Operating and Procedures

Operating and Procedures

References:

<u>Study Guide</u>: Chapter 12

Agenda

1. Phonetic Alphabet
2. Numbers
3. Voice operating procedures
4. HF / UHF / VHF / band plans
5. Tuning up, testing, dummy loads
6. CW operations, procedural signs / prowords
7. “Q” codes
8. R.S.T. reports – readability, strength, tone
9. Emergency operating procedures
10. Record-keeping, confirmation, maps, charts, antenna orientation

Phonetic Alphabet

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

Phonetic Alphabet

- Use words to represent letters
- First letter corresponds to the letter
- Prevents confusion on a radio, “B” can sound much like “D”

- “B”
- “BRAVO”
- “D”
- “DELTA”

VICTOR
ECHO
3 THREE
ECHO
MIKE
OSCAR

VE3EMO

THIS IS A CALL SIGN

Numbers

- Spell out numbers greater than 9
  - i.e. 121 = “one two one”
- Some numbers are pronounced differently to avoid confusion

0	**Zee-roe**	**6**	**Six**
1	**Wun**	**7**	**Say-ven**
2	**Too**	**8**	**Ate**
3	**Thu-ree**	**9**	**Niner**
4	**Fower**	**10**	**Wun-zee-roe**
5	**Fife**	**11**	**Wun-wun**

Voice Operating Procedures

UHF & VHF CHANNELIZED / REPEATERS

The main purpose of a repeater is to **increase the range of mobile and portable stations.** Repeaters use two frequencies or **"DUPLEX"** to transmit on one frequency and receive on a different frequency.

When calling via a repeater, say the call sign of the desired station and then yours **i.e. VE3EOT THIS IS VA3SUG.** Typically do NOT use phonetic alphabet for calls on repeaters. Pause between transmissions to listen to or allow anyone else who wants to use the repeater. Keep transmissions short to allow for emergency use of repeaters (don't tie them up).

Switch to **"SIMPLEX"** operation (transmitting and receiving on the same frequency) if distance between stations allows it. If you can hear the station you are talking to on "reverse" or the input frequency of the transmitter, you can and should use simplex. **Do not use repeater frequencies for simplex operation**, change to another frequency!

To break into a conversation (non-emergency) on a repeater, wait for a pause and say your call sign. Using the term **"contact**" is NOT proper procedure

To properly ask someone's location, you simple ask them, "What is your location?" or "Where are you?"

An **"autopatch"** is a device to allow telephone calls via a station or radio (repeater). Most repeaters have a "**TIME OUT"** timer function to limit the amount of transmit time

An Autopatch is a feature of a repeater to access an outgoing telephone connection. Users with a transceiver capable of producing Dual-Tone Multi-Frequency or touch tones (DTMF) can make a telephone call via public telephone system.

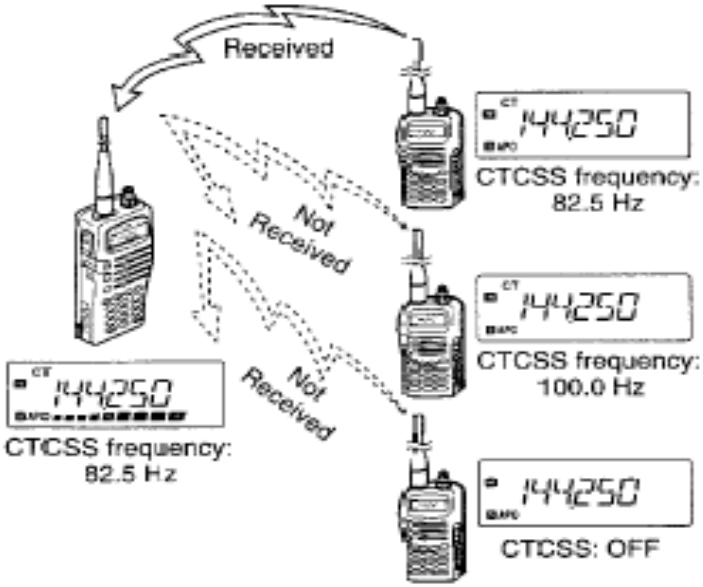
Voice Operating Procedures

"Continuous Tone-Coded Squelch System" **CTCSS** or **"Private Line" PL Tone** is a sub-audible tone added to a carrier which causes a repeater to accept a signal (without the tone, the repeater will not re-transmit the signal)

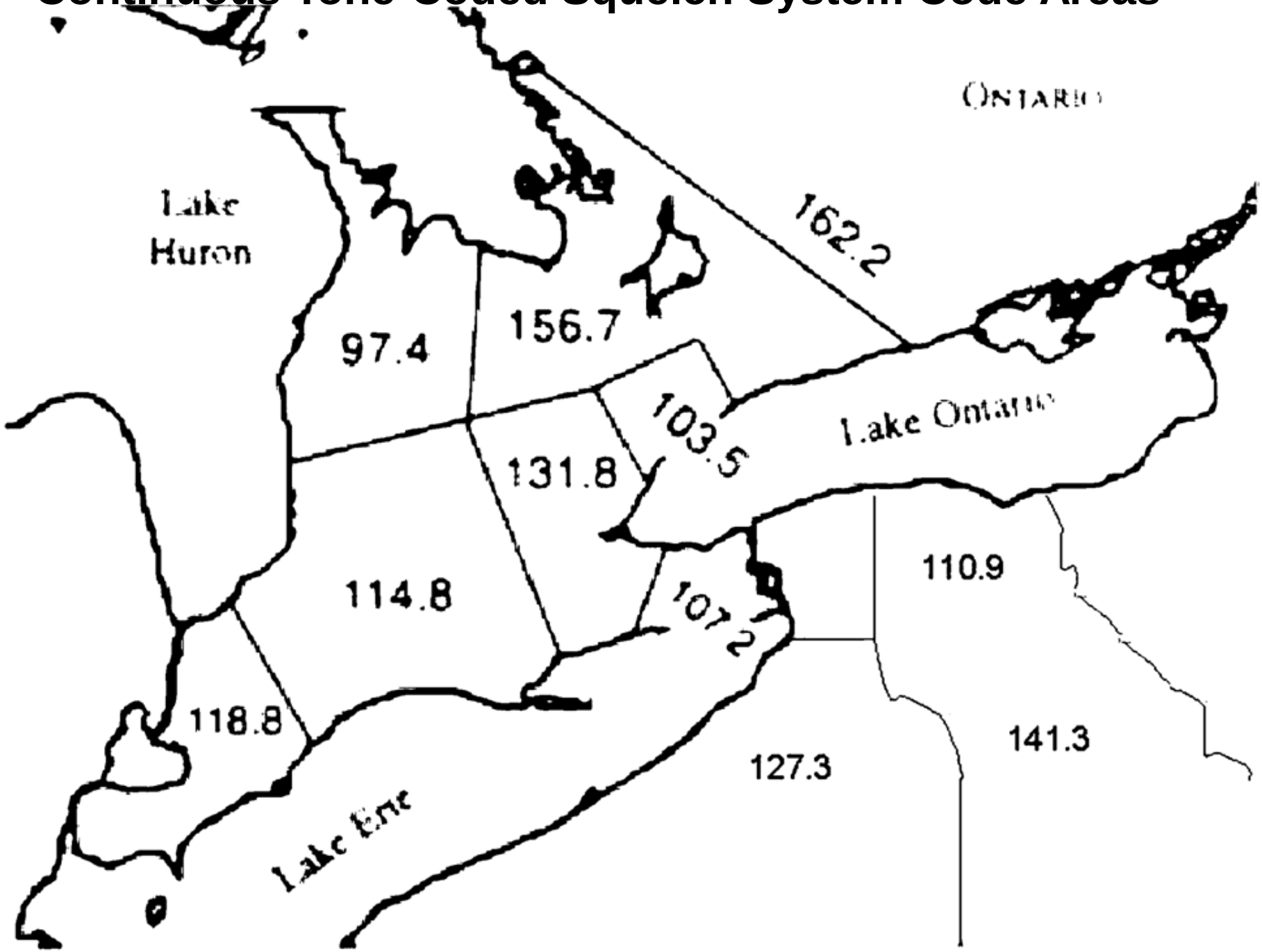
2-Meter FM repeaters use one frequency for transmit and one for receive (duplex operation). **The difference between the frequencies (the "offset") is usually 600 kHz.**

