PENN WIRELESS ASSOCIATION

X-MITTER

PUBLIC SERVICE THROUGH COMMUNICATION

January 2018 Vol. 57 No. 1

PENN WIRELESS ASSOCIATION

CLUB INFORMATION

W3SK VHF Analog Repeater Frequency: 146.790 MHz (-0.6, 131.8pl)
W3SK UHF ***Fusion*** Repeater Frequency: 448.225 MHz

PWA Webpage URL: p***ennwireless.org***
PWA Email: ***PennWirelessARC@gmail.com***
PWA Executive Board: ***PWA-EBoard@googlegroups.com***
Technet Email Reflector: ***PWA-Technet@googlegroups.com***

Penn Wireless Association holds regular meetings consisting of general club business, current committee reports, group discussions, featured programs and a social period. This meeting is held at the Falls Township Building, 188 Lincoln Highway, Fairless Hills, PA on the fourth Monday of each month at 7:30 pm. Please contact the club vice president to add your business topic to the meeting agenda.

VISITORS ARE ALWAYS WELCOME!

PWA-Technet @ googlegroups.com Email Reflector

User Account Policy

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X-MITTER

Newsletter Policy

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In this issue ...

Reminders:

TechNet every Sunday evening at 8:00 P.M. local on the W3SK repeater.

January E Board meeting: 01/15/18, 7:00 P.M., Rm 205, Twp. Bldg.

January General Membership Meeting: 01/22/18, 7:30 P.M., Main Mtg. Rm., Twp. Bldg.

Ed Wells Embedded Processor Class resumes:01/18/18: 7:30 P.M., Rm 202, Twp. Bldg.

Dues and Member participation are the life blood of PWA. Please stay active and up to date on

FROM THE EDITOR

Crisis within the ARRL?

Over the past several issues we have included articles regarding controversies arising with recent ARRL decisions and proposed actions. This issue also contains additional articles on this subject. Why the concern and continuing focus?

If you read the previous articles, you are aware that there are issues with the League that have a large portion of the membership very concerned. These include proposed By-law changes, censure of elected members and an appearance of lack of transparency by the Board. It is not currently the position of this Editor or this publication to pick a side in this debate but rather to attempt to gather all relevant information possible to allow our readership to make an informed decision.

Why should you care? Well, hopefully you are a member of the ARRL. I'm sure you've all received the sales pitch as to why you you should be but beyond those reasons consider this. You, as an Amateur operator and member of the ARRL have an extremely powerful ally to help protect your operating privileges!

It is for this reason, above all, that a healthy ARRL is of paramount importance to all of us. The ARRL can only remain relevant with an informed and active membership.

Please take a few moments to read these articles. Additional information on the subject can be obtained at myARRLvoice.com.

'73 KE3LA

Winter Ham Activities

Well, how many of you hardy individuals are up for a trip to the field for Winter Field Day? (https://www.winterfieldday.com/) Just one of a number of activities coming up to start the New Year. We've got the NAQP - CW on the 13th, NAQP—SSB on the 20th and the ARRL January VHF Contest on the 20th.

Additionally, January hosts a number of state QSO parties and DX contests. Enough radio activity to keep anyone busy and interested. Check the ARRL January Contest Corral (Pg. 9) for details. Warm up the rigs, use some RF to melt the ice off your antennas and make some contacts.

Another winter activity to consider is the Penn Wireless Builders Corner initiative, headed up by Howard, N3FEL. There was a time when building was an integral part of our hobby. Amateurs not only built their own antennas but much of the equipment they used. Much of the equipment we use routinely today can trace its roots to Ham experimenters. Sadly, interest in this aspect of Amateur radio seems to have waned. We hope to see some interesting projects spring forth from our group of builders. Log onto the website for additional details and to join.

Also in January, Ed Wells is scheduled to resume his weekly Embedded Processor class. I had the honor of attending last year's session before I relocated and can highly recommend it.

I know that January and February can really be a challenge on the 'Ham' front but take heart. Spring is around the corner. Invest some of your free time in the listed activities, keep your skills sharp and your spirits high!

Jim—KE3LA

Rebuttal to December Xmitter Article — K3TX

Rebuttal to the December Xmitter Article – "New Ham Operating Tips – WB9VGO

First let me address the author's suggestion to repeatedly call CQ. Excessive CQ'ing gets no answers worth a damn. My own best results come from "CQ CQ CQ K3TX. Wait 2 seconds and repeat if necessary. The writer suggests that most operators can "send faster than they can receive". No Way! Send faster, maybe, but not so that anyone can copy it. This might also be true if using a keyboard/computer or something else "artificial". Definitely not when using a bug or keyer.

For me, I'm fine sending 20 wpm even 25 wpm if I pay attention. Faster is fine, but not at the expense of readability. I can manage to copy 25 wpm while talking on the phone and in excess of 35 wpm if I pay attention, though I may miss a bit. When conditions are poor due to propagation, QRM or QRN, everyone has to slow down a bit. When copying formal traffic networks, we normally slow down a bit, restricted by the slower speed of hard copying messages and the requirement of total accuracy.

The trick to efficient CW is ***brevity!***
The author suggests the following examples:

"Please repeat your QTH". Wrong! The correct response would be "QTH?"
"Please QRS a bit". Wrong again! Just send "QRS". ***Brevity!***

What I often hear on CW; "my name is", "my QTH is", and with beginners especially, excessive repetition. On a casual contact I'll send "589 hr Dave in Yardley PA". For clarity, I might repeat my town name.

Another common error is the use of "R". You don't answer a question by sending "R".
"R" (roger) means *received* not *yes.* Send the letter "C" to *confirm* or answer *yes.*

On phone contacts, extraneous wording doesn't really hurt; it's not hard to talk much faster than 25 wpm. Done properly, omitting pleasantries, CW ends up being as fast as phone. In fact, when hard copy is needed, CW ends up being faster. Under poor operating conditions, CW is much faster. It has been my experience that even when conditions make phone contacts nearly impossible, CW permits solid copy.

In short, CW is a language, and if used properly, a very efficient means of communication.

N6NB—Letter to Members of the Board of Directors ARRL

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N6NB Letter January 10, 2018

Members of the Board of Directors

ARRL, the National Association for Amateur Radio Newington, CT 06111

Dear Members of the Board:

As a former four-term vice director and ARRL member since 1957, I never before considered submitting a letter like this to the Board of Directors. However, the board now faces the most serious threat to its credibility since the incentive licensing controversy 50 years ago. In fact, the current crisis is more serious because so many of those who are concerned about recent and proposed board actions are prominent and highly respected leaders of amateur radio.

I believe the board must act quickly to reaffirm its commitment to democratic principles if it is to avoid long-term damage to ARRL's effectiveness and its endowment.

The new code of conduct, which is widely perceived as a gag rule to silence directors who may disagree with ARRL policy, must be abolished. It cannot be saved by wordsmithing or spin-doctoring. Directors must be free to express their views on all matters to the members who elected them, even if what they say could be deemed to disparage ARRL itself. Their primary loyalty must be to the membership. The code of conduct is fundamentally at odds with that principle.

Moreover, the board needs to reaffirm its commitment to free elections. No committee should be allowed to disqualify board candidates who meet the written qualifications for the position. The membership must be free to elect any legally qualified candidate, regardless of his or her stance on any issue or any undefined "conflict of interest." A committee that can remove candidates from the ballot with seeming arbitrariness reminds a lot of us of a "guardian council" that disqualifies potential candidates for their lack of ideological purity in some countries. It has no place in a democratic organization. Equally undemocratic is the proposal to allow ARRL memberships to be arbitrarily revoked. That could also be used to undercut free elections. And the recent proposal to dilute elected directors' votes by giving a board vote to persons not elected by the members is still another action that would undermine ARRL's status as a democratic organization.

Above all, the board must bring sunshine to its governance process. Frankly, during the many board meetings I attended, too many things happened that would never withstand public scrutiny. The minutes rarely provided a complete picture of what really happened at those meetings. The best solution is to open board meetings to any member who wishes to attend. When ARRL was established and its governing documents were written to allow

N6NB—Letter to Members of the Board of Directors ARRL

closed board meetings, sunshine laws were rare even for government agencies. The federal Freedom of Information Act was not enacted until 1967 and the Government in the Sunshine Act came even later. Now we live in a different time. Today the public and ARRL members expect even private membership associations to be far more open and transparent than they did when ARRL was founded.

In short, I believe the board must work to restore public confidence by recognizing full freedom of speech for directors, assuring free elections and opening board meetings to members. It's been very heartening to see the huge outpouring of support for an open and democratic ARRL. Now the board needs to address these issues.

In addition, the board should reconsider the recent censure of director Norton. His alleged offense was nothing more than making members aware of the existence of the new code of conduct. After hearing him discuss this issue in two venues, I believe his presentations were not only accurate but also very much in the best interests of ARRL and its members. He deserves praise, not censure, for supporting members' right to know.

