The Chawed Rag

Next Meeting Program:
Arduino Microcontroller Projects for Ham Radio with Brady Pamplin W5LH & Bob Coelln KG5JL

RWK Winter Field Day 2019
article by Joe Hodgkins KG5WRZ, photos by Paul Newman KA5TYW, Hal Wolff N5BT, and Patty Di Filippo

Winter Field Day was held again this year for a span of twenty-four hours on January 26-27th. With cool and favorable weather conditions, we were up and running again for another successful year. This winter we setup at Lookout Park, and also had access to Richardson's wonderful EOC location for a warm place to duck out of the cold.

Upon arrival, we were fortunate to have **David Hartwig KG5YXA** helping this year. David supplied a majority of the physical setup items of our location, as well as some critical power components for keeping the system up and running on alternative power for the entire weekend. He supplied tents, tables, wind breaks, and all of these items made our weekend comfortable and welcoming.

Scott Greeson KG5MKC and **Kevin Sims KD5YVL** from the City of Richardson were once again gracious with their time and resources. We had access to a great section of Lookout Park, and they helped facilitate off-season usage of the park restrooms. Upon arrival, Scott and Kevin got Richardson's portable tower up and in place right out in the field. The fifty-footer held a variety of antennas, and was a great visual attraction for other visitors to the park. The tower held a 2m/440 gain antenna, UBIQUITI hardware for AREDN mesh network, and two separate dipoles in opposing directions.

Page 1

Winter Field Day (continued)

The dipoles were built by **Jon Suehiro NN5T** and were fantastic to use. One dipole was resonant on 40 meter band, and the other was capable of operation on 160m band and the entire 80m band. Other antennas included a 20m vertical, random long wire, 6m 2-element beam, and a magnetic loop for receive diversity. All of these extra antennas made for plenty of opportunity for each of the HF stations.

Upon completion of setup of the weekend, we settled in and got to work. Working as many as three stations at a time, we were confident that we would have a good showing this year. Jon made some adjustments this year, and graciously lent his time to setup RTTY on one of the computers at the event. That software and computer helped us take a step back and make an effort to use a different mode of communication to help gather more bonus opportunities in the scoring structure. Along with digital modes and voice, several hams helped create contacts with CW as well.

Winter Field Day (continued)

In all we made an effort to make as many different mode and band contacts as possible to generate bonus points for each category. Once again **Mac Cody AE5PH** made his skill-set available to track and make contacts via satellite for a massive bonus. Thanks also for all of the operators and loggers that spent great lengths of time to help with the process.

The RWK effort included a successful application of emergency power sources for the entire event. David's generators ran consistently throughout the weekend, and they were supported by battery banks setup by **Andrew Koenig KE5GDB** and **Danny Siminiuk K5CG**. Danny also setup three networked laptops with logging software that helped keep track of our progress and also send in the final logs for the weekend.

Winter Field Day is a reflection of the same spirit as the ARRL Field Day held in June each year. It offers an opportunity for us to expand the outreach to our community, as well as a chance to spend time together working on our shared skills. I am grateful for the time to help coordinate the event this year, and look forward to more events together in the future. **-CR-**

Welcome New Members!

Mark Mantooth KI5CYA
Josiah Hamilton KE5ZNI
Mike Jahrig KG5P
Jim Szot N5JS
Ron Knerr KG5BRL

RWK Wednesday "Hungry Hams" Lunch

The RWK lunch bunch meets each Wednesday at noon at Sonny Bryan's BBQ on West Campbell Rd. two blocks East of Coit Rd. All are invited to enjoy the benefit of a lot of "eyeball QSOs." NOTE: On the first Wednesday of the month, RWK helps the City of Richardson conduct siren tests, so lunch is delayed until around 12:30 P.M. If you go often, you should get your "frequent customer" card. If you don't yet have one, get one, for a free sandwich and cobbler after 10 purchases of any kind. Of course, members of other ham clubs and guests are very welcome to join in the fun and fellowship.

