The Hellgate Static
April 2024

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

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Coming Events 2024

Apr	1	April Fool's Day
Apr	8	HARC Testing, Meeting
Apr	15	Tax Day
Apr	27	Morse Code Day
		Riverbank Run
May	1	May Day
May	12	Mothers Day
May	13	ARC Testing, Meeting

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

HARC March Meeting

Program: CERT Presentation

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: 30 Mar 2024 @4:45 PM by N7PAS

11 Mar 2024 Exam Testing Results

Congratulations to:

* 1. **Daniel Belanger** of Lolo passed his Technician exam. His new call sign is KK7RWH.
* 2. **Seth P McClain** of Missoula passed his Technician exam. His New call sign is KK7RWD.
* 3. **Byron T Hall Sr.** of Hamilton passed his Technician exam. His current call sign is KK7RWI.

11 Mar 2024 HARC Meeting Minutes

Meeting called to order @ 7:03 PM

1. **Attendance:** N7PAS, W7RPG, KJ7PCR, N7BIO, W7XT, NZ7S, K7QA, KK7QJH, AG7FH, K7MTD, W7KJA, K0SN,
   Visitors: Seth McClain, Doug Drader, Bob Bumke KJ7DWX
   NOTE: 11 Members present. Thank you to all that attended.
2. **Last meeting minutes, Jan:** Motion to approve minutes: 1st W7XT 2nd K7MTD
   Discussion __None_____ Vote: Passed
3. **Treasurer's report KJ7HYG: ___**Nothing to report. _____
   _____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 _____
   _____Motion to approve report 1st _____ 2nd _____ Vote: Tabled

6. New Business:

a. None

7. Net Control Operators

Mar	06	N7PAS	Apr	03	N7PAS
Mar	13	K7MSO	Apr	10	W7RPG
Mar	20	K7MSO	Apr	17	NZ7S
Mar	27	N7JGS	Apr	24	N7JGS
___	__	_____	___	__	_____

8. Good & Welfare: 1.) Club SOTA/POTA book to KJ7CPR then to W7RPG `2.) K7MTD has lors set up to internet vis igate. 3.) W7KJA repaired a kenwood unit, needs mic.

Meeting adjourned at 7:29 PM.

Program: Great progeam given by W7XT on FT8 using WSJT-X program.
Lots of information given and how to operate.

1. 80MHz frequency of 3580 to 3585 and slighty up.
2. on Tuesdays after 8pm can hear prepers.
3. Use DX Lab suite – DX Keeper for log program.
4. Persons: East use odd 15 sec interval, West use even 15 sec interval.
5. Do NOT transmit on transmit frequenc – use split.

Minutes by N7PAS

HARC INVENTORY -- FOR SALE

Line	ITEM	MAKE	MODEL	CONDITION	VALUE	STORED	Remarks
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	parts only, no cabinet
7	Speaker + Power Supp.	Drake	MS-4 + AC4	Not tested	75	K7QA	needs upgrade
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	Ebay sales $50-300
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	w/ control head
19	Transceiver	Collins	RT-91ARC-2	untested	100	KGVO	Aircraft Military
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	no cabinet top
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	for the HW-101
27	SSB Transceiver	Heath Kit	HW-101	needs repair		KGVO	Ebay $90-300
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	Ebay sales $100-300
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	Transceiver	Kenwood	TS-940	Needs Repair	250	KGVO	No output on CW, others
40	Transmitter	Meissner	9-1160 (tube)	good		KGVO	was in use
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	Ebay sales $80-350
48	Receiver	Signal Corp	R-392/URR	fair	300	KGVO	Stromberg Carlson
49	VTVM	Simpson	311	untested	25	KGVO	
50	Oscilloscope	Telequip.		untested	20	KGVO	

51	Var. power resistors	Various		untested	10	KGVO	box of ~20
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	some free, door prizes
59	Misc. meters			untested,	40	KGVO	2 boxes full
60	RCA male Patch cords			good	10	KGVO	box of ~20
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	66 pounds - pick up only
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	Ebay sales $50-300
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 Countdown

Field Day is just about 3 months away, and now is the time for your club to plan 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