Respectfully submitted,

Wayne Overbeck, N6NB

Life member and former vice director

(Circulated Jan. 10, 2018)

On January 10, 2018 / Correspondence

Search for: Type here to search

Time to Next Board Meeting

08	11	30
Days	Hours	Minutes

Recent Posts

- N6NB Letter January 10, 2018
- Hiram Percy Maxim, September 1927
- Yankee Clipper Contest Club Letter
- W3IDT Letter January 4 2018
- W6OAT Letter December 30 2017

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Contest Corral January 2018

Check for updates and a downloadable PDF version online at **www.arrl.org/contests**.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start Date	Start Time	Finish Date	Finish Time	Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	0000	1	0100	3.5	AGB New Year Snowball Contest	CW Ph Dig	RST, serial, mbr (if any)	www.qsl.net/eu1eu/agb_nysb.htm
1	0800	1	1100	3.5-7	SARTG New Year RTTY Contest	Dig	RST, serial, name, "Happy new year" in native language	sartg.com/contest/nyrules.htm
1	0800	7	2000	All	IQRP Quarterly Marathon	CW Ph Dig	RS(T)	www.arimontebelluna.it
1	0900	1	1200	3.5-14	AGCW Happy New Year Contest	CW	RST, serial, mbr (if any)	www.agcw.org/index.php/en
1	1400	1	1800	144, 432	AGCW VHF/UHF Contest	CW	RST, serial, power class, 6-char grid	www.agcw.org/index.php/en
1	1500	1	1800	3.5-28	QRP ARCI New Years Day Sprint	CW	RST, SPC, mbr or power	www.qrparci.org/contests
2	0200	2	0400	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
3	2000	3	2100	3.5	UKEICC 80-Meter Contest	Ph	4-char grid square	www.ukeicc.com
3	2300	7	2300	1.8-7	AWA Linc Cundall Memorial CW Contest	CW	RST, eqpt year, power	www.antiquewireless.org
4	1800	4	2200	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid square	www.nrau.net
6	0000	6	2359	3.5-28	PODXS 070 Club PSKFest	Dig	RST, SPC	www.podxs070.com
6	1200	7	1200	3.5-28	WW PMC Contest	CW Ph	RS(T), PMC abbreviation or CQ zone	www.s59dcd.si
6	1800	6	2359	3.5-28, 144 repeaters	Kids Day	Ph	Name, age, QTH, favorite color	www.arrl.org/kids-day
6	1800	7	2359	3.5-28	ARRL RTTY Roundup	Dig	RST, SP or serial	www.arrl.org/rtty-roundup
6	2000	7	0700	1.8	EUCW 160-Meter Contest	CW	RST, name, mbr or "NM"	www.eucw.org/eu160.html
13	0000	13	2359	3.5-28	YB DX Contest	Ph	RS, serial	ybdxcontest.com
13	0500	13	0900	3.5-28	Old New Year Contest	CW Ph	RST, sum of operator age and years on the air	www.radio.ru
13	1200	14	1200	3.5-28	UBA PSK63 Prefix Contest	Dig	RSQ, UBA section or serial	uba.be/en/hf/contest-rules
13	1200	14	2359	1.8-28-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
13	1800	14	0559	1.8-28	North American QSO Party, CW	CW	Name, state/DC/province/country	www.ncjweb.com
14	0630	14	0830	3.5-7	NRAU-Baltic Contest, SSB	Ph	RS, serial, 2-letter region	www.nrau.net
14	0900	14	1059	28	DARC 10-Meter Contest	CW Ph	RS(T), serial, DOK (if any)	www.darc.de
14	0900	14	1100	3.5-7	NRAU-Baltic Contest, CW	CW	RST, serial, 2-letter region	www.nrau.net
18	0130	18	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info/sprint
19	1800	19	2200	3.5-7	LZ Open Contest	CW	3-digit serial, 3-digit serial received from previous QSO	www.lzopen.com
20	1200	21	1159	1.8-28	Hungarian DX Contest	CW Ph	HA: RS(T), 2-letter county or mbr. Non-HA: RS(T) + serial	www.ha-dx.com/HADX
20	1800	21	0559	1.8-28	North American QSO Party, SSB	Ph	Name, state/DC/province/country	www.ncjweb.com
20	1900	21	2300	1.8	WAB 1.8 MHz Phone	Ph	RS, serial, WAB square or country	wab.intermip.net
20	1900	22	0359	50 and up	ARRL January VHF Contest	CW Ph Dig	4-char grid square	www.arrl.org/january-vhf
20	2000	21	0559	1.8-7	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	sites.google.com/site/feldhellclub
21	1300	24	0800	1.8-144	Classic Exchange, CW	CW	Name, RST, SPC, rcvr/xmtr model	www.classicexchange.org
22	0200	22	0400	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
24	0000	24	0200	1.8-28	SKCC Sprint	CW	RST, SPC, name, mbr or power	www.skccgroup.com
24	0130	24	0330	1.8	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info/sprint
26	2200	28	2200	1.8	CQ 160-Meter Contest, CW	CW	RST, SP or CQ zone	www.cq160.com/rules.htm
27	0000	27	2359	1.8-432	Montana QSO Party	CW Ph Dig	RS(T), county or SPC	fvarc.org
27	0600	28	1800	3.5-28	REF Contest, CW	CW	RST, French Department or serial	concours.r-e-f.org
27	1200	28	1200	3.5-28	BARTG RTTY Sprint	Dig	Serial	www.bartg.org.uk
27	1300	28	1300	3.5-28	UBA DX Contest, SSB	Ph	RST, serial, province (if ON)	uba.be/en/hf/contest-rules
27	1900	28	1900	All	Winter Field Day	CW Ph Dig	Category, ARRL section (or "DX")	www.winterfieldday.com/rules
31	2000	31	2100	3.5	UKEICC 80-Meter Contest	CW	4-char grid square	www.ukeicc.com

All dates refer to UTC and may be different from calendar dates in North America. No contest activity occurs on the 60-, 30-, 17-, and 12-meter bands. Mbr = Membership number. Serial = Sequential number of the contact. SPC = State, Province, DXCC Entity. XE = Mexican state. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column. *Data for Contest Corral is maintained on the WA7BNM Contest Calendar at www.hornucopia.com/contestcal and is extracted for publication in QST 2 months prior to the month of the contest. ARRL gratefully acknowledges the support of Bruce Horn, WA7BNM, in providing this service.*


Star Trek: The Space Seed
ASUSDVD
Captain, that's the old
Morse code call signal.
Morse Code "CQ" :
© 1967 CBS
RF Cafe


What's his RST Spock?
599 Captain, but
fading rapidly
PHOTO: CBS VIA GETTY IMAGES

LOCAL NETS

Net Name	Day	Local Time	Frequency	Comments
DEN	Tuesday	1900	147.03+	Philmont repeater PL 91.5
Digital Education Net – training on all digital modes				
WARC	Wednesday	2000	147.09+	WARC repeater PL 131.8
Warminster Amateur Radio Club Net				
BCARES	Wednesday	2030	147.270+	N3KZ repeater PL 100
Bucks County ARES NBEMS training using Fldigi – 1500 on waterfall				
BCARES	Wednesday	2100	147.09+	WARC repeater PL 131.8
Bucks County ARES voice net				
Montco ARES	Thursday	1900	146.835-	MCARES repeater PL 88.5
They send one practice NBEMS message during voice net using Flmsg				
CCARES	Thursday	1930	446.175-	CCARES repeater PL 100
Chester County ARES voice net				
CCARES	Thursday	1945	446.175-	CCARES repeater PL 100
NBEMS training net after voice net using Fldigi				
NY NBEMS	Saturday	1000	3.583 mHz	1500 on waterfall FLDIGI
SATERN	Saturday	1300	14.065 mHz	1000 on waterfall FLDIGI
Salvation Army NBEMS net – early checkins starting at 1200				
Shortwave Radiogram Broadcast – for information see: http://swradiogram.net/				
Pa NBEMS	Sunday	0800	3.585 mHz	1500 on waterfall FLDIGI
NJ NBEMS	Sunday	0930	3584.5 mHz	1500 on waterfall FLDIGI
PEMA	Sunday	0900	3.987.5 mHz	Voice Net
PWA	Sunday	2000	146.790-	PWA repeater PL 131.8
Penn Wireless Association Technical Net				

All About Antennas Part 2

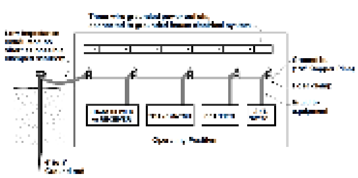
By Bob Grove W8JHD

Last month we examined some of the characteristics (peculiarities?) of radio waves and the importance of proper placement of an antenna. This month we'll take a close look at the antenna itself.

What is a *Ground*?

The earth plays an important role in radio signal propagation, but *grounding* your radio equipment is not one of them. While attaching the chassis of your radio to a buried conductor in moist soil may protect you from electrical shock; drain off static-charge buildup; help dissipate nearby lightning-induced spikes, and even reduce electrical noise pickup, it will not make received or transmitted signals stronger.

Radio waves travel through space, not through the ground except at very close ranges or at extremely low frequencies. They are intercepted by the antenna's metal element(s), not by the soil beneath it which absorbs and dissipates the signal as heat.



A good ground system utilizes short, large-gauge wire to connect radio equipment commonly to at least one deep ground rod.

A good electrical ground consists minimally of two eight-foot metal rods, at least ten feet apart, connected to the radio equipment by a short length of heavy braid. Moist, mineralized soil is best; dry, sandy soil is worst.

A radio-frequency (RF) ground, on the other hand, is more extensive. A vertical antenna may be thought of as a center-fed dipole turned on its end, and the lower half removed so that we can mount the remaining element on the ground where the coax will be attached. But we must somehow supply that missing half of the antenna.

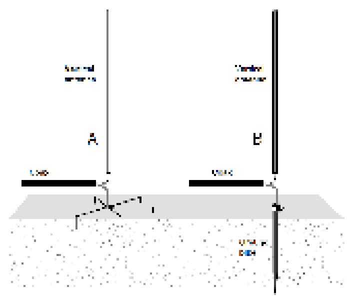
If we simply bury the needed wire in the ground, the energy that would radiate from that element is absorbed by the mineralized soil, simply heating it. Such an antenna is sometimes referred to as a "worm warmer!"

Instead, we construct a *counterpoise* on or above the soil, a metallic surface emulating a "perfect" (reflective) earth, composed of radial wires connected to, and extending outward from the coax shield at the base of the antennas.

