Before you get started, skip to page 9 for important printing information.

RADIO

JULY HAC - MERIT BADGE FOR SCOUTS BSA

MERIT BADGE TRACKING

A HomeScouting Adventure

The tracking tool below is simply for your own tracking of completion of requirements.
Scouts are encouraged to find a local merit badge counselor to meet, discuss, and sign off on completion of the merit badge, however the HomeScouting Adventure Club will offer limited counseling sessions for Scouts needing a counselor.

Requirement	Completed?
1. Explain what radio is. Then discuss the following: • The differences between broadcast radio and hobby radio • The differences between broadcasting and two-way communications • Radio station call signs and how they are used in broadcast radio & amateur radio • The phonetic alphabet and how it is used to communicate clearly	
2a. Sketch a diagram showing how radio waves travel locally and around the world.	
2b. Explain how the radio stations WWV and WWVH can be used to help determine what you can expect to hear when you listen to a shortwave radio.	
2c. Explain the difference between a distant (DX) and a local station.	
2d. Discuss what the Federal Communications Commission (FCC) does and how it is different from the International Telecommunication Union.	
3. Do the following: ❑ 3a. Draw a chart of the electromagnetic spectrum covering 300 kilohertz (kHz) to 3,000 megahertz (MHz). ❑ 3b. Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram. ❑ 3c. 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. Include in your explanation: transceiver, transmitter, receiver, amplifier, and antenna.	
5. Do the following: ❑ 5a. Explain the differences between a block diagram and a schematic diagram. ❑ 5b. Draw a block diagram for a radio station that includes a transceiver, amplifier, microphone, antenna, and feed line. ❑ 5c. Discuss how information is sent when using amplitude modulation (AM), frequency modulation (FM), continuous wave (CW) Morse Code transmission, single sideband (SSB) transmission, and digital transmission. ❑ 5d. Explain how NOAA Weather Radio (NWR) can alert you to danger. ❑ 5e. Explain how cellular telephones work. Identify their benefits and limitations in an emergency.	
6. Explain the safety precautions for working with radio gear, including the concept of grounding for direct current circuits, power outlets, and antenna systems.	
7. Visit a radio installation (an amateur radio station, broadcast station, or public service communications center, for example). 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.	

MERIT BADGE TRACKING

A HomeScouting Adventure

Requirement	Completed?
8. Find out about 3 career opportunities in radio. Pick one and find out the education, training, & experience required. Explain why this profession interests you.	
9. Do **ONE** of the following (**a** OR **b** OR **c** OR **d**):	
A. Amateur Radio ❑ Tell why the FCC has an amateur radio service. Describe activities that amateur radio operators can do on the air, once they have earned an amateur radio license. ❑ Explain differences between the Technician, General, and Extra Class license requirements and privileges. Explain who administers amateur radio exams. ❑ Explain at least five Q signals or amateur radio terms. ❑ Explain how you would make an emergency call on voice or Morse code. ❑ Explain the differences between handheld transceivers and home "base" transceivers. Explain the uses of mobile amateur radio transceivers and amateur radio repeaters. ❑ Using proper call signs, Q signals, and abbreviations, carry on a 10-minute real or simulated amateur radio contact using voice, Morse code, or digital mode. (Licensed amateur radio operators may substitute five QSL cards as evidence of contacts with five amateur radio operators.) Properly log the real or simulated ham radio contact, and record the signal report.	
B. Radio Broadcasting ❑ Describe FCC broadcast regulations. Include power levels, frequencies, and the regulations for low-power stations. ❑ Prepare a program schedule for radio station "KBSA" of exactly one-half hour, including music, news, commercials, and proper station identification. Record your program on audiotape or in a digital audio format, using proper techniques. ❑ Listen to and properly log 15 broadcast stations. Determine the program format and target audience for five of these stations. ❑ 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. ❑ Describe alternative radio platforms such as internet streaming, satellite radio, and podcasts.	
C. Shortwave and Medium-Wave Listening ❑ 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 map, globe, or web-based mapping service. ❑ Listen to several medium-wave stations for two one-hour periods, one period during daylight hours and one period at night. Log the stations properly and locate them on a map, globe, or web-based mapping service. ❑ Compare your daytime and nighttime shortwave logs; note the frequencies on which your selected stations were loudest during each session. Explain differences in the signal strength from one period to the next. ❑ Compare your medium-wave broadcast station logs and explain why some distant stations are heard at your location only during the night. ❑ Demonstrate listening to a radio broadcast using a smartphone/cell phone. Include international broadcasts in your demonstration.	
D. Amateur Radio Direction Finding ❑ Describe amateur radio direction finding and explain why direction finding is important as both an activity and in competition. ❑ Describe what frequencies and equipment are used for ARDF or fox hunting. ❑ Build a simple directional antenna for either of the two frequencies used in ARDF. ❑ Participate in a simple fox hunt using your antenna along with a provided receiver. ❑ Show, on a map, how you located the "fox" using your receiver.	

