



Archery

# SPARC



Dog



Eye



Hippo



Insect



Laboratory



Mustache

South Pasadena Amateur Radio Club  
presents

## Learning Morse Code

Carol Bruegge, KE6SRN  
May 1, 2024

SouthPasRadio.org  
For info: [contact@southpasradio.org](mailto:contact@southpasradio.org)



Quarterback



Robot



Submarine



# Overview



The International Morse Code

Getting on the air

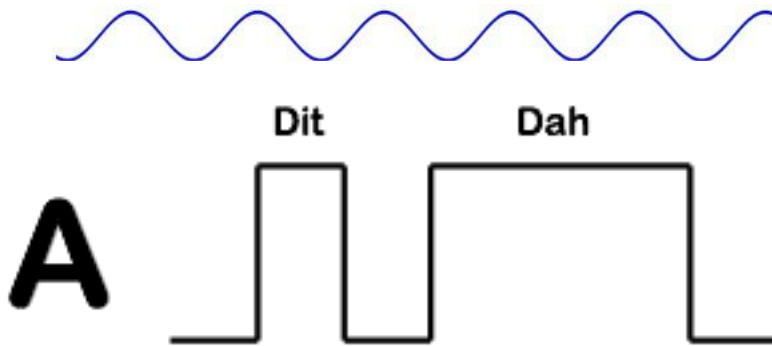
Learning tools



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- In amateur radio, Morse code is a communication mode where a CW (continuous wave) is turned on and off with use of a telegraph key. This is used to create **characters** (letters, numbers, prosigns) using combinations of two **elements**.
  - short bursts are called *dits* (pronounced di- or dit) and written as a dot
  - long bursts are called *dahs* and written as a dash

# International Morse Code



**Spacing** – the gap between letters and words

- A dit length is one
- A dah length is three
- Space between elements is one
- Space between characters is three
- Space between words is seven

Warning: spacing matters!

- “AN” can be heard as “P”, or “WE” depending on spacing
- “We got here” vs “We go there” have same characters, different spacing
- “We train today” vs “Wet rain today”

A	· —	N	— ·
B	— · · ·	O	— — —
C	— · — ·	P	· — — ·
D	— · ·	Q	— — — ·
E	·	R	· — ·
F	· · — ·	S	· · ·
G	— — ·	T	—
H	· · · ·	U	· · —
I	· ·	V	· · · —
J	· — — —	W	· — —
K	— · —	X	— · · —
L	· — · ·	Y	— · — —
M	— —	Z	— — · ·
1	· — — — —	6	— · · · ·
2	· · — — —	7	— — · · · ·
3	· · · — —	8	— — — · · ·
4	· · · · —	9	— — — — ·
5	· · · · ·	0	— — — — —

# Why use CW?



- 100 years old, but still popular today
- Spectrum-efficient.
  - Dozens of CW conversations can take place within the bandwidth of one single SSB voice signal
  - Power in a smaller bandwidth leads to higher signal-to-noise
- Effective for long-distance communication, even at low power levels
  - A 5 W CW signal is comparable in readability to an 80 W voice contact
- Simple equipment (no voice related circuitry)
- QRP (low power) CW radios are small, easy to transport
  - Smaller Go-Pack for trips
  - Nice setup for POTA and SOTA

# QRP radios



## MountainTopper Mtr4b (\$370)

- By Steve Weber (KD1JV), NH
- 4-band (80, 40, 30, 30 m)
- CW only
- 5 W with 12 V supply
- 8 ounces
- Internal iambic B keyer, 5 to 31 WPM
- Three message memories
- Chinese version available from Venus

