PCARA Update

Volume 8, Issue 9 Peekskill / Cortlandt Amateur Radio Association Inc. September 2007

Of mice and 70 cm

Here we are, quickly approaching the end of another summer. I hope that everyone enjoyed their vacations, and quality time with family and friends. Now it's time to get back to the serious business of Amateur Radio! While most of us were enjoying the lazy hazy days, Bob, N2CBH and Malcolm, NM9J were busy investigating an alternate location for the 2m repeater not too far from it's current site. This will be discussed in further detail at the September 9th meeting, so come and find out.

Putnam Valley 448.725 repeater cabinet with unwanted guests. See report by Bob, N2CBH starting on this page.

You may have noticed that the Putnam Valley 70 cm repeater (448.725 MHz) has been very quiet as of late. Unbeknownst to anyone, the repeater cabinet had become home to a family of field mice. When Bob, N2CBH went to the site to check on the repeater, he opened the cabinet and beheld a sight that would have made the Pied Piper of Hamelin jealous! Needless to say, in this instance, mouse housekeeping and nominal repeater operation were somewhat incompatible. The repeater is on the bench awaiting renovation. To be continued…stay tuned.

So bring all of your summer adventure stories with you to the September 9th meeting at Hudson Valley Hospital Center at 3:00 PM. I look forward to seeing each of you there.

-73 de Greg, KB2CQE

PCARA Officers

President:
Greg Appleyard, KB2CQE kb2cqe *at* arrl.net
Vice President:
Joe Calabrese, WA2MCR; wa2mcr *at* arrl.net

Contents - Special Green issue

Of mice and 70 cm - KB2CQE	1
Repeater Update - N2CBH	1
Adventures in DXing - N2KZ	4
Essential$_2$ Solder	8

Membership dues

Joe, WA2MCR reminds us that membership renewal letters were sent out three months ago and dues for 2007/2008 are now very much due. If members have not sent in their dues yet, please do so.

Repeater update - N2CBH

A little history

For a long time I have been dissatisfied with the performance of our two meter repeater on 146.67 MHz. We have operated the machine since Labor Day weekend 1999 from the radio station transmitter site high up in Phillipstown. The site is a good one but we have been limited in what we could do up there. The repeater started out as a mostly homebrewed affair using commercial components. A circa 1966 Motorola Motrac receiver fed a c. 1970 Motorola Mocom 70 mobile unit, used as a transmitter. A commercial repeater controller was purchased shortly after the repeater was put on the air and put into service.

A few years ago I had the good fortune to purchase at reasonable cost a complete Motorola Micor Compa-Station repeater. This unit dates to 1977... so we are getting newer all the time! I modified the receiver, exciter and transmitter to work on our frequency. Malcolm, NM9J worked to modify the interface to the repeater so that a newer, commercial repeater controller could be used. At the same time the club purchased and installed a new cavity system to combine the transmitter and receiver signals to be fed to one antenna. That updated system has been used for approximately five years now (see *PCARA Update*, Nov 2002, page 3).

The antenna system has had its ups and downs over the years. For the first couple of years the repeater was on the air we had a high gain, dual band antenna mounted on the tower at about 100 feet above ground level (AGL). Over time this antenna developed problems and we

discontinued using it as we could not get someone to climb the tower for us to inspect the defective antenna system. Rich, WZ2P, Malcolm NM9J and others assisted with installing a new antenna on the roof of the radio station transmitter building and we have used this configuration ever since. (See *PCARA Update*, Dec 2002, p 4).

The Green, Green Hills of Hud

The radio station site is on the side of a hill that is approximately 700 feet above sea level. If you look at the nearby geography, it becomes obvious that our site is actually *below* several surrounding mountains. For example Bear Mountain across the Hudson is 1284 feet above sea level. Add the fact that there is a high powered FM station at the site, which can cause problems with a sensitive receiver, and it becomes a perfect storm for poor repeater performance.

For a long time we have had a UHF repeater at a site in Putnam Valley. We were recently afforded the opportunity to try a VHF system from that same location. The "Put Valley" site is approximately 225 feet higher than our present radio station site. The picture shows the view from ground level at the new site toward the old radio station site. You actually look down at the radio station tower from the new site! The new site is approximately 3.5 miles to the north and slightly east of the present site.

View from Putnam Valley site, looking toward the radio station transmitter. The radio station tower is just visible, peeking up at left, from behind the nearby hill.

Test Repeater

My original intention was to put together a test repeater out of spare parts. Luckily, I have plenty of spare parts! The receiver consists of a Kendecom VHF model that we had previously used on the original 146.67 repeater. The transmitter is a modified Mocom 70 mobile transceiver where we are only using the transmitter. This is again the original transmitter used for the first 146.67 machine. The controller is an earlier model Pacific Research Solutions model RI-300. This is functionally identical to the later unit used at the radio station site. The power supply is a Motorola 12V DC supply normally used with a high powered base station. The filter network is a six cavity band-pass/band-reject type that was salvaged from a previous Dayton expedition. This unit actually needed the most work as it was originally tuned to 161 MHz. Rebuilding the harness, remanufacturing the coupling loops and retuning were all part of the duplexer modification.

