NRVARC Winter Build 2022

Regen Receiver

with Cam, W4XXV

10 November 2022 - Version 1.0

Contents

Objective

This year we will attempt a build of the Four State QRP Group's "Ozark Patrol". This is a simple regen receiver that uses technology from a generation (or two) ago to create a receiver capable of listening in on CW, AM, and SSB signals on frequencies from 3.5-15 MHz. Use of through hole components is unique as the components are flush mounted, 'Pittsburg' style, to the back of the face of the receiver. This will give the builder a chance to expand their skills with a newer technique.

Once we are introduced to the kit and basic assembly techniques, students will be encouraged to continue the build on their own time. Any questions can be fielded during the session, or via email between sessions. The assumption is that the build is completed prior to Unit 2 to allow for any troubleshooting needs to be fielded, and operation of the final assembly to take place.

Students may wish to sand and finish the included pine board base prior to the sessions for a better finished look.

Caution:

We will be using sharp cutting tools, and hot, molten metal that can damage your kitchen table, or your body. Please use caution, and always use safety glasses when performing these tasks. Trimmed component leads are sharp and can go flying as they are snipped. These discarded leads should be carefully disposed of.
If you choose to follow along with this course, you are doing so at your own risk.

Tools Required

- Work desk/area with close available outlet for soldering iron
- Multimeter w/capacitance
- Soldering iron/solder
- Flush cutters
- Small needle nose pliers
- Medium and small Phillips screwdriver
- Small slotted screwdriver

Tools Recommended

- Silicone mat
- Helping hands
- Magnification with light
- Box cutter for scraping magnet wire
- Packing foam to poke components into for sorting

Kits/Parts Required

Note: Please order at least 3 weeks ahead of the class schedule.

- Ozark Patrol Simple Regen Receiver - $55
  http://www.4sqrp.com/ozarkpatrol.php
- 6 x AA batteries
- Scrap wire for antenna

Unit 1: Initial Setup and Start Build

Unit Overview

The Ozark Patrol kit is an all-inclusive kit to build a regenerative receiver. This kit makes use of thru hole components, mounted flush to a circuit board. This technique is called 'Pittsburg' construction.

- Parts identification and inventory
- Parts placement and order
- Toroid winding and construction

Tools Needed

- Work area
- Soldering Iron
- Solder
- Multimeter
- Needle nose pliers
- Flush cutters
- Phillips screwdrivers
- Foam block or empty egg carton
- Sharpie and tape to mark on

Kits/Parts Needed

- Ozark Patrol kit
- 6 x AA batteries
- Scrap wire for antenna

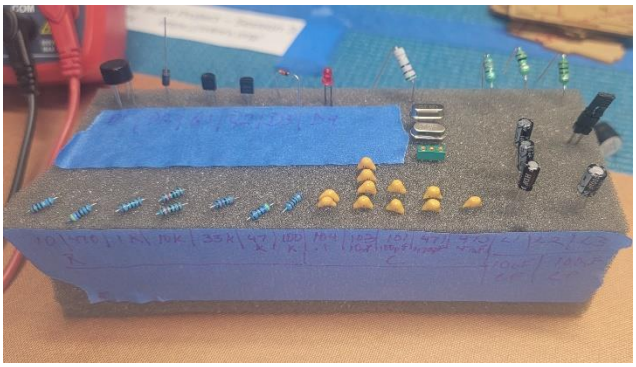
Standards/Expectations

This unit will cover basic components of the kit we are building, how to test and organize parts. Assembly steps will be showing tips for mounting, soldering, and trimming components. Students will continue their build with expectation of it being completely assembled before the next session.

Build Procedure

Inventory all items and organize them.

Read all instructions in "Ozark Patrol Assembly Manual" before starting, then follow the instructions.



Example Inventory and Sort

Unit 2: Final Build and Operation

Unit Overview

Final assembly and testing of the unit will be the focus of this session. Hopefully the unit has been fully assembled prior to the session so that concentration of the session can be on troubleshooting and operation. Antenna should be run to the workbench area prior to the session. Operational guidance will be given of the final unit and students will be encouraged to find signals to tune in.

- Final assembly
- Testing
- Tuning/operation

Tools Needed

- Work area
- Soldering Iron
- Solder
- Multimeter
- Needle nose pliers
- Flush cutters
- Phillips screwdrivers
- Small slotted screwdriver

