The Hellgate Static

August 2023

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

Inside this issue:

Coming Events:

Aug	14	Testing, Meeting & C&BL voting
Sep	09	Fox Hunt – Multiple – Times vary
Sep	11	Testing, Meeting

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 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 hfc@w7px.org
President: NZ7S
Members: K0SN, K7QA, W7XT.

HARC August Meeting

Program: ???
We'll have one, just don't know what yet.

We are having in-person monthly meetings and live in person electronic 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 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 (Program & Business).

Published: 31 Jul 2023 @3:40 PM by N7PAS

10 Jul 2023 Exam Testing Results

Congratulations to:

1. Graeme Brown of Polson who passed his Technician exam. His new call is KK7NOL.
2. Adam Davis of Missoula who passed his Technician exam. His new call is KK7NOM.
3. Jackson Miner of Alberton who passed his Technician exam. His new call is KK7NON.

10 Jul 2023 HARC Meeting Minutes

1. **Attendance**: Paul Shuey N7PAS, Jerry Ehli N7GE, David Herzberg K7MTD, Dale Baldwin W7RPG, Eric Sedgwick NZ7S, Aaron Nelson N7BIO, Tom McGinley K7QA
Visitors: Adam Davis, Graeme Brown, Isaac Stephens

NOTE: Quota not met. No business conducted. Need at least 8 members present. Please come join us.

2. **Approve last meeting minutes**
   NONE
3. **Treasurer's report**
   NONE
4. **Repeater Committee**
   NONE
5. **HF Committee Report**
   NONE
6. **Discussion List**
   a. Fox Hunt Sep 09 – This will be the only Fox Hunt this summer. There will be multiple hunts conducted, Times to be determined. Please come and join us for this 1 time fun event.

7. **Net Control Operators**

Aug	02	N7PAS	Sep	06	N7PAS
Aug	09	NZ7S	Sep	13	_____
Aug	16	K7MTD	Sep	20	_____
Aug	23	W7RPG	Sep	27	_____
Aug	30	N7JGS	___	__	_____

Minutes by N7PAS

Program: Dave K7MTD talked about putting together a Tinker's group for discussing/building projects. Items mentioned in no particular order were: Computer programming, Oscilloscopes, PC Board Fabrication, Python programming, Spectrum Analyzers, Antennas, Raspberry Pi Computers, Filters & Amps, Lora 32 boards, Node Red, Soldering skills, Basic Electronics, Tennis ball gun, Wireless racing timers.
Contact Dave K7MTD for further information or to add items that interest you to the list.

Note **Please Send Information for Static to editor@w7px.org**
in LibreOffice or Microsoft Office formats only. Thank You

