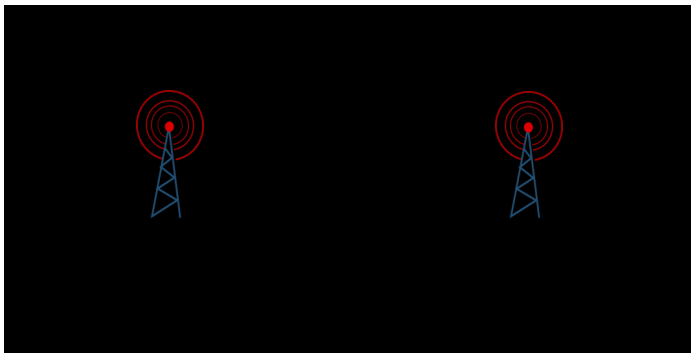
Lewisville Amateur Radio Association



From the President's Shack, Ron Ford, KF5OMH:

Roger, AE5EZ, showed us how he catalogs "How To" articles from each issue of QST at the January meeting. Although he didn't have all of 2019 complete, he promised to update the file and we'll post it to the web site when he is finished. This is a fantastic way to keep an archive of potential projects without storing a stack of magazines.

The election of officers for the 2020-2021 club year is drawing close. Nominations will close on March 31 at 1700 (5:00 PM). Ballots will be distributed shortly thereafter and voting will close April 17 at 1200 (12:00 PM). I would like to encourage all members to consider taking a leadership role in the organization; after all, this is YOUR club, so how about stepping up to help lead it. The elected positions are President, Vice President, Secretary, Treasurer, Technical Director and Operations Director. Job descriptions can be found in the by-laws on the web site. Just an administrative note – the office of President must be filled by a new candidate this year as I will have served two terms which is the max permitted by the by-laws. If you would like to put your name in nomination or nominate another individual contact Steve Kline, W5JK, the election coordinator.

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Web Site: W5LVC.org

Check us out

facebook.com/w5lvc/

Lewisville Amateur Radio Association
Is a 501(c)(3) organization

LARA Upcoming Events

Business Meeting

8:00 AM Saturday
February 15, 2020
Lewisville Central Fire Station
188 North Valley Parkway
Lewisville, TX

Weekly Nets

"Information and Help Net"

Wednesday, 7:00 PM on 145.170
PL 110.9, -.600 repeater

Saturday Breakfast

(except 3rd Saturday)

Main Street Cafe
208 E. Main Street
Lewisville, TX 75057

Association Contact Information

Email: W5LVC.Club@gmail.com

Mailing Address:

LARA, P.O. Box 292282
Lewisville, TX 75029

Welcome New Members

Matthew A. Keathley, KG5MVZ

2019-2020 Officers

President
Ron Ford, KF5OMH
rfavcon@verizon.net, 972-742-7839

Vice President
Roger Carver, AE5EZ
Ae5ez.radio@gmail.com, 817-966-3412

Secretary
Ron Swain, KG5VIV
Lronswain@gmail.com, 210-410-2008

Treasurer
Clark Highsmith, K5LGX
alacrity@bennoah.net

Technical Director
Jim Horton, WB8YWA
wb8ywa@arrl.net, 972-523-8467

Operations Director
Mike Reitz, W5EVT
w5evt@sbcglobal.net, 214-535-1368

VE Coordinator
Steve Kline, W5JK
skline4@verizon.net, 972-679-6288

Public Information Officer
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meweston55@gmail.com, 460-781-5803

Youth Education Coordinator
Perry Abernathy, NE5ET
desertyachter@gmail.com, 505-221-3993

Newsletter Editor
David Jackson, W5YS
w5ys@aol.com, 940-345-0060

"THE ARRAY"

EVENTS

General License Classes

The Lewisville Amateur Radio Association (LARA) will be conducting a General Licensing Class with the classroom sessions being conducted on March 7, 14, and 21. The class will be held at the Lewisville Central Fire Station, 188 N. Valley Pkwy in the Training Room located at the rear of the station. Entrance is adjacent to the fuel pumps.

The preferred text for the class is the Gordon West 2019-2023 General Class Study Manual which is available at Amazon.com, local book stores or the Gordon West web site, W5YI.org. An alternate manual is the ARRL General Class Study Guide. Both manuals contain the same material only presented in a much different manner.

To successfully pass the test the student must spend self-study time prior to the classroom sessions reading and taking practice tests. Once you register for the class a training coordinator will contact you with pertinent information to prepare you for the self-study and classroom sessions.

The fee for the class is $15.00 payable in advance through PayPal on the LARA web site, w5lvc.org. Click on the Training tab and use the PayPal button at the bottom of the page. We'll also accept your personal check mailed to LARA, PO Box 292282, Lewisville, TX 75029. This fee will also cover the testing fee at the end of the class.

The test will be administered on March 21 following the final classroom session. You must bring a non-returnable copy of your Technician license along with two forms of identification, one of which should be a picture ID.

To register complete the General Class Registration on the web site and submit your payment for the class. Once the payment is received a training coordinator will contact you at the email address provided.

Questions can be directed to Jim Horton, WB8YWA@arrl.net.

The President's greeting, from page 1

Winter Field Day was a fun weekend. There was a good turnout with over 200 contacts made. Speedy fingers Steve, W5JK worked the CW frequencies to really bolster our contact count. Several members made their first HF contacts on Saturday morning. Now it's time to be shopping for those HF rigs. See a recap of the event elsewhere in the newsletter.

