

AMECO

CODE COURSE

PREPARATION FOR
AMATEUR AND COMMERCIAL
CODE EXAMINATIONS

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CHAPTER 1

INTRODUCTION

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Why do we use Code?

It is a simple matter for anyone to broadcast a message using a radio-telephone transmitter. The only requirement is that the individual sending the message speak into the transmitting microphone. At the receiving end, the procedure is just as simple. The individual desiring to hear the transmitted message need only tune his receiver to the broadcasting station to listen to the spoken word as they are reproduced by the receiving loudspeaker.

Transmission of messages by CODE, however, requires the sender and receiver to be specially trained and skillful. The question may therefore arise in the minds of many people, - "Why use code transmission at all, when voice transmission is so much simpler?" This question can be answered with three important reasons for using code rather than voice transmission.

1) Radio communication by code requires less elaborate transmitting equipment than does radio-telephone transmission.

2) Code transmission will get through radio interference more readily than will phone transmission. Although radio-phone transmission is often rendered impossible by unfavorable transmitting conditions, code transmission will most probably be intelligently received.

3) Code provides one valuable way of sending secret messages.

The Nature of Code

Code consists of letters in the same way as any language consists of letters. The code letters are made up of SOUNDS of short and long duration which are called dot

and dashes. These sounds are usually high pitched tones of about 500 cycles or approximately C above middle C on the piano. The long sound (dash) is three times as long in duration as the short sound (dot). Each letter of the alphabet and each punctuation mark are made up of a different combination of these long (dash) and short (dot) sounds.

There are two different code systems in use today. One is the International or Continental Morse Code which is used in radio telegraphy; the other is the American Morse Code which is used by the railroad systems. Both of these codes are practically the same, except for the difference in a few letters. Since we are primarily interested in radio communications, we shall study the INTERNATIONAL MORSE CODE.

Importance of Learning Code

Before we discuss the methods of learning code, we should realize why such knowledge can be of importance to us.

1) Your knowledge of code can be of great service to others in times of emergency. During war the Armed Forces call upon thousands of experienced code operators for special duty. During peacetime disasters, such as floods, a knowledge of code can help to save lives and property.

2) Many important jobs require a knowledge of code. For example, Radio operators in the Maritime service send and receive messages by code. Code operators are required in transoceanic and transcontinental radio stations, etc. In order to hold a position as a code operator, an individual must be licensed by the Federal Communications Commission of the U.S. government. Government licenses for radio-telegraph and radio amateur operators are only issued to those individuals who can successfully pass an examination in sending and receiving code in addition to a written examination on radio theory.

Requirements for Government License

In order to pass the Amateur Operator's code examination for the Novice or Technician classes, the Applicant must know how to send and receive 5 words per minute of International Morse Code. The General, Conditional, and Advanced classes of licenses require a code speed of 13 words per minute. The prospective Amateur Extra Class operator must know 20 words per minute. The average word is considered to be made up of 5 letters. Numbers & punctuation marks count as 2 letters.

The code requirements for the second class radio-telegraph examination are a sending and receiving rate of 13 words per minute. For a First Class telegraph license, the sending and receiving rate is 25 words per minute. The text for the commercial operator examination is made up of coded groups of letters and punctuation marks; whereas the text for the amateur examinations is made up of English words.

Learning the Code

Beginners usually ask the question, - "How long will it take me to learn now to send and receive 13 words per minute?" Well, the answer to this question varies with each student. The rate of learning code depends solely upon the individual. Some people learn any new subject faster than others. On the average, however, a student should require approximately 120 half-hour lessons of practice (total of 60 hours) to learn to copy 13 words per minute; fifteen words per minute should take on the average 150 half-hour lessons, or a total of 80 hours.

If you intend to take the amateur test which requires a speed of 13 words per minute, you should know how to send and receive at least 15 words per minute. Likewise, if you are preparing for the 16 words per minute, Second Class radio-telegraph test, you should be proficient at 18 words per minute. The extra two words per minute are necessary as a safety factor, as most people become nervous during code examination and lose speed as a consequence.

Another question that is frequently asked by code beginners is, - "How do I know that I can learn the radio-telegraph code?" The answer to this question is that there is no such thing as "can't learn code". With sufficient practice and willpower, everyone can learn code. Of course not everyone can learn to copy up to 40 words per minute. However, every student can certainly learn to copy 15-20 words per minute.

The most important factor in learning the code is PRACTICE. You CANNOT learn code by reading a book. You can only learn by continually practicing. In order for you to learn code the correct way, a definite schedule of practice periods must be set aside every day. In this schedule, the practice periods must be properly spaced and timed.

Rules for Practicing the Code

In studying the code, one should adhere to the following rules:

- 1) Never study for more than an hour and a half a day. Spread the practice periods out as much as possible as this will improve the rate of learning. For instance, it is better to schedule five one-hour periods during a week rather than two, 2½ hour sessions per week.
- 2) At no time should you practice until you become exhausted. For that matter, do not study if you are "not in the mood", or if you do not feel well, as you will gain nothing from the practice session.
- 3) Do not attempt to receive code continuously for more than 15 minutes at a stretch. After you have received code for a 15-20 minute period, take a short break for relaxation and then start to practice once again.
- 4) Go slowly! Do not attempt to learn to send and receive 13 words a minute in one week's time. It simply cannot be done. You will only wear yourself out in the attempt, and probably develop such a distaste for code that it will cause you to discontinue your studies. You must be patient with yourself and realize that you must learn one thing well before going on to another. Do not worry about developing speed at first. If you learn the code well at the beginning, it will be a lot easier for you to gain speed later on.
- 5) Follow the lessons carefully. There are no further short cuts to learning code. If you follow the instructions in the lessons, you will be learning code by the fastest and most proficient method. These instructions have been worked out by the American Electronics Company after many years of teaching experience.
- 6) Study the sending of code along with the receiving of code. Many code learners make the mistake of ignoring to practice their sending. Knowing how to send correctly is an important asset to a radio operator. No amateur will want to or be able to listen to your code transmission if it is "sloppy". Also remember that the F.C.C. examiners test your sending by the same standards as they test your receiving.
- 7) While learning the code, you may reach a point where you find yourself not progressing. This is what is

