Archery

Banjo

Candy

Dog

JPLARC presents

Learning Morse Code

Carol Bruegge, KE6SRN

August 16, 2024

Eye

Hippo

Insect

Laboratory

Mustache

Net

Orchestra

Paddles

Quarterback

Robot

Submarine

Overview

The International Morse Code

Efficient communication

- Q-codes, Abbreviations, Prosigns

Getting on the air

- Simple exchanges

Learning tools

- Copying
- Keying

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International Morse Code

A	•–	N	–•	1	•––––	.	•–•–•–
B	–•••	O	–––	2	••–––	,	––••––
C	–•–•	P	•––•	3	•••––	?	••––••
D	–••	Q	––•–	4	••••–	!	–•–•––
E	•	R	•–•	5	•••••	‘	•––––•
F	••–•	S	•••	6	–••••	"	•–••–•
G	––•	T	–	7	––•••	(	–•––•
H	••••	U	••–	8	–––••	)	–•––•–
I	••	V	•••–	9	––––•	&	•–•••
J	•–––	W	•––	0	–––––	:	–––•••
K	–•–	X	–••–			;	–•–•–•
L	•–••	Y	–•––			/	–••–•
M	––	Z	––••			_	••––•–

SOS	•••–––•••	Break	–••• –•–
New Line	•–•–	Closing	–•–• •–••
New Page	•–•–•	Shift to Wabun code	–•••–––
New Paragraph	–•••–	End of contact	•••
Attention	–•–•–	Understood	••••–•
Error	••••••••	Invitation for named station to transmit	–•––•
Wait	•–•••	Invitation for any station to transmit	–•–

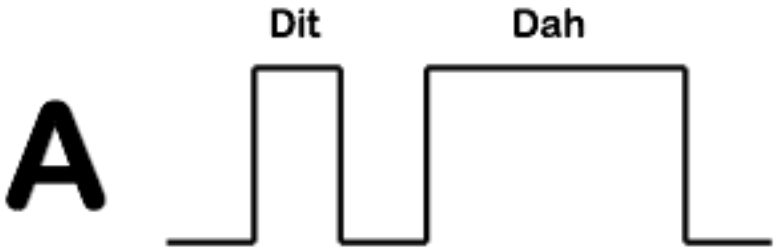
Morse Code terms

Elements – the dits and dahs that make up a character

Character – a letter, numeral, punctuation mark, or Prosign

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”