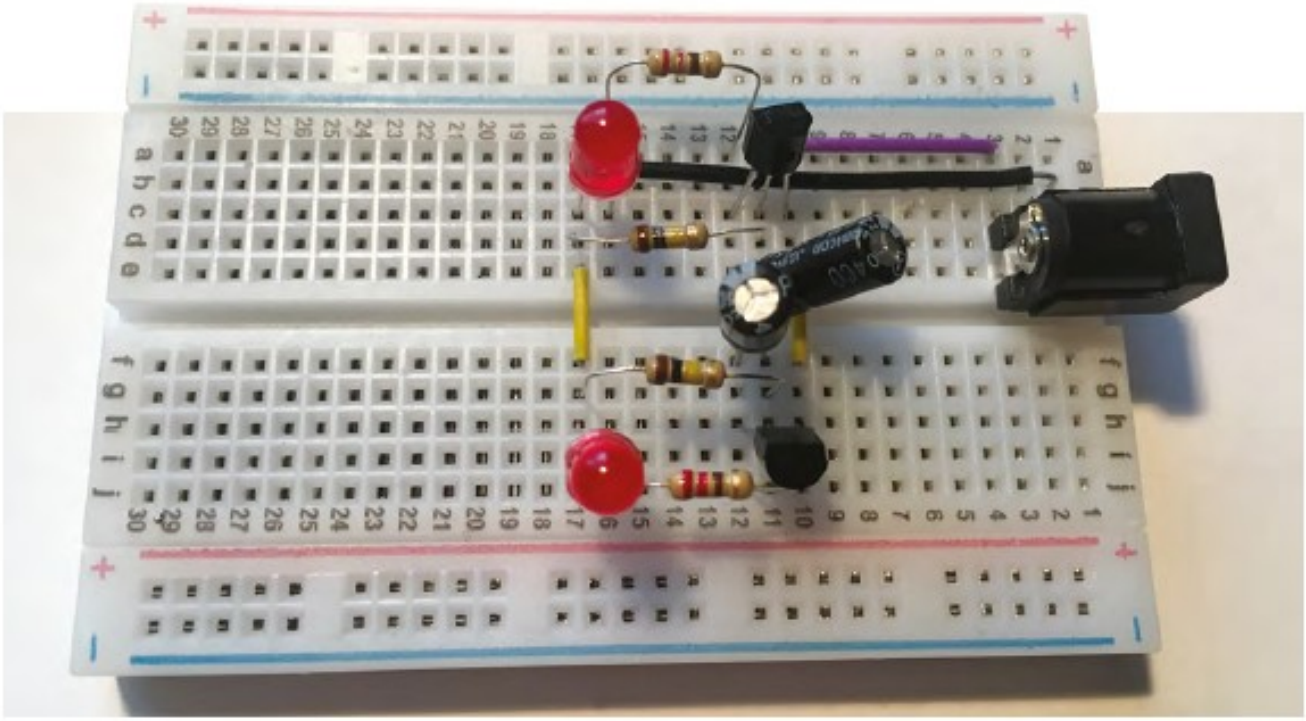
HARC INVENTORY -- FOR SALE

Line	ITEM	MAKE	MODEL	CONDITION	VALUE	STORED	REMARKS
1	Computer	Dell	Latitude	Fair	100	N7GE	
2	Pow Supply 220-225mhz	Mirage	C106G	Good	25	N7GE	
3	Radio-Hand Held 2 met.	Realistic	HTX 202	Good	50	N7GE	
4	Radio--2 meter	Yaesu	FT-2500M	Fair	$100	N7GE	
5	Portable Repeater		TM-241X2	?		N7GE	
6	Triband Beam	Hy-Gain		Few Missing parts	200	K0SN	
7	Tuner	Signal Corps	BC939B	Parts only	25	K0SN	parts only, no cabinet
8	Speaker + Power Supply	Drake	MS-4 + AC4	Not tested	75	K7QA	needs upgrade
9	Reflected Pwr Mtr	Heathkit	HM-15	Works		K7QA	
10	Mobile Tuning Mtr	Heathkit	PM-2	Untested		K7QA	
11	Trap Vertical	Hygain	14AVQ	Clean, untested	150	K7QA	
12	Transceiver-2 mtr	Kenwood	TR-7400A	Works	70	K7QA	
13	2 Mtr HH Transceiver	Realistic	HTX-202	Error Code	25	K7QA	
14	Speaker w/volume control	Yaesu		Untested	50	K7QA	
15	1993 ARRL Handbook			like new	free	K7QA	
16	Handbooks	ARRL	1950-1980	OK	Free	KGVO	
17	Vintage Mic	Astatic	JT-30	worn, untested	50	KGVO	Ebay sales $50-300
18	13.8V, 12A power supply	Astron	RS12A	works	30	KGVO	
19	C&R checker	CDE		untested	30	KGVO	
21	Rotor	CDE?		untested	50	KGVO	w/ control head
22	Transceiver	Collins	RT-91ARC-2	untested	100	KGVO	Aircraft Military
23	Transverter Interface	Down E. Micro		untested	offer	KGVO	
24	Low pass Filter	Drake	TV-3300	untested	20	KGVO	
25	Receiver	Hallicrafters	SX-100	fair	150	KGVO	
26	Receiver	Hallicrafters	SX28	very good	900	K0SN	
27	Receiver	Hallicrafters	SX-62B	untested, rough	75	KGVO	no cabinet top
28	Vintage Speaker	Hallicrafters	PM 23	Nice, untested	150	KGVO	
29	Vintage Speaker	Hammarlund	S-100	Nice, untested	60	KGVO	
30	AC Power Supply	Heath Kit	HP-23-A	works		KGVO	for the HW-101
31	SSB Transceiver	Heath Kit	HW-101	needs repair		KGVO	Ebay $90-300
32	HF Xcvr + Power Supply	Heathkit		untested	150	KGVO	
33	Oscilloscope	Heathkit	IO-4105	untested	30	KGVO	
34	Power/SWR Meter	Heathkit	HM15	untested		KGVO	
35	Vertical antenna		Dipole 80	?		NOAA	
36	Receiver	Heathkit	HR-10	untested, rough	offer	KGVO	Ebay sales $100-300
37	SSB Adapter	Heathkit		untested	40	KGVO	
38	Transceiver	Heathkit	SB102	good	250	KGVO	W/ matching spkr. & p.s.
39	Test Oscillator	HP	650A	untested	offer	KGVO	
40	Rotor Control	Hygain	DCU-1	untested	200	KGVO	
41	VHF Mobile Transceiver	Icom	IC-25A	fair, untested	30	KGVO	
42	Transceiver	Kenwood	TS-450S	Excellent	400	KGVO	
43	2M FM Transceiver	Kenwood	TR7400A	no output	10	KGVO	
44	HF Transceiver +Man	Kenwood	TS-520	non-working	100	KGVO	
45	Transceiver	Kenwood	TS-940	Needs Repair	250	KGVO	No output on CW, others
46	Transmitter	Meissner	9-1160 (tube)	good		KGVO	was in use
47	Voice Keyer	MFJ	MFJ-432	untested	30	KGVO	
48	Fwd/Refl. pwr meter	Midland	23-126	untested	10	KGVO	
49	2 mtr, 30 Watt amp	Mirage	B23	untested	25	KGVO	
50	20-40M QRP Transceiver	Oak Hills	QRP Classic	untested	30	KGVO	
51	13.8V, 10A P.S.	Pyramid	PS15-KX	Nice, untested	30	KGVO	

