The Hellgate Static
April 2023

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

Inside this issue:

Mar Testing Results
Mar Meeting Minutes
HARC VHF Total check-ins for 2022
K7VK Yagi for sale
HARC Inventory
Electronics 101-2 Capacitance
YMCA Riverbank Run
Apr Meeting Agenda
Apr HARC Calendar

Officers:

President: NZ7S
Vice-President: K7MTD
Treasurer: W7XT
Secretary: K7MSO

Standing Committees:

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

Repeater Advisory Committee:

K7MTD (Chair)
K0SN, Dec 2021 for (22/23)
K7QA, Dec 2022 for (23/24)
N7PAS, Dec 2022 for (23 - 1Yr)
KG7WYQ, Dec 2022 for (23/24)

TAC – Board + K0SN and N7PAS
C&BL – Board + N7PAS and W7RPG

HF Committee

President: NZ7S
Members: K0SN, K7QA, W7XT.

Coming Events

Apr	09	Easter Sunday
Apr	10	Testing, Meeting
Apr	18	Tax Day
Apr	29	Riverbank Run
May	05	Fox Hunt 7:00 PM
May	08	Testing, Meeting
May	14	Mothers Day
May	29	Memorial Day

HARC March Meeting

Program: Slide Presentation on GoBox's
From ERC Training by Todd Smith N7TMS
Presentation by N7PAS

We are having in-person monthly meetings and live in person online testing. The testing and meeting are on the 2nd Monday of each Month

Meetings 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.

Testing will begin promptly at 5:30PM, and end at 6:30PM.

Meeting area will be set up between 6:30-7:00PM and meeting will begin at 7:00PM (Business & Program).

Cleanup will be done from the end of the program until done. Volunteers may assist.

Published: 31 Mar 2023 @6:30 AM by N7PAS

March Meeting Testing Results

Congratulations to:

1. Chad Moore who passed his Tech. His new call sign is KK7LJU
2. David Kelley who passed his General. His call sign is still KK7JXZ

HARC Meeting 13 March 2023 Minutes

1. **Attendance** Paul Shuey N7PAS, Jim Ramsey KJ7YHG, Bill Reese KJ7PCR, Aaron Nelson N7BIO, Dale Baldwin W7RPG, Joe Geldrich AF7GH, Mike Leary K7MSO, Gary Duncan KG7WYQ, Dick Walton W7XT, Eric Sedgwick NZ7S, David Herzberg K7MTD, Jesse Seaton KK7GVO, Chad Moore, Tom McGinley K7QA

2. **Approve last meeting minutes**
   1st Bill KJ7PCR 2nd Paul N7PAS Motion passed

3. **Treasurer's report**
   a. Dues and contributions - some 2022 members are late.
   b. Money Management - Plan as previously discussed in previous meetings has been executed.
   Club money moved from Clearwater to Edward Jones on 1 March.
   All of our money is earning interest. CDs, money market.
   c. Club Treasurer's tasks more complex, need more Exel files.
   Edward Jones has a website where the Treasurer can log in.
   d. Dick mentioned that Dave Herzberg K7MTD was appointed as assistant treasurer.
   e. Dick proposes courtesy forgiveness of dues for two members in bad health.
   1st Eric 2nd Tom Motion passed

4. **Repeater Advisory Committee** Nothing to report.

5. **HF Committee Report**
   a. Estate of KB0HP donated gear to the club. List published in last month's Static.
   b. Another estate list will be published in the Static soon.

6. **Net Control Operators**

	05 Apr Paul N7PAS
15 Mar Dean N7DLP	12 Apr Mike K7MSO
22 Mar Dave K7MTD	19 Apr Dale W7RPG
29 Mar Eric NZ7S	26 Apr Mike K7MSO

Secretary: Mike Leary K7MSO

Presentation
Dale Baldwin W7RPG demonstrated two of his superb radio go-boxes, one for VHF and the other for HF.