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

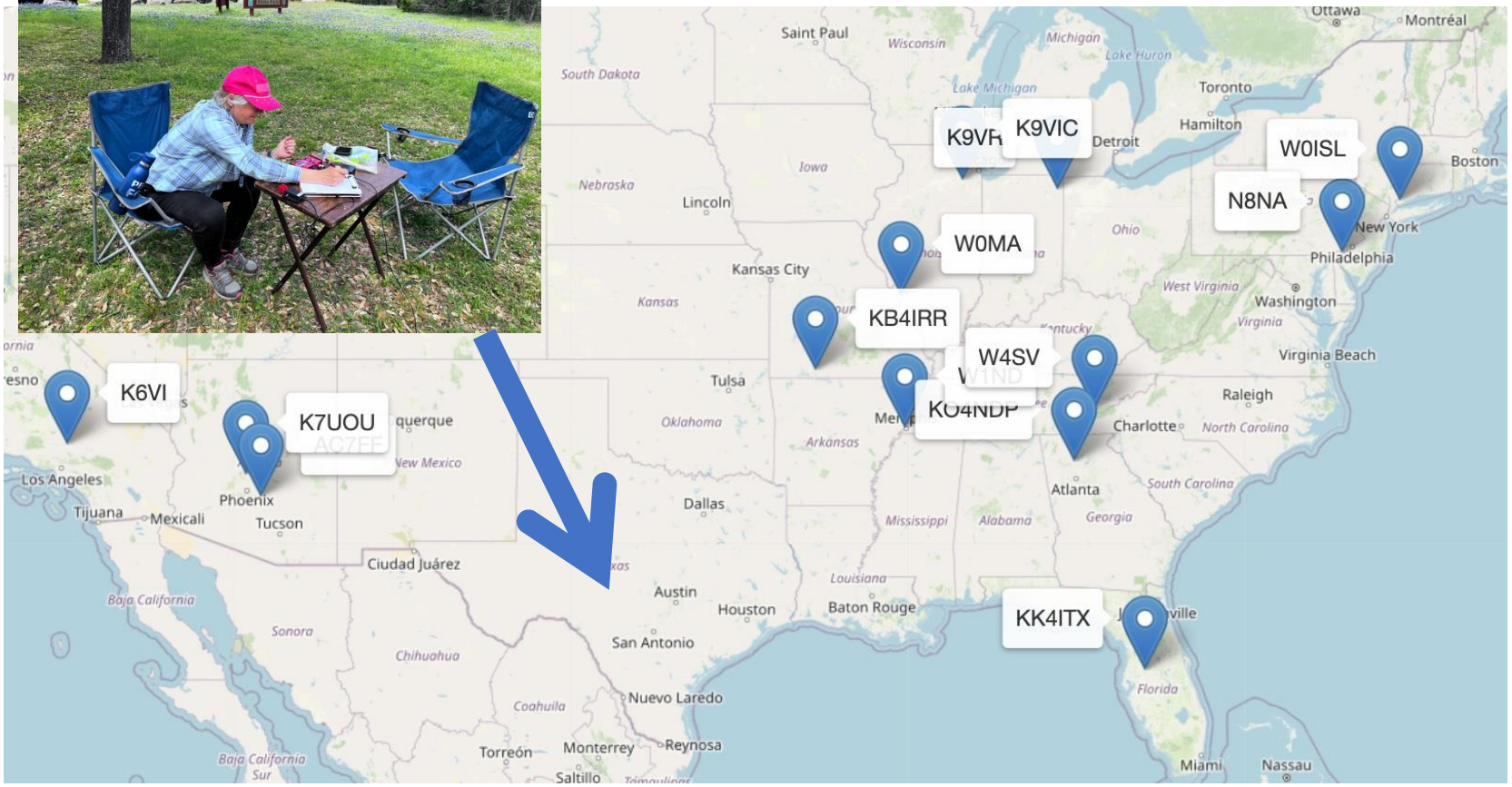
MountainTopper Mtr4b ($370)

- 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 keyer, 5 to 31 WPM
- Three CW/ data memories
- Two voice message memories

QRP (5 W) contacts from Pedernales Falls State Park



- POTA effort this day: 17 QSOs, 3 Park-to-park contacts.
  - Equipment: Mountain Topper and 20 m using a dipole, CW only

… 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.

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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

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Simple Exchanges

POTA (Parks-on-the-air) exchange

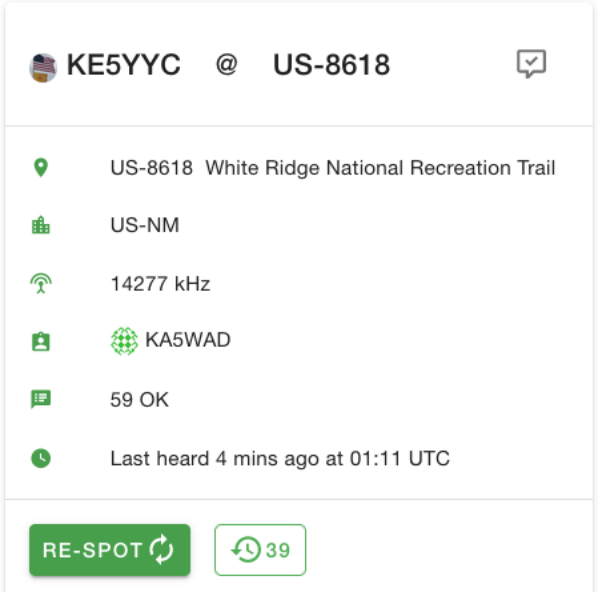
CQ POTA CQ POTA DE KE6SRN

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

- 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 …

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.