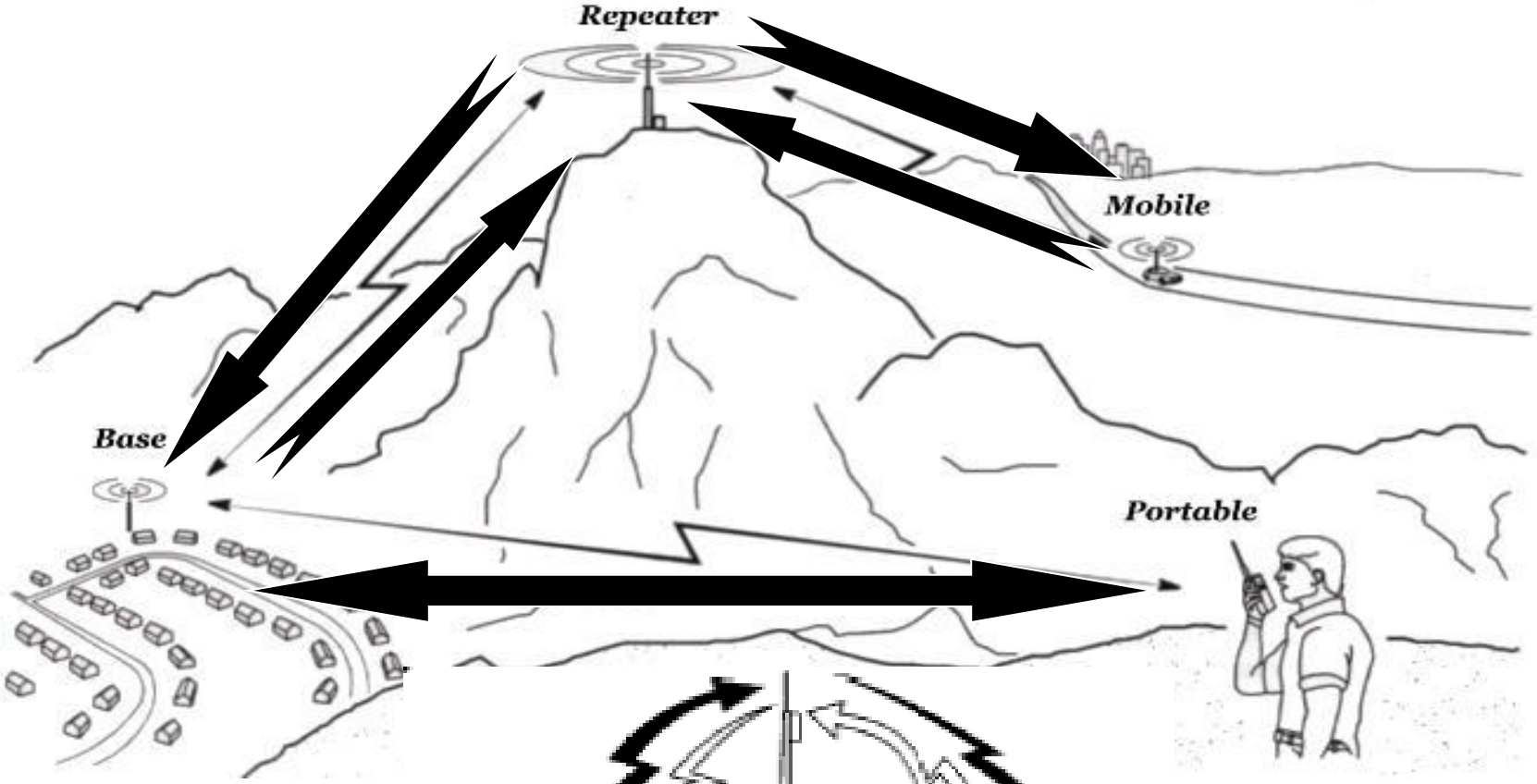
*Example: a repeater's output – what you hear - is at **145.350 MHz**. The input frequency – where you talk – will usually be **600 KHz** lower at **144.750 MHz**. However at higher VHF frequencies the offset is 600 KHz higher, eg. **147.225 / 147.825**. Most modern radios "know" this automatically.*

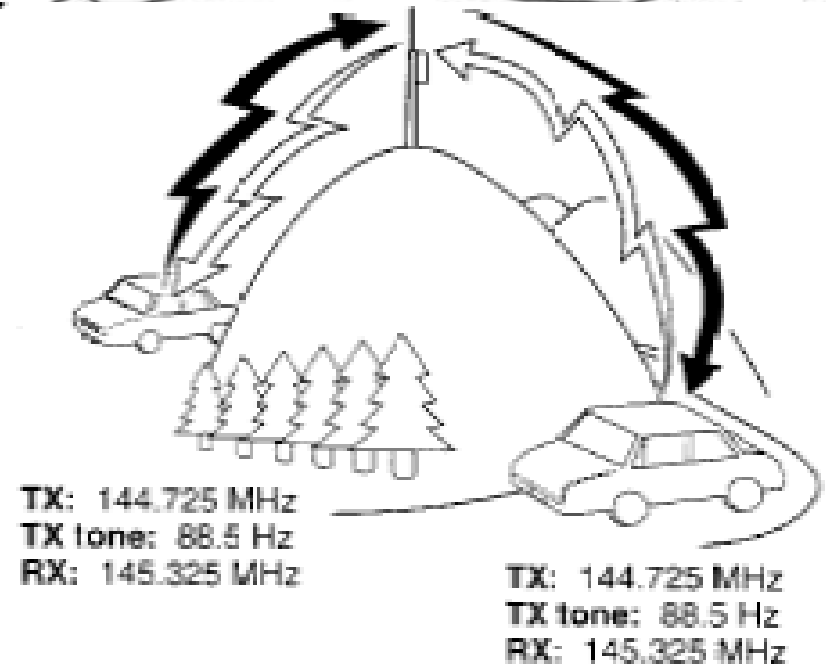
BAND	**OFFSET**
10 meters -	100 KHz
2 meters -	600 KHz
222 MHz -	1.6 MHz
70 centimeters -	5 MHz
33 centimeters -	12 MHz
23 centtmeters -	12 MHz



Continuous Tone-Coded Squelch System Code Areas




Repeater
Mobile
Base
Portable


TX: 144.725 MHz
TX tone: 88.5 Hz
RX: 145.325 MHz
TX: 144.725 MHz
TX tone: 88.5 Hz
RX: 145.325 MHz

Voice Operating Procedures

HF / VHF / UHF SIMPLEX

Local communications should use VHF and UHF to reduce and free up interference on **high frequency** (HF) Bands

To find out if HF band conditions are open in a specific area or distant location, you can listen for a **beacon signal** from that area, a foreign broadcast, or a TV station on a nearby frequency

Before transmitting you should **always listen to ensure the frequency is not occupied**, then you should also ask if the frequency is in use

To call a station, Say “CQ” three times and then your call i.e. CQCQCQ this is VA3EOT, VA3EOT, VA3EOT (or use phonetics for the call sign)

To answer, say the other stations call sign once followed by your own phonetically i.e. VA3EOT this VICTOR ALPHA THREE SIERRA UNIFORM GOLF (VA3SUG)

Voice Operating Procedures

HF / UHF / VHF SIMPLEX

If propagation or band conditions change during a contact and you notice increasing interference **you should move to a different frequency**