Connecting the pieces together was the fun part. I needed to keep the package compact, so my goal was to fit this all into a half-height Motorola base station cabinet. This cabinet was another find at Dayton. Ten bucks for a nicely engineered box. I actually brought home two of them and for a time used them for saw horses!

I assembled the equipment, one night at a time, over a two week period. When I fired it all up the transmitter came up nicely but when I listened to the output on a scanner it sounded pretty rotten! A little investigation revealed a few shortcomings in my lash-up of the equipment. I had originally modified the Mocom transmitter to feed audio into the microphone input. Not such a good idea as it turned out because the engineers at Motorola did a great job of designing a microphone preamplifier with proper filtering to pass a voice quality signal only. I performed an experiment, feeding the modulator directly with tone and found it to be very flat in frequency response. That seemed like the solution, so I hooked the controller output directly to the modulator. Well, things got a little better but the sound was still not right.

Malcolm and I pored over the controller manual thinking there was a setting we had missed. There was an optional pre-emphasis circuit so we made sure it was turned on. Things still sounded lousy! I next focused on the receiver and I found the culprit. The receiver output was severely filtered and was rolling off the high frequencies too much. A quick inspection of the schematic revealed the problem. The engineers at Kendecom had designed in a low-pass filter that was not working the way we would like. In addition the components installed in our receiver were not the ones called out on the schematic. I determined what would be right to flatten out the frequency response and installed new components. Another test determined that we had solved the problem and all that was needed was some level tweaking.

So now we had a functioning box. The next thing to do was to test it on the ground — that is to say, run it through its paces in my garage where it

Bob, N2CBH working on the test repeater in his garage. The large cabinet behind Bob houses the six-cavity duplexer.

could be monitored and adjusted if necessary. This was done for about ten days on an alternate PL tone of 88.5 Hertz. This allowed us to run the test machine along with the main machine with minimal interference. Some in the club helped us with signal reports. I'd like to thank Malcolm NM9J, Mike N2EAB, Gary WB2HNA and many others who helped with signal reports.

Of mice and moves

The decision to transfer the test repeater was made after Malcolm and I decided that the machine was sufficiently well behaved to support a move to the big hill. Saturday August 11th the repeater was moved to the new site. When we arrived we discovered to our horror that the 448.725 MHz repeater had become a rodent motel, quite literally! This explained why the machine had been silent!

One of the inhabitants of the 448.725 MHz repeater. The entire Aerotron UHF repeater is pictured in its cabinet on page 1.

We removed the 440 equipment, cleaned it as best we could and moved it out of the way. We cleaned up the general area where the new repeater was going to be located and began moving the equipment in. After putting everything in place and making connections, we fired it up. All seemed in order and we put out a call for signal reports. The only station to come back was KB2SFV, Diane who happens to be my XYL. She reported that the repeater sounded good and she was making it into the repeater fine. With that done we decided to pack up and start enjoying the new repeater.

We drove down off the hill in the N2CBH pick-up and discovered that the handheld coverage was not all that great. We got a little further away — perhaps a mile or so — and we couldn't bring up the repeater at all. What gave? Well, we had to wait because it was the end of a long day.

The next afternoon I ventured up to the site to see what was going on. I could hear the repeater identifying, so I was pretty sure the antenna and the transmitter were working. A quick check of the receiver sensitivity from the antenna input to the filter revealed a problem. It took a large signal to make the receiver break squelch. Hmm, how could this be? A check of the receiver proper indicated it was OK. The problem had to be the filter or the interconnecting cable from the duplexer to the receiver — it turned out to be the latter. A substitute cable was installed and another receiver check through the system was performed. A 0.2 microvolt signal was enough to open the squelch — not bad at all. Most modern handhelds have sensitivity like that without a multi-cavity filter between the antenna and the receiver input terminals.

I gave a call and was able to raise Gary WB2HNA. Gary's help was invaluable because he lives in an area that was never served well by the old repeater. Gary told me that he was able to bring up the machine with a handi-talkie from his back porch! Success at last. Gary then volunteered to jump in his car and take a ride around to some known trouble areas. Gary reported improved coverage nearly everywhere he traveled in Putnam and back into Westchester. I have to complement Gary for his operating skills too. He kept his transmissions brief but frequent. He gave accurate signal reports and locations at every transmission. This is so important for testing. Brief and concise is the order of the day.

Tower at the new site. Antenna is at lower left.

The machine has now been running from the new site for a few weeks and I would say that it has been mostly a success story. We have much-improved coverage to the north and west — previous trouble areas. At this writing I am sitting in Wayne County, Pennsylvania, which is about 25 miles due west of Liberty, New York. I am able to key the repeater and at times it reaches S5. (We were fortunate in being situated on top of a 1500 foot hill and could keep up with the local goings on while we were away!)

