Radio

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 2009 • This workbook was updated in January 2014.

Scout's Name: Merit Badge Counselor Unit: Camp Bob Hardin 2014

Counselor's Name: Alex Summers Counselor's Phone No.: _____

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

Please submit errors, omissions, comments or suggestions about this **workbook** to: Workbooks@USScouts.Org
Comments or suggestions for changes to the **requirements** for the **merit badge** should be sent to: Merit.Badge@Scouting.Org

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1. Explain what radio is.

Radio is: Electronic communication from one location to another without wires.. It involves the use of electrical waves to send and receive information and communications.

Then discuss the following:

a. The differences between broadcast radio and hobby radio.

Broadcast - uses radio to send information to lots of people at the same time. The people receiving the communication/broadcast can usually only listen and can't transmit any information back. It might be voice or voice and music and TV.

Hobby radio - is the use of radio by ordinary people. These people include ham radio operators, truckers using citizen band, model aircraft enthusiasts, or a Scout Troop using Family Radio Service (FRS) frequencies. Normally, hobby radio involves sending and receiving transmissions. Amateur radio is a licensed type of Hobby Radio

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b. The differences between broadcasting and two-way communications.

Broadcasting - One-way transmissions to the public. Could be commercial (music, news, sports with advertisements) or non-commercial (National Public Radio, school radio stations, Voice of America).

Two -way communications - messages are received and transmitted on each end of the communication. Radios both send (transmit) and receive messages.
walkie-talkies, Amateur Radio, cell phones, fire and police, aviation, ships
military, etc.

c. Radio call signs and how they are used in broadcast radio and amateur radio.

Call Signs are identification. They show you have a license to transmit. Broadcast Call Signs:
WHO, KDKA, KORA, WNBC
Ham Call Signs: WW3Y, KB3BOY, VR2DK, 9N1MM, JA1ABC, A92EB/OZ, G4RZC/MM
All ham call signs contain a number
Every US station has a call sign issued by the Federal Communications Commission (FCC)
Broadcast call signs begin with K or W: KXAS WBAP, generally W stations are east of the Mississippi River, K stations are west of the Mississippi.
Amateur call signs begin with A, K, N or W: AB2SN KF5WT NY8N W3ZLP
(show map that contains the amateur radio license zones and station identification information)

d. The phonetic alphabet and how it is used to communicate clearly.

(Show the slide from Module 1 containing the phonetic alphabet).

The phonetic alphabet is used to spell words so that there is less chance for confusion over letters that sound similar. This is important especially for times where there is static and poor reception during radio transmissions.

2. Do the following:

a. Sketch a diagram showing how radio waves travel locally and around the world.

Explain how the broadcast radio stations, WWV and WWVH can be used to help determine what you will hear when you listen to a shortwave radio?

(show slides 21, 22, and 23 from Module 1 that explain how waves travel around the world and locally)

Show slides 24, 25 and 26 from Module 1 to explain how stations WWV and WWVH can be used to help you determine what you will here. Basically you know where they are on the dial, and the strength of the signal from these stations can help you know how well you are receiving transmissions from all over the dial.

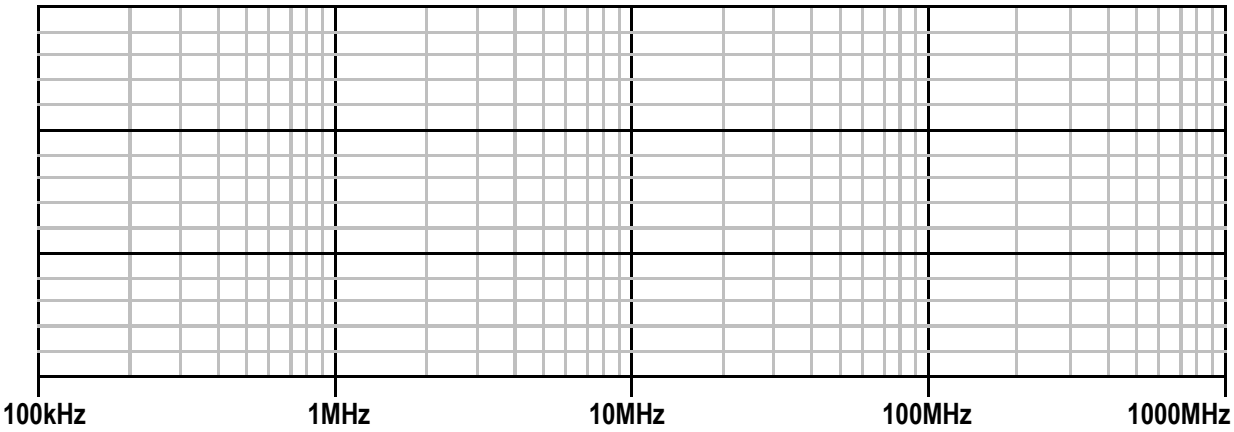
b. Explain the difference between a DX and a local station.