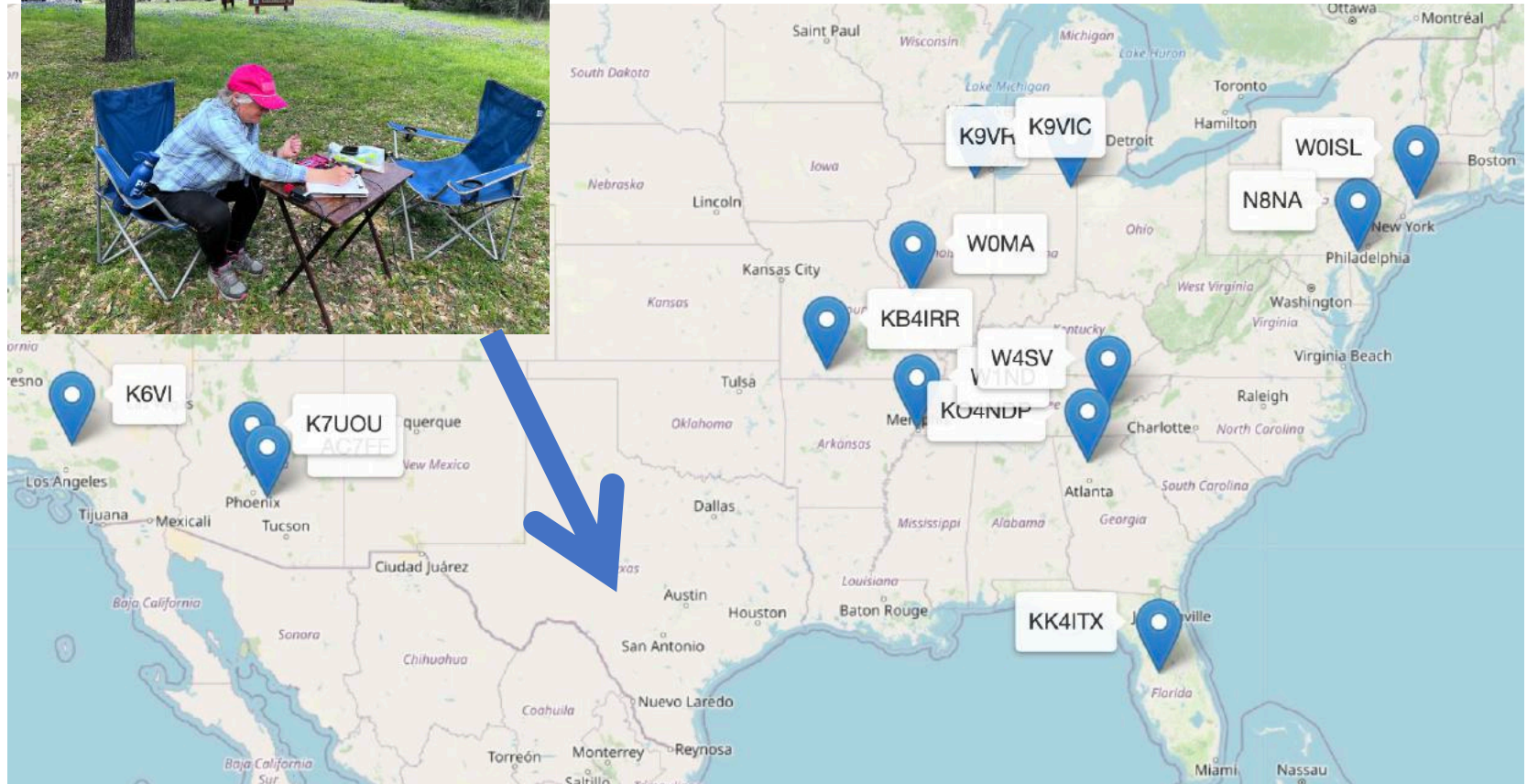


## Elecraft KX2 (\$1000 or \$1600 for package)

- K6KR and WA6HHQ, Watsonville, CA
- 9 bands (80 – 10m)
- SSB, CW, and data
- 10 W with 12 V supply
- 13 ounces
- Automatic Antenna Tuner
- Built-in speaker and mic
- Internal iambic B keyer, 5 to 31 WPM
- Three CW/ data memories
- Two voice message memories



# QRP (5 W) contacts from Pedernales Falls State Park



- 17 QSOs, 3 Park-to-park contacts. All on 20 m using a dipole

W .--  
H ....  
A .-  
T -  
I ..  
S ...  
C -.-.  
W .--  
? ..--..

... or more precisely – what is the Gerke Code?

- 1836. Samuel Finley Breese Morse demonstrates signals can be sent over wires.
  - Develops precursor code using numbers in a codebook
- 1840. Alfred Vail creates the American Morse Code. It used letters and numbers, where the letters most commonly used are assigned the shortest sequence of dits and dahs.
- 1865. Paris conference adopted the International Morse code, the (Fredriche) Gerke code used on Hamburg railways, as the international standard. Only four characters (E, H, K, N) the same as the original American Morse Code.
  - *What we today call Morse Code is actually the Gerke Code*
    - *We use the term CW interchangeably with Morse Code, since it is the most common way to send Morse Code in radiotelegraphy.*



# Morse Code in Radio Communications



- 1890. Morse Code used in early radio communication; no voice communication at this time.
- July 12, 1999. Last commercial Morse code transmission. Signed off with Morse's original 1844 message: "What Hath God Wrought SK (end of contact)"
- 2004. Dept. of Defense declares operators no longer need to be trained in Morse code.
  - U.S. Navy and Coast Guard continue to use signal lamps to communicate by Morse code.

## Licensing

- In 1951 Extra Class required 20 wpm, General and Technician 13 wpm, and novice 5 wpm.
  - 2007 Morse Code no longer required for licensing.



## Efficient communication

Q-codes

Abbreviations

Prosigns

# Q signals



- Q-signals are three letters that begin with Q and replace common phrases.
- They are carried over from early telegraph days, but are still used to speed up a message

Q Signal	Used as a question	Used as a statement
QRL	Are you busy?	I am busy, please do not interfere
QRM	Are you bothered by noise (man-made)?	There is interference in your transmission
QRN	Are you bothered by noise (of a natural origin)?	
√ QRP	Shall I decrease power?	Decrease transmission power
QRS	Shall I send more slowly?	Send more slowly
√ QRT	Shall I stop sending?	I am stopping transmission
√ QSL	Can you acknowledge receipt?	I am acknowledging receipt
√ QRZ	Who's calling me?	You are called by ____
QSO	Can you communicate?	A communication.
QSY	Shall I change to another frequency?	I am changing to another frequency.
√ QTH	What is your location?	My location is ____

# Abbreviations, Numeric substitutions, and prosigns



## Abbreviations

- AGN: Again
- ANT: Antenna
- CQ: Calling any amateur radio station
- ES: And
- FB: Fine business
- GM, GA, GE: Good morning, afternoon, evening
- HiHi: Laughter
- HW?: How do you copy?
- PWR: Power
- TNX, TU: Thanks
- YL: young lady. XYL: Wife
- 73: Best regards

## Abbreviations, cont.

- K: Invite any station to transmit
- R: Roger (all received OK)

## Numeric substitutions

- N for 9
- O (letter) for 0 (number)

## Prosigns

Procedural signals, 2 characters with no space between them.

