

Chapter 1

Combat Net Radio (CNR) Deployment

1-1. New Equipment

a. Modern semiconductor technology has made high-speed signal processing part of everyday life and has enhanced communications systems capabilities. Adding electronic counter-countermeasures (ECCM) modules and devices makes radios and command and control (C²) facilities more survivable. Frequency hopping (FH) is a spread-spectrum radio technique. It degrades enemy forces' abilities to find, monitor, or destroy friendly systems.

b. Single-channel radios are being upgraded or replaced. This provides the maneuver force commander with a reliable multifaceted C² communications system. The combination of high frequency (HF), very high frequency (VHF), and ultra high frequency (UHF) radios gives commanders redundant, but different, means to control their forces. Each system takes advantage of a different transmission path increasing the probability that at least one communications system will work at any given time.

c. Joining active electronic and passive ECCM techniques with multiple radio sets in the C² system provides effective communications to control ground and airborne forces. However, the increase in complexity and number of different radio types also increases the predeployment planning necessary to ensure completely operational communications networks.

1-2. The CNR Network

a. The CNR network is designed around three separate radio systems. Each system has different capabilities and transmission characteristics. The three systems are--

- Improved high frequency radio (IHFR).
- Single-Channel Ground and Airborne Radio System (SINCGARS).
- Single-channel tactical satellite (TACSAT).

The CNR network's primary role is voice transmission for C². The CNR network assumes a secondary role for data transmission when requirements exceed the Army Data Distribution System (ADDS) or Mobile Subscriber Equipment (MSE) capabilities. Voice C² information maintains priority over data in most networks. The exception is using SINCGARS with the Tactical Fire Direction

System (TACFIRE) or Advanced Field Artillery Tactical Data System (AFATDS). Current demands on voice C² networks require a large amount of operational time dedicated to voice. This leaves little time for data sharing.

(1) The IHFR will selectively replace the current HF manpack and vehicular radios. It will use ground and skywave propagation paths for short- and medium-range communications. FM 24-18 covers radio wave propagation. IHFR gives the tactical commander alternate means of passing voice and data communications. IHFR has a dual role with voice C² taking precedence over data transmission. Passing data requires an interface device called a modem. The high-power version is used for voice networks that pass highly perishable C² information or for medium- to long-range communications (50 to 300 kilometers (31 to 186 miles)). Brigade and battalion level units primarily use the low- power version (0 to 50 kilometers (0 to 31 miles)). All IHFR versions are user-owned and -operated.

(2) SINCGARS is replacing all AN/PRC-77 manpack and AN/VRC-12 series vehicular mounted VHF and airborne VHF frequency modulated (FM) radios. SINCGARS accepts either digital or analog inputs and imposes the signal onto an FH output signal. In FH, the input changes frequency about 100 times per second over portions of the tactical VHF range from 30 to 88 MHz. This hinders threat intercept and jamming units from locating or disrupting friendly communications. SINCGARS is the primary means for short-range (less than 35 kilometers (22 miles)) secure voice C² below division level. It is also the secondary means for combat support (CS) and combat service support (CSS) units throughout the corps. SINCGARS is user-owned and -operated like the current VHF-FM radios. SINCGARS can provide access to the area common-user (ACU) network through the Net Radio Interface (NRI) System, or its range can be increased by retransmission. Data and facsimile transmission capabilities are available to tactical commanders through simple connections with various data terminal equipment (DTE). Until the ADDS fielding is complete, SINCGARS will, on a limited basis, fulfill the data transmission requirements. However, avoid this when possible because voice has priority on the system.

(3) The current single-channel TACSAT systems include the AN/URC-101, AN/URC-110, AN/VSC-7, AN/PSC-3, and AN/VHS-4. Special Forces and Ranger units use the AN/PSC-3 and AN/VSC-7 for minimum essential communications. Special contingency units at selected corps and division levels use AN/URC-101 and AN/URC-110.

b. Currently, SINCGARS can interface with MSE and Tri-Service Tactical Communications (TRI-TAC) equipment. Each interface device is peculiar to that Area Common-User System (ACUS).