How many spokes of wire, and how long? AM broadcast stations use at least 120 radials for transmitting purposes; you should use at least 16 1/8-wavelength wires to avoid power losses from soil absorption.

Because current is at its maximum at the feed point, density of metal around the base of the antenna is more important than the length of the radials. If you have 100 feet of wire, ten 10-foot lengths are better than two 50-foot lengths. This is not so critical on receive-only antennas.

Even a single quarter-wavelength wire provides counterpoise effect; it may be run randomly

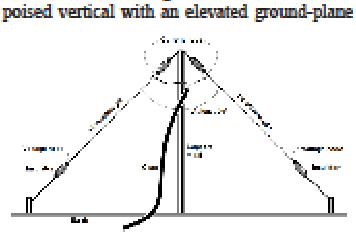


A good radial counterpoise (A) is always preferable to using lossy Earth (B) in a vertical antenna system.

or even coiled loosely in some cases. Such a wire is often connected to the chassis of the transmitter if it is *hot* during transmitting as evidenced by painful RF burns when touching the equipment, especially your lip to the mike!

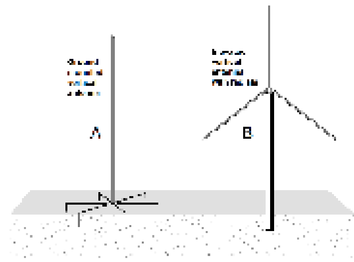
The inverted V antenna is a good example of how to keep the high-current feed point away from absorptive and reflective earth by elevating it to the apex of the antenna. The ends of the drooping elements (high-voltage points) come to within a few feet of the ground where their capacitive interaction with the soil may cause some length detuning of the antenna, but little signal loss.

Don't confuse a ground-mounted, counterpoised vertical with an elevated ground-plane



The inverted V is a popular dipole configuration.

antenna. On the ground we are trying to prevent radiation from being absorbed by the soil; an



The radial counterpoise on a ground mounted vertical (A) prevents soil absorption of the radio waves; the radials of an elevated vertical (B) are part of the antenna itself and help shape the pattern.

elevated ground-plane antenna, however, behaves more like a dipole in free space, with the radials supplying half of the antenna and forming the pattern.

Construction and Size

Two neighboring shortwave listeners decide to erect antennas to monitor 41-meter (7.1-7.3 MHz) international broadcasting. One neighbor, using rocks as counterweights, throws about 50 feet of small-gauge hookup wire over a couple of tree limbs; it sags in a number of places, has no insulators other than its plastic covering, and averages some 30 feet in the air. At the center cut of the wire he has soldered a 50-foot length of TV coax which he runs down to his receiver.

His neighbor, a purist, erects two 30 foot telephone poles 60 feet apart, stretching 66 feet of heavy gauge, silver plated, uninsulated wire between porcelain insulators. The antenna is in an open yard with no trees. At the center he carefully attaches a commercial coax connector, from which he runs a 50-foot length of large-diameter, low-loss, RG-8/U coax.

Does the purist hear signals any better? Nope. Assuming identical environment and antenna orientation, reception will be virtually the same. The difference in signal strengths between 50 and 66 feet is imperceptible. The plastic-coated wire insulates it from the moist tree limbs, but even if it touched, the resistance of the trees would not contribute significant signal loss. Signal absorption by foliage at 7 MHz is minimal; the resistance of the thinner wire is less than one ohm; and the difference between 50 feet of RG-58/U and RG-8/U at 7 MHz is a mere fraction of a dB.

For receiving purposes, an antenna may be thick or thin; its texture may be solid, stranded or tubular; its composition may be any metal (gold, steel, copper, lead or aluminum); it may be covered with insulation or left bare. All signals will sound virtually the same.

Even if signal strengths were reduced considerably, they would still be just as audible, because at shortwave frequencies, once there is enough signal to be heard above the atmospheric noise (static), a larger antenna will only capture more signal *and* noise. The S-meter may read higher, but you would hear the same signal above the noise audio with the "deficient" antenna by simply turning up the volume control.

So why bother with good construction practices? Heavy gauge, stranded wire will withstand

All About Antennas - Part 2 - Bob Grove, W8JHD

ice, wind loading, and flexing better than thin solid wire, and it will radiate transmitted power more efficiently. Commercially made center insulators with built-in connectors are more rigid and water resistant than soldered connections and they can be easily disconnected for servicing or inspection. Sturdy, insulated suspension is more durable over time, and keeping antennas away from tree foliage may avoid some signal loss at higher frequencies.

Skin Effect

A thin, hollow, metal tube is just as efficient in conducting and radiating radio-frequency energy as a solid wire of the same diameter and material. This is because RF energy barely dips below the surface of the conductor, and the higher the frequency, the shallower the depth. The larger the surface, the less resistance, which would waste power as heat. Skin depth varies inversely with the square root of the conductivity and the permeability (magnetic attraction) of the metal; the better the conductor, the deeper the skin effect. At microwave frequencies (10 GHz), the skin depth of silver, an excellent conductor, is 0.64 micrometers (μm), while that of aluminum, a poorer conductor, is 0.80 μm.

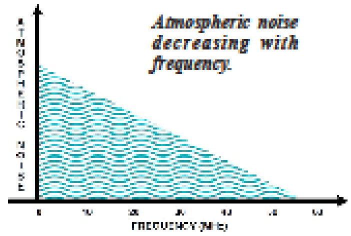
Iron is a very poor conductor and has high permeability; its skin depth is only 1/7 that of copper, making it a poor choice as a conductor at radio frequencies.

Antenna Size

The energy-intercepting area of an antenna is called its *aperture* (another similarity to light as in the aperture of a camera lens) or *capture area*; the larger its aperture, the more signal it captures. Curiously, a large antenna is not necessarily better at transmitting (or receiving) than a smaller antenna. If a small element can be designed to be just as efficient as a large antenna, and radiates the same pattern, there is no benefit in using a larger antenna unless it can be configured to offer *gain*, which comes from shaping the directionality of the antenna. Similarly, all antennas of the same size (wire dipoles, folded dipoles, fans, trap antennas, cages, or any other) radiate the same amount of power. Their relative advantages come from pattern directivity.

The U.S. Coast Guard found several decades ago that a five-foot antenna was adequate for HF reception 100% of the time. Remember, the purpose of an antenna is to detect enough signal to overcome the receiver's own internally-generated noise; once that is accomplished, more signal only means more atmospheric noise with its attendant interference from strong-signal overload.

Below approximately 50 MHz, atmospheric noise (static) becomes increasingly worse the lower we tune. This background hiss is a composite of thousands of lightning strikes occurring simultaneously, around the world. Once we detect enough signal to overcome



Atmospheric noise decreasing with frequency.

the receiver's own self-generated circuit noise, a larger aperture will only increase the atmospheric noise right along with the signal. If the noise is locally generated (power lines or an electrically-noisy neighbor, for example) a beam or loop antenna can be rotated away from the source of the noise to null the interference, hopefully toward the direction of the signal as well.

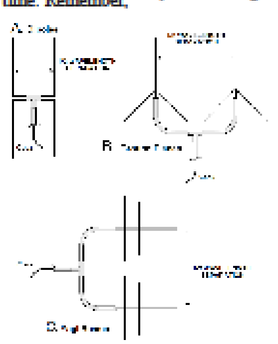
As we tune upwards from 50 MHz, atmospheric noise diminishes; therefore, larger and better-matched antenna systems do improve reception because they help overcome receiver noise, which can be higher than atmospheric noise at VHF and UHF frequencies. Ultimately, once the aperture is great enough to overcome receiver noise at these higher frequencies, larger aperture will only pick up more noise (just as at the lower frequencies) so directivity should be the goal for better reception.

Antenna Gain

Signal improvement may come from a larger aperture, or from intentionally distorting (shaping) the field to produce a narrower pattern. While larger aperture increases background noise as well as signal strengths, directivity favors one or more directions at the expense of others. This reduces overall pickup (better signal-to-noise-ratio), concentrating on a target direction for receiving and/or transmitting, and reducing reception interference from the sides and back.

Such pattern re-direction often refers to *front-to-back ratio* and *side-lobe rejection*, describing how improvement in one direction is accompanied by the desirable loss in other directions. The pattern can be shaped by adding parasitic elements, which are unconnected but secured to the boom, called reflectors and directors (see Yagi below). Feed point mismatch does not affect an antenna's gain or pattern.

Adding a second identical antenna separated by ½ wavelength and connected in phase, known as *stacking* will increase transmitted and received signal strengths by 3 dB, regardless of the original gain. Thus, two 1-dB-gain antennas will provide 4 dB total gain, and two 20-dB-gain interconnected antennas will provide 23 dB total gain.



Stacking any two identical antennas, regardless of their individual gain, will increase the total gain by 3dB.

Antenna performance is usually compared to a half-wave dipole reference. Some manufacturers compare the gain of their antennas to an "isotropic" radiator which is a theoretical (and nonexistent) antenna that has a spherical radiation pattern. This gives manufacturers a 2.1 dB higher gain claim than if they compared it to a real antenna: a half-wave dipole. Unless the claimed gain figure is followed by dBd or dBi, referencing a dipole or isotropic radiator in free space, it is meaningless and suspect.

Assuming we run the transmission line away at right angles from the antenna for at least a quarter wavelength, the location of the feed point causes very little distortion of the pattern, but the impedance selection varies dramatically.