52	2 mtr mobile Xcvr	Radio Shack	HTX-242	untested	40	KGVO	
53	25A switching P.S.	Radio Shack		untested	40	KGVO	
54	Field str/SWR meter	Radio Shack		untested	10	KGVO	
55	VHF/UHF/FM amp	Radio Shack		untested	20	KGVO	
56	Gen. Coverage Rvr.	Realistic	DX302	untested	125	KGVO	Ebay sales $80-350
57	12V DC p.s.	Samlex		untested	25	KGVO	
58	Receiver	Signal Corps	R-392/URR	fair	300	KGVO	Stromberg Carlson
59	VTVM	Simpson	311	untested	25	KGVO	
60	Oscilloscope	Telequipment		untested	20	KGVO	
61	Var. power resistors	Tru-ohm, etc		untested	10	KGVO	box of ~20
62	Scanner	Uniden	BC9000	untested	50	KGVO	
63	BUG KEY	unknown		fair		KGVO	
64	12V DC Backup Power	West Mtn	PG40S	good, untested	25	KGVO	
65	Radio-Sound card interface	West Mtn	Riblaster Plus			KGVO	
66	HF Transceiver	Yaesu	FT-840	fair, works	300	KGVO	
67	Speaker	Yaesu	SP-8	Good, untested	125	KGVO	
68	VHF FM Transceiver	Yaesu	FT720RU	untested	25	KGVO	
69	VHF Transceiver	Yaesu	1500M	untested	75	KGVO	
70	Many electronic parts for amps, tuners, other projects, too numerous to list.				offer	KGVO	some free, door prizes
71	Misc. panel mount meters			untested,	40	KGVO	2 boxes full
72	Patch cords w/ RCA male			good	10	KGVO	box of ~20
73	Peter Dahl 10 HY @ 1 A		new	new		KGVO	
74	Peter Dahl 40 HY @ .6 A		new	new		KGVO	
75	Peter Dahl 9 HY @ 1.5A		NEW	NEW	200	KGVO	66 pounds - pick up only
76	Peter Dahl Swgng Choke		new	new		KGVO	
77	Antenna Tuner	Icom	AH-4			NZ7S	
78	Voice Synthesizer	Icom	UT-102			NZ7S	
79	Transceivers, qty.2	Kenwood	220-225 mhz.	?		NZ7S	
80	Antenna Tuner + man	MFJ	MFJ-934			NZ7S	
81	RTTY CW	MFJ		?		NZ7S	
82	Wattmeter/SWR	Coax. Dynam.	81021	com	200	KGVO	

Contact K0SN or W7XT for further information

Contact HFC@w7px.org for further information (note this is not yet set up)



Electronics 101.6: Simple transistor projects

Let's start putting theory into practice with these beginner circuits

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**

In earlier parts of this series, we looked at the basic components, how they work, and how to use them. It's time to put that knowledge to use and look at some simple projects. To keep things simple, we'll look at circuits that run by themselves without external input. And to keep things interesting, we'll look at circuits that do something we can see. In particular, we'll start with a dual LED flasher.