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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.

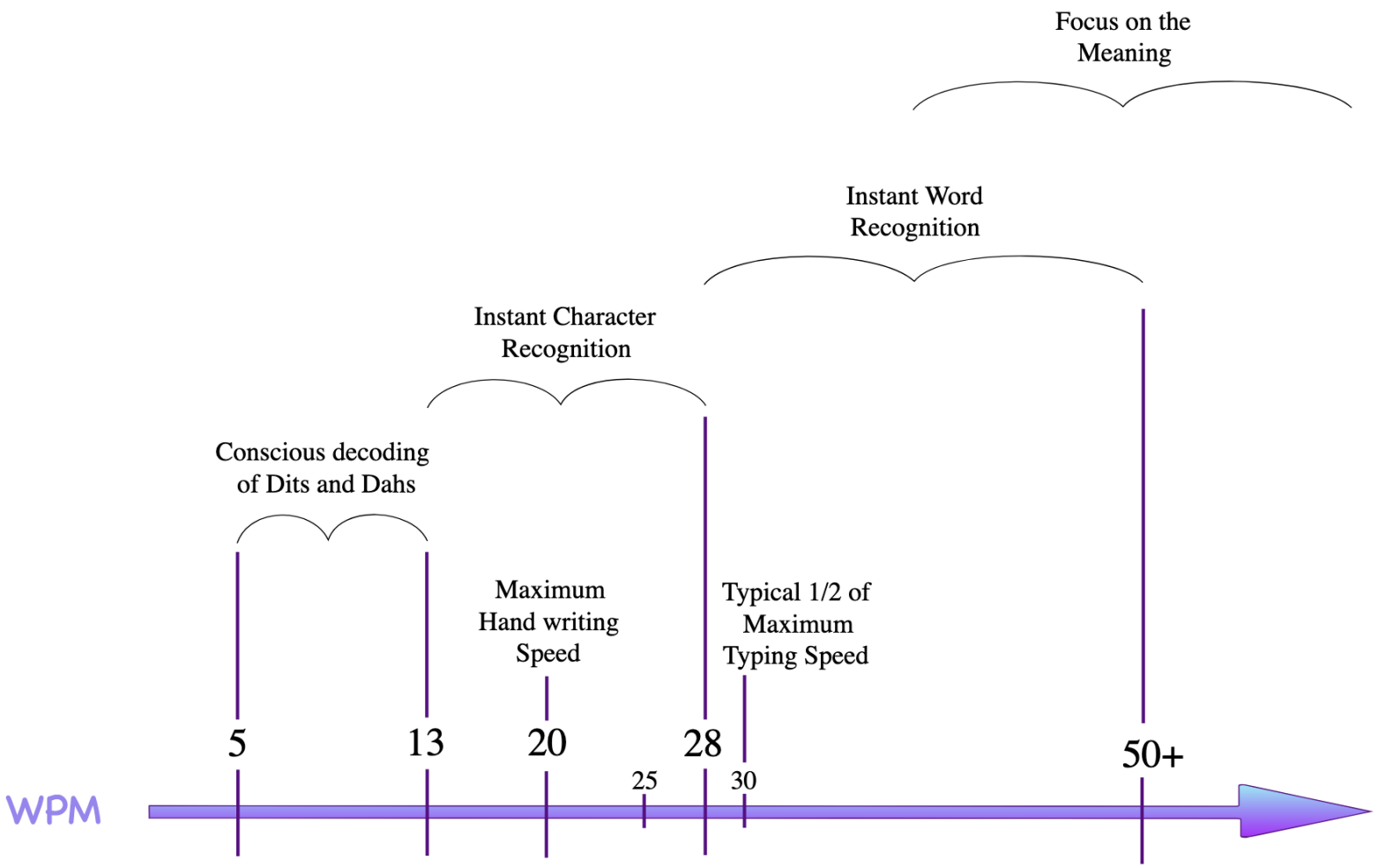
Learning objectives

- 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
- Strive for frequent, short practice sessions
  - Practice twice a day, 15 min/ day
- 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.