Kits/Parts Needed

- Assembled Ozark Patrol kit
- 6 x AA batteries
- Scrap wire for antenna

Standards/Expectations

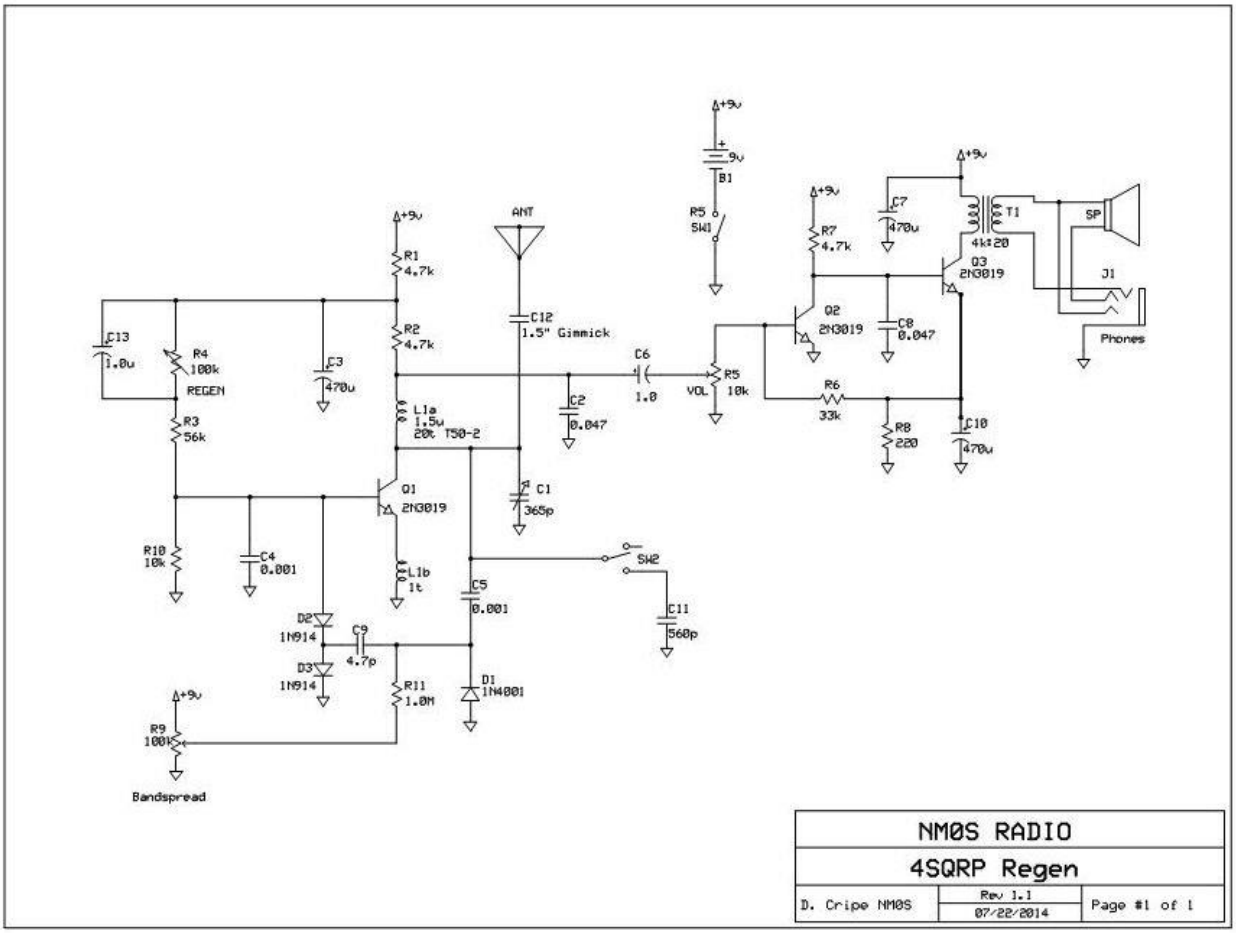
Once the kit build is complete, operation of the build will start. If there are any issues, we will try to work through them during the session.

Final assessment will be basic testing of the assembled unit, power-up, and operation. Operational guidance will be given to ensure success of an operational unit.

Procedure

- Initial questions and troubleshooting
- Powering up of unit
- Tuning in to signals
- Troubleshooting

