V CORPS MSE STANDARD OPERATING PROCEDURES
TECHNICAL REFERENCE MANUAL

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APPENDIX A - Glossary

CHAPTER 1

SECTION I. NETWORK MANAGER PROCEDURES

1. PURPOSE: To provide information on the network manager procedures for installing and maintaining a V Corps MSE network.

2. GENERAL:

PHASE I

INSTALL BACKBONE

- Initialize Node Center with local RAU (marker off until Phase II)
- Insure PNCS has been loaded with network essential keys and verified by BCMO
- Update Battalions progress of backbone installation according to priority specified in OPORD
- Insure Battalions are installing internodals IAW SOP as follows:
    1. Install 2 Internodals, must include Tn key transfer to be a "Green" link
    2. Complete duplication on first 2 links (see Chap 2, Sec II)
    3. Request bulk transfer of COMSEC keys (list 6) (see Chap 9, Sec II)
    4. Install remaining links IAW OPORD and BATCON directives
    5. BN and Bde PAL's are loaded per OPORD & SOP
- Insure SCC, local J-box, remote J-box, and NMC are installed & prepared for network activation (see Chap 8, Sec IV)
- Enforce a prepared A-B numbering plan (critical phones should be on local NC J-box)
- When PNCS installs 2 internodal links, affiliate local phones and direct installation of SCC
- Insure NMC is installing packet network (see Chap 8, Sec VII)
- Evaluate backbone network for bulk transfer capability
- Monitor and enforce duplication (must be on best links) (see Chap 2, Sec II)

PHASE II

BULK TRANSFER and EXTENSION LINK INSTALLATION

- When a solid backbone is installed, direct PNCS to bulk transfer "list 6" throughout the Network. (see Chap 9, Sec II)
    - Recipient NC's must have two solid internodals prior to receiving BT
    - Once NC has received BT, NC will request frequency plan download from SCC and activate local RAU marker beacon; report action complete to BATCON.
- Continue installation of remaining link by established priorities
- Insure NMC is building network as backbone and network grows
- Insure all extension node PS's are dual homed when possible (don't cross IP boundaries) (see Chap 4, Sec II)

PHASE III

SPECIAL CIRCUITS & GATEWAY INSTALLATIONS

- Institute gateway interfaces IAW OPORD and network considerations (E.G. DSN, EAC, NAI, SB-3865, DNI)
- Monitor gateway quality and availability status
- Insure gateway connectivity is adequate to support mission
- Analyze Gateway traffic levels (consideration of additional links or zone restriction)
- Verify all 5C DSN SEN access
- Verify Brigade & Battalion MCS, single channel TACSAT and CT-144 terminal operation

PHASE IV

NETWORK MATURATION

- Notify SIB in order to start subscriber PAL loading scheme
- Ensure controllers are verifying proper duplication (best links, NC receives no more than 3 NC/LEN's dupes)
- Notify SIB/SCC to download and verify PCL and CDL to all NC's and LEN's
- Monitor and enforce periodic checks of the following
    1. Duplication
    2. RAU beacon and affiliation status
    3. Link quality (R-6) reporting period
    4. Evaluate DSN and Gateway call completion rates for possible imposition of Zone Restriction
    5. Evaluate subscriber density (RAU's) for saturation
    6. Monitor packet network status
    7. CDL's, PCL's updates (See SIB)
    8. Insure Switch Recovery Procedures (SRP) are followed (see TSOP) and switch crash reports forwarded to SIB
    9. Prioritization of Battalion maintenance needs
- Closely monitor GMF terminal access requirements and implementation (i.e. access/de-access times)

NETWORK CONTROLLER RESPONSIBILITIES

- Insure all Controllers are familiar with the following areas
    1. Backbone Installation procedures (TSOP Chap 5)
    2. Bulk Transfer (TSOP Chap 9) and extension link installation procedures
    3. Duplication and bypass (TSOP Chap 2)
    4. Published Switch Recovery Procedures (TSOP Chap 2)
    5. Reporting requirements and procedures (see FSOP)
    6. Link troubleshooting procedures (TSOP Chap 6)
    7. Record traffic network (TYC-39 and CT-144) requirements and troubleshooting

- Provide details and “reality check” on questionable RFO’s
- Aggressively pursue answers and guide network priorities

SYSTEMS INTEGRATION RESPONSIBILITIES

- Subscriber database PAL management
- Switch database management
- Gateway configuration & maintenance for DSN (direct dial), NAI, DNI, EAC, adjacent corps
- Provide technical assistance to teams in response to network difficulties/switch outages
- Monitor the Brigade Trouble Number (55-701-51) and provide assistance to G-6 as necessary
- Test and evaluate new equipment/procedures
- Evaluate network performance (circuit and data)
- Gateway configuration & maintenance of DSN (direct dial), NAI, EAC, adjacent Corps

SECTION II. BTOC MANAGER PROCEDURES

1. PURPOSE: To provide information on the BTOC manager procedures for installing and maintaining Battalion assets in a V Corps MSE network.

2. GENERAL:

PHASE I

INSTALL BACKBONE

- Initialize Node Center with local RAU (marker off until Phase II)
- Insure PNCS has been loaded with network essential keys and verified by BCMO
- Update Nodes progress of backbone installation according to priority specified in OPORD, Coordinate with SYSCON for changes
- Insure Nodes are installing internodals IAW SOP as follows:
    1. Install 2 Internodals, must include Tn key transfer to be a "Green" link
    2. Complete duplication on first 2 links (see Chap 2, Sec II)
    3. Request bulk transfer of COMSEC keys (list 6) (see Chap 9, Sec II)
    4. Install remaining links IAW OPORD and SYSCON directives
    5. BN and Bde PAL's are loaded per OPORD & SOP
- Enforce a prepared A-B numbering plan for BTOC (critical phones should be on local NC J-box)
- When PNCS installs 2 internodal links, affiliate BTOC phones
- Evaluate backbone network for bulk transfer capability
- Monitor and enforce duplication (should be on best links) (see Chap 2, Sec II)

PHASE II

BULK TRANSFER and EXTENSION LINK INSTALLATION

- Ensure Nodes are prepared to receive bulk transfer "list 6" throughout the Network. (see Chap 9, Sec II)
    - Recipient NC's must have two solid internodals prior to receiving BT
    - Once NC has received BT, NC will request frequency plan download from SCC and activate local RAU marker beacon; report action complete to BATCON.
- Continue installation of remaining link by established priorities
- Insure all extension node PS's are dual homed when possible (don't cross IP boundaries) (see Chap 4,)

PHASE III

SPECIAL CIRCUITS & GATEWAY INSTALLATIONS

- Institute gateway interfaces IAW OPORD and network considerations (E.G. DSN, EAC, NAI, SB-3865, DNI) (within AOR)
- Monitor gateway quality and availability status (within AOR)
- Verify all 5C DSN SEN access (within AOR)
- Verify Battalion MCS, single channel TACSAT terminal operation

PHASE IV

NETWORK MATURATION

- Ensure controllers are verifying proper duplication (best links, NC receives no more than 3 NC/LEN's dupes)
- Monitor and enforce periodic checks of the following
    1. Duplication
    2. RAU beacon and affiliation status
    3. Link quality (R-6) reporting and evaluation
    4. Evaluate subscriber density (RAU's) for saturation
    5. Monitor packet network status using Packet Watch or WS Watch
    6. Insure Switch Recovery Procedures (SRP) are followed (see TSOP) and switch crash reports are analyzed and forwarded to SIB
    7. Maintain current DDL lists from each node
    8. Prioritization of all Company maintenance needs

BTOC NODE CONTROLLER RESPONSIBILITIES

- Insure all Controllers are familiar with the following areas
    1. Backbone Installation procedures (TSOP Chap 5)
    2. Bulk Transfer (TSOP Chap 9) and extension link installation procedures
    3. Duplication and bypass (TSOP Chap 2)
    4. Published Switch Recovery Procedures (TSOP Chap 2)
    5. Reporting requirements and procedures (see FSOP)
    6. Link troubleshooting procedures (TSOP Chap 6)
- Provide details and "reality check" on questionable RFO's
- Aggressively pursue answers and guide network priorities

SECTION III. NODE MANAGER PROCEDURES

1. PURPOSE: To provide information on the node manager procedures for installing and maintaining node assets in a V Corps MSE network.

2. GENERAL:

PHASE I

INSTALL NODE AND BACKBONE

- Perform any necessary modifications to Local Database, save as Exercise Specific Database
- Maintain Database Cutsheets, update as necessary (see Chap 2, Sec I)
- Initialize Node Center with local RAU (marker off until Phase II)
- Insure Node has been loaded with NC/LEN cold start keys
- Load Node PAL
- Update Team progress of link installation according to priority specified in OPORD
- Insure Team is installing internodals IAW SOP as follows:
    1. Install 2 Internodals, must include Tn key transfer to be a "Green" link

        Note: GLARE is determined by Team Label. The higher team label ACCEPTS Glare and the lower team label REJECTS Glare. Example: NCS 5501 would REJECT glare from NCS 5502
    2. Complete duplication on first 2 links (see Chap 2, Sec II)
    3. Request bulk transfer of COMSEC keys (list 6) (see Chap 9, Sec II)
    4. Install remaining links IAW OPORD and BATCON directives
- Enforce a prepared A-B numbering plan (MSRT must be affiliated off distant RAU)
- When PNCS installs 2 internodal links perform dupes and request bulk transfer
- Monitor and enforce duplication (must be on best links) (see Chap 2, Sec II)

PHASE II

BULK TRANSFER and EXTENSION LINK INSTALLATION

- Once NC/LEN has received BT, request frequency plan download from SCC and activate local RAU marker beacon; report action complete to BATCON.
- Continue installation of remaining link by established priorities
- When contacted by PAL Manager, load directed PALs
- Maintain printed copy of DDLs for all active (SEN/RAU) and virtual TGC, forward to BTOC

PHASE III

NETWORK MATURATION

- Monitor and enforce periodic checks of the following
    1. Duplication
    2. RAU beacon and affiliation status

3. Link quality (R-6)
4. Evaluate subscriber density (RAU's) for saturation
5. Monitor packet network status
6. Insure Switch Recovery Procedures (SRP) are posted and followed (see TSOP) and switch crash reports forwarded to SIB
7. Maintain printed copy of DDLs for all active (SEN/RAU) and virtual TGC, forward to BTOC

CHAPTER 2

SECTION I. NCS/LENS DATABASE

1. PURPOSE: To provide information on the contents of the standard database at the NC and LEN, and to provide a systematic procedure for planning a NC or LEN database.

2. GENERAL: The standard database provides a standard set of classmarks and hardware-software assignments for each digital transmission group (DTG), permanently stored on load disks, which are removable hard drives.

3. DEFINITIONS:

a. Standard database - the standard initialization and reinitialization load disk. Version will be stated in the OPORD.

(1) The NC has 16 DTGs assigned in the standard database: 5-NC, 1-LEN, 6-SEN, 3-RAU and 1-SCC.

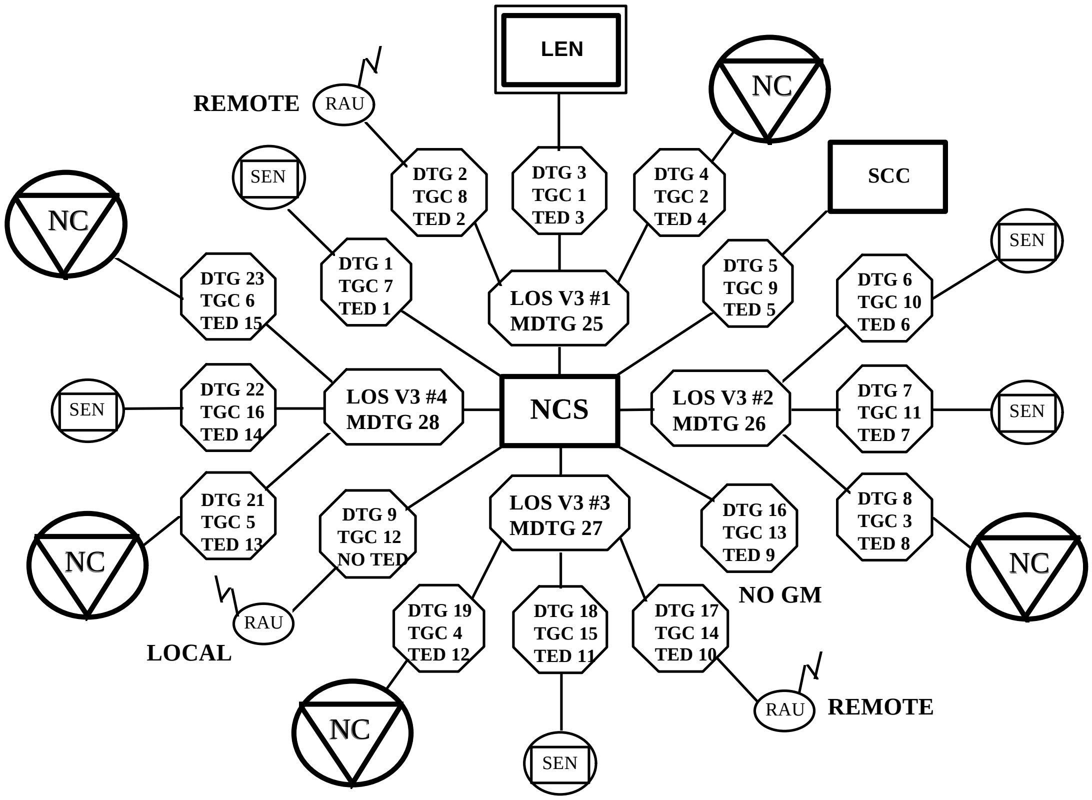
(2) DTGs 1, 5 and 16 can be multiplexed into MDTGs 25, 26 and 27 respectively, or via group modem (GM) using the low speed DTG switch. All MDTGs have a data rate of 4096 kb/s.

(3) The LENS has eight DTGs in the standard database.

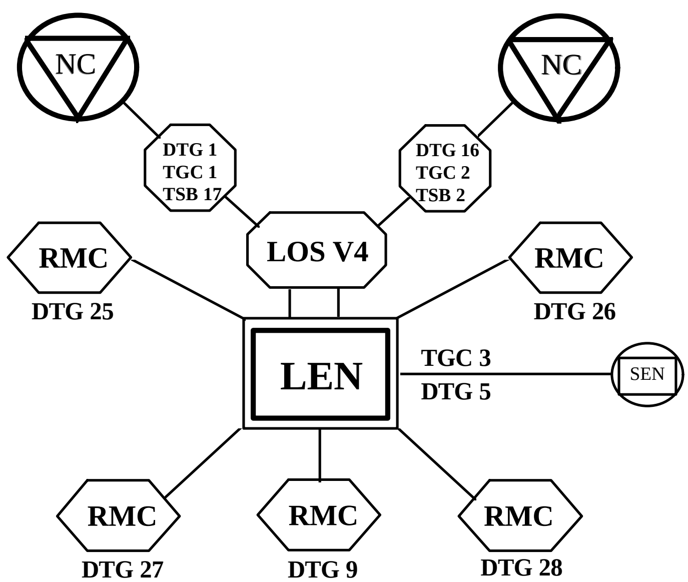
b. MSE DTGs are assigned at standard group and channel rates. The channel rate is always 16 kbps (assigned at switch initialization). The standard database assigns DTGs for NCs at 1024 kbps, LENs at 512 kbps, and SENs, RAUs and SCCs at 256 kbps. It is possible to modify a DTG from MODULO 8 (MSE/TRITAC Family) to MODULO 9 (ATACS Family) data rates for a DTG: 256 to 288, 512 to 576 and 1024 to 1152 kbps. RMC DTGs are assigned a data rate of 288 kbps. DTGs may be installed at group rates of 256, 288, 512, 576, 1024, 1152 kbps. Other rates are possible, but most Army equipment runs at one or more of the standard rates.

CAUTION: The standard MSE UHF and SHF radios (AN/GRC-226 and AN/GRC-224) will only operate at the Modulo 8 (MSE/TRITAC Family) data rates.

NCS STANDARD DATABASE



LENS STANDARD DATABASE



5. RESPONSIBILITIES:

a. Regional Support Center (RSC) - the RSC is responsible for the collection and issue of software versions.

b. Brigade S3/SIB - The Brigade SIB will create and maintain the V Corps Standard MSE Database (see Section III Database Management). SIB will notify the Battalions/Divisions when new software is available for issue. Exchanges will be made on a one for one basis. The disk edition number will be clearly labeled on the exterior of the disk. Configuration control is the responsibility of the S3 Systems Integration Branch.

c. Modifying the standard database - the NCS/LENS crew is responsible for writing and executing their own required MSE modifications. The process of modifying the database is not really a modification at all, since the operator must delete the DTG and "rebuild" or reassign all of the desired DTG characteristics for each voice and signaling trunk through a series of assignment screens within the switch.

d. The standard database must be modified for all non-MSE links, i.e., AN/TYC-39, TACSAT etc. Modifications are also required whenever the standard assignment of DTGs is changed within MSE. The preferred data base modifications are; RAU DTG TO SEN, SEN DTG TO RAU, LEN DTG TO SEN, LEN DTG TO RAU, LOCAL SEN TO TACSAT, LOCAL SEN TO MESSAGE (AN/TYC-39) OR CIRCUIT (AN/TTC-39D) SWITCH, LOCAL SEN AT ATACS DATA RATE, LEN RMC PORT TO SCC OR LOCAL RAU and lastly NC DTG TO LEN OR SEN. DTGs can be modified up or down in size by processor controlled strapping of nine channel mux-demux cards (NCMDs). These NCMDs must be physically collocated within the switch, and the cards must be in sequential order. When modifying a local DTG up in size from 256 or 288 kbps to 512 or 1024, remember that this will "cost" a NC or LEN DTG, since you are "borrowing" NCMDs for use elsewhere. Refer to “Allowable NCMD/DTG Chart” from QRG.

e. There are two card racks, (racks 1 and 2), within the NCS/LENS. The NCMD and trunk signaling buffer (TSB) cards are located within these racks. Each voice and signaling channel and each primary signaling channel (PSC) is assigned a physical address on the time division switching matrix (TDMX). The operator must know these addresses in order to modify the database. Refer to “TDMX Address Table” from QRG.

6. The following Cutsheets are intended to be used by Planners at all Levels. These are also very handy when kept up to date for managing Circuit Switch assets.

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NC Operations Configuration Worksheet

Team Label	Phone Number	TSB	PCKT TRKS	PCKT Ports	TYPE	Trans Type	DTG	TGC	KBS Rate	Data Rate	NCMD	Mod NCMD	TDMX	Mod bs-la's	TED	TGMOW	GPMDM	Card Racks	
			02-41		**SEN**		**1**	**7**	256		(1) 09- (1) 10		02-26 02-43		**1 (0)**	L503	L502 A5		**MDTG** **25**
					RAU		**2**	**8**	256		(1) 05- (1) 06		01-44 01-61		**2**	L504	GPMDM= R302		
		5 01-04	04-10 04-13		**LEN**		**3**	**1**	512		(1) 19- (1) 22		04-08 04-43		3	L505	TGMOW= R303 MUXA= R304		**Phone #**
		2 01-01	05-28 05-31		**NCS**		**4**	**2**	1024		(1) 27- (1) 34		05-26 06-43		4	L506		**A1**	
			04-45		**SCC**		**5**	**9**	256		(1) 23- (1) 24		04-44 04-61		0 (5)	L509	L508 A6		**MDTG** **26**
			06-59		**SEN**		**6**	**10**	256		(1) 35- (1) 36		06-44 06-61		6	L510	GPMDM= R307		
			02-23		**SEN**		**7**	**11**	256		(1) 07- (1) 08		02-08 02-25		7	L511	TGMOW= R308 MUXA= R309		**Phone #**
		3 01-02	02-46 02-49		**NCS**		**8**	**3**	1024		(1) 11- (1) 18		02-44 03-61		8	L512		**A2**	
					RAU		**9**	**12**	256		(1) 25- (1) 26		05-08 05-25			L513		L514 **A7**	
			08-41		**SEN**		**16**	**13**	256		(2) 09- (2) 10		08-26 08-43		9	R503	R502 A8		**MDTG** **27**
					RAU		**17**	**14**	256		(2) 05- (2) 06		07-44 07-61		10	R504	GPMDM= R312		
			10-23		**SEN**		**18**	**15**	256		(2) 19- (2) 20		10-08 10-25		11	R505	TGMOW= R313 MUXA= R314		**Phone #**
		19 07-03	10-28 10-31		**NCS**		**19**	**4**	1024		(2) 21- (2) 28		10-26 11-43		12	R506		**A3**	
		17 07-01	11-46 11-49		**NCS**		**21**	**5**	1024		(2) 29- (2) 36		11-44 12-61		13	R510			**MDTG** **28**
			08-23		**SEN**		**22**	**16**	256		(2) 07- (2) 08		08-08 08-25		14	R511	GPMDM= R317 TGMOW= R318		**Phone #**
		18 07-02	08-46 08-49		**NCS**		**23**	**6**	1024		(2) 11- (2) 18		08-44 09-61		15	R512	MUXA= R319	**A4**	

DUPLICATION

NC/LEN_______ TGC's (Odds) ____________________

NC/LEN_______TGC's (Evens) ____________________

OP's DNVT, TGC _______

LEN Operations Configuration Worksheet

15 Jul 1996

Team Label	Phone Number	TSB	PCKT TRKS	PCKT Ports	TYPE	Trans Type	DTG	TGC	KBS Rate	Data Rate	NCMD	Mod NCMD	TDMX	Mod bs-la's	TED	TGMOW	GPMDM
		17 07-01	03-28 03-31		NCS		1	1	512		(1) 15- (1) 18		03-26 03-61		1	L501	L502 A5
			04-23		SEN		5	3	256		(1) 19- (1) 20		04-08 04-25		5	L507	L508 A6
					RMC		9		288		(1) 21- (1) 22		04-26 04-43			L513	L514 A7
		2 01-01	09-28 09-31		NCS		16	2	512		(2) 15- (2) 18		09-26 09-61		9	R501	R502 A8
					RMC		25		288		(2) 19- (2) 20		10-08 10-25			R301	R302 A1
					RMC		26		288		(2) 21- (2) 22		10-26 10-43			R306	R307 A2
					RMC		27		288		(2) 23- (2) 24		10-44 10-61			R311	R312 A3
					RMC		28		288		(2) 09- (2) 10		08-26 08-43			R316	R317 A4

DUPLICATION

NC/LEN_______ TGC's (Odds) ______________________

NC/LEN_______ TGC's (Evens) ______________________

OP's DNVT, TGC _______

SECTION II. LEN TANDEMING PROCEDURES

In order to use the len as a tandem switch in the MSE network the following procedures must be followed.

1. Load the V Corps LEN standard database.

2. On the Switch Operations / Switch Identification Screen (**ASI)** check the block **TANDEM ROUTING "YES"**, save this as DBLENT via Switch Operations / Database Management.

3. Initialize the switch in the normal manner using DBLENT.

4. Once the interswitch links are in the LEN will now tandem (continue flood search).

5. In order to verify packet ports in the LEN, a series of **AOD-62** connections-readback commands must be verified or entered via **AOD-61** and then re-verified.

6. The packet switches in the LEN will be operational however the TNS function will still not be operational in the LEN switch.

AOD-61 / 62 COMMANDS FOR TANDEM LEN PACKET SWITCH

DTG #1

03-28, 07-44, f, 1
03-29, 07-45, f, 1
03-30, 07-46, f, 1
03-31, 07-17, f, 1

DTG #5

04-23, 07-52, f, 1

DTG #16

09-28, 07-48, f, 1
09-29, 07-49, f, 1
09-30, 07-50, f, 1
09-31, 07-51, f, 1

SECTION II.1 HUNG COMMERCIAL OFFICE LINE PROCEDURE

LEN ONLY

1. Display the terminal address for the commercial office subscriber using the display terminal service (DTS) command (enter terminal type 44).

2. Using the information obtained from the DTS, mark the commercial office subscriber's terminal address out-of-service, using the (AEI) assign equipment in/out-of-service command.

3. Perform a single trunk test (AOD 10), entering the same terminal address as in step two (2).

4. Upon successful completion of AOD 10, the message "TRUNK BS-LA RESET ATTEMPTED" is displayed.

5. Using AEI command, mark the commercial office subscriber's terminal address back in-service.

SECTION III: DATABASE MANAGEMENT PROCEDURES

1. Disk Sanitation.

a. NC/LEN must be off-line with WSOLOP and CSOLOP running.

b. VIA FILE MAINTENACE: Go to Load Disk “SPU” Directory and Delete all files beginning with DB do the same for System Disk “SPU” Directory.

c. Insert V Corps MSE Standard Database **DBVCNCE8** for a NC or **DBVCLENE8** for a LEN.

d. Copy this file onto the Load Disk SPU Directory.

e. This File is **never** to be edited and saved as the same name.

2. Creating/Saving Local Database

a Purpose - A local database is created to make a switch unique database . It allows you to have all changes necessary from the standardized database that must be made to make it switch unique. Most importantly, it reduces link outage times whenever database corruption is suspected during troubleshooting.

b Creation - A local database is always created off-line, generally in garrison, and never during operations, because any errors or problems occurring in the switch at the time you save the database will also be duplicated onto the disk. The following steps are used to create a local database save disk:

(1) Switch must be off-line.

(2) Load WSOLOP and CSOLOP, **DO NOT** use Switch Operations/Switch Initialization.

(3) Read V Corps standardized NC/LEN database DBVCNCE8 or DBVCLENE8 for LEN (via Database Management/Switch Database Actions).

(4) Complete Switch Identification screen with NC/LEN unique information.

(5) Complete Switch Classmarks screen with “**NO**” for Autosave , “**None**” for time intervals. Use **DBAUTOXX** as autodatabase save file name. XX = Team Label.

(6) Complete Call service position screen via Subscriber services for local CSP (55XXX**00**) 55XXX = PAL Number.

(7) Complete Terminal Service screen via Node Management for local DTA (TT 15, TDMX 15-03), with (55XXX**07**) 55XXX = PAL Number.

(8) Write local database to hard disk via Database Management/Switch Database Actions with the name **DBVCNCXX** , XX = NC Number, **DBVCLENXX** , XX = LEN Number.

(9) This File is **never** to be edited and saved as the same name.

3. Database Archiving.

a. Copy all files in the Load Disk "SPU" Directory to the System Disk "SPU" Directory to be kept as a back-up.

4. Creating an Exercise Unique Database.

a. Purpose - A Exercise Unique database is created to add data or make modifications to the local database. It allows you to perform particularly cumbersome requirements and to validate modifications during a switchex. Creating and saving an exercise unique database prior to deployment eases the workload during the deployment phase and makes for a much more efficient operation. Most importantly, it reduces link outage times after a switch crash/restoral.

b. Creation - An Exercise Unique database can be created on-line, generally during operations. The following steps are used to create an Exercise Unique database.

(1) Read Local database DBVCNCXX or DBVCLENXX for LEN (via Database Management/Switch Database Actions).

(2) Perform any and all database modifications needed for exercise.

(3) Write Exercise Unique database to hard disk via Database Management/Switch Database Actions with the name **DBXXXX** , XX = Exercise Name

c. Usage - Enter this file name as the AUTODATABASE SAVE Database via Switch Operations/Switch Classmarks. This file will be used throughout the exercise in case of switch failure.

SECTION IV - DUPLICATION AND BYPASS

1. PURPOSE: To provide guidelines for the assignment of duplication and bypass at NC and LEN switches. Procedures for implementing ALD (Activate Local Duplication) or EUB (Essential Use Bypass) are contained in Section III of this chapter.

2. GENERAL: Duplication and Bypass are two different but related functions performed by NCs/LENs.

a. DUPLICATION is the process of safeguarding (saving) subscriber information (telephone numbers, profiles and affiliation status's) in one NC/LEN database to an adjacent NC/LEN. Duplication is achieved by using the ABD (Assign Bypass and Duplication) command, inputting Trunk Group Cluster (TGC) numbers over which subscribers are affiliated. By Corps SOP, all SEN/RAU and virtual TGC's are <u>ALWAYS</u> duplicated, whether active or not.

b. BYPASS. While assigning duplication, NC/LEN operators will also classmark some TGCs for EUB by marking BYPASS "Yes". Normally, a NCS is not too overloaded and can so classmark every TGC which is assigned to a SEN, RAU or SCC. If, however, he has too many active TGCs, he should mark TGCs for BYPASS following this priority: Remote RAUs, Local RAU, SCC, SENs, in order of priority based on direction from NMF, who consults with Battalion TOC. EUB is essentially a software patch which allows subscriber service to continue over the classmarked TGCs despite some types of NC/LEN failures.

3. RESPONSIBILITIES:

a. NODE MANAGERS manage duplication and bypass assignments at the NC/LEN. Ensure each TGC is duplicated properly, IAW this SOP.

Report duplication scheme as per Chapter 9 of this SOP, and update higher HQs whenever changes occur.

b. BATCON's maintain accurate duplication/bypass status for each of the NCs/LENs assigned to their Area of Control, and provides status to their controller at the Bde/Div SYSCON. Implement and monitor Switch Recovery procedures and report to Bde/Div SYSCON.

c. BDE SYSCON controllers maintain accurate duplication status for all NCs/LENs. The SIB tracks status of NC/LEN preaffiliation lists and directs loading of subscriber directory numbers. Based on this information and the tactical situation, the SYSCON OIC will direct Switch Recovery or ALD's during NC/LEN displacement and switch failures.

5. PROCEDURES: The assignment of duplication and bypass is a priority task for all NCs/LENs. Duplication <u>must</u> be accomplished <u>prior</u> to providing service to subscribers. Each TGC must be duplicated as shown in figure 1-C.

a. Initial Assignments. Duplication and bypass must be programmed immediately whenever the NC/LEN is initialized or re-initialized. NC/LEN operators install two internodal links, referred to as the "A" and "B" links, and assign duplication. TGCs will be duplicated one at a time to ensure each is accepted by the adjacent switch. The switch must receive this message: TGN duplication - Status 2. Odd numbered TGCs should be duplicated down link "A"; evens and virtuals down "B". Duplication will be verified using the DBD (Display Bypass and Duplication) command after all TGCs have been duplicated. The NMF will maintain a hard copy of the DBD screen.

NOTE: If it is not possible to install at least two internodal links within ten minutes then assign all duplications over he single link.

NOTE: If any duplication is refused, report TGN status code, RSS reject code, or interprocessor messages lost through the BATCON to Bde SYSCON (SIB) at MSE 5570150/51/52 for resolution.

b. Maintenance. Node managers will re-direct duplication and bypass assignments whenever the link to one of the receiving nodes is lost. Duplication should also be re-directed if a high BER is received on a link. Any changes to duplication scheme should be reported immediately through the BATCON to Bde SYSCON.

c. ALD. BATCON will order ALD for a NC/LEN upon closing a NC/LEN for displacement. ALD may also be ordered by the BATCON only in the event ABR failures at recipient switches.

d. EUB. The Node Center experiencing any type of failure will always initiate the Brigade Switch Recovery procedures. (IAW section III of this chapter).

Standard Duplication and Bypass Scheme

NODE CENTER SWITCH

TGCs 1 - 6	Normally not duplicated unless modified to a SEN, RAU, or SCC. If so, then duplicate with BYPASS = "yes".
TGCs 7 - 16	Always duplicated. Mark active TGCs for BYPASS ="yes", inactive TGCs as BYPASS = "no".
TGCs 32 - 35	Always duplicated with BYPASS = "yes".
TGCs 36 - 40	Always duplicated with BYPASS = "no".
Other TGCs	Duplicate when other TGCs are assigned within MSE. Program for BYPASS = "yes" if supporting a SEN, RAU or SCC. (TGCs shown after EUB are duplicated with BYPASS = "no").

LARGE EXTENSION NODE SWITCH

TGCs 1 - 2 Normally not duplicated unless modified as a SEN, RAU, or SCC. If so, duplicate with BYPASS = "yes".

TGC 3 Always duplicated. Mark for BYPASS="yes" if active.

TGCs 32 - 35 Always duplicated with BYPASS = "yes".

TGCs 36 - 40 Always duplicated with BYPASS = "no".

Other TGCs Normally not duplicated unless modified as a SEN, RAU, or SCC. If so, duplicate with BYPASS = "yes".

Once all duplication has been completed a simple formula can check the status of your duplication. Complete the following to check your "dups":

1. Call distant switch and request operator to pull up a "DBR" screen for each switch containing your duplications (can be found by referring to DBD screen).
2. Pull up a "DDS" screen at your switch and record the amount of non-duplicated entries.
3. The number of non-duplicated entries should equal both DBR's + 2.

Formula:

Rec Rec
DBR NC1 **(____)** + DBR NC2 **(____) + 2 =** DDS non-duped**(____)**.

NOTE: There are some instances where this formula will not work. In most cases it will.

Reminders: When assigning duplication, check to make sure you receive a "STATUS 2" msg.

SECTION V. SWITCH RECOVERY PROCEDURES

1. PURPOSE: To coordinate actions necessary for recovering from unexpected failures (i.e. crashes) of NC/LEN switches. These procedures are written in a checklist format to ensure that each action is completed in the correct order.

2. PROCEDURES: These Switch Recovery procedures will be used in the event of <u>ANY</u> type of Switch failure. Responsibilities are outlined in the checklists.

3. REMINDERS: There are several points to keep in mind about switch recovery:

- Duplication and bypass must be completed to ensure successful EUB's.
- Constant checks of link quality and duplication maintenance is essential.
- ALD is only implemented in the event of ABR failures at the recipient switches.
- EUB will not always ensure non-disrupted service to users ever when proper procedures are followed, but is <u>the</u> proven technique to minimize the damage.
- In all cases when the switch is reinitialized the subscriber will not have to reaffiliate his phone.
- The Key question: Did ABR’s store?

4. NC/LEN Crash Recovery Checklist: The next 3 pages contains reproducible checklists for use in Switching Shelters, NMFs and BATCONs. It serves as a reminder of exactly what must be done, by whom, when a switch fails for any reason.

<u>SWITCH RECOVERY PROCEDURES (Operator)</u>

1. Save TTY Log (“save” on System Log Window)
   name file: (example; **NC03OCT29 or L16NOV03**)
2. Save Core Dump per TSOP procedures
3. Initiate EUB; Toggle up, press initiate, toggle down.
4. Contact Switches containing your duplication, request “ABR”.

NOTE: If ABR’s fail, “bump” TED’s at each end of link and retry ABR

a.) Request switch containing your operator DNVT perform “ABR” first (TGC 34)
b.) Contact second switch, perform “ABR”
c.) Provide accurate RFO to NMF for relay to BATCON
d.) Remind NMF to have Local RAU beacon turned off
e.) Once both ABR’s are successful, ensure all SEN and EUB “Y” local phones are working. (Note: If SEN phone is busy “bump” the TED on SEN DTG)

NOTE: If your unsure whether “ABR” was successful ask Receipient switch to check DTG for miscellaneous Terminal Types

5. If either ABR fails contact BATCON to request "ALD" Do not perform ALD until BATCON has given approval.

NOTE: If one or both ABR's failed ensure an ALD has been performed prior to reinitialization.

6. Restart SPU. Leave SPU running, awaiting reinitialization. (If theres a problem provide RFO)
7. Reinitailize switch when given approval by BATCON as follows.
   a.) Contact both receipient switches to ensure links are in sync
   b.) Call receipient switches to remind them to stay off their keyboards.
   c.) Perform switch initialization. (See note below)

NOTE: If not using autosave database load exercise database and perform mods if required.
Using off-line database you must "read" database, perform mods and "write" database then perform switch initialization.

8. Install links containing dupes prior to crash first.
9. Reduplicate
10. Check all SEN's and RAU's ("Bump" TED's when required)
11. Reinstall remaining links based on BATCON priority
12. Request SCC download of PCL, CDL and AZR. (RAU download and Bulk Transfer if required)
13. Remind NMF to have Local RAU beacon turned on.

NMF Responsibilities in the event of a Switch Failure

INIT

____ 1. Inform BATCON of Switch failure . Request ABRs at recipient Switches containing your duplication , only if Ops cannot contact recipient Switches.

____ 2. Contact Switch containing your Operator DNVT first.. Once ABRs are stored without any "Ramifications" your operator DNVT should work if EUB is successful. (Reminder: Bypassed phones work in some Switch failures, not all)

____ 3. If unable to contact recipient Switch 1, contact BATCON and have them contact Recipient Switches starting with duplicated link containing Ops DNVT first.

____ 4. Direct local and remote RAUs to shut off their beacons. Try to reestablish MSRT affiliation. (If not already affiliated of another NCs RAU)

____ 5. If ABR's fail. Make sure BATCON has requested ALD.

____ 6. Check your Switch status to see if it is recovered to the point of AOD 91.

____ 7. Ensure all required database modifications have been performed.

____ 8. Once all dbase mods are finished and your switch is ready to perform AOD 91 inform BATCON that you are ready to complete Switch initialization and fully recover your Switch.

____ 9. When BATCON gives you approval to Recover you must recover links which were bypassed first. BATCON should give you your link priorities from then on. (Reminder: Duplication must also be a priority)

____ 10. Once all links have been recovered make sure there was no loss of phone numbers during the Switch failure.

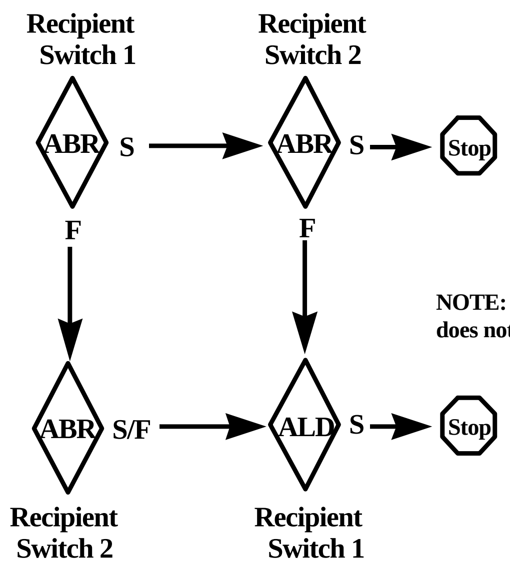
____ 11. Request SCC download.

____ 12. Complete necessary reports on Switch failure and send to BATCON. An accurate description of the Switch failure is very important to afford proper diagnosis of software and hardware problems.

BATCON Responsibilities in event of Switch Failure

1. In the event of a Switch failure BATCON should only monitor the failure unless the downed Switch cannot contact the recipient Switches.
2. If requested by the failed Switch immediately request an ABR at the Switches requested by failed Switch. Make sure ABR is successful at each recipient Switch.

Use the following flowchart for conducting ABR's and ALD.



S= Successful

F= Failed

NOTE: If an ALD fails make sure failed NC does not have any links in service.

3. Notify SYSCON of Switch failure with initial RFO if available.
4. Once the ABR's or ALD have been accomplished. Diagnosis and repair of fault should be performed.
5. Test Phones and packet while in EUB. All phones profiled for bypass should work while in EUB. All SEN/RAU subscribers should also work.
6. Make sure failed switch has performed any required database modifications and saved them to load disk prior to reinitialization.
7. Once the failed Switch is up to AOD 91. DO NOT PERFORM AOD 91 until you are confident Switch is functional . Once you give approval for Switch to perform AOD 91 and AOD 99 all users will lose phone service until the two bypassed links are reestablished. They must be the first links brought in. After the bypassed links are brought in you must establish priority of links based on user requirements. Reduplication must also be accomplished as soon as possible. If establishing links takes too long, make sure you have the Switch pause to perform duplication.
8. Make sure NC has requested SCC download.
9. Complete RFO reports to SYSCON.

NOTE: If unforeseen problems occur, during any of the above steps , please contact SIB for assistance. (5570151/52).

SECTION VI: NMF INITIALIZATION PROCEDURES

1. PURPOSE. To establish standard procedures for initializing the Node Management Facility workstation.

2. NMF ENHANCEMENTS. The CSR/ESOP hardware and software upgrades brings several completely new capabilities to the NMF: the ability to communicate with other MSE elements (including SCC/SYSCON) via the Tactical Packet Network (TPN), and the ability to view the switch's database in real time and to analyze switch online history in order to address problems at the local level or refer them to a higher level of management.

3. PROCEDURES. A LAN cable must be ran from the NC and connected to the NMF, for TPN configurations see current OPORD. The main menu of the NMF includes the SCC2 phone numbers. They must be input properly for technical and operational messages to be sent from the NMF to the SCC. The following numbers will be used:

a. 32d, 17th and 440th:

* NC/LEN TEAM LABEL _XX
** NC/LEN DTA DIR NUMBER
SCC C&C DIR NUMBER 5508506
SCC COMSEC DIR NUMBER 5508507
SCC RAU/MSRT DIR NUMBER 5508508
AUTHORIZATION CODE 00XX (FOR NCS)
11XX (FOR LENS)

b. 141st Sig Bn:

* NC/LEN TEAM LABEL _XX
** NC/LEN DTA DIR NUMBER
SCC C&C DIR NUMBER 5508606
SCC COMSEC DIR NUMBER 5508607
SCC RAU/MSRT DIR NUMBER 5508608
AUTHORIZATION CODE 00XX (FOR NCS)
11XX (FOR LENS)

c. 121st Sig Bn:

* NC/LEN TEAM LABEL _XX
** NC/LEN DTA DIR NUMBER
SCC C&C DIR NUMBER 5508706
SCC COMSEC DIR NUMBER 5508707
SCC RAU/MSRT DIR NUMBER 5508708
AUTHORIZATION CODE 00XX (FOR NCS)

11XX   (FOR LENS)

XX = TEAM LABEL

* There must be a space before the team label on this line.
** This must be the NCS DTA number.

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
WIRELINE																		
1	3	1	P	F	V	N	N	Y	Y	Y	Y	0	0	1	0	2	27	3
2	3	1	P	I	V	N	N	Y	N	N	N	0	0	1	0	2	27	3
3	3	1	P	I	V	N	N	Y	Y	Y	Y	0	1	1	0	2	27	3
4	3	2	P	P	V	N	N	Y	Y	Y	Y	0	2	1	0	2	27	3
5	3	3	P	R	V	N	N	Y	N	N	N	0	4	1	0	2	27	3
6	3	3	P	R	V	N	N	Y	Y	Y	N	0	4	1	0	2	27	3
7	3	1	P	**FO**	V	N	N	Y	Y	Y	Y	1	0	1	0	2	27	3
8	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	1	0	2	27	3
9	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	1	0	2	27	3
10	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	1	0	2	27	3
11	3	2	P	P	V	N	N	Y	Y	Y	Y	1	2	1	0	2	27	3
12	3	2	P	R	V	N	N	Y	Y	Y	Y	1	4	1	0	2	27	3
13	3	3	P	R	V	N	N	Y	N	N	N	1	4	1	0	2	27	3
14	3	3	P	R	V	N	N	Y	Y	Y	N	1	4	1	0	2	27	3
15	3	5	P	R	V	N	N	Y	Y	N	N	1	5	1	0	2	27	3
16	3	1	P	**FO**	V	N	N	Y	Y	Y	Y	2	0	1	0	2	27	3
17	3	1	P	F	V	N	N	Y	Y	Y	Y	2	0	1	0	2	27	3
18	3	1	P	I	V	N	N	Y	Y	Y	Y	2	1	1	0	2	27	3
19	3	1	P	P	V	N	N	Y	Y	Y	Y	2	2	1	0	2	27	3
20	3	2	P	P	V	N	N	Y	Y	Y	Y	2	2	1	0	2	27	3
21	3	2	P	R	V	N	N	Y	Y	Y	Y	2	4	1	0	2	27	3
22	3	3	P	R	V	N	N	Y	N	N	N	2	4	1	0	2	27	3
23	3	3	P	R	V	N	N	Y	Y	Y	N	2	4	1	0	2	27	3
24	3	5	P	R	V	N	N	Y	Y	N	N	2	5	1	0	2	27	3
25	3	1	P	F	V	N	N	Y	Y	Y	Y	3	0	1	0	2	27	3
26	3	1	P	I	V	N	N	Y	Y	Y	Y	3	1	1	0	2	27	3

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
27	3	2	P	P	V	N	N	Y	Y	Y	Y	3	2	1	0	2	27	3
28	3	3	P	R	V	N	N	Y	N	N	N	3	4	1	0	2	27	3
29	3	3	P	R	V	N	N	Y	Y	Y	N	3	4	1	0	2	27	3
30	3	1	P	F	V	N	N	Y	Y	Y	Y	4	0	1	0	2	27	3
31	3	1	P	I	V	N	N	Y	Y	Y	Y	4	1	1	0	2	27	3
32	3	2	P	P	V	N	N	Y	Y	Y	Y	4	2	1	0	2	27	3
33	3	3	P	R	V	N	N	Y	N	N	N	4	4	1	0	2	27	3
34	3	3	P	R	V	N	N	Y	Y	Y	N	4	4	1	0	2	27	3
35	3	1	P	F	V	N	N	Y	Y	Y	Y	5	0	1	0	2	27	3
36	3	1	P	I	V	N	N	Y	Y	Y	Y	5	1	1	0	2	27	3
37	3	2	P	P	V	N	N	Y	Y	Y	Y	5	2	1	0	2	27	3
38	3	3	P	R	V	N	N	Y	N	N	N	5	4	1	0	2	27	3
39	3	3	P	R	V	N	N	Y	Y	Y	N	5	4	1	0	2	27	3
NRI																		
40	3	2	P	I	V	N	Y	N	N	N	N	0	0	1	0	2	27	3
AF PACKET																		
41	3	1	P	F	M	N	N	N	N	N	Y	0	0	1	0	2	27	3
DATA/VOICE																		
42	3	1	P	**FO**	M	Y	**N**	N	N	N	Y	0	0	1	0	2	27	3
43	3	1	P	F	M	Y	**N**	N	N	N	Y	0	0	1	0	2	27	3
44	3	1	P	F	M	Y	**N**	N	N	N	N	0	1	1	0	2	27	3
45	3	2	P	F	M	Y	**N**	N	N	N	Y	0	6	1	0	2	27	3
46	3	1	P	I	M	Y	**N**	N	N	N	Y	0	1	1	0	2	27	3
47	3	1	P	I	M	Y	**N**	N	N	N	Y	0	6	1	0	2	27	3
48	3	2	P	I	M	Y	**N**	N	N	N	Y	0	6	1	0	2	27	3
49	3	1	P	P	M	Y	**N**	N	N	N	Y	0	2	1	0	2	27	3
50	3	1	P	P	M	Y	**N**	N	N	N	Y	0	6	1	0	2	27	3
51	3	3	P	P	M	Y	**N**	N	N	N	Y	0	6	1	0	2	27	3

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
52	3	2	P	R	M	Y	**N**	N	N	N	N	0	4	1	0	2	27	3
53	3	3	P	R	M	Y	**N**	N	N	N	N	0	6	1	0	2	27	3
54	3	5	P	R	M	Y	**N**	N	N	N	N	0	6	1	0	2	27	3
DATA ONLY															0			
55	3	1	P	**FO**	D	N	N	N	N	N	Y	0	0	1	0	2	27	3
56	3	1	P	F	D	N	N	N	N	N	Y	0	0	1	0	2	27	3
57	3	1	P	I	D	N	N	N	N	N	Y	0	1	1	0	2	27	3
58	3	3	P	P	D	N	N	N	N	N	Y	0	2	1	0	2	27	3
59	3	4	P	R	D	N	N	N	N	N	N	0	4	1	0	2	27	3
DAS																		
60	3	1	P	F	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
61	3	1	P	I	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
62	3	1	P	P	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
63	3	1	R	F	M	N	N	N	N	N	Y	0	0	1	1	2	27	3
64	3	1	R	I	M	N	N	N	N	N	Y	0	0	1	1	2	27	3
65	3	1	R	P	M	N	N	N	N	N	Y	0	0	1	1	2	27	3
66	3	1	R	F	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
67	3	1	R	I	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
68	3	1	R	P	V	N	N	N	N	N	Y	0	0	1	1	2	27	3
TS																		
69	3	1	E	F	V	N	N	Y	Y	N	Y	1	0	1	0	2	27	3
70	3	1	E	I	V	N	N	Y	Y	N	Y	1	1	1	0	2	27	3
71	3	1	E	P	V	N	N	Y	Y	N	Y	1	3	1	0	2	27	3
72	3	1	E	I	M	Y	N	N	N	N	Y	0	1	1	0	2	27	3
73	3	1	E	P	M	Y	N	N	N	N	Y	0	2	1	0	2	27	3
74	3	1	E	I	M	Y	N	N	N	N	N	1	0	1	0	2	27	3
74	3	1	E	I	M	Y	N	N	N	N	N	1	0	1	0	2	27	3
76	3	2	E	P	M	Y	N	N	N	N	Y	1	2	1	0	2	27	3

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
77	3	1	E	I	M	Y	N	N	N	N	Y	2	1	1	0	2	27	3
78	3	2	E	P	M	Y	N	N	N	N	Y	2	2	1	0	2	27	3
79	3	1	E	I	D	N	N	N	N	N	Y	0	2	1	0	2	27	3
80	3	1	E	P	D	N	N	N	N	N	Y	0	4	1	0	2	27	3
MOBILE CD																		
81	3	1	P	**FO**	V	N	N	Y	Y	Y	Y	1	0	2	0	2	27	4
82	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	2	0	2	27	4
83	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	2	0	2	27	4
84	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	3	0	2	27	5
85	3	2	P	R	V	N	N	Y	Y	Y	Y	1	4	4	0	2	27	6
86	3	5	P	R	V	N	N	Y	Y	N	N	1	5	5	0	2	27	7
87	3	1	P	F	V	N	N	Y	Y	Y	Y	2	0	2	0	2	27	4
88	3	1	P	I	V	N	N	Y	Y	Y	Y	2	1	2	0	2	27	4
89	3	1	P	P	V	N	N	Y	Y	Y	Y	2	2	6	0	2	27	8
90	3	2	P	R	V	N	N	Y	Y	Y	Y	2	4	7	0	2	27	9
91	3	5	P	R	V	N	N	Y	Y	N	N	2	5	8	0	2	27	10
92	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	9	0	2	27	11
93	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	9	0	2	27	11
94	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	9	0	2	27	11
95	3	5	P	R	V	N	N	Y	Y	N	N	1	5	9	0	2	27	11
96	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	10	0	2	27	12
97	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	10	0	2	27	12
98	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	10	0	2	27	12
99	3	5	P	R	V	N	N	Y	Y	N	N	1	5	10	0	2	27	12
100	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	11	0	2	27	13
101	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	11	0	2	27	13
102	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	11	0	2	27	13
103	3	5	P	R	V	N	N	Y	Y	N	N	1	5	11	0	2	27	13

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
104	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	12	0	2	27	14
105	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	12	0	2	27	14
106	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	12	0	2	27	14
107	3	5	P	R	V	N	N	Y	Y	N	N	1	5	12	0	2	27	14
108	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	13	0	2	27	15
109	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	13	0	2	27	15
110	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	13	0	2	27	15
111	3	5	P	R	V	N	N	Y	Y	N	N	1	5	13	0	2	27	15
112	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	14	0	2	27	16
113	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	14	0	2	27	16
114	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	14	0	2	27	16
115	3	5	P	R	V	N	N	Y	Y	N	N	1	5	14	0	2	27	16
116	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	15	0	2	27	17
117	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	15	0	2	27	17
118	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	15	0	2	27	17
119	3	5	P	R	V	N	N	Y	Y	N	N	1	5	15	0	2	27	17
120	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	16	0	2	27	18
121	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	16	0	2	27	18
122	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	16	0	2	27	18
123	3	5	P	R	V	N	N	Y	Y	N	N	1	5	16	0	2	27	18
124	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	17	0	2	27	19
125	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	17	0	2	27	19
126	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	17	0	2	27	19
127	3	5	P	R	V	N	N	Y	Y	N	N	1	5	17	0	2	27	19
128	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	18	0	2	27	20
129	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	18	0	2	27	20
130	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	18	0	2	27	20
131	3	5	P	R	V	N	N	Y	Y	N	N	1	5	18	0	2	27	20

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
132	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	19	0	2	27	21
133	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	19	0	2	27	21
134	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	19	0	2	27	21
135	3	5	P	R	V	N	N	Y	Y	N	N	1	5	19	0	2	27	21
136	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	20	0	2	27	22
137	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	20	0	2	27	22
138	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	20	0	2	27	22
139	3	5	P	R	V	N	N	Y	Y	N	N	1	5	20	0	2	27	22
140	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	21	0	2	27	23
141	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	21	0	2	27	23
142	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	21	0	2	27	23
143	3	5	P	R	V	N	N	Y	Y	N	N	1	5	21	0	2	27	23
144	3	1	P	F	V	N	N	Y	Y	Y	Y	1	0	22	0	2	27	24
145	3	1	P	I	V	N	N	Y	Y	Y	Y	1	1	22	0	2	27	24
146	3	1	P	P	V	N	N	Y	Y	Y	Y	1	2	22	0	2	27	24
147	3	5	P	R	V	N	N	Y	Y	N	N	1	5	22	0	2	27	24
148	3	2	P	F	M	Y	N	N	N	N	Y	0	6	23	0	2	27	25
149	3	2	P	I	M	Y	N	N	N	N	Y	0	6	23	0	2	27	25
150	3	3	P	P	M	Y	N	N	N	N	Y	0	6	23	0	2	27	25
151	3	3	P	R	M	Y	N	N	N	N	N	0	6	23	0	2	27	25
DNVT DAS																		
152	13	1	N	I	V	N	N	N	N	N	Y	0	0		1			N
153	13	2	N	P	V	N	N	N	N	N	Y	0	0		1			N
154	13	3	N	R	V	N	N	N	N	N	N	0	0		1			N
155	13	1	P	F	M	N	N	N	N	N	Y	0	0		1			N
156	13	1	P	I	M	N	N	N	N	N	Y	0	1		1			N
157	13	1	P	P	M	N	N	N	N	N	Y	0	3		1			N
158	13	1	P	F	V	N	N	N	N	N	Y	0	0		1			N

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
159	13	1	P	I	V	N	N	N	N	N	Y	0	0		1			N
160	13	1	P	P	V	N	N	N	N	N	Y	0	0		1			N
DNVTs																		
161	13	1	N	**FO**	V	N	N	Y	Y	Y	Y	1	0		0			N
162	13	1	N	F	V	N	N	Y	Y	Y	Y	1	0		0			N
163	13	1	N	I	V	N	N	Y	Y	Y	Y	2	1		0			N
164	13	2	N	P	V	N	N	Y	Y	Y	Y	3	2		0			N
165	13	3	N	P	V	N	N	N	N	N	Y	3	2		0			N
166	13	4	N	R	V	N	N	N	N	N	N	3	3		0			N
167	13	3	N	R	V	N	N	N	N	N	N	4	3		0			N
168	13	3	N	R	V	N	N	Y	N	Y	N	4	4		0			N
169	13	4	N	R	V	N	N	N	N	N	N	4	3		0			N
170	13	5	N	R	V	N	N	Y	N	N	N	4	3		0			N
171	13	1	P	F	V	N	N	Y	Y	Y	Y	0	0		0			N
172	13	1	P	I	V	N	N	Y	Y	Y	Y	0	1		0			N
173	13	1	P	P	V	N	N	Y	Y	Y	N	0	3		0			N
174	13	1	P	P	V	N	N	Y	Y	Y	Y	0	3		0			N
175	13	2	P	R	V	N	N	N	N	N	N	0	1		0			N
176	13	2	P	R	V	N	N	N	N	N	N	0	2		0			N
177	13	4	P	R	V	N	N	N	N	N	N	0	0		0			N
178	13	4	P	R	V	N	N	N	N	N	N	0	1		0			N
179	13	4	P	R	V	N	N	N	N	N	N	0	2		0			N
180	13	4	P	R	V	N	N	N	N	N	N	0	2		1			N
181	13	4	P	R	V	N	N	N	N	N	N	0	2		2			N
182	13	1	P	**FO**	V	N	N	Y	Y	Y	Y	1	0		0			N
183	13	1	P	F	V	N	N	Y	Y	Y	Y	1	0		0			N
184	13	1	P	I	V	N	N	Y	Y	Y	Y	1	1		0			N
185	13	1	P	P	V	N	N	Y	Y	Y	Y	1	2		0			N

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
186	13	1	P	P	V	N	N	Y	Y	N	Y	1	3		0			N
187	13	1	P	P	V	N	N	Y	Y	Y	N	1	3		0			N
188	13	1	P	P	V	N	N	Y	Y	Y	Y	1	3		0			N
189	13	1	P	R	V	N	N	Y	Y	Y	N	1	4		0			N
190	13	2	P	R	V	N	N	Y	Y	Y	Y	1	4		0			N
191	13	5	P	R	V	N	N	Y	Y	N	N	1	5		0			N
192	13	1	P	**FO**	V	N	N	Y	Y	Y	Y	2	0		0			N
193	13	1	P	F	V	N	N	Y	Y	Y	Y	2	0		0			N
194	13	1	P	I	V	N	N	Y	Y	Y	Y	2	1		0			N
195	13	1	P	P	V	N	N	Y	Y	Y	Y	2	2		0			N
196	13	1	P	P	V	N	N	Y	Y	N	Y	2	3		0			N
197	13	1	P	P	V	N	N	Y	Y	Y	N	2	3		0			N
198	13	1	P	P	V	N	N	Y	Y	Y	Y	2	3		0			N
199	13	2	P	R	V	N	N	Y	N	Y	N	2	4		0			N
200	13	3	P	R	V	N	N	Y	Y	Y	N	2	4		0			N
201	13	5	P	R	V	N	N	Y	N	N	N	2	5		0			N
202	13	1	P	F	V	N	N	Y	Y	Y	Y	3	0		0			N
203	13	1	P	I	V	N	N	Y	Y	Y	Y	3	1		0			N
204	13	1	P	P	V	N	N	Y	Y	Y	N	3	3		0			N
205	13	1	P	P	V	N	N	Y	Y	Y	Y	3	3		0			N
206	13	3	P	R	V	N	N	Y	Y	Y	N	3	4		0			N
DNVT VOICE/DATA																		
207	13	1	P	**FO**	M	Y	N	N	N	N	Y	0	0		0			N
208	13	1	P	F	M	Y	N	N	N	N	Y	0	0		0			N
209	13	2	P	F	M	N	N	N	N	N	Y	0	6		0			N
210	13	1	P	I	M	Y	N	N	N	N	Y	0	1		0			N
211	13	2	P	I	M	N	N	N	N	N	Y	0	6		0			N
212	13	1	P	P	M	Y	N	N	N	N	Y	0	3		0			N

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
213	13	3	P	P	M	N	N	N	N	N	Y	0	6		0			N
214	13	1	P	R	M	Y	N	N	N	N	N	0	4		0			N
215	13	2	P	R	M	Y	N	N	N	N	N	0	1		0			N
216	13	2	P	R	M	Y	N	N	N	N	N	0	2		0			N
217	13	2	P	R	M	Y	N	N	N	N	N	0	4		0			N
218	13	2	P	R	M	Y	N	N	N	N	N	0	5		0			N
219	13	3	P	R	M	Y	N	N	N	N	N	0	4		0			N
220	13	3	P	R	M	N	N	N	N	N	N	0	6		0			N
221	13	4	P	R	M	Y	N	N	N	N	N	0	1		0			N
222	13	4	P	R	M	Y	N	N	N	N	N	0	2		0			N
223	13	4	P	R	M	Y	N	N	N	N	N	0	5		0			N
DNVTs																		
224	13	1	R	**FO**	V	N	N	Y	Y	N	Y	1	0		0			N
225	13	1	R	F	V	N	N	Y	Y	N	Y	1	1		0			N
226	13	1	R	I	V	N	N	Y	Y	N	Y	1	1		0			N
227	13	1	R	P	V	N	N	Y	Y	N	Y	1	1		0			N
228	13	1	R	R	V	N	N	Y	Y	N	Y	1	1		0			N
229	13	2	R	R	V	N	N	N	N	N	N	1	3		0			N
230	13	1	R	F	V	N	N	Y	Y	N	Y	2	1		0			N
231	13	1	R	I	V	N	N	Y	Y	N	Y	2	1		0			N
232	13	1	R	P	V	N	N	Y	Y	N	Y	2	1		0			N
233	13	1	R	F	M	N	N	N	N	N	Y	0	6		0			N
234	13	2	R	I	M	N	N	N	N	N	Y	0	6		0			N
235	13	3	R	P	M	N	N	N	N	N	Y	0	6		0			N
236	13	3	R	R	M	N	N	N	N	N	N	0	6		0			N
237	15	1	P	**FO**	D	N	N	N	N	N	Y	0	0		0			N
238	16	1	P	**FO**	M	N	N	N	N	N	Y	0	0		0			N

PROFILE NO	TERM TYPE	TRAFF CONT LEV	SEC LEVEL	MAX PRECEDENCE	TERM CHAR	MS COMPATABLE	NRI	PROG CONF	CALL FORWARD	COMCL NETWORK	ESSENTIAL USER	COMP DIAL	ZONE REST	REKEY ID	DIRECT ACCESS	NET ID A	NET ID B	U KEY
ANALOG																		
239	248	1	N	**FO**	V	N	N	Y	Y	Y	N	1	0		0			N
240	248	1	N	F	V	N	N	Y	Y	Y	N	1	0		0			N
241	248	1	N	I	V	N	N	Y	Y	Y	N	1	0		0			N
242	248	1	N	I	V	N	N	N	N	N	N	1	1		0			N
243	248	1	N	P	V	N	N	Y	Y	Y	N	1	0		0			N
244	248	1	N	P	V	N	N	N	N	N	N	1	3		0			N
245	248	5	N	R	V	N	N	N	N	N	N	1	5		0			N
246	248	1	N	F	V	N	N	Y	Y	Y	N	2	0		0			N
247	248	1	N	I	V	N	N	Y	Y	Y	N	2	0		0			N
248	248	1	N	I	V	N	N	N	N	N	N	2	1		0			N
249	248	1	N	I	V	N	N	N	N	Y	N	2	1		0			N
250	248	1	N	P	V	N	N	Y	Y	Y	N	2	0		0			N
251	248	1	N	P	V	N	N	N	N	N	N	2	3		0			N
252	248	1	N	P	V	N	N	N	N	Y	N	2	3		0			N
253	248	2	N	R	V	N	N	Y	Y	Y	N	2	0		0			N
254	248	5	N	R	V	N	N	N	N	N	N	2	5		0			N
255	248	5	N	R	V	N	N	N	N	Y	N	2	5		0			N

CHAPTER 3

SEN/RAU/LTU TECHNICAL PROCEDURES

SECTION I. SEN QUICK REFERENCE COMMANDS

1. Each command is in the format: command designator + parameters required + command delimiter

For example: FO + 26 + LNXXXXXTT + R.

2. Command Designators:

FO	Enters data into the database
F	Verifies data in database
I	Deletes individual data items from database
P	Erases all entries of a data designator from database

3. Commonly used data designators and their functions:

00	Password Table FO-3614-R
04	Direct Access Table FO-04-LNXXXXX-TT-R
05	Call Forwarding Table FO-05-LNXXXXXLNXXXXX-R
07	Out of Service Terminals FO-07-TT-R
10	Diagnostic Tests Table FO-10-12-TT-R
22	Re-Key Identifier Table FO-22-TT-R
26	Affiliation Table FO-26-LNXXXXX-TT-R
99	Signoff FO-99-R

4. "Parameters required" usually mean a directory number and/or terminal address; refer to TM 11-5805-772-12.

5. The command delimiter is ALWAYS "R".

SECTION II. SEN DCO TERMINATION

1. Terminals 29 and 30 are the DCO trunks on the master board in the SEN switching shelter.

2. Run wireline from the DCO drop to the SEN Signal Entry Panel.

3. Ensure a TYPE V card is inserted into slot A42. Both S1 and S2 switches on the card should be to the left ("DC CLOSURE ").

4. Test DCO trunks by pressing "5C" on the DNVT; DCO terminals should light up and dial tone should be heard on operator's DNVT.

5. Outgoing DCO: Press re-entry and then "5C"; you should hear dial tone. Dial the MSE number, and once a ring has been established, press Operator Release.

6. Incoming DCO: Press re-entry; operator should hear dial tone. Dial the MSE number and once ring has been established, press Operator Release.

7. If only one DCO drop is to be installed, delete the other terminal (FO + 07 + Terminal # + R + Clear).

NOTE: Whenever you make a change to the database, ensure that the switch on the master board is placed to program, and then enter the password.

8. <u>IMPORTANT:</u> If no DCO drops are installed, delete terminals 29 and 30 per paragraph 7 above. Otherwise when our customers dial 5C they will not be able to search the network for another SEN that has DCO drops.

9. Ensure supporting NCS has programmed the proper gateway information (AGC).

SECTION IIa. ADDING ADDITIONAL DCO LINES

1. Purpose: To add additional DCO lines to a SEN.

2. Execute the following procedures.

    a. Replace a Type VII card with a Type V card.
    b. Enter the following command to tell the SB that you now have a Type V card in the slot. FO 06 TT 000032 000 000 R (TT = 01 - 60)
    c. Repeat for other terminals as needed.
    d. Enter FO 08 TT 11 R. This adds the new terminals to the Trunk Hunting Group with the other DCO Lines. (NOTE: 5 terminals are the maximum that can be entered in this group).
    e. Repeat for all new DCO lines.

Test setup by dialing 5C. The SB should access terminal 29. Hang up and dial 5C again. Each time you dial 5C, the switch should go to the next DCO terminal in the group.

To undo, re-install the Type VII card and enter FO 06 TT 49 000 000 000 000 R and I 08 TT R for each terminal.

SECTION III. RAU QUICK REFERENCE COMMANDS

AFFILIATE a DSVT: 8 + R + Personal Code + Directory Number

ACTIVATE FREQUENCY PLAN: 8 + FO + NN + P1 through P4, where NN = the frequency plan number, and P1 - P4 are subplan numbers.

CHECK FREQUENCY PLAN (INTERROGATE THE GLU): 8 + I + NN + R, where NN = the frequency plan number. If the GLU light flashes, the plan is active. If the GLU light remains solid, it's a reserve plan. If no GLU light comes on, the frequency plan is not loaded.

DELETE FREQUENCY PLAN: 8 + C + F + R

DOWNLOAD A FREQUENCY PLAN FROM RAU to MSRT: 8 + C + F + R on the DSVT; then 8 + NN + R, where NN is the plan number.

MANUALLY LOAD A FREQ PLAN INTO GLU:

1. 8 + C + F + R to clear old frequency plan.
2. 8 + NN + LB1 + UB1 + R, where NN = the plan number, LB1 = a low band frequency, and UB1 = a high band frequency. Add low band and high band freqs until the plan is complete.

CONVERT FREQS INTO CHANNELS FOR MANUAL LOAD:
30 MHz = 0000, and every 25 KHz = one channel. Therefore, freq 30.100 = channel 0004. Best to refer to MSE Apps conversion program or RAU TM.

LOAD THE M KEY INTO RT-1539:

1. Attach the KYK-13 to the fill position on the RT. Use a fill cable to avoid stripping the connectors. Set to M Key position and turn on.
2. Toggle the RT selector switch to the load position four times. The crypto light goes out after the fourth toggle.

LOAD THE U KEY INTO THE DSVT:

1. Turn the functions switch on the DSVT to DSBL position and toggle the selector switch to ZERO.
2. Attach the KYK-13 (via fill cable) to DSVT. Set the KYK-13 to the U Key position and turn on. Set function switch to LOAD and listen for two beeps.

LOAD THE M KEY INTO DSVT:

1. Connect the KYK-13 to DSVT via fill cable; set to M position and turn on.
2. Set the DSVT function switch to LDX. Toggle the DSVT selector switch to LOAD and listen for two beeps.

SECTION IV. RAU DOWNLOADS

1. PURPOSE: This section establishes procedures for conducting RAU frequency plans downloads in accordance with the "filling station" concept.

2. THE THREE-PHASE "FILLING STATION" CONCEPT.

a. PHASE I - GENERATE and DOWNLOAD Signal Battalion RAUs.

1) First, the Corps SCC will generate a frequency plan for the maneuver. Once generated, it must be downloaded into RAUs for further distribution.

2) The Brigade S3 coordinates a date and place for this first phase to occur. Each Corps and Division signal battalion is tasked to provide one RAU to receive the download on that date. One of the battalions will also be tasked to provide a node center switch to interface with the SCC and facilitate the downloads.

3) The Signal Battalions are responsible for downloading their integral MSRT assets with the frequency plans prior to deployment.

NOTE: No more than one RAU per battalion will be downloaded during this phase. This is enough to download the signal battalion MSRTs and to meet any tasking requirements during Phase II of this process. The remaining RAUs will be downloaded by the SCC once deployed.

b. PHASE II - DOWNLOAD UNIT BSOs.

1) The Corps or Division G6 is responsible for setting up the "filling station", when and where the unit BSOs can be downloaded with the frequency plans. The G6 must coordinate with the Signal Brigade (at the Corps level) or the Signal Battalion (at Division level) to provide a RAU or MSRT to perform the downloads, and then notify the BSOs.

2) The unit BSOs are responsible for bringing their MSRT and fill cable to receive the download at the appointed place and time.

c. PHASE III - DISTRIBUTION TO SUBSCRIBERS. The BSOs will in turn coordinate a filling station, using their own MSRTs, to download their unit subscribers.

3. NOTES:

- Each Div SCC must be downloaded, not there RAUs. They do their own RAU downloads.
- This will be exercise specific and spelled out in taskings.

a. Signal Battalions should NOT send more than the requested number of RAUs (one per battalion) during Phase I. First, numerous RAUs slow down the process and keep our assets tied up much longer than we would like. Second, each RAU will receive a download after deployment, to ensure that the RAU is operating on the correct plan and to verify his GLU affiliation and operation.

b. Manual entry of frequency plans should be avoided, due to the margin for error, unless otherwise directed by the Brigade SYSCON. The only time manual entry will be approved is when there is no SCC in the network to download RAU's.

c. Unit BSOs should make every effort to personally attend the filling station and receive the download. Not only does this give him an opportunity to check out his equipment, but it also provides a refresher on user training, which can be important, especially to new BSOs. In addition, the filling station provides the BSO an opportunity to re-establish face-to-face contacts with the signal unit prior to deployment.

Frequently Asked Questions:

1. Q. Can a RAU download another RAU?
   A: No. The following is the minimum network required to perform a download:

   SCC —— NC —— RAU

2. Q. How often does the frequency plan change?
   A. In central Germany, not very often. Changes are directed by the Brigade S-3.

3. Q. Is the RAU frequency plan classified?
   A. It depends on the actual frequencies and where we are deployed. Normally the plan used during Corps and Division exercises in Central Germany is UNCLASSIFIED.

4. Q. Should RAU's zeroize the freq plan after re-deploying from a exercise?
   A. This will be dictated by the Brigade S-3. If the current plan will be reused, RAUs and MSRTs should keep the freq plan, to make garrison training easier and to avoid having to call for an SCC for a new download.

SECTION V. COMMUNICATIONS MODEM SETTINGS

1. PURPOSE: This section establishes standardized and proper Communications Modem settings for all MSE equipment usage .

2. The following charts depect proper settings.

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
		NORM	NORM		
	OPER	ALT		GMRCLK	
		NORM			
SEN (V) 1,		ALT	ALT	TED RED	GM
SEN (V) 2		NORM	NORM		
	ES LPBK	ALT			
		NORM			
		ALT	ALT		GM
BITE - 2		NORM	NORM	Master	
Thumbwheel: 7	LS LPBK	ALT			
		NORM			
		ALT	ALT		GM
Card Set: -17		NORM	NORM		
	DVOW	ALT		GMRCLK	
		NORM			
		ALT	ALT	TED RED	
Functions:		NORM	NORM		GM & Mux
DVOW & GM, &	BRIDGE	ALT		GMRCLK	
Mux (4 LTUs)		NORM			
		ALT	ALT	TED RED	
		NORM	NORM		
	OPER	ALT		GMRCLK	
		NORM			
RAU,		ALT	ALT		
DES		NORM	NORM		
	ES LPBK	ALT			
		NORM			
		ALT	ALT		
BITE - 2		NORM	NORM	MASTER	
Thumbwheel: 6	LS LPBK	ALT			
		NORM			
		ALT	ALT		
Card Set: -16		NORM	NORM		
	DVOW	ALT			
		NORM			
		ALT	ALT		
Functions:		NORM	NORM	GMRCLK	GM & Mux
DVOW & GM, &	BRIDGE	ALT			
Mux (3 LTUs)		NORM			
		ALT	ALT		

SECTION VI. LTU PROCEDURES

1. PURPOSE: The section provides Line Termination Unit (LTU) Functional Description.

2. INSTALLATION: See Interface chapter and current OPORD.

Digital Line Termination Units (DLTUs).
Nine of the 21 CCA slots in the LTU are assigned to DLTUs. There are seven types of DLTUs that can be placed in the 9 CCA slots, with certain placement rules applying. The seven DLTU types are as follows:

DLPMA The Diphase Loop Modem-A is a CCA that provides up to four single-channel conditioned Diphase interfaces and phantom loop power to Digital Subscriber Voice Terminals (DSVTs) and or Digital Nonsecure Voice Terminals (DNVTs).

EMLTU The E&M Line Termination Unit is a CCA that provides up to two standard Type I E&M interfaces, whereby trunk signaling is accomplished by signaling lines separate from the voice paths.

MFLTU The Multifrequency Line Termination Unit is a CCA that provides up to two termination's which employ single-frequency (SF) supervision and either multifrequency (MF), dual-tone multi-frequency (DTMF), or Dial Pulse (DP) signaling.

4WLTU The 4-Wire Line Termination Unit is a CCA that provides up to four 4-wire analog interfaces.

2WLTU The 2-Wire Line Termination Unit is a CCA that provides up to four 2-wire analog interfaces. Use of the 2WLTU in the Line Termination Unit requires that the 20-Hz Generator card set be installed as specified in paragraph 1-9.8.

TCLTU The Twenty Hertz Contact Closure Line Termination Unit is a CCA that provides up to two 2-wire DC Closure/20-Hz Ringdown supervised analog interfaces. Use of the TCLTU in the Line Termination Unit requires that the 20-Hz Generator card set be installed (unless only Line type 44 is to be supported) .

NILTU The NATO interface Line Termination Unit is a CCA that provides up to two single-channel NATO loop interfaces. Use of the NILTU CCA in the Line Termination Unit requires that a NATO Crossover Cable, SM-DS11745 be connected to the far end of the 26-pair loop cable, SM-D-81 1235.

Loop Multiplexer/Demultiplexer (LMD).

The LMD (MXDMX CCA) uses time division multiplexing to interleave 8, 9, 16, 18, 32, or 36 channel groups into a single data stream. It also performs the reverse function of demultiplexing a data stream.

Transmission Group Module/Orderwire (TGMOW).

The TGMOW CCA contains a transmission group module (TGM) circuit and an engineering orderwire signal processor (EOWSP) circuit. The TGM provides time buffering and frame synchronization for the multiplexed bit stream. It also provides an external balanced NRZ baseband signal for use in cryptographic or other terminal equipment. The EOWSP combines and conditions the order wire are received from the Digital Voice Order wire CCA and forwards the data to the Group Modem to be superimposed on the line side group signal.

Group Modem (GM).

The GM CCA receives equipment-side multiplexed data and clock, modulates it to a conditioned Diphase or dipulse group signal, and performs the reverse function. It also receives Order Wire data from the engineering orderwire signal processor and superimposes the data on the line-side group signal. The GM operates at a group rate and cable length selected on the front panel. Group rates vary from 128 to 1152 kHz; cable lengths vary from zero to one mile in 1/4 mile increments.

Digital Voice Orderwire (DVOW).

The DVOW (DVOWA CCA) is capable of processing eight 16 kb/s DVOW channels. The delivered LTU uses only one channel. It contains a ring code detector, ring code generator, and a KY-57 interface circuit. It routes digital voice data to the KY-57 through a connector on the LTU rear panel. The KY-57 encrypts/decrypts the data and provides an analog voice interface to the KY-57 handset. It generates and detects 16 DVOW ring codes.

Timing Generator.

The timing generator operates in either a local standalone mode or in a Slave mode. In the slave mode, timing is slaved to a recovered clock from the group modem. In the slave mode, if the recovered clock is lost. the timing generator automatically defaults to its local oscillator. A master/slave toggle switch is located on the timing CCA (TIMTG) that overrides all other timing controls. When placed in the slave Position, the LTU's timing operates slaved to a clock in the switching system. In the master position, al(clocking comes from the internal crystal oscillator in the local timing generator. The LTU normally operates with this switch in the slave position.

Built in Test Equipment (BITE).

The BITE function employs the TIMBT CCA to provide fault alarm collection and a front panel fault/status display. A summary alarm (SMY FAULT) lights when any internal fault occurs, and works together with the BITE FAULT Leeds to direct the operator to the specific area in which the fault occurred. The BITE FAULT LEDs provide two separate fault codes: the first, a two-digit code, identifies the CCA that failed; the second a single-digit code, describes the particular type of fault (interlock, -15V failure, loss of mux, etc.).

20-Hz Generator.

The LTU must be populated with a 20-Hz Generator (not provided with the delivered LTU) whenever the LTU is populated with a TCLTU CCA (unless only Line Type 44 is to be supported) or a 2WLTU CCA. The purpose of the 20-Hz Generator is to provide 20-Hz voltages for ringing out on two-wire common battery lines, and 20-Hz ringdown lines and trunks. The 20-Hz Generator card set consists of three (3) CCAs.

Line Termination Unit Card Population

REF DES	NAME	PART NO.	Function
A1	DLTU		
A2	DLTU		
A3	DLTU		
A4	DLTU		
A5	DLTU		
A6	DLTU		
A7	DLTU		
A8	DLTU		
A9	DLTU		
A10	MXDMX	06-1402258-2	Provides time-division multiplexing demultiplexing function.
A11	TGMOW	SM-E-820421	Provides line buffering and frame synchronization for signals. Demodulates Diphase stream to NRZ for use in cryptographic or other terminal equipment requiring TTL levels, and performs the reverse function. Combines and conditions orderwire data received from DVOW.
A12	MTG	06-1408949-1, -2	Provides the LTU with a timing generator that can be operated in either a master or slave mode. In the slave mode, if the clock pulse used to slave the timing generator is absent, the timing generator operates using its local oscillator.
A13	GPMDM	SM-E-820429-3*	Modulates multiplexed NRZ to conditioned Diphase or dipulse group signals, and performs the reverse function.
A14	TIMBT	06-1408960-1	Provides fault collection, and fault and status display capabilities to the LTU BITE function.
A15	Spare		
A16	Spare		(Reserved for 2O-HZG CCA, if needed. P/O 20-HZ GEN card set)
A17	Spare		(Reserved for STGEN CCA, if needed. P/O 20-HZ GEN card set)
A18	Spare		(Reserved for STDlS CCA, if needed. P/O 20-HZ GEN card set)
A19	Spare		
A20	DVOWA	06-1404382-3*	Functions as interface for the LTUs channel.
A21	Spare		

* GPMDM card SM-E-820429-3 is preferred; SM-E-820429-2 is an alternate.
* DVOWA card 06-1404382-3 is preferred; 06-1404382-2 is an alternate.

Performance Characteristics

Data Rate: 16 kb/s
32 kb/s

Group Rate:

Group Rate	Number of Channels/Channel Rate
1152*	36/32
1024	32/32
576*	18/32 or 36/16
512	16/32 or 32/16
288*	9/32 or 18/16
256	8/32 or 16/16
144	9/16
128	8/16

*Group rates followed by an asterisk are rates for Diphase and Dipulse operation. Group rates not followed by an asterisk are used for Diphase operation only.

Cable Length Switch Settings

Cable Length Setting	Receive	Transmit	Mode
0	0	1	Diphase/dipulse
1	1/4	1	Diphase/dipulse
2	1/2	1	Diphase/dipulse
3	3/4	1	Diphase/dipulse
4	1	1	Diphase
5	Loop back		
6	0	0	dipulse
7	1/4	1/4	dipulse
8	1/2	1/2	dipulse
9	3/4	3/4	dipulse

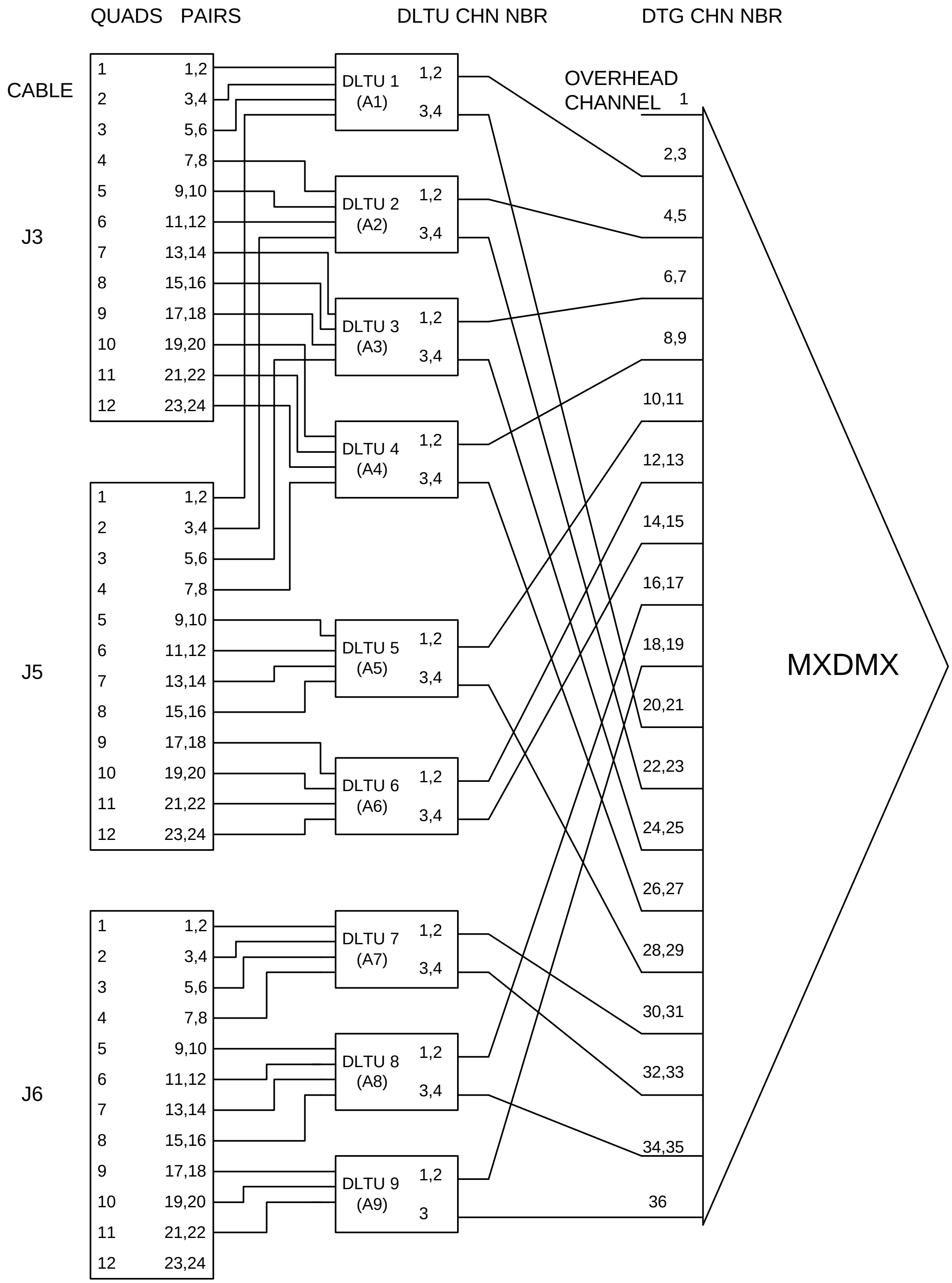
Group Modem Operating Rate Settings

GROUP RATE SWITCH SETTING	SWITCH RATE 32 KHZ/16 kHz	TRANSMISSION RATE (kHz)	CHANNEL (kHz)	SIZE LOOP CAPICITY
1	16	--	--	--
2	16	128	8	7
3	16	144	9	8
4	16	256	16	15
5	16	288	18	17
6	16	512	32	31
7	16	576	36	35
4	32	256	8	7
5	32	288	9	8
6	32	512	16	15
7	32	576	18	17
8	32	1024	32	31
9	32	1152	36	35

LINE TERMINATION UNIT CHANNEL ASSIGNMENT

MXDMX CHAN	DLPMA	EM LTU	MF LTU	2W LTU	4W LTU	TCL TU	NI LTU	Card Slot	Circuit Number	Rear Con	Term Quad	J-box Quad
1	(Framing Channel)											
2	X		X	X	X	X	X	A1	1	J3	1	1
3	X		X	X	X	X	X	A1	2	J3	2	2
4	X		X	X	X	X	X	A2	1	J3	5	4
5	X		X	X	X	X	X	A2	2	J3	6	5
6	X		X	X	X	X	X	A3	1	J3	9	7
7	X		X	X	X	X	X	A3	2	J3	10	8
8	X		X	X	X	X	X	A4	1	J3	13	10
9	X		X	X	X	X	X	A4	2	J3	14	11
10	X	X	X	X	X	X		A5	1	J5	17	5
11	X	X	X	X	X	X		A5	2	J5	18	6, 7*
12	X	X	X	X	X	X		A6	1	J5	21	9
13	X	X	X	X	X	X		A6	2	J5	22	10, 11*
14	X	X	X	X	X	X		A7	1	J6	25	1
15	X	X	X	X	X	X		A7	2	J6	26	2, 3*
16	X	X	X	X	X	X		A8	1	J6	29	5
17	X	X	X	X	X	X		A8	2	J6	30	6, 7*
18	X		X	X	X	X		A9	1	J6	33	9
19	X		X	X	X	X		A9	2	J6	34	10
20	X		X	X				A1	3	J3	3	3
21	X		X	X				A1	4	J5	4	1
22	X		X	X				A2	3	J3	7	6
23	X		X	X				A2	4	J5	8	2
24	X		X	X				A3	3	J3	11	9
25	X		X	X				A3	4	J5	12	3
26	X		X	X				A4	3	J3	15	12
27	X		X	X				A4	4	J5	16	4
28	X		X	X				A5	3	J5	19	7
29	X		X	X				A5	4	J5	20	8
30	X		X	X				A6	3	J5	23	11
31	X		X	X				A6	4	J5	24	12
32	X		X	X				A7	3	J6	27	3
33	X		X	X				A7	4	J6	28	4
34	X		X	X				A8	3	J6	31	7
35	X		X	X				A8	4	J6	32	8
36	X		X	X				A9	3	J6	35	11

* Junction box quad for EMLTU Card only.


QUADS PAIRS
DLTU CHN NBR
DTG CHN NBR
CABLE
J3
J5
J6
1 1,2
2 3,4
3 5,6
4 7,8
5 9,10
6 11,12
7 13,14
8 15,16
9 17,18
10 19,20
11 21,22
12 23,24
DLTU 1 (A1)
DLTU 2 (A2)
DLTU 3 (A3)
DLTU 4 (A4)
DLTU 5 (A5)
DLTU 6 (A6)
DLTU 7 (A7)
DLTU 8 (A8)
DLTU 9 (A9)
1,2
3,4
3
OVERHEAD CHANNEL 1
2,3
4,5
6,7
8,9
10,11
12,13
14,15
16,17
18,19
20,21
22,23
24,25
26,27
28,29
30,31
32,33
34,35
36
MXDMX

CHAPTER 4

TACTICAL PACKET NETWORK PROCEDURES

SECTION I. NC/LEN/39D PACKET SWITCH INITIALIZATION PROCEDURES

1. (ALL) Ensure that the LAN terminators (caps) are securely connected on the SEP:

NC: ports A9 and A10
LEN: ports A1, A2, A3 and A4
39D: ports A1, A2 and A3

2. (NC/LEN) Connect the LAN cable between the switch shelter (J14) and operations shelter:

Switch	Sw sh	Ops sh
NC	J14	J8
LEN	J1	J10

3. Check the toggle settings on all the PSHTI cards (Ref: Chap 8). The dial-up ports are not part of the standard configuration). The standard configuration is as follows:

NC: All switches down: A6: 0402, 0404
A7: 0402, 0404, 0533, 0535, 0537
Bottom switch UP (all other Sw down): A6 0406, A7 0406

LEN: All switches down: A7: 0409, 0411
Bottom switch UP (all other Sw down): A7 0413

39D: All switches down: A13: 325, 326
A16: 315, 316, 317, 325, 326
Bottom switch UP (all other Sw down): A16: 327
Bottom 2 switches UP (Sw 1-4 down): A13: 327
A16: 313

4. (ALL) Verify your IP network (148.14 or 148.15) with the network diagram (OPORD). Insert correct work disk(s) into the C3/XA packet switch (AN/TYC-20) disk drive(s) and turn it on.

NC: Only one disk is used
LEN/39D: Lower numbered disk in top PS, higher numbered in bottom PS

5. (NC/39D) Insert Gateway disk into the T/20 gateway disk drive and turn it on.

Note: Even if no gateway is to be installed at this switch, turn the T/20 (AN/TYC-19) on.

6. (ALL) Wait 5 minutes and then observe the green LEDs on the PS to ensure it is operating correctly. LEDs 16&8 on at the same time indicate that the IGW is working. If LEDs 16&8 do NOT come on at the same time, then STOP and troubleshoot using the PS troubleshooting procedures.

7. (ALL) Check the PS to ensure the IGW is operating correctly. The top row of the PS has 5 LEDs. ALL 5 LEDs should be illuminated. If not, then STOP and troubleshoot using the PS troubleshooting procedures.

8. (NC/39D) Observe the green LEDs on the PS. LEDs 19&5 on at the same time indicate the T/20 is connected to the packet switch. If LEDs 19&5 do NOT come on at the same time, then STOP and troubleshoot using the PS troubleshooting procedures.

9. (LEN) Observe the green LEDs on the PS. After LEDs 16&8 go out, LED 5 should go on, which indicates the trunk between the two packet switches is up. If not, then STOP and troubleshoot using the PS troubleshooting procedures.

10. (ALL) After switch is initialized, check the configuration of the MTA/TNS. Go to MTA/TNS Maintenance menu, then select item 1 (Input Systems Parameters). Verify the following:

Switch Code: sXXXX (XXXX=Your switch code, example NC01)
NOTE: This is the same code as the one used in ASI.
Domain Name: c5.army.mil
Net ID: Either 148.14 or 148.15 (specified by OPORD or SYSCON)
Packet Switch #: Your PSN (same as on PS work disk).

Do you want to store these changes? Y/N

Type Y if any changes were made or if MTA and TNS are not both running. (Typing 'Y' here will restart the MTA and TNS).

NOTE: LENs make the following changes: For switch code, type ''sXXXX', and for PS# type 'XX,YY', where XX is the bottom (higher) PSN# and YY is the top (lower) PSN#.

11. (ALL) When initializing internodal links, type Packet Switch 'Y' if both switches are in the same IP network. If the other switch is in a different IP network, then check the OPORD to find out if PS should be marked 'G' (gateway) or 'N'. If PS is marked 'Y' or 'G', then mark PS Bypass 'Y'. NOTE: If directed by OPORD or SYSCON to install a LOW-Speed PS link to another NC/LEN/39D, then follow the Low-Speed Link Initialization Procedures. If directed by OPORD

or SYSCON to install a third HIGH-Speed PS Link (LENs only), then follow the Third High-Speed LEN Initialization Procedures.

NOTE: LENs do not have a T/20 gateway and therefore cannot have links marked PS 'G'.

12. (ALL) When initializing SEN links (ASR), always mark packet switch 'Y' and tell the SEN operator what IP network you are in (148.14 or 148.15). This is important for two reasons; (1) so the SEN operator knows which work disk to put in the PS, and (2) so supported customers can be told their correct IP Address.

13. Do the following IP ECHO (ping) tests to verify PS operation: (XX=14 or 15, depending on which IP network you are in. LEN/39D: PSN1=Top PS, PSN2=Bottom PS).

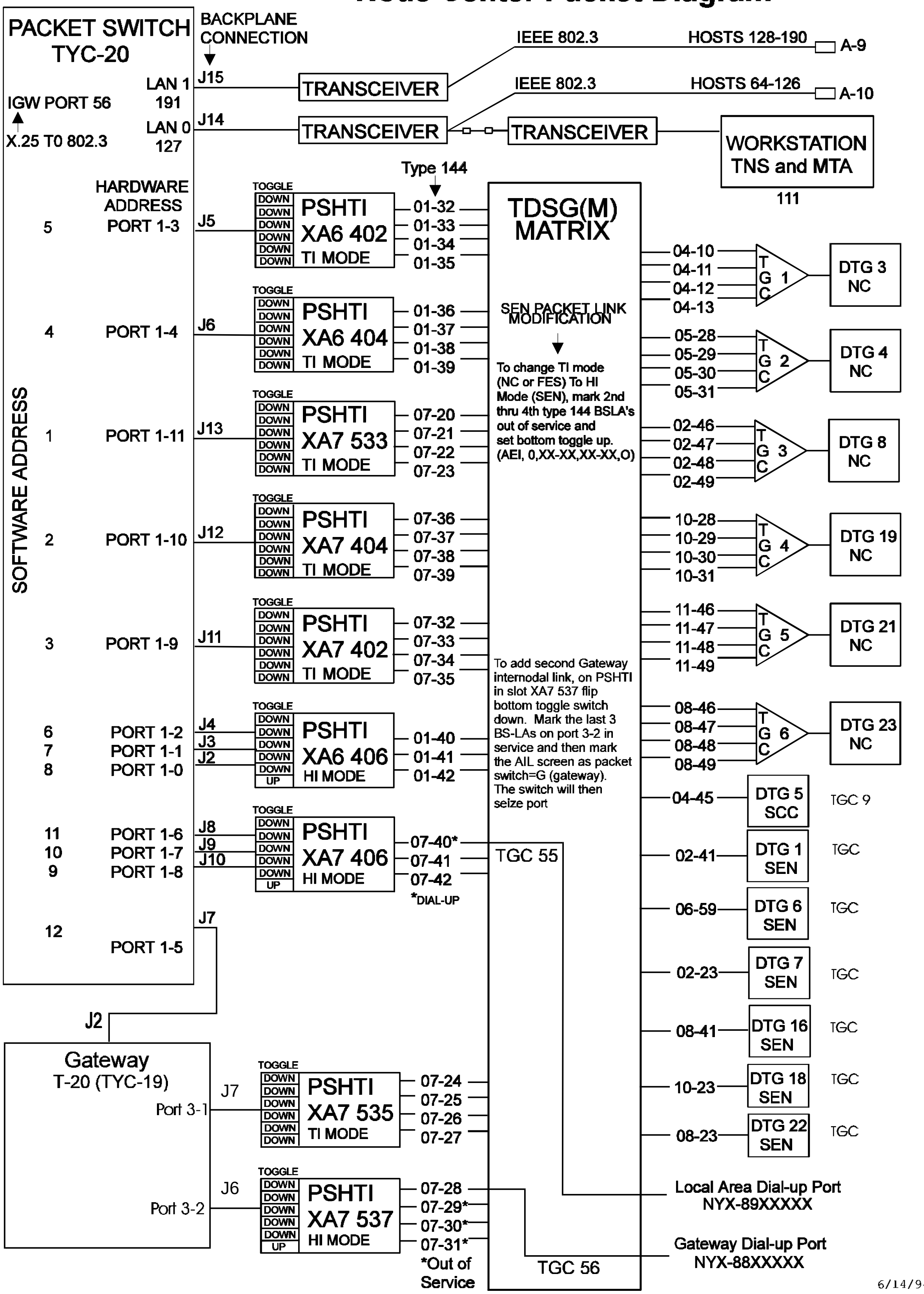
Step	SW	IP Address	Time*	Host
a.	NC	148.XX.111.PSN	0 ms	Workstation
	LEN	148.XX.111.PSN2	0 ms	Workstation
	39D	148.XX.111.PSN1	0 ms	Workstation
b.	NC	148.XX.56.PSN	66 ms	IGW in PS
	LEN	148.XX.56.PSN2	66 ms	IGW in Bottom PS
	39D	148.XX.56.PSN1	66 ms	IGW in Top PS
c.	NC	148.XX.5.PSN	116 ms	T/20 Gateway
	39D	148.XX.5.PSN1	116 ms	T/20 Gateway
d.	LEN	148.XX.56.PSN1	190 ms	IGW in Top PS
	39D	148.XX.56.PSN2	190 ms	IGW in Bottom PS
e.	ALL	148.XX.56.OTH	*	IGW for connected NC/LEN/SEN/39D

NOTE: Be sure to use the correct NET ID and PSN# for each link. The PSN# for each NC/LEN/SEN is listed in Chapter 8.