known as a "plateau" of learning. For instance, you may find that you have reached the speed of 10 words per minute, and for some unknown reason you cannot improve your speed beyond this point. This is a common experience reached by most code students. You must understand that this apparent standstill in your speed will only last for a short period of time, and that you have nothing to worry about. You must not become discouraged. Continue to take your regular practice lessons with sufficient relaxation breaks. Before you know it, you will be over the "plateau" and on your way to a higher code speed.

So much for the rules, and now a final word before you actually start the course. Ninety percent of learning the code is practice and a willingness to learn. Natural ability means very little when it comes to acquiring speed in sending and receiving code. If you are determined to learn the code and set aside sufficient practice periods in which to study, you have a 100 percent guarantee that you will become a proficient radio-telegraph operator (whether on an Amateur or on a Commercial basis) in just a short period of time.

THE CODE ALPHABETSounds Used in Code

Each letter in the English language is made up of different sound combinations. For instance, the letter "I" is formed by pronouncing the sounds "ah" and "ee" in rapid succession. Likewise, the letter "C" is formed by the sounds "SS" and "ee". Thus we see that the letters are formed by the combination of several sounds.

In International Morse Code we are concerned with only two sounds that are used to make up the elements of the code. Both sounds have a tone similar to a whistle or about a 500 cycle pitch. The only difference between the two sounds is their time duration. The one sound is very short, a fraction of a second. The other sound is about three times as long. Each letter and punctuation mark of the code alphabet is made up of different combinations of these two sounds.

The names given to the two sounds are "dit" for the short sound and "dah" for the longer sound. The code sounds can be produced over a loudspeaker by means of a telegraph key and an electrical device known as an oscillator. The sound of the words "dit" and "dah" closely resemble the actual sounds that are generated by the oscillator-key combination. That is why we use the words "dit" and "dah" to represent the code sounds.

"Dit" and "Dah" in Combination to Represent Letters

Suppose we examine a few letters of the alphabet and see what combinations of dits and dahs go to make them up in code. For example, the letter "A" is made up of one short sound followed by one long sound. We, therefore, think of A when we hear the sounds "dit-dah". The letter "B" consists of the long sound followed by three short sounds. The time interval between two adjacent sounds is equal to the time interval of the dit. In other words, if it takes one-fifth of a second to sound the dit, the dah sound would take three-fifths of a second, and the spaces between the four elements of the letter B would each take one-fifth of a second. The entire letter would take one and four-fifths of a second to be produced. We arrive at this figure as follows:

B dah - dit - dit - dit

↓ ↓ ↓ ↓ ↓ ↓ ↓

$$\frac{3}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{9}{5} = 1\frac{4}{5} \text{ seconds.}$$

When using the dit-dah language, always accent the dah. This is true regardless of wherever the dah may fall.

Rules For Beginners

In order to help you, the beginner, to avoid certain basic mistakes while learning the code, you should observe the following rules:

1) Do not use the words "dot" and "dash" to represent the code element sounds "dit" and "dah". If you want to say "C" in code language, you should say dah-dit-dah-dah and NOT dash-dot-dash-dot. "Dit" and "dah" sound more like the actual code sounds than do dot and dash. In order to be a successful code operator, you must learn to translate the code sounds directly into letters. For example, when a radio operator hears the sounds dah-dit he immediately translates these sounds into the letters "N". If he begins the wrong way and learns the code in terms of dots and dashes, he must first translate the code sounds into their respective dots and dashes. He would then have to translate the dots and dashes into letters. For example, the sounds dah-dit would first have to be translated into dash-dot. Only in this form could he recognize them as representing the letter "N". This is an indirect and inefficient method of receiving.

2) Learn code by the correct aural method and not the incorrect and slower visual method. The incorrect visual method causes you to mentally visualize the entire chart of code letters in order to pick out the English letter corresponding to the code sounds that you hear. This method, again, is a very slow and inefficient one. The correct aural method is to immediately associate the letter with the rhythm of the code sounds. For example, hearing the rhythm of the sounds dah-dit-dah-dit should immediately bring to your mind the letter "C"; that and nothing else.

3) You will find that certain letters are more difficult to memorize than others. You must therefore give these difficult letters more practice than the easier ones. Too many beginners learn the easy letters very well and hardly know the difficult ones.

4) Learn the punctuation marks and numbers just as well as the letters of the alphabet. Even though, punctu-

that marks are used less than actual letters, they are just as important. The code tests for both the Amateur and Commercial licenses contain punctuation marks and numbers. As a matter of fact, each punctuation mark or number counts for two letters on the code test.

Learning the Code Alphabet

We are now ready to actually study the code. We will study one group of letters at a time.

Read the dit-dah sounds out loud. Keep repeating the sounds and look at the chart as little as possible. Keep the pauses between the sounds of each letter the same.

Here is the first group. The line under the dah means that it should be accented.

