Chapter 3
Area Communications Systems

3-1. Overview

The tactical ACUS is a network switching system that provides voice and data traffic interconnectivity for subscribers. EAC use the TRI-TAC systems; ECB use the MSE system. These systems link to provide a seamless area communications system across an entire theater of operations (see Figure 3-1). This chapter provides an overview of both systems.

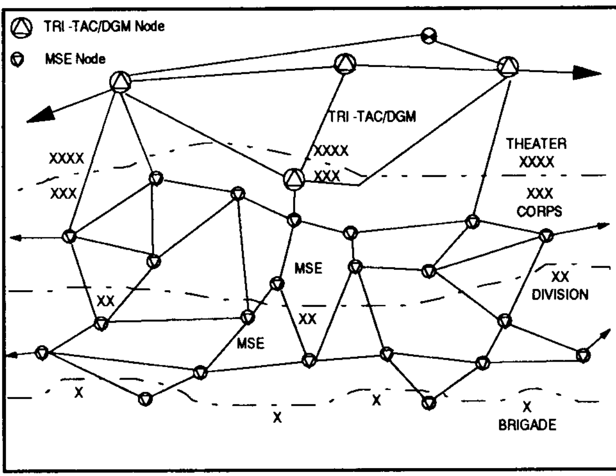


Figure 3-1. Area communications systems.

3-2. Mobile Subscriber Equipment

Employment. The MSE system is the primary ACUS configuration for ECB. MSE forms a network that covers the area occupied by unit subscribers. For a division, the grid is made up of four to six centralized NCs which make up the hub or backbone of the network. Throughout the maneuver area, subscribers connect to SENs/LENs by radio or wire. These extension nodes serve as local call switching centers and provide access to the network by connecting to the NCs. See Figure 3-2.

NOTE: For the following radio configurations not all switches have super high frequency (SHF) radios. SHF radios are allocated on the basis of about one to every two switches.

System Features. The MSE system is an area-switched communications system. The system provides communications for a notional five-division corps in an area of operations of up to 15,000 square miles (37,500 square kilometers). The system is digital, secure, highly flexible, and contains features that deal with link or functional element outages, traffic overload, and rapid movement of users. The MSE system provides both voice and data communications on an automatic, discrete addressed, fixed-directory basis using flood search routing. The system supports both mobile and wire subscribers in the five-division corps with a means to exchange command, control, communications, and intelligence information in a dynamic tactical environment.

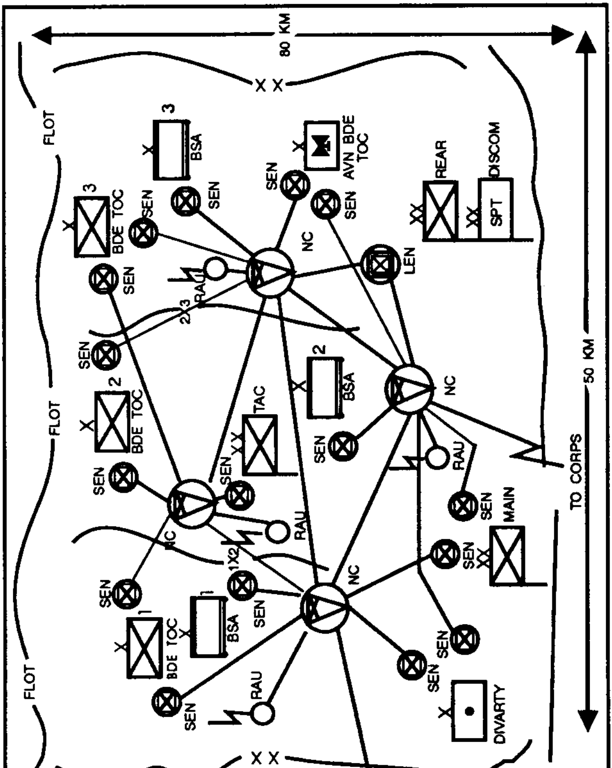


Figure 3-2. Light division ACUS.

The TPN is a packet switching network that is overlaid on the circuit switching network of MSE. Along with providing data communications with the corps structure, the TPN provides data interoperability with adjacent corps and EAC forces, NATO forces, and commercial networks.

Power Requirements. Diesel engine driven generators provide alternating current (AC) power to assemblages/ shelters. The two types of power units, as well as the shelter carrier alternator used in the MSE system are listed in Table 3-1 with their respective operating data. Vehicles equipped with the 200-ampere alternators provide direct current (DC) power as backup during site setup or generator start up, maintenance, or refueling. The shelter battery bank provides up to ten minutes of power between time of generator shutdown and vehicle engine (and 200 ampere alternator) start up. The figures in Table 3-2 reflect fuel consumption under full load conditions.

Table 3-1. Shelter power requirements.

EQUIPMENT	POWER REQUIREMENT (kW)	POWER UNIT
NC SWITCH:		
switching and operations shelters	8	PU753/M
LEN SWITCH:		
switching and operations shelters	8	PU753/M
MANAGEMENT FACILITY	3.5	PU753/M
SEN( ) SWITCH	5	PU753/M
RAU	4	PU751/M
LOS( )	3	PU751/M
SCC:		
Management and technical shelters	7	PU753/M
Planning shelter	5	PU751/M

Table 3-2. Fuel consumption.

TYPE	FUEL CAPACITY (GALLONS)	FUEL CONSUMPTION (GALLONS/HR)	POWER RATING (kW)	FREQUENCY (Hz)
PU751/M	6.75	0.84	5	60
PU753/M	12.5	1.56	10	60
Alternator (shelter carrier)	25.0	0.8	378	N/A

NODE CENTER

Function. NCs serve as an access point for LENs, SENs, RAUs, and system control centers-2 (SCC-2s). Each NC operates as an automatic switching point that receives traffic and routes it to other switches through flood search. The NC site contains two shelters, one for switching and one for operations, four LOS(V)3 multichannel terminals, one local RAU, and a node management facility (NMF). See Figure 3-3.

Connectivity. Most NC traffic is passed between the NC switch and the four LOS(V)3 multichannel radio assemblages. Each LOS(V)3 passes three digital transmission groups (DTGs) multiplexed into one multiplex DTG (MDTG) to the NC switch. The NC switch also can cable directly to two SENs, a RAU, and an SCC-2. In addition to the LOS assemblages, the NC connects to multichannel TACSAT/tropospheric scatter (TROPO) systems, or allied subscribers. Twenty-four local telephones are available for NC personnel.

Node Management. The NMF contains a workstation, an intercom, a DNVT, a digital voice orderwire (DVOW), a mapboard, and workspace. The workstation has a monitor and keyboard, and it communicates with the SCC-2 to update NC/LEN status and to receive operational messages and directives. The NMF does not have a printer. It accesses the operations shelter's printer.

NOMENCLATURE	
SWITCH: •SWITCHING GROUP ON/308/TTC-47 •OPERATIONS GROUP OL/413/TTC-47	AN/TTC-47
MULTICHANNEL LOS:	AN/TRC-190(V)3 (4 ea)
SHF RADIO:	AN/GRC-224 (2 ea) OPTIONAL IN NC SWITCH
GENERATORS:	PU-751 5KW (5 ea) PU-753 10KW (2 ea)
NODE MGT FACILITY:	AN/TSQ-154
RAU:	AN/TRC-191

TECHNICAL INFORMATION	
BIT RATE:	1024 kbps
PACKET SWITCH CONNECTIONS:	1 IEEE 802.3 LAN 2 Dial up x .25 Host
CHANNELS USED:	58 Voice 4 Packet Switch 2 Overhead 64 TOTAL

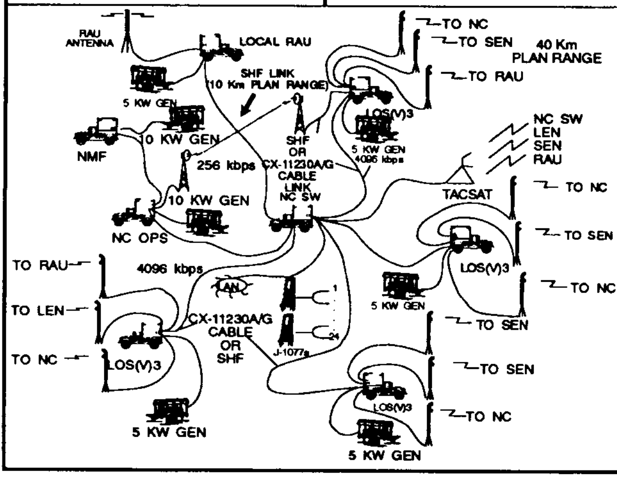


Figure 3-3. Typical NC configuration.

The Standard Integrated Command Post System (SICPS) tent is used in conjunction with the NMF to make up the operations center. It contains the basic equipment and charts from the NMF. Figure 3-4 shows a typical operations center layout and Figure 3-5 shows a typical node operations board.

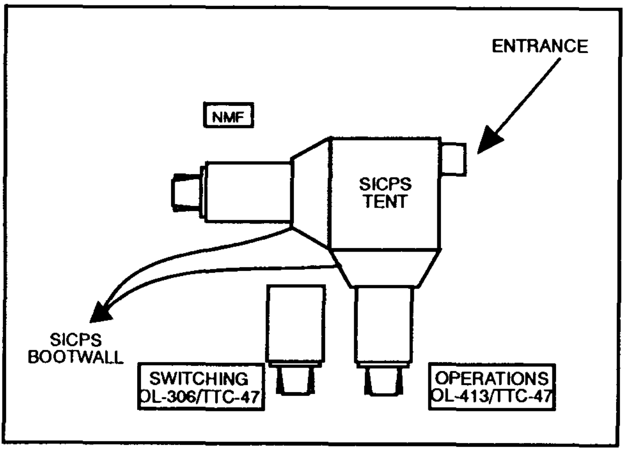


Figure 3-4. Nodal operations.

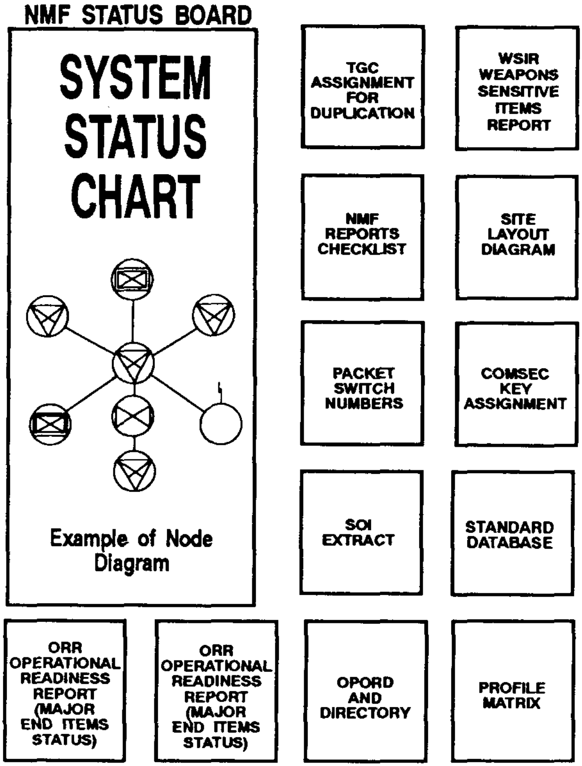


Figure 3-5. Typical node operations board.

LARGE EXTENSION NODE

Function. The LEN consists of two shelters, one for switching and one for operations, an LOS(V)4 multichannel terminal, and an NMF. The LEN provides ACUS access to large groups of users in areas where mobility and dispersion are not primary considerations. See Figure 3-6. The LEN usually deploys to support large CPs such as the corps support command (COSCOM) and the DISCOM.

Interconnectivity. Eighty-four of the LEN subscribers install wire from their telephones to the J-1077 and the remaining 80 connect to remote multiplexer combiners (RMCs). These are cabled to the switch that connects to the LOS(V)4 either through CX-11230A/G cables or SHF links. Two LOS shots from the LOS(V)4 provide links to two different NCs. If the situation dictates, a SEN or RAU can connect to the LEN. Like the SEN, the LEN may connect to a multichannel TACSAT and may provide 2- or 4-wire connections for commercial switches.

Node Management. The NMF for a LEN is the same as the NMF for the NC. The SCC-2 connects to the LEN switch by CX-11230A/G cable. The LEN uses the same SICPS configurations as shown in Figures 3-4 and 3-5.

NOMENCLATURE		TECHNICAL INFORMATION	
SWITCH:	AN/TTC-46	BIT RATE:	512 kbps
• SWITCHING GROUP ON/305/TTC-46			
• OPERATIONS GROUP OL/412/TTC-46		PACKET SWITCH CONNECTIONS:	4 IEEE 802.3 LANs 7 x .25 Hosts
MULTICHANNEL LOS:	AN/TRC-190(V)4 (1 ea)		
SHF RADIO:	AN/GRC-224 (2 ea)	CHANNELS USED:	26 Voice 4 Packet Switch 2 Overhead 32 TOTAL
GENERATORS:	PU-751 5KW (1 ea) PU-753 10KW (2 ea)		
NODE MGT FACILITY:	AN/TSQ-154		

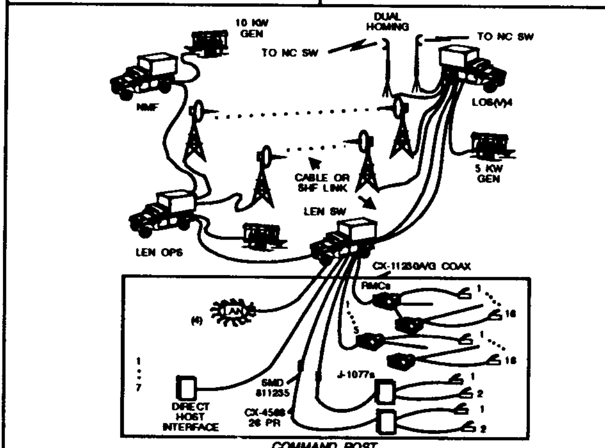


Figure 3-6. Typical LEN configuration.

