The Hellgate Static
Jul 2024

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

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Jun Testing Results
Jun Meeting Minutes
HARC Inventory: These Items are for Sale
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Jul Meeting Agenda Jul HARC calendar
HARC Events
Field Day Events & Pictures & Items

Coming Events 2024

Jul 04 W7PX Special Event - 4th of July.
Jul 08 HARC Testing, Meeting
Jul 19-21 Glacier Waterton Hamfest - 90th Annual
Aug 12 HARC 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 Jul Meeting

Program: APRS 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 Jun 2024 @11:00 PM by N7PAS

10 Jun 2024 Exam Testing Results

Congratulations to:

* 1. **Byron Hall** of Hamilton passed his **Extra** exam. His call sign is **KK7RWI**.

Program: Red Cross – Was canceled by Red Cross due to presenter deploying to Arkansas for tornado shelter ops.

10 Jun 2024 HARC Meeting Minutes

Meeting called to order @ 7:01 PM

1. **Attendance:** N7PAS, N7BIO, W7RPG, N7NHS, W5JOK, KK7NOM, KK7QJH, NZ7S, KJ7YHG, AG7SW, K7MTD, K7MSO, K7QA, K7MH, W7XT, Quorum - **Y**
   Visitors: Carlos Abozeo W7CMA, Dennis Davis N5JIL, Brett Hiscock KD0CHT
   NOTE: 15 Members / 3 Visitors present. Thank you to all that attended.
2. **Last meeting minutes, May:** Motion to approve minutes: 1st K7MTD 2nd AG7SW
   Discussion __None_____ Vote: Passed
3. **Treasurer's report KJ7HYG: Jun:** 1 new Member-AI7XI; More QSL cards in club mailbox.
   Edward Jones needs updated forms_____ Motion to approve report 1st _____ 2nd _____ Vote: Tabled
4. **Repeater Committee W7RPG:** Research started on replacement of .04 Repeater– Dale to chair;
   .90, APRS & Packet working OK. _____ Motion to approve report 1st _____ 2nd _____ Vote: Tabled
5. **HF Committee Report K0SN:** Discussion: Hope to sell equipment on list in Static.
   _____ Motion to approve report 1st _____ 2nd _____ Vote: Tabled

6. New Business: **a.** - Board to discuss at later date liability insurance
b.
c.

7. Net Control Operators

Jul	03	N7PAS	Aug	07	N7PAS
Jul	10	N7NHS	Aug	14	_____
Jul	17	NZ7S	Aug	21	_____
Jul	24	K7MSO	Aug	28	_____
Jul	31	K7MSO	___	__	_____

8. Up Coming Events:

1.) -Field Day on Mt Sentinel to cost over $300.
- POC for Council Groves park retired. No overnight camping. Does not look good.
- Group will go out to VPs property to check feasibility of operating there.
-HF Com. & NZ7S had meeting. Decided University Mountain this year.

2.)

9. Good & Welfare:

1.)

