

FM 11-50

DEPARTMENT OF THE ARMY FIELD MANUAL

SIGNAL BATTALION ARMORED, INFANTRY, AND INFANTRY (MECHANIZED) DIVISIONS



HEADQUARTERS, DEPARTMENT OF THE ARMY
JULY 1965

FIELD MANUAL }
 No. 11-50 }

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON 25, D. C., 27 July 1965

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(MECHANIZED) DIVISIONS

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* This manual supersedes FM 11-10, 7 June 1961; FM 11-11, 24 April 1958; and FM 11-50, 11 December 1961, including C 1, 10 April 1963.

CHAPTER 1

INTRODUCTION

1. Purpose

This manual is a guide for the employment of personnel and the use of equipment in the signal battalion of the armored, infantry, or infantry (mechanized) division.

2. Scope

a. This manual contains information on the mission, organization, administration, logistics, and tactical employment of a signal battalion as equipped under TOE 11-35. The information presented, when coupled with experience, judgment, and foresight, will guide the battalion commander, his staff, company commanders, and other key personnel of the signal battalion in effective communications support of the division.

b. The material presented herein is applicable, unless otherwise indicated, to both nuclear and nonnuclear warfare.

c. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be

keyed to the specific page, paragraph, and line of text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded directly to the U. S. Army Combat Developments Command Communications-Electronics Agency (ATTN: Organization and Doctrine Directorate), Fort Monmouth, N. J. 07703.

3. References

a. Publications and other reference materials pertaining to subjects within the scope of this manual are listed in appendix I.

b. Appendix II summarizes the technical characteristics of the major items of signal equipment used in the division signal battalion. It may be used to obtain further detail on the equipments mentioned briefly in the narrative of the manual.

c. Appendix III illustrates type interconnections of signal equipments in signal centers installed and operated by the division signal battalion.

CHAPTER 2

ORGANIZATION OF THE SIGNAL BATTALION

4. Battalion Components

(fig. 1)

a. General. The division signal battalion (TOE 11-35) is organic to each armored, infantry, or infantry (mechanized) division.* The battalion is part of the combined arms team and provides communications support for the division.

b. Organization of the Battalion. The division signal battalion consists of a headquarters and headquarters detachment, a command operations company, a forward communications company, and a signal support operations company. Department of the Army orders for organization of a new signal battalion designate the operating companies of the battalion

as company A (command operations), company B (forward communications), and company C (signal support operations).

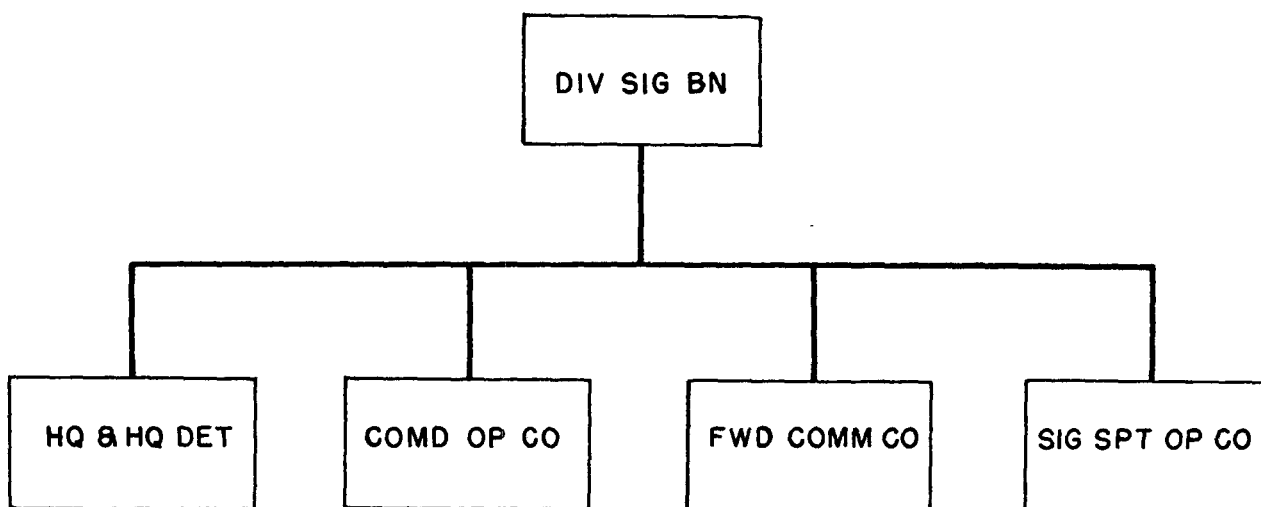
5. Mission

The mission of the division signal battalion is to—

a. Provide signal communications to include communications to subordinate units for the division headquarters and division support command; this provision is exclusive of internal radio nets of the units served.

b. Establish and operate the division communications system.

c. Provide each brigade headquarters with multichannel communications to each of the two command echelons of the division.



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Figure 1. Armored, infantry, and mechanized division signal battalion.

* Hereafter in this manual, the infantry (mechanized) division will be referred to as the mechanized division.

d. Provide area signal center service to units located in the vicinity of the division area (forward) signal centers; this service is supplemental to organic facilities of the units served.

e. Establish and operate facilities that connect division artillery headquarters into the division communications systems.

f. Operate the division ground messenger service.

g. Perform photography and still picture laboratory service for divisional units (except processing of color film); this does not include aerial photography.

h. Perform direct support maintenance of all cryptographic equipment in the division, and to perform organizational maintenance on all other signal equipment organic to the division signal battalion.

i. Distribute cryptographic material within the division.

j. Provide a signal officer and signal staff for the division.

6. Capabilities

a. *Facilities Provided.* At full strength, the division signal battalion provides the following facilities:

- (1) Communications on a 24-hour basis for all established echelons of division headquarters and division support command to include message center, messenger service, cryptography, teletypewriter, telephone, radio, and radio relay (with exceptions as noted).
- (2) Establishment and operation of a division communications system consisting of a maximum of seven signal centers, 12-channel radio relay, field cable (spiral-four) links, and field wire lines as required to provide:
 - (a) Trunk line and signal center service for headquarters and units designated in (1) above.
 - (b) Trunk line service for combat support and service units in the division area.
 - (c) Field wire, FM radio/wire integration, radio relay, or field cable links

to connect using units into the division communications system.

- (d) Signal center service for units, elements, and installations in the division area as required to supplement organic communications means of the units being supported.
- (3) Establishment and operation of direct 12-channel radio relay links between each brigade and the division main and division alternate command posts.
- (4) Operation of the division area ground messenger service within the capabilities of the six motor messenger teams.
- (5) Performance of photographic service for the division include:
 - (a) Still and motion picture coverage for the division (except aerial photography).
 - (b) Provision and operation of one mobile photographic laboratory and the processing of ground and aerial still photographic coverage (except aerial combat surveillance) for divisional units as required.
- (6) Performance of direct support maintenance of all cryptographic equipment of the division.

b. *Type B Organization.* The division signal battalion is not adaptable to Type B organization.

c. *Required Supporting Service.* The division signal battalion is dependent upon other divisional units for the services indicated below:

- (1) Other divisional units for medical, dental, and religious services, and supplemental transportation.
- (2) Division aviation battalion or other units for aircraft and pilots for signal operations.
- (3) Division support command for direct support maintenance of signal equipment, other than cryptographic equipment.
- (4) Army or other higher echelons for processing motion picture, color, and Air Force aerial photographic coverage.

d. Combat Capability. Each individual of the division signal battalion is trained to fight as an infantryman when required. The battalion, therefore, has some capability of defending itself against hostile ground attack.

However, isolated elements of the battalion, such as radio relay teams and forward signal centers, cannot defend themselves and are dependent upon supported units for defense of their installations.

CHAPTER 3

ORGANIZATION OF HEADQUARTERS AND HEADQUARTERS DETACHMENT

7. General

(fig. 2)

The headquarters and headquarters detachment (TOE 11-36) contains the commander and staff necessary for the command control of the signal battalion. In addition, a battalion motor maintenance section is included in the detachment.

8. Mission

The mission of headquarters and headquarters detachment is to—

a. Direct and coordinate operations and training within the signal battalion and pro-

vide the headquarters facilities with which the battalion commander exercises control.

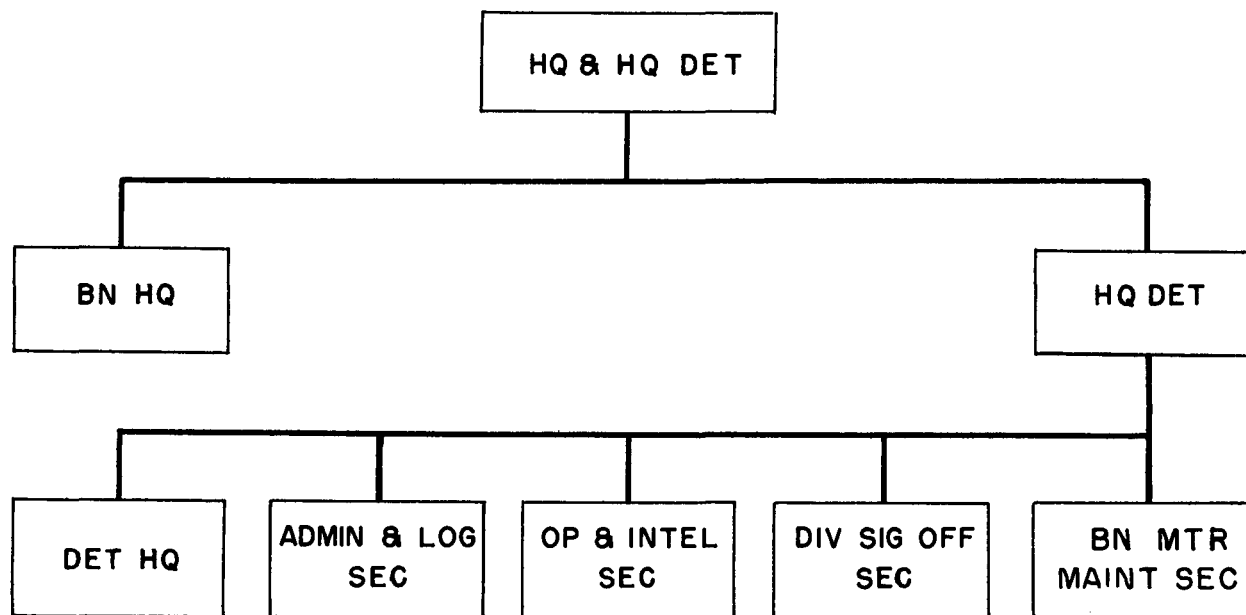
b. Provide the division with a signal officer, a signal staff, and staff facilities.

c. Provide supply and motor maintenance support for the headquarters and headquarters detachment and supplemental supply and motor maintenance support for the operating companies of the signal battalion.

d. Distribute cryptographic material within the division.

9. Battalion Headquarters

The battalion headquarters includes the bat-



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Figure 2. Headquarters and headquarters detachment.

talion commander, who is also the division signal officer (DSO), and the battalion staff which advises and assists the battalion commander in the supervision of all units assigned or attached to the battalion.

10. Detachment Headquarters

a. Detachment headquarters provides a small enlisted staff for routine detachment functions.

b. The battalion S1-adjutant also serves as detachment commanding officer and exercises direct control over detachment headquarters. He is assisted by the battalion sergeant major who acts as first sergeant of the detachment.

11. Division Signal Officer's Section

The division signal officer's section provides the officer and enlisted complement as well as the equipment for operation of the DSO's staff. Included in this section is the assistant division signal officer (ADSO) (para 99) who serves as the direct assistant to the DSO in supervising all communications operations of the division. Other staff members are concerned with such communications functions as radio, telephone and teletypewriter operations, communications security, standing signal instructions (SSI), and signal operation instructions (SOI). Field operations of this section are conducted from Communications Operations Center AN/ MSC-31.

12. Administrative and Logistics Section

a. This section provides the enlisted personnel and the equipment required to support the administrative and logistics functions of the battalion.

b. The personnel staff NCO functions under the general direction of the S1 and under the direct supervision of the sergeant major. This NCO acts as liaison between battalion headquarters and the administration company of

the support command on all personnel matters. He performs similar liaison between operating companies of the battalion and battalion headquarters. Maintenance of battalion personnel records and related activities is performed by the administration company of the support command.

c. Other individuals of this section are involved in battalion logistics functions. They function under the general supervision of the S4 and the direct supervision of the unit supply technician (warrant officer). They include the battalion supply sergeant, general supply specialist, signal supply-parts specialist, and supply clerk.

13. Operations and Intelligence Section

a. This section provides commissioned and enlisted personnel to support the operations and intelligence functions of the battalion. The section operates under the supervision of the battalion S3. Assisting the battalion S3 is the assistant S3 who has additional duties as the battalion S2-intelligence officer.

b. The section establishes the *division system control and information center* to coordinate the communications activities of the operating elements of the battalion (para 112).

c. A chemical noncommissioned officer (NCO) is provided by this section to assist the battalion S3 in all aspects of chemical, biological, and radiological (CBR) operations. CBR personnel are appointed as specified in AR 220-58.

14. Battalion Motor Maintenance Section

This section operates under the supervision of the battalion motor officer. It provides supplemental organizational motor maintenance support for the battalion. Refer to paragraph 115 for further details.

CHAPTER 4

ORGANIZATION OF THE COMMAND OPERATIONS COMPANY

15. General (fig. 3)

The command operations company TOE 11-37 is organized into a company headquarters, two command signal center platoon headquarters, and seven operating sections or teams. The company is capable of providing its own supply, mess, organizational maintenance of all TOE equipment, and direct support maintenance of cryptographic equipment. The company will establish and operate signal facilities

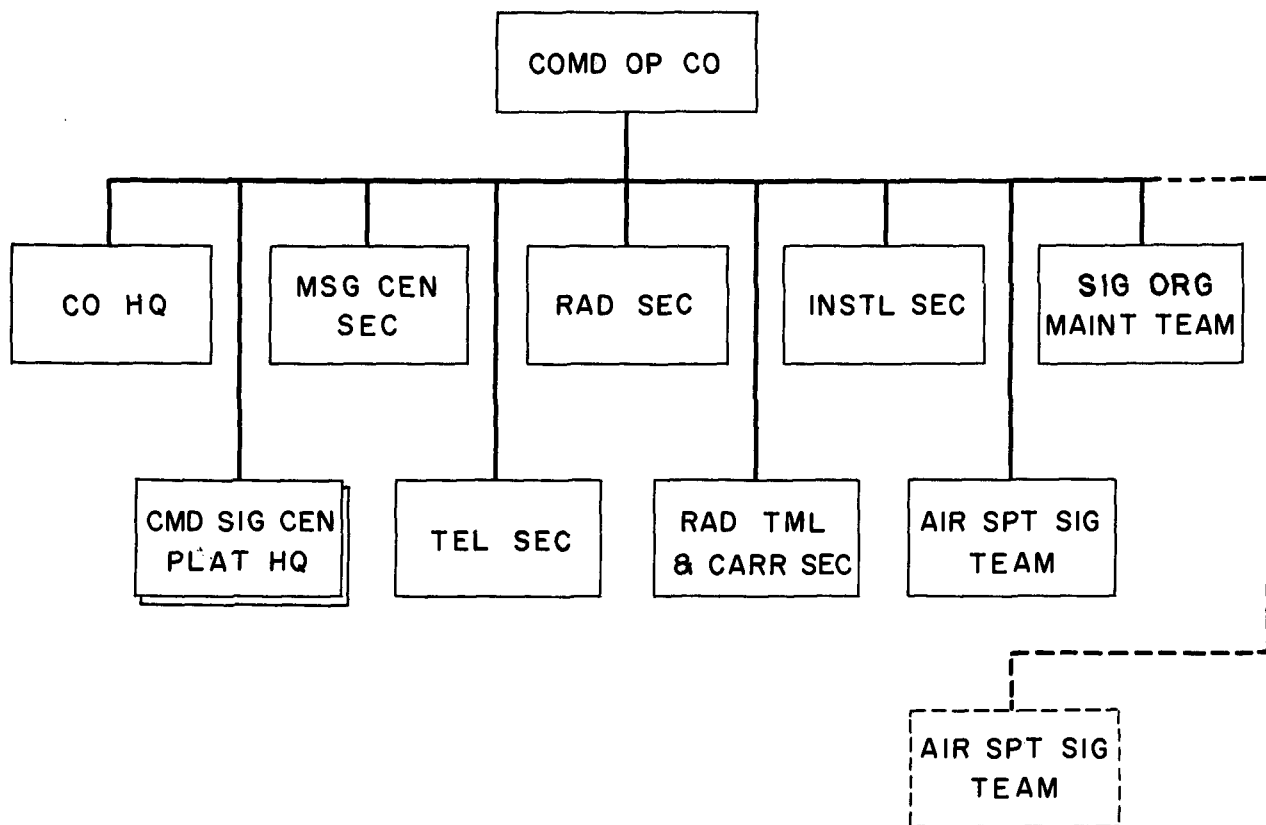
on a 24-hour basis for the division main, division alternate, and division tactical CP's.

16. Mission

The mission of the command operations company is to—

a. Provide signal communications for division alternate command posts (CP's) including the division tactical operations center (DTOC).

b. Provide signal communications for divi-



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Figure 3. Command operations company.

sion headquarters, exclusive of staff vehicle radios (these are provided by the division headquarters and headquarters company).

c. Furnish signal center service to units located in the vicinity of division headquarters echelons. This service is supplementary to that of the organic facilities of the unit being supported.

d. Establish and operate an assigned portion of the division communications system.

e. Provide and operate the facilities that connect division artillery headquarters into the division communications system.

f. Furnish and operate stations as required in the radio nets of the division or higher echelons.

g. Perform direct support maintenance of organic cryptographic equipment. This service is provided, within unit capabilities, to other units located in the vicinity of the various echelons of division headquarters.

17. Company Headquarters

The company headquarters provides command, control, and coordination of the company operations. Headquarters services include motor maintenance and a company mess. In most situations, it is envisioned that the major portion of the battalion headquarters and headquarters detachment will mess with the command operations company. The company commander is provided with a vehicular FM radio (AN/VRC-46) to operate in the battalion command net.

18. Command Signal Center Platoon Headquarters

a. The command operations company provides two command signal center platoon headquarters for operational control of the various operating sections of the company. Teams from these sections are assigned to one platoon headquarters to establish and operate a signal center in support of the division main command post. Signal resources not committed to support of the division main command post are assigned to the remaining platoon headquarters to operate one or more of the following:

- (1) A signal center in support of a separate alternate division CP.
- (2) A displacement signal center to be committed when the division main CP moves.
- (3) A small mobile communications element to support a tactical division CP (when and if established).
- (4) Necessary augmentation for any element of the division that may be designated an alternate CP; for example, division artillery, brigade, or support command.

b. Each platoon headquarters has an FM radio set (AN/VRC-46) in the battalion command radio net.

19. Message Center Section

a. This section provides message center facilities at the various command signal centers. The services provided include message handling, cryptography, facsimile (AN/TXC-1), teletypewriter (AN/MSC-29), and messenger. Normally, the facsimile station is located in the signal center at the division main CP.

b. The section has sufficient personnel and equipment to operate—

- (1) Three message centers AN/GSQ-80 (these are shelters mounted on 2½-ton trucks).
- (2) Three shelter-mounted Telegraph Terminals AN/MSC-29, mounted on 2½-ton trucks.

c. Messenger service is operated by the message center element of the particular command signal platoon. If signal centers are widely dispersed, air messenger service is employed between the signal centers of division main and division alternate, or to other major subordinate elements of the command; aircraft is provided by the division aviation battalion on an established priority basis. Motor messenger service is used when command posts are accessible by road; it is recommended that motor messengers be dispatched in pairs, as driver and guard respectively.

20. Telephone Section

The telephone section operates the telephone switchboard and the circuit control facilities

for the command post installations listed in paragraph 18. This section is capable of manning and operating the following:

- a. Three mobile manual central offices (AN/MTC-3), shelter-mounted on 2½-ton trucks.
- b. Three mobile communications patching panels (SB-611/MRC), shelter-mounted on ¾-ton trucks.
- c. Four manual telephone switchboards (SB-22()/PT) for use as required.

21. Radio Section

The radio section operates the net control stations (NCS's) of the division headquarters radio nets as well as certain subordinate stations at other echelons of division headquarters. In addition, this section operates radio-wire integration stations at the division main and division alternate CP's. Capabilities of the section are summarized below:

- a. Three mobile high-power tactical radio teletypewriter (RATT) stations (AN/GRC-26()).
- b. Four mobile medium power RATT stations (AN/GRC-46).
- c. Two mobile medium power voice or continuous wave (CW) radio stations (AN/GRC-106 or AN/GRC-19).
- d. Two mobile frequency-modulated (FM) radio stations for radio-wire integration (AN/VRC-49).
- e. Two high-frequency (HF) radio receivers to monitor in the division warning net (AN/GRR-5), one receiver for each of the two command signal center platoons.

22. Radio Terminal and Carrier Section

This section installs and operates terminals of the radio relay system and associated carrier equipment for division main CP, division alternate CP, division artillery CP, and other command echelons of division headquarters as designated. Total personnel and equipment allocations are sufficient for ten radio relay and carrier terminals (AN/MRC-69).

23. Installation Section

The installation section installs wire and cable for the command signal centers listed in paragraph 18. This section operates under the

supervision of an enlisted wire foreman and is composed of three teams. Section equipment includes two ¾-ton trucks, three 2½-ton trucks, three engine-driven cable reeling machines (RL-207/G), and two hand cable reeling machines (RL-31). Typical wire and cable installations performed by the section include:

- a. Interconnecting cable between signal center equipment assemblages.
- b. Wire and cable connections to all elements within the various division CP echelons.
- c. Wire trunks to other units in the immediate CP area.

24. Air Support Signal Team

a. The air support signal team provides communications for the tactical air support element (TASE) of the DTOC. (The DTOC is normally located within the division main CP.)

b. At TASE, DTOC, this team provides cryptographic services and installs and operates the following:

- (1) A manual telephone switchboard (SB-22()/PT).
- (2) One mobile high-power RATT station AN/GRC-26() in the Army air request net.
- (3) One radio station in the Air Force spot-report receiver system (AN/VRC-24).
- (4) A HF radio receiver in the division warning broadcast net (AN/GRR-5).
- (5) One VHF-FM station (AN/VRC-46) in the division command net (FM Voice).
- (6) One medium-power high frequency voice or CW station in the division air request net (AN/GRC-19 to be replaced by AN/GRC-106 when available).

c. Augmentation by an additional air support signal team may be authorized when the U.S. Air Force does not provide communications support to its air liaison officer (ALO) with the division headquarters. In this application, the high-powered frequency RATT set is used in a net with the ALO's at other divisions, corps, and army, and the medium-power high frequency voice or CW set is used in a net with all air control teams of the division.