SMALL EXTENSION NODE

General. The SEN has two assemblages, the SEN switch and its supporting multichannel LOS radio terminal. The SEN provides ACUS access to smaller units such as battalion or brigade CPs. Currently, there are five different models of the SEN switch. (See Table 3-3.) The AN/TTC-48A(V)2 is used at EAC. The four remaining models are AN/TTC-48(C)1, 2, 3, and 4. The two configurations of the SEN are: the SEN(V)1 services 26 subscribers and the SEN(V)2 services 41. See Figure 3-7.

SEN teams must rapidly and aggressively seek to incorporate themselves into the CP they support. Threats, updates, casualty evacuation procedures, nuclear, biological, chemical (NBC) and early warning (air) procedures must be understood as well as the SENs responsibility in the site's defense. As the signal battalion representative, SEN chiefs must circumvent problems, keeping the unit BSO and battle staff well informed of system status and actual/potential problems.

Interconnectivity. Local users install wire from their telephones to a J-1077 which the SEN team connects to the switch. External connection to the NC is made by a LOS(V)1 at the SEN site. If the SEN switch is near its parent NC switch, it can be connected by cable. An SHF radio link can connect the LOS(V)1 to the SEN switch up to 10 kilometers away. This enables the remoting of the CP which reduces its RF signature. Also, the SHF link overcomes time, distance, and terrain limitations (down-the-hill radio). The SEN switch connects to multichannel TACSAT, AN/TSC-85 or AN/TSC-93 terminals by CX-11230A/G or CX-4566 (26-pair) cables. This facilitates range extension of the ACUS.

Interoperability. The SEN switch provides 2-wire (DC closure) for direct access to commercial switching offices. CNR users can access the MSE system through the secure digital NRI (KY-90). The AN/VRC-46, AN/VRC-90, AN/PSC-3, or the AN/VSC-7 satellite radio systems are compatible with the KY-90 NRI unit.

Table 3-3. SEN models.

Model	Capability/Equipment
AN/TTC-48 C(V)3 and C(V)4	Loop Group Multiplexer, TD-1426(P)/T
AN/TTC-48 C(V)3 and C(V)4	Group Modem MD
AN/TTC-48 C(V)3 and C(V)4	Orderwire Control Unit, C-11878/T
AN/TTC-48 A(V)2, C(V)1, and C(V)2	Communication Modem, MD-1270(P)/T
AT/TTC-48 C(V)1, C(V)2, C(V)3 and C(V)4	Signal Data Converter/ThinLan Packet Switch C/3XA (operational)

NOMENCLATURE		TECHNICAL INFORMATION	
SWITCH:	AN/TTC-48 (1ea)	BIT RATE:	256 kbps
MULTICHANNEL LOS:	AN/TRC-190(V)1 (1ea)	PACKET SWITCH CONNECTIONS:	2 IEEE 802.3 LANs 5x.25 HOSTS
SHF RADIO:	AN/GRC-224 (1ea)	CHANNELS USED:	10 Voice (V)1 1 Packet Switch 1 Overhead 4 Unused 16 Total
GENERATORS:	PU-751 5KW (1ea) PU-753 10KW (1ea)		10 Voice (V)2 1 Packet Switch 1 Overhead 4 Unused 16 Total

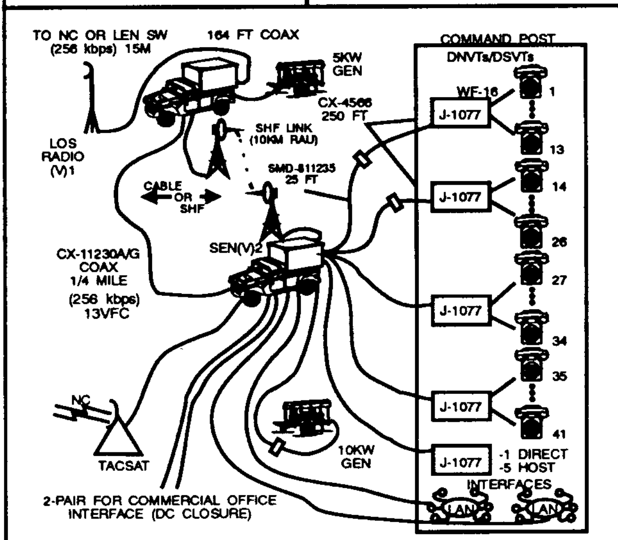


Figure 3-7. Typical SEN configuration.

LINE-OF-SIGHT RADIO LINKS

General. LOS radio links are multichannel digital radio systems which connect all MSE nodes. The LOS radio uses a 15-meter mast antenna system; however, a 9-meter mast antenna may be used to establish an SHF downhill radio link with the switch. There is one 30-meter mast antenna per NC and can be used if the radio link is profiled for it. The AN/TRC-190 assemblages provide these radio links. The radios operate between 225 and 400 MHz and between 1350 to 1850 MHz.

Configurations. The four LOS AN/TRC-190 versions are: (V)1, (V)2, (V)3, and (V)4. (See Table 3-4.) The LOS(V)1 interfaces with a RAU, SEN, FES, and the air defense artillery (ADA) interface unit. The LOS(V)2 interfaces with the NATO analog interface (NAI) converter. The LOS(V)3 interfaces with the NC switch and can be a radio relay or provide a digital NATO interface (DNI). See Figure 3-8. The LOS(V)4 interfaces with a LEN switch as a radio relay and an ADA interface. The AN/TRC-198(V)1 and (V)2 are used in the airborne/air assault, light signal battalion which uses the more compact MSE system, the CCP.

Planning. MSE network planners select the radio band, antenna polarization, site location, and interface used between the LOS and the switch before deploying LOS shelters. The information passes from system control/battalion control (SYSCON/BATCON) through the MSE network as open link messages for implementation.

Table 3-4. LOS radio link configuration.

LOS	#OF RADIOS	# OF RADIOS USED SIMULT	#OF ANTENNAS BND 1 BND 3	MUX	DTGs kbps	SHF
AN/TRC-190 V1	2	1	1+1	0	1/256	1
V2	2	1	1+1	1	1/256	0
V3	4	3	2+2	1	3/4096	1
V4	2	2	1+1	0	2/512	2
AN/TRC-198	3	3	3 or 3	0	1/256	0
V1 DISMOUNTED V2	1	1	1 or 1	0	1/256	0

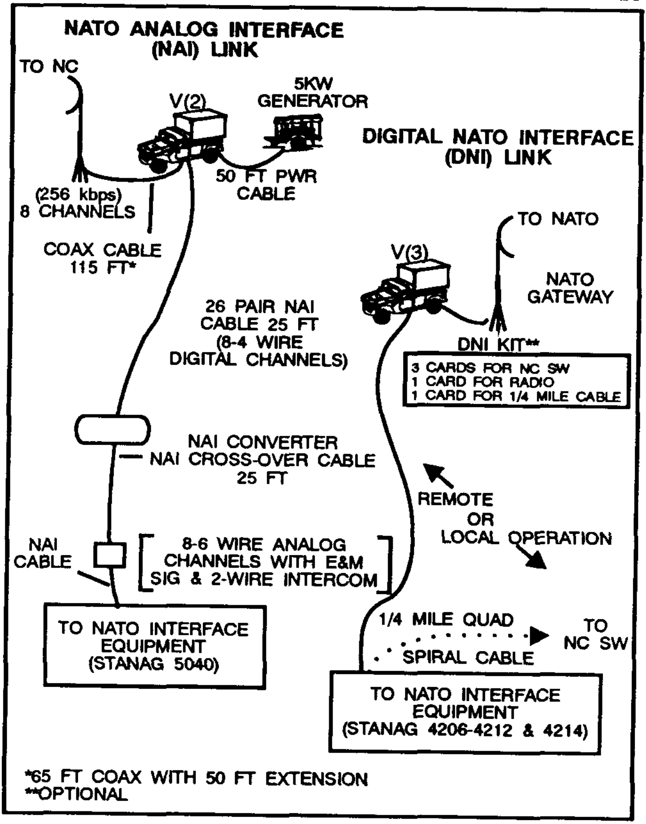
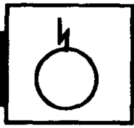


Figure 3-8. Typical LOS(V)2 NATO analog interface link and LOS(V)3 digital NATO interface link.

RADIO ACCESS UNIT



Function. The RAU gives each mobile subscriber secure, wireless access to the ACUS. Subscribers within the RAU's 15-kilometer range use their MSRTs to connect to the MSE network through the RAU. The RAU receives the transmissions and passes them to the NC switch. See Figure 3-9.

Deployment. RAUs are used in two configurations. In a local RAU, the RAU assemblage is collocated with the NC and connects to the NC switch by cable. A remote RAU can be up to 40 kilometers away from the NC connected by an LOS(V)1 at the RAU site.

Remote RAU teams deploy alone; consequently, the team must be well briefed on both the friendly maneuver and the enemy situation. RAU teams must understand routes, rally points, casualty evacuation procedures, decontamination data, and early warning (air) procedures. The team chief must maximize use of terrain, vegetation, or buildings for concealment and maintain constant security. RAU teams require constant threat updates and must be quickly moved if necessary. Movement should be planned in detail to prevent fratricide. These same considerations apply to an LOS(V)3 radio when being used as a relay.

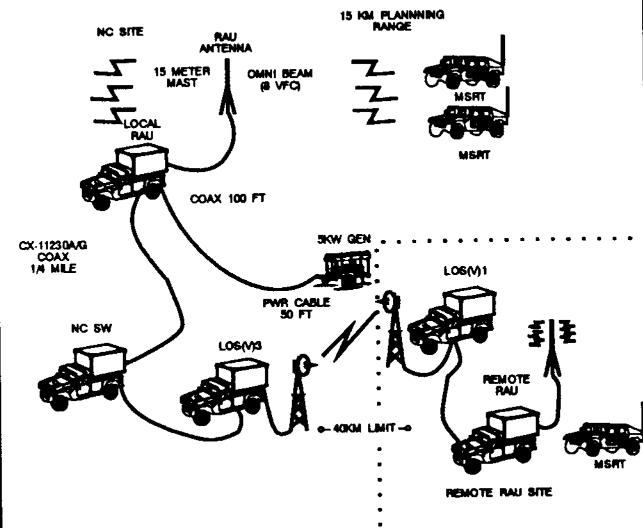
Users. A RAU can support customers within a 15-kilometer radius. Each RAU has eight radios that allow eight subscribers to talk simultaneously, although as many as 50 can share the same RAU. Three RF levels (16W, 3W, and .5W) are delivered to the antenna. The RAU selects the lowest working output automatically. Affiliation is the process by which subscribers enter and identify their location within the network. The subscriber affiliation is obtained by keying 8R followed by the three-digit personal code and seven-digit directory number. Successful affiliation results in the subscriber receiving a dial tone and the ability to initiate and receive telephone calls. Once a subscriber initially affiliates into the network with their MSRT, their affiliation is maintained automatically as they move from one RAU's range to another.

BSO's should advise their users, when they are moving from one RAU footprint to another, they will lose their telephone call and must reestablish it.

System planners and managers analyze terrain to select the best RAU location before deployment. Dead spots should be briefed to the unit and subordinate units during the rehearsal for an operation. Additionally, high and low terrain that assist or mask the possible execution of MSRT or FM operations should be highlighted so that the terrain can be used to its maximum advantage.

Careful consideration for density of subscribers and maximum amount of traffic must be used in determining the planning ranges of RAUs.

NOMENCLATURE		TECHNICAL INFORMATION	
RAU:	AN/TRC-191 (1 ea)	BIT RATE:	256 kbps
MULTICHANNEL LOS:	AN/TRC-190(V)1 (1 ea) (If remoted)	CHANNELS USED:	8 Voice 1 GLU 1 DSVT 6 Unused 16 TOTAL
GENERATORS:	PU-751 5KW (2 ea)		



NOTE: Not all generators are shown.

Figure 3-9. Typical RAU configuration.

SYSTEM CONTROL CENTER-2

SCC-2

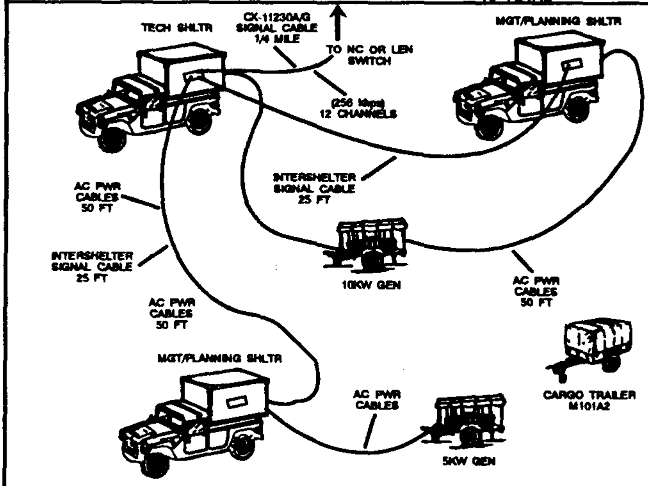
Function. The SCC-2 is a computer-assisted, automated tool that helps SYSCON cells manage the network. It consists of a technical shelter, management shelter, and planning shelter (corps only). It is collocated within the SYSCON and provides the information for network management. See Figure 3-10.

Deployment. At corps, three SCC-2s deploy: two primary and one standby. The three are interchangeable. At division, there is one SCC-2 and it consists of the technical and management/planning shelters. The division SCC-2s are subordinate to the corps primary SCC-2, unless the division is in a stand-alone configuration.

Connectivity. The SCC-2 connects to an NC or LEN switch by CX-11230A/G cable. All network SCC-2s receive regular database updates from each other through a packet switch in the technical shelter. All traffic from the SCC-2 to the NCs, LENs, FESs, and RAUs is routed through the circuit switch.

