GET YOUR
RADIO MERIT BADGE DAY

PLANNING AND MATERIALS NOTEBOOK

THIS NOTEBOOK WAS PREPARED BY,
AND IS THE PROPERTY OF,
THE VALENCIA COUNTY AMATEUR RADIO ASSOCIATION
NEW MEXICO

January 2004

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PLANNING YOUR RADIO MERIT BADGE DAY

Purpose of this Document

This document provides some suggestions for planning and conducting your own Get Your Radio Merit Badge Day. It will be updated as we gain more experience.

Program Basis

The materials associated with this document are based on the 2001 copyrighted merit badge pamphlet printed in 2002. The materials are based on this being done at a club station with a large group of scouts in one day. However, the same concepts and most of the material would apply to working with individual scouts at a home station, or to working with scouts at a camp or other gathering, either in one day or in several meetings.

Suggestions

- Start early – It takes time to plan, get a merit badge counselors approved, find a place, publicize the event, get the scouts signed up, and get the volunteer Hams on board.
- Coordinate date with scout district calendar to prevent conflicts.
- If you will be using HF contacts for the scout QSO's, avoid contest weekends.
- Get a lot of club members (and others) involved. We had 20 volunteers, some for half days and some at home to make VHF contacts with the scouts and we were a few short for our first time when we had 25 scouts.
- Use care in making assignments. We initially thought any Ham would be able to teach any of the mini courses provided they got the mentor guide and class materials ahead of time. This was not the case. Some are just not teachers. Some can't tune down their extensive knowledge to a scout level. And some do not know the background information well enough to adequately cover the required material. In the future we would still try to involve every person who volunteered, but would get a few more good teachers for the classes, even if we had to recruit them from outside the area. A note in passing, we had a YL of 14 who did an excellent job teaching a class.
- Get the applicable materials out to each volunteer a few weeks before the event and then go over it in detail with them on a one-on-one basis so they are prepared and know what they should be doing.
- Determine how many merit badge counselors you will need. We had two for 25 scouts and we were very (!) rushed to get things completed since this all occurred at the end of the day. If possible, consider having the counselor(s) not tied up with teaching. They could then collect the blue cards early and get most of the stuff completed on them before the rush as the end. This would also leave them some time to supervise and assist with the requirements pass off which follow each class.
- Consider the available space and stations you have when you set a scout limit. Remember the space must also accommodate your volunteers, the scout leaders, and some parents. We had 25 scouts the first time and found that for the space we had we should have limited it to 15 scouts.
- Pre arrange for other stations to visit with the scouts. A 10 minute QSO is a long QSO which will take a cooperative effort as will working in Q signals and appropriate procedures. We were fortunate our first time that propagation was great and lots of Hams from across the nation responded to our CQ's and were willing to talk individually to the scouts for the required 10 minutes.

- Have the scouts complete special QSL cards when they complete their contact. Have them self address a stamped envelope for a reply and mail to the contacted Ham. During the QSO, have the scout ask if the Ham's address is current on QRZ so they can send them a QSL card (and get the current address over the air if not current) and request the Ham wait until they get the scout's card before sending a card so it can go directly to the scout.
- Plan on having the scouts there from 8 AM to 5 PM. We planned 8:30 to 4 and we were rushed to get all the scouts circulated in small groups through all the classes, the one-on-one passing off of requirements, and the review/confirmation/signing of each scout's merit badge blue card.
- Even if you use VHF for the scout contacts, have an HF station running throughout the event so the scouts get a feel for the fun of Ham radio. Demonstrate CW. Map the contacts. We ran both an HF station and a VHF station. The HF contacts generated a lot more enthusiasm and interest; the scouts who only got on VHF felt they had been shorted.
- Have fun and make the event enjoyable for the scouts.
- Have something for the scout leaders and parents to do so they also get a good introduction to Amateur Radio.
- Be ready to offer follow up efforts such as a licensing class and JOTA participation.
- Have a follow-up plan in case some of the scouts are not able to complete the badge requirements during the day. Of the 25, we had two that had to leave early and one who just did not understand the material. The merit badge counselor arranged to work with these later so they could complete the requirements.

Open Your Event to Young Ladies Too

- We had two young ladies attend our event. One was a girl scout and was able to earn a girl scout badge by completing these requirements. The other was a sister to a scout who showed an interest and she waltzed right through every requirement.

Use of these Materials

Request

If you do your own Get Your Radio Merit Badge Day, please share your suggestions and improvements with us. If you make improvements to our documents, we would appreciate receiving copies. You can find contact information on our www.qsl.net/vcara web site. Also, we would appreciate hearing from you if you use this material so we can decide if it is worth leaving in our web site.

VALENCIA COUNTY AMATEUR RADIO ASSOCIATION
VALENCIA COUNTY, NEW MEXICO - SERVING OUR COMMUNITY AND OUR HOBBY
PO Box 268, Peralta, New Mexico 87042

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To Boy Scout Leaders and Boy Scouts in Valencia County and Nearby Communities

GET YOUR RADIO MERIT BADGE DAY

Saturday, January 24, 2004 - 8:30 AM - 4 PM
511 Becker Ave, Belen, New Mexico
Downtown Belen under the elevated water tank – enter by back door.

The Valencia County Amateur Radio Association will be hosting a **GET YOUR RADIO MERIT BADGE DAY**. With a little preparation, most scouts will complete all requirements for their radio merit badge during the event. A registered merit badge counselor will be there to verify completion and sign the scout's blue cards.

You are invited to bring your scouts and join in this activity. Individual scouts are also welcome, but they must be accompanied by a scout buddy in accordance with scout requirements. Parents are welcome too. Scouts in your troop who are not yet ready to work on the merit badge are welcome to come and get an introduction to Ham Radio.

Before coming, each scout should:

Get a merit badge blue card, fill it out and have it signed by their scout leader.
Get a copy of the Radio Merit Badge Pamphlet and:
Read the first 53 pages.
Study pages 16-18 in the merit badge pamphlet

All other information will be presented, discussed and reviewed in small groups (and individually as necessary) so the each scout can complete the requirements for this merit badge. The club's KC5OUR Amateur Radio station will be on the air so each scout can fulfill the requirement for contacting another station and logging the contact. This event and the operation of the station will also provide a good introduction to the exciting world of Amateur Radio.

If you want to participate in this event, make reservations with Ralph Clark (NM5RC) at 821-7636 or Paul Ridley (N5PR) at 864-7217 by January 6. Also call if you have any questions. Participation is limited to 20 scouts, so early registration is advised.

Lunch: A two dollar ($2) per scout ($3 for adults) contribution to the pizza and soda fund or bring your own.

WE HOPE TO SEE YOU AT OUR
FIRST ANNUAL GET YOUR RADIO MERIT BADGE DAY

Valencia County Amateur Radio Association

VOLUNTEERS FOR HELPING WITH GET YOUR RADIO MERIT BADGE DAY

Saturday, January 24, 2004 at club station in Belen Contribute $3 to the pizza pool or bring your lunch.

Indicate time you will spend at the club station. Need 10 at all times.

	Name	Callsign	8:00 - 1:00	12:00 - 5:00	Phone	Email	Said OK	Class Info Sent	Rechek Just Before	Classes
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Indicate time you will be at your home station ready to talk to scouts and indicate if 2-meter and/or HF. Need 2 at all times. Indicate time if not 8-1 and/or 12-5.

1										
2										
3										
4										
5										
6										

SCOUTS COMING TO THE RADIO MERIT BADGE DAY EVENT

Contact Person	Who is this Person?	Troop Number	Location	Number of Scouts	Contact Phone	Contact's Email	

TOTAL NUMBER OF SCOUTS **0**

We need to contact and reconfirm with all of these about ten days before the event.
If more than we can handle want to participate, we could put them on standby in case there are cancellations.

SUMMARY OF MATERIALS FOR EACH MINI CLASS

Purpose of this List

This list was prepared to make it easier for those organizing the event to assemble packages of printed material for each mini class mentor and to arrange for other materials.

General Material for Mentors and Event Supplies

Mentor Pre Event Briefing	General Instructions for Mentors Merit badge Requirement Checklist (print side-by-side on 11 X 17)
General Supplies	Merit badge pamphlet Pencils Paper

List by Mini Class

General Introduction

Mini class guide	General Introduction
Merit badge pamphlet pages	none
Handouts for scouts	The Plan for Today Merit Badge Requirement Checklist (page 1 only)
Other	Pencils for scouts to use

General Radio Information

Mini class guide	General Radio Information
Merit badge pamphlet pages	11, 14, 16-19, and 42
Handouts for scouts	Radio Station Callsigns
Other	8.5 X 11 paper

Radio Safety

Mini class guide	Radio Safety Safety Demo/Discussion/Visual Aide sheet
Merit badge pamphlet pages	17 and 30-31
Handouts for scouts	none
Other	115 V zip cord with plug/bare wires

Radio Frequencies

Mini class guide	Radio Frequencies and Propagation
Merit badge pamphlet pages	16-19
Handouts for scouts	None
Other	Icom band chart 20-ft of rope Meter stick, 11 X 17 paper 8.5 X 11 paper

Propagation of Radio Waves

Mini class guide	Propagation of Radio Waves
Merit badge pamphlet pages	12-15 and 39
Handouts for scouts	Radio Wave Propagation
	WWV and WWVH Broadcast Stations
	Sending Information with Radio Waves
Other	Icom band chart
	URFMS repeater map,
	Cell phone (or FRS radio, GPS unit)
	8.5 X 11 paper

Electronic Parts and Symbols

Mini class guide	Electronic Parts and Symbols
Merit badge pamphlet pages	20-29
Handouts for scouts	Block and Schematic Diagrams
	Schematic Symbols for Electronic Parts
Other	Demonstration board with spare parts
	Box of mixed electronic parts
	Electronic boards with variety of parts on them
	8.5 X 11 paper

Amateur Radio Licenses

Mini class guide	Amateur Radio Licenses
Merit badge pamphlet pages	39-42
Handouts	The Amateur Radio Licenses
Other	Icom band chart
	Now You're Talking book and/or other test books
	8.5 X 11 paper