Meeting adjourned at 8:02 PM. Minutes by K7MSO

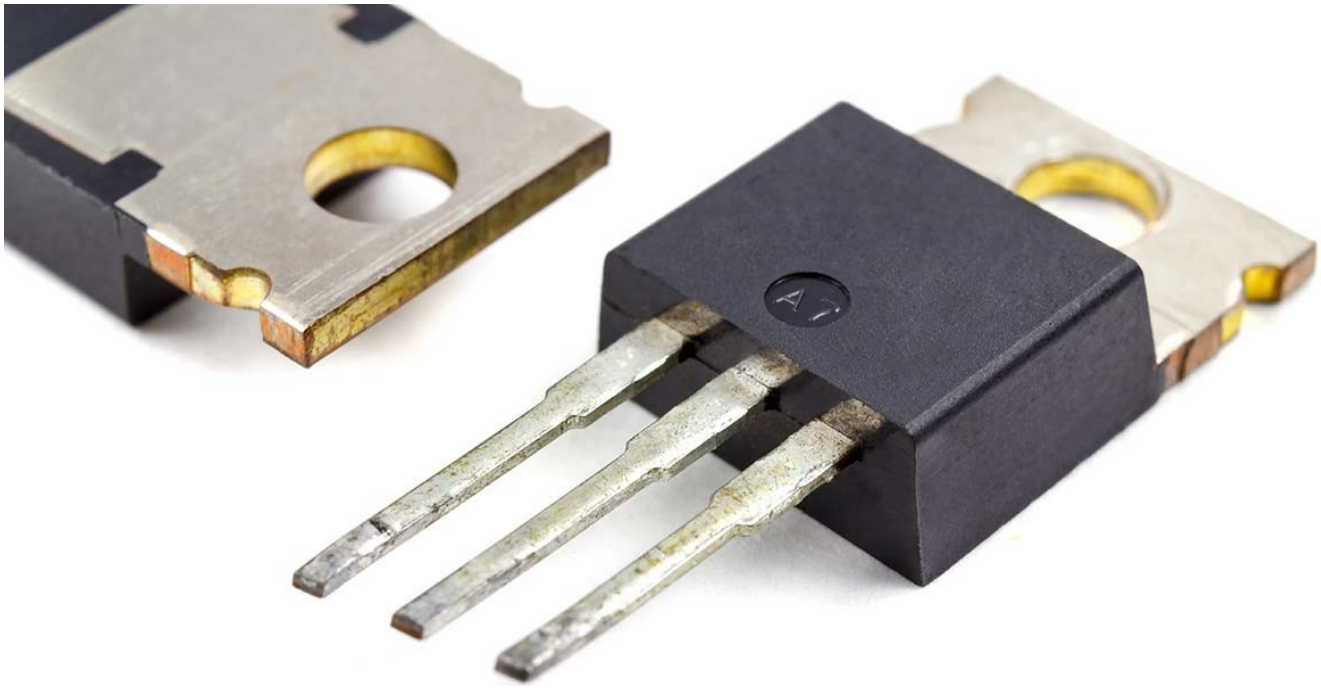
HARC INVENTORY -- FOR SALE

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						
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

Jul 19-21 Glacier Waterton Hamfest - 90th Annual **https://www.gwhamfest.org/**



The Field Effect Transistor

By Dan Shanefield

A Necessary Device for the Modern IC

The commonly used *bipolar transistor* — in which electrons or holes pass through two PN semiconductor junctions — is essentially a *current* amplifying device. Although *voltage* can be amplified indirectly if the "common emitter" or "common collector" wiring configurations are used, it still is true that a small amount of input *current* must always flow into the transistor's base region for control purposes.

Another type of semiconductor device, the *field effect transistor* or "FET," is not as familiar to many electronics hobby enthusiasts, possibly because it is easily damaged by misuse. The FET amplifies *voltage* directly, and the *current* needed for control is so low that it cannot be measured with common instruments. This transistor was actually the first type of semiconductor amplifier predicted theoretically at Bell Labs, back in the 1950s, but it was not developed into a practical device until after the bipolar type had become popular. However, FETs have now become the most common type, with tens of millions of them in each microprocessor IC chip.

With such a huge number of transistors operating in a single chip, we certainly don't want much current to be required for the control of each one — the battery power would be used up fast, and a lot of heat would have to be removed. Also, there are many other applications where super-low input current is desirable. An obvious example is in the first stage of an accurate voltmeter, where we don't wish to cause any new voltage drops by draining current out of the circuit being studied.

Still another advantage of the FET, probably less important, is the fact that its input versus output characteristics are similar to those of vacuum tubes. Because tubes have been used since about 1910, we have a great deal of experience with them, and some designers feel more comfortable with FETs than with bipolar devices, especially in audio amplifiers. (Whether or not this is truly an advantage borders on emotional factors as much as scientific ones. Some readers might recognize the author of the present article as an early partisan on one side of this intensely debated issue, so we won't discuss it any further here!)

At any rate, the FET responds entirely to *voltage* at the controlling electrode, and this can be used to throttle fairly large amounts of output current and/or voltage in the other two wires.

The JFET

Instead of making a transistor that conducts through both PN junctions when it is turned on (“bipolar”), one type of FET transistor can be made with just a single PN junction (“unijunction”). Since it does have a junction, it is called a juncFET or JFET, and a simplified cross section diagram is shown in **Figure 1**.