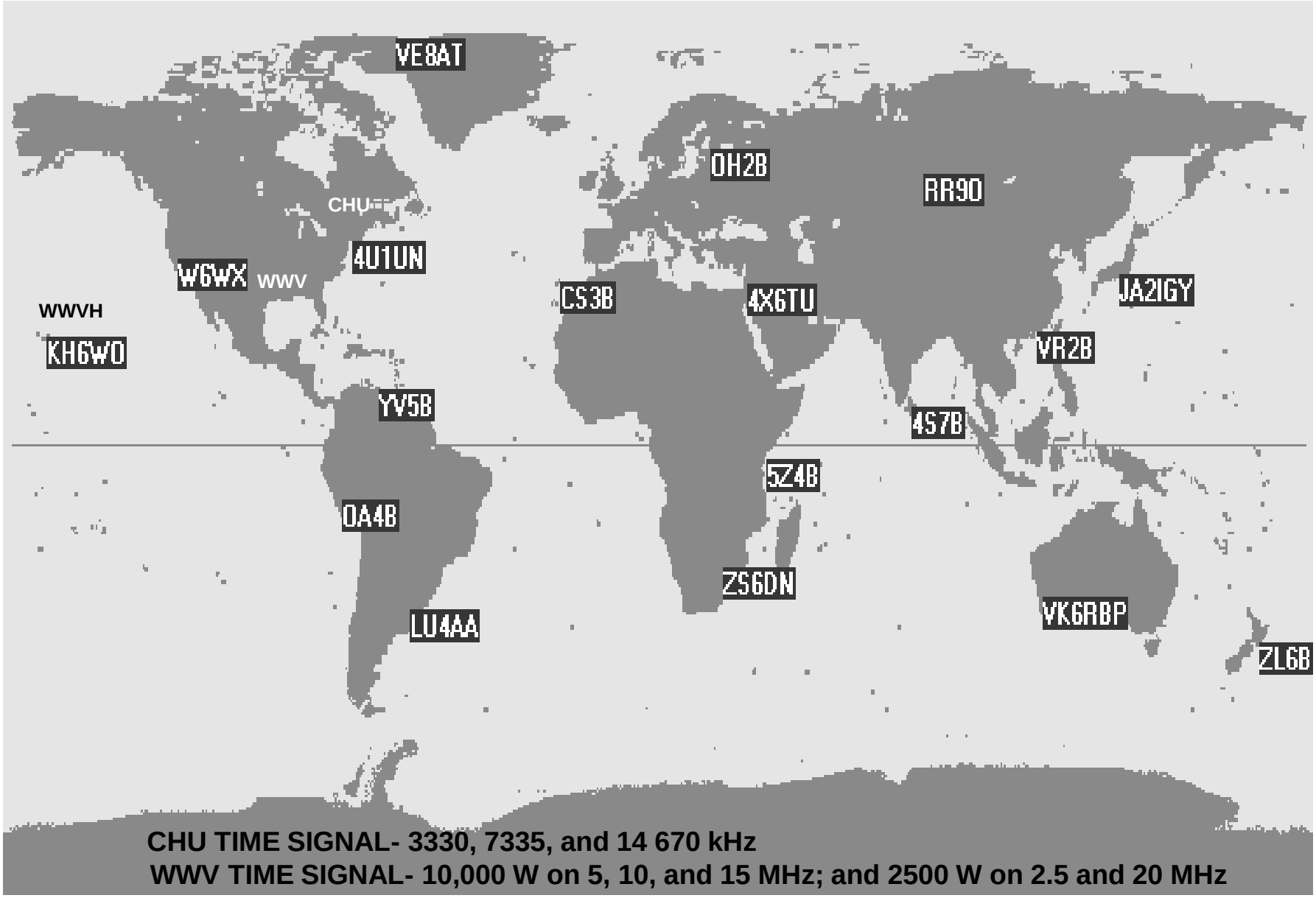
During a contact you find you have a extremely strong signal into your contact station, one adjustment you should consider **is to turn down your output power to the minimum necessary**

When selecting a single side band (SSB) phone transmitting frequency, the **minimum separation between you and a contact in progress is 3 KHz** to avoid interference.

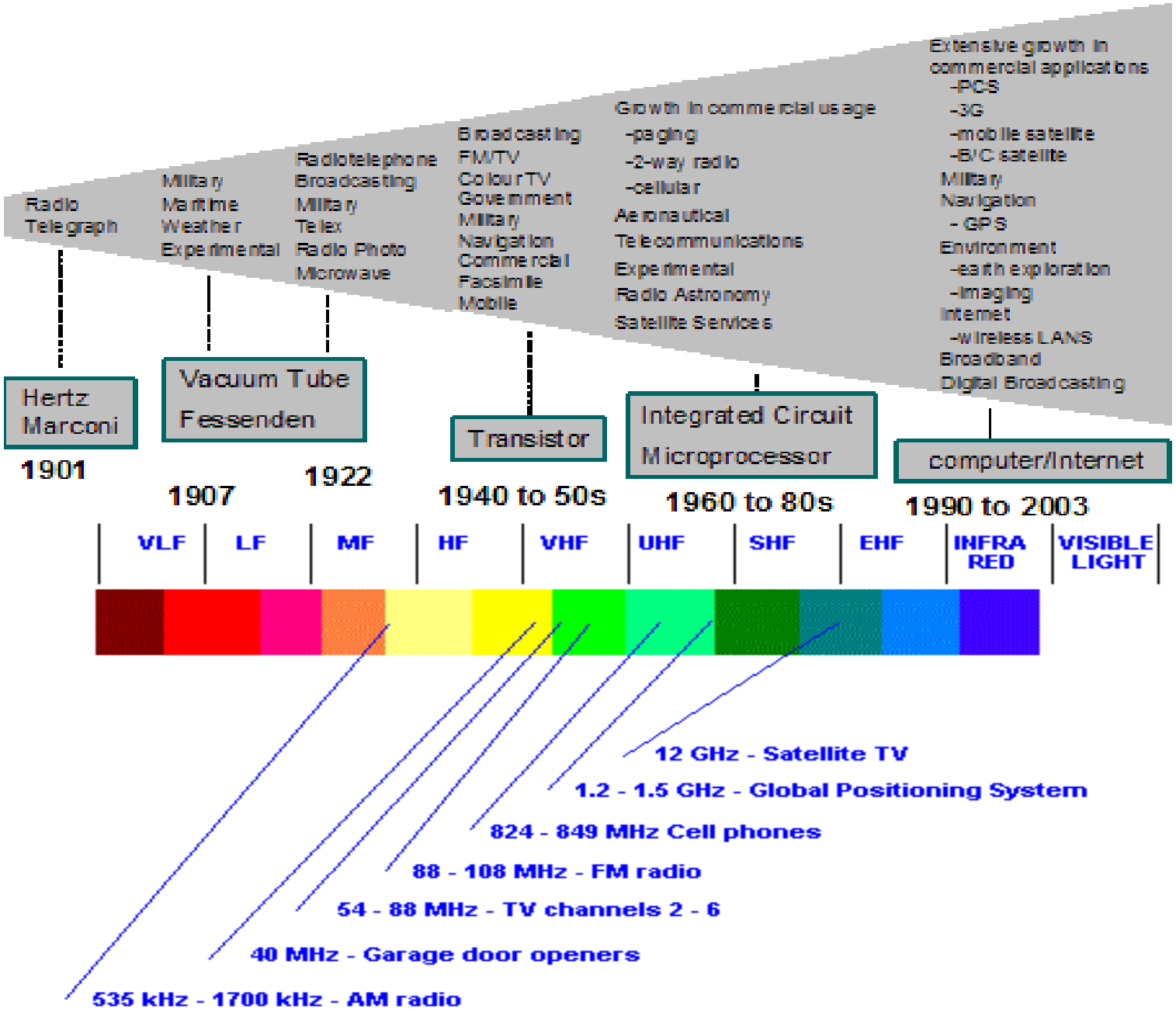
If you are a net control station on a daily HF net and your normal frequency is occupied you should conduct the **net 3 to 5 KHz** away from the normal net frequency

If a net is about to begin on the frequency you are on, as a courtesy to the net, you should **move to another frequency**