25. Signal Organizational Maintenance Team

The signal organizational maintenance team performs direct support maintenance of organic cryptographic equipment; this maintenance

service is also furnished to other units located in the near vicinity of division main and division alternate CP's. In addition, a mobile signal maintenance team performs organizational maintenance of organic signal equipment.

CHAPTER 5

ORGANIZATION OF THE FORWARD COMMUNICATIONS COMPANY

26. General (fig. 4)

The forward communications company (TOE 11-38) consists of a company headquarters, a signal organizational maintenance team, a forward command terminal section, and three forward area signal center platoons. The company is capable of providing its own supply, mess, organizational maintenance of all TOE equipment, and direct support maintenance of cryptographic equipment. The company has the capability to establish three forward area signal centers and operate them on a 24-hour basis.

27. Mission

The mission of the forward communications company is to—

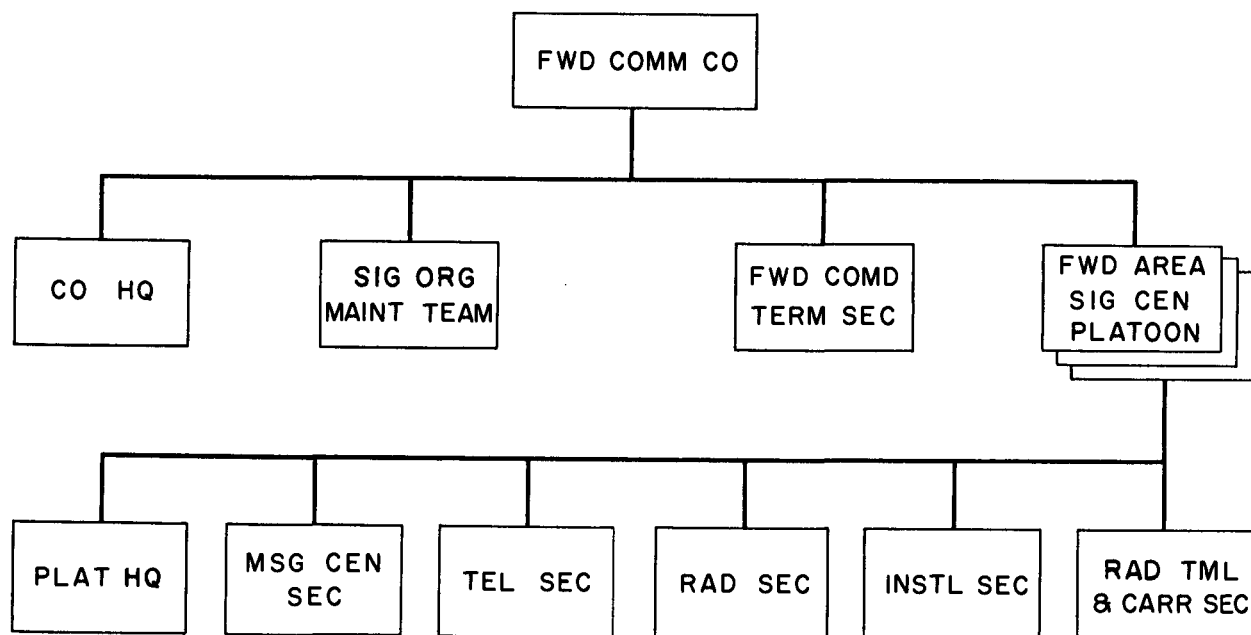
a. Provide signal center service to units in the forward area of the division zone. This service is supplemental to that of the organic facilities of the units being supported.

b. Establish and operate an assigned portion of the division communications system.

c. Provide brigade headquarters with multi-channel communications to the two command echelons of the division and to at least one forward area signal center.

d. Connect brigade headquarters and other units into the division communications system.

e. Perform direct support maintenance of all cryptographic equipment organic to the company. Cryptographic maintenance support within the repair capability of the company is provided to units within the area.



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Figure 4. Forward communications company.

28. Company Headquarters

The company headquarters provides command, control, and coordination of the company operations to include unit mess, supply, and organizational motor maintenance. The company commander is provided with an FM vehicular radio set (AN/VRC-46) to operate in the battalion command net.

29. Forward Command Terminal Section

a. The forward command terminal section is composed of nine teams—three teams for each of the three brigades. These teams provide radio relay and associated carrier terminals (AN/MRC-69's) at brigade headquarters to connect brigade headquarters to the division main and the division alternate CP's and the supporting area signal center.

b. If the brigade trains are not provided wire or cable connection to a forward signal center, a radio relay terminal may be provided by the forward communications company for direct entry of the trains area into the division communications system.

30. Forward Area Signal Center Platoon

(fig. 4)

A forward area signal center platoon is composed of a platoon headquarters, message center section, telephone section, radio section, installation section, and radio terminal and carrier section. Each of the three platoons is assigned the task of establishing and operating a signal center to support units within a designated forward area, and to connect the brigade headquarters into the division multichannel communications network. Brigade trains, and the field trains of the maneuver battalions when in the brigade trains area, are connected to a forward area signal center by wire or cable if not otherwise provided entry into the division multichannel network by radio relay terminals. Basically, these signal centers afford access to the division communications system for all units being supported, in particular the forward direct support elements of the division support command. All support, however, is supplemental to the organic capabilities of the supported unit.

a. *Platoon Headquarters.* A platoon headquarters provides command control and coordi-

nation of platoon operations. Each platoon leader must maintain close coordination with the units being supported. The platoon leader is provided with a vehicular FM radio set (AN/VRC-46) for use in the battalion command net.

b. *Message Center Section.* Each message center section provides message handling, cryptographic, teletypewriter, and limited motor messenger service for units in the signal center's zone of responsibility. Normally, supported units will pick up and deliver messages as required. A mobile teletypewriter central office (AN/MGC-17) provides teletypewriter terminal, switching, and cryptographic facilities for the signal center. Each section has an HF radio receiver (AN/GRR-5) for monitoring in the division warning net.

c. *Telephone Section.* The telephone section is made up of circuit control specialists and switchboard operators.

(1) The section operates a manual telephone central office (AN/MTC-7) which is designed to handle both the local and trunkline switching requirements of the signal center. A small manual switchboard (SB-22()/PT) is also provided for displacement or for setting up a forward switch for short periods of time.

(2) Communications control functions for the signal center are also performed by this section. These functions include patching and termination of trunk lines, circuit testing, and maintenance. A mobile communications patch panel (SB-611/MRC) is provided for this purpose. Most of the telephone instruments (TA-312/PT) assigned to the platoon are carried within this section. Since the number of telephone sets is limited, their assignment must be on a carefully controlled basis.

d. *Radio Section.* The radio section installs and operates the following:

- (1) One mobile, medium-power RATT station (AN/GRC-46) in the division general purpose net.
- (2) One FM radio station (AN/VRC-49) to provide a radio-wire integration

capability at the forward area signal center.

e. Installation Section. This section installs the interconnecting cable (5-pair and 26-pair) for all component elements of the signal center, and cable or field wire to supported units.

- (1) The installation section is equipped with an engine-driven, cable reeling machine (RL-207/G) mounted on a 2½-ton truck. Two manually operated reel units (RL-31) are also provided.
- (2) Since the installation section has limited capability, priorities should be established for connecting units into the system. These priorities depend on the tactical situation, and must be coordinated by the DSO with the division staff.

f. Radio Terminal and Carrier Section. This section provides personnel and equipment to install and operate three mobile radio relay and carrier terminal sets (AN/MRC-69's) at each signal center in the forward area. The multichannel terminals thus provided connect the forward signal centers into the division multichannel network.

31. Signal Organization Maintenance Team

The signal organization maintenance team performs direct support maintenance of organic cryptographic equipment. Within its capability, the company provides this service to other units located in the vicinity of signal centers in the forward division areas. In addition, a mobile signal maintenance team performs organizational signal maintenance for the company.

CHAPTER 6

ORGANIZATION OF THE SIGNAL SUPPORT OPERATIONS COMPANY

32. General (fig. 5)

The signal support operations company (TOE 11-39) consists of a company headquarters, a signal organizational maintenance team, a photographic section, a field cable installation platoon, a radio relay terminal and carrier section, a rear echelon operations platoon, and a support command operations platoon. The capabilities for field cable installation and radio relay are intended to supplement the facilities of the two other operating companies of the battalion. Basically, this company is capable of supplying its own supply, mess, organizational maintenance of all TOE equipment, and direct support maintenance of cryptographic equipment. Personnel and equipment are sufficient to establish and operate signal centers at division support command headquarters and at division rear echelon on a 24-hour basis.

33. Mission

The mission of the signal support operations company is to—

a. Provide signal communications for the division support command headquarters and the division rear echelon.

b. Provide signal center service for units located in the vicinity of the support command headquarters and in the division rear echelon. This service is supplemental to that of organic facilities.

c. Establish and operate an assigned portion of the division communications system.

d. Provide and operate radio stations in division and higher echelon nets, including division administrative/logistical net and the Army logistical net, and to serve as net control in division administrative logistical nets.

e. Perform field cable construction and to provide an augmentation of radio relay terminal and repeater stations and the telephone carrier terminals of the division signal battalions.

f. Perform photography (except aerial photography) and photographic still picture laboratory service (except color processing) for divisional units.

g. Provide organizational signal maintenance support for the company, and supplemental organizational maintenance for the remainder of the signal battalion.

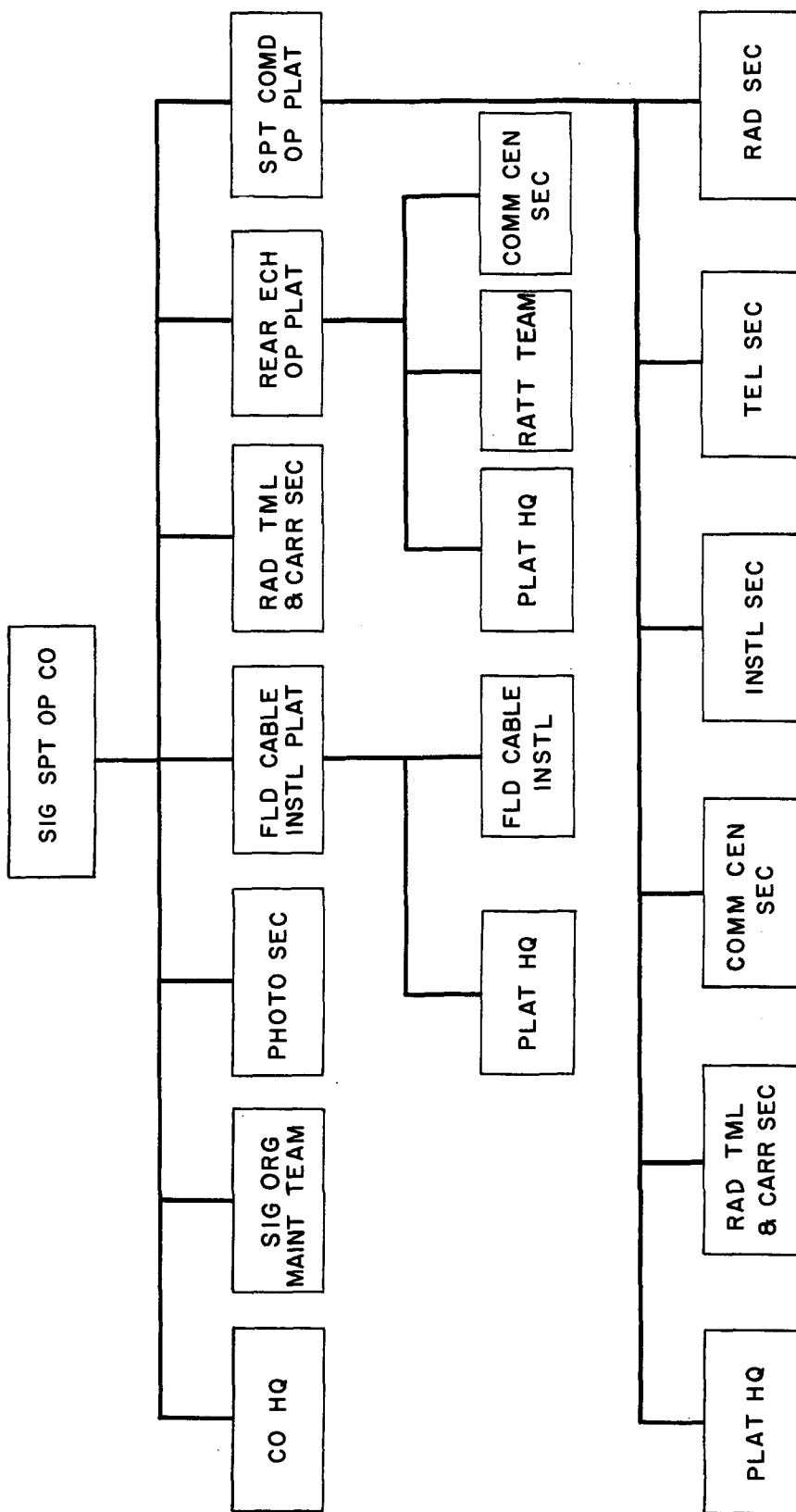
h. Perform direct support maintenance of all cryptographic equipment organic to the company and to divisional units in the vicinity of division support area.

34. Company Headquarters

The company headquarters provides the personnel and equipment for the command, control, and coordination of company operations. The services provided include a company mess, organizational motor maintenance, and supply. A vehicular FM radio set (AN/VRC-46) is provided for the use of the company commander in the battalion command net.

35. Signal Organizational Maintenance Team

The signal organizational maintenance team performs signal organizational maintenance on company equipment and direct support maintenance on cryptographic equipment. It also furnishes this maintenance service to other signal units located in the vicinity of the support command signal center. In addition, a mobile signal maintenance team performs signal organizational maintenance for the various echelons of the company and is used to supple-



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Figure 5. Signal support operations company.

ment the signal organizational maintenance of other units of the signal battalion as required.

36. Photographic Section

a. The photographic section provides still and motion picture ground coverage for the division. Organic equipment includes one mobile photographic laboratory (dark room) to process film for divisional units. This laboratory is deployed as directed by the battalion commander. Activities of the section require close coordination with the division staff and the units being supported. Processing of still color and all motion picture film is beyond the capability of the section and must be performed by army or theater army signal photographic laboratories.

b. Aerial photographic coverage is provided by the division aviation battalion or by the Air Force.

37. Field Cable Installation Platoon

a. The mission of the platoon is to install, maintain, and recover field cable (spiral-four) for the division signal battalion (fig. 6). A summary of the cable installations normally performed by this platoon follows:

- (1) Division main to division alternate.
- (2) Division main to division support command.
- (3) Division main to division artillery headquarters.
- (4) Division alternate to division artillery headquarters.
- (5) Forward area signal center to the supported brigade headquarters, where time and the tactical situation permit.
- (6) Forward signal center to brigade trains area, where time and the tactical situation permit.

b. To perform its mission, the platoon is organized into a headquarters and eight five-man teams, each team consisting of a team chief and four wiremen. Team equipment and supply include one 2½-ton truck, one engine-driven cable reeling machine (RL-207/G), one cable hand reeling machine (RL-31). Sixteen Telephone Repeaters (AN/TCC-11) and 50 miles of spiral-four cable are available for platoon use. Both the platoon leader and platoon

sergeant have FM radio sets (AN/VRC-46) mounted in their assigned ¼-ton vehicles. These radio sets are used to operate in the battalion command net.

38. Radio Terminal and Carrier Section

a. The radio terminal and carrier section provides an augmentation capability of both personnel and equipment for two mobile radio (relay) terminal sets (AN/MRC-69) and six radio (relay) repeater sets (AN/MRC-54). All equipment is shelter-mounted on 2½-ton trucks. Each AN/MRC-54 radio relay repeater set is jointly mounted with an AF radio set AN/VRC-46.

b. The two teams operating the mobile AN/MRC-69's are intended to augment the division relay and carrier terminal facilities as needed. The six mobile radio relay repeater teams (AN/MRC-54's) are deployed as an integral part of the division communications system either to extend normal radio relay range or to overcome terrain masks. In addition, four telephone carrier terminals (AN/TCC-7) are provided for use as needed in the division communications system.

39. Rear Echelon Operations Platoon

The rear echelon operations platoon establishes and operates signal facilities at the division rear echelon. This platoon provides communications for both the administration company and the administration center; radio relay and carrier terminal facilities are not provided. If operating in the army area, the division rear echelon is normally connected by field cable into the nearest army area signal center; if in the division area, either field cable connection is made to the nearest division signal center or a radio relay terminal (AN/MRC-69) is provided by the signal battalion. The component sections of the platoon with their respective missions are given below:

a. *Platoon Headquarters.* Platoon headquarters provides command, control, and coordination of the operations of the platoon. The platoon leader serves as the signal officer of the division rear echelon.

b. *RATT Team.* This team operates a high-power RATT station (AN/GRC-26()) in the division general purpose net.

c. Communications Center Section. This section provides varied communications center service for the division rear echelon. These services include cryptography, teletypewriter (AN/MGC-17) operation, trunk and local switching (AN/MTC-7), local wire construction, and telephone installation; messenger service, however, is not provided. In addition, the section operates a vehicular FM station (AN/VRC-46) in the battalion command net (for the platoon leader) and maintains a HF receiver (AN/GRR-5) in the division warning broadcast net. There is no provision for a radio-wire integration station at division rear.

- (1) The single-position manual telephone central office (AN/MTC-7) provided by this section affords local switching and trunk switching into either the army area communications system or into the division communications system, depending upon the location of division rear echelon.
- (2) The communications center section is manned and equipped to operate in one echelon only. If displacement is required, the section must close out or be sufficiently augmented to provide two-echelon operation.

40. Support Command Operations Platoon

The support command operations platoon establishes and operates a signal center which provides signal support for the headquarters of the support command and other units in the support command area. The component sections of the platoon with their respective missions are discussed below.

a. Platoon Headquarters. Platoon headquarters provides command, control, and coordination of platoon operations and maintains an FM vehicular station (AN/VRC-46) in the battalion command net.

b. Radio Terminal and Carrier Section. This section furnishes the signal center at support command headquarters with the capability to operate by radio relay in the division communications system. Personnel and equipment are sufficient to man and operate three radio relay

terminal sets (AN/MRC-69) with their associated carrier equipment.

c. Communications Center Section. This section provides cryptographic service and teletypewriter (AN/MGC-17) operation for the communications center at division support command headquarters. Messenger service is not provided.

d. Installation Section. This section has the capability to install and maintain wire and cable within the support command headquarters area and to support command elements nearby. Included in the equipment of this section are one $\frac{3}{4}$ -ton truck, two $2\frac{1}{2}$ -ton trucks, two engine-driven Cable Reeling Machines RL-207/G, and two hand Cable Reeling Machines RL-31.

e. Telephone Section. This section provides telephone, trunk and local switching, and circuit control for support command headquarters and for units in the support command area.

- (1) The section provides and operates a single-position manual telephone central office (AN/MTC-7) in the signal center at support command headquarters. A second smaller switchboard (SB-22()/PT) is provided for utility purposes.
- (2) Circuit control functions include patching (SB-611/MRC) and termination of trunk lines, circuit testing, and maintenance.

f. Radio Section. The radio section provides and operates a high-power RATT station (AN/GRC-26()) in the army logistics net and a medium-power RATT station (AN/GRC-46), the net control station, in the division administrative logistics net. The section also provides a net control station (AN/GRC-46) in division RATT net No. 3 (general purpose). The remaining AN/GRC-46's may be used to support subordinate units of the support command, as required. In addition, an FM station (AN/VRC-49) is maintained for radio/wire integration.

CHAPTER 7

DIVISION COMMUNICATIONS SYSTEM

Section I. BASIC CONSIDERATIONS

41. Area Concept and Communications Support

The area concept of tactical offense and defense necessitates an infantry, armored, or mechanized division potential of great operational flexibility with the capability to meet the extended frontages anticipated on the nuclear battlefield. Such required capability will place heavy demands on the *division communications system* and, therefore, on the division signal battalion.

a. Operational flexibility in the division will require an equally flexible communications system. The division communications system, therefore, must provide, wherever possible, alternate paths of communications and afford speedy reaction to cope with changes in operational plans and task organizations.

b. Tactical dispersal and operations over extended frontages entail a concurrent dispersal of supporting communications means throughout the division area. This places heavy reliance on the use of radio relay for division communications.

42. Characteristics of the Division Communications System

The division communications system is designed to provide rapid and responsive communications that will meet the requirements of command control. The system must provide the following:

a. Communications service to widely dispersed units.

b. Flexibility to meet changes in division task organization and, at the same time, to facilitate the relocation of units, command posts, and installations.

c. Patching facilities to permit electrical re-

routing and physical relocation of circuits with a minimum of system changes.

d. Secure facilities for transmitting classified information.

e. Reliable and alternate means of communications.

f. Common-user circuits for installations and units which eliminate the need for extensive organic systems.

g. Sole-user circuits for coordination of weapon employment and other high priority requirements.

h. Integration with the corps command and field army communications systems.

43. Composition

The division communication system as established, equipped, and operated by the signal battalion will normally consist of the following:

a. Signal centers at each echelon of division headquarters (main, alternate, and rear) support command headquarters, and at three forward sites in the division zone.

b. Multichannel communications links (radio relay and spiral-four cable and carrier) to interconnect the division signal centers (see above), division artillery headquarters, and the headquarters of each brigade.

c. Division ground messenger service and air messenger service (aircraft provided by the general support company of the division aviation battalion) to link echelons of division headquarters with the major subordinate commands of the division.

d. AM and FM radio nets.

e. Radio wire integration stations at each signal center, except division rear, for interconnecting mobile FM radio stations to the telephone system at the signal centers.

44. Responsibility

a. The establishment, operation, and maintenance of communications is a command responsibility. Basically, the DSO is responsible to the division commander for the performance of these functions.

b. The DSO operates in the dual capacity as a member of the division special staff and as commanding officer of the division signal battalion.

45. Employment

Variations in operational environment will preclude rigid rules for the employment of the

division communications system. The configuration, extent, and composition of the system are governed by the following factors:

- a.* Division mission and task organization for combat.
- b.* Location and disposition of divisional units.
- c.* Terrain characteristics in the area of operations.
- d.* Enemy capability.
- e.* Attachment of forces by higher headquarters.
- f.* Logistical situation.
- g.* Communications security considerations.

Section II. SYSTEM ANALYSIS

46. Multichannel Network

The multichannel portion of the division communications system consists of the radio relay, carrier, and cable facilities installed and operated by the signal battalion. Figure 6 illustrates a *recommended type* configuration of these facilities. Final determination as to network composition is made by the DSO; his decisions are based on the desires of the division commander, the division SOP, the tactical situation, the frequencies and equipments available, and the factors listed in the preceding paragraph.