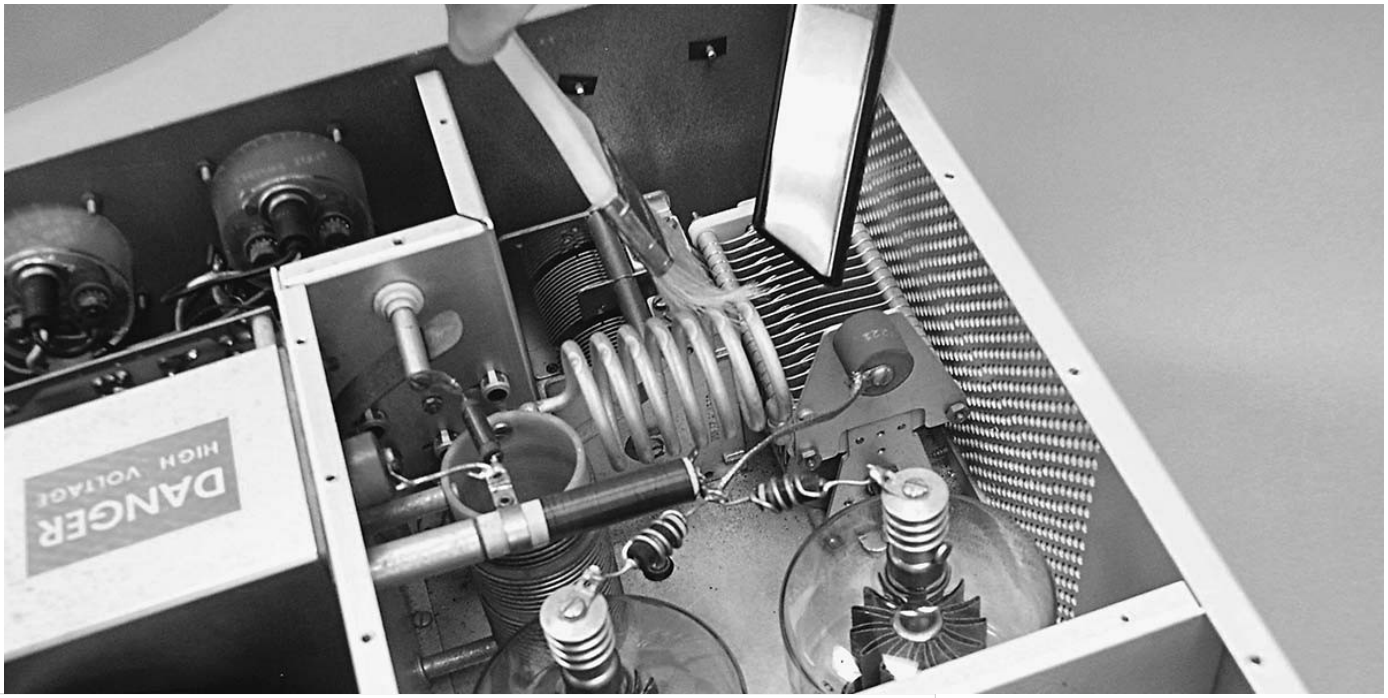
    b. American Red Cross

    c. Local police, fire, and ambulance companies

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

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.



Working with High Voltages

By H. Ward Silver

A previous **article** about vacuum tubes and tube-based equipment included a sidebar about safety with tube-level voltages — it seemed to me an article on some of the issues associated with those voltages would be interesting. There are lots of circuits for generating high voltages out there, but what about the "gotchas?"

How High is High?

Let's talk a bit about what the "high" in "high voltage" means. To a designer of logic ICs, a few tens of volts might be "high voltage." In the AC power world, voltage might need to exceed 1 kV to be properly classified as "high voltage." To the Tesla coil builder or EMC (electromagnetic compatibility) engineer, several kilovolts (kV) might be needed to get the high voltage juices flowing. This column will assume you're working with AC line voltages and higher.

Safety Basics

Start by referring to the sidebar "**High Voltage Safety**" in the previous article. All of those things are important. A comment in the digital *Nuts & Volts* issue by Larry Reynolds K4MLA noted an old and effective rule: "When working with high voltage equipment, keep one hand in your pocket."

Why this is a safe practice is discussed below in the sidebar. Heed that rule and all those in the *Vacuum Tubes* article — we want you as a reader for a long time!

Hand in the Pocket

One of the oldest rules in the ham's safety list is to keep one hand in your pocket or behind your back whenever adjusting or measuring equipment containing a voltage high enough to be a safety hazard. Why? Most workbench shocks come from a hand or arm touching an energized component or wire.

If the lowest resistance path for that current goes through your other hand, that conducts current through your heart and that is the most dangerous path. So, don't create that path!

If you're wearing pants and shoes with insulating soles, the current path has a much higher resistance so less current will flow. Better yet, the path from a hand to a foot doesn't go through the heart. Make it a habit to work one-handed around energized equipment and you'll be a step ahead of electricity.

Fuse Ratings

We're all familiar with the maximum current rating for a fuse, but fuses have a voltage rating too. If you have a glass cartridge fuse handy, on the end with the current ratings stamped into or printed on the metal there will also be a voltage; for example, "3A 250V." The rating tells you how much voltage the fuse can withstand after the element melts and opens.

