



# US ARMY SIGNAL SCHOOL



FORT GORDON, GEORGIA 30905

IT 11-180-8

## MEANS OF COMMUNICATION

PREPARED BY:  
DEPARTMENT OF ARMY WIDE TRAINING SUPPORT

## MEANS OF COMMUNICATIONS

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\*This instructional text supersedes ST 11-180-8

## OBJECTIVES

This text is for teaching yourself the various means of communication the Army uses for purposes of command and control. After reading this text, you should:

- a. Know the meaning of communications.
- b. Be able to identify the several means of communication.
- c. Know the advantages and disadvantages inherent in each means of communication.

## INTRODUCTION

This text is presented in frames. Each frame is a small bit of instruction. The frames in their sequence as numbered form a program for attaining the objectives of this text.

a. Read and Respond. As a rule, each frame requires some kind of response from you; for example, filling a blank space with the correct word or words, or selecting the correct completion response from two or more choices appearing in parentheses. A few frames require no response, but contain information you must read. Such an information frame relates to subsequent frames that do require responses; so read each information frame. As you read, we recommend that you place a sheet of paper or a piece of cardboard over the next frame below the one you are reading to cover the frame answers.

b. Check Each Response. After you complete a frame, advance to the next frame and check your response against the desired response (the correct solution); they should be the same or very nearly so. Then go on to the next frame.

c. Read Summary and Complete the Self-Test. After you finish all the frames, read the summary. Next, take the self-test. Finally, check your answers to the self-test against the solutions.

## PROGRAMED INSTRUCTION

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1. A means of communication is a medium by which a message is conveyed from one person or place to another. To communicate, there must be at least two persons, a message, and a \_\_\_\_\_.

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(1. Answer: means (or medium))

2. The means of communication include radio of all types, wire lines, messenger, couriers, trained animals, mail, and visual or sound devices. Radio, wire, messenger, visual, and sound are means of \_\_\_\_\_.

---

(2. Answer: communication)

3. Broadly speaking, all of the specific methods fall under either of two categories of means, namely telecommunications and physical means. Any transmission, emission or reception of signs, signals, writings, images and sounds or information of any nature by means of wire, radio, visual or other electromagnetic system is tele\_\_\_\_\_. Obviously, the mail, a messenger, a courier, or a trained animal (such as a pigeon) that delivers a message is a p\_\_\_\_\_ means.

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(3. Answer: telecommunications, physical)

4. In this text we will discuss all of the telecommunication means, but of the physical means we will discuss only the messenger. In tactical communications we are concerned primarily with \_\_\_\_\_ as a physical means.

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(4. Answer: messenger)

5. The primary means used in tactical communications are R \_\_\_\_\_,  
W \_\_\_\_\_, M \_\_\_\_\_, V \_\_\_\_\_, and S \_\_\_\_\_.

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(5. Answer: Radio, Wire, Messenger, Visual, Sound)

6. Radio and wire means may be classified together and called electrical/  
electronic means. Communications using radio or wire, or a combination of  
the two, is known as \_\_\_\_\_/\_\_\_\_\_ means.

---

(6. Answer: electrical/electronics)

7. The primary means of communication used in the combat zone are

- a. \_\_\_\_\_/\_\_\_\_\_, which includes \_\_\_\_\_  
and \_\_\_\_\_.
  - b. \_\_\_\_\_.
  - c. \_\_\_\_\_.
  - d. \_\_\_\_\_.
- 

(7. Answer: electrical/electronics, radio, wire, messengers, visual,  
sound)

8. In tactical operations, no single means is best for communicating under  
all conditions or in all situations. Each means has its own capabilities and  
limitations. If you are aware of the advantages and the disadvantages each  
means typically offers, you will be better able to employ the means that will  
be the most likely to get the message through, without compromising it to the  
enemy, and in the least possible time. In other words, the means employed in

any given situation should be whatever gives the maximum reliability, security, and speed with a minimum of effort and materiel. Effective communications should be rapid, but the first and foremost requirement is that they be r\_\_\_\_\_ and s\_\_\_\_\_.

---

(8. Answer: reliable, secure)

9. Messenger communication is one of the primary means of communication used in tactical operations. Messenger continues to be the most secure means available to all units. It is the most effective method for transmission and delivery of lengthy messages and bulky items. The efficiency of messenger communications depends on the selection and training of the messengers. This means is flexible and reliable. Its speed depends on the mode of travel, the tactical situation, the terrain, and the trafficability of routes. Limitations include vulnerability to enemy action in forward areas and the lack of person-to-person conversation.