- BK: Back to you
- BT: Break between text



Getting on the air

Simple exchanges



# Simple Exchanges

## POTA (Parks-on-the-air) exchange

CQ POTA CQ POTA DE KE6SRN

*KK6ZVQ*

KK6ZVQ GM UR 5NN 5NN BK

*GM UR 5NN 5NN CA CA BK*

TU ES 73 DE KE6SRN E E

## SOTA (Summits-on-the-air) exchange

CQ SOTA DE KE6SRN

*KK6ZVQ*

KK6ZVQ UR 599 K

*TU UR 599 K*

TU QRZ SOTA KE6SRN

🇺🇸 KE5YYC @ US-8618

📍 US-8618 White Ridge National Recreation Trail

🏠 US-NM

📡 14277 kHz

🌐 KA5WAD

📄 59 OK

🕒 Last heard 4 mins ago at 01:11 UTC

RE-SPOT ↻

🕒 39

- The POTA website lists current activators. This makes it easy to find a frequency for an exchange. For those new at CW, it allows you to understand a simple QSO.
- Activators are listed based on a self-spot, a posted spot by a hunter, or by the reverse-beacon-network (RBN)

# Basic QSO



CQ CQ CQ DE KB6NU KB6NU KB6NU K

KB6NU KB6NU DE W8JNZ W8JNZ BK

W8JNZ DE KB6NU TNX FER CALL UR RST 5NN 5NN NAME IS DAN DAN QTH  
ANN ARBOR, MI ANN ARBOR, MI HW? W8JNZ DE KB6NU BK

KB6NU DE W8JNZ R TNX FER RPT. UR RST 5NN 5NN. NAME IS CLAY  
CLAY. QTH DIXBORO, MI DIXBORO, MI. BK

... TU CLAY FER RPT FRM DIXBORO. WX IS CLDY ES COOL. RIG RUNS KW TO  
4EL YAGI ...



## Learning tools

Copying

Keying

# Learning methods



“It is not the speed at which a letter is sounded that perplexes the learner, but the rapid succession in which they follow each other.” Thomas Edison

## Farnsworth

- Full-speed character (18 to 20 wpm). Space added between characters and words. Spacing decreased as proficiency increases.

## Koch

- Learn 2 characters at full speed. When can copy 90% of the time, add an additional character.

## Goal

- ICR (Instant Character Recognition). Ability to hear a sound pattern and instantly recognize the character.

# Learning Do's and Don't



## Objective

- To have the unconscious mind transform audible tones directly into characters, words, and sentences without conscious thinking of dits and dahs
- Develop ICR (Instant Character Recognition) to achieve this objective

## Do

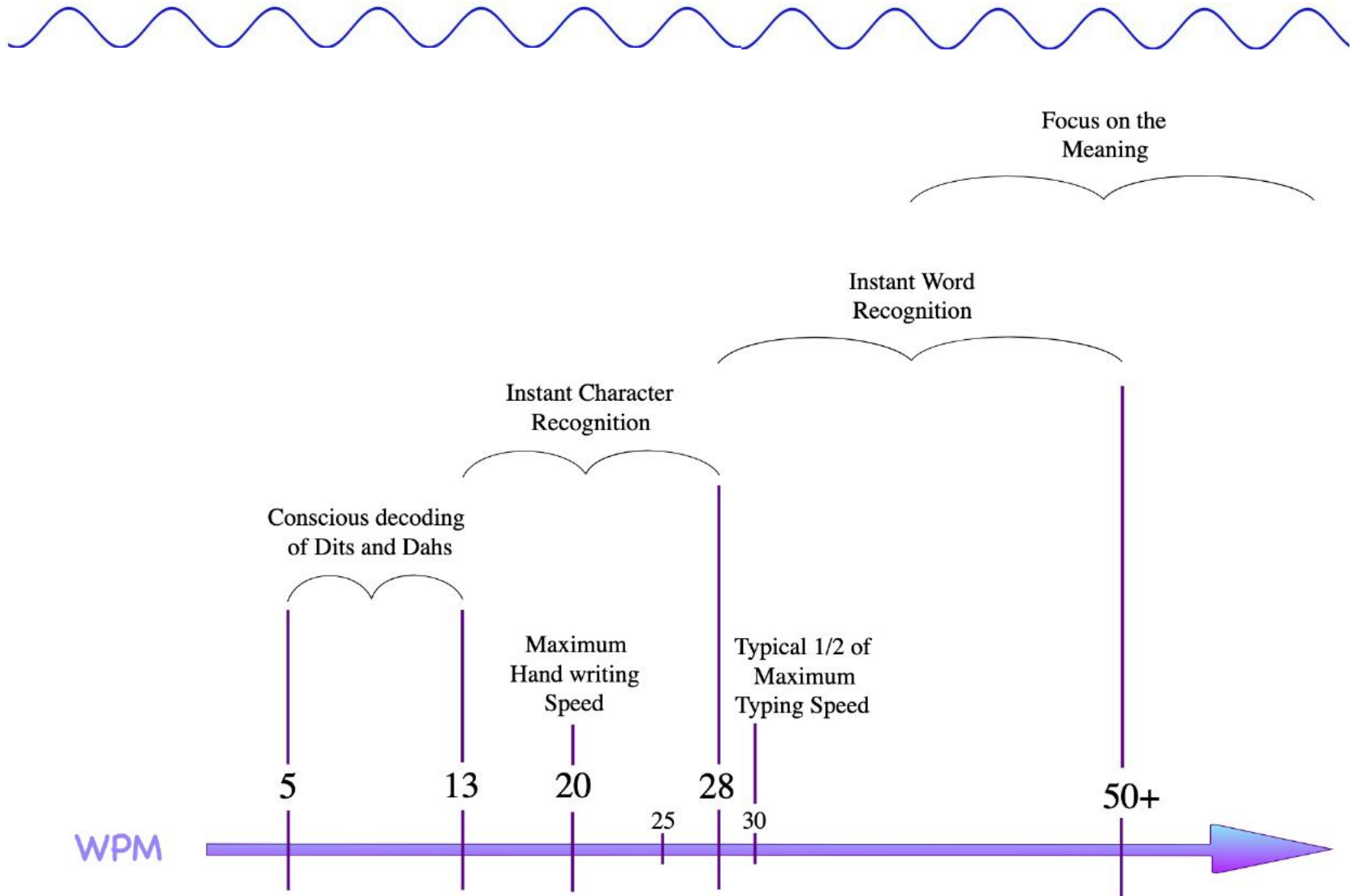
- Strive for frequent, short practice sessions
  - Practice twice a day, 15 min/ day
- Learn characters at 20 WPM. Adjust overall character & word spacing to match skill level (e.g., 10 WPM to start).
- Head copy or copy behind (hear entire word before writing)
- Don't stress. If you miss a character or word, go on.