Be aware that a fuse needs to withstand the peak AC voltage which is 1.414 times the RMS voltage. Peak voltage in a 120V AC circuit can easily exceed 170V. In higher voltage circuits, special HV fuses must be used.

If the voltage across the fuse is higher than its rating, an arc may develop. The arc may continue to conduct current, defeating the purpose of the fuse entirely! Some fuses for higher voltages are filled with sand or another insulating material that block current after the metal element melts. Never use a low voltage fuse in a higher-voltage circuit.
When can you use an automotive-type blade fuse? They are inexpensive and widely available, but the standard ATO fuse is only rated for 32V. These must not be used in a circuit connected to, say, the AC line's 120V RMS.

Another tip — when wiring a panel-mount holder for cartridge-style fuses: Connect the "hot" or "live" circuit to the rear contact so that when the fuse is removed from the holder, its rear contact disconnects from the power source. Otherwise, the holder will be energized as you pull the fuse out.

Grounding Stick

Veterans of broadcast and high voltage applications may refer to something called a "chicken stick" or "grounding stick." **Figure 1A** shows a typical commercial model. To use the stick, turn off the equipment and wait for 30 seconds to one minute (or for as long as metering shows significant voltage is present). This allows charged capacitors to be drained by bleeder resistors (high-value resistors connected directly across the capacitors). If practical, disconnect the power source for the equipment and insure it can't be turned on again while you're working on it.

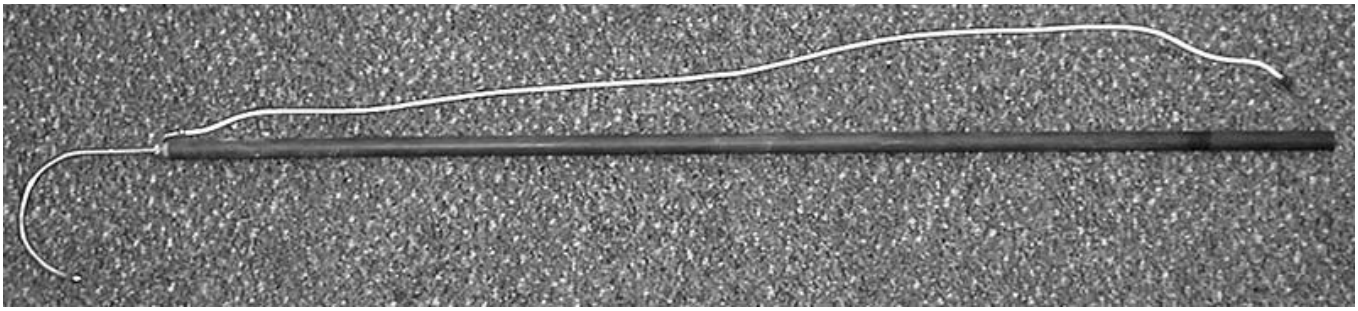


FIGURE 1A. The top photo (**A**) is a commercial grounding stick. The handle is a phenolic resin rod approximately two feet long. The bottom drawing (**B**) shows how to build your own grounding stick. Be sure the ground wire is outside the handle, and use a heavy ground clip. Never touch the ground wire while using the stick. *(Figure courtesy of ARRL.)*