If you are interested in taking SKYWARN training, it will be conducted on February 22, 8:00 – 12:00 at the MCL Building on the TWU campus in Denton. If you are an ARES member or are contemplating ARES membership this training is required at least every two years. Even if you're not interested in ARES activity this training is good knowledge to have in your toolbox and it's free.

Are you a Technician looking to upgrade to General? Here's your opportunity coming up in February and early March. LARA will be conducting self-study guidance and classroom sessions in the near future. See details elsewhere in this newsletter.

YOUR club is in need of some help. Effective with the May issue of this newsletter we are in need of an editor. David, W5YS, is unable to continue with his efforts. We're also in need of a web master to take over the club web site. Unfortunately, it looks like I will be out of pocket for part of the year and will not be in a position to keep up with the site. Please, please, please get active in your club and help out with one of these projects.

Looking forward to seeing everyone at the meeting on February 15. Come out and bring a guest.

73, Ron KF5OMH

TECHNICAL DIRECTOR

Jim Horton, WB8YWA

Information and Tips - Are older radios any good today when compared to today's high tech radios?

By Jim Horton, WB8YWA

One would think that a radio designed in 1970 would not hold up much to a radio that is designed with today's technologies. Certainly the feature will not be there. So lets look at two radios that are pretty much top of the line. The Drake C Line for our 1976 radio and the ICOM 7610 for our current radio.

The Drake C line – 1976 Cost new $1,299

The ICOM 7610 – 2019 Cost new $3,299

First let us look at the cost difference of these two.

Drake – in 1976 the average wage was $9,226 and the cost of the Drake was $1.299.

$9,226 / by $1,299 = **14%** of your yearly average wage

ICOM 7610 – 2019 the average wage was $46,800 and the cost of the ICOM was $3,299.

$46,800 / by $3,299 = **14%** of your average wage.

So now we know we are/were paying the same for each of these radios. I find that very interesting.

Frequency coverages:

Drake 1.8 to 29.8 MHz including all the frequencies between the ham bands, transmit and receive. **No six meters**.

ICOM .5 to 54 MHz continuous for receive and transmit 160-6 Meters.

Modes of Operation:

Drake USB, LSB, AM, CW & RTTY

ICOM USB, LSB, AM, **FM** & RTTY

Filters:

Drake special purchase option for three different filters.

ICOM comes with filters and includes roofing filters that are programmable.

Both have Band Pass Tuning. Both have Notch Filter.

Power Output: Drake can output **140 watts**. ICOM 100 watts

Receiver sensitivity:

Drake: For years the R4C was considered one of the best in receiving sensitivity and signal to noise ratio. Data can be found at Sherwood Engineering Labs who is considered one of the best testing labs for amateur radios. http://www.sherweng.com/index.html

Today there are many radios that exceed the Drake but it is still toward the top of the list. The ICOM is a better receiver then the Drake according to Sherwood and should be with the advancement of technologies. Yaesu' s new FTdx-101D is holding the top spot and the Kenwood TS-890 is right there with it along with the Elecraft K3X. These are $4,000 plus radios.

ICOM 7610 is loaded with more features then the Drake as any brand would be. Couple of biggies is the 7610 has two Independent receivers and both can be used at the same time. It has a high frequency IF which makes it filter out interference better. Also the Spectrum Scope is awesome.

So now you are thinking, why would I want an older radio? There are so many neat features on the new radios and they cost to me the same when they were new. That is true, but you will be surprised with how well the older radios work and the difference of hearing the same signal is hard to determine if they are not the same. I can tell you that comparing my ICOM 756 PROII to my Drake R4B receiver that everything the ICOM hears the Drake does also. I am sure fancy test gear could show the difference, but I copy both and cannot tell.

For me, I can still work on the older tube type radios whereas the new radios with its surface mount and computer type control it is almost impossible for me. I love my Drakes, but I also love my ICOM 756 PROII and use it far more than the old Drakes. Guess it is sort of like having and driving a 1965 Mustang or Corvette and have a brand new one. The 1965 is simple but works great against the 2019 complex car that also works well. Nice to be able to have both. Wonder how the cost would be compared to these cars.

Bottom line, you can save a lot of money by buying used older radios. You do not have to go all the way back to 1976. My 2003 ICOM 756 PROII cost new around $2,700 and today I see them all the time from $650 to $900. It is loaded with features including the Spectrum Scope.

TREASURER'S REPORT

Clark Highsmith, K5LGX

Hello Members and Friends of LARA,

My, how the time seems to fly. We are now well into 2020. Club dues were due at the beginning of the year. HamClubOnline is programmed to allow for one month's grace period. After that time, members who have not paid are moved to inactive status. If you did not pay, or, if I made a mistake, you likely received an email detailing the change in status around the 1st of February. Please contact me at alacrity@bennoah.net if I made a mistake in handling your payment and/or updating it in HamClubOnline. If you purposely decided not to renew, we will certainly miss you. However, you can rejoin at anytime and we will move you back to the active roster. Dues are $25 for an individual or $30 for a family.

The annual club officer election begins next month. I will not be running again for the treasurer's position. If you are interested in running for treasurer, I would be happy to talk with you and describe what it involves.