DX	Distant radio stations. DX radio stations are the ones picked up through propagation of waves instead of by ground waves. It usually includes stations outside your country or outside your area of the country.
Local	Stations that are picked up primarily via ground waves. They are relatively close to the listening station.

Discuss what the Federal Communication Commission (FCC) does and how it is different from the International Telecommunication Union.

FCC:	FCC Federal Communication Commission Set Frequency Assignments in US. Issues Licenses & Call Signs in US. Enforces Radio Laws in US.
International Telecommunication Union:	ITU International Telecommunications Union Meets every few years. Sets International Frequency assignments. Assigns prefixes to countries.

3. Do the following:
   a. Draw a chart of the electromagnetic spectrum covering 100 kilohertz (kHz) to 1000 megahertz (MHz).
   b. Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.
   c. Locate on your chart at least eight radio services such as AM and FM commercial broadcast, citizens band (CB), television, amateur radio (at least four amateur radio bands), and public service (police and fire).



4. Explain how radio waves carry information.

(show slides 4 and 5, plus slides 20 - 23 from Module 2)

Include in your explanation: transceiver, transmitter, receiver, amplifier, and antenna.

Transceiver:	Both a transmitter and receiver in one box
Transmitter:	Generates radio frequency (RF) signal
Receiver:	Receives a radio signal. Demodulates the carrier

Scout's Name: Merit Badge Counselor

Amplifier:	Makes the signal stronger and drives feed line
Antenna:	Sends radio frequency signals into the air.

5. Do the following:
   a. Explain the differences between a block diagram and a schematic diagram.

Block diagram:	Block Diagram: Outlines the various functions within an electronic device Show Slides 14 - 19, and Slides 24, 25 from Module 2 slides.
Schematic diagram:	Schematic Diagram: Uses standard electrical symbols to describe an electrical circuit in detail

   b. Draw a block diagram for a radio station that includes a transceiver, amplifier, microphone, antenna, and feed line.

c. Explain the differences between an open circuit, a closed circuit, and a short circuit.

Open circuit:	Open Circuit Circuit is incomplete. Electricity doesn't flow. Show Slide 26 from the Module 2 slides.
Closed circuit:	Closed Circuit Circuit is complete. Electricity flows like it should.
Short circuit:	Short Circuit Circuit is complete through an unplanned shortcut. Electricity flows where it shouldn't! Dangerous - parts can get hot, start fires or even explode! Show Slide 19 from Module 2 again - Schematic symbols.

d. Draw eight schematic symbols.

Explain what three of the represented parts do.

1.	Resistor	Resists the flow of electric current, reducing its flow
2.	Capacitor	Gets and stores an electric charge. Lets alternating current (AC - like in your house) flow but stops direct current (DC - like from a battery).
3.	Coil	Also called a choke, it works the opposite of a capacitor. It lets DC flow but stops AC.

Scout's Name: Merit Badge Counselor

Find three electrical components to match to three of these symbols.

1.	Resistor	Find pictures of these components for them to look at (in the merit badge pamphlet there is a good picture).
2.	Capacitor	
3.	Coil	

6. Explain the safety precautions for working with radio gear, including the concept of grounding for direct current circuits, power outlets, and antenna systems.

General safety precautions:	Never operate radios with the cover off. The case keeps the RF radiation in. Exposure to high levels of RF can cause burns and cancer Human eyes especially sensitive to RF. Keep antennas out of reach. Hams required to conduct a “routine station evaluation” to verify safe operation Usually done by consulting a chart.
Grounding for direct current circuits:	Direct Current Grounding Hams add another ground rod and connect all of their station equipment cases to it as well. Provides additional safety and grounds any stray RF.
Grounding for Power outlets:	AC Outlet Grounding Ground wire connected to house wiring. Equipment uses 3 prong plugs to ground equipment case. If wire inside touches case, house circuit breaker is opened.
Grounding for antenna systems:	Antenna Grounding Use lightning protectors where antennas enter the house. These bleed off static electricity. No protection to a direct strike.

Scout's Name: Merit Badge Counselor

7. ☑ Visit a radio installation (an amateur radio station, broadcast station, or public communications center, for example) approved in advance by your counselor.

Discuss what types of equipment you saw in use, how it was used, what types of licenses are required to operate and maintain the equipment, and the purpose of the station.

Equipment:	We will figure this out while I am there.
Licenses:	The station is not licensed - it is a listening station only. (We may be able to transmit on a certain frequency unlicensed... I will find out about that).
Purpose:	For listening to radio transmissions as part of the Radio Merit Badge.