## Don't

- Learn at 5 WPM
- Use conscious thinking of dits and dahs.



# Speed versus proficiency



# Learn with others via Zoom



**The best Morse Code practice method is the one you will do!**

## CW Academy (free)

- Three sessions offered each year (Jan, Apr, Sept), each eight weeks
- Focus is on “head copy” (understanding without writing down characters as heard) and Instant Character Recognition
- Four levels
  - Beginner: characters, protocols
  - Fundamental: Operating at 6 WPM with goal of increasing to 10 WPM
  - Intermediate: Operating at 10 WPM with goal of increasing to 20 WPM
  - Advanced: Operating at 20 WPM with desire to increase
    - Skills required to become a CWops member

## Long-Island CW Club (\$30/ year, ... \$90/ lifetime)

- 138 classes/ week
- No entry point, progress at own pace

If you get bored with your practice routine, change it up.

## Free Morse Code learning tools

Name	Platform	Usage
Morse Code Ninja	Web site guide to YouTube videos	Course
LCWO	Web browser	Learn characters
RufzXP	Windows	Call sign; Push speed
Morse Runner	Windows	Learn contesting skills in a simulated environment
Morsle.fun	Web browser	Guess 5-letter word at decreasing speed (WPM)
Morse Code News	Web browser	Daily news headlines at a speed you choose
W1AW Code practice	MP3 audio files	Updated routinely
Iambic Master	Windows	Sending practice. Requires Winkey.

# Morse Code Ninja

Morse Code course created by AD0WE, Kurt A Zoglmann, Manhattan KS

- First YouTube video released May 21, 2019
- Morse Code Ninja website live July 28, 2019
- Find YouTube videos via Morse Ninja site or directly from YouTube search
- More than 1000 practice videos available with speeds from 15 to 50 wpm.
- Material can be downloaded or podcast setup