Clark Highsmith, LARA Treasurer
K5LGX

LARA Treasurer's Report--January 31, 2020

Checking				
Beginning				$2,670.25
Income				
	Dues		$480.00	
	Donations		$7.25	
	Events		$15.00	
	Miscellaneous		$2.00	
		Total Income	$504.25	
Expenses				
	Paypal Fees		$15.59	
	Events		$400.00	
	Club Equipment		$40.00	
		Total Expenses	$455.59	
Ending				$2,718.91
Petty Cash (Included in				$0.00
Club Assets				
	For Sale	$0.00		
	Stock (Not for Sale)	$3,009.34		
	Loaner Equipment	$375.00		
			$3,384.34	
LARA NET				$6,103.25

Support LARA with AmazonSmile

AmazonSmile is a simple and automatic way for you to support your favorite charitable organization every time you shop, at no cost to you. When you shop at smile.amazon.com, you'll find the exact same low prices, vast selection and convenient shopping experience as Amazon.com, with the added bonus that Amazon will donate a portion of the purchase price to LARA. To shop at AmazonSmile simply go to smile.amazon.com from the web browser on your computer or mobile device. You may also want to add a bookmark to smile.amazon.com to make it even easier to return and start your shopping at AmazonSmile. The AmazonSmile Foundation will donate 0.5% o the purchase price from your eligible AmazonSmile purchases. On your first visit to AmazonSmile (smile.amazon.com), you need to select Lewisville Amateur Radio Association as the charitable organization to receive donations from eligible purchases before you begin shopping. AmazonSmile will remember your selection, and then every eligible purchase you make at smile.amazon.com will result in a donation to LARA.

Kroger Rewards

If you shop at Kroger and are a member of their Rewards Program you can also support LARA by selecting Lewisville Amateur Radio Association as your charitable organization of choice. Simply sign in to your account and select us and Kroger will donate 0.5% of your eligible purchases to LARA.

Matching Funds

Many employers will match hours that employees spend supporting a non-profit with donations to that non-profit. If your employer has such a program LARA may qualify to receive these types of funds as we are an approved 501 (C)(3) organization. So, you're retired? Some companies even support a program of this nature for their retirees. Check with your current, or former, employer to see if they have a program of this nature.If 501 (C)(3) details are needed contact the club treasurer.

AREA REPEATERS

FREQ	SHIFT	PL	CALL	NAME	ALLSTAR
144.9100	none	none	W5NGU-4	DCARA DIGIPEATER DENTON	
144.9900	none	none	KC5GOI	DCARA DIGIPEATER ROSSTON	
144.9900	none	none	KD5EOC-10	DCARA WL GATEWAY	
145.1700	-0.600	110.9	W5FKN	DCARA DENTON COUNTY EOC	
145.2100	-0.600	110.9	N5MJQ	METROCREST ARA CARROLLTON	
145.4000	-0.600	110.9	NETARC	GRAPEVINE	
145.4900	-0.600	85.4	WD5U	ROSSTON TOWER	41089
146.6200	0.600	110.9	N5ERS	GRAPEVINE	
146.7800	0.600	131.8	WQ5A	WISE COUNTY SKYWARN	
146.9200	-0.600	110.9	W5NGU	DCARA DENTON	41087
146.9400	-0.600	110.9	K5FTW	FT. WORTH SKYWARN	
147.3800	0.600	110.9	K5LRK	LAARK THE COLONY	47668
147.4500	-1.000	none	W5NGU-C	DCARA EOC D*STAR "C"	
147.4900	-1.000	none	KE5YAP-C	DCARA ROSSTON D*STAR "C"	
147.9700	none	none	K5YX-10	WINLINK GATEWAY	
224.0000	-1.600	110.9	K5LRK	LAARK THE COLONY	
224.2000	-1.600	110.9	KE5GDB	DCARA DENTON	43409
224.9200	-1.600	110.9	AF5RS	AF5RS	43784
440.6625	5.000	none	N5LS	DMR MARC CC1	
440.6875	5.000	none	W5NGU	ROSSTON DMR MARC CC1	
440.7125	5.000	none	KE5YAP-B	DCARA ROSSTON D*STAR "B"	
441.3250	5.000	88.5	W5NGU	PORTABLE DCARA REPEATER	
442.1750	5.000	110.9	NETARC	SOUTHLAKE	
442.6000	5.000	131.8	WQ5A	WISE COUNTY SKYWARN	
442.6500	5.000	110.9	N5MJQ	METROCREST ARA CARROLLTON	
442.7500	5.000	110.9	KA5R	TROPHY CLUB	
442.9250	5.000	none	W5NGU-B	DCARA EOC D*STAR "B"	
443.2250	5.000	110.9	N5ERS	DECATUR	
443.3000	5.000	110.9	K5LRK	LAARK C4FM ONLY	
443.5250	5.000	118.8	WA5LIE	DCARA DENTON	
443.7375	5.000	141.3	N6LXX	ROSSTON TOWER	
443.8250	5.000	103.5	KC5BY	COPPELL HIGH SCHOOL	40666, 50187
443.8750	5.000	110.9	NETARC	DFW AIRPORT	
444.0500	5.000	110.9	W5NGU	DCARA DENTON COUNTY EOC	
444.2250	5.000	110.9	K5CFD	COPPELL	
444.5125	5.000	123.0	KE5UT	CELINA	
444.7000	5.000	110.9	NETARC	SOUTHLAKE	
444.8500	5.000	110.9	N5ERS	GRAPEVINE	
927.0500	-25.000	110.9	W5FKN	DECATUR	
927.4125	-25.000	432.0	N5LS	DENTON	
927.6125	-25.000	110.9	W5NGU	DCARA DENTON COUNTY EOC	
927.6625	25.000	none	N5LS	DMR MARC CC1	
1253.6000	none	none	W5NGU-G	DCARA EOC D*STAR "G"	
1259.2000	none	none	KE5YAP-G	DCARA ROSSTON D*STAR "G"	
1293.2000	-20.000	none	KE5YAP-A	DCARA ROSSTON D*STAR "A"	
1293.4000	-20.000	none	W5NGU-A	DCARA EOC D*STAR "A"	