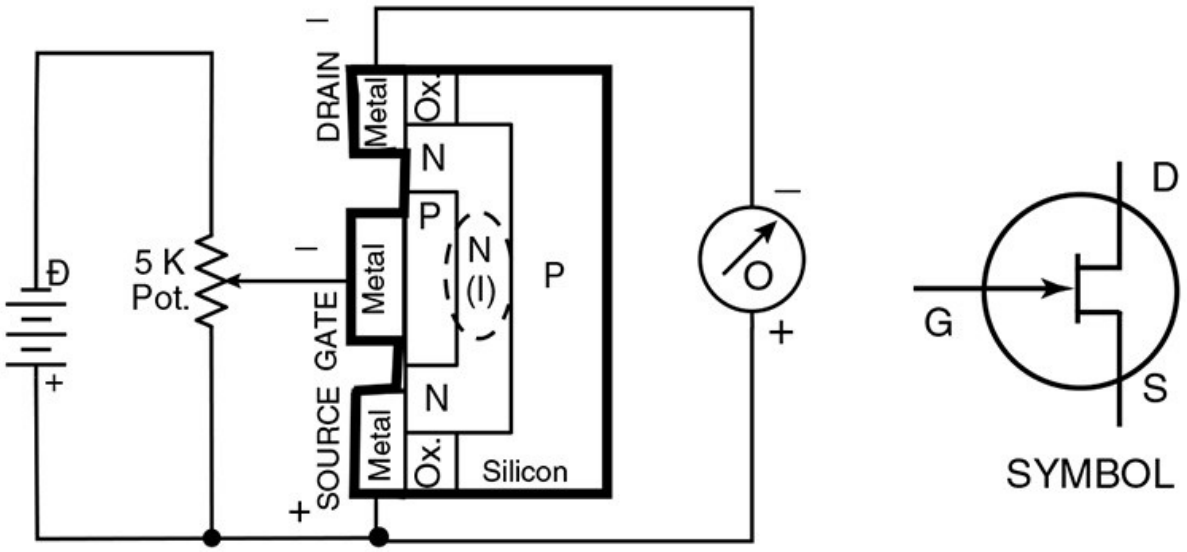


FIGURE 1. Simplified cross section of a JFET, with an operating circuit. It is N-channel, depletion mode, and normally on. The symbol is at the right-hand side of the figure.

The rectangles enclosed by a thick line are solid materials, including two regions that are P-type silicon but do not conduct appreciable current. There is an N-type region in the middle that can conduct all the current. In the very simple circuit shown in the diagram — which the reader can easily construct to get some experience with the JFET — an ohmmeter provides a voltage and also indicates a flow of load current. This type of FET is normally in the turned-on state, before any control voltage is applied. If the 5K potentiometer is set so there is no voltage on the “gate” (by sliding its arrow downwards as shown in the diagram), then “positive” load current from the ohmmeter goes into the upper left corner of the FET, then down into the topmost metal, then down through the continuous N-type silicon, and out of the transistor through the lower metal. (The “Ox.” regions are silicon dioxide insulators.)

The diagram is not drawn to scale, and the rectangles show regions that are actually only about a micron in size. (A more formal size designation is “micrometer,” which is a millionth of a meter.) The metal is usually a thin aluminum or copper film about a micron thick, and the whole configuration is sometimes more complex than shown in this simplified diagram. The P-type silicon (to the right, as drawn here) is mainly just a mechanical support for the smaller active regions that do the conducting. It is often referred to as the “substrate.”

To turn off the transistor, the 5K pot setting can be raised to provide a negative control voltage. This charges the P-type region, but practically no electricity actually flows, because there is a “reverse-biased” PN junction (negative voltage on P-type silicon and positive on N). However, this charge strongly repels electrons from the very thin N-type conductive “channel” in the middle. A depletion zone conaining fewer electrons is formed there, so the silicon inside the dashed-line oval becomes intrinsic (I-type, as symbolized by the I in parenthesis), which is insulating, and the FET stops conducting. This type of behavior is called “depletion mode.” Because the controlling action is done by an electric *field* (and not by carriers flowing into a base region), the whole device is called a *field effect transistor*, or “FET.”

One metal electrode is called the source, one is the gate, and one is the drain, similar to the emitter, base, and collector in a bipolar transistor. This is an “N-channel” device, because the current goes through N-type silicon. The symbol is shown to the right of the cross section. Another type of JFET, a “P-channel” device, has the opposite types of P and N semiconductor regions, so the arrow in the symbol is aimed away from the channel. That type of gate must be charged positive in order to turn off the channel by repelling holes. It is not as common as the one shown here, but it does exist, and it can be useful for special purposes.

Constant Current Diode

An interesting application for the JFET is in the “constant current diode.” The total effect of this is similar to that of a bipolar voltage regulator, except that *current* is regulated here instead of voltage. This can be a very simple circuit, as shown in **Figure 2**, diagram B.