Ham Radio Station Visit

Mini class guide	Ham Radio Station Visit
Merit badge pamphlet pages	none
Handouts for scouts	WWV and WWVH Broadcast Stations
Other	Stations: HF, VHF, HT, and mobile
	Accessories: CW key, UTC clock, headphones
	Logbook
	ARRL Operating Manual and ARRL Handbook
	FCC regulations
	Icom band chart

Preparing to Talk on the Radio

Mini class guide	Preparing to Talk on the Radio
Merit badge pamphlet pages	44-49
Handouts for scouts	Radio Contact Procedures
	Q Signals
	RST System
	Phonetics
	UTC Conversion Chart
	Logging Contacts
Other	World time circle
	Two FRS radios with spare batteries
	8.5 X 11 paper

Radio Contact

Mini class guide	Radio Contact
Merit badge pamphlet pages	none
Handouts for scouts	none (scouts will have handouts from previous classes)
Other	none

Radio Contact Home Station

Mini class guide	Radio Contact Procedures for Home Stations
Merit badge pamphlet pages	None
Handouts for reference only	The Plan for Today
	Radio Contact Procedures
	Q Signals
	RST System
	Phonetics
	UTC Conversion Chart
	Logging Contacts
	Merit Badge Requirements Checklist

Amateur Radio Equipment and Procedures

Mini class guide	Amateur Radio Equipment and Procedures
Merit badge pamphlet pages	44-51
Handouts for scouts	none (scouts will have from previous classes)
Other	8.5 X 11 paper

GENERAL INSTRUCTIONS FOR MENTORS

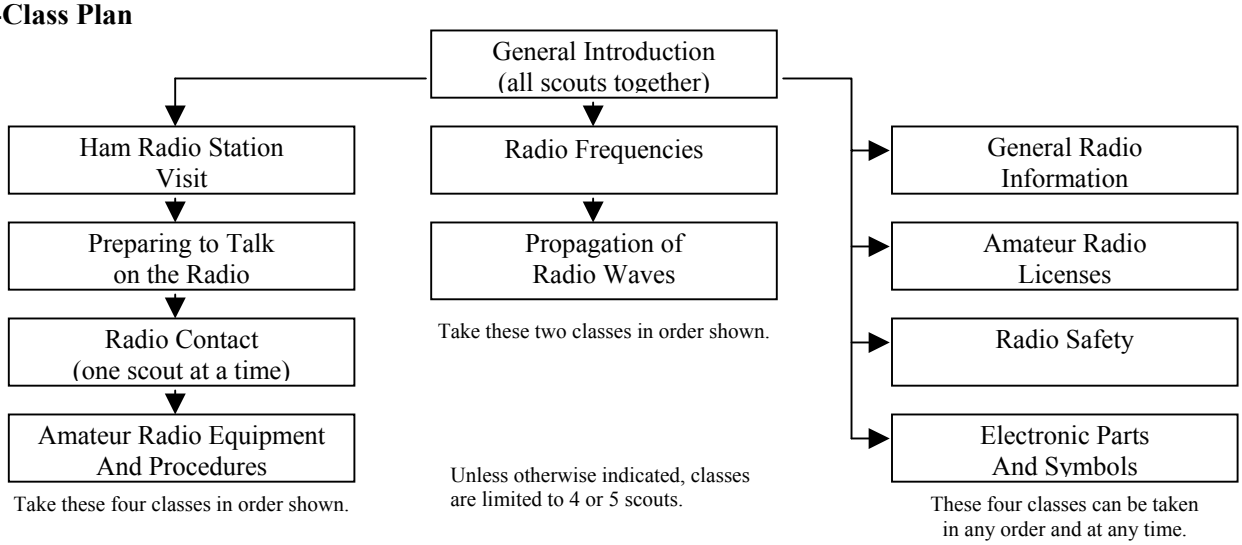
Introduction

Eleven mini classes will be used to help the scouts prepare for, and complete, the requirements for their badge. The requirements are given in the radio merit badge pamphlet as is most of the information the scout will need to complete the requirements. The scouts will have a copy of the pamphlet and will have read it before they arrive. We have about a dozen handouts which provide additional information (and information organized differently) which will help the scouts learn the required information. The classes are organized to group related material rather than in the order of the requirements given in the pamphlet.

The badge requirements given in the pamphlet have been divided into bite-size pieces and an 8.5 X 11 record sheet showing these will be given to each scout to carry throughout the day. When a scout completes each bite-size requirement, the class mentor will sign the sheet in the space provided. The merit badge counselor supervising our event will review this record sheet and complete the scout's official merit badge blue card record. The record sheet has also been printed on an 11 X 17 sheet with additional information including applicable pages of the pamphlet, applicable handouts and the associated class; you will have a copy of this for reference.

Written guides have been prepared for each class. These guides list the badge requirements, applicable pages in the pamphlet, associated handouts, suggested activities for you to do with the scouts, and documenting a scout's fulfillment of the requirements.

Mini-Class Plan



Remember

- To successfully complete a requirement, the scout has to do what it says, nothing more or less.
- When passing off a requirement (except for visiting the station), it should be done on a one-on-one basis rather than in a group.
- Scouts can move to another class (or return to a previous mentor to pass off a requirement) while waiting to pass off a requirements for a just completed class.
- Mentors should pitch in and help teach other classes and verify scouts' fulfillment of requirements when they have free time.
- Provide one-on-one mentoring when a scout needs some extra instruction.
- Time will not allow us to go into as much detail as our Ham Radio excitement would want us to.
- Boy scouts are not adults, so putting some zip and demonstrations into our explanations will help keep their interest and firm the information in their minds.
- ASK QUESTIONS AND GROUP DISCUSSIONS RATHER THAN LECTURE.
- Have fun helping the scouts have an enjoyable introduction to Amateur Radio.

GENERAL INTRODUCTION

Objectives

- Welcome the scouts, leaders and parents.
- Provide an oversight of how the event is organized.

Reference Materials

- Handouts: The Plan for Today
  Merit Badge Requirement Checklist

Suggested Activities

- Welcome scouts and introduce Ham volunteers and merit badge counselor.
- Mention scouts must have their copy of the Radio Merit Badge Pamphlet and a blue card signed by their scout leader (some scouts may be sharing a pamphlet).
- Review The Plan for Today handout:

    - Eleven mini classes (this is the first).
    - Some classes must be taken in sequence.
    - Some classes can be taken in any order.
    - Classes (except for this introduction and the radio contact) will be in groups of 4-5 scouts.
    - Passing off badge requirements will be on a one-on-one basis.
    - Encouraged to move to other classes rather than wait to pass off requirements.
    - Merit badge counselor and volunteers other than the class instructor can work with you to pass off requirements.

- Review Merit Badge Requirement Checklist

    - Same requirements as in merit badge pamphlet, but divided into smaller pieces.
    - Put your name on checklist and keep it with you so it can be signed by the volunteers as you complete each requirement.
    - Merit badge counselor will review the checklist with you and complete and sign your blue card.

- You will receive a bunch of handouts during the classes to help you understand the material.

- Ask lots of questions and request one-on-one instruction if you do not understand.

- Go over other arrangements

    - Rest room location, lunch arrangements, waste baskets, off limits areas, etc.
    - We are guests of the City of Belen and the Metropolitan Court Judge. Please keep everything clean and neat.

- We hope you have a good time. We expect every scout will earn their radio merit badge today.

- Assign groups to the first classes.

BOY SCOUT RADIO MERIT BADGE REQUIREMENT CHECKLIST

No.	Requirement	Verified By (name and callsign)
1 a	Explain what radio is [general description].	
b	Explain the differences between broadcast radio and hobby radio.	
c	Explain the differences between broadcasting and two-way communicating.	
d	Explain what broadcast radio and amateur radio call signs are and how they differ.	
e	Explain what phonetics are and how they are used.	
2 a	Sketch a diagram showing how radios waves travel locally and around the world.	
b	How do broadcast stations WWV and WWVH help determine what you will hear when you listen to the radio?	
3 a	Draw a chart of the electromagnetic spectrum covering 100 kHz to 1000 MHz.	
b	Label the MF, HF, VHF, UHF and microwave portions of the spectrum on your chart.	
c	Locate on your chart at least eight radio services, such as AM and FM commercial broadcasts, citizens band (CB), television, amateur radio (at least four ham bands), and police.	
d	Discuss why some radio stations are called DX and other are called local.	
e	Explain what the FCC and ITU are.	
4 a	Explain how radio waves carry information.	
b	Include in your explanation: Transceiver, transmitter, amplifier and antenna.	
5	Explain the safety precautions for working with radio gear, particularly direct current and RF grounding.	
6 a	Explain the difference between a block diagram and a schematic diagram.	
b	Draw a block diagram that includes a transceiver, amplifier, microphone, antenna and feedline.	
c	Explain the differences between an open circuit, a closed circuit, and a short circuit.	
d	Draw eight schematic symbols for electrical parts.	
e	Explain what three of the electrical parts do.	
f	Find three electrical parts to match three of the schematic symbols.	
7 a	Amateur Radio	
1	Describe some of the activities that licensed amateur radio operators can do on the air.	
2 *a*	Carry on a 10-minute real or simulated ham radio contact using voice; use proper call signs, Q signals and abbrevations	
b	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.	
4 *a*	Explain some of the requirements for a Technician Class license.	
b	Explain some of the privileges a Technician Class licensed radio operator has.	
c	Explain who gives amateur radio exams.	
5 *a*	Explain how you would make an emergency call using voice or Morse code.	
b	Tell why the Federal Communications Commission has an amateur radio service.	
6 *a*	Discuss handheld transceivers versus home “base” stations.	
b	Explain the uses of mobile amateur radios.	
c	Explain the uses of amateur radio repeaters.	
8 a	Visit a ham radio station.	
b	Discuss what types of equipment you saw in use and how it was used.	
c	Discuss what types of licenses are required to operate and maintain the equipment.	
d	Discuss the purpose of the station.	