E - dit

T - dah

A - dit-dah

R - dit-dah-dit

L - dit-dah-dit-dit

a period (.) - dit-dah-dit-dah-dit-dah

The first four letters in the first group are rather simple. The L and period need more practice. Remember to keep the dits short, and the dahs three times as long as the dits. Remember, also, to accent the dahs, as this will help to give you the proper rhythm of the code. Make sure that the dits and dahs of each letter are separated by the SAME time interval which is equivalent to the duration of the sound "dit". If this is not done, a group of sounds which are supposed to represent one letter, may be understood to stand for two letters. For instance, if you leave too much space between the dah and the last dit of the letter "R", it will sound like dit-dah—dit. This will be interpreted as the two letters A and E rather than the one letter "R".

Do not go to the next group until you have completely mastered the above group to the extent that you know all of the letters and their rhythms by heart.

Group Two

I - dit-dit

U - dit-dit-dah

F - dit-dit-dah-dit

S - dit-dit-dit

V - dit-dit-dit-dah

? - dit-dit-dah-dah-dit-dit*

* - This last symbol may also stand for request for repetition of a transmission not understood.

After you have memorized the second group, go back and review the first group. At this point, you should know both groups well. It will be a great help to you if you can have someone test you by reading the dit-dah language to you correctly. You can judge how well you know these two groups by how quickly you recognize the letters and punctuation marks from the rhythm of the dit-dah sounds.

Group Three

M - dah-dah

G - dah-dah-dit

Z - dah-dah-dit-dit

Q - dah-dah-dit-dah

O - dah-dah-dah-

comma.,(,)- dah-dah-dit-dit-dah-dah

In group three, the letters become a bit more complicated. This is especially true of the Z and the Q which are easily confused with the F and L. Make sure, by constant practice, that you can differentiate between Z and Q and L.

Group Four

- K - dah-dit-dah
- C - dah-dit-dah-dit
- E - dah-dit-dit-dit
- D - dah-dit-dit
- W - dit-dah-dah

colon (:)- dah-dah-dah-dit-dit-dit

Continue to review the material in the previous groups after you have mastered group four. An excellent way to give yourself practice in learning the code is to translate words which you may see on posters into code sounds as you walk along the streets or ride in a bus.

Group Five

- N - dah-dit
- Y - dah-dit-dah-dah
- X - dah-dit-dit-dah
- P - dit-dah-dah-dit
- J - dit-dah-dah-dah
- H - dit-dit-dit-dit

semicolon (;)- dah-dit-dah-dit-dah-dit

fraction bar - dah-dit-dit-dah-dit

double dash or break - dah-dit-dit-dit-dah

Most beginners confuse the H with the S. This will happen if you do not learn to recognize the difference in rhythm between the two letters. Here again, sufficient practice does the trick.

Group Six

- 1 - dit-dah-dah-dah-dah
- 2 - dit-dit-dah-dah-dah
- 3 - dit-dit-dit-dah-dah
- 4 - dit-dit-dit-dit-dah
- 5 - dit-dit-dit-dit-dit
- 6 - dah-dit-dit-dit-dit
- 7 - dah-dah-dit-dit-dit
- 8 - dah-dah-dah-dit-dit
- 9 - dah-dah-dah-dah-dit
- 0 - dah-dah-dah-dah-dah

error - dit-dit-dit-dit-dit-dit-dit-dit

wait - dit-dah-dit-dit-dit

hyphen- dah-dit-dit-dit-dit-dah

parenthesis* - dah-dit-dah-dah-dit-dah*

end of telegram or message unit - dit-dah-dit-dah-dit

end of entire transmission - dit-dit-dit-dah-dit-dah

received message O.K. - dit-dah-dit

invitation to transmit - dah-dit-dah

* - Before and after words.

Group six contains numbers, punctuation marks, and special procedure signals. As you learn this group, think of the punctuation marks and procedure signals as individual units and memorize them as such. For example, the code symbol that signifies the end of a message in a tran

which is to be memorized as dit-dah-dit-dah-dit, one syllable unit.

You will notice that there is a definite pattern to the numbers. Each number contains five code elements. The number one has pre dit and four dahs. Number two has two dits and three dahs, etc. This pattern should be an aid to memorizing the numbers. However, do not think of the numbers as consisting of so many dits and so many dahs. Learn to hear the rhythm of the combination of dits and dahs in a number so that when you receive dit-dit-dit-dah-gah, for example, you will immediately associate that particular rhythm with the number 3. The incorrect way to do it would be to first figure that there are 3 dits and 2 dahs; then to figure back that this stands for the number 3. The mental figuring required for the incorrect method will cause you to lose speed. Remember, the key to learning the long numbers and symbols is to associate a number or symbol with the particular rhythm of all the dits and dahs as a combined sound unit.

After you have studied group six, you will have completed all the letters, numbers, and important signals. Do not go on to chapter 3 until you are 100 percent sure that you have mastered all of the groups contained in Chapter 2.

LEARNING HOW TO SEND CODE

The Importance of Sending Properly

The importance of learning how to send is usually underestimated. Many beginners do not pay enough attention to code sending. They may feel that learning how to send "comes naturally". This, of course, is not true. It takes patience, practice, and skill to send properly.

It is important to send correctly for many reasons. First of all, you will be examined for proper code sending on the Federal Communications Commission's Commercial and Amateur examinations. The examiner listens carefully to your sending and will fail you if he feels that you are difficult to copy. A second reason for learning how to be come a good code sender is that as an Amateur operator, it will be difficult for you to make contacts if your sending is poor. Other Amateur operators would just as soon not make contact with you rather than try to copy poor code. Also, in order to hold a position as a commercial telegraph operator, it is very important to send code well enough so that all other operators can copy you easily. You can therefore see that sending code is just as important as receiving it.