Activities in Amateur Radio

from ARRL

One of the best things about this passion we call Amateur Radio is its *flexibility.* In other words, Amateur Radio can be whatever *you* want it to be. Whether you are looking for relaxation, excitement, or a way to stretch your mental (and physical) horizons, ***Amateur Radio can provide it.***

Awards — the individual and competitive pursuits that make up the tradition we call "paper chasing."
Contests — the challenge of on-the-air competition.
Nets — *traffic nets*, where amateurs pass messages on behalf of hams and nonhams, and the *casual nets*, where groups of people with common interests meet on the air to swap equipment, anecdotes and information.
Ragchewing — meeting new friends on the air.
Amateur Radio Education — Educating current and future hams brings in new blood (and revitalizes old blood!); educating our neighbors about ham radio is good for public relations and awareness.
ARRL Field Organization — Amateur Radio in general, and the ARRL in particular, depend on the volunteer spirit. As part of the Field Organization, you can exercise your administrative, speaking and diplomatic skills in service of the amateur community.
Emergency Communications — When disaster strikes, hams often have the only reliable means to communicate with the outside world. Practice and preparation are key to fulfilling this mission.
DF (Direction Finding) — If you've ever wanted to know where a transmitter (hidden or otherwise) is located, you'll find that
DFing is an enjoyable and useful skill.
HSMM (High Speed Multimedia) — Making contacts using video, voice, text, and data simultaneously on the ham radio version of a wireless Internet called the Hinternet.
Satellite Operation — You may be surprised to learn that hams have their own communications satellites! Satellite operation can be great fun and a technical challenge for those who want to operate on the "final frontier."
Repeaters — Using and operating repeaters is one of the most popular activities for both new and old hams.
Image Communications — Although it's fun to talk to other amateurs, it's even more fun to *see* them.
Digital Communications — Use your computer to communicate with stations around your town or around the world.
VHF, UHF and Microwave Weak Signal Operating — Explore the challenging, quirky and surprising world above 50 MHz.
EME (Earth-Moon-Earth), Meteor Scatter and Aurora — Making contacts by bouncing your signals off the moon, the fiery trails of meteors and auroras.
Vintage Radio — Use equipment from Amateur Radio's historic past to make contacts, enhance troubleshooting skills and put you in touch with ham radio's roots.
RTTY and digital mode contests. RTTY has never been more popular, thanks to soundcards and software that make the digital modes easy. RTTY contests sponsored by the ARRL and others provide a great opportunity to try the mode and garner contacts for digital-mode WAS or DXCC awards.

Keeping a Log Book
Keeping a log of your on-air activity is optional, so why do it? Some of the more important reasons for keeping a log include:
Legal protection — If you can show a complete log of your activity, it can help you deal with interference complaints. Good record keeping can help you protect yourself if you are ever accused of intentional interference, or have a problem with unauthorized use of your call sign.
Awards tracking — A log helps you keep track of contacts required for DXCC, WAS, or other awards. Keeping a log lets you quickly see how well you are progressing toward your goal.
An operating diary — A log book is a good place for recording general information about your station. You may be able to tell just how well that new antenna is working compared to the old one by comparing recent QSOs with older contacts. The log book is also a logical place to record new acquisitions
(complete with serial numbers in case your gear is ever stolen). You can also record other events (names and calls of visiting operators, license upgrades, contests and so forth) in your log.
Paper and Computer Logs
Many hams, even those with computers, choose to keep their logs on paper. Paper logs still offer several advantages (such as flexibility) and do not require power. Paper logs also survive hard-drive crashes! Preprinted log sheets are available, or you can create your own. Computers with word processing and publishing software let you create customized log sheets in no time. On the other hand, computer logs offer many advantages, especially if you enjoy contests, DX or awards chasing. For example, the computer can search a log and instantly tell you whether you need a particular station for DXCC. Contesters use computer logs to manage information during the contest and weed out duplicate contacts before they happen. Computer logs can also tell you at a glance how far along you are toward certain awards and help with
printing QSL labels. And of course computer logs make it easy to submit your contacts to ARRL's online Logbook of The World. Computer logging programs are available from commercial vendors. Some are general purpose programs, while others are optimized for contests, DXing or other activities. Check the ads in QST and take a look at capabilities and requirements before you choose. June and September. There is also a contest for 10 GHz and up operators, and another one for EME (moon bounce) enthusiasts.

NETS
A net is simply a group of hams that meet on a particular frequency at a particular time. Nets come in three flavors:
public service, traffic and special interest.

"Information and Help Net"

Wednesday, 7:00 PM on 145.170
PL 110.9, -.600 repeater

Activities in Amateur Radio

from ARRL, from page 9

HF and Repeater Nets

HF nets usually cover a region, although some span the entire country. This has obvious advantages for amateurs sending traffic over long distances. Repeater nets usually cover only a local area, but some linked repeater nets can cover several states. Both types of nets work together to speed traffic to its destination. For example, think of the HF nets as a "trunk" or highway that carries traffic quickly and reliably toward its *approximate* destination. From there, the local and regional nets take over and pass the traffic directly to the city or town. Finally, a local amateur delivers the message to the recipient. *Winlink*, a worldwide Amateur Radio digital e-mail system, is becoming popular for emergency communications traffic handling. *Winlink* offers the ability to pass standard style e-mail messages and can be connected to the Internet outside of the disaster area. Routine traffic handling keeps the National Traffic System (NTS) prepared for emergencies. In the wake of hurricanes, forest fires, earthquakes and other natural disasters that cripple normal communications, hams are called upon to carry thousands of messages in and out of the stricken region. The work that hams do during crisis situations ensures good relations with neighbors and local governments.

