

## CHAPTER 4

# INTERNATIONAL MORSE CODE

The international Morse code is a telegraphic alphabet, with letters and numbers represented by sound patterns. Mastery of the code is one of the most important of the Radioman's skills.

If you are a graduate of a Class A Radioman School, you were taught the Morse code, and much of this chapter may be of little interest to you. But, if this is your first acquaintance with the code—if you are striking for Radioman from the deck force or changing to Radioman from another rating—you have many, many hours of hard work ahead. Do not be discouraged on this account. Many fine Radiomen learn the code for themselves. Most ham operators are self-taught. You can learn it too—if you stay with it.

The international Morse code is a dit and dah system. (By the way, the code is pronounced by saying "dit" and "dah," NOT "dot" and "dash." So forget about dots and dashes and think only in terms of dits and dahs.) The groups of dits and dahs representing each letter must be made as one unit, with a clear break between each dit and each dah, and a much more distinct break between the letters. A dit is one-third the length of a dah.

You must never try to count the dits and dahs. Don't let yourself get in the habit of doing so. It's a temptation at first, but you won't be able to count fast enough when the code speed picks up. Learn sound patterns instead. To understand what this means, rap out the pattern beginning "Shave and a haircut." You recognize this from its characteristic rhythm, not because it has a certain number of beats in it. You must learn the code the same way. There are 36 Morse sound patterns for the letters and numbers, plus a few others representing prosigns and punctuation marks. With study and drill you can learn to recognize each as fast as you now recognize "Shave and a haircut." The accent always falls on dahs, and you should

pronounce each rhythmical combination with that in mind.

Go through the alphabet several times to get the sound feel of the dit and dah combinations.

### MORSE ALPHABET

In the pronunciation guide for sounds of letters that follows, sounds are written as phonetically as possible. In the middle of a group, the short sound "dit" actually takes on the sound "di". The phonetic alphabet is included in parentheses after the letters. Get in the habit of referring to the letters phonetically.

Letter	Pronunciation
A (ALFA) - - - - -	di-DAH
B (BRAVO) - - - - -	DAH-di-di-dit
C (CHARLIE) - - - - -	DAH-di-DAH-dit
D (DELTA) - - - - -	Dah-di-dit
E (ECHO) - - - - -	dit
F (FOXTROT) - - - - -	di-di-DAH-dit
G (GOLF) - - - - -	DAH-DAH-dit
H (HOTEL) - - - - -	di-di-di-dit
I (INDIA) - - - - -	di-dit
J (JULIETT) - - - - -	di-DAH-DAH-DAH
K (KILO) - - - - -	DAH-di-DAH
L (LIMA) - - - - -	di-DAH-di-dit
M (MIKE) - - - - -	DAH-DAH
N (NOVEMBER) - - - - -	DAH-dit
O (OSCAR) - - - - -	DAH-DAH-DAH
P (PAPA) - - - - -	di-DAH-DAH-dit
Q (QUEBEC) - - - - -	DAH-DAH-di-DAH
R (ROMEO) - - - - -	di-DAH-dit
S (SIERRA) - - - - -	di-di-dit
T (TANGO) - - - - -	DAH
U (UNIFORM) - - - - -	di-di-DAH
V (VICTOR) - - - - -	di-di-di-DAH
W (WHISKEY) - - - - -	di-DAH-DAH
X (XRAY) - - - - -	DAH-di-di-DAH
Y (YANKEE) - - - - -	DAH-di-DAH-DAH
Z (ZULU) - - - - -	DAH-DAH-di-dit

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Number	Pronunciation	Medium length sounds	Practice words
1 - - - - -	di-DAH-DAH-DAH-DAH	D DAH-di-dit	MUST SAME MAMA
2 - - - - -	di-di-DAH-DAH-DAH		SUIT AUTO
3 - - - - -	di-di-di-DAH-DAH	G DAH-DAH-dit	MUSS OUST MUSE
4 - - - - -	di-di-di-di-DAH		MUTE ATOM
5 - - - - -	di-di-di-di-dit	K DAH-di-DAH	TAUT MAST MASS
6 - - - - -	DAH-di-di-di-dit		SUET SAM
7 - - - - -	DAH-DAH-di-di-dit	O DAH-DAH-DAH	WIND SEA TUM SAW
8 - - - - -	DAH-DAH-DAH-di-dit		OAT
9 - - - - -	DAH-DAH-DAH-DAH-dit	R di-DAH-dit	SUE SAT WED SUM
∅ - - - - -	DAH-DAH-DAH-DAH-DAH		MUD IOU

