The Ragchewer

October 2006

The monthly newsletter of the Lancaster & Fairfield County Amateur Radio Club

On the Web: www.k8qik.org

Send email to K8QIK@columbus.rr.com

Club Meetings :

1st Thursday of every month at 7:30 pm at the club house.

Radio Night:

Every Thursday except the 1st Thursday at the club house, 6:30 pm to 8:30 pm

VE Testing:

The third Sunday of every even numbered month. Register at 9:30 am and testing at 10:00 am

Club House Location:

On State Route 37 (Granville Pike) next to Beavers Field.

Net:

Mondays at 9:00 p.m. 147.03 MHZ (+.6)
146.70 MHZ (-.6) Alternate Freq.
443.875 MHZ (+5)

Club Packet BBS
145.53 MHZ
K8QIK-1 BBS
K8QIK-2: Ohio53

Weather Spotter Net:

146.76 Repeater with 123Hz tone every Tuesday at 7:30 p.m.
Alt frequency 147.24 MHZ

October Birthdays

Ronald L Braden	W8MYY
Raymond Webb	KB8GUN
David E Harrington	W8EZE
Richard A Schleiffer	W9ZZX

Thursday Night Radio Night

Radio night is every Thursday at 6:30 p.m. (except the first Thursday which is the club monthly meeting). Work a little HF, make a few DX contacts, maybe build something? How about a hot cup of coffee and a few good stories? We'll have them all waiting for you.

ARRL Membership

When you join the ARRL, or renew your membership through the club, we retain $15 for each new membership OR lapsed membership (of two years or more), and we retain $2 for each renewal. Please support our club, it doesn't cost any more. Send or give all paperwork to Treasurer with your money.

October VE Test:

The next VE test will be Sunday October 15th at the club house on Route 37. Register at 9:30 a.m. and testing at 10:00 a.m. Try it you might surprise yourself ?

Upcoming Hamfests

October 29 is the Massillon Hamfest in Massillon. You can get more info at http://www.marcradio.org

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November 18-19 is the Fort Wayne, Indiana Hamfest in Fort Wayne. You can get more info at http://www.fortwaynehamfest.com/

2006/2007 Officers

President:
Don Stephenson
WD8PCF

Vice President:
Scott Snoke
WD8IXO

Treasurer:
Ed Campbell Sr.
WD8PGO

Secretary:
Robert Northrup
KC8PSW

Activities Manager:
Kay Hanna
KC8HJW

Station Engineer:
John Hilliard
W8OF

Trustee:
John Hilliard
W8OF

Editor:
Jack Travis
AE8P
(740) 687-1985

October 5, 2006 Meeting Minutes

At 7:30pm meeting called to order by Secretary, Robert Northrup, who led the pledge of allegiance.

There were 19 members and 3 guests present. Our guests were Matt Keefe, Deb Pearson from Fairfield County EMA and Ray Hurlburt – W8FLX.

Secretary Report: Robert Northrup, KC8PSW

Minutes are posted in the Ragchewer.

Treasurer's Report: Ed Campbell, Sr., WD8PGO.

Motion to accept by John, W8AGS and second by John, W8OF - Passed.

Trustee Report: John Hilliard, W8OF

John reported the gas heater in the radio shack that was scheduled for repair (bad gas valve) will not be repaired. Discussing the problem with the county, it was discovered that the temperature inside the radio shack doesn't drop below about 50 deg F because of the heat the equipment generates. So a consensus was to not bear the expense of repairing or replacing the heater but let the equipment heat itself in the shack.

VP Report: Scott Snoke, WD8IXO

No Report

Activities Manager: Kay Hanna, KC8HJW

The Christmas Party will be held on December 16, 2006 from 6:30pm to 9:30pm at the Ponderosa Restaurant on Rte 22 East 9 (Main Street).

Station Report: John Hilliard, W8OF

John stated that all is OK and no problems to report.

VE Testing: Allan Sellers, KB8JLG

The next VE session will be October 15 at the clubhouse. Testing will begin about 9:30 AM.

Monday Night Net: Position is open

Oct 9 John, W8OF Oct 23 John, W8AGS
Oct 16 Gary, W8GTS Oct 30 Charlie, W8KZN

Ragchewer: Jack Travis, AE8P

Jack said all is OK at his end but is still looking for local club input.

If you wish to submit an article, news item, cartoon, or other Ham related bits of trivia, you can email him at k8qik@columbus.rr.com.

Emergency Coordinator: Ed Campbell, WD8PGO

Ed introduced two of our guests, Matt Keefe and Deb Pearson, Fairfield County EMA, who then informed club members of 2 new training classes. One class is for Damage Assessment and the other is for Disaster Recovery. Both are aimed at the Amateur Radio person so they may get involved with assistance in case of an emergency in the area. Matt also spoke about the interlinking of county EMA organizations (as well as at the state level) so that resources can be shared to better utilize them. He also noted that the county has procured about 27 warning sirens to be deployed around the county to alert when severe weather is close by. Ed note: I live in NW Baltimore and cannot hear a siren when it's needed. The sirens need varying levels of repair but some funds have been set a side for the work. However not all monies are present so plans are afoot to procure them. A weather spotter class will be offered in the spring 2007 so stay tuned for more info.

Ed reported the Holiday Parade is scheduled for November 18, 2006. Parade officials are looking for the club to provide 8-12 folks to aid in the parade logistics so if you can help, get with Ed for more details. Charlie, N8KZN stated the club has been asked to help decorate the gazebo in downtown Lancaster on November 11. If you can lend a hand, Charlie has the info.

Safety Report: Scott Snoke, WD8IXO

No Report

The Flower Fund: Juanita Gaffney, KC8OYO

There was $14 collected for the fund and Charlie Snoke, N8KZN won half. He donated his winnings back to the club's radio fund.

Old Business:

Charlie said the firehouse antenna project is still being worked and will attempt to install the last antenna soon. One antenna was installed since last

meeting. Get with Charlie to help.

Three applications, one for John Fick, KD8EEK; Paul Freshour, KD8DDD and Mary Travis, KD8EEI were circulated for their final review. All 3 were voted into the club. Welcome one and all!!!

New Business:

This is a notice for past club officers/members who are no longer serving as an officer to return your club house key so that new officers may use them. Please come to the next meeting or mail your key to your club treasurer Ed Campbell, 1243 Quarry Rd SE, Lancaster, Oh 43130.

Charlie, N8KZN said there would be no food at the next Radio Night due to the club's activity in the Fairfield County Fair this next week. But he is planning on having a Ribs cookout the next week (Oct 19th) so come hungry but let Charlie know so he can get enough food for those in attendance.

Motion to adjourn was made by Robert, KI8JM and second by Gary, W8GTS.

Meeting adjourned at 8:15 PM.

Respectfully submitted,
Robert Northrup, KC8PSW

Tubes For Sale

If you need tubes for your boat anchor or TV contact Jeff Bell WD8JLI at 614-774-2973 or email at jbell@imagearray.net he has a huge supply for most needs.

Free Swap and Sell

If you have anything ham radio related, you can swap it or sell it here. List your items for free. Give a price and how to contact you. Send the list to K8QIK@columbus.rr.com

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The Wayback Machine #4

By Bill Continelli, W2XOY

By the time World War I ended in November, 1918, almost 5000 amateurs had served in uniform, with many giving their lives overseas. Amateurs had proven themselves to be invaluable to the war effort. The Army and Navy were faced with an absolute lack of trained radio officers, instructors, operators, and even state of the art equipment. Amateurs stepped in and provided the knowledge, men and sometimes even the equipment necessary to help win the war. An interesting example of this was the case of Alessandro Fabbri, a wealthy yachtsman and radio amateur, who had top notch stations on board his yacht and on Mount Desert Island, Maine. The Navy commandeered the stations (and the yacht), made Fabbri an ensign, and placed him in command. Largely with his own money, he expanded his operation and improved his equipment. Fabbri's station was used to pass most of the official communications between the battlefronts in Europe and Washington. The traffic often amounted to 20,000 words a day, most of them in cipher. Captain (later Major) Edwin Armstrong, whose regenerative receiver was being used worldwide, was in charge of the Signal Corps' Radio Laboratory in Paris, where he developed the superheterodyne receiver. Thousands of amateurs served as Navy radiomen and Signal Corps operators.