Note Please Send Information for Static to editor@w7px.org

HARC VHF Total Checkins for 2022

																	Net called by Suffix	
	Month/Year:		XXX/2022														Location: Missoula, MT	
		Date:	J	F	M	A	M	J	J	A	S	O	N	D	YR		Updated: 16 MAR 2023	
	CALL	Suffix															NAME	CITY
A	NN8	A 1						1							1		Byron Van Alstein	Helena
	KF7	AGO 1	3									1			4		James Russell	Marion
	KK7	AJO 1		2	3	3	4	3	1	2	1	1		2	22		Ben Cerise	Big Fork
	W7	ALT 1								1	1				2		Jim Hamilton	Whitefish
	KK7	AZG 1				1			1						2		Glenn Weaver	Columbia Falls
	N7	BIO 1	4	3	4	3	3	2	1		2	1	1	1	25		Aaron Nelson	Missoula
	KK7	BIP 1	1					1	1						3		Evan Mohn	Lolo
	KF7	CBY 1	1			1	1	1		1					5		Andy Commons	Missoula
	KJ6	CQC 1					1								1		Dean McCollum	
D	K7	DDE 1	2	4	5	4	4	5	2	3	4	4	4	3	44		Dallas Erickson	Stevensville
	N7	DLP 1	4	4	4	2		2		2	3	4	4	4	33		Dean Pond	Missoula
	N7	DXT 1			1	2									3		Gary Watson	Frenchtown
	KK7	DZZ 1			3										3		Bennett Wright	Missoula
E	K7	EKG 1	2	1	2	1	1	1	2	1	1	2	2	2	18		Bob Hull	Missoula
	KJ7	EP 1										1			1		Wayne Salsbery	Ronan
F	AG7	FH 1	4	2		1		1	2		2	2	2	3	19		Joe Geldrich	Missoula
G	N7	GE 1										2			2		Jerry Ehli	Missoula
	KF7	GZR 1	4	4	5	4	2	2	2		3	4	3	4	35		Sandra Pond	Missoula
H	N7	HRR 1								2	3			1	4		Hal	Stevensville
	KI7	HVG 1					1	1			1				3		Robert Grayson	Stevensville
I	K7	IMZ 1	2	4	3	4	2	4	2	2	2	3	2	4	34		Jerry Nelson	Missoula
J	N7	JGS 1	4	4	5	4	4	5	4	5	4	4	4	4	51		Jerri Shuey	Missoula
	K7	JRJ 1			1	2				1					4		Jon Raymond	Columbia Falls
K	W1	KGK 1			3		1								4		Kevin Kerr	Missoula
	N7	KOA 1	1	1								1	1	1	5		Steve Marshall	Missoula
L	KF7	LCC 1	1	2	1										4		Mike Fell	Superior
	KI7	LMV 1			1										1		Bryce Rowe	Missoula
	N7	LT 1											1		1		Lyndel Thiesen	Kalispell
M	KC7	MDW 1			1	1									2		Steven Wright	Missoula
	K7	MSO 1	4	4	5	3	4	4	3	4	4	3	4	4	46		Mike Leary	Missoula
	K7	MTD 1		2	3	1		2	2	1	2	2	3	3	21		David Herzberg	Missoula
N	KE7	NJK 1	2	3	3	3	2	3	3	3	3	4	3	4	36		Lawrence Brooker	Missoula (Victor)
P	N7	PAS 1	4	4	5	4	4	5	4	5	4	4	4	4	51		Paul Shuey	Missoula
	N7	PMS 1	1	3	3	3	2	2	1		3	3	1		22		Mike Standon	Columbia Falls
Q	KT7	QA 1								1					1		Glen Meacham	Missoula
	K7	QNZ 1	3	4	2	4	4	1	2	2	4	3	2	3	34		Rich Kingdon	Missoula
R	W7	RPG 1				2	4	5	2	5	4	3	2	4	31		Dale Baldwin	Missoula
S	NZ7	S 1	3	4	5	2	4	4	2	3	2	3	3	3	38		Eric Sedgwick	Missoula
T	KI7	THQ 1		1			1					1			3		Ernie Wicks	Hamilton
	KD7	TUE 1	3		3	2	2	1		3	2	2	1		19		JC Jackson	Victor
	KD7	TUF 1	2		3	2	4	2		3	3	2	1		22		Eilleen Jackson	Victor
	W7	TYY 1	3	2	2	2	3	3	3	2	1	3	2	2	28		Ty Marbut	Missoula
V	K7	VK 1		1	3			1					1	2	8		Vick Applegate	Missoula
W	N7	WBG 1				1	1								2		Bennett Wright	Missoula
	K7	WJP 1		1	2	2	2	2	2	1	3	1	1		17		Walt Pippo	Drummond
Y	WJ7	YHG 1						1							1		James (Jim) Ramsey	Missoula
	WA7	YYB 1				1									1		Chuck Weihe	Missoula
Z	KG7	ZGE 1				2	2	2	1		2	2	2	2	15		Louie (Richard Lewis)	Hungry Horse
	KJ7	ZJC 1	4	4	4	3	3	5	3	3	2	3	2	3	39		Tim Jacobs	Lolo
Total	Callsigns	49																

Visitors																	
1	KK7	AZG	1												1	Glen Weaver	Columbia Falls
2	W4	TJO	1												1		
3	KH7	AL		1	1										2	Allen Le Vie	Helena
4	K7	GMM			1										1	Gary	
5	K7	KAP			1										1	Ken Piippo	DR-IF
6	KG7	YHG			1										1	Jim	
7	KC8	MXM			1										1	Alan Wilson	Kila
8	AF2	DDE							1						1	Tom Brownlee	Middletown, VA
9	N7	--S							1						1		
10	N0	XO									1				1	Alan Wilson	Samon, ID
11	KD7	SWH												1	1	Jon Pielaet	Portland,Or
		SUM	64	65	90	70	66	72	48	56	67	69	56	64		Monthy Total	783
																Total for year:	787

FOR SALE

HF Yagi - Mosley PRO 57b 7-Element 5-Band Yagi
Antenna details are at
http://www.mosley-electronics.com/pro.html.
Original Manual included. $500.
It's been up for 25 years, is in good condition but I'd recommend cleaning the element and trap connections prior to returning to service.
The 'pre-removal' SWR curves are available as are antenna photos if interested.
Contact: K7VK@arrl.net
Vick k7vk