Punctuation Mark	Pronunciation	Medium length sounds	Practice words
		S di-di-dit	USE SEAM WOOD
			DARK
		U di-di-DAH	GEORGE DOWN KIND
			SORT
Dash - - - - -	DAH-di-di-di-di-DAH		DOOR MASK WORK
Parenthesis - - -	DAH-di-DAH-DAH-di-DAH	W di-DAH-DAH	GROW WOMAN EDGE
Period or decimal			GAGE WIGS WORM
point - - - - -	di-DAH-di-DAH-di-DAH		WAGER WAKE KEG
Slant - - - - -	DAH-di-di-DAH-dit		
Apostrophe - - -	di-DAH-DAH-DAH-DAH-dit		
Colon - - - - -	DAH-DAH-DAH-di-di-dit		
Comma - - - - -	DAH-DAH-di-di-DAH-DAH		
Question mark - -	di-di-DAH-DAH-di-dit		
Hyphen - - - - -	DAH-di-di-di-di-DAH		

Long sounds	Practice words
B DAH-di-di-dit	VAT VET VIM HAM
	SIX
C DAH-di-DAH-dit	SAY
F di-di-DAH-dit	HAS HAT EVE CUT
H di-di-di-dit	CAM VEST
J di-DAH-DAH-DAH	HEAT HAVE MUCH
L di-DAH-di-dit	THAT EACH
P di-DAH-DAH-dit	COAT ACHE SAVE
	HUSH
Q DAH-DAH-di-DAH	ACME
V di-di-di-DAH	CUTE BAKER CHARLIE
X DAH-di-di-DAH	FIVE
Y DAH-di-DAH-DAH	HOW JIMMY LIKE
Z DAH-DAH-di-dit	PAPA QUICK
	QUILL VICTORY XRAY
	YOUNG
	ZERO BUZZ GARGLE
	FIZZLE
	LYNX OXYGEN WAX
	QUAY
	JERKY WHIP QUEBEC

STUDYING CODE

If you have any trouble learning the code, the following method may be helpful. Go through the three groupings of short, medium, and long sounds with their accompanying practice words. Make up words of your own if you wish to give yourself further practice. Speak the practice words in code. Say "TEE: DAH dit dit," "MINE: DAH-DAH di-dit DAH-dit dit."

If you can speak words in code rapidly and distinctly, you will have an easier time when you learn to receive code on the receiver. The sounds are very similar.

Short sounds	Practice words
E dit	TEE ATE EAT TEA
	MEAT
T DAH	MEET MINE TIME
	MAINE
A di-DAH	TEAM AIM NITE TAME
	TEA
I di-dit	MATE TAME NAME
	MITE
M DAH-DAH	MIAMI MAMA MEAN
	MAN MAT
N DAH-dit	EMIT MINT MANE
	TAN ITEM TINT

Figure sounds

1. di-DAH-DAH-DAH-DAH
2. di-di-DAH-DAH-DAH
3. di-di-di-DAH-DAH
4. di-di-di-di-DAH
5. di-di-di-di-dit
6. DAH-di-di-di-dit
7. DAH-DAH-di-di-dit
8. DAH-DAH-DAH-di-dit
9. DAH-DAH-DAH-DAH-dit
- ∅. DAH-DAH-DAH-DAH-DAH

You've probably noticed by now that numerals slow your speech in oral transmission. That is understandable—they also slow the speed of radio transmission. Headings and procedure signs containing calls and numerals are transmitted at a slower rate of speed than straight alphabetical characters.

RECEIVING

If you have carried out the recommendations made up to this point, you are ready to receive code transmitted to you on an oscillator. The ship or station to which you are attached is almost certain to have practice oscillators for your use.

An experienced Radioman will key code groups to you for your training. The sound produced by an oscillator closely resembles the sound of code from the radio receiver. The operator keying to you for practice should transmit each individual character at the standard rate of 20 words per minute, and he should maintain a fairly long interval between characters. As you progress, you gain speed by shortening spaces between characters.

The standard character speed is shown in figure 4-1. Note that the characters themselves may be keyed at 20 words per minute, but that the longer intervals between characters and words materially decreases the beginner's overall speed.

Note also that the code, compared against time in the 20-words-per-minute transmission, is in the proper form of having the dit as a unit. There is one unit between each element of a character, three units between each character, and seven units between each group or word.