It would seem from the information above that amateurs had conclusively proven their worth and that the Navy would return the amateurs' frequencies back to them once the war had ended. Sadly, this was not the case. A string of events conspired against the amateur and almost eliminated all privately owned stations.

The villain in this play was the Secretary of the Navy, Josephus Daniels, a puritanical landlubber and teetotaler, whose opinions often got him into trouble. He was the type of individual that H. L. Mencken and Sinclair Lewis satirized as "one who is terrified that somewhere, someone is having fun". For years, he had demanded that the Navy have exclusive control of the radio spectrum. Now, it appeared, he had his chance.

The effects of the first modern global war, along with the Bolshevik Revolution in Russia, had temporarily turned the country extremely conservative. It was in this mindset that the Espionage Act of 1918 and Prohibition were passed. Hundreds of suspected communists and anarchists were deported in the "Red Scare". Even the great Socialist Eugene V. Debs was imprisoned for disagreeing with the government. Seizing the opportunity, Secretary Daniels urged the passage of

legislation giving the Navy a monopoly on radio communications. As a result, the Poindexter Bill was introduced in the Senate, and the Alexander Bill in the House. Political observers gave both bills an excellent chance of passing.

Back at the ARRL, things looked bleak. All memberships had lapsed (along with all amateur licenses), 80% of the amateurs were still overseas, "QST" had ceased publication, the unpaid printing bill was $4700, and there was $33 in the treasury. However, action was needed immediately to defeat these bills. Hiram Percy Maxim and the other board members dug into their own personal funds and sent out a "blue card appeal" to all known amateurs or their families asking them to write their Congressman and urge defeat of these bills. It worked. Thousands of letters poured into Washington from amateurs or (more often than not) their family members asking that amateur radio be saved. Congressmen who opposed a military monopoly of the airwaves also joined in, lending their support to amateur radio. Overwhelmed by this grassroots opposition to Naval control of the radio spectrum, Congress killed the bills in committee. This 1919 letter writing campaign had a profound historical impact on all of radio, for, had these bills passed, not only would amateur radio have disappeared forever, but all private communication activities (such as broadcasting, business radio, CB, GMRS, Cellular, etc.) either never would have evolved, or would have been delayed by years or even decades.

With the bills defeated, Maxim and the ARRL Board of Directors issued $7500 worth of bonds to League members to get "QST" going again. At the same time, pressure was brought on Washington to lift the radio ban and allow amateurs back on the air. Partial success was achieved on April 12, 1919, when the Navy removed the ban on receiving, but not transmitting. Thousands of amateurs and other listeners removed the seals from their receivers (which had been placed there by Government Radio Inspectors), strung up their antennas and warmed their filaments with the sounds of the government stations. But they wanted more. Their fingers fondled their telegraph keys as they waited for the lifting of the transmitting ban. Finally, in November 1919, after a Joint Resolution had been introduced in Congress demanding that the Secretary of the Navy remove the restrictions on amateur radio, the transmitting ban was lifted, licenses were reissued, and amateurs were back on the air.

Now began the "second war", Spark vs. CW. Remember that amateurs were allowed, in effect, just one frequency - 200 Meters. A spark station on 200 meters actually generated a signal from 150 to 250 meters. With the sensitive regenerative receivers now in use, the practical range was several hundred miles. Transcontinental relays now took less than five minutes. The number of licensed amateur operators stood at 5719 in 1920, 10,809 in 1921, and 14,179 in 1922. And all were operating on 200 meters! To quote Arthur Lyle Budlong in "The Story of the American Radio Relay League", it was "Interference, Lord, what interference! Bedlam!". Something had to be done.

And it was. Various transatlantic tests were conducted from 1921 to 1923. The results overwhelmingly showed CW was far superior to spark. Postwar vacuum tube production was at its peak. In 1921, an RCA 5 watt tube cost $8, and, as a single tube CW transmitter, could outperform a 500 watt spark station. A 50 watt tube cost $30, and was five times more effective than the best 1 kW spark station. Since CW took only a fraction of the bandwidth that spark did, over 50 CW stations in the same area could occupy the 150 to 250 meter range, vs. one spark station.

The transatlantic tests also revealed some other interesting facts. Due to the excessive interference on 200 meters, some stations had dropped down to 100 meters where, to their surprise, they found conditions much better. Throughout the 1922-24 period, hundreds of tests and casual contacts were made on the 100 meter wavelength which conclusively showed not only CW's superiority over spark, but increased range on the shorter wavelengths. Once again, the scientists came forward and said that long distances on 100 meters were mathematically impossible, and once again, the amateurs proved them wrong. During 1924, several CW contacts were made at distances exceeding 6000 miles. On October 19, 1924, a station in England worked New Zealand, a distance of almost 12,000 miles. Amateur communications had now reached halfway around the world. Although it would take a few years to discover the role that the ionosphere played in shortwave communications, there is no doubt that amateurs pioneered the practical uses of shortwave.

The phenomenal success of CW convinced the vast majority of amateurs to buy that vacuum tube. A few still clung to their spark sets, screaming "spark

forever", but by 1924, spark was almost extinct. The 150 to 250 meter region was now orderly, filled with thousands of CW stations living in peaceful coexistence with each other (and the occasional spark renegade). Legally, however, amateurs could not go below 150 meters. True, many were already on 100 meters without a problem, but amateurs wanted a slice of the shortwave spectrum allocated to them. After all, it was amateurs who discovered the short waves. Now, with world wide interest being shown here, they wanted protection. Negotiations were ongoing with the Department of Commerce to give the amateurs specific frequencies.

On July 24, 1924, the Department of Commerce authorized new amateur frequency bands. They were 150 to 200 meters (1500 to 2000 kc), 75 to 80 meters (3500 to 4000 kc), 40 to 43 meters (7000 to 7500 kc), 20 to 22 meters (13,600 to 15,000 kc), and 4 to 5 meters (60,000 to 75,000 kc). Except for a portion of the 150 to 200 meter band, spark was prohibited. Spark would survive in the hands of a few rebels until 1927 when it was banned altogether. CW was here to stay. By January, 1925, the 80, 40, and 20 meter bands were filling up with amateurs, drawn by the promise of transcontinental, daylight DX.

"The Wayback Machine" is going to hover over the 1920's for one more edition, checking out an amateur with the call 8XK, and his activities on the night of November 2, 1920. In the meantime, take a sip of that Prohibition bootleg gin, check out those new SW bands, and join us next time on board "The Wayback Machine."

Why Do We Announce We Are Leaving the Frequency?

by Eric Falkof, K1NUN

Were you ever listening to the dead, empty repeater output frequency, when all of a sudden someone said, "W1BlahBlahBlah leaving the frequency" or "KB1YadaYada Clear"? Did you ever wonder why they announced they were no longer listening? Didn't make much sense, eh? Here's an explanation why that person did it.

First, it is wrong to do so in Amateur practice. However, it is proper in different services, but only in a historic context. Unless considered a one-way broadcast of general interest to Amateurs, it is an announcement that the Ham is not listening for responses nor conducting a test. Furthermore, it is impolite to tell everyone within listening range that you are not going to listen to them any longer!

But why was it OK to do so in different services? In the old days, the 50s and 60s, when commercial (business) two-way radio was in its infancy, there were few radios and few frequencies available and in use in any geographic area. Consequently, frequencies were shared. The oil delivery company used the same frequency that the automobile travel club's trucks, taxis, fire departments, municipal services, and since frequencies were shared, it was necessary to listen before talking to avoid interfering with another service's transmissions. As frequencies were shared resources, people were careful not to interfere or else they might be interfered with themselves. The Golden Rule applied.

It was more than a courtesy to announce that a series of transmissions were complete, it was a requirement. It was necessary to announce that a station was going out of service or off the air so other listeners would know they could use the frequency, as it was freely available again. Also, a dispatcher would know a truck, for example, was not going to be available for a call.