47. Radio Relay (fig. 6)

a. Within the Division. Radio relay is the primary means of providing common-user and sole-user telephone and teletypewriter circuits for the major headquarters of the division. The equipments required in the division multichannel network are radio terminal sets (AN/MRC-69) augmented as required by radio repeater sets (AN/MRC-54). A summation of the responsibilities of individual companies of the signal battalion is given below:

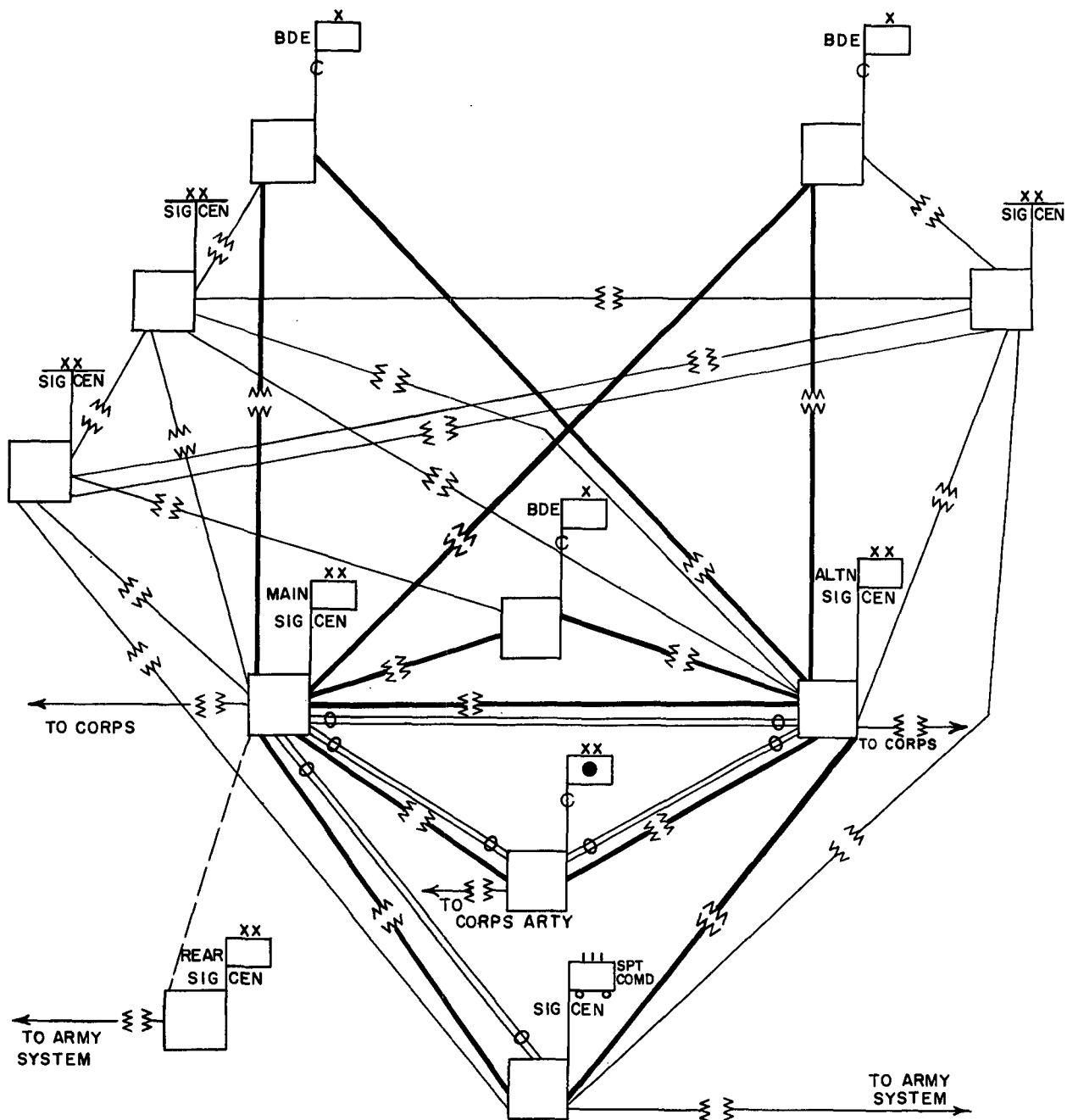
- (1) The command operations company installs and operates the terminals at the signal centers of division main, division alternate, and division artillery.
- (2) The forward communications company installs and operates radio (re-

lay) terminals at the forward signal centers, the headquarters of each brigade, and, if necessary, at brigade trains.

- (3) The signal support operations company maintains a pool of terminal and repeater equipment for installation or augmentation to the system as needed. In addition, this company installs and operates terminals at division support command headquarters, and, if needed, at division rear echelon.

b. To Corps and Army. Normally, the corps signal battalion installs radio relay terminals (AN/MRC-73) at division main and division alternate CP's to operate in the corps communications system. Similarly, the combat area signal battalion (army) usually installs a radio relay terminal (AN/MRC-73) at division support command to operate in the army area communications system. If the division rear CP is located in the army area, a radio relay set may be provided by army signal units to connect this division echelon into the army area communications system. Normally, however, this signal center is connected by field wire into the nearest army area signal center.

c. Lateral Communications. Although not shown in figure 6, lateral communications from division main or division alternate CP's to adjacent division or other units are established as required (figs. 11 and 12).



LEGEND:

T DIVISION FORWARD SIGNAL CENTER

W RADIO RELAY

○ ○ SPIRAL FOUR CABLE

— PRIORITY LINKS

— SECONDARY LINKS

--- AS REQUIRED BASED ON LOCATION. WHEN IN DIVISION ZONE, RADIO RELAY OR CABLE WILL BE PROVIDED BY DIV. SIG. BN.

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Figure 6. Type configuration of the multichannel portion of division communication system.

48. Establishing the Radio Relay System

a. *Priority Radio Relay Links.* After the signal center sites have been determined, the priority links of the radio relay systems are established. These links, illustrated by the heavy lines in figure 6, are the radio relay links that must be immediately established and continually maintained. The following are recommended as priority radio relay links for establishment by the division signal battalion.

- (1) Division main and alternate CP's to each brigade.
- (2) Division main and alternate CP's to division artillery headquarters.
- (3) Division main and alternate CP's to division support command.
- (4) Division main CP to division alternate CP.

b. *Secondary Radio Relay Links.* The secondary radio relay links complement the priority links and offer wider area and alternate routing paths for the multichannel portion of division communications system. Typical secondary radio relay links are given below:

- (1) Lateral links between area signal centers.
- (2) Area signal centers to brigade.
- (3) Area signal centers to division main, alternate, and support command CP's.
- (4) Area signal centers to division support command.
- (5) Lateral link to adjacent division.
- (6) Division main CP to division airfield.

49. Radio Relay Equipment

a. The radio relay equipments shown in figure 6 are currently Radio Terminal Sets AN/MRC-69. Each set provides either two 12-channel radio relay terminals or one 12-channel radio relay terminal and one 12-channel landline carrier terminal. Although not shown in the illustration, Radio Repeater Sets AN/MRC-54 (from the signal support operation company) are inserted into the system as required to overcome terrain masks or to extend operating ranges.

b. The corps and army radio relay teams operating from the division area currently employ Radio Terminal Sets AN/MRC-73. The AN-MRC-73 can provide 12 channels of

carrier telephone, or 11 channels of carrier telephone and 4 channels of carrier telegraph over radio relay or spiral-four cable.

50. Field Cable Installation (fig.6)

a. In all types of operation, plans must be made for the field cable interconnection of the command posts at division main, division alternate, division artillery, and division support command. If time permits, the other major subordinate headquarters may also be tied in with cable.

b. Division systems control and information center must develop a list of cable installation priorities based on the particular tactical situation. Priorities for cable support to units are determined by such factors as the time available, the tactical situation, and the commitment of radio relay terminal equipments.

c. The cable construction capability of the field cable installation platoon (signal support operations company) is limited. If extensive field cable construction is required, augmentation of the division signal battalion will be necessary. Refer to figure 6 and paragraph 37 for recommended field cable installations.

51. Common- and Sole-User Circuits

a. *Common-User Circuits.* Primarily, the division communications system is made up of common-user circuits. Emphasis on this type of circuit will afford maximum utilization of the area features of the division communications system.

b. *Sole-User Circuits.* Sole-user circuits are those circuits allocated to an organization on a full-time basis to provide point-to-point contact; assignment of these circuits is based on traffic volume or traffic precedence. A brief analysis of these determining factors follows:

- (1) Traffic volume must be great enough to keep the circuit in use for 60 percent of its daily rated capacity; that is, the circuit must be required so much of the time that its use for any other purpose would be impractical.
- (2) Traffic precedence is based on tactical urgency. In this instance, certain types of traffic, because of their

tactical importance, warrant sole-user regardless of traffic volume. Typical of the circuits requiring sole-user service in the division communications system are fire direction and air traffic regulation. These are circuits on which even a slight delay cannot be tolerated.

52. Signal Centers

a. Characteristics of Division Signal Center. A division signal center is a grouping of communications facilities installed, operated, and maintained by the division signal battalion. Normally, a signal center provides communications center facilities, messenger service, telephone and teletypewriter switching, circuit testing, and circuit rerouting facilities. Most of the facilities consist of shelter-mounted equipments interconnected by wire and cable. If possible, a minimum of 50 meters should be maintained between shelters; however, radio and radio relay transmitters should be located as far away from the division command post as practicable. Operating elements of the signal center may be within the command post or they can be as much as 200 to 400 meters outside the CP proper. Normally, if the signal center is supporting a small headquarters such as the division rear echelon, it will be located within the command post complex. The signal centers provided by the division signal battalion are discussed in *c*, *d*, *e*, and *f* below:

b. Characteristics of a Communications Center. A communications center is a communications agency charged with the responsibility for receipt, transmission, and delivery of messages. Since the terms "signal center" and "communications center" have caused confusion in the past, the definitions given in this subparagraph and in subparagraph *a* above should be carefully compared. Normally, the communications center includes a message center, a cryptocenter, and transmitting and receiving facilities. Transmitting, receiving, and relay stations are not usually located in the communications center but facilities for their remote control must terminate within the communications center. In this text, the term "signal center" is used wherever possible, and the communication center is considered to be a part of the signal center.

c. Signal Centers at Division Main and Division Alternate. Signal centers at division main and division alternate are provided by the command signal center platoons of the command operations company (ch. 4). These signal centers may provide signal support to units in the immediate vicinity. This support is supplementary to the organic capability of the unit being supported. Division SOP may require that certain elements composing these signal centers be further echeloned to make up a tactical division CP or a division displacement team.

d. Signal Centers in Forward Division Areas. The forward communications company installs and operates three signal centers in the forward area of the division. These centers are established at sites selected by the DSO after consultation with the division staff and are designed to provide signal support to both divisional and nondivisional units in the immediate area of operation. All signal support provided by these signal centers is supplemental to the organic capabilities of the unit or units being served.

e. Signal Center at Support Command Headquarters. The signal center at division support command headquarters is installed and operated by the support command operations platoon of the signal support operations company. This signal center will also supplement the organic facilities of units located in the vicinity of support command headquarters; it does not provide messenger service.

f. Signal Center at Division Rear Echelon. The signal center at division rear echelon is provided by the rear echelon operations platoon of the signal support operations company. Services provided by this platoon are limited; for example, the center can operate in one echelon only, messenger service is not provided, and the platoon has no organic radio relay facilities; refer to paragraph 39 for further details.

53. Locating Signal Centers

The location of the command signal centers is determined by the location of division main and division alternate CP's. In forward areas, however, location of the signal centers is usu-

ally determined by the DSO. Considerations which definitely influence the choice of forward signal center sites are given below:

a. Terrain. Ground reconnaissance should be made to select an area which is firm enough to support wheeled vehicle traffic with minimum engineer assistance. Marshes and masked areas should be avoided. Special attention should be paid to drainage, soil type, and leaf accumulation which could reduce trafficability in the event of precipitation after establishment of the signal center.

b. Tactical Disposition. The site located must be advantageous to service forward brigades or possibly the cavalry squadron.

c. Nearness to Division Support Units. Communication needs of the forward support units must be assessed. It must be determined whether they are spread out or close together and what communications will be required.

d. Projected Operations. Where possible, the signal center must be located so as to best service the next tactical move.

e. Command Requirements. Command requirements may vary; for example, a forward signal center may be used for a command priority radio relay link to the cavalry squadron or a nuclear delivery unit.

f. Nuclear Requirements. Division nuclear and chemical fire requests are handled by direct command channels; however, forward signal centers may be required to tie in a special ammunition supply point that is well forward in the division area; or, a corps nuclear artillery unit may be committed forward in support of division units and require signal center services.

g. Requirements of Supported Units. The volume of traffic from supported units in the vicinity of the forward signal centers must be carefully analyzed. The location selected must afford the maximum signal support to these units.

h. Defense. If guerrilla or infiltration activity is heavy in a particular area, forward signal centers may be located within a brigade or battalion headquarters defensive perimeter for protection.

54. Division Radio Nets

a. Amplitude-modulated (AM) and frequency-modulated (FM) radio nets form an integral part of the division communications system. Two typical division radio net configurations are illustrated in figures 7 and 8. Final determination, however, on these radio net configurations must be made by the division signal officer based on the tactical situation, the availability of frequencies and equipment, and the desires of the division commander. Any arrangement of radio nets must be flexible enough to meet unexpected changes in tactical employment.

b. Normally, AM and FM radio sets are used to establish initial communications between headquarters. As radio relay and wire facilities become available, radio is often relegated to a backup communications role. However, in rapidly moving situations, radio is frequently the only practical means of communication.

c. Although the radio nets are designed functionally for command logistics, intelligence, etc., traffic volume and other conditions may dictate that the nets be combined and used for more than one kind of traffic.

d. It is recommended that RATT nets be restricted to four active stations as an efficient maximum for traffic handling; other stations in excess of four may be placed on a "monitor only" basis. A total of seven stations is recommended as maximum for a RATT net; however, the number of equipments and frequencies available may make it impossible to stay within recommended limits.

55. Internal Radio Nets

(fig. 7)

Recommended or type radio nets for operation within the division are described below:

a. Operations-Intelligence Net (RATT Net No. 1). This net is used to control operations and intelligence functions within the division. The net control station (NCS) is located at the division main CP; alternate NCS is at division alternate CP. The division signal battalion provides personnel and equipment to operate the stations at division main and division alternate.

b. Administrative Logistics Net (RATT Net

UNITS	DIVISION COMMAND NET (FM VOICE)	DIVISION WARNING BROADCAST NET (AM VOICE)	DIVISION OPERATIONS INTELLIGENCE	DIVISION RATT NET #1	DIVISION RATT NET #2 ADMIN LOGISTICS	DIVISION GENERAL PURPOSE	DIVISION AIR REQUEST NET (AM VOICE - CW)	AIR FORCE SPOT REPORT RECEIVER SYSTEM UHF	CORPS COMMAND OPERATIONS NET (RATT)	ARMY LOGISTICS NET (RATT)	ARMY AIR REQUEST NET NET (RATT)
DIVISION MAIN	VRC-12 MCS (S)	^a GRC-19 MCS (S)	GRC-46 MCS (S)	GRC-46 MCS (S)	GRC-46 (S)	GRC-26 MCS (S)			GRC-26 (S)		
DIVISION ALTERNATE	VRC-12	^a GRC-19 (S)	GRC-46 (S)			GRC-46 (S)			GRC-26 (S)		
DIVISION REAR		GRR-5 (S)				GRC-26 (S)					
DIVISION TASE, TOC	VRC-46	GRR-5 (S)					^a GRC-19 MCS (S)	VRC-24 (S)			GRC-26 (S)
DIVISION ARTILLERY	VRC-47	^a GRC-19 (S)	GRC-46	GRC-46	GRC-46			VRC-24			
BRIGADES (3 EACH)	VRC-12	GRR-5	GRC-46	GRC-46			^a GRC-19	VRC-24			
MANEUVER BATTALIONS		GRR-5					^a GRC-19	VRC-24			
CAVALRY SQUADRON	VRC-12	GRR-5	VRC-29	VRC-29			^a GRC-19	VRC-24			
AVIATION BATTALION	VRC-47	GRR-5				GRC-46					
ENGINEER BATTALION	VRC-47	GRR-5				GRC-46					
SIGNAL BATTALION	VRC-47	GRR-5 (S)									
SURVL PLAT AVIATION BATTALION			GRC-46								
SUPPORT COMMAND	VRC-47	GRR-5 (S)		GRC-46 MCS (S)		GRC-46 (S)				GRC-26 (S)	
BRIGADE TRAINS (3 EACH)					GRC-46						
FORWARD AREA SIGNAL CENTERS (3)		GRR-5 (S)				GRC-46 (S)					
MAINTENANCE BATTALION		GRR-5				GRC-46 (D)					
MEDICAL BATTALION						GRC-46 (D)					
SUPPLY AND TRANSPORT BATTALION		GRR-5				GRC-46 (D)					

LEGEND:

MCS - NET CONTROL STATION
(S) - RADIO SET PROVIDED BY SIGNAL BATTALION
(D) - RADIO SETS ARE PROVIDED BY SUPPORT OPERATIONS COMPANY, DIVISION SIGNAL BATTALION, THESE SETS ARE EMPLOYED AS REQUIRED TO MEET VARIATIONS IN TACTICAL AND OPERATIONAL NEEDS WITHIN THE DIVISION.

^a TO BE REPLACED BY AN/GRC-106

^b NORMALLY MONITDR

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Figure 7. Type division radio nets.

No. 2). This net is used for the transmission of administrative and logistical traffic. NCS is located at division support command headquarters, with division main copying all traffic of interest to G1 and G4. Equipment and personnel for the stations at division main and support command headquarters are provided by the division signal battalion.

c. *General Purpose Net (RATT Net No. 3)*. This net is designed to connect division main with division alternate, division rear, division support command, the aviation battalion, the engineer battalion, and the three forward area signal centers. NCS is located at division main command post. Three additional AN/GRC-46's are available in the support command operations platoon for use on an as-needed basis.

d. *Division Warning Broadcast Net (AM-Voice)*. This net is used to broadcast air alerts; chemical, biological, and radiological (CBR) attack warnings; fallout information, rad-safe data; nuclear strike warnings; and similar information of an urgent operational nature. As shown in figure 7, the division signal battalion furnishes the radio sets (AN/GRC-19 or AN/GRC-106) at division main (NCS) and at division alternate, as well as the monitoring receivers (AN/GRR-5) at the DTOC, signal battalion headquarters, division rear, support command, and the three forward signal centers. To insure that all units will have immediate access to the vital information broadcast, the following practices normally apply:

- (1) Battalions and separate companies, and sometimes subordinate elements thereof, are equipped with separate receivers to monitor these broadcasts.
- (2) Certain organizations may switch radio equipments from other nets to transmit in this net (*d* above);
 - (a) Division artillery usually broadcasts all air alerts.
 - (b) The cavalry squadron may broadcast urgent reconnaissance information of immediate interest to elements of the division.

e. *Division CG/Command Net (FM-Voice)*. This net provides the division commander with short-range, direct-voice communications to all major subordinate unit commanders. Because of the large number of stations, use of this net

is restricted; however, commanders and/or staff officers of the units indicated (fig. 7) will monitor this net continually and will actively operate in it when required. Note that the FM radio sets in the type net shown will permit monitoring in one net while actively participating as a station in a second net. The following additional facts are emphasized:

- (1) All radio sets are organic to the particular unit and are vehicular-mounted.
- (2) Retransmission stations for the net may be established as required. For this purpose, radio/wire integration stations or aerial retransmission may be utilized.

f. *Need for Flexibility in Internal RATT Nets of the Division*. The three RATT nets shown in figure 7 embody the greatest economy in employment of equipments and frequencies; however, the configurations represent only one flexible solution—the actual employments will depend upon the desires of the division commander, the tactical situation, and the professional interpretation of the DSO. In some tactical environments, a four RATT net arrangement of internal division radio sets will prove more acutely responsive to combat communications needs. For example, in figure 8 an additional combat support net (RATT net 4) is constituted from available equipments to afford greater flexibility, improved net control, and more immediate response to the combat functions of such units as the engineer and aviation battalions. In addition, RATT net 3 (general purpose) is reduced from 12 to a minimum of 4 or maximum of 7 stations. RATT nets 1 and 2 as shown in figure 7 are unaffected in figure 8.

56. External Radio Nets (fig. 7)

The external radio nets in which the division operates are described below:

a. *Army Air Request Net (RATT)*. This net is used to request immediate tactical close air support for the division. A high-power RATT station (AN/GRC-26()) is established by the division signal battalion to provide communication from G2 and G3 air (at TASE, DTOC) to the field army tactical operations center (FATOC).

UNITS	DIVISION COMMAND NET (FM VOICE)	DIVISION WARNING BROADCAST NET (AM VOICE)	DIVISION RATT NET #1 OPERATIONS INTELLIGENCE	DIVISION RATT NET #2 ADMIN LOGISTICS	DIVISION RATT NET #3 GENERAL PURPOSE	DIVISION RATT NET #4 COMBAT SUPPORT	DIVISION AIR REQUEST NET AM (VOICE - CW)	AIR FORCE SPOT REPORT RECEIVER SYSTEM UHF VOICE	CORPS COMMAND OPERATIONS NET (RATT)	ARMY LOGISTICS NET (RATT)	ARMY AIR REQUEST NET (RATT)	LEGEND
DIVISION MAIN	VRC-12 NCS	GRC-19 ^a NCS (S)	GRC-46 NCS (S)	GRC-46 (S)	GRC-46	GRC-26 NCS (S)			GRC-26 (S)			<p>NCS - NET CONTROL STATION. (S) - RADIO SET PROVIDED BY SIGNAL BATTALION. (D) - RADIO SETS ARE PROVIDED BY SUPPORT OPERATIONS COMPANY, DIVISION SIGNAL BATTALION. THESE SETS ARE EMPLOYED AS REQUIRED TO MEET VARIATIONS IN TACTICAL AND OPERATIONAL NEEDS WITHIN THE DIVISION. ^a TO BE REPLACED BY AN/GRC - 106</p>
DIVISION ALTERNATE	VRC-12	GRC-19 ^a (S)	GRC-46 (S)						GRC-26 (S)			
DIVISION REAR		GRR-5 (S)			GRC-26 (S)							
DIVISION TASE, TOC	VRC-46	GRR-5 (S)				GRC-19 ^a NCS (S)	VRC-24 (S)				GRC-26 (S)	
DIVISION ARTILLERY	VRC-47	GRC-19 ^a	GRC-46	GRC-46			VRC-24					
BRIGADES (3 EACH)	VRC-12	GRR-5	GRC-46				VRC-24					
MANEUVER BATTALIONS		GRR-5					VRC-24					
CAVALRY SQUADRON	VRC-12	GRR-5	VRC-29	VRC-29			VRC-24					
AVIATION BATTALION	VRC-47	GRR-5				GRC-46						
ENGINEER BATTALION	VRC-47	GRR-5				GRC-46						
SIGNAL BATTALION	VRC-47	GRR-5 (S)										
SURVL PLAT AVIATION BATTALION			GRC-46									
SUPPORT COMMAND	VRC-47	GRR-5 (S)		GRC-46 NCS (S)	GRC-46 NCS (S)	GRC-46 (S)				GRC-26 (S)		
BRIGADE TRAINS (3 EACH)				GRC-46								
FORWARD AREA SIGNAL CENTERS (3)		GRR-5 (S)			GRC-46 (S)							
MAINTENANCE BATTALION		GRR-5			GRC-46 (D)							
MEDICAL BATTALION					GRC-46 (D)							
SUPPLY & TRANSPORT BATTALION		GRR-5			GRC-46 (D)							

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Figure 8. Type division RATT nets (alternate arrangement).

b. Army Logistics Net (RATT). The division signal battalion operates a high-power RATT station (AN/GRC-26()) in this net at support command headquarters. The net is used for the transmission of administrative and logistical traffic between division support command and army headquarters. Upon implementation of the field army support command (FASCOM) organization, all army logistical nets will be reoriented and the division station will become a station in the corps support brigade net.

c. Corps Command Operations Net (RATT). This net is used by the corps commander for the command and operational control of subordinate units. The division signal battalion furnishes high-power RATT stations (AN/GRC-26()) at division main and division alternate CP's.

d. Air Force Spot Report Receiver System (UHF-Voice). The signal battalion operates a UHF-voice station (AN/VRC-24) in this net at TASE, DTOC. This station is used for monitoring Air Force close support missions flown for the division. Other division stations in this net are at the headquarters of the brigades, maneuver battalions, and the cavalry squadron.

e. Division Air Request Net (AM-Voice-CW). This net is used to forward requests for immediate tactical air support from the maneuver battalion to the TASE of DTOC. The net is monitored at brigade headquarters by the S3 Air.