(1) In the NRI, SINCGARS uses the KY-90 to link the MSE radio and the switched area communications network. Presently, the NRI gains access into the MSE ACUS through large extension node switch (LENS) or small extension node switch (SENS) shelters. This allows a SINCGARS radio user to access the entire common-user network. Future plans may be to move the radio systems by remoting. Since the switching node will be colocated with a headquarters

element in the forward battle area, reducing the signature enhances survivability.

(2) The C-6709 provides NRI access for SINCGARS to analog switched systems (either AN/TTC-38 or AN/TTC-39). Again, the NRI device must be colocated with a switch to provide the necessary physical connections.

1-3. Doctrinal Networks

a. Units from battalion echelon up generally establish the following three categories of VHF-FM networks:

- C².
- Administrative/Logistics.
- Intelligence.

C² networks can be further divided into functional areas of maneuver, fire support, aviation, air defense artillery (ADA), and engineers. These units establish internal C² networks and are subscribers in at least one other network. In this manual, the networks shown only serve as guides for establishing radio networks. The actual networks established depend on the existing situation, command guidance, and equipment available.

(1) Figure 1-1 lists the typical networks formed at division and brigade level. Figure 1-2 shows typical subscribers for a maneuver unit C² network. Note that the subscribers in a C² network are members of that echelon and the next senior echelon C² network.

(2) Units establish administrative/logistics networks (Figure 1-3) as required. All echelons from battalion through division have a support network to separate administrative/logistics and operational information. This prevents support information from overwhelming the command operations network during battle.

(3) Intelligence networks (Figure 1-4) are usually established from battalion through division. The information passed over these networks is continuous in nature and requires a separate network to prevent overloading the C² net. The local situation determines whether other subscribers are added or deleted.

(4) The rear battle command FM network (Figure 1-5) is a key network under the AirLand Battle concept. This network consists of many units that are colocated. The members of the rear battle network also depend on the actual units that form the base cluster.

NET STATIONS	CMD OP FM NET	INTEL FM NET	REAR OP CEN FM NET	OP HF VOICE NET (IHFR)
CDR	*	*		
ASST CDR	*	*		
OP G3/S3	**	*	*	**
G2/S2		**		
TAC G3/S3	*			*
TAC G2/S2		*		
DISCOM	*		**	
SUBORD CP	*	*	*	*
MSB/FSB				
AVN UNITS	*	*	*	*
ENGR UNIT	*	*	*	*
MI UNIT	*	*		*
ADA UNIT	*	*		*
ARTY	*	*	*	*
MP	*		*	
REAR OP CEN	*		*	*
SIG	*	*	*	
LO	*			
LONG-RANGE RECON DET		*		

*NET MEMBER

**NCS

Figure 1-1. Radio net structure.