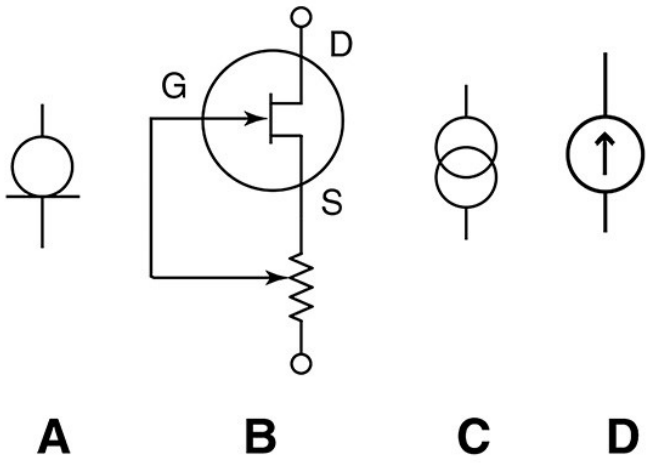


FIGURE 2. An N-channel JFET wired to be a constant current self-regulating device, with the symbol shown next to it on the left. The other two symbols, to the right, are for constant current sources that include power supplies such as batteries.

Looking at the negative current that flows upward through the resistor, some of it will be sent to the gate, which partially turns off the FET. This is negative feedback, so if the current in the circuit starts to increase, then the transistor gets turned off even more. Thus, less current flows, until some constant current level is reached. The JFET and potentiometer are all inside an insulating plastic “package.” That whole thing, plus a power source like a battery (not shown here), is symbolized by two overlapping circles, **Figure 2**, diagram C. Occasionally an alternative symbol is used, with an upward arrow, especially in Europe, as shown in diagram D.

The MOSFET

A different kind of field effect transistor is illustrated in **Figure 3**, the *metal-oxide-semiconductor* or “MOS” device.

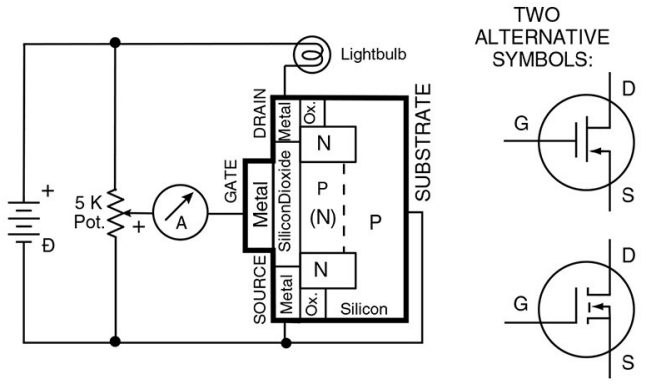


FIGURE 3. Simplified cross section diagram for a MOSFET, with an operating circuit. It is N-channel, enhancement mode, and normally off. Two alternative symbols are shown at the right.

In this transistor, there is insulating silicon dioxide to prevent gate current from going into the main semiconductor, instead of the reverse-biased junction that was used in the JFET. This one is sometimes called an “IGFET,” because of the insulated gate. It is a normally off device, which has to be turned on by some sort of action, and therefore it is referred to as an “enhancement mode” device. (The IGFET can also be made in a depletion mode configuration.)

In the figure, if the pot is turned down to zero voltage, then the battery current tending to go through both the lightbulb and the transistor will be stopped by one of the PN junctions. In this diagram, it is the upper one, which is reverse-biased. (Initially, the dashed line and the N region in the middle are not present.)

If the potentiometer arrow is raised, and a positive potential is now applied to the gate, holes in the P-type silicon are repelled, causing this region to become N-type (as indicated by the N in parenthesis). Now there is no PN junction directly in the path between the upper and lower N-type regions, because it is all one continuous N-type region (drawn as a vertical bar, with the dashed-line as one edge). This transistor is also N-channel, because the electricity goes through N-type silicon when it is turned on.

If the reader wishes to get some experience with the MOSFET, an ammeter can be placed as in **Figure 3**, to show that no measurable current flows into the gate, even when the bulb is lit. In this diagram, the multimeter has been switched to measure current, and it is moved to the gate lead. (This circuit could be used for the JFET experiment also. The experimenter should note that precautions for avoiding damage to MOS devices are described in the ESD Sensitivity section below.)

Symbols for the MOSFET are shown on the right. The arrow, in this case, indicates that the “source” electrode is internally connected to the substrate, which is often done if one of the PN junctions is not going to be used.

