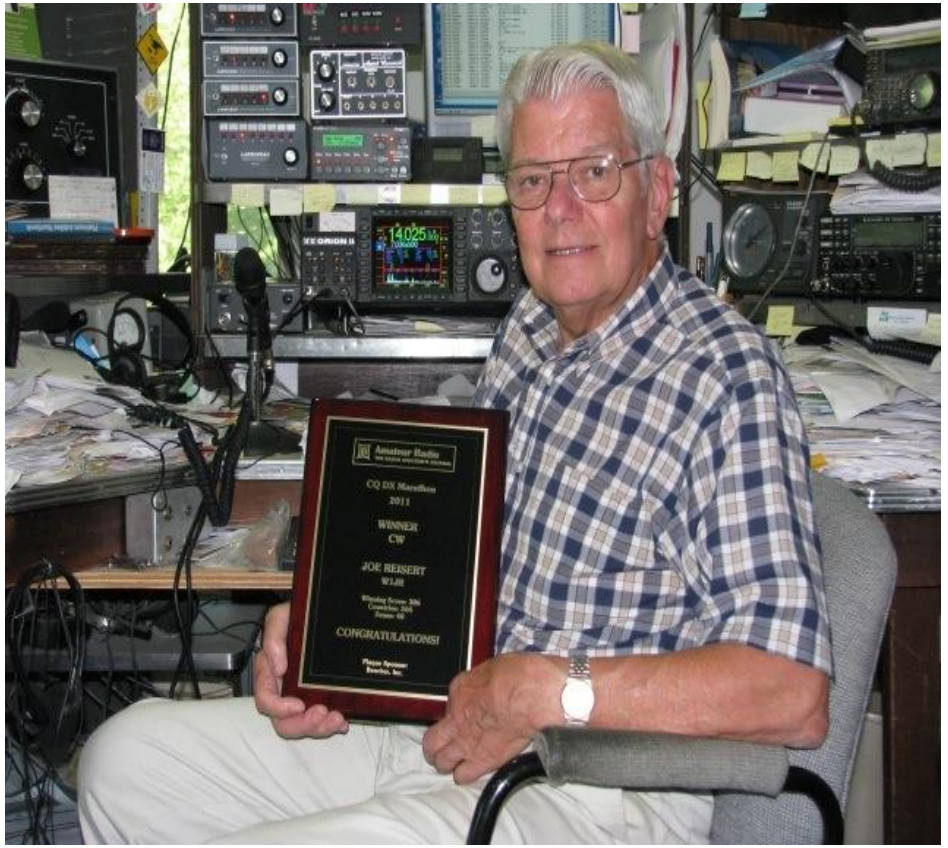
Working HF DX

by

Joe Reisert, W1JR



First licensed in 1951 as WN2HQL and has been a serious DXer since 1954. Prior calls included W2HQL, WA6TGY, W6FZJ, W1JAA and W1JR.

Top of the DXCC Honor Roll with 392/340 total, DXCC Challenge 3172. Satellite DXCC and 11-band DXCC (160 through 6 meters including 60 Meters). 13 Band WAS

DXpeditions in 1957 as W2HQL/KC4 (Navassa I.) and as VP2VB in 1958 with Danny Weil.

Member of the YCCC Contest Club. Life member of ARRL and AMSAT. Over 150 published articles and over 125 Invited talks. CQ Magazine DX Hall of Fame (2014))

"AA"

BY JOHN G. TROSTER,* W6ISQ

Ting-a-ling-a-ling — "My gosh, forgot to take the phone off the hook. Sweepstakes not two hours old and interrupted already. Not enough I get rid of Marge and the kids for the weekend . . . Hello."

"Is your radio number W6ISQ?"

"Yes . . . ahh . . . lady. But I have my own TV set going and have a perfect picture. It must be your set. My station has been approved by the FC . . ."

"No, no. I'm calling about my husband. He's a radio bug and his number is WA6TGY. There's something wrong with him."

"Ohhhh, Joe. That's right. You just got married a few weeks . . . I mean . . . well . . . ahhh . . . what's wrong with him?"

"I don't know. He won't talk to me, and all he does is just sit in front of a lot of radios and turn the knobs. He hasn't spoken a word in two hours. He won't come to supper. Just stares and turn knobs. Finally pleaded with him to say something . . . anything . . . and he said, 'call this fella.' And he gave me a card with your phone number on it."

"Ohhh, I see. Now, Mrs. TGY, every once in a while does Joe kinda jump a little, grab a dial and then you hear little clicks and snaps?"

"Yes, yes. For two hours now."

"And does he smile and scowl off and on?"

"Yes."

"And maybe a couple of hours ago he was normal — talked calmly . . . well, maybe a little nervous, a twitch maybe . . . walked around the house, looked up at his aerials?"

AA

A new citation is offered this year. In keeping with the theme of the story starting on page 27 of this issue, W6ISQ will send a special "AA" citation (a certificate not good for anything except framing—and even that's a dubious value) to any station working all 74 ARRL sections, or scoring over 200,000 points (citizens of Virginia and Indiana, take heed). Published results of the Sweepstakes in a spring 1964 QST will be the basis for issuing this citation.

DXing, an Overview

DX (Distance) or DXing is one of the most exciting activities within ham radio.

DX can be line-of-sight on VHF/UHF or bouncing VHF signals off the Moon (EME).

DXing is easy and most exciting on HF (High Frequency 1.8-30 MHz) bands.

To participate as a beginner (newbie) is easy.

Expensive equipment is not required.

You only need a low power (100 Watts or less) transceiver and an antenna.

A simple wire or vertical antenna will get you started.

DX Signal Modes of operation on HF

Voice:

AM: Amplitude Modulation

FM: Frequency Modulation

SSB: Single Side Band. The most common voice DX mode

Code:

CW: Continuous Wave

RTTY: Radio Teletype

PSK: Phase Shift Keying

WSJT: New and very popular weak signal digital modes

Radio Equipment

- New and used low cost transceivers for the HF bands (1.8-30 MHz) are readily available.
- Other accessories such as microphones, earphones, keys and keyers will improve operating convenience.
- Built-in or external antenna tuners, RF selectivity choice and audio enhancements are great features.
- Simple low cost end fed half wave (EFHW) antennas are available from ARRL , MyAntennas and others.
- Long wires, dipoles and verticals are also good starter antennas.
- Power amplifiers, masts, towers, rotors and gain antennas are not required for beginners.
- However the above will help later as your DX'ing skills improve and will make contacts easier to make.
- All of the above accessories are readily available and advertised in amateur magazine and on the Internet.
- Product Reviews are also helpful as are demonstrations of equipment at ham radio gatherings.

Simple transceiver and Antenna Setup

Typical Accessories

Typical HF Antennas

One common ham expression is that “**You can never have enough antennas**.”

Antennas give you the most “**bang for the buck $$$$$”**

A one dB antenna gain improvement is the minimum detectable improvement.

However, if an antenna is used for both transmit and receive a 1 dB gain improvement yields an overall 2 dB.