Some final thoughts and tips on the new machine. The plan is to replace the temporary test repeater with new hardware at some point. In the meantime we will maintain both machines. If there is a failure of the test repeater, the radio station site can be brought up remotely. Since the new repeater is intended to be temporary, please be mindful that the transmitter is a mobile unit intended for 25% duty cycle operation. Keep your transmissions brief and allow the repeater to drop completely every couple of transmissions. This is a good operating practice anyway. The better operators we all are, the longer the equipment will last. In the meantime enjoy the new repeater coverage and please send Malcolm or myself a signal report from a foreign land like Dutchess County!

Brief note on N2CBH/R

We plan to have the 448.725 MHz Putnam Valley repeater back up and running shortly. It is important to keep the repeaters operational as much as possible. We are working on a standby repeater and hope to have it on test from "ground level" around the Labor Day weekend.

- 73 de Bob, N2CBH

Adventures in DXing

– N2KZ

Seeing Green

While most hams were getting ready for Field Day, I was getting ready for a field trip! My destination: 3100 miles to the east to visit the land of the green. I touched down in Dublin on Saturday morning, June 23rd at about 9 a.m. From the first moment I left the plane I felt relaxed and at home. What a beautiful place it was! In many ways, Ireland is quite similar to America, but many things were interesting and new. Let me tell you all about them!

Plugging In

Adapting to the Emerald Isle is easy, at least electronically! Ireland's power grid provides a standard 230 volts at 50 hertz instead of America's 120 volts at 60 Hz. Many "travel" voltage step-down converters can convert 230 to 120 volts, but most cannot change the frequency from 50 to 60 Hz. American clocks may run slower than expected! AC hum is also a couple of notes lower at 100 Hz instead of the familiar 120 Hz we all know and love. Inspect all the electronic devices you bring abroad. Many computers and battery chargers (iPod, Nintendo, etc.) accept both 230 and 120 volts by design. If that's so, then all you'll need is a simple plastic plug adapter! No heavy power converter would be required! Ireland uses a more rugged power connector larger than our standard three prong plug. This style is universal throughout Ireland and Northern Ireland, with one exception: If you want to use an electric shaver in a hotel it needs to be fitted with an old–fashioned two round pin plug. Also, modern AC wall receptacles all feature individual on/off switches for each outlet. Take a look at the light bulbs! Ireland uses an interesting twist-lock bayonet style with two connection prongs in the lamp base.

Irish power outlets are rated at 13 amps, 230 volts AC and each outlet is switched. The plug top contains its own fuse. [UK power outlets are similar - Ed.]

What's On the Telly?

Four Irish channels are seen most everywhere: RTE One and Two, independent TV3 and RTE's Irish Gaelic TG4. RTE is "owned by the people of Ireland" and is somewhat similar to our PBS. Each household in Ireland is required to purchase an annual TV licence (158 Euro - about $218) to support RTE's expenses. Most of the hotels I visited also offered Britain's BBC2, Sky News and Sky Sports and CNN International. A few satellite-delivered channels might also be available such as SkyOne.

Irish incandescent lamp has bayonet base with two power connectors.

The four basic Irish channels were well-balanced and filled with variety. Most viewed are the soap operas Fair City and the British EastEnders, Saturday Night with Miriam (a very popular talk show) and any coverage of Gaelic football or hurling (Ireland's two great sports.) The world stops every Saturday night around 9:35 pm to watch Miriam O'Callaghan chat with the famous on RTE One. There was no shortage of programs imported from America and Britain, but many shows seen are produced in Ireland. The Simpsons are enormously popular in Ireland seen at 5:35 pm on RTE Two. I caught Wimbledon tennis on the BBC in English with a second match on TG4 with commentary in Gaelic!

Irish television is transmitted using the Pal-I standard at 625 line resolution. (America uses a different system called NTSC.) It looks a little sharper than American TV, but you may see a little bit of on-screen flicker due to the slower alternating 50 hertz power standard.

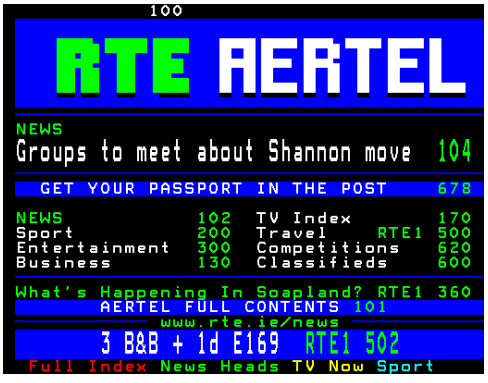
Television distribution is interesting and diverse. RTE 1 and 2 can be seen in most areas over-the-air on UHF. Two companies, NTL and Chorus, provide most of Ireland's "cable" television via cable or over-the-air microwave similar to America's MMDS. NTL and Chorus have recently merged nearly creating a terrestrial monopoly. Irish MMDS antennas are fitted with block down-converters shifting the received microwave signals to UHF television frequencies. In some homes, a "converter" box processes the signals and presents them for viewing. Digital MMDS provides more channels by incorporating signal compression. The widest variety of channels can be seen via subscription service Sky Digital employing 10 GHz Ku band transmission via geosynchronous satellite. Unlike our DirecTV or Dish TV satellite services, a host of channels can be seen free-of-charge using Sky equipment. Of course, Sky wants you to subscribe to one of their many pay packages!