If the device were P-channel, the source and drain would be P-type, and the arrow would be aimed away from an N-type substrate.

Characteristic Curves and Load Line

Typical FET “spec sheets” use formats similar to those of vacuum tubes. The shapes of the curves are almost the same, but the voltages are usually much lower. The input is the V_{GS} and the output is the I_D. In this case, a type 2N7000 MOSFET is used in N-channel enhancement mode.

A “load line” is shown here as a dashed line. Its slope represents the effect of a load resistance (such as the lightbulb in **Figure 4**), and it is quite valuable as a way to show the amount of current in any situation.

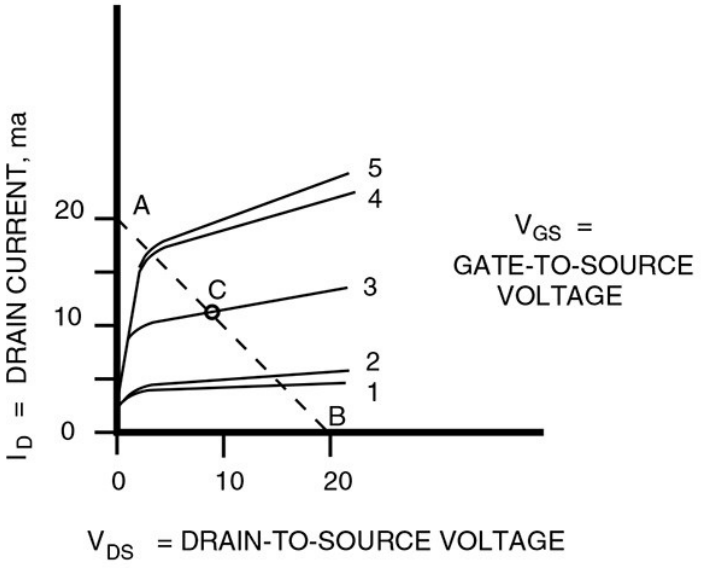


FIGURE 4. Characteristic curves for a 2N7000 MOSFET, with a load line.

In the case graphed here, the load resistance is 1,000 ohms, and V_{DS} is 20 volts. The dashed load line is drawn from the maximum possible voltage (shown here as B) to the maximum possible current with that particular load, which is 20V/1Kohm = 20 mA (shown as A). If the transistor is turned partly “on” (V_{GS} = 3 volts), the drain current would be about 11 mA, as shown by the intersection (the circle under the letter C).

CMOS

Two MOS transistors of opposite type can be wired as in **Figure 5**, in the *complementary MOS* configuration ("CMOS").

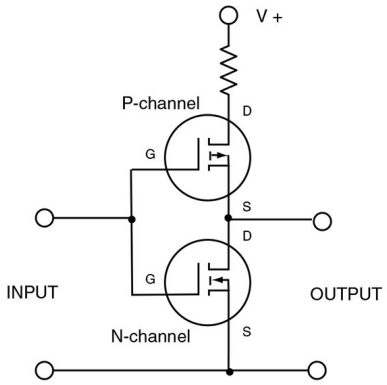


FIGURE 5. CMOS transistor pair. The current is extremely low when there is no input signal.

When no signal is fed to the input, one of the transistors is always "off," so essentially zero current can get from the power supply down through the resistor, and then through the pair of transistors. When a signal comes to the input, then load current can be drawn from the output terminal, at either high (V+) or low (ground) voltage, depending on the polarity of the input voltage. However, in the situations when there is no input, the overall current is practically zero.

Modern integrated circuits have millions of transistors attached in parallel, so if only a microamp of "leakage current" flowed through each one that was not being used, an ampere or more would still be drawn from the power supply or battery at all times. That would generate a lot of heat and also drain batteries too fast for portable devices. Therefore, almost all modern calculators, laptop computers, cellular phones, etc., use CMOS circuits whenever possible.

ESD Sensitivity

The MOS transistor is particularly susceptible to damage from static electricity, of the kind generated when a person walks across a rug in dry weather. The spark that the person makes when touching the metal faceplate on a light switch is called *electrostatic discharge*, or "ESD," but damage can be done to a MOSFET, even if there is not enough static to make a visible spark.