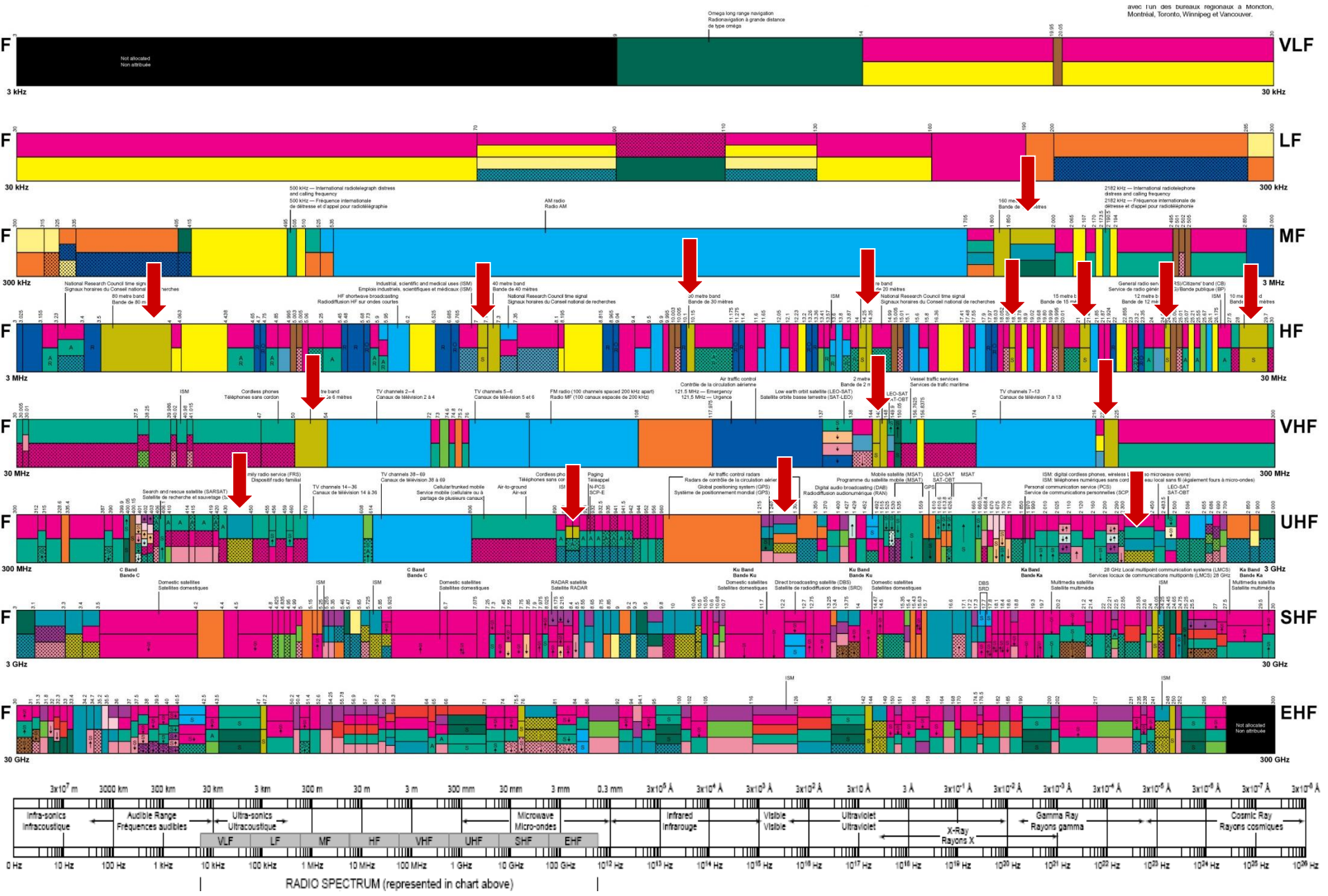
Beacon Locations Worldwide



Growth in telecommunications and use of the Radio Spectrum



Radio Spectrum Allocation in Canada



Canadian Band Plan

Lower side band is used for 3755Khz phone

CW & DIGITAL MODES ONLY

Upper side band is used for 20 meters phone

ENOUGH BW TO HAVE FM PHONE

HF LSB

HF USB

VHF

UHF

Frequency (MHz) Lower edge	Frequency (MHz) Upper edge	Maximum Bandwidth
1.8	2.0	6 kHz
3.5	4.0	6 kHz
7.0	7.3	6 kHz
10.1	10.15	1 kHz
14.0	14.350	6 kHz
18.068	18.168	6 kHz
21.0	21.450	6 kHz
24.890	24.990	6 kHz
28.0	29.7	20 kHz
50.0	54.0	30 kHz
144	148	30 kHz
220	225	100 kHz
430	450	12 MHz
902	928	12 MHz
1,240	1300	Not Specified
2,300	2,450	Not Specified
3,300	3,500	Not Specified
5,650	5,925	Not Specified
10,000	10,500	Not Specified
24,000	24,050	Not Specified
24,050	24,250	Not Specified
47,000	47,200	Not Specified
75,500	76,000	Not Specified
76,000	81,000	Not Specified
142,000	144,000	Not Specified
144,000	149,000	Not Specified
241,000	248,000	Not Specified
248,000	250,000	Not Specified

The HF Band Plan is a voluntary, gentleman's agreement. It is intended for the guidance of and observation by Canadian Radio Amateurs.

A guideline for using different operational modes within an amateur band.

Canadian HF Band Plan

160 Metre Band - Maximum bandwidth 6 kHz
1.800 - 1.820 MHz - CW
1.820 - 1.830 MHz - Digital Modes
1 830 - 1.840 MHz - DX Window
1.840 - 2.000 MHz - SSB / band modes

80 Metre Band - Maximum bandwidth 6 kHz
3.500 - 3.580 MHz - CW
3.580 - 3.620 MHz - Digital Modes
3.620 - 3.635 MHz - Packet/Digital Secondary
3.635 - 3.725 MHz - CW
3.725 - 3.790 MHz - SSB / side band modes
3.790 - 3.800 MHz - SSB DX Window
3.800 - 4.000 MHz - SSB / wide band modes

40 Metre Band - Maximum bandwidth 6 kHz
7.000 - 7.035 MHz - CW
7.035 - 7.050 MHz - Digital Modes
7.040 - 7.050 MHz - International packet
7.050 - 7.100 MHz - SSB
7.100 - 7.120 MHz - Packet within Region 2
7.120 - 7.150 MHz - CW
7.150 - 7.300 MHz - SSB / wide band modes

30 Metre Band - Maximum bandwidth 1 kHz
10.100 - 10.130 MHz - CW only
10.130 - 10.140 MHz - Digital Modes
10.140 - 10.150 MHz - Packet

20 Metre Band - Maximum bandwidth 6 kHz
14.000 - 14.070 MHz - CW only
14.070 - 14.095 MHz - Digital Mode
14.095 - 14.099 MHz - Packet
14.100 MHz - Beacons
14.101 - 14.112 MHz - CW, SSB, Packet
14.112 - 14.350 MHz - SSB
14.225 - 14.235 MHz - SSTV

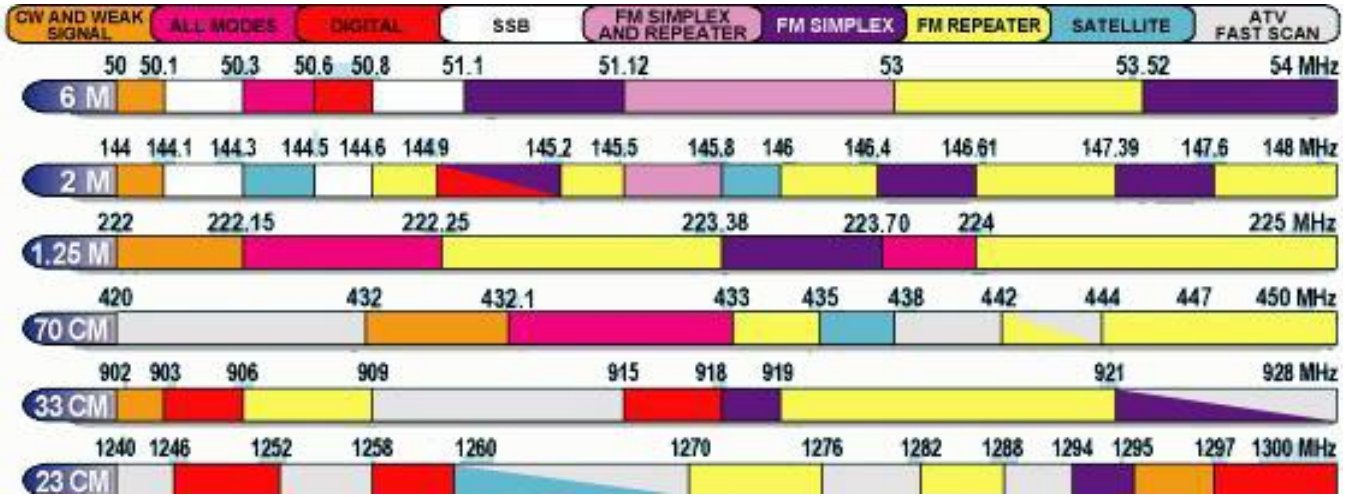
17 Metre Band - Maximum bandwidth 6 kHz
18.068 - 18.100 MHz - CW
18.100 - 18.105 MHz - Digital Modes
18.105 - 18.110 MHz - Packet
18.110 - 18.168 MHz - SSB / wide band modes

15 Metre Band - maximum bandwidth 6 kHz
21.000 - 21.070 MHz - CW
21.070 - 21.090 MHz - Digital Modes
21.090 - 21.125 MHz - Packet
21.100 - 21.150 MHz - CW and SSB
21.150 - 21.335 MHz - SSB / wide band modes
21.335 - 21.345 MHz - SSTV
21.345 - 21.450 MHz - SSB / wide band modes

12 Metre Band - Maximum bandwidth 6 kHz
24.890 - 24.930 MHz - CW
24.920 - 24.925 MHz - Digital Modes
24.925 - 24.930 MHz - Packet
24.930 - 24.990 MHz - SSB / wide band modes