A simple dipole antenna is usually the standard reference. *

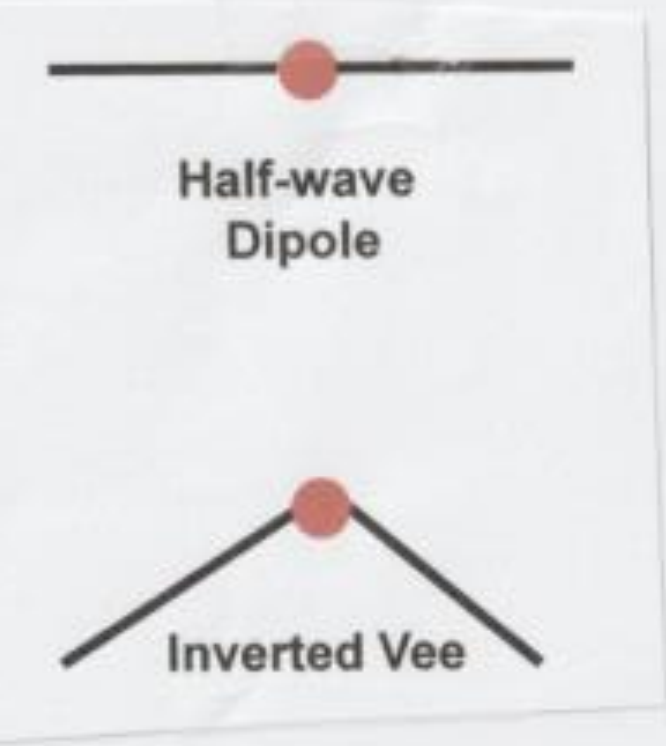
Directional antennas such as a Yagi or hex-beam can improve results by several dBs over a dipole.

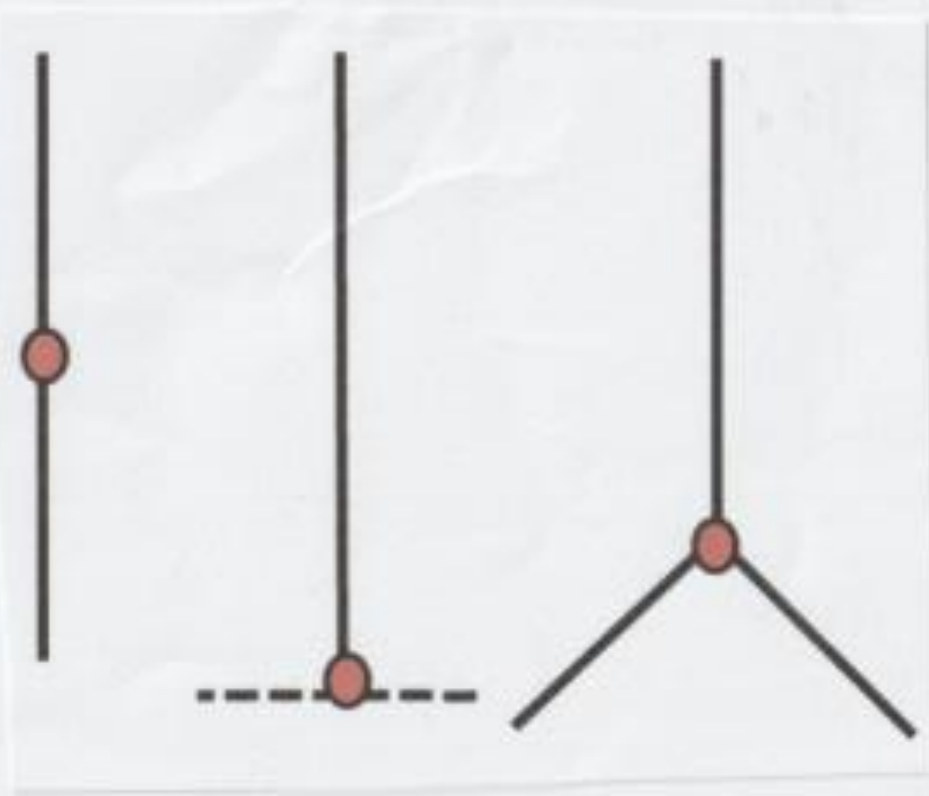
Directional antennas also improve your ability to hear weak signals and decrease interference (QRM).

Furthermore directional antennas can decrease local noise (QRN).

* See the ARRL Handbook for many different antenna choices

Some simple common antennas





Types of Transmission Lines

Coaxial cable

RG-58 50 Ohm coax cable

RG-8 popular 50 Ohm coaxial cable

Other types:

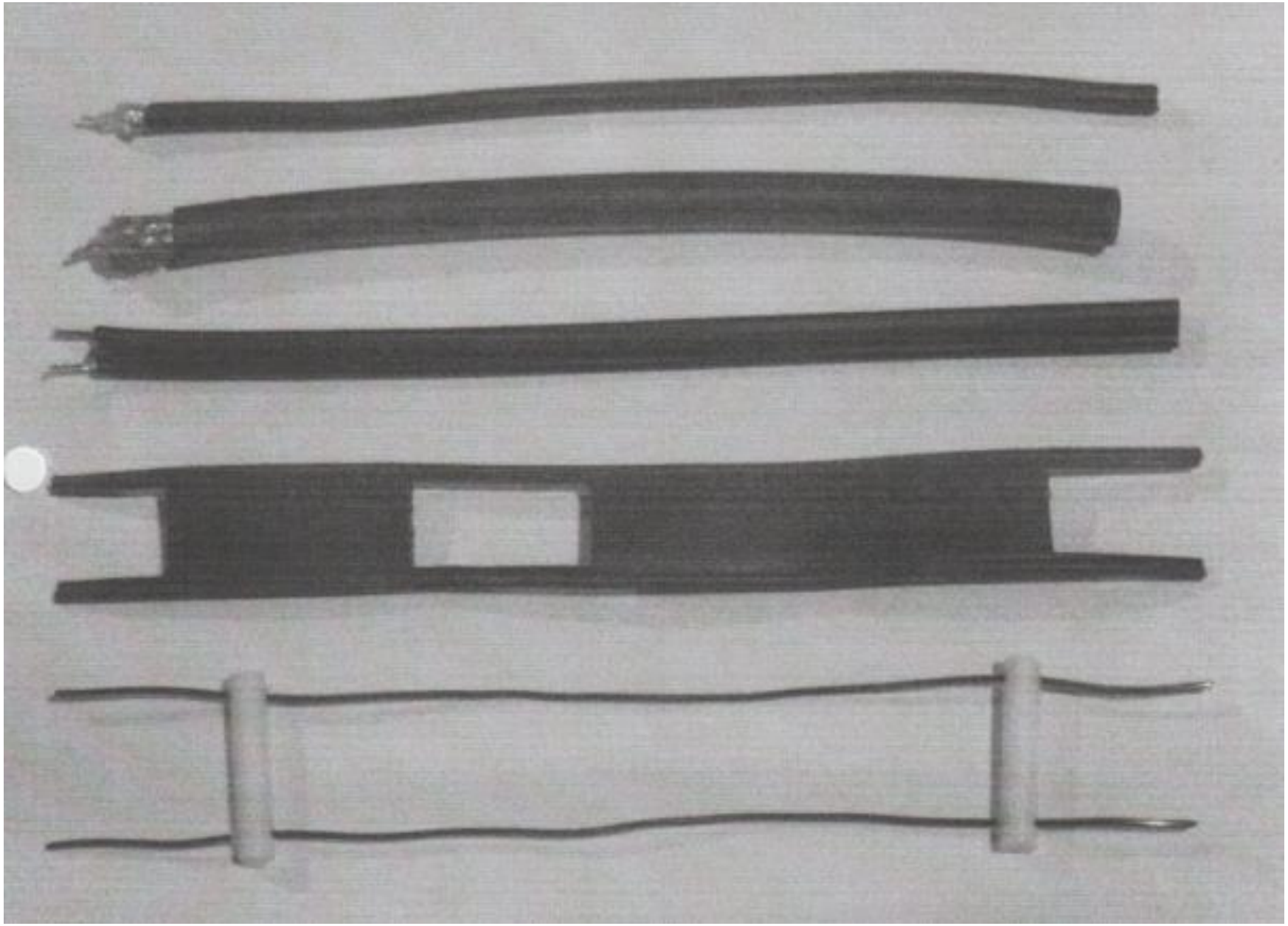
Twin lead: Typical low cost 300 Ohms*

Ladder line: Typically 400-450 Ohms *

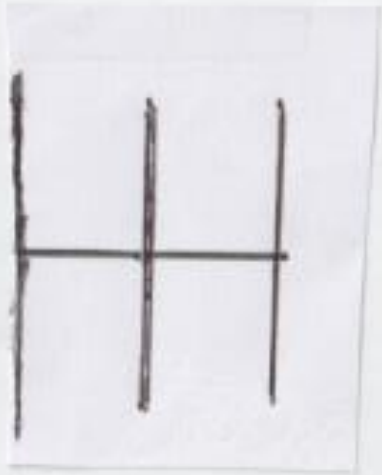
Open wire line: Wires with spaces*

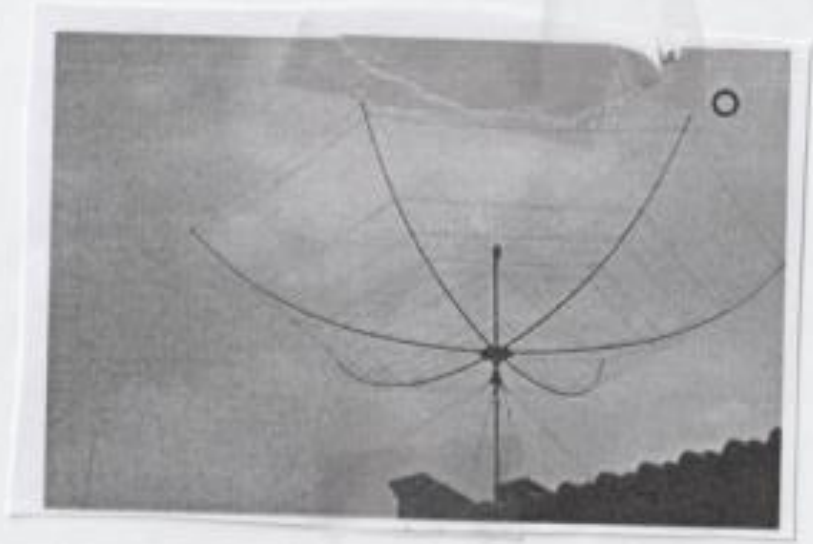
* Usually requires a balun and antenna tuner.

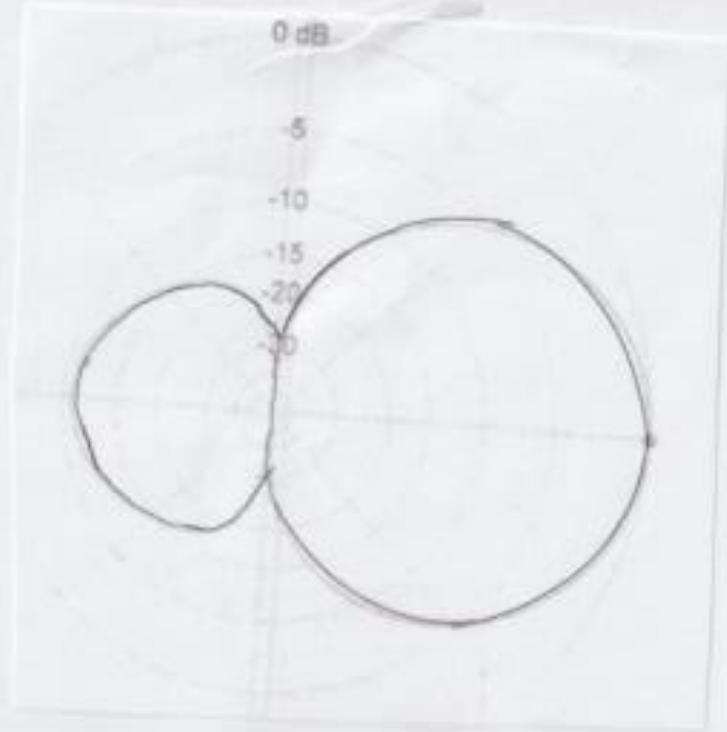
Typical Transmission Lines



Higher gain HF antennas



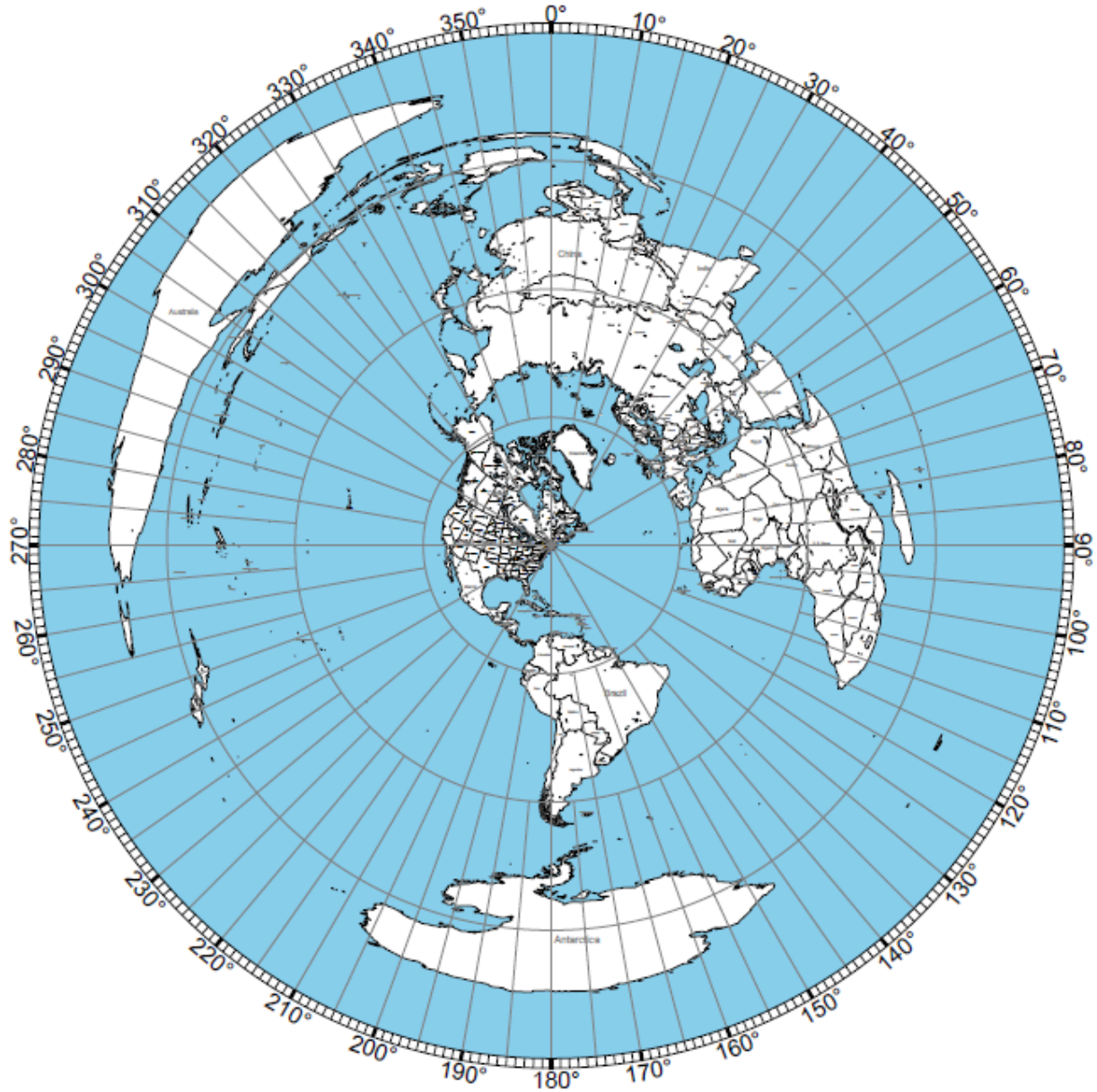




Azimuthal Map

Center: 42°53'45"N 71°37'30"W

Courtesy of Tom (NS6T)



Typical HF Radio Propagation

A knowledge of HF radio propagation is very beneficial for DXers

Publications such as The Daily DX has daily updates on worldwide radio propagation by W3LPL. ARRL has weekly solar updates by K7RA.