ON AND OFF

In the earlier parts of this series, we explored electricity and basic components. You can take a look back at these if you need to, as we go over how to put this theory into practice.

The circuits in this part are all oscillators. Specifically, they are what's called astable multivibrators. That just means that they alternate between two (in these circuits) states, without any outside stimulus.

Figure 1 shows the LED flasher circuit. Notice how the two halves of the circuit are identical, connected by the capacitors that couple the transistor collector of one side to the base of the other. Let's walk through how the circuit works. We'll start by assuming the Q1 is on (i.e. saturated) so that the voltage at its collector (and hence the positive plate of C1) is essentially 9V. Also, LED1 is lit.

1. C1 charges through R4, while the RC time constant of these two determines the rate.
2. As C1 charges, the voltage across it increases. Since the positive plate is fixed (by the saturated Q1) at 9V, the voltage on its negative plate is dropping relative to that 9V.

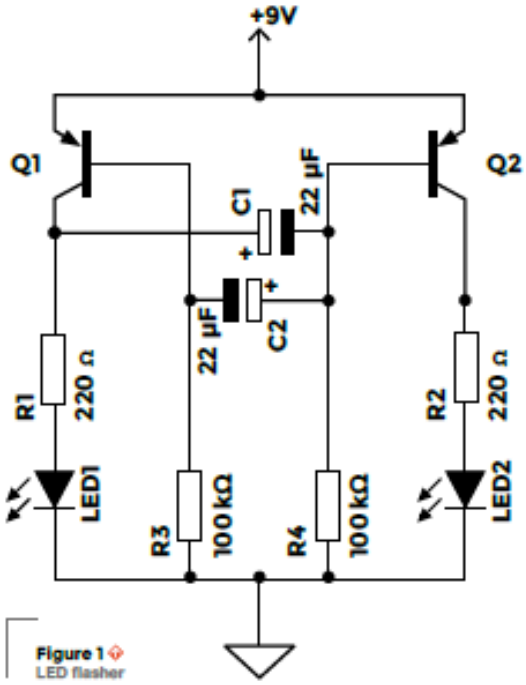


Figure 1 LED flasher

3. Eventually it reaches 8.4V. This means that the voltage on the base of Q2 is 0.6 less than its emitter. Since it's a PNP transistor, this causes it to saturate and switch on.
4. That causes LED2 to illuminate as well, setting the voltage on the positive plate of C2 to 9V.
5. Since any charge in C2 has long ago drained away through R3, the voltage across it is 0V, and so the base of Q1 is now at 9V just like its emitter, and that will turn it off.
6. We're now in the same state as we started, but with the other side of the circuit.
7. C2 now charges through R3 until there is 0.6V across it and its negative plate is at 8.4V.
8. Q1 then switches on, Q2 switches off, and the cycle continues.

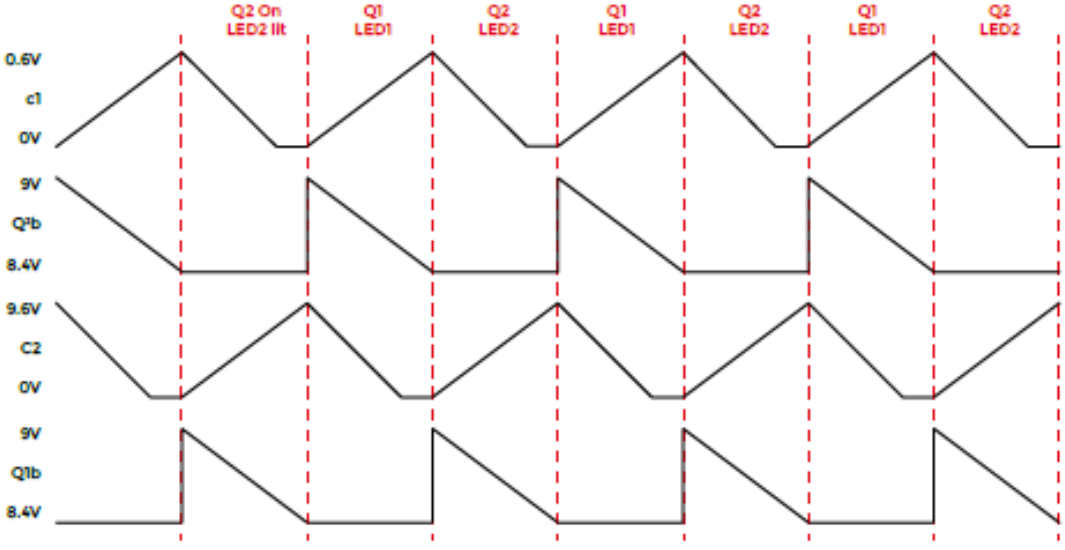
Put more simply: when Q1 turns on, it turns Q2 off and starts its capacitor charging. Eventually the capacitor charges enough to turn Q2 on. That turns Q1 off, and so on. Approximate signals for the voltage across the capacitors and on the transistor bases are shown in **Figure 2**.