Messenger is a \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ means of communication.

---

(9. Answer: secure, flexible, reliable)

10. Messenger service may be scheduled with messengers making periodic runs over a given route along which are regularly scheduled stops at certain headquarters. Nonscheduled messenger service on an as-needed basis employs messengers referred to as special messengers. A messenger who follows a schedule and uses a motor vehicle in making deliveries and pickups is a \_\_\_\_\_ messenger. If he is called upon

at any time to carry a message by air, he is a \_\_\_\_\_  
\_\_\_\_\_ messenger.

---

(10. Answer: scheduled motor, special air)

11. If a messenger travels on foot to make deliveries, he is a foot messenger. If he makes deliveries by aircraft, he is an \_\_\_\_\_ messenger. If he uses a motor vehicle on the route he travels, he is a \_\_\_\_\_ messenger.

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(11. Answer: air, motor)

12. The type of messenger who travels at the slowest rate of speed normally is the \_\_\_\_\_ messenger, whether scheduled or special. He would be good for (short/long)-distance runs.

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(12. Answer: foot, short)

13. Name the six types of messengers that may be employed.

- scheduled \_\_\_\_\_ messengers
- \_\_\_\_\_ messengers
- \_\_\_\_\_ air \_\_\_\_\_ messengers
- \_\_\_\_\_ messengers
- \_\_\_\_\_ messengers
- \_\_\_\_\_ air \_\_\_\_\_ messengers

(13. Answer: scheduled foot, scheduled motor, scheduled air, special foot, special motor, special air)

14. The main advantages of messenger as a means are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

---

(14. Answer: security, reliability, flexibility)

15. You can use sound to attract attention, transmit prearranged messages, and spread alarms. You may even send messages in international Morse code by the \_\_\_\_\_ signals these devices generate. Devices commonly used in communicating with sound include: horns, sirens, bells, whistles, voice amplifiers, and explosives.

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(15. Answer: sound)

16. Name six devices employed for sound communications.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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(16. Answer: horns, whistles, sirens, bells, voice amplifiers, explosives)

17. When using sound to communicate, you must keep messages short and simple. Battle noise reduces the effectiveness of sound signals. Such signals are good only for relatively (short/long) distances, and are vulnerable to enemy interception.



(17. Answer: short)

18. Security, distance, enemy situation, and message length are considerations as to whether \_\_\_\_\_ communications will "get the message through."

---

(18. Answer: sound)

19. Visual signaling is another means of communication available to all units. An advantage of \_\_\_\_\_ communication is that it is readily \_\_\_\_\_.

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(19. Answer: visual, available)

20. Visual signaling employs flags, lights, pyrotechnics, panels, arm-and-hand signals, aircraft maneuvers, and any other devices or techniques prearranged to be sighted or seen by those for whom messages are intended. Such means are suitable for transmitting prearranged messages rapidly over short distances, and for recognition and identification of friendly forces. Visual signals are easily misunderstood and are very vulnerable to interception. In addition, the enemy may use similar signals for purposes of deception and confusion. Their use is restricted during poor visibility or when line-of-sight locations are not available, and may be prohibited for security reasons. Visual communications are particularly useful when radio silence must be imposed, in reconnaissance operations, and in situations requiring special control. Visual signals are easily \_\_\_\_\_ and vulnerable to \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

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(20. Answer: misunderstood, interception, deception, confusion)

21. Flags can be used to transmit international Morse code characters and other wigwag or semaphoric representations during daylight hours. International Morse code can be transmitted in daytime by using \_\_\_\_\_.

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(21. Answer: flags)

22. Lights are used for signaling as prescribed by the commander or by the unit's Communications-Electronics Operation Instructions (CEOI). You may use flashlights, headlights, or practically any other kind of light--even infrared devices-- for sending code or giving prearranged messages in a wide variety of tactical operations. A nighttime means of transmitting Morse code message is \_\_\_\_\_

---

(22. Answer: lights)

23. Pyrotechnics contain chemicals that produce a smoke or a brilliant light when burning. Good for identifying friendly units, controlling fire, marking targets, and reporting locations, pyrotechnics come in various colors. Their effective use calls for preplanning. Pyrotechnics can transmit certain messages speedily to large bodies of troops and to isolated units. Normally the unit CEOI covers the meanings and uses of \_\_\_\_\_ signals.