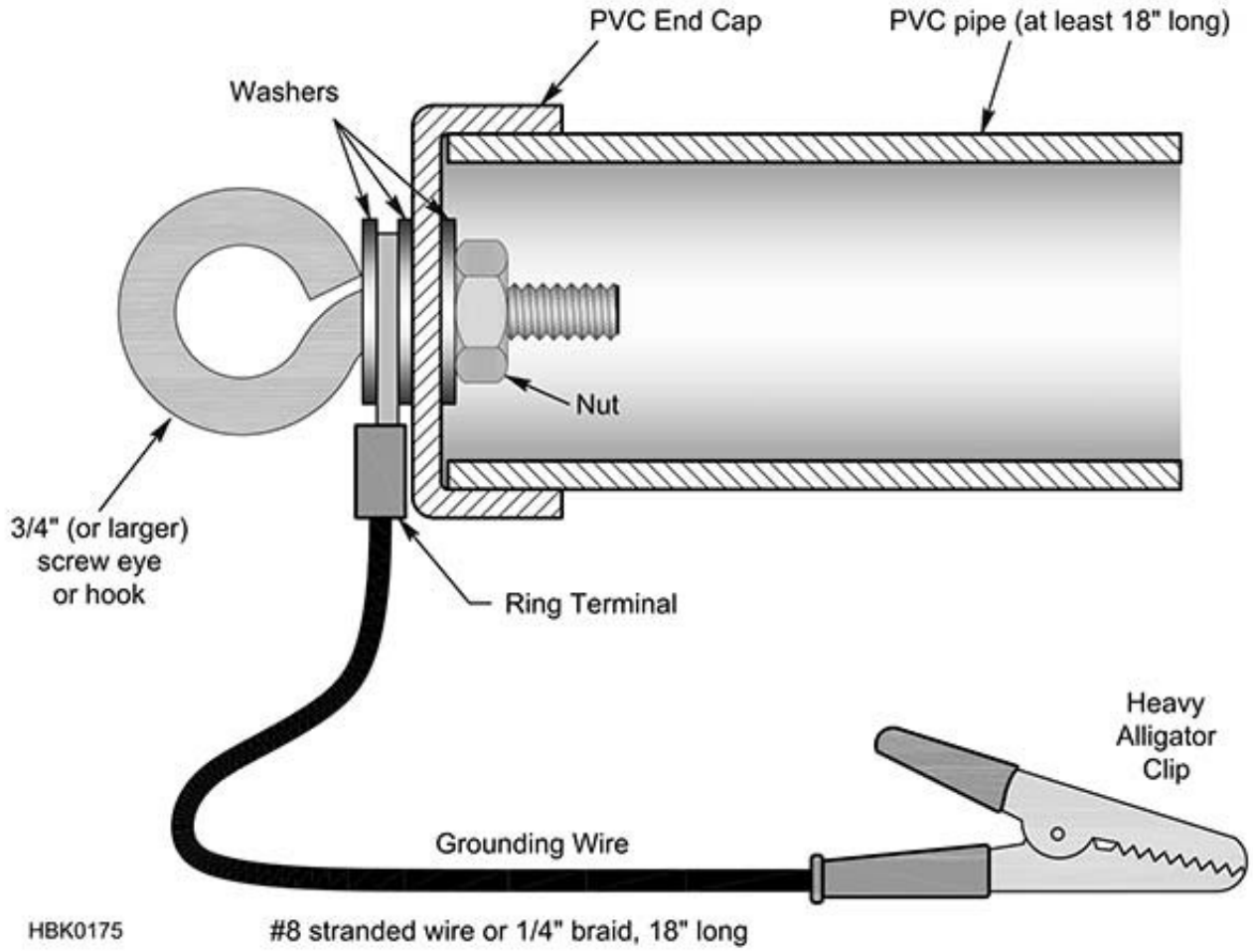


FIGURE 1B.

Save the Screwdriver

Never (repeat after me ... never) use a screwdriver as a grounding stick. They aren't designed or intended for that use.

The handle may look like it has a lot of plastic, but you don't know if it's a good insulator or not. There may be small internal cracks that result in a lot less insulation than you think!

Screwdriver handles are often dirty or greasy which creates a somewhat conductive path from the blade to your hand. Plus, if you do happen to discharge a big capacitor, you'll probably ruin the blade with a big pit.

Take a few minutes and make yourself a good grounding stick. Your screwdrivers will thank you for it!

Once the meters show the power supply capacitors have discharged, open the equipment and attach the stick's ground lead to the power supply common. (Common is usually but not always the metal enclosure — don't assume that it is; verify first.) Put on some safety glasses — just in case. Holding the stick by the insulated portion (never hold the ground lead in your fingers), touch its tip to every point in the circuit where voltage can be present. Only then is the equipment safe to work on.

If you don't have a grounding stick, you can make one as shown in **Figure 1B**. Note that the ground lead is attached outside the PVC tubing. (Dry wood, fiberglass, or plastic rod will also work.) The ground wire should be extra heavy (#8 AWG or larger) because it might have to withstand high current when a fully-charged capacitor is discharged. Shorting out that charged capacitor you thought was discharged will certainly get your attention!

Meter Ratings

Another surprise to hobbyists is that voltmeters themselves can be a source of danger. A maximum voltage rating is printed on your meter (see **Figure 2**). Heed it! That is the maximum voltage the probes, connectors, and body of the meter can withstand. A higher voltage may cause a flashover from the wiring to anything touching the case, such as your hand.