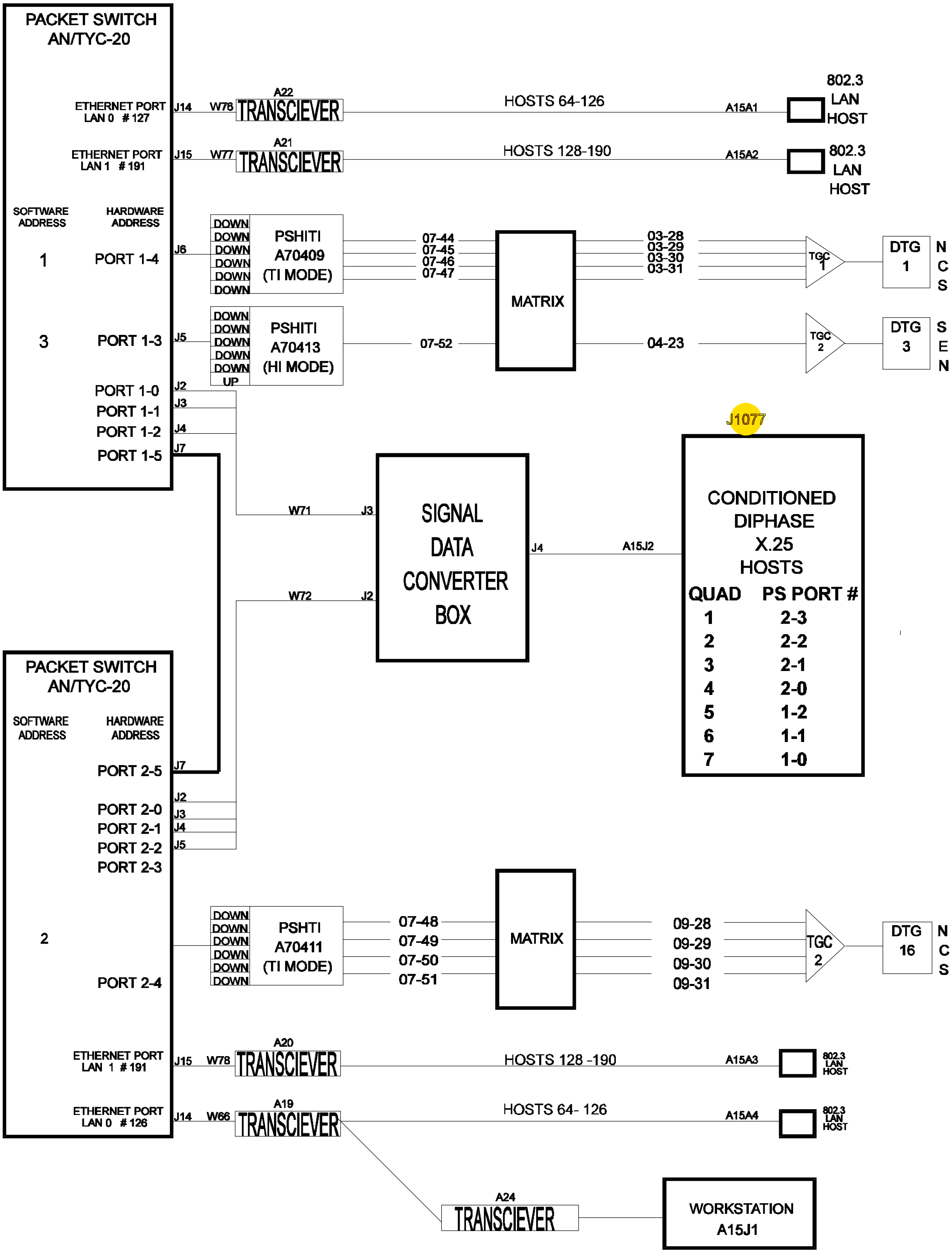
If any of these ping tests fail (100% packet loss), then troubleshoot using the MSE SOP Vol 1(pp. 7-i-1 through 7-i-4). If this fails, then call the NMC operator in your IP network (148.14: 5508507, 148.15: 5508607).

14. If instructed by OPORD or SYSCON to assign a dial-up PS Port (either gateway or X.25), then follow the Assign Dial-Up procedures.

Node Center Packet Diagram



LEN PACKET SWITCH FUNCTIONAL DIAGRAM



SECTION II. SMALL EXTENSION NODE (SEN) INITIALIZATION PROCEDURES

1. Ensure that the LAN terminators (caps) are connected on the SEP (ports A1 and A2).

2. Verify your MPN IP network (148.14 or 148.15) with the parent NC. If you have the correct work disk, then insert it into the PS disk drive and turn the PS on. Wait 5 minutes and then observe the green LEDs on the PS to ensure it is operating correctly (Ref: MSE SOP Vol 1 p. 2-iii-1). LEDs 16&8 on at the same time indicate that the IGW is working.

If you do not have the correct work disk, then call the NMC in your IP network (148.14: 5508501, 148.15: 5508601) so that they can configure your work disk. Do NOT turn your PS on until instructed by the NMC.

3. Have the NC operator do an IP Echo test (ping) to your PSN's IGW. If the ping is successful, then your Packet Switch is operating correctly. Verify this by observing the green LEDs on the PS. After LEDs 16&8 light up, LED 0 should light (this indicates the PS trunk to the NC is good). Call the NMC to verify this status with the NMC operator (148.14: 5508501, 148.15: 5508601). If the ping fails or if LED 0 does not light, then troubleshoot using the MSE SOP Vol 1 (pp. 7-i-3 through 7-i-4).

SECTION III. NON-STANDARD PORT ASSIGNMENTS

1. LOW-SPEED LINK (NC/NC AND NC/LEN) INITIALIZATION PROCEDURES

Use: This procedure is normally required only when a NC packet switch has a 6 port I/O board (instead of a 12 port I/O board), or when a NC has six internodal PS links.

a. Normally the DTG has the first four voice trunks marked PS 'Y'. Verify this by performing a DTG (Display Trunk Group Cluster) on the TGC. Write down the TDMX address of the first trunk that is marked PS 'Y'. This will be referred to as TDMX XX-YY). (NOTE: The first channel is the PSC, the second is the RSC, and the third is the first voice/PS channel).

b. Use ATS Delete to delete the first trunk (the third channel) in the TGC.

c. Mark PS 'N' and PS Bypass 'N' when you AIL the link.

d. All of the low-speed ports are assigned to the SEN TGCs in the NC standard database. The next step is to free a low-speed port in order to re-assign that port to the NC/LEN link. Complete the following steps to do this:

(1). Select a SEN TGC that is currently not being used and most likely will not be used during the exercise. (NOTE: If also assigning a PS dial-up port, the low-speed port (1-6) normally assigned to TGC 16 will already be used).

(2). Perform an ASR Modify on the TGC. Write down the Port Number displayed. This will be referred to as Port 1-Z. Change "Packet Switch" to NO. This will free the low-speed port.

e. Perform ADU (Assign Dial-Up) Modify to connect the PS TDMX to the trunk TDMX address. Use Port 1-Z. Type Xmit, then type in TDMX address XX-YY on the "TDMX address of host user (XX-XX)" line, then type Xmit and Store.

f. Wait two minutes, then do a ping test to the distant NC/LEN and check the I/O lights on the packet switch to verify the full connect. If possible, verify this by contacting the NMC.

2. RE-ASSIGNING LOW-SPEED PORT PROCEDURES (NC)

This procedure is normally required in three cases: (1) To assign PS to an SCC link, (2) to assign PS to a SEN on TGC 16 when the X.25 Dial-Up port (1-6) assigned, and (3) to assign PS to a SEN on a RAU DTG (TGCs 8 and 14).

a. Perform an ASR Modify on the TGC of the SEN/SCC you want to assign PS to. Ensure that Packet Switch is marked 'N'.

b. Select a SEN TGC that is currently not being used and most likely will not be used during the exercise. Perform an ASR Modify on that TGC and note the PS Port number displayed. (This port will be reassigned to the active SEN). Mark PS 'N', Xmit and Store.

c. Perform an ASR Modify on the SEN/SCC TGC you want to assign packet to (the same as in #1). Mark PS 'Y' and note the PS Port number displayed. It should be the same as the one listed in #2.

d. Wait two minutes and perform an IP echo (ping) test to verify. The IP address of the SEN's IGW is NETID.56.SEN-PSN.

3. THIRD HIGH-SPEED LEN LINK INITIALIZATION PROCEDURES

Use: This procedure is only used when a LEN has three internodal links (and no SENs connected to it). The first two internodals can be initialized normally; this procedure only applies to the third internodal.

a. Ensure the PSHTI card A7 0413 (port 1-3) is in trunk mode. All toggle switches should be down.

b. Ensure the TGC was built with the first four voice channels marked as PS 'Y'.

c. Perform a CRF to connect the PSHTI addresses to the DTG. The PSHTI addresses are 04-23 through 04-26.

SECTION IV. PS DIAL-UP PROCEDURES

1. DATABASE

ATG to define TGC (already done for TGC 55 and 56) on standard database.
APR to assign NN routing (already done for 88 and 89) on standard database.
ADU to associate TGC to a PS port (NOT done)
Ensure PSHTI is in low-speed mode with FEC ON (bottom 2 toggles UP)
Dial number to verify - good indication from DNVT call is to receive error tone.

A. PS ON A GATEWAY TGC:

Cannot add PS on ATG Add. Must use ATG Modify.
Screen 1:
Type of Cluster (I) {Xmit}
Screen 2:
Packet Switch (Y or G)
PS Bypass (Y)
NOTE: TGC Type must be (Adjacent Corps, EAC or Message Switch). If TGC type is = 1 (within MSE), then the above two inputs will be ignored.

B. PS T/20 DIAL-UP (SPECIAL):

(This is used to assign a second T/20 Dial-up to a NC when the Gateway interface must be changed. STACCS is currently the only user of this).

ATG:
- Action: Add
- TGC: 54
- Type: Other
- Spill Forward: No
- Destination Code: 614
- Zone Restriction: 0
- Access Trunk Group: N
- Traffic Limitations: N

APR:
- Action: Add
- Input NN Code: 87
- Classmark: Foreign
- TGC Number: 54

ADU:
- Action: Modify (preset)
- Port Number: 3-1
- Xmit

TDMX Address: (leave blank)
TGC Number: 54

Verify:

Dial 870-7000

C. PS T/20 DIAL-UP (SPECIAL): (This is used to assign a second T/20 Dial-up to a NC when both are of same type).

ATG: TGC 54 (same as above)
ADU: (same as above)
APR:

Action: Modify
Input NN Code: 89
'Xmit'
Classmark (foreign)
Primary TGC (56)
Alternate 1: 54

Verify:

Dial 890-9000 (error tone)
AEI 07-28/07-31 OOS (Port 3-2)
Dial 890-9000 (error tone)
AEI 07-24/07-27 OOS (Port 3-1)
Dial 890-9000 (busy)
AEI 07-24/07-31 in service

D. PS DIAL-UP FOR LEN:
APR: TGC for Primary NC.

E. PS ERROR MESSAGES

NO LOW SPEED PS PORT AVAILABLE .(F)

Cause: ASR (M) screen when trying to assign PS to a TGC.
Solution: Use ASR (M) to free a PS port first.

XX:NOT ASSIGNED.(F)

XX=NN routing
Cause: APR Screen when doing APR (Add).
Solution: Assign ATG (Add) to construct TGC first.

WARNING: PS CARD MUST BE SET TO HOST MODE!

Cause: ADU screen. PSHTI in Host or Trunk mode.
Solution: This message is normal.

PORT ALREADY ASSIGNED TO ANOTHER TGC.(F)

Cause: ADU screen when TGC already assigned and try to add DU.
Solution: ASR (Mod) and mark PS 'N' for port, then try ADU again.

DELETION OF PS INDICATED, ARE YOU SURE?
Cause: ASR Screen when assigning PS 'N'.
Solution: Normal.

TGC :MODIFICATION NOT ALLOWED.(F)
Cause: ADU screen--trying to reassign port to TGC when the port is already assigned.
Solution: ADU (Mod) and blank out TGC, then try ADU again.

TGC WILL NOT BE RELATED TO THE ASSIGNED PS PORT
Cause: ADU screen when deleting (blanking) TGC
Solution: Normal.

TGC ALREADY CONTAINS A TDMX ADDRESS(ES) .(F)
Cause: ADU screen when assigning a second dial-up to TGC.
Solution: Assign port to another TGC, and add this TGC to the APR as alternate TGC.

TGC AND TDMX ADDRESS: NOT IN AGREEMENT.(F)
Cause: ADU screen when assigning TDMX address of host user AND the TGC.
Solution: Leave TDMX entry blank. The TDMX address is only assigned if assigning a PS port to an X.25 host.

2. PACKET SWITCH DIAL-UP PORT (X.25) PROCEDURES (NC)

Use: This procedure is normally used to support an X.25 host connected via an MSRT. It can also be used to support an X.25 host that is directly connected to the NC. Since the PS disk must be re configured for this procedure, you most likely will have a special disk to use for this. Ensure that your PS disk is configured with the NC template.

a. PS Port 1-6 is assigned to TGC 16 in the standard database. To free this port, perform an ASR Modify on TGC 16 and mark PS 'N'. (NOTE: If TGC 16 is being used for a SEN, then also follow the Re-assigning LS Port procedures).

b. Turn FEC (Forward Error Correction) ON for the PSHTI card. To do this, change toggle switch #5 (second from the bottom) to UP on card A7 0406.

c. Assign the TGC to the PS. To do this, perform the ADU command. Type '1-6' for the Port Number, hit 'xmit', type '55' for the TGC Number, hit 'xmit'. (NOTE: Leave the 'TDMX address of host user (XX-XX)' entry blank. This is only used when assigning an X.25 host to a FES).

d. Verify that the PS dial-up port is working correctly by dialing 880-8000 on your DNVT. You should get error tone. If you do not get error tone, then contact your battalion SYSCON.

3. PACKET SWITCH DIAL-UP GATEWAY PORT PROCEDURES (NC)

Use: This procedure is normally used to connect an X.25 host to one of the T/20 ports, either connected to a SEN or an MSRT user. Since this procedure requires the T/20 disk to be reconfigured, you should have a special T/20 disk for this.

a. Turn FEC (Forward Error Correction) ON for the PSHTI card. Also, change the PSHTI from TI (Trunk Interface) to HI (Host Interface) mode. To do this, change switches #5 and #6 (the bottom two) to UP on card A7 0537.

b. Assign the TGC to the PS. To do this, perform the ADU command. Type '3-2' for the Port Number, hit 'xmit', type '56' for the TGC Number, hit 'xmit'. (NOTE: Leave the 'TDMX address of host user (XX-XX)' entry blank). The message 'Warning! PS card must be set to host mode!' should appear. This is normal.

c. Verify that the PS dial-up gateway port is working correctly by dialing 890-9000 on your DNVT. You should get error tone. If you do not get error tone, then contact your battalion SYSCON.

SECTION V. PACKET SWITCH DUAL HOMING PROCEDURES

1. Purpose: Dual homing the Packet Switch provides continual TPN service in the absence of its parent NC link. This is accomplished by connecting the packet switch of one assemblage to the packet switch of a co-located SEN or LEN assemblage.

2. SEN Configuration

A. Requirement: Two co-located SENs, each with 4 or less X.25 subscribers, in the same NETID, and with the S3T packet switch template. (The S3T template has ports 4 and 5 configured as trunks)

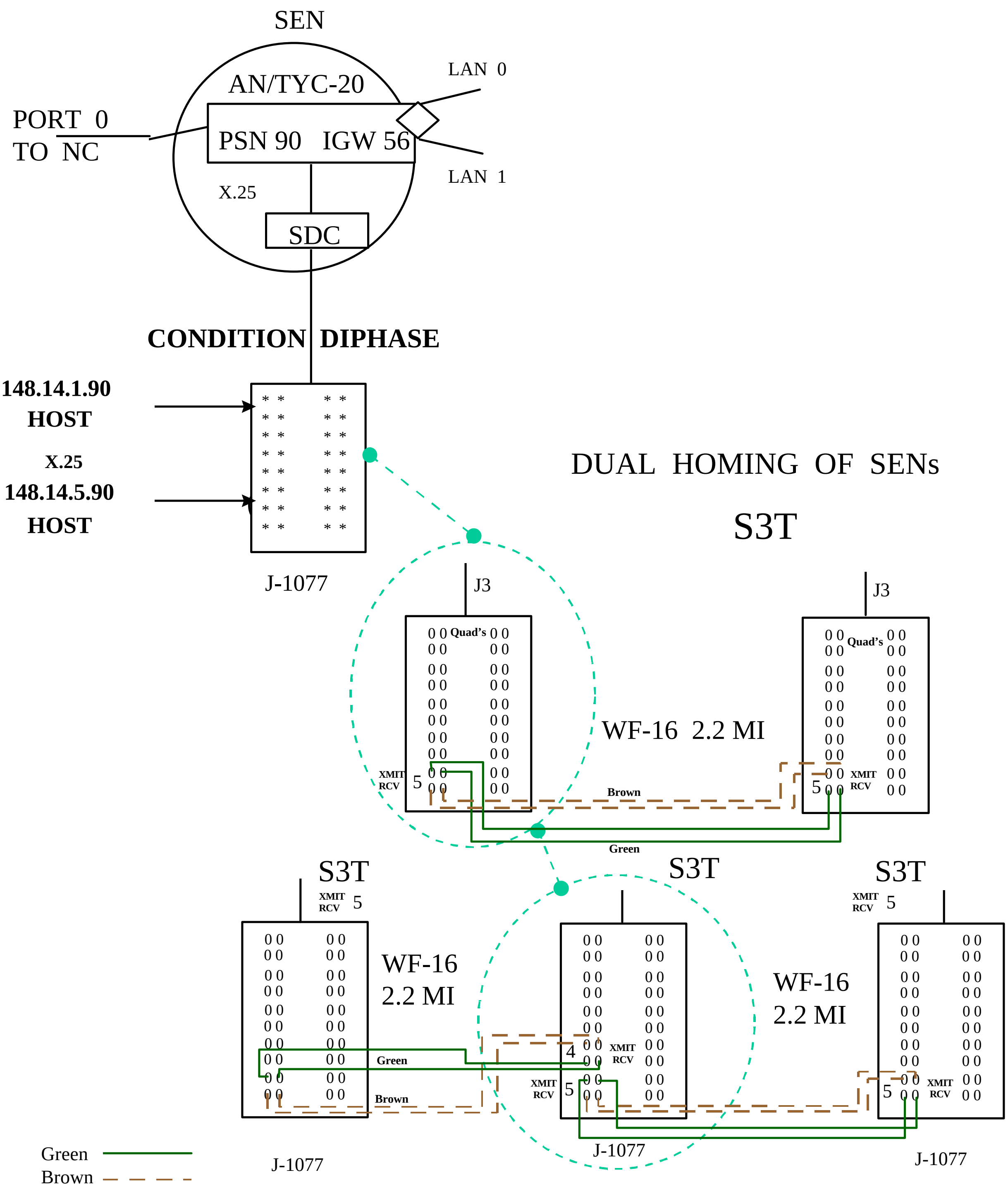
Note: The SENs will be identified as SEN "1" and SEN "2" for this procedure. SEN 1 will be responsible for wiring of J-Boxes.

(1) Ensure that both SENs are in the same NETID and both have the S3T templates.

(2) SEN operators will attach the X.25 J-Box and ensure that quad 4 and 5 are not used by subscribers.

(3) SEN 1 will use WF-16 field wire to connect quad 5 on J-Box 1 to quad 5 of J-Box 2. The WF-16 will be transposed from J-Box 1 to J-box 2 as shown in figure 4-1.

SMALL EXTENSION NODE (SEN) S3T PACKET SWITCH
PORT CONNECTION / IP ADDRESSES



Note: Brown/Green wires must be transposed between J-1077

Figure 4-1

B. Turn on the Conditioned Diphase Converter (CDC) box in both SENs and observe the CDC for the illumination of light #5 (as illustrated below by "*").

```
                   1    2    3    4    ALARM
     o   o   o     o    o    o    o      o

     o       o     5    6    7    8     PWR
                   *    o    o    o      o
     o       o                          ON
                   9    10   11   12    PWR
     o   o   o     o    o    o    o      o
                                        OFF
```

Figure 4-2

C. After 1 minute, check the I/O status lights on the packet switch. Ensure that LED 5 illuminates the same time as LED 0 (the normal trunk LED). these will light after Led's 16 and 8.

3. LEN CONFIGURATION

A. Purpose: To connect a LEN with multiple SENs (X.25 J-BOX) for packet switch stability. This procedure outline the packet switch connection of a LEN and multiple SENs.

B. Requirement: A LEN with 5 or less X.25 subscribers and both switches configured with the S3T template. The LEN and all SENs must be co-located and in the same NETID.

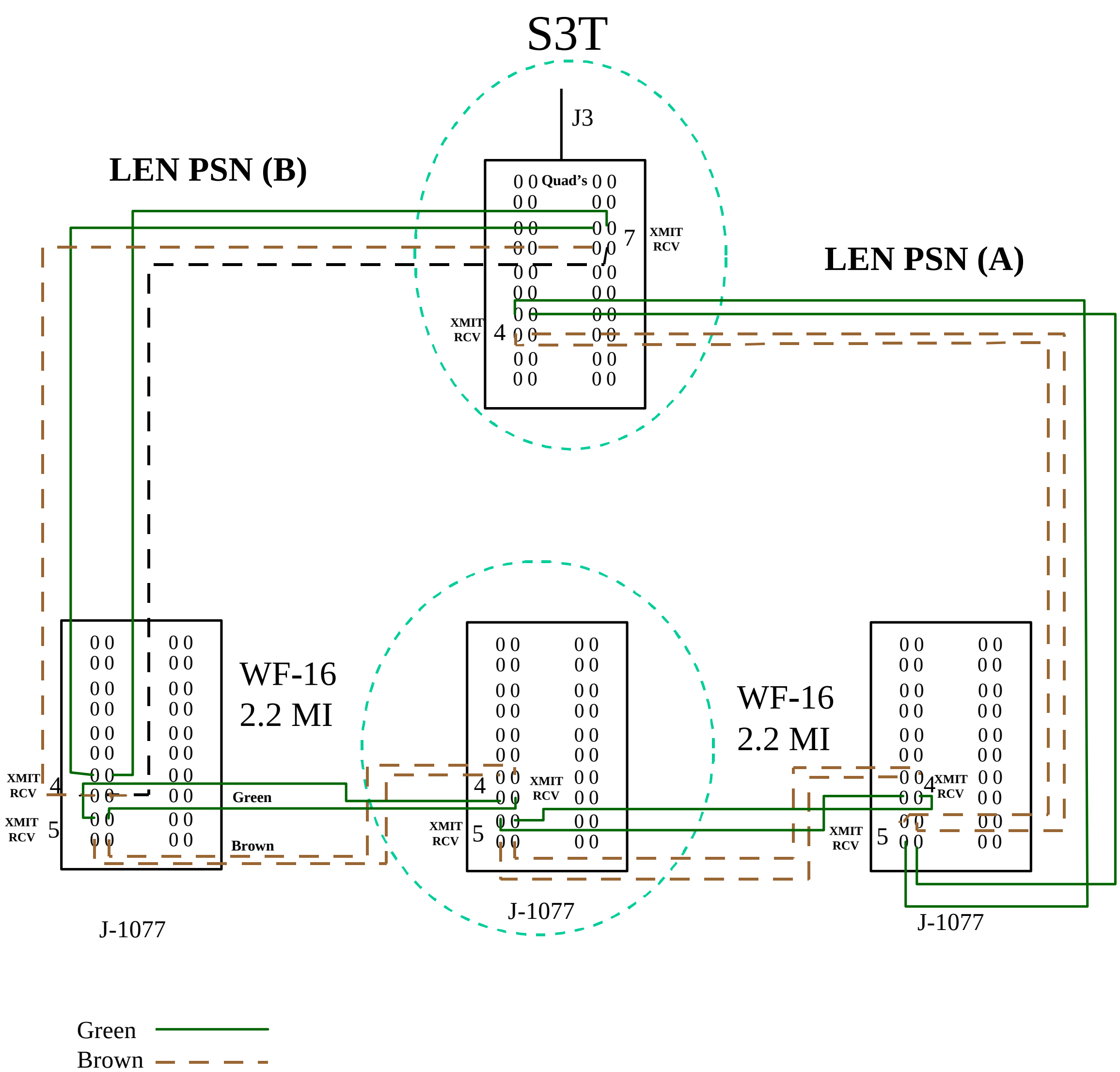
NOTE: LEN personnel will be responsible for supervision of the wiring of each J-Box to include the LEN and each SEN.

(1) Ensure that LEN and all SENs are in the same NETID. All SENs and both LENs packet switches must be configured with S3T template.

(2) LEN will attach the X.25 J-Box and ensure that quad 4 and 7 are not used by the subscriber. SENs will follow the procedure above (See SEN configuration).

(3) LEN will connect quad 7 to quad 4 of SEN (1) J-BOX. SEN (1) will connect Quad 5 to quad 4 of SEN (2) J-BOX; SEN (2) will connect quad 5 to quad 4 of SEN (3) J-BOX. This will continue with all SENs that are collocated. The last SEN will connect quad 5 to quad 4on the LEN (SEE FIGURE 4-3)

LARGE EXTENSION NODE (LEN)
SMALL EXTENSION NODE (SEN) S3T
PACKET SWITCH Dual Homing



NOTE: Brown/Green field wire must be transposed between J-1077

FIGURE 4-3

SECTION VI. USERS GUIDE TO THE TPN

1. INTRODUCTION

This guide is designed for Brigade and Battalion SIGOs, and any end user/manager of the ARMY TPN. Suggested improvements should be sent to stolaszj@hq.22sigbde.army.mil

2. BACKGROUND

A. IP addressing and NETIDs

IP addresses (in the form xxx.xxx.xxx.xxx) consist of two parts. A network part and a host part. The different classes of addresses determine which part of the IP address is used for the network portion and which part is used for the host identifier. See the following table:

Network Size (hosts)	**Class**	**1st Octet Range**	**Example**	**Network Portion**	**Host Identifier**	**Subnet Mask**
Over 65,533	A	1-127	31.0.0.1	31	0.0.1	255.0.0.0
254 to 65,533	B	128-191	140.154.0.1	140.154	0.1	255.255.0.0
Under 254	C	192-223	195.200.50.1	195.200.50	1	255.255.255.0

The MSE TPN is divided into Class B networks. The Network portion of the TPN has a special name called a Network ID or NETID. In V Corps the two NETIDs used are 148.14 and 148.15

The host identifier on the TPN also has some special characteristics. The first part of the host identifier (3rd octet in the IP address) is known as the host number and the second part (last octet in the IP address) is the Packet Switch Number or PSN of the SEN/LEN/NCS your LAN originates from. To put all this together we have an IP address in the form: xxx.xxx.yyy.zzz
Where:

xxx.xxx	is	NETID 148.14 or 148.15 (V Corps)
yyy	is	host number
zzz	is	PSN of SEN/LEN/NCS

B. Determining Host Number

In order to determine the host number for each computer on the local network you first must know to which LAN port of the MSE assemblage your LAN cable is connected. As you are looking at the Signal Entry Panel (SEP), the left BNC connector is LAN 0 and the right BNC connector is LAN 1. Valid host number ranges for LAN 0 are 64 - 126, for LAN 1 are 128 - 190. Each host number must be unique per LAN and can be used only once at a time. It is recommended that someone, usually the local ISSO or SIGO, be charged with the management IP addresses coming off each MSE assemblage. Note: It does not matter in what order the host numbers are used but it is recommended when assigning IP addresses that you start from the lower number and move consecutively higher because when the Packet Switch automatically issues IP addresses via RARP, to machines like MCS and Warloard, it starts from the top and works down.

C. DNS and TNS

DNS stands for Domain Name Server. This is database that correlates a workstation's IP address with its host name. The TNS or Tactical Name Server is the DNS that works over MSE. In order for one computer to exchange information with another using host names (essential for email and most other network functions) both computers must be registered in a TNS. Registration is accomplished in two ways, manually and automatic. Manual registration is done by the Node Center operator and is set for a specific number of days. Automatic registration is done by software running on the workstation. The software must remain running in order for the registration to remain current. The software sends a refresh message to the TNS every 20 minutes. IP addresses for the TNS should be configured in this order:

NETID.192.111	Logical address of the closest TNS
NETID.193.111	Logical address of round robin TNS

Host names on the TNS are in the form *hostname.domainname*. The host name is arbitrarily picked by the user or LAN administrator, usually set by SOP. The domain name is standard throughout the network; V Corps standard is c5.army.mil. A typical example of a complete computer host and domain name is s3-22sig.c5.army.mil. Note: Host names on the DNS/TNS must begin with a letter not a number. Also, domain names on the DNS/TNS mean something totally different than domain names on Windows NT.

D. Gateways

Gateways can be considered doorways from one class of network to another. On the TPN, gateways are used to route packets between NETIDs. Without a gateway it would be impossible for a computer on one NETID to see a computer in another NETID. The logical address for gateways on the TPN is NETID.196.1. For example the default gateway for NETID 148.14 would be 148.14.196.1.

E. Other Addresses

Some other important addresses one should know on the TPN are:

NETID.56.PSN	Packet Switch IGW card
NETID.111.PSN	Operator workstation
NETID.127.PSN	IGW LAN 0 interface
NETID.191.PSN	IGW LAN 1 interface
NETID.192.111	Logical address of closest TNS
NETID.193.111	Logical address of round robin TNS
NETID.196.1	logical address of closest T/20 gateway

3. Configuring a Computer for Operation on the TPN

The following procedure is designed to aid those users wishing to configure a computer running the Windows 95 operating system for use on the TNS.

A. The first step is to edit the Windows 95 registry. This only has to be done once and does not have to be undone at the end of the exercise. In order to use Windows 95 over the TPN it is necessary to adjust its MTU size. Perform the following steps to do this:

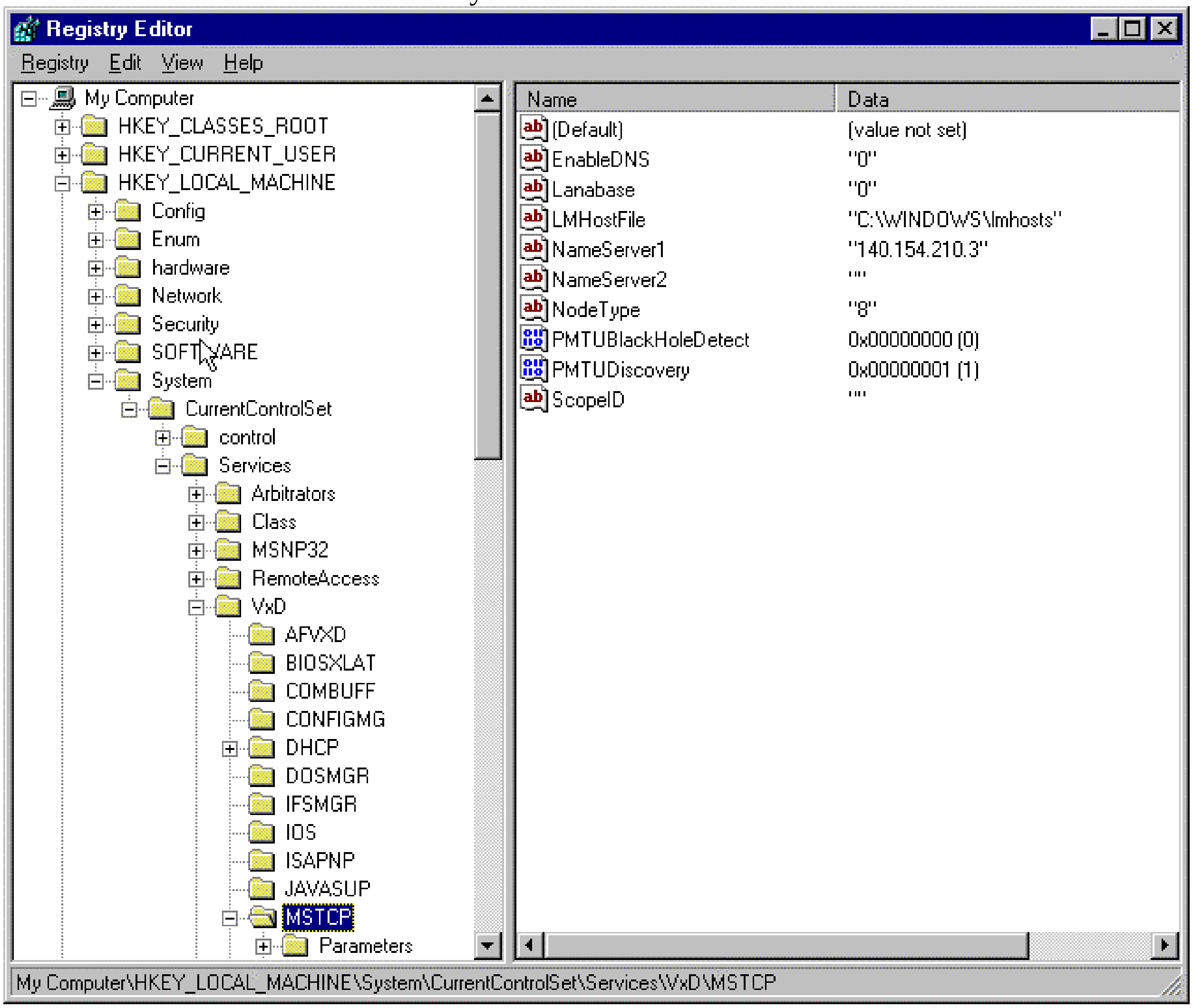
1. from the START button Select Run… and run "regedit".
2. Go to the following directory:

HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\VxD\MSTCP

3. Add the following DWORD values by selecting Edit..New..DWORD value

PMTUBlackHoleDetect=0

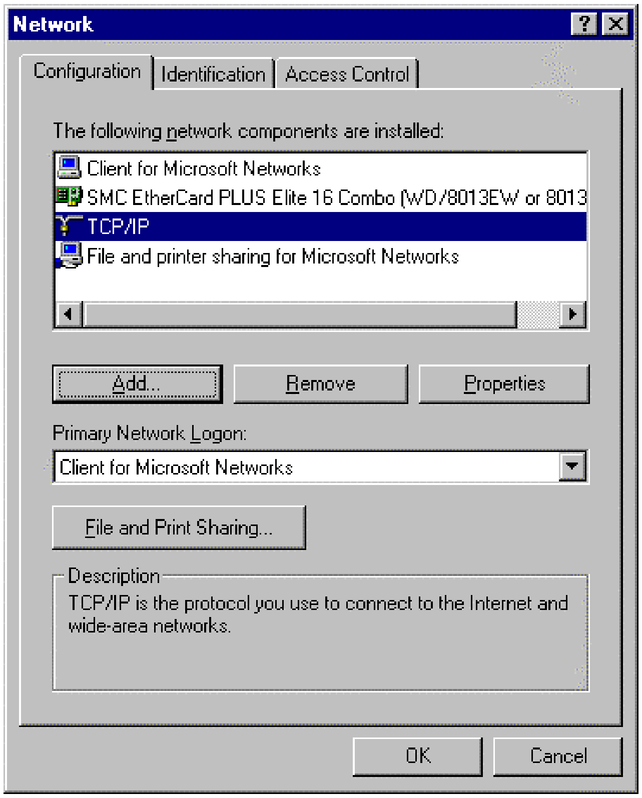
PMTUDiscovery=1

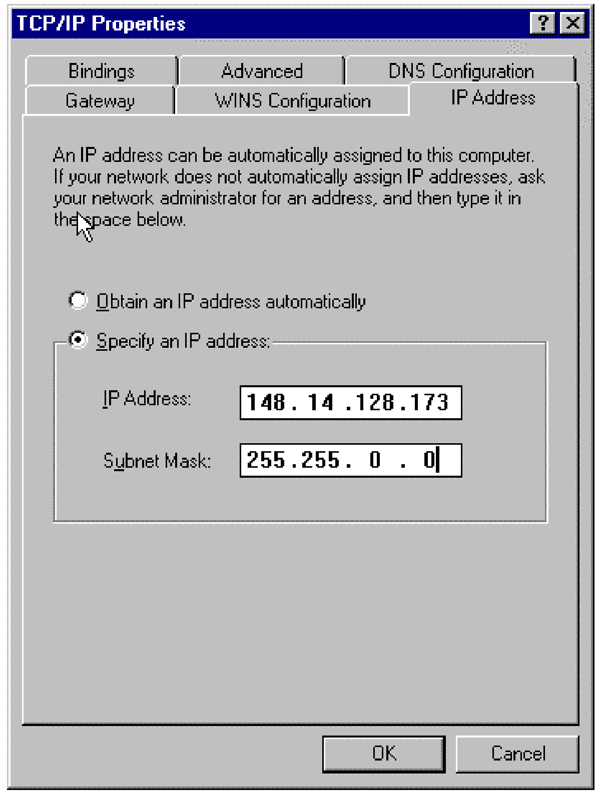


4. Exit and restart your computer.

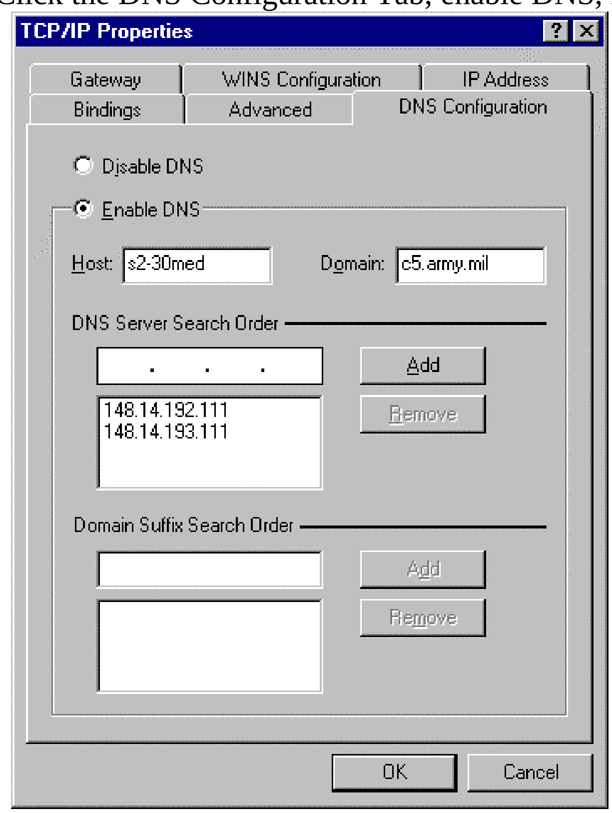
B. Second, determine Which SEN/LEN/NCS and port your LAN is coming from. For this example we will assume we are attached to LAN 1 of SEN C90 in NETID 148.14. Since we are the first computer configured on this LAN we will pick host number 128, and from the Packet Switch Number Table our PSN is 173. Therefore our IP address is 148.14.128.173. We will choose a host name of s2-30med.c5.army.mil.

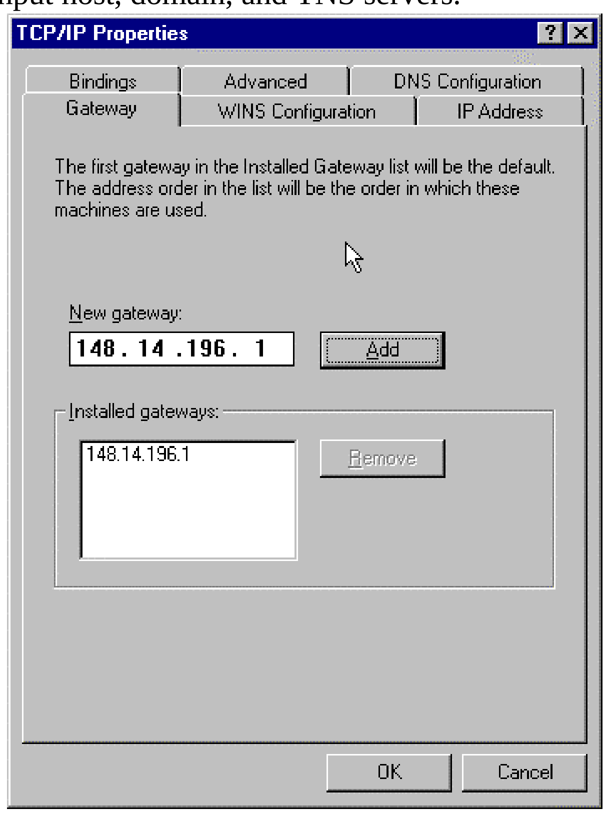
C. Third, click the network icon of the control panel. You should see the following (top left panel):





Highlight TCP/IP and click properties. Input your IP address and subnet mask.
Click the DNS Configuration Tab, enable DNS, input host, domain, and TNS servers.





Click the Gateway Tab and input the default gateway of 148.15.196.1

Click on the WINS Configuration Tab and disable WINS Resolution. Click OK then OK again on Network Configuration and click yes to restart computer. After the computer has restarted go to the MS DOS prompt and try to ping the IGW card of the packet switch to the SEN/LEN/NCS you are connected to (in this case it's ping 148.14.56.173). If you get a reply, your configuration is correct. Start TNS registration and you're done.

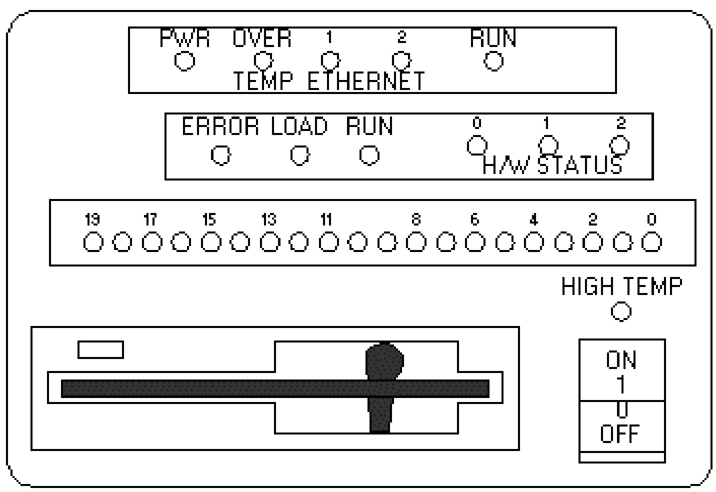
4. Troubleshooting

A. If you have followed the instructions on the previous pages and cannot see all or part of the network use the attached troubleshooting flowchart to determine possible problems.

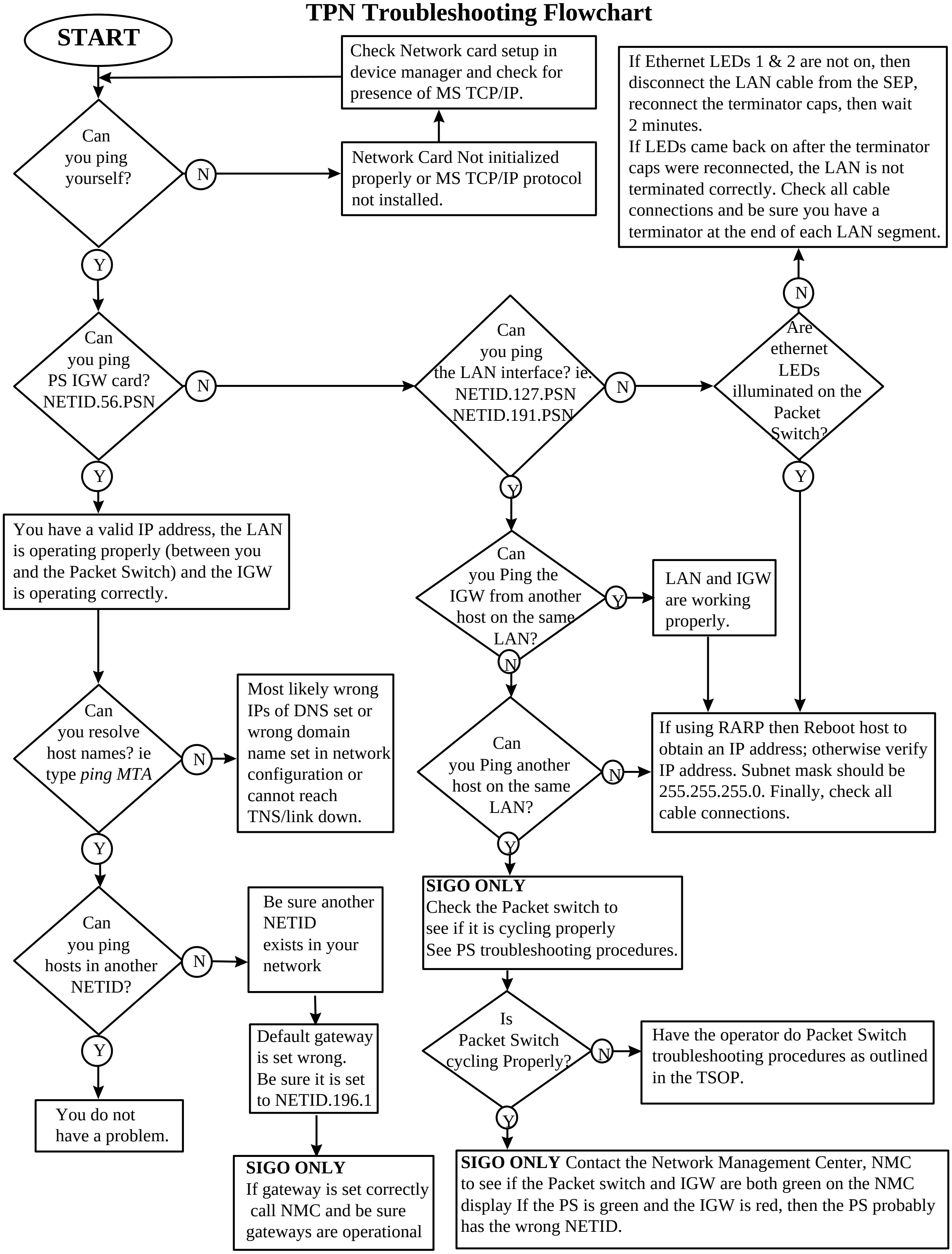
B. Packet Switch troubleshooting

When looking at the packet switch the disk should be in the drive with the drive door closed. The ethernet lights 1 and 2 should be illuminated. When the packet switch is cycling normally the numbered lights should illuminate in this sequence: 19 (& possibly 5) then 18, then 17, then 16 & 8, and finally 0 (0 is for SEN/LENs only). The most common problems are 16 & 8 not lighting, which means the IGW is not working properly; or zero not lighting, indicating no Packet Switch trunk is active.

FRONT PANEL OF TYC-20 PS



TPN Troubleshooting Flowchart



SECTION VII. NETWORK ENCRYPTION SYSTEM (NES) PROCEDURES

I. Introduction. The Network Encryption System (NES) is a commercial encryption system built by Motorola Corporation and used within the Department of the Army's Mobile Subscriber Equipment (MSE) Tactical Packet Network (TPN). It is used to encrypt Standard Army Management Information Systems (STAMIS) computer data and unclassified email. Once encrypted, the information can travel the classified TPN to various unclassified exit points to the NIPRNET and INTERNET.

It should be mentioned that the unclassified TPN user going through the NES does not have access to the classified TPN user. In fact, classified users and unclassified users will never "see" one another when using the NES on the TPN.

II. Hardware. The Network Encryption System (NES) Security Platform is the first network security device designed to Secure Data Network Standards (SDNS) and endorsed by NSA to handle government classified (TYPE I) data up to the TOP SECRET level. It provides data confidentiality, data integrity, peer identification and authentication, and mandatory/discretionary access control services.

The NES Security Platform is keyed using material supplied by the NSA Electronic Key Management System (EKMS). A KSD-64A containing a non-forgeable certificate and the NES identity and security classification is loaded at the front panel. This key may be an Operational Key, or a Seed Key to receive Operational Keys electronically.

NOTE:

The NES Security Platform device is considered CCI equipment, with TEMPEST tamper detection, and COMSEC. These assurances increase the user's confidence that data is protected. The NES should receive proper physical security based on the classification of the key. UNDER NO CIRCUMSTANCES SHOULD THE CASE BE OPENED.

Here is a diagram of a NES (See Figure 4-4):

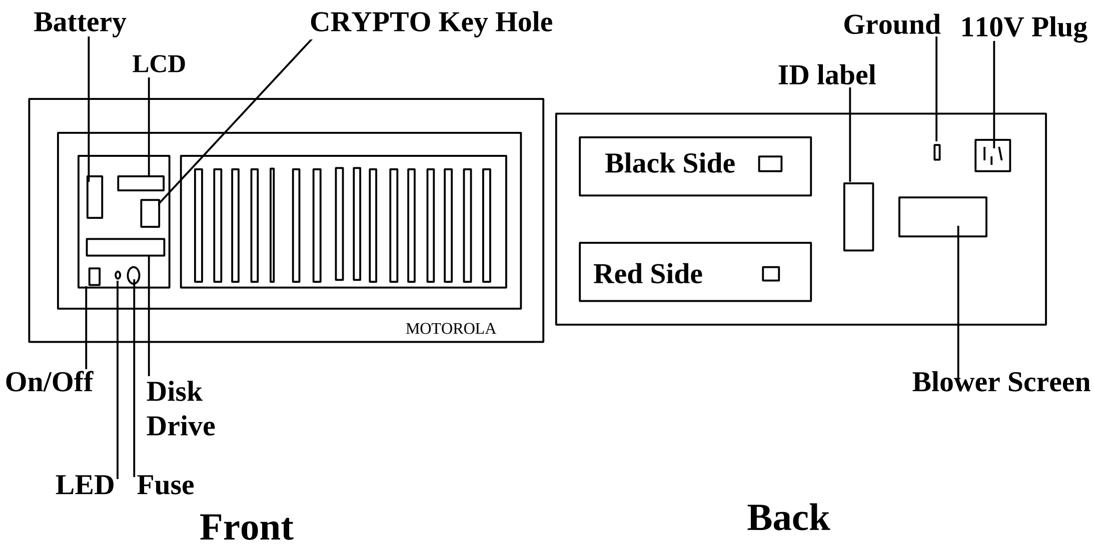


Figure 1.

The NES is basically a box with two ports. One port is used to provide a connection to the unclassified user (hosts) and is on what is called the “RED Side” or CLASSIFIED side. The other port is used to connect to the TPN (usually the LAN connection on a SEN or LEN) and is called the “BLACK Side”.

For the purpose we will be using the NES for, the Red Side is the A1 Port for the NES on all SENs and LENs.

Other major components of the NES include;

a. On/Off Switch, a rocker switch that applies input power to NES Security Platform.

b. The 3.5” floppy disk drive used as a secondary storage medium.

c. Fuse holder supporting a 3 Ampere (3 AG-normal blow fuse) for input power protection,

d. Battery housing for 6v lithium battery used to maintain key material when main power is turned off.

e. Key-receptacle Port for Key Storage Device KSD-64A.

f. LCD (Liquid Crystal Display) provides status and error messages to the Network Administrator.

g. LED (Light Emitting Diode) assembly:

RED - initial power-up or alarm state
Yellow - performing self tests
Green - self tests passed
Blinking Green - passing traffic

The recommended method of mounting the NES is in the rack in a SEN. Secure it with bolts and nuts to the rack. Another method, although less preferred, is to place it on the inside ledge near the two Cabletron Transceivers (ST-501) supporting the A1 and A2 cables to the TPN ports on the side of the shelter. The ledge has enough room to fit the NES however it must be lashed down with bands or ties. Additionally, in order to see the LED and LCD screen you have to pull it out from the ledge. Any 110V input socket will work to provide power requirements.

CAUTION. The NES must ALWAYS be grounded. Ground the system by connecting a groundstrap from the NES ground lug (on the rear of the NES) to the ground rod outside of the vehicle.

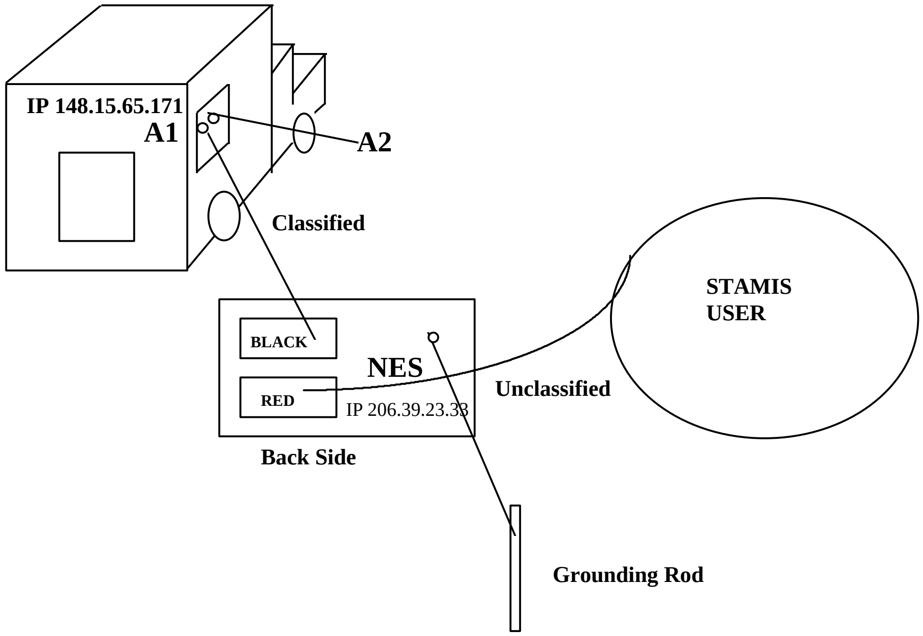


Figure 4-5.

III. Software. The NES's "see" one another across the Tactical Packet Switch Network using a database created with the PRODUCT SERVER Database Software. The Product Server Database Software, written by Motorola Corporation, is used on any IBM/Compatible MS-DOS computer system. The Product Server Administrator constructs all the specific Internet Protocol (IP) addresses associated with each MSE switch in a network that supports a NES. The administrator assigns the A1 TPN port for the BLACK Side IP address on the NES and then constructs a class "C" address range for the RED Side of the NES to be assigned for the unclassified users.

When issued a NES for use on an exercise or deployment, the team will receive a NES, all cables for connection and a new PSN disk for that NES. The PSNs that we have adopted for use in the NES network are unique PSNs that are not used elsewhere in the V Corps network. They range from 201-210. For example, if a NES is issued to C74, C74s PSN will change from 152 to whichever PSN disk is issued to it (ie 201). This helps the NES administrator when writing the database for the NESs. The administrator does not need to know which SEN will be supporting which site prior to writing the database. They will only need to know the requirements of the exercise to produce the database.

The standard in V Corps for the NES BLACK side IP address is to use 64 (the lowest IP available on LAN0 (A1). SEN operators will install the NES onto the RG-58 cable on the Cabletron Transceiver that corresponds to the A1 port inside of the SEN. The Red Side of the NES is cabled into the area where unclassified users with their computers will be. The RG-58 for the Red Side will be run out the drain hole of the SEN and to the users. Each NES on the database is constructed with specific IP address range for the unclassified user.

NOTE. Both ports on the switch are still black and will be used for the classified users, i.e., MCS boxes, S2's Warlord, etc.

The database now becomes "relational" and "sees" the other NES's.
The output of the database is a specific "NES Disk" for the switch it is to be assigned to. The files on the disk are as follows:

PRIOR TO FIRST BOOT	AFTER FIRST BOOT
umap_2.dir	umap_2.dir
umap_2.rte	umap_2.rte
umap_2.map	umap_2.map
r2ide03-.cex	r2ide03-.cex
umap_3.dir	umap_3.dir
umap_3.rte	umap_3.rte
umap_3.map	umap_3.map
b3ide03-.cex	b3ide03-.cex
kernel.cnf	kernel.cnf
	verify.rec
	audit.dat

These files are important in respect they are what makes the NES operational. In addition, when the CRYPTO key is inserted into the NES for "bootup", the disk obtains key material in a file called "verify.rec" and creates a "audit.dat" file for historical recording.

VI. Field Setup. In Figure 3 we see a sample MSE TPN Network with the NES being utilized. With the NES, users can connect their computers (ULLS, SARRS, SAMS, EMAIL, etc.) to the RED side of the NES. You will connect the BLACK side of the NES to the A1 T-connector attached to the Transceiver on the inside of the switch. This connection will allow the user to still use both connectors on the outside of the SEN.

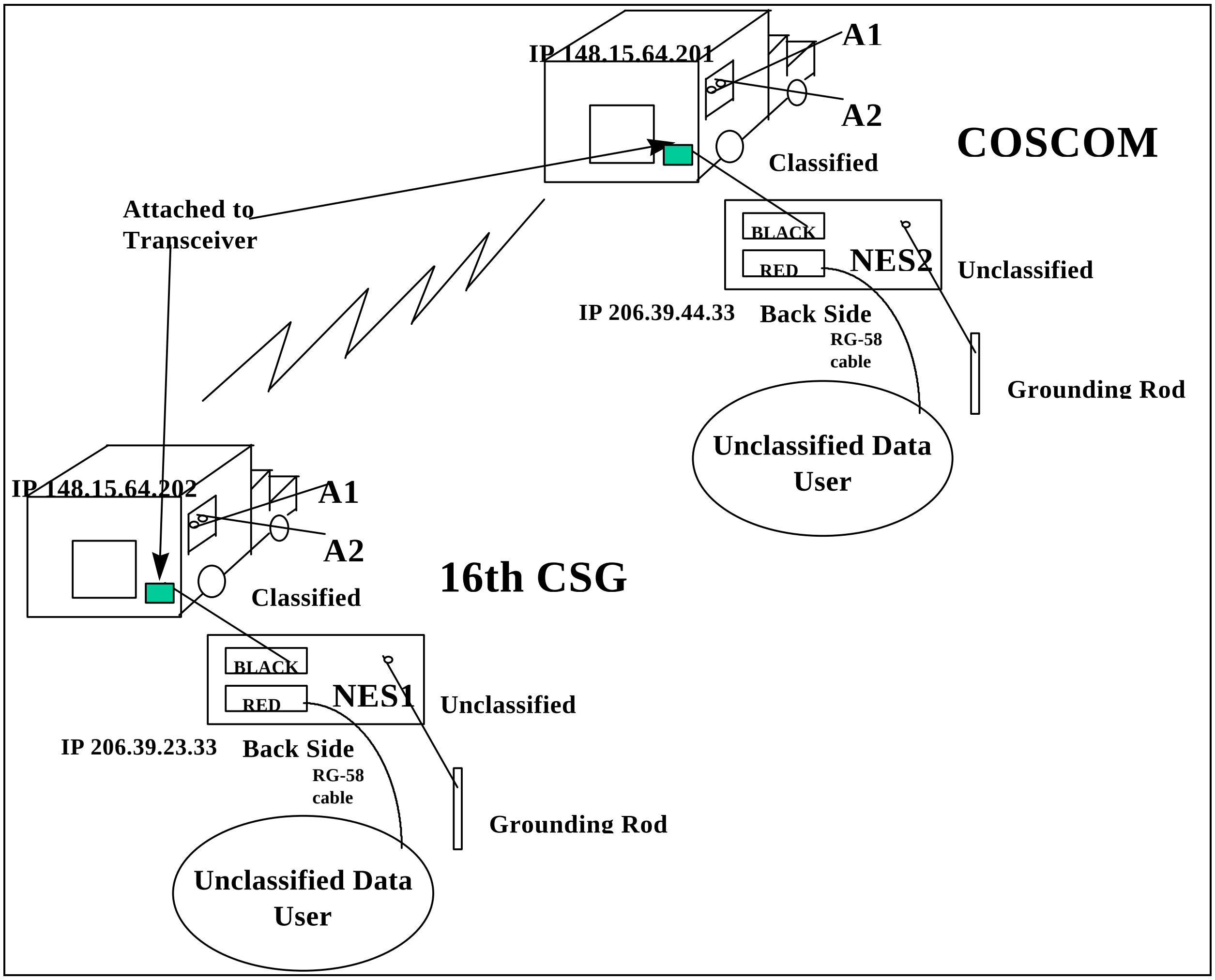


Figure4-6.

V. Equipment Check. To make the NES work you need three items;

1) NES Security Platform (the box),

2) Configuration disk (a 3.5” HD floppy disk),

3) KSD-64A COMSEC key. (a STU III type key)

Items 2 & 3 will be provided to you by the Systems Administrator in probably the same way you receive your startup disk for a computer .

Once the KSD-64A COMSEC key and configuration disk has been inserted into the NES and the initialization procedures performed, these three items are linked together. The thing to remember here is that once the NES has been initialized, these three items (box, key, and disk) are tied together. All three items must be present the system to work.

When the KSD-64A is first entered into the NES it will contain a Seed Type COMSEC Key. During the initialization process, the Seed Key will be converted and loaded into a CRYPTO Ignition Key (CIK). This CIK is then identified to the configuration disk by a file being written to the disk (verify.rec). This is the process that ties the three items together.

Equipment Checklist

* Make sure the NES is grounded
* AC power cord is connected
* Power switch at 0 (off)
* No configuration disk in disk drive
* No COMSEC Key in key-receptacle
* 6V battery installed
* 3Amp fuse
* Black Cable (RG-58) connected to A1 transceiver in SEN shelter
* Red Cable (RG-58) off the back side of the NES extending to the UNCLASSIFIED user for STAMIS boxes and email.

TURN ON PROCEDURE

* STEP 1. Make sure power switch is set to 0 (off)

* STEP 2. Remove 6V battery for at lease +30 seconds. This will ensure that the NES has been zeroized.

DO NOT ZEROIZE IF JUST REBOOTING THE NES.

* STEP 3. Re-Install the battery.

* STEP 4. Set power I/O switch to 1 (ON); LED glows RED

* STEP 5. Insert configuration disk in disk drive

* STEP 6. When prompted on LCD, insert and turn operational key one-quarter turn clockwise.

CAUTION:

The key fits only one way; Do not try to turn the key beyond the stop point. The key can be damaged.

NOTE:

After turning the key DO NOT turn it back (counter-clockwise) until the booting process is complete, indicated by:

a) The NES's LED turns GREEN

b) The NES's LED stays red while the LCD alternates between an error message and "REMOVE DATA KEY"

NOTE:

A few seconds after the key is turned, the LED glows yellow while the self-tests are running, with the exception that the LED turns RED for less than 30 seconds while the "Power up Test SEC" message is displayed.

* STEP 7.   Watch the LCD messages and verify that the third LCD message reads "NO TAMPER KEY". This confirms that the NES was successfully zeroized.

* STEP 8. Wait about 4 minutes for the NES to boot while watching the LCD status messages. Figure 4 lists the normal messages that are displayed on the NES LCD as it goes through its booting sequence.

OPERATIONAL KEYLOAD	CIK LOAD
AC POOT PASSED	AC POOT PASSED
NES VERSION (FIRMWARE)	NES VERSION (FIRMWARE)
NO TAMPER KEY	POWER TEST SPU
Power Test SPU	Power Test SMU1
Power Test SMU1	Power Test SAC1
Power Test SAC1	Power Test CU
Power Test CU	Power Test SEC
Power Test SEC	Power Test DSK
Power Test DSK	Power Test SMU2
Power Test SMU	Power Test SAC2
Power Test SAC2	DISK INTEGRITY CK
OPER KEY CONVERT	DOD IP C2 XXX
DOD IP C2 XXX	VMEmodule CONFIG
VMEmodule CONFIG	DOD IP C3 XXX
DOD IP C3 XXX	VMEmodule CONFIG
VMEmodule CONFIG	READING CIK
Store OP KEY	CIK Verify
Store OP KEY ***	CIK Verify ***
Creating CIK	Exp. date (of key material)
CIK Created	Writing CIK
CIK Verify	CIK Written
CIK Verify ***	PLEASE SHUT DOOR
Exp. date (of key material)	C: Classification
Writing CIK	N: Name of NES
CIK Written	T: ASCII ID (of key)
PLEASE SHUT DOOR	K: KMID (Reg. No.)
C: Classification	TIME OF DAY
N: Name of NES	DATE
T: ASCII ID (of key)	
K: KMID (Reg. no.)	
TIME OF DAY	
DATE	
BATTERY (STATUS)	

Figure 4.

NOTE: If the NES is being initialized for the first time with an Operational Key, the NES will scroll through the status messages on the left. If this is a succeeding initialization procedure (due to power loss in van or a site jump) the NES will be initialized with the CIK Key (CIK Key is created during the initial boot). The NES will scroll through the messages on the right side.

* STEP 9. The LCD will either finally turn GREEN, indicating a successful boot and key loading, or it will turn RED with a corresponding “EC” Error Code displayed, follow by “REMOVE DATA KEY”.

* STEP 10. If the attempt was successful as described in the previous step, the LCD will continuously scroll through a cycle of 8 messages. Look for the LCD message displayed a “C”, which will indicate the classification of the key that was loaded. Compare this to the classification that was intended to be loaded. If there is a discrepancy, this is a COMSEC incident. Report this problem to your network administrator.

* STEP 11. When the LCD displays the messages “CIK written”, “DATE:”, “BATTERY OK”, and “UNCLASSIFIED”, the turn-on procedure will be completed and the LED will turn GREEN.

TURN-OFF PROCEDURE

* STEP 1. Remove CIK key

* STEP 2. Eject configuration disk and remove

* STEP 3. Set power switch to 0

* STEP 4. Store CIK and configuration disk according to local security regulations.

This completes the turn-off procedure.

VI. Troubleshooting. The following trouble shooting guide is designed to aid the SEN or LEN Operator as well as the SIGO.

LOSS OF AC POWER

If during operation, AC power is lost, turn the NES off. Restore AC power and reinitialize the NES. This is particularly critical when SENs have to go to DC power to service the generators. Turn off the NES during this period.

SELF-TEST FAILURE

If the NES fails any test during the self-test process, an error code and/or error message will appear on the LCD. Record the information and report it to the system administrator.

FAILURE DURING FULL OPERATION

If during full operation, the LED changes from GREEN to RED,
The LCD should have a message of “REMOVE DATA KEY” follow by “INSERT/TURN KEY”. Remove the KSD-64A Key and reinsert it. If the self test fails to complete, call the system administrator to verify the working condition of the key, battery, and configuration disk. If the items are good then refer to chapter five of the “NES Security Platform User’s Guide” for further instructions.

EXCESSIVE DUST and DIRT

The impact of harsh field conditions on the NES, especially the disk drive, will cause considerable headaches. The disk is susceptible to dust and dirt being drawn into the drive and crypto key hole by the internal cooling fan. Backup disks MUST BE MADE for each NES. Replace the NES disk at least once per month (extreme harsh conditions). Place Scotch tape over disk drive and CRYPTO key hole. Brush dirt and dust from vent fan in back of NES and the front grills.

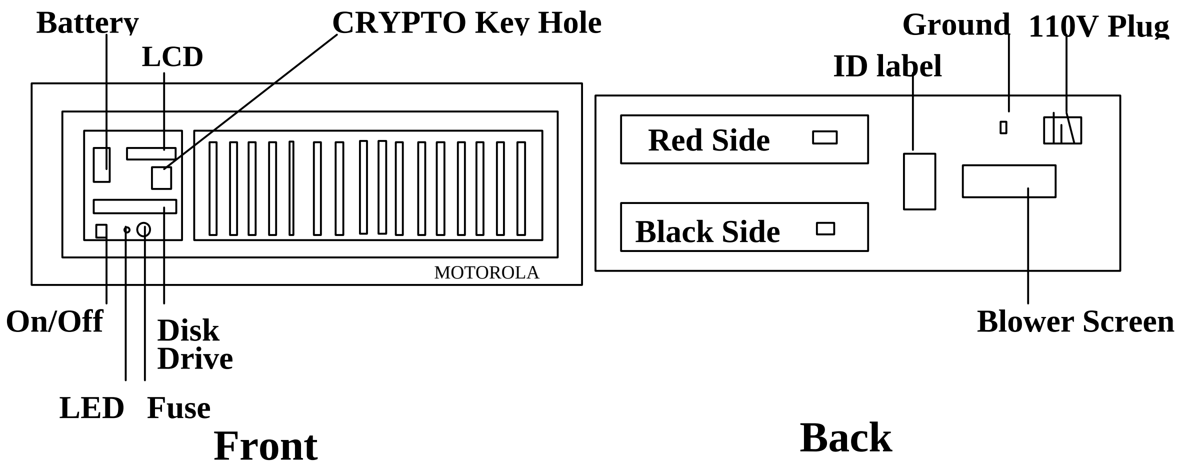


Figure 1.

Installing the NES:
1. Attach both AUI cables to the back of the NES;
2. Attach grounding cable to grounding bolt;
3. Plug in the power cable;
4. Secure NES in rack;
5. Attach a MAU to each AUI cable;
6. Attach the TPN LAN to the BLACK side MAU using a "T" connector;
7. Attach the Unclassified LAN to the RED side MAU using a "T" connector.

Booting the NES:
1. Turn on power; LED glows red;
2. Insert configuration floppy disk into drive;
3. Insert and turn key one-quarter turn clockwise;
4. The light will glow yellow except when "POWER UP TEST SEC" message is displayed;
5. The light will turn green when the boot is completed. If light turns red for an extended period of time, go to the troubleshooting procedures.

Shutting Down the NES
1. Turn the key one-quarter turn counterclockwise;
2. Remove the floppy disk;
3. Turn off the power.

Troubleshooting the NES
1. If the light on the NES turns red, call the NES Manager at your Battalion BATCON or Brigade SYSCON.

CHAPTER 5

LINK INSTALLATION

SECTION I. NODE CENTER

1. General. The following steps present a procedural approach to link initialization. There are three phases to this procedure: in house checks, connections from NC/LENS to LOS, and initialization of links. Link installation begins based on priorities established by OPORD.

2. Control. The master is identified by being listed first in the OPEN LINK order. Master always rejects glare while the slave accepts glare. This identifies who reports and directs the link installation.

a. Link priorities are specified in the OPORD/team packets. Priorities do not preclude all work on lower priorities, but must be the node manager's primary concern. Call to request a change in priority if the situation warrants it.

b. SEN/RAU links will not be installed prior to establishment of the backbone and bulk transfer (BT) of COMSEC keys. RAU beacons remain off and TEDs are loaded with the appropriate T key IAW the matrix in CHAPTER 6 (COMSEC). A secure FM or MSRT will be located at every SEN, remote RAU and LOS using SHF upon installation.

3. Responsibility:

a. NC/LEN works through internal checks and loopbacks of all MDTGs and local DTGs ensuring the following status:

(1) TGM/DTG # (status 13)

(2) TSB # (status 5)

(3) TED (Resync and Full Operate Lamps are lit)

b. SEN performs in house loopback (blue plug) ensuring that:

(1) TED (Resync and Full Operate Lamps are lit)

(2) CM LED reads 000 (ensure CM is in EQ side LPBK)

c. RAU perform in house loopback (blue plug) ensuring that:

(1) TED (Resync and Full Operate Lamps are lit)

(2) CM LED reads 000 (ensure CM is in EQ side LPBK)

(3) GLU and all RT 1539 loaded with Freq plan and COMSEC

d. LOS V3 perform the following loopbacks test:

(1) Blue plug loopback

(2) TGMD tear drop loopback (if possible)

(3) Single DTG

(4) 6-1-6, 6-2-6 and 6-3-6

Note: clear all faults that appear on radio LED for each loopback

e. LOS V1 perform the following loopbacks test:

(1) Blue plug loopback

(2) 6-1-6, 6-2-6, and 6-3-6 (see note above)

Note: Radio transmission path must be verified good prior to link installation.

4. LINK INSTALLATION: Each assemblage works through internal checks and loopbacks to speed up the process of initialization, then proceed with next step.

a. NC to NC/LEN via UHF or SHF

(1) Perform internal loopback within each NC checking for the following status.

a. TGM/DTG # (status 13)

b. TSB # (status 5)

c. TED (Resync and Full Operate Lamps are lit)

Note: If the above status is not received see link trouble shooting.

(2) Connect CX 11230 if not already connected, Remove patch, set DVOW ring code for (master) LOS V3 and establish communication via CM.

(3) Request LOS V3 perform its loopbacks with CX 11230 connected. The NC should receive good DTG and TSB status (see step 1). If not see trouble shooting section.

(4) LOS will remove all loopbacks establish communication for master NC and distant end LOS via CM.

(5) NC will request a radio loopback from distant end LOS. If link is good the master NC will receive a good DTG and TSB status.

(6) The distant end LOS will remove all loopbacks and establish communication with master NC to slave NC.

(7) The slave NC will remove all loopbacks. At this time if the link path is good each NC will a see a good DTG and TSB status.

a. TGM/DTG # (status 13)

b. TSB # (status 5)

c. TED (Resync and Full Operate Lamps are lit)

(8) Each NC will then assign a AIL with master NC rejecting glare and slave accepting glare. At this time if the link is good each NC will see a good RSB status.

a. RSB # (status 5)

(9) Perform DIL and check for the following parameters.

a. LINK INITIALIZED (Y)es

b. TRANSMISSIONS STATUS = 2

Note: A DIL status 1 indicates the link is marginal and passing traffic or bulk transfer (BT) may not be possible. Status 0 means the link is out of service for routing. For solution see link trouble shooting section.

(10) After initialization of link the "Tn" key must be bulk transferred from master NC to slave NC.

(11) Reload TED with the "Tn" key.

(12) Check the following link status information for correct parameters (shown below):

a. TGM/DTG # (status 13)

b. TSB # (status 5)

c. TED (Resync and Full Operate lamps are lit)

(13) Ensure that the LINK is operational by performing the following:

a. Place a call to the slave NCSs'/LENSs' CSP.

b. Check the Display Transmission Group (DTG) to insure that the call is routed over the respective link (check to see that there are two trunk in use).

(14) If necessary: Execute the Assign Bypass and Duplication (ABD) command waiting to receive "Action Complete and Duplication STATUS 2 msg".

b. NC to Remote SEN

(1) NC Perform internal loopback while SEN will perform its own in house loopback and establishing a local link with its LOS V1. The NC will work to establish the following results:

a. TGM/DTG # (status 13)

b. TED (Resync and Full Operate Lamps are lit)

Note: If the above status is not received see link trouble shooting.

(2) Connect CX 11230 if not already connected, Remove patch, set DVOW ring code for (master) LOS V3 and establish communication via CM.

(3) Request LOS V3 perform its loopbacks with CX 11230 connected. The NC should receive good DTG. (see step 1) if not see trouble shooting section.

(4) LOS will remove all loopbacks establish communication for master NC and distant end LOS via CM.

(5) NC will request a radio loopback from distant end LOS. If link is good the master NC will receive a good DTG status.

(6) The distant end LOS will remove all loopbacks and establish communication with SEN

(7) The SEN will remove all loopbacks. At this time if the link's path is good the NC will receive a good DTG status.

(8) The SEN will have the following indications:

a. TED (Resync and Full Operate Lamps are lit)

b. CM LED reads 000

Note: if indication not present see link trouble shooting section.

(9) SEN will now place a call to the NC's CSP.

c. NC to Remote RAU

(1) NC Perform internal loopback while RAU will perform its own in house loopback and establishing a local link with it's LOS V1. The NC will work to establish the following results:

a. TGM/DTG # (status 13)

b. TED (Resync and Full Operate Lamps are lit)

Note: If the above status is not received see link trouble shooting.

(2) Connect CX 11230 if not already connected, Remove patch, set DVOW ring code for (master) LOS V3 and establish communication via CM.

(3) Request LOS V3 perform its loopbacks with CX 11230 connected. The NC should receive good DTG status. (see step 1) if not see trouble shooting section.

(4) LOS will remove all loopbacks establish communication for master NC and distant end LOS via CM.

(5) NC will request a radio loopback from distant end LOS. If link is good the master NC will receive a good DTG status.

(6) The distant end LOS will remove all loopbacks and establish communication with RAU

(7) The RAU will remove all loopbacks. At this time, if the link's path is good the NC will receive a good DTG status.

(8) The RAU will have the following indications:

a. TED (Resync and Full Operate Lamps are lit)

b. CM LED reads 000

Note: if indication not present see link trouble shooting section.

(9) RAU in MSRT Mode

- Perform all in-house loopbacks
- Load al RT-1539s
- Perform local loopbacks with LOS V1
- Install Radio link, establish DVOW

RAU in RAU Mode (If EOW/DVOW ever lost, go back to MSRT Mode)

- Install DTG, affiliate DSVT
- Affiliate GLU
- Interrogate GLU
- Activate Freq Plan (XMIT Marker) when given permission.

(10) NC will call RAU DSVT and Bump the GLU. If possible call an MSRT affiliated off this GLU.

Notes:

1. RAUs must get permission from NC/NMF to turn on marker.
2. If the link to the goes out for any reason, immediately turn off marker. Do not ask permission, just do so and report it.
3. If the link to the NC goes out for more than 5 minutes, change back to MSRT Mode.

d. NC to Local SEN

(1) NC Perform internal loopback while SEN will perform its own in house loopback . The NC will work to establish the following results:

a. TGM/DTG # (status 13)

b. TED (Resync and Full Operate Lamps are lit)

Note: If the above status is not received see link trouble shooting.

(2) Connect CX 11230 if not already connected, Remove patch, set DVOW ring code for local SEN and establish communication via CM.

(3) The SEN will remove all loopbacks. At this time if the link's path is good the NC will receive a good DTG and TSB status.

(4) The SEN will have the following indications:

a. TED (Resync and Full Operate Lamps are lit)

b. CM LED reads 000

Note: if indication not present see link trouble shooting section.

(9) SEN will now place a call to the NC's CSP.

(10) NC will check the Display Transmission Group (DTG) to insure that the call is routed over the respective link (check to see that there are two trunk in use).

e. NC to Local RAU

(1) NC Perform internal loopback while RAU will perform its own in house loopback . The NC will work to establish the following results:

a. TGM/DTG # (status 13)

c. TED (Resync and Full Operate Lamps are lit)

Note: If the above status is not received see link trouble shooting.

(2) Connect CX 11230 if not already connected, Remove patch, set DVOW ring code for local RAU and establish communication via CM.

(3) The RAU will remove all loopbacks. At this time if the link's path is good the NC will receive a good DTG status.

(4) The RAU will have the following indications:

a. TED (Resync and Full Operate Lamps are lit)

b. CM LED reads 000

Note: if indication not present see link trouble shooting section.

(5) RAU in MSRT Mode

- Perform all in-house loopbacks
- Load al RT-1539s
- Perform local loopbacks with LOS V1
- Install Radio link, establish DVOW

RAU in RAU Mode (If EOW/DVOW ever lost, go back to MSRT Mode)

- Install DTG, affiliate DSVT

- Affiliate GLU
- Interrogate GLU
- Activate Freq Plan (XMIT Marker) when given permission.

(6) NC will call RAU DSVT and Bump the GLU. If possible call an MSRT affiliated off this GLU.

Notes:

1. RAUs must get permission from NC/NMF to turn on marker.
2. If the link to the goes out for any reason, immediately turn off marker. Do not ask permission, just do so and report it.
3. If the link to the NC goes out for more than 5 minutes, change back to MSRT Mode.

f. LOS V3/V4/V1/V2 will check out radio equipment and shelters in-house before contacting each other. The master LOS V3/V4 will direct link installation. Ensure that the receive and transmit frequencies and data rate on TGMD and RADIO have been set (according to the open link message).

(1) Ensure the UHF radio is operational using a loopback tests 6-1-6, 6-2-6 and (6-3-6).

(2) Ensure that the shelter passes in house looped back to itself and that all equipment in the shelter checks out with no alarms

(3) Perform any necessary equipment patching.

(4) Set power level and data rate on each UHF radio and leave in low power unless an acceptable communications link cannot be established.

(5) LOS V3 settings, see open link order.

(6) Fully extend antenna mast, then lower as much as possible without degrading bars received by distant end.

(7) Set the UHF radio to the EOW mode (0-5-0) and contact the slave LOS V3/V4.

(8) Instruct the slave LOS V3/V4 to adjust antenna azimuth for the strongest receive signal level, then do the same.

(9) Conduct a test of the RF link using the 6-4-6 and 6-5-6 loop tests. (Ensure that the UHF radio is set to the correct data rate to pass traffic) A status E5 or E6 on the UHF radio front panel indicates that the link is able to pass traffic, but strive for the best possible signal.

(10) Perform an interference test by turning off one transmitter and recording the received signal level for each end of the link.

(11) After passing of 6-4-6, 6-5-6 and interference tests, proceed to the next step.

(12) **For NCS/LENS ONLY:** Establish contact with the slave NCS/LENS and inform the operator that you will be establishing a bridge to the master NCS so that the link may be engineered.

(13) Establish a bridge with the master NCS and the slave NCS/LENS and confirm NCS to NCS/LENS communications.

(12) **FOR SEN/RAU ONLY:** Contact the LOS V1 operator and request the status of the LOS V1 to the SEN/RAU. (The 6-2-6 loop test will determine the quality of this sublink.)

(13) Have the LOS V1 establish a bridge to the SEN/RAU.

(14) Establish contact with the terminating assemblage

(SEN/RAU) and inform the operator that you will be performing a loopback. Have the operator inform you of the status of the TED (Resync and Full Operate).

(15) Perform a radio patch panel loopback for this link to the terminating assemblage (SEN/RAU).

(16) Establish DVOW communications with the NCS and inform the operator of the status of the external link.

(17) Upon direction of the NCS operator, remove the radio patch panel loopback.

(18) Direct the SEN/RAU to remove DVOW timing patch.

g. LOS V1 to LOS V3.

(1) Set DVOW ring code.

(2) Ensure that the data rate is set to 256 kbps on the UHF radio (0-1-0).

(3) Ensure that the receive and transmit frequencies have been set (according to the open link message).

(4) Ensure that the UHF radio is operational with a loopback test (6-3-6). It should read L3 on the LED.

(5) Ensure that the shelter has been looped back to itself and that all equipment in the shelter checks out with no alarms.

(6) Set the power level of the UHF radio to low power (4-1-4) and leave it set at this power level unless you cannot establish an acceptable communications link.

(7) Fully extend antenna mast, then lower as much as possible without degrading bars received by distant end.

(8) Set the UHF radio to the EOW mode (0-5-0) and contact the LOS V3.

(9) Upon direction of the LOS V3 adjust the azimuth of the antenna for the strongest receive signal (11-15 bars).

(10) Upon direction of the LOS V3 perform the 6-4-6 and 6-5-6 loop and interference tests. Strive for the best signal possible.

(11) Ensure that the radio and CM is set to the correct data rate for the link being tested.

(12) Upon direction of the LOS V3 bridge DVOW to the SEN/RAU and leave it bridged.

h. LOS V1 to SEN/RAU:

(1) Set DVOW ring code.

(2) Establish DVOW communications with the SEN/RAU.

(3) Ensure that the SEN/RAU has completed operational checks and is ready to establish a sublink.

(4) Perform a UHF loopback (6-2-6) to the SEN/RAU.

(5) Contact the SEN/RAU to insure that their TED is in sync while the loopback is enabled.

i. SEN:

(1) Set all SEN equipment operating parameters:

- DVOW ring code.

- Data rate set for 256 Kbps on CM and LGM, both in thumb wheel position 4.

(2) Patch the DVOW timing for loopback until directed by the LOS V3 to remove the patch.

(3) Ensure that the shelter has been looped back to itself and that the equipment in the shelter checks out with no alarms. Patch normal through (DTG) when completed.

(4) Upon direction from the NCS affiliate your DNVT and place a call to the NCS operator.

j. RAU:

(1) Set DVOW ring code.

(2) Set data rate for 256 Kbps on CM and LGM, both in thumb wheel position 4.

(3) Upon direction of the NCS affiliate the DSVT and place a call to the NCS operator.

(4) Affiliate GLU and ask the NMF to request a frequency plan download from the SCC via the NMF terminal.

3. INSTALLING LOCAL DTGs (RAU/SEN/SCC).

a. Ensure that loopback is removed from the patch panel.

b. Patch DTG for normal through connection, check TED for full op/Resync light.

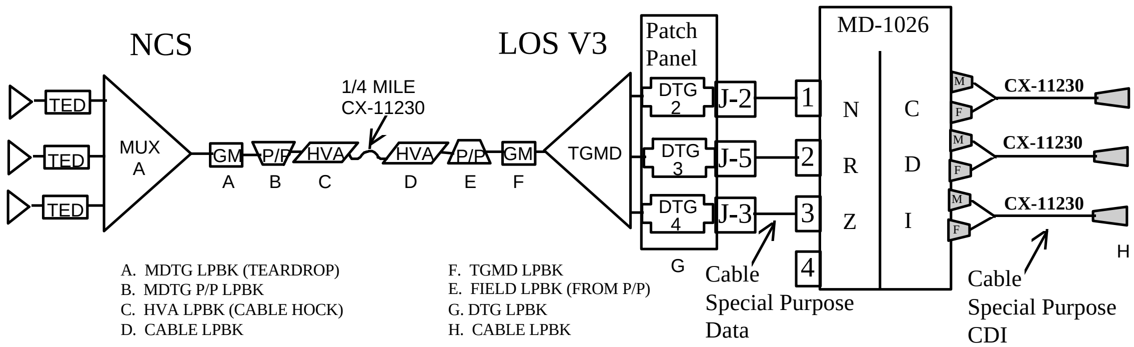
c. Contact assemblage operator.

d. Have operator affiliate DNVT/DSVT and place a call to the NCS operator.

SECTION II. INSTALLING UNLIMITED LOCAL NC DTGS

MD-1026 Group Modem (GM) Link Installation and Configuration

The GM is a digital modem that converts up to four independent groups of NRZ data into conditioned diphase modulated signals (based on installed DPHS CCA) for cable transmission. Provided with the MD-1026 are special cables to interface the LOS V3's TGMD output as shown.



1 Installation.

The GM accepts 110 VAC only. An uninterruptible Power Source (UPS) is recommended due to the fact that the V3 will only provide DC during emergency conditions.

Each group is independent. Install the Data and CDI cables as a pair. Example: NRZ data inserted into group 1, Group 1 CDI will be the output. The diagram shows all three TGMD DTGs using the MD-1026, in reality any Radio/MD-1026 combination will work. Example: LOS V3 connected to MDTG 25 allows access to DTGs 2,3 and 4. Install DTG's 2 and 3 to their respective assemblages via cable system. DTG 4 is still free to use the normal Baseband/Radio configuration.

Give **EXTREME CARE** to the special purpose cables as they are not "factory made" or "developed" for a tactical scenario. Do not put any type of stress on the cables or connectors.

2. Configuration.

Install or populate the GM with a DPHS CCA. Select a group rate via the thumbwheel switch position equivalent to each group (see chart to translate group rate to thumbwheel setting). Enter "0" for any group not being used. The DPHS OW CCA is not necessary for operation, if installed (ease of troubleshooting) set the SYS/MAINT to **Maint,** as Orderwire signal is not a part of this interface.

CCA SLOT	TYPE OF CCA	SWITCH SETTINGS
A4	DPHS	GRP RATE -see chart
A5	DPHS OW	MAINT
A7	DPHS	GRP RATE -see chart
A8	DPHS OW	MAINT
A11	DPHS	GRP RATE -see chart
A12	DPHS OW	MAINT
A14	DPHS	GRP RATE -see chart
A15	DPHS OW	MAINT

SW POS	GRP RATE	SW POS	GRP RATE
0	OFF	7	576
1	72	8	1024
2	128	9	1152
3	144	11	2048
4	256	12	2304
5	288	13	4096
6	512		

MD-1026/MDTG TROUBLESHOOTING

STEP 1: **ACTION:** * Local NCS perform a teardrop LPBK on a ssociated MDTG.
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 2: **ACTION:** * Local NCS switch the MDTG teardrop switch to GM, and put the MDTG in P/P loopbac k (Blue Plugs).
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 3: **ACTION:** * Local NCS connect a CX-11230 cable between the switching shelter and LOS V3 radio, and put a loopback plug on the LOS V3 end of the cable.
RESULTS: ** should be displayed on VDT for associated DTG.
*** in case loopbacks fails
GO/NO GO

STEP 4: **ACTION:** * Local LOS V3 operator removes the loopback plug and the CX-11230 cable to the shelter. Inside the shelter the V3 operator puts the P/P in a field loopback.
RESULTS: ** should be displayed on VDT for associated DTG.
*** in case loopbacks fails
GO/NO GO

STEP 5: **ACTION:** * Local LOS V3 operator puts the P/P in the normal through configuration, and switches the TGMD Interface Select the LPBK.
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 6: **ACTION:** Local Los V# operator puts the associated DTG in a loopback on the P/P (XMIT to REC and CLK to CLK) .
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 7: **ACTION:** Local LOS V3 operators remove the patch cords and put a loopback plug on end of special purpose CX-11230 cable.
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 8: **ACTION:** All loopbacks should be removed and the NCs should be able to initialize the link.
RESULTS: A quality link with an R6 report of -6 in the range of 90-100 percent.
GO/NO GO

* Do not perform this test if there are other DTGs in use on this MDTG.

** After operator initiates LPBK, results should be:
SEN/RAU DTG/TGC -
" **DTG/TGM nn STATUS 13**"
INTERNODAL DTG/TGC -
" **TSB nn STATUS 5 TGC mmm"**
If no status's are received attempt to **"force a status"** by restarting the TED.

*** If loopback fails the operator must change the demodulate mileage via ADT command to double cable length " **from 1/4 to 1/2** " to get good results. Do not forget to change this setting back to 1/4 after test is completed.

Use the AMD/BER link testing procedures outlined in Chapter six of the V CORPS Technical Reference Manual in conjunction with these procedures.

SECTION III. LEN INSTALLATION PROCEDURES

1. The checklist provided below describes the installation steps for each assemblage on the LEN site.

a. LEN Switch.

(1) Perform equipment checkout using the following VDT commands:

- Display Major Equipment status (DME).

- Display Terminal Type (DTT) for LKGs (123).

(2) Load local preaffiliation list as directed by the operational order.

(3) Place all DTG selection switches in the loopback position.

(4) As the CX-11230 cables are connected from the LOS V4, ensure that DTGs (1 and 16) indicate TGM/DTG # status 13 on the TTY.

(5) Establish DVOW communications with the LOS V4.

(6) Upon direction from the NCS place the DTG selector switch to the GM position.

(7) Check the following link status information for correct parameters (shown in parentheses):

- TGM/DTG # (status 13).

- TSB # (status 5).

- TED (Resync and Full Operate lamps are lit).

(8) Inform the NCS of the above link status information.

(9) Once the NCS has placed its MDTG selector switch in the GM position you must repeat the above step and inform the NC of the link status information.

(10) Upon direction of the NCS perform Assign Interswitch Link (AIL) command (accept glare).

(11) Check the following status using the Display Interswitch Link (DIL) command (Y2):

- LINK INITIALIZED (Y)es

- Transmission Status = 2

(12) Receive BT of the "Tn" key from the NCS.

(13) Reload TED with "Tn" key.

(14) Check for following link status information:

- TGM/DTG # (status 13).
- TSB # (status 5)
- TED (Resync and Full Operate lamps are lit)

b. Local SEN/RAU:

(1) Remove loopback from the patch panel.

(2) Patch DTG for normal through connection.

(3) Check TGM/DTG for a status 13 and that TED Resync and Full Operate lamps are lit.

c. Remote Multiplexer Combiner (RMC):

(1) Remove loopback from the patch panel. (DTGs 9, 25, 26, 27 and 28)

(2) Patch DTGs for normal through connection.

(3) Check TGM/DTG for a status 13 for respective links.

d. LOS V4.

(1) Set DVOW ring code.

(2) Set transmit and receive frequencies and data rates according to the OPEN LINK order.

(3) Set data rates to 512 kbps on the following:

- GM (position) or SHF (512).
- UHF Radio Set (0-2-0).

(4) Ensure that the UHF radio is operational by using a 6-3-6 loop test. Should indicate L3 on the LED.

(5) Ensure that the shelter has been looped back to itself and that all equipment in the shelter checks out with no alarms.

(6) Establish DVOW communications with the LENS to do an initial check of the cable.

(7) Perform a 6-2-6 loop test to ensure that the link to the LEN is good.

(8) Set the power level of the UHF radio to low power (4-1-4) and leave it set at this power level unless an acceptable communications link cannot be established.

(9) Fully extend antenna mast, then lower as much as possible without degrading bars received by distant end.

(10) Instruct the slave LOS V3/V4 to adjust antenna azimuth for the strongest receive signal level, then do the same.

(11) Set the UHF radio to the EOW mode (0-5-0) of operation and attempt to contact the LOS V3.

(12) Upon direction of the LOS V3 perform loop test 6-4-6 and 6-5-6 (ensure that the radio is set for the correct data rate for the link being tested). Should indicate E5 or higher on the LED.

(13) Set the UHF radio to the correct data rate to pass traffic.

(15) Upon direction of the LOS V3 bridge to the LENS.

SECTION IV. SHF INSTALLATION PROCEDURES

1. This section will cover SHF installation on NC, LEN, and SEN sites.

2. Erect the SHF antenna in accordance with the procedures in TM 11-5820-1024-13.

NOTE: When locating a suitable site for the antenna, the following should be taken into account.

a. Ensure that the signal path between antennas is not obstructed by trees or other obstacles. (SHF is VERY sensitive to this -- any obstructions whatsoever will usually block the signal).

b. Try to avoid shooting over smooth terrain such as water or over other nearby shelters.

c. Do not exceed the specified range of 25 km.

d. Remember to set up the antenna to face in the direction of the given azimuth. Verify proper polarization of the antenna.

e. Double-check all cable connections before raising the antenna.

3. Once the antenna is erected and cables run, return to shelter and apply both AC/(mains) and DC/(battery) to the SHF radio. Use the following procedures to check for proper operation.

NOTE: All the functions are listed on the information plate mounted on the face of the Control Module.

a. Initial display should read * MF-15*.

b. Set the bit rate selector switch to the desired position.

NOTE: Observe the alarms. If the up light is flashing, go back outside and recheck the connections at both ends of the RF cable, reseating as necessary. This should eliminate the alarm.

c. Press (FL 4) to turn off the audible alarm.

d. Initiate the loop tests (S 22 E).

(1) Enter Password (22222), then Enter.

(2) "RF Loop = D" will be displayed.

(3) Enter any number (0-9) and press the Enter key. The D is now an E.

(4) Observe the LED fault lights.

(a) All RF and DC/DC LEDs should extinguished. TM 11-5820-1024-12.

e. Enter the Loop tests once again and take the system out of loop. Enter any number 0-9 and press the Enter key. The E will change back to a D. At this point, use the save function (S51, Enter, Enter, Clear) and (CL) to return to the original *MF-15* display.

f. Enter the Main Channels function (S 11 E).

Remember, this function tells the operator two things: the operating channels and the subrange being used on transmit and receive. Ensure that you are operating with the proper RF Module. Modifications have been made to some of the RF Modules, so serial number plates alone should not be referenced for this proof. A good way to verify this is to enter the assigned channel, and compare the frequency displayed on the channel/frequency conversion chart. If you enter a channel and an "L" band transmit frequency is displayed, you can be sure that the RF head is in fact an L band (1000) transmitter.

(1) Change the transmit and receive channels as necessary.

(a) The transmit channel will be flashing. Entering the channel number will automatically replace the one displayed. The cursor will now be over-written. When this operation is complete, press the Enter key, then exit Main Channels.

g. Check the following functions:

(1) TX on (L20E)

(a) If this is off, the RF Module will not transmit.

(2) RF Range (L43 E)

(a) Displays maximum number of channels and subranges in use.

(3) RX Power (L 21 E)

(a) Displays AGC level in dBm.

NOTE: The Control Module should display the RX POWER throughout the remainder of the set up procedure.

4. When the Control and RF Modules have been tested, remove all test loops and begin aligning the antenna.

a. Connect the alignment meter to the gray cables at the base of the antenna mast and mount the meter to the mast at or near eye level.

b. Place the DC volts switch in the 10 position and adjust the meter to mid-scale using the BIAS/VOLTAGE ADJ knob.

NOTE: The meter does not provide accurate voltage readings. Setting the needle to mid-scale allows you to see deflection to the right and left as the alignment procedure is performed.

c. Double check the orientation of the tilter/rotor assembly.

d. Contact the distant end through any means available (DO NOT ASSUME SHF RADIO SHOTS WILL WORK LIKE UHF SHOTS; COMMUNICATIONS OTHER THAN ORDERWIRE IS ESSENTIAL) Check engineering data and ensure the transmitter is ON.

e. One soldier begins the alignment procedures while another sits in the shelter, monitoring the RX POWER level.

(1) Grasp both green ropes, pull in one direction while watching the alignment meter.

NOTE: The needle should deflect to the right, signifying an increase in receive signal strength. Any deflection to the left signifies a DECREASE in signal strength and is not desired. If there is NO deflection in either direction, the Control Module is likely in RF LOOP, or no signal is being received . Check to be sure the Control Module is not in RF Loop.

(2) When you have reached maximum deflection, grasp the yellow ropes (to tilter) and adjust in the same manner.

(3) Turn the DC Volts switch to 5 and repeat steps (1) and (2).

(4) Turn the DC Volts switch to 2.5 and repeat steps (1) and (2).

(5) Turn the DC Volts switch to 1.0 and repeat steps (1) and (2).

NOTE: As the procedure progresses down the scale on the meter (10 to 5 to 2.5 to 1.0), the sensitivity increases and more care must be given to adjusting slowly while watching for quick jumps or dips in signal strength. Wind or reflections may cause false drops in signal strength. While aligning, when the signal strength drops, continue in that direction to make sure that it does not jump up higher than the previous reading. If it does not, return to the peak you found previously.

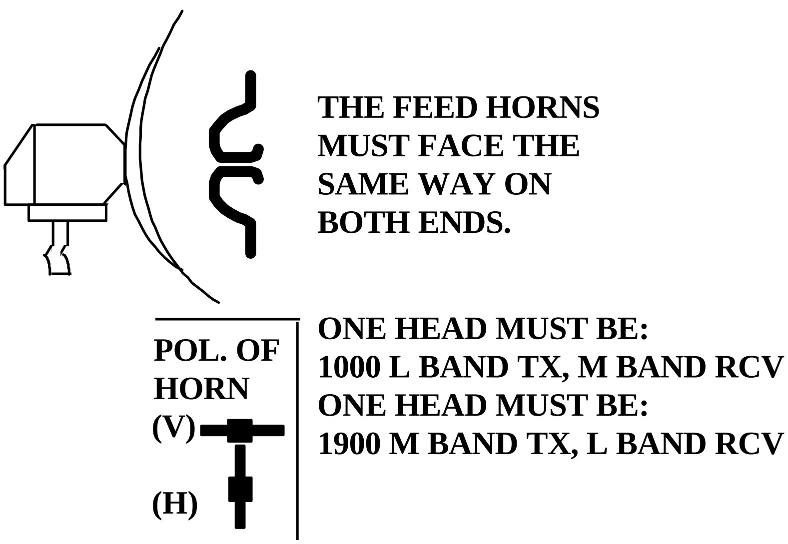
(6) When the alignment is complete, check the RX POWER level and verify a good reading. (> -70 dBm). If this minimum is not met, notify the other end and realign the antenna. A very good SHF radio link ranges between -45 and -60 dBm.

(7) When the reading is good, STOP, notify the other end to begin their adjustment.

f. When BOTH ends are completed and you have a good signal strength, then you are ready to put traffic on the SHF.

(1) While coordinating with the other end, make any appropriate patches on patch panels to accommodate the SHF radio.

