



# Electronics

## Merit Badge Workbook

This workbook can help you but you still need to read the merit badge pamphlet.

The work space provided for each requirement should be used by the Scout to make notes for discussing the item with his counselor, not for providing the full and complete answers. Each Scout must do each requirement.

No one may add or subtract from the official requirements found in ***Boy Scout Requirements*** (Pub. 33216 – SKU 34765).

The requirements were last issued or revised in 2004 • This workbook was updated in March 2012.

Scout's Name: \_\_\_\_\_ Unit: \_\_\_\_\_

Counselor's Name: \_\_\_\_\_ Counselor's Phone No.: \_\_\_\_\_

<http://www.USScouts.Org> • <http://www.MeritBadge.Org>

Please submit errors, omissions, comments or suggestions about improving this workbook to: [Workbooks@USScouts.org](mailto:Workbooks@USScouts.org)

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

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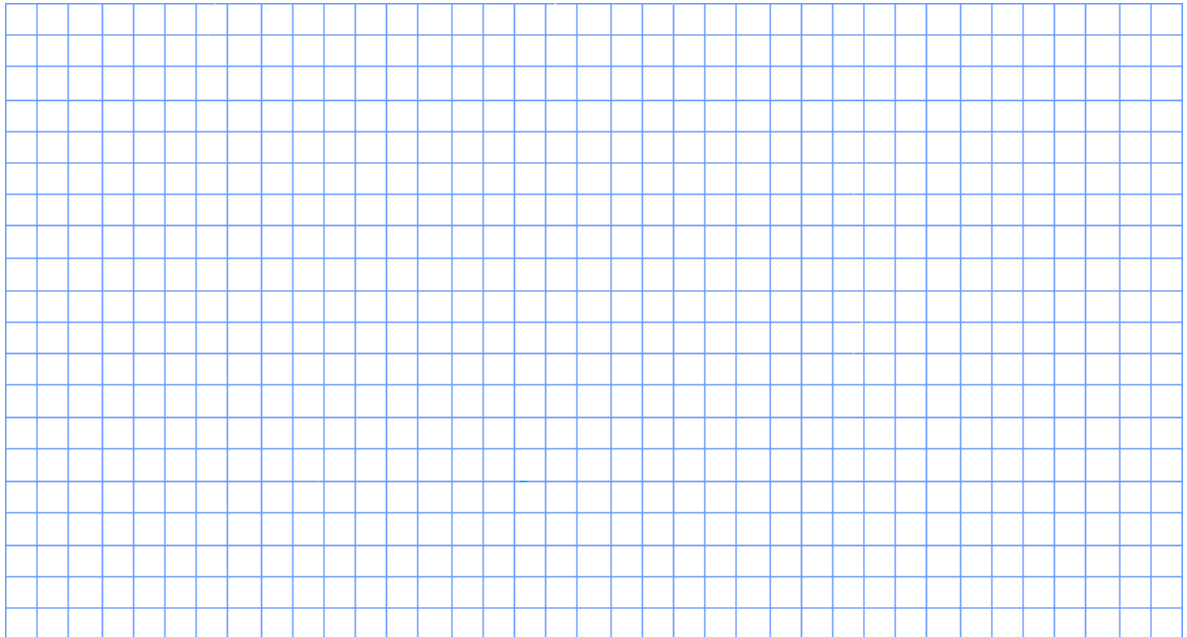
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2. Do the following:

- 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.

Resistor: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Capacitor: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Transistor: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Integrated circuit: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Other?: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Discuss each of the following with your merit badge counselor, and then choose ONE of the following and build a circuit to show the techniques used: (*Hint: an electronics kit may be used. Consider one of the kits from your Scout Shop.*)

a. Tell how you can use electronics for a control purpose, and then build a control device circuit. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Build a control device circuit.

b. Tell about the basic principles of digital techniques, and then build a digital circuit. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Build a control device circuit.

Show how to change three decimal numbers into binary numbers and three binary numbers into decimal numbers.

c. Tell about three audio applications of electronics, and then build an audio circuit. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Build an audio circuit.