57. Signal Battalion Radio Net (FM-Voice) (fig. 9)

The signal battalion radio net (FM-voice) enables the battalion commander/DSO to maintain direct contact with all elements of the signal battalion. When units of the battalion are widely scattered, an FM radio with a retransmission capability may have to be employed to maintain communications.

58. FM Radio-Wire Integration (fig. 10)

a. The division signal battalion operates an FM radio-wire integration (RWI) station at each signal center (except division rear). These centers are used to connect the FM radio

stations operating within the division area to the division communications system on a push-to-talk basis. Interconnection from the RWI station to a main switchboard is made through a remote control unit (Radio Set Control AN/GSA-7) and a Manual Telephone Switchboard SB-22()/PT. (Special Purpose Cable CX-7474 is required to interconnect the AN/GSA-7 to Radio Set AN/VRC-49.)

b. Operation of RWI stations should be standardized throughout the division. SOP's covering such standardization should be used by FM radio operators, RWI station operators, and switchboard operators; users of the system should employ procedures as set down in the division standing signal instructions (SSI).

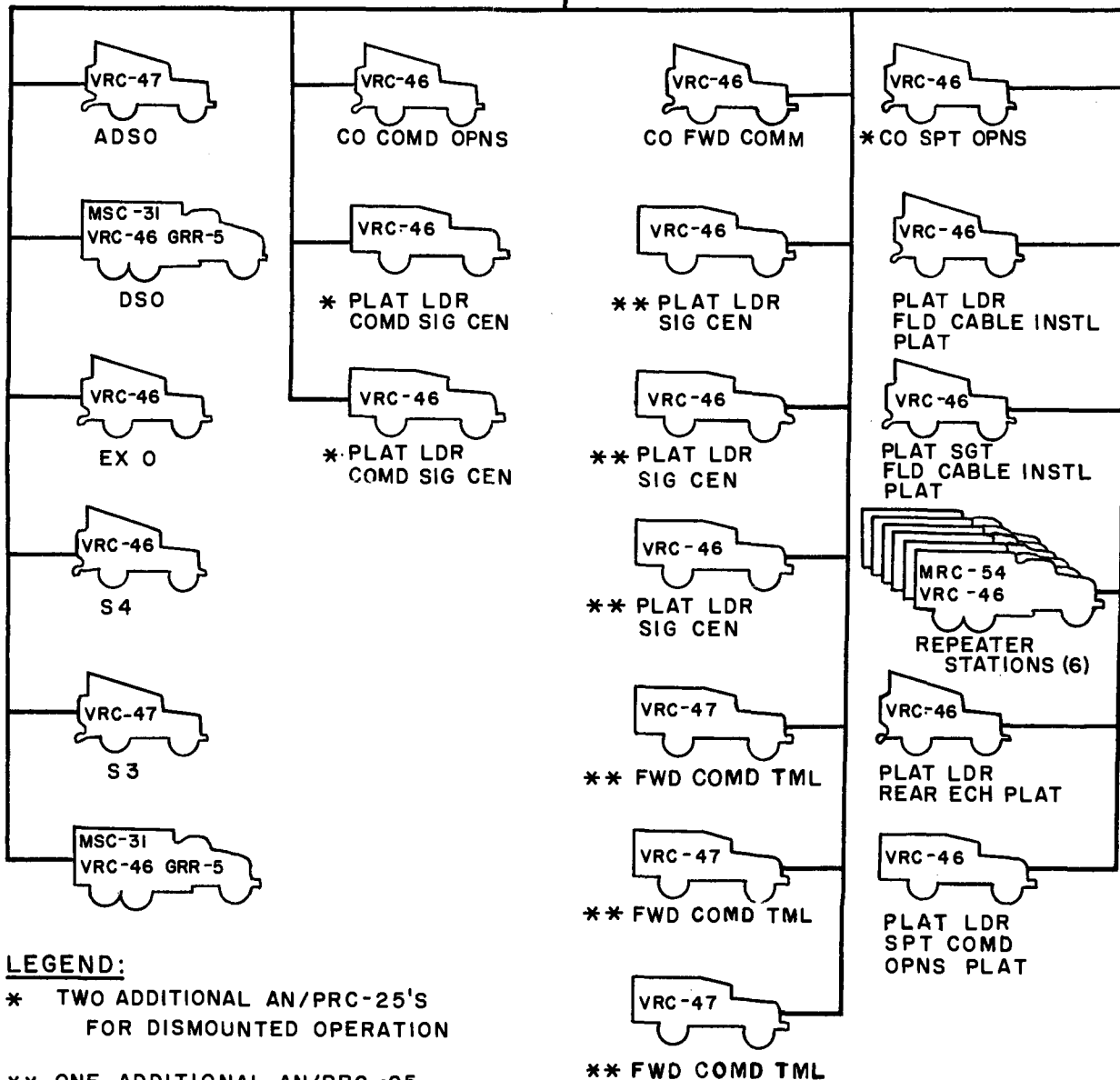
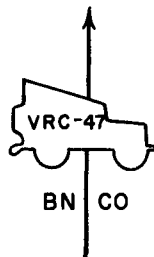
c. A summation of RWI uses is given below:

- (1) Emergency communications between a mobile FM radio station and a unit having access to the telephone system.
- (2) Communications between two widely separated FM stations which are beyond normal FM range.
- (3) Voice communications from mobile units in forward division areas to units located in division rear.
- (4) Contact with low-flying army aircraft from flight control elements that have access to multichannel links of the division communications system.
- (5) Initial establishment (before multichannel facilities are operative) of telephone service between signal centers.
- (6) Supplementing of communications between air liaison officers and forward air controllers.
- (7) Contact between subordinate and higher headquarters during displacement.
- (8) Connection between two switchboards in spanning a break in a wire line.
- (9) Continuation of communications during a river crossing.

59. Provisions for Messenger Service

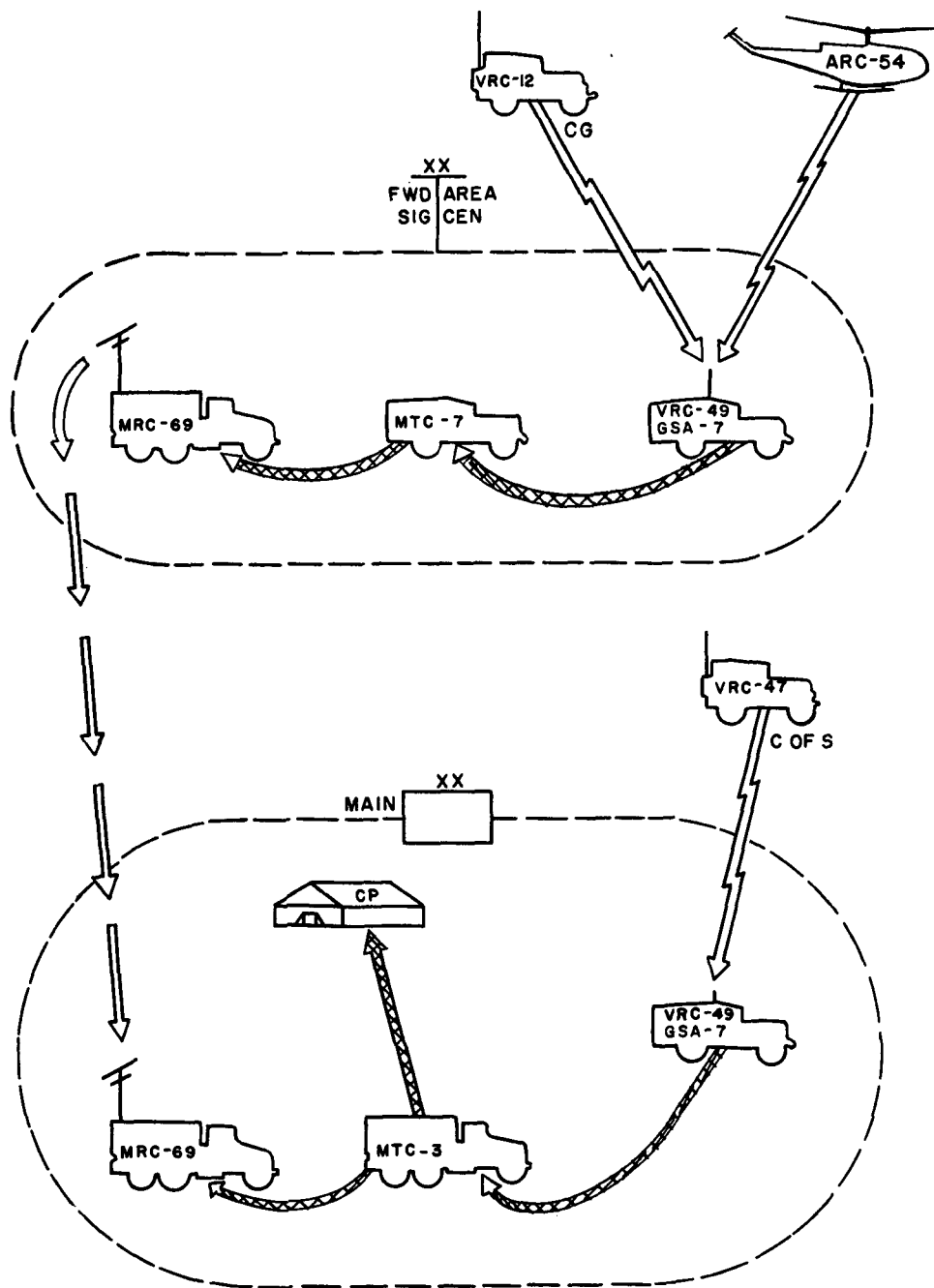
The signal battalion provides messenger service from the command echelons of division headquarters to all organic and attached units. Normally, messengers are dispatched from

TO DIV CG COMD NET



FM 11-50-8

Figure 9. Type FM radio net for division signal battalion.



LEGEND:

- MRC-69 RADIO TERMINAL SET
12 CHANNEL SYSTEM
- MTC-3 SB-86, 120 DROP
2 POSITION SWITCHBOARD
- MTC-7 SB-86, 60 DROP
SINGLE POSITION SWITCHBOARD
- GSA-7 & RADIO/WIRE INTEGRATION STATION
- VRC-49

- RADIO RELAY
- FM RADIO
- FIELD WIRE OR CABLE

FM 11-50-9

Figure 10. Type utilization of radio/wire integration stations.

higher to lower headquarters; in certain instances, however, special messengers may be sent from subordinate to superior headquarters.

a. Motor Messengers. The signal battalion is manned and equipped to provide motor messenger service. It is recommended that motor messengers be dispatched in two-man teams, as driver and guard respectively.

b. Air Messenger Service. The relative efficiency of air messenger service is greatest when the road systems are congested and distances between headquarters are excessive. Aircraft and pilots are furnished by the aviation battalion; messengers are provided by the division signal battalion.

60. Allocation of Messengers

a. Message Center Section at Division Headquarters. This section, which is organic to the command operations company, has six messenger teams and six $\frac{1}{4}$ -ton trucks. Allocation of these teams has to be proportioned between the signal centers at division main and division alternate. It is desirable that two air messengers be kept on call.

b. Message Center Section at Forward Signal Centers. This section, which is organic to the forward communications company, essentially furnishes over-the-counter pick-up and delivery service to the units being supported. One messenger team, with $\frac{1}{4}$ -ton truck, is provided to each of the forward signal centers. Motor messenger runs are made to the division command posts at hours which complement the messenger schedule from division main and division alternate CP's. Messenger service from forward signal centers may require augmentation.

61. Types of Messenger Service

Messenger service, as furnished by the signal battalion, may be classified as scheduled, and special.

a. Scheduled messengers depart and return at specified times, making regular stops along predetermined routes. Messenger schedules should be disseminated to staff officers and the units concerned.

b. Special messengers are used to augment scheduled service or to take care of units to which a route has not been established. Where security is the prime factor, special messengers or couriers may be employed.

62. Typical Items for Messenger Distribution

In the division, messenger service is frequently the most logical means of distributing certain items. A typical list consists of:

- a.* Maps and overlays.
- b.* Passwords.
- c.* SOI and SSI items, SOP's.
- d.* Spare parts and sundry small items.
- e.* Promotion and decoration papers.
- f.* Routine correspondence, division memoranda, etc.

63. Advantages of Messenger Service

The advantages of messenger service are briefly summarized below:

a. Messenger service is the most secure and reliable means of communication.

b. Congestion of electrical means is relieved when messengers are used to carry low precedence traffic.

c. Extensive messenger service may materially reduce requirements for the installation of electrical means.

d. Classified traffic may be transmitted to units not having a cryptographic capability. In addition, messengers can be used for short runs where delivery time is less than the encoding-decoding time required for transmission by electrical means.

e. Bulky items, such as maps and overlays, can only be transmitted by messenger.

CHAPTER 8

TACTICAL APPLICATION OF THE SIGNAL BATTALION'S COMMUNICATION CAPABILITY

Section I. COMMUNICATIONS IN THE ASSEMBLY AREA

64. General

The division assembly area is a specified area in which units of the division command assemble preparatory to further action. During this phase, necessary orders are issued, and maintenance and resupply are accomplished to the extent permitted by the time available.

65. Functions of the DSO Before Assembly

Prior to the division's entry into the assembly area, the DSO and his staff should, if possible, perform the following:

a. Reconnoiter the assembly area to determine logical CP sites, messenger routes, and the adequacy of existing military or civilian communications facilities.

b. Prepare a signal plan that insures communications during the division movement into the assembly area.

c. Coordinate the installation of a signal system within the assembly area to insure integrated communications.

d. Insure that communications security is maintained during the movement into the assembly area.

66. Signal Battalion Activities During Assembly

After occupation of the assembly areas, the signal battalion maintains essential communications and performs signal activities directly related to the forthcoming military action. The more important of these activities may include the following:

a. Revision of the battalion SOP to meet the requirements of the anticipated operation.

b. Training of personnel in the installation, operation, and maintenance of new or special

equipment provided for the operation. This training may include modified or new operating techniques.

c. Adoption of special precautions and security measures that have been found necessary after careful assessment of enemy capabilities.

d. Technical inspection and maintenance of all signal equipment to insure optimum performance.

e. Replenishment of shortages and replacement of unserviceable items.

f. Reconnaissance of the proposed area of operations preparatory to the establishment of the division communications system.

g. Finalization of the signal plan, to include communications security considerations, for the operation, with preliminary provisions for its execution.

67. Required Communications in the Assembly Area

Normally, communications are required from the division CP in the assembly area to landing zones and debarking, detraining, deplaning, and detrucking points. In addition, the division CP must communicate with division security-reconnaissance forces and the headquarters of division support command, rear echelon, and the major subordinate units. A more detailed summation of communications activities in the assembly area follows:

a. Signal Centers. Signal centers are operated at each established echelon of division headquarters. Other centers may be established as needed; for example, at airfields, debarking points, and detrucking points.

b. Messenger Service. Messengers operate

from each established signal center. As a security precaution, heavy reliance is normally placed on messenger service.

c. Radio Communications. In the assembly phase, radio is normally silenced to maintain secrecy and surprise. Exceptions to this are warning broadcasts and transmissions from reconnaissance forces in contact with the enemy.

d. Wire Installation. Wire installation in the assembly area should be limited; however, it must suffice for immediate assembly operations or future use of the area.

e. Radio Relay. Radio relay teams may be deployed throughout the assembly area, but will normally remain silent unless urgently needed.

Section II. COMMUNICATIONS DURING MARCHES AND HALTS

68. General

Division marches may be made in one or more stages, in one or more columns, and over one or more routes. Depending on the type of division (armored, mechanized, or infantry) and the tactical situation, marches are either by foot or motor, or they can be a combination of both. To insure adequate communications to the moving columns, the DSO should, if possible, receive advance briefing on the march plan.

69. Communications While Columns Are Forming

Special messengers are normally used to communicate with units en route to their respective march positions. If radio communication is authorized, it should be limited to short-range, low-power sets. If relays are required, they should be located as far to the rear as practicable.

70. Communications During Marches

The division march command post maintains communication to all column commanders, reconnaissance and security forces, traffic control points, and other operating echelons of division headquarters. Within a particular column, local communication is the responsibility of the column commander. A summary of recommended signal battalion activities for the division on the march is given below:

a. Signal Centers. If designated in the march plan, signal centers may be set up for division main, division alternate, division support command, division rear, and traffic control points or other designated sites along the route of march. When the division CG accompanies the moving column, signal center operations are

conducted from a vehicle accompanying the division march command post.

b. Messengers. Motor messengers operate from the signal center of the march command post. At least one messenger vehicle should follow the division commander. In addition, motor messengers may be detailed to follow designated staff vehicles, the communications center vehicle, and the operating radio vehicles. If aircraft are available, air messenger service may also be employed.

c. Radio Communications. Radio communications will afford rapid command control of the march columns; however, the employment of radio is determined by such factors as security, speed of movement, and the necessity for surprise which may or may not outweigh the requirement for rapid communication. It is recommended that the division CG/command net (FM-voice) have stations at division main march command post, the march command post of each column, and, if required, at control points and advance message centers. For longer range communications, the division operations-intelligence net may be operational with stations at division main, the cavalry squadron, and the aviation battalion.

d. Visual Communications. During the march, the principal means of visual communications are panels, hand signals, and pyrotechnics including colored smoke.

- (1) Friendly aircraft may warn of impending hostile attack by prearranged visual signal.
- (2) Panels are used to transmit short prearranged messages to aircraft, or to mark specified vehicles in column for identification. Generally, the messages

are displayed by either message center or radio teams.

- (3) It is recommended that a special pyrotechnic code be established for march control. If such a code is designated by higher authority, the division may request permission to assign additional special meanings as needed.

e. Wire Communications. When control points or advance communications centers are located near existing wire circuits, arrangements may be made to use these circuits. If commercial wire lines parallel the route of march, arrangements may be made to use them during periodic halts, or at other specified times.

f. Radio Relay. Radio relay may be employed during the march if it does not compromise security or hamper the speed of movement. Normally, in a march situation radio relay employment will be single axis along the division's route of march. To implement radio relay communications, a base station should be installed on the most commanding height—this might require helicopter movement. Such a station may require some assistance for defense.

71. Communications During An Extended Halt

Plans must be made in advance for the communications required at an extended halt. These plans must take into account such factors as the desires of the commanding general, the tactical situation, security requirements, possible bivouac sites of division headquarters echelons and major column headquarters, and

the location and operating conditions of the various elements of the signal battalion. The communications established should be sufficient to maintain command control and to conduct a minimum of administration. An analysis of communications needs at an extended halt is given below.

a. Signal Centers. Signal centers maintain continuous operation during the stay in the bivouac area.

b. Messenger Service. The DSO determines whether special or scheduled messenger service is required; normally, special messenger service is adequate.

c. Radio Communications. The few radio stations operating should be located reasonably close to the division message center. If security permits, the division operations intelligence net may be active; otherwise communications should be restricted to the low-power CG/FM command net. Radio operation in corps and army nets will be as directed by corps and army commanders.

d. Visual Communications. During a daylight halt, a panel station may be set up to communicate with observation aircraft. Such a station can be combined with a message drop and pickup point.

e. Wire Communications. The telephone system installed in the bivouac area is held to a minimum. If wire facilities exist, arrangements may be made for their use.

f. Radio Relay. Radio relay may be used to interconnect signal centers at extended halts only when it is certain that security will not be compromised.

Section III. COMMUNICATIONS DURING DEPLOYMENT

72. General

In the deployment, columns break up into smaller groups and move to assigned march objectives, or to assembly positions preliminary to deployment for offense or defense. The communications provided by the signal battalion must remain continuous during this phase.

73. Application of Communications During Deployment

The signal battalion must be prepared to

meet the communications requirements created by tactical variations in the deployment. Because of this, communications planning must remain flexible. A general analysis of the application of communications to deployment is given below.

a. Signal Centers. The division march command post (division main) may continue to be operational during deployment. If the division march command post did not accompany the march, a division signal center must be estab-

lished by signal battalion personnel of an advance party.

b. Messengers. Close coordination is required to maintain sufficient messenger service because of the continuous shifting of unit locations during deployment. To insure coordination, each unit must notify division signal centers as to the location of their command posts. Timely information of this nature will insure adequate briefing of messengers on routes to and from major CP's. Scheduled messengers will continue deliveries to old CP sites until new CP's are established and proper routing instructions are available.

c. Radio Communications. The extent of radio communications is determined by security requirements and the urgency of traffic. Consistent with the foregoing, the division operational-intelligence net may be operative (fig. 7); however, traffic should be restricted to combat units actually in contact with the enemy, or to units performing a vital intelligence

function; for example, the cavalry squadron or the surveillance and target acquisition platoon of the aviation battalion.

d. Visual Communications. During deployment, the use of visual communications is governed by the ability of the enemy to observe visual signals. Visual communication is not recommended if enemy aircraft are active.

e. Wire Communications. It may be feasible, during deployment, to begin construction of the field cable system that will be required for combat. Installation of wire lines that will have little carry-over use in the approaching tactical deployment must be held to an absolute minimum.

f. Radio Relay. During the early phases of the deployment, radio relay is not operational. This is, however, the ideal time to plan, and perhaps deploy, the radio relay teams to advantageous sites that can best support the forthcoming operation.