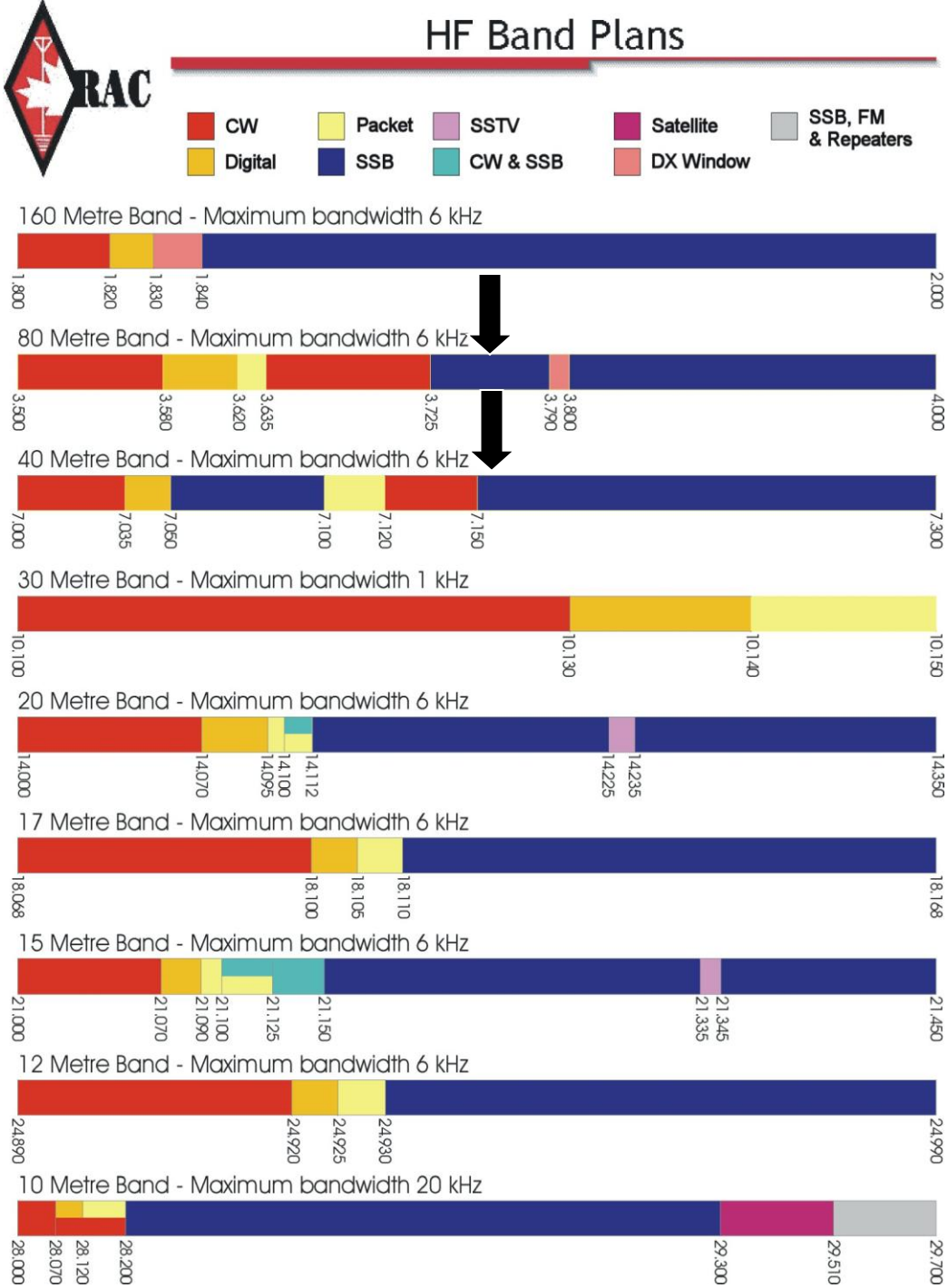
10 Metre Band - Maximum band width 20 kHz
28.000 - 28.200 MHz - CW
28.070 - 28.120 MHz - Digital Modes
28.120 - 28.190 MHz - Packet
28.190 - 28.200 MHz - Beacons
28.200 - 29.300 MHz - SSB /wide band modes
29.300 - 29.510 MHz - Satellite
29.510 - 29.700 MHz - SSB, FM and repeaters

Canadian VHF/UHF Band Plan



AMATEUR RADIO EMERGENCY SERVICE
ARES
COMMUNICATIONS

HF Band Plans



During a wide area emergency, ARES Ontario and the NTS (National Traffic System) will use 3.742 MHz and 7.153 MHz, adjusted for QRM, for Province wide voice communications.

AMATEUR RADIO
RAC
EMERGENCY SERVICE

Tuning Up, Testing & Dummy Loads

A dummy load is a device used to simulate an electrical load, usually for testing purposes in place of an antenna

Tuning into a dummy load will shorten transmitter tune up time on air and avoid interference to stations on frequency.

On air interference can be avoided by using a dummy load to test transmissions, or loading up procedures.

Using a **dummy antenna will allow tuning without causing interference**

Tuning Up, Testing & Dummy Loads

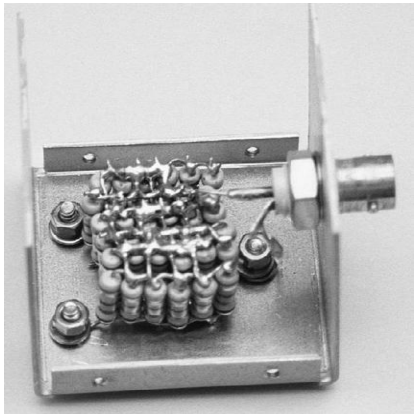
Cantenna dummy load suitable up to 30 MHz and up to 1 kW

A dummy load capable of dissipating four times the legal limit (6 kW) for 2 to 3 minutes and legal limit (1500 watts)

The "dummy load" is an indispensable accessory for any radio amateur. Using a dummy load, transmitter adjustments can be made "off-the-air" so that no unnecessary interference is generated on the ham bands.

Dummy loads are an easy useful project that just about anyone with moderate soldering skills can build.

A very simple and effective dummy load can be made from several resistors, a connector, and a small metal plate or piece of PC board stock.



25 Watt dummy Load
"HOME BREW"

CW Operations, Procedural Words (Prowords)

Listen first to ensure the frequency is **NOT** in use

Continuous wave/waveform (CW) or Morse code is sent at **any speed <u>you can reliably receive.</u>**

CW Transmitting frequency should be between **<u>150-500 Hrz for minimum interference</u>**

<u>Full Break-in Telegraphy:</u> **Incoming signals received between transmitted Morse code "signals"**(dashes or dots) this enables the other station to "break-in" while you are still sending.

CW Operations, Procedural Signs / Prowords

<u>NOTE: This is Morse Code protocol, NOT voice</u>

CQ = Calling any station

CQ three times, then your call sign three times

CQ CQ CQ DE VE3EMO VE3EMO VE3EMO

To answer or reply

VE3EMO VE3EMO DE VA3SUG VA3SUG K

DE = from (like the French “from” or “of”)

K = go ahead, or over to you

CW Operations, Procedural Signs / Prowords

DX = Long distance

73 = Best wishes / bye **(not 73's)**

AR = End of message

BT = Break in the text

SK = End of transmission

RST = **R**eadability, **S**trength, **T**one (signal report)

“Q” Codes

Q-codes are abbreviations for a detailed question or answer

Standardized collection of three-letter message codes, all starting with the letter "Q“

Agreed upon by the International Telecommunication Union (ITU), used worldwide on radiotelegraph

Q-code abbreviations can be a question when followed by a question mark: “QTH?” = What is your location?

“Q” Codes (cont’d)

- QR**L** “Is this frequency in use?” *(or are you busy?)*
- QR**M** “I’m being interfered with” *man-made* *(e.g. jamming)*
- QR**N** “I’m troubled by static” *non-man-made* *interference*
- QR**S** “Send more slowly”
- QR**X** “I will call you again”
- QR**Z** “Who is calling me?”
- QS**O** “A contact is in progress” (i.e. *thanks for the QSO*)
- QS**Y** “Change frequency” *(QSY to 14.210)*
- QT**H** “My location is” *My QTH is Toronto*
- QS**L** “I acknowledge” *I understand, Roger …*
- QR**T** “Stop sending” *I’m QRT for the day (finished, done)*

RST Signal Reports

Readability, Strength, Tone

A short way to describe or give a signal or reception report (i.e. radio check) based upon your “S” meter reading and what you actually hear.