The **SWPC** (Space Weather Prediction Center) website gives hourly statistics of solar activity. H**TTP://DX.QSL.Net/Propagation** is another good site for timely solar indices. Understanding these data can help us predict radio propagation conditions.

Generally speaking when radio propagation is optimum 20 meters (especially 14.195 +/-5 on SSB) is usually the primary go-to DX band. 20 Meters is most often useable during local daylight hours. When radio propagation is good the bands above 20 meters may also be useable. 40 Meters is usually the best night time band.

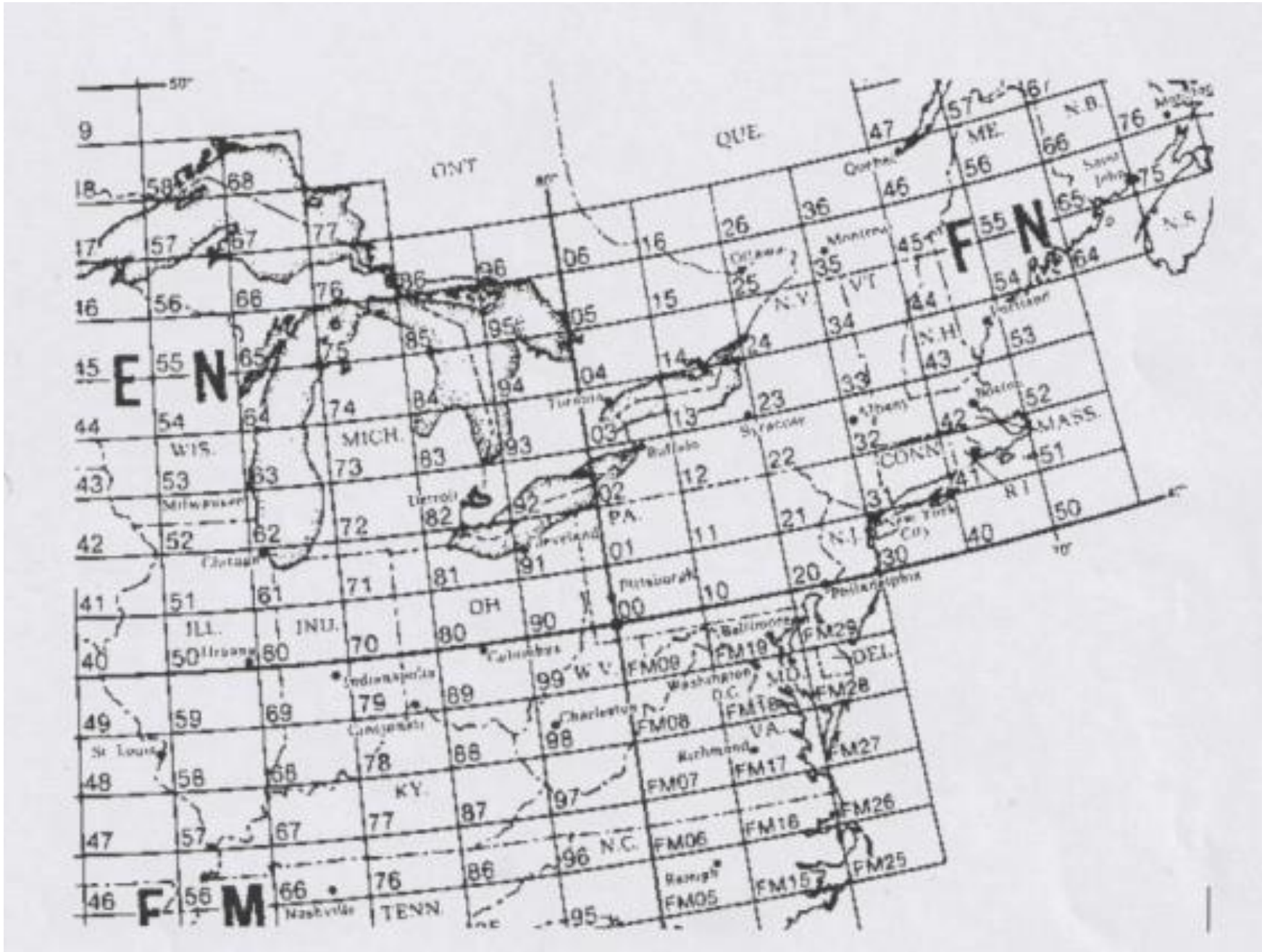
Good radio propagation reference numbers are when the A Index is <10, K is <4, solar wind speed is <300 km/s, Solar flux is >100 (and even better when >150) while sunspot numbers are > 25.

Watch out for CMEs (Coronal Mass Ejections). They are a warning of ionospheric disturbances. CMEs typically affect propagation negatively within 48-72 hours.

Also listen for propagation beacons such as the NCDXF/IARU international beacons transmissions around 14.1 MHz and on other HF frequencies and bands.

Grid Locator Map

Local New England Grids



Personal Computers

The introduction of personal computers (PCs) in the 1970s has had a profound affect on just about everything we hams do but especially affect DXing.

PCs allow access:

Radio control

Computer logging especially for radio contests.

Internet access

Access to worldwide DX Packet Clusters such as DX Summit and DXHeat*.

Digital mode program control

Use of the WSJT digital modes such as JT65, FT4 and FT8 etc.

Etc. etc. etc.

*More later

DX Bulletins and DX Clusters

DX Bulletins tell you what DX stations are available, when and where they are operating.

The ARRL and “The Daily DX” bulletins are great DX sources of information.

Many DX bulletins are available free such as OPDX (KB8MW), 465 DX List, DX World, DXNL DX News etc.

DX Clusters help warn you instantly what’s happening worldwide. They tell you call signs, frequency etc.

DX Clusters help improve information on what’s happening worldwide

Typical DX Cluster

DX de	Freq	DX	Tags	Comments	UTC	Date
J28JD	18 100,8	EA3BT	@		17:55	28/07/22
RI0QQ	7 016,0	UA0CID		russia kills children	17:54	28/07/22
RW4K	7 016,0	RI0QQ		Up 1.2	17:54	28/07/22
AI3Z	18 152,0	CN23ZG			17:54	28/07/22
ON4LDU	21 075,0	YC2DUC		FT8 JN29vq - OI52 Hey Guna	17:54	28/07/22
AH6FC	14 075,0	AP2IN		BL20DA MM63 mahalo (thanks) for the	17:54	28/07/22
A71AM	14 247,5	OM3KAP		USB LL55lk - JN98ep	17:54	28/07/22
HC1FQ	21 074,0	LU6XQB	@	TNX FOR QSO 73	17:54	28/07/22
RA2F	14 160,0	RM2T		russia is a world terrorist	17:53	28/07/22
RA2F	14 160,0	UA0DM	@	russia kills, rapes, loots, lies	17:53	28/07/22
BH6KOK	14 027,0	EA6/EA3HSO		CW	17:53	28/07/22
R6MM	14 160,0	RA2F	@	TNX	17:53	28/07/22
RC8SA	7 164,0	OE3DIA	@	Tnx for QSO!	17:53	28/07/22
SP5MXG	21 074,0	YB4BYA		FT8 -07dB from OI18 1501Hz	17:53	28/07/22
RY3D	7 017,8	OH0/DL1SVA	@	CQ...	17:53	28/07/22
PE4BAS	50 313,0	G4FVZ	@	Tnx TU73	17:52	28/07/22
IW8ELR	14 080,0	KZ2I		tnx	17:52	28/07/22
PY4OY	18 100,0	J28JD		FT8 -09dB 846Hz	17:52	28/07/22
LU9DCE	21 075,5	SQ7BFC	@	FT8 Send -18 Rcvd -08 By PHPDCE	17:52	28/07/22

DX Jargon

Use proper Phonetics on voice. They are carefully selected words representing the English alphabet.