The Key

The instrument that is used to form the dits and dah when sending code is called a KEY. The key is simply a switch with a set of two contact points that open and close a circuit. Figure 1 illustrates a typical labeled telegraph key. When the knob is pressed down two contact points touch each other to complete a circuit. This completed circuit generates the code sound.

Correct Position for Sending

Many operators use their own unique methods when it comes to sending code. There are, however, certain standard rules in regard to sending that all good code operators observe. These rules have been tried and have been proven throughout the many years of radio telegraphy.

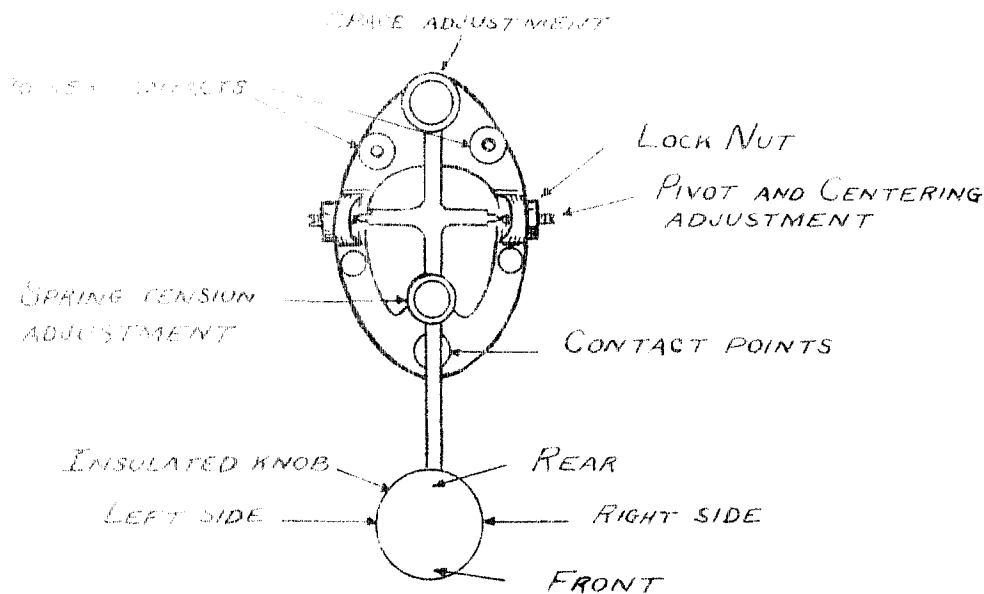


Fig. 1 A simple telegraph key.

Therefore, it is advisable that you follow the rules as detailed below very closely.

- 1) Sit fairly erect and comfortable at the code-table. A table 30" high is ideal for this purpose.
- 2) Both your feet must be on the floor, and your shoulder line should be parallel to the table.
- 3) The key should be in line with your right shoulder and about 18" from the edge of the table. This will allow enough room for your elbow to rest on the table. Your forearm muscle will then carry the weight of your arm. The key should be mounted on the table or on a large board.

Grasping the Key

How one grasps the key knob is another factor where we find a great deal of individual variation. Figure 2 shows the correct finger position for grasping the key knob. This position is used by all good telegraph operators. Study the picture carefully and try to duplicate the position shown with your own key. Your fingers should grasp

the knob of the key as follows: Your thumb should press against the left edge of the knob. Your index finger, or first finger, should be slightly curved and should touch the top rear end of the knob. Your second finger should also be curved and be placed toward the rear right side of the knob, as shown in Figure 2. The two remaining fingers curve toward the palm and do not touch the key knob

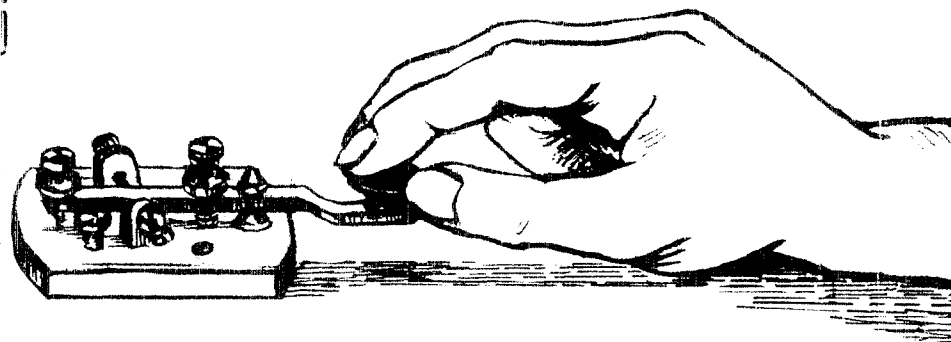


Fig. 2 How to Hold the Key

Adjusting the Key

After you become familiar with holding a key, the next thing for you to learn is the method of adjusting the key. See Figure 1 for the names of the various parts of the key. The steps in the adjustment of the key are as follows:

- 1) Adjust the two side screws so that the arm of the key is free to move up and down with ease and without any noticeable side play. Once this is done, tighten the two lock nuts on the side screw to secure their adjustment.
- 2) Adjust the space between the two contact points. This is done by adjusting the "space adjustment" screw at the rear of the key until the distance between the contact points in the "key-up" position is from 1/32 of an inch to 1/16 of an inch. When this adjustment is made, tighten the lock nut to secure the space adjustment. The exact spacing of the points will vary with the individual operator. As you become more experienced in code sending, you will choose the spacings that suit you best.