An “S” meter is used to measure relative signal strength in a receiver

Poor Good

RST =	Readability	1-5
	Signal strength	1-9
	Tone	1-9

RST - Readability

A qualitative assessment of how easy or difficult it is to correctly copy the information being sent

1 Unreadable

2 Barely readable, occasional words distinguishable

3 Readable with considerable difficulty

4 Readable with practically no difficulty

5 Perfectly readable

RST - Strength

An assessment of how powerful the received signal is at the receiving location

1 Faint signal, barely perceptible
2 Very weak
3 Weak
4 Fair
5 Fairly good
6 Good
7 Moderately strong
8 Strong
9 Very strong signal

RST - Tone

Used only in Morse code and digital transmissions

therefore omitted during voice operations

1 Very rough and broad
2 Very rough, very harsh and broad
3 Rough, tone, rectified but not filtered
4 Rough note, some trace of filtering
5 Filtered rectified, but strongly ripple-modulated
6 Filtered tone, definite trace of ripple modulation
7 Near pure tone, trace of ripple modulation
8 Near perfect tone, slight trace of modulation
9 Perfect tone, no trace of ripple or modulation of any kind

RST Signal Reports

An RST of 599 best reading, *i.e. "you're 599"*

11 = Unreadable and barely perceptible
57 = Perfectly readable, moderately strong
33 = Readable, some difficulty, weak in strength
59 **plus 20db** = Signal strength is 20db over strength 9 ***"you're 20 over 9"***

RST of 459 **=** Quite readable, fair strength, perfect tone (usually used for CW and Digital Modes)

RST of 579 = Perfectly readable, moderately strong, perfect tone

A quadrupling (**4 times**) of power will raise your "S" meter by **ONE "S" unit.**

To raise the receiver's meter from **S8 to S9,** transmit power needs to quadruple (i.e. from 50 watts to 200 watts, 4 times the power)

Emergency Operating Procedures

<u>MAYDAY or SOS</u> takes precedence over all calls!

Real emergencies only – it is illegal to knowingly transmit a false distress signal

<u>URGENCY (PAN-PAN)</u> Say it three times

Safety for a person, vehicle, aircraft, vessel, residence etc is threatened.

Pan-Pan, Pan-Pan, Pan-Pan this is VE3EOT with …..

<u>SECURITY ("securitay")</u>

Weather warnings, aids to navigation, used mostly in or by maritime situations.

Sécurité, Sécurité, Sécurité. All ships, all ships, all ships this is VA3XMJ

Emergency Operating Procedures

If you need immediate emergency assistance, the appropriate voice signal is “MAYDAY” and the appropriate Morse code signal is “SOS”

Used only in a life threatening situation to you or some one else

Derived from the French venez m'aider, meaning "come [to] help me, venez" is dropped, thus MAYDAY.

The proper way to use it is to say “MAYDAY” several times

MAYDAY MAYDAY MAYDAY this is VA3NSC

For CW “SOS” …---…

If you are using a repeater and you want to interrupt a conversation with a distress call, you say “BREAK” twice and then you call sign

B*reak break this is VA3SUG with emergency traffic*

Emergency Operating Procedures

During a contact you hear a distress call or break in, you:

1. Acknowledge the station in distress
2. Determine their location (their “QTH”)
3. Ask what assistance is needed

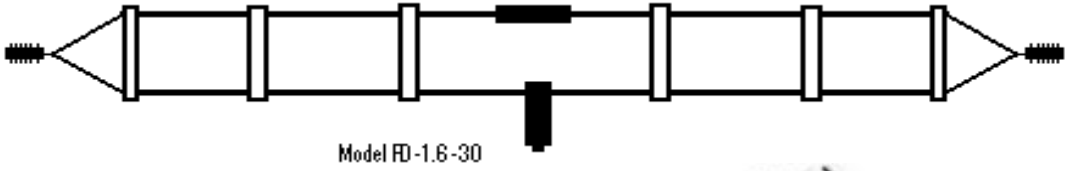
If you hear a distress call and can not assist, you maintain watch on the frequency until certain that assistance is forthcoming to the caller

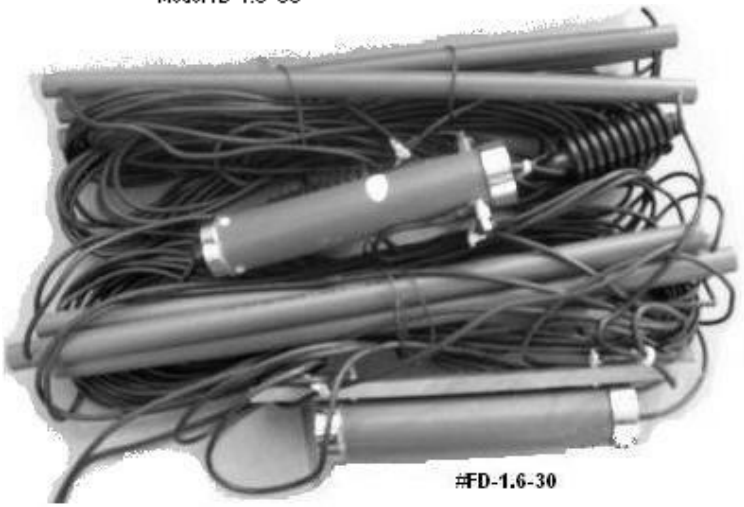
If you are in contact with a station and you hear a emergency call on your frequency you:

1. Stop your contact
2. Take the call

Emergency Operating Procedures

- Have back-up power to use your stations in an emergency if usual electrical supply fails
- Have several batteries / sets of batteries for handheld radios
- Simple wire dipole antennas are a good choice for portable and/or emergency HF stations


Model FD-1.6-30


#FD-1.6-30


PC300RS


POWER STATION
P2P 1200
-12Volt, 12 Amp.
P2P400
12volt - 4 Amp

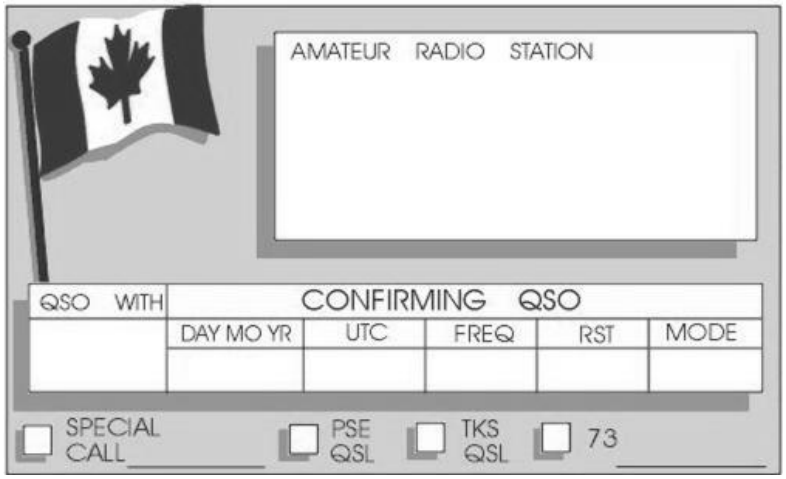
Record-Keeping, Confirmation, Maps, Charts, Antenna Orientation

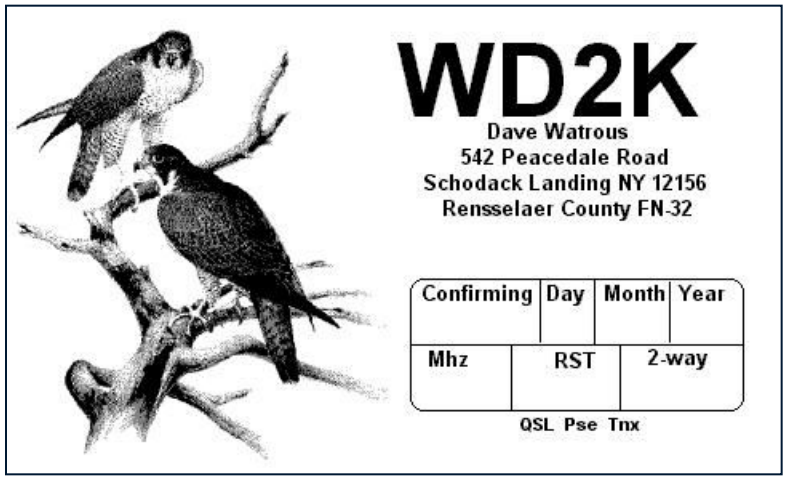
QSL Cards & Station Logs

QSL Card is written proof of communications between two amateurs

(Today, electronic “e-QSL” confirmation is becoming more common)

QSL Cards are a signed postcard listing the date, time, frequency, mode, and power used in a contact