From: http://www.mosley-electronics.com/pro.html

Model	**PRO-57-B**
Frequency, MHz	28, 24, 21, 18, 14
Power Rating, watts CW	2500
Power Rating, watts SSB	5000
Power Rating, AM/FM	600
Power Rating, RTTY/AMTOR	600
VSWR at frequency	1.0/1 to 1.6/1
Forward Gain, dBd / Elements on 10 m	9.4 / 4
Forward Gain, dBd / Elements on 12 m	8.3 / 3
Forward Gain, dBd / Elements on 15 m	8.5 / 3
Forward Gain, dBd / Elements on 17 m	8.5 / 3
Forward Gain, dBd / Elements on 20 m	8.5 / 3
Forward Gain, dBd / Elements on 30 m	-
Forward Gain, dBd / Elements on 40 m	-
Front-to-Back Ratio, dB 10 m	20
Front-to-Back Ratio, dB 12 m	15
Front-to-Back Ratio, dB 15 m	20
Front-to-Back Ratio, dB 17 m	23
Front-to-Back Ratio, dB 20 m	20
Front-to-Back Ratio, dB 30 m	-
Front-to-Back Ratio, dB 40 m	-
Boom Length	24 ft / 7.32 m
Maximum Element Length	27.5 ft / 8.38 m
Turning Radius	18.33 ft / 5.59 m
Mast Mount Hardware (equipped)	2 in / 5.08 cm
Assembled Weight	92 lbs / 41.73 kg
Wind Surface Area	11 sq ft /1.02 sq m
Wind Load, EIA Standard 80 MPH	280 lbs / 127.01 kg
Warranty	2 years
Recommended Coax	RG-8 / RG-213

Harc Inventory

ITEM	MAKE	MODEL	CONDITION	Location	Remarks
Triband Beam	Hy-Gain		Few Missing parts	K0SN	
Tuner	Signal Corps	BC939B	Parts only	K0SN	parts only, no cabinet
SWR Bridge, Forward Pwr Mtr	Heathkit	HM-2102	Works	K7QA	
Reflected Pwr Mtr	Heathkit	HM-15	Works	K7QA	
Mobile Tuning Mtr	Heathkit	PM-2	Untested	K7QA	
Speaker w/volume control	Yaesu		Untested	K7QA	
Trap Vertical	Hygain	14AVQ	Clean, untested	K7QA	
Speaker + Power Supply	Drake	MS-4 + AC4	Not tested	K7QA	in one cabinet
1993 ARRL Handbook			like new	K7QA	
Transceiver	Kenwood	TS-450S	Excellent	K7QA	
Transceiver-2 mtr	Kenwood	TR-7400A	Works	K7QA	
2 Mtr Hand Held Transceiver	Realistic	HTX-202	Error Code	K7QA	
Voice Keyer	MFJ	MFJ-432	untested	KGVO	
Keyer-Semiautomatic	unknown		fair	KGVO	
Rotor Control	Hygain	DCU-1	untested	KGVO	
Peter Dahl Swgng Choke		new	new	KGVO	
Peter Dahl 9 HY @ 1.5A		new	new	KGVO	66 pounds/pick up only
Peter Dahl 40 HY @ .6 A		new	new	KGVO	
Peter Dahl 10 HY @ 1 A		new	new	KGVO	
Transceiver	Kenwood	TS-940	Won't key on CW	KGVO	
VHF radio + mic	Yaesu	FT-720R	?	KGVO	
AC Power Supply	Heath Kit	HP-23-A	works	KGVO	for the HW-101
SSB Transceiver	Heath Kit	HW-101	needs repair	KGVO	
HF Transceiver+Manual	Kenwood	TS-520	non-working	KGVO	
Transmitter	Meissner	9-1160 tube	good	KGVO	was in use
Receiver	Hallicrafters	SX-100	fair	KGVO	
Receiver		SX28	very good	KGVO	
Receiver	Signal Corps	R-392/URR	fair	KGVO	Stromberg Carlson
Transceiver	Collins	RT-91ARC-2		KGVO	Aircraft Military
Transceiver	Heathkit	SB102	good	KGVO	W/ matching spkr. &p.s.
Voice Synthesizer	Icom	UT-102		NZ7S	
RTTY CW	MFJ		?	NZ7S	
Telescoping Mast	MFJ	MFJ-1910	new		
Transceivers, qty-2	Kenwood	220-225 mhz	?	NZ7S	
Antenna Tuner	Icom	AH-4		NZ7S	
Antenna Tuner+manual	MFJ	MFJ-934		NZ7S	

Many electronic parts for amps, tuners, other projects, too numerous to list

Electronics 101.2: Capacitance

In previous issues we've covered electricity and resistance. Now let's take a look at capacitance and capacitors...

Dave Astels

daveastels.com

Dave's career started in the 8-bit days, with the Z80 and 6502, and he's been working with computers ever since. Check him out at **daveastels.com** and **learn.adafruit.com**

Recall our discussion of electrical charge in HackSpace issue 9. Consider that it's an accumulation of electrons. In simplest terms, capacitance is the ability to store charge. There is a whole class of component whose purpose is to do just that: store charge. They are known as capacitors (at one point they were called condensors, and you may see that terms in places). Physically, a capacitor is made of two conductors separated by an insulating (i.e. non-conducting) region referred to as a dielectric. You may recall that a conductor allows the free flow of electrons, while an insulator prevents it.

Putting a charge on one of a capacitor's conductors will create an electric field that will influence the charge of the other conductor in such a way that it will be equal but opposite. If, for example, excess electrons are placed on one conductor, an equal number of electrons will be repulsed from the other conductor, developing a net positive charge on it. Due to those charges, an electric field is developed in the dielectric.

The unit of capacitance is the farad. Capacitance (C) in farads is equal to the ratio of the charge on the conductors (Q) in coulombs and the voltage across them (V) in volts: C = Q/V. Specifically, 1 farad = 1 coulomb / 1 volt.

CHARGING AHEAD

In the last part, we used water flow as an analogy for discussing electricity flow and resistance. We

can think of capacitors in these terms as well. In this case we can picture a capacitor as an elastic membrane blocking water flow in a pipe (in such a way that no water can leak through). As the pressure on one side increases (i.e. there's a high voltage on one side), the membrane stretches, pushing the water on the other side. Take the pressure off and the membrane will push the water back to return to its unstretched state.