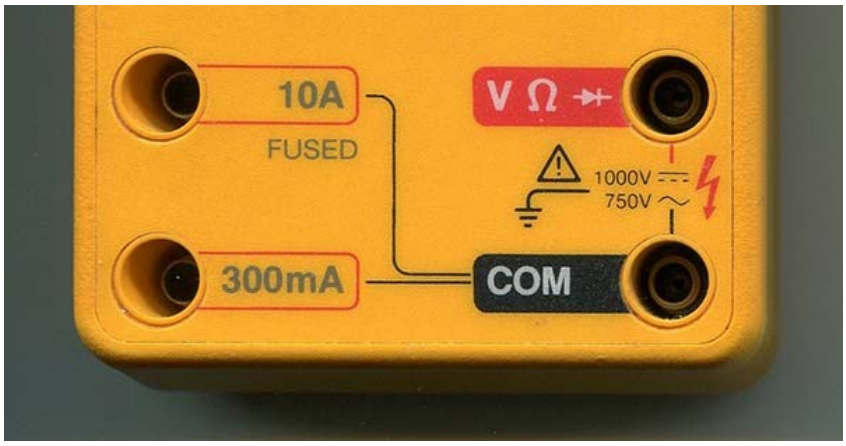


FIGURE 2. Voltage ratings are shown next to a voltmeter's probe jacks (1,000V DC and 750V AC). Exceeding these voltages can result in a flashover, also presenting a severe electrocution hazard.

Electrocution caused by using meters beyond their voltage rating happens regularly. In the photo, note that the probes are recessed for extra insulation — use the right probes for the full rating.

If you use a voltmeter to measure high voltages, power-down the equipment, discharge the high voltage points, then attach the meter to the point being measured. Place the meter where you can see it. Then, power-up the equipment and take a reading. That way, you're not touching the meter when it's energized.

Special high voltage probes (such as the Fluke 80K-40 or B&K HV44-A) are available for the multi-kV voltages sometimes found in tube gear. Remember, it's not a race. Take your time.

Switch to Safety

Finally, follow the "switch to safety" rule long promoted by the ARRL (American Radio Relay League) in its literature. One of the ARRL's early technical pioneers, Ross Hull, died in 1938 from an electric shock when working on transmitting equipment. The "Switch to Safety" campaign began thereafter.

Don't work on live equipment unless it's absolutely necessary, and then take precautions. Follow basic safety procedures at all times.

Don't work alone and know how to respond if someone else does get a shock or burn. CPR courses are often available through a public safety agency like police or fire at very low cost or free. Electrical safety classes may be available through your power utility or an electrician's trade union.

Know how to remove power and show your friends and family how to remove power in your shop or station. This all sounds like a lot of bother I'm sure, but you won't regret having those skills if they are ever needed.

Avoid Crack Attacks

If you're like most electronic-ers, you never throw anything away — especially test instruments and accessories. In the world of high voltage, this can be dangerous.

As probes, fixtures, and connectors age, their insulation can become brittle and crack. That crack compromises the insulation, and you can even come in direct contact with the internal wiring.

Before beginning a high voltage project, carefully inspect your test probes and other equipment. Make sure the insulation is clean, flexible, and not scuffed or cracked so it can protect you as you expect.

Static Voltages and ESD

ESD stands for electrostatic discharge. Anyone who has gotten a shock from walking across a carpet and touching a grounded object has experienced ESD. **Figure 3A** shows the IEC-61000-4-2 ESD waveform used for testing devices that will be subjected to static electricity. Pulse voltages are typically around 2 kV but can be as high as 15 kV! The various models and tests are discussed in the STMicroelectronics document **DM00023467.pdf** which is available online.

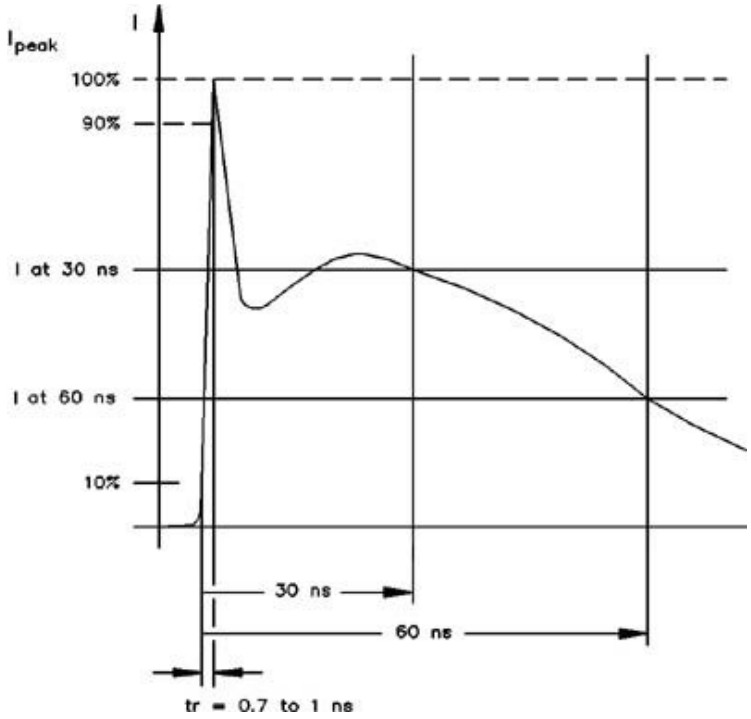


FIGURE 3A. The IEC 60001-4-2 electrostatic discharge (ESD) waveform (**A-** top). The Human Body Model (HBM) circuit (**B-** bottom**)** is used to perform ESD testing on equipment.