Before you get started, skip to page 9 for important printing information.

RADIO

JULY HAC - MERIT BADGE FOR SCOUTS BSA

MERIT BADGE WORKSHEET

A HomeScouting Adventure

Through exploring The Trail inside the ClubHouse for the HomeScouting Adventure Club, complete this worksheet to demonstrate your knowledge of radio . This worksheet will not be turned in and for your own use to demonstrate knowledge.

Explain what radio is.

What is the difference between broadcast radio and hobby radio?

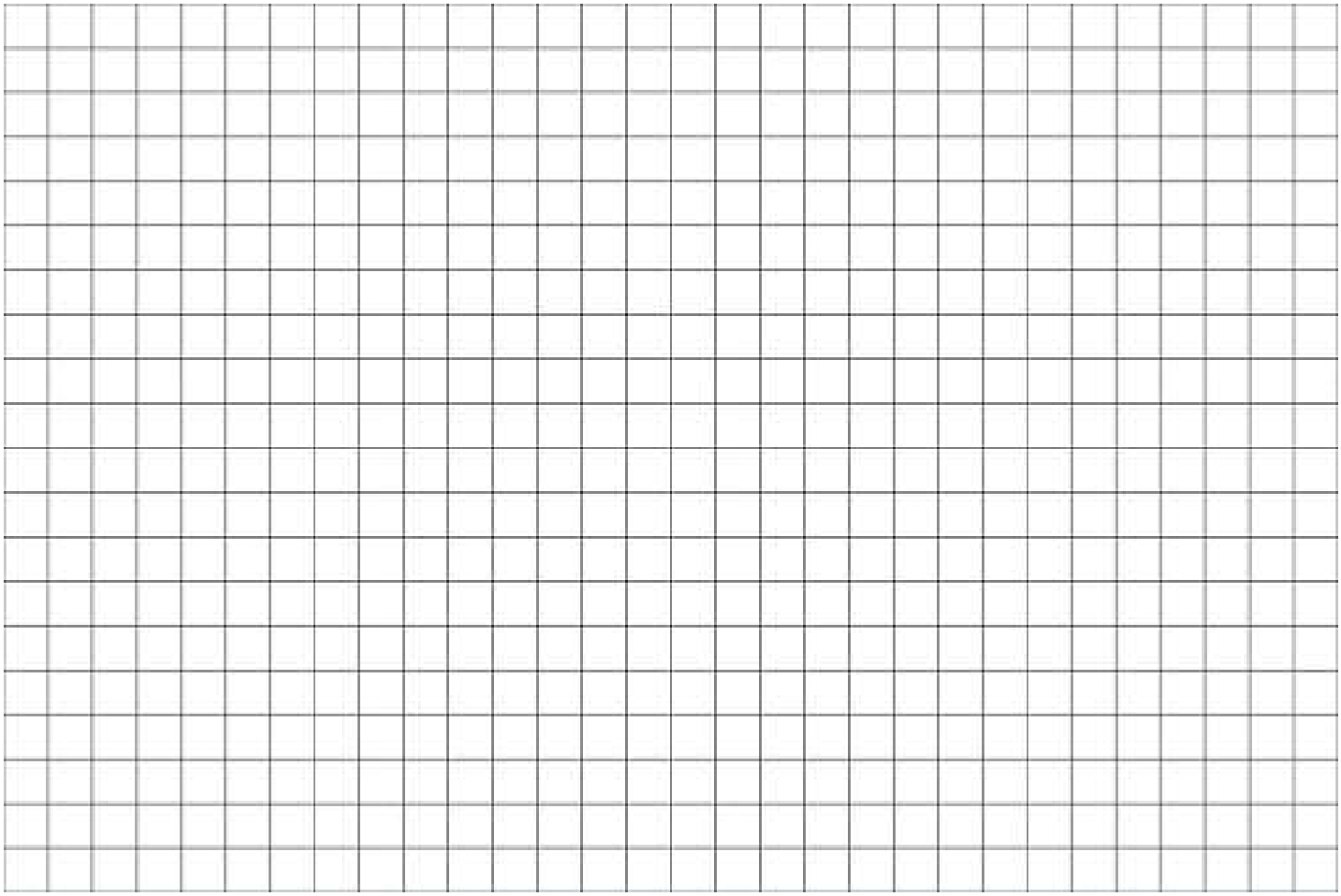
What is the difference between broadcasting and two-way communications?