---

(23. Answer: pyrotechnic)

24. Panels in bright fluorescent colors mark positions and identify units. Black and white sets of panels, for use on light and dark backgrounds respectively, enable you to send brief messages. The panel system and the

panel recognition code normally will be found in your unit CEOI. Thus, you consult your unit \_\_\_\_\_ if you are going to communicate by using \_\_\_\_\_.

---

(24. Answer: CEOI panels)

25. Panels, flags, lights, and colored flares are just a few specific examples of \_\_\_\_\_ communication means.

---

(25. Answer: visual)

26. Name six different visual means.

_____	_____
_____	_____
_____	_____

---

(26. Answer: flags, lights, panels, pyrotechnics or flares, arm-and-hand signals, aircraft maneuvers)

27. One advantage of visual means is that they are readily \_\_\_\_\_  
But such means do have the disadvantages of being easily \_\_\_\_\_  
and \_\_\_\_\_.

---

(27. Answer: seen, misunderstood (or confused), intercepted)

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#### INFORMATION FRAME

28. Wire and radio circuits, or paths, serve as the fundamental media of all electrical/electronics communications. The terminating, or subscriber, equipment allows us to further categorize electrical/electronics communications as voice, telegraphy, teletypewriter, facsimile, television, and data.

a. Voice includes telephone and radiotelephone voice radio. Voice allows direct communication between two or more individuals.

b. Telegraphy, as used in present-day tactical communications, is a method of transmitting messages in international Morse code over radio. Continuous-wave (CW) transmissions often are the answer to problems of distance and interference. Message rate is rather slow: 10 to 15 words per minute.

c. Teletypewriter is a rapid method of transmitting written messages over wire circuits or radio circuits. Teletypewriters operate at a rate of 40 to 100 words per minute, depending on equipment capability and operator skill. Most communications centers make teletypewriter service available.

d. Facsimile is a method of transmitting graphic material, such as photographs, maps, and map overlays. Facsimile is a relatively slow way of transmitting such matter, and it takes skilled operators and high-quality voice circuits. Normally it is employed on a point-to-point basis to meet a specific requirement.

e. Television is an electronic method of transmitting a combination of audio and graphic information. It is virtually an instantaneous one-way system since information is transmitted at one point and received at another simultaneously. Requiring expensive, complex terminal equipment and broadband circuits, television is a specialized system specifically designed to meet special requirements such as visual display in a tactical operations center.

f. Data is an electronic method of rapidly transmitting digital and analog information used primarily for fire control, meteorological, and automatic data processing systems.

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29. All electrical/electronic means carry messages or information over paths that are called \_\_\_\_\_, which interconnect a transmitting device with one or more receiving devices.

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(29. Answer: circuits)

30. Circuits installed for the common use of all authorized users of a communication system are called common-user circuits. If the commander allocates certain circuits for the exclusive use of certain individuals or certain units, these restricted-use circuits are known as sole-user circuits. Thus

there are two types of circuits in a communication system: namely

\_\_\_\_\_ and \_\_\_\_\_.

---

(30. Answer: common-user, sole-user)

31. Whenever you communicate by radiotelephone or by telephone, you are using the electrical/electronic means identified as \_\_\_\_\_ communication.

---

(31. Answer: voice)

32. The two different electrical/electronic methods for transmitting pictures are \_\_\_\_\_ and \_\_\_\_\_. The faster of the two is \_\_\_\_\_.

---

(32. Answer: television, facsimile, television)

33. Data communications will be employed to transmit information in analog or digital form for use in automatic data processing, meteorological, and \_\_\_\_\_ systems.

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(33. Answer: fire control)

34. Messages can be transmitted over radio or wire circuits and printed at the rate of 40 to 100 words per minute if the means employed is \_\_\_\_\_.

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(34. Answer: teletypewriter)

35. Now, to sum up, give the six electrical/electronic communication methods.

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(35. Answer: voice, telegraphy, teletypewriter, facsimile, television, data communications)

36. Wire is a very dependable means. It includes the use of field wire, wire-laying and recovery equipment, cable, battery-operated and sound-powered telephones, switchboards, teletypewriters, multiplexers and other associated or terminal equipment. When properly installed and employed, these items form a means that is one of the most \_\_\_\_\_, a distinct advantage.

