Morse Code 101

Introduction to Morse Code

Estes Valley Amateur Radio Club

David O’Farrell, WBØIXV
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First It's MORSE CODE
- NOT MORRIS CODE
- Morris is a cat
Samuel Fineley Breese Morse is given credit as the inventor of the telegraph and the code.

Alfred Vail was his Assistant.
What we will cover

- Learning Morse Code
- Sending Morse Code
- A ‘standard’ QSO
- Some Misc items
My Amateur Radio History

- First Licensed as a Novice in 1964, when I was 15 years old – KN7YXO
  
  - That required a 5 wpm code test

- I upgraded to General Class in 1965 - WA7COH
  
  - That required a 13 wpm code test from the FCC
There are actually two Morse codes!

- American Morse
- International (Continental) Morse code
Am I learning Morse Code or CW?

CW – Continuous Wave
Why Morse Code?

- Why not Phone?
  - Effective
  - Efficient
  - Universal
  - Simple!
It’s Simple!

- You can build a CW transmitter with just 17 parts!
Why else use Morse Code?

- More Frequencies
- Low profile or Stealth operation
- Backpacking and Hiking
- It’s FUN
- Hearing Impairments
- You will be special!
● Learning the code

- The Right way
  ● Learning by sound from the start

- The Wrong way
  ● Learning visually by memorizing a code table
● Learning the code
  – **BIG MISTAKE** – memorizing a code table

<table>
<thead>
<tr>
<th>Character</th>
<th>Morse Code</th>
<th>Character</th>
<th>Morse Code</th>
<th>Number</th>
<th>Morse Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.-</td>
<td>N</td>
<td>.-</td>
<td>1</td>
<td>....</td>
</tr>
<tr>
<td>B</td>
<td>-...</td>
<td>O</td>
<td>---</td>
<td>2</td>
<td>...-</td>
</tr>
<tr>
<td>C</td>
<td>-.-.</td>
<td>P</td>
<td>-..</td>
<td>3</td>
<td>..-</td>
</tr>
<tr>
<td>D</td>
<td>-..</td>
<td>Q</td>
<td>---</td>
<td>4</td>
<td>...-</td>
</tr>
<tr>
<td>E</td>
<td>.</td>
<td>R</td>
<td>.-</td>
<td>5</td>
<td>-...</td>
</tr>
<tr>
<td>F</td>
<td>..-</td>
<td>S</td>
<td>...</td>
<td>6</td>
<td>...-</td>
</tr>
<tr>
<td>G</td>
<td>-...</td>
<td>T</td>
<td>-..</td>
<td>7</td>
<td>..-</td>
</tr>
<tr>
<td>H</td>
<td>....</td>
<td>U</td>
<td>.-</td>
<td>8</td>
<td>-...</td>
</tr>
<tr>
<td>I</td>
<td>.-.</td>
<td>V</td>
<td>---</td>
<td>9</td>
<td>....</td>
</tr>
<tr>
<td>J</td>
<td>..---</td>
<td>W</td>
<td>-..</td>
<td>0</td>
<td>-...</td>
</tr>
<tr>
<td>K</td>
<td>-.</td>
<td>X</td>
<td>.-</td>
<td></td>
<td>-...</td>
</tr>
<tr>
<td>L</td>
<td>.-.</td>
<td>Y</td>
<td>---</td>
<td></td>
<td>-..</td>
</tr>
<tr>
<td>M</td>
<td>--</td>
<td>Z</td>
<td>-..</td>
<td></td>
<td>..-</td>
</tr>
</tbody>
</table>
• Best Way to Learn – Aurally (dits & dahs)
  – Learn it by SOUND

• NEVER Dots and Dashes and visually

• Practice both sending and receiving at the same time.
• **Methods:**

  - Recordings
  - Computer programs
  - On the air code practice
What do you need to learn?

- The Alphabet (A to Z)
- The numbers (0 to 9)
- Punctuation . , / ? =
- Prosings
  - AR, AS, SK, CL, K, KN, error ……
- Only 48 symbols!
What order to learn them in?
  - It really doesn’t matter
Learn Code the EASY Way

Beginners, Amateurs and Experts alike recommend the INSTRUCTOGRAPH, to learn code and increase speed.

Learning the INSTRUCTOGRAPH way will give you a decided advantage in qualifying for Amateur or Commercial examinations, and will increase your speed from 3 to 40 words per minute to the standard of an expert. The Government now uses a machine in giving examinations.

Machines with adjustable speed and spacing of characters on tape permit a speed range of from 3 to 60 words per minute. A variety of tapes are available in elementary, words, messages, plain language and coded groups. Also an "Airways" series for those interested in Aviation.

