The Hellgate Static
Jun 2024

Hellgate Amateur Radio Club
P.O. Box 3811, Missoula, MT. 59806-3811
Web: www.w7px.org

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Officers:

President: NZ7S
Vice-President: W7RPG
Treasurer: KJ7YHG
Secretary: K7MSO

Positions:

Emergency Coordinator: contact_us@w7px.org
QSLs, Awards: contact_us@w7px.org
Webmaster: contact_us@w7px.org
Asst Webmaster: editor@w7px.org
License Exams Contact VE:
harc.ve.testing@gmail.com
Static Editor: editor@w7px.org

Repeater Committee:

W7RPG (Chair)
K7QA --- Dec 2022 for (23/24)
KG7WYO – Dec 2022 for (23/24)
N7PAS -- Dec 2023 for (24/25)
KI7PCR -- Dec 2023 for (24/25)

C&BL – Board + N7PAS and K7MTD

Buy-Sell Operations hfc@w7px.org
W7XT, K0SN, K7QA

Coming Events 2024

Jun 04 Trail Rail Run
Jun 10 HARC Testing, Meeting
Jun 22-23 Field Day – University Mtn.
See Map & Directions below.
Jun 28-30 Missoula Marathon
Friday: (Free) Beer Run; Runner Expo
Saturday: Tony Banovich 5K; Kids Marathon; Runner Expo
Sunday: Missoula Marathon; Missoula Half Marathon
Jul 08 HARC Testing, Meeting

HARC Jun Meeting
Program: Red Cross

RADIO TESTING EXAMS AND MEETING

The testing and meeting are on the 2nd Monday of each Month.
We are having in-person, electronic testing and monthly meetings.
The Radio license Exams are from 5:30-6:30PM
Meetings which start at 7:00PM (Program & Business).
Both will be held at **The Church of Jesus Christ of Latter Day Saints**, 3026 South Avenue West, across the street from Big Sky High School.
Use the North entrance as all others will be locked.

Published: 31 May 2024 @1:30 PM by N7PAS

13 May 2024 Exam Testing Results

Congratulations to:

* 1. **Jeffrey Abbott** of Missoula passed his **General** exam. His call sign is **KK7QJH**.
* 2. **Maurice Austin** of Missoula passed his **Extra** exam. His call sign is **N7NHS**.
* 3. **Brad Benson** of Missoula passed his **Technician** exam. His new call sign is **KK7TKO**.
* 4. **Dennis Davis** of Frenchtown passed his **Extra** exam. His call sign is **N5JIL**.
* 5. **Doug Drader** of Missoula passed his **Extra** exam. His call sign is **K7INJ**.
* 6. **Byron Hall** of Hamilton passed his **General** exam. His call sign is **KK7RWI**.
* 7. **John Wilson** of Beaumont,TX. passed his **Technician** exam. His new call sign is **KJ5GKJ**.

Program: Red Cross – Was canceled by Red Cross on 3 April. Reschedguled for June meeting.

13 May 2024 HARC Meeting Minutes Meeting called to order @ 7:03 PM

1. **Attendance:** W7RPG, KJ7PCR, KK7QJH, N7PAS, NZ7S, K7INJ, KF7GZR, N7DLP, N7BIO, K7QA, N7NHS, W5JOK, AI7XI, K7MSO, W7XT, Quorum - **Y**
   Visitors: Even Mohn KK7BIP, Brad Benson KK7TKO (new-see testing results above)
   NOTE: 15 Members / 2 Visitors present. Thank you to all that attended.
2. **Last meeting minutes, May:** Motion to approve minutes: 1st KJ7PCR 2nd N7DLP
   Discussion __None_____ Vote: Passed
3. **Treasurer's report:** _Treasurer Absent _____
   _____Motion to approve report 1st _____ 2nd _____ Vote: Tabled
4. **Repeater Committee W7RPG:** Discussion _Nothing to Report _____
   _____Motion to approve report 1st _____ 2nd _____ Vote: Tabled
5. **HF Committee Report K0SN:** Discussion _Nothing to Report - Hope to sell equipment on list in Static.
   _____Motion to approve report 1st _____ 2nd _____ Vote: Tabled

6. New Business: **a. N**one

7. Net Control Operators

Jun	05	N7PAS	Jul	03	N7PAS
Jun	12	W7RPG	Jul	10	_____
Jun	19	K7MSO	Jul	17	_____
Jun	26	K7MSO	Jul	24	_____
___	__	_____	Jul	31	_____

8. Up Coming Events:

1.) Field Day 22-23 Jun 2024–Council Grove/Blue Mtn.-F.S. said NO. HF Com. & NZ7S had meeting. Decided University Mountain this year. See directions below. 3 stations: CW, SSB, GOTA. All are welcome. Would really like to see some new faces/operators. Sign up sheet at June meeting.

2.) Possible APRS presentation at July Meeting.

9. Good & Welfare:

1.) N7PAS did show and tell on new triangle bits that are showing up in equipment.

2.) W7RPG got some good pictures of the aurora borealis light show.

3.) N7BIO said Winlink Thursday had an exercise scheduled for May 7-12 to simulate comms support during/after a geomagnetic storm on the scale of the Carrington Event. The exercise just happened to be scheduled during a G4 geomagnetic storm. Sent up to 9 messaages to RMS ststions at increasingly farther distances from the QTH.