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(36. Answer: dependable or reliable)

37. Wire communications are more secure than radio communications. Transmission is confined to wire rather than being radiated into space for anyone's receiver to pick up. This fact represents an advantage/disadvantage of wire.

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(37. Answer: advantage)

38. Wire communications, however, are not completely secure. The security of classified information is never assured when it is transmitted in the clear over wire circuits. The employment of wire communications reduces the probability of intercept by the enemy, but you should NOT consider wire as a \_\_\_\_\_ means of transmission unless the circuits are approved by proper authority for the transmission of \_\_\_\_\_ information.

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(38. Answer: secure, classified)

39. The decision to establish wire communications depends on the need for them, the time available to install and use them, and the capability to maintain them. The supply of wire on hand, the expected resupply, and the future needs must be considered. In other words, whether to use wire is largely a question that rests on the \_\_\_\_\_, \_\_\_\_\_ available, and \_\_\_\_\_ capability.

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(39. Answer: need, time, maintenance)

40. Although it may take longer to install wire communications than other means, wire systems can increase communication reliability by serving as an alternate means. Having an \_\_\_\_\_ means enhances the \_\_\_\_\_ of communications.

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(40. Answer: alternate, reliability)

41. The use of radio is (widespread) (very limited) in the Army. Radio normally is (more secure than) (as secure as) (less secure than) wire as a communication medium. Radio (suffers from) (seldom has) problems of interference. Wire lacks the (reliability) (flexibility) that radio has.

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(41. Answer: widespread, less secure than, suffers from, flexibility)

42. The Army employs radio equipment that varies from low-powered voice radio sets that are lightweight and portable to high-powered multichannel radio, radio teletypewriter, radiotelegraph (CW), or voice sets of fixed stations. Practically every commander or leader has suitable radio

equipment. There is radio equipment suited to every level in the chain of command. The use of \_\_\_\_\_ has many advantages.

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(42. Answer: radio)

43. Radio communications can be quickly set up for operation, can interconnect tactical echelons separated by great distances (e.g., terrain and the enemy), and can provide high-quality multichannel circuits. Radio lends itself to concepts of mobility and fast-moving, swiftly changing tactical situations. The advantages of radio are \_\_\_\_\_ and \_\_\_\_\_.

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(43. Answer: quick installation, mobility)

44. Unfortunately, radio is subject to interference from atmospheric disturbances, jamming, and transmissions from other radio stations. However, properly allocated frequencies, competent operators, and suitable site selection will minimize these (advantages) (disadvantages).

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(44. Answer: disadvantages)

45. For operating together, radio sets must have a common or overlapping frequency range, be of the same type modulation, and transmit and receive the same type of signal. Thus, if two or more radio stations are to be used to form a radio net and to intercommunicate, they must operate on the same f \_\_\_\_\_, have the same type of m \_\_\_\_\_, and have similar or compatible s \_\_\_\_\_.

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(45. Answer: frequency, modulation, signals)

46. Radio equipment is generally identified by the frequency band in which it is designed to operate. The frequency bands the Army usually uses are:

High frequency (HF) \_\_\_\_\_ between 3 and 30 megahertz

Very high frequency (VHF) \_\_\_\_\_ between 30 and 300 megahertz

Ultra-high frequency (UHF) \_\_\_\_\_ between 300 and 3,000 megahertz

Super-high frequency (SHF) \_\_\_\_\_ between 3 and 30 gigahertz

NOTE: 1,000 megahertz = 1 gigahertz

The abbreviations for the four bands or frequencies commonly used in radio communications are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

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(46. Answer: HF, VHF, UHF, SHF)

47. Radio is identified not only in terms of frequency or band in which it is designed to operate, but also in terms of the type of modulation it has. Radio signals may be frequency modulated (FM), amplitude modulated (AM), or phase modulated (PM), depending on how the equipment is designed to function. The three possible types of radio modulation are

\_\_\_\_\_ modulation,

\_\_\_\_\_ modulation,

\_\_\_\_\_ modulation.

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(47. Answer: frequency, amplitude, phase)

48. Most radio communication systems in use today are either FM or AM. However, some of the newer radio equipment features what is called single-sideband transmission, which is related to AM. Such equipment is often referred to as SSB or \_\_\_\_\_ radio.