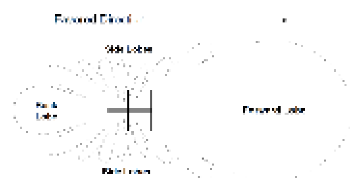
Is a good transmitting antenna always a good receiving antenna? Yes, if its aperture is large enough to capture enough signal to overcome receiver noise. The law of reciprocity states that if an antenna system efficiently radiates a signal into space, it will just as efficiently deliver an intercepted signal to a receiver.

Is a good receiving antenna a good transmitting antenna? Not necessarily. If randomly erected, it may be susceptible to power loss due to impedance mismatch. Its pattern will be unpredictable and reactance may shut down a transmitter with built-in protection against mismatches.

Arrays

Depending upon its thickness, taper and length, a mass of metal, brought within one-quarter-wavelength of a *radiator* (the driven element, connected to the feed line), will interact with the field, *focusing* (there's that light analogy again!) the energy to produce directivity or *gain*.

Probably the best known of these combinations is the *Yagi-Uda* array, named for the two Japanese scientists who developed the antenna in 1928. While Uda actually did all the developmental work, Yagi published the results, so the antenna, as fate would have it, usually bears his name alone.



The Yagi is a popular beam antenna with forward gain.

Curiously, the Japanese did not use the Yagi in World War II.

The modern Yagi consists of a half-wave-length driven element, a single rear reflector about 5% longer, and one or more forward directors about 5% shorter. The elements are usually spaced 0.15-0.2 wavelengths apart.

Depending upon the number of directors, a Yagi may have six to twenty decibels (6 - 20 dBd) gain over a half-wave dipole in free space.

There are many computer programs available in handbooks and on the Web for designing Yagi as well as other effective antennas.

Next Month :

What do we mean by "matching" an antenna? What is "impedance?" Is it possible to remotely "tune" an antenna for best performance? Stay tuned for the next thrilling installment!

4 from the archives of Bob Grove

NVIS Antenna Systems—Ham Radio School

NVIS

Near Vertical Incidence Skywave **(NVIS)** is an ionospheric skip operating technique that directs the strongest signals from a station vertically, or upward, rather than toward the horizon. Signals propagating nearly vertically approach the ionosphere with steep incidence angles and may be bent back to earth with similarly small angles. The operational result is skip communications effective within a radius of a few hundred miles. The NVIS technique can help to bridge the communications gap between the local range of VHF/UHF repeater or simplex communications and the longer distance skip of low-to-the-horizon HF signal propagation.

The NVIS technique relies upon a combination of station factors, most importantly the frequency used, the power of transmissions, and the antenna configuration. Let's consider each of these three factors in the context of the NVIS technique.

Frequency: The refractive effects of the ionosphere vary with frequency. The bending effect on signals is reduced as frequency increases. This is why the 2-meter band (144 – 148 MHz) and higher frequencies are almost never received via skip propagation. The HF bands of 10-meters (28 MHz) to 30-meters (10 MHz) are often effectively refracted back to earth's surface when directed toward the horizon where incidence angles into the ionosphere are closer to the horizontal, and this propagation geometry provides long skip distances with single skips up to 2500 miles. However, the ionosphere usually does not have sufficient bending strength to return these upper HF band frequencies to earth with the steep take-off angles necessary for the NVIS technique.

The ionosphere's bending effect is sufficient, even at steep "near vertical" angles of incidence, to bend back to earth the lower HF frequencies, particularly the 40-meter band (7 MHz), 60-meter band (5.3 MHz), and 80-meter band (3.5 MHz) signals. These bands are most suitable for the NVIS technique, even during daylight hours when more distant skip propagation on these bands is ineffective due to D-layer absorption.

Transmitting Power: Transmitting power with the NVIS technique does not need to be great. Very effective NVIS communication can be completed with the typical 100 watts of many HF transceivers "running barefoot." In good ionospheric conditions much lower power may be quite sufficient for effective QSOs. When atmospheric conditions are less favorable, increasing transmitting power with the use of an RF

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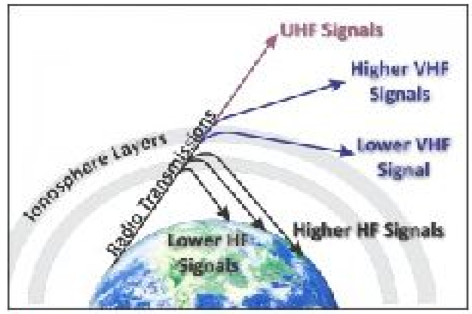
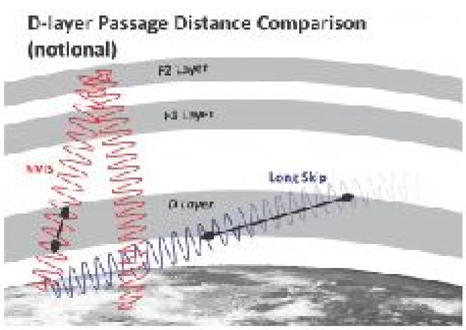
power amplifier can help to keep NVIS communications reliable. It is common for amplifiers to be employed by NVIS operators in the high daylight part of the day when the D-layer absorption attenuates signals more severely.



The bending effect of the ionosphere is greater for lower frequencies.

The D-layer of the ionosphere normally absorbs skip signals below the 30-meter band during daylight hours, so long distance skip is not effective on the low bands during the day. These bands open for long distance skip at night when the D-layer dissipates and the F-layer refracts these frequencies. However, since NVIS signals travel through the D-layer at very steep angles, the transit distance through the layer is minimized, as compared to the long skip signals traveling low to the horizon. As a result, D-layer absorption of NVIS signals is minimized, and NVIS is usually a viable technique throughout the daylight hours, with performance variations for ionospheric conditions.



NVIS propagation minimizes transit through the D-layer with steep angles.

Antenna Configuration: Perhaps the most critical factor, and certainly the most controversial among ham discussions, is the antenna configuration for NVIS that produces the best vertically directed signals. Let's consider the basics first, and then we will address some details that are not universally agreed upon.

A horizontally polarized antenna provides the best NVIS propagation. A wire half-wave dipole trimmed for the frequency of use is very effective and also the most common type of antenna used for NVIS. Horizontal full-wave loop antennas are also very effective. In the half-wave dipole case, a flattop configuration or mildly down-sloped inverted V configuration works well. But, regardless of the specific type of horizontally polarized antenna used, the key factor in configuration is *the antenna's height above ground.*

To direct the greatest portion of the transmitted signal vertically, the antenna must be positioned relatively low to the ground. The interaction of directly radiated signals with ground reflections results in more signal strength radiated in the vertical direction when the horizontal antenna is much less than ½ wavelength above the ground. Height above ground is usually less than ¼ wavelength for the NVIS technique, and much lower heights are preferred by many operators due to reported performance improvement. A height of 1/8 to 1/10 wavelength is often used for effective NVIS. On the 40-meter band a dipole elevated just 4-meters (13 feet) above ground can provide very effective NVIS propagation in a radius of several hundred miles.

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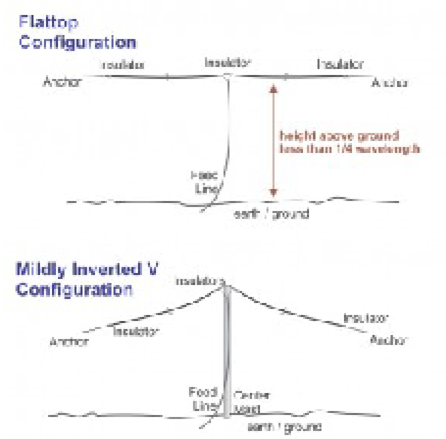
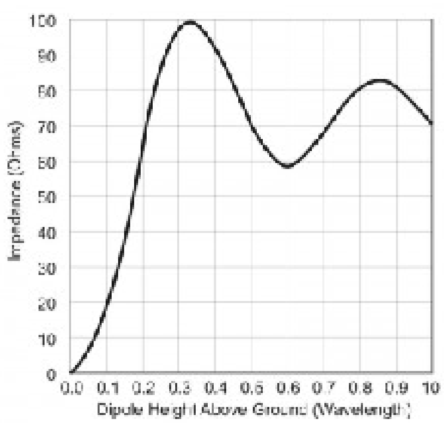
The precise height above ground for the very best NVIS performance is not a well-agreed value. Antenna models reported by Jack Swinden W5JCK (and based on work of L.B. Cebik W4RLN) seem to point to best performance on 40-meters at 0.175 wavelength (7 meters, ~21.7 feet) above ground, and on 80-meters a height of 0.165 wavelength (13 meters, ~41 feet). Pat Lambert WØIPL has conducted extensive objective data collection in Colorado and reports an experience of better coverage with a height of only 1/20 wavelength above ground. He notes that noise is significantly reduced as the antenna is lowered below 1/8 wavelength, and that communications with close stations (up to 300 miles away) was greatly enhanced with such low antenna height, particularly using the 80-meter band.



Half-wave dipole antennas are great for NVIS, positioned a fraction of a wavelength above the ground.

Other Factors: Beyond the antenna height, power, and frequency, other factors will impact performance. The height above ground effects the dipole feed point impedance. As the dipole is lowered below ¼ wavelength the feed point impedance will be significantly reduced in value, and SWR may rise. For best performance, trim the dipole antenna while at the height at which you intend to use it.



Approximate impedance of dipole antenna for height above ground in units of wavelength.

The local ground conductivity will impact performance, with the poor conductivity of rocky or sandy and dry soil reducing antenna gain. With a more conductive ground, such as richly conductive and moist soil, antenna gain will improve. This brings up another less-than-solidly-agreed factor, the use of a parallel ground wire under the horizontal dipole element. You may think of this arrangement as a vertically pointed, two-element Yagi directional, with the ground wire providing an enhanced "reflector" element.