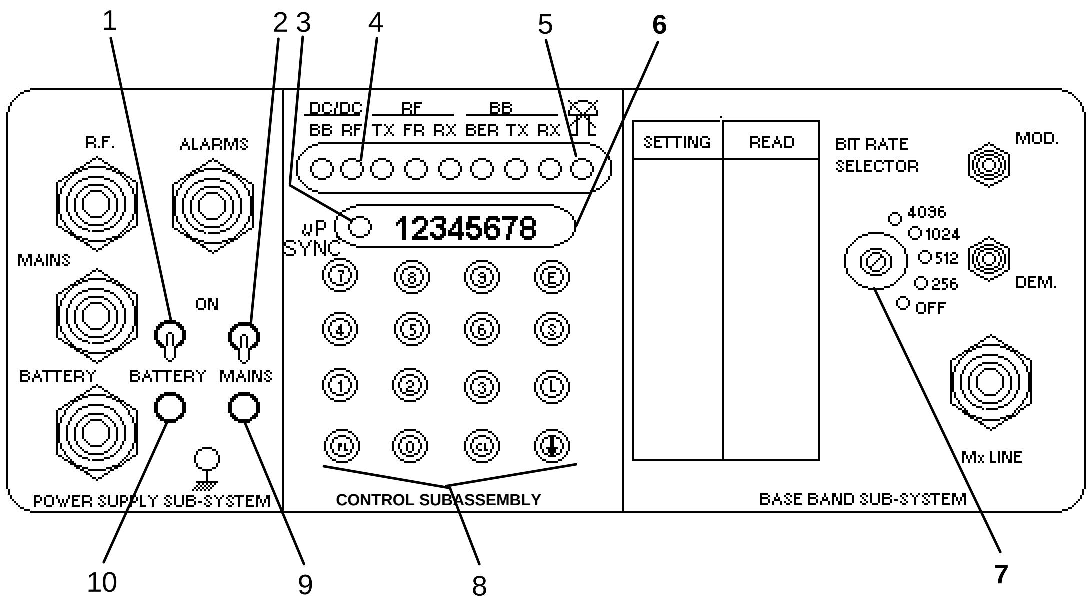
The LEN has two SHF radio sets available to use, but are DEDICATED to DTGs 1 and 16. Care must be taken to ensure that the proper set is being used to avoid switching traffic to the improper DTG.



The figure above shows the configuration for the SHF heads. For a single SHF link, a series 1000 head and a series 1900 head must be used. The reason for this is that the series 1000 head transmits in the L band and receives M band, while the series 1900 head transmits M and receives L. If both heads are the same then the receive and transmit of the heads are not compatible! The polarity of the heads must be the same, polarity difference is shown in figure 1. Note the requirement of the feed horns facing the same way on both ends.

Some references call the “L” band transmitter an “A” head, with the “M” transmitter a “B” head. But from experience, it is easier to refer to these as “1000” and “1900” since this is the how they are labeled on the data plate of the SHF RF head. Also, it is recommended that units stencil the bottom of the RF head with a label of “1000” or “1900” so that it is possible to tell the difference from ground level after the RF head has been installed and the antenna mast raised.

AN/GRC-224 SHF RADIO



FREQ: 14.508 - 15.35 GHZ (divided into 10 subranges)
SUBRANGE WIDTH: 100 Mhz
SUBRANGE CAPACITY: 29 radio channels (Band C or F (switch))
49 radio channels (Band L or M (los))

TRANSMISSION RANGE: 5 - 25 km
NOMINAL OUTPUT POWER: 30 milliwatts
Antenna Bandwidth: V plane - 2.2 degrees
H plane - 2.4 degrees

1. BATTERY toggle switch - Switch for battery power supply. Automatic cutoff in case of overload.
2. MAINS toggle switch - Switch for 115-Vac power supply. Automatic cutoff in case of overload.
3. up SYNC LED - Indicates microprocessor is out of service when on continuously. Indicates control link to rf interface is out of service when flashing.
4. ALARM LED Array:

DC/DC BB	Control module power supply subsystem overload.	RF RX	Received rf power from rf module below selected threshold or malfunction in rf module.
DC/DC RF	rf module dc/dc converter overload.	BB BER	Indicates malfunction location: rf module, control module, or received signal.
RF TX	Loss of rf carrier when transmitter output power drops at least 6 db below fixed threshold.	BB TX	Indicates failure in control module: multiplexer disconnected from baseband, or failure exists in baseband interface.
RF FR	Transmit frequency presetting and regulating loop not locked.	BB RX	Indicates loss of signal to multiplexer.

5. Alarm disable LED - Indicates alarm buzzer enable/disable.
6. Alphanumeric display - Displays read and write codes.
7. BIT RATE SELECTOR switch - Enables data transmission at four rates:
   256, 512, 1024, and 4096 kilobits, and OFF.
8. KEYPAD:

E	Activates data display, enables data storage.
S	Write mode
L	Read mode
down arrow	Scan for next available function code
CL	Erases last number entered, terminates rread operation
FL	Activates second function for next key command assigning it a diffeerent meaning
0 to 9	Keypad for entering read and write codes and channel numbers
MAINS, LED	On when 115 Vac power is being sukpplied
BATTERY, LED	On when battery power is supplied.

NOTES: Xmt and Rec frequencies must be flip-floped

QUICK REFERENCE FOR SHF RADIO INITIALIZATION

1. IN SWITCHING SHELTER PATCH SHF 1 TO MDTG 26
2. ON DVOW PATCH PATCH, PATCH SHF 1 TO DVOW CHANNEL 5
3. ON SHF CONTROL MODULE SET BIT RATE TO 4096
4. TURN ON "MAINS" THEN BATTERY TOGGLE SWITCHES
5. PRESS "FL" THEN "4" TO DISABLE THE ALARM
6. PRESS "S11E" TO WRITE TO MAIN CHANNELS
7. PRESS "22222 E" TO ENTER PASSWORD
8. PRESS "0525 E" TO SELECT CHANNELS 05 AND 25
9. PRESS "CL" THEN "40E" TO CHECK FOR SINGLE OPERATING MODE
10. PRESS "E" TO ENTER SINGLE MODE
11. PRESS "CL" THEN "41E" TO CHECK EOW SQUELCH
12. IF "EOWSQ =D" PRESS "E"

> NOTE
>
> TO CHANGE A SETTING FROM "E" (ENABLE) TO "D" (DISABLE) OR VICE VERSA. PRESS ANY NUMBER KEY AND THE SELECTION WILL CHANGE.

13. PRESS "CL" THEN "20E"
14. PRESS "E" IF OPER=E IS DISPLAYED OR CHANGE TO OPER=E THEN ENTER
15. PRESS "CL" THEN "22E" TO CHECK /SET LOOPS & TESTS.

> NOTE
>
> ENABLE OR DISABLE THE FOLLOWING LOOPS & TESTS TO READ AS SHOWN. USE THE DOWN ARROW KEY TO GET THE NEXT TEST

RF LOOP = E
BB LOOP = D
BB TEST = E
TC LOOP = D

16. PRESS "E" AFTER THE ABOVE LOOPS & TEST ARE SET
17. PRESS "CL" THEN"22E"
18. SET THE RF LOOP TO "D" (RF LOOP =D) THEN PRESS "E"
19. PRESS "FL CL" THEN PRESS "L21E" (CHECK POWER -IT WILL MOVE TO -46 dbm)
20. PRESS "CL" THEN :S22E" (TO DISABLE ALL LOOP & TESTS)
21. PRESS "222222E" TO ENTER PASSWORD.
22. SET THE FOLLOWING LOOPS & TESTS

RF LOOP = D
BB LOOP = D
BB TEST = D
TC LOOP = D

23. PRESS "E" AFTER THE ABOVE LOOPS & TEST ARE SET.
24. PRESS "FL CL", THEN PRESS "L21E" (CHECK REC'D POWER. IT MUST BE -46 dbm)

25. IN THE SWITCHING SHELTER, SET MDTG SELECTOR SWITCH TO "SHF" POSITION.
26. PRESS "S51E" TO SAVE CONFIGURATION INTO MEMERY.
27. PRESS "22222E" TO ENTER PASSWORD.
28. PRESS "E" TO SAVE.
29. PRESS "FL CL". DISPLAY READS "MF 15"

Either SHF radio can be used with any MDTG. This example is just one possible combination.

5. DIAGRAMS: The diagrams on the following pages are provided to serve as a guide to installing non "doctrinal" configurations of MSE/SHF links, since these are already covered adequately by existing TM's and training materials.

Encl: Diagrams for SHF Reference Guide

NODE CENTER TO SEN VIA LOS (V)3 SHF TO LOS (V)1 CONFIGURATION

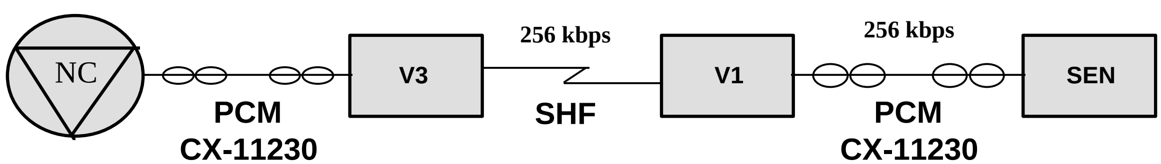


FIGURE 4A

Figure 4A shows a basic configuration of a node center cable to a V3, SHF to a V1 cabled to a SEN. This is a very flexible option since it permits the SHF radio to be remoted from the Command Post.

LOS(V)1 PATCH PANEL

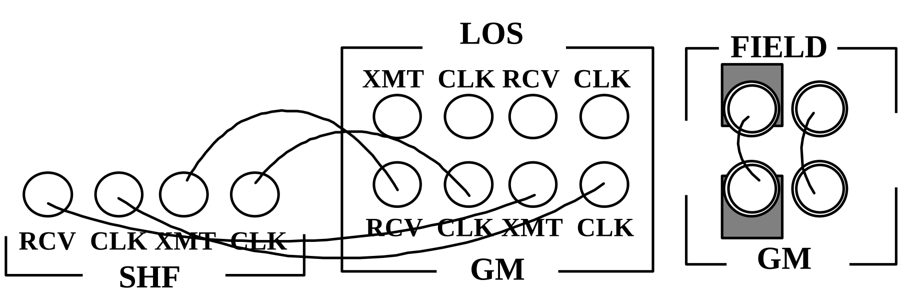


FIGURE 4B

Figure 4B shows the correct patching for a LOS(V)1 according to figure 4A configuration. Use either 2-prong or 4-prong patch cords.

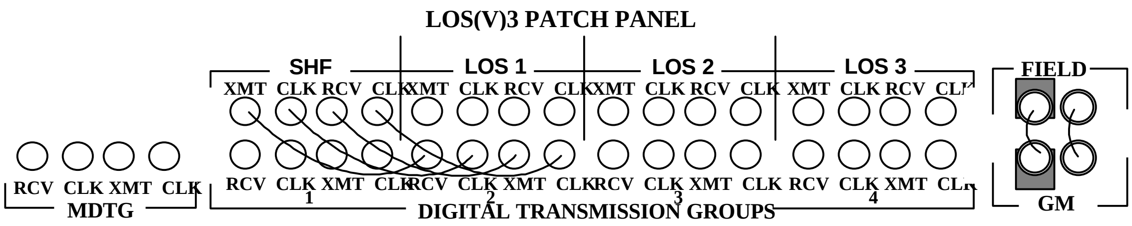


FIGURE 4C

Figure 4C shows the correct patching for a LOS(V)3 according to figure 4A configuration. Use a 4-prong patch cord. Figure 4C shows the patching for a SEN link on the second DTG. It is possible to use any of the DTG's except for DTG 1 in the LOS(V)3.

CM SETTINGS		
	TIMING	MODE
NC	NORMAL	NORMAL
LOS V3	NORMAL	NORMAL
LOS V1	NORMAL	NORMAL
SEN	NORMAL	NORMAL

Note: CM settings in the SEN and V1 may vary depending on internal CM card settings.

NODE CENTER TO SEN VIA LOS (V)3 SHF DIRECTLY TO SEN CONFIGURATION

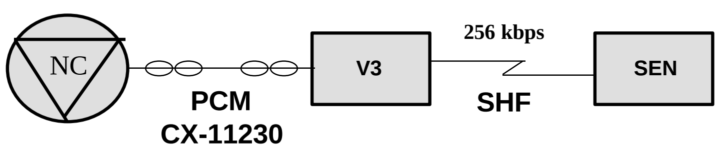


FIGURE 3A

Figure 3A shows a basic configuration of a node center cable to a V3, SHF to a SEN. This is the most economical SHF link and, when permitted by terrain, is preferred to UHF links. 31F MOS personnel <u>must</u> be able to perform this installation since there is no LOS(V)1 at the SEN site. Refer to page one of this handout for instructions on SHF installation. Reference TM 11-5820-1024-13.

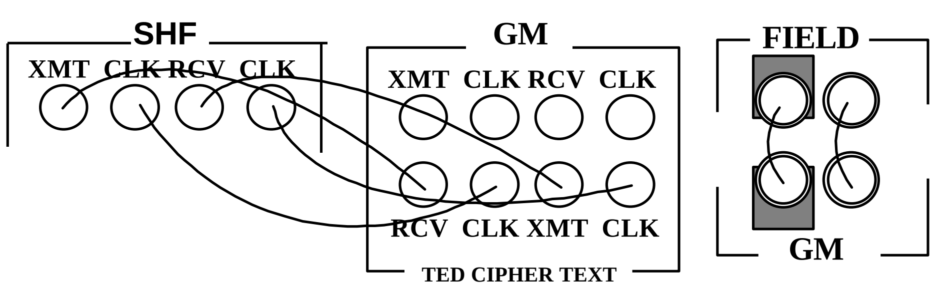


FIGURE 3B

Figure 3B shows the correct patching for a SEN according to figure 3A configuration. Use a 4-prong patch cord.

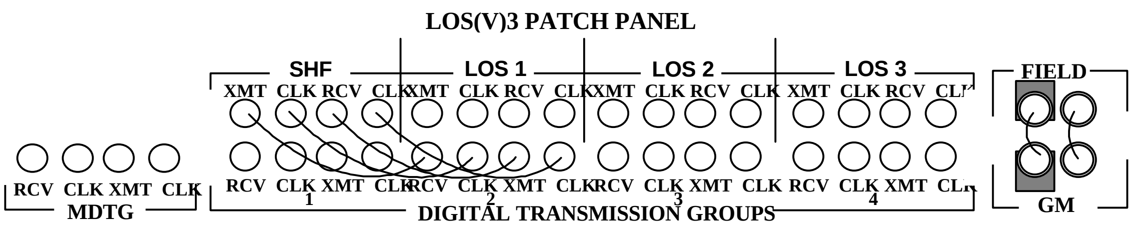


FIGURE 3C

Figure 3C shows the correct patching for a LOS(V)3 according to figure 3A configuration. Use a 4-prong patch cord. Figure 3C shows the patching for a SEN link on the second DTG of the LOS(V)3.

CM SETTINGS

	TIMING	MODE
NC	NORMAL	NORMAL
LOS V3	NORMAL	NORMAL
SEN	ALT	ALT

Note: CM settings in the SEN may vary depending on internal card settings in the CM.

LEN TO NODE CENTER VIA LOS (V)1 SHF TO LOS (V)3 CONFIGURATION

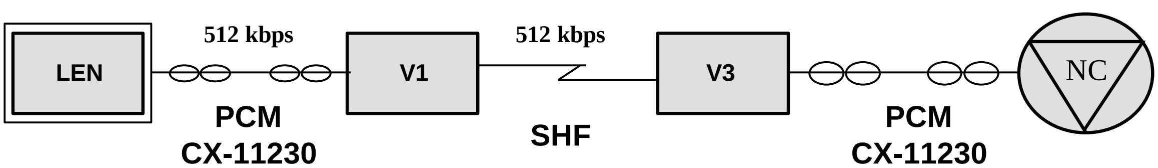


FIGURE 4A

Figure 4A shows a basic configuration of a LEN cabled to a LOS(V)1, SHF to a LOS(V)3 then cable to the Node Center. Any modulo-8 data rate (256, 512, or 1024 kbps) is possible depending on the databases built at the Node Center and LEN.

LOS(V)1 PATCH PANEL

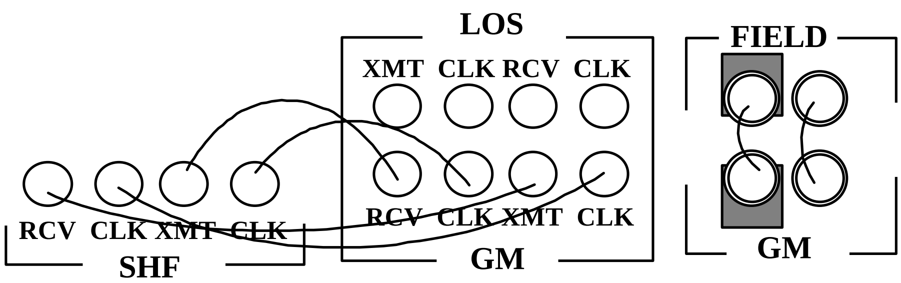


FIGURE 4B

Figure 4B shows the correct patching for the figure 4A configuration. Use 2-prong patch cords.

LOS(V)3 PATCH PANEL

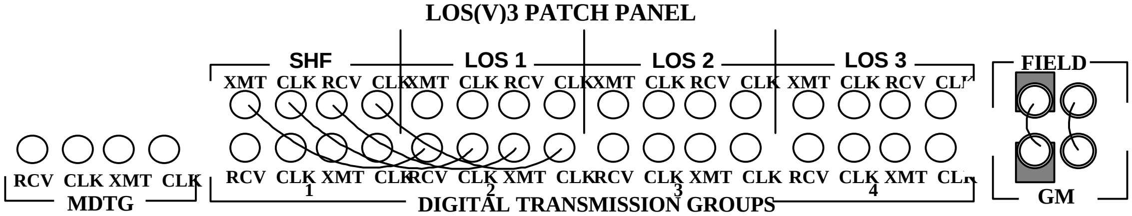


FIGURE 4C

Figure 4C shows the correct patching for a LOS(V)3 according to figure 4A configuration. Use a 4 prong patch cord. Figure 4C shows the patching for a LEN link on the second DTG of the LOS(V)3.

CM SETTINGS		
	TIMING	MODE
LEN	NORMAL	NORMAL
LOS V1	NORMAL	NORMAL
NC	NORMAL	ALT

LEN TO NODE CENTER VIA LOS (V)4 SHF TO LOS (V)3 CONFIGURATION

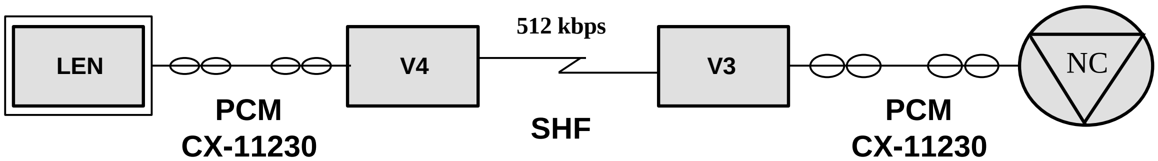


FIGURE 5A

Figure 5A shows a basic configuration of a LEN cable to a LOS(V)4, SHF to a LOS(V)3 then cable to the Node Center.

LOS(V)4 PATCH PANEL

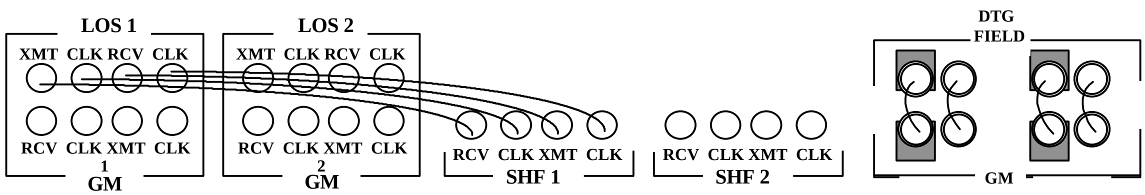


FIGURE 5B

Figure 5B shows the correct patching for a LOS (V)4 according to figure 5A configuration. Use 2 2-prong patch cords. Figure 5B shows a link on DTG 1 patch to SHF 1.

LOS(V)3 PATCH PANEL

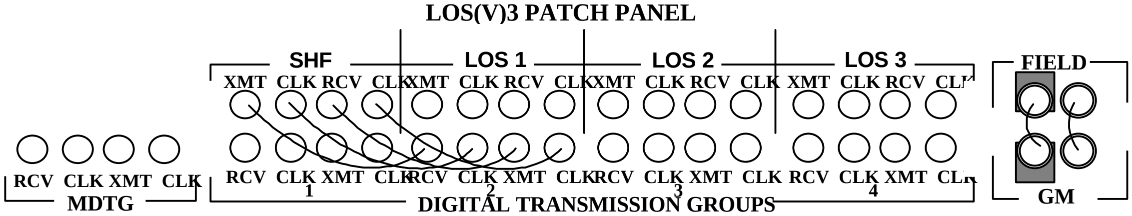


FIGURE 5C

Figure 5C shows the correct patching for a LOS(V)3 according to figure 5A configuration. Use a 4 prong patch cord. Figure 5C shows the patching for a SEN link on DTG 2.

CM SETTINGS		
	TIMING	MODE
LEN	NORMAL	NORMAL
LOS V4	NORMAL	NORMAL
LOS V3	NORMAL	NORMAL
NC	NORMAL	NORMAL

NODE CENTER TO NODE CENTER VIA LOS (V)3 SHF TO LOS (V)3 CONFIGURATION

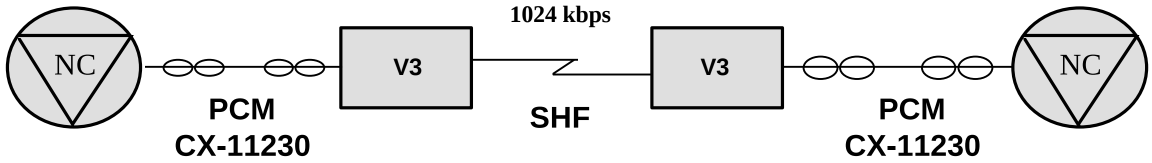


FIGURE 6A

Figure 6A shows a configuration of a Node Center cabled to a LOS(V)3, SHF to a LOS(V)3, then cable to the distant Node Center.

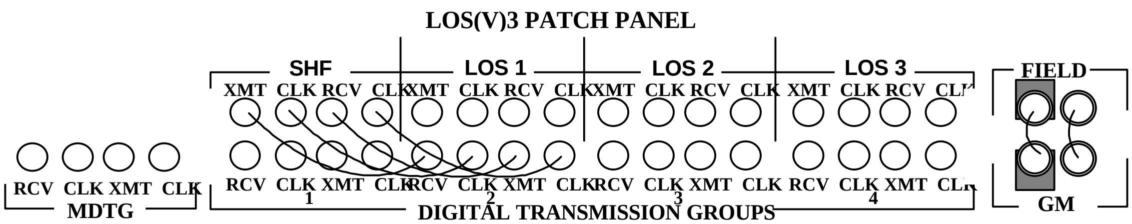


FIGURE 5B

Figure 5B shows the correct patching for a LOS(V)3 according to figure 5A configuration. Use a 4 prong patch cord. Figure 5B shows the patching for a Node Center link on DTG 2. On the TGMD, the SHF (DTG1) switch is left at the "idle" position (when the SHF link is patched to the appropriate DTG, the data rate on that DTG's select switch is used to set the data rate of the DTG, in addition to the data rates selected at the SHF control module and on the CM).

CM SETTINGS		
	TIMING	MODE
NC	NORMAL	NORMAL
LOS V3	NORMAL	NORMAL

SECTION V. DSVT PROCEDURES

A. DSVT Affiliation.

(1) Place the function selector switch on the DSVT in the DSBL position. Insure 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 M 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. Again if the two tones are not heard the load was not successful. If the load was successful, disconnect the KYK-13 and place the DSVT function select switch in the OP (operate) position. Go off hook on the DSVT and the RING/BUSY and NSW indicators should go on.

(5) Remove the handset of the DSVT from the cradle. You should hear error tone. Using the key pad of the DSVT, dial 8+R+PC+DN, to load the personnel code and telephone directory number. Hang up and wait at least 30 seconds, or until the non-secure warning and ring busy lights cycle and stop flashing, indicating that the "X" key has been downloaded to the DSVT from the NCS/LENS. Note: for DSVTs connected to a SEN this can be as much as two minutes. Go off hook and dial tone should be returned.

SECTION VI. MSRT USER PROCEDURES

1. PURPOSE: This section establishes standardized and proper Mobile Subscriber Radio Telephone (MSRT) procedures for all V Corps MSE users .

2. MSRT USER GUIDEINE

Before power is applied to the MSRT, prepare the RT-1539 (MSRT)and DSVT by acquiring the correct frequency plan and COMSEC variables. An accurate way of obtaining the correct variables is to go to your signal officer and down-load the correct variables to your KYK-13. The frequency plan must be obtained from a RAU or another operating MSRT.

To begin loading the MSRT:

1. Zero the RT-1539 then proceed with loading the "M" key. A proper load will extinguish the CRYPTO alarm LED.

2. Load the DSVT with the proper CRYPTO variables.

a. Load the "U" key into the LDU location on your DSVT. The "U" Key must correspond to the instrument Profile code for proper operation of the DSVT.

b. Load the "M" key into the "LDX" location on the DSVT.

c. After removing the KYK-13 from the DSVT, place the DSVT into the Operate position (both LEDs should go out).

3. Prepare to down-load the frequency plan from a RAU or another MSRT. Connect the fill cable to the Remote connector (J-4) of the MSRT and to the Signal Entry Panel (SEP J-8) of a RAU or to the J-4 connector of another MSRT. Go off-hook with the DSVT and dial the following:

a. 8CFR (This clears any frequency plans which may be in the radio. The Frequency Plan Loaded LED will extinguish.)

b. 8FFR (Will begin loading the RT-1539 with the new frequency plan. A steady tone should be heard in the handset and the Loaded Frequency Plan LED will be flashing. Upon completion error tone will be heard on the handset and the Loaded Frequency Plan LED will remain lit.

4. MSRT is now ready for affiliation.

NOTE: To affiliate and disaffiliate, dial:
AFFILIATE: 8R XXX (Personal Code) XXXXXXX (7-digit directory number.)
DISAFFILIATE: 8C XXX (Personal Code) XXXXXXX (directory number.)

a. Upon entering the affiliation number return the DSVT hand set to the cradle and observe the RT-1539. If you receive a CRYPTO alarm refer to step 6.

NOTE: The directory number LED should be solid, the scanning LED should be flashing. When the scanning LED goes solid a RAU has been accessed, and affiliation is in progress.

b. If affiliation is successful the affiliation LED should remain solid. Affiliation is complete and dial tone can be heard in the hand set.

c. If the scanning LED does not lock on, and affiliation is not successful or the Alarm LED and/or the Directory Number LED are flashing refer to step number 7.

5. To verify operation of MSRT attempt to place a call to any known working DNVT/DSVT number. (The NCS 7-digit operator's number is an excellent choose.)

NOTE: A waiting tone (steady tone) followed by a series of beeps then a momentary second waiting tone should be received. At that time ring back is obtained. When the distant end answers operation is verified.

a. A waiting tone followed by an error tone indicates that disaffiliation and re affiliation should be attempted. If after several attempts you the same symptoms are noted, notify the NCS operator for further assistance. **A MSRT can reach the NCS operator ANYTIME by dialing 0, waiting for the non-secure warning tone, then picking up the plunger on the DSVT.

b. If a waiting tone is received followed by a series of beeps, then the DSVT goes dead, attempt to call again. If the same symptoms occur check to ensure that the correct CRYPTO variables were loaded into the DSVT. Reload the "U" and "M" keys, if symptoms still occur notify the operator for further assistance.

6. ZERO the RT-1539 and reload the "M" key and attempt to re-affiliate the radio.

7. If the scanning light never locks on, verify the frequency plan. To check what plan the radio is operating on, dial: 8IXX (where XX is a number from 00 to 15. These represent the 16 different frequency plans the radio may have in memory.)

a. Observe Freq. Plan LED on the RT-1539, if it is flashing, this means that whatever number you used as XX, is the active frequency plan in the radio.

b. If the Freq. Plan LED goes solid, the frequency plan is resident in the RT-1539's memory, but is not active.

c. If the Freq. Plan LED goes out, the XX (frequency plan) is not loaded into the RT-1539's memory.

d. If the proper frequency plan is in the RT-1539, attempt to affiliate again. If the same symptom is occurring notify the NCS operator for assistance.

e. If the scanning light is locking on and neither a solid nor flashing affiliation light (possibly accompanied with a flashing directory number LED or CRYPTO alarm light) is observed, notify the operator. One of several things may exist:

1. Not pre-affiliated at the NCS.
2. Incorrect personal code used resulting in Blacklisting.
3. The DSVT number is incorrectly affiliated at another NCS.

8. To turn the MSRT off, dis-affiliate in one of two ways to prevent the directory number from becoming inactive at the NCS.

1. On the RT-1539 turn the "On/Off/Blackout switch to off, after 30 seconds the RT-1539 will have automatically sent the NCS a dis-affiliation request and the radio is dis-affiliated.

2. On the DSVT dial the dis-affiliation sequence 8CXXX(personal code)XXXXXXX (7-digit directory number). When error tone is heard in the receiver the radio is dis-affiliated.

9. To re-enter the network after dis-affiliation, power back up and re-affiliate the directory number. (8RXXX(personal code)XXXXXXX(directory number)

FREQUENCY PLAN

MEMORY LOCATIONS

MEMORY	ADDRESS	PLAN NUMBER			
1	0	0	4	8	12
2	1	1	5	9	13
3	2	2	6	10	14
4	3	3	7	11	15

MSRT BIT TEST

1. LOAD KEYS INTO RT-1539 AND DSVT.
2. DOWN LOAD FREQUENCY PLAN TO BE USED 8FFR. IF NO FREQUENCY PLAN AVAILABLE LOAD TEST FREQUENCY PLAN 8F 00 00 00 11 77 R
3. PUT DIRECTORY NUMBER INTO RT-1539
   8R-PC(PERSONAL CODE)-DN(7-DIGIT DIRECTORY NUMBER)
4. PRESS BIT PUSH BUTTON , ALL LEDs SHOULD BE ON.
5. RELEASE BIT BUTTON, DSVT RINGS ANSWER ON THIRD RING
6. LIFT HAND SET INPUT R-PC-DN
   a. NON-SECURE WARNING TONE IS OBTAINED, PICK UP DSVT PLUNGER
   b. SPEAK INTO THE HANDSET, YOU WILL HEAR YOUR VOICE IN THE RECEIVER.
   c. AFTER 30, SECONDS BUSY TONE IS RECEIVED. THIS IS A SUCCESSFUL TEST, ANYTHING OTHER INDICATES A PROBLEM IN THE RADIO.
7. A BUSY SIGNAL RECEIVED IMMEDIATELY AFTER DIALING R-PC-DN INDICATES ONE OF TWO POSSIBILITIES:
   1. THE WRONG PERSONAL CODE OR DIRECTORY NUMBER WAS ENTERED.
   2. THE RADIO HAS THE WRONG PC OR DN.
8. IF THE RADIO GOES INTO ALARM CHECK THE CABLE CONNECTIONS, IF THESE ARE OK THEN CONTACT THE MAINTENANCE SHOP.

MSRT Dial Sequence

R = End of Dial Sequence
C = Clear
F = Frequency Load
FF= Frequency Fill
I = Interrogate
CF = Clear Frequency

<u>MSRT/DNVT GUIDE</u>

CODE	**FUNCTION**
8CFR	CLEAR FREQUENCY PLANS
8F+FP#+R	CLEAR SINGLE FREQUENCY PLAN
8F+ FP#+LB+UB+R	MANUALLY LOAD FREQUENCY PLAN
8CFR8FFR	CABLE LOAD FREQUENCY PLAN
8I+FP#+R	INTERROGATE FOR FREQUENCY PLAN
8R+PC+SDN	AFFILIATION
8FR	FORCED AFFILIATION
8R	ERASE PERSONAL CODE AND DIR #
8C+PC+SDN	DISAFFILIATION
0	SERVICE ATTENDANT
SDN	AREA SUBSCRIBER
R+SDN	MSRT TO MSRT DIRECT
C+SDN	PROGRESSIVE CONFERENCE
6C+XX	PREPROGRAMMED CONFERENCE
2C+SDN	CALL FORWARDING
2C+YOUR #	RETURN CALL FORWARDING
XX+C	COMPRESSED DIAL
5C	COMMERCIAL CALL
4C+SDN	END TO END ENCRYPTED CALL
1C+SDN	SECURITY REQUIRED
MYX+	AREA TO AREA SUBSCRIBER
C+RECEIVE	SEND FAX DNVT TO DSVT
C+SEND	SEND FAX DSVT TO DNVT
SEND+C+SEND	RETURN TO VOICE FROM DATA

KEY	
MYX =	INTERSWITCH AREA CODE
8F =	FREQUENCY
81 =	INTERROGATE
FP# =	FREQUENCY PLAN NUMBER
C =	SPECIAL FUNCTION KEY
R =	SPECIAL FUNCTION KEY
LB =	LOWER BAND FREQUENCY
UB =	UPPER BAND FREQUENCY
PC =	3 DIGIT PERSONAL CODE
SDN =	SUBSCRIBER DIRECTORY NUMBER
X =	ANY NUMBER O TO 9
FO =	FLASH OVERRIDE
F =	FLASH
I =	IMMEDIATE
P =	PRIORITY

CHAPTER 6

TROUBLESHOOTING

SECTION I: TACTICAL PACKET SWITCH NETWORK

1. Packet Switch Link.

These procedures will be followed by the NMC operator with cooperation of both NC operators to bring in a link. Other troubleshooting procedures can be found in the TMs or TIBs.

a. Ensure the circuit link is in.

Internodal: Y2 status
SEN: DTG status 13

b. Ensure that both packet switches are operating correctly.

c. Ensure a PS port is assigned to the link (internodal--AIL, circuit GW--ATG, SEN--ASR). Write down the port number.

d. Check the trunk status on the PS. The trunk status appears after LEDs 16 & 8 light. The LED number corresponds to the port number (e.g. LED 3 is for port 1-3). If the LED is ON, then check the trunk status on the other side. If both sides are good, then the link is good. If the LED is flashing, then the link is in loopback (either the PS trunk(s) or the entire DTG).

e. Check the settings on the PSHTI card. Do this at both ends. NOTE: SENs do not have PSHTI cards. If the toggle switches are set incorrectly, the fix, wait 2 minutes, and go to step 4.

f. Use AOD 62 to verify path connections between the PSHTI and DTG. Check to make sure that both sides of the path are connected (e.g. for a high-speed port each switch will need to do eight AOD 62s). If any are improperly connected, then fix using AOD 61, wait two minutes, then go to step 4.

g. This step should be done at one end at a time. Since the path connections appear to be correct, we will now use loopback to determine if there is a break in the link, as this is now the most likely problem. But first, we will check the hardware status of the PSHTI card(s).

(1). Put the PSHTI card in loopback. For High-Speed Ports (HSPs), this is the top toggle switch. For Low-Speed Ports (LSPs), this is one of the top three toggle switches. Put the toggle in the UP position.

(2). Perform AOD 60 for that PS port. If it tests good, then continue. If it fails, then the PSHTI card is bad. Either select another port or swap PSHTI cards.

(3). Wait two minutes and check the trunk status on both packet switches. If one side is flashing and the other one isn't, then the problem must be between your PSHTI card and the distant PS.

(4). Repeat this step with the distant end. If the distant end is a SEN, then use a double-pronged patch cord

2. SEN Packet Switch Link.

a. Initially, ensure that:

(1). The circuit link is in.

(2). Both packet switches are on.

(3). Both configured disks are in.

b. Determine the NCS packet port number for the trunk.

c. If TGM/DTG status 5 messages are being received or if the R6 says the BER is -4 for 50%, then FEC could be tried.

NOTE 1. Reassigning Port Numbers.

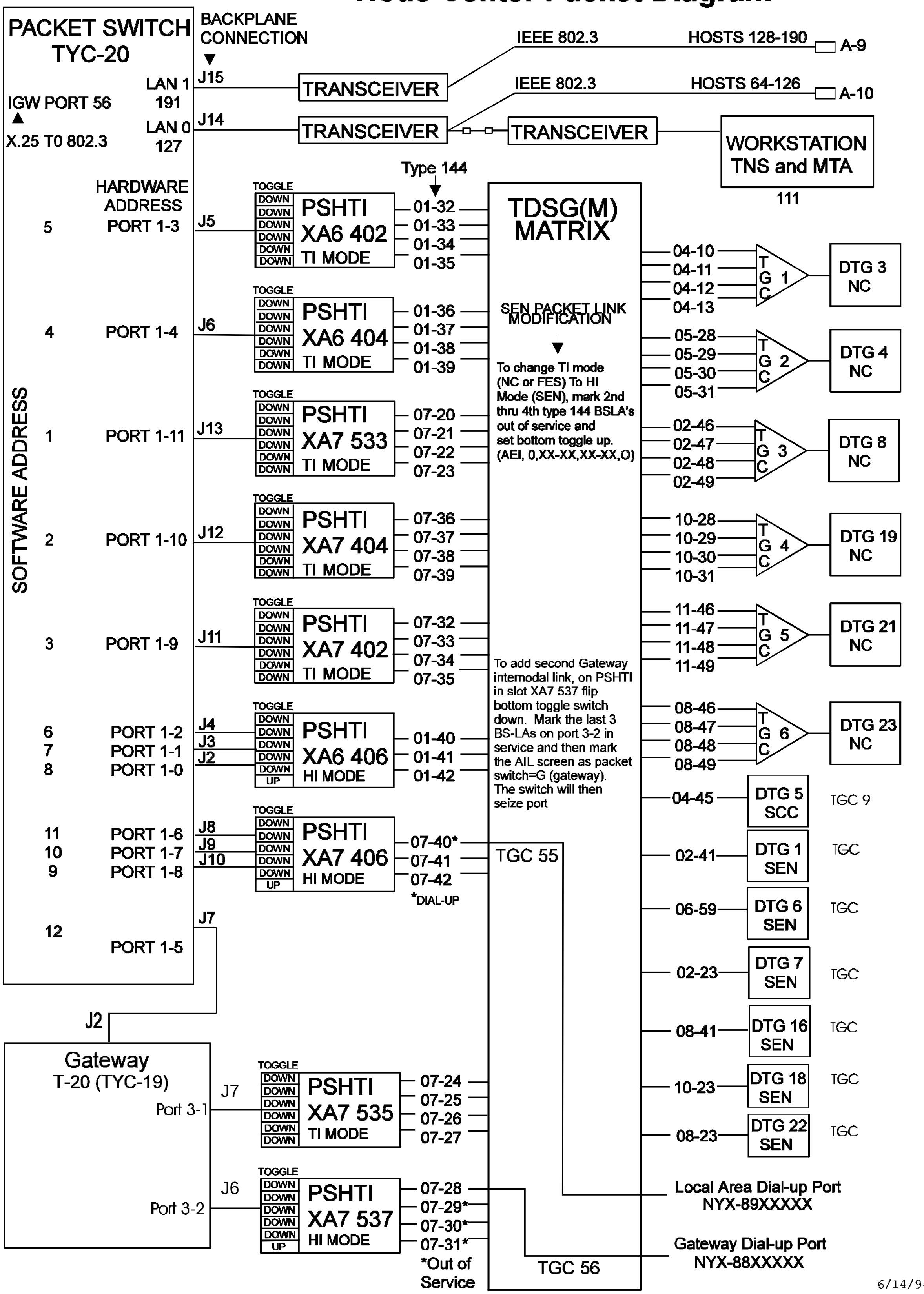
To assign a link to a different port using a different PSHTI CCA, perform the following steps:

1. AIL the link and mark packet switch "no". Note the port number.

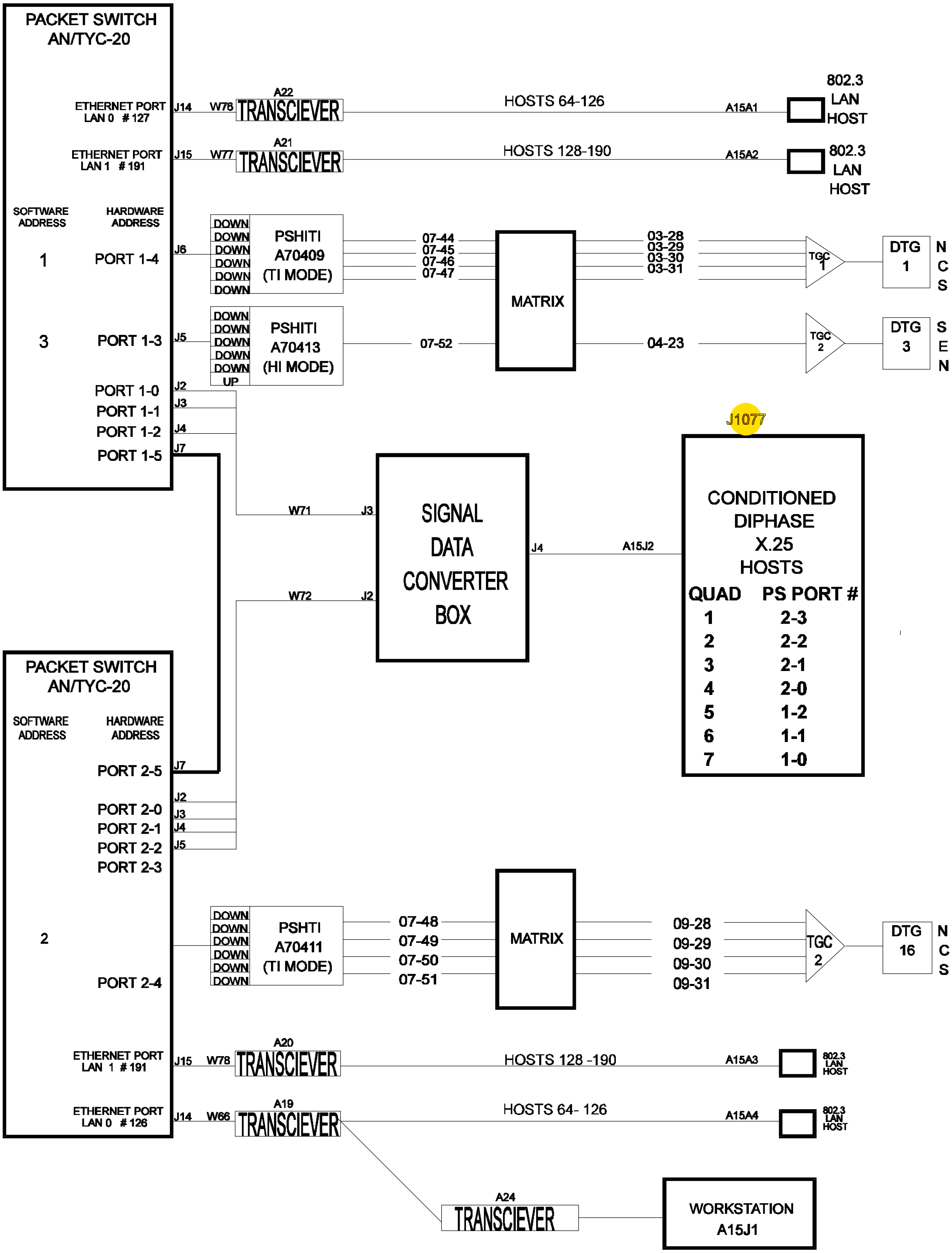
2. AEI (Assign Equipment In/Out of Service) the link and mark the terminal addresses associated with that PSHTI CCA out of service. Refer to the functional diagrams to determine the terminal addresses. Under the AEI screen, input: o, terminal address, terminal address, o.

3. AIL the link again and mark packet switch "yes". This will force it to choose the next available port.

Node Center Packet Diagram



LEN PACKET SWITCH FUNCTIONAL DIAGRAM



3. Packet Switch AN/TYC-19.

a. Ensure a PS work disk (operations disk) is in the disk drive. Ensure the drive door is closed (down). Ensure the PS is turned ON.

b. Look at the green LEDs on the first (top) row. Ensure that #1 (Power), #2 (Op Temp) and #5 (Run) are all ON. Ignore LEDs 3 and 4 (Ethernet 1 and 2) at this time. If LEDs 1,2 and 5 are NOT on, then see NOTE 1. If the disk checks out good, then contact ELM (Most likely problem: Bad IGW board).

c. Look at the LEDs on the second (middle) row. If any red or yellow LEDs are on, then see NOTE 1. If the disk checks out good, then contact ELM (Most likely problem: Bad PAM board).

d. Look at the LEDs on the third (bottom) row. The LEDs should be cycling through a series. Each LED should illuminate for 3 seconds, and it should take 15 seconds to complete one cycle. Look for the following lights: 19, 18, 17, 16&8. After 16&8 light up, LEDs 1-11 may or may not light up. Ignore these for now. If you do NOT see this sequence, then see NOTE 1. If the disk checks out good, then contact ELM:

LEDs 19-16 fail to illuminate: Most likely bad I/O board or bad power supply board.

LEDs 16&8 fail to illuminate: Most likely bad IGW board.

e. Look at LEDs 3 & 4 (Ethernet 1 and 2) on the first (top) row. They should both be lit. The three most common reasons for these not to illuminate are (1) LAN ports not terminated correctly, (2) 253 Startup disk in packet switch, and (3) bad IGW board. First check to make sure the terminators are connected on the outside of the shelter and that the cables are correctly connected on the inside of the shelter. If they are, then the disk is probably a 253 Startup disk. Try another work (operations) disk in the PS to verify. If the second disk gives the same results, then try it in a different PS. If it works in the second PS (but not the first), then the problem is hardware related. Contact ELM (Most likely problem: Bad IGW board).

f. If all of these steps work, then your packet switch is working correctly.

NOTE 1: Verify that the problem is not a bad disk. Take your work disk (the one in question) and test it in another packet switch (either NC, LEN, 39D or SEN). If the disk works, then the problem is hardware related. If the disk does NOT work, then mark the disk, contact your nettech, and try another disk.

4. PS DIAL-UP

Symptom: 15 seconds of search tone, then Not-assigned-OOS message.
Problem: Both APR and ADU not assigned.

Symptom: Immediate busy tone.
Possible Problem: APR assigned; ADU not assigned.
Possible Problem: APR and ADU both assigned. TGC in use or PSHTI TDMX OOS.

Symptom: Error tone.
Problem: Voice call (Both APR and ADU are assigned).

Symptom: High pitched tone.
Problem: Data call (Both APR and ADU are assigned).

Quick Reference Table for PS Dial-up tones

Symptom	APR	ADU	TYPE	Problem
15 sec's search tone,	NO	NO	V/D	Normal tone, then N/A-OOS
Immediate busy tone	YES	NO	V/D	TGC in use or PSHTI TDMX OOS
Error tone	YES	YES	voice	normal
High pitched tone	YES	YES	data	normal

Quick Reference Packet Switch Screens

AOD 60 -- LOOPBACK TEST ON PSHTI (PSHTI must be in Loopback)
AOD 61 -- PATH CONNECT (FULL/HALF/DIS-)
AOD 62 -- Connection Test
AEI -- Assign Equipment IN/OUT of service

Format: 0,start_addr,end_addr,I or O

AIL: To change between Gateway and Yes (packet), first mark PS 'N' (Bypass N), and then mark PS Y/G (Bypass Y). The link does NOT have to be disabled to do this (CSOLOP VX.07).

5. MTA/TNS

a. TNS Messages and Operator responses:

RESERVED MTA/TNS IP ADDRESS.

Cause: Host Registration Screen when trying to assign workstation (host 111) to a different Host name.

DOMAIN DB REVISION AAA.BBB FROM TNSXXX DOES NOT INCLUDE THIS TNS

Description: TNSXXX has the latest domain database, which does not include your TNS.

Solution: Contact your BATCON or SYSCON.

DOMAIN DB REVISION AAA.BBB NOT SENT, TNSXXX IS NOT INCLUDED IN DB

Description: Your TNS has the latest domain database, but it does not include TNSXXX.

Solution: Contact your BATCON or SYSCON.

DOMAIN DB HAS BEEN UPDATED TO REVISION AAA.BBB, FROM TNSXXX

Description: A new domain database has been received from TNSXXX.

Solution: This is normal.

DOMAIN DATABASE EXCHANGE ERROR OCCURRED WITH TNSXXX

Description: An error occurred with TNSXXX because there is a discrepancy between the two TNSs' domain DB. Either your domain DB is the latest and does not include TNSXXX or TNSXXX domain DB is the latest and it does not include your TNS.

Solution: Contact your BATCON or SYSCON.

LOCAL DATABASE EXCHANGE ERROR OCCURRED WITH TNSXXX

Description: The TNS timed out waiting for a response from TNSXXX.
Solution: None.

DOMAIN DB CHECKSUM DISCREPANCY WITH TNSXXX

Description: The revision numbers of the Domain DB between the two TNSs are the same but the checksums are different.

Solution: Contact your BATCON or SYSCON.

TNSXXX IS NOT IN THE SAME DOMAIN RESULTS IN AN UNSUCCESSFUL TNS_PING ATTEMPT

Description: The domain name between the two TNSs is incorrect.

Solution: Verify that the correct domain name (as determined by OPORD or SYSCON) is entered in INPUT SYSTEMS PARAMETERS.

SECTION II. LINK TROUBLESHOOTING

1. Reference:

a. TM 11-5805-766-12-4, Node Center Switch AN/TTC-47

b. TM 11-5820-1023-13-1, LOS Radio Terminal AN/TRC-190(V)

c. TM 11-5820-1029-13&P, Radio Set AN/GRC-226(V)

d. TIB 91-05-021, Ensuring Proper S/N Ratio When Operating the UHF Radio

e. TIB 90-01-004, MSE LOS Radio Path Loss Calculations

f. "Radio LOS Operating/Troubleshooting Procedures"

g. TIB 90-10-061 Rev C, Communication Modem, MD-1270(P)/T Redesign

h. TIB 90-10-062 Rev D, Communication Modem, MD-1270(P)/T Redesign Changes Impacting the LOS Multi-Channel Radio Terminal

i. FM 24-21, Tactical Multichannel Radio Communications Techniques

2. General: The following pages present a procedural approach to link troubleshooting. There are three phases to the procedure: problem detection, problem identification, and problem solution. Problem detection involves a machine-made or man-made detection of link degradation. Detection ranges from a customer complaint of poor service to NCS or LEN or 39D fault messages on the TTY. Once a link problem has been detected, it must be identified. Identification is a three part process. First, conduct an individual site inquiry to the problem. Second, (if the problem is not identified) conduct loopback on the link in question. Third, if the problem is identified in a particular assemblage, troubleshoot the assemblage. Once the problem has been identified it normally can be solved. This may involve further sublink troubleshooting or solutions such as equipment exchange or SYSCON radio engineering assistance.

3. Problem Detection: The first phase of the procedure is the detection of a link problem. It may be as obvious as a complete outage (indicated by a DTG nn STATUS 14) or not so obvious (DTG nn STATUS 44 or poor sounding circuit). In general, operators, system planners, and customers are the sources of detection. The following are indications that a problem exists on a link.

a. Problem Detection by NCS: System operators are the primary source for detecting problems on a given link. Each site has a responsibility to monitor the status of the link and quickly report changes/observations to the "Master" NCS. The NCS operator detects a link problem via message and non-message indications. Fault messages consists of TTY messages in response to periodic diagnostics, DTG and TSB status changes, and failure of diagnostics initiated by operator. Non-Messages Faults consist of SPU DIAGNOSE STATUS errors, I/O ERROR, or CSP/DNVT call processing malfunction. Fault message and non-message indications are ranked in priority; higher priority faults can cause lower priority faults. TM 11-5805-766-12-3, Table 6-17 contains the Fault Message Priorities Listing and Table 6-18 contains the Non-Message Fault Indication Priorities Listing.

The following are common fault messages that indicate an isolated link problem:

1. Transient synchronization faults that indicate marginal or degrading link:

-- DTG nn STATUS 3 H/W not in bit synchronization
-- DTG nn STATUS 5 TGM/DTG BER threshold exceeded
-- DTG nn STATUS 44 TGM/DTG BER threshold exceeded
-- DTG nn STATUS 7 Frame search count threshold exceeded
-- TSB nn STATUS 3 No ACK in 20 seconds

-- DIBTS TRUNK xx-xx

DIBTS BUFFER nn FAILED 1 Trunk failed
FAILED 2 Test aborted
FAILED 3 Software time-out
-- DIBTS TRUNK xx-xx MARKED FOR MAINTENANCE, DSB nn Adjacent switch detects DIBTS problem
-- EQBY: R5:(HEX) Indicates partial call blocking

-- ATBY: R5:(HEX) Indicates partial call blocking

2. Faults that mark DTG out-of-service:

-- DTG nn STATUS 14 Software has marked DTG OOS
-- TSB nn STATUS 2 TSB out of sync

3. Results from AOD 10 and 18:

-- Trunk xx-xx FAILED 1 Loopback MSG Timed Out
FAILED 2 Glare
FAILED 11 Trunk marked OOS

b. Problem Detection by Subordinate Site: Subordinate sites include LOS, TACSAT, TROPO, RAU, SEN, and SCC. The cause of the failure is not message driven like the NCS. Some causes are as follows:

- -- Loss of radio link or high bit error rate
- -- Loss of satellite tracking or high bit error rate
- -- Equipment failure indications
- -- Loss or fluctuating TED "FULL OP" light
- -- CM error indications

If a subordinate site detects a link problem, they should immediately notify the "Master" NCS.

c. Problem Detection by SYSCON: There are two basic ways a system planner may detect a link problem. The first is through the R6 Traffic Metering Report. The R6 is a "DTG Bit Error Report." It gives a DTG BER expressed as a percentage. It does not provide a real-time value but a value over an interval of time. Nevertheless, the R6 is a valuable tool to analyze link quality over time. For example, take the below reports:

1st Report	2d Report	3d Report
DTG #7	DTG #7	DTG #7
BER -6 100	BER -6 68	BER -6 27
BER -5 0	BER -5 0	BER -5 14
BER-4 0	BER -4 32	BER -4 0
OTHER 0	OTHER 0	OTHER 59

The BER % is shifting from BER-6 to OTHER. Report #1 exhibits no noise or call blocking. Report #2 exhibits noise which the voice customer may not notice but the data customer may. Report #3 exhibits excessive noise causing the link to lose synchronization. The customer would exhibit call blocking and excessive data errors on the lines.

Battalion Network Technicians and Batcon personnel must monitor the R-6 reports. Links showing low BERs should be further analyzed using AMD commands. These are included in Section II m.

The Network Management Center (NMC) capability in the SCC-2 displays an "almost" real-time status of the MSE Packet Network (MPN). The packet switch trunks will show up as "green" on the display if packets can be transported on the link between the two nodes. If it displays a "red" status, packets can not be transported on the link; however, voice capability may still exist. A BER of 10-4 may be good enough for voice and to maintain DTG synchronization, but borderline for data between two nodes. Using the NMC can be a valuable tool for link status. Dual homed SEN's can show up as green on the NMC when one link is not in.

d. Problem Detection by the Customer: The customer sometimes is the first to detect a degradation of link quality. A customer may be a voice user, a data user, or both. The following are some common symptoms:

-- Crackle on the line
-- Conversation fading in and out
-- Disconnection from call
-- Lose and regain connection during call
-- Garbled data
-- Long delay for data connections for file transfers
-- Problem affiliating telephone
-- Excessive BUSY calls to different numbers
-- Unable to call certain locations

The customer should report any problems to the BSO who should report to the LEN or SEN team chief.

4. Problem Identification: Once a problem in the link is detected, the "Master" NC operator must be notified. The NC operator must identify the source of the link failure. The following steps are taken as a result:

a. NC operator notifies NMF (who in turn notifies BATCON), then establishes contact with all sites in link and directs them to perform preliminary site troubleshooting IAW the Individual Site Checklists, depending on the type assemblage. Each checklist covers all visual indications of link failure for the respective site.

b. Each assemblage reports the following back to the NC operator:

-- Whether the site appears to be operating (power, etc.)
-- Whether there is obvious damage at the site
-- Any fault codes, alarms, settings, or other indications of failure
-- If orderwire is still available on link and in what direction
-- Any specific customer complaints
-- Problems noted from Check List

c. If the problem is identified during preliminary site actions, all further troubleshooting is halted and repair actions are immediately taken. If the problem is not identified, the NC operator directs/coordinates loopback testing.

d. If loopback testing does not reveal the problem, the NC operator must seek assistance from higher HQ. This may include requesting to disable link to perform diagnostics

e. If loopback testing does reveal the problem, the NC operator directs/coordinates repair actions or initiates sublink troubleshooting. Sublinks include cable, MSE UHF, MSE SHF, TACSAT, and TROPO links. Repair actions may require in-depth system troubleshooting of assemblage IAW TM, a need to realign radios, request new freqs, replace cables, replace equipment, improve tracking of DCSCU, etc.

f. In all steps, Batcon and SYSCON must be kept informed of the situation.

5. <u>Problem Solution</u>: In this phase, the NC operator directs/coordinates repair actions. If the exact problem has been identified (i.e. baseband unit, etc.) repair actions can immediately be coordinated/directed. However, sublink troubleshooting may be necessary to identify the problem. Sublinks include the assemblage itself or the transmission path between two assemblages. Refer to the appropriate TM for assemblage troubleshooting.

There are 5 types of transmission links organic to the Signal Brigade: UHF LOS, SHF LOS, SHF TACSAT, TROPO and CX-11230 cable. The following sections provide details on troubleshooting these sublinks.

SECTION II b. UHF ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Power Control Panel
DC: CONTROL - tripped
DC ON-OFF - on
EMERGENCY POWER - on
BATTERY ON BUS - off
BATTERY EXHAUST
FAULT - on
BUS VOLTAGE METER < > 24 Volts
AC: RGLTR CHARGER - off
CONTROL - tripped
FREQUENCY < > 58-62 Hz
VOLTAGE < > 103-127 Vac
ACTIONS: Set all circuit breakers to on position. If any breakers return to off position go to prime power troubleshooting.

STEP 2
CHECK FOR: Damaged power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Repair or replace cable. Then restart generator.

STEP 3
CHECK FOR: Disconnected power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Reconnect cable. Then restart generator.

STEP 4
CHECK FOR: Power Unit indications
VOLTAGE < > 115 Vac
FREQUENCY < > 60 Hz
ACTIONS: If power unit failure, activate backup power. If power unit functioning, adjust voltage/frequency.

STEP 5
CHECK FOR: Communication Modem Front Panel
POWER ON/OFF - off
SMY FAULT - on
BITE FAULT LEDs - Any indicating other than 00-0
ACTIONS: Refer to TM 11-5895-1465-13&P if fault exists.

CHECK FOR: Timing Settings should be as follows:
TEST SELECT SW - OPERATE
TMG SW - NORM

MODE SW - NORM

ACTIONS: If not, set properly. Determine if fault still exists.

STEP 6

CHECK FOR: "Power on" indicators not on radios or other equipment

ACTIONS: Verify equipment is not receiving power (use lamp test). If equipment is receiving power, fault has not been located. If equipment is receiving power, troubleshoot power system and faulted equipment.

STEP 7

CHECK FOR: Damaged CX-11230/G cable (See Cable Test Guide)

ACTIONS: Repair or replace cable. Determine if fault has been corrected.

STEP 8

CHECK FOR: Antenna down or not oriented

ACTIONS: Re-aim antenna (repair mast as necessary). Reinstall UHF link IAW Table 5-13.

STEP 9

CHECK FOR: Antenna cable damaged

ACTIONS: Shut off related UHF or SHF radio. Repair or replace cable. Turn on radio. Re-initialize parameters as necessary if auto-reconfiguration does not work properly. Determine if fault has been corrected.

STEP 10

CHECK FOR: Antenna cable disconnected

ACTIONS: Shut off related UHF or SHF radio. Reconnect cable. Turn on radio. Re-initialize parameters as necessary if auto-reconfiguration does not work properly. Determine if fault has been corrected.

STEP 11

CHECK FOR: Patch panel configured incorrectly

ACTIONS: Install patches in proper configuration. Determine if fault has been corrected.

STEP 12

CHECK FOR: Damaged patch panel patches

ACTIONS: Install good patches in proper configuration. Determine if fault has been corrected.

STEP 13

CHECK FOR: Damaged HVA assembly, HVA connectors, or signal entry panel connectors; disconnected connectors at signal entry panel

ACTIONS: Repair, reconnect, or replace as necessary. Determine if fault has been corrected.

STEP 14

CHECK FOR: TDMG Status and Control Panel

DCPS FAULT - on

SYNC - on
MDTG - on
DTG1 - on
DTG2 - on
DTG3 - on
DTG4 - on

ACTIONS: If any of the above faults exist, refer to TGMD troubleshooting procedures.

STEP 15

CHECK FOR: KG-194A fault indicator on

ACTIONS: Troubleshoot or replace KG-194A.

STEP 16

CHECK FOR: UHF radio cabling:

Data cable -- RF to baseband;
IF cable -- RF to baseband;
Antenna cable -- from RF unit;
Data cable -- to baseband unit

ACTIONS: Shut off related UHF radio. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on radio. Re-initialize parameters as necessary if auto-reconfiguration does not work properly.

CHECK FOR: AC and DC power cables

ACTIONS: If radio is still operating, this is not the cause of the link failure. If radio is not operating, shut off power source. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on power. Turn on radio. Re-initialize parameters as necessary if auto-reconfiguration does not work properly.

STEP 17

CHECK FOR: Incorrect UHF switch settings (DS1-OFF, S1-OFF, ALM DS1-ON, Fault Code)

ACTIONS: Set settings properly. Go through startup procedures and re-initialize parameters as necessary if auto-reconfiguration does not work properly.

STEP 18

CHECK FOR: UHF radio fault indication:

Ld, LE, rd, rE, Sd, or SE

ACTIONS: "Ld" is the correct standard display for MSE; the other five are incorrect standard displays and indicate that the parameters must be reset.

CHECK FOR: F (in position 1)

ACTIONS: "F" in position 1 indicates a processor failure. Refer to Table 5-2.

CHECK FOR: F (in position 4)

ACTIONS: "F" in position 4 indicates an invalid or incorrect set of parameters; key (9,1,2), and (9,1,3) for further information. Then reset the parameters as needed.

CHECK FOR: F (in position 5)
ACTIONS: "F" in position 5 indicates an external fault; key (9,2,1), (9,2,2), and (9,2,3) for further information (refer to Table 4-2 to interpret results). Troubleshoot and repair if within LOS site; continue fault isolation if location is unknown.

CHECK FOR: F (in position 6)
ACTIONS: "F" in position 6 indicates a baseband unit fault; troubleshoot and replace the baseband unit if necessary. See Table 5-6 TM 11-5820-1029-13&P.

CHECK FOR: F (in position 7)
ACTIONS: "F" in position 7 indicates an RF/diplexer unit fault; troubleshoot and repair the RF/diplexer unit if necessary. See Table 5-6 TM 11-5820-1029-13&P.

STEP 19
CHECK FOR: SHF radio cabling: Data cable (from patch panel)
ACTIONS: Shut off related SHF radio. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on radio. Re-initialize parameters if necessary. Determine if fault has been corrected.

CHECK FOR: Antenna cable
ACTIONS: Shut off related SHF radio. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on radio. Re-initialize parameters if necessary.

CHECK FOR: DC power cable
ACTIONS: If radio is still operating on AC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable. Determine if fault has been corrected.

CHECK FOR: AC power cable
ACTIONS: If radio is still operating on DC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable.

STEP 20
CHECK FOR: Incorrect SHF switch settings
ACTIONS: Set properly. Then go through startup procedures and re-initialize if necessary. Determine if fault has been corrected.

STEP 21
CHECK FOR: SHF radio fault indication:
    uP SYNCH indicator on
    uP SYNCH indicator flashing

DC/DC BB on, or DC/DC RF on, or RF TX on, or RF FR on, or BB TX on, or BB RX on
ACTIONS: Using TM 11-5820-1024-13, perform self-test of SHF radio. If test fails, refer to next higher level of maintenance.

CHECK FOR: BB BER on, or RF RX on
ACTIONS: This does not necessarily indicate the location of the fault. The fault is either in the SHF, at the distant SHF radio, or in the SHF sublink. Notify master NC. Anticipate instructions to troubleshoot the SHF sublink. The NC will request troubleshooting of the sublink unless information from the distant SHF radio indicates that the fault is at the distant site.

SECTION II c. UHF RADIO INTERNAL TEST PROCEDURE

1 a. Ensure that proper ac power connections have been made to baseband subassembly
b. Ensure that proper dc power connections have been made to baseband subassembly
c. Ensure that antenna signal cable has been installed at S2 on receiver-transmitter subassembly

WARNING

Dangerous voltage is used in the operation of this equipment. Death on contact can result if personnel fail to observe safety precautions.

d. Set power switch S1 on Baseband subassembly to ON. If ac and dc power are used, lamps DS1 and DS2 go on. If only ac power is used, only lamp DS1 goes on. If only dc power is used lamp DS2 goes on. ALM lamp DSI on receiver-transmitter subassembly does not go on.

e. Observe display on receiver-transmitter. The display panel lights and the radios begins its power up sequence. The display panel shows *F* then *NItP*. The frequency band is displayed as *band 1* or *band 3*. If the display panel shows *AUTO*, disable the auto configuration by pressing any key immediately after *AUTO* appears in the display The display will show *L -F* ---.

2 Set the radio to local control by keying 505 on the keypad
3 Set the display brightness to high by keying 737
4 Set the DVOW alarm monitor to off by keying 848
5 Enable auto-configuration by keying 838
6 Set the operating mode to EOW by keying 050
7 Set the transmit and receive frequencies as follows:

For Band I:	TX 225.0 MHz	T2250T
	RX 400.0 MHz	R4R
For Band III:	TX 1350.0 MHz	T3500T
	RX 1850.0 MHz	R85R

8. Set rf power out to off by keying 404. The display shows *P --OFF*---
9 Select display test by keying 676 . Display cycles through four levels of brightness including off.
All digits and all decimal points light, *8.8.8.8.8.8.8.* The alarm lamp cycles
10 Cancel the display test by pressing any key.
11 Select the keypad test by keying 686 The right most position of the display prompts to sequentially key in each of the 12 keypad characters

NOTE

The test will time out if a key is not pressed for several seconds.

12 Sequentially press each key corresponding to the flashing number on the display. A successful entry prompts the display to step to the next key. Successful test completion is indicated by *End* appearing briefly on the display panel at the final key press
13 Deleted
14 Deleted
15 Set the power out to full by pressing 424 The display shows *P2*----

NOTE

If both ac and dc supplies are not present, skip steps 16-19

16 Disconnect the ac power supply from connector J4. The display shows *LE*---- with no interruption
17 Reconnect the ac power supply
18 Disconnect the dc power supply from connector J5. The display shows *LE*---- with no interruption
19 Reconnect the dc power supply
20 Turn the radio off by placing power switch S1 to off (down)
21 Turn the radio on by moving S1 to ON. The radio goes through a power-on sequence lasting about 20 seconds. After this time the display shows *LE*----
22 Check the transmit frequency by pressing T. The display indicates *225000* for Band 1, *1350000* for Band III. After several seconds the display reverts to *LE*----
23 Check the receive frequency by pressing R. The display shows *400000* for Band 1, *850000* for Band III. After several seconds the display will revert to *LE*----
24 Check the power level by pressing 4. The display shows *P*, After several seconds the display will revert to *LE*----
25 Set the power out to low by pressing 414. The display shows: *P.. I...*
26 Set the transmit frequency as follows: The display shows *LE*----

For Band I:	TX 310.0 MHz	T3100T
For Band III:	TX1600.0 MHz	T6000T

27 Set the power out to high by pressing 424. The display shows *P.. 2...*
28 Set the transmit and receive frequencies as follows: The display shows ----

For Band 1:	TX 400.0 MHz	T4T
	RX 225.0 MHZ	R 2250R
For Band III:	TX 1850.0 MHz	T85T
	RX 1350.0 MHz	R3500R

29 Set the power out to low by pressing 414. The display shows *P.. !...*
30 Set power out to off by keying 404. The display shows : *P-OFF*----
31 Disconnect antenna from connector J2.
32 Set the orderwire volume control to position high

32.1 Set the radio to 256 kb/s data mode by keying 010

33 Select loop test 3 by keying 636. The display shows: *L 3-*

34 Press the push-to-talk button on the handset and speak into the handset in a normal voice. The words spoken are heard in the handset earpiece

35 Disconnect the IF cable from the baseband subassembly connector J3. A random fault may appear.

36 Silence the alarm by entering status mode, press 931. The alarm tone in the handset stops

37 Press the push-to-talk button on the handset and speak into the handset in a normal voice. The words spoken are not heard in the handset earpiece.

38 Reconnect the IF cable

39 Press 9 to exit status mode.

40 Press any key but 9 to exit LOOP 3.

41 Deleted

42 Deleted

43 Set the radio to 512 kb/s data made by keying 020

44 Repeat steps 33 to 40

45 Set the radio to 1024 kb/s data mode by keying 030

46 Repeat steps 33 to 40

47 Set the radio to 2048 kb/s data mode by keying 040

48 Repeat steps 33 to 40

49 Set the transmit frequency as follows:

For Band I:	TX 330.0 MHz	T3300T
For Band III:	TX 1675.0 MHZ	T6750T

50 Select loop test 3 by keying 636 The display shows: *L 3-*

51 Press any key but 9 to exit LOOP 3

52 Set the transmit frequency as follows:

For Band I:	TX 290.0 MHz	T2900T
For Band III:	TX 1525.0 MHz	T5250T

53 Select loop test 3 by keying 636 The display shows *L 3-*

54 Press any key but 9 to exit LOOP 3

55 Set the transmit and receive frequencies as follows:

For Band l:	TX 225.0 MHz	T2250T
	RX 400.0 MHz	R4R
For Band III:	TX 1350.0 MHz	T3500T
	RX 1850.0 Mhz	R85R

56 Select loop test 3 by keying 636 The display shows *L 3-* ·

57 Press any key but 9 to exit LOOP 3

58 Connect antenna cable to connector J2

SECTION II c I. UHF RADIO DATA ENTRY PROCEDURE

Mode and Data Rate.

The first parameter to be selected for a configuration is the mode and data rate. The following procedure can be used to select and enter one of five choices available within this parameter:

a. On keypad, press key 0 to display current mode of EOW or data rate in kb/s.
b. To select new mode, press the following keys to obtain desired EOW or data rate by entering key 1 = d.256; key 2 = d.512: key 3 - d.1024; key 5 - EOW only; key 6 = EOW tone.
c. Press key 0 to enter selection made in step b above in the microprocessor. After 1 second, standard display appears.

Transmitter Frequency

This second parameter to be selected for a configuration is the transmitter frequency (table 3·5). The following procedure can be used as a guide in selecting and entering a desired transmitter frequency:

a. On keypad, press T to display current frequency in use.

b. Select new frequency in kHz digit-by-digit by pressing keys in sequence. All valid digits replace flashing digits and cursor moves to next digit for selection, invalid digits are ignored and have no effect. When less significant digits are made invalid by any selection, they are automatically deleted. UHF radio set automatically completes last two digits. For example, to change 1660125 kHz to 1840375 kHz, follow procedure in steps c through g below.

c. First digit (1) is set automatically by UHF radio set microprocessor. Press key 8 to delete less significant digits that otherwise would indicate unattainable high frequency.

d. Press key 4 to place 4 to right of 8.

e. Press key 0 to place 0 to right of 4.

f. Press key 3 to place 3 to right of 0. UHF radio set microprocessor completes last two digits.

g. Press key T to enter previously selected frequency. After 1 second, standard display appears.

Receiver Frequency.

The third parameter to be selected for a configuration is the receiver frequency. The following procedure can be used as a guide in selecting and entering a desired receiver frequency:

a. On keypad, press R to display current frequency in use.

b. Select new frequency in kHz digit-by-digit by pressing keys in sequence. All valid digits replace flashing digits and cursor moves to next digit for selection, invalid digits are ignored and have no effect. When less significant digits are made invalid by any selection, they are automatically deleted. UHF radio set automatically completes last two digits. For example, to change 1660125 kHz to 1840375 kHz, follow procedures in steps c through g below.

c. First digit (1) is set automatically by UHF radio set microprocessor. Press key 8 to delete less significant digits that otherwise would indicate unobtainable high frequency.

d. Press key 4 to place 4 to the right of 8.

e. Press key 0 to place 0 to right of 4.

f. Press key 3 to place 3 to right of 0. UHF radio set microprocessor completes last two digits.

g. Press key R to enter previously selected frequency. After 1 second, standard display appears. Configuration is complete and can be used immediately stored for later use.

Display Brightness.

The fourth parameter to be selected for a configuration is the display brightness. The following procedure can be used to select and enter one of the three options available within this parameter:

a. On keypad, press key 7 to display brightness options.

b. Select brightness option by pressing key 1, 2, or 3 for low, medium, or high brightness, respectively.

c. Enter brightness option selected in step b above by pressing key 7. After 1 second, standard display appears.

Remote Status.

The fifth parameter to be selected for a configuration is the remote status. The following procedure can be used to ensure that the remote status is off:

a. On keypad, press key 5 to select remote status.

b. On keypad, press 0 to turn off remote status.

c. Enter remote status off selection by pressing key 5 on keypad. After 1 second, standard display appears.

Automatic Reconfiguration Enabled.

The sixth parameter to be selected for a configuration is automatic reconfiguration. When enabled, this feature allows the microprocessor to automatically load the stored configuration in use before loss of power or equipment shutdown. To enable automatic reconfiguration, use the following procedure:

a. Press key 8 on keypad to obtain display shown.
b. Press key 3 on keypad to select automatic reconfiguration.
c. Press key 4 on keypad to turn off DVOW alarm.
d. Press key 8 on keypad to enter automatic reconfiguration enabled in the microprocessor. After 1 second, standard display.

Transmitter Power Level.

The seventh parameter to be selected for a configuration is the transmitter power level. The following procedure can be used to select and enter one of the three choices available within this parameter:

a. On keypad, press key 4 to display transmitter power displays.
b. Select power level desired by pressing keys 0, 1, and 2 for power off, low power, and high power respectively.
c. Enter power level selected in step b above by pressing key 4 again. After 1 second standard display appears.

Storing Configurations.

After the keystrokes have been completed for the seven parameters (and choices) for a configuration, that configuration can be used immediately or it can be entered into one of nine microprocessor storage location. The following procedure can be used as a guide in selecting and entering a configuration into storage:

a. Store each configuration by pressing key 1 on keypad to obtain display.
b. Keys 1 through 9 select storage locations 1 through 9, respectively. Press key that selects storage location desired.
c. Enter selected configuration into its intended store location by pressing key 1. After 1 second, standard display appears.

Erase Selected Storage Locations.

A storage location must be vacant before a new configuration can be stared there. One or more stored configurations can be erased by using the following procedure:

a. Press key 1 on keypad to obtain display.
b. Press key 0 to invoke erase mode.
c. Keys 1 through 9 select storage locations 1 through 9, respectively. Press key that selects storage location desired.
d. Press key 1 to enter erase command for storage location selected. After 1 second standard display appears.

Erase All Storage Locations.

Use the following procedure to erase all stored configurations:

a. Press key 1 on keypad to obtain display.

b. Press key 0 to invoke erase mode.
c. Press key 0 to select all nine storage locations to be erased.
d. Press key 1 to enter erase command for all nine storage locations selected. After 1 second, standard display (fig. 3-4) appears.

Load in a Stored Configuration.
A stored configuration can be loaded into the microprocessor, either manually or automatically according to the procedures provided in the following paragraphs.

Manual Load.
In manual loading, the operator uses the keypad to select one of nine stored configurations as described in the following procedure:

a. Press key 3 on keypad to obtain display.
b. Keys 1 through 9 select storage locations 1 through 9, respectively. Press key that selects storage location desired.
c. Press key 3 to enter the storage location chosen in step b above. After 1 second, standard display appears.

Automatic Reconfiguration Enabled. Refer to Special Configurations.

Automatic Reconfiguration Disabled.
To disable automatic reconfiguration use the following procedure.

a. On keypad, press key 8 to obtain display.
b. Press key 1 on keypad to disable automatic reconfiguration.
c. Press key 8 on keypad to obtain display. After 1 second, standard display appears.

DVOW Alarm Enabled.
To enable the DVOW alarm, use the following procedure:

a. Press key 8 on keypad to obtain display.
b. Press key 6 on keypad to select DVOW enable.
c. Press key 8 on keypad to obtain display shown in. After 1 second, standard display appears.

DVOW Alarm Disabled.
To disable the DVOW alarm, use the following procedure:

a. Press key 8 on keypad to obtain display.
b. Press key 4 on keypad to disable DVOW alarm.
c. Press key 8 on keypad to obtain display. After 1 second, standard display appears.

Special Configuration.
With automatic reconfiguration disabled this feature allows the operator to load the configuration in use before loss of power or equipment shutdown, as described in the following procedure:

a. On keypad, press key 3 to obtain display.
b. Press key 0 to select special configuration.
c. Press key 310 load special configuration. After 1 second, standard display appears.

SECTION II c II. UHF RADIO ENGINEERING ORDER WIRE PROCEDURES

Engineering Call to Distant UHF Radio Set.

NOTE

Both local and distant UHF radio sets must be in Engineering Orderwire (EOW) mode.

a. On keypad, press key 0, then key 5, then key 0 to obtain E on display.
b. To call a distant UHF radio set, press key 2 on keypad to obtain display After 1 second, CALL display flashes.

NOTE

An analog tone is transmitted and an alert tone sounds in headsets of both local and distant UHF radio sets.

c. Keep pressing key 2 to continue call tone and alert tone. After 1 second, standard display appears.

Engineering Call From Distant UHF Radio Set.

a. After an alert tone sounds in the local UHF radio headphone, the display shown in A, figure 3-20 is obtained.
b. When the call tone in the headphone of the local UHF radio set stops, the flashing CALLED display is obtained. The alert tone continues for 4 minutes In, key is pressed.
c. On keypad, press any key to clear display and silence alert tone. After 1 second, standard display appears.

Engineering Orderwire Plus Tone.

a. On keypad, press key 0 to display current mode, which can be EOW only or data rate in kb/s.
b. Press key 610 select engineering tone.
c. Press key 0 to enter selection of engineering tone.

NOTE

If the distant UHF radio set is not in the standard display, the alert tone will occur when the standard display is obtained.

d. Press any key to cancel engineering tone. After 1 second, standard display appears.

Received Signal Strength.

After antennas have been aliened and EOW communications established, it is necessary to verify that the received signal strength at each end of the radio link is sufficient to maintain effective data traffic at the assigned operating frequency and data rate. Verify received signal strength as described below

a. Check that antennas at local and distant radio sets are properly aligned, and that both radios are configured to the operational data rate and frequencies.
b. Disable transmitter power on both radios by entering 4 0 4 on front panel keypad.
c. Enter R 9 on the keypad and observe received signal strength bar readout on front panel display of each radio.

d. If display on either radio shows more than eight bars, request a new frequency and check signal strength again. Both radios must display less than eight bars.
e. Record number of bars shown at each radio.
f. Power up both transmitters by entering 4 2 4 (high power) and 41 4 (low power) on keypad.
g. With transmitters powered, bar display on each radio should show a received signal strength of four or more bars above readout in step e, for a total of nine bars minimum.

MODE SELECT FUNCTIONS

a. Mode or data rate - key 0.
b. Transmitter power level - key 4.
c. Transmitter frequency - key T.
d, Receiver frequency - key R.
e. Brightness - key 7.
f. Automatic reconfiguration/DVOW alarm - key 8.
g. Remote mode - key 5.

SECTION II c III. UHF RADIO FAULT CODES

UHF RADIO FAULT

F11 1- -	DATA RATE UNDEFINED)	
F11 - 2-	(TUNING PROCESS)	CLEARS WHEN BIT TEST PASSES.
F11 - - 3	(FREQUENCY SEPARATION)	XMIT/REC FREQ LESS THAN 50 MHz APART.
F11 4- -	(REC FREQ UNDEFINED)	
F11 - 5-	(XMIT FREQ UNDEFINED)	
F11 - - 6	(XMIT POWER UNDEFINED)	
F12 1 - -	(DVOW UNDEFINED)	
F12 - 2 -	(NO AUTO CONFIGURATION)	
F12 - - 3	(REMOTE INTF UNDEFINED)	
F12 4 - -	(NO DISPLAY BRIGHTNESS)	
F12 - - 6	(CONFIG INCOMPATIBLE)	CHECK EOW/CALL/SECURE MODE.
F13 1 - -	(ENTRY NOT ALLOWED)	
F13 - 2 -	(FREQ SET W/O DATA RATE)	
F13 - - 3	(POWER SET W/O FREQ)	
F13 4 - -	(STORAGE SLOT EMPTY)	
F13 - 5 -	(STORED DATA INVALID)	
F21 1 - -	(ANTENNA CIRCUIT OPEN)	
F21 - 2 -	(NO DATA INPUT)	
F21 - - 3	(NO DVOW INPUT)	CHECK DVOW CABLE AT BASEBAND.
F22 1 - -	(ANTENNA IS CONNECTED)	
F22 4 - -	(ANTENNA VSWR HIGH)	CHECK ANTENNA CONNECTIONS.
F23 1 - -	(LOW RECEIVE SIGNAL)	
F23 - 2 -	(HIGH BIT ERROR RATE)	IGNORE IF IN EOW DURING LOOP TEST.
F23 - - 3	(SUPPLY VOLTAGE IOW)	
F31 - 2 -	(NO DATA OUTPUT)	CHECK DATA CABLE OR OTHER FAULTS.
F31 - - 3	(NO DVOW OUTPUT)	ONLY ACTIVE WITH DVOW MONITOR ENABLED.
F32 1- -	(NO REGENERATOR LOCK)	CHECK DATA RATE/FREQ/MULTI-PATH.
F32 - 2 -	(EOW CALL FAULT)	NO RECEIVE SIGNAL WHEN CALL WAS SENT.
F32 - - 3	(DEMODULATOR FAULT)	CHECK DATA CABLE AND BASEBAND.
F33 - - 3	(SUPPLY VOLTAGE HIGH)	
F33 4 - -	(PRE MODULATOR FAULT)	CHECK DATA CABLE AND BASEBAND.
F41 1 - -	(DIPLEXER FAULT)	CHECK DATA CABLE AND TRANSMITTER.
F41 - 2 -	(POWER AMP FAULT)	CHECK VOLTAGE LEVELS.
F41 - - 3	(LOW XMIT POWER)	CHECK DATA CABLE AND TRANSMITTER.
F41 4 - -	(POOR SIGNAL QUALITY)	TEST 3 ONLY. CHECK OTHER FAULTS.

F41	*- 5 -*	(MICROPROCESSOR FAULT)	REPLACE RECEIVER/TRANSMITTER.
F41	*- - 6*	(STORED DATA CORRUPT)	ENTER DATA MANUALLY.
F42	*1 - -*	(XMIT LOOP FAULT)	CHECK DATA CABLE AND TRANSMITTER.
F42	*- 2 -*	(XMIT VCO FAULT)	CHECK DATA CABLE AND TRANSMITTER,
F42	*- - 3*	(HF MODULATOR FAULT)	CHECK DATA CABLE AND TRANSMITTER.
F42	*4 - -*	(HF MODULATOR FAULT)	CHECK OTHER FAULTS AND DATA CABLE,.
F42	*- 5 -*	(LF MODULATOR FAULT)	CHECK EOW EQUIPMENT AND DATA CABLE
F42	*- - 6*	(LF MODULATOR FAULT)	CHECK OTHER FAULTS AND DATA CABLE.
F43	*1 - -*	(RECEIVER LOOP FAULT)	CHECK OTHER FAULTS AND DATA CABLE.
F43	*- 2 -*	(RECEIVER VCO FAULT)	CHECK DATA CABLE AND TRANSMITTER.
F43	*- - 3*	(DOWN CONVERTER FAULT)	BAND III ONLY, CHECK DATA CABLE.
F43	*4 - -*	(FIRST IF FAULT)	LOOP TEST 2 AND 3, 70 MHz OUTPUT LOW.

UHF BIT FAULT CODES

F11 1- - **DATA RATE/EOW UNDEFINED**

Higher priority Fault: None

Description: This fault will be present when a radio is first turned on with auto-configuration disabled.

Corrective Action: Select a data rate or EOW mode or recall a stored configuration.

F11 - 2- **TUNING PROCESS**

Higher Priority Fault:

F 11u --3-	Frequency separation less than 50 MHz
F21u 1---	Antenna open circuit
F22u -4--	Antenna VSWR high
F41u 1---	Diplexer fault
F 41u -2--	Power amplifier(PA) mismatch
F 42u 1---	TX Phase Locked loop fault
F 42u -2--	TX VCO fault
F 43u 1---	RX Phase Locked Loop fault
F 43u -2--	RX VCO fault
F 43u --3-	Down Converter Reference fault

Description: This fault will be active when the radio begins to tune and clears when tuning is finished. Since all of the higher priority faults must be cleared before tuning is complete, a disconnected antenna or a hardware failure can result in this fault not clearing.

Corrective Action: Investigate higher priority faults if fault does not clear within several seconds.

F11 - - 3 **FREQUENCY SEPARATION LESS THAN 50MHZ**

Higher Priority Fault: None

Description: This fault is present whenever the transmitter and receiver frequencies are within 50 MHz of another. This can temporarily occur when tuning to two new frequencies and can be ignored until both new frequencies have been completely entered.

Corrective Action: Select new transmitter and/or receiver frequency.

F11 4 - - **RECEIVE FREQUENCY NOT DEFINED**

Higher Priority Fault: None

Description: This fault will be present when a radio is first turned on with auto-configuration disabled.

Corrective Action: Select the receive frequency or recall a stored configuration.

F11 - 5 - **TRANSMIT FREQUENCY NOT DEFINED**
Higher Priority Fault: None
Description: This fault will be present when a radio is first turned on with auto-configuration disabled.
Corrective Action: Select Transmitter Power Level or recall a stored configuration.

F11 - - 6 **TRANSMIT POWER LEVEL NOT DEFINED**
Higher Priority Fault: None
Description: This fault will be present when a radio is first turned on with auto-configuration disabled.
Corrective Action: Select Transmit power level or recall a stored configuration.

F12 1 - - **DVOW MONITOR STATE NOT DEFINED**
Higher Priority Fault: None
Description: This faun will be present when a radio is first turned on with auto-configuration disabled.
Corrective Action: Select DVOW Monitor State or recall a stored configuration.

F12 - 2 - **AUTO-CONFIGURATION STATE NOT DEFINED**
Higher Priority Fault: None
Description: This fault will be present when a radio is first turned on with auto configuration disabled.
Corrective Action: Select Auto-Configuration State or recall a stored configuration.

F12 - - 3 **REMOTE INTERFACE STATE NOT DEFINED**
Higher Priority Fault: None
Description: This fault will be present when a radio is first turned on with auto-configuration disabled.
Corrective Action: Select Remote interface State or recall a stored configuration.

F12 4 - - **display BRIGHTNESS NOT defined**
Higher Priority Fault: None
Description: This fault will be present when a radio is first turned on with auto configuration disabled.
Corrective Action: Select Auto-Configuration State or recall a stored configuration.

F12 - - 6 **CONFIGURATION INCOMPATIBLE WITH REQUEST**
Higher Priority Fault: None

Description: This fault results from attempting to change a parameter or enter a test mode that is incompatible with the current configuration. Attempting to do the following will result in this fault:

To enter loop tests 4 or 5 with the transmit power off
To enter loop tests 4 or 5 while in EOW mode
To enter loop test 2 while in EOW mode
To CALL when in SECURE mode.

Corrective Action: Establish that the radio is operating in the correct Mode for the keypad entry. This fault will be cleared upon exiting status mode.

F13 1 - - **KEYPAD ENTRY NOT ALLOWED**

Higher Priority Fault: None

Description: This fault results from attempting to change a parameter from the keypad when the radio is in remote mode.

Corrective Action: Set the radio to local mode or enter parameter changes via the remote control device. This fault will be cleared upon exiting status mode.

F13 - 2 - **FREQUENCY SET BEFORE DATA RATE/EOW**

Higher Priority Fault: None

Description: This fault results from attempting to enter either the transmit or receive frequency before selecting the data rate or EOW mode.

Corrective Action: Select the data rate or EOW Mode. This fault will be cleared upon exiting status mode.

F13 - - 3 **TRANSMIT POWER LEVEL SET BEFORE TRANSMIT FREQUENCY**

Higher Priority Fault: None

Description: This fault results from attempting to enter transmit power level before entering the transmit frequency.

Corrective Action: Select the transmit frequency. This fault will be cleared upon exiting status mode.

F13 4 - - SELECTED STORE IS EMPTY

Higher Priority Fault: None

Description: This fault results from attempting to load a configuration from a store that is empty.

Corrective Action: Select another storage location or enter the required configuration from the keypad. This fault will be cleared upon exiting status mode.

F13 - 5 - **CONTENTS OF SELECTED STORE ARE INVALID**

Higher Priority Fault: None
Description: This fault results from attempting to load a configuration from a store in which the contents are invalid.
Corrective Action: Select another storage location or enter the required configuration from the keypad. This fault will be cleared upon exiting the status mode.

F21 1 - - **ANTENNA OPEN CIRCUIT**
Higher Priority Fault: None
Description: This fault will be present when a radio is disconnected from its antenna or the antenna does not contain a DC path less than approximately 10k ohms.
Corrective Action: Check antenna cables and antenna for loose connection or damage, If antenna and cables are properly connected and no damage apparent, replace receiver-transmitter subassembly.

F21 - 2 - **NO INPUT DATA**
Higher Priority Fault: None
Description: This fault will be present when no data is detected at the baseband input to the radio.
Corrective Action: Check associated equipment for proper function and inspect DATA IN/OUT cable for damage

1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. If no external fault can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F21 - - 3 **NO INPUT DVOW**
Higher Priority Fault: None
Description: This fault will be present whenever the DVOW monitors are enabled and there is no input baseband DVOW traffic. Since most orderwire equipment is push-to-talk operation, the DVOW monitors should be disabled by the operator and, therefore, this fault is not present. The DVOW monitors may be enabled for troubleshooting orderwire problems
Corrective Action: Disable DVOW monitors by keying 818. If during troubleshooting orderwire problems, this fault is present when external orderwire equipment is sending data to the radio, then:

1. Check associated orderwire equipment for proper function and inspect the DATA IN/OUT cable for damage
2. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
3. Replace baseband subassembly

4. If fault does not clear, install original baseband subassembly and replace receiver- transmitter subassembly
5. If no external fault can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F22 1 - - **<u>DISCONNECT ANTENNA</u>**

Higher Priority Fault: None

Description: This fault will be present when a radio is in loop tests 2 or 3 and the antenna is connected. The antenna must be disconnected to pass this test

Corrective Action: Disconnect antenna

F22 4 - - **<u>ANTENNA VSWR HIGH</u>**

Higher Priority Fault: None

Description: This fault results from a high VSWR condition at the antenna connector. When this fault is present, the rf power amplifier will shut down and an *F41u--3*, low transmitter forward power fault will be present.

Corrective Action: Check antenna cables and antenna for loose connections or damage. If antenna and cables are properly connected, replace receiver-transmitter subassembly. Fault will clear upon exiting status mode

F23 1 - - **<u>LOW RECEIVE SIGNAL STRENGTH</u>**

Higher Priority Fault:
F41u 1-- - Diplexer fault
F43u 1-- RX Phase Locked Loop fault
F43u -2- RXVCO fault
F43u --3 Down Converter Reference Fault
F43n 4-- First IF fault

Description: This fault results from low receive signal strength being detected in the demodulator assembly. It indicates that no receive data is being detected

Corrective Action:
1. If this occurs after a link has been established, check for higher priority faults listed above. If a higher priority fault exists take corrective action as indicated under the specific fault
2. Check antenna to be sure alignment has not been altered
3. If no external cause can be found, place the radio in loop test 3 to check proper operation of the radio set. If the radio passes loop test 3, the most probable cause is external
4. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue.
5. Replace receiver-transmitter subassembly.
6. If fault does not clear, install original receiver-transmitter subassembly and replace baseband subassembly
7. If loop test 3 fails, replace IF cable connecting receiver-transmitter and baseband subassemblies

8. If fault does not clear, install original IF cable and replace data cable

F23 - 2 - **HIGH BIT ERROR RATE**

Higher Priority Fault: None

Description: This fault will be present in loop tests 3, 4, and 5 when a high BER is detected. It is not active during normal operation. ignore this fault if it occurs in EOW mode during loop test 3.

Corrective Action: Check for other accompanying faults and take action as necessary

F23 - - 3 **SUPPLY VOLTAGE LOW**

Higher Priority Fault: None

Description: This fault will be present when the supply to the inverter is low. The supply to the inverter will be low if external ac supply is present, but low; or if the unit is running from dc and the dc supply is low

Corrective Action: Check external supply voltages and restore to proper levels as required

1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. If no external cause can be found, replace data cable

F31 - 2 - **NO DATA OUTPUT**

Higher Priority Fault:

F23u 1-- Low receive signal strength
F32u 1-- Regenerator out-of-lock
F41u 1-- Diplexer fault
F43u 1-- RX Phase locked loop fault
F43u -2- RX VCO fault
F43u --3 Down converter reference fault
F43n 4-- First IF fault

Description: This fault will be present when no receive data is detected at the output of the line interface Circuit Card Assembly (CCA)

Corrective Action: Check for higher priority faults as listed above and take action as per those faults

1. Check cables for damage and connectivity, if damaged, replaceable. If fault does not clear, continue
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. If no higher priority faults can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F31 - - 3	**<u>NO DVOW OUTPUT</u>**	
Higher Priority Fault:	*F23u 1--*	Low receive signal strength
	F32u 1--	Regenerator out-of-lock
	F41u 1--	Diplexer fault
	F43u 1--	RX Phase locked loop fault
	F43u -2-	RX VCO fault
	F43u --3	Down converter reference fault
	F43n 4--	First IF fault

Description: This fault is present whenever DVOW monitors are enabled and there is no output receive DVOW traffic. Since most orderwire equipment is push-to-talk operation, normally DVOW monitors are disabled by the operator and this fault is not present. DVOW monitors nay be enabled for troubleshooting orderwire problems

Corrective Action: Disable DVOW monitors by keying 818. If during troubleshooting orderwire problems, this fault is present when orderwire is being received by the radio, then:

1. Confirm that no higher priority faults exist
2. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
3. Replace baseband subassembly
4. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly.
5. If no higher priority faults exist, replace data cable connecting baseband and receiver-transmitter subassemblies

F32 1 - -	**<u>REGENERATOR OUT-OF-LOCK</u>**	
Higher Priority Fault:	*F23u 1--*	Low Receive Signal Strength
	F41u 1--	Diplexer fault
	F43u 1--	RX Phase Locked Loop fault
	F43u -2-	RX VCO fault
	F43u --3	Down Converter Reference Fault
	F43n 4--	First IF fault

Description: This fault will be present when the regenerator circuit is unable to recover a clock from the incoming data. This fault can be caused by a number of both external and internal factors:

1. Data rate not set correctly - Data rate is not set to same rate as the transmitting radio
2. Frequency set incorrectly - If the frequency between transmitting and receiving radios is offset by just a few channels, sufficient receive signal strength may be indicated, but data cannot be received
3. Multipath Condition - This can occur if radio is receiving the same signal over several paths

4. Signal Interference -This could be deliberate jamming, interference from a collocated radio or from a remote radio other than the desired source.
5. Very Low Frequency Data - Data that contains few transitions does not provide enough information for the regenerator to recover the clock
6. Internal Hardware Failure

Corrective Action:
1. Check for higher priority faults as listed above and take action as per those faults
2. Verify that data rate and frequency are both set properly and correct as necessary
3. Verify that fault is not internal by performing loop test 3. If radio passes loop test 3 at data rate in use, then fault is likely external. If radio does not pass loop test 3, then:
   a. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
   b. Replace baseband subassembly
   c. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
   d. Replace data cable between baseband and receiver-transmitter subassemblies
4. Multipath conditions can sometimes be cleared by changing the polarization of the antenna. Check system personnel before taking this action
5. Interference can usually be eliminated by choosing other frequencies. Again, check with system personnel before taking this action

F32 - 2 - **ENGINEERING CALL FAULT**

Higher Priority Fault: None

Description: This fault will be present when the internal CALL detector cannot verify that a CALL has been generated. This generally occurs only if there is a hardware failure however, it also occurs if there is no receive signal when the CALL signal is sent

Corrective Action: This fault indicates that the CALL signal has not been sent. It may be ignored if there is no receive signal. This fault clears upon exiting status mode

1. Check that power switch S1 on baseband assembly is set to ON.

1.1 Check cables for damage and connectivity, if damaged replace cable. If fault does not clear, continue

2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. If there is sufficient receive signal, replace data cable connecting baseband and receiver-transmitter subassemblies

F32 - - 3 **DEMODULATOR FAULT**

Higher Priority Fault:
F23u 1-- Low receive signal strength
F41u 1-- Diplexer fault
F43u 1-- RX Phase Locked Loop fault
F43u -2- RX VCO fault
F43u --3 Down Converter Reference Fault
F43n 4-- First IF fault

Description: This fault indicates that demodulated video signal is too low in amplitude

Corrective Action: Check for higher priority faults and take action as necessary

1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. If no external cause can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F33 - - 3 **SUPPLY HIGH**

Higher Priority Fault: None

Description: This fault will be present when a high +5V supply rail is detected on the display board.

Corrective Action:

1. Shut radio down immediately to avoid damage
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly

F33 4 - - **PRE-MODULATOR FAULT**

Higher Priority Fault: None

Description: This fault will be present when no data is detected at the input to the pre-modulator

Corrective Action:

1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace baseband subassembly
3. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
4. Replace data cable connecting baseband and receiver-transmitter subassemblies

F41 1 - - **DIPLEXER FAULT**

Higher Priority Fault: None

Description:	This fault will appear if the Diplexer has failed to tune within about 8 seconds
Corrective Action:	1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue 2. Replace receiver-transmitter subassembly 3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly 4. Replace data cable

F 41 - 2 -	**<u>POWER AMPLIFIER MISMATCH</u>**
Higher Priority Fault:	*F23u --3* Supply Low
Description:	This fault will be present when a high reverse power condition at PA output results in PA shutting down to avoid damage. This fault, accompanied by an *F41u --3* LOW Transmitter Forward Power fault, can also occur if supply voltage to radio gets too low
Corrective Action:	This fault nay be reset by exiting status mode 1. Check for higher priority faults and take action as necessary 2. If fault reappears, check for loose connections or damage to antenna or its cable 3. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue 4. Replace receive r-transmitter subassembly 5. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly

Ff41 - - 3	**<u>LOW TRANSMITTER FORWARD POWER</u>**
Higher Priority Fault:	*F21u 1--* Antenna Open Circuit! *F22n 4--* Antenna VSWR High *F41u 1--* Diplexer Fault *F41u -2-* Power amplifier mismatch *F42u 1--* Transmitter Phase Locked Loop fault *F42u -2-* Transmitter VCO fault *F43u --3* Down Converter Reference Fault
Description:	Fault will be present whenever the transmitter forward power drops too low for the corresponding RF power setting
Corrective Action:	1. Check for higher priority faults and take action as necessary 2. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue 3. Replace receiver-transmitter subassembly 4. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly

5. Replace data cable

F41 4 - - **POOR SIGNAL QUALITY**

Higher Priority Fault: None

Description: This fault will be present only in loop test 3 when test is failing. It indicates a failure in the transmit or receive path. When radio is in EOW mode, the source of the alarm is the receive signal strength indicator in the demodulator. When in data mode, alarm is raised by a high BER condition, as detected on line interface CCA. This fault is normally present with other faults

Corrective Action: Check for other faults on the radio. Take action as indicated by other faults.