MACHINES FOR RENT OR SALE

The INSTRUCTOGRAPH is made in several models to suit your purse and all may be purchased on convenient monthly installments if desired. These machines may also be rented on very reasonable terms and it is only a matter of time when renting you should decide to buy the equipment. The first three months rental enables you to see the machine and apply in full on the purchase price.

ACQUIRING THE CODE

It is a well-known fact that practice and patience alone constitutes ninety per cent of the entire effort necessary to "Acquire" the code. Acquire words, learn telegraphy either way or wayless. The INSTRUCTOGRAPH supplies the speed that is needed. It takes the place of an expert operator in teaching the student, it will send slowly at first, and gradually faster and faster, until the student is just naturally copying the fastest sending without conscious effort.

BOOK OF INSTRUCTIONS

Other than the practice offered by the Instructograph, all that is needed is well directed practice instruction, and that is just what the Instructograph's "Book of Instructions" does. It supplies the remaining ten per cent necessary to acquire the code, besides enabling you to practice the code in the best advantage, and how to take advantage of the code. "Short cut" instructions by experienced operators, that materially assists in acquiring the code in the quickest possible time. Therefore, the Instructograph, the tapes, and the book of instructions is needed to acquire the code as well as it is possible to acquire it.

The Instructograph

ACCOMPLISHES THESE PURPOSES:

FIRST: It teaches you to receive telegraph symbols, words and messages.

SECOND: It teaches you to send perfectly.

THIRD: It increases your speed of sending and receiving after you have learned the code.

With the Instructograph it is not necessary to impose on your friends. It is always ready and waiting for you, through your receiver. This machine is just as valuable in the learning process to the beginner who wishes to obtain his amateur license, as to the person who wishes to increase his speed to obtain his amateur license.

Postal Card WILL BRING FULL PARTICULARS IMMEDIATELY

THE INSTRUCTOGRAPH CO.
4707 SHERIDAN ROAD
4700 S. CRENSHAW BLVD.
CHICAGO, ILLINOIS 60640
LOS ANGELES, CALIFORNIA 90043
From the Instructograph Manual (1931):

Factors in learning Morse Code:

Natural Ability          5%
Psychology              10%
Study and Practice      85%
From the Instructograph Manual (1931)

VITAL FACTORS of PRACTICE AND STUDY:
1. Psychological Attitude
2. Regularity of Practice
3. Timing of Characters
4. Persistency
Have a positive mental attitude:

“It is easy for me to learn code; I am doing it now”

“Zen and the Art of Radiotelegraphy”
- Carlo Consoli, IK0YGJ

Relaxation Exercise to do before you start
- Learning
  - Recordings – Records, CD’s, cassette tapes:
Learning

- Recordings – CD’s, MP3 files
  - K7QO’s Fists Code Course (50 free today!)
  - ARRL
  - W5YI
  - VIS Amateur Supply – KB6MT
    - High Speed QSO training
Learning

- Computer programs
  - G4FON (Koch method)
  - Just Learn Morse

- There’s an App for that!
Learning – On the Air

- W1AW code practice
  - Slow code at 5, 7-1/2, 10, 13, 15 wpm
  - Fast code at 35, 30, 25, 20, 15, 13, 10 wpm
  - Also available as mp3 download
• Learning – On the Air

  – Use of CW Filters / DSP (Selectivity)
    • Wide ~ 2200-2500 Hz (often SSB filter)
    • Use a Narrow filter ~ 500 Hz

  – Use Headphones (ear phones, ear buds)
Learning – On the Air

- Read your manual!
  - i.e. AGC-F should be in on an FT-840
  - Know how to use reverse CW sideband
  - Know how to change your sidetone pitch
  - An automatic DSP notch filter can remove the desired signal at the same time as it removes interfering signals
Learning – On the Air

- CW Ops Club [www.cwops.org](http://www.cwops.org)
  - CW Academy - (3x a year; 8 weeks)
  - Training is online (Skype) and on the air
  - Three levels:
    - Beginners < 10 wpm
    - Intermediate 11 – 15 wpm
    - Advanced 16 - 20 wpm
How long will this take?

<table>
<thead>
<tr>
<th>Receiving Speed attained (wpm)</th>
<th>Approximate Learning Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 wpm</td>
<td>30 hours</td>
</tr>
<tr>
<td>10 wpm</td>
<td>60 hours</td>
</tr>
<tr>
<td>15 wpm</td>
<td>95 hours</td>
</tr>
<tr>
<td>20 wpm</td>
<td>150 hours</td>
</tr>
</tbody>
</table>
- Best to do *daily* short practice sessions
  - No more than thirty minutes daily
  - Two fifteen minute sessions daily best
- More frequent practice sessions are better
- Repetition, Repetition, Repetition
- Writing in script is 50% faster than printing
- If you miss a letter, let it go. Leave a space.
  - Otherwise you will miss the next 4 or 5 characters.
● Your goal is instance recognition.

● RELAX! Take a deep breath.