TICK TOCK

Our next circuit is a metronome: it ticks regularly. R2 sets the frequency of the ticks, while R1 sets the maximum frequency; i.e. the resistance between Q1's base and +9V can't be less than the 10kΩ of R1. R2 lets the total resistance between Q1's base and +9V vary between 10kΩ and 60kΩ. That controls the time it takes for C1 to charge, and thus the frequency of the oscillator. The schematic is shown in **Figure 3**.

Let's start with C1 being completely discharged. That means there's 0V across it. The speaker has a resistance of 8Ω, which is pretty much nothing compared to the 10–60kΩ of R1+R2. This means that the voltage at the base of Q1 is essentially 0V. C1 charges through R1+R2 (and the speaker), →

Figure 2 Approximate LED flasher signals



YOU'LL NEED

- Solderless breadboard
- 9 V power supply

For the LED flasher

- 2 × 2N3906 (or similar) PNP transistor
- 2 × 220 Ω resistor
- 2 × 100 kΩ resistor
- 2 × 22 µF electrolytic capacitor
- 2 × LED

For the metronome

- 10 kΩ resistor
- 50 kΩ variable resistor (potentiometer)
- 2N3904
- 2N3906
- 22 µF electrolytic capacitor
- 8 Ω speaker

For the siren

- 2 × 47 kΩ resistor
- 2N3904
- 2N3906
- 100 µF electrolytic capacitor
- 10 nF capacitor
- 2.2 µF electrolytic capacitor
- Momentary contact SPST push-button switch
- 8 Ω speaker

continues overleaf →

YOU'LL NEED (continued)

For the voltage controlled oscillator

- 100 kΩ variable resistor (potentiometer)
- 2N3904
- 2N3906
- 10 nF capacitor
- 2.2 µF electrolytic capacitor
- 8 Ω speaker