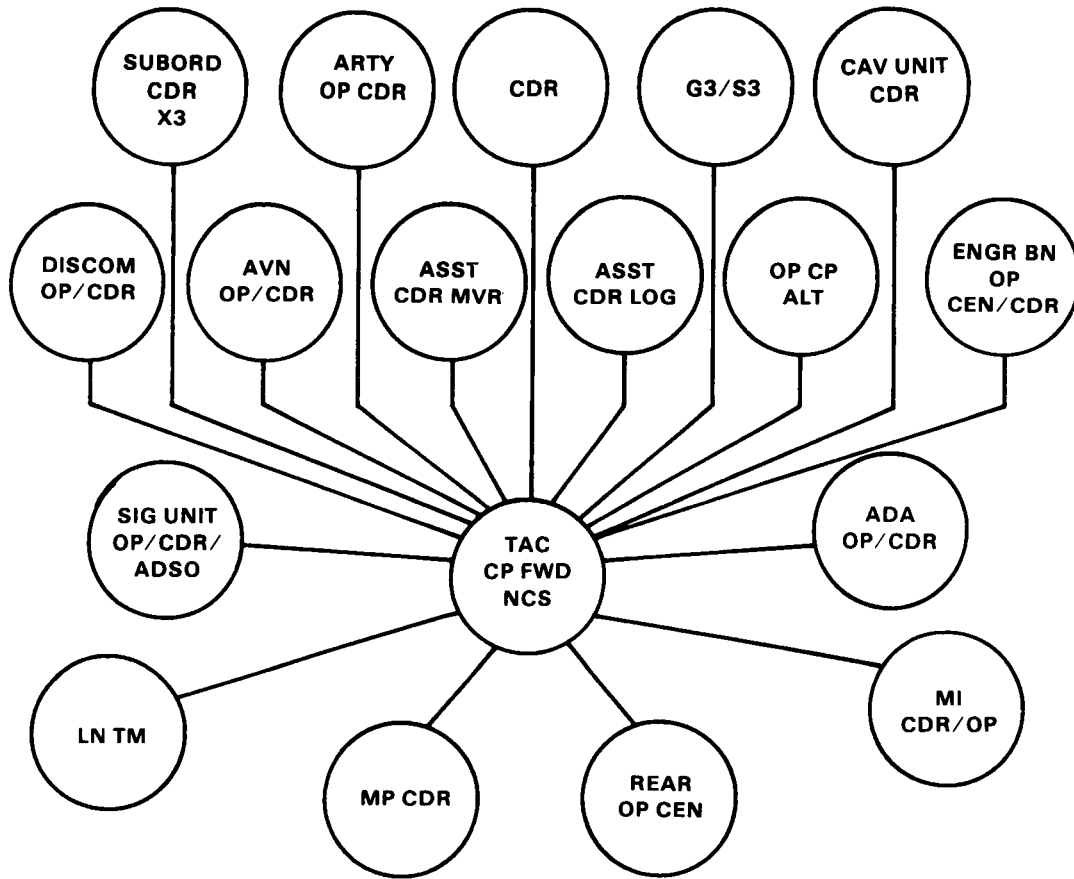


Figure 1-2. Command operations FM net.

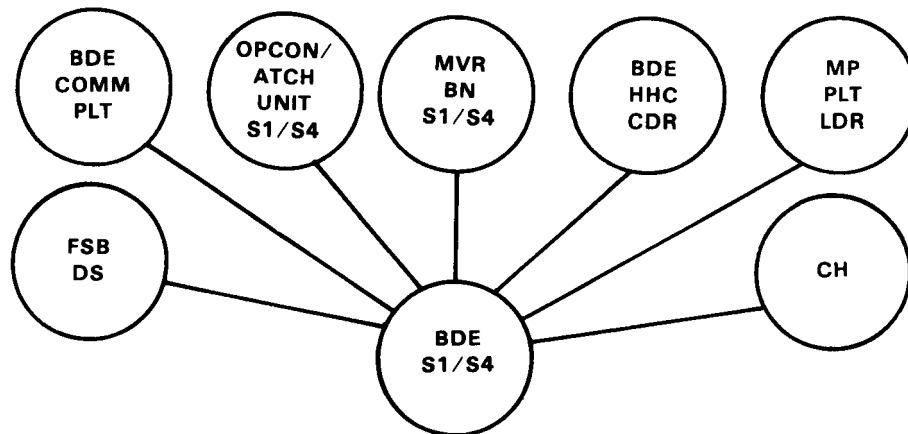
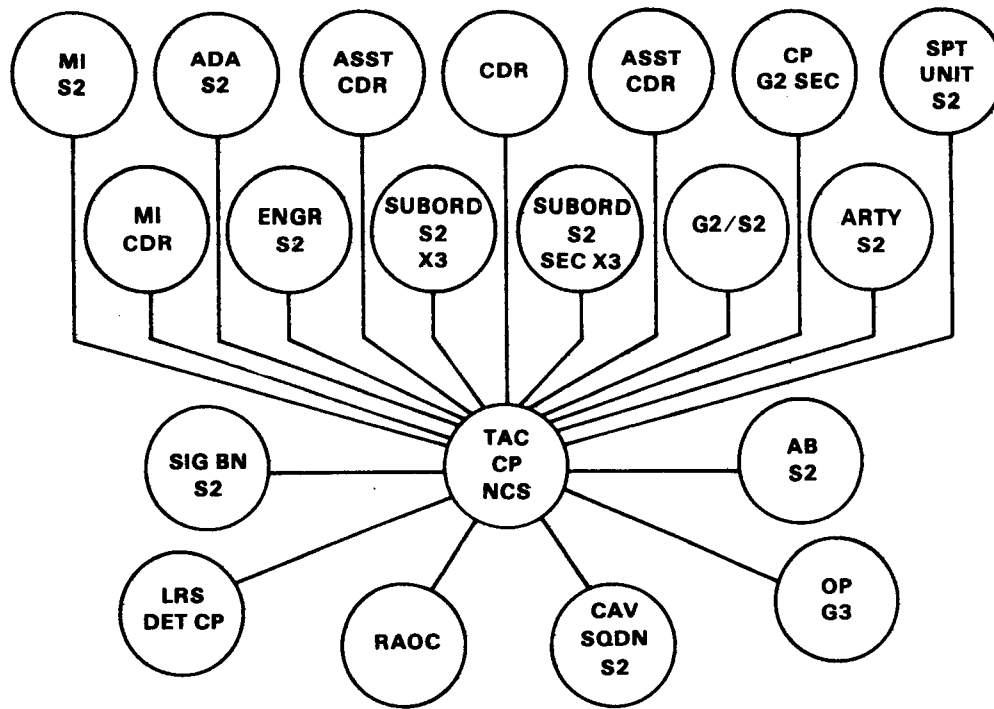