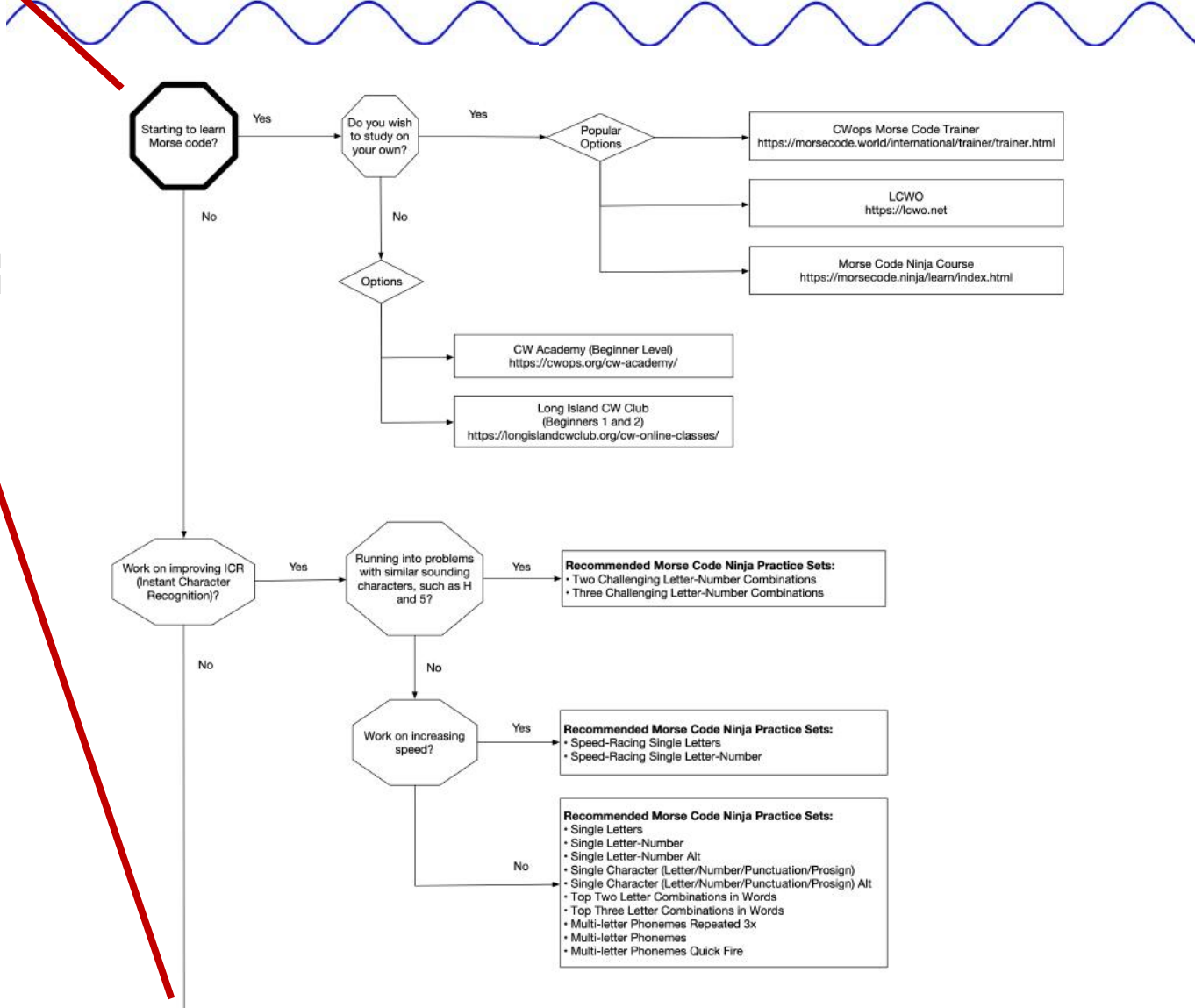
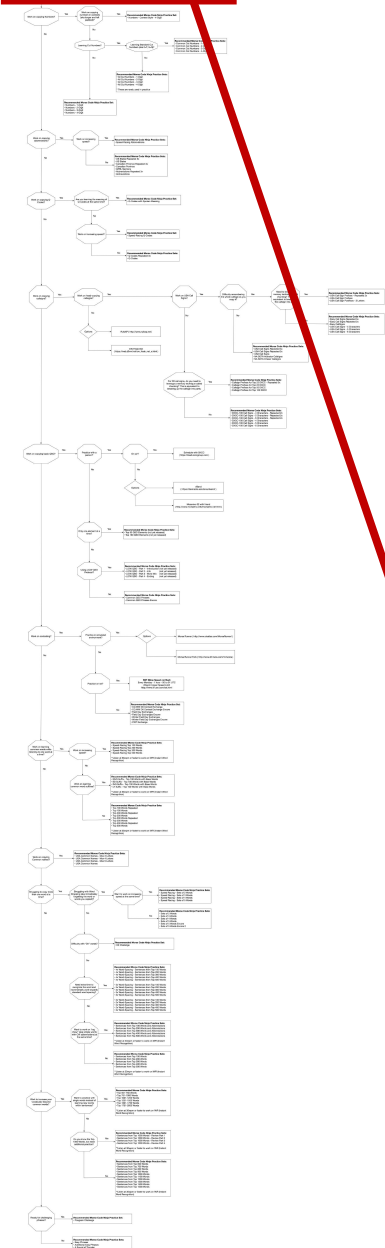
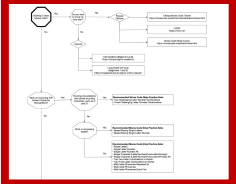


Top 100 Words  
Repeated 3x  
at 20wpm

- For each word:
1. Sent 3x in Morse code
  2. Spoken
  3. Repeated in Morse code
  4. Courtesy tone



# Ninja course flow-chart





# LCWO

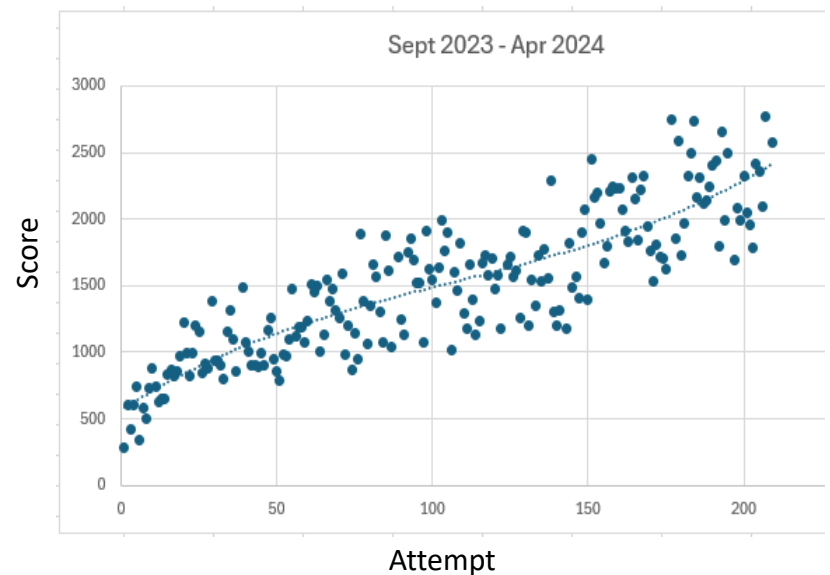
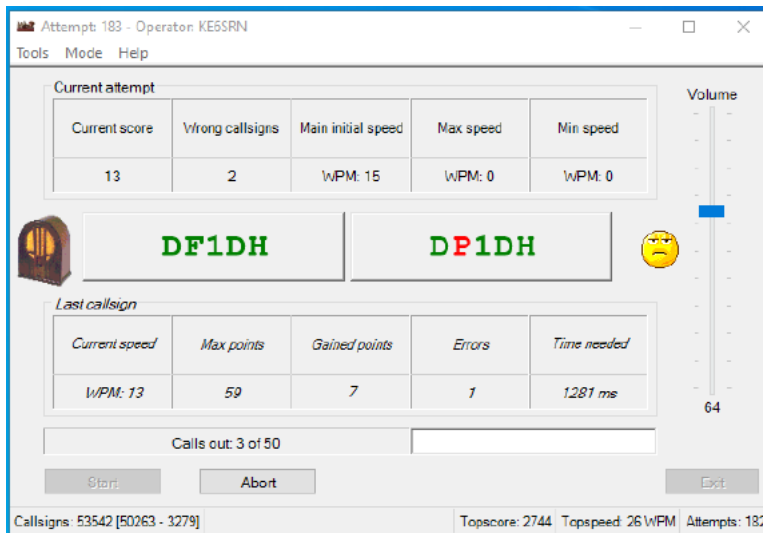
Get comfortable with being uncomfortable!!!