3) The final key adjustment is the tension of the spring. The spring tension should be so adjusted that the contact points separate as soon as pressure on the key knob is released. At the same time, the spring tension should not be so strong that heavy pressure is required to close the key contacts. If the spring tension is too strong, the physical effort required to press the key arm will cause hand fatigue in a short time. Also, the sending will appear to be choppy. On the other hand, if the spring tension is not strong enough, the spacing of the sounds will be uneven and the dits will sound slurred.

Sending dits and dahs

Now that you know how to adjust and grasp the key, you are ready to send "dits" and "dahs". Connect the key to the audio oscillator or buzzer, following the instructions that you received with the equipment. Begin by sending a series of "dits". Try to time the dits by sending about three per second. Do not grasp the knob too tightly. Be sure to keep your fingers on the knob at all times. Send about five or six evenly spaced dits in a period of about two seconds. Bend by flexing your wrist. Do not attempt to send by working either your fingers or your arm. Keep your wrist flexible and allow it to bob up and down during sending. It is your wrist that always does the work in sending, not your fingers or arm.

Be careful not to slur over the dits. Each dit must be clear and sharp. The space between the dits should be of the same time duration as the dits themselves. After you have acquired a certain amount of rhythm in sending dits, start sending dahs. The dahs are more prolonged than the dits. Each dah takes three times as long as a dit. The space between the dahs, however, is equal to the time duration of a dit. Send four or five dahs at a time. Also, be sure not to send for more than a few minutes at a time. You are using new muscles which will tire easily if you overwork them at first. As your arm and wrist muscles become stronger, you will be able to send for longer periods of time without tiring.

After you have satisfied yourself that you can send the dahs well, you can start sending dits and dahs alternately. Do not send too quickly. Go very slowly at the beginning. Send the dits and dahs clearly and distinctly. At first, try to prolong the dah even more than necessary.

In order to develop the feeling for the difference between the dits and dahs. Keep all the spaces equal in time to dit.

Practise sending the following groups of dits and dahs:

4 dits, 4 dahs, 4 dits, 4 dahs, etc.

3 dits, 3 dahs, 3 dits, 3 dahs, etc.

2 dits, 2 dahs, 2 dits, 2 dahs, etc.

1 dit, 1 dah, 1 dit, 1 dah, etc.

Practice these exercises until you have full control over the key.

Sending the Letters of the Alphabet, Punctuation Mark and Numbers

You are now ready to learn how to send the letter of the Alphabet. The simplest letters to learn are the (dit) and the T (dah). They require no practicing. The next letters that you must learn are the ones containing elements. These are the A, I, M and N. Send each of these letters many times until you are familiar with its individual rhythm.

In order to acquire the correct rhythm, you will duplicate code sounds that you hear on records. You will find a complete discussion of this procedure in Lessons 1 & (Pages 20 and 21).

After you have mastered the two-element letters, you are ready to practice sending three-element letters. These are the D.G.K.O.R.S.U and W. These letters require much more practice than the two-element letters. As you practice, be sure to keep the spaces between the elements equal. Beginners may run into the difficulty of having one letter sound like two other letters because of unequal spacing between the elements of the letter. If you do not keep the same space between the elements of a letter the following may happen: When practicing the letter D (dah-dit-dit) you may find yourself sending it as dah--dit dit. Someone receiving your code would interpret what you had intended to be the letter D as the two letters T and I. Or, if the letter G (dah-dah-dit) is sent as dah-dah--dit it would be interpreted as the two letters M and E. In order to prevent yourself from making these errors, you must become thoroughly familiar with the rhythm of all o

the letters in the alphabet. At this stage in your practice sessions you should work slowly and carefully, and not worry at all about speed. Be sure to review the two-element letters after you have thoroughly studied the three-element ones. You can now go ahead with the last group, the four-element letters. They are B, C, F, H, J, L, P, Q, V, X, Y, and Z. This is the most difficult group of all to learn to send. As with the other groups, it is extremely important that you keep the spacing between the elements equal. Most beginners let their C (dah-dit-dah-dit) sound like N and N, and their B (dah-dit-dit-dit) like T and S because they have not acquired the individual sending rhythms for the different letters. Practice and lots of practice is necessary to master the rhythm of the four element letters. When you know the four element group, go back once again over all the other letters of the alphabet. Concentrate on those letters which give you difficulty. Only when you are completely satisfied that you know how to send the letters, are you ready to practice sending numbers and punctuation marks. Everything we have said about four element letters holds doubly true for numbers and punctuation marks because they contain five and six elements. Make sure that you can send the numbers and punctuation marks as well as you can send the letters. Do not forget that punctuation mark errors on the code examination can fail you just as easily as errors in the letters of the alphabet.

Sending Whole Words

After you are sure that you have acquired the proper sending rhythm for each and every letter, number and punctuation mark, you are ready to practice sending whole words. Use the daily newspapers for your text material. Be sure that the text material contains plenty of numbers and punctuation marks.

You know that the spacing between the elements of a letter is equal to the duration of dit. Now, the spacing between the different letters of a word is equal in time to three dits. Thus, the space between letters that make up a word is three times as long in time as between the elements of a letter. Since you are now sending from text material, you must also know the proper spacing between words. The time interval between words is, on the average, equivalent to six dits. It may vary, however, from five to seven dits, depending on the individual style of sending and the overall code speed. At first, it would be a good idea to have the space between words equal to seven dits.