Cute phonetics such as “W One Jack Rabbit” may not be quickly understood by non-English speaking persons.

Typical expressions are 73 (Best wishes) and 88 (Love and kisses).

Up means transmit up from the frequency you are listening to.

RS(T) is a signal report meaning “readability, signal strength and tone”. 59(9) is the most common signal report.

TU means thank you which is often used at the confirmation of the end of a contact.

“Q” signals are often used such as: QSL (confirmation), QRM (interference), QTH (location), QRV (are you ready?), QRT (stop transmitting), QRX (wait a moment), QRS (slow down), QRZ (who is calling me?), QRL (are you busy) and QSO (conversation).

Birdie: (spurious signal), eyeball (in person), CW (continuous wave), DXCC (DX Century Club), IOTA (Islands on the Air), ITU (International Telecommunications Union), Green Stamp ($$), LID (slang for a stupid operator), OO (Official Observer), SASE (self addressed stamped envelope), LSB/USB (lower sideband, upper sideband), WX (weather), Wallpaper (award), YL/XYL (young lady/ex-young lady), WAS (Worked All States), WAC (Worked All Continents), WAZ (Worked All Zones), etc.

NATO Phonetic Alphabet

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

Logging Contacts

It is very important to accurately log call signs worked as well as Date, Time, Frequency and mode of operation.

The ***ARRL Log Book*** is highly recommended.

For time and date, hams universally use GMT (Greenwich Mean time) also known as UTC (Universal Time Central).

GMT is very accurate based on astronomy and originates in Greenwich, UK. It is often abbreviated as “Z” time.

For reference, NY City is 5 hours (-5) behind GMT.

As one becomes more skilled working DX there are various electronic log programs and other sources such as the ARRL LoTW (Log Book of the World). For example, 0500Z which means 5 hours after midnight in Greenwich, UK.

QRZ.com is an excellent source of call sign info.

AMATEUR RADIO STATION LOG

CALL SIGN

ARRL
the national association for
amateur radio®

Book No. _____

From: _____

To: _____

DATE	FREQ.	MODE	POWER	TIME	STATION WORKED	REPORT		TIME OFF	COMMENTS	QSL	
						SENT	REC'D		QTH NAME QSL VIA	S	R

Operating and Awards

It goes without saying that you must observe the frequency, band limits and modes of operation allowed by your operating license class.

Operating skills for working DX are very important and can be quickly acquired.

It is best to **Listen, Listen, Listen** and follow instructions from the DX station.

Many DX stations, especially from the rarer entities and DXpeditions do not listen on their own frequency. They may listen up a KHz or more depending on the mode of operation. They usually don't like duplicate contacts on the same band and mode.

Listening can help determine where and when to transmit.

Follow carefully the **DX Code of Contact.**

Tip: When you hear a rare DX station especially on a DXpedition, try to work them early since they may unexpectedly QRT

The DXCC award by the ARRL is the most recognized and sought after award worldwide for working and confirming 100 or more DXCC entities. There are now 340 entities or independent countries, territories or political entities on the list. The DXCC list is a great source of information to help identify DX call signs and locations.

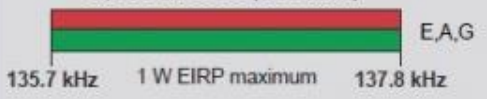
US Amateur Radio Bands

US AMATEUR POWER LIMITS — FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

ARRL The national association for AMATEUR RADIO®

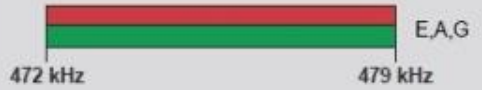
Amateurs wishing to operate on either 2,200 or 630 meters must first register with the Utilities Technology Council online at **https://utc.org/plc-database-amateur-notification-process/.** You need only register once for each band.

2,200 Meters (135 kHz)



630 Meters (472 kHz)

5 W EIRP maximum, except in Alaska within 496 miles of Russia where the power limit is 1 W EIRP.

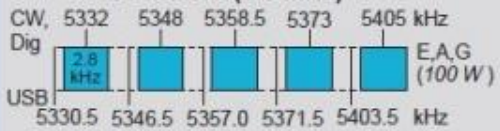


160 Meters (1.8 MHz)

Avoid interference to radiolocation operations from 1.900 to 2.000 MHz

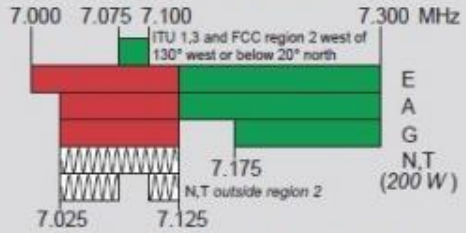
80 Meters (3.5 MHz)

60 Meters (5.3 MHz)



General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated power (ERP) of 100 W PEP relative to a half-wave dipole. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III. Only one signal at a time is permitted on any channel.

40 Meters (7 MHz)

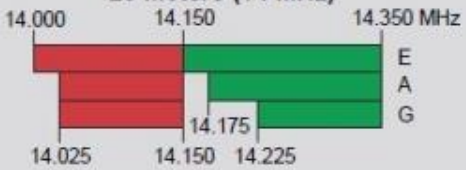


See Sections 97.305(c), 97.307(f)(11) and 97.301(e). These exemptions do not apply to stations in the continental US.

30 Meters (10.1 MHz)

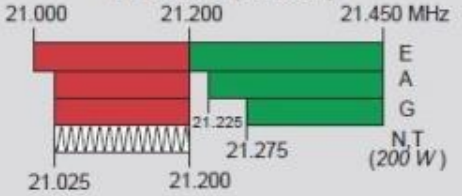
Avoid interference to fixed services outside the US.

20 Meters (14 MHz)



17 Meters (18 MHz)

15 Meters (21 MHz)



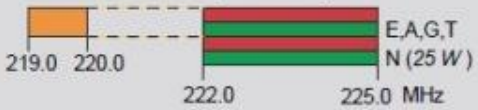
12 Meters (24 MHz)

10 Meters (28 MHz)

6 Meters (50 MHz)

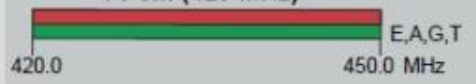
2 Meters (144 MHz)

1.25 Meters (222 MHz)

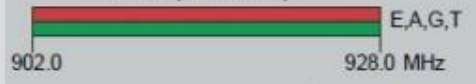


*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

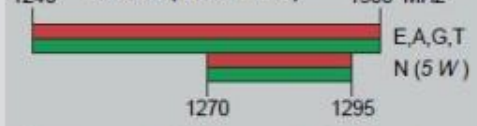
70 cm (420 MHz)*



33 cm (902 MHz)*



23 cm (1240 MHz)*



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

‡ No pulse emissions

KEY

Note:

CW operation is permitted throughout all amateur bands.

MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- = RTTY and data
- = phone and image
- = CW *only*
- = SSB phone
- = USB phone, CW, RTTY, and data
- = Fixed digital message forwarding systems *only*

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb at www.arrl.org* for detailed band plans.

