

WAR DEPARTMENT

TECHNICAL MANUAL

THE RADIO OPERATOR

April 21, 1942



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No. 11-454

THE RADIO OPERATOR

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SECTION I
GENERAL

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1. Purpose.—The purpose of this manual is to provide a text for the training of radio operators and to establish an authoritative basis for coordination between all units of the Army in the use of radio procedure in the conduct of radio communication. Since operators of manual field telegraph equipment, signal lamp equipment, and wigwag flags also employ the International Morse Code and applicable portions of radio procedure, this text is suitable for the instruction of those operators also.

2. Scope.—This manual covers the selection of personnel which will probably absorb instruction most quickly, the basic instruction of all operators, and radio procedure in tactical and other nets. While the bulk of the content is devoted to the radiotelegraph operator, such instruction as is considered essential for the radiotelephone operator is also included. Typewriting instruction is covered only to the extent of showing how it fits into basic operator instruction. Such material as is included can be given effectively with other instruction without appreciable loss of time. The ability to use a typewriter increases the value of an operator, and this fact should be emphasized when code instruction is initiated.

3. Basic radio procedure.—*a.* The radio procedure prescribed herein is for use in radio communication within the Army.

b. Intercommunication between the Army and the Navy is conducted as prescribed in FM 24-10.

SECTION II
SELECTION OF PERSONNEL

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4. General.—Because of the relatively great length of time required to train radio operators, the prior determination of the aptitude of students is essential. Consequently, within the limitations of available equipment, all personnel to be trained as operators will be selected as indicated in paragraphs 5, 6, and 7.

5. Radiotelegraph operator aptitude test, U. S. Army.—*a.* This test, heretofore known as the Signal Corps Code Aptitude Test,

has been used for many years by schools and units of all arms and may be considered a standard test. It is designed to determine the aptitude of an individual for learning the International Morse Code phonically by requiring him to indicate whether or not certain tone signals sound exactly alike.

b. A complete test, consisting of an answer sheet, the test, and a solution sheet, is included in appendix I. The test may be given manually with the use of organizational equipment, but is given preferably by phonographic transcription. Phonographic transcriptions for use with code transmitter and recorder TG-8-A, or disk phonograph records which may be played directly on any standard phonograph, are available.

c. The nature of the test makes it difficult for anyone to memorize correct answers. However, available copies of the test and of the solution, as well as all phonographic transcriptions, will be safeguarded to the extent necessary to assure that no person to be tested has had an opportunity to study the test before taking it.

6. Testing.—*a.* The aptitude test is given in about 20 minutes and can be taken simultaneously by as many men as the receiving equipment will permit. Having decided upon the number of men to be trained, give the test to double that number. One copy of the answer sheet is required for each man to be tested. Allow sufficient time prior to the start of the test for men to comply with the directions indicated on page 1 of the answer sheet.

b. When giving the test manually, speak those portions of the test shown in quotation marks and transmit by means of a telegraph key and tone source, the characters shown in parentheses. Transmit all characters at a speed corresponding to 20 words per minute of normal transmission, but allow a time interval of approximately 2 seconds between paired characters. Where test characters are overscored, transmit them as a continuous character without pause between them. Thus, transmit (AJ) as . - . - - - not as . - . - - -

c. When the test is given by means of phonographic transcription, set the code transmitter and recorder or the phonograph at a speed corresponding to 20 words per minute of normal transmission. Monitor the transcription of the test to insure that satisfactory transmission is being accomplished. When the transcription consists of two or more disks, change disks promptly at the proper time.

7. Selecting students.—The test is objectively scored; that is, the person scoring the test needs no knowledge of its subject matter in order to score it properly. The final score is determined by deducting one point for each unmarked or incorrectly marked test pair.

Thus, with every pair correctly marked, a maximum score of 78 is obtained. With 16 pairs unmarked or incorrectly marked, the score is 62. The test of each man is scored in about 2 minutes. After scoring the tests, tabulate scores and select students as follows:

a. Place each test paper in one of the following groups:

(1) Those which show that the man tested has had previous experience, however slight, in radiotelegraph or telegraph operation.

(2) Those which show that the man tested has had no previous experience in radiotelegraph or telegraph operation.

b. From each group list the name of each man, followed by his score, in order from the highest to the lowest score.

c. Select the proper number of men to be trained in the order listed below, taking all men from the first category before taking any from the next, and so on.

(1) Those in group a(1) above with scores of 60 or higher.

(2) Those in group a(2) above with scores of 60 or higher.

(3) Those in group a(1) above with scores of 50 or higher.

(4) Those in group a(2) above with scores of 50 or higher.

d. If a sufficient number of men are not obtained from the first group, follow the same procedure with another group of prospective students.

e. If, after testing all available men, a sufficient number in the first four categories cannot be obtained, select those with scores of 40 or higher, and then those with scores lower than 40. The former may be expected to become operators only after long training, but in general, instruction of the latter is not productive.

f. Do not inform any student of his score while he is undergoing instruction.

SECTION III

BASIC INSTRUCTION

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8. International Morse Code.—In the International Morse Code, all letters, numerals, and punctuation marks are represented by short and long signals. A short signal is called a dot and is printed as . and a long signal is called a dash and is printed as —. These signals may be transmitted visually as flashes of a lamp for short and long periods or as positions of a flag to the right and left of the flagman. They may also be transmitted phonically, as by a buzzer making short and long sounds or by a telegraph sounder making two successive different sounds with short and long intervals of time between successive sounds. Finally, they may be recorded as transmitted on a tape and read therefrom, by eye, as short and long inked lines. Figure 1 is a full-size sample of receiving tape. This manual is concerned primarily with the instruction of students in recording dot and dash

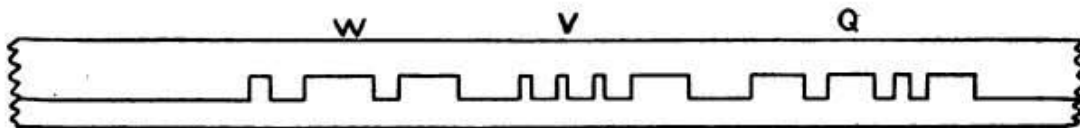


FIGURE 1.—Tape-recorded code characters.

characters as received by ear, and in transmitting similar signals by means of manually operated telegraph keys.

9. Mental processes.—The whole process of receiving consists of recognizing combinations of short and long sounds and recording the characters they represent.

a. Recognizing sounds.—(1) The short and long sounds in each character could be memorized and the characters identified by counting the sounds of each length and noting their arrangement. This process is limited to a very slow receiving speed of about 50 characters per minute.

(2) A better method is to recognize the sound of a complete character without regard to its components.

(3) In order to keep the student from following the faulty mental process in (1) above, experience has shown that it is better to begin by teaching the sound of the character when it is made at a speed used in normal operation, which is about 100 complete characters per minute, corresponding to about 20 words or groups of five character each per minute. Such a speed discourages the counting of separate dots and dashes. Consequently, in all instruction, individual characters are transmitted at a speed corresponding to 20 groups of five characters each per minute. The speed of transmission is increased by shortening the silent periods (spaces) between successive characters. The longer spaces afford the beginner more time to identify each character. With practice, this thinking process becomes faster and

faster until the student recognizes the characters without conscious mental effort, just as he recognizes words in conversation.

b. Recording the characters.—Characters are recorded by the typewriter or by lettering as prescribed in FM 24-5. Instruction in lettering is given concurrently with that in *a* above, and performance in both is graded. When a student has attained a receiving speed of about ten groups of five characters each per minute, instruction in recording by typewriter may be initiated.

(1) *Lettering.*—In order to insure legibility and thus prevent errors, the prescribed lettering is used. To assist in the grading of lettering, a board may be prepared and kept exhibited to students showing various degrees of excellence in lettering the same message. Examples may be arranged in order from the best to the poorest which is to be accepted as satisfactory. All performance is graded accordingly, and deficiencies are pointed out to the student.

(2) *Typewriter.*—The touch system of typewriting is taught by arranging characters in each lesson so as to cause the recording of characters by certain fingers. Thus, the sound of a character is mentally connected with the action of a specific finger, and an operator while training, simultaneously becomes a touch typist of sounds heard. With a little additional practice he can readily become proficient also as a touch typist in transcribing written or dictated material.

10. Instruction periods.—*a. Duration.*—The duration of an instruction period should not exceed 1 hour, and such a period should be followed by one or more similar periods of instruction which does not require close mental effort. (See par. 11.)

b. Frequency.—Two or more code instruction periods may be scheduled daily, but a total of more than three hours per day is not desirable. However, if periods cover such varied matters as receiving, transmitting, procedure, etc., and if the allotted training time is short, productive instruction may be given for as much as 6 hours daily.

c. Relaxation.—One or two 5-minute periods of relaxation during an instruction period are desirable for maintaining mental alertness.

11. Sequence of instruction.—Code instruction is given in the sequence indicated below concurrently with instruction in the operation of authorized unit equipment. Each operator in a unit should be capable of operating any set with which the unit is equipped. Consequently, instruction in the various sets, including nomenclature, composition, methods of installing, methods of transporting, characteristics, and technical design, together with such fundamental electrical studies as are necessary, should begin when the code course starts. The periods of code and operating instruction are alternated at the discretion of the instructor:

a. Initial reception of five groups per minute.—Initially, separate periods are devoted to each of the five lessons given in paragraphs 14 to 18, inclusive, and in that order. These lessons contain the letters of the alphabet and the numerals. Transmission is at the rate of five groups (25 characters) per minute, and in each lesson the characters of that lesson are transmitted in random order. As soon as the student is able to receive 50 consecutive characters (10 groups) of lesson No. 1 without error, lettering them satisfactorily, he is advanced to lesson No. 2. He is similarly advanced to lessons Nos. 3, 4, and 5. As soon as he has completed lesson No. 5 in this manner, all the letters and numerals are transmitted at the same rate in random order. He qualifies at five groups per minute when he is able to receive 50 consecutive characters (10 groups) without error, recording them satisfactorily.

b. Reception of seven groups per minute and initial transmission.—After the student has qualified as prescribed in *a* above—

(1) The rate of transmission is increased to seven groups per minute. He qualifies at this rate when he is able to receive 70 consecutive characters (14 groups) without error, lettering them satisfactorily.

(2) Instruction in transmission is begun. From this point approximately one-third to one-half of the student's instruction time is devoted to transmitting, with the object of bringing his transmitting speed to at least eight groups per minute by the time he has qualified in reception at the rate of 12 groups per minute. Thereafter, approximately one-third of his time is devoted to transmitting. If the equipment is available, the student is required to transmit to an instrument which records his transmission and reproduces it later. He then is required to receive his own transmission as it is reproduced before he is considered to have qualified at that transmitting speed. He is required to transmit for 2 minutes, and the number of consecutive groups transmitted correctly during that period (as indicated by the student's received copy), divided by 2, is his transmitting speed in groups per minute. If the reproducing equipment is not available, the student is required to transmit to an experienced instructor, who grades the transmission for accuracy, proper spacing, correct manner of transmitting, and speed.

c. Reception of ten groups per minute.—After the student has qualified as prescribed in *b*(1) above, the rate of transmission is increased to ten groups per minute. He qualifies at this rate when he is able to receive 100 consecutive characters (20 groups) without error, lettering them satisfactorily.

d. Recording by typewriter.—After the student has qualified as prescribed in *c* above, and if he is to be instructed in recording by

typewriter, he is returned to lesson No. 1 and repeats the instructions indicated in *a*, *b*, and *c* above, except that all recording is accomplished on the typewriter. At the outset of this instruction he should be furnished an instruction book on the care and use of the machine and a copy of the keyboard chart as shown in figure 2.

e. Subsequent reception.—When the student has qualified as prescribed in *c* above—

(1) All transmissions to him are in the form of messages or procedure signals, and he is required to record them on the prescribed message form. If the student is being trained to record reception by typewriter, he receives the bulk of his instruction in that manner, but is given one period daily in which he is required to record by lettering. For code speeds under 20 words per minute, the student is advanced only when he is able to record properly by both printing and typing. For code speeds above 20 words per minute, reception recording is exclusively by typewriter.

(2) The rate of transmission is increased successively to 12, 15, 20, 25, 30, and 35 groups per minute. When the student is able to receive three consecutive messages averaging 12 groups each without error at any rate, recording them satisfactorily, he is permitted to advance to the next higher rate.

12. Suggestions for instructors.—If a copy of this manual is not available for each student, furnish each man with a copy of the suggestions indicated below at the beginning of his instruction and a copy of each of the lessons given in paragraphs 14 to 18, inclusive, at the beginning of his instruction in each of those lessons. When instruction in transmission is begun, furnish the student with a copy of paragraph 19, and a copy of each of the exercises given in paragraphs 20 and 21 at the beginning of his instruction in those exercises.

13. Suggestions for students.—*a.* Try to recognize the sound of the entire character and to ignore the number of dots and dashes that make it up.

b. Letter the characters exactly as shown in each lesson. Practice lettering until it requires no conscious effort when receiving.

c. Work hard, but if after a while you feel so tired that you are not learning or you become disgusted, lean back, relax, and think of something else for a few minutes in order to restore your mental alertness.

d. Never look back over your copy while you are receiving.

e. If you do not recognize a character immediately, skip it, write down a small dash in place of it, and go on to the next. You will eventually realize what sound combinations you do not recognize and can then give special attention to them.

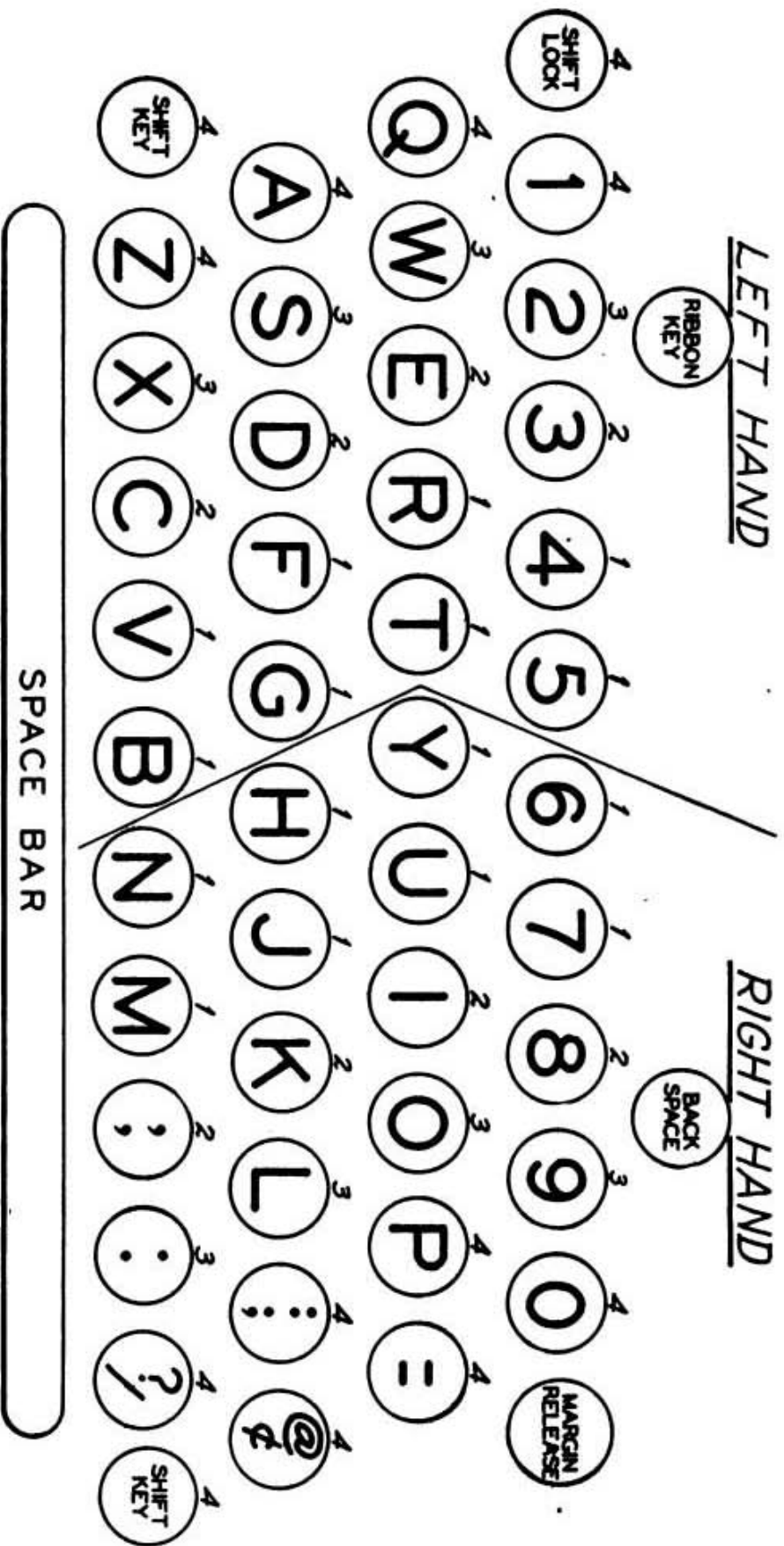


FIGURE 2.—Keyboard chart for typewriter, MC-88. (The small number above each key indicates the finger of the left or right hand to be used on that key. The typewriter, MC-88, is different from standard business typewriters in two respects: all the characters of the alphabet print as capitals, and there is a separate key for the number "1". If a standard machine is used for code transcription, the student must merely learn to use the small letter "1" to indicate the number "1"; otherwise the finger positions are the same.)

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f. After having qualified at ten groups per minute, develop the habit of lettering one or two characters behind the sender. This will allow your lettering to become smooth and easy. It will also prevent you from forming the habit of trying to guess a word and of recording it before it has been completely transmitted.

14. Receiving lesson No. 1.—*a. Objective.*—To teach the sounds of the characters F, G, H, M, J, R, and U and the correct methods of recording them.

b. Information.—The characters consist of dots (short sounds—dit) sounds—dah). The dashes are three times as long e sounds making up a single character are separated but uniform space of no sound. The characters in-son, together with the dots and dashes and the sound n as follows:

	Dots and dashes	Sound
	..--.	Dit dit dah dit
	---.	Dah dah dit
	Dit dit dit dit
	--	Dah dah
	..---	Dit dah dah dah
	..--.	Dit dah dit
	..--	Dit dit dah

(1) Listen to the sounds and record the characters size.

g by typewriter, use only the first finger of the proper aracter as shown on the keyboard chart.



FIGURE 3.

g by lettering, letter each character as shown in figure okes in the directions shown and in the order in which ed.

have recorded 100 consecutive characters that you t, request the instructor to check your paper. If haracters are all correct and the recording has been ly, you will be advanced to lesson No. 2.

Lesson No. 2.—*a. Objective.*—To teach the sounds B, D, K, N, T, V, and Y and the correct methods of recording them.

c. *Directions.*—(1) Listen to the sounds and record the characters you recognize.

(2) If recording by typewriter, use only the second and third fingers of the proper hand for each character as shown on the keyboard chart.

(3) If recording by lettering, letter each character as shown in figure 5, making the strokes in the directions shown and in the order in which they are numbered.

(4) When you have recorded 100 consecutive characters that you think are correct, request the instructor to check your paper. If 50 consecutive characters are all correct and the recording has been done satisfactorily, you will be advanced to lesson No. 4.



FIGURE 5.

17. **Receiving lesson No. 4.**—a. *Objective.*—To teach the sounds of the characters A, P, Q, X, Z, 4, and 5 and the correct methods of recording them.

b. *Information.*

Character	Dots and dashes	Sound
A	. -	Dit dah
P	. - - -	Dit dah dah dit
Q	- - - -	Dah dah dit dah
X	- - . -	Dah dit dit dah
Z	- - - .	Dah dah dit dit
4	. . . . -	Dit dit dit dit dah
5	Dit dit dit dit dit



FIGURE 6.

c. *Directions.*—(1) Listen to the sounds and record the characters you recognize.

(2) If recording by typewriter use only the first, third, and fourth fingers of the proper hand for each character as shown on the keyboard chart.

(3) If recording by lettering, letter each character as shown in figure 6, making the strokes in the directions shown and in the order in which they are numbered.

(4) When you have recorded 100 consecutive characters that you think are correct, request the instructor to check your paper. If 50 consecutive characters are all correct and the recording has been done satisfactorily, you will be advanced to lesson No. 5.

18. Receiving lesson No. 5.—*a. Objective.*—To teach the sound of the characters 1, 2, 3, 6, 7, 8, 9, and Ø and the correct methods of recording them.

b. Information.

Character	Dots and dashes	Sound
1	— — — —	Dit dah dah dah dah
2	. — — —	Dit dit dah dah dah
3	. . — —	Dit dit dit dah dah
6	—	Dah dit dit dit dit
7	— — . . .	Dah dah dit dit dit
8	— — — . .	Dah dah dah dit dit
9	— — — — .	Dah dah dah dah dit
Ø	— — — — —	Dah dah dah dah dah

c. Directions.—(1) Listen to the sounds and record the character you recognize.

(2) All fingers are used in typing these characters. Use the proper finger of the proper hand for each character shown on the keyboard chart.



FIGURE 7.

(3) If recording by lettering, letter each character as shown in figure 7, making the strokes in the direction shown and in the order in which they are numbered.

(4) When you have recorded 100 consecutive characters that you think are correct, request the instructor to check your paper. If 50 consecutive characters are all correct and the recording has been done satisfactorily, you will be advanced to receiving practice on all characters transmitted in random order at five groups per minute.

19. Transmitting.—*a. General.*—The ability of a radio operator to transmit well-formed code characters is just as important as is his ability to recognize and record them accurately. In furtherance of this end it is essential that a student's practice transmissions be accomplished in the correct manner; habits formed when beginning to learn to send will remain with operators throughout their careers. Continuous accurate transmission of characters requires a properly adjusted key, a proper position of the operator at the key, and key operation in accordance with the principles enunciated below. When a student has demonstrated his familiarity with these principles, he begins his first transmitting exercise.

b. Key adjustment.—Figure 8 shows an ordinary closed circuit key. To adjust the key—

(1) See that the hammer is directly over the anvil. If not, loosen the lock nuts on the trunnion screws and turn these screws until the

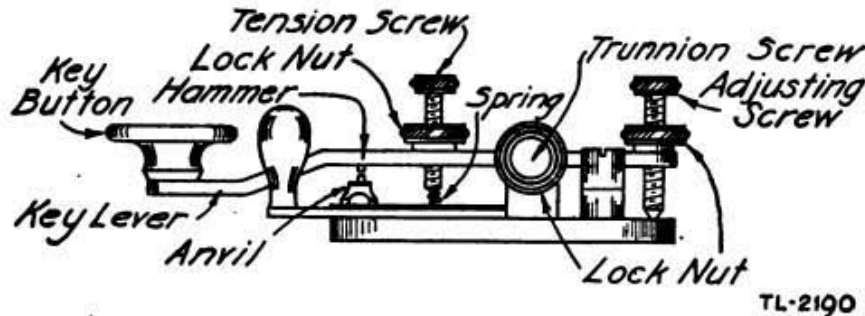


FIGURE 8.—Side view of a closed circuit key.

hammer is in the proper position and the key lever works freely without undue play. Tighten the lock nuts.

(2) Loosen the lock nut on the adjusting screw and turn this screw until the distance between the hammer and the anvil is about 0.008 inch (about the thickness of three sheets of bond paper) with the front of the key lever raised. Tighten the lock nut.

(3) Loosen the lock nut on the tension screw and turn this screw until the key can be closed easily by the hand and will be broken sharply by the spring. Tighten the lock nut.

(4) If difficulty is experienced in forming dots or dashes after the tension screw has been adjusted as in (3) above, change this adjustment until you are able to send both easily. Too much tension is usually identified with short dashes, irregular and long spacing between characters, and dot skipping. Too little tension is usually identified with long dots and short and irregular spacing between characters.

c. Position at key.—The proper position of an operator at a key is illustrated in figure 9.

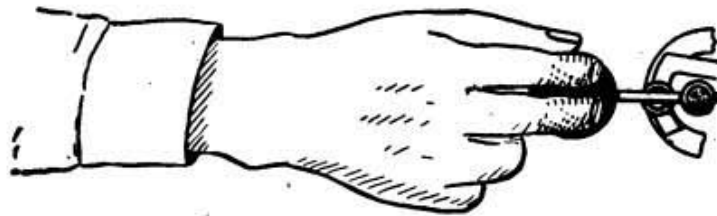
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(1) To assume a correct position at the key—

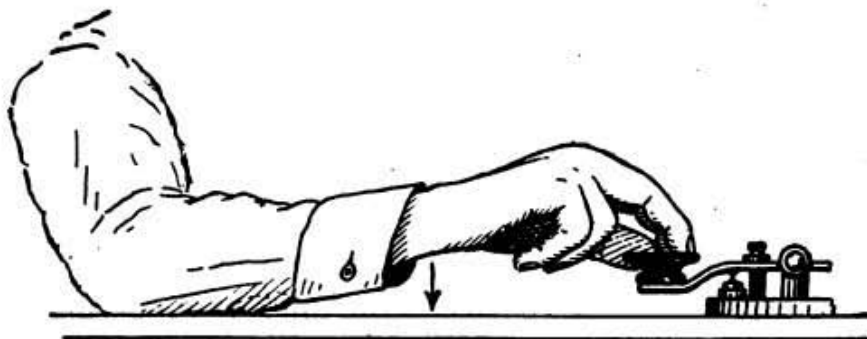
(a) Place the elbow on the table in prolongation of the key lever and at such distance from the key button that, with fingers slightly curved and the wrist about $1\frac{1}{2}$ inches above the table, the ends of the first and second fingers rest easily on the distant half of the key button.

(b) Rest the ends of the first and second fingers lightly but firmly on top of the key button, the first joint of each finger being more nearly vertical than horizontal.

(c) Place the thumb lightly on the edge of the key button.



View from above



Side view

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FIGURE 9.—Proper position of an operator at a key. (Note particularly that the wrist is clear of the table.)

(d) Allow the third and fourth fingers to curve naturally under the palm without tension or rigidity.

(2) After the sending arm, wrist, and fingers have been placed as indicated above, check their positions. See that—

(a) The elbow, *not the forearm*, rests on the table.

