



Coconino Amateur Radio Club
www.cocoradio.club

High-Country Static

March 2017

News and Information Concerning
 Amateur Radio in Northern Arizona and
 Beyond

Welcome to the Coconino Amateur Radio Club (CARC) Monthly Newsletter. CARC is a non-profit club devoted to providing communication services to local volunteer agencies and events. Meetings are held the second Thursday of each month at the East side Sizzlers Restaurant Highway 66 at Fanning Dr. Flagstaff, at 7:00PM. All persons interested in amateur radio, whether licensed or not, are welcome to attend.

Coconino SkyWarn meets 1900 every Monday evening on the 146.98 repeater and at 1930 on the Navajo Mountain CACTUS repeater and 146.480 simplex.

Coconino ARES meets 1900 every Wednesday evening on the 146.98 repeater and at 1930 on the Navajo Mountain CACTUS repeater and 146.480.

Officers:

President: Tom Shehan KY7WV

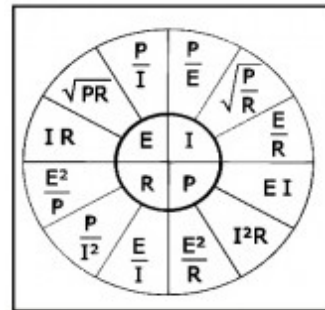
Vice-President: Sandy Meadowcroft KF4JHC

Secretary: Erv Perelstein, KE7QFI

Treasurer: Pat Traber, KE7QFG

PIO: Vacant

Newsletter: Janice Enloe, KI6WCK



E = voltage I = current
 R = resistance P = power

From our Club President:

Time to get prepared for Field Day 2017! June 24 will be here before you know it. This year we have the added competitive component of the challenge with the Oro Valley Amateur Radio Club (OVARC) and the Cochise Amateur Radio Association (CARA). Club members, they mean business! And so do we!

The Northern Arizona DX Association (NADXA) is joining us for this friendly competition. Together we can take home the trophy (Yes! There is an actual trophy!). BUT we need the participation of YOU!!

We need SSB, digital operators, and loggers. Every one of you that has keyed up your VHF handheld to support an event can operate SSB. It's easy. We'll coach you to get you started if you want. I'll be doing some crash courses in digital using PSK31. I know a few of you are very interested in learning digital. This is easier than you think! Loggers are critical to keep the operators efficient. While one person operates, the other records the QSO in the simple-to-use software. You can take turns operating and logging.

With over 24 hours of Field Day, if everyone signed up for an hour the entire club could participate. That's right, just an hour of your time on Field Day is all you need to volunteer and we can make this

happen. Of course, you are welcome to volunteer more hours – many of us do.

The signup sheets will be out soon. Put your name on it. We will be sticking to them this year. CARC needs each of you to bring home the Field Day Trophy!!

73,
Tom, KY7WV
CARC President

P.S. Yes, there are other activities that will need your support too. All that is coming out soon, so you can do more than operate and log.

Calendar of Events for 2017:

January

- 21 Amateur Radio Examinations at Northern Country Health Care
Held 28 January due heavy snow on 21 January

February

March

- 6 STEM Celebration Day at NAU Skydome

April

- 22 Amateur Radio Examinations at Northern Country Health Care
- ?? PFAC Wild Lands Fire Exercise; waiting for more information

May

- ?? Arizona ARES/RACES Full Scale Exercise
- 12-14 Overland Expo: Demonstrations and Amateur Radio License Examinations
At Fort Tuthill
- 28-29 Red Cross Exercise

June

- 3 Sacred Mountain Prayer Run
- 24-25 Field Day (KG7OH & Team)

July

- 4 Munds Park Parade
- 16? Snow Bowl Hill Climb
- 22 Amateur Radio License Exams at North Country Health Care

August

- 1 National Night Out (First Tuesday in August)
- 5 Toys for Tots/Fat Tire Bicycle Ride
- 12 Big Brothers/Big Sisters Run for the Magic
- 27 Arizona Trail Marathon at North Rim

September

- 4 Williams 10K Labor Day Run
- 23-24 Flagstaff to Grand Canyon 100 Mile Run

October

- 14 Soulstice Mountain Trail Run
- 21 Amateur Radio License Exams at North County Health Care
- ?? MARS COMEX

