HEADQUARTERS
DEPARTMENT OF THE ARMY

FM 24-27

Tactical Automatic Circuit Switching AN/TTC-39

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Field Manual
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HEADQUARTERS
DEPARTMENT OF THE ARMY
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Tactical Automatic Circuit Switching AN/TTC-39

Contents

Preface

Purpose and Scope

This manual is one of several covering the planning for and the use of Tri-Service Tactical Communications (TRI-TAC) equipment. TRI-TAC equipment refers to tactical communications systems equipment designed for use by one or more of the military services. The Army joins the other military services in planning for, fielding, and using these equipments in their tactical communications systems. This manual is the basic reference document for the use of the Automatic Telephone Central Office AN/TTC-39( )(V), known as a circuit switch, and for the AN/TITC-39A known as the nodal control circuit switch. References in this manual to the AN/TTC-39 generally apply to both unless otherwise noted. The manual does not replace technical manuals or systems engineering manuals for the AN/TTC-39. The purpose of the manual is to translate doctrine and detailed technical data into practical guidance for planning and operating the circuit switch,

The manual includes a full description of the AN/TTC-39. Pending doctrine development for mobile subscriber equipment, this manual describes the use of the AN/TTC-39 at both corps and theater levels. It also provides instructions for its doctrinal use. The word doctrine means that the Army has made decisions regarding the use of the switch in both general and specific situations. This doctrine provides a foundation of guidance to the users of the switch and will evolve as the Army's tactical communications situations change. The intended users of the manual are operators, supervisors, planners, engineers, and to some extent, maintainers. Operators and supervisors (switch and node) will use the manual for basic instruction and as a guide on how to operate the switch. Planners and engineers will use it for system and network planning and as a reference to the equipment's capabilities. Maintainers can use it as an adjunct to the technical manual and as a quick reference when needed.

The manual also deals with the transition from the analog to the digital worlds of equipment. The Army's integrated tactical communications system is the road map to the all digital systems that it plans to field in the 1990s. Under current plans, a steady stream of digital equipment will arrive in the field. This began with the Message Switch AN/TYC-39, and the Circuit Switch AN/TTC-39. It will continue with a range of digital transmission and multiplex equipment. There will also be automated control and management facilities, encryption equipment, and interface devices, The goal is a secure, automatic, digital, state-of-the-art communications system that can meet the operational objectives of the Army. The AN/TTC-39 is a key building block in achieving this goal, and the guidance provided by this manual is an important aid to Army communicators in coping with this transition.

User Information

The provisions of this publication are the subject of the following International Standardization Agreements (STANAG): STANAG 4214 (International Routing and Directory for Tactical Communications Systems); STANAG 5040 (NATO Automated and Semi-Automated Interface Between the National Switched Telecommunications Systems of the Combat Zone and between these Systems and the NATO Integrated Communications Systems (NICS): Period from 1975 to 1990's); and STANAG 5046 (NATO Military Communications Directory System).

You are encouraged to submit comments and recommended changes to improve this manual. Submit your comments on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and key them to pages and lines of text to which they apply. If DA Form 2028 is not available, a letter is acceptable. Provide reasons for your comments to ensure complete understanding and proper evaluation. Forward your comments to the Commander, United States Army Signal Center and Fort Gordon, ATTN: ATZH-DTL, Fort Gordon, Georgia 30905-5070.

CHAPTER 1
AN/TTC-39 Circuit Switch

1-1. Mission and Functions

The use of telephone switching equipment for Army tactical needs is constantly changing. The manual switchboards that once carried all telephone calls are giving way to automatic ones. The first automatic switchboards were large and cumbersome. The newer ones are far smaller and can be used at many levels of command. The first of these automatic switches were analog, yet because the Army is committed to digital communications, all future switches must have digital capability. However, they still must be able to work for some time with the existing analog equipment. The advantages of digital equipment include smaller size, faster operation, and greater efficiency. Digital systems are easier to reconfigure in time of emergency. They are also less vulnerable to noise than analog systems and are not degraded as much over long distances. Finally, they are simpler to multiplex and to encrypt.

The AN/TTC-39 circuit switch has brought digital electronics to tactical communications. It is a hybrid switch that combines analog and digital capabilities and is thus a bridge between the two. It is also modular. As more and more switching equipments and terminals become digital, the AN/TTC-39 can move toward an all digital function by changing its modules to increase its digital capacity. However, the switch introduces immediate benefits for the hybrid world, Combined with the AN/TYC-39 message switch, it reduces the need for and may eventually eliminate separate voice and data networks. It also combines the secure and nonsecure voice networks.

The Army's goal is to have a completely digital communications system. Such a system will have all its diverse elements, such as message systems, telephone systems, and mobile units, fully integrated. This means that each element can communicate with its related elements in the fastest, most secure, and most efficient way possible. The AN/TTC-39 circuit switch is one of the keys to reaching that goal. It is, as a result, the pivotal element around which most of the Army's communications system revolves. Chapter 2 describes a number of configurations for the AN/TTC-39. The Army intends to field both single and dual shelter versions of the AN/TTC-39 family of switches. However, the dual shelter, nominal 600-line version of the AN/TTC-39 is described since these may be used by other services at higher level headquarters and in joint usage.

The greatest use of the AN/TTC-39 is in the area switching systems in the theater and in the current corps. In both echelons, the circuit switches anchor a cohesive circuit switching network. Each switch is the center of a node that serves a group of subscribers (or users) and that provides tandem switching (switch-to-switch routing). Figure 1-1 shows an example of a theater circuit switching network. There can be up to twenty-four 300-line AN/TTC-39s in the theater area and up to twelve in each corps area. However, these maximums are guidelines and the actual number would depend on the need at the time. The AN/TTC-39s that serve the theater and the corps headquarters connect to this network. There can be three 600-line switches for the three theater headquarters and two 300-line switches for the two corps headquarters. Each of these headquarters has a displacement switch so that a maximum of AN/TTC-39s can be thirty in the theater area and sixteen in each corps area.

Figure 1-1 illustrates what is called the objective system. This is the term for the all-digital system of the future when enough digital equipment is in use to convert the entire communications system. This also involves changes to the communications concept of operations. By tradition and by need, tactical communications has involved two parallel systems. One was the common-user system, the other the command system. The latter ensured quick, efficient communications to the commanders and meant that the system had to be dedicated and discrete. The increased reliability and capabilities of the digital system make this dual arrangement obsolete and now there is a need for only one system. The AN/TTC-39 is able to handle all traffic without any unacceptable delays of the type that could occur in the older, dual system. The switching network of Figure 1-1 does not show the large number of other smaller circuit switches that are a part of it. These switches act as extension switches for local service. They may be digital or analog. The unit-level circuit switches AN/TTC-42 and SB-3865 are examples. The figure also does not show the network's message switches (the AN/TYC-39). These generally reside at the AN/TTC-39 circuit switching nodes. The smaller switches, digital transmission and multiplex equipment, and other new equipment will be fielded over a long period of time. Because of this, the objective system will not be complete for several years.

For further information about corps and theater communications organizations and missions, see FM 11-50 and FM 11-92. Chapter 5 expands on this description of the AN/TTC-39's mission and functions. It also shows how to develop a system.

1-2. Communications-Electronics Management System

The introduction of automatic switches like the AN/TTC-39 has caused major changes in the Army's Communications-Electronics (CE) management policies and procedures. No longer can a commander operate his own communications in his own way. He must now concern himself with systems integration across all levels of the battlefield command. Requirements for higher capacity and for greater speed, security, dependability, and mobility have grown. This has led to an increased interdependence among all units. Good CE system management now requires centralized management joined with decentralized action. This means that the Army must change a number of its procedures. To this end, it has setup a standardized Communications-Electronics Management System (CEMS) as described in FM 24-22.

The CEMS exercises dynamic technical control over tactical CE systems and coordinates interfaces with other systems. Among its functions, it allocates resources, determines equipment status, sets levels of security access and subscriber precedence,

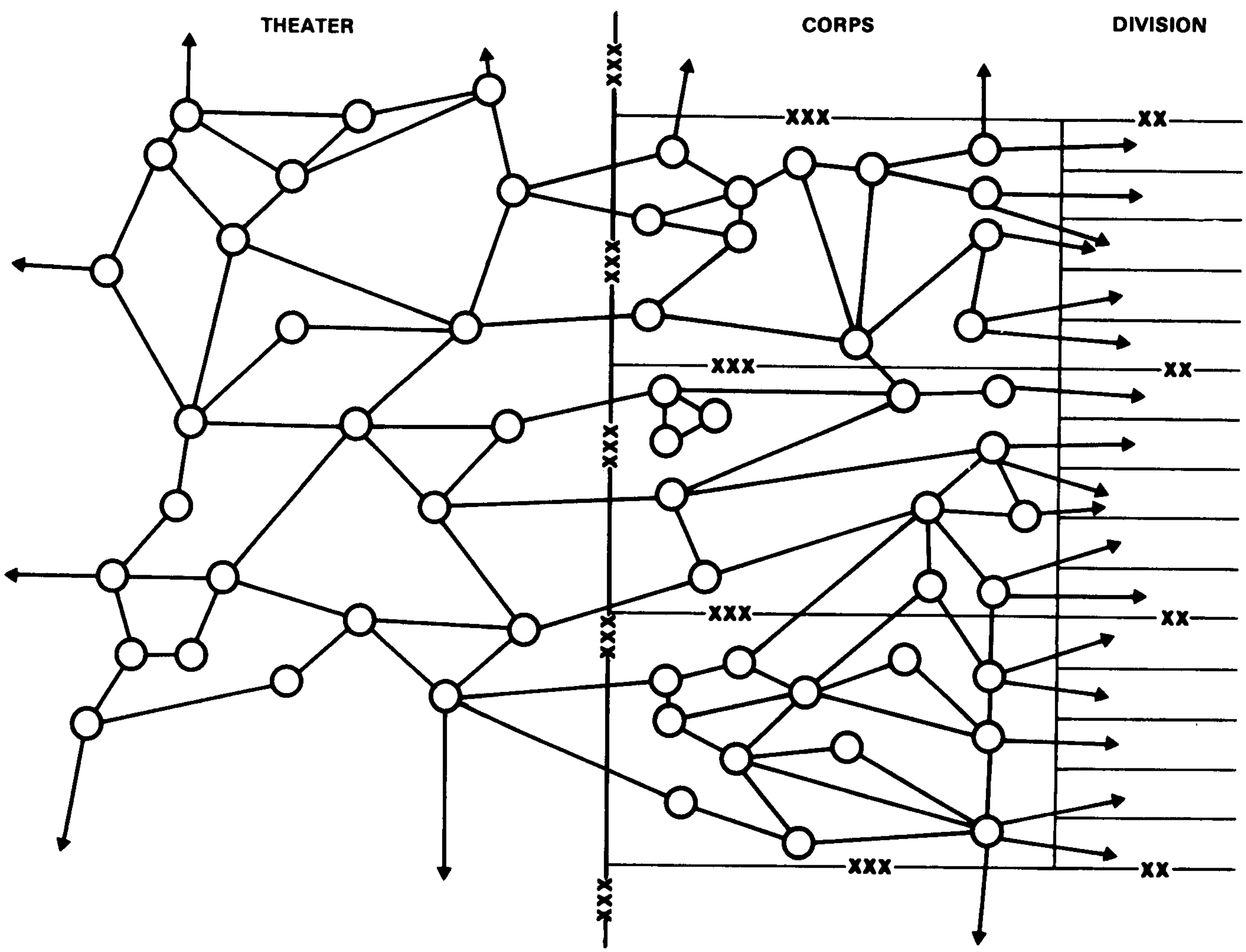


Figure 1-1. AN/TTC-39 networks in the theater.

and provides for equipment interfaces. It also handles all primary technical control functions that must be performed on a real-time or near real-time basis. These include monitoring, testing, failure prediction, restoring, and reporting. The CEMS functions with a complex mix of secure and nonsecure analog and digital CE equipments. The system will use automatic means to help analyze performance and to disseminate planning, engineering, and control information. The CEMS consists of four functional levels:

Communications systems planning element (CSPE).

This system element includes overall system planning, engineering, and management functions at the highest level. The theater signal brigade and the theater communications command (Army) (TCC(A)) have the responsibility for long-range planning, resources, and overall communications system management functions. At the corps level, the corps commander's CE staff coordinates with the corps signal brigade staff to do the CSPE work.

Communications system control element (CSCE).

This system element includes the systems control function for the network. It operates and controls the system on a real-time basis. Like the CSPE, the CSCE's functions are split among several organizational units at each of the echelons involved (for example, theater or corps). At the theater level, the CE staffs of the TCC(A) headquarters, of the theater signal brigade, and of the subordinate signal battalions carry out the CSCE functions. At the corps level, the staffs of the corps signal brigade and of the signal battalions perform them. The CSCE prepares and executes detailed orders that implement CSPE plans to deploy CE assets. It then takes overall technical control of the deployed resources and network operations. This includes all trunk and circuit routing and alternate routing for the entire network, generation of all subscriber information tables required by the nodal switches, and relocation of nodes.

Communications nodal control element (CNCE).

This system element includes the management and control functions of the local node. These functions take place at all of the major area nodes in the network. This includes switching, trunking, and subscriber activities at and around the node. It also includes certain testing functions on interconnecting trunks and recovery actions in response to failures, threat, or damage. The nodal control functions under the direction of the CSCE and it keeps the CSCE closely advised of the operational status of the subnet.

Communications equipment support element (CESE).

This system element includes the system status or performance measuring and reporting functions. Information from this function enables the control elements to run the network. It acts as the nerve endings of the control system providing feedback information. This function is, for the most part, currently done manually by personnel operating the various components of the system.

1-3. Information Flow

The previous description of the CEMS functions illustrates the changes in the information flow needed for automated networks. The use of the traditional chain-of-command hierarchy is no longer adequate for real-time control. Figure 1-2 summarizes the flow of information among the CEMS elements, Note that technical directives (or orders) may flow from the brigade CSPE/CSCE to both the battalion CSCE and to the node simultaneously. Status information flows to all levels but varies by type. To the brigade from the battalion the information is detailed but is sent by exception only. To the battalion and the brigade from the node the information is real time but is of the red/green (on/off) type. However, the battalion CSCE gets a constant flow of detailed status information.

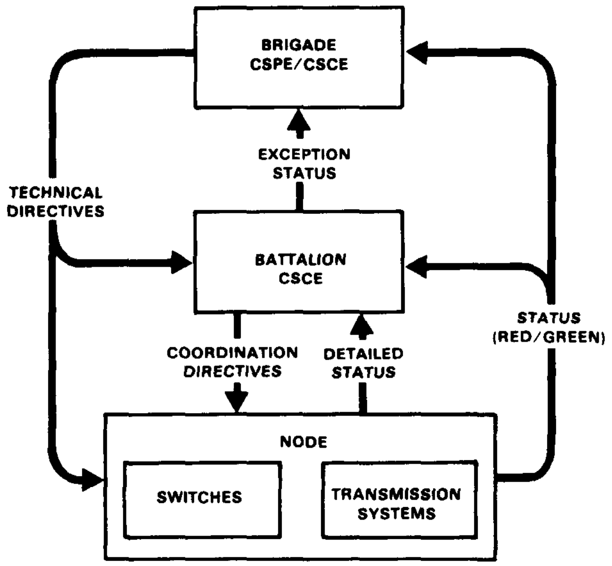


Figure 1-2. CEMS information flow.

CHAPTER 2
Equipment Description

2-1. AN/TTC-39( )(V)

The Automatic Telephone Central Office AN/TTC-39( )(V) is a mobile, automatic, modular, electronic circuit switch. It operates under processor control with integral COMSEC and multiplex equipment. The AN/TTC-39 switches secure and nonsecure voice and data traffic. It is compatible with the Defense Communications System AUTOVON and with the tactical communications systems of the armed services. It can also operate with the NATO Integrated Communications System and with Allied organic combat communications systems. The circuit switch can transit from the present analog system to the mostly secure digital system of the future by replacing analog matrices with digital ones and with associated multiplex equipment for digital transmission groups (DTG). The switch will soon be modified to become the Automatic Nodal Control Circuit Switch AN/TTC-39A( )(V).

2-2. Overview

The AN/TTC-39 is in two sizes of configurations, single shelter and dual shelter. The descriptions following are for both of these. The part numbers and reference designations used are from TM 11-5805-681-12. Figures 2-1 and 2-2 show the AN/TTC-39 and the equipments used with it for both the single shelter (300-line) and dual shelter (600-line) installations. These figures show the switch in the transportation mode, Table 2-1 lists the items making up the equipments shown in Figures 2-1 and 2-2. Table 2-2 lists the items supplied or used with the switch. This table gives the common name and the official nomenclature of each item.

Configuration.

Table 2-3 identifies the current switch configurations that have received official nomenclatures. The AN/TTC-39(V)2 (dual shelter switch) and the AN/TTC-39(V)3 (single shelter switch) are the two basic configurations you will most often see in the field. The AN/TTC-39(V)4 and the AN/TTC-39(V)5 are 400-Hz powered versions of the two basic configurations. The switch is modular in both software and hardware. Various versions of the basic configurations can be obtained by changing the mix of analog and digital matrices in the switch. Table 2-4 shows some possible configurations and their terminal capacities. Note that the specific terminations vary from the nominal sizes.

Description

Figure 2-3 shows the roadside and curbside elevations for the single shelter switch. Figure 2-4 shows this for the dual shelter switch. Labels and keys identify the equipments. These key letters will appear in later tables and figures. Figure 2-5 is a functional block diagram, which the following text describes. Follow the diagram for each part of the description.

Power group. A prime AC power source provides power to the shelter. This can come from engine generators or from commercial power. A backup power subsystem (batteries) provides 15 minutes worth of power to critical AC and DC operating equipment.

Central processor group (CPG). This group of equipments processes, routes, and controls the calls in the circuit switch. Redundant central processor units (CPU) increase reliability and prevent downtime. Interface devices provide operator and maintainer access to the CPG. Each switch has two magnetic tape transports (MTT). A magnetic tape controller (MTC) located in an interface control unit controls the MTTs.

Common equipment group (CEG). This group handles the control, switching supervision, and signaling of analog and digital lines and trunks. A common equipment distribution frame (CEDF) interconnects conference bridge units (CBU), senders, receivers, scanners, and control and timing equipments.

COMSEC common equipment facility (CEF). The CEF incorporates the racks that contain all the trunk and line encryption equipment of the switch. This includes automatic key distribution centers, key generators, trunk encryption devices, loop key generators (LKG), and the necessary interface units.

Space division switching group (SDSG). The SDSG includes a space division matrix (SDMX), analog scanners, line termination units (LTU), and type II modems. Each group provides circuit switching functions for up to 120 terminations of analog voice and data lines and trunks.

Time division switching group (TDSG). This group includes a time division matrix (TDMX); various loop, group, and supergroup multiplex/demultiplex (MUX/DEMUX) and modems; scanners and signaling buffers; and associated equipment. It provides digital circuit switching functions and interface connections to digital voice and data lines and trunks and to selected analog subscribers. It also provides external terminations for digital loops, 4-wire analog AC supervised loops, and transmission groups, Each TDSG can terminate a maximum of 150 circuits.

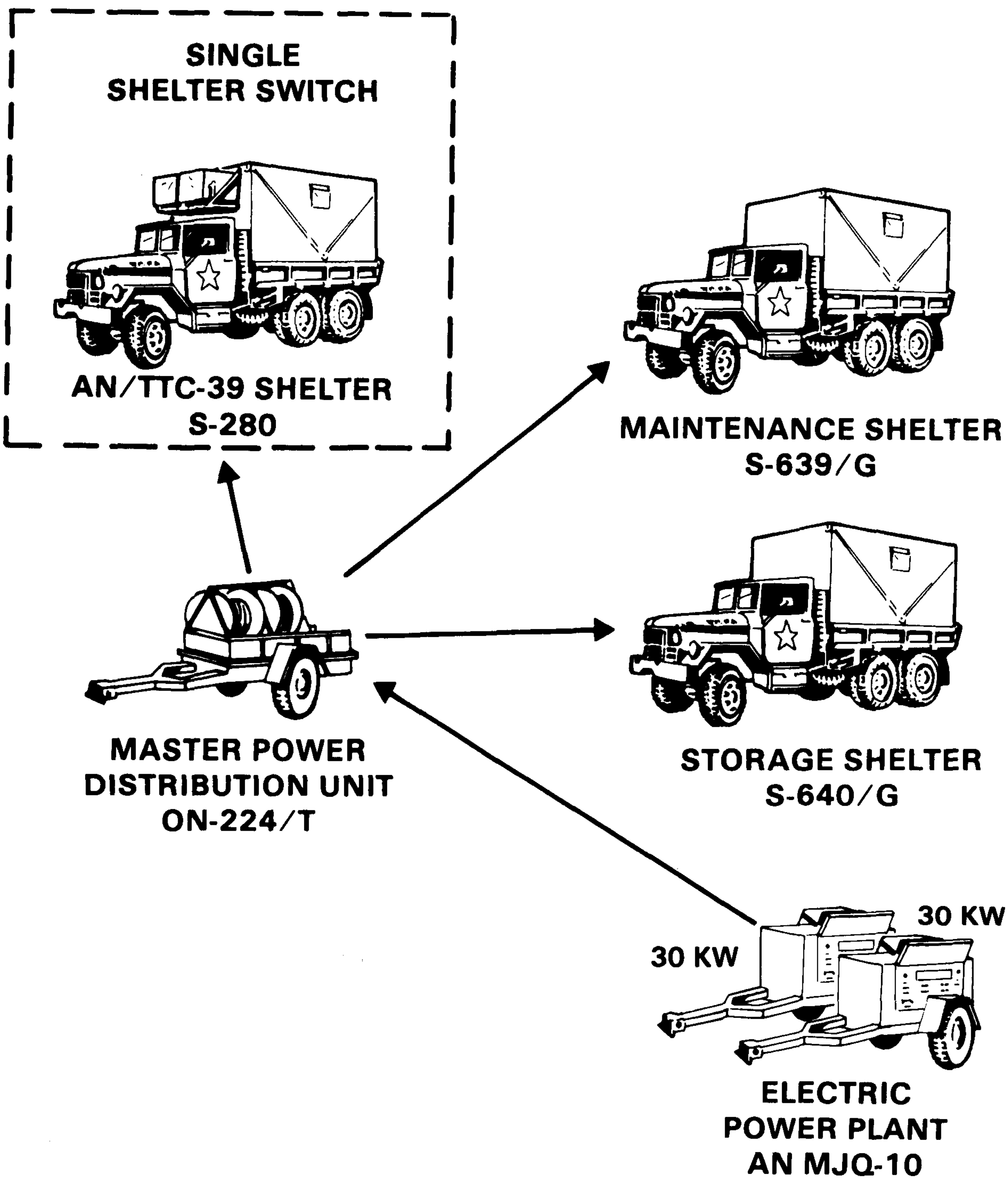


Figure 2-1. AN/TTC-39 circuit switch 300-line configuration.

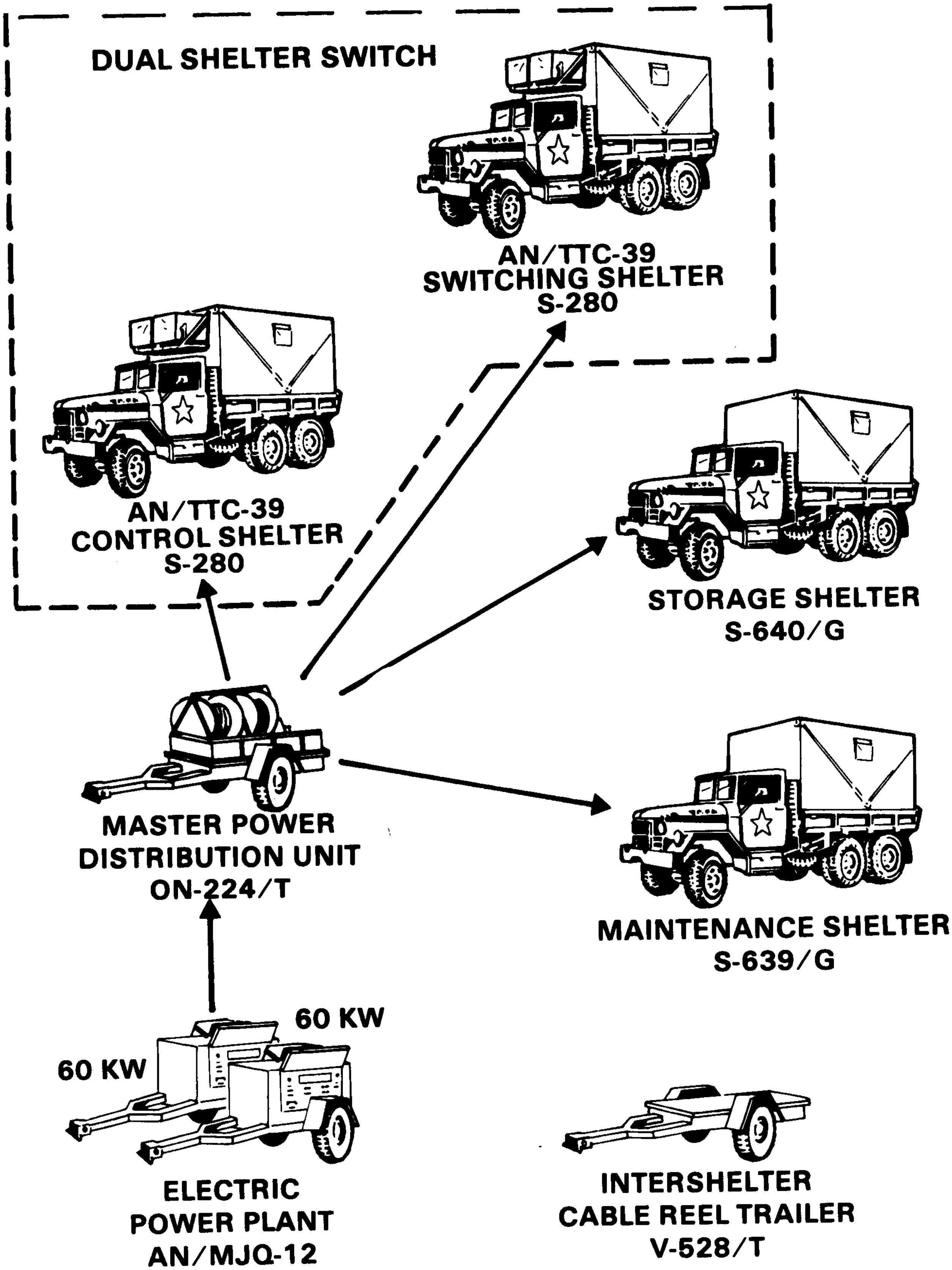


Figure 2-2. AN/TTC-39 circuit switch 600-line configuration.

Special circuits group (SPCG). The SPCG includes an auxiliary patch panel, various adapters (SF, E&M, DC closure), timing distribution, line driver interface, and a circuit switch summary alarm.

Operator machine interface group. This group enables operator personnel to interact with the switching equipment and to communicate with other shelters, switches, control activities, and subscribers.

- Call service position (CSP). The CSP assists subscribers who are having difficulties or are not equipped to make certain calls,
- Control and alarm panel/control transfer logic (CAP/CTL). The panel displays circuit summary system status configuration and the status of the redundant processors. The CTL portion lets a user select the processor, controller, and peripheral configuration by hand.

Table 2-1. Equipment shipped with AN/TTC-39.

NO	ITEM	LINES 300	LINES 600	TYPE	NOMENCLATURE	NSN
1	Truck, Cargo, 5-Ton, Carrying	X	X	M923		2320-01-050-20848
	Central Office, Telephone, Automatic					
	Single Shelter Assemblage	X			*	
	Switching Shelter Assemblage		X		*	
2	Truck, Cargo, 5-Ton, Carrying		X	M923		2320-01-050-20848
	Central Office, Telephone, Automatic				*	
	Control Shelter Assemblage		X			
3	Truck, Cargo, 2 1/2-Ton, Carrying	X	X	M35A2		2320-00-077-1616
	Shelter, Electronic Equipment (Maintenance)	X	X		S-639/G	5411-01-127-6853
	Truck, Cargo, 2 1/2-Ton, Carrying	X	X	M35A2		2320-00-050-20848
	Shelter, Electronic Equipment (Storage)	X	X		S-640/G	5411-01-127-6854
5	Power Plant, Electric	X			AN/MJQ-10	6115-00-056-7906
	Generator Set, Diesel Engine	X			PU-406/M	
	Trailer Mounted 30 KW (2 each)				(2 each)	
	Power Plant, Electric		X		AN/MJQ-12	6115-00-257-1602
	Generator Set, Diesel Engine		X		PU-150B/U	
	Trailer Mounted 60 KW (2 each)				(2 each)	
7	Power Distribution, Interconnecting Group, Trailer Mounted; MPDU	X	X		ON-224/T	6150-10-698-0698
	Trailer, Utility 1 1/2-Ton	X	X	M105A2		
	Switchboard, Power	X	X		SB-4093/T	
	Reeling Machine, Cable, Motor Driven	X	X		RL-291(V)1/T	
	Reeling Machine, Cable, Motor Driven	X	X		RL-291(V)2/T	
	Cable Assembly, Power (50 feet) (4 each)	X	X			
	DC Cable Reel Control Assembly	X	X			
8	Trailer, Cable Reel		X		V-528/T	
	Trailer, Utility 1 1/2-Ton		X	M105A2		
	Reel Units (12 each) (For Intershelter Signal Cables)					

*Part of AN/TTC-39(V).

- Video display unit/keyboard (VDU/KB). This unit is the main interface between the operator and the CPG. It consists of a video display monitor, a keyboard, and a video display controller.
- Digital subscriber voice terminal (DSVT). The DSVT provides the switch operator with a secure means of communications to other switches or to subscriber terminals. It also provides secure telephone communications between shelters.
- Intercommunication Station LS-147/FI. This intercom system provides local communication between the circuit switch shelters and any colocated message switch shelter.
- Teletypewriter (TTY) communications terminal. ATTY (AN/UGC-74A) resides in each shelter. It consists of a keyboard for data entry and a page printer for hard copy. Both the operator and the maintainer may use it.

Table 2-2. AN/TTC-39 supplied item identification.

	NOMENCLATURE		SHELTERS *	
COMMON NAME	NAME	TYPE	SINGLE	DUAL
RCSP	Control, Remote Switchboard	C-10333/TTC-39(V)	A	B
NIU	Converter, Telephone Signal	CV-3478/TTC-39(V)	C	C
Junction Box	Junction Box	J-1077A	D	E
MPDU	Power Distribution, Interconnection Group, Trailer Mounted	ON-224/T	X	X
TTY	Teletypewriter Communications Terminal	UGC-74/A	X	X
DSVT	Telephone, DSVT	TSEC/KY-68	X	X
Telephone	Telephone Set	TA-838/TT	X	X
Engine Generator	Power Plant, Electric	AN/MJQ-10	X	
Engine Generator	Power Plant, Electric	AN/MJQ-12		X
Maintenance Shelter	Shelter, Electronic Equipment	S-639/G	X	X
Storage Shelter	Shelter, Electronic Equipment	S-640/G	X	X
Intershelter Cable Reel	Trailer, Cable Reel	V-528/T		X

SHELTER LEGEND:

A. One unit with the single shelter.
B. Up to three units can be handled in the dual shelter, but only one is supplied.
C. One or more with each switch. Used for up to eight circuits each. Each NATO trunk (line type 9) requires an SF adapter and the maximum number of such trunks is 24 for a single shelter and 36 in a dual shelter.
D. Twenty-five for single shelter.
E. Fifty for dual shelter.
X. Used with shelter configuration checked.

Transportability.

The AN/TTC-39 maybe shipped by fixed-wing cargo aircraft, military helicopters, M series military cargo vehicles, rail, sealift, and remountable transporters. It meets the following storage and transfer environmental conditions:

- Temperature: -70°F to +160°F, (magnetic tape cassettes: -40°F to +140°F).
- Relative humidity: 100 percent up to +80°F, dew point 86 percent at +l00°F; 5 percent at +120°F.
- Altitude: Sea level to 12,192 meters (40,000 feet).
- Sand and dust: Wind speeds up to 35 knots (40 miles per hour).
- Snow: 18.26 kilograms per square centimeter (40 pounds per square inch) loading,
- Fording: No leakage when immersed up to 53.34 centimeters (21 inches).
- Salt fog: Capable of prolonged exposure.
- Fungus: Resistant.
- Vibration: Roads, cross-country terrain, water, and fixed- and rotary-wing aircraft.
- Shock: Transport by rail, water, and air.
- Orientation: In any position for a period of 2 years.

Table 2-3. AN/TTC-39 shelter identification.

ITEM	ANALOG/DIGITAL MATRICES	AN/TCC-39			PART NUMBER	TERMINATIONS	
		(V)1	(V)2,4*	(V)3,5*		ANALOG	DIGITAL
Single Shelter	2/1			1	SME-810957	240	150
Switch Shelter	3/2		1		SME-810301	360	300
Switch Shelter	4/1	1			SME-810300	480	150
Control Shelter		1	1		SME-810368		

*AN/TTC-39(V) 4 and 5 are designed for 400-Hz power.

Table 2-4. AN/TTC-39 possible configurations.

Single Shelter (300-LINE)						(V)3,5*	X	X
Dual Shelter (600-LINE)	(V)	(V)2,4*	X	X	X			
Analog/Digital Matrices	4/1	3/2	2/3	1/4	0/4	2/1	1/2	0/3
Analog Terminations	480	360	240	120	0	240	120	0
Digital Terminations	150	300	450	600	600	150	300	450
Total Terminations	630	660	690	720	600	390	420	450

* The (V)4 and (V)5 configurations are designed for 400-Hz power.
X Denotes single or dual shelter configuration.

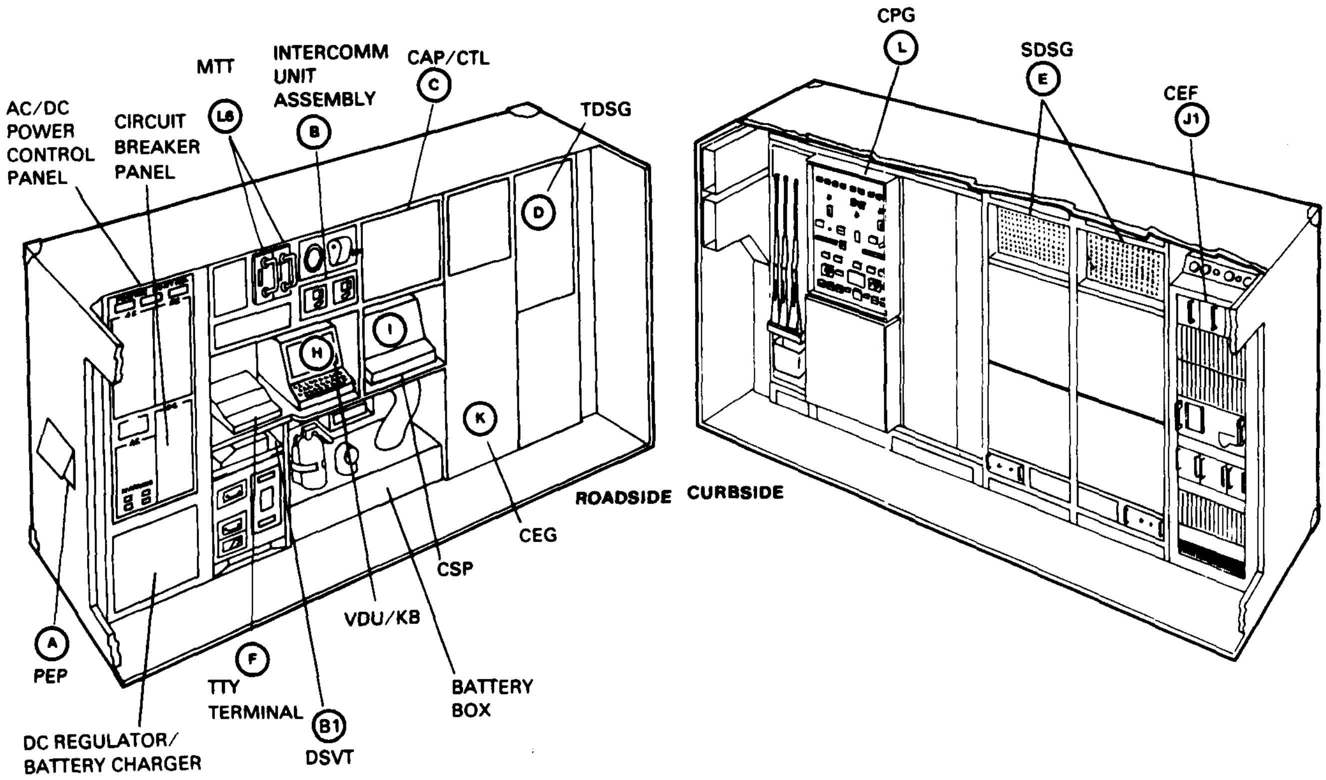


Figure 2-3. AN/TTC-39 300-line single shelter switch layout.

Power and environmental control system. (See Figure 2-2.)

Prime power comes from an electric power plant (AN/MJQ-10 for single shelter or AN/MJQ-12 for dual shelter installation). External power to each shelter connects to a power entry panel (PEP) on the exterior wall. A master power distribution unit feeds prime input power to one of two waterproof receptacles on the PEP. The master power distribution unit (ON-224T) accepts a source of 50\60-Hz power from a commercial power line or a military electric power plant (AN/MJQ-10 or AN\MJQ-12). The power distribution unit monitors, controls, and distributes power from up to four sources to up to four shelters. The unit also contains circuits to monitor phase relationships of the applied AC power. The environmental control units (ECU) mounted on each shelter provide either warm or cool air. Shelters operating at 400-Hz ((V)4) require a different ECU than that for 50/60-Hz ((V)1,2,3). Shelters using 400-Hz power use an additional DC/AC converter,

2-3. Hardware

Table 2-5 lists the AN/TTC-39 hardware items by group, by function, and by nomenclature. Figures 2-6, 2-7, and 2-8 show the locations of the equipments listed in Table 2-5. The equipments are described in the subparagraphs below. Key designations (in parentheses below) are from Table 2-5 and Figures 2-6, 2-7, and 2-8. Note that not all the keys in the table are shown in the diagrams.

Analog switching.

Analog subscribers connect to the SDMX (E3) through the signal entry panel (SEP) (E2), the SDSG patch panel (El), and the LTU (E4). Subscribers using SF, DC, or E&M signaling also go through the auxiliary special circuits patch panel (Ml) or the patch and control panel (K2). The patch panels enable special adapters to be inserted in series. These adapters are in line with the LTUs on the first cable of each analog rack. If the terminations are used without the adapters, the adapters must be patched out.

Line termination units. LTUs convert signals to a standard used by the SDMX (E3). The special adapters make signals compatible with these normal wideband LTUs.

Space division matrix. Analog subscribers from the SDMX connect to digital subscribers via intermatrix units that are part of the SDSG.

Conference bridge unit. A subscriber can set up a five-party analog or digital conference with a CBU (K5). Use more than one bridge to set up larger conferences. A conference can be either nonsecure or secure if the appropriate security devices are used. A conference can also be progressive (caller initiated) or preprogrammed.

Receiver matrix unit (RMU). The RMU (K4) provides a switched analog path for up to 60 analog subscribers terminated on the TDMX (digital side of the switch) to five dual tone multifrequency (DTMF) receivers (K6). The switch can thus receive address signals from these subscribers. Three digital racks are needed to reach this maximum of 60. These analog subscribers are grouped 24 to the first digital rack, 24 to the second, and 12 to the third.

Matrix controller (MXC). The MXC (K13) in the switching controller group (SCG) controls the RMU.

Special circuits group. The special circuits group in the 300-line switch (M) can accommodate twenty-four 4-wire adapters or sixteen 6-wire adapters. The 600-line switch can accommodate

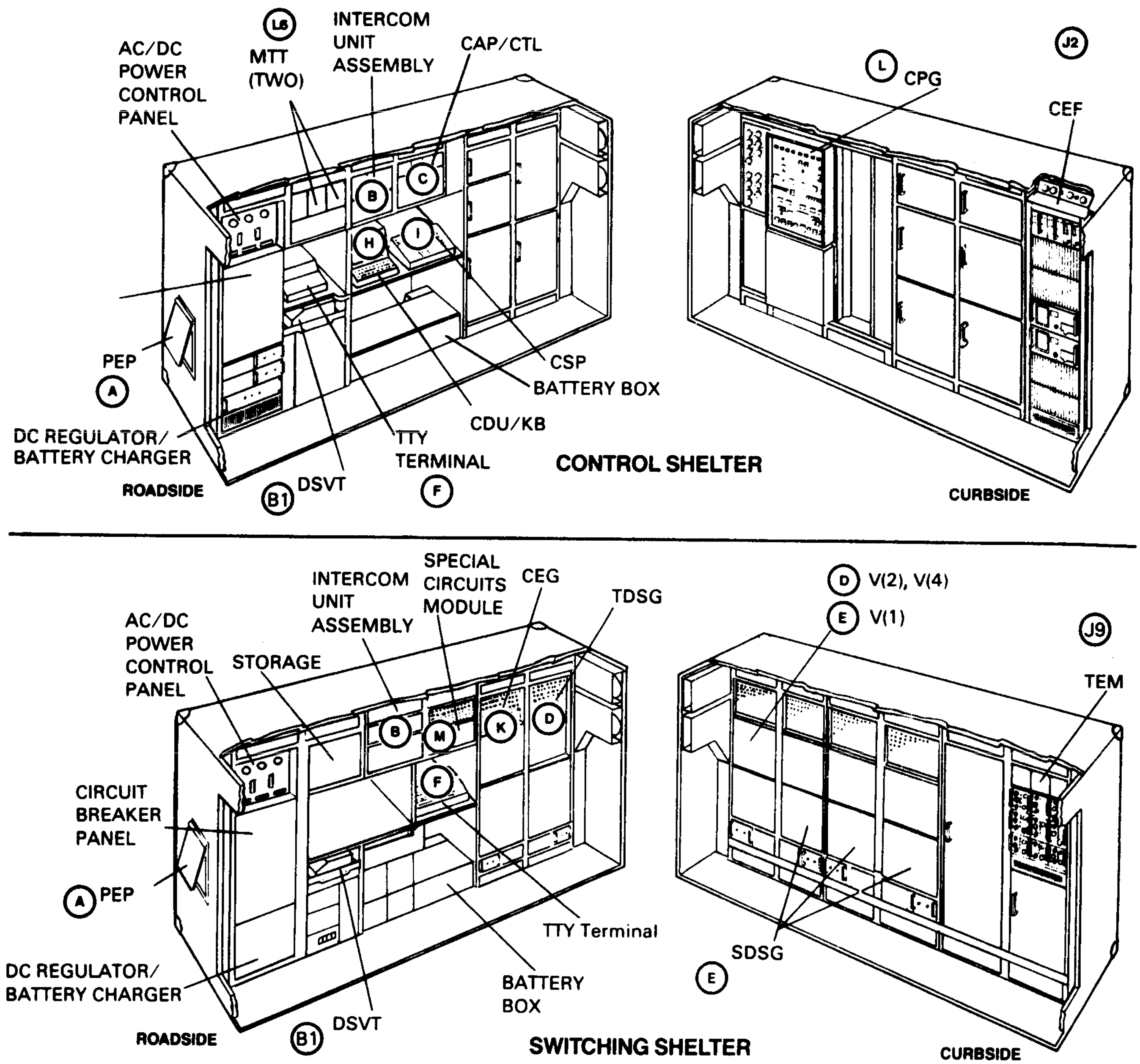


Figure 2-4. AN/TTC-39 600-line dual shelter switch layout.

thirty-six 4-wire adapters or twenty-four 6-wire adapters. With these, the SDSG can connect to single frequency (SF) 2600-Hz, DC closure, and 6-wire loops or trunks.

Circuit switch summary alarm. The circuit switch summary alarm (M2) is on the auxiliary special circuits patch panel (Ml). Also on the patch panel are normal-through jacks for lines or trunks using the special adapters.

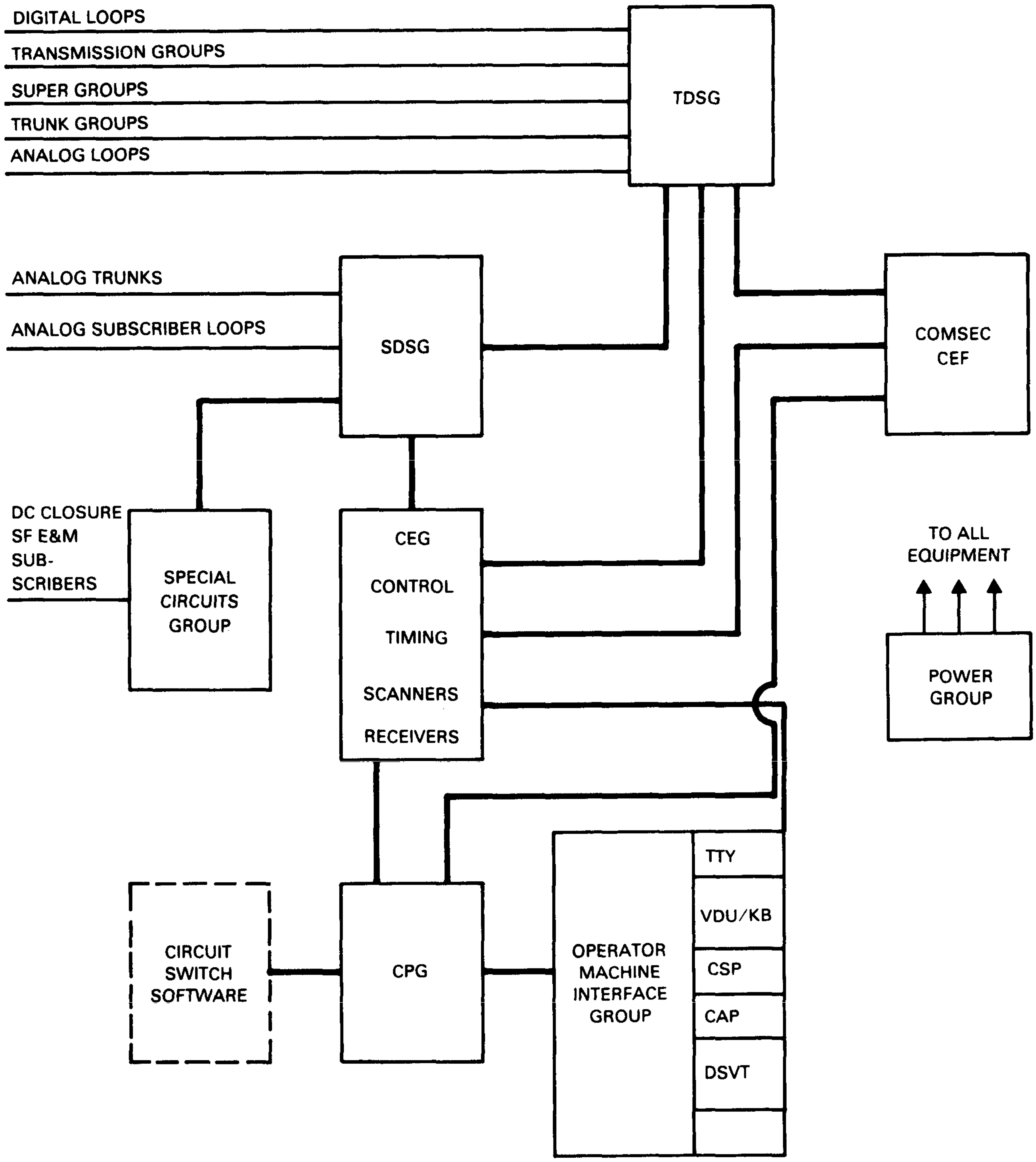


Figure 2-5. AN/TTC-39 block diagram.

Digital switching.

Traffic and transmission lines enter the digital system through the SEP (D4) and the TDSG patch panel (D1). Analog traffic then goes through a continuously variable slope delta (CVSD) modulater (D2). The digital subscriber loop goes through a diphase loop modem A (DILPA) (D12). Digital transmission groups pass through modems (D5), From these points, the digital traffic then goes through various MUX/DEMUX, patch panels, buffers. and interface units via a switch multiplexer/demultiplexer (SMD) (D6) to the TDMX (D3).

Table 2-5. AN/TTC-39 major unit functional breakdown.

KEY	UNIT NAME	NOMENCLATURE
	Power Group	
A	Power Entry Panel	
	AC/DC Power Control Panel	
	AC Power Distribution Panel	
	DC Power Distribution Panel	
	Power Supply, Regulator Battery	PP-7724/G
	Batteries	
	DC Power Processor	
	AC/DC Converter	
	DC/DC Converter	
	24 V DC Power Supply	
	56 V DC Power Supply	PP-7815/TTC-39
	DC/AC Inverter (400 HZ Only)	
	Communications Group	
B	Intercomm System; Interconnection Station	LS-147/FI
B1	Digital Subscriber Voice Terminal	TSEC/KY-68
C	Control and Alarm Panel/Control Transfer Logic	
	Summary Status Display	
	Redundant Processor Display	
	Manual Selection, Configuration	
D	Time Division Switching Group	
D1	TDSG Patch Panel	
	Trunk Encryption Device Patch	
	Manual Resynchronization Panel	
D2	CVSD Modulator	
D3	Time Division Matrix	
D4	Signal Entry Panel	
D5	Group Modem	
D6	Switch MUX/DEMUX	
D7	Digital Scanner	
D8	Remote Special Devices DEMUX	
D9	Transmission Group Module	
D10	Loop MUX/DEMUX	
D11	Remote Fault MUX	
D12	Diphase Loop Modem A	
D13	Diphase Group Modem	
D14	Dipulse Group Modem	
D15	Diphase Supergroup Modem	
D16	Digital In-Band Trunk Signaling Buffer	
	Loop Clock Selectors	
	Group Clock Selectors	

Switch multiplexer. The switch multiplexer processes calls into 64-channel data streams. The TDMX (D3) performs the digital switching of these subscribers. The central processor controls the matrix through the matrix controller (K13). This resides in the switching controller group (SCG) of the CEG (K).

Switch multiplexer/demultiplexer. The SMD(D6) combines sixty-four 32-kHz digital data streams into a 64-channel, 2.048-MHz multiplexed data stream, and vice versa,

Digital and analog scanners. A digital scanner (D7) searches all switched digital loops, groups

Table 2-5. AN/TTC-39 major unit functional breakdown. (continued)

KEY	UNIT NAME	NOMENCLATURE
D17	Trunk Signaling Buffer	
D18	Remote Signaling Buffer Controller MUX/DEMUX	
D19	Group MUX/DEMUX	
E	Space Division Switching Group	
E1	Patch Panel	
	Type II Modem	
E2	Signal Entry Panel	
	Intermatrix Units	
E3	Space Division Matrix	
	Analog Scanner	
E4	Line Termination Units	
F	Teletypewriter	AN/UGC-7A
	Keyboard	
	Page Printer	
	Teletypewriter Communications Terminal Interface	
H	Visual Display Unit/Keyboard	
H1	Visual Display Monitor	
	Keyboard	
	Visual Display Unit Controller	
I	Call Service Position	C-10333/TTC-39(V)
I1	Local Call Service Position	
I2	Remote Call Service Position (Optional)	
	Remote Control Switchboard	
J	COMSEC Common Equipment Facility System	TSEC/CI-5,8
J1	COMSEC Common Equipment Facility	HGF-85/TSEC
J2	COMSEC Common Equipment Facility Transition Unit Frame	HGF-82/TSEC HGF-91/TSEC
J3	Loop Key Generator Common Unit	HGX-82/TSEC
J4	Trunk Encryption Device	TSEC/KG-81
J5	Loop Key Generator	TSEC/KG-82
J6	Key Variable Generator	TSEC/KG-83
J7	Automatic Key Distribution Center	HGX-83/TSEC
J8	Interface Control Unit	HGX-84/TSEC
J9	Trunk Encryption Module	
	Transition Unit Frame	HGF-91/TSEC
	Trunk Encryption Device	TSEC/KG-81
	Interface Control Unit	HGX-84/TSEC

and trunks. An analog scanner searches those TDMX loops that are terminated on analog telephones. (A maximum of 60 subscribers off the TDMX may be analog. Refer back to paragraph 2-2a(4).) These scanners determine the change of status of each external termination (on-hook or off-hook). This change of status is then forwarded to the processor through the scanner controller (K14).

Remote special devices demultiplexer. The remote special devices demultiplexer (D8) decodes addresses from the special devices controller (K15) and sends out commands to the group modems

Table 2-5. AN/TTC-39 major unit functional breakdown. (continued)

KEY	UNIT NAME	NOMENCLATURE
K	Common Equipment Group	
K1	Master Timing Generator	
K2	Patch and Control Panel	
	DC Scanner	
	Tone Generator	
K3	20-Hz Generator	
	Local Timing Generator	
	SDSG Timing Generator	
	Teletypewriter Interface	
	Line Driver Interfaces	
K4	Receiver Matrix Unit	
K5	Conference Bridge Units	
	DTMF/Multifrequency Senders	
K6	DTMF Receivers	
	Multifrequency Receivers	
K7	CVSD Modulator	
K8	Digital Signal Generator	
K9	Digital Receivers	
	Auxiliary Receivers	
	Intercept Recorder	
	Diphase Loop Modem A	
	Telephone Instruments, CESE	
K10	Essential User Bypass Selector	
K11	Comsec Controller	
	Common Equipment Distribution Frame	
	Analog Scanner	
	Analog Scanner Signal Generator	
K12	Signaling Buffer Controller	
	Comsec Controller	
K13	Switching Controller Group	
	Matrix Controller	
	Test Generator Controller	
	CPU Central Controller	
K14	Input/Output Transformer Interface	
	Scanner Controller	
K15	Receiver Controller	
K16	Sender/Special Devices Controller	
	Fault Controller	
	Central Processing Group	
L	Automatic Data Processor	
	Input/Output Units	
	Main Core Memory Units	AN/GYK-12
L1	Central Processor Units	
L2	Peripheral Interface Panel	
L3	Power Group	

(D5). It also feeds signals to the transmission group module (D9) and the SMD (D6) and sends resets to the loop MUX\DEMUX (D1O) and remote fault multiplexer (D11).

Remote fault multiplexer. The remote fault multiplexer (D11) connects to all monitored equip ment in the TDSG. It sends fault information to the fault controller (K16) in the SCG.

Diphase loop modem A. The DILPA (D12) handles conditioned diphase signals between individual subscribers and the time division portion of the switch. It also provides DC power to connected DSVTs.

Continuously variable slope delta. The CVSD modulator (K7) translates analog signals to digital signals and vice versa. This enables the switch to terminate 4W DTMF AC supervised analog telephones. The CVSD modulator card (K7) in the common equipment group is used in conjunction with the local call service position (LCSP) when terminated on the TDMX. The diphase loop modem A located in the CEG is used to terminate the signaling part of the LCSP on the TDMX. Termination of the LCSP on the TDSG or SDSG is determined by the CEDF patching.

Group and supergroup modems. Diphase supergroup modems (D15), diphase group modems (D13), and dipulse group modems (D14) terminate transmission groups brought into the circuit switch over CX-11230/G coaxial cables. The diphase group and supergroup modems are used to interface with the new family of digital group multiplex transmission equipments in groups as follows:

- Group modems -8, 9, 16, 18, 32, 36, 48, 64, 72.
- Supergroup modems -128, 144.

The dipulse group modem is used to interface with existing multichannel equipment (TD-754, TD-204, TD-660, AN/GRC-143, and AN/GRC-144).

Diphase supergroup modems. Diphase supergroup modems (D15) connect 128 and 144 channel supergroups to the switch.

Digital in-band trunk signaling buffer (DSB). The DSB (D16) provides in-band signaling and supervision between the AN/TTC-39 and a digital subordinate switch such as the SB-3865.

Trunk signaling buffer (TSB). The TSB (D17) provides common channeling signaling (CCS) on interswitch trunk groups. It performs the required encoding, decoding, data storage, and message formatting. TSBs are used in conjunction with type II modems for analog interswitch trunks.

Transmission group module. The transmission group module (D9) contains a group buffer, a group framing unit, and output control logic. These units work with the trunk encryption device (TSEC/KG-81) (J4) to adjust, encrypt, decrypt, and frame synchronize DTG data.

Remote signaling buffer controller (SBC) multiplexer/demultiplexer (RSBMD). The RSBMD (D18) transfers input and output data

Table 2-5. AN/TTC-39 major unit functional breakdown. (continued)

L4	Automatic Data Processing Status and Control Panel	
L5	Interface Control Unit	
	Magnetic Tape Controller	
	Teletype Controller	
	Processor To Processor Interface	
L6	Magnetic Tape Transport	AN/UYH-5
	Teletypewriter Control Unit	
M	Special Circuits Group	
M1	Auxiliary Special Circuits Patch Panel	
M2	Circuit Switch Summary Alarm	
	Timing Distribution	
M3	E&M Adapter	
M4	DC Closure Adapter	
	Line Driver Interface	
M5	SF Adapter	
M6	Special Circuits Patch Panel	

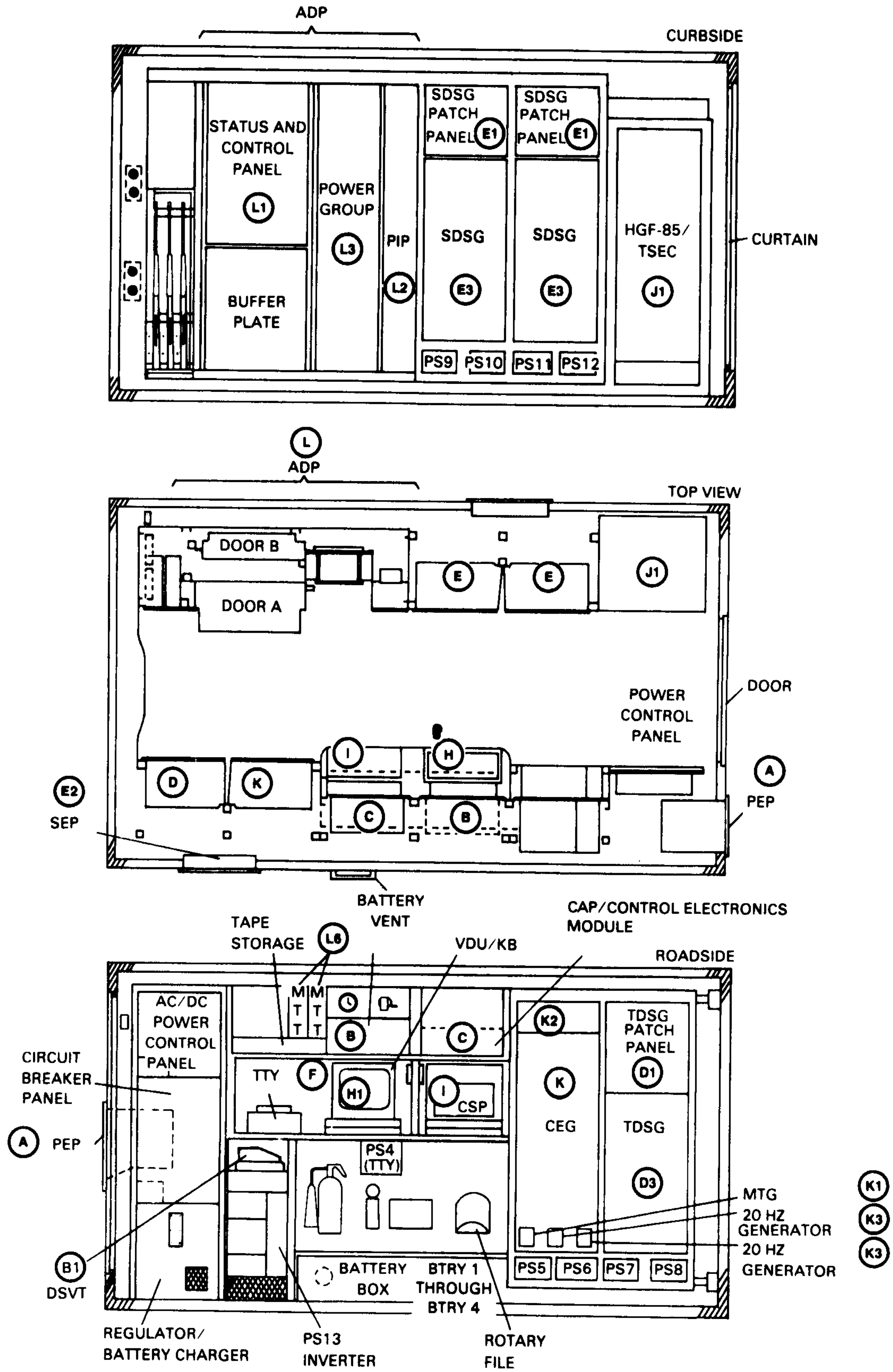


Figure 2-6. Equipment locations on the single shelter AN/TTC-39.

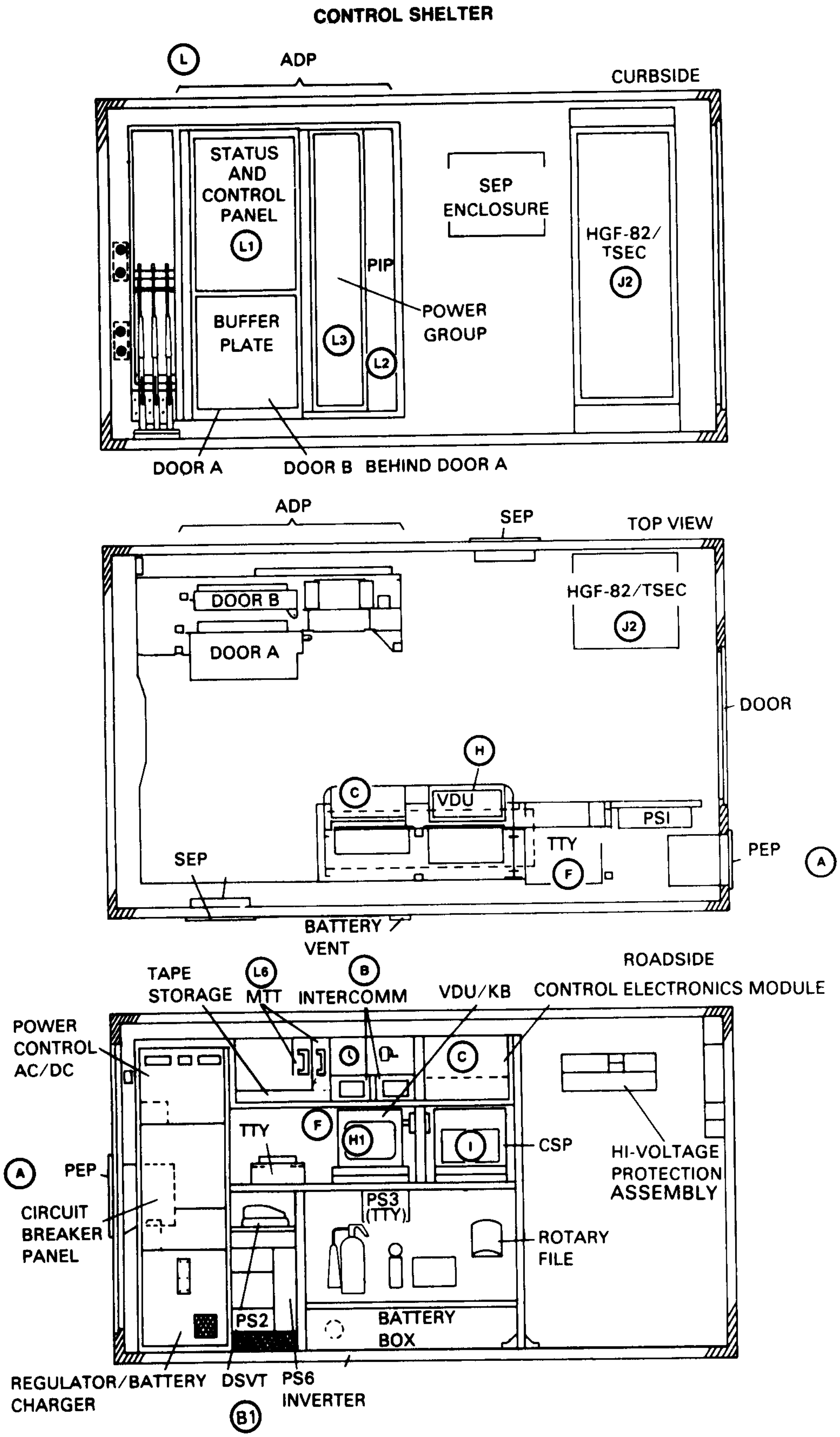


Figure 2-7. Equipment locations on the dual shelter AN/TTC-39 — control shelter.