F41 - 5 - **MICROPROCESSOR CONTROL ELEMENT FAULT**

Higher Priority Fault: None

Description: This fault indicates a controller failure

Corrective Action: Replace receiver-transmitter subassembly

F41 - - 6 **MICROPROCESSOR NONVOLATILE STORE FAULT**

Higher Priority Fault: None

Description: This fault indicates a failure in the configuration memory. The radio will continue to function fully with the exception that stored configurations may be corrupted

Corrective Action:
1. Avoid use of stored configurations. Enter configurations manually
2. Replace receiver-transmitter subassembly

F42 1 - - **TRANSMITTER PHASE LOCKED LOOP FAULT**

Higher Priority Fault: *F42u -2-* Transmitter VCO fault
F43u --3 Down Converter Reference fault

Description: This fault indicates that transmit synthesizer loop is unable to lock up

Corrective Action: If higher priority faults exist, take action as necessary; otherwise:
1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly
4. Replace data cable

F42 - 2 - **TRANSMITTER VCO FAULT**

Higher Priority Fault: None
Description: This fault indicates that transmit VCO has low output
Corrective Action:
1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault appears on the new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly
4. Replace data cable

F42 - - 3 **HF MODULATOR DATA FAULT**

Higher Priority Fault: *F33n 4--* Pre-modulator fault
Description: This fault indicates a lack of analog data input to HF modulator
Corrective Action: If higher priority faults exist, take action as necessary; otherwise:
1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault does not clear, install original receiver-transmitter subassembly and replace baseband subassembly
4. Replace data cable

F42 4 - - **HF MODULATOR MODULATION FAULT**

Higher Priority Fault:
F33n 4-- Pre-modulator fault
F42u 1-- Transmitter Phase Locked Loop fault
F42u -2- Transmitter VCO fault
F42u --3 HF Modulator Data fault

Description: This fault indicates a lack of modulation on VCO output
Corrective Action: If higher priority faults exist, take action as necessary; otherwise:
1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault does not clear, install original receiver-transmitter subassembly and replace baseband subassembly
4. If no external fault can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F42 - 5 - **LF MODULATOR EOW FAULT**

Higher Priority Fault: None
Description: This fault is present whenever DVOW monitors are enabled and there is no orderwire traffic detected in LF modulator. Since most orderwire equipment is push-to-talk operation, DVOW monitors are normally

disabled by the operator, and this fault would not be present. The DVOW monitors may be enabled for troubleshooting orderwire problems

Corrective Action: Disable DVOW monitors by keying 818. If, during orderwire troubleshooting, this fault is present when external orderwire equipment is sending data to the radio, then:

1. Check associated orderwire equipment for proper function and inspect DATA IN/OUT cable for damage
2. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
3. Replace baseband subassembly
4. If fault does not clear, install original baseband subassembly and replace receiver-transmitter subassembly
5. If no external fault can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F42 - - 6 **<u>LF MODULATOR FAULT</u>**

Higher Priority Fault: *F21u -2-* No input data
F33n 4-- Pre-modulator fault

Description: This fault indicates a lack of low frequency modulation in the LF modulator. With some data sources, this fault may be present. When the bulk data, in the absence of orderwire, does not contain enough low frequency components, this fault will occur. This fault may be present when the radio is running from its internal pattern generator

Corrective Action:

1. Check for higher priority faults and take action as necessary
2. To determine if fault is internal, press push-to-talk button on handset; or, if in SECURE mode, activate external orderwire equipment. If fault disappears, the most probable cause is a lack of low frequency components in the data corning in from external equipment
3. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
4. Replace receiver-transmitter subassembly
5. If fault appears on he new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly
6. If no external fault can be found, replace data cable connecting baseband and receiver-transmitter subassemblies

F43 1 - - **<u>RECEIVER PHASE LOCKED LOOP FAULT</u>**

Higher Priority Fault: *F43u -2-* Receiver VCO fault
F43u --3 Down Converter Reference fault

Description: This fault indicates that receive synthesizer loop is unable to lock up

Corrective Action: If higher priority fault exists, take action as necessary; otherwise:

1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly
4. Replace data cable

F43 - 2 - **RECEIVER VCO FAULT**

Higher Priority Fault: None

Description: This fault indicates that receive VCO has low output

Corrective Action:
1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue
2. Replace receiver-transmitter subassembly
3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly
4. Replace data cable

F43 - - 3	**DOWN CONVERTER REFERENCE FAULT**
Higher Priority Fault:	None
Description:	This fault will be present when no output is detected from Down Converter Reference Generator in RX sidewall. This fault can only be present on a Band III subassembly
Corrective Action:	1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue 2. Replace receiver-transmitter subassembly 3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly. 4. Replace data cable

F43 4 - -	**FIRST IF FAULT**
Higher Priority Fault:	*F43u 1--* Receiver Phase Locked Loop fault *F43u -2-* Receiver VCO fault *F43u --3* Down Converter Reference fault
Description:	This fault is active only in loop tests 2 and 3. It will be present when the 70- MHz IF output from RX sidewall is too low
Corrective Action:	If higher priority faults exist, take action as necessary; otherwise: 1. Check cables for damage and connectivity, if damaged, replace cable. If fault does not clear, continue 2. Replace receiver-transmitter subassembly 3. If fault appears on new receiver-transmitter subassembly, install original receiver-transmitter subassembly and replace baseband subassembly 4. Replace data cable

SECTION II d. RAU ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Power Control Panel
DC: CONTROL - tripped
DC ON-OFF - on
EMERGENCY POWER - on
BATTERY ON BUS - off
BATTERY EXHAUST
FAULT - on
BUS VOLTAGE METER < > 24 Volts
AC: RGLTR CHARGER - off
CONTROL - tripped
FREQUENCY < > 58-62 Hz
VOLTAGE < > 103-127 Vac
ACTIONS: Set all circuit breakers to on position. If any breakers return to off position go to prime power troubleshooting.

STEP 2
CHECK FOR: Damaged power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Repair or replace cable. Then restart generator.

STEP 3
CHECK FOR: Disconnected power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Reconnect cable. Then restart generator.

STEP 4
CHECK FOR: Power Unit indications
VOLTAGE < > 115 Vac
FREQUENCY < > 60 Hz
ACTIONS: If power unit failure, activate backup power. If power unit functioning adjust voltage/frequency.

STEP 5
CHECK FOR: Communication Modem Front Panel
POWER ON/OFF - off
SMY FAULT - on
BITE FAULT LEDs - Any indicating other than 00-0
ACTIONS: Refer to TM 11-5895-1465-13&P if fault exists.

CHECK FOR: Timing Settings should be as follows:
TEST SELECT SW - OPERATE

TMG SW - NORM
MODE SW - NORM

ACTIONS: Set Properly. Determine if fault still exists.

STEP 6

CHECK FOR: Power on indicators not on TED

ACTIONS: Verify equipment is not receiving power (use lamp test). If equipment is receiving power, fault has not been located. If equipment is receiving power, troubleshoot power system and faulted equipment. Determine if fault has been corrected.

STEP 7

CHECK FOR: Power on indicators not on any other equipment

ACTIONS: A secondary fault is indicated; notify master node of situation and troubleshoot secondary fault after link fault is corrected.

STEP 8

CHECK FOR: Damaged CX-11230/G cable (See Cable Test Guide)

ACTIONS: Repair or replace cable. Determine if fault has been corrected.

STEP 9

CHECK FOR: Patch panel configured incorrectly

ACTIONS: Install patches in proper configuration. Determine if fault has been corrected.

STEP 10

CHECK FOR: Damaged patch panel patches

ACTIONS: Install good patches in proper configuration. Determine if fault has been corrected.

STEP 11

CHECK FOR: Damaged HVA assembly, HVA connectors, or signal entry panel connectors; disconnected connectors at signal entry panel

ACTIONS: Repair, reconnect, or replace as necessary. Determine if fault has been corrected.

STEP 12

CHECK FOR: KG-194A fault indicator on

ACTIONS: Troubleshoot or replace KG-194A. Determine if fault has been corrected.

STEP 13

CHECK FOR: Group Logic Unit Fault Indicators

GENERAL ALARM - on
EQPT FAULT - on
FREQ MGMT FAULT - on
BATTERY FAULT - on
PRESATURATION FAULT - on

ACTIONS: These alarms do not indicate the source of the link fault; they may indicate possible secondary faults within the RAU. Report situation to master node and continue troubleshooting the link failure as directed by the master node. After the link failure has been corrected, troubleshoot the secondary failure if it continues to exist.

STEP 14

CHECK FOR: RT-1539 radio alarms

ACTIONS: These alarms do not indicate the source of the link fault; they may indicate possible secondary faults within the RAU or transmission problems external to the RAU shelter. Report situation to master node, and continue troubleshooting the link failure as directed by the master node. After the link failure has been corrected, troubleshoot the secondary failure if it continues to exist. If radio is faulted, refer to DS maintenance.

SECTION II dI. RAU (RT-1539) BIT TEST

There are two BIT tests that can be run on the RAU radio (RT-1539).

1. The first test is a battery check. (This test is valid only if the radio has been turned off for more than 30 seconds.) To complete the battery check push the BIT TEST/BATTERY TEST push button on the RT-1539 if the BATTERY/ALARM indicator comes on then the battery is good. If the indicator does not come on, the battery MUST be replaced. The battery is important because it retains the CRYPTO variable (M-Key) in the radio should there be an emergency power loss or when the radio is intentionally powered down, such as when the RAU jumps.

2. The second BIT test (actually a loop test to the NCS) is used after the RAU has been set up, the GLU has been affiliated and the RAU shelter is ready to begin communications. For this test the radios must be powered on and should be in system. Start with any radio which is NOT TRANSMITTING the marker and IS NOT in traffic, press the BIT TEST push button the TRAFFIC indicator should go solid for a few seconds (depending if the RAU is remote or local) then go out normal operation, that is the correct indications of a good loop test to the NCS. A failed test will cause the radio to go into alarm, clear the alarm with a "Quick" reset (ON/OFF/BLACKOUT switch turned off then on in less then two seconds).

NOTE: This BIT test sends a code word to the NCS, checking for connectivity between the radio and the NCS, if a path exists (a trunk) then the NCS sends the RAU an acknowledgment and the loop has been successfully checked. If the loop test fails, check the radio connections, repeat the test, if again the test fails call the NCS operator and report what number radio failed. The NCS operator should check the trunks to the RAU to determine if any trunks are out of service, marked for maintenance, or not assigned.

SECTION II e. SEN ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Power Control Panel
DC: CONTROL - tripped
DC ON-OFF - on
EMERGENCY POWER - on
BATTERY ON BUS - off
BATTERY EXHAUST
FAULT - on
BUS VOLTAGE METER < > 24 Volts
AC: RGLTR CHARGER - off
CONTROL - tripped
FREQUENCY < > 58-62 Hz
VOLTAGE < > 103-127 Vac
ACTIONS: Set all circuit breakers to on position. If any breakers return to off position go to prime power troubleshooting.

STEP 2
CHECK FOR: Damaged power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Repair or replace cable. Then restart generator.

STEP 3
CHECK FOR: Disconnected power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Reconnect cable. Then restart generator.

STEP 4
CHECK FOR: Power Unit indications
VOLTAGE < > 115 Vac
FREQUENCY < > 60 Hz
ACTIONS: If power unit failure, activate backup power. If power unit functioning, adjust voltage/frequency.

STEP 5
CHECK FOR: Communication Modem Front Panel
POWER ON/OFF - off
SMY FAULT - on
BITE FAULT LEDs - Any indicating other than 00-0
ACTIONS: Refer to TM 11-5895-1465-13&P if fault exists.

CHECK FOR: Timing Settings should be as follows:
TEST SELECT SW - OPERATE

TMG SW - NORM
MODE SW - NORM

ACTIONS: Set Properly. Determine if fault still exists.

STEP 6

CHECK FOR: Power on indicators not on, on TED.

ACTIONS: Verify that equipment is not receiving power (use lamp test). If the equipment is receiving power, the fault has not been located. If the equipment is receiving power, troubleshoot the power system and the faulted equipment. Determine if fault has been corrected.

STEP 7

CHECK FOR: Power on indicators not on, on any other equipment

ACTIONS: A secondary fault is indicated; notify master node of situation and troubleshoot secondary fault after link fault is corrected.

STEP 8

CHECK FOR: Damaged CX-11230/G cable

ACTIONS: Repair or replace cable. Determine if fault has been corrected.

STEP 9

CHECK FOR: Antenna down or missoriented

ACTIONS: Re-aim antenna (repair mast as necessary). Determine if fault has been corrected.

STEP 10

CHECK FOR: Antenna cable damaged

ACTIONS: Shut off related SHF radio. Repair or replace cable. Turn on radio. Re-initialize parameters as necessary. Determine if fault has been corrected.

STEP 11

CHECK FOR: Antenna cable disconnected

ACTIONS: Shut off related SHF radio. Reconnect cable. Turn on radio. Re-initialize parameters as necessary. Determine if fault has been corrected.

STEP 12

CHECK FOR: Patch panel configured incorrectly

ACTIONS: Install patches in proper configuration. Determine if fault has been corrected.

STEP 13

CHECK FOR: Damaged patch panel patches

ACTIONS: Install good patches in proper configuration. Determine if fault has been corrected.

STEP 14

CHECK FOR: Damaged HVA assembly, HVA connectors, or signal entry panel connectors; disconnected connectors at signal entry panel

ACTIONS: Repair, reconnect, or replace as necessary. Determine if fault has been corrected.

STEP 15
CHECK FOR: SHF radio cabling:
Data cable (from patch panel);Antenna cable
ACTIONS: Shut off SHF radio. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on radio. Re-initialize parameters if necessary. Determine if fault has been corrected.

CHECK FOR: DC power cable
ACTIONS: If radio is still operating on AC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable. Determine if fault has been corrected.

CHECK FOR: AC power cable
ACTIONS: If radio is still operating on DC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable. Determine if fault has been corrected.

STEP 16
CHECK FOR: Incorrect SHF switch settings
ACTIONS: Set properly. Then go through startup procedures and re-initialize if necessary. Determine if fault has been corrected.

STEP 17
CHECK FOR: SHF radio fault indication:
uP SYNCH indicator on; uP SYNCH indicator flashing; or DC/DC BB on, or DC/DC RF on, or RF TX on, or RF FR on, or BB TX on, or BB RX on
ACTIONS: Troubleshoot SHF radio. Determine if fault has been corrected.

CHECK FOR: BB BER on, or RF RX on
ACTIONS: This does not necessarily indicate the location of the fault. The fault is either in the SHF, at the distant SHF radio, or in the SHF sublink. Notify master NC. Anticipate instructions to troubleshoot the SHF sublink. The NC will request troubleshooting of the sublink unless information from the distant SHF radio indicates that the fault is at the distant site.

STEP 18
CHECK FOR: KG-194A fault indicator on
ACTIONS: Troubleshoot or replace KG-194A. Determine if fault has been corrected.

STEP 19
CHECK FOR: SB-4303 Alarm Indications
20 HZ - lit
CCU - lit
DC LED - lit
TERMINAL STATUS - blinking
ACTIONS: SB-4303 faulty. Refer to TM 11-5805-772-12 for switchboard troubleshooting.

SECTION II f. SCC ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Power Control Panel
DC: CONTROL - tripped
DC ON-OFF - on
EMERGENCY POWER - on
BATTERY ON BUS - off
BATTERY EXHAUST
FAULT - on
BUS VOLTAGE METER < > 24 Volts
AC: RGLTR CHARGER - off
CONTROL - tripped
FREQUENCY < > 58-62 Hz
VOLTAGE < > 103-127 Vac
ACTIONS: Set all circuit breakers to on position. If any breakers return to off position go to prime power troubleshooting.

STEP 2
CHECK FOR: Damaged power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Repair or replace cable. Then restart generator.

STEP 3
CHECK FOR: Disconnected power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Reconnect cable. Then restart generator.

STEP 4
CHECK FOR: Power Unit indications
VOLTAGE < > 115 Vac
FREQUENCY < > 60 Hz
ACTIONS: If power unit failure, activate backup power. If power unit functioning adjust voltage/frequency.

STEP 5
CHECK FOR: Communication Modem Front Panel
POWER ON/OFF - off
SMY FAULT - on
BITE FAULT LEDs - Any indicating other than 00-0
ACTIONS: Refer to TM 11-5895-1465-13&P if fault exists.

STEP 6
CHECK FOR: Power on indicators not on, on any other equipment

ACTIONS: A secondary fault is indicated; notify master node of situation and troubleshoot secondary fault after link fault is corrected.

STEP 7

CHECK FOR: Patch panel configured incorrectly

ACTIONS: Install patches in proper configuration. Determine if fault has been corrected.

STEP 8

CHECK FOR: Damaged patch panel patches

ACTIONS: Install good patches in proper configuration. Determine if fault has been corrected.

STEP 9

CHECK FOR: Damaged CX-11230/G cable (See Cable Test Guide)

ACTIONS: Repair or replace cable. Determine if fault has been corrected.

STEP 10

CHECK FOR: At technical shelter: damaged HVA assembly, HVA connectors, or signal entry panel connectors; is connected at signal entry panel

ACTIONS: Repair, reconnect, or replace as necessary. Determine if fault has been corrected.

STEP 11

CHECK FOR: Any other equipment: any alarm indicator on or flashing

ACTIONS: These alarms do not indicate the source of the link fault; they may indicate possible secondary faults within the SCC. Report situation to master node and continue troubleshooting the link failure as directed by the master node. After the link failure has been corrected, troubleshoot the secondary failure if it continues to exist.

SECTION II g. LEN or NCS ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Power Control Panel
DC: CONTROL - tripped
DC ON-OFF - on
EMERGENCY POWER - on
BATTERY ON BUS - off
BATTERY EXHAUST
FAULT - on
BUS VOLTAGE METER < > 24 Volts
AC: RGLTR CHARGER - off
CONTROL - tripped
FREQUENCY < > 58-62 Hz
VOLTAGE < > 103-127 Vac
ACTIONS: Set all circuit breakers to on position. If any breakers return to off position go to prime power troubleshooting.

STEP 2
CHECK FOR: Damaged power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Repair or replace cable. Then restart generator.

STEP 3
CHECK FOR: Disconnected power cable
ACTIONS: Shut down generator. Activate backup power from HMMWV. Determine if fault is corrected. Reconnect cable. Then restart generator.

STEP 4
CHECK FOR: Power Unit indications
VOLTAGE < > 115 Vac
FREQUENCY < > 60 Hz
ACTIONS: If power unit failure, activate backup power. If power unit functioning adjust voltage/frequency.

STEP 5
CHECK FOR: VDU displays fault messages
ACTIONS: Troubleshoot according to priorities in site manual (Chapter 6).

STEP 6
CHECK FOR: Communication Modem Front Panel
POWER ON/OFF - off
SMY FAULT - on
ACTIONS: Refer to TM 11-5895-1465-13&P if fault exists.

CHECK FOR: Timing Settings

TEST SELECT SW - OPERATE
TMG SW - NORM
MODE SW - NORM

STEP 7
CHECK FOR: Damaged CX-11230/G cable (See Cable Test Guide)
ACTIONS: Repair or replace cable. Determine if fault has been corrected.

STEP 8
CHECK FOR: Antenna down or not oriented
ACTIONS: Re-aim antenna (repair mast as necessary). Determine if fault has been corrected.

STEP 9
CHECK FOR: Antenna cable damaged
ACTIONS: Shut off related SHF radio. Repair or replace cable. Turn on radio. Re-initialize parameters as necessary. Determine if fault has been corrected.

STEP 10
CHECK FOR: Antenna cable disconnected
ACTIONS: Shut off related SHF radio. Reconnect cable. Turn on radio. Re-initialize parameters as necessary. Determine if fault has been corrected.

STEP 11
CHECK FOR: Patch panel configured incorrectly
ACTIONS: Install patches in proper configuration. Determine if fault has been corrected.

STEP 12
CHECK FOR: Damaged patch panel patches
ACTIONS: Install good patches in proper configuration. Determine if fault has been corrected.

STEP 13
CHECK FOR: Damaged HVA assembly, HVA connectors, or signal entry panel connectors; disconnected connectors at signal entry panel
ACTIONS: Repair, reconnect, or replace as necessary. Determine if fault has been corrected.

STEP 14
CHECK FOR: SHF radio cabling:

Data cable (from patch panel) / Antenna cable

ACTIONS: Shut off SHF radio. Repair, replace, or reconnect broken, missing, or disconnected cable. Turn on radio. Re-initialize parameters if necessary. Determine if fault has been corrected.

CHECK FOR: DC power cable

ACTIONS: If radio is still operating on AC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable. Determine if fault has been corrected.

CHECK FOR: AC power cable
ACTIONS: If radio is still operating on DC power, this is not the cause of the link failure. If radio is not operating, this is the cause of the link failure. Repair, replace, or reconnect broken, missing, or disconnected cable. Determine if fault has been corrected.

STEP 15
CHECK FOR: Incorrect SHF switch settings
ACTIONS: Set properly. Then go through startup procedures and re-initialize if necessary. Determine if fault has been corrected.

STEP 16
CHECK FOR: SHF radio fault indication:
uP SYNCH indicator on;
uP SYNCH indicator flashing;
DC/DC BB on, or DC/DC RF on, or RF TX on, or RF FR on, or BB TX on, or BB RX on
ACTIONS: Troubleshoot SHF radio. Determine if fault has been corrected.

CHECK FOR: BB BER on, or RF RX on
ACTIONS: This does not necessarily indicate the location of the fault. The fault is either in the SHF, at the distant SHF radio, or in the SHF sublink. Notify master NC. Anticipate instructions to troubleshoot the SHF sublink. The master NC will request troubleshooting of the sublink unless information from the distant SHF radio indicates fault is at the distant site.

SECTION II h. TACSAT ASSEMBLAGE CHECKLIST

STEP 1
CHECK FOR: Voltage not equal to 120 volts
ACTIONS: If voltage is less than or greater than 120 volts, adjust output voltage of generator until reading of 120 volts. If voltage is equal to 0 volts, then check for generator failure.

STEP 2
CHECK FOR: Power cable
ACTIONS: Ensure power cable is properly connected to terminal and not damaged. If cable is disconnected/damaged, turn off generator, connect/replace cable, and restart generator.

STEP 3
CHECK FOR: Voltage phase
ACTIONS: Check rotation of blower. If blowing into the terminal, the phase is incorrect. Reverse phase leads and check blower.

STEP 4
CHECK FOR: TSSP not operating but power indicator on
ACTIONS: Ensure that voltage meter reading is 120 volts. Adjust generator output if necessary.

STEP 5
CHECK FOR: System fault receive alarm on FAMU
ACTIONS: A fault in the receive system has occurred:

1. DCSCU antenna control unit has faulted
2. MD-945 modem on the receive side has faulted
3. TD-1337 DEMUX on receive side has faulted

Notify GMF controller and node center of fault.

STEP 6
CHECK FOR: System fault transmit alarm on FAMU
ACTIONS: A fault in the transmit system has occurred:

1. HPA amplifier has faulted
2. MD-945 modem on the transmit side has faulted
3. TD-1337 MUX on transmit side has faulted

Notify GMF controller and node center of fault.

STEP 7
CHECK FOR: Safety alert alarm on FAMU
ACTIONS: A safety alert condition has occurred:

1. Antenna elevation is too low
2. Waveguide connection is open or not secured

Notify GMF controller and node center of fault.

STEP 8
CHECK FOR: MD-945 modem phase light on
ACTIONS: Communication link has lost synchronization. Check if modem is receiving signal. If so, check BER. If BER is not 10^{-7}, troubleshoot modem (Data rate, QPSK or BPSK, coded or uncoded).

STEP 9
CHECK FOR: TSSP major alarms
ACTIONS: LOS or LOT indicates either a bad CCA in TSSP or loss of communication link. Check to see if modem is phase locked. If so, troubleshoot DEMUX in TSSP.

STEP 10
CHECK FOR: Down converter frequency setting
ACTIONS: Ensure that receive frequency is 725 MHz less than distant terminal transmit frequency. If not, set frequency properly.

STEP 11
CHECK FOR: Up converter frequency setting
ACTIONS: Ensure that transmit frequency is 725 MHz more than distant terminal receive frequency. If not, set frequency properly.

STEP 12
CHECK FOR: SAW filter setting
ACTIONS: Ensure that SAW filter is set IAW SAW filter chart. If not, set properly.

STEP 13
CHECK FOR: VCXO drift
ACTIONS: If VCXO drift exists, change to master timing. Determine if fault has been corrected.

STEP 14
CHECK FOR: Damaged CX-11230/G (See Cable Test Guide)
ACTIONS: Replace damaged CX-11230/G.

STEP 15
CHECK FOR: TSSP programming
ACTIONS: Ensure TSSP is programmed IAW TSSP worksheet. Correct programming if necessary.

STEP 16
CHECK FOR: PCM connection to terminal
ACTIONS: Ensure that CX-11230/G is connected to correct SEP connector. Correct if necessary.

STEP 17
CHECK FOR: Group modem summary fault indicator
ACTIONS: If summary light is on, there is no data input to group modem. Check CX-11230/G connection and continuity between TSSP and group modem.

TACSAT LOOPBACKS:

1. PCM Cable Loopback: The TACSAT operator puts a loopback plug on the PCM cable to insure integrity of the cable back to the switch.

2. TSSP Loopback: This loopback checks all the group modem and multiplexer equipment in the satellite terminal.

3. Modem Loopback: This loops back the signal in the MD-945 Data Modem. It does not always work with MSE systems and should not be used as a reliable indication of a problem.

4. Translator Loopback: Loops the system up to the antenna-mounted equipment and back.

5. Satellite Loopback: Loops the system up to the satellite and back. This loopback can be used in a point-to-point mode of operation; it will loop back ALL the systems in the Hub-spoke mode of operation. This loopback is not a preferred method of troubleshooting because it will interrupt other systems.

6. Farside Loopback: The distant satellite terminal puts a PCM loopback plug on the connector at the SEP or far end of the PCM before it enters the distant end switch. This allows the system to be check through both satellite terminals without cutting off other systems on a satellite loopback.

SECTION II i. TROPO ASSEMBLAGE CHECKLIST

1. PCM Cable Loopback: The operator puts a loopback plug on the PCM cable to test its integrity.

2. Group Modem Loopback: This loopback checks the individual DTG after it has passed through the MD-1026 Group Modem.

3. Trunk Group Modem Loopback: This loops back all incoming DTGs at the TD-1236 Trunk Group Modem. This loopback is not preferred when the Tropo terminal is using more than one DTG because it will interrupt other systems.

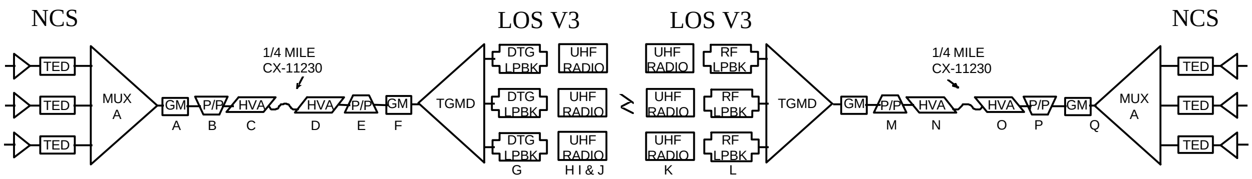
4. Receiver Loopback: Loops the system up to the Tropo terminal receiver equipment and back.

5. Farside Loopback: The distant Tropo terminal puts a PCM plug onto the connector at the SEP or far end of the PCM cable before it enters the distant end switch. This allows the system to be checked through both Tropo terminals without cutting off other systems as in the TGM Loopback.

SECTION II j. MSE LINK LOOPBACKS

Link Troubleshooting

NCS-NCS

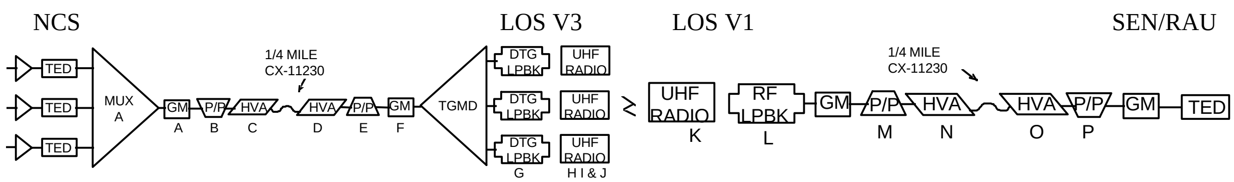


A. MDTG LPBK (TEARDROP)
B. MDTG P/P LPBK
C. HVA LPBK (CABLE HOCK)
D. CABLE LPBK
E. FIELD LPBK (FROM P/P)
F. TGMD LPBK

G. DTG LPBK
H. 6-1-6 LPBK (BASEBAND)
I. 6-2-6 LPBK (RADIO)
J. 6-3-6 LPBK (PATTERN GENERATOR)
K. 6-4-6/6-5-6 LPBK
L. RF P/P LPBK

M. P/P LPBK
N. HVA LPBK
O. CABLE LPBK
P. P/P LPBK
Q. TEARDROP LPBK

NCS-SEN/RAU

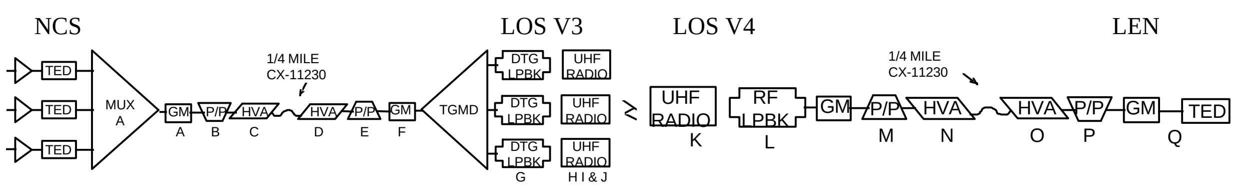


A. MDTG LPBK (TEARDROP)
B. MDTG P/P LPBK
C. HVA LPBK (CABLE HOCK)
D. CABLE LPBK
E. FIELD LPBK (FROM P/P)
F. TGMD LPBK

G. DTG LPBK
H. 6-1-6 LPBK (BASEBAND)
I. 6-2-6 LPBK (RADIO)
J. 6-3-6 LPBK (PATTERN GENERATOR)
K. 6-4-6/6-5-6 LPBK
L. RF P/P LPBK

M. P/P LPBK
N. HVA LPBK
O. CABLE LPBK
P. P/P LPBK

NCS-LEN



A. MDTG LPBK (TEARDROP)
B. MDTG P/P LPBK
C. HVA LPBK (CABLE HOCK)
D. CABLE LPBK
E. FIELD LPBK (FROM P/P)
F. TGMD LPBK

G. DTG LPBK
H. 6-1-6 LPBK (BASEBAND)
I. 6-2-6 LPBK (RADIO)
J. 6-3-6 LPBK (PATTERN GENERATOR)
K. 6-4-6/6-5-6 LPBK
L. RF P/P LPBK

M. P/P LPBK
N. HVA LPBK
O. CABLE LPBK
P. P/P LPBK
Q. TEARDROP LPBK

STEP 1: **ACTION:** * Local NCS perform a teardrop LPBK on a ssociated MDTG.
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 2: **ACTION:** * Local NCS switch the MDTG teardrop switch to GM, and put the MDTG in P/P loopback (Blue Plugs).
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 3: **ACTION:** * Local NCS connect a CX-11230 cable between the switching shelter and LOS V3 radio, and put a loopback plug on the LOS V3 end of the cable.
RESULTS: ** should be displayed on VDT for associated DTG.
*** in case loopbacks fails
GO/NO GO

STEP 4: **ACTION:** * Local LOS V3 operator removes the loopback plug and the CX-11230 cable to the shelter. Inside the shelter the V3 operator puts the P/P in a field loopback.
RESULTS: ** should be displayed on VDT for associated DTG.
*** in case loopbacks fails
GO/NO GO

STEP 5: **ACTION:** * Local LOS V3 operator puts the P/P in the normal through configuration, and switches the TGMD Interface Select the LPBK.
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 6: **ACTION:** Local Los V# operator puts the associated DTG in a loopback on the P/P (XMIT to REC and CLK to CLK).
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 7: **ACTION:** Local LOS V3 operators remove the patch cords and performs a 6-1-6 loop test on the radio.
RESULTS: ** should be displayed on VDT for associated DTG. The radio should display L1.
GO/NO GO

STEP 8: **ACTION:** Local LOS V3 operator performs 6-2-6 loop tests on the radio.
RESULTS: ** should be displayed on VDT for associated DTG.. The radio should display L2.
GO/NO GO

STEP 9: **ACTION:** Local LOS V3 operator performs 6-3-6 loop tests on the radio.
RESULTS: ** should be displayed on VDT for associated DTG.. The radio should display L3.
GO/NO GO

STEP 10: **ACTION:** Set the radio power level (4-1-4).
RESULTS: N/A
GO/NO GO

STEP 11: **ACTION:** Elevate antennas high enough to clear obstacles in its path.
RESULTS: N/A
GO/NO GO

STEP 12: **ACTION:** On radio set EOW mode (0-5-0) and attempt to establish contact between LOS shelters in link.
RESULTS: N/A
GO/NO GO

STEP 13: **ACTION:** At master LOS V3, adjust antennas azimuth for maximum received signal, then request remote LOS to do the same.
RESULTS: Receive signal strength should be in the range of 9-12 bars.
GO/NO GO

STEP 14: **ACTION:** At master LOS V3, slowly adjust antennas height for maximum received signal, then request remote LOS to do the same.
RESULTS: Receive signal strength should be in the range of 9-12 bars.
GO/NO GO

STEP 15: **ACTION:** Increase radio output level at both master and slave LOS V3s.
RESULTS: Radios at maximum output power level should receive signal strength in the 9-12 bar range. If radios receive 15 bars return to low power.
GO/NO GO

STEP 16: **ACTION:** Initiate loopback test (6-4-6) at both LOS V3s.
RESULTS: Radio front panel should display status E5 or E6.
GO/NO GO

STEP 17. **ACTION:** Request distant LOS to initiate loop 5 loopback test (6-5-6) and return to (6-4-6) after radio displays results.
RESULTS: Radio front panel should display status E5 or E6.
GO/NO GO

STEP 18: **ACTION:** Initiate loop 5 loopback test (6-5-6) and return to (6-4-6) after radio displays results.
RESULTS: Radio front panel should display status E5 or E6.
GO/NO GO

STEP 19: **ACTION:** Return both radios to normal through (DATA) and master tells distant end to initiate loop 5 test (6-5-6).
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 20: **ACTION:** Distant radio returns to normal through (DATA) and master initiates loop 5 test (6-5-6).
RESULTS: ** should be displayed on VDT for associated DTG.
GO/NO GO

STEP 21: **ACTION:** All loopbacks should be removed and the NCs should be able to initialize the link.
RESULTS: A quality link with an R6 report of -6 in the range of 90-100 percent.
GO/NO GO

* Do not perform this test if there are other DTGs in use on this MDTG.

** After operator initiates LPBK, results should be:
SEN/RAU DTG/TGC -
"**DTG/TGM nn STATUS 13**"
INTERNODAL DTG/TGC -
"**TSB nn STATUS 5 TGC mmm"**
If no status's are received attempt to **"force a status"** by restarting the TED.

*** If loopback fails the operator must change the demodulate mileage via ADT command to double cable length "**from 1/4 to 1/2**" to get good results. Do not forget to change this setting back to 1/4 after test is completed.

SECTION II j. I. COMMUNICATIONS MODEM TIMING AND BITE SETTINGS

1. The tables provided below describe the different CM settings for each assemblage and mode of operation.

2. The TIMBT- 2 or BITE - 2 Thumbwheel, Test Select Switch, Timing Switch, Mode Switch, and CCA population each contribute to determine the capabilities and function of the CM.

3. The Test Select Switch, Timing Switch and Mode Switch labels are deceiving; they have no intuitive functional implications. For example, placing the Test Select Switch in LS LPBK does not result in a loopback within the CM, nor does it require or assume the line side be in loopback; this Test Select Switch position can be used operationally as can OPER. These switches effect CM functionality <u>only</u> as described by these tables.

4. The only means to initiate a loopback within the CM is via the GM Cable Length Thumbwheel (position 5).

LOS (V) 1/2/3/4 - Recommended CM Settings

Configuration	**Timing**		
	Slave (From)		**Master**
Cable - UHF	OAN (Cable)	ONN (UHF)	EAN
SHF - UHF	See Note		
Cable - SHF	OAN (Cable)	ONN (SHF)	EAN

NOTE: The CM cannot be used in this configuration. Settings and Fault Display is irrelevant.

CM Timing and BITE

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
LOS (V) 1, RT-LOS (V) 1, RT-LOS (V) 2 TIMBT - 2 Thumbwheel: 1 Card Set: -11 Functions: DVOW & GM	OPER	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM			
		ALT	ALT	EOW 3	GM
	ES LPBK	NORM	NORM	GMRCLK	
		ALT			
		NORM		Master	
		ALT	ALT		GM
	LS LPBK	NORM	NORM	TED BLACK	
		ALT			
		NORM			
		ALT	ALT	MASTER	
	DVOW	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM			
		ALT	ALT	EOW 3	GM
	BRIDGE	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM			
		ALT	ALT	EOW 3	
LOS (V) 3, NC (OPS) LEN (OPS) TIMBT - 2 Thumbwheel: 1 Card Set: -12 Functions: DVOW	OPER	NORM	NORM	EOW 4	
		ALT		EOW 5	
		NORM			
		ALT	ALT	GRP CLK	
	ES LPBK	NORM	NORM		
		ALT			
		NORM			
		ALT	ALT		
	LS LPBK	NORM	NORM	Master	
		ALT			
		NORM			
		ALT	ALT		
	DVOW	NORM	NORM	EOW 4	
		ALT		EOW 5	
		NORM			
		ALT	ALT	GRP CLK	
	BRIDGE	NORM	NORM	EOW 4	
		ALT		EOW 5	
		NORM			
		ALT	ALT	GRP CLK	

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
		NORM	NORM		
	OPER	ALT			
		NORM		TED RED	
LOS (V) 2		ALT	ALT		
		NORM	NORM		
	ES LPBK	ALT			
		NORM			
		ALT	ALT		
BITE - 2		NORM	NORM	Master	
Thumbwheel: 4	LS LPBK	ALT			
		NORM			
		ALT	ALT		
Card Set: -14		NORM	NORM		
	DVOW	ALT			
		NORM			
		ALT	ALT		Mux
Functions:		NORM	NORM	TED RED	
DVOW &	BRIDGE	ALT			
Mux (2 LTUs)		NORM			
		ALT	ALT		

				GM	1
Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
		NORM	NORM	TED Black	
	OPER	ALT		GMRCLK	
		NORM		EOW 5	
LOS (V) 4,		ALT	ALT	EOW 6	GM
RT-LOS (V) 1,		NORM	NORM	GMRCLK	
	ES LPBK	ALT			
		NORM		Master	
		ALT	ALT		GM
TIMBT - 2		NORM	NORM	TED Black	
Thumbwheel: 3	LS LPBK	ALT			
		NORM		Master	
		ALT	ALT		
Card Set: -13		NORM	NORM	TED Black	
	DVOW	ALT		GMRCLK	
		NORM		EOW 5	
		ALT	ALT	EOW 6	GM
Functions:		NORM	NORM	TED Black	
DVOW &	BRIDGE	ALT		GMRCLK	
GM 1 & 2		NORM		EOW 5	
		ALT	ALT	EOW 6	

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
				GM	2
LOS (V) 4, RT-LOS (V) 1, TIMBT - 2 Thumbwheel: 3 Card Set: -13 Functions: DVOW & GM 1 & 2	OPER	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM	ALT	Master	GM
		ALT			
	ES LPBK	NORM	NORM	GMRCLK	
		ALT		Master	
		NORM	ALT		GM
		ALT			
	LS LPBK	NORM	NORM	TED Black	
		ALT			
		NORM	ALT	Master	GM
		ALT			
	DVOW	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM	ALT	Master	
		ALT			
	BRIDGE	NORM	NORM	TED Black	
		ALT		GMRCLK	
		NORM	ALT	Master	
		ALT			

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
SEN (V) 1, SEN (V) 2	OPER	NORM	NORM	GMRCLK	
		ALT			
		NORM	ALT	TED RED	GM
		ALT			
	ES LPBK	NORM	NORM	Master	
		ALT			
		NORM	ALT		GM
		ALT			
BITE - 2 Thumbwheel: 7	LS LPBK	NORM	NORM		
		ALT			
		NORM	ALT		GM
		ALT			
Card Set: -17	DVOW	NORM	NORM	GMRCLK	GM & Mux
		ALT			
		NORM	ALT	TED RED	
		ALT			
Functions: DVOW & GM, & Mux (4 LTUs)	BRIDGE	NORM	NORM	GMRCLK	
		ALT			
		NORM	ALT	TED RED	
		ALT			
RAU, DES	OPER	NORM	NORM	GMRCLK	
		ALT			
		NORM	ALT		
		ALT			
	ES LPBK	NORM	NORM	MASTER	
		ALT			
		NORM	ALT		
		ALT			
BITE - 2 Thumbwheel: 6	LS LPBK	NORM	NORM		
		ALT			
		NORM	ALT		
		ALT			
Card Set: -16	DVOW	NORM	NORM	GMRCLK	GM & Mux
		ALT			
		NORM	ALT		
		ALT			
Functions: DVOW & GM, & Mux (3 LTUs)	BRIDGE	NORM	NORM		
		ALT			
		NORM	ALT		
		ALT			

SECTION II j. I. LOOPBACKS FOR NC SWITCH TO LOS V2 (NAI) USING LOS, SINGLE DTG FAULT ONLY

STEP 1
DTG P/P LOOPBACK: At LOS (V)3 patch panel (Digital transmission group row--for faulted DTG), patch RCV to XMT, and patch receive CLK to transmit CLK
TEST: AOD-29 (option 2) from NC
ACTIONS: If test passes (STATUS 13), remove patch and continue. If test fails, fault is isolated to either DTG within NC or MUX/DEMUX at LOS (V)3; troubleshoot DTG at NC, and then wait for a period of low traffic before troubleshooting MUX/DEMUX at LOS (V)3. (This test is performed as part of TGM/DTG fault isolation).

STEP 2
6-1-6 LOOPBACK: At LOS (V)3 GRC-226 radio, for faulted DTG, activate 6-1-6 loopback.
TEST: AOD-29 (option 2) from NC
ACTIONS: If test passes, deactivate 6-1-6 and continue. If test fails, fault is within LOS (V)3 at either GRC-226 radio (baseband unit), patch panel, or interconnecting wires; deactivate 6-1-6 and perform LOS (V)3 troubleshooting.

STEP 3
6-2-6 LOOPBACK: At LOS (V)3 GRC-226 radio for faulted DTG, activate 6-2-6 loopback.
TEST: AOD-29 (option 2) from NCS
ACTIONS: If test passes, deactivate 6-2-6 and continue. If test fails, fault is within LOS (V)3 at GRC-226 radio, either unit or interconnecting cables. Deactivate 6-2-6 and perform LOS (V)3 troubleshooting at LOS (V)3.

STEP 4
6-3-6 LOOPBACK: At LOS (V)3 GRC-226 radio, for faulted DTG, activate 6-3-6
TEST: GRC-226 radio loop 3 test (initiated at LOS (V)3)
ACTIONS: If test passes (L3), deactivate 6-3-6 and continue. If test fails (L3F), a secondary fault exists in GRC-226 radio (pattern generator or pattern error detector); deactivate 6-3-6 and continue; but do not use GRC-226 radio loop tests (initiated at LOS (V)3) during subsequent steps. (Repair secondary fault in GRC-226 radio after link fault is corrected, and when traffic conditions permit).

STEP 5
6-5-6 LOOPBACK: At LOS (V)4 GRC-226 radio, (for faulted DTG) activate 6-5-6 loopback.
TEST: LOS (V)3 initiate 6-4-6
ACTIONS: If test passes (L4E6), deactivate 6-4-6 and continue. If test fails (L4EF), fault is in UHF radio sublink between LOS (V)3 and LOS (V)4. Deactivate loops and reinstall UHF sublink IAW Table 5-14.

TEST: Master NCS initiate AOD 29

ACTIONS: If test passes (STATUS 13), deactivate built-in loop(s) and continue. If test fails, fault is in UHF radio sublink between LOS (V)3 and LOS (V)4. Deactivate loops and reinstall UHF sublink IAW Table 5-14.

STEP 6

RF P/P LOOPBACK: At LOS (V)2 patch panel, (LOS row), patch XMT to RCV and patch transmit CLK to receive CLK

TEST: AOD-29 (option 2) from NC

ACTIONS: If test passes, remove patches and continue. If test fails, fault is in LOS (V)2 (at GRC-226 radio, at patch panel, or in interconnecting wires); remove patches and perform LOS (V)2 troubleshooting.

STEP 7

LGM LOOPBACK: At LOS (V)2 patch panel, (LGM CHANNELS row), patch each transmit jack to adjacent receive jack (eight patches -- all at once)

TEST: AOD-29 (option 2) from NC

ACTIONS: If test passes, fault is isolated to NAI unit or cable, LOS (V)2 signal entry panel, LOS (V)2 patch panel, or interconnecting wires and cables; remove patches and perform LOS (V)2 and NAI troubleshooting. If test fails, fault is in LOS (V)2 (at loop group modem, at KG-194A, at patch panel, or in interconnecting wires); remove patches and perform LOS (V)2 troubleshooting.

SECTION II k. UHF LOS SUBLINK TROUBLESHOOTING

1. Establish analog communications using EOW.

2. Controlling LOS ensures that the link has no interference by accomplishing the following:

a. Disable transmitter power on both radios by entering 404 on their respective front panel keypads.

b. Observe received signal strength bar readout on front panel display of both radios by entering R9 on keypad. Any level above 1 bar is considered interference.

c. If bar readout on front panel of either radio is more than 5, request a new frequency from SYSCON and repeat procedure from step b.

d. If bar readout on front panel of both radios is less than 6, record the number of bars. Power up both transmitters by entering 424 (high power) or 414 (low power) on their front panel keypads.

2. Controlling LOS ensures that the link has achieved a maximum BER by accomplishing the following:

a. Local UHF Radio Set: Select EOW + tone (0-6-0). Check that tone is heard and that display shows adequate number of bars (1.g.).

b. Distant UHF Radio Set: Ask operator to check display for adequate received signal strength (bars above threshold noise recorded in 1.d.).

DATA RATE = 256 kbps (10) bars above threshold noise
= 512 kbps (11) bars above threshold noise
= 1024 kbps (11) bars above threshold noise

If inadequate, realign antenna subassembly. If realignment does not increase the received signal strength verify grid location of mast. Relocate if not. If mast is located at same grid, request SYSCON analyze profile using AFES, SCC-2, and Map Profiling.

c. Local UHF Radio Set: Cancel EOW + tone by pressing any key on keypad. Ask distant UHF radio set operator to transmit EOW + tone (0-6-0).

d. Local UHF Radio Set: Ask distant operator to initiate 6-5-6 loopback.

e. Local UHF Radio Set: Select 6-4-6 test. Check display. It should read L4Ey, where y is at least 5. If BER is inadequate, realign antenna subassembly. If realignment does not increase

BER verify grid location of mast. Relocate if not. If mast is located at same grid, request SYSCON analyze profile using AFES, SCC-2, and Map Profiling.

f. Distant UHF Radio Set: Operator should report that display indicates L4Ey, where y is at least 5.

g. Local UHF Radio Set: Press any key to cancel 6-4-6. Ask distant UHF radio set to initiate 6-4-6. Initiate 6-5-6.

h. Distant UHF Radio Set: Ask operator to check display. It should read L4Ey, where y is at least 5. If BER is inadequate, realign antenna subassembly. If realignment does not increase BER verify grid location of mast. Relocate if not. If mast is located at same grid, request SYSCON analyze profile using AFES, SCC-2, and Map Profiling.

i. Local UHF Radio Set: Display should indicate L4Ey, where y is at least 5.

3. Both operators shift to data mode and attempt voice communications utilizing the correct data configuration.

SECTION II l. SHF TACSAT LINK TROUBLESHOOTING

1. Functional Description (See Tac-Sat Loopback Tests)

a. The Conditioned Diphase DTG and/or multiplexed ATACS groups are super grouped by the TD-1337(V) Tactical Satellite Signal Processor (TSSP). This super group includes the satellite orderwire channels and other overhead required by the system.

b. The super group from the TSSP is connected to the MD-945/TSC Digital Data Modem. In the transmit direction, the modem encodes and modulates the super group and sends it as an IF signal to the upconverter where it is changed to the selected uplink frequency. The power amplifier then amplifies the signal to the required output level and transmits it through the antenna as the uplink RF signal.

c. In the receive direction, the downlink RF signal is received by the antenna, amplified by the low noise amplifier (LNA), and changed to an IF signal by the down converter. The digital data modem then demodulates and decodes the super group and provides it to the TSSP.

2. Timing functional description.

All timing in the satellite terminal must be synchronized to a single timing source. There are three timing source options in the AN/TSC-93/85.

a. CNCE Timing: When the AN/TSC-85A is directly connected to a MSE Node Center(NC) or LEN, this option synchronizes the TSSP to the timing standard of the NC or LEN.

b. Master: This option causes the TSSP to operate from an internally generated standard. Ordinarily this option will not be used when interfacing TACSAT with MSE.

c. Slave: This option causes the TSSP to be synchronized to a remote TSSP that is slaving timing from an external source such as a NC or LEN. This timing option is required at the TACSAT when it is connected to a SEN or RAU.

STEP 1

GM P/P LOOPBACK: At NC switching shelter patch panel, large DTG jacks, GM row for faulted DTG, patch receive to transmit. At NC operations shelter, change demodulator cable length to zero using ADT command

TEST: AOD-29 (option 2) from NC

ACTIONS: If test passes (DTG nn STATUS 13), remove patch, restore demodulator cable to original length using ADT command, and continue. If test fails, fault is isolated to the DTG within the NC; troubleshoot the DTG at the NC. (This test is performed as part of TGM/DTG (or group modem) fault isolation).

STEP 2

TSSP LOOPBACK: Program DEMUX loopback option for DTG on TSSP
TEST: AOD-29 (option 2) from NC
ACTIONS: If test passes, remove loopback option on TSSP and continue. If test fails, troubleshoot cable sublink, baseband equipment, continuity, and TSSP programming.

STEP 3
DISTANT TERMINAL LOOPBACK: Distant terminal programs TSSP for master or slave timing. Distant terminal places PCM pigtail on SEP connector. Local terminal must be in either external or master timing.
TEST: AOD-29 (option 2) from NC
ACTIONS: If test passes, remove loopback and continue. If test fails, troubleshoot satellite communication link.

STEP 4
DISTANT PCM CABLE LOOPBACK: Disconnect CX-11230/G from subordinate assemblage. Connect pigtail to CX-11230/G.
TEST: AOD-29 (option 2) from NC
ACTIONS: If test passes, fault exists in subordinate assemblage. If test fails, replace CX-11230/G and repeat loopback.

SECTION II m. AMD/BER LINK TESTING USING CSOLOP

1. This is an invaluable trouble shooting aid that can be used in place of the SG-1139. Typical use is limited to the Last Error Report Received (PTDSEC) and the Last Ten Reports Received (GDEC). The AMD locations are given in the order of the most often used.

2. This data pertains to CSOLOP releases RD281939, all earlier versions of this information should be purged. The preferred table to use for troubleshooting is the "Last Ten Reports Received".

3. This data is only valid for DTGs that maintain synchronization (i.e. STATUS 13, but STATUS 5 and STATUS 44 reports are OK too.) While a DTG is out-of-sync (OOSync), no BER data is reported to CSOLOP by the TGMOW. When a DTG regains sync it will again immediately begin to collect BER data, and will report only if sync is maintained for the duration of its reporting interval (50 seconds for DTGs, 25 seconds for MDTGs). If a DTG cannot maintain synchronization, the effective BER is below 10^{-3}. OOSync conditions or Out of Service DTGs are processed at the highest possible BER, "FF" (2×10^{-3}).

LAST ERROR REPORT RECEIVED

PTDSEC maintains the last BER report received from each TGMOW. If a DTG has lost sync (check the TTY log) within the last interval (50 seconds for DTGs, 25 seconds for MDTGs), this data is invalid.

PTDSEC	0ECFE4	range: 0-255 (FF)
		bits 8-15 (--XX)
		30 entries (one/DTG)

LAST TEN REPORTS RECEIVED

GDEC contains the last ten reports used to calculate the R6 report. It's also used to determine whether to print the STATUS 5 or STATUS 44 messages. If a DTG has lost sync (check the TTY log) within the last 10 periodic reporting intervals (roughly 10 minutes for DTGs, 5 minutes for MDTGs), this data is invalid.

GDEC 00FC92	range: 0-255 (FF)
	bits 0-7 (XX--) & bits 8-15 (--XX)
	10 reports / entry
	5 halfwords (16 bits) / entry
	30 entries (one/DTG)

4. To read these reports you must understand a little about how things are numbered. When looking at an AMD screen, it is arranged in 8 columns by 9 rows of 4 character sets. (See example below).

ASSIGN MEMORY DISPLAY (AMD)

M_ ACTION (A=ADD CHANGE,M=RETRIEVE DATA FOR DISPLAY)
H_ IF A(H=HALF,F=FULL)/IF M(H=HEX,I=INSTRUCTION,T=TERM ADDR.)
00FC92_ PHYSICAL HEX ADDRESS(5 CHAR) OR TERM ADDR
_____ HEX VALUE (FOR ADD ONLY)
___ INCREMENTAL VALUE FOR NEXT KEY (BLANK=0)

Reports	1 2	3 4	5 6	7 8	9 10		
00FC92	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_
	0000_	0000_	0000_	0000_	0000_	0000_	0000_

____ ASSIGNMENT CODE STATUS:

BER RELATED TABLE ADDRESSES

00	no errors	3-	5 x 10 -4
01	10 -5	4-	6 x 10 -4
02	2 x 10 -5	5-	8 x 10 -4
03	3 x 10 -5	6-	10 -3
04	4 x 10 -5	7-	10 -3
05	5 x 10 -5	8-	10 -3
06	6 x 10 -5	9-	10 -3
07	7 x 10 -5	A-	2 X 10 -3
08	8 X 10 -5	B-	2 X 10 -3
09	9 X 10 -5	C-	2 X 10 -3
0A	10 -4	D-	2 X 10 -3
1-	2 X 10 -4	E-	2 X 10 -3
2-	3 X 10 -4	F-	2 X 10 -3

APPROXIMATE BER

DTG	LAST TEN
	REPORTS RCV’D
	BTERRS
1	00FC92
2	00FC97
3	00FC9C
4	00FCA1
5	00FCA6
6	00FCAB
7	00FCB0
8	00FCB5
9	00FCBA
16	00FCDC
17	00FCE1
18	00FCE6
19	00FCEB
21	00FCF5
22	00FCFA
23	00FCFF
25	00FD09
26	00FD0D
27	00FD12
28	00FD17

SECTION III. DNVT/DSVT Troubleshooting

1. DVNT (TA-1035/U, TA-954):

SYMPTOM: No Power

a. Check WF-16 connection and data connection at DNVT. Ensure both (as applicable) are secure. WF-16 must be connected properly, green to XMT and brown to RCV binding posts.

b. Check WF16 for cuts or exposed wire all along its length to the J-1077. Repair or replace the wire as necessary.

c. Check connection at the J-1077; ensure the wireline is in the correct quad, with green in the top pair, brown in the bottom.

SYMPTOM: Cannot Affiliate

a. If WF-16 checks out good and connections are secure and properly made and the subscriber still cannot affiliate, report to the switch operator; get verification of directory number, personal code, and current status in the switch. The number should be in the pre-affiliated state. The switch operator will correct the problem if the number has been blacklisted or has not been loaded into the system yet.

e. Note: The switch operator must receive permission from Bde SYSCON (557-0150) before loading any subscriber numbers or changing a subscriber profile.

2. DSVT (KY-68):

a. SYMPTOM: Continuous ringing tone.

This is caused by a lack of key in one or more of the registers. Hang the handset up and set the DSVT function switch to DSBL. Press and hold the DSVT selector switch to the zero position and release. Reload the DSVT following the procedures in Volume 1, Chapter 2.

NOTE: Be careful not to load while the KYK-13 is in the OFF position. As soon as you turn the KYK-13 to ON it will initiate and a beep will be heard. If this occurs, follow the reload procedures.

b. SYMPTOM: Failure to affiliate.

Verify the number (including personal code) and attempt affiliation again. If you still receive error tone but cannot affiliate, dial zero and report the problem to the switch operator. He will verify the status of your number in the system (should be pre-affiliated).

c. SYMPTOM: Failure to affiliate - no error tone.

Check cable connections. Switch pairs at J-1077 if necessary.

d. SYMPTOM: Affiliated, but when calling another number you hear several popping sounds and then disconnect.

The problem is probably mismatch between the M or U key in the DSVT and the M and U keys held by the NC/LEN; reload your M and U keys. If this does not rectify the problem verify with the NC/LEN that you hold the correct Corps M key and U key per your profile. Or the problem could be the DSVT was taken off-hook before the X key was downloaded and SEN rekey tables updated. The subscriber must wait at least 60 seconds, or until the non-secure warning and ring busy lights cycle and stop flashing, before going off-hook. This indicates that the X key has been downloaded to the DSVT by the NC/LEN.

e. SYMPTOM: Affiliated, but during first call attempt the phone "dies". You are unable to call anyone else.

The problem is probably a bad M key; reload and attempt another call. If the problem still exists, call the Bde SYSCON at 5570150.

f. SYMPTOM: DSVT is "dead".

If connected to a NCS, it is probably marked out of service. Or no sync attempt, no drop-off may indicate U key mismatch. Contact NCS operator.

g. NC/LEN may receive error messages under the following circumstances:

- Wrong U key in LDU of DSVT:

COMMAND 42 FAILED, KGX 93 xx KG 82 nn FAILED TO SYNC WITH xx-yy D RCVR n.
Where xx = KGX-93 used for call;
nn = KG-82 used for call;
xx-yy = terminal address of wireline DSVT or
SEN/RAU trunk.

- Wrong M key in LDX of a DSVT/MSRT:

KG 82 nn FAILED TO SYNC WITH D RCVR n.
REKEY TERMINATED: zz, LNXXXXX, yy.
Where nn = KG-82 used for the call;
zz = HUS location;
LNxxxxx = DSVT directory number
yy = TGC # of RAU.

- Wrong M key in LDX of a wireline DSVT:

KG 82 nn FAILED TO SYNC WITH xx-xx D RCVR yy.
xx OUT OF SERVICE 3.

Where nn = KG-82 used for call;
yy = Digital Receiver used for call;
xx-xx = Terminal address of DSVT terminal.

- M key of DSVT fails to sync with the NC/LEN:

TERMINAL ADDRESS xx-xx MARKED OUT OF SERVICE.

For a wireline DSVT, NC/LEN operator should contact SEN operator and mark terminal address back in service. See h (I) below.

For an MSRT, check user's command post in phone book and inform SEN or BSO.

h. SEN OPERATOR ACTIONS:

(1) For a SEN operator to mark a terminal address of a DSVT back in service the operator must delete the re-key identifier associated with locked out DSVTs. The easiest solution is to delete the problem directory number at the SEN, which will also delete the re-key ID, using the command I + 26 + DN + R, where DN = 7-digit directory number.

(2) The command P + 22 + R deletes all re-key IDs in the SEN.

(3) Check the DSVT - it must be in mode 2 in order to make local calls. If the DSVT is in mode 1, DSVT to DSVT calls within the same SEN cannot be made. The indicator for mode 1 or mode 2 is found on the top left corner of the DSVT. If the mode block is checked off, contact your COMSEC maintenance support. COMSEC maintenance personnel are the only personnel authorized to make modifications to the DSVT.

i. MSRT CRYPTO-ALARM:

(1) MSRT LOADED WITH A WRONG M VARIABLE:

- MSRT starts scanning.
- MSRT captures first RAU marker and experiences key mismatch.
- MSRT makes four attempts to sync its Modular COMSEC unit (MCU) with the RAU.

(2) First warning:

- MSRT front panel crypto-alarm light (yellow) and affiliation light start blinking.
- MSRT continues to scan, trying to capture another RAU marker.

(3) MSRT is not yet in Crypto-Alarm:

- If the MSRT MCU succeeds in synching with another RAU, crypto-alarm disappears.
- When MSRT fails to affiliate with four RAU markers (after four attempts each), the RT-1539 MCU is locked in crypto-alarm due to wrong M key.

(4) MSRT user action:

- Turn RT-1539 power switch OFF.
- Wait 30 seconds, and turn RT-1539 back ON.
- Load M key again.
- Affiliate from DSVT: 8 + R + PC + DN.

(5) If same problem occurs again:

- Request to be issued a new key set.
- Load M key into RT-1539.
- Load U key in LDU and M key in LDX of DSVT.

j. RAU CRYPTO ALARM:

(1) RAU RT-1539s have the same crypto alarm feature as MSRT RT-1539s.

(2) RAU RT-1539s fail in crypto-alarm after 16 consecutive key mismatches with 16 MSRTs.

(3) This crypto alarm is inhibited after 10 minutes when RAU operator changes the M key in all his radios. This gives the COMSEC Manager time to re-key the MSRT network.

SECTION IV. RAU Troubleshooting

1. In addition to the fault indications in the TM, perform the following steps as necessary to troubleshoot the RAU.

a. Check all cable connections and loopback the CX-11230 cable with the loopback plug kept in the van.

b. Loopbacks fail. If the GM/LGM has loss of input on summary alarms, reseat the cards and initiate a BIT test.

c. GLU is in alarm. Verify that the correct GLU directory number and terminal type are in the proper state in the NC/LEN database. If so contact the NMF for electronic maintenance support.

d. GLU will not affiliate. Verify that the GLU number and not the DSVT number was affiliated. Verify that the profile is 238 (GLU) at the NC/LEN. Ensure that the number is preaffiliated in the switch database. If the NC made a database change for your link, request they verify the assignment and terminal type of all the RAU trunks.

e. RT 1539 (s) go into crypto alarm after jumps or when power is lost to the shelter. Perform battery test. If radio battery loses power, crypto variable is lost.

NOTE: Batteries are changed every six months during the semiannual service and noted on the DD 314. VINSON batteries look somewhat like MSRT batteries but are NOT the same - don't use them. The RT-1539 battery is the same as for SINGARS.

f. DSVT is out of service or does not return dial tone. Zero COMSEC, reload and reaffiliate. Contact the NC and have the DSVT put back in service (if required). Affiliate and wait on-hook about 30 seconds after the first affiliation attempt to allow download of the X key (ring busy light will flash briefly on DSVT). Go off hook, you should hear dial tone. If not, check with the NCS to see if the DSVT is marked out of service. Verify that the correct DSVT (not GLU) number was used in the affiliation attempt. Verify the DSVT terminal type.

RAU, OPERATIONAL TEST SHEET

The following checks are intended to be used as a comprehensive checksheet for testing RAU operation and serviceability.

The test is broken into two phases. Phase 1 being basic checks which can be accomplished without the use of a Node Center to provide network access. These steps can be accomplished by setting the RAU in a stand-alone configuration. AC pwr is required, therefore use of a generator or a commercial hook-up. Antenna erection should be planned if you intend on continuing to phases 2.

Phase 2 incorporates the RAU with an on-line Node Center in order to check complete functionality of all aspects of the RAU. It is recommended to test 2 RAU's at a time to alleviate having to use an MSRT. One RAU can be placed in MSRT mode while the other RAU is operational and vice versa.

Team Label: _____ Company: ______ Bumper #: _____ Date: ______

PHASE 1 (Stand alone)

1. DC power checks

_____ a. fire up shelter using DC pwr
_____ b. check all meters
_____ c. check blackout bypass
_____ d. ensure all DC powered equipment works
Remarks:____

2. AC power checks

_____a. fire up shelter using AC pwr,
_____b. check all meters
_____c. check battery charger voltage
_____d. check equalizer charge (+28.5 volts DC)
_____ Float (+26.6 volts DC)
_____ Reduced voltage (+25.5 volts DC)
_____e. ensure all AC powered equipment works
Remarks:____

3. Power Bay Lamps

_____a. Audible alarm
_____b. Equalizing Charge
_____c. Regulator Charge On
_____d. Blackout Bypass
_____e. Battery Exhaust Fault
_____f. Battery On Bus
_____g. Emergency Power
_____h. DC On/Off

The following section contains visual checks. Physically check for broken or damaged connectors/cables.

4. RT-1539's

Radio 1 Serial Number:___________

_____a. E-4 Ground
_____b. W006-Antenna
_____c. W005-RAU-REC
_____d. W060-Telephone

______e. +24 volt-Power
______f. W024-GLU
______g. Battery Test (New Lithium)

Radio 2 Serial Number:____________
______a. E-4 Ground
______b. W006-Antenna
______c. W005-RAU-REC
______d. W060-Telephone
______e. +24 volt-Power
______f. W024-GLU
______g. Battery Test (New Lithium)

Radio 3 Serial Number:____________
______a. E-4 Ground
______b. W006-Antenna
______c. W005-RAU-REC
______d. W060-Telephone
______e. +24 volt-Power
______f. W024-GLU
______g. Battery Test (New Lithium)

Radio 4 Serial Number:____________
______a. E-4 Ground
______b. W006-Antenna
______c. W005-RAU-REC
______d. W060-Telephone
______e. +24 volt-Power
______f. W024-GLU
______g. Battery Test (New Lithium)

Radio 5 Serial Number:____________
______a. E-4 Ground
______b. W006-Antenna
______c. W005-RAU-REC
______d. W060-Telephone
______e. +24 volt-Power
______f. W024-GLU
______g. Battery Test (New Lithium)

Radio 6 Serial Number:____________
______a. E-4 Ground
______b. W006-Antenna
______c. W005-RAU-REC
______d. W060-Telephone

_____e. +24 volt-Power
_____f. W024-GLU
_____g. Battery Test (New Lithium)

Radio 7 Serial Number:___________
_____a. E-4 Ground
_____b. W006-Antenna
_____c. W005-RAU-REC
_____d. W060-Telephone
_____e. +24 volt-Power
_____f. W024-GLU
_____g. Battery Test (New Lithium)

Radio 8 Serial Number:___________
_____a. E-4 Ground
_____b. W006-Antenna
_____c. W005-RAU-REC
_____d. W060-Telephone
_____e. +24 volt-Power
_____f. W024-GLU
_____g. Battery Test (New Lithium)

5. GLU Serial Number:___________

Cables:

_____a. J-1	_____h. J-8
_____b. J-2	_____i. J-9
_____c. J-3	_____j. J-10
_____d. J-4	_____k. J-11
_____e. J-5	_____l. J-12
_____f. J-6	_____m. J-13
_____g. J-7	_____n. E-11
	_____o. Battery test (New Lithium)

6. RF Multicoupler

Cables:

_____a. J-1 W021	_____k. J-11 W006
_____b. J-2 W005	_____l. J-12 W008
_____c. J-3 W007	_____m. J-13 W010
_____d. J-4 W009	_____n. J-14 W012
_____e. J-5 W011	_____o. J-15 W014
_____f. J-6 W013	_____p. J-16 W016
_____g. J-7 W015	_____q. J-17 W018
_____h. J-8 W017	_____r. J-18 W020
_____i. J-9 W019	_____s. J-19 W003

_____j. J-10 W002

7. SEP

Inside

_____a. Filter/Antenna/Connector
_____b. HVA-10
_____c. HVA-Frequency Download Connector
_____d. Ground Lug

Outside

_____a. Antenna Connector
_____b. HVA-10 (CX-11230)
_____c. Frequency Download Connector
_____d. Ground Lug

PHASE 2 (In System)

* indicates using 2 RAU's during in-system checks

_____a. Affiliate GLU
_____b. Ensure GLU will hold Freq. Plan (test battery)
_____c. Affiliate DSVT
_____d. Ensure DSVT will hold fill (test battery)
_____e. Install TED (Do not bypass)
_____f. Ensure TED holds fill (test battery)
_____g. Test all RT-1539 batteries (test batteries)
_____h. Place call over Orderwire

Perform an in-system Bit test from each RT-1539. This test sends a codeword to the Node Center which ensures the trunk to that RT-1539
is in service. If the RT-1539 goes into alarm the trunk is out-of-service. NC must be informed and the RT-1539 must be turned off
and back on to reset.

i. Bit test each RT-1539

_____ Radio 1
_____ Radio 2
_____ Radio 3
_____ Radio 4
_____ Radio 5
_____ Radio 6
_____ Radio 7
_____ Radio 8

j. Turn off all but tested radio and have 2d RAU place call while in MSRT mode (rec also) Use MSRT if not using 2 RAU's

______ Radio 1
______ Radio 2
______ Radio 3
______ Radio 4
______ Radio 5
______ Radio 6
______ Radio 7
______ Radio 8

k. Test each RT-1539's output wattage using dummyload and watt-meter. (Procedures will be trained to ELM by GTE personnel)

______ Radio 1
______ Radio 2
______ Radio 3
______ Radio 4
______ Radio 5
______ Radio 6
______ Radio 7
______ Radio 8

COMSEC COMMAND FAILURES
AND POSSIBLE SOLUTIONS

SUBSCRIBER CALL ATTEMPTS

ERROR: **LKG ## FAILED TO SYNC WITH bs-la, D RCVR nn**
bs-la OUT OF SERVICE e

Problem: An LKG (##) has failed to achieve initial synchronization with an unit at the terminal address (bs-la), using a digital receiver (nn). This is caused by a mismatch in key between the unit denoted by the terminal address and the parent switch COMSEC.

If the terminal address is associated with a local DSVT, the DSVT must be marked back in service using AEI or ATS--that is the only time the 'bs-la OUT OF SERVICE e' message will be printed following the LKG Fail to Sync message. NOTE: If the digital receiver denoted is 0, the DSVT involved in the command failure is the Called party of the call attempt.

If the terminal address is associated with a trunk type, determine what type it is (via ATS).

Resolution: The key loaded in the LD X position of the DSVT is different from what is at the parent switch-the terminal must be re-loaded with the proper re-entry key.

ERROR: COMSEC COMMAND 20 FAILED; AKDC STATUS ss, LKG ## STATUS zz

Problem: The Calling DSVT, utilizing an LKG (##) has failed to receive dial tone after going off-hook. The terminal has the correct net key in the LD X position, however, due to the key mismatch with the parent switch COMSEC, dial tone cannot be received. The statuses denoted inform the operator of the equipment state, which are usually ss=08 and zz=2l for the AKDC and LKG, respectively, in this case. The only way to gain access into the network (parent switch operator, only) is for the subscriber to utilize Emergency Access.

Resolution: The key loaded in the LD U position of the DSVT is different from what is at the parent switch --the terminal must be re-loaded with the proper unique key.

ERROR: COMSEC COMMAND 40 FAILED; AKDC STATUS ss, LKG ## STATUS zz

Problem: The Called DSVT, utilizing an LKG (##) has failed to go to traffic after going off-hook. The terminal has the correct net key in the LD X position, however, due to the key mismatch with the parent switch COMSEC, the traffic state cannot be achieved. The statuses denoted inform the operator of the equipment state, which are usually ss=08 and zz=2l for the AKDC and LKG, respectively, in this case. The only way to gain access into the network (parent switch operator, only) is for the subscriber to utilize Emergency Access.

Resolution: The key loaded in the LD U position of the DSVT is different from what is at the parent switch--the terminal must be re-loaded with the proper unique key.

ERROR COMSEC COMMAND 42 FAILED; AKDC STATUS ss, LKG ## STATUS zz

Problem: The Calling DSVT, utilizing an LKG (##) has failed to receive dial tone after going off-hook. The terminal has the correct re-entry key in the LD X position, however, due to the key mismatch with the parent switch COMSEC, dial tone cannot be received. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=2l for the AKDC and LKG, respectively, in this case. The only way to gain access into the network (parent switch operator, only) is for the subscriber to utilize Emergency Access.

The Called DSVT, utilizing an LKG (##)has failed to go to traffic after going off-hook. the terminal has the terminal has the correct re-entry key in the LD X position, however, due to the key mismatch with the parent switch COMSEC, the traffic state cannot be achieved. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=2l for the AKDC and LKG, respectively, in this case. The only way to gain access into the network (parent switch operator, only) is for the subscriber to utilize Emergency Access.

Resolution: For each of the above cases, the key loaded in the LD U position of the DSVT is different from what is at the parent switch--the terminal must be re-loaded with the proper unique key.

ERROR: COMSEC COMMAND 31 FAILED; AKDC STATUS ss, LKG ## STATUS zz
LKG ## FAILED TO SYNC WITH bs-la, D RCVR 0 *

Problem: The parent switch of the Called party (DSVT/DNVT) has a key mismatch with the parent switch of the Calling DSVT. The LKG denoted in this call attempt has failed to achieve synchronization with the terminal address (bs-la) specified. This terminal address, when checked via ATS, will identify an interswitch trunk (Line Type 29) that was being used to route the attempted call. No digital receiver is required for this part of the call scenario. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=21 for the AKDC and LKG, respectively, in this case.

Resolution: A COMSEC key mismatch exists between the AKDCs of the origination and destination switches. The ClRK key of each switch should be down-loaded from the PNCS to insure integrity.

ERROR: COMSEC COMMAND 41 FAILED; AKDC STATUS ss, LKG ## STATUS zz
LKG ## FAILED TO SYNC WlTH bs-la, D RCV 0 *

Problem: The parent switch of the Calling DSVT has a key mismatch with the Parent switch of the Called parry (DSVT/DNVT). The LKG denoted in this call attempt has failed to achieve synchronization with the terminal address (bs-la) specified. This terminal address, when checked via ATS, will identify an interswitch trunk (Line Type 29) that was being used to route the attempted call. No digital receiver is required for this part of the call scenario. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=21 for the AKDC and LKG, respectively, in this case.

Resolution: A COMSEC key mismatch exists between the AKDCs of the origination and destination switches. The CIRK key of each switch should be down-loaded from the PNCS to insure integrity.

*NOTE: A COMSEC Command 31 failure may not always be associated with a COMSEC Command 41 failure. The TDIXs and call registers may be released prior to the realization by the destination switch that a COMSEC Command 31 failure was imminent. The origination switch will always alert the operator with a COMSEC Command 41 failure in this case.

ERROR: ACTIVATE INITIATED, LIST #
...
AKDC 1, STATUS ss, CMD 53, LKG O, ERROR 3
ACTIVATE COMPLETE, LIST #

Problem: A list of keys (#) are being transferred from their reserve HUS locations to their active HUS locations, however, one reserve HUS location does not have a key stored in it. The COMSEC command 53 error message will be printed for each attempt to activate a key that is not stored in its reserve HUS location. The Activate operation will continue for the remaining key(s). No LKG is needed for this part of the Activate command because the operations are internal to the AKDC. The status informs the operator of the equipment state, which is usually ss=10 for the AKDC.

Resolution: The operator should verify the key list maintained and ensure that it is correct and identifies reserve HUS locations that contain keys. Proper modifications should be made and key(s) should be transferred, if necessary.

ERROR: BULK TRANSFER # INITIATED, SWITCH XXX

AKDC 1, STATUS ss, CMD 52, LKG O, ERROR 3
BULK TRANSFER # SWITCH XXX STOPPED 3

Problem: The Bulk Transfer that has been initiated (#) at the origination switch has stopped because there is no key in the HUS location that is to be transferred to the destination switch (XXX). No LKG is needed for this part of the bulk transfer because there is no key for the AKDC to obtain. The status informs the operator of the equipment state, which is usually ss=10 for the AKDC.

Resolution: Ensure that the key(s) you have selected for transfer are actually present in the HUS location(s) of the AKDC. If not, either do not specify the HUS location(s) or create the key(s)for the HUS location(s) and re-try the bulk transfer. NOTE: The destination switch will have to authorize receipt of the bulk transfer, again, via ABT.

ERROR BULK TRANSFER n INITIATED, SWITCH XXX

COMSEC COMMAND 41 FAILED; AKDC STATUS ss, LKG ## STATUS zz
BULK TRANSFER n SWITCH XXX STOPPED 3

Problem: The origination switch in a Bulk Transfer (n) has a key mismatch with the destination switch (XXX). The transmitting LKG (##) cannot obtaining synchronization with the receiving LKG and the Bulk Transfer is stopped. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=21 for the AKDC and LKG, respectively, in this case.

Resolution: A COMSEC key mismatch exists between the AKDCs of the origination and destination switches. The BT key of each switch should be down-loaded from the PNCS to insure integrity.

ERROR: BULK TRANSFER n INCOMING, SWITCH XXX

COMSEC COMMAND 31 FAILED; AKDC STATUS ss, LKG ## STATUS zz INCOMING BULK TRANSFER n SWITCH XXX STOPPED *

Problem: The destination switch in a Bulk Transfer (n) has a key mismatch with the origination switch (XXX). The receiving LKG (##) cannot obtain synchronization with the transmitting LKG and the Bulk Transfer is stopped. The statuses inform the operator of the equipment states, which are usually ss=08 and zz=21 for the AKDC and LKG, respectively, in this case.

Resolution: A COMSEC key mismatch exists between the AKDCs of the origination and destination switches. The BT key of each switch should be down-loaded from the PNCS to insure integrity.

*NOTE: A COMSEC Command 31 failure may not always be associated with a COMSEC Command 41 failure. The key transfer (which is a call attempt) may be released prior to the realization by the destination switch that a COMSEC Command 31 failure was imminent. The origination switch will always alert the operator with a COMSEC Command 41 failure in this case.

BULK TRANSFER STOPPED Messages

ERROR: BULK TRANSFER n SWITCH XXX STOPPED e

Problem: A Bulk Transfer from/to a switch could stop for several reasons. There are 9 error codes that could be printed, depending on the type of error, from incomplete Bulk Transfers.

l-- Supervisor requested
2-- LKG reservation failure
3-- Hardware failure (TDMX command, COMSEC)
4-- CIMSA cannot find route
5-- No/improper response to CCS message
6-- Destination switch failure
7-- Three consecutive HUS locations not available
8-- Busy
9-- Bulk Transfer not authorized

Resolution: These are possible explanations for errors encountered that could lead to a successful Bulk Transfer.

l-- Supervisor requested
The supervisor of the origination switch stopped the Bulk Transfer via ABT. The recipient switch must authorize receipt of another Bulk Transfer if the following transfer is to complete.

2-- LKG reservation failure
There are no LKGs available at the switch to process the key transfers. Check LKG memory and the units themselves to make sure they are in service. If in Service, make sure LKGs are not hung in use. If available, make sure no visible faults are present on the LKGs.

3-- Hardware failure
COMSEC equipment is not functioning correctly. Check COMSEC Controller (CC) for faults. If CC is not faulted, check status of AKDC to make sure unit is on-line and processing traffic.

4-- CIMSA cannot find a route
The routing processor of the origination switch cannot find a route to the destination switch. Make sure the links out of the origination switch are initialized. If initialized, make sure the DTGs and TSBs are in synchronization.

5-- No/improper response to CCS message
The key transfer messages are transmitted to the destination switch, however, the wrong or no response is received by the origination switch. Make sure the trunks at the destination switch are not hung in use or out of service. Make sure the correct switch code was input at the origination switch for the destination switch.

6-- Destination switch failure
A Problem at the destination switch has stopped the Bulk Transfer. Re-try the key transfer after problem has been investigated and solved.

7-- Three consecutive HUS locations not available.
The origination switch is attempting to send keys from HUS locations that are empty. The Bulk Transfer now stops if one empty HUS location transfer is attempted with an error code of 3. Therefore, error code 7 should not be seen.

8-- Busy
The destination switch is busy with another Bulk Transfer. The key transfer must be re-tried at a time when no Bulk Transfers are being conducted at the destination switch.

9-- Bulk Transfer not authorized
The destination switch has not authorized receipt of a Bulk Transfer. The Bulk Transfer must be re-tried after the destination switch has authorized receipt.

COMSEC KEYS

KEY	MSE FUNCTION
Z	ENCRYPTS KEYS FOR STORAGE IN AKDC (HGX-83). IS SWITCH UNIQUE, NOT REQUIRED TO BE SAME AT ANY OTHER SWITCH.
CIRK	"COMMON INTERSWITCH RV". THE COMMON KEY USED TO SECURE THE PER CALL VARIABLE TRANSFER WITHIN THE HOME AREA CODE.
UIRV	"UNIQUE INTERSWITCH RV". KEY USED TO SECURE THE PER CALL VARIABLE TRANSFER BETWEEN TWO 39As WHICH MAY BE USING PATHS NOT DIRECTLY CONNECTED. NO COMSEC INVOLVEMENT AT TANDEM SWITCHES.
AIRK	"AREA INTERSWITCH REKEY VARIABLE". USED TO SECURE THE PER CALL VARIABLE TRANSFER BETWEEN AREA CODES (GATEWAYS). ONLY GATEWAY SWITCHES REQUIRE THIS KEY. IF A SINGLE 39 HAS 2 GATEWAYS INTO ANOTHER AREA CODE, ALL 3 SWITCHES MUST HAVE THE SAME AIRK KEY.
IAUR	"INTERAREA UNIQUE REKEY VARIABLE". KEY USED TO SECURE THE PER CALL VARIABLE TRANSFER BETWEEN TWO 39As IN DIFFERENT AREA CODES WITHOUT THE INVOLVEMENT AT TANDEM SWITCHES.
M	"REHOME OR REENTRY KEY". USED WHEN A SUBSCRIBER INITIALY ENTERS THE NETWORK OR RE-ENTERS THE NETWORK AFTER BEING ZEROIZED.
U NET	"TERMINAL RV - UNIQUE". USED TO ENCRYPT THE PER CALL VARIABLE AND THE NEW "X" VARIABLES SENT TO THE DSVT.

X	"THE TERMINAL NET VARIABLE". AUTOMATICALLY DOWNLOADED TO THE DSVT (OVERWRITING THE "M") WHEN THE SUBSCRIBER ENTERS OR AFFILIATES. THE "X" DOES NOT HAVE TO BE THE SAME AT ALL SWITCHES.
Te	"TED KEY". USED BETWEEN THE 39 AND SB-3865 (ULCS) OR EAC SEN OR RAU. EACH BATTALION HAS ONE Te SHARED BY ALL SENs OR ULCSs WITHIN THE BATTALI EACH 39A WILL HOLD ALL THE Te KEYS FOR THE NETWORK (WITHIN SAME AREA CO ALLOWS EACH SEN OR ULCS TO MOVE WITHIN THEIR NETWORK CARRYING ONLY THEIR ORIGINAL Te KEY.
Ti	"TED KEY". NORMALLY COMES FROM THE IC3S MATRIX (PAIR WISE UNIQUE) FOR USE BETWEEN 39s, NCSs, LENs and 42s. FROM THIS INITIAL KEY THE CONTROLLING END OF THE PATH GENERATES TRAFFIC KEYS WHICH ARE COOPERATIVELY TRANSF TO THE OTHER SWITCH.
CNV	"DIGITAL VOICE ORDERWIRE KEY". USED TO SECURE THE VINSON. MUST BE SHARED BY ALL ASSEMBLAGES WITH DVOW.

BT	"BULK TRANSFER COMMON"	USED AS THE COMMON BULK TRANSFER.
BT SW XX	"BULK TRANSFER U FOR SW XX"	UNIQUE KEY BETWEEN 2 SWITCHING NODES.
BT SW LXX	"BULK TRANSFER U FOR LEN XX"	UNIQUE CODE FOR USE WITH LEN
	WE ARE ALLOWED TO PUT A COMMON VARIABLE IN EACH OF THE BT LOCATIONS.	

DSVT RE-ENTRY

LOAD DSVT

- Load U into LDU
- Load M into LDX
- Place DSVT in OPERATE

RE-ENTRY PHASE (39A NOT ZEROIZED)

- Take DSVT off-hook (DSVT will attempt to sync on "X")
- Failure to sync will cause new attempt with another LKG
- Second failure to sync will cause new attempt with the re-entry variable "M"
- Successful attempt will update the DSVT network "X"
- Should get dial tone with the assigned NET "X"

RE-ENTRY PHASE (39A DATABASE SHOWS ZEROIZED OR 39D USING "M")

- Take DSVT off-hook (DSVT will attempt to sync on RE-ENTRY variable "M")
- Failure to sync will cause new attempt with another LKG
- Second failure to sync will cause the phone to be marked out-of-service
- Successful sync gives dial tone

NOTE: affiliation using "X" variable will fail

SECURE CALL PROCESSING

SUBSCRIBER CRYPTONETTING:

MSRT NET/DSVT RE-ENTRY KEY	M	TEK
DSVT NET KEY	X	TEK
PER CALL UNIQUE	V	TEK
DSVT UNIQUE	U	KEK

TRUNK CRYPTONETTING:

TED TRAFFIC KEY	T	TEK
TED EXTENSION	Te	TEK

ORDERWIRE CRYPTONETTING GROUP:

ORDERWIRE CRYPTO NET VARIABLE	CNV	TEK
EOW REKEYING VARIABLE	RKV	KEK

SWITCH CRYPTONETTING GRUOP:

COMMON INTERSWITCH REKEY KEY	CIRK	KEK
AREA INTERSWITCH REKEYING KEY	AIRK	KEK
BULK TRANSFER KEY COMMON KEY	BTp	KEK*

KEYS REQUIRED FOR A LOCAL CALL

CIRK	Must be assigned (needed for COMSEC tests)
U NET (1-25)	Unique for profile (common to network)
M	One time RE-ENTRY key (used to get X key - common to network)
X NET	Used by a phone after being re-entered, then X remains in DSVT until zeroized or rekeyed

KEYS REQUIRED FOR A SECURE TANDEM CALL

NOTE: The calling and called phones must be capable of processing local secure calls.

TED	Path between switches is secured by TED variable
CIRK	Calls in same area code use CIRK to transmit the per call variable between switches
AIRK	Calls to other area codes use the AIRK to transmit the per call variable

AKDC COMMANDS (AUTOMATIC KEY DISTRIBUTION CENTER)

57	From HUS to FILL device
75	From FILL device to HUS
91	Change Z stand alone
92	Change Z dual

55 Variable transfer from A to B
25 KG-83 to HUS A
5 Cancel HUS A
11 Enable HUS a
59 ALARM check

COMMAND 31 FAILED check of the interswitch keys (CIRK/CIRV)
COMMAND 41 FAILED

COMMAND 20 FAILED check of the phone keys

Checking AKDC Using Command 87.

Use the following procedures to check the AKDC using command 87:

a. Set NORM/ZEROIZE switch to NORM, if not already set.
b. On keyboard, press 8, then 7.
c. Observe 87 on OPERATlON display.
d. Press and hold COMMAND restriction switch.
e. Press ENTR on keyboard.
f. If error occurs, ERROR indicator goes on and display indicates failed sequence.
g. If procedure was good, 87 stays on display until this test is completed. Display will go blank and CMD indicator activates.
h. Release COMMAND restriction switch.

Checking AKDC Using Command 89.

Use the following procedure to check the AKDC using command 89:

a. Set NORM/ZEROlZE switch to NORM, if not already set.
b. On keyboard, press 8, then 9.
c. Observe 89 on OPERATION display.
d. Press ENTR on keyboard.
e. If error occurs, ERROR indicator lights and display indicates failed sequence.
f. If procedure was good, 89 stays on display until OA1 appears (in about 8 seconds). Press COMMAND restriction switch and observe display changing to OA2. Release switch and test is completed. Display goes blank and CMD indicator activates.

HUS LOCATION TABLE

COMSEC ID	Paired ID	Variable Type	COMSEC ID	Paired ID	Variable Type
000	257	RESERVED	106	362	TE 121st
001	258	CIRK	107	363	TN
002	259	BT	108	364	TN 141st
003	260	U NET 1	109	365	TN
004	261	U NET 2	110	366	TN
005	262	U NET 3	111	367	TN
006	263	U NET 4	112	368	TN V Corps RAU
007	264	U NET 5	113	369	TN V Corps IST
008	265	U NET 6	114	370	TN V Corps Tropo
009	266	U NET 7	115	371	TN V Corps Tacsat
010	267	U NET 8	116	372	TN V Corps TYC
011	268	U NET 9	117	373	TN
012	269	U NET 10	118	374	TN
013	270	U NET 11	119	375	TN
014	271	U NET 12	120	376	TN
015	272	U NET 13	121	377	TN
016	273	U NET 14	122	378	TG
017	274	U NET 15	123	379	TG OR TN
018	275	U NET 16	124	380	TG OR TN
019	276	U NET 17	125	381	TRANSFER
020	277	U NET 18	126	382	AIRK
021	278	U NET 19	127	383	AIRK
022	279	U NET 20	128	384	AIRK
023	280	U NET 21	129	385	AIRK
024	281	U NET 22	130	386	AIRK
025	282	U NET 23	131	387	AIRK
026	283	U NET 24	132	388	AIRK
027	284	U NET 25	133	389	AIRK
028	285	DVOW KEK	134	390	AIRK
029	286	CNV TEK	135	391	AIRK
030	287	FM/MISTY20	136	392	AIRK
031	288	GW DVOW	137	393	AIRK
032	289	BTP	138	394	AIRK
097	357	RKV	139	395	AIRK
098	358	RKV	140	396	AIRK
099	359	RKV	141	397	AIRK
100	360	RKV	142	398	AIRK
101	361	TE 32nd	143	399	AIRK
102	362	TE 17th	144	400	AIRK
103	363	TE 440th	145	401	AIRK
104	364	TE	224	480	M
105	365	TE	225	481	X NET 2

SECTION VI Line Termination Unit Troubleshooting

1. Purpose: This section establishes procedures for troubleshooting the LTU.

a. To properly troubleshoot the LTU as a stand-alone mode, it must first be taken off-line. This is accomplished by turning off the LTU (PWR ON/OFF switch) and setting the GROUP MODEM CABLE LENGTH switch on the front panel(position 5) so that the group modem function is internally looped back. Also, the LTU must be connected to % TED, or have the TED bypass cable installed (TED red cable connected from J1 to 54 on the rear panel). Prior to performing any troubleshooting of the LTU, ensure the following: Master/Stave switch on the TIMTG CCA is in the slave (down) position TlMBT CCA functional configuration switch is set to 2 Front panel GROUP MODEM CABLE LENGTH rotary switch is set to Position 5 (loopback)

b. Proper power cable (AC or DC) is connected and the corresponding jumper positions have been set on TB1 located on backside of front panel . All cables except the proper Bower cable and the TED cable(s) are disconnected.

c. LTU faults are indicated on a priority basis. Consequently, upon clearing one fault, another may be indicated. A normal indication on the BITE FAULT CARD ID CODE display during loopback is 13-6. This section gives a breakdown of the display by CARD ID, showing its CODE fault identification and its priority rating.

1	Set PWR ON/OFF switch to ON. Observe PWR indicator lamp	PWR indicator lamp is off	Yes	Go to step 4
			No	Continue
2	Wait 10 seconds, then observe SMY FAULT indicator lamp	SMY FAULT indicator lamp is lit	Yes	Go to step 8
			No	Continue
3	Depress BITE FAULT DISPLAY ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads other than 13-6	Yes	Go to step 8
			No	No fault is indicated; return to normal operation
4	Observe all other indicators	An indicator is lit	Yes	Continue
			No	Go to step 7
5	Depress BITE FAULT DISPLAY ENABLE push-button and observe CARD ID CODE display	CARD ID COOE display reads other than 13-6	Yes	Go to step 8
			No	Continue

6	Replace PWR indicator lamp	PWR indicator lamps is lit	Yes	Return to normal operation
			No	Possible PWR on/off circuit breaker or wiring fault; refer problem to D/S
7.	Ensure external power and power on/off circuit breakers are on, power supply cable is securely connected, and power strapping (AC/DC) at TB1 is correct	PWR indicator lamps is lit	Yes	Return to normal operation
			No	Possible wiring fault; refer problem to direct support
8.	Depress BITE FAULT DISPLAY ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 10-1, 11-1, 12-1, or 13-1 indicating a major function interlock	Yes	Continue
			No	Go to step 11
9.	Verify that each circuit card assembly(CCA) is in its slot designated card slot	Correct CCA is in each card	Yes	Continue
			No	Place correct CCA in card slot, and return to step 1
10.	Remove CCA indicated by CARD ID CODE display and check it for bent pins	Bent pin discovered	Yes	Straighten pin and reinsert CCA, or replace CCA and recheck indication. If BITE FAULT CODE is still displayed, go to step 20. Otherwise return to normal operation.
11	Depress BITE FAULT DISPLAY ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 15-1, 15-2, 15-3, 15-4, or 15-5	Yes	Replace power supply assembly and return to step 1
			No	continue
12	Depress BITE FAULT DISPLAY in ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 10-2, 10-3, 10-4, 10-5, or 10-6	Yes	Replace TlMTG CCA slot A12 and return to step 1
			No	Continue
13	Depress bite FAULT display ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 13-2, 13-3, 13-4, or 13-5	Yes	Replace GPMDM CCA in slot A13 and return to step 1
			No	Continue

14 Depress bite FAULT display ENABLE push-button and CARD ID CODE display	CARD ID CODE display reads 11-2 or 11-3	Yes	Replace MXDMX CCA in slot A10 observe and continue
		No	Goto step 17
15 Depress bite FAULT display ENABLE push-button and observe CARD ID CODE display	CARD ID COOE display reads 11-2 or 11-3	Yes	Reinstall original MXDMX CCA, replace TlMTG CCA and continue
		No	MXDMX CCA was faulty. Return to step 1
16 Depress bite FAULT display ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 11-2 or 1 1-3	Yes	Replace MXDMX CCA (both MXDMX and TlMTG CCAs were defective) and return to step 1
		No	MXDMX CCA was faulty. Return to step 1
17 Depress bite FAULT display ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 12-2	Yes	Out of sync. Ensure TED or TED bypass cable(s) are connected properly. If indication remains, replace TGMOW CCA in slot A11 and go to step 1. If indication disappears, return to normal operation
		No	Continue
18 Depress bite FAULT display ENABLE push-button and observe CARD ID COOE display	CARD ID CODE display reads 1-(blank) through 9·(blank)	Yes	LTU CCA is either not seated properly, or is not present in the indicated card slot. Reseat CCA, or ignore, and return to normal operation
		No	Continue
19 Depress bite FAULT display ENABLE push-button and observe CARD ID CODE display	CARD ID CODE display reads 13-6	Yes	Normal indication during loopback mode. Return to normal operation
		No	Continue

20	Replace TlMBT CCA in slot A14 and recheck CARD ID CODE display	CARD ID CODE display reads other than 13-6	Yes	Reinstall original TIMBIT CCA and refer problem to D/S
			No	Original TlMBT CCA was faulty. Return to normal operation

Card ID Display	Code (ID) Display	Card/Function AT Fault	Fault Name	FAULT	PRIORITY
01	Blank	DLTU#1 Interlock	N/A	N	25
02	Blank	DLTU#2 Interlock	N/A	N	26
03	Blank	DLTU#3 Interlock	N/A	N	27
04	Blank	DLTU#4 Interlock	N/A	N	28
05	Blank	DLTU#5 Interlock	N/A	N	29
06	Blank	DLTU #6 Interlock	N/A	N	30
07	Blank	DLTU#7 Interlock	N/A	N	31
08	Blank	DLTU #8 Interlock	N/A	N	32
09	Blank	DLTU #9 Interlock	N/A	N	33
10	1	Timing Generator	Interlock	Y	4
	2	128kHz		Y	12
	3	l00Hz		Y	13
	4	576kHz		Y	14
	5	Out of lock		Y	15
	6	3072kHz		Y	16
11	1	36-Channel Mux/Demux	Interlock	Y	3
	2	Loss of Mux Activity		Y	21
	3	Loss of Demux Activity		Y	22
12	1	TGMOW	Interlock	Y	2
	2	Out of Sync		Y	23
13	1	Group Modem	Interlock	Y	1
	2	Demodulator Carrier		Y	17
	3	Modulator Data		Y	l8
	4	Demodulator Data		Y	19
	5	Modulator Carrier		Y	20
	6	In Loopback		N	34
15	1	Power Supply +15V		Y	7
	2	-52V		Y	8
	3	+5V		Y	9
	4	-5v		Y	10
	5	-15v		Y	11
16	1	DVOW Bridge	Interlock	Y	5
	2	Fault		Y	24
17	1	DVOW	Interlock	Y	6

CHAPTER 7

MSE INTERFACES

SECTION I. GENERAL

1. An Interface link refers to any non-standard link with any switching system or through any transmission other than those integral to MSE. An interface may require modification of the MSE standard database.

2. **WARNING!!! The following examples are just that, EXAMPLES! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.**

a. The NATO Analog Interface provides links with the analog communications systems of allies.

b. Digital NATO Interface devices allow communications with allies using digital communications systems.

c. Use of tactical satellite (TACSAT) as a transmission means greatly extends distances over which we can communicate.

d. Use of the AN/TRC-170 Tropospheric Scatter Radio (TROPO) as a transmission means.

e. Use of the AN/TTC-39D Switch to provide connectivity to Echelons Above Corps (EAC).

f. Use of the AN/TYC-39A Message Switch (MS) to provide message traffic throughout the network and into AUTODIN.

g. Use of the MSE Network to support data transfer for battlefield subsystems such as TACFIRE or the Maneuver Control System (MCS).

h. Use of the CV-4180 Line Termination Unit (LTU) accommodates the Strategic Tactical Entry Point (STEP) for Direct-Dial DSN and approved Data Network interfaces.

i. Use of the strategic Digital European Backbone (DEB) or Military Path (MILPATH) as a transmission means.

j. Use of the SB-3865 Switch to provide connectivity to other U.S. services ie: Marines and Air Force.