Section IV. COMMUNICATIONS DURING OFFENSE

74. General

a. Forms of Offensive Maneuver. As described in FM 61-100, the basic forms of offensive maneuver are the *penetration* and the *envelopment*. The *exploitation* is an offensive operation which may follow a successful penetration or envelopment. The pursuit is an extension of the successful exploitation.

b. Signal Support for Offense. During any offensive operation, combat forces of the division are normally organized into three tactical forces: the main attack force, the supporting attack force, and the division reserve force. Since the main attack force will require the maximum in communications support, the DSO and his staff must direct the planning and support efforts accordingly.

75. Signal Orders and Instructions to the Signal Battalion

If time permits, the DSO will obtain staff approval of his plan for communications, complete the detailed signal plan, and issue the necessary orders to the signal battalion. How-

ever, actual commencement of signal installation cannot be delayed until a detailed signal plan is received. If delay is anticipated, the DSO should order advance parties to proceed to predetermined CP and signal center sites to begin installation of the division communications system. Fragmentary orders and SOP's can be used when more detailed instructions are lacking.

76. Signal Instructions to Subordinate Units

a. Necessary signal instructions to subordinate units may be issued at a conference of the DSO with unit signal or communications officers. In lieu of a conference, signal instructions may be forwarded as the signal annex of the division operations order.

b. Signal instructions for subordinate units will cover messenger service and the use of radio, radio relay, and the wire system as well as any other information of a coordinating nature. An adequate division SOP, however, will tend to reduce the volume of required signal instructions.

77. Application of Communications in the Penetration

During the penetration, the time available will govern the extent of signal communications facilities that can be installed by the signal battalion. Further limiting factors are the quantities of signal supply and equipment immediately on hand. An analysis of the functions of the signal battalion in the penetration is given below:

a. Signal Centers. Normal signal centers are installed at all echelons of division headquarters (fig. 6). During the penetration, provisions must be made to displace the division signal centers on short notice.

b. Messenger Service. Normally, after launching of an attack to achieve penetration, only special messengers are used forward of division main or the division tactical CP. Messenger service to the rear may continue on a scheduled basis.

78. Application of Communications to Envelopment

The functions of the division signal battalion in the envelopment are generally similar to those described above for the penetration. However, since in the envelopment the attacking force avoids the enemy's main defensive areas and strives for objectives in his rear area, communications distances will be relatively greater and listening silence will be required for relatively longer periods of time.

79. Application of Communications in an Exploitation

The speed of a vigorous exploitation necessitates rapid and numerous displacements of command posts. Despite this, continuous signal center operation must be maintained. A brief summary of signal battalion activities is given below:

a. Messengers. All available motor messengers are used at established communications centers. When distances between CP's become excessive, messenger relay points may be required; in addition, there will be increased need for air messenger service.

b. Radio Communications. Radio is the most suitable means of communication for the exploitation forces. The distance between these forces and the nearest division signal center may require the employment of high-power radio sets (AN/GRC-26()).

c. Visual Communications. Direct pressure and encircling forces use panels to identify themselves to friendly aircraft and to communicate with division air support. Pyrotechnic signals of various types may also be used.

d. Wire Communication. Rapid exploitation does not permit the construction of wire lines. Existing facilities along the routes may be used when practicable.

e. Radio Relay. Use of radio relay during an exploitation is often limited by the speed of the advance. Where possible, radio relay systems will be installed, using the same criteria as in a march situation.

Section V. COMMUNICATIONS DURING DEFENSE

80. General

a. The elaborateness of the communications system in a defensive situation is broadly determined by the time available and the communications facilities in operation. However, the form of defense adopted will influence the type of communications needed; for example—

- (1) When the mission requires retention of specific terrain, the commander may adopt an area defense and place primary reliance on the ability of fires and forces deployed on position. In

this circumstance, reliance on wire communications is emphasized.

- (2) If a mobile defense is employed, primary reliance is placed on maneuver, fire, and offensive action to accomplish the defensive mission. In this situation, radio communications and messenger service will be used most extensively.
- (3) When either form of defense is adopted hastily, the communications facilities currently available are con-

tinued in use. These facilities are supplemented as time and the tactical situation permit.

b. In general, a well organized and strongly manned area defense will afford the most versatile employment of division signal communications.

81. Application of the Communications to Defense

In the defense, the division communications system provides communications to elements of the division base and entry into the communications systems for the covering force, division outposts, and division reserve as required. Entry into the system may also be required for other units and activities such as the division airfield, attached troops, combat service support activities, and the echelons of division headquarters. An analysis of communications follows:

a. *Signal Centers.* Normally, division signal centers do not move frequently when the division is engaged in defensive operations. Nevertheless, communications center personnel must be prepared to displace as required.

b. *Messengers.* Special messengers are required during the organization of a defensive

position. After organization is complete, the messenger service normally reverts to scheduled messenger runs.

c. *Radio Communications.* Radio nets are subordinated to multichannel communications and messenger service. Radio nets remain operative to supplement the multichannel facilities.

d. *Visual Communications.* Visual signals may be used in the defense as in other situations. A panel station is established for very brief messages. Usually, air-to-ground radio communication is less time-consuming than panel systems.

e. *Wire Communications.* The wire system is made as elaborate as time and the facilities permit. High priority circuits are established as rapidly as possible to meet immediate requirements. Thereafter, additional circuits are installed to increase traffic capacity and flexibility.

f. *Radio Relay.* During the initial phases of a defensive operation, when security aspects permit, extensive radio relay systems are installed to provide the large circuit capacity required. This service is supplemented as wire systems are installed.

Section VI. COMMUNICATIONS DURING RETROGRADE MOVEMENTS

82. General

Retrograde movements include withdrawals, delaying actions, retirements, and a combination of these types. (Refer to FM 100-5 for a more complete discussion.) In general, the division signal battalion becomes involved in retrograde operations which are usually a combination of the types listed. Thus, paragraph 83 below is directed to the combination-type retrograde action.

83. Application of Communications During Combination-Type Retrograde Movement

During preparations for a combination-type retrograde movement, the division communications system will continue to be operative. However, at CP sites soon to be abandoned, new installation is held to an absolute minimum,

while maximum use must be made of the facilities remaining. An analysis of possible signal battalion actions is given below:

a. *Radio Communications.* Radio operation is regulated during all disengagements. For deceptive purposes, dummy stations may be used to maintain the normal level of message traffic at old positions, when authorized or required by the corps or army commander. Listening silence may be enforced on the other radio stations, both while withdrawing and on reaching the new locations. Transmission may be resumed when retrograde operations have been completed.

b. *Messengers.* During retrograde actions, the need for special messengers is increased. Advanced signal centers are established where required, and special messengers are assigned to them. Messengers may remain at the old CP

site to insure continuance of this service to forces left in contact with the enemy.

c. Wire Communications. The wire system currently in operation is used as needed during the retrograde action. The installation of new wire lines is held to a minimum. As the retrograde action progresses, wire lines not required by retiring units or by the elements left in contact with the enemy are recovered. If recovery is impossible, the wire lines are destroyed by removal of random sections.

d. Radio Relay. Use of radio relay during

a retrograde maneuver may be dictated by deception plans and prior practices. If the commander wishes to convey the illusion of a long-term defense, selected radio relay sets in operation retain the division's habitual electronic traffic pattern. Such action is a calculated risk that might result in loss of radio relay equipments. In the meantime, radio relay sites to the rear, which will afford long-range control of divisional elements, are reconnoitered. Where possible, equipments are installed at these sites prior to, and in anticipation of, retrograde maneuver.

Section VII. COMMUNICATIONS DURING PASSAGE OF LINES

84. General

The respective signal officers of units engaged in withdrawal actions or passage through lines must closely coordinate their communication efforts. In this situation, it is assumed that a division force is passing through a sector occupied by friendly forces also of division strength.

85. Application of Communications During a Passage of Lines

Communications of the unit passing through the line will be restricted as much as possible. Some circuits of the unit occupying the position may be made available to the unit passing through. These circuits should be employed to the fullest extent possible. A brief analysis of the application of communications is given below:

a. Radio. To a limited extent, radio communications will be needed between the unit occupying the position and the unit making the passage of lines. The frequencies employed and

the procedures adopted must be carefully coordinated by the units involved.

b. Wire. Wire communications of the unit passed through should be relatively unaffected. Where possible, the unit making the passage should use these circuits to the maximum extent allowable.

c. Messenger Service. Messenger service of the unit making the passage will be on a special basis. The unit occupying the position will maintain messenger service on a normal basis. Messenger traffic, as needed, will be conducted between the two units involved.

d. Radio Relay. Since security is of the utmost importance, units passing through friendly lines should not employ their radio relay equipment until the passage is complete. However, the unit occupying the position should retain a normal radio relay traffic pattern. It may be possible for the unit passing through to use the multichannel facilities of the occupying force.

Section VIII. COMMUNICATIONS DURING A RELIEF IN PLACE

86. General

a. Successful relief in place, as in the passage of lines, requires close coordination between the signal officers involved. Again it is assumed that both units are of division strength.

b. During the relief in place, it is recommended that the relieving unit take over existing communications facilities of the divi-

sion occupying the sector. This applies particularly to wire circuits. However, any exchange of TOE equipment requires the mutual consent of the signal officers concerned; such an exchange is dictated by the urgency of the tactical situation. Where possible, it is recommended that signal personnel of the relieving unit precede the main force into the area.

87. Application of Communications for a Relief in Place

The communications facilities of the unit being relieved should remain in place until an orderly relief is accomplished. Facilities already employed continue in operation until taken over by the relieving unit, or the need for a facility ceases to exist. A summary of communications actions is given below:

a. Radio Communications. Radio nets of the unit being relieved will continue operation up to a time agreed upon by the signal officers concerned. To maintain security, it is recommended that the relieved unit continue operation of its normal radio nets for a limited period after the relief has been completed. This will require coordination and agreement

between the signal and the intelligence officers of the respective commands. Radio liaison nets may be established, or frequencies in existing nets may be used, to allow liaison officers of the two units to communicate with organic radio sets.

b. Wire. The wire circuits and switching facilities of the relieved unit will be taken over by the relieving unit, subject to the considerations of paragraph 86b.

c. Messenger Service. Messenger service will be assumed by the relieving unit on a jointly established schedule.

d. Radio Relay. Radio relay employment for a relief in place is governed by the same guidelines as for a passage of lines (para 85d).

Section IX. AIRMOBILE OPERATIONS

88. General

If the division is designated to participate in an airmobile operation, the signal battalion is governed by procedures as outlined in FM 57-35. For details on signal operations in an airborne division, refer to FM 11-57.

89. Planning Considerations

The battalion SOP and available planning guides should provide pertinent data for the use of both organic division aircraft and aircraft that might be assigned by higher headquarters. SOP and planning data should cover at least the following:

a. Requirement for a provisional signal center that is both airportable and airmobile.

b. Use of aircraft for laying wire and cable into an airmobile objective.

c. Use of radio repeater stations.

d. Weight requirements for moving certain equipments by air, such as radio relay, to otherwise inaccessible sites.

e. Communications to aviation unit operations.

f. Use of airmobile elements for rear area defense and damage control activities.

CHAPTER 9

COMMAND AND STAFF RELATIONSHIPS

Section I. DIVISION SIGNAL STAFF

90. General

The staff of the division signal officer is provided by TOE 11-36, headquarters and headquarters detachment of the division signal battalion. Included in the DSO's section of the detachment are the assistant DSO, radio officer, telephone-teletypewriter officer, cryptotechnician (warrant officer) (para 117a), and key enlisted personnel. Details on the functioning of the DSO and his staff are given in the paragraphs immediately following.

91. Dual Role of DSO

a. The DSO, as a member of the division commander's special staff, serves as chief adviser and planner for all communications matters affecting the command. In addition to his staff capacity, the DSO commands the division signal battalion and is responsible for the installation, operation, and maintenance of the division communications system.

b. From the foregoing, is it evident that the DSO exercises the dual functions of staff and command. The present discussion, however, is concerned only with his staff relationships. The two functions, although vested in a single individual, remain separate and distinct in each will involve different responsibilities and duties (FM 101-5).

92. Staff Coordination and Functions of the DSO

As a member of the division special staff, the DSO is included in all staff planning to present communications aspects for proposed tactical operations.

a. *Coordination.* The duties and responsibilities of the DSO must, of necessity, involve both the general as well as the special staff. The DSO normally operates under the general

supervision of the G3, but has free access to the Chief of Staff and deals with him directly on overall communications matters that affect the command.

b. *Functions.* The broad functions of the DSO and/or battalion commander can be listed under the categories indicated below. The command and staff functions involved are closely interwoven.

- (1) Command (para 104).
- (2) Advisory.
- (3) Plans and orders.
- (4) Technical supervision.
- (5) Liaison.
- (6) Training.

(Functions (2) through (6) above are covered in more detail in paragraphs 93 through 98 that follow.)

93. Advisory (DSO)

The DSO serves as staff advisor to the commanding general, his staff, and all division units on communications matters discussed below:

a. *Commanding General.* The DSO advises the commanding general on all communications aspects to include the employment of signal troops, availability of communications facilities and required augmentation of same, pictorial requirements, manipulative electronic deception and electronic counter-countermeasures (ECCM), communication security, and the location of division CP's as far as they affect signal communications. Much of this information might first be passed through the chief of staff or general staff officers, as determined by division SOP.

b. *ACofS G1.*

- (1) Personnel in respect to strength, replacement, and morale.

- (2) Movement, organization, operation, internal arrangements, and allocation of space for the headquarters or CP's.
- (3) Internal operation and other administrative functioning of the headquarters.
- (4) Administrative support requirements of division communications activities.

c. ACofS G2.

- (1) Communications security and counterintelligence aspects of communications operations.
- (2) Interpretation of captured enemy signal documents.
- (3) Evaluation of captured enemy signal equipment.
- (4) Pictorial (photographic) support for intelligence activities.
- (5) Other special signal support for intelligence operations.

d. ACofS G3.

- (1) Overall communications activities pertaining to the tactical mission.
- (2) Manipulative electronic deception and ECCM as related to the tactical mission.
- (3) Organization and signal equipment of units assigned or attached to the division.
- (4) Training of personnel engaged in signal communications activities.
- (5) Signal employment in combat operations.
- (6) Selection of CP's for the headquarters.
- (7) Physical security of signal installations.
- (8) Preparation of orders related to signal activities, to include paragraph 5 of the division operations order.
- (9) Preparation of the EW annex to the division operations order, pertaining to manipulative electronic deception and ECCM, assisted by U.S. Army Security Agency (USASA) liaison officer, as required.
- (10) Allocation and assignment of radio frequencies.

e. ACofS G4. Coordination on priority of issue of signal supply.

f. Support Command Commander.

- (1) Allocation of critical signal supplies and equipment.
- (2) Preparation of the signal portion of the division administrative order.
- (3) Communications activities pertaining to the support command.

g. ACofS G5. (When civil affairs augmentation to the division is provided and, if not, to the ACofS G3.)

- (1) Indigenous signal communications facilities.
- (2) Signal communications aspects of treaties.
- (3) Military use of local civilian communications facilities, supplies, equipment, and military support of civilian communications.

h. Special Staff. Signal support available for the respective activities of the special staff.

i. Unit Commanders and/or Communication Officers.

- (1) Training of communications personnel.
- (2) Signal security.
- (3) Miscellaneous technical aspects of a communications nature.
- (4) Additional communications support that may be available.

94. Plans and Orders (DSO)

The early phase of every combat operation requires detailed signal planning and coordination. To insure proper planning, coordination, and supervision in signal matters, the DSO resorts to the written instructions and orders listed below:

Note. The first eight items must be prepared for the particular operation; items 9 through 12 must be kept current at all times.

- (1) Signal estimate.
- (2) Signal plans.
- (3) Signal portion, paragraph 4, division operation order.
- (4) Paragraph 5, division operation order.

- (5) Signal annex to division operation order.
- (6) Signal portion of the division administrative order.
- (7) Signal battalion operation order.
- (8) Manipulative electronic deception and ECCM portion of EW annex division operations order.
- (9) Division memoranda.
- (10) Standing signal instructions.
- (11) Signal operations instructions.
- (12) Standing operating procedures.

95. Staff Supervision (DSO)

Normally, the DSO has staff supervision in the following matters:

- a. Installation and operation of signal communications facilities.
- b. Compliance with established communications security regulations.
- c. Ground and air still and motion picture coverage in support of combat intelligence, historical, and public information activities.
- d. Allocation and assignment of radio frequencies.
- e. Cryptologistics support of all units of the division.

96. Liaison (DSO)

In addition to staff and coordinating functions within the division, the DSO conducts *active* and *continuous* liaison with the signal officers of—

- a. *Higher headquarters* on matters pertaining to—
 - (1) Technical directives.
 - (2) SOP, SOI, and SSI matters.
 - (3) Routes of signal communications and location of signal centers of the communications systems.
 - (4) Tactical plans for impending operations.
 - (5) Requirements for signal personnel.
 - (6) Use of indigenous signal communications facilities.
 - (7) Manipulative electronic deception and ECCM for EW.

- (8) Allocation and assignment of radio frequencies.

b. *Adjacent headquarters* (units and signal officers) on matters pertaining to—

- (1) Signal support for the operation.
- (2) Establishment of lateral signal communications.
- (3) Tactical plans for impending operations.
- (4) Changes anticipated in current operations.
- (5) Allocation and assignment of radio frequencies.

c. *Division USASA staff officer* on matters pertaining to—

- (1) Manipulative electronic deception.
- (2) Electronic counter-countermeasures.
- (3) EW plans, operations, and EW annex.
- (4) Communications security.
- (5) Frequency use.

97. Training (DSO)

Signal training responsibility of the DSO extends to all assigned signal and communications units of the division. Where possible, centralized division or several unit signal schools may be established for personnel of the command who are involved in communications.

98. Automatic Data Processing (DSO)

The DSO is responsible for providing circuits for automatic data processing facilities which may be assigned to the division.

99. Assistant Division Signal Officer

The functions of the assistant division signal officer (ADSO) include:

- a. Assistance to the DSO on planning future communications operations of the division.
- b. Responsibility for publication of the division SSI and SOI.
- c. Direction of the integration of all signal communications facilities within the division.
- d. Preparation of the signal annex of the division operations order.
- e. Serving as team chief of the communications electronic element (CEE) of the DTOC when it is established.

f. Responsibility for the efficient operation of the division signal office.

g. Acting for the DSO in his absence.

100. Radio Officer

The radio officer operates in the division signal officer's section. Normal functions assigned to the radio officer include:

a. Staff supervision over all radio communications established within the division.

b. Preparation and dissemination of radio nets diagrams of the nets directed or controlled by the division.

c. Maintenance of a radio frequency utilization register and map to assure accurate and up-to-date radio frequency assignment data.

d. Preparation of items of the division SOI and SSI relating to radio matters.

e. Preparation and dissemination of the division radio relay system map overlays.

f. Necessary coordination to reduce radio frequency interference within the division and with adjacent divisions.

101. Telephone-Teletypewriter Officer

The telephone-teletypewriter officer will normally work in the division systems control and information center under the supervision of the battalion S3. This officer, commonly called the wire officer, is assigned such functions as:

a. Staff supervision over wire cable installation and maintenance practices to be employed by the units assigned or attached to the division.

b. Preparation and dissemination of—

(1) Telephone and teletypewriter traffic diagrams and directives.

(2) Systems and circuit diagrams.

(3) Line route maps.

c. Conduct of communications traffic studies to assess the load on the division communications system. After study of data, he makes recommendations to the communications control officer (signal battalion S3) to increase or decrease facilities as required.

d. Compilation of factual and experience data for future reference on communications installations.

102. Cryptographic Technician

The cryptographic technician, a warrant officer, operates in the division signal officer's section. He is normally designated the division cryptographic security officer and cryptographic custodian (AR 380-40 and AR 380-41). His functions include:

a. Staff supervision over all cryptographic security matters within the division.

b. Receipt of all division cryptomaterial from the issuing office or distribution authority designated by higher headquarters.

c. Allocation, distribution, and accounting for all cryptomaterial within the division.

d. Preparation of items of the division SSI and SOI relating to cryptography and cryptographic security.

e. Staff supervision over cryptographic maintenance within the division.

Section II. SIGNAL BATTALION COMMANDER AND STAFF

103. Staff Relationship to the Battalion Commander

The battalion headquarters element of the headquarters and headquarters detachment provides an officer staff to assist the commander in controlling the employment and operation of the division signal battalion. Duties and functions of the battalion commander and his staff are described in the following paragraphs.

104. Battalion Commander

The battalion commander, as previously stated, exercises the dual functions of DSO and signal battalion commander. As battalion commander, he directs his staff and issues SOP and mission-type orders to the operating companies of the battalion. Normal control is exercised through command channels. Certain technical instructions, such as circuit allocations and changes, frequency assignments and

changes, adjustments to the communications system, and similar instructions pertaining to communications may be passed directly from the responsible staff activity to operating elements of the signal battalion. These instructions represent technical control and should be clearly defined by the battalion commander in the signal battalion SOP. In accomplishing his command functions, the battalion commander must concern himself with:

- a. Organization and control.
- b. Personnel strength, morale, discipline, and training.
- c. Administration and housekeeping.
- d. Logistical matters.

105. Executive Officer

The executive officer performs functions as defined in FM 101-5. As far as regulations permit, the executive officer will act for the battalion commander on internal matters. This will afford the commander maximum freedom to concentrate on his responsibilities as DSO.

106. Battalion S1

The S1 is the administrative chief for the battalion and also serves as detachment commander of the headquarters and headquarters detachment. The battalion sergeant major has an additional duty of assisting the S1 by acting as first sergeant of headquarters detachment.

107. Battalion S3

a. In the division signal battalion, the S3 is normally delegated authority to issue technical instructions dealing with frequency assignment and change, circuit assignment and and circuit control adjustments to the communications system. These activities constitute technical control.

b. The technical control authority delegated by the commander must be well defined within the limits indicated above. All other orders or instructions to operating units by the S3 must be issued in the name of the battalion commander.

c. The S3 is normally charged with the establishment and operation of the division systems control and information center.

108. Battalion S4

The battalion S4 performs functions as defined in FM 101-5. For details on battalion supply operations, refer to chapter 10.

109. Battalion Motor Officer

The battalion motor officer advises the battalion commander and his staff on motor transportation matters; this includes the training of personnel. He exercises staff supervision over battalion motor maintenance, and coordinates with battalion S4 to assure adequate petroleum, oil, and lubricant support for all elements of the battalion.