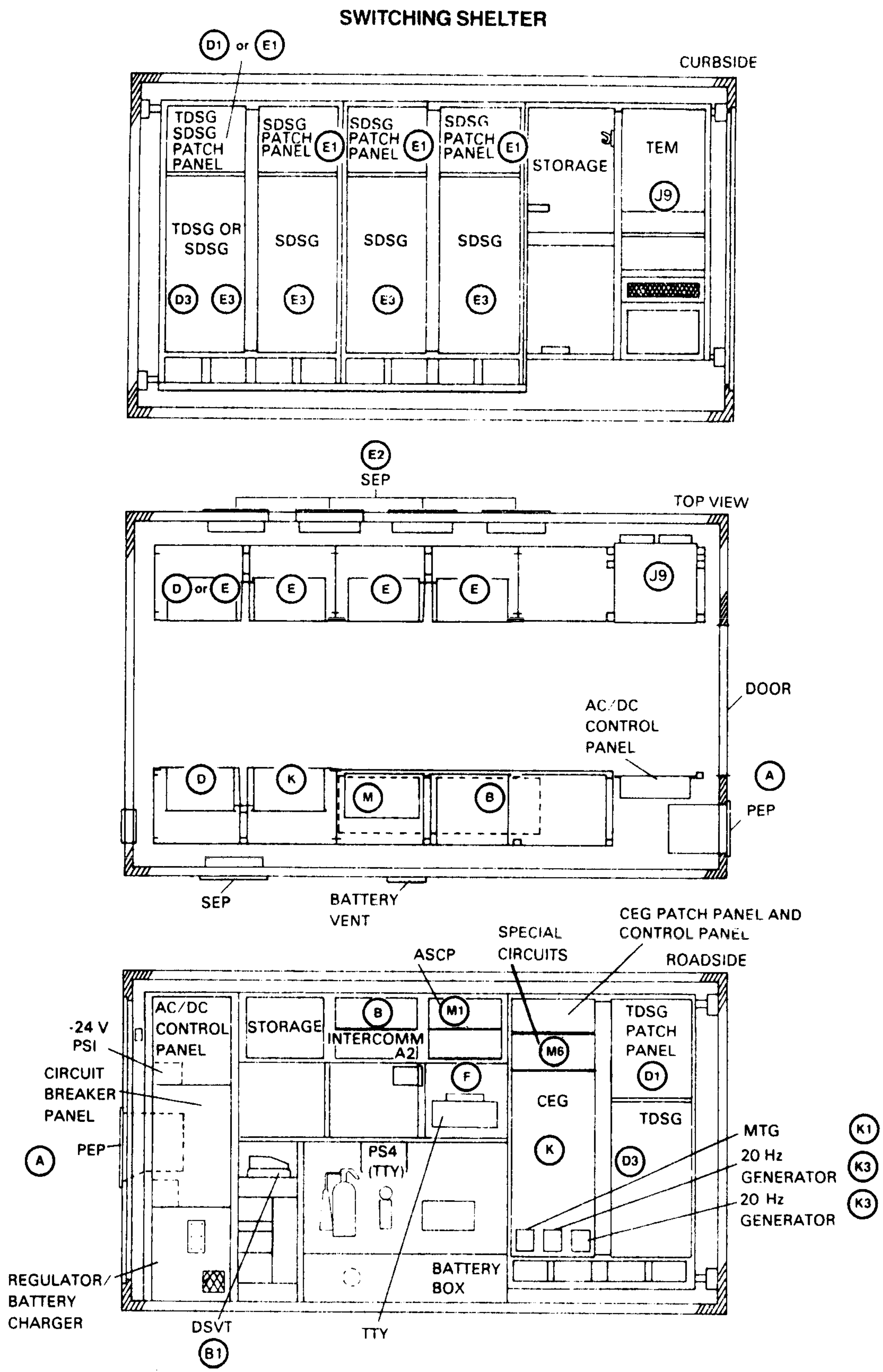


Figure 2-8. Equipment locations on the dual shelter AN/TTC-39 — switching shelter.

between the TSB (D17), the digital in-band trunk signaling buffer (D16), and the SBC (K12).

Group multiplexer and demultiplexer. The group multiplexer and demultiplexer (D19) consists of 16 nine channel multiplexer/demultiplexer (NCMD) units. From these, digital groups can be formed in modularities of 8,9,16,18,32,36,48,64, 72,128, and 144.

Digital signal generator. The digital signal generator (K8) provides code words, recorded announcements, and digitized tones to both digital and analog subscribers. A CVSD voice digitizer converts digital signals to analog waveforms.

Digital receiver. A digital receiver (K9) picks up address signals from calling subscribers. It then decodes the signals and sends them to the processor for action. The processor assigns the call to the digital receiver.

Essential user bypass. If both local processors fail, the essential user bypass (EUB) selector (if programmed and activated) routes selected digital subscribers to a distant switch. It can handle up to 60 such subscribers.

Control and timing equipments.

These equipments reside in the CEG (K). They provide for switching, supervision and signaling of analog and digital loops and trunks. Overall switch control is the function of the CPG. Exercise of control is through the SCG, the signaling buffer controller (K12), and the COMSEC controller (K11). The master timing generator (MTG) (K1) and local timing generators (LTG) provide system timing. The CAP/CTL (C) provides configuration control and system fault display.

Switching controller group. The SCG is in the CEG (K). It includes the scanner, receiver, sender, special devices, fault matrix, test generator, and CPU central controllers. Each device controller connects to a specific set of devices. Access to the CPG is through the CPU central controller. The controllers access the following devices:

- Scanner — analog, DC, and digital scanners.
- Receiver — DTMF, multifrequency, digital, and auxiliary receivers.
- Fault — all devices in thes system.
- Sender — sender devices.
- Special devices — miscellaneous devices.
- Matrix — time division and space division matrices.
- Test generator — loop testing through other controllers.

COMSEC controller. The COMSEC controller (K11) provides bidirectional serial parallel data conversions for interface with the CEF.

Master timing generator. The master timing generator (K1) provides all the clock signals required by the switch. It can generate these signals itself, or the recovered clock can synchronize them from the received clock patch panel.

Central processor group.

This group is the brain of the circuit switch. It is the link between the software and hardware. It stores programs and it controls the switch functions of call processing, switch control, and fault detection. Of the two processors, only one actively processes traffic. The other is redundant. The CPU (1.1) provides the logic and computational ability to compose and interpret data, to assess status, to search tables, and to perform arithmetical functions. The interface control unit (L5) provides an interface between processors. It also provides access to both the magnetic tape transports (L6) and the TTYs (F). The switch stores programs both in core memory and on tape.

Operator machine interface.

The operator and maintainer access the switch through a VDU/KB (H), a TTY (AN/UGC-74A (F)), the LCSP (I1), the remote call service position (RCSP), a remote control switchboard (C-10333/TTC-39(V)) (I2), an intercommunications station (LS-147/FI) (B), and the control and alarm panel/control transfer logic (C) already described. The VDU/KB connects the operator to the processor. It updates the data base, reports system status, and exercises special maintenance routines. The TTY includes a keyboard and page printer, It serves as a backup for the VDU/KB and provides a hard copy of processor messages, Intercom stations in each shelter of the circuit switch and connections to intercoms in the local AN/TYC-39 message switch shelter provide convenient local switch communications. The switch operator helps complete local calls, supplies directing and routing information, receives trouble reports, verifies busy and no answer calls, and sets up progressive conference calls. The operator also handles verbal precedence and preemption requests, holds and splits calls, and places secure calls through the LCSPs or RCSPs.

2-4. Communications Security Group

COMSEC equipment is both physically and electrically integrated into the AN/TTC-39 circuit switch. The AN/TTC-39 serves both secure and nonsecure analog and digital users. Thus its system security features must be able to provide a mixture of secure and nonsecure communications. The COMSEC equipment described below performs these functions. The key letters in parentheses are from Table 2-5. In the AN/TTC-39, built-in equipment and terminal devices provide the basis for end-to-end encryption. FM 24-27A describes the encryption/decryption capability in more detail.

COMSEC common equipment facility. The CEFs identified in Figures 2-6, 2-7, and 2-8 as (J) are an integral part of the AN/TTC-39. They are equipment racks that house the plug-in COMSEC equipment needed to establish and maintain the requisite security for calls and trunk traffic flow. In the 300-line single shelter switch, the COMSEC CEF (J1) is the HGF-85/TSEC. In the control shelter of the 600-line switch the CEF (J2) is the HGF-82. A small trunk encryption module (J9) in the switching shelter of the 600-line switch provides added trunk encryption devices. The CEF is the equipment rack that contains the trunk security devices required to encrypt and decrypt all DTG traffic. There are also loop security devices to encrypt and decrypt all loop traffic. Interface units provide access to the communication and computer equipment of the switch. The circuit switch uses the following items of COMSEC equipment:

- The TSEC\KG-82, loop key generator (J5) is a loop security device. It encrypts and decrypts signaling and digital traffic received from a digital subscriber. It also provides the encryption interface for the circuit switch to the AN/TYC-39 trunks.
- The TSEC/KG-81 or KG-94 trunk encryption device (J4) encrypts and decrypts trunk traffic.
- The TSEC/KG-83 key generator (J6) generates electronic keys.
- The HGX-83/TSEC automatic key distribution center (J7) stores and distributes keys.
- The HGX-84/TSEC interface control unit (J8) provides the electrical interface between the security devices and the central processing unit of the switch.
- The HGX-82/TSEC loop key generator common unit (J3) serves as the equipment control unit for up to eight KG-82s.

Terminal security device. The AN/TTC-39 connects to the following terminal COMSEC devices:

- KY-68 digital subscriber voice terminal performs the audio processing, signaling, and cryptographic functions needed to provide secure and nonsecure access to the AN/TTC-39.
- KY-90 secure digital net radio interface unit provides semiautomatic connection between VINSON secured radios and switched subscribers via the AN/TTC-39. PARKHILL and ANDVT nets can also be connected if COMSEC equipment is collocated with the KY-90.
- KG-84/84A dedicated loop encryption device connects with the KG-82 in the switch to provide secure loops to data terminals and secure trunks to the AN/TYC-39.

2-5. Software

The operational software in the AN/TTC-39 consists of independent modules operating under control of an executive program. The software operates in real time. Thus it must be driven by external events. Since these events happen randomly, queue processing is an essential part of software design. The operating program queues the event for service and processes it in turn. It then notifies the program that requested the service that the service is completed. Table 2-6 describes the software features of the switch. It includes the title and mnemonic of each program module and tells what the module does. Some important operating features and processes are listed below:

On-line control and operational program (OLCOP). The OLCOP is the primary on-line software operating system. It initiates program activity and schedules the programs listed in Table 2-6. It services interrupts and generally provides traffic control.

Cold start.

A system cold start initializes the switch to an off-line state. The supervisor mounts the operational program tape (program library tape). A reset command then initializes each device in the system. It also initializes all buffer control tables. The system accepts the time of day as an input parameter. It sends a message to the operator on the visual display unit (VDU) when the start-up process is completed.

Recovery.

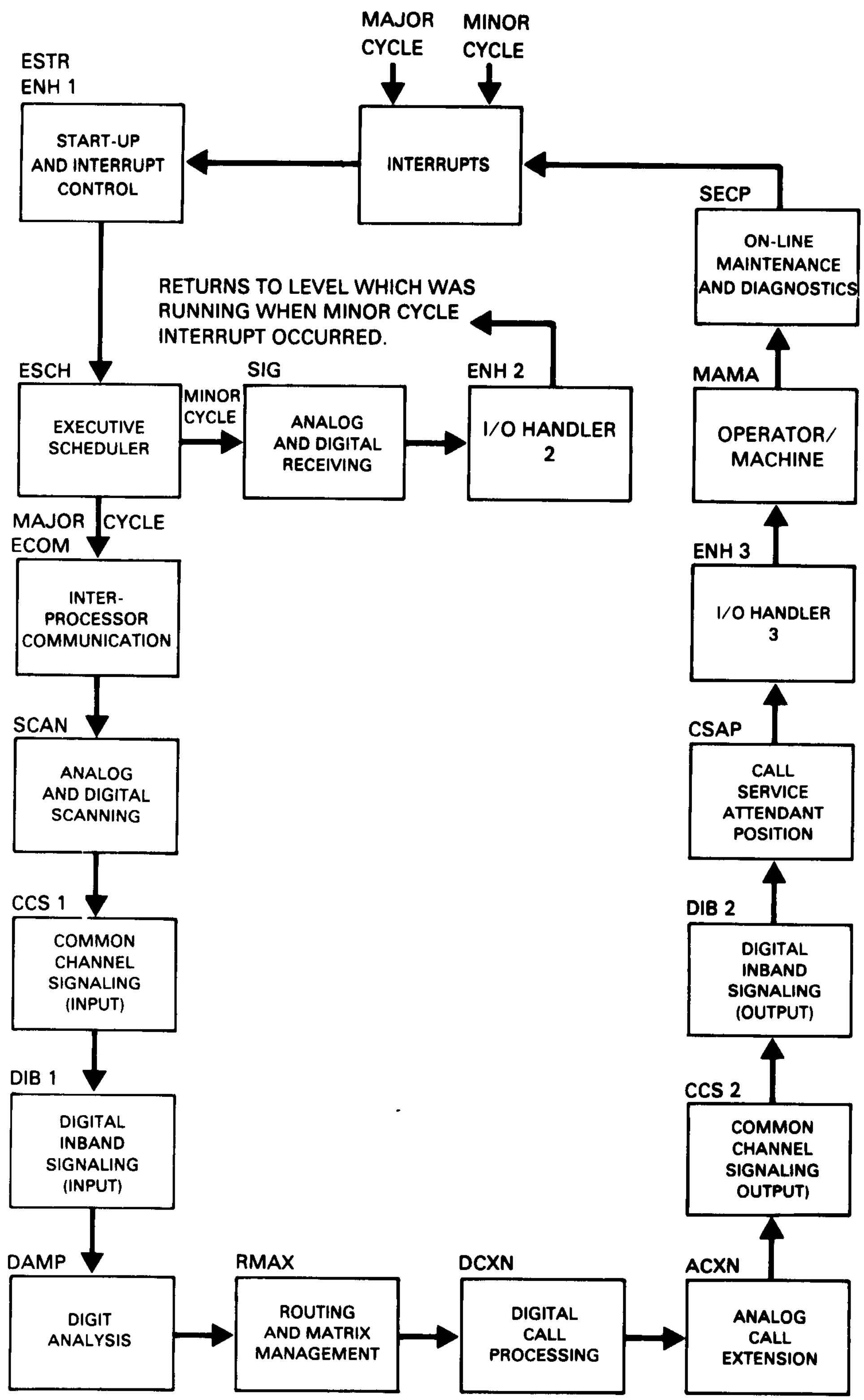
This is a process that takes place during processor switchover. It ensures that no through-connected calls are lost.

CAP/CTL monitoring.

The operating system reads the CAP/CTL and determines if the configuration has changed. It compares the current CAP/CTL map to the previous one. The system processes the necessary changes.

Table 2-6. AN/TTC-39 software.

	PROGRAM MODULE	DESCRIPTION
MNE-MONIC	TITLE	TITLE
ENH	Input/Output Interrupts	Real-time hardware generated input/outputs. Operator/machine interfaces.
SCAN	Scanning	Processes scanner hardware inputs.
SIG	Signaling	Processes real time signaling inputs. Performs outgoing signaling.
DAMP	Digit Analysis	Processes codes and telephone numbers. Applies call restriction criteria.
RMAX	Routing Matrix Management	Selects, reserves, and tracks circuit switch matrix paths, associated pooled equipment, and connections and equipment in use.
CCS 1 CCS 2	Common Channel Signaling	Processes signaling messages sent to and received from other circuit and message switches and system control.
DIB 1 DIB 2	Digital Inband Signaling	Processes signaling information for SB-3865.
ACXN	Analog Call Extension	Controls outgoing signaling and supervision sequences on analog calls.
DCXN	Digital Call Processing	Controls processing of digital calls.
CSAP	Call Service Attendant Position	Processes operator and maintainer service.
MAMA	Operator/Machine	Processes VDU/KB, tape cassette, and system alarm panel operations. Services system control messages.
ONLFD	On-Line Fault Detection	Detects, analyzes, and reports hardware error conditions.
ECOM	Interprocessor Communication	Transfers data between active and standby processors. Transfers control to standby CPU on request.
ESTR	Start Up/Recovery	Initializes data base and external devices following start-up or switchover.



PROGRAM MODULES RUN IN SEQUENCE UNTIL ALL WORK HAS BEEN PROCESSED OR AN INTERRUPT OCCURS.

Figure 2-9. AN/TTC-39 operational program flow.

Input/Output (I/O) software.
Centralized I/O software receives I/O requests from the application programs. It then generates the necessary I/O commands and services interrupts from the hardware. Priority levels determine which requests will be serviced first. Scanning, receiving, and trunk signaling channel inputs are examples of high priority interrupts. I/O handlers access each of the controllers in the switch control group. These include the signaling buffer controller, the COMSEC controller, the magnetic tape controller, the VDU/KB controller, the TTY controller, and the CAP/CTL.

Diagnostics.
Software diagnostics may be either core or tape-resident. They may be run in on-line or off-line and may be operator-initiated or run on a continuous basis. (See paragraph 3-15.)

Cycles.
The main program operates on a major/minor cycle time base to provide external event interrupt processing. Figure 2-9 illustrates the modules included in these cycles. Each of these modules is illustrated with its mnemonic program name. The flow shown in the diagram indicates the sequence of program operation. Interrupt handlers service hardware interrupts. Priorities determine which are handled first. Scanning inputs, receiving inputs, and trunk signaling inputs are high priority interrupts. They must be serviced quickly. VDU input is an example of a low priority interrupt.

2-6. AN/TTC-39A

The modifications to the AN/TTC-39 which turn it into a AN/TTC-39A are in these major areas:

- The processor L3050 is replaced by the L3212A. This new one has 512K of memory and is 19 percent faster. There is a redundant processor as before. It is also smaller and uses less power.
- Internal and external digital connections are increased.
- Certain control functions have been added.
- Certain switch functions are more easily done.
- The analog/digital matrix configuration is standardized.
- The ability to condition up to 24 analog circuits is provided.

Descriptions of some of these changes follow. Chapter 3 covers the functional changes.

Configuration.
The changes to the switch have increased its capacity above that of both the 300-line and 600-line AN/TTC-39s. This capacity resides in a single shelter, eliminating the need for a dual shelter switch. All AN/TTC-39As will initially have one analog matrix (or switching group) and two digital matrices (or switching groups). Figure 2-10 shows the internal arrangement of the AN/TTC-39A. If you compare this figure with Figure 2-3, you will see very little change on the roadside. The curbside however is completely changed.

Timing.
A new atomic timing standard is added. Rubidium is used to provide improved clock reference.

Switching group.
The TDSG in the AN/TTC-39 is replaced by a time division switching group modified (TDSGM). The TDSGM memory structure and switching are functionally the same as the old TDSG. However, the TDSGM has twice the capacity. It has 15 DTGs, giving a switch total of 30 DTGs (using 2 TDSGM).

Communications security.
The major change for COMSEC equipment is that there are 15 KG-94 trunk encryption devices. These replace the 6 KG-81s. There are also 32 KG-82 loop key generators.

Orderwires.
Digital voice orderwire (DVOW) and analog voice orderwire (AVOW) capabilities are added. Diphase DTGs are used with the DVOW, and diphase and dipulse DTGs are used with the AVOW. The KY-57 (VINSON) is provided for the DVOW. There are 12 DVOWs and 6 AVOWs available simultaneously. These are available to all DTGs and analog trunks by patching. Both types are controlled through the orderwire control unit II.

Remote video display unit.
A remote VDU position is added to allow an external attendant to perform the same functions as at the internal position. A remote VDU controller is also added.

Low speed cable driver modem.

Two low speed cable driver modems (LSCDM) are added. These are for dedicated operation on DTGs 15 and 30.

Use of fiber optics.

Fiber optic transmission cables are used both internally and externally to replace metallic paths.

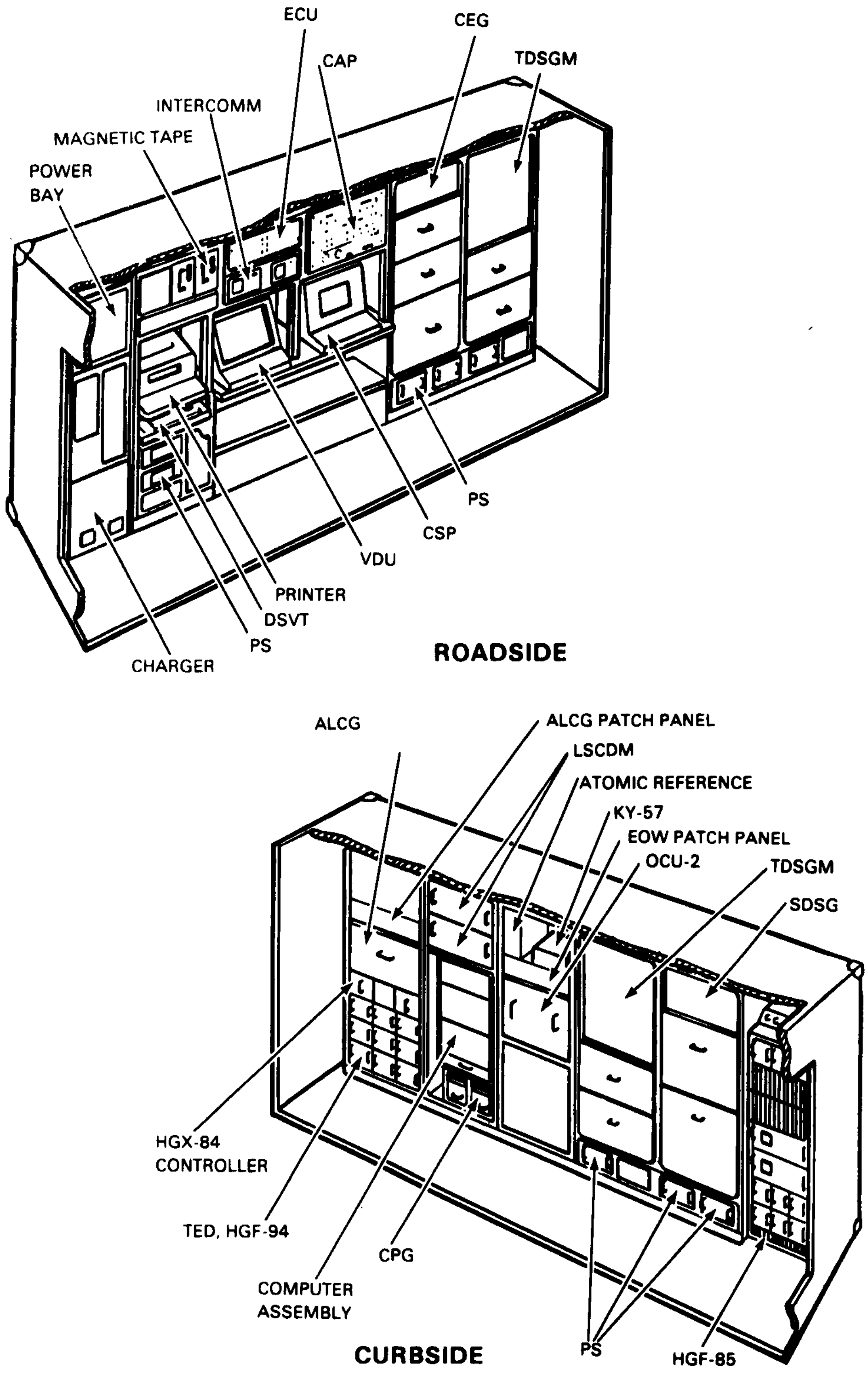


Figure 2-10. AN/TTC-39A layout.

CHAPTER 3
Planning Factors
SECTION I. FEATURES

3-1. Loop and Trunk Capacities

The loop and trunk capacities of the AN/TTC-39 vary, depending on the specific configuration of the switch. The AN/TTC-39 is modular in both hardware and software. Because of this, it can provide a whole family of compatible switching configurations. Table 3-1 shows the standard terminal allocations for the five basic configurations. Figures 3-1 and 3-2 depict line termination capacities for two AN/TTC-39 switch sizes and configurations: The 600-line (V)2 and the 300-line (V)3, respectively. These are the configurations you will find in the field until more digital equipment is in service. Review Chapter 2 for equipment descriptions. See Table 3-5 for terminal descriptions. Table 3-2 provides more detailed information on the types of terminations. It shows a typical issue of loop and trunk terminations of each type.

3-2. Digital Operating Rates

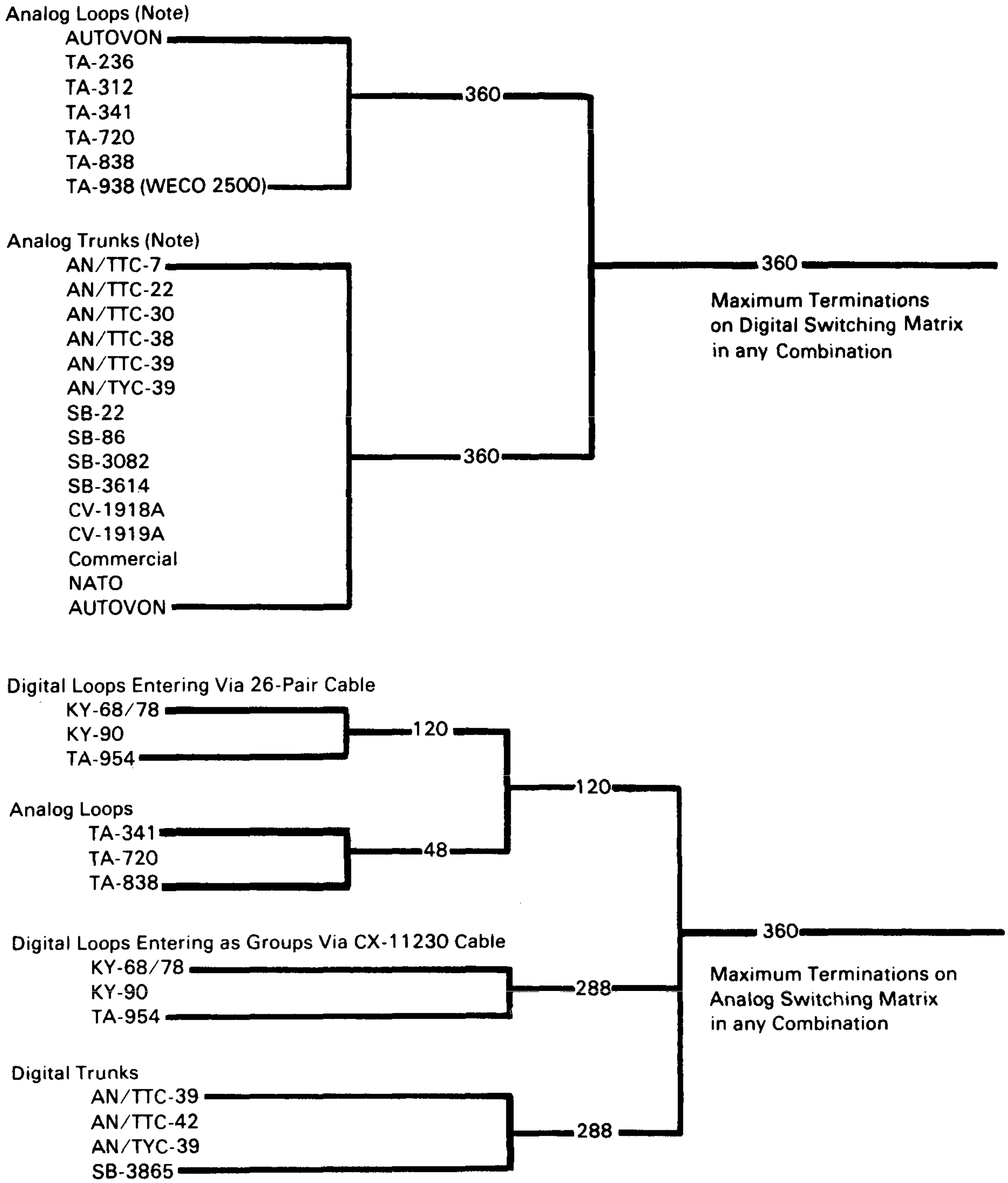
The AN/TTC-39 can operate at either a 16- or 32-kilobits per second (kbs) digital channel rate. All trunks within a trunk group and all loops terminated on a given switch must operate at the same rate. However, a switch operating at 32-kbs can accommodate trunk group traffic at a 16-kbs channel rate. This traffic must flow on designated trunk groups terminated on the TDMX. You must replace or strap certain circuit cards to change TDMX trunk groups from a 32-kbs to a 16-kbs rate. Table 3-3 identifies the cards you must strap to change the rate of an AN/TTC-39. Paragraph 4-4 gives specific instructions for strapping each card.

3-3. Traffic Handling Capacity

The AN/TTC-39 can accommodate a number of tactical and strategic applications. This gives it a broad capacity to handle a variety of traffic. Its

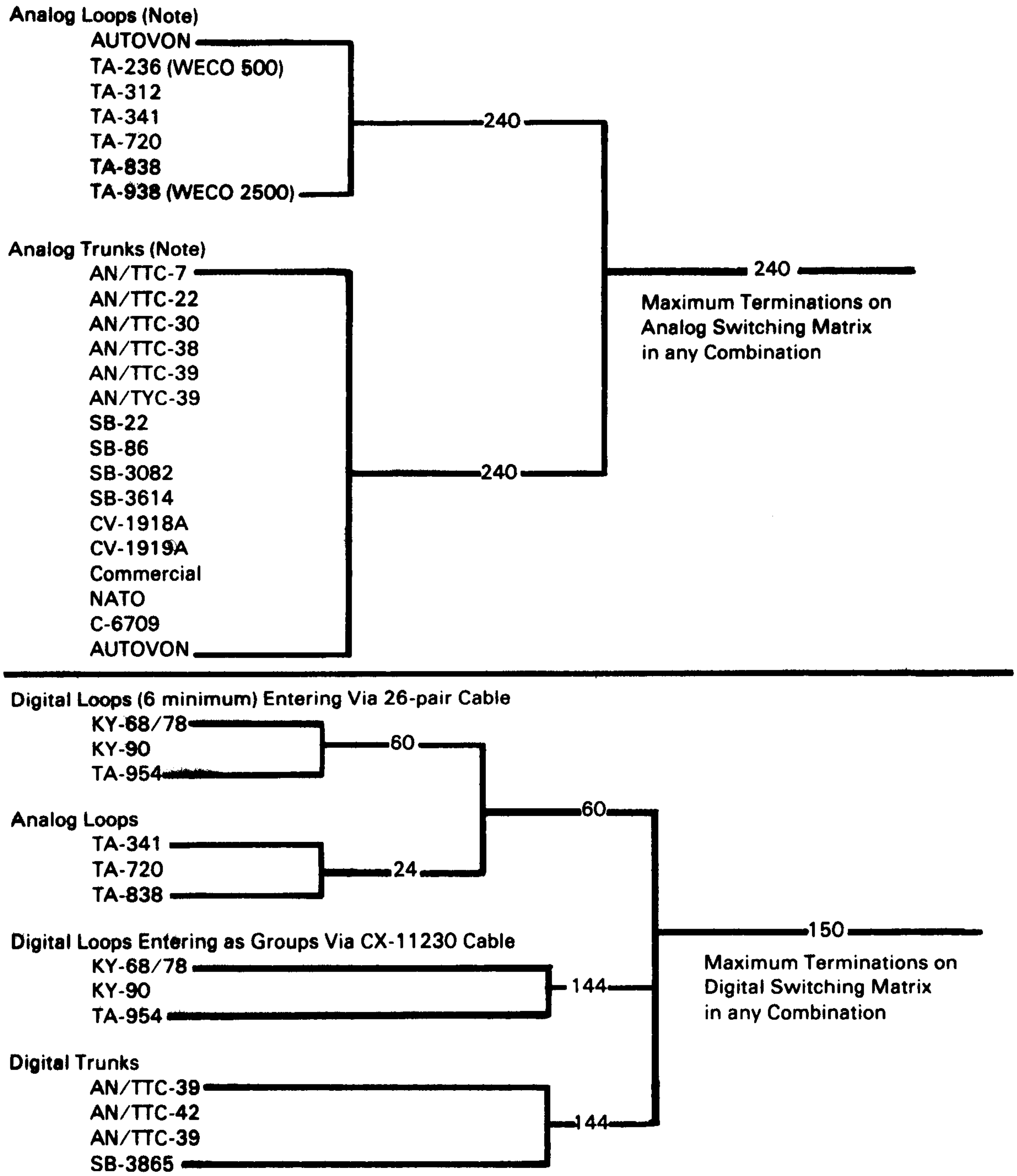
Table 3-1. Summary of terminal allocations for circuit switch configurations.

CONFIGURATION	(V)1	(V)2 (V)4	(V)3 (V)5
Analog/Digital Matrices	4/1	3/2	2/1
Nominal Size (Lines)	600	600	300
Analog/Digital Subscribers	480/150	360/300	240/150
SDMX			
Analog Service Terminations	110	108	71
Unused Terminations	34	0	1
Analog External Terminations	480	360	240
Total SDMX Terminations (Analog)	624	468	312
TDMX			
Digital Service Terminations	156	205	132
Unused Terminations	14	71	38
Digital External Terminations	150	300	150
Total TDMX Terminations (Digital)	320	576	320
Total Analog and Digital Terminations	944	1,044	632
Total Analog and Digital External Terminations	630	660	390



NOTE: Number of equipment terminations is limited by the number of LTUs of each compatible type. See Table 3-5 and paragraph 3-17.

Figure 3-1. 600-line switch (3/2) capacity.



NOTE: Number of equipment terminations is limited by the number of LTUs of each compatible type. See table 3-5 and paragraph 3-17.

Figure 3-2. 300-line switch (2/1) capacity.

tactical applications include use in various type of node configurations (command, base, and area), as an access of trunk/tandem switch and as a stand-alone switch. It can also function in combined circuit switch/message switch configurations. Call rates and traffic loads will vary with the various uses and configurations of the switch. In analyzing traffic handling capacity, you must consider how certain factors affect the switch traffic handling capacity. These include subscriber/loop traffic loading, off-hook factors (percentage of time the circuit is in use), and average call holding times. Trunk group traffic loading, total busy hour traffic load, and voice/data traffic mix

Table 3-2. AN/TTC-39 loop and trunk terminations (typical issue).

(1) SDSG (ANALOG) TERMINATIONS	CONFIGURATION IDENTIFIER		
	(V)1	(V)2,4	(V)3,5
Normal wideband terminations for TA-341, TA-720, TA-838 (4-wire mode), CV-1918, CV-1919, CV-2875, CV-2907, AN/TTC-30, AN/TTC-38, SB-3614, TA-341 RCSP talking ports (2 terminations), and the following special termination adapters: DC closure, SF (2600 Hz), and E&M.	270	222	136
CB terminations for: WE-2500-DW, AE-500, TA-236, TTC-22 (2-wire mode), TA-838 (2-wire mode), TA-312 (CB model), and commercial offices (CB type), AN/TTC-4, AN/TTC-5, AN/TTC-7, and TC-10, TA-312 with TA-955.	188	116	92
AUTOVON terminations for AE-023, overseas AUTOVON telephone and data terminal.	4	4	4
20-Hz RD terminations for TA-312 (RD mode), SB-22, SB-86, SB-3082, and SB-3614 (RD mode).	6	6	6
1600-Hz RD terminations for SB-3082 and HF trunks.	12	12	12
Maximum SDSG installable external terminations (normal wideband, CB, AUTOVON, and 20-Hz and 1600-Hz RD terminations).	480	360	240
2600-Hz SF special termination adapters (4-wire type) for AUTOVON overseas trunks, AUTOVON PBX access line, AUTOSEVOCOM NB trunks, NATO interfaces, TTC-28, TTC-22 (4-wire mode), and commercial offices (2600-Hz SF dial type). (Used with NB termination.) (Note 1)	36	36	24
DC closure adapters (2-wire type) for commercial offices and PBXs. (Note 1)	36	36	24
E&M special termination adapters (6-wire type) for commercial offices (1 1/2 terminations each). (Used with NB termination.) (Note 2)	24	24	16
Maximum SDSG installable termination adapters (2600 Hz SF, E&M, and DC closure special termination adapters). (Note 3)	--	--	--

are also factors. Refer to paragraph 5-4 for further information on traffic engineering.

You should plan the switch network so that there is a grade of service (GOS) goal of 0.100. This means that, during the busy-hour, no more than one call (at the Routine and Priority precedence levels) per 100 attempted calls will fail to go through (or be blocked) for lack of an available path. In critical situations this GOS goal can be degraded up to 0.20 with the approval of the senior CE officer at the corps or theater level depending on the level at which the planning was done. The AN/TTC-39 will provide nonblocking service for Immediate, Flash, and Flash Override precedence levels. It does this by preempting lower level calls on a line. The SDMX of the AN/TTC-39 is designed for a grade of service of .001 and the TDMX is

Table 3-2. AN/TTC-39 loop and trunk terminations (typical issue). (continued)

(2) TDSG (DIGITAL) TERMINATIONS	CONFIGURATION IDENTIFIER		
	(V)1	(V)2,4	(V)3,5
Analog loop (CVSD) terminations on TDMX for TA-341, TA-838, RCSP talking ports (2 terminations each).	24	48	24
Diphase loop modem terminations for DSVT, DNVT, RCSP signaling ports, and digital data terminal.	48	108	48
Maximum installable (analog loop and DSVT modem terminations).	60	120	60
Transmission group buffer and framing units.	4	8	4
DISGM terminations.	2	2	2
DIGPM terminations.	4	8	4
DPLSM terminations.	4	8	4
Maximum DTG.	4	8	4
Digital TSB terminations - maximum installable.	10 14	24 28	10 14
Analog TSB modem terminations (type II) - maximum installable.	4 4	4 4	4 4
(3) CONNECTORS			
UG-1837/U coax interface.	4	8	4
UG-1870/U coax interface (cable type CX-11230).	4	8	4
26-pair subscriber interface (U-18SB/G connector of J-1077A/U J-box).	45	40	25

NOTES: 1. There are 24 card slots in the CEG (single and dual shelters) and 12 card slots in the auxiliary special circuits group (dual shelter) available for accommodating special circuit adapters (SF and DC closures). Thus the total available adapters for a single shelter is 24 and for dual is 36. The adapters are cabled such that they are in line with the terminations associated with cable 1 of each analog rack (racks 1, 2 and 3). None are associated with rack 4 in a 4/1 configuration. To use these terminations for nonadapter circuits, the adapter needs to be patched out at the CEG or auxiliary special circuits patch panels. SF and DC closure adapters are packaged one per card.

2. There are eight card slots in the CEG (single and dual shelter) and four card slots in the auxiliary special circuit group (dual shelter) available for accommodating E&M adapters. E&M adapters are packaged 2 per card, so the total number of circuits that can be handled is 16 for the single shelter and 24 for the dual.

3. Any combination of SF, DC closure, and E&M adapters may be accommodated up to the maximum card slot capacity of the particular AN/TTC-39 configuration.

designed for nonblocking. Analog-to-digital calls use intermatrix units (IMU) that can cause blocking at equal precedence levels.

3-4. Secure and Nonsecure Operation

The AN/TTC-39 provides automatic switching and trunking service to both secure and nonsecure analog and digital subscribers. System security features can function at all traffic modes. This provides for mixed secure and nonsecure traffic and data. The switch can connect to and be part of military switched networks of all types, both secure and nonsecure. It can also connect with commercial switches and terminal equipment and with Allied and NATO communication systems. The AN/TTC-39 will provide for compatible signaling and supervision. This means that no changes to existing equipments are necessary when such additional equipments as NATO interface units and SF adapters are used.

Secure operation.

The AN/TTC-39 provides secure operations by means of encryption and the use of protected wireline distribution systems (approved circuit). Refer to AR 530-2 and to FM 24-27A for modes of secure operation. A COMSEC module is contained within (built-in) each AN/TTC-39. This module provides the required loop and trunk security devices for digital voice, data, and record traffic. A digital terminal security device encrypts and decrypts transmissions to and from the switch. The subscriber uses the DSVT (TSEC/KY-68) for this function. Although the KY-68 is digital, its subscriber may place and receive calls to and from analog terminals. When the call is to an analog terminal, not classmarked for Security Required, the KY-68 must be changed to the nonsecure mode. A nonsecure warning red light shows on the instrument panel and a nonsecure warning tone sounds in the earpiece when an off-hook terminal is operating in a nonsecure connection. The call will then be conducted in the nonencrypted mode. If the analog user has been classmarked for Security Required, the call will remain encrypted until it reaches the destination switch. If a KY-68 user calls the CSP at the circuit switch, an LKG will remain connected for the duration of the call.

Table 3-3. AN/TTC-39 cards to be strapped for operating rate.

CARD NAME	CARD MNEMONIC
Call Service Position Modem	CSPMD
Diphase Group Modem	DIGPM
Diphase Supergroup Modem	DISGM
Dipulse Group Modem	DPLSM
Group Buffer	GRPBF
Group Clock	GCLK
Local Timing Generator	LTG
Matrix Receiver Controller A	MXRCA
Nine Channel Multiplexer/Demultiplexer	NCMD
Trunk Signaling Buffer B	TSBFB

Nonsecure operation.

The AN/TTC-39 can provide automatic, nonencrypted, voice only switching access for nonsecure subscribers with a TA-954, digital nonsecure voice terminal (DNVT). The circuit switch also provides access to a variety of analog subscriber equipments that use the normal wideband, common battery 20-Hz, 1600-Hz, and AUTOVON equipment via LTUs. Any voice subscriber connected to the circuit switch can communicate with any other voice subscriber. This can be either directly or via a trunk. The exception is when security devices or classmarks of either subscriber prohibit the connection. It is also possible to connect two analog subscribers with each other via digital trunks. The circuit switch provides analog-to-digital and digital-to-analog converters. These can provide connections between a subscriber using an analog voice terminal and a subscriber using a digital telephone set. The converters also can connect approved analog voice subscribers routed over digital trunks. The TA-954 provides nonsecure subscriber service for uncleared areas and secure service using protected distribution systems. These are done by a combination of physical security and transmission link encryption. The DNVT employs CVSD modulation that converts analog voice signals to a 16-or 32-kbs digital bit stream. It can operate in the nonsecure circuit switched mode with the KY-68. It can also send a single frequency control (seize) tone for use with net radio interface devices to allow for half-duplex voice transmissions.

As mentioned, the circuit switch can also accommodate a variety of analog subscriber equipments. Five of the seven LTUs of the switch directly terminate a variety of analog subscriber types and service terminal equipment. They provide the proper connection with the SDMX. These five types of LTUs are:

- Normal wideband (NW).
- Common battery (CB).
- 20 Hz.
- 1600 Hz.
- AUTOVON telephone.

The five units are interchangeable (two per card), Any SDMX terminal can be adapted for use by an analog subscriber. A termination on the SDMX can be connected to any termination on the TDMX and vice versa.

Normal wideband line termination unit (NWLTU). The normal wideband LTU connects the A crosspoint matrix with either a direct current or tone-supervised loop, trunk, or adapted line. The inlet and outlet transformers connect the termination adapter to the NWLTU. The connection is then made in the silicon-controlled switch (SCS) crosspoint matrix completing the path from the termination adapter to another subscriber through the LTU and SCS.

Common battery. The common battery LTU connects the SCS crosspoint matrix and a common battery-supervised, 2-wire loop or trunk.

20 hertz. The 20-Hz LTU interfaces the SCS crosspoint matrix and loops and trunks. It provides two-way 20-Hz ringdown with idle tone on trunks.

1600 hertz. The 1600-Hz LTU connects the SCS crosspoint matrix with the 4-wire trunks. It provides two-way 1600-Hz ringdown with idle tone.

AUTOVON telephone. The AUTOVON telephone LTU interfaces the SCS crosspoint matrix and overseas AUTOVON telephones. The AUTOVON telephone is a 4-wire subset that employs DTMF signaling. It employs DC loop supervision on the subset transmit terminal with DC ringing on the receive terminal.

3-5. Timing of Switches.

A primary and secondary network timing source will be designated, and a network timing diagram, similar to Figure 3-3, will be included in the operations plan or operations order. All networks should have a designated master timing source and at least one alternate source in case of failure of the master source. Any network AN/TTC-39 may be designated as a master source. All other digital switches shall be slaved to the master for synchronization. A timing path for a given switch should not traverse more than one intermediate switch. The master source may derive its timing from a source external to it (for example, AN/TRC-170 or AN/TSQ-111), but is still the source for all timing in the network.

3-6. Numbering Plan Format

The AN/TTC-39 uses the following numbering format or portions of it as described in this paragraph. There are also prefixes for special features. (See paragraph 4-4.)

9YX MYX NNXXXXX where M = 2 thru 8
N = 2 thru 9
Y = 0 and 1
X = 0 thru 9.

The first three digits, 9YX, identify the NATO nation (military unit) being called. (See STANAGS 5046 and 4214.) The next three digits, MYX, represent a set of national area codes. The last seven digits, NNXXXXX, identify a combination of switch codes (similar to commercial telephone exchanges) and subscriber numbers. The seven digits are then defined by one of two numbering plans, the 4/3 or 3/4 plans. These plans group the seven numbers NNXX XXX or NNX XXXX. The switch can function with only one numbering plan at a time. However, it can serve calls that use an alternate numbering plan. It does this by routing such calls over an interconnecting trunk that carries all routing indicators of the calls. Numbering plans that the AN/TTC-39 can accommodate fall into two categories:

- The current Army tactical telephone numbering plan (TTNP).
- Certain nontactical numbering plans.

Tactical telephone numbering plan. The TTNP places the basic NNXXXXX seven digits in the 4/3 format. The TTNP consists of a 2-digit primary area code, a 2-digit switch location, and a 3-digit subscriber code in the following format

PR-SL-XXX where PR = 72 through 98
(except 80,81,90,91)*
SL = 00 through 99
X = 0 through 9.

You can use portions of this numbering scheme as abbreviations. For example, you can use PR routing to specify routing to a primary zone or area, SL routing for routing to a switch location, and XXX routing for routing to a subscriber or loop.

*There are other PRs in use for overseas AUTOVON.

Nontactical numbering plans.

In a nontactical system, the AN/TTC-39 uses a numbering plan similar (but not identical) to the AUTOVON numbering plan. This type of plan uses a 3-digit switch code and a 4-digit subscriber code in the 3/4 format:

NNX XXXX where N= 2 through 9
X= 0 through 9.

Again, you can use portions of this numbering plan as abbreviations. For example, NNX routing can specify routing to a switch and XXXX routing can specify routing to a subscriber or loop. You can also use NNXX numbering to conserve NNX codes on calls to a private branch exchange (PBX) or an expanded switch. The NNXX refers to the switch code NNX plus the first digit of the subscriber code. This enables up to 10 PBXs or expanded switches to share the same NNX code. (See paragraphs 4-4 and 5-6 for a detailed discussion of numbering and how it applies to the AN/TTC-39. FM 24-26 provides further information about numbering plans.)

3-7. Services and Classmarks

The basic service of the AN/TTC-39 is to establish connections between subscribers on a direct dialing basis. However, the switch also provides supplementary services, and it imposes restrictions on subscribers through application of modular hardware and activation of specific software. You can specify these supplementary services and restrictions by switch data entries called class-of-service marks, or classmarks. Listed below are the more significant of these.

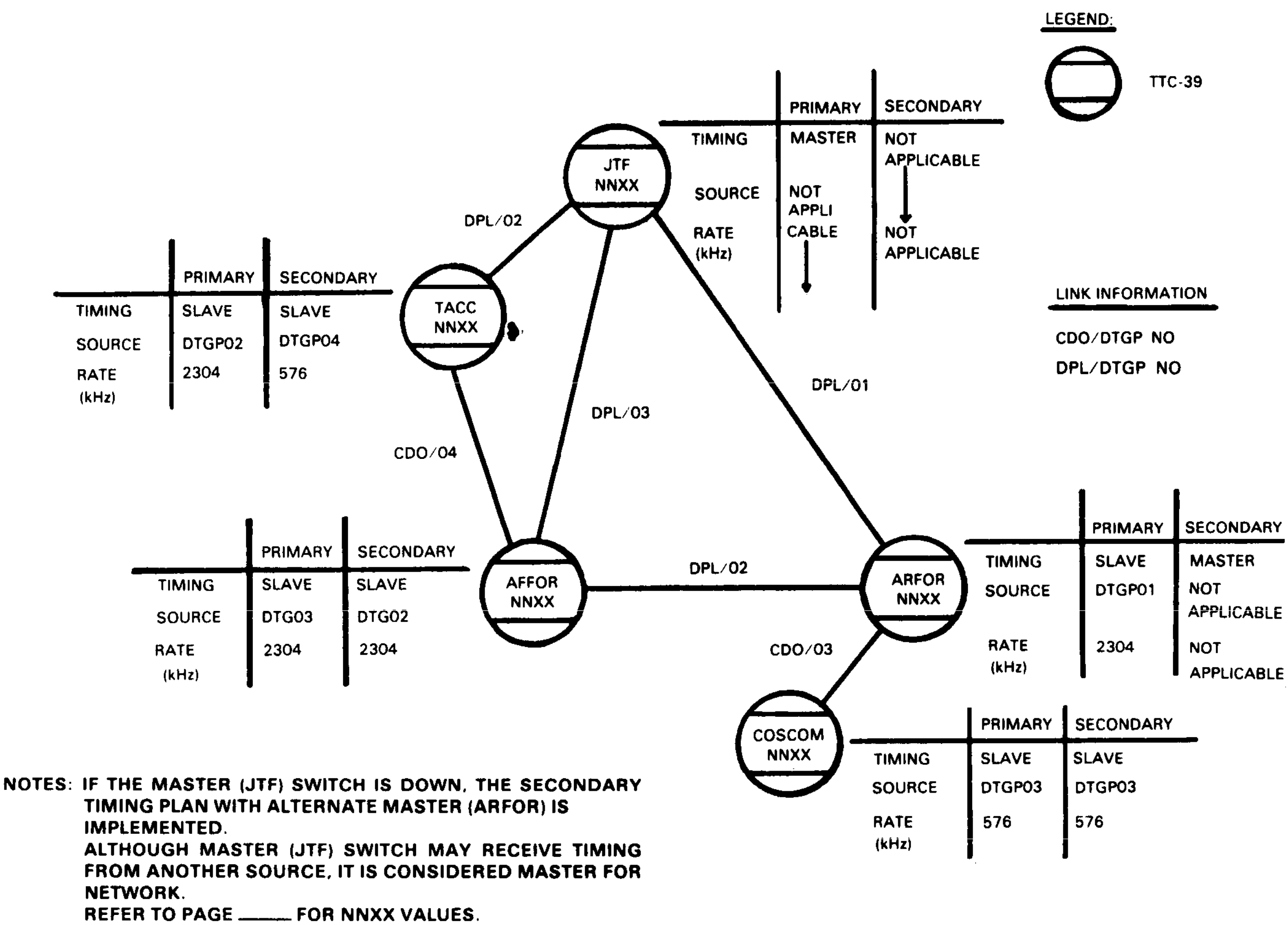


Figure 3-3. Sample network timing diagram.

Subscriber services.

Specialized subscriber services include the following:

- Precedence and preemption.
- Conferencing.
- Direct access.
- Automatic line hunting service.
- Compressed dialing service (switching system wide).
- Abbreviated dialing service.
- Fixed directory service.
- Call transfer service.
- Data service.
- Commercial office.

Precedence and preemption. Subscribers, if properly classmarked, can use five levels of precedence in making calls. In ascending order, the five levels of precedence are: Routine (R), Priority (P), Immediate (I), Flash (F), and Flash Override (FO). The originator of a call sets its precedence level regardless of the precedence levels authorized for other parties in the call. The switch supervisor, through the use of classmarks and by direction of the planner, can easily assign and change a maximum precedence level for any subscriber line. Calls routed to other switches employing no precedence level or noncompatible precedence levels are assigned the desired level within the AN/TTC-39 switch. However, the desired precedence converts at the destination switch to the level compatible with that switch serving the called terminal. Preemption occurs when a call in process or equipment necessary to process a call is of lower precedence than a preempting call. A call can not preempt a line, trunk, or switching center function handling another call of equal or of higher level precedence. The precedence indicator precedes all other dialed digits. If preempting occurs, a tone burst will notify both parties on the preempted call. Upon request, the operator can provide a higher precedence on a call-by-call basis. The precedence reverts as soon as the call ends, however.

Conferencing. The AN/TTC-39 uses analog conference bridges to establish progressive and preprogrammed conferences. You can classmark the switch to handle up to six simultaneous five-party conferences per 600 external lines (in the (V)1 and (V)2 configurations). The (V)3 configuration can handle up to four conferences. The maximum conference sizes (including the originator) at any switch are 20 parties for the 600-line switch and 14 for the 300-line switch per progressive or preprogrammed conference.

- Progressive conferencing enables the subscriber originating a conference to dial the other subscribers in any sequence. He must wait and verify whether he has connected each party before calling the next one.
- Preprogrammed conferencing establishes conferences between predesignated subscribers. It functions via a software programmable list of conferees. The originator sets up the conference by keying in the program code (6C) and the conference list designation (NX). The central processor of the switch then looks up a table that supplies the conferees' addresses. This enables the switch to connect each listed party to the conference bridge and to notify the conferees by recorded announcement. Each conference list is classmarked as either secure or nonsecure. If a nonmember tries to dial a conference list, he gets an error tone. If there is no bridge available for the conference, the originator gets a busy tone. The bridge is released only if all parties are unavailable.

Direct access service (DAS). This feature enables one subscriber to access another subscriber by simply going off-hook. The connection between points is made automatically. A telephone classmarked as a DAS phone cannot call any parties other than the ones he is classmarked to call. A DAS phone, however, can receive incoming calls from other DAS phones that are classmarked to call him. DAS phones can operate in two ways: both ways or only one way. Both ways mean that either party can directly access the other by going off-hook. This allows a temporary hotline to be set up between these two DAS classmarked phones. This only works if the planner does not allow other DAS phones in the network to access either of them. One way means one party can be classmarked to directly access another specified party by going off-hook. You can classmark up to 60 lines for DAS service.

Automatic line hunting grouping. When a user dials the address of a subscriber who has been classmarked as a member of an automatic line hunting group, the switch local to the group tries to contact the desired party. If the called party is busy, the switch tries to contact the next listed member. It in fact calls each member of the group via a predesignated search list until it finally contacts one. If the priority of the call is higher than Routine and if all lines are busy, the search begins again at the Priority level. The switch repeats the cycle until it can preempt a lower precedence call. Should all the lines remain busy, the originator receives a busy tone. A maximum of 32-line hunting groups with up to five parties in each group may be programmed in the AN/TTC-39.

Compressed dialing. This feature lets a subscriber save time by dialing fewer numbers and getting faster connections. It also reduces the number of digits that he needs to memorize. Compressed dialing lets a subscriber dial a 2-digit number (NX) plus C to reach the called party. The switch translates the 2-digit code via a table lookup and routes the call to the specified party. There are two categories of compressed dialing: common pool and individual.

- The common pool holds 80 subscribers. This pool may be accessed by those subscribers classmarked for this. A switch can handle up to five common pool lists of 80 subscribers each.
- Individual compressed dialing provides same type of service as common pool. The difference is the manner in which it is programmed. There is one lookup table with a capacity of 80 subscriber listings. These 80 listings can be assigned into 8 groups of varying size of 2 to 80 subscribers.

Each switch can handle five common pool lists and one individual dialing list that can be subdivided into eight smaller lists. A subscriber with access to an individual compressed dialing list cannot have access to a common pool lists.

Abbreviated dialing. Abbreviated dialing is like dialing between extensions in a PBX. The switch supervisor classmarks each switch programmed for the 3/4-numbering plan for either abbreviated or not abbreviated dialing. A switch classmarked for the 4/3-numbering plan is automatically classmarked for abbreviated dialing. Abbreviated dialing enables a subscriber to place a call by dialing only the last three or four digits of each others subscriber's address on the same switch. The number of digits depends on whether the switch uses the 4/3- or 3/4-numbering code, To call other switches, the caller must prefix the 7-digit or 10-digit address with a nine.

Fixed directory. The AN/TTC-39 provides the fixed directory list feature to both roving subscribers and roving units. There are two lists; a fixed directory subscriber list (FDSL) and a fixed directory unit list (FDUL). The processor retains the fixed numbers for both types of list. When the calling subscriber dials, the switch looks to the auxiliary routing table, translates the fixed number to a normal directory number (up to 7 digits), and applies normal routing procedures. The caller dials one constant 7-digit number (the first 2-digits are 99) regardless of the subscriber's location within an area code. The format for FDSL numbers is 99 PXJXZ (P = 7 through 9, X = 0 through 9, J = 7 through 9, and Z = 0 through 3). The FDSL consists of 3,400 entries, In the format for FDUL numbers the first 2 digits after the 99 refer to the unit and the remaining three to a specific party within the unit. They are in the form XXIXX (X = 0 through 9 and I = 0 through 6). The FDUL consists of 100 entries.

Call transfer. This feature enables an operator or a subscriber classmarked as such to transfer calls automatically to another AN/TTC-39 subscriber's telephone. Call transfer is not available to data subscribers or to line-hunting group members. Only 40 subscribers per switch can use this service at any one time. It applies only to incoming calls. Call transfer can be initiated only by subscribers with keypad telephones.

Data service. The AN/TTC-39 is designed to provide real-time data switching to both analog and digital telephone subscribers within their own communities. Terminal equipment includes teletype, paper tape and card devices, mobile data terminals, weather facsimile, low speed video scanners, printers, magnetic tape terminals, and imagery devices. To avoid signal degradation, an analog data subscriber should request analog required service by keying 3C as an access code. Digital subscribers need not key the access code. If a data call between an analog subscriber and a digital subscriber at another switch is attempted, the circuit switch returns an error tone.

Commercial office. Each DTMF subscriber may be permitted direct access to a commercial network (ATS entry). If routing has been assigned (ACN worksheet), the access code 5C is dialed to acquire the commercial network dial tone. (See the subparagraph on commercial network access in paragraph 4-4.)

Other classmarks.

Other classmarks deal not so much with subscriber services as with network and switch operations. Among these are loop and trunk classmarks such as spill forward, switch operating channel rate (16 and 32 kbs), digital trunk group channel rate, data service, data equipment type, secure call privilege, security required, key net identification (long loops), and satellite link identification. Some of the more significant of these are listed and described below:

- Zone restriction/call inhibit.
- Traffic load control.
- Secure call/key conversion.
- Glare.
- Automatic intercept.

Zone restriction/call inhibit. The circuit switch uses classmarks to prevent classmarked terminals from completing calls to certain restricted zones. Each switch has eight zone restriction tables. Two of the eight contain up to 101 entries each. The rest contain up to 33 entries each. You must designate each of the zone restriction tables as either permissive or restrictive. If permissive, a terminal classmarked for that table can call only the listed codes. If restrictive, the terminal cannot call the listed codes. Classmark trunk or loop terminations either for one of the eight zone restriction tables or for global. Those with global classmarks can call anywhere. The AN\TTC-39 returns a recorded announcement to any attempt to call a restricted zone. This is applicable to both 3/4- and 4/3-numbering plans. Calls inhibit is like zone restriction except that it prohibits all calls to listed numbers. Each switch maintains a list (local subscribers and PBX trunks) containing area codes that can receive no calls. There are no classmark exceptions. If a subscriber or PBX trunk tries to dial a call inhibit area, the switch returns a recorded announcement.

Traffic load control. The switch can limit calls during high traffic periods to make optimum use of available switching and transmission resources. The switch does this by classmarks assigned to each directly connected subscriber and lower level switch in two ways:

- By restricting access to trunks (transmission resources).
- By restricting access to the switch (switching resources).

When traffic load control is done by trunk restriction, restricted subscribers (and lower level switches such as PBXs and unit-level switches) attempting to make trunk calls are returned a busy signal. These subscribers, however, are permitted local call access. (For purposes of traffic load control, a line(s) from an AN/TTC-39 to a PBX or unit-level switch is considered to be an access trunk that can be classmarked for traffic load control.) When traffic load control is done by call restriction, restricted subscribers attempting to make calls do not receive dial tone. Any one of the following five classmarks (1-5) maybe assigned to each directly connected subscriber and lower level switch to obtain various levels of traffic load control:

Level	***Name***
1	***Most essential (no restriction)***
2	***More essential (trunk restriction only)***
3	***Essential (trunk restriction only)***
4	***Less essential (switch access restriction only)***
5	***Least essential (switch access restriction only)***

The circuit switch automatically activates traffic load control when traffic on trunks and calls to the switch reaches certain preset thresholds. You may also activate traffic load control by setting or changing the preset traffic thresholds through readily changeable software programming. Traffic load control for trunk restrictions (levels 2 and 3) may be implemented independently from traffic load control for switch access restrictions (levels 4 and 5). No traffic load control is imposed on those subscribers and lower switches classmarked for level 1. When trunk traffic restriction is desired, level 3 is implemented first; if additional trunk traffic restriction is desired, level 2 is implemented. Similarly, when switch access traffic restriction is imposed, level 5 is implemented first; if additional switch access restriction is desired, level 4 is implemented. See Table A-6 for a summary of classmarking for load control levels.

Secure call key conversion. In a circuit switched network, a number of cryptonets are established. Each switch uses one or more traffic (switch net) keys for its own subscribers. Key conversion thus becomes necessary to allow subscribers from different areas of the network to establish secure calls. The AN/TTC-39 at the originating end of the call controls the key distribution process so that two subscribers can be provided with the same per call key. This process of key transfer and conversion is covered in detail in FM 24-27A.

Glare. Glare condition occurs when two switches try to access each other at the same time over the same trunk. Without the proper software, neither switch would get access to the trunk. This could result in a lost call if only that trunk were available. Antiglare software will recognize the condition and will assign the use of the trunk to one or the other of the two switches, depending on the classmark. To set this up, enter classmarks into the switch data bases to designate each connected trunk group cluster (TGC) as either ACCEPT (glare) or REJECT (glare). When ACCEPT has been assigned to a switch TGC, that switch prepares to accept the glare signal and will either reroute the call or return a busy signal to the subscriber. When REJECT has been assigned, the switch will reject the incoming glare signal and will proceed with the call it placed on the trunk. Be careful not to assign the same classmark to both switches for the same TGC. Work out glare classmark rules on a network basis. (See paragraph 5-6.)

Automatic intercept. A caller will now and then dial a number that is nonexistent, unassigned, marked disabled, or otherwise unavailable. In these cases the AN/TTC-39 will intercept the call and will inform the caller of the condition via a recorded message. The switch sends calls intercepted from- 20-Hz ringdown subscribers to the operator, who then completes the call. The recorded messages are:

- The number you are calling is not assigned or out of service.
- Area called is restricted at this station.
- Standby for conference.
- Precedence is being downgraded to highest allowed this station.

3-8. Essential User Bypass

The function of the EUB is to make sure that priority users retain service even if both switch CPUs fail. This feature uses a bypass function to transfer up to 60 designated digital subscribers from their home switch to a distant AN/TTC-39 switch. The switch EUB selector can prestore up to 60 from/to addresses in its random access memory. Use the assign and display EUB configuration (AEU) command (Figure 4-35) to load the EUB connection information from the CPU into a random access memory in the EUB selector. The VDU will display this information. When needed, you will activate the EUB function from the EUB control position of the patch and control panel. Upon activation, the EUB selector transmits the 60 prestored connection commands. The EUB selector can also accept manual from/to connection addresses. Key these manual addresses via the EUB control position of the patch and control panel. Bear in mind, however, that the maximum number of designated digital EUB subscribers, both manual and prestored, cannot exceed 60. You can also designate analog telephones to be essential users (EU). However, in order to activate these, you must strap them through the switch manually just as you would on a patch panel. You must also use analog trunks because the conversion capability is bypassed. Each AN/TTC-39 can accept up to 60 subscribers from two separate failed switches.