Capacitors come in a variety of values, all shapes and sizes, and various materials. To the left you can see a selection. The schematic symbol for a capacitor is two parallel lines, reminiscent of its parallel conductors. Some capacitors are polarised (they have a positive side and a negative side, like an LED). The symbol for those has a curved plate for the negative side. The diagrams later show this.

COMBINING CAPACITORS

So a capacitor is made from two conductors (assumed to have the same surface area) separated by an insulator (which has some thickness keeping the conductors separated). The bigger the surface area of the conductors, the higher the capacitance. Conversely, the further they are apart, the lower the capacitance. Keep this in mind.

Remember how resistors combined? If they are connected in series, the total resistance is the sum of the individual values: Rt = R1 + R2 + ... + Rn. In parallel we add up the inverse of their values: 1/Rt = 1/R1 + 1/R2 + ... + 1/Rn. For capacitors, it's the opposite.

If we connect capacitors in parallel, we are effectively combining their conductors, which results in a large effective surface area. So: Ct = C1 + C2 + ... + Cn.

Below
A good multimeter can read the value of a capacitor, like this 10 µF electrolytic capacitor

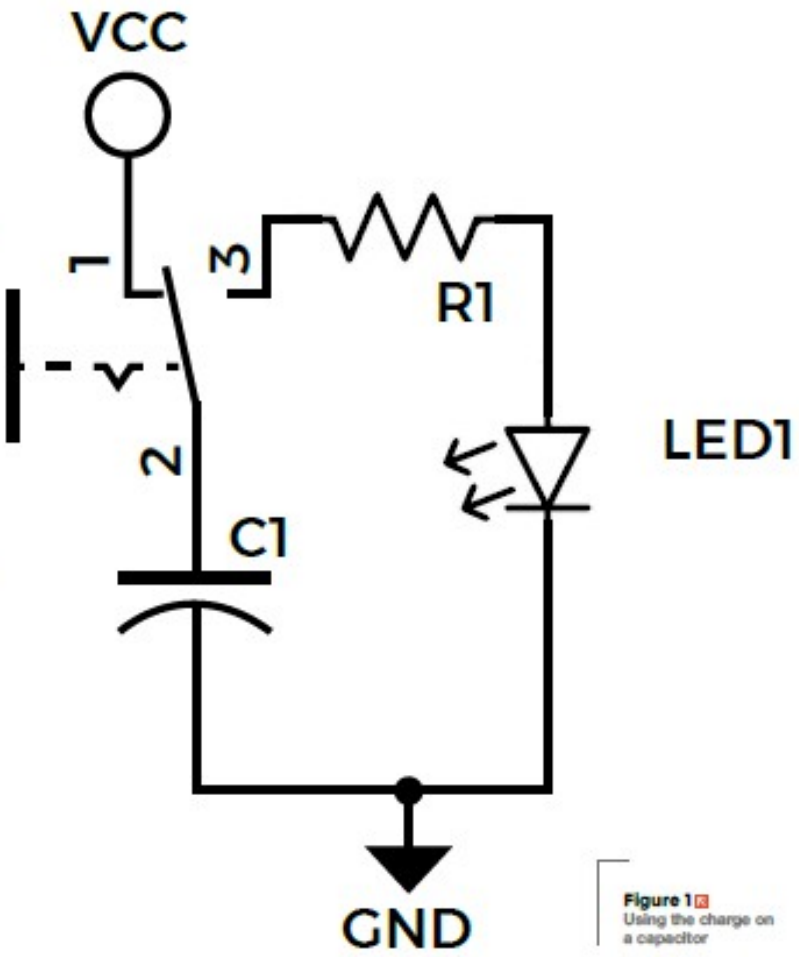


Figure 1
Using the charge on a capacitor

When we connect them in series, we are effectively combining the thicknesses of their insulators and so the equation becomes: 1/Ct = 1/C1 + 1/C2 + ... 1/Cn.

BREAKDOWN VOLTAGE

When you look at capacitors in the main image to the left, you will often see a voltage mentioned. For example, the big, blue capacitor is labelled 35V. That's its breakdown voltage. If the voltage across its conductors is greater than that, charge will start leaking across the insulator. Depending on the composition of the capacitor, that leak can avalanche, resulting in the insulator changing into a conductor and the capacitor becoming useless.

With some capacitors, especially large, older ones that used a liquid soaked paper as a dielectric, that short generates heat, and that heat causes the liquid to evaporate very quickly. Since the capacitor is sealed (to keep that liquid in), it turns into an explosive, shattering and spewing shrapnel (bits of its metal body) in all directions. These capacitors are generally polarised (one conductor has to be →

YOU'LL NEED

- **Solderless breadboard**
- **5 V power supply** or battery pack that can be connected to the breadboard
- **LED**
- **SPDT switch** (optional – a jumper will suffice)
- **Resistors of various values**
- **Electrolytic capacitors of various values** 1uF to 1000uF
- **Digital multimeter** To do the measurements in some exercises