110. Battalion Staff Relationship with Company Commanders

a. *Headquarters and Headquarters Detachment.* Basically, the detachment is streamlined and staff-oriented with housekeeping chores kept to a minimum. Because of this, staff relationship with the detachment commander should present no serious problem.

b. *Command Operations Company.* Orders to the company commander of the command operations company are normally received through normal command channels. In certain instances, however, specified technical instructions may be forwarded by the battalion S3 directly to signal centers operating at division main and division alternate. Such instructions will be in accordance with policies prescribed by the battalion commander and must, in no way, prevent the company commander from effectively controlling his unit.

c. *Forward Communications Company.* The company commander of the forward communications company has a similar relationship with the battalion staff (*b* above). As with the command operations company, the battalion S3 is usually empowered to issue certain technical instructions directly to signal centers operating in forward areas of the division zone, or to the command terminal teams operating at the various brigade headquarters. Otherwise, all orders follow normal command channels to the company commander.

d. *Signal Support Operations Company.* The signal support operations company has a diversified mission which requires commitment of

its operating elements throughout the division zone. To insure command control, the company commander and battalion staff must maintain close staff relationships. Many of the personnel of this company, e.g., field cable installation teams, repeater teams, and radio teams, will be required to spend much of their time with units which they are directly supporting. In such

situations, direct technical instructions may be immediately issued by the battalion S3 to these detached elements of the company. Wherever possible, however, the company commander must be kept informed of present and future plans in order that he may function effectively as a unit commander.

Section III. SIGNAL COMMUNICATIONS CONTROL

111. Operation and Importance of Communications Control

a. Signal communications control involves the tailoring of signal communications resources to the tactical requirements. In brief, the DSO must adjust the available circuit capacity and facilities to meet the specific requirements of the situation. Since the division communications system is widely dispersed and constantly subject to change, effective control is required to meet the communications requirements of the changing tactical situation. This control is accomplished by establishing a systems control and information center at the signal center of division main and subordinate facilities control elements at other division signal centers.

b. All control centers are authorized to make changes in the communications system in response to user needs. This authority should be properly implemented through a tested and clearly understandable SOP. In addition, each control center must have a current list of priorities for establishing, routing, and re-routing circuits within the signal system.

c. When the DTOC is established, the DSO, assistant DSO, or designated representative will remain in the communications-electronics element of the DTOC. From DTOC, the signal representatives keep pace with the tactical situation and advise the signal systems control center of actions required to meet the immediate needs of the tactical situation. In addition, signal representatives at DTOC will put the DSO

in a better position to anticipate and plan future requirements.

112. Division Systems Control and Information Center

a. The division systems control and information center is supervised by the signal battalion S3. Engineering, planning, and determination of requirements for the division area communications system are performed by the division signal staff; however, actual control of the system is the responsibility of the division systems control and information center. Generally, control includes circuit routing assignment, emergency rerouting, and designation of control terminals.

b. The systems control and information center also supervises signal installation, operation, maintenance, and fault location and correction within the system. To facilitate circuit control, the center must have engineering circuits to each signal center. Detailed information on division signal communications control is found in FM 11-21.

c. The division systems control and information center at division main operates from a communications operations center (AN/MSC-31). The major components of the AN/MSC-31 consist of a shelter, a manual telephone switchboard, and telephone instruments. Also included in the shelter are intercommunication and telephone circuits and drafting and display board facilities for planning, engineering, and controlling the division communications system.

CHAPTER 10

BATTALION SUPPORT FUNCTIONS AND TRAINING

113. Mess Operations in the Field

In the field, the method of providing mess facilities for the division signal battalion is a matter of command choice that will vary with the particular battalion and the specific mission. Normally, staff responsibility for the coordination of mess operations is delegated to the S4. He has at his disposal three company-size mess facilities which are organic respectively to the command operations company, the forward communications company, and the signal support operations company. During combat operations, these facilities are normally deployed to support selected areas where the largest concentration of division signal troops will be employed. The following are suggested methods of mess employment:

a. Headquarters and Headquarters Detachment. Not having messing facilities of its own, this detachment will normally obtain mess support from the command operations company.

b. Command Operations Company. The mess facility of this company is normally operated in the vicinity of the signal center at division main.

c. Forward Communications Company. The mess facility of this company may operate a company mess at division alternate, feeding as many personnel from this point as practical. Another solution is to establish a separate mess facility at some other point (perhaps near a forward signal center) where sufficient numbers of signal personnel are concentrated.

d. Signal Support Operations Company. In this company, organic mess facilities may be set up near the signal center in the division support command area. However, the wide deployment of troops of the company may make this an impractical solution. The location selected should serve the greatest concentration of signal troops, regardless of the organic company.

114. Battalion Supply

Operation of signal battalion supply is under the staff supervision of the battalion S4. All supply actions will be conducted in accordance with AR 735-35.

a. Battalion supply operations are conducted on the basis that a minimum of supplies will be held in the battalion, and that rations and water will be delivered directly to using elements.

b. The administrative and logistics section of the headquarters and headquarters detachment operates two mobile filling stations to deliver gasoline to the various elements of the signal battalion.

c. It is anticipated that the battalion supply section will make supply runs to the various elements of the battalion. Such service will be within the inherent capability of the battalion.

115. Battalion Motor Maintenance

a. Battalion motor maintenance is under the general supervision of the battalion motor officer and under the direct supervision of the battalion automotive maintenance warrant officer. Both officers are carried in headquarters and headquarters detachment.

b. Battalion motor maintenance is confined to organizational maintenance of motor vehicles that is supplemental to the capability of the organic companies. As far as practicable, maintenance is performed on site. To accomplish this, the detachment is provided with a $\frac{3}{4}$ -ton truck, a 2 $\frac{1}{2}$ -ton truck, a 5-ton wrecker, tool sets, and a maintenance shelter for the establishment of a motor repair facility.

116. Location of Battalion Command Post

Normally, the CP of the division signal battalion will be located in the vicinity of division main. Selection of the CP is a responsibility of

the headquarters and headquarters detachment commander (S1-Adjutant); the selection is subject to the approval of the battalion commander.

117. Signal Maintenance

a. With the exception of the headquarters and headquarters detachment, each operating company of the battalion has a signal organizational maintenance team. These teams perform organizational maintenance on organic signal equipment and direct support maintenance of organic cryptographic equipment. Within its capability, each company will perform cryptographic maintenance for other units in the immediate area.

b. The maintenance team at the command operations company consists of a team chief, one carrier repairman, two general cryptographic repairmen, two radio repairmen, and two teletypewriter equipment repairmen. In the forward communications company, the maintenance team is made up of a team chief and only one repairman of the types listed above. In the signal support operations company, the maintenance team consists of a team chief, two general cryptographic repairmen, one manual central office repairman, one powerman, one radio repairman, and one teletypewriter equipment repairman.

c. From the foregoing paragraph, it will be noted that the only central office repairman in the battalion is carried in the signal support operations company. Thus, organizational maintenance on central office equipment can be extended from this company on a limited, on-site basis. It is anticipated that the signal organizational maintenance team of the signal support operations company will supplement the overall maintenance capability of the signal battalion as needed.

d. Direct support maintenance of signal equipment within the division is performed by the maintenance battalion of the division support command, except for cryptographic maintenance.

118. Training

a. *General.* Personnel of the division signal battalion are trained first as infantrymen and then as technicians and specialists. To achieve

and maintain proficiency in both areas, continuous training must be given in basic military as well as technical subjects. Such training must first be individual, and then successively team, section, platoon, company, and battalion training. On-the-job technical training must be continuously implemented and closely supervised.

b. *Unit Training and Service School Training.* Individual enlisted specialists within the battalion may be either service school trained or unit trained. The amount of service school training is limited by available quotas and other factors. Unit training, on the other hand, is unit-controlled, and is limited only by the time available for battalion training.

c. *CW-Radio Operators.* The division has an undiminishing requirement for high-speed and intermediate-speed CW radio operators. Continuous unit training under experienced operators insures retention of individual skills and provides a pool of cross-trained specialists with an added CW proficiency for use as needed.

d. *Communications Security.* Communications security is of paramount importance to all personnel of the division signal battalion. The facts listed below must be stressed during training and effectively implemented during all operations of the unit:

- (1) *Definition.* Communications security (COMSEC) is the protection resulting from all measures designed to deny unauthorized persons information of value which might be derived from the possession and study of communications, or to mislead unauthorized persons in their interpretation of the results of such a study. COMSEC includes cryptosecurity, transmission security, and physical security of COMSEC materials and information.
- (2) *Application of COMSEC.* The basic objective of COMSEC is the effective and efficient application of security to communications. The requirement for COMSEC must be considered during the planning stage for any type of operation. Security measures for the protection of military information, equipment, and material include defense against capture, observation,

photography, salvage, theft, interception, direction finding, traffic analysis, cryptanalysis, imitative deception, and personal carelessness and laxity. Summarized below are recommended procedures for effective COMSEC (refer to FM 32-5 for more detailed discussions):

(a) *Cryptosecurity*

1. Use only authorized cryptosystems.
2. Use authorized cryptosystems only as prescribed by the operating instructions.
3. Encrypt information requiring long term security only in those cryptosystems providing long term security.

(b) *Transmission Security*

1. Use radio only when other means of communications are not practical.

2. Restrict plain language transmissions to a minimum.
3. Maintain circuit discipline.
4. Assign call-signs/words and frequencies in a random manner and change them frequently.
5. Change call-signs/words and frequencies simultaneously.
6. Make transmissions brief.
7. Authenticate.
8. Use broadcast and intercept transmission methods.
9. Use only prescribed communications operating procedures.

(c) *Physical Security*

1. Maintain an adequate emergency plan and practice it frequently.
2. Provide proper safeguarding and control of COMSEC materials at all times.

APPENDIX I

REFERENCES

1. General

This appendix contains a selected list of publications pertinent to the operations of the signal battalion, armored, infantry, or mechanized divisions. For availability of items listed and other publications on additional subjects, refer to DA Pamphlets 310-1, 310-3, and 310-4. (Equipment publications (TM's) are listed in appendix II under "Nomenclature.")

2. Administration

AR 230-5	Nonappropriated Funds and Related Activities; General Policies
AR 320-5	Dictionary of United States Army Terms
AR 320-50	Authorized Abbreviations and Brevity Codes
ARO 340-15	Correspondence
AR 380-5	Safeguarding Defense Information
FM 100-10	Field Service Regulations; Administration
FM 101-5	Staff Officers' Field Manual; Staff Organization and Procedure
FM 101-10, Part I	Organizational, Technical, and Logistical Data Part I—Unclassified Data
FM 101-10-2	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data Part II—Extracts of Tables of Organization and Equipment
TOE 11-35	Signal Battalion, Armored, Infantry, or Infantry (Mechanized) Division
TOE 11-215	Signal Battalion, Airborne Division

3. Operations and Training

FM 3-12	Operational Aspects of Radiological Defense
FM 11-8	Field Radio Relay Techniques
FM 11-21	Tactical Signal Communications Systems, Army, Corps, and Division
FM 11-40	Signal Corps Pictorial Operations
FM 11-57	Signal Battalion, Airborne Division
FM 11-92	Corps Signal Battalion
FM 11-95	Army Signal Battalion
FM 21-5	Military Training Management
FM 21-6	Techniques of Military Instruction
FM 21-26	Map Reading
FM 21-30	Military Symbols
FM 21-40	Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations
FM 21-41	Soldier's Handbook for Chemical and Biological Operations and Nuclear Warfare
FM 21-48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises
FM 24-1	Tactical Communications Doctrine
FM 24-16	Signal Orders, Records, and Reports
FM 24-17	Tactical Communications Center Operations
FM 24-18	Field Radio Techniques

FM 24-19	Communications-Electronics Reference Data
FM 24-20	Field Wire and Field Cable Techniques
FM 24-150(C)	Electronic Warfare (U)
FM 31-25	Desert Operations
FM 31-30	Jungle Operations
FM 31-71	Northern Operations
FM 31-72	Mountain Operations
FM 32-5(CM)	Communications Security (U)
FM 33-5	Psychological Operations
FM 54-1	The Logistical Command
FM 54-2	Division Logistics and Support Command
FM 57-35	Airmobile Operations
FM 57-100	The Airborne Division
FM 61-100	The Division
FM 100-1(S)	Doctrinal Guidance (U)
FM 100-5	Field Service Regulations; Operations
ATP 11-35	Signal Battalion, Armored Division; Signal Battalion, Infantry Division; Signal Battalion, Mechanized Division
AR 220-58	Organization and Training for Chemical, Biological, and Radiological Operations
AR 350-1	Army Training Policies
AR 380-40	Safeguarding Crypto Information
AR 380-40-1 (CMHA)	Safeguarding Crypto Information (Supplement) (U)
AR 380-41	Control of Cryptomaterial
AR 380-51	Transmission of Classified Messages
ATT 32-400	Communications Security-Electronic Security-Army Type Brigades, Bat- talions, Other Units and Teams
TM 57-210	Air Movement of Troops and Equipment

4. Supply and Maintenance

AR 711-16	Installation Stock Control and Supply Procedures
AR 735-5	Property Accountability: General Principles and Policies
AR 735-11	Accounting for Lost, Damaged, and Destroyed Property
AR 735-35	Supply Procedures for TOE Units, Organizations, and Non-TOE Units
AR 750-5	Organizations, Policies, and Responsibilities for Maintenance Operations
AR 750-8	Command Maintenance Management Inspections
AR 750-610	Communications Security Equipment Maintenance
DA Pam 310-21	Military Publications: Index of Supply Manuals, Signal Corps
FM 9-30	Maintenance Battalion, Division Support Command
FM 10-50	Supply and Transport Battalion, Division Support Command

**APPENDIX II
CHARACTERISTICS OF SIGNAL EQUIPMENT**

This appendix briefly covers the major items of signal equipment that are organic to the current division signal battalion of an armored, infantry, and mechanized division (TOE 11-35) (ROAD). The information presented is intended for signal users and planners at the division level. More detailed technical information may be obtained from appropriate equipment technical manuals, these manuals are listed in the appendix under the "Nomenclature" column. Note that throughout this appendix, multipart equipment technical manuals are listed without indication as to the echelons of maintenance; for example, a "TM 11-5820-222-" listing actually represents five technical manuals, namely, TM 11-5820-222-10, -20, -20P, -35, and -35P (DA Pam 310-4).

Also included is an index of signal equipments by type number and their TOE allocation in the division signal battalion.

Index by Type Number

<i>Type No.</i>	<i>TOE Allocation</i>	<i>App. II Para No.</i>
AN/GRA-6	3 ea Comd Opns	7
AN/GRA-39	2 ea Comd Opns 3 ea Fwd Comm 2 ea Sig Spt Opns	7
AN/GRC-19	3 ea Comd Opns	6
AN/GRC-26D	4 ea Comd Opns 2 ea Sig Spt Opns	6
AN/GRC-46	4 ea Comd Opns 3 ea Fwd Comm 5 ea Sig Spt Opns	6
AN/GRC-106	3 ea Comd Opns	6
AN/GRR-5	2 ea Hq & Hq 4 ea Comd Opns 3 ea Fwd Comm 2 ea Sig Spt Opns	6
AN/GSA-7	2 ea Comd Opns 6 ea Fwd Comm 1 ea Fwd Comm 1 ea Sig Spt Opns	7
AN/MGC-17	3 ea Fwd Comm 2 ea Sig Spt Opns	12
AN/MRC-54	6 ea Sig Spt Opns	8

<i>Type No.</i>	<i>TOE Allocation</i>	<i>App. II Para No.</i>
AN/MRC-69	10 ea Comd Opns 18 ea Fwd Comm 5 ea Sig Spt Opns	8
AN/MSC-29	3 ea Comd Opns	12
AN/MSC-31	2 ea Hq & Hq	2
AN/MTC-3	3 ea Comd Opns	10
AN/MTC-7	3 ea Fwd Comm 2 ea Sig Spt Opns	10
AN/PRC-25	4 ea Comd Opns 6 ea Fwd Comm 2 ea Sig Spt Opns	7
AN/TCC-7	4 ea Sig Spt Opns	11
AN/TCC-11	16 ea Sig Spt Opns	11
AN/TFQ-7()	1 ea Sig Spt Opns	4
AN/TXC-1	1 ea Comd Opns	3
AN/VRC-24	1 ea Comd Opns	1
AN/VRC-46	4 ea Hq & Hq 3 ea Comd Opns 4 ea Fwd Comm 11 ea Sig Spt Opns	7
AN/VRC-47	3 ea Hq & Hq 3 ea Fwd Comm	7
AN/VRC-49	2 ea Comd Opns 3 ea Fwd Comm 1 ea Sig Spt Opns	7
CX-162/G (1000 ft)	20 ea Comd Opns 54 ea Fwd Comm 18 ea Sig Spt Opns	13
CX-162/G (100 ft)	18 ea Fwd Comm 6 ea Sig Spt Opns	13
CX-162/G (200 ft)	20 ea Comd Opns 18 ea Fwd Comm 6 ea Sig Spt Opns	13
CX-163/G	30 ea Comd Opns 24 ea Fwd Comm 8 ea Sig Spt Opns	13
CX-1065/G	200 ea Sig Spt Opns	13
CX-1606/G	24 ea Sig Spt Opns	13
CX-4566/G (250 ft)	134 ea Comd Opns 213 ea Fwd Comm 77 ea Sig Spt Opns	13
CX-4760/G	30 ea Comd Opns 48 ea Fwd Comm 17 ea Sig Spt Opns	13
J-1077/U	20 ea Comd Opns 33 ea Fwd Comm 12 ea Sig Spt Opns	10

<i>Type No.</i>	<i>TOE Allocation</i>	<i>App. II Para No.</i>	<i>Type No.</i>	<i>TOE Allocation</i>	<i>App. II Para No.</i>
KLX-7/TSEC-----	3 ea Comd Opns 3 ea Fwd Comm 2 ea Spt Opns	14	SB-22/PT-----	1 ea Hq & Hq 10 ea Comd Opns 3 ea Fwd Comm 1 ea Sig Spt Opns	10
KS-4A (1)-----	2 ea Sig Spt Opns	4	SB-86/P-----	Refer to:	10
KS-5 (1)-----	2 ea Sig Spt Opns	4	(2 ea per AN/MTC-3)-----	AN/MTC-3 and	
KS-6 (1)-----	2 ea Sig Spt Opns	4	(1 ea per AN/MTC-7)-----	AN/MTC-7	
KS-10 (1)-----	2 ea Sig Spt Opns	4	SB-611/MRC-----	3 ea Comd Opns 3 ea Fwd Comm 1 ea Sig Spt Opns	10
KS-14-----	2 ea Sig Spt Opns	4	TA-182/U-----	48 ea Sig Spt Opns	11
KS-15 (1)-----	1 ea Sig Spt Opns	4	TA-312/PT-----	12 ea Hq & Hq 125 ea Comd Opns 69 ea Fwd Comm 59 ea Sig Spt Opns	9
OA-1754/GRC-----	5 ea Comd Opns 3 ea Fwd Comm 5 ea Sig Spt Opns	6	TSEC/HL-1(B)-----	3 ea Comd Opns 3 ea Fwd Comm 2 ea Spt Opns	14
PU-290/MR-----	1 ea Comd Opns 1 ea Fwd Comm 1 ea Sig Spt Opns	5	TSEC/KL-7-----	8 ea Comd Opns 6 ea Fwd Comm 4 ea Spt Opns	14
PU-294/G-----	1 ea Hq & Hq 1 ea Sig Spt Opns	5	TSEC/KW-7-----	23 ea Comd Opns 9 ea Fwd Comm 13 ea Spt Opns	14
PU-322/G-----	1 ea Sig Spt Opns	5	WD-1/TT on DR-8-----	4 ea Hq & Hq 12 ea Comd Opns 30 ea Fwd Comm 7 ea Sig Spt Opns	13
RA-87-----	1 ea Comd Opns 2 ea Fwd Comm 2 ea Sig Spt Opns	5	(1/4 mi)		
RL-27-----	3 ea Comd Opns 6 ea Fwd Comm 4 ea Sig Spt Opns	13	WD-1/TT on RL-159/U-----	24 ea Comd Opns 60 ea Fwd Comm 25 ea Sig Spt Opns	13
RL/31E-----	2 ea Comd Opns 6 ea Fwd Comm 12 ea Sig Spt Opns	13			
RL-39-----	1 ea Hq & Hq 5 ea Comd Opns 9 ea Fwd Comm 7 ea Sig Spt Opns	13			
RL-207/G-----	3 ea Comd Opns 3 ea Fwd Comm 10 ea Sig Spt Opns	13			

1. Avionics Equipment

Nomenclature	Description	Remarks
Radio Set AN/VRC-24 TM 11-5820-222-	A compact, vhf-uhf, vehicular AM radio set providing ground-to-air radio telephone voice communication over a frequency range of 225-399.9 mc. May be used as a retransmission device for Radio Sets AN/GRC-3 through -8 and the AN/VRC-12 series of Radio Sets. Range: 30 mi (48 km) for aircraft at 1000 ft elevation; 100 mi (160.9 km) at 10,000 ft.	Requires 24 volts dc for operation. Power output is 16 watts minimum. Is dc version of Radio Set AN/TRC-68 which uses ac power. Employed throughout the combat zone to communicate with aircraft in close support of ground operations.

2. Communications Operations Center

Nomenclature	Description	Remarks
Operations Center, Communications, AN/MSC-31 TM 11-5895-223-	A mobile communications operations office with facilities for planning, engineering, and controlling an army area communications system. Includes Manual Telephone Switchboard SB-22A/PT and four Telephone Sets TA-312/PT.	Installed in Shelter S-183/MSC-31. Can be mounted on 2½-ton truck. May be used with Operations Central AN/MSC-32. Employed throughout the combat zone.

3. Facsimile Equipment

Nomenclature	Description	Remarks
Facsimile Set AN/TXC-1 TM 11-2258	Transmits or receives pictures, maps, or messages in sizes up to 12" x 18 ¹¹ / ₁₆ ". Transmission time is 20 minutes per page. Requires one radio or wire voice circuit.	Employed throughout the combat zone.

4. Photographic Equipment

Nomenclature	Description	Remarks
Camera Set, Motion Picture KS-5(1) TM 11-2396	A 35-mm silent motion picture camera plus various lenses and components. In conjunction with Photograph Accessory Kit LF-1(1), the KS-5(1) becomes a complete recording system suitable to furnish motion picture coverage under practically all field situations and work of a semi-production nature.	Has 100 ft. daylight-loading spool or 400 ft. darkroom-loading magazine. Employed throughout the combat zone.
Camera Set, Motion Picture KS-10(1) TM 11-2390A	A turret-type, 16-mm silent motion picture camera plus tripod, lenses, and other related items used for general purpose black-and-white and color photography.	Has 100 ft. daylight-loading spool or 400 ft. darkroom-loading magazine. Employed throughout the combat zone.
Camera Set, Still Picture KS-4A(1) TM 2352-B	A 4" x 5" press-type camera supplemented by tripod, flash units, and other accessories to form a complete operating system for general purpose photography; 1—1/1000 sec shutter speed.	Employed throughout the combat zone.
Camera Set, Still Picture KS-6(1) TM 11-2343	An assemblage of photographic accessories and a hand-held, precision 70-mm still picture camera which provides field photographers with all essential facilities necessary to record all phases of military operations; 1—1/500 sec shutter speed.	Uses 50 exposure roll film cassettes. Employed throughout the combat zone.
Camera Set, Still Picture KS-14 TM 11-2343	A hand-held, 70-mm picture camera plus tripod, exposure meter, and other accessories which provide field photographers with a rugged, high-precision, general purpose pictorial system; 1—1/500 shutter speed.	Uses 50 exposure roll film cassettes. Employed throughout the combat zone.
Camera Set, Still Picture KS-151(1) TM 11-6720-201	An assemblage of 35-mm photographic equipment used primarily for still black and white color photography under conditions where lens speed, depth of field, and ease of operation are most important; 1—1/100 sec shutter speed.	Uses 20 or 36 exposure magazine. Employed throughout the combat zone.