What is the difference between radio call signs and how they are used in broadcast radio and amateur radio?

On the next page, sketch a diagram showing how radio waves travel locally and around the world.

MERIT BADGE TRACKING

A HomeScouting Adventure



Explain how the radio stations WWV and WWVH can be used to help determine what you can expect to hear when you listen to a shortwave radio.

Explain the difference between a distant (DX) and a local station.

Distant (DX) Station

Local Station

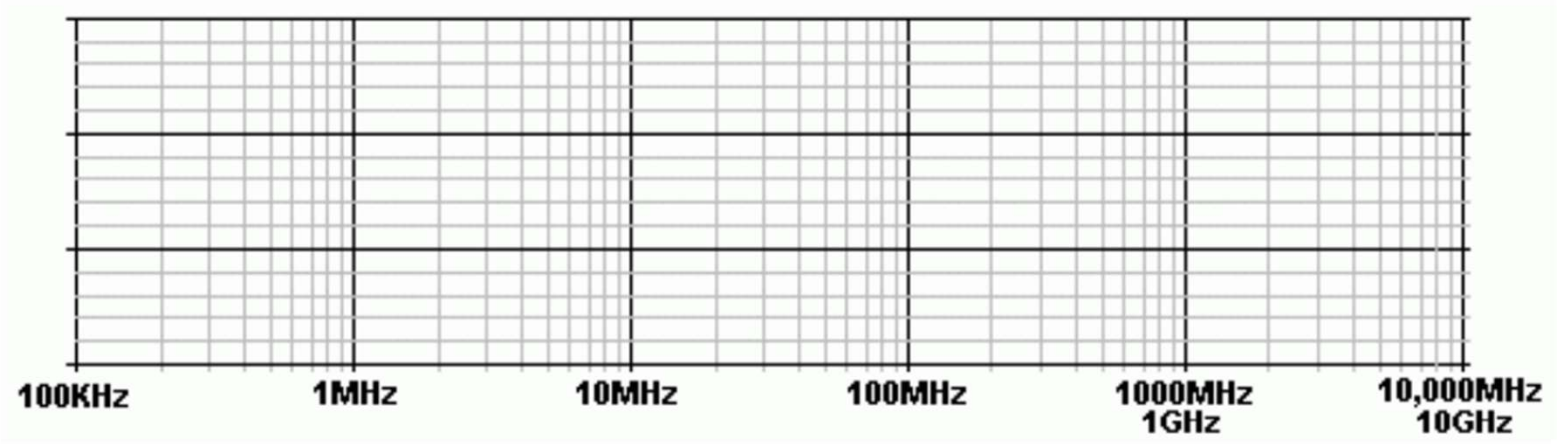
MERIT BADGE TRACKING

A HomeScouting Adventure

What does the Federal Communication Commission (FCC) do? And how does it differ from the International Telecommunication Union?

Do the following on the chart below.

- ❑ Draw a chart of the electromagnetic spectrum covering 300 kilohertz (kHz) to 3,000 megahertz (MHz).
- ❑ Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.
- ❑ 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).



Explain how radio waves carry information. Make sure to include how a transceiver, transmitter, receiver, amplifier, and antenna play a part.