(b) There is space between the table and the forearm and wrist.

(c) The fingers are curved and flexible, not straight or stiff.

(d) The finger ends (pads) of the first and second fingers rest on top of the key button near the back edge.

(e) The thumb is on the edge of the key button, resting lightly against it, but not grasping it.

d. *Key operation.*—(1) *Method.*—Having assumed the proper position at the key, press down the key button by a straight downward motion of the forearm. In doing this, let the wrist break or bend downward a little, acting as a hinge between the forearm and the hand. Keep the fingers loose so that they can bend a little; in any event, do not let them be stiff. When the key contacts have been closed, release the pressure on the key button and allow the spring to return the key to the up position, keeping the fingers in light contact with the key button.

(2) *Precautions.*—(a) Make sure that the key button goes down because your forearm is moved down.

(b) Do not actuate the key with the finger muscles. The fingers are merely the medium through which the stroke of the forearm is transmitted to the key.

(c) Do not actuate the key with the wrist muscles. The wrist is merely a hinge through which the stroke of the forearm is transmitted to the key.

(d) Avoid all stiffness and rigidity in the fingers and wrist. Any such stiffness not only makes for ragged transmission but is very conducive to fatigue.

20. Transmitting exercise No. 1.—Check the key, making adjustments if necessary. Take the correct position for sending, checking the position of your forearm, wrist, fingers, and thumb. Start making dots at the rate of about 100 per minute. Continue to transmit dots until your forearm, wrist, or fingers become tired. Rest for a short time, then transmit again. *Do not make anything but dots.* Try making dots faster as you feel your muscles limbering up. Do not permit your practice to become erratic. *Send smoothly.* Try constantly to make the dots equal. If you are trying to transmit faster than you should, your sending will be rough (unequal and not rhythmic) and may “stutter.” Continue your transmission of dots

10 dots in one group smoothly in about ten seconds.

When you have acquired this ability, ask the instructor for permission. If it is satisfactory, you will be advanced to exercise 2.

Exercise No. 2.—Transmit a few groups of 30 dots at the position of your forearm, wrist, fingers, and thumb, using the character V (dit dit dit dah), making the dits at the same rate at which you made them upon completion of exercise 1 and holding the key down for the dah 3 times as long as the time

required to transmit a dit. Allow the same space between the third dit and the dah as exists between the dits. Begin making the character V at the rate of about 35 per minute. Keep your fingers and wrist flexible. If you feel them tightening up, remove your hand from the key and flex the fingers and wrist until the muscles are completely relaxed. Continue transmitting V's until you can send 20 consecutive characters smoothly. When you feel that you have acquired this ability, ask the instructor to check your transmissions. If it is satisfactory, you will be advanced to practice transmission of the material included in appendix II.

SECTION IV

TRAINING IN RADIO OPERATING PROCEDURE

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22. General.—The purpose of the radio operating procedure employed by the Army is to promote accuracy and speed in the exchange of radio messages. Radio operators trained at widely scattered stations may ultimately find themselves obliged to communicate with one another and under conditions of stress. With this in mind, it is evident that the necessity for a single precise and completely uniform system of handling radio traffic cannot be too strongly emphasized.

23. Phases of training.—*a.* The training of a radio operator in procedure may be divided into four phases:

(1) The basic training phase using code room equipment and devoted to a study of the fundamentals of procedure.

(2) A survey phase using code room equipment and devoted exclusively to the handling of traffic, simulating actual field operation as closely as possible without the use of field radio transmitters and receivers.

(3) An introductory field phase using field equipment at reduced distances.

(4) An actual field phase using regular field equipment at normal distances.

b. Phases (3) and (4) above may appear to be properly a part of technical radio operation instruction. However, there is a definite and important aspect of radio operating procedure, entirely aside from

any technical problems of the radio equipment, which can only be mastered under genuine field conditions. The radio operating procedure lessons covered herein deal only with the phases (1) and (2) enumerated above.

c. Study and practice in radio operating procedure may begin after the student has attained a code speed of five words a minute. The time required to attain proficiency in field radio operating procedure depends largely upon the individual student, but a satisfactory knowledge of procedure is usually obtained in 25 to 75 hours of operation and study.

d. The comments given in paragraph 10 on duration, frequency, and relaxation for operating study apply equally well to procedure studies.

24. Flexibility of training program.—It is not essential that the instructor adhere rigidly to the training program described herein. In fact, the instructor is encouraged to inject his own personality into his teaching and to alter the style of the course freely to suit his own purpose and the needs of his class. However, the system suggested below has been found highly successful in the training of radio operators, and the program, in the main, should serve as a useful guide.

25. Instructional material.—*a. Text material.*—If this manual is not available for each member of the class, the instructor should provide mimeographed copies of the first lesson to the entire class at the beginning of the course and copies of additional lessons to students as their progress warrants it. Further, a list of procedure signals and procedure signs as found in the appendixes should be made available to each student. In all units using the abbreviated form of message exclusively, sections V to IX, inclusive, XI, and XII provide adequate training material for the essential principles.

b. Station logs.—During the initial training phase, logs should be employed which provide for the recording of all signals heard and transmitted. A suitable training log is shown in FM 24-5. During the second phase of training, when operators are able to carry on with a minimum of supervision, the practical type of log is the regular field log. This type of log is shown in figure 10.

c. Prepared messages.—Beginning with radiotelegraph procedure lesson IV, it is necessary for the instructor to prepare "canned" messages for transmission. The messages listed in appendix II may serve for this purpose, or these specimen messages may be used as guides to assist the instructor in preparing additional messages.

d. Message book.—The standard field message form is used for both transmitted and received messages.

THE RADIO OPERATOR

SIGNAL CORPS, UNITED STATES ARMY

LOG

Enter opening and closing time, frequencies and frequency changes, traffic delays and any incidents or conditions affecting circuit efficiency

STATION LC 13TH INF

DATE 4 MARCH

TIME	OPERATOR	REMARKS
022A	A-X	CENTERVILLE 4100 KC REPORT IN TO LA (NCS) OUR SIGS ZSB4 AT LA
029		LB IN NET OUR SIGS ZSB3 AT LB
045		LA DOES NOT ANSWER CALL-UP
1003	X-A	X TO KEY A TO GENERATOR
1007		LA REPORTS BY WIRE CKT HE IS TEMPORARILY SILENCED BY ORDER CG
1212 P	W-A	W RELIEVES X
1235	W-T	T RELIEVES A
211		BLUE GLOW IN AMPLIFIER TUBE DRAWING EXCESSIVE CURRENT
214		REPLACE AMP TUBE PLATE CURRENT OK
450	A-X	RELIEVE W-T
632		CLOSE STATION FOR MOVE
840		BLUFTON 4100 KC REPORT IN TO LA OUR SIGS ZSB5 AT LA ZSB4 AT LB
0910		NET SHIFTS TO 4120 KC ON ORDER OF LA
1026		MICROPHONE ACCIDENTALLY DROPPED LA REPORTS PHONE QUALITY POOR NO SPARE MIKE ON HAND
1119		CLOSE STATION FOR MOVE

TL-2186A

FIGURE 10.—Sample station log with typical entries.

26. Conducting the class.—*a.* The order of administering an instructional period is as follows:

(1) The instructor distributes the necessary text material and delivers any introductory remarks which he feels advisable for supplementing the text.

(2) The students study the text.

(3) The students ask questions of the instructor on any point which they do not understand.

(4) The instructor gives a written quiz on the subject matter of the lesson.

(5) The students practice transmitting individually, during which time the instructor grades the quizzes.

(6) Those students who pass the quiz are grouped into nets of three stations each to carry out the operations prescribed in the operation exercise for the corresponding lesson. Any student who fails initially to pass the quiz must review the lesson at his desk. He is then given a second opportunity to take the same quiz whenever he feels adequately prepared. This process is continued, if necessary, until each student successfully completes the quiz and proceeds to the operation exercise.

(7) Students completing an operation exercise submit their log sheets and copies of all messages handled, both transmitted and received, to the instructor for check, and then study the next lesson.

(8) A written quiz on the information contained in the next lesson is given to any student who feels adequately prepared and whose log sheet on the previous lesson is found to be satisfactory.

(9) At the close of an instructional period, nets which have not completed their operation exercises simply stop at any convenient point and resume operation at that point at the opening of the following instructional period without any apparent break being shown on the log sheets. Operators always retain their log sheets until all operations described in that lesson are completed.

b. The method of teaching indicated in *a* above has the advantage of automatically dividing the class into groups, so that the instructor may concentrate his attention on the slower students, who need the most assistance; and of providing an incentive to the better students to work as fast as they desire, and so reducing the training time to a minimum. One or more assistant instructors are desirable if the class is large, although it is possible for one instructor with some experience to handle successfully a class of as many as 50 men.

c. In this series of lessons all references to recording received material imply lettering with pencil. The instructor checking

received messages should emphasize good lettering as much as accurate copying, since the radio operator's copy must normally be legible to other personnel for deciphering. Typewritten copy is permissible. However, typewriters are rarely available to field radio stations, and training should be handled accordingly.

d. An effective arrangement of the three key operators in any one net is one fast operator and two slower operators rather than three fast operators in any one net and three slow operators in another. A man who shows good aptitude for transmitting and receiving ordinarily also exhibits ready understanding of procedure. Such a man generally sets an example of good operating procedure, and, if desired, he may incidentally be employed as an assistant instructor to guide the operators at the other two stations of the net. It is not intended that the net control station (NCS) assignment should be confined to the best operator; this assignment should be rotated to provide equal opportunity for all students to practice NCS responsibility.

27. Measurement of progress.—*a. General.*—The objective of net training is to provide operators with a thorough understanding of operating procedure. Emphasis is placed on thorough training rather than on putting all men through the course in the same length of time. If any individual student is unreasonably slow, it is best to arrange for his release from training and to recommend his transfer to other duty. All grading of individual items in the course should be either "pass" or "fail." A student must repeat each item as many times as necessary to insure mastery before proceeding to the succeeding material.

b. Grading quizzes.—Quizzes are retained by the instructor. The instructor summons each student to his desk individually, or the instructor may visit each student at the latter's desk, and grades each particular quiz in the writer's presence. In this way the student sees his paper checked and has an opportunity for personal discussion of any item with the instructor. Quizzes are graded either "pass" or "fail" according to the judgment of the instructor on how well the student has grasped the essential points involved.

c. Grading logs.—Log sheets may be partially checked by the instructor, using a colored pencil, as he observes the various nets in actual operation. This system of checking logs, over the students' shoulders, promotes further close contact between student and instructor and facilitates both teaching and grading. Occasionally, if errors of important basic points of operation are indicated by the logs of any one net, it may be well for the instructor to stop that

particular net, point out the errors, and have all stations in the net repeat the complete operation. Logs are graded "pass" or "fail" depending upon whether or not the indicated performance of the operations is satisfactory.

d. Progress chart.—The instructor will find it advantageous to employ a wall or blackboard chart such as shown in figure 11 for keeping a record of the progress of each member of the class.

Name	Lesson number											
	1	2	3	4	5	6	7	8	9	10	11
Allen.....	×	×	×	×	×	×						
Brown.....	×	×	×	\								
Doe.....	×	×										
Johnson.....	×	×	×	×	/							

Key
 \ completed quiz
 / completed operation
 × completed lesson

FIGURE 11.—Progress chart.

SECTION V

RADIOTELEGRAPH PROCEDURE LESSON I, THE CALL-UP AND ANSWER

Call signs.....	Paragraph 28
The call-up.....	29
Collective call-up.....	30
Multiple call-up.....	31
The answer.....	32
Procedure signs.....	33
Procedure signals.....	34
Terminating transmissions.....	35
Correction of error.....	36
Repetitions.....	37
Questions for self-review.....	38
Sample quiz.....	39
Operation exercise.....	40

28. Call signs.—All radio stations are identified by call signs, for example, WLW is the call sign of a broadcasting station in Cincinnati; WAR is the call sign of the War Department station in Washington, D. C. Call signs for the various Army stations in the field are nor-

mally assigned in Signal Operation Instructions (S. O. I.). An example of a list of call signs is given in FM 24-5. The S. O. I. in effect may prescribe that call signs change at a time when stations are in operation. This change is made automatically by each station at the specified time with no attendant formalities and with no interruption of radio communication.

29. The call-up.—*a. Definition.*—A station whose call sign is LB contacts a station whose call sign is LA by means of the “call-up”:

L A V L B $\overline{A R}$

In the above, V is an abbreviation for “from”, and $\overline{A R}$ means “end of transmission and standing by to receive your reply”.

b. Repetition of call signs in a call-up.—Each station’s call sign may be transmitted more than once in a call-up but not more than three times. Example:

L A L A L A V L B L B L B $\overline{A R}$

In establishing contact between two stations, the transmitting operator may call three times and sign three times, as in the above example in order to give the receiving operator the utmost opportunity to tune in the signal. Repeated calls are also permissible at any time under doubtful or definitely adverse communication conditions, such as during heavy static. However, the student must constantly bear in mind the possibility that in actual field operations enemy position-finding stations will welcome a radio operator’s prolonged transmissions. One goal of training should be station contact and message exchange with the fewest and shortest possible transmissions. Recommended procedure in this connection is illustrated in *c* below.

c. Repetition of call-up.—In an initial call-up call signs are transmitted only once. If a called station fails to answer an initial call-up promptly, the call-up may be repeated immediately, with the call signs therein sent three times. If the second call-up is not answered, the calling station should wait at least two minutes before transmitting a third call-up. Any additional call-ups necessary before receiving an answer should be at intervals of at least five minutes, except when the calling station has an urgent or priority message for the called station, in which case no restriction is placed upon such repetitions.

Original call-up.....	L A V L B $\overline{A R}$
Second call-up.....	L A L A L A V L B L B L B $\overline{A R}$
2 minute (or greater) interval	
Third call-up.....	L A L A L A V L B L B L B $\overline{A R}$
5 minute (or greater) interval	
Fourth call-up.....	L A L A L A V L B L B L B $\overline{A R}$

30. Collective call-up.—In the event that a station wishes to gain the attention of two or more stations simultaneously, a prearranged “collective” call sign may be used. Thus, the call sign ABC may be designated to include three stations, LA, LB, and LC. One of the stations, LC, should call LA and LB simultaneously by transmitting the collective call-up:

A B C V L C $\overline{A B}$

31. Multiple call-up.—In the absence of a prearranged collective call sign which includes all the stations with which communication is desired, these stations may be called simultaneously by simply transmitting the call signs of each desired station in sequence. This is known as a “multiple” call-up. Example:

L A L B X A V L C $\overline{A B}$

The prescribed order of call signs is alphabetical if their first symbol is a letter as in the above illustration. The call signs are arranged in ascending numerical order if their first symbol is a number as shown below.

2 C 3 A 4 B V L C $\overline{A B}$

32. The answer.—*a Definition.*—Station LA, upon hearing a call-up from LB, would answer by transmitting:

L B V L A K

K means “go ahead (transmit)”.

b. Order of answering.—(1) The order of stations answering a multiple call-up is the same as the order in which their calls appeared in the original call-up.

Call-up.....	L A	L B	X A	V	L C	$\overline{A B}$
First station to answer.....	L C	V	L A	K		
Second station to answer.....	L C	V	L B	K		
Third station to answer.....	L C	V	X A	K		

(2) In answering a collective call-up, the called stations answer in alphabetical or numerical order of call signs. If call signs beginning with both numerals and letters are used in the same net, the stations having call signs beginning with letters will answer first, alphabetically; they will be followed by the stations having call signs beginning with numerals, answering in numerical order. Again taking the collective call sign ABC to include LA, LB, and LC:

Call-up.....	A B C	V	L C	$\overline{A B}$
First station to answer.....	L C	V	L A	K
Second station to answer.....	L C	V	L B	K

(3) If a called station fails to answer a multiple or collective call-up in its turn, the next station in order, after waiting 15 seconds, answers; and the delinquent station does not answer until all other stations have answered.

Call-up.....	LA	LB	XA	V	LC	<u>AR</u>
First station to answer.....	LC	V	LA	K		
15-second interval						
Second station to answer.....	LC	V	XA	K		
Third station to answer.....	LC	V	LB	K		

c. *Answering a station whose call sign is unknown.*—Occasionally a receiving station recognizes its own call in a call-up but fails to distinguish the call sign of the calling station. Such a call-up would be answered by the use of the “unknown station” procedure sign AA. Thus FG, having heard someone call him but not being certain who called, transmits:

AA V FG K

The calling station then repeats its call-up:

FG V XY AR

33. Procedure signs.—The abbreviations V, AR, and K, which appeared in the above call-ups and answers, are three of a group of commonly used radio abbreviations referred to as “procedure signs.” The complete list of procedure signs is given in appendix III. A partial list is given below:

<i>Procedure sign</i>	<i>Meaning</i>
<u>AR</u>	End of transmission.
EEEEEEEE.....	Error. Erase.
<u>IMI</u>	Repeat. Question mark.
K.....	Go ahead. (Transmit.)
V.....	From. Calling.
<u>VA</u>	Finish.

34. Procedure signals.—*a. Definition.*—Another type of abbreviation used in Army radio communication is the “procedure signal.” A procedure signal is a three letter group, often called a “Z” signal because its first letter is Z, representing some frequently used complete expression which facilitates conversations between operators. The second letter of a procedure signal characterizes the signal as of a particular classification, and the third letter distinguishes any one procedure signal from others of the same classification. With some procedure signals, as will be seen in the partial list below, blanks are indicated in the meanings given. All blanks except those in

parentheses are required to be filled in by the transmitting station. Those in parentheses are filled in if desired. In all cases filled-in data follow the procedure signal and appear in the same order as the blanks filled in. Except as otherwise noted, words rather than numerals are used to complete the meanings of procedure signals. Thus, to express "I am in radio communication with LA", a station transmits: ZCB LA ONE and not ZCB LA 1.

b. *Examples.*—A partial list of procedure signals is given below. A complete list of procedure signals will be found in appendix III.

Classification	Procedure signal	Meaning
C: Calling; communication.	Z C A	Are you (or is -----) in communication with ----- (by -----) (1. Radio; 2. Wire; 3. Visual)?
	Z C B	I am (or ----- is) in communication with ----- (by -----) (1. Radio; 2. Wire; 3. Visual).
M: Messages-----	Z M A	I have (or ----- has) (-----) messages (numeral indicating number of messages may be followed by O, P, or D to indicate precedence other than routine) for you (or -----).
	Z M W	Of what precedence and to whom are your messages?
Z: Miscellaneous-----	Z Z B	Negative, no, not.
	Z Z C	Affirmative, yes.

c. *Use.*—(1) As an illustration of the use of procedure signals, consider ZMW, meaning: "Of what precedence and to whom are your messages?" (Messages are given precedence according to their relative importance and urgency as designated by the originator.) Station LB might ask station LA:

L A V L B Z M W AR

to which, in the event that station LA has no messages whatsoever on hand to transmit, LA would reply:

L B V L A Z M A Z E R O AR

ZERO is used in the above rather than NONE to avoid the possibility of the receiving operator's mistaking NONE for ONE.

(2) Procedure signals are the only authorized means other than regular messages for conversations between operators. If procedure signals are found to be inadequate, the chief operator or chief of a

station may authorize the transmission of messages relating to the conduct of communications.

35. Terminating transmissions.—Some sort of terminating sign is necessary to indicate when the transmitting station cedes the air to the receiving station. The following examples illustrate the uses of various procedure signs which are employed for the purpose.

a. \overline{AR} : "*End of transmission.*"—This has the meaning, "I am through with this transmission, you may respond if a response is in order or necessary." Example:

LA V LB ZMW \overline{AR}

LB expects a reply to his query and so terminates his transmission with \overline{AR} . For an additional example:

LA V LB \overline{AR}

Station LB has called up station LA with the intention of sending LA something and now anticipates a "go ahead" sign from LA before proceeding. Without the \overline{AR} on the end, LA is not sure whether LB has just paused briefly in his transmitting or is definitely standing by waiting for LA to reply. The use of the \overline{AR} removes this uncertainty.

b. *K*: "*Go ahead, transmit.*"—One station LA, having been informed that another station, LB, has something to transmit to LA advises LB to proceed by means of the terminating sign *K*, which means "Go ahead, transmit." LB might have advised LA of his desire to transmit something to LA by stating:

LA V LB ZMA ONE \overline{AR}

LA prepares his message form in anticipation of receiving a message from LB and transmits:

LB V LA K

that is, LA says to LB, in effect: "Go ahead, transmit. I am ready to copy."

When a receipt is required, a transmission will end with *K*. This applies mainly to regular messages, but it may also apply to any special instructions in the form of procedure signs or signals for which the transmitting station wants receipts as a matter of record or information. For example, station CB desires station RU's last message verified and repeated, and also desires a receipt for this request itself:

RU V CB J K

RU receipts simply:

CB V RU R

As soon as the message is verified, RU calls CB back and repeats the

message as requested. Examples of the use of K with messages will be found in sections VIII, IX, and X. When a receipt is not required, a transmission will end with \overline{AR} or some other appropriate terminating sign.

c. \overline{VA} : "Finish".— \overline{VA} is employed—

(1) To terminate a transmission to which an acknowledgment or reply is prohibited or not expected, or:

(2) To indicate to the receiving station that henceforth until some future time, the transmitting station will no longer be in communication with the receiving station, as, for instance, should the transmitting station be closing down to displace to a new position, or closing down until the next regular operating schedule, or leaving the net (by shifting frequency) to operate with a station in another net.

d. Other procedure signs which may be employed for terminating transmissions are B, which means "More to follow"; C, "Affirmative. Correct"; \overline{MI} , "Question mark"; N, "Not received. Negative"; R, "Receipt"; J, "Verify and repeat"; Y, "Acknowledge." Various examples of the uses of these procedure signs occur in the text of this manual.

36. Correction of error.—When an error is made in transmission, the transmitting operator immediately makes the "error" sign (EEEEEEEE), then repeats the last word, group, or procedure sign or signal which was correctly made and continues with the transmission. Example:

LA U EEEEEEEE LA V LB \overline{AR}

37. Repetitions.—a. Repetition of transmission.—A request for a repetition of a complete transmission is made by sending \overline{MI} . Thus:

LA V LB \overline{MI} \overline{AR}

In response to the above request station LA would repeat its entire previous transmission.

In this case \overline{MI} is a little message meaning "Please repeat the last transmission", and it therefore requires a separate terminating sign. \overline{MI} is a terminating sign by itself when it is used as a question mark after some other procedure sign or signal, to give it an interrogatory meaning, as in paragraph 46c and f.

b. Repetition of difficult portion.— \overline{MI} may also be used to indicate that the transmitting operator is about to repeat a difficult portion to insure the correct reception by the receiving operator. Example:

LA V LB \overline{BT} BODY OF VISCAY
A ZULANGA \overline{MI} VISCAY A ZULANGA FOUND
1052P K

38. Questions for self-review.—The student should answer each of the following questions as a test of his understanding of the lesson.

- a. How does one station contact another?
- b. How many times may each station's call sign be transmitted in a call-up?
- c. What action would you take if a station failed to answer your initial call-up?
- d. What is a collective call-up?
- e. What is a multiple call-up?
- f. In what order is a multiple call-up answered?
- g. If a called station failed to answer a collective call-up in its proper turn how long should the next called station in order wait before answering?
- h. The meaning of the procedure signal ZMA is given as: "I have (or ——— has) ——— messages (numeral indicating the number of messages may be followed by O, P, or D to indicate precedence other than routine) for you (or ———)." Of the blanks provided in the stated meaning of ZMA, the first and third are inclosed in parentheses whereas the second is not. What is the significance of this usage of parentheses?
- i. How would you request a repetition of a complete transmission which you had missed?
- j. In a message made up of code groups, which you are about to transmit, one group is SEIS, conceivably difficult to receive on account of the succession of dots involved. How might you make your transmission to assist the receiving operator on this difficult group?

k. Correct the following transmissions:

- (1) LA LA LA V LB LD YMY LB LB LB AR
- (2) LA LA LA V LB LD EEEEE LB LB LB AR
- (3) LA LB FG V LC AR
- (4) NOW IS THE TIMI EEEEEEEEE TIME FOR ALL GOOD MEN
- (5) ZCA LB 3 LA
- (6) ZCB ZCB LA LC

39. Sample quiz.—The following is a suggestion for a quiz covering the principles enunciated in lesson I. Sample quizzes are not illustrated in this manual for any of the succeeding lessons, the writings of these quizzes being left to the instructor. The instructor is cautioned to examine quiz questions carefully to avoid ambiguities. Having an assistant take the quiz before it is submitted to the students will often serve to bring out any unsuspected defects in the quiz.

Quiz on operation lesson I

Directions to the student: Fill in all spaces. Print plainly. Assume that you are the operator at station LA.

1. You wish to ask LB of what precedence and to whom are his messages. Show your transmission to LB.

 2. You intend to transmit the following.

LB V LA AR

However, you accidentally make LR instead of LA in the actual transmission. Show your complete transmission to LB including the error and its correction.

 3. Assume that CD did not receive your transmission of question 2. Show how he would request a repetition.

 4. Using a multiple call-up, indicate how you would request LB, LE, LD, and LC to inform you if they are in communication with BZ by wire.

 5. Show the replies of the individual stations in the proper order to your request of question 4. Assume that LE and LB are not in wire communication with BZ but that LD is; LC has just developed transmitter trouble and is unable to reply by radio. Indicate the occurrence and the duration of any extended pauses.

 40. **Operation exercise.**—*a. Directions to the student.*—The net consists of three stations, LA, LB, and LC. The collective call sign which includes all three stations of the net is ABC. For simplicity any repeated group may be recorded once with a superscript to indicate the number of times the group was actually transmitted. Thus

LA LA LA V LB LB LB AR

may be recorded as

LA³ V LB³ AR

Execute the following communications in the order listed, recording every transmission (including your own) directly on the log sheet.

b. Exercises.—(1) Station LA will call up station LB and ask if LB has any messages for LA.

(2) Station LB will answer station LA, and state that he has no messages for LA.

(3) Station LA will call up station LC and ask if LC has any messages for LA.

(4) Station LC will answer station LA and state that he has no messages for LA.

(5) Station LA will call up stations LB and LC using a multiple call-up and ask if they are in wire communication with station BA.