Information on each of the above interfaces is provided in a step-by-step format throughout the following pages to facilitate implementation at operator level.

2. CRITICAL INFORMATION. Some of the critical information required for interface links are described below.

a. Grid coordinates of sites, switches and terminals.

b. Transmission equipment type. Identify radio equipment used (its associated modems or Multiplexers) and the transmission media (TRITAC or MSE). The media will dictate group rate and modularity (8 or 9), sync delay, and satellite trunk entries on the database. FIGURE 7-1 shows the acceptable parameters for the different transmission media.

c. Frequency bands for radio equipment.

d. XMT and RCV frequencies, azimuths, polarization.

e. Switching equipment in link (i.e. TTC-39D).

FIGURE 7-1. Parameters for Transmission Media.

MEDIA	TRITAC	MSE
MODULATION	CDI	CDI
MODULARITY	8 or 9	8 or 9 (if Local DTG)
SYNC DELAY	YES (if TROPO)	YES (if TROPO)
SAT TRUNK	YES (if TACSAT)	YES (if TACSAT)

CDI = CONDITIONED DIPHASE
MOD 8 = 256 kbps (16 ch), 512 kbps (32 ch), 1024 kbps (64 ch)
MOD 9 = 288 kbps (18 ch), 576 kbps (36 ch), 1152 kbps (72 ch)

g. Timing. Assign necessary master/slave timing relationships. The MSE Node Center Switch (NCS), Large Extension Node Switch (LENS) and the TRI-TAC AN/TTC-39D have a very stable atomic timing source and should normally act as the master for the timing source when master/slave relationships are required (every MSE NCS, LENS and 39D are their own timing source or master).

h. Phone numbers, area codes and CNR (FM) call signs for each end.

i. COMSEC keys and key procedures.

j. Standard Trunk Group Cluster Assignments.

FIGURE 7-2 displays TGC assignments

FIGURE 7-2

STANDARD TRUNK GROUP CLUSTER ASSIGNMENTS	
TGC-01 thru TGC-06	INTERNODAL LINKS
TGC-07 thru TGC-16	SENs, RAU,s SCC
TGC-17 thru 31	BYPASSED TGCs
TGC-32 thru TGC-35	LOCAL SUBSCRIBERS
TGC-36	ABSENT SUBSCRIBERS
TGC-37 thru TGC-39	PREAFFILIATED SUBSCRIBERS
TGC-40	BLACKLIST
TGC-41	TYC-39A
TGC-42	DNI
TGC-43	NAI
TGC-44 thru TGC-46	EAC/ADJACENT CORPS GATEWAYS
TGC-47	CV-4180 (LTU) DSN TRUNKS
TGC-48 thru TGC-49	SB-3865
TGC-50	CO - SF/DIAL PULSE (LENs only)
TGC-51	CO - DC CLOSURE (LENs only)
TGC-52 thru TGC-54	NOT ASSIGNED
TGC-55	DIAL-UP PSN HOST
TGC-56	DIAL-UP PSN GATEWAY
TGC-57	NOT ASSIGNED (SPARE)

SECTION II. NATO ANALOG INTERFACE

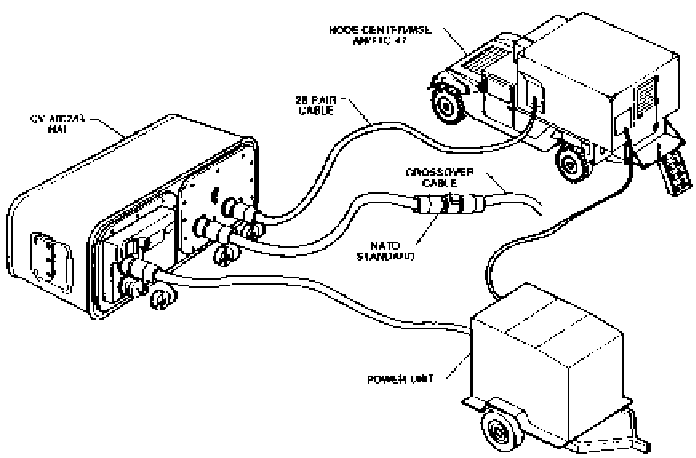
1. EQUIPMENT DESCRIPTION:

a. Interface is performed by the CV-4002/G NAI device (complies with STANAG 5040), which is connected via 26-pair cable directly to an MSE switch or to the LOS (V2) for UHF transmission of the signal into the MSE network. It is connected by a NATO standard crossover cable to the NATO communications assets. The NAI is powered by the tactical generator used by the MSE assemblage.

b. Bulk encryption is provided by the TED in the switch or the LOS (V2), from that assemblage into the network.

c. The NAI takes the analog (6 wire) signal coming in from the NATO communications equipment and converts it into a digital signal, acceptable to MSE(4-wire, CDI). However, modification of the MSE standard database is required.

NAI IN USE



2.   DATABASE MODIFICATION:

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. Basic Information for remote NAI through LOS(V2):

Use DTG 6, TED 6. (Or any SEN/RAU DTG, with appropriate NCMD's TDMX addresses)
NCMD 35 & 36.
8 trunks (numbered 1-8) at TDMX addresses 06-45 thru 53, skipping 06-52.
The 9YXNYX of the NATO switch will be distributed by OPORD or FRAGO.

ESOP PROCEDURES.

Highlight Icon DTG 6

right click

Modify Link Type

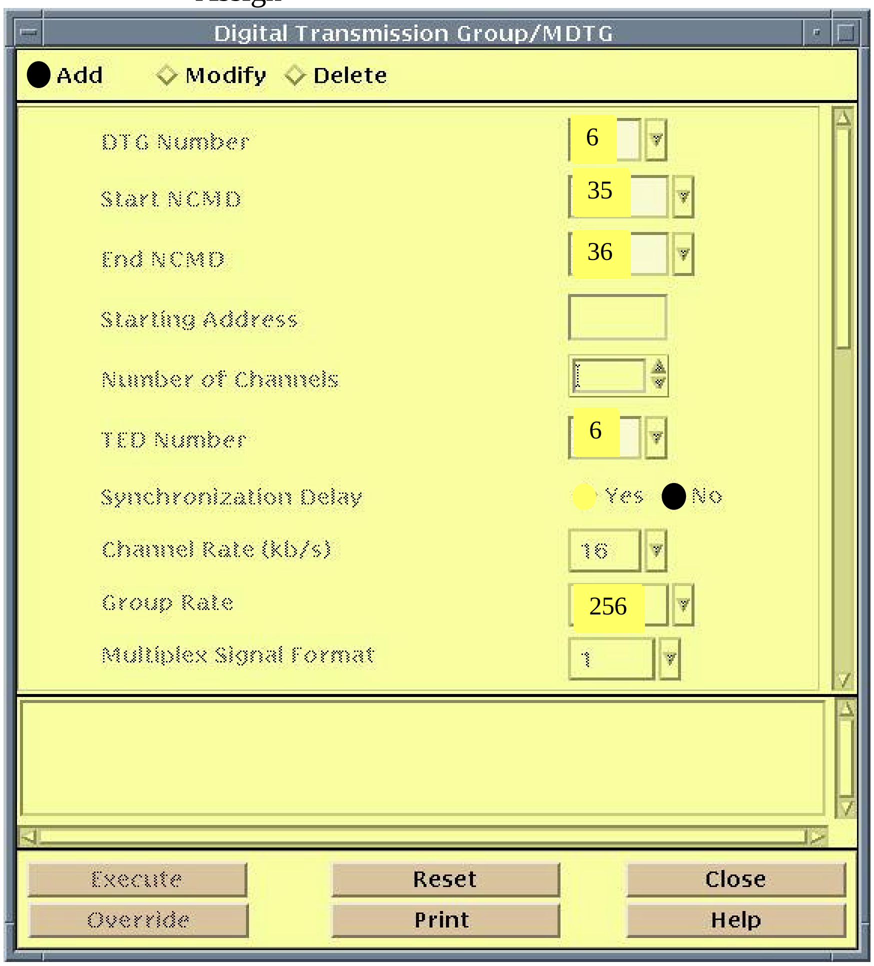
Delete Link

Execute ,After all steps Complete, Close Window.

Node Management

Digital Transmission Group

Assign



Screen cont.	INPUT	ACTION
	Subgroup 1 Rate	Blank
	Subgroup 2 Rate	Blank
	Subgroup 3 Rate	Blank
	Subgroup 4 Rate	Blank

Service State	In
Mod cable Length	1 (mile, never changes)
Demod cable Length	¼ (actual cable length)
Modulation	Diphase
Repeater Mode	No
OCU	No
Red Clock Group	Black
Recover Timing	No
DTG Release Timer	0

EXECUTE ,After all steps Complete, Close Window.

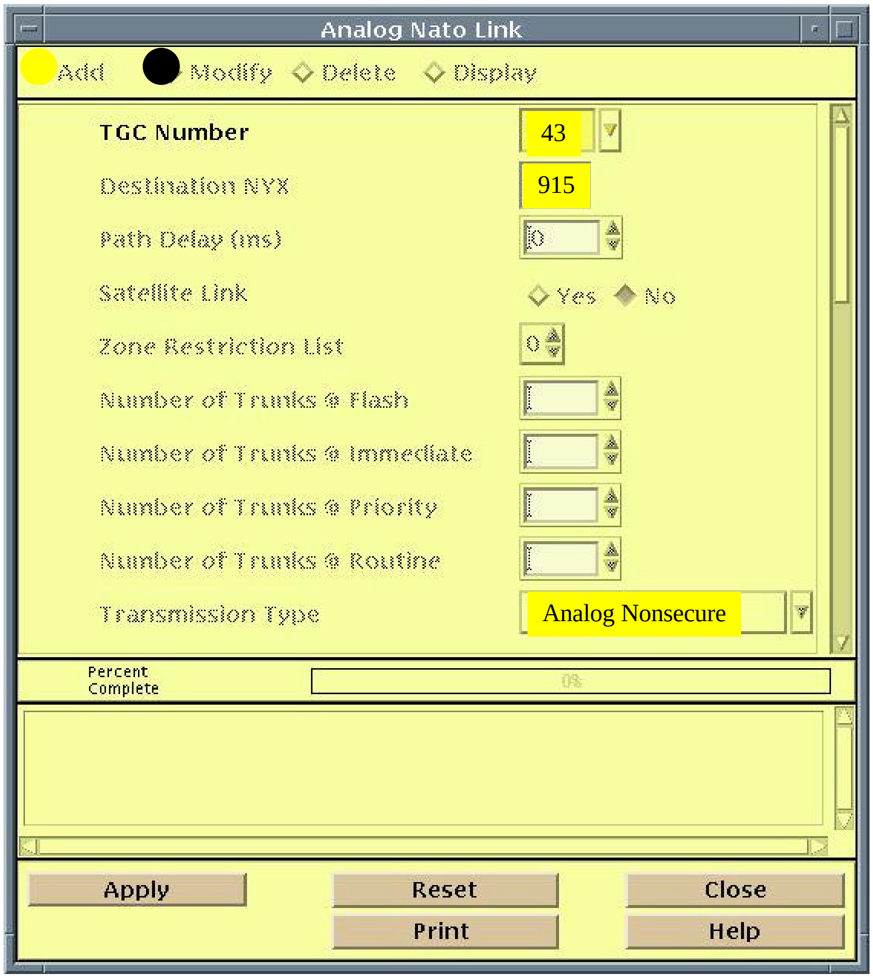
Node Management
    Terminal Service
        Assign

Screen	INPUT	ACTION
ATS	Add, 06-44	Terminal Type 119

Execute , After all steps Complete, Close Window.

LINK MANAGEMENT
    ADD LINK
        Add Link Type To Analog Nato TGC 43

Execute
    Apply Analog Nato



Screen Cont.	INPUT	ACTION
	DLTU	No
	Trunk 1 Address	06-45
	Trunk 2 Address	06-46
	Trunk 3 Address	06-47
	Trunk 4 Address	06-48
	Trunk 5 Address	06-49
	Trunk 6 Address	06-50
	Trunk 7 Address	06-51
	Trunk 8 Address	06-53

Execute , After all steps Complete, Close Window.

NODE MANGEMENT
ROUTING
GATEWAY/COMMERCIAL OFFICE ROUTING
ASSIGN

Screen	INPUT	ACTION
AGC	A, Interface ID	915NYX (see Opord)
	NATO Designation	6-Digit
	Primary TGC	43

EXECUTE , After all steps Complete, Close Window.

b. Basic Information for local NAI at NC/LEN:

(1) Use J-3 at a NC, or any 26 pair connector at a LEN, and build a TGC on 8 quads of that 26 pair.

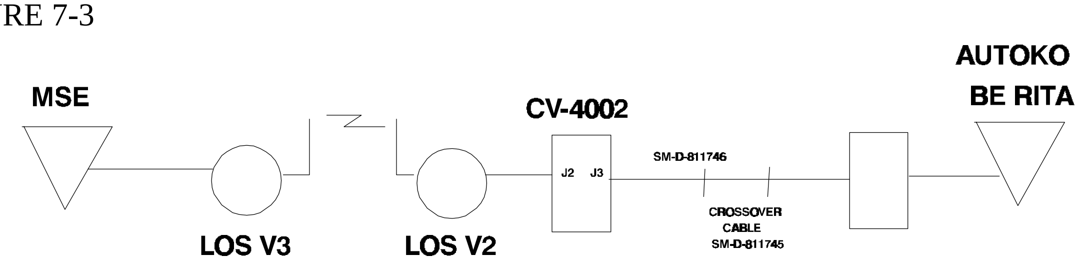
(2) Coordinate directly with the Allied switch team chief to verify the need for a crossover cable.

Note: Common mistake is when both countries use a crossover, which negates the effect.

3. Example NATO Interfaces.

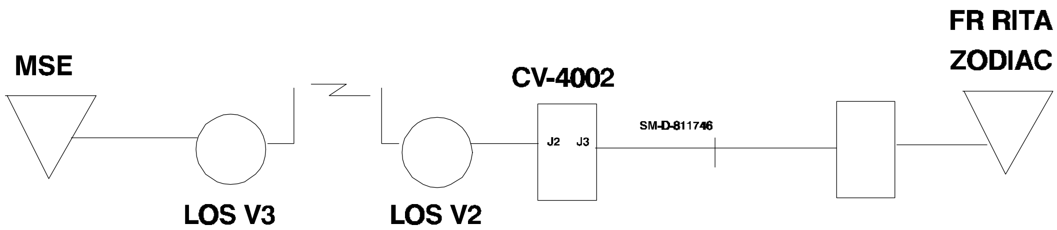
a. German AUTOKO and Belgian RITA. A standard STANAG 5040 interface is configured for these two countries. The NAI is connected to the LOS (V2) or directly to the switch and is connected to the NATO switch via a crossover cable as shown below in FIGURE 7-3.

FIGURE 7-3



b. French RITA and Dutch Zodiac. For these two countries a modification is needed. Crossover is made in the Dutch switch and French 26 pair cable, so the crossover cable is not needed as shown below in FIGURE 7-4.

FIGURE 7-4



4. Verification of CV-4002 operation

a. The following procedures can be used to test and verify the operation of each individual channel assigned to a STANAG 5040 gateway using a CV-4002. This test configuration connects two channels on the six-wire side and, using digit editing, routes the call back to the switch. The test checks the DLPMA cca, the four wire to six wire conversion performed in the CV-4002, the circuit switch cable, NATO cable, and the crossover cable. The following database is written for the TTC-47.

Assign Trunk Group Cluster

A	Action
44	Trunk Group Cluster
O	TGC Type
Y	Spill Forward
915	Destination Code
0	Zone Restrictions
Y	Access Trunk Group
N	Traffic Limitations

Assign Terminal Service

A	Action
06-45	Terminal Address
87	Terminal Type
44	Trunk Group Cluster
0	Path Delay
N	Satellite Trunk
I	In Service
1	Trunk Number
N	Transmission Type
N	Packet Switch Trunk

Assign Gateway/Commercial Office

A	Action
915614	Destination Code

S NATO Designator
44 Primary Trunk Group Cluster

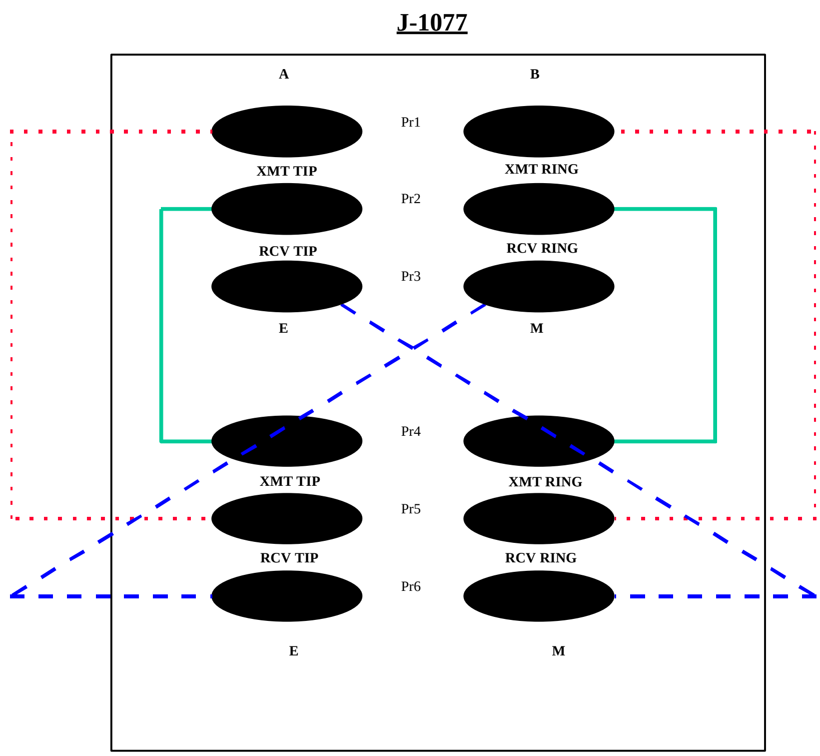
Assign Digit Editing List

A Action
915 Code
P Prefix
914 Prefix Code

b. When a 13 digit number is dialed (915-614-5500103 or any local phone) the digit editing converts the 9YX (915) to 914 the home 9YX of the TTC-47. The NYX is the same as the home, so the switch strips off the first six digits and routes on the last seven digits. This route is through the CV-4002 gateway which is patched to a second channel on a J-1077 and routed back to the TTC-47. This test can be done to check each individual channel consecutively. The Figure 7-5 depicts the necessary patching at the J-1077 to connect the channels for testing . Prior to connecting the channels on the J-1077, the third pair alpha side must show -26 vdc, if not the cca in the CV-4002 and or the 26 Pair/J-1077 is bad.

c.When the call is successful, the transmit and receive pairs, and the E&M signaling is verified on each channel.

Figure 7-5



SECTION III. DIGITAL NATO INTERFACE

1. GENERAL: At publication, only two of our NATO allies, the Dutch and Norse, have digital interface capability. MSE may use the DNI system in one of two ways: locally, via cable; or remote, via UHF radio.

2. EQUIPMENT DESCRIPTION: The DNI kit consists of four circuit cards (DNTGM, DNGPM, DNTSB, and DNEOW cards) and a 1/4-mile spiral quad cable.

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

3. INTERFACE DESCRIPTION: See FIGURE 7-6.

a. Local Configuration.

(1) At the NC, ensure that the DNTSB, DNTGM, and DNGPM cards are placed in the proper slot for the DTG you will be using. At the present time, only DTG 1 and 16 may be used, as it is the only local DTG with a HVA-7 connector at the Signal Entry Panel.

(2) Connect spiral quad cable connector P1 to NC connector P2 and then to NATO equipment.

(3) Perform database modifications as noted on the next page.

NOTE: Due to improper spiral quad cables, it may be necessary to transpose the DTG P/P blue plugs with triax cables.

b. Remote Configuration.

(1) The NCS operator must ensure that the DNGPM, DNTGM, and DNTSB cards are inserted in the slot for the DTG to be used. The three cards will replace the TGMOW, GPMDM, and TSB.

(2) Insert the cards as follows:

DNTSB into slot A634
DNGPM in place of GPMDM
DNTGM in place of TGM0W

(3) In the LOS V3, install the DNEOW card into TGMD circuit card slot A105.

(4) Prior to any database modification, ensure that all screens are printed. Then make the necessary deletions.

c. DATABASE MODIFICATION:

(1) The database modification may be performed on or off-line; if doing it off-line, disregard AOD-79. The database mod will be done the same way for both local and remote DNIs.

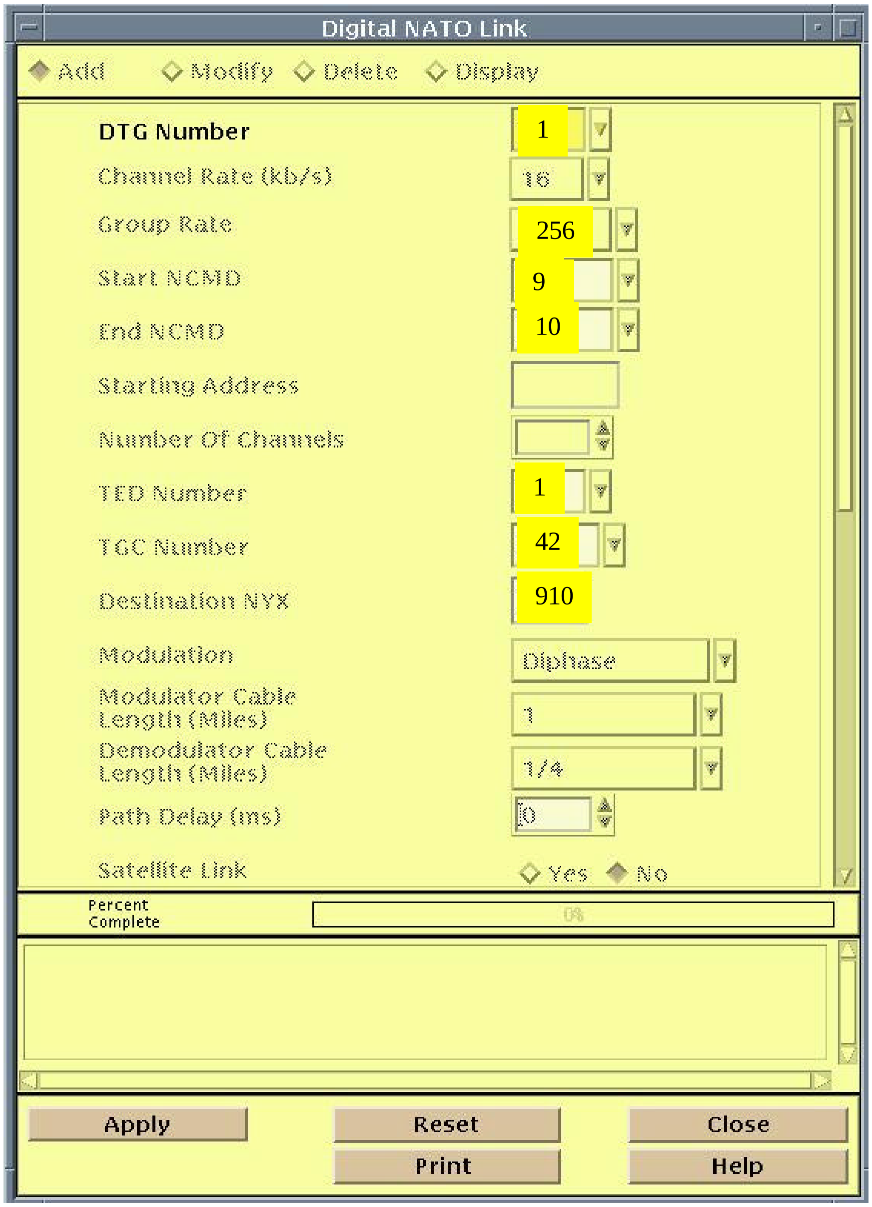
(2) General Information:

DTG 1 (can be local or MUX DTG)
TGC 42
Data rate 256/16 kbs
NCMD 9 and 10
Destination code NYX (National Area Code)
Interface code NIAC (National Identifier Area Code example: 9YXNYX)
14 trunks (numbered 2 - 15), at TDMX addresses
02-28 through 02-42, skipping 02-34.

ESOP PROCEDURES.

Highlight Icon DTG 1
right click

Modify Link Type
Modify Link Type To Digital Nato
Execute
Apply Digital Nato Link



Screen Cont.	INPUT	ACTION
	Satellite Link	No
	Synch Delay	No
	Zone Restriction	0
	Nato Signaling	
	Buffer Number	1
	NSB Block Step	
	Back Parameter	Short
	DTG Release Timer	0

Execute , After all steps Complete, Close Window.

NODE MANGEMENT

ROUTING

GATEWAY/COMMERCIAL OFFICE ROUTING

ASSIGN

Screen	INPUT	ACTION
AGC	A, Interface ID	910NYX (see Opord)
	NATO Designation	6-Digit
	Primary TGC	42

EXECUTE , After all steps Complete, Close Window.

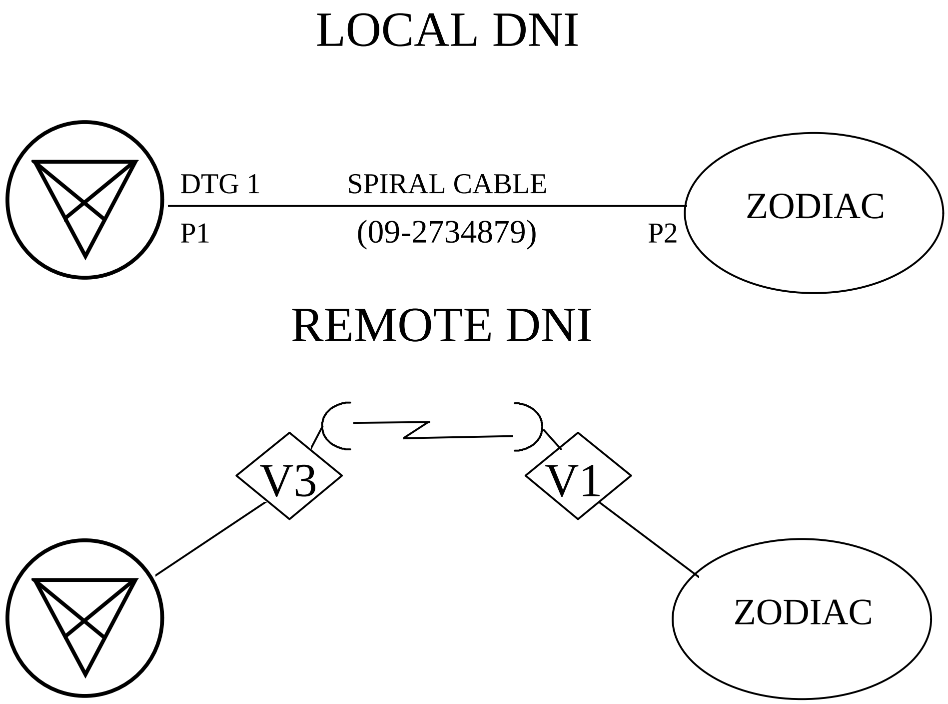
(3) DTG/DTR entries:

CHAN NO	TERM ADDR	TERM TYPE	TRK NO
1	02-26	119	
2	02-27	PSC	
3	02-28	88	2
4	02-29	88	3
5	02-30	88	4
6	02-31	88	5
7	02-32	88	6
8	02-33	88	7
9	02-35	88	8
10	02-36	88	9
11	02-37	88	10
12	02-38	88	11
13	02-39	88	12
14	02-40	88	13
15	02-41	88	14
16	02-42	88	15

NOTE: On a Digital NATO TGC, the first channel is the framing channel, and the second is the signaling channel.

Any changes to the above will be specified in the OPORD.

FIGURE 7-6


LOCAL DNI
DTG 1
SPIRAL CABLE
P1
(09-2734879)
P2
ZODIAC
REMOTE DNI
V3
V1
ZODIAC

SECTION IV. TACTICAL SATELLITE INTERFACE

1. EQUIPMENT DESCRIPTION:

The AN/TSC-85B and AN/TSC-93B are versatile, tactical military communications terminals designed to provide point to point or multipoint trunking facilities in the diverse range of environmental conditions which tactical forces encounter. Using military Satellites, either short or long range communications can be established in minutes without need for mid point repeaters or extensive site preparation. The AN/TSC-85B/93B can be deployed and made operational in 20 minutes by a crew of four and 30 minutes by a crew of three.

- AN/TSC-85B. The AN/TSC-85B normally acts as a Hub or Nodal Terminal, even though it could be used as a Spoke/Non Nodal or Point To Point Terminal.

- AN/TSC-93B. The AN/TSC-93B normally acts as a Spoke/Non Nodal or Point To Point Terminal.

The TSC-85B and TSC-93B replaced the TSC-85A/93A. The TSC-85B/93Bs are equipped with Low Rate Multiplexers (LRMs) TD-1389s as the internal Multiplexers and Key Generators KG-94A as the Trunk Encryption Device (TED).

a. Tactical Satellite Signal Processor (TSSP) TD-1337(V)G:
The TD-1337 provides a full duplex capability in interfacing the modem in the terminal radio equipment with the ground Equipment (Multiplexer). Input data users are multiplexed into a Supergroup and supplied to the modem in the terminal radio equipment for transmission. Received supergroups are demultiplexed and are supplied to their respective data users (Multiplexers). The TD-1337 combines the group inputs, dedicated user input (if used), and 16 Kb/s DVOW input (if used) into a single super group. The TD-1337 SG output is an unbalanced NRZ signal that can range from 16 Kb/s to 4664 Kb/s in 8 Kb/s increments. The SG rate is always the total of the following:

Sum of the active group input rates. 16 Kb/s or 32 Kb/s for dedicated users (if used). 16 Kb/s for DVOW (if used). 8 Kb/s for Overhead (this includes 2.4 Kb/s Advance Narrow band Digital Voice Terminal (ANDVT) and 2 Kb/s for DOW). There are four (4) versions of TD-1337(V); two of which are used in Army terminals:

TD-1337(V)1 is used with AN/TSC-85B.

TD-1337(V)2 is used with AN/TSC-93B.

Each version of TD-1337(V) has different functional capabilities:

Max number of active (V)1 (V)2 ports(group inputs/outputs). 8 2

Number of unbalanced NRZ interfaces. 4 2

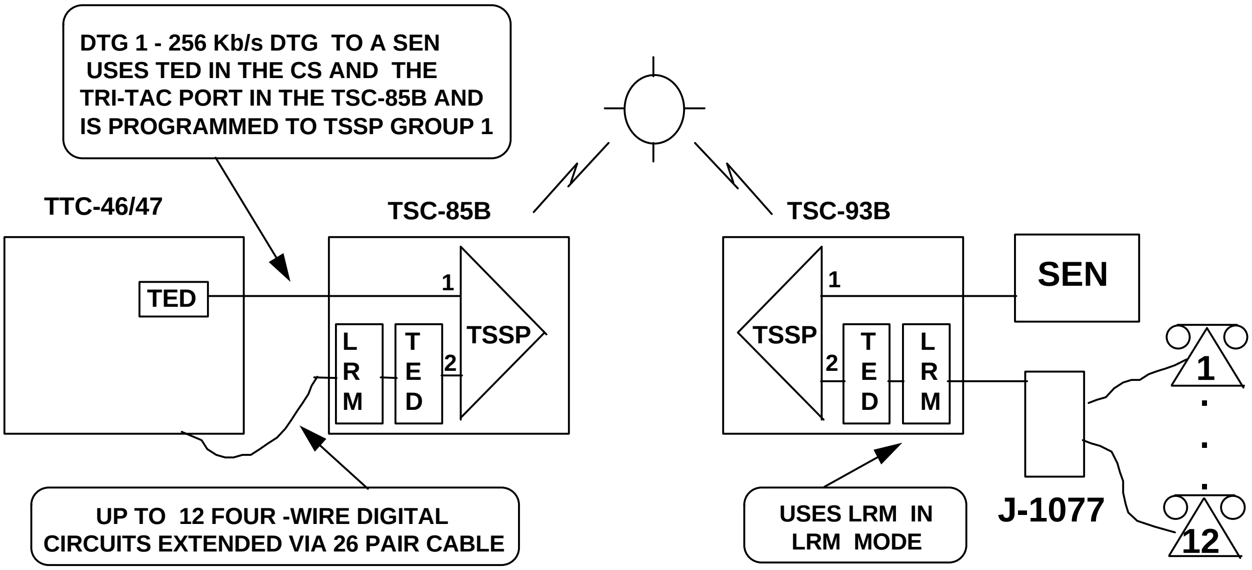
Number of balanced NRZ interfaces.	8	2	
Number of conditioned diphase(group modem)interfaces.	6	1	
Number of supergroups transmitted.		1	1
Number of supergroups received.		4	1
16 Kb/s nonsecure digital voice(H 250 handset).	yes	yes	
16 Kb/s secure digital voice(VINSON).	yes	yes	
16/32 Kb/s dedicated user CDI (loopmodem).	yes	yes	

b. TD-1389(V) Low Rate Multiplexers. The TD-1389(V) Low Rate Multiplexer (LRM) is a micro processor controlled Multiplexer/demultiplexer. It will accommodate input data rates from 37.5 Kb/s to 56 Kb/s. The LRM multiplexes/demultiplexes up to 12 channels of Digital, Analog (Voice Frequency), and FSK Signals into a composite data stream for transmission. The composite rate cannot exceed 256 Kb/s. The composite output is balanced NRZ. There are five versions of the TD-1389(V). The versions differ in interface card population, composite interface card type and strategic or tactical drawer assembly. There are three types of line interface cards. The digital line card provides interfaces for digital users in a variety of data format, rates, and signal types. The Continuously Variable Slope Delta Interface Card issued to interface Analog Voice or other VF Signals (300 3400 Hz). This card converts Analog to Digital and vice versa. These cards are the same as AAU Cards (commonly used in EAC units) except for the sampling rate. FSK Line Cards permit two tone(mark/space) FSK Signals to interface with the LRM with out intervening modem.

(1) TD-1389(V) Low Rate Multiplexer Modes of Operation. There are six modes of operation LRM, LGM, GSC 24, GM, Rate Pass, and Emergency Bypass. We are only going to be concerned with LRM, LGM, and GM Modes.

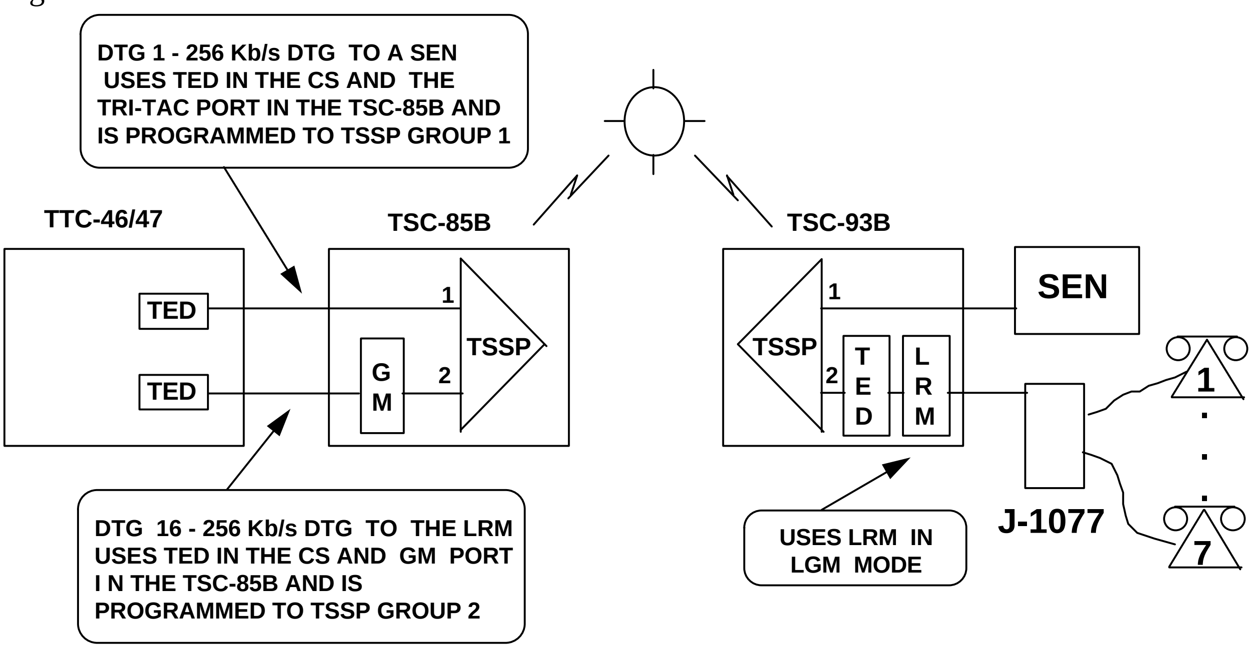
(a) LRM Mode. FIGURE 7-7. In the LRM Mode, up to 12 user channel inputs may be multiplexed and transmitted as a composite signal. The composite is the sum of the channel data rates plus overhead. All three types of interfaces (Digital, CVSD, and FSK) can be accommodated.

Figure 7-7



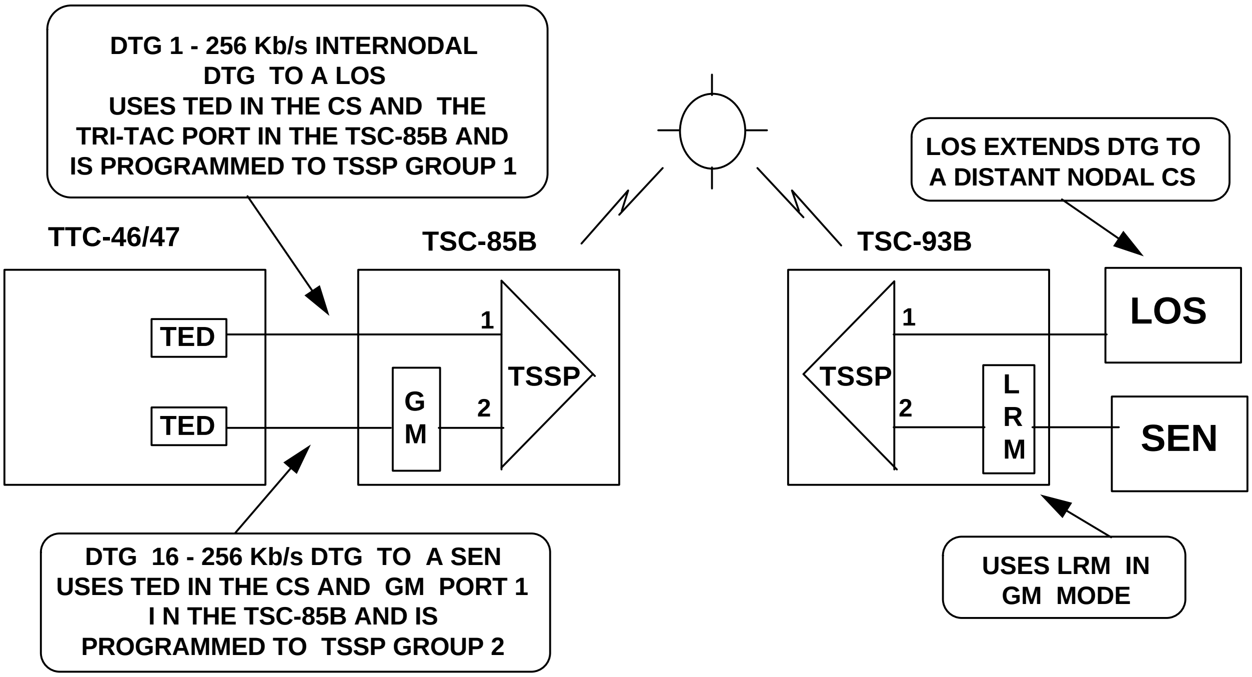
(b) LGM Mode. FIGURE 7-8. In the LGM Mode, the LRM emulates the TD-1235 LGM. This mode of operation provides seven user channels (16/32 Kb/s or CVSD only) at composite data rates of 128 or 256 Kb/s. The FSK interface cards can not be used in LGM Mode. The Overhead Channel in the LGM Mode does not provide user data rate in formation to the distant end, but is used for synchronization and framing only.

Figure 7-8



(c) GM Mode. FIGURE 7-9. In the GM Mode, the LRM emulates a conditioned diphase module of a GM MD-1026. Interface with a GM must utilize rates common to both LRM and GM. These rates are 72 kb/s, 128 Kb/s, 144 Kb/s, and 256 Kb/s.

Figure 7-9



c. TIMING. All timing in the satellite terminal must be synchronized to a single timing source. There are three timing source options in the AN/TSC-85/93B.

- CNCE Timing: When the AN/TSC-85/93B is directly connected to a MSE NCS or LEN, this option synchronizes the TSSP to the atomic standard of the NCS or LEN.

- Master: This option causes the TSSP to operate from an internally generated standard. Ordinarily this option will not be used when interfacing TACSAT with MSE.

- Slave: This option causes the TSSP to be synchronized to a remote TSSP that is slaving timing from an external source such as a MSE NCS or LEN. This timing option is required at the TACSAT when it is connected to a SEN or RAU.

2. SYSTEM CONFIGURATIONS.

a. Multipoint operations: To conduct multipoint operations a nodal terminal is linked via satellite, with up to four non nodal terminals to form a communications network. The nodal terminal in this case the AN/TSC-85B receives four PCM Data Streams for transmission to four individual non nodal terminals (AN/TSC-93B). The Tactical Satellite Signal Processor (TSSP) TD-1337 in the nodal terminal combines these data systems into a single Supergroup data stream and transmits the Supergroup on a single carrier frequency. Each non nodal terminal receives the entire Supergroup data stream, demultiplexes it, and processes the data group intended for that particular non nodal terminal. Each non nodal terminal in the network transmits it's respective data on independent carrier frequencies which are received and separated. The four individual data streams are processed by the TSSP and sent to the individual Multiplexers (TD-1389) in the nodal terminal.

b. Multipoint operation possible frequency break down. The non nodal terminals (AN/TSC-93B) all receive the same frequency, because the TSSP (TD-1337) allows each terminal to receive only the group destined for that particular terminal. The nodal terminal (AN/TSC-85B) has only one transmit frequency but receives four separate down link frequencies, with the group from each individual non nodal terminal.

c. Point To Point Operation. This operation allows two terminals to operate as a communications link. This configuration is commonly engineered utilizing AN/TSC-93B at one site and AN/TSC-93B at the other site. This configuration can also be engineered using AN/TSC-85B at one or both ends. Once the TSSP is set to Point To Point operation both terminals can only set the TSSP group switch to receive group 1.

d. Group configuration through the AN/TSC-85B.

(1) The MD-1026 group modem is part of the AN/TSC-85B. It converts up to four conditioned diphase groups to a balanced NRZ format compatible with the TD-1337. Data rates through the MD-1026 are as follows: for conditioned diphase 72, 128, 144, 256, 288, 512, 576, 1152,2536, 2304, 4906, and 4608 kb/s.

Note: The AN/TSC-85B could also use LRMs in the GM Mode.

(2) Maximum transmission distances for conditioned diphase signals is 2 miles for data rates up to 576 kb/s and 1 mile for 1024 and 1152 kb/s.

(3) The stand alone conditioned diphase group input to the TD-1337 may be operated at 72, 128, 144, 256, 288, 512, 576, 1024, or 1152 kb/s.

(4) Groups may be red or black when entering the terminal. The AN/TSC-85B can use one of it's TEDs to encrypt the incoming group.

(5) Echo suppressers are not available for digital signals.

(6) Entry is via CX 11230 cable.

(7) The conditioned diphase (stand alone) group may be connected to TD-1337 port 1, 3, or 5. If the data rate is 1024 or 1152 kb/s, the next higher even numbered port (i.e., 2, 4, or 6) is not available for use.

(8) The four group inputs from the MD-1026 group modem to the TD-1337 may be connected to TD-1337 ports 1 through 8. If the group rate is 1024 or 1152 kb/s, the group

must be assigned to an odd numbered port and the next higher even numbered port is not available for use.

(9) The input from the MD-945 modems to the TD-1337 will be on DEMUX port 1, 2, 3, 4. This choice will depend on which distant GMF terminal is being received.

(12). The conditioned diphase (stand alone) group must be used for entry to the AN/TSC-85B if 16 kb/s Data Voice Order wire (DVOW) communication is desired with the Communication Nodal Control Element (CNCE) or MUX Van that originates

e. Group configurations through AN/TSC-93B

(1) The stand alone conditioned diphase group input may be operated at 72, 128, 144, 256, 288, 512, 576, 1024, or 1152 kb/s. Maximum transmission distance is 2 miles for data rates up to 576 kb/s and 1 mile for 1024 or 1152 kb/s.

Note: Group may also enter the AN/TSC-93B through the LRMs in GM Mode.

(2) Groups may be red or black when entering the terminal. The AN/TSC-93B can use it's TEDs to encrypt the incoming group.

(3) Echo suppression is not available for digital signals.

(4) Entry is via CX 11230 cable.

(5) This group always enters TD-1337 MUX port 1. If data rates of 1024 or 1152 kb/s are used, MUX port 2 is not available for use.

(6) The input from the MD-945 modem enters the TD-1337 through DEMUX port 1.

4. DATABASE MODIFICATIONS:

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. TACSAT to NC/LEN. When a TACSAT link is installed on a local DTG at the NC/LEN a data rate of 256 is normally used. In this case a link between a NC and SEN requires no database modifications. An internodal link however, requires the NC to modify the Link. Because of the inherant delay, Satellite -Y must be annotated on the Link Modification and Link Initialization screens.

b. DTG's 1, 5, or 16 can be modified to data rates of 256, 288, 512, 576 Kb/s. Higher data rates are possible but not practical for MSE.

c. As a general modification rule, DTG 9 will not be used to support a TACSAT or TROPO modification because the there is no TED available.

d. The modifications for any LEN over TACSAT will be modified the same as a NC-NC modification. In the LEN there will be no modification other than to mark the trunk for Satellite - Y on the Link Modification and Link Initialization screens. A link going to a SEN requires no more than also annotating a satellite trunk and modifying the standard database from a RAU to a SEN, if applicable.

SECTION V. TROPOSPHERIC SCATTER RADIO SYSTEMS

1. GENERAL. Tropospheric Scatter Radio Systems (TROPO) are found at Echelons Above Corps (EAC), and are also inherent assets of the Brigade in its long-haul communications sections. Node Centers in the V Corps MSE Network can expect to terminate TROPO terminal EAC links or MSE internodal links. The primary advantage of TROPO is its over the horizon 100 miles capability. The TRC-170 V3 is capable of interfacing with TRI-TAC and MSE equipment.

2. EQUIPMENT DESCRIPTION:

a. The AN/TRC-170(V)3 TROPO terminal consists of an S-250 shelter mounted on an M35A2 2-1/2 ton truck and two 6 foot parabolic dish quick reaction antennas integrally mounted on a 1-1/2 ton M116 trailer. Power is provided by two trailer mounted 10 kW generators towed by an M-1037 1-1/4 ton support vehicle.

b. The terminal is capable of line of sight, diffraction, or tropospheric scatter propagation modes. It operates in the 4.4 to 5.0 gigahertz frequency spectrum with a selectable bandwidth of 3.5 or 7.0 Mhz. The transmitted signal is a time division multiplexed group consisting of from one to four DTGs.

c. The four DTG inputs may be any combination of dipulse or conditioned diphase cable modulation. Two Loop Group Multiplexers (LGMs) provide for the connection of up to 32 DNVT/DSVT 16 Kb/s conditioned diphase loops in place of one or two DTGs. The conditioned diphase DTGs allow direct connection to MSE or TRI-TAC DTGs through four CX-11230/G cable hocks. All four of the conditioned diphase DTGs will accept any of the following data rates: 72, 128, 144, 256, 288, 512, 576, 1024, 1152, 2048, 2304, 4096, 4608.

d. Supergroup rates above 2304 require 7.0 Mhz transmission bandwidth.

e. The terminal is equipped with a TRI-TAC compatible Digital Voice Orderwire (DV0W) secured with a KY-57. It is fully compatible with the MSE DVOW and can bridge all incoming DTGs with the transmitted Supergroup.

f. Through cable connectors on the curbside signal entry panel, up to four incoming DTGs are connected to the MD-1026 Digital Group Modem (GM). GM cards convert the incoming conditioned diphase or dipulse signals to NRZ and route the individual DTGs to the patch panel. Each DTG is then manually patched to the group side of the TD-1236 Trunk Group Multiplexer (TGM). The incoming DTGs are then multiplexed into a Supergroup and patched into the TR0PO Modem (TM).

g. The TROPO modem adds DV0W to the Supergroup data stream and prepares the signal for transmission. Up converters modulate the signal, high power amplifiers boost the signal to appropriate output power and transmission is accomplished through wave guide to two six foot parabolic dish antennas.

h. Received signals are simultaneously fed from the two parabolic dish antennas to down converters. Each down converter sends its signal to the TROPO modem demodulator. The demodulator compares the information from each received signal and recovers and reconstructs the digital data signal. DV0W signals are separated and routed to the DVOW and the Supergroup data signal is routed to the TGM via patch panel.

i. TIMING. All timing in the TROPO terminal must be synchronized to a single timing source. There are three timing source options in the AN/TRC-170:

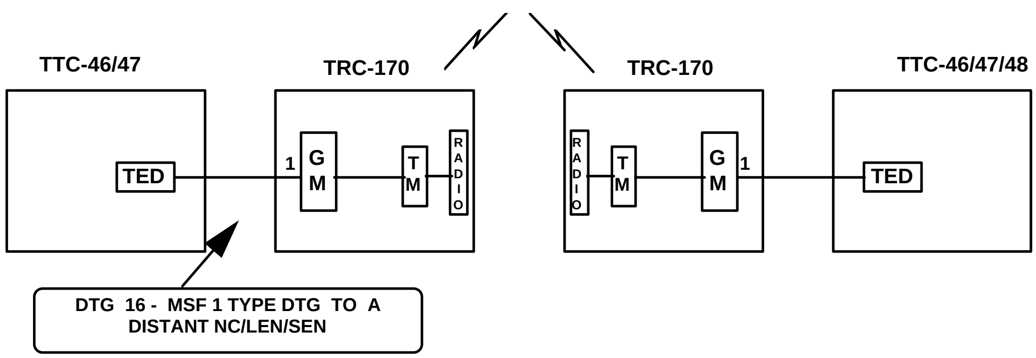
(1) RB-STD: This option causes the terminal to operate from an internally generated Rubidium Atomic standard clock. This atomic standard alone is hampered by the fact timing is still drawn from the Orderwire Control Unit which has a insufficient crystal oscillator. This option will be used when interfacing with non-atomic standard producing assemblages.

(2) MISSION: This option synchronizes the terminal to one of the incoming DTGs. Ordinarily this option will be used when interfacing with any atomic standard producing assemblage i.e.: Circuit Switches.

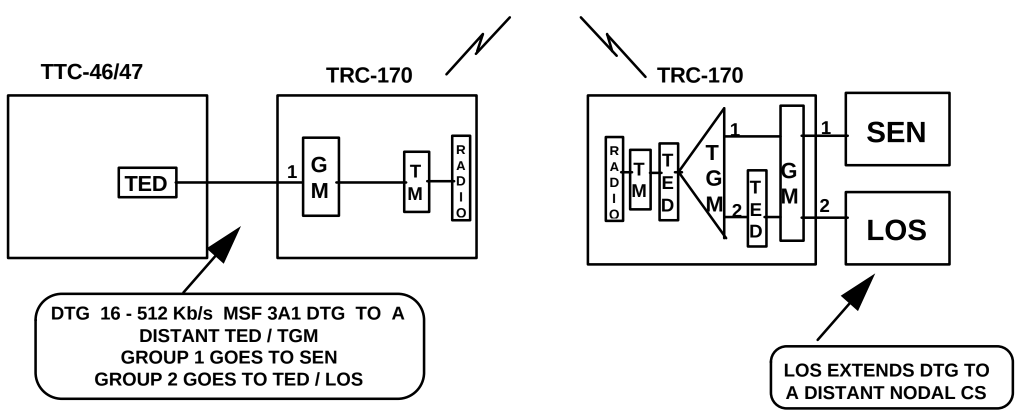
(3) GROUP: This option synchronizes the terminal to the distant end TROPO terminal timing source.

3. SYSTEM CONFIGURATIONS.

a. Point to point. FIGURE 7-11. Basic long haul concept.



b. Drop and insert (switch). FIGURE 7-12. With use of the TGM and Multiplex Signaling Format (MSF) techniques a single DTG can be used to provide signaling for a SEN and extend on to a distant station.



c. Drop and insert (Phones). FIGURE 7-13. With use of the TGM, Multiplex Signaling Format (MSF) techniques and the LGM a single DTG can be used to provide signaling for up to

15 DNVT/DSVTs and extend on to a distant station. SEE MSF 3A1 NC/LEN Database Modification example.

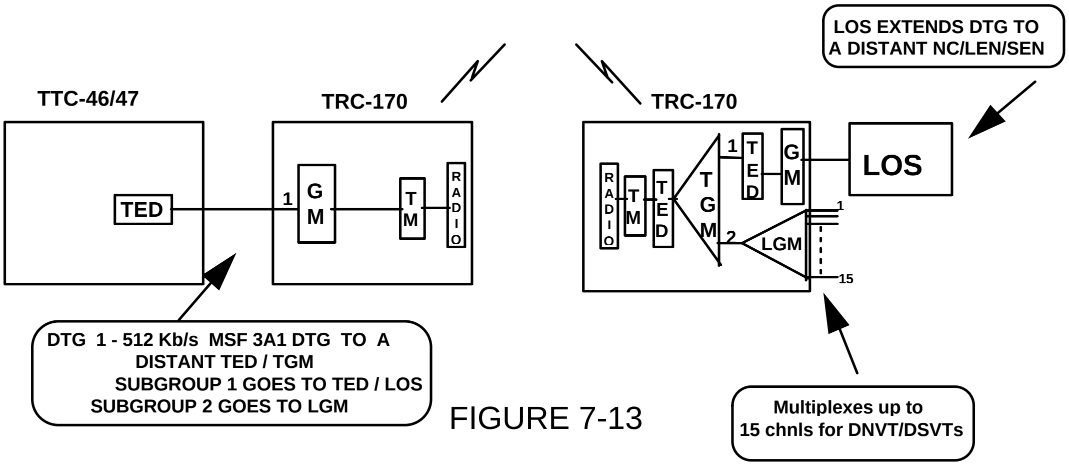


FIGURE 7-13

4. DATABASE MODIFICATIONS. When a TROPO link is installed on a local DTG at the NC/LEN a data rate of 256 the NC/LEN requires no database modifications. An internodal link at 1024kb/s, requires the NCs to modify the primary signaling channel on the local DTG. Other configurations will be published as changes.

a. TROPO to NC/LEN. When a TROPO link is installed on a local DTG at the NC/LEN a data rate of 256 is normally used. In this case a link between a NC and SEN or RAU require no database modifications. An internodal link however, requires the NC to modify the local DTG. Other configurations will be published as changes.

b. DTG's 1, 5, or 16 can be modified to data rates of 256, 288, 512, 576 and 1024 Kb/s. Higher data rates are possible but not practical for MSE.

c.   As a general modification rule, DTG 9 will not be used to support a TROPO modification because the Brigade will usually employ a local RAU at the Node Center.

d.   This is an example of a database modification of DTG 1 being used as an MSF 3A1 to Drop (phones) and Insert a SEN DTG from a distant station.

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

Basic Information:
DTG 1, (SEN TGC 7) . Utilizing NCMD's 7 through 10.
Trunks 1 - 14, at TDMX addresses 02-10 through 02-39, skipping odd addresses.
Upon affiliation, LGM Phones will build ATS records automaticlly.

WARNING!!! These commands can only be done in VDU mode.

Screen	INPUT	ACTION

ADT, ATG	Delete records for DTG 1 TGC 7 and DTG 7 TGC 11	
ADT	A, DTG #	1
	Message Switch	N
	Start NCMD	07
	End NCMD	10
	TED Number	1
	SYNC Delay	**Y**
	AUTO Sync	Y
	DTG Channel Rate	16
	Group Rate	512
	MUX Signal Format	3A1
	SUBGROUP 1 RATE	256
	SUBGROUP 2 RATE	256
	SUBGROUP 3 RATE	0
	SUBGROUP 4 RATE	0
	In/Out of Service	I
	Mod cable Length	4
	Demod cable Length	1
	Modulation	1
	DTG Repeater	N
	OCU-II Modem	N
	Red Group Clock	N

Screen	INPUT	ACTION
ASR	A, TGC #	7
	TYPE	2 (SEN)
	ABSENT	N
	PACKET SWITCH	N (Change during Link Installation)
	PACKET SWITCH PORT NUMBER(DISPLAY ONLY)	

Screen	INPUT	ACTION
ATS	A, Terminal addresses	Start with 02-10 (**increase by two with each trunk**)
	Terminal Type	86
	TGC #	7
	Path Delay	0
	Satellite Trunk	N
	In/Out of Service	I
	Trunk Number	1 (will increase by one with each trunk)
	Transmission Type	DN
	Packet Switch Trunk	N (only the 14^{th} trunk will be yes)

Screen	INPUT	ACTION
ATS	A	02-08 and 02-09
	Terminal Type	119

End Result is deslayed via the DTG command as shown below.

DTG 1
MSF
3A1

CHN #	BS-LA	TT	TGM PORT	BIT SEQ	USER
1	02-08	119	1	1	SEN OH
2	02-09	119	2	1	LGM OH
3	02-10	86	1	2	SEN TGC
4	02-11	13 or 3	2	2	LGM PHONE
5	02-12	86	1	3	SEN TGC
6	02-13	13 or 3	2	3	LGM PHONE
7	02-14	86	1	4	SEN TGC
8	02-15	13 or 3	2	4	LGM PHONE
9	02-17	86	1	5	SEN TGC
10	02-18	13 or 3	2	5	LGM PHONE
11	02-19	86	1	6	SEN TGC
12	02-20	13 or 3	2	6	LGM PHONE
13	02-21	86	1	7	SEN TGC
14	02-22	13 or 3	2	7	LGM PHONE
15	02-23	86	1	8	SEN TGC
16	02-24	13 or 3	2	8	LGM PHONE
17	02-26	86	1	9	SEN TGC
18	02-27	13 or 3	2	9	LGM PHONE
19	02-28	86	1	10	SEN TGC
20	02-29	13 or 3	2	10	LGM PHONE
21	02-30	86	1	11	SEN TGC
22	02-31	13 or 3	2	11	LGM PHONE
23	02-32	86	1	12	SEN TGC
24	02-33	13 or 3	2	12	LGM PHONE
25	02-35	86	1	13	SEN TGC
26	02-36	13 or 3	2	13	LGM PHONE
27	02-37	86	1	14	SEN TGC
28	02-38	13 or 3	2	14	LGM PHONE
29	02-39	86	1	15	SEN TGC PS
30	02-40	13 or 3	2	15	LGM PHONE
31	02-41	86	1	16	
32	02-42	13 or 3	2	16	LGM PHONE

SECTION VI. AN/TTC-39D/SMU/CDS INTERFACE

1. EQUIPMENT DESCRIPTION:

a. The AN/TTC-39D/SMU/CDS circuit switch was designed as the nucleus of the TRITAC communications system. It provides automatic tandem and access switching over a maximum of 708 lines.

b. The TTC-39D/SMU/CDS switch has the same subscriber affiliation and flood search routing provided in MSE. Though thier switching matrix is all-digital, analog capability is incorporated through the use of Digital Line Termination Units, which provide the necessary digital code conversions to interface with the switching matrix.

c. Two ways to perform this interface, depending on network design:

(1) Circuit Switch (Voice) Gateway. This will be used when the distant switch is in a different Area Code. For this you must use "**Adjacent Area**" type Link modification.

(2) Flood Search Internodal (within MSE type TGC, must be in the same Area Code). Within MSE requires no modification to the standard database.

2. ADJACENT AREA INTERFACE:

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. Verify NYX (Area Codes), COMSEC, Net Id's and group rates with the TTC-39D/SMU/CDS team chief.

b. AIRK/TG will be bulk transferred from the PNCS on order of the Bde SYSCON.

c. The following is an example of a typical **Adj. Area Voice/Packet gateway**:

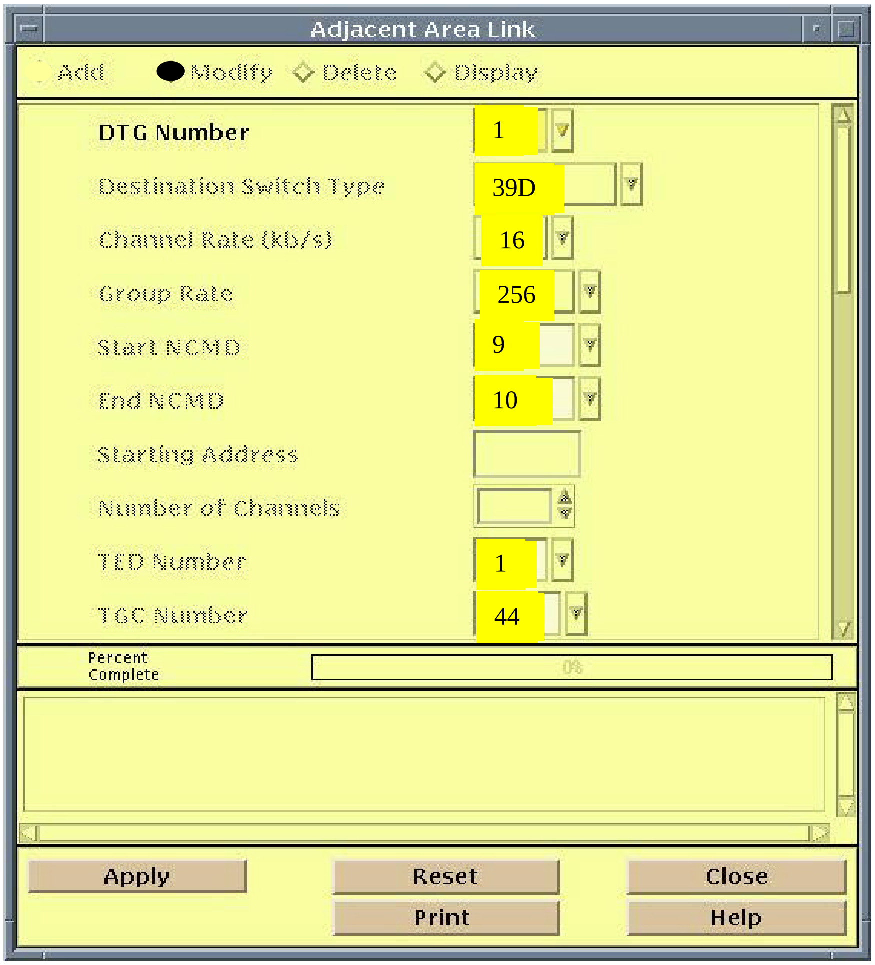
d. NOTE: This example can be used for any Area Code Gateway, reguardless of the switch type.

Basic Information:
DTG 1, TGC 44, distant switch will be in a different Net ID.
Trunks 1 - 15, at TDMX addresses 02-27 through 02-42, skipping address 02-34.

ESOP PROCEDURES.

Highlight Icon DTG 1
right click

Modify Link Type
Modify Link Type To Adj Area
Execute
Apply Adj Area Link



Screen Cont.	INPUT	ACTION
	Destination NYX	406 (ref. to OPORD)
	Modulation	Diphase
	Mod cable Length	1 (mile, never changes)
	Demod cable Length	¼ (actual cable length)
	TSB Number	4
	Path Delay	0
	Satellite Link	No
	Synch Delay	No

Packet Switch	Gateway
Zone Restriction	0
Glare	Accept (verify)
DTG Release Timer	0

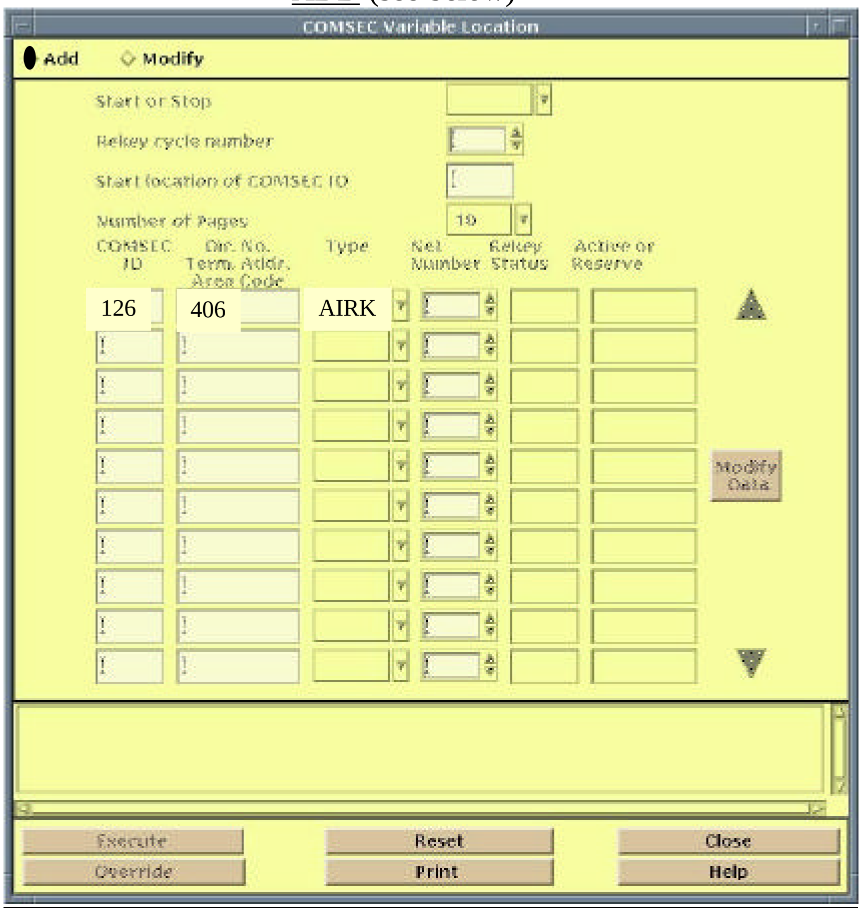
Execute , After all steps Complete, Close Window.

Switch Operations

COMSEC

COMSEC VARIABLE LOCATION

ADD (see below)



EXECUTE , After all steps Complete, Close Window.

NODE MANGEMENT

ROUTING

GATEWAY/COMMERCIAL OFFICE ROUTING

ASSIGN

ADD

Screen	INPUT	ACTION
AGC	A, Interface ID	914406

NATO Designation	6-Digit
Primary TGC	44

<u>EXECUTE </u>, After all steps Complete, Close Window.

Any changes to the above will be specified in the OPORD.

SECTION VII. TYC-39A INTERFACE

1. EQUIPMENT DESCRIPTION:

The AN/TYC-39A is a tactical, automatic store-and-forward message switch. It offers access and tandem message processing for strategic and intelligence communities, automatic message protection and management, dial-up data service with forward error correction, and traffic segregation capabilities. The 22d Signal Bde has the single shelter S-280 version which provides a maximum of 48 subscriber lines.

2. INTERFACE WITH THE TYC-39A:

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. Coordinate/confirm COMSEC, data rate, number channels, etc., with the TYC team chief.

b. The following is an example of operator input:

Basic Information:	NC	LEN
DTG	1	5
TGC	43	43
TED	1	3
NCMD	9,10	19,20
Group Rate	256	256

Node Center provides 10 trunks at TDMX addresses 02-27 through 02-37, skipping address 02-34.

LEN provides 10 trunks at TDMX addresses 04-09 through 04-19, skipping address 04-16.

NOTE: ESOP MACRO provides 15 trunks by default, Operator must delete unwanted trunks.

ESOP PROCEDURES:

Highlight Icon DTG 1

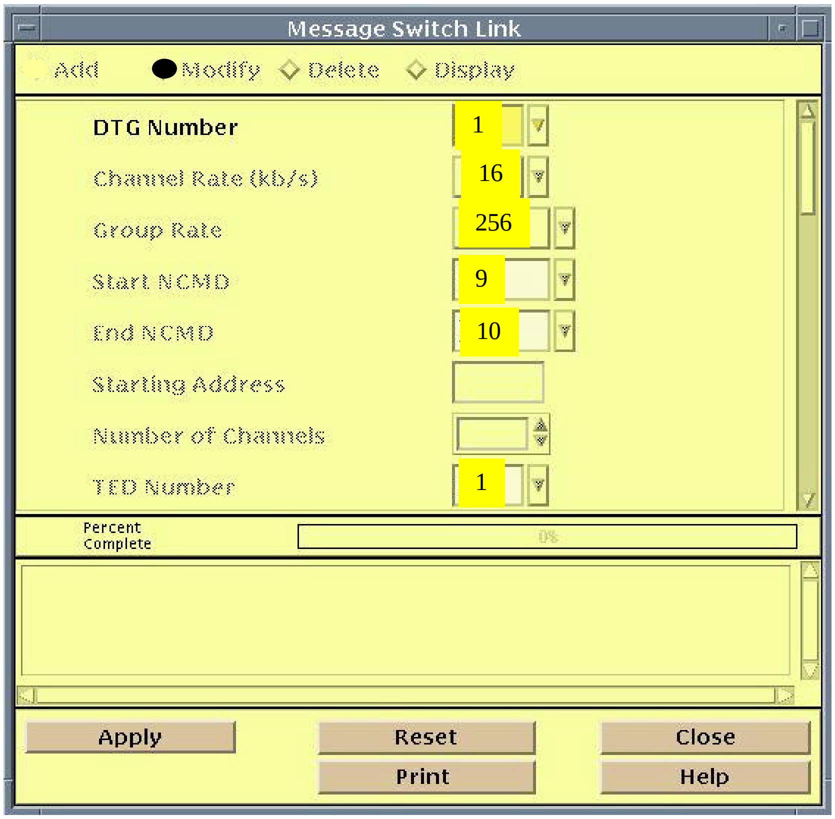
right click

Modify Link Type

Modify Link Type To Message Switch

Execute

Apply Message Switch Link



Screen Cont.	INPUT	ACTION
	TGC Number	43
	Destination NYX	619 (ref. to OPORD)
	Modulation	Diphase
	Mod cable Length	1 (mile, never changes)
	Demod cable Length	¼ (actual cable length)
	TSB Number	4
	Path Delay	0
	Satellite Link	No
	Synch Delay	No
	Zone Restriction	0
	Recover Timing	No
	Glare	Accept (verify)
	DTG Release Timer	0

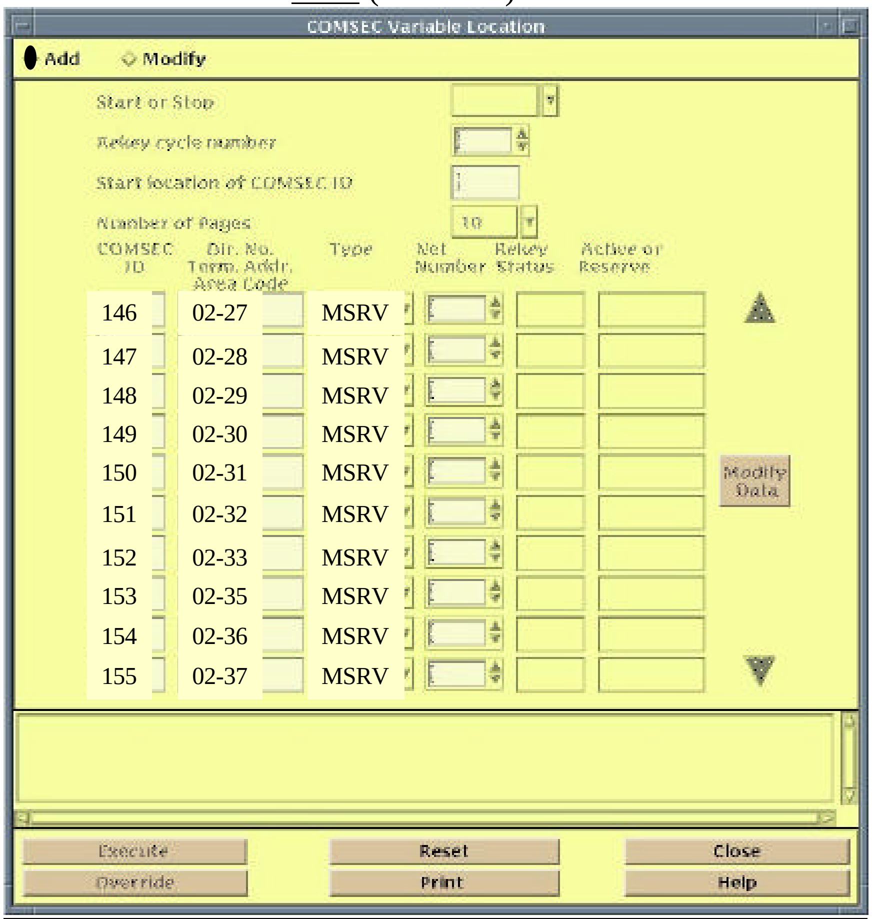
Execute , After all steps Complete, Close Window.

Switch Operations

COMSEC

COMSEC VARIABLE LOCATION

ADD (see below)



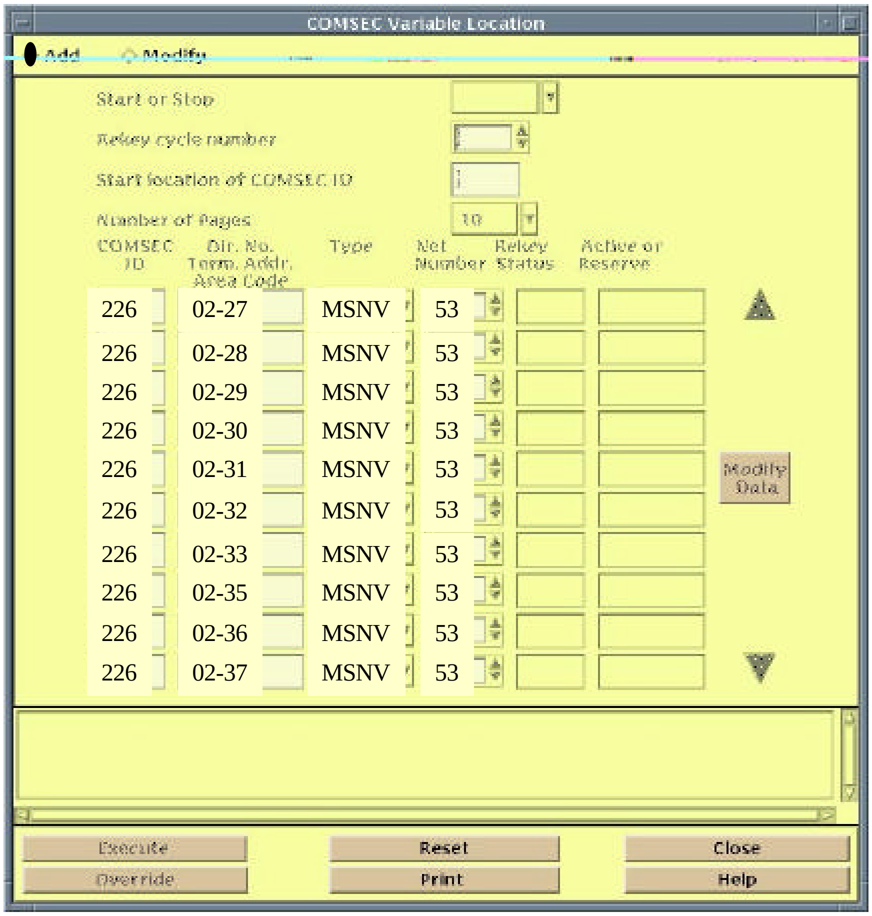
EXECUTE , After all steps Complete, RESET.

Switch Operations

COMSEC

COMSEC VARIABLE LOCATION

ADD (see below)



COMSEC ID	TYPE	NC BS-LA	LEN
146	MSRV	02-27	10-09
147	MSRV	02-28	10-10
148	MSRV	02-29	10-11
149	MSRV	02-30	10-12
150	MSRV	02-31	10-13
151	MSRV	02-32	10-14
152	MSRV	02-33	10-15
153	MSRV	02-35	10-17
154	MSRV	02-36	10-18
155	MSRV	02-37	10-19

COMSEC ID	TYPE	NC BS-LA	LEN	NET
226	MSNV	02-27	10-09	53
226	MSNV	02-28	10-10	53
226	MSNV	02-29	10-11	53
226	MSNV	02-30	10-12	53
226	MSNV	02-31	10-13	53
226	MSNV	02-32	10-14	53
226	MSNV	02-33	10-15	53
226	MSNV	02-35	10-17	53
226	MSNV	02-36	10-18	53
226	MSNV	02-37	10-19	53

<u>EXECUTE</u> , After all steps Complete, Close Window.

<u>NODE MANGEMENT</u>
    <u>ROUTING</u>
        <u>GATEWAY/COMMERCIAL OFFICE ROUTING</u>
            <u>ASSIGN</u>

Screen	INPUT	ACTION
AGC	A, Interface ID	914619
	NATO Designation	6-Digit
	Primary TGC	43

EXECUTE , After all steps Complete, Close Window.

Any changes to the above will be specified in the OPORD.

SECTION VIII. CV-4180A DSN STEP INTERFACE

1. EQUIPMENT DESCRIPTION:

a. The CV-4180 Line Termination Unit (LTU) is a stand alone, transit-case mounted Level 1 Multiplexer. Some of the more V Corps relevant features, capabilities/functions of the LTU are listed below.

Multiplexes up to 36 individual channels into a TRI-TAC framed Digital Transmission Group (DTG).

Detects Loss of Frame and forwards resync commands to an external Trunk Encryption Device (TED), normally a KG-94A.

The loop side may be analog or digital, depending on the type of Digital Line Termination Unit (DLTU) circuit card installed.

The LTU contains nine card slots, with each DLTU supporting either two or four channels per card. The LTU supports a mixture of DLTU card types. DSN trunks require MFLTUs which provide two circuits per card.

PSHTI cards can be installed into slots A-6 and A-7 to extend Tactical Packet Network (TPN) into other approved Data Networks. Slot A-6 can only be used for PSHTI

T1/E1 LTU Interface

Expands interface applications:

:DSN
:Commercial - North America
:Commercial - Outside North America

Tactical Network use of Commercial Carrier Circuits
Allows modified LTU to support T1/E1 capability

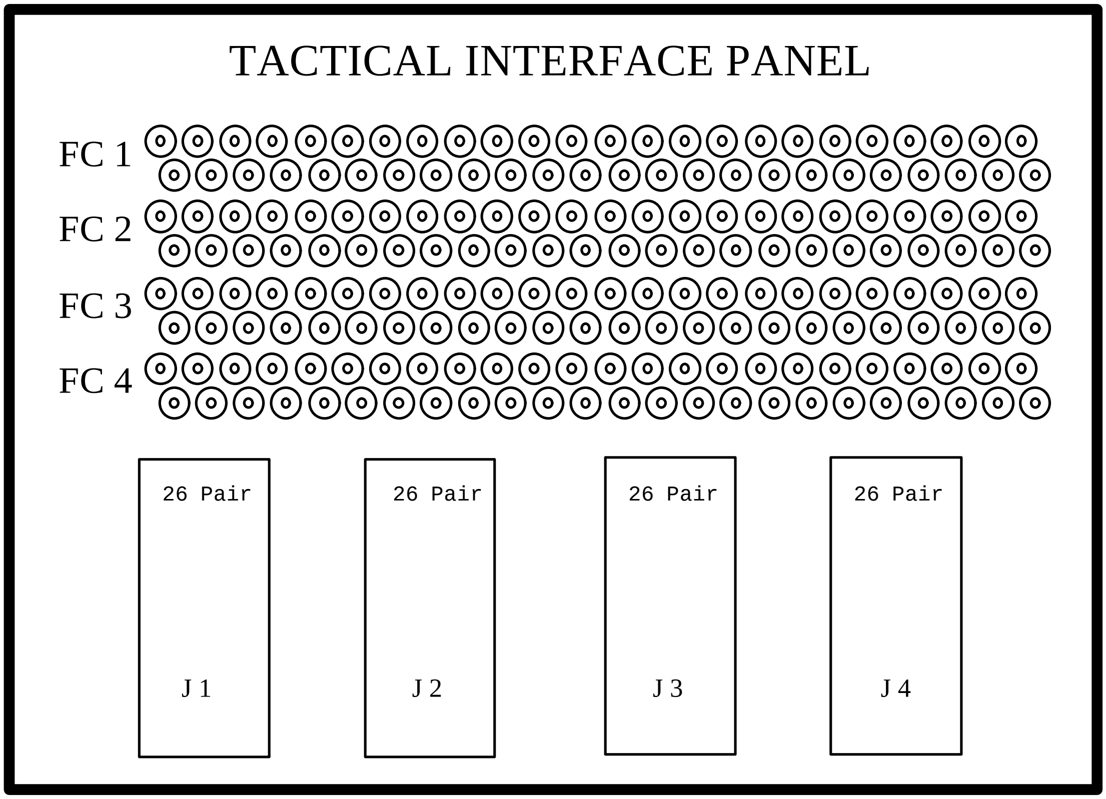
b. The LTU can accommodate many different interfaces, this section will concentrate on two common interfaces: MFLTU DSN and T1/E1 DSN. MSE may interface with the CV-4180 in one of two ways: locally, via cable or remote, via TACSAT or LOS radio - see FIGURE 7-15 and 7-16.

2. INTERFACE DESCRIPTION: MFLTU

a. Interface is performed by the CV-4180, which is connected via CX-11230 coaxial cable directly to an MSE switch or remote transmission assets for transmission into the MSE network.

It is connected by three 26 pr cables to the Tactical Interface Panel - see FIGURE 7-14, of the Defense Communication System (DCS) station.

FIGURE 7-14



b. Depending on the amount of available circuits and mission the LTU's card population and configuration will be published separately by use of a Crew assignment Sheet (CAS). Patching will be accomplished at the DCS Telecommunications Control Facility with use of the Circuit Routing Charts (CRC's) issued with the Telecommunications Service Order (TSO).

FIGURE 7-15

NC / DSN DIRECT

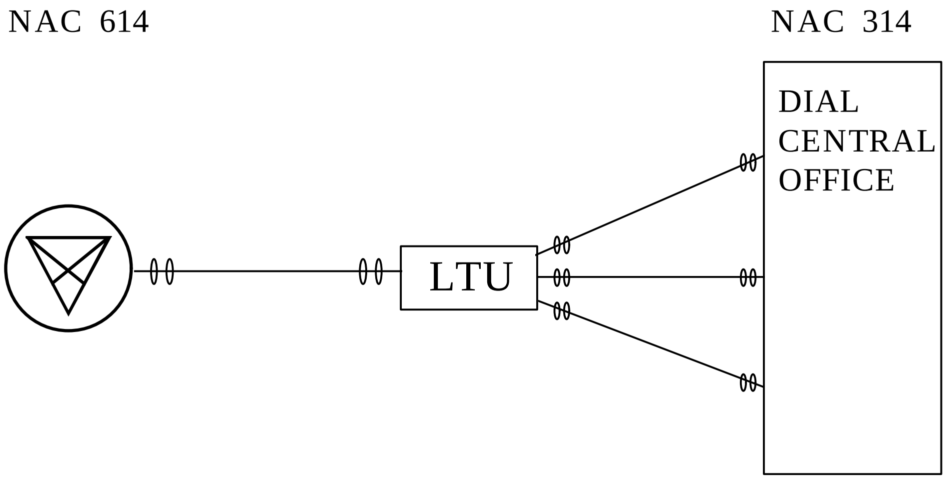
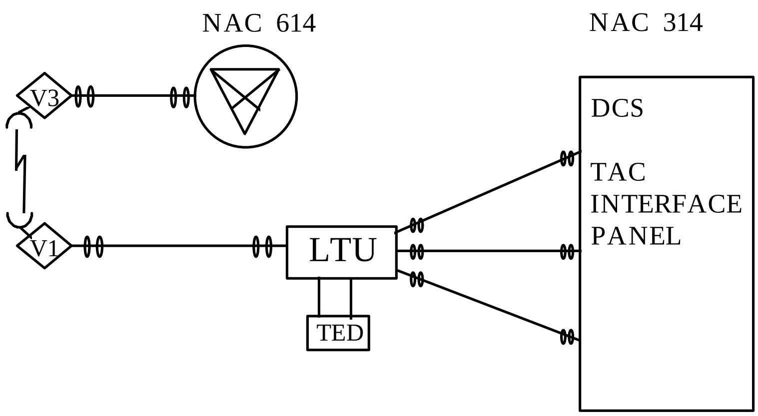


FIGURE 7-16

NC / DSN REMOTE



c. Bulk encryption (if necessary) is provided by the Trunk Encryption Device (TED) in the switch and a External TED, normally a KG-94A at the LTU.

d. The LTU takes the analog signal coming in from the DCS communications equipment and converts it into a digital signal acceptable to MSE. However, modification of the MSE standard database is required.

3. DATABASE MODIFICATION: MFLTU

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. General Information. (Example using DTG 7):
b. Coordinating Instructions.

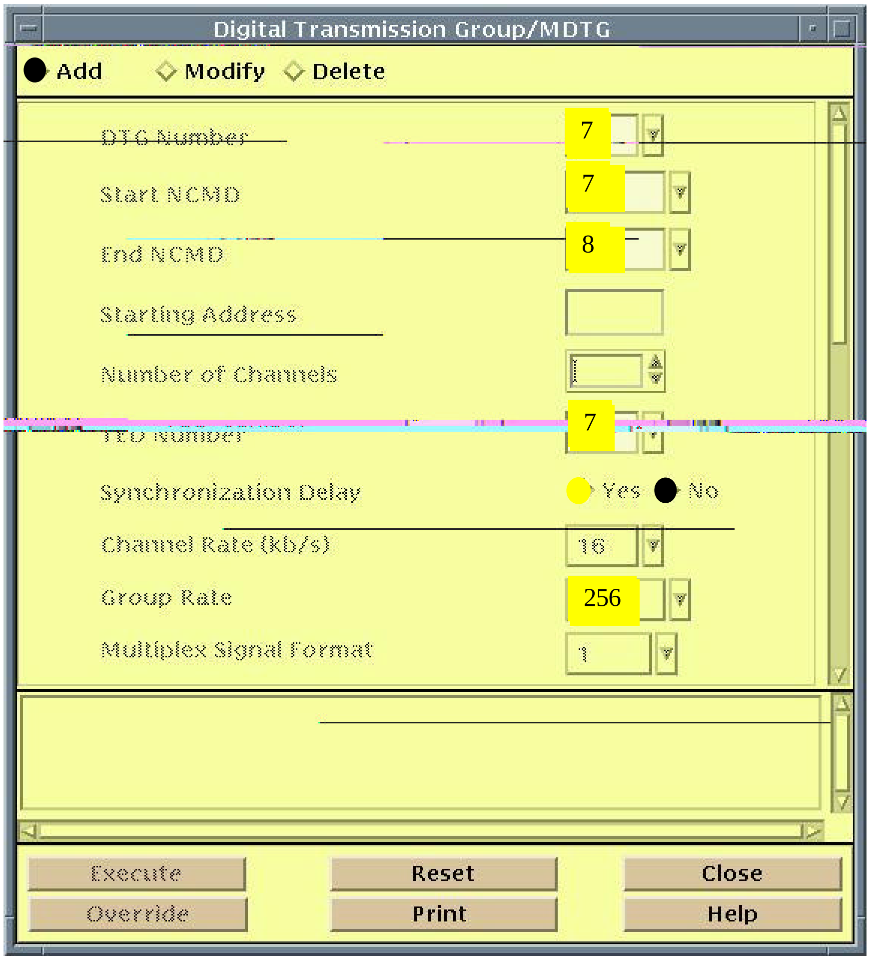
- CV-4180 will be installed at TCF IAW OPORD and TM 11-5805-783-13&P
- Install 12 trunks as shown below.
- Use appropriate Bn Te key for the LOS V1 team supporting the mission.
- Assign Traffic Metering (ATM) to TGC 47 and all NYXs used (312/314) for all reports.

ESOP PROCEDURES.

Highlight Icon DTG 7
right click

Modify Link Type
Delete Link
Execute ,After all steps Complete, Close Window.

Node Management
Digital Transmission Group
ASSIGN



Screen cont.	INPUT	ACTION
	Subgroup 1 Rate	Blank
	Subgroup 2 Rate	Blank
	Subgroup 3 Rate	Blank
	Subgroup 4 Rate	Blank
	Service State	In
	Mod cable Length	1 (mile, never changes)
	Demod cable Length	¼ (actual cable length)
	Modulation	Diphase
	Repeater Mode	No
	OCU	No
	Red Clock Group	Black
	Recover Timing	No
	DTG Release Timer	0

Execute

OVERRIDE, After all steps Complete, Close Window.

Node Management

Terminal Service

Assign

Screen	INPUT	ACTION
ATS	Add, 02-08	Terminal Type 119

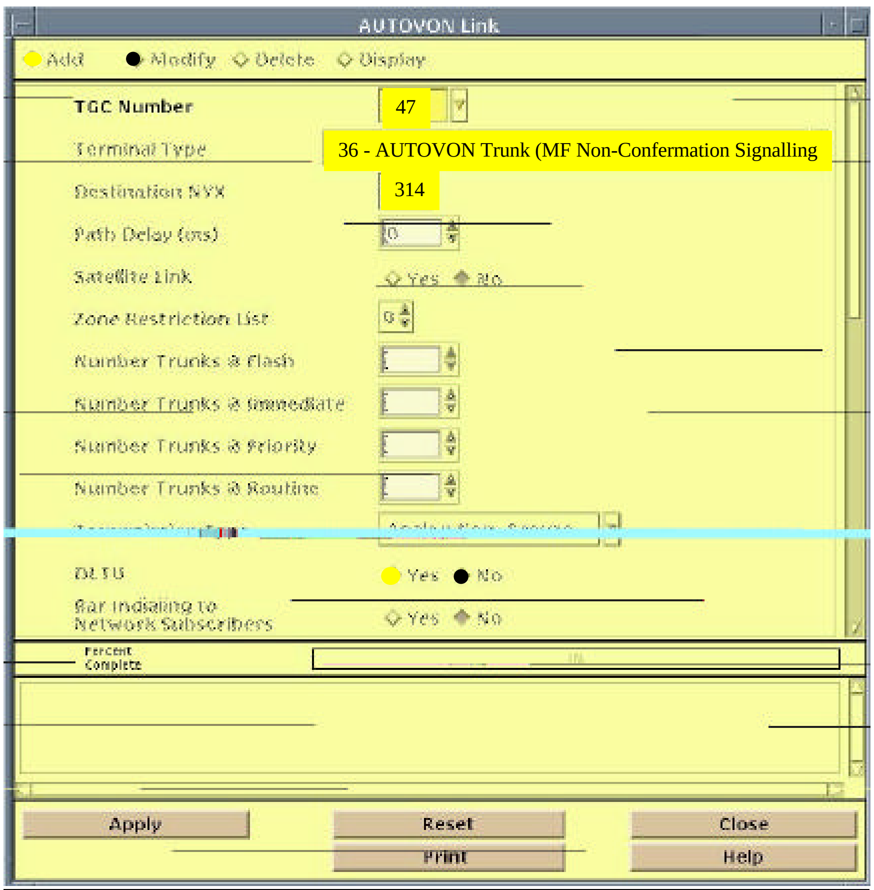
EXECUTE , After all steps Complete, Close Window.

LINK MANAGEMENT

ADD LINK

Add Link Type to Autovon Link TGC 47

APPLY



Screen Cont.	INPUT	ACTION	CBL No	QUAD No
	Trunk 1 Address	02-09	J3	1
	Trunk 2 Address	02-10	J3	2
	Trunk 3 Address	02-11	J3	4
	Trunk 4Address	02-12	J3	5
	Trunk 5 Address	02-13	J3	7

Trunk 6 Address	02-14		J3	8
Trunk 7 Address	02-15		J3	10
Trunk 8 Address	02-17		J3	11
Trunk 9 Address	02-18		J5	5
Trunk 10 Address	02-19		J5	6
Trunk 11 Address	02-20		J5	9
Trunk 12 Address	02-21		J5	10
	02-22	*	J6	1
	02-23	*	J6	2
	02-24	Blank	J6	5

Blank = Operator can affiliate DNVT for troubleshooting purposes.

* Note. Due to PSHTI wiring slot A-7 cannot access channels 14 and 15.

EXECUTE , After all steps Complete, Close Window.

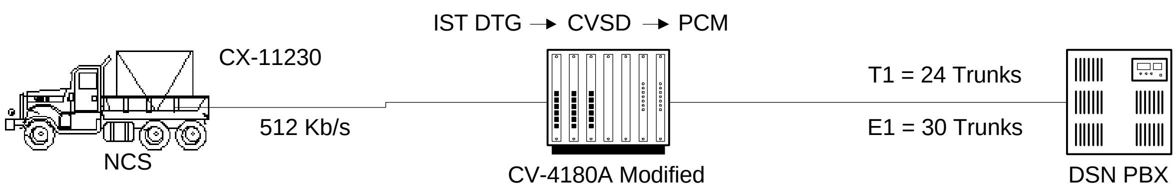
NODE MANGEMENT
ROUTING
GATEWAY/COMMERCIAL OFFICE ROUTING
ASSIGN

Screen	INPUT	ACTION
AGC	A, Interface ID	914314 (see Opord)
	NATO Designation	6-Digit
	Primary TGC	47

EXECUTE , After all steps Complete, Close Window.

4. INTERFACE DESCRIPTION: T1/E1 Trunk Mode DSN

a. Interface is performed by the modified CV-4180A, which is connected via CX-11230 coaxial cable directly to an MSE switch or remote transmission assets for transmission into the MSE network. It is connected to the Commercial Telephone Switch (KNS-4100 for Europe) via standard T1 or E1 trunks. See Figure below.



b. This type of interface has many advantages over MFLTU interfaces:

- Additional trunks available
- Reduced signal conversions
- Less hardware deployed, alignment procedures eliminated
- Increased secure and data call completion rate

5. DATABASE MODIFICATION: T1/E1 Trunk Mode DSN

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. General Information. (Example using DTG 7):
b. Coordinating Instructions.

- CV-4180 will be installed at TCF IAW OPORD and TM 11-5805-783-13&P
- Program 24 trunks for T1 or 30 trunks for E1 by deleting unwanted trunks.
- Database programming changes from a conventional level one mux to a Non-Flood Search (Deterministic) Interswitch Trunk Group (IST)
- Use appropriate Bn Te key for the LOS V1 team supporting the mission.
- Assign Traffic Metering (ATM) to TGC 47 and all NYXs used (312/314) for all reports.

ESOP PROCEDURES.

Highlight Icon DTG 4
right click

Modify Link Type
Delete Link
Execute ,After all steps Complete, Close Window.

LINK MANAGEMENT
ADD LINK
Add Link Type to Deterministic Link TGC 47
APPLY (program either E1 or T1, See OPORD)

E1

DETERMINISTIC LINK													
DTG #	TGC #	CHN RATE	Group RATE	TED #	DEST NYX	SAT LINK	PKT SW Y/N/G	GLARE A/R	START NCMD	END NCMD	# of TRUNKS TT 29	PSC	TSB #
7	47	16	512	7	312	N	N	**A**	1-27	1-30	30	02-26	2

T1

DETERMINISTIC LINK

DTG #	TGC #	CHN RATE	Group RATE	TED #	DEST NYX	SAT LINK	PKT SW Y/N/G	GLARE A/R	START NCMD	END NCMD	# of TRUNKS TT 29	PSC	TSB #
7	47	16	512	7	312	N	N	**A**	1-27	1-30	24	02-26	2

EXECUTE , After all steps Complete, Close Window.

NODE MANGEMENT
TERMINAL SERVICE
ASSIGN
DELETE

Screen	INPUT	ACTION
ATS	D	05-60 (For E1, 30 trunks)
	D	05-55 through 05-60 (For T1, 24 trunks)

EXECUTE , After all steps Complete, Close Window.

NODE MANGEMENT
ROUTING
GATEWAY/COMMERCIAL OFFICE ROUTING
ASSIGN

Screen	INPUT	ACTION
AGC	A, Interface ID	914314 (see Opord)
	NATO Designation	6-Digit
	Primary TGC	47

Screen	INPUT	ACTION
AGC	A, Interface ID	914312 (see Opord)
	NATO Designation	6-Digit
	Primary TGC	47

EXECUTE , After all steps Complete, Close Window.

VDU EMULATION (Not available with ESOP)

Screen
ADX (ASSIGN DIGIT TRANSLATION)

TGC #	SUBCRIBER DIGITS IN	MODIFY TO OUTPULSE
47	314*******	---*******
47	312*******	---*******

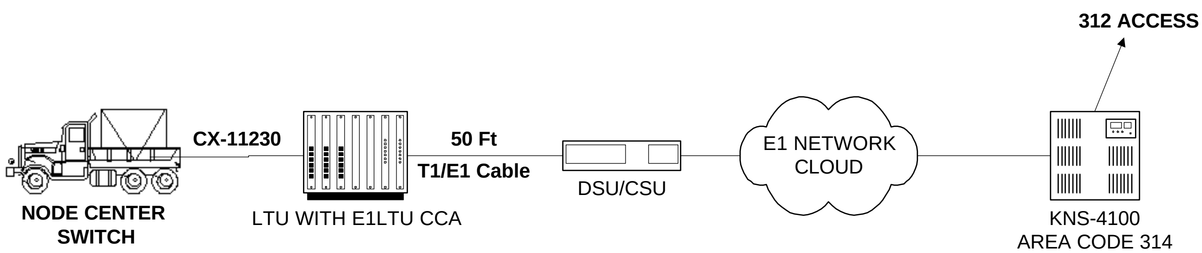
XMIT

STORE, After Complete, Close Window.