Nomenclature	Description	Remarks
Laboratory, Dark-room AN/TFQ-7() TM 11-6740-200	A transportable photographic shelter completely equipped to process film ranging from 35-mm to 9½" wide roll film, and to permit the production of contact prints from all negative sizes and enlargements of all but 9½" wide negatives.	Installed in Shelter S-71/G and includes Trailer Mounted Generator Set PU-248/U (or PU-256()/U). Can be mounted on 2½-ton truck. Employed throughout the combat zone.

5. Power Equipment

Nomenclature	Description	Remarks
Generator Set, Gasoline Engine, Trailer-Mounted PU-290/MR TM 11-6115-222-	Consists of one Trailer-Mounted Gasoline Engine Generator Set PU-248/U, plus ancillary equipment.	Used throughout the combat zone as a mobile power source for various communications equipment.
Generator Set, Gasoline Engine, Trailer-Mounted PU-294/G TM 11-6115-223-	Consists of two Gasoline Engine Generator Sets PU-286/G mounted in 1½-ton trailer, plus ancillary equipment.	Only one generator used at a time; the other is on standby. Employed throughout the combat zone as a mobile power source to operate communications and similar electronic equipment.
Generator Set, Gasoline Engine, Trailer-Mounted PU-322/G TM 11-6115-225-	Consists of two Power Units PE-75AF mounted in ¾-ton trailer, plus ancillary equipment.	Only one generator used at a time; the other is on standby. Employed throughout the combat zone as a mobile power source to operate communications and similar electronic equipment.
Power Supply RA-87 TM 11-957A	A complete, self-contained, shed-mounted, metal-housed, single phase, ac gasoline-engine-driven, electric generating unit with built-in dc exciter. Supplies 10-kw at 120 or 240 volts ac, 60 cps.	Manual or battery starting. May be started from remote position. Used as a power source for mobile and fixed plant installations.

6. Radio Equipment—HF AM

Nomenclature	Description	Remarks
Radio Set AN/GRC-19 TM 11-5820-295-	A vehicular, high frequency, AM radio set providing voice, radio telegraph, and fsk radio teletypewriter signals over a transmission range of 1.5—20 mc and a reception range of 0.5—32 mc. Range: voice—50 mi (80 km) ground wave; 150—1500 mi (241—2413 km) sky wave. RATG: 75 mi (120 km).	Requires 28.5 volts dc for operation. Power output is 100 watts. To be replaced by Radio Set AN/GRC-106. Part of Radio Teletypewriter Sets AN/GRC-46, AN/VRC-29, and AN/VSC-1. Employed throughout the combat zone.
Radio Set AN/GRC-26D TM 11-264B TM 11-5820-256-	A mobile AM radio set with facilities for the transmission and reception of fsk radio teletypewriter and voice signals over a frequency range of 1.5—20 mc. Capable of full-duplex, half-duplex, one-way reversible, or closed loop operation. Voice transmission may be used alone or simultaneously in voice and teletypewriter operation. Range: RATG: or fsk: 250 mi (401 km); voice 100 mi (160.9 km). Extended ranges with doublet antenna.	Requires 105 or 125 volts ac, 50 to 60 cps for operation. Power output is 400 watts voice and 450 watts RATG or fsk. Installed in Shelter S-56/G and includes Trailer-Mounted Generator Set PU-474/M. Can be mounted on 2½-ton truck. Employed throughout the combat zone.

Nomenclature	Description	Remarks
Radio Set AN/GRC-106	A high-power radio set which transmits and receives single-sideband (SSB) (upper sideband only), AM voice (compatible AM), and CW signals over a frequency 2-30 mc. Requires 24 volts dc for operation and is intended for vehicular installation. Requires appropriate installation kit. Power obtained from vehicular electrical system. Radio teletypewriter operation is possible with addition of an external amplifier kit, a high-capacity vehicular generating system, and teletypewriters. Range: 50 mi (80 km).	Power output is 200 watts AM voice, CW, and fsk; 400 watts PEP for SSB voice. Intended to replace Radio Set AN/GRC-19. Employed throughout the combat zone.
Radio Set, Control Group OA-1754/GRC TM 11-5820-389-	Small, lightweight, remote control equipment used for CW keying or on-and-off control of the carrier for fsk operation of a transmitter. Range: At least 1 mi (1.6 km) using WD-1/TT.	Used with Radio Set AN/GRC-19 and Radio Teletypewriter Set AN/GRC-46.
Radio Teletypewriter Set AN/GRC-46 TM 11-5815-204-	A mobile AM radio set providing separate or simultaneous transmission and reception of voice, CW, or fsk radio teletypewriter signals over a transmission frequency range of 1.5-20 mc and a reception frequency range of 0.5-32 mc. Range: 50 mi (80 km) ground wave; 1000 mi (1609 km) sky wave.	Requires 28 volts dc for operation. Power output is 100 watts. Installed in Shelter S-89/G or S-144/G. Employed throughout the combat zone.
Receiving Set, Radio AN/GRR-5 TM 11-295 TM 11-5820-284-	A portable or vehicular mounted AM radio receiver providing for the reception of AM voice, radio telegraph, or MCW signals within a frequency range of 1.5-18 mc.	Requires 6, 12, or 24 volts dc or 115 volts ac for operation. Uses dry battery. Employed throughout the combat zone.

7. Radio Equipment—VHF FM

Nomenclature	Description	Remarks
Control, Radio Set AN/GRA-6 TM 11-5038 TM 11-5820-489-	Lightweight, battery operated equipment providing local and remote control facilities for radio sets of the push-to-talk type. Provision for two-way telephone communication and ringing between remote and local control operators. Range: 2 mi (3.2 km) using Field Wire WD-1/TT.	To be replaced by Radio Set Control AN/GRA-39. Employed throughout the combat zone with Radio Sets AN/GRC-3 through -8 and AN/PRC-8, -9, and -10.
Control Radio Set AN/GSA-7 TM 11-5135	A small, lightweight, remote control unit to interconnect radio circuits with local battery telephone on a push-to-talk basis. Range: 10 mi (16 km) using Field Wire WD-1/TT.	To be replaced by Control Group Radio Set AN/GRA-23. Operated on the ground or in stationary vehicles. Employed throughout the combat zone with any push-to-talk radio transmitter.
Radio Set AN/PRC-25 TM 11-5820-398-	A short-range, transistorized battery operated FM radio receiver-transmitter used for two-way radio-telephone voice communication over a frequency range of 30-75.95 cm. Can be used for receive-transmit, remote, or retransmission operations. (Retransmission requires two AN/PRC-25's and essential auxiliary equipment.) Range: 3-5 mi (4.8-8 km).	Uses Dry Battery BA-386/PRC-25. Power output is 1.5 to 2 watts. To replace Radio Sets AN/PRC-8, -9, and -10. Can be operated as a man pack, vehicular, aircraft, or ground installation. Employed within and between all tactical units.

Nomenclature	Description	Remarks
Radio Set AN-VRC-46 TM 11-5820-401-	A short-range, two way, transistorized, vehicular FM radio set that provides radio telephone communication between the vehicle and crew-served weapons over a frequency range 30-75.95 mc. Can monitor on one channel or transmit on one channel. Set is manually controlled and does not permit remote selection of frequencies. Includes Receiver-Transmitter RT-524/VRC. Frequency range is 30-75.95 mc. Range: 20 mi (32 km) stationary; 15 mi (24 km) moving.	Requires 24 volts dc for operation. Power output is 25-35 watts. To replace Radio Sets AN/GRC-3 through -8. Employed within and between armored, artillery, and infantry units in the combat zone.
Radio Set AN/VRC-47 TM 11-5820-401-	A short-range, two way, transistorized, vehicular FM radio set providing radio telephone communication between vehicles and crew-served weapons over a frequency range of 30-75.95 mc. Set permits monitoring of two channels simultaneously, or for monitoring on one channel while transmitting on the other. Set is manually controlled and does not have intercom facilities, and is not capable of remote selection of frequencies. Includes Receiver-Transmitter RT-524/VRC and Auxiliary Receiver R-442/VRC. Frequency range is 30-75.95 mc. Range: 20 mi (32 km) stationary; 15 mi (24 km) moving.	Requires 24 volts dc for operation. Power output is 25-35 watts. To replace Radio Sets AN/GRC-3 through -8. Employed within and between armored, artillery, and infantry units in the combat zone.
Radio Set AN/VRC-49 TM 11-5820-401-	A short-range, two-way, transistorized, vehicular FM radio set providing radio telephone communication between vehicles and crew-served weapons over a frequency range of 30-75.95 mc. Set is manually tuned and is capable of transmitting on two channels simultaneously, or of monitoring one channel while transmitting on the other. Set does not permit remote selection of frequencies. Includes two Receiver-Transmitters RT-524/VRC. Frequency range is 30-75.95 mc. Range: 20 mi (32 km) stationary; 15 mi (24 km) moving.	Requires 24 volts dc for operation. Power output is 25-35 watts. To replace Radio Sets AN/GRC-3 through -8. Employed within and between armored, artillery, and infantry units in the combat zone.
Radio Set, Control Group AN/GRA-39 TM 11-5820-477-	A transistorized battery-operated, remote control system providing duplex telephone operation and two-way signaling for the operation of FM radio sets from a remote location. Built-in loudspeaker and audio power amplifier. Range: 2 mi (3.2 km) with Field Wire WD-1/TT.	Used with tactical FM Radio Sets AN/VRS-12, AN/VRC-43 through -49, and AN/PRC-25. Employed throughout the combat zone.

8. Radio Relay Equipment

Nomenclature	Description	Remarks
Radio Terminal Set AN/MRC-69(V) TM 11-2139	A mobile, FM radio relay terminal set providing two 12-channel radio relay terminals, or one 12-channel radio relay termin-	Power output is 75 watts. Installed in Shelter S-178/MRC-69(V) and includes Trailer-Mounted Generator

Nomenclature	Description	Remarks
TM 11-5820-287- TM 11-5820-204- Repeater Set, Radio AN/MRC-54(V) TM 11-5820-203- TM 11-5820-287-	<p>al, and one 12-channel land-line carrier terminal. Frequency range is 100-400 mc. Range: 25-30 mi (40-48 km) line-of-sight; 200 mi (321 km) in a radio relay system. Maximum of 8 hops per system.</p> <p>A mobile, high quality, vhf-uhf, FM radio relay repeater used in conjunction with Radio Terminal Set AN/MRC-69(V) as a repeater or with Telephone Terminal AN/TCC-7 or Telegraph-Telephone Terminal AN/MCC-6 as a terminal. Depending on terminal used, provides 12 or 24 voice channels for telephone, teletypewriter, facsimile, or data circuits. Frequency range is 100-400 mc. Range: 25-30 mi (40-48 km) line-of-sight; 200 mi (321 km) in a radio relay system. Maximum of 8 hops per system.</p>	<p>Set PU-474/M. Can be mounted on 2½-ton truck. Composed of two Radio Sets AN/TRC-24 and two Telephone Terminals AN/TCC-7. Employed throughout the combat zone.</p> <p>Power output is 75 watts. Basically consists of three Radio Sets AN/TRC-24 installed in Shelter S-177/MRC-54(V) and Trailer-Mounted Generator Set PU-474/M. Can be mounted on 2½-ton truck. Employed throughout the combat zone.</p>

9. Telephone Sets

Nomenclature	Description	Remarks
Telephone Set TA-312/PT TM 11-2155	<p>A rugged, lightweight, waterproof battery operated telephone set designed for local battery, common battery, or common battery signaling operation. Range: 14-22 mi (22.5-35.4 km) using non-loaded WD-1/TT with 36 db loss.</p>	<p>Uses two BA-30 Batteries. Employed throughout the combat zone.</p>

10. Telephone Switching Equipment

Nomenclature	Description	Remarks
Central Office Telephone, Manual AN/MTC-3 TM 11-5805-202-	<p>A mobile, two-position, manual telephone central office capable of interconnecting 120 local telephone circuits to trunk circuits and switching local telephone circuits. Includes two Manual Telephone Switchboards SB-86/P, two Switchboard Signal Assemblies TA-207/P, and other equipment.</p>	<p>Installed in Shelter S-175/MTC-3, and includes Trailer-Mounted Generator Set PU-294/G. Can be mounted on 2½-ton truck. When connected to Communication Patching Panel SB-611/MRC, carrier derived trunks are also available. Employed throughout the combat zone.</p>
Central Office, Telephone, Manual AN/MTC-7 TM 11-5805-211-	<p>A mobile, single-position, manual central office capable of interconnecting 60 local telephone circuits to trunk circuits and switching local telephone circuits. Includes one Manual Telephone Switchboard SB-86/P, one Switchboard Signal Assembly TA-207/P, and other equipment.</p>	<p>Installed in Shelter S-170/MTC-7 and includes Trailer-Mounted Generator Set PU-322/G. Can be mounted on ¾-ton truck. When connected to Communication Patching Panel SB-611/MRC, carrier-derived trunks are also available. Employed at division and field army levels.</p>
Distribution Box J-1077/U TM 11-5805-204- TM 11-5895-225-	<p>A weatherproof binding post panel for providing access to the pairs in one 26-Pair Cable (CX-4566/G) at a junction in the cable.</p>	<p>Used for distribution of pairs in 26-pair cables associated with army area communication assemblages. Employed throughout the combat zone.</p>

Nomenclature	Description	Remarks
<p>Panel, Patching Communication SB 611/MRC TM 11-5805-204-</p>	<p>A flexible, mobile, circuit control facility capable of connecting forty-six 26-Pair Cables (CX-4566/G) and 18 Field Wire Pairs (WD-1/TT). Testing and monitoring facilities for voice and teletypewriter circuits are integral. Includes one Manual Telephone Switchboard SB-22A/PT, one Teletypewriter TT-4A/TG, and other equipment.</p>	<p>Installed in Shelter S-171/MRC. Can be mounted on ¾-ton truck. Employed throughout the combat zone, primarily in division.</p>
<p>Switchboard, Telephone Manual, SB-22/PT TM 11-5805-262-</p>	<p>A portable, local battery, monocord switchboard capable of connecting 12 local battery telephone circuits, remote controlled radio circuits, or voice frequency teletypewriter circuits.</p>	<p>Uses four BA-30 Batteries. Two or three additional SB-22/PT's can be used to increase line capacity from 12 to 29 or 46 lines, respectively. Employed throughout the combat zone.</p>
<p>Switchboard, Telephone Manual SB-86/P TM 11-2134 TM 11-4134</p>	<p>A complete, transportable, single-position, non-multiple, local battery tactical switching central capable of terminating 30 magneto or common battery signaling lines or trunks, two of which may be automatic-one-way ringdown trunks to civilian exchanges. Can be used for voice frequency teletypewriter circuits. Includes a switchboard section, Jack Field Switchboard Signal Assembly TA-207/P, and Power Supply PP-990/G.</p>	<p>Expansible to 60 lines with the addition of Switchboard Signal Assembly TA-207/P. Employed throughout the combat zone.</p>

11. Telephone Transmission Equipment

Nomenclature	Description	Remarks
<p>Converter, Telegraph- Telephone Signal TA-182/U TM 11-5805-247-</p>	<p>A portable carrier modulator and demodulator which makes possible signaling over circuits which will not pass 20 cps ringing signals.</p>	<p>Employed throughout the combat zone for signaling on telephone and telegraph circuits. Used with Telephone Terminals AN/TCC-3 and AN/TCC-7 and Telegraph Terminal AN/TCC-4. Part of Telegraph-Telephone Terminal AN/TCC-14.</p>
<p>Terminal, Telephone AN/TCC-7 TM 11-2139 TM 11-2150</p>	<p>A lightweight carrier telephone terminal which provides 12 telephone channels and one voice frequency order wire channel for use over non-loaded Spiral-4 Cable (CS-1606/G) and/or radio relay facilities. Range: 200 mi (321.8 km) with repeaters using non-loaded spiral-4 cable.</p>	<p>Requires 115 or 230 volts ac, 50 to 60 cps, for operation. Used with Telephone Repeaters AN/TCC-8, AN/TCC-11, and AN/TCC-23. Employed throughout the combat zone.</p>
<p>Repeater, Telephone AN/TCC-11 TM 11-2150 TM 11-5805-240-</p>	<p>An unattended telephone repeater used to extend the range of 12-channel carrier telephone systems employing non-loaded Spiral-4 Cable (CX-1606/G). Range: 5¼ mi (9.25 km) per repeater using non-loaded spiral-4 cable.</p>	<p>Requires 148 volts dc, 0.1 amp, for operation. Used with Telephone Terminal AN/TCC-7 and Telephone Repeater AN/TCC-8. Employed throughout the combat zone.</p>

12. Teletypewriter Transmission Equipment

Nomenclature	Description	Remarks
Central Office Teletypewriter AN/MGC-17 TM 11-2225 TM 11-5805-262- TM 11-5815-205- TM 11-5815-206-	A mobile central office containing facilities for three full-duplex or half-duplex teletypewriter circuits including one secure circuit, and switching facilities for 12 subscriber lines. Includes one Teletypewriter TT-4A/TG, two Teletypewriter Reperator-Transmitters TT-76B/GGC, one Manual Telephone Switchboard SB-22A/PT, and other equipment.	Installed in Shelter S-169/MGC-17 and includes Trailer-Mounted Generator Set PU-322/G. Can be mounted on ¾-ton truck. Employed throughout the combat zone.
Terminal, Telegraph AN/MSC-29 TM 11-2225 TM 11-5805-262- TM 11-5815-205- TM 11-5815-206-	A mobile telegraph terminal providing eight full-duplex or 12 half-duplex nonsecure voice frequency teletypewriter circuits, or two full-duplex or four half-duplex secure circuits. Also provides switching facilities for 16 subscriber telegraph circuits. Includes eight Teletypewriter Reperator-Transmitters TT-76B/GGC, four Teletypewriters TT-4A/TG, one Manual Telephone Switchboard SB-22A/PT, communication security equipment, and other items.	Installed in Shelter S-176/MSC-29 and includes Trailer-Mounted Generator Set PU-294/G. Can be mounted on 2½-ton truck. Employed throughout the combat zone.

13. Wire and Cable Equipment

Nomenclature	Description	Remarks
Cable Assembly, Telephone CX-162/G SB 11-523	A five-pair, voice frequency, field telephone cable assembly furnished in 100, 300, 500, and 1000 ft lengths (30.4, 91.4, 152.4, and 304.8 meters) with universal type connectors on each end. Has 1.5 db loss per mile.	Assemblies are connected together to form desired length. Employed throughout the combat zone.
Cable Assembly, Telephone CX-163/G SB 11-523	A 12-ft (3.6 meter) cable stub with universal connector on one end for mating with CX-162/G and with exposed conductors available at the other end for connection to equipment not provided with cable connectors.	Employed throughout the combat zone.
Telephone Cable Assembly CX-1065/G TM 11-381	Same as CX-1606/G (1320 ft).	Same as CX-1606/G (1320 ft).
Cable Assembly, Telephone CX-1606/G (1320 ft or 402 meters) TM 11-381	¼ mile (402 meters) of Telephone Cable WF-8G (spiral-4 cable) with a universal connector at each end for rapid connecting and disconnecting. Assemblies are connected together to form a desired length. Designed as the transmission medium for 4-channel and 12-channel carrier telephone systems. Has 1.25 db loss per mile (1.6 km) nonloaded; 0.725 db loss per mile (1.6 km) loaded.	When used with Telephone Loading Coil Assembly CU-260/G it provides transmission medium for a 4-channel carrier system and when used without loading coil, it provides a 12-channel transmission medium. Employed throughout the combat zone.
Cable Assembly, Telephone CX-1606/G (100 ft or 30.4 meters) TM 11-381	100 ft assembly (30.4 meters) of Telephone Cable WF-8/G. Used to span short distances between equipments, between a piece of equipment and the end of a long line, or between two ¼-mile lengths (402 meters) of CX-1606/G.	Employed throughout the combat zone.

Nomenclature	Description	Remarks
Reeling Machine, Cable, Hand RL-31E TM 11-352	A collapsible type A-frame with one divided axle for manual wire laying and pickup. Holds two Wire Reels RL-159 ()/U, one Cable Reel DR-5, one Cable Reel DR-15B, or one Cable Reel DR-7. Includes two crank handles for recovering wire and two brake units.	Accommodates reels up to 27½" in diameter and 18" wide. Can be used as a carrying cradle or used on tail-gate of a vehicle or on the ground. Replaced by Engine Driven Cable Reeling Machine RL-172()/G in forward areas only. Employed throughout the combat zone.
Reeling Machine, Cable, Hand RL-39 SB 11-100-43	A portable, single axle, collapsible hand reel for manually laying and recovering ¼ mile (402 meters) of Field Wire WD-1/TT from Spool DR-8A. Includes crank for recovering wire.	Employed throughout the combat zone.
Reeling Machine, Cable, Engine Driven RL-207/G TM 11-3895-209-	A 3-hp gasoline engine driven, 2-axle reel unit designed to pick up and play out Field Wire WD-1/TT. Holds 4 Wire Reels RL-159 ()/U, 2 per axle, or 2 Cable Reels DR-15B, 1 per axle. Includes auxiliary hand driving facilities.	Primarily intended to be mounted on ¾-ton or larger vehicle but can be used on the ground. Flexible belts are used to obtain the desired reel speed. Employed throughout the combat zone.
Telephone Cable Assembly CX-4566/G TM 11-5895-225-	250 ft (76.2 meters) of general purpose 26-pair cable with universal connectors on both ends.	For truck-mounted shelter assemblages. Employed throughout the combat zone.
Telephone Cable Assembly CX-4760/G TM 11-5895-225-	A 15-ft stub (4.5 meters) of 26-pair cable with universal connector on one end for mating with CX-4566/G and with exposed conductors available at the other end for connection to equipment not provided with cable connectors.	Employed throughout the combat zone.
Wire WD-1/TT SB 11-100-154	General purpose, twisted pair, polyethylene jacketed field telephone wire packaged as follows: ¼ mile (402 meters) on Spool DR-8A, ½ mile (804 meters) on Wire Dispenser MX306A/G, 1 mile (1.6 km) on Wire Reel RL-159 ()/U, and 2½ miles (4 km) on Cable Reel DR-5. Range: 12-24 miles (19.3-38.6 km).	Employed throughout the combat zone.