A good code operator is one who can send accurately with a minimum of mistakes. At your stage of the game you will find that the only way to get into the habit of sending accurately is to send slowly. You must overcome your natural desire on your part to increase your speed. An early speedup will only result in a decrease in sending accuracy. Do not worry about lack of speed at this point. The important thing to concentrate on is accuracy. As your accuracy in sending increases, you will find your speed increasing with it. When you can accurately send eight to ten words per minute, you are ready to start receiving practice. Your sending and receiving speed should increase at the same rate; do not neglect one for the other. As your receiving speed increases, continue with your sending practice. Your practice periods should consist of both sending and receiving exercises so that you can work both speeds up together.

There are many automatic sending keys on the market today which enable one to send at high speeds. These automatic keys are designed for highly experienced operators who can send well over twenty words on a standard key. It would therefore be unwise for you to use an automatic key until you can accurately send twenty words per minute with a standard key. Once you have become an "old timer" with a standard key, you can learn to use an automatic key, "bug" in a few short lessons.

THE CODE RECORDS

Each record that you have received consists of two lessons, one on each side. The Junior Code Course, containing 10 lessons, takes you through 7.5 words per minute. The Senior Code Course has the same 10 lessons plus 12 additional ones. It covers the alphabet through 18 words per minute.

After you have read through the first three quarters of this book and have memorized the alphabet, numbers, and punctuation marks, you are ready for the code records. Go through each of the following lessons in the order given. Pay particular attention to the sample F.C.C. type examinations.

After you have copied the code information from a record, check it against the record contents which you will find below the discussion of each lesson.

LESSON 1 -- Alphabet, Send-Receive. 3½ words per minute.

This lesson contains the alphabet, numbers, and the more common punctuation marks. Because the alphabet and numbers are in their regular order, there is no guessing as to which letter or number is about to be heard. This lesson is designed to teach you the correct code sounds and rhythm. You simply sit back and listen to the proper formation of each character.

Lesson 1 is also a sending lesson. There is sufficient time between characters to enable you to duplicate them immediately after you hear them. Set up your phonograph, key, and buzzer or oscillator. As soon as you hear a character, imitate, with your key, its sound and rhythm as closely as possible. You can start with the one and two element letters. Then you can go on to the more difficult ones. Before you are through with Lesson 1, you should be able to go through the entire side, repeating, with ease and accuracy, each character that you hear.

The Lesson 1 recording consists of the following:

ABCDEFGHIJKLMN OPQRSTUVWXYZ 1234567890 . ,

? Double Dash (Break) Fraction Bar

End of Message End of Entire Message

LESSON 2 -- Mixed Letters, Numbers, Etc. 4 words per minute

Lesson 2 is similar to Lesson 1 except that letters and numbers are not in their regular order. They are all mixed up. This enables you to practice receiving. Go over this lesson until you have mastered the entire alphabet, numbers, and punctuation marks.

This lesson may also be used for sending practice in the same way that Lesson 1 was used. There is plenty of time between the characters to repeat them.

The Lesson 2 recording consists of the following information:

R2GWK4MAGYLR3E5

RTB2CIPJ.1?TK3VME

0CTNAQGD6VZF, XO

LESSON 3 -- 2 Letter Groups. 4.5 words per minute.

This lesson consists of 2 letter code groups. It is faster than Lesson 2. The difficult characters and the simple ones are mixed together. The numbers and punctuation marks are mixed in with the alphabet. Practice this lesson until you are quite sure of the material in it.

The Lesson 3 recording contains the following:

LR TF CI BA NF DE AZ DO YI GT VC NE PS JQ

D. IY 21 38 45 67 90 GK LJ MA B? UZ X, RW

FD HL OA

LESSON 4 -- 5 Letter Code Groups. 5 words per minute.

This lesson consists of 5 letter groups. It is given at 5 words per minute--the same speed as the F.C.C. Novice and Technician code examinations. There are no numbers or punctuation marks in this lesson because the F.C.C. 5 w.p.m. examination does not contain them. You may, however, be responsible for sending numbers and simple punctuation marks. When you copy code groups or words leave spaces on your paper wherever spaces occur in the sending. This makes your work easy to check.

Lesson 4 recording consists of the following:

ERISU ARGFT KITAC NSOHI GYUDT VMKEN OBRTI

MAHFE SGANZ ROVIN TBARS LIOTW JUGEK CNDNX PEKEG

LESSON 5 -- 5 Letter Words. 5 words per minute.

Lesson 5 is a sample F.C.C.-type examination. It consists of the same type of material that you will receive on the Novice and Technician Code examinations. Five letter words make up the material on the record. The speed is 5 words per minute, the same as the F.C.C. examination. Study this lesson carefully: it is important to you if you intend to take the 5 words per minute examination.

Lesson 5 recording consists of the following:

SLAVE KEYED NIGHT PLAIN PARIS LEAST TODAY
HOTEL STEAM DONOR COURT AWAIT CRASH BEING USUAL

LESSON 6 -- 3 Letter Groups. 5.5 words per minute.

Lesson 6 contains 3 letter code groups, 3 letter words, numbers, and punctuation marks. It is at a slightly faster speed than Lesson 5. It is excellent practice since you do not know whether words or code groups are coming next.

Lesson 6 recording consists of the following:

NOS REP DEZ IRO HTU AYL UDA SIR VET AMO IDO NRI
NEC SEB FTG THE LOG SUM RIG 384 721 965 BR. H,U
SC? EET

LESSON 7 -- 5 Letter Code Groups. 6 words per minute.

This lesson is exactly the same as Lesson 4, except that the code speed is 6 words per minute. It provides excellent receiving practice before taking the 5 w.p.m. FCC Code examination.

You will notice that this lesson, as well as most of the others, are in code groups and not in English. This is because code groups are much more difficult to memorize than English words.