When setting up a communications network, you must take great care in assigning EUB subscribers to their backup switches. The number of trunks between the two switches limits the number of bypass subscribers that a distant switch can accept. You must also instruct distant switch personnel to enter your list of EUB subscribers into the tables of their switch. To do so, will use the ARB command (Figure 4-54). In addition, the distant switch must plan for the use or reuse of subscriber functions (classmarking), including rekeying actions, to accommodate your bypass subscribers. This is because your users will also become subscribers at that switch.

3-9. Signaling and Supervision

The AN/TTC-39 employs a full range of signaling and supervision modes to transfer call and network-related status, control, and information bearing message among terminals, subscribers, and switching nodes. Supervision refers to line status and control-type signals like off-hook, dial tone, ringing, and ringback. Signaling refers to information bearing signals, such as the addresses of called and calling parties. These signals are call-related. They initiate, set up, and complete calls between subscribers connected to the circuit switch. The switch also uses network-related signals. These perform such functions as maintenance testing, equipment failure identification, and periodic routine checks. See Table 3-5 for a summary of the AN/TTC-39 signaling modes and of the interface equipments compatible with these modes. In paragraph 4-2, the subparagraph on analog and digital call processing describes how signaling is used in typical call processing sequences for analog and digital subscribers,

The AN/TTC-39 uses two basic types of signaling and supervision modes: in-band and out-of-band. In-band signaling carries control and status information into the same channel (or frequency bandwidth) that carries the voice (or message) information. Out-of-band signaling uses a channel (or frequency bandwidth or time slot allocation) separate from the voice (or message) channel. This band transmits only control and status information. For analog transmissions, in-band signaling uses either an SF or DTMF within the nominal 4-kHz voice bandwidth. AN/TTC-39in-band digital signaling inserts special digital signaling codes into the same channel that carries the digital voice (or message) bit stream, It then uses digital logic in the receiving terminals to decode signaling information. The switch also uses digital in-band trunk signaling (DIBTS). A DIBTS buffer provides in-band signaling between the AN/TTC-39 and subscriber switches such as the SB-3865. Out-of-band analog signaling in the AN/TTC-39 uses one designated trunk of an analog trunk group to carry signal and control data for trunks in that trunk group. This signaling channel operates at a 2.4-kbs rate. Outside the switch, the signal is combined with other members of the transmission group and is then transmitted to the distant switch. This is known as CCS or as common channel interswitch signaling. For the AN/TTC-39, digital out-of-band signaling is similar to the analog CCS.

3-10. Magnetic Tape

The AN/TTC-39 uses magnetic tape cartridges to store data, operational programs, and diagnostic and maintenance routines. Two cartridges contain scratch tapes for temporary storage. The program library tape contains the OLCOP programs and the others contain off-line diagnostic and maintenance programs. Two MTTs may be used to load the programs into the processor memory. Both communicate with the central processor units through the MTC. Either MTT can be selected to perform storage and retrieval functions. Data base information directly entered via the VDU keyboard and stored in memory can be written on one of the scratch tapes. This tape is then referred to as the current data base tape. This tape may be used to load and/or reload the processor in restoring operation in the event memory is lost. When on-line changes are made to the database, you can use a scratch tape to update the database information, keeping the data base content current and on tape.

3-11. Satellite Connectivity

All AN/TTC-39 satellite trunk connections must be classmarked to provide variable time delays consistent with trunk lengths. Each switch through which a call passes adds a time delay path penalty to the outgoing trunk. Place echo suppressors in the circuit when the total delay path penalty exceeds 40 milliseconds. (The time delay path penalty classmark is a programmable item from 0 to 40 milliseconds in 5-millisecond steps.) Because of their extreme path lengths, satellite trunks require echo suppressors to setup clear connections. You can mark all outgoing trunks as either satellite or nonsatellite (Y or N). (See Figures 4-30 through 4-32.) You can also specify the maximum time delay path penalty (40 milliseconds). Each switch adds its own satellite path delay penalty to all outgoing satellite trunk calls. The total penalty reflects the number of satellite trunk links involved in the connection.

Certain analog switches, like the AN/TTC-38, cannot provide their own satellite path delay penalty classmarks. This creates a problem when calls from such switches pass through the AN/TTC-39. In such cases, the AN/TTC-39 must increase the satellite trunk link count by one to account for the incoming satellite trunk link. The switch then forwards this signaling data item to the next switch. The switch/supervisor can control the maximum number of tandem satellite links through which a connection may be routed. The choices are 1, 2, 3, or unlimited. If the supervisor does not set a threshold in the routing table, the switch automatically sets an unlimited threshold.

3-12. Operator/Machine Interface

The operator/machine interface consists of peripheral equipment by which the circuit switch personnel communicate with each other, with subscribers, and with the central processors. The AN/TTC-39 uses the following equipments for the functions:

- A call service position.
- The digital subscriber voice terminal (KY-68).

- Telephone set (TA-838).
- A teletypewriter (AN/UGC-74).
- A control and alarm panel.
- An intercommunication station (LS-147).

Digital subscriber voice terminal (KY-68).
The dual shelter circuit switch uses two KY-685. The single shelter circuit switch uses one. In the dual shelter switch, one KY-68 resides in the control shelter and one in the switching shelter. The KY-68s provide secure voice communications for the operator.

Intercommunications system.
The Intercommunications System LS-147/FU for the circuit switch consists of a nonsecure system of two or three networks. These networks are as follows:

- Local switch net. Only the dual shelter switch uses this net. Terminals in the two shelters connect to each other through the intershelter cabling.
- Colocated switch net. There is a terminal in each switch shelter. These connect to each other through the intershelter cabling and connect to other colocated circuit or message switches through the outside plant.
- Nodal control net. There is a terminal in each switch shelter. These connect to each other through the intershelter cabling and connect to nodal control through the outside plant.

Two intercommunications systems are employed for use on the three networks described above. This is done by using an applique which permits the use of one intercom on any of the above two nets. Normally, the applique provides a switched connection to one of the two terminating networks. When activity in the form of electrical signals is detected on the unselected network, an alarm sounds in the applique of the intercom system. This alarm alerts the operator to switch the network selector on the applique to the other net. Interface to the outside plant is through the SDSG and TDSG patch panels and the SEPs.

Visual display unit/keyboard.
The VDU/KB consists of a visual display monitor, a keyboard, and a visual display controller. The VDU/KB is the primary operator/machine interface with the CPG. The VDU/KB uses a menu-type display of all mnemonic commands along with their meanings. From this, the operator can select the proper commands. Software responds to a command with a set of questions along with a set of fixed fields for the answers. Based upon the answers, the VDU/KB may display additional questions or may display additional data. Below each question is a set of possible responses. The operator selects from a range of choices and can choose the information elements needed from a set of some 60 interactive displays.

The software checks each response to determine that it is valid and that it has no adverse ramification. To be valid, a response must be correct in terms of field size and parameter range. A ramification check looks at all the possible consequences of a data entry. If an entry would cause discrepancies in the data base, the switch will void the command, For each command the switch runs a comparison check for compatibility with existing data.

Teletypewriter.
The UGC-74 TTY is both an input and an output device. It consists of a keyboard for data entry and a page printer. Each shelter has one TTY. Its prime user is the supervisor, and its prime use is for switch maintenance. The TTY also provides hard copies of all changes to the data base, of all detected faults, and of all traffic monitoring data. The page printer can print at 60 characters per second and uses an 8-level ASCII code (seven information bits, one parity bit). When performing maintenance, the supervisor uses the MY to request special exercise test routines from the processor. The software accepts a limited number of special inputs from the TTY keyboard and issues a specific set of messages as hard copy output.

Call service position.
Each circuit switch contains one local CSP. It can also have up to three remote CSPs at a distance not greater than 100 meters from a shelter. The electrical designs of the local and remote CSPs are the same. They differ only in that the remote positions are in cases while the local position is mounted on a table top. The CSP assists subscribers who are having trouble making calls. It also serves subscribers who do not have dial or keyset telephone instruments. Through the CSP, the operator can provide the following specific services:

- Help complete local calls.
- Give directory and routing information.

- Respond to trouble.
- Help complete trunk calls.
- Verify busy signals and numbers that fail to answer.
- Establish conference calls.
- Respond to verbal precedence and preemption requests.
- Hold calls.
- Split calls.
- Establish secure calls.

The CSP interacts with the SDSG and TDSG to provide signaling and voice access to the switching matrices. The CSP voice ports can terminate on either the SDMX or the TDMX, but in both cases subscribers from the other matrix can be served through intermatrix units. The CSP accommodates voice communications through a three-party bridge. This enables the operator and two subscribers to hold a three-way conversation. Most calls to the operator involve two steps: First, subscribers request operator intervention and go into the queue. Then the operator uses his push buttons to bring the calls out of the queue and to deal with the request. There are three basic ways in which subscribers can get the services of the operator. Two of these involve placing the subscribers in a queue.

The standard method for reaching the operator is to simply go off-hook and dial 0 (following precedence, if desired). The queue has a capacity of twenty calls and is shared by up to four CSPs. If there is room, the calling subscriber goes into the queue at the keyed precedence level and receives a ringback until the operator answers. If there is no room and preemption is not possible, he receives a busy tone. To answer a call in the queue, the operator simply depresses the QUEUE ANSWER push button. Certain subscribers, such as 1600-Hz and 20-Hz ringdown lines and trunks and TA-312 subsets, may lack a dial-up capability. If they are classmarked for CB, these subscribers go into the queue automatically when they go off-hook. Each CSP has a unique directory number. By dialing that number (following precedence, if desired), a subscriber causes the ANSWER push-button indicator (PBI) at the operator's position to flash. To answer, the operator depresses the ANSWER PBI.

Control and alarm panel/control transfer logic.

The CAP/CTL panel provides a visual summary of current status and configuration of the system. The CAP portion is a summary status display of the circuit switch. The CTL portion has switches to manually select the processor/controller/peripheral configuration. Another section on the panel shows the status of the redundant processors. The CAP/CTL provides the following functional capabilities:

- Automatic initial start-up processor selection.
- Manual call processing initiation.
- Automatic processor switchover control and processor status indication, both visual and audible.
- Automatic initial start-up controller selection.
- Automatic switchover and configuration control for the SCGs, COMSEC controllers, SBCs, and controller status indicators, both visual and audible.
- Manual controller configuration control.
- Automatic and manual selection control, plus visual and audible status indications for the peripherals.
- Subsystem summary fault indications, both visual and audible.
- System traffic load restriction, both visual and audible.
- Alarm acknowledge and test capabilities.
- Control and alarm panel lamp test.
- Processor to processor interface on/off indications and manual selection control.

3-13. AN/TTC-39A Capabilities and Functions

Capacities.

Table 3-4 is a summary of the capacity of the AN/TTC-39A and a comparison with the capacities of the 300-line and 600-line AN/TTC-39 switches. Note the substantially increased digital capability and the lower analog capability.

Channel reassignment function.

This new capability adds an electronic patch panel to allow the supervisor to combine and decombine channels/trunks. Both single channel

Table 3-4. Capacity comparisons between AN/TTC-39 and AN/TTC-39A.

ITEM	AN/TTC-39A	300-LINE AN/TTC-39(V)3,5	600-LINE AN/TTC-39(V)2,4
Analog/Digital Groups (Matrices)	1/2	2/1	3/2
Total External Terminations	744	391	662
Total DTG	30	4 (8-144 Channels)	8 (8-144 channels)
TEDs	15	4	6
Single Channels			
Digital	144	60	120
Analog	96	240	360
Total	240	300	480
SDMX			
External Terminations	96	240	360
Total Terminations	156	312	468
TDMX			
External Terminations	648	151	302
Total Terminations	960	320	576

to single channel and group to group reassignments can be done. The patching is made through the TDMX and data bases can be created on-line or off-line. Several new commands are used to assign the channel reassignment function and to display transmission groups, channel reassignment, and individual channels being reassigned. (See Chapter 4.)

Engineering orderwire.

Both digital and analog orderwire capabilities are added. Orderwire capability can be used on all 30 DTGs. Twelve 16-kbs DVOW can be used on a diphase DTG at 256 kbs or higher. Six AVOW can be used on diphase and dipulse DTGs from 72 to 4608 kbs. There is added an orderwire control unit to connect the AVOWs and DVOWs to the DTGs. One KY-57 allows orderwire encryption. One of the DTGs can carry a group of 12 multiplexed 16-kbs DVOWs for connection to a CSCE.

Automatic frame synchronization.

If the processor fails to synchronize a DTG, frame synchronization will be initiated automatically. This eliminates the manual push buttons which were on the TDSG patch panel in the AN/TTC-39.

Processor-controlled strapping.

This new capability reduces the number of printed circuit boards (PCB) that have to be strapped manually. The functions which were most often manually strapped are now done electronically by the processor. The cards involved are:

- Group modem.
- Transmission group module.
- Nine channel multiplexer/demultiplexer.
- Time division memory module.
- Trunk signaling buffer.

Processor-controlled strapping is done at the VDU by using the commands assign and display switch initialization (ASI), assign digital transmission group (ADT), assign trunk group cluster (ATG), assign on-line diagnostics (AOD). These commands were already used in the AN/TTC-39. (See Table 4-21.)

Analog line conditioning.

Line conditioning for analog circuits is provided by using an analog line conditioning patch panel. Gain and attenuation can be applied to as many as 24 circuits at onetime. Equalization can be applied to 2 circuits at one time.

Analog DTG interface.

A TDMX interface is provided for analog AC supervised loops using a DTG. This allows up to 40 TA-341s, TA-838s and TA-720s operating in the 4-wire, local battery mode, using DTMF signaling to use CVSD modulation through a DTG traffic channel. DTMF receivers and the digital signal generator are used for signaling.

SECTION II. CONTROL AND DIAGNOSTICS

3-14. Switch Control

Switch control involves functions that manage and impose effective control on the AN/TTC-39. This includes the surveillance capability of the switch, which provides statistical information on the overall use of the system to planners and supervisors at all levels. It also includes the technical control features of the switch. Finally, control deals with the relationship of the switch to the nodal and system facilities controls; with the reconfiguration of the switch in response to tactical situations or failures; and with the communications between the supervisor, the operating positions in the shelter, a colocated message switch, and nodal control.

Metering.

The AN/TTC-39 has a built-in metering capability that monitors selected loops and trunk groups. This tool provides the switch performance information needed to maintain top performance. The assign traffic metering (ATM) command enters the traffic metering requirements into the data base. Paragraph 4-6 describes the data entry commands for the switch and the procedures for data input. The switch can monitor given loops and TGCs for periodic traffic reports. You can select the time interval between reports. To make sure that all the desired data elements get into the data base, you should maintain detailed records. These records can be in worksheet form. They must address the following data base elements:

Loop number = A-BB-CC or DD-EE. This identifies the loop's matrix address. The numbers must be compatible with entries in the assign terminal services (ATS) and the ATG worksheets. (See paragraph 4-6 and Tables A-3 and A-4.)

TGC number= XXX (1-127). (See ATG worksheet.)

Report interval. One to four digits specify the interval between reports in minutes. The switch generates reports automatically at the specified time. Use the design frequency for network reporting (AFR) worksheet to assign these intervals for each type of report.

Type of Report. (See below.) Use worksheets (paragraph 4-6) to help you gather this information. All trunks and switched loops in the AN\TTC-39 can be metered. Traffic metering begins at the switch supervisor's console. The supervisor uses SOPs, plans, and orders for guidance to identify the loops and trunks to be metered. The planner or CSCE will provide specific direction. There are two methods for acquiring the data from traffic metering. One involves automatic printing at fixed intervals. In the other, the supervisor requests specific printouts. The automatic method is set by entering metering requirements and time intervals into the data base via the VDU. In the other method, the supervisor specifies the trunk group or loop to be metered and then selects the type of metering he wants, He then initiates the metering using the VDU. The circuit switch can meter 10 subscriber loops and 28 trunk groups at one time. Report intervals can be set for 15,30,60,240,480, or 1,440 minutes. The AN/TTC-39 makes eight traffic metering reports available to the supervisor. Below are descriptions of each. The R number identifies the report code used on the VDU.

- Operator report (R3). This meter counts each time an attempt is made to call the operator. It also counts each time a call is removed from the operator queue and connected to the operator. It does not count calls initiated by the operator or extended for a subscriber.
- Total calls by precedence (R4). The number of outgoing calls by precedence is counted. The meter also counts the number of all trunks busy, by precedence, for each TGC. This is the number of times a TGC cannot complete a call offered over an idle trunk within the TGC. It counts more than once per call if the condition exists at primary and alternate TGCs.
- Trunk group cluster status (R5). The average number of trunks busy per TGC is counted by precedence. The meter also counts total calls completed per TGC and primary route attempts. The latter is for each time an attempt is made to route a call over the TGC as a primary route.
- Calls preempted per TGC (R6). This meter counts by precedence each time a trunk in a designated TGC is preempted.
- Digital transmission group error rate (R27). This reports the approximate bit error rate for up to 12 DTGs.

- Total traffic count (R44). Attempted calls are counted for these categories: network to network, network to subscriber; subscriber to network; and subscriber to subscriber. For example, a network-to-network call is a call coming into the switch over a trunk and going out over a trunk.
- Loop report (no R-number). This meter counts calls originated by designated loops by precedence.
- Call offered to a remote switch (R47). This meter is not yet active.

Technical control.

The term technical control or tech control usually applies to a central facility through which all or most circuits pass. We need technical controls for testing, patching, troubleshooting, circuit conditioning, status reporting, and other technical management functions. Some of these functions can be performed at the switch or at the transmission equipment, but the more complex CE systems are likely to need central facilities. The AN/TTC-39 is designed to work with such facilities.

Automatic tech control. This concept of technical control is a basic element of the CEMS. Review paragraph 1-2 to see how the nodal control performs this function. Bear in mind that the equipment for automatic control will not be available for some time. In the meantime you will use manual equipment. This will continue even after many functions become automatic. This also means that certain capabilities will not be available. You will have to plan for this and to understand these limitations, Paragraph 5-3 shows how to use some of the tech control facilities.

Manual tech control. With the AN/TTC-39, you will probably use the AN/TSQ-84 communications technical control center. This equipment can interface, patch, and test analog circuits only. The AN/TSQ-84 cannot interface with the digital group multiplex capability of the AN/TTC-39. (See paragraph 5-3 for further explanation.) These limitations will affect your planning because they restrict the number of digital circuits and the connectivity to the switch with other AN/TTC-39s. You can control individual digital circuits of the AN/TTC-39 through the AN/TSQ-84, but you cannot control digital trunk groups. They feed directly to the transmission systems and the directly-connected multiplex without providing the ability to monitor, test, or patch. Under this arrangement, the switch supervisor must coordinate these circuits. He must also spend more time working with the tech control.

Equipment configuration.

Chapter 2 showed how the capabilities of the AN/TTC-39 vary according to the number of analog or digital modules it contains. This flexibility is consistent with the change to all digital systems spelled out in Chapter 1. The switch also can vary according to the kinds and numbers of circuit cards (or PCBs) in use. These PCBs include LTUs, adapters, scanners, interface devices, controllers, senders, receivers, drivers, MUX/DEMUX units, buffers, and other support electronic components for the switch. Paragraph 4-6 describes the circuit card inventory that you will make when first using the switch. All switches may not have the same number of cards. They may also have different spares due to repairs and breakdowns. Thus, each switch has its own unique configuration of equipment and cards within the specified limits. Anything that changes the capabilities of the switch is a reconfiguration. All this is significant because such resources as circuit cards may be limited. You may have to apply them throughout a network in ways that reflect the needs of the network. For example, a switch serving a large headquarters may need more LTUs than a tandem switch. You may need to reconfigure both switches to provide enough cards (including spares) for both.

The AN/TTC-39 is flexible enough to permit this rearrangement of equipment. In addition, certain card nests can accept several different kinds of cards. This depends on the kinds of interfaces involved and on the sizes of the signaling and MUX groups. (See TM 11-5805-681-12 for further information on card nest locations and options.)

3-15. Diagnostics

Diagnostics enables the AN/TTC-39 to refine fault isolation to a card or card group. The processor can evaluate the switch either automatically on a periodic basis, in response to a fault indication, or on demand.

The maintenance concept for the AN/TTC-39 is to allow the maximum on-site repair with available skills, tools, and test equipment. This requires a family of spares that can be carried without compromising mobility. Organizational personnel will fault isolate to a least replaceable unit and will replace the faulty unit from organizational spares.

For switching logic, diagnostics and maintenance aids will provide fault isolation to the card level. Not covered are faults involving the central processor and peripheral device controllers. All switching logic is subject to workable repair by replacement. Diagnostics will also refine fault isolation for failures of the central processing subsystem. The maintenance concept specifies additional aids to continue rapid fault isolation to the card level. These include the fault catalog, the module test set, and the VDU/KB. The switch supervisor conducts most of the initiated diagnostic testing on the circuit switch via the VDU/KB.

Maintenance and diagnostic software.

Fault isolation and repair activities will involve a combination of on-line maintenance and diagnostic sofware and built-in test equipment (BITE). The supervisor's access to the software depends on the function to be performed and on the frequency of use of each program. The programs reside in off-line memory storage on magnetic tape. They can be recalled to main memory (core) storage when needed. On-line maintenance involves detecting and isolating circuit switch fault conditions and repairing or restoring malfunctioning equipment. Again, the two basic parts of the process are the BITE and the diagnostic software. BITE is an integral part of the circuit switch used to monitor and detect equipment fault conditions. It consists both of specific equipment used for test purpose only and of general circuitry integral to other functional circuit switch elements. Software on-line diagnostic routines work in conjunction with the BITE to periodically assess the status of the system and to detect and isolate faults. The supervisor can augment the periodic tests by using the VDU/KB to request special or operator indicated testing.

Visual display unit/keyboard.

The VDU/KB provides the primary interface between the switch supervisor and the processor. The supervisor uses it for data base updates, system status reports, and as a maintenance aid in requesting special maintenance and diagnostic routines. These routines include:

- Display of failure responses to software initiated tests.
- Initiation and display of supervisor initiated tests.
- Initiation and display of all resets and switchovers.
- Display of call processing fault messages.
- Display of major equipment status.
- Request and display of traffic metering.
- Erasure of computer memory during node overrun.
- Request for data base transfers between core and magnetic tape.

The supervisor uses the VDU\KB to assign, change, delete, and display the switch data base. The VDU/KB also handles requests to execute special on-line diagnostic routines, to alternate system time-outs, and to impose traffic load control. Its operation involves a menu with question and answer type fixed format displays. The menu displays all the mnemonics along with their meanings. This makes it easy for the supervisor to select the proper command mnemonic. When the supervisor enters a command, software responds with a set of questions along with a set of fixed fields for the answer. The switch supervisor has access to equipment loop, trunk, and group status indicators through his VDU and automatic print-out.

VDU/KB initiated tests.

The switch supervisor uses the VDU/KB to request specific tests to aid in performing fault isolation. To initiate these tests, use the AOD command. A list of all tests, resets, switchovers, and the test numbers associated with each AOD command can be requested and displayed. Tests are requested by entering the AOD command at the VDU\KB. When the command is entered, a list of tests is displayed on the VDU screen. If the desired test is listed on the screen, you can run it by entering the AOD command and the proper test number. If the testis not listed on the initial AOD screen, other screens with test listings can be obtained by keying the NEXT key. Repeated keying of NEXT will display all the screens with the list of all possible tests, resets, and switchovers for the AN/TTC-39.

For certain tests, ancillary equipment may be required. After the test is complete, the software will display its results. Figure 3-4 shows the general format for display of test results. All tests result in one of the four following states:

- Unit good.
- Unit failed.

```
UNIT n TESTED BY EXTRA q, FAILED e

ALL VARIABLES ARE AS FOLLOWS:
    n = UNIT NUMBER OF THE PIECE OF EQUIPMENT SPECIFIED.
    e = ERROR CONDITION IDENTIFYING THE TYPE OF FAULT.
    q = UNIT NUMBERS OF ANCILLARY EQUIPMENT OR EQUIPMENTS THAT HAVE MORE THAN ONE
        POSSIBLE UNIT NUMBER.
```

Figure 3-4. Test response display format.

- Unit busy.
- Unit undefined.

Test results of good and failed are self-explanatory. If the equipment that you want to test is in use, the test will not run. The software will then display a busy message. If you try to test apiece of equipment that does not exist or is out of range, the software will display an undefined message.

Circuit switch tests.

Through the VDU/KB, you can test circuit switch equipment in either active or standby modes. You can also test via either the control shelter TTY or the switching shelter TTY. The TTY in both shelters connects with the circuit switch processors. There are three types of circuit switch tests.

- Periodic initiated tests. These tests run on a scheduled or automatic basis to meet availability requirements. You can also initiate them via the VDU/KB or TTY.
- Fault initiated tests. Software runs these tests in response to a detected fault.
- Switch supervisor initiated tests. The switch supervisor initiates these tests manually via either VDU/KB or TTY.

Table 3-5 provides a complete list of these tests. Any software initiated test will provide a VDU output only when the test results indicate a problem condition. There will be no display if the test results are positive. Any fault display will appear in the protected region of the VDU.

TTY operation.

You can request all maintenance and diagnostic commands, as well as the assign equipment in/out-of-service command, from either the control shelter TTY or the switching shelter TTY. The control shelter TTY will log all failure responses. The VDU and TTY output messages are essentially the same. However the TTY output will contain the time and date the message is logged. Both the VDU/KB and the TTY interface with each of the processors via one channel of an input/output extender. You can switch the TTY manually from one redundant processor to another via a select switch located on the control and alarm panel. The TTY is the main device for logging the various messages that must be displayed to the switch supervisor.

SECTION III. INTERFACE

3-16. Connections to Subscribers

Connections to subscribers and to other switches make a switch part of a network. An interface consists of the electrical and mechanical connections and the procedures necessary to make these connections functional. As the planner, you must understand the conditions under which the interface can be made. The physical connections to the switch are through multipair cables, coaxial cables, and fiber optic cables. The electrical interface is more complicated. Switches connect to subscribers and to other switches by way of circuits (which are called channels), lines, or trunks. Below are functional definitions of these connections:

- Loops – single channel connections to subscribers (may be grouped for transmission purposes).
- Trunks — channels between switches.
- Trunk group cluster — a collection of both analog and digital trunks between two switches.

Table 3-5. Circuit switch tests.

Periodically Initiated - Scheduled, but may also be initiated at the VDU/KB or TTY. (Time periods are indicated in parentheses.) 1. Analog Receivers (6 hours). 2. Analog Scanner Test Cards (24 hours). 3. Auxiliary Sender/Receiver (24 hours). 4. ASSP Test Card (24 hours). 5. CBUs (five-party - 6 hours; 30-party - 24 hours). 6. DC Scanner (24 hours). 7. Digital Receivers (6 hours). 8. Digital Scanners (6 minutes). 9. DSG (6 hours). 10. KG-82 (6 hours). 11. KG-82 back-to-back (6 hours). 12. KY-68 (6 hours). 13. KY-68 Loop Test (6 hours). 14. DTMF/MF Senders (6 hours). 15. EUB (24 hours). 16. IMU (6 hours). 17. Message Processing Test (6 hours). 18. RMU/DTMF Receiver (6 hours). 19. Remote Special Device DEMUX/Fault MUX (6 hours). 20. SDM (driver error detection - 24 hours). 21. Switching Controller Group (24 hours). 22. TDMX (misrouting/verification - 40 minutes; fault logic - 24 hours). 23. COMSEC Controller (120 seconds). 24. Tone Generator (24 hours). 25. Trunk (continuity test - 6 hours). 26. Spare Digital Scanner (24 hours). 27. Spare TDMM. 28. DIBTS Buffer. 29. DIBTS Trunk. 30. DNVT. 31. Signaling Buffer Controller (120 seconds).
Fault Initiated - Run by software in response to a fault. 1. PPI and I/O Errors. 2. SDMX. 3. TDMX.
Switch Supervisor Initiated - Manually initiated at the VDU/KB or TTY by the switch supervisor 1. CSP. 2. CAP. 3. DTG. 4. Group Modem. 5. Transmission Group Module. 6. TSB. 7. CTL. 8. SDMX. 9. TDMX. 10. Peripheral Controllers.

- Digital transmission group — a set of trunks and trunk group clusters which share the same transmission, facility.
- Interswitch trunk — trunk (or trunk group cluster) between the AN/TTC-39 and a switch using CCS.
- Extraswitch trunk — trunk (or trunk group cluster) between the AN/TTC-39 and a switch not using CCS.

Planning for or installing a switch in a network involves several major tasks. You must connect the proper equipment to each channel or line. You must also program the switch to recognize the characteristics of each of these lines or channels. In addition, you must setup the correct circuit card configuration and card strapping and prepare the switch data base. Each of these tasks requires a knowledge of interface procedures, capabilities, and limitations. This section contains detailed descriptions of the AN/TTC-39 interface. It also describes the signaling, supervision, and special characteristics of these interfaces. Finally, it briefly discusses interface security.

3-17. Trunk and Telephone Interface Equipment

The AN/TTC-39 works with a wide variety of switches, converters, and telephones. This paragraph describes the equipment used within the switch to process information.

Analog access.
Analog lines and trunks end in an LTU before they are routed to the SDMX. These units provide the SDMX with standard control signals derived from various different line characteristic signals. There are five types of LTUs.

- NW — normal wideband for direct current or tone supervised loops or trunks.
- CB — common battery supervised 2-wire loop or trunk.
- 20 — two-way 20-Hz ringdown on loops and two-way 20-Hz ringdown with idle tone on trunks.
- 1600 — two-way 1600-Hz ringdown with idle tone on 4-wire trunks.
- AV — 4-wire overseas AUTOVON telephone loops with DTMF signaling and DC loop supervision.

Loops or trunks that use 2600-Hz single frequency, DC closures, or E&M supervision require special adapters. These adapters convert special signals to signals that the NWLTU will accept. There are three types of special adapters.

- SF— single frequency (2600-Hz) supervision and control adapter.
- DC — direct current closure adapter that provides access to 2-wire commercial central offices and PBXs.
- EM — E&M adapter for use on 6-wire trunks to PBXs and commercial central offices.

Analog signaling and supervision.
The typical tactical network channel contains the signaling and supervision features needed to complete a call over analog lines and trunks, The AN/TTC-39 has a special feature that enables suitably equipped switches to exchange signaling and supervision over a separate analog signaling channel. This channel operates at 1200 baud. The term for the function is common channel signaling.

Digital access.
Digital trunks and subscriber loops terminate on the digital TDMX. The signals come into the AN/TTC-39 in a digital stream or through an individual diphase or CVSD modulated subscriber loop. There are three types of group modems that can connect these signals:

- DIGPM – The diphase group modem transforms a diphase signal to a digital baseband bit stream. It is used for 72 channels or less.
- DISGM — The diphase supergroup modem also transforms a diphase signal to a digital baseband bit stream and vice versa. It is used for channel modularities of 128 and 144.
- DPLSM — The dipulse group modem is used to interface with existing (pulse code modulation) multichannel transmission equipment.

There are also two types of loop devices that are used for digital access:

- DILPA — The diphase loop modem A transforms a 4-wire full duplex diphase modulated signal (from a subscriber with a digital terminal) to a digital signal and vice versa.
- CVSD – The continuously variable slope delta unit provides 4-wire, full-duplex interface for analog subscribers entering the digital switching group.

Digital signaling and supervision. Digital signaling and supervision consist of digital signals either mixed in with the information bits (in-band) or carried on a separate channel (out-of-band). There are three signaling and supervision types:

- DIBTS – digital in-band trunk signaling controlled by a buffer. DIBTS provides in-band digital signaling and supervision between the AN/TTC-39 and a subscriber switch such as the SB-3865.
- CCS – common channel signaling using a separate subchannel in a digital transmission group. CCS provides signaling and supervision information for TGCs.
- LOOP — digital in-band signaling for a loop by means of digital code words in the data stream.

3-18. Switch, Trunk, and Telephone Line Interface Table

Information on line and trunk interface equipment characteristics is very important to planners and operators. Table 3-6 summarizes and tabulates this information. It also presents an overall picture of all the equipments and services that the AN/TTC-39 supports. The table shows the equipments involved in planning the initial design or in making additions after a switch is in use. Below is a key to the table headings:

- EQUIPMENT OR SERVICE. Table 3-7 gives nomenclatures.
- SIGNAL AND SUPERVISION OPTIONS. These are variations normally requiring a separate assignment of terminal equipment type.
- TYPE. This refers to the assigned terminal equipment type. These are type numbers assigned to equipments or services. The numbers inform the switch of the line or trunk characteristics of the equipments/services. (See Table A-1.)
- ADAPT. This refers to the adapter required, if any.
- LTU. This identifies the LTU to be used.
- SIGNAL. This identifies the type of digital signaling scheme.
- MODEM. This identifies the modem access.

Use this table to complete the planning and the data entry worksheets. Figure 3-5 will help you use it. This figure illustrates eight (A through H) interfacing schemes. These represent the most common connections of loops, trunks, and switch equipment. The relationships of each to the table are as follows:

A - Telephone and local net radios that can be routed directly to the switch via junction boxes, such as J-1077/U. These connections require no adapters or interface devices.

B - Switchboard and switched trunks and access lines that require no special adapters. These are normally routed to the switch from the nodal technical control. Table 3-6 uses a blank in the column labeled ADAPT to indicate these.

C - Switchboard and switched trunks and access lines requiring special adapters. These have an entry in the ADAPT column of Table 3-6.

D - An analog trunk to and from another AN/TTC-39 or any switch using CCS. (See note 3 of Table 3-6.)

E - Analog telephones and local net radios routed directly to the switch with access to the TDMX. The MODEM column of Table 3-6 shows these as CVSD.

F - Analog loop and access lines accessing the TDMX through a technical control. Once again, the MODEM column of Table 3-6 shows these as using a CVSD modulator in the switch.

G - Digital telephones using diphase modulation transmission to enter the switch, The MODEM column of Table 3-6 shows these as DILPA.

H - Digital trunks using the group modem to enter the switch. These are shown in Table 3-6 as digital group or supergroup modems (diphase or dipulse).

The cable or wire shown in Figure 3-5 is WD-1 field wire, WF-16 field wire, WM-130 cable, CX-4566 cable, or coaxial cable, as appropriate. The LTU column of Table 3-6 shows the type of line termination unit required. The TYPE shown in Table 3-6 is the classmark number the switching system uses to identify the line or trunk. The

SIGNAL SUPERVISION OPTIONS column shows why there is a change in classmark for different trunks running from the same switch.

3-19. Communications Security

This paragraph describes the security relationships and functional interface of the integrated COMSEC equipment. FM 24-27A has specific functions and capabilities. Below are brief descriptions of the COMSEC equipments and their interface characteristics.

COMSEC controller.

The AN\TTC-39 COMSEC controller links the COMSEC equipment with the CPG. It contains all

Table 3-6. Switch, trunk, and telephone line interfaces.

EQUIPMENT OR SERVICE	SIGNAL AND SUPERVISION OPTIONS	ANALOG TYPE	ANALOG ADAPT	ANALOG LTU	DIGITAL TYPE	DIGITAL SIG	DIGITAL MOD
AN/TTC-7 (Note 2)	2W RD	43		20 Hz			
AN/TTC-4,5,7,10,22	2W DP	40		CB			
AN/TTC-22	4W DP	38	SF	NW			
AN/TTC-28		37	SF	NW			
AN/TTC-30	Confirmation DTMF	32		NW			
AN/TTC-38	Tone Burst DTMF	26		NW			
AN/TTC-38	Confirmation DTMF	25		NW			
AN/TTC-39(V)	4W (Note 3)	28		NW	29	CCS	DIM
AN/TTC-42(V)					29	CCS	DIM
AN/TYC-39(V)	4W				29	CCS	DIM
AUTOVON PBX Access Line	INID	33	SF	NW			
AUTOVON PBX Access Line	PNID	34	SF	NW			
AUTOVON PBX Trunk		47-81	SF	NW			
AUTOVON Trunk	MF Confirmation	35	SF	NW			
AUTOVON Trunk	MF Nonconfirmation	36	SF	NW			
AUTOVON Telephone	CB 4W (Overseas) DC	5		AV			
AUTOVON Telephone	(Remote)	6	SF	NW			
CV-1918A/G	4W	30		NW			
CV-1919A/G	4W	30		NW			
CV-2875/G	4W	30	SF	NW			
CV-2907/TT	4W	30		NW			
CV-3478/TTC-39(V) (NIU)	DP	39	SF	NW			
C-6709/G (BNRID) (Note 1)	DTMF 4W LB	30	SF	NW			
Commercial Trunk	Wink Start 6W DP	82	EM	NW			
Commercial Trunk	Timed Start 6W DP	83	EM	NW			
Commercial Trunk	DC Closure 2W	44	DC	NW			
Commercial Trunk (6W)	MF Wink Start 6W DP	46	EM	NW			
Commercial Trunk	4W DP	45	SF	NW			
Commercial Trunk (PBX)	2W	40		CB			
HF Trunk		42		1600 Hz			
SB-22/PT (Note 4)	4W AC	30		NW			
SB-22/PT	2W RD AC	43		20 Hz			
SB-86/P (Note 4)	4W AC	30		NW			
SB-86/P	2W CBS	44		CB			
SB-86/P	2W RD	43		20 Hz			
SB-3082(V)/GT	2W AC	43		20 Hz			
SB-3082(V)/GT	DTMF 4W	30		NW			
SB-3082(V)/GT	2W	43		CB			
SB-3082(V)/GT	4W RD	42		1600 Hz			
SB-3082(V)/GT	CBS	44	DC	NW			
SB-3614/T	(3 Digit PBX) DTMF 4W	31		NW			
SB-3614/T	2W AC RD	43		20 Hz			
SB-3865(P)/TTC					31	DINBS	DIBTS

the circuitry necessary to perform data conversion and to operate COMSEC Interface Control Unit HGX-84/TSEC.

COMSEC interface control.

The HGX-84/TSEC connects the COMSEC equipment with the rest of the switch equipment. It reports errors in command signal transmission and malfunctions in the COMSEC equipments to the switch processor. It also provides an encrypted or black control channel interface between the circuit switch processor and the following COMSEC equipment:

- Trunk Encryption Device TSEC/KG-81.
- Loop Key Generator/Common Unit HGX-82/TSEC.
- Loop Key Generator TSEC/KG-82.
- Automatic Key Distribution Center HGX-83/TSEC.
- Key Generator TSEC/KG-83.

SECTION IV. OPERATIONAL CONSIDERATIONS

3-20. Operation Under Emergency Conditions

The switch can operate satisfactorily under a wide range of conditions. Some of these conditions are the result of the combat environment, some the result of weather, and others the result of the terrain and climate. Paragraph 3-21 shows how the switch can operate under extreme conditions. It also gives the design tolerances of the switch. If any of these conditions are exceeded or if combat actions cause damage, the switch must operate under emergency conditions.

Power during emergencies.

The power system is one of the most critical systems of the switch. (Refer to Chapter 2 for a description of this system.) The circuit switch power subsystem (CSPS) is one of the four subsystems of this power system. It helps assure that

Table 3-6. Switch, trunk, and telephone line interfaces. (continued)

EQUIPMENT OR SERVICE	SIGNAL AND SUPERVISION OPTIONS	ANALOG			DIGITAL		
		TYPE	ADAPT	LTU	TYPE	SIG	MOD
TA-236/FT (WECO 500)	DC 2W DP						
TA-312/PT	DC 2W LB RD	7		CB			
TA-312/PT	2W CB	12		20 Hz			
TA-312/PT with TA-955	DTMF 2W CB	9		CB	1		CVSD
TA-341/TT	DTMF 4W LB AC	8		CB			
TA-341/TT	DC	1		NW	1		CVSD
TA-720/TTC	4W LB AC	2		NW			
TA-838/TT	4W DC	1		NW	1		CVSD
TA-838/TT	DTMF 4W LB AC	2		NW			
TA-838/TT	DTMF DC 2W	1		NW			
TA-938/G (WECO 2500)	DTMF DC 2W	8		CB	13	DINBS	DILPA
TA-954/TT		8		CB	3	DINBS	DILPA
TSEC/KY-68/78	Subscriber				3	DINBS	DILPA
TSEC/KY-90					3	DINBS	DILPA

NOTES: 1. Basic net radio interface device used with An/VRC-12, AN/GRC-106, AN/GRC-193, AN/MRC-138, AN/PRC-70, AN/PRC-77, AN/PRC-104, AN/SRC-20A, AN/SRC-21A, AN/URC-39V.

2. Includes AN/GTA-14, AN/MTC-1, AN/MTC-9, AN/TTC-23.

3. Analog CCS terminates in type II modem. (Type II modem is used for analog out-of-band signaling.)

4. Accesses either as 4-wire DTMF analog or CVSD digital when used with converters CV-1918/G, CV-1919/G, or CV-2875/G.

the critical AC and DC loads (those needed to keep the switch functioning) can get power if the prime AC power source fails. It does this by switching to a bank of batteries that can maintain the critical loads for 15 minutes. The batteries can be recharged in 24 hours after a complete discharge. This recharging begins automatically as soon as the prime AC power is restored. The CSPS keeps the batteries fully charged during normal operations. There are also a series of circuit breakers that will trip if the power fluctuates or falls below minimum voltages, If this occurs, check the prime AC power source. This will usually be a trailer-mounted generator. You may have to switch to batteries while you replace or repair the generator.

Essential user bypass.

If your switch fails, the EUB capability lets you transfer your most important subscribers to another switch. (Refer to paragraph 3-8 for an explanation. Paragraph 4-6 shows you how to do this.) Use the AEU and ARB worksheets and coordinate the lists with both switches in advance. Up to 60 digital subscribers can transfer in this way. (If your switch is accepting EUB subscribers, it can accommodate 60 from each of two switches.) These subscribers must be connected to the TDMX, and there must be enough digital trunks to carry them. You can also transfer analog EUB subscribers by manual patching using analog trunks.

Emergency patching.

With manual patching, you can maintain emergency service for subscribers not on the EUB lists. If the switch fails, use the patch panel to connect subscribers directly to each other or to trunks. Make sure that the equipment at both ends is mutually compatible. You should make out both the EUB and the manual patching lists before an emergency occurs. Include both in your SOP so that there is no question about who gets service. Because of the confusion likely when a switch is bypassed, it is important that the planner controls both the bypassing and the restoral of the switch.

Table 3-7. Nomenclatures.

AN/TTC-22 Telephone Central Office
AN/TTC-30 Telephone Central Office
AN/TTC-38 Telephone Central Office
AN/TTC-39(V) Automatic Telephone Central
AN/TTC-42(V) Automatic Telephone Central
AN/TTC-7 Manual Telephone Central Office
AN/TYC-39(V) Automatic Message Switching Central
C-6709/G BNRID
CV-1918/G Telephone Signal Converter
CV-1919/G Telephone Signal Converter
CV-3478/TTC-39(V) Converter, Telephone Signal; NIU
Commercial - PBX, Step by Step, Cross Bar, Electronic Switching System
SB-22/PT Manual Telephone Switchboard
SB-3082(V)/GT Cordless Manual Telephone Switchboard
SB-3614/T Automatic Telephone Switchboard
SB-3865(P)/TTC Automatic Telephone Switchboard
SB-86/P Manual Telephone Switchboard
TA-236/FT Telephone Set; Commercial Type WECO 500
TA-312/PT Tactical Telephone Set
TA-341/TT Tactical Telephone Set
TA-720/TTC Telephone Set Subassembly
TA-838/TT Tactical Telephone Set
TA-938/G Telephone Set; Commercial Type WECO 2500
TA-954/TT DNVT
TA-955/PT Tone Signaling Adapter
TSEC/KY-68 DSVT
TSEC/KY-90 SDNRIU

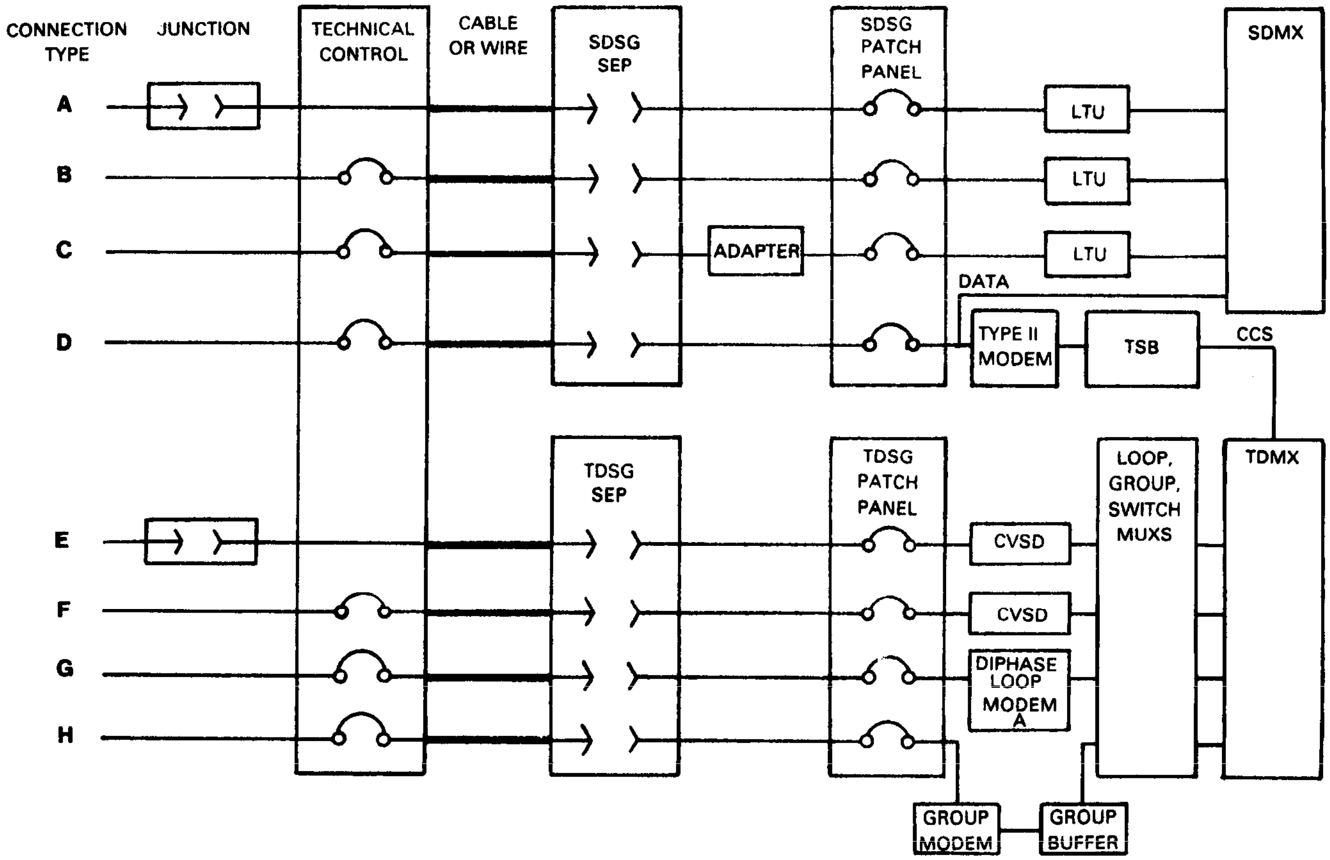


Figure 3-5. AN/TTC-39 interfacing schemes.

Switch abandonment.

There are four things you must do if a switch must be abandoned or if a node is in danger of enemy capture:

- Erase memory and zeroize key variables.
- Erase or destroy magnetic tapes and records.
- Destroy classified components of the switch.
- Disable the switch.

Erasing memory deprives the enemy of information that could be used for intelligence purposes. The order to do this may come to the node or switch from higher headquarters. However, if the node is about to be overrun, you must make the decision on your own. To erase memory, enter the PUNT command. (See Table 4-18 for a list of all commands,) This command will not appear on the screen. You must then reconfirm the command on the keyboard. This will start a 5 minute time-out period. You can abort at any time within those 5 minutes. It may take too long to erase the magnetic tapes. If possible, take them with you. If you cannot, chop them up or burn them. Burn all paper records. If you have time, disable the switch by cutting its wires and breaking the circuit boards, (Disconnect all power first,) (See TM 750-244-2 for approved destruction methods.)

3-21. Operation Under Extreme Conditions

The AN/TTC-39 can operate very effectively and very efficiently under extreme environmental conditions. The shelters are full y insulated and weatherproofed for tactical operations in all types of climates. However, you should take special precautions for the following extreme conditions.

Low temperature.

The switch heater and electronics equipment can start running at -50°F without damage to the equipment. However, at low temperatures, the switch does not reach full operational capability until the equipment has been in operation for 2 hours. External heaters can reduce this 2-hour warm-up time. Extreme cold causes cables to become hard, brittle, and very difficult to handle. When handling and connecting cables to shelters, take the following precautions:

- Remove unnecessary loops and links.
- Free all connectors of frost, snow, or ice.
- Replace covers on receptacles and close entrance box covers when they are not in use.
- Open hood shields and lower the covers when the entrance boxes are open.
- Replace connector covers when a cable is disconnected.
- Keep open connectors out of the snow. By no means should you drag an open connector through the snow.

High temperature.

The AN/TTC-39 electronic equipment and ECUs can start at +120°F external ambient temperature. An added safety factor involves solar radiation. The switch can reach full operation after it has run for 45 minutes. This includes the extra 15 minutes that the master timing unit needs for stabilization. Under abnormal or emergency conditions, the switch can operate satisfactorily for at least 2 hours in extreme heat with only one of the two ECUs working. In hot, dry climates, connectors and receptacles are subject to damage from dust and dirt. Be sure to replace covers on connectors and receptacles and to close covers on entrance boxes when they are not in use. Never place or leave open connectors on the ground.

Humidity.

The circuit switch can operate without degradation during and after prolonged exposure to humidity extremes. This includes relative humidities as high as 100 percent at all ambient air temperatures up to +80°F, high humidity corresponding to a dew point of +86°F at an ambient temperature of +100°F, and a low relative humidity of 5 percent at +120°F. The switch equipment is always subject to damage from moisture and fungus in warm, damp climates. Make sure that all equipment is checked periodically and that all moisture and fungus is wiped from the equipment.

Rainfall.

The switch will sustain no physical damage or degradation in performance when subjected to the wind and rain conditions of an extreme tactical environment. You should, however, protect it from long-term exposure to dirt and water. Conduct periodic visual checks of the equipment to ensure that:

- Connector covers are replaced when a cable is disconnected.
- Open connectors are not placed near or in the water.
- Covers on receptacles and entrance box covers are closed when they are not in use.
- All moisture and possible dirt and fungus are wiped from the equipment.

Sand and dust.

The AN/TTC-39 is fully weatherproofed. This means that it can perform at full capacity under all adverse conditions. This feature protects the switch from the effects of fine sand and dust particles at wind speeds of up to 40 miles per hour. It also protects against the dust that can build up within the enclosure as a result of operator activities. However, connectors and receptacles are susceptible to damage from fine sand and dust. As a result, you should conduct periodic inspections of exposed switch equipment. Make sure that covers on connectors and receptacles are replaced and that covers on entrance boxes are closed when not in use. Keep all open connectors off the ground.

Snow.

The AN/TTC-39 shelter can withstand 40 pounds per square foot of snow loading on the top of the shelter. (See subparagraph above titled low temperature for precautionary measures.)

Salt fog.

The circuit switch in its shelters can withstand prolonged exposure to a salt-laden atmosphere without any operational degradation. Check external equipment periodically to make sure that all moisture is wiped from the equipment.

Fungus.

The AN/TTC-39 equipment is resistant to fungus and should not be adversely affected by it. (See subparagraph above titled sand and dust for precautionary measures.)

Electromagnetic compatibility.

The AN/TTC-39 contains shielding, bonding, and grounding protection for electromagnetic compatibility. The openings in the shelter for ventilation, air conditioning, heating, or any other purpose use a screen or honeycomb filter. This acts as a waveguide cutoff for the highest frequency that the shelter processes. Multiple powerline radio frequency interference filters are on the inside of the shelter at the input power panel. The shelter, with a modification kit (MOD-1079), has a 60-db shielding effectiveness to electrical fields and to plane waves over the frequency range of 14 kHz to 100 MHz. It also has a 60-db shielding effectiveness to magnetic fields over the frequency range of 200 kHz to 1000 MHz. External cables are shielded. Coaxial cables are double shielded.

3-22. Reliability and Maintainability

You must understand how to keep the AN/TTC-39 working reliably. You also need to know the factors that affect the maintainability of the switch. This knowledge will help you:

- Minimize maintenance actions at the organizational level.
- Reduce downtime spent in corrective maintenance.
- Increase the availability of the switch during operations.
- Produce data feedback for use in corrective actions and in evaluating the work of supporting organizations.

Reliability.

Reliability is the measure of how the switch performs under all types of conditions. Paragraph 3-21 described some extreme environmental conditions. These will cause reliability to fall off. So will the emergency conditions described in paragraph 3-20. The most critical factor is temperature. The switch meets the following standards:

- In the range of +32°F to +100°F ambient (outside) temperature, there should be no more than .2 percent lost calls.
- At +25° F to +32° F, there should be no more than .3 percent lost calls.
- At +100°F to +120°F, there should be no more than .4 percent lost calls.

In general, the switch should be available for use 99.9 percent of the time.

Maintainability.

Maintenance of the switch must conform to the 99.9 percent availability goal. Thus, you must plan maintenance for times when the switch is in use. This includes work at the organizational and intermediate levels. Depot level work requires that the switch be taken out of use. You should not need to do this until the switch has been running for 3 years.

Corrective maintenance. Organizational level personnel can correct at least 95 percent of all failures. The mean corrective maintenance time should be 30 minutes. The maximum corrective maintenance time must not be greater than 60 minutes.

Preventive (scheduled) maintenance. You can do preventive maintenance on the AN/TTC-39 without interrupting its operation. This takes an average of 15 minutes per day. There may be times when you have to shut down the equipment for reasons of safety. In these cases, mean preventive maintenance time should be only 5 minutes.

Operational maintainability. This has to do with such external factors as outside maintenance, supply, and administrative actions. The mean downtime for these items is 45 minutes. In no case should the switch be down for more than 90 minutes. Include these losses of operating time only in long-term planning. This means planning for periods of 30 days or more.

Intermediate level maintenance. Fewer than 5 percent of switch failures should need intermediate level maintenance actions. The mean corrective maintenance time for this is 1 hour.

Maintenance levels.

All maintenance, as determined by the logistic support analysis and level of repair, will be performed at three levels: organizational, intermediate, and depot.

Organizational maintenance. At the organization, 95 percent of the AN/TTC-39 failures are corrected by removing and substituting the lowest replaceable units (LRU). These include major assemblies, subassemblies, modules, and PCBs. You should also replace minor components, such as fuses and knobs, and do minor repair of cables on site. The replacement of connectors and pins in the HGF-82 and the HGF-85 are also included. The capability exists to detect a fault and isolate it to an LRU by using BITE. Thus, by using BITE with maintenance diagnostic programs for troubleshooting, LRU replacements will be the only action required, other than routine nontechnical preventive maintenance.

Intermediate maintenance. Work at this level uses the common support and test equipment to service the 5 percent of repairs/faults that cannot be restored by replacement of LRUs. These failures consist primarily of problems in chassis components, wiring, wire and cable connectors, and patch panel connections. COMSEC maintenance at this level consists of fault isolation to the circuit boards, the replacement of faulty boards, and verification testing of all repair actions. Switch COMSEC equipment (except for the KG-81, the KG-82, and the KG-94) is tested at this level with the ST-34 test set. The KG-81 and its replacement, the KG-94, are tested with the STX-34 test set. Nodal maintenance facilities are equipped with shelterized maintenance facilities for on-site intermediate level and for stockage of repair parts. No intermediate COMSEC maintenance capability is provided at the node, however.

Depot maintenance (special repair activity). Depot maintenance consists of both software and hardware support for the AN/TTC-39. The hardware support consists primarily of the testing, fault isolation, and repair of those LRUs forwarded to the depot from intermediate maintenance. The depot also has the capability to repair and overhaul end items whose maintenance requirements exceed the intermediate maintenance capability. The software support encompasses the maintenance of the existing software configuration. It also includes any software modifications resulting from changes in operational requirements. Processor controlled test equipment, such as the AN/USM-410 or TSEC/ST-51, is used for hardware support for all repairable LRUs and boards. Fault isolation is accomplished automatically under processor control to the greatest extent possible. The test procedures will isolate the fault to a piece part or circuit node of the LRU or board. Computer aided diagnostic software is used to automatically determine computer guided probing instructions.

3-23. Survivability and Vulnerability

The switch has certain built-in features to help it withstand enemy attack. TM 11-5805-681-12 describes these. SOPs, the CEOI, and operations orders provide instructions on coping with the effects of enemy action. Also review paragraph 3-20 on emergency operations. Simple physical damage to the switch requires repair or replacement of the damaged components. Causes of such damage can include explosives, small arms fire, or such natural causes as storm or lightning. Other threats may be more complex. These include nuclear attack, chemical attack, and electronic warfare.

Nuclear attack.

Repair physical damage from nuclear blast and heat by replacing components. You might also use components as spares for less damaged equipment. (See TM 11-5805-681-12 for repair procedures.) Radiation will not normally affect the equipment, but it will affect personnel. The electromagnetic pulse (EMP) from a nuclear detonation can damage electronic components by inducing high voltages in their wiring. The electromagnetic compatibility kit, MK-1079, provides some protection. In some cases, EMP may not cause damage but could interrupt calls. A well-trained subscriber will recognize the problem and reinitiate the call.

Chemical attack.

Chemical attack affects personnel. The main protection consists of individual protective clothing and protective mask. Use of these will keep switch personnel — and the switch — in operation. The shelter also provides some protection. The ECU and shelter air filters will help remove some liquid agent particles. There is also a kit available that includes collective protection equipment. This consists of a protective entrance and air filter. Rely mainly, however, on the mask and clothing. Decontamination procedures are in your unit SOP.

Electronic warfare.

Enemy electronic warfare (EW) is an important combat factor. Its goal is to deprive us of our electromagnetic systems. When you consider how much military equipment depends on electronics, you can see how big the problem is. For practical purposes, the AN/TTC-39 switch does not radiate. Thus, the switch itself is not likely to be a prime target for intercept or jamming. More likely targets are the transmission equipments supporting the switch. You should consider the vulnerability of the switch in the total communications system and apply measures to reduce this vulnerability system-wide. In most EW situations consider the following countermeasures:

- Use COMSEC equipment to the maximum possible. This reduces the amount of information available from intercepted telephone calls.
- Try to avoid establishing calling patterns.

- Limit transmission power of transmission equipment. This reduces intercept possibilities.
- Orient antennas of radios away from hostile territory. This will be a factor in network planning. (See paragraph 5-6.)
- Consider the use of alternate transmission facilities. This keeps the circuit switch from being connected to one electronic signature or location. In practice this would place the switch in one location, possible protected, with two or more other radio locations used alternately for trunking to the switch.

3-24. Physical Security

When deployed, the AN/TTC-39 will reside in a restricted area. This refers to a secure area set up for safeguarding materials. Entry is subject to special controls and restrictions. Restricted access to the AN/TTC-39 will safeguard the integral COMSEC equipment, key lists, and classified COMSEC material. Specific protection requirements will be found in your unit physical security SOP. Your unit security officer will have this information. Examples of appropriate security controls are:

- Fences combined with on-site or perimeter guards.
- Fences combined with ID and security check procedures.
- Fences combined with alarms.

Each shelter of the circuit switch functions as an exclusion area. Access to the shelter is restricted to those who need to go in. There will be a visitors' register for those with temporary access. All switch personnel must have at least a SECRET clearance. Only personnel with the required security clearances can operate the switch in the field. Personnel with less than a SECRET clearance can enter and remain in the shelter only with a properly cleared escort. This includes those who perform occasional noncryptographic maintenance, repair, or housekeeping functions. In all cases, a need to know must be verified. That is, persons entering the shelter must have a valid reason for being there. Clearance is necessary for access to equipments and fill devices, keyed or unkeyed, and to supporting documents. This will include military or civilian employees of the US Government or of its contractors. Guards and security patrols who provide area protection for the shelters need not be cleared. However, such uncleared guards cannot enter the restricted area. Guards who are cleared can provide more flexible service. They can, for example, serve as escorts for uncleared visitors.

3-25. Siting

In the press of network planning, it may be easy to overlook the siting needs of the AN/TTC-39. You can avoid this by including in your SOP requirements for node and equipment sites. This forces all concerned to consider these during planning. It is also important to make a reconnaissance of the command post (CP) and node sites. Base this on the SOP requirements for sites and on the network's operational needs. Follow it with a terrain analysis. This will help you determine how to use your line-of-sight radio systems. It will also help you verify the selection sites for all the network's equipment.

Since the AN\TTC-39 does not radiate it does not have an electronic signature. You can locate the switch near a CP with no signature related restrictions if you specify the use of cable to the transmission equipment. Power units may be a factor, however, and restrictions on heat (for infrared detection) and sound may apply. Camouflage capability is important. You should look for natural cover and concealment to conceal the size of the system and its cable network. Use natural terrain features such as ravines or tree lines for cables. Bury cable when possible.

CP and nodal sites must have access to transmission media. If you use such radio links as the short-range wideband radio, you must provide for line-of-sight to the top-of-the-hill radio. Note that use of the SRWBR will probably create the electronic signature mentioned above. If you use cable to the transmission media, you must consider whether cable can be installed over the terrain or if it is impractical. The advantage of separating the switch and other nodal elements from the transmission equipment is that you can locate the node in a more protected and concealed location. Review paragraph 3-23 for EW siting considerations.

You must make a careful study of the actual site for the switch. The site should have a dry surface with good drainage. It should have a good electrical ground or be near a spot (such as a wet area) where the ground is good. If this is not available, you may have to dig a hole and construct a ground. The surface of the switch should be level, with no more than a 10 percent slope. When possible, use natural camouflage, such as trees. Augment this with netting. Do not cut foliage for camouflage, as this is easy to detect.

Locate power units at least 30.48 meters (100 feet) away to protect the switch from fire and to minimize noise. Bury power cables and communications cables when possible to hide them from detection and to protect them against damage from vehicles and artillery. Keep power and communications cables as separate as possible.

You should always put strong emphasis on equipment and personnel survivability. If possible, locate the switch in protected terrain, such as below a cliff or in a canyon. Sometimes you may wish to dig the switch in to help protect it against small arms fire or artillery. If the threat is this great, however, moving the node might be a more prudent measure. (For further information about displacement, see paragraph 5-7.)

CHAPTER 4
Application

4-1. Operations of the Switch

The preceding chapters have described what the AN/TTC-39 consists of and what it does. They also described the differences brought about by the modified switch, the AN/TTC-39A. This chapter explains how the AN/TTC-39 works. It also applies generally to the AN/TTC-39A, except for the structure of the TDSGM and the strapping of PCB. The last paragraph, 4-8, shows the additional data entry and display capabilities of the AN/TTC-39A.

Our perspective for the AN/TTC-39 is basically from the inside of the switch looking out. This chapter describes what takes place when a call enters, traverses, and exits the switch. It then will summarize the actions you take to set the switch up, turn it on, and bring it up to operating condition. Before the switch can process calls, however, it must recognize certain numbering schemes. The Army TTNP and other numbering plans with which the switch operates will be explained. You will learn how to implement planning orders from higher echelons to prepare the switch for processing calls. This will involve how to use planning and configuration worksheets. One of the most important things you will learn is how to design a circuit switch network and to provide the necessary information to switch personnel so that they may develop the switch data base. The chapter will also present a detailed description of how calls are routed through a network and how you can develop a routing plan for your own situation.

4-2. Traffic Switching and Processing

The AN/TTC-39 circuit switch can have many configurations. All of them, however, process and switch traffic in a similar manner. The fundamental difference between configurations is in the mix of analog and digital switching modules. The switch can connect analog and analog, digital and digital, and digital and analog subscribers. The switch also terminates analog and digital trunks, TGCs (for example, other AN\TTC-39 circuit switches and AN/TYC-39 message switches), digital switched groups, and supergroups (128/144 channels).