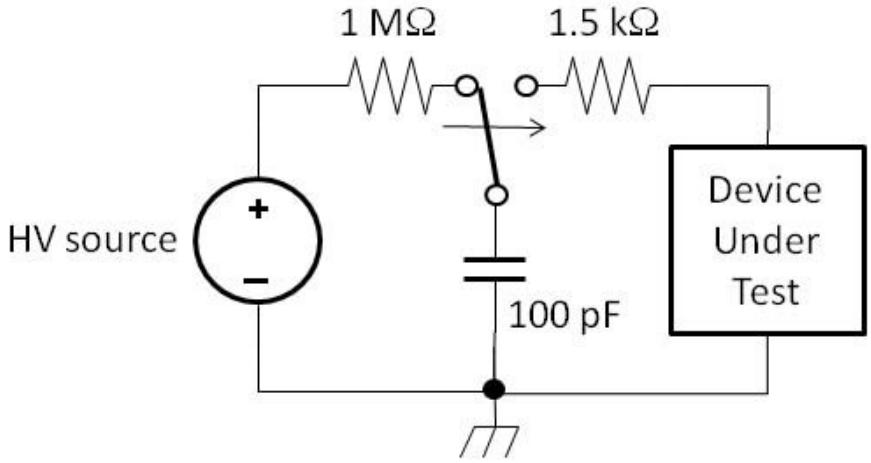


FIGURE 3B.

Figure 3B shows a typical ESD test pulse generator based on the Human Body Model or HBM. The HV source is set to the desired voltage and the 100 pF capacitor representing the body is charged. A test probe is connected to the Device Under Test (DUT) and the switch is thrown, discharging the capacitor through it. *(This is the contact discharge test. If the capacitor is discharged through an air gap, that is the air discharge test.)*

Static electricity can certainly pack a punch — ask any cat in the winter! The pulse can destroy sensitive electronics and also upset their operation. Use of static-discharge equipment in your workshop and when working on equipment is a great idea and not expensive.

Nevertheless, ESD doesn't present a direct hazard to humans. There simply isn't enough energy to cause burns or significant shocks.

High Voltage Components

When building high voltage circuits, be sure to select components intended for that use. High voltage doesn't just result in higher power dissipation; there are special stresses to account for.

Resistors

Resistors have maximum voltage ratings aside from their power dissipation rating. For example, a 1/4 watt carbon-film resistor with axial (wire) leads has two primary voltage ratings: maximum working voltage (MWV); and maximum overload voltage (MOV). (See the datasheet for Yageo CFR resistors at **www.mouser.com**.)

The first represents the "normal" maximum voltage the resistor should experience on a regular or continuous basis. The second is a temporary overload voltage for pulses or transients. For these voltages, the resistor won't arc over or break down just from voltage effects. (It might be dissipating too much power, but that's a different issue.)

For the 1/4 watt Yageo CFR series resistors, MWV is 250V and both MOV and VP are 500V. If your circuit will have higher voltages — even if the resistor's power dissipation is not exceeded — an arc across the body may occur.

Surface-mount resistors have very low voltage ratings because they are so small. The typical voltage rating for body size 0603 components is 75V, an 0805 can handle 150V, and 1206 components up to 200V. This applies to all the components in SMT packages.

For voltages above a few hundred volts, you'll need to use resistors that are physically larger with a longer body and more insulation from lead to lead. Compare the Yageo HHV series of high voltage resistors to their lower voltage cousins. They are longer and have broad end caps that act similarly to the insulating discs on power-line insulators. These resistors have MWV ratings starting at 1,600V.

Capacitors

You're probably more familiar with capacitor voltage ratings. These are generally working voltage ratings for continuous use. Depending on the type, the capacitor may also have pulse overload ratings or peak voltage ratings that represent the absolute maximum voltage the dielectric can withstand. Once the dielectric breaks down, the capacitor is generally destroyed. In a high voltage power supply, this type of failure is not subtle!

For typical tube circuits, ceramic and mica, plastic film, and oil-filled capacitors are normally used, in order of increasing capacitance. Disc ceramic and mica capacitors are very common with values of 0.1 µF or less and ratings up to 1 kV. Film capacitors are generally available with ratings up to 600V and values up to 1 µF or so.