Meeting adjourned at 7:45 PM. Minutes by K7MSO

HARC INVENTORY -- FOR SALE

Line	ITEM	MAKE	MODEL	CONDITION	VALUE	STORED
1	Computer	Dell	Latitude	Fair	100	?
2	Pow Supp. 220-225mhz	Mirage	C106G	Good	25	?
3	Handie-talkie	Realistic	HTX 202	Good	50	?
4	Portable Repeater		TM-241X2	?		?
5	Triband Beam	Hy-Gain		Few Missing parts	200	K0SN
6	Tuner	Signal Corps	BC939B	Parts only	25	K0SN
7	Speaker + Power Supp.	Drake	MS-4 + AC4	Not tested	75	K7QA
8	Reflected Pwr Mtr	Heathkit	HM-15	Works	10	K7QA
9	Mobile Tuning Mtr	Heathkit	PM-2	Untested	10	K7QA
10	Trap Vertical	Hygain	14AVQ	Clean, untested	150	K7QA
11	2 Mtr HH Transceiver	Realistic	HTX-202	Error Code	25	K7QA
12	Spkr. w/vol. control	Yaesu		Untested	50	K7QA
13	1993 ARRL Handbook			like new	free	K7QA
14	Handbooks	ARRL	1950-1980	OK	Free	KGVO
15	Vintage Mic	Astatic	JT-30	worn, untested	50	KGVO
16	13.8V, 20A power supp.	Astron	RS20A	No output	15	KGVO
17	RC checker	CDE		untested	30	KGVO
18	Rotor	CDE?		untested	50	KGVO
19	Transceiver	Collins	RT-91ARC-2	untested	100	KGVO
20	Transverter Interface	Down E. Micro		untested	offer	KGVO
21	Low pass Filter	Drake	TV-3300	untested	20	KGVO
22	Receiver	Hallicraft.	SX-100	fair	150	KGVO
23	Receiver	Hallicraft.	SX-62B	untested, rough	75	KGVO
24	Vintage Speaker	Hallicraft.	PM 23	Nice, untested	150	KGVO
25	Vintage Speaker	Hammar.	S-100	Nice, untested	60	KGVO
26	AC Power Supply	Heath Kit	HP-23-A	works		KGVO
27	SSB Transceiver	Heath Kit	HW-101	needs repair		KGVO
28	HF Xcvr + Power Supp.	Heathkit		untested	150	KGVO
29	Oscilloscope	Heathkit	IO-4105	untested	30	KGVO
30	Power/SWR Meter	Heathkit	HM15	untested		KGVO
31	Vertical antenna		Dipole 80	?		NOAA
32	Receiver	Heathkit	HR-10	untested, rough	offer	KGVO
33	SSB Adapter	Heathkit		untested	40	KGVO
34	Test Oscillator	HP	650A	untested	offer	KGVO
36	VHF Mobile Xceiver	Icom	IC-25A	fair, untested	30	KGVO
37	2M FM Transceiver	Kenwood	TR7400A	no output	10	KGVO
38	HF Transceiver +Man	Kenwood	TS-520	non-working	100	KGVO
39						
40	Transmitter	Meissner	9-1160 (tube)	good		KGVO
41	Voice Keyer	MFJ	MFJ-432	untested	30	KGVO
42	Fwd/Refl. pwr meter	Midland	23-126	untested	10	KGVO
43	2 mtr, 30 Watt amp	Mirage	B23	untested	25	KGVO
44	2 mtr mobile Xcvr	RadShack	HTX-242	untested	40	KGVO
45	Field str/SWR meter	RadShack		untested	10	KGVO
46	VHF/UHF/FM amp	RadShack		untested	20	KGVO
47	Gen. Coverage Rvr.	Realistic	DX302	untested	125	KGVO
48	Receiver	Signal Corp	R-392/URR	fair	300	KGVO
49	VTVM	Simpson	311	untested	25	KGVO
50	Oscilloscope	Telequip.		untested	20	KGVO
51	Var. power resistors	Various		untested	10	KGVO
52	Scanner	Uniden	BC9000	works	50	KGVO
53	BUG KEY	unknown		fair		KGVO

54	12V DC Backup Power	West Mtn	PG40S	good, untested	25	K7MTD
55	Speaker	Yaesu	SP-8	Good, untested	125	KGVO
56	VHF FM Transceiver	Yaesu	FT720RU	untested	25	KGVO
57	VHF Transceiver	Yaesu	1500M	untested	75	KGVO
58	Many electronic parts too numerous to list.				offer	KGVO
59	Misc. meters			untested,	40	KGVO
60	RCA male Patch cords			good	10	KGVO
61	Peter Dahl 10 HY @ 1 A		new	new		KGVO
62	Peter Dahl 40 HY @ .6 A		new	new		KGVO
63	Peter Dahl 9 HY @ 1.5A		NEW	NEW	200	KGVO
64	Peter Dahl Sw. Choke		new	new		KGVO
65	Antenna Tuner	Icom	AH-4			NZ7S
66	Voice Synthesizer	Icom	UT-102			NZ7S
67	Transceivers, qty.2	Kenwood	220-225 mhz.	?		NZ7S
68	Antenna Tuner + man	MFJ	MFJ-934			NZ7S
69	RTTY CW	MFJ		?		NZ7S
70	Telescoping Mast	MFJ	MFJ-1910	new		NZ7S
71	Audio Filter	Heathkit	HD-1418	works	15	K0SN
72	Audio Filter	AFTronics	Super SCAF	works	15	K0SN
73	TRIPLEXER	Comet	CFX-324			K7MTD
74	WATTMETER/SWR	MFJ	864	works	10	K7MTD
75	2 mtr, 30 Watt amp	Mirage	B23	works	25	K7MTD
76	Microphone	Astatic	D104, SE	needs work	offer	K7QA
77	Vintage Mic	Astatic	JT-30	worn, untested	50	KGVO
78	Rotor Control	Hygain	DCU-1	untested	100	KGVO
79	VHF FM Transceiver	Yaesu	FT720RU	untested	25	W7KJA