Analog switching.

The SDSG provides analog switching, supervising, and signaling. The SDSG functions in conjunction with the SCG, the CPG, the SPCG, and the CEG. Review Chapter 2 for descriptions of these. The key component of the SDSG is the SDMX where the switching occurs. The SDMX is an array of solid-state, silicon-controlled switches called cross points that connect circuits involved in analog switching. These circuits include external voice and data circuits and internal signaling and supervision circuits. All of them work together to process an analog call through the switch.

Each SDMX provides 156 inlets in 13 groups of 12 inlets each. The switch scans 120 of these 156 inlets for subscriber signals. The remaining 36 provide internal circuit connections. A basic shelter configuration could contain from one to four SDMXs, each of which contains up to 13 groups of 12 inlets. Thus, in a configuration of four SDMXs there may be a total of 624 inlets, of which 480 should be extranodal connections. The remaining 144 inlets can provide such service functions as tone sending or receiving, conference bridging, and intermatrix connections.

Digital switching.

The TDSG, in conjunction with the CEGs, provides digital switching, line termination, and signaling. The key component equipment of the TDSG is the TDMX where the switching occurs. (See Figure 4-l.) The switch converts all incoming signals to a 32-kbs pulse rate for digital processing. It then switches the 32-kbs subscriber pulse trains through a multistage multiplexing and demultiplexing chain into five 64-channel data streams. These data streams are routed to the TDMX which provides switching by transposing the incoming time-ordered bit locations to the outgoing bit locations of the called subscribers. The incoming bit locations correspond to the originating subscriber lines. This transposition occurs in the time division memory modules in the TDMX. (See Figure 4-l.)

The process is one of writing data into and reading data out of a single TDMM. (See Figure 4-2.) The process interchanges the information in selected time slots. As shown in the example in

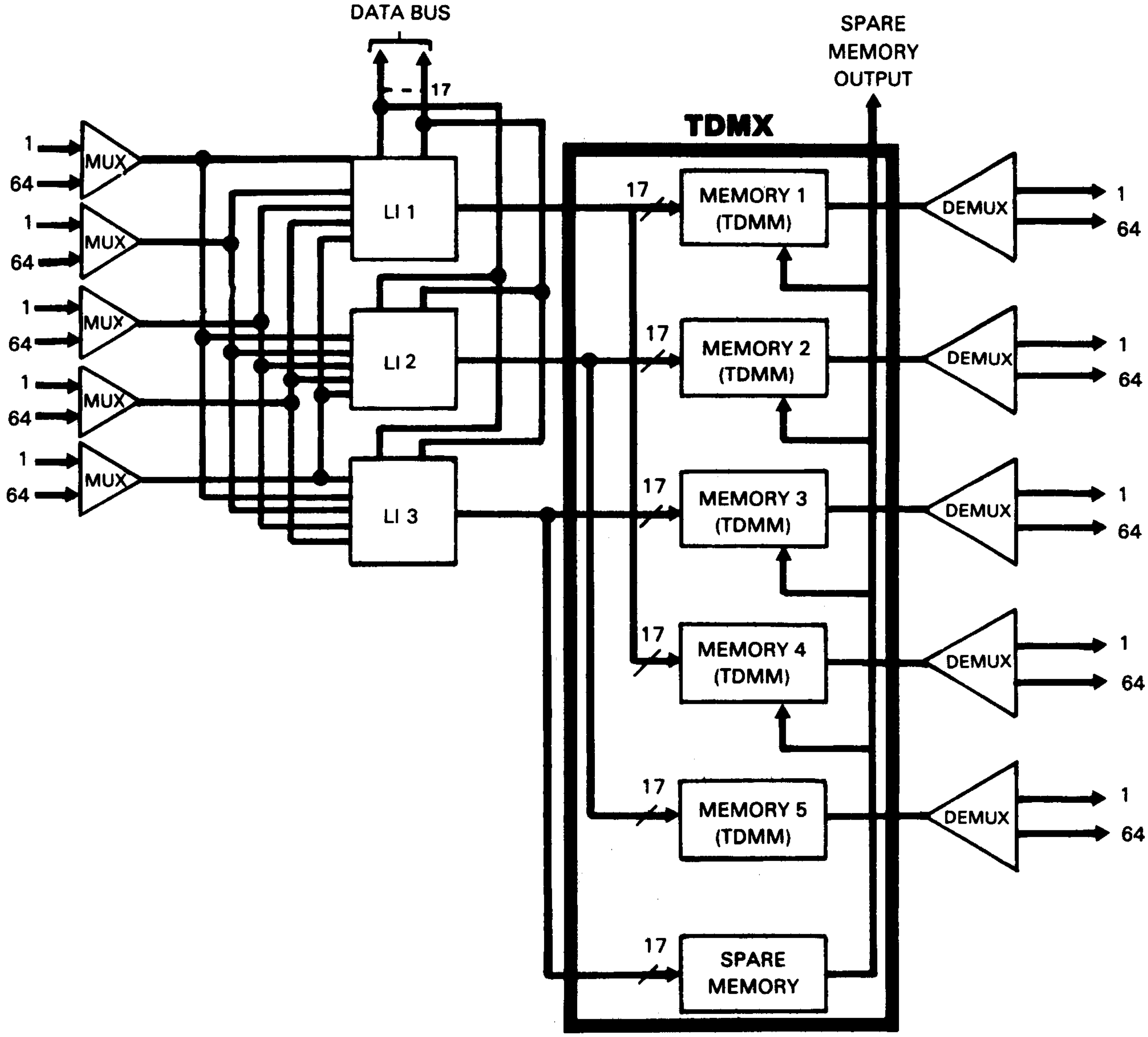


Figure 4-1. TDMX design.

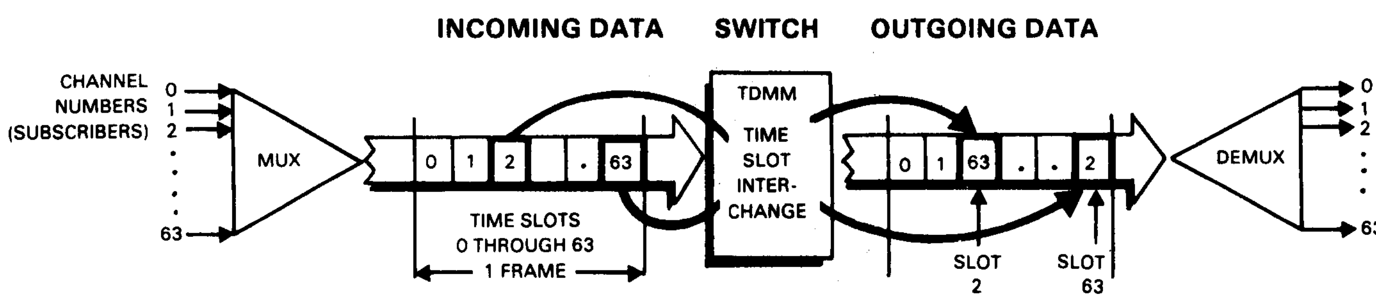


Figure 4-2. Time slot interchange operation.

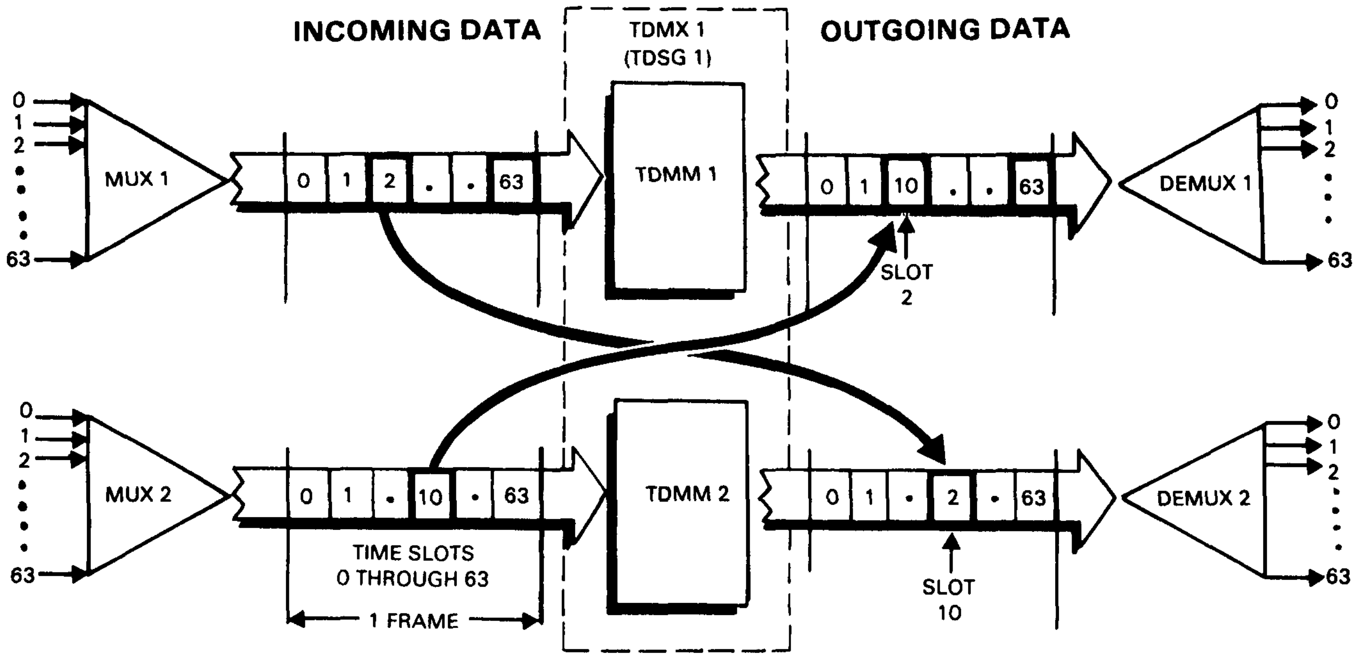


Figure 4-3. Time division switching.

Figure 4-2, information arriving in time slot 63 transfers to time slot 2 in the outgoing data stream. Because full-duplex operation also requires the retum connection, information arriving in time slot 2 must also transfer to time slot 63. Each 4-wire connection, therefore, requires two transfers of information.

Each TDMM provides access to sixty-four 4-wire terminations. A TDMX (or a TDSG) may consist of 3 to 5 TDMMs. (See Figure 4-l.) Thus, to connect a subscriber from one TDMM with a subscriber in a different TDMM, the switch must perform two functions. Not only must it interchange time slots between incoming and outgoing bit locations in a single data stream (as shown in Figure 4-2), but it must also switch the bit locations from one TDMM (from one data stream) to another. Figure 4-3 shows this process. As shown in this example, incoming information from subscriber 2 in TDMM 1 transfers to subscriber 10's outgoing time slot in TDMM 2. In the same way, an incoming call from subscriber 10 in TDMM 2 is connected to subscriber 2 by transferring subscriber 10's incoming information to subscriber 2's outgoing time slot in TDMM 1.

An AN/TTC-39 can have a maximum of 15 TDMMs. Table 4-1 lists TDMM assignments to TDSGs. It also shows the binary number (also called the bit select location) of each TDMM that corresponds to a MUX data stream. A fully populated digital switch would include all four TDSGs. Each TDSG uses the following TDMMs:

TDSG 1 uses TDMM numbers 1, 2, 3, 13, 14, and 18. (18 is a spare)

TDSG 2 uses TDMM numbers 4, 5, 6, and 15.

TDSG 3 uses TDMM numbers 7, 8, and 9.

TDSG 4 uses TDMM numbers 10, 11, and 12.

TDMX operation.

This paragraph describes the internal operation of a TDMM. (See Figure 4-4.) The TDMM performs the time division switching of multiplexed data streams that originate at the switch multiplexers (bit select numbers 1 through 15) or at the digital signal generators (bit select numbers 16 and 17). (See Table 4-l.)

Each TDMM contains a 64 x 17 bit data memory storage area for all subscriber address location data bits. The 64 columns correspond to the subscriber channels. The 17 rows correspond to the multiplexed data streams (or bit select numbers). Each TDMM also contains a 64 x 15 bit command memory storage area. This identifies originator and recipient address locations. The 64 columns correspond to the recipient subscriber channels. The 15-bit field consists of 5 bits for the call originator bit select location, 6 bits for the originator address location, and 4 bits for a parity check. Each TDMM contains all the logic necessary to connect it with the SCG and to interpret the connection and control commands from the processor. This enables it to perform its time division switching and memory check functions.

Figure 4-4 illustrates the call originator, subscriber number 131 (bit select number 3 or MUX 3, address location number 2 or channel 2), making a half connection call to recipient subscriber number 63 (bit select number 1 or MUX 1, address location number 62 or channel 62).

The switch multiplexer multiplexes each group of 64 subscribers into a single 64-channel, 2.048-mbs digital data stream. The data stream from each switch multiplexer passes to every TDMM where the 64 data bit positions (one for each subscriber) are stored in the data memory at the appropriate bit select location. In addition to a maximum of 15 data streams from the switch multiplexer, there are two 64-channel data streams from two digital signal generators. The digital signal generator output data streams also pass to every TDMM in the circuit switch. Thus, a fully populated circuit switch contains 15 TDMMs, each of which contains a 17 x 64 data memory. All the data memories are identical and contain an input data bit from every subscriber. For a complete listing of TDMX addresses available in a fully populated digital switch, see Table A-3.

The half-connection command from the processor designates both the originator and the recipient of the call. The TDMM that recognizes itself as the recipient (TDMM 1 in this case) stores the originator address (a 15-bit message including parity) in the command memory at the recipient location (one of the 0 to 63 columns). In this example, the command memory of TDMM 1 (bit select 1) at recipient address location 62 stores the originator's address (bit select 3, address location 2). If this

Table 4-1. TDMM assignments.

BINARY NUMBER/ BIT SELECT LOCATION	DEVICES	MODULE LOCATION
1	TDMM 1	TDSG 1
2	TDMM 2	TDSG 1
3	TDMM 3	TDSG 1
4	TDMM 4	TDSG 2
5	TDMM 5	TDSG 2
6	TDMM 6	TDSG 2
7	TDMM 7	TDSG 3
8	TDMM 8	TDSG 3
9	TDMM 9	TDSG 3
10	TDMM 10	TDSG 4
11	TDMM 11	TDSG 4
12	TDMM 12	TDSG 4
13	TDMM 13	TDSG 1
14	TDMM 14	TDSG 1
15	TDMM 15	TDSG 2
16	DSG 1	CEG
17	DSG 2	CEG
18	Spare TDMM	TDSG 1

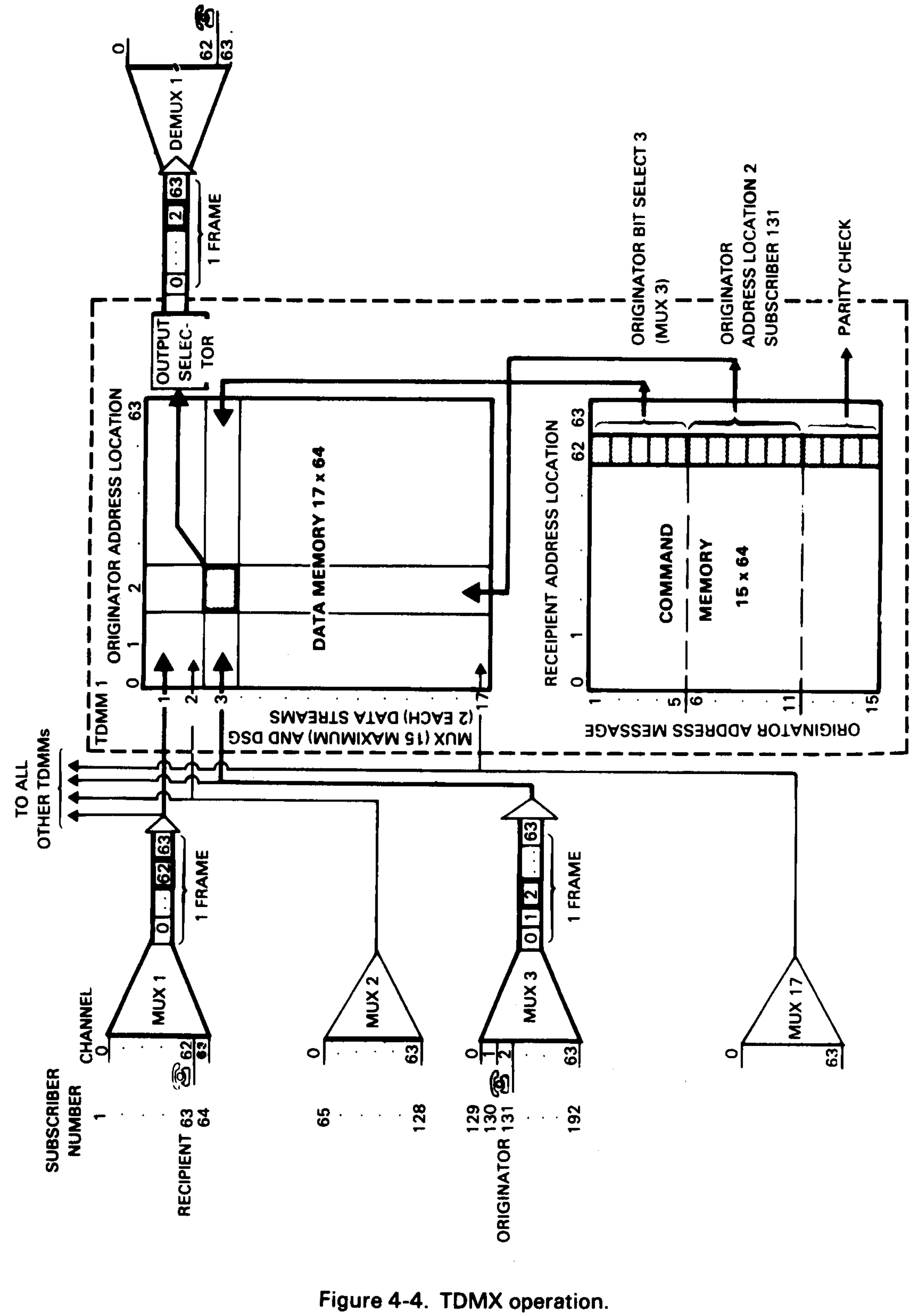


Figure 4-4. TDMX operation.

were a full connect command, the command memory of TDMM 3 at recipient address location 2 would store bit select 1, address location 62.

The output selector synchronously reads the 64-recipient locations in the command memory to order the sequence of the time slots of the outgoing data stream. In this example, the selector reads recipient column 62 in the command memory. It determines (from the first five bits) the row in the data memory to access for the originator bit select address (bit select 3). It also determines (from the next six bits) the column in the data memory to access for the originator location address (address location 2). The output selector accesses the data bit at the intersection of these two addresses in the data memory as the output in time slot 62 to the switch DEMUX 1.

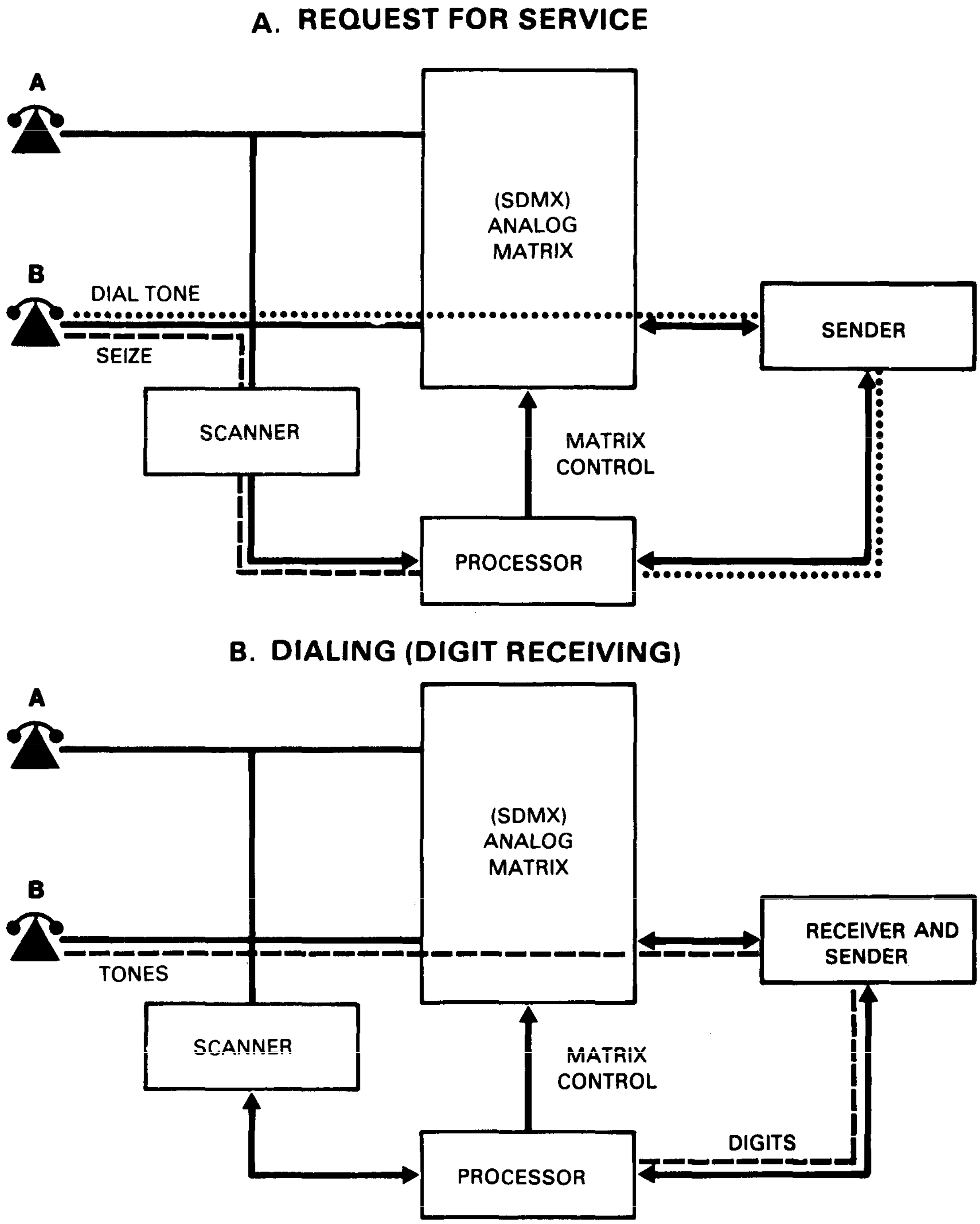


Figure 4-5. Analog switch processing actions.

The output selector repeats this scanning and processing for all 64-column locations of the command memory. The switch DEMUX recombines the 64-channel bit stream into 64-individual data channels. It then sends the (originator) data bit in time slot 62 to subscriber 63. This is how subscriber 63 (the recipient) listens to subscriber 131 (the originator).

Analog call processing.

From the moment a subscriber goes off-hook (to start a call) until the last connected subscriber goes on-hook (hangs up), the switch takes a number of call processing actions. The following paragraphs and figures depict the most common analog processing actions. These actions involve calls

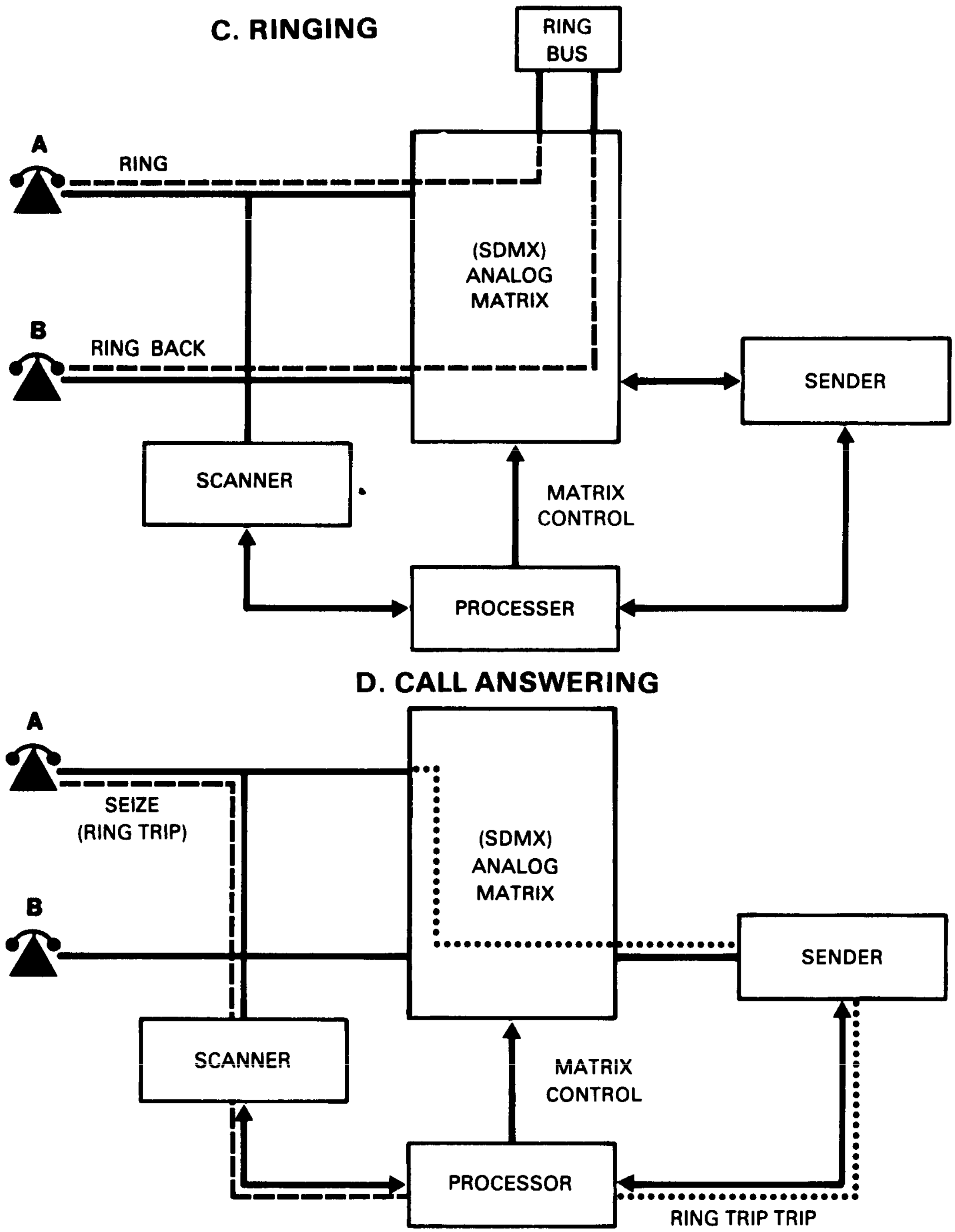
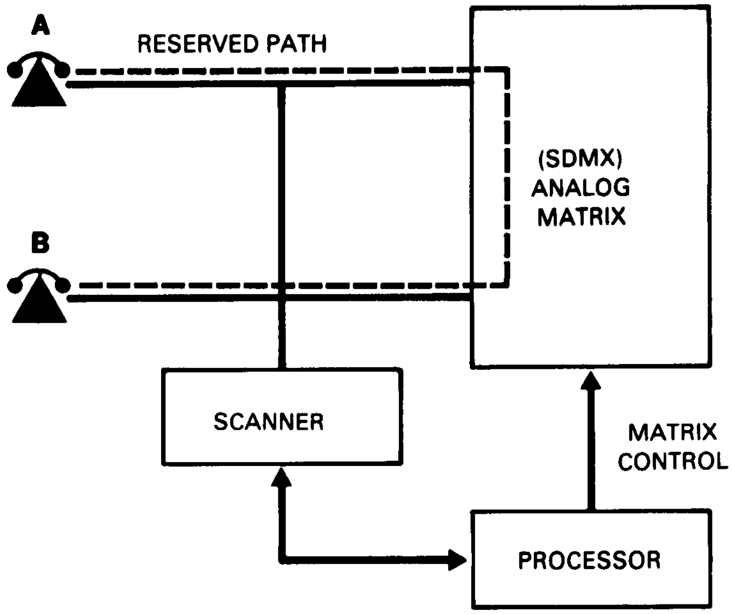


Figure 4-5. Analog switch processing actions. (continued)

E. NONSECURE CALL COMPLETE



F. SUBSCRIBER RELEASE

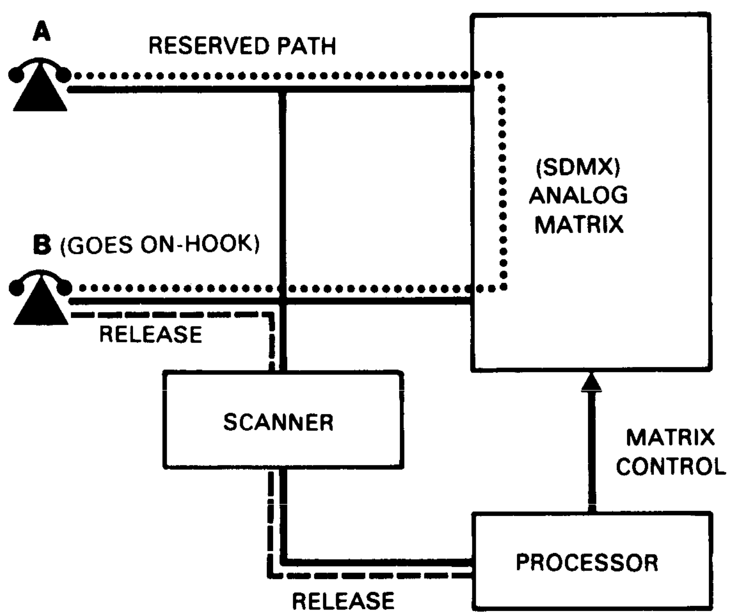


Figure 4-5. Analog switch processing actions. (continued)

G. CALL RELEASE

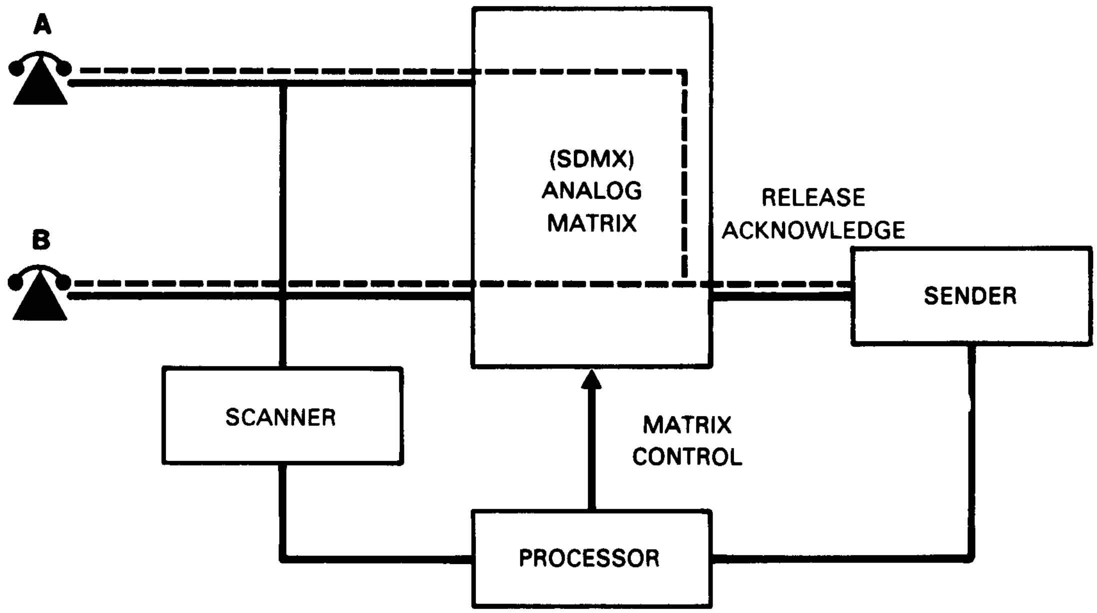


Figure 4-5. Analog switch processing actions. (continued)

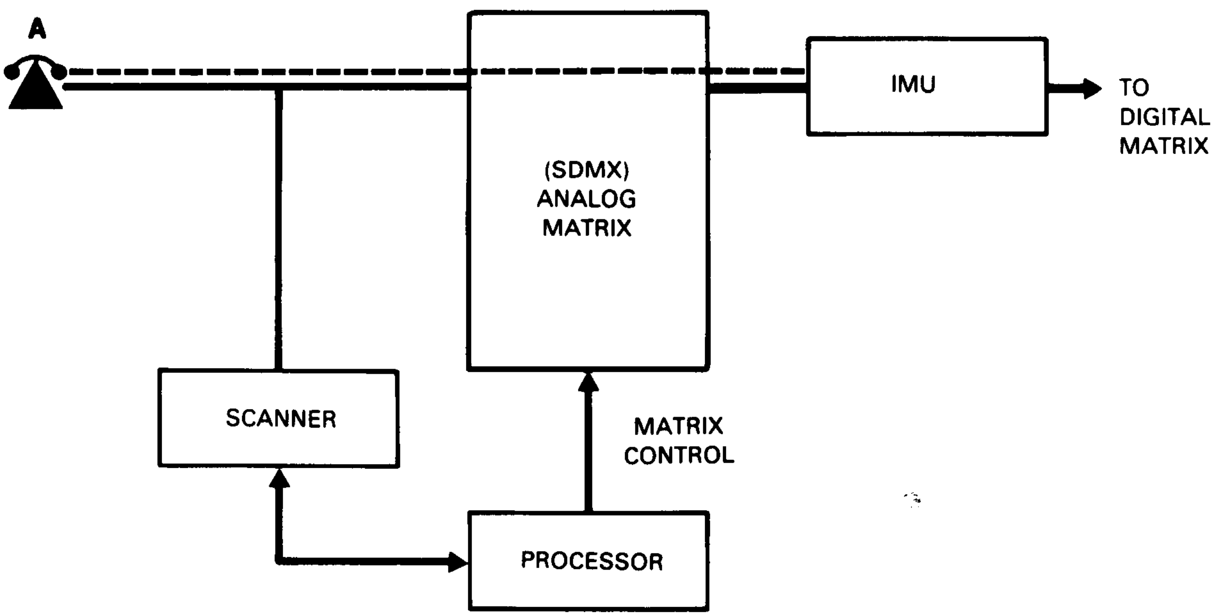


Figure 4-6. Analog-to-digital call processing.

originated from TA-341 type subscribers. We will describe three types of calls: nonsecure calls, analog-to-digital subscriber calls, and conference calls. Table 4-2 summarizes the seven switch processing actions common to most analog calls. Figure 4-5 depicts each of these actions.

Calls from analog subscribers (connected to the SDSG) to digital subscribers that terminate at the TDSG pass through the SDMX to the IMUs. (See Figure 4-6.) An IMU has the characteristics of an analog-to-digital converter. The digital output of the IMU exits the SDSG through the SDSG patch

Table 4-2. Common nonsecure analog call processing actions.

1. REQUEST FOR SERVICE (Figure 4-5A)	Calling subscriber goes off-hook, sending a seize signal to switch. Analog scanner, sampling each incoming line, detects seize at the LTU dedicated to calling subscriber and sends message to processor that seize has been received on line B. Processor connects a DTMF/MF sender and receiver through the SDMX to line B. Dial tone generated by the tone generator is forwarded to calling subscriber through the sender.
2. DIALING (DIGIT RECEIVING) (Figure 4-5B)	Caller, receiving dial tone, keys in digits of called party (subscriber A). Connected receiver reports receipt of first digit to processor, which cuts off dial tone and disconnects sender from subscriber B. Receiver converts dialed tones to digits, which are forwarded to the processor. Processor translates digits to an outlet on the SDMX corresponding to called subscriber A and reserves a path through the SDMX that will connect subscriber B to subscriber A. If appropriate, a busy tone or an out-of-service or precedence-violation announcement is forwarded to subscriber B through the sender.
3. RINGING (Figure 4-5C)	After the processor has identified called subscriber A and reserved and SDMX path to connect B to A, the receiver connected to line B is disconnected. Subscribers A and B are then each connected through the SDMX to the ring bus amplifier. Ring and ringback signals, generated by the tone generator, are sent to subscribers A and B, respectively.
4. CALL ANSWERING (Figure 4-5D)	Subscriber A answers call (goes-off-hook) and generates a seize signal (called a ring trip), which is detected by the scanner and reported to the processor. This ring trip signal cuts off the ring and ringback signals. The processor assigns a sender and provides it an SDMX path to subscriber A. The sender sends ring trip trip to subscriber A, cutting off the ring trip (seize) signal.
5. CALL COMPLETE (Figure 4-5E)	The sender assigned to subscriber A is then disconnected, and the SDMX path previously reserved and stored by the processor (in action 2 above) is used to connect subscribers A and B.
6. SUBSCRIBER RELEASE (Figure 4-5F)	When one subscriber goes on-hook (hangs up), a release signal is sent to the switch. The scanner detects the release signal and reports it to the processor.
7. CALL RELEASE (Figure 4-5G)	When the SDMX path between the subscribers is broken (sending release to the processor), the processor connects a sender to the party releasing the call. The sender sends release acknowledge and is then disconnected. When the second subscriber releases, the scanner detects the release signal and assigns a sender. The sender sends release acknowledge and the second subscriber is also then disconnected.

panel. From there, it passes to the TDSG for further processing. The following is the sequence of processing actions for completing a conference call. (See also Figure 4-7.)

Goes off-hook. The originator goes off-hook, receives DIAL tone, indicates precedence (if desired), and then keys C to request a conference call, The processor checks the originator's classmark for conference privilege. If not classmarked for conferencing, the originator receives ERROR tone.

Returns to originator. If all conference bridge units are busy, a BUSY tone returns to the originator. If a conference bridge is available, the originator again receives the DIAL tone.

Keys the directory number. The originator keys the directory number of the first party.

Connects call party. The called party is connected through the SDMX to the conference bridge unit and receives all signaling and information tones through the conference bridge.

Receives an answer. Once the caller receives an answer, he can add other conferees to the call. To do this, he keys C, receives a DIAL tone, and proceeds as stated in the two previous subparagraphs.

Digital call processing.

The full range of circuit switch services and switching functions is available to all digital subscribers (DNVT and DSVT subsets). Most of these are also available to those analog subscribers (TA-341 or signaling-compatible equivalent subsets) who are connected to the switch TDMX. Most of the major control operations involved in providing these services relate to the supervision, information or address signaling, and the matrix connections of each call. The text below describes the call processing sequence. It uses a DSVT subset as an example.

Request for service. This sequence begins when a subscriber on a loop places a call. The digital scanner, which sequentially samples each incoming line, detects the demodulated SEIZE code word and notifies the processor that it has found a service request (seize signal) on the caller's loop. The processor, after determining the type of subset that the caller is using, connects the proper LKG unit and digital receiver to the calling subscriber. This sets up the subscriber dial phase. Now the processor connects the digital signal generator to the subscriber and sends the DIAL code word and digitized DIAL tone signals. This tells the subscriber to begin dialing.

Dialing phase. The calling subscriber, upon hearing the DIAL tone, starts to key in the digits of the called party's number. This includes any applicable precedence digits and access codes. A connected digital receiver detects the digits at the switch. It then forwards them to the processor. Receipt of the first digit causes the IDLE codeword

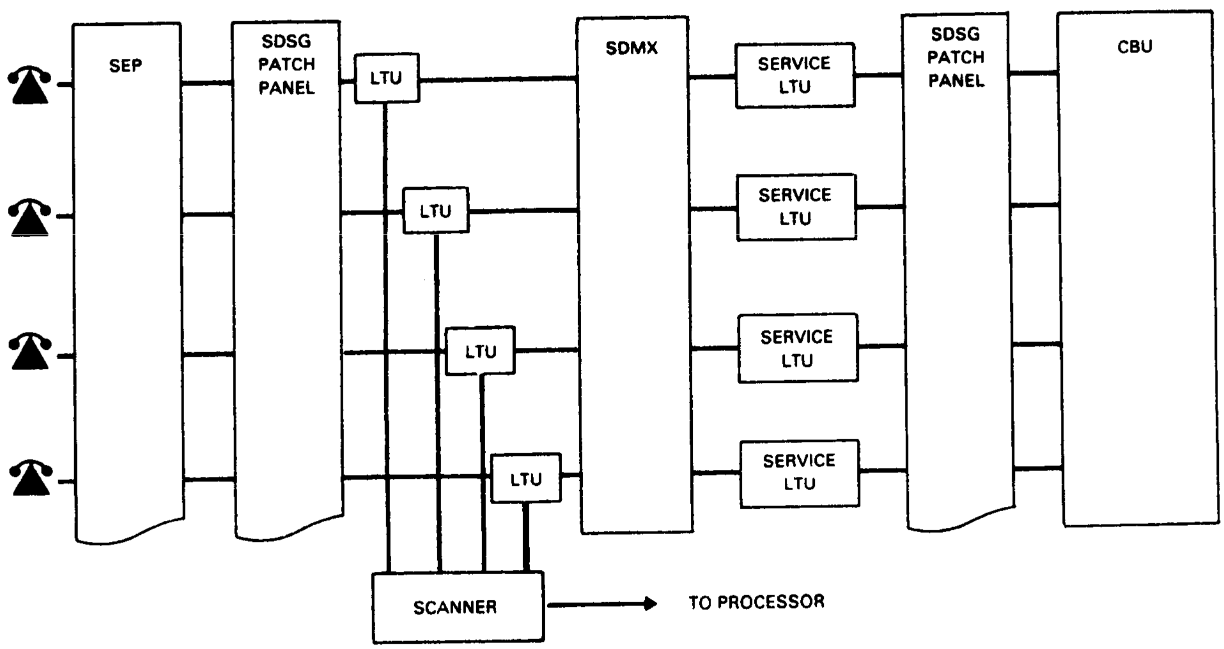


Figure 4-7. Conference call.

to replace the DIAL tone. This code word is a product of the digital signal generator. Upon receipt of the last digit, the switch sends a signal to the DSVT from the digital signal generator. This asks what the mode (voice or data) of the subscriber is if the subscriber is classmarked as dual mode. The digital receiver detects the response to this signal, indicating a voice or data mode. The processor then disconnects the digital receiver and returns it to the pool. If the called party is busy, the digital signal generator sends a BUSY tone to the caller. If the called party is incompatible with respect to mode, voice, or data, the caller receives an ERROR tone.

Ringing phase. If the called party is on-hook and compatible, the switch connects a compatible LKG unit to the called DSVT's diphase loop modem. The digital signal generator then sends a RING VOICE or RING DATA code word. The called DSVT responds to a RING by activating its ringer and sending a ring acknowledge signal back to the switch. The called DSVT responds to a RING DATA signal by going electrically off-hook and sending a RING TRIP code word back to the switch. The switch digital scanner detects RING ACKNOWLEDGE or RING TRIP. The switch digital signal generator then responds by sending the calling party a RINGBACK SECURE, RINGBACK NONSECURE, or GO TO SYNC code word. Which one depends on the encryption mode of the call? The calling DSVT responds to these code words by starting up its internal ringback tone generator and sending the LOCK-IN code word to the switch. The switch detects the LOCK-IN code word with its digital scanner. It responds by sending the IDLE code word to the calling DSVT from its digital signal generator.

Ring answer phase. When the called DSVT goes off-hook, it sends a RING TRIP codeword to the switch. The switch digital scanner detects RING TRIP, and the switch digital signal generator responds by sending back a RINGBACK SECURE, RINGBACK NONSECURE, or GO TO SYNC code word. Which one depends on the encryption mode of the call? The called DSVT responds to this code word by sending the LOCK-IN codeword to the switch. The switch responds to LOCK-IN by proceeding to the traffic phase of signaling.

Traffic phase. When the switch has detected LOCK-IN from both the calling and called parties, it completes a connection between the calling and called parties diphase loop modems (end-to-end connections). Under paragraph 4-2, the subparagraphs on digital stitchings and TDMX operation describe how the connection between calling and called parties is made. Additional code word exchanges will take place between the two DSVTs, but the switch processor ignores all but those involving RELEASE and C key.

Digital/analog calls. For calls between digital (DSVT and DNVT) and analog telephones, the switch must provide the type of codeword signaling that takes place between two digital telephones in a normal digital-to-digital connection. This means that the switch detects LOCK-IN with its digital scanner and sends LOCK-IN to the digital telephone from the digital signal generator. The digital telephone responds to LOCK-IN by stopping its internal ringback tone generator (if activated) and sending the TALK ENABLE code word to the switch. When the switch detects a TALK ENABLE code word with its digital scanner, it responds by sending TALK ENABLE codeword from its digital signal generator to the digital telephone. These continue for a fixed period of time. After that time, the switch makes the connection between the diphase loop modem and the IMU. If the calling party is the digital telephone, the switch may provide a RINGBACK tone. This travels from the analog ringback bus through the IMU. If the calling party is analog, RINGBACK travels from the digital signal generator through the IMU to the analog calling party.

Conferencing. The switch provides digital subscribers with the conferencing (more than a two-party call) privilege by connecting them through IMUs to the analog conference bridge units. Signaling for such calls is the same as for digital/analog calls. (See processing action in the subparagraph above.)

Subscriber release. When a DSVT goes on-hook, it sends the RELEASE code word to the switch. The switch detects the RELEASE code word with its digital scanner. It responds by sending the ONES code word (by disconnecting the subscriber's diphase loop modem) to the DSVT. A DSVT sending a RELEASE codeword will shut off its power on receipt of a ONES code word.

Call release. When the other subscriber connected to a DSVT subscriber releases first, the switch sends an IDLE codeword to the DSVT from the digital signal generator. The DSVT subscriber, hearing silence, will go on-hook, and the DSVT will send the RELEASE codeword to the switch.

From this point, the switch follows the subscriber release procedure. (See the above subparagraph.) The switch can force digital telephones to go electrically on-hook and, therefore, to send RELEASE signals. It does this by sending CUE and FORCE CLEAR code words to the digital telephone.

4-3. Initialization Process

The initialization process includes all those actions taken by planners, control elements, and switch operators that lead to circuit connection, data entry, and system start-up. This phase of switch operation is very important because poor procedures or errors made at this point can delay operation of the entire network. The planner must have a thorough appreciation of the initialization process and the activities at the lower levels of operation. This is especially true of the control that is exercised at the CSCE and at the node. Paragraph 5-6 gives a more complete picture of the planning process and paragraph 5-5 explains the flow of documentation and orders for a circuit switching network. This paragraph is an introduction to the initialization portion of the planning process.

After network planning and configuration have been completed and the CE order has been issued, the communications units deploy to designated sites. The CE order specifies these sites and provides certain basic information needed to initialize the switches. This information is also used by the control facilities to setup operations. The planner issues the CE order (in the name of the commander) from the CSPE. For a corps network, this CSPE is located at corps headquarters or at the corps signal brigade operating location. For a theater network, the CSPE is at a theater headquarters or at the theater communications command operating location.

The CE order may include sets of worksheets needed for initialization of the network switches. All of the information developed so far by the planners and engineers is used to configure the network and is reflected on these worksheets. The order, with the worksheets, goes to the operating units and the CSCEs which add data to these worksheets according to their local responsibilities. The worksheets then go to the node where they may be completed by the switch supervisor who allocates switch resources. The switch data base is loaded at the switch by direct entry from the worksheets (on-line), or by making a data base tape for later loading (off-line). Copies of the worksheets are returned through the same chain so that each level has a record of what has occurred.

If the CSCE has automated facilities or can use the processor of an AN/TTC-39, the data base load tape can be made at the CSCE for each switch under its control. This may save time and can help assure accuracy of the database. In this case, some items of information would still be supplied at the switch. In addition, the worksheets should accompany the tape as documentation and as a backup. They also are used to return information to higher levels. The following steps are a general summary of initialization actions. Note that some can begin as soon as the switch has reached its site if that location is known before the CE order is received. (See paragraph 5-7 for displacement information and time factors.)

Cabling and connections.

This includes power cabling, intershelter cabling, and cabling to transmission media. Subscriber cabling can be started as soon as subscriber units are in place. Some can be connected according to an SOP if the CE order specified this. Internal switch connections are also made in accordance with the CE order.

Interconnection and patching.

All signaling and communication lines entering or leaving the shelter or any major piece of equipment appear on a patch panel. Under normal conditions, initialization requires minimal patching. The patching option, however, lets you isolate lines or equipment to identify and correct faults. It also lets you make temporary use of redundant circuits to bypass failed lines or components without changing the site data base or configuration. (See TM 11-5805-681-12 for details.)

Strapping options.

The CE order with its attached worksheets will define the settings for the strappable PCBs. These include modems, buffers, MUX/DEMUX units, remote transfer switches, and timing generators. Strapping worksheets may be prepared by planners and/or switch personnel. If worksheets are prepared by switch personnel, sufficient information by the planner must be provided to ensure correct strapping. Information pertaining to cable length must be obtained from cable installers. An important item is the switch operating rate. (See paragraph 3-2.) You will need to verify and set it to either 16 or 32 kbs. This will be a matter mainly of setting circuit card strapping. All digital loops terminated on a given switch must have the same rate as all trunks in a given group cluster. However, on certain designated TDM group terminations, a switch operating at 32 kbs can accommodate digital trunk groups with a basic trunk channel rate of 16 kbs. You must also check the time and space division group interface to verify that the appropriate circuit cards are correctly strapped for channel modularity, loop rate, operation mode, and cable length. (See paragraph 4-5 for specific strapping instructions.)

Power-on procedures.

The power initialization procedure involves setting main circuit breakers and switches, ECU controls, battery circuit breakers, and AC and DC controls. It also involves checking various power indicators. (See TM 11-5805-681-12-1.)

Processor start-up.

Refer to TM 11-5805-681 -12-1 for start-up procedures.

Data entry.

If not previously entered, you are now ready to enter the current operating data for your unit's tactical operation. This involves data entry worksheets keyed to prompts generated by the on-line processor. Paragraph 4-6 describes the use of worksheets and the sequence of data entry.

Testing.

You may conduct on-line diagnostic testing after start-up either before or during call processing. Either the system software or the operator should detect faults in the on-line system.

4-4. Numbering Plan

A numbering plan to identify users is basic to any telephone communications network. In a network employing automatic switching, the numbering plan is the vehicle for programming network switches to accept and complete calls. It is the basis on which automatic switches route calls through the network. Users, of course, need a numbering plan to identify the parties they want to call. The Army has established the TTNP to identify all subscribers in its telephone networks. The TTNP is described below:

Figure 4-8 shows a hypothetical network containing typical combinations of subnetworks that might use the AN/TTC-39. The NATO members have reached a standardization agreement to use a unique 3-digit national identification (NI) number 9YX (where Y = 0 or 1; X = 0 through 9) for the military forces of each member country. The NI code for US forces is 914, for Germany 904, for the United Kingdom 913, and so on. The NI code serves as the first 3 digits of a 13-digit telephone number for NATO intercountry calls.

The next level down uses a 3-digit area code similar to a commercial area code. This code takes the form MYX (where M = 2 through 8) (sometimes shown as RA (regional area)). The figure shows three such areas, each with its own code. An MYX area code can serve either geographic areas or such organizations as a division, a corps, or a larger command area. You also can partition each MYX area by any one of three methods. In the figure, MYX areas 1, 2 and 3 each illustrate one of these methods. MYX area 1 is called a primary switch location (PRSL) subnetwork, MYX area 2 is called an NNX subnetwork, and MYX area 3 is called a mixed subnetwork.

In the PRSL subnetwork, you can partition an MYX area into as many as 23 primary zones (PR) or areas (PR = 72 through 98, except 80, 81, 90, and 91; 99 is reserved for fixed directory dialing described below). Each PR can then contain up to 100 SLs. For routing, each switch in an MYX area must be able to store path selection information for as many as 23 primary areas plus up to 100 switch locations for its own home primary area. Thus, the total storage for each switch is 23 + 100 or 123 items. It is not 23 x 100.

The AN/TTC-39 is capable of processing PRs of 22 through 98 (except 30, 31, 40, 41, 50, 51, 60, 61, 70, 71, 80, 81, 90, and 91), making a total of 63 PRs that can be assigned. The total number of SLs for each switch is 100. Thus, the total data storage of PRSLs for each AN/TTC-39 switch is 163. However, due to limitations of other equipments in the field with which the AN/TTC-39 must interact (for example, the AN/TTC-38), PRs for the present tactical numbering system are limited to 72 through 99, allowing only 123 PRSLs.

In an NNX subnetwork, you can partition an MYX area into as many as 640 switching center (NNX) codes (N (8 digits) x N (8 digits) x X (10 digits) = NNX (640 digits); N = 2 through 9). In a mixed subnetwork (MYX area 3), both PRSL and NNX subnetworks coexist within a single MYX area. As a network planner, your task is to set up a combination of MYX areas and NNX and PRSL subnetworks that serve their users well. This means that you must design an unambiguous numbering plan. Within each given MYX area, each primary area and each NNX code must be unique. If the MYX area contains mixed subnetworks, there must be no NNX codes in which the NN portion is the same as a primary area code. In the same way, within each primary area, each SL code must be unique.

The numbering plan for the AN/TTC-39 may use as many as 13 digits (for international calls) or as few as 3 digits (for abbreviated dialing). The 13-digit number takes the form:

9YX-MYX-NNXXXXX.

The first 6 digits, 9YX-MYX, represent the NI and the area codes. They are for calls between different national boundaries and between different areas. Within a given MYX area, there can be no ambiguity in the assignment of the last 7 digits of the basic address. Similarly, the assignment of MYX area codes must be unambiguous in a given network. The AN/TTC-39 is fully compatible and can interoperate with any portion of a network that conforms to the basic 13-digit numbering plan outlined above.

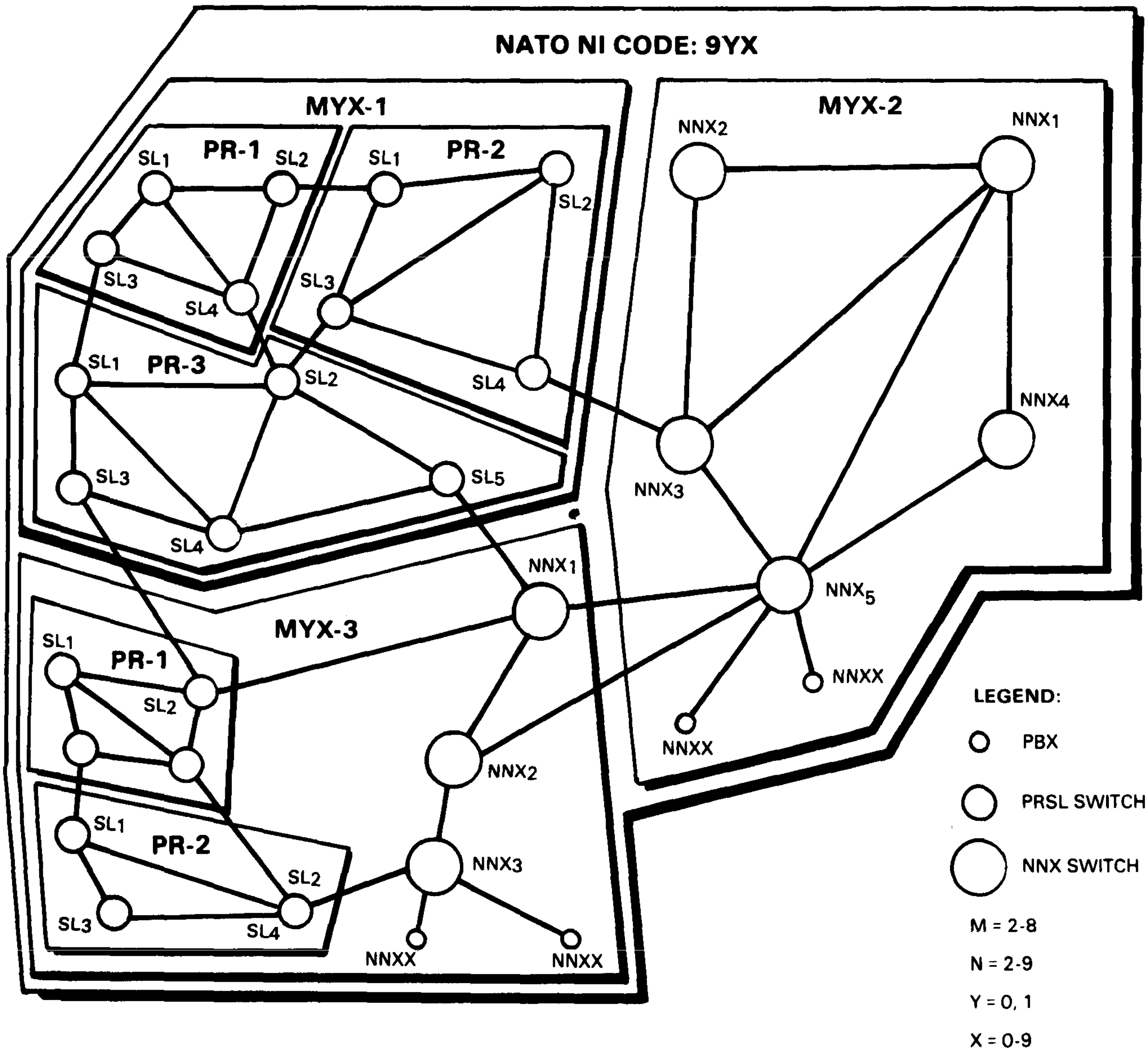


Figure 4-8. Illustrative network.

The last 7 digits, NNXXXXX, of the basic address are like commercial telephone numbers. Such numbers use the first 3 digits to designate the exchange and the last 4 to designate the subscriber. However, in a tactical system, the AN/TTC-39 will use the current TTNP. This uses a 4-digit code, as if it were the commercial 3-digit exchange code, to identify the primary zone and switch location. It uses the last 3 digits to identify the subscriber. This 7-digit TTNP number takes the form:

PRSL-XXX.

The last 3 digits, XXX, identify the individual subscriber. These are further categorized into OXX numbers from 000 through 099, and GXX numbers 100 through 899. OXX numbers are reserved for identifying DC trunks that require operator assistance to complete the call. They are not assignable numbers, GXX numbers (G = 1 through 8) are divided into two groups for the use of the network planner:

- IXX 100 through 699 (I = 1 through 6) identify individual subscribers and are the most common. Any IXX subscriber can dial any other IXX subscriber on the same switch without dialing a PRSL.
- JXX 700 through 999(J = 7 through 9) usually identify units or activities served by a small mantial switch having fewer than 100 lines.

You may wish to reserve certain numbers in specific positions of the basic PRSL-XXX format. This serves two purposes. First, it enables the switch to make certain decisions automatically, (See the paragraph below on abbreviated dialing.) Second, it gives the user some picture of the types of subscribers in the system. For example, you can use the IXX plan to identify subscribers by type of function. Do this by giving subscribers with the same job, regardless of echelon, the same last digit or last two digits. The first digit identifies the function. The number of the G1 could be 101 and the number of the G2 could be 202. Figure 4-9 illustrates a matrix that you can use to assign the second and third digits for subscribers of small switches. (For more information on this, see FM 24-26.)

In a nontactical network, the AN/TTC-39 can use a numbering plan much like the AUTOVON plan. This consists of a 3-digit switch code and a 4-digit subscriber code. It is essentially the same as the 7-digit commercial telephone numbering system. The nontactical number has the form:

NNX-XXXX.

The NNX-XXXX format is known as the 3/4 code and the PRSL-XXX format as the 4/3 code. The AN/TTC-39 can handle either the 3/4 or the 4/3 codes but can never use both at once. However, an AN/TTC-39 programmed to use the 3/4 code can function in a network with other switches that use the 4/3 code.

Abbreviated dialing.

Subscribers of the same switch may use abbreviated dialing. Switches using 4/3 numbering have automatic abbreviated dialing capability. For switches using 3/4 number plan, abbreviated dialing is optional and must be programmed on the ASI worksheet. This means that a user need dial only the last 3 or 4 digits of the basic 7-digit number

GXX (for a PRSL-GXX format) or

GXXX (for an NNX-GXXX format).

G identifies up to 8 (G = 1 through 8) interconnected switches. The 3- or 4-digit format reflects the programming of the local switch (3/4 or a 4/3 code). A 3-digit (GXX) number would limit abbreviated dialing to a single local switch.

When a switch provides for abbreviated dialing, users must always dial the digit 9 to make regular calls outside of their local switch. Thus, the digit 9 (the escape code) must precede the basic 7- or 10-digit number, NYX-NNXXXXX. Expanded switch nodes (nodes composed of two to four AN/TTC-39 switches trunked together to form 1,200- to 2,400-line capacity switches) expand the abbreviated dialing service. Here one can dial 4 digits to place calls between the switches of the expanded node. The first digit of the GXXX abbreviated dial number format accesses a specific AN/TTC-39 within the node. The last 3 digits (XXX) access the subscriber.

Fixed directory dialing.

A key goal of any tactical network is to provide efficient telephone service to roving subscribers on the battlefield. This requirement has led to the fixed directory capability. In an AN/TTC-39 network, this feature enables roving subscribers to have fixed directory numbers, regardless of their locations. The fixed directory scheme has two elements:

- The fixed directory subscriber list (FDSL).
- The fixed directory unit list (FDUL).

The FDSL serves individual subscribers, who will have IXX or JXX numbers. FDUL serves selected units that may move frequently.

Fixed directory numbers are accessed by dialing the access code 99 (instead of a PR number) and then a 5-digit directory number. The 5-digit code has two forms:

- FDSL = PXJXZ.
- FDUL = XXIXX.

(*P and J* = 7-9, X = 0-9, Z = 0-3, and I = 1-6.)

The switch first recognizes the 99 as indicating a fixed directory number. It then reads the 3-digit of the 5-digit number to identify the directory to which the number belongs (for example, J = the FDSL or I = the FDUL).

FDSL: Next, the switch reads the last 5 digits and consults the FDSL table for translation. It would, for example, translate PXJXZ into a PRSL-XXX number. The maximum number for these is 3,400. The network planner at the CSPE, in coordination with the CSCEs, assigns and controls the FDSL assignments. Once the FDSL is assigned, the FDSL directory can be published and service activated. The AN/TTC-39 will automatically accept FDSL numbers and will route all FDSL calls. The CSCE must determine and coordinate routing changes dictated by subscribers' movements.

FDUL: After reading the third digit of the 5-digit number (XXIXX) as an I, the switch reads the first 2 digits. It then consults the FDUL table for the translation. Each entry is of the form XX = PRSL. Since XX can equal 00-99, there are 100 (PRSL)

3d Digit (X)

	1	2	3	4	5	6	7	8	9	0
0	ADMIN S1/G1	INTELL S2/G2	OP S3/G3	SUPPLY S4/G3	XO DCG	CMD CO/CG	ORDERLY ROOM/ 1SG/CSM	MAINT SEC (MOTOR)	MEDICAL AID STATION	COMM OP
1	Asst Plt				HQ Co	LO	Security Sec	Elec Maint	Medical Sec Surgery	Comm Sec
2	EO and HR Off	Drug Abuse Off	Avn Off	QM (Materiel)	Mess		Dismount Point (Guard)		Chaplain	Msg Center
3	AG/Adj	2 Air	3 Air				Survl Sec	Trans Sec		RWI
4	Pers Off	OB	Air Con		Provost Marshal		HQ Comdt	Ord Ammo		Radio
5	Postal	Recon	Air Support		S5/G5		Hel Pad	Engr	Arty	Data
6	TOC 1	2	3	4		CofS		NBC	Air Defense Emerg	CE/Comm Off
7	SJA	Weather	Tng			Aide	Finance	EW	Frame	CNCE
8	IG	CI	MI		Info Off	CSCE			Photo	CNCE
9	Qtr								Test Tone	Tel Repair

NOTES: 1. Arrows indicate direction of expansion.

2. Numbers 1 through 6 can serve as the first digit (I) of IXX.

Figure 4-9. Small switch matrix (IXX).

entries in the FDUL table. The switch then adds the last three digits, IXX, to form the address: XXIXX = PRSL-IXX. As the unit moves, the network managers and controllers must update the FDUL table in some or all of the switches. Note that one update of the XX = PRSL table will identify hundreds of subscribers because XXIXX = PRSL-IXX.