Another interesting quirk is the proliferation of "deflector" transmitters in rural areas of Ireland. When reception is poor in an outback area, many locals have established unofficial repeater transmitters to bring wanted signals to their community for both television and

radio. Deflector transmitters date back to the early days of TV and radio when the Irish public was anxious for more diverse (or any!) content. In the early 1950s, deflectors brought the first available television broadcasts to Ireland using high gain antennas on towers installed to snag and repeat BBC signals from nearby Wales. Deflectors are generally tolerated by ComReg, the Irish version of the FCC.

Turn on your television and you'll immediately know you are not in America! First, most sets sit idle in standby mode. You "wake up" the telly by entering a program number. The power button is only used to put the set back in standby when you are done. TV surfing is arranged by program numbers, not channel numbers. Your television's auto-scanning set-up allows you to scan the Irish VHF and UHF bands for signals. When they are captured, you assign each a program number and an ID. After your TV is programmed you will never see a blank channel. You will only see the TV services saved in your presets. Manual tuning is very difficult, if not impossible, on modern Irish TV sets.

Irish television also features RTE Aertel, an extraordinary teletext system. Aertel cleverly transmits text data along with regular TV programming. Your home TV set receives and stores the data for your use on-demand. Information worthy of an elaborate newspaper can be seen on-screen using your remote control. First, press the text button. You'll see the familiar RTE Aertel front page. Then, you can either enter specific page numbers or use the four coloured buttons on your remote to access teletext sub-groups: Full Index, News Heads, TV Now and Sport. You can even see detailed descriptions of RTE transmitter maintenance! Try it out for yourself at: http://www.rte.ie/aertel/.



Aertel teletext service.

Closed captioning is available on most RTE programs using Aertel. If you are watching BBC channels, a similar text data service called Ceefax can caption your show, as well. Open the appropriate teletext service (Aertel or Ceefax,) and simply press 888 on your remote to activate. Captions appear in several text colors to distinguish who is speaking. Many Sky channels also offer teletext. Most TVs allow you to superimpose any teletext screen over live programming so you won't miss a beat!

Aerials Above

Oh, the things you can see in Ireland! My fascination continued by looking up! Irish TV antenna designs are amazingly diverse. I almost thought there was a prohibition on aerial use in Dublin. You have to look very carefully to see even one TV antenna in the city (and it would probably be abandoned in poor condition.) Most everyone here is on cable or watches Sky satellite. Leave Dublin city and the aerial fun begins!

Mesh-style dish antenna for Sky satellite TV. [All photos by N2KZ]

The Irish use both vertical and horizontal polarities to transmit over-the-air TV signals. (The United States uses horizontal polarization exclusively.) The advantage is more efficient spectrum use allowing tighter spacing of multiple transmitters to fill in all the nooks and crannies common to the terrain. Most popular are long inexpensive Yagis. You'll notice their unusual flat metal grid reflectors and little black button weather-sealed baluns. Other UHF designs use a few elements mounted in a V as a reflector as you would expect to see in The States. UHF bow-tie arrays, with screen back grids, are quite popular as well. Depending on your location, you'll see any or all of these types of antenna mounted horizontally or vertically and sometimes both!

UHF Yagi TV antennas

Many areas still have a remnant or two of the days when VHF transmission was prevalent here. Simple classic design VHF Yagis still stand on chimney mounts. I caught a few built as an upper VHF Yagi in one polarity along with a couple of low VHF elements in the reverse polarity reminiscent of a 2 meter / 70 cm combo familiar to hams. Satellite dishes also have a different look: You can see through most of them! Unlike American home dishes that are solid in construction, Sky dishes are manufactured using perfo-

Dual-polarized VHF TV antenna

rated mesh. Their current design is oval. Some older dishes, still in use, are nearly identical to our familiar DirecTV designs.

Ireland's MMDS aerials are equally unusual. You'll see LNB assemblies much like America's designs, but the mini-dish reflector is actually a piece of metal screening that has been pressed into a parabola for economy. They are prolific all over Counties Sligo, Galway and Clare. Microwave Internet distribution is quite common using small square antennas resembling white mini-roadsigns seen on many chimney mounts or miniature Yagis usually polarized vertically.

Irish Radio

Things are a wee bit different on the radio in Ireland, as well. Bring a simple radio with continuous analog tuning! Frequency allocations on FM are in 100 kHz increments across the 88 to 108 MHz standard FM band. You'll find stations in unusual places like 102.0 MHz. Your American digitally-tuned FM radio will only get some stations clearly since they are programmed to receive only "odd" frequencies like 92.7 or 100.1 FM. (We use a wider 200 kHz spacing standard.) An analog radio is also essential for listening to AM since stations are separated 9 kHz apart unlike America's "even" allocations every 10 kHz. Most European stations also follow these frequency allocation schemes on AM and FM.