NOTE: Leave all areas blank except what is shown above. * equals Asterisk , - equals Dash. Extreme caution must be taken to ensure there are seven Asterisk's and three Dash's.

6. E1 Installation.

- Verify Cutsheet via TSO with Tech Control and DCO Technicians
- Verify Cabling with Tech Control and DCO Technicians (is a crossover cable required)
- Remove MUX-DEMUX (MXDMX) CCA and replaced with T1LTU or E1LTU CCA
- MXDMX CCA must be manually programmed via DIP Switches (see LTU Cutsheet)
    - MXDMX CCA has three LEDs
        - TOP - Extinguished after successful BITE
        - MIDDLE - YELLOW ALARM: Remote T1/E1 carrier missing
        - BOTTOM - T1/E1 Xmit carrier missing
- To RESET LTU, Cycle Power
- If TED is not used, Insure TED Bypass cable is installed
- Connect P1 of T1/E1 Special Cable to J3 (next to HVA)
- Connect P2 of T1/E1 Special Cable to Channel Service Unit (CSU)
    - Use Crossover Cable if necessary (Must fabricate, see diagram)
- Insure DTG is in SYNC, STATUS 13
- Insure TSB is in SYNC, STATUS 5
- Insure all trunks pass AOD 10, TGC passes AOD 18



LINE TERMINATION UNIT (CV-4180A)

INTERNAL CONFIGURATION

CCA SLOT	DLTU TYPE	PURPOSE		
A1				
A2				
A3				
A4				
A5				
A6				
A7	DLPMA	DNVT, 26 Pair cable J6, Quad 3 and 4		
A8				
A9				
A10	CCA	MXDMX	T1LTU	**E1LTU**
A12	TIMTG	MASTER	**SLAVE**	
A14	TIMBT	**2**		

FRONT PANEL SWITCHES

DVOW HOME CODE (1-16)	
TEST SELECT	**OPERATE**
CABLE LENGTH (1-9)	1
GROUP RATE (1-9)	6
CHANNEL RATE	**16 KHZ**
MODULATION TYPE	**DIPHASE**

DVOW RING CODE DIRECTORY

1		7		13	
2		8		14	
3		9		15	
4		10		16	
5		11			
6		12			

T1LTU OR E1LTU SWITCH SETTINGS

S1

Switch	1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	ON	ON	ON	ON
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Function	NOT USED		SAT HOPS		NOT USED			
Setting	SET TO ON	SET TO ON	see table below (TRUNK MODE ONLY)		SET TO ON			

3	4	HOPS
OFF	OFF	0
OFF	ON	1
ON	OFF	2

S2

Switch	1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	ON	ON	ON	ON
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Function	SIG	MODE	FRM	CODE	SIG	T1 or E1 CABLE LENGTH		
Setting	ON = DSN Signaling (MLPP) **(TRUNK MODE ONLY)** OFF = Commercial Signaling	ON = DTG-CXR Mode (pipeline) OFF = TRUNK MODE	ON =E1 Normal Frame or T1 SuperFrame OFF = E1 CRC-4 Frame or T1 ESF	ON = B7 OFF = B8ZS **(T1 ONLY)**	ON = Transparent Signaling OFF = ABCD Bit Signaling	see table below		

6	7	8	LENGTH (Feet)
ON	ON	ON	0 - 110
ON	ON	OFF	111 - 220
ON	OFF	OFF	221 - 330
ON	OFF	OFF	331 - 440
OFF	ON	ON	441 - 550
OFF	ON	OFF	551 - 650

S3

Switch	1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	ON	ON	ON	ON
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Function	START TYPE	DIG DLY	SIGNALING TYPE		N/A	DIG CAD	NOT USED	
Setting	ON = Digit Delay Start OFF = Wink Start	ON = Digit Delay 70 mSec OFF = No Digit Delay	see table below			ON = T1 = 100/100 E1 = 70/70 OFF = T1 = 50/50 E1 = 60/60 SEE NOTE 1	SET TO OFF	SET TO OFF

3	4	TYPE
OFF	OFF	DTMF
OFF	ON	MF
ON	ON	DIAL PULSE

(TRUNK MODE ONLY)

GROUP RATE SETTINGS

1	72	16K ONLY	6	512	16K OR 32K
2	128	16K ONLY	7	576	16K OR 32K
3	144	16K ONLY	8	1024	16K OR 32K
4	256	16K OR 32K	9	1152	16K OR 32K
5	288	16K OR 32K			

CABLE LENGTH SETTINGS

0	0	MILES	5	LOOPBACK
1	1/4	MILES	6	NOT USED
2	1/2	MILES	7	NOT USED
3	3/4	MILES	8	NOT USED
4	1	MILES	9	NOT USED

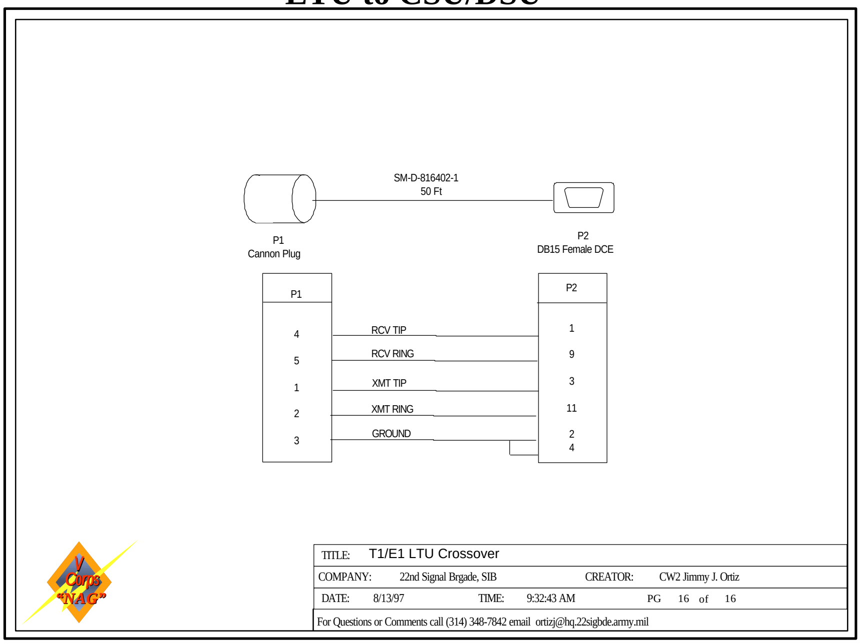
NOTE 1 : (Digit Cadenence in mSec for DTMF or MF COMMERCIAL Singaling Only)

NOTE 2 : DIP Switches S-4 and S-5 are NOT USED, SET TO OFF

Crossover Cable Diagram

- Prepare Male DB15 using pinouts below to DCO/Tech Control Technicians instructions

LTU to CSU/DSU



Line Termination Unit CCA Functional Description - LTU

Digital Line Termination Units (DLTUs).
Nine of the 21 CCA slots in the LTU are assigned to DLTUs. There are seven types of DLTUs that can be placed in the 9 CCA slots, with certain placement rules applying. The seven DLTU types are as follows:

DLPMA The Diphase Loop Modem-A is a CCA that provides up to four single-channel conditioned Diphase interfaces and phantom loop power to Digital Subscriber Voice Terminals (DSVTs) and or Digital Nonsecure Voice Terminals (DNVTs).

EMLTU The E&M Line Termination Unit is a CCA that provides up to two standard Type I E&M interfaces, whereby trunk signaling is accomplished by signaling lines separate from the voice paths.

MFLTU The Multifrequency Line Termination Unit is a CCA that provides up to two termination's which employ single-frequency (SF) supervision and either multifrequency (MF), dual-tone multi-frequency (DTMF), or Dial Pulse (DP) signaling.

4WLTU The 4-Wire Line Termination Unit is a CCA that provides up to four 4-wire analog interfaces.

2WLTU The 2-Wire Line Termination Unit is a CCA that provides up to four 2-wire analog interfaces. Use of the 2WLTU in the Line Termination Unit requires that the 20-Hz Generator card set be installed as specified in paragraph 1-9.8.

TCLTU The Twenty Hertz Contact Closure Line Termination Unit is a CCA that provides up to two 2-wire DC Closure/20-Hz Ringdown supervised analog interfaces. Use of the TCLTU in the Line Termination Unit requires that the 20-Hz Generator card set be installed (unless only Line type 44 is to be supported) .

NILTU The NATO interface Line Termination Unit is a CCA that provides up to two single-channel NATO loop interfaces. Use of the NILTU CCA in the Line Termination Unit requires that a NATO Crossover Cable, SM-DS11745 be connected to the far end of the 26-pair loop cable, SM-D-81 1235.

Loop Multiplexer/Demultiplexer (LMD).
The LMD (MXDMX CCA) uses time division multiplexing to interleave 8, 9, 16, 18, 32, or 36 channel groups into a single data stream. It also performs the reverse function of demultiplexing a data stream.

Transmission Group Module/Orderwire (TGMOW).
The TGMOW CCA contains a transmission group module (TGM) circuit and an engineering orderwire signal processor (EOWSP) circuit. The TGM provides time buffering and frame synchronization for the multiplexed bit stream. It also provides an external balanced NRZ baseband signal for use in cryptographic or other terminal equipment. The EOWSP combines and conditions the order wire are received from the Digital Voice Order wire CCA and forwards the data to the Group Modem to be superimposed on the line side group signal.

Group Modem (GM).

The GM CCA receives equipment-side multiplexed data and clock, modulates it to a conditioned Diphase or dipulse group signal, and performs the reverse function. It also receives Order Wire data from the engineering orderwire signal processor and superimposes the data on the line-side group signal. The GM operates at a group rate and cable length selected on the front panel. Group rates vary from 128 to 1152 kHz; cable lengths vary from zero to one mile in 1/4 mile increments.

Digital Voice Orderwire (DVOW).

The DVOW (DVOWA CCA) is capable of processing eight 16 kb/s DVOW channels. The delivered LTU uses only one channel. It contains a ring code detector, ring code generator, and a KY-57 interface circuit. It routes digital voice data to the KY-57 through a connector on the LTU rear panel. The KY-57 encrypts/decrypts the data and provides an analog voice interface to the KY-57 handset. It generates and detects 16 DVOW ring codes.

Timing Generator.

The timing generator operates in either a local standalone mode or in a Slave mode. In the slave mode, timing is slaved to a recovered clock from the group modem. In the slave mode, if the recovered clock is lost. the timing generator automatically defaults to its local oscillator. A master/slave toggle switch is located on the timing CCA (TIMTG) that overrides all other timing controls.   When placed in the slave Position, the LTU's timing operates slaved to a clock in the switching system. In the master position, al(clocking comes from the internal crystal oscillator in the local timing generator. The LTU normally operates with this switch in the slave position.

Built in Test Equipment (BITE).

The BITE function employs the TIMBT CCA to provide fault alarm collection and a front panel fault/status display. A summary alarm (SMY FAULT) lights when any internal fault occurs, and works together with the BITE FAULT Leeds to direct the operator to the specific area in which the fault occurred. The BITE FAULT LEDs provide two separate fault codes: the first, a two-digit code, identifies the CCA that failed; the second a single-digit code, describes the particular type of fault (interlock, -15V failure, loss of mux, etc.).

20-Hz Generator.

The LTU must be populated with a 20-Hz Generator (not provided with the delivered LTU) whenever the LTU is populated with a TCLTU CCA (unless only Line Type 44 is to be supported) or a 2WLTU CCA. The purpose of the 20-Hz Generator is to provide 20-Hz voltages for ringing out on two-wire common battery lines, and 20-Hz ringdown lines and trunks. The 20-Hz Generator card set consists of three (3) CCAs.

Line Termination Unit Card Population

REF DES	NAME	PART NO.	Function
A1	DLTU		
A2	DLTU		
A3	DLTU		
A4	DLTU		
A5	DLTU		
A6	DLTU		
A7	DLTU		
A8	DLTU		
A9	DLTU		
A10	MXDMX	06-1402258-2	Provides time-division multiplexing demultiplexing function.
A11	TGMOW	SM-E-820421	Provides line buffering and frame synchronization for signals. Demodulates Diphase stream to NRZ for use in cryptographic or other terminal equipment requiring TTL levels, and performs the reverse function. Combines and conditions orderwire data received from DVOW.
A12	MTG	06-1408949-1, -2	Provides the LTU with a timing generator that can be operated in either a master or slave mode. In the slave mode, if the clock pulse used to slave the timing generator is absent, the timing generator operates using its local oscillator.
A13	GPMDM	SM-E-820429-3*	Modulates multiplexed NRZ to conditioned Diphase or dipulse group signals, and performs the reverse function.
A14	TIMBT	06-1408960-1	Provides fault collection, and fault and status display capabilities to the LTU BITE function.
A15	Spare		
A16	Spare		(Reserved for 2O-HZG CCA, if needed. P/O 20-HZ GEN card set)
A17	Spare		(Reserved for STGEN CCA, if needed. P/O 20-HZ GEN card set)
A18	Spare		(Reserved for STDlS CCA, if needed. P/O 20-HZ GEN card set)
A19	Spare		
A20	DVOWA	06-1404382-3*	Functions as interface for the LTUs channel.
A21	Spare		

* GPMDM card SM-E-820429-3 is preferred; SM-E-820429-2 is an alternate.
* DVOWA card 06-1404382-3 is preferred; 06-1404382-2 is an alternate.

Performance Characteristics

Data Rate: 16 kb/s
32 kb/s

Group Rate:

Group Rate	Number of Channels/Channel Rate	
1152*	36/32	
1024	32/32	
576*	18/32 or 36/16	
512	16/32 or 32/16	
288*	9/32 or 18/16	*Group rates followed by an asterisk are rates for
256	8/32 or 16/16	Diphase and Dipulse operation.
144	9/16	Group rates not followed by an asterisk
128	8/16	are used for Diphase operation only.

Cable Length Switch Settings

Cable Length Setting	Receive	Transmit	Mode
0	0	1	Diphase/dipulse
1	1/4	1	Diphase/dipulse
2	1/2	1	Diphase/dipulse
3	3/4	1	Diphase/dipulse
4	1	1	Diphase
5	Loop back		
6	0	0	dipulse
7	1/4	1/4	dipulse
8	1/2	1/2	dipulse
9	3/4	3/4	dipulse

Group Modem Operating Rate Settings

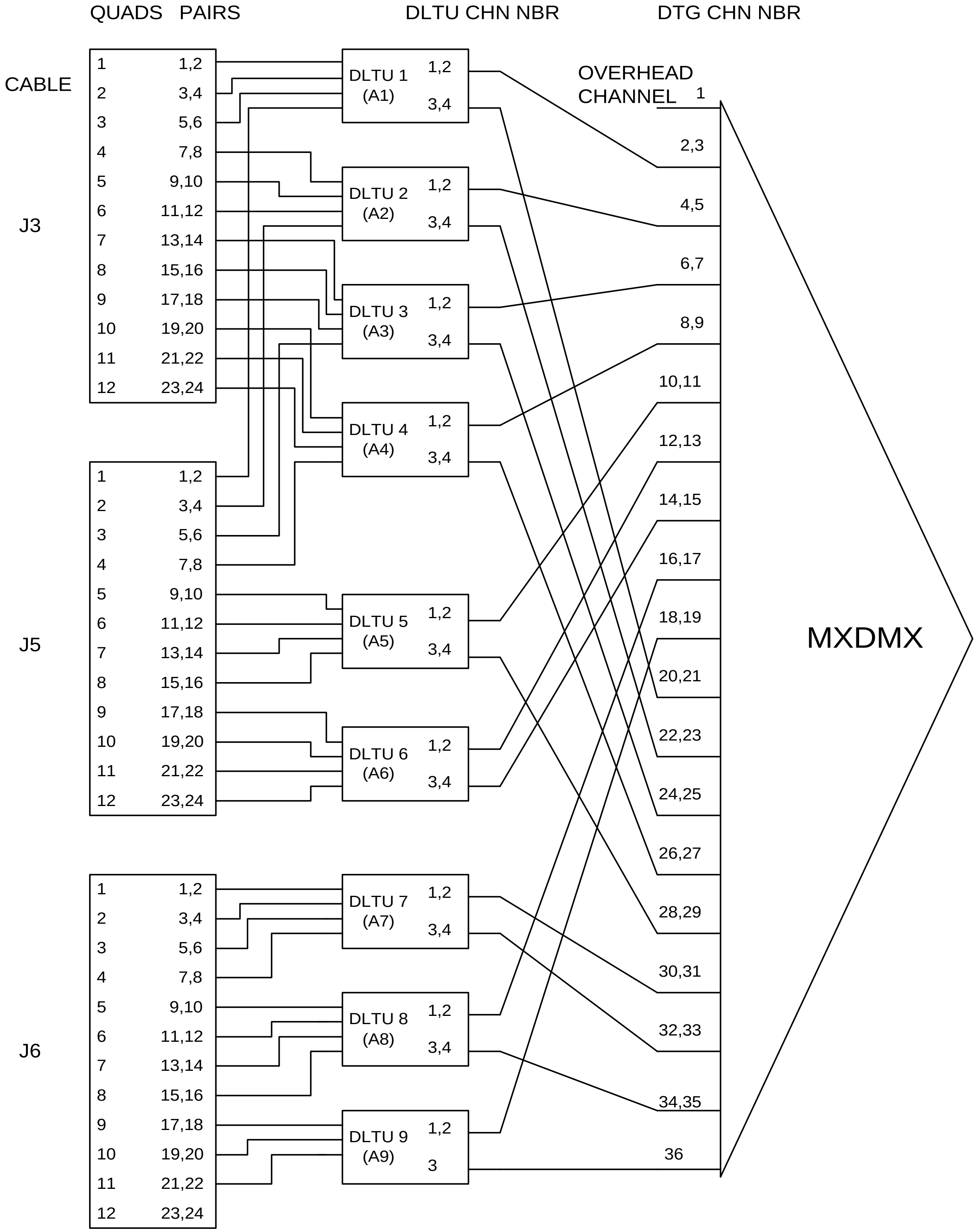
GROUP RATE SWITCH SETTING	SWITCH RATE 32 KHZ/16 kHz	TRANSMISSION RATE (kHz)	CHANNEL (kHz)	SIZE LOOP CAPICITY
1	16	--	--	--
2	16	128	8	7
3	16	144	9	8
4	16	256	16	15
5	16	288	18	17
6	16	512	32	31
7	16	576	36	35
4	32	256	8	7
5	32	288	9	8
6	32	512	16	15
7	32	576	18	17
8	32	1024	32	31
9	32	1152	36	35

LINE TERMINATION UNIT CHANNEL ASSIGNMENT

MXDMX CHAN	DLPMA	EM LTU	MF LTU	2W LTU	4W LTU	TCL TU	NI LTU	Card Slot	Circuit Number	Rear Con	Term Quad	J-box Quad
1	(Framing Channel)											
2	X		X	X	X	X	X	A1	1	J3	1	1
3	X		X	X	X	X	X	A1	2	J3	2	2
4	X		X	X	X	X	X	A2	1	J3	5	4
5	X		X	X	X	X	X	A2	2	J3	6	5
6	X		X	X	X	X	X	A3	1	J3	9	7
7	X		X	X	X	X	X	A3	2	J3	10	8
8	X		X	X	X	X	X	A4	1	J3	13	10
9	X		X	X	X	X	X	A4	2	J3	14	11
10	X	X	X	X	X	X		A5	1	J5	17	5
11	X	X	X	X	X	X		A5	2	J5	18	6, 7*
12	X	X	X	X	X	X		A6	1	J5	21	9
13	X	X	X	X	X	X		A6	2	J5	22	10, 11*
14	X	X	X	X	X	X		A7	1	J6	25	1
15	X	X	X	X	X	X		A7	2	J6	26	2, 3*
16	X	X	X	X	X	X		A8	1	J6	29	5
17	X	X	X	X	X	X		A8	2	J6	30	6, 7*
18	X		X	X	X	X		A9	1	J6	33	9
19	X		X	X	X	X		A9	2	J6	34	10
20	X		X	X				A1	3	J3	3	3
21	X		X	X				A1	4	J5	4	1
22	X		X	X				A2	3	J3	7	6
23	X		X	X				A2	4	J5	8	2
24	X		X	X				A3	3	J3	11	9
25	X		X	X				A3	4	J5	12	3
26	X		X	X				A4	3	J3	15	12
27	X		X	X				A4	4	J5	16	4
28	X		X	X				A5	3	J5	19	7
29	X		X	X				A5	4	J5	20	8
30	X		X	X				A6	3	J5	23	11
31	X		X	X				A6	4	J5	24	12
32	X		X	X				A7	3	J6	27	3
33	X		X	X				A7	4	J6	28	4
34	X		X	X				A8	3	J6	31	7
35	X		X	X				A8	4	J6	32	8
36	X		X	X				A9	3	J6	35	11

- Junction box quad for EMLTU Card only.

LTU SHOWING PSHTI WIRING



SECTION IX. DIGITAL EUROPEAN BACKBONE

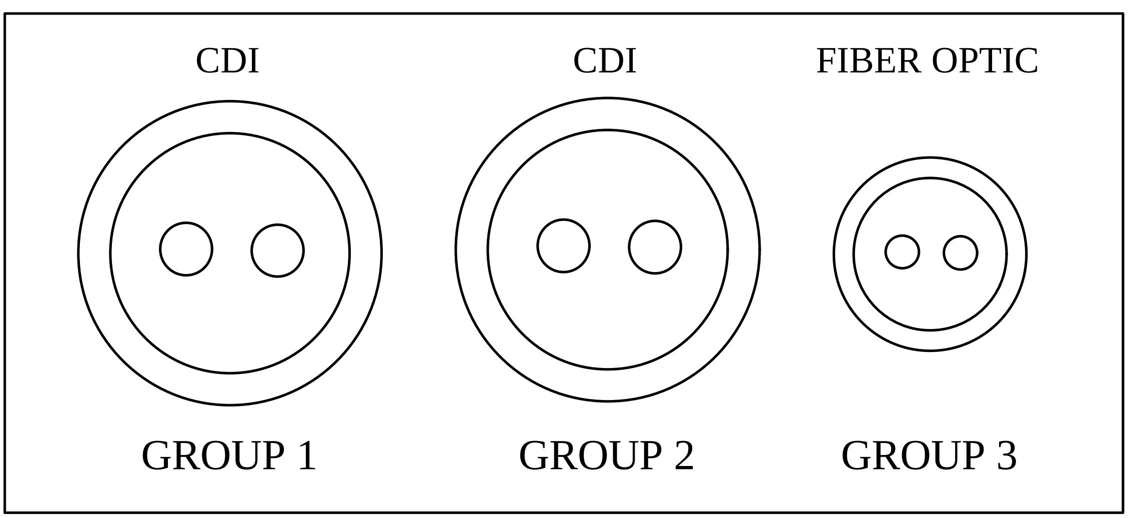
1. GENERAL. The Digital European Backbone (DEB) is made up of strategic Defense Information Systems Agency (DISA) Radio, Multiplexer, and Fiber Optic assets. Located throughout Europe are numerous Defense Communication System (DCS) Stations which house these assets and provide necessary Telecommunications control functions. Through use of the DCS Stations TRI-TAC Port, MSE is capable of maintaining long-haul communication with other TRI-TAC and MSE equipment without having to provide organic TACSAT and TROPO assets. Node Centers, and Small Extension Nodes in the V Corps MSE Network can expect to terminate DEB links. Such circuits are frequently used to extend a DTG long distances, for example from Heidelberg or Darmstadt to Grafenwehr. The primary advantage of DEB is its reliable virtual circuit or path which is part of a world-wide network.

2. INTERFACE DESCRIPTION:

a. The Circuit is initiated via local DTG at a TTC-47, TTC-48 or LOS etc. The two types of cable connections available to the user are CX-11230 cable for Groups 1 and 2, and Fiber Optic cable for Group 3, see FIGURE 7-17. The TRI-TAC interface will accept any of the following data rates: 72, 128, 144, 256, 288, 512, and 576.

FIGURE 7-17

TRI-TAC INTERFACE BOX



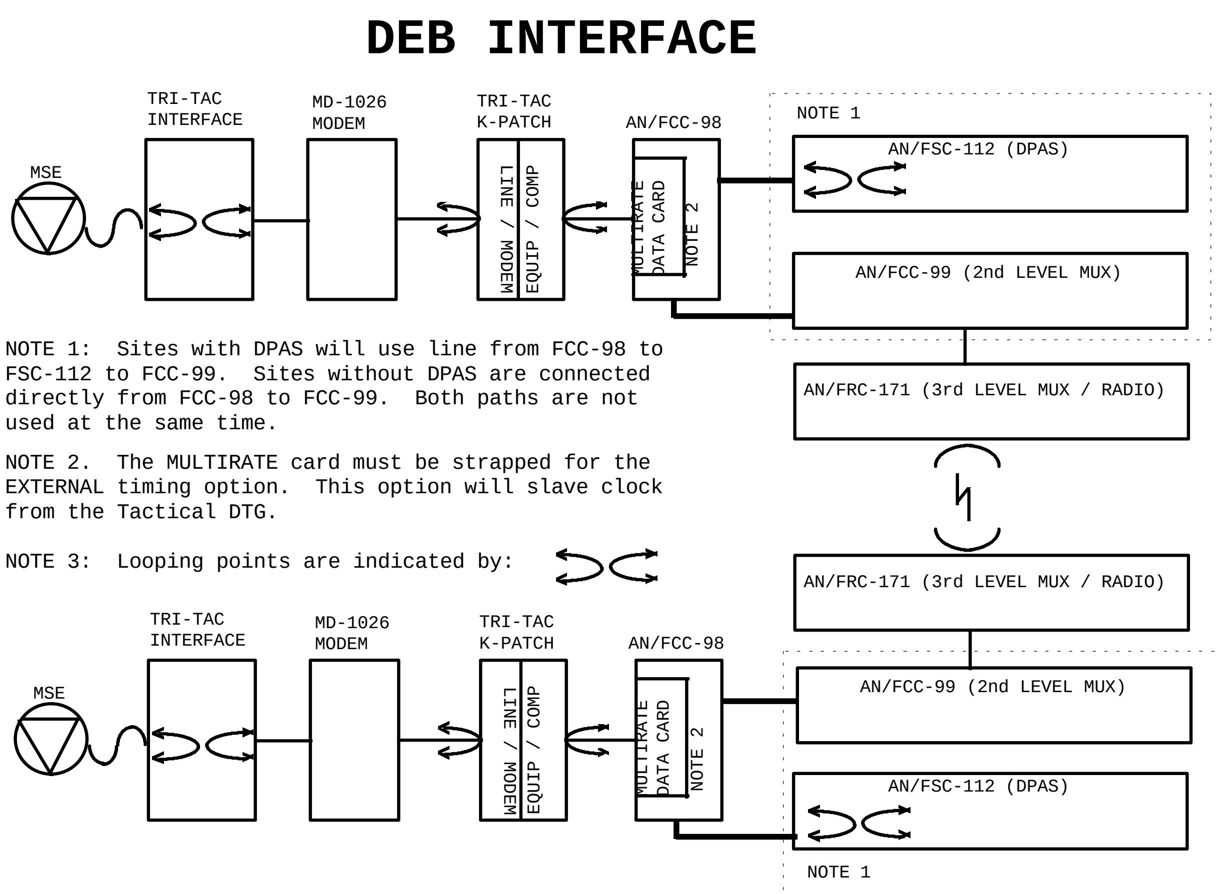
3. EQUIPMENT DESCRIPTION:

a. Signal Flow SEND: The MSE DTG is passed, via CX-11230 or Fiber cable, to the TRI-TAC interface port located adjacent to the DCS. The TRI-TAC interface is connected to the GM by coaxial cable (FOM and cable for GP-3) and is converted from Conditioned Diphase to NRZ at the GM. The resultant NRZ signal is separated into data which becomes the transmit data into the FCC-98, and timing which becomes the transmit clock in into the FCC-98. The FCC-98's multirate card must be strapped for the appropriate rate and channelization, and MUST be strapped to use the EXTERNAL timing option. From the FCC-98 the multiplexed signal (1.544 Mb/s) is passed to the DACCS 11 frame (DPAS) and then to one of eight FCC-99 ports. Next, this 12.928 Mb/s, Mission Bit Stream (MBS is sent to the third level Multiplexer of the AN/FRC-171 radio. The Aggregate (26.112 Mb/s) is then converted to a 8-GHZ LOS transmission to a distant DCS station.

b. Signal Flow REC: The circuit is received and demultiplexed in a reverse application of the above paragraph. At the GM level, data and clock from the FCC-98 is passed to the REC data and clock of the GM which converts this NRZ signal to Diphase for CX-11230 cable transmission to the tactical van.

c. System Diagram. FIGURE 7-18

FIGURE 7-18



4. COORDINATION INSTRUCTIONS.

a. Prior to exercise: Teams must inform Corps G-6 of intent to use DEB in a timely manner to insure that a Request For Service (RFS) can be sent to 5th Signal Command. 5th Sig in turn submits a Telecommunications Service Request (TSR) to the Defense Information Service Agency (DISA) who will issue the Telecommunications Service Order (TSO) to all organizations involved.

b. These TSO's will be the basis for all installation and troubleshooting worksheets, details will be provided by OPORD.

c. Units involved must coordinate for real estate and commercial power hookups.

d. Prior to Set Up: Test circuit on looback from TRI-TAC interface box. GM alarms should clear.

e. During Set up: TRI-TAC circuits being activated should, at a minimum, have the following tests performed.

(1) Install loopback on CX-11230 cable toward the tactical van.

(2) Install loopback on TRI-TAC K-Patch, "line side", toward the tactical van.

(3) Install or have installed bi-directional DPAS loopback.

f. If circuit does not come up.

(1) DPAS or ANY bi-directional loop brings both users up but circuit does not come up.

(a) Both users should verify COMSEC keymat.

(b) If COMSEC keymat is changed or verified and circuit does not come up, it is possible that a tip-ring reversal exists at ONE of the two DCS TRI-TAC locations.

(2) Circuit loops good to local user from TRI-TAC interface box but does not loop good from K-Patch .

(a) Possible modem problem: Verify proper operation of the MD-1026.

(b) Possible K-Patch problem: Due to the placement of the K-patch and the proximity of the modem clock, this loop does not always work. Try loopback from location beyond the K-patch (i.e. DPAS or distant end.)

(c) Possible coaxial cable problem: It is possible that the transmit/receive coaxial cables between the TRI-TAC interface and the MD-1026 modem could be reversed.

SECTION X. SB-3865 DATABASE MODIFICATIONS

1. INTERFACE DESCRIPTION:

On most Corps level exercises the Brigade will interface with at least one SB-3865 Switch. Interface Data will be provided in the OPORD. Some things to remember in interfacing with a SB-3865. SB-3865 subscribers must dial "91" to access MSE. Once MSE dial tone is received, the 3865 subscriber can dial any valid 7, 10, or 13 digit number. DSN trunking for the 3865 will be provided by TTC-39D switches or LTU's as with MSE.

2. DATABASE MODIFICATION:

WARNING!!! The following EXAMPLE are just that, EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

a. General Information. Example using a local DTG. When remoted, can be done via either Army or Air Force transmission assets.

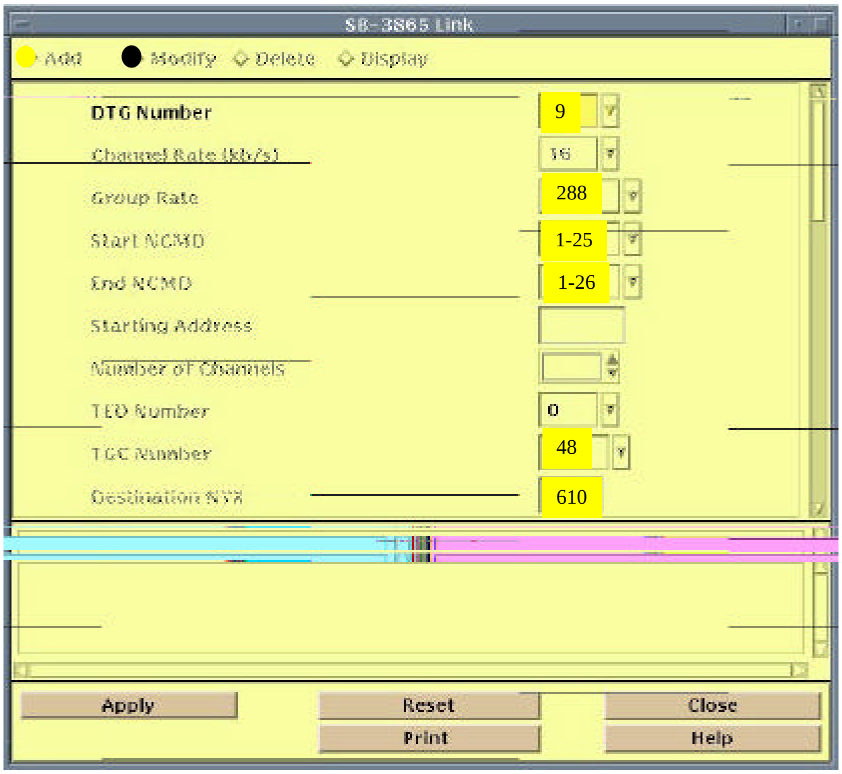
XMSN System...........	Local CX-11230 Cable
Master/Slave..........	L26/SB-3865 or NC01/SB-3865
Ring Codes............	16/15
DTG/TGC...............	9/48
Destination Code......	914610
Type Interface........	D = 3865
DTG Rate..............	288
Channel Rate..........	16 Kb/s
Modularity............	9 Channel (ATS all Trunks)
Routing Channel.......	No
Packet Switch.........	N
Glare.................	R
TED Key...............	N/A Bypass TEDs
Switch Code(NNXX)	3865 (see OPORD)
HRV Key...............	U156 (net 6)
HN Key................	X227 (net 7)

ESOP PROCEDURES.

Highlight Icon DTG 9
right click

Modify Link Type
Modify Link Type To SB-3865

Execute
Apply SB-3865 Link



Screen Cont.	INPUT	ACTION
	Modulation	Diphase
	Mod cable Length	1 (mile, never changes)
	Demod cable Length	¼ (actual cable length)
	Path Delay	0
	Satellite Link	No
	Synch Delay	No
	Zone Restriction	0
	Access Trunk Group	No
	Max Level of Precedence	Routine
	Traffic Load Control	1
	Glare	Accept (verify)
	Switch Code (NNXX)	3865
	Commercial Access	No

DTG Release Timer 0

Execute , After all steps Complete, Close Window.

SWITCH OPERATIONS

COMSEC

COMSEC VARIABLE LOCATION

ADD

EXECUTE , After all steps Complete, Close Window.

NODE MANGEMENT

ROUTING

GATEWAY/COMMERCIAL OFFICE ROUTING

ASSIGN

Screen	INPUT	ACTION
AGC	Add, Interface ID	914610
	Start NNXX	3865
	End NNXX	3865

NATO Designation	6-Digit
Primary TGC	48

EXECUTE , After all steps Complete, Close Window.

Any changes to the above will be specified in the OPORD.

b. Coordinating Instructions.

- Install 17 trunks as shown on MODS below.
- COMSEC keys will be Bulk Transferred from PNCS on order of SYSCON.
- Assign Traffic Metering (ATM) to TGC 48 for all reports.
- All trunks will be tested via AOD-23 prior to AGC.
- SB-3865 *must* bypass TED.
- Do Not Simultaneous Cold Start SB-3865s. When setting up an interface between two SB-3865s through the TTC-46/47 do not cold start both SB-3865s at the same time. Only one SB-3865 should be cold started at a time. When a SB-3865 is connected to the TTC-46/47 through another SB-3865, simultaneous rekey via the ANR will be unsuccessful. Each SB-3865 must be individually rekeyed.

3. SB-3865 INITIALIZATION:

When notified that the SB-3865 is in the emergency mode, system is ready to initialize. You must cold start the SB-3865.

ESOP PROCEDURE:

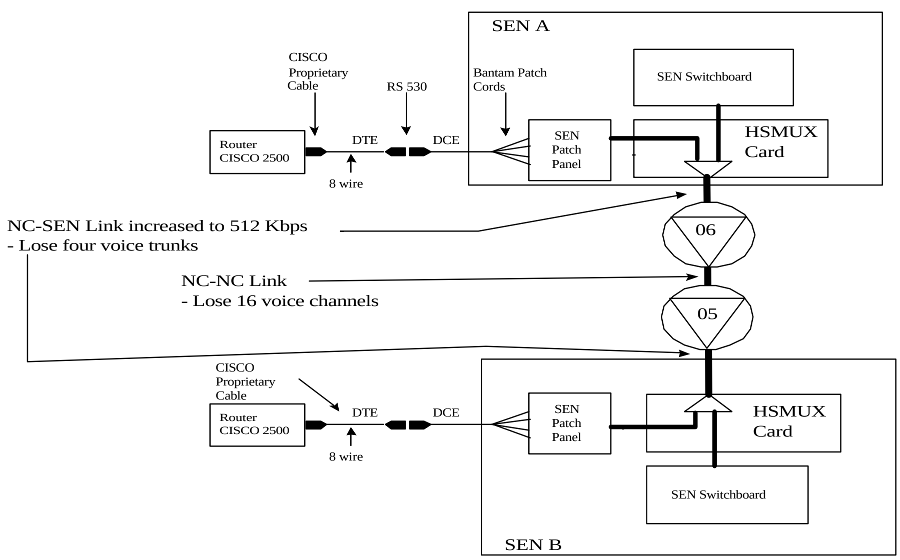
SWITCH OPERATIONS
COMSEC
NET REKEY
GENERATE

Rekey Cycle Number 00=Cold Start
HN NET # (7)

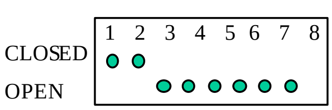
SECTION XI. HSMUX INSTALATION PROCEDURES

1. Overview: The High Speed Multiplexer (HSMUX) provides for high speed data and VTC access over the MSE and TRI-TAC networks. The HSMUX is compatible with the existing MXDMX circuit card and in addition provides up to four RS-530 serial high speed data and VTC interfaces. The HSMUX can be used in the Line Termination Unit (LTU) and Small Extension Node (SEN) to provide 1 to 4 high speed data/VTC interfaces. ***The HSMUX card is a new and somewhat experimental product at printing time for this document. The cards and the methods to use them may have changed in the interim. Check the documentation that accompanies the HSMUX card in addition to this guide. The information below is considered to be the most common use of this card. It is an example only.***

HSMUX Functionality: The HSMUX accepts data simotaineously from both the Switchboard and CISCO Router, Multiplexes this data into one 512Kb/s bitstream which is sent to the Node Center (NC). Each NC will increase the SENs DTG Group Rate to the Group Rate of the SENs Communication Modem (CM) setting. Typical rate will be 512Kb/s. The NC's will Connect the CISCO Routers (or VTC) via the Assign Channel Reassignment Function (ACR) by connecting the last 16 channels from the SEN DTG to the last 16 channels of the distant NC. This will create a "static" link between the CISCO / VTC terminals. (Note: in some cases a modem will be used to remote the user equipment from the SEN/LTU, RS-530 will be the normal EIA standard). Figure 7-19



2. HSMUX Circuit Card Strapping. The dip switches on the card determine the configuration supported. Set the dip switches as defined in the following table to support the desired configuration. The typical SEN configuration is Mode 4. Although any configuration may be used. If installing in a SEN go to paragraph 3, if installing in a LTU go to paragraph 4.



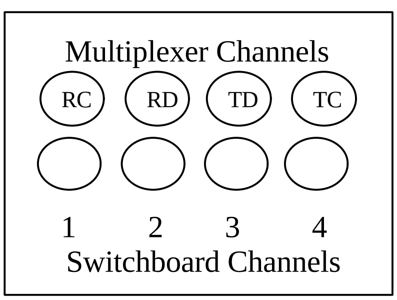
Mode	Group Rate	Local Port Chn's	HS Port 1	HS Port 2	HS Port 3	Dip Switch
4	512	16	256 kb/s	N/A	N/A	00000011
5	1024	16	256 kb/s	256 kb/s	256 kb/s	00000100

3. Communication Modem Configuration.

a. Turn power off on CM.
b. Open front cover of CM
c. Remove existing MXDMX CCA from slot A10.
d. Remove DLPMA CCA from slot A1. (Note: This will reduce the number of SEN trunks by four (insure these trunks are marked out of service (OOS) at the SEN and connecting NC.
e. Install the Cable Access CCA in slot A1.
f. Place the HSMUX CCA in slot A10, but do not seat the card. Connect the cable from the Cable Access card to the HSMUX CCA extender pins. Insure the connector with all 10 wires is placed on pins 1 through 10, the second connector begins on pin 11.
g. Seat the HSMUX.
h. Close and secure the front cover of the CM.
i. Change the Group Rate switch on the CM to be consistent with the HSMUX configuration selected. 512Kb/s is the typical setup which is position 6.

3.1. SEN / User Setup.

a. Install BANTAM Patch cords from special purpose cable (provided) into Multiplexer channels (1&2) as shown.



b. Connect DB25 end of special purpose cable to CISCO data cable or VTC Cable.
c. Apply power to CM, initialize switchboard as in normal configuration.
d. The SEN Switchboard and Packet will operate normally but the LED will display 01 rather than 000, this is normal due to removing the DLPMA CCA in A1.

4. LTU Configuration.

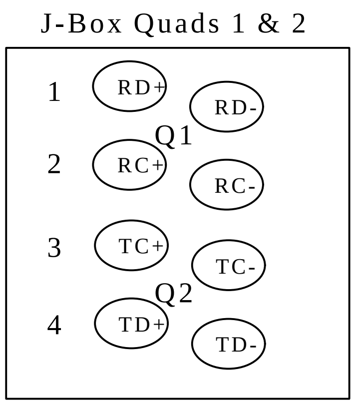
a. Turn power off on LTU.
b. Open front cover of LTU.

c. Remove existing MXDMX CCA from slot A10.
d. Remove DLPMA CCA from slot A1. (Note: This will reduce the number of loops by four.
e. Install the Cable Access CCA in slot A1.
f. Place the HSMUX CCA in slot A10, but do not seat the card. Connect the cable from the Cable Access card to the HSMUX CCA extender pins. Insure the connector with all 10 wires is placed on pins 1 through 10, the second connector begins on pin 11.
g. Seat the HSMUX.
h. Close and secure the front cover of the LTU.
i. Change the Group Rate switch on the LTU to be consistent with the HSMUX configuration selected. 512Kb/s is the typical setup which is position 6.

4.1. LTU / User Connection.

a. Connect data cable (provided) to quads 1 and 2 of the J-Box connected to J-3 as shown.

Figure 7-20



b. Connect DB25 end of special purpose cable to CISCO data cable or VTC Cable.
c. Apply power to LTU.
d. The LTU will operate normally but the LED will display 01 rather than 000, this is normal due to removing the DLPMA CCA in A1.

5. Network Connection. The HSMUX is interconnected using the Channel Reassignment (ACR) Function. A HSMUX Network Diagram (see OPORD) with Primary and Secondary ACR paths will be issued by SYSCON. Channel Reassignment must be made to interconnect the paths throughout the Network.

WARNING!!! The following example is just that, an EXAMPLE! Read and execute the current OPORD for your specific mission. Care must be given when modifying any element of the database, to insure appropriate data rates, NCMD's and TDMX addresses etc.. are utilized.

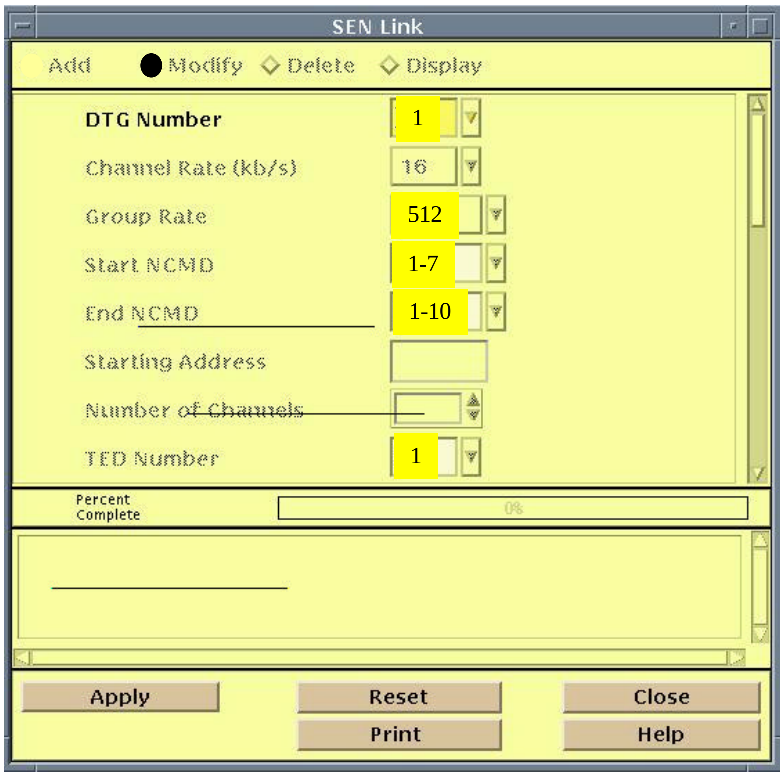
6. NC Configuration / Database Modification using DTG 1 to terminate a SEN and a CISCO Router or VTC and DTG 4 (link to NC terminating distant end SEN with HSMUX).

ESOP PROCEDURES.

HIGHLIGHT ICON DTG 7
right click
DELETE LINK
Delete TGC 11

EXECUTE ,After all steps Complete, Close Window.

HIGHLIGHT ICON DTG 1
right click
MODIFY LINK TYPE
Modify TGC 7
EXECUTE



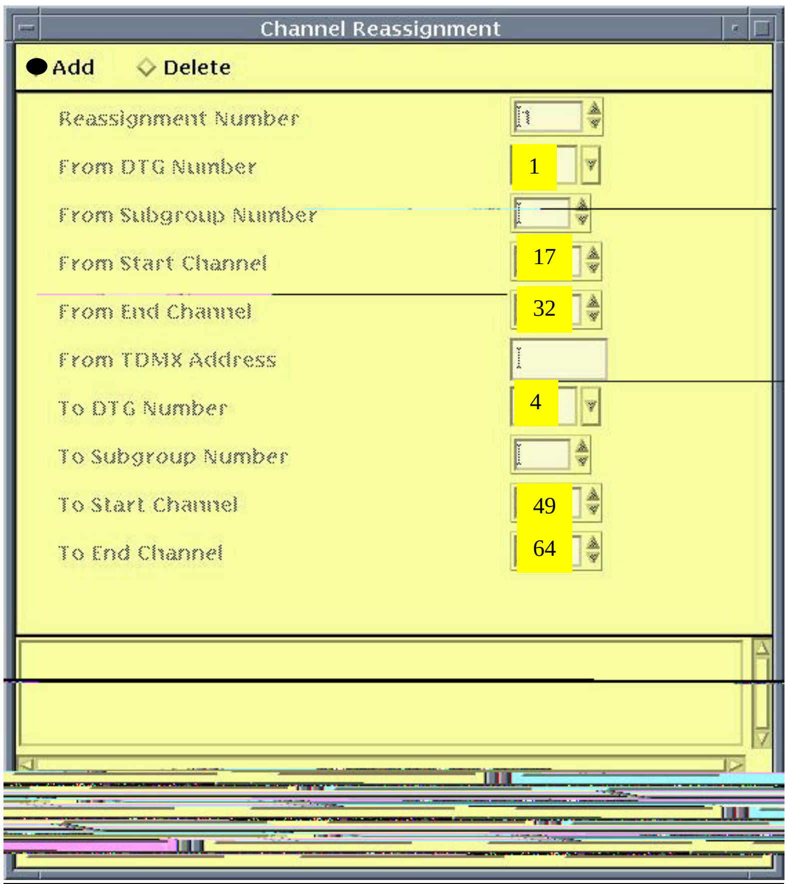
Screen Cont.	INPUT	ACTION
	TGC Number	7
	Modulation	Diphase
	Mod cable Length	1 (mile, never changes)
	Demod cable Length	¼ (actual cable length)
	Path Delay	0
	Satellite Link	No
	Synch Delay	No

Packet Switch Yes
DTG Release Timer 0

Execute , After all steps Complete, Close Window.

NODE MANAGENT
TERMINAL SERVICE
ASSIGN
Delete, 06-26
EXECUTE, Continue ATS Delete until 06-26 through 06-49 are deleted.

SUBSCRIBER SERVICES
CHANNEL REASSIGNMENT
ASSIGN



SECTION XII EXTERNAL INTERFACE TO THE TPN

1. Overview.   The external interface to the TPN is done through a connection to either the AN/TYC-19 (T/20) or the AN/TYC-20 (PS). The preferred way of connecting external interfaces to the TPN in V Corps is by using the Packet Switch.

2. Port on Router. Coordination must be done with 5th Signal Command DNIC to request a port on the local Secure Data Network router or use a DISA router. Both processes require a Network Change Proposal and an Accreditation package. This can normally be done through the G6 channels of V Corps (Preferred method).

3. Circuit. Once it is determined that an external interface needs to be used in a network, planners have to determine where the interface will come into the network, where the closest access point is, and what is the best way to move the circuit to the field. Some options are Codex 3500 over four wire pairs, TACSAT, TROPO, DEBs, etc. Any circuit that we use needs to be encrypted with KG-84s. At the Switch, the KG-84 encrypting the link will be placed into the shelter. The cable coming from the red side of the KG will be connected to the back of the Packet Switch or T/20.

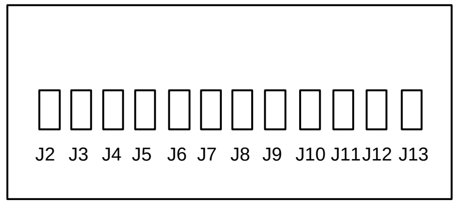
4. Installation Procedures. The first step is to determine whether the SDN/SIPR node runs balanced or unbalanced signaling on the black side of their KG-84s. (e.g. The Graf SDN uses unbalanced and DISA Landstuhl uses balanced) You should be able to find this information from the SDN system administrators. The type of signaling hard wired at the SDN/SIPR node determines which black side cable (balanced or unbalanced) you will use. See diagrams at the end of this section for the proper pinouts of these cables.

   a. AN/TYC-20 (Packet Switch)

      Note: the first six steps only apply to Node Centers.

      - Remove the metal grate over the T/20 mounting position.
      - Power down the T/20.
      - Remove the screws that secure the T/20.
      - Slowly slide the T/20 forward until you can reach behind it and work with the cables.
      - Remove all cables connected to the T/20 including power and ground.
      - Slide the T/20 out and place it aside.
      - Power down the packet switch.
      - Remove the screws that secure the Packet Switch.
      - Slowly slide the PS forward until you can reach behind it and work with the cables.
      - Remove the cable from the desired host port on the back of the PS (see table).
      - Attach the cable from the red side of the KG to the host port. (Note: using a DB-25 ribbon cable is preferred as it is easier to work with.)
      - Gently slide the PS back into place with the cable running over the top.
      - Power up the PS
      - Reattach all cables to the T/20 and slide it back into place (cables are labeled on the yellow tag).
      - Power up the T/20

AN/TYC-20 (Packet Switch)
Backside



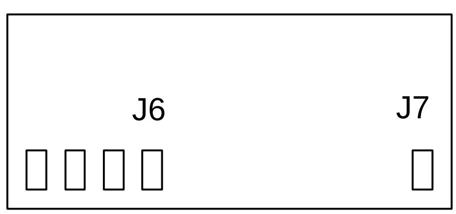
CISCO X.25 Router commands. The following commands need to be entered on the router (either the SDN or a local router) when connected to a Packet Switch.

(This example uses port 6 on NC 13)
ip address 148.14.6.10 255.255.255.0
encapsulation x25 ddn
ip mtu 576 (optional)
x25 nvc 7
x25 facility windowsize 7 7
x25 facility packetsize 1024 1024

b. AN/TYC-19 (T/20)

- Power down the T/20.
- Remove the metal grate over the T/20 mounting position.
- Remove the screws that secure the T/20.
- Slowly slide the T/20 forward until you can reach behind it and work with the cables.
- Remove the cable off of port J7 on the T/20 (See Diagram)
- Attach the cable from the red side of the KG to port J7
- Gently slide the T/20 back into place with the cable running over the top of the gateway.
- Power up the T/20

AN/TYC-19 (T/20 Gateway)
Backside



Once this is done, make sure that the PS is seeing the T/20 by watching it cycle through its pattern until it shows 19-5 lighting up on the LED display. This tells you that the gateway is being seen by the PS. Also, make sure that the T/20 bootup disk has the write protection off. (There is a square hole on the right side of the disk and it is not covered by tape).

1. SCC. At the SCC the following procedures need to be done for T/20 interfaces.

   - Select the ICON for the Node Center where the interface is going to be.
   - Right click the trackball and select Gateway 148.XX.5.YY (where XX is the NETID you are in and YY is the PSN of the Node Center).
   - Using the menus do these commands:

   COMMANDS

   Modify Gateway's Interface

   When the window comes up for this command, select the interface number (1 = J6 and 2 = J7). Normally this will be J7. Select the PPP option on the check boxes. Enter the IP address of your side of the link and the netmask. These should be provided to you from whoever gave you the port on the SDN router (5^{th} Signal Command DNIC or DISA). Select Execute. (When returning it back to normal just select trunk and execute)

   COMMANDS

   Add or Delete Gateways BGP & EGP Neighbors

   When the window comes up for this command, type the IP address of the router that you are connecting to into the BGP Neighbors' box. (Again this should be provided to you from your provider). Select Restart Gateway box and then execute the command. (When returning it to normal, after entering the IP address, select the delete box)

5. Routing. BGP-4 Routing is the protocol the T/20s use to pass routing updates between themselves. In theory, all T/20s should hold the same information. If one T/20 knows of a route it should notify all T/20s in the network of these known routes. The following is the correct format for BGP-4 routing statements at the secure router. The secure router must talk BGP to a T/20 (preferably the closest) in order to pass the SIPRNET routing information. In the enable mode of the router, enter the configure mode (**configure t**) and type the following commands:

Router bgp xxx	(xxx = asn of the local router)
network 204.35.66.0	(each serial port should have a network statement.)
neighbor 204.35.66.2 remote-as 4068	(this is the ip of the T/20 port as assigned by the NMC, and the asn of the 148.14 NETID; the asn for 148.15 is 4069) Note: the IP address shown may be the nearest T/20 in the case of a PS interface
redistribute connected	(passes along other routes known by this router)

<CTRL-z>

Be sure 5th Signal CMD and/or DISA uses the above BGP routing configurations.

One should also add a default route to one of the active T/20s in the network. This route should point to the Packet Switch port or T/20 port that contains the interface. This points any traffic that the T/20 does not have routes to out the interface. With access lists installed, the default route is needed, as routing information passed to the T/20s from the SIPR/SDN is minimal.

Here is a sample Cisco 2500 router configuration used between the Grafenwoher SDN Node and a Packet Switch (port 2).

```
Using 1309 out of 32762 bytes
!
version 10.2
service tcp-small-servers
!
hostname SIB-GRAF
!
enable last-resort password
enable password 7 1107495415061E
!
!
interface Ethernet0
no ip address
ip accounting output-packets
shutdown
!
interface Serial0
ip address 148.14.2.45 255.255.0.0
ip accounting output-packets
ip mtu 576
encapsulation x25 ddn
bandwidth 64
x25 address 000000450200
x25 nvc 7
x25 facility windowsize 7 7
x25 facility packetsize 1024 1024
!
interface Serial1
ip address 207.85.20.174 255.255.255.252
!
router eigrp 694
redistribute bgp 999 metric 56 2000 1 255 1500
network 148.14.0.0
network 207.85.20.0
no auto-summary
```

```
!
router bgp 999
redistribute connected
redistribute eigrp 694
network 148.14.0.0
network 207.85.20.0
neighbor 148.14.5.9 remote-as 4068
neighbor 148.14.5.9 distribute-list 96 in
no auto-summary
!
ip classless
ip default-network 140.49.0.0
access-list 96 permit 148.15.0.0 0.0.255.255
access-list 96 permit 148.14.0.0 0.0.255.255
access-list 96 permit 192.74.55.0 0.0.0.255
access-list 96 permit 192.74.53.0 0.0.0.255
access-list 96 permit 192.74.105.0 0.0.0.255
access-list 96 permit 192.74.21.0 0.0.0.255
access-list 96 permit 192.74.39.0 0.0.0.255
!
line con 0
password
login
line aux 0
password
login
transport input all
line vty 0 4
password
login
escape-character 3
!
end
```

Sample access list (recommended but optional) that will be different for each situation

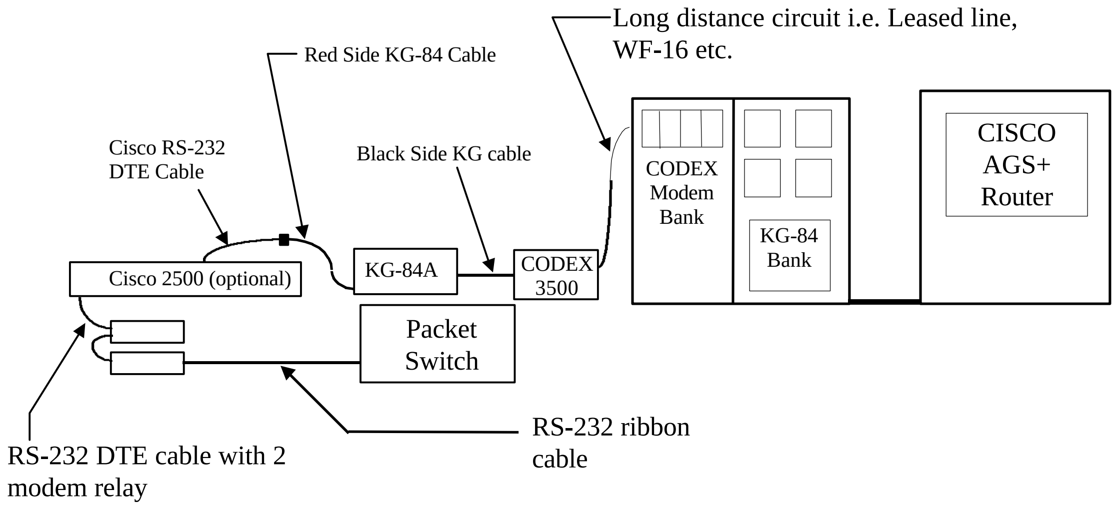


Figure 7-XII-1
5th SIG SDN Configuration

Codex Modem Settings:	<u>SDN</u>	<u>22nd SIG</u>
Timing	internal	Network
Data Rate	56K	56K
KG-84A settings:		
Clock	2	2
Data Mode	2	2
Data Rate Tx/Switch	8/B	8/B
Data Rate Rx/Switch	8/B	8/B
Step Pulse Interval	1	1
INTFC	3	3
Sync Mode	5	5
Switch	+0	+0
TTY Mode	1	1
Data Length	SYNC	SYNC
Comm Mode	1	1

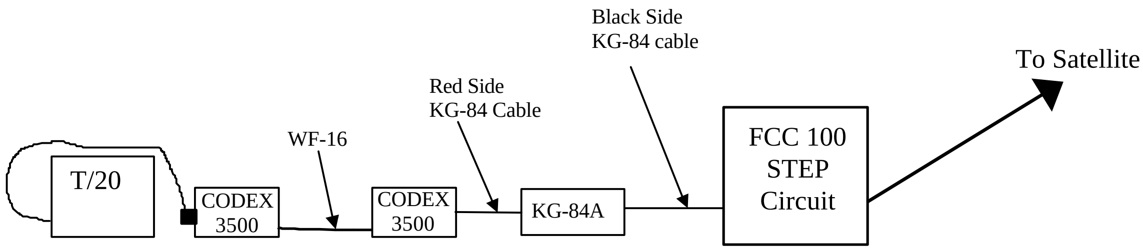


Figure 7-XII-1
DISA STEP Configuration

PACKET SWITCH HOST PORT ASSIGNMENTS

39D PS #1 (TOP - D1)		
Port	**J-C**	**Function**
0	J2	X.25 Dedicated
1	J3	X.25 Dedicated
2	J4	X.25 Dedicated
3	J5	X.25 Dedicated
4	J6	X.25 Dial-Up

39D PS #2 (BOTTOM - D1)		
Port	**J-C**	**Function**
0	J2	X.25 Dedicated
1	J3	X.25 Dial-Up
2	J4	X.25 Dedicated
3	J5	X.25 Dedicated
5	J7	X.25 Dedicated

NCS PS (NCS Template)		
Port	**J-C**	**Function**
6	J8	X.25 Dial-Up

SEN PS (S3T Template)		
Port	**J-C**	**Function**
1	J3	X.25 Dedicated
2	J4	X.25 Dedicated
3	J5	X.25 Dedicated

LEN PS #1 (TOP - LENa)		
Port	**J-C**	**Function**
0	J2	X.25 Dedicated
1	J3	X.25 Dedicated
2	J4	X.25 Dedicated

LEN PS#2 (BOTTOM - LENb)		
Port	**J-C**	**Function**
0	J2	X.25 Dedicated
1	J3	X.25 Dedicated
2	J4	X.25 Dedicated
3	J5	X.25 Dedicated

KG-84A 56K RED SIDE CABLE

RS-232 PIN#	SIGNAME	KG-84A (RED SIDE) PIN#	SIGNAME
2	TXD	17	TXD+
3	RXD	6	RXD+
4	RTS	11	PTRS+
5	CTS	19	PTCS+
6	DSR	51	PTDM+
7	SG	1	SIG GND
		3	RED COM SIG RTN
		18	TXD-
		43	PTTT-
8	CD	40	PTRR+
15	TXC	16	TXC+
17	RXC	21	RXC+
20	DTR	38	PTTR+
22	RNG IND	45	PTIC+
24	TT	42	MUX INSTRUCTION
		41	PTRR-
		29	?

NRZ

Cannon Connector, Plug, Elec
5935-00-306-3219
Conn Assy Backshell
5935-00-146-4526

DB-25 MALE
5935-01-282-3114

TITLE: KG-84A 56K RED SIDE CABLE			
COMPANY: 22nd Signal Brgade, SIB		CREATOR: CW2 Jimmy J. Ortiz	
DATE: 8/13/97	TIME: 9:32:43 AM	PG 14 of 16	
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil			

V Corps "NAG"

KG-84A 56K BLACK SIDE CABLE

SIG	DNE PIN#	RS-530 PIN#	V.35 PIN#	KG-84A(BLACK SIDE) PIN#	SIG NAME
TXD+	2	2	P	14	TXD+
TXD-	14	14	S	15	TXD-
RXD+	3	3	R	12	RXD+
RXD-	19	16	T	13	RXD-
TXC+	15	15	y	21	TXC+
TXC-	16	12	AA	22	TXC-
RXC+	17	17	V	19	RXC+
RXC-	18	9	X	20	RXC-
RTS	4	4	C	27	CTCS
CTS	5	5	D	34	CTRR
				51	CTDM
				52	+6VDC
DSR	6	6	E		
CD	8	8	F		
DTR	20	20	H		

NRZ

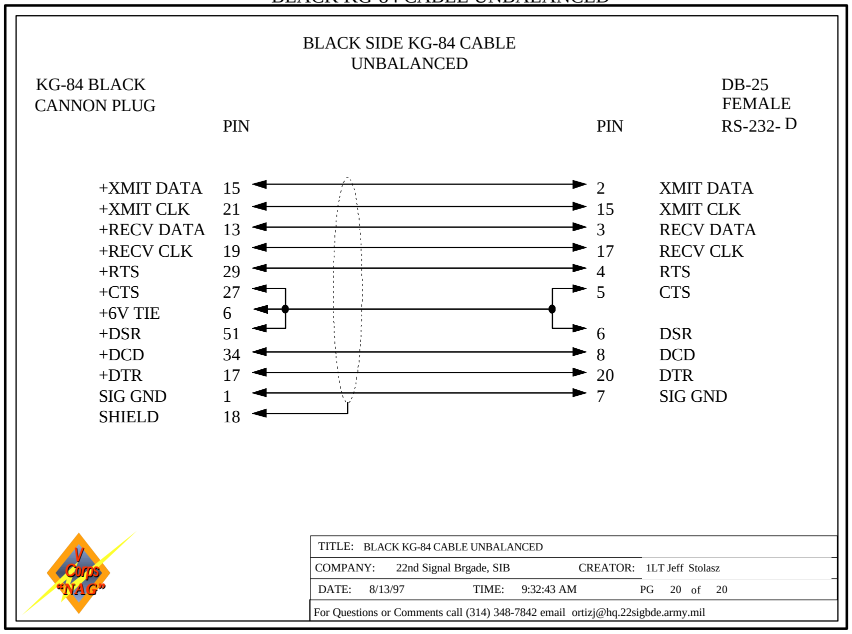
DB-25 MALE
5935-01-282-3114

Cannon Connector, Plug, Elec 5935-00-410-9250
Conn Assy Backshell 5935-00-146-4526

TITLE: KG-84A 56K BLACK SIDE CABLE			
COMPANY: 22nd Signal Brgade, SIB		CREATOR: CW2 Jimmy J. Ortiz	
DATE: 8/13/97	TIME: 9:32:43 AM	PG 15 of 20	
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil			

V Corps "NAG"

BLACK KG-84 CABLE UNBALANCED



SECTION XIII. VIDEO TELECONFERENCING

1. EQUIPMENT DESCRIPTION:

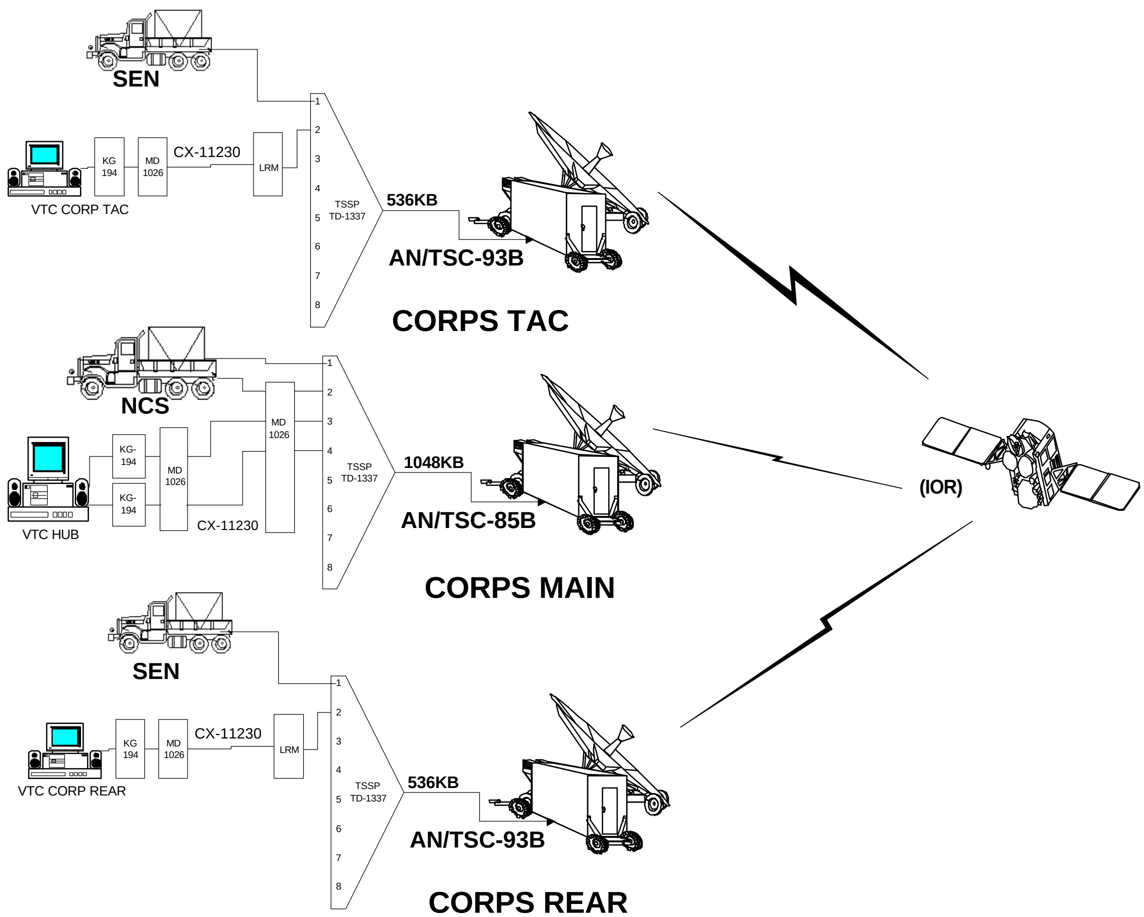
a. Video Teleconferencing (VTC) is a contractor installed, operated and maintained (IOM) service provided to various V Corps and Division Headquarters.

b. As the battlefield changes, signal soldiers will be required to provide 256K transmission paths for VTC circuits, this could be TAC-SAT or LOS.

c. Encryption is provided on each circuit to the Video Hub by a KG-194A, which is normally provided to the contractor by the collocated Tac-Sat assemblage.

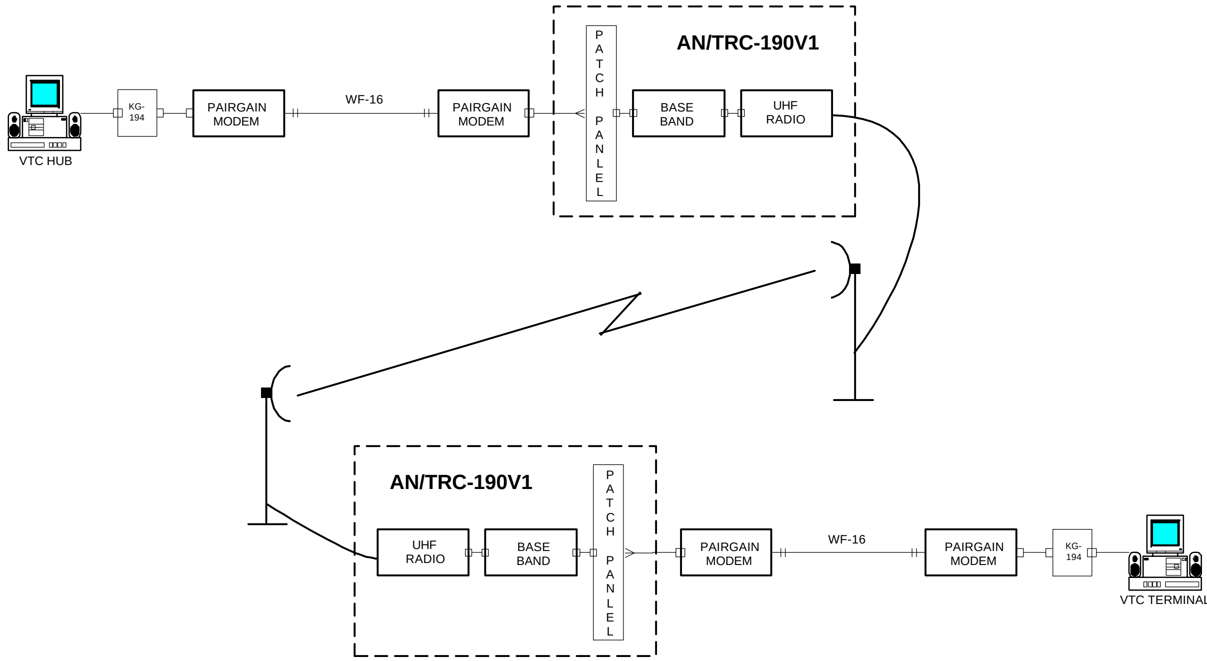
d. For the Tac-Sat operator, providing a transmission path for VTC is no different than providing a path for a SEN. Meaning no special configuration is required inside the TSC-85B/93B. For the VTC Hub and Suite, a MD-1026 with cards (Diphase A/B) and special cables (CX-11230 to BNC and RS-530 to MD-1026) must be used. Cable diagrams are provided later in this section.

TYPICAL VTC/MSE NETWORK



e. For the LOS operator, providing a transmission path for VTC requires no communication modem. Meaning the VTC data will be carried by Pairgain Modem. VTC data will access the LOS system at the patch panel via a special cable (RS-530 to Bantam Cord). Cable diagrams are provided later in this section.

TYPICAL VTC/LOS LINK



2. PLANNING CONSIDERATIONS:

a. When using Tac-Sat as the transmission path, MSE should be incorporated into the VTC Tac-Sat network.

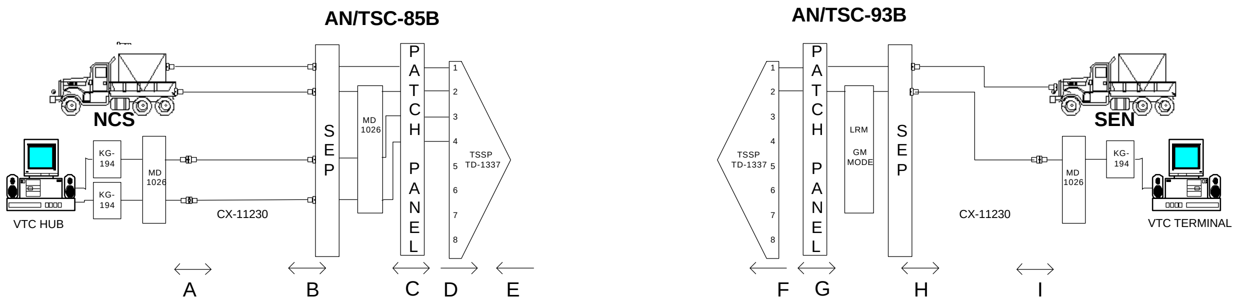
b. This provides a three fold benefit:

(1) VTC Network visibility for the SYSCON via TPN
(2) stable timing source for VTC/SATCOM Network
(3) efficient use of Tac-Sat resources

c. When using LOS, the VTC personnel must ensure Timing is incorporated into the circuit starting at the Hub.

3. VTC CIRCUIT TROUBLESHOOTING USING TACSAT:

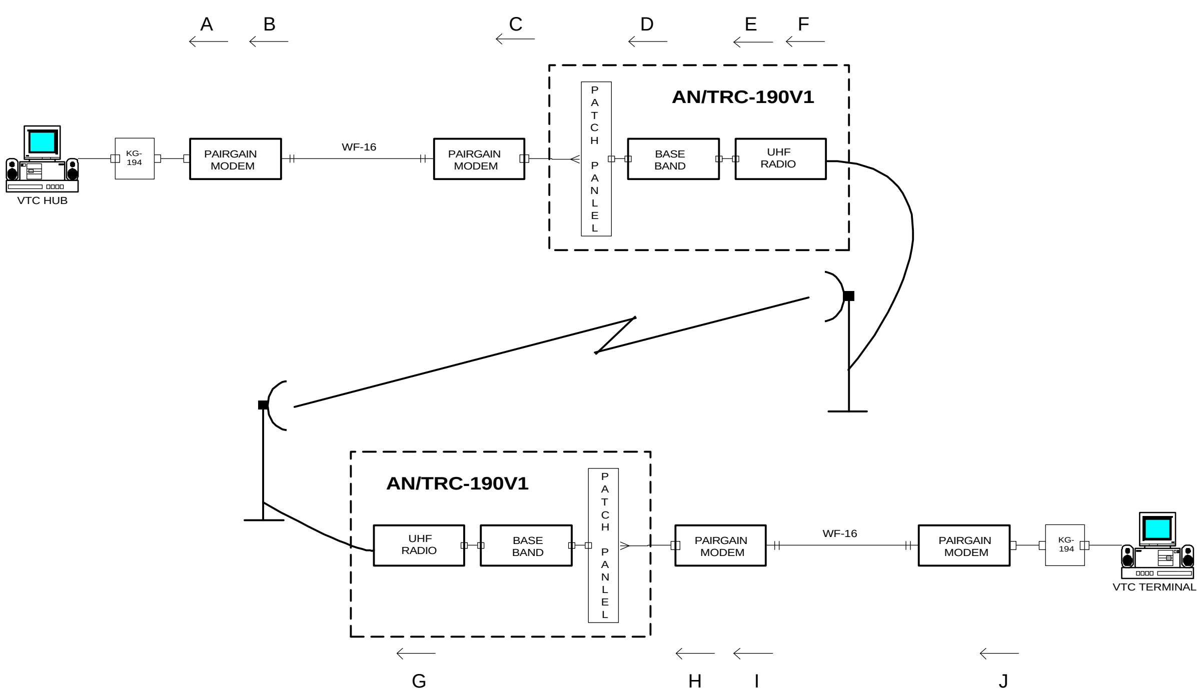
a. As in all system troubleshooting, loopbacks must be done from the VTC Hub. The diagram below shows all loopback points and the direction of data flow.



A. CX-11230 Pigtail	D. TSSP Port	G. Patch Panel
B. CX-11230 Pigtail	E. Full TSSP	H. CX-11230 Pigtail
C. Patch Panel	F. TSSP Port	I. CX-11230 Pigtail

4. VTC CIRCUIT TROUBLESHOOTING USING LOS:

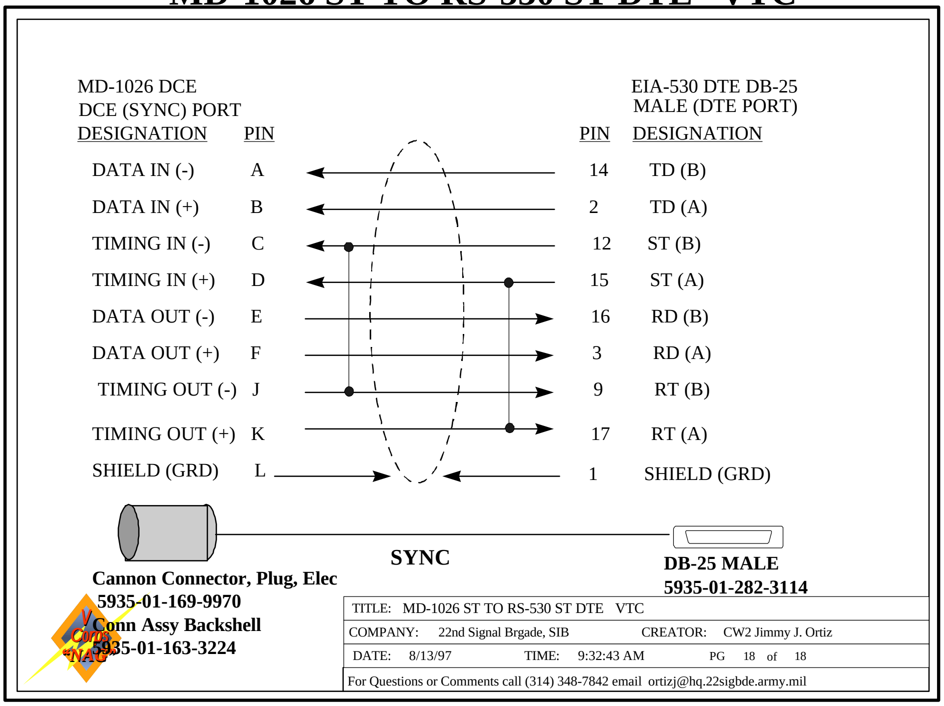
a. As in all system troubleshooting, loopbacks must be done from the VTC Hub. The diagram below shows all loopback points and the direction of data flow.



A. Local I/F Lpbk	D. 6-1-6 Lpbk	G. 6-4-6/6-5-6 Lpbk	J. Remote I/F Lpbk
B. HSDL Lpbk	E. 6-2-6 Lpbk	H. Local I/F Lpbk	
C. Remote I/F Lpbk	F. 6-3-6 Lpbk	I. HSDL Lpbk	

5. SPECIAL CABLE DIAGRAMS:

MD-1026 ST TO RS-530 ST DTE VTC



CHAPTER 8

SCC PROCEDURES

SECTION I. V Corps MSE SCC Standard Database

1. PURPOSE. To outline the standard database for SCCs to use on V Corps exercises.

2. SCOPE. These procedures apply to all SCCs in V Corps.

3. DATABASE ENTRIES. The following items are on the SCC-2 standard database.

a. Preprogrammed Conference Lists
b. Compressed Dial Lists
c. Authorized UHF, SHF and VHF Frequencies
d. All V Corps teams to include 123d and 141st Sig Bn teams and any other MSE asset teams operating in the V Corps MSE network.

Note: There are no zone restriction lists or locally prohibited or restricted frequencies on this database. If necessary, these lists are built on a per-exercise basis.

4. INITIALIZATION. The following windows must be completed with the appropriate entries.

a. SCC STATE WINDOW. The following entries are required in the SCC STATE window.

PARENT SWITCH LABEL: (The local NC switch for the SCC)
IAC: 914614 (exercise specific)
TECH/NB: 550-8507
AUTH/NB: 1111
CLASSIFICATION: UNCLASSIFIED
DEPLOYMENT AREA COORDINATES: 32U MA XXX XXX (exercise specific)
POLARIZATION MODE: RANDOM
KO COEFFICIENT: 06 KREF COEFFICIENT: 1.33
ATTENUATION MODE: WITH DIGITIZED TERRAIN
TYPICAL PATH PROFILE: HILLS
EARTH SPHEROID: INTERNATIONAL .
ANTENNA POLARIZATION:

b. SCG DEFINITION WINDOW.

c. TECH TIME WINDOW. A time hack must be taken from the Corps Active SCC.
SYSTEM TIME: YEAR/MONTH/DATE/HOUR/MIN
TIME ZONE LETTER: Z

SECTION II. PROCEDURES FOR BUILDING CORPS AND DIVISION NETWORKS IN ONE SCC AND COPYING AN SCC DATABASE

1. PURPOSE. To establish procedures for building both the Corps and Division networks simultaneously in one SCC without a node center. Also, to establish procedures for making a copy of the SCC database by saving it to another system disk in one SCC.

2. GENERAL. This procedure was used to build the Corps and Division networks simultaneously without a NC. The Division simply brought a system disk to the Corps SCC. This was also used to back-up the V Corps MSE SCC Standard Database. Without a floppy drive in the SCC, there is currently no way to save a copy of the database.

3. PROCEDURE.

a. To build the Corps and Division networks:

1. Bring a workstation up as 148.14.70.AAA, where AAA is Corps Active SCC PSN, as the Tech workstation.

2. Bring another SM workstation up as 148.14.70.XXX, where XXX is the Division SCC PSN as a Tech waiting for download.

3. Download from AAA to XXX. XXX will then be in a reserve state and the copied database will be on system disk X.

4. Transfer the Division's SCG from the Corps SCC.

5. To verify that the VHF frequency plans were received by the Division, transfer RAU/MSRT function to the Division SCC and safeguard.

6. Begin building the network.

b. To copy the database:

1. Bring a workstation up as 148.14.70.AAA, where AAA is Corps Active SCC PSN, as the Tech workstation. This system disk (A) contains the database to be copied.

2. Bring another SM workstation up as 148.14.70.XXX, where XXX is an unused SCC PSN (250 was used for the V Corps back-up), as a Tech waiting for download. This must be done in an inactive state or if it is done with an active network, XXX must be an unknown or inactive SCC.

3. Download from AAA to XXX. XXX will then be in a reserve state and the copied database will be on system disk X.

4. Shut down the Corps Active SCC (148.14.70.AAA).

5. XXX performs a hot takeover of the Active SCC (AAA).

SECTION III. SCG AND RAU/MSRT CONTROL TRANSFER PROCEDURES

1. Upon initial installation of the Corps MSE network, the active Corps SCC will have control of all SCC Control Groups (SCG). Control will be transferred to the Division SCC by order of the Brigade SYSCON. The following procedures will be followed when transferring control between SCCs.

2. SCG Control Transfer:

a. The PNCS will AMA disaffiliate the command and control (C&C) number of the SCC to be transferred by order of the Brigade SYSCON.

141st Signal SCC C&C	550-7707
121st Signal SCC C&C	550-5707

b. The active SCC will then "give" the SCG to the gaining Division SCC.

c. The Division SCC will then "gain" the SCG.

d. The transfer will be verified on the recap SCG screen.
The “Local Switch” the SCC is off of

e. The "Leader Switch" (Division) will AMA affiliate the C&C number.
(When affiliating the C&C number via AMA, the switch operator will NOT use the CSP. Not using the CSP prevents improper affiliation of the wrong instrument.

3. RAU/MSRT Control Transfer:

a. The PNCS will AMA disaffiliate the RAU/MSRT number (550-8509) by order of the Brigade SYSCON.

b. The active SCC will then "give" RAU/MSRT control to the gaining Division SCC.

c. The Division SCC will then "gain" RAU/MSRT control.

d. The transfer will be verified on the recap SCG screen.

e. The leader switch (Division) will AMA affiliate the RAU/MSRT number.

SECTION IV. SCC-1 TO SCC-2 INTERCONNECT PROCEDURES

1. PURPOSE. To establish procedures for connecting two SCC-2 Technical Shelters without a node center for packet switch working disk configuration and packet switch interface testing.

2. GENERAL. These procedures were established to allow the SCC to download packet switch configuration to NC/LEN/SEN working disks when NC/LEN/SEN equipment is not available. The packet switch in the second SCC is used for configuration purposes only. When used for packet switch interface testing the NMC need not be initialized.

3. PROCEDURE.

a. Connect the two shelters via 1 reel of 1/4 mile CX-11230 cable.

b. On SCC Tech shelter #1, put the CM TEST SELECT switch in equipment side loopback. This will force the CM to master mode. Both timing switches (MODE and TMG) are up and the thumb wheel setting is 14. The CM should say 000 on the BITE FAULT LEDs.

c. On SCC Tech shelter #2, put the CM TEST SELECT switch in operate. This will put the CM in slave mode and cause the CM to recover the clock from the other SCC. Both timing switches (MODE and TMG) are up and the thumb wheel setting is 14. The CM should say 000 on the BITE FAULT LEDs.

Configuration	Test Select Switch	Timing Switch	Mode Switch	Timing Recovery	Disabled BITE Circuitry
		NORM	NORM		
	OPER	ALT			
		NORM		GMRCLK	
SCC - 2 (tech)		ALT	ALT		
		NORM	NORM		
	ES LPBK	ALT			
		NORM			
		ALT	ALT		
BITE - 2		NORM	NORM	Master	
Thumbwheel: 5	LS LPBK	ALT			
		NORM			DVOW
		ALT	ALT		
Card Set: -15		NORM	NORM		
	DVOW	ALT			
		NORM			
		ALT	ALT		
Functions:		NORM	NORM	GMRCLK	
GM &	BRIDGE	ALT			
Mux (3 LTUs)		NORM			
		ALT	ALT		

SECTION V. SCC-2 INSTALLATION PROCEDURES

1. PURPOSE. To establish procedures for installing the Corps Active and Reserve SCCs within V Corps.

2. GENERAL. The NC's standard database has DTG 5 configured for a Division SCC. The following procedures must be used by the NC connecting either the Corps Active or Standby SCC.

3. PROCEDURES.

a. The CX11230A/G is run to the NC and hooked to the port J6 on the SEP at the NC.

b. The NC operator must ensure that the TED for DTG 5 is bypassed using the four prong connector.

c. Two additional SCC trunks (terminal type 84) must be added on terminal address locations 04-54 and 04-55, using ACC as follows:

ASSIGN SCC TRUNKS (ACC)

M ACTION
9 TRUNK GROUP CLUSTER
P SECURITY
XX-XX XX-XX (ENTER THE TERMINAL ADDRESS OF THE SCC TRUNKS)
04-46 04-55
04-47
04-48
04-54

<XMIT>, <STORE>

d. Verify SCC trunks using the DTG command as follows:

Display Transmission Groups (DTG)
5 DTG NUMBER KEY "XMIT" FOR DISPLAY

MULTIPLEX SIGNAL FORMAT 1 GROUP RATE 256

CHAN NO.	TERM. ADDR.	TERM. TYPE	IN USE	PRI/ SEC	SUBGRP NO.	OVHD CHAN	PACKET SWITCH
1	04-44	119	N	P	-	-	N
2	04-45	84	N	P	-	-	Y
3	04-46	84	N	P	-	-	N
4	04-47	84	N	P	-	-	N
5	04-48	84	N	P	-	-	N

6	04-49	----	-	P	-	-	N
7	04-50	13	N	P	-	-	N
8	04-51	13	N	P	-	-	N
9	04-53	13	N	P	-	-	N
10	04-54	84	N	P	-	-	N
11	04-55	84	N	P	-	-	N
12	04-56	13	N	P	-	-	N

e. Assign SCC (ASR) TGC 9 to verify "ABSENT NO" for the SCC trunk and to verify "PACKET SWITCH" YES.

f. On initial deployment, NC/LENS will manually affiliate (via APL) numbers for the SCC they support using profile 237.

Corps Active SCC:

550-8507 (Corps Active SCC Technical number)
550-8508 (Corps Active SCG C&C number)
550-8608 (Corps Standby SCG C&C number)
550-7708 (141st SIG BN SCG C&C number)
550-5708 (121st SIG BN SCG C&C number)
550-8509 (RAU/MSRT SCG number)

Corps Standby SCC:

550-8607 (Corps Standby SCC Technical number)

141st SIG BN SCC:

550-7707 (141st SIG BN SCC)

121st SIG BN:

550-5707 (121st SIG BN SCC)

g. NC/LENs will manually affiliate the numbers listed above using AMA as shown below:

ASSIGN MANUAL AFFILIATION (AMA)

1 ACTION (1 = AFFILIATE, 2 = DISAFFILIATE, 3 = DELETE)
LNXXXXX DIRECTORY NUMBER (listed above)
___ PERSONAL CODE (leave blank)
___ TERMINAL ADDRESS (leave blank)
L_ SCC TRUNK (L = LOCAL, B = BYPASS, BLANK = NO SCC)

SECTION VI. NMC INITIALIZATION PROCEDURES

1. Ensure that the packet switch is turned ON with the correct work disk.

2. After applying power to the NMC workstation, wait for the monitor to display a screen that resembles piano keys and the BIT display of the workstation processor displays 00. Press the SYSTEM RESET push button on the workstation processor.

3. The Console window opens on the monitor and displays several operating system messages. The window displays:

```
*************************************************************
*                                                           *
*        MSE Packet Network Management System               *
*             NMC Software Revision 6.1 P2                  *
*                                                           *
*************************************************************
```

The current date and time is Mon Nov 7 09:04:33 GMT 1991
Is this correct (yes):

4. STOP! If this is the only NMC being initialized in the domain (148.14 and 148.15) or is the first NMC in the domain, then continue. If not, then you MUST perform a time hack with the first NMC in the net. Call the primary NMC to find out the time. The clocks on the NMCs must be NO MORE than 30 seconds apart for proper operation. The Brigade standard is for the clocks to be within 10 seconds of each other.

UNIT	NETID	NMCID	NMC	PHONE#
22d BDE	148.14	17	246	550-8501/3 (PRI)
22d BDE	148.14	18	247	550-8601/3 (ALT)
123d	148.14	20	249	550-5701/3
32d AADCOM	148.14	22	251	540-0401/03
22d BDE	148.15	47	246	550-8501/3 (PRI)
22d BDE	148.15	48	247	550-8601/3 (ALT)
141st	148.15	49	248	550-7701/3
32d AADCOM	148.15	50	251	550-0401/3

NOTE: Normally the Corps NMC will be the first to initialize. Division NMCs are required to call the Corps NMC when initializing.

5. When the normal NMC display window appears perform the following:

A. Create a system clock window (under SYSTEM COMMANDS menu) and place it in the upper right-hand corner.

B. Open a NETLOG window (under SYSTEM COMMANDS menu) and place it in the bottom of the screen so that it is still partially visible. Do not click on any filters for this window.

C. Open any other NETLOG windows (with filters) as directed and place them in the bottom of the screen.

D. Assume your Domain of Responsibility (DOR), which is the same as your NMCID. Assume other DORs as directed.

6. Notify SIB that you are online. Notify the other NMCs that you are online.

7. Corps NMCs will notify the SYSCON/SIB whenever an NMC comes on-line in the network.

8. Follow the NMC Normal operating procedures below. Do NOT perform a COPY DATABASE unless this SOP dictates it.

SECTION VII. NMC NORMAL OPERATING PROCEDURES

1. Monitor the ALERT window for domain database conflicts. If a domain database conflict message appears, then follow the Domain Database Conflict Procedures.

2. Monitor the net log(s) for traps. If a particular trap appears repeatedly, then follow the Trap Troubleshooting Procedures.

3. Monitor the clock and the response time of the NMC. If the NMC slows down to 5 seconds between clock updates, then annotate your log and notify the SIB.

4. If Trap 1086 (FEC On Request) appears consistently, then notify the network manager of the poor link quality. Implement software FEC on the trunk. If successful, and if it is an internodal link, then remove software FEC and implement hardware FEC. Annotate in your log the time, link, type of FEC, and R6 for the link.

NOTE: If this is a non-critical link then recommend to the network manager todrop the link (using software loopback at both ends) until the link quality improves. If SW FEC does not fix the link, then attempt to use both HW and SW FEC. Be sure to LOG all these actions!

5. AVOID doing the following unless directed by SIB:

A. Have operator turn off/on packet switch to troubleshoot.

B. Use VERIFY PSN CONFIGURATION command.

C. Use SEND PSN CONFIGURATION command.

D. Create any High Priority Hosts.

6. If a Packet-Watch or PC-PING program is running, then monitor the PING screen for connectivity to the other NMCs and PING response times to the other NMCs. Notify SIB if another NMC becomes isolated. NMC isolation is a major cause of the NMC slowdown problem.

SECTION VIII. NMC SHUTDOWN PROCEDURES

1. Notify SIB before shutting down. After SIB is notified, notify all the other NMCs in the domain that you are shutting down, so they can avoid making database changes (adding/deleting records).

2. If in a large network, notify another NMC so they can assume your DOR.

3. Annotate in log the time shutdown was started.

4. Execute SYSTEM SHUTDOWN from SYSTEM COMMANDS menu.

5. Follow NMC Initialization Procedures and annotate in log when NMC is operating normally.

SECTION IX. NMC DOMAIN DATABASE CONFLICT PROCEDURES

1. If a "domain database conflict detected with NMC xx" appears, contact the other NMC(s) (the one(s) identified by xx) and do a time check. The other NMC should be receiving the same message (with your NMCID). The NMC with the additional message "Resolve with Copy Database" should do a copy database from the other NMC. Ensure all other NMCs are informed before this is started, so they can avoid adding new database records until it is completed.

2. Annotate the time in your log and execute COPY DATABASE from the SYSTEM COMMANDS menu.

3. Annotate the time in your log when the copy database is completed. NOTE: This could take an hour or more.

4. Inform SIB of the times logged above.

NOTE: Domain database conflict messages are normal the FIRST time an NMC enters the network. Domain database conflict messages are NOT normal if an NMC reboots during the exercise.

SECTION X. NMC TRAP PROCEDURES

Use your experience to and information on the trap to fix traps. If this fails, then follow the procedure below and complete the Trap Analysis worksheet. Upon completion of this worksheet, give it to SIB for analysis and action.

1. Log the information in section 1. Pay particular attention to the frequency of the trap. Usually a trap will repeat once a second, once a minute, or twice a minute.

2. Log the information in section 2. Sometimes the toggle settings on a PSHTI card will be wrong, or the link may be poor quality.

3. Log the information in section 3. Have the operator perform AOD 62 commands from the matrix locations to the PSHTI locations. Then have the operator perform the same commands from the PSHTI locations to the matrix locations. Have the operator check the DTG (DTG command) to make sure the correct channels are marked for PS.

4. If step 3 does not fix the trap, then give the worksheet to SIB for further analysis.

Troubleshooting Hints:

Use the following guide to assist in troubleshooting traps. Be sure to document any new information gained from troubleshooting, so they may be incorporated into this.

TRAP	Action
2	Hardware problem. Contact SIB
350	Port is configured as host when should be trunk. Indicates wrong template, Contact SIB.
1006	Serious. Investigate
1086	Software FEC, then Hardware FEC (if possible)
1087	Remove software FEC
1152	Serious. Investigate
1160	Add or remove software FEC on the trunk in question. Usually indicates S/W FEC running on one PS but not the other.

TRAP WORKSHEET

Section 1:

DATE:________ NMC:________ OPERATOR:______________________

TIME:________ FREQUENCY (TIMES/MIN):__________________

TRAP NU:______ TRAP DESCRIPTION:______________________________

____

TYPE OF LINK (HI/LOW):_________

Section 2:

	ORIGINATING	RECEIVING
PSN	____________	_________
PORT	____________	_________
PSHTI	____________	_________
TOGGLES (U/D)	__/__/__/__/__/__	__/__/__/__/__/__
R6 REPORT	____________	_________

Section 3:

TDMX CONNECTS:

MATRIX->PSHTI-->MATRIX MATRIX->PSHTI-->MATRIX

__-__ __-__ __-__ __-__ __-__ __-__

__-__ __-__ __-__ __-__ __-__ __-__

__-__ __-__ __-__ __-__ __-__ __-__

__-__ __-__ __-__ __-__ __-__ __-__

TRAP FIXED: YES/NO

SOLUTION:____

____

FOR SIB USE:

ANALYZED BY:__________________________

SOLUTION:____

____

SECTION XI. REMOTING THE NMC AND SCC WORKSTATION

1. PURPOSE. To document procedures to remote the Network Management Center and an SCC workstation out of the S-250 shelter and into the SYSCON using the set of remote cables provided by GTE.

2. PROCEDURE.

a. Remoting the workstation:

1. Connect coax to the J10 connector on the inside of the SEP to the BNCT connector of the transceiver replacing the 50 Ohm terminator. Then connect the 50 Ohm terminator to the other side of the BNCT connector.

2. Remove the workstation (monitor, processor, track ball, keyboard, and mouse) from the shelter.

3. Make the following connections on the processor (figure 1):

PROCESSOR	
J2	track ball
J3	keyboard
CP1	J6 (monitor)
CP2	J4 (monitor)
CP3	J8 (monitor)
J7	transceiver

4. Apply power (110 V).

b. Remoting the NMC. This procedure is the same as above with the following addition: connect the coaxial cable to port 1 on the back of the packet switch to J8 on the processor.