Sent Group	Received Group	Errors
,QB?H	,QB?H	,QB?H 0
,6?PZ	,6?PZ	,6?PZ 0
F2RAN	F2RAN	F2RAN 0
FNX1=	FNX1=	FNX1= 0
B,=4A	B,=VA	B,=4A 1
LPB.5	LPB.5	LPB.5 0
RYQUH	RYQUH	RYQUH 0
/50G9	/50G9	/50G9 0
/,USF	/,USF	/,USF 0
EG?TZ	EG?TZ	EG?TZ 0
9UL02	9UL02	9UL02 0
9BM=/	9BM=/	9BM=/ 0

- URL: <https://lcwo.net>
- On-line app. Create an account to save settings and history
- To begin, go to “Change CW settings” and select character speed, effective speed, and group length. For example, 25/10/2 (It is suggested to always keep character speed at 25). Start at effective speed of 10 and 2 group length. **Increase speed an/or group length when you get 10% or less errors.** (Increase challenge when you master at <10% error rate.)
- Then go to “Code Groups” and select between letters, numbers, mixed, or custom. The latter is useful in working out difficulties (h vs 6 vs s)

# RufzXP

- Download to your PC: <https://www.rufzxp.net/>
- “Start” then enter your call sign and starting speed (WPM), and enter
- Enter what you hear. Get it right and your speed increases; get it wrong and your speed decreases. Points earned are proportional to speed of the call. More points if you get it correct on first of 2 calls
- Fun to review scoreboard and see your progress with time.



# MORSE RUNNER: A QSO simulation

The screenshot shows the Morse Runner application window. At the top, there is a blue wavy line representing a Morse signal. The main window has a menu bar (File, Run, Send, Settings, Help) and a central table of QSOs. To the right of the table are station settings and band conditions. At the bottom, there is a summary panel with call signs, RST, and a score table.

UTC	Call	Recv	Sent	Pref	Chk
00:00:50	F5INJ	599 0001	599 0001	F5	
00:02:03	W5YB	599 0002	599 0002	W5	
00:02:46	K8NU	599 0006	599 0003	K8	
00:03:15	K2PH	599 0004	599 0004	K2	
00:04:12	KK7UV	599 0004	599 0005	KK7	
00:04:55	ON6TJ	599 0007	599 0006	ON6	
00:05:58	KB4CAU	599 0009	599 0007	KB4	
00:06:42	G3MCS	599 0003	599 0008	G3	
00:08:36	RZ9IB	599 0002	599 0009	RZ9	
00:09:45	YV5OHV	599 0005	599 0010	YV5	
00:10:53	W6T2D	599 0002	599 0011	W6	NR
00:12:14	I1CRB	599 0001	599 0012	I1	
00:14:08	RW3PN	599 0017	599 0013	RW3	
00:14:55	SP9ZE	599 0013	599 0014	SP9	

**Station Settings:**  
 Call: KE6SRN  QSK  
 CW Speed: 15 WPM  
 CW Pitch: 600 Hz  
 RX Bandwidth: 600 Hz  
 Mon. Level: [Slider]

**Band Conditions:**  
 -15.0 dB Activity  
 QRN  Flutter  
 QRM  LID's 2  
 QSB

**Run Settings:**  
 for 15 min.

**Summary Panel:**  
 Call: WR7Q RST: 599 Nr: 100  
 48 qso/hr.  
 00:15:00  

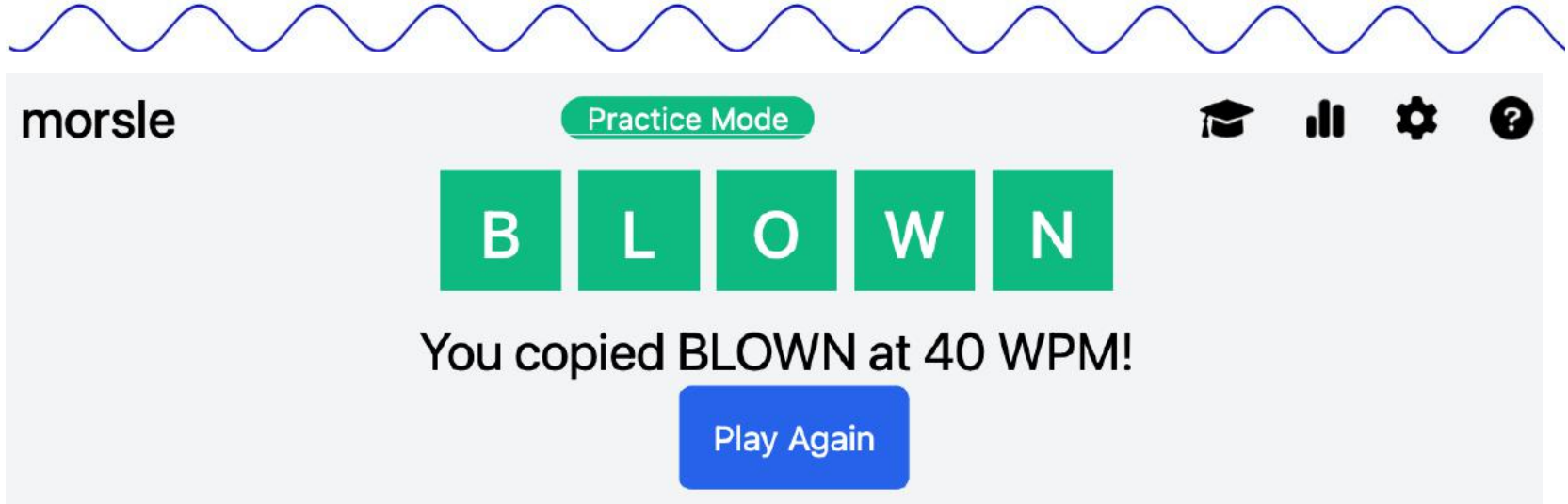
	Raw	Verified
Pts	14	13
Mult	14	13
Score	196	169