A parasitic wire reflector is usually implemented 5% longer than the driven element, or 5% longer than the half-wave dipole, and positioned below the driven element. The distance below the driven element is usually recommended as 0.15 wavelength, although other values are also advocated. Various sources recommend the ground wire be elevated above the surface of the earth 0.01 to 0.06 wavelength (1.24 to 7 feet for 40-meters) for best effectiveness and least impact on the antenna's SWR bandwidth. Implementing the wire reflector narrows the SWR bandwidth somewhat, and Jack W5JCK

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indicates a substantial narrowing of 25% to 50% with the reflector wire on or near the earth. Further, his data claim a transmit gain with such reflectors of only 0.2 dB to 0.7 dB in the best cases, putting into question the value of the ground reflector wire. On the other hand, Pat WØILP reports up to 6 dB improvement of the transmitted signal with some experimental ground wire configurations he has tried.

The upshot of these conflicting data and reports is that the arena of NVIS antenna configuration is ripe for experimentation! It is most likely that the variation among models, reports and claims is a result of uncontrolled factors that impact NVIS antenna performance. Soil conductivity, height above ground, reflector element implementation and configuration, other RF-coupling conductors in the vicinity, varying atmospheric conditions, transmitter power levels, transceiver and feed line quality, precision of signal strength measurements, and perhaps many other things can impact the measured performance of the NVIS antenna. So, perhaps the best policy is to familiarize yourself with some of the theory of these factors and then try a few things to see what seems to work best for your specific situation.

The Bottom Line on Antennas: If you are not aiming for the very optimal NVIS station by manipulating the somewhat controversial factors above, a horizontal wire positioned a fraction of a wavelength above the ground will likely provide you quite acceptable short radius communications via NVIS propagation paths. I often erect a 40-meter wire dipole in a gentle inverted V or flattop configuration at 1/10 wavelength (13 feet) above ground, with no reflector ground wire and above my absolutely terrible Colorado rocky, dry soil. With a 100 watt signal I frequently make clear contacts of 25 to 500 miles. The following describes my NVIS portable antenna solution, only one of many different ways to implement such an antenna.

A 40-meter NVIS Portable Dipole Concept: I constructed this 40-meter dipole to readily switch between wire elements and loaded hamstick elements. The center mast connecting component is the MFJ-347 Double T Pipe Mount. It mounts easily to any mast up to 1/25" diameter, and I use an extendable painter's pole

supported by a second-hand utility spotlight tripod. This MFJ connector sports an SO-239 coaxial connector and two standard 3/8"– 24 thread antenna mounts. One threaded mount is electrically connected only to the coax center conductor, and the other only to the coax shield, as required for a dipole antenna. Simply connect the pair of dipole driven element conductors, one to each mount, and you have a simple dipole antenna. With the MFJ connector mounted to the painter's pole extended up to 13 feet, and with the driven element properly extended and anchored at the end points, the NVIS dipole is ready to operate.

The wire dipole element is connected to the MFJ-347 mount using soldered ring connectors, star washers, and 3/8"-24 bolt.

For the full-length wire dipole, I connect a pair of 3/8"-24 thread bolts to the MFJ-347, and ring connectors with the dipole wire soldered solidly into them are snugged down using star washers and nuts.

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Both radiating wire elements and coaxial cable connected, ready for deployment.

Alternatively, I sometimes opt for the convenience of two 40-meter hamsticks, specifically MFJ-1640T Hamtennas. The Hamtennas each fit into the same 3/8"-24 mounts, replacing the wire elements. The SWR bandwidth is narrower and performance is somewhat reduced (roughly -3 dB) when using the loaded and

shortened sticks rather than the full length wire, but the stick dipole antenna can be quickly deployed with my portable station and it provides acceptable NVIS communications in most instances.

NVIS is one of my favorite operating techniques. I really enjoy connecting with hams in my local region, and NVIS is terrific for emergency communications across the local area outside of repeater range, or in the case of repeater failure. Throw up your own low altitude wire dipole and give NVIS a shot!

NVIS wire dipole deployed along with the truly ugliest "Ugly Balun" in the history of ham radio.

–WØSTU

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Related Articles and Topics:

General Question of the Week on NVIS, G9D02
Your First Dipole in Shack Talk, by Bob KØNR
Trimming a Dipole Antenna, Ham Radio 101, by Stu WØSTU

40m NVIS using hamsticks

The Builder's Corner—K1EL Keyer Project—N3FEL

The paddle keyer introduced here provides a fully implemented keyer and touch paddle implementation for the beginner and the purist alike in the art of Morse code sending. I built this keyer kit after building another of their products, the K16 battery powered kit. In this article I will describe my experience in its construction and suggest techniques others can use to duplicate and improve on my effort. I cannot and won't even try to describe all that this little chip and circuit card can achieve. Instead, I encourage anyone interested in obtaining their own CW keyer to research and download the keyer instruction manual per the reference at the close of this article. I would like to point out just some of the features I like the most. It is not just an accurate dot-dash generator with precise character spacing according to programmed parameters, but also a multi-slot message server with dynamically allocated message length. It includes its own variable audio frequency sidetone generator. The operating speed can be set with a manual potentiometer so that operating speed can be temporarily slowed at the benefit of a wide community of operators. The circuit includes a buffered output transistor capable of keying most modern transmitters up to 60VDC input in the low milliamp range. It includes a 5v low voltage regulator to accommodate a wide range of input voltage from 7-13.5 vdc.

I ordered the K1EL keyer about a year ago and never had reason to build it. Why bother? I already had another way to use my iambic key for CW dot and dash formation and messaging when using my Dell computer running a freeware code named CWType. That package used the parallel port of the Dell to transform the dot and dash contact closures and an output line for PTT and another for Keying. Steve Birnbaum and I built about a half dozen for club use as a CW training tool. We called it KID, Keyer Interface Device, and it cost about $5 each in parts and about a half-hour to build. The KID and CWType included all of the functionality I required and up until a few years ago was all that I used in the shack and at Field Day. Sadly, the days of the parallel ports have gone, and although I still have a desktop and an ancient laptop with such an interface, it is far less convenient to use than desired. What I wanted now is a handy keyer that is inexpensive, lightweight, fully functional, and a stand-alone solution – no computers needed.

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I had already built the K1EL K16 CW Keyer last year but used the breadboard implementation only when CWType software was inconvenient to realize. I researched other products from Steven Elliott, K1EL and decided to try his paddle keyer kit. Out went the $26 and in came the bag of parts. I must admit that I was drawn by the thought of a self-contained keyer solution with the key included. As an added incentive the chip solution included nearly all of the functionality provided on the K16 chip, which has all and more of every conceivable function programmed in. Far more than anyone would need, including twelve 236-character non-volatile message memories.

The kit of parts includes the paddle and electronics, but not everything for a complete solution. Still needed were the key pad, connectors, push buttons, battery supply, external speaker and foundation or enclosure. I chose both of the latter – a foundation for the circuit board and an enclosure for the rest of the parts. I suppose a well-stocked workshop could provide many of the electrical components, but the primary features of the kit are the pre-programmed PIC IC

The Builder's Corner—K1EL Keyer Project—N3FEL

and the touch paddles. Buying the complete kit cut down the procurement time. I bought the switches on EBAY and scrounged the potentiometer (speed control) and wires from my junk box. They also could have been purchased on EBAY. I needed a way to interface the board with the control panel and found an old parallel printer cable that yielded most of the lighter gauge stranded wire in all of the colors of the rainbow. (If you can find any of these cables at the next flea-market, do yourself a favor and buy a length.)

It is a well-designed keyer kit, but the K1EL Paddle Keyer kit demands a certain level of dexterity to organize the parts and assemble the board. I would rate it as an intermediate skills project since sensitive electronic components and a somewhat densely-populated board is involved. Those experienced in small board assembly will have no difficulty with the through-hole components and silk-screened bare-board. Those challenged by soldering connectors and battery connections should consider working with a mentor to learn the needed skills and practice the techniques of circuit assembly. As seen in the figure, I used a soldering station assembled from electric wiring devices and boxes, a dimmer switch for heat control and a dollar-store ashtray for the tiny wet sponge and place to park the hot iron. Highly recommended is the use of a 32 x 32 piece of ¼" masonite board as a table protector. The only thing missing here was the shop light with magnifying glass. While I had a few of the articulated desk lamps, none had the magnifying glass. (I hope to procure one of those at the next flea market.) In the meanwhile, a large hand-held glass from the local DollarTree store will suffice.

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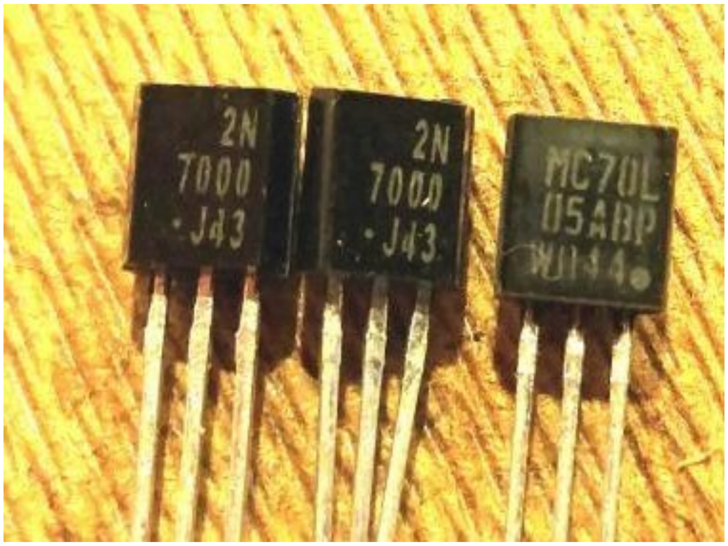

Thanks to cell phone cameras, we have a very high resolution magnifying glass by our side. The tiny electronic components usually have some form of marking on their cases to identify which of the thousand variations they possess. Putting one these components in the wrong socket and powering them up could result in improper performance if not catastrophic failure. The trick to using the cell phone camera is find the best non-glare lighting and to steady the camera as close as its focusing control will allow. For the LG G4 that I use, focusing is made easy by touching the screen at the point in the image where best focus is desired, then to actuate the electronic shutter and wait for the feedback signaling that the image is recorded. Occasionally, a bit of post-processing was required after downloading the image to software. The final picture shown in the figure was enhanced by first cropping the desired image, increasing the brightness and contrast until the desired information popped out. What you see is what I got. The two transistors on the left are actually field-effect transistors and the one on the left a 5v three-terminal regulator. The circuit was designed with the regulator making it more tolerant of a variety of input voltages from 7 to 13.5 volts.