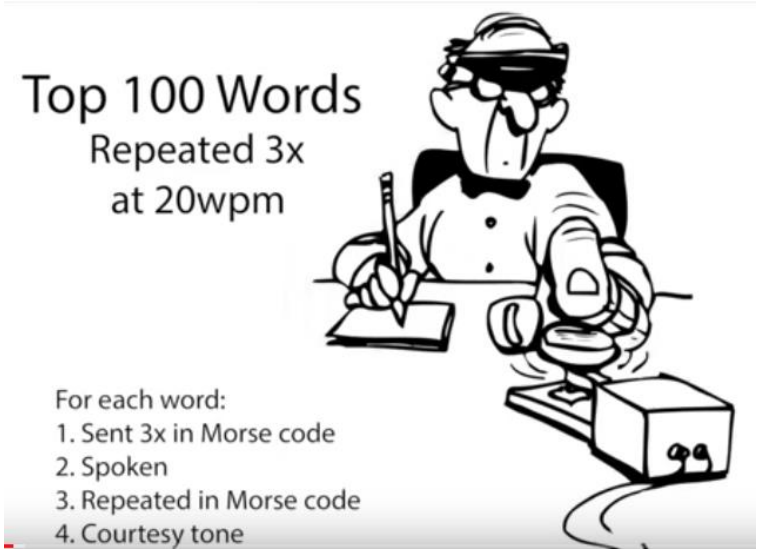
Free Morse Code learning tools

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

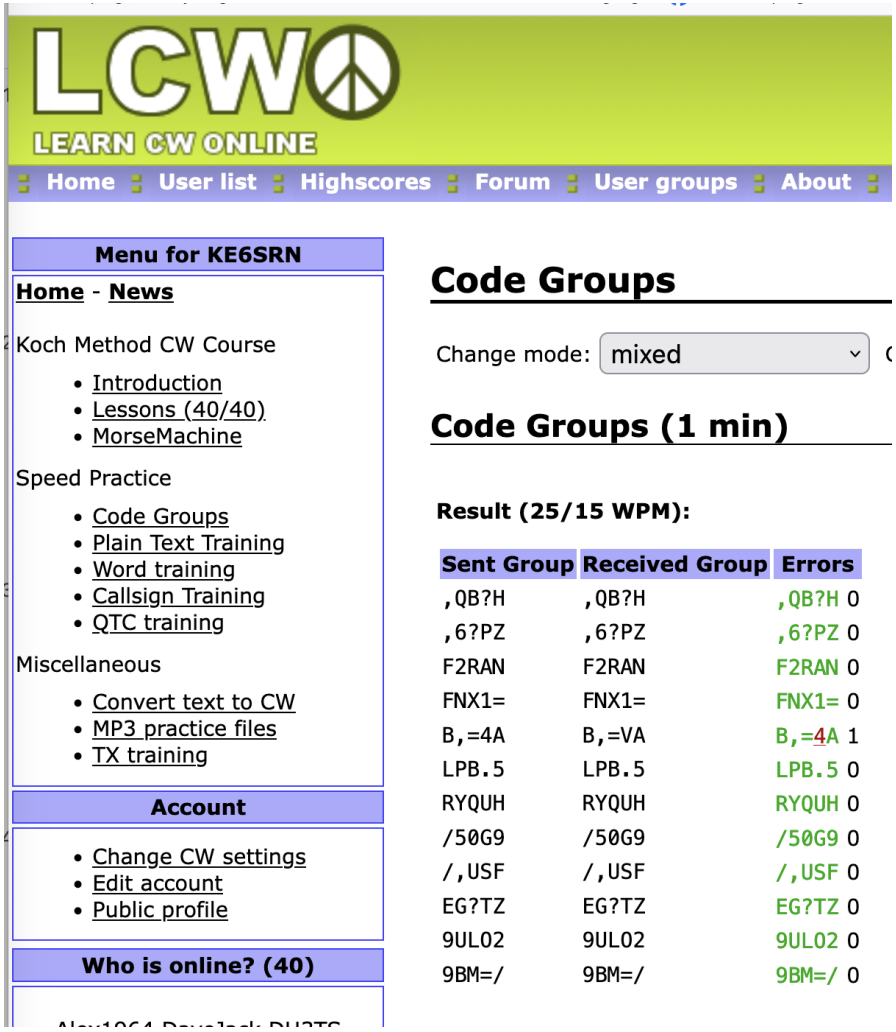
Morse Code course created by AD0WE, Kurt A Zoglmann, Manhattan KS