MERIT BADGE TRACKING

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Explain the differences between a block diagram and a schematic diagram.

Block diagram

Schematic diagram

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

Describe how information is sent when using the following methods:

Method	How info is sent
Amplitude modulation (AM)	
Frequency modulation (AM)	

MERIT BADGE TRACKING

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Method	How info is sent
Continuous wave (CW) Morse Code transmission	
Single sideband (SSB) Transmission	
Digital transmission	

Explain how NOAA Weather Radio (NWR) can alert you to danger.

Explain how cellular telephones work. Identify their benefits and limitations in an emergency.

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

MERIT BADGE TRACKING

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Visit a radio installation (an amateur radio station, broadcast station, or public service communications center, for example). Describe 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.

Where did you visit? _____

Take notes below of your visit.

_____

_____

_____

_____

_____

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_____

Learn more about three career opportunities in radio. What are they?

1. _____

2. _____

3. _____

MERIT BADGE TRACKING

A HomeScouting Adventure

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

Career = _____

Education Required

_____

_____

Training Required

_____

_____

Experience Required

_____

_____

Why does this profession interest you?

_____

_____

Over the next few pages, you will find worksheets for each of the topics for Requirement 9. To save paper, only print the pages that you need.

Amateur Radio Option

A HomeScouting Adventure

Explain 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.

_____

_____

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

	License Requirements and Privileges
Technician	
General	
Extra Class	

Who administers amateur radio exams? _____

_____

Explain at least five Q signals or amateur radio terms.

Q signal or term	Explanation

Amateur Radio Option

A HomeScouting Adventure

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

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

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

Take notes below.

Radio Broadcasting Option

A HomeScouting Adventure

Describe FCC broadcast regulations. Include power levels, frequencies, and the regulations for low-power stations.

Prepare a program schedule for radio station "KBSA" of exactly one-half hour, including music, news, commercials, & proper station identification. Use the space below to outline your schedule.

- ❑ **Record your program on audiotape or in a digital audio format using proper techniques.**

Radio Broadcasting Option

A HomeScouting Adventure

Using a radio of your choice, tune up and down the dial of both the AM and FM bands Log each station below. Then choose five of the stations above and determine the program format and target audience. *For example the target audience for 95.3WKLM in Millersburg, OH is anyone who likes rock music because their program format is rock.*

Frequency	Call Sign	Community of License
95.3	WKLM	Millersburg, OH

#1 = _____	Program Format: _____
	Target Audience: _____
#2 = _____	Program Format: _____
	Target Audience: _____
#3 = _____	Program Format: _____
	Target Audience: _____
#4 = _____	Program Format: _____
	Target Audience: _____
#5 = _____	Program Format: _____
	Target Audience: _____

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: _____

_____

Cut: _____

_____

Radio Broadcasting Option

A HomeScouting Adventure

Fade: _____

_____

Continuity: _____

_____

Remote: _____

_____

Emergency Alert System: _____

_____

Network: _____

_____

Cue: _____

_____

Dead Air: _____

_____

PSA: _____

_____

Playlist: _____

_____

Describe alternative radio platforms such as internet streaming, satellite radio, and podcasts.

_____

_____

_____

_____

Shortwave & Medium-Wave Listening Option

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 and locate them geographically on a map.

Take notes below.

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.

Listen across several medium-wave bands for four one-hour periods - at least one period during daylight hours and at least one period at night. Log the stations and locate them geographically on a map.

Take notes below.

Shortwave & Medium-Wave Listening Option

Compare your medium-wave broadcast station logs and explain why some distant stations are heard at your location only during the night.

Demonstrate listening to a radio broadcast using a smartphone/cell phone. Include international broadcasts in your demonstration. Take notes below.

Amateur Radio Direction Find Option

Describe amateur radio direction finding and explain why direction finding is important as both an activity and in competition.

_____

_____

_____

_____

Describe what frequencies & equipment are used for ARDF or fox hunting.

_____

_____

_____

- ❑ **Build a simple directional antenna for either of the two frequencies used in ARDF.**
- ❑ **Participate in a simple fox hunt using your antenna along with a provided receiver.**
- ❑ **Show on a map how you located the "fox" using your receiver.**