November

- ?? Arizona ARES/RACES Full Scale Exercise
- 11? Girls on the Run

December

2 SkyWarn Recognition Day at NWS Belmont (UTC date)

10? Christmas party

Thank you and Help Wanted:

Thank you to all who have run the Monday and Wednesday night nets:

Flagstaff: Tom KY7WV, Erv KE7QFI, Mike KD8RQV, Bob KF4RKS, Mary Lou Hagan, KG7TPK
Mike Clever, KD8RQV, Phil Brunner, AE7OH

Page: Eric Kg7UNI, Nancy KG7WKS and Vince WB7UWW

If anyone one would like to help with the nets, please let Tom know. It is good practice for radio skills and the script is written for you to use.

Licensing Exams for 2017:

Remember to bring your HAM license and a copy (if you are upgrading your license), a government issued picture ID, a black ink pen, calculator with memory erased and fifteen dollars (exact change is appreciated).

April 22 Amateur Radio Examinations at Northern Country Health Care

May14 Overland Expo: Demonstrations and Amateur Radio License Examinations
At Fort Tuthill

July 22 Amateur Radio License Exams at North Country Health Care

October 21 Amateur Radio License Exams at North County Health Care

<http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp>

Arizona Newsletter: <http://www.arrl.org>

Tutorials: <http://www.arrl.org/tutorials>

http://www.arrl.org/exam_sessions/flagstaff-az-86004-1221-2

Next Business Meeting:

Our next business meeting will be March 9, 2017 at the East side Sizzlers at the corner of Highway 66 and Fanning. Dinner @1800 and meeting starts @1900.

Minutes of the Coconino Amateur Radio Club 2/8/2017

Meeting Started: 19:00

Guests: 3

Secretary's Report: Since the minutes of the January meeting were published in the newsletter there was no need to read them. Janice Enloe made a motion and Scott Martin seconded the motion to accept the minutes. They were approved unanimously.

Treasurer' s Report: Pat Traber, our club treasurer, gave the treasurer's report. The closing bank balance was \$2,214.29. Membership is 44 members, consisting of 40 paid members and 4 lifetime members. Pat suggested that Dan Boone be removed as a secondary on the bank account. Janice Enloe volunteered to take his place. Scott made a motion and David Schaubert seconded the motion to accept the Treasurer's Report. Unanimously accepted.

President's Report: After Introductions, (we welcomed three guests to our meeting) Tom Shehan, our CARC President, reported on his experience with Winter Field Day.

Vice President's Report: Sandy Meadowcroft reported that she and Bob were re-locating to Prescott so the club will need for someone to take over shirt/hat sales. She and Bob will continue to support our race activity through this year.

Old Business – Continuing Business:

Tom reminded us that we still need a Public Information Officer, or co-PIO Officers.

Bids are being accepted from CARC members only for the tower donated by Bill Smith, KQ1S. Last date for bids is March 16. CARC officers will meet to review and accept winning bid.

Tom also reminded us of the upcoming 2017 Tech Class: Dates will be Mar 11, 18, 25, Apr 8, 22, 29, May 13, May 20. Classes will be in the North Country Health Care Conference Room. So far there are no students signed up. Need to create Event on FaceBook to try to get interest in the class. Sandy will also make flyers to send to Scott and & Robert Morris to help advertise the class.

Tom updated us on the Memo to race directors on expectations.

Tom asked for a List of presentations members would like to see in upcoming meetings

Discussion was held to finalize committee to build-out interior of club trailer. Currently Pat, Robert, Mary Lou, Phil Bruner, and Dawnelle Shehan have agreed to be on the build out committee with Scott to be a senior consultant. It was suggested that the committee might need extra keys for the trailer so Tom will have extra keys made. (lists for equipment for trailer – Tom will send to the committee along with the pictures from Scott. It was proposed that the committee be approved to use \$400 on materials for the build out. A motion was made by Janice and a second to the motion was made by Gary Loving to approve the \$400 budget. Unanimously approved.

Tom reminded us of the Flagstaff Community STEM Celebration Monday, March 6th, 5:00 to 7:30 pm NAU Dome! Tom, MaryLou, Robert and Sandy are scheduled to help with the event.