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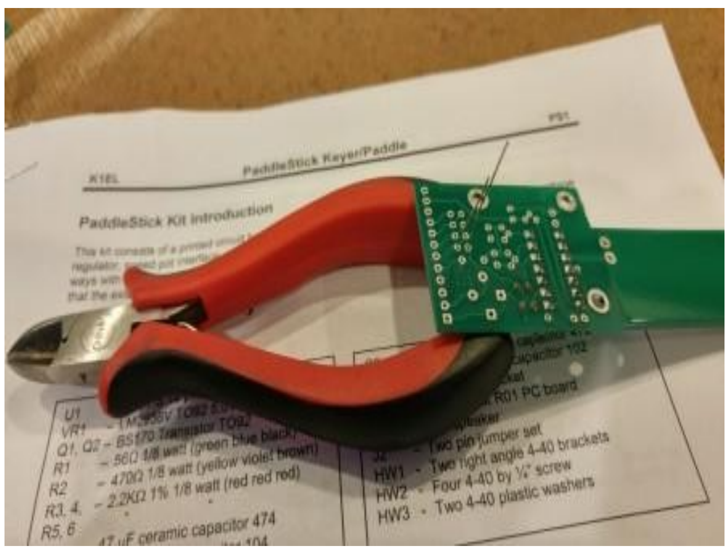
The DVM and/or its analog equivalent are the most useful tool in the shop for the electronics assembler. Electronic components are getting smaller and smaller as the operating currents decrease with advancement in technology. It's very easy to mistake one value for another even if the color codes and markings are visible. Fortunately, the K1EL keyer supplies most of the tiny parts and each of the correct value. But it's still possible to select the wrong part for assembly. So, I routinely checked the value of each resistor before inserting it into its silk-screened assignment. (Regrettably, one of my better DVMs has bitten the dust. So, I am on the lookout for better, more accurate tools and look forward to a great flea market shopping season for bargains. EBAY also have numerous vendors for these tiny test devices; one circuit I've been reviewing is the Mega238 LCR, a multipurpose inductance, capacitance, resistance and transistor tester, and expect to order one in the very near future.)



Small electronic working tools are needed for handling today's microelectronic components. I suggest acquiring the best available as the better quality tools will last a lifetime of use. The diagonal pliers shown in the picture is not my favorite for snipping wire, but they do well to hoist the board to a manageable angle for soldering. A better solution would be to use a jig for holding the board. They come in a variety of format from a pair of alligator clips on a weighted base to a more elegant platform with brackets and swivels. The board for the keyer is small with few components so the use of the pliers' handles was sufficient. (Now, when I start that next 40m transceiver project I'll be sure to use better board holding jigs.) One word of advice, stay out of the dollar stores when purchasing your tools. The professional tools found at Home Depot or Lowes can be very expensive, but they won't disappoint. Some of the tools at Harbor Freight are usable, but shop wisely.

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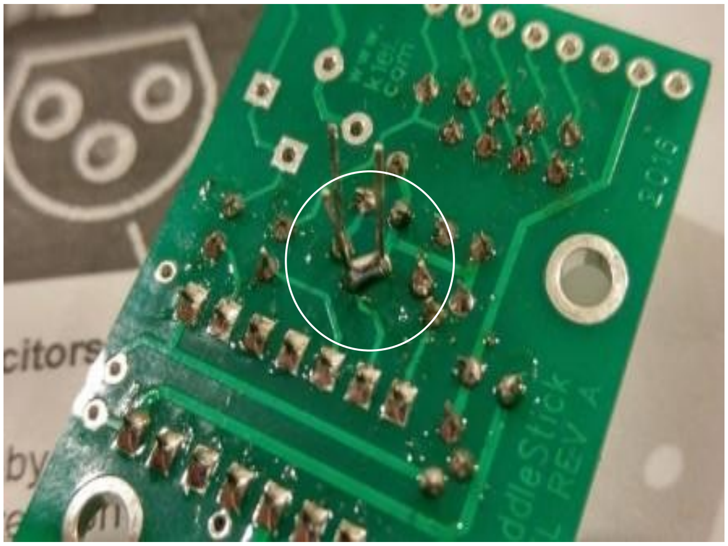
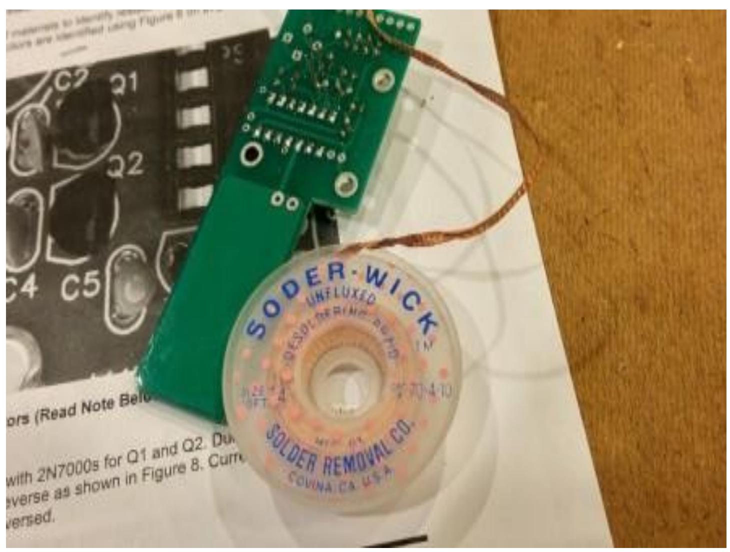


All components are through-hole making the board larger than it could otherwise be, but a lot easier to assemble for the average builder. Each component was soldered in place using a clean iron tip at the coolest temperature necessary to melt the solder and result in a secure weld. No cold solder joints please! The technique I use is to insert the component with just bit of air space between it and the board – maybe a 1/16" at the most to allow for effects of temperature expansion/contraction, inspection and possible removal later. In the old days we used a service loop on one side of the component, but I haven't seen that done for a while. I then will invert the board and heat up the connection a moment before adding a tiny bit of solder, then holding the iron until a good weld occurs. Be still! Any shaking will result in a cold solder joint. Too much solder can result in a solder bridge across two joints, which occurred as shown in the circle. These solder bridges are easily fixed. I don't use a solder sucker, instead a use a solder wick.



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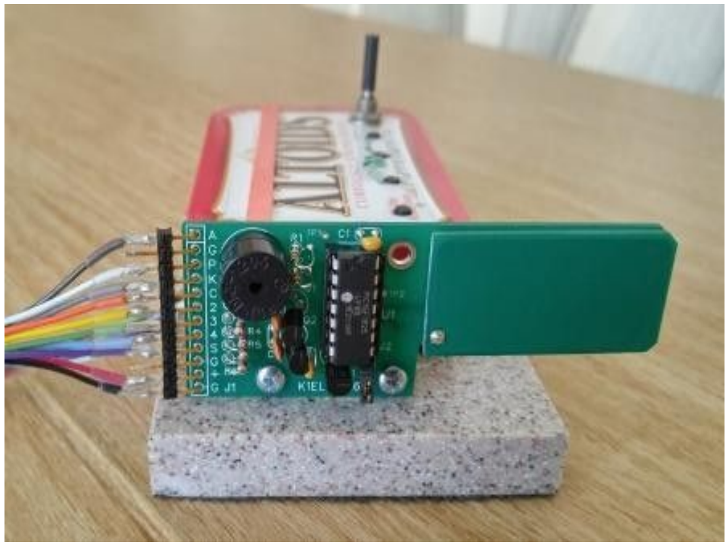
It does just that when placed over the bridge and heated by the iron's tip. The melted solder flows quickly into the wick and away from the bridge. So much so that additional solder is often required to complete the desired weld. This repair made, it's on to the next component and completion of the board assembly. Rather than describe every step in the assembly, I instead direct the reader to the very fine installation instructions provided in the keyer manual. When the entire board is assembled, inspect for solder splashes and inadequate solder welds before moving on to the wiring of the keyboard and interface cable.

The keyboard provides convenient access to the memory keys and speed control. It can take a variety of forms depending on the builder and how operators find it most comfortable to use. The command key is located on the far right. This key is used not only to place the keyer chip in its programming mode but to call for message no. 1 when already programmed. Since there are six messages in each of the two banks, it is possible to program up to twelve messages. In my experience six messages are plenty for contesting. Note that there are only four buttons. That's because depressing the command key and immediately thereafter key 2 or 3 calls for message 5 and 6 respectively. But the command key can't be depressed too long; else the keyer will be commanded into programming mode. The microcode is incredibly immune to user programming errors, but a general reset is available if all else fail. At this time there is only one other control – the speed potentiometer. A twist of the knob to its most counter-clockwise setting will signal the processor to send code at a user-programmed favorite speed, which for me is 18 WPM. The minimum and maximum speeds using the control are also user-programmed. In my case I allow the speed to vary from 15 WPM (slow enough for beginners) to 25 WPM (fast enough for contesting.) By the way, speed is typically calibrated as the number of times the word PARIS can be sent in 60 seconds. Therefore, if it takes three seconds to send one PARIS word, the speed is twenty WPM. Oh yes, the rubber band holds the lid down until internal access is desired. Not shown are the four velcro squares holding the tin box onto the plastic platform.