Many Irish car radios incorporate the BBC's RDS (Radio Data System) on FM. Using RDS, you simply set your radio to the network you wish to hear and the radio takes it from there! You'll only see the name of your chosen network on the front panel display. Chances are, you'll have continuous reception wherever you go! The radio automatically searches for the strongest signal available for your chosen network and always keeps you tuned in. If you have sharp ears (or a very quiet car) you may hear a slight difference in audio level or processing when the radio swaps to a better frequency. FM stations are allocated in groups of frequencies nationwide. RTE broadcasts four networks: RTE 1 (full-service radio,) 2FM (pop rock and chat,) Raidió na Gaeltachta in Gaelic (news, sports and lots of traditional Irish music,) and Lyric FM, their classical music service. Two independent networks are also heard: Today FM (top 40 pop and chat,) and Newstalk with the motto "different station, different nation" expressing their independence from Northern Ireland. Many areas have smaller independent FM stations that serve one county or area exclusively.

Car radio with RDS

As you travel you will find these networks in the same order across the dial: RTE 1, 2FM and RnaG in a row from 88 to 95 MHz; Lyric shows up midband, followed by Today FM. Newstalk is always at the top of the band up around 106 to 108 MHz. Local FM broadcasters were usually found shuffled into the middle of the FM band. Even at the most remote outposts, I managed to hear at least 5 or 6 FM stations. Many, many transmitters are used to achieve good coverage, especially in rural areas, making RDS nearly a necessity.

Local medium wave "AM" radio is almost extinct in Ireland. RTE 1 is relayed, via a 500 kilowatt transmitter, from Tullamore (located dead center in Ireland) on 567 kHz. You'll hear it effortlessly, nearly everywhere, even during the day. RTE 1 is also available on longwave via the former Atlantic 252 transmitter in County Meath, also in central Ireland. I searched several electronics shops and never found a modern radio capable of receiving long wave. I also heard a non-identifying (pirate?) AM station in Donegal (far north) playing endless traditional American country music.

Ireland sits much farther north than our native New York at about the same latitude as Canada's Labrador. In the height of summer, nights are quite short! You won't see complete darkness until about 11:30 pm, and dawn's early light peeks in around 4:30 am. Late in the evening, the medium wave band in Ireland begins to sound like shortwave in America. Without any competition from local stations, the world starts to arrive at your receiver.

Possibly the most dominant medium wave signal at night is Radio China International, relayed through the facilities of RTL Luxembourg on 1440 kHz with 300 kilowatts. This is the same frequency once used by the famous Radio Luxembourg (208 metres) that delivered rock 'n' roll to all of post-war Europe until the end of the 1960s. It is very odd to hear China so clearly in Western Europe on medium wave! Sweden's 600 kilowatt station is equally prominent on 1179 kHz in English from 9:30 to 10 pm. You'll hear them in Swedish and other languages throughout the night. Many stations can be heard in French, German and Slavic languages. You'll also find a host of frequencies airing the BBC's Radio Wales, Radio 5 and Radio Scotland along with independent Virgin Radio from London. A lifetime could be spent logging all the mysteries heard on Irish medium wave. I only had nine days and a little transistor radio!

Blaupunkt seems to be today's car radio manufacturer of choice throughout the Emerald Isle. Old German-design wooden table radios, quite popular in the 1960s, can be found seemingly everywhere in quantity as antiques. I saw dozens of them during my trip in hotel lobbies, restaurants, and shop windows. They all share the distinctive Grundig design and shape with dual speakers behind the front grille cloth, two big knobs, volume on the left and tuning on the right, and white "piano keys" for turning the set on and off and changing bands. Most sets offer three bands: Long wave, medium wave and shortwave. The dials

Grundig table radio

note where to look for broadcasts from places like Hilversum, Paris and Munich. You'll also find a piano key to switch to your Gramophone (record player!) A radio restorer could easily establish a career here. I never met one of these radios that still worked!

New Technology

Ireland is a nation in waiting (for HDTV.) Many hotels and taverns have 16 x 9 sets and some of them actually display HDTV! All HDTV programming arrives from abroad via Sky satellite. Sky TV offers nine channels of HDTV including BBC HD, the HD channels of History Channel, National Geographic and Discovery and five exclusive channels produced by Sky. Nearly every place I went had some sort of widescreen display, but most often it was filled with Irish sports coverage (in zoom mode) or even RTE Aertel's teletext showing listings of Euro (currency) exchange rates. A late update: RTE aired their first experimental HDTV sports broadcast this past July.

Digital radio is beginning to be broadcast on a new band around 225 MHz via two experimental multiplexes in select areas around the country. Multiplex One carries ten RTE channels including the classic four basic services widely heard throughout the country on analog radios. Multiplex 2 features national independent services Newstalk and Today FM along with 4 local stations from Dublin. A special receiver is required to hear these tests. Ireland decided not to try in-band on-channel digital currently used here in America.

The Places You See

The most fascinating experience of my trip was not fully appreciated until several days after I left The Emerald Isle. I visited the most northerly point in Ireland called Malin Head in County Donegal. As our bus approached the site, we passed a rather elaborate small radio station. With very limited knowledge of the area, I could only guess its purpose. A quick scan with my AM/FM portable produced no clues!