After learning the sound of each character at this rate of speed, it is not difficult to reduce the time between characters and to copy code at a much faster speed.

As you advance in rating, you will be required to increase your transmission and reception speed. If you learn the fundamentals well, it will be fairly easy for you to increase your speed. When copying code, if you miss a character, don't stop to worry about it; get the next character and let the one missed go by. Be a competent operator. Make every transmission and every reception accurately. Do not speed before accuracy.

PRINTING CLEARLY

Learn to print clearly and rapidly. The messages you handle are important, and someone must read what you have written without puzzling over it. Examine figure 4-2 and compare the printed letters with your own. Notice that the sequence of strokes for some letters may be different from the way you are accustomed to form them. This is an aid to rapid printing; the more of the letter you can form with a single stroke, the better. Use this illustration as a guide to avoid confusions between printed letters and printed numerals. Especially watch the letter Z and the numeral 2. If you wish, write Z with a line through the stem. Even more important is the distinction between the letter O and the figure zero. Zero is always written with a slant through it: Ø. Also exercise care to avoid confusion between letter I and figure 1, letter S and figure 5.

As your code speed increases, you will find it impossible to print rapidly enough to keep up; therefore, typewriting is a skill also required of all Radiomen. Use of a good commercial text can help you master touch-typing. USAFI also offers a typing course for beginners.

SENDING

Your ability to send well depends mainly upon two capabilities. First, you must know the

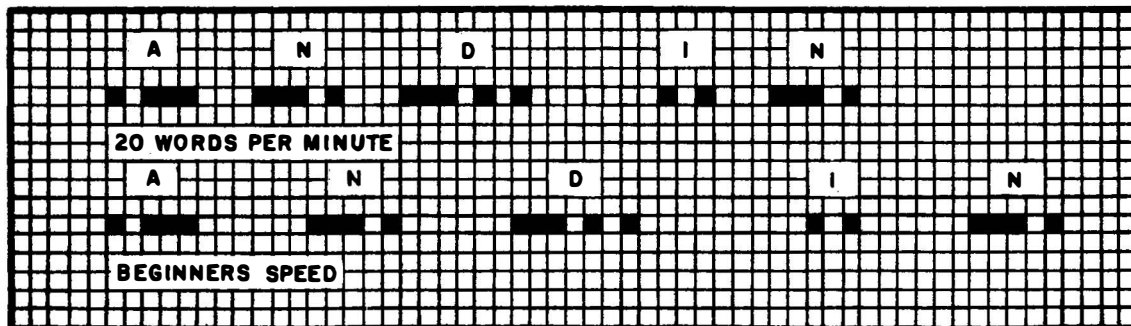
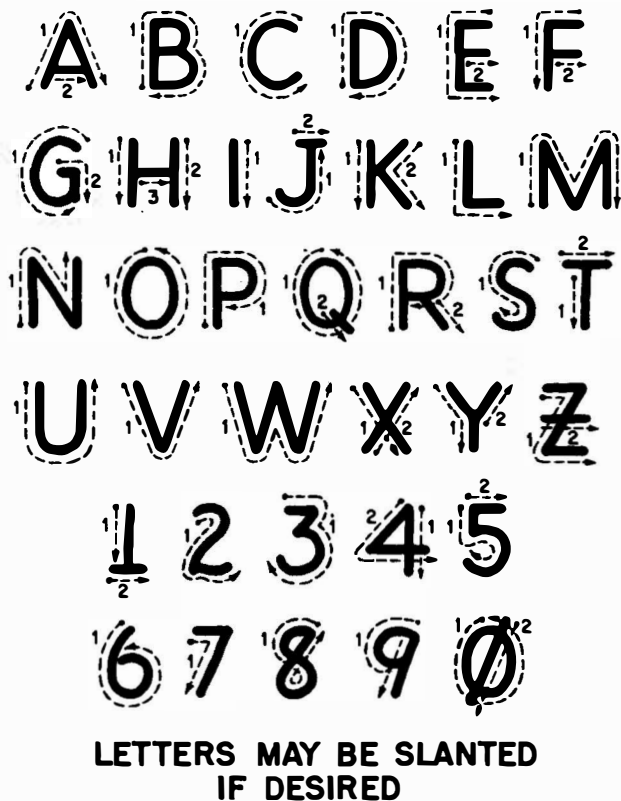


Figure 4-1.—Correct keying of Morse characters. 51.5



45. 207(76)

Figure 4-2.—How to form printed characters.