14. Communications Security Equipment

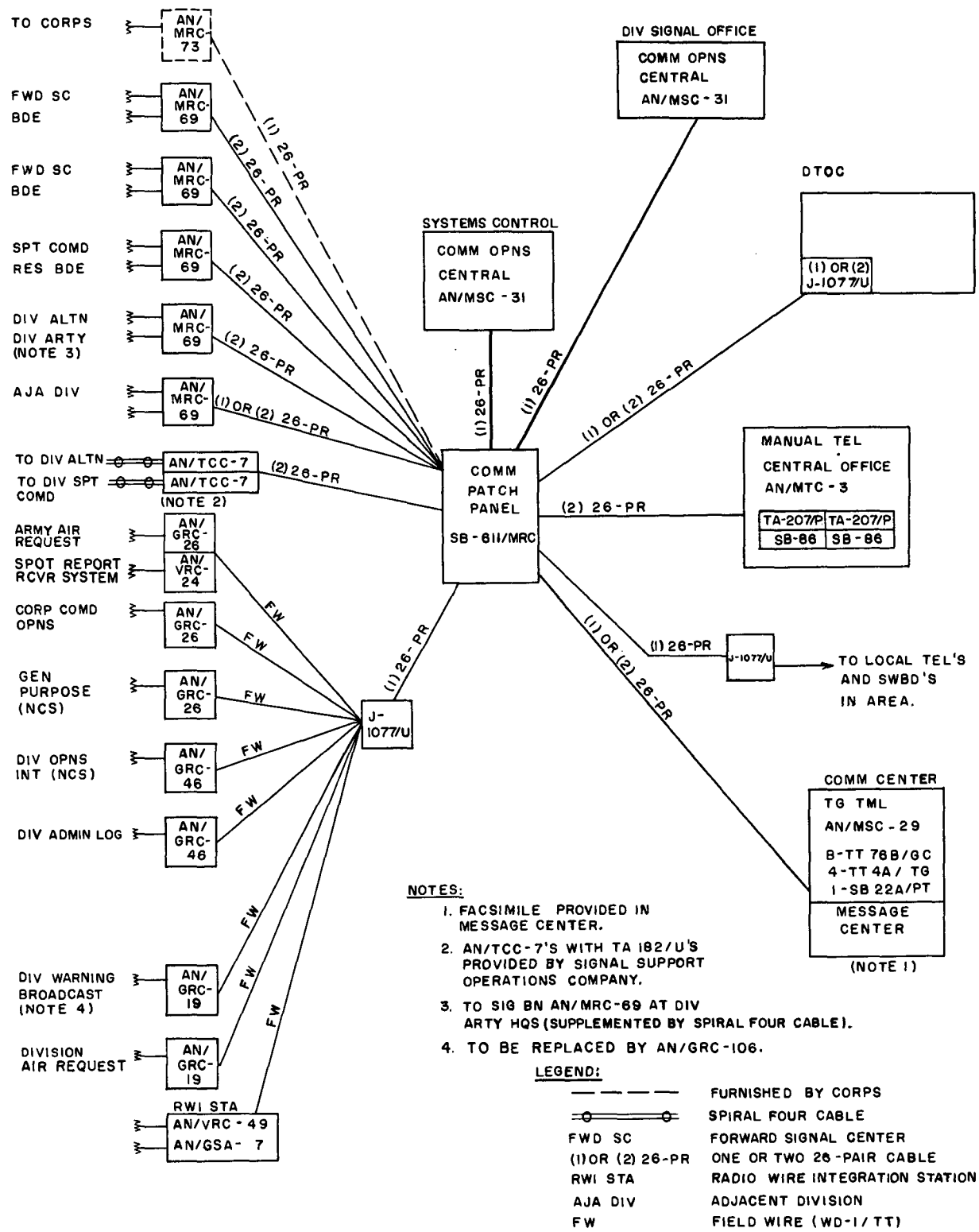
Nomenclature	Description	Remarks
Electro-mechanical Literal Cipher Machine, TSEC/ KL-7	An off-line electromechanical, portable, keyboard operated, tape printing cipher machine which encrypts literal and digital text.	Requires 24 volts DC or 115/230 volts AC for operation. Employed throughout the combat zone.
Electronic Tactical Tele- typewriter Security Equipment, TSEC-KW-7	An on-line, electronic, portable, synchronous, half duplex, teletypewriter security equipment used for securing tactical point to point or netted communications.	Requires 21-31 volts DC or 115/230 volts AC for operation. Employed throughout the combat zone.
Keyboard Adapter, KLX- 7/TSEC	A keyboard adapter which, together with the TSEC/HL-1, provides the KL-7 with an automatic encryption or decryption capability from punched teletypewriter tape.	No power required. Employed where requirement exists for handling large volumes of KL-7 encrypted traffic.
Electro-mechanical Tape Reader for Literal Cipher Machine, TSEC/HL-1	An electro-mechanical, offline tape reader converter which, together with the KLX-7, provides the KL-7 with an automatic encryption or decryption capability from punched teletypewriter tape.	Requires 115/230 volts AC for operation. Employed where the requirement exists for handling large volumes of KL-7 encrypted traffic.

APPENDIX III

INTERCONNECTION OF SIGNAL FACILITIES

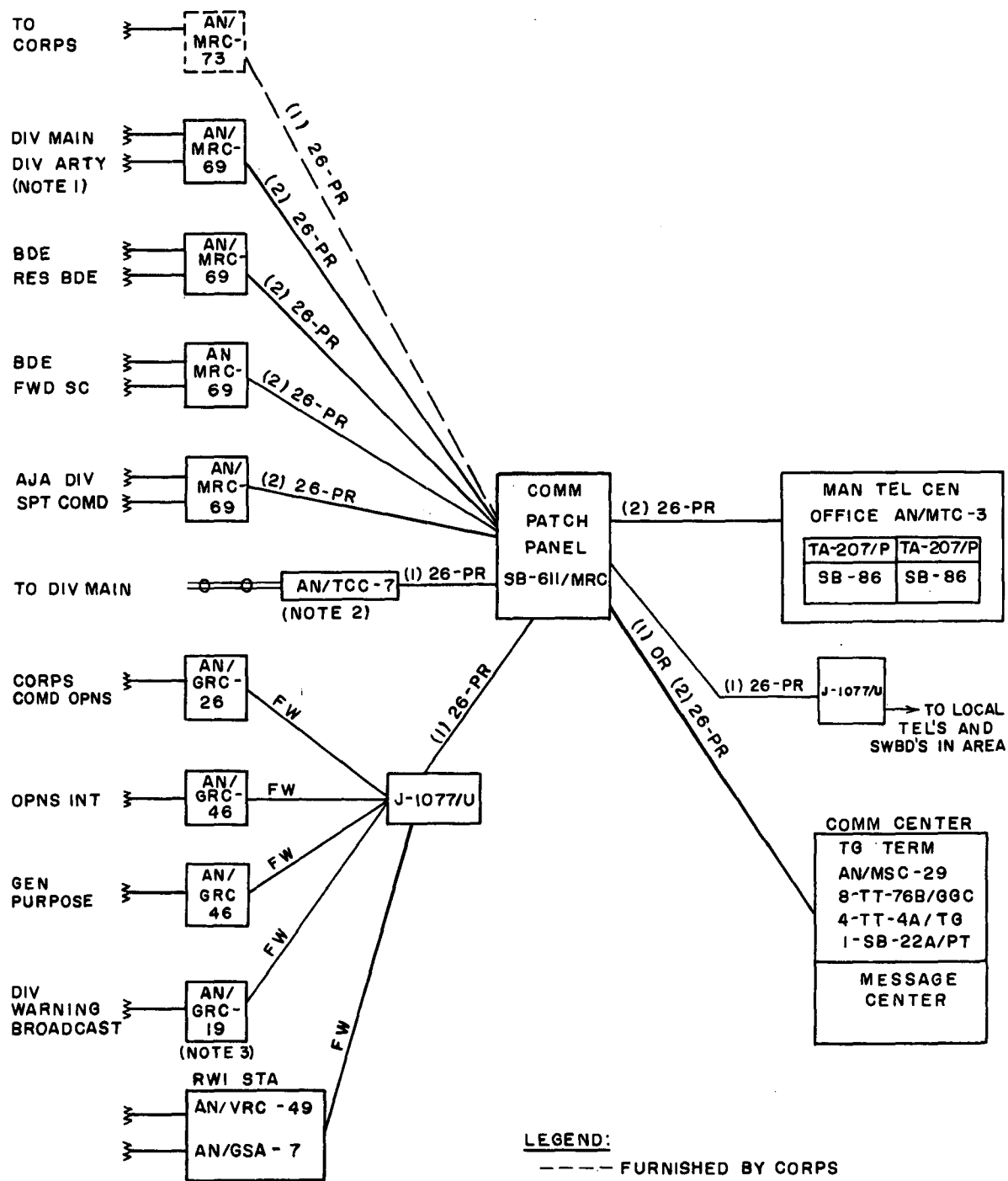
The illustrations of this appendix depict type interconnections of the major items of signal equipment for signal centers at division main, division alternate, division support command, division rear, and one forward signal center. Each illustration provides a suggested functional, but not a terrain-oriented placement of equipment—interior arrangements of equip-

ments within a CP complex will necessarily vary to a great extent. These finalized arrangements must reflect the orders of the commanding general, the tactical situation, division SOP, status of equipment, and other factors. For further information, consult appendix II, appropriate TOE's, and the pertinent equipment technical manuals.



FM 11-50-10

Figure 11. Type interconnection of signal facilities at a division main command post.

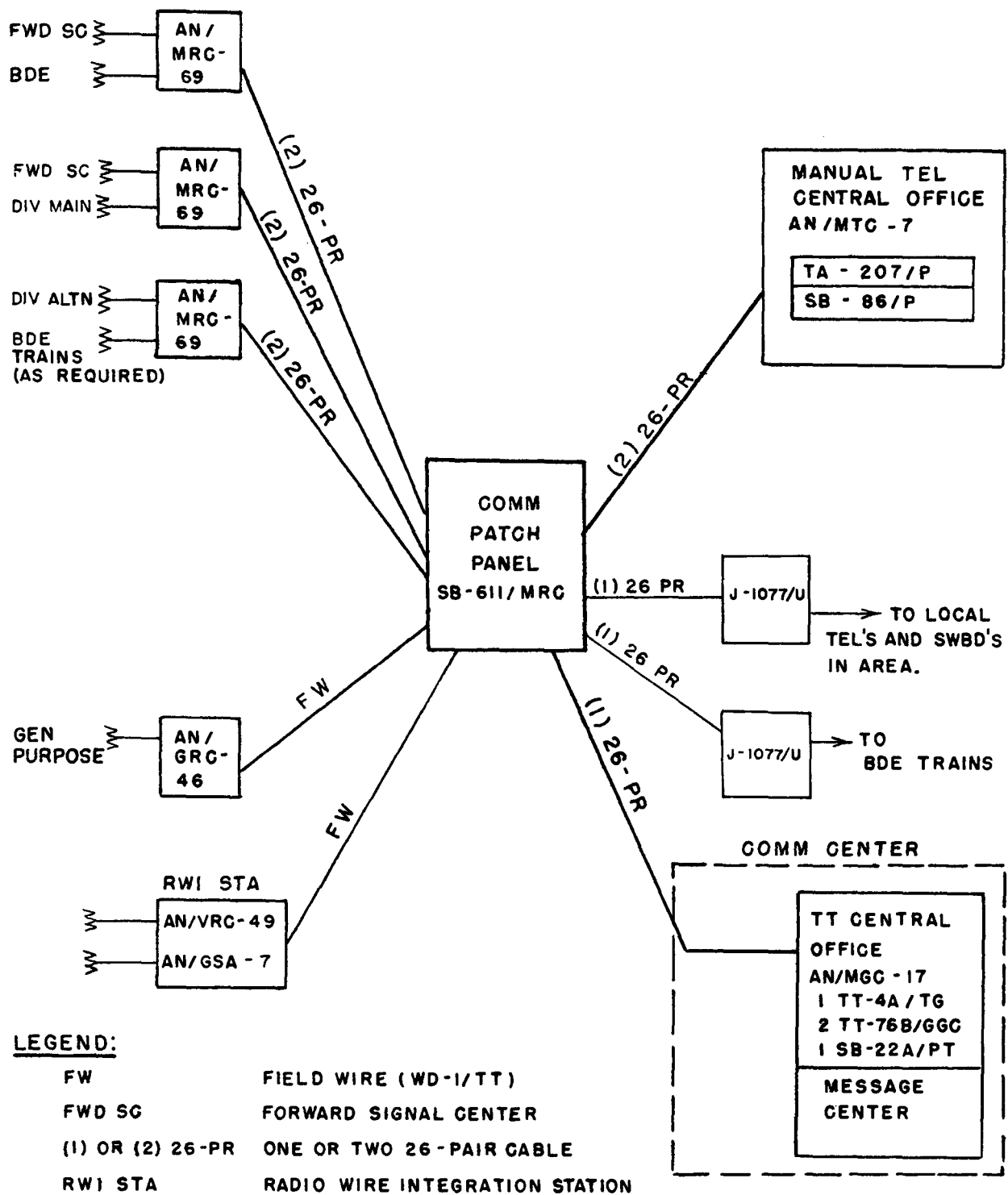


1. TO SIG BN AN/MRC-69 AT DIV ARTY HQ (SUPPLEMENTED BY SPIRAL FOUR CABLE).
2. AN/TCC-7 WITH TA-182/U'S PROVIDED BY SIGNAL SUPPORT OPERATIONS COMPANY.
3. TO BE REPLACED BY AN/GRC-106.

- LEGEND:**
- FURNISHED BY CORPS
 - ⊗ SPIRAL FOUR CABLE
 - FWD SC FORWARD SIGNAL CENTER
 - AJA DIV ADJACENT DIVISION
 - FW FIELD WIRE (WD-1/TT)
 - RWI STA RADIO WIRE INTEGRATION STATION
 - (1) OR (2) 26-PR ONE OR TWO 26-PAIR CABLE

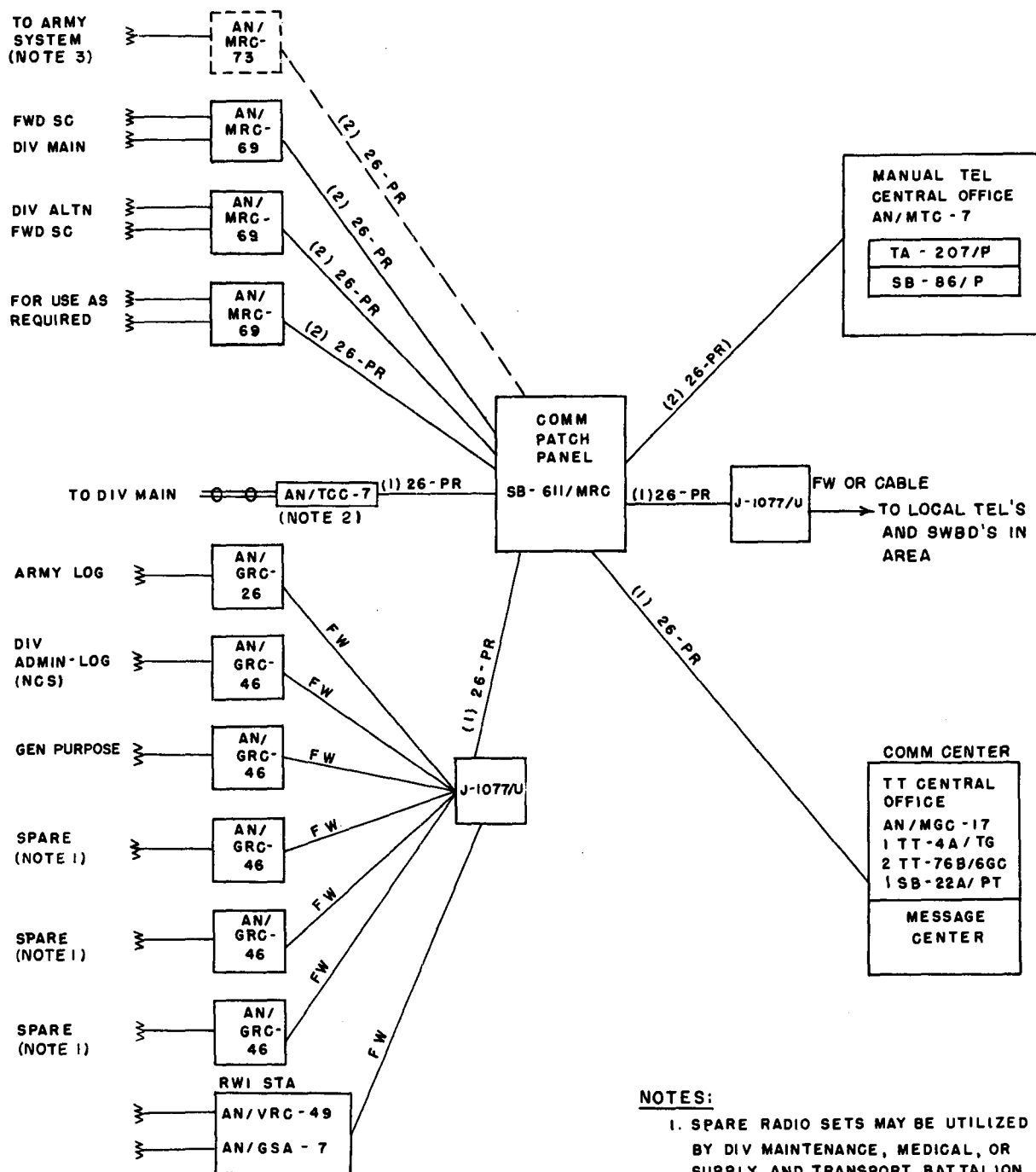
FM 11-50-11

Figure 12. Type interconnection of signal facilities at a division alternate command post.



ST 11-50-12

Figure 13. Type interconnection of signal facilities at a forward division signal center.



LEGEND:

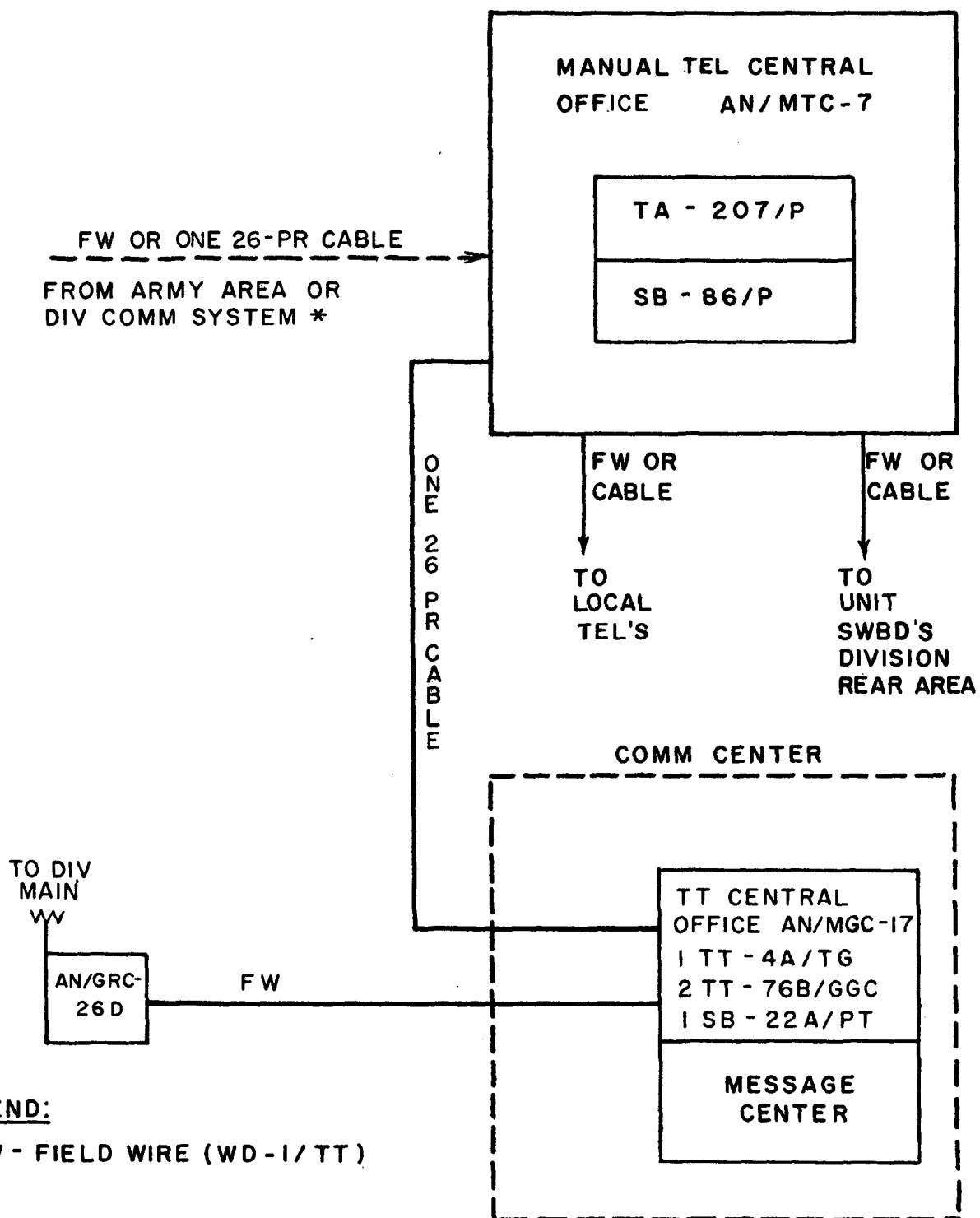
- FURNISHED BY ARMY
- ⊖⊖ SPIRAL FOUR CABLE
- FW FIELD WIRE (WD-1/TT)
- FWD SC FORWARD SIGNAL CENTER
- (1)OR(2) 26-PR ONE OR TWO 26-PAIR CABLE
- RWI STA RADIO WIRE INTEGRATION STATION

NOTES:

1. SPARE RADIO SETS MAY BE UTILIZED BY DIV MAINTENANCE, MEDICAL, OR SUPPLY AND TRANSPORT BATTALION WHEN THESE UNITS OPERATE AWAY FROM DIVISION SUPPORT COMMAND AREA.
2. AN/TCC-7 FURNISHED BY SIGNAL SUPPORT OPERATIONS COMPANY.
3. AN/MRC-73 PROVIDED BY ARMY.

FM 11-50-13

Figure 14. Type interconnection of signal facilities at headquarters of division support command.



LEGEND:

FW - FIELD WIRE (WD - 1/ TT)

NOTE:

* DIV SIG BN WILL FURNISH ONE AN/MRC-69 IF DIVISION REAR IS TO BE INTEGRATED INTO THE DIVISION COMMUNICATION SYSTEM.

FM 11-50-14

Figure 15. Type interconnection of signal facilities at division rear echelon command post.

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☆ U.S. Government Printing Office: 1965-200-537/5019A