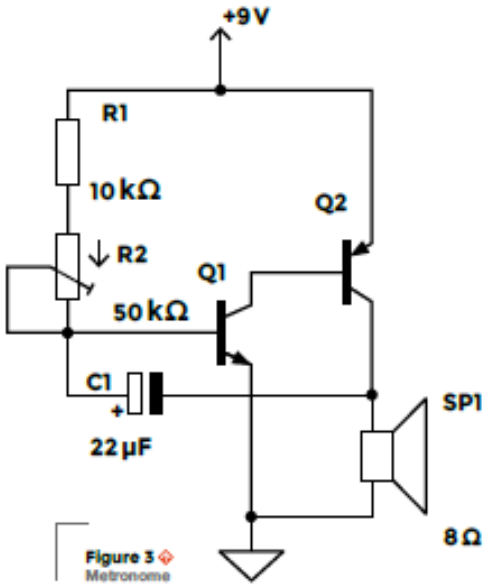


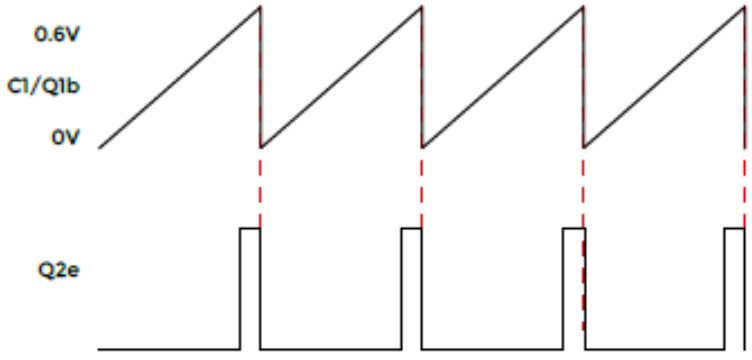
Figure 3 Metronome

and when the voltage across it reaching ~0.6V, Q1's base-emitter junction is forward-biased and it turns on. This connects Q2's base to ground through Q1. That makes Q2's base far below the 8.4V needed to forward-bias its base-emitter junction. As a result, Q2 turns on. This does two things. First, it puts ~9V across the speaker, making it twitch. It also connects the negative plate of C1 to the same voltage. That quickly drains off the electrons built up on it. That, in turn, means that the voltage across C1 goes to 0V, taking the base of Q1 with it. This turns off Q1, which then turns off Q2, disconnecting the speaker and C1 from +9V. The speaker snaps back and C1 starts charging again. **Figure 4** shows the approximate signals at C1 and Q2's emitter.

ALARMING!

Figure 5 shows the schematic for a siren circuit. The core of the circuit is similar to the metronome. The capacitor (C2) is much smaller, thus it runs faster, and instead of ticking now and then, it produces a tone.

Figure 4 Approximate metronome signals



This works in a similar way to the metronome. The two transistors work as an oscillator, using feedback through C2. This is much smaller than C1 in the metronome, so the frequency will be higher: tones rather than clicks. However, the theory is the same. The frequency of the oscillator is also affected by the charge on C1 (and thus the voltage across it). Remember that the frequency is determined by how quickly the charge/voltage of C2 brings the base voltage of Q1 to 0.6V to turn it on. Any voltage below that will keep Q1 off. The voltage on C1 affects the base voltage of Q1 in addition to the voltage on C2.

> **"The frequency of the oscillator is also affected by the charge on C1** (and thus the voltage across it)**"**

When S1 is closed, C1 charges through R2, and the voltage across it gradually increases. When S1 is open, C1 discharges through R1 and Q1. When the voltage across C1 is higher, it takes less time for the charging of C2 to forward-bias Q1's base-emitter junction (turning it on). That results in a higher oscillator frequency. When the voltage across C1 is lower, it takes longer and so the frequency is lower.

By alternately pressing and releasing S1, the frequency can be made to go up and down. The result is a warbling siren effect.

BALANCING ACT

We've looked at three different oscillator circuits. They all have things in common:

1. A capacitor charging (though a resistor), and the voltage across it controlling the biasing of a transistor
2. Feedback that causes the switching on of the transistor to drain the capacitor, which turns the transistor off

The resistor and capacitor combination determines how quickly the capacitor charges (this was discussed in HackSpace #10). This is shown in action in the metronome circuit by the use of a potentiometer to vary the resistance and thus the time constant of the RC circuit, i.e. how fast the capacitor charges. By changing the charge rate of the capacitor controlling the base voltage, we can change the frequency of the oscillator.

CLASSIC **CIRCUITS**

Before we had Arduino and Raspberry Pis, electronics were built out of discrete components and simple ICs. Many people who learned electronics during this period (including the HackSpace mag editor) learned from the classic books sold through RadioShack by Forrest M. Mims III. Perhaps the most famous of these is Getting Started in Electronics.

More recently, Star Simpson brought some of the circuits in these books to life in the Circuit Classics series of soldering projects. You can get these (including the dual LED flasher that we've looked at in this article) at **hsmag.cc/FVvkXM**.

Changing the resistor is one way to alter the timing (and thus frequency) of the circuit. Changing the capacitor is another. Replace the capacitor(s) in the previous circuits and observe the effect on the operation. The LED flasher is especially interesting to play around with. With both timing resistors and capacitors of equal value, the LEDs are on/off equally. If the values differ between the two sides, the relative amount of time the LEDs are on/off will differ as well.