CORRECT SOUND of the character you are attempting to transmit. Second, you must know the PROPER METHOD FOR KEYING with perfect control. Practicing the code aloud, as well as receiving it by oscillator, has given you a good knowledge of code sound. The proper method for keying is your next concern.

#### HAND KEY

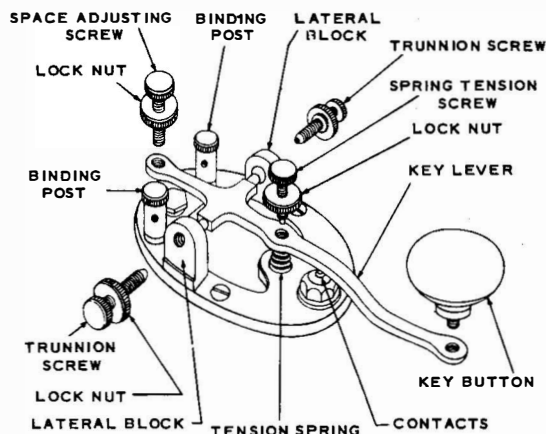
The first key you will use is the hand key. The hand key is widely used on radiotelegraph circuits and with practice oscillators. It must be adjusted properly before you can send clear-cut characters. Figure 4-3 shows a hand key, with parts labeled.

#### KEY ADJUSTMENT

The spring tension screw, behind the key button, controls the amount of upward tension on the key. The tension desired varies with operators. Too much tension forces the key button up before the dahs are completely formed; spacing between characters is irregular, and dits are not clearly defined. If the spring tension

is very weak, characters run together and the space between characters is too short.

The gap between the contacts, regulated by the space adjusting screw at the back of the key, should be set at one-sixteenth inch for beginners. This measurement does not apply to every key and operator; it is a matter of personal preference. Some operators like a closed key, others an open key. "Closed" and "open" are terms for a short and a long gap. As the student progresses, further gap adjustment may be made to suit his sending speed. Contacts that are too close have an effect similar to weak



76. 8A

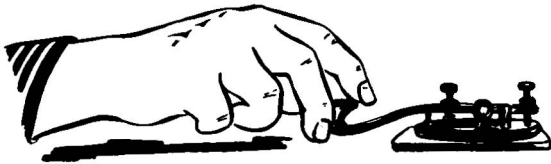
Figure 4-3.—Hand key.

spring tension. Contacts that are spaced too far have the same effect as too much spring tension.

The final adjustment of the key is the side-wise alignment of the contact points. The trunnion screws at either side of the key control this alignment. If they are too tight, the key lever binds. If they are too loose, the contacts have sidewise play. Usually, when the sidewise alignment is correct, no further adjustment is required.

#### POSITION OF HAND ON KEY; WRIST MOVEMENT

Learn from the beginning the correct way to grasp the key. Do not hold the key tightly, but let your fingers rest lightly on the key knob. Your thumb rests against the side, your fore-finger rests on top of the key, with your third finger bent and relaxed lightly with the remaining two fingers. Check figures 4-4 and 4-5 for the correct method of keying. To ensure correct movement of your wrist and forearm, your arm should lie on the operating desk. The



76. 8B  
Figure 4-4.—Grasping the key.

muscle of your forearm—not your elbow—should support the weight of your arm. Your elbow should not stick out over the edge of the table, because the pressure of the underside of your forearm will partly block circulation and tire you. Sit upright, with your arm in line with the key.

Your ability to transmit depends to a great extent on acquiring the PROPER MOVEMENTS of your WRIST and HAND while operating the key. To close the key, your wrist moves upward and your hand rocks downward toward your fingertips. To open the key, these two movements are reversed—your wrist comes down and your hand rocks back.

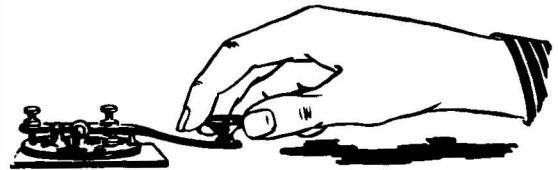
Make your wrist flexible. Limber it up. Correct wrist action may be developed by exercising your wrist up and down like a hinge. Another exercise is rotating your hand in clockwise circles, with your wrist held in a stationary position. These exercises will relieve any undue tension you may experience when first beginning to transmit.

### SEMI-AUTOMATIC KEY

The semiautomatic key, also known as the bug or speed key, is used chiefly when operators are required to send for relatively long periods of time. It is designed to make sending easy instead of fast. Hence, perfect control of the key is far more important than speed.