The President's Corner
By John Di Filippo, AF5MN

I won't say too much about Winter Field Day in this column because I want you to get all the details from **Joe Hodgkins' KG5RWZ** excellent article in this same issue. But I will say that Joe did an excellent job managing the event and soliciting the help of some very generous and hardworking RWK members. We couldn't have accomplished what we did without the help of members like **David Hartwig KG5YXA, Jon Suehiro NN5T, Danny Siminiuk K5CG, Scott Greeson KG5MKC, Kevin Sims KD5YVL,** and **Mac Cody AE5PH**.

The weather, the band conditions, the location, and the up-front preparation were all much better than previous years which I believe will be evident in this year's score and ranking. In 2017 we scored 7,816 points putting us 17th overall in the Outdoor group and 5th in the 1-Outside category. In 2018 we scored 8,255 points putting us in 12th place out of 41 entrants in the 2-Outside category. This year we estimated that we scored over 25,000 points operating in the 3-Outside category so we are hoping for a very good national ranking. So please, if you haven't already, take a look at the lead article starting on page 1 in this month's Chawed Rag for Joe's perspective on this year's WFD.

I'd also like to opine a little on local hamfests. The first two for 2019 are already behind us (Cowtown and Irving) and the next ones are just on the horizon (Belton's HamExpo in April and Plano's Ham-Com in June). [Not to mention the Hamvention in Dayton in May.]

The Irving hamfest this year was especially good with a great turnout of both buyers and sellers. My favorite aspects of these hamfests is the opportunity to pick-up vintage electronics and amateur radio equipment from the halcyon days of the late 20th century.

I think that's why I enjoy the Irving and Belton swapmeets so much. They are heavy on vintage and much lighter on new.

When I first got into personal computers back in the 80s I used to enjoy going to the 1st Saturday sidewalk swap-meets down on Ross Ave. At the time I wasn't interested in anything other than finding computer hardware bargains so I tended to overlook the hams that were hocking their used equipment. But since becoming a ham in 2013 I've been making up for lost time by lightening the loads and enriching the wallets some of my fellow hams.

Get-togethers like hamfests not only allow us to pick-up indispensable vintage electronics but they also offer us the opportunity to network, learn, and share our know-how. This is so essential today considering that innovations and technological advancements in our hobby are moving faster than ever before. So hamfests offer us a glimpse on what's happening now, and what's to come. If you haven't been to one in a while I hardily recommend checking out Belton or Ham-Com in the coming months.

I'll end this month's column with just a short comment about the start of 2019. The first two months of this year have been, to put it technically, "good and not-so-good." The good part is that the President's Dinner, Winter Field Day, and the Cowtown and Irving Hamfests were really enjoyable and are now pleasant memories that have left us looking forward to next year. But the not-so-good part is that our membership has dropped from a high of 233 at the end of December down to 220 members at the end of February. The drop-off may just be due to some members being slow to renew expired memberships but there may also be some other underlying issues. To address this I have asked the klub officers and directors to actively look into the reasons why more than a dozen long-time members haven't felt motivated to renew. We genuinely want to make membership in the RWK rewarding for all members so if you hear of any reason why a fellow member is unhappy with the klub then please ask them to contact me or one of the other officers so that we can address their concerns.

73 de,
John Di Filippo, AF5MN
President, The Richardson Wireless Klub
president@k5rwk.org

High Flying Arduino
by Doug Kilgore KD5OUG

In 2017, members of the Richardson Wireless Klub met with students of the Physics class of Dr. George Hademenos at Richardson High School with the goal of creating a payload to fly on a planned high altitude balloon launch in early spring of 2107. The Plano Amateur Radio Club periodically sends up weather balloons with radio packages attached. This flight was PHAB-16.

A thick walled light weight Styrofoam box previously used for shipping temperature sensitive medicines was chosen to hold all of our equipment. The insulation was needed to protect equipment and batteries from the sub-zero temperatures of high altitude.

A commercial lab instrument which measured temperature and pressure and stored those readings internally was provided by the high school. A hole was cut in the side of the box near the bottom to allow it's sensor probe access to outside air. This location was an unfortunate choice because it allowed water to get inside the box upon landing in a lake.