Static electricity can destroy the very thin silicon oxide that insulates the gate. Some MOS transistors are protected by zener diodes that are attached in parallel with them, inside the packages, but most are not protected. To prevent damage, people handling IGFETs should always follow these two precautions:

1. Only touch the plastic insulation with your hands, not the metal leadwires directly;
2. Use a grounded wrist strap.

The latter is a plastic band (usually black or pink) that conducts electricity and is attached to a long wire. It should be fastened around either wrist, touching the person's skin, and then the other end of the wire is hooked up to a good ground connection such as a water pipe. **NV**

Parts List

JFET	N-channel
Potentiometer	5,000 ohms
Power MOSFET	N-channel
Lamp bulb	Tungsten, 12 volt, 40 mA
Battery	Nine-volts
Multimeter	
Static-grounding wrist strap	

HELLGATE AMATEUR RADIO CLUB

AGENDA – 8 Jul 2024 meeting

Program: APRS

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, Jun: _____ Motion to approve minutes: 1St_____ 2nd_____
Discussion _____ Vote: P/F/T

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

Repeater Committee Report: W7RPG, _____Motion to approve report: 1St _____2nd _____
Discussion_____ _ Vote: P/F/T

HF Committee Report: K0SN, _____Motion to approve report: 1St_____2nd_____
Discussion _____ Vote: P/F/T

Events for 2024:

Jul	08	HARC Testing, Meeting
Jul	19-21	Glacier Waterton Hamfest
Aug	03	Fox Hunt – any interest ???

HARC Net every Saturday morning @ 9:00 AM on ~~147.040~~ Repeater – Buy/Sell – During.
Currently on 146.090 -offset 88.5Hz tone

HARC Discussion List

1. _____
2. _____
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: Aug 12 ***
Is there any other business? _____
_____ Meeting is Adjourned at _:__ PM.

July 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 Independence Day	5	6 HARC Saturday Net 9:00AM on 147.040 Repeater.
7	8	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 HARC Testing 5:30 & Meeting 7:00PM Program: Red Cross	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 Father's Day	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
28	29	30	31 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			

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
4.	June	04	Trail Rail Run
5.	June	22-23	Field Day
6.	June	28-30	Missoula Marathon – See Coming Events – pg 1
7.	July	04	W7PX Special 4th of July Event – Cabin needs to be reserved.
8	July	19-21	Glacier Waterton Hamfest
9.	Aug	03	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 - 5th
14.	December		Sky Warn Recognition Day (0000Z-2359Z)
15.	December	9	HARC Christmas Dinner Meeting

←------- We are here

HARC Field Day 2024

Our field day effort this year began in April with NZ7S, K0SN and K7QA all trying to obtain use approval at potential sites owned by government entities. After being turned down by MT FWP at Council Grove Park and the USFS at the previously used Blue Mtn recreation area, we decided to pay to play with the MT DNRC to again use the University Mountain site. DNRC higher fees and the new requirement for liability insurance cost HARC $425. But with previous FD efforts at that very low noise site generating big scores, including a national 1A class record in 2021, that was compelling enough to spend the $$$$ this year. Plus the advantage of the steep dropoff below the ridge facing east adds at least another 10 dB to our transmitted signals.

A total of 11 HARC members and several visitors participated this year, including. Eric NZ7S, Tom H K0SN, Dale W7RPG, Tom M K7QA, Mel K5MH, Paul N7PAS, Doug K7INJ, Dennis N5JIL, Evan KK7BIP, Adam KK7NOM, and Andy AG7SW with his 11 year old nephew Walter.

With the sunspot cycle nearing a maximum, we all felt 10 meters would be in play this year. Tom, K0SN spent considerable effort modeling and adding 3 element 10 meter capability to his 20/15 meter yagi (2 elements on each band) used for FD the past few years. We tuned it up on all three bands hoisted in the air 35 feet with a tractor boom loader. As it turned out, 10 meters sadly never opened, even with SFI at almost 200.

A primary mission of this year's FD was to involve newer club members in the effort and to make QSOs using the N1MM logging software. We deployed the club's old HP Win7 desktop along with a Win10 laptop provided by K0SN and K7QA. To assist in that mission, we deployed a real GOTA station this year (Get On The Air) to entice members who may not have yet participated or operated in FD or used the N1MM logger.

The GOTA station consisted of K7QA's IC7300 driving a multi-band dipole fed with ladder line and a Johnson Matchbox up about 30 feet. Several members including Dennis, Evan, Adam, and Walter, the 11 year old nephew of Andy AG7SW who came to observe, all operated and made QSOs. About 50 QSOs entered the GOTA SSB logs.