So what does this have to do with Ham Radio? In the early days of Ham FM radio, the primary users were Hams who were two-way radio service people. They knew how to put commercial gear on Ham frequencies using converted commercial equipment. These first adopters brought with them the practices they used in commercial services. Initially, "everyone" used 146.94 Mc (Megacycles; now MHz, but before the designation was changed) simplex. Repeaters were yet to come. This common frequency was a shared resource and it was necessary to use courtesy for all the same reasons the commercial services did.

Therefore, the Hams announced they were leaving or clearing the frequency. And so, some of the next generation of Hams copied the practice, and then the next generation, and so on and on. In Ham Radio, announcing that one is leaving or clearing the frequency is a practice that no longer makes sense nor is it desirable nor needed. But now you know why some people do it – it is a borrowed practice from long ago. It is just one vestigial trace of our heritage in the radio arts.

Annual Allen Sellers Swap Meet

The swap meet held on October 7, 2006 was a success with 29 persons registered and two visitors from OU-L's Electronics Department that came late. When I arrived at 8AM there were about 4 automobiles in the parking lot and I left at 12:30PM. In addition to the locals there were people here from Athens, Hocking, Licking, Franklin and Delaware counties. Although I contacted several people from Muskingum county nobody came so I didn't get to ask about the N8HR open-house that I enjoyed last year, I assume there is not going to be one this year. Roy, KC8TFW, won the 50-50 drawing held at 11:30AM.

Bob, KI8JM, had an excellent demonstration of "Deadbug, Manhattan and Ugly" construction techniques and made at least two 40M CW contacts (one to New Jersey) with a rig that consisted of the following modules laid out on the table; 4-watt transmitter, keyer, T/R switch and DC receiver powered by a GelCel battery. He also had five or six other modules/units such as an active audio filter, a low-pass LC filter, a NorCal BLT tuner, etc.

Thanks all for making the swap meet a success, Allen Sellers, KB8JLG

"SWR-itus" Can it be cured?

The advent of low cost SWR bridges has enabled ever increasing numbers of hams to become acquainted with so called "reflected power". This has become such a popular conversation piece on the ham bands that an entirely unwarranted degree of importance has attached itself to the subject of SWR.

Many hams, who for years had experienced excellent results with their beam antennas, suddenly found that their feed lines possessed something less than perfect "unity" match to their antennas.

Such is human nature that, regardless of past performance, this newly discovered "revolting development" became entirely intolerable! This unjustified "mental attitude" has for some years provided nice incomes for Chiropractors and broken bone specialists, who have reaped far more profit from the roof and tower excursions, than have the hams who restlessly seek "perfection".

Competent professional antenna engineers generally agree that in most applications a standing wave ratio of up to 5 to 1, or sometimes higher, is satisfactory and acceptable! For example: referring to the ARRL Antenna Handbook, we see that an SWR of 5 to 1 in RG-8/U coax will result in a signal loss (at 28 MHZ—10 Meters) of only 1db. This decrease in signal strength cannot normally be detected in an S meter! This is the "introduced loss" due to SWR, and has no bearing on the normal 1db line loss inherent in 100 feet of the line, which is present in any case.

Furthermore, these losses decrease as frequency decreases! Sometimes, and particularly with ham antennas which must operate over wide ranges of frequencies, it is not at all desirable to have a feed line / antenna combination that offers perfect unity SWR. Such combinations usually are very critical and while providing unity at one frequency, will often have a poorer response curve than other antennas designed to give optimum performance over a greater bandwidth." OK, I admit these people were most likely using "tube type" equipment, but with today's solid state auto cutback protection circuits, WHY IS THERE SO MUCH WORRY ABOUT A PERFECT MATCH???!!!! My ears are wide open.

Making a Voice Contact with the International Space Station

By Bob Varone, W4ETN

Others are doing it with everyday 2 meter gear and antennas. You can, too!

I have been in Amateur Radio for over 42 years and have worked just about all modes and bands but I must say the biggest kick was having voice contacts with the International Space Station. Most would think this would be hard to do, but using standard 2 meter equipment and a modest antenna it can be done easily.

The first thing you will need is a 2 meter radio that can be programmed to do a split frequency other than the normal up/down 600. The downlink frequency is 145.800 and the uplink is 144.490. I use an ICOM IC706MKIIG, but most modern 2 meter FM transceivers can be programmed for odd splits.

I used a Comet dual band 2 meter 440 with about 6.5 dB gain. I have heard folks doing it from their mobile and even with handhelds.

The key to making a contact is knowing when the

ISS is overhead. I have found two Web sites the way to go. The first is the ISS Fan Club. After you have received your password and do an initial tracking of the ISS, putting in the city nearest you it will remember when you sign in and show you when the next pass will be over you. See the tracking window on the upper left corner.

You can also enter and see comments from other amateurs on recent contacts and passes.

After finding out when it will be over head go to the Science@NASA site. This will show the current ISS location with a circle around the image of the ISS showing the area where a contact can be made.

I have made three contacts with the ISS so far and the current crew with Bill McArthur has been very active calling CQ almost daily. After you make your contact be sure to send for your QSL card, the instructions are on the ISS Fan Club site.

Law Makes Amateur Radio Part of Emergency Communications

A section of the Department of Homeland Security (DHS) 2007 Appropriations Act, HR 5441 <http://thomas.loc.gov/cgi-bin/bdquery/z?d109:h.r.05441:>, formally includes Amateur Radio operators as a part of the emergency communications community. Congress approved the measure before adjourning for its pre-election break. President George W. Bush signed the bill into law October 4.

Amateur Radio is included within the legislation's Subtitle D, Section 671, known as the "21st Century Emergency Communications Act." Radio amateurs are among the entities with which a Regional Emergency Communications Coordination Working Group (RECC Working Group) must coordinate its activities. Included within the DHS's Office of Emergency Communications – which the measure also creates -- RECC Working Groups attached to each regional DHS office will advise federal and state homeland security officials. The final version of the legislation incorporated language from both House and Senate bills and was hammered out in a conference committee. An earlier version of the 21st Century Emergency Communications Act, HR 5852, included Amateur Radio operators as members of the RECC Working Groups.

In addition to Amateur Radio operators, RECC Working Groups also will coordinate with communications equipment manufacturers and vendors – including broadband data service providers, local exchange carriers, local broadcast media, wireless carriers, satellite communications services, cable operators, hospitals, public utility services, emergency evacuation transit services, ambulance services, and representatives from other private sector entities and nongovernmental organizations.

The RECC Working Groups will assess the survivability, sustainability and interoperability of local emergency communication systems to meet the goals of the National Emergency Communications Report. That report would recommend how the US could "accelerate the deployment of interoperable emergency communications nationwide." They also will coordinate the establishment of "effective multi-jurisdictional, multi-agency emergency communications networks" that could be brought into play in an emergency or disaster.

In light of the new legislation, the ARRL plans to follow up to determine how it can interact with the DHS and its Office of Emergency Communications.

Cable Minimum Bend Radii

Most cables produced by reputable manufacturers have two minimum bend radius specifications. One is the minimum bend radius during cable installation. The other is the long-term minimum bend radius, which usually is larger. Both bend radius specifications are important to cable performance. If either specification is exceeded, cable conductors will excessively deform the insulation, which will lower the breakdown voltage, cause a radio-frequency impedance bump, increase multi-conductor signal crosstalk, and leave a cable more susceptible to future mechanical or thermal damage. Cable mechanical stress should be relaxed the extent reasonably possible after cable installation to reduce long-term conductor drift into insulation at cable bends.

Tips On Working 60 Meters

By James "Scott" Duckworth, NA4IT

I have been amazed at the conditions on 60 meters, the "channelized" band opened up to amateurs in the US by the FCC. The conditions on this band can go from "local" of a couple of hundred miles to across the US. And at times, you can hear it all at the same time!