# MorseRunner: Getting started

- Download app to your PC <https://www.dxatlas.com/MorseRunner/>
- Enter a CW speed a bit higher than your current proficiency.
- Check QSK (full break-in) box. Leave all band conditions unchecked
- Set time for 15 minutes. Under the Run field, select Single Calls
- Listen to the call until you think you have it, then hit F5 <his> to confirm.

F1 CQ	CQ		F7 ?	Request repeat of his call sign
F2 <#>	If hear "NR?" then press F2 to send your number		ESC	Stop sending
F3 TU	Sends TU then information moved to log		F5+F2	Full exchange. If hear "NR?" second time then press F5 + F2
F4 <my>	Sends your call sign		Enter	If just heard his call: Sends F5+F2. He should reply with his Nr. Or, If after he confirms his call ("R") and sends his Nr, then this enters info into log
F5 <his>	Sends what typed in the call field. Use to confirm			

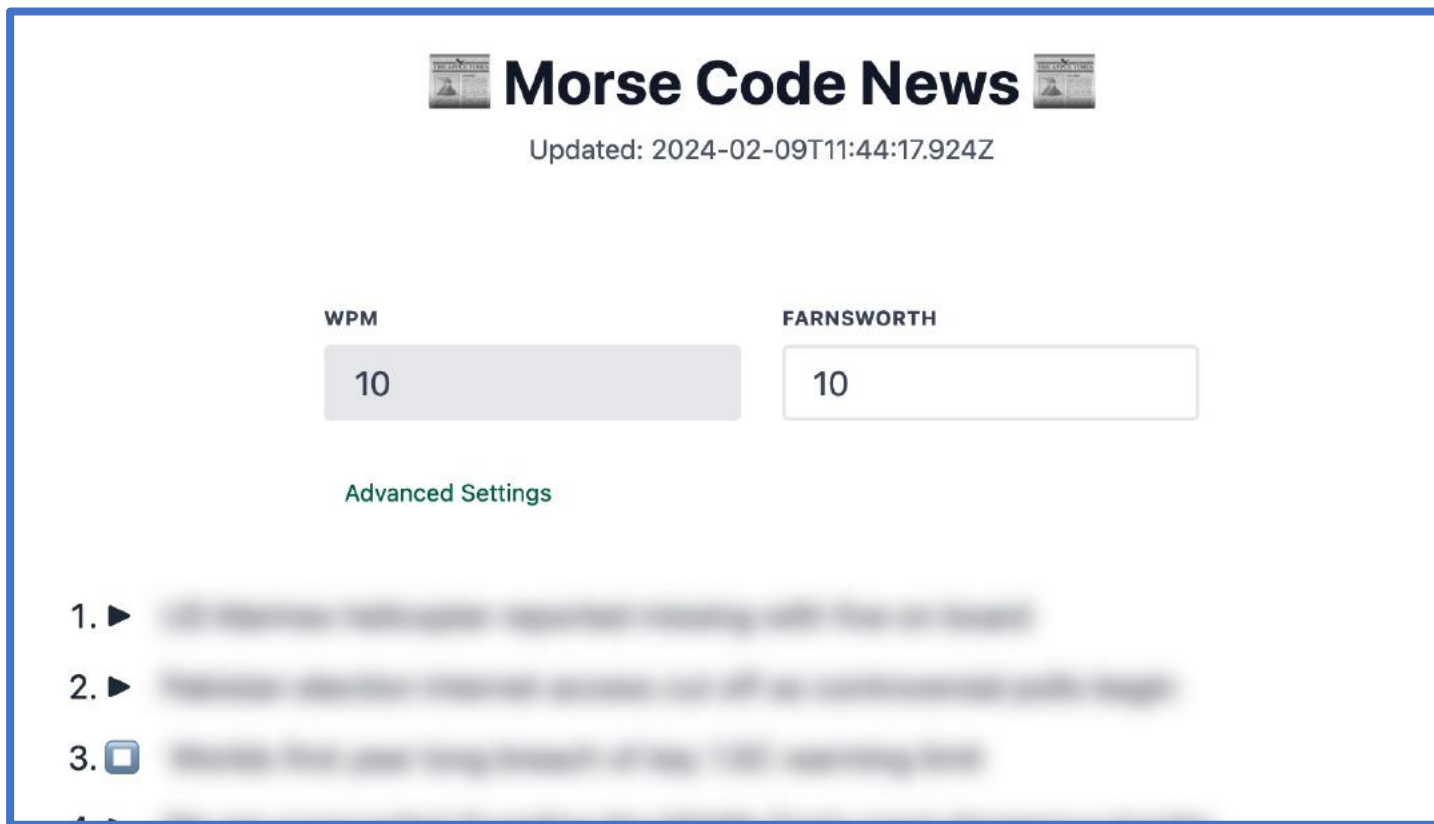
# Morsle.fun



- URL: <https://morsle.fun/>
- Web page tool; keeps score only for current session
- You have **21 tries** to guess the word, which will be played out loud in Morse code.
- Playback speed **starts at 40 words per minute (WPM)**; every three tries the speed **decreases by 5 WPM**.
- You are granted **one guess** every time you play the word. Play the word again if you need to keep guessing.
- You can guess even if there are some blank letters. Correct answers will be marked in green, but there are no other hints.