New Business:

There was much discussion regarding the Williams Repeater as the repeater is very important to us during some of our events such as the 100 mile race.

We need a new location for the Amateur Radio Examinations on April 22nd. Janice and Pat will check into alternate location.

Overland Expo has been moved to Fort Tuthill. Scott reported that there are limited passes this

year and our location has yet to be determined.

Bob Meadowcroft will be coordinating the Sacred Mountain Prayer Run again this year – more information to follow.

Discussions are beginning regarding Field Day.

ARES Report:

Joe reported on the most recent testing. He also thanked members for monitoring snow activity and road conditions during our recent storms. A high snowfall of 39" was reported by Pat and Al in Munds Park.

Joe mentioned that there is going to be an ARES RACES exercise in May.

Joe also asked that members report any issues with ARES repeaters to him.

50/50 drawing was held: MaryLou Hagan won the 50/50 raffle. Bill Hagan won the free lunch card.

There being no further business, David moved and Dawnelle seconded a motion to adjourn. Passed unanimously.

Meeting Ended: 20:42.

Presentations: No additional presentations this month.

A note from Rick Paquette our new ARRL AZ Section Manager:

Again, thanks to your club for the warm welcome and informative sessions when I attended your meeting. I hope to do this again soon. Please give my thanks to your members for opening-up and teaching me some of the issues and solutions you are using to make the Coconino club successful. I was impressed with how much you accomplish.

See some of you at the SpringFest at Scottsdale.

Rick Paquette W7RAP
ARRL AZ Section Manager (Elect)
W7RAP@ARRL.NET

Starting out: Essential Electronics Tools

On June 3, 2016 in [Open Source](#) by [Mike Parks](#)

The rise of Open Source Hardware (OSHW) has made it easier than ever to tinker with electronics. But even in a world where open source development (dev) platforms are making it appreciably easier to get started, tools are still a must for doing any serious circuit building and testing. Investing in good tools early in your maker career can make all the difference as to whether or not you stick with electronics as a hobby (or even profession), or give up in frustration when a circuit doesn't quite work the way you intended.

Just as there are seemingly endless options of [open source hardware platforms](#), there are tons of options and configurations of tools as well. Unless you were a recent lottery winner, chances are your resources aren't unlimited. Knowing which tools to invest in early and which can wait for later in a career is perhaps a matter of opinion depending on your specific project goals. However, there are a couple tools that many would agree are smart to invest in early on. Spending a few extra bucks on quality tools today can save hours (and potentially even more money) in the future.

Here is a look at some of the tools we recommend you consider:

1. Digital Multimeter (DMM) - A digital multimeter is the fundamental tool for understanding what is happening in your circuit. Beyond the three basic measurements of voltage, current, and resistance, a decent low-cost DMM today will also measure characteristics such as signal frequency and duty cycle. Even \$30 can get you a DMM that includes the ability to measure capacitance and temperature (via an included thermocouple probe). While lower cost options might trade off accuracy, ruggedness, or other advanced features, for a lower price, a reasonably priced DMM is a wise first investment when building your electronics toolbox. The [Extech MN15A](#) is a pretty solid choice for first DMM that includes a thermocouple for measuring temperature and has the ability to measure capacitance. For the various budget-conscious, check out the [Gravitech DMM-899](#) it's barebones current, voltage and resistance measurements but it's also very inexpensive.

Figure 1: Weller WESD51 digital 50W soldering station. Microprocessor controlled with LED digital display in F/C.



2. Variable Temperature Soldering Station - When you are ready to go from breadboard only projects to something more permanent, you will need to start learning how to solder. Soldering is sort of like that

mythical “weed out” course in college, the one that separates those who like the idea of majoring in a certain subject from those who are actually crazy enough to stick with it until graduation. The skill of soldering is not especially hard. However, if your first experience is bad one as a result of using a cheap soldering iron with poor temperature controls, it can be enough to forsake electronics forever. A good soldering iron is one that has good variable temperature control and an assortment of easily interchangeable soldering tips. A brass sponge is also highly recommended.

A solid choice is the [Apex Tool Group’s WESD51 digital soldering station](#) which will give you 350°F to 850°F of finely controlled temperature depending on what components you are soldering.