The main SSB station used the club's Elecraft K3 driving the club's 2 band yagi at 35 ft on the trailer mounted crank-up tower. 40 meter contacts used the GOTA dipole in the evening.
SSB operators included, Eric, Dale, Tom H, Evan, Dennis and Adam. 1279 SSB QSOs were recorded in the N1MM log.

Unfortunately, the K3 developed intermittent high SWR and low power faults late Saturday afternoon and had to be replaced by the GOTA IC7300. The GOTA crew was not to be denied so Eric set up his old IC-756 Sunday morning to keep them going. We could have also used the club's Elecraft K2. Tom H will send the failed K3 back to Elecraft for repair.

The main CW station used K0SN's Elecraft K3 driving his newly modified tribander, supported by K7VK Vick Applegate's old 40ft sectionalized aluminum tower. Tom H recently purchased that tower after Vick decided to decommission his HF yagi/tower setup. Tom built a heavy metal tilt over base for it. The tower was erected with a pulley fixed high in a tree (thanks N7PAS for the ladder work) and a heavy rope hauled by 3 strong men, (N7PAS, K5MH, and KK7NOM). It was lowered with the same rope, this time tied to the front end of a truck (much easier!).

We erected a multi-band ladder line fed dipole for 40 and 80m between 2 70ft pine trees assisted by K0SN's tennis ball air cannon. It was a bit too long at 133ft to fit between the 2 best trees so we decided to reduce the length to 113 ft to make it fit, assuming the Johnson Matchbox tuner would tune it up just fine. Big Mistake. We could not make it resonate on any ham band.

So we strung up another 133ft dipole using the nearby LMR tower for one end (thanks NZ7S for your climbing expertise) which worked AOK, just in time for the evening's 40 and 80m operations. K0SN ran CW during daytime hours with K7QA running late afternoon and nighttime hours, joined by K5MH during the evening until almost sunrise.

Here are the totals: (Does not include GOTA station)

Band	CW	SSB
80	64	
40	323	80
20	510	700(!!)
15	576	499
Total	1473	1279

Adding to the fun was a bit of friendly competition between the two modes.

It was pretty much neck and neck for most of the period, with the CW crew eking out a small advantage at the finish line. A quick look at the above table will reveal the reason- the SSB crew made a small strategic error in that they failed to spend enough time on 40 meters during the night. Undoubtedly they will not make the same mistake in the future!

We were able to have all 3 stations up and running at the 12N Saturday starting bell. When the event ended at 12N Sunday, the remaining crew of about 7 quickly and efficiently broke down the entire operation including all antennas and got all loaded up by 3PM. We celebrated with a few cold Coors sitting in the shade and recapped the 2024 FD experience. Adam had made an extensive list of actionable items to improve our FD efforts going forward. Hopefully he will share those at the next HARC meeting.

And for those who may be interested in statistics, here are some from recent years:

Year	Place	QSO's
2016	Ft Missoula 2A	687
2019	University Mtn 2A	2075
2020	Bitterroots, Victor, MT 4750' Elevation 2A	2169
2021	University Mtn 1A	2262
2022	Ft Missoula 2A	755
2023	Ft Missoula 2A	759
2024	University Mtn 2A	2752

Artical by K7QA with edits by K0SN and N7PAS.

Photos by **photographer_subject_date_time**:

Adam_Paul chaining pulley up in tree_20240621_153901.jpeg

Adam_Break time & Horizontal Tower_20240621_153914.jpeg

Adam_Checking the work_20240621_155710.jpeg

Adam_Almost ready to start hoisting_20240621_1558018.jpeg

Adam_Beautiful Day_202406211_160610.jpeg

Paul_Tom's Tribander & Tower 20240621_161107.jpg

Adam_Getting HARC tower into possition_20240621_163822.jpeg

Adam_Not quite there yet_20240621_163825.jpeg

Adam_Rearranging equipment_20240621_181415.jpeg

Dale_Eric & Tom fixing 2 band beam antenna_20240622-095900.jpg

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Dale_Evan,Eric,Tom H,Adam working on 2 band Ant_20240622-095934.jpg