● If you are missing letters, struggling, etc.
  – Take a break! This is a hobby, not a job!

● If you hit a plateau, just keep practicing.
  – Some days you won’t copy as fast as you previously did
  – But at few days later you will be through the plateau

● Remember, we are amateurs, not professionals!
– Copying code is a sub-conscious mental process.

– There really isn’t a way to ‘learn sub-consciously’, other than practice.
Farnsworth method (aka Farnsworth spacing)

- The letters are sent at a higher wpm,
  - But the space between them is longer to make the overall speed slower.

- Always use the Farnsworth method, or you will need to learn the code 3 or 4 times!
Koch Method

Traditionally, Morse code has been taught by struggling through all the codes at a slow speed and then (slowly) progressing toward higher speeds.

Koch's method was invented by German psychologist Ludwig Koch in the 1930s.

Koch's method, on the other hand, dictates that you should start learning at the desired speed - but you start with only two characters. Each session is five minutes long, and whenever you get 90% or more correct, you add another character.

G4FON & Just Learn Morse utilizes Koch's method for teaching Morse code.
TIPS You May Hear From Hams:

- You have to push yourself hard.
- Don’t push yourself too hard, you’ll burn out.

- Use Code CD’s.
- Don’t use code CD’s, use a computer program

- Listen to CD’s in the car
- Don’t listen to CD’s in the car, it’s dangerous!
TIPS You May Hear From Hams:

- Never look at a chart when you practice.
- Look at the chart to help you remember.

- Learn the code in groups of related sounds.
- Learn the most frequently used letters first.

- Try to copy code off the air.
- Don’t try to copy code off the air.
BEST TIPS on learning:

So different methods work for different people.
Try different ones to see what you like.

Sometimes a change in approach helps create variety.
BEST TIPS on learning:

Give extra attention to P, Y, J, Z, X, Q, and L

They are not so frequently used as the rest of the alphabet.
Printing or Writing copy?

You can print your copy up to about 10wpm;
Handwriting work up to about 30wpm,
Then use a keyboard or typewriter (Mill) for higher speeds.
Your Plan of Attack!

1. Start with the CD
2. If you wish, use a computer program
3. Then move to on the air copying
SENDING MORSE CODE

- **Spacing or Timing** – VERY IMPORTANT if anyone is going to copy you!
  - A Dit is the basic element everything is measured with.
  - A Dah is the length of 3 dits.
  - The space between code elements is 1 dit.
  - The space between code characters (letters) is 3 dits.
  - The space between words is 7 dits.

- Listening to properly sent code is the best way to learn the correct spacing
Terms

- **FIST** – Your distinctive rhythm when sending with a straight key.

- **LID** – A poor operator – has a POOR FIST, and poor operating procedures.

- **Ham** – Ham fisted? Due to poor sending?
Learning to Send Morse Code
  – Code Practice Oscillator (CPO)
  – Straight key
    or
  – Paddle

Forget trying to use a ‘bug’, or a semi-automatic key at this point.
● Sending Morse Code
  – Code Practice Oscillator (CPO)
Sending Morse Code – Straight Key
- Your goal is Accuracy, Beauty, Speed.
  - Just in that order

- The motto of the FISTS telegraph club is
  - “Accuracy transcends Speed”
Practice sending using Panagrams

- The quick brown fox jumps over the lazy dog. (35 letters)
- While making deep excavations we found some quaint bronze jewelry. (56 letters)
Adjusting and using a Straight Key

- Spacing
- Spring tension
- Sit upright with your arm inline with the key
- The knob should be about 18 inches from the table edge
- Use a relaxed grip
The wrong way!

- The NIBBLER
- The HITCH HIKER
- The CLUTCHER
- The JITTER
- The POUNDER
- The SLAPPER
- The TEA DRINKER
- The TAPPER
● Single Lever Paddle  GH-GF501A
- Double Lever Paddle
● Sending Morse Code
  – Keyer -
  – Speed with a Keyer is can be up to 60 wpm.
Sending Morse Code

- Keyer - Modes:
  - Standard
  - Iambic
    - Iambic Mode A
    - Iambic Mode B
  - Ultimatic
  - Bug Mode
Iambic keying

- Has nothing to do with the paddle! It has to with the Keyer.
- However, Iambic sending requires a dual-lever paddle.
● Sending Morse Code
  – Keyer
    ● Standard – Series of Dit’s to the Right
           Series of Dah’s to the Left

Uses a **single or double** paddle
• Sending Morse Code

  – Keyer

    • Iambic - Uses a Double Paddle – Squeeze keying
      – Iambic Mode A – Checks for paddle inputs after the end of each dit or dah.
Sending Morse Code

- Keyer
  - Iambic - Uses a Double Paddle – Squeeze keying
    - **Iambic Mode B** – Checks for paddle input during each dit or dah
Sending Morse Code

- Keyer
  - Ultimatic – Will send dits and dahs according to the last paddle to be pressed.
– Now that you can send and receive, let’s get on the air!
  ● Side Tone from your Transceiver

  ● ZERO BEAT aka SPOTTING

  ● RIT – Receiver Incremental Tuning
Q Signals –

- To speed up the QSO;
- To overcome language differences
**Q Signals** – create question by adding ‘?’