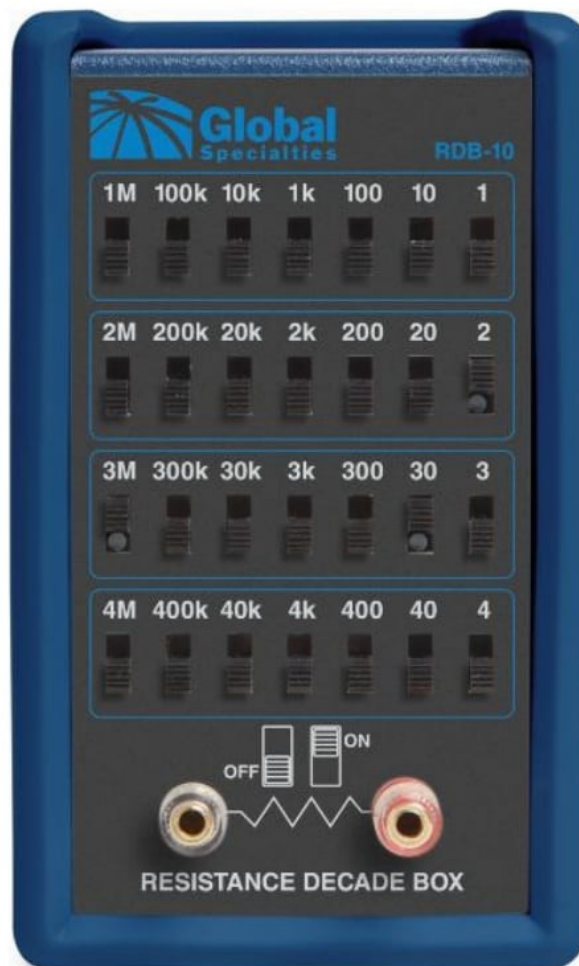


Figure 2: A decade box is invariably useful for testing out resistor values in a prototype without having to swap out resistors manually. Image courtesy Global Specialties.

3. Resistor Substitution Box - This is one of those tools that you may not use every single day but is invariably useful for just about every project I have ever worked on. A resistor substitution box is a simple but clever device that lets you very easily test out a variety of resistors in a prototype without having to constantly swap out resistors manually. Simply insert the leads of the substitution box into the part of the circuit where you will eventually place the leads of a fixed resistor. Then by turning the knobs on the substitution box you can quickly step through a variety of resistance and monitor how the circuit reacts. This is extremely useful in a [voltage divider circuit](#) in which one of the resistors is variable, for example, a [photoresistor](#). If you have a desired quiescent output voltage when the circuit is in ambient conditions, you can use the [resistor substitution box](#) to determine the ideal value for the fixed resistor. Then in your final circuit you will replace the substitution box with a fixed resistor of the appropriate value. There are also capacitance substitution boxes that perform a similar role for capacitors.

There are quite a few good options of substitution boxes at a reasonable cost including the [Global Specialties' RDB-10](#) and the [Extech 380400](#). Both allow you to dial-in a variety of resistances from the single ohms all the way up to multiple mega-ohms.

4. [Bench Top DC Power Supply](#) - Battery packs, wall warts, and USB cables are all ways we've powered our circuits at one time or another. Eventually, the mess of having to accumulate a massive collection of wall warts of various voltage and current ratings can get old. A reliable benchtop DC power supply is a welcomed addition to just about any electronics workspace. I prefer a split voltage power supply that can produce both positive and negative voltages, useful for many operational amplifiers applications. 0V to 30V at 1A is a respectable power supply for most DIY applications.

Take a look at the [B&K Precision 9110 benchtop supply](#) which will provide up to 60VDC and 100W in a very small form factor. If your application requires a little more control over characteristics such as inrush current or you wish to mimic battery performance, check out [the Keithley 2260B power supplies](#) that have USB connectivity so you can control the power output from a desktop computer.

