Ohm's Law to solve for I (in mA).



(5b) Write a short paragraph explaining why we need test equipment. The multimeter contains 3 fundamental types of test equipment: a voltmeter, ammeter, and ohmmeter. Explain what each of these measures. Then explain how to connect the multimeter probes to the circuit for each of the 3 types of measurements.

6. Find out about three career opportunities in electronics that interest you. Discuss with and explain to your counselor what training and education are needed for each position.

Write a short paragraph about 3 types of careers in electronics that interest you. Do not just guess at the education requirements. Make sure that you take the time to learn about different types of degrees offered by universities and technical colleges.