(6) Stations LB and LC will answer in the proper order, LB answering in the affirmative, LC in the negative.

Request the instructor to check the log at this point before continuing

(7) LB will call up LC and ask if LC has any messages for LB.

(8) LC will answer LB and state that he has no messages for LB.

(9) LB will call up LA and ask if LA has any messages for LB.

(10) LA will answer LB and state that he has no messages for LB.

(11) LB will call up LC and LA using the collective call sign assigned to the net and ask them if they are in radio communication with FG.

(12) LC and LA will answer in the proper order, LC answering in the affirmative, LA in the negative.

Request the instructor to check the log at this point before continuing

(13) LC will call up LA and ask if LA has any messages for LC.

(14) LA will answer LC and state that he has no messages for LC.

(15) LC will call up LB and ask if LB has any messages for LC.

(16) LB will answer LC and state that he has no messages for LC.

(17) LC will call up LA and LB using the net call and ask if LA and LB are in communication with FG.

(18) LA and LB will answer in the proper order, LA stating that he is not in communication with FG, and LB stating that he is in communication with FG by wire.

SECTION VI

RADIOTELEGRAPH PROCEDURE LESSON II, READABILITY, THE STATION LOG

	Paragraph
Readability.....	41
Signal and interference strengths.....	42
Test signals.....	43
The station log.....	44
Time notations.....	45
Procedure signs.....	46
Procedure signals.....	47
Questions for self-review.....	48
Operation exercise.....	49

41. Readability.—*a. Readability scale.*—It is of interest to a transmitting operator to know the “readability” of his signal at the receiving station. By “readability” is meant an estimate of the ease with which the receiving operator can make intelligent copy. This estimate depends partly upon the relative strength of the desired versus the undesired (interference, static, inherent receiver noise, etc.) signal and partly upon the capabilities of the receiving operator. A numerical scale of readability has been adopted as follows:

- (1) Unreadable.
- (2) Poor but readable; make plain language messages through twice, code unreadable.
- (3) Fair; readable; plain language once slowly, make code messages through twice.
- (4) Good; readable; plain language or code once.
- (5) Perfectly readable.

b. Request for readability.—An operator may request a readability report by the use of the procedure signal ZSG. Thus:

L A V L B Z S G $\overline{A R}$

LB might reply:

L B V L A Z S B 4 $\overline{A R}$ (Readability 4)

Since ZSG means “What is my readability?”, it is not necessary for LA to fill in the first blank in the meaning of ZSB, “I can receive _____ Readability _____”, as this would merely be a repetition of LB’s own call. This is an exception to the rule that all blanks in Z signals not in parentheses be filled. However, note the full use of ZSB in case LB asks LA about a third station, LC.

L A V L B Z S A L C $\overline{A R}$

LA would then answer

L B V L A Z S B L C 4 $\overline{A R}$

c. Exchange of readabilities.—Operators may exchange readability reports without mutual request on first establishing communication with each other. Suppose station LA has heard station LB transmitting to station LC. LA, noting that LB’s signal is perfectly readable, transmits a report of this readability on his initial call-up of station LB.

L B V L A Z S B 5 $\overline{A R}$

The $\overline{A R}$ with which LA concludes his transmission indicates that he expects a readability report from LB. LB then replies:

L A V L B Z S B 4 $\overline{A R}$

d. Change of readability.—In the event of any change of readability later in the day, a readability report so indicating is promptly transmitted. Thus, suppose that while LB is informing LA that he has a message for LA, an interfering station causes LB's readability at LA to drop from 4 to 3. LA might send:

LB V LA ZSB3 K

LB would comply by transmitting all coded groups twice and all plain language once slowly, continuing in this manner until advised by LA of any further change in readability.

e. Change of readability due to frequency shift.—In the event of a readability drop caused by some drift or accidental shift in a transmitter's frequency, the procedure for correcting the frequency to obtain better readability is illustrated in the following:

LA V LB ZFO AR (Your frequency is too high.)

or

LA V LB ZFO 15 AR (Your frequency is 15 kilocycles too high.)

Station LA adjusts his transmitter to restore his frequency to the proper value and then asks:

LB V LA ZFM AR (How does my frequency check?)

To which LB might reply:

LA V LB ZFN ZSB4 AR (Your frequency is correct. Readability good.)

42. Signal and interference strengths.—Strength of signals and of interference may be expressed by the use of procedure signs S and W, respectively, together with an appropriate numeral according to the following scale:

Very weak; hardly audible.....	1
Moderately weak.....	2
Medium strong.....	3
Moderately strong.....	4
Strong.....	5

LB might report to LA:

LA V LB ZSB4 W3 FG AR

meaning "readability good; medium strong interference from station FG."

43. Test signals.—If one station has difficulty tuning in another's signals, the first station may request, by the use of the procedure

signal ZFD, that the second station send a series of V's (the standard test signal):

LA V LB ZFD \overline{AR}
 LB V LA V V V V V \overline{AR}
 LA V LB ZSB5 \overline{AR}

Or if LB wished to tune in LA on a different frequency, say 4210 kilocycles, LB might request:

LA V LB ZFD 4210 \overline{AR}

(Numerals, not words, are used to indicate frequencies and frequency deviations in procedure signals.)

44. The station log.—*a. Log material.*—The station log is the radio operator's diary. A reasonable rule to follow in selecting material to be entered in the log is to enter sufficient information to enable a replacement operator to carry on at any point merely by reference to the log. In case of doubt as to whether or not an item is important enough to record, it is generally well to record it. What appears to be inconsequential at one time may develop to be of genuine importance later. However, the keeping of the log must not delay the handling of traffic. The log always includes, among other things, such data as—

- (1) Names of operators on duty.
- (2) Times of opening and closing of station.
- (3) Causes of delays in traffic.
- (4) Frequency adjustments and changes.
- (5) Unusual occurrences, such as procedure violations.

b. Recording.—Log items are a matter of semipermanent record. Items are entered in the log immediately following the occurrence of the incidents being reported, or as soon thereafter as the traffic situation permits. Entries are not erased. Any necessary changes are made by drawing a line through the original statement and indicating the changed version alongside or nearby.

c. Student log.—During the initial instruction phase and until advised to the contrary by the instructor, the student will enter the five minimum essentials listed in *a* above and will continue to record in the log every transmission in the net with the single exception that a transmitted message may be indicated in the log by a notation "Sent msg" or "Repeated msg", instead of including the entire transmitted message in the log. The original copy of the message on the message blank delivered to the operator from the (simulated) message center will be considered adequate record of a transmitted message. However, any received message, regardless of whether it

corresponds to an original transmission or to a repeat, is copied completely in the log.

d. Log for trained operator.—The amount of detail to be entered in the log may vary with the state of training of the student. As training progresses to a point where the student is able to handle traffic without close supervision, the entries in the log may be reduced to simply the five minimum essentials listed in *a* above. A typical log for an experienced operator is shown in figure 10.

e. Personal sign.—In the column marked "operator" in the log shown in figure 10, each letter designates an operator and is known as that operator's "personal sign". Each operator at a station has a distinguishing personal sign of one or two letters (not necessarily his initials) with which to identify himself in the station records. This personal sign is never transmitted.

45. Time notations.—*a.* In Army radio operations, time notations in logs and elsewhere are in the usual 12-hour system, the new day starting at midnight. Except for midnight and noon, which are spelled out MIDNIGHT and NOON respectively, time groups are always designated by numerals. 600A is used to indicate 6:00 A. M., 512P for 5:12 P. M. ZCC 733P means, "Call me again at 7:33 P. M."

b. In joint Army and Navy communications, time is expressed in the 24-hour clock system and is transmitted as a group of four figures. The first two digits represent the hours from midnight and the last two the minutes past the hour. Thus, 6:00 A. M. in the ordinary 12-hour system becomes 0600; 7:43 P. M. is 1943.

46. Procedure signs.—*a. R: "Receipt."*—R is used to mean "receipt" of a preceding transmission, particularly one ending in K. For example, LA, having just received a message from LB, transmits:

L B V L A R

As a simple acknowledgment of receipt, R may be used alone, as above. However, the terminating sign K may be necessary, as in *b* below. R may also be followed by \overline{VA} , when, for instance, a receiving station acknowledges receipt of instructions from the net control station to close down station. Example:

L A V L B Z W A K

L B V L A R \overline{VA}

b. B: "More to follow."—B is used to terminate a transmission when the transmitting operator wishes to indicate that there is more to follow.

L A V L B ----- (message) B

When B is used along this way, the receiving operator knows that he must prepare another message form, and the transmitting operator pauses for a second or two to allow the necessary time.

If station LB desires a receipt for the first message before proceeding with the next one, he should send:

LA V LB ----- (message) **B K** (more to follow; receipt for this one first)

If he received the message properly, and is ready for the next one, LA should transmit:

LB V LA R K (message received; go ahead with next one)

c. Suppose that LA has transmitted a message to LB, and during the sending LB's transmitter breaks down. On next contacting LB, LA might ask:

LB V LA R \overline{IMI}

meaning "Did you receive my last message?" to which, if LB had received the message, LB would reply:

LA V LB R

d. *N*: "Not received."—If in *c* above, LB had not received the message, LB would reply:

LA V LB N K (Not received; go ahead)

e. \overline{AS} : "Wait."— \overline{AS} is used to mean, "Wait, and stand by for further communication." Example:

LA V LB \overline{AR}

LA may require a few seconds perhaps to locate a fresh message form or possibly to replace a lead in a pencil. LA sends:

LB V LA \overline{AS}

LB does not answer but stands by tuned in to LA awaiting further instructions by LA. The procedure sign \overline{AS} is transmitted once every 30 seconds until LA is ready for LB to transmit. LA then sends:

K

and LB proceeds.

f. \overline{IMI} : "Repeat. Question mark."—To request repetition of doubtful or missed parts of a message, study the examples in paragraph 68.

IMI may be used to request verification of doubtful reception, without necessarily asking for repetition. For example, station LA questions his reception from LB of the word HANSE after LAROW:

LB V LA LAROW HANSE IMI

If this is correct, the reply is:

LA V LB C

IMI is especially useful as a means of enabling a procedure signal to be read as a question in case the desired question is not listed; IMI is simply placed after the signal whose meaning is to be changed to the interrogative sense. Care must be taken that the signal so constructed will not be interpreted wrongly at the receiving station. Likewise, the procedure signal ZZB may be put in front of another procedure signal to give it a negative meaning. The following examples show some of the possibilities:

"I have been calling you on 2980 kc."—ZCE 2980

"Have you been calling me on 2980 kc.?"—ZCE 2980 IMI

"I have not been calling you on 2980 kc."—ZZB ZCE 2980

"Make preliminary call-up before transmitting traffic."—ZCL

"Shall I make preliminary call-up before transmitting traffic?"—ZCL IMI

"Do not make preliminary call-up before transmitting traffic."—ZZB ZCL

g. XE: *Separator sign*.—Just as punctuation marks are used to set off portions of a sentence for clarity, so the separator sign, XE, may be used to "punctuate" and clarify a transmission. The transmission illustrated in paragraph 42 might better have been:

LB V LA ZSB4 XE W3 FG AR

h. *List of procedure signs*.—Those procedure signs which are introduced in this lesson are tabulated below for convenience in reference and study.

Procedure sign:

Meaning

<u>AS</u>	Wait.	
<u>B</u>	More to follow.	
<u>IMI</u>	Repeat. Question mark.	
<u>N</u>	Not received. Negative.	Exempted.
<u>R</u>	Receipt. Routine.	
<u>S</u>	Signal strength.	
<u>W</u>	Interference.	
<u>XE</u>	Slant (/) or separator.	

47. Procedure signals.—The following procedure signals with their meanings should be memorized:

Classification	Procedure signal	Meaning
C: Calling; communication.	Z C C	Call me again at ——— (on ——— kc.).
F: Frequency; frequency adjustments.	Z F D	Send V's on this frequency (or ——— kc.).
	Z F M	How does my frequency check?
	Z F N	Your frequency is correct.
	Z F O	Your frequency is too high (or is ——— kc. too high).
	Z F P	Your frequency is too low (or is ——— kc. too low).
O: Operating	Z O A	Send at speed of ——— words per minute.
S: Signals; readability	Z S B	I can receive ———. Readability ———.
	Z S F	What is my signal strength?
	Z S G	What is my readability?

48. Questions for self-review.—*a.* A received signal is quite loud. However, on account of the presence of temporary unavoidable, disturbances near the radio station, intelligent copy is impossible unless the transmitting operator sends plain language once slowly and code twice. What is the correct readability signal to describe these conditions?

b. What is the proper readability report to designate that the received signal, although discernible, is not good enough to permit copying plain language even if each group is sent twice?

c. In adjusting your transmitter for optimum output, which would you request of the receiving operator, ZSG or ZSF? Why?

d. In the ordinary exchange of traffic, which is of the most importance, readability or signal strength? Why?

e. How would you inform another station that its frequency is ten kilocycles too low?

f. Name the five items required to be entered in every station log.

g. Criticize the following transmissions:

- (1) Z C C N I N E A
- (2) Z C C 900 A M
- (3) Z C C 1200 P
- (4) L A V L B V $\overline{V A}$

49. Operation exercise.—*a. First exercise.*—Directions to the student: The net consists of three stations, LA, LB, and LC. The net call sign is ABC. Execute the following communications.

(1) Station LA will ask the other stations of the net (collectively) for a report on the signal strength and readability of station LA.

(2) Stations LB and LC will answer in proper turn. LB will inform LC that his signals are moderately strong but that his readability is poor. LC will inform LA that his signals are moderately weak but perfectly readable.

(3) LB will request a report on his frequency by LA.

(4) LA will inform LB that his frequency is ten kilocycles too low.

(5) LB will simulate adjustment of transmitter to correct the frequency and ask LA to check the frequency again.

(6) LA will inform LB that his frequency is now correct, readability good.

(7) LA will direct LC to send a series of V's.

(8) LC will comply.

(9) LA will inform LC that his frequency is five kilocycles too high.

(10) LC will simulate transmitter adjustment and request frequency check from LA.

(11) LA will inform LC that his frequency is now correct, readability excellent.

(12) LC will inform LA that he has two messages for LA.

(13) LA will request LC to repeat his last transmission.

(14) LC will comply.

(15) LA will direct LC to send the messages.

(16) LC will ask LA if he (LC) should send at a speed of ten words per minute.

(17) LA will tell LC: "Yes."

(18) LA will ask LB if he is in radio communication with FG.

(19) LB will tell LA to wait.

(20) LB will call FG. (No reply from FG.)

(21) LB will call FG again. (No reply from FG.)

(22) LB will inform LA that LB is not in radio communication with FG.

(23) Using the net call-up LA will direct LB and LC to call LA again at 8:30 P.M. on 3900 kilocycles.

(24) LB and LC will acknowledge LA's order.

b. Subsequent exercises.—The instructor will check the logs at this point. After the instructor has done so, the operator originally at station LA will take over station LB, the operator at station LB proceeding to LC and the one at LC going to LA. With this new arrangement of operators, repeat the communications listed in *a*(1) through (24) above.

SECTION VII

RADIOTELEGRAPH PROCEDURE LESSON III,
TACTICAL RADIO NETS

	Paragraph
Organization of tactical radio nets.....	50
Establishing a net.....	51
Leaving the net; internet traffic.....	52
Directed net.....	53
Silence restriction.....	54
Closing the net.....	55
Procedure signals.....	56
Questions for self-review.....	57
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50. Organization of tactical radio nets.—Field radio stations are grouped into separate nets of a few stations each. All operations

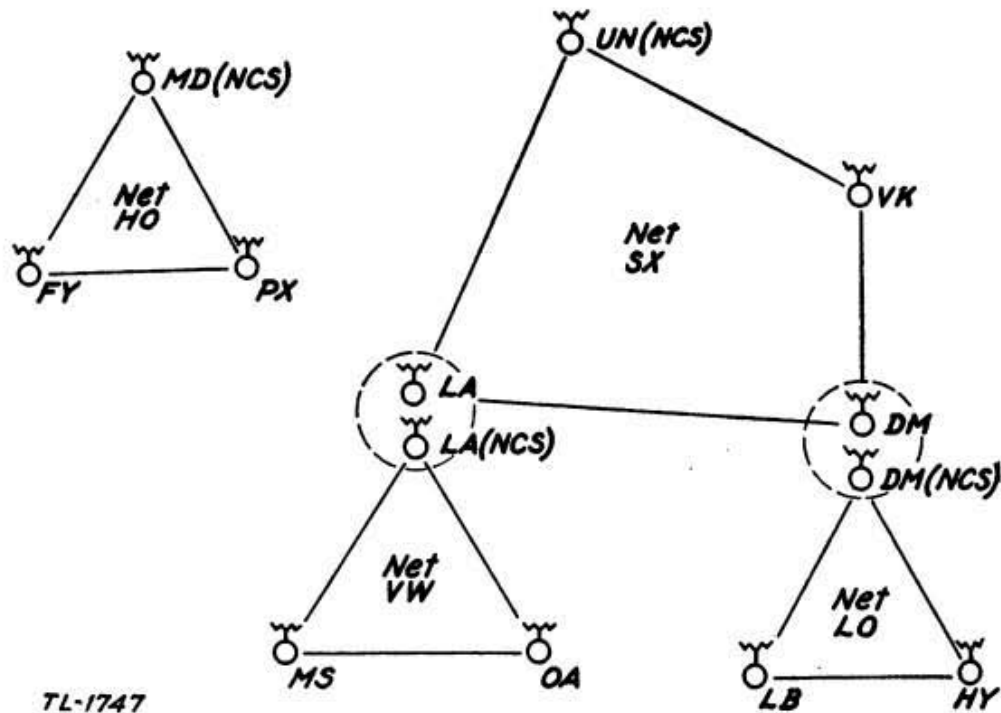


FIGURE 12.—Tactical radio nets.

normally are confined to communications within the individual nets. For purposes of administration, one station, generally the one which is located at the highest headquarters, is appointed net control station (NCS) with authority to direct the net in the control of radio communication. All other stations of the net are referred to as secondary stations. A scheme of tactical radio nets showing net control stations and the normal traffic channels is shown in figure 12. The two stations with the same call sign, LA, are two distinct stations located at the same headquarters. One operates in the net SX on the frequency

assigned to the net SX, and the other operates in the net VW on that net's frequency. The two stations are far enough apart, both in frequency separation and in physical distance, so as not to interfere with each other; and yet they are located close enough together to be cooperative in that each can serve as a relay station for internet traffic.

51. **Establishing a net.**—*a.* UN, LA, DM, and VK are stations in net SX (figure 12). The net is about to go into operation in a tactical situation. The operators are informed of their call signs and their frequency and of the time when complete communication within the net is expected. They know that UN is to be the NCS. This information, together with other pertinent instructions, appears in signal operation instructions issued to the units concerned.

b. LA, on completing the installation of his station, listens on the assigned net frequency. Hearing nothing, LA calls:

SX V LA ZGQ AR

LA repeats the call-up once shortly afterward, and again at intervals as prescribed in paragraph 29*c*:

SX V LA ZGQ AR
SX SX SX V LA LA LA ZGQ AR

At this point UN has just completed his installation, and, listening on the assigned net frequency, hears LA's call-up. UN answers:

LA V UN ZSB4 ZGQ U AR

U means "I am the NCS." And the complete transmission implies "Give me a readability report." LA answers:

UN V LA ZSB5 AR

During the above intercommunication DM, completing his installation and listening on the assigned net frequency, overhears UN and LA working together. He waits for them to complete their transmissions and then calls:

UN V DM ZSB4 ZGQ AR

UN replies, presuming DM's frequency to be too high:

DM V UN ZFO AR

DM makes the necessary adjustments and transmits:

UN V DM ZFM AR

UN replies:

DM V UN ZFN ZSB4 ZWG LA U K

ZWG means: "The following stations (in addition to UN and DM) are in the net: LA." UN concludes with K because he wants a receipt for the transmitted information. DM complies:

UN V DM R

DM now calls LA to exchange readabilities.

LA V DM ZSB5 AR
DM V LA ZSB4 AR

VK, completing his installation several minutes later, listens on the assigned frequency but hears no signals being transmitted at the time. He calls:

SX V VK ZGQ AR

UN answers, assuming VK's frequency to be low:

VK V UN ZFP AR

VK adjusts his transmitter and continues:

UN V VK ZFM AR

UN replies:

VK V UN ZFN ZSB5 ZWG LA DM U ZSG AR

VK answers:

UN V VK ZSB4 AR

VK, now knowing that LA and DM also are in the net, calls these stations to exchange readabilities:

LA V VK AR
VK V LA ZSB4 AR
LA V VK ZSB3 AR
DM V VK AR
VK V DM ZSB5 AR
DM V VK ZSB5 AR

It is to be noted that UN has caused LA, DM, and VK to adjust their transmitters until all three stations came in at the same tuner dial setting on UN's receiver. Now in order to insure that his (UN's) signals come in at the same place as the other stations' signals on any of the other receivers, UN calls up one station, say LA, and requests:

LA V UN ZFM AR

LA checks his receiver dial setting against the position where he receives DM and VK, and, presuming that UN's indicated frequency is high, advises UN accordingly:

UN V LA ZFO AR

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UN adjusts his transmitter to conform and sends:

LA V UN ZFM AR

LA replies:

UN V LA ZFN ZSB4 AR

The four stations are now in communication with each other and are ready to exchange traffic.

c. In establishing the net, in case the regular NCS is late in reporting in, the first station entering the net acts as NCS and so informs the other stations by means of the procedure signal ZGD. The use U is confined to the regularly appointed NCS.

52. Leaving the net; internet traffic.—a. Whenever the NCS withdraws from the net, he appoints a substitute to act in his absence:

LA V UN ZGB THIRTY MIN ZGR K (Take over NCS duties for 30 minutes. I am leaving the net.)

or

LA V UN ZGB THIRTY MIN ZGR LB 3890 K
(Take over NCS duties for 30 minutes. I am leaving to communicate with LB on 3890 kilocycles.)

LA acknowledges:

UN V LA R VA

A secondary station which wishes to leave the net to transmit a message to a station in another net must first report to the NCS of its own net, indicating the station with which it intends to communicate. Thus:

UN V VK ZGR PX AR

Further, any station calling a station in another net must report in to the NCS of the net being entered, and then finally report out again at the conclusion of the transaction of the internet traffic:

MD V VK ZGQ ZMA ONE PX AR
 VK V MD K
 PX V VK AR
 VK V PX ZSB4 K
 PX V VK ZSB4 XE ——— (message) ——— K
 VK V PX R VA
 MD V VK ZGR AR

VK reenters his own net just as he did upon initially entering the net. He exchanges readabilities with all other stations in the net and adjusts his frequency in accordance with UN's directions.

b. In the case of VK having traffic for OA (see fig. 12), this could be handled in a fashion similar to that in a above, or, if desired, VK could here make use of the relay services of LA.

c. The only exception permitted to the procedure described in *a* and *b* above for the exchange of internet traffic is in the handling of urgent messages. These are dispatched in any expedient manner, through direct call-up if practicable, to insure the fastest transmission possible.

53. Directed net.—If operation of the net is not progressing smoothly, as, for instance, if two stations are monopolizing the net frequency by continued transmissions, preventing the flow of other traffic in the net, the NCS may exercise close control by ordering a directed net:

SX V UN ZGT ONE ZMW K

The K indicates that UN wants a receipt of the directed-net order, as well as a report of the traffic on hand. The secondary stations answer:

UN V DM R ZMA ZERO AR
 UN V LA R ZMA TWO DM XR ONE VK AR

(Two routine messages for DM; one routine for VK)

UN V VK R ZMA THREE LA AR

UN directs:

LA V UN K (Send all traffic which you reported)

As long as the net is directed, each station reports to the NCS as it acquires new traffic to transmit and then awaits direction from the NCS before proceeding, except that immediately upon receipt of an urgent message from his message center, the operator will break in on any transmission, except the transmission of another urgent message, and clear the urgent traffic directly to the station of destination without preliminary permission of the NCS. To restore the net to free operation the NCS transmits:

SX V UN ZGT TWO K

This is receipted for in the regular order by the secondary stations.

54. Silence restriction.—As a control measure, or for other reasons, the NCS may silence an individual station of the net (or the whole net) by addressing the silence procedure sign, sent five times to that station (or to the whole net):

DM V UN HM HM HM HM HM AR

HM transmitted five times and followed by a procedure sign designating a class of traffic means: "Cease all transmission except for class of traffic indicated."

DM V UN HM HM HM HM HM O AR

\overline{UO} transmitted five times means: "Silence restriction removed." Neither \overline{HM} nor \overline{UO} is ever repeated for.

55. Closing the net.—The NCS orders the closing of the net by use of the procedure signal ZWA:

S X V U N Z W A K

The use of K indicates that UN wants the net stations to receipt for the instructions to close the net.

The secondary stations receipt in order:

U N V D M R \overline{VA}
U N V L A R \overline{VA}
U N V V K R \overline{VA}

56. Procedure signals.—The following procedure signals with their meanings should be memorized.

Classification	Procedure signal	Meaning
G: Net control.....	Z G B	Take over radio guard or net control for (until _____).
	Z G C	Are you (or is _____) radio guard or net control station for _____ (on _____ kc.). (In the second blank indicate either net call sign or station call sign.)
	Z G D	I am (or _____ is) radio guard or net control station for _____ (on _____ kc.).
	Z G Q	Station reports into net.
	Z G R	Station leaves net temporarily (or for _____ hours) (to communicate with _____) (will be on _____ kc.).
	Z G T	Net is _____ (1. Directed; 2. Free).
T: Time and transmissions.	Z T J	Transmit only urgent or priority messages.
W: Stations.....	Z W A	Close or secure (or direct _____ to close or secure) your (his) station or watch (on _____ kc.).
	Z W G	Following stations are keeping watch on _____ kc. (or are in net).

57. Questions for self-review.—Refer to figure 12 in conjunction with these questions.

a. PX is the first station to be set up in the net H O, M D is the second, and FY is the last. Indicate all transmissions in order of occurrence in establishing the net. Presume all signals ZSB4 and frequencies correct.

b. Repeat the above for the case of FY's frequency being high, the others being correct.

c. What station acts as NCS until the NCS reports into the net?
 d. HY wishes to leave his net to communicate with VK. Show all transmissions in order of occurrence involved in HY's exchange of traffic with VK and ultimate return to the original net.

e. What information does each station furnish the NCS in compliance with an order from the NCS for a directed net?