For information email to hfc@w7px.org

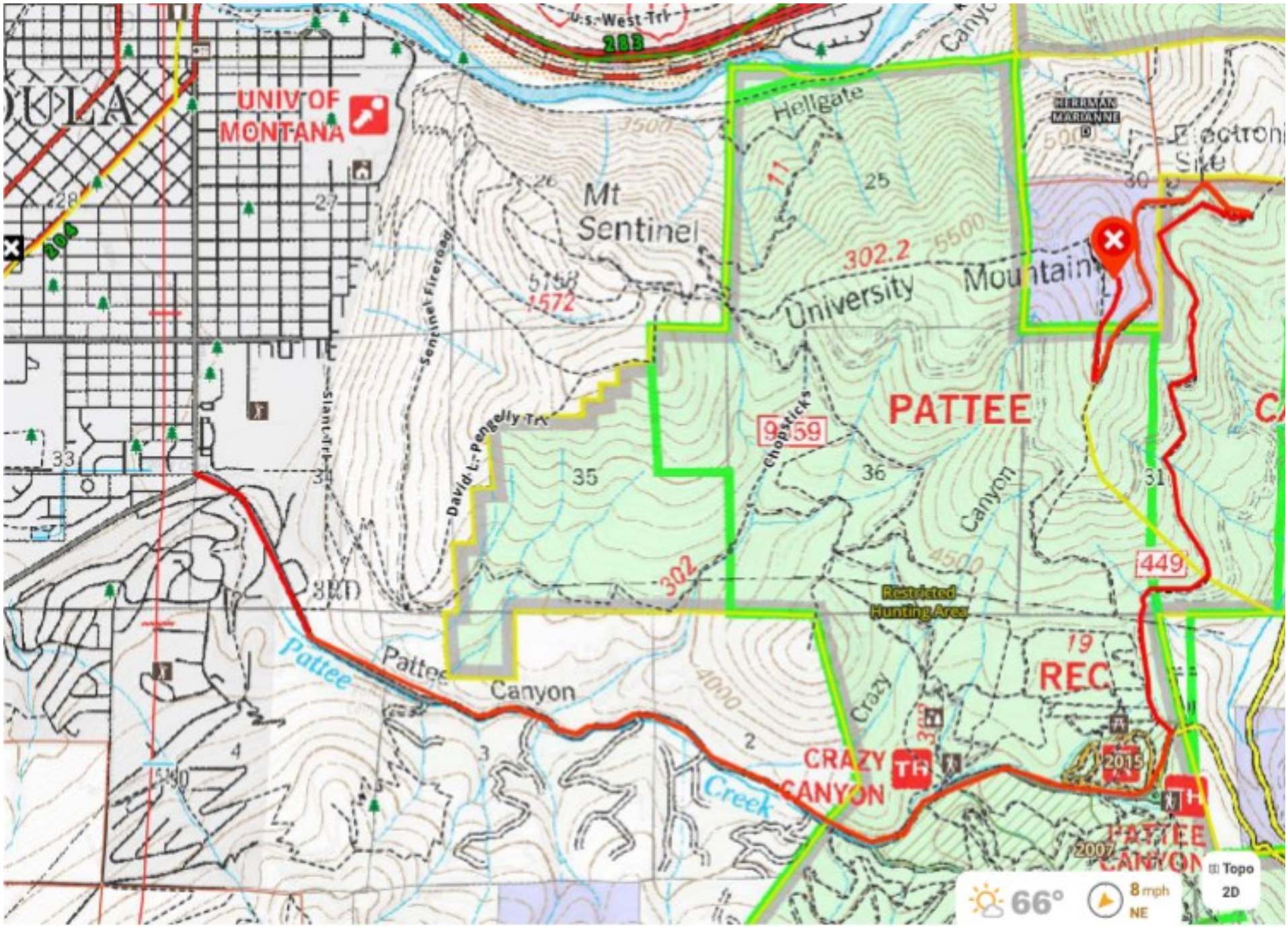
Field Day Route to University Mountain, just east of Mt. Sentinal.

Red line on map denotes the entire route from the turnoff at Higgins onto Pattee Canyon Rd to the Field Day site (X).

From the turnoff at Higgins it is approximately 4 miles to the forest road gate on the left. The road may be marked with a sign as forest road 449 but I am not sure about this. However, the gate is clearly visible looking toward the left while you are proceeding along on Pattee Canyon Rd.

The gate is locked with a padlock using a 4 digit combination. The combination is ????. Make sure you lock the gate after passing through. It might help to have a flashlight or headlamp along as it is difficult to read the numbers on the lock, it is inside of an enclosure and you practically need to lay down on the ground and look up at it to see it.

After you pass the gate it is approximately a 3 mile drive to the FD site.As you can see from the map you will be heading mostly north. When you get to the most northward point of the route you will encounter another road coming in on the right that goes straight north to an electronic site, along with a pair of roads coming at you on the left.
At this point, turn left and take the road farthest to the left. This takes you mostly south for a ways to a very sharp hairpin turn.
Once past the hairpin a short distance, look for a Y, at which point you should stay to the right as it is the easiest route.
From here you should be able to see a radio tower and building directly north a few hundred yards.
This is the Field Day site.
K0SN


UNIV OF MONTANA
Mt Sentinel
Hellgate
University Mountain
302.2
PATTEE
Canyon
Pattee Canyon
Restricted Hunting Area
CRAZY CANYON
REC
Creek
Crazy
Sentinel Fireroad
David L. Pengelly Trl
Chopsticks
Slant Trl
U.S. West Trl
283
200
302
449
66°
8 mph
NE
Topo
2D

Field Day Countdown

Field Day is just about 3 weeks away, and by now your club should have planed for the event. Many of the details of this event should not be left to the last minute. With hopes of pointing clubs in the right direction, here are a few tips that may help.