Starting out: Essential Electronics Tools, Part II: Oscilloscopes, Function Generators and Logic Analyzers

On June 28, 2016 in [General](#) by [Mike Parks](#)

In the previous blog about essential tools for electronics, I mentioned some of the more basic items. As you do more advanced electronics, and sometimes to better understand the basics, you would do well to have the following tools. They are not really needed for building basic circuits and playing around with Arduino projects and the like, but as you start to expand into more complex technologies, you will find these tools extremely helpful:

1. Benchtop Oscilloscopes (50MHz, 2CH, 1GS/s) - For some, the acquisition of a digital oscilloscope is akin to reaching electronics nirvana. An oscilloscope is no doubt an extremely useful tool if you can master its use. Digital oscilloscopes are driving down the cost of basic test equipment at breakneck speed. With decent scopes hovering at around the \$500 mark, they may still not be feasible for every open source maker, but if you are serious about doing even the most basic work signals, such as projects utilizing infrared transceivers, then an oscilloscope will serve you well during troubleshooting. A decent digital oscilloscope for many makers will have a bandwidth of 50MHz, offer two channels, and offer 1G/s capture rate. Some basic scopes even offer the ability to save waveform captures to a USB thumb drive, which can be quite useful for those collaborating on an open source project with team members scattered around the globe.

A fantastic entry-level oscilloscope to check out is the [Tektronix TBS1052B](#)

A lot further up the chain is the [Teledyne LeCroy WaveAce 1001](#). While both offer great features at relatively reasonable price points, including 2GS/S sampling rate and USB connectivity, there are other differences you should consider. The WaveAce comes in models that have bandwidths that reach up to 300MHz whereas the Tektronix model recommended here peaks at 200MHz.

2. Function Generator (B&K Precision .05 MHz - 4 MHz) - If an oscilloscope allows you to peer into a circuit to watch signals interact with components, then a function generator (also sometimes called a signal generator) allows you to inject a known, well-defined signal into a circuit in hopes of stimulating the circuit to respond in a predetermined manner. Hopefully the response is based on how the circuit was designed and constructed. A decent function generator that can meet the needs of most open source makers will probably run you a few hundred dollars. It should be able to produce signals from 0.5Hz to up to 5MHz sine waves. Additional waveforms such as square, saw tooth, and ramp waveforms may operate at slightly lower

frequencies. There are also some fairly low cost signal generators that can produce arbitrary waveforms that you first design in computer application, then transfer to the function generator via a USB interface.



Figure 1: The B&K Precision 4003A Function Generator is a powerful yet inexpensive option.

Check out the [B&K Precision 4003A model](#) for powerful yet inexpensive option for a good function generator. If your project is going to remain in the audio domain, you can try a less costly [audio generator instead](#).

3. Logic Analyzer - Most entry level oscilloscopes are great for analyzing analog signals but can leave a lot to be desired when trying to analyze digital signals. A logic analyzer can be thought of as an oscilloscope that specializes in observing and analyzing digital signals. The peaks and valleys (aka the 3.3V/5V 1's and 0V 0's) of digital signals concatenate together to form specific symbols based on predefined protocols such as I2C or SPI. It is much easier to troubleshoot a circuit looking at the string of symbols that are represented by the 1's and 0's than analyzing the individual 1's and 0's themselves. A logic analyzer serves as the translator between man and machine. Just like most of the tools mentioned thus far, logic analyzers come in variety of configurations and price points. I would consider 4 capture channels, 100MS/s digital sample rate, a 25 MHz maximum signal, and the ability to handle 1.8V to 5.5V signal levels as adequate for most open source maker applications.

The [Saleae Logic Analyzer](#) is a popular choice amongst the maker community. Another option to check out comes from [EasySync and is their ES-DLA-8 analyzer](#). Features to consider when selecting a logic analyzer include sample rate, bandwidth, memory depth, and the number of channels. Many analyzers come in 4, 8, and 16 channel options.

3-D Printing as Part of the Next Industrial Revolution
On September 13, 2016 in [3D Printing](#) by [Sylvie Barak](#)



The advent of 3-D printing is an integral part of what many are dubbing the fourth industrial revolution, aka [Industry 4.0](#) or the Industrial Internet of Things. The recent convergence of cyber-physical systems, the [Internet of Things](#), and the Internet of Services, has all served to bring customers and suppliers closer together.

Humanity has streamlined the process of manufacturing several times over the course of its history. First, we channeled water and steam to mechanize production. Then we learned to harness electrical power for mass production. Next, electronics and information technology helped us increase automation. Now with 3-D design and printing, we're able to blend the physical, virtual, biological, and chemical. While previous industrial revolutions took the means of production out of people's homes, some future 3-D printing scenarios put manufacturing machinery back in the general public's hands – a new mechanized cottage industry with all the best of personalization and creativity blended with the efficiency of machine production.