8. Find out about three career opportunities in radio.

1.	Broadcast Announcer/Personality
2.	Radio Engineer
3.	Public Safety Dispatcher

Pick one and find out the education, training, and experience required for this profession.

Career:	Broadcast Announcer/Personality
Education:	Require high school diploma and most of the time a college degree.
Training:	Gain broadcasting experience through college radio stations and by interning or helping with radio broadcasts.

Experience: Gain experience at college radio stations and by helping with existing radio programs. Must be able to get and keep an audience, so that advertising can be sold for the time that you are on the radio.

Discuss this with your counselor, and explain why this profession might interest you.

Get them to tell you what they think.

9. Do ONE of the following: (a OR b OR c)

☐ a. **AMATEUR RADIO**

1. Tell why the FCC has an amateur radio service.

Describe some of the activities that amateur radio operators can do on the air, once they have earned an amateur radio license.

Scout's Name: Merit Badge Counselor

☐ 2. Using proper call signs, Q signals, and abbreviations, carry on a 10 minute real or simulated radio contact using voice, Morse Code, or digital mode. (Licensed amateur radio operators may substitute five QSL cards as evidence of contacts with amateur radio operators from at least three different call districts.) Properly log the real or simulated ham radio contact and record the signal report.

3. Explain at least five Q signals or amateur radio terms you hear while listening.

1.		
2.		

3.		
4.		
5.		

4. Explain some of the differences between the Technician, General, and Extra Class license requirements and privileges.

Technician:	
General:	
Extra Class:	

Scout's Name: Merit Badge Counselor

Explain who administers amateur radio exams.

5. Explain how you would make an emergency call on voice or Morse code.

6. Explain the differences between handheld transceivers and home "base" transceivers.

Handheld

Base

Explain the uses of mobile amateur radio transceivers and amateur radio repeaters.

Transceivers:

Repeaters:

☑ b. **BROADCAST RADIO**

☑ 1. Prepare a program schedule for radio station "KBSA" of exactly one-half hour, including music, news, commercials, and proper station identification

Do this in class and then record the program. Might take some extra time on Friday morning or at some point.

☑ Record your program on audiotape or in a digital audio format using proper techniques.

2. Listen to and properly log 15 broadcast stations.

	Call sign	Freq.	
1.			(Listen to the radio to log in 15 different stations. Use the internet to
2.			figure out what the call signs are - look for local radio stations by
3.			frequency.)
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

Determine the program format and target audience for five of these stations.

	Call Sign	Program Format	Target Audience
1.		(Do this for 5 of the stations above)	
2.			
3.			
4.			
5.			

Scout's Name: Merit Badge Counselor

3. Explain at least eight terms used in commercial broadcasting, such as segue, cut, fade, continuity, remote, Emergency Alert System, network, cue, dead air, PSA, and playlist.

☑ Segue:	Without interruption; to play two recordings one after the other with no silence or interrupting remarks.
☑ Cut:	An abrupt transition from one sound or program element to another.
☑ Fade:	Gradual reduction of sound level from full volume to silence.
☐ Continuity:	
☑ Remote:	Audio recorded or sent "on location" - that is, away from the radio studio. Usually done to promote an advertiser's special event.
☐ Emergency Alert System:	
☑ Network:	Interconnected radio stations receiving program material from a central source.
☑ Cue:	A signal to begin an action or to prepare for airing.
☑ Dead Air:	Complete silence on the air; unmodulated carrier; generally an undesirable situation.
☑ PSA:	Public Service Announcement. A certain number are required each month by each commercial broadcasting radio station.
☐ Playlist:	

☐ c. **SHORTWAVE LISTENING**

☐ 1. Listen across several shortwave bands for four one-hour periods - at least one period during daylight hours and at least one period at night. Log the stations properly and locate them geographically on a globe.