RHS Instrument, Arduino & Li-Ion Batteries

To be able to track the location of the balloon, a Byonics TinyTrak3 tracker with a Byonics GPS5 GPS antenna was to be used to transmit positional data to the Automatic Packet Reporting System (APRS) on the nationally used frequency 144.39 Mhz. GPS telemetry generated by the TinyTrak would be transmitted real-time to the ground stations following the balloon flight.
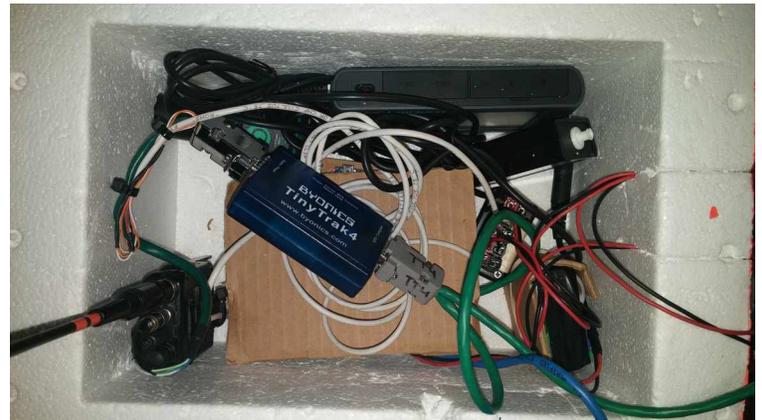
TinyTrak with Radio

However, upon reading the specs, the GPS5 would work only to 60K feet. The PHAB-16 would exceed that altitude. **Andrew Koenig KE5GDB** came to the rescue by providing a TinyTrak4 with a GPS5HA GPS antenna that would work to 270K feet. That unit came with a hand-held radio flown on balloon flights previously.
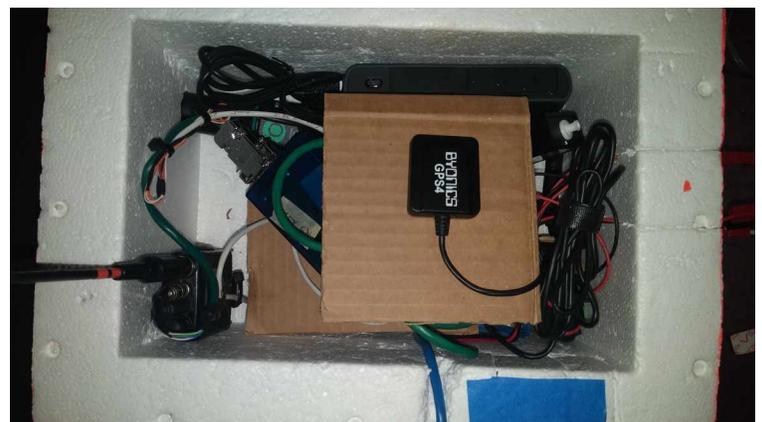
Byonics GPS4 antenna

The TT4 can also accept data from a computer. **Brady Pamplin W5LH** and **Doug Kilgore KD5OUG** developed an Arduino based board that had sensors for measuring temperature, humidity and barometric pressure. This data was passed to the TT4 on a real-time basis for inclusion in the transmitted packets. The TT4 can be powered with 6-15 volts DC. Two 3.6V non-rechargeable lithium batteries in series provided 7.2V for the TT4, Arduino, and radio.

Feature Article (cont.)
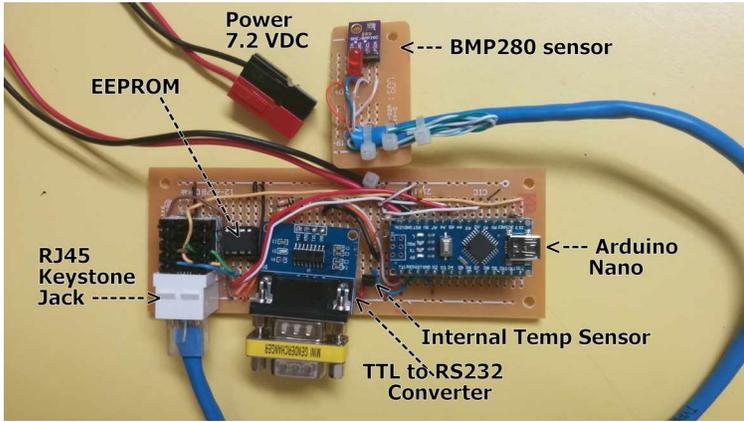
Arduino-based Control Board

Andrew Koenig KE5GDB in the water

Packaging was simple. The equipment was just laid in the box in layers separated by cardboard partitions. The GPS antenna was on top of the stack to give best view of satellites. The sensors from the Arduino were passed through the seal of the box and taped to the outside. The box was then taped shut.