58. Operation exercise.—*a. First exercise.*—The net consists of three stations, FY, PX, and MD, with net call sign HO. MD is the NCS. Proper acknowledgment will be made for all transmissions whenever appropriate in the operations below. Readabilities will be exchanged and frequencies adjusted as necessary each time a new station enters the net.

- (1) The NCS will open a free net.
- (2) Secondary stations will report into the net in order of call signs.
- (3) PX will report out of the net to transmit a message to OA.
- (4) The NCS will report out of the net temporarily.
- (5) PX will report back into the net.
- (6) The NCS will return to the net.
- (7) The NCS will order a directed net.
- (8) The NCS will impose the silence restriction upon PX.
- (9) The NCS will close the net.

b. Subsequent exercises.—The instructor will check the logs at this point. After the logs have been checked, repeat operations *a*(1) through (9) above with FY acting as NCS and MD being one of the secondary stations.

SECTION VIII

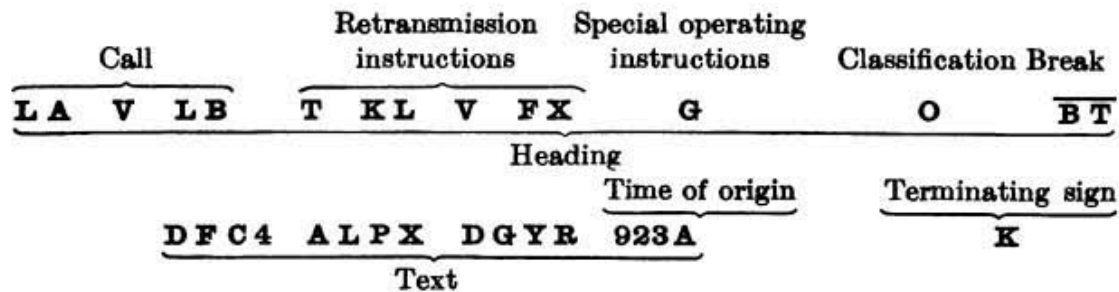
RADIOTELEGRAPH PROCEDURE LESSON IV, THE ABBREVIATED FORM MESSAGE

	Paragraph
Form of message.....	59
Classification of messages.....	60
Identification of messages.....	61
Retransmission and special operating instructions.....	62
Transmitting messages in strings.....	63
Copying and servicing.....	64
Requests for repetitions.....	65
Procedure signs and procedure signals.....	66
Questions for self-review.....	67
Operation exercise.....	68

59. Form of message.—*a. General.*—Army radio messages are of two types. One, a "streamlined" style designed for speed in transmission of tactical messages, is known as the "abbreviated form". Its use is required within divisions and by smaller units and in all

communications involving air elements. The other type of message, known as the "normal form", is designed for use by headquarters above division. In addition to a difference in the form of the two types of messages, there is some difference in the procedure for handling them. This lesson is devoted principally to the abbreviated form message and its handling. The normal form message is treated in section X.

b. *Abbreviated form.*—The following is an example of an abbreviated form message with its various components labeled:



The retransmission instructions to LA, viz., T KL V FX, are interpreted: "Transmit the following to KL from FX." The special operating instruction G means "Repeat back". The classification O means "Urgent". The complete message above extends from the call to the time of origin, inclusive. If, for instance, it is requested that the message be repeated, everything shown above is repeated.

60. Classification of messages.—Abbreviated form messages are designated as either urgent or routine; there are no other classifications. An urgent message carries the classification procedure sign O in the heading. No classification designation is carried on routine messages. An urgent message is given utmost precedence, never being delayed except for the transmission of other urgent traffic. The handling of routine traffic is interrupted in order to transmit an urgent message.

61. Identification of messages.—The station of origin and the time of origin serve to identify a message for any future reference. The message in paragraph 59b may be referred to as FX 923A or, if the station of origin is understood, simply as 923A. To illustrate abbreviated form message identification by station and time: One station might ask another, FX923A R IMI, meaning "Have you received the message which originated at FX at 923A?"

62. Retransmission and special operating instructions.—Retransmission and special operating instructions do not appear on every message transmitted.

a. *Relaying messages.*—The message shown in paragraph 59b illustrates the special operating instructions required for directing the relay of a message. The station in a relay chain which finally forwards the message to the station of destination obviously omits the procedure sign T which means "Retransmit". Thus when LA forwards the abbreviated form message shown in paragraph 59b to the addressee, KL, LA transmits:

KL V LA \overline{XE} KL V FX G O \overline{BT}
DFC4 ALPX DGYR 923A K

It may so happen that in receiving the message from LB, LA misses the group DGYR and then for some reason (possibly faded signals) is unable to contact LB again at that time for a repeat request. LA does not delay the relaying of the message on account of this missing group, but transmits as follows to KL:

KL V LA \overline{XE} KL V FX G O \overline{BT}
DFC4 ALPX \overline{AA} 923A K

The \overline{AA} signifies that a group is missing at this place in the message. As soon as possible LA obtains the missing group from LB and passes it on to KL. If the text of the message under discussion were included in a routine message transmitted from FX directly to KL, with no special operating instructions, the message would appear:

KL V FX \overline{BT} DFC4 ALPX DGYR 923A K

b. *Repeat back.*—(1) To definitely insure correct reception, the transmitting operator of the message illustrated in paragraph 59b as ordered a repeat back by use of the procedure sign G.¹ LA repeats back to LB as follows:

LB V LA \overline{XE} LA V LB T KL V FX
G O \overline{BT} DFC4 ALPX DGYR 923A \overline{AR}

LB underscores each group repeated back correctly and acknowledges:

LA V LB C (Correct)

Or, if this is the only or last message sent by LB:

LA V LB C \overline{VA}

The original message is not considered as properly received until the transmitting operator sends this C. When repeating back or correcting repeat backs, each group is sent only once, notwithstanding that each group may have been sent twice in the original transmission. Any relayed message bearing the instructions G is repeated back by

¹ In Joint Army and Navy operations, ZPG is used instead of G.

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each receiving station which handles the message. The message illustrated in paragraph 59b advances in the order FX-LB-LA-KL. LB repeats it back to FX on receiving it from FX; LA repeats it back to LB on receiving it from LB; and KL repeats it back to LA on receiving it from LA.

(2) An operator may request a repeat back of any previously sent message by transmitting G together with proper identification of the message. Thus:

NA V NB G 713A AR
NB V NA XE NA V NB BT VUBO ABYZ 713A AR
NA V NV C

63. Transmitting messages in strings.—When radio communication is good, it frequently facilitates the handling of traffic for one station to send several messages to another without interruption. The receiving station might request ZOD THREE: "Transmit your messages in strings of three." The transmitting station separates the messages with the sign AR¹:

LA V LB BT TMST LTHJ 930P AR LA V LB BT
LDFX ORZY 941P AR LA V LB BT LOUX
946P K

When the receiving operator hears the K he knows the string is finished and that he is expected to receipt for the messages. The receiving station acknowledges.

L B V L A R 930P XE 941P XE 946P AR

64. Copying and servicing.—*a. Copying.*—Typewritten copy is made either five or ten groups to the line; penciled copy, five groups to the line. The receiving operator does not copy the complete call in a message as it is transmitted, but records only the call sign of the transmitting station. This information, together with retransmission and special operating instructions and the message classification, is entered on the message blank at the top near the word "Message." Figure 13 shows the receiving operator's original copy of the message corresponding to the following transmission:

LA V LB T KL V FX G O BT
NR13 CD GOXDR FADUL KIJEY
NAMIH LAEDG PRYNO CAJIN ZEDBL
DOFIN AWENJ 957A K

¹ The transmitting station will allow 15 seconds between messages sent in strings. All operators will listen during this silent period in order that any urgent traffic may be cleared.

THESE SPACES FOR MESSAGE CENTER ONLY		
TIME FILED	MSG CEN NO	HOW SENT
LB T KL V FX	MESSAGE	G O
(SUBMIT TO MESSAGE CENTER IN DUPLICATE)		
No _____	DATE _____	
To _____	NR13 CD GOXDR FADUL KIJEY	
NAMIH LAEDG PRYNO CAJIN ZEDBL		
DOFIN AWENJ 957A		
1015A X		
OFFICIAL DESIGNATION OF SENDER		TIME SIGNED
SIGNATURE AND GRADE OF WRITER		

TL-2187

FIGURE 13.—Abbreviated form message copies on message form.

The receiving operator copies all messages in duplicate. The first line of the text is copied on the line below the line beginning with the word "To." Succeeding lines of text are copied on alternate lines of the message form to enable handling personnel to read the text more easily. Unless otherwise specified in the text of the message, the writer and the addressee are indicated by the call signs of the station of origin and the station of final receipt and are the commanding officers of the units which these stations serve. The first group of the text, NR13, is a number group which is composed of the two letters NR and the number which the writer assigned to the message as a means for his future identification of the message. This number may or may not appear on messages in either the abbreviated or normal form. The blank following "No" on the message form is for use with the normal form message only and is properly filled with a serial number assigned by the radio station of origin and serves as a means of future identification of the message for that radio station. The blank following "Date" on the message form is for use with the normal form message only and is filled with

the date of the day on which the message was filed with the message center. This date when inserted as part of the heading of a normal form message is spelled out; for example, "Fifteenth," and the month and year are *not* written on the blank containing the message. The blank following "To" is reserved for use of the message center, as are also the blanks following "Time filed," "Msg Cen No," and "How sent" at the top of the message form.

b. Receiving operator's service.—The notation 1015A X is called the receiving operator's "service." X is the receiving operator's personal sign. 1015A is the time the message was receipted for by the receiving operator, that is, the time at which the message was considered as completely and correctly received. The receiving operator encircles his service as shown in figure 13 to indicate definitely that the service is not part of the text.

c. Transmitting operator's service.—The transmitting operator services his copy of the message by entering the time of receipt and his personal sign at the bottom of the message. In addition he indicates the station to which the message was sent, in the event that this information is not already noted on the message blank. Many operators perform this service with one hand while operating the key with the other.

65. Requests for repetitions.—*a. Use of \overline{IMI} .*—The manner in which a receiving station requests repeats for all or parts of a message is given below. Consider the original transmission to have been:

BC2 V CA O \overline{BT} DFC4 XPST ROYM ACZU FVLN
 PKGZ QEBD HJOW 610P K

Should BC2 desire a repetition of the entire message, he transmits:

CA V BC2 \overline{IMI} \overline{AR}

CA then repeats the entire message. Had BC2 missed any portion of the heading, he must request a repetition of the entire heading:

CA V BC2 \overline{IMI} AB \overline{BT} \overline{AR} (Repeat all before \overline{BT} .)

To which CA replies:

BC2 V CA \overline{XE} BC2 V CA O \overline{BT} \overline{AR}

This transmission includes the \overline{BT} itself, as well as everything before the \overline{BT} . For any other repeat requests, BC2 makes judicious use of AB (all before), AA (all after), WA (word after), and GR (text group number). For example, desiring a repeat of the time of origin, BC2 might have transmitted either of the following:

CA V BC2 \overline{IMI} WA HJOW \overline{AR}

or

CA V BC2 \overline{IMI} AA HJOW \overline{AR}

Responses to the above requests would be respectively:

BC2 V CA HJOW 610P AR
BC2 V CA HJOW 610P AR

Note that in each case the originating station repeats the last group received correctly as well as that portion requested. For a repetition of all between DFC4 and FVLN, the request is as follows:

CA V BC2 IMI DFC4 TO FVLN AR

CA replies:

BC2 V CA DFC4 XPST ROYM ACZU FVLN AR

Note that the originating station repeats the correctly received end groups as well as intervening portions requested. It is possible that a group to which reference is made appears elsewhere in the same text. Consider the following transmission:

OG3 V MY9 BT OBSERVER GUNNER AND PILOT OF ENEMY BOMBER CAPTURED AND BEING HELD PENDING ARRIVAL OF INTERPRETER 957A K

Having missed everything after OF, the fifth word of the text, OG3 requests:

MY9 V OG3 IMI AA PILOT AR

Had OG3 requested simply IMI AA OF, MY9 would not have known whether to begin his repeat with OF ENEMY or with OF INTERPRETER. In a message with a long text a particular group referred to by the receiving operator might be difficult for the transmitting operator to locate readily. In such a case repetitions are facilitated by numbering the text groups in sequence and referring to any particular group by both its number and the group itself. For example, IMI AA GR19 ADQC requests a repetition of all groups after ADQC, ADQC being group number 19; or IMI GR19 ADQC TO SUMC requests a repetition of all groups between ADQC, which is number 19, and SUMC. Whenever the receiving operator is uncertain of the ordinal number of a group, as is the case if he has missed an unknown number of preceding groups, it will be necessary to refer to the group alone without number as was done above with SUMC: IMI ADQC TO SUMC.

b. Break-in operation.—Break-in operation, in which the receiving operator may interrupt the transmitting operator at any time, is authorized, and its use will be explained later. However, since break-in operation is not possible with many types of field radio equipment, all requests for repetitions during this preliminary training period will be conducted as indicated in *a* above.

66. Procedure signs and procedure signals.—a. Procedure signs.

<i>Procedure sign</i>	<i>Meaning</i>
AA -----	All after.
AB -----	All before.
BT -----	Break.
C -----	Affirmative. Correct.
G -----	Repeat back.
GR -----	Group.
O -----	Urgent.
T -----	Transmit (to).
WA -----	Word after.

b. Procedure signals.

Classification	Procedure signal	Meaning
O: Operating -----	ZOD ZOE	Transmit your messages in strings of ----- I am going to transmit my messages in strings of -----

67. Questions for self-review.—a. In the transmission shown below indicate the following: message, text, time of origin, call, special operating instructions, retransmission instructions, break, heading, station of origin, station of destination, and terminating procedure sign.

**JK V FG T KL V FG G O BT ATTACK AT ONCE
820A K**

b. How does the transmitting operator indicate that a message is urgent? Routine?

c. In the message shown in question *a* above, if JK had missed the word ATTACK, how would he request a repetition to obtain this word? How would he request a repetition of the operating instructions? Of the complete text?

d. With reference to a G message should the service time be that at which the originating station transmits K, that at which the receiving station completes the repeat back, or that at which the originating station transmits C? Why?

e. What procedure sign is used to separate messages sent in strings?

f. Show the receiving operator's acknowledgment for reception of the following three messages sent in a string: 1210A, 1215A, 1222A.

g. How many groups are printed per line in reception?

h. Why is the text of the message copied on alternate lines?

i. Does a receiving operator record anything on the line of the message blank marked "To"? Why?

68. Operation exercise.—A net consists of three stations, LA, LB, and LC, with net call sign LX. LA is the NCS. The NCS will open a free net. No readability will be below ZSB4. Traffic will be exchanged in the following order:

To	From	Retransmission instructions	Special operating instructions	Remarks
LB	LC	None	None	Single message.
LC	LA	None	G O	LA sends to LC; LC repeats back to LA.
LA	LB	None	None	Single message.
LC	LB	T L A V L B	O	LB sends to LC; LC relays to LA.
LB	LA	None None	None None	Two messages in string.
LA	LC	None T L B V L C	O G	LC sends two messages to LA in string; LA repeats back second message and then relays this second message to LB; LB repeats it back to LA.

SECTION IX

RADIOTELEGRAPH PROCEDURE LESSON V, THE ABBREVIATED FORM MESSAGE, CONTINUED

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69. Acknowledgment by addressee.—The writer of a message may require personal acknowledgment by the addressee of receipt of a message. In this case the transmitting operator includes the procedure sign Y (“Acknowledge”) in the special operating instructions in the heading of the message. Example:

JK V FG Y O BT DFC4 PLIX FOAM 1030A K

JK receipts for correct reception in the usual manner:

FG V JK R

When the message is delivered to the addressee, he is informed that an acknowledgment is requested. The addressee, after he has received and understood the message, notifies his message center that the message is to be acknowledged. When JK is so informed, he transmits:

FG V JK O BT FG 1030A 1045A K

The above acknowledgment is a regular message. 1045A is the time of origin of the message; in other words, it is the time of the acknowledgment by the addressee. The text of the acknowledgment message, viz., FG 1030A 1045A, means: "The message which was originated at FG at 10:30 A. M. has been acknowledged by the addressee at 10:45 A. M." An operator receiving such an acknowledgment forwards the acknowledgment message to his message center just as he has copied it. The message center interpolates its text to read: **YOUR MESSAGE OF 10:30 A. M. HEREBY ACKNOWLEDGED.** The signature on the above message is that of the commanding officer of the tactical unit to which JK belongs; the addressee is the commanding officer of the tactical unit to which FG belongs; and the ultimate recipient is the individual who wrote the original message which is being acknowledged. The acknowledgment carries the same classification as the original message. An original urgent message receives an urgent acknowledgment; an original routine message, a routine acknowledgment.

70. Check with originating message center.—In case a received message appears incoherent when decoded, a check with the station from which the message was received may be directed by the message center of the receiving station. Having been directed to obtain such a check, the radio operator of the receiving station employs the procedure signal ZMX: "Verify the message or portion thereof indicated with your message center (communication office) and transmit correct version." EF, having receipted for an abbreviated form message with a time group 1130A from DD, later is requested by his (EF's) message center to secure a check and repetition of a portion of the message. EF transmits:

DD V EF ZMX DD 1130A NUGWH TO APDWT K

DD transmits:

EF V DD R

And then DD refers this questionable portion to his message center for check. DD's message center locates the error in the original encoding

and gives the correct coded version to the radio operator, who transmits:

EF V DD C DD 1130A NUGWH WIGSO ZLAYS
APDWT K

C DD 1130A means: "The following is the correct version of a portion of a message originated at DD at 11:30 A. M." In reply to a request for a check and repeat of the complete message, DD would transmit:

EF V DD C EF V DD BT NR76 CD NUGWH WIGSO
ZLAYS APDWT ZOTQB ITBQW RLUMN 1130A K

In this last transmission a reference to the station and the time of origin preceding the message is unnecessary, since this information appears in the message. Requests for check of specific portions of a message are made in a manner corresponding to that for which requests are made for ordinary repetitions, using ZMX in the former case where IMI is used in the latter. Thus, whereas a repetition of the complete text of a message is requested by transmitting IMI AA BT, a check of a text by a message center is requested by transmitting ZMX AA BT.

71. Verification by the writer.—The addressee may direct that all, or a part, of the contents of a message be verified by the writer. EF, having received an abbreviated form message from DD with a time group 1130A, later is directed by the addressee at EF's unit to secure a verification and repetition of a portion of the message. EF transmits:

DD V EF J DD 1130A HIHO TO SAPV K

DD transmits:

EF V DD R

And then DD's message center refers this questionable portion (properly decoded) to the originator for verification. The verified original or altered version is transmitted:

EF V DD C DD 1130A HIHO DANY MASU SAPV K

C DD 1130A means: "The following is the correct version of a portion of a message originated at DD at 11:30 A. M." The procedure is entirely analogous to that used for checking errors within the signal network, replacing ZMX with J.

72. Correction initiated by originating station.—It is possible that an originating station may detect an error in a message previously transmitted, and for which a receipt has already been obtained. For example, consider that EF has transmitted as a part of a message: NUGWH NOZIQ LPURT APDWT. EF some time later discovers

that the groups NOZIQ LPURT are incorrect and should have been WIGSO ZLAYS. EF transmits:

DD V EF CCCC EF 1130A NUGWH WIGSO ZLAYS
APDWT K

including the overlapping groups NUGWH and APDWT which were previously sent correctly. This means to DD: "Herewith a correct portion of a message originated at EF at 11:30 A. M. Correct the message accordingly." The four C's serve to direct definitely the receiving operator's attention to the fact that the transmission following is a correction originated by the transmitting station.

73. Transmitting to a silent station.—A station whose transmitter is inoperative can receive messages by radio but must acknowledge receipt of the message by other signal means if such are available. To increase a silent station's chances of receiving a radio message intended for it, the message is generally transmitted twice.

a. "F" method.—One way of transmitting to a station when a radio reply is forbidden or impossible is the direct, or "F", method. F means "Do not transmit. Do not answer." The transmitting station sends all calls, groups, procedure signs, with the exception of V, twice, and terminates with \overline{VA} .

Example:

DB DB V DA DA F F \overline{BT} \overline{BT} \overline{VOBU} \overline{VOBU} 1235P
1235P \overline{VA} \overline{VA}

b. Intercept method.—A second method is the "intercept" or "I" method. By prearrangement, messages whose contents are intended for a silent station can be exchanged between two regularly operating stations. For example, EF might transmit a message to EG. The message center at EG, on decoding the message, learns from its contents that it is intended for a third station, EH, and EG takes no further action on the message. EH, however, gets the message by "eavesdropping" when it is transmitted from EF to EG. In this way the enemy may be kept in ignorance of the existence of a station at EH at least until such time as EH begins transmitting. To assist EH's reception of messages by the intercept method, those messages which are intended for EH may be confined to the G messages in the net. In this way EH has two opportunities for copying each message, once when it is first transmitted and a second time when it is repeated back. Further, EH is not obligated to copy and decode all the messages in the net, but only the G messages.

74. Messages of execution.—The procedure sign \overline{IX} transmitted just before the \overline{BT} sign means: "The message following is a prepara-

tory command and is not to be acted upon until the execute sign is received." Example:

NA V EF \overline{IX} BT ATTACK 630A K

This message means: "Prepare to attack. A signal of execution will follow shortly." The message is acknowledged:

EF V NA R

Then, until the signal of execution is transmitted, no transmissions whatsoever will be made in the net other than such as pertain directly to the preparatory order just issued, for example, a revoking order by EF or the signal of execution itself. The signal of execution is \overline{IX} followed by a five-second dash:

NA V EF \overline{IX} 5-second dash.

This message is not acknowledged. In the event that there may not be sufficient time intervening between the preparatory order and the signal of execution to permit a receipt for the former, EF concludes the preparatory order with \overline{AS} instead of with K:

NA V EF \overline{IX} BT ATTACK 630A \overline{AS}

NA does not receipt but awaits the next transmission from EF. (The student should practice making five-second dashes. Individuals who have not definitely trained themselves to perceive time intervals usually have a surprisingly poor concept of the duration of seconds.)

75. Break-in operation.—If the radio equipment in the net is of a type permitting break-in operation, one station may interrupt another by making long dashes. To illustrate: BC, while receiving message from EF, misses the group after ABYZ. BC transmits a series of long dashes until EF stops, at which time BC transmits:

ABYZ K

EF resumes his transmission with the group ABYZ:

ABYZ BZXY CDWX 630A K

If BC encounters temporary interference which blankets EF's signals, making reception impossible, BC transmits a series of long dashes until EF stops, at which time BC transmits:

\overline{AS}

BC repeats \overline{AS} every 30 seconds until the interference has sufficiently subsided and then directs that EF continue from the last group which BC has correctly received, say ZYNO, by transmitting:

ZYNO K

76. Procedure signs and procedure signals.—a. Procedure signs.

Procedure sign:	<i>Meaning</i>
<u>F</u>	Do not transmit. Do not answer.
<u>I X</u>	Execute to follow.
<u>J</u>	Verify and repeat.
<u>Y</u>	Acknowledge.
<u>I X</u> 5-second dash	Execute.

b. Procedure signals.

	<i>Meaning</i>
M: Messages..... ZMX	Check the message or portion thereof indicated with your message center (communication office) and transmit correct version.

77. Questions for self-review.—a. How does a transmitting operator indicate to the receiving operator that the writer of a message desires a personal acknowledgment from the addressee?

b. If at 7:25 A. M. the addressee acknowledges an abbreviated form message BC2 711A, show the message of acknowledgment which is actually transmitted.

c. What procedure signal is used to request a check with the message center of origin?

d. Show the transmission sent to the station of origin from BC2 to obtain the writer's verification on an abbreviated form message BC1 515A.

e. Show the transmission from the station of origin to BC2 to indicate that the writer of an abbreviated form message BC1 329A verifies the group after HIHO as DANY.

f. EF has sent the following message to BC:

BC V EF BT ADVANCE TO CONEWAGO 102A K

A few minutes later EF's message center discovers that the word TO in the above message should have been ON and directs EF to correct the message. Show EF's transmission to BC.

g. How is an F message terminated? Why?

h. What is the principal advantage of the intercept method over the F method for transmission to a silent station? Give one advantage of the F method over the intercept method.

i. How is the following transmission interpreted:

LA V LB I X BT FIRE MIDNIGHT K

j. Do stations report into the net anew in the event of a change of call signs during net operation?

78. Operation exercise.—Radio stations in this exercise are those of the 4th Infantry and of the 1st, 2d, and 3d Battalions, 4th Infantry. The 2d Battalion station is a silent station. Student operators assigned to these units will refer to the signal operation instructions shown in FM 24-5 for their call signs. Consider the date as December 1, 1938. (If FM 24-5 is not available, the instructor will supply each student with some form of signal operation instructions.) The instructor will prescribe the traffic to be handled and will order checks, verifications, acknowledgments, and corrections as desired. Messages of execution will be included.

SECTION X

RADIOTELEGRAPH PROCEDURE LESSON VI, THE
NORMAL FORM MESSAGE

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79. Variation from abbreviated form.—*a. General.*—The normal form message differs from the abbreviated form message principally in that the former includes the additional features of a text group count (total number of groups in the text), a station-to-station serial number, and a date in the heading. A further distinction is in the classifications of the messages. Abbreviated form messages are classified simply as either urgent (O) or routine, whereas normal form messages are divided into four groups: urgent (O), priority (P), routine, and deferred (D), in descending order of precedence. Handling of the two forms of messages, differs in certain details. These differences are illustrated in this lesson.

b. Precedence of handling.—(1) Urgent messages (O) are transmitted immediately upon receipt except when communication involving another urgent message is being carried on. Thus, the transmission of a deferred, routine, or priority message is interrupted for the transmission of an urgent message.

(2) Priority messages (P) are sent in the order received but before such routine or deferred messages as may be waiting to be sent. The transmission of a message usually is not interrupted to send a priority message.