Public Service/Traffic Nets

Public service and traffic nets are part of a tradition that dates back almost to the dawn of Amateur Radio. The ARRL, in fact, was formed to coordinate and promote the formation of traffic nets. In those early days, nets were needed to communicate over distances longer than a few miles. (Thus the word "Relay" in American Radio Relay League.) Public service and traffic nets benefit hams and non-hams alike. Any noncommercial message — birthday and holiday greetings, personal information or a friendly hello — may be sent anywhere in the US and to foreign countries that have third-party agreements with the United States. ARES (emergency communication) groups often meet on scheduled local nets to practice their skills. The National Traffic System (NTS) oversees many of the existing traffic nets. Most nets are local or regional. They use many modes, from slow-speed CW nets in the HF bands, to FM repeater nets on 2 m. Traffic is also passed on various digital modes.

Other Nets

Some nets exist for hams with common interests inside and outside of Amateur Radio. Some examples include computers, owners of Collins radio equipment, religious groups and scattered friends and families. Most nets meet on the 80- and 20-m phone bands, where propagation is fairly predictable and there are no shortwave broadcast stations to dodge.

Sending and Receiving Domestic QSLs

Although most QSL cards can be sent as post cards within the United States, usually saving some postage costs, post card style QSL cards often arrive with multiple cancellations and other unintended markings that can obscure or obliterate the printed and written information. It is best to send all QSL cards in a protective envelope. Back when postage was cheap, you could send out 100 post cards for a few dollars and domestic stations would send QSLs as a matter of course. These days, if you really need a particular QSL, it is best to send a self addressed stamped envelope along with your card.

DIRECTION FINDING (DF)

If you've ever wanted to learn a skill that's both fun *and* useful, then you'll enjoy direction finding, or DFing. DFing is the art of locating a signal or noise source by tracking it with portable receivers and directional antennas. Direction finding is not only fun, it has a practical side as well. Hams have been instrumental in hunting down signals from illegal jammers and malfunctioning transmitters in addition to locating noise sources. We will just scratch the surface of DF activities in this section.

Fox Hunting

Fox hunting, also called *T-hunting* or sometimes *bunny hunting*, is ham radio's answer to hide-and-seek. One player is designated the fox; he or she hides a transmitter, and the other player attempts to find it. Rules change from place to place, but the fox must generally place the transmitter within certain boundaries and transmit at specific intervals. Fox hunts vary around the world. American fox hunts often employ teams of fox hunters cruising in their cars over a wide area. European and other fox hunters employ a smaller area and conduct fox hunts on foot. *Radiosport* competitions are usually European style.

Locating Interference

Imagine trying to check into your favorite repeater or HF net one day, only to find reception totally destroyed by noise or a rogue signal. If you can track down the interference, then you can figure out how to eliminate it. Finding interference sources, accidental or otherwise, has both direct and indirect benefits. Touch lamps are a notorious noise source, especially on 80 m. If you can find one, the owner is legally obligated to eliminate the interference. Even better, if you can show your neighbors that something other than your station is interfering with their TV reception, you might gain an ally next time you apply for a building permit for a higher tower!

QSLing

A QSL card (or just "QSL") is an Amateur Radio tradition. QSL cards are nearly as old as Amateur Radio itself, and the practice has spread so that shortwave listeners (SWLs) can get cards from shortwave and AM broadcast stations. Most amateurs have printed QSL cards. QSL card printers usually have several standard layouts from which to choose. Some offer customized designs at extra cost. If you are just starting out, or anticipate changing your call sign, you may want to purchase a pack of "generic" QSL cards available from ham stores and mail-order outlets.

Filling Out Your Cards

QSL cards must have certain information for them to be usable for award qualification. At a minimum, the card must have:

- Your call sign, street address, city, state or province and country. This information should be preprinted on one side of your QSL card.
- The call sign of the station worked.
- The date and time (in UTC) of the contact.
- The signal report.
- The band and mode used for the contact.

Awards for VHF and UHF operations may also require the grid locator (or "grid square") in which your station is located. Current practice is to include your 6-digit grid square (such as FN31tt) on your QSL card even if you have no plans to operate VHF and UHF, since some HF competitions and awards require your grid square designator. If you don't know your grid, you can look it up using the Location Service on the ARRL Web site. Many hams provide additional information on their QSL cards such as the equipment and antennas used during the contact, power levels, former calls and friendly comments.