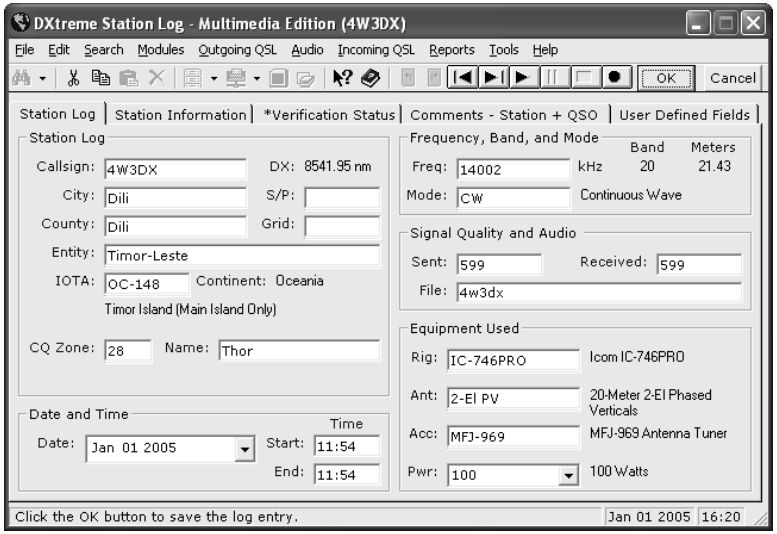


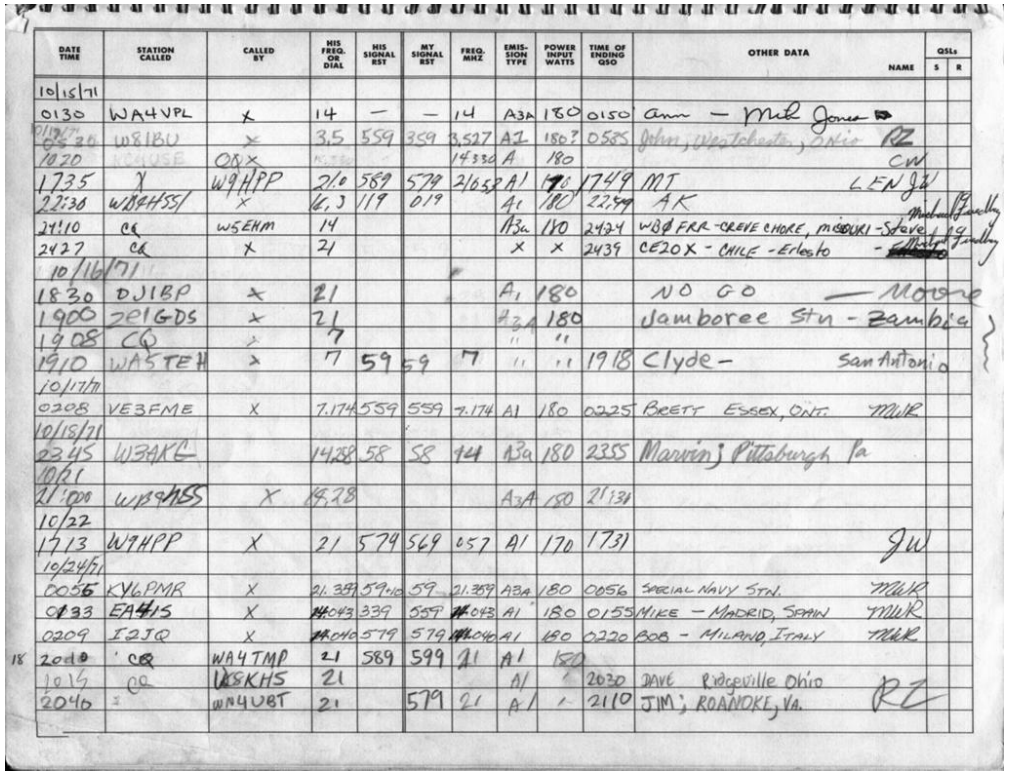


Record-Keeping, Confirmation, Maps, Charts, Antenna Orientation

Station logs and QSL cards are always recorded with UTC time (Universal Time Coordinated) formerly called Greenwich Mean Time (GMT). It is the time at zero degrees longitude, which meridian passes through Greenwich, England.

To set your clock to UTC time listen to either CHU in Canada, or WWV or WWVH time signals in the U.S.





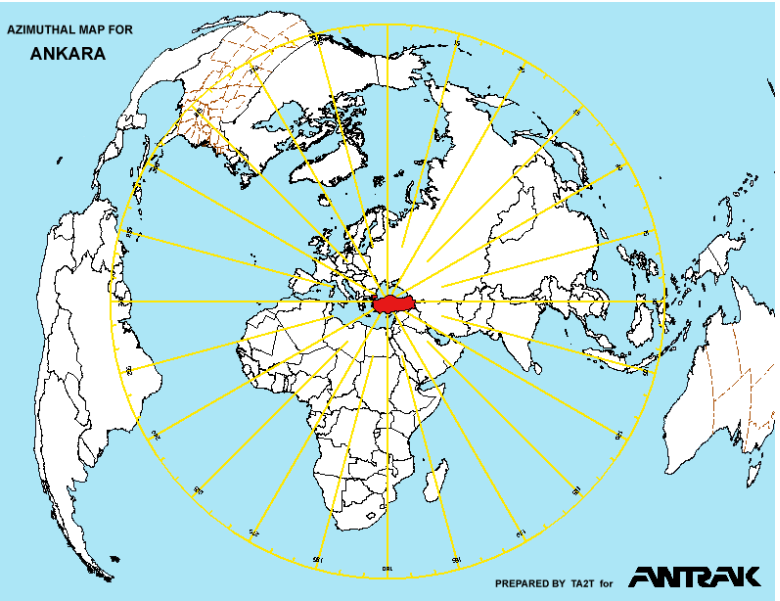
Recording contacts and keeping station logs is <u>no longer required by Industry Canada</u>

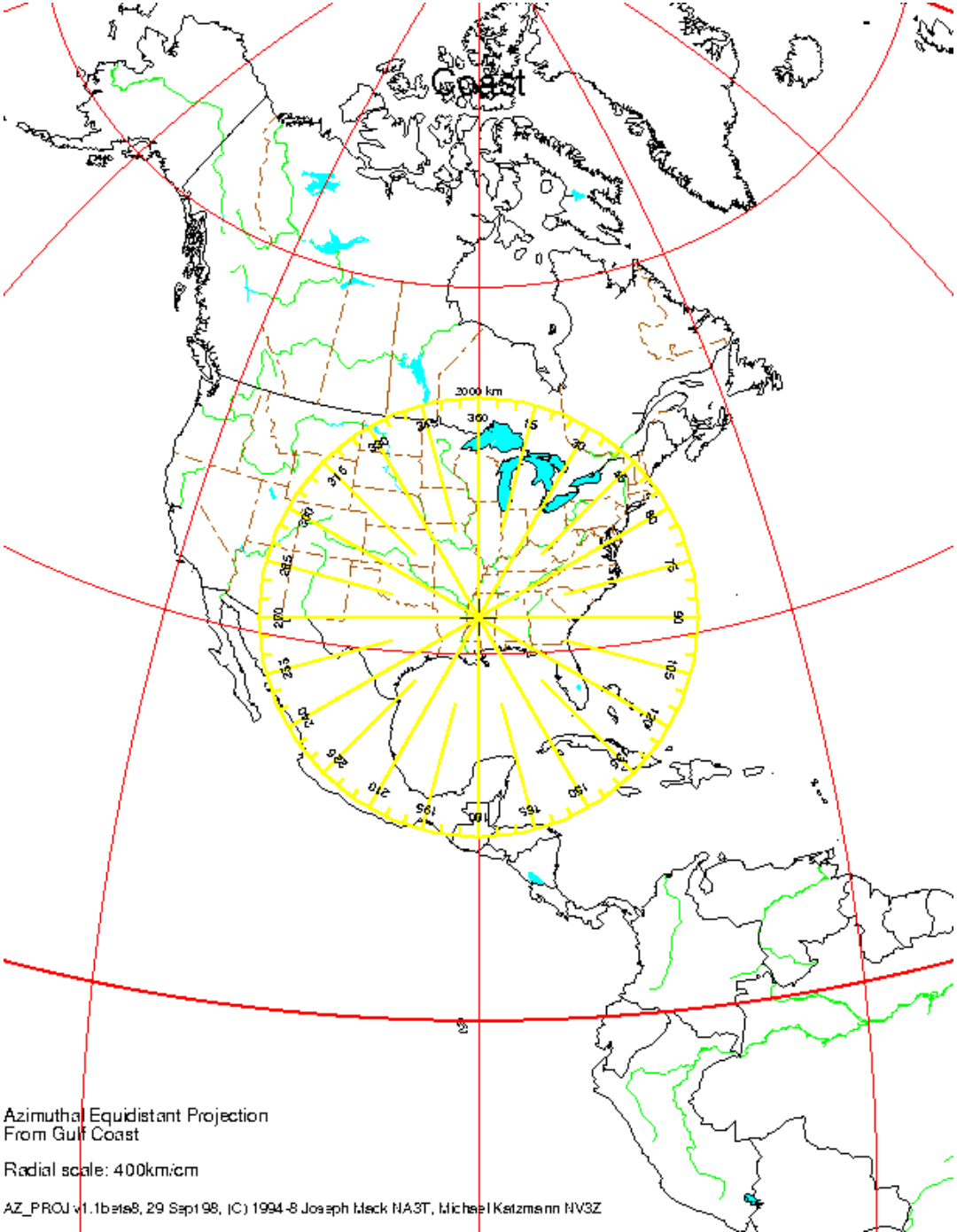
Azimuthal Maps

The most useful map to use when orienting a directional antenna towards a distant station