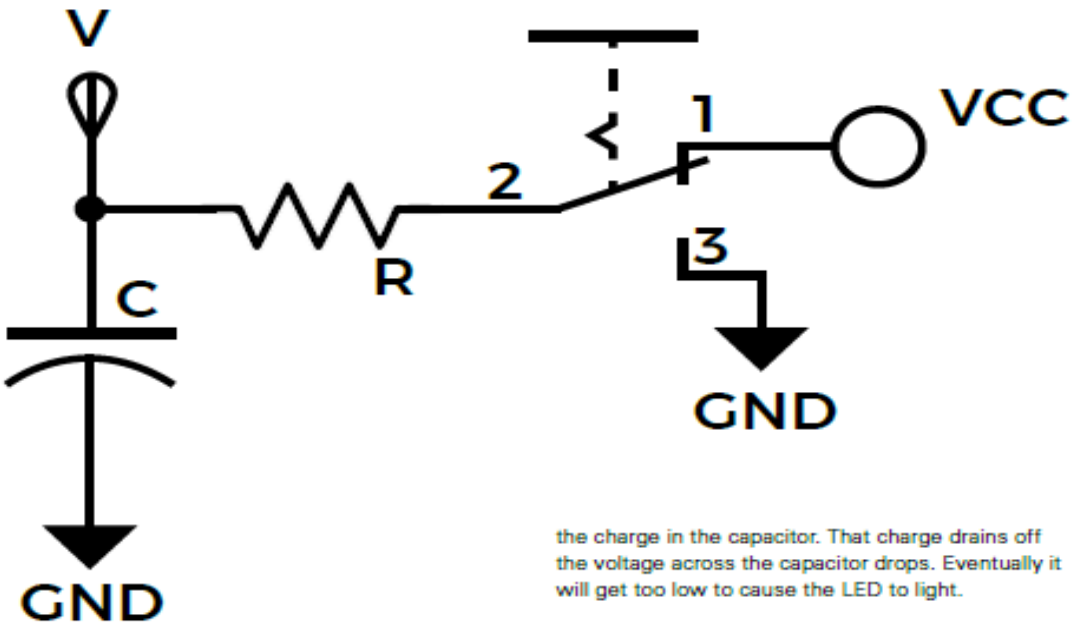


Figure 2
A circuit for charging and discharging a capacitor through a resistor

> **Be careful connecting polarised capacitors:** double-check that you have them connected the correct way before powering up

at a higher voltage than the other). So, be careful using large, old capacitors that are enclosed by an aluminium body. The same thing can happen if the polarity is opposite what is labelled.

Be careful connecting polarised capacitors: double-check that you have them connected the correct way before powering up, and that they have a high enough voltage rating.

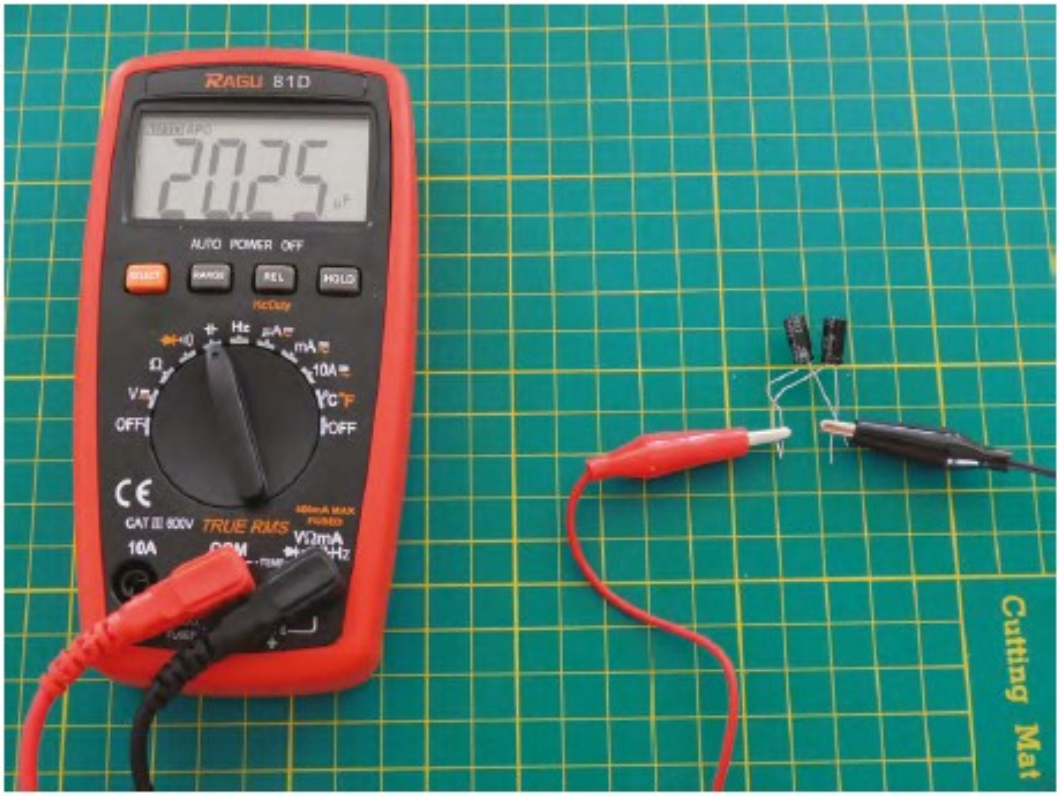
LITTLE BOXES OF CHARGE

If a charge is put on a capacitor and it is disconnecting, the charge will stay; the electrons have no way to move off of the capacitor's conductor unless there's a path provided for them. The capacitor can then be used to power a circuit – see **Figure 1**. With the switch connecting the capacitor to Vcc, the capacitor charges with the resulting voltage across it being equal to Vcc. When the switch is changed to connect the capacitor to the resistor and LED, the LED will light because of the charge in the capacitor. That charge drains off the voltage across the capacitor drops. Eventually it will get too low to cause the LED to light.