Commercial network access.

A commercial network access capability is provided for the AN/TTC-39 subscriber. The commercial network access code is 5C. The dialing sequence for calls into a commercial communication system consists of P (for precedence routing through the tactical network only), then 5C followed by a second dial tone (from the commercial switch), then the desired commercial number. Dialing of the C key at the end of the commercial number indicates the end of dialing. Only one commercial network can be automatically accessed by the tactical subscribers within a given area code.

The actual number of digits in the address depends on the commercial network and the extent of service the planner desires. If the local commercial network uses a 7-digit number, the address for commercial access is:

5C-XXXXXXX-C

Digital transmission required.

This request can be dialed via the prefix 7C from a local or long loop KY-68 or TA-954 terminal of an AN/TTC-39. The switching system will complete such calls by using only digital trunks between the originating and terminating digital switches. The call will not be completed if an appropriate digital path cannot be found. The quality of the signal is retained end-to-end because this service avoids the use of analog/digital conversions within the hybrid trunking network. The availability of the digital path allows the subscriber, after verbal coordination, to transmit digital data or digital facsimile as well. The basic form of the address for digital transmission required is:

7C-address.

Security required.

This request is transmitted to the AN/TTC-39 by dialing the prefix lC from a local or long loop KY-68. The call will only be completed via a digital path to a KY-68 or an AN/TYC-39 message switch (MS), or to a protected distribution system for an analog or DNVT subscriber terminal. When used for the MS, this allows full-duplex transfer of data between an AN/TYC-39 and a secure digital net radio interface station (KY-90). The basic form of the address for security required is:

1C-address.

Analog transmission required.

The prefix 3C can only be used by analog terminals of an AN/TTC-39. The prefix ensures the calling subscriber an analog end-to-end connection. This may be used when transmission of quasi-analog signals is intended and where any degradation caused by employment of analog-to-digital conversions should be avoided. The basic form of the address for analog transmission required is:

3C-address.

End-to-end encryption required.

The prefix 4C can be used by local and long loop KY-68 subscribers to ensure setup of a digital, end-to-end, encrypted path to the called party. This service provides for a change from the voice to the data mode or for the use of a compartmented key by both subscribers after initial contact over the end-to-end encrypted link has been established. The basic form of the address for end-to-end encryption is:

4C-address.

Summary of numbering plans and dialing sequences.

Table 4-3 summarizes the fundamental properties of the TTNP. Subscribers using the AN/TTC-39 have available to them a variety of special service features based on their classmarks. The following numbering prefixes activate these special features:

P F E followed by 3- to 13-address digits.

P is a precedence code, F a special feature code, and E an escape code. When all three codes are used, they must be in the sequence shown. However, any or all of them in any combination may be omitted. If the precedence code is not dialed, the switch assumes routine precedence. In the absence of a special feature code, F, the switch treats the call as an ordinary voice call. Treatment then depends on the subscriber's classmark. For example, the switch treats a call from a secure voice subscriber as a secure voice call even though a special feature has not been indicated.

Dialing of the escape code, E, is not optional. When required to make an outside call (as in the 4/3 code when abbreviated dialing is available), it must be dialed. Otherwise (as in the 3/4 code without abbreviated dialing), it must not be used. Failure to use the E digit properly will generally cause the switch to receive an incorrect number of digits. This in turn will result in the return of an error signal to the calling party.

Subscriber dialing sequences. The different subscriber instruments with which the AN/TTC-39 must interface use specific codes to request special features. Table 4-4 lists these codes. Table 4-5 shows the allowable sequences that a subscriber may dial. The switch can accept all these sequences, but it rejects any sequence not listed and returns an error signal to the subscriber. Table 4-5 is divided into 11 categories, A through K. Each of these provides a set of compatible sequences. As an example, consider category D, special features with precedence. A subscriber may dial any of the precedence codes indicated, followed by a special feature code, followed by any of the six combinations of escape code and address digits. All sequences shown in the table are legal. However, the switch must determine from classmark data whether a particular subscriber can have a certain special feature. Remember that the escape code is not optional. Below are specific examples of allowable dial sequences in category D.

Table 4-3. Tactical telephone numbering plan.

DIGIT POSITION	GENERAL APPLICATION	GENERAL ASSIGNMENT	AVAILABLE NUMBERS
PR	Primary zone or area. Used as primary identification number	Geographic areas for theater, corps, and division command areas.	72 - 79, 82 - 89, 92 - 98 (See notes.)
SL	Switch location. Used as a secondary identification within a given primary zone.(Can be either automatic or manual).	Command posts, area signal centers, peripheral organizations/installations, combat units, combat support, combat service support units (brigade level and higher), miscellaneousfacilities.	00 - 99
IXX	Local subscriber identification.	Terminates at an individual telephone. Can be used at any command level or echelon.	100 - 699
JXX	Local switch identification	Generally terminates in a switch, although switch, although individual subscribers may be assigned such a number.	700 - 999
OXX	Terminations that require operator intercept and interface.	Assigned to DC closure lines for use with commercial central offices. (For use with the tactical automatic switch with manual interface only.)	001 - 099
0 or 000	Operator.	0 rings local operator; PR-SL-000 rings operator at distant switch designated by PR-SL digits.	0 and 000

NOTES: 1. This table relates to the 7-digit telephone numbers used in a PR-SL-XXX numbering plan.

2. The switch is programmed to recognize any number having a first digit of 7, 8, or 9 as being a 7-digit number. If the first digit is 1, 2, 3, 4, 5, or 6, it processes the call after the third digit (abbreviated dialing).

3. PR-99 is reserved for access to the fixed directory.

Sequence	*Meaning*
13C9 NNXXXXX	Analog required call at IMMEDIATE precedence to subscriber at a distant switch; local originating switch has abbreviated dialing requiring the escape code 9 for outside calls.
R1 GXX	Call at PRIORITY precedence to local subscribe local switch has 3-digit abbreviated dialing.

Trunk dialing sequences. The AN/TTC-39 interfaces with a variety of trunk types. These in turn use a number of methods to indicate precedence and special features. Table 4-6 shows the particular legal sequences with which the switch is compatible. These sequences fall into 13 categories (A through M in the table). Any sequence not indicated is illegal and the switch will reject it.

4-5. Technical Management

Technical management involves the work done to prepare the switch for operation. This work implements planning done by a planner at a higher echelon. It consists of gathering all the required data and of fitting it into a format that enables the switch to be configured and the data entries to be made.

For the circuit switch, the basic management tools are worksheets. Worksheets are used in the

Table 4-4. Subscriber call service feature dialing codes.

CALL SERVICE FEATURE	TELEPHONE TYPES				
	12-KEY	15-KEY		DIAL PULSE	RINGDOWN
Precedence					
Flash Override	R4	FO	FO	NA	NA
Flash	R3	F	F NA	NA	
Immediate	R2	I	I	NA	NA
Priority	R1	P	P	NA	NA
Conference					
Progressive					
Initiate	C + Address	A + Address	C + Address	NA	NA
Release unanswered	C	A (Note 2)	C	NA	NA
Preprogrammed					
Initiate	6 CNX	6 ANX	6 CNX	NA	NA
Release unanswered	C	A	C	NA	NA
Reinitiate	C	A	C	NA	NA
Call transfer	2C	2A	2C	NA	NA
Compressed dial	NXC	NXA	NXC	NA	NA
Attendant access	PO (Note 3)	PO	PO	O	RD
Analog required	3C	3A	3C	NA	NA
Abbreviated dialing					
4/3 switch trunk access	GXX	GXX	GXX	GXX	NA
	9	9	9	9	NA
Communications network access	5C	5A	5C	NA	NA

NOTES: 1. X = 0 through 9; G = 1 through 8.

2. A and C represent the same electrical signal and are thus identical and indistinguishable as far as the switch is concerned.

3. P indicates one of the four precedence codes or no code for a routine level call.

Table 4-5. Allowable subscriber dialed sequences.

Format: P F E address digits.

A. Address digits only, routine precedence.

E	Address Digits	Notes
9	9YX X....X	Call to NATO at switch with abbreviated dialing, 0 to 10 digits following 9YX.
9	MYX NNXXXXX	10-digit number at switch with abbreviated dialing.
9	NNXXXXX	7-digit number at switch with abbreviated dialing.
	9YX X....X	Call to NATO at switch without abbreviated dialing, 0 to 10 digits following 9YX.
	MYX NNXXXXX	10-digit number at switch without abbreviated dialing.
	NNXXXXX	7-digit number at switch without abbreviated dialing.
	GXX	3-digit abbreviated dial.
	GGXX	4-digit abbreviated dial.
	NXC	Compressed dial code.
	0	Operator. The attendant must not key 0.

B. Address digits with precedence above routine.

	P	E	Address Digits
(Note 3)	FO, R4	9	9YX X....X
	F, R3	9	MYX NNXXXXX
	I, R2	9	NNXXXXX
	P, R1		9YX X....X
			MYX NNXXXXX
			NNXXXXX
			GXX
			GGXX
			NXC
			0

Table 4-5. Allowable subscriber dialed sequences. (continued)

C. Special features, routine precedence.

	F	E	Address Digits	Notes
(Call Transfer)	2C	9	MYX NNXXXXX	The attendant does
(Analog Required)	3C	9	NNXXXXX	not have data access.
			MYX NNXXXXX	
			NNXXXXX	
			GGXX	
			GXX	

D. Special features with precedence above routine.

P	F	E	Address Digits
FO, R4	3C	9	MYX NNXXXXX
F , R3		9	NNXXXXX
I , R2			MYX NNXXXXX
P ,R1			NNXXXXX
			GXX
			GGXX

E. Preprogrammed conference, precedence above routine.

P	F	E	Address Digits
FO, R4	6C		NX
F , R3			
I , R2			
P , R1			

F. Preprogrammed conference, routine precedence.

P	F	E	Address Digits
	6C		NX

G. Progressive conference, routine precedence.

F	E	Address Digits
C	9	9YX X...X
	9	MYX NNXXXXX
	9	NNXXXXX
		9YX X...X
		MYX NNXXXXX
		NNXXXXX

Table 4-5. Allowable subscriber dialed sequences. (continued)

G. Progressive conference, routine precedence.

F	E	Address Digits
		GGXX
		GXX
		0

H. Progressive conference with precedence above routine.

P	F	E	Address Digits
FO, R4	C	9	9YX X...X
F, R3		9	MYX NNXXXXX
I, R2		9	NNXXXXX
P, R1			9YX X...X
			MYX NNXXXXX
			NNXXXXX
			GGXX
			GXX
			0

I. Call to commercial network, routine precedence.

P	F	E	Address Digits
	5C		XX....XC 0 to 13 digits between 5C and C

J. Call to commercial network, precedence above routine.

P	F	E	Address Digits
FO, R4	5C	E	XX....XC 0 to 11 digits between 5C and C
F, R3			
I, R2			
P, R1			

Table 4-5. Allowable subscriber dialed sequences. (continued)

K. Call to monitor commercial trunks (allowable only by attendant).

P	F	E	Address Digits	Notes
	R		01	The attendant selects
			02	1 of 36 trunks to monitor.
			.	
			.	
			.	
			36	

NOTES: 1. M = 2 through 8, N = 2 through 9, X = 0 through 9, G = 1 through 8, Y = 0 through 1.

2. PRSL is a subset of NNXX and is implied by each NNXX type entry.

3. The switch processes all precedence codes separated by a comma as equivalents. R1, R2, R3, and R4 do not indicate precedence when received from an attendant.

planning process, in configuration, and in data entry. They can also function as scratch notes, as guides for initialization and operation, and as documentation for actions and orders. They are very important as guides because they encourage a system of orderly and logical thought and action. They are even more important as documentation because they help build a data base. Afterwards, they become an important record of that database for reference and emergency use. In addition, worksheets sent out with orders can transmit technical details in a common format. When returned, they become completion reports for the planner's file.

There are four types of worksheets: planning worksheets, configuration or strapping worksheets, data entry worksheets, and COMSEC management worksheets. Planning worksheets evolve from the actions at the planning level. Configuration or strapping worksheets are used to develop and record the information needed to make connections on circuit cards. These connections, or straps, change the configuration of the switch. Data entry worksheets provide a way to gather data. They also guide the making of entries for initialization or for data base changes. COMSEC management worksheets are used to configure COMSEC devices and to provide data for the data entry worksheets. (See FM 24-27A for further information.) When all of the worksheets are completed, it may be necessary to return to the planning worksheets to make adjustments. These in turn may lead to adjustments on the configuration and data entry worksheets. The fact is that each part of the process is tied closely to the other parts.

Note that all worksheets described in the following subparagraphs are not required for every communications system development. Also, the planner may complete only a portion of those worksheets that are required. For example, the planner may be faced with developing a complete network from scratch, or with setting up only a subnetwork to interoperate with an existing network. In all cases, the planner will be responsible for initiating the preparation of various planning and data base worksheets. Such worksheets will then be completed with site-specific information prepared at the switch level. Reproducible forms are found in Appendix C. For further discussion of planner responsibilities and planning levels, see paragraph 5-6 and Figure 5-5.

Table 4-7 is a listing of all worksheets used for the circuit switch. The following pages will describe each of these in turn. Use this table as a ready reference to the worksheets.

Planning worksheets.

The diagram in Figure 4-11 shows an example network of circuit switches. It illustrates the transition period during which digital equipment replaces older analog equipment. The planning to be done

Table 4-6. Allowable trunk dialing sequences.

A. AUTOVON trunks (to and from).

Basic format: P X(X) address digits.

	P	X	Address Digits
(Flash override)	0	0 (voice)	NYX NNXXXXX
(Flash)	1	1 (data)	NNXXXXX
(Immediate)	2	5 (direct access voice)	
(Priority)	3	6 (direct access data)	
(Routine)	4		

The switch can operate with X or XX as a special feature code. Only one can be in use in the network at any one time; when the XX code is implemented, the use of the X code must stop. The switch can translate either X or XX. The allowable values shown above are for operation with the X special feature code. Category B (below) shows allowable values for XX.

B. AUTOVON PBXs (to the AN/TTC-39).

Basic format: P X(X) address digits.

	P	1X	Address Digits	Notes
1)	FO F I P	10 (voice) 11 (data)	MYX NNXXXXX NNXXXXX	
2)		10 11	MYX NNXXXXX NNXXXXX	Routine voice call. Routine data call.
3)	FO F I P		MYX NNXXXXX NNXXXXX	
4)			MYX NNXXXXX NNXXXXX	Routine voice call.

C. AUTOVON PBXs (from the AN/TTC-39).

Basic format: P address digits.

		P	Address Digits	Notes
1)	(Flash override) (Flash) (Immediate) (Priority) (Routine)	0 1 2 3 4	XX ... X	Last zero to seven digits of NNXXXXX based on trunk classmarked editing; use this sequence only for a PNID-capable PBX.

Table 4-6. Allowable trunk dialing sequences. (continued)

2)		XX ... X	Last zero to seven digits of NNXXXXX based on trunk classmarked editing; use this sequence only for a routine call to INID PBX.
3)			No address information forwarded to manual PBXs; use precedence alerting signal on precedence calls to manual and INID PBXs.

D. AN/TTC-38 (to and from).

Basic format: A P address digits.

	A	P	Address Digits	Notes
1)	5	0 (Routine) 1 (Priority) 2 (Immediate) 3 (Flash) 4 (Flash override)	XXXXXXX	Call to foreign network; address digits are assumed to be compatible with AN/TTC-39 numbering plan and are processed accordingly.
2)	6	0 1 2 3 4	NNXXXXX	Request for wideband trunk.
3)	9	0 1 2 3	NNXXXXX NYX NNXXXXX	Escape code used to reach AUTOVON (or AUTOVON-like) number.
4)		0 1 2 3 4	NNXXXXX	

On an outgoing call, the access code digit 9 must be inserted whenever the call is identified as going to an AUTOVON-like number (based on the digit 9 previously received from an AN/TTC-38) or whenever 10 address digits (determined after all editing is performed) are to be forwarded to an AN/TTC-38 trunk.

E. AN/TTC-39 (to and from).

Basic format: Address digits.

Address Digits	Notes
MYX NNX XXXX NNX XXXX	

Table 4-6. Allowable trunk dialing sequences. (continued)

MYX NNX XCNX NNX XCNX	Request for remote preprogrammed conference using last NX (last two digits).
9YX X ... X	NATO call, 0 to 10 digits following 9YX.
XXX ... X	Commercial network call, 0 to 13 digits.

Precedence and special feature codes must be contained within the common channel signaling call initiate message.

F. AN/TTC-30 (to and from).

Basic format: P address digits.

	P	Address Digits	Notes
1)	R	XXXX	Precedence call above routine; address digits are last five of NNXXXXX.
2)		XXXX	Routine precedence level call.

The allowable values for the first two digits (excluding precedence) sent by the AN/TTC-30 are restricted to 1X from the full range of XX.

A classmarked NN code is affixed in front of the received XXXX digits before translation.

G. NATO (to the AN/TTC-39).

Basic format: T P address digits.

	T	P	Address Digits
1)	(unencrypted secure)	1 (routine)	9YX XX ...X
2)	(encrypted)	2 (priority)	MYX NNX XXXX
		3 (flash)	NNX XXXX

If 9YX is received from the NATO interface, as many as 10 following digits may be received or as few as none.

If only T and P are received, the call shall be intercepted to the AN/TTC-39 attendant.

NATO (from the AN/TTC-39).

Basic format: T P address digits.

	T	P	Address Digits
1)	(unencrypted secure)	1 (routine)	XXX ... X
2)	(encrypted)	2 (priority or immediate)	
		3 (flash or flash override)	

Table 4-6. Allowable trunk dialing sequences. (continued)

The number of address digits transferred may be from 0 to 13.

H. AN/TTC-4, AN/TTC-5, AN/TTC-7, AN/TTC-22, AN/TTC-28, CV-1918, CV-1919, CV-2875, SB-3614, SB-3802, TC-10, 3-digit PABX, E&M trunk to commercial network (to the AN/TTC-39).

Basic format: P address digits.

	P	Address Digits	Notes
1) Routine Precedence		9YX X X	Call to NATO, 0 through 10 digits following 9 YX.
		MYX NNXXXXX	10-digit number.
		NNXXXXX	7-digit number.
		O	Operator.
2) Precedence Above Routine	FO, R4 F, R3 I, R2 P, R1	9YX X .... X MYX NNXXXXX NNXXXXX O	

I. 3-digit PABX (from the AN/TTC-39).

Basic format: P address digits.

P	Address Digits	Notes
1) R	XXX	Last three digits of NNXXXXX forwarded when PABX serves called party directly. R digit sent for calls at precedence above routine.
2)	XXX	
3)	O	Digit O; forwarded when PABX does not serve called party directly. R digit sent for calls at precedence above routine.
4) R	O	

J. Commercial offices (from the AN/TTC-39).

Basic format: Address digits.

Address Digits	Notes
XX ...X	0 through 13 digits based on classmark.

Table 4-6. Allowable trunk dialing sequences. (continued)

K. AN/TTC-4, AN/TTC-5, AN/TTC-7, AN/TTC-22, CV-1918, CV-1919, CV-2875, SB-3614, SB-3082, TC-10 (from the AN/TTC-39).

No address information is forwarded.

L. From AUTOVON switch to AN/TTC-39 actting as a PBX (AUTOVON PBX access line).

Basic format: P address digits.

		P	Address Digits	Notes
1)	(Flash override) (Flash) (Immediate) (Priority) (Routine)	0 1 2 3	NNX XXXX	PNID PBX access lines.
2)			NNX XXXX	INID PBX access line, routine level call.
3)				No address information forwarded to INID PBX access line on precedence call above routine; use precedence alerting signal.

M. To AUTOVON switch from AN/TTC-39 acting as a PBX (AUTOVON PBX access line).

Basic format: P IX(X) address digits.

	P	IX	Address Digits	Notes
1)	FO F I P	11 (data)	NYX NNXXXXX NNXXXX	Data call above routine precedence.
2)		11	NYX NNXXXXX NNXXXXX	Routine data call.
3)	FO F I P		NYX NNXXXXX NNXXXXX	Voice call above routine precedence.
4)			NYX NNXXXXX NNXXXXX	Routine voice call.

Table 4-7. Worksheet summary.

NUMBER	MNEMONIC	TITLE	TYPE
P1		Subscriber List	Planning
P2		Trunk Group Cluster List	
P3		Loop Terminations	
P4		Trunk Terminations	
P5		Circuit Card Inventory	
S1		Matrix Strapping	Strapping
	COMXC	COMSEC Transmit Controller	
	CTLU6	Processor Control Unit	
	CAP09	Control and Alarm Panel/TTY Buffer Baud Rate	
	CSPMD	Call Service Position Modem	
	MXRCA	Matrix Receive Controller A	
	LTG	Local Timing Generator	
	MTX-G	Matrix Interface G	
	RSBMD	Remote Signaling Buffer Controller MUX/DEMUX	
	DSCNB	Digital Scanner B	
S2		Modem/Clock Strapping	
	GRPBF	Group Buffer	
	DISGM	Diphase Super Group Modem	
	GCLK	Group Clock Selector	
S3		MUX/DEMUX Strapping	
	NCMD	Nine Channel MUX/DEMUX	
	DPLSM	Dipulse Group Modem	
	DIGPM	Diphase Group Modem	
S4	NWLTU	Normal Wideband Line Termination Unit	
S5	MOD21/MOD22	Type II Modem	
S6	TSBFB	Trunk Signaling Buffer B	
S7	SWMCT	Switch Memory Control	
S8	LPCLK	Loop Clock Selector	
S9	DILPA	Diphase Loop Modem A	
D1/D4	ASI/ASC	Switch Initialization and Classmarks	Data Entry
D2A	ATT	Conference Bridge and Call Service Position Worksheet	
D2B	ATT	Loop Key Generator Worksheet (KG-82, Type 123)	
D2C	ATT	Intermatrix Unit Worksheet (Type 98) Signaling	
D3A	ATS	Signaling Equipment Worksheet	
D3B	ATS	Analog Loop and Trunk Worksheet	

Table 4-7. Worksheet summary. (continued)

NUMBER	MNEMONIC	TITLE	TYPE
D3C	ATS	Digital Loop and Trunk Worksheet	Data Entry
D5	ADT	Digital Transmission Groups	
D6	ATG	Trunk Group Clusters	
D7	AEU	Essential User Bypass	
D8	AVL	Key Locations	
D9	ANR	Net Rekeying	
D10	ACN	Commercial Network Routing	
D11	ANY	NYX Routing	
D12	APR	PR Routing	
D13	ANN	NNX Routing	
D14	ANX	NNXX Routing	
D15	AXX	XXX Routing	
D16	AAA	Alternate Area Routing	
D17	ASL	SL Routing	
D18	ACP	Common Pool Compressed Dial List	
D19	AFD	Fixed Directory Routing	
D20	AIC	Individual Compressed Dial List	
D21	APC	Preprogrammed Conference List	
D22	ADE	Digit Editing Lists	
D23	ACI	Call Inhibit Lists	
D24	AST	Secondary Traffic Channels	
D25	AZR	Zone Restriction List	
D26	ARB	Assign Received Bypass List	
D27	AAR	Assign, Accommodate, and Restore Received Bypass List	
D28	AFR	Assign Frequency for Network Reporting	
D29	ATH	Thresholds	
D30	ATM	Traffic Metering	
		CONAUTH KVM Worksheet	COMSEC
		CNCS KVM Worksheet	

is for one of the AN/TTC-39 switches or nodes in this network. (See paragraph 5-6 for more information about developing networks. Also see Appendix B for an example of how the planning worksheets are used.)

DD Form 2490-1, Network Planning and Configuration Data--Subscriber List (Figure 4-10). To analyze what is needed at switch A (Figure 4-11), start with worksheet P-1 (P for planning) in Figure 4-10. List all the subscribers for the switch. An operations order or plan may already provide this information. If not, use available documents to create the list. Consider the switch capacity and, if necessary, assign priorities for service. If a directory number has not been assigned, make the assignment from available numbers. Assign equipment according to availability. The rest of the information on the worksheet is for assigning class of service marks (classmarks) during the data entry process. Use the AFD worksheet (D-19) to make fixed directory assignments. To make essential user bypass (EUB) assignments, use the AEU worksheet (D-7). For everything else, use the ATS worksheet (D-3). Paragraph 3-7 explains each of these classmarks.

DD Form 2490-2, Network Planning and Configuration Data–Trunk Group Cluster List (Figure 4-12). This worksheet is for gathering the information needed to determine the requirements for trunking between switches. Because the AN/TTC-39 is a hybrid switch (analog and digital capabilities), the interswitch trunking is composed of sets of trunks with various transmission characteristics. If the trunks had identical characteristics, they would form a trunk group. But these are varying, and so they are called trunk group clusters. In the example network in Figure 4-11, the numbers on the lines around switch A represent TGCs. List each of the trunks in each of the TGCs on worksheet P-2. If TGCs have not yet been assigned, this worksheet can be used to develop the trunk composition of each.

List each TGC number and the DTG number of the digital trunks. Under channels list the number of channels assigned both to traffic and to signaling. The destination switch is also listed by NYX-NNXX number. Equipment at both ends is listed to help determine the technical characteristics in worksheet P-4. The traffic limits columns are to indicate whether outgoing calls for each trunk are to be restricted by precedence. For this worksheet check the highest level of precedence for each trunk. Later on, the data entries will total these to classmark each TGC. (See ATG worksheet.) If there is to be no restriction on precedence, leave blank. Mark yes or no for glare, spill forward, and to show if this is part of a TGC to an access node. Finally, you can assign the circuit number now or later on when filling out the ATS worksheets.

DD Form 2490-3, Network Planning and Configuration Data-Loop Terminations (Figure 4-13). Figure 4-13 shows worksheet P-3 which details the technical information needed to terminate a subscriber loop. This information is the basis for equipment assignment and switch configuration. Worksheet P-3 must be prepared in conjunction with P-1. Under technical characteristics, indicate 2-wire or 4-wire (2W/4W) and supervision AC or DC for both analog and digital loops. Indicate common battery or local battery (battery) and signaling characteristics (signaling) for analog loops. These can be 20-Hz ringdown, 1600-Hz ringdown, 2600-Hz SF, DC closure, or one-way automatic/one-way ringdown.

You can now assign a modem or LTU. (See worksheet P-5 for available equipment.) If an adapter is needed for an analog termination, list it here and assign the location and type. Be cautious when adapters are used because all loops with adapters must enter the SEP through jack J1. (J1 is wired to the CEG special circuits patch panel and, in turn, to the SDSG patch panel.) Thus, you must select locations for circuit cards used for LTU and adapter combinations from those slots hard-wired to J1.

DD Form 2490-4, Network Planning and Configuration Data-Trunk Terminations (Figure 4-14). Figure 4-14 shows worksheet P-4. It is similar to the loop termination worksheet (P-3). For clarity P-4 repeats some of the information in the trunk list. Both worksheets provide information used to assign and to configure the switch.

List both analog and digital trunks by trunk and TGC. Destination equipment identifies the destination switch or other equipment. Enter the type of TGC (interswitch, commercial, private automatic branch exchange DIBTS) and the signaling characteristics (1600-Hz ringdown and 2600-Hz SF dial). Assign the modem of LTU to be used, and determine the SDSG or TDSG assignment.

Now select and enter the trunk rates. The number of channels refers to the number of multiplex data stream channels (8, 9, 16, 18, 32, 36, 48, 64, 72, 128, or 144). Both the diphase group modem and the DISGM require selection of cable length. Cable for

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - SUBSCRIBER LIST			WORKSHEET NO. P-1
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	EQUIP-MENT	LINE HUNT-ING	DAS NO. CALLED	LOAD CON	SEC CALL	PREC	DATA USE (DVM)	HDX	MS COM-PAT	FAX USE	CONF PROG PREPROG	CALL TRANS-FER	COM-PRESSED DIAL	ZONE RESTR	COM-MERCIAL NET	EUB	FIXED DIREC-TORY	CIRCUIT NO.
	202	TA 838	N	—	4	N	R	—	—	—	—	N	Y	N	1	N	N	N	

SAMPLE

DD Form 2490-1, FEB 87

Figure 4-10. Subscriber list.

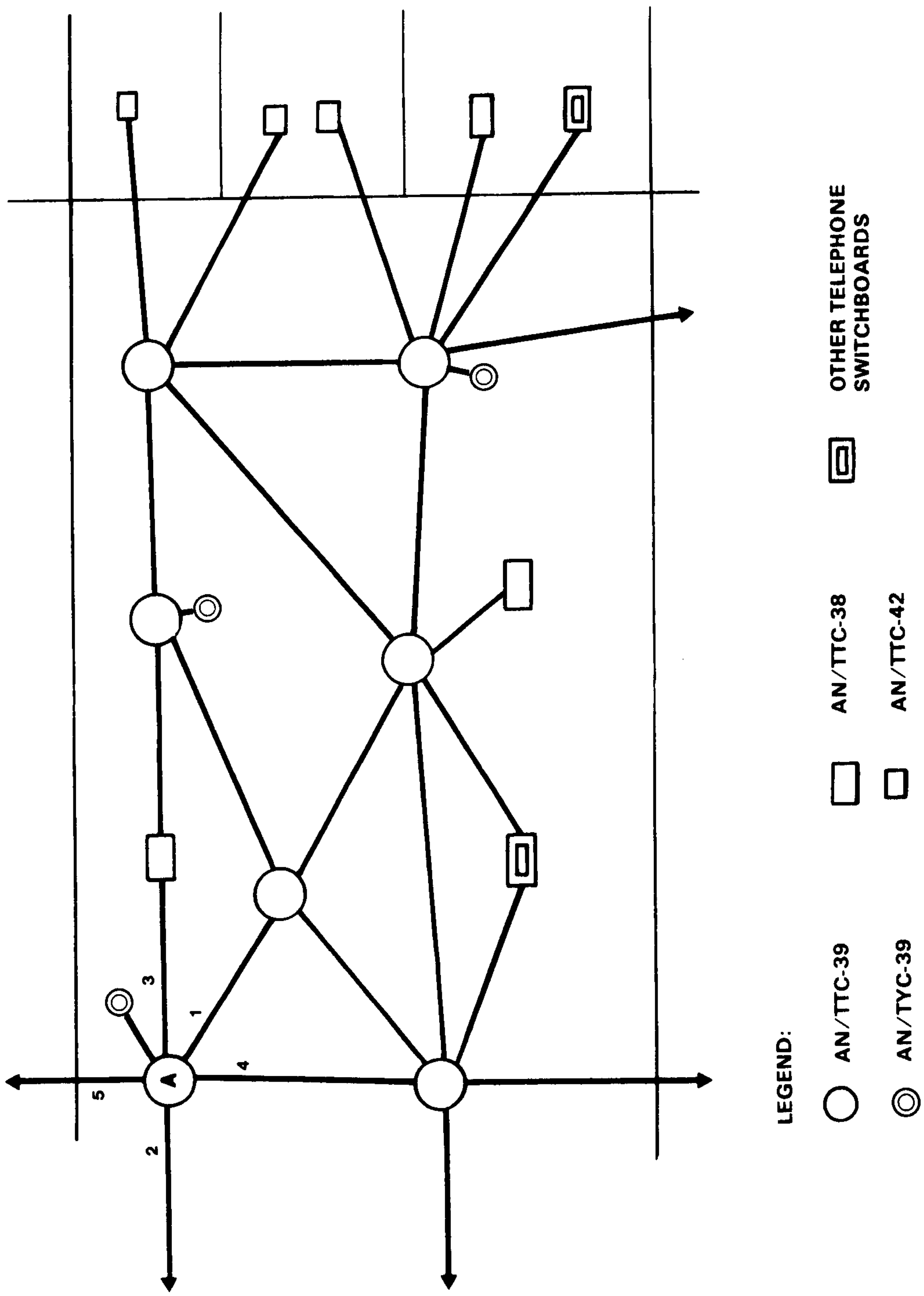


Figure 4-11. Example circuit switch network.

COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER LIST			WORKSHEET NO. P-2
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ___ OF ___
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

TGC NUMBER	DTG NUMBER	CHANNELS		DESTINATION NYX-NNX(X)	DEST EQUIP-MENT	XMSN EQUIP-MENT	TRAFFIC LIMITS				GLARE	SPILL FORWARD	ACCESS TGC	CIRCUIT NUMBERS
		TRAFFIC	SIG				F	I	P	R				
001	—	2	—	214-8211	SB 3614		—	—	1	1	—	Y	Y	

SAMPLE

DD Form 2490-2, FEB 87

Figure 4-12. Trunk group cluster list.

COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - LOOP TERMINATIONS			WORKSHEET NO. P-3
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

				TECHNICAL CHARACTERISTICS				SWITCH CONFIGURATION									
											MODEM/LTU				ADAPTER		
SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	TERM EQUIP-MENT	TERM TYPE	2W/4W	BATTERY	SIGNALING	SUPVN	SDSG/TDSG NO.	CABLE CONN	CABLE PAIR	TYPE	NO.	CARD SLOT	ADDRESS	TYPE	NUMBER	CARD SLOT
	202	TA 838	2	4W	CB	DTMF	DC	S1	J2	1-2	NWB	1	A103	1-13-01			

SAMPLE

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Figure 4-13. Loop terminations.

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - TRUNK TERMINATIONS			WORKSHEET NO. P-4
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

TGC NO	DTG NO	TRUNK NO	DEST EQUIP	TERMINAL TYPE	TED NO	OPERATIONAL TECHNICAL CHARACTERISTICS					SWITCH CONFIGURATION											
														MODEM LTU						ADAPTER		
						TGC TYPE	TRUNK RATE	NO OF CHANNELS	SIG-NALING	CABLE LENGTH	SDSG TDSG NO	CABLE CONN	CABLE PAIR	TYPE	NO	CARD SLOT	NCMD NO (S)	ADDRESS	TSB NO	TYPE	NO	CARD SLOT
001	–	1-2	SB 36M	31	–	P	–	–	DTMF	½M	SI	J2	13 16	NWB	2	A104	–	–	–	–	–	–

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Figure 4-14. Trunk terminations.

the DISGM cannot exceed 1/2 mile, but the diphase group modem can use cable of up to one mile. For nine channel multiplexer/demultiplexer list the nine channel MUX\DEMUX cards to be used and their locations. For TSB and adapters, list the equipment.

DD Form 2490-5, Network Planning and Configuration Data-Circuit Card Inventory (Figure 4-15). Figure 4-15 shows worksheet P-5. It is both an inventory list and a master checklist of all circuit cards in the switch. This includes the adjustable or strappable cards described in the next paragraph. This worksheet is important because there are a number of cards and a number of ways in which they can be used.

Specifically, the switch employs over 150 circuit cards, also called printed circuit boards or PCBs. For example, an LTU is a circuit card. There are various ways of connecting these to make a particular switch configuration. These configurations will depend on the size of the switch, its type (paragraph 2-2), what it has been assigned to do, and the number and kinds of cards that are used for spares or are being repaired. The circuit card inventory keeps track of these cards and shows where and how they are being used.

One of your early actions when activating a switch should be to make a complete inventory of all circuit cards installed and in spare racks. This will show what the configuration is and show the capability of the switch. You can fill out worksheet P-5 either by card type alphabetically or by card number. Location shows the card nest or other location. Entries under SDSG/TDSG/CEG and number of cards will help identify the location. The strapped column provides a cross reference to the strapping worksheets. On this worksheet, the column is either a record that strapping has been done or a reminder that it needs to be done. The three last columns are for counting. When cards are to be assigned as the requirements change, you can use the card count column as a running tally of the number available. For example, if five cards are available, the column might read: 5432, as the first three cards are used or assigned.

Tables A-3 and A-4 will help you use worksheet P-5. Because these tables list all the matrix addresses, you can use them to record card assignments and to check available resources. If you use these tables as worksheets, label them P-5A and P-5B.

Strapping worksheets.

Of the approximately 150 circuit cards in each switch, 22 types must be strapped manually. This strapping adjusts the loop rate, trunk rate, clock rates, polarity, frequency responses, and other unique functions as described in the following paragraphs, Paragraph 3-2 gives an example. In that example, a series of 11 cards is strapped to assign the switch loop rate to either 16 or 32 kbs.

Of the nine worksheets (Figures 4-16 through 4-24) used for strapping, three of them consolidate several cards on one page. For ease of reference, the card identification is the mnemonic and is listed to the left at the beginning of each worksheet. These are numbered S-1 through S-9 (S for strapping). In several instances, the strapping tables use the term frequency. This refers to the baseband information transmission rate of a DTG. (See paragraph 3-2 for further explanation.) It is not necessary to know this rate for strapping because the decision will depend on the number of channels selected and on the loop rate of the switch. However, it is useful to know this baseband rate (expressed in kbs, robs, and sometimes in Hz). It enables you to check the information you are gathering against the tables and with the data in TM 11-5805-681-12. Table 4-8 shows the fixed relationships between channel modularity, switch loop rate, and the DTG baseband rates.

DD Form 2490-6, Network Planning and Configuration Data-Matrix Strapping (Figure 4-16). There are nine card groups shown on this form. They are identified and explained as follows:

COMSEC transmit controller (COMXC) (worksheet S-1) (Figure 4-16). The COMSEC controller links the COMSEC equipment with the CPG. There are two controllers in the CEG, each of which consists of four cards. One card in each is the transmit controller. It is strapped to show the size of the switch, 300 lines or 600 lines. Strap both cards because enable signals from the CAP/CEM select the controller. Make the following worksheet entries:

Card number. Enter A and B, as listed.

Switch configuration. Enter 300-line or 600-line.

Straps. For 600-line: J2-J3.
For 300-line: J4-J3.

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - CIRCUIT CARD INVENTORY			WORKSHEET NO. P-5
SWITCH NO 8366	PREPARED BY SSGT Crawford	CHECKED BY SFC Gilbert	APPROVED BY MAJ Gould	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

CARD TYPE	CARD NO.	NO. OF CARDS	LOCATIONS	SDSG/ TDSG/ CEG	STRAPPED	CARDS IN USE	SPARES	CARD COUNT
NWB	1	135	A 101	SDSG1	AC	1	0	134

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Figure 4-15. Circuit card inventory.

Table 4-8. DTG baseband information rates.

CHANNELS PER DTG	FOR 16-KBS LOOP RATE DTG RATE KBS	FOR 32-KBS LOOP RATE DTG RATE KBS
8	128	256
9	144	288
16	256	512
18	288	576
32	512	1024
36	576	1152
48	768	1536
64	1024	2048
72	1152	2304
128	2048	4096
144	2304	4608

Processor control unit 6 (CTLU 6) (worksheet S-1) (Figure 4-16). There is a CTLU 6 for each of the two processors. Both CTLU 6s are strapped to connect either COMSEC controller (A or B) to the associated processor. Normal connection is A connect and B disconnect. The cards reside in the CAP/CTL nest. You must strap them both to show connection or disconnection. The straps are operational only when the CAP/CTL panel is in the manual mode. Make the following worksheet entries:

Card number. Enter A and B, as listed.

Status. Enter connect or disconnect. Normal is A connect, B disconnect.

Straps. For connect: J2-J3.
For disconnect: J3-J4.

Control and alarm panel/TTY buffer band rate (CAP 09) (worksheet S-1) (Figure 4-16). This card provides the interface between the TTY and the switch electronics. One strap selects the baud rate or speed at which the TTY operates. Usual operation is at 300 baud. Make sure the teletype is set for the same rate. Make the following worksheet entries:

Baud rate. Enter 300 for an interface rate of 300 baud, or enter 150 for an interface rate of 150 baud.

Straps. For 300: J3-J4.
For 150: J2-J3.

Call service position modem (CSPMD) (worksheet S-1) (Figure 4-16). This card is one of five in a card nest within the CSP console. It provides part of the interface between the CSP and the TDSG loop modem and the SDSG line termination unit. Two straps select the loop rate and the function. Strap the cards according to the CSPs used. Make the following worksheet entries:

Call service position. Enter L for the local CSP and R1, R2, or R3 for remote positions, as listed.

Function. Enter Normal or Loopback. The latter is for maintenance only.

Loop rate. Enter 32 kbs or 16 kbs.

Straps. For 32 kbs Normal: J6-J7 and J3-J4.
For 16 kbs Normal: J5-J6 and J3-J4.
For 32 kbs Loopback: J6-J7 and J2-J3.
For 16 kbs Loopback: J5-J6 and J2-J3.

Matrix receive controller (MXRCA) (worksheet S-1) (Figure 4-16). The matrix controller interfaces the central processing unit controller with the space division matrices and the time division matrices. In each of the two matrix controllers there are transmit and receive sections. The MXRCA is one of three cards in the receive section. It is strapped to show the loop rate. Strap both cards because the CPU central controller selects the controller. Make the following worksheet entries:

Matrix controller number. Enter A and B, as listed.

Loop rate. Enter 32 kbs or 16 kbs.

Straps. For 32 kbs: J4-J3.
For 16 kbs: J2-J3.

Local timing generator (LTG) (worksheet S-1) (Figure 4-16). The LTG is part of the switch timing circuits which provide all clock signals for

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - MATRIX STRAPPING			WORKSHEET NO. S-1
SWITCH NO. 83bb	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

CARD ID	SDSG OR TDSG NO.	UNIT OR CARD NO.	NEST LOC	CONFIGURATION	LOOP/BAUD RATE	STATUS	FUNCTION	STRAPS			
COMXC		A		600 LINE				J 2-3			
		B		600 LINE				J 2-3			
CTLU 6		A						J 2-3			
		B						J3-4			
CAPO 9					300	CONNECT		J3-4			
CSPMD		L		NORMAL	32K6S	DISCONNECT		J 6-7	J 3-4		
		R1									
		R2									
		R3									
MXRCA		A			32K6S			J 3-4			
		B									
LTG		1						J 2-3			
		2									
		3									
MTX - G	SDSG 1	1						J 7-6			
	2	2						J 5-6			
	3	3						J 4-3			
	4	4						J 2-3			
RSBMD	TDSG 1	1						J 5-6	J 4-3		
	TDSG 2										
DSCNB	TDSG 1							J 11-12	J 9-8	J 5-4	
	TDSG 2										

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Figure 4-16. Matrix strapping.

operation. There are three LTGs that use the output of the MTG and that deliver timing frequencies to the TDSG and SDSG. Strapping selects the loop rate. Strap all three cards. Make the following worksheet entries:

LTG number. Enter 1, 2, and 3 as listed.

Loop rate. Enter 32 kbs or 16 kbs.

Straps. For 32 kbs: J2-J3.
For 16 kbs: J3-J4.

Matrix interface G (MTX-G) (worksheet S-1) (Figure 4-16). There are matrix interface units in each SDSG. These assist in signal routing and switching in the space division matrix. The MTX-G has a strap that identifies the group of unite with one of the SDSGs. Make the following worksheet entries:

SDSG number. Enter 1-4, according to the number used, as listed.

Card number. Enter 1-4 to indicate the number of cards to be strapped.

Straps. For SDSG 1: J7-J6.
For SDSG 2: J5-J6.
For SDSG 3: J4-J3.
For SDSG 4: J2-J3.

Remote signaling buffer controller multiplexer/demultiplexer (RSBMD) (worksheet S-1) (Figure 4-16). This device is the interface between signaling buffers and the central processing group. It transfers input and output data and provides the needed multiplexing and demultiplexing. There are four cards for each TDSG, two of which are spares. Strapping identifies which cards are used and shows input and output units. Make the following worksheet entries:

TDSG number. Enter 1 and 2, as listed, according to the number of TDSGs.

Card number. Enter 1 through 4 for each TDSG to show which two cards are used.

Straps. For TDSG 1, Input is: J5-J6. Output is: J4-J3.

For TDSG 2, Input is: J7-J6. Output is: J2-J3.

Digital scanner B (DSCNB) (worksheet S-1) (Figure 4-16). The digital scanner provides status monitoring of all TDMX switched lines and trunks. It also updates the processor memory when a change occurs. There are two cards for this scanner, but only card B needs strapping. There is a scanner for each TDSG in use. Make the following worksheet entries:

TDSG number. Enter 1 and 2 to indicate the number of TDSGs used.

Straps. For TDSG number 1: J11-J12, J9-J8, J5-J4.
For TDSG number 2: J13-J12, J7-J8, J5-J4.
For spare: J11-J10, J7-J6, J3-J2.

DD Form 2490-7, Network P1anning and Configuration Data-Modem/Clock Strapping (Figure 4-17). There are three card groups shown on this form. They are identified and explained as follows:

Group buffer (GRPBF) (worksheet S-2) (Figure 4-17). The GRPBF is part of the transmission group module. The transmission group module works with the trunk encryption device to provide timing adjustment and synchronization. There are four GRPBF cards per TDSG. Strap all four. Make the following worksheet entries:

TDSG number. Enter 1 and 2, as listed, to show how many TDSGs are used.

Card number. Enter 1-4 for each.

Loop rate. Enter 32 or 16 kbs.

Number of channels. Enter 8, 9, 16, 18, 32, 36, 48, 64, 72, 128, or 144.

Channel straps. Connections are as listed in Table 4-9.

Loop rate straps. For 32 kbs: J16-J15.
For 16 kbs: J14-J15.

Equipment option. Enter TGM and TDMX combination loop rates.

Equipment option straps. Both 32 kbs: J17-J18.
TGM 16, TDMX 32 kbs: J19-J18.
Both 16 kbs: J17-J18.

Diphase supergroup modem (DISGM) (worksheet S-2) (Figure 4-17). The DISGM terminates digital transmission groups in the same way as the diphase group modem but with greater channel capacity. The modem uses only two sets of straps. These specify the cable length and the bit rate, the selector rate, and the low pass band frequency. There are up to four modems per TDSG. Strap all that are used. Make the following worksheet entries:

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - MODEM / CLOCK STRAPPING			WORKSHEET NO. S-2
SWITCH NO. 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

CARD ID	TDSG NO.	UNIT OR CARD NO.	NEST LOCATION	CHANNELS	LOOP RATE	CABLE LENGTH	EQUIP	CLOCK	STRAPS								
GRPBF	1	1		18	32	0	TGM		J5-6	J10-9	J11-12	J4-3	J16-15	J17-18			
		2															
		3															
		4															
	2	1															
		2															
		3															
		4															
DISGM	1	1	A 411	144	32	0			J24-25	J18-19	J21-22	J5-6	J9-10	J14-15	J12-13		
		2															
		3															
		4															
	2	1															
		2															
		3															
		4															
GCLK	1	1	A 404	18				RED	J36-37	J38-39	J40-41	J42-43	J44-45	J46-47	J52-53	J54-55	
									J58-59	J60-61	J62-63	J64-65	J66-67	J68-69			
		2															
		3															
		4															
	2	1															
		2															
		3															
		4															

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Figure 4-17. Modem/clock strapping.

TDSG number. Enter 1 and/or 2 for TDSG, as listed.

Modem number. Enter 1-4 for modem or card identification for each TDSG.

Cable length. Enter 0, 1/4, or 1/2 in miles, or enter loopback.

Cable length straps. For 0: J24-J25, J18-J19, J21-J22,
For 1/4: J24-J23, J18-J19, J21-J20.
For 1/2: J24-J25, J18-J17, J21-J20
For loopback: J24-J23, J18-J17, J21-J20.

Loop rate. Enter 16 or 32 kbs.

Channels. For 16 kbs, enter 128 or 144.
For 32 kbs, enter 64, 72, 128, or 144.

Straps. Connections are as listed in Table 4-10.

Group clock selector (GCLK) (worksheet S-2) (Figure 4-17). The GCLK is a part of the TDSG. It selects red or black clock (timing) for the group modems and the supergroup modems. This determines whether the modem operates on encrypted or nonencrypted groups. There are four cards per TDSG. Strap all four. Make the following worksheet entries:

TDSG number. Enter 1 and/or 2, as listed.

Card number. Enter 1-4 for each TDSG.

Loop rate. Enter 32 kbs or 16 kbs.

Loop rate strap. For 32 kbs: J50-J51.
For 16 kbs: J34-J35.

Clock. Enter red or black.

Clock straps. Make sixteen connections as in Table 4-11. Use two rows to enter the straps for each card.

DD Form 2490-8, Network Planning and Configuration Data–MUX/DEMUX Strapping (Figure 4-18). There are three card groups shown on this form, They are identified and explained as follows:

Nine channel multiplex/demultiplex (NCMD) (worksheet S-3) (Figure 4-18). Each TDSG has a group multiplexer/demultiplexer, which consists of up to 16 NCMD cards. Each of these cards combines nine 32-kHz digital data streams into a single data stream. These cards can themselves be combined to form one overall data stream. There are three groups of straps on each card. One selects the trunk rate, the second selects the frame rate (loop rate), and the third selects the input/output ports. The modularity noted in the table on the following page can be in multiples of either 8 or 9. The choice made will affect the multiplex operating frequencies but not the use of the channels available in the multiplexer. Note that all NCMDs in use are strapped the same. Thus, you will make one entry for each TDSG. Make the following worksheet entries:

TDSG number. Enter 1 and/or 2, as listed.

Card number. Use is optional.

Number of NCMDs. Enter 1, 2, 4, 6, 8, or 16 according to the number of channels needed.

Number of channels. Enter 8, 9, 16, 18, 32, 36, 48, 54, 64, 72, 128, or 144.

Channel straps. Make the connections as listed in Table 4-12 (Part 1).

Loop rate. Enter 32 kbs or 16 kbs.

Loop rate strap. For 32 kbs: J30-J31.
For 16 kbs: J29-J30.

Interface. This selection is the input/output port. (See Table 4-12 (Part 2).)

First card. The entry of yes or no shows which card is the first in the series. (See Table 4-12 (Part 2).)

Straps. Make the connections in Table 4-12 (Part 2).

Dipulse group modem (DPLSM) (worksheet S-3) (Figure 4-18). This modem is used for data over transmission links that interface with current multichannel equipment such as TD-754, TD-204, AN\GRC-144, and AN/GRC-143. There are up to four modems per TDSG. Make the following worksheet entries:

TDSG number. Enter 1 and/or 2, as listed.

Modem number. Enter 1-4 for each, as listed.

Modulator cable length. Enter 1, 3/4, 1/2, 1/4, or 0 miles, or enter loopback.

Straps. Make connection in Table 4-13 (Part 1).

Demodulator cable length. Enter 1, 3/4, 1/2, 1/4, or 0 miles, or enter loopback.

Straps. Make connections in Table 4-13 (Part 2).

Loop rate. Enter 16 kbs or 32 kbs.

Number of channels. Enter 9, 18, 36, 72, or 144.

Table 4-9. Group buffer strapping options.

NUMBER OF CHANNELS	STRAPS				LOOP RATE (KBS)
144	J7-J6	J8-J9	J13-J12	J4-J3	32
	J5-J6	J8-J9	J13-J12	J4-J3	16
72	J5-J6	J8-J9	J13-J12	J4-J3	32
	J7-J6	J9-J10	J11-J12	J4-J3	16
36	J7-J6	J10-J9	J11-J12	J4-J3	32
	J5-J6	J10-J9	J11-J12	J4-J3	16
18	J5-J6	J10-J9	J11-J12	J4-J3	32
	J6-J7	J8-J9	J11-J12	J4-J3	16
9	J7-J6	J8-J9	J11-J12	J4-J3	32
	J5-J6	J8-J9	J11-J12	J4-J3	16
128	J5-J6	J10-J9	J13-J12	J2-J3	32
	J6-J7	J8-J9	J13-J12	J2-J3	16
64	J7-J6	J8-J9	J13-J12	J2-J3	32
	J6-J7	J9-J10	J11-J12	J2-J3	16
48	J5-J6	J8-J9	J13-J12	J2-J3	32
	J6-J7	J9-J10	J13-J12	J2-J3	16
32	J7-J6	J10-J9	J11-J12	J2-J3	32
	J5-J6	J10-J9	J11-J12	J2-J3	16
16	J5-J6	J10-J9	J11-J12	J2-J3	32
	J6-J7	J8-J9	J11-J12	J2-J3	16
8	J7-J6	J8-J9	J11-J12	J2-J3	32
	J5-J6	J8-J9	J11-J12	J2-J3	16

Table 4-10. Diphase supergroup modem strapping options.

NUMBER OF CHANNELS		FREQUENCY*	STRAPS			
16-KBS LOOP RATE	32-KBS LOOP RATE					
	64	2.048 kbs	J6-J7	J9-J10	J15-J14	J12-J13
-	72	2.304 kbs	J5-J6	J9-J8	J15-J16	J12-J13
128	-	2.048 kbs	J6-J7	J8-J9	J15 J16	J12-J13
-	128	4.096 kbs	J6-J7	J9-J10	J14-J15	J12-J13
144	-	2.304 kbs	J5-J6	J8-J9	J15-J16	J12-J13
-	144	4.608 kbs	J5-J6	J9-J10	J14-J15	J12-J13

*See page .

Table 4-11. Group clock selector strapping options.

GROUP CLOCK SELECTED	STRAPS
Black	J2-J3, J4-J5, J6-J7, J8-J9, J10-J11, J12-J13, J14-J15, J16-J17, J18-J19, J20-J21, J22-J23, J24-J25, J26-J27, J28-J29, J30-J31, J32-J33
Red	J36-J37, J38-J39, J40-J41, J42-J43, J44-J45, J46-J47, J48-J49, J52-J53, J54-J55, J56-J57, J58-J59, J60-J61, J62-J63, J64-J65, J66-J67, J68-J69

Information rate straps. Make connections in Table 4-13 (Part 3).

Repeater power. Enter ON or OFF.

Straps. For ON: J3-J4.
For OFF: J2-J3.

Diphase **group modem (DIGPM) (worksheet S-3) (Figure 4-18).** These modems terminate DTGs. There are usually four modems per TDSG. Four groups of straps are used to set trunk rate, cable length, repeater power, and the low pass band on a single card. Make the following worksheet entries:

TDSG number. Enter 1 and / or 2, as listed.

Modem number. Enter 1-4 for each TDSG, as listed.

Cable length. Enter 0, 1/4, 1/2, 3/4, or 1 mile, or enter loopback.

Cable straps. For 0: J39-40, J38-J34, J36-J37.
For 1/4: J39-J38, J33-J34, J36-J37.
For 1/2: J39-J40, J33-J32, J36-J37.
For 3/4: J39-J38, J33-J34, J36-J35.
For 1: J38-J40, J38-J32, J36-J35.
For loopback: J39-J38, J33-J32, J36-J85.

Loop rate. Enter the loop rate at which the switch operates, 16 or 32.

Number of channels. Enter 8, 9, 16, 18, 32, 36, 48, 64, or 72 to show the number *of* channels multiplexed on the TDSG.

Channel straps. For channel options, use Table 4-14.

Low pass band selector straps. For 16-kbs loop rate and channels 8, 9, 16, 18, 32, and 36 and for 32-kbs loop rate and channels 8, 9, 16, and 18: J29-J30, J21-J22, J18-J19.

For 16 kbs and channel 64 or 72 and for 32 kbs and channel 32 or 36: J30-J31, J20-J21, J18-J19.

For 16 kbs and channels 96, 128, and 144 and for 32 kbs and channels 48, 64, and 72: J27-J28, J24-J25, J18-J19.

Repeater power ON/OFF. Enter ON or OFF.

Repeater power straps. For OFF: J2-J3.
For ON: J3-J4.

DD Form 2400-9, Network Planning and Configuration Data-Normal Wideband LTU (Figure 4-19). For normal wideband line termination unit (NWLTU) use worksheet S-4. This LTU is one of six types that directly terminate a variety of analog subscribers. Each one provides for loop, trunk, or adapter line interface with the SDMX. The normal wideband LTU is strapped to supply either DC (common battery power) or AC (tone supervised). There are two LTUs per card and a maximum of 60 cards per SDSG. Make the following worksheet entries:

SDSG number. Enter 1-4.

Card number. Enter 1-60.

Supervision. Enter AC or DC.

Straps. Make the following connections:

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - MUX/DEMUX STRAPPING			WORKSHEET NO. S-3
SWITCH NO. 83bb	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

CARD ID	TDSG NO.	UNIT OR CARD NO.	NEST LOC	NO. OF NCHMX	NO. CHANNELS	LOOP RATE	INTERFACE	FIRST CARD	STRAPS								
NCMD	1	1	A 440	7	9	32		YES	J14-15	J18-19	J20-21	J23-24	J27-28	J2-3	J5-6	J9-10	J12-13
		2	A 441	8	9	32		NO	J14-15	J18-19	J20-21	J23-24	J27-28	J2-3	J5-6	J9-10	J12-13

CARD ID	TDSG NO.	UNITS OR CARD NO.	NEST LOC	MODULATOR CABLE LENGTH	DEMODULATOR CABLE LENGTH	LOOP RATE	INFO RATE	RPTR POWER	STRAPS									
DPLSM	1	1																
		2	A 407	0	0	32	9	OFF	J5-6	J8-9	J11-12	J20-21	J24[illegible]	J26-27	J15-16	J18-19	J3-4	
		3																
		4																
	2	1																
		2																
		3																
		4																

CARD ID	TDSG NO.	UNITS OR CARD NO.	NEST LOC	CABLE LENGTH	LOOP RATE	NO. CHANNELS	RPTR POWER	STRAPS										
DIGPM	1	1	A 403	0	32	9	—	J33-34	J36-37	J38-39	J2-3	J5-6	J9-10	J15-16	J18-19	J21-22	J29-3[illegible]	
		2																
		3																
		4																
	2	1																
		2																
		3																
		4																

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Figure 4-18. MUX/DEMUX strapping.

For DC or common battery power, NWLTU 1 (top) is: J7-J6 and J4-J3. NWLTU 2 (bottom) is: J13-J12 and J10-J9.

For AC, NWLTU 1 (top) is: J5-J6 and J2-J3. NWLTU 2 (bottom) is: J11-J12 and J8-J9.

DD Form 2490-10, Network Planning and Configuration Data–Type II Modem (Figure 4-20). For MOD 21-22 use worksheet S-5. Type II modems provide an interface for common channel signaling from the trunk signaling buffer with an analog out-of-band signaling channel. These modems provide a single channel, 4-wire, full-duplex, synchronous, frequency shift capability. There are two type II modems for each SDSG. Each modem consists of two cards which are labeled II-1 and II-2 (or MOD 21 and MOD 22). Both of the cards are strapped. Strapping is done with alignment adjustments as described in TM 11-5805-681-12. Make the following worksheet entries:

SDSG number. Enter 1-4.

Modem number. Enter 21 or 22.

MOD 21 interface. Enter MIL STD 188C (end-to-end encryption) or LKG.

Table 4-12. Part 1. Nine channel multiplex/demultiplex strapping options.

NO OF NCMD	MODULARITY 9/8	NO OF CHANNELS	CHANNEL STRAPS			
16 *	9	144	J3-J4	J6-J7	J9-J10	J12-J13
16	9	144	J2-J3	J6-J7	J9-J10	J12-J13
8 *	9	72	J2-J3	J6-J7	J9-J10	J12-J13
8	9	72	J3-J4	J5-J6	J9-J10	J12-J13
4 *	9	36	J3-J4	J5-J6	J9-J10	J12-J13
4	9	36	J2-J3	J5-J6	J9-J10	J12-J13
2 *	9	18	J2-J3	J5-J6	J9-J10	J12-J13
2	9	18	J3-J4	J6-J7	J8-J9	J12-J13
1 *	9	9	J3-J4	J6-J7	J8-J9	J12-J13
1	9	9	J3-J4	J5-J6	J8-J9	J12-J13
16 *	8	128	J2-J3	J5-J6	J9-J10	J11-J12
16	8	128	J3-J4	J6-J7	J8-J9	J11-J12
8 *	8	64	J3-J4	J6-J7	J8-J9	J11-J12
6 *	9	54**	J2-J3	J6-J7	J8-J9	J12-J13
6 *	8	48	J3-J4	J6-J7	J8-J9	J11-J12
8	8	64	J3-J4	J6-J7	J9-J10	J11-J12
4 *	8	32	J3-J4	J6-J7	J9-J10	J11-J12
6	9	54**	J2-J3	J5-J6	J8-J9	J12-J13
6	8	48	J3-J4	J5-J6	J8-J9	J11-J12
4	8	32	J2-J3	J6-J7	J9-J10	J11-J12
2 *	8	16	J2-J3	J6-J7	J9-J10	J11-J12
2	8	16	J3-J4	J5-J6	J9-J10	J11-J12
1 *	8	8	J3-J4	J5-J6	J9-J10	J11-J12
1	8	8	J2-J3	J5-J6	J8-J9	J11-J12

NOTE: Selection of the number of channels automatically selects eight- or nine-channel modularity.

* 32-kbs switch rate. Others are for 16 kbs.

** Use this configuration to interface with the loop MUX/DEMUX.

Table 4-12. Part 2. Nine channel multiplex/demultiplex strapping options.

INTERFACE	FIRST CARD TO INTERFACE	STRAPS				
Loop MUX/DEMUX	Yes	J15-J16	J17-J18	J20-J21	J23-J24	J27-J28
TGM 1	Yes	J14-J15	J18-J19	J20-J21	J23-J24	J27-J28
TGM 2	Yes	J14-J15	J17-J18	J21-J22	J23-J24	J27-J28
TGM 3	Yes	J15-J16	J18-J19	J21-J22	J23-J24	J27-J28
TGM 4	Yes	J14-J15	J17-J18	J20-J21	J24-J25	J27-J28
Loop MUX/DEMUX	No	J15-J16	J17-J18	J20-J21	J23-J24	J26-J27
TGM 1	No	J14-J15	J18-J19	J20-J21	J23-J24	J26-J27
TGM 2	No	J14-J15	J17-J18	J21-J22	J23-J24	J26-J27
TGM 3	No	J15-J16	J18-J19	J21-J22	J23-J24	J26-J27
TGM 4	No	J14-J15	J17-J18	J20-J21	J24-J25	J26-J27
TGM 0	Unused NCMDs	J14-J15	J17-J18	J20-J21	J23-J24	J26-J27

MOD 21 interface strap. For 188C: J2-J3.
For LKG: J3-J4.

MOD 21 equalizer. Enter In or Out for delay equalization. Normally it will be out.

MOD 21 equalizer strap. For In: J5-J6.
For Out: J8-J7.

MOD 22 mode. Enter master or slave. Each circuit has a master and a slave. The controlling switch is the master.

MOD 22 mode strap. For master J2-J3.
For slave: J3-J4.

MOD 22 baud rate. Enter 150,300,600,1200, or 2400. Common channel signaling uses 1200

Table 4-13. Part 1. Dipulse group modem strapping options.

CABLE LENGTH (MILES)	STRAPS		
*1	J6-J7	J8-J9	J12-J13
3/4	J6-J7	J9-J10	J11-J12
1/2	J5-J6	J8-J9	J12-J13
1/4	J5-J6	J9-J10	J11-J12
0	J5-J6	J8-J9	J11-J12
Loopback	J6-J7	J9-J10	J12-J13

* Normally programmed for 1 mile unless an unusual cable interface is specified.

Table 4-13. Part 2. Dipulse group modem strapping options.

CABLE LENGTH (MILES)	STRAPS		
1	J20-J21	J24-J25	J27-J28
3/4	J21-J22	J24-J25	J26-J27
1/2	J20-J21	J23-J24	J27-J28
1/4	J21-J22	J23-J24	J26-J27
0	J20-J21	J23-J24	J26-J27
Loopback	J21-J22	J24-J25	J27-J28

baud. 2400 baud requires baseband conversion to duobinary format. Others are frequency shift keying.

MOD 22 baud rate strap. For 150: J7-J8.
For 300: J6-J7.
For 600: J5-J6.
For 1200: J9-J10.
For 2400: J10-J11.

MOD 22 transmit data. Enter 1200 (normal) or 2400 (inverted) Hz to show the mark frequency. Note that receive data (see below) must have the opposite assignment.

MOD 22 transmit data strap. For 1200: J12-J13.
For 2400: J13-J14.

MOD 22 transmit clock. Provide comparison with the transmit clock by selecting normal for trailing edge sampling of the transmitted signal, or invert for leading edge sampling. Use normal when selecting the master mode and invert when selecting a switch in the slave mode.

MOD 22 transmit clock strap. For normal: J15-J16.
For invert: J16-J17.

MOD 22 receive data. Enter 1200 or 2400 Hz to show the space frequency.