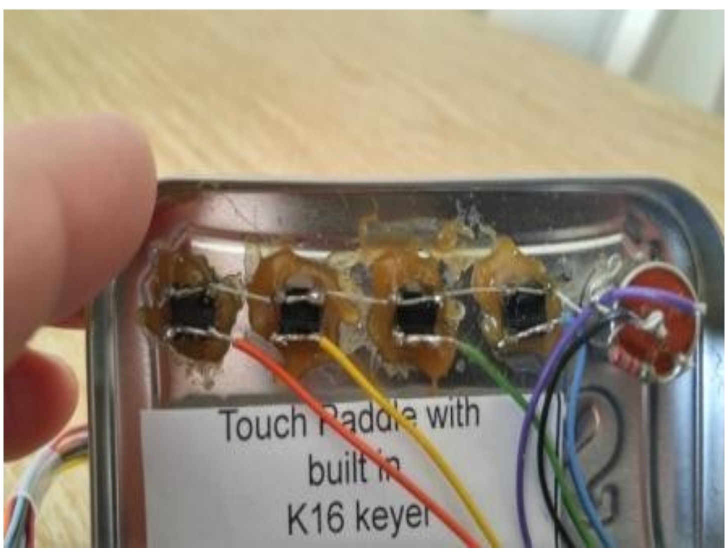
The Builder's Corner—K1EL Keyer Project—N3FEL



Maybe the circuit board is precariously exposed, but it does present the ingenuity of the design for the casual and curious observer. On the far left of the board are the connections to the keyboard, speaker, output and power supply. As mentioned above, the use of color-coded wires made it easier to connect the bundle and route the conductors to their correct locations inside the box. In wiring my board I had fewer conductors than terminal points, but the designer provided multiple grounds that appeared to be common, so I chose not to bring them all into the tin box. My hunch to exclude all but one of the grounds proved valid. Here's a suggestion, find a way to connect the cable to the board via a strip connector rather than direct soldering. Eager to complete my assembly, I was too impatient to do the research and procure the connector. This at the expense of making future packaging changes more difficult. Now wired, the next challenge was packing all of the external components into the tin box.

The Builder's Corner—K1EL Keyer Project—N3FEL

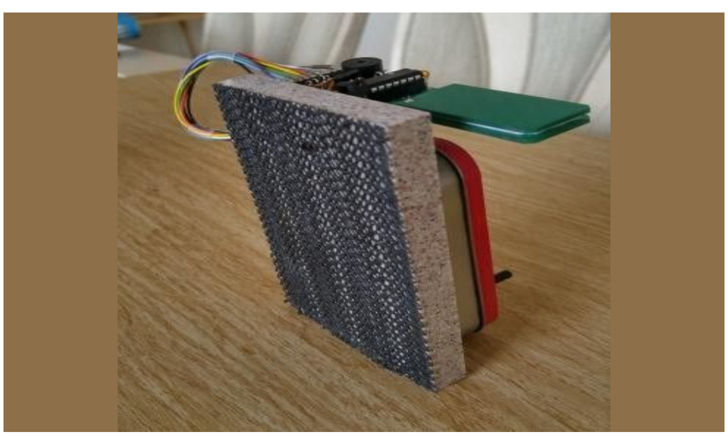
There's not a lot of room in the Altoids tin box, but with a bit of space-rationing everything needed fit inside. First to be added were the pushbutton key array and speed potentiometer located along the top edge. I drilled holes just big enough to allow the button of switch to protrude without binding on the edge of the hole. Were I to do this over again, I would make the hole diameter a bit larger. Not wide enough for the switch to fall through, but wide enough to allow a bit of movement in the switch body during the gluing. I then located the speaker and 9v battery in a way that the lid of the box would close without interference. Having done that, I found an opening to accommodate the output jack. Then I created a through hole to pass the cable bundle from the external pc card. Thus having drilled all of the holes in the tin box, I now could begin the mounting of the components. I routed the cable bundle first using the jacket of the bundle to protect the wires from the sharp edges of the box. I then glued in the small speaker, pre-wired and mounted the output jack, and mounted the battery in its assigned location. Two properly spaced holes in the bottom of the box and a light duty tie-wrap were all that I used to hold down the battery, while periodically check that the top lid would close securely. Once the major components were mounted, the next task was securing the pushbuttons in place.



The switch buttons were just long enough to protrude through the thin metal lid of the tin box. Use of a more substantial switch with a threaded collar would be easier to mount. Though cheap enough, the snap switches required a permanent ring of glue applied by a hot-melt glue gun. No second chance available here, it either worked or had to be reheated and replaced with another switch. A few failed attempts provided enough practice to successfully finish the job. To complete the wiring of the box, I made sure that all wiring was significantly longer than needed so I could fold them inside in a way to permit opening and closing of the lid.

The Builder's Corner—K1EL Keyer Project—N3FEL

Whether the keyer is used for sending CW with a transceiver or for Morse code practice, this little system is ready for action. I installed a 1/8 stereo jack at the rear of the tin box for convenient interface to a transceiver. A simple setting in software is possible to switch the keyer function from an iambic paddle function to be used with a transceiver that has an embedded keyer function to a full-function memory keyer that K1EL programmed into the PIC IC. I often use the keyer with as code practice iambic paddle to enhance my sending ability. To increase the audible level I installed a miniature speaker in the tin box. Sending CW is a great stress reliever, so I like to keep it nearby my Dell keyboard and will break into a sentence or two of fast CW sending to relax and collect my thoughts. I set it at the highest speed on the potentiometer to challenge my dexterity. K1EL also included a CW practice mode that will challenge the operator at whatever speed is set. I will soon add a headphone jack to the internal speaker circuit so that I can practice my code and not disturb others in the room, (a must-have addition for taking the keyer to work.)



The Builder's Corner—K1EL Keyer Project—N3FEL

Although the keyer foundation is a substantial piece of thick plastic countertop, it does not provide enough weight to prevent lateral movement even with light key presses for the dot and dashes. I decided to increase the friction of the undersurface by applying a rubber shelf liner coating glued onto the bottom with simple paper glue. This provides a simulated fixed foundation for this touch paddle keyer.

Looking back, this project is a satisfying effort providing me a tool to develop my CW skills. What makes this little keyer different from others is how compact it is and that it includes the paddle and a self-contained battery. It's not battle proof due to its exposed circuit card but it is an attractive and useful device that should be interesting to the younger members of my family. I look forward to showing this keyer to my grandchildren and hope it will capture their attention and introduce them to the fun of Morse code.

Improvements recommended for this project:

- Enclose the circuit board portion of the keyer to expose only the paddles.
- A headphone jack for private listening.
- An on/off switch to conserve battery while off.
- A plug and socket to disconnect the circuit board from the keyboard.
- An external 12v input to bypass the battery.

References:

K1EL Keyer, http://k1el.tripod.com/PS1.html or Google "K1EL Paddle Stick PS1"
Paddle Stick Manual, http://k1el.tripod.com/files/PS1man.pdf

January 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
	New Year					
7	8	9	10	11	12	13
Technet 8PM						NAQP CW
14	15	16	17	18	19	20
Technet 8PM NAQP CW	PWA E-Board Meeting 7:00PM MLK Holiday			Embedded Processor Class		NAQP SSB ARRL VHF
21	22	23	24	25	26	27
Technet 8PM NAQP SSB ARRL VHF	PWA General Membership Meeting 7:30 P.M. ARRL VHF			Embedded Processor Class		
28	29	30	31			
Technet 8PM						

February 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
				Embedded Processor Class		
4	5	6	7	8	9	10
Technet 8PM				Embedded Processor Class		
11	12	13	14	15	16	17
Technet 8PM	PWA E-Board Meeting 7:00PM			Embedded Processor Class		
18	19	20	21	22	23	24
Technet 8PM				Embedded Processor Class		
25	26	27	28			
Technet 8PM	PWA General Membership Meeting 7:30 P.M.					

Volunteer Examiners

Take the FCC Amateur Exam...

Our ARRL/VEC VE Team is ready and willing to administer any license grade/upgrade or code element test. Confirm your intention to test with Ben Johns, VE Contact at 215-657-5994 not later than the Friday evening before the 4th Monday of the month. Please advise us in advance of any special needs you may have in successfully completing the intended test. Our testing session begins promptly at 6:30 pm and remains active until all license grades desired are administered. We do not recommend, nor is it our practice, to administer repeat examinations of similar license grades to any candidate. However, progressive license grades may be attempted by any applicant at no additional charge. Please come prepared with the following items.

- Confirmation of appointment letter, email, note, etc. Walk-ins are not guaranteed a test session.
- Test fee of $15 in cash or personal check payable to ARRL/VEC.
- Either of the following ID methods:

  - One legal photo ID (driver or non-driver license, passport, radio*telegraph* license, or other legal photo ID)

  OR

  - Any two of the following IDs: Non Photo ID/Driver License, Social Security Card, Birth certificate, Minor's work permit, Utility bill, bank statement, business correspondence specifically naming the person, postmarked envelope addressed to the person at their mailing address as it appears on the FCC Form 605

- Any of the following ID numbers: Taxpayer ID (Social Security Number), IRS issued EIN (Employer Information Number), Alternate taxpayer ID Number (ATIN), FCC Issued Registration Number (FRN), FCC Issued Licensee ID Number
- The **original** plus one copy of your FCC license or CSCE (Certificate of Successful Completion of Examination). The original will be returned immediately to you.
- If applicable, a Physician's Statement if necessary to validate your claim of difficulty at reading, writing or speaking when requesting special assistance.
- A calculator is recommended and allowed if ALL internal memories are cleared and can be demonstrated free of information. A simple four-function calculator is suggested.
- One or more black-lead pencils and eraser, and a ball point pen.