Figure 1-3. Administrative/logistical FM net.



NOTE: Support unit S2 (DISCOM) is not present in division intelligence net.

Figure 1-4. Intelligence FM net.

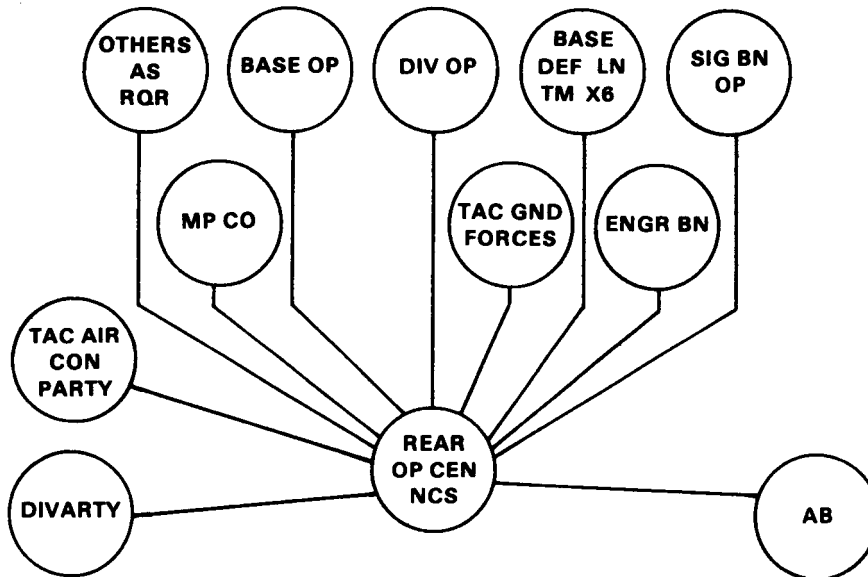


Figure 1-5. Typical rear operations FM net.

b. IHFR is the primary radio used in the HF networks. The high frequency-amplitude modulated (HF-AM) networks shown are generic networks. Specific networks established and subscribers to those networks depend on local guidance and requirements.

(1) HF networks are similar to the VHF-FM networks in function and establishment. Many HF networks are backup or supplemental to their VHF-FM counterparts. HF networks are established when unit dispersal exceeds the planning range for VHF-FM systems. Figure 1-6 shows a typical C² network at division level. Note the similarity with the VHF-FM C² network (Figure 1-2). The HF C² network is established as a secondary means of controlling the battle.