We finally reached our destination: A high bluff featuring gale force winds and gorgeous expansive views. Sailors beware! The seas below were rampant in turmoil and treachery. Two abandoned buildings stood at the summit. One was a three story lookout tower and the other was a concise low profile concrete hut. Both buildings were of a similar vintage - old but not ancient. They were obviously abandoned long ago. I did not give them much thought.

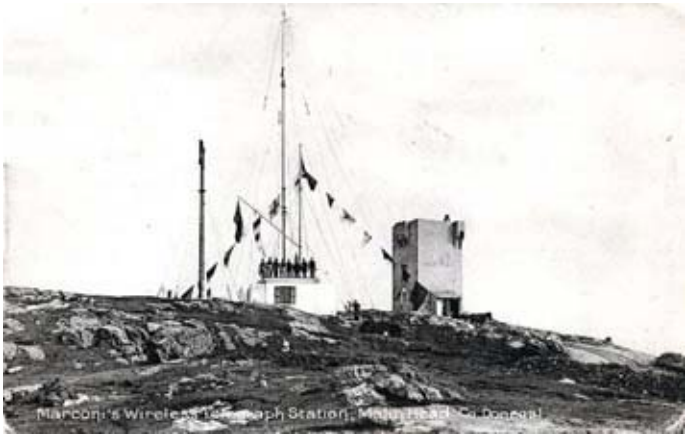
As we drove away, I asked our bus driver if he could pause at the radio station so I could take some snapshots. My curiousity was piqued when I noticed the station was an outpost of the Irish Coast Guard. Outside the small buildings at the station were two short towers, about 150 feet tall, supporting a complex array of wire antennae. I wished I had a back yard like this at home! I documented the site with my digital camera as best I could. On we went!

Radio station photographed by Karl.

Only after I had arrived home in The States did I understand what a magical visit that was! Some quick research on the Internet revealed the answers to my questions. The little radio station was Malin Head Radio - callsign EJM - a primary centre for marine communications and rescue support.

Today, EJM operates primarily on 1677 kHz, and the standard safety frequency 2182 kHz, in SSB. The station is home to four one-kilowatt Rohde and Schwarz transmitters, a 750 watt Scanti transmitter, a one-kilowatt Navtex transmitter and an array of professional HF receivers. Malin Head Radio is also the control point for many VHF radio transceivers installed throughout a wide area of the Irish seacoast. It is a beehive of activity for navigation and life saving support.

The abandoned hilltop site proved more remarkable. This bluff is properly known as Banba's Crown. This three-story lookout was built in 1805 by Lloyd's of London as a signal tower to communicate with passing ships. Semaphore and telescopes were used initially along with signal lights. In 1902, Marconi wireless equipment and antennae were installed at the site. The station itself was situated in the tall tower. The low profile building housed the connec-



Karl's radio station turned out to be Malin Head Radio, current callsign EJM, pictured here on its opening day in 1902. Previous callsigns were MH and GMH.

Banba's Crown

tions and tuning unit for the antennae strung aloft. The original spark transmitter operated at 250 watts.

The Post Office took over the station in 1909. Four years later, in 1913, the station was rebuilt at its present site, two miles south of Banba's Crown, with a 5,000 watt transmitter feeding one tall mast and antenna. The average range of the new station was about 450 miles during the day. At night, Malin Head's signals could be heard 1200 miles away and beyond. The site was ideal for medium wave radio transmission. Malin Head Radio was one of scores of stations worldwide who operated and monitored 500 kHz for CW traffic. The last 500 kHz CW transmission was completed on December 31, 1988. The station now operates exclusively with SSB on medium and shortwave. They have not missed one day's operation since opening day January 1, 1902!

Journey's End

Over the nine days spent in Ireland, I never lost my smile. We traveled north into Donegal followed by a long pleasant journey south through Counties Sligo, Galway, Clare, Kerry and Limerick before casting off from Shannon. No matter where we went, rolling hills of green meadows followed us everywhere. With only six million people living in Ireland, the sheep and cattle far outnumbered people! The sights, the heavenly music, the memorable food and drink all conveyed a single message: You're very welcome! What a lovely place to be. Try it out for yourself and see!

- de Karl, N2KZ

Essential$_2$ solder

Here's another episode in the occasional series where we look at chemical products that are indispensable to the radio amateur. The American Chemistry Council's "Essential2" campaign aims to explain how the chemistry industry is "essential2" our lives.

One of the first things I learned in my early days of electronics was **how to solder**. As a youngster, I assembled an AM/SW transistor radio kit. Components had to be soldered, so I learned as I went along. That same receiver was also my first introduction to amateur radio – but that's another story.

Unfortunately, that first kit did not teach me to solder *very well.* I found this out at a hilltop VHF contest, where my home-brew transmitter just refused to work. A bumpy ride up the hill had shaken one of my cold-soldered joints loose. A club member showed me how to heat the component leads and circuit trace first, then flow solder over the leads, wetting the surface and forming a strong, conducting joint between the components.