1. **Plan your location with a few questions in mind.**

    a. Will you have public traffic around your site, and are the antennas you will be using mindful of safety?

    b. Is your site on property that requires supplying an insurance certificate to the owners? Many public sites require this.

    c. Are you planning to create signs telling the public what you are doing and inviting them to learn more?

    d. Does the site have adequate parking and access? Remember, Field Day is a 24-hour operation. You don't want to get locked in or out of your location, especially once it's dark.

    e. Have you reviewed the safety requirements for fueling and grounding your generator? Noise may be an issue if you are on a public site.

    f. How do you plan to keep the site clean and uncluttered for pictures?

2. **Contact the local media to invite them to your site.**

    a. Local newspapers

    b. Local television networks

    c. Plan to have someone that can serve as a guide, answer questions, and direct pictures.

3. **Operator planning is essential. Create a schedule of operators.**

    a. Think about whether you will operate for the full 24 hours or not.

    b. Invite new hams to learn by logging and operating.

    c. Don't forget to think about having relief operators.

4. **Consider contacting your local served agencies to demonstrate the capabilities of hams in an emergency.**

    a. Local emergency management

    b. American Red Cross

    c. Local police, fire, and ambulance companies

    d. Other local agencies that may be involved with shelter management

What is ARRL Field Day?

Produced by ARRL, the national association for amateur radio http://www.arrl.org

ARRL Field Day is the single most popular on-the-air event held annually in the US and Canada. On the fourth weekend of June of each year, thousands of radio amateurs gather with their clubs, groups or simply with friends to operate from remote locations.

Field Day is a picnic, a campout, practice for emergencies, an informal contest and, most of all, FUN!

It is a time where many aspects of Amateur Radio come together to highlight our many roles. While some will treat it as a contest, other groups use the opportunity to practice their emergency response capabilities. It is an excellent opportunity to demonstrate Amateur Radio to the organizations that Amateur Radio might serve in an emergency, as well as the general public. For many clubs, ARRL Field Day is one of the highlights of their annual calendar.

The contest part is simply to contact as many other stations as possible and to learn to operate our radio gear in abnormal situations and less than optimal conditions.

We use these same skills when we help with events such as marathons and bike-a-thons; fund-raisers such as walk-a-thons; celebrations such as parades; and exhibits at fairs, malls and museums — these are all large, preplanned, non-emergency activities.

But despite the development of very complex, modern communications systems — or maybe because they ARE so complex — ham radio has been called into action again and again to provide communications in crises when it really matters. Amateur Radio people (also called "hams") are well known for our communications support in real disaster and post-disaster situations.

What is the ARRL?

The American Radio Relay League is the national association for Amateur Radio in the USA, representing over 170,000 FCC-licensed Amateurs. The ARRL is the primary source of information about what is going on in ham radio. It provides books, news, support and information for individuals and clubs, special events, continuing education classes and other benefits for its members.

What is Amateur Radio

Often called "ham radio," the Amateur Radio Service has been around for a century. In that time, it's grown into a worldwide community of licensed operators using the airwaves with every conceivable means of communications technology. Its people range in age from youngsters to grandparents. Even rocket scientists and a rock star or two are in the ham ranks. Most, however, are just normal folks like you and me who enjoy learning and being able to transmit voice, data and pictures through the air to unusual places, both near and far, without depending on commercial systems.

The Amateur Radio frequencies are the last remaining place in the usable radio spectrum where you as an individual can develop and experiment with wireless communications. Hams not only can make and modify their equipment, but can create whole new ways to do things.

For More Information visit: www.arrl.org/field-day

Updated 3/2021

Field Day is what you want to make of it. Treat it like a contest and see how many contacts you can make, make it an emergency drill, use it for outreach to the public, or make it a social event for your club and include having fun on the radio. Field Day is all about having fun and showcasing the different aspects of amateur radio. Make your Field Day an event that the club will learn from, and, most importantly, have fun! Find the complete list of Field Day resources at field-day.arrl.org.

The Joys of Retooling — Again By Bryan Bergeron

After decades of focusing on microcontrollers, MEMS, and barely visible SMDs, I've returned — at least for the next year or two — to the danger zone of high voltages, high temperatures, and heavy metal.

Over the last few years, I've refurbished a DX-60B ham receiver from my childhood; three Zenith table-top radios from the 1950s; a McIntosh tuner, preamp, and amp; and a handful of analog instruments.

I haven't given up my benchtop DMM, digital oscilloscope, or digital function generator. However, there's something about aligning an old tube radio with a Simpson 311 vacuum tube voltmeter (VTVM) that can't be beat.

My once mainly empty parts bins are now overstuffed with chunky 600V capacitors, 2W resistors, and, of course, vacuum tubes. One of the odd results of shifting to vintage tube gear from modern electronics is that there is no place for radial capacitors. Virtually every electrolytic capacitor that I've run across in vintage gear has axial leads, reflecting the reliance of point-to-point wiring instead of circuit boards.

My ESD mat now serves as a desk protector, scarred from my handling one sharped-edged heavy metal chassis after another. I've become hooked on contact cleaner — especially CRC QD and DeoxIT — for cleaning scratchy potentiometers and rotary contact switches.

Then, there are the hand tools. I've given up ruining my 4.5" CK antistatic diagonal cutters on 18 gauge component leads buried below layers of point-to-point wiring. Now I work with 6" channel lock pliers with extra long snouts that enable me to pluck a component from the bowels of a circuit without disrupting other components.