Oil-filled capacitors are commonly available with capacitances in the 1 to 50 µF range and voltage ratings up to several kV. Old units are available as surplus and are often removed from old equipment. Be wary of old oil-filled capacitors! Really old ones made in the 1960s and 1970s often have PCBs (a carcinogen) in the insulating oil.

You can often take these old capacitors to a local utility or recycling center for proper disposal. Some locations have hazardous waste disposal events where they will take these old components. It should be obvious that you don't want to use them if the oil is leaking from the seals or if the enclosing can is dented or punctured. Once discharged, it's good practice to install a shorting wire across the capacitor to avoid self-charging to hazardous voltages.

Vacuum- and air-variable capacitors are often used for tuning or adjusting high power RF circuits. Vacuum capacitors have voltage ratings of 10 kV or more and values up to 2,000-3,000 pF. The electrodes are copper

cylinders, and the variable models move one cylinder with a threaded shaft attached to flexible copper bellows.

Air-variables have somewhat lower voltage ratings. Semi-circular plates connected in parallel are interleaved to create the necessary area. One set of plates is attached to a rotating shaft to vary the amount by which the plates overlap to change the capacitor's value.

These capacitor types are non-polarized, meaning they can be used with AC or either DC voltage polarity. However, you should pay attention to which electrode is closest to the outside of the capacitor's insulation. This is often marked with a line on the component's body.

The reason this matters is that many capacitors are connected with one electrode tied to circuit common or chassis ground. If the capacitor fails shorted, connecting the outer electrode to the lower voltage point reduces the safety hazard.

If you're going to connect capacitors directly to the AC line, you should use X- and Y-type self-healing metalized film capacitors. X capacitors are connected from line to line, and Y capacitors are connected from line to ground. These capacitors are safety-tested to minimize fire or shock hazards.

Energy-Storage or Filter Capacitor?

Browsing through websites or rooting through boxes of capacitors at a flea market, you will encounter capacitors that have pretty high values and voltage ratings — but they're so small! What's the deal?

These are probably energy-storage or photoflash capacitors for pulse discharge use, like in a camera flash unit. They are intended to be charged up, hold that energy, and then discharge it all at once.

Filter capacitors, on the other hand, are intended to have a continuous AC ripple current through them as they store and release energy in a power supply or other filter circuit. This continuous current creates heat in the capacitor which must be dissipated.

An energy-storage capacitor is not manufactured to withstand that stress and while it may work "for a while," it's best to use the physically larger filter capacitor. Similarly, the filter capacitors may have too much inductance to discharge as quickly as an energy-storage capacitor.

Even though the two types may have the same value and voltage rating, they behave very differently. Know that difference!

Dust and Dirt

Dust, dirt, and grime are the mortal enemy of high voltage electronics. Not only do they make it harder for a component to dissipate heat, they can be conductive too. High voltages also attract other particles such as oil mist or water vapor. The result can be a surprisingly large buildup inside your equipment.

Once foreign substances get inside, they are electrostatically attracted to surfaces, wires, and components by the high voltages. Eventually, enough accumulates to create a physical connection between two points at

different voltages — such as from one end of a resistor to the other, across an insulator, or from a high voltage point to ground. This creates a leakage path and small leakage currents start to flow.

As long as it stays small, this current may not be a problem. If the material is organic (fibers, hair, oil, or grease), it will eventually start to break down and carbonize. This lowers the resistance and increases the current in a cycle that eventually causes the material to break down and create a carbon track like a resistor. There may be an arc or the current may just upset the circuit functions. Either way, you'll need to find and clean away the track before it becomes permanent, damages components, or starts a fire.

The best way to prevent this from happening is twofold. First, prevent the contamination from getting into the equipment in the first place. Use filters on fan and ventilation openings and don't let dust accumulate around the equipment. Second, open up and clean high voltage equipment on a regular basis.

Figure 4 shows a good method of using a paint brush and vacuum cleaner to do the job.