REVIEWED AND APPROVED BY RADIO MERIT BADGE COUNSELOR (also complete and sign scout's blue card)

Name: Ralph H. Clark, NM5RC Signature: _____ Date: _____

Merit Badge Pamphlet Pages	HANDOUTS															MINI CLASS GUIDES											
	The Plan for Today	Requirements Checklist	Radio Station Call Signs	Radio Wave Propagation	WWV and WWVH	Sending Info with Radio	Block & Schmtic Diagms	Schematic Symbols	Radio Contact Procedrs	Q Signals	RST	UTC	Phonetics	Loging Contacts	Amateur Radio Licenses	General Instructions	General Introduction	General Radio Info	Radio Frequencies	Propagation	Radio Safety	Electronic Parts & Symb	Amateur Radio Licenses	Ham Radio Station Visit	Preparing to Talk	Radio Contact	Radio Contact-Home Sta	Am Radio Equip & Proc
11																		X										
11																		X										
11																		X										
42			X															X										
42																												X
14 - 16				X																X								
14 - 16					X															X				< X				
16 - 19																			X									
16 - 19																			X									
16 - 19																			X									
16 - 19																		X										
16 - 19																		X										
12 - 13						X														X								
12 - 13						X														X								
30 - 31																					X							
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Also, Safety Demo/ . . . Aide sheet

X > or < X = covered here, but signed off in class indicated with X

GENERAL RADIO INFORMATION

Objectives

- Prepare the scout to complete the following merit badge requirements:

  - 1.a. Explain what radio is (general description).
  - 1.b. Explain the differences between broadcast radio and hobby radio.
  - 1.c. Explain the differences between broadcasting and two-way communication.
  - 1.d. Explain what broadcast radio and amateur radio call signs are and how they differ.
  - 3.d. Discuss why some radio stations are called DX and others are called local.
  - 3.e. Explain what the FCC and ITU are.

Reference Material

- Handouts: Radio Station Callsigns.
- Merit badge pamphlet pages: 11, 14, 16-19, and 42.
- 8.5 X 11 blank paper for scouts to use.

Suggested Activities

- Discuss the handout.
- Lead a discussion comparing broadcast radio and hobby radio, and comparing broadcasting and two-way communication.
- Discuss what a Ham means when he refers to a station as being a DX station.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

RADIO STATION CALL SIGNS

Radio station call signs are assigned by the Federal Communications Commission (FCC).

Call signs for commercial broadcast radio stations in the United States:

Begin with **W** if the station is east of the Mississippi River.

Example: **WHSE**

Begin with **K** if the station is west of the Mississippi River.

Example: **KKOB**

Do not contain numbers.

Some stations use numbers with their call signs to indicate where you can find them on the radio dial (like 770 KOB), but the number is not part of their call sign.

Call signs for Amateur Radio stations in the United States:

Begin with **A**, **K**, **N**, or **W**.

Examples: **AA3BN**, **KC5OUR**, **N5PR**, **W6KJC**

Have a number in them that corresponds to the area of the country in which the operator lives (see map on page 43 of the merit badge pamphlet).

However:

When you move, you do not have to get a new call sign.

You can apply for a special call sign known as a vanity call sign containing any number.

So, you can not always tell where a Ham lives by the number in his call sign.

An Amateur Radio operator's call sign identifies both the operator's station and the operator.

A Ham may use his call sign wherever he goes in the United States.

A visiting Ham may operate someone else's station using their own call sign.

A guest may operate a Ham's station using the owner's call sign if the owner is there and acts as the control operator.

RADIO SAFETY

Objectives

- Prepare the scout to complete the following merit badge requirement:

    5 Explain the safety precautions for working with radio gear, particularly direct current and RF grounding.

Reference Material

- Merit badge pamphlet pages: 17 and 30-31.
- Visual aide: 120 VAC wire with plug on one end and bare wires on other end.
    - Safety Demonstration/Discussion/Visual Aide (write up about using above)

Suggested Activities

- Use visual aide and go over electrical shock questions which accompany it.
- Ask questions about the material on pages 30-31 in the merit badge pamphlet and provide additional insight to help the scouts understand the safety considerations.
- Use questions to get the scouts to understand the following points about RF safety and provide additional insight as needed (this material isn't really covered in the merit badge pamphlet).
    - A microwave oven demonstrates the power of RF energy. A microwave oven uses RF around 2500 MHz to cook food (See where this frequency falls on the chart on page 17 of the pamphlet.). You will note your microwave is enclosed in a metal case and the window has a metal screen to shield you from the RF and the microwave generator turns off when the door is opened to protect you from RF.
    - The amount of energy depends on the transmitter power, type of antenna and the distance from the antenna. Some antennas concentrate energy in one direction.
    - Some frequencies are more dangerous than others. As an example, a wave length of 2.5 cm would find the eyeball a good receiving antenna and could damage it.
    - During the Electronic Parts and Symbols mini class, you will see an example of the RF energy in and leaving an antenna.
    - It is important that RF sources be grounded.
    - Typical power, frequencies and distances from antennas do not create RF hazards for Ham operators, their families or their neighbors. Hams receive special RF safety training.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

SAFETY DEMONSTRATION/DISCUSSION/VISUAL AIDE

(use with Safety mini-class)

What

120 VAC zip wire with plug on one end and exposed wires on other end.
Run a cable tie through holes in plug prongs so it can not be actually plugged in.

Discussion Questions

Note: Questions 3 and 4 are the important items for this mini class. Questions 1 and 2 will help prepare the scouts for questions 3 and 4. Questions 1, 2 and 5 will reinforce concepts further discussed in another mini class. Question 5 can be skipped here.

1. If we plug this in and the bare wires are not touching, what kind of a circuit is it? (Open)

2. If plugged in and we brought the two wires bare wires together, what kind of circuit is it? (Short) What would happen? (Sparks, wires welded together, wire insulation melted, fuse in building electrical system blown.) Why? (No limit to the electrical current that can flow in the wires.)

3. What would happen if we plugged it in and then used one hand to touch the two bare wires? (Electrical shock in hand and may get burned. May leave us a little dazed.)

4. What would happen if we held one bare wire in one hand and the other bare wire in the other hand and then had someone plug it in? (Electrical shock through our body, possibly affecting our heart and killing us; as a minimum burn both hands and leave us a quite dazed. Illustrates the importance of the one hand rule.)

5. If we connected the two wires to a light bulb and plugged it in, what would happen? (Bulb would light.) Why would the wires not overheat and the building fuse blow? (The bulb is electrical load (resistance) in the circuit which limits the amount of electrical current that can flow in the circuit.)

RADIO FREQUENCIES

Objectives

- Help prepare the scout to fulfill the following merit badge requirements:

  - 3.a. Draw a chart of the electromagnetic spectrum covering 100 kHz to 1000 MHz.
  - 3.b. Label the MF, HF, VHF, UHF and microwave portions of the spectrum on your chart.
  - 3.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 ham bands), and police.

Reference Materials

- Handouts: None
- Merit badge pamphlet pages: 16-19.
- Icom band chart.
- 11 X 17 paper for the scouts to use to draw their frequency charts.
- 8.5 X 11 blank paper for scouts to use.
- 20-ft rope and meter measuring stick

Suggested Activities

- Review the handout.
- Review the frequency chart on page 17 of the pamphlet
- Show and explain the Icom band chart.
- Have one scout hold one end of the rope and another scout move the other end slow then fast to create waves (if you have a slick floor, this can be done horizontally on the floor and the movement stopped so the scouts can see the waves and how they might be measured). Discuss frequencies, waves and wave lengths referring to meter stick and to the fact that radio signals travel at 300,000,000 meters per second.
- Go over Hz, KHz, MHz and GHz (this is on the middle of page 16 of the pamphlet).
- Provide the scout with a large piece of paper and ask them to prepare their frequency chart (requirements 3.a, 3.b and 3.c). They can use the reference material while doing this.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

PROPAGATION OF RADIO WAVES

Objectives

- Help prepare the scout to fulfill the following merit badge requirements:

  - 2.a. Sketch a diagram showing how radio waves travel locally and around the world.
  - 2.b. How do broadcast stations WWV and WWVH help determine what you will hear when you listen to the radio?
  - 4.a. Explain how radio waves carry information.
  - 4.b. Include in your explanation: Transceiver, transmitter, amplifier and antenna.
  - 7.a.6.*c.* Explain the uses of amateur radio repeaters.

Reference Materials

- Handouts: Radio Wave Propagation.
  WWV and WWVH Broadcast Stations.
  Depending on order scout takes classes, they may already have this.
  Sending Information with Radio Waves
- Merit badge pamphlet pages: 12-15 and 39.
- Icom band chart.
- URFMS repeater map.
- Cell phone (or FRS radio or GPS unit).
- 8.5 X 11 blank paper for scouts to use.

Suggested Activities

- Quickly go over the handouts.
- Discuss wave length vs antenna length – use cell phone and CB and station antennas as examples.
- Ask and discuss the following questions:

  - Why are FM radio stations only heard locally while AM radio stations are heard at long distances? Refer to frequency chart to see that FM stations broadcast above 50 MHz so they are limited to line of sight while AM stations are about 1 MHz and will thus bounce off the ionosphere.
  - Why do you hear different AM radio stations at night than you do in the day? Refer to frequency chart and propagation handout and discuss how the ionosphere changes at night.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

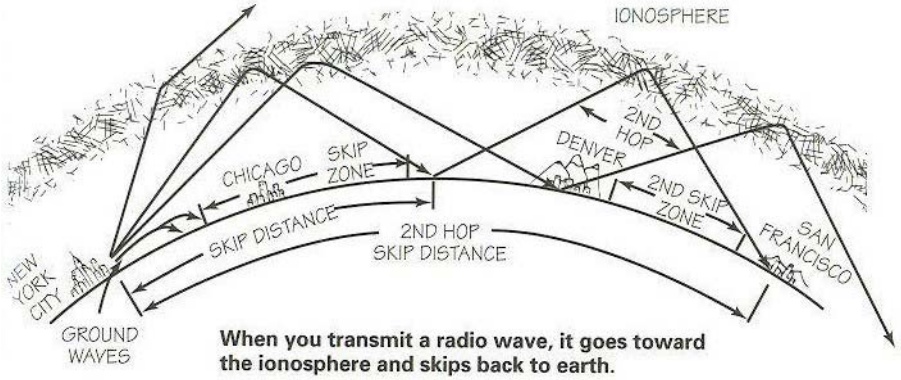
RADIO WAVE PROPAGATION

Introduction

Propagation means how radio waves get from the transmitter to the receiver.