Each SCC-2 has a technical shelter. The shelter has two computers: The transmission interface module (TIM) and the packet switch. One computer is usually used as the technical workstation, and the other is the packet switch controller. The TIM connects the SCC-2 to the other 16-channel trunk group from the NC switch.

NOMENCLATURE	TECHNICAL INFORMATION
SHELTER: AN/TYQ-46 • TECHNICAL SHELTER OL-489/TYQ-46 • MANAGEMENT/PLANNING SHELTER OL-490/TYQ-46 GENERATORS: PU-753 10KW (1 ea) PU-751 5KW (1 ea) *Corps only*	BIT RATE: 256 kbps PACKET SWITCH CONNECTIONS: 1 IEEE 802.3 Interface x .25 Interface CHANNELS USED: 8 *Auto dial up* 1 Packet Switch 3 DNVT 4 Unused 16 TOTAL



Active SCC-2 connects to the primary NC switch (PNCS).
Standby SCC-2 connects to secondary NC switch (SNCS).
Division SCC-2 connects to leader NC switch.

Figure 3-10. Typical corps SCC-2 configuration.

The packet switch controller serves as the network management center. The switch controller is in the SCC-2. However, it does not control any circuit switch assets, or calculate radio links. It controls and monitors the packet switch network (PSN). It does not provide interaction with the circuit switch network.

The technical workstation acts as the focal point for the SCC-2. It controls the message traffic within, into, and out of the SCC-2. It assigns system management responsibilities to the other workstation and maintains the SCC-2 network database for all workstations. It also provides map data to the other workstations and passes along updates from the other SCC-2s in the network.

The SICPS tent is used to makeup the SCC-2 operations center. This configuration may be set up differently to meet mission requirements. There are only two shelters used in the division SCC-2 configuration as opposed to the three which are shown in Figure 3-11.

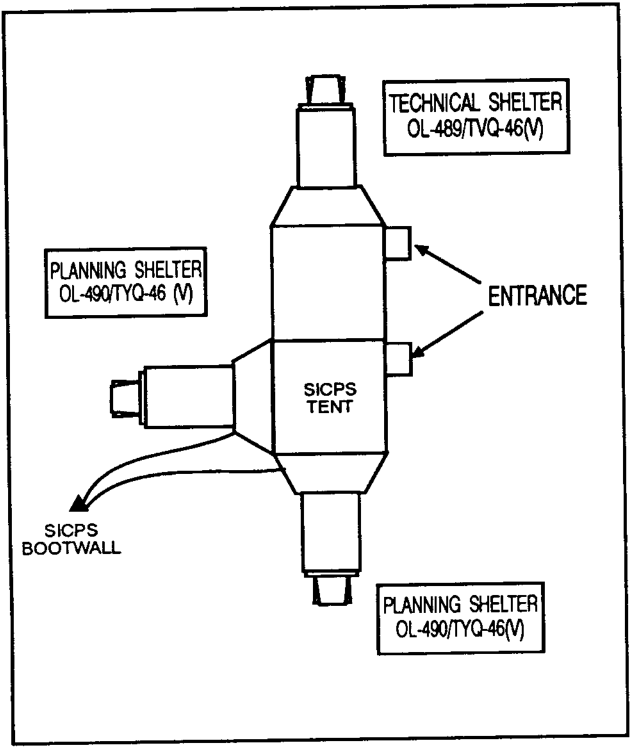


Figure 3-11. Corps SCC-2 operations.

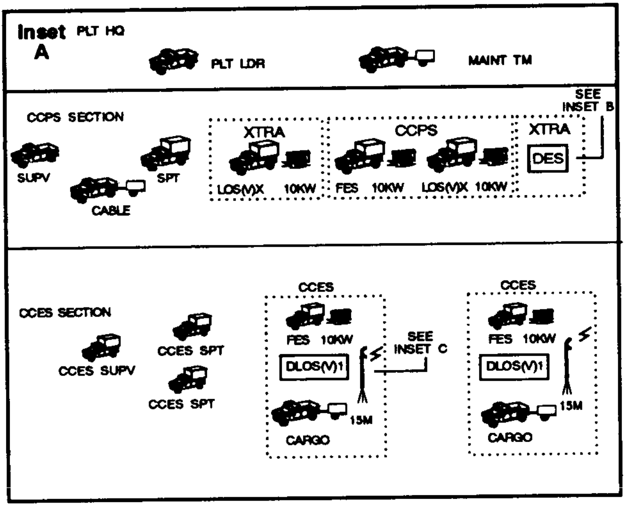
CONTINGENCY COMMUNICATIONS PACKAGE

Contingency Communications Package (CCP). A CCP consists of four basic elements:

- One contingency communications parent switch (CCPS) which combines the essential functions of the NC switch/LEN/NMF shelters and a RAU in a single FES shelter and an LOS(V)TRC-198; the FES supports 25 affiliated mobile subscribers.
- Two contingency communications extension switches (CCESs), which include an FES and a dismounted LOS (DLOS).
- One extra dismounted extension switch (DES), which is essentially an “unsheltered” SEN switch with half its capacity and an extra DLOS.

The FES interfaces with an SCC-2, the AN/TYC-39 message switch, the AN/TTC-39A and the AN/TTC-39D circuit switches, the NAI, and the DNI.

A typical CCP mission (initial deployment) can be airlifted in two C-141B sorties. See Figures 3-12A, B, C, 3-13, and 3-14.



LEGEND

LOS(V)X - LOS W/3 COMPLETE GRC-226 RADIO SETS
DLOS(V)1 - DISMOUNTED LOS(V)1

INITIAL DEPLOYMENT

SORTIE #1

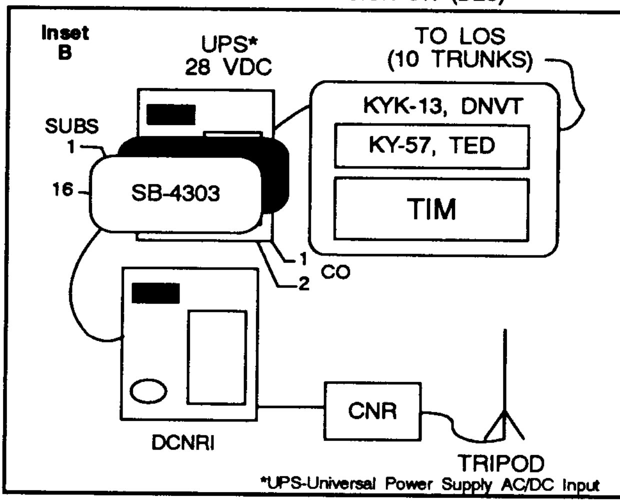
- 1 FES WITH 10KW GENs
- 1 TACSAT WITH 10KW GENs
- 1 TACSAT SPT VEHICLE WITH CARGO TRAILER

SORTIE #2

- 1 LOS(V) X WITH 10KW GEN
- 1 CCP SPT VEH WITH CARGO TRAILER
- 1 FES WITH 10KW GEN

Figure 3-12A. Contingency communications platoon.

DISMOUNTED EXTENSION SW (DES)



LEGEND

LOS(V)X - LOS W/3 COMPLETE GRC-226 RADIO SETS

DLOS(V)1 - DISMOUNTED LOS(V)1

INITIAL DEPLOYMENT

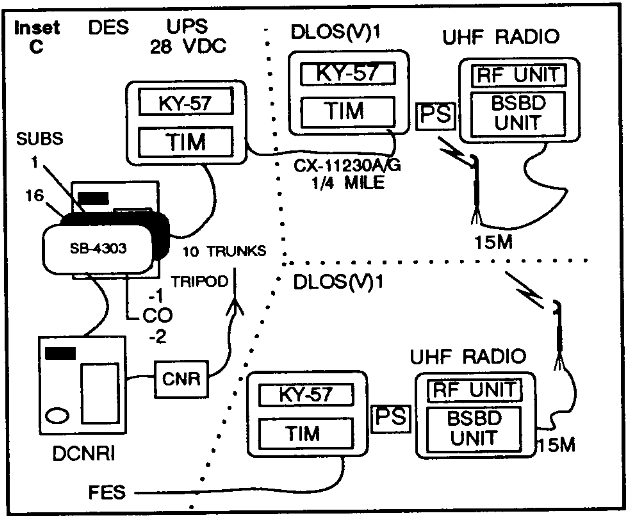
SORTIE #1

- 1 FES WITH 10KW GEN
- 1 TACSAT WITH 10KW GEN
- 1 TACSAT SPT VEHICLE WITH CARGO TRAILER

SORTIE #2

- 1 FES WITH 10KW GEN
- 1 LOS(V)X WITH 10KW GEN
- 1 CCP SPT VEHICLE WITH CARGO TRAILER

Figure 3-12B. Contingency communications platoon.



LEGEND

LOS(V)X - LOS W/3 COMPLETE GRC-226 RADIO SETS
DLOS(V)1 - DISMOUNTED LOS(V)1

INITIAL DEPLOYMENT

SORTIE #1

- 1 TACSAT WITH 10KW GEN
- 1 TACSAT SPT VEH WITH CARGO TRAILER
- 1 FES WITH 10KW GEN

SORTIE #2

- 1 FES WITH 10KW GEN
- 1 LOS(V)X WITH 10KW GEN
- 1 CCP SPT VEH WITH CARGO TRAILER

Figure 3-12C. Contingency communications platoon.

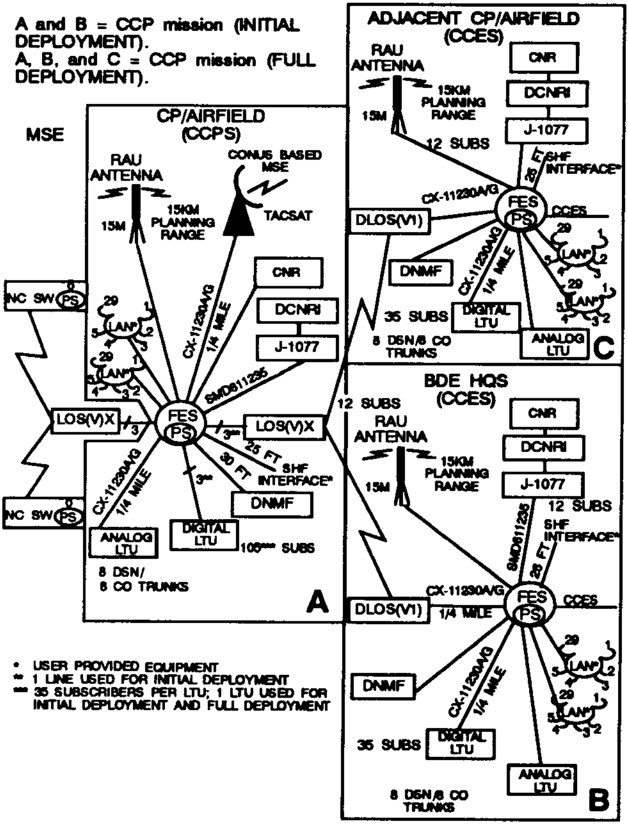


Figure 3-13. CCP conventional mission in its entirety.

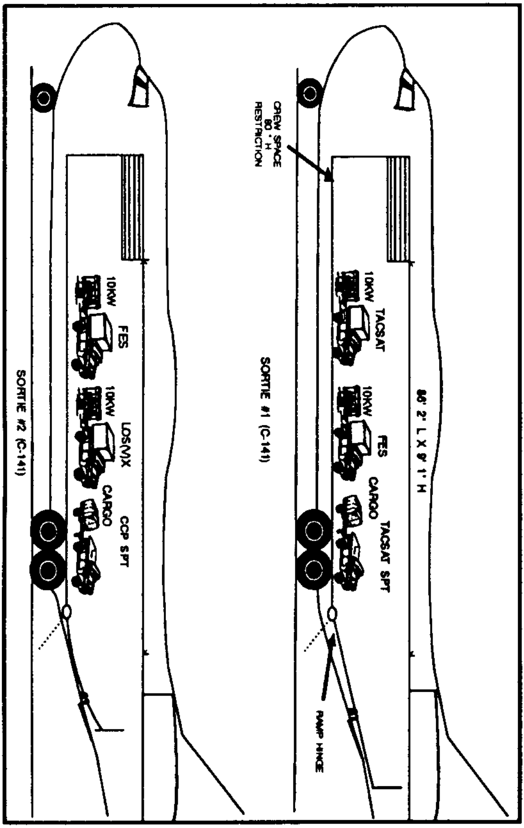


Figure 3-14. CCP initial deployment.

Contingency Communications Parent Switch (CCPS). The CCPS consists of one FES shelter towing a 10-kilowatt diesel generator, and one LOS(V)X that can dismount one LOS(V)1. The connections between the FES and the LOS are by cable initially, since no SHF is supplied. The FES can be operator-controlled external to the shelter by a dismountable remote terminal, which can be configured as a workstation or a dismountable NMF (DNMF). The FES has packet switch capability, but without the gateway function; hence, no direct connections to adjacent corps or EAC. The packet switch provides ports for two LANs and six X.25 local hosts, plus one dial-in port, The FES provides full flood search capability via a downsize routing subsystem (RSS-D) and an SHF interface capability and a digital subscriber voice terminal (DSVT) in the truck, The line termination unit (LTV) provides modem/multiplex functions for the main local subscriber interface and is equipped with a rear terminal board to permit direct connections instead of the J-1077.

The LOS(V)X is similar to an LOS(V)3, except that the LOS(V)X's ultra high frequency (UHF) radios operate on three separate link connections to the FES (no multiplex) and all links operate on either band.

The CCPS provides service for a total of 117 wire line subscribers including eight defense switching network (DSN) and eight commercial analog trunks.

Additionally, the FES provide a a fully functional, downsized RAU capability for up to 25 mobile subscribers as well as dismounted combat net radio interface (DCNRI) *access* for single-channel radio users.