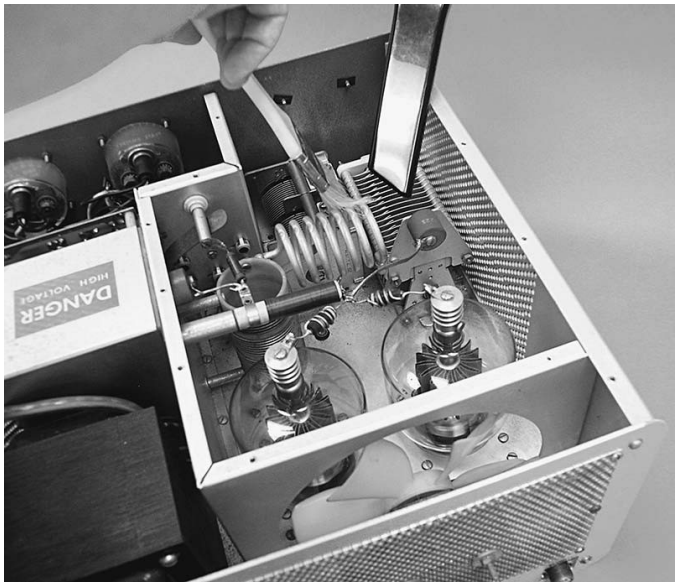


FIGURE 4. Cleaning high voltage equipment can be done with a small paintbrush and home vacuum crevice cleaning attachment. Knock the dust loose with the paintbrush into the vacuum cleaner. Avoid blowing dust away as it will only get into hard-to-reach places or into other equipment. (Photo courtesy of ARRL.)

Knock the dust loose with the brush and vacuum it up. Don't blow the dust away as it just gets deeper into crevices and flies away to other places it shouldn't be. For stubborn or caked-on material or grease/oil deposits, use a soft cloth and mild solvent to remove it. (If you use soap and water, be sure to clean away any soap residue with a water-only wipe.) After cleaning with liquids, let the equipment dry thoroughly before turning it back on.

After you've cleaned the equipment, give it a close visual inspection for any problems that might be starting. This is a good time to look for carbonized or scorched material, cracked insulators or insulation, and loose wires.

Be Smart

In closing, remember the number one rule for working with or around high voltage: Be smart! You might not get a second chance. This is particularly important if you are used to working on low voltage circuits and equipment.

There are lots of "beginner" kits and projects for Tesla coils and various arc-and-spark devices. The voltages involved can be lethal. If you aren't used to high voltage techniques, on that first adventure up the voltage scale work with someone who is. Be extra cautious. Measure twice. Don't assume anything is off or discharged without verifying it. Make good use of that grounding stick. And, of course, switch to safety! **NV**

A Tube-Based Bench Supply for Tube Projects

If you like building tube gear, you'll probably have to build your own power supply. Not too many manufacturers are selling adjustable regulated HV supplies these days! Bryant Julstrom KCØZNG (an ARRL Handbook contributor and prolific builder) designed just such a power source in his August 2014 QST article that is downloadble at **www.arrl.org/files/file/QST/This%20Month%20in%20QST/August%202014/JULSTROM.pdf**.

The supply output of 150-260 VDC is regulated up to 50 mA. A 6.3 VAC output for filaments is also available. Just the thing for getting your "hollow-state" designs up and running!

HELLGATE AMATEUR RADIO CLUB

AGENDA – 8 Apr 2024 meeting

Program: CERT Presentation

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

Last meeting minutes, Mar: 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, Discussion _____
_____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:

Apr	01	April Fool's Day
Apr	08	HARC Testing and Meeting
Apr	15	Tax Day
Apr	27	Riverbank Run; Morse Code Day
May	12	Mothers Day
May	13	HARC Testing and Meeting

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

HARC Discussion List

1. April 27th – River Bank Run_Who? Where? When?_____
2. _____
3. _____

VHF Net Control Station assignments:

Apr	03	N7PAS	May	01	N7PAS
Apr	10	W7RPG	May	08	_____
Apr	17	Eric	May	15	_____
Apr	24	N7JGS	May	22	_____
___	__	_____	May	29	_____

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

Good and Welfare. _____

*** Next Club meeting: May 13 ***
Is there any other business? _____
_____ Meeting is Adjourned at _:__ PM.

April 2024

Hellgate Amateur Radio Club

Calendar of Events

Board: NZ7S, W7RPG, KJ7THG, K7MSO

Editor - N7PAS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3 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	4	5	6 HARC Saturday Net 9:00AM on 147.040 Repeater.
7	8 HARC Testing 5:30 & Meeting 7:00PM CERT Presentation	9	10 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	11	12	13 HARC Saturday Net 9:00AM on 147.040 Repeater.
14	15 TAX DAY	16	17 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	18	19	20 HARC Saturday Net 9:00AM on 147.040 Repeater.
21	22	23	24 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	25	26	27 HARC Saturday Net 9:00AM on 147.040 Repeater. River Bank Run
28	29	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		Trail Rail Run	
5.	June	22-23	Field Day – What are we doing? -	
6.	June		Missoula Marathon - was same day as field day in 2022	
7.	July		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-2400Z)	
15.	December		HARC Dinner Meeting	