### OPERATION

In sending with the bug, the thumb presses the dit paddle (fig. 4-6) to the right, and the index finger forms dahs by pressing the knob to the left. The key sends successive dits when the paddle is held to the right. One dit or a series may be sent, depending on how long the thumb pressure is maintained against the paddle. One dah is formed every time the knob is pressed to the left. Dahs must be sent individually. While



76. 8C  
Figure 4-5.—Your thumb rests against the side.

sending, the hand pivots at the wrist, and the hand and arm motion is horizontal.

### KEY ADJUSTMENT

Best operation of the semiautomatic key is obtained when it is adjusted to send dits and spaces of equal length.

Adjust the key as follows (locate the parts in fig. 4-6 when adjusting the key):

1. Adjust the back stop screw until the reed lightly touches the deadener. Tighten the locknut.

2. Adjust the front stop screw until the separation between the end of the screw and the reed is approximately .015 inch. Tighten the locknut.

3. Operate the dit paddle to the right. Hold the lever in this position and stop the vibration of the reed. Adjust the dit contact adjusting screw until the dit contacts just meet. Tighten the locknut. This adjustment determines whether the dits will be too heavy, too light, or perfect. The adjustment must be made without flexing the contact spring.

4. If the dits are too fast, move the weight, located on the reed, in the direction of the deadener. If the dits are too slow, move the same weight in the opposite direction.

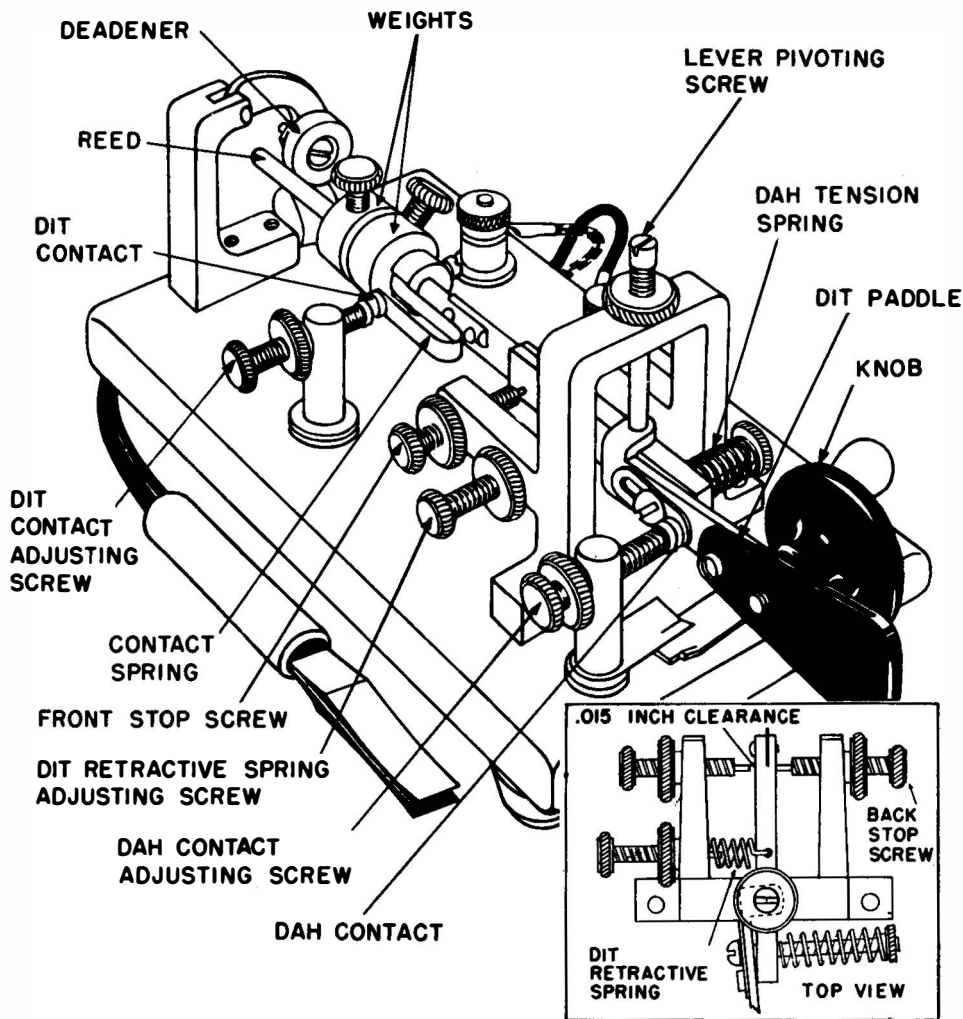
5. Adjust the dah contact adjusting screw to a clearance of approximately one thirty-second of an inch.