Table 4-13. Part 3. Dipulse group modem strapping options.

NUMBER OF CHANNELS		STRAPS	
16-KBS LOOP RATE	32-KBS LOOP RATE		
144	72	J14-J15	J17-J18
72	36	J15-J16	J17-J18
36	18	J14-J15	J18-J19
18	9	J15-J16	J18-J19

Table 4-14. Diphase group modem strapping options.

NUMBER OF CHANNELS		STRAPS			
16-KBS LOOP RATE	32-KBS LOOP RATE				
16	8	Not Applicable	J5-J6	J8-J9	J15-J14
18	9	Not Applicable	J5-J6	J8-J9	J15-J16
32	16	Not Applicable	J5-J6	J10-J9	J15-J14
36	18	Not Applicable	J5-J6	J10-J9	J15-J16
64	32	Not Applicable	J7-J6	J8-J9	J15-J14
72	36	Not Applicable	J7-J6	J8-J9	J15-J16
—	48	J12-J11	J7-J6	J10-J9	J15-J14
—	64	J12-J11	J7-J6	J10-J9	J15-J16
—	72	J12-J13	J7-J6	J10-J9	J15-J16

COMMAND NWLTU	NETWORK PLANNING AND CONFIGURATION DATA - NORMAL WIDEBAND LTU			WORKSHEET NO S-4
SWITCH NO 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ______ OF ______
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ______ OF ______

SDSG	CARD NO	NEST LOCATION	SUPVN	STRAPS			
				LTU 1		LTU 2	
1	3	A 301	AC/DC	J 11-12	J 8-9	J 7-6	J 4-3

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Figure 4-19. Normal Wideband LTU.

COMMAND: MOD 21 - 22	NETWORK PLANNING AND CONFIGURATION DATA - TYPE II MODEM			WORKSHEET NO. S-5
SWITCH NO. 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ___ OF ___
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

			MOD 21				MOD 22											
SDSG NO.	MODEM NO.	NEST LOCATION	INTER-FACE	STRAP	EQUAL-IZER	STRAP	MODE	STRAP	BAUD RATE	STRAP	XMIT DATA	STRAP	XMIT CLOCK	STRAP	REC DATA	STRAP	REC CLOCK	STRAP
1	21	A634	188C	J2-3	OUT	J6-7												
	22	A636					SLAVE	J3-4	1200	J9-10	1200	J12-13	NORMAL	J15-16	1200	J19-20	INVERT	J22-23

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Figure 4-20. Type II modems.

MOD 22 receive data strap. For 2400: J18-J19.
For 1200: J19-J20.

MOD 22 receive clock. Provide comparison with the receive clock by selecting normal for leading edge data alignment, or invert for trailing edge data alignment. Use normal for the master mode and invert for the slave mode.

MOD 22 receive clock strap. For normal: J21-J22.
For invert: J22-J23.

DD Form 2490-11, Network Planning and Configuration Data–Trunk Signaling Buffer B (Figure 4-21). For trunk signaling buffer B (TSBFB) use worksheet S-6. The TSB works with the signaling buffer controller to provide common channel signaling. It consists of two cards, A and B, of which the B card is a subchannel MUX/DEMUX and a type II modem interface. There are 14 TSBs for each TDSG. The B card is strapped to show interfaces, the mode, and the clock rate. Make the following worksheet entries:

TDSG number. Enter 1 or 2.

Interface. Enter type H modem or TDMX.

Bit rates. For TSB, switch, and trunk, enter 16 kbs or 32 kbs for each.

Straps. Make connections in Table 4-15.

DD Form 2490-12, Network Planning and Configuration Data–Switch Memory Control (Figure 4-22). For switch memory control (SWMCT) use worksheet S-7. This card identifies the TDMM that makeup a TDMX with the associated TDSG. Each TDSG uses three or more TDMMs. Each TDMM provides 64-channel terminations. Only two TDSGs are shown here. Make the following worksheet entries:

TDSG number. Enter 1 or 2.

TDMM number. Enter 1-6,13-15, or 18 or according to the number used.

Straps. Make connections in Table 4-16.

DD Form 2490-13, Network Planning and Configuration Data–Loop Clock Selector (Figure 4-23). For loop clock selector (LPCLK) use worksheet S-8. The LPCLK is a part of the TDSG. It selects red or black clock (timing) for the loop modems. This determines whether the modem handles encrypted signals (black) or nonencrypted signals (red). There are five cards per TDSG. Make the following worksheet entries:

TDSG number. Enter 1 or 2.

Card number. Enter 1-5.

Loop clock. Enter black or red.

Straps. Make connections in Table 4-17.

DD Form 2490-14, Network Planning and Configuration Data–Diphase Loop Modem A (Figure 4-24). For diphase loop modem A (DILPA) use worksheet S-9. This modem provides synchronous, 4-wire, full-duplex interface between digital subscribers and the time division switching equipment. It can provide remote power for digital

Table 4-15. Trunk signaling buffer B strapping options.

CONDITIONS	STRAPS		
Type II modem interface.	J2-J3	Not Applicable	Not Applicable
TDMX interface, TSB, trunk, and switch at 32 kbs.	J3-J4	J10-J11	J6-J7
TDMX interface, TSB, trunk, and switch at 16 kbs.	J3-J4	J10-J11	J5-J6
TDMX interface and TSB at 16 kbs, switch and trunk at 32 kbs.	J3-J4	J9-J10	J6-J7
TDMX interface, TSB, and trunk at 16 kbs, switch at 32 kbs.	J3-J4	J8-J9	J5-J6

COMMAND TSBFB	NETWORK PLANNING AND CONFIGURATION DATA - TRUNK SIGNALING BUFFER B			WORKSHEET NO S-6
SWITCH NO 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ___ OF ___
REV NO / DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

TDSG NO	NEST LOCATION	INTERFACE	TSB BIT RATE	SWITCH BIT RATE	TRUNK BIT RATE	STRAPS		
1	A 304	TDMX	16KBS	32KBS	16KBS	J3-4	J8-9	J5-6
	A 302	TYPE II	16Kbs	32 Kbs	16Kbs	J2-3		

SAMPLE

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Figure 4-21. Trunk signaling buffer B.

Table 4-16. Switch memory control strapping options.

TDSG NO	TDMM NO	STRAPS				
1	1	J16-J15	J11-J12	J8-J9	J5-J6	J2-J3
	2 3	J14-J15	J13-J12	J8-J9	J5-J6	J2-J3
		J16-J15	J13-J12	J8-J9	J5-J6	J2-J3
		J16-J15	J11-J12	J10-J9	J7-J6	J2-J3
	13	J14-J15	J13-J12	J10-J9	J7-J6	J2-J3
	14 18	J14-J15	J13-J12	J8-J9	J5-J6	J4-J3
2	4	J14-J15	J11-J12	J10-J9	J5-J6	J2-J3
	5 6	J16-J15	J11-J12	J10-J9	J5-J6	J2-J3
	15	J14-J15	J13-J12	J10-J9	J5-J6	J2-J3
		J16-J15	J13-J12	J10-J9	J7-J6	J2-J3

terminals. Strapping on this card supplies-56 volts DC over a phantom loop to a DSVT or DNVT. Make the following worksheet entries:

TDSG number. Enter 1 or 2.

Card number. Enter the identification of the card.

Connect / disconnect -56 V. Enter connector disconnect.

Straps. For connect J2-J3.
For disconnect: J3-J4.

4-6. Data Entry

The data base for the circuit switch consists of data lists or tables. These tables provide the processor with the information needed to route, to switch, and to perform the subscriber services described in paragraph 3-7. The information in the tables also shows the status of the switch at a particular time.

Entries and changes to the data base are via a keyboard and a VDU. A series of commands from the keyboard calls up various forms, or menus, on the VDU screen. The operator then makes keyboard entries corresponding to the information to be placed in the data base.

Each of the commands is a mnemonic group of letters that tells the switch to add, change, delete, or display the information. There are two major types of command: assign and display. The assign type includes add, change, and delete functions. It may also include a command to display the existing data. The display command is for displaying the data only. Table 4-18 is a list of these commands. For most of the assign commands, there are worksheets showing how to assemble the data. However, some commands deal with operator functions that do not need worksheets.

Data entry worksheets are important both to switch personnel and to planning personnel. At their locations, worksheets are records of planned and completed actions and show what the switch capabilities are. They are also important as guides for assembling information. Finally, they encourage a system of logical actions.

Validation and ramification.

To avoid errors, the switch checks each data entry. It also informs the operator of the results of certain entries. It performs validation checking on each entry to see if the entry is acceptable and if its size and range of values are correct. Ramification checking on each entry detects data base discrepancy errors and warns the operator of possible results of these errors and of the entries themselves. If an attempted action will change certain critical elements, or if there is an error that must be corrected, ramification message numbers will show on the screen. Each assign command produces a specific set of messages.

(Refer to TM 11-5805-681-12 for lists of ramification messages for each command.) These messages can also tell the operator when an action cannot be taken. They do this by displaying an F (for fatal),

COMMAND: SWMCT			NETWORK PLANNING AND CONFIGURATION DATA - SWITCH MEMORY CONTROL				WORKSHEET NO: S-7
SWITCH NO: 8366			PREPARED BY: SSGT CRAWFORD	CHECKED BY: SFC GILBERT		APPROVED BY: MAJ GOULD	WORKSHEET ___ OF ___
REV NO	DATE		REFERENCE WORKSHEETS				PAGE ___ OF ___
TDSG NO	NEST LOC	TDMM NO.	STRAPS				
1		1	J 16-15	J 11-12	J 8-9	J 5-6	J 2-3
		2					
		3					
		13					
		14					
		18	J 14-15	J 13-12	J 8-9	J 5-6	J 4-3

SAMPLE

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Figure 4-22. Switch memory control.

COMMAND- LPCLK	NETWORK PLANNING AND CONFIGURATION DATA - LOOP CLOCK SELECTOR			WORKSHEET NO S-8
SWITCH NO 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ____ OF ____
REV NO / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

TDSG NO	NEST LOCATION	CARD NO.	LOOP CLOCK	STRAPS					
1		1	BLACK	J2-3	J4-5	J6-7	J8-9	J10-11	J12-13

SAMPLE

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Figure 4-23. Loop clock selector.

Table 4-17. Loop clock selector strapping options.

LOOP CLOCK SELECTED	STRAPS
Black	J2-J3
	J4-J5
	J6-J7
	J8-J9
	J10-J11
	J12-J13
Red	J14-J15
	J16-J17
	J18-J19
	J20-J21
	J22-J23
	J24-J25

which blocks the entry. In such cases, it may be necessary to redo an entire sequence of data entries to produce the desired action.

Data entry process.

Figure 4-25 shows the process of data entry. For each step of the process, the figure lists the three-letter mnemonics of the worksheets used for entering data.

The first step defines the switch functions and enters them into the data base. ASI initializes the switch and ASC assigns the switch classmarks. This step also involves assigning the CSP portion of terminal types (ATT) and the switch supervisor portion of terminal services for loops (ATS A).

The next step assigns terminal services. This concludes the assignment of terminal types (ATT) and terminal services for loops (ATS). This step also involves configuration for the essential user bypass (AEU).

The third step sets up trunking. This involves assigning the digital transmission groups (ADT) and organizing the trunk group clusters (ATG). This step also involves assigning terminal services to trunk terminals (ATS).

You will make COMSEC assignments by assigning the location of data for the key distribution center (AVL) and, when needed, by rekeying COMSEC nets (ANR).

Routing constitutes the fifth step. It involves assigning commercial routing (ACN), NYX routing (ANY), alternate area routing (AAA), NN routing (APR), NNX routing (ANN), NNXX routing (ANX), XXX routing (AXX), and XX routing (ASL). Most of this work involves assigning trunk group clusters and their alternates to particular functions.

The final step (and the largest) is the assignment of subscriber services. This involves implementing the classmarking that was done for each terminal insteps 2 and 3 (ATS) by grouping classmarks and providing access to them. Products of this task include compressed dial lists (ACP and AIC), fixed directory lists (AFD), and conference lists (APC). Also included are such data controls as call inhibit (ACI), zone restriction (AZR), and digit editing (ADE). This step also involves assigning secondary traffic channels to a terminal (AST). Finally, it involves organizing the essential user bypass lists for other switches (ARB) and, when necessary, adjusting or activating them (AAR).

Data entry worksheets.

Tables 4-7 and 4-18 list the data entry worksheets and identify them as D-1 through D-30 (D for data). They are numbered by order of entry. (This greatly facilitates error checking, described in the subparagraph on validation and ramification, above.) The only exception involves the terminal services worksheet, D-3 (ATS). Entry of the trunk portion of worksheets B and C must follow the assignment of trunk group clusters, D-6 (ATG).

Before you use these worksheets, review paragraph 4-4 on numbering plans. The numbers used in the worksheets are coded according to the following system:

X = 0-9	P=7-9	M=2-8
N=2-9	J = 7-9	
G=1-8	Z= 0-3	
Y = 0, 1	1=0-6	

A=1-4	
BB = 01-13	DD=01-15
CC = 01-12	EE =00-63

COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - DIPHASE LOOP MODEM A			WORKSHEET NO.
DILPA				S-9
SWITCH NO. 8366	PREPARED BY SSGT CRAWFORD	CHECKED BY SFC GILBERT	APPROVED BY MAJ GOULD	WORKSHEET ____ OF ____
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

TDSG NO	CARD NO.	NEST LOCATION	CONNECT / DISCONNECT -56 V	STRAP
1	1	A 212	CONNECT	J 2-3

SAMPLE

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Figure 4-24. Diphase loop modem A.

Under certain circumstances you will find number assignments already recorded for units or switch components. This could be the case if an SOP has been established to make switch configuration easier. If not, the number assignment will be sequential, and one of the planning worksheets will probably already have assigned it. If it is not there, you can make the assignment at the time you fill out the data entry worksheets.

DD Form 2490-15, Network Planning and Configuration Data-Switch Initialization and Classmark Worksheet (Figure 4-26). The assign switch initialization (ASI) and assign

Table 4-18. Circuit switch commands.

MNEMONIC	FUNCTION	REMARKS
AAA	Assign Alternate Area Routing Lists	Worksheet
AAR	Assign, Accommodate, and Restore Received Bypass Lists	Worksheet
ACI	Assign Call Inhibit Lists	Worksheet
ACN	Assign and Display Commercial Network Routing	Worksheet
ACP	Assign Common Pool Compressed Dial Lists	Worksheet
ADA	Assign Directive Acknowledgement	Operator Function
ADB	Assign Data Base Transfer	Operator Function
ADE	Assign Digit Editing Lists	Worksheet
ADT	Assign Digital Transmission Groups	Worksheet
AEI	Assign Equipment In/Out-of-Service	Operator Function
AEU	Assign and Display Essential User Bypass Configuration	Worksheet
AFD	Assign Fixed Directory Routing	Worksheet
AFR	Assign Frequency for Network Reporting	Worksheet
AIC	Assssign Individual Compressed Dial Lists	Worksheet
ANN	Assign NNX Routing	Worksheet
ANR	Assign Net Rekeying	Worksheet
ANX	Assign NNXX Routing	Worksheet
ANY	Assign NYX Routing	Worksheet
AOD	Assign On-Line Diagnostics Exerciser	Operator Function
AOI	Assign Other Equipment In/Out-of-Service	Operator Function
AOR	Assign and Display Operator Routing	Operator Function
APC	Assign Preprogrammed Conference List	Worksheet
APR	Assign NN Routing	Worksheet
ARB	Assign Receive Bypass Worksheet	Worksheet
ASC	Assign and Display Switch Classmarks	Worksheet
ASI	Assign and Display Switch Initialization	Worksheet
ASL	Assign XX Routing	Worksheet
AST	Assign Secondary Traffic Channels	Worksheet
ATG	Assign Trunk Group Clusters	Worksheet
ATH	Assign and Display Thresholds	Worksheet
ATM	Assign Traffic Metering	Worksheet
ATS	Assign Terminal Services	Worksheet
ATT	Assign Terminal Types	Worksheet
AVL	Assign Variable Locations	Worksheet
AXX	Assign XXX Routing	Worksheet
AZR	Assign Zone Restriction List	Worksheet
DAA	Display Alternate Area Routing Lists	Display Only
DLS	Display XX Routing	Display Only
DME	Display Major Equipment Status	Display Only
DNN	Display NNX Routing	Display Only

Table 4-18. Circuit switch commands. (continued)

MNEMONIC	FUNCTION	REMARKS
DNX	Display NNXX Routing	Display Only
DNY	Display NYX Routing	Display Only
DPR	Display NN Routing	Display Only
DSD	Display Subscriber Directory	Display Only
DTM	Display Traffic Metering	Display Only
DTR	Display Trunks	Display Only
DTS	Display Terminal Service	Display Only
DTT	Display Terminal Type	Display Only
DXX	Display XXX Routing	Display Only
PUNT	Erase Memory	Emergency Use

switch classmark (ASC) functions are necessary for the initial activation of the switch. Changes to ASI will cause major data base changes but changes to ASC can be made without a major update. Worksheets D-1 (ASI) and D-4 (ASC) are combined on one worksheet page for ease of entry.

Make the following worksheet entries for *ASI:*

SDSG matrix size. Enter 0-4 to show the number of space division switching groups (analog).

TDSG matrix size. Enter 1-4 to show the number of time division switching groups (digital).

NOTE: These two groups of numbers define the configuration of the switch. For example, 2/1 is the usual 300-line configuration and means two SDSGs and one TDSG.

Single shelter switch. Enter Y for YES or N for NO. This differentiates between the 300-line and 600-line switches.

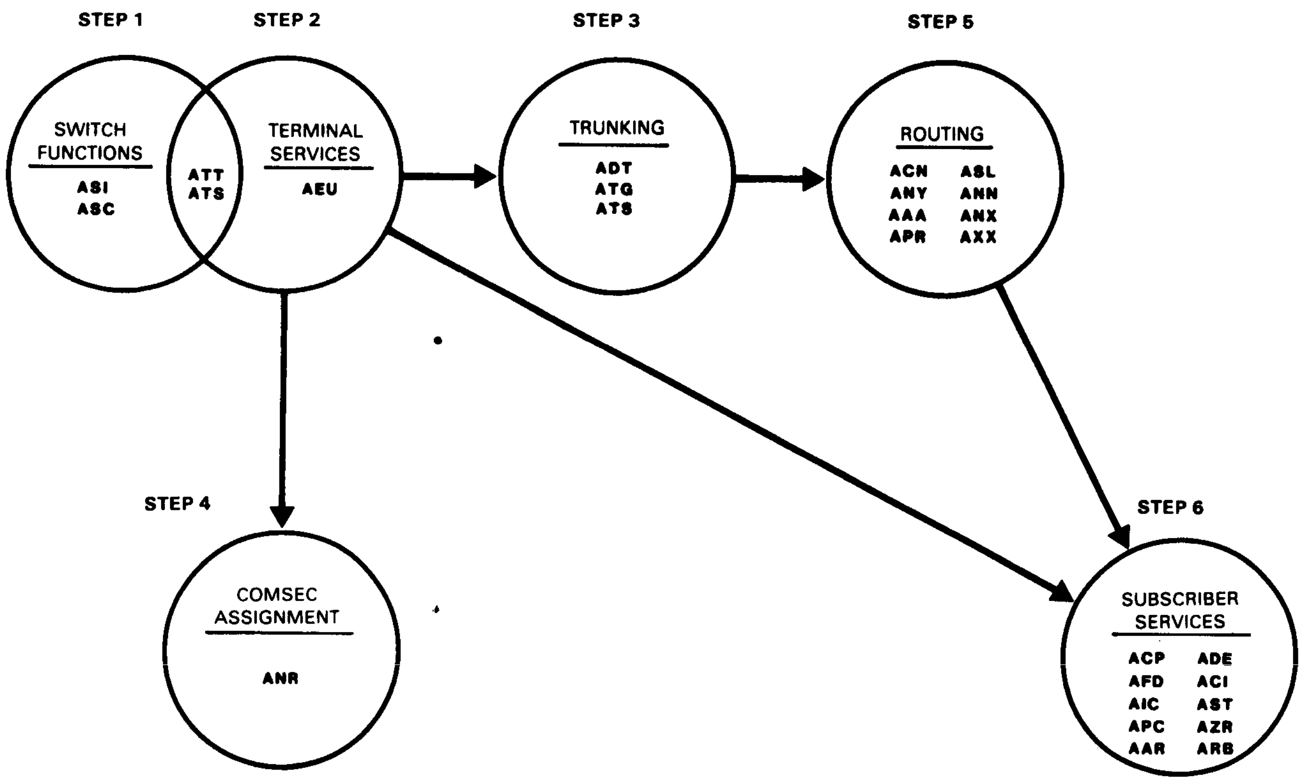

Figure 4-25. AN/TTC-39 circuit switch data entry process.

NETWORK PLANNING AND CONFIGURATION DATA - SWITCH INITIALIZATION AND CLASSMARK WORKSHEET

ASI / ASC	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-1 / D-4

ASI

2	SDSG MATRIX SIZE (0 - 4)
	TDSG MATRIX SIZE (1 - 4)
	SINGLE SHELTER SWITCH (Y = Yes, N = No)
	NUMBERING PLAN (3/4 or 4/3)
	16/32 KBS SWITCH
	TIME DAY 1 - 366
	HOUR 0 - 23
	MINUTE 0 - 59
	TENTHS OF MINUTES 0 - 9

FOR 3/4 NUMBERING PLAN, ALSO INCLUDE:

	ABBREVIATED DIAL (Y = Yes, N = No)
	LOCAL SUBSCRIBER CODE (NNXG)

ASC

N	ALTERNATE ROUTING (Y = Yes, N = No)
	GATEWAY CLASSMARK (Y = Yes, N = No)
	NN CODE FOR TTC - 30 TRUNKS
	SATELLITE LINKS (1 - 4)
	NATO HOMEAREA (9YX)
	SWITCH SUPERVISOR LOOP DIGITS
	SSB RESET Y = YES, N = NO (Always displayed as N)
	TCCF INTERCEPT (Y = Yes, N = No)
	TCCF ELEMENT ID
	TCCF AUTO (Y = Yes, N = No)
	PERIODIC REPORT PRINT (Y = Yes, N = No)

SAMPLE

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Figure 4-26. Switch initialization and classmark worksheet.

Numbering plan. Enter 3/4 or 4/3 to show which numbering scheme is used. (See paragraph 4-4 for descriptions of these.) Usually 4/3 is used.

16/32-kbs switch. Enter 16 or 32 to show the operating rate at which the switch operates. Usually 32 kbs is used.

Time. These entries set the time at which the switch begins to operate. Under day (the Julian date) enter 1-366. Under hour enter 0-23. Under minute enter 0-59. Under tenths of minutes enter 0-9.

The following entries are for the *3/4 numbering plan only:*

Abbreviated dial. Enter Y for YES or N for NO to indicate whether the switch will use abbreviated dialing. (See paragraph 3-7.)

Local subscriber code. Enter a local subscriber code in the format NNXG. NNX is the switch code, and G is the number all subscriber numbers will begin with.

Make the following worksheet entries for *ASC:*

Alternate routing. This entry enables the switch to perform alternate routing according to a routing plan. This applies only if the switch is operating in the tandem mode for a particular call. Enter Y for YES or N for NO.

Gateway classmark. This classmark is used to reduce analog-to-digital conversion in a network or in several networks. A NO entry (N) prevents conversion on alternate routes if the primary TGC is an interswitch TGC (from AN/TTC-39 to AN/TTC-39). AYES entry(Y) allows conversion.

NN code for TTC-30 trunks. If the switch connects to an AN/TTC-30 telephone switch, this classmark provides for numbering plan compatibility. If there is no such connection, leave blank.

Satellite link number. If the switch uses satellite links for trunking, this classmark adds a path delay to introduce external echo suppressors on 2-wire analog to 4-wire connections. The classmark allows you to set the maximum number of satellite links in a connection. Although four are possible, for tactical systems only one satellite link is permitted. Enter 1 or, if no satellite is used, enter O.

NATO home area. If the switch homes on a NATO switch, this entry identifies that home area. Use 9YX; otherwise leave blank.

Switch supervisor loop digits. Use GXX or GXXX to identify the directory number assigned to the switch supervisor.

SSB reset. Enter N for NO in all cases because the switch does not use the SYSCON signaling buffer (SSB).*

Tactical communications control facility (TCCF) intercept. Enter N for NO in all cases.*

TCCF element. This entry involves the use of multiple automatic control elements. Always leave blank.*

TCCF Auto. This entry also involves automatic control elements. Always enter NO.*

Periodic report print. Entry Y for YES or N for NO to specify whether you want periodic traffic metering reports to be printed locally.

*Changes to the switch software may eliminate these entries.

Assign terminal type (ATT) worksheets D-2A,B,C (Figures 4-27 through 4-29). This function assigns common equipment and defines those types used with more than one terminal. These include conference bridges, the call service position, LKGs, and IMUs. These worksheets are in three sections. Section A is for conference bridges and the call service position SDMX/TDMX. Section B is for the loop key generators, and Section C is for the intermatrix unit.

DD Form 2490-16, Network Planning and Configuration Data—Conference Bridge and Call Service Position Worksheet (Figure 4-27). For the conference bridge, equipment type 95, make the following worksheet entries on worksheet D-2A:

Type. Enter 95. (See Table A-l.)

Unit number. Enter 1-6 to identify the bridge to be used.

In/Out of service. Enter I for IN or O for OUT, depending on equipment status.

Addresses. Enter the matrix location for each of the five ports. Use A-BB-CC for SDSG bridges and DD-EE for TDSG bridges. (See Tables A-3 and A-4.)

DD Form 2490-16, Network Planning and Configuration Data–Conference Bridge and Call Service Position Worksheet (Figure 4-27). For the call service position SDMX/TDMX, equipment types 96 and 121, make the following worksheet entries on worksheet D-2A:

Type. Enter 96 or 121. (See Table A-l.)

Unit number. Enter 1-4. Enter 1 for the local and 2, 3, or 4 for remote CSPs, if used.

In/Out of service. Enter I or O.

Voice port 1 and 2. Enter two matrix locations for SDMX or TDMX voice ports. (See Tables A-3 and A-4.)

TDMX signal term. This entry identifies the TDMX terminal that the CSP will use for signaling. Use format DD-EE. (See Table A-3.)

Directory number. Use the format GX1X or GX1XX in which Xl is not O. This will enable a caller to route a call to the operator by dialing GOX or GOXX. Do not use the format GOXX for any terminals.

Digital receiver unit number. Use 1-5 to identify the digital receiver to be used. (See Table A-3.) The selected receiver must already be assigned and marked out-of-service.

DD Form 2490-17, Network Planning and Configuration Data–Loop Key Generator Worksheet (KG-82, Type 123) (Figure 4-28). For loop key generator worksheet (KG-82, type 123), make the following worksheet entries on worksheet D-2B:

Equipment type. Enter 123.

Unit number. Use 1-64.

In/Out of service. Enter I or O.

Cipher/plain terminals. Enter locations in format DD-EE (See Table A-3.)

DD Form 2490-18, Network Planning and Configuration Data–Intermatrix Unit Worksheet (Type 98) (Figure 4-29). The intermatrix unit worksheet (type 98) provides analog-to-digital and digital-to-analog conversions between the SDMX and the TDMX. Worksheet D-2C entries show which IMUs are connected.

Equipment type. Enter 98.

Unit number. Enter 1-120.

In/Out of service. Enter I or O.

SDMX terminal. Enter address location in format A-BB-CC. (See Table A-4.)

TDMX terminal. Enter address location in format DD-EE. (See Table A-3.)

Assign terminal services (ATS) worksheets D-3A,B,C. (Figures 4-30 through 4-32). Use these worksheets to assign classmarks to terminals using the terminal services function. These classmarks identify types of equipment, equipment characteristics, and available services. Be careful not to classmark a terminal unless the DTG associated with that terminal is in service. Use the ADT command to check this. The ATS command is also used to define loops, trunks, and signaling equipment. These worksheets are in three sections. Section A is for signaling equipment, Section B is for analog loops and trunks, and Section C is for digital loops and trunks.

DD Form 2490-19, Network Planning and Configuration Data-Signaling Equipment Worksheet (Figure 4-30). For signaling equipment worksheet, make the following entries on worksheet D-3A:

Terminal address. Use Tables A-3, A-4, and A-5 for these addresses. Tables A-3 and A-4 show the addresses by matrix, and Table A-5 shows signaling and common equipment addresses.

Terminal type. Enter 99,110-116, or 119. (See Table A-l.)

Unit number. This entry assigns the receiver and sender units. (See Tables A-3 and A-4.) Enter 1-32 for types 99 and 110-115, and 1-16 for type 116. (See Table A-1. Type 119 has no unit number.)

In/Out of service. Enter I for IN or O for OUT to reflect current equipment status reports.

DD Form 2490-20, Network Planning and Configuration Data–Analog Loop and Trunk Worksheet (Figure 4-31). For analog loops and trunks use worksheet D-3B. This worksheet and the one following, D-3C, are based on the planning worksheets P-1 and P-3. Some of the information on D-3B and D-3C repeat that in P-1 and P-3, but they are used for somewhat different purposes. The planning worksheets allow the gathering of data and are a master list. They become the basic source for information. Worksheets D-3B and D-3C relate that information to specific data entries. Worksheet D-3B also has strapping information for the NWLTU, for the master panel (SEP) number in the shelter to which the cable is connected, for the SDSG number, and for the specific cable

NETWORK PLANNING AND CONFIGURATION DATA - CONFERENCE BRIDGE AND CALL SERVICE POSITION WORKSHEET

ATT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-2A

CONFERENCE BRIDGE (TYPE 95, 120)								CALL SERVICE POSITION SDMX/TDMX (TYPE 96, 121)									
			MATRIX ADDRESSES														
EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	VOICE PORT 1	VOICE PORT 2	TDMX SIGNAL TERMINAL	DIRECTORY NUMBER	DIGITAL RECEIVER	UNIT NO	
95	1	I	1-02-12	1-03-12	1-04-12	1-05-12	1-06-12	121	1	I	14-53	14-54	14-52	100	1		

SAMPLE

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Figure 4-27. Conference bridge and call service worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - LOOP KEY GENERATOR WORKSHEET
(KG - 82, TYPE 123)

ATT	PRSL / NNX		SW LOCATION		DATE	REV NO.		PREPARED BY		CHECKED BY		PAGE ____ OF ____		D-2B
EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER-VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER-VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER-VICE	CIPHER TERMINAL	PLAIN TERMINAL
123	1	I	13-14	02-00	123	21	I	13-34	03-08					

SAMPLE

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Figure 4-28. Loop key generator worksheet (KG-82, type 123).

NETWORK PLANNING AND CONFIGURATION DATA - INTERMATRIX UNIT WORKSHEET
(TYPE 98)

ATT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-2C

EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL
98	1	I	1-03-11	13-50	98	21	I	2-11-11	14-08

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Figure 4-29. Intermatrix unit worksheet (type 98).

number. On the left side of the worksheet there are common entries for both loops and trunks. These are:

CCSD/circuit number. Enter the system and/or circuit number assigned by the CSPE. The entry should be sufficient to identify the circuit. Use common channel signaling data (CCSD) in joint applications.

Cable pair. This column enables you to assign the circuit. to a pair or to two pairs of a 26-pair cable. If the circuit is 2-wire, delete the unused pair number.

Office designation. This is the unit or subscriber designation.

Type circuit. Enter trunk, local, or long local.

Type equipment. Enter nomenclature of terminal equipment.

Technical characteristics. Enter 2-wire or 4-wire, supervision (AC or DC), common battery or local battery, and signaling characteristics.

LTU type. Enter type of LTU.

LTU strap. If a NWLTU is used, enter strapping from worksheet S-4 and from the bottom of the worksheet.

Card location. Enter card slot location of LTU. (See worksheet P-3.)

Adapter type/location. If an adapter is used, enter type and card slot location. (See worksheet P-3.)

For analog loops use the headings on the top of the worksheet. If the loop is for DAS make only the entries under the block labeled DAS. Make these entries:

Terminal address. Use Tables A-3, A-4, and A-5 for these addresses.

Terminal type. (See Table A-l.) The terminal type will determine the next entries.

Directory number. Enter GXX(X) to show which subscriber is to receive service. Use this entry for types 1-3 and 5-13.

Line hunting group. Enter 1-32 if the terminal is a member of a line hunting group. If not, enter O. (See paragraph 3-7.) Use for types 1-3 and 5-13.

DAS called number. If direct access is available to the subscriber, enter the directory number to be called. To make it easier to account for DAS numbers you can use a separate worksheet for DAS subscribers. Use this entry for types 1-3 and 5-13.

Traffic load control. Enter 1-5 to specify level of busy hour restrictions. (See paragraph 3-7.) Use for types 1-3 and 5-13. See Table A-6 for the relationship between subscriber classmarks and trunk and switch restrictions.

Secure call. For types 1,2,5,7-9,12, and 13, enter R for REQUIRED or N for NONSECURE. For type 3, enter R for REQUIRED, P for PREFERRED, or E for END-TO-END. For type 6, enter R for REQUIRED, P for PREFERRED, or N for NONSECURE. This classmark determines the way the call will be routed. (See paragraph 4-7 for explanation.)

Maximum precedence. Enter FO, F, I, P, or R to show the maximum precedence allowed for subscriber calls. Use for types 1-3 and 5-13.

In/Out service. On the basis of the switch status reports, enter I for IN or O for OUT. Use for types 1-3 and 5-13.

Adapter number. Enter 1-24 for the 300-line switch and 1-36 for the 600-line switch. Use for line type 6 equipment on an analog loop. Otherwise leave blank.

Progressive conference. Enter Y for YES or N for NO to show whether the subscriber will receive this capability. This capability may not be available in your switch. In this case, enter N.

Call transfer. Enter Y for YES or N for NO to show whether the subscriber will receive this capability.

Compressed dial classification. Enter C for COMMON POOL, I for INDIVIDUAL LIST, or N for NONE to identify the subscriber as having access.

Compressed dial list. Enter 1-5 to show which list of common pool numbers is available to the subscriber, or 1-8 to show which subset of the individual list is available. Use O for NONE.

Zone restriction. Enter O for NONE or 1-8 to assign zones (lists) to which the subscriber is restricted. (See worksheet AZR.)

Preprogrammed conference only. Enter Y for YES or N for NO to show whether the subscriber is limited to preprogrammed conferencing.

NETWORK PLANNING AND CONFIGURATION DATA - SIGNALING EQUIPMENT WORKSHEET

ATS	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-3A

TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE
14-58	113	1	O	1-12-12	111	1	I	1-09-10	111	18	I

SAMPLE

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Figure 4-30. Signaling equipment worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ANALOG LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-3B

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	TYPE CIRCUIT	EQUIPMENT TYPE	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	TYPE/LOCATION ADAPTER	ANALOG LOOPS: DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	ADAPTER NUMBER	PROGRESSIVE CONF	CALL TRANSFER	DIAL CLASS COMP	DIAL LIST COMP	RESTRICTION ZONE	CONF ONLY PREPROG	NET COMMERCIAL ACCESS
	1-2		L	TA-838	4W CB	N	DC		—	1-13-01	2	202	Ø	—	4	N	R	I	-	N	Y	N	Ø	1	N	N
	3-4					W B	DC	A103																		
	5-6																									
	7-8																									
	9-10																									
	11-12																									
	13-14																									
	15-16																									
	17-18																									
	19-20																									
	21-22																									
	23-24																									

SAMPLE

NWLTU

MP NUMBER	SDSG	CABLE

BOTTOM CIRCUIT		TOP CIRCUIT	
AC	DC	AC	DC
J11-J12	J13-J12	J5-J6	J7-J6
J8-J9	J10-J9	J2-J3	J4-J3

ANALOG TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	TYPE II = MODEM MASTER/SLAVE TSB NUMBER	SATELLITE TRUNK	IN/OUT SERVICE	39 TRUNK: TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE	NON 39: ADAPTER NUMBER	SUPPRESSOR NO ECHO	XMSN TYPE

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Figure 4-31. Analog loop and trunk worksheet.

Commercial network access. Enter Y for YES or N for NO to show whether the subscriber will have access to a commercial network.

For analog trunks use the headings on the bottom of the worksheet. Note that all types use the first seven entries but interswitch trunks with equipment types 28 and 29 use the block marked 39 trunk. Extraswitch trunk terminals using equipment types 25-26 and 30-83 use the block marked NON-39. Make the following entries:

Terminal address. Use Tables A-3, A-4 and A-5.

Terminal type. Use Table A-1. The terminal type will determine the entries. For interswitch trunks, equipment types 28 and 29, make the following entries.

TGC number. Enter 1-127.

Path delay. Enter 0-40 in steps of five for milliseconds of path delay. This is used for line-of-sight radio, troposcatter radio, and cable and is based on technical characteristics of the transmission media. It activates echo suppressors external to the switch. Use this classmark at the switch closest to the 2-wire party for a 2-wire to 4-wire connection. Use at both locations for a 2-wire to 2-wire connection.

TSB number, master/slave for type II modem. This is an optional entry and is not part of the data entry process. Enter the number of one of the TSBs, (3,4,5, or 6) to be used for analog CCS.

Satellite trunk. Enter Y for YES or N for NO. This adds a control indicator to outgoing calls to tell a terminating switch whether or not to introduce echo suppressors. (See ASC worksheet.)

In/Out of service. Enter I for IN or O for OUT.

Trunk number. Enter 1-255 to identify the trunk. (Trunk numbers will only be entered for interswitch or DIBTS trunks.)

16kbs trunk. Enter Y for YES or N for NO to show whether the trunk is assigned this rate.

MS trunk. Enter Y for YES or N for NO to show whether the trunk terminates at a AN/TYC-39.

MS trunk characteristic. If the trunk is an MS trunk, enter 1-15 for analog or O for digital.

Transmission type. If the trunk is not an MS trunk, enter AN for analog nonsecure, AS for analog secure, or DN for digital nonsecure.

Adapter number. Enter 1-24 or 1-36 to assign an SF adapter for an analog trunk.

Echo suppressor. Enter 1-120 to identify a specific item of equipment. If none, enter O.

For DIBTS equipment, equipment type 27, enter TGC number, path delay, satellite trunk, in/out of service, and trunk number.

DD Form 2490-21, Network Planning and Configuration Data-Digital Loop and Trunk Worksheet (Figure 4-32). For digital loops and trunks use worksheet D-3C. The layout of this worksheet is similar to D-3B. The common entries are on the left. Strapping information is at the bottom. Refer to worksheets S-8 and S-9 for these. The common entries have the same instructions except for the last one. Instead of adapter type and location enter:

NCMD number and location. This is the nine channel multiplexer/demultiplexer card. Enter which card is used and its card slot location.

For digital loops, the entry instructions are the same for the DAS subscribers. Other entries are:

Terminal characteristic. Enter D for Data Only, V for Voice Only, or M for Multi-Use to show the use of the terminal. Use for type 3 only.

16 kbs HDX. Enter Y for YES or N for NO to show whether a DSVT is to be used in the push-to-talk mode (use with net radio). Use for type 3 only.

MS compatible. Enter Y for YES or N for NO to show whether the DSVT is to connect to a message switch. Use for type 3 only.

Facsimile. Enter Y for YES or N for NO to show whether facsimile is to be used. Use for type 3 only.

MS type 2. Enter Y for YES or N for NO to show whether the DSVT is to connect to a type 2 message switch. A type 2 message switch is other than a AN/TYC-39 (for example, the unit level message switch (ULMS) AN/GYC-7). Enter Y only if the MS compatible entry was Y. Use for equipment type 3 only (Table A-l).

The remaining entries have the same instructions as D-3B. For digital trunks the instructions are also the same except that there is no NON-39 block.

Assign switch classmark (ASC) worksheet D-4. Worksheets D-1 and D-4 are combined on one worksheet. Refer to previous discussion about worksheet D-1/D-4 (Figure 4-26).

DD Form 2490-22, Network Planning and Configuration Data–Digital Transmission Group Worksheet (Figure 4-33). Assign digital transmission group (ADT) is a command on worksheet D-5. Digital transmission groups (DTG) contain trunk groups and loops. This command assigns, modifies, or deletes these or updates their characteristics. Make the following worksheet entries:

DTG number. Enter 1-16 to indicate the number of the group.

Message switch DTG. This entry indicates whether or not the group is from an MS. Enter Y for YES or N for NO.

Start NCMD/end NCMD. These entries assign NCMD units to a DTG. The number you assign must be compatible with the trunking used in worksheet P-2. Use 1-16.

KG-81. This indicates which trunk encryption device will be assigned to the group. Refer to FM 24-27A. Enter 1-6 (or O for no trunk encryption).

Sync delay. This indicates whether or not circuit conditions will require a delay to achieve synchronization. Use either O for no delay or 0.5 (seconds). Use the latter for troposcatter and satellite links.

In/Out of service. Enter I for IN or O for OUT. Marking the DTG out of service makes all the terminals in the DTG unavailable.

Auto sync desired. This entry specifies whether or not the switch requires synchronization for out-of-service DTG testing. Enter Y for YES or N for NO. The usual entry is Y.

Planning information. These entries are not part of the data entry process. They assist the planner and the switch supervisor in recording information relating to each DTG.

DD Form 2490-23, Network Planning and Configuration Data–Trunk Group Cluster Worksheet (Figure 4-34). Assign trunk group cluster (ATG) is a command on worksheet D-6. A trunk group cluster (TGC) consists of more than one trunk between two switches. Clustering of these trunk groups enables the switch processor to treat them as an entity when making assignments or when defining their characteristics. This command makes it possible to assign, modify, or delete characteristics throughout the cluster. Make the following worksheet entries:

TGC number. Assign a number from 1 to 127 on the basis of the network routing plan. See worksheets P-2 and P-4.

Cluster type. This entry classifies the TGC according to the kind of switch at the other end. Enter:
C for commercial connection.
I for interswitch connections to AN/TYC-39s, and to other AN/TTC-39s and AN/TTC-42s.
P for PBX or PABX connections. In general, any switch that requires operator assistance to access the AN/TTC-39 is a PBX.
D for DIBTS when used between crypto net control station and subscriber switches.
O for other uses, such as connection to an AN/TTC-38 or AN/TTC-30.

Spill forward. This only effects intermediate (tandem) switches. Enter Y for YES or N for NO for inbound traffic only. See paragraph 4-7 for an explanation of this control. Always use this when crossing NYX boundaries.

Destination. NYX. Enter an NYX code to define the area code at the TGC destination.

Zone restriction. The AZR worksheet defines eight zone restriction tables. Enter 1-8 if this TGC pertains to any one of these tables. Enter O if there is no restriction.

Access TGC. An access TGC is one that provides the only connection from your network to a certain switch. Use this classmark to tell the calling switch not to try alternate routing if the access TGC is busy. Enter Y for YES, or N for NO.

Traffic limits. Enter Y for YES or N for NO to indicate whether any trunks in this cluster are restricted to precedence traffic. If YES, enter under each of the precedence columns in descending order (F, I, P, and R) the number of trunks (0-255) for which the precedence level applies. For example, if the TGC has 10 trunks, entries may be F = 10, I = 8, P = 6, R = 4. If no, leave these columns blank.

(If your entry is C or O, make no further entry.)

If the entry under type is I for interswitch, make the following entries:

Key change. Do not use this entry. Enter N for NONE.

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-3C

CCSD. CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/ LOCA-TION	DIGITAL LOOPS: DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	CONTROL TRAFFIC LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	CC COMP DIAL	CL COMP DIAL	ZONE RESTRICTION	CONF PREPROG	COMMERCIAL ACCESS NET
	1-2		L	TA-838	4W AC	C B	–	A202	NA	01-08	1	391	Ø	—	3	N	I	I	—	—	—	—	—	N	Y	N	Ø	2	N	N
	3-4																													
	5-6																													
	7-8																													
	9-10																													
	11-12																													
	13-14																													
	15-16																													
	17-18																													
	19-20																													
	21-22																													
	23-24																													

SAMPLE

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE

STRAP: RED	STRAP: BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DILPA	
56 V ON J2-J3	56 V OFF J3-J4

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

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Figure 4-32. Digital loop and trunk worksheet.

Glare. See paragraph 3-7 for an explanation of glare. Enter A for ACCEPT or R for REJECT of glare conditions. You must classmark switches at either end of this TGC so that one accepts and one rejects glare.

TSB number. This entry assigns a TSB to the TGC to provide CCS. (See worksheet P-4.) Enter 1-14 for a 300-line switch or 1-28 for a 600-line switch.

Message switch TGC. Enter Y for YES or N for NO to show if the TGC goes to an MS. Only one MS can be connected.

Call inhibit. Enter Y for YES or N for NO to indicate whether the call inhibit function is in effect for the area in which the destination switch is located.

Digital TSB TDMX address. If the TSB is digital (on a digital TGC), enter the TDMX address from Table A-3.

Primary/secondary signaling channels. If the TSB is digital, enter the TDMX addresses of the primary signaling channel and of up to 3 secondary channels.

If the entry under type is P for PBX, leave the interswitch cluster columns blank and make the following entries in the PBX cluster columns:

Number of outgoing digits. Enter 0-10 to show the number of digits needed for routing at the distant switch.

Maximum precedence. Enter FO, F, I, P, or R to show the highest level of precedence accepted at the PBX.

Switch code. Enter NNXX for the switch code of the switch being routed to.

Traffic load control level. Enter 1-5 to show the busy hour restrictions. (See paragraph 3-7 and Table A-6.)

If the entry under type is D for DIBTS, you will make only limited entries after the traffic limits entry. These will include entries for maximum precedence, traffic load control, glare, call inhibit, and destination switch code. Also fill in the last column as follows:

Commercial network access. Enter Y for YES or N for NO.

DD Form 2490-24, Network Planning and Configuration Data-Essential User Bypass Worksheet (Figure 4-35). Assign essential user bypass configuration (AEU) is a command on worksheet D-7. The essential user bypass (EUB) capability provides for automatically transferring certain subscribers to another circuit switch if the parent switch fails. EUB can accommodate up to 60 digital users. Make the following worksheet entries:

Subscriber. Identify the user by title or name. This entry does not go into the data base.

Subscriber number. Make this entry for identification. Again, it will not go into the data base.

From/To. Enter the TDMX addresses in the format DD-EE. Under FROM, enter the current address of the subscriber. Under TO, enter the route out of the switch to the trunk dedicated for this purpose. Check the ATS worksheet to make sure that these entries are consistent. Each EUB subscriber will require a dedicated trunk.

DD Form 2490-25, Network Planning and Configuration Data-Assign Key Location Worksheet (Figure 4-36). The assign variable key location (AVL) is a command on worksheet D-8. The AVL function assigns and modifies the data in the automatic key distribution center. Use this function for rekeying operations for COMSEC subscribers, for local and essential user DSVTs, and for message switch trunk LKGs. You can also use it for changing data base information without going through anew rekeying operation. Make the following worksheet entries:

COMSEC ID. This is the hardened unique store (HUS) location in the automatic key distribution center.

Directory number. Enter the subscriber's directory number or, in the case of a message switch trunk LKG, the matrix address. Leave this entry blank if the type (see below) is common interface rekey (CIR) or reentry home (RH).

Type. Enter 2-4 characters. This is the code which stands for the type of key in the HUS location. See FM 24-27A.

Net number. See FM 24-27A for information on this number.

DD Form 2490-26, Network Planning and Configuration Data-Net Rekeying Worksheet (Figure 4-37). Assign net rekeying (ANR) is a command on worksheet D-9. This command rekeys up to 15 COMSEC nets automatically. The nets must be of the same type and must consist of local DSVTs, those affiliated with subordinate switches, essential users, or message switch trunks.

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL TRANSMISSION GROUP WORKSHEET

ADT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-5

DATA ENTRY								PLANNING INFORMATION				
DTG NUMBER	MESSAGE SWITCH DTG	START NCMD	END NCMD	KG-81	SYNC DELAY	IN/OUT SERVICE	AUTO SYNC DESIRED	NUMBER OF CHANNELS	MODEM TYPE	REPEATER IN USE	CABLE LENGTH	REMARKS
1	N	7	7	Ø	Ø	I	N	9	DiPhase	N	1/4 MILE	

SAMPLE

DD Form 2490-22, FEB 87

82027

Figure 4-33. Digital transmission group worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER WORKSHEET

ATG	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-6

											INTERSWITCH										PBX				DIBITS					
TGC NO.	CLUSTER TYPE	SPILL FORWARD	DESTINATION NYX	ZONE RESTRICTION	ACCESS TGC	TRAFFIC LIMITS	F	I	P	R	KEY CHANGE	GLARE	TSB NO.	MESSAGE SWITCH TGC	CALL INHIBIT	DIGITAL TSB TDMX ADDRESS	PRIMARY SIG CHANNEL	SECONDARY SIG CHANNEL 1	SECONDARY SIG CHANNEL 2	SECONDARY SIG CHANNEL 3	NO OF OUTGOING DIGITS	MAXIMUM PRECEDENCE	SWITCH CODE NNXX	TRAFFIC CONTROL LEVEL LOAD	MAXIMUM PRECEDENCE	TRAFFIC CONTROL LEVEL LOAD	GLARE	CALL INHIBIT	SWITCH CODE	COMMERCIAL NET ACCESS
001	P	Y	214	Z	Y	Y	–	–	1	1	–	–	–	–	–	–	–	–	–		3	P	8211	3	–	–	–	–	–	–

SAMPLE

DD Form 2490-23, FEB 87

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Figure 4-34. Trunk group cluster worksheet.

Make the following worksheet entries:

Method. Enter G to generate a new net or M to merge nets.

Rekey cycle number. When starting or initializing (cold start), use 00. For subsequent rekeying, use sequential numbers from 01 through 99.

Current net number. Enter 2-98 to record the new number. Get this number from the COMSEC worksheets.

New net number. If a number has not yet been assigned, enter 2-98 to assign a new number.

(For additional information see FM 24-27A.)

DD Form 2490-27, Network Planning and Configuration Data—Commercial Network Routing Worksheet (Figure 4-38). Assign cormercial network routing (ACN) is a command on worksheet D-10. Use this command to assign routing to a commercial telephone network. Make the following worksheet entries:

Primary TGC. Enter 1-127. To determine your entry, see the network routing plan. This shows how to make commercial connections.

Alternate. You may designate up to five alternate TGCs.

DD Form 2490-28, Network Planning and Configuration Data–NYX Routing Worksheet (Figure 4-39). Assign NYX routing (ANY) is a command on worksheet D-11. The NYX code is the area code. The switch uses NYX tables to route to other NYX areas. This command defines the trunk group clusters by which this is done. Make the following worksheet entries:

NYX code. Enter the area code to which routing will be done (N = 2 through 9). Use 9 only when interfacing with NATO countries.

Home/Foreign. Enter H for HOME on the first line to define your own area code. Enter F for FOREIGN on the other lines to define other than home codes.

NATO designation. If you are routing to a NATO switch, enter 9YX as the NYX code and specify the number of routing digits. Use S for SIX and T for THREE.

Primary TGC. Enter the selected primary route only for Foreign entries. Use numbers 1-127.

Alternate TGCs. You may list up to 5 alternates. Both primary and alternate listings must agree with the ATG and ATS worksheets.

DD Form 2490-29, Network Planning and Configuration Data–PR Routing Worksheet (Figure 4-40). Assign NN routing (APR) is a command on worksheet D-12. The NN routing tables contain routing data used by the switch to reach an NN (primary) area. The NN code is the first part of the switch code and defines the area in which the switch is located. You can also use it to define the home area of your switch if the 4/3 numbering plan is being used. Make the following worksheet entries:

NN code. Enter 22-99 to define the NN area for which routing is to be assigned.

Home/Foreign. Enter H for HOME or F for FOREIGN. Use H for your switch and F for all others. The use of H automatically defines the HOME code. You will need no other entry.

Primary TGC. For FOREIGN only, enter the trunk group cluster number, 1-127.

Alternates. You may assign up to five alternate TGCs for FOREIGN NN codes. Use 1-127. These entries are optional, but they must follow the network routing plan and be compatible with the ATG worksheet entries.

DD Form 2490-30, Network Planning and Configuration Data–NNX Routing Worksheet (Figure 4-41). Assign NNX routing (ANN) is a command on worksheet D-13. This command defines the primary and alternate TGCs to be used in routing calls between switches using the 3/4 number plan at the called switch. Make the following worksheet entries:

Switch code. Enter the switch code (NNX) of the switch to which you are routing.

Primary TGC. Use numbers 1-127 to identify the primary routing.

Alternates. If alternate routing is used, you may select up to five alternate TGCs.

DD Form 2490-31, Network Planning and Configuration Data–NNXX Routing Worksheet (Figure 4-42). Assign NNXX routing (ANX) is a command on worksheet D-14. You can use NNXX routing to conserve NNX codes when addressing a PBX or expanded switch. See paragraph 4-4 for an explanation of NNXX numbering plans.

NETWORK PLANNING AND CONFIGURATION DATA - ESSENTIAL USER BYPASS WORKSHEET

AEU	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____OF____	D-7

SUBSCRIBER	SUBSCRIBER NO.	ADDRESS		SUBSCRIBER	SUBSCRIBER NO.	ADDRESS	
		FROM	TO			FROM	TO
COMMANDER TAACOM1	606	01-10	02-48				

SAMPLE

DD Form 2490-24, FEB 87

39/027

Figure 4-35. Essential user bypass worksheet.

An expanded switch is one with a capacity increased to more than 600 lines. NNXX routing makes it possible for up to ten switches to share the same NNX code. The ANX command defines the primary and alternate TGC through which a call will reach the designated NNXX code. Make the following worksheet entries:

NNXX code. This entry identifies the NNXX code being routed to. For an expanded switch, the code becomes NNXG. Each NNXX table has a capacity of five groups of ten each for PBX routing and one group often that breaks down as follows:

NNXO - Operator

NNXX - Home code

NNXX$_{2-9}$ - Expanded switches

Primary TGC. Enter 1-127 to designate the primary TGC.

Alternate TGC. You may list up to 5 alternates. Both the primary and alternate entries must agree with the entries on the ATG worksheet.

DD Form 2490-32, Network Planning and Configuration Data–XXX Routing Worksheet (Figure 4-43). Assign XXX routing (AXX) is a command on worksheet D-15. This function defines primary and alternate TGCs for routing to such XXX destinations as manual switchboards and PABXs. Make the following worksheet entries:

XXX code. Enter 100-999 to designate the XXX code being routed to.

Routing to operator. Enter Y for YES or N for NO to indicate if calls for the XXX code are to be intercepted and routed to the AN/'TTC-39 operator. If calls are to be extended by the operator, TGCs must be programmed.

Primary/Alternate TGC. Enter 1-127 to show the TGC through which a call will reach the XXX code. (See the ATG worksheet.) You may also enter up to five alternates.

DD Form 2490-33 Network Planning and Configuration Data-Alternate Area Routing Worksheet (Figure 4-44). Assign alternate area routing (AAA) is a command on worksheet D-16. Use this command to assign alternate area routing tables for areas to which multiple paths exist. Its use will increase the flexibility of the switch. It will also enhance the ability of the switch to complete calls during periods of heavy traffic. Make the following worksheet entries:

Alternate area codes. These are 9YX, NYX, or NN. You may assign up to eight of these to specify the alternate areas to which calls can be routed.

Switch code or national access code (NAC). You may assign up to ten of these for each alternate area code. The formats are XXX in a 9YX table; NNX, NNXX, or NN in an NYX table; and XX in an NN table. Each area requires at least one switch code.

TGCs. Use TGCs to designate first and second preferred routes. The routing plans assign each TGC a number. Enter the appropriate numbers (1-127) here.

Paragraph 4-4 provides an explanation of the numbering plans.

DD Form 2490-34, Network Planning and Configuration Data-SL Routing Worksheet (Figure 4-45). Assign XX routing (ASL) is a command on worksheet D-17. This function defines the primary and alternate TGCs through which a call will reach an XX (switch) code. You can assign only XX codes associated with the home NN. Make the following worksheet entries:

XX code. This defines the switch to be routed to or the switch to be designated as home. Enter 00-99.

Home/Foreign. Enter H for HOME for the switch you are operating from. Enter F for FOREIGN for all others.

Primary TGC. For FOREIGN only, enter the identification number (1-127) of the trunk group cluster used for primary routing. (See the routing plan.)

Alternates. For FOREIGN only, you may enter up to five alternate TGCs. Use 1-127.

DD Form 2490-35, Network Planning and Configuration Data-Common Pool Compressed Dial Worksheet (Figure 4-46). Assign common pool compressed dial list (ACP) is a command on worksheet D-18. Compressed dialing enables subscribers to dial a 2-digit number plus C rather than a longer number. The ATS command enables you to assign subscriber numbers to one of five common pools or lists. Only those subscribers authorized access to a compressed dial list on the ATS worksheet can utilize the 2-digit plus C address to access subscribers listed on that compressed dial list. (A subscriber does not have to be a member of the compressed dial list in order to access members of the list.) Make the following worksheet entries:

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN KEY LOCATION WORKSHEET

AVL	PRSL/NNX	SW LOCATION			DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ___OF___	D-8

COMSEC ID	DIR NO/BS LA	TYPE	NET NO.	COMSEC ID	DIR NO/BS LA	TYPE	NET NO.	COMSEC ID	DIR NO/BS LA	TYPE	NET NO.
001	505	TERV	02	600	02-48	MSRV	03				

SAMPLE

DD Form 2490-25, FEB 87

54027

Figure 4-36. Assign key location worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - NET REKEYING WORKSHEET

ANR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-9

METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER
G	01	02	04								

DD Form 2490-26, FEB 87

56/027

Figure 4-37. Net rekeying worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - COMMERCIAL NETWORK ROUTING WORKSHEET

ACN	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-10

0	0	5	PRIMARY TGC
			ALTERNATE 1
			ALTERNATE 2
			ALTERNATE 3
			ALTERNATE 4
			ALTERNATE 5

SAMPLE

DD Form 2490-27, FEB 87

34027

Figure 4-38. Commercial network routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - NYX ROUTING WORKSHEET

ANY	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-11

NYX CODE	HOME FOREIGN	NATO DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NYX CODE	HOME FOREIGN	NATO DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
214	14	914	—	—	—	—	—	—									

SAMPLE

DD Form 2490-28, FEB 87

96/027

Figure 4-39. NYX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - PR ROUTING WORKSHEET															
APR	PRSL/NNX		SW LOCATION		DATE		REV NO.	PREPARED BY			CHECKED BY		PAGE ____OF____		D-12
NN CODE	HOME FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NN CODE	HOME FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
82	H	—	—	—	—	—	—								

SAMPLE

DD Form 2490-29, FEB 87

66/027

Figure 4-40. PR routing worksheet.

List number. This establishes each pool. Enter 1 through 5 for the five pools.

Compressed dial number. You may assign up to 80 NX codes to each pool. Enter 20-99.

Directory number. Enter the telephone number for each compressed number.

DD Form 2490-36, Network Planning and Configuration Data-Fixed Directory Routing Worksheet (Figure 4-47). Assign fixed directory routing (AFD) is a command on worksheet D-19. With the fixed directory, roving subscribers and unite do not have to change telephone numbers when changing locations. This command assigns subscribers to the FDSL and assigns units to the FDUL. Make the following worksheet entries:

List type. Enter S for SUBSCRIBER or U for UNIT. (Use separate lists for each.)

Index code. This is the fixed directory telephone number. The format PXJXZ enables you to list up to 3400 subscribers. You can list up to 100 units using the format XXIXX, where the IXX digits are the last three of the directory number (NNXXXXX).

Directory number. Enter the standard 7-digit directory number of the unit or subscriber.

Signal forward. Enter F for FIXED DIRECTORY or S for STANDARD DIRECTORY to show which number will be forwarded. (See paragraph 4-7 for fixed directory routing information.) Use S for all unite and subscribers homed on your switch or when your switch is a gateway for other switches.

To reach a subscriber or unit in the fixed directory, dial 99 plus the 5-digit fixed directory number (PXJXZ for a subscriber, XXIXX for a unit). If you are dialing a subscriber, the switch will convert the number dialed to the 7-digit directory number. If you are dialing a unit, the switch will convert the first 2 digits of the fixed directory number (XX) to an NNXX. It will then add the last 3 digits (IXX) of the fixed directory number to create the 7-digit directory number. Review paragraph 4-4 for further information on numbering.

DD Form 2490-37, Network Planning and Configuration Data-Individual Compressed Dial Worksheet (Figure 4-48). Assign individual compressed dial list (AIC) is a command on worksheet D-20. Compressed dialing enables subscribers, if authorized, to dial a 2-digit number plus C rather than a longer number to access subscribers of the network. The ATS command allows you to authorize selected subscribers access to one of eight individual compressed dial lists. A subscriber can be a member of only one list, individual or common pool, but not both. Make the following worksheet entries:

Compressed dial number (CDN). Enter 20-99 for up to 80 assignments. Dialing these two numbers plus C (NX + C) will convert the CDN into a telephone number of up to 13 digits.

Directory number. Enter the subscriber's assigned telephone number.

Subsets. You can define eight subsets or groups of varying size for this list. In your entries, assign each CDN to one or more groups, according to the needs of the subscribers. Enter an X under the number of each group to which you wish to assign the CDN in question. When you enter the data into the switch, simply key in the marked numbers from left to right. For example, you will enter as 24568. This entry would enable the subscriber to dial all numbers in groups 2,4,5,6, and 8.

1	2	3	4	5	6	7	8
	X		X	X	X		X

DD Form 2490-38, Network Planning and Configuration Data-Preprogrammed Conference Worksheet (Figure 4-49). Assign preprogrammed conference list (APC) is a command on worksheet D-21. A subscriber may have authorization to initiate conference calls from a preprogrammed list. For the dual-shelter switch (600-line), this command assigns up to 20 subscribers to one of 20 lists or groups. The single-shelter switch (300-line) can accommodate only 14 subscribers per list. With this capability, the authorized subscriber dials the group number, and the switch automatically connects all numbers of the groups. Make the following worksheet entries:

Preprogrammed conference group number. Enter a number from 20 to 99 to identify the group.

Security required. Enter Y for YES or N for NO to indicate whether the group needs security. A Y entry means that member must have a secure terminal.

Member directory numbers. List the number of each member of the group. Not all members need be subscribers on the same switch, and a subscriber may be a member of more than one

NETWORK PLANNING AND CONFIGURATION DATA - NNX ROUTING WORKSHEET

ANN	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-13

SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
—	—	—	—	—	—	—							
	SEE	CHA	PTER	4									

SAMPLE

DD Form 2490-30, FEB 87

44/027

Figure 4-41. NNX routing worksheet.

NETWORK PLANNING CONFIGURATION DATA - NNXX ROUTING WORKSHEET

ANX	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-14

NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
8211	001	—	—	—	—	—							

SAMPLE

DD Form 2490-31, FEB 87

43/027

Figure 4-42. NNXX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - XXX ROUTING WORKSHEET

AXX	PRSL / NNX		SW LOCATION		DATE	REV NO.		PREPARED BY		CHECKED BY			PAGE ___ OF ___			D-15
XXX CODE	HOME / FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XXX CODE	HOME / FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	
525	N	003	—	—	—	—	—									

SAMPLE

DD Form 2490-32, FEB 87

66/027

Figure 4-43. XXX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ALTERNATE AREA ROUTING WORKSHEET											
AAA	PRSL / NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ___ OF ___	D-16
ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC
508	7230	005	—								

DD Form 2490-33, FEB 87

51/027

SAMPLE

Figure 4-44. Alternate area routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - SL ROUTING WORKSHEET

ASL	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-17

XX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
10	H		—	—	—	—	—	—									

SAMPLE

DD Form 2490-34, FEB 87

66/027

Figure 4-45. SL routing worksheet.

group. You may use up to 10 digits. Check the ATS worksheet to make sure that classmarks are assigned.

Initiate classmark. This entry, Y for YES or N for NO, authorizes any member to initiate the conference by dialing the group number. You must list at least one Y.

DD Form 2490-39, Network Planning and Configuration Data–Digit Editing Worksheet (Figure 4-50). Assign digit editing list (ADE) is a command on worksheet D-22. Digit editing provides for modification of a telephone number to make it compatible with line and trunk types and with network numbering plans. This involves adding or deleting digits in specific portions of the NYX-NNXXXXX number. Up to 100 numbers may be so edited. Make the following worksheet entries:

Code. Enter the NYX, NNX, or NNXX code to be changed.