Here are a few tips I have found that help when working this band:

1 Make sure you are on the proper frequency. Your VFO should read the following: 5.330.5, 5.346.5, 5.366.5, 5.371.5, or 5.403.5. These frequencies are all UPPER SIDEBAND! It is best if you put them in memory, and leave the VFO locked.
2 There is no room for "enhanced audio". Your signal needs to be just a normal signal.
3 Effective Radiated Power (ERP) must be NO MORE THAN 50 Watts! A simple dipole is the best answer with 50 watts at the rig. Mine is up at the apex at 40 ft and slopes down each leg to about 20 ft.
4 Filtering is necessary for reception. DSP works really well, and a good notch, as well as the use of your RX IF shift helps.
5 Courtesy abounds on this band. Ragchewers will stand by for DX contacts or a state hunter readily, and the same is appreciated.
6 Here in East TN, the 5.366.5 frequency is useless. We are secondary users on 60 meters, and there is some type of data transmission there almost 24 hours a day.

Final thoughts:

1 60 meters is not for everybody.
2 I believe if the current operating practices prevail on 60 meters, we could see the FCC open up more frequencies in the future.
3 50 watts is more than adequate for communication on this band. It also helps to keep everyone "even".
4 Listen to it before you open up your rig. It may not be for you.

Cleaning Aluminum Antenna Components

The use of steel wool in cleaning aluminum antenna components can create more problems than it solves. Small particles of steel that are difficult to see will become imbedded into the aluminum causing problems later.

Try using 3M Scotch (or similar) pads. They work wonders in cleaning aluminum. You can find these green pads at many of the “Super stores” (Home Depot, Wal-Mart, etc.). Scotch pads are about 6 X 9 inches in size. To improve handling, you will probably want to cut them in half. Ordinary scissors make quick work of this.

To begin the antenna cleaning process, get the Scotch pad wet and simply start rubbing the aluminum surface in question. You will be amazed how fast it removes corrosion from the aluminum. Just rinse the Scotch pad frequently and before you know it, you’re looking at a clean antenna. In addition, you will discover an added bonus--no steel slivers in your hands.

If you choose to avoid wearing rubber gloves when scrubbing antenna components, be prepared for a bad case of “The Ugly Gray Hands.” This is not a healthy practice since the fine aluminum powder that results from this activity will get into the pores/cracks of exposed skin.

A Bit of Do, Don't and Why for the HF Beginner

By VE3PMK, VE3NJG, VE3IDT, VE3PZR

So, you've learned your radio privileges now include HF, but now what do you do? HF can be intimidating to a new operator, but it can also be a fun place. Hams new to HF want to know how to be a good HF operator. Everyone has to learn somewhere, so we thought a quick bit of reading might be a good start. There are a few important ground rules with HF, some are in accordance with national and international laws, some are founded in tradition, and they're all founded in good reason. What you do on HF can affect or interfere with

communications halfway around the globe! Just like driving, there are laws and conventions that keep the traffic running smoothly. In the following paragraphs we will try to illustrate a few pointers that every HF operator (both new and experienced) should keep in mind. Albeit numbered, the points are not in any specific sequence, so their order does not suggest degrees of importance. The numbering is more for reference purposes in case you wish to review or refer to a specific point(s).

1. A ham ticket is a privilege, not a right. Just like driving, there are rules that must be observed. They are there to protect the usefulness of the radio spectrum and the safety of all persons using it. Radio is a recreation 99% of the time to a ham, but it can be a critical life-safety device to others. Please treat it with care and respect.

2. On HF, it is very important to listen before attempting to transmit. (A.K.A.: listen, listen, listen!) There are a lot of frequencies that are assigned to nets, calling, and other categories of traffic. Always listen for a minute before you transmit.

3. Okay, so you listened and didn't hear anything, but before assuming the frequency is not occupied, ask if frequency is in use. You can't always hear both sides on HF; in fact it's very common! Someone could be working a station in your skip zone, but they are outside of your skip zone.

4. A simple 'This is {your call sign}, is this frequency in use?' works wonders. Listen for about 10 seconds for any reply or existing traffic. Repeat this procedure and if nothing is heard, there is a high probability the frequency is vacant.

5. This of course begs the question your receive conditions are such that you can hear a reply if it was there. If your noise floor is S-5 or S-7 (as can often be the case with urban living) and there's a station or stations below this level, you won't hear them and therefore you might still be barging onto an occupied frequency. This illustrates the importance of doing everything we possibly can to keep our operating conditions as ideal and clean as possible. Put a little work into setting up a good antenna with minimal receive noise, it will pay off with lots of good DX!

6. You will eventually inadvertently QRM an ongoing QSO. When this happens, simply apologize quickly to the parties involved and move to another frequency or wait quietly until the frequency is relinquished. Do not try to start a round table chat unless you are specifically invited to join in.

7. Keep proper spacing from other stations. (4 kHz minimum for phone.). To QRM another station is both rude and violates the terms and conditions of your privileges. Remember, we are allowed zero emissions beyond the band edge. That means you can't use 14.350MHz for USB! You're side band would occupy 14.350 to 14.353, possibly 14.354. This means you must keep your 'dial indicated' frequency several kHz away from the band edge. For LSB, the reverse is true, stay at least four kilohertz above the band edge. For AM or FM (as in 10m) your signal occupies spectrum in BOTH directions, so the same rules apply. This also applies to the sub-sections within the band itself. You cannot allow your 'phone' signals to bleed into a non-phone section of the band.

8. It is illegal to communicate with a pirate station. If you encounter a pirate do not lecture them. You may not communicate with them in any way, this is the law! Do not give them an audience. This also applies to any station deliberately causing QRM or attempting to interfere with the operation of other stations. The best way to deal with these people is to ignore them. Pretend they're not there. Do not speak about their interference to your contact. Do not acknowledge their presence in any way. Do not react to anything they say. Denied an audience, these stations disappear very quickly. This simple yet effective procedure is the best means with which to deal with this problem. It has worked for generations, so please follow it and it will continue to do so.

9. Before replying to a CQ, be sure you are allowed to operate on that frequency, in that mode, and with that station. Some classes of license have more privileges than others. Many nations have different band plans than ours. Some allow operation in areas and modes we are not, and conversely, we are permitted to operate in spectrum and modes where others may not. Although few and far between, there are a few countries that have forbidden their operators from communicating with certain other countries. With the advent of the internet, third party traffic is pretty rare these days, however, some countries do not allow it.

10. The best thing to keep in mind when on any band (HF or otherwise) is to keep everything as polite as possible. After technical considerations, courtesy is your paramount concern. If all operators treat other operators with the same courtesy and respect they would like to receive, the bands will remain a fun and relaxing place to be.

11. Use plain language whenever you can; there is no need for slang at all other than the Q-code if necessary or RST etc. Use phonetics only when required, once the other station has copied your call correctly, you no longer need to keep saying it with phonetics. Save your voice for the next contact. You're going to need it.

12. Let your contacts know if you are new to HF radio. They will make you feel welcome and will overlook your inexperience. They might also offer you some valuable pointers which may ultimately make you a better operator.

13. Learn what frequencies on each band are established net or DX calling windows or known DX frequencies, [eg: IOTA.]

14. Understand split operation. If a station is calling 'CQ and listening up 5 & 10' it means they are not listening on the same frequency on which they are transmitting. They're tuning a receive frequency about 5 to 10kHz higher than their TX freq. This is one method of controlling pile-ups.

15. Avoid sensitive topics. {i.e. politics and religion} Keep the QSO positive and interesting. Never lecture or condemn anyone on air. If they are causing deliberate interference, remember point 8. Nobody wants to hear people arguing over the air, it's a waste of spectrum. No one wants to listen to someone 'soap boxing.' If you want to pontificate, try a public speaking club.

16. Respect the human rights code. Never slander or libel others on the air. Idle gossip is never good form. Don't propagate rumors. Give everyone the first benefit of doubt. 99.999999% of radio operators are really nice folks. Remember the golden rule: Treat others as you would like to be treated.

17. Avoid the use of alcohol when operating. Luckily this is a rarity, but every few years you may hear someone on the air who's obviously intoxicated. This is both dangerous and unwise from many perspectives. You could damage your gear by not noticing a problem due to your diminished awareness. You may violate the terms of your license. You may say or do things you would not do otherwise. You could be causing interference and not realize it. No matter how you look at it, it's simply not appropriate and it can be very dangerous.