- 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. (Please consider donating if you do this).



LCWO

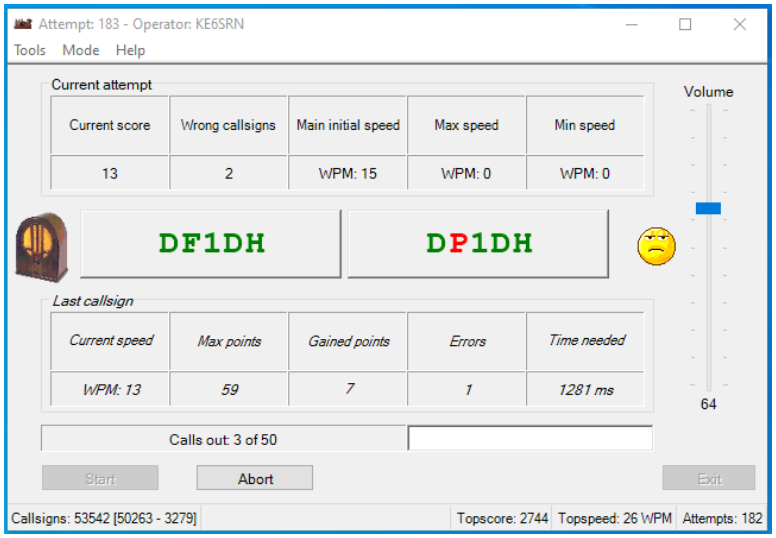
Get comfortable with being uncomfortable!!!

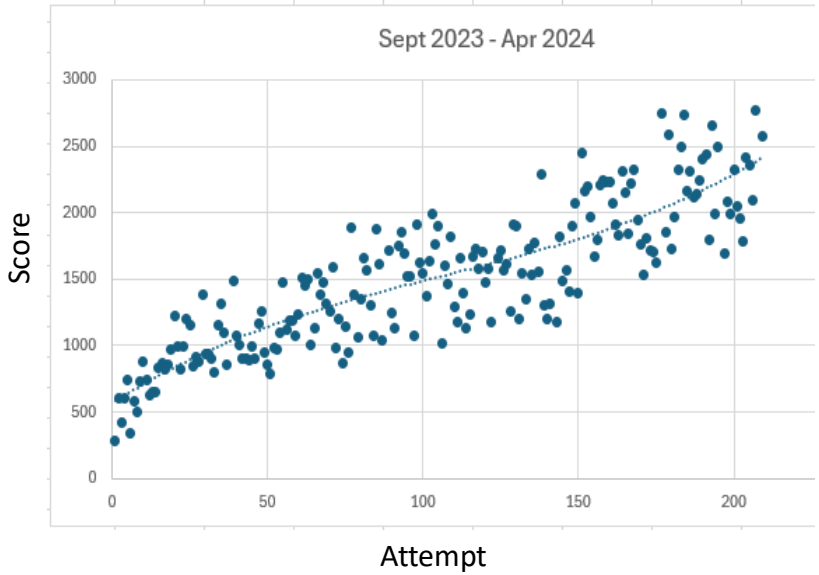


- URL: https://lcwo.net
- On-line app. Create an account to save settings and history
- To begin, go to “Change CW settings” and select character speed, effective speed, and group length. For example, 25/10/2 (It is suggested to always keep character speed at 25). Start at effective speed of 10 and 2 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)