Building on the previous industrial revolution, Henry Ford's moving assembly line, and the dawn of mass production, 3-D printing now offers scope for improvisation in addition to creating things with speed with fairly

high standards of quality. The standard product no longer needs to be so standard. 3-D printing was born from the PC and laser printing industries, taking the best qualities of both. Like both of those industries, 3-D printing – or additive manufacturing – has been around for decades. Starting with stereolithography technology back in 1984, using UV lasers to solidify photopolymer for the creation of 3-D parts layer by layer. A plethora of other systems and patents emerged throughout the 1980s, 1990s, and early 2000s, though most were still exorbitantly expensive and focused on industrial applications, mainly processes for prototyping.

In parallel to the big industrial 3-D printers for aerospace and [automotive](#), however, many firms also continued developing less expensive user-friendly systems of which we're only just starting to see the tip of the iceberg – many of them raising money through crowdfunding websites and enjoying huge success and publicity from [the maker movement](#). 3-D printing has become a key player in the maker movement by giving regular people the ability to take an idea and turn it into a finished product with a CAD file, some [filament](#), and the press of a button.

Large technological leaps have been made in personal 3-D printers, taking them mainstream, as the number of applications have ballooned and people have found ways to share printers, making even larger ones [accessible to the general public](#).

What has, in the past, only been possible to make on the industrial level can now be made in small tech workshops, or even people's homes. Small businesses selling 3-D printed art, jewelry, furniture, and tools are springing up on a monthly basis as 3-D printing also helps people save on transport and other logistics. It is, of course, premature and naïve to suggest 3-D printing is about to become the premiere solution for all manufacturing needs. For prototyping, product development, innovation, cost reduction, and efficiency, however, it's clear to see the value and potential 3-D printing offers, especially for low-batch runs. Things can be printed on-demand, less material is required, and nearly none wasted.

The advantages of 3-D printing will eventually solve a number of supply-chain challenges, especially with printing speeds expected to increase by a significant 88% in the next five to seven years.

Today, more than 100 years since the birth of the [standardized product](#), 3-D printing is making it possible for people both within large industries and small businesses to create [customized products on demand](#) at affordable prices.

It may be too early to describe the emergence of 3-D printing as a new industrial revolution, but as the technology becomes faster, cheaper, and more sophisticated, moving from rapid prototyping to advanced manufacturing, there's little doubt it will have wide-reaching impacts on industry and the global economy.

Feb. 23,
2016

Technician Class Spring 2017 9:00 AM - 12:00 PM

Session	Module	Chapter and Topics	Instructors
Mar. 11	1	- Chapter 1 - Introduction and Welcome to Amateur Radio	Sandy
	2	- Chapter 2 - Radio Waves and Signals	Sandy
	3	- Chapter 2 - Modulation and Bandwidth	Sandy
Mar. 18	4	- Chapter 3 - Electricity	Sandy
	5	- Chapter 3 Ohms Law, Power and the Metric System	Sandy
Mar. 25	6	- Chapter 3 - Electronic Components	Erv/Phil
	7	- Chapter 3 - Types of Radio Circuits	Erv/Phil
Apr. 8	8	- Chapter 4 - Propagation	Erv
	9	- Chapter 4 - Antennas and Feed Lines	Jack Lunsford
	10	- Chapter 4 - Practical Antenna Systems	Jack Lunsford
Apr. 22	11	Chapter 5 - Basic Amateur Radio Equipment	Ron Licensing Exam
	12	- Chapter 5 - Power Sources and Interference	Ron
Apr. 29	13	- Chapter 6 - Communicating with Other Hams Part 1	Ron
	14	- Chapter 6 - Communicating with Other Hams Part 2	Tom
13-May	15	- Chapter 7 - License Regulations and License Privileges	Bobbie
	16	- Chapter 7 & 8 - Call Signs and Operating Regulations Part 1	Bobbie
20-May	17	- Chapter 8 - Call Signs and Operating Regulations Part 2	Tom
	18	- Chapter 9 Safety and Amateur Radio	Tom