18. As a new operator, learn and adhere to the existing long established operating practices. They are conventions that have evolved over the years for good reasons. You wouldn't race a car through a parking lot even though there may not 'technically' be a speed limit. These operational conventions are there because they keep everything running smoothly and help avoid or minimize problems. Stick with the rules and observe conventions and you too will soon be a well seasoned HF'er!

19. Avoid calling public safety nets [i.e.] Hurricane net or Maritime net unless you can be of use or are requested. These nets pass specific and sometimes critical traffic. If they need stations in a specific area or a certain kind of assistance they'll ask for it.

20. Be patient with everyone. We are all different. If you feel challenged or uncomfortable, then politely sign clear. Avoid confrontation. If you don't know the correct protocol for a certain situation, get some advice from an experienced operator.

21. Look for an Elmer! Ask for help. There are lots of seasoned HF operators who would be more than happy to get you going in the right direction. You local club meetings are likely filled with guys (and gals!) with many years of experience. If you can't make it out to a meeting, ask on some local repeaters. Help is everywhere!

22. Listen and check in with local nets. It's a great way to get your feet wet and meet some active HF operators in your area.

23. Listen to some contesting and make a few contacts. The contacts are short and sweet and a great way to practice using your rig. Also, if there's a problem on your signal, someone will likely point it out to you.

24. Give honest signal reports. There's no shame in getting a 3/3 or a 2/1. It’s radio, and you're not going to be booming in everywhere all the time. Some operators seem to be offended if they receive a report less than a 5/9. There are others who have to have the contact repeat their call numerous times, get it wrong the first few, and still give out a 5/9. This is a common problem and is perhaps due to many not understanding the proper way to evaluate a received signal. It would be a benefit to all hams if everyone reviewed this simple procedure. A report is of no value to anyone if it is not accurate.

With a bit of care, forethought and consideration your HF experience can be lots of fun. Remember: Ham radio is a gentleman's (and lady's) hobby. Be on your best behavior and treat all others with courtesy and you'll have many years of happy DX. It doesn't take long before you accumulate and occasionally 'bump into' a long list of 'radio-friends' from every corner of the globe. Happy DX!

Battery Basics

By Dick Arnold, AF8X

If you look at any battery, you'll notice that it has two terminals. One terminal is marked (+), or positive, while the other is marked (-), or negative, mix them up and unless you have diode protection in your rig, the pop and bit of smoke may be the last activity you see from your rig. Portable operation is almost always done using battery power. The type of battery used and it's care may decide whether you get hours of operating time or only a brief few minutes.

The most common types of batteries powering portable equipment are: Deep cycle marine type lead acid, Gel cell, NiCd, NiMh, and the long life but most expensive, Lithium Ion battery.

Deep cycle lead acid batteries

These marine/RV type batteries are made to resist the stress of being run flat and then recharged without the damage that would occur to an automobile type starting battery. These deep cycle batteries are sometimes used in the shack as back-up power for radio gear. During the normal discharge process, soft lead sulfate crystals are formed on the surfaces of the plates inside a lead-acid battery. When a battery is left in a discharged condition, continually undercharged, or the electrolyte level is below the top of the plates, some of the soft lead sulfate re-crystallizes into hard lead sulfate. It cannot be reconverted during subsequent recharging. This creation of hard crystals is commonly called "lead sulfation". It accounts for approximately 85% of the deep cycle lead-acid battery failures.

A popular method of keeping these batteries healthy is by "float charging," the battery being connected to the radio power supply delivering voltages between 13.2 VDC and 13.6 VDC, measured at 70° F.

A second and less desirable method is to periodically recharge the battery when the State-of-Charge drops to 80% or below. At 70° F a battery with 100% State-of- Charge measures approximately 1.261 Specific Gravity or 12.63 VDC and at 80% State-of-Charge, it measures 1.229 Specific Gravity or 12.47 VDC. Maintaining a high State-of-Charge tends to prevent irreversible permanent sulfation.

A third technique is to use a regulated solar panel or wind generator designed to float charge the battery. This is a popular solution when AC power is unavailable for charging. A cheap, unregulated "trickle" charger can overcharge a battery and destroy it.

Be aware that this is probably the most hazardous type of battery because of the gases emitted during charging and the liquid electrolyte (read as acid). These type batteries should always be contained in a suitable battery box.

Gel Cells

Gel cell batteries are a better choice for our application; the electrolyte is in the form of a gel, which is sealed inside the case. They are maintenance free, can accept high recharge rates and are less subject to damage if left in a discharged state. They can be deep cycled fewer times than a heavy-duty wet cell battery but their handling safety and convenience, in my opinion, out weigh the advantages of the wet cell type. Gel cells can be found in very high capacities suitable for large loads. Gel cell batteries need to be charged at a lower voltage than wet cell batteries so care must be taken that the charging equipment can be set or adjusted to suit, otherwise premature failure will result. In other words, use a proper gel cell charger.

NiCd

NiCds are probably the most popular rechargeable power source for hobbyists. They are fairly inexpensive and their voltage output remains constant until their last dying gasp.

The most common size NiCd is the AA or AAA. These cells are rated at 1.2 volts per cell, so you will need 10 cells for a 12-volt battery pack. NiCds are quite robust and will withstand heavy discharge loads without damage.

A typical NiCd AAA cell has a capacity of around 220mAh. That means it should be charged at the basic 1/10C rate of 22mA for 14 hours. NiCd cells will normally accept indefinite charging at the 1/10C rate. A faster charge (from flat) could be at the 1C rate for 50 minutes followed by 5 hours at the 1/10C rate. Any attempt to try to charge a NiCd cell completely at a high rate is doomed to failure. It is always best to do a 2/3 charge at a high rate followed by a 1/3 charge at the 1/10C rate.

NiMh

NiMh batteries get my vote for the most practical low cost portable power for your QRP operation. Nickel-metal hydride batteries are like super NiCds. NiMhs are available in much larger capacities than NiCds. I have seen 2200 mah AA cells for sale. This kind of capacity makes them a better choice to power

your portable rig than the wimpy NiCds. These cells can be charged with the same charger that NiCds use, just be aware of the capacity of the cells and the output of the charger. They are going to take a bit longer to charge than your NiCds. It is important to note that NEW NiMh batteries need to be cycled 3-5 times before they hold a FULL charge. This doesn't mean charged 3-5 times in a row but rather over the first 3-5 cycles the batteries will hold a better charge each time until they take a full charge.

Lithium Ion

Lithium-ion cells offer high energy density, high capacity and long cycle life in the most common, lightweight sizes. These cells, which operate over a wide temperature range, are ideal for portable devices and are commonly found in watches, cameras, cell phones and the newer amateur radio HTs. The working voltage is 3.6 volts per cell and I have seen capacities in the larger cells up to 200 AH! The price of these cells is quite high compared to NiCds and NiMh cells, but the difference in voltage allows fewer cells per battery pack. The voltage drop during discharge is very similar to the NiCd curve but the Lithium cells don't like heavy discharge loads.

The lithium ion battery is easy to charge. The basic algorithm is to charge at constant current (0.2 C to 0.7 C depending on manufacturer) until the battery reaches 4.2 Vpc (volts per cell), and hold the voltage at 4.2 volts until the charge current has dropped to 10% of the initial charge rate. The termination condition is the drop in charge current to 10%. The top charging voltage and the termination current varies slightly with the manufacturer.

However, a charge timer should be included for safety. The charge cannot be terminated on a voltage. The capacity reached at 4.2 Volts per cell is only 40 to 70% of full capacity. For this reasons you need to continue to charge until the current drops, and to terminate on the low current. There are many specialized chargers for Lithium batteries including quick charge devices.

It is important to note that trickle charging is not acceptable for lithium batteries. The Li-ion chemistry cannot accept an overcharge without causing damage to the cell, possibly plating out lithium metal and becoming hazardous.

Conclusion

My personal preference is using high capacity 12 volt Gel Cells for long excursions in the field and smaller, lighter NiMh packs for short-term operation. The NiMh packs I use are two 6 volt-600mah cordless phone batteries connected in series providing the needed 12 volts for my QRP rigs. If you decide to operate using your car battery via the cigar lighter plug, don't strand yourself by depleting your battery to the point where it won't crank your engine. This is not only embarrassing, but it's very hard on the battery.