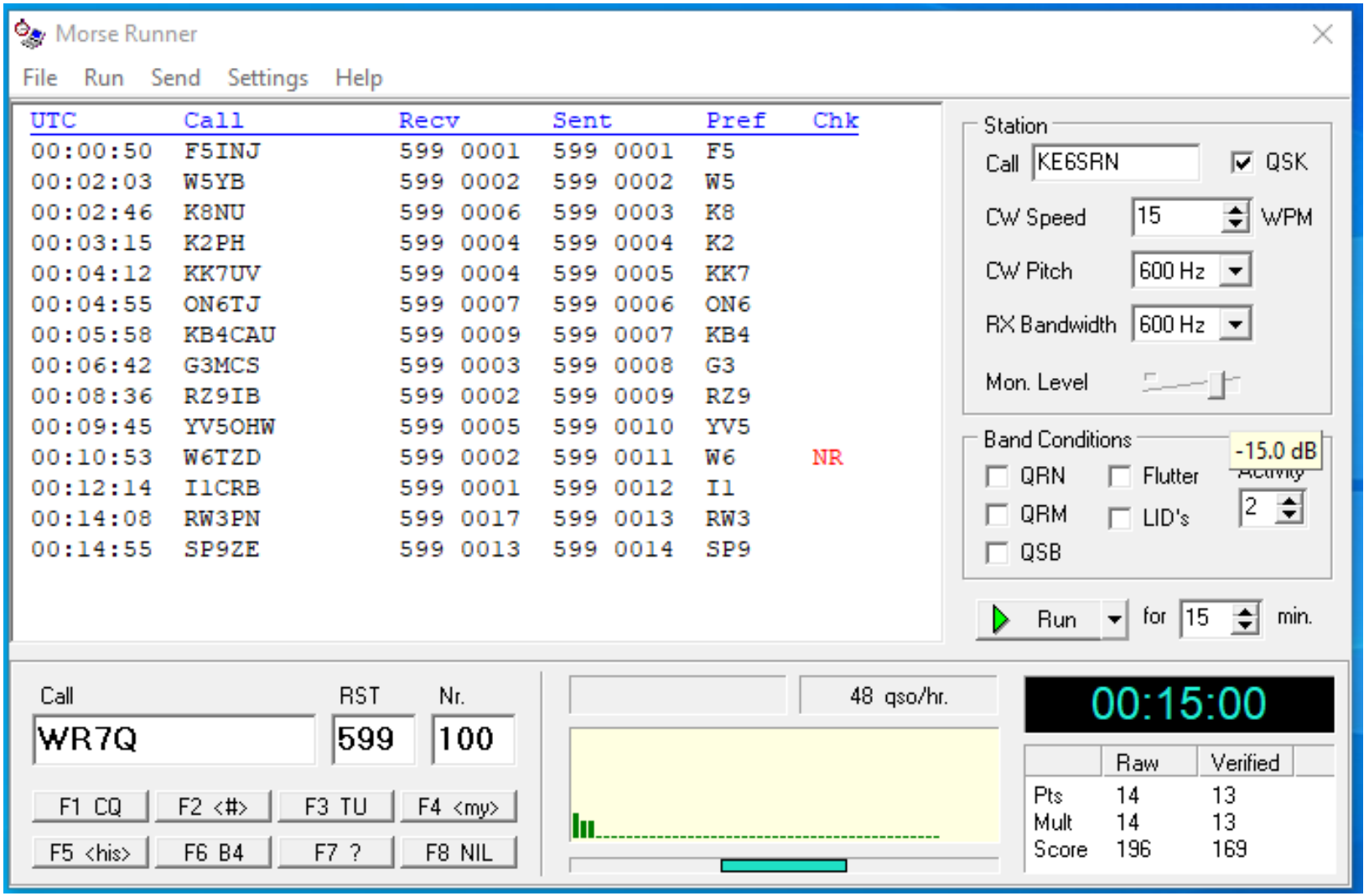
RufzXP

- 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

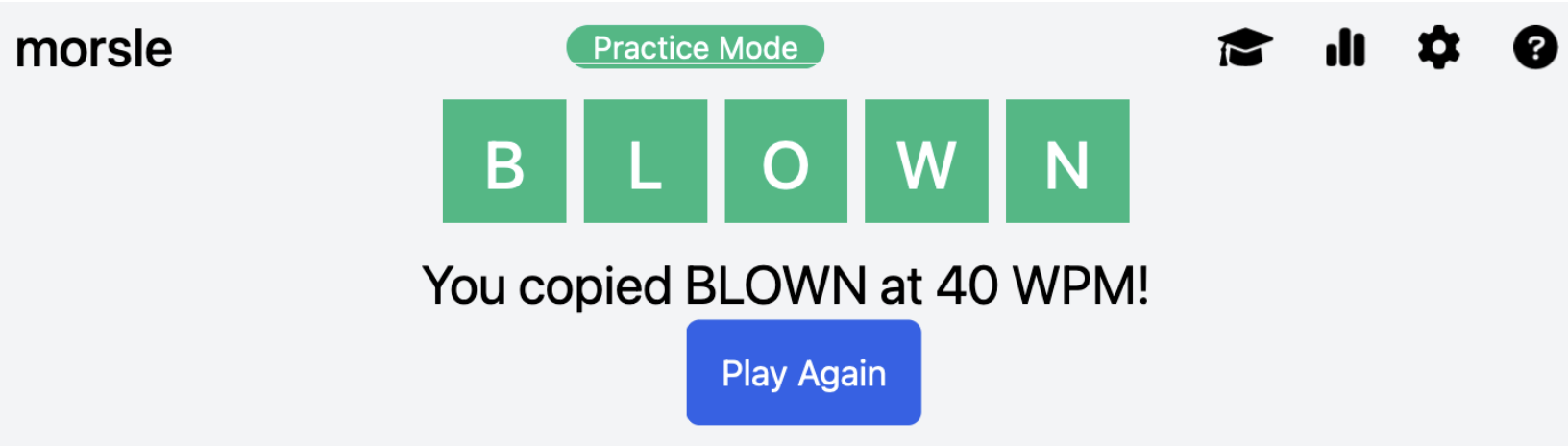


MorseRunner: Getting started

- 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			

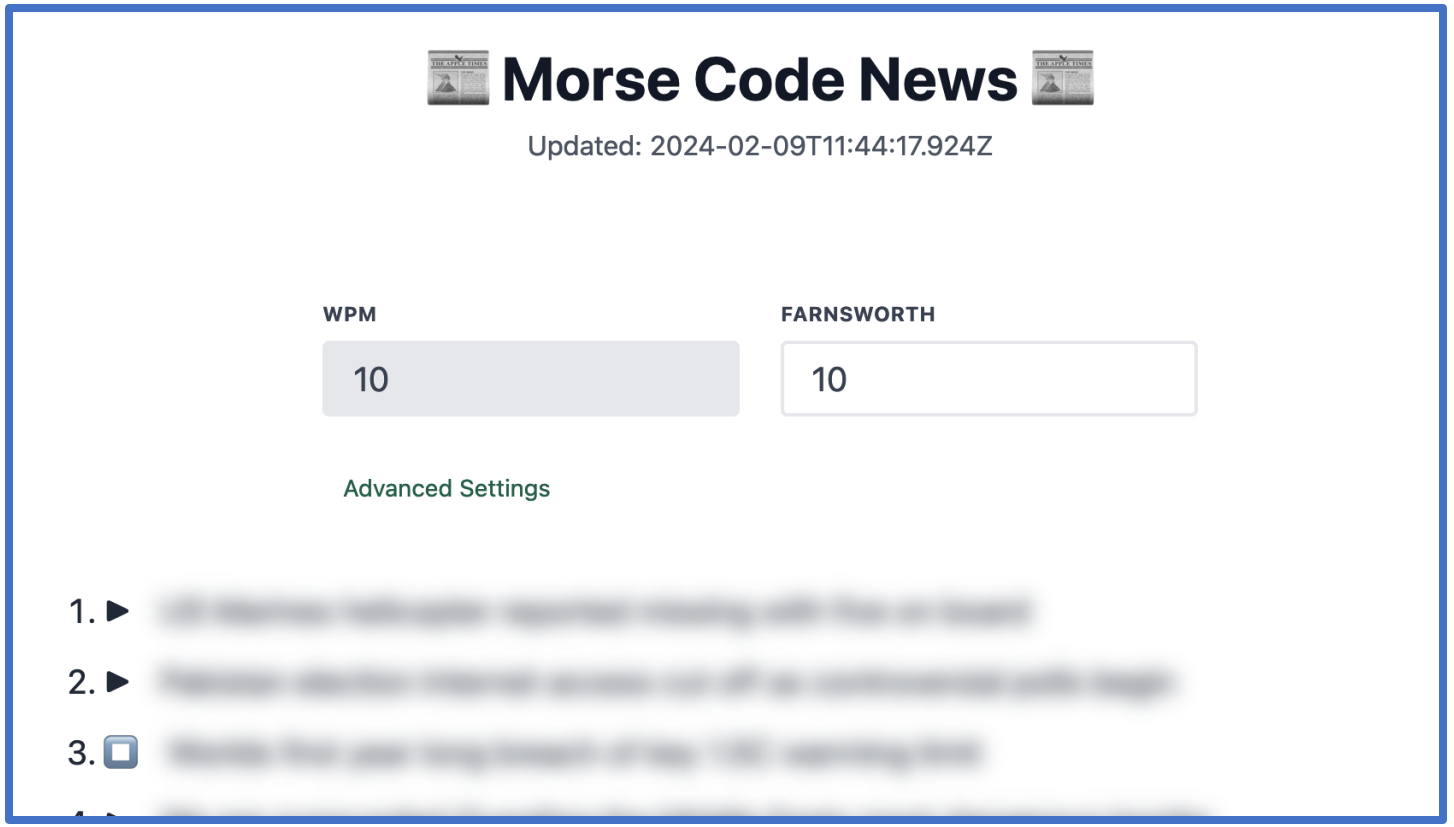
Morsle.fun



- 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