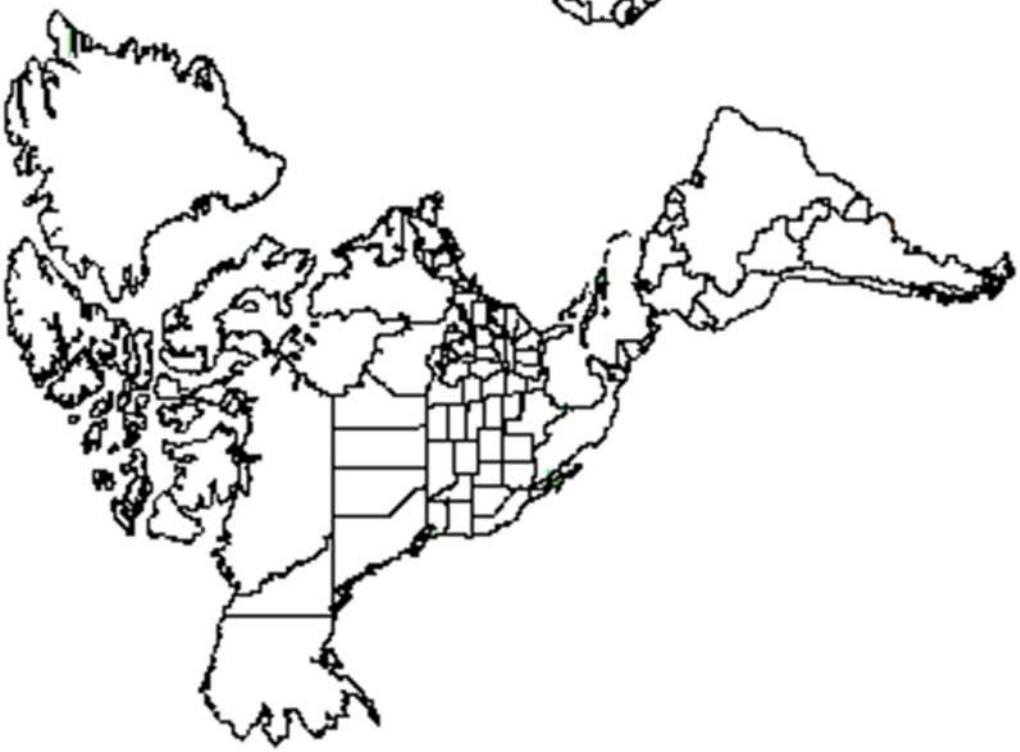
(Note: You may want to use the map on the next page if a globe isn't available)

2. For several major foreign stations (BBC in Great Britain or HCJB in Ecuador, for example), list several frequency bands used by each.

3. Compare your daytime and nighttime logs; note the frequencies on which your selected stations were loudest during each session.

Explain the differences in the signal strength from one period to the next.

Scout's Name: Merit Badge Counselor



Requirement resources can be found here:
http://www.meritbadge.org/wiki/index.php/Radio#Requirement resources

Important excerpts from the *Guide To Advancement - 2013*, No. 33088 (SKU-618673)

[1.0.0.0] — Introduction
The current edition of the *Guide to Advancement* is the official source for administering advancement in all Boy Scouts of America programs: Cub Scouting, Boy Scouting, Varsity Scouting, Venturing, and Sea Scouts. It replaces any previous BSA advancement manuals, including *Advancement Committee Policies and Procedures*, *Advancement and Recognition Policies and Procedures*, and previous editions of the *Guide to Advancement*.

[Page 2, and 5.0.1.4] — Policy on 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 special needs. For details see section 10, "Advancement for Members With Special Needs".

[Page 2] — 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.

[7.0.3.1] — The Buddy System and Certifying Completion
A youth member must not meet one-on-one with an adult. 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 verification. 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.
Note that from time to time, it may be appropriate for a requirement that has been met for one badge to also count for another. See "Fulfilling More Than One Requirement With a Single Activity," 4.2.3.6.

[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.
It is sometimes reported that Scouts who have received merit badges through group instructional settings have not fulfilled all the requirements. To offer a quality merit badge program, council and district advancement committees should ensure the following are in place for all group instructional events.

- Merit badge counselors are known to be registered and approved.
- Any guest experts or guest speakers, or others assisting who are not registered and approved as merit badge counselors, do not accept the responsibilities of, or behave as, merit badge counselors, either at a group instructional event or at any other time. Their service is temporary, not ongoing.
- Counselors agree not to assume prerequisites have been completed without some level of evidence that the work has been done. Pictures and letters from other merit badge counselors or unit leaders are the best form of prerequisite documentation when the actual work done cannot be brought to the camp or site of the merit badge event.
- There is a mechanism for unit leaders or others to report concerns to a council advancement committee on summer camp merit badge programs, group instructional events, and any other merit badge counseling issues—especially in instances where it is believed BSA procedures are not followed. See "Reporting Merit Badge Counseling Concerns," 11.1.0.0.
- 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.

[7.0.3.3] — Partial Completions
A Scout need not pass all the requirements of one merit badge with the same counselor. It may be that due to timing or location issues, etc., he must meet with a different counselor to finish the badge. 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, the counselor does not retain his or her 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 unit leader 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 Scout's 18th birthday. Units, districts, or councils shall not establish other expiration dates for partial merit badges.

[7.0.4.8] — Unofficial Worksheets and Learning Aids
Worksheets and other materials that may be of assistance in earning merit badges are available from a variety of places including unofficial sources on the Internet and even troop libraries. Use of these aids is permissible as long as the materials can be correlated with the current requirements that Scouts must fulfill. Completing "worksheets" may suffice where a requirement calls for something in writing, but this would not work for a requirement where the Scout must discuss, tell, show, or demonstrate, etc. Note that Scouts shall not be required to use these learning aids in order to complete a merit badge.