6. Adjust the dit retractive and dah tension springs for the most comfortable operation.

If the adjustment instructions are followed carefully, the bug makes 25 or more dits before stopping. The first 12 to 15 dits will be practically perfect, with the dits and spaces equal.

### SENDING EXERCISES

Good operators have sending rhythm, and you can acquire it in just one way: by PRACTICE.



76.9

Figure 4-6.—Semiautomatic key.

It may be difficult for you to key correctly at first, because your wrist is unfamiliar with the type of movement required for sending telegraphic code. Your wrist will be stiff, and you'll have to get rid of that stiffness by a lot of practice. Don't favor the stiffness of your wrist. If you do, your sending will be choppy.

The following exercises have been prepared carefully. Use them as an instruction guide.

#### CHARACTER E

The dit characters require a good "fist." They must be transmitted quickly and rhythmically. Make a series of Es (dits). These are made with a pronounced movement of your wrist

upward, returning to the normal position after each dit. At first, maintain a fairly long interval between dits. To assist you in limbering your wrist, exaggerate the movement upward. To prevent tenseness and tiredness of your wrist, remove your hand from the key periodically and flex your wrist. After practicing Es for 15 or 20 minutes, decrease the interval between dits until you are making them rather rapidly. Each sound should continue to be a definite dit, however. Keep at it until you can control each dit.

#### CHARACTER I

When you feel that your wrist is limbering up, make the character I (di-dit). Start with your

wrist in the normal relaxed position, raise it for the first dit, lower it quickly halfway back, and make the second dit with another quick movement of your wrist upward. Your transmission, made slowly, produces the sound dit-dit. As you practice and develop more rhythm, this character acquires the sound of di-dit.

#### CHARACTER T

Send a series of Ts (DAH) with a good interval between them. Instead of a quick movement of your wrist upward, make a slower, more definite movement of your wrist and exert more pressure on the key. Send dahs for a few minutes, gradually shortening the interval between characters.

#### CHARACTER M

Now try sending strings of Ms (DAH-DAH). As with the character I, you don't return your wrist to the beginning position at the end of the first dah, but bring it to the halfway point and then make the last dah. With practice, you'll soon change the hesitant DAH DAH sound to the snappy DAH-DAH. Don't forget the correct wrist movements. If you find that your sending requires exertion of forearm muscles or that your shoulder is moving, stop and recheck your wrist motions.

Try these practice groups several times, backward and forward. Make them clearly and distinctly, spending more time on characters that cause you any trouble.

MEET EMIT MITE ITEM

#### CHARACTER A

The character A (di-DAH) gives you practice in making a dit and a dah together. Sending motions in their proper order are (1) a slight pressure of your fingers alongside the key, (2) a quick surge upward of your wrist, (3) a slight relaxing of your wrist to the halfway point, and (4) a final definite upward movement of your wrist. This produces the sound dit DAH when you begin to practice it. But keep at it—you'll soon have the proper di-DAH sound. Avoid tenseness; relax your forearm muscles when sending.

#### CHARACTER U

You're now ready for the character U (di-di-DAH). Start slowly, sending dit dit DAH. Practice it until you get a di-di-DAH sound.

#### CHARACTER N

The character N (DAH-dit) requires only slight pressure on the sides of the key, a strong wrist movement upward, a half return, and a quick, short, upward motion for the dit. Practice this for several minutes until you are able to send DAH-dit easily and with complete relaxation.

#### CHARACTER D

Try the letter D (DAH-di-dit). At first, with the correct wrist movement, it will be DAH dit dit. But the sound you want to hear is DAH-di-dit—with a swing. Send Ds until you can transmit them with perfect control.

Check yourself on the following groups. You should have less difficulty than you did with the first groups.

MINED UNITED READY MAUDE TEAMED

#### CHARACTER S

Go back to the dits for S (di-di-dit). Get a good position on the key and put your wrist to work. See how quickly you can change the dit dit dit sound to di-di-dit. Relax your forearm.