(3) Routine messages are sent in the order received but before such deferred messages as may be waiting to be sent. The transmission of a deferred message is not interrupted to send a routine message.

(4) The deferred classification (D) is used for those messages whose delivery to an addressee may be delayed until the beginning of office hours on the morning following the day on which they are filed. Although deferred messages are sent ordinarily after routine messages, they must be delivered by the beginning of office hours, which means that under some circumstances they must be sent ahead of routine messages. However, no deferred message is sent ahead of a priority message.

80. Form of the message.—A specimen normal form message with the various components noted is illustrated below:

Heading	Call	Station-to-station serial number	Retransmission instructions	Special operating instructions
	E O 2 V B C 3	NR 2	T A K 1 V B C 3	G Y
	Classification	Group count	Date	Break
	P	GR 10	F I F T H	B T

Writer's serial number	Code identification			Time of origin	Terminating sign
NR 6	D F C T 1	ALPX DGRY QWRC HJVJ KLG Y HYTR DJYR		818A	K

Text

If the same text were included in a routine message sent direct to AK1 from BC3 with no special operating instructions, the message would appear:

	Station-to-station serial number	Group count	Date	Break	
	AK 1 V B C 3	GR 10	F I F T H	B T	
Writer's serial number	Code identification	Station-to-station serial number	Group count	Date	Break
NR 6	D F C T 1	ALPX DGRY QWRC HJVJ KLG Y HYTR DJYR		818A	K

Text

81. Group count.—Any connected group of transmitted characters in the text is counted as one group, each operator being careful to preserve the manner of separating groups as they are originally written. Thus if an originator of a message chooses to write TWENTY ONE (two words), this expression should reach the addressee as TWENTY ONE (two words) and not as TWENTYONE (one word) Obviously, considerable care must be exercised in both transmission and reception to maintain the separations between groups as they properly occur. Examples:

Group:	<i>Counted as—</i>
DG8F.....	One word
DG 8F.....	Two words
630A.....	One word
NR14.....	One word
NEWYORK.....	One word
NEW YORK.....	Two words
Thirty-first is | THIRTY FIRST.....	Two words
sent either | THIRTYFIRST.....	One word

82. Station-to-station serial number.—The station-to-station serial number is the normal form message identification. EO2 V BC3 NR2 in the heading of the message of paragraph 80 means “message number 2 from BC3 to EO2.” BC3 assigns a number 1 to the first message of the radio day which this station transmits to EO2, a number 2 to the second message it transmits to EO2, etc. Further, BC3 assigns a number 1 to the first message of the radio day which it transmits to AK1, a number 2 to the second message it transmits to AK1, etc. With the number and the station to which the message is sent, BC3 uniquely identifies each message it transmits. In a similar manner in its records of received messages, BC3 identifies each message it receives as the third for the radio day from EO2 or the fifth from BC1, etc. If it is desired to send the same message to two or more stations simultaneously, a separate station-to-station serial number is included in the heading for each individual station in the following manner:

OR2 CB2 V AB3 XE OR2 NR8 XE CB2 NR3 GB5
 FOURTEENTH BT VUBO ABYZ BCKY CDWX
 807P K

The station-to-station serial number changes as a message passes through the various links of a relay system. Each station transmitting the message assigns it a number appropriate to that station's own records. In referring to a message of some preceding date, the date is included along with the serial number, as NR7 TWENTYFIRST.

several numbers indicates a group of messages sent in a string. The operator's servicing time for the string is that shown opposite the last number of the series. If it develops that through some oversight one number has been omitted in the numbering of messages to or from a particular station, for example, if five consecutively transmitted messages had carried the numbers 1, 2, 3, 5, 6, respectively, the operator detecting the error enters the notation BLANK, plus his personal sign in the space on the number sheet corresponding to this missing number and notifies the other station concerned to do the same. If two messages are through error assigned the same serial number, the number bearing the latest filing time is assigned the next half number above. For example, if two messages have been given the number 8, the message with the more recent filing time is given the number 8½. The other station concerned is notified to do the same.

84. Traffic check.—At the end of the radio day or just prior to the closing of the net, each station checks traffic with each other station in the net. The use of the procedure sign ZNI facilitates the traffic check. ZNI means: "Prior to closing station records, last message transmitted to you (or to——) was message number ——; last message received from you (or from him) was message number ——." The NCS first checks traffic with the secondary station. Using the net call sign, FGG, the NCS (NP) transmits:

**FGG V NP ZNI XE MS TWO XE FIVE XE QE ZERO
XE ZERO XE RJ SIX XE ZERO AR**

This indicates that the last message NP has sent to MS is NR2, the last received from MS, NR5; NP has handled no traffic with QE; and his last message sent to RJ was NR6, with none received from RJ. Presuming their records are in agreement, the secondary stations reply:

**NP V MS C
NP V QE C
NP V RJ C**

If, however, QE's number sheet shows one message received by QE from NP and none transmitted by QE to NP, QE would so state:

NP V QE ZNI ZERO XE ONE AR

If, on rechecking, NP observes that this is correct, he transmits to QE:

QE V NP C

Otherwise the two stations make an effort to rectify the error by using any of a series of procedure signals, ZNA to ZNI, provided for this purpose. After the NCS has completed his traffic check with all

secondary stations, the next station in alphabetical or numerical order of call signs will check traffic with the remaining stations, etc., until every station in the net has checked traffic with every other station in the net.

85. Transmissions relating to traffic handling.—a. Deviations from abbreviated form message procedure.—Repetitions, verifications, acknowledgments, and other transmissions relating to the signal system are handled in the same manner for normal form messages as for abbreviated form messages with the one principal difference that normal form messages are referred to by serial number (and date if necessary) whereas abbreviated form messages are referred to by station of origin and time of origin. As an example of normal form identification practice consider the verification request:

EF5 V CD3 J NR3 K

This transmission means: "Secure verification of EF5's message number 3 to CD3." The acknowledgment message in answer to the above verification request is a further example:

CD3 V EF5 NR3 GR2 SEVENTH BT NR10 620P K

In the case of a normal form message which has passed through relay channels and has suffered the accompanying serial number changes, it may be advisable in the interest of clarity to discard the usual normal form identification by number and to refer to the message by station of origin and time of origin (as is done with abbreviated form messages). Thus a message which has reached the addressee through intermediate relays might be followed by an acknowledgment in which the original message is referred to in this abbreviated form manner. Example:

FG V LA NR9 T FR V LA P GR3 THIRTYFIRST
BT FR 341A 400A K

b. Challenging the check.—When the group count in the heading of a received message is in disagreement with the number of groups in the text as counted by the receiving operator, the receiving operator challenges the check before receipting for the message. Assume that RX has transmitted the following to LC:

LC V RX NR3 D GR 13 TWENTYSEVENTH BT NR15
WXKZ BNTZ LOPY QRKS TNTU XART NQRK WFTS
RXZY DOGY 620P K

LC copies the message, counts the number of text groups, and finds that the group count should be GR12 instead of GR13. LC transmits:

RX V LC GR12 IMI (Isn't GR12 correct?)

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RX on recounting finds that LC is correct and replies:

LC V RX C

LC receipts for the message:

RX V LC R

Assume now that RX had properly transmitted GR 12 with the above message but that LC, missing the entire group NQRK in copying, believes the group count to be GR11. LC transmits:

RX V LC GR11 IMI

RX, recounting and finding GR12 to be correct, transmits the first letter of each text group as follows:

LC V RX GR12 XE N W R L Q T X N W
R D 6 AR

LC readily observes that the second group which begins with N is missing from his copy. Possibly RX failed to transmit this group; possibly LC missed this group in copying. LC requests:

RX V LC IMI WA XART AR

RX complies:

LC V RX XART NQRK AR

and LC receipts for the message:

RX V LC R

c. Long messages.—Long messages may be broken down into sections of fifty text groups each, the receiving station receipting for each section before the section following is transmitted. Each section except the last is terminated with B ("more to follow") and a number indicating the last group transmitted. For example, CD transmits a long message to EF, in which the fiftieth group is WPLA and the one-hundredth group is UBLA:

EF V CD NR4 GR137 TWENTYNINTH BT (49 groups of
text) WPLA B 50 K

EF either requests repetitions as necessary or receipts for the first fifty groups correctly copied:

CD V EF R 50 K

CD renews transmission with the fifty-first group and continues to the one-hundredth:

EF V CD XE (next 49 groups of the text) UBLA
B 100 K

EF either requests repetitions again, if necessary, or receipts for the second fifty groups correctly copied, after which CD transmits the remainder of the message, that is, groups 101 through 137.

d. Messages sent in strings.—Normal form messages sent in strings are acknowledged in the following manner:

TW V WG R NR3 TO 10 AR

86. Procedure signs and procedure signals.—*a. Procedure signs.*

<i>Procedure sign</i>	<i>Meaning</i>
D-----	Deferred.
P-----	Priority.

b. Procedure signals.

Classification	Procedure signal	Meaning
N: Numbers-----	Z N A	What was station serial number of last message received from this station (or from -----)?
	Z N B	Station serial number of last message received from you (or from -----) was -----.
	Z N C	What was station serial number of last message you transmitted to me (or to -----)?
	Z N D	Station serial number of last message transmitted to you (or to -----) was -----.
	Z N E	Number ----- from ----- is blank.
	Z N F	Repeat all before group 1 of message number ----- to number ----- transmitted (or transmitted by -----) to straighten out confusion in serial numbers.
	Z N G	Two messages, reference numbers ----- and ----- (or group counts and time of origin ----- and -----), both received as serial number ----- . Designate correct serial number.
	Z N H	Change serial number of message with reference numbers ----- (or group count and time of origin -----) to serial number -----.
	Z N I	¹ Prior to closing station records, last message transmitted to you (or to -----) was message number -----; last message from you (or him) was message number -----.

¹ Repeat for as many stations as necessary to complete check.

87. Questions for self-review.—*a.* List the relative advantages of normal form and abbreviated form messages.

b. How would an operator acknowledge receipt of messages NR1, NR2, and NR3 sent in a string?

c. Does a relayed message retain its original station-to-station serial number?

d. Prior to closing stations, the last message which LA has sent to LB is NR2, and the last message which LB has sent to LA is NR8. Show how LA could convey this information to LB, and also how LB could convey this information to LA.

e. A receiving operator counts 23 groups in a message which he has just received. The transmitted heading of the message carries a group count GR22. How does the receiving operator indicate this discrepancy to the transmitting operator? If the transmitting operator on rechecking finds no error in his own group count, what action does he take?

f. How would a message of 212 groups be subdivided for transmission? Show how each subdivision is terminated in transmission.

88. Operation exercise.—*a. Suggestions to instructor.*—(1) Arrange table nets of three stations designating the stations in each net as 6th Corps, 601st Division, and 603d Division. Furnish each operator with—

(a) Signal operation instructions in which call signs for these stations may be found.

(b) An operator's number sheet.

(c) A station log blank.

(d) Message forms.

(e) Ten "canned" messages in the normal form as they would be furnished the operator by the unit message center. In a few of these messages insert an incorrect group count.

(2) During the actual exercise, deliberate omission of a group in some message and deliberate misnumbering of a message may be directed. This procedure will require practice on the part of the student in correcting such errors.

b. Directions to the student.—(1) Establish the net using call signs found in the signal operation instructions furnished.

(2) Transmit the traffic with which you have been supplied.

(3) Keep a station log and an operator's number sheet.

(4) Check traffic in preparation for closing the net.

(5) Close the net.

SECTION XI

RADIOTELEPHONE PROCEDURE LESSON I, GENERAL

	Paragraph
General.....	89
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Procedure signs and procedure signals.....	92
Establishing a net.....	93
Separate call-ups and answers.....	94
Receipts and answers.....	95
Repetitions.....	96
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Operation exercise, radiotelephone procedure lesson I.....	100

89. General.—Radiotelephone communication is conducted in a manner similar to that in which radiotelegraph communication is conducted. Thus the radiotelegraph procedure previously presented is used as a background on which instruction in radiotelephone procedure is based. When it is desired to conduct instruction in radiotelephone procedure only, the material covering radiotelegraph procedure for abbreviated form message may be modified easily to adapt it to that purpose. The use of the radiotelephone for signal communication contemplates the transmission of many short messages in the abbreviated form. Rapidity and accuracy of transmission, as well as simplicity of language and procedure, are essential.

90. Phonetic alphabet.—When transmitting individual letters and the component letters of unpronounceable groups by radiotelephone, each letter is spoken as indicated in the phonetic alphabet shown below. This alphabet is habitually used in the transmission of cryptographed texts of messages and of call signs. Thus, group XISV is transmitted as "XRAY INTER SAIL VICTOR," and the call sign GM as "GEORGE MIKE". However, when transmission conditions are favorable and the operators are able to recognize each other's voices without confusion, the use of the phonetic characters for the call signs may be dropped. Under some circumstances, as in artillery air-ground communication, when speed of transmission is important, the entire call-up may be eliminated, once communication has been established. Words, the pronunciation of which is apt to be misunderstood, should be spelled out. Thus BARTS is transmitted

“BARTS, BAKER AFIRM ROGER TARE SAIL” and not “B AS IN BAKER, A FOR AFIRM”, etc.

Letter	Spoken as	Letter	Spoken as	Letter	Spoken as
A.....	AFIRM.	J.....	JIG.	S.....	SAIL.
B.....	BAKER.	K.....	KING.	T.....	TARE.
C.....	CAST.	L.....	LOVE.	U.....	UNIT
D.....	DOG.	M.....	MIKE.	V.....	VICTOR.
E.....	EASY.	N.....	NEGAT.	W.....	WILLIAM.
F.....	FOX.	O.....	OPTION.	X.....	XRAY.
G.....	GEORGE.	P.....	PREP.	Y.....	YOKE.
H.....	HYP0.	Q.....	QUEEN.	Z.....	ZED.
I.....	INTER.	R.....	ROGER.		

In joint Army and Navy operations, “I” is “interrogatory.”

91. Pronunciation of numerals.—*a.* The following pronunciation of numerals is prescribed for use in all transmissions:

Numeral	Spoken as	Numeral	Spoken as
0.....	ZE-RO.	5.....	FI-YIV.
1.....	WUN.	6.....	SIKS.
2.....	TOO.	7.....	SEV-VEN.
3.....	THUH-REE.	8.....	ATE.
4.....	FO-WER.	9.....	NI-YEN.

b. Numbers are transmitted by transmitting the separate digits of the number, except in the case of an even hundred, thousand, or million, when the word hundred, thousand, or million is used:

Number:	Spoken as—
44.....	FO-WER FO-WER.
30.....	THUH-REE ZE-RO.
196.....	WUN NI-YEN SIKS.
300.....	THUH-REE HUNDRED.
1572.....	WUN FI-YIV SEV-VEN TOO.
8000.....	ATE THOUSAND.
12000.....	WUN TOO THOUSAND.

92. Procedure signs and procedure signals.—When procedure signs or procedure signals are used in radiotelephone communication,

either procedure words or the exact words in the meanings of procedure signs and procedure signals are spoken. Examples:

Procedure sign or signal:	<i>Transmitted by radiotelephone as—</i>
<u>AB</u>	ANSWER (applies only when establishing communication).
<u>AS</u>	WAIT.
<u>C</u>	THAT IS CORRECT.
<u>EEEEEEEE</u>	ERASE ERASE ERASE.
<u>GB</u>	GROUP COUNT.
<u>IX</u>	EXECUTE TO FOLLOW.
<u>IX</u>	STAND BY-EXECUTE (in artillery operations, FIRE).
<u>J</u>	VERIFY AND REPEAT.
<u>K</u>	GO AHEAD.
<u>R</u>	ROGER or WILCO (see note below).
<u>T</u>	TRANSMIT or TRANSMIT TO.
<u>V</u>	(in complete call) FROM; (in partial call) THIS IS.
<u>Y</u>	ACKNOWLEDGE.
<u>IMI</u>	REPEAT or IS THIS CORRECT?
<u>VA</u>	THAT IS ALL (finish of communication).
<u>ZMW</u>	OF WHAT PRECEDENCE AND TO WHOM ARE YOUR MESSAGES?

NOTE.—The word ROGER, which is the phonetic equivalent of the letter R, is used as a general signal of receipt. WILCO, which is a coined word meaning "will carry out orders" or "will comply," is used when the operator receipts for a message which contains an order or a request which he can carry out directly. When an operator handles messages which he gives to his message center, he can properly use only ROGER in receipting for them, regardless of their contents. However, the pilot of an airplane, the commander of a tank or other vehicle, or any commander who uses radiotelephone equipment, is the direct recipient of messages containing orders or requests, and he therefore acknowledges them directly by using WILCO. Of course, if the messages contain information only, and not orders or requests requiring execution, he uses ROGER.

93. **Establishing a net.**—a. UN, LA, and DM are stations in a net having the net call SX. The net is about to go into operation in a tactical situation. The operators are aware of their call signs, of the net frequency, of the time when complete communication within the net is expected, and that UN is the net control station. Under normal circumstances, the net would come into operation as follows:

SAIL XRAY FROM UNIT NEGAT ANSWER

The other stations report in:

UNIT NEGAT FROM DOG MIKE GO AHEAD
UNIT NEGAT FROM LOVE AFIRM GO AHEAD

If all readabilities are satisfactory, it is not necessary to exchange reports, as it is important in all radiotelephone operation to keep net "chatter" down to a minimum. Message traffic can commence

immediately after the net is established in this quick, efficient manner.

b. Suppose that station UN does not make the net call at the prescribed time, possibly because his installation is not yet complete. Station LA is ready, and, hearing nothing on the net frequency, transmits:

SAIL XRAY FROM LOVE AFIRM
STATION REPORTS INTO NET
ANSWER

LA may repeat the call-up as prescribed in radiotelegraph procedure. Station UN, completing his installation and listening on the assigned net frequency, hears LA's transmission and answers:

LOVE AFIRM FROM UNIT NEGAT
READABILITY GOOD
STATION REPORTS INTO NET
NET CONTROL STATION
ANSWER

Since UN gave LA a readability report, his terminating word ANSWER implies, "Give me a readability report." LA answers:

LOVE AFIRM READABILITY GOOD
GO AHEAD

Station UN receipts for this report simply by saying

UNIT NEGAT ROGER

UN then continues to listen on the net frequency for station DM

c. During the above intercommunication DM, completing his installation and listening on the assigned net frequency, overhears UN and LA working together. He waits for them to complete their transmissions and then transmits:

UNIT NEGAT FROM DOG MIKE
READABILITY GOOD
STATION REPORTS INTO NET
ANSWER

UN replies:

UNIT NEGAT
PERFECTLY READABLE
FOLLOWING STATION IS IN THE NET LOVE AFIRM
NET CONTROL STATION
GO AHEAD

DM complies:

DOG MIKE ROGER

DM now calls LA to exchange readabilities:

LOVE AFIRM FROM DOG MIKE
READABILITY GOOD
ANSWER

LA replies:

LOVE AFIRM
PERFECTLY READABLE
GO AHEAD

DM finishes:

DOG MIKE ROGER

The three stations are now in communication with each other and are ready to exchange traffic.

94. Separate call-ups and answers.—*a.* The use of a separate call-up and answer prior to the transmission of a message, or of operating instructions, is unusual. Only under adverse circumstances of communication are separate call-ups authorized. Thus station JM, having a routine message for station WG, transmits without prior call-up:

WILLIAM GEORGE FROM JIG MIKE
MISSION ACCOMPLISHED
GO AHEAD

b. Under very adverse circumstances of communication, station JM may transmit:

WILLIAM GEORGE FROM JIG MIKE
ANSWER

and, after receiving GO AHEAD from station JM, WG transmits:

WILLIAM GEORGE FROM JIG MIKE
MISSION ACCOMPLISHED
GO AHEAD

Obviously this latter procedure introduces considerable delay and is avoided whenever possible.

95. Receipts and answers.—*a.* Receipts and answers do not contain the call sign of the station which made the transmission being answered. Thus, station WG, in receipting for the message transmitted by JM in paragraph 94*a*, transmits:

WILLIAM GEORGE ROGER

b. Station JM transmits to WG:

WILLIAM GEORGE FROM JIG MIKE
REPORT POSITION
GO AHEAD

If the operator at station WG is both able and authorized (as may be the observer in an airplane) to furnish the required report promptly, he transmits:

WILLIAM GEORGE
FIVE MILES SOUTH OF HARS HYPO
AFIRM ROGER SAIL ON STATE HIGHWAY THREE FOUR
GO AHEAD

THE RADIO OPERATOR

and JM receipts:

JIG MIKE ROGER

If the operator at station WG is either unable or unauthorized (as may be the operator at a unit headquarters) to furnish the required report promptly, he acknowledges receipt of the message:

WILLIAM GEORGE ROGER

and transmits a message to station JM as soon as the required information is determined or the answering message is received from proper authority.

96. Repetitions.—A request for a repetition is made by transmitting the word REPEAT after a call. Use of the words GO AHEAD is not required. In replying to a request for a repetition, the entire transmission must be repeated. Thus, if WG failed to receive accurately the transmission from JM shown in paragraph 94a, he transmits:

JIG MIKE FROM WILLIAM GEORGE
REPEAT

JM replies:

WILLIAM GEORGE FROM JIG MIKE
MISSION ACCOMPLISHED
GO AHEAD

WG, assuming the message was then correctly received, then transmits:

WILLIAM GEORGE ROGER

97. Closing a net.—The net established as in paragraph 93 is closed by the NCS who transmits:

SAIL XRAY FROM UNIT NEGAT
CLOSE YOUR STATIONS
GO AHEAD

Secondary stations acknowledge in alphabetical order of call signs. Thus DM transmits:

DOG MIKE WILCO

LA then transmits:

LOVE AFIRM WILCO

Note that in this case the operator uses WILCO because he complies directly with the order contained in the message from UN.

98. Difficult communication.—When communication is difficult, receiving stations may request the transmitting station to make transmissions through twice. The transmitting station in complying with such a request transmits the message or other trans-

mission in its entirety and then repeats the entire transmission. Station FG2 makes such a request of station CA by transmitting:

CAST AFIRM FROM FOX GEORGE TWO
MAKE TRANSMISSIONS THROUGH TWICE
GO AHEAD

Station CA complies as follows:

FOX GEORGE TWO FROM CAST AFIRM
REPORT POSITIONS

FOX GEORGE TWO FROM CAST AFIRM
REPORT POSITIONS
GO AHEAD

When the readability of radiotelephone signals is reported as "poor but readable" (ZSB2) the transmitting station automatically makes all transmissions through twice.

99. Questions for self-examination.—*a.* Is there any great difference between radiotelegraph and radiotelephone procedure?

b. The first letter in each word of the phonetic alphabet bears what relationship to the letter which that word represents?

c. How would you transmit the proper name "BREAM", which appeared in the text of a message being transmitted by radiotelephone?

d. How would you transmit the code group "PQTR", in the text of a radiotelephone message?

e. In transmitting procedure signs and signals, is the sign or signal itself transmitted? If not, how is the required information transmitted?

100. Operation exercise, radiotelephone procedure lesson I.—

a. Suggestions for instructor.—Telephone circuits of three telephones each may be used to represent the radiotelephone net. The telephone at each station is preferably located at such distance from other stations on the same wire circuit as to preclude direct sound transmission from one station to another. Each of the three telephones should be marked as one of the three stations of the net indicated below.

b. Directions to the student.—Your radiotelephone station is represented by the telephone to which you have been assigned. In carrying out the exercises listed in *c* below, speak slowly and distinctly, being careful to enunciate clearly all words and characters that might be misunderstood. Do not shout into the telephone. All readabilities will be indicated as at least 4. Keep a station log. Write therein your own transmissions as well as those of all other stations in the net. Entries on log sheets will be made exactly as spoken except that phonetic alphabet transmissions of call signs may be entered as the

letters involved. Actual operation will be slow. You may find it helpful, particularly during initial stages of the exercise, to write down what you are going to transmit prior to transmitting it.

Organization	Call sign	Frequency
1st DIVISION.....	CB7 (NCS).....	2700 kc.
ADVANCED LANDING FIELD 1st DIVISION.	FB1.....	
OBSERVATION PLANE IN FLIGHT.....	KB3 NET CALL— CBB	

c. *Exercise.*—Complete the following requirements in the order given:

- (1) NCS will open the net.
- (2) FB1 will assume that he heard the transmission of the NCS and will report into the net.
- (3) NCS will answer, giving necessary information.
- (4) KB3 will assume that he did not hear the transmission of the NCS and FB1 and will report into the net.
- (5) NCS will answer KB3.
- (6) KB3 will make required transmission.
- (7) FB1 will report out of the net temporarily.
- (8) NCS will acknowledge.
- (9) NCS will ask KB3 if he has anything to transmit.
- (10) KB3 will answer, telling NCS he has nothing to transmit.
- (11) FB1 will report back into the net.
- (12) NCS will answer FB1, transmitting required information.
- (13) FB1 will make required transmission.
- (14) NCS will order stations closed.
- (15) Secondary stations will acknowledge in proper order.

SECTION XII

RADIOTELEPHONE PROCEDURE LESSON II, MESSAGES

	Paragraph
Classification of messages.....	101
Omission of <u>BT</u>	102
Terminating messages.....	103
Examples of message transmissions.....	104
Relay of messages.....	105
Multiple call.....	106
Collective call.....	107
Broadcast messages.....	108
Questions for self-review.....	109
Operation exercise.....	110

101. Classification of messages.—Messages transmitted by radiotelephone are of the abbreviated form and carry the urgent classification or no classification at all. If a message is classified as urgent, the word URGENT is transmitted in the heading of the message, and the message handled as is the urgent radiotelegraph message of the abbreviated form. (See par. 60.)

102. Omission of \overline{BT} .—Neither the "break" sign \overline{BT} nor any procedure word corresponding to \overline{BT} is used in radiotelephone communication. The intonation of the voice is adequate for separating portions of the transmission involved in sending a message.