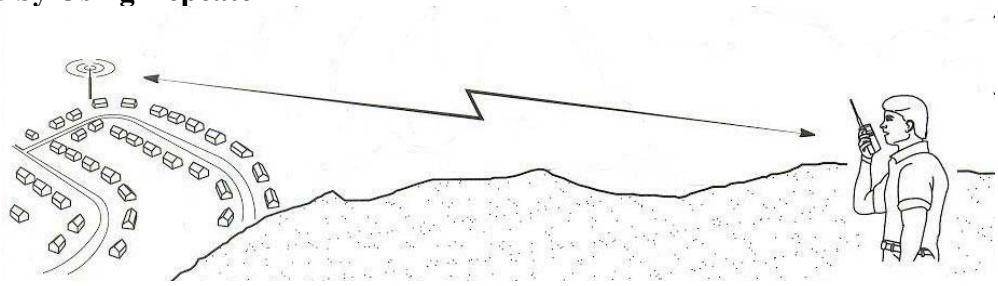
High frequency radio waves can bounce off the ionosphere (i.e., a layer of the atmosphere high above the earth) and return to earth a long distance from the transmitter. Starting at about 50 MHz (i.e., very high frequency or VHF) and higher, radio waves do not return to earth and are thus limited to being received within sight of the transmitter. Examples are shown below:

HF Radio Waves Bounce Back to Earth and Make Long Distance Contacts Possible

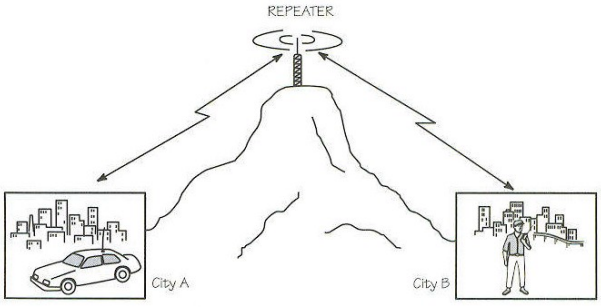


When you transmit a radio wave, it goes toward the ionosphere and skips back to earth.

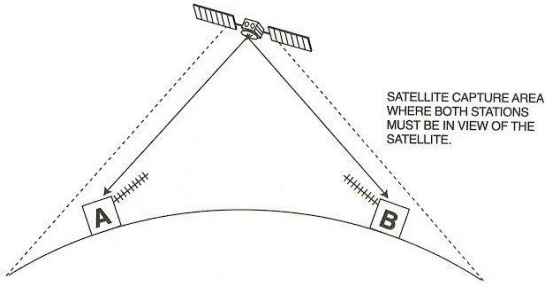
VHF and Higher Frequency Waves are Limited to Line of Sight. Distance Covered Can Be Increased by Using Repeater



VHF and UHF radio signals travel in a straight line from antenna to antenna.



You can use a handheld radio while walking or driving to send your signal through a repeater. By using repeaters, you can talk to people farther away.



Successful Earth-to-Satellite Communications

There are about 100 Amateur Radio repeaters in New Mexico. One sponsor's repeaters can be linked together so communication around the state is possible with a HT. Another sponsor's repeaters are always linked so communications on one repeater are heard throughout the state.

WWV AND WWVH BROADCAST STATIONS

Uses

Provide accurate time signals for GPS, satellite, communications and reference. Determine radio wave propagation at various frequencies.

Operated By

National Institute of Standards and Technology (NIST) which is an agency of the U.S. Department of Commerce.

Location

WWV is located in Fort Collins, Colorado
WWVH is located on the Island of Kauai, Hawaii

Frequencies and Power

MHz	Watts WWV	Watts WWVH
2.5	2,500	5,000
5	10,000	10,000
10	10,000	10,000
15	10,000	10,000
20	2,500	none

Power Comment

Amateur Radio stations typically transmit at 25 to 700 watts. Thus, you may be able to hear WWV or WWVH, but not be able to hear (or be heard by) Ham stations located near WWV or WWVH even though you both have your radios tuned to a frequency in the same band.

Similar Stations

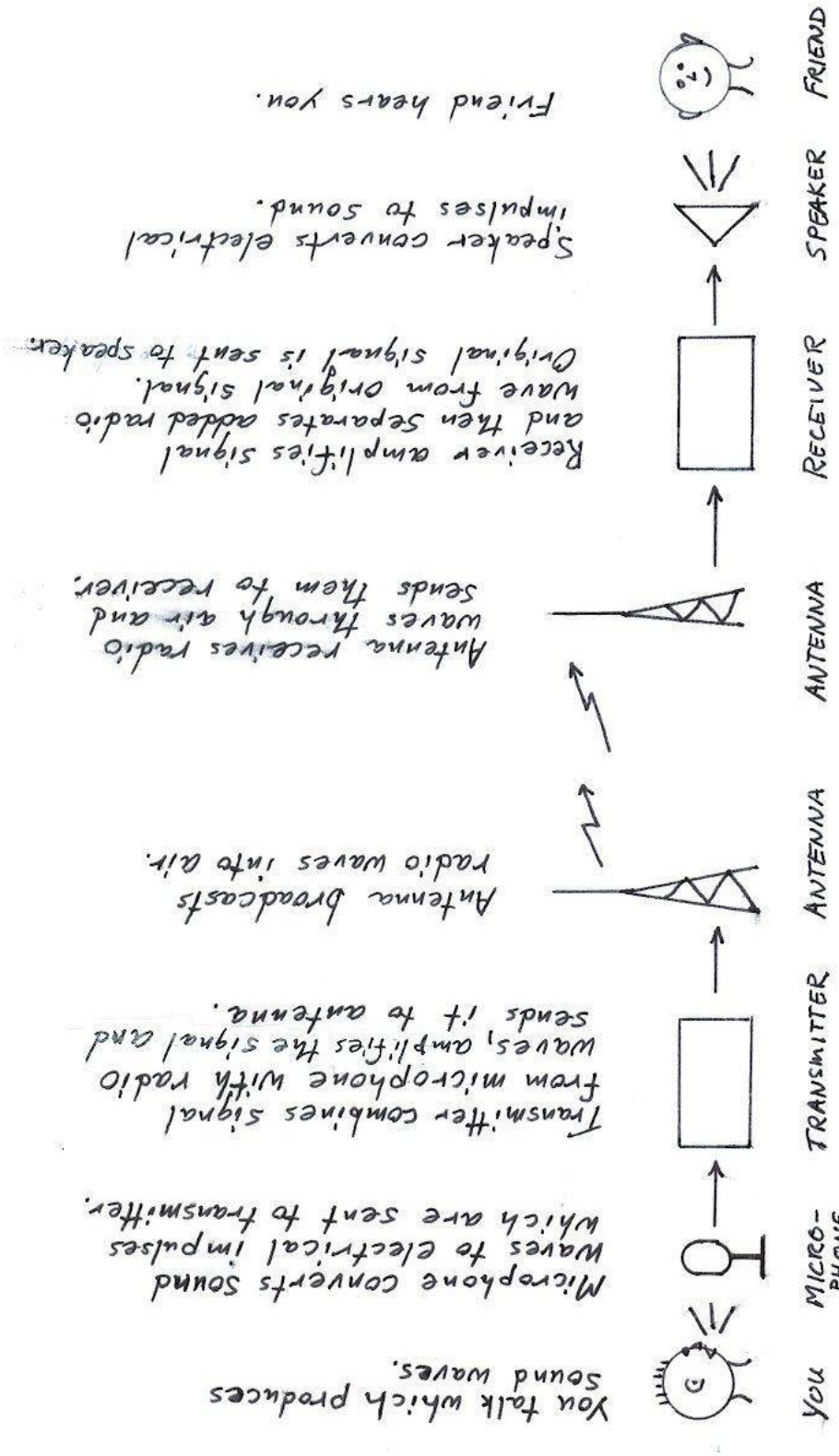
There are many other beacon stations around the world that can be tuned into to see if the band (frequency) is open to the station's location.

Possible Demonstration

When you visit the KC5OUR station, ask if you can listen on some of these frequencies and determine if you are hearing WWV or WWVH.

SENDING INFORMATION WITH RADIO WAVES

Process Diagram



Note: When the transmitter and receiver are in the same box, it is often referred to as a transceiver.

How Radio Waves Carry Information

Radio waves can be modified to carry information in many ways. Three ways are shown and described below.

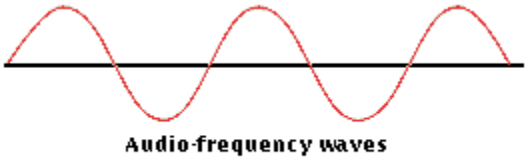
The "Audio-frequency waves" shown below might be the electrical signal produced by a microphone when you speak into it. It would also be the electrical signal sent to the speaker to produce the voice you hear coming from the radio.

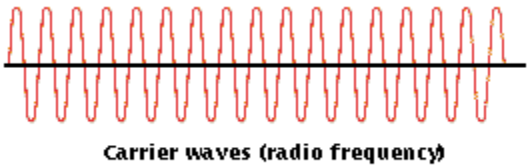
The "Carrier waves" shown below are the radio waves produced by the transmitter at the frequency you have your radio set to.