Lesson 7 recording consists of the following:

USADE ZPHRT EDHAS BELOS TIYEK AUHPI NMKXR EYSGE
DHTOM VEMOA LTFEI PDRSU THJEA GROEL NHAKI SIFAC
BTAEU NRSTI

LESSON 8 -- English words. 6.5 words per minute.

This lesson consists of mixed English words numbers. The words have anywhere from two to six letters in them. If you have learned Lesson 7 well, you should have any trouble with this lesson. English is easier copy than code groups.

Lesson 8 recording consists of the following:

RANGE MEANS THE OF GRID WILL THERE AND UNDER
THEN CAN LOOP PICK ? METER FOR WITH COIL PLACE
SHOWN 4723 WEST 86TH STREET

LESSON 9 -- 4 Letter Code Groups. 7 words per minute.

This lesson may sound more than a half word faster than Lesson 8. This is because you are going from simple English words to code groups containing difficult letters. If you can master this lesson, you will have no difficulty with the F.C.C. 5 w.p.m. code test. Whenever you intend to take a code examination, make sure that you can do at least 2 words per minute better than the speed requirement.

Lesson 9 recording consists of the following:

GNSZ DEEP FERI HTKS 2UJA MWEN IAEQ VNDR KDIO
UDTM VILM XVIE UFRA KTNQ ZEGT ?ADB SLHI OHTG
5KRM NSDU CFET MKDE EABU GY6V QWIN RE

LESSON 10 -- Mixed English Words. 7.5 words per minute

Lesson 10 should be fairly simple after Lesson 9. It consists mainly of English words having from 2 to 6 characters. This is the last lesson in the Junior Group. It can be considered additional practice for the Novice and Technician Code examinations, which also contains English words.

Lesson 10 recording consists of the following:

FREQUENCY ANTENNA SYSTEM LOWER HALF MOBILE 28
DEGREES NORTH OF THE 35TH PARALLEL . A SMALL
TRIMMER ACROSS THE COIL ? CAPACITY OF TUBE

LESSON 11 -- 4 Letter Code Groups. 8.7 words per minute.

Lesson 11 is somewhat more difficult than the previous lessons. It contains a considerable amount of characters that generally give trouble to code learners. Go over this lesson as many times as necessary to master these difficult letters.

If you count the amount of characters per minute in this lesson and divide by 5, you will arrive at a code speed of slightly over 7 w.p.m. However, the number of characters per minute is not the only criterion by which we judge code speed. An important consideration is the type of characters used. Letters such as Q and J take a longer time to send than letters such I and E. Therefore, since this lesson contains a larger percentage of the longer characters, its speed is higher than 7 w.p.m. Its actual speed by F.C.C. standards is 8.7 w.p.m.

Lesson 11 recording contains the following:

IADE JQCH LFPZ BEFN LPRY FYZS BDSH FLQX VUWE
LQCA LZGI RESA IH50 PDES S5TL JXQI CLFU WPJU
BFHQ JVIY LOZK FYPA EOWG ?MSZ ONW. ,UIT 2MOE

LESSON 12 -- Mixed English. 9.5 words per minute.

Lesson 12 contains mixed words, numerals and punctuation marks. After Lesson 11, this should be a simple lesson.

Lesson 12 recording contains the following:

RUGGED COMPLETE THE IOWA VOLT METER PANEL
PORTABLE FROM OVER TYPE . TWO AND SQUAR 7.3
MC. POWER STATION SET PEAK FLASH RANGE MODEL
2456 WITH AUDIO PERCENT CIRCUIT

LESSON 13 -- 5 Letter Code Groups. 10 words per minute.

Letters, numerals, and punctuation marks are mixed together in groups of five. Once again, this lesson may seem more than $\frac{1}{2}$ word per minute faster than the previous lesson. This is because you are going from words to code groups. In code groups, you never know what letter or number to expect.

Lesson 13 recording contains the following:

REBHT UORSE SEIRT YRNIA ARBIV NSFU3 CBOVI
TX8UE SRGO4 LTXEV TF7ED VZEEH .CTNG QPTFC
IPELD ALT9R KY,EM OUWEQ GTZOE B5GAD SIBWV
RDUNR AV2WH NRZHI FANSM MYEEX NGLCQ

LESSON 14 -- Mixed English Words. 11 words per minute.

Common words and numerals make up Lesson 14. It should be simple to copy.

Lesson 14 recording contains the following:

SIMPLE GAS COAX CONVERT FURNACE LOW HEAT FOR
MAIL BANK PAID INTEREST EASILY SAVE PRODUCT
NEW CUSTOMERS 74 CENTS, QUALITY BOTTOM PACKAGE
FATHER NOON RECORD SIDE CARTON PLAIN MILK
ENGINE?

LESSON 15 -- 5 Letter Code Groups. 12.2 words per minute

Letters, numerals, and punctuation marks are mixed together. In Lesson 15, quite a few of the more difficult characters are included. Stay with this lesson until you have mastered all the characters including the more difficult letters.

Lesson 15 recording contains the following:

RISMJ KQYFG IRMUS GOLEH TGTFX LYTOC ITZEN SBUTC
CFOXU NSE?U HRBE, GSIHA XAP30 I4WAS GERPT ELIC7
SRMZE NDCFG VWAQK ENOTU BJH.N CIPAO W2DTY LGUXE
BFLEB ?TIIW VSO,L QZETV AYYWG BH9FB PQKRE

LESSON 16 -- Mixed English. 13 words per minute

Lesson 16, as well as Lesson 17 was made to consist of English words in order to prepare you for the F.C.C. General Class Code examination. This examination

consists of English words, numerals, and simple punctuation marks. The speed is 13 words per minute. Lesson 16 is a typical General Class F.C.C. - type exam.