The CCPS supports the brigade headquarters with parent node capabilities and provides local switching for the mobile subcriber and local wire subscribers with appropriate interfaces with CNR, commercial access, TACSAT, DSN, and packet switch. Figure 3-15 shows a typical CCPS deployment. The power subsystem is similar to the NC switch.

Contingency Communications Extension Switch (CCES). The CCES consists of one FES shelter towing a 10 kilowatt generator, one dismounted LOS(V)1 with one radio with Band 1 and Band 3 capabilities, and one cargo high mobility multipurpose wheeled vehicle (HMMWV) with cargo trailer. Figure 3-16 shows a typical CCES.

The CCES provides the same wire, mobile and DCNRI capabilities as the CCPS; however, the quantity of LTU's limits wire access to 47 subscribers including eight DSN and eight commercial analog trunks.

Dismounted Extension Switch (DES). The DES provides access for 16-local wire subscribers with access to over 10 digital encrypted trunks to the MSE network via LOS or TACSAT. The DES consists of one of the two SB-4303s that populate a SEN switch.

FES DTG CAPABILITIES*

MISSION DEPLOYMENTS	TOT DTG	ENCRYP	UN-ENCRYP	FES DATABASE
LCCP				
FULL	10	6	4	BASELINE (BL)
INIT/CONV	8	4	4	BL + BLK 1
OPTION	8	6	2	
CCP				
INIT/FULL	8	4	4	BL + BLKS 1 & 2
OPTION	8	6	2	
CONV	8	4	4	BL + BLKS 1, 2 & 3
OPTION	8	6	2	

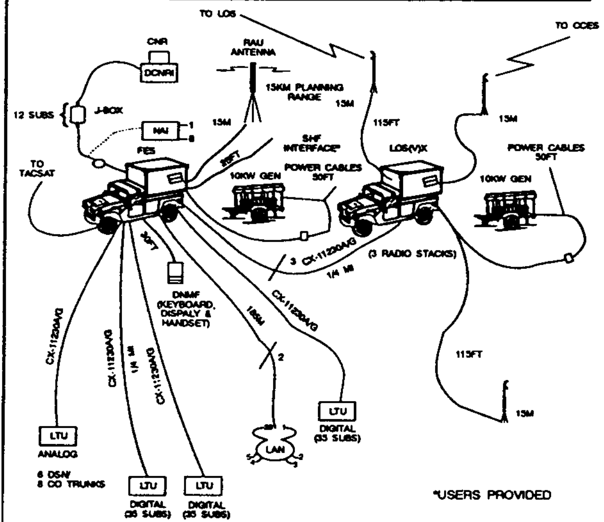


Figure 3-15. Typical CCPS deployment.

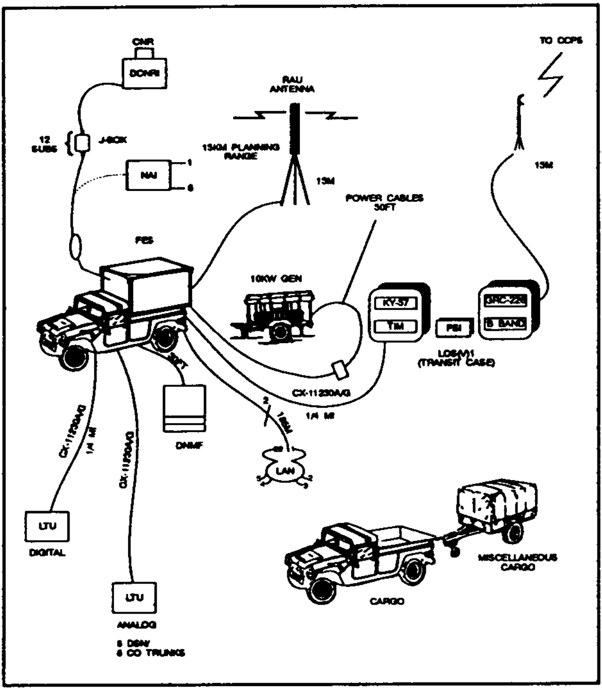


Figure 3-16. Typical CCES.

LIGHT CONTINGENCY COMMUNICATIONS PACKAGE

Light Contingency Communications Package (LCCP). The LCCP consists of two basic elements

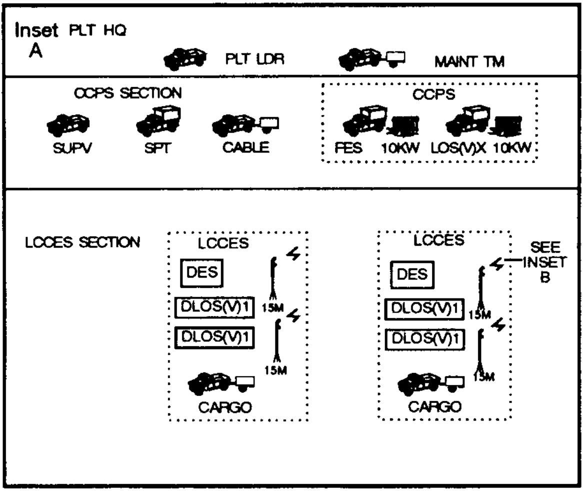
- One CCPS which combines the essential functions of the NC switch / LEN / NMF shelters and a RAU in a single FES shelter and an LOS(V)X.
- Two light contingency communications extension switches (LCCESs).

The main difference between the LCCES and the CCES is that the LCCES' equipment is dismountable.

A typical LCCP contingency mission (initial deployment) can be airlifted in two C-141B sorties. See Figures 3-17A, B, 3-18, and 3-19.

Light Contingency Communications Extension Switch (LCCES). This switch performs functions similar to the CCES in the CCP. The main differences between the LCCES and the CCES is that the LCCES' equipment is dismountable, unlike the CCES' equipment.

This subsystem differs considerably when compared to its counterpart the CCP. The major differences are that all the equipment is dismountable and the switch is a DES (essentially half a SEN switch); there are no shelters, and the only vehicle is the cargo vehicle and it a trailer which are required to carry the dismounted equipment.



LEGEND

LOS(V)X - LOS W/3 COMPLETE GRC-226 RADIO SETS
DLOS(V)1 - DISMOUNTED LOS(V)1

INITIAL DEPLOYMENT

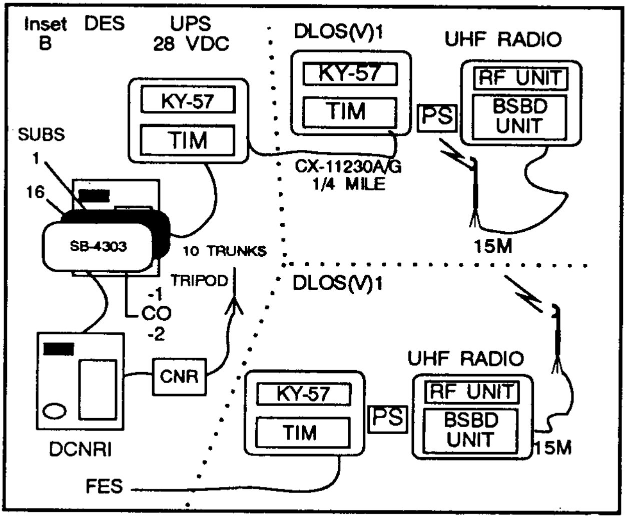
SORTIE #1

- 1 TACSAT WITH 10KW GEN
- 1 TACSAT SPT VEHICLE WITH CARGO TRAILER
- 1 FES WITH 10KW GEN

SORTIE #2

-1 LOS(V)X WITH 10KW GEN
-1 LCCP SPT VEHICLE WITH CARGO TRAILER
-1 FES WITH 10KW GEN

Figure 3-17A. Light contingency communications platoon.



LEGEND

LOS(V)X - LOS W/3 COMPLETE GRC-226 RADIO SETS
DLOS(V)1 - DISMOUNTED LOS(V)1

INITIAL DEPLOYMENT

SORTIE #1

- 1 FES WITH 10KW GEN
- 1 TACSAT WITH 10KW GEN
- 1 TACSAT SPT VEH WITH CARGO TRAILER

SORTIE #2

- 1 LOS(V)X WITH 10KW GEN
- 1 LCCP SPT VEHICLE WITH CARGO TRAILER
- 1 FES WITH 10KW GEN

Figure 3-17B. Light contingency communications platoon.

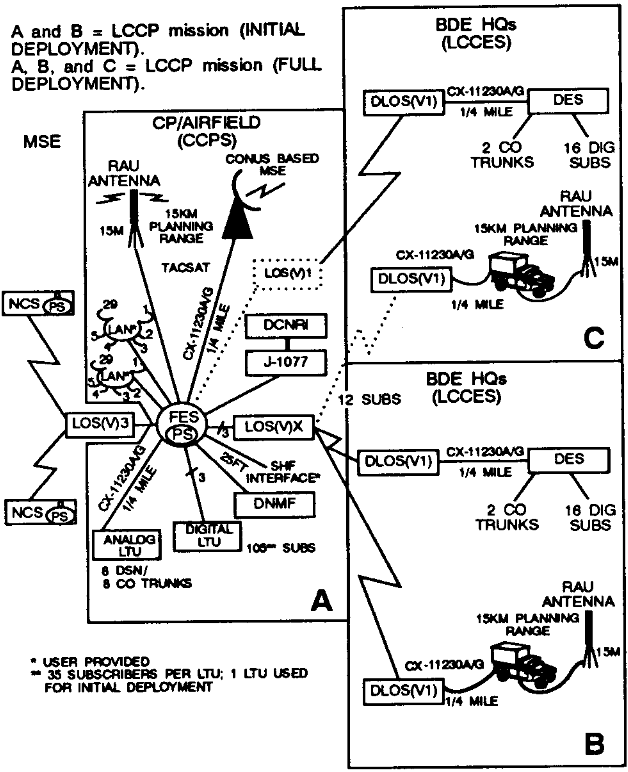


Figure 3-18. LCCP conventional mission in its entirety.

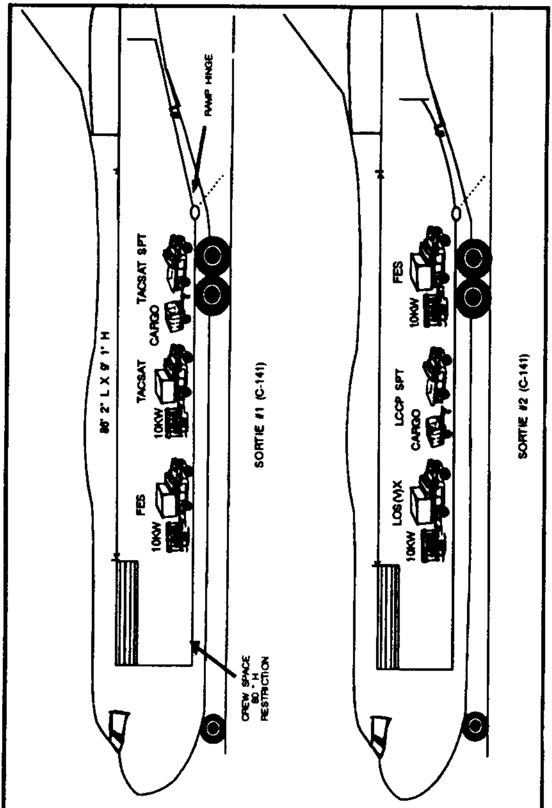


Figure 3-19. LCCP initial deployment.

Light Contingency Communications Parent Switch (LCCPS). The LCCPS is configured identically to the CCPS.

Databases. The baseline (BL) FES database has been written to support LCCP full mission deployment. However, this BL database can be modified for other missions (LCCP and CCP). Once the operator implements the block procedures, they can be saved to the hard or floppy disks for future use.

MSE STANDARD DATABASE

Function. The MSE standard database is loaded by the software in the NC switch and LEN switch. This database is standardized for every NC to maintain consistency throughout the MSE network. The standardized setup means that each DTG entering the NC switch is assigned its own specific trunk group cluster (TGC) number and trunk encryption device (TED). This particular DTG has the same TGC and TED at every NC in the MSE system. Also, each MDTG will always contain the same three DTGs. However, since the needs of each NC differ, modify the database when the situation dictates

Assigning DTGs affects the NC site layout for cabling and antenna configurations, since each LOS(V)3 shoots to the same type of sites. Figure 3-20 shows the standard database configuration for the NC switch. Figure 3-21 shows the standard database configuration for the LEN switch. Table 3-5 shows commonly used COMSEC keys required for the initialization of the MSE system.

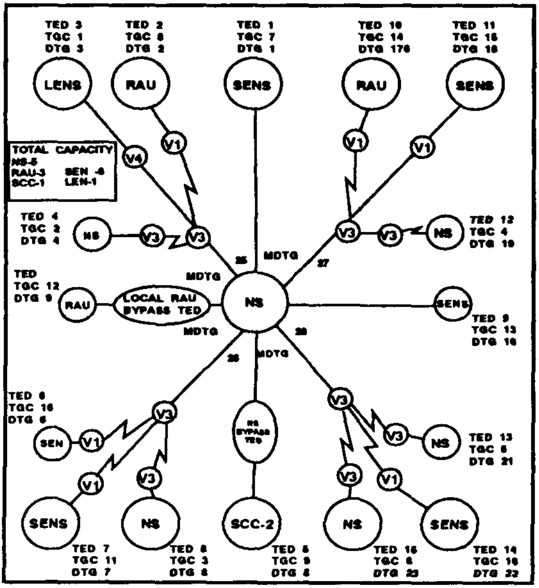


Figure 3-20. NC switch DTG/TGC standard database.