Max Pincu KG5PKX and Doug Kilgore KD5OUG

Doug Kilgore KD5OUG and high school student **Max Pincu KG5PKX** attended the launch from Terrell, TX. The Balloon traveled 51 miles northeast and landed in the water at Jim Chapman Lake. Again **Andrew Koenig KE5GDB** came to the rescue by swimming out and recovering all the payloads. The Styrofoam box floated and kept the other payloads from sinking. All equipment in our package survived. **-CR-**

Results from the 21-Feb- 2019 VE Session:
Candidates Served: 4
Total Exam Elements: 5
New License Class Earned: 4
Brand new licenses: 3

License Class Breakdown:
Technician: 3
General: 1

VE Ham Exam Sessions

The Richardson Wireless Klub holds license exam sessions on the third Thursday evening of each month, starting at 7pm. We have an excellent group and the numbers that sit for tests is growing each month.

Know someone who might like to become a ham?

Please tell him/her about The RWK VE program. Our VE testing project also has produced quite a few new RWK members. We're anxious to help new hams learn and enjoy!

Interested in helping with VE testing?

An open book orientation exam for Volunteer Examiners is all it takes to receive ARRL certification. If you are a General, Advanced, or Amateur Extra, why not get your accreditation?

For more information, contact Don Click at rwkhamtest@gmail.com

Building an Arduino Based Balloon Controller
by Brady Pamplin - W5LH

Most hams have probably assembled a circuit from components or a kit at some time but it seems some have not taken the next step of tying several parts together with a microcontroller and then writing or tweaking a program to give desired results. An Arduino can be viewed as the glue that ties your components together and controls them as you wish.

Figure 1: Arduino Nano

The development of the balloon controller project is presented as an example of two casual microcontroller hobbyists who did a bit of research, cobbled together a bunch of parts and had a high success - 18 miles high. This article is not to document the technical details but to illustrate how anyone interested in electronics is capable of doing the same and beyond.

But first, what is a casual microcontroller hobbyist? We see it is someone who reaches out for a goal and does not get bogged down in a full analysis of the world's most perfect project. He does not mind overkill like dropping a Raspberry Pi or Arduino Nano board into a project when it saves time and effort over using a simple microcontroller chip and a few components.

So what does it take to become a microcontroller hobbyist? It has never been easier. An Arduino is widely recommended as a starting point because it is cheap and there are so many sources of information and compatible parts. Youtube is an awesome resource with videos from downloading the Arduino IDE to very advanced projects. At the end of this article are links to online classes and other resources. Several teachers are running free beginner, open to non-member, all parts furnished except laptop PC classes at Dallas Makerspace.
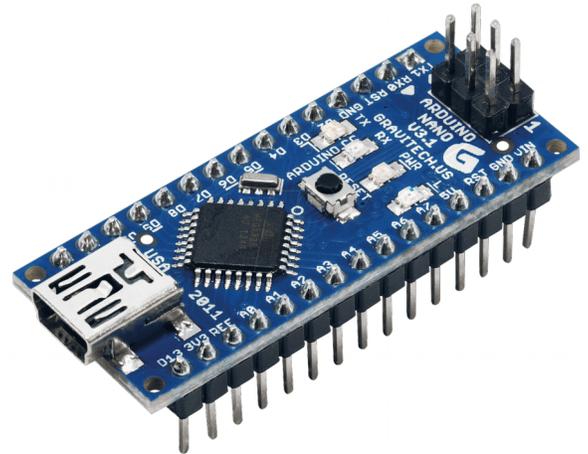
The final program was not a tightly integrated structure like a software engineer would produce. Each of the components had been tested individually with small test programs. The useful lines of each test program was pulled into the final program as needed. Links to articles on the components we used is provided below.