(2) Logistics units use HF radios for C² and internal coordination due to the communications distances from the division support area (DSA) to the brigade support area (BSA). This net is a backup to FM when the tactical spread of the division extends the lines of communications. When available, the ACUS replaces this net as well as similar corps nets. Figure 1-7 shows the network for logistics support in a division. The support units within the corps establish similar networks or monitor the division networks to ensure push forward support.

(3) Reconnaissance and cavalry units require HF radios to provide long-range communications for reconnaissance patrols. Figure 1-8 shows the typical subscribers in a cavalry unit HF network. Cavalry squadrons and troops use the low-power IHFR for their C² networks. The same is true of both divisional and regimental cavalry.

(4) Medical units need dedicated long-range, reliable communications systems that can be user-operated. Communications distances from major medical support bases to forward aid stations will be substantial under the AirLand Battle concept. Push-button automatic tuning and other simplified operating features make IHFR ideal for nonsignal personnel. Figures 1-9 through 1-11 show typical medical unit HF networks for corps and division.

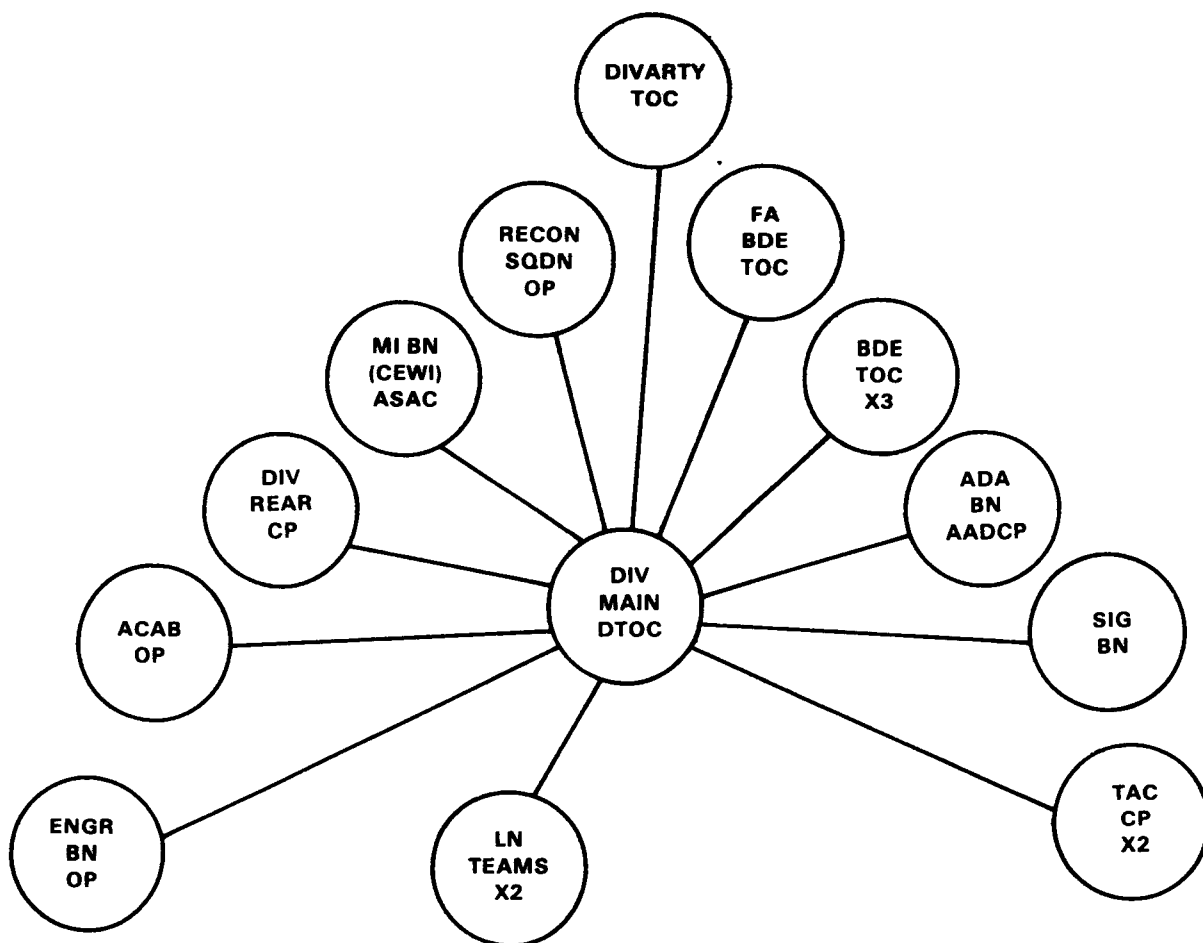


Figure 1-6. Typical HF operations voice net.

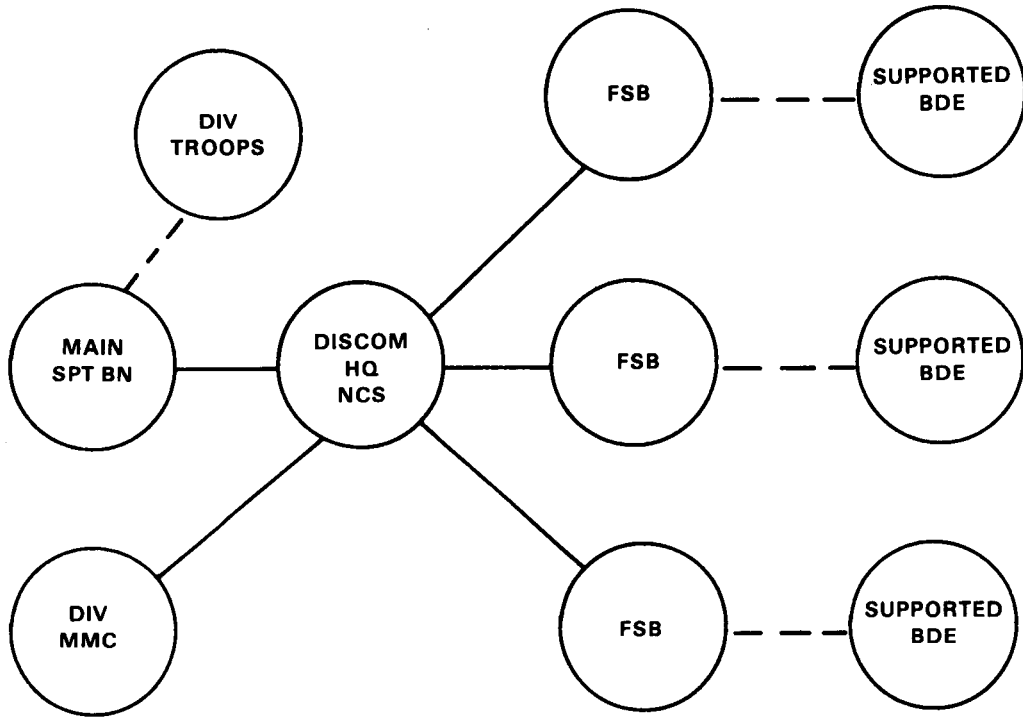


Figure 1-7. Logistics support HF net.

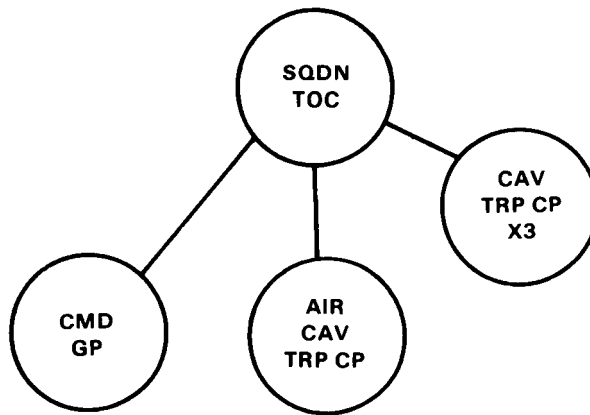


Figure 1-8. Cavalry unit HF net.