#### CHARACTER V

The letter V is di-di-di-DAH, so you'd better learn how to send it that way. Relax. If your wrist is tied up in a knot, you'll be sending dit dit dit DAH. Move your wrist up and down easily until you are sending di-di-di-DAH with perfect control. Practice this letter carefully. It is used in every radio test.

#### CHARACTER O

DAH-DAH-DAH is O. Keep at it until it stops sounding like three Ts. Test your skill with these words:

DOOM MOST ROAD MOTOR WORST  
MOTION WOKE ANCHOR DOMO

#### CHARACTER H

Character H is di-di-di-dit. Send one. If it sounds similar to four Es, your wrist is too stiff. Develop the di-di-di-dit sound.

#### CHARACTER B

Send DAH-di-di-dit. That's the Morse code equivalent of B.

Practice for perfect control, then try these groups:

SOB BASSINET BIND BESTED BEAUTY  
SNOB BABBITT BURST

**CHARACTER K**

At this point you should be prepared to tackle the other characters. They are mostly combinations of the letters you have practiced. Each one has a distinct overall sound. For instance, K should not have the sound DAH-dit-DAH. It should be DAH-di-DAH. Think of the tune "Over There." DAH-di-DAH has the same rhythm as OH-ver THERE--DAH-di-DAH.

**CHARACTER Q**

The letter Q (DAH-DAH-di-DAH) has the same rhythm as the words "Payday today." Say in a monotone "payday today," then say DAH-DAH-di-DAH. When transmitted, these combinations have the same swing given them as when speaking or chanting.

**REMAINING LETTERS AND NUMERALS**

The preceding 15 characters have taught you proper wrist movement. You know the remaining 11 letters and 10 figures. Following are 14 practice exercises. Use these for self-drill.

**PRACTICE EXERCISES**

Practice the remaining letters of the alphabet and the numerals. When you think you're ready for it, practice the code exercises that follow.

1. E E E T T T A A A N N N I I I S S S H H H  
M M M O O O E E E T T T A A A N N N  
I I I S S S H H H M M M O O O E E E T T T  
I I I M M M A A A N N N S S S O O O H H H  
E E E T T T E E E T T T I I I M M M I I I  
M M M A A A N N N A A A N N N S S S  
O O O S S S
2. U U U V V V D D D B B B K K K C C C  
W W W J J J P P P U U U V V V D D D  
B B B K K K C C C W W W J J J P P P  
W W W J J J P P P U U U V V V K K K  
C C C B B B D D D U U U D D D V V V  
B B B P P P J J J C C C K K K W W W  
D D D B B B V V V U U U W W W J J J

3. R R R L L L F F F G G G Z Z Z X X X  
Y Y Y Q Q Q R R R L L L F F F G G G  
Z Z Z X X X Y Y Y Q Q Q G G G Z Z Z  
F F F L L L R R R Y Y Y Q Q Q R R R  
X X X Z Z Z R R R F F F L L L Q Q Q  
Y Y Y G G G Q Q Q Y Y Y R R R
4. 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8 8 8  
9 9 9 0 0 0 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6  
7 7 7 8 8 8 9 9 9 0 0 0 1 1 1 2 2 2 3 3 3 4 4 4 5 5  
6 6 7 7 8 8 9 9 0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7  
8 8 9 9 0 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7  
8 9 1 2 3 4 5 6
5. V U I Y Q Z C X G R S L K J P Q X Z R I  
F C V B W F K D S H Q Z A L K F B V R  
S T U O T M E G Y Z X V E G N I W S L H  
M U A E V U A E W Q G H V C I X Z L N  
R Y U K V U
6. E 8 Y 7 B 6 X 1 W 0 Z 2 A 3 C 5 S 4 I 2 F  
U 1 F 5 D 8 Q 4 T 6 U 9 Q 2 E 0 S 5 U 1 Y  
G 2 J 4 S 3 E 5 T 7 Z 8 K 6 M 9 R 1 A 2 R  
S 7 W 8 E 9 R 2 A 3 Z 3 X 6 U 8 B 7 C 6 T
7. M I A N S Y N L T Y C E D O P S C X Z W Q A P K  
L N H U W C V N B M Z S C D Q A I U S D L M U H  
G Y T R D C V T A R Y U F D S A I G W Q X T Z I  
N Y O T E D B M L P Y U G H B Y R E D F L S  
W Q X S Z I T Y B G N H J V K L M D M I A N S Y  
N L T Y C E D O P S
8. E F T S 16 29 83 Z J 45 07 W R N D K W I C U X  
91 02 I B L O F G 84 63 X W A C T M S U 57 72  
X R J Z M 43 65 V H 97 L M 12 46 70 F C F E  
E Y 34 56 27 F T F Y J U I T 98 76 75 52 D E  
W E Q T 13 36 57 K F R I Y T 19 93 35 41 F K  
Y U 96 01 M C A R T H 19 25 30 U R B O U L  
32 05 21
9. N D T E G H R T S L Y B F C C Z E X P I H C W E  
L K J Q I E N U G C V T E P L S Z W Q A U S H  
G B T V R T G I K G Y O D C M X S D Z A U Y E R  
D L N U R G H N B V D X Z W S Q T A G H I P T  
M B Y P L K R D C E S X I U P P K J N Y H G H T  
D F R V E D S W N V B T X F Z R D A S E N F U  
G B C Y R F D S E W N J G V A S W Q Q I X Z O T  
M E H G K D B G V C F I A T A R U R S A C L T  
N V R D A B G L M I N Y E G B L K O M W D S K Z  
Q L D Y G B N D T E G H R R S F L M F C C M E
10. O V L H M Y B L U R X O H I Z O V I C T  
F I N X S C X S H T Y V I Q N T U B M L  
A B L B E J L N C Y Z B Z W C N J N D Z  
U T L Z K L A B D E F Z V N U W K F R E
11. J I C O Y T X S T Y 38095 R D I H A  
J X T D Z O X Y D W X P Z S Y R S P H D  
89706 C U S P I R N B R J 65288 Z O N I G  
F Y E Q U A R Q N V R N L P T K A K O Z  
87840 B V G A N W K O Q T S R Q M T  
U J V W N 45872 Y X B C X A F K O Z  
O G L C T N I H G P 12349 A T U S K  
S L E W Q