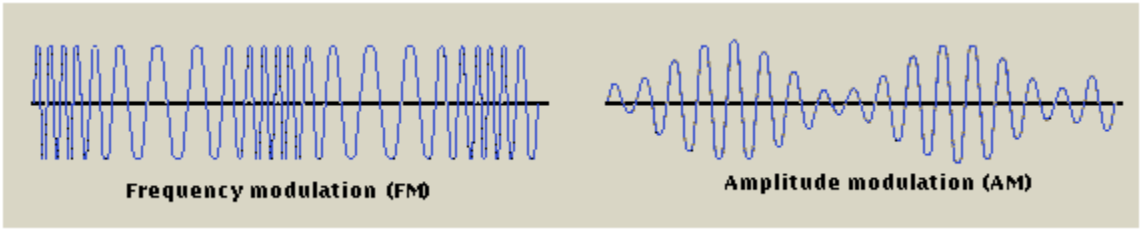
The transmitter modifies the carrier waves by combining it with the audio frequency waves to produce a new radio wave.

> One way to do this is by changing the carrier frequency. This is known as frequency modulation (FM). A picture of the resulting wave is shown below.
>
> Another way of modifying the carrier wave's amplitude (i.e., height). This is known as amplitude modulation (AM). A picture of the resulting wave is shown below.

These modified waves thus carry the audio frequency signal as they are transmitted from antenna to antenna through the air. When this modulated signal gets to the receiver, the receiver pulls out the carrier wave and is left with the original audio frequency wave which it can send to the speaker.

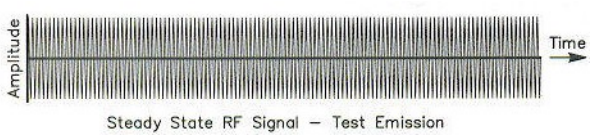


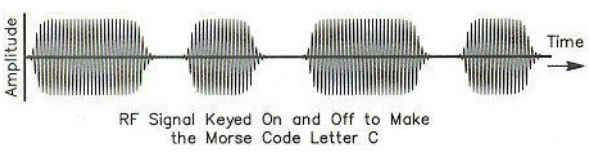




FM radio stations like KUNM 89.9 use this. AM radio stations like 770 KKOB use this.

Another way a radio wave can carry information is to just turn it on and off. This is the way Morse code is sent. Pictures of the carrier wave and the signal you get when you turn it on and off to send the letter C is shown below.





ELECTRONIC PARTS AND SYMBOLS

Objectives

- Help the scout complete the following merit badge requirements:

  6.a. Explain the difference between a block diagram and a schematic diagram.
  6.b. Draw a block diagram that includes a transceiver, amplifier, microphone, antenna and feedline.
  6.c. Explain the differences between an open, a closed, and a short circuit.
  6.d. Draw eight schematic symbols for electrical parts.
  6.e. Explain what three of the electrical parts do.
  6.f. Find three electrical parts to match three of the schematic symbols.

Reference Materials

- Handouts: Block and Schematic Diagrams
  Schematic Symbols for Electronic Parts
- Merit badge pamphlet pages: 20-29.
- Demonstration board with jumper wires, batteries and spare fuses.
- Box of mixed electronic parts and boards with electronic parts on them.
- 8.5 X 11 blank paper for scouts to use.

Suggested Activities

- Use the block diagram Block and Schematic Diagrams handout to illustrate both types of diagrams.
- Use the test board to demonstrate:

  Open circuit, closed circuit and short circuit.
  A resister reduces the amount of current (electricity) flowing in a circuit.
  A diode only passes current in one direction.
  A capacitor will not pass DC current (or low frequency AC).
  Ask the questions posed on the board.
  The difference between AC and DC current.

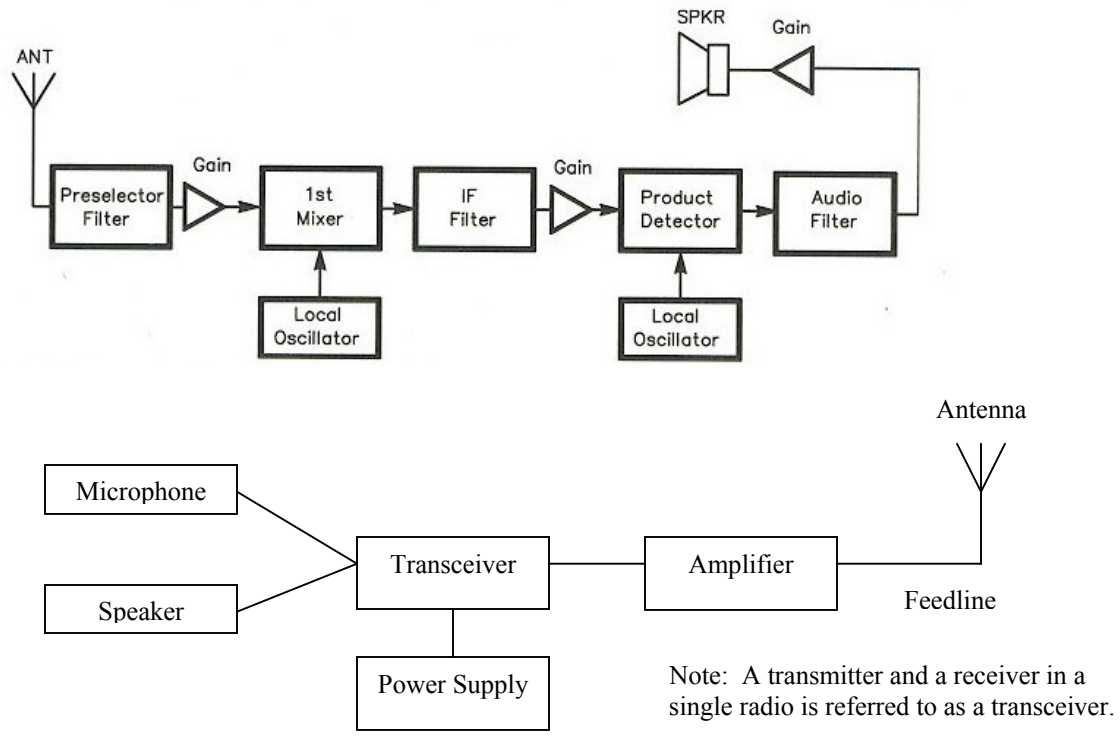
- Use the Schematic Symbols for Electronic Parts handout along with the box of parts and the parts on the boards to identify some of the parts and the corresponding symbols.
- Page through pages 20-29 from Radio Merit Badge pamphlet with the scouts and answer any questions the scouts have.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

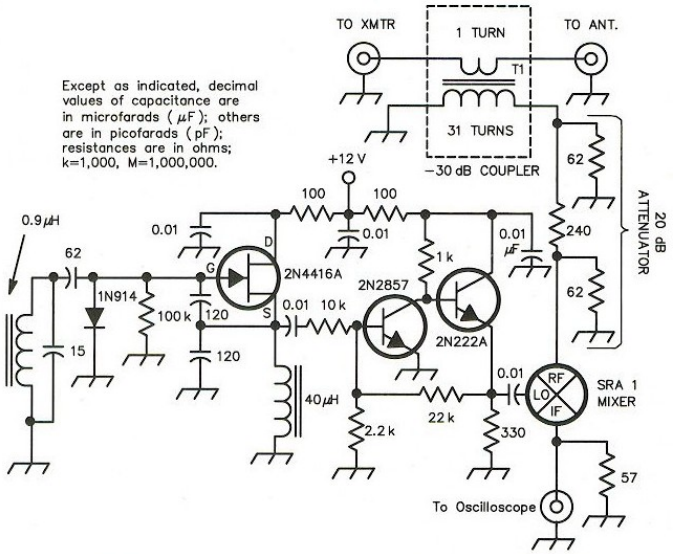
BLOCK AND SCHEMATIC DIAGRAMS

Block Diagrams show radio components in functional blocks. The blocks are connected to show how they relate to each other. Here are two examples:

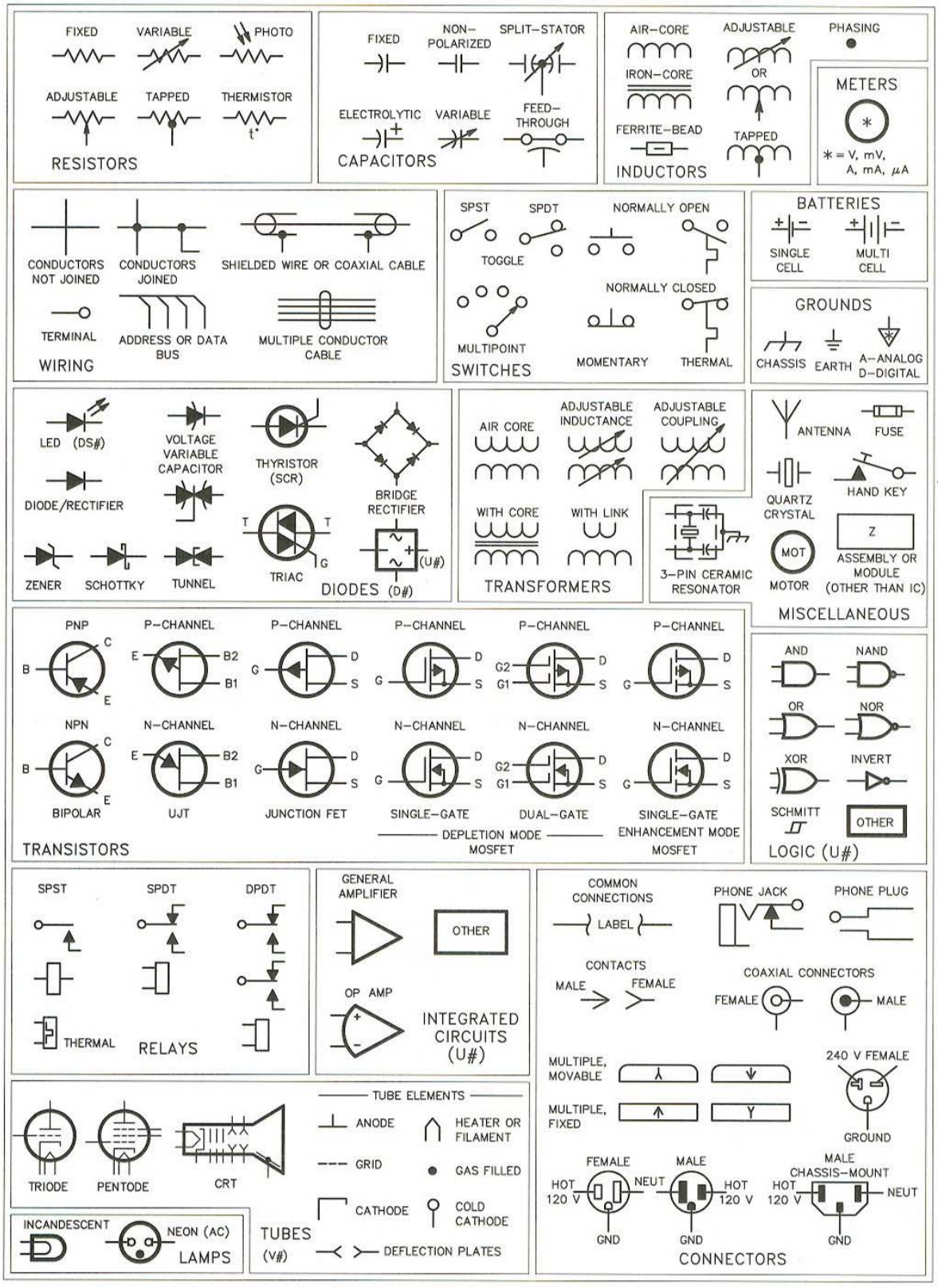


Block Diagram for a Typical Amateur Radio Station

Schematic Diagrams show the individual electronic parts in the equipment and how the parts are connected together. Here is an example:



SCHEMATIC SYMBOLS FOR ELECTRONIC PARTS



ELECTRONIC PART DEMONSTRATION BOARD SUGGESTIONS

We made a simple board with exposed components, wires and open push to make momentary circuit through various components and a light bulb. This is used in the Electronic Parts and Symbols mini class to demonstrate show actually parts and their function. We also use a box of old parts and a couple of old boards with parts on them to show further parts.

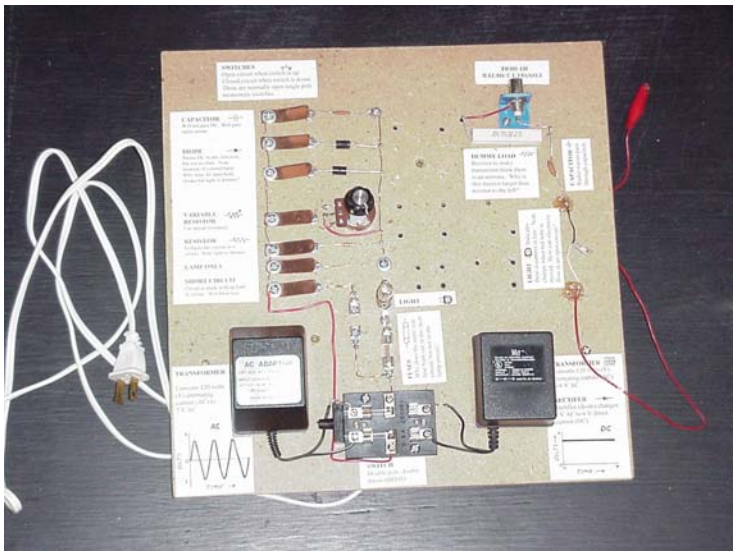
A DC wall wart and an AC wall wart were mounted on the board to provide the power and connected to the circuit with a DPDT knife switch. The board can be used to demonstrate:

- An open circuit
- A closed circuit
- A short circuit (blows a fuse when current does not go through bulb, yet the same size fuse is not blown in the circuit which has the bulb)
- A resistor restricts the flow of electricity (bulb is dimmer)
- A rheostat is a variable resister.
- A capacitor will not pass DC (unfortunately, it won't pass AC either)
- A diode will pass DC in one direction
- A diode only passes part of the AC (bulb is dimmer)
- The difference between AC and DC (little graphs on the board help with this)

Also on the board is a TNC connection so an HT can be connected. This circuit contains a 50 ohm resistor as a dummy load and a wire running from the center connector to a capacitor then to a mini light bulb and then a foot or so of wire of wire. When the transmitter is turned on, the bulb lights: This indicates:

- There is current flowing in the antenna wire, i.e., RF have energy.
- RF waves pass through capacitors.
- You should stay away from antennas.
- The bulb lights even through the antenna is an open circuit. How come?
- The intensity of the light varies as the wire is moved about. Why?

While a much more sophisticated demo board could have been developed. We wanted it simple so the scouts could easily see what components were in the circuit.



AMATEUR RADIO LICENSES

Objectives

- Help prepare the scout to fulfill the following merit badge requirements:
  - 7.a/1. Describe some of the activities that a licensed amateur radio operator can do on the air.
  - 7.a.4.*a.* Explain some of the requirements for a Technician Class license.
  - 7.a.4.*b.* Explain some of the privileges a Technician Class licensed radio operator has.
  - 7.a.4.*c.* Explain who gives amateur radio exams.
  - 7.a.5.*b.* Tell why the Federal Communications Commission has an amateur radio service.
- Give the scout some other general information about the licensing procedures and privileges.

Reference Materials

- Merit badge pamphlet pages: 39-42.
- Handouts: The Amateur Radio Licenses.
- Icom band chart.
- Now You're Talking book and/or other licensing question books.
- 8.5X11 blank paper for scouts to use.

Suggested Activities

- Ask questions about the material on the handout and provide additional insight based on your own knowledge.
- Use the Icom band chart to illustrate the privileges a licensed operator has, especially the Technician Class operator.
- Show Now You're Talking book (and/or other books).
- Ask if there are any questions about the merit badge pamphlet pages.

Verifying Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

AMATEUR RADIO LICENSES

Who licenses Amateur Radio stations and operators?

In the United States, the Federal Communications Commission (FCC) issues Amateur Radio licenses. This is the same agency that licenses commercial broadcast radio stations and television stations.

Why does the FCC authorize the Amateur Radio Service?

The FCC regulations (47 CFR Part 97.1) state the following reasons for having an Amateur Radio service:

- To voluntarily provide emergency communications.
- To contribute to the advancement of the radio art.
- To encourage and improve amateur communications and technical applications.
- To increase the number of trained operators, technicians and electronic experts.
- To enhance international good will.

What is required to get a license?

Technician Class - Get a passing score on a multiple choice test.

General Class - Have a Technician Class license, pass a multiple choice test, and demonstrate ability to receive Morse code at 5 words per minute.

Extra Class - Have a General Class license and pass a multiple choice test.

The questions for the written exams are selected from known groups of questions.

Who gives amateur radio license exams?

Exams are given by volunteer Hams who are volunteer examiners. They are called VE's. In New Mexico, tests are generally scheduled every couple of months. One VE group (at least three VE's are required to give an exam) in Rio Ranch schedule individual tests when requested.

What are some of the things a ham can do with a technician license?

- Use any mode of communication on any Amateur Radio frequency above 50 MHz.
- Operate a base station, mobile radio or handheld radio.
- Communicate using repeaters including satellites.
- Operate a repeater station.
- Provide emergency communications as a Radio Amateur Civil Emergency Service, Amateur Radio Emergency Service or Skywarn operator.
- Participate in radio club activities and become a club officer.
- Have a lot of fun while gaining knowledge and experience that can lead to a career.

HAM RADIO STATION VISIT

Objectives

- Help the scout prepare to fulfill the following merit badge requirements (most of these requirements will be passed off in a subsequent class):

  8.a. Visit a Ham Radio station.
  8.b. Discuss what types of equipment you saw in use and how it was used.
  8.c. Discuss what licenses are required to operate and maintain the equipment.
  8.d. Discuss the purpose of the station.
  7.a.1. Describe some of the activities Amateur Radio operators can do on the air.
  7.a.6.*a.* Discuss handheld transceivers verses home "base" stations.
  7.a.6.*b.* Explain the uses of mobile amateur radio.
  2.b. How do WWV and WWVH help determine what you will hear on radio?

- Demonstrate to scouts some of the operational aspects and capabilities of Amateur Radio and what fun it is.
- This visit will help prepare the scouts for the radio contact they need to make.

Reference Materials

- Handouts: WWV and WWVH Broadcast Stations. (Depending on order classes are taken, scouts may already have this.)

Suggested Activities

- Point out and discuss the uses of the equipment in the base station including:
  - HF transceiver - Include power supply, antenna selection switch, antennas, microphone, speaker, earphones and CW key
  - VHF transceivers - Include power supplies, antennas, microphone, speaker
  - UTC clock
  - Log book
  - Copy of FCC regulations, ARRL Operating Manual, ARRL Handbook.
- Show a couple of handheld transceivers (HT's)
- Tour and discuss mobile amateur radio station
- As you discuss each radio, use the Icom band chart to show which frequencies they operate on and what license class is required to operate them.
- Listen to each radio and actually use each type of radio to make a few contacts, if practical.
- Listen to the WWV and WWVH time stations on several frequencies.
- Demonstrate CW – actual contact would be nice, but a couple of operators just sending to each other in the shack would be OK .
- Show some of the QSL cards we have received.
- So the scout can meet the "maintain" portion of requirement 8.c, you might comment that: While the FCC requires a special license to service and maintain commercial broadcast equipment, that is not required for Amateur Radio equipment. Thus, a Ham can build his own equipment, and maintain and service his own equipment. He can also get anyone he feels is qualified to service his equipment.

Signing Off the Scout's Completion of Visit Requirement

- At the completion of the visit, sign the scout's record sheet for requirement 8.a. The other requirements will be reviewed and signed off in another class.

PREPARING TO TALK ON RADIO

Objectives

- Prepare scout for the following merit badge requirements:

    7.a.2.*a.* Carry on a 10-minute real or simulated ham radio contact using voice. Use proper call signs, Q signals and abbreviations.
    7.a.2.*b.* Properly log the real or simulated ham radio contact and signal report.
    7.a.3. Explain at least five Q signals or amateur radio terms you hear while listening.
    Note: Actually doing these requirements is a separate class.