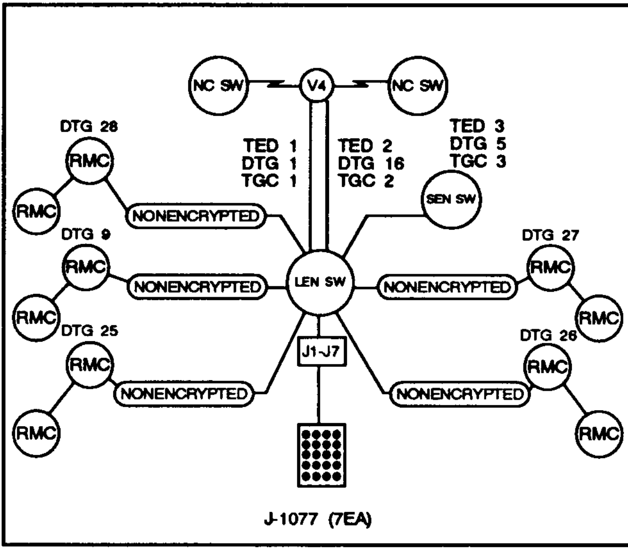


Figure 3-21. LEN switch DTG/TGC standard database.

Table 3-5. COMSEC keys initialization chart.

	KEY	TYPE	WHERE USED	DISRIBUTION	DESCRIPTION
SUBSCRIBER	M	TEK	KY-68 RT-1539	CORPS COMMON	USED IN KY-68 FOR INITIAL AFFILIATION. USED IN MOBILE COMSEC UNIT (MCU)
	X	TEK	KY-68 NS/LENS RT-1539	CORPS COMMON	ENCRYPTS CALLS ASSOCIATED WITH MSRT OR DSVT USERS. AUTOMATICALLY REPLACES M KEY UPON SUBSCRIBER AFFILIATION.
	U1-23	KEK	KY-68 NS/LENS	ONE PER SUBSCRIBER DETERMINED BY PROFILE	USED TO SUPPORT TS/SCI USERS TO THE TYC-39 MESSAGE SWITCH.
	U24 AND 25	KEK	KY-68 NS/LENS	ONE PER SUBSCRIBER DETERMINED BY PROFILE	USE TO SUPPORT TS/SCI USERS TO THE TYC-39 MESSAGE SWITCH.
	V	TEK	KY-68	UNIQUE PER CALL	GENERATED BY KG-82/KG-112 ENCRYPTS INDIVIDUAL SECURE CALLS.
	S	TEK	KY-68	SPECIAL USE	GENERATED AND USED BY OTHERS TO RAISE ENCRYPTION LEVEL TO TS/SCI (USUALLY MILITARY INTELLIGENCE (MI).
TRUNK	TG	TEK	KG-94/A	CORPS/ DIVISION UNIQUE TO GATEWAYS	USED TO ESTABLISH GATEWAY TRUNKS (BETWEEN CORPS OR FROM CORPS TO EAC) UPDATED BY LINK MASTER.
	TI	TEK	KG-94/A	CORPS COMMON	USED BY ALL NSs/LENs WITHIN THE CORPS TO INITIALLY SYNCHRONIZE TEDs BETWEEN NCs OR LENs. ALLOWING BULK TRANSFER OF KEYS.
	TN	TEK	KG-94/A	PAIR WISE UNIQUE	USED TO ENCRYPT TRUNKS FOR SENs. UPDATED BY LINK MASTER.
	TE	TEK	KG-94/A	ONE PERSON NSG (SEN)	USED TO ENCRYPT TRUNKS FOR SENs. UPDATED BY LINK MASTER.
	TEc	TEK	KG-94/A	ONE CORPS COMMON FOR ALL RAUs	USED TO ENCRYPT TRUNKS FOR RAUs. UPDATED BY LINK MASTER.
ORDERWIRE	N	TEK	KY-57	CORPS COMMON	USED TO ENCRYPT ORDERWIRE TRAFFIC BETWEEN ALL MSE ASSEMBLIES WITH ORDERWIRE CAPABILITY.
	K	KEK	KY-57	CORPS COMMON	USED TO ENDRYPT COMSEC KEYS FOR OTAR TRANSMISSION.
SWITCH	CIRK	KEK	NS/LEN	CORPS COMMON	USED TO ENCRYPT THE TRANS FER OF THE PER-CALL (V) KEY BETWEEN NS/LENS.
	AIRK	KEK	NS	AS NEEDED	PROVIDES SAME ENCRPYTION AS CIRK KEY. ONLY IT IS UAED BETWEEN GATEWAY SWITCHES.
	BTc	KEK	NS/LEN	CORPS COMMON	USED TO ENCRYPT THE BULK TRANSFER OF INDIVIDUAL OR ENTIRE KEY SETS BETWEEN AKDCs.
	MSRV	KEK	NS TYC-39	MESSAGE SWITCH REKEY (SPECIAL USE)	USED TO ENCRYPT THE PER-CALL KEY TO THE TYC-39 MESSAGE SWITCH.
	MSNV	TEK	NS TYC-39	MESSAGE SWITCH NET KEY (SPECIAL USE)	USED TO ENCRYPT THE SYNCHRONIZATION SIGNALING BETWEEN MSE AND THE TYC-39 MESSAGE SWITCH.

MSE TACTICAL PACKET NETWORK

General. The MSE TPN performs data distribution. The TPN uses a few MSE trunks exclusively for data distribution using the packet switch. Packet switching divides data transmissions into small "packets" and routes them along the most efficient path to their destination. The receiving packet switch reassembles the data and sends it to its destination computer. The result is an efficient method of data distribution that has almost no effect on voice traffic.

Implementation. The TPN is implemented with AN/TYC-20 packet switches in the NC, LEN, SEN, and SCC-2 switch assemblages. (See Figure 3-22.) In the SCC-2's packet network management center (PNMC), the system planner manages the network. AN/TYC-19 gateways at NC switches provide connectivity between other data networks, such as the EAC TPN. Data is transferred at 64 kbps for NC to NC and NC to LEN connections and at 16 kbps for NC to SEN and LEN to SEN connections.

User Access. Users who wish to gain access to the TPN must have the following:

Physical Interface. The signal entry panels on the SEN and LEN switches have connectors for RG-58 Ethernet ThinLan coaxial cable. LANs inside the CP are connected to this cable. There are two connectors on a SEN switch, four on a LEN switch, and one on an NC switch.

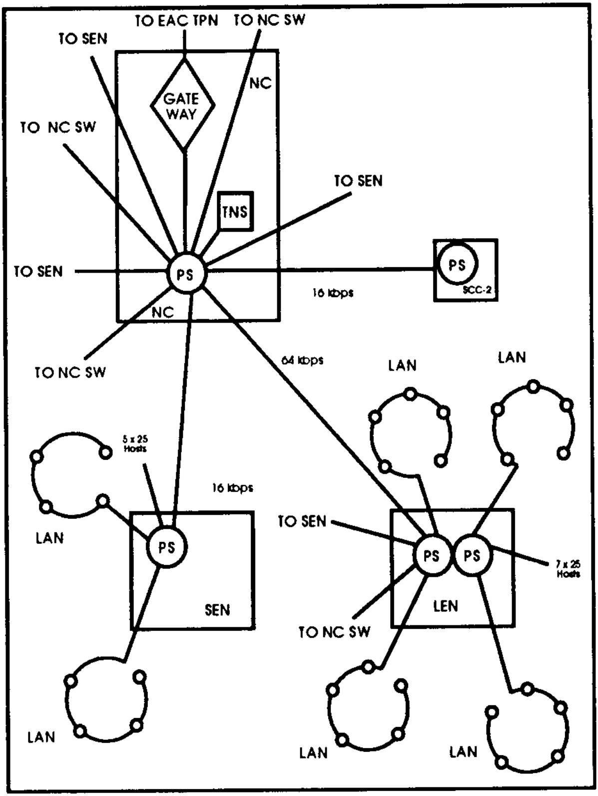


Figure 3-22. The TPN system.

The length of the coaxial cable cannot exceed 185 meters (600 feet). In addition, host computers with X.25 conditioned diphase compatibility connect to a J-1077 using WF-16 field wire, The J-1077 connects to the packet switch. The SEN has the capability to support 58 LAN subscribers. See Figure 3-23.

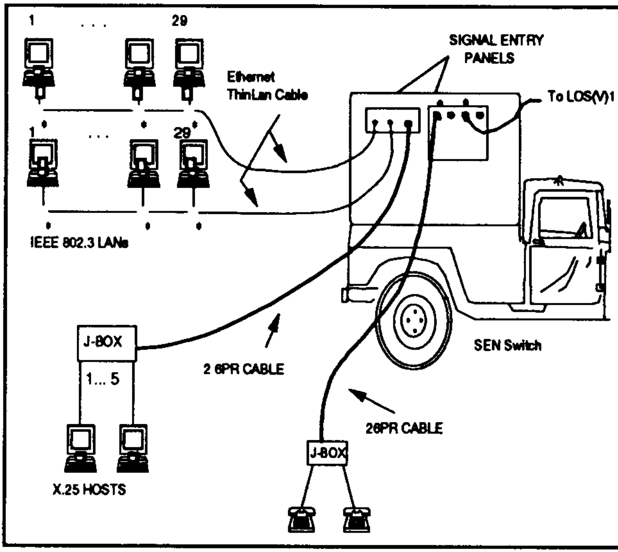


Figure 3-23. TPN host connectivity at a SEN.

Protocol and Software. In addition to being physically connected to the TPN, the user's computer system (or host) must be able to interface with the TPN. To do this, the system must support DOD standard protocols for functions like mail and tile transfer. These are the same protocols used by the defense data network (DDN). The software should support a tactical name server (TNS). This is necessary due to the high mobility of computers in the tactical arena. Once a host sets up at a new location, it must "affiliate" much like the MSE voice users do. The TNSs, found at NCs, keep track of each host's location in the area network.

Addresses. Every mobile host is assigned a unique, deducible name. For example, the G3, 1st Cavalry Division, III Corps using one MCS host would have the following address:

G3-1CAVM1-G3-1CAV.3C.ARMY.MIL*

*** A standard Internet Protocol (IP) naming scheme has not been approved as of March 1995.**

QUICK LAN TROUBLESHOOTING

Ensure that the IP address is correct. If not, provide the user with the correct IP address and direct the subscriber to return to normal operation.

Ensure the connection from the subscriber to the SEN or LEN is good (either direct connection via the J-Box to the signal data connector (SDC), or LAN connection through the integral gateway (IGW) to the AN/TYC-20(V)2).

Ensure the operator has made a visual inspection of the AN/TYC-20(V)2 front panel for failure indicators. The indicators are: light emitting diode's (LED's) 19 plus the appropriate port LED's, 0-5, Lit for X.25 hosts and or LED 16 plus LED 8 Lit for LAN hosts during SCAN cycle.

If the AN/TYC-20(V)2 indicates failure, the switch operator will begin packet switch troubleshooting in accordance with the appropriate technical manual.

If the Echo Test of the terminal fails instruct the user to begin appropriate troubleshooting according to the manual for the devices being used to access the PSN.

MSE TROUBLESHOOTING

LOS radio links connect MSE nodes. Each link is vital to the network while some links are more important than others. MSE network planners, coordinating with the corps and division G3 staffs, determine the priority for initializing and restoring links.

The LOS and NC switch equipment operators establish, operate, and maintain the links. This ensures the system is working properly. When a system fails or operations begin to degrade, the NMF operator notifies the SCC-2 of the situation. They also initiate troubleshooting procedures to find the cause of the problem. The troubleshooting process is a coordinated effort between MSE elements.

Every link in the MSE system has a label. The first half of the designator is the master link; the second half is the slave. The master terminal operator reports all link failure to the SCC-2. Failure reports are sent in message report format if possible. If not, the reports are sent to the SCC-2 by CNR, MSRT, DNVT, or courier. The SCC-2 must be informed of link failures as soon as possible. This allows the SCC-2 to react quickly to the failure.

Troubleshooting procedures are coordinated between the master and slave ends of the link using various means. The preferred means is by the secure DVOW.

If the DVOW is not available, it may still be possible to use the engineering orderwire (EOW). Exercise caution when using the EOW, because it is not secure, CNR is another means to troubleshoot.

When a link outage occurs, it generates an error message at the NC or LEN switch. The switch operator must contact each assemblage within the failed link. Each assemblage operator provides assistance for loop back tests until the outage can be isolated and corrected. Particular caution must be taken when doing MDTG loop back tests (between an LOS(V)3 radio and the NC switch). MDTG loop back testing disrupts all communications on the tested MDTG.

Maintain the trunk status of the links when troubleshooting using a status chart. See Figure 3-24.

There are five loopbacks used inside the LOSS for link initialization. All five loops are available in each LOS type.

- **6-1-6 loop**:

  - Loopback from baseband units to associated LOS equipment.

  - A good indication is L1 on the radio.

- **6-2-6 loop**:

  – Loops data from the terminating assemblage back to the terminating assemblage (SEN/RAU/LEN).

– Good indications are **L2_** in the radio, and the TED in the terminating assemblage in resync and full operate condition.

– The operator must disconnect the antenna coaxial cable.

- **6-3-6 loop**:

– Disable signal from the baseband to the assemblage.

– A test pattern is generated on the transmit side of the baseband, which is looped back in the diplexer of the RF head. An error detector on the receive side of the baseband compares the receive pattern with the original.

– A good indication is **L3_** on the radio

– The operator must disconnect the antenna coaxial cable.

- **Radio patch loopback**:

– Loops data incoming from the distant end of a radio link back to the originating point.

– DVOW communications is nonfunctional using this loop.

- **6-4-6 and 6-5-6 loops**:
  - 6-4-6 loop disables the signal from the baseband to the assemblage. A test pattern is generated in the baseband and transmitted to the distant end.
  - 6-5-6 loop is used with the 6-4-6 loop. It loops incoming data from the 6-4-6 loopback to the originating LOS, where it is compared to the original signal.
  - A good reading at the 6-4-6 end would be **L4_ _E5** or **L4_ _E6.** If there were a fault, it would be indicated as follows: **4F4,** as an example.
  - A good reading at the 6-5-6 end would be **L5_ _E5** or **L6_ _E6.** If there were a fault, it would be indicated as follows: **5F4,** as an example.
  - The readings are a measure of the bit error rate on the RF link.
  - Each LOS in the link would perform a 6-4-6 loop to a 6-5-6, then reverse the loops.