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(48. Answer: single-sideband)

49. What frequency bands do Army tactical radio communications employ mostly? Name them.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

One type of modulation is phase modulation; two other types of modulation are \_\_\_\_\_ modulation and \_\_\_\_\_ modulation.

\_\_\_\_\_

(49. Answer: High frequency or HF, very high frequency or VHF, ultra high frequency or UHF, amplitude, frequency)

SELF-TEST

MEANS OF SIGNAL COMMUNICATION

- 
1. The device for getting a message from one person or place to another is referred to as the \_\_\_\_\_ of communication.
  2. Telecommunications is a term that applies to all means of signal communications except \_\_\_\_\_, which is a \_\_\_\_\_ means.
  3. If a messenger makes his deliveries by motor vehicle on a regular route and schedule, he must be a \_\_\_\_\_.
  4. If a messenger is on call to make a message delivery by traveling in an aircraft at any time, he must be a \_\_\_\_\_.
  5. The most secure means of signal communications is \_\_\_\_\_.
  6. Bells and sirens are examples of \_\_\_\_\_ communications, a means of signal communications whose prearranged signals are good for \_\_\_\_\_ distances and \_\_\_\_\_ messages.
  7. Pyrotechnics, panels, and lights are examples of \_\_\_\_\_ signaling, a means that works well if visibility is good and if prearranged messages are used and kept short.
  8. The document that governs what visual signals a unit will use is the unit's \_\_\_\_\_.
  9. All electrical/electronic means involve circuits formed of \_\_\_\_\_ or \_\_\_\_\_, or a combination of these two media.
  10. International Morse code is sent by radiotelegraph, a mode of transmission identified by the abbreviation \_\_\_\_\_, which stands for \_\_\_\_\_.

11. "Voice" as an electrical/electronic means uses instruments or equipment that we know familiarly as the \_\_\_\_\_ and the \_\_\_\_\_.
12. Written messages are transmitted and printed out at about 40 to 100 words a minute by \_\_\_\_\_, another electrical/electronic means.
13. Pictorial or graphic matter can be transmitted by either \_\_\_\_\_ or \_\_\_\_\_ as the electrical/electronic means.
14. Data in digital form or in analog form are transmitted by the electrical/electronic means known as \_\_\_\_\_ communications.
15. The path of any electrical/electronic transmission is called a \_\_\_\_\_.
16. Radio stations in a net must operate on the same frequency \_\_\_\_\_ and have the same type of \_\_\_\_\_.
17. Radio has the advantage of being more \_\_\_\_\_ than wire, but wire is more \_\_\_\_\_ than radio.
18. Classified information should be transmitted over \_\_\_\_\_ circuits only.
19. "SSB" stands for \_\_\_\_\_, and pertains to \_\_\_\_\_ equipment that emits signals which are essentially \_\_\_\_\_ modulated.
20. If tank commanders are ordered to operate their radio sets at a frequency of 23.0 megahertz, their authorized channel is in the \_\_\_\_\_ band.

ANSWERS TO THE SELF-TEST  
MEANS OF COMMUNICATIONS

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1. means. Ref: frames 1 and 2
2. messenger, physical. Ref: frame 3
3. scheduled motor messenger. Ref: frames 10 and 13
4. special air messenger. Ref: frames 10, 11, and 13
5. messenger. Ref: frame 9
6. sound, short, short (or simple). Ref: frames 15, 16, and 17
7. visual. Ref: frames 19 thru 26
8. Communications-Electronics Operation- Instructions (CEOI). Ref: frames 22, 23, 24.
9. radio, wire. Ref: frames 28 and 29
10. CW, continuous wave. Ref: frame 28b
11. telephone, radiotelephone (or voice radio). Ref: frames 28a and 31
12. teletypewriter(s). Ref: frames 28c and 34
13. television, facsimile. Ref: frames 28d, 28e, and 32
14. data. Ref: frames 28f and 33
15. circuit (or channel). Ref: frames 28 and 29
16. band (or range), modulation. Ref: frame 45
17. mobile (or flexible), secure. Ref: frames 41 and 43
18. approved. Ref: frame 38
19. single sideband, radio, amplitude. Ref: frame 48
20. high frequency. Ref: frame 46