Reference Materials

- Handouts: Q Signals
  RST System
  Phonetics
  UTC Conversion Chart
  Logging Contacts
  Radio Contact Procedures
- Merit badge pamphlet pages: 44-49.
- 8.5 X 11 blank paper for scouts to use.
- Other materials: Two FRS radios

Suggested Activities

- Look over Q Signals handout and indicate the most commonly used signals.
- Discuss RST system and quickly go over RST handout.
- Mention why standard phonetics are used. Have scouts write out phonetics are for their name, our station callsign, our QTH and their home QTH.
- Discuss why we use UTC and go over UTC handout.
- Discuss the Logging Contacts handout and how it should be completed.
- Discuss the Radio Contact Procedures handout. Stress that scout must do their part to carry the conservation by doing about half the talking, asking questions, and giving more than one word answers to questions.
- Quickly look through pages 44-49 with the scouts to make sure there are not questions.

    - Note that the abbreviations listed on page 45 and starting on the bottom of page 46 and onto page 47 (and used in the QSO on page 48) are for CW (Morse code) contacts and are not used for voice contacts.

- Have some scouts (as many as time will allow) simulate a short contacts using the FRS radios and provide mentoring on their procedures so they will be ready to make a real contact. Have them use Q signals, exchange RST reports and log the contact.

INTERNATIONAL Q SIGNALS

A Q signal followed by a ? asks a question. A Q signal without the ? answers the question, unless otherwise indicated. Those most commonly heard on voice contacts are marked with *. Examples of voice use for these are given. For Morse code, signals are used without any unnecessary words.

*** CQ** Not really a Q signal. Means wanting to talk to another station.
Example: "CQ CQ CQ KC5OUR KC5OUR" means KC5OUR wants to talk to any station.

QRA What is the name of your station?
QRG What's my exact frequency?
QRH Does my frequency vary?
QRI How is my tone? (1-3)
QRK What is my signal intelligibility? (1-5)
QRL Are you busy?
*** QRM** Is my transmission being interfered with?
Your transmission is being interfered with. Example: "You are 57 with QRM."
*** QRN** Are you troubled by static?
I'm having trouble with static. Example: "QRN is making it hard to understand you."
QRO Shall I increase transmitter power?
*** QRP** Shall I decrease transmitter power?
I'm running low power (usually 5 watts or less). Example: "I'm QRP."
QRQ Shall I send faster?
QRS Shall I send slower?
QRT Shall I stop sending?
QRU Have you anything for me? (Answer in negative)
QRV Are you ready?
QRW Shall I tell _____ you're calling him?
QRX When will you call again?
*** QRZ** Who is calling me?
Usually said "Q R Zed." Example: "KC5OUR Q R Zed."
QSA What is my signal strength? (1-5)
QSB Are my signals fading?
QSD Is my keying defective?
QSG Shall I send _____ messages at a time?
QSK Can you work breakin?
*** QSL** Can you acknowledge receipt?
I acknowledge receipt of your last information. Example: "QSL your 55."
QSM Shall I repeat the last message sent?
*** QSO** Can you communicate with _____ direct?
Our radio contact. Example: "Thanks for the QSO."
QSP Will you relay to _____?
QSV Shall I send a series of V's?
QSW Will you transmit on _____?
QSX Will you listen for _____ on _____?
*** QSY** Shall I change frequency?
I am changing or leaving this frequency. Example: "KC5OUR QSY."
QSZ Shall I send each word/group more than once? (Answer, send twice or _____)
QTA Shall I cancel number _____?
QTB Do you agree with my word count? (Answer negative)
QTC How many messages have you to send?
*** QTH** What is your location?
My QTH is ____. Example: "QTH here is Los Chavez, New Mexico."
QTR What is your time?
QTV Shall I stand guard for you _____?
QTX Will you keep your station open for further communication with me?
QUA Have you news of _____?

THE RST SYSTEM

Readability

1--Unreadable
2--Barely readable, occasional words distinguishable.
3--Readable with considerable difficulty.
4--Readable with practically no difficulty.
5--Perfectly readable.

Strength (Signal strength can be read from the S meter when receiving.)

1--Faint signals, barely perceptible.
2--Very weak signals.
3--Weak signals.
4--Fair signals.
5--Fairly good signals.
6--Good signals.
7--Moderately strong signals.
8--Strong signals.
9--Extremely strong signals.

Tone

1--Sixty cycle ac or less, very rough and broad.
2--Very rough ac, very harsh and broad.
3--Rough ac tone, rectified but not filtered.
4--Rough note, some trace of filtering.
5--Filtered rectified ac but strongly ripple-modulated.
6--Filtered tone, definite trace of ripple modulation.
7--Near pure tone, trace of ripple modulation.
8--Near perfect tone, slight trace of modulation.
9--Perfect tone, no trace of ripple or modulation of any kind.

- Signal reports are exchanged when Ham Radio operators contact each other.
- For Morse code (CW) communications, all three are used. A very good signal report would be 599.
- For voice communications, only readability and strength are used. A very good signal report would be 59.

STANDARD PHONETICS

Letter	Word
A	Alfa
B	Bravo
C	Charlie
D	Delta
E	Echo
F	Foxtrot
G	Golf
H	Hotel
I	India
J	Juliett
K	Kilo
L	Lima
M	Mike
N	November
O	Oscar
P	Papa
Q	Quebec
R	Romeo
S	Sierra
T	Tango
U	Uniform
V	Victor
W	Whiskey
X	X-Ray
Y	Yankee
Z	Zulu

Write out your name, location, radio station callsign, etc. here so you will be ready to give them on the air.

COORDINATED UNIVERSAL TIME (UTC) CONVERSION CHART

UTC	EDT/AST	CDT/EST	MDT/CST	PDT/MST	PST
0000*	2000	1900	1800	1700	1600
0100	2100	2000	1900	1800	1700
0200	2200	2100	2000	1900	1800
0300	2300	2200	2100	2000	1900
0400	0000*	2300	2200	2100	2000
0500	0100	0000*	2300	2200	2100
0600	0200	0100	0000*	2300	2200
0700	0300	0200	0100	0000*	2300
0800	0400	0300	0200	0100	0000*
0900	0500	0400	0300	0200	0100
1000	0600	0500	0400	0300	0200
1100	0700	0600	0500	0400	0300
1200	0800	0700	0600	0500	0400
1300	0900	0800	0700	0600	0500
1400	1000	0900	0800	0700	0600
1500	1100	1000	0900	0800	0700
1600	1200	1100	1000	0900	0800
1700	1300	1200	1100	1000	0900
1800	1400	1300	1200	1100	1000
1900	1500	1400	1300	1200	1100
2000	1600	1500	1400	1300	1200
2100	1700	1600	1500	1400	1300
2200	1800	1700	1600	1500	1400
2300	1900	1800	1700	1600	1500
2400*	2000	1900	1800	1700	1600

Coordinated Universal Time (UTC) is the time at the zero or reference meridian near London, England. Time changes one hour with each change of 15 degrees in longitude. The five time zones in the US proper and Canada roughly follow these lines.

* 0000 and 2400 are interchangeable. (2400 is associated with the date of the day ending, 0000 with the day just starting.)

LOGGING CONTACTS

Purpose of this Handout

To provide an example of a log book page and an example of how a contact might be logged.
To provide a space for you to log the contact you will make during your merit badge efforts.

	Frequency		Power	Time	Station	Report		Time Off	Comments	QS
Date	(MHz)	Mode	(watts)	(UTC)	Worked	Sent	Rec'd	(UTC)	Name, QTH, notes, etc.	S
Examples										
15-Oct-03	14.265	SSB	100	1455	W7SPC	57	59	1503	Elsie Porland, OR Nurse	√
									Sister of Bill, KF5NZD	
03-Jan-04	146.70	FM	25	2232	KF5NZD	59	59	2233	Bill Bosque Farms, NM	
	repeater								Invited her to club meeting when she visits Bill.	
17-Jan-03	146.52	FM	5	2246	NM5JOE	53	43		Joe Belen, NM	
									Verfying HT simplex works between us	
Room for You to Practice and to Log Your Merit Badge Qualification Contact										

Notes VHF contacts (the last two examples) are usually not logged, but are shown here since this frequency may be used fory your contact.
Including notes in the log is not required, but makes it fun when looking back to remember things about the other operator.
Some operators do not log the time off.
Some operators keep their logs on computers.

RADIO CONTACT PROCEDURES

Background

The four most common ways Amateur Radio operators talk with each other are:

- High frequency (HF) CW (Morse code): Used for long distance contacts. The Q signals and abbreviations on pages 45, 46 and 47 of the merit badge pamphlet are usually used. These contacts are usually entered into the operator's log book.

- High frequency voice: Used for long distance contacts. The Q signals on page 46 of the merit badge pamphlet are sometimes used. Callsigns, names and locations are usually spelled using phonetics (see page 44 of merit badge pamphlet) to be sure important information is not misunderstood. These contacts are usually entered into the operator's log book.

- Very high frequency (VHF) voice over repeater: Used for local contacts. Normal conversation similar to what you would do over a telephone. A couple of seconds after you let up button on the microphone, the repeater will send a beep. After the other station stops talking, wait until you hear the beep before you talk. These contacts are seldom logged.

- Very high frequency voice direct (simplex): Used for local contacts. Other than the beep, normal conservation is used like with a repeater. These contacts are seldom logged.

NOTE: The voice contact you make today may be on VHF, but we will go ahead and use the Q signals and phonetics as if we were making a HF voice contact. You will also need to log the contact on your log book sheet.

When You Make Your Contact

- Carry your half of the conversation by doing half the talking, giving more than one word answers and asking questions.
- Use Q signals to ask questions and in your answers.
- Use phonetics for the callsign at the first of the contact, for your name and your location.
- Identify your station by giving the callsign at the start of the contact, at least every ten minutes during the contact and at the end of the contact.
-
- Relax and have fun!

Example Contact

See rear for an example of a contact.

Example Merit Badge Ham Radio Contact

CQ CQ CQ, KC5OUR, Kilo Charlie Five Oscar Uniform Romeo, KC5OUR standing by

KC5OUR, this is Whiskey Sierra Zero Juliet Mike

Whiskey Sierra Zero Juliet Mike, this is Kilo Charlie Five Oscar Uniform Romeo. Thank you for the contact. You are 57. My QTH is Belen, New Mexico. I spell Belen - Bravo Echo Lima Echo Lima.