And my Weller WD station and pinpoint tips designed for SMD work just don't cut it for heavy terminals and wires. I've moved to a simple 100 watt Weller 100P that's capable of soldering to a bare chassis if I need to.

My Rolodex for go-to supplies has also evolved. While I still rely on the big parts houses — Mouser and Digi-Key — I save time by visiting curated collections of high voltage capacitors, wire, tubes, and switches from the likes of:

Antique Electronic Supply (**tubesandmore.com**),
TubeDepot (**tubedepot.com**),

Hayseed Hamfest (**hayseedhamfest.com**),
Parts ConneXion (**partsconnexion.com**),
and Sal's Capacitor Corner (**http://tuberadios.com/capacitors/**).

Sal's offers affordable kits of capacitor values most often found in vintage radios and test gear. Antique Electronic Supply offers just about everything you could need for a vintage radio repair, including schematics.

Hayseed Hamfest is my go-to for custom electrolytic can capacitors, and the Parts ConneXion caters to high-end audiophile hardware.

Perhaps the biggest retooling of all is my thought process — including my appreciation for safety. Most of the devices I work with are directly connected to the power mains, without an intervening transformer.

That means I never plug a piece of vintage gear directly into a power socket, but minimally use an isolation transformer to keep me and my test equipment safe.

With a non-polarized plug, the odds are 50-50 that the chassis is hot. And there is the issue of heat. The tubes and power resistors are easily hot enough to cause blistering burns.

Is retooling your shop and your mind to the world of vacuum tubes worth it? If you're contemplating expanding your knowledge base or revisiting your past, should you invest in a new infrastructure or stay the course?

Well, there's certainly more for anyone to learn about the ever-expanding world of microcontrollers, drones, and the like.

However, there's just something magical surrounding a simple tube device, with maybe two to six active components that you pluck from an attic or eBay. **NV**

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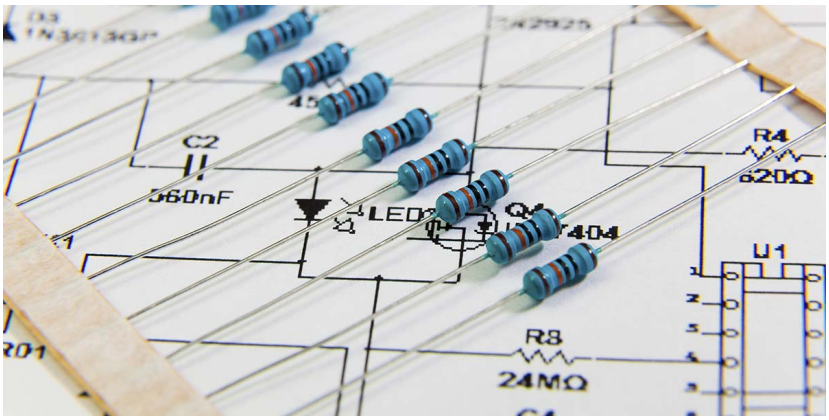
Resistors: Types And Applications

By H. Ward Silver



An ohm is an ohm, right? Not so fast — there are many different types of resistors. To insure that your circuit works and stays working, use the right type of resistor. In this article, you'll learn about the common types of resistors and their special characteristics.

Resistor Fundamentals

George Ohm.

Every conductor exhibits some resistance to the flow of electrical charge (except for superconductors). George Ohm discovered the exact relationship between voltage (V), current (I), and resistance (R), formulating the law that bears his name and is learned by every electronics student:

$$V = I \times R \text{ or } I = V / R \text{ or } R = V / I$$

As electrons flow through a material in response to an electric field, they collide with the atoms that make up the material. The collision transfers some of the electron's energy to the atoms, which vibrate in response. These vibrations result in an increased temperature of the material. The energy that heats the material is the power dissipated, calculated as:

$$\text{Power } (P) = I^2 \times R \text{ or } P = V^2 / R$$

A perfect resistor does not care whether the current flowing through it is AC or DC. The electrons collide with atoms going in either direction.

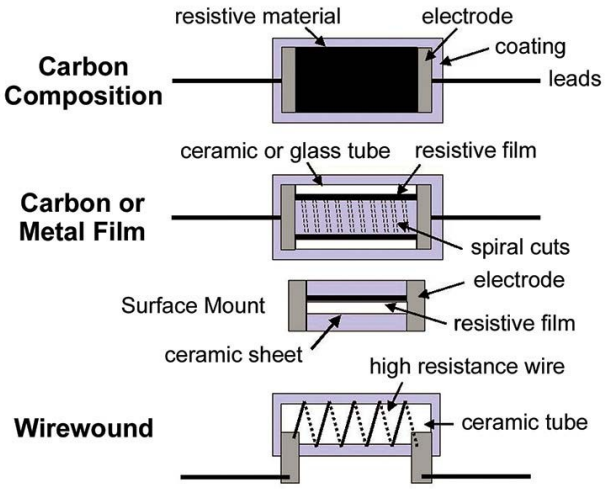


FIGURE 1. Resistors can be constructed in a number of ways to optimize power handling, stability, or size.

Nevertheless, practical construction details, as shown in **Figure 1**, create some *parasitic* effects, making an actual resistor act like the circuit model shown in **Figure 2**. The model describes how the actual resistor's characteristics make its electrical behavior depend on frequency and on how voltage and current are applied to it.