103. Terminating messages.—Methods of terminating radiotelephone messages are similar to methods of terminating radiotelegraph messages, with the following exceptions:

a. Procedure words are used instead of procedure signs. (See par. 92.)

b. The use of a specific end-of-message sign is less frequent in radiotelephone than in radiotelegraph communication. Intonations of the voice, usually quite apparent in radiotelephone transmission, clearly indicate end of message or transmission. Furthermore, some messages are commands or requests which require no answer. However, when operating conditions are poor and voice intonations are likely to be lost, the use of some formal terminating signal, such as GO AHEAD, THAT IS ALL, etc., is advisable to prevent misunderstandings.

c. The procedure word EXECUTE which replaces the 5-second dash of radiotelegraph communication is used after a call to specify that instructions, orders, or commands contained in the last message will now be carried out. When used at the end of a message it specifies that orders, commands, or instructions contained in the message it terminates will be carried out immediately.

104. Examples of message transmissions.—*a.* Urgent message from JM to WG, receipt for which is required:

WILLIAM GEORGE FROM JIG MIKE
URGENT
ENEMY TANK COLUMN MOVING SOUTH
FROM PREVIOUSLY REPORTED BIVOUAC
GO AHEAD

WG answers:

WILLIAM GEORGE ROGER

b. Routine message transmitted by the "F" method from PL to WG:

THE RADIO OPERATOR

WILLIAM GEORGE FROM PREP LOVE
 DO NOT ANSWER
 ENEMY PLANES RETURNING TO HOSTILE TERRITORY
 WILLIAM GEORGE FROM PREP LOVE
 DO NOT ANSWER
 ENEMY PLANES RETURNING TO HOSTILE TERRITORY
 THAT IS ALL

No answer is permitted from WG.

c. Transmission of a routine message to which no answer is desired and in which the context of the message and the intonation of the voice when transmitting it indicate the end of the transmission:

PREP LOVE FROM WILLIAM GEORGE
 AM ON MY WAY IN

d. Transmission of an urgent message to which no answer is desired and the context of which is a command which is to be executed immediately:

PREP LOVE FROM WILLIAM GEORGE
 URGENT
 RETURN TO ADVANCED LANDING FIELD
 EXECUTE

105. Relay of messages.—An originator may transmit messages to a receiving station for retransmission to a third station. The procedure words, RELAY TO, replace the procedure sign of radio telegraph procedure for conveying the required retransmission instructions to the relaying station. A receipt from the relaying station may or may not be required. Station WG transmits an urgent message to station JM for relay to station PL, and requests a receipt from station JM in the manner shown below:

JIG MIKE FROM WILLIAM GEORGE
 RELAY TO PREP LOVE
 URGENT
 PROCEED ON MISSION ASSIGNED
 GO AHEAD

Station JM answers:

JIG MIKE ROGER

When the above message is transmitted to station PL the call sign of the station of origin followed by the word DIRECTS, REPORTS, or REQUESTS, as the case may be, is placed just preceding the text of the original message, thus:

PREP LOVE FROM JIG MIKE
 URGENT
 WILLIAM GEORGE DIRECTS PROCEED ON MISSION ASSIGNED
 GO AHEAD

Station PL answers:

PREP LOVE ROGER

106. Multiple call.—*a.* The radiotelephone transmission of multiple address messages is accomplished in a manner similar to the transmission of multiple address messages by radiotelegraph, except that the procedure word PLUS is transmitted between the call signs of the called stations.

b. Examples.

JIG MIKE PLUS WILLIAM GEORGE PLUS PREP ROGER FROM
TARE WILLIAM RETURN TO AIRDROME ONE IMMEDIATELY
AFTER COMPLETION OF ATTACK THAT IS ALL

Note that no answer is required to the above message.

BAKER CAST THREE PLUS FOX GEORGE NINE FROM PREP LOVE
FIVE
ENEMY ARTILLERY POSITION ZED ONE
GO AHEAD

Stations BC3 and FG9 answer in the order in which they were called:

BAKER CAST THREE ROGER
FOX GEORGE NINE ROGER

c. If a station fails to answer promptly in its turn, the next station in proper order answers. Stations passed over because of their delay in answering await the completion of answers by other stations before answering.

107. Collective call.—The transmission of a message to several stations simultaneously by means of the collective call is accomplished in a manner comparable to that employed in radiotelegraph messages. Thus a station DM, having a message addressed to all other stations in the same net, the net call of which is SX, transmits:

SAIL XRAY FROM DOG MIKE
REPORT POSITIONS
GO AHEAD

Stations in the net answer in alphabetical or numerical order of call signs as the case may be.

108. Broadcast messages.—Special radio transmitters are frequently employed for the transmission of time signals and press reports. Broadcast messages from such stations are preceded by the general call transmitted three times as follows:

GENERAL CALL ALL STATIONS COPY
GENERAL CALL ALL STATIONS COPY
GENERAL CALL ALL STATIONS COPY

Each transmission is terminated with:

THAT IS ALL

No answer is permitted.

109. Questions for self-review.—*a.* How are radiotelephone messages classified as to precedence in handling?

b. When a receipt of a message is required by a transmitting station, how is that fact indicated to the receiving station?

c. LA, LB, and LC are stations in radio net LFX. Indicate two methods, either of which is suitable for the simultaneous transmission of a message to each of these stations.

d. How do you convey to a receiving station that the message you are about to transmit is to be relayed to a third station?

e. How does a relaying station indicate the station of origin of the message to the station to which he relays the message?

f. Is information received on a general broadcast acknowledged?

110. Operation exercise.—*a. Suggestions for instructor.*—The telephone net described in section XI is employed in carrying out the exercises of this lesson. If the number of students exceeds the number of telephones available, a log and a key operator may be assigned to each station. Messages should be prepared and stations in the same net furnished with different messages. If two operators are assigned to a station, that station's traffic should be divided into two sections. In each section of a station's traffic should be included messages which—

- (1) Require an answer.
- (2) Require no answer.
- (3) Prohibit an answer.
- (4) Require a repeat back.
- (5) Require a relay to a third station.
- (6) Are addressed by a multiple call.
- (7) Are addressed by a collective call.
- (8) Require the use of the phonetic alphabet in transmitting words likely to be misunderstood.

b. Directions to the student.—Your radiotelephone station is represented by the telephone to which you have been assigned. In carrying out the radiotelephone transmissions listed in *c* below, speak slowly and distinctly, being careful to enunciate clearly. Do not shout into the telephone. Use the phonetic alphabet to spell out words that might be misunderstood. Talking between key and log operators will be held to a minimum. Such conversation as is absolutely necessary will be carried on in a very low voice, as loud talking between key and log operators may be transmitted to the distant stations and

cause considerable confusion. Log operators will keep a complete log. Write down all transmissions from your own and all other stations. Make log entries exactly as spoken by the transmitting operators except that phonetic alphabet transmissions of call signs may be written as the letters represented.

Organization	Call sign	Net call	Frequency
Reconnaissance company, 1st Armored Division.	R C 1	R E C	2700
Advanced command post, 1st Armored Division.	A D 2		
Advanced landing field, 1st Armored Division.	A F		

c. Exercise.—(1) Open a free net. No readability will be indicated as less than R4.

- (2) Handle first section of your traffic.
- (3) Log and key operators change positions and duties.
- (4) Handle second section of the traffic.
- (5) Close the net.

SECTION XIII

RADIO PROCEDURE IN ARTILLERY NETS

	Paragraph
General.....	111
Codes.....	112
Air-ground net.....	113
Use of the conventional call-up.....	114
Combating interference.....	115
Illustrative examples.....	116
Questions for self-review.....	117
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111. General.—*a.* This section covers the radio procedure for the control of field artillery fire, using air observation. The procedure for forward ground observers is essentially the same.

b. The control of artillery fire by radio requires a special procedure designed for brevity, simplicity, and economy of time. Economy of time is particularly essential in the use of airplane observation. Careful prearrangement as to the observer's mission and the method of communication may eliminate much of the routine procedure prescribed in this manual.

112. Codes.—*a.* The Fire-Control Code is used by air and ground observers when fire-control messages are transmitted by radio-telegraph; this facilitates communication for observation and conduct

of fire. The Fire-Control Code is not used in voice transmissions by either wire or radio; however, for uniformity in training radio operators, the clear text equivalent of the code group is used in transmitting fire commands and sensing by radiotelephone.

b. The Air-Ground Liaison Code is used by the Field Artillery primarily for transmitting tactical information. It may be used for the designation of targets for artillery fire control when appropriate code groups do not exist in the Fire-Control Code. *In no case should groups from both codes be mixed in the same message.*

113. Air-ground net.—*a.* The air-ground net of the division artillery includes the division artillery headquarters station (NCS) and the battalion stations. The net is organized on a given frequency (W) as a directed net when a single airplane is present or expected, or on a schedule prescribed by the division artillery headquarters. At all other times the net is silent.

b. Each battalion is assigned a frequency (W, X, Y, Z, or ———) to be used when an airplane is to work only with that battalion. If all units are to use one airplane successively, all stations will work on the frequency (W) or to a designated medium battalion if there is more than one.

c. If more than one airplane is available, each is assigned to a battalion or group of battalions, and a frequency is designated for each airplane. These arrangements are made by the division artillery headquarters prior to the take-off of the airplane. Each airplane then reports directly on the prearranged frequency to the battalion or group station that will control its mission. It will be most unusual to require an airplane to change frequency while in flight; if a change in frequency is necessary, ground stations change to the frequency of the airplane.

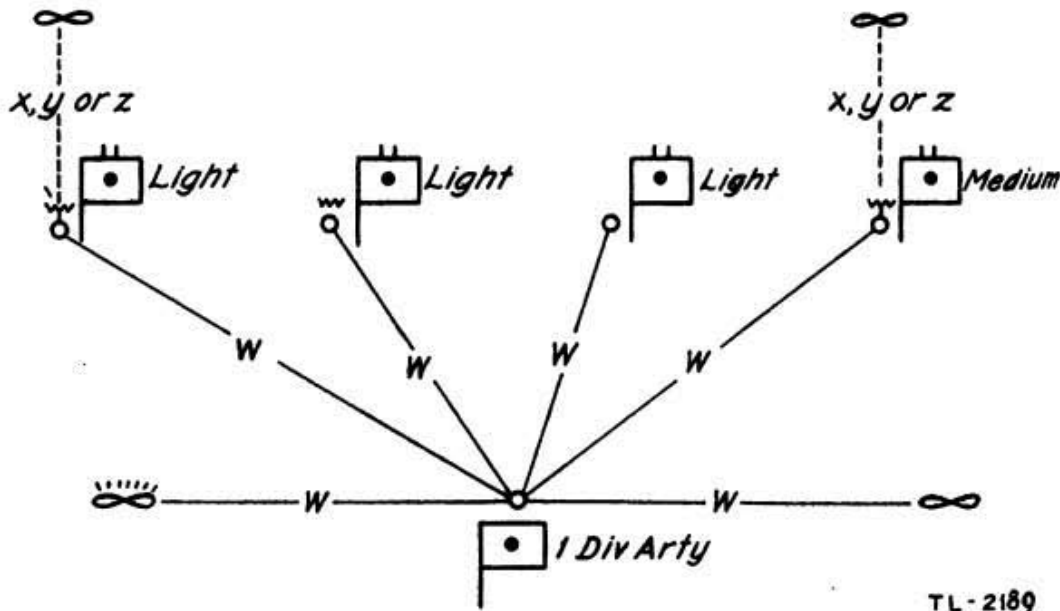
d. Figure 15 illustrates the organization of a typical division artillery air-ground net.

114. Use of the conventional call-up.—When the air observer has had little work with a particular artillery unit, considerable use of the conventional call-up (e. g., 4CZ V API \overline{AR}) may be necessary initially. However, the break sign \overline{BT} may be substituted for the entire call-up after communication has been established by radiotelegraph and no interference or difficulty of communication is anticipated. In radiotelephone work the \overline{BT} is not used (par. 102). The observer merely begins his message without formality.

115. Combating interference.—Hostile radio stations can interfere deliberately with radio communication used in the control of artillery fire, by blocking a single frequency or a band of frequencies,

and by deception, that is, causing friendly stations to accept false or erroneous information, sensings, fire commands, and the like from the enemy. The effects of interference can be minimized by—

- a. Training radio operators to work through interference.
- b. The strictest observance of radio discipline and radio security.
- c. Frequent changes of call signs and frequencies.
- d. **Limited** use of the conventional call-up.
- e. Short, quick transmissions.
- f. Limiting the number of stations in a net.
- g. Careful prearrangement as to methods to be used, and as to the mission of the observer.
- h. The use of prearranged signals or groups of letters preceding each transmission to identify the station making the transmission.



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FIGURE 15.—Artillery air-ground nets.

116. Illustrative examples.—The examples which follow are given as guides for the training of air observers and radio operators. The Fire-Control Code is used for radiotelegraph transmission; radiotelephone equivalents are also given. The conventional call-up, and prearranged transmission for identification, have been omitted.

a. *Example 1.*—(1) *Mission.*—An air observer has the mission of registering, in rapid succession, one battery from each battalion of the division artillery, using centers of impact. The observer is to pinpoint the location of each center of impact on an air photo. When these are completed, the air photo is to be dropped at the command post of the division artillery.

(2) *Prearrangement.*—The method is explained to the observer. He is given an air photo of the target area, on which are marked the probable areas of impact. He is informed that, when ready, he is to call for each battery in turn by saying: FIRST BATTERY, FIRE: ——— SECOND BATTERY, FIRE, etc. Each battalion listening in will direct its registering battery to fire at the proper time. The airplane and all battalions are to work on the same frequency. The observer is to check in with the net-control station (division artillery) and then proceed with his mission with no establishment of communication with battalions. The location of the command post, where the photo is to be dropped, is indicated to the observer.

(3) *Communication.*—The observer, having arrived over the position area and having established communication, transmits:

<i>Radiotelegraph</i>	<i>Radiotelephone</i>
<u>B T</u>	
F P	First.
B A	Battery.
<u>I X</u> 5-second dash	Fire.
K	Go ahead.

The battalion concerned replies:

R

ROGER.

and, when the battery fires the first round, transmits:

<u>B T</u>	
2-second dash	Battery fired.
K	Go ahead.

When ready, the observer calls for the next battery:

<u>B T</u>	
S P	Second.
B A	Battery.
<u>I X</u> 5-second dash	Fire.
K	Go ahead.

and the battalion concerned replies:

R

ROGER.

The registration of the other batteries continues as indicated for the first and second batteries. By prearrangement, the reply of the battalion may be omitted, or simple improvised panel signals may be used, since only two are needed.

b. Example 2.—(1) *Mission.*—An air observer has the mission of surveillance of fires for a groupment of three battalions of medium artillery. The groupment¹ is part of the division artillery. The

¹ A groupment is a provisional tactical unit of artillery temporarily formed with two or more artillery battalions.

observer is to report the errors of the initial volleys as quickly as possible in order that any remaining zone fire may be corrected.

(2) *Prearrangement.*—The observer does not check in with the division; he reports directly to the groupment; the three battalions are to listen in on the same frequency. The locations of the position areas and the panel stations are indicated on a photo. The observer understands that panels are to be used in the event of radio silence of ground sets. He is given a gridded photo. On this photo are marked several areas of possible hostile activity. He is to call for fire upon any targets appearing in these areas, or, using the grid for accurate designation, he may call for fire on targets of his own selection in other areas. The fires of one or more battalions may be placed on any target, each battery firing when ready. If more than one battalion is to fire, the observer is to sense on the initial volleys as a whole.

(3) *Communication.*—When the observer sees activity in one of the previously marked areas, he transmits:

<u>B T</u>	
C N	Concentration.
52	Five two.
C P	Command post.
S V	Surveillance.
K	Go ahead.

The ground station (groupment) replies:

R	ROGER.
---------	--------

And then sends:

<u>B T</u>	
B N	12th Battalion will fire.
12	
<u>K</u>	Go ahead.

The 12th Battalion receipts to groupment as follows:

B K 7	BK7 (call sign of groupment).
V	From.
A U 3	AU3 (call sign of battalion to fire).
R	ROGER.
<u>V A</u>	That is all.

This is not only to insure receipt of the groupment's message but also to allow the airplane to tune accurately to the battalion's frequency. Then, as soon as each battery fires, the battalion transmits:

<u>B T</u>	
B A	Battery.
A	A (Afirm).
2-second dash	Fired.

B A	Battery.
B	B (Baker).
2-second dash	Fired.
B A	Battery.
C	C (Cast).
2-second dash	Fired.
K	Go ahead.

The observer notes the errors of the three volleys and replies:

B T	
B A	Battery.
A	A (Affirm).
30	Three zero.
L L	Left.
50	Five zero.
S S	Short.
B A	Battery.
B	B (Baker).
C R	Range correct.
B A	Battery.
C	C (Cast).
50	Five zero.
00	Over.
K	Go ahead.

The ground station (battalion) acknowledges:

R	ROGER.
----------------	--------

All batteries now correct their zone fire. The observer watches the fire as a whole, and transmits:

B T	
R Z	Mission accomplished.
K	Go ahead.

The ground station (groupment) now assumes control and transmits:

B T	
R	ROGER.
F I	Follow instructions.
K	Go ahead.

The observer receipts for the message as follows:

B T	
R	WILCO.

c. Example 3.—(1) Mission.—An observer assigned to a battalion of light artillery has the mission of locating targets and adjusting fire upon them.

(2) Prearrangement.—The observer does not check in with any intermediate stations. He reports directly to the battalion. Photos and maps are not available; the general locations of the target and position areas are known from a previous reconnaissance flight.

The position area is to be verified by panels. For establishment of scale and orientation and identification of base point, a smoke ladder is to be used.

(3) *Communication.*—The observer, having reported, cannot identify the base point; he transmits:

<u>B T</u>	
M K	Mark.
B P	Base point.
L A	Ladder.
S M	Smoke.
I X 5-second dash	Fire.
K	Go ahead.

The ground station replies:

R ROGER.

and, when the battery fires, transmits:

<u>B T</u>	
2-second dash	Battery fired.
K	Go ahead.

The observer, after seeing the ladder, acknowledges:

R ROGER.

and then, after observation of the target area, he discovers infantry forming for a counterattack and sends:

<u>B T</u>	
B P	Base point.
800	Eight hundred.
L L	Left.
200	Two hundred.
S S	Short.
J P	Counterattack.
B N	Request battalion.
A D	Will adjust.
K	Go ahead.

The ground station replies:

R ROGER.

and as soon as the information is available transmits:

<u>B T</u>	
C N	Concentration.
35	Three five.
B N	Battalion will fire. (ing).
A	A (Afirm) battery (Adjust-
K	Go ahead.

The observer replies:

R ROGER.

When the battery fires, the ground station transmits:

<u>B T</u>	
2-second dash	Battery fired.
K	Go ahead.

The observer senses and transmits:

<u>B T</u>	
100	One hundred.
R R	Right.
200	Two hundred.
O O	Over.
K	Go ahead.

The ground station replies:

R	ROGER.
---------	--------

The adjustment continues until the observer considers the adjustment sufficiently accurate to request fire for effect. He then transmits:

<u>B T</u>	
20	Two zero.
R R	Right.
C R	Range correct.
F E	Fire for effect.
K	Go ahead.

The ground station replies:

<u>B T</u>	
F E	Will fire for effect.
2-second dash	Battery fired.
K	Go ahead.

and then as each of the other batteries fires:

<u>B T</u>	
B A	Battery.
B (C)	B (Baker) (C) (Cast).
F E	Firing for effect.
K	Go ahead.

The observer may correct the fire of the individual batteries, if this is possible, or correct the massed fire of the battalion as a whole. He may call for fire for effect again, if he believes it necessary, by sending:

<u>B T</u>	
A F	Request additional fire.
F E	Fire for effect.
K	Go ahead.

If the initial fire for effect was sufficient, the observer transmits:

<u>B T</u>	
R Z	Mission accomplished.
K	Go ahead.

If there is no further need for the airplane, the ground station replies:

<u>B T</u> -----	
N F-----	No further need of you.
K-----	Go ahead.

or if there are other prearranged missions, the following is transmitted:

<u>B T</u> -----	
C T-----	Change target.
K-----	Go ahead.

The observer then looks for the other targets and reports when one is located.

It may be seen that the actual radio operating in artillery fire control communication is very simple, and requires mainly a knowledge of the abbreviated codes that are used for the transmission of information.

117. Questions for self-review.—*a.* Why does artillery fire control by radio require a special procedure?

b. What codes are used in this communication?

c. Is the conventional call-up used in establishing air-ground communication?

d. Under what conditions may the call-up be dropped?

118. Operation exercise.—Suggestions for instructor: If training editions of the Fire-Control Code and the Air-Ground Liaison Code are available, students should be given the opportunity to familiarize themselves with the contents.

THE RADIO OPERATOR

APPENDIX I

RADIOTELEGRAPH OPERATOR APTITUDE TEST

U. S. ARMY

SCORE.....

ANSWER SHEET

Directions: Fill in the following concerning yourself.

(Last name) (First name) (Middle initial) (Army serial number)

Grade----- Organization----- Age-----

Date of present enlistment }----- Date today-----

or Date of induction into service }

Total years service in Army----- Navy----- Marine Corps-----

What training and experience have you had in radio operation?-----

How many words per minute can you receive in—

Radio telegraphy (International Morse code)?-----

Wire telegraphy (American Morse code)?-----

Stop here. Put down your pencil and wait for instructions.

PRACTICE ONE

- | | |
|------------------------------|------------------------------|
| First practice pair. YES NO | Third practice pair. YES NO |
| Second practice pair. YES NO | Fourth practice pair. YES NO |
1. YES NO
 2. YES NO
 3. YES NO
 4. YES NO
 5. YES NO
 6. YES NO
 7. YES NO
 8. YES NO
 9. YES NO
 10. YES NO
 11. YES NO
 12. YES NO
 13. YES NO
 14. YES NO
 15. YES NO
 16. YES NO
 17. YES NO
 18. YES NO
 19. YES NO
 20. YES NO
 21. YES NO
 22. YES NO
 23. YES NO
 24. YES NO
 25. YES NO
 26. YES NO
 27. YES NO
 28. YES NO
 29. YES NO
 30. YES NO
 31. YES NO
 32. YES NO
 33. YES NO
 34. YES NO
 35. YES NO
 36. YES NO
 37. YES NO
 38. YES NO
 39. YES NO
 40. YES NO
 41. YES NO
 42. YES NO

SIGNAL CORPS

43. YES NO	55. YES NO	67. YES NO
44. YES NO	56. YES NO	68. YES NO
45. YES NO	57. YES NO	69. YES NO
46. YES NO	58. YES NO	70. YES NO
47. YES NO	59. YES NO	71. YES NO
48. YES NO	60. YES NO	72. YES NO
49. YES NO	61. YES NO	73. YES NO
50. YES NO	62. YES NO	74. YES NO
51. YES NO	63. YES NO	75. YES NO
52. YES NO	64. YES NO	76. YES NO
53. YES NO	65. YES NO	77. YES NO
54. YES NO	66. YES NO	78. YES NO

INSTRUCTOR'S GUIDE

"Give me your attention."

"This is the Signal Corps Code Aptitude Test. In this test you will hear long and short sounds. This is a short sound (E). This is a series of short sounds (E E E E E). This is a long sound (T). This is a series of long sounds (T T T T T). Here is a group (F). Here is another group (X). When this test starts you will hear two groups of long and short sounds. The groups will be sent in the following order: First group, then a pause; and then the second group. You will indicate on the test paper whether or not the second group sounds exactly like the first. If the second group DOES sound exactly like the first, underline YES. If the second group DOES NOT sound like the first, underline NO. For example: (A A). Those two groups sounded exactly alike; therefore, YES would be underlined if they were sent in the test. Take this example: (G M). Now, those two groups were not exactly alike; therefore, NO would be underlined if they were in the test."

"Take your pencils."

"In the spaces marked PRACTICE ONE, on the first page of the test paper, indicate whether the groups you hear are exactly alike or different."

"Attention!" "First practice pair", (A A). "Those two groups were alike; therefore, you should have underlined the word YES."

"Second practice pair", (F W). "The second group of sounds was different from the first. You should have underlined NO."

"Third practice pair," (Q Q). "Those two groups were alike; therefore, you should have underlined the word YES."

"Fourth practice pair", (V 3). "The second group of sounds was different from the first. You should have underlined the word NO."

"The number of each pair of groups will be called before sending the group. For example: First pair, second pair, and so forth. If you miss a pair go to the next pair when its number is called."

THE RADIO OPERATOR

"Turn the page of your test paper."