The goal of this project was to collect environmental data on a high altitude balloon flight, reformat the data and output it to a Tiny Trak 4 unit which would transmit it into the APRS system using a handy talkie. For better or worse, we had no specific requirements on equipment to use. On balloon flight projects there are always limits on size, weight and power requirements. Fortunately these were very generous when compared to everything we considered.

Figure 2: TinyTrak4

Technical Article (cont.)

The most interesting data is external atmospheric conditions. The Bosch BME280 measures temperature, humidity and atmospheric pressure. It's a beautiful little 3mm square surface mount device. It's ideal for this project but is only documented for use up to 30,000 feet. Devices for higher altitudes were outside our budget so this was not seen as a problem. Since we don't do surface mount soldering we took the casual hobbyist approach. We purchased the tiny sensor mounted on a little board about a half inch square with four male header pins 0.1" apart. Doug mounted it on a piece of small perf board along with a red LED to show status. He attached the little board to about a foot of CAT 5 cable with an RJ45 connector which could be pushed through the Styrofoam box and plugged into our main controller board.
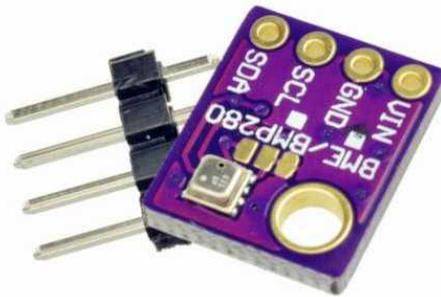

Figure 3: Bosch BME280 Temp., Humidity, & Pressure Sensor

Internal temperature was measured with Dallas Semiconductor DS18B20. The TO-92 package with three leads looks like many common transistors but actually contains an integrated circuit with a unique serial number. A 4.7k pullup resistor is required on the signal line which is connected to a digital input of the microcontroller.
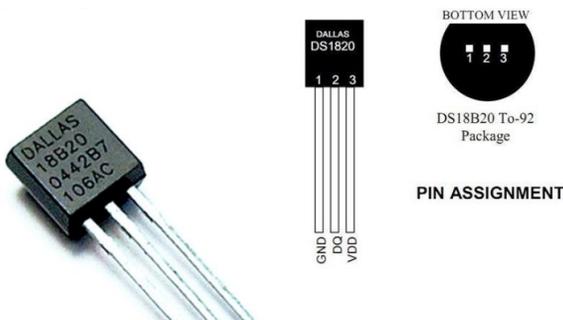

Figure 4: Dallas Semi. DS18B20 Temp. Sensor

The Arduino is a five volt device so two resistors in a voltage divider configuration allows supply voltage which started at 7.2 volts to be measured. The center of the resistors was connected to an analog input of the Arduino.

Unexpected things sometimes happen when projects are exposed to harsh environments and the risk is multiplied considerably for casual hobbyists projects. In the event of an early failure anywhere in the radio link, all data would have been lost. The Arduino under consideration had a 1k EEPROM which would be insufficient for logging on this project. A 24LC256 32KB EEPROM requires only power, ground and two signal wires to read or write 32k bytes of data. With the EEPROM we could lose radio data be able to recover all data even if the equipment were to crash into a lake.
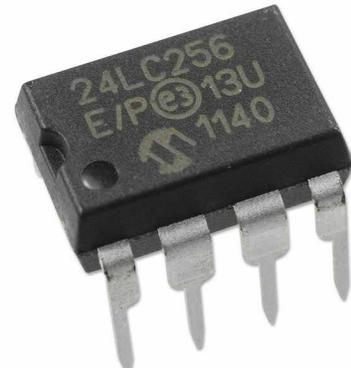