See TM 11-6800-216-10-4 for complete system and link troubleshooting and fault isolation procedures.

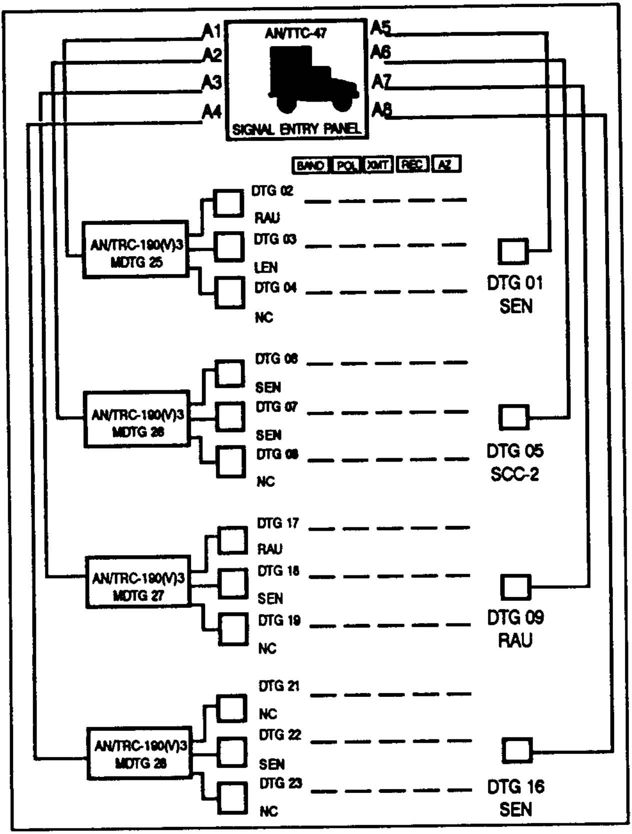


Figure 3-24. NC switch trunk status diagram.

3-3. The TRI-TAC System

EAC use the TRI-TAC system as the primary area communications system. Similar to MSE, the TRI-TAC network forms a communications grid of area nodes which cover the area of operations. The area nodes normally interconnect by LOS SHF links up to 40 kilometers apart. Users gain access to the network at many extension nodes, which tie into the area nodes through LOS UHF links. The use of relay assemblages can increase the distance between nodes. TACSAT and TROPO links can further extend the range between nodes. See Figure 3-25.

The TRI-TAC network is a digital, large volume, circuit switched system and has analog to digital converting capability. This allows the EAC customers to use the same DSVTs and DNVTs as corps and below subscribers. It is designed around the AN/TTC-39D area node switch. The AN/TTC-39D, an upgraded switch, provides packet switching, flood search routing, and subscriber affiliation for the TRI-TAC network.

In addition to voice communications, TRI-TAC can switch message traffic with the tactical message switch, AN/TYC-39. The AN/TYC-39D is an automatic, store-and-forward message switch.

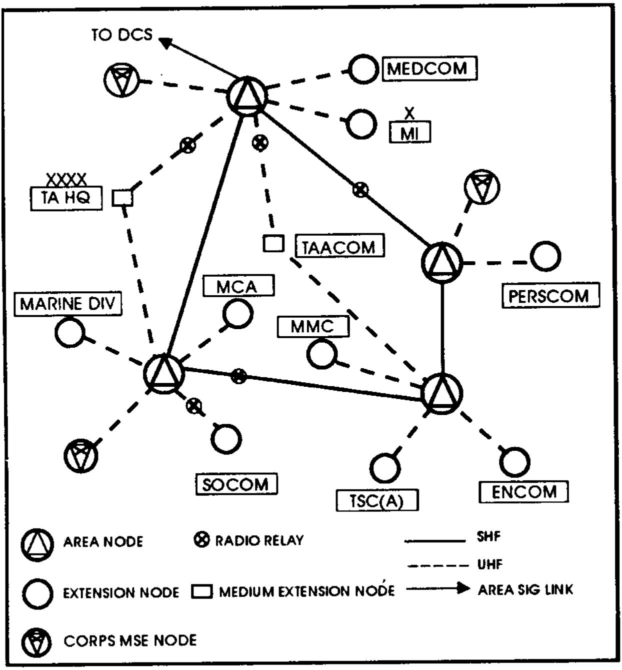


Figure 3-25. TRI-TAC area communications system.

AREA NODE

Function. The area node primarily consists of an AN/TTC-39D switch and its associated multichannel link assemblages. Area nodes serve as central access points for the medium and small extension nodes. Each area node operates as an automatic switching point that receives traffic and routes it to other nodes. Node management is performed from a communications system control element (CSCE), AN/TYQ-31. See Figure 3-26.

Connectivity. A standard node configuration terminates four SHF links to other area nodes, four UHF links to small extension nodes, and two UHF links to medium extension nodes. These connect by an SHF radio or cable link to a radio terminal assemblage, AN/TRC-175. It passes the DTGs to the AN/TTC-39D switch which can handle 712 circuits and can switch both analog and digital trunks. The node connects to multichannel TACSAT/TROPO systems and NATO subscribers using the standard NATO interface device.

NOMENCLATURE		TECHNICAL INFORMATION	
SWITCH:	AN/TTC-39(A/D) (1 ea)	BIT RATE:	32 kbps/ch 16 kbps/ch
MULTICHANNEL TERMINALS:	AN/TRC-175 (1 ea)	AN/TRC-175 FREQ RANGE:	4400 to 5000 MHz
SHF REPEATERS:	AN/TRC-138A (2 ea)	AN/TRC-138A FREQ RANGE:	4400 to 5000 MHZ
UHF REPEATERS:	AN/TRC-174 (2 ea)	AN/TRC-174 FREQ RANGE:	1350 to 1850 MHz
NODAL MGT FACILITY:	ANTYQ-31 (1 ea)		
GENERATORS:	AN/MJQ-10A 10KW AN/MJQ-18 10KW		

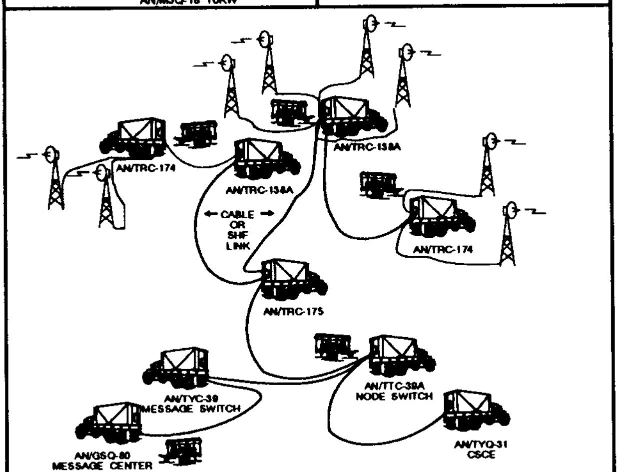


Figure 3-26. Typical TRI-TAC area node.

EXTENSION NODE

Function. The TRI-TAC extension nodes consist of an AN/TTC-48A switch and a single multichannel link. They service smaller units requiring access to the theater area communications system. The extension node provides automatic circuit switching, terminations for up to 41 subscribers, and has an NRI for CNR users. RAU coverage gives users with MSRTs access to the theater area communications system. See Figure 3-27.

Interconnectivity. The SEN connects with the area node through a single UHF multichannel link to a radio terminal assemblage, AN/TRC- 173. The MSE SEN switch, AN/TTC-48A, performs circuit switching and connects to the J-1077s. Users install field wire from their telephones to the J-1077s. Users can also install telephones by using RMCs. They connect to the AN/TRC-173's group modem (GM) by cable.

NOMENCLATURE		TECHNICAL INFORMATION
SWITCH:	AN/TTC-48 (1 ea)	BIT RATE: 32 kbps 16 kbps
MULTICHANNEL LOS:	AN/TRC-173 (1 ea) J-1077 (4 ea)	AN/TRC-174 FREQ RANGE: 1350 to 1850 MHz
GENERATORS:	AN/MJQ-18 10KW (1 ea) PU-751 5KW (1 ea)	

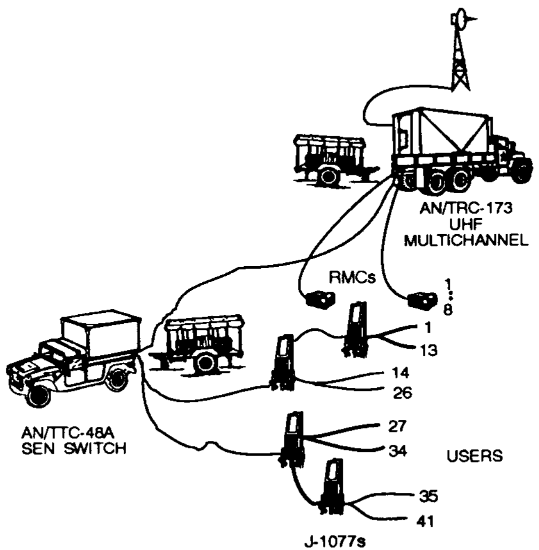


Figure 3-27. Typical TRI-TAC extension node.

MEDIUM EXTENSION NODE

Function. The TRI-TAC headquarters medium extension node consists of an AN/TTC-46 switch, an AN/TRC-174, a message center, and an operations van. The medium extension node services larger units requiring access to the theater area communications system. See Figure 3-28.

Interconnectivity. The medium extension node is dual homed with the AN/TRC-174 providing two LOS UHF links to area nodes. Subscribers connect to the switch through J-1077s and RMCs. The switch supports NATO interfaces.

NOMENCLATURE	TECHNICAL INFORMATION
SWITCH: AN/TTC-46 (1 ea) MULTICHANNEL: AN/TRC-174 (1 ea) COMM CENTER: AN/TSC-58 (1 ea) MESSAGE CENTER: AN/GSQ-80 (1 ea) GENERATORS: AN/MJQ-18 10KW (3 ea) PU-751 5KW (2 ea)	BIT RATE: 16 kbps 32 kbps AN/TRC-174 FREQ RANGE: 1350 to 1850 mHz

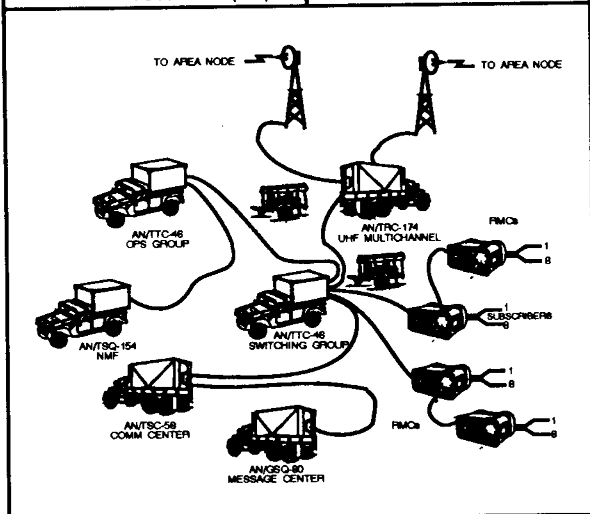


Figure 3-28. Typical TRI-TAC medium extension node.

3-4. Subscriber Terminal Equipment

The supporting signal battalion provides the users access to the ACUS. The users provide their own terminal equipment and ensure it is functioning properly. The maneuver signal officer ensures equipment maintenance is scheduled and performed.

A sampling of this equipment includes—

- DNVT, TA-1035/U or TA-1042A/U.
- DSVT, TSEC/KY-68.
- MSRT, AN/VRC-97.
- Lightweight digital facsimile (LDF), AN/UXC-7/7A.
- CT, AN/UGC-144.

DNVT, TA-1035/U or TA-1042A/U. This is a 4-wire nonsecure telephone terminal that transmits and receives full duplex, conditioned diphase, digitized voice and loop signaling information. The DNVT (TA-1035/U) is the primary nonsecure voice/data terminal device used by static subscribers to access the MSE/TRI-TAC system via a SEN, usually collocated with a CP. The TA-1042A/G operates at 16 or 32 kbps. Most Army communications networks require terminal devices to be set at 16 kbps. The 32 kbps setting may be used to interface with joint/TRI-TAC switches (always verify the settings used with the local switch). The local switch provides power for the DNVT therefore no batteries are needed. The local switch also provides a nonsecure warning tone for the DSVT user if the user initiates the call to a DNVT; however, the tone stops as soon as the DNVT user answers the call. The user connects the DNVT by installing WF-16 field wire from the

DNVT to a J-1077. The signal battalion's SEN team provides the J-1077. The user installs the field wire up to 4 kilometers. See Figure 3-29.

Technical Features.

- Input power voltage: +24 to +56 VDC.
- Input power: (power drain) 300 milliwatts on-hook 1.5 watts off-hook.
- Weight: 5 pounds 12 ounces.
- Compatible with: AN/UXC-7A, AN/UGC-144, and DSVT.

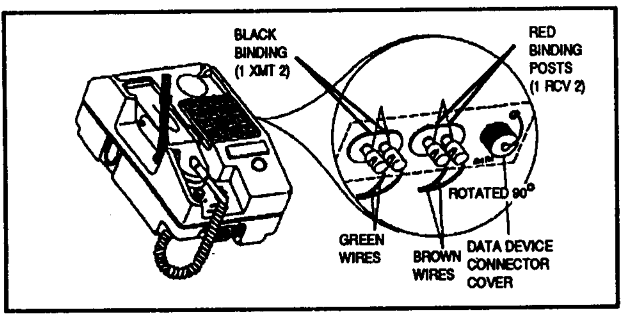


Figure 3-29. DNVT, TA-1035/U and field wire connections.