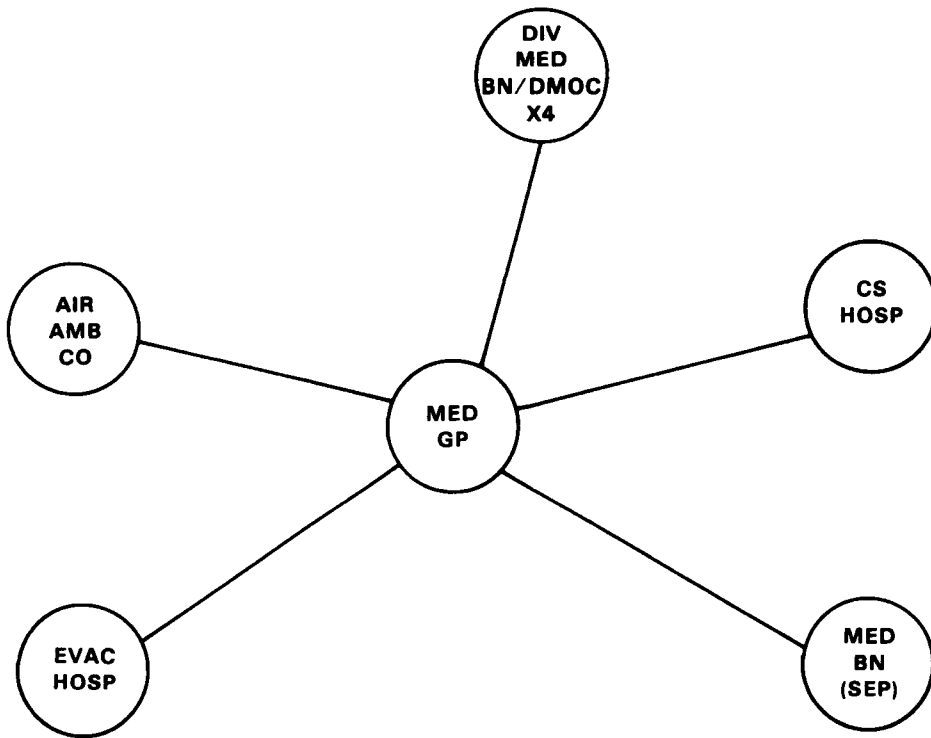


Figure 1-9. Corps medical operations net high frequency-single sideband (HF-SSB).