Show how to read the schematic diagram of the project you chose and, to the best of your ability, explain to your counselor how the circuit you built operates. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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.

- 1. \_\_\_\_\_  
\_\_\_\_\_
- 2. \_\_\_\_\_  
\_\_\_\_\_
- 3. \_\_\_\_\_  
\_\_\_\_\_

6. Find out about three career opportunities in electronics that interest you.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

Discuss with and explain to your counselor what training and education are needed for each position.

1. Training: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Education: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Training: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Education: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Training: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Education: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Requirement resources can be found here:**  
[http://www.meritbadge.org/wiki/index.php/Electronics#Requirement\\_resources](http://www.meritbadge.org/wiki/index.php/Electronics#Requirement_resources)

## Important excerpts from the [‘Guide To Advancement’](#), No. 33088:

Effective January 1, 2012, the ‘Guide to Advancement’ (which replaced the publication ‘Advancement Committee Policies and Procedures’) is now the *official* Boy Scouts of America source on advancement policies and procedures.

- **[ Inside front cover, and 5.0.1.4 ] — Unauthorized Changes to Advancement Program**  
***No council, committee, district, unit, or individual has the authority to add to, or subtract from, advancement requirements.***  
(There are limited exceptions relating only to youth members with disabilities. For details see section 10, “Advancement for Members With Special Needs”.)
- **[ Inside front cover, and 7.0.1.1 ] — The [‘Guide to Safe Scouting’](#) Applies**  
Policies and procedures outlined in the ‘Guide to Safe Scouting’, No. 34416, apply to all BSA activities, including those related to advancement and Eagle Scout service projects. [Note: Always reference the online version, which is updated quarterly.]
- **[ 7.0.3.1 ] — The Buddy System and Certifying Completion**  
Youth members must not meet one-on-one with adults. Sessions with counselors must take place where others can view the interaction, or the Scout must have a buddy: a friend, parent, guardian, brother, sister, or other relative —or better yet, another Scout working on the same badge— along with him attending the session. When the Scout meets with the counselor, he should bring any required projects. If these cannot be transported, he should present evidence, such as photographs or adult certification. His unit leader, for example, might state that a satisfactory bridge or tower has been built for the Pioneering merit badge, or that meals were prepared for Cooking. If there are questions that requirements were met, a counselor may confirm with adults involved. Once satisfied, the counselor signs the blue card using the date upon which the Scout completed the requirements, or in the case of partials, initials the individual requirements passed.
- **[ 7.0.3.2 ] — Group Instruction**  
It is acceptable—and sometimes desirable—for merit badges to be taught in group settings. This often occurs at camp and merit badge midways or similar events. Interactive group discussions can support learning. The method can also be attractive to “guest experts” assisting registered and approved counselors. Slide shows, skits, demonstrations, panels, and various other techniques can also be employed, but as any teacher can attest, not everyone will learn all the material.  
  
There must be attention to each individual’s projects and his fulfillment of *all* requirements. We must know that every Scout — actually and *personally*— completed them. If, for example, a requirement uses words like “show,” “demonstrate,” or “discuss,” then every Scout must do that. It is unacceptable to award badges on the basis of sitting in classrooms *watching* demonstrations, or remaining silent during discussions. Because of the importance of individual attention in the merit badge plan, group instruction should be limited to those scenarios where the benefits are compelling.
- **[ 7.0.3.3 ] — Partial Completions**  
Scouts need not pass all requirements with one counselor. The Application for Merit Badge has a place to record what has been finished — a “partial.” In the center section on the reverse of the blue card, the counselor initials for each requirement passed. In the case of a partial completion, he or she does not retain the counselor’s portion of the card. A subsequent counselor may choose not to accept partial work, but this should be rare. A Scout, if he believes he is being treated unfairly, may work with his Scoutmaster to find another counselor. An example for the use of a signed partial would be to take it to camp as proof of prerequisites. Partials have no expiration except the 18th birthday.