- QTH - Location
- QRL - I am busy
- QRM - I am being interfered with (hint: **Man Made**)
- QRN - I am troubled by Static (hint: **Natural**)
- QRP - Reduce power / QRO increase power
- QRS - Send slower / QRQ Send faster
- QRT - Stop sending / Quit
- QSY - Change frequency
- QSB - My signals are fading
• Abbreviations

   – Common ones used in QSO

   • R – received
   • FER – for
   • TNX – Thanks
   • WX – weather
   • 73 – Best regards
   • EEEEEEEE – error

   • GM – Good Morning
   • HW? – How copy?
   • BTU – Back to you
   • CUL – See you later
   • 88 – Love and Kisses
   • C – Correct / Yes
**Prosigns** - (procedure signals) Sent as one character

- **CQ** – general to call to anyone
- **DE** – From/this is (i.e. KB0WVH de WB0IXV)
- **K** – Go ahead and transmit / Over
  - **KN** – same as K, but for specific station
- **AR** – End of message
- **AS** – Wait / Stand by
- **SK** – End of transmission / QSO / Clear
- **CL** – Closing station / Going off the air
- **BT** or ‘=‘ – to separate thoughts / like period
- **SOS** – Emergency Signal
- **RST**
  - Readability (1-5)
  - Signal Strength (1-9)
  - Tone (1-9, plus c, k)
    - **C = Chirpy or Unstable**
    - **K = Key Clicks**
- **Cut numbers**
  - 5NN instead of 599
• QRL?  (is this frequency in use?)

• CQ CQ CQ DE WB0IXV WB0IXV K (repeat up to 3 times)

• WB0IXV WB0IXV DE N6UA N6UA KN

• QRZ? – WHO IS CALLING ME
N6UA DE WB0IXV R = GM (GA, GE) TNX FER CALL = UR RST 599 599 = QTH ESTES PARK, CO. ESTES PARK, CO. = NAME IS DAVE DAVE = HW? AR N6UA DE WB0IXV KN

WB0IXV DE N6UA R = GM (GA, GE) DAVE TNX FER CALL = UR RST 578 578 = QTH LOGAN UTAH LOGAN UTAH = NAME DOUG DOUG = HW? AR WB0IXV DE N6UA KN
N6UA DE WB0IXV R = TNX DOUG FOR (NICE) RPT = MY RIG IS A YAESU FT840 ANT IS A WINDOM = HW? AR N6UA DE WB0IXV KN

WB0IXV DE N6UA R = RIG HR IS KENWOOD ANT IS DIPOLE LAYING ON ROOF = BK TO U = WB0IXV DE N6UA KN

N6UA DE WB0IXV R = UR RIG IS DOING GOOD JOB HERE = YOU HAVE FB SIG = WX IS COLD TEMP IS 35 = HW? AR N6UA DE WB0IXV KN
WB0IXV DE N6UA R = ITS COLD HR IN UTAH TOO = TEMP IS 15 = BK TO U = WB0IXV DE N6UA KN

N6UA DE WB0IXV R = OK TNX DOUG FOR REAL FB QSO = HPE CU AGN = (GUD LUCK) VY 73 GM (GA GN) SK N6UA DE WB0IXV K (CL)

WB0IXV DE N6UA R = 73 DAVE TNX FER QSO = WB0IXV DE N6UA K
QSO Resources:

- [www.fistsna.org](http://www.fistsna.org)
  - Operating / Op Aids / Basic CW Operating Manual
- [www.skccgroup.com](http://www.skccgroup.com)
  - CW Beginners Corner
- QSK - Full Break In
IMPORTANT:

- Only send as fast as you can receive!

- Only send as fast as the other operator is sending

- Ask them to slow down, **QRS 10 PSE**, if needed!

- When selecting an operating frequency, separate yourself 150 to 500 Hz from other stations.
Groups with slow speed (QRS) code operators:

FISTS – The International Morse Preservation Society

SKCC – Straight Key Century Club
7.055, 7.120, 10.120, 14.050, 21.050, and others
Contesting

CQ TEST  CQ TEST
DX’ing

- Working Split

- Don’t work too close to the band edge.
Morse Code 101

- **Contact info:**
  - WBØIXV@arrl.net
  - 970.577.7372

- **Resources:**
  - See handout
  - Morse Express
    10691 E Bethany Dr, Suite 800
    Aurora, CO 80014 USA