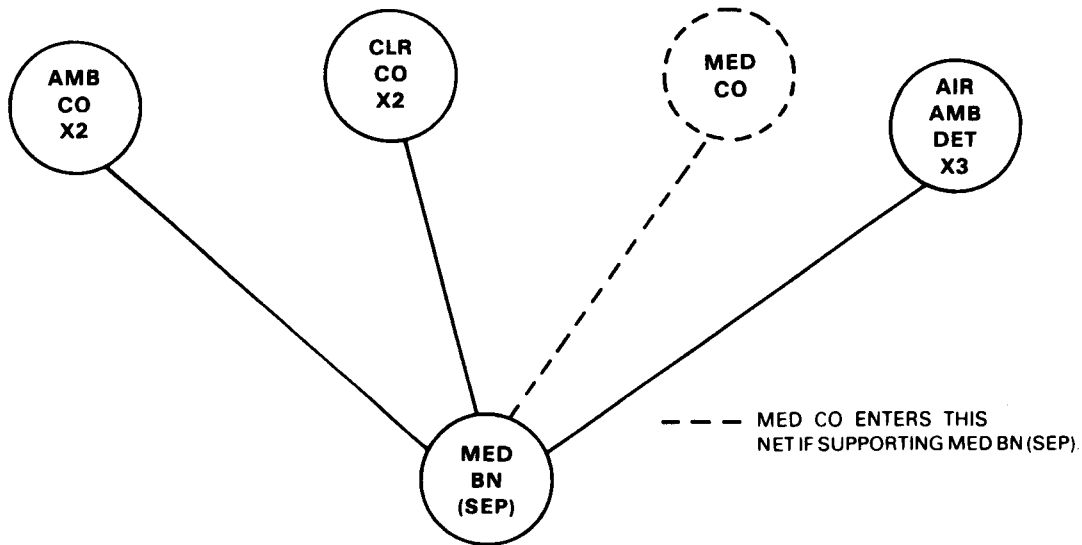
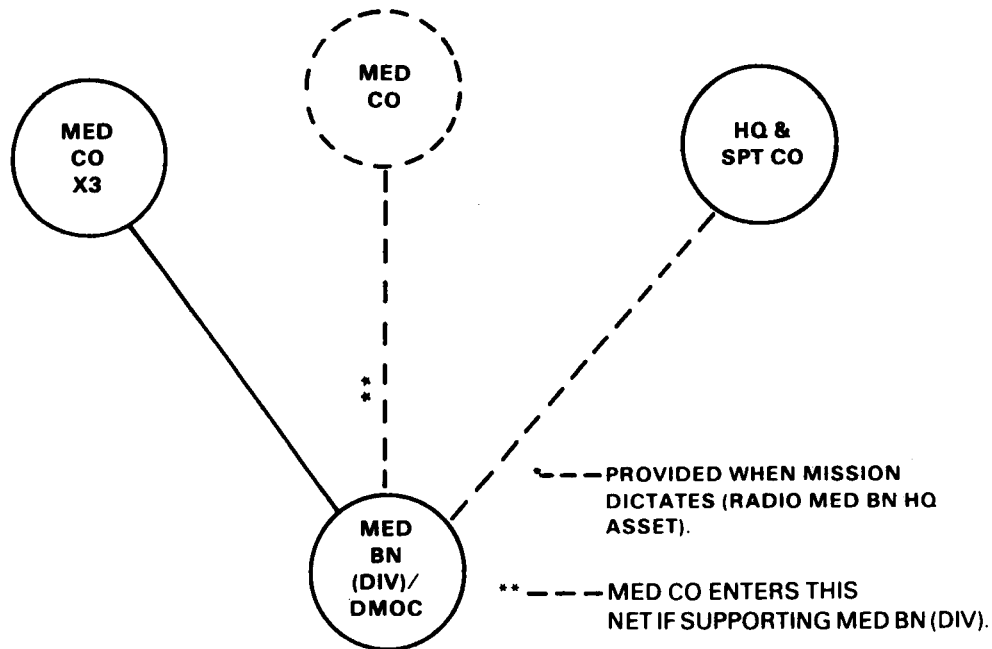


Figure 1-10. Separate medical battalion operations net (HF-SSB).



NOTE: Medical companies belong to the FSB. Medical battalion personnel are subordinate to the MSB at DISCOM.

Figure 1-11. Heavy division medical operations net (HF-SSB).

1-4. Corps and Division

a. SINCGARS and IHRF are the primary means of communications within maneuver brigades. CS and CSS units operating in the division area behind the brigade rear boundary use CNR as a secondary means of communications; however, the ACUS is the primary means of communications. Single-channel radios fulfill many voice communications missions within the division and corps areas. Separate networks may be established for C², intelligence, or administration and logistics. Although each network is designed for a particular type of information, other information may be passed over the network. SINCGARS provides secure communications for all users, regardless of the network's main function. The current method of securing HF voice communications is with the KY-65.

b. Data transmission (non-TACFIRE) throughout the corps and division area will share a voice network. At brigade and division, primary shared network data information originates from either the tactical facsimile or the C² computer system. TACFIRE or AFATDS establishes dedicated data networks via SINCGARS. IHRF and UHF TACSAT can pass data rates up to 2400 baud and can be secured with the KG-84 data encryption device.