DSVT, TSEC/KY-68. This is a tactical telephone terminal with a built-in encryption / decryption module for secure traffic. It is a full-duplex voice and data interface terminal. It digitizes voice signals and transmits at 16 or 32 kbps. Most Army communications networks require terminal devices to be set at 16 kbps. The 32 kbps setting may be used to interface with joint / TRI-TAC switches (always verify the settings used with the local switch). Although used primarily for secure communications, the DSVT is interoperable with the DNVT. The traffic in this mode, in a protective environment, is secure at least at the SECRET level. The local switch provides the DSVT user with a warning tone when communicating with a nonsecure terminal; however, the tone stops as soon as the DNVT user picks up the handset. For data communications, the DSVT is equipped with a data port for encryption with various data devices such as MCS, tactical facsimile, and special circuits. See Figure 3-30.

The DSVT (TSEC / KY-68) is normally found in three configuration: static (wire), MSRT (mobile), and as stand-alone (static with the RT-1539). See Figures 3-31 and 3-32. Generally, DSVTs (in an MSRT configuration) are found with the commander, the S3 section, and the XO. It is a commander's prerogative on the actual locations of the DSVTs.

Technical Features.

• Input power voltage:	+21 to +56 VDC.
• Circuit Protection:	DC-4 fuses 1 / 2 ampere.
• Weight	14 pounds.

- Compatible with: AN/UXC-7, AN/UXC-7A, AN/UGC-144, and DNVT.

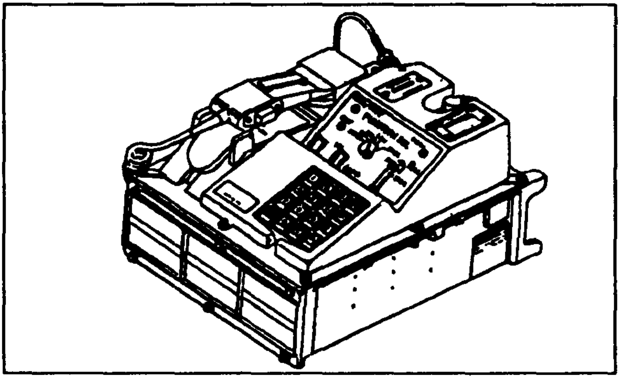


Figure 3-30. DSVT, TSEC/KY-90.

MSRT, ANNRC-97. The MSRT provides secure, full-duplex voice communications to the user throughout the tactical area of operations. It consists of a VHF radio and a DSVT. The MSRT automatically selects random channels for each call and chooses the lowest effective RF transmit level. The radio transmits in the low band and receives in the high band and interfaces at 16 kbps to the DSVT which provides secure, discrete addressability. The MSRT can be installed in a vehicular configuration (MX-2564/AN/VRC-97) or in a stand-alone mode (MX-2565/AN/VRC-97) when used with a power supply such as a PP-2953. See Figures 3-31, 3-32, and 3-33.

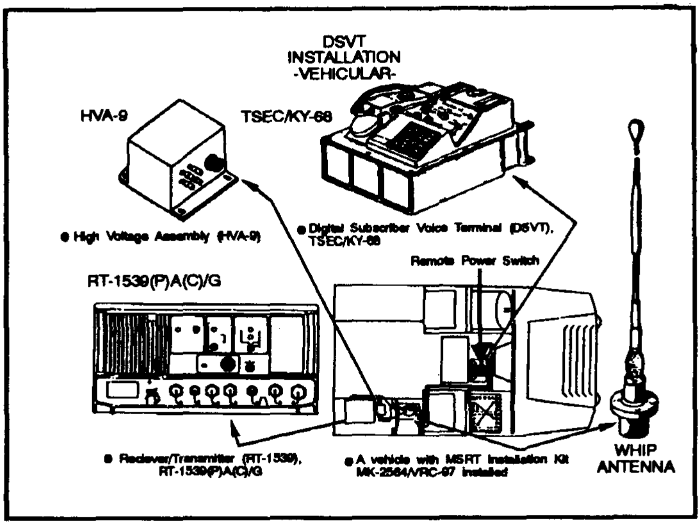


Figure 3-31. Vehicle mounted (MK-2564/AN/VRC-97) MSRT.

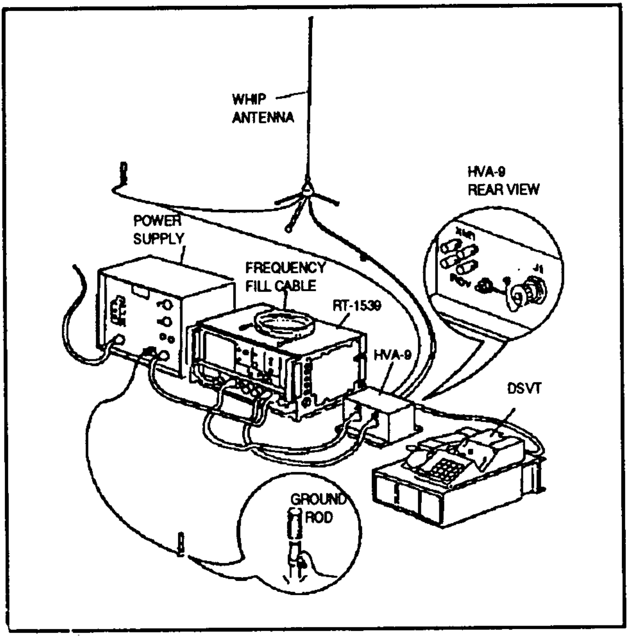


Figure 3-32. Stand-alone kit (MK-2565/AN/VRC-97) with MSRT.

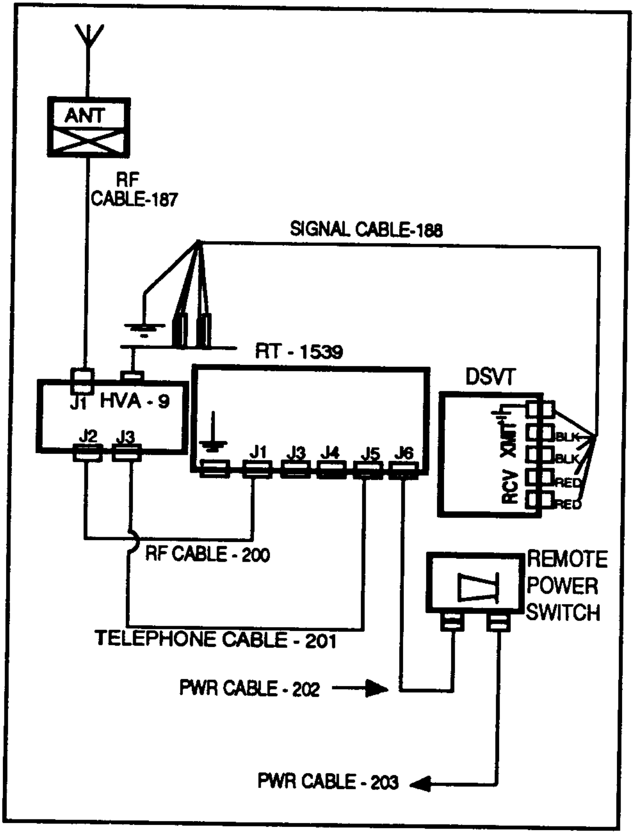


Figure 3-33. MSRT wiring diagram.

Technical Features.

• Input power voltage:	+21 to +33 VDC.
• Power output	RF output, 14 to 18 watts.
• Circuit protection:	one 16-ampere power fuse; four 0.25 ampere line fuses.
• Frequency range	30 to 88 MHz.
• Transmitting range:	15 kilometers.

The MSRT consists of the following components:

- **Receiver-Transmitter (RT), RT-1539.** This is a very high frequency (VHF)-FM transceiver which is the heart of the MSRT. The RT-1539 is the radio used in the RAU. The radio operates in a full-duplex mode with a high and low frequency band for transmit and receive channels. In the RAU, the radio transmits in the high band and receives in the low band. This procedure reverses when the radio is used in the MSRT configuration. The RT-1539's power requirements are +21 to +33 VDC. Its levels of HF power are as follows: N0, 16W nominal; N1, 3W nominal; N2, 0.5W nominal. The continental United States (CONUS) mode is 30 to 35 MHz and 40 to 50 MHz. Outside continental United States (OCONUS) mode is 30 to 51 MHz and 59 to 88 MHz. Its radio planning range is 15 kilometers.

- **DSVT, TSEC/KY-68.** It makes up the telephone portion of the MSRT. It functions the same as described in the previous section. The DSVT can be remoted up to one kilometer or 1/2 mile.

- **VHF Antenna, AS-3885.** It is a fiberglass, vehicle spring-mounted whip antenna. It is insulated to avoid electrical shock. During transportation, the AS-3885 is tied down to avoid damage.

- **High Voltage Antenna (HVA), HVA-9.** It provides high altitude electromagnetic pulse (HAEMP) protection for the MSRT and 4-wire connectivity when remoted.

- **Remote Power Switch.** It is part of the vehicle kit. The two-position toggle switch controls power to the RT-1539 when mounted in specified Army vehicles. The remote power switch provides the power receptacle for the AN/UXC-7/7A.

MSRT and DSVT AFFILIATION

PROCEDURES

MSRT Affiliation RT-1539

(1) Perform all the preoperational adjustments and settings in accordance with TM 11-5820-1021-10.

(2) Turn on the radio.

(3) Load the M key - Connect the KYK-13 to the fill connector on the front panel of the RT-1539, ensuring that the KYK-13 selector (1-6) is in the position containing the M variable and the selector switch is in the ON position. Raise the Fill/Zero switch on the RT-1539 four times in rapid succession. DO NOT RAISE MORE THAN FOUR TIMES. If the crypto alarm light goes off, the fill was successful. If the light remains lit, remove the KYK-13 and zero the RT-1539 then attempt to reload the M variable. See Figure 3-34.

(4) Install the DSVT.

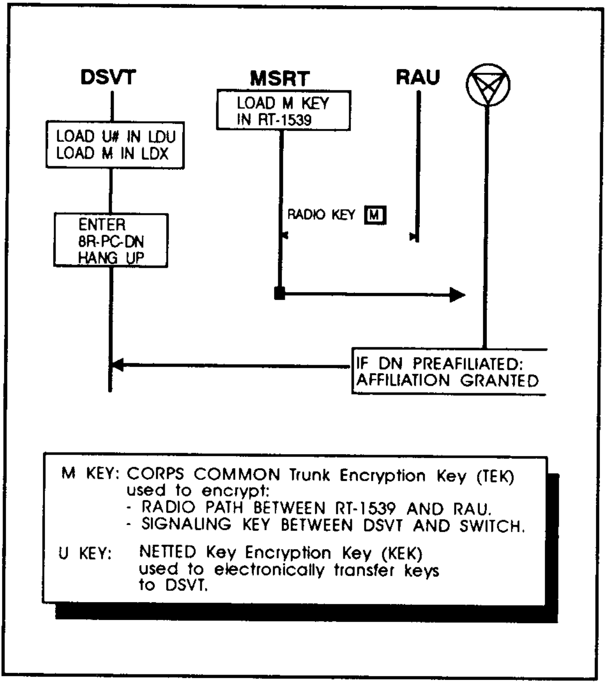


Figure 3-34. MSRT affiliation process.

(5) Verify frequency plan by dialing 8 I xx R where xx is the plan number the subscriber is using. If the light comes on (you will hear either a dial or error tone), then plan xx is in reserve; if the light flashes (you will hear either a dial or error tone), then plan xx is active; if no light appears (you will hear a busy tone), then there is no plan loaded in the MSRT.

(6) Cable download—if plan xx is not loaded in the MSRT and perform the following procedures:

a. Connect frequency fill cable P2 connector to the REMOTE CONTROL CONNECTOR on the RT-1539 which is to receive the frequency plan. Connect the RT-1539 which already has the frequency plan loaded.

b. Pick up the handset on the MSRT needing the frequency plan. Unlock the DEPRESS/LOCK cradle hook switch and turn counterclockwise to the up position.

c. Using the key pad of the DSVT, dial 8CFR 8FFR.

d. You will hear a low frequency tone on the hand set and the Loaded Frequency Plan light on the RT-1539 will flash. Once this tone ceases and the Loaded Frequency Plan light goes solid, you will hear an error tone. Hangup the hand set.

e. Disconnect the fill cable from both radios.

f. Verify the frequency plan by following instructions outlined in paragraph (5) above.

DSVT Affiliation

(1) Place the function selector switch on the DSVT in the DSBL position. Ensure that the DSVT has been zeroized by pulling up on the VAR/STOP switch and moving it to the ZERO position and then releasing it back to the center position.

(2) Place the function selector switch on the DSVT in the LDU position. Turn on the KYK-13. Connect the KYK-13 to the DSVT and place the KYK-13 function selector switch in the position containing the U variable.

(3) Press and hold the VAR/STOP switch to the load position. A tone should be heard. Release the switch to the center position, a second tone should be heard. If the two tones were heard, the load was successful.

(4) While the KYK-13 is still connected to the DSVT, place the switch of the KYK-13 to the position containing the U variable. Place the DSVT selector switch to the LDX position. Press and hold the VAR/STOP switch to the load position. A tone should be heard. Release the switch to the center position. Another tone should be heard. If the two tones are not heard, the load was not successful. If the load was successful, disconnect the KYK-13.

(5) Load the personal code and directory number. Remove the handset of the DSVT from the cradle. You should hear an error tone. Using the key pad of the DSVT, dial 8R + the three-digit personal code + the seven-digit directory number. Dial tone should be returned. See Table 3-6.