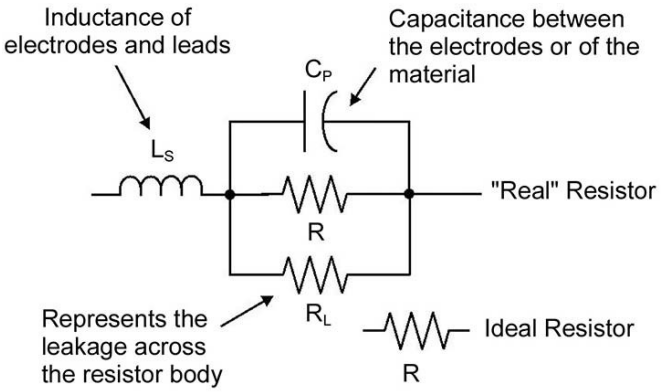


FIGURE 2. This is a model of how a resistor actually behaves in a circuit. The type of resistor determines the importance of each component.

The series inductance, L_S, is primarily created by the leads attached to the resistor. Notice that for the surface-mount resistor, there are no leads, which greatly reduces L_S. The electrodes also form a very small capacitor, C_P, that affects the resistor's behavior at very high frequencies. Although the resistor's coating is a very good insulator, current can still flow in very small amounts across the surface of the resistor as a *leakage current*, represented by R_P. This becomes important when the resistor has a very high value or is used in a high voltage circuit.

Resistor Types

For a piece of conducting material to be made into a practical resistor, a pair of electrodes and leads are attached so that current can flow. The resistor is coated with an insulating material to protect the conducting material from the surrounding environment and vice versa. There are several different resistor construction methods and body styles or *packages* that are designed for a certain range of applied voltage, power dissipation, or other considerations.

Carbon Composition

Composition means that the resistive material is a mix of carbon and stabilizing compounds. The amount of carbon in the mix determines the resistance of the material. A small cylinder, like a pencil lead, is held between the two electrodes and coated with resin or phenolic, making a *non-inductive* resistor with low L_S that is often used in RF circuits.

Carbon comp resistors are available with power ratings of 1/4 to 2 watts. They can also handle temporary overloads much better than film resistors because the heat is distributed evenly throughout the cylinder of resistive material. That makes them a good choice for circuits that protect against and absorb pulses and transients, for example. Unfortunately, these resistors are also strongly influenced by temperature and humidity and so are not good for circuits that depend on precise, stable resistance values.

Film Resistors

In a film resistor, the resistive material is a very thin coating of carbon or metal on an insulating substrate, such as ceramic or glass. The value of the resistance is determined by the thickness of the film and the amount of carbon or metal in it. These resistors are available with very accurate and stable values.

A drawback of film resistors is that they are unable to handle large amounts of power because the film is so thin. Overloads can also damage the film by creating “hot spots” inside the resistor, changing its value permanently. The value of film resistors is sometimes adjusted before sealing by cutting away some of the film with a laser, a process called *trimming*.

If the film is deposited on the inside of a tube, the trimming process creates a coil-like current path that raises the L_S of the resistor. If your circuit operates at high frequencies, be sure the resistors you select have a low value of L_S.

Surface-mount resistors are almost always film resistors. These resistors have no leads at all, so L_S is very low. The film is deposited on a ceramic sheet. Because of their extremely small size, surface-mount resistors have very low power ratings — from 1/10 to 1/4 watt.

Wirewound

Common in power supplies and other equipment where lots of power is dissipated, a wirewound resistor is made just as you might expect. A high-resistance wire is wound on an insulating form — usually a ceramic tube — and attached to electrodes at each end. These are made to dissipate a lot of power in sizes from one-watt to hundreds of watts! Wirewound resistors are usually intended to be air cooled, but some styles have a metal case that can be attached to a heatsink or metal chassis to get rid of undesired heat.

Because the resistive material in these resistors is wound on a form, they have very high L_S. For this reason, wirewound resistors are not used in audio and RF circuits. Be careful when using a resistor from your junk box or a grab bag in such a circuit!

Small wirewound resistors look an awful lot like film or carbon comp resistors. There is usually a wide color band on wirewound resistors, but not always. If you’re in doubt, test the resistor at the frequencies you expect to encounter. There are special versions with windings that cancel most of the inductance, but have a much higher C_P that also affects the resistor’s performance above 50 kHz.

Ceramic and Metal Oxide

If you need a high-power non-inductive resistor, you can use *cermet* (ceramic-metal mix) or metal oxide resistors. These are constructed much like a carbon comp resistor, substituting the cermet or metal oxide for the carbon composition material.

Adjustable Resistors

There are many different types of adjustable resistors. The simplest are wirewound resistors with some of the wire exposed so that a movable electrode can be attached. The most common are adjusted with a rotary shaft as shown in **Figure 3**. The *element* provides a fixed resistance between terminals 1 and 3. The *wiper* moves to contact the element at different positions, changing the resistance between either end of the element and terminal 2.

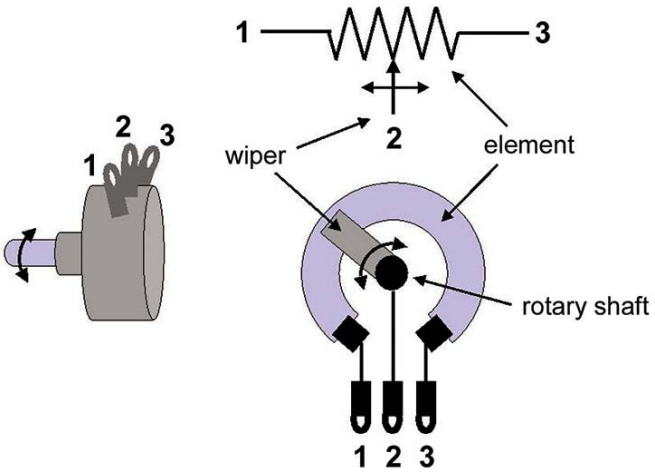


FIGURE 3. A potentiometer (or pot) acts as a variable voltage divider by moving a wiper across the surface of a fixed-resistance element.