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Getting Started in Amateur Radio:
Toll-Free 1-800-326-3942 (860-594-0355)
email: newham@arrl.org

Exams: 860-594-0300 email: vec@arrl.org

DX Code of Conduct

1. I will listen, and listen, and then listen again before calling.
2. I will only call if I can copy the DX station properly.
3. I will not trust the DX cluster and will be sure of the DX station's call sign before calling.
4. I will not interfere with the DX station nor anyone calling and will never tune up on the DX frequency or in the QSX slot.
5. I will wait for the DX station to end a contact before I call.
6. I will always send my full call sign.
7. I will call and then listen for a reasonable interval. I will not call continuously.
8. I will not transmit when the DX operator calls another call sign, not mine.
9. I will not transmit when the DX operator queries a call sign not like mine.
10. I will not transmit when the DX station requests geographic areas other than mine.
11. When the DX operator calls me, I will not repeat my call sign unless I think he has copied it incorrectly.
12. I will be thankful if and when I do make a contact.
13. I will respect my fellow hams and conduct myself so as to earn their respect.

The ARRL DXCC List

Published by: ARRL The national association for AMATEUR RADIO®

About the DXCC Rules

The DXCC List is based on Clinton B. DeSoto's, W1CBD, landmark 1935 *QST* article, "**How to Count Countries Worked, A New DX Scoring System**." DeSoto's article discussed problems DXers had in determining how to count the DX, or entities, they had worked. He presented the solution that has worked successfully for succeeding generations of DXers.

In DeSoto's words, "The basic rule is simple and direct: Each discrete geographical or political entity is considered to be a country." This rule has stood the test of time -- from the original list published in 1937, to the ***ARRL DXCC List*** of today. For more than 85 years, the *DXCC List* has been the standard for DXers around the world.

DeSoto never intended that all DXCC "countries" would be countries in the traditional sense of the word. Rather, they are the distinct geographic and political entities which DXers seek to contact. Individual achievement is measured by working and confirming the various entities comprising the DXCC List. This is the essence of the DXCC program.

Over time, criteria for the DXCC List has changed. The List remains unchanged until an entity no longer satisfies the criteria under which it was added, at which time it is moved to the **Deleted List**. Thus, today's *DXCC List* does not fully conform with today's criteria since many entities are grandfathered under previous rules.

- DXCC Rules

Click on the different sections below to learn the DXCC rules.

+ Section I. Basic Rules

+ Section II. DXCC List Criteria

+ Section III. Accreditation Criteria

+ Section IV. Field Checking of QSL Cards

ARRL DXCC LIST

All entities on the current list are eligible for field checking.

Note: * Indicates current list of entities for which QSLs may be forwarded by the ARRL Membership Outgoing QSL Service.

Note: † Indicates entities with which US Amateurs may legally handle third-party message traffic.

Prefix	Entity	CONTINENT	ZONE		MIXED	PHONE	CW	DIGITAL	SAT	160	80	40	30	20	17	15	12	10	6
			ITU	CQ															
	Spratly Is.	AS	50	26															
1A[1]	Sov. Mil. Order of Malta	EU	28	15															
3A*	Monaco	EU	27	14															
3B6, 7	Agalega & St. Brandon Is.	AF	53	39															
3B8	Mauritius	AF	53	39															
3B9	Rodrigues I.	AF	53	39															
3C	Equatorial Guinea	AF	47	36															
3C0	Annobon I.	AF	52	36															
3D2*	Fiji	OC	56	32															
3D2*	Conway Reef	OC	56	32															
3D2*	Rotuma I.	OC	56	32															
3DA†	Swaziland	AF	57	38															
3V*	Tunisia	AF	37	33															
3W, XV	Vietnam	AS	49	26															
3X	Guinea	AF	46	35															
3Y*	Bouvet	AF	67	38															
3Y*	Peter 1 I.	AN	72	12															
4J, 4K	Azerbaijan	AS	29	21															
4L*	Georgia	AS	29	21															
4O[47]*	Montenegro	EU	28	15															
4S*	Sri Lanka	AS	41	22															
4U_ITU†*	ITU HQ	EU	28	14															
4U_UN*	United Nations HQ	NA	08	05															
4W[44]	Timor - Leste	OC	54	28															
4X, 4Z†*	Israel	AS	39	20															
5A	Libya	AF	38	34															
5B, C4, P3*	Cyprus	AS	39	20															
5H-5I*	Tanzania	AF	53	37															
5N*	Nigeria	AF	46	35															
5R	Madagascar	AF	53	39															
5T[2]	Mauritania	AF	46	35															
5U[3]	Niger	AF	46	35															
5V	Togo	AF	46	35															

QSLs and QSLing

This is a real fun part of DXing. QSLs are a great way to confirm a QSO

ARRL QSL bureau.

LOTW: An ARRL program that allows contact credit without a QSL

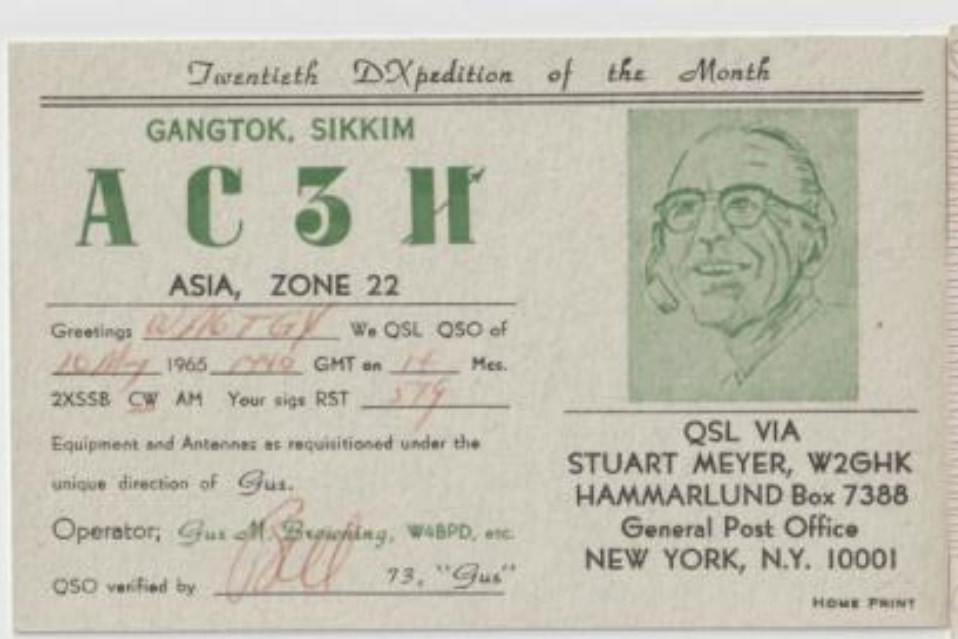
“Clublog” is an international site to see info on QSLing other stations and OQRS access.

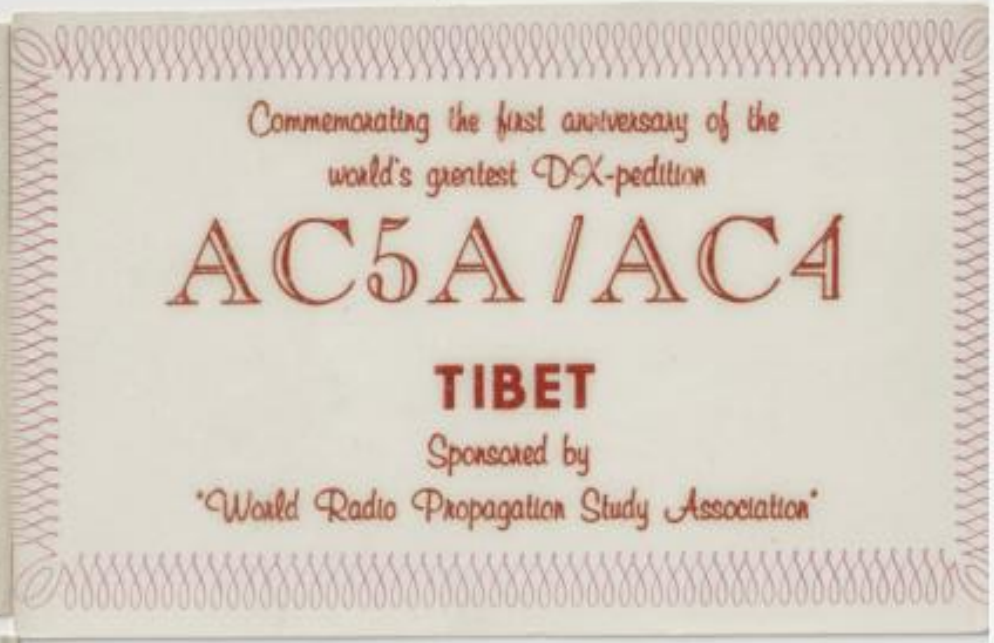
OQRS (Online QSL Service) is a great way to request a QSL without having to send one.