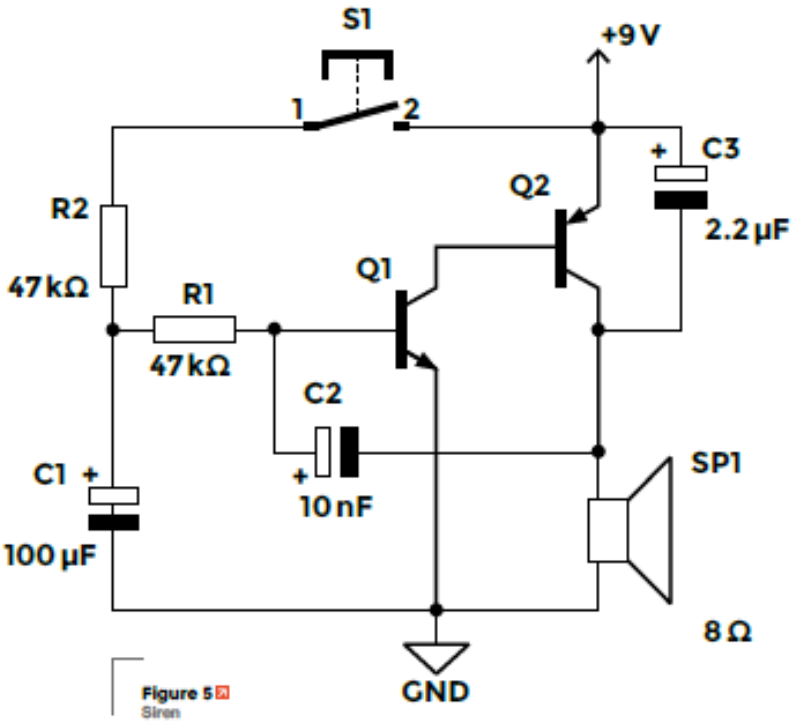


Figure 5
Siren

VOLTAGE CONTROL

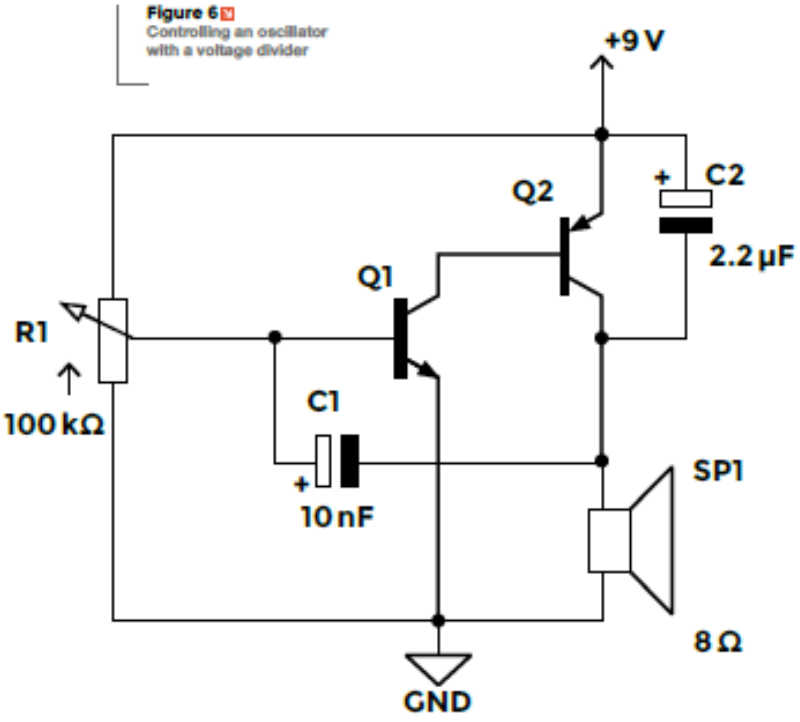
The other way to control the frequency of an oscillator is shown in the siren circuit. In that case, the voltage from which the biasing capacitor is charging is controlled. Here it's the voltage on another capacitor which is charged and discharged using the switch.

We can use this idea to make an oscillator that's adjustable. See **Figure 6** for the circuit. This works identically to the two previous circuits, except that the frequency is controlled by a potentiometer that is working as a voltage divider. It serves to control the voltage that the capacitor is charging from, and thus the timing.

This is referred to as a voltage-controlled oscillator, or VCO, and is a building block of analogue synthesizers. You could easily use this in conjunction with the synth we look at in the cover feature this month, though we'll leave implementing this as an exercise for the reader.