If an adjustable resistor has only two terminals (1 and 2 in the **figure**), then it is called a *rheostat* and acts as an adjustable resistance. Most rheostats are intended for use in high-power circuits with power ratings from several watts to several tens of watts.

If the adjustable resistor has three terminals, it is called a *potentiometer* or "pot" for short. Most pots are intended to act as voltage dividers and can be made into a rheostat by leaving terminal 1 or 3 unconnected. Miniature versions called *trimmers* mount on a circuit board and are used to make small adjustments or calibrate a circuit. They are available in single-turn or multi-turn versions.

Larger pots with 1/8" or 1/4" diameter shafts are intended for use as a user control. Pots are available with resistance values from a few ohms to several megohms and with power ratings up to five watts.

Like fixed-value resistors, the construction of the pot is important. Higher-power pots may have a wirewound element that has enough inductance to be unsuitable for audio or RF signals. Smaller pots, particularly trimpots, are not designed to be strong enough for use as a frequently-adjusted control. Most pots have relatively high values of C_P, as well.

Pots are also available with elements that have a non-linear *taper* or change of resistance with wiper position. For example, a *log taper* pot has a resistance that changes logarithmically with shaft rotation. This is useful in attenuator circuits, for example. An *audio taper* pot is used to create a voltage divider that mimics the loudness response of the human ear so that volume appears to change linearly with control rotation.

Resistor Networks

In order to save space on printed circuit boards, resistor networks are often used. These are miniature printed circuits themselves, placing several resistors on one substrate. The resistors may be isolated from each other, share one common terminal, or be connected in series. There are a number of configurations that can be found in any component supplier's catalog.

Power Dissipation and Voltage Ratings

After value, power dissipation is the next most important characteristic of a resistor. An overloaded resistor often changes in value over time and can often get hot enough to burn itself and surrounding components. Every circuit designer learns the smell of burnt resistor sooner or later!

The common rule of thumb is to calculate how much power the resistor will have to dissipate and then use the next largest size or a factor of two higher dissipation rating, whichever is larger. The power rating is based on unobstructed air circulation around the resistor. For resistors dissipating more than a watt, arrange nearby components so that air can circulate freely. If possible, mount power resistors horizontally so that convection cools all parts of the resistor equally.

Another important rating is *maximum applied voltage*. Voltages above this value may cause an arc between the resistor terminals! At high voltages, R_P can also become significant, allowing current to leak around the internal resistance. High-voltage resistors must be kept clean. Fingerprints, oil, dirt, and dust all create unwanted current paths, lowering R_P and increasing leakage or even arcing. This is why resistors for use in high-voltage circuits are long and thin with their terminals far apart — to minimize leakage and maximize the ability to withstand high voltage. **NV**

HOW TO READ A RESISTOR

Learning the resistor color code ("Bad boys ravish ...") is a rite of passage for electronics techs the world over. A handy Web guide is available at **https://physics.ucsd.edu/neurophysics/courses/physics_120/resistorcharts.pdf** or just type in "resistor color code" to an Internet search engine. Surface mount and power resistors may also have the value printed on their body as a three- or four-digit code with the final digit acting as an exponent. For example, '513' means 51 x 10^3 or 51KΩ.

TOLERANCE AND TEMPERATURE COEFFICIENT

Resistors have a *nominal* value and a *tolerance* (the amount of acceptable variation above or below the nominal value). Most resistors have a 1%, 5%, or 10% tolerance and you can find smaller or *tighter* tolerances. Which values of resistors are available is determined by the *tolerance series*. For example, in the 5% series, values are selected so that each is approximately twice the tolerance or 10% from the next highest or lowest value.

Resistors also change value with temperature. The relative change of resistance with temperature is called the *temperature coefficient* or tempco and it is specified as *parts per million* or ppm or as percentage change per degree Celcius of temperature change. A positive tempco means that resistor value increases with temperature. When designing and constructing sensitive circuits that use precision (1% or tighter tolerance) resistors, it is important to keep them at an even temperature.

CHOOSING RESISTORS

Here are some special applications that require special types of resistors. These aren't hard and fast rules, but can guide your initial selection. For most circuits, plain old carbon film or carbon comp resistors will work just fine.

- •ESD and Transient Protection — Carbon composition, metal oxide (withstand short pulse overloads and low inductance)
- •Audio and Instrumentation circuits — metal film (low noise)
- •High Voltage — wirewound and metal oxide in high-voltage body styles
- •RF — carbon composition and metal oxide (low inductance)
- •Precision circuits — carbon or metal film (fixed value) and cermet (trimmers or controls)

Remember to consider what is important for your circuit — value, power or voltage, stability, cost — then look for the resistor type that meets those requirements

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FURTHER READING

To learn more about resistors, there's a website with a resistor dictionary, terms, and definitions **here**. Download the article on choosing resistors "Ask the Applications Engineer #24" from Analog Devices' website at **www.analog.com/library/analogDialogue/archives/31-1/Ask_Engineer.html**. Serious designers will want to find a copy of The Resistor Handbook by Kaiser (CJ Publishing, 2851 W. 127th St., Olathe, KS 66061) which is a good reference.

ABOUT THE AUTHOR

H. Ward Silver is an engineer, writer, and teacher with well over 30 years of practical experience in medical electronics, instrumentation design, and broadcasting. He is the author of T*wo-Way Radios and Scanners for Dummies* and *Ham Radio for Dummies* by Wiley Press and numerous articles for *QST* magazine. Ward's ham radio call sign is NØAX.