HONOURABLE DISCHARGE

When we talk about charging a capacitor, we mean accumulating a charge on its conductors. It's useful to note from the equation above that as charge accumulates, the voltage difference between its conductors increases proportionally. Charging a capacitor is simply the act of moving charge onto one of its conductors, and that is essentially what current is, it follows that a resistor can be used to control how quickly that charge moves to the capacitor's conductor. This is where it gets interesting. Look at **Figure 2**. We see a capacitor connected in series with a resistor to either Vcc or ground. When the switch connects to Vcc, the capacitor charges through the resistor. When it connects to ground, the capacitor discharges through the resistor.

Recall the equation from above: $C = Q/V$. Solving that for V, we get $V = Q/C$. This tells us that (since the capacitance for a part is fixed – ignoring variable capacitors for the moment) the voltage across a capacitor is directly proportionate to the charge it's holding. With no charge, the voltage at point V is 0V. The full Vcc is across the resistor, so the current through it (Vcc/R) is at its highest. As that current flows, charge accumulates on the capacitor, raising the voltage at V. That means that the voltage across the resistor decreases and, with it, the current flowing through the resistor. That means there is less current flowing, so the charge accumulates on



Left
Two 10 µF capacitors in parallel have 20 µF of capacitance

the capacitor more slowly. This continues as the charge on the capacitor increases. Now we flip the switch so that it connects to ground and the charge that has accumulated in the capacitor drains off through the resistor. At first the charge is high, and so is the voltage at V, so the current through the resistor is high as well. The capacitor discharges quickly, but as the charge diminishes, so does the voltage at V, as does the current through the resistor. That, in turn, means that the capacitor discharges more slowly. The voltage at V follows very well defined curves. See **Figure 3**.

THEORY TO PRACTICE

Wire the resistor-capacitor-switch circuit up on a breadboard. You can move the end of a wire in place of using a switch. Attach a meter to measure the voltage at V (black probe to ground, red to the point V in the circuit). For large-value capacitors, you can watch it charge and discharge, and see how the voltage changes more slowly over time.

> Use different capacitors and resistors and watch the voltage as the capacitor charges and discharges. **You should see it start rapidly, then slow down the further it goes**

Use different capacitors and resistors and watch the voltage as the capacitor charges and discharges. You should see it start rapidly, then slow down the further it goes.

Because of these rules and equations, the behaviour of C (dis)charging is well known. In fact, if you multiple R's value (in ohms) and C's →

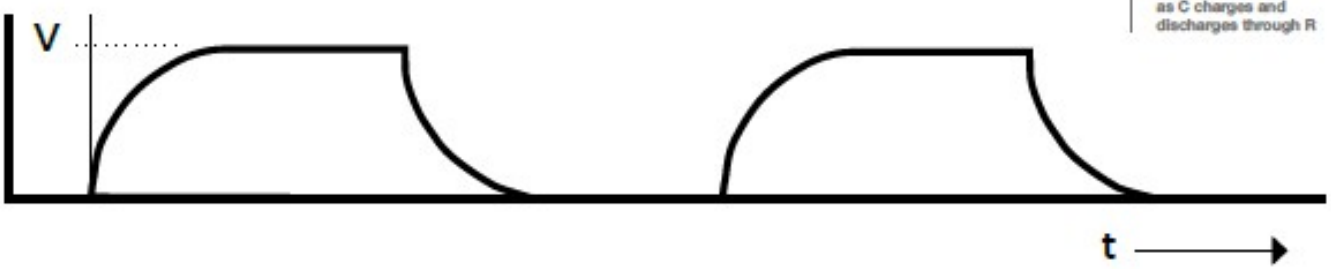


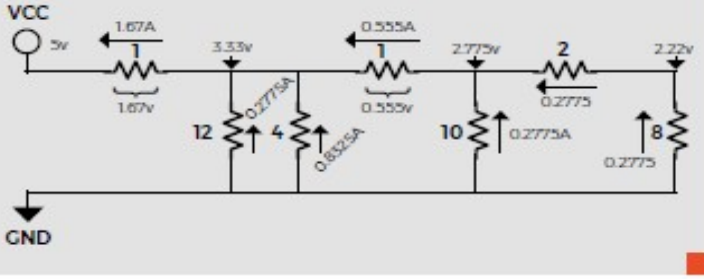
Figure 3
The voltage at V as C charges and discharges through R

Figure 4
Low frequency bypass capacitor in the power circuitry of an Arduino Uno clone

EXERCISE SOLUTION

We start by computing the total effective resistance: the 2 and 8 at the right combine in series to be 10. We now have two 10s in parallel: 1/10 + 1/10 = 2/10 = 1/5, so the resistance is 5. The 5 is in series with the 1, giving 6. The 6 is in parallel with the 4 and the 12. 1/x = 1/6 + 1/4 + 1/12 = 2/12 + 3/12 + 1/12 = 6/12 = 1/2, so the equivalent resistance is 2. That's in series with 1, to give an overall total resistance of 3. Assuming Vcc is 5v, I = V/R = 5/3 = 1.67A

The entire 1.67A flows through the leftmost resistor with means V = IR = 1.67 * 1 = 1.67V. That leaves 5 - 1.67 = 3.33V across the 12, 4, and effective 2 resistors; their currents will be 3.33 / 12 = 0.2775A, 3.33 / 4 = 0.8325A, and 3.33 / 6 = 0.555A, respectively. The 1 resistor in the middle of the diagram will have all 0.555A through it resulting in 0.555A * 1 = 0.555V across it. That leaves 3.33V - 0.555V = 2.775V across the 10 resistor and the effective 10. Since those are in parallel they will split the current evenly: 0.555A / 2 = 0.2775A. The 2 resistor will have that 0.2775A through it giving 0.2775 * 2 = 0.555V across it. The final 8 resistor will have the 0.2775A through it as well and a voltage of 0.2775 * 8 = 2.22V across it.