Oscillators are a fundamental type of circuit. They can be found in many types of equipment, from a simple LED flasher to the clock generators of computers. We've looked at a few simple transistor-based oscillators that demonstrate the basic ideas. □

Figure 6
Controlling an oscillator with a voltage divider



HELLGATE AMATEUR RADIO CLUB

AGENDA – 14 Aug 2023 meeting

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

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

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

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

Events for 2023:

Aug 14 Testing 5:30pm & Meeting 7:00pm
Sep 09 Fox Hunt – Multi-event Day

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

HARC Discussion List

1. Voting on Constitution and By-Laws _____ A/R__

2. _____

3. _____

VHF Net Control Station assignments:

Aug	02	N7PAS	Backup	Sep	06	N7PAS	Backup
Aug	09	NZ7S	Backup	Sep	13	_____	Backup
Aug	16	K7MTD	Backup	Sep	20	_____	Backup
Aug	23	W7RPG	Backup	Sep	27	_____	Backup
Aug	30	N7JGS	Backup	___	__	_____	Backup

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

Good and Welfare. _____

***** Next Club meeting: Sep 11 *****

Is there any other business ? _____

Since there are no other items of business this meeting is Adjourned.

Program: ??? Always looking for ideas/presenters -- If anyone wants to do an add-hock program, please come prepared.

August 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	5
			ERC NET 7:30 On 146.900-88.5T BARC NET 8:15 On 146.720-203.5T HARC NET 9:00 On 147.040+No Tone			HARC Net 9:00Am on 147.040 Repeater
6	7	8	9	10	11	12
			ERC NET 7:30 On 146.900-88.5T BARC NET 8:15 On 146.720-203.5T HARC NET 9:00 On 147.040+No Tone			HARC Net 9:00Am on 147.040 Repeater
13	14	15	16	17	18	19
	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 Net 9:00Am on 147.040 Repeater
20	21	22	23	24	25	26
			ERC NET 7:30 On 146.900-88.5T BARC NET 8:15 On 146.720-203.5T HARC NET 9:00 On 147.040+No Tone			HARC Net 9:00Am on 147.040 Repeater
27	28	29	30	31	1	2

Late Additions: 1. Here is the final entry and confirmation for Field Day 2023.

ARRL FIELD DAY 2023

ARRL Home | Field Day Home | Field Day Resources | Field Day Locator | Rules | Entry Form | Entries Received | Results | Soapbox

2023 Field Day Entry - Confirmation

Congratulations! You've successfully submitted your Field Day entry, as well as uploaded all required documentation. Your confirmation number is **25ncosa3**. A summary of your submission is provided below for your review, as well as e-mailed to you. If you have any questions about your entry, please contact the Contest section at contests@arrl.org.

If you need to update your entry, enter soapbox comments or upload photos of your Field Day activities, please use the appropriate link below (also included in the e-mail sent to you).

	Link
Update entry/upload documents	https://field-day.arrl.org/fdentry.php?call=w7px&id=25ncosa3
Soapbox comments/photos	https://contests.arrl.org/contestsoapbox.php?call=w7px&id=25ncosa3

Summary

Entry received at: 2023-07-24 23:52:17 UTC

Submitted by: **Bill Reese, KJ7PCR** E-mail: instinctsurvivalist@gmail.com

Call Used: **W7PX** GOTA Station Call: **N7PAS** ARRL/RAC Section: **MT** Class: **2A**

Participants: **9** Club/Group Name: **Hellgate Amateur Radio Club**

Power Source(s): **Generator, Battery, Solar**

Power Multiplier: **2X**

Preliminary Total Score: 2,836

Bonus Points:

Bonus	Points	Status
100% emergency power	200	
Public location	100	
Youth participation (3 x 20, max of 100)	60	
GOTA Station	50	
Entry submitted via web	50	
Total bonus points	**460**	

Score Summary - Cabrillo log/dupe sheet file: FD Calls Worked W7PX.xlsx

	CW	Digital	Phone	Total	
Total QSOs	361	0	466		
Total Points	722	0	466	**1188**	**Claimed Score =** (QSO points x power mult) = **2,376**

Band/Mode QSO Breakdown:

	CW		Digital		Phone	
Band	QSOs	Pwr(W)	QSOs	Pwr(W)	QSOs	Pwr(W)
160m						
80m						
40m	235	100			54	100
20m	121	100			398	100
15m	5	100			4	100
10m						
6m						
2m						
222						
432						
Other						
Satellite						
GOTA					10	5
Total	**361**		**0**		**466**	

GOTA Station: No GOTA Coach

Name	Call	QSOs	Bonus Points
PAUL SHUEY	N7PAS	10	50