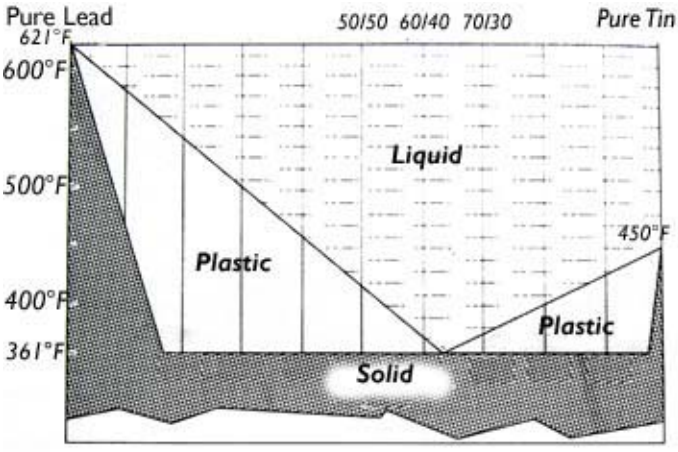
What is solder made of and why is it so good at joining metals together? There are several different types — but traditional solder for electrical work contains just two metallic elements — **tin** and **lead**.

Tin is an element we are all familiar with — it's the shiny coating over sheet steel in tin-plate and tin-cans. Molten tin is used to manufacture float glass — I once toured Pilkingtons' factory in St Helens, England, where the float-glass process was invented. Metallic tin was used in the manufacture of organotin stabilizers by one of the companies I worked for in the U.K. Metallic tin melts at 232° C, 450° F. Its price has been rising all this year.

Lead is also a familiar element. You may remember when the dense, blue-gray metal was used in tubular form as water pipes and in sheets as a roofing material. Not long ago, lead was used in pigments such as "white lead" to make lead paint. Lead paint is extremely durable, but when the surface flakes, the particles and dust are highly toxic. Another of my former employers in England manufactured lead pigments, lead stabilizers and paints, starting from metallic lead, which arrived at the plant in weighty ingots. Metallic lead has a melting point of 327°C, 621° F, which is hotter than most soldering irons.

When tin and lead are melted together, they form an alloy. Alloys of lead and tin have lower melting points than the individual metals – and one particular mixture of 63% tin and 37% lead has the lowest melting point of all: 183°C, 361° F. The popular 60/40 tin/lead solder has similar characteristics.

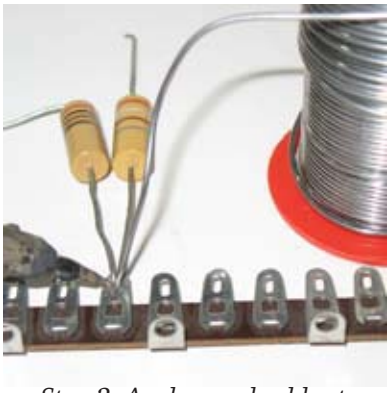
Solder has a low melting point – so it is relatively easy to heat the connecting leads of electronic components to a temperature at which solder melts and forms a liquid. Molten solder will then flow over the metal surfaces, being drawn into the narrow gaps and crevices between them by surface tension ("capillary action"). Once the molten



Tin/Lead phase diagram after Kester Solder. Pure lead melts at 621°F, pure tin melts at 450°F. A 63/37 tin/lead mixture melts at 361°F.

*How to solder **well** — Step 1. first heat the component leads with the tip of the iron.*

solder has wetted the metal surfaces, the iron is removed and the joint is left to cool below the solder's melting point. The result should be a sound, soldered joint with the solder firmly holding the electrical leads in good mechanical and electrical contact. It is important that the metal parts are not moved as the solder solidifies – otherwise the cooling joint may break apart, or the solder may cool into a gray mass that will fracture easily. If the surfaces have not been properly wetted, the solder may appear to join the components, but in fact a sharp tug will pull them apart – this is a "cold-soldered" joint.



Step 2. Apply cored solder to the heated component leads.

Wetting of the component leads by molten solder is a critical part of the process. Component "leads" and circuit traces are usually made of copper. If the copper surface is oxidized, it becomes coated with a layer of copper oxide and wetting is more difficult. One solution is to "pre-tin" the copper "leads" with melted tin/lead solder. Copper pads on circuit board traces are similarly tinned with solder. The tin/lead plating prevents corrosion of the copper surface and ensures a good connection when the wire leads or copper traces are eventually soldered.

Another solution is to use a "flux" to coat the metal surfaces and remove any oxide layer prior to soldering. During the soldering process, the flux stays in place on the hot metal surfaces, reducing the surface tension and keeping the leads free from further oxide formation. The most common flux used for electronic soldering is based on **rosin**, a solid resin obtained from the sap of pine trees and other conifers. The active ingredient is an organic acid, abietic acid, with other acids present.

For industrial production of circuit boards, flux is applied to the copper side of the board *before* the board is dipped in molten solder. With hand soldering, it is more convenient to employ **cored solder,** where the flux is contained within the tin/lead alloy and applied at the same time as the solder. Rosin-cored solders are most popular for electronic work – the rosin is only active during the soldering process and stops attacking the metal surface as soon as the heating is finished. Rosin fluxes are non-conductive, a desirable property when making close-spaced electrical connections.