VINTAGE RADIO

Present day commercial Amateur Radio equipment has become so complex that specialized test and troubleshooting equipment is often required to fix equipment that has failed in service or has simply aged enough to require repair or alignment. Indeed, SMDs (surface mount devices — miniature components that mount directly to a circuit board without leads) and ASICs (application specific integrated circuits — encapsulated miniature circuits designed for a specific circuit function) have come into such common use that a modular approach to equipment repair has now become customary. Rather than troubleshoot and replace a defective component, many manufacturers now prefer to replace an entire module. It is simply more cost effective to do this. Many amateurs, however, prefer to repair and adjust their own equipment and covet the days when it was easy to do so. This is but one reason for the surge in attention to vintage radio operating and collecting. Some others have to do with equipment cost, availability, rarity and, of course, nostalgia. Additionally, many feel that operating equipment from Amateur Radio's past brings them closer to radio's historic roots. Whatever the reasons, there has been a flood of interest in the restoration and operation of classic vintage ham radio equipment. Vintage radio equipment falls into several classes, some of which include early homebrew transmitters and receivers, kits, military surplus equipment and commercial gear. Many of these radios have been affectionately called "boat anchors" by their vintage radio aficionados (for obvious reasons — early radio gear tends to be relatively large and heavy).

Early Homebrew Equipment

Amateur Radio before 1955 tended to rely a good deal upon home made equipment. Many hams built their own transmitters and a few enterprising amateurs even constructed sophisticated station receivers and test equipment. Indeed, operating in the VHF/UHF spectrum required home construction. There was simply little or nothing available commercially for these frequencies and *QST* of the period abounds with construction articles for transmitters, converters, receivers and amplifiers. Lots of vintage radio enthusiasts collect, restore and operate homebrew equipment from this bygone era. Many enjoy linking a particular piece of equipment to a construction article that appeared in radio magazines or journals of the period and work hard to bring it to life again on the air.

Kits

Radio kits used to be a popular way to get started in Amateur Radio and a good many amateurs can trace their beginning adventures in radio to kit assembly. By far, the most popular kit manufacturer of the period 1947 through 1965 was the Heath Company of Benton Harbor, Michigan. *Heathkits* were available for transmitters, receivers and test equipment and many of Heath's popular early items are eagerly collected by vintage radio fans. The Heath Company's first widely accepted amateur transmitter, the AT-1 and its accessories (the AC- 1 antenna coupler and VF-1 VFO), have now become coveted collectors items. The AT-1 was a 30 W CW transmitter that originally sold for $29.50 in 1954. Another popular Heathkit transmitter, the DX-100 (a 120 W CW/AM unit), has now achieved similar status. EICO (the Electronic Instrument Company of Brooklyn, New York) also produced electronic kits and, although production was mainly limited to test equipment, a few amateur transmitters were made. Knight kits, a product of the Allied Radio Corporation of Chicago, were also popular. Several commercial amateur radio manufacturers also made kit versions of their assembled equipment available. The E. F. Johnson Company of Waseca, Minnesota is a good example, with kit versions of their popular Johnson Viking Ranger I and Ranger II and Viking I and Viking II transmitters obtainable during the late 40s through the early 1960s.

Military Equipment

For amateurs active in the immediate post-war era and well into the 1950s, surplus military radio equipment represented a costeffective way to get on the air. Transmitters and receivers were available for as little as $5! Thousands of military ARC-5 type transmitters and receivers were converted to amateur operation. In many cases, all that the amateur needed was the simple addition of a suitable power supply because much of the WWII-era equipment was designed to be operated from 28 V dc sources. Conversion articles regularly appeared in radio magazines of the day. In addition, the military made wide use of frequencies in the amateur VHF and UHF spectrum, so conversion of military surplus equipment to the 144 and 432 MHz amateur bands was relatively easy.

The popularity of the amateur 2- meter band probably owes as much to the military SCR-522 transmitter-receiver as it does anything else. It was available in 1947 for a mere $15 Paradoxically, vintage radio enthusiasts try to find military equipment in its native state, and if it is converted or modified in any way, then restoration to its original condition is usually attempted. It is interesting to note that equipment that was readily available in the 1950s for almost nothing is now difficult to locate, but this now adds to the fun of its discovery.

Commercial Equipment

By far, the most popular vintage gear is equipment that was made by commercial manufacturers. Equipment manufactured by Hallicrafters, National, Collins, Johnson, Hammarlund, Drake, Swan, Gonset and World Radio Laboratories is widely collected, restored and operated. Equipment from lesser-known makers, such as Harvey- Wells, Eldico, Clegg, Morrow, Sonar, Squires-Sanders and Multi-Elmac is also sought. And, limited production equipment from cottage-industry makers like Lettine, Tecraft, Tapetone and Centimeg, to name but a few, is also collected. There are others to be sure; this is but a sampling. Commercial equipment is usually sought in excellent physical and electrical condition — this makes restoration easier. Some enthusiasts, however, prefer equipment that is not pristine, so they can "sink their teeth" into it . These hams enjoy the challenge of a restoration project — with the amateur exchanging his or her labor for equipment cost. Others strive to bring the equipment back to its original factory condition (as closely as possible), both physically and electrically. Still other enthusiasts seek equipment only to restore to operating condition. Their concern is mainly about how the equipment "sounds" on the air, so physical appearance is secondary to operational readiness. Whatever the approach, all agree that operation of a vintage station is gratifying, enriching and practical; it once again puts the amateur "in charge" of his or her station. The lure of vintage radio is the excitement and participation in building, collecting, troubleshooting, repair, restoration and, finally, operation. It takes the vintage radio fan back to radio's earliest beginnings, when amateurs built most of their equipment, knew how it worked, and repaired it when it didn't.