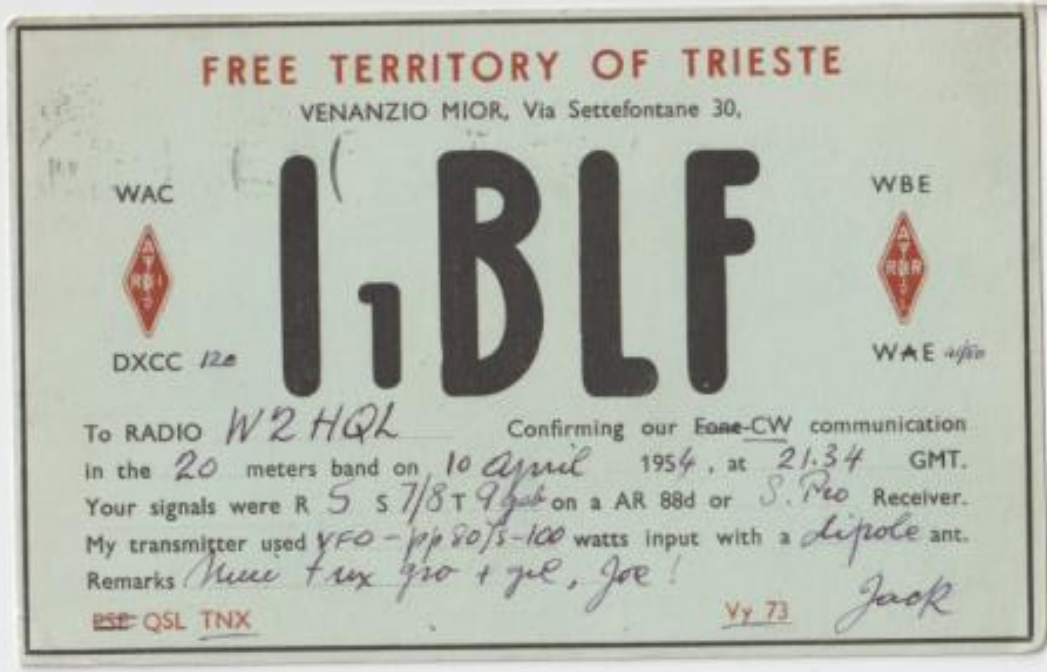
SASE (self addressed stamped envelope) is often requested especially on USA QSL requests**.**