If you yearn for more in-depth information about batteries and their care, the following web page address will take you to the most knowledgeable battery person I know.

http://www.rcbatteryclinic.com/

His page is about R/C (Radio Control) batteries and devices, but pertains to the same types of batteries we use.

On his recommendation I have recently purchased a Great Planes Triton battery charger and conditioner. his unit, available through hobby suppliers, will insure the good health of most types of batteries and will prevent "cooking" them by over charging. Interested parties can see it here. http://www.electrifly.com/accys/gpmm3150.html.

HF Purchase Tips

By Jeff Wolf, K6JW

There are certain "killer questions" that always surface when the doors are thrown open wide to all comers. This month we attempt to deal with one of them:

Q: I just passed my General and I'd like to purchase an HF radio. My budget for a transceiver is limited. What should I buy?

A: Arrrgh!!! This is the kind of question that has no absolute answer or, perhaps more correctly, has almost as many answers as folks willing to offer an opinion on the subject.

Recognizing this and not wanting to take a hit from nearly everybody for offering up specific makes and models, I'm only going to limit this discussion to a few general considerations in choosing an HF rig that may be useful. For specific make and model recommendations or for help in evaluating any particular potential purchase, you should consult directly with one of the Club's more experienced hams. What follows is not meant to be an all inclusive list everything to think about but, rather,

just a sampling of some more important factors you'll want to keep in mind as you check out the new and used market for ham gear.

The first issue which must be addressed, of course, is your actual budget. If the sky were the limit, there would be little problem. Unfortunately, for most of us there are financial constraints on what we can spend on our hobby. So, you should first set that upper limit and then start to list the features that are important to you in a radio. If the list gets very long or the features are only present on higher priced rigs, you may want to consider a used radio rather than a new one. If the list is relatively short, one of the newer entry level radios might be just right for you.

Here are some general recommendations of my own with regard to selecting an HF radio in 2002:

Confine your search to radios that are fully solid state. Radios that have tubes in them require more complicated tune up than fully solid state radios, which generally are much easier to operate. Also, the older generation radios with tubes often don't have as many interference fighting features as the newer, solid state radios.

Look for radios that have built-in antenna tuners. You'll almost certainly want an antenna tuner and you'll find it much more economical to purchase a rig with one built into it than buying an "outboard" tuner, either manual or automatic. The exception, here, is that you may need an external antenna tuner if you're planning to add a linear amplifier (that does not include one) to your station.

Remember to factor the cost of a power supply into the cost of the radio. Most of the radios you'll be seeing require an external source of 12-14 volts DC at 20 amps to operate properly. You'll pay a premium if you buy a new "matching" power supply made by the radio's manufacturer to coordinate with the appearance of the radio. Power supplies by "after-market" manufacturers such as Astron and MFJ are popular, reliable and less expensive. Prices for new 20 amp units start in the $150 range for switching type supplies which are suitable for general use.

Look for a radio that has two VFOs and the ability to operate "split" in convenient fashion. Split mode operation is operation in which you receive and transmit on different frequencies. This is an important feature if you are planning to chase DX.

If you are planning to operate CW, try to find a radio that has "full break-in" (QSK) capability. This feature instantaneously keys the transmitter when you send but, between each dit and dah, returns the radio to receive. Thus, you can hear "during" your transmission. This is very useful for conversational CW and to detect interference or breaking stations.

Decide whether VOX is important to you. VOX is the term for voice activation of the transmitter. With VOX turned on, all you have to do is speak into your microphone to transmit. When you stop speaking, after a user-determined time delay, the radio switches back into receive mode. VOX is useful during contest operation and when DXing, although it can be a nuisance if you have to speak with others in the shack while operating. For more casual operation and even in some competitive situations, I often prefer a footswitch to activate my rig.

Look for a radio with adjustable AGC: The AGC circuit in a transceiver helps to keep strong stations from overpowering weaker ones or "swamping" your receiver. AGC has a time factor associated with it such that the damping effect is sustained for a period of time after the circuit is triggered by a strong signal. This time is generally longer for voice than for CW. It is therefore desirable to be able to switch from slow (for SSB) to fast (for CW) AGC operation. Sometimes it is better to be able to turn the AGC off, altogether. Many lower priced radios are limited in their AGC selection capability, leaving them more susceptible to degraded performance under crowded band conditions.

RIT: RIT stands for "receiver incremental tuning". This adjustment allows you to shift your receive frequency without altering your transmitting frequency. The benefit of this is that it allows you to fine tune a station you're in contact with and not make the station retune your signal. The flip side of RIT is XIT, or transmitter incremental tuning. This alters your transmit frequency without altering your receiving frequency. Personally, I don't find much use for this and it is not a feature you have to invoke for working split, which is generally activated in a different manner.

IF shift and/or slope controls: These features allow you to change the "passband" characteristics of the receiver section of your transceiver. This allows you to narrow, widen, or move the door that lets signals through and, as a result, minimize interference when you're trying to listen to a particular station. These features are very helpful when bands are crowded or just when there's a single

station interfering with your QSO.

Accessory slots for narrow filters and the actual filters, themselves: Narrow filtering is an option for many radios and accomplishes much in the way of interference reduction. As in the case of IF shift and/or slope controls, it narrows the passband of frequencies including and adjacent to the desired, tuned frequency. This has the effect of eliminating interference from nearby stations and allowing you to focus more clearly upon the station you want to hear. Narrow filters are highly desirable and can be purchased specifically for your preferred modes of operation, whether voice, CW or digital. You should look for a radio with at least two slots for optional filters unless you plan to operate using only one mode, in which case a single-slotted radio will be acceptable if not flexible. Be aware that several radios now on the market use full digital filtering. These new generation rigs are the exception to the rule about looking for a radio that will accept accessory filters.

Buy a transceiver with the best quality receiver in it that you can afford and then spend the rest of your budget on the power supply and the best antenna you can muster. "If ya can't hear 'em, ya can't work 'em." That takes a good receiver and a good antenna.

These are only a few of the considerations that may be of importance to you in deciding upon the purchase of an HF radio. Again, I would encourage you to speak with more experienced Club members before laying out hard-earned cash for what rightly ought to be your new pride and joy rather than a source of buyer's remorse. Enjoy the hunt!

Balun Basics

By Alan Pickering, KJ9N

The word "balun" is derived by combining the words "balanced" and "unbalanced", referring respectively to the two ends of a dipole and the single center conductor of a coax feed line. When a single wire transmission line is connected to a dipole consisting of two radiating elements, one on each side of the feed point, some sort of matching device is required so that equal RF currents can flow in both sides of the dipole. A balun provides this conversion, dividing the RF currents in the feed line into a set of two balanced RF currents in the antenna, and also inhibiting antenna currents from returning back to the RF source along the outside of the coax shield.

The two most popular baluns are the "current" or Guanella balun (named after its inventor) and the "voltage" or Rhuthroff balun (also named after its inventor).

The first consideration in use of a balun is the transformation ratio--that is, whether the feed line and antenna feed point impedances are the same or multiples of each other. While most dipoles and yagis have a feed point impedance around 50 ohms, where a 1:1 balun would be used, a cubical quad has a feed point impedance of 100 ohms, where a 2:1 ratio would be appropriate.

Next, determine whether a current or voltage balun is most appropriate. If the coax is attached at the center of a resonant dipole where the antenna current is high and the voltage low, then a current balun will be more effective and often easier to match if you are using an antenna tuner. On the other hand, if the antenna is being driven at some harmonic of its characteristic resonance such that the voltage is high and the current low, then a voltage balun is the better choice.

Since high SWR will develop if the antenna is used at a frequency well away from its resonant frequency, high currents and voltages can develop within the balun, causing its failure. A safety factor of current or voltage capacity from 2 to 5 times normal operating conditions is wise.

Sometimes RF currents and voltages will still appear on the outside of the coax feed line. This may occur when the SWR rises to a point that the balun is no longer efficient in suppressing such currents and voltages. Use of "line isolators" or ferrite sleeves made up of ferrite beads slipped over the outside of the coax at or near the RF feed end of the coax should cure this problem.