SECTION XII. TEAM LABELS

1. PURPOSE: To provide information on team designations.

2. SCOPE: Applies to all signal battalions, active, reserve, and National Guard, belonging to V Corps.

3. GENERAL: The following are the V Corps Signal Battalion team labels. Team labels are assigned for all signal elements (NCs, Relays, RAUs, LENs and SENs) and are part of the SCC database. They are used for command and control of the teams. For example, an order message generated by the SCC will say open link 01A13, meaning the LOS radio link NC 01 and SEN A13. The link label also tells the operator which element of the link is master and which is slave. The first element of the label (01) is master, the second element (A13) is slave.

4. The team labels are presented in chart form for each Corps Area and Division signal battalion. The Packet Switch Number (PSN) for each switch is given immediately under their team label. KY-90 (CNRI) and SHF placement is also noted on each team label chart.

NC / LEN			
Label	Unit	PSN	CSP
NC01		1	550-0100
NC02		2	550-0200
NC03		3	550-0300
NC04	32nd	4	550-0400
NC05		5	550-0500
NC06		6	550-0600
L07		45,46	550-0700
NC10		7	550-1000
NC11		8	550-1100
NC12		9	550-1200
NC13	17th	10	550-1300
NC14		11	550-1400
NC15		12	550-1500
L16		47,48	550-1600
NC20		13	550-2000
NC21		14	550-2100
NC22		15	550-2200
NC23	440th	16	550-2300
NC24		17	550-2400
NC25		18	550-2500
L26		49,50	550-2600
NC50		25	550-5000
NC51		26	550-5100
NC52	121st	27	550-5200
NC53		28	550-5300
L54		53,54	550-5400
NC70		31	550-7000
NC71		32	550-7100
NC72	141st	33	550-7200
NC73		34	550-7300
L74		55,56	550-7400

SEN PSN TABLES						
UNIT		32nd	17th	440th	121st	141ST
Label	PLT	A	B	C	F	H
X11	A/1	57	97	137	177	217
X12	A/1	58	98	138	178	218
X13	A/1	59	99	139	179	219
X21	A/2	61	101	141	181	221
X22	A/2	62	102	142	182	222
X23	A/2	63	103	143	183	223
X31	B/1	65	105	145	185	225
X32	B/1	66	106	146	186	226
X33	B/1	67	107	147	187	227
X41	B/2	69	109	149	189	229
X42	B/2	70	110	150	190	230
X43	B/2	71	111	151	191	231
X51	C/1	73	113	153		
X52	C/1	74	114	154		
X53	C/1	75	115	155		
X54	C/1				193	
X61	C/2	77	117	157		
X62	C/2	78	118	158		
X63	C/2	79	119	159		
X71	A/1	60	100	140	180	220
X72	A/2	64	104	144	184	224
X73	B/1	68	108	148	188	228
X74	B/2	72	112	152	192	232
X75	C/1	76	116	156		
X76	C/2	80	120	160		
X90	D/1	93	133	173		
X91	D/1	94	134	174		

PHONE NUMBERS		
NC & LEN	NMF	55xxx01
	OIC	55xxx02
	OPER	55xxx03
	DTA	55xxx07
	MSRT	55xxx09

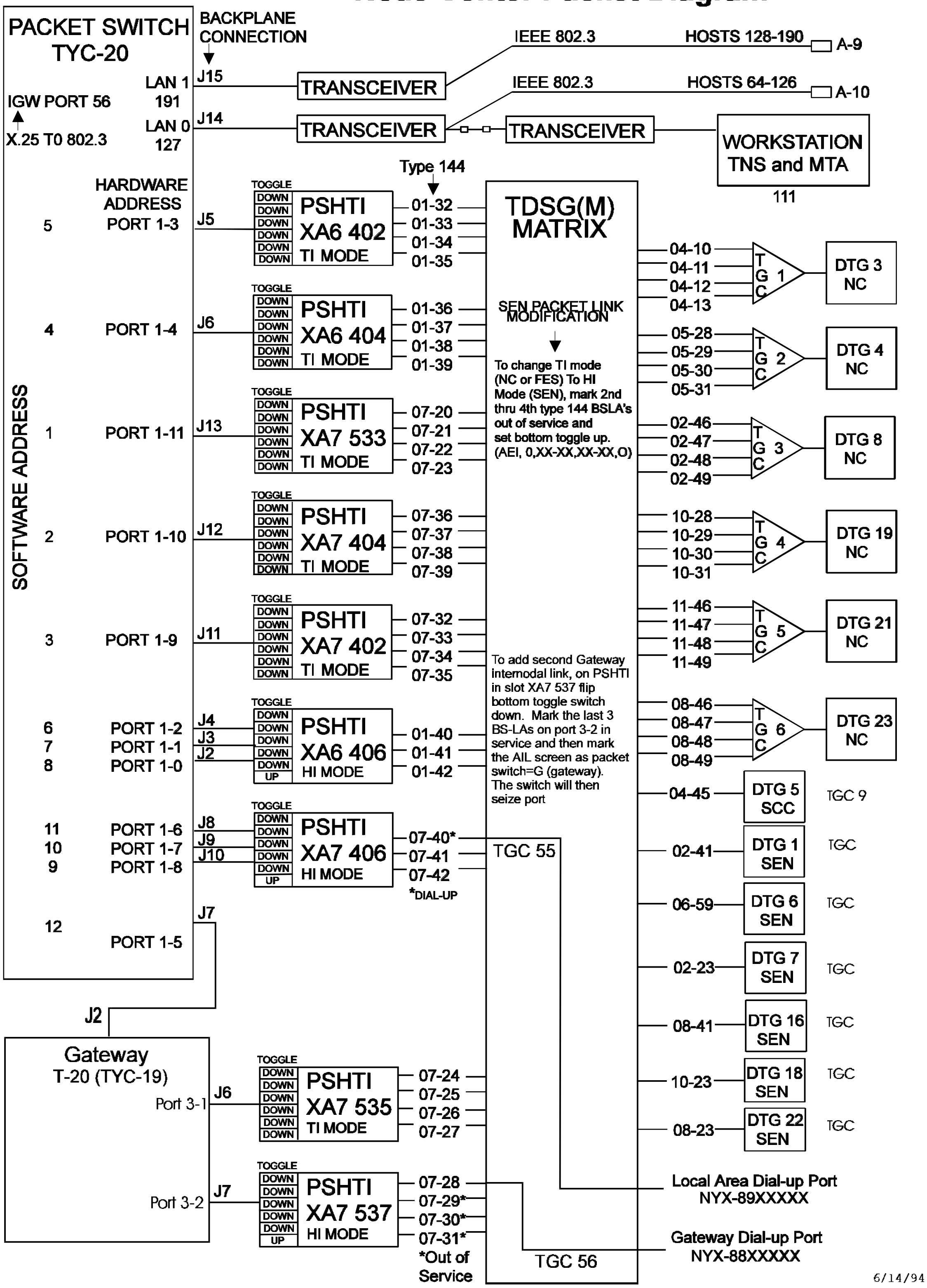
NETWORK INFORMATION		
NET IDs	148.14	121st 22nd Bde
	148.15	141st, 22nd Bde
Domain Name		c5.army.mil
Default Gateway		148.xx.196.1
Def closet TNS		148.xx.192.111
Round Robin		148.xx.193.111

BATCON's	
32nd	5570231,32,33
17th	5570731,32,33
440th	5571231,32,33
121st	5538831,32,33
141st	5518631,32,33

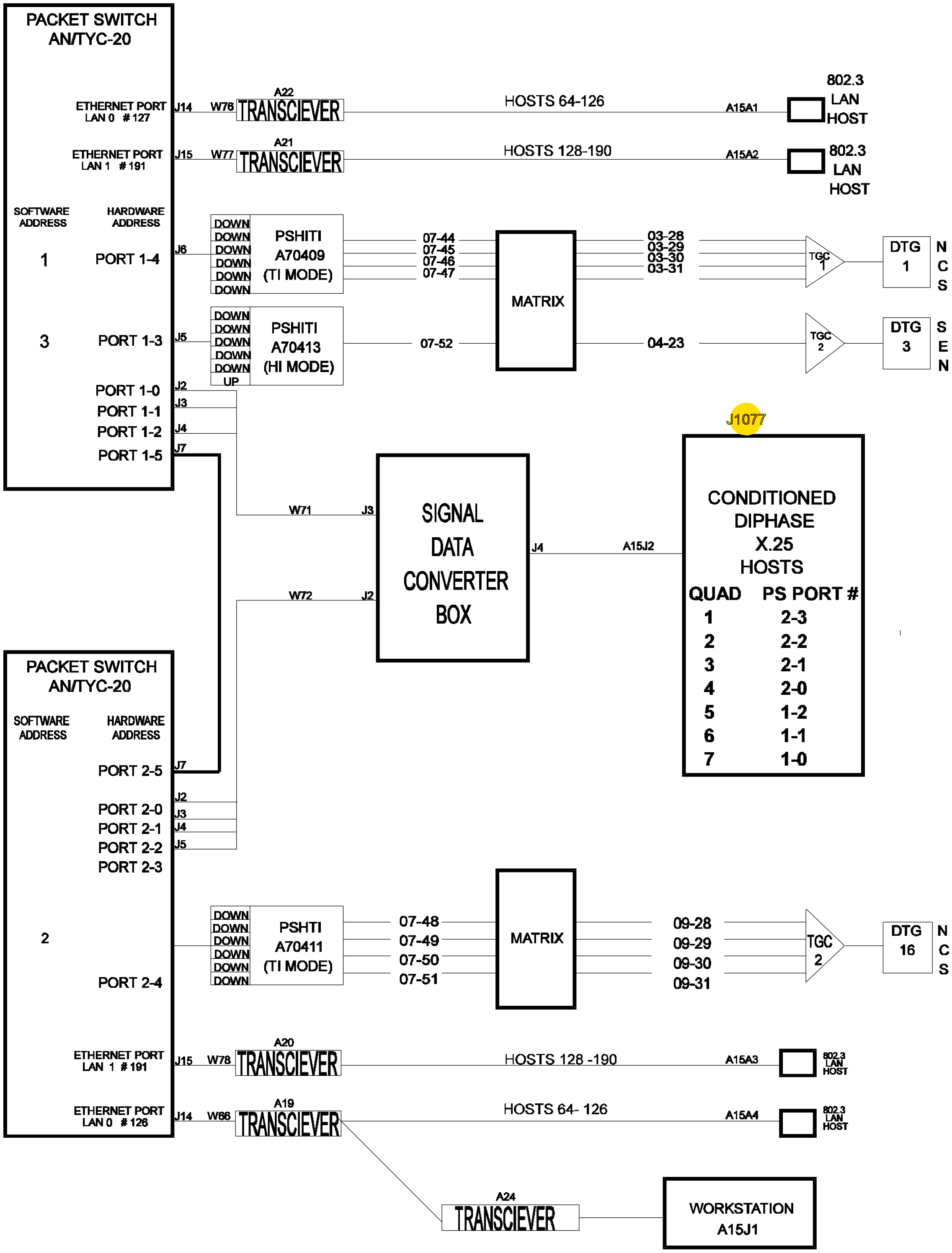
SEN PHONE NUMBERS				
UNIT		*32nd*	*17th*	*440th*
Label	*PLT*			
X11	A/1	5500110	5501010	5502010
X12	A/1	5500120	5501020	5502020
X13	A/1	5500130	5501030	5502030
X21	A/2	5500210	5501110	5502110
X22	A/2	5500220	5501120	5502120
X23	A/2	5500230	5501130	5502130
X31	B/1	5500310	5501210	5502210
X32	B/1	5500320	5501220	5502220
X33	B/1	5500330	5501230	5502230
X41	B/2	5500410	5501310	5502310
X42	B/2	5500420	5501320	5502320
X43	B/2	5500430	5501330	5502330
X51	C/1	5500510	5501410	5502410
X52	C/1	5500520	5501420	5502420
X53	C/1	5500530	5501430	5502430
X61	C/2	5500610	5501510	5502510
X62	C/2	5500620	5501520	5502520
X63	C/2	5500630	5501530	5502530
X71	A/1	5500140	5501040	5502040
X72	A/2	5500240	5501140	5502140
X73	B/1	5500340	5501240	5502240
X74	B/2	5500440	5501340	5502340
X75	C/1	5500540	5501440	5502440
X76	C/2	5500640	5501540	5502540
X90	D/1	5500722	5501622	5502622
X91	D/1	5500724	5501624	5502624

RAU AND NRI NUMBERS				
UNIT		*32nd*	*17th*	*440th*
Label	*PLT*			
LRxx	A/1	5500159	5501059	5502059
LRxx GLU	A/1	5500157	5501057	5502057
Rxx	A/1	5500169	5501069	5502069
Rxx GLU	A/1	5500167	5501067	5502067
LRxx	A/2	5500259	5501159	5502159
LRxx GLU	A/2	5500257	5501157	5502157
Rxx	A/2	5500269	5501169	5502169
Rxx GLU	A/2	5500267	5501167	5502167
LRxx	B/1	5500359	5501259	5502259
LRxx GLU	B/1	5500357	5501257	5502257
Rxx	B/1	5500369	5501269	5502269
Rxx GLU	B/1	5500367	5501267	5502267
LRxx	B/2	5500459	5501359	5502359
LRxx GLU	B/2	5500457	5501357	5502357
Rxx	B/2	5500469	5501369	5502369
Rxx GLU	B/2	5500467	5501367	5502367
LRxx	C/1	5500559	5501459	5502459
LRxx GLU	C/1	5500557	5501457	5502457
Rxx	C/1	5500569	5501469	5502469
Rxx GLU	C/1	5500567	5501467	5502467
LRxx	C/2	5500659	5501559	5502559
LRxx GLU	C/2	5500657	5501557	5502557
Rxx	C/2	5500669	5501569	5502569
Rxx GLU	C/2	5500667	5501567	5502567
Rxx	D/1	5500799	5501699	5502699
Rxx GLU	D/1	5500797	5501697	5502697
NRI	A/1	5500160	5501060	5502060
NRI	A/2	5500260	5501160	5502160
NRI	B/1	5500360	5501260	5502260
NRI	B/2	5500460	5501360	5502360
NRI	C/1	5500560	5501460	5502460
NRI	C/2	5500660	5501560	5502560

Node Center Packet Diagram



LEN PACKET SWITCH FUNCTIONAL DIAGRAM



CHAPTER 9

COMSEC

SECTION I - GENERAL

1. PURPOSE. To establish standard communications security (COMSEC) procedures for the V Corps Mobile Subscriber Equipment (MSE) network.

2. SCOPE. The MSE network employs many new concepts for generating, distributing, and managing electronic COMSEC key. These procedures reflect the emerging doctrine, and are based on the most recent NSA guidance, DA directives, and command policies. They apply to all signal teams assigned, attached, or under the operational control of the 22d Signal Brigade.

3. CONFLICTS. Policies and procedures contained in many DA publications don't always reflect emerging COMSEC doctrine for MSE. Conflicts between these procedures and others should be addressed to the V Corps Signal Office for resolution.

4. GENERAL. The MSE network is designed to ensure the integrity and security of communications at the secret level with provisions for Top Secret and/or Sensitive Compartmented Information (TS/SCI). Overall COMSEC is a result of the netted protection provided through the use of standing operating procedures (SOP), physically protected WIRE LINES and various cryptographic systems as described in the following paragraphs.

a. STANDING OPERATING PROCEDURES (SOP). Coordinated SOPs are an essential part of the MSE COMSEC plan. When executed properly, these procedures deny unauthorized access to our communications.

b. PROTECTED WIRE LINES Wire lines between subscribers and MSE switchboards are considered approved loops. Operators and users must provide physical security for these wire lines to ensure only authorized subscribers access the network.

c. CRYPTOGRAPHIC SYSTEMS. Overall cryptographic security is a result of netted protection in four functional areas: Trunk, Orderwire, Switch and Subscriber (T-O-S-S).

(1) TRUNK SECURITY. Trunk Encryption Devices (TEDs, KG-194As) are used throughout the system to encrypt Digital Transmission Groups (DTGs) for transmission between switches.

(2) ORDERWIRE SECURITY. VINSON (KY-57) provides secure half duplex communications for orderwires over radio and cable links. This system also provides Over The Air Rekey (OTAR) capability to MSE assemblages.

(3) SWITCH SECURITY. The Automatic Key Distribution Center (AKDC, KGX-93A) provides for the generation, storage, and transfer of COMSEC Keys. Dual Loop Key

Generators (DLKGs, KG-112s) are used to provide secure communications between MSRTs and NC/LENs, and key transfers between NC/LENs.

(4) SUBSCRIBER SECURITY. Cryptographic protection for wireline subscribers using DNVTs (Digital Non-secure Voice Terminals) is provided via the TED, as explained in paragraph (1). Additional protection is provided for Mobile Subscriber Radio-Telephones (MSRTs) by using RT-1539A radios to secure the radio link with the Radio Access Unit (RAU), and a Digital Subscriber Voice Terminal (DSVT, KY-68) to secure the connection to another DSVT, or to the NC/LENs Dual LKG for connection to a DNVTs.

5. RESPONSIBILITIES. The 22d Signal Brigade Commander, in his role as the Corps Signal Officer, is ultimately responsible for COMSEC of the V Corps communications network. The responsibility for COMSEC management is shared or distributed throughout the system.

a. SCC (System Control Center). A fully complemented corps will have one active, one reserve, and up to seven division SCCs. Each SCC is co-located with a SYSCON which performs specific functions as follows:

(1) Brigade SYSCON (BCMO) performs COMSEC key management for the network.

(2) Division SYSCON (DCMO) monitors network and performs COMSEC key management for their Node Switch Group.

b. NCs (Node Center Switches) generate, distribute, and activate COMSEC keys only as directed by the Network Technician at the Brigade SYSCON; this may include providing keys to associated LOS teams; and MSRT keys in exceptional cases. Several NCSs will be identified to perform COMSEC tasks as follows:

(1) PNCS (Primary Node Center Switch) is usually located on the same site as the Brigade SYSCON and receives direction from the network COMSEC manager.

(2) SNCS (Secondary Node Center Switch) is usually connected to the V Corps Reserve SCC. The SNCS receives corps operational keys in order to assume role as PNCS when necessary. Capable of performing COMSEC related tasks for the network COMSEC manager.

(3) LNCS (Leader NCS) is usually connected to a Division SCC or a Battalion SYSCON and is the primary tool for the Division/Battalion COMSEC Manager. May also serve as the PNCS/SNCS.

c. LENS (Large Extension Node Switch) stores and distributes keys as directed by the Brigade SYSCON; provides keys to associated LOS teams; and may issue MSRT keys when directed by SYSCON. The LEN may also operate a secure Combat Net Radio Interface (CNRI, KY-90). 22ND Signal Brigade LENs are not normally equipped with the KY-90.

d. SENS (Small Extension Node Switch) provides keys to associated LOS teams and, in exceptional cases, may receive subscriber keys for issue to MSRTs. SENs may also operate a secure Net Radio Interface (NRI, KY-90).

e. RAU (Radio Access Unit) provides keys to associated LOS teams and, in exceptional cases, may receive subscriber keys for issue to MSRTs.

f. BCMO (Brigade COMSEC Management Office) is operated by the Signal Brigade S3 and normally deploys with the Brigade SYSCON. The BCMO will ensure the corps bi-monthly operational keys are generated and propositioned IAW this SOP, (Appendix 9A). The BCMO loads and verifies the operational keys in the PNCS AKDC for Bulk Transfer to all NCs in the system. The BCMO distributes keys to the brigade Signal Battalion Sub-accounts prior to deployment. The BCMO analyzes, determines and coordinates requirements for key with Corps and outside organizations (7th Sig Bde, 5th Sig Cmd, DISA, USAF, etc.) (Appendix 9B).

g. CCMO (Corps COMSEC Management Office) is operated by the Corps Signal Office and normally deploys with the Corps Main and Corps Rear. The CCMO receives keys from the BCMO and distributes them to major subordinate unit COMSEC Custodians.

h. DCMO (Division COMSEC Office of Record) is operated by the division signal office(s) and normally deployed with the Division Main. DCMOs receive keys from the CCMO for further distribution to their user COMSEC Sub-accounts.

6. CLASSIFICATION. As a general rule, unclassified COMSEC information, including this SOP, is intended for official use only and should be withheld from public disclosure.

SECTION II. DEPLOYMENT PROCEDURES

1. PURPOSE. To outline COMSEC procedures for deployment of the MSE network.

2. REFERENCES.

a. TM 11-5800-216-10-3 (S), Appendix K, COMSEC Key Management, to Mobile Subscriber Equipment System Manual.

b. GTE Key Management Addendum (S), REV. 2 dated 14 Jul 89.

3. GENERAL. "Cold Start" of the MSE network requires carefully coordinated procedures to ensure proper COMSEC key distribution in an operational scenario. The following procedures develop the concept of prepositioned key prior to deployment, transfer of operational keys as the network matures and operational management by the Brigade SYSCON at the completion of "cold start".

4. PROCEDURES. "Cold Start" is conducted in four phases: 1) Predeployment, 2) Deployment and Backbone Installation, 3) Link Installation and 4) Operational Management. Each NC/LEN must complete all required actions in each phase prior to beginning the next.

a. PREDEPLOYMENT - PHASE I. Start-up key management tasks consist of generating the Corps operational key set, issuing these keys to the CCMO and Signal Brigade COMSEC Sub-Accounts. Prepositioning keys at Node Switch Group (NSG) Leader Node Center Switches (LNCS)(one per signal battalion within the corps), and providing mobile subscriber and wireline DSVT keys.

(1) The Corps' operational key set is generated at the PNCS by the BCMO and stored at the Brigade COMSEC Office of Record (BCMO) Appendix 9A. In some cases, such as actual deployment, propositioned key tape systems will be used IAW classified instructions issued by the Corps Signal Office (G-6).

(2) The BCMO issues keys to the Signal Brigade Sub-Accounts and the CCMO and further prepositioned to LNCS as shown in figure 9-1. Through the use of prepositioned operational key sets, the MSE system is ready to begin corps-wide electronic distribution of keys.

(3) CCMO/DCMOs will issue DSVT/MSRT key sets to COMSEC custodians who will store keys for issue to users (reference Section IV). The BCMO will issue DSVT/MSRT keys to HHC, Signal Brigade users.

b. LINK INSTALLATION - PHASE II. NCs/LENs install internodal links and by direction from the Brigade SYSCON receive the corps operational keys via Bulk Transfer (BT).

Figure 9-1

PRE-POSITIONED KEYS

32d SB	17th SB	440th SB	SPARE	SPARE
T1O1	T102	T103	T104	T105
T112	T112	T112	T112	T112
T113	T113	T113	T113	T113
B002	B002	B002	B002	B002
N029	N029	N029	N029	N029
K028	K028	K028	K028	K028
M224	M224	M224	M224	M224
U003	U003	U003	U003	U003
U004	U004	U004	U004	U004
U017	U019	U021	U023	U005
U018	U020	U022	U024	U006

121st SB	SPARE	141st SB	SPARE	SPARE
T106	T107	T108	T109	T110
T112	T112	T112	T112	T112
T113	T113	T113	T113	T113
B002	B002	B002	B002	B002
N029	N029	N029	N029	N029
K028	K028	K028	K028	K028
M224	M224	M224	M224	M224
U003	U003	U003	U003	U003
U004	U004	U004	U004	U004
U007	U009	U011	U013	U015
U008	U010	U012	U014	U016

(1) Bn COMSEC managers issue "cold start" keys to NCs/LENs in the staging area.

NC/LEN Cold Start Keys
C001
T113
B002
N029

Figure 9-2

2) NCs/LENs load "cold start" keys in HUS locations as shown in Figure 9-2 and initialize internodal links.

(3) NCs/LENs issue CM key N029 to LOS teams as required.

. Figure 9-3

(4) The Brigade SYSCON directs bulk transfer (BT) of List 6 to NC/LENs as internodal links are installed. The Division SYSCON directs bulk transfer (BT) of List 6 within

INTERNODAL LINK
INSTALLATION PROCEDURES

- LOAD T 1 1 3 IN TED TO INITIALIZE LINK.

- CONTROLLING NCS GENERATES T 3 7 0 AND BULK TRANSFERS IT TO THE DISTANT NCS/LEN.

- SECURE THE LINK: BOTH NCSs/LENs EXTRACT T 3 7 0 AND RELOAD IT IN THE TED FOR THE LINK.

- CONTROLLING NCS UPDATES TEDS AND REPORTS LINK "GREEN" STATUS THROUGH THEIR NMF TO SYSCON NOTE:

NOTE: TED UPDATE CORRESPONDS TO DAY OF THE MONTH.

their portion of the network only.

Figure 9-4

BULK TRANSFER
LIST 6

ASSIGN TRANSFER LIST (ATL)

A ACTION
6 LIST NUMBER
__ START ID
KEY XMIT
COMSEC ID RANGE
START END E=ELIMINATE

001	001	CIRK
003	025	U KEYS
028	029	CM KEYS
101	113	Ti,Te KEYS
224	225	M & X KEYS

(5) The Brigade SYSCON will authorize each NC/LEN to proceed to phase III when BT is completed. COMSEC List 6 is part of the standard and local database and can be verified. List 6 entries can be modified using an ATL command. NOTE: Care must be taken not to activate any RAU beacons or affiliate any DSVTs until the operational keys are transferred.

c. LINK INSTALLATION - PHASE III. SEN and RAU links are installed IAW established priorities. See SEN/RAU Cold Start Key (Figure 9-5), Extension Link Installation Procedures (Figure 9-6) and Te HUS Allocation Chart (Figure 9-7).

(1) NCS COMSEC managers issue "Cold Start" keys to SENs and RAUs in the staging area.

(2) SEN/RAUs issue CM key N029 to LOS teams as required.

Figure 9-5

SEN/RAU COLD START KEYS

* T
N029
K028
** M224
** U

* NSG Te KEY FOR SENS or Te KEY FOR RAUs/DSVT key for remote RAUs.
** NRI ONLY

Figure 9-6

EXTENSION LINK
INSTALLATION PROCEDURES

- LOAD Te KEY ASSIGNED TO SEN/RAU.

- CONTROLLING NCS/LENS DIRECTS TED UPDATE.

- CONTROLLING NCS/LENS REPORTS LINK "GREEN" STATUS THROUGH THEIR NMF TO SYSCON.

NOTE: TEDs UPDATE CORRESPONDS TO DAY OF THE MONTH.

(3) RAU markers will be activated on order by the SCC after verification of COMSEC and frequency transfers.

Figure 9-7

Te HUS ALLOCATION CHART

Key Label	Active	HUS Reserve	Use	
T101	101	357	Te - 32d Sig	"A" SENs
T102	102	358	Te - 17th Sig	"B" SENs
T103	103	359	Te - 440th Sig	"C" SENs
T104	104	360	Te - SPARE	"D" SENs
T105	105	361	Te - SPARE	"E" SENs
T106	106	362	Te - 123s Sig	"F" SENs
T107	107	363	Te - SPARE	"G" SENs
T108	108	364	Te - 141st Sig	"H" SENs
T109	109	365	Te - SPARE	"H" SENs
T110	110	366	Te - SPARE	"I" SENs
T111	111	367	Te - SPARE	"J" SENs
T112	112	368	Te - RAUs (V Corps)	"K" SENs
T113	113	369	Ti - Initialization	
		370	Tn - Transfer	
T114	114	371	Te - TROPO	
T115	115	372	Te - TACSAT	
T116	116	373	Te - VTC	
T117 - T124			SPARES	
T125	125	381	Tg - TED Gateway	

d. OPERATIONAL MANAGEMENT - PHASE IV. Brigade SYSCON assumes operational control upon the conclusion of PHASE III "cold start".

(1) MOVEMENT. Procedures for relocating or re-homing MSE teams (NCs, LENs, SENs and RAUs) are essentially the same as a "cold start". All teams maintain "cold start" keys in their AN/CYZ-10/KYK-13/KYX-15As; and zero AKDC and TEDs during movement, RAUs may keep one RT-1539A and their KY-68 loaded for MSRT capability. Upon re-opening, MSE teams re-load their "cold start" keys and follow the procedures outlined in this section. NCSs and LENs will start over with PHASE II procedures and SENs and RAUs will start over with PHASE III procedures.

(2) SWITCH CRASH COMSEC PROCEDURES. In the event of a switch crash, the affected MSE team will <u>NOT</u> zeroize their COMSEC equipment. There is no need to reload key after a switch crash. Processor failures do not have any affect on the COMSEC keys stored in the TEDs or the AKDC. Key will only be affected in the event of a bad fill battery and a power loss.

(3) SURVEILLANCE. COMSEC managers must continuously monitor the status of the network in order to detect circumstances that could jeopardize the integrity of the network. Such incidents will be reported IAW Section VI, of this Chapter.

SECTION III - OPERATIONAL RE-KEY

1. PURPOSE. To provide standard procedures for re-keying the MSE network when deployed.

2. GENERAL. Once the MSE network is deployed, it will be re-keyed based on operational and security requirements, as directed by the Corps Signal Officer - in coordination with the Corps Operations Officer (G-3). Any re-key must be carefully coordinated and precisely executed to avoid loss of essential communications or network security during critical operations within the Corps. These procedures serve as a guide for re-keying an operational MSE network. Specific procedures may vary depending on the situation and type of re-key performed (i.e., operational or compromise recovery).

3. PLANNING FACTORS. The effective time for key changes must be determined prior to conducting any re-key. The following factors should be considered when determining change over times:

a. Coordination by G-6 with Corps/Division G-3 to know the tactical situation.

b. Estimated time required for distribution of new keys to MSRTs, if necessary.

c. Estimated time to pass key change time through command and operations channels.

4. PROCEDURES. The following procedures describe an operational re-key of the entire network in four phases: 1) activate BT keys, 2) distribute next-up keys, 3) activate keys and 4) re-key links. A successful re-key requires participation from leaders at all levels.

a. PHASE I - ACTIVATE BT KEYS. The BCMO generates and loads next-up keys at the PNCS. The Brigade SYSCON notifies the G-6 CCMO and each battalion that COMSEC Account couriers are required to pick up a new MSE key set at the BCMO. New BT keys are picked up from the Battalion COMSEC Manager by couriers from their NCs/LENs. The new BT is loaded in reserve HUS locations prior to re-key. Once the new BT keys are distributed, Battalion BATCONs notify the Brigade SYSCON which directs all NCs/LENs to activate key 258. Node managers notify their Battalion SYSCON when these actions are completed. Battalion BATCONs notify the Brigade SYSCON when all their NCs/LENs have complied.

b. PHASE II - DISTRIBUTE NEXT-UP KEY. The Brigade SYSCON orders the PNCS to assign transfer list 7. The PNCS notifies the Brigade SYSCON when completed.

(1) The Brigade SYSCON directs BT of a new list 7 from the PNCS to all NCs/LENs. The PNCS notifies the Brigade SYSCON when completed. All Battalion BATCONs notify the Brigade SYSCON when all of their NCs/LENs have received the Bulk Transfer.

(2) The Brigade SYSCON directs BT of the new X key (X225) from the PNCS to all NCs/LENs. The PNCS notifies the Brigade SYSCON when completed. The Battalion

BATCONs notify the Brigade SYSCON when all of their NCs/LENs have received the Bulk Transfer. List 7 is part of the V Corps Standard Databse.

Figure 9-8

```
                   BULK TRANSFER
                        LIST 7

                ASSIGN TRANSFER LIST (ATL)
NOTE: This
may be           _A_  ACTION
modified in      _7_  LIST NUMBER
current          ___  START ID
OPORD.                KEY XMIT
                      COMSEC ID RANGE
                   START   END      E=ELIMINATE

                257  -  257    CIRK
                259  -  281    U KEYS
                284  -  285    CM KEYS
                357  -  369    Ti & Te KEYS
                480  -  480    M KEY
```

(3) Node managers provide next-up M224 key to RAUs and report completion to their NSG COMSEC manager.

(4) CCMO and DCMO coordinate MSRT key distribution with user COMSEC Custodians.

c. PHASE III - RE-KEY LINKS. NCs, LENs, SENs and RAUs receive new TED and CM keys during this phase. CM keys are changed for each link as they are re-keyed.

(1) INTERNODAL LINKS. Battalion BATCONs direct NCs/LENs to re-key internodal links. Node managers coordinate the generation, transfer and re-initialization of each internodal link under their control. Battalion BATCONs notify the Brigade SYSCON when all internodal links are re-keyed.

(2) EXTENSION LINKS. Battalion BATCONs coordinate the manual delivery of Te and CM keys to connected SENs/RAUs. Node managers direct re-key as keys are delivered to SENs/RAUs, and report completion to their Battalion BATCONs which notify the Brigade SYSCON when all their extensions are re-keyed.

d. PHASE IV - ACTIVATE KEYS. The Brigade SYSCON directs all NCs/LENs to turn off RAU markers, activate COMSEC list 7 and manually activate the X key (i.e., extract key from HUS 481 and load into HUS 225). As NCs/LENs activate the keys, node managers direct

RAUs to load new M224 keys and reactivate markers. Node managers report completion to their Battalion BATCONs, who notify the Brigade SYSCON when all their NCs/LENs have complied.

(1) BCMO VERIFICATION. The Brigade BCMO will Re-load his/her DSVT and call each NC, LEN, RAU and external Gateway in the NETWORK to verify secure calling. When he/she is satisfied, report verification to Brigade SYSCON Network Manager.

(2) SUBSCRIBER TERMINALS. Brigade SYSCON reports to Corps G-6 that Re-Key is complete. Corps G-6 directs subordinate commands to Re-Load all DSVT/MSRT devices.

SECTION IV - TS/SCI PROCEDURES

1. PURPOSE. To establish standard procedures for transmitting TOP SECRET and/or SENSITIVE COMPARTMENTED INFORMATION (TS/SCI) via the MSE network.

2. SCOPE. These procedures adapt MSE's SECRET high architecture to accommodate an extremely limited number of TS/SCI users. This requires extensive coordination between the Brigade SYSCON, MI unit Signal Officer(s) and NCs/LENs operators that support TS/SCI users. These procedures only apply to the MSE network support of AN/UGC-144 Communications Terminals (CT's)

3. REFERENCES.

a. TB 380-40, Electronically Keyed COMSEC Systems (C).

b. NSA Memorandum, V2-031-88, Subject: TS/SCI Traffic Over MSE (C), dated 25 February 1988.

c. GTE Key Management Addendum (S), REV. 2, dated 14 July 1989.

4. GENERAL. The MSE network is designed to ensure the integrity and security of communications at the SECRET level with special provisions for TS/SCI. These procedures describe two methods for transmitting TS/SCI over the MSE network. The first method is used for informal (Non-AUTODIN) record communications, where information is transmitted directly between two terminals (point-to-point). The second method is used for information that is introduced to the formal (AUTODIN) record traffic network, via the AN/TYC-39 Message Switch.

5. PROCEDURES.

a. INFORMAL RECORD COMMUNICATIONS. Information transmitted directly between two terminals will be protected using DSVT and a specially Compartmented key (S key). Once communications is established, users load their S key in the DSVT and transmit. The S must be loaded for each transmission. This procedure can be used over a gateway to TRI-TAC, but not to AUTODIN. NOTE: Using units primarily MI units, provide and store their own S-key. Neither the Signal Brigade nor any Node Center will ever handle the S-Key.

b. FORMAL RECORD COMMUNICATIONS. These users are assigned to profile 47 or 48 (end-to-end encryption). The following procedures will be used at NCs/LENs providing service to these subscribers and/or gateway links to the AN/TYC-39 Message Switch.

(1) All NC/LEN switch personnel will become familiar with these procedures and will sign a briefing statement prior to the opening of the AKDC in the switch. A copy of the briefing statement to be signed is provided in this section.

(2) The keys/combinations for the AKDC locks will never be held by one individual.

(3) The keys in HUS locations 026 and 027 will never be downloaded into any other fill devices unless authorized by the Brigade Network Technician or OIC of the Brigade SYSCON. These two keys are Node Center unique and will NEVER be bulk transferred (BT) anywhere in the MSE network except by direction of the BCMO. These two keys will only be hand carried by at least two MI personnel.

(4) The senior person in each switch is required to train all assigned personnel in that switch. The briefing statement will be signed by all personnel and maintained on file at each switch for review by MI personnel.

(5) Any deviation from these procedures will be reported to the Brigade SYSCON for evaluation (reference Section VI).

SI KEY HANDLING PROCEDURES

I have become familiar with the following procedures and will comply with these instructions at all times. I understand that I will never have both keys or both combinations to the AKDC at any time. I understand that a COMSEC incident will result any time I have the capability of accessing the AKDC by myself.

All openings and closings of the AKDC will be under two person integrity. The names of the individuals opening the locks, the time the locks were opened, the HUS locations that keys were loaded into or downloaded from and the time the locks were placed back on the AKDC will be placed in the switch master station log.

I will notify the senior person present and the Brigade SYSCON via normal command channels if I become aware of any noncompliance with the above procedures.

RECORD OF BRIEFINGS

PRINTED NAME, RANK	DATE	SIGNATURE

SECTION V - PHYSICAL SECURITY

1. PURPOSE. To establish physical security procedures for COMSEC material used with MSE.

2. REFERENCES. These procedures implement guidance from the following DA publications.

a. AR 380-40 (U), Policy for Safeguarding and Controlling COMSEC Information.

b. AR 190-51, Security of Army Property at Unit and Installation Level.

c. TB 380-41, Chapter 5 - Safeguarding COMSEC Material.

d. Security Standards for Controlled Cryptographic Items (CCI).

3. GENERAL.

a. COMSEC material plays a vital role in the protection of national security communications. The acquisition of new systems, such as MSE, have resulted in new applications of COMSEC protection and has created the need for new physical security procedures.

b. These procedures describe the minimum physical security measures necessary to prevent the loss, theft, sabotage, unauthorized access to or observation of COMSEC material.

c. The phrase "COMSEC material," used throughout these procedures, is intended to include classified and unclassified COMSEC equipment and CRYPTO codes, including Controlled Cryptographic Items (CCI).

4. ACCESS CONTROLS.

a. Individuals assigned to shelters containing COMSEC equipment will have a minimum of SECRET security clearance.

b. Personnel with less than a SECRET clearance shall be permitted entry to shelters only when continuously escorted by regularly assigned, appropriately cleared personnel.

c. Each shelter containing COMSEC material will limit access to those individuals assigned. Team members on duty shall screen COMSEC material from other visitors and annotate their name, unit, arrival and departure times in their station log.

d. Uncleared users may be allowed access to MSE approved loops in the presence and under the supervision of appropriately cleared personnel, provided that the distant party has been alerted to the participation of an uncleared user.

e. Whenever possible, NCs should be arranged so that the node manager can supervise access to the AKDCs in the switching shelter. Locking bars must be <u>properly</u> installed

(BEWARE THE ALMOST LOCKED AKDC--IT IS POSSIBLE TO LOCK THE PADLOCKS AND STILL NOT HAVE THE TAB INSERTED PROPERLY TO INCLUDE PUSHING THE ENABLE BUTTON) on AKDCs once all links are in. To facilitate rapid re-entry, the locking bars may be secured using quality key operated padlocks, Series 200, 5200. Sergeant Greenleaf combination locks are an acceptable substitute. Padlock keys used to secure classified material take on the same classification as the material secured and must be protected as classified IAW AR 380-5. COMBINATION LOCKS REQUIRE THAT A DA FORM 700 BE COMPLETED AND SAFEGUARDED AS SECRET MATERIAL, WHICH REQUIRES THAT THEY BE LOCKED IN AN APPROVED SAFE. In order for the NCs/LENs to have emergency access to these stored combinations, it is recommended that all units bring a GSA approved one-drawer safe to the field.

5. STORAGE. Security containers and/or guards will be used to protect COMSEC material when it is not under the operational control of authorized personnel. The following storage requirements must be applied when storing COMSEC material.

a. CLASSIFIED ITEMS. May be stored only in security containers approved UP AR 380-5. (Exception: Un-keyed AKDCs will be secured in their operational configuration with double bars secured in a secure, guarded motor pool or in a guarded tactical site.

b. COMSEC EQUIPMENT. Unit key control procedures (UP AR 190-51 and AR 380-5) are an integral part of the physical security plan for COMSEC equipment. Additional requirements vary depending on the configuration.

(1) OPERATIONAL CONFIGURATIONS. COMSEC equipment will not be removed from its operational configuration for the sole purpose of providing secure storage. Shelters containing such equipment will be protected to a degree which, in the judgment of the commander, is sufficient to prevent theft, sabotage, tampering or access by unauthorized persons. The KGX-93A when zeroed is classified SECRET, all padlock keys or combinations for the KGX-93A are therefore to be protected as SECRET.

(2) NON-OPERATIONAL CONFIGURATIONS. Keyed COMSEC equipment will be stored the same as classified items. Un-keyed CCIs will be stored by a suitable method which will prevent any reasonable possibility of theft, tampering or access by unauthorized individuals (UP TB 380-40-22).

(3) FILL DEVICES. Controlled Cyrptographic items (CCI) (AN/CYZ-10, KYK-13, KYK-15A) when not in use, must be double barrier protected or guarded at all times. COMSEC equipment or devices filled with COMSEC must be stored in a GSA approved container when not in use.

6. INVENTORY. A listing of all COMSEC material (<u>CLASSIFIED EQUIPMENT,</u> <u>KEY,</u> <u>FILLED KEY DEVICES,</u> AND <u>LOADED CCI</u>) will be maintained by each MSE signal site. (Recorded on DA Form 2653-R)

7. EMERGENCY ACTIONS. The importance of these procedures cannot be over emphasized. Each MSE team member must know how to destroy or zero all codes to prevent them from falling into enemy hands. Figure 9-9 lists the normal priority for destroying classified material and zeroing of crypto equipment.

Figure 9-9

DESTRUCTION PRIORITIES

PAPER CODES AND OTHER PAPER MATERIAL	CRYPTOGRAPHIC EQUIPMENT
TOP SECRET AKDCs	
SECRET	KOK-12/16s
CONFIDENTIAL	KYX-15s
FOR OFFICIAL USE ONLY	KYK-13s
	MSRT/CNR
	AN/CYZ-10’s

When large amounts of material are held, destruction should be accomplished in the following order: Superseded, Future, Current.

8. COMSEC INCIDENTS. Good physical security is essential to COMSEC. Incidents which jeopardize the security of the MSE network must be reported IAW procedures contained in Section VI.

NOTE: The initials above signify that all equipment (i.e., TEDs, AKDCs, RT-1539s, KY-57s, KY-68s, KY-90s, and common fill devices) have been **ZEROED**. Failure to zero equipment constitutes a COMSEC incident. Upon completion, this form must be returned to the BNCOMSEC Account. The platoon is cleared for COMSEC sensitive items by the BN S-3.

SECTION VI - INCIDENT PROCEDURES

1. PURPOSE. To establish procedures for reporting and evaluating incidents which jeopardize the integrity of the MSE network.

2. REFERENCES.

a. NAG-16, Field Production and Key Distribution of Electronic Key in Support of Short-Notice Operations.

b. TB 380-41, Safeguarding, Accounting and Supply Control of COMSEC Material, Chapter 5.24 thru 5.26.

c. USAREUR Pam 380-40, Communications Security (COMSEC) Custodian Guide, Chapter 7.

d. Security Standards for Controlled Cryptographic Items (CCI).

3. GENERAL. It is essential that incidents which jeopardize the security of electronic key be reported expeditiously to the commander directing the generation and distribution of the key (in the case of field generated key) or to the controlling authority (in the case of electronic key converted from key tape).

4. RESPONSIBILITIES. Both the holders of electronic key and the commanders who manage it have important responsibilities when such key is compromised.

a. HOLDERS. The principal task of holders/operators is to report the circumstances precisely and expeditiously to the appropriate evaluator, usually located at the Brigade SYSCON.

b. CONTROLLING AUTHORITY. Controlling authorities of key tape which has been converted to electronic form, and the commanders who direct the generation of electronic key in the field, are responsible for evaluating reported COMSEC incidents affecting their key, and for directing actions to minimize the security impact of the reported occurrences.

5. REPORTING. On the premise that COMSEC incidents affecting electronic key in the field will normally occur during time sensitive tactical deployments, the general COMSEC incident reporting procedures directed by non-tactical COMSEC directives are hereby simplified.

a. Any incident that could impact the integrity of the MSE network should be reported immediately to the Brigade SYSCON when deployed, or to the V Corps Signal Office (G-6) in garrison.

b. In order to conduct a proper evaluation, it is vital that all immediately available information be reported. Initial reports should be classified CONFIDENTIAL and provide a brief description of the incident; and answer the questions: who, what, where, when, why and how.

c. The G-6 will review all COMSEC incident reports and prepare any necessary reports to offices outside V Corps (UP TB 380-41, Chapter 5).

d. When classified material is presumed lost, commanders must initiate a preliminary inquiry to determine the scope of the loss, and determine if a formal investigation is warranted (UP AR 15-6). Investigation reports will be reviewed by the next higher headquarters IAW local policy.

e. The BCMO will evaluate COMSEC incident reports and advise the commander as to their impact on security, and possible courses of action.

6. EVALUATION. Commanders who must act on reported COMSEC incidents must consider a variety of factors. The basic decision an evaluator must make is whether the key has been compromised.

a. COMPROMISE. Unless the reported facts are conclusive, this decision is usually subjective and must frequently be based on only partial understanding of the circumstances. At one end of the spectrum are "positive compromises" - such as where a user reports having abandoned a keyed fill device or equipment to enemy recovery. At the other end are cases which can safely be declared "no compromise" - such as those where an aircraft was seen to crash and burn on impact. Between these extremes lie the majority of cases, where the evaluator must use his experience, judgment and knowledge of the operational situation to decide whether the affected key is compromised or not.

b. SUPERSESSION. Ideally, key which has been declared compromised or possibly compromised should be superseded before it becomes effective, or as soon as possible, if it is effective. However, operational considerations may make this difficult or impossible. Evaluators should consider the following factors prior to implementing an emergency supersession:

(1) Key may be scheduled for routine supersession before an emergency supersession can be implemented.

(2) Some communication paths used to deliver key electronically may no longer exist.

(3) In some situations, the need for continuity of communications may override security considerations. During active hostilities, the potential confusion which might stem from superseding key could outweigh the security advantage of superseding it. Net members should be alerted for possible intruders in nets which must continue to use jeopardized key.

(4) Where future electronic key is compromised or possibly compromised, the cryptoperiod of current key may be extended.

7. PRACTICE. Evaluating and reacting effectively to COMSEC incidents is a skill which is difficult to learn under the duress of actual operations or hostilities. For this reason, it is advisable to incorporate simulated incidents affecting electronic key in training exercises.

SECTION VII - AN/CYZ-10

1. PURPOSE. To establish procedures for accomplishing processes that affect OTAR and OTAT on nets/circuits that are secured by the KG-84A, KY-57/58/67, and KYV-5 and KY-99, and OTAT on KW-46 secured broadcasts, KY-68 secured voice circuits, and STU-III/STU-IIIA/IIB secured telephone circuits.

2. REFERENCES

a. NAG-16, Field Production and Key Distribution of Electronic Key in Support of Short-Notice Operations.

b. Data Transfer Device (DTD), AN/CYZ-10/10A, V3- User Manual

3. GENERAL. The AN/CYZ-10 data transfer device is capable of emulating the KYX-15 net control device, the KYK-13 electronic transfer device, and the KOI-18 tape reader (without being able to read punched tape) in support of OTAR and OTAT. It is also capable of introducing unencrypted)i.e., RED) key or encrypted (i.e., BLACK) key into a STU-III, STU-IIIA, or Allied STU-IIB data port and extracting it, in the same form, at a distant STU-III or STU-IIIA terminal.

I. **EMULATING COMMON FILL DEVICES**. To configure a CYZ-10 to emulate a KYK-15 or KYK-13, use the following steps:

1. From main menu, select "Appl" and "Fill".
2. From fill main menu, select "Setup", "Protocol", "Cfd" and either "13" or "15", as appropriate.

II. **LOADING CYZ-10 FROM KOI-18**. To load a CYZ-10 from a KOI-18, use the following steps:

1. Set up CYZ-10 to emulate KOI-18.
2. From CYZ-10 fill main menu, select "Recv".
3. Connect CYZ-10 to KOI-18.
4. Press CYZ-10 RCV key.
5. Pull key tape through KOI-18.
6. Enter key tag as prompted by CYZ-10.

III. **LOADING CYZ-10 FROM ANOTHER CYZ-10**.

A. **Data Standard**. Set up both CYZ-10s to DS-101”, using “Setup” and Protocol” from fill main menu.

B. **Sending CYZ-10**, perform the following steps:

1. From the fill menu, select “Xmit” and “Issue”.
2. Use P UP and P DN keys to scroll thru key data base and ENTR key to select key(s) to be transferred.
3. Select “Quit”, when finished selecting key(s).
4. Connect sending and receiving AN/CYZ-10s.
5. Press SEND key.

C. **Receiving CYZ-10**, perform following steps:

1. From fill main menu, select “Recv”.
2. Press RCV key.

NOTE: Key tag data will also be transferred to receiving CYZ-10.

3. Disconnect sending and receiving AN/CYZ-10s.

IV. **LOADING COMSEC EQUIPMENT FROM CYZ-10**. To load an OTAR capable COMSEC equipment from a CYZ-10, use the following steps:

1. Set up CYZ-10 to emulate KYK-15 or KYK-13.
2. From CYZ-10 fill main menu, select “Xmit”.
3. Use CYZ-10 P UP and P DN key to scroll thru key data base and ENTR key to select key(s) to be transferred.
4. Select “Quit”, when finished selecting key(s).
5. Connect CYZ-10 to COMSEC equipment.
6. Press CYZ-10 CLR.
7. Press CYZ-10 SEND key.
8. Press “initiate” on COMSEC equipment.
9. Disconnect CYZ-10 from COMSEC equipment.

V. **PERFORMING MK OTAR.** When using a CYZ-10 in lieu of a KYK-15 to accomplish MK OTAR on a KG-84A/C or ANDVT secured point-to-point circuit (or to recover from KEK updating error on a ANDVT secured circuit, the NCS must perform the appropriate COMSEC equipment steps and the steps with the CYZ-10:

1. Set up CYZ-10 to emulate KYX-15.
2. From fill main menu, select “Net” and “Mk”.
3. Use ENTR key and P DN keys to select TEK to be transferred.
4. Connect CYZ-10 to COMSEC equipment.
5. Press SEND key.
6. Disconnect CYZ-10 to COMSEC equipment.

VI. **PERFORMING AK OTAR.** To accomplish AK OTAR on a KG-84A/C, KIV-7, KY-57/58, RT-1523/A, or KYV-5/KY-99/99A secured multi-station net using a CYZ-10 in lieu of a KYX-15, the NCS performs the appropriate COMSEC equipment steps and the following steps involving the CYZ-10:

1. Set up CYZ-10 to emulate KYX-15.
2. From fill main menu, select “Net” and “Ak”.
3. Press CLR key, and use ENTR key and P DN keys to select KEK(s) to be used.
4. Select “Quit” when finished selecting KEKs.
5. Press CLR key, and use ENTR key to select TEK to be transferred.
6. Select “Quit”.
7. Connect CYZ-10 to COMSEC equipment.
8. Press SEND key.
9. Disconnect CYZ-10 from COMSEC equipment.

VII. **PERFORMING OTAT.** To accomplish OTAT on a KG-84A/C, KY-57/58, or ANDVT secured net or circuit using an CYZ-10 in lieu of a KYX-16, the AN/CYZ-10s at both the NCS and OS(s) must be set up to emulate KYX-15s.

A. **NCS** performs appropriate COMSEC equipment steps and following CYZ-10 steps:

1. From fill main menu, select “Net” and “Mk”.
2. Use ENTR key and P DN keys to select key to be transferred.
3. Connect CYZ-10 to COMSEC equipment.
4. Press SEND key.
5. After selected key has been transferred, repeat steps 2 thru 4 for each additional key to be transferred.
6. After all keys have been transferred, disconnect CYZ-10 from COMSEC equipment.

B. **OSs** performs appropriate COMSEC equipment steps and following steps involving the CYZ-10:

1. From fill main menu, select “Net” and “Rcv”.

2. Connect CYZ-10 to COMSEC equipmant.
3. Press RCV key.
4. When OTAT transmissions are completed, disconnect CYZ-10 from COMSEC equipment.

VIII. **TRANSFERRING KEY AND TAG FROM ONE CYZ-10 TO ANOTHER VIA STU-III/STU-IIIA TELEPHONE CIRCUITS.**

NOTE: To transfer a RED tactical key from on CYZ-10 to another using the data ports of attached STU-III or STU-IIIA equipment, both secure telephones must be configured to communicate in asynchronous mode, at 2400 baud, with one start bit and one stop bit. Additionally, the CYZ-10s at the receiving and the sending locations must be set for the "STU" protocol.

A. **Sending Operator** performs following steps:

1. Connect CYZ-10 to STU-III/STU-IIIA.
2. Call intended receiver using STU-III/STU-IIIA secure voice mode and inform operator that tagged COMSEC key is to be transferred.
3. Verify with receiving operator that his/her CYZ-10 is set to "RS-232" mode and is connected to STU III/STU-IIIA in use
4. Shift STU-III/STU IIIA to secure data mode.
5. From CYZ-10 fill main menu, select "Xmit" and "Issue".
6. Use ENTR and P DN keys to select keys to be transferred.
7. Select "Quit" when finished selecting keys.
8. Press CYZ-10 SEND key.
9. When all tagged keys have been transmitted, disconnect CYZ-10 from STU III/STU IIIA.
10. Return STU III/STU IIIA to secure voice mode

B. **Receiving Operator** performs following steps:

1. Respond to sending operator's call and verify that CYZ-10 is attached to STU-III/STU-IIIA being used.
2. Verify that CYZ-10 is in "RS-232" protocol mode.
NOTE: If not, from CYZ-10 fill main menu, select "Setup", "Protocol", and "RS-232".
3. From fill main menu, select "Recv".
4. Press either CYZ-10 ENTR key or RCV key.
5. When all tagged keys have been received, disconnect CYZ-10 from STU-III/STU- IIIA.
6. Return STU-III/STUIIIA to secure voice mode and verify to sender that key was received.

Appendix 9A

V CORPS
MSE KEY MANAGEMENT LIST

KEY LABEL	**TYPE**	**USE**	**SOURCE**	**LIST**	**DISTRO**
C001	TEK	CIRK	GEN	6	NC/LENS
B002	KEK	BT	GEN	-	NC/LENS
U003	KEK	MSRT/DSVT	GEN	6	NC/LENS
U004	KEK	MSRT/DSVT	GEN	6	NC/LENS
U005	KEK	MSRT/DSVT	GEN	6	NC/LENS
U006	KEK	MSRT/DSVT	GEN	6	NC/LENS
U007	KEK	MSRT/DSVT	GEN	6	NC/LENS
U008	KEK	MSRT/DSVT	GEN	6	NC/LENS
U009	KEK	MSRT/DSVT	GEN	6	NC/LENS
U010	KEK	MSRT/DSVT	GEN	6	NC/LENS
U011	KEK	MSRT/DSVT	GEN	6	NC/LENS
U012	KEK	MSRT/DSVT	GEN	6	NC/LENS
U013	KEK	MSRT/DSVT	GEN	6	NC/LENS
U014	KEK	MSRT/DSVT	GEN	6	NC/LENS
U015	KEK	MSRT/DSVT	GEN	6	NC/LENS
U016	KEK	MSRT/DSVT	GEN	6	NC/LENS
U017	KEK	MSRT/DSVT	GEN	6	NC/LENS
U018	KEK	MSRT/DSVT	GEN	6	NC/LENS
U019	KEK	MSRT/DSVT	GEN	6	NC/LENS
U020	KEK	MSRT/DSVT	GEN	6	NC/LENS
U021	KEK	MSRT/DSVT	GEN	6	NC/LENS
U022	KEK	MSRT/DSVT	GEN	6	NC/LENS
U023	KEK	MSRT/DSVT	GEN	6	NC/LENS
U024	KEK	MSRT/DSVT	GEN	6	NC/LENS
U025	KEK	MSRT/DSVT	GEN	6	NC/LENS
U026	KEK	TS/SCI MI BN	CANISTER	-	NC/LENS
U027	KEK	TS/SCI MI BN	CANISTER	-	NC/LENS
K028	KEK	DVOW	GEN	6	NC/LEN/ SEN/RAU TACSAT
N029	TEK	DVOW	GEN	6	NC/LEN/ SEN/RAU TACSAT
CCK01 N030	KEK	FM/MISTY20	GEN	-	FM USERS
N031	TEK	GW DVOW	CANISTER	-	NC/LEN/ SEN/RAU TACSAT

T101	TEK	TED(Te)	GEN	6	32d SIG SEN
T102	TEK	TED(Te)	GEN	6	17th SEN
T103	TEK	TED(Te)	GEN	6	440th SEN
T104	TEK	SPARE(Te)	GEN	6	SPARE
T105	TEK	SPARE(Te)	GEN	6	SPARE
T106	TEK	TED(Te)	GEN	6	121st SEN
T107	TEK	SPARE(Te)	GEN	6	SPARE
T108	TEK	TED(Te)	GEN	6	141st SEN
T109-T111	TEK	SPARE(Te)	GEN	6	SPARE
T112	TEK	TED(Te)	GEN	6	V CORPS RAU
T113	TEK	TED(Ti)	GEN	6	NC/LEN
T114	TEK	TED(Tg)	GEN	-	NC/TROPO
T115	TEK	TED(Tg)	GEN	-	NC/TACSAT
T116	TEK	AUTODIN	CANISTER	-	NC/ACS/ TYC-39
T117	TEK	SB-3865(AF)	GEN	-	NC/AFSWB
T118	TEK	VTC	GEN	-	NC/LEN/VTC TERM
T119-T124	TEK	SPARE(Tg)	OPTIONAL	-	SPARE GATEWAY
T125	TEK	MSG SW(Tg)	GEN	8	NC/LEN/ TYC-39
A126	TEK	AIRK(Tg)	CANISTER	-	GATEWAY
U127	KEK	SB-3865(HRV)	GEN	-	NC/LEN/ AF SWB
A128-A145	TEK	AIRK(Tg)	OPTIONAL	-	SPARE
U146-U155	KEK	MSRV	GEN	8	NC/LEN/ TYC-39
M224	KEK	MSRT/DSVT	GEN	6	NC/LEN/ MSRT/RAU
X225	KEK	X-KEY(NET)	GEN	6	NC/LEN
X226	KEK	MSNV	GEN	8	NC/TYC39
X227	KEK	SB-3865(HN)	GEN	-	NC/LEN/ AF SWB

Appendix 9B

INTERTHEATER COMSEC PACKAGE (ICP)

SHORT TITLE	EQUIPMENT/CIRCUITS
USKAT 2720	Trunk Encryption Devices (TED) Transiting the Satellite
USKAT 1985	KY-57s for the Satellite DVOWs
USKAT 11529	KG-84/194s Used for SIPR/NIPR Circuits (Intern KEY USKAT 19696 will be used beginning 1 Mar 98 until USKAT 11529 is issued)
Segment 4 (KEK)	KG-84s
Segment 5 (TEK)	KG-84s
Segment 6 (KEK	KG-194s
Segment 7 (TEK)	KG-194s

NOTE: Intertheater COMSEC Package (ICP) keying material is to be used for all systems/circuits terminating at the Landstuhl SATCOM facility.

CHAPTER 10

CSR-ESOP PROCEDURES

SECTION I. DESCRIPTION OVERVIEW

1. Circuit Switch Routing (CSR) software was incorporated to provide a common baseline Circuit Switch On-line Operating Program (CSOLOP) for use in all MSE, and Tri-Tac switches. CSR software fixes the differences that had existed between the two switching systems. In most cases the changes incorporated by the CSR software are restricted to the call processing software or CSOLOP. The Enhanced Switch Operating Program (ESOP) is the functional name used adressing the software used to run the new Sunsparc workstation which replaced the UYK-86. ESOP provides a much more user freindly platform for operation and manipulation of switching configurations. The old workstation software or Workstation On-Line Operating Program (WSOLOP) has been replaced with Sunsparc Workstation On-Line Operating Program (SWOLOP) software.   Changes affecting Technical operations will be discussed in this Chapter.

2. Switch Database Saves

This feature permits a switch database to be saved (written to the load disk) while the switch is OnLine and "filtered" when it is subsequently loaded (read back from the load disk). Previously, the switch had to be off-line in order to save a database. In addition, OnLine database saves can be performed either automatically or manually:

The switch operator can initiate a periodic autosave of the current exercise unique database through entries added to the Assign Switch Classmarks (ASC) screen. All switches will set their Autosave database for every 1 hour and name that save as **DBAUTO**(***XX***), ***XX*** = Team label, for example **NC03** database will be **DBAUTO03**, **LEN16** will be **DBAUTO16.**

The operator can also initiate a manual save of the OnLine database by a "Hot Key" (Control - D), which causes an instantaneous save while in the TTY or the switch Man Machine (MAMA) display mode. Previously, a database could only be saved using the Assign Database (ADB) screen. ADB can still be used to save a database either OnLine or off-line.

The "filter" feature provides a screening process to any database saved while the switch was OnLine. The result of the filtering is that the database is "cleaned up", i.e., all terminals that were marked out-of-service are marked back in-service and any in use" bits are reset to zero.

3. The Switch TTY Log

The TTY log has been enhanced by two additional features:

The TTY log can now be automatically saved to a file (on the System disk) using a new screen called the TTY Logging Setup screen. Logs can be saved at pre-defined size and/or time intervals, at WS shutdown, on WS restart, or any combination thereof. The file(s) created by this function can be obtained by a properly configured remote host (such as a computer at SYSCON) via FTP.

The Brigade standard will be Logs saved at 4 hours, 100 percent fill and named by identifying the NC or LEN. For Example Node Center 01 would setup it’s TTY Logging Setup Screen would look like this.

TTY LOGGING SCREEN

SAVE TTY LOG ON WS SHUTDOWN, Y/N:	Y
ENTER TTY LOG FILENAME ON SHUTDOWN:	SHUTDOWN
SAVE TTY LOG ON WS RESTART?	YES
RESTART TTY LOG FILENAME:	RESTART
SAVE TTY LOG AT TIME INTERVALS?	YES
TIME INTERVAL FOR AUTO SAVE:	4
SAVE TTY LOG AT SIZE INTERVALS?	YES
PERCENT FULL FOR AUTO SAVE:	100
AUTO SAVE TTY LOG FILENAME:	NC01

In addition, the log can now include switch MAMA screens. Whenever the operator keys "Print Screen" from the MAMA display mode, the screen goes to the SPU--to be included with the TTY log--before going to the print buffer. "Print screen" requests from any other display mode send the screen only to the print buffer.

4. Call Service Position (CSP) Alarm

The CSP function has been enhanced so that <u>any</u> call to the CSP (either to "0" or to the 7 digit directory number) results in audible alarm, regardless of WS display mode (MTA, TTY, etc.) or the CSP state (staffed or unstaffed). Previously, the audible alarm sounded only when "0" was dialed.

5. Workstation (WS) Name, Address, and Registration

The WS in all three of the large switches can now be "named" by the operator via a new entry on the Input System Parameters screen. "Host name" is used in conjunction with new services like FTP and E-mail. At the LEN, the WS automatically registers the host name and Internet Protocol (IP) address with the closest Tactical Name Server (TNS) CNCE the screen information is "stored."

6. File Maintenance Utility

The existing File Maintenance function of the WS Utilities menu has been modified to allow greater flexibility, including operator capability to copy files between directories on the system disk.

7. New Services at the Switch Workstation

The WS now provides the switch operator with a completely new function called Network Services, which improves the communications capability of the node. New services available to the switch operator include:

A file transfer capability, using the FTP protocol

Electronic mail (E-mail), using the Elm mail utility

Text editing, using the Emacs text editor A new file management capability, using a limited set (29) of UNIX commands

· A "hot key" Copy & Paste capability (not restricted to network services)

8. User Accounts

These network services, and the new services provided to the NMF operator and remote users, are accessed through four user accounts named:

operator (used by the Switch operator) nmf_op (used by the NMF operator) rem_ftp (used by remote hosts for file transfer login), and rem_mama (used by a remote host to open a Telnet session and perform limited commands)

Each of these accounts is password-protected. Initial fielded passwords are assigned during WSOLOP installation. Passwords may only be changed by the Brigade Network Technician.

9. New Directories

Three new directories (corresponding to the User accounts) have been added to the WS System disk: /ops is the "home" directory for the operator account, /nmf is home for the nmf_op account, and /remote for the rem_ftp account. (There is no directory for the rem_mama account.) A summary of accounts, directories, fielded passwords, and user privileges is provided below. UR" = UserUread only" privilege; "RN~" = both "Read" and "Written; UN" = None (no ability to access this directory):

Each new directory has a /help sub-directory, which includes "help" text files for FTP, Emacs, Elm, UNIX, and remote man-machine. An example of the path and filename to access the Uhelp" file is: "/ops/help/unix.hlp."

CHAPTER 11

STANDARDIZED TACTICAL ENTRY POINT PROCEDURES

SECTION I. GENERAL INFORMATION

1. Purpose. The chapter outlines the standard communication systems configuration for users of the Landstuhl Defense Information Infrastructure (DII) gateway. It focuses on the initial communications support of an US European Command (USEUCOM) Theater contingency. This chapter is intended to give deployed users a common picture of the overall communications network. Detail diagrams are also provided for individual circuits.

2. Concept.

a. USCINCEUR directed operations must provide effective initial command, control, communications, computers, and intelligence (C41) during the early stages of a contingency operation. For this TSOP, the baseline scenario is three Ground Mobile Forces (GMF) Super High Frequency (SHF) satellite terminals "reaching back" to the Landstuhl DII gateway, in a hub-spoke configuration. One deployed site will use a TSC-IOOA or TSC-85B. The second and third (if needed) deployed site(s) will use a TSC-94A and/or TSC-93B. Table I reflects the standard V Corps GMF configuration for this scenario.

Table I - GMF Mobile Satellite Configurations

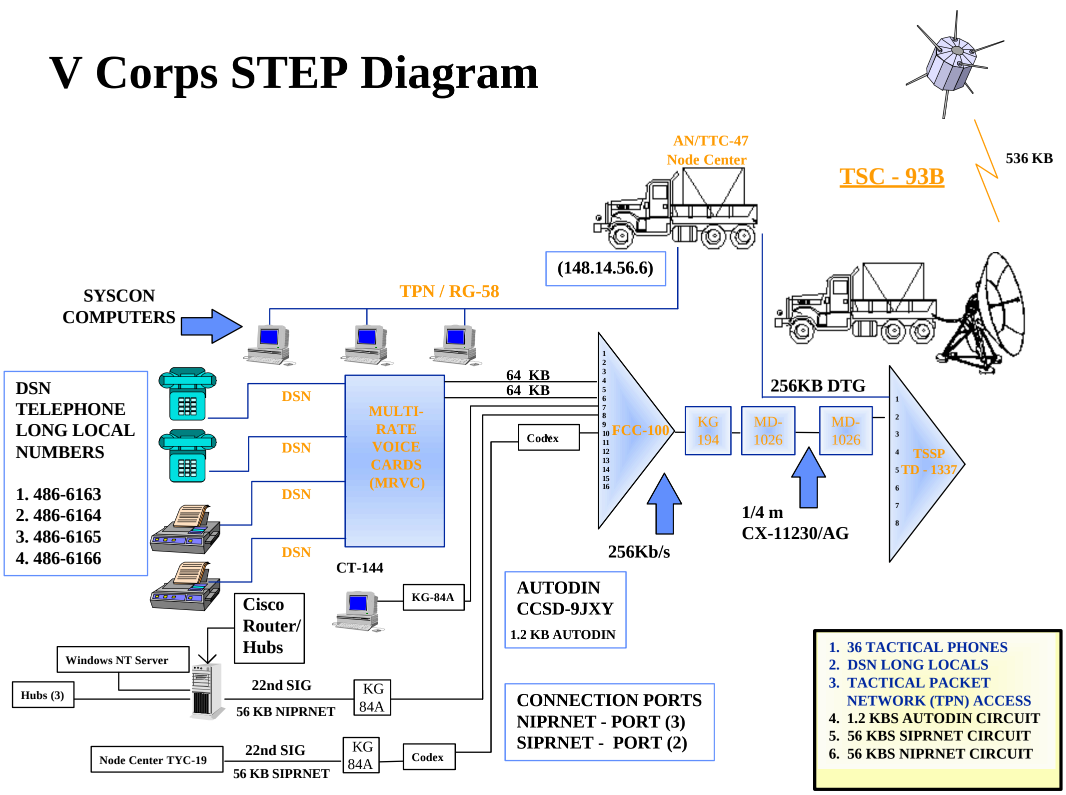
	TSC-85B w/FCC-100	TSC-93B w/FCC-100
DSN L/L	4 x 32K	4 x 32K
AUTODIN	1.2K	1.2K
NIPRNET	56K	56K
SIPRNET	56K	56K
Circuit Total	**241.2K**	**241.2K**
FCC-100 Aggregate		
MSE DTG	256K	256K
TSSP/DVOW Overhead	256K	256K
	24K	24K
BANDWIDTH TOTAL	**536Kb/s**	**536Kb/s**

b. For planning purposes, the Landstuhl DII gateway will be the primary reachback site for deployed units. This will enable Landstuhl to pre-configure "Hot Circuits" to allow rapid circuit activation.

c. Defense Information Systems Agency - Europe (DISA-EUR) will provide operational direction and management control (as Central Control Office (CCO)) over all circuits extending from Landstuhl to deployed locations. This responsibility includes end-to-end circuit management and directing authority over all technical control facilities where the circuits transverse.

d. The following diagram and cutsheets depict the standard V Corps deployed user configuration.

V Corps STEP Diagram



TD-1337(V)/G TSSP CREW ASSIGNMENT SHEET

TERMINAL TYPE:	TERMINAL ID:	TERMINAL LOCATION:
AN/TSC-85B or 93B	GF1	FIELD SITE

ORDERWIRE CONFIGURATION ROUTINE

STATION	ITEM	LOCAL	REMOTES 1	REMOTES 2	REMOTES 3	REMOTES 4
TD-1337(V)/G	CALL NO.	2	1			
	TERM NO.	2	1			
	MODE	SECURE X NONSECURE ____	SECURE X NONSECURE ____	SECURE ____ NONSECURE ____	SECURE ____ NONSECURE ____	SECURE ____ NONSECURE ____
CNCE	CALL NO.					
	TERM NO.					

LOCAL MUX CONFIGURATION ROUTINE

MEMORY 1 X MEMORY 2 ____

LOCAL MUX PORT	PORT RATES (kb/s)	PORT INTERFACE: BAL	PORT INTERFACE: CDI	PORT INTERFACE: ▲ UNBAL	PORT OUTPUT: DEMUX (LOCAL)	PORT OUTPUT: PORT (DISTANT)	EXTERNAL TIMING SOURCE
1	256		X		1	1	
2	256	X			1	2	
3							
4							
5							
6		✓					
7		✓					
8		✓					

16 kb/s ORDERWIRE OPTION	YES X NO ____
16/32 kb/s USER OPTION	16 kb/s ____ 32 kb/s ____ NO X
16/32 kb/s USER DEMUX	DEMUX NO. ____
TIMING SOURCE SELECTION	CNCE OR EXT STD ____ SLAVE X MASTER ____
SLAVE TIMING SOURCE	REMUX NO. 1
CDI GROUP MODEM CABLE	NO. .25 MILE REELS 1
CESE TLM PATCH OPTION ■	PATCH LOCAL ____ PATCH DEMUX 1 ____
CESE TELEMETRY EQUIP ID ■	EQUIPMENT ID ____
TD-754 MUX OPTION ▲	PORT 5 PORT 7 ____
TD-754 DEMUX OPTION ▲	PORT 1 ____ PORT 3 ____

REMOTE MUX MINIMUM CONFIG. ROUTINE

MEMORY 1 X MEMORY 2 ____

REMOTE MUX PORT	PORT RATE (kb/s): REMOTE MUX 1	REMOTE MUX 2	REMOTE MUX 3	REMOTE MUX 4
1	256			
2	256			
3				
4				
5				
6				
7				
8				
16 KB/S ORDER-WIRE OPTION	YES X NO ____	YES ____ NO ____	YES ____ NO ____	YES ____ NO ____
16/32 kb/s USER OPTION	16 kb/s ____ 32 kb/s ____ NO X	16 kb/s ____ 32 kb/s ____ NO ____	16 kb/s ____ 32 kb/s ____ NO ____	16 kb/s ____ 32 kb/s ____ NO ____

▲ INDICATES NOT USED IN V3/V4 (AF) MODELS

■ INDICATES NOT USED IN V1/V2 (ARMY) MODELS

DISTANT TERMINAL LOCATION(S)	
REMOTE MUX 1	LANDSTUHL (LOC)
REMOTE MUX 2	
REMOTE MUX 3	
REMOTE MUX 4	

Pg. of

TIME DIVISION MULTIPLEXER AN/FCC-100(V) 6 / 7 / 8 ~ CREW ASSIGNMENT SHEET

AGGERATE DATA RATE: 256 Kb/s TSSP PORT 2 | LOCATION: 22 Sig Bde TO STEP

TRUNK TYPE:	SYMMETRY:	STATION CLK RATE:	RX TRACKER REF:	TXCLOCK SCR:	TX TRACKER REF:	AGGR DELAY:
NRZ-ASYM ___ NRZ-EQUI X CDI-EQUI ___	EQUIRATE X ASYMMETRIC ___ RX SIMPLEX ___ TX SIMPLEX ___	AUX-NONE X SYN-1MHZ ___ SYN-5MHZ ___ AUX - 1200 to 2048 Kb/s ___	TRKREF-AUX ___ TRKREF-INT ___ TRKREF-RXCK X TRKREF-TXCKI ___ TRKREF-P16 ___ RXREF-INT ___	TXCKSCR-TRK ___ TXCKSCR-TXIN X	X RXREF-INT ___ RXREF-RXCK ___ RXREF-TXCKI ___	BUF 0 ___ BUF 4 ___ BUF 8 ___ BUF 16 ___ BUF 32 ___ BUF 63 X

TX AGG CLK SENSE:	RX AGG CLK SENSE:	DATA SENSE:	FRAME ERR CHK:	EXAM REM HDW:	CL LOOPBACK MODE:	FRAME CHARACTER:
TXCLK-NORML X TXCLK-INVRT ___	RXCLK-NORML X RXCLK-INVRT ___	NEG-MRK X POS-MRK ___	ERR-ENA X ERR-DIS ___	REMHW-ENA X REMHW-DIS ___	CLLP-OFF ___ CLLP-ACTIVE X	FRAME 1 ___ FRAME 2 ___

CAU SWITCH:	CAU TYPE:	CAU EAD:	CAU ACT LEVEL:	CAU RESYNC:	CAU RST MODE:	CAU RETRIES:
DISABLED ___ ENABLED X	USER-DEFINED ___ KG-34 ___ KG-84 ___ KG-81 ___ KG-94 X	25.6 to 46.5 SEC 0.5	ACT-HIGH ___ ACT-LOW ___	END-AROUND ___ ONE-WAY ___	LEVEL ___ PULSED ___	00 RETRY ___ CONTINUOUS ___

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
CARD TYPE			2	2			4	2	2								SEE NOTE BELOW
SYMMETRY			1	1			1	1	1								1=EQUIRATE 2=RXSIMPLEX 3=ASYMMETRIC 4=TXSIMPLEX
DATA RATE			64	64			1.2	56	56								SEE REAR PAGE
DATA BITS																	1=5 BIT 2=6 BIT 3=7 BIT 4=8 BIT
STOP BITS																	1=1 STOP BIT 2=1.5 STOP BIT
I/O LEVEL																	1=0/0 DB 2=-16/7 DB
CTRL LEADS			1	1			1	1	1								1=CL-HIGH 2=CL-DTR-DCD 3=CL-DTR-CTR 4=DIS-SIG 5=ENA-SIG
RX CLK SCR			1	1			1	1	1								1=RX-INT 2=RX-EXT
TX CLK SCR			1	1			1	1	1								1=TX-INT 2=TX-EXT
PORT FIFO DEPTH			1	1			1	1	1								1=MIN 2=MAX
DATA SENSE			1	1			1	1	1								1=NEG-MARK 2=POS-MARK
ENCODING																	1=UNUSED 2=PCM 3=CELP 4=STU-III
MODE-BW																	1=MBW-DIS 2=MBW-ENA
ECHO CANCEL																	1=ADAPTIVE 2=FIXED
IMPEDANCE																	1=600 OHMS 2=900 OHMS
TX-TLP																	
RX-TLP																	
START MODE																	1=LOOP START 2=GND-START 3=DID-IMM-START 4=DID-WINK-START 5=PLAR
GAIN RANGE																	1=LOW 2=HIGH

CCSD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
			MRVC 1, 2	MRVC 3, 4			AUTODIN	NIPRNET	SIPRNET							

NOTE:

1 = UNUSED	2 = SYNC	3 = ASYN	4 = CDI	5 = T-CDI
6 = ISO	7 = PCM	8 = ADPCM	9 = CVSD	10 = BAS-STAT
11 = EXP-STAT	12 = FXS (DPO)	13 = FXO (DPO)	14 = E&M	15 = ASY/SYN
16 = CDI/SYN	17 = T-CDI/SYN	18 = ISO/SYN	19 = CVS/SYN	20 = PCM/SYN
21 = SYN/ASY	22 = SYN/CDI	23 = SYN/T-CDI	24 = SYN/ISO	25 = ASY/PCM
26 = SYN/CVS	27 = CDI/CVS	28 = CVS/CDI	29 = CELP/STU-III	30 = CELP/VOICE/FAX/MODEM

SECTION 11. GMF SATELLITE NETWORKING OPTIONS

1. Purpose. This section provides information on the procedures for requesting GMF satellite access and the various configuration options developed to provide a plug-and-play capability within the USEUCOM theater.

2. Concept. DII/DISN gateway entry requests will be combined with the satellite access request. Tail circuits from the DII/DISN gateway may incur costs. It is the users responsibility to ensure the Program Designator Code (PDC) are on the RFS when notified of potential circuit costs.

3. Procedures. The subject for a combined satellite access request and DII/DISN gateway entry request will be: "REQUEST FOR GMF SATELLITE ACCESS AND DII/DISN GATEWAY ENTRY."

a. The request will be sent to the same addressees as a SAR and be divided into two parts.

(1) Part one will be for the RSSC Europe and will consist of all the information required in the SAR.

(2) Part two of the request will be for DISA-Europe/EU31 ID. The following is an example two part Request for GMF Satellite Access and DII/DISN Gateway Entry:

b. The following is an example of a SAR requesting STEP access.

FROM
:CDRHQ22DSIGBDE DARMSTADT GE//AETV-SBH-C//
TO
:RSSC EUROPE VAIHINGEN GE//SMDC-AR-OE-S//
:DISA EUROPE VAIHINGEN GE//EU311/RCC//
INFO
:CDRHQ22DSIGBDE DARMSTADT GE//AETV-SBH-C//
:CDR7THSIGBDE MANNHEIM GE//ASQE-S-04/ASQE-S-CO//
:RSSC CONUS WASHINGTON DC//MOSC-OMC-CO//
:RSSC PACIFIC WHEELER AAF HI/MOSC-OMP-PA//
:USCINCEUR VAIHINGEN GE//ECJ6//
:CDRCCO1STSATCONBN LANDSTUHL GE//SMDC-AR-SB-C//
XMT
:
ACCT
:
TEXT
:UNCLAS
SUBJ/ REQUEST FOR SHF/GMF GATEWAY STATION AND SATELLITE ACCESS
MISSION. CHANGE 1 TO MISSION E033-98 ALL CHANGES ANNOTATED BY A

DOUBLE ASTERISKS.
1. REQUESTER: SFC JOHN DOE/HHC 22D SIGNAL BRIGADE/DSN 348-7632 COMM. 06151697632 E-MAIL DOEJ@HQ.22SIGBDE.ARMY.MIL
A. PART ONE FOR RSSC EUROPE:
1 SFC JOHN DOE /22D SIGNAL BRIGADE/DSN 348-7632
2. MISSION TYPE AND PURPOSE: DANGER STORM/SWIFT VICTORY - 1ID BATTLE COMMAND TRAINING PROGRAM (BCTP) EXERCISE.
3. TIME FRAME REQUIRED: 121300Z FEB 98/311300Z MAR 98.
4. MISSION PRIORITY 4B/**ICDB #411**/NETWORK TYPE: **HYBRID MESH** TYPE OF SERVICE: ANALOG VOICE, DIGITAL VOICE, DATA.
5. MISSION PARAMETERS:
A. **AN/GSC-39**
(1) LANDSTUHL, GE
(2) 49-25-00N: 007-34-00E
(3) 536 KB/S BPSK
(4) DISTANT END TERMINAL:
(A) TML2 (SEE B BELOW)
(5) 121300Z FEB 98/311300Z MAR 98 (SEE REMARKS) CONTINUOUS
(6) SFC JOHN DOE DSN 348-7632, COMMERCIAL 06151-69-7632 E-MAIL DOEJ@HQ.22SIGBDE.ARMY.MIL
B. TML2/85B/8FT
(1) GRAFENWOEHR, GE (OP3)
(2) 49-43-53N: 011-52-01E
(3) 536 KB/S BPSK
(4) DISTANT END TERMINAL:
(A) TML1 (536 KB/S)
(5) 121300Z FEB 98/311300Z MAR 98 (SEE REMARKS) CONTINUOUS
(6) SAME AS A (6)
6. MISSION DESCRIPTION/REMARKS: DANGER STORM/SWIFT VICTORY IS THE 1ST INFANTRY DIVISION'S BATTLE COMMAND TRAINING PROGRAM EXERCISE (BCTP)
7. **REMARKS: ALL TERMINALS HAVE AN OVERHEAD OF 24 KB/S BPSK. THE 85'S AND 93'S ARE L AND A MODIFIED.

B. PART TWO FOR DISA EUROPE:
1. IAW REFS A AND B, THE FOLLOWING REQUEST IS SUBMITTED:
A. REQUEST USE OF LANDSTUHL GATEWAY STATION
B. SERV. ON/OFF TIMES: 121300Z FEB 98/311300Z MAR 98
C. TERMINAL 2
D. TERMINAL LOCATION: GRAFENWOEHR, GE (OP3) 49-43-53N: 011-52-01E
E. DISANOC ON-CALL CONTINGENCY TAIL CIRCUTS:
(1) MRVC (CASCADED) 64 KB/S (2 X DSN)
(2) MRVC (CASCADED) 64 KB/S (2 X DSN)
(3) NIPR 56 KB/S
(A) REQUESTING TEMPORARY IP ADDRESSES FOR APPROXIMATELY 100 USERS

(B) REQUEST ASN
(C) START/END DATES: 121300Z FEB 98/311300Z MAR 98
(D) CISCO, 2501, IOS 10.1
(E) BGP-4
(F) 56 KB/S
(G) POC: CW2 ORTIZ, DSN 348-7842, COMM 06151-69-7842
(4) SIPR 56 KB/S
(A) REQUESTING TEMPORARY IP ADDRESS FOR APPROXIMATELY 100 USERS
(B) REQUEST ASN
(C) SAME AS C ABOVE
(D) BBN,T-20,3.5
(E) BGP 4
(F) 56 KB/S
(G) SAME AS G ABOVE
(H) NEED CLASS B IP ADDRESS ON WELLFLEET ROUTER AT LANDSTUHL
F. USER LEASED CIRCUITS: NONE
G. GMF SYSTEM INFORMATION:
(1) AN/TSC-85B/08FT
(A) TD-1337 MULTIPLEXER (TSSP)
(B) AN/TTC-47 256 KB/S
(C) AN/FCC-100 256 KB/S
(D) DTG BULK ENCRYPTION: KG-194A
SIPRNET CHANNEL: KG-84A
NIPRNET CHANNEL: KG-84A
(E) COMPOSITE DATA RATE: 536 KB/S
(F) GATEWAY ACCESS REQUIRED TO SUPPORT COMMANDER, V CORPS COMMUNICATION REQUIREMENTS.
2. POC: SFC JOHN DOE /HHC 22D SIGNAL BRIGADE/DSN 348-7632/COMM 06151-69-7632/EMAIL DOEJ@HQ.22SIGBDE.ARMY.MIL
BT

**NOTE: It is the users responsibility to ensure the DII SHF Gateway has MUX sheets (cut sheets) prior to mission access. Also to ensure that MD-945 modem is aligned IAW published procedures. Failure to do so will delay mission access.

b. RSSC Europe will process the request as follows:

(1) RSSC Europe will attempt to satisfy the request with allocated resources.

(2) If the request cannot be satisfied with available resources, RSSC EUR will coordinate with DISA-EUR/EU311D for resolution. They will attempt to use additional resources to satisfy the requirement.

(3) If the request cannot be satisfied by DISA-EUR because of competing demands-ids, it will be coordinated with HQ DISA/D321 for resolution.

(4) If the request cannot be satisfied by HQ DISA, it will be referred to the JCS for final resolution.

NOTE: If the RSSC can satisfy the request through any of the previous steps, they will formally notify the requesting unit of their approval.

(5) JCS will make the final determination on approving the request. JCS will transmit their decision to the requesting unit via HQ DISA, DISA-EUR, and USARSPACE RSSC.

c. The following lead times are required to allow for RACS frequency analysis, frequency clearance, satellite engineering, assignment of a satellite controller, and preparation and transmittal of the operational data base.

(1) 14 days for units operating within Germany.

(2) 60 days for units operating outside Germany but within the European theater.

d. In processing the request the USARSPACE RSSCs will:

(1) Coordinate available satellite access up-link frequencies, down link frequencies, transmit power, and data rate information for each terminal with the respective theater USARSPACE RSSC. RSSC Europe GMF manager will coordinate frequency approval in the European AOR. RSSC Europe GMF manager will utilize RACS frequency analysis for contingencies within Germany. The respective host nation will grant frequency approval for contingencies outside of Germany.

(2) Forward the operational frequencies, transmit power, and data rates to DISA EUROPE VAIHINGEN GE//EU311D// and appropriate area commanders via satellite access authorization message.

e. DISA-Europe RCC gives final approval for satellite access and notifies the DSCSOC GMF controller. GMF terminals will contact the GMF controller for confirmation of final approval to establishing the link.

SECTION III. DEFENSE SWITCH NETWORK (DSN) TELEPHONES

1. Purpose. This section provides information on the DSN phone lines provided through the Landstuhl DSCS facility.

2. Concept.

a. There are thirty-four (34) prepositioned two-wire long local phone numbers off of the Landstuhl Regional Medical Center (LRMC) DSN switch. Six of these phone numbers are classmarked for worldwide immediate precedence and worldwide commercial access. The remaining telephone numbers are classmarked only for worldwide routine access. There may be variances such as establishing hunt groups (rotary) for specific sets of numbers terminating at different locations, downgrading calling areas, and other possible feature changes unforeseeable at this time. The LRMC switch technicians are responsible for accomplishing these changes. During non-duty hours and holidays the 5th Signal Command Switching Control Center (SCC) will accomplish these changes.

(1) The DSN long local connections begin at the Landstuhl switch main distribution frame (MDF). Next they are connected to the Technical Control Facility (TCF) via copper cable. They are connected to a circuit concentration frame bay (CCFB) within the TCF, which in-turn is connected to a second CCFB. The next connection is from the TCF to the SATCOM facility intermediate distribution frame (IDF) via copper cable. Finally, these DSN lines interface into the STEP hardware via preassigned Multiple Rate Voice Cards (MRVC).

(2) The thirty-four active (with dial tone) DSN telephone numbers are permanently terminated at the SATCOM facility entry (demarcation) point. The SATCOM personnel, within the facility, are responsible for ensuring all thirty-four numbers are isolated from their equipment until required for use. This separation is needed to ensure the telephone circuitry is not affected by the STEP equipment.

(3) A CCSD is assigned to each DSN long local to ensure that they are permanent. These DSN circuits will be utilized by all components at various times, and thus the circuit costs will be taken directly from the Defense Business Operating Fund (DBOF).

(4) The telephone numbers classmarked with priority precedence or higher, have been approved by USEUCOM J6-S. There is no additional requirement by the components to revalidate the long local precedences when they're used during contingency periods. If additional long locals require an upgrade in precedence, USEUCOM J6-S can mandate this change through DISA-Europe. Once a contingency has terminated, all telephone numbers will be changed back to their original configuration and active state, by the Landstuhl DSN switch personnel.

(5) The distant end user interfaces for the DSN long locals could consist of STU-III telephones, SB3614 tactical switchboards, plain old telephone service (POTS), and other interfaces depending on the current contingency requirements.

b. The STEP facility interfaces to the Defense Switched Network (DSN)through two trunk groups, each having 24 interswitch trunks (ISTs). One trunk group is connected from the TTC-39D (in the Landstuhl SATCOM compound) through the Landstuhl TCF IDNX to the Pruem DSN switch. The second trunk group is connected from the TTC-39D (in the Landstuhl SATCOM compound) through the SATCOM facility IDNX to the Pruem DSN switch.

c. The distant end transmission equipment interface may consist of various tactical equipment. Table 1-1 shows the possible equipment interfaces, their maximum number of long local connections, and their maximum data rates.

3. Procedures. STU-III to DRSN.

NOTE

STU-IIIs must have a CIK inserted and turned to establish a secure call.

NOTE

a. STU-III user goes off hook and dials 430-4483 for TS-SCI access, 430-4484 for TS access, or 430-4485 for S access depending on the level of the user CIK.

b. The STU-III user will make connection with the Red Switch and will be prompted to dial the digits for the desired IST. STU-III user dials the appropriate digits.

c. The STU-III user reads his/her ANI which will prompt the STU-III user to press a button to send digits. STU-III user will press the appropriate button.

d. The Red Switch will connect the STU-III with an IST. Once connection is made, subscribers may communicate.

LRMC LONG LOCAL CONNECTIVITY

PHONE #	CCSD	COS	TCRC	REMARKS
486-6072	9EUBTA01	13	1	
486-6073	9EUBTA02	50	5	
486-6074	9EUBTA03	13	1	
486-6075	9EUBTA04	50	5	
486-6076	9EUBTA05	13	1	
486-6077	9EUBTA06	13	1	
486-6078	9EUBTA07	13	1	
486-6079	9EUBTA08	13	1	
486-6080	9EUBT501	13	1	
486-6081	9EUBT502	13	1	
486-6082	9EUBT503	13	1	
486-6083	9EUBT504	13	1	
486-6084	9EUBT505	13	1	
486-6085	9EUBT506	13	1	
486-6086	9EUBT507	13	1	
486-6087	9EUBT508	13	1	
486-6149	9EUBT701	13	1	
486-6150	9EUBT601	13	1	
486-6151	9EUBT602	50	5	
486-6152	9EUBT603	50	5	
486-6153	9EUBT604	13	1	
486-6154	9EUBT605	13	1	
486-6155	9EUBT606	13	1	
486-6156	9EUBT607	13	1	
486-6157	9EUBT608	13	1	
486-6158	9EUBT702	13	1	
486-6159	9EUBT703	50	5	
486-6160	9EUBT704	50	5	
486-6161	9EUBT705	13	1	
486-6162	9EUBT706	13	1	
486-6163	9EUBT707	13	1	
486-6164	9EUBT708	13	1	
486-6165	9EUBT709	13	1	
486-6166	9EUBT710	13	1	

(CCFB) CIRCUIT CONCENTRATION FRAME BAY 2.16 IN LANDSTUHL TECH CONTROL FACILITY — CBL 39 — DCO CABLE TERMINATION POINT, LOCATED IN LANDSTUHL TECH CONTROL BLDG 3377 — CBL 05 — LANDSTUHL DSN SWITCH BLDG 3765

TO IDF V4B LOCATED IN LANDSTUHL SATCOM FACILITY ← (CCFB) CIRCUIT CONCENTRATION FRAME BAY 1.13 IN LANDSTUHL TECH CONTROL FACILITY

(COS) CLASS OF SERVICE LEGEND:

9 = DSN CONUS
10 = DSN CONUS (PILOT FOR HUNT GROUP)
13 = DSN WORLDWIDE (ROUTINE)
47 = DSN CONUS + PRECEDENCE LEVEL 2 (IMMEDIATE)
50 = DSN WORLDWIDE + PRECEDENCE LEVEL 2 (IMMEDIATE)
51 = DSN WORLDWIDE + PRECEDENCE LEVEL 3 (FLASH)
54 = DSN CONUS + PRECEDENCE LEVEL 2 (IMMEDIATE)

(TCRC) TOLL CODE RESTRICTION CLASS

1 = NO "99" ACCESS
5 = "99" ACCESS WORLDWIDE

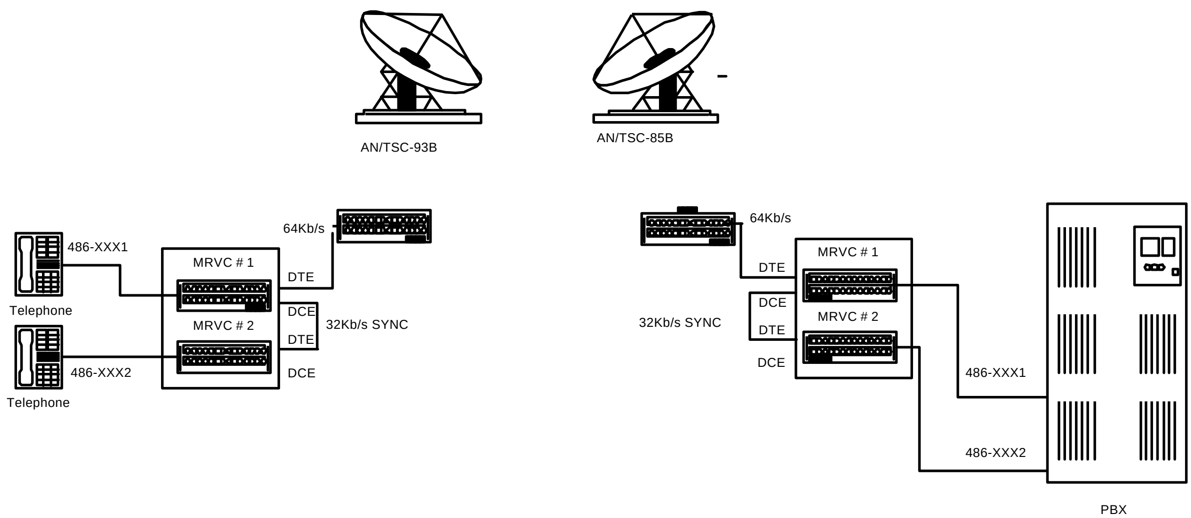
4. Multiple Rate Voice Cards. The Multiple Rate Voice Card (MRVC) is a single telco card vocoder/multiplexer/echo canceller system. Companion enclosures that provide power, cooling, ring generation and input/output interconnections are available as separate items from TITAN Corp.

a. OVERVIEW

The MRVC employs voice and digital signal processing (DSP) technologies to provide a compact, real-time voice/data transmission system. The MRVC provides multi-rate digital voice compression, a multifunction data port, a zero-overhead two-channel voice/data multiplexer, a patented digital echo canceller and multiple telephony termination sets. Voice and data can be multiplexed consecutively without requiring overhead bandwidth or framing information from the transmission equipment. The operator has complete control over the bandwidth allocation of the composite aggregate data stream between voice and data. The MRVC may be operated individually or cascaded to form a complete multi-channel voice/data communication system.

An example of a multi-channel voice/data system is presented in the figure below. The equipment on the left side is Considered to be at a remote site, while the equipment on the right is located at a central site with access to a PBX and mainframe computer. The remote MRVCs are used in a manner identical to any other phone connected to the PBX. Lifting MRVC #1's receiver results in a dial tone originating from the PBX. The desired extension is then dialed with call progress *(i.e.*, audible ringing signal, busy, etc.) being provided by the PBX until the phone is answered or the MRVC phone set is hung up. Any phone connected to the PBX can call remote MRVC #2 by dialing 486-XXX2. MRVC #2's phone set then ring: until the call is answered or canceled.

Figure. Cascaded MRVCs Form a Multi-channel Voice/Data System



5. Programing and Cabling.

   a. MRVC cards must be internally configured by hardware straps as shown below.