- "First pair" (B 6).
- "Second pair" (A U).
- "Third pair" (D D).
- "Fourth pair" (8 7).
- "Fifth pair" (5 5).
- "Sixth pair" (1 J).
- "Seventh pair" (Z 7).
- "Eighth pair" (3 3).
- "Ninth pair" (4 V).
- "Tenth pair" (L \overline{AS}).
- "Eleventh pair" (\emptyset \overline{MM}).
- "Twelfth pair" (2 \overline{IM}).
- "Thirteenth pair" (\overline{AF} \overline{UF}).
- "Fourteenth pair" (\overline{BT} X).
- "Fifteenth pair" (Y Y).
- "Sixteenth pair" (\overline{KA} \overline{KR}).
- "Seventeenth pair" (\overline{KN} \overline{KN}).
- "Eighteenth pair" (\overline{MW} \overline{NW}).
- "Nineteenth pair" (\overline{KU} \overline{KU}).
- "Twentieth pair" (\overline{BM} \overline{BMT}).
- "Twenty-first pair" (\overline{WD} \overline{WD}).
- "Twenty-second pair" (\overline{KAK} \overline{KAK}).
- "Twenty-third pair" (\overline{WW} \overline{WA}).
- "Twenty-fourth pair" (\overline{KL} \overline{KL}).
- "Twenty-fifth pair" (\overline{KUT} \overline{KU}).
- "Twenty-sixth pair" (\overline{VS} \overline{VH}).
- "Twenty-seventh pair" (\overline{BT} $\overline{6T}$).
- "Twenty-eighth pair" (\overline{KM} \overline{MW}).
- "Twenty-ninth pair" (\overline{MUT} \overline{MU}).
- "Thirtieth pair" (\overline{WJ} \overline{WJ}).
- "Thirty-first pair" (\overline{NM} \overline{NO}).
- "Thirty-second pair" (\overline{KH} \overline{KS}).
- "Thirty-third pair" (\overline{MI} \overline{MI}).
- "Thirty-fourth pair" (\overline{KK} \overline{KX}).
- "Thirty-fifth pair" (\overline{OS} $\overline{M7}$).
- "Thirty-sixth pair" (\overline{SN} F).
- "Thirty-seventh pair" (\overline{XK} \overline{XL}).
- "Thirty-eighth pair" (\overline{XU} \overline{XU}).
- "Thirty-ninth pair" (\overline{UAD} \overline{UP}).
- "Fortieth pair" ($\overline{6T}$ \overline{BT}).
- "Forty-first pair" (B7 B7).
- "Forty-second pair" (WG WG).
- "Forty-third pair" (7S 7H).
- "Forty-fourth pair" (CV KV).
- "Forty-fifth pair" (FL FL).
- "Forty-sixth pair" (MP MW).
- "Forty-seventh pair" (XZ XD).
- "Forty-eighth pair" (B2 D2).
- "Forty-ninth pair" (KC KL).
- "Fiftieth pair" (PM PM).
- "Fifty-first pair" (BLT BLT).
- "Fifty-second pair" (YQQ YQZ).
- "Fifty-third pair" (RUN RAN).
- "Fifty-fourth pair" (BOS BOS).
- "Fifty-fifth pair" (\overline{KU} \overline{KA}).
- "Fifty-sixth pair" (\overline{KOI} \overline{KOI}).
- "Fifty-seventh pair" (\overline{MI} \overline{MI}).
- "Fifty-eighth pair" (\overline{KXM} \overline{KBM}).
- "Fifty-ninth pair" ($\overline{16}$ $\overline{1B}$).
- "Sixtieth pair" (\overline{WAA} \overline{WAR}).
- "Sixty-first pair" ($\overline{6X}$ $\overline{6X}$).
- "Sixty-second pair" ($\overline{11}$ \overline{JI}).
- "Sixty-third pair" (60 60).
- "Sixty-fourth pair" ($\overline{2AS}$ $\overline{3AS}$).
- "Sixty-fifth pair" ($\overline{KM2}$ \overline{KMVM}).
- "Sixty-sixth pair" (MKR MKL).
- "Sixty-seventh pair" (CEY CAY).
- "Sixty-eighth pair" (POL PML).
- "Sixty-ninth pair" (WAX WAX).
- "Seventieth pair" (UNE EAD).
- "Seventy-first pair" (MSH MHA).
- "Seventy-second pair" (KTD KZ).
- "Seventy-third pair" (BCD BCD).
- "Seventy-fourth pair" (AUU XU).
- "Seventy-fifth pair" ($\overline{BT3S}$ $\overline{BT3S}$).
- "Seventy-sixth pair" (\overline{VUI} \overline{VUI}).
- "Seventy-seventh pair" (\overline{QQA} \overline{RQKR}).
- "Seventy-eighth pair" (\overline{BTOK} \overline{BTOA}).

THE RADIO OPERATOR

SOLUTION

- | | | | | | |
|---------|-----------|---------|-----------|---------|-----------|
| 1. YES | NO | 27. YES | NO | 53. YES | NO |
| 2. YES | <u>NO</u> | 28. YES | <u>NO</u> | 54. YES | <u>NO</u> |
| 3. YES | <u>NO</u> | 29. YES | <u>NO</u> | 55. YES | NO |
| 4. YES | NO | 30. YES | <u>NO</u> | 56. YES | <u>NO</u> |
| 5. YES | <u>NO</u> | 31. YES | NO | 57. YES | NO |
| 6. YES | NO | 32. YES | <u>NO</u> | 58. YES | NO |
| 7. YES | <u>NO</u> | 33. YES | <u>NO</u> | 59. YES | <u>NO</u> |
| 8. YES | <u>NO</u> | 34. YES | NO | 60. YES | <u>NO</u> |
| 9. YES | NO | 35. YES | <u>NO</u> | 61. YES | <u>NO</u> |
| 10. YES | <u>NO</u> | 36. YES | <u>NO</u> | 62. YES | NO |
| 11. YES | <u>NO</u> | 37. YES | <u>NO</u> | 63. YES | <u>NO</u> |
| 12. YES | <u>NO</u> | 38. YES | <u>NO</u> | 64. YES | NO |
| 13. YES | <u>NO</u> | 39. YES | NO | 65. YES | <u>NO</u> |
| 14. YES | <u>NO</u> | 40. YES | <u>NO</u> | 66. YES | <u>NO</u> |
| 15. YES | <u>NO</u> | 41. YES | <u>NO</u> | 67. YES | <u>NO</u> |
| 16. YES | NO | 42. YES | NO | 68. YES | <u>NO</u> |
| 17. YES | <u>NO</u> | 43. YES | NO | 69. YES | <u>NO</u> |
| 18. YES | NO | 44. YES | <u>NO</u> | 70. YES | NO |
| 19. YES | <u>NO</u> | 45. YES | <u>NO</u> | 71. YES | <u>NO</u> |
| 20. YES | NO | 46. YES | NO | 72. YES | <u>NO</u> |
| 21. YES | <u>NO</u> | 47. YES | <u>NO</u> | 73. YES | <u>NO</u> |
| 22. YES | <u>NO</u> | 48. YES | <u>NO</u> | 74. YES | NO |
| 23. YES | NO | 49. YES | <u>NO</u> | 75. YES | <u>NO</u> |
| 24. YES | <u>NO</u> | 50. YES | <u>NO</u> | 76. YES | NO |
| 25. YES | NO | 51. YES | NO | 77. YES | NO |
| 26. YES | <u>NO</u> | 52. YES | <u>NO</u> | 78. YES | <u>NO</u> |

APPENDIX II
PRACTICE GROUPS AND MESSAGES *

PART I

Code groups

Exercise 1.—5 words per minute

OVLH	MYBL	URXO	HIZO	VIOT
FINX	XCSH	XTYV	IQNT	UBML

Exercise 2.—5 words per minute

ABLB	EJLN	CYZB	ZWCN	JNDZ
UTZL	KLAB	DEFZ	VNUW	KFRE

Exercise 3.—5 words per minute

JICOY	TXSTY	38701	BDIHA	JXTDZ
OXPDW	XPZSY	RSPHD	89760	CUSPI

Exercise 4.—5 words per minute

RNBBJ	65289	ZONIG	FYEQU	ARQNV
SNLPT	KAKOZ	88217	BVGAN	WKQQT

Exercise 5.—5 words per minute

SRQMT	UJVWN	46521	YXGCX	AFKOZ
CDEHK	NIHGP	12327	ZWQMN	BHLYC

*NOTES

1. Exercises 1 to 56, inclusive, furnish material for 2 minutes of sending at speeds of 5, 7, 10, 15, and 20 code groups per minute.
2. Exercises 57 to 60, inclusive, furnish clear text material, to be sent at any desired speed. Number of words per line and total number of words in exercise are indicated.
3. Exercises 61 to 85, inclusive, furnish traffic handled in field radio nets. This traffic may be transmitted at any desired speed.

Exercise 6.—5 words per minute

OG L C T	8 0 9 4 2	X H N L F	K H G X S	B Z V R E
L D F G H	S I Q Y O	A B J F X	8 3 9 0 6	U D L O M

Exercise 7.—5 words per minute

OL M X	M V N H	U W Q R	N V U T	K U X F
C D E H	L Y H E	D I P A	Z Q W I	A Y S K

Exercise 8.—5 words per minute

Q I Q A	W M N W	Z I H Z	C A K D	B T G W
W N L I	P W B U	O X A D	X F R J	I Q C A

Exercise 9.—5 words per minute

Z M J Z I	U R Y N C	9 3 8 2 7	P Q A Z M	D E G V M
N C B V G	H U G H Y	1 3 2 6 7	M D N I E	F W X E T

Exercise 10.—5 words per minute

1 2 8 9 0	M C N D H	E U I R Y	W Q Z X S	I R S V Z
M C U R I	7 2 4 3 9	O Q N Z I	P I Q A W	C N J W O

Exercise 11.—5 words per minute

OW Q A J	O I S K M	1 0 7 6 0	D G F H G	K S B O U
W E X C Z	D Y R I U	Q A U Z N	4 7 1 6 9	J H F N Q

Exercise 12.—5 words per minute

5 8 7 2 1	L D G V A	D K H P K	V K E O L	C E T N V
K E O X J	C K N C T	A E B C L	3 4 6 4 8	Q L M I A

Exercise 13.—7 words per minute

U T H A	V N C B	R F D S	E D C D	C Z V D	D S F D	U Y H G
R W Q I	L M N J	T N B L	U J H K	S H G N	O A N O	4 3 7 1

Exercise 14.—7 words per minute

NIOQ JUYB GBNS VCKT BJTV YHGV VNCW
BCDV UTHN AVYR UTING UYTR VBHF 5148

Exercise 15.—7 words per minute

BUYE OGFH 5781 JHVX BEBV HUGT ZAQK
EFFR IURL DKIZ VITK HGJD QAIW NBVC

Exercise 16.—7 words per minute

KJHB OPLJ VRCE UBHY NVBC ERDV
JUTN GRID QUDC VHIG QCAV ZASF ACBD

Exercise 17.—7 words per minute

BURLI TXOEC AXZIL UNGBT VKNHB TONOM
WSQDE OICJN FLFFL HZACD TKNOZ BCDBC

Exercise 18.—7 words per minute

TULCC JWNAAW RSVNU KZQGE IJLOT AIYUG GOTXH
SHRNJ Ø5894 NBZTF HASTYI NQMEV TVGIO WSDMR

Exercise 19.—7 words per minute

IBRZJ OZLFW 19Ø43 XTNGS DKWBD JCGAK PFKGX
ELVQC KDPHL QGJHY VXELQ FMUPB LECGM RFI AZ

Exercise 20.—7 words per minute

AFWYF WZRST SUNKN OPCYL KKFEG BEKZB 47372
TTLOR PQDAK LJEFB CDYAD TBPFR USMSU QRITJ

Exercise 21.—7 words per minute

DCZCE ZEOMN VHNVZ RDJBI NHLHT 19149 EXTBL
BXNLB YZENC UYINF YHBVG BEIJN VBHGN ADVKO

Exercise 22.—7 words per minute

AHQXB BUIMY NCSTO QDSTZ HEXLM FYMBU GJBCJ
 ONTRO RUOWA APVKL WZNXK KYADK AWLOW PEDGN

Exercise 23.—7 words per minute

SKEVB ZPBJK OCOYD IZYHL BKKPB QFORM TLVCC
 TDPZE FIMPI CYJQU RQBHL UMSD XEZH I UEGAF

Exercise 24.—7 words per minute

GNOQJ DZIBT SHASR VNKTE WXYGH VFRUG 89321
 TDIUR KOBDZ AKUXE FPSQD AWHBT DLTYE OPEVE

Exercise 25.—7 words per minute

IERUT GHEFJ VTUFY DJUGH SNKAD 98731 QWADS
 UJHDS CUTYR AGHSD FEHJH IJKSL MNHNY UTYGH

Exercise 26.—7 words per minute

VNXAX DBGHB TYGNH QWERT 5440 OPIKJ NBVJS
 WNFSA JBINY JICOY TXSTY BDAIH OXPDW XPNZY

Exercise 27.—7 words per minute

IBRZJ OXLFW 19943 KTNCS DKWDB JCGAD PHEGX
 ILVQC KDPBL QGJHQ VXELQ FMUPB LECGM PFI AZ

Exercise 28.—7 words per minute

AFWYF WZRST SUKNO OPCLY DKFEQ BEKZB 47372
 TTLOR PQDAK LJEFB CYDAD YBPPB USMSU QRIGJ

Exercise 29.—10 words per minute

SOLV CMYB CUBS PZYW BFIN GXCC HOLQ PIQN AJLN SKBA
 TWPI BKSA FTUQ OUSY CSJP DYT D EKMP FJRO IZPY TQUR

Exercise 30.—10 words per minute

NBLB AEJL WCYZ ZWNJ TUTZ DKLA CDEF AVNU NOZA KAJL
ABVS MEKC MANL HSNV TUSC NWZA WNFS JBIN VRPE NZHR

Exercise 31.—10 words per minute

JICOY TXSTY 38791 BDIHA OXPDW KPZSY PSPHD 89464 CWVPE HIQLE
LWQOX HNGEW OVOCN BNAIZ XEYPA PVDER 90675 PVRTM MNATU QB IYO

Exercise 32.—10 words per minute

RNBRJ 62589 ZONIG FFEQU SNLPT KAKOQ 88217 BVGAN DNVOB QEXGI
HNEXE DEOTC TMLQC BNPCT HIMAN FDWCS UNMPO YTIQB TDKEN CWCEN

Exercise 33.—10 words per minute

SRQMT UJVWN WNJKD YXGGX CEDHI NHCPE 12327 ZWQMN OYNKR BUTY
UBPKF VDMBO 10974 DHINK QZJME PCSHN TGWIN BKALY AACUC RRHIL

Exercise 34.—10 words per minute

OGLECT 80942 XHNLF HKGXS LDGHE SIQUO ARJFX AUBWP KCLFN XTYER
DIDNW 36541 NEURY NHGDA LENVX ZAIRU IEOLD 83903 TUTLB DCINE

Exercise 35.—10 words per minute

OLMS MVNH UWQR CDEH KDNQ DIPA QZWI MGCX MCCX OSSJ
ZLUN LDKM BCNX ZYZU GHJD OSLP NCMY DFJU DJFU NAJS

Exercise 36.—10 words per minute

IQAQ MNWX IJZA QWZE NLID WBUA PXOI FJRA ZAPQ JRGD
YQUA USJN NZXC SJAN EYRU LAMZ EURY MKOP AGTX DAQY

Exercise 37.—10 words per minute

ZMJZI URYCH 93287 PQAQM NCBVG HUGHY DIEUR MDNIE OSSME ERRT
27394 MCVUH KALZX COPLC VEYRY OSIKJ OIDSJ OIDS MEUYR CVTZO

Exercise 38.—10 words per minute

1 2899 MCNHD EIVRY WZQKS MCVRI KDJND OQNZI QPIAW OXNDK MOTTL
 MNAGH 91876 LCMNX KSIET UQTZX 72439 MONBX OIEZX UIETC SGVBD

Exercise 39.—10 words per minute

SWQAJ OIBKM 19769 DFHJG WEK CZ DYRIU QUAMN IRNVB MLIFN BOFME
 RQPSM 47196 TUVJM XYZAC VBWXX YXTLD PONIM ILKUT QVAZR POLKD

Exercise 40.—10 words per minute

57921 LDGVA DKHPK UKEOL KEOSJ CKNCT AEBCK GOJYW ABBVT LHIJZ
 39996 MN IHN FRKDJ SJHV FCBMF INIFM EIMGQ 19791 MCVNK KOUTY

Exercise 41.—15 words per minute

IUTH BVNC ERFD WEDC XCVZ SDSD IUYH EWRQ ILVJ DSHG
 XCAN ABDH KLLO YTNB H NIO MJRY HGBS BVCK IUVJ IERT
 YHGH HVNC BBGD IUTH QAVY HUNT JURY JVRV NNVH VNBG VNCX

Exercise 42.—15 words per minute

RUYE CGHF TDCN JHVH RBYV HUGT ZAQQ ERFI TURL DIZK
 UITK HGJD QAIW NBVC EJFN KJHB OPLJ VRCE UBHY NVCB
 OIDG ERDV JUTN GRLD QUDC VHIG QCAV ZASF ABOD BNBH

Exercise 43.—15 words per minute

BURLI TXOEC AXZIL UNGBT VXNBH 17455 TONOM WSQDE OIGJN FLFFL
 BCDBC BEACD TKNOZ KCLPX NOTED TULCC JWNAW BSVNU KZQGE KJLOT
 AIYUG GOTXH SRJHN 94594 NBZTF HASTYI NQMEV TVGIO WSDMR CJASE

Exercise 44.—15 words per minute

IBRZJ OZLFW 19943 XTCNS DKWRD JAQAK PFKGX ELVQC KDBLI QGHUY
 VXELQ FMUPB LECOM RFI AZ YBOUT AFWFY WZBST SUKNO OPIOL KKFEG
 BEZXB 47372 TTLOR PADAK LJEFR CDYAD YBPPR USKST GRITJ KIKGS

Exercise 45.—15 words per minute

DCZC	ZEMO	VHNV	NHLH	ENTZ	EXTR	BXNL	YZEC	RDJB	UYIN
YHBY	BEIJ	VBJG	ADVK	PASV	AHQX	BULM	NCST	GDST	HEXI
FYMB	GJRC	ONTR	ROUW	APVK	WZNX	KYAD	AWOL	PEGD	OAKW

Exercise 46.—15 words per minute

SKEUB	ZPBJK	OCOYD	IZYHL	BKKPV	TLVCC	TDPZE	FIMPI	AFOFM	CYJQU
RGLBH	UMVSD	KRZHI	VEZAF	05647	GNOQJ	DZIRT	SHASR	VNSTE	WSYGH
VFRUG	80821	TDIRU	KOBDZ	AKUKE	FPSGD	AWBHT	DLTYE	OPRYB	DXFIN

Exercise 47.—15 words per minute

IERUT	GFFNJ	VTUFY	DJUGH	SNKAD	89731	QWADS	JUSWE	UJHDS	CUTYR
AHGSB	FHEJH	IJKSL	MIJNY	UTYGH	VNZXZ	DHFGB	UTGNH	QWERT	54430
OPHIJ	NVBJJ	CFCVF	WNFSA	JBINY	JICOY	TXSTY	RIDIAH	OXDPW	XPZSY

Exercise 48.—15 words per minute

IBRJZ	OZLEW	10943	XTCNS	DKWRD	JCGAK	PIKGX	UWFKP	ELVAC	KDPBL
GGJKQ	VXELQ	FMUPB	LECCM	PFIAX	AFWYF	WZBST	SUKNO	OPCYL	KKEFQ
TTLOR	BEXZB	47372	XAQOZ	PDQAK	LJEFR	CYDAD	YBPPR	USMSU	QRITJ

Exercise 49.—20 words per minute

ZAYU	YRSB	NYHL	HBSZ	NAYN	SFBL	TSXA	NYAV	OCTG	HMTU
WUGT	ORLO	UVSK	XILR	UWVL	YPOM	JIVA	VWJK	DESL	TWXI
VXBF	UAWN	YRAV	TKYS	CXNZ	OCAR	MRZN	BLSR	KMOY	IOTL
JUMN	VWAX	ADKH	EBCL	VBBC	WUDG	JCTE	KYIS	PDNA	SLHZ

Exercise 50.—20 words per minute

TRSA	WVNT	XURU	SVYN	WXZT	TYZL	MCGW	DLDA	DCDF	AVNU
TGPE	MCKC	MXXKL	HNBUT	JWZA	TUXZ	WNFS	JNIN	JICO	YHAI
SPHD	QXOC	ZGEW	MOBT	VUOA	RNGI	KEYP	PDDF	PVRT	RNBR
XLTC	PRAW	ZOUO	FYEQ	SNLH	HAOK	BVGO	PGUN	PRQA	ZOUL

Exercise 51.—20 words per minute

HENEX DRTOT TCGML UPBCN NMHIA 42597 JUMOM BZCND DTQVI BHEYT
 MCNVT TMLCQ BCNUF HIMAN 97425 JUMOM DTOBT UEYRH NCBZC QIIDD
 MCNZA QXQCZ KNNZU PGLIK WEIBY ZNXAB OQWUO 98991 PQZIL ERVDT
 KDMSM MCITUJ KDJLO 92837 QVBAF XVZQS OKSAI LOAJN 21968 ZUVISH

Exercise 52.—20 words per minute

GHNFI OSIAW ZXNCE IREUH JSNHF BNDNX JSNFH OEIUR 87659 PQAKH
 MCNBX IEURY NYDHE 01298 KDJMZ XJIAQ MZBAQ BKIVM YDRTE MJKEB
 PSLAQ FRTJF 39829 PDLSE AMNZB ZVZGG ANKXU TSTDI ASHIE FGPWN
 90347 HAVGO WVRUR CVBTJ DFGOH LIBPF 99638 HICPOV QDWCG DSIEN

Exercise 53.—20 words per minute

OKICQ CEMID 97201 ALCRJ MAIDP JRNOL 24889 JXEYF EFXNK DLZIK
 76321 EWSKM CTOG EMEY LCRQH PHVTX 70365 HZGNA AXBTR 49285
 OCYAA HIMAD OHWIM SFCG 03759 JNABD ZLJBI CPNZI VTNEE FMEMI
 CWXCK JBCYD 84707 JBOAH JELKF ZDLYS DKAKK PGZUN DKDNG GYEVZ

Exercise 54.—20 words per minute

47382 KTLES WQYFZ CTILL FHFUX ARJZU MRFKE WBPOM OMIWG THQVI
 NTVMG DXAQN 40367 SPEJN HSPCQ HMOUS WOHZR 11902 OBRDK VIODO
 XGLDT TVCPT IPAZQ 06143 PVFKQ CUBEZ 80701 CPTKO FNZQJ CPTKO
 RBEFP AXTRX BKMOZ 20184 PGMAR IBAGO KDIEY KCNYQ EKJCD VNFBB

Exercise 55.—20 words per minute

10273 PZOKA MDIDH EIRY DJHNG DIEUY DXNZE OQUIW 9185 MCNBS
 HAHGJ JCVWH 98284 MCNUY QZASU IHDIJ LDOSJ 83746 JEHDY BCNBX
 CVFZA SCQZW 12310 LKDOF MCNCB ZAOIZ ELKAM ZJHFG BAYQT WEAFA
 PAOKU 30210 JDMNF DKEUR GNBAY 17868 MDNHA TGRYW EIOUW MXNBS

Exercise 56.—20 words per minute

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

PART II

Clear text

Exercise 57

EVERY ACTION IS A WISE OR UNWISE INVESTMENT FOR FUTURE..... (10)
 DIVIDENDS THE PAST IS GONE WHAT WE CALL THE PRESENT MOMENT..... (11)
 GOES OVER TO THE PAST EVEN WHILE WE ARE SAYING THE WORD LEAVING..... (13)
 ONLY THE FUTURE IN WHICH TO WORK AND ENJOY WHATEVER WE DO IS..... (13)
 DONE FOR AN EFFECT IN THAT FUTURE BE IT NEAR OR FAR A MINUTE..... (14)
 OR A YEAR CONSIDER WELL THEN THE EFFECT YOU ARE TRYING TO..... (12)
 PRODUCE..... (1)

Total words..... (74)

Exercise 58

THE LOCAL INTERESTS OF A STATE OUGHT IN EVERY CASE..... (10)
 TO GIVE WAY TO THE INTERESTS OF THE UNION FOR WHEN A SACRIFICE..... (13)
 OF ONE OR THE OTHER IS NECESSARY THE FORMER BECOMES ONLY AN..... (12)
 APPARENT PARTIAL INTEREST AND SHOULD YIELD ON THE PRINCIPLE..... (9)
 THAT THE SMALL GOOD OUGHT NEVER TO OPPOSE THE GREAT ONE WHEN..... (12)
 YOU ASSEMBLE FROM YOUR SEVERAL COUNTRIES IN THE LEGISLATURE..... (9)
 WERE EVERY MEMBER TO BE GUIDED ONLY BY THE APPARENT INTERESTS..... (11)
 OF HIS COUNTRY GOVERNMENT WOULD BE IMPRACTICABLE..... (7)

Total words..... (80)

Exercise 59

THESE ARE THE TIMES THAT TRY MENS SOULS THE SUMMER
 SOLDIER AND THE SUNSHINE PATRIOT WILL IN THIS CRISIS SHRINK
 FROM THE SERVICE OF THEIR COUNTRY BUT HE THAT STANDS IT NOW
 DESERVES THE LOVE AND THANKS OF MAN AND WOMAN TYRANNY LIKE
 HELL IS NOT EASILY CONQUERED YET WE HAVE THIS CONSOLATION
 WITH US THAT THE HARDER THE CONFLICT THE MORE GLORIOUS THE
 TRIUMPH WHAT WE OBTAIN TOO CHEAPLY WE ESTEEM TOO LIGHTLY IT
 IS DEARNESS ONLY THAT GIVES EVERYTHING ITS VALUE

Total words (83)

Exercise 60

IT IS REFRESHING TO KNOW THAT THERE ARE GREAT FORCES
 FOR GOOD AT WORK IN THE BUSINESS WORLD THAT IMPROVEMENTS ARE
 BUT THE NATURAL EXPRESSION OF UPLIFTED THOUGHT THAT EXAMPLE
 PURER MOTIVES HIGHER IDEALS AND THE RIVALRY OF EXCELLENCE
 ARE LEAVING THE WORLD THAT OPPRESSION IS DECREASING IN ORDER
 THAT SPONTANEOUS EFFORT MAY BE UTILIZED THAT COURTESY AND
 KINDNESS ARE GAINING RECOGNITION AS FACTORS OF SUCCESS AND
 THAT MEN ARE LEARNING TO LOVE THEIR DAILY WORK BECAUSE THROUGH
 IT THEY FEEL THE DIVINE IMPULSE

Total words (84)

PART III

Tactical net traffic

Exercise 61

OG 3 V MY 9 Y O BT
 NR 3 CD OMEYA TANDG FOEYV NICEL PABEX TALFO MISHQ YEDHG
 XILVM COQWK DAVZO VASOL UTINY FWEAJ OVIXA YASUL GAGGJ FOLXY
 9 21 A K

Exercise 62

OG 3 V MY 9 BT
 NR 7 CD DAFOL CYOZN QOSID GALNU FIFTK JNMZE DALDD FOYEV
 CALKU ZOZYG MARKSV SONIZ SMEAG KAKTU VASTB 937 A K

Exercise 63

OG 3 V MY 9 G BT
 NR 15 CD AMISD COXEN GAILO VEAND BOVER TAFTE SIXXE MASIO
 QASSU VIONT GAFYS LOKIL JESBI SIMAR DETTE IPRRC DIFSO CALGU
 PRSOZ 939A K

Exercise 64

OG 3 V MY 9 T LB 7 V MY 9 O BT
 NR 6 CONCENTRATION OF ENEMY FORCE INDICATES MAIN EFFORT AGAINST HILL TWO SIXTY 943A K

Exercise 65

OG 3 V MY 9 F Y BT
 NR 4 CD PASQX MHIOJ YUSET KALKE SASSY VARIV BLEDT HCADJ
 UXELY PEQJN SISMT HISVK LESIS QIFRJ VEWID FORMC VEWID TRUCA
 DAQIN UYVAL NUNBC BOEPD SALRF DAUSE BAUYI FQICE 947 A VA