Broken Safety Grounds

Electric power outlet safety grounds (also called equipment grounds) generally return to a main power panel and then connect to a large-gauge ground wire that is clamped to an incoming water pipe. Home owners often install various types of water treatment devices such as water softeners, mechanical filters, reverse osmosis filters, electromagnetic water conditioners, or magnetic water conditioners after

original home construction and wiring. Sometimes those devices are installed in a main water line between the power panel ground-point and water pipe entrance. Some water filters have plastic pipe couplers or plastic pipes that break the electrical ground circuit. In those cases, the ground wire either should be reconnected to the street-side of the filter or the filter should be bridged with a large-gauge electrical conductor.

Earth Conductivity & Dielectric Constant

The dielectric constant and conductivity of earth vary greatly at different locations. High dielectric constant values tend to be found in areas of high conductivity (low resistance) and vice versa. Mountainous regions; areas with dry, sandy or rocky soil; cities with many large buildings; and wooded areas all tend to have low conductivities. Flat areas with wet loam tend to have the highest conductivities. Earth characteristics are important down to depths of 50 feet or more at A.M. broadcast and lower frequencies, but radio signals penetrate only 5 to 10 feet with sufficient intensities for earth characteristics to be important throughout most of the high-frequency spectrum.

Earth's Resistance

The earth's DC resistance in a circuit where the earth constitutes one of two conductors is essentially zero ohms, because the specific resistance of the material of the earth, whatever it may be, is made negligible by the earth's size. For example, if the DC resistance of a loop consisting of a transatlantic cable and earth is measured, all the DC resistance is accounted for in the copper cable conductor and zero ohms in the earth as a conductor. The earth even constitutes a DC short-circuit shunt of the large steel armor wires in contact with the sea.

Electrical Safety Grounds

Electrical wiring to the power outlets in most modern homes and offices includes a safety ground (*also called an equipment ground*) wire. Safety ground wires usually are green or bare metal in the U.S. and green/yellow in Europe. The function of a safety ground is to provide a low-resistance return path to ground to trip a circuit breaker if insulation protecting the case of a powered device fails. A safety ground circuit ideally should be grounded at one and only one point, so fault currents return via a path that is known to be safe. That single point usually is at the main breaker panel. However, that consideration conflicts with the need for an additional lower-impedance ground connection to the chassis of most communications receivers and transmitters for proper operation of some types of antenna systems and for lightning protection.

Graphite Ground Enhancement

Some people recommend mixing graphite with the soil surrounding copper ground radial wires to decrease soil resistance. That will reduce the resistance of the connection to earth for a short time. The problem with that method is that graphite is much more noble than copper. Because of that, the graphite will function as a cathode with respect to the copper which will function as a sacrificial anode in moist soil functioning as an electrolyte. The sacrificial copper will soon dissolve away into the soil. As it does, the resistance of the connection to earth will rise rapidly and will soon exceed the resistance the earth connection would have had without the graphite.

Ground Plane Radials

The number of ground plane antenna radials needed for efficient operation depends on the height in wavelengths of the ground plane above ground. Nearly all the electric field from the vertical radiator will return to as few as three of four ground plane radials if the radials are high above ground. However, if the radials are at ground level as many as 180 radials are needed for highly efficient operation, because otherwise a significant percentage of the electric field will pass between the radials and return through comparatively high-resistance soil. The number of radials required for high efficiency

diminishes rapidly with radial height above ground, such that at a radial height of one-quarter wavelength eight to ten generally are adequate.

Ground Rod Resistance Measurement

The resistance between two ground rods spaced farther apart than their length can be measured to obtain a general indication of their likely ability to safely conduct lightning induced currents to earth. However, resistance measurements taken soon after ground rod installation are inaccurate, because the soil is not yet in good contact with the rods. It is necessary to wait six to eight weeks in average soil to obtain a reliable measurement. The measured resistance will be twice the earth contact resistance of one rod if the rods are identical. Earth contact resistance below 5 ohms is excellent. 5 to 10 ohms is good. 10 to 15 ohms is poor. Grounds with more than 15 ohms resistance are of little value in reducing damage from lightning induced currents.

Ground Rods in Rocky Areas

It is practically impossible to drive a ground rod in some mountainous areas of the western United States and in certain other parts of the world without rock drilling equipment or dynamite. In some areas it is not just a matter of breaking or pushing a few rocks to the side as a ground rod is driven, because there is a thick, solid layer of rock below a thin layer of top soil. Even if a rod was driven by some means, the result would be a 'rock rod' rather than a 'ground rod.' A better alternative is to bury a similar (*or preferably longer*) length of copper pipe horizontally below the top soil. A ground rod can be buried horizontally instead, but a ground rod costs more than copper pipe, the mechanical strength of a ground rod isn't needed, and the wall thickness of copper pipe is greater than the thickness of copper plating on a ground rod.

Grounding Steel Towers

Steel towers obviously should be grounded for lightning protection whether or not grounding is needed for efficient antenna operation. Steel is a difficult metal to electrically bond to. Satisfactory connections can be made using exothermically welded lugs, compression lugs, or crimp lugs, but only if these rules are followed: 1) Never use a single-hole ground lug, because it is apt to come lose if jarred. Ground lugs should be secured by at least two bolts. 2) Tinned-copper ground lugs should be used, because tin reduces corrosion between copper and steel. 3) Use the nuts and bolts supplied by the lug manufacturer. 4) Torque them according to lug manufacturer recommendations. Insufficient torque increases resistance because no surfaces are perfectly smooth. Excess torque increases resistance because of lug warping. 5) Carefully clean and dry both lug and steel before attachment, because tin and steel both corrode when exposed to air and corrosion increases contact resistance.

Lightning Surge Transmission Modes

Most homes have three incoming power lines. One is grounded (usually at both ends). It connects to the center-tap of a secondary winding in a power transformer located on a nearby power pole in aerial transmission systems or inside a nearby ground-level cabinet in underground transmission systems. The other two lines connect to opposite ends of the secondary. Lightning may strike lines connected to either side of the primary, or both, to a line connected to either side of the secondary, or both, to the secondary ground line, the ground and either side, or any other combination. As a result, lighting surges may arrive in transmission mode, common-mode, on the ground line, or in any combination. The best protection against ground-line surges is a good home-side ground. Some surge protectors do not protect against all the other possibilities. Look for protectors designated both L-L (line-to-line) and L-G (line-to-ground).

RF Ground Conductors

Low impedance connections between radio equipment and a good ground system are important to the operation of some types of antennas and tend to reduce interference to and from other services. However, large gauge copper wire is heavy, difficult to bend, and expensive. Copper water pipe is a good substitute. RF currents flow mostly near the skin of a conductor, so the RF impedance of copper pipe is almost the same as for solid copper wire the same diameter. Copper pipe is light, easy to work with, and much less expensive. Copper tubing is even cheaper and easier to work with, but has higher impedance per unit length, because of its smaller diameter.

RF vs. Lightning-Protection Grounds

Some ground systems are installed primarily to make an antenna function correctly, such as where a quarter-wave vertical radiator is fed against a ground system. Some are installed primarily to provide a safe lightning strike current sink. Many are intended for both purposes, but few are adequate for both. The distinction is important, because a ground system that is adequate to make a high-frequency antenna function correctly is rarely adequate to safely sink direct lightning strike currents. Most lightning energy is at very low frequencies. Massive ground systems are required to safely sink high currents at very low frequencies.

Service Entrance Surge Protection

Electric service entrance surge protection is important both to human safety and to the protection of all electrical and electronic devices in a home or office from lightning damage. However, very few older homes and offices have service entrance surge protection devices installed in most parts of the world. They are available in several forms. Some are designed to be installed outside at the base of the electric power meter. Some are designed to be installed inside the main circuit breaker panel. Others are designed to be installed at, but outside, the main circuit breaker panel. Some only protect against electric power surges. Others also provide incoming telephone and cable TV line surge protection. All types require low-impedance, high-current-capacity ground circuits for proper operation. Though they may seem somewhat expensive, their cost is relatively trivial compared to the value they protect.