Multi-cored tin/lead solder has been used for decades with no great problems. Millions and millions of soldered joints have been made over the years. Equipment that was soldered in World War II is still functioning today. What more could anyone want?

Green solder: Unfortunately, some organizations have decided that what they want to do is "get the lead out" of solder. The aim is to prevent lead ending up in landfill where it may contaminate land and water supplies. The European Union's "Restriction of Hazardous Substances Directive" (RoHS) requires parts for new electrical and electronic equipment for the European market to contain less than 0.1% lead.

Lead-free solders are available, but they have higher melting points and inferior wetting properties when compared with traditional solders. Tin/lead solder melts around 180° C (356° F) while lead-free solders melt about 40°C higher. As a result, electronic components must be able to withstand higher temperatures — which can cause additional oxide formation — so more aggressive fluxes are needed to remove the oxide film and improve wetting.

Some lead-free solder joints can look quite different compared to tin/lead joints – the shiny surface is missing, and an untrained eye can assume that the joint is faulty.

There are several choices of lead-free solders depending on the particular application. One of the most popular is "SAC" solder, or Sn/Ag/Cu (tin/silver/copper).

While getting the lead out of solder, we also need to get the lead out of those "tinned" component leads. This is done by replacing the tin/lead solder covering with *pure tin*. Unfortunately, coatings of pure tin have an undesirable property – they form tin "whiskers", to relieve stress in the tin plating. The unfortunate result can be that adjacent conductors are bridged by a thin whisker of metallic tin – with unpleasant consequences if the conductors were supposed to be insulated. NASA's web page on tin whiskers (http://nepp.nasa.gov/whisker/index.html) reports several system failures on earth and space-based systems, including short circuits that resulted in failure of commercial satellites. These problems were much less significant in the days of tin/lead plating.

Lead free-solders have other disadvantages. The physical connection between components is much weaker, making the joints likely to shake apart in applications where severe vibration and acceleration are involved. Military and aerospace companies are now having to avoid lead-free assemblies and stay with tin/lead solder for their critical soldered joints.

Some people have suggested that Europe's RoHS directive is misguided and the small amount of lead used in conventional solder is a small price to pay for reliable electronics. We shall have to see how the change to lead-free components affects reliability in the long term.

A final word about safe use of solder. Take care not to breathe the rosin fumes from hot solder and don't smoke. When the job is finished, pick up any tin/lead solder splashes and dispose of them in a sealed bag. Then wash your hands to prevent ingesting any lead! - NM9J

Peekskill / Cortlandt Amateur Radio Association

Mail: PCARA, PO Box 146, Crompond, NY 10517
E-Mail: w2nyw@arrl.net
Web site: http://www.pcara.org

PCARA Update Editor: Malcolm Pritchard, NM9J
E-mail: NM9J @ arrl.net
Newsletter contributions are always very welcome!
Archive: http://home.computer.net/~pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization.** PCARA meetings take place the first Sunday of each month* at 3:00 p.m. in Dining Room B of the Hudson Valley Hospital Center, Route 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. *Apart from holidays.

PCARA Repeaters

W2NYW:	146.67 MHz -0.6, PL 156.7Hz
KB2CQE:	449.925MHz -5.0, PL 179.9Hz (IRLP node: **4214)**
N2CBH:	448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

September 9: September meeting, 3:00 p.m. Hudson Valley Hospital Center.

Hamfests

Sun Sept 16: Candlewood ARA Western CT Hamfest, Edmond Town Hall, 45 Main St, Newtown, CT. 8:30 a.m.
Sat Oct 6: Bergen ARA Hamfest, Westwood Jr/Sr High School, 701 Ridgewood Road, Washington Township, NJ. 8:00 a.m.
Sun Oct 7: Hall of Science ARC Hamfest, New York Hall of Science Parking Lot (Flushing Meadows Corona Park) 47-01 111th Street, Queens NY. 9:00 a.m.

VE Test Sessions *(No more code tests!)*

Sep 2: Yonkers ARC, Yonkers PD, 1st Precinct, E Grassy Sprain Rd, 8:30 a.m. Contact D. Calabrese, (914) 667-0587.
Sep 13: WECA, Westchester Co Fire Trg Cntr, 4 Dana Rd, Valhall NY. 7:00 p.m. Contact: Stanley Rothman, 914 831-3258.
Sep 21: Bergen ARA, Westwood Regional HS, 701 Ridgewood Rd, Washington Township NJ. 7:00 p.m. Contact Donald Younger, (201) 265-6583.
Sep 24: Columbia Univ ARC, 2960 Broadway, 115 Havemeyer Hall, New York, NY 10027. 6:30 PM. Contact: Alan Crosswell, (212) 854-3754.
Sep 29: PEARL, Mahopac Public Library, Periodicals Room, Route 6, Mahopac. 10:00 a.m. Contact NM9J.

Peekskill / Cortlandt Amateur Radio Association Inc.
PO Box 146
Crompond, NY 10517