(in farads), you get a number that is called the RC time constant. It's an amount of time in seconds. The relationship between the RC time constant and the charging rate/curve of C is as follows (with C starting empty so that V at 0V): it takes 1RC for V to get to 63% of Vcc, 2RC to get to 85%, and 5RC to get to 100%. Notice that these are percentages of Vcc. That means that the behaviour/use of the RC time constant is independent of what Vcc is. Discharging is the same, except that it's the percentage discharged.

SMOOTH OPERATOR

As well as storing charge, capacitors have a slightly unusual property in that they block steady voltages, but allow changes in voltage to pass. If you think back to the water metaphor where we imagined a capacitor as an elastic membrane, this membrane would quickly block a constant flow of water;

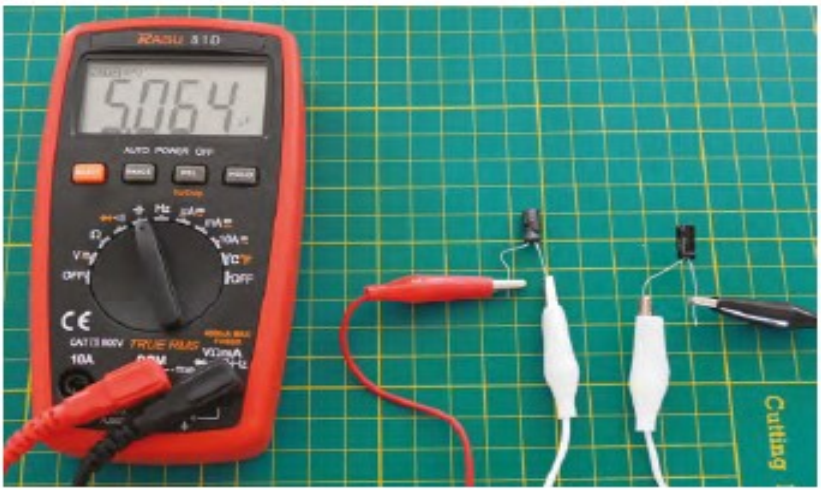
however, if the water were moving back and forth, this movement of the water would pass straight through the membrane.

Because of the capacitor's ability to pass changes in a voltage but to block steady voltage (the water metaphor again), they can be used to reduce noise on the power lines in a circuit by passing (shunting) those changes to ground. These are commonly referred to as bypass capacitors.

Normally there will be a moderately large capacitor near the regulator to smooth slower changes. **Figure 4** shows the 47 µF capacitors in the power circuit of an Arduino Uno clone board.

Small capacitors are used near digital circuits that operate very rapidly, with fast signal changes. These fast changes cause high frequency noise on the power line. The small capacitors shunt that high frequency noise to ground. In early digital circuits, it was common to have a small capacitor as close as possible to each digital integrated circuit. **Figure 5** shows the small capacitors in the memory circuitry of an early microcomputer. If noise is allowed in the power to sensitive circuits, it can confuse them.

Capacitors take a little time to get your head around. On their own, the don't do much, but once you grasp how they work, you'll get a much better understanding of both analogue and digital electronics. They harness the attractive/repulsive forces between subatomic particles to transfer current across an insulator. They let a changing signal travel across the insulator while blocking a steady one. This is very useful, especially in the world of analogue and audio electronics. Used in combination with resistors to control the charge and discharge rates, capacitors become the basis for various sorts of timing and oscillator circuits (we'll see more of that when we look at transistors). Really big capacitors can even be used in a similar way to batteries, and store charge to power circuits. □