AM (Amplitude Modulation)

Once the main voice mode in Amateur Radio, AM is regarded as a specialty mode these days. From vintage tube-based gear, to military surplus, to modern, ultra-efficient transmitters, AM offers the experimenter, homebrewer, and radio restoration buff great opportunities to learn, build, and enjoy radio. Hams enjoy leisurely AM operating because it offers a warm, rich audio quality that provides for more personal interaction. The simplicity of AM circuit design encourages many hams to try their hand at restoring or modifying vintage radios, or even building something from scratch. You can listen to AM operators near these frequencies:
160 meters — 1885,1900, 1945, 1985 kHz;
80 meters — 3825, 3870, 3880 3885 kHz;
40 meters — 7290, 7295 kHz.
For more information about AM operation, visit **www.arrl.org/tis/info/am.html**.

Electrical Fundamentals

ARRL

DC Circuits and Resistance Glossary

Alternating current — A flow of charged particles through a conductor, first in one direction, then in the other direction.

Ampere — A measure of flow of charged particles per unit time. One ampere represents one coulomb of charge flowing past a point in one second.

Atom — The smallest particle of matter that makes up an element. Consists of protons and neutrons in the central area called the nucleus, with electrons surrounding this central region.

Coulomb — A unit of measure of a quantity of electrically charged particles. One coulomb is equal to 6.25 × 1018 electrons.

Direct current — A flow of charged particles through a conductor in one direction only.

EMF — Electromotive Force is the term used to define the force of attraction between two points of different charge potential. Also called voltage.

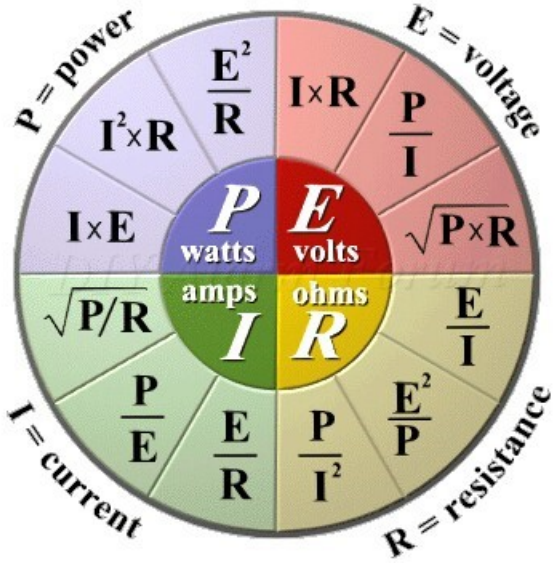
Energy — Capability of doing work. It is usually measured in electrical terms as the number of watts of power consumed during a specific period of time, such as watt-seconds or kilowatt-hours.

Joule — Measure of a quantity of energy. One joule is defined as one newton (a measure of force) acting over a distance of one meter.

Ohm — Unit of resistance. One ohm is defined as the resistance that will allow one ampere of current when one volt of EMF is impressed across the resistance.

Power — Power is the rate at which work is done. One watt of power is equal to one volt of EMF, causing a current of one ampere through a resistor.

Volt — A measure of electromotive force.



RESISTANCE AND CONDUCTANCE

Suppose we have two conductors of the same size and shape, but of different materials. The amount of current that will flow when a given EMF is applied will vary with the resistance of the material. The lower the resistance, the greater the current for a given EMF. The *resistivity* of a material is the resistance, in ohms, of a cube of the material measuring one centimeter on each edge. One of the best conductors is copper, and in making resistance calculations it is frequently convenient to compare the resistance of the material under consideration with that of a copper conductor of the same size and shape. The longer the physical path, the higher the resistance of that conductor. For direct current and low-frequency alternating currents (up to a few thousand hertz) the resistance is inversely proportional to the cross-sectional area of the path the current must travel; that is, given two conductors of the same material and having the same length, but differing in cross-sectional area, the one with the larger area will have the lower resistance.

RESISTORS

A package of material exhibiting a certain amount of resistance, made up into a single unit is called a resistor. Different resistors having the same resistance value may be considerably different in physical size and construction. Current through a resistance causes the conductor to become heated; the higher the resistance and the larger the current, the greater the amount of heat developed. Resistors intended for carrying large currents must be physically large so the heat can be radiated quickly to the surrounding air. If the resistor does not dissipate the heat quickly, it may get hot enough to melt or burn. The amount of heat a resistor can safely dissipate depends on the material, surface area and design. Typical carbon resistors used in amateur electronics (1/8 to 2-W resistors) depend primarily on the surface area of the case, with some heat also being carried off through the connecting leads. Wirewound resistors are usually used for higher power levels. Some have finned cases for better convection cooling and/or metal cases for better conductive cooling. In some circuits, the resistor value may be critical. In this case, precision resistors are used. These are typically wirewound, or carbon-film devices whose values are carefully controlled during manufacture. In addition, special material or construction techniques may be used to provide temperature compensation, so the value does not change (or changes in a precise manner) as the resistor temperature changes.

CONDUCTANCE

The reciprocal of resistance (1/R) is *conductance*. It is usually represented by the symbol G. A circuit having high conductance has low resistance, and vice versa. In radio work, the term is used chiefly in connection with electron-tube and field-effect transistor characteristics. The unit of conductance is the siemens, abbreviated S. A resistance of 1 Ω has a conductance of 1 S, a resistance of 1000Ω has a conductance of 0.001 S, and so on. A unit frequently used in connection with electron devices is the μS or one millionth of a siemens. It is the conductance of a 1-M Ω resistance.

OHM'S LAW

One ohm is defined as the amount of resistance that allows one ampere of current to flow between two points that have a potential difference of one volt. Thus, we get Ohm's Law, which is:

R = E / I

Where
R = resistance in ohms,
E = potential or EMF in volts and
I = current in amperes.