# Morse Code News

- <https://morse.mdp.im/news/>
- Daily headline news in Morse Code at your selected speed



The screenshot shows the Morse Code News website interface. At the top, there is a blue wavy line. Below it, the title "Morse Code News" is displayed in a large, bold, black font, flanked by two small icons of a newspaper. Underneath the title, the text "Updated: 2024-02-09T11:44:17.924Z" is shown. The interface features two input fields for speed settings: "WPM" with a value of "10" and "FARNSWORTH" with a value of "10". Below these fields is a link for "Advanced Settings". At the bottom, there is a list of three items, each with a play button icon and a checkbox, representing news headlines.



## Learning tools

Copying

Keying

# Iambic Master/ Winkeyer for sending practice

## Iambic Master

- URL: <https://sites.google.com/site/korkowp1/iambic-master>
- Using this software, learn to send accurately with a [K1EL](#) Winkeyer such as the [WKUSB-SMT CW Keyer](#) (or compatible device).
- Copy text into the clipboard, then key it using your paddle and Winkey
- What you type is decoded and displayed, allowing you to evaluate your code, and letter and word spacings

## Winkeyer

- Iambic Master app requires a Winkeyer device
- Keyer can be used with or without a computer
- Used with Iambic Master to practice keying without a radio





# Types of Keys

- **Straight keys** – simple down motion completes the circuit where the time the contacts are together determines whether a dit or a dah is keyed.
- **Keyer** – a circuit that automatically forms dits and dahs in response to a pair of momentary switch closures. The input to the keyer is from a key that has two sets of contacts. One activates the dits and the other activates the dahs.
- **Paddle (Key)**
  - Sends input to a keyer. Can be a single or dual paddle.
- **Iambic Keying**
  - Uses a double paddle. Squeezing both creates alternating dit-dahs.
  - Iambic describes rhythm of alternating dots and dashes
  - Pros vs straight key: Will be better code and easier on the arm
  - Con: Some prefer a straight key for high-speed QSOs



Bug key (Just kidding)

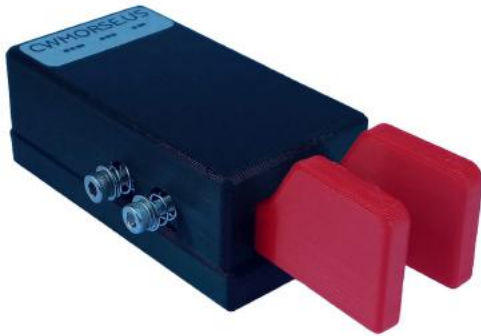
## Keystroke comparisons



- Number of keystrokes needed to send the alphabet plus the numbers 0 - 9:

Type of Key	Number of movements
Straight key	132
Semi-automatic bug	87
Non-iambic electronic keyer	73
Iambic electronic keyer	65

# Dual paddles



- cwmorse.us
  - \$45, Outdoor Pocket Double Paddle Morse Code Key
  - Family operated, TX
- If you have a 3D printer, make one for \$2
  - By Adam Kimmerly, K6ARK
  - <https://www.printables.com/model/332611-morse-code-paddle-cw-key>



- Vibroplex, ~\$200 for jeweled; ~\$150 for standard
  - Jeweled movements for precision control
- Begali, Italy, \$560. (Magnetic return for highspeed)

# Key practice



## Pangrams

(A sentence or phrase that uses every letter of the alphabet)

- The quick brown fox jumped over the lazy dogs back
- A mad boxer shot a quick, gloved jab to the jaw of his dizzy opponent
- While making deep excavations we found some quaint bronze jewelry
- (Hundreds more available on practice files)

## Fun

- Bens Best Bent Wire
  - Jazzy rhythm/ Used by early commercial operators as a warm-up
- HiHi (laughter)
- 73 (goodbye)

# Acknowledgements



# Get on the Air!!



**POTA**  
**PARKS ON THE AIR**

*Celebrating a new beginning*  
**2024**  
*Activator*

That  
**Carol J Bruegge**  
**KE6SRN**

has submitted proof of activating a  
Parks on the Air reference area during  
the first week of 2024

*Jason Johnston*

Jason Johnston, W3AAX, POTA Coordinator

01/05/2024  
Date





## Backup

# Definitions



## Morse Code terms

- Elements – the dits and dahs that make up a character
- Character – a letter, numeral, punctuation mark, or Prosign

## On-the air terminology

- Keyer: The combination of a mechanical paddle (“key”) plus electronics to create the dits and dahs
  - Electronics typically included in the transceiver, so only the paddle is needed.
- Full break-in: allows you to hear incoming signals between dits and dahs.
- Semi-break-in: no signal is heard between dits and dahs
- Pitch (tone): An offset to the signal frequency (the one displayed). This offset is what is heard as the audible signal. Yaesu uses UBS/ +tone, ICOM LSB/ -tone. Try CW-R if there is interference at the default frequency.
- Zero beating: rigs may have one-touch button to ensure transmit is on the same frequency as received.