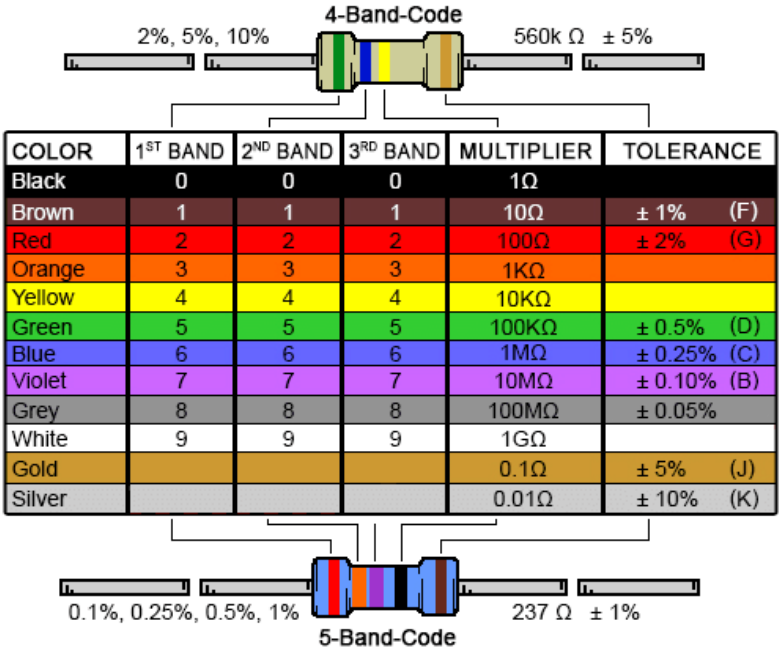
Schematic



Links

- Kit - http://www.4sqrp.com/ozarkpatrol.php
- Assembly Manual - http://www.4sqrp.com/kits/ozarkpatrol/ozarkpatrol_manual_12-28-15.pdf
- How to use a Regen Receiver - https://www.frostburg.edu/personal/latta/ee/twinplex/howtouse/twinplexhowtouse.html
- How a Regen Receiver Works - https://www.youtube.com/watch?v=JEuUK_DsNVk
- Past Build - https://www.n4nrv.org/2021-winter-build-project/

Appendix A – Component Value Charts



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8	100MΩ	± 0.05%
White	9	9	9	1GΩ	
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

Taken from https://www.digikey.com/-/media/Images/Marketing/Resources/Calculator/resistor-color-chart.png?la=en-US&ts=4db603f5-4e9b-4759-84b7-21a04d18b1a8

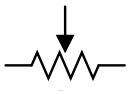
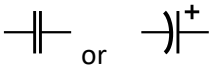
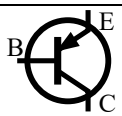
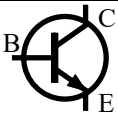
Capacitance Conversion

picofarad	nanofarad	microfarad	Code	picofarad	nanofarad	microfarad	Code
pF	nF	µF		pF	nF	µF	
10	0.01	0.00001	100	4700	4.7	0.0047	472
15	0.015	0.000015	150	5000	5	0.005	502
22	0.022	0.000022	220	5600	5.6	0.0056	562
33	0.033	0.000033	330	6800	6.8	0.0068	682
47	0.047	0.000047	470	10000	10	0.01	103
100	0.1	0.0001	101	15000	15	0.015	153
120	0.12	0.00012	121	22000	22	0.022	223
130	0.13	0.00013	131	33000	33	0.033	333
150	0.15	0.00015	151	47000	47	0.047	473
180	0.18	0.00018	181	68000	68	0.068	683
220	0.22	0.00022	221	100000	100	0.1	104
330	0.33	0.00033	331	150000	150	0.15	154
470	0.47	0.00047	471	200000	200	0.2	204
560	0.56	0.00056	561	220000	220	0.22	224
680	0.68	0.00068	681	330000	330	0.33	334
750	0.75	0.00075	571	470000	470	0.47	474
820	0.82	0.00082	821	680000	680	0.68	684
1000	1	0.001	102	1000000	1000	1	105
1500	1.5	0.0015	152	1500000	1500	1.5	155
2000	2	0.002	202	2000000	2000	2	205
2200	2.2	0.0022	222	2200000	2200	2.2	225
3300	3.3	0.0033	332	3300000	3300	3.3	335

Taken from https://www.digikey.com/-/media/Images/Marketing/Resources/Calculator/capacitance-conversion-table.png?la=en-US&ts=373a63b5-6e0f-49d8-8a69-027753b03d84

Appendix B – Multimeter Component Measurement Chart

All readings are taken with component removed from the circuit.

Component	Schematic Symbol(s)	Multimeter Mode	Notes
Resistor		Ohms Ω	Touch test leads to either side of component and read measurement.
Variable Resistor		Ohms Ω	To measure total resistance (rating of the variable resistor) touch test leads to opposite sides of component and read measurement. To check variable resistance, touch outside and center tap to test leads, and read measurement as you rotate the component shaft.
Capacitor		Capacitance 	Touch test leads to either side of component and read measurement. If capacitor is polarized, the negative test lead should be used on the negative or stripped side of the capacitor.
Variable Capacitor		Capacitance 	Touch test leads to component leads and read measurement as you rotate the component shaft.
Diode		Diode or Ohms (9v multimeters only) 	(Diode mode) Touch positive test lead to anode and negative (or common) lead to the component cathode. Stripe is normally printed closer to cathode side. Measurement will be forward voltage needed for current to flow. (Ohms mode) Touch positive test lead to anode and lead to the component cathode. Measurement should indicate low resistance. Swap test leads and test again. This test should show infinite resistance.
LED		Diode 	(Diode mode) Touch positive test lead to anode (normally longer component lead) and negative (or common) test lead to the component cathode. The LED should light. Swap test leads and test again. It should not illuminate. You can test as a standard diode as well.
PNP Transistor		Diode 	Test as if it is two diodes C->|B and E->|B
NPN Transistor		Diode 	Test as if it is two diodes B->|C and B->|E
Inductor		Ohms Ω	Touch test leads to either side of component and read measurement. Should indicate low resistance (under 10 ohms)