Equipment. At one time this entry assigned loop-around equipment to perform mode conversions in conjunction with the digit-editing process. This equipment is no longer used. Enter O.

Edit type. Enter D for DELETE or P for PREFIX.

Prefix code. If you entered P in the preceding column, enter the NYX, NNX, NX, or N prefix code here. Otherwise, leave this column blank.

DD Form 2490-40, Network Planning and Configuration Data-Call Inhibit Lists Worksheet (Figure 4-51). Assign call inhibit list (ACI) is a command on worksheet D-23. Use this command when it is necessary to deny access to certain calling areas. With it, you can prevent groups of subscribers from calling restricted areas. You can also use it as a traffic control measure to channel calls to certain portions of the area. Make the following worksheet entries:

NYX area code. This identifies the area containing the codes to which you are restricting access. You may identify up to 20 of these areas.

Start NNX. This entry indicates the first of a series of numbers within the area to be restricted. In each NYX, you can assign up to 50 individual codes or up to 25 consecutive code groups. A code group is a block of NNX numbers.

End NNX. This entry indicates the last number of a consecutive group. Do not use it for individual codes.

E. Enter E to eliminate the NNX line entry when making changes.

DD Form 2490-41, Network Planning and Configuration Data–Secondary Traffic Channels Worksheet (Figure 4-52). Assign secondary traffic channels (AST) is a command on worksheet D-24. Some configurations involving digital group multiplex equipment will require that secondary traffic channels be identified. This increases the accuracy of call completion. To perform this function, you will assign secondary traffic channels to a terminal, to digital trunks, or to the loop group signaling channel. Use it for terminal types 3, 13, 27,29, and 119. (See Table A-l.) Make the following worksheet entries:

Terminal address of primary traffic channel (PTC). Enter the terminal address of the PTC, XX-XX.

Secondary traffic channel (STC). Enter the terminal address of each secondary traffic channel. You can list up to three. You must assign either one or three STCs to each PTC.

In/Out of service. Enter I for IN or O for OUT to show whether traffic channels are in service. If you mark a secondary channel In, you must also enter an In for the DTG associated with it. Use the ADT command to check DTG status.

DD Form 2490-42, Network Planning and Configuration Data-Zone Restriction Worksheet (Figure 4-53). Assign zone restriction (AZR) is a command on worksheet D-25. Zone restriction is a means of traffic control. Zone restriction lists can be either restrictive (in which the code listed may not be called) or permissive (in which only the codes listed may be called). The AZR worksheet identifies makeup of zone restriction lists. The ATG command classmarks TGCs and the ATS command classmarks loops to a zone restriction list. Two of the eight lists can holdup to 101 entries each. The others hold up to 33 entries each. Make the following worksheet entries:

List number. Enter 1-8 to identify list.

Permissive/restrictive. Enter either P or R.

Start code. Enter NYXNNX, NNXXXX, NYX, or NNX to show the first of a consecutive list of numbers. You can also list a single number.

End code. Enter the last number of each consecutive list. If you entered a single number under start code, you must also enter it here.

NETWORK PLANNING CONFIGURATION DATA - COMMON POOL COMPRESSED DIAL WORKSHEET

ACP	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-18

LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER
1	20	81672/0605		40			60			80	
	21			41			61			81	
	22			42			62			82	
	23			43			63			83	
	24			44			64			84	
	25			45			65			85	
	26			46			66			86	
	27			47			67			87	
	28			48			68			88	
	29			49			69			89	
	30			50			70			90	
	31			51			71			91	
	32			52			72			92	
	33			53			73			93	
	34			54			74			94	
	35			55			75			95	
	36			56			76			96	
	37			57			77			97	
	38			58			78			98	
	39			59			79			99	

DD Form 2490-35, FEB 87

SAMPLE

47/027

Figure 4-46. Common pool compressed dial worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - FIXED DIRECTORY ROUTING WORKSHEET

AFD	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-19

LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD	LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD
S	76763	8210605	S				

SAMPLE

DD Form 2490-36, FEB 87

43027

Figure 4-47. Fixed directory routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - INDIVIDUAL COMPRESSED DIAL WORKSHEET

AIC	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-20

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
20	605	X							
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
91									
92									
93									
94									
95									
96									
97									
98									
99									

SAMPLE

DD Form 2490-37, FEB 87

55/027

Figure 4-48. Individual compressed dial worksheet.

Eliminate. Use E to delete data on the line. Leave blank if you are not deleting data.

DD Form 2490-43 Network Planning and Configuration Data–Assign Received Bypass Worksheet (Figure 4-54). Assign received bypass list (ARB) is a command on worksheet D-26. Use this command in conjunction with the AAR command (assign, accommodate, and restore received bypass lists). This function can accommodate up to 60 EUs from each of two other switches. This command lists those users. When you have completed the list, the switch stores it until the AAR command activates it. Note that the presence of these EUs will reduce the capacity of your switch for local subscribers. Make the following worksheet entries:

Switch code. This is the switch code of the switch being bypassed. Enter NNX(X).

GXXX/GXX. List the subscribers by number. Enter GXX(X).

Matrix location. Enter the matrix address to which the EU will be assigned. Select this location from the interswitch digital trunks connecting to the bypassed switch.

Terminal type. Enter 3.

Security. Enter P for PREFERRED, R for REQUIRED, N for NONSECURE, or E for END-TO-END ENCRYPTION REQUIRED. (See the ATS worksheet from the bypassed switch.)

Adapter number. Enter 1-36 for terminal types 6, 10, and 11 to assign adapters if needed. Otherwise leave blank.

This command will automatically classmark all EUs for FLASH precedence after list activation. It will classmark the DSVTs of EUs for multimode use. Refer to AVL command for DSVT information.

DD Form 2490-44, Network Planning and Configuration Data—Assign, Accommodate, and Restore Received Bypass Worksheet (Figure 4-55). Assign, accommodate and restore received bypass list (AAR) is a command on worksheet D-27. Use this command in conjunction with the ARB command. This function activates (accommodates), deactivates (restores), and adds (assigns) lists of EUs from two other switches. When activated, those subscribers of the other switches become local loops to your switch until deactivated. Make the following worksheet entries:

Switch code. This is the received (or bypassed) switch. Enter NNXX or NNX. Note that this menu must be rekeyed for the second switch.

GXXX/GXX. Use only to add new subscribers. Enter those subscribers' numbers.

Matrix location. Use only for new subscribers. This is the matrix location to which the incoming EUs are assigned. Use formats A-BB-CC or DD-EE. (See Tables A-3, A-4, and A-5.)

Terminal type. This is also for new subscribers. Use 1-3 and 5-13. (See Table A-1).

Security. This is also for new subscribers. Enter P for PREFERRED, R for REQUIRED, N for NONSECURE, or E for ENCRYPTION REQUIRED. This determines how routing is done. (See paragraph 4-7.)

Adapter number. This is for terminal types 6, 10, and 11. Enter 1-36. (See Table A-l.)

Deactivating the lists deletes all new subscribers added in this way.

DD Form 2490-45, Network Planning and Configuration Data-Assign Frequency for Network Reporting Worksheet (Figure 4-56). Assign frequency for network reporting (AFR) is a command on worksheet D-28. Use this command to set the reporting interval for traffic metering reports. The worksheet lists codes for the various reports and times which can be used. Refer to paragraph 3-14 for explanation of the reports. Make the following worksheet entries:

ID. Enter one of the numbers listed identifying the reports R3, R4, R5, R6, R27, R44, and R47.

Frequency adjustment. Enter one of the numbers listed identifying the time. If the frequency adjustment is left blank, the switch will assign the longest interval.

DD Form 2490-46, Network Planning and Configuration Data-Thresholds Worksheet (Figure 4-57). Assign variable thresholds (ATH) is a command on worksheet D-29. Use this command to assign and change the values assigned to time-out limits. This worksheet lists those time-outs and the range of times and calls which can be used for each. The normal entry should be used if no information is available on which to base other limits. Each entry is explained as follows:

Dial tone time-out. The time limit after receipt of dial tone until the first digit is received.

NETWORK PLANNING AND CONFIGURATION DATA - PREPROGRAMMED CONFERENCE WORKSHEET

APC	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-21

PREPROG CONF GROUP NO.	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK	PREPROG CONF GROUP NO.	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK
20	Y	606	Y				

SAMPLE

DD Form 2490-38, FEB 87

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Figure 4-49. Preprogrammed conference worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - DIGIT EDITING WORKSHEET

ADE	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-22

NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE	NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE
—	—	—	—				
SEE	CHAPTER 4						

DD Form 2490-39, FEB 87

50/027

Figure 4-50. Digit editing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - CALL INHIBIT LISTS WORKSHEET

ACI	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-23

NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E
—	—	—	—								
SEE	CHAPT	ER 4									

SAMPLE

DD Form 2490-40, FEB 87

.51027

Figure 4-51. Call inhibit list worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - SECONDARY TRAFFIC CHANNELS WORKSHEET

AST	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-24

PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE	PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE
—	—	—	—	—					
SEE	CHAPTER	4							

SAMPLE

DD Form 2490-41, FEB 87

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Figure 4-52. Secondary traffic channels worksheet.

Next digit time-out. The time allowed to a subscriber between the dialing of each digit.

Release time-out. The time the switch has to send a tone or a message.

Ring/ringback time-out. The time to send ring or ringback after completion of a connection.

Lockout state out-of-service time-out. The time between release time-out and marking an off-hook terminal out-of-service.

Precedence violation announcement time-out. The time the switch has to send a precedence violation message.

Traffic load control time-out. The time period to measure traffic to determine load control thresholds.

Traffic load control thresholds. The number of calls during the specified time period before load controls are activated.

Enter the time or call number next to each time-out or threshold. Table 4-19 below provides data for the other time-out number entry. List the number and the time to activate one of these numbers.

DD Form 2490-47, Network Planning and Configuration Data–Traffic Metering Worksheet (Figure 4-58). Assign traffic metering (ATM) is a command on worksheet D-30. Use this command to set the reporting interval and to designate the loops and TGCs to be monitored. The entries are:

Modify. Enter 1 to display current valve; 2 to change the loop report interval and/or the loop number; 3 to change the TGC number; and 4 to change loops and trunks.

Loop report interval. Enter one of the time intervals (15, 30, 60, 240, 480, 1,440 minutes).

Loops. Enter the matrix address in the format A-BB-EE for analog and DD-EE for digital. (See Tables A-3 and A-4.)

TGC. Enter the TGC number 1-127.

Sequence of data entry.

After the data worksheets have been filled out or the switch has received them from the CSCE or the planner, assemble them in entry order. This is generally the order in which they are numbered, with the exception of D-3. Use Table 4-20 as an assembly guide and a checklist to show that the entry was made. If any ramification messages result, you can also note them here for later analysis.

4-7. Routing

The earlier parts of this chapter described how the switch operates and how the data base is built. This paragraph gives you a detailed description of the routing function. With it, you can develop the routing plan described in paragraph 5-6. This routing plan is put together at the highest planning level in the network to make sure that all routing is coordinated. From this master plan each lower level adapts its planning. The following factors affect the routing process, and they are explained below:

- Trunking.
- Number plans.
- Routing tables.
- Precedence.
- Routing controls.
- Special features.
- Routing to other networks.

Trunking.

Trunks are channels between switches. Grouping of trunks is analog and digital; that is, into digital trunk groups and analog trunk groups. These are further grouped by clusters. TGCs may be of mixed types. The types are based on security capabilities and transmission types in the following combinations:

- Digital/nonsecure.
- Analog/secure.
- Analog/nonsecure.

The switch selects one of the trunks in a TGC for a particular call depending on the factors listed above and on the classmarks that you assigned in the data entry process (paragraph 4-6). For example, the switch will not route a call from a terminal classmarked Secure Call Required over an AN trunk. The originating terminal and the type of call are also factors in trunk selection. Using digital trunks for an analog call causes some degradation because of the analog-to-digital conversion. Some calls are more restrictive. For example, data calls may not be converted. The switch does

NETWORK PLANNING AND CONFIGURATION DATA - ZONE RESTRICTION WORKSHEET

AZR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-25

LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE	LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE
1	P	816	816	—					

SAMPLE

DD Form 2490-42, FEB 87

102/027

Figure 4-53. Zone restriction worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN RECEIVED BYPASS WORKSHEET

ARB	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-26

SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.	SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.
—	—	—	—	—	—						
SEE	CH	APTER	4								

SAMPLE

DD Form 2490-43, FEB 87

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Figure 4-54. Assign received bypass worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN, ACCOMMODATE, AND RESTORE RECEIVED BYPASS WORKSHEET

AAR	PRSL/NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ____OF____	D-27
SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER	SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER
—	—	—	—	—	—						

SAMPLE

DD Form 2490-44, FEB 87

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Figure 4-55. Assign, accommodate, and restore received bypass worksheet.

not recognize analog data calls except from a AN/TYC-39. Others are treated as voice calls and will go over analog trunks only if the 3C prefix is keyed. Digital data calls go over digital trunks only.

When a circuit switch routes a call to its connected message switch (AN/TYC-39), other trunk selection rules apply. For an analog call, the circuit switch selects a trunk compatible with such data characteristics as modem type, COMSEC equipment, and COMSEC key. On a call from a data subscriber, the switch translates data characteristics from the called loop number. On a call between message switches, the call initiate message carries this information.

Numbering plans.

Review paragraph 4-4. It shows how the numbering plan reflects the network routing plan. Paragraph 5-6 shows how you will organize your nodes and their interconnections. The end result of this will be the assignment of PRs, switch locations, and area codes.

Routing tables.

The AN/TITC-39 uses routing tables as its basic reference for sending calls. These tables are organized by the data entries you made on worksheets D-10 through D-17. The specific entries depend on the organization of the network as defined by the routing plan and the number assignments. For each switch code and for each area code, you must designate a primary TGC. You may designate up to five alternate TGCs. The number of alternates depends on your routing plan and the needs of your networks. When a call is dialed, the originating switch scans the primary TGC for an idle trunk. If none is available, it scans each alternate TGC in order. The kind of routing depends on the number dialed and on the destination. Calls within your own PR will use XX (SL) routing. Calls to another PR but in the same area code use NN (PR) routing. Calls to a number in another area code use NYX routing. Calls to a switch not using the TTNP or PRSL numbering plan use NNX routing and follow the same area routing rules. This enables you to use the 3/4 numbering plan to route to a switch. Calls to manual switchboards use XXX routing.

When multiple paths exist to an NYX or PR area, select routing based on the NNX or PR code for NYX areas, and select the SL code for PR areas. (See worksheet D-16.) There are eight alternate area tables for each switch. You can assign each one to one NYX or PR. You may then assign up to ten switch codes, subarea codes, or national access codes per table. In this case, the switch routes over a primary or alternate (first preferred and second preferred) route. Designate these on worksheet D-16.

Precedence.

Another factor in trunk selection is the call precedence dialed by the caller. The switch will search all available trunks in the sequence described above to find an idle trunk. If none is found and if the call precedence is greater than ROUTINE, the switch conducts a preemptive search in the same sequence. This continues up to one level below the precedence of the call. If a trunk is found, the switch will preempt it for the caller. If not, the switch will return a busy signal.

Routing controls.

If the network uses intermediate (tandem) switches to route calls to their destinations, you can apply certain controls. The originating office control means that the originating switch retains control of the call. For example, take the case of an intermediate switch that has tried all its routes with no success. This control will return the call to the originating switch, thus enabling it to try an alternate route.

Spill forward control is used for calls coming into a switch which will need further routing to reach their destination. The switch acts as an intermediate switch for these calls. If the TGC is classmarked for spill forward, the switch assumes complete control for all calls coming in on that TGC that require routing and acts as an originating switch. However, alternate routing is no longer available to the switches through which the call has passed. This prevents calls from being routed back to the area or network from which they come. If a route is not found, the switch sends an all-trunks busy signal back to the caller. Always use this control at gateways and when crossing NYX boundaries. Worksheet D-4 enables you to classmark the switch for alternate routing. In general, always mark for alternate routing. Withhold alternate routing only if you want to limit the use of trunk calling.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN FREQUENCY FOR NETWORK REPORTING WORKSHEET

AFR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-28

| — | — | ID

| — | — | FREQUENCY ADJUSTMENT

ID

48 = R3 CALLS TO OPERATOR

49 = R4 TGC CALLS BY PRECEDENCE

50 = R5 INDIVIDUAL TRUNK GROUP STATUS

51 = R6 TGC(S)/CALLS PREEMPTED

74 = R27 DTG(S)/AVERAGE ERROR RATE(S)

92 = R44 CALLS OFFERED

95 = R47 CALLS OFFERED TO REMOTE SWITCH(ES)

TIME (MINUTES)

7 = 15

8 = 30

9 = 60

12 = 240

14 = 480

16 = 1440

SAMPLE

DD Form 2490-45, FEB 87

71/027

Figure 4-56. Assign frequency for network reporting worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - THRESHOLDS WORKSHEET

ATH	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-29

SAMPLE

Entry	Item	NORMAL ENTRY	RANGE OF ENTRIES
	DIAL TONE TIME-OUT	10 SECONDS	0 - 300
	NEXT DIGIT TIME-OUT	10 SECONDS	0 - 300
	RELEASE TIME-OUT	10 SECONDS	0 - 300
	RING / RINGBACK TIME-OUT	180 SECONDS	0 - 300
	LOCKOUT STATE OUT-OF-SERVICE TIME-OUT	60 SECONDS	0 - 300
	PRECEDENCE VIOLATION ANNOUNCEMENT TIME-OUT	10 SECONDS	0 - 300
1 5	TRAFFIC LOAD CONTROL TIME-OUT	1 MINUTE	1 - 15 MINUTES
	TRAFFIC LOAD CONTROL THRESHOLD 2	2047 CALLS	0 - 2047
	TRAFFIC LOAD CONTROL THRESHOLD 3	2047 CALLS	0 - 2047
	TRAFFIC LOAD CONTROL THRESHOLD 4	2047 CALLS	0 - 2047
	TRAFFIC LOAD CONTROL THRESHOLD 5	2047 CALLS	0 - 2047
	OTHER TIME-OUT NUMBER	SEE TEXT	1 - 9
	OTHER TIME-OUT VALUE	SEE TEXT	0 - 300

DD Form 2490-46, FEB 87

91/027

Figure 4-57. Thresholds worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - TRAFFIC METERING WORKSHEET

ATM	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-30

15, 30, 60, 240, 480, 1,440 MINUTES

2 MODIFY (None = 1; Interval + Loops = 2; Trunks = 3; All = 4)

480 LOOP REPORT INTERVAL (15, 30, 60, 240, 480, 1,440 Minutes)

LOOPS	TGC NUMBERS					LOOPS	TGC NUMBERS				
301											

SAMPLE

DD Form 2490-47, FEB 87

43/027

Figure 4-58. Traffic metering worksheet.

Other routing controls include call inhibit, zone restriction, TGC traffic limitations, restrictions on the use of satellite trunks, and load controls. Paragraph 3-7 described each of these. An additional control (or protection) is the ability to detect a routing loop. If a call is routed back to its origination (sometimes called ring-around-the-rosy), an alarm will alert the supervisor. A message will also appear on the printer. With this information, you can reconfigure the network to prevent the routing loop. Usually a change in routing will do the job.

Special features.

The special features of the AN/TTC-39 have a direct effect on routing. Paragraph 3-7 describes these features. Paragraph 4-4 shows how to activate them, and paragraph 4-6 shows how to classmark them. They include direct access, conferencing, compressed and abbreviated dialing, call transfer, and fixed directory. Use these features very carefully because their use may affect the service provided by the switch.

When a fixed directory code is dialed, the switch must look at the fixed directory table to determine how to route the call. This will occur at each switch through which the call is routed. The call is routed on the standard (or system) directory number, not on the fixed directory number. If the subscriber or unit has the classmark F for fixed directory number forward (see worksheet D-19), each switch checks the table and routes the fixed directory number accordingly. When the call reaches the current home switch for the subscriber or unit, the classmark S for standard directory indicates that routing should stop. The call is then connected locally. The last AN/TTC-39 in the route should also have the classmark S if the fixed directory call is routed to any other type of switch.

Routing to other networks.

Worksheet D-4 also enables you to classmark a switch as a gateway. If a primary TGC connects to a switch other than an AN/TTC-39, that switch is a gateway. This classmark enlarges the scope of trunk selection. It also provides for analog-to-digital conversion so that analog switches may receive and transmit calls. The dialing sequences in paragraph 4-4 describe commercial network routing. Use worksheet D-10 to assign commercial routing. The use of prefixes controls AUTOVON and other DCS routing. (See paragraph 4-4.)

NATO and allied routing is via the international access code (IAC), 9YX, followed by a 10-digit subscriber number. The switch then routes the call on the IAC and the NAC if listed. NATO systems are classmarked for either a 3- or 6-digit routing capability. If the connecting network uses 6-digit rules, the address is forwarded to that network. The procedures different if the connecting network uses 3-digit rules and if the call is to terminate in that network or is to go to a network that also uses the 3-digit rules. The gateway AN/TTC-39 strikes off the NAC but retains the IAC. If the call has to transit the 3-digit rule network to reach a 6-digit network, the AN/TTC-39 forwards the address as dialed. Any call that is from a US subscriber to another US subscriber but that has to transit a NATO network must use the NAC. If the caller does not dial the NAC, the designation is added by the gateway switch.

When publishing instructions for using the circuit switching system, make sure that you include

Table 4-19. Other Time-outs.

OTHER TIME-OUT NUMBER	TIME-OUT	NORMAL VALUE (SECONDS)
1	Await start dial indication (wink start release or KP digit).	5
2	Send seize (await restart).	10
3	Send seize (await restart) (confirmation).	2
4	Await first or each successive digit.	16
5	Send digit (wait for complement).	1
6	Send interdigit (wait for proceed or restart).	4
7	Send interdigit (wait for end of complement of last digit).	1
8	Send interdigit (wait for end of restart).	3
9	Wait for digit acknowledge.	1

Table 4-20. Worksheet entry checklist.

WORKSHEET NO	COMMAND	ENTERED ( )	RAMIFICATION/REMARKS
D1/4	ASI/ASC		
D2A, B, C	ATT		
D3A, B, C	ATS		Signaling equipment, loops entry
D3B, C	ATS		Trunks entry
D5	ADT		
D6	ATG		
D7	AEU		
D8	AVL		
D9	ANR		
D10	ACN		
D11	ANY		
D12	APR		
D13	ANN		
D14	ANX		
D15	AXX		
D16	AAA		
D17	ASL		
D18	ACP		
D19	AFD		
D20	AIC		
D21	APC		
D22	ADE		
D23	ACI		
D24	AST		
D25	AZR		
D26	ARB		
D27	AAR		

information on how to call other networks. You can include this in a telephone directory, an SOP, or the CEOI. The telephone directory can also be part of your network or unit SOP or part of the CEOI.

4-8. AN/TTC-39A Application

Although the basic data entry process is not changed by the AN/TTC-39 modification, there are several new commands related to the channel assignment function. These are:

Assign channel reassignment (ACR).

The ACR data entry input shows the DTG number and channel number, channel range, or subgroup number for each channel or group for each reassignment.

Display channel reassignment (DCR).

The DCR command shows all channel reassignment from the subgroup, channel range, or channel number to the DTG number and the subgroup, channel range, or channel number.

Digital transmission group (DTG).

The DTG command displays for each DTG number the multiplex signal format and the group rate. For each channel it shows the channel number, the TDMX address, the terminal type, the status (primary or secondary), and the subgroup number.

Display individual channel reassignment function.

The display individual channel command displays for each DTG the channel number and the TDMX address before and after the channel reassignments. Inputs are started with the TDMX address from which the reassignments were started.

Change to assign digital transmission group.

The existing ADT data entry has added inputs of multiplex signal format, group rate, and subgroup rates or number of channels.

CHAPTER 5
Employment

5-1. Use of the Switch in a Communications System

Employment means placing the switch into a communications system. To do this, use all the information presented in the previous chapters about switch capabilities and operation. All the actions involved in employment are part of system planning and network development, which is covered in paragraph 5-6. This chapter also presents additional information to help the planner see his position in the broad sense of overseeing the entire communications system.

5-2. General Concept of Operations

Chapter 1 introduced you to the Army's plan to move to an all digital tactical communications system. This requires the production and fielding of a large amount of new equipment. Other changes will include major increases in capabilities. The Army is making changes in methods of operation and in doctrine which will continue for some time. Figure 1-1 gives an example of this. A major change is that the command communications system will combine with the area or common-user system. The result is a single, cohesive common-user network of telecommunications centers that supports the major commanders in the theater. Each of these centers includes an AN/TTC-39 circuit switch. Paragraph 5-3 gives an example of the makeup of these centers, or nodes.

These changes are concurrent with many other changes in the makeup of Army units. The theater army is now supported by a theater communications command. This in turn has at least two signal brigades. The current corps has one signal brigade for support. All of the brigades include signal telecommunications battalions which are made up of signal telecommunications companies. Those companies assigned to area functions each have one AN/TTC-39 and have evolved from ones that used manual or automatic analog switches (AN/MTC-9 or AN/TTC-38). All of these AN/TTC-39S are of 300-line size. The Army uses 600-line switches only for certain special purposes. These changes apply to a wide range of CE equipment. For example, subscriber equipment, telephone, teletype, data, and facsimile will in time become all digital. Some of this equipment is in use now. New transmission systems include high frequency, troposcatter, and line-of-sight. These, coupled with new digital multiplex devices, will add greatly to the usefulness of the Army's tactical CE systems.

In addition, the Army is applying new concepts in CE management and control. Chapter 1 described the CEMS. The CEMS includes several elements of automation. The CSPE and the CSCE are planned to include some features that will enable users to send orders and reports automatically. This will add to efficiency, responsiveness, and the centralized control of communications. Equipment at the node will also improve planning and control functions.

The conversion from analog-to-digital will take a number of years. During this time, you may see many combinations of equipments and of the organizations that support them. The AN/TTC-39 is a key element in this process of change. Its modular design will enable it to take on a more digital configuration as needed. The switch you work with will most likely be the standard configuration. (See Chapter 2.) You should, however, be aware of its full range of capabilities to help prepare you for the mixed analog-to-digital world that is now upon us.

5-3. Nodal Composition

The major use of the AN/TTC-39 in the theater and the current corps is at an area node. The switch can be an intermediate (tandem) switch (switching between switches), it can serve local subscribers, or it can do both. The last is usually the case. The breakout of services between local subscribers and trunk switching use depends on the needs at the node in question. It will vary from node to node and from event to event. Network planning depends on accurate estimates of nodal requirements. Thus, you must identify these early in the planning cycle. However, the analog-to-digital changes taking place make this task difficult. This is because changes in equipment produce changes in the node's needs. To help clarify all this, this paragraph describes typical area nodes for the AN/TTC-39 in environments that are mainly analog and that are mostly digital.

Current area node.

The nodal arrangement in Figure 5-1 is typical of what you will find in the present stages of AN/TTC-39 use. Except for the circuit and message switches, all of the equipments are basically analog and will in time be replaced, This figure shows a 300-line AN/TTC-39 in the 2/1 configuration which has two SDSGs (analog) and one TDSG (digital). The control facility for the node is the AN/TSQ-84 communications technical control center. This is a replacement for the SB-675 communications patching panel. The AN/TSQ-84 can terminate, patch, and test analog circuits and can terminate and patch individual digital circuits.

The AN/TCC-73 telephone terminal is the standard multichannel system used at the node. It uses pulse code modulation. Its basic building block is 12 channels at 48-kbs per channel for a 576-kbs composite transmission rate, Use of the digital groups of the AN/TTC-39 requires use of 18-channel groups (576 kbs) between AN/TTC-39 switches. This is true even when the GOS requires fewer channels. These trunk groups bypass the AN/TSQ-84 and its limited capabilities for monitoring, testing, and patching. If there is need for additional DTGs, the AN/TSQ-84 can patch individual digital circuits (up to 60) from the AN/TTC-39 to the AN/TCC-73. This reduces the

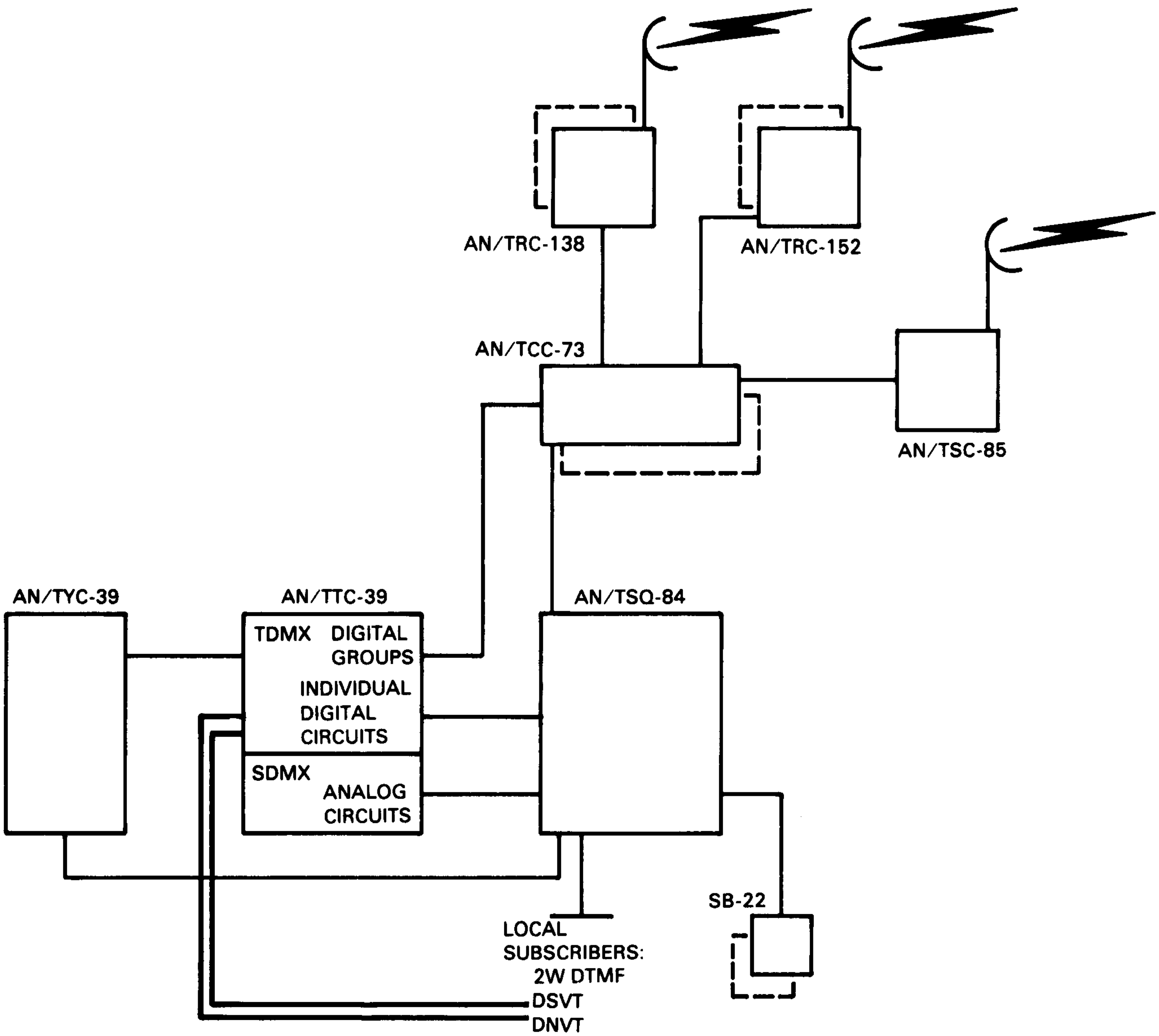


Figure 5-1. Current area node.

number of digital local subscribers that can connect to the AN/TTC-39. If a switch configured with more TDSGs is used (for example, the 600-line switch in the 3/2 analog-to-digital configuration has 2 TDSGs), up to 8 DTGs are available.

Analog trunks do not have the same restrictions as digital trunks. (See Table 3-1 for maximum terminations.) The major trunking limitation of the available equipment is in its ability to combine multiplex and transmission equipment. Patching of all of the analog circuits and of the individual digital circuits is through the AN/TSQ-84. All local connections (including local subscribers, PBXs, and PABXs) are also through the AN/TSQ-84.

Use of an AN/TYC-39 message switch at the node (as in Figure 5-1) may involve further restrictions. The AN/TYC-39 can operate in the stand-alone mode but if circuit switching is available, it is more efficient, in terms of transmission media, to use the AN/TTC-39. However, the interface between the message and circuit switches will use one of the four (300-line switch) or eight (600-line switch) available circuit switch digital trunk groups. This reduces the digital connectivity even more.

The transmission facilities at this node are the AN/TRC-138 and the AN/TRC-152. The AN/TRC-138 is a microwave radio terminal and repeater using AN/GRC-144 radio sets. The AN/TRC-152 is a newer microwave terminal and repeater set using AN/GRC-103 radio sets. It replaces Radio Set AN/TRC-110. There may also be a satellite terminal at the node. The AN/TSC-85 is a multichannel SHF terminal that can connect to either analog or digital portions of the switch. (For further information about the transmission equipment, see the appropriate technical manuals.)

Objective system area node.

The objective system area node is almost all digital. Thus, the availability of digital equipment influences its composition and operation, and so do the changes in the theater communications system described in paragraph 5-2. Combining the command and administrative systems into one common-user system will affect the user distribution and the traffic load for each node. Figure 5-3 illustrates the objective system area node. This is the equipment arrangement which takes full advantage of digital switching and digital multiplex and transmission systems. However, some analog capability is retained for subscribers who still use older equipment and for emergency use.

The heart of this node is the AN/TTC-39A nodal control circuit switch. This switch incorporates changes which have a major impact on node operations. The digital capability is increased by changing the analog-to-digital matrix relationship from 2 to 1 in the 300-line AN/TTC-39 to 1 to 2 in the AN/TTC-39A. The total number of terminations is also increased. The switch also performs control functions such as channel reassignment and analog line conditioning. (See paragraphs 2-6 and 3-13 for more details.) There is also a control facility as part of the node. This is in accord with the CEMS, and the equipment will be a Control Center AN/TYQ-31. This control center will report to the CSCE at the battalion level and will eventually provide processor-to-processor interface for the nodes and automatic data base entry and updates.

Approximately every third node in the area system has a AN/TYC-39 message switch. Data subscribers can also be served by the circuit switch using a DSVT. Figure 5-2 shows a single subscriber terminal teletype device connected in this way. The node also has a secure digital net radio interface unit (SDNRIU). This enables single channel combat net radio subscribers to enter the switched system. This replaces the radio wire integration devices used in earlier systems.

This node's multiplex and transmission systems are different than those of earlier nodes. Radio equipment will reduce or even eliminate the use of cable to the radio park location. This means that the radios can be placed in the best location for transmitting to other nodes. There are short-range wideband radios (SRWBR) both at the bottom of a hill (where the terrain protects the node), and at the top (where the line-of-sight or other transmission characteristics are best). Each SRWBR set includes an AN/GRC-144 radio modified to handle the higher digital group rates. The bottom of the hill set is the AN/TRC-175, which sends the data stream to the AN/TRC-138A at the top of the hill. The older AN/TRC-138 has been modified and this involves not only a modified AN/GRC-144 but also the addition of digital group multiplex equipment. The AN/TRC-138A can patch digital groups to other top-of-the-hill radio equipment for up to eight extension nodal systems and to four other nodes. An extension node is one at a location subordinate to the main node. In Figure 5-2, the AN/TRC-174 radio terminal set transmits to an extension node.

An extension node uses either of the radio terminal sets AN/TRC-173 or AN/TRC-174 to terminate the channels at that location. To transmit over longer distances, the system can use a digital tropospheric Radio Terminal Set AN/TRC-170. It may also use a satellite terminal such as the AN/TSC-85A or AN/TSC-93A. Figure 5-3 illustrates the use of digital multiplex equipment at this type node. This diagram shows the part played by each type of equipment at the node.

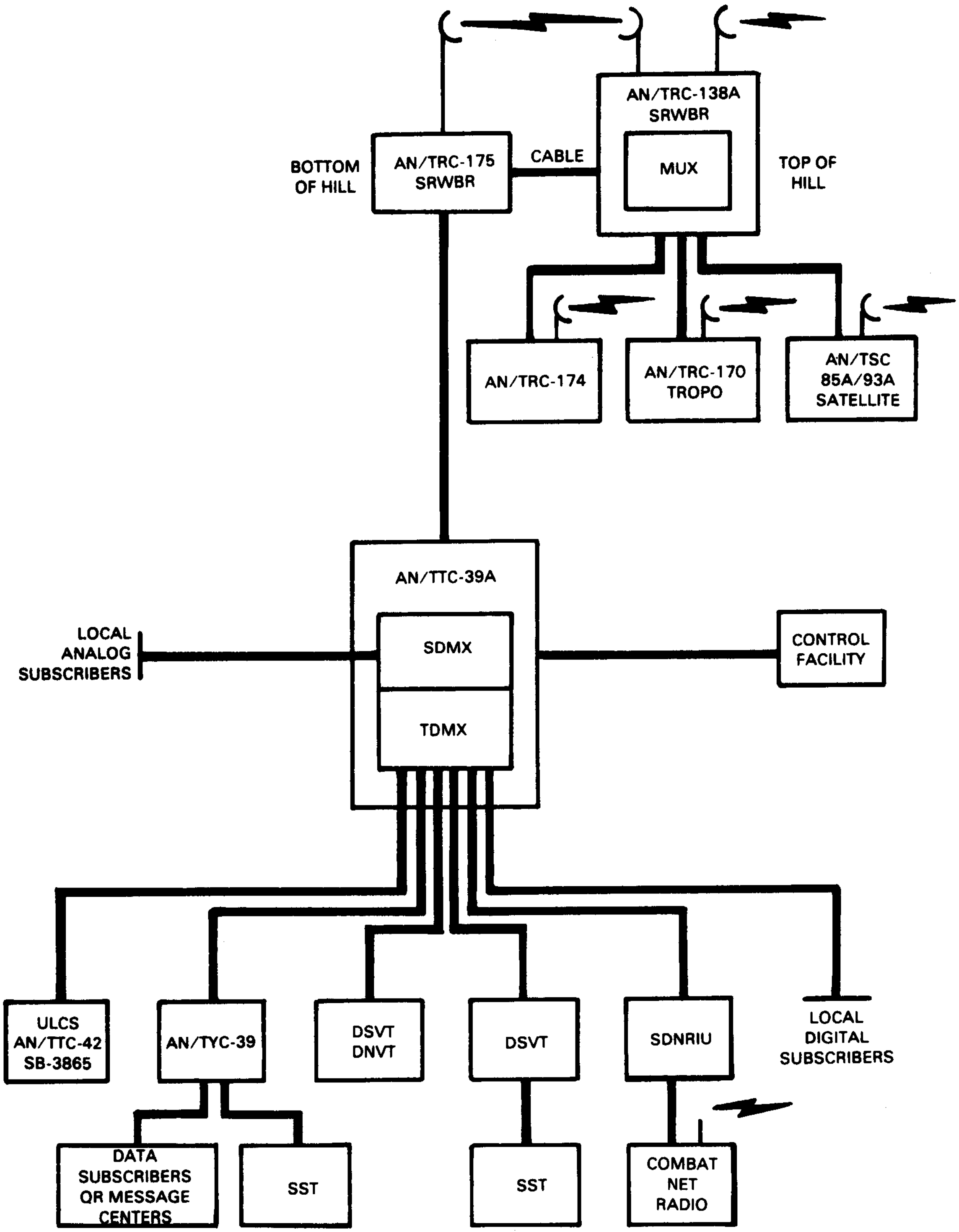
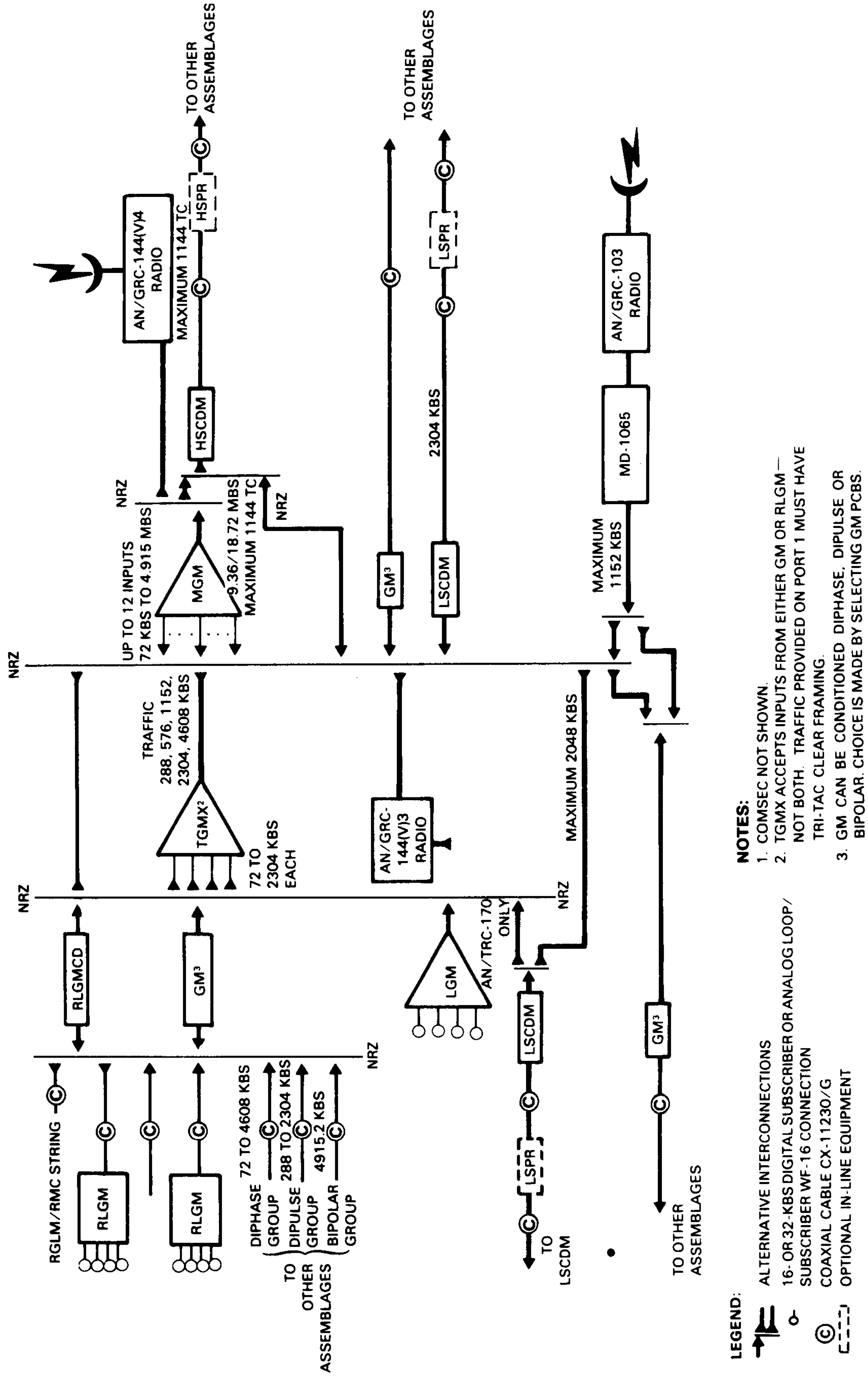


Figure 5-2. Objective system area node.



NOTES:

1. COMSEC NOT SHOWN.
2. TGMX ACCEPTS INPUTS FROM EITHER GM OR RLGM—NOT BOTH. TRAFFIC PROVIDED ON PORT 1 MUST HAVE TRI-TAC CLEAR FRAMING.
3. GM CAN BE CONDITIONED DIPHASE, DIPULSE OR BIPOLAR. CHOICE IS MADE BY SELECTING GM PCBS.

Figure 5-3. DGM connections.

5-4. Traffic Engineering

Traffic engineering begins after a tactical switched communications network is planned. The planning phase will identify switching node locations and will lay out the interswitch transmission links. It will also determine trunk group types for those links and will make out subscriber lists for the nodes. Traffic engineering is the proper allocation of network assets (principally interswitch transmission channels) to enable the network to carry the calls originated by, and destined for, network subscribers. Initial traffic engineering is done on the basis of estimates made using experience factors from past tactical communications networks. (For a complete description of the traffic engineering process, see FM 11-486-2.)

Terms.

Below are brief explanations of terms commonly used in traffic engineering.

Holding time. Call holding time is the length of time that a subscriber is off-hook in the process of making a call to another subscriber. It includes the time the network takes to setup and take down the call as well as the time that is actually spent in communication between the subscribers. Call holding times in telephone networks have been shown to follow a negative exponential distribution. The average call holding time in a tactical communications network has been found through experience to be 240 seconds (4 minutes). Use this number in your initial traffic engineering estimates for anew network, or for a new configuration of an existing network.

Busy hour offered load. Communications networks are generally designed to carry, at an acceptable GOS, subscriber traffic offered during the busiest hour of a typical 24-hour day. For tactical communications networks, the measure of traffic is hundred call seconds (ccs). To estimate the subscriber busy hour offered load in ccs for a tactical communications network, or for a particular switch in that network, use the following formula:

$$\text{Offered load (ccs)} = \frac{X \times 3{,}600 \text{ seconds} \times 0.3}{100}$$

where

X = number of subscribers to the network or switch

3,600 seconds = duration of the busy hour in seconds

0.3 = subscriber average off-hook factor during the busy hour as determined by experience (off-hook factor of 30 percent)

Dividing by 100 converts traffic in call-seconds to traffic in ccs.

Grade of service. GOS, mentioned above, is the measure of acceptable service for a switched communications network. It is the percentage of time that a caller fails to reach the called subscriber (fails to receive either ringback or a subscriber busy signal) when he attempts a call. A particular GOS value is the basis on which you engineer or allocate the assets for a switched communications network. Atypical target value used for automated tactical communications networks is .01. Table 5-1 lists some assumptions about tactical subscriber traffic that were used in designing the AN/TTC-39.

Distribution of calls at a tactical switching center.

Field experience has shown that the calls handled by a major nodal switch, with roughly a 2:1 ratio of loops to trunks, typically has the following breakdown:

Local calls	***30 percent***
Nonlocal calls	***70 percent***
Out-trunk	*25 percent*
In-trunk	*25 percent*
Tandem (trunk-to-trunk)	*20 percent*

These experience factors, along with the ones previously given, are used in making the initial traffic engineering estimates for a tactical switched communications network. The process is described in subsequent subparagraphs.

Initial traffic engineering.

The objectives of the traffic engineer's initial efforts is to estimate the required sizes of the TGCs between switches so that the network, when actually deployed, will operate close enough to its target GOS to provide effective subscriber service. Once the network is up and running, traffic metering will provide actual data on which to base load balancing and other corrective measures to refine the network's configuration. To obtain size estimates for the TGCs at a switch, the traffic engineer first uses the formula shown above in the subparagraph on busy hour offered load to estimate the local subscriber portion of the switch busy hour traffic load. The local subscriber portion includes local calls, out-trunk calls, and in-trunk calls but not tandem calls. Therefore, the total busy hour traffic load can be found as follows:

$$\text{Total traffic load} = \frac{\text{subscriber portion of traffic load}}{0.8}$$

where

0.8 (80 percent) = local calls (30 percent)+ out-trunk calls (25 percent) + in-trunk calls (25 percent)

To get the traffic load on the TGCs, use the following formula:

Traffic load on all TGCs = total traffic load x 0.9

where

0.9 (90 percent) = out-trunk calls (25 percent)+ in-trunk calls (25 percent) + 2 x tandem calls (2 x 20 percent)

Tandem calls count twice because a tandem call comes in on one TGC and goes out on another. This traffic load has to be distributed over the various TGCs terminating at the switch. The traffic engineer will distribute it evenly if there is no reason to do otherwise. (For example, if the total TGC traffic load is estimated to be 3500 ccs, and there are five TGCs, then each would carry 700 ccs.) Once the traffic carried by each TGC has been estimated, use the Erlang-B tables in FM 11-486-2 to determine how many trunks the TGC should contain to provide .01 GOS (.01 GOS means that 1 percent, or 35 ccs, of the offered traffic will not be carried by the TGC because of traffic load). The process above has to be repeated for each switch in the network.

Deployment.

After the network is actually up and running, the traffic engineer can see how close he came with his initial estimates to providing a .01 GOS. He does this by using the traffic metering capabilities of the automatic switches. Adjustments are usually made by adding and deleting individual trunks in TGCs to better match their sizes to the actual loads offered. In combat situations the constraints on available switching and transmission assets, the hostile threat, the continual movement of subscribers, and the resulting network reconfiguration to provide subscriber service combine to provide a real challenge to the traffic engineer.

Traffic.

The AN/TTC-39 will pass more traffic than older switches for the following reasons:

- CCS reduces the time to set up a call. This in turn reduces the holding time.

Table 5-1. Traffic assumptions for design of AN/TTC-39.

TACTICAL SUBSCRIBER TRAFFIC	TRAFFIC ASSUMPTIONS
Busy hour average subscriber off-hook factor.	Up to 30%.
Grade of service.	.01 for trunk groups connecting major switchboards. .05 for trunk groups connecting an AN/TTC-39 to unit level switchboards and PABXs.
Switch blocking. (Achievement is based on the other traffic assumptions given in the table.)	Not more than 1 in 1,000 call attempts blocked by matrix during busy hour. Nonblocking for immediate, flash, and flash-override calls.
Average system voice to data call ratio.	7:3 early deployment. 1:1 late deployment.
With inband trunk signaling only.	Busy hour call rates of up to five originating calls per termination.
Holding time distribution.	Negative exponential call holding time assumed.
Average holding time.	Voice calls - 4 minutes. Data calls - 30 seconds initially to 7.5 seconds. Teletypewriter calls - 100 seconds initially to 10 seconds.

- Combinations of analog and digital trunk requirements make it necessary to use more varied TGCs (analog, digital, and analog to-digital).
- Overhead channels handle combined system control, framing, and synchronization. This makes more channels available for traffic.
- Maximum use of automatic calling without the assistance of an operator reduces call holding times.

5-5. Coordination and Information Flow

It takes a great deal of data, many documents, and much coordination to support the operation of a tactical communication system. With the introduction of automatic switching, coordination and information flow is more complex. Planners and controllers are making management decisions on a real or near real-time basis. All parts of the system are interdependent. You need to understand what information is necessary for planning and you need to know whereto get it. You need to know what documents, directives, and orders you must issue and where to send them.

Figure 5-4 shows some typical documents, displays, and information flows. Not every situation, however, will require all of these documents nor all of these flow paths. The flows shown here mainly reflect the theater level situation. However, most of them apply to other levels as well. The figure can also apply to a variety of switches. The documents shown are specific to the AN/TTC-39, yet you could substitute documents dealing with other switches without affecting the general flow picture. Table 5-2 lists some of the required planning information and tells where to get it.

To follow the whole information flow involved in building a CE network plan, start at the top of Figure 5-4 and read down. The process begins with the commander's initial operations orders. It ends when you fill out the configuration and data base entry worksheets for a specific AN/TTC-39 at a network node. The figure describes only a single planning cycle, but building and refining a communications network never really ends. In actual operation, you would repeat the cycle as often as necessary to refine the plan and to accommodate changes in requirements as they occur.

The documents and information sources you will use include CE operations orders, CEOIs, SOPs, graphic type orders (diagrams, maps, overlays, sketches), Standardization Agreements, and joint publications (Allied Communications Publications and Joint Army-Navy-Air Force Publications). You will also review user requirements and requests for services, as well as troop lists and tables of organization and equipments.

At the CSPE level, you will use these documents to analyze your assigned mission and to prepare a CE estimate on how best to carry out the mission. Your goal will be to prepare a systems concept and a detailed CE plan. The plan must satisfy system requirements as well as possible with available resources. It follows the same format as operations orders and the CE annex. (See FM 24-16,) The CE plan tells how to provide CE support for the command as a whole. It may become the basis for system implementation orders issued by the supporting signal units (at the CSCE level). At the CSPE level, this plan involves several components. Start preparing the plan by filling out planning worksheets P-1 and P-2 as described in paragraph 4-5. These list subscriber and trunking requirements respectively. Then prepare an inventory of the major equipments you will need. Most CE plans will include three elements: multichannel plans, single channel plans, and wire communications plans.

Multichannel systems are either radio (line-of-sight, satellite, or tropospheric scatter) or wire/cable systems that provide more than one simultaneous channel of communications, (Use wire/cable only where radio equipment cannot be used, in rear areas where wire/cable is secure, or to free radio equipment for movement.) Single channel systems may include AM or FM radio, single side band radio, radio teletypewriter, or very high frequency equipments. You will need to determine the specific number and types of radio nets to assign frequencies and to establish station and net radio call signs. Wire communications plans specify the use of field wire, wire laying and recovery equipment, cable, different types of telephones and telephone equipment, teletypewriters, and switches.

With all of the above planning products in hand, you can start preparing a detailed plan for deploying specific AN/TTC-39 switches. For each nodal switch, complete the remaining planning worksheets (P-3 and P-4) and partially fill out the switch data entry worksheets (D-1 through D-27). (See paragraph 4-6 for details.) These worksheets

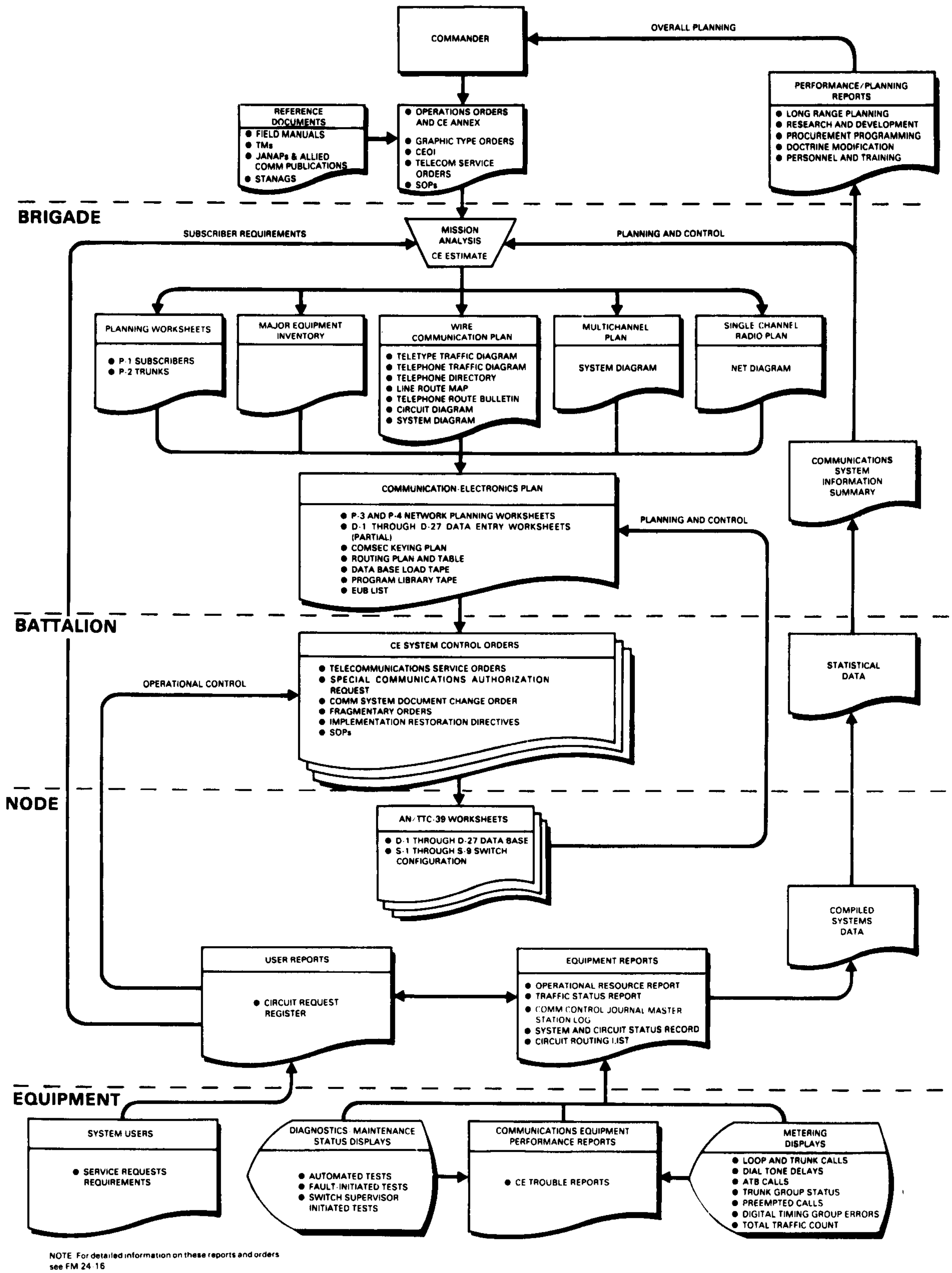


Figure 5-4. Coordination and information flow.

identify class of service marks/features for each switch and for switch subscribers. They will also list PR and SL numbers and subscriber addresses. Next prepare COMSEC keying plans, routing plans, and EUB lists. As the planner, you also direct the composition and release of pre-made data base load tapes and the program library tapes for the automatic switches.

For plans to work, the CSCE must prepare and issue a number of implementation and installation orders. These can include:

- Telecommunications service orders (TSOs).
- Special communications authorization requests.
- Communication system documentation change orders.
- Fragmentary orders.
- Standing operating procedures. These are usually prepared and issued through command channels.

Once a system is running, the CSCE must send subordinate nodes a number of other directives to set up its system monitoring and operational control functions. For the AN/TTC-39, these may include:

- Traffic control directives.
- Circuit and patching control directives.
- Transmission control directives.
- COMSEC data element messages.
- Directory control messages.

At each of the nodal switches, the switch supervisor will add site-specific information to the AN/lTC-39 data base. He does this by completing the partially prepared data base worksheets D-1 through D-27 received from the CSPE/CSCE. The supervisor will also carry out the switch configuration or strapping instructions spelled out in his orders. He does this by completing worksheets S-1 through S-9. Once the switches have been initialized, tested, and are operating, the nodal control facility will provide detailed local communications planning, direction, and control. This will require the switch supervisor to monitor switch performance, to modify or correct circuit configuration/operation, to activate and deactivate circuits, and to coordinate these changes with the appropriate CSCE. The CSCE will maintain records and reports received from subscribers and from the switching equipments. These will cover data on such matters as resource commitments, trouble conditions, traffic status, diagnostics, and

Table 5-2. Sources of required planning information.

INFORMATION REQUIRED	SOURCE OF INFORMATION
User locations and requirements.	Troop lists, SOPs, CEOIs, operations plans, orders, overlays.
Existing network status.	CE plans, orders, SOPs, CEOIs, subordinate CSCE.
Personnel/equipment team status.	TOEs, SOPs, operational readiness/resources reports.
Map coordinates of termination points to include NATO interface and foreign commercial and military systems.	Requirements density overlays and operations plans/orders, frag orders.
Points of interface with other systems/equipments.	Systems interface plan, orderwire requirements list, and requirements density overlays.
Terrain conditions.	Requirements density overlays, profiling analyses, topographical data, Army/Air Force data.
Available CE and COMSEC resources, personnel, and equipment.	CE plans and orders, TOEs, operational resource reports, and unit readiness reports.

metering. The switch VDUs may display some of this information and some may be printed out automatically or prepared by hand.

To maintain system control and to improve the overall system performance, the switch crews must compile various reports and send them back up the chain of control. These reports provide feedback information, which helps in controlling day-to-day operations. In addition, periodic reports on the system's operation are needed. The Army uses these for long-range planning, for research and development, for programming procurements, for planning personnel needs and for training, and for developing and modifying doctrine. Coordination and information flow in current tactical CE systems is a continuing cycle of planning, re-planning, adjustment, and day-to-day direction. Its purpose is to keep the system running smoothly in the face of rapidly changing technical and field conditions.

5-6. System Planning and Network Development

So far, this manual has described only partially the place of the circuit switch in a network. To make the picture complete, this paragraph guides the planner through the planning process. It also discusses the numerous factors that the planner must consider when putting together a circuit switching network. The previous discussion on coordination and information flow is the basis for much of the planning process. It will be helpful to refer back to this discussion and to Figure 5-4 as the process develops.

Planning guidance.

The circuit switch may be used at a headquarters or to provide local subscriber service within its home area at a non-headquarters location. In the latter case, your major planning function will be to allocate equipment and calling services to those subscribers. This also can be the situation when a switch supports a task force headquarters where most of the staff and subordinate units are in the close vicinity. However, it is more likely that the AN/TTC-39 is part of a complex network of circuit switches. The major example is within the rear areas controlled by a theater headquarters. Paragraphs 1-1 and 5-2 provide some insight into the general organization of these areas. The geographical area size can be very large (such as the whole European theater). Such size increases the complexity and the potential problems.

The circumstances surrounding the procurement, introduction, and use of the AN/TTC-39 compound this already complicated situation. This is a factor of the transition from analog-to-digital communications and of the organizational changes involved. The organizational changes are the result of more efficient use of equipment and personnel. This in turn results from the use of digital systems, from changes in training needs, and from the doctrinal changes involved with the new capabilities. As the planner, you must function in this environment. You must deal with both the new and the old while these changes are taking place.

The title planner as used here describes the responsibilities more than it does the position. The senior communicator is responsible to the commander for communications. He will have charge of planning, engineering, and operating staffs and organizations. Planning is a function at all levels, down to the switch itself. Direction and guidance, however, must come from the top level. This seems to imply centralized planning (and control), and this is indeed a fact of the analog-to-digital trend. There are several reasons why CE networks can no longer be operated piecemeal. These include the complicated mix of old and new equipment, the changes in capabilities, the greater speeds at which systems work, and the increased need to control the system. They also include the increased interconnection of systems (other services, Allied, AUTOVON), and the fact that automation demands more precise information,

However, there is a paradox in the centralized direction and control we now have. In the older, manual systems, the communicator had complete control of the operation of thes system. For example, all calls passed through switchboard operators who made connections, monitored and tested the system's workings, and reported problems. The users run our new system, Users are able to make their own connections of all kinds. This increases the need for detailed planning. It also increases the need to train the user. No longer can a subscriber simply pick up his handset and tell the operator to route him to a distant switch. He must know how to do it himself by proper dialing. The operator is available to handle certain calls, but does not have the time to handle routine calls. Thus, part of the planning effort must be to determine user training needs. The planner must also set up checks to prevent untrained users from degrading any part of the system by improper use. The user is not the only one who may need additional training. The planner's increased role increases his need for training also. He (and his staff) must be adept in communications and traffic engineering and in network operations. Knowledge of equipment, automated processing, real-time reporting, and technical administration is vital. Planner training requires extensive instruction in each of these areas. All network planners should have this training.

Earlier it was mentioned that planning takes place at all levels including the switch or node. Of course, planning varies from level to level and depends on guidance from the next higher level. It is within this framework of the CE management system that the planner's work focuses. (See paragraph 1-3). As paragraph 5-3 described, reporting and certain operational functions are automatic. However, this automation is a result of direction from the CSCE, which resides at the signal telecommunications battalion controlling the switches in its area. There are planners at the CSCE and also at the CSPE who handle broad, long-range planning. The CSPE resides at the corps and theater headquarters. The function at the CSCE involves operations, logistics, and administration. The planner at the CSPE handles the detailed system planning and resource and management function.

Network development principles. The development of any CE system must follow certain logical procedures that rest on standard principles of communications use. These procedures fall into phases:

- Determine the mission.
- Compile and evaluate requirements.
- Assess the resources.
- Configure the network.
- Develop routing,
- Allocate services to subscribers.
- Establish control and reporting.
- Issue the orders.
- Test the system.

These procedural phases are, of course, interdependent. Each has an effect on the others. They apply generally in the order listed and represent a logical progression. However, at the completion of each phase, the planner must look at all of the other phases to see what adjustment is needed. In other words, the use of these procedures is an iterative process. We will use them hereto illustrate the planning needed for a switched network.