Most DX stations request at least $2-$3 to receive a direct QSL in return**.**

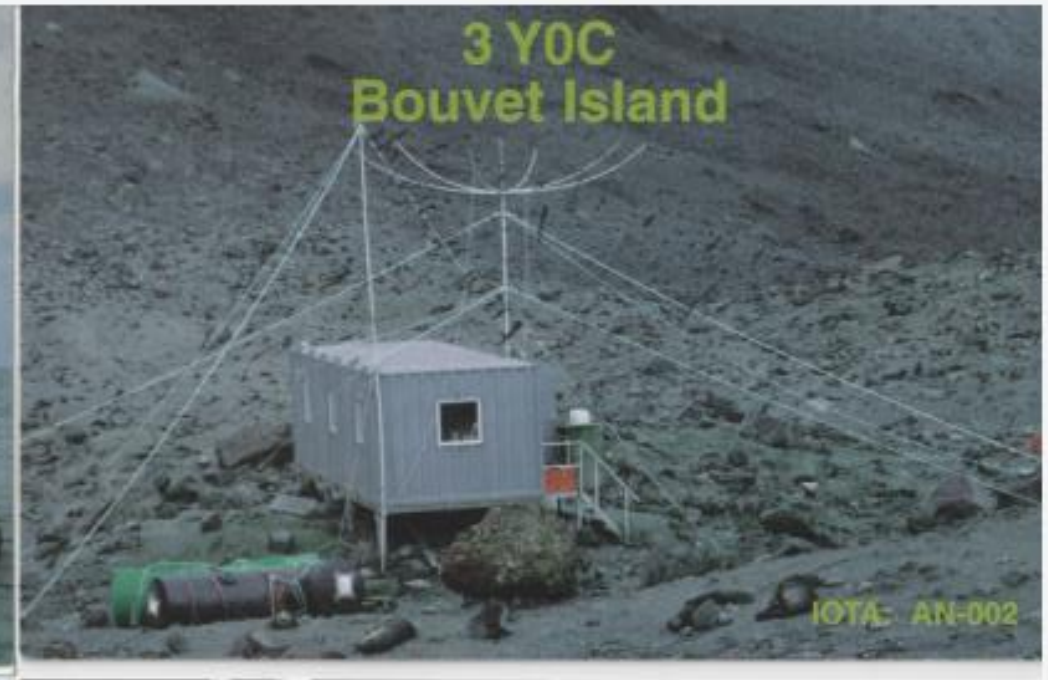
Some Rare Deleted Entities QSLs



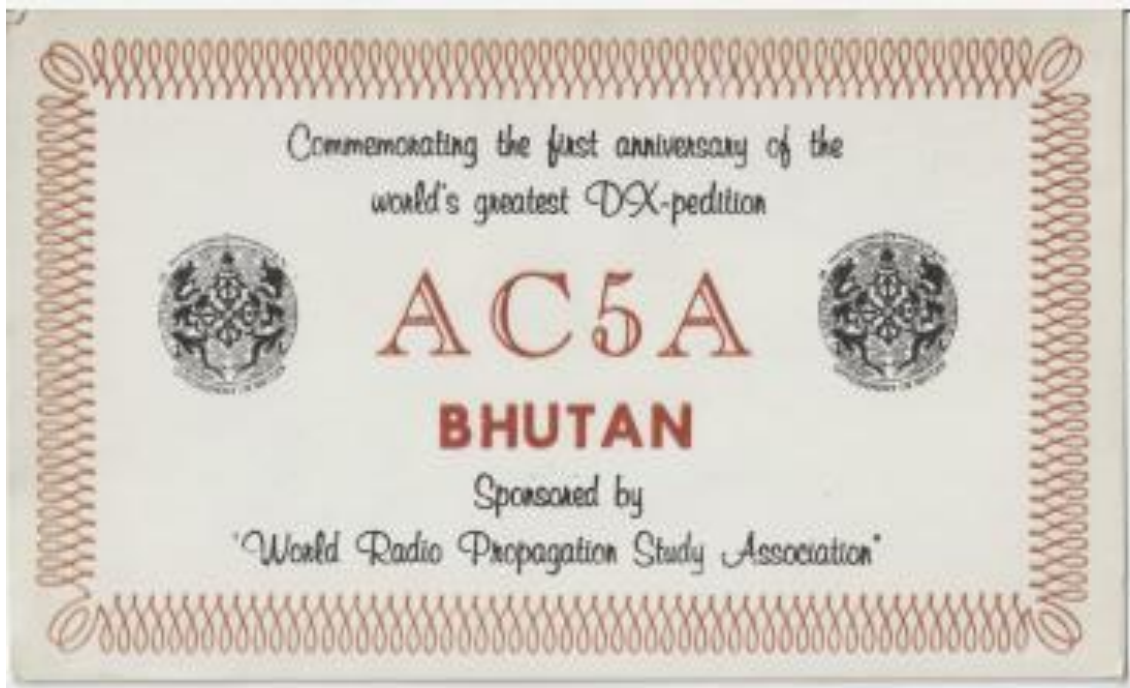


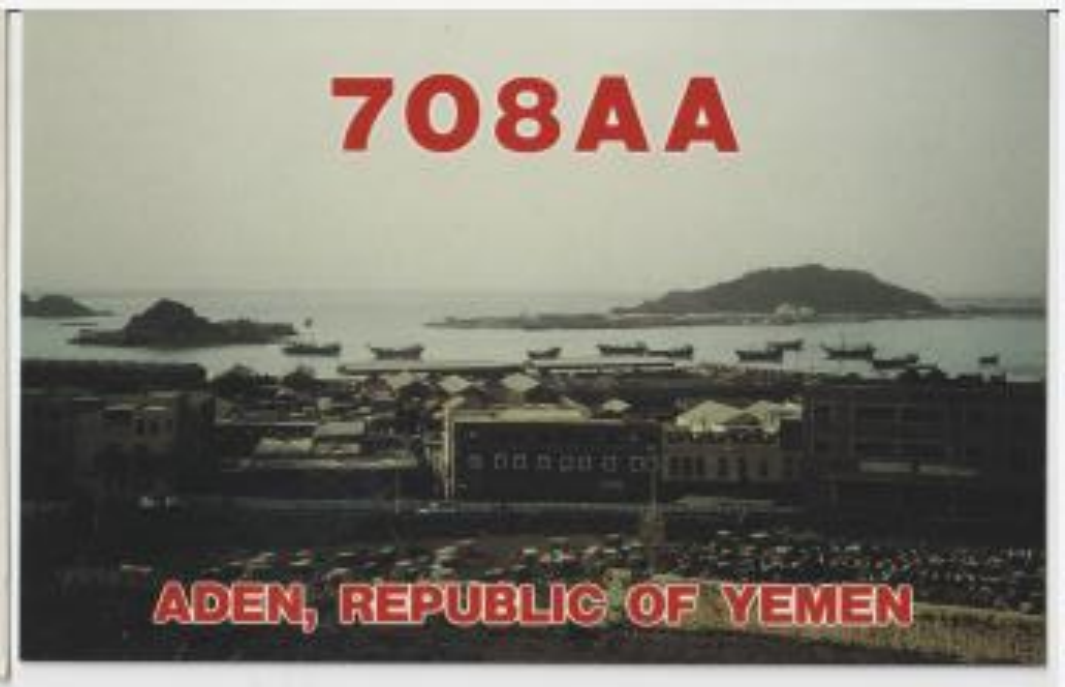


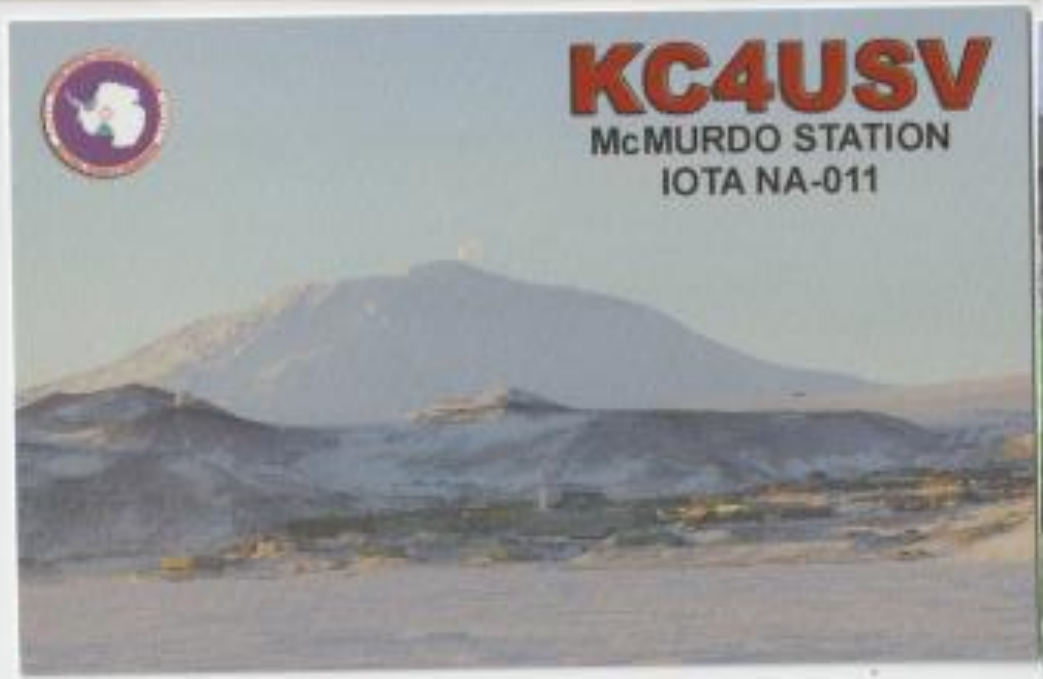
DX QSLs from rare entities



Typical DXCC QSLs







DXCC 335 | DXCC 340 | DXCC 345 | DXCC 350 | DXCC 355 | DXCC 360 | DXCC 365 | DXCC 370 | DXCC 375 | DXCC 380 | DXCC 385 | DXCC 390

The American Radio Relay League, Inc.

DX CENTURY CLUB

DXCC 110 5/5/75 | DXCC 120 5/29/75

This Certifies that JOSEPH H. REISERT, JR., W1JAA

DXCC 130 7/2/75 | DXCC 140 7/31/75

HAS THIS DAY SUBMITTED EVIDENCE TO THE AMERICAN RADIO RELAY LEAGUE SHOWING TWO-WAY COMMUNICATION WITH OTHER AMATEUR STATIONS IN AT LEAST ONE HUNDRED DIFFERENT COUNTRIES SINCE NOVEMBER 15, 1945. THIS CERTIFICATE RECOGNIZES OUTSTANDING PERFORMANCE AND ATTESTS TO MEMBERSHIP IN THE DX CENTURY CLUB.

DXCC 150 | DXCC 160 | DXCC 170 | DXCC 180 3/25/75 | DXCC 190 | DXCC 200 8/18/76 | DXCC 210 2/17/77 | DXCC 220 | DXCC 230 | DXCC 240

#15902 May 5, 1975

Communications Manager, A. R. R. L.

Summary

HF DXing is great fun

Generally speaking the use of English is almost universal on both voice and code.

International borders don't matter.

Politics is verboten in ham radio and therefore almost non-existent.

Sometimes multilingual DXers practice their language skills especially hams from non-English speaking countries. Never make fun of their English pronunciation. Instead try to assist them.

See "The Growing Use of Foreign languages by American Amateurs" by W1YLV in March 1972 QST pg. 60.

You meet people from other countries around the world improving your knowledge of geography.

People such as the late King Hussein JY1 who was an ardent ham. US astronauts like Owen Garriott, W5LFL, Barry Goldwater, K7UGA, Father Moran, 9N1MM, Monk Apollo SV2ASP/A and Marlon Brando FO5GJ were all active hams.

You make new friends as well as learn about other cultures. Sometimes these people will even visit you.

QST Cover, August 1983 Astronaut Owen Garriott, W5LFL

SkyLab 3 Astronaut Owen Garriott, W5LFL (SK) and Joe Reisert W1JR
at Dayton HamVention May 16, 2009

References

INDEXA Summer 2022 Newsletter: “Tips and Techniques” by W1JR

ARRL Logbook of the World

ARRL DXCC List

DX Code of Conduct

Many thanks to K2RR and AD1C for helping me put his material all together.