12. OLMX MVNH UWQR NVUT KUXF  
 CDEH LYHE DIPA ZQWI AYSK  
 QIQA WMNW ZIHZ CAKD BTGW  
 WNLI PWBU OXAD XFRJ IQCA
13. ZMJXI URYNC 93470 PQAZM  
 DEGVM NCBVG HUGHY 13267  
 PHRAN QUECC 12890 MCNDH  
 EUIRY WQAZX IRSVZ MCURI  
 72439 OYTRW PIQAW CNJWO  
 OWQAJ OISKM 10706 DGFHG  
 KXBOU
14. UTHA VNCB RFDS EDCD CXVD  
 RWQI MNJF STRO TNBL UJHK  
 NIOQ JUJR GBNS VCXT RJTU  
 BCDV CGFH 5781 JGVX HGJD

### PRACTICE MAKES PERFECT

Continue sending to yourself with the practice key and oscillator. If you can operate with another striker, so much the better. Sit down at an unused operating position and tune in some slow code. It is not hard to find, especially on amateur frequencies. Copy as best you can. Don't worry too much about missing letters. Get what you can, no matter how little it is. As your speed picks up, tune in faster code. If you find you are copying a certain speed solidly, the code is too slow. Keep it faster than you can copy comfortably.

Make the transition from pencil copying to the typewriter as soon as possible.

You will need lots of practice. Class A Radioman Schools ashore run a full day, and for months a man copies code several hours daily.

As you gain skill, try copying the 18-wpm to 20-wpm fleet broadcasts. This does not mean for an hour now and then; it means for as much time as possible—15 or 20 hours per week. Don't be afraid to use some of your off-duty time. At the same time, begin to learn how to hold down a circuit. One of the best ways to do this is to spend several watches logging circuits that other operators are manning. At the end of every watch, compare your log with that of the regular operator, and question him about anything you do not understand. That way you see procedure in use and get practice in copying many fists.

Learn to copy behind. If you are recording B as D, S as I, J as W, and so on, you are copying too close. The farther behind the better. At first, listen to one character while setting down the previous one. Try to fall back one letter more. Listen for the character while carrying one in your head and setting down the one before that. Once you get the knack, you will find copying behind to be easier, faster, and more accurate. The faster the code, the farther you must stay behind. Watch an oldtimer copy press at 35 or 40 wpm. You will find he is carrying anywhere from 5 words to a sentence in his head.

One thing further: It is common for a student learning code to hit a plateau. The regular progress to higher speed stops, and for a time the student finds himself unable to copy faster than a certain speed. If this happens to you, just stay with it until your speed picks up. Never lose confidence in the knowledge that any man of ordinary ability can learn the code if he puts in the necessary time and work.