Underground Power Cable Faults

Underground power distribution is now common in most upscale communities. There are many advantages, including elimination of unsightly power poles and aerial wires, elimination of damage from falling trees and tree limbs, elimination of automobile/pole conflicts, elimination of snow and ice damage, elimination of wind damage, and of special importance to radio amateurs, elimination of power line antenna pattern distortions and greatly reduced RF interference radiation. However, underground power distribution is not without problems. One of the biggest problems is finding underground cable faults. A relatively new solution to that problem is to bundle a fiber optic cable with buried power lines. Hot spots along a power cable deform the fiber optic cable, causing a light-wavelength impedance bump. Short light pulses transmitted down the fiber reflect back from any impedance bumps. Echo times can be measured with sufficient accuracy to pinpoint hot-spot locations to within about three feet (one meter) of cable length.

Why Copper Ground Rods?

'Copper ground rods' actually are copper clad steel, because copper rods would be too soft to drive in the ground and unnecessarily expensive. Most people probably assume that copper is used because of its high conductivity. That is a slight added advantage, but not the real reason. The resistance of the soil surrounding a ground rod is so high compared to the resistance of any metal that the series resistance of a rod and the soil surrounding it would be almost the same regardless of the metal

used. The real reason copper is used is copper a noble metal that has high corrosion resistance. It becomes a cathode when joined together with a less noble metal such as steel in the presence of an electrolyte such as moist soil. The less-noble steel becomes a sacrificial anode that corrodes away first, leaving a relatively corrosion-free copper shell in contact with the soil.

Being 'On the Air'

Amateur Radio operators often talk about being 'On the Air' or having been 'On the Air.' Broadcast radio announcers often say they are 'On the Air.' The media and members of the public often refer to radio and television programs that recently 'Aired.' Of course, radio and television signals are sent via waves of electromagnetic radiation which have nothing to do with air. They do not ride on air. They could be sent without air. Otherwise, it would not be possible to receive television signals from earth satellites or to communicate via radio with space research vehicles sent far outside earth's air atmosphere. Next time you go for an airplane or hot air balloon ride you will be 'On Air.' Next time you talk via radio with your feet firmly on earth, you will not be 'On Air,' unless, of course, your backside is supported by an air mattress.

Electric Shock Effects

Some people think they will be able pull their hands away if they accidentally touch an electrical conductor charged with enough voltage to cause injury or death. There are several serious problems with that idea. When someone decides to move their hands their brain sends low-voltage electrical signals via nerves to muscles that move their hands. Those electrical signals are so small compared to the much higher voltage typically associated with an electrical shock that their effects on muscles are relatively negligible compared to the much stronger effects of the external voltage. A shocked person's brain instantly looses muscle control and the external voltage causes their muscles to contract strongly. That may cause one or both hands to tightly grip the conductor, and if that happens, their brain will not be able to release their grip. Even if that doesn't happen and there is only instantaneous contact, electric current flows so fast that their heart, lungs, and other vital organs may be critically injured almost instantly.

Human RF Radiation Risks

Radiant RF energy is non-ionizing and is believed to not have cumulatively damaging effects like ionizing radiations such as x-rays have, if radiation doses are small enough to not cause biological cell damage due to heating. The amount of human heating from radiant RF energy is highly dependent upon both field-strength and frequency. A human body absorbs only very small percentages of radiant RF energy below 30 MHz. However, the absorption percentage rises at higher frequencies. About half the energy in a 400 MHz electromagnetic wave passing through a human is absorbed. Between 1 and 3 GHz the RF energy absorption of human flesh is nearly 100 percent (microwave ovens operate at 2.4 GHz, because the same is true for many foods). Human RF radiation absorption decreases above 3 GHz and is down to about 50 percent at 10 GHz, because about half the energy is reflected.

Never Used Linux?

Many computer users say they have never used Linux when in fact they use it almost every day. Anyone who uses Google uses Linux. Google search services are provided by approximately 100,000 networked Linux computers. Is Linux reliable? How often do you find Google's site down? Is Linux fast? How long does it take Google to search 8,058,044,651 web pages located at 60,442,655 sites and point you to some that contain what you are looking for while simultaneously doing the same for countless other users? Google's success with Linux has done a lot to legitimize the Linux operating system among previous doubters. Of course, Google is not the only way everyone who uses the Internet uses Linux. A large percentage of the web, mail, DNS and other types of servers routinely used by everyone who uses to the Internet run under Linux. The odds are high that you are using Linux whenever you go to a website or send an e-mail.

Storing Lithium-Ion Batteries

Many people falsely assume that lithium-ion batteries should be stored fully-charged. Even without that assumption, someone who buys a spare lithium-ion battery for a laptop computer or handheld radio generally will keep the spare battery charged and ready for use. That is reasonable where two batteries will be swapped soon. However, lithium-ion battery storage capacity degrades significantly faster if a battery is stored fully-charged, rather than at a lower charge level. If lithium-ion batteries didn't self-discharge it would be better to store them almost fully discharged. However, they contain electronic circuitry that will fail and make a battery totally unusable if it ever becomes fully discharged, so the recommended charge prior to storage is 40-percent. A lithium-ion battery that is stored with a 40-percent charge will have 96-percent of its original storage capacity one year later. If will have only 80-percent of its original storage capacity after one year if it is stored fully-charged.

Standard NATO Phonetic Alphabet

A – Alfa	N – November
B – Bravo	O – Oscar
C – Charlie	P – Papa
D – Delta	Q – Quebec
E – Echo	R – Romeo
F – Foxtrot	S – Sierra
G – Golf	T – Tango
H – Hotel	U – Uniform
I – India	V – Victor
J – Juliet	W – Whiskey
K – Kilo	X - X-Ray
L – Lima	Y – Yankee
M - Mike	Z - Zulu

The ARRL and many other national entities recommend the NATO phonetics for Amateur Radio use as most Hams around the world recognize them. This alphabet dates from about 1955 and is approved by the International Civil Aviation Organization, the FAA and the International Telecommunication Union, and many National Amateur Leagues / Societies / Orgs. Note that different bodies prefer different spellings, so one also sees: Alfa Juliet Juliette Oskar Viktor. As a matter of reference see NATO phonetic alphabet From Wikipedia, the free encyclopedia.

The NATO phonetic alphabet was developed in the 1950s to be intelligible (and pronounceable) to all NATO allies. It replaced other phonetic alphabets, for example the US military Joint Army/Navy Phonetic Alphabet ("able baker") and several versions of RAF phonetic alphabets. It is sometimes inappropriately referred to as International Phonetic Alphabet, which is actually the official name of an alphabet used in linguistics created in the late nineteenth century.

The NATO phonetic alphabet is now widely used in business and telecommunications in Europe and North America, and has been approved by ICAO for use in international civil aviation. It has been adopted by the ITU, (many radio operators will refer to the NATO phonetics as ITU phonetics). Although it consists of English words, its letter code words can easily be recognized by speakers of languages other than English.

The NATO phonetic alphabet is generally understood by Amateurs in all countries. Used when giving your call sign or passing information that must be spelled out for clarity. For example, AC6V should sign ALPHA CHARLIE SIX VICTOR

Some others heard on the bands

Funny Phonetics which are memorable and easy to recall - like Karl # Always Killing Time. W # Empty Alcohol Jugs. Wrong phonetics but very very common on VHF repeaters and HF Contests. Kilowatt # Blue Oyster. W # Big Kilowatt !!!

WWII Phonetics: Some old timers insist on the WWII phonetics: Able Baker Charlie Dog Easy Fox George How Item Jig King Love Mike Nan Oboe Peter Queen Roger Sugar Tare Uncle Victor William X-ray Yoke Zebra. And these guys are always tuning after a CQ Call !!

Civil Entity Phonetics. Some hams use the police/fire phonetics but many don't use or understand these: Adam Boy Charlie David Edward Frank George Henry Ida John King Lincoln Mary Nora Ocean Peter Queen Robert Sam Tom Union Victor William X-ray Young Zebra

And a lot of other Boy/Girl names depending on locale

Make Em Up Phonetics: Then we have Hams who don't know any of these and you might hear

Name is Tim - Texaco Indigo Macy's Actually heard this one!

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