Table 3-6. MSRT troubleshooting chart.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
*DSVT is "dead." If connected directly to NC switch, it is marked out of service. No sync attempt, no drop-off.	U key mismatch.	Ensure correct U key is being used. NOTE: U key must match user's terminal profile
Error tone on DSVT, CRYPTO ALARM, TRAFFIC/SCANNING and AFFILIATION lights flashing.	RT-1539 M key mismatch.	Reset RT-1539 by turning the OFF/BLACKOUT/ON switch to OFF, then to ON, if M KEY mismatched occurs again, reload M key in RT-1539.
TRAFFIC/SCANNING indicator flashes then becomes solid while DN is being confirmed. If DN is not confirmed, then the TRAFFIC/SCANNING indicator goes from solid to flashing.	DN refused during affiliation.	Ensure correct DN is used. Dial "0" for operator assistance.
After 2 min. FREQ PLAN indicator starts to flash. AFFILIATION indicator is off. TRAFFIC/SCANNING indicator is flashing. Error tone on DSVT.	Unable to find RAU marker.	Reset RT-1539 by turning the OFF/BLACKOUT/ON switch to OFF, then to ON. Attempt to affiliate. If unsuccessful: RAU may be down, or you may be out of RAU range.
*NOTE: The most common error is to load the incorrect key into a terminal device. This could occur when users improperly share keys (KYK-13). To prevent this, units should develop a key distribution plan per SOP.		

Table 3-6. MSRT troubleshooting chart (cont).

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Loaded DIR PLAN indicator flashes. Error tone on DSVT.	Wrong PC entered (only after a successful disaffiliation from the system).	Verify PC and attempt to reaffiliate. (After 4 attempts, you will be blacklisted.) If indicator is still flashing after 3 attempts, dial "0" for operator.
Loaded DIR NO AFFILIATION and TRAFFIC/SCANNING indicators are flashing. Error tone on DSVT.	Blacklisted.	Refer to the phone directory for procedures. Contact BSO.
AFFILIATION indicator flashing. Error tone on DSVT.	RAU saturation has occured.	Only high precedence calls (immediate and above) may be processed. Unless you have a high precedence call, wait until indicator stops flashing, then make call.
ALARM indicator is flashing. DSVT rings.	Low DC power.	Turn RT-1539 OFF/ BLACKOUT/ON switch to OFF, start vehicle. Turn RT-1539 OFF/BLACKOUT/ON switch to ON. If vehicle takes longer than 20 seconds to start, you must reaffiliate your MSRT.
ALARM indicator is flashing. DSVT rings.	Problem external to RT-1539.	Check cable connections, antenna, and DSVT connections. If all connections are correct, call maintenance personnel.
Voice quality is poor or starts to fade out.	Poor voice communications.	Go on hook, then off hook and redial subscriber, or go on hook, stop vehicle, turn REMOTE POWER switch or turn RT-1539 OFF/BLACKOUT/ ON switch to OFF. Leave RT-1539 on, reaffiliate the MSRT, and place the call again.

LDF, AN/UXC-7/7A. This is a tactical facsimile that electronically transmits data from one LDF to another. The LDF is ruggedized and has a universal mount which allows installation in tactical vehicles. It transfers data over radio, common-user telephone systems, or digital equipment. The LDF connects to the MSE network through the data ports on DSVTs and DNVTs. The LDF can transmit maps, photographs, line drawings, and printed or handwritten messages. Because it uses carbon paper, no special toner is needed.

The LDF has two separate modes of operation: Mode A and Mode B. The appropriate transmission medium (CNR, MSE, or TRI-TAC) must be considered when determining the mode of operation.

In Mode A, images are scanned and transmitted from one machine to another machine that receives and prints as the transmitted information arrives. This mode requires more transmission time than Mode B.

When Mode B is selected, the LDF becomes much more versatile. Each LDF has an image memory, a transmit memory, a receive memory, and supporting electronic functions which are now activated. Pressing the MEMORY LOAD switch causes processed scanner data to be entered into the image memory from where it can then be appropriately formatted for rapid transmission (called burst operation) from the transmit memory into the receiving LDF's receive memory. The data can now be printed out at the convenience of the receiving operator. An important advantage of Mode B operation is that significantly less time is required on the communications link.

The AN/UXC-7/7A can store images in memory and reproduce or send them at a later time, See Figures 3-35, 3-36, 3-37, and 3-38. Table 3-7 gives an LDF troubleshooting chart.

Technical Features.

• Input power voltage:	+22 to +32 VDC; 115/230 VAC at 47 to 470 Hz.
• Power consumption	
Standby:	50 watts.
Operating	100 watts.
• Weight:	54 pounds
• Transmission Speed:	
Mode A - Analog	2 to 6 minutes for an 11-inch page.
Mode B - Digital	7 to 15 seconds for an 11-inch page.

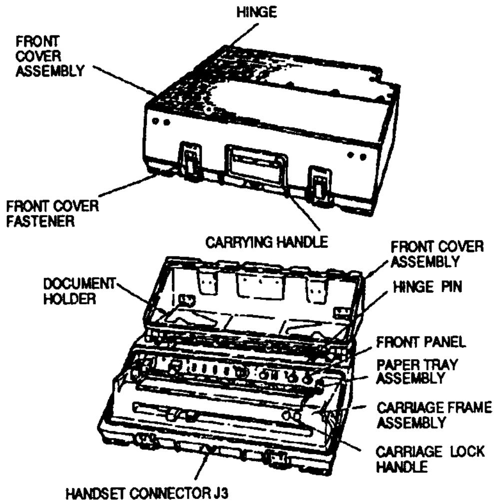


Figure 3-35. LDF, AN/UXC-7/7A.

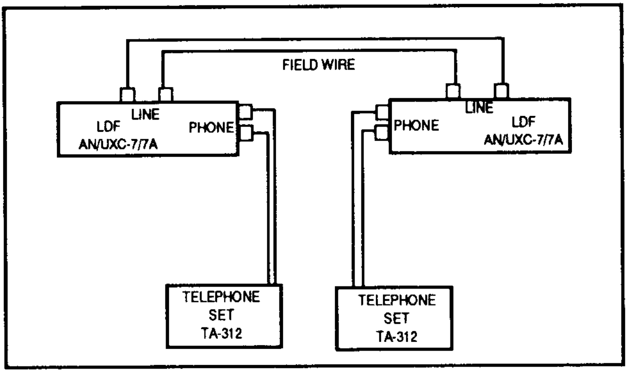


Figure 3-36. Phone line interface to LDF.

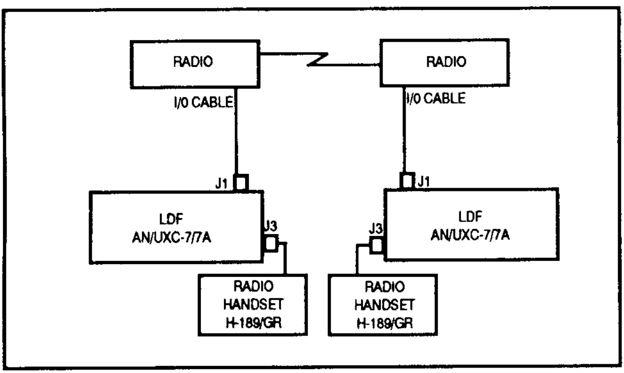


Figure 3-37. Radio interface to LDF.

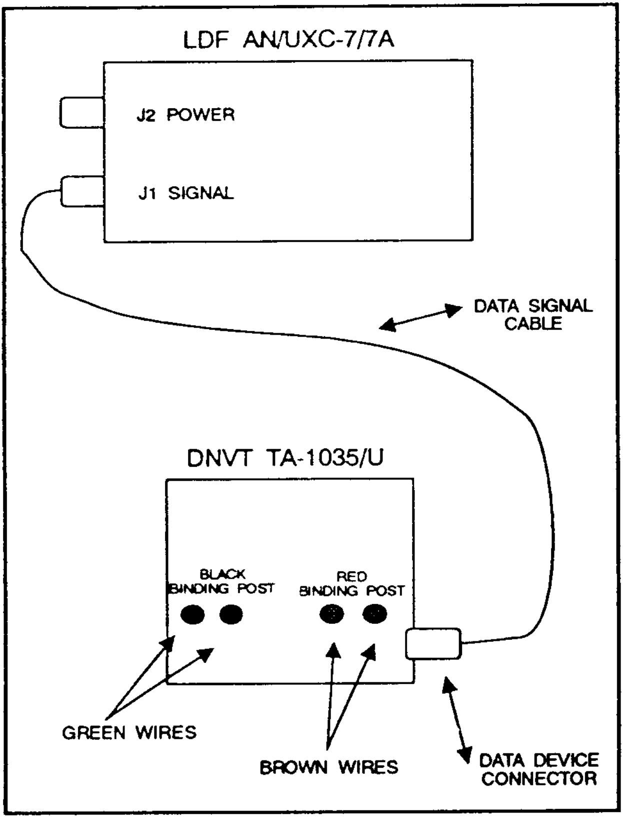


Figure 3-38. MSE telephone interface to LDF.

Table 3-7. LDF troubleshooting chart.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Output copy smeared.	Print stylus jammed.	Clean stylus pivot assembly using paint brush NSN 8020-00-263-3873.
Input and output copy scratched or marred.	Document pads dirty.	Clean document pads using typewriter brush, NSN 7510-00-550-8446.
Vertical plane of transmitted image tilted on output copy.	Improperly loaded input or output copy.	Reload input and output copies.
Voice transmission continuously keyed when used in voice transmit mode.	Defective handset connection.	Disconnect and reconnect hanset. If problem continues, replace handset.
Error lamp does not flash at power on.	Loss of power.	Check power indicator and recycle PUSH FOR ON power switch.
Error lamp stays on.	Memory BIT fialure.	Recycle PUSH FOR ON power switch.
Will not produce shades of gray.	Improper switch settings.	Check switch settings to ensure GRAY/B-W. Transmit switch is set to GRAY.
Will not receive message.	Margin stops are together.	Separate margin stops.

FACSIMILE OPERATION

The following is a checklist for facsimile operation, The operator must--

• Ensure that the DNVT/DSVT is affiliated.

• Ensure that the facsimile is properly connected to the DNVT/DSVT.

• Preset the switches on the facsimile,

·· Unlock the carriage lock handle

·· Set the MODE switch to COMP FEC.

·· Set the ANLG/DIGITAL switch to DIGITAL.

·· Set the HI RES LO SP/HI SP LO RES switch as needed. (This setting is determined by the document being transmitted.)

·· Set the GRAY/B/W switch as needed.

·· Set the NATO switch to the LDF position.

• Turn on the power (push IN on POWER switch).

• Press the PAPER RELEASE lever and insert paper to transmit slot.

• Place the paper text side up lengthwise into facsimile.

• Set the margins.

• Press the MEMORY LOAD button.

• Remove the paper when the scan is finished.

• Verify that the MEMORY LOAD indicator is lit.

·· Insert the copy set page into the facsimile to make a copy. (If using carbon, place it on top of the blank page and insert both.)

·· Set the margins.

·· Press the SELF TEST switch.

- Contact the receiving station over the DNVT/DSVT to send the copy.
- Ensure that the distant-end operator has the switches set in the same mode of operation as the sending machine.
- Instruct the distant-end operator to press the RECEIVE button.
- Press the TRANSMIT button. (The distant-end operator prints the message after it is received.)

CT, AN/UGC-144. This is a digital communications terminal that provides single-subscriber operation. When in a network, the unit has a full-duplex asynchronous communications capability. It has the ability to access the automatic digital network (AUTODIN) and can monitor narrative message traffic in the U (unclassified), R (routine), and Y (emergency command precedence, usually seen as TOP SECRET/senaitive compartmented information (TS/SCI)) communities. The CT is a medium-speed device that includes interface data, power supply, and control mechanisms. See Figure 3-39.

The CT is typically found in military intelligence units and division, corps, and theater headquarters. Figure 3-40 shows a configuration of CT communications via MSE.

Technical Features:

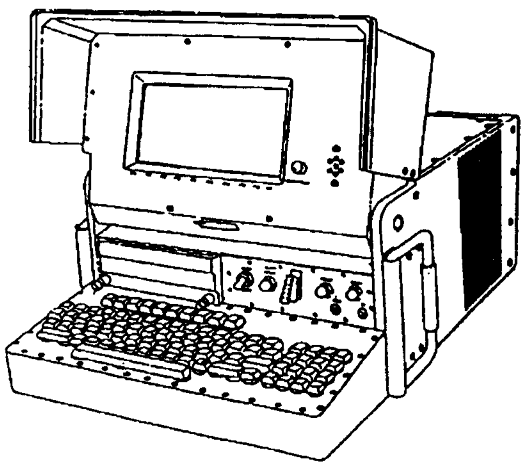
TERMINAL:

• Voltage input:	100/130 VAC, 48/63 Hz, or 200/260 VAC, 48/63 Hz.
• Consumption:	93 watts.

- Weight: 55 pounds.

PRINTER:

- Speed: 150/240 CPS.
- Voltage input: 100/130 VAC, 48/63 Hz.
- Consumption: 13-watt average.
- Weight: 11 pounds without paper.



NOTE: Printer is separate.

Figure 3-38. CT, AN/UGC-144.

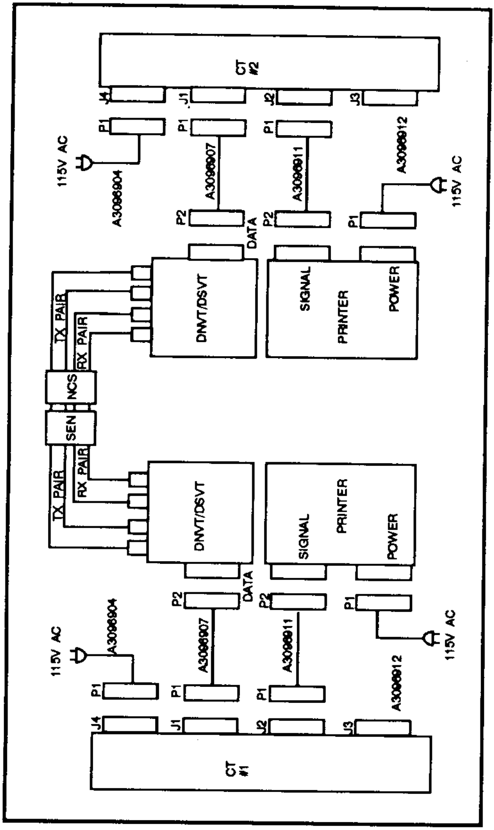


Figure 3-40. CT communications via MSE.