KC5OUR, you are 55 in Grand Rapids, Michigan. My name is Chuck, that is Charlie Hotel Uniform Charlie Kilo.

Hi Chuck, my name is Bob, that is Bravo Oscar Bravo. I am a Boy Scout working on my radio merit badge. If you have the time, I would appreciate it if you would visit with me for a few minutes. One of the requirements for the badge is to make a 10 minute Ham radio contact.

Nice to make your acquaintance Bob. I'll be happy to visit with you. WS0JM back to KC5OUR.

Chuck, some of the things I'm supposed to do in this contact are to correctly use callsigns, phonetics, Q signals and other Amateur Radio procedures. Any guidance you can give me would be appreciated.

> *At this point the conservation continues with asking questions and exchanging information. You might ask how he got interested in Ham Radio, what radio and antenna he has, how much power he is using, what interesting Ham Radio experiences he has had, what he does for a living, if he was a scout, what he remembers best about scouting.*
>
> *When he asks questions, be sure to give more than one word answers and carry your part of the conservation. For example if you are asked if you have a pet:*
>
> > *Don't just say: Yes I have a dog.*
> > *Do say: Yes, I have a dog named Shep. It is a black Labrador. I have trained it to retrieve a ball and it loves to go to the lake where it can swim.*

KC5OUR back to WS0JM. Chuck I want to thank you for helping me with my radio merit badge. It has been a pleasure talking with you. I will send you a QSL card with a SASE. Please wait until you get my card so your card will come direct to me rather than this club station. If your mailing address is not correct at QRZ, please give me the correct address before you sign off. 73 and back to you for final. This is KC5OUR.

My address is correct at QRZ. I will be looking for your card and will get a card back to you. Bob, it was my pleasure to help you with your merit badge. Amateur Radio is a great hobby. 73 to you and best of luck with your merit badge. This is WS0JM clear.

RADIO CONTACT

Objectives

Have the scout fulfill the following merit badge requirements:

7.a.2.*a.* Carry on a 10-minute real or simulated ham radio contact using voice; use proper call signs, Q signals and abbreviations.
7.a.2.*b.* Properly log the real or simulated ham radio contact and record the signal report.
7.a.3. Explain at least five Q signals or amateur radio terms you hear while listening .

Preparation the Scout Will Have

When the scout arrives at the radio station to make his contact, he will already have attended the following classes: Ham Radio Station Visit and Preparing to Talk On the Radio.

Suggested Procedures

With 20 scouts expected and a 10 minute contact for each, this would amount to 3.5 hours of operation. Depending on propagation, finding folks who will answer our CQ on HF and visit for 10 minutes QSO's may be difficult. If we can prearrange for some folks to be standing by in other states to make some of the contacts, that would be nice. If possible, we should make HF contacts by CQing as this would be the most exciting to the scouts.

Rather than solely relying on HF and not wanting to just simulate contacts, we will have some Hams standing by at home to make contacts via the club's repeater (146.700 – 100 tone), 2-meter simplex (146.540), or HF so we can allow each scout to meet this requirement. We will probably have one scout doing this at the club station while another is working from a mobile station in the parking lot.

Those working with the scouts from home should be briefed that we want to use Q signals, phonetics, signal reports etc. and other normal HF procedures so the scouts will meet the QSO and logging requirements (there is a separate mini class guide for the home stations). The at home operators should ask open ended questions and other tactics so the scout is required to give more than one word answers; ideally the scout should do about half the talking. The at home operator should also do some over the air mentoring about proper practices and ask questions to cement the procedures and practices.

Guide the scouts so they use proper Amateur Radio procedures, work in some Q signals, and carry their end of the conservation. They need to also provide/get QSLing information as noted in the contact guide.

Verifying Scouts Have Met the Merit Badge Requirements

When the scout completes the contact and log entry badge requirements (7.a.2.*a* and 7.a.2.*b*), sign their record sheet in the appropriate spaces.

Have the scout prepare a QSL card for their contact, self address a stamped envelope, and put the card and SASE into an envelope with the contacted station's call sign on it so we can mail it and the scout will get a QSL card back.

Requirement 7.a.3 (explaining Q signals and Ham terms) will be reviewed and signed off in another class.

Other Contacts Using the HF Station

It would be nice, when it does not interfere with the scouts working towards their merit badges, to keep the HF station on the air and make a bunch of contacts so the scouts get a further demonstration of amateur radio. If it would not interfere with the scouts' merit badge activities, they could participate in some of these contacts. Earphones could be used for these contacts if not doing so would interfere with the merit badge activities. Doing some of this in CW would be neat too.

RADIO CONTACT PROCEDURES FOR HOME STATIONS

Objectives

Help the scout complete the following merit badge requirements:

7.a.2.*a.* Carry on a 10-minute real or simulated ham radio contact using voice. Use proper call signs, Q signals and abbreviations.
7.a.2.*b.* Properly log the real or simulated ham radio contact and signal report.
7.a.3. Explain at least five Q signals or amateur radio terms you hear while listening.

References

- Handouts: Q Signals, RST System, Phonetics, UTC Conversion Chart, Logging Contacts, Radio Contact Procedures, Merit Badge Requirements Checklist, The Plan for Today

Contact Frequency Information

While the contact will probably be VHF via (VCARA's KC5OUR 146.700 – 100 tone) repeater or by simplex (146.540), we will handle it as if it were a HF contact. Thus, the scout will be calling CQ, using Q signals, giving a RST report and using phonetics. You should reply in a similar manner.

Suggestions

Ask questions and provide on the air mentoring to help the scout learn the proper procedures. Some possible questions/approaches are listed below:

- Ask for phonetics for names, QTH's, school names, etc.
- What is your QTH? Follow up with what is your home QTH?
- Give a signal report other than 59 then ask the scout to tell you what that report means.
- After you give some information (like your QTH) ask QSL. Ask the scout what the QSL means in that context (Did you receive OK?) and how else QSL can be used (1. Understood, and 2. As part of the name for an after contact post card as in "QSL Card").
- What frequency are you using? Follow up with is that HF, VHF, or UHF? What band is that (meters)? If via a repeater, is the frequency you are transmitting on different than you are listening on? Follow up with why (so the repeater will not get confused between what it is listening too and what it is sending)?
- What are some amateur radio terms you have learned today. Follow up with what does each of these terms mean?
- Say you have QRM or QRN and ask them to tell you what that means.
- Look over The Plan for Today handout and ask the scout which of the mini classes they have attended. Follow up by asking what they learned in each of the classes.
- Look over the Merit Badge Requirements Checklist and ask the scout to tell you how they did (or will explain some specific requirements. Repeat for four or five requirements.
- What scout rank are you? Follow up with what are the five most important things you had to do to earn that rank? Follow up with what are the five most important things you must do to earn your next rank.
- Tell me about the last scout camping trip you went on. Follow up what were the five most important things you had to do to prepare for the trip. Follow up with what were the five most important things you did to help the troop during the trip. Follow up with how would you prepare differently next time and what would you do differently on the trip.
- Turn back to the scout with KC5??? (i.e., your call sign) back to KC5OUR, and on the next exchange explain why you slip that in once in a while. Ask the scout what the station identification requirements are (every ten minutes and at the end of a contact)?
- Ask the scout what time they have shown in the log for the contact. If necessary, work with them on UTC time and indicate they should get a time in the log at the front of the contact. Follow up with tell me what else you have logged for our contact.
- Have fun!

AMATEUR RADIO EQUIPMENT AND PROCEDURES

Objectives

- Prepare the scout to complete the following merit badge requirements:

  - 1.e. Explain what phonetics are and how they are used.
  - 7.a.3. Explain at least five Q signals or amateur radio terms you hear while listening.
  - 7.a.5.*a.* Explain how you would make an emergency call using voice or Morse code.
  - 7.a.6.*a.* Discuss handheld transceivers verses home "base" stations.
  - 7.a.6.*b.* Explain the uses of mobile amateur radios.
  - 7.a.6.*c.* Explain the uses of amateur radio repeaters.

- Help firm in the scout's mind what he has observed in the preceding mini-classes, which were:

  - Ham Radio Station Visit
  - Preparing to Talk on the Radio
  - Radio Contact

Reference Materials

- Merit badge pamphlet pages: 44-51.
- Handouts: Several from previous classes.
- 8.5 X 11 blank paper for scouts to use.

Suggested Activities

Proceed directly to the verifying the scout meets the merit badge requirements.

Verifying the Scouts Have Met the Merit Badge Requirements

- Meet with each scout individually so they can present to you the information required to fulfill each of the above merit badge requirements.
- Sign the scout's record sheet in the spaces provided to indicate scout has fulfilled those requirements.
- If the scout is not able to meet any requirement, have them review the handout and referenced pages in the merit badge pamphlet and come back later to complete the requirement. Provide additional one-on-one mentoring if needed.

Valencia county Amateur Radio Associations Get Your Radio Merit Badge Day

SCOUT SIGN IN SHEET

Please sign in so we can get you through all the classes.

	Name	Troop	City		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
14					
16					
17					
18					
19					
20					
21					
22					
23					
24					

SCOUT LEADER QUESTIONAIRE

Thank you for having your scouts participate in the Valencia County Amateur Radio Association's GET YOUR RADIO MERIT BADGE DAY. We want to improve this event and would appreciate your comments about how we did today. In the next few days after you have had a chance to visit with your scouts and reflect on this event, please complete this questionnaire and return it in the attached self addressed stamped envelope.

Date of event _____ Location of event _____

How many scouts came with you to work on their merit badge? _____

How many of these scouts completed all the requirements? _____

What were the ages of these scouts? _____

How many other people were in your group?

Scouts not working on badge _____ Adults _____

Where is your troop from? _____

How often do you think this event should be repeated? _____

At what time of year? _____

What do you think we did well?

_____

_____

What could we do to improve this event?

_____

_____

Other comments

_____

_____

If you want to give us your name and contact information, please do it here:

_____

_____