Above
Two 10 µF capacitors in series have 5 µF of capacitance

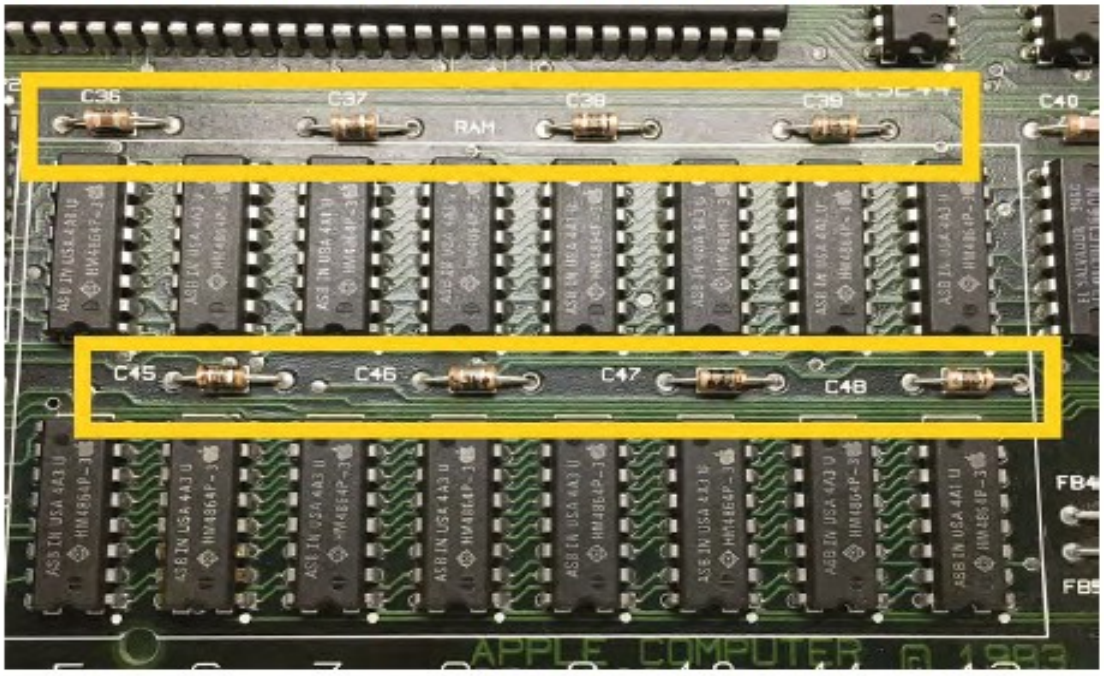


Figure 5
High frequency digital circuitry bypass capacitors

YMCA Riverbank Run

Race Information

Saturday, April 29, 2023
All ages

The YMCA Riverbank Run returns to its downtown roots! All races start at Higgins & Broadway, and end along the Kim Williams Trail across from Caras Park.

Regular race registration is January 19–April 9. Late registration begins April 10. Race day registration is available.

One Mile

11:25 a.m. start time (Trifecta Mile)
11:45 a.m. start time (1 Mile Fun Run)

Regular Registration: $37

Late Registration: $41

Youth Registration (12 and under): $15

Dennis T. Bender 5K

10:30 a.m. start time

Regular Registration: $37

Late Registration: $41

Youth Registration (12 and under): $15

10K

9:00 a.m. start time

Regular Registration: $37

Late Registration: $41

Youth Registration (12 and under): $15

Trifecta (10.321 Miles)

Regular Registration: $46

Late Registration: $49

The Riverbank Run Trifecta consists of all three races (1 Mile, 5K, and 10K).

Packet Pickup:

- April 27–28 from 10:00 a.m.–6:00 p.m. at SCHEELS
- April 29 from 7:30 a.m.–12:00 p.m. at the start line

- Participants are **strongly** encouraged to collect packets prior to race day.
- Grade School Challenge participants have the option to collect their packets at their schools. Please note: If you wish to pick your student's packet up at their elementary school, you **MUST** note this at time of registration.

In-Person Event Details:

- All races start at Higgins & Broadway, and end along the Kim Williams Trail across from Caras Park.
- 2,000+ racers are expected on race day. We recommend carpooling.
- Trifecta racers may collect their long-sleeve event shirts **after** completing all three races. Shirts are available at the finish line.
- Portapotties are located at the start and finish lines.

- Strollers and wheelchairs welcome. No pets, please.

Race Start Times: All races start at Higgins & Broadway.

- **9:00 a.m.** 10K start time
- **10:30 a.m.** 5K start time
- **11:25 a.m.** 1 Mile Trifecta start time
- **11:45 a.m.** 1 Mile Fun Run start time

Course Map: All races start at Higgins & Broadway.

HELLGATE AMATEUR RADIO CLUB

AGENDA – 10 Apr 2023 meeting

Introductions. Please make sure you sign the attendance sheet

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

Treasurer's report: Motion to approve report: 1St _____ 2nd _____
Discussion _____
_____ Vote: P/F/T ___

Repeater Advisory Committee Report: Motion to approve report: 1St _____ 2nd _____
Discussion _____
_____ Vote: P/F/T ____

Events for 2023:

Apr	9	Easter Sunday	May	5	Cinco de Mayo
Apr	10	Testing, Meeting	May	5	Fox Hunt 7:00 PM
Apr	18	Tax Day	May	8	Testing, Meeting
Apr	29	YMCA Riverbank Run	May	14	Mothers Day
			May	29	Memorial Day

HARC Social Net every Saturday morning @ 9:00 AM on 147.040 Repeater – Buy/Sell at end.

HARC Discussion List

1. _____

2. _____

VHF Net Control Station assignments:

Apr	5	N7PAS	Backup	May	3	N7PAS
Apr	12	_K7MSO	Backup	May	10	_____
Apr	19	_W7RPG	Backup	May	17	_____
Apr	26	_K7MSO	Backup	May	24	_____
___	__	_____	Backup	May	31	_____

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

Good and Welfare. _____
_____

***** Next Club meeting: May 8**
Motion to Adjourn: 1St _____ 2nd _____ Vote: P/F/T

Program: Slide Presentation on GoBox's From ERC Training by
Presentation by N7PAS

April 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	31	**1**
						HARC Social Net 9:00Am on 147.040 Repeater
2	**3**	**4**	**5**	**6**	**7**	**8**
			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 Social Net 9:00Am on 147.040 Repeater
9	**10**	**11**	**12**	**13**	**14**	**15**
Easter Sunday	Easter Monday HARC Testing 5:30 & Meeting 7:00 PM		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 Social Net 9:00Am on 147.040 Repeater
16	**17**	**18**	**19**	**20**	**21**	**22**
		Tax Day	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 Social Net 9:00Am on 147.040 Repeater Riverbank Run Start 9:00 AM
23	**24**	**25**	**26**	**27**	**28**	**29**
			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 Social Net 9:00Am on 147.040 Repeater
30	1	2	3	4	5	6