Lesson 16 recording contains the following:

SYMBOL DO CITY GREENWICH SHIELD BOTTOM CHART
NUMBER THE COURSE CONDITION PRICE SPEAK VAGUE
READING SECTION VACUUM HISTORY CONVERT? COLOR
CODE? BEAM POWER TUBE . HIS LONGITUDE IS
NORTHWEST MY ALTITUDE IS 268 FEET ABOVE SEA

LESSON 17 -- Mixed English. 13.5 words per minute.

Lesson 17 is another typical General Class F.C.C. type examination. The speed of Lesson 17 is about $\frac{1}{2}$ word per minute faster than the F.C.C. examination. As such, it represents excellent code practice for the exam.

Lesson 17 recording contains the following:

UNIT OF SHIELDING ON THE AIR COUPLED TO TWO 811s.
ORIGINAL 600 OHM, OPEN WIRE A LOW PASS FILTER
SPURIOUS RADIATION CAN EASILY BE ELIMINATED
HIGH FREQUENCY PARASITICS REDUCTION OF
HARMONICS VERIFY MY SIGNAL? CQ DE W5MOI TRAP
CIRCUITS

LESSON 18 -- 5 Letter Code Groups. 14 words per minute

Lesson 18 contains mixed letters, numbers, and punctuation marks in groups of five. There is no special emphasis on difficult letters.

Lesson 18 recording consists of the following:

VIBRA NAIRY TRIES ESROU THZER VEXTL EUTX8
G4ORS EOVBC 3UFNS DLEPI CETPQ GNT2C HEEZU
OE7FT DAGB5 GOZT6 QEWUC ME,YK R9TLA DB-MH
ETKSU YZB?O QCLGN XCEYM MSNAF IHZRN HW2VA
RNUDR VWBIS VWIT, GCBLF JSNLM BALRH ISYJE GFYQK

LESSON 19 -- 3 Letter Code Groups. 15 words per minute

You should know this lesson well before taking the 15 word per minute F.C.C. examination. This lesson is 2 w.p.m. faster than the F.C.C. exam. If you can copy it, you will have no difficulty with the actual examination.

Lesson 19 is also intended to prepare you for the F.C.C. Second Class Radio - Telegraph Code examination, which is 15 words per minute. Lesson 19 is similar to this examination, except that it is one w.p.m. slower. Notice that the groups consist of 5 letters except where a numeral or punctuation mark is involved. In these cases, the groups only have 4 actual characters because the numbers and punctuation marks count as two characters.

Lesson 19 recording contains the following:

UDEZR CAH5 BUSEC EK2H P4AU YINLE TODHE THPAS
NX?N GRESX FIEML R,IO CREGI THDYE ?NKM VTJAG
AOLTD 4NEK IFTAC 9SAI M0AH D,RE P?EH BAEUC
NOSER 6NBI SFOIB DTJ5 2RAV ZIT4 RMG, ISURM PNSEM
UGS2 ERFON EBELS M3KQ 5OCT H?EN ZGEO TBERH ARNIY
VZERK FIM3 LST

LESSON 20 -- 5 Letter Code Groups. 16 words per minute

Lesson 20 is a sample F.C.C. - type code examination for the Second Class Telegraph license. It is similar in its makeup and speed to the actual F.C.C. exam.

Lesson 20 recording consists of the following:

DAOLT 5OISE ?PEH JTD5 EPMSN VAR2 TZAI ACIFT
WFK3 OITNE COT5 LIMYT FTGTI EBSLE MR,G PDEFZ
ONERE 37G JXMOI SREDA ?EHN ROHTG DELEH BYDN
S2GU E,DR JYTIR NET0 VLANN AIS2 BYDN INSE
RO7T CTUBS ETAYR 20I HELOG SUMRI ERH. NORSE
UPA4 ZDFUR SIFA PAVS HIRA FROUE LIFF. WITUE

LESSON 21 -- 5 Letter Code Groups. 17 words per minute

Lesson 21 is further practice for the Commercial Second Class Radiotelegraph Code examination. All the letters, numerals, and punctuation marks are mixed together.

Lesson 21 recording contains the following:

DGATC F4WEJ IPKMR VE,UL LHIOW AUSEJ KDTEI
HMRQB RMHUS KEGLD HFEST COACM 7FTNG EELHQ
EEYBU V?LEA GSENF HFZNH RIBTU EERUO CNOIT
URTSN /DARB GNIMM BFXIA LHPZD VTCTF YLGNE
WIOFJ KQPTA RU. TO 9OURC TIONC SNEZZ ?ENOT
ELYFH S,2VA UPQOT HIFFJ UWOTD /ARKB BTFQC
CSVOR SGW6E

LESSON 22 -- 5 Letter Code Groups. 18 words per minute

You should be able to copy Lesson 22 well before taking the 16 w.p.m. F.C.C. examination. This lesson contains the same type of material, only it is 2 w.p.m. faster than the actual code test.

Lesson 22 recording consists of the following:

KEZH YIMED ESGXR ZBNAT DTHOE HEF1 CNEMR 27W
ELYNI K4DM ROI, CPW? PTHAS GIRFX TNKIO YES.
CNEMR IUSF BERIS FJ?I DEABQ UGFAV YEDTH TLHCI
RAVNS EQF5 MPFWS 4NEK Z6BO NFILS FDRFP EXSIW
RHTKS 2GUN TLHMI JEPAT TCHWI INYFL OIR? REXLG
IREVT 7VDM 48Z UITSO .NAH LOADT SBIOF ,HEP
5JTB PMSNE 2AVR 4IZT TFIAC TEONT