Figure 5: 24LC256 32K Byte EEPROM

For many decades, RS232 with its positive and negative voltage swings was the king of serial data communications. However, microprocessors and microcontrollers use from zero to 3.3 or 5.0 volts for serial communications. That was an issue when connecting to the Tiny Trak 4 which requires RS232. The first attempt to solve this was a MAX232 chip, four capacitors and a DB9 connector. That's a lot of detail for a lazy hobbyist but it worked the first time on a breadboard. Ironically, I was never able to get it working when soldered on the perf board. Then we discovered an awesome RS232 to TTL module. The microcontroller side only required power, ground, RX and TX. The other side had a beautiful DB9 connector built in. Our kind of module! A gender mender completed this section.
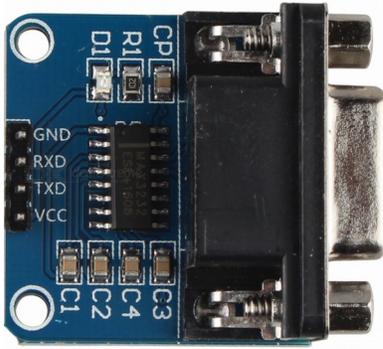
Technical Article (cont.)

Figure 6: TTL Serial to RS232 Serial Port Module

A computer of some type was required to access data from the sensors, scale and reformat it, save to the EEPROM and send packets to the Tiny Trak 4 for transmission. A microcontroller is an integrated circuit chip with a processor, flash memory and IO support included. Some pins support specific protocols and many are for general purpose. Microcontrollers do not run an operating system but run a single program.

While a bare microcontroller would be a problem for casual hobbyists, the awesomely popular Arduino boards make it easy for a total beginner to learn how to access sensors and they to tie them into a package as we did. An Arduino board contains an ATmega328P microcontroller and support circuitry which makes them very easy to program and connect to sensors. They are great for prototyping and hobby use because the board also includes a USB connection for loading programs and viewing output, two voltage regulators, LEDs and other support components. While Uno is the flagship Arduino model, we like the Nanos. Nanos have two rows of 15 pin male headers which can be plugged into a breadboard or female headers on a perf board. The capability of this neat little board was overkill for this project but it is the go to solution for casual hobbyists unless you have requirements that it cannot handle.

Doug built the control panel with a piece of perf board with two 15 pin female headers to hold the Nano. A set of Anderson Power Pole connectors provided battery power with was connected to the VIN pin (5volt regulator input).
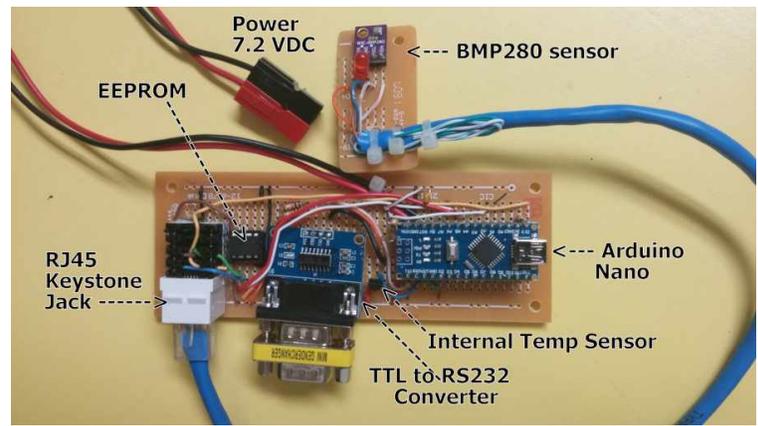

Figure 7: Control Panel

We hope this overview will encourage you to build your first or expand on your previous micro-controller project.

Resources:
Arduino Nano:
https://www.theengineeringprojects.com/2018/06/introduction-to-arduino-nano.html

Bosch BME280 Temperature, Humidity, Pressure Sensor:
https://learn.adafruit.com/adafruit-bme280-humidity-barometric-pressure-temperature-sensor-breakout/arduino-test

Dallas Semiconductor DS18B20 Temperature Sensor:
https://create.arduino.cc/projecthub/TheGadgetBoy/ds18b20-digital-temperature-sensor-and-arduino-9cc806

Voltage divider circuit:
https://startingelectronics.org/articles/arduino/measuring-voltage-with-arduino/

24LC256 32K Byte EEPROM:
http://kamilslab.com/2015/12/11/24lc256-eeprom-on-arduino/

TTL Serial to RS232 Serial Port Module:
https://www.arduino.cc/en/Tutorial/ArduinoSoftwareRS232