Adam_Setting up Dipole tuner_20240622_105910.jpeg

Eric_Dennis,Dale,Evan,Adam at SSB & GOTA stations_20240622_133816.jpg

Dale_Tom H,Dennis,Adam,Evan,Eric SSB & GOTA_20240622-140853.jpg

Dale_ SSB&GOTA Trailer with 2 band beam and dipole_20240622-141719.jpg

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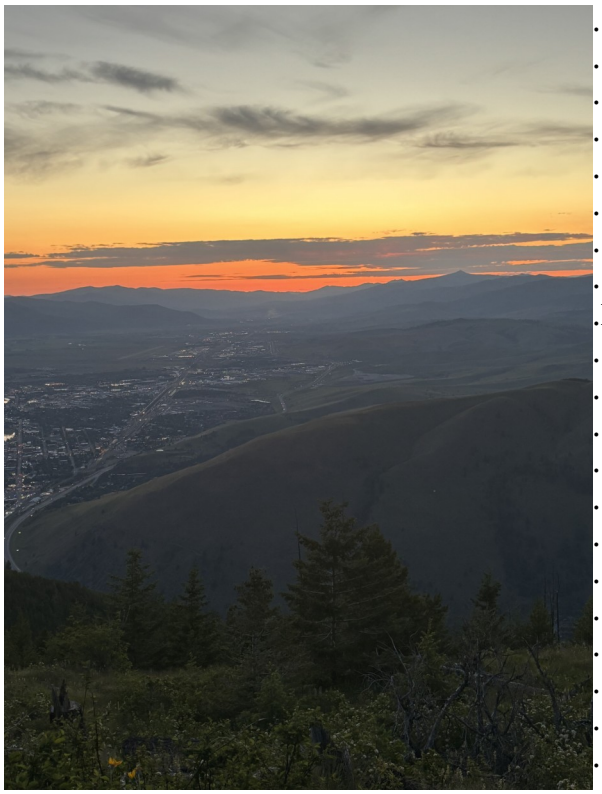

.Eric_Sunset over Missoula_20240622_215310.jpg

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.Adam_Moon rise over University Mtn FS Bldg_20240623_005210.jpeg

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. Eric_Sin Rise looking East 20240623_045023.jpg

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Adam_Getting ready to lower the tower_20240623_123248.jpeg

Adam_Take down and cleanup continues_20240623_123510.jpeg

End of Photos

Field Day After Action Ideas

Areas that we noticed we could have changed something or had problems with

- ***Pre Event Planning***
  - We could try to organize the event a little better. It was mentioned that some clubs go so far as to make an assignment list
  - It would be nice to include a COMM Plan with the hand out that was in the HARC Static. This would be a list of VHF frequencies that we would be monitoring for people traveling to or from the event.
  - A schedule of operators could be made. On this event we each worked for about an hour or so. One person logging the contacts and the other operating the radio.
  - Plan to set up at least two stations for each mode of operation, one for more experienced operators that are going to compete in the contest and another station for newer operator. This station would have an experienced operator mentoring the new operator on how to use the radio and how to log contacts in the software.
  - Every few years we would plan this event to take place on the valley floor. This might help to draw more interest in the club/amateur radio hobby.
  - Have smaller events that members of the club can practice with the radios and logging software before field day. There are other contest and activities that we can try to do such as POTA.
    - Training with the logging software could be considered an individual activity. However it would help if members saw and used the software before field day. A club activity to set up and practice with it would point members in the right direction.

- ***Set up***
  - **Permanent Tags** - When setting up the beam antenna, we found that the parts were labeled wrong and we had to difficulty reading the permanent marker that had faded off of the parts, they are stored outside for the year. It would help to make a metal or other permanent tag for the parts and where they are installed
  - *Radio Stations* - When the radios were set up they came in three or for boxes total. The radios were in one box and all the cables and headphones in another. KK7NOM said that he had difficulty determining how to set up the radios. Some suggestions about this were
    - Have a complete radio set up in one box. Example radio, mic, cables and headphones
    - Labeling cables and equipment for each radio
  - Bring some more shelters like
    - Sun Shades
    - Mosquito nets
  - Mark the road to the event location
  - We had trouble connecting to the internet. This turned out to not be a problem but if in the future we need internet it is something to think about.

- ***During the event***
  - Have a dedicated 2 meter radio station monitoring frequencies for members traveling to or from the event
  - The idea was presented to have two modes of operation in one trailer such as FT8 and SSB
  - Planning to work for 1 hour shifts seemed to work well for operators.
  - During the night we ran out of gas for the generator at the SSB trailer and could not find the gas can because it had been moved. Some ways to avoid this
    - Use a timer set to remind us to fill up the generator
    - Keep the gas can near by or in a specific spot
  - Keep a fire extinguisher handy

- ***Some other projects that might be fun to try***

Include solar power into our set up. Possibly for the 2 meter radio station

Write up by Adam KK7NOM