Transposing the equation gives the other common expressions of Ohm's Law as:

E = I × R and I = E/R

All three forms of the equation are used often in radio work. You must remember that the quantities are in volts, ohms and amperes; other units cannot be used in the equations without first being converted.

For example, if the current is in milliamperes you must first change it to the equivalent fraction of an ampere before substituting the value into the equations.

POTENTIOMETERS

Potentiometer is a big name for a variable resistor. They are commonly used as volume controls on radios, televisions and stereos. A typical potentiometer is a circular pattern of resistive material, usually a carbon compound, that has a wiper on a shaft moving across the material. For higher power applications, the resistive material may be wire, wound around a core. As the wiper moves along the material, more resistance is introduced between the wiper and one of the fixed contacts on the material. A potentiometer may be used primarily to control current, voltage or resistance in a circuit Typical specifications for a potentiometer include maximum resistance, power dissipation, voltage and current ratings, number of turns (or degrees) the shaft can rotate, type and size of shaft, mounting arrangements and resistance "taper." Not all potentiometers have a *linear* taper. That is, the resistance may not be the same for a given number of degrees of shaft rotation along different portions of the resistive material. A typical use of a potentiometer with a nonlinear taper is as a volume control. Since the human ear has a logarithmic response to sound, a volume control may actually change the volume (resistance) much more near one end of the potentiometer than the other (for a given amount of rotation) so that the "perceived" change in volume is about the same for a similar change in the control. This is commonly called an "audio taper" as the change in resistance per degree of rotation attempts to match the response of the human ear. The taper can be designed to match almost any desired control function for a given application. Linear and audio tapers are the most common.

Power and Energy

Regardless of how voltage is generated, energy must be supplied if current is drawn from the voltage source. The energy supplied may be in the form of chemical energy or mechanical energy. This energy is measured in joules. One joule is defined from classical physics as the amount of energy or work done when a force of one newton (a measure of force) is applied to an object that is moved one meter in the direction of the force. Power is another important concept. In the USA, power is often measured in horsepower in mechanical systems. We use the metric power unit of watts in electrical systems, however. In metric countries, mechanical power is usually expressed in watts also. One watt is defined as the use (or generation) of one joule of energy per second. One watt is also defined as one volt of potential pushing one ampere of current through a resistance. Thus,

$P = I \times E$

where:

P = power in watts
I = current in amperes
E = EMF in volts.

When current flows through a resistance, the electrical energy is turned into heat. Common fractional and multiple units for power are the milliwatt (one thousandth of a watt) and the kilowatt (1000 W).

AC Theory and Reactance Glossary

Admittance (Y) — The reciprocal of impedance, measured in siemens (S).
Capacitance (C) — The ability to store electrical energy in an electrostatic field, measured in farads (F). A device with capacitance is a capacitor.
Conductance (G)— The reciprocal of resistance, measured in siemens (S).
Current (I) — The rate of electron flow through a conductor, measured in amperes(A).
Flux density (B) — The number of magnetic-force lines per unit area, measured in gauss.
Frequency (f) — The rate of change of an ac voltage or current, measured in cycles per second, or hertz (Hz).
Impedance (Z) — The complex combination of resistance and reactance, measured in ohms (Ω).
Inductance (L) — The ability to store electrical energy in a magnetic field, measured in henrys (H). A device, such as a coil, with inductance is an inductor.
Peak (voltage or current) — The maximum value relative to zero that an ac voltage or current attains during any cycle.
Peak-to-peak (voltage or current) — The value of the total swing of an ac voltage or current from its peak negative value to its peak positive value, ordinarily twice the value of the peak voltage or current.
Period (T) — The duration of one ac voltage or current cycle, measured in seconds (s).
Permeability (μ) — The ratio of the magnetic flux density of an iron, ferrite, or similar core in an electromagnet compared to the magnetic flux density of an air core, when the current through the electromagnet is held constant.
Power (P) — The rate of electrical-energy use, measured in watts (W).
Q (quality factor) — The ratio of energy stored in a reactive component (capacitor or inductor) to the energy dissipated, equal to the reactance divided by the resistance.
Reactance (X) — Opposition to alternating current by storage in an electrical field (by a capacitor) or in a magnetic field (by an inductor), measured in ohms (Ω).
Resistance (R) — Opposition to current by conversion into other forms of energy, such as heat, measured in ohms (Ω).
Resonance — Ordinarily, the condition in an ac circuit containing both capacitive and inductive reactance in which the reactances are equal.
RMS (voltage or current) — Literally, "root mean square," the square root of the average of the squares of the instantaneous values for one cycle of a waveform. A dc voltage or current that will produce the same heating effect as the waveform. For a sine wave, the RMS value is equal to 0.707 times the peak value of ac voltage or current.
Susceptance (B) — The reciprocal of reactance, measured in siemens (S).
Time constant (τ) — The time required for the voltage in an RC circuit or the current in an RL circuit to rise from zero to approximately 63.2% of its maximum value or to fall from its maximum value 63.2% toward zero.
Toroid — Literally, any donut-shaped solid; most commonly referring to ferrite or powdered-iron cores supporting inductors and transformers.
Transducer — Any device that converts one form of energy to another; for example an antenna, which converts electrical energy to electromagnetic energy or a speaker, which converts electrical energy to sonic energy.
Transformer — A device consisting of at least two coupled inductors capable of transferring energy through mutual inductance.
Voltage (E) — Electromotive force or electrical pressure, measured in volts (V).