MRVC internal settings

Cascade operation

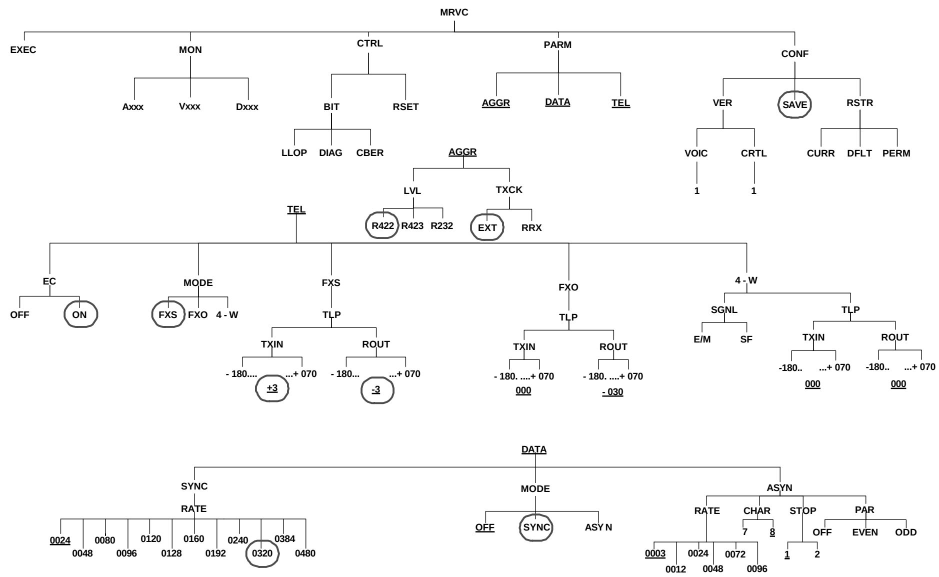
MRVC UPPER						MRVC LOWER					
J1	=	N/A	**J15**	=	OPEN	**J1**	=	N/A	**J15**	=	CLOSED
J2	=	N/A	**J16**	=	CLOSED	**J2**	=	N/A	**J16**	=	OPEN
J3	=	N/A	**J17**	=	OPEN	**J3**	=	N/A	**J17**	=	OPEN
J4	=	N/A	**J18**	=	CLOSED	**J4**	=	N/A	**J18**	=	CLOSED
J5	=	2-3	**J19**	=	OPEN	**J5**	=	2-3	**J19**	=	OPEN
J6	=	2-3	**J20**	=	CLOSED	**J6**	=	2-3	**J20**	=	CLOSED
J7	=	2-3	**J21**	=	OPEN	**J7**	=	1-2	**J21**	=	OPEN
J8	=	2-3	**J22**	=	CLOSED	**J8**	=	1-2	**J22**	=	CLOSED
J9	=	2-3	**J23**	=	OPEN	**J9**	=	1-2	**J23**	=	OPEN
J10	=	OPEN	**J24**	=	CLOSED	**J10**	=	OPEN	**J24**	=	CLOSED
J11	=	OPEN	**J25**	=	2-3	**J11**	=	OPEN	**J25**	=	2-3
J12	=	OPEN	**J26**	=	1-2	**J12**	=	OPEN	**J26**	=	1-2
J13	=	CLOSED	**J27**	=	1-2	**J13**	=	CLOSED	**J27**	=	1-2
J14	=	OPEN				**J14**	=	OPEN			

Single operation

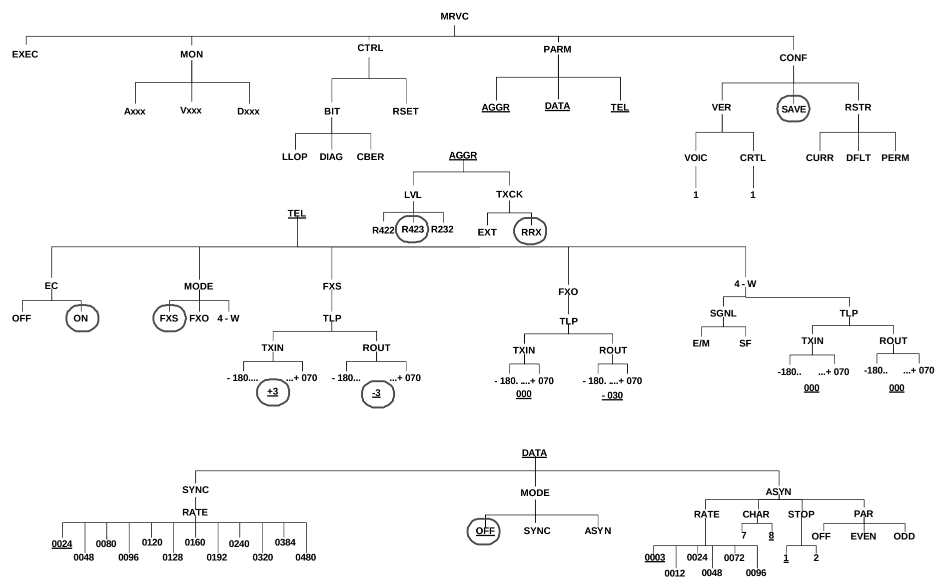
MRVC SINGLE - LANDSTUHL						MRVC SINGLE -DEPLOYED					
J1	=	N/A	**J15**	=	OPEN	**J1**	=	N/A	**J15**	=	CLOSED
J2	=	N/A	**J16**	=	CLOSED	**J2**	=	N/A	**J16**	=	OPEN
J3	=	N/A	**J17**	=	OPEN	**J3**	=	N/A	**J17**	=	OPEN
J4	=	N/A	**J18**	=	CLOSED	**J4**	=	N/A	**J18**	=	CLOSED
J5	=	2-3	**J19**	=	OPEN	**J5**	=	2-3	**J19**	=	OPEN
J6	=	2-3	**J20**	=	CLOSED	**J6**	=	2-3	**J20**	=	CLOSED
J7	=	2-3	**J21**	=	OPEN	**J7**	=	1-2	**J21**	=	OPEN
J8	=	2-3	**J22**	=	CLOSED	**J8**	=	1-2	**J22**	=	CLOSED
J9	=	2-3	**J23**	=	OPEN	**J9**	=	1-2	**J23**	=	OPEN
J10	=	OPEN	**J24**	=	CLOSED	**J10**	=	OPEN	**J24**	=	CLOSED
J11	=	OPEN	**J25**	=	2-3	**J11**	=	OPEN	**J25**	=	2-3
J12	=	OPEN	**J26**	=	1-2	**J12**	=	OPEN	**J26**	=	1-2
J13	=	CLOSED	**J27**	=	1-2	**J13**	=	CLOSED	**J27**	=	1-2
J14	=	OPEN				**J14**	=	OPEN			

b. MRVC cards must be software programmed as shown below.

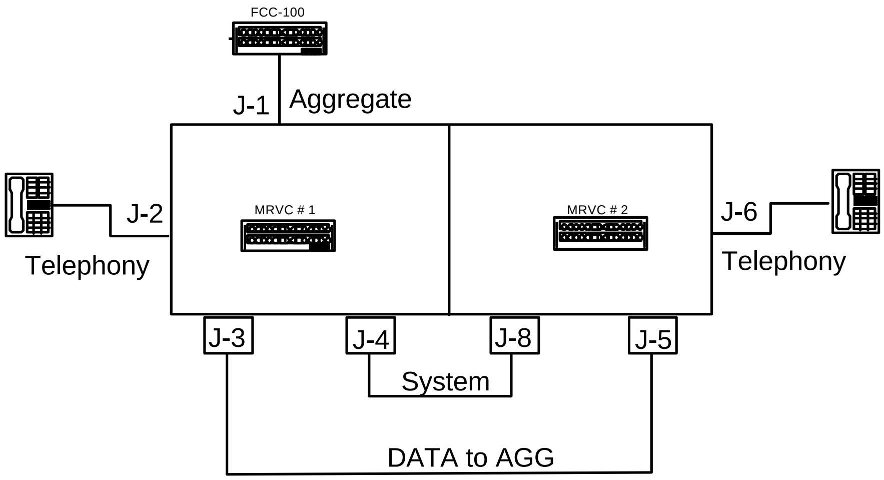
DEPLOYED MRVC - UPPER (CASCADE)



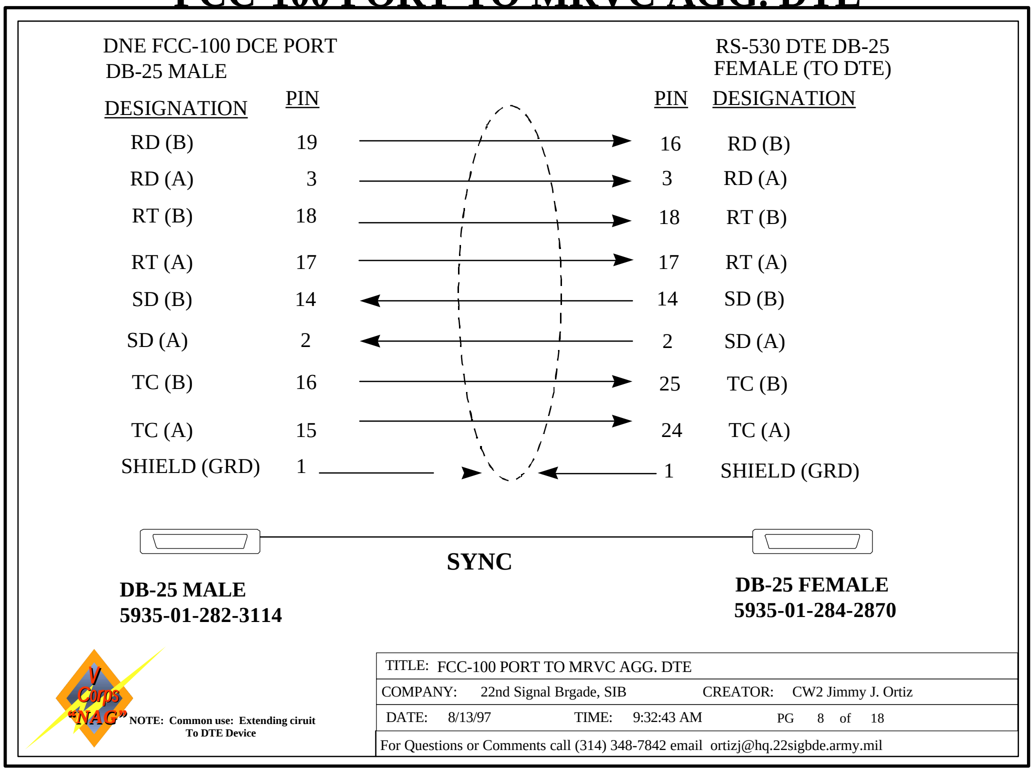
DEPLOYED MRVC - LOWER (CASCADE)



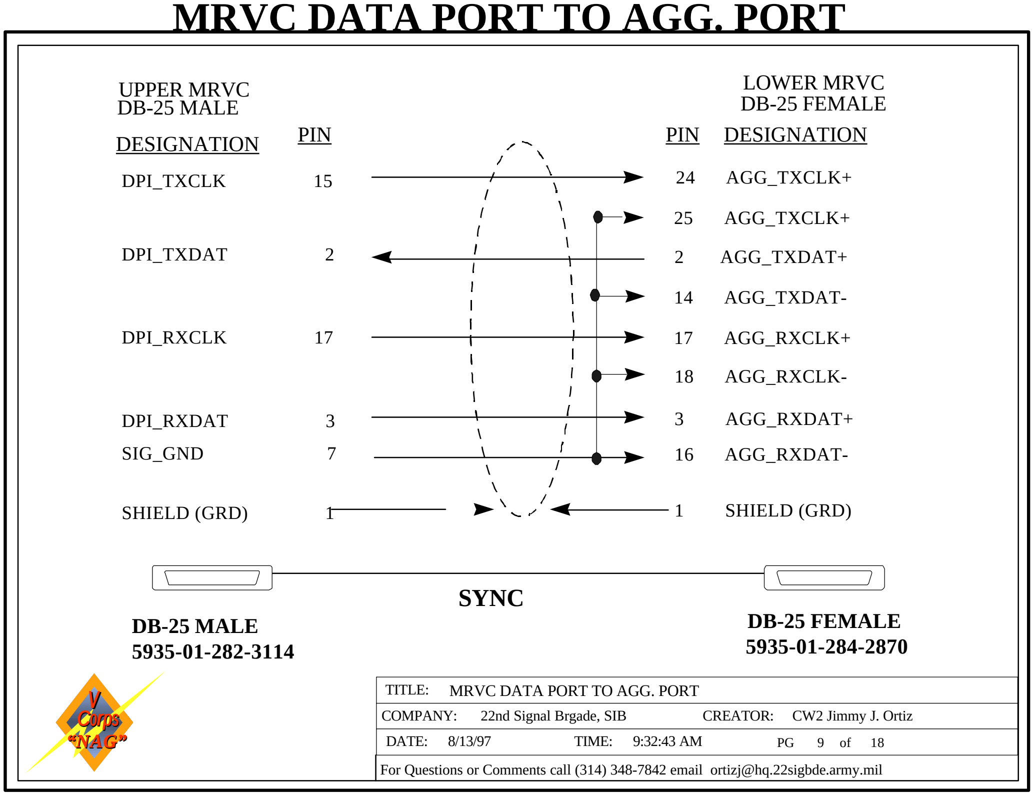
c. Cascaded MRVCs are cabled at the remote location as shown below.



FCC-100 PORT TO MRVC AGG. DTE



MRVC DATA PORT TO AGG. PORT



MRVC SYSTEM PORT TO SYSTEM PORT

UPPER MRVC DB-15 FEMALE DESIGNATION	PIN		PIN	LOWER MRVC DB-15 FEMALE DESIGNATION
SYS_CLKOUT+	3	→	1	SYS_CLKIN+
SYS_CLKOUT-	11	→	9	SYS_CLKIN-
SYS_FSYNCOUT	12	→	5	SYS_FSYNCIN
SYS_PSBITIN	7	→	14	SYS_PSBITOUT
SHIELD (GRD)	1	→ ←	1	SHIELD (GRD)

J - 4 — **SYNC** — **J - 8**

DB-15 FEMALE
5935-01-290-4816

DB-15 FEMALE
5935-01-290-4816

TITLE: MRVC SYSTEM PORT TO SYSTEM PORT			
COMPANY: 22nd Signal Brgade, SIB		CREATOR: CW2 Jimmy J. Ortiz	
DATE: 8/13/97	TIME: 9:32:43 AM	PG 10 of 18	
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil			

MRVC TELEPHONY PORT TO RJ-11 C-BLOCK

MRVC J-2 or J-6 DB-15 MALE DESIGNATION	PIN		PIN	RJ-11 C-BLOCK DESIGNATION
TEL_FXO_RNG	2	→	R	TEL_FXO_RNG
TEL_FXO_TIP	10	→	G	TEL_FXO_TIP
TEL_FXS_TIP	1	→	G	TEL_FXS_TIP
TEL_FXS_RNG	9	→	R	TEL_FXS_RNG

J - 2 or 6 — **VF** — **USER**

DB-15 MALE
5935-01-296-0114

RJ-11 C-BLOCK
5935-01-XXX-XXXX

TITLE: MRVC TELEPHONY PORT TO RJ-11 C-BLOCK			
COMPANY: 22nd Signal Brgade, SIB		CREATOR: CW2 Jimmy J. Ortiz	
DATE: 8/13/97	TIME: 9:32:43 AM	PG 11 of 18	
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil			

SECTION IV. AUTODIN.

1. Purpose. This section provides information on the Automatic Digital Network (AUTODIN) services provided through the Landstuhl DSCS facility.

2. Concept. The AUTODIN operates as the principal long-haul record communications system for the Department of Defense (DoD). The composition of the AUTODIN Switching Centers (ASCs), located at Pirmasens, Germany, and at Croughton, England, with interconnecting high speed trunks and subscriber access lines, functions as a single, integrated, worldwide, high speed, general purpose, secure record communications network. It processes General Service (GENSER) traffic (R community) and Defense Special Security Communications System (DSSCS) traffic (Y community).

a. In support of short notice contingencies of a limited scope and short duration, three permanent on-call 1.2 KB AUTODIN circuits have been established between the Landstuhl SATCOM facility and the Pirmasens ASC.

b. The CCSDs for the three on-call circuits are 9JXW, 9JXX, and 9JXY. For ease of reference the three CCSDs have been assigned to the following packages: 9JXW is assigned to the Army TSC-93B (FOB) package, 9JXX is assigned to the Air Force TSC- I OOA (ISB # 1) package, and 9JXY is assigned to the Air Force TSC-94A (ISB #2) package.

c. The following equipment configurations can be used to ensure interoperability in providing AUTODIN service.

(1) Modems. The following modems are installed at both ASCs located at Pirmasens and Croughton.

Equipment	Nomenclature
Codex Modem 1200 & 2400	MX-2400
Codex Modem 4800	LSI-4800
Codex Modem 9600	LSI-9600
High Speed Modem	MD-701
Low Speed Wire Line Modem	MD-674

(2) Tactical Terminals. The following tactical terminals are most frequently deployed.

(a) Message Distribution Terminal (MDT)

(b) Army/Navy Universal General Communications (AN/UGC-144)

Crypto Equipment. Each AUTODIN circuit is encrypted using KG-84A equipment. Standard AUTODIN internal strapping and external settings can be found in Section VI.

3. Procedures. The preference of MODE I for AUTODIN access provides the capability of ensuring message integrity. The deployed communications user must ensure that the request for AUTODIN service is included in the Satellite Access Request (SAR) for STEP service. The SAR will be submitted to the RSSC-EUR and DISA-EUR with USEUCOM ECJ6-0 as an info addressee. The SAR will include all pertinent AUTODIN information.

a. The following is a list of general settings for all terminals. For specific terminal settings for the MDT and UGC-144, refer to figures.

(1) Platen size (max. characters per line): 80
(2) Operating protocol: MODE I
(')) Operating Mode: Block by Block
(4) Equipment format code: AO (ASCII only)
(5) Security level: SECRET (TOP SECRET, if required.)
(6) Message format: JANAP 128
(7) Routing Indicator capability: 500
(8) Transmission Identifier (TI) line: No
(9) End of Medium (EM): No
(IO) Baud Rate: 1200
(I 1) Crypto equipment: KG-84A
(12) Crypto operation: Free-Running

b. COMSEC Key. Presently, **all** tactical users desiring AUTODIN circuit service from the ASC **will** use USKAT 16969, an Intertheater COMSEC Package (ICP) key. The user will receive the specific Edition/Segment to be used information from their COMSEC custodian, who will verify the information using the ICP Manager's monthly status message. Users should then verify, before deploying, keymat information with the ASC COMSEC Custodian (ASC Pirmasens, DSN 495-6492 and ASC RAF Croughton, DSN 236-8478). Sometime in the future, at a time to be determined, the use of electronic over-the-air key distribution will replace the use of the paper tape ICP key. This will avoid the logistics and security burdens of physical key.

c. Plain Language Address (PLA)/Routing Indicator (RI) Assignment.

(1) There are pre-established PLAs and Non AUTODIN Relay Center (NARC) Routing Indicators available for assignment by USEUCOM. These PLAs/NARCs will be assigned to deployed units upon receipt of SAR for STEP service. It will be the responsibility of the deployed communications detachment to ensure the widest dissemination of the PLAs once assigned as well as **any** changes made to PLAs during the course of the operation.

(2) The deployed communications user should provide message traffic management instructions for any traffic remaining in the AUTODIN after the mission is complete.

(3) DSSCS (Y Community) message traffic will not be supported in the types of scenarios supported by this (STEP) concept.

(4) Commonly Used PLAS.

DISA EUR VAIHINGEN//EU3/EUA/EU2/EU7//
USCINCEUR VAIHINGEN GE//ECJ35/ECJ6-0// COMSOCEUR VAIHINGEN GE//SOJ3/SOJ6H HQ USAFE PAMSTEIN AB GE//SC/SCC/SCCDH
CINCUSAREUR HEIDELBERG GE//AEAGC/AEAIM/AEAGB//
RSSC EUROPE VAIHINGEN GE//MOSC-OME-EUH ASC PIRMASENS GE
ASC RAF CROUGHTON
USAFE AOS RAMSTEIN AB DE//CAT-DIR/AORSC/AOXX// JOINT STAFF WASHINGTON DC//J6/J6Z//
DISA WASHINGTON DC//D3 3 3/D341 I /DE2 I CINCUSNAVEUR LONDON UK/iN6H HQ MARFOREUR BOEBLINGEN GE//G6H SETAF VICENZA ITALY//G6H
CDR5THSIGCMD WORMS GEHASQE-OPH
CDR7THSIGCMD MANNHEIM GE//ASQE-S-O//
CDR2DSIGBDE WORMS//ASQE-XH
DCS STA LANDSTUHL GEHASQE//
CDRUSRSPACE DET LANDSTUHL GE//MOSC// I CCSQ PAMSTEIN AB GE//CC/CYCMD// 352SOG MILDENHALL AB UK//CC// NAVCSRF HONOLULU HIHW33H

AN[UGC-144 CURRENT SETUP PARAMETERS

CURRENT SYSTEM SETUP

TERMINAL COMMUNITY	= R
CONTENT/COMM INDICATOR	= ZYUW
ORIGINATOR/DESTINATION LMF	= AA
TERMINAL ROUTING INDICATOR	= ?
TERMINAL PLAIN LANG ADDR	= ?
TERMINAL CLASSIFICATION	=SECRET
TERMINAL PHONE NUMBER	=
CHANNEL ID	= (Determined by Routing Indicator)
EOLSEQUENCE	= <CR> <CR> <LF>
XMIT START ENVELOPE	=
XMIT STOP ENVELOPE	= <CR> <CR> <LF> <LF> <LF> <LF> <LF> <LF> <LF> <LF> NNNN
RCV START ENVELOPE	=
RCV STOP ENVELOPE	= <CR> <CR> <LF> <LF> <LF> <LF> <LF> <LF><LF> <LF> NNNN

FREETEXT CAPABILITY	= DISABLED

CURRENT SSI SETUP

MASTER/SLAVE	= SLAVE
DACBPROTOCOL	= OFF
CHANNEL CONTROL	= MODE I CONTINUOUS
MESSAGE CODE/PARITY	= ASCII ODD PARITY
LOOP RATE	= 1200
DATA RATE	= 1200
ERROR CONTROL	= MULTI-SAMPLING
SSI INTERFACE	= DLED
AUTO RESYNC	= ON
CLOCK SOURCE	= EXTERNAL
EXT CLOCK POLARITY	= POSITIVE
TRANSMIT SIGNAL SENSE	= MARK POSITIVE
RECEIVE SIGNAL SENSE	= MARK NEGATIVE
SERIAL DATA CODE	= NRZ
NUMBER OF STOP BITS	= 1
DATA MODE CONTROL	= OFF
MODE VI STORAGE BLOCKS	=NONE
MODE I ANSWER TIMER	=5SECONDS

CURRENT EDITOR SETUP

CAPS LOCK	= OFF
LINE LENGTH	= 69
TABS	= 0

CURRENT PRINTER SETUP

BAUD RATE	= 9600
DATA BITS	= 7
STOP BITS	= 1
PARITY	=ODD
AUTO-OPT	= OFF

CURRENT AUTOSAVE SETUP

AUTOSAVE OPTION	= OFF
AUTOSAVE DEVICE	= ASC
DELETE SAFESTORED MSG OPTION	= OFF

CURRENT COMM SETUP

COMM PROTOCOL	= KERMIT
COMM BAUD RATE	= 2400
COMM ERROR DETECTION	= CHECKSUM (I CHARACTER)
COMM RECEIVE ALARM	= OFF

DEFAULT SETUP PARAMETERS

DEFAULT SYSTEM SETUP

TERMINAL COMMUNITY	= R
CONTENT/ COMM INDICATOR	= ZYUW
ORIGINATOR/DESTINATION LMF	= AA
TERMINAL ROUTING INDICATOR	= ?
TERMINAL PLAIN LANG ADDR	= ?
TERMINAL CLASSIFICATION	=SECRET
TERMINAL PHONE NUMBER	=
CHANNEL ID	= ERE
EOL SEQUENCE	= <CR> <CR> <LF>
XMIT START ENVELOPE	=
XMIT STOP ENVELOPE	= <CR> <CR> <LF> <LF> <LF> <LF> <LF> <LF> <LF> <LF> NNNN
RCV START ENVELOPE	=
RCV STOP ENVELOPE	= <CR> <CR> <LF> <LF> <LF> <LF> <LF> <LF> <LF> <LF> NNNN
FREETEXT CAPABILITY	= DISABLED

DEFAULT SSI SETUP

MASTER/SLAVE	= SLAVE
DACBPROTOCOL	= OFF
CHANNELCONTROL	= MODE I CONTINUOUS
MESSAGE CODE/PARITY	= ASC 11 ODD PARITY
LOOP RATE	= 1200
DATA RATE	= 1200
ERROR CONTROL	= MULTI-SAMPLING
SSI INTERFACE	= DLED
AUTO RESYNC	= ON
CLOCK SOURCE	= EXTERNAL
EXT CLOCK POLARITY	= POSITIVE
TRANSMIT SIGNAL SENSE	= MARK POSITIVE
RECEIVE SIGNAL SENSE	= MARK NEGATIVE
SERIAL DATA CODE	= NRZ
NUMBER OF STOP BITS	= 1
DATA MODE CONTROL	= OFF
MODE VI STORAGE BLOCKS	= NONE
MODE I ANSWER TIMER	= 5 SECONDS

DEFAULT EDITOR SETUP

CAPSLOCK	= OFF
LINE LENGTH	= 69
TABS	= 0

DEFAULT PRINTER SETUP

BAUD RATE	= 9600
DATA BITS	= 7
STOP BITS	= 1
PARITY	= ODD
AUTO-OPT	= OFF

DEFAULT AUTOSAVE SETUP

AUTOSAVE OPTION	= OFF
AUTOSAVE DEVICE	= ASC
DELETE SAFESTORED MSG OPTION	= OFF

DEFAULT COMM SETUP

COMM PROTOCOL	= KERMIT
COMM BAUD RATE	= 2400
COMM ERROR DETECTION	= CHECKSUM (I CHARACTER)
COMM RECEIVE ALARM	= OFF

SECTION V. DATA SYSTEMS

1. Purpose. This section provides the basic information necessary for the tactical user to access the unclassified (NIPRNET, Unclassified but sensitive) and classified (SIPRNET, Secret) Internet Protocol Router (IPR) Networks at selected Defense Information Infrastructure/Defense Information Systems Network (DII/DISN) gateway stations. It will also provide information on establishing a Joint Deployable Intelligence Support System (JDISS) circuit.

2. Concept. The Integrated Tactical Strategic Data Network (ITSDN) is designed to provide contingency or exercise support to the Commanders in Chief (CINCs)/Services/ Agencies of the Department of Defense (DoD). The ITSDN system includes ten Points of Presence (PoP) to provide worldwide coverage. Each ITSDN PoP consists of two Wellfleet routers and associated communications security (COMSEC) devices. One router is connected to the SIPRNET and the other is connected to the NIPRNET.

3. Procedures.

a. Plan Development

(1) Develop an exercise or contingency plan to interconnect a specific ITSDN PoP to the user's location. This plan should depict the communications architecture that will be supported by the tactical router connected to the ITSDN Pop.

(2) Develop and transmit the Satellite Access Request (SAR). This SAR will describe the type of service requested, dates required, and the communications architecture including the Autonomous System (AS) number, preferred routing protocol, and IP addresses of subordinate networks that will be supported by the tactical router. When requesting service, remember that Ports I and 2 of the NIPRNET and SIPRNET routers are configured with KG- 1 94 devices that permit high speed traffic. Ports 3 through 12 are configured with KIV-7s which emulate KG84A devices that are limited to 64 Kilobits per second (Kbs) operation.

(3) IP addresses supporting the tactical users host/Lan may be obtained and provided by the user. In this case, the IP network addressees) should be stated in Part 2, E(3)A/(4)A of the SAR, If the user does not have a block of "deployable" IP addresses, HQ USEUCOM ECJ6-0 is prepared to provide subscriber IP's on a temporary basis. The requirement for EUCOM supplied IP addresses should be identified in Part 2, E(3)A/(4)A of the SAR.

USCINCEUR COMPONENT IP ADDRESSING ASSIGNMENTS

Note that the following addresses may only be used when assigned by HQ EUCOM, and must not be used beyond the authorized term of deployment.

PRIMARY NIPR ADDRESSES: SECONDARY NIPR ADDRESSES:

ARFOR 199.113.128.0	199.113.144.0
AFFOR 199.113.129.0	199.113.145.0
MARFOR - 199.113.130.0	199.113.146.0
NAVFOR - 199.113.13 1.0	199.113.147.0
JSOTF - 199.113.132.0	199.113.148.0
JTF - 199.113.133.0	199.113.149.0
THRU	THRU
199.113.143.0	199.113.159.0

RESERVED NIPR IP ADDRESSES: 199.113.192.0 THRU 199.113.223.0

PRIMARY SIPR ADDRESSES: SECONDARY SIPR ADDRESSES:

ARFOR - 199.113.160.0	199.113.176.0
AFFOR - 199.113.161.0	199.113.177.0
MARFOR - 199.113.162.0	199.113.178.0
NAVFOR - 199.113.163.0	199.113.179.0
JSOTF - 199.113.164.0	199.113.180.0
JTF - 199.113.165.0	199.113.181.0
THRU	THRU
199.113.175.0	199.113.191.0

RESERVED SIPR IP ADDRESSES: 199.113.224.0 THRU 199.113.25 5.0

(4) Border Gateway Protocol (BGP) requires use of Autonomous System Numbers. Users obtain AS numbers from the Network Information Center (www.nic.ddn.mil). Presently ASNs are a user responsibility and are a required element of the SAR (Part 11, I.E.(/4).B). In the longer term USCINCEUR ECJ6-0 will provide temporary ASN's in a fashion similar to temporary subscriber IP addresses.

b. Operations

(1) Upon receipt of the approved Satellite Access Authorization (SAA) from the RCC, the tactical user should make direct contact with the ITSDN PoP to ensure that all other issues are resolved. The issues may be hours of operation, changes to the physical layouts of equipment at the ITDSN PoP, and Port addresses on the router(s).

(2) At the appropriate time activate the link IAW approved mission orders.

c. Tactical Router Configurations. Suggested baseline user router configurations for Wellfleet and Cisco family routers are provided to help tactical users in establishing communications with the ITSDN PoP routers.

(1) Cisco Router Configuration

*Example of user's Cisco 2500 configuration:

User Cisco Configuration- i.e. Nipr ITSDN Port #2

<u>BASIC</u>

-autonomous system (DISA)
-interface Ethernet 0

-ipaddressXXX.XXX.XXX.1 255.255.255.0
(User's LAN Network IP)

-interface serial 0

-ip address 204.35.221.2 255.255.255.0 (Interface to ITSDN Node)
-router bgp
Note: user must use DISA ASN

-network XXX.XY-X.XXX.0
-neighbor 204.35.221.1 (remoteas3542)
ITSDN IP and ASN

Note: If subnetting occurs, and user's Cisco is running oh only OS version 9, special configurations will need to be made. Contact NIPR/SIPRNET monitoring center for assistance.

The following is an example of a properly configured Cisco Router's configuration connected to the STEP.

```
22sigbde#sh conf
Using 582 out of 32762 bytes
!

version 10.2
service tcp-small-servers

hostname 22sigbde
!

enable secret XXX
enable password XXXXXX
!

                         Ethernet Port IP Address
interface Ethernet0
ip address 199.113.128.1 255.255.255.0 ip accounting output-packets
!
                   S0 IP Address    Net Mask Address
interface Serial0
ip address 204.35.222.2 255.255.255.0
ip accounting output-packets
bandwidth 56
!

interface Serial 1
no ip address
shutdown
!                  LDL ASN from SAA
                     Advertised Class B IP Range
router bgp 3542
network 199.113.128.0  LDL GWY IP Address
neighbor 204.35.222.1 remote-as 3542

ip route 0.0.0.0 0.0.0.0 204.35.222.1
!

line con 0
line aux 0
transport input all
line vty 0 4
password XXX
login
escape-character 3

end

22sigbde#
```

Assumptions:

- Users have 1st and 2nd level router passwords.

- Serial interface to ITSDN: IP address is derived via chart for the ITSDN (Landstuhl NIPR poi-t#2 204.35.221.2)

- User is using DISA ASN 3542.

d. Cryptographic Device Settings. Recommended settings for systems which encrypt data through KIV-7/KG84A and KGI94 devices will be found in Section VI. Users should directly coordinate with the supporting PoP to ensure that these settings are current at the time of employment.

e. Customer Requirements.

(1) Each customer must be prepared to use the services provided. While a few non-network ready computers can be supported, it is best if the customer has a network ready computer and all the associated equipment, cables, and software. The deployed customer must bring the following items:

(a) A network ready computer with a 10base2 or 10baseT NIC.

(b) A TCP/IP software suite (i.e. WIN95).

(c) Any specialized access software for connecting to the desired systems (i.e. InfoConnect).

(d) IP address, Login, and Password for access to the desired system (i.e. CAMS or SBSS).

(e) Any servers for converting Domain Names to IP addresses, sharing files, sharing printers, E-mail, etc.

(f) TCP/IP E-mail programs if required (i.e. Microsoft Exchange),

(g) Ethernet cables and connectors. Suggest each computer come with the following:

- one 15 foot 10base2 cable

- one IO foot I Obase2 cable

- one 5 foot I Obase2 cable

- two male-to-male BNC couplers

- one BCN "T" adapter (female-male-female configuration)

- one 50 ohm BNC terminator

f. Router Checklist to be Used Prior to Deployment

(1) Router administrative Point of Contact:

Name: ___________________

Organization: _________________

Department: ___________________

Telephone: DSN: ______________ Commercial: __________________

(2) Routing Protocol:BGP4- BGP3- Other: ________________

(3) Users host/LAN IP addresse(es): _______________________

Subnetting: __________________________

(4) User's network Autonomous System Number: ________________

(5) Router first and second level passwords: _______________

N.B., password required to allow RCC to assist in router configuration/troubleshooting

(6) Router make/model: ____________
Software version _____________

(7) CRYPTO: Yes/No Type: ___________
Short title and Segment: _______________

CRYPTO switch settings and straps: See COMSEC section. (note any deviation from "standard")

(8) Regional Control Center NIPR/SIPR Monitoring Center telephone numbers:

Commercial: 01 1-49-711-680-5532/5534/5148/5817
(314) 430-55-')2/5534/5148/5817

SECTION VI. COMMUNICATIONS SECURITY (COMSEC)

1. Purpose. This chapter provides information on the COMSEC keying material to be used with the systems/circuits provided through the Landstuhl SATCOM facility. It also provides the strapping options for various encryption devices.

2. Concept. Intertheater COMSEC Package (ICP) keying material is to be used for all systems/circuits terminating at the Landstuhl SATCOM facility. This is ICW DISA CONEXPLAN, JCS J6Z, the ICP Manager at MacDill AFB, and agreed by ALCON at the STEP Coordination Conference, held June 1996.

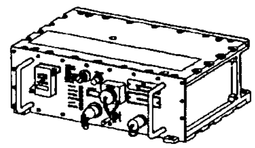
3. Procedures.

a. The following is a list of the short titles that will be used for specific equipment/circuits:

USKAT 2720	Trunk Encryption Devices (TED) Transiting the Satellite		
USKAT 1985	KY-57s for the Satellite DVOWs		
USKAT C5573	KG-84/194S Used for SIPR/NIPR Circuits		
		Segment 4 (KEK)	KG-84s
		Segment 5 (TEK)	KG-84s
		Segment 6 (KEK)	KG- 194s
		Segment 7 (TEK)	KG- 194s

b. All other COMSEC requirements will be directed to the Theater COMSEC Management Office (TCMO) via the Brigade COMSEC Management Office (BCMO) to be satisfied.

KG-81, KG-94, & KG-194 STRAPPING



6-2

KG-81

KG-81 STRAPPING
- EKX E22-E23
- EEW E1-E2
- EEW E22-E23
- EEX E1-E2
- EEX E3-E4
- EEX E7-E8
- EEX E11-E12
- EEX E16- E17
- EEX E5, E6, E9, E10 OPEN
- EEZ* E12-E13
- EEZ* E15-E16
- EEZ* E17-E22
- EEZ* E20-E21
- EEZ* E37-E38
- EEZ* E40-E49
- EEZ* E44-E45
- EEZ* E61-E65
- EEZ* E71-E72
- EEZ* E25, E28, E29 OPEN
  E39 OPEN

* OR EKY BOARD *

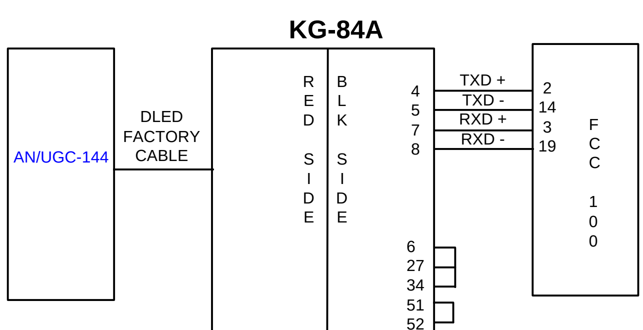
KG-94

KG-94 STRAPPING
- E-GFY E1-E2
- E-GFY E7-E8
- E-GFX E1-E2
- E-GFX E5-E6
- E-GFX E9-E10
- E-GFX E11-E12
- E-GFX E15-E16
- E-GFX E20-E22
- E-GFX E23-E24
- E-GFX E29-E30
- E-GFX E31-E32
- E-GFW E1-E3
- E-GFW E5-E6
- E-GFW E9-E11
- E-GFW E14-E16
- E-GFW E15-E17
- E-GFW E19-E21
- E-GFW E23-E25
- E-GFW E28-E30
- E-GFW E31-E32
- E-GFW E33-E34
- E-GFW E37-E38
- E-GFW E39-E40
- E-GFW E43-E44
- E-GFW E45-E46
- E-GFW E49-E50
- E-GFV E1-E2
- E-GFV E3-E5
- E-GFV E11-E12
- E-GFV E22-E24
- E-GFV E27-E28
- E-GFV E30-E32

KG-194

KG-194 STRAPPING
- E-GQY E1-E2
- E-GQY E7-E8
- E-GQY E10-E11
- E-GFX E1-E2
- E-GFX E5-E6
- E-GFX E9-E10
- E-GFX E11-E12
- E-GFX E15-E16
- E-GFX E20-E22
- E-GFX E23-E24
- E-GFX E29-E30
- E-GFX E31-E32
- E-GFW E1-E3
- E-GFW E5-E6
- E-GFW E9-E11
- E-GFW E14-E16
- E-GFW E15-E17
- E-GFW E19-E21
- E-GFW E23-E25
- E-GFW E28-E30
- E-GFW E31-E32
- E-GFW E33-E34
- E-GFW E37-E38
- E-GFW E39-E40
- E-GFW E43-E44
- E-GFW E45-E46
- E-GFW E49-E50
- E-GFV E1-E2
- E-GFV E3-E5
- E-GFV E11-E12
- E-GFV E22-E24
- E-GFV E27-E28
- E-GFV E30-E32

AUTODIN CIRCUIT (DEPLOYED LOCATION) CONDITIONED DIPHASE



4-12

FRONT PANEL SETTINGS

CLOCK INT	2
DATA MODE	5
RX RATE	8A
TX RATE	8A
STEP PULSE	1 +0
TTY MODE	1
INTFC	2
DATA LENGTH	SYNC
SYNC MODE	4
COMM MODE	1

* AUTODIN HAS A BUILT IN DATA INVERSION ON THE RED SIDE OF THEIR FPA. THEY MUST WIRE THE KG-84s TXDPT - TO TXDPT + AT THEIR FPA

INTERNAL SETTINGS

E-FNK
J6 TO J7
J8 TO J9
J12 TO J13
J15 TO J16
J17A

E-FNL
J6 TO J7
J9 TO J10
J20 TO J22
J15 TO J16
J12 TO J13
J18 TO J19

E-FNN
J8 TO J9
J5 TO J6
J11 TO J12

E-FNO
J7 TO J8

E-FNP
J14
J15
J8 TO J9
J11 TO J12

ITSDN
KG-84A CRYPTOGRAPHIC EQUIPMENT CONFIGURATION

(FOR USE WITH THE SIPRNET & NIPRNET)

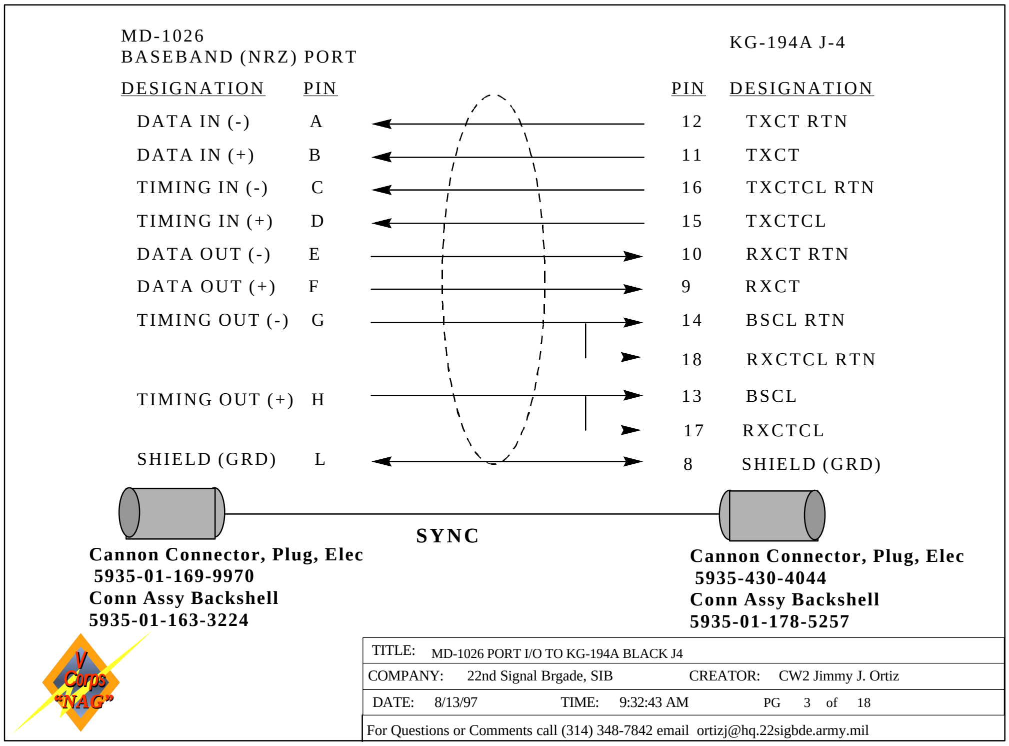
KG-84A INTERNAL STRAPS

OPTION	CARD	STRAP	SETTING
ETCT	A-1	J6-J7 J8-J9	BALANCED BALANCED
XMIT CTRL/CTRR	A-1	J12-J13 J15-J16	BALANCED BALANCED
INTERFACE	A-1	J17 B LOWER HALF	KG-84
TCTC	A-2	J6-J7 J9-J10	BALANCED BALANCED
CLOCK LOCK	A-2	J21-J22	ENABLED
CTCD/CTRS	A-2	J12-J13 J15-J16	BALANCED BALANCED
TIMEOUT	A-5	J9-J10	ENABLED
VUX	A-5	J5-J6	ENABLED
FILL SELECT	A-5	J12-J13	KG-84
UPDATE	A-6	J7-J8	ENABLED
RED I/O	A-9	J14 & J15	BALANCED
STEP PULSE	A-9	J9-J10	DOUBLE
TX CLOCK	A-9	J11-J12	CONTINUOUS

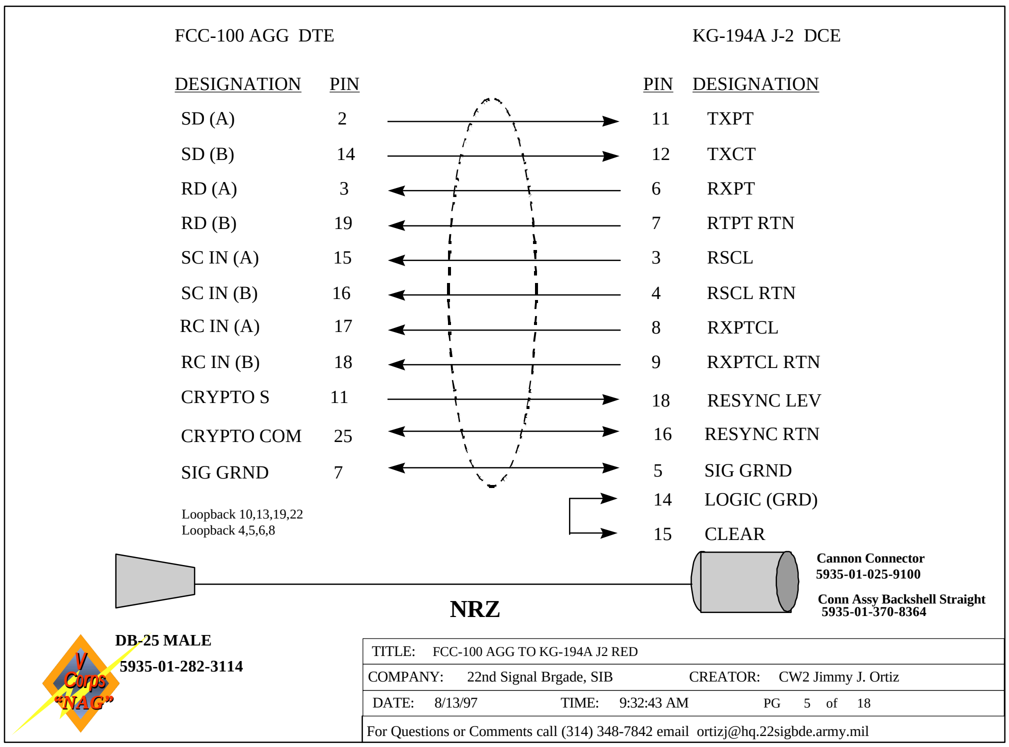
KG-84A FRONT PANEL SWITCH SETTINGS

SWITCH	TACTICAL USER SETTINGS	LDL ITSDN SETTINGS
CLOCK	2 SLAVE	1 MASTER
DATA MODE	2 BB NON CONDITIONED	2 MIL STD 188-114 NON-COND
RX DATA RATE	8B EXT CLK	8B EXT CLK
TX DATA RATE	8B EXT CLK	8B EXT CLK
STEP PULSE INTERVAL	1 OFF (NOT USED)	1 OFF (NOT USED)
TOGGLE	+0 OFF (NOT USED)	+0 OFF (NOT USED)
TTY MODE	1 AUTO RESYNC	1 AUTO RESYNC
INTERFACE	3 CA-CB	3 CA-CB
DATA LENGTH	1 SYNC	1 SYNC
SYNC MODE	5 OP2	2 RED A/S
COMM MODE	1 FULL DUPLEX	1 FULL DUPLEX

MD-1026 PORT I/O TO KG-194A BLACK J4



FCC-100 AGG TO KG-194A J2 RED



KG-84A 56K BLACK SIDE CABLE

SIG	DNE PIN#	RS-530 PIN#	V.35 PIN#	KG-84A(BLACK SIDE) PIN#	SIG NAME
TXD+	2	2	P	14	TXD+
TXD-	14	14	S	15	TXD-
RXD+	3	3	R	12	RXD+
RXD-	19	16	T	13	RXD-
TXC+	15	15	y	21	TXC+
TXC-	16	12	AA	22	TXC-
RXC+	17	17	V	19	RXC+
RXC-	18	9	X	20	RXC-
RTS	4	4	C	27	CTCS
CTS	5	5	D	34	CTRR
				51	CTDM
				52	+6VDC
DSR	6	6	E		
CD	8	8	F		
DTR	20	20	H		

NRZ

DB-25 MALE
5935-01-282-3114

Cannon Connector, Plug, Elec 5935-00-410-9250
Conn Assy Backshell 5935-00-146-4526

TITLE: KG-84A 56K BLACK SIDE CABLE
COMPANY: 22nd Signal Brgade, SIB CREATOR: CW2 Jimmy J. Ortiz
DATE: 8/13/97 TIME: 9:32:43 AM PG 15 of 18
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil

V Corps "NAG"

KG-84A 56K RED SIDE CABLE

RS-232 PIN#	SIGNAME	KG-84A (RED SIDE) PIN#	SIGNAME
2	TXD+	17	TXD+
3	RXD+	6	RXD+
4	RTS	11	PTRS+
5	CTS	19	PTCS+
6	DSR	51	PTDM+
7	SG	1	SIG GND
		3	RED COM SIG RTN
		18	TXD-
		43	PTTT-
8	CD	40	PTRR+
15	TXC+	16	TXC+
17	RXC+	21	RXC+
20	DTR	38	PTTR+
22	RNG IND	45	PTIC+
24	TT	42	MUX INSTRUCTION
		41	PTRR-
		29	?

NRZ

DB-25 FEMALE
5935-00-410-9250

Cannon Connector, Plug, Elec 5935-00-306-3219
Conn Assy Backshell 5935-00-146-4526

TITLE: KG-84A 56K RED SIDE CABLE
COMPANY: 22nd Signal Brgade, SIB CREATOR: CW2 Jimmy J. Ortiz
DATE: 8/13/97 TIME: 9:32:43 AM PG 14 of 18
For Questions or Comments call (314) 348-7842 email ortizj@hq.22sigbde.army.mil

V Corps "NAG"

APPENDIX A
GLOSSARY

A

ABSENT SUBSCRIBER FEATURE
Provides the capability for subscribers to notify the switch they are affiliated to, that they will not be available to receive (or place) calls for an indefinite period of time. When calling an absent subscriber, the calling subscriber will receive a recorded announcement in lieu of a ringback tone.

ACCESS SWITCH
A switch whose primary purpose is to allow the subscribers access into the MSE system. Also allows the MSE system access to the subscriber. The LEN and SEN switches are access switches.

ACCESS TRUNK GROUP CLUSTER
Enter a single letter (Y = yes or **N =** no) to indicate if this TGC provides the only access to the destination code (i.e. MSE NATO or EAC interface). It is used to inform other switches whether any attempt to alternate route will be successful.

ADT - ASSIGN DIGITAL TRANSMISSION GROUP Used to build DTGs

AFFILIATION
The process by which mobile and wire subscribers enter and identify their connection to the MSE network. Affiliation can be compared to "logging on" a computer system or ham radio net.

AHLP ARPANET
Host Interface Protocol, a proprietary protocol allowing subscriber hosts to access the TPN. Like the CCITT X.25 protocol, AHIP provides services at the physical, data link, and network layers of the network architecture.

AKDC - AUTOMATIC KEY DISTRIBUTION CENTER (KGX-93A)
Used for the bulk transfer and storage of electronic keys.

ALLOCAT
Technical function of the SCC network that computes the frequencies for the LOS/DTH links.

ALTG - AUXILIARY LINE TERMINATION GROUP

AMLCD - ACTIVE MATRIX LIQUID CRYSTAL DISPLAY AMPLIFIER
Any electric component that boosts the strength or amplitude of a transmitted (usually analog) signal; functionally equivalent to a repeater in digital transmissions.

AN/TYC-19

Inter-network gateway router that is installed in NC switches to provide routing protocol for messages transmitted by the packet switch to Inter-area networks, such as inter-MSE networks, Echelon Above Corps (EAC) networks, Defense Data Networks (DDN), etc.

AN/TYC-20
The packet switch used in TPN is a data concentrator and switching device that establishes, operates, and manages the data paths between nodes, and selects the minimum delay path for each packet according to current traffic activity. There are two versions of the packet switch in the TPN. The first is a 12-port configuration that is installed in each NCS and the second is the 6-port version that is installed in the LEN, SEN, and the SCC. Each port can be used to interface either a subscriber or trunk. Located within the packet switch is an Integral Gateway (IGW). This IGW is referred to and treated similarly to the AN/TYC-19. It provides the gateway function necessary to give LAN hosts access to the packet switching network.

ANALOG
In voice/data transmission, a representation of information that bears an exact relationship to the original information. This representation does not have discrete values, but is continuously variable.

AOD - ASSIGN ON-LINE DIAGNOSTICS

ARP - ADDRESS RESOLUTION PROTOCOL

Its purpose is to dynamically map the addresses in the physical network. In the case of TPN, the physical addresses are mapped to the inter-network IP address.

ASI - ASSIGN SWITCH INITIALIZATION

ATG - ASSIGN TRANSMISSION GROUP

ATTENUATION
Reduction or loss of signal strength, measured in decibels, in analog circuits. Opposite of Gain.

AUTOSAVE
Procedure to automatically save the System Log or CBCS Database.
B

BACKBONE
Portion of the network consisting of packet/circuit-switching equipment and interconnecting trunks that are essential for network communication flow. These are usually NC to NC communications.

BANDWIDTH
The difference, expressed in Hertz (Hz), between the highest and lowest frequencies of a transmission channel.

BIT
A binary digit, the representation of a signal, wave, or state, as either a binary zero or a one.

BLACKLIST TABLE
A list of subscribers, stored at each switch, who have unsuccessfully tried to affiliate. A subscriber is blacklisted after four affiliation attempts. Unsuccessful attempts are due to a mismatch between the preaffiliated information stored in the network and information dialed during affiliation. The table also stores the number of previous unsuccessful attempts. After four attempts, affiliation cannot take place even if the dialed information matches the stored information. At this point, affiliation can only take place with operator intervention, or by relocating to another switch. Blacklist tables are never duplicated. (See duplication.)

BUFFER
A device for storing information temporarily during data transfers. A storage device used to compensate for a difference in the rate of flow of information or the time of occurrence of events when transmitting information from one device to another.

BUS
A transmission path or channel, typically an electrical connection, with one or more conductors used as a path, where all attached devices receive all transmissions / information at the same time.

BULK ENCRYPT
To encrypt numerous separate signals that have already been multiplexed into a combined signal by subjecting them to a single encryption key.

C

CBU - CONFERENCE BRIDGE UNIT
Used to make multiple party conversations.

CDS - COMPACT DIGITAL SWITCH

CEG - COMMON EQUIPMENT GROUP

CEN - CONTROL ELECTRONICS NEST

CHANNEL
That part of a communications system that connects a message source to a message sink (receiver) A path for electrical transmission between two or more points. The following could be referred to as a channel: circuit, line, link, trunk, or path.

CHANNEL RATES
Refers to the number of significant bits of information carried on a single communications path in a measured period of time (e.g., 1 second in MSE).

CRF - CHANNEL REASSIGNMENT FUNCTION
The channel reassignment function provides the capability to reassign channels from an incoming DTG to channels in an outgoing DTG. It can also be used to reassign a single digital sole user type channel to a channel in an outgoing DTG. The data base allows up to 64 reassignments to be made. Multiplex signaling formats 1, 2, 3, and 4A can be accommodated. Use the ACR screen to implement the CRF.

CHARACTER SYNCHRONIZATION
A method of inserting characters in assigned time slots for fixed rate transmission without employing start and stop controls. The receiver and transmitter use precise timing to separate and assemble individual messages from the multiplexed signal.

CIRCUIT SWITCHING
A method of communications where an electrical connection between calling and called stations is established on demand for exclusive use of the circuit until the connection is released.

COS - CLASS OF SERVICE
Designation for one of several variable network connection services, available to the user of a network, usually distinguished by security offered (such as encryption), transmission, priority, and bandwidth; the network user designates class of service at connection establishment, typically using a symbolic name mapped into a list of potential routes, any of which can provide the requested service.

CLASSMARK
Method of identifying service featured (security classification, restriction, signaling, supervision, etc.) of a particular subscriber or trunk circuit to a switch processor.

CLASSMARKED
Used to indicate the presence or lack of a particular user feature. Based on the users profile.

CLOCK
An oscillator-generated signal that provides a timing reference for a transmission link; used to control the timing of functions such as sampling interval, signaling rate, and duration of signal element, an enclosed digital network typically has only one master clock.

COAXIAL CABLE
A transmission cable in which one conductor completely surrounds the other, separated by a continuous solid dielectric.

COI - COMMUNITY OF INTEREST (PACKET SWITCH)
This is an TPN feature that permits the grouping of DTEs for access purposes. All DTEs connecting to the TPN must subscribe to this feature. Each DTE is assigned to at least one COI and can hold membership in up to 27 COIs All TPN DTEs are part of the same COI in the

standard configuration. A DTE can make connections with the members of the COI that it belongs to and no other.

COMMON BATTERY
Battery that serves as a central source of energy for many circuits.

CCS - COMMON CHANNEL SIGNALING
Single channel used for transmitting processor messages required to establish, update, and disconnect trunk circuits between switches.

COMMON FILL DEVICE
Any one of a family device developed to read in, transfer, or store key(s).

COMPRESSED DIALING
A feature of some telephone switches that permits users to establish calls by entering fewer digits than would otherwise be required; speed dialing directories are pre-defined, though usually changeable by the user; also, speed dialing.

COMSEC
Acronym for Communications Security. Measures designed to deny unauthorized persons information of value that might be derived from the possession and study of telecommunications, or to mislead unauthorized persons in their interpretation of the results of such possession and study. Communications Security includes cryptosecurity, transmission security, emission security, and physical security of communications materials and information.

CONDITIONED DIPHASE
A modulation process of a baseband data signal that incorporates a coding conditioning followed by a Diphase signal conversion. The coding conditioning techniques use data transitions and data nontransitions to convey the baseband signal. The conditioning signal generator produces a one to zero or a zero to one transition (maintenance of the previous bit state one/zero) to convey a baseband "zero". The conditioned Diphase signal is formed by dividing each code-conditioned baseband bit into two half-period bits. The first half-period bit is the complement of the conditioned baseband bit, while the second half-period bit carries the logic state on the conditioned baseband bit. The conditioned Diphase signal is designed to nearly imitate the DC component of baseband data and thus enhances recovery of time from the received data.

CVSD - CONTINUOUSLY VARIABLE SLOPE DELTA MODULATION
A type of delta modulation in which the size of the steps of the approximated signal is progressively increased or decreased as required to make the approximated signal closely match the input analog wave. (See Delta Modulation.)

Used to convert the analog human voice to the digital format required in MSE. It is the type of delta modulation in which the size of the steps of the approximated signal (frequency of sampling) is progressively increased or decreased as rehired to make the approximated signal closely match the input analog wave.

CONTROLLER
The equipment that makes interval possible between the processors and switching/signaling devices.

CORTRON
Manufacturer of the keyboard used on the SUN workstation in the Operations shelters.

CPG - CENTRAL PROCESSOR GROUP

CRYPTONET
Stations holding a specific short title of operational or contingency key who can communicate with one another.

CSOLOP - CIRCUIT SWITCH ON-LINE OPERATIONAL PROGRAM

CSP - CALL SERVICE POSITION

CTLR - CONTROLLER

CVSDA - CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR "A"

D

DAS - DIRECT ACCESS SERVICE

DATA
Digitally represented information; included voice, text, facsimile, and video.

DATA COMMUNICATIONS
The transmission, reception, and validation of data; data transfer between data source and data sink through one or more data links according to appropriate protocols.

DATA LINK
The communication medium that allows for the transmission of information in a data format between devices.

DATA LINK LAYER
The ISO name for the layer of the network architecture that takes a raw transmission facility and transforms it into a line that appears free of transmission errors to the next network layer. At the data link layer, a link access protocol is used for data level and level 2.

DATA SINK
Equipment that accepts transmitted data.

DATA SOURCE
Equipment that originates data for transmission.

DTA - DATA TERMINAL ADAPTER
Provides the interface between the NMF and the SCC for the electronic transfer of operational and technical messages.

DB - DATABASE

DB-37P
The 37-pin male connector used for the physical link between a subscriber device and the TPN DCE.

DCE - DATA CIRCUIT TERMINATING EQUIPMENT
Equipment that provides signal conversion and coding between the DTE and the communications line. The DCE may be part of the DTE, separate equipment, or part of an intermediate piece of equipment.

DCSDSD - DEFENSE COMMUNICATIONS SYSTEM DATA SYSTEM DIRECTORATE
The organization within the DCA with overall responsibility for implementation and executive management of the TPN.

DDN - DISPLAY DIRECTORY NUMBER

DECRYPTION
The decoding of an encrypted message.

DEDUCIBLE FIXED DIRECTORY
A numbering plan based on the NATO fixed directory numbering structure (STANAG 5046) that enables users to determine seven-digit subscriber directory numbers without having knowledge of a subscribers location or network connectivity. Most seven-digit numbers can be determined without the use of a telephone directory.

DEDUCIBLE NUMBER
A seven-digit telephone number that can be determined without having knowledge of a subscribers physical location or network connectivity.

DEGAUSS
In SCC, when pressed and held for 10 seconds, automatically demagnetizes the monitors cathode ray tube (CRT), which can improve color purity and convergence. The built-in degaussing coil functions only when operating with AC power, and only degausses the CRT. Degaussing other parts of the monitor requires the use of a separate degaussing coil.

DELTA MODULATION

A form of analog to digital conversion in which, at each sample point, the bit output is a one if the waveform is more positive than at the last sample point or, the output is a zero if the sample point is more negative. On the positive slopes of a waveform, the output of the delta modulator is a string of ones and is a string of zeros for the negative slopes. (See CSVD.)

DEMODULATION
The extraction of transmitted information from a modulated carrier signal.

DEMULTIPLEXING - DEMUX
Reconstructing individual information channels from a common multiplexed channel.

DEMUX - DEMULTIPLEXER

DEREGISTRATION
Process of removing a registered user from receiving active services.

DIFFRACTION
The bending of a radio wave around a man-made or natural object; it decreases the signal strength.

DIGITAL
Referring to communications, procedures, techniques, and equipment where information is encoded as either a binary 1 or 0; the representation of information in discrete binary form, discontinuous in time, as opposed to the analog representation of information in variable, but continuous waveform. A circuit that operates like a switch,i.e.,itis either “on” or “off”'. Unlike analog, the result data is usually represented by means of coded characters.

DIGITAL LOOP TERMINATION
Provides digital telephone service for a four-wire subscriber telephone.

DIGITAL LOOPBACK
Technique for testing the digital processing circuitry of a communications device; can be initiated locally, or remotely, through a telecommunications circuit; device being tested echoes back a received test message, after first decoding and then re-encoding it, the results of which are compared with the original message (compare with analog loopback).

DTG - DIGITAL TRANSMISSION GROUP
Consists of a collection of individual digital channels or channel groups that have been time-multiplexed into a single bit stream for transmission over a communications link.

DIGITAL TRUNKS
A common-user circuit, between switches, utilizing digital information versus analog information.

DIPHASE

A non-conditioned baseband signal that used the modulation technique of carrying the information on the transitions corresponding to the highs and lows of the signal. Diphase is an acronym for "differential phase".

DAS - DIRECT ACCESS SERVICE
Capability to call a predesignated subscriber without dialing, but by simply going off-hook.

DISCRIMINATOR
A circuit that can be adjusted to accept or reject signals of different characteristics (i.e., frequency and amplitude).

DIVERSITY
(Space Diversity) The process of using two or more receiving antennas spaced a distance apart to decrease signal, loss due to variations in wave projection (fading).

DME - DISPLAY MAJOR EQUIPMENT

DOWNLOADING
Transmission of the contents of the database of an SCC to an empty SCC. If this operation succeeds, the SCC becomes a reserve SCC.

DTE - DATA TERMINATING EQUIPMENT
Equipment that serves as the data source, data sink, or data source and sink. For purposes of subscription to TPN X.25 service, a DTE may be any applications host, front end, gateway, or packet assembler/disassembler that uses the X.25 protocol.

DTG - DISPLAY TRANSMISSION GROUP
Used to view an existing group of channels and assigned data rate.

DUPLICATION
The process of storing the directory numbers from one switch in an adjacent switch. It preserves all network directory numbers and associated data when the NCS/LEN switch is not operational for any reason.

E

ECP - ENGINEERING CHANGE PROPOSAL
Document identifying soft and hardware changes to a particular device.

ELDEC
Type of keyboard used in the Node Management Facility.

EMI - ELECTROMAGNETIC INTERFERENCE

Radiation leakage outside of a transmission medium that result (mainly) from the use of high-frequency wave energy and signal modulation: reduced by shielding, minimum acceptable levels are based on type of device and operating frequency.

ELM.HLP - ELECTRONIC MAIL HELP FILE May be viewed by the operator.

EMACS - ELECTRONIC MAIL TEXT EDITOR

EMACS-KEYS.HLP
Electronic mail Text editor help file, may be viewed by the operator.

ENCRYPTION
The coding of a message.

END TO END - E-E
A form of communication and/or protocol transfer. The two ends of any link can perform E-E functions transfers.

END TO END PROTOCOL
The proprietary software at the network layer of the TPN that passes user data from source to destination through the backbone.

ESSENTIAL USERS
Those subscribers who, because of their importance to the mission, are designated for extraordinary restoral measure in case of failure of the circuit switch.

EXTERNAL TERMINATIONS
Refers to trunk, loop, and DTG connections outside of the NC, LEN or SEN Switches. The connections on the signal entry panel are external terminations.

F

FAX - FACSIMILE
The communications process in which graphics or text documents are scanned, transmitted over a (typically dial-up) phone line, and reconstructed by a receiver; also FAX.

FADING
A phenomenon, generally of microwave or radio transmission, where atmospheric, electromagnetic, or gravitational influences cause a signal to be deflected or diverted away from the target receiver.

FEC - FORWARD ERROR CORRECTION

A special feature of the ANfTYC-20 (packet switch) that ensures reliable data transmission over a trunk line when there is high interference FEC can be disabled or enabled for a particular trunk anytime.

FES - FORCED ENTRY SWITCH

FLOOD SEARCH ROUTING
The MSE System's ability to find called subscribers regardless of subscriber location, congested or blocked links, partial network destruction, or equipment failures.

FRAME
A unit of information transferred between DTEs and DCEs at the data link layer of the network. Frames enclose the packets formed at the packet level of the network and are, in turn, included in the stream of bits that comprise the transfer of information at the physical layer. The object of framing information is to present reliable data to the packet layer processes.

FREQ-FREQUENCY
The number of repetitions per unit time of a complete waveform; the number of complete cycles per unit of time, usually expressed in Hertz (Hz).

FREQUENCY BAND
Portion of the electromagnetic spectrum within a specified upper and lower frequency limit; also frequency range.

FREQUENCY DIVISION MULTIPLEXING
Technique for sharing a transmission channel wherein carrier signals of different frequencies are transmitted simultaneously.

FREQUENCY MODULATION
Method of encoding a carrier wave by varying the frequency of the transmitted signal.

FRONTIER LINK
An inter-nodal link that crosses the Corps/Division boundaries, thus connecting two MSE networks.

FTP - FILE TRANSFER PROTOCOL
A protocol used to transfer files between two connected hosts.

FTP - FILE TRANSFER PROTOCOL
ftp.hlp - File Transfer Protocol help file, may be viewed by the operator.

FULL DUPLEX
A channel on which simultaneous two-way communication is available.

G

GAIN
Increased signal power, usually the result of amplification; measured in decibels for the ratio of an output signal level to an input signal level; opposite of loss or attenuation.

GATEWAY
A conceptual or logical network station that serve to interconnect two otherwise incompatible network, network nodes, subnetworks, or devices; performs a protocol conversion operation across a wide spectrum of communication, functions, or layers.

GB - GIGABYTE
Unit of measure for one million bytes of information.

GLARE
Enter a single letter (A = accept or R = reject) to specify whether the switch will accept or reject a glare signal. Glare occurs when two switches simultaneously attempt to seize the same trunk while attempting to complete a call. If a switch is classmarked to accept glare, the switch will accept the signal and drop off the trunk and continue its search for another idle trunk. If a switch is classmarked to reject glare, the switch will ignore the glare.

GPMDM - GROUP MODEM

GRC - GROUND RADIO COMMUNICATIONS

GRID NETWORK
A preconfigured planned switch network that provides a subscriber with multiple access to any other subscriber in the system.

HALF DUPLEX
A channel that offers send and receive capability, one way at a time. Equipment that runs user applications. In the case of the TPN, a private PAD connecting subscriber hosts or terminals to the network is also a host. The subscriber is responsible for implementing the physical and software interface of the host to the network at the various network layers.

HANDSHAKE PROTOCOL
In communications, a pre-defined exchange of signals or control characters between two devices or nodes that set up the conditions for data transfer or transmission; also handshaking.

HCU - ESOP COMPUTER

HOST
Equipment that runs user applications. In the case of TPN, a private PAD connecting subscriber hosts or terminals to the network is also a host. The subscriber is responsible for implementing the physical and software interface of the host to the network at the various network layers.

HTM - HOST TRAFFIC MATRIX
The HTM package determines how many packets each host sends to every other network host.

I

ICMP - INTERNET CONTROL MESSAGE PROTOCOL
A mechanism used between gateways and hosts to report errors in IP-datagram processing. ICMP uses the basic support of IP as if it were a higher level protocol. However, ICMP is actually an integral part of IP and must be implemented by every IP module.

ICONIFY
Term used for reducing a window to a small graphic representation, which is easier to manipulate.

IGW - INTEGRAL GATEWAY
This IGW forwards packets to the TPN that are nonlocal to the LAN. The TPN's PSNs route the packets to their ultimate destination (as long as a viable path to the destination exists). The IG contains two ports for LAN connections. Both of these ports pass through separate 802.3 transceivers, and then the shelter SEP for ultimate connections to the external LAN hosts. Each LAN can accommodate up to a maximum of 29 hosts each. (See LAN.)

IGW - INTEGRAL GATEWAY

IMAGE
When used in regard to the SCC, disk indicates a duplicate of a partition of the database under the control partition of another SCC.

IMS - INTEGRATED MANAGEMENT SYSTEM (NMC)
The application software system that facilitates the monitoring and control of the TPN. It also provides specialized database structures to support status and event displays, reports, and commands. Commands are available to configure and control network entities, to poll network components for status, and to diagnose network problems. On-line help is available to operators for all user commands.

INTERFACE
A shared boundary between entities of a network (devices, architectural layers), defined by the characteristics of their physical interconnection and/or software functions. A point or device at which a transition between media, power levels, or modes of operation are made.

INTERNATIONAL CLASS OF USER SERVICE
A category of public data transmission service in a network in which the data signaling rate, control signaling rates, and other parameters are specified with reference to the services, interfaces, and terminal operating mode.

INTEROPERABILITY
Capability of two or more items or components of equipment to perform essentially the same function or to complement each other in a system, regardless of differences in technical characteristics and with negligible additional training of personnel.

INTERSWITCH TRUNK
A circuit that interconnects message switches, circuit switches, or a message switch and a circuit switch.

IP - INTERNET PROTOCOL
The companion transport protocol to TCP in the TPN that transmits and receives data across the TPN internet. This protocol does not check user data for errors or attempt to control its flow. IP supports a global addressing system and is connectionless.

IP - INTERNET PROTOCOL
Usually used for addressing a particular device on a LAN.

ISO - INTERNATIONAL STANDARDS ORGANIZATION
The Reference Model of Open Systems Interconnection (OSI) is followed in the design of network
architectures worldwide. The CCITT standards, published in a series of recommendations, conform to some degree to the ISO standards.

K

KB - KILOBYTE
Unit of measure for one thousand bytes of information.

KBPS - KILOBYTES PER SECOND
Unit of measure for one thousand bits in a second of time.

KEY
A sequence of binary digits used to initially set up and periodically change the existing electronic key setting in COMSEC equipment for the purpose of encrypting/decrypting electronic signals, for transmission security processing (frequency hopping, speed spectrum, etc.) and for producing other keys.

KEY ENCRYPTION KEY
A key that is used in the encryption and decryption of other keys, for transmission (rekeying) or storage.

KEY GENERATOR
A device that produces electronic keys for COMSEC equipment.

KEY MANAGEMENT
The process by which keys are generated, stored, protected, transferred, loaded, and destroyed.

KEYING
Modulation of a carrier signal, usually by frequency or phase, to encode binary information; also, interruption of a circuit for the purpose of signaling information.

KILOBIT
Standard measure of data rate and transmission capacity.

KO - COEFFICIENT
Transmission/Reception Roughness factor that can be set by man/machine interaction, it can take values from 0 to 99. Its default value is 06. Values greater than 12 have no physical meaning but can be useful for test purposes.

KREF (COEFFICIENT); K=RADIUS EFFECT
Parameter defining the ratio between the effective earth radius and actual earth radius LOS frequency assignment.

L

LAN - LOCAL AREA NETWORK
The objective of the LAN is to provide a communications path among a group of host computers, or subscribers, that are physically close to one another. The TPN's LAN connection is particularly suitable because there is a lot of local interaction among the members of a command post. This on-LAN traffic will be delivered directly the local destination without traversing the TPN. The LAN is designed to also provide a common off-LAN communications mechanism. In the TPN, this off-LAN communications path is provided by the IGW, which is contained within the AN/TYC-20 enclosure at the SEN, LEN, SCC, or NCS. (See IGW.)

LAYER
The ISO term for a collection of related functions that provide services to the higher layers of a network architecture, shielding those layers from the details of how the services are implemented.

LINE HUNTING GROUP
Provides easier access to a busy subscriber by assigning more than one terminal number to be accessed by one directory number.

LOOP
A closed path in an electrical circuit. In this case, a loop is a four wire connection between the subscriber equipment (telephone) and the switch.

LINK

A communications path between two transmission devices, e.g., NCS to a Large Extension Node Switch via LOS radio.

LND - LOCAL NETWORK DISPLAY
Provides a graphic image of the database currently loaded into the workstation.

LOGIN
Process of authentication to a computer or network.

LOGOUT
Process of removing authorization to a computer or network.

LKG LOOP KEY GENERATOR
A COMSEC device that provides an interface at the switch for the DSVR to decrypt signaling information and to decrypt traffic when communications are with a subscriber who is not equipped with a DSVT.

LOOPBACK DIAGNOSTIC
Procedure used for transmission devices; a test message is sent to a device being tested, and then sent back to the originator and compared with the original transmission; loopback testing can be within a locally attached device or conducted remotely over a communications circuit.

LTU - LINE TERMINATION UNIT

M

MASTER CLOCK
The source of timing signals, or the signals themselves, which all network stations use for synchronization.

MASTER STATION
A station that controls slave stations.

MATRIX
In switch technology, that portion of the switch architecture where input leads and output leads meet, any pair of which can be connected to establish a through circuit.

MC - MONITORING CENTER
In the TPN this is the NMC. Commands can be issued from the NMC to the Packet Network, which are called MC commands.

MDTG - MULTIPLEXED DIGITAL TRANSMISSION GROUP Two or more DTGs combined into one Super Group.

MTA - MESSAGE TRANSFER AGENT
Used transferring electronic messages between the NMF and the SCC.

MTH - MESSAGE TRANSMISSION HEADER
Used in technical messages in the SCC. The role of the MTH is to quickly indicate to the receiver the type of processing that must be performed on the message.

MTU - MAXIMUM TRANSFER UNIT
The maximum frame size of the LAN (within the TPN).

MULTIPLEXED CHANNEL
A communication, channel capable of servicing a number of devices, or users at a time.

MULTIPLEXER
A device that performs multiplexing; any multipart device that allows two or more users to share a common physical transmission medium; employed in pairs, one at each end of the communication, channel, where each device performs multiplexing of the channel back into the separate user data streams.

MULTIPLEXING
The combining of multiple data channels onto a single transmission medium; any process through which a circuit normally dedicated to a single user can be shared by multiple users; typically, user data streams are interleaved on a bit or byte basis (time division) or separated by different carrier frequencies (frequency division)

N

NAS - NETWORK ACCESS SYSTEM
An algorithm used for transmission authentication.

NCMD - NINE CHANNEL MULTIPLEXER/DEMULTIPLEXER

NETWORK ARCHITECTURE
The structure of a communications network in which there is a series of layers of levels performing certain functions. Each layer is designed to serve the layers immediately above and below, and thus have interfaces with both. Devices carrying on a conversation communicate at every layer of the architecture by means of corresponding peer processes. The rules for these communications are determined by protocols.

NETWORK LAYER
The ISO name for the layer of the network architecture that determines the format and control of packets transferred between the DTE and DCE and between the DTEs at both ends of a connection. In the TPN, a backbone protocol called the End-to-End protocol is responsible for the transfer of data between the local and remote DOES. This protocol processes the packets

(X.25) or message data (AHIP) passed to it by the DTE/DCE interface at the calling end, transfers the data across the network, then passes it to the DTE/DCE interface in the proper format at the called end. Synonymous with packet level and level 3.

NMC - NODE MANAGEMENT CENTER

NMF - NODE MANAGEMENT FUNCTION
Software used to manipulate the technical and operational messages for a nodal manager.

NMF-OP - NMF OPERATOR ACCOUNT
Resides on the system disk.

NMT - NODE MANAGEMENT TERMINAL Used in ISYSCON

NODE
A point where one or more functional units interconnect transmission lines; a physical device that allows for the transmission of data within a network; an end point of a link or a junction common to two or more links in a network; typically includes hot processors, communications controllers, cluster controllers, and terminals.

NODE SWITCH
A switch with the primary function of connecting trunks in tandem. It can also serve subscribers located at a network node.

NONVOLATILE STORAGE
Any storage medium or circuitry, the contents of which are not lost when power is turned off or lost.

NSB - NATO SIGNALLING BUFFER
used in place of a TSB/RSB to interface with NATO Forces.

0

OFF-HOOK
In telephony, condition indicating the active state of a subscribers telephone circuit; a line state that signals a central office that user requires service; opposite of on-hook.

OFF-LINE
Condition in which a user, terminal, or other device is not connected to a computer, or is not actively transmitting through a network; operation of a functional unit without the continual control of a computer-, compare with on-line.

OKI - OKIDATA

OMNIDIRECTIONAL - OMNI (ALL) DIRECTIONAL
Enables an antenna to transmit and receive a signal in any and all directions. The vertical whip antenna is the most widely used omnidirectional antenna found in the military.

ON-HOOK
Deactivated condition of a subscribers telephone circuit, where the telephone or circuit is not in use; opposite of off-hook.

ON-LINE
Condition in which a user, terminal, or other device is actively connected with the facilities of a communications network or computer; pertaining to the operation of a functional unit that is under the continual control of a computer; opposite of off-line.

ON-LINE - CALL PROCESSING STATE
Ability to place and complete telephone calls.

OOS - OUT OF SERVICE

OPS - OPERATIONS

OPTIONAL USER FACILITY
An element of data communications service that provides an enhanced rather than basic capability. Data networks can categorize these facilities as essential (E) or additional (A) depending on specific criteria.

OVER THE AIR REKEYING

OTAR
The electronic transfer of a key using the KY-57 and Communications Modem, for the purpose of rekeying the net.

OVERHEAD
In communications, all information, such as control, routing, and error-checking characters that is in addition to user-transmitted data; includes information that carried network status or operational instructions, network routing information, as well as retransmission of user-data messages that are received in error.

PACKET
A unit of information transferred between DTEs and DCEs at the network layer of the network.

PACKET LEVEL
The CCITT term for network layer.

PACKET MODE OPERATION

The manner of operation by a host, terminal, or other equipment that utilizes packets to transfer user data.

PACKET MODE TERMINAL
A data terminal that can format and control packets and send and receive them.

PACKET SWITCH
A device that processes and transmits messages in packetized form. The MSE network utilizes the ANffYC20, an SF (Store and Forward) packet switch that temporarily stores incoming messages, breaks them down into packets, and forwards each packet over the fastest path to the destination. The ANffYC-20 is capable of rerouting packets over different paths during the same call. The network equipment that transmits user data in the form of packets across a network. Packet switches provide access ports for hosts and network trunks. The TPN packet switches comprise the PSN.

PACKET SWITCH NODE
Processor manufactured by BBN Communications Corporation and used by the TPN as packet-switching equipment. The model of PSN used by the TPN is the AN/TYC-20.

PACKET SWITCH NUMBER
Three-digit identification number assigned to packet switches for the purpose of routing selection. Each packet switch will be assigned a unique PSN address.

PAD - PACKET ASSEMBLER/DISASSEMBLER
Device that permits non-packet mode devices (usually terminals) to exchange data in the packet mode. (Not part of MSE)

PARITY CHECKS
A common technique for error detection in data transmission. Parity check bits are added to the data so that each group of bits adds up to an odd number for odd parity in the MSE system.

PER CALL KEY
A key that is generated on demand and distributed electrically to secure an individual time period of communication between or among users authorized that key. A per call key is a type of Traffic Encryption Key.

PERIPHERAL DEVICE
With respect to a particular processing unit, any equipment that provides the processor with outside communications.

PHYSICAL LAYER
The ISO name for the layer of the network architecture at which the physical connection between the DTE and DOE is activated, maintained, and deactivated. The DTE/DCE interface at this layer is defined by, the physical electrical, mechanical, and procedural characteristics of the connection.

PIXEL - PICTURE ELEMENT
Smallest unit of a graphics or video display, the light characteristics of which (color and intensity) can be coded into an electrical signal for transmission.

PLASMA DISPLAY
Type of flat visual display device in which selected electrodes, part of a grid of crisscross electrodes in a gasfilled panel, are energized, causing the gas to be ionized and light to be emitted.

POINT TO POINT
Describing a circuit that connects two points directly, where there are generally no intermediate processing nodes or computers, although there could be switching facilities; a type of connection, such as a phone line circuit, that links two, and only two, logical entities.

POLARIZATION
Characteristics of electromagnetic radiation (e.g., lightwave, radio, or microwave) where the electrified vector of the wave energy is perpendicular to the main direction, or vector, of the electromagnetic beam.

POPUP
Data field that is displayed when activated.

PREAFFILIATION
The operation that enters the identity of the subscribers likely to be connected to the network into the database of the switches.

PRECEDENCE
Controlled transmission of messages in the order of their designated importance or urgency. In the MSE system, Routine, Priority, Immediate, Flash, and Flash Override are used.

PREEMPTION
The process of interrupting a call being transmitted for a higher priority call.

PROFILES
Subscriber Profiles define the type of service and classmarks (e.g., maximum precedence, call restrictions, call forwarding) automatically assigned, when the subscriber affiliates in the MSE network.

PROPAGATION
The act of a transmitted signal taking more than one path to reach the receiver, increases chances of reception.

PROTOCOL
The rules or conventions by which two devices communicate at a specific layer of the network architecture.

PROTOCOLS
Sets of rules that prescribe the format and sequencing of messages that may be exchanged between a pair of computers. These include protocols for gateways to share routing information.

PSHTI - PACKET SWITCH HOST TRUNK INTERFACE
Circuit card located in the TDSG(M) to accommodate both low-speed (16k) host ports and high-speed (64k) trunk ports. 16k host ports are connected to SEN switch packet switch and dial-ups, and 64k ports are connected to NC and LEN switches. (See TDSG(M))

PSN - SAME AS TPN

PCM - PULSE CODE MODULATION
Modulation of a pulse train in accordance with a code.

PVC - PERMANENT VIRTUAL CIRCUIT
A permanent association that exists between two DTES, identical to the data transfer phase of a virtual call. No call setup procedure is required.

Q

QTBP
Queue of the tasks waiting to be processed by an SM or of the projects waiting for an execution report.

QUAD
Colloquial name for a cable consisting of two twisted pairs of conductors, each separately insulated.

QUEUE
Any line or list of items, such as computer job, or messages, waiting for service.

QUEUING
In telephony, a feature that allows calls to be delayed at the origination switch while waiting for a trunk to become available; sequencing of batch data sessions.

R

RAU - RADIO ACCESS UNIT

RAUMGT - RADIO ACCESS UNIT MANAGEMENT
The technical function of the SCC Network that generates and distributes the RAU/MSRT frequency plans to the RAUs of the system and directs the activation of these plans.

RDBMS - RELATIONAL DATABASE MANAGEMENT SYSTEM
Database software used in the SCC computer suite.

REAL
Database partition of an SCC under control of that SCC.

RECIPROCITY
Characteristic of an antenna that can be used for receiving or transmitting.

RECONFIGURATION
Changes made to a circuit switching network or to a switch (number of matrices, cards, modules, and other equipment).

REFLECTION
The bouncing of a radio wave off a surface; the amount depends upon the irregularities electrical conductivity, and angle the wave strikes the surface.

REFRACTION
The bending of a radio wave as it passes through different mediums, much as, different temperature, pressure, humidity, and density.

REM MAMA
Account used for remote subscribers to connect and perform limited Display Commands.

REM MAMA.HLP - REMOTE MAN MACHINE HELP FILE
May be viewed by the operator.

RFC-859

RMC - REMOTE MULTIPLEXER COMBINER
Device used to combine eight subscribers into a DTG and or eight remote subscriber trunks.

RMD - RACK MAP DIAGRAM
A graphical representation of nested components and their current state based on color.

ROUTING
The process of selecting the correct circuit path for a message.

RSB - ROUTING SIGNALLING BUFFER
Used for Flood Search routing. Second Channel on a Flood Search Link.

RSMI - REMOTE SOLDIER MACHINE INTERFACE

S

SCANNER
An instrument that automatically samples or interrogates the state of various processes, conditions, or physical states and initiates action in accordance with the information obtained.

SCSI - SMALL COMPUTER SYSTEM INTERFACE

SECURITY
The system's ability to deny the enemy the capability of deriving useful intelligence from communications transmissions.

SEP - SIGNAL ENTRANCE PANEL

SFD - SIGNAL FLOW DIAGRAM

SFSTATS - STORE AND FORWARD STATICS PACKAGE
Provides data on the store and forward behavior of the packet switch including:

a. Number of data, routing, and line protocol packets on each trunk.

b. Number of packets received on each trunk with bad checksums.

c. Line utilization in each direction on each trunk.

d. Average queuing delay for packets going out each trunk.

e. Link-level acknowledgment protocol traffic.

f. Breakdown of retransmission between packet switch for each trunk.

g. Breakdown of packets rejected due to insufficient resources by reason.

SDC - SIGNAL DATA CONVERTER
Performs signal conversion function between wire subscribers and the packet switch, using a line for line conversion. It converts four-wire data into a conditioned Diphase stream (incoming to the packet switch. It also converts conditioned Diphase back into four-wire data (outgoing from the packet switch to the X.25 wire subscriber). It also enables hosts to operate at distances up to 2.4 miles **(4** Km).

SINCGARS - SINGLE CHANNEL GROUND AIRBORNE RADIO SYSTEM
Used in LEN/SEN switches for Net Radio Interface.

SLP - SINGLE LINK PROCEDURE
When a DTE utilizes only using the link operation, the DTE has to use a single link procedure.

SOK - SWITCH OPERATORS KEYBOARD

SMD - SWITCH MULTIPLEXER DEMULTIPLEXER

SMI - SOLDIER MACHINE INTERFACE

SMTP - SIMPLE MAIL TRANSFER PROTOCOL
A protocol used to simply transfer electronic mail messages between senders and destination electronic mailboxes.

SMTP - SIMPLE MAIL TRANSFER PROTOCOL

SPILL FORWARD
Enter a single letter (Y = yes or **N =** no) to identify whether the TGC can operate in the spill forward mode or not. In the spill forward mode of operation, control of routing a call is transferred from the originating switch to an intermediate switch. The switch to which control is transferred then acts as the originating switch. The spill forward mode is always used when crossing area code boundaries if the switches connected by the trunk group crossing the boundary are either NCs and LENs or others (like AN/TTC-39s) that can operate in spill forward mode. Note that classmarking is done at the immediate switch for the TGC; i.e., classmarking affects inbound traffic only.

SPOOLER
Program which opens a temporary file, normally associated with print queues.

SPU
Switching Processor Unit, in MSE the term is replaceable with Central Processor Unit (CPU)

SRN - SINGLE ROW NEST
Card nest normally populated with Line Termination Unit circuit cards.

SUBCHANNEL
Particular channel out of a group, when more than one trunk group exists on a DTG.

SUBLIST
Extension information

SUG - SOFTWARE USERS GUIDE

SHF - SUPER HIGH FREQUENCY
Portion of the electromagnetic spectrum in the microwave region, with frequencies ranging from about 2 to 20 GHz.

SVC - SWITCHED VIRTUAL CONNECTION
Synonymous with virtual call.

SWOLOP - SUN WORKSTATION ON LINE OPERATIONAL PROGRAM

SYNCHRONOUS
Digital circuits having a constant time interval between successive bits, characters. The term implies that all equipment in the system is in step with a clock.

SYNCHRONOUS SYSTEM

A system in which the sending and receiving instruments are operating continuously at substantially the same frequency and are maintained, by means of correction if necessary, in a desired phase relationship.

SYNCHRONOUS TRANSMISSION
Data communication, where characters or bits are sent at a fixed rate, with the transmitting and receiving devices synchronized; eliminates the need for start and stop bits basic asynchronous transmission and significantly increases data throughput rates.

SYSTEM
A logical collection of computers, peripherals, software service routines, accounting and control procedures, terminal, and end users; a collection of men, machines, and method, organized to accomplish a set of specific functions; an assembly of components united by some form of regulated interaction to form an organized whole; generally, systems can include networks, but only to the limited degree that those networks connect users directly to system resources; see network.

SYSTEM-LOG
Directory for System Log messages, resides on t@ system disk.

T

TPN - TACTICAL PACKET NETWORK

The tactical packet-switching network serving the data communications requirements of the MSE community. This network is an inter-network of several secure and non-secure subnetworks connected by various types of communications links.

TPN - TACTICAL PACKET NETWORK
Refers to the total collection of tactical MSE computer networking resources.

TNS - TACTICAL NAME SERVER
Software in the NC/LEN switches (active only in the NC) that allows the naming of domains and users of the TPN.

TANDEM SWITCH
A switch used to provide a means of transferring traffic through a switch without terminating it. An NC Switch is an example of a Tandem Switch.

TCO - TELECOMMUNICATIONS COMMAND OFFICE
The organization within the Military Service commands and Government agencies that acts as the primary link between TPN subscribers and the DOS DSD.

TCP - TRANSMISSION CONTROL PROTOCOL
The transport layer protocol in the TPN protocol suite that provides for reliable data communications between host processors.

TDMF - TIME DIVISION MEMORY FUNCTION
Refers to the Group and Switch Mux DEMUX, Command and data Memory Modules.

TDMM
Used to perform pathway and half connects.

TDSG(M) - TIME DIVISION SWITCHING GROUP (MODIFIED)
A group of circuit cards located in the NC and LEN Switch Switching shelters to provide all of the physical aspects required to complete a call, including terminations, modems, MUX/DEMUX, matrix, and timing functions.

TDSG(M) - TIME DIVISION SWITCHING GROUP MODIFIED Comprised of two equipment racks.

TED -TRUNK ENCRYPTION DEVICE
Used to Bulk Encrypt and Decrypt Transmitted data.

TELETYPEWRITER
Generic term for a teleprinter terminal.

TELNET
Used to remotely connect to a computer to use the remote computers services.

TGC - TRUNK GROUP CLUSTER
Used to identify the traffic channels of a DTG to the CPU and it's software.

TGM - TRANSMISSION GROUP MULTIPLEXER

TGMD - TRANSMISSION GROUP MULTIPLEXER DEMULTIPLEXER

TGMOW - TRANSMISSION GROUP MODULE ORDERWIRE
Used to provided frame synchronization and buffering and orderwire processing.

TIME DIVISION MULTIPLEXING
Interleaving digital data from many users onto one or two serial communications links by dividing channel capacity into time slice. A systematic process of transmitting two or more channels of information over the same link by allocating a different time interval for the transmission of each channel.

TIME DIVISION SWITCHING
A switching arrangement whereby the various connections share a common path, but are separated in time.

TIMEOUT
Expiration of pre-defined time period, at which time specified action occurs; in communications, timeouts are employed to avoid unnecessary delays and improve traffic flow; used, for example, to specify maximum response times to polling and addressing, before a procedure is automatically restarted.

TNS - TACTICAL NAME SERVER
Used to associate an IP address to a host name so it is easier to find a subscriber.

TONE A - TONE GENERATION CARD

TONE B - TONE GENERATOR CARD

TRACKBALL
Device used to move cursor across display screen.

TRAFFIC LOAD CONTROL
Used to limit subscriber access to transmission or switch resources during times of network or switch congestion or network degradation (i.e. switches crashing). TLCs are implemented at the NCS and/or LEN. Implementation is on a switch by switch basis, and is also activated when directed by the SCC.

TLC is normally inactive, resulting in no restrictions for any subscriber. The subscribers profile dictates the effect that TLC will have over the use of his telephone. The switch will implement traffic load control automatically when preset thresholds are exceeded by the traffic load during a measured period of time. The switch operator can adjust this up or down according to how sick his switch is or how heavy the traffic is.

This parameter establishes the length of the time period. The time period of effect is variable between 1 and 15 minutes in 1 minute increments. The default time is 1 min. Traffic Load Controls will be automatically removed at the end of the time period during which the traffic level has fallen below and stayed below the preset threshold. The load controls apply to both trunk restrictions (level 2 and 3) and switch access restrictions (levels 4 and 5). There are five (5) Traffic Load Control levels.

TRAFFIC LOAD CONTROL THRESHOLD I
No restrictions. It is automatically implemented when the switch is brought on-line. The user experiences no change in service.

TRAFFIC LOAD CONTROL THRESHOLD 2 (2047 CALLS)
The switch will automatically implement trunk load control on level 2 subscribers (i.e. restrict trunk access) when the specified threshold is exceeded in the time limit assigned. This level is adjustable from 0-2047 calls. Any subscriber whose profile indicates TLC 2-5 will be denied access to trunks. Local calls are possible, and dial tone will be heard when the subscriber goes off-hook.

TRAFFIC LOAD CONTROL THRESHOLD 3 (2047 CALLS)
The switch will automatically implement trunk load control on level 3 subscribers (i.e. restrict trunk access) when the specified threshold is exceeded in the time period assigned. This level is adjustable from 0-2047 calls and may not exceed the threshold 2 value. Any subscriber whose

profile indicates TLC 1 or 2 will not be affected. All other subscribers will be denied access to trunks. Local calls are possible, and dial tone will be heard when the subscriber goes off-hook.

TRAFFIC LOAD CONTROL THRESHOLD 4 (2047 CALLS)
The switch will automatically implement switch access control on level 4 subscribers when the specified threshold is exceeded during the time period assigned. This level is adjustable from 0-2047 calls. Any subscriber whose profile indicates TLC 1-3 will not be affected. All other subscribers will be denied access to any switch resource. As far as the switch is concerned, that subscriber will be totally ignored. No dial tone to affected subscribers.

TRAFFIC LOAD CONTROL THRESHOLD 5 (2047 CALLS)
The switch will automatically implement switch access control on level 5 subscribers when the specified threshold is exceeded during the time period assigned. This level is adjustable from 0-2047 calls and may not exceed the threshold 4 value. Any subscriber whose profile indicates TLC 1-4 will not be affected. All other subscribers will be denied access to any switch resource. As far as the switch is concerned, that subscriber will be totally ignored. No dial tone to affected subscribers.

TRANSMISSION
The dispatching of a signal message, or other form of intelligence by wire, radio, telegraphy, telephony, facsimile, or other means; a series of characters, messages or blocks, including control information and user data; the signaling of data over communications channels.

TRANSPORTLAYER
The ISO name for the layer of the network architecture that accepts user data from the layer above these units are transmitted to the other end of the connection. As such, this is the true source-to-destination layer, sometimes referred to as the host-to-host or end-to-end layer.

TROPO - TROPOSCATTER
Radio system using the Troposphere.

TRUNK
A dedicated telephone circuit connecting two switching centers, central offices, or data concentration devices.

TRUNKEXCHANGE
A telephone exchange dedicated primarily to interconnecting trunks.

TRUNK GROUP
Multiple trunk circuits between the same two switching centers that can be accessed by dialing a single trunk number and use the same multiplexing equipment at both ends.

TSB - TRUNK SIGNALLING BUFFER

TSD - TRUNK SIGNALING DEVICE
Device by which the routing processor performs its flood search, duplication, etc. Each TSD terminates one RSS-D signaling channel in interswitch links.

TTY TRANSMISSION
Teletypewriter communications; generally, basic asynchronous ASCII coded data communications.

U

UDP - USER DATAGRAM PROTOCOL
Provides connectionless datagram delivery service using IP to transfer messages between machines. It adds the ability to distinguish among multiple destinations within a given host computer. It is also a protocol from the transport layer. UDP uses IP to send and receive datagrams.

Ul- USERINTERFACE

UHF - ULTRA HIGH FREQUENCY
Portion of the electromagnetic spectrum ranging from about 300 MHz to about 3 GHz.

UNIX.HLP - UNIX HELP FILE
May be viewed by the operator.

UNMODULATED
Signal without amplification conditioning.

URDB - USER REQUIREMENTS DATA BASE
The database maintained by the DCS DSD for data about TPN subscriber systems and their connecting hosts and terminals.

V

VARIABLE
A sequence of random binary digits used to set up or periodically change the existing electronic key settings in COMSEC equipment.

VHF - VERY HIGH FREQUENCY
Portion of the electromagnetic spectrum with frequencies between about 30 and 300 MHz.

VIRTUAL CALL
A temporary association between two DTEs in which call setup and call clearing procedures determine the period of time that the DTEs will have to exchange user data in packet mode operation.

VIRTUAL TGC
Software tables in the RSS processor containing directory numbers of subscribers in either affiliated, disaffiliated (absent subscriber), or preaffiliated state. Virtual TGCs 32-35 contain local affiliated loops (subscribers directly connected to the NC/LEN switch via J-Boxes, RMCS, and the RAU's DSVT & GLU). Virtual TGC 36 contains all disaffiliated subscribers (absent subscribers). Virtual TGCs 37-40 contain all preaffiliated subscribers. Virtual TGCs 17-31 contain subscribers duplicated from another switch (Groups accepted for bypass).

VME
System Bus with 32-Bit non-multiplexed address and data paths.

VMIEA - ETHERNET CONTROLLER (LAN CONTROLLER) CCA
Provides control signals for LAN connection, and two asynchronous lines which communicate data between the remote switching processing unit and the load disk drive that stores its data.

VMIS - SCSI CONTROLLER CCA
Provides the control signals for the asynchronous RS-232C and SCSI ports.

VMLI - VME LOOP **(DTA) INTERFACE CCA**
Transmits messages over a 16kb/s circuit through the network, using high-level data link control (HDLC); an acknowledge requested protocol with forward error detection. Provides full dial-up capability to place calls to the various addressees; interface data unit terminals (IUDTS) for operational messages; group logic units (GLUS) for frequency plan updates and data terminal adapters (DTAS) for operational and technical messages.

VMSY - FAULT MONITOR CONTROLLER CCA
Provides power supply control, sensor information management, BIT management, and front panel management.

VMTV2B - CENTRAL PROCESSING UNIT CCA
Drives two RS-232C asynchronous lines for built-in-test (BIT) of keyboard and trackball inputs.

VOLATILE STORAGE
Any storage device whose contents are lost when power is removed.

W

WORKSTATION

Input/output equipment at which an operator works; a station at which a user can send data to or receive data from a computer for the purpose of performing a job.

X

X-REF
Window in the lower left corner of the screen.

Z

ZEROIZE
To permanently remove or eliminate the key from crypto-equipment or a fill device.

ZONE RESTRICTION
This feature provides the capability to restrict any terminal, on a terminal by terminal basis, from completing calls to certain designated destinations. The terminal may be a loop or a Trunk Group Cluster. The feature is implemented through the use of eight tables, with each table designated as either "permissive" or "restrictive". A "permissive" table is one in which the terminal is allowed to call only the codes listed. A "restrictive" table restricts a terminal from calling the codes that are listed. (The terminal may call any other code.) MSE supports 8 zone restriction lists. A subscriber is assigned to 1 of the 8 or no (0) zone restrictions based upon the profile number of his phone.

Two of the eight tables may have up to 101 entries, (i.e. zone restriction list 1) and the remaining six can contain up to 33 entries. Each entry consists of a three-, four-, or six-digit code in accordance with the following:

Three-digit: NYX (Area Codes)
Four-digit: LNXX
Six-digit: NYXWXX or 999999 (Gateway or Commercial Network Access)

Modification to the list is made at the SCC and all switch databases are modified via a technical message.

ZONE 1 - FOR **EXAMPLE**
Normally contains a permissive range that allows subscribers to call anywhere. Changes to the list will be made when restrictions are required. These restrictions would be used when it becomes necessary to prevent routine subscribers from calling outside the Corps or access to satellite links. A subscriber's zone can be temporarily changed by the NC or LEN operator. Because of the deducible numbering plan, the utility of zone restriction lower than GATEWAY ACCESS is extremely limited. When using a 3/4 numbering plan this feature can restrict or permit to a single switch by using the NYX code in a table. If a TGC is to be classmarked for zone restriction, it is done on the ATG screen. The zones are defined on the Assign Zone Restriction (AZR) screen.