Exercise 66

OG 3 V MY 9 BT
 NR 8 DUMPS ESTABLISHED AS AGREED UPON AND READY FOR FIRST TRAIN. 962A K

THE RADIO OPERATOR

OG 3V MY 9G BT
 NR 11 DFCT 1 H IHO DANY MASTU SAPV IUNA HAVV SISO XABJ
 NAME QUEL VADE JAJI MISH MISH CALV VIXO PAOV GETX VVEN
 SUZH KLWE PEIN TATU TATU ENXY LEFG 955A K

Exercise 67

Exercise 68

OG 3 V MY 9 T XU 2 V MY 9 Y BT
 CD GOKDR FADUL KIJRY NAMIH LAEDG PRYNO CAJIN ZEDBL DOFIN
 A WEN J 957A K

Exercise 69

OG 3 V MY 9 BT
 PILOT OF ENEMY PLANE CAPTURED AND BEING HELD PENDING ARRIVAL OF INTERPRETER 957A K

Exercise 70

OG 3 V MY 9 G BT
 DFCT 1 HOLW VISK SUMC LXPN COBA PYSN ZJEL HEVX WUCA
 FIST BEUJ KWDL SKIM KHEN FIFD DYXA JEVV YIRZ XYOL
 AJEN BAGL JISY 958A K

Exercise 71

OG 3 V MY 9 F BT
 NR 23 SCOUTS REPORT ENEMY CONCENTRATIONS IN VICINITY OF BISCHENWELER WITH SEVERAL TANKS
 ADVANCING ALONG KALDFARM ROAD TEN PM 1993A VA

Exercise 72

OG 3 V MY 9 BT
 CD KEWBA LIHJU NEIDG SAVOL KRYST ALMUN ZODEV BASIF DUNYX
 FUCEN DELIO 1997A K

Exercise 73

OG 3 V MY 9 BT
 NR 14 THREE PRISONERS CAPTURED BY FIRST BN EARLY THIS MORNING
 RELIABLY REPORT COUNTER SAPPING WORKS ARE BEING DRIVEN IN POSITIONS
 IN ADVANCE OF EAGLEBROCK 1912A K

Exercise 74

OG3 V MY9 O BT
NR15 CD BAVOV CEALD PYSNO TARIK OLIVA DESMR XELDM ZAZKH
MYSED TAI0Z MEMNO DAFUG LIGNO GEYKZ 1013A K

Exercise 75

OG3 V MY9 NR15 GR26 TWENTYFIVE BT
NR11 DECT1 JELD KOSI RVVA BEBY NULZ FOSH JELJ USEN
HIHO DEKY ESEN PYSK CELB JEYQ QUAD NEPT RUGX LILG
DEFM KIHE VOWJ MEDK YEKH 1014A K

Exercise 76

OG3 V MY9 NR16 GR10 TWENTYFIVE BT
NR76 CD NUGWH WIGSO ZLAYS APDWT ZOTQB ITBQW BLUMN 800P K

Exercise 77

OG3 V MY9 NR17Y O GR30 TWENTYFIVE BT
NR12 REPLACEMENTS CAN DETOUR ROUTE AT CROSSING SIX FORTY TWO ACCOUNT
HEAVY SHELL FIRE STOP IN NO CASE TO ARRIVE BEFORE DARK AS OUR APPROACH SYSTEM
IS UNDER OBSERVATION 1017A K

Exercise 78

OG3 V MY9 NR18 P GR18 TWENTYFIVE BT
NR21 CD SIVAN DAMIX PSEB ADFUB LEKGA LILB DAZEJ TERIK
CEDIJ KHEMI YEVAK CMENQ HXKFJ ULSHO PXENY 1019A K

Exercise 79

OG3 V MY9 NR19 P GR19 TWENTYFIVE BT
URGENTLY REQUIRE REPLACEMENT FOR ONE STORAGE BATTERY TYPE BB EIGHTEEN FOR
TRUCK TWO THREE SEVEN ONE EIGHT THREE 1017A K

Exercise 80

OG 3 V MY 9 NR 20 F GR 24 TWENTYFIVE BT
 NR 23 DFC T1 SESA JIYC NOHV DELC FIMQ WING JELK VEXY
 DALT CEJV BAKY VOLK CENG YIBW SEMU COLD STYX DEMI
 OLIN YENY 1020A VA

Exercise 81

OG 3 V MY 9 NR 21 G GR 15 TWENTYFIVE BT
 NR 22 OUR CASUALTY LISTS DELAYED BY ERROR OF MESSENGER BUT WILL ARRIVE BEFORE MIDNIGHT
 1028A K

Exercise 82

OG 3 V MY 9 NR 22 O GR 24 TWENTYFIVE BT
 CD OMIKT DEFSU YALMO LTRDI CALKE VOSIN FULLIC ERSTY KOSIL
 BELDO TAMUC WALIG SASMY REGIN ZONDE DENCE YEYOC PRVNY VOKEJ
 GAMEK HOBUX SEVYX 1029A K

Exercise 83

OG 3 V MY 9 NR 23 NITE GR 22 TWENTYFIVE BT
 NR 29 SPOT AMMUNITION AS REQUESTED BY LAKELAND THIS MORNING STOP OUR MEN WILL BE ON HAND
 TO RECEIVE IT AT ZEBANDEN 1033A K

Exercise 84

OG 3 V MY 9 NR 24 O Y GR 21 TWENTYFIVE BT
 NR 23 DFC T1 JONI PADE VEXT YUZP VEWS CAJG SELB DOFI
 MESHK JULY KLUC ROTE PALU DIXT PEYG RUGA DEPN SADE
 1029A K

Exercise 85

OG 3 V MY 9 NR 25 F P GR 13 TWENTYFIVE BT
 REPORT ARRIVAL OF MAJOR RINLAND BY TELEPHONE UPON ARRIVAL
 YOUR CP 1025A VA

THE RADIO OPERATOR

APPENDIX III
PROCEDURE SIGNS AND SIGNALS

PROCEDURE SIGNS

	<i>Sign</i>	<i>Meaning</i>
<u>AA</u>	. . . . -	Unknown station. Blank.
AA	. - . -	All after.
<u>AB</u>	. - - . . .	All before.
<u>AE</u>	. - . - .	End of transmission.
<u>AS</u>	. - . . .	Wait.
<u>B</u>	- . . .	More to follow.
<u>BT</u>	- . . . -	Break.
C	- . . .	Affirmative. Correct.
D	- . .	Deferred.
DUPE	- . . . - . - . . .	Duplicate message.
EEEEEEEE	Error. Erase.
F	. . - .	Do not transmit. Do not answer.
G	- - .	Repeat back.
<u>GR</u>	- - . . . -	Group(s).
<u>IMI</u>	. . - . . .	Repeat. Question mark.
<u>IX</u>	. . - . . -	Execute to follow.
<u>IX</u> (5 second dash)	. . - . . - - - - -	Execute.
J	. - - - -	Verify and repeat.
K	- - . -	Go ahead. (Transmit.)
L	. - . .	General relay.
N	- .	Not received. Negative. Exempted.
NR	-	Number.
O	- - - -	Urgent.
P	. - - .	Priority.
Q	- - . - -	Information.
R	. - .	Receipt. Routine.
S	. . .	Signal strength.
T	-	Transmit (to).
<u>V</u>	. . . -	From. Calling.
<u>VA</u>	. . . - - -	Finish.
W	. - - -	Interference.
<u>WA</u>	. - - . - -	Word after.
<u>XE</u>	-	Slant (/) or separator.
Y	- - . - -	Acknowledge.
Z	- - . . .	Originator.
U ¹	. . -	Net control station.
<u>HM</u> ²	. . . - - -	Silence.
<u>UO</u> ²	. . - - - - -	Negative silence.

¹ Used by Army with identical meaning of ZGD.
² Employed by Army for net control purposes.

SIGNAL CORPS

PROCEDURE SIGNALS

(A) ANSWERING—AIRCRAFT—AUTHENTICATION

- Z A A You are causing delay by slowness in answering.
- Z A B You are causing confusion by answering out of order.
- Z A C Answer in alphabetical order of call signs.
- Z A D Answer me (or ———) on ——— kc.
- Z A E Am reeling in antenna ——— (1. Before landing; 2. To rejoin formation).
- Z A F Am forced to land (at or near ———) because of ——— (1. Fire; 2. Collision; 3. Engine failure; 4. Out of gas).
- Z A G -----
- Z A H -----
- Z A I -----
- Z A J -----
- Z A K -----
- Z A L -----
- * * * * *
- Z A R Check your message authentication.
- Z A S Message authentication has been checked and is ———.
(1. Correct; 2. Incorrect, corrected authentication is ———).
- Z A T -----
- Z A U -----
- Z A V -----
- Z A W -----
- Z A X -----
- Z A Y -----
- Z A Z -----

(B) CALL SIGNS

- Z B A -----
- Z B B -----
- Z B C -----
- Z B D -----
- Z B E -----
- Z B F -----
- Z B G -----
- Z B H -----
- Z B I -----
- * * * * *
- Z B S -----
- Z B T -----
- Z B U -----
- Z B V -----
- Z B W -----
- Z B X -----
- Z B Y -----
- Z B Z -----

THE RADIO OPERATOR

(C) CALLING—COMMUNICATIONS

- Z C A Are you (or is —) in communication with — (by —) (1. Radio; 2. Wire; 3. Visual)?
 - Z C B I am (or — is) in communication with — (by —) (1. Radio; 2. Wire; 3. Visual).
 - Z C C Call me again at — (on — kc.).
 - Z C D Following is what I (or —) sent (at —).
 - Z C E I have (or — has) been calling you (on — kc.).
 - Z C F I (or —) will call you again as soon as I (he) can (or at —) (on — kc.).
 - Z C G Inform — that I have (or — has) been calling him (on — kc.).
 - Z C H Cease listening for messages from —.
 - Z C I Listen in for messages from — (on — kc.).
 - Z C J You were (or — was) sending at the same time as —.
 - Z C K Transmit message(s) without preliminary call-up.
 - Z C L Make (or direct — to make) preliminary call-up before transmitting traffic.
 - Z C M Collective (or net) call sign — for the present includes —.
 - Z C N -----
 - Z C O -----
 - Z C P -----
- * * * * *
- Z C V General call; all stations copy.
 - Z C W -----
 - Z C X -----
 - Z C Y -----
 - Z C Z -----

(D) DIRECTION FINDER

- Z D A Transmit "MO's" and call signs (on — kc.).
- Z D B Report bearings by direction finder in plain English.
- Z D C What is my bearing (code understood if not followed by ZDB)?
- Z D D Your bearing in code was — at —.
- Z D E Your bearing in plain English was — at —.
- Z D F Your bearing from — was — (and distance from — was —) at —.
- Z D G Bearing furnished you is — (1. Bilateral; 2. Unilateral).
- Z D H I am unable to furnish you (or —) bearing now. Call again in — minutes.
- Z D I I am (or — is) now ready to furnish you (or —) with radio direction-finder bearings.
- Z D J I am (or — is) unable to furnish reliable bearings due to (1. Night effect; 2. Poor minimum; 3. Uncalibrated sector; 4. Weak signals; 5. Poor note; 6. Interference; 7. Uncalibrated frequency; 8. Poor cross).
- Z D K What is my bearing and distance from you (or —)?
- Z D L What is reciprocal of bearing just furnished me by you (or —)?

SIGNAL CORPS

- ZDM Reciprocal of bearing just furnished you by me (or ——) is ——.
- ZDN Bearings appear to be reliable.
- ZDO -----
- ZDP -----
- ZDQ -----
- ZDR -----
- * * * * *
- ZDV -----
- ZDW -----
- ZDX -----
- ZDY -----
- ZDZ -----

(E) EQUIPMENT, ADJUSTMENTS OF EQUIPMENT

- ZEA I am (or —— is) going to use ——.
- ZEB Use ——.
- ZEC I am (or —— is) unable to use ——.
- ZED My —— (on —— kc.) is out of commission.
- ZEE Repairs completed. Am in commission now.
- ZEF I have adjusted my —— (1. Radiating system; 2. Power).
- ZEG Cease using ——.
- ZEH I am (or —— is) using ——.
- ZEI Your —— appears to be defective (on —— kc.).
- ZEJ Your key or relay appears to be sticking.
- ZEK Your speed key is improperly adjusted.
- ZEL -----
- ZEM -----
- ZEN -----
- ZEO -----
- ZEP -----
- ZEQ How is my note?
- ZER Your note is —— (1. Good; 2. Poor; 3. Rising and falling; 4. Over-modulated; 5. Under-modulated).
- ZES Your dots are —— (1. Too heavy; 2. Too light).
- ZET Your (or ——) transmitter is not keying properly.
- ZEU -----
- ZEV -----
- ZEW -----
- ZEX -----
- ZEY -----
- ZEZ -----

(F) FREQUENCY, FREQUENCY ADJUSTMENTS

- ZFA I must shift to work another station (or ——).
- ZFB Frequency —— mc.
- ZFC Frequency —— kc.
- ZFD Send V's on this frequency (or —— kc.).
- ZFE I am (or —— is) shifting to transmit on —— kc. (at ——).
- ZFF I am (or —— is) shifting to receive on —— kc. (at ——).
- ZFG I am (or —— is) able to receive on —— kc.

THE RADIO OPERATOR

- Z F H I am (or ——— is) able to transmit on ——— kc.
- Z F I Shift (or direct ———) to receive on ——— kc.
- Z F J Shift (or direct ———) to transmit on ——— kc.
- Z F K Shift (or direct ———) to transmit and receive on ——— kc.
- Z F L What frequency are you (or is ———) using (to work ———)?
- Z F M How does my frequency check?
- Z F N Your frequency is correct.
- Z F O Your frequency is too high (or is ——— kc. too high).
- Z F P Your frequency is too low (or is ——— kc. too low).
- Z F Q Your frequency is ——— kc.
- Z F R Adjust your transmitter frequency to zero beat with mine (or with ———).

* * * * *

- Z F W -----
- Z F X -----
- Z F Y -----
- Z F Z -----

(G) NET CONTROL (ARMY), GUARDS (NAVY)

- Z G A Indicate ships or stations for which you are radio guard (net control station) (——— kc.).
- Z G B Take over radio guard or net control for ——— (until ———).
- Z G C Are you (or is ———) radio guard or net control station for ——— (on ——— kc.).
- Z G D I am (or ——— is) radio guard or net control station for ——— (on ——— kc.).

- Z G E -----
- Z G F -----
- Z G G -----
- Z G H -----
- Z G I -----

* * * * *

- Z G L -----
- Z G M -----
- Z G N -----
- Z G O -----
- Z G P -----
- Z G Q Station reports into net.
- Z G R Station leaves net temporarily (or for ——— hours) (to communicate with ———) (will be on ——— kc.).
- Z G S Is net directed or free?
- Z G T Net is ——— (1. Directed; 2. Free).
- Z G U -----
- Z G V -----
- Z G W -----
- Z G X -----
- Z G Y -----
- Z G Z -----

SIGNAL CORPS

(L) LIST OF TYPES AND MEANS OF COMMUNICATION

- Z L A CW -----
- Z L B ICW -----
- Z L C Type or model ----- transmitter.
- Z L D Type or model ----- receiver.
- Z L E Landline or cable ----- (1. Telegraph; 2. Telephone).
- Z L F Visual.
- Z L G Radio ----- (1. Radio beacon; 2. Aircraft radio; 3. Field radio; 4. Radiotelegraph; 5. Radiotelephone; 6. Direction finder).
- Z L H -----
- Z L I -----
- Z L J -----
- Z L K -----
- Z L L -----
- * * * * *
- Z L P -----
- * * * * *
- Z L S -----
- Z L T -----
- Z L U -----
- Z L V -----
- Z L W -----
- Z L X -----
- Z L Y -----
- Z L Z -----

(M) MESSAGES, TRAFFIC

- Z M A I have (or ----- has) ----- messages (numeral indicating number of messages may be followed by O, P, or D to indicate precedence other than routine) for you (or -----).
- Z M B Nothing received from ----- (at -----).
- Z M C Fragments only received (from -----).
- Z M D Have you received SOS just made (or made by ----- at -----)?
- Z M E The following is heading of message ----- as received. Check station of origin if necessary and repeat.
- Z M F Unable to locate message(s) ----- Give better identification data.
- Z M G This message is in error—disregard it.
- Z M H How do you count following text group(s) ----- -----? Word (or words -----) should be counted as ----- group(s).
- Z M I Hold my message number ----- until correctness is confirmed.
- Z M J Following received from ----- (at -----).
- Z M K Verify enciphering (or encoding) of your message ----- (or portion indicated).
- Z M L Cryptographic system indicated in your message ----- (1. Is not held; 2. Is inoperative).
- Z M M -----
- * * * * *
- Z M V -----
- Z M W Of what precedence and to whom are your messages?

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- ZMX Verify the message or portion thereof indicated with your message center (communication office) and transmit correct version.
- ZMY -----
- ZMZ -----

(N) STATION SERIAL NUMBERS

- ZNA What was station serial number of last message received from this station (or from -----)?
 - ZNB Station serial number of last message received from you (or from -----) was -----.
 - ZNC What was station serial number of last message you transmitted to me (or to -----)?
 - ZND Station serial number of last message transmitted to you (or to -----) was -----.
 - ZNE Number ----- from ----- is blank.
 - ZNF Repeat all before group 1 of message number ----- to number ----- transmitted (or transmitted by -----) to straighten out confusion in serial numbers.
 - ZNG Two messages, reference numbers ----- and ----- (or group counts and time of origin ----- and -----), both received as serial number ----- . Designate correct serial number.
 - ZNH Change serial number of message with reference numbers ----- (or group count and time of origin -----) to serial number -----.
 - ZNI Prior to closing station records, last message transmitted to you (or to -----) was message number -----; last message received from you (or him) was message number -----.
- NOTE.—Repeat for as many stations as necessary to complete check.

- ZNJ -----
- ZNK -----
- ZNL -----
- ZNM -----
- ZNN -----

- * * * * *
- ZNS -----
 - ZNT -----
 - ZNU -----
 - ZNV -----
 - ZNW -----
 - ZNX -----
 - ZNY -----
 - ZNZ -----

(O) OPERATING

- ZOA Send at speed of ----- words per minute.
- ZOB Your ----- (1. Characters are indistinct; 2. Words are poorly spaced; 3. Transmitter or key missing dots).
- ZOC Has executive sign (signal of execution) for last message (or for message following -----) been made?

SIGNAL CORPS

- Z O D Transmit your messages in strings of _____.
- Z O E I am going to transmit my messages in strings of _____.
- Z O F Cease using speed key.
- Z O G -----
- Z O H -----
- Z O I -----
- Z O J -----
- Z O K -----
- Z O L -----
- Z O M Use speed key if qualified to do so.
- * * * * *
- Z O T -----
- Z O U -----
- Z O V -----
- Z O W -----
- Z O X -----
- Z O Y -----
- Z O Z -----

(P) FACSIMILE (JOINT); OPERATING (NAVY)

- Z P A -----
- Z P B -----
- Z P C -----
- Z P D -----
- Z P E -----
- * * * * *
- Z P U -----
- Z P V -----
- Z P W -----
- Z P X -----
- Z P Y -----
- Z P Z -----

(R) RETRANSMISSION, ROUTING, RELAYING, AND DELIVERY

- Z R A Forward this message (or message _____) by visual to _____.
- Z R B Deliver (or direct _____ deliver) message(s) _____ via _____ (to _____).
- Z R C Act as relay between me (or _____) and _____.
- Z R D Give me your message(s) for _____; I will forward.
- Z R E Forward this message by wire _____ (1. Collect; 2. Paid).
- Z R F Take no further action with regard to forwarding message _____ (to _____).
- Z R G Transmit this message now (or at _____) by _____ (1. I method; 2. F method).
- Z R H Inform me when this message (or message _____) has been received by addressee(s) (or by _____).
- Z R I Message _____ has been received by the addressee (or by _____) at _____.

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- Z R J Pass following message to destination by _____ (1. Hand; 2. U. S. Postal Service; 3. Fast mail).
- Z R K Distribute this message by dispatch where no charges are involved and to all others by mail.
- Z R L How route traffic for _____?
- Z R M Route traffic for _____ through _____ (on _____ kc.).
- Z R N Have been unable to relay (or deliver) message _____ to _____ (1. Will continue efforts to effect relay (or delivery); 2. Advise disposition).
- * * * * * * *
- Z R P -----
- * * * * * * *
- Z R Z -----

(S) SIGNALS, SIGNAL STRENGTH, READABILITY

- Z S A Can you receive _____? If so, what is his readability?
- Z S B I can receive _____. Readability _____.
- Z S C Your signals fade (from strength _____ to _____).
- Z S D Decrease strength of signals.
- Z S E Increase strength of signals.
- Z S F What is my signal strength?
- Z S G What is my readability?
- Z S H -----
- Z S I -----
- Z S J -----
- Z S K -----
- Z S L -----
- Z S M -----
- Z S N -----
- Z S O Reception _____ (1. Poor; 2. Fair; 3. Good; 4. Excellent; 5. Impossible; 6. Impossible due to echo).
- Z S P -----
- Z S Q -----
- Z S R -----
- Z S S -----
- Z S T -----
- Z S U -----
- Z S V -----
- Z S W -----
- Z S X -----
- Z S Y -----
- Z S Z -----

(T) TIME AND TRANSMISSIONS

- Z T A I am (or _____ is) going to make a timing signal for correcting clocks. The numerals indicating the time (and zone _____ plus or minus understood) will be followed by the executive sign—the 5-second dash terminating exactly at the time indicated.
- Z T B What is your time and time zone?
- Z T C My time is _____ zone _____ time (plus or minus understood).
- Z T D From _____ to _____.
- Z T E Until further orders (or until _____).
- Z T F Established at _____ (by _____).

SIGNAL CORPS

- Z T G At _____.
- Z T H Did you (or _____) transmit anything for me? If so, please repeat.
- Z T I Transmit traffic blind (or broadcast traffic) to me (or to _____ on _____
kc.). I (or _____) will receipt for traffic later (on _____ kc.).
- Z T J Transmit only urgent or priority messages.
- Z T K Routine messages may be transmitted now.
- Z T L -----
- Z T M -----
- Z T N -----
- Z T O -----
- Z T P -----
- * * * * *
- Z T T -----
- Z T U -----
- Z T V -----
- Z T W -----
- Z T X -----
- Z T Y -----
- Z T Z -----

(V) MISCELLANEOUS AIRCRAFT

- Z V A -----
- Z V B -----
- Z V C -----
- Z V D -----
- Z V E -----
- Z V F -----
- Z V G -----
- Z V H -----
- Z V I -----
- Z V J -----
- * * * * *
- Z V S -----
- Z V T -----
- Z V U -----
- Z V V -----
- Z V W -----
- Z V X -----
- Z V Y -----
- Z V Z -----

(W) WATCHES AND SCHEDULES

- Z W A Close or secure (or direct _____ to close or secure) your (his) station or
watch (on _____ kc.).
- Z W B Are you (or is _____) maintaining continuous watch on _____ kc.?
- Z W C I am (or _____ is) maintaining a continuous watch on _____ kc.
- Z W D Request (or _____ requests) permission to secure watch (or close
station) on _____ kc.
- Z W E I am (or _____ is) securing watch (or closing station) on _____ kc.
- Z W F What stations are keeping watch on _____ kc. (or are in net)?

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ZWG Following stations are keeping watch on _____ kc (or are in net).
 ZWH _____
 ZWI _____
 ZWJ _____
 ZWK _____
 * * * * * *
 ZWV _____
 ZWW _____
 ZWX _____
 ZWY _____
 ZWZ _____

(X) AUTOMATICS

ZXA _____
 ZXB _____
 ZXC _____
 ZXD _____
 * * * * * *
 ZXG Use hand key.
 * * * * * *
 ZXI _____
 * * * * * *
 ZXS _____
 ZXT _____
 Z XU _____

 ZXV _____
 ZXW _____
 ZXX _____
 ZXY _____
 ZXZ _____

(Y) TEMPORARY SIGNALS

FOR NAVY AND COAST GUARD USE

ZYA _____
 ZYB _____
 ZYC _____
 ZYD _____
 ZYE _____
 ZYF _____
 ZYG _____
 ZYH _____
 ZYI _____
 ZYJ _____
 ZYK _____
 ZYL _____
 ZYM _____
 ZYN _____
 ZYO _____
 ZYP _____

SIGNAL CORPS

FOR ARMY USE ONLY

Z Y Q -----
 Z Y R -----
 Z Y S -----
 Z Y T -----
 Z Y U -----
 Z Y V -----
 Z Y W -----
 Z Y X -----
 Z Y Y -----
 Z Y Z -----

(Z) MISCELLANEOUS

Z Z A Stand by.
 Z Z B Negative, no, not.
 Z Z C Affirmative, yes.
 Z Z D Meaning of your (or -----'s) procedure signal (or procedure sign) is
 not understood.
 Z Z E -----
 Z Z F -----
 Z Z G -----
 Z Z H -----
 Z Z I -----
 Z Z J -----
 * * * * *
 Z Z M -----
 * * * * *
 Z Z U -----
 Z Z V -----
 Z Z W -----
 Z Z X -----
 Z Z Y -----
 Z Z Z -----

THE RADIO OPERATOR

APPENDIX IV

THE INTERNATIONAL MORSE CODE

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

SPECIAL CHARACTERS

Period (.)	.....-	Starting signal-
Comma (,)	-----	Underline (—)-
Colon (:)	-----	Double dash (==)-
Interrogation (?) or request to repeat	..-...-	Understood	...-.
Apostrophe (')	..-...-	Error	.....
Hyphen or dash(—)	-----	Cross or end (+)	.....
Wait	.....	Invitation to transmit	..-
Fraction bar (/)	.....	End of work	...-.
Brackets or parentheses ()-	Separation between whole number and fraction-
-	Is it correct	...-.

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[A. G. 062.11 (2-24-42).]

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(For explanation of symbols see FM 21-6.)