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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.

Bug key (Just kidding)

- **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

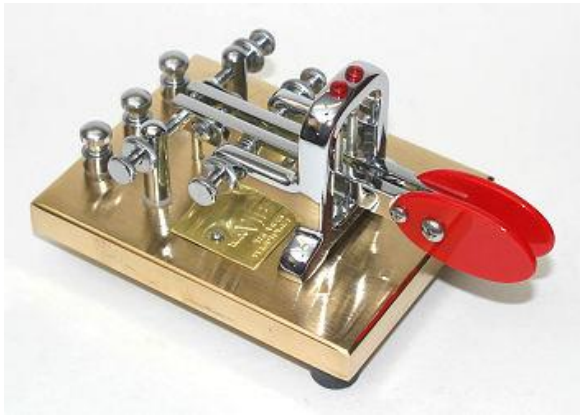
Keystroke comparisons

- 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)

Ackno

Get on the Air!!

Feedback

- Dania Lazo's son, KO6ETY, was interested in learning Morse code and I put together this list of Koch Method aids for her:
-
  - Online:
    - https://lcwo.net/
  -
  - PC:
    - http://www.g4fon.net/ and select from lefthand menu
  -
  - Linux & MacOS
    - https://dm3mat.darc.de/kochmorse/ and go to the GitHub repository.
-
- You may want to incorporate them into your Friday JPLARC presentation.
-
- 73 GL
-
- Jan Tarsala
-
- WB6VRN
- Still QRV