HELLGATE AMATEUR RADIO CLUB

AGENDA – 10 Jun 2024 meeting

Program: Red Cross

Meeting called to order at 7:__ PM (8 needed for business)
Introductions. Please make sure you signed the attendance sheet **Quorum Y/N ____**

Last meeting minutes, Apr: Motion to approve minutes: 1St _____ 2nd _____
Discussion _____ Vote: P/F/T

Treasurer's report: KJ7HYG, Discussion _____
_____Motion to approve report: 1St _____2nd _____ Vote: P/F/T

Repeater Committee Report: W7RPG, Repeaters, Should we or shouldn't we be replacing a set this year??? _____
_____Motion to approve report: 1St _____2nd _____ Vote: P/F/T

HF Committee Report: K0SN, Discussion _____
_____Motion to approve report: 1St _____2nd _____ Vote: P/F/T

Events for 2024:

Jun 04 Trail Rail Run
Jun 10 HARC Testing, Meeting
Jun 22-23 Field Day
Jun 28-30 Missoula Marathon
Jul 08 HARC Testing, Meeting

HARC Net every Saturday morning @ 9:00 AM on 147.040 Repeater – Buy/Sell - During.

HARC Discussion List

1. Field Day Fourth weekend in June, 22-23rd. _____
2. Jun 28-30 Missoula Marathon. _____
3. _____

VHF Net Control Station assignments:

Jun	05	N7PAS	Jul	03	N7PAS
Jun	12	W7RPG	Jul	10	_____
Jun	19	K7MSO	Jul	17	_____
Jun	26	K7MSO	Jul	24	_____
___	__	_____	Jul	31	_____

Reminder: Backup is always the next person in line as the net control.

Good and Welfare. _____

*** Next Club meeting: Jul 8 ***
Is there any other business? _____
_____ Meeting is Adjourned at _:__ PM.

June 2024

Hellgate Amateur Radio Club

Calendar of Events

Board: NZ7S, W7RPG, KJ7THG, K7MSO

Editor - N7PAS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 HARC Saturday Net 9:00AM on 147.040 Repeater.
2	**3**	**4**	**5** ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	**6**	**7**	**8** HARC Saturday Net 9:00AM on 147.040 Repeater.
9	**10** HARC Testing 5:30 & Meeting 7:00PM Program: Red Cross	**11**	**12** ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	**13**	**14**	**15** HARC Saturday Net 9:00AM on 147.040 Repeater
16 Father's Day	**17**	**18**	**19** ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	**20** Summer Begins	**21**	**22** HARC Saturday Net 9:00AM on 147.040 Repeater
23	**24**	**25**	**26** ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	**27**	**28**	**29** HARC Saturday Net 9:00AM on 147.040 Repeater
30						

HARC Events: (Actual Dates Unknown)

#	Month		Activity
1.	Monthly		MARS Interoperability Exercises – Eric NZ7S will keep us advised. 1st week of each month for 2024. Check in on 60 meters. Noon and 8 pm Channel
2.	April		Grizzly Triathlon
3.	April	27	Riverbank Run ←------- We are here
4.	June	04	Trail Rail Run
5.	June	22-23	Field Day
6.	June	28-30	Missoula Marathon – See Comming Events – pg 1
7.	July	04	W7PX Special 4th of July Event – Cabin needs to be reserved.
8	July	??	Glacier Waterton Hamfest
9.	Aug		Fox Hunt 1 per year on Saturday from 10:00AM to 4:00PM
10.	October		JOTA/JOTI
11.	October		Great Montana Shakeout Drill
12.	October		Bitterroot Mushers Dirt Dash
13.	November		Election Day
14.	December		Sky Warn Recognition Day (0000Z-2359Z)
15.	December	9	HARC Christmas Dinner Meeting

Hi,

Can you forward this to club members, or put it in the Static?

Thanks and 73,

Mike in Montana

Begin forwarded message:

From: Randy Jones <n7ckjmail@gmail.com>
Subject: Re: Idaho State Convention
Date: May 23, 2024 at 17:02:30 MDT
To: "secretary@vhfclub.org" <secretary@vhfclub.org>, contact@kbara.org, newsletter@w7bfi.com, info3riversarc@gmail.com, KC7VBT@arrl.net, K7JEP@arrl.net, LCARG.MT@gmail.com, contact_us@w7px.org, ko6uw@yahoo.com, wa0www@hotmail.com

My apologies,

Please use the attached document for our upcoming convention.

Thank you.

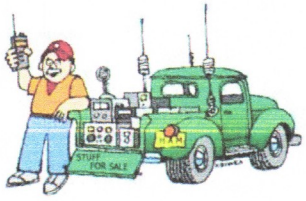
Randy Jones
Convention Chairman

On Thu, May 23, 2024 at 12:06 PM Randy Jones <n7ckjmail@gmail.com> wrote:

> Greetings,
>
> Could you see that the attachment is forwarded to the correct person for dissemination.
>
> Thanks and 73.
>
> Randy Jones N7CKJ
> Convention Chairman

.

ARRL Idaho State Convention And KARS Hamfest 2024



2130 N Meyer Road, Post Falls, ID

08/03/24, 8AM – 3PM

Tailgaters Arrive 7AM, Visitors Arrive 8AM, Sales Begin 9AM

$5 per Visitor, $10 per Tailgate (incudes entry)

Kids under 18 free

Raffle tickets $1, or 6 for $5

Grand Prize tickets $5

Breakfast and Lunch Available

Club Resale Table and Program Your Radio Table

Commercial Vendors

Many Raffle Prizes

Grand Prize: ICOM 7300 HF Transceiver

Contact Persons

Jay Bremner (KK7BVY) – (208) 640-4878

Ed Stuckey (AI7H) – (208) 699-7743

Visit us on *K7ID.ORG*

Talk-In: 146.98 Mhz, PL 127.3