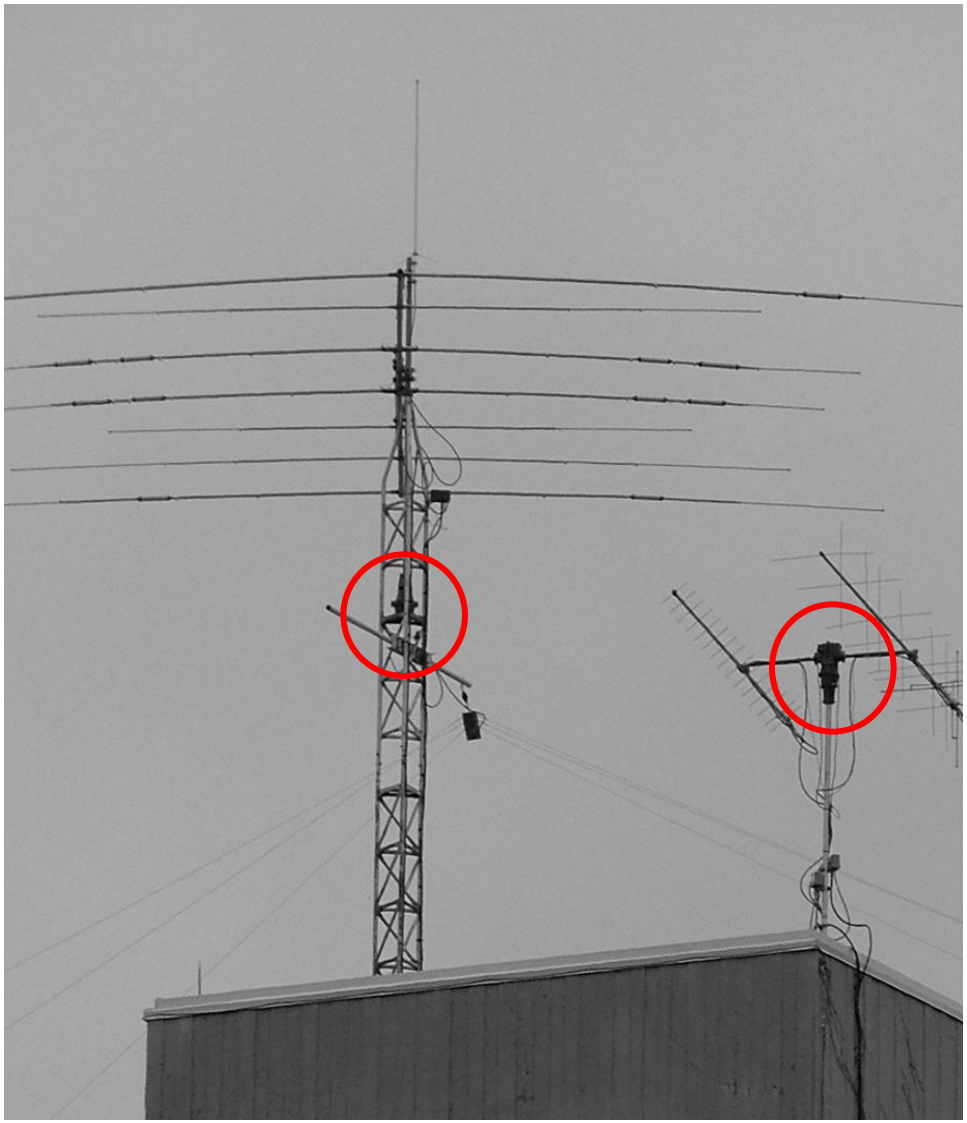
Azimuthal maps are projected or centered on a specific location and are used to determine the shortest path between the center and the location of the desired contact.

Azimuthal maps will also show a compass bearing from your centered location to any point on the map and will assist in antenna planning and pointing.





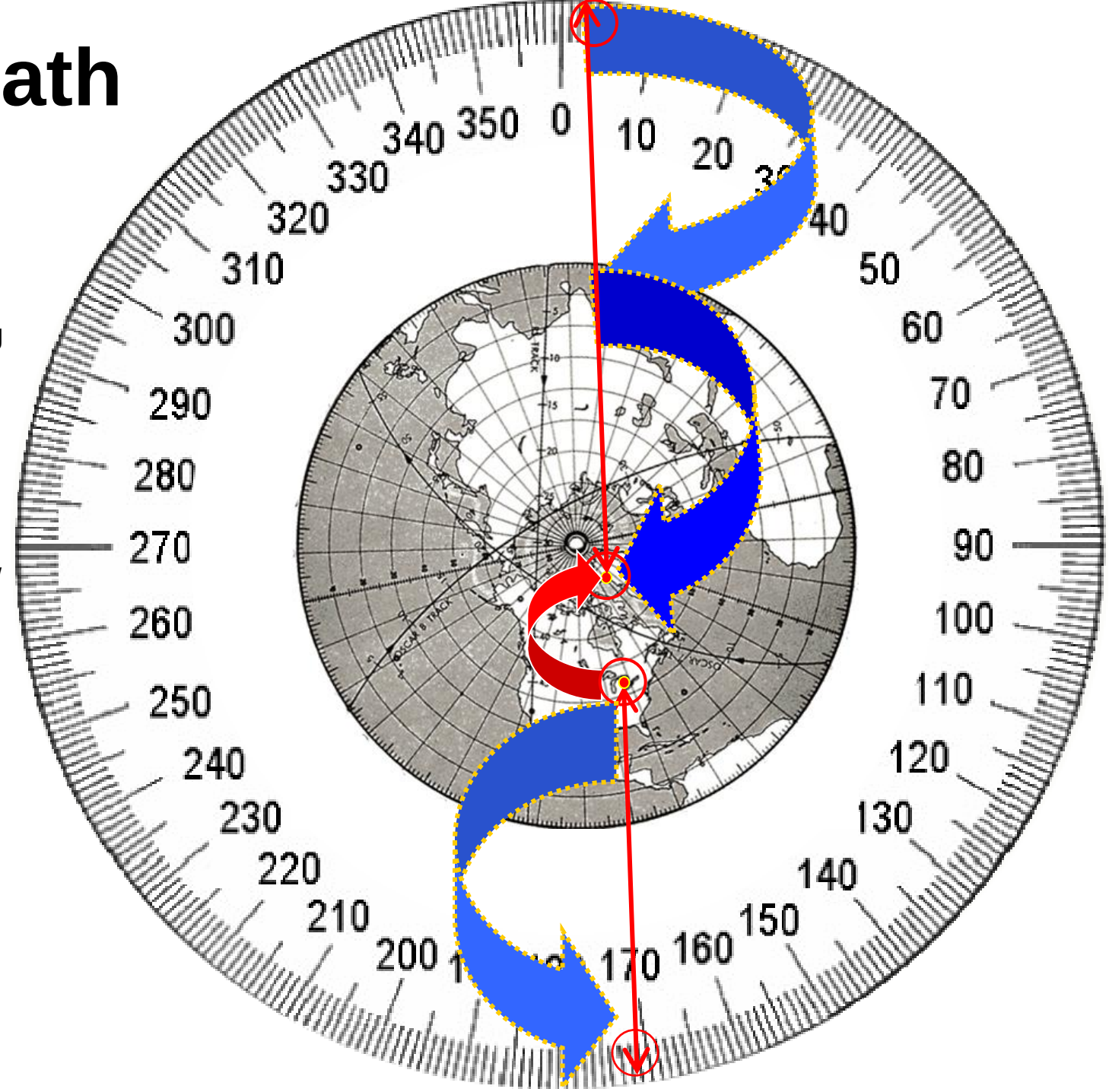
HF, VHF, Satellite Antenna Rotator



Long Path

A directional antenna position 180 degrees (reverse bearing) from the shortest path is referred to as the “long path”

If you can hear local stations making contact with distant stations (i.e. DX in New Zealand) but you cannot hear the DX station, try pointing your antenna in the long path direction (180 degrees from the azimuthal map’s short path). You may find that – like the other local stations – you can hear best on the long path.



QUESTIONS ????