Tiny Trak 4:
https://www.byonics.com/downloads/TinyTrak4%20Quick%20Start%20Guide%20v0.7.pdf
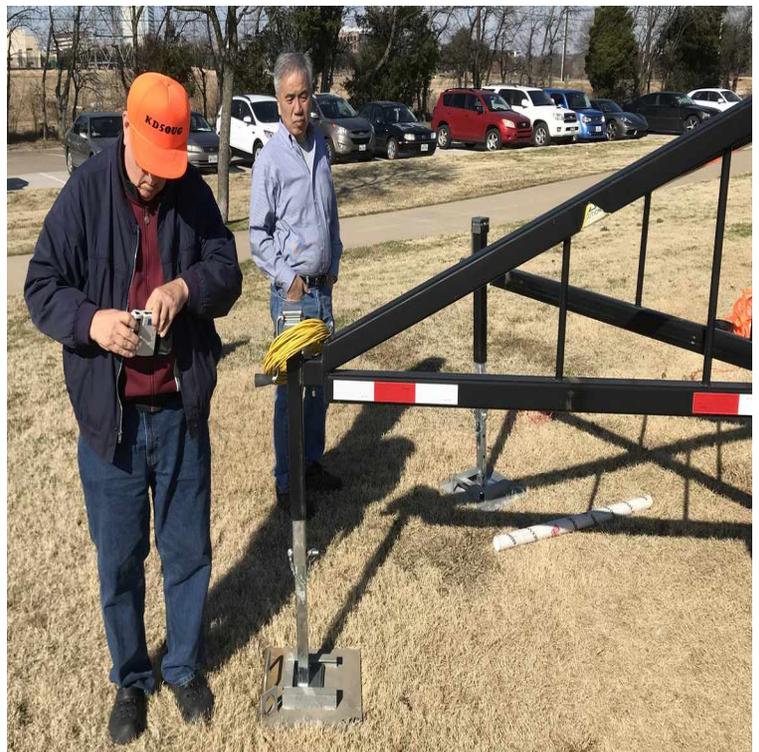
-CR-

RWK Siren Testing Services

The City of Richardson tests emergency sirens on first Wednesdays, at noon (weather permitting). We do not conduct the test if the weather looks threatening, to avoid confusing residents. Hams assist each month by going to a designated siren, checking into the net on 147.120 MHz, watching and listening to the performance of the siren, then reporting on the net. Most sirens have an assigned ham, but there often are unassigned sirens. New hams are welcome to participate and learn!

Want to help? Contact Don Bowen K5LHO, (214) 738-4088, sirentest@k5rwk.org

A lending library like no other!

Below are some of the things the RWK has to lend to members. Contact an officer or board member for details.

- Kenwood TS-590SG (kit includes a RadioSPort headset and power supply)
- Kenwood TS-440S/AT (kit includes a Heil ProSet Headset and power supply)
- LDG 1000ProII Antenna Tuner
- Balun Designs 4:1 OCF Balun
- Daiwa CN-108HP Dual needle SWR meter
- Bird 43 Wattmeter
- PowerWerx PowerPole 12VDC Analyzer
- Baofeng UV-82HP Handy Talkie (currently out on loan)
- Rig Expert AA-30 Antenna Analyzer (currently out on loan)
- LDG 100ProII Antenna Tuner (currently out on loan)

"Radio Scouting" with Amateur Radio

Amateur Radio needs younger hams to get on board. Help promote radio to scouts in your area. To learn more check out these radio scouting sites:

www.k2bsa.net - National Site
http://circleten.org/circle-ten-radio - local BSA site for radio scouting in Richardson

Write an article for the Chawed Rag

We're always on the lookout for ham radio related articles by our members. You choose the topic and simply draft your article. You don't need to be a writer as I will help you with the process from start to great article! You might describe your most memorable QSO, or put together a technical description of an antenna design that you have used successfully. Tell other members the ham activities that most interest you and tell why you find those aspects so compelling. Your article can be as short as three or four paragraphs, or as long as a page...or two. Remember that pictures are a plus!

Send ideas and feedback to John, AF5MN at editor@k5rwk.org

The RWK wants you... To write an article for the Chawed Rag!