Good Luck!

Penn Wireless Association
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APPLICATION FOR MEMBERSHIP

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Home Phone: ___________________________ Cell Phone: ______________________________

Birth Date: _____________ Occupation: ______________________________ [] active [] retired

License Information:

Call Sign: _______________________ Class: [] Novice [] Tech [] General [] Advanced [] Extra

Date First Licensed _______________ Previous Calls: ___________________________________

Preferences:

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Bands/Modes Frequently Operated ____

Emergency Power? _____________ Portable/Mobile? __________________________________

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[] Rag Chewing	[] MARS	[] Field Day	[] QRP
[] Projects	[] Newsletter	[] Fund Raising	[] Renewable Energy
[] DX'ing	[] Fox Hunting	[] Public Service	[] QSL Card Collection
[] County Hunting	[] Packet Radio	[] Rig Restoration	[] _________________
[] Education	[] Hamfest	[] Antennas	[] _________________

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PENN WIRELESS ASSOCIATION

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	dennis.powell.bcitruck@gmail.c0m
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VEC Contact	Ben Johns	K3JQH	k3jqh@arrl.net
VEC Coordinator	Cully Phillips	N3HTZ	n3htz@verizon.net
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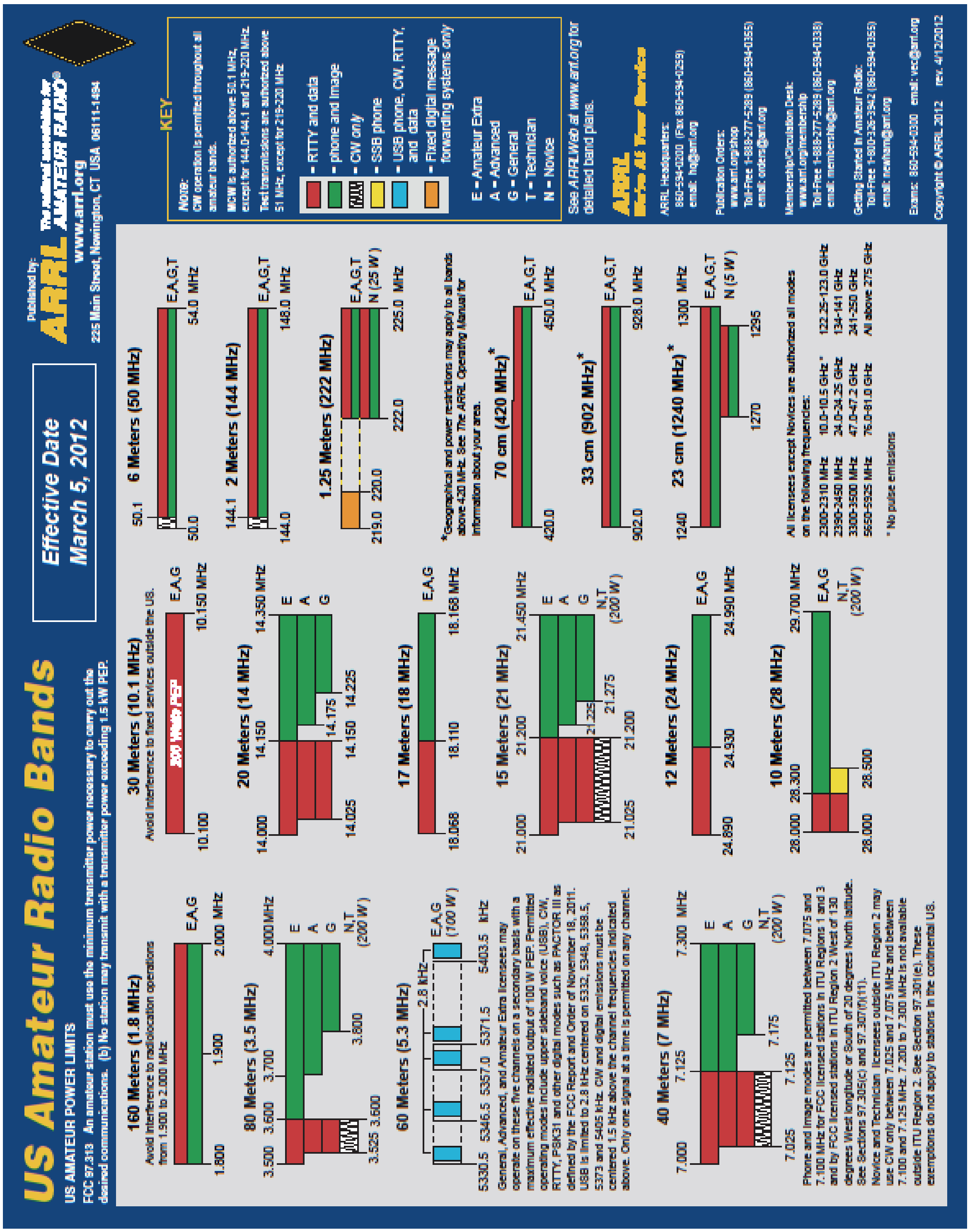
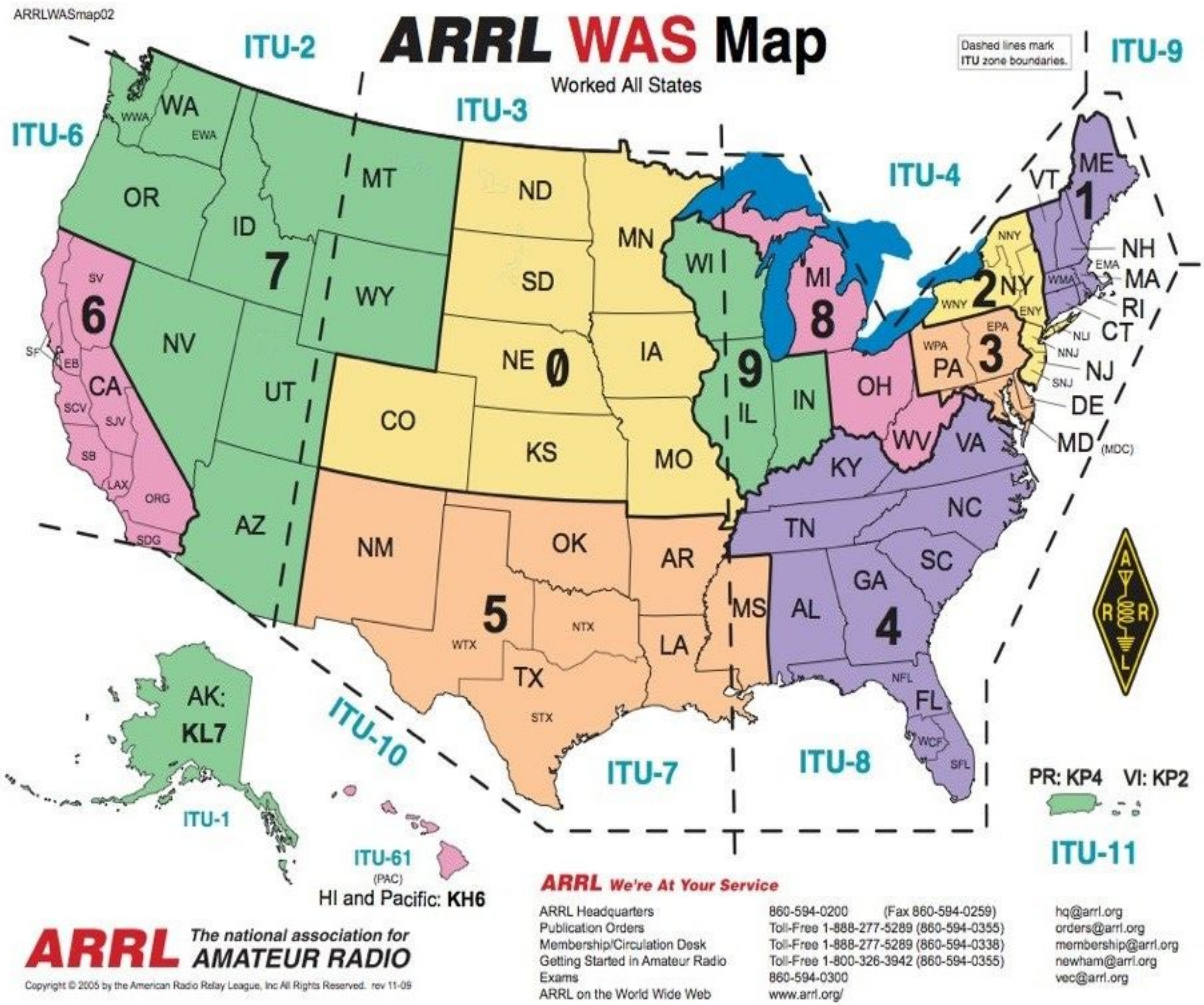
U.S. Amateur Radio Bands




ARRLWASmap02
ARRL WAS Map
Worked All States
Dashed lines mark ITU zone boundaries.
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ITU-2
ITU-3
ITU-4
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ITU-7
ITU-8
ITU-9
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ITU-11
ITU-61 (PAC)
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