Determine the mission. The usual method for announcing a mission is the operations order. Paragraph 5 of the operations order, Command and Signal, provides some information for the CE planner. There may also be a CE annex to the order. If the planner helped write these portions of the order, he has already done part of this task. In all cases the planner should be a part of the order-writing process. If the network is automated, he must participate. The operations order defines the mission of the CE organization. The planner then does a mission analysis to find if the mission is feasible and to find its cost. This is a general, preliminary estimate but it is necessary. It lets the commander know if the CE system will be over-extended.

Compile and evaluate requirements. Once the mission has been assigned, the details are put together. The first step is the CE estimate which provides a logical way to decide on a course of action. The CE estimate involves some analysis of requirements and the possible effects of enemy capabilities. The next step is to see what the pattern of needs will be. The best way to do this is to make a rough sketch of a possible network. This sketch will eventually be your multichannel systems diagram. Remember to base this sketch on the mission, the estimate, and your own SOP. This SOP is important because it shows you how the standard system is usually put together. For a corps, the rough sketch may look like Figure 5-5. Such a sketch will become your worksheet as you progress. It is best to combine this with a map overlay so that you can analyze actual locations later.

Now list each major headquarters in the corps area and in each division area. These are the critical supported activities. Then show all other concentrations of supported units. At first, list only the nodes to support these headquarters and units. Paragraph 4-5 describes the use of planning worksheets. You should start with worksheet P-1 (subscriber list) for each circuit switch at each node so far listed. This will give a preliminary idea of your resource needs. Fill in most of the items on this worksheet later on. In the same way, start a worksheet P-2 (trunk list) for each node. List only the rough information and show only the simple connections between each node. This is the first compilation of requirements. Adjust it at each step. It is the first part of your CE plan.

Assess the resources. You have already addressed the question of resources in the estimate. This is, of course, the primary issue in the design of any system. You must first determine that you have enough resources to establish a doctrinal or a standard system. This done, you will then be able to tailor one to meet your mission requirements. The first step here is to make (or review) a list of communications units and to inform yourself on what they can do. It is important to try to maintain unit integrity when assigning equipment. This means that, when a unit is responsible for communications in an area, it should have control over all equipment that affects the level of service. For example, one unit should supply and operate all equipment at a node, if possible. Your next item is a list of all major items and of the units to which they are assigned. This will be your running record of what you have and of where it is to be used. Careful use of this will keep you from overcommitting resources and will enable you to keep track of them.

Configure the network. You should now have all the information you need to develop a complete network. The first step is to go back to your network plan and assign other nodes. You will also assign equipment to those nodes. Base your assignments on the following factors:

- Support of lower priority users.
- Redundancy for restoral and for alternate routing.
- Capability of transmission media.
- Electronic and physical security.

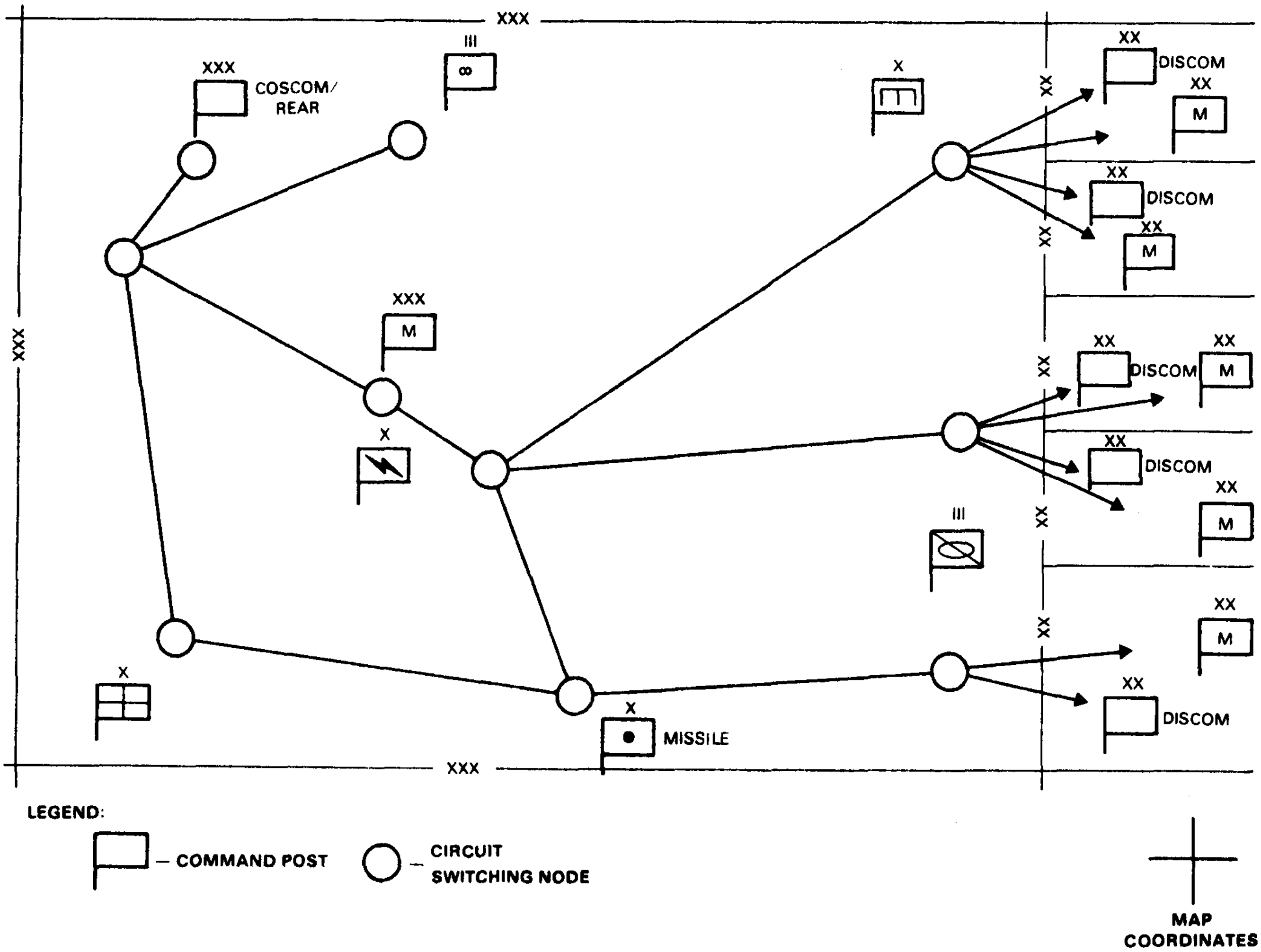


Figure 5-5. Corps circuit switching network plan (initial).

- Expected unit displacement frequency.
- Nodal equipment limitations.

You should apply the rest of the capability to support the other users of the network. Generally, you would have assigned AN/TTC-39s to the higher priority nodes. Now you must portion out the rest of the AN/TTC-39s and the other high capacity switches. These include such items as AN/TTC-38s and other automatic and manual switches. If you need interface devices of any type, list them also and allocate them in your equipment inventory. (See Chapter 3, Section III, for interface information.) When you assign nodes, arrange them so that destruction of any one will not isolate any part of the network. The key to this is in your routing plan. This will also provide the basis for alternate routing under both normal and emergency conditions. (See paragraph 5-8).

The capability of the transmission media is, of course, critical to the network arrangement. For example, if enough repeater equipment is available, the network will be able to handle rough terrain. But using terminal sets for repeaters will reduce this ability, The need for electronic and physical security because of the tactical situations can place severe limitations on your configuration. Where possible, you should not direct antennas toward enemy territory. You should also protect node and transmission locations from enemy fire and from enemy incursions.

You can form an estimate of unit displacement frequency from the nature of the mission. In a swift moving advance, units will not stay in one place very long. (See paragraph 5-7 for displacement information.) You must then plan to locate more nodes forward or along an axis so that support is available for units moving in and out of an area. To keep up with the forward movement, you may also have to save nodal communications for your own nodal jump capability. This would decrease the number of possible nodes in your network. The factor nodal equipment limitations refers to the maximum number of subscribers and trunks the node can handle. It also refers to limitations on connections to other nodes due to the nature of the control and multiplex equipment. Your network plan should now look like Figure 5-6.

Develop factors affecting configuration. During the configuration phase and also during the next two phases (routing and subscriber services), you must deal with many details in the use of the circuit switch. This will enable you to complete the planning and to issue the communications order. Refer back to paragraphs 4-5 and 4-6, which tell how to use the worksheets for AN/TTC-39 operation. Your orders should include a set of these worksheets for each switch. This will ensure that the switch supervisor knows exactly what the configuration and trunking are to be. You have already started P-1 and P-2 but have not filled in all of the blanks. The switch supervisor will complete those having to do with specific resources of the switch. However, you must know these resources for each switch so that you can allocate them. Keep copies of worksheet P-5 (circuit card inventory) for each switch in your file and require a return copy for each switch that goes into operation. Include instructions of this nature in your SOP so that you do not have to repeat these instructions.

Now complete worksheets P-1 and P-2 (subscriber list and trunk list). From these, develop P-3 and P-4 (loop terminations and trunk terminations). The planner will not usually fill out strapping worksheets (S-1 through S-9). However, the information you need for them should be on either your planning or data entry worksheets. Now partially fill out the data entry worksheets (D-1 through D-27). They will be completed at the switch. Gathering information and filling out worksheets may seem like a big job. However, you will probably only do it once. As an operation continues, you should only be issuing changes. At this point, the decisions you have made to configure the network have given it its major shape. Your future decisions will continue to affect it, however, and will add to the data elements that will become the data bases for each switch. Some of these decisions follow:

Extension nodes. Your network may have to serve areas of deployment that are too far from a major node to be served by long locals. These deployments will help conserve your switching capacity, but they will be a drain on transmission and multiplex capacity.

Traffic load. Paragraph 5-4 has information on traffic loads. When first planning a network, you will have to estimate the amount of the load. Draw on system records, history, and your own experience. One of the reasons you started P-1 worksheets for each switch is to provide a pattern of use as an aid to this estimate. Add to this from your information on extension nodes. The key part of the traffic estimate deals with large headquarters subscriber traffic, which probably involves the highest proportion of users. Once you have a picture of the traffic, you can determine the number of trunks. Now use this figure to plan the amount of equipment to use. When you plan the routing, you may want to alter this somewhat. Use the information in paragraphs 3-3 and 5-4 to design the network for GOS.

COMSEC. The first consideration in COMSEC planning must be compatible keys and COMSEC equipment. You must designate circuit switches as cryptonet control stations for COMSEC key distribution. See FM 24-27A for further instructions. TB 380-40 provides additional information on key management and distribution.

Switch loop rate. Paragraphs 3-2 and 4-6 describe the loop rate (or channel rate). You can set each switch for either all 16 kbs or all 32 kbs. If your network contains any analog switches, use the 32 kbs rate for the entire network. You can use the 16 kbs rate only when the all digital network is a reality. Use of the 32 kbs rate will minimize path degradation which could occur with multiple analog-to-digital and digital-to-analog conversions.

Essential user bypass. As the network planner, you control the allocation of EU. The operations order and your SOP give you guidance for this. However, the telecommunications battalion planners should verify your assignments because they are closer to the served units. Use worksheets D-7 and D-27 for the switches involved.

Glare. See paragraphs 3-7 and 4-6. Glare is classmarked by TGC. Assign classmarks on worksheet D-6 for every switch so that one switch accepts and one rejects glare for each TGC.

Numbering plan. Each switch can be classmarked for either 3/4 or 4/3 plans but cannot use

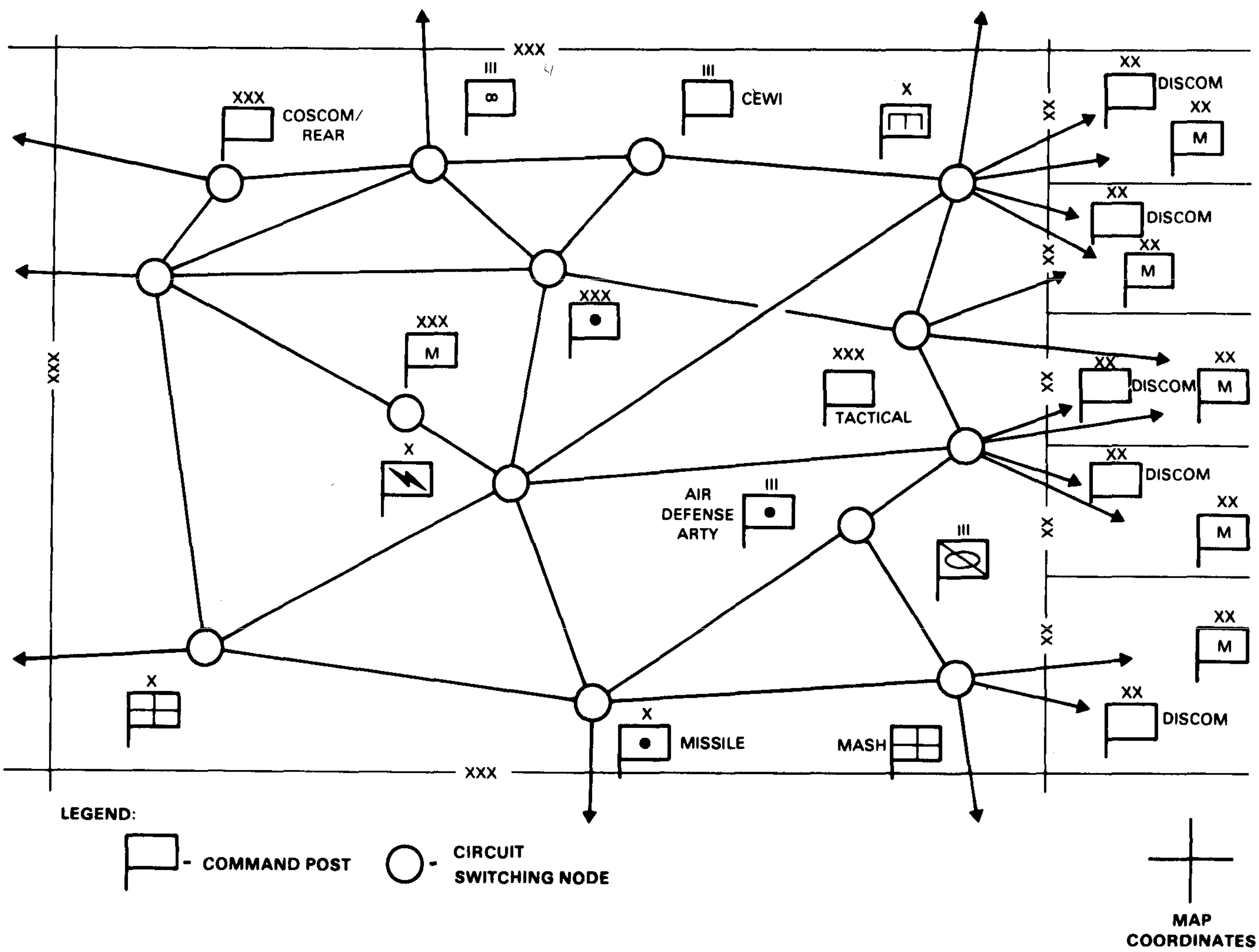


Figure 5-6. Corps circuit switching network plan (final).

both at the same time. See paragraph 4-4. The format will be decided at the theater level, but if possible, use the 4/3 plan for your network so that the standard TTNP applies. Use worksheet D-1/D-4 for each switch, At the same time specify whether the switch will accept abbreviated dialing. You can authorize this for all switches that have local subscribers. Use worksheet P-1 to assign PR, SL, and XXX numbers. Also use this worksheet to make fixed directory assignments. The PR is assigned by theater, and SL and XXX are assigned at lower levels.

Data traffic. There is no analog-to-digital or digital-to-analog conversion for data subscribers. In your path planning, you must assign digital paths for digital data calls and analog paths for analog data calls.

Gateway switches. Review paragraph 4-7. Use worksheet D-1/D-4. The use of this classmark minimizes some analog-to-digital conversions that are permitted at gateways but not at intermediate switches. A gateway may do unlimited conversion for all calls, but if the switch is classmarked gateway NO, there are limits. When the switch is a tandem or intermediate switch for a call, it will not do conversion on alternate routes if the primary TGC is an interswitch trunk (AN/TTC-39 to AN/TTC-39). But it will allow analog-to-digital conversion if the primary TGC is to any switch other than an AN/TTC-39. This requires the planner to designate gateways only where needed to assure that calls being switched through intermediate switches will be completed. Only two conversions are permitted. The goal is no more than one.

Traffic limits for precedence traffic. (See worksheet D-6.) Use this restriction to assure that incoming calls can get through to a switch. Do this on a network-wide basis so that incoming as well as outgoing traffic can be balanced.

Other restrictions. Use zone restriction, call inhibit, and load controls based on operational experience. It is very difficult to impose these restrictions unless there is some network experience to show the need. It is probably wise not to use them until a significant problem shows that they are necessary.

Develop routing (network routing plan). Review paragraph 4-7 for a description of the routing schemes for the AN/TTC-39. Also review the calculations you made for the traffic load. Trunk requirements based only on the traffic load will reflect minimum needs. The basic factor here is alternate routing. Each set of routes to a distant switch consists of one primary and up to five alternate TGCs. TGCs are a set of trunks between two switches, including both analog-to-digital types. The composition of these TGCs reflects the traffic load estimated between two switches (local plus tandem traffic) and the transmission characteristics needed. Each TGC should be some combination of the types of trunks listed in paragraph 4-6. This mix enables the switch to search each trunk type in an order determined by the type of call. The switch will then match the trunk to the caller’s equipment characteristics. (See paragraph 4-7 for details.)

Return now to the network plan (as per Figure 5-6). Make sure that every node has at least two connections so that the elimination of one node will not isolate another. You may also want to add connections in certain areas of heavy usage. For guidance, draw on your experience and on the traffic engineering data. This will provide additional alternate routes. However, it is important that you keep alternate routing to the minimum needed to meet GOS requirements. An excess could cause uncontrolled multiple routing resulting in system degradation.

Now develop the network routing plan. You must list each switch that can receive calls in the routing tables of every other switch. These tables show primary and alternate routing. However, you must also plan routing for the entire network. Figure 5-7 is a simplified sample theater routing diagram showing a theater with three corps and four divisions each. Each of the nodes is numbered (SL) and is within a PR zone. Two area codes cover the theater and corps and division areas. The area code and the PRSL identify each node. Each connection (TGC) has a number. Figure 5-8 is the form of a sample network routing plan. To use this form list each node vertically and horizontally. Then for each switch list the primary and alternate routes to every other switch. The sample has switches 601 72 10, 701 83 18, and 701 92 24 filled in to show how this is done. Note that you must read from the originating switch at the top.

Choose the routes according to the size of the TGC, the most direct connection, and the amount of traffic expected. In most cases, the primary connection should be the most direct one. If switches connect directly through a TGC, use this as the primary route. If routes must go through other switches, use the shortest path as the primary unless traffic or TGC size dictates otherwise. The example in Figure 5-8 shows only one alternate route. However, the AN/TTC-39 is able to provide up to five, depending on the number of routes serving each switch. Now extract from the routing plan the information for the data entry worksheets for each AN/TTC-39. Use the ANY entry (worksheet D-11) for each route between areas. Use the APR entry (worksheet D-12) for primary zone routing. Use the ASL entry (worksheet D-17) for switch locations. The rest of the routing entries are for variations of these basic routing decisions. (See paragraph 4-6 for further discussion.) A complete routing plan may contain further information about numbering plans, fixed directory routing, subscriber numbers, area codes, and switch codes. On the other hand, the CE order may include this information.

Allocate services to subscribers. You have already started worksheet P-1 (subscriber list). You should refine your preliminary estimate of the subscriber needs at each switch. You should also check your estimate with the telecommunications battalion that serves the switch area. The essential user bypass and the fixed directory list are especially important. Give them close attention. (See Chapter 3, Section I, for additional information.)

Establish control and reporting. The purpose of the CEMS is to manage the communications system of which your circuit switched network is a part. (See paragraph 1-3.) The CEMS is the principal tool for controlling the system and for receiving reports on its operation. However, the

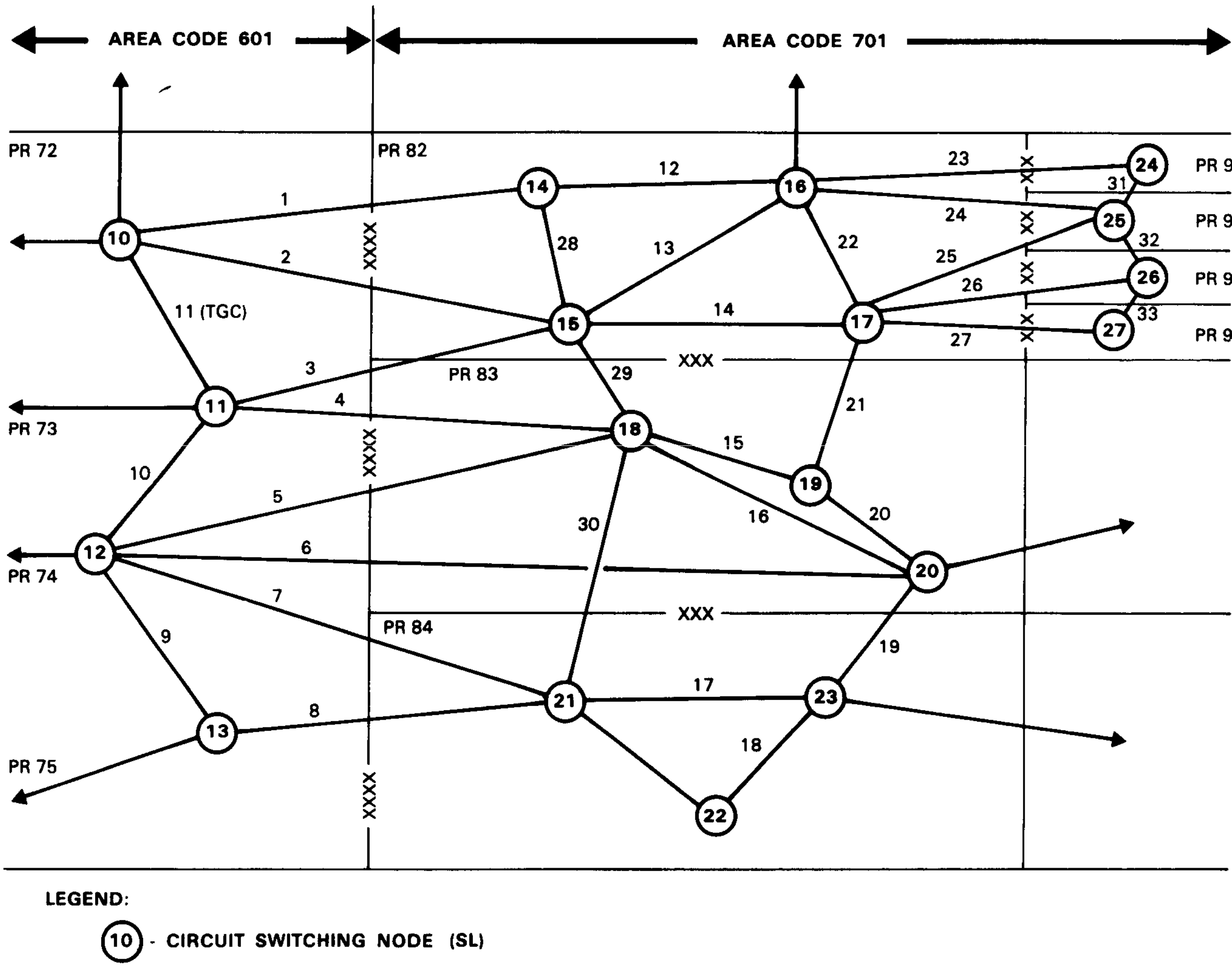


Figure 5-7. Sample theater routing.

uses of this tool will vary considerably, depending on whether automated devices are present. If they are, you will have much more timely information available and may even be able to automate changes to the network. In either case, at this phase of network development you must inform all subordinate elements as to how you will manage the system. Inmost instances, your SOP will cover this. In writing the SOP consider all of your needs as the planner and all of the needs of the operating elements. The CEOI can also be helpful. It will provide much of the technical information and instructions you will need. However, you will usually have to supplement it with the SOP and by the CE order.

Issue the CE order. At this point, you are ready to issue the CE order. The format for this is in FM 24-16. As already noted, this may be part of the command's operations order. For the corps planner, it will more likely be a signal brigade order. The CE order includes the worksheet already described, diagrams and map overlay. showing the switching network, and a multichannel systems diagram showing the technical layout of the entire system. Your network plan may well be the basis for this multichannel systems diagram. (See paragraph 5-5 for further information.)

Test the system. The best way to test the communications system is to operate it. However, it is much less painful to try it out before operations begin and to iron out any bugs that are present. If you can, test the circuit switched network as soon as it is operational, Do this by having network personnel place random calls from each switch. If you have access to a computer, you can develop a simulation program to check parts of the network by sending out data streams that represent traffic.

SWITCH DESIGNATORS (NYX-NNXX)

	601 7210	601 7311	601 7412	601 7513	701 8214	701 8215	701 8216	701 8217	701 8318	701 8319	701 8320	701 8421	701 8422	701 8423	701 9224	701 9325	701 9426	701 9527
601 7210									29/4						23/31			
601 7311	11/2								4/5						23/31			
601 7412	11/2								5/4						31/23			
601 7513	11/2								5/30						31/23			
701 8214	1/2								29/4						23/31			
701 8215	2/1								29/4						23/31			
701 8216	1/2								29/15						23/31			
701 8217	1/2								15/29						31/23			
701 8318	2/11														31/23			
701 8319	1/11								15/16						31/23			
701 8320	2/11								16/15						31/23			
701 8421	11/2								30/5						31/23			
701 8422	2/11								30/5						31/23			
701 8423	2/11								30/16						31/23			
701 9224	1/2								29/15									
701 9325	1/2								15/29						31/23			
701 9426	1/2								15/29						31/23			
701 9527	1/2								15/29						31/23			

NOTE: Numbers in each block show primary TGC and alternates in order of priority.

Figure 5-8. Network routing plan.

In any case, you must require technical control personnel to run local tests between switches. Although these test should be part of your SOP, you must specify the extent, duration, and report procedures for each operation.

5-7. Displacement

Unit movements.

No matter how stable a combat operation is, the communicator must always be prepared to move. Communications is always critical during a movement. The same is true during the early stages of setting up after a movement. But movement of all or part of a supported unit does not always mean that you must move everything. In a circuit switch planner's ideal situation, the units can move from one switching node to another. You would only have to worry about maintaining contact while the unit is mobile. If the planner is able to configure the network so that it lies along the axis or direction of movement, connection will be simplified. Units needing the area system for support will tie into the nearest node. Remember that these moving units may be part of the fixed directory system.

Nodal movements.

Changes in CE demands, such as shifts in unit concentrations, may require you to move a node. If you were able to keep enough equipment as spares or in reserve, you can use a phased displacement. This permits you to setup a switch and the other needed nodal equipment at the new location and then gradually phase down the old. Phasing may also mean simply turning power on at the new site and shutting it off at the old. But remember that a circuit switch does not operate by itself. You must plan for the use and the phasing of transmission equipment, multiplex equipment, and technical control. You must, in other words, plan for the total node.

If the switch movement is from one of the major headquarters, you may already have jump equip ment allocated. In most such cases, the new switch will move with the advance headquarters, It can also move ahead of it so that it will be partly operational when the headquarters arrives. Again, the other nodal equipment will move with the switch. Whether the movement involves anode or a headquarters support switch, you may have to reconfigure your network. If only a few nodes are moving, this task is fairly simple. It grows complex when there is constant network movement. However, both cases involve the same procedures. Below are the advanced planning tasks for moving a node:

- Estimate the need for using jump capability (if any). If you have another AN/TTC-39 available, you can position it to start up as soon as the old one shuts down. You may have to use a temporary manual switch or a smaller automatic switch to fill in while the AN/TTC-39 moves.
- Determine the subscribers at the new location and those to be discontinued at the old location. Some of the old subscribers will move also. Others may be served by another node. You may have to activate the EUB for those critical users at the old location who must continue to receive service.
- Use already reported metering data to estimate the amount of trunking needed for the new location. Review your assets to see if you have enough. Set priorities if necessary.
- Look at the network plan (Figure 5-6 is an example) to determine a location for the new node in the network. Revise the plan.
- Look at the routing (Figure 5-8 is an example) to see what changes are needed. Assign primary and alternate TGCs.
- Estimate the time needed to tear down, move, and set up the node. Also estimate the times needed to connect new subscribers.
- Engineer the transmission paths. Take into account terrain, security, frequency problems (EW and friendly), and logistics.

After you finish the advance planning, issue the CE order. The order will specify:

- Times required to tear down the node and to make it operational at the new location.
- Lists of subscribers and when to connect them.
- Changes to the data bases of each switch in the network. Each must adjust its data base to cover routing to the new location.
- New subscriber services, especially EUB and fixed directory lists.
- Instructions to technical controls about cutover and patching of circuits. Include orders to discontinue and reestablish circuits. Require reports on each.

- Unit responsibility for the node and the switch, for transmission control, and for MUX equip ment.

These procedures are similar to those for planning a new network (paragragh 5-6). This is because displacement procedures are really procedures for changing a part of your network.

Network movements.

In a fast-changing situation, you may need to move more than one node at a time. You may have a combination of nodes closing out, being jumped (putting replacement nodes in place before closing out the old one), and being established. But whether the situation is simple or complex, the basic things you must do are the same, Complexity means that a number of things are happening in a very short time. In such cases, you will in effect be planning your network over and over. The procedures set forth in paragraph 5-6 provide a basis for this.

Switch capabilities for displacement.

- Setup time for the AN/TTC-39 is 80 minutes with 6 fully trained personnel. This includes initialization. It does not include subscriber instrument installation.
- Teardown time is 60 minutes. Again, this does not include removal of subscriber instruments.
- Because the switch is truck-mounted, it can start moving as soon as it is powered down and the cables disconnected.
- The EUB and fixed directory procedures can assist in the displacement operations.

5-8. Reconfiguration and Restoral

Reconfiguration is a general term that describes changes made to a circuit switching network. Sometimes this term also describes a change to the physical arrangement of the switch. Chapter 2 uses the term configuration to show the number of matrices, cards, and other equipment for a particular switch model. Paragraph 5-6 uses the same term to describe the circuit switching network arrangement. In this paragraph, reconfiguration refers to network changes. Restoral refers to the efforts made to return communications service to the subscriber, to a node, or to the network in general.

Reconfiguration.

It is possible to reconfigure a network with no change in the service provided. For example, you can discontinue one node and serve its subscribers from another node. If the trunk switching remains adequate, the service will stay the same. Paragraph 5-7 showed how displacement can result in network reconfiguration. On the other hand, displacement might not affect the network at all, especially if you can use jump equipment, There are four reasons to reconfigure a circuit switching network:

- To meet a new mission.
- To increase the efficiency of the network.
- To conserve equipment.
- To adapt to transmission media.

When the mission changes, you must begin anew planning cycle to meet the new requirements. The transition from one configuration to the next is very critical. You will probably have to do it in a short time. In this case, you must plan for scaled-down communications while the equipment is in transit. Sometimes this will consist only of a mobile radio until the critical part of the system is in place. This critical part will generally be the backbone of the network from theater headquarters to the corps. Figure 5-5 is a sample backbone network. Such a network could be even more austere with even fewer nodes. If you are fortunate, you may have enough time to phase the transition. In this case, you can leave some circuit switching nodes in place until the supported units move or until other nodes must be in new locations.

It is always important to increase the efficiency of your circuit switching network. This is true even when there is constant movement of part or all of the communications units. Look for ways to save transmission capability or to identify and retire unneeded nodes. This will leave you better prepared for the next change or displacement. You should be doing a constant analysis of the network. (This is called configuration analysis.) Base this procedure on your information input. Your traffic analysis should also be continuous. It will tell you whether or not your preplanned trunking is adequate. Consult the metering information from each switch in the network. (See paragraph 3-13.) (Establish the reporting of this by SOP.) If the percentage of blocked calls on any trunk is higher than your planned GOS you must make adjustment. Examine also the precedence call figures to see if the subscriber services need adjusting. Bear in mind that if no blocking occurs you may have allocated too much trunking. Also stay alert to subscriber comments. Commanders at all echelons should have satisfactory service. Thus, your SOP should include a system to find out whether they are getting it.

Conserving equipment is essential if you are gathering your resources for a change of mission or a displacement. You can reconfigure by withdrawing equipment from service, by rerouting certain trunks, and if necessary, by providing reduced service to area subscribers. Part of your constant configuration analysis will focus on adapting to transmission media. This is a key factor in improving network efficiency. Different types of transmission equipment have differing capacities and you may at times have to change from one to another. Take for example a very extended network in which a node moves beyond the transmission equipment's line-of-sight. In this case you may have to install a troposcatter or a satellite system. If the use of the satellite system reduces the availability of trunks, you may have to reconfigure to provide more trunks from another node. You may even have to degrade the service. On the other hand, the use of the troposcatter system may add trunks. Again, you may want to reconfigure this time to take advantage of the added capacity. You could use these extra trunks to send traffic to a node connected to the remote one, which in turn might allow you to move or to eliminate a node. Remember that the AN/TTC-39 functions most often as a tandem switch. Any change of capability that changes the need for trunk switching is a valid reason for reconfiguration.

Restoral.

FM 24-22 sets up a way of assigning priority indicators to circuits and systems. There are five categories: 1,2,3,4, and O. The letters A through I show subpriorities. The combination of the two shows the times and the order in which restoral of a circuit or system should take place. For example, a 1 means restore service immediately; a 2 means restore in 10 minutes, 3A in 20 minutes, 3B in 1 hour, 3C in 6 hours, 4A in 24 hours, and 4B in 72 hours. A 00 means restore after all others. DOD Directive 4605.2 (CONFIDENTIAL) tells how to use this system. Designations used in tactical systems are 1A, 1C, 1D, 1E, 1F, 1G, 2C, 2D, 2H, 2I, 3A, 3B, 3C, 4A, 4B, and 00. As the planner you can extract the needed portions so that CSCEs will have this guidance. Use this method to assign a priority to each trunk and to each system. This will tell all controllers, operators, and planners which outages to work on first.

Bear in mind, however, that restoral of network means more than simply tying in and turning on equipment. Paragraph 5-6 showed how to plan the network so that a loss of one node would not isolate any portion of the network. This meant providing alternate routing to at least one other node. The combat situation may dictate that you plan for even more alternates so that multiple node failures will do the least harm. If a node is out temporarily, the network will route around it if trunks exist. If the node failure is permanent, you should change the data bases of all switches to show the new routing and then delete the switch. Failure to do this will lessen the network's efficiency because it will always be trying to transmit on a primary route that is not there. Thus, restoral can mean trying to replace the node, meanwhile depending on alternate routing. If you cannot do this, you will have to reconfigure the network. The procedure is the same even if several nodes are in trouble. If you have unused nodal assets, you can apply them according to the above priority system.

5-9. Interoperability

Tactical communications networks must be designed to exchange information and to interconnect, signal, and use the facilities of other networks. The AN/TTC-39 can fulfill this important interoperability requirement for all planned networks. Switch design factors that support this involve:

- The ability to handle various signaling schemes.
- The use of various analog and digital transmission formats.
- The ability to substitute for nontactical switches such as AUTOVON.
- The ability to act as a gateway switch to other systems.
- The use of interface units such as the NATO interface unit.
- The ability to connect to most types of commercial switches.
- The ability to handle multiple numbering schemes.
- Use of net radio interface unite to connect various types of radio users to switched subscribers.

Table 3-5 shows the AN/TTC-39 connections to the networks described below.

AUTOVON (Department of Defense communications system).

The AN/TTC-39 design conforms to the AUTOVON analog network. The AN/TTC-39 can connect to the AUTOVON network and acts as a PABX. It provides AUTOVON telephones with subscriber access. It can also substitute for an AUTOVON switch, This means that the switch design includes AUTOVON signaling, supervision, and trunking procedures. The AN/TTC-39 also recognizes the numbering system of the AUTOVON switch. It can use all AUTOVON preemptions and protocols.

NATO and other Allied communications systems.

The AN/TTC-39 connects to NATO networks through Telephone Signal Converters CV-3478/TTC-39(V). These are commonly known as NATO interface units (NIU). Each NIU can connect up to 8 NATO circuits in accordance with NATO Standardization Agreement (STANAG) 5040. AN/TTC-39 subscribers can call:

- NATO subscribers
- US elements under the command of a non-US NATO force
- NATO subscribers under the command of US tactical forces. Any allied system conforming to STANAG 5040 can communicate with the AN/TTC-39 system.

Commercial networks.

The AN/TTC-39 provides equipment, signaling, and supervision to connect to commercial 2-wire, 4-wire, and 8-wire trunks from commercial offices. All types of commercial telephone terminal sets can be connected to the switch.

Applicability.

The AN/TTC-39 is a universal switch in the tactical, strategic, and commercial world. It can carry information across network system boundaries. It handles a wide variety of signaling and numbering schemes. It can be used as a gateway switch and can substitute as a strategic switch, It uses the latest CCS format. It can operate with both present and future tactical modulation, multiplexing, and transmission equipment, and it includes built-in COMSEC capabilities.

APPENDIX A
Tables

This appendix contains seven tables that are referred to at some point in the text.

Table A-1. Terminal equipment types.

TYPE NUMBER	TYPE	EQUIPMENTS
	LOOPS	
1	TA-341 (AC)	TA-341/TTC (AC), TA-720/TTC, TA-838/TT (AC)
2	TA-341 (DC)	TA/341/TT (DC), TA-838/TT (DC)
3	KY-68 (Subscriber)	TSEC/KY-68 (Subscriber), TSEC/KY-90
4	Spare	
5	Overseas AUTOVON	AUTOVON Telephone (Overseas)
6	Remote AUTOVON	AUTOVON Telephone (Remote)
7	CB (DP)	TA-236/FT, WECO 500
8	CB (DTMF)	TA-838/TT (DTMF), TA-938/G, WECO 2500, TA-312 W/TA-955
9	TA-312 (CB)	TA-312/PT (CB)
10	Spare	
11	Spare	
12	20-Hz RD	TA-312/PT (RD)
13	TA-954 (DNVT)	TA-954/TT
14	Spare	
15-24	Spares	
	TRUNKS	
25	AN/TTC-38 (Confirmation)	AN/TTC-38 (Confirmation)
26	AN/TTC-38 (Tone Burst)	AN/TTC-38 (Tone Burst)
27	DIBTS Trunk	SB-3865
28	AN/TTC-39 (analog)	AN/TTC-39 (Analog)
29	AN/TTC-39 (Digital)	AN/TTC-39 (Digital), AN/TTC-42, AN/TYC-39
30	Converters	CV-1918/G, CV-1919/G, CV-2875/G, CV-2907/TT, SB-3082/GT (DTMF), C-6709/G
31	SB-3614 (3-digit PABX), SB-3865	SB-3614/T (3-digit PABX), SB-3865
32	AN/TTC-30	AN/TTC-30
33	AUTOVON INID PBX	AUTOVON PBX (INID)

Table A-1. Terminal equipment types. (continued)

TYPE NUMBER	TYPE	EQUIPMENTS
34	AUTOVON PNID PBX	AUTOVON PBX (PNID)
35	AUTOVON (MF - Confirmation)	AUTOVON SWITCH (Confirmation)
36	AUTOVON (MF - nonconfirmation)	AUTOVON SWITCH (Nonconfirmation)
37	Commercial Office Interface	WECO 400
38	AN/TTC-22 (SF)	AN/TTC-22 (SF)
39	NATO	CV-3478/TTC-39 (V)
40	CB, DP	AN/TTC-4, 5, 7 (DP), 10, 22 (DP) SB-3082/GT (CB), Commercial PBX (CB)
41	1600-Hz RD	
42	SB-3082 (1600-Hz RD)	SB-3082/GT (1600), HF Trunk
43	20-Hz RD	AN/TTC-7 (RD), SB-22/PT (RD), SB-86/P (RD), SB-3082/GT (20 Hz), SB-3614/T (RD)
44	Commercial Office (DC Closure)	Commercial (DC), SB-22/PT (DC), SB-86/P (DC), SB-3082/GT (DC)
45	Commercial Office (SF, DP)	Commercial Central Office (SF, DP)
46	Commercial Office E&M, MF, Wink Start)	Commercial Central Office E&M, MF, Wink Start)
47-81	Various AUTOVON PBX Trunks (See Table A-2)	AUTOVON PBXs
82	Commercial Office (E&M, DP, Wink Start)	Commercial Central Office (E&M, DP, Wink Start)
83	Commercial Office (E&M, DP, Timed Start)	Commercial Central (E&M, DP, Timed Start)
84-94	Spares	
95	Analog Conference Bridge, SDMX	
96	CSP, SDMX	
97	Spare	
98	IMU	
99	Echo Suppressor Controller	

Table A-1. Terminal equipment types. (continued)

TYPE NUMBER	EQUIPMENTS
	SIGNALING AND POOLED EQUIPMENT
100-109	Spares
110	DIBTS Buffer
111	DTMF Receiver on SDSG
112	MF Receiver
113	Digital Receiver
114	DTMF Receiver on TDSG
115	Auxiliary Sender/Receiver
116	DTMF/MF Sender
117	Digital Trunk Signaling Buffer
118	Digital Signaling Channel
119	Loop Group Signaling Channel
120	Analog Conference Bridge, TDMX
121	CSP, TDMX
122	Spare
123	LKG (KG-82)
124	Key Changer/Regenerator
125	TDMM
126	SDMX
127	DSG
128	NCMD
129	Control Shelter TTY Controller
130	Switching Shelter TTY Controller
131	VDU Controller
132	Magnetic Tape Unit Controller
133	Switching Controller Group A
134	Switching Controller Group B
135	COMSEC Controller A
136	COMSEC Controller B
137	Signaling Buffer Controller A

Table A-1. Terminal equipment types. (continued)

TYPE NUMBER	EQUIPMENTS
	OTHER EQUIPMENT
138	Signaling Buffer Controller B
139	PPI
140	DTG
141	Switch MUX/DEMUX
142	Loop MUX/DEMUX

Table A-2. AUTOVON PBX trunks terminal types.

INCOMING SIGNALING			OUTGOING SIGNALING	
TYPE NO	MODE	START SEND SIGNAL	MODE	START SEND SIGNAL
47	DP/DTMF	Wink Start	DP (PNID)	Timed Start
48	DP/DTMF	Wink Start	DP (PNID)	Wink Start
49	DP/DTMF	Wink Start	DP (INID)	Timed Start
50	DP/DTMF	Wink Start	DP (INID)	Wink Start
51	DP/DTMF	Wink Start	Local Terminating	
52	DP/DTMF	Wink Start	MF 2/6 Nonconfirmation (PNID)	Wink Start
53	DP/DTMF	Wink Start	MF 2/6 Nonconfirmation (PNID)	KP Tone
54	DP/DTMF	Dial Tone	DP (PNID)	Timed Start
55	DP/DTMF	Dial Tone	DP (PNID)	Wink Start
56	DP/DTMF	Dial Tone	DP (INID)	Timed Start
57	DP/DTMF	Dial Tone	DP (INID)	Wink Start
58	DP/DTMF	Dial Tone	Local Terminating	
59	DP/DTMF	Dial Tone	MF 2/6 Nonconfirmation (PNID)	Wink Start
60	DP/DTMF	Dial Tone	MF 2/6 Nonconfirmation (PNID)	KP Tone
61	MF 2/6 Nonconfirmation	Wink Start	DP (PNID)	Timed Start
62	MF 2/6 Nonconfirmation	Wink Start	DP (PNID)	Wink Start
63	MF 2/6 Nonconfirmation	Wink Start	DP (INID)	Timed Start
64	MF 2/6 Nonconfirmation	Wink Start	DP (INID)	Wink Start
65	MF 2/6 Nonconfirmation	Wink Start	Local Terminating	
66	MF 2/6 Nonconfirmation	Wink Start	MF 2/6 Nonconfirmation (PNID)	Wink Start
67	MF 2/6 Nonconfirmation	Wink Start	MF 2/6 Nonconfirmation (PNID)	KP Tone
68	MF 2/6 Nonconfirmation	Dial Tone	DP (PNID)	Timed Start
69	MF 2/6 Nonconfirmation	Dial Tone	DP (PNID)	Wink Start
70	MF 2/6 Nonconfirmation	Dial Tone	DP (INID)	Timed Start
71	MF 2/6 Nonconfirmation	Dial Tone	DP (INID)	Wink Start
72	MF 2/6 Nonconfirmation	Dial Tone	Local Terminating	
73	MF 2/6 Nonconfirmation	Dial Tone	MF 2/6 Nonconfirmation (PNID)	Wink Start
74	MF 2/6 Nonconfirmation	Dial Tone	MF 2/6 Nonconfirmation (PNID)	KP Tone
75	MF 2/6 Nonconfirmation	KP Tone	DP (PNID)	Timed Start
76	MF 2/6 Nonconfirmation	KP Tone	DP (PNID)	Wink Start
77	MF 2/6 Nonconfirmation	KP Tone	DP (INID)	Timed Start
78	MF 2/6 Nonconfirmation	KP Tone	DP (INID)	Wink Start
79	MF 2/6 Nonconfirmation	KP Tone	Local Terminating	
80	MF 2/6 Nonconfirmation	KP Tone	MF 2/6 Nonconfirmation (PNID)	Wink Start
81	MF 2/6 Nonconfirmation	KP Tone	MF 2/6 Nonconfirmation (PNID)	KP Tone

Table A-3. TDSG terminal allocations.

MATRIX ADDRESS		USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
01	00	LKG 25 Plain Text		
	01	26		
	02	27		
	03	28		
	04	29		
	05	30		
	06	31		
	07	32		
	08	Loop Subscriber		
	09			
	10	Analog or		
	11			
	12	Digital		
	13			
	14			
	15	Group Test Terminal	1	
	16	Group/Loop		
	17			
	18	Analog or		
	19			
	20	Digital		
	21			
	22			
	23			
	24		2	
	25			
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33	Group/Loop	3	
	34			
	35			
	36			
	37	Digital Only		
	38			
	39			
	40			
	41			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	42	Group/Loop	4	
	43			
	44			
	45	Digital Only		
	46			
	47			
	48			
	49			
	50			
	51		5	
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60		6	
	61			
	62			
	63	Scanner Test DR 7		
02	00	LKG 1 Plain Text		
	01	2		
	02	3		
	03	4		
	04	5		
	05	6		
	06	7		
	07	8		
	08	9		
	09	10		
	10	11		
	11	12		
	12	DSVT 1 Central Shelter		
	13	DSVT 2 Switch Shelter		
	14	Group/Loop	6	
	15			
	16	Digital Only		
	17			
	18			
	19			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS		USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
	20 21 22 23 24 25 26 27 28	Group Terminal Digital Only	7	
	29 30 31 32 33 34 35 36 37		8	
	38 39 40 41 42 43 44 45 46		9	
	47 48 49 50 51 52 53 54 55		10	
	56 57 58 59		11	

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	60			
	61			
	62			
	63	Scanner Test DR 8		
03	00	LKG 13 Plain Text		
	01	14		
	02	15		
	03	16		
	04	17		
	05	18		
	06	19		
	07	20		
	08	21		
	09	22		
	10	23		
	11	24		
	12	Spare (LDI 9)		
	13	Spare (LDI 9)		
	14	Group Terminal	11	
	15		11	
	16		12	
	17	Digital Only		
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25		13	
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33			
	34		14	
	35			
	36			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	37			
	38			
	39			
	40			
	41			
	42			
	43		15	
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51			
	52		16	
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60			
	61	COMSEC Operator		
	62	Scanner Test		
	63	Scanner Test DR 9		
04	00	LKG 57 Plain Text		
	01	58		
	02	59		
	03	60		
	04	61		
	05	62		
	06	63		
	07	64		
	08	Loop Subscriber		
	09			
	10	Analog or		
	11			
	12	Digital		
	13			
	14			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS		USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
	15	Group Test Terminal	1	
	16	Group/Loop		
	17			
	18	Analog or		
	19			
	20	Digital		
	21			
	22			
	23			
	24		2	
	25			
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33	Group/Loop	3	
	34			
	35	Digital Only		
	36			
	37			
	38			
	39			
	40			
	41			
	42		4	
	43			
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51		5	
	52			
	53			
	54			
	55			
	56			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	57			
	58			
	59			
	60		6	
	61			
	62			
	63	Scanner Test DR 11		
05	00	LKG 33 Plain Text		
	01	34		
	02	35		
	03	36		
	04	37		
	05	38		
	06	39		
	07	40		
	08	41		
	09	42		
	10	43		
	11	44		
	12	Spare (LDI 19)		
	13	Spare (LDI 20)		
	14	Group/Loop	6	
	15			
	16	Digital Only		
	17			
	18			
	19			
	20	Group Terminal	7	
	21			
	22	Digital Only		
	23			
	24			
	25			
	26			
	27			
	28			
	29		8	
	30			
	31			
	32			
	33			
	34			
	35			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS BS (DD)	MATRIX ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	36 37			
	38 39 40 41 42 43 44 45 46		9	
	47 48 49 50 51 52 53 54 55		10	
	56 57		11	
	58 59 60 61 62			
	63	Scanner Test DR 12		
06	00	LKG 45 Plain Text		
	01	46		
	02	47		
	03	48		
	04	49		
	05	50		
	06	51		
	07	52		
	08	53		
	09	54		
	10	55		
	11	56		
	12	Spare (LDI 19)		
	13	Spare (LDI 19)		

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	14	Group Terminal	11	
	15		11	
	16	Digital Only	12	
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25		13	
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33			
	34		14	
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42			
	43		15	
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51			
	52		16	
	53			
	54			
	55			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	56 57 58 59 60			
   07	61 62 63 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14	Spare (LDI 19) Scanner Test Scanner Test DR 13 Spare (LDI 22) Loop Subscriber Analog or Digital		
	15 16 17 18 19 20	Group Test Terminal Group/Loop Analog or Digital	1	
	21 22 23	Group/Loop Digital Only		
	24 25 26 27 28 29 30 31 32		2	

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	33		3	
	34			
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42		4	
	43			
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51		5	
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60		6	
	61			
	62			
	63	Scanner Test DR 15		
08	00	IMU 73		
	01	74		
	02	75		
	03	76		
	04	77		
	05	78		
	06	79		
	07	80		
	08	81		
	09	82		
	10	83		

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS BS (DD)	LA (EE)	USE	NCMD NO	REMARKS
	11	84		
	12	LDI 29		
	13	LDI 30		
	14	Group/Loop	6	
	15			
	16	Digital Only		
	17			
	18			
	19			
	20	Group Terminal	7	
	21			
	22	Digital Only		
	23			
	24			
	25			
	26			
	27			
	28			
	29		8	
	30			
	31			
	32			
	33			
	34			
	35			
	36			
	37			
	38		9	
	39			
	40			
	41			
	42			
	43			
	44			
	45			
	46		10	
	47			
	48			
	49			
	50			
	51			
	52			
	53			

Table A-3 TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	54			
	55			
	56		11	
	57			
	58			
	59			
	60			
	61			
	62			
	63	Scanner Test DR 16		
09	00	IMU 85		
	01	86		
	02	87		
	03	88		
	04	89		
	05	90		
	06	91		
	07	92		
	08	93		
	09	94		
	10	95		
	11	96		
	12	LDI 29		
	13	LDI 29		
	14	Group Terminal	11	
	15		11	
	16	Digital Only	12	
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25		13	
	26			
	27			
	28			
	29			
	30			
	31			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	32			
	33			
	34		14	
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42			
	43		15	
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51			
	52		16	
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60			
	61	Spare		
	62	Scanner Test		
	63	Scanner Test DR 17		
10	00	Spare (LDI 32)		
	01			
	02			
	03			
	04			
	05			
	06			
	07			
	08	Loop Subscriber		
	09	Digital Only		

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS		USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
	10			
	11			
	12			
	13			
	14			
	15	Group Test Terminal	1	
	16	Group/Loop		
	17			
	18	Digital Only		
	19			
	20			
	21			
	22			
	23			
	24		2	
	25			
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33		3	
	34			
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42		4	
	43			
	44			
	45			
	46			
	47			
	48			
	49			
	50			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS		USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
	51		5	
	52			
	53			
	54			
	55			
	56			
	57			
	58			
	59			
	60		6	
	61			
	62			
	63	Scanner Test DR 18		
11	00	Spare (LDI 31)		
	01			
	02			
	03			
	04			
	05			
	06			
	07			
	08			
	09			
	10			
	11			
	12	LDI 39		
	13	LDI 40		
	14	Group/Loop	6	
	15			
	16	Digital Only		
	17			
	18			
	19			
	20	Group Terminal	7	
	21			
	22	Digital Only		
	23			
	24			
	25			
	26			
	27			
	28			

Table A-3. TDSG terminal allocations. (continued)

MATRIX	ADDRESS	USE	NCMD NO	REMARKS
BS (DD)	LA (EE)			
	29		8	
	30			
	31			
	32			
	33	Group Terminal		
	34			
	35	Digital Only		
	36			
	37			
	38		9	
	39			
	40			
	41			
	42			
	43			
	44			
	45			
	46			
	47		10	
	48			
	49			
	50			
	51			
	52			
	53			
	54			
	55			
	56		11	
	57			
	58			
	59			
	60			
	61			
	62			
	63	Scanner Test DR 19		
12	00	Spare LDI 31		
	01			
	02			
	03			
	04	LDI 32		
	05			
	06			
	07			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS BS (DD)	MATRIX ADDRESS LA (EE)	USE	NCMD NO	REMARKS
12	08			
	09			
	10			
	11			
	12	LDI 39		
	13	LDI 39		
	14	Group Terminal	11	
	15		11	
	16	Digital Only	12	
	17			
	18			
	19			
	20	Group Terminal		
	21			
	22	Digital Only		
	23			
	24			
	25		13	
	26			
	27			
	28			
	29			
	30			
	31			
	32			
	33			
	34		14	
	35			
	36			
	37			
	38			
	39			
	40			
	41			
	42			
	43		15	
	44			
	45			
	46			
	47			
	48			

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	49 50 51			
	52 53 54 55 56 57 58 59 60		16	
13	61 62 63 00 01 02 03 04 05 06 07 08 09 10 11 12 13	Spare LDI 39 Scanner Test Scanner Test DR 20 TSB 1 Digital Only 2 Digital Only 3 Analog or Digital 4 5 6 7 Digital Only 8 9 10 11 12 13 14		
	14 15 16 17 18 19 20 21 22 23 24 25 26	LKG 1 Cipher Text 2 3 4 5 6 7 8 9 10 11 12 13		

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	27	14		
	28	15		
	29	16		
	30	17		
	31	18		
	32	19		
	33	20		
	34	21		
	35	22		
	36	23		
	37	24		
	38	25		
	39	26		
	40	27		
	41	28		
	42	29		
	43	30		
	44	31		
	45	32		
	46	Spare LDI 10		
	47			
	48			
	49			
	50	IMU 1		
	51	2		
	52	3		
	53	4		
	54	5		
	55	6		
	56	7		
	57	8		
	58	9		
	59	10		
	60	11		
	61	12		
	62	Spare Not Connected		
	63	Spare DR 10		
14	00	IMU 13		
	01	14		
	02	15		
	03	16		
	04	17		
	05	18		

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS BS (DD)	MATRIX ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	06	IMU 19		
	07	20		
	08	21		
	09	22		
	10	23		
	11	24		
	12	25		
	13	26		
	14	27		
	15	28		
	16	29		
	17	30		
	18	31		
	19	32		
	20	33		
	21	34		
	22	35		
	23	36		
	24	37		
	25	38		
	26	39		
	27	40		
	28	41		
	29	42		
	30	43		
	31	44		
	32	45		
	33	46		
	34	47		
	35	48		
	36	49		
	37	50		
	38	51		
	39	52		
	40	53		
	41	54		
	42	55		
	43	56		
	44	57		
	45	58		
	46	59		
	47	60		
	48	Spare Not Connected		
	49			
	50			

Table A-3. TDSG terminal allocations. (continued)

MATRIX ADDRESS BS (DD)	LA (EE)	USE	NCMD NO	REMARKS
	51			
	52	CSP - Signaling		
	53	CSP - Voice 1		
	54	CSP - Voice 2		
	55	Monitor and Test 1		
	56	Monitor and Test 2		
	57	Monitor and Test 3		
	58	Spare DR 1		
	59	DR 2		
	60	DR 3		
	61	DR 4		
	62	DR 5		
	63	DR 6		
15	00	TSB 15		
	01	16		
	02	17		
	03	18		
	04	19		
	05	20		
	06	21		
	07	22		
	08	23		
	09	24		
	10	25		
	11	26		
	12	27		
	13	28		
	14	LKG 33 Cipher Text		
	15	34		
	16	35		
	17	36		
	18	37		
	19	38		
	20	39		
	21	40		
	22	41		
	23	42		
	24	43		
	25	44		
	26	45		
	27	46		
	28	47		

Table A-3. TDSG terminal allocations. (continued)

MATRIX BS (DD)	ADDRESS LA (EE)	USE	NCMD NO	REMARKS
	29	48		
	30	49		
	31	50		
	32	51		
	33	52		
	34	53		
	35	54		
	36	55		
	37	56		
	38	57		
	39	58		
	40	59		
	41	60		
	42	61		
	43	62		
	44	63		
	45	64		
	46	Spare LDI 20		
	47			
	48			
	49			
	50	IMU 61		
	51	62		
	52	63		
	53	64		
	54	65		
	55	66		
	56	67		
	57	68		
	58	69		
	59	70		
	60	71		
	61	72		
	62	Not Connected		
	63	DR 14		

Table A-4. SDSG terminal allocations.

MATRIX ADDRESS		USE	REMARKS
SDMX (BB)	TERM (CC)		
01	01		
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10		
	11	Service Terminal	
	12	Service Terminal	
02	01		
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10		
	11	Service Terminal	
	12	Service Terminal	
03	01		
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10		
	11		
	12		

Table A-4. SDSG terminal allocations. (continued)

MATRIX SDMX (BB)	ADDRESS TERM (CC)	USE	REMARKS
04	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	
05	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	
06	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	

Table A-4. SDSG terminal allocations. (continued)

MATRIX SDMX (BB)	ADDRESS TERM (CC)	USE	REMARKS
07	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	
08	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	
09	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	

Table A-4. SDSG terminal allocations. (continued)

MATRIX SDMX (BB)	ADDRESS TERM (CC)	USE	REMARKS
10	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	
11	01 02 03 04 05 06 07 08 09		
	10 11	Service Terminal Service Terminal	
12	01 02 03 04 05 06 07 08 09		
	10 11 12	Service Terminal	

Table A-4. SDSG terminal allocations. (continued)

MATRIX SDMX (BB)	ADDRESS TERM (CC)	USE	REMARKS
13	01		
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10	Service Terminal	
	11		
	12		

Table A-5.Signaling and common equipment addresses.

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS		
			(V)1	(V)2,4	(V)3,5
CBU	1	1	1-02-12	1-02-12	1-02-12
		2	1-03-12	1-03-12	1-03-12
		3	1-04-12	1-04-12	1-04-12
		4	1-05-12	1-05-12	1-05-12
Type 95		5	1-06-12	1-06-12	1-06-12
	2	1	1-07-12	1-07-12	1-07-12
		2	1-08-12	1-08-12	1-08-12
		3	1-09-12	1-09-12	1-09-12
		4	1-10-12	1-10-12	1-10-12
		5	1-11-12	1-11-12	1-11-12
	3	1	2-04-10	2-04-10	2-04-10
		2	2-05-10	2-05-10	2-05-10
		3	2-06-10	2-06-10	2-06-10
		4	2-07-10	2-07-10	2-07-10
		5	2-08-10	2-08-10	2-08-10
	4	1	2-09-10	2-09-10	2-09-10
		2	2-10-10	2-10-10	2-10-10
		3	2-11-10	2-11-10	2-11-10
		4	2-12-10	2-12-10	2-12-10
		5	2-13-10	2-13-10	2-13-10
	5	1	(Note 5) 4-08-10	(Note 5) 3-02-11	(Note 1)
		2	4-07-10	3-01-11	
		3	4-06-10	3-13-10	
		4	4-05-10	3-12-10	
		5	4-04-10	3-11-10	
	6	1	3-08-10	3-10-10	
		2	3-07-10	3-09-10	
		3	3-06-10	1-01-11	
		4	3-05-10	1-13-10	
		5	(Note 5) 3-04-10	(Note 5) 1-12-10	(Note 1)
IMU	1	SDMX	1-03-11	1-03-11	1-03-11
		TDMX	13-50	13-50	13-50
Type 98	2	SDMX	1-04-11	1-04-11	1-04-11
		TDMX	13-51	13-51	13-51
	3	SDMX	1-05-11	1-05-11	1-05-11
		TDMX	13-52	13-52	13-52

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS		
			(V)1	(V)2,4	(V)3,5
	4	SDMX TDMX	1-06-11 13-53	1-06-11 13-53	1-06-11 13-53
	5	SDMX TDMX	1-07-11 13-54	1-07-11 13-54	1-07-11 13-54
	6	SDMX TDMX	1-08-11 13-55	1-08-11 13-55	1-08-11 13-55
	7	SDMX TDMX	1-09-11 13-56	1-09-11 13-56	1-09-11 13-56
	8	SDMX TDMX	1-10-11 13-57	1-10-11 13-57	1-10-11 13-57
	9	SDMX TDMX	1-11-11 13-58	1-11-11 13-58	1-11-11 13-58
	10	SDMX TDMX	1-12-11 13-59	1-12-11 13-59	1-12-11 13-59
	11	SDMX TDMX	1-13-11 13-60	1-13-11 13-60	1-13-11 13-60
	12	SDMX TDMX	1-01-12 13-61	1-01-12 13-61	1-01-12 13-61
	13	SDMX TDMX	2-03-11 14-00	2-03-11 14-00	2-03-11 14-00
	14	SDMX TDMX	2-04-11 14-01	2-04-11 14-01	2-04-11 14-01
	15	SDMX TDMX	2-05-11 14-02	2-05-11 14-02	2-05-11 14-02
	16	SDMX TDMX	2-06-11 14-03	2-06-11 14-03	2-06-11 14-03
	17	SDMX TDMX	2-07-11 14-04	2-07-11 14-04	2-07-11 14-04
	18	SDMX TDMX	2-08-11 14-05	2-08-11 14-05	2-08-11 14-05
	19	SDMX TDMX	2-09-11 14-06	2-09-11 14-06	2-09-11 14-06

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1	MATRIX ADDRESS (V)2,4	MATRIX ADDRESS (V)3,5
	20	SDMX TDMX	2-10-11 14-07	2-10-11 14-07	2-10-11 14-07
	21	SDMX TDMX	2-11-11 14-08	2-11-11 14-08	2-11-11 14-08
	22	SDMX TDMX	2-12-11 14-09	2-12-11 14-09	2-12-11 14-09
	23	SDMX TDMX	2-13-11 14-10	2-13-11 14-10	2-13-11 14-10
	24	SDMX TDMX	2-01-12 14-11	2-01-12 14-11	2-01-12 14-11
	25	SDMX TDMX	2-02-12 14-12	2-02-12 14-12	2-02-12 14-12
	26	SDMX TDMX	2-03-12 14-13	2-03-12 14-13	2-03-12 14-13
	27	SDMX TDMX	2-04-12 14-14	2-04-12 14-14	2-04-12 14-14
	28	SDMX TDMX	2-05-12 14-15	2-05-12 14-15	2-05-12 14-15
	29	SDMX TDMX	2-06-12 14-16	2-06-12 14-16	2-06-12 14-16
	30	SDMX TDMX	2-07-12 14-17	2-07-12 14-17	2-07-12 14-17
	31	SDMX TDMX	2-08-12 14-18	2-08-12 14-18	2-08-12 14-18
	32	SDMX TDMX	2-09-12 14-19	2-09-12 14-19	2-09-12 14-19
	33	SDMX TDMX	2-10-12 14-20	2-10-12 14-20	2-10-12 14-20
	34	SDMX TDMX	2-11-12 14-21	2-11-12 14-21	2-11-12 14-21
	35	SDMX TDMX	2-12-12 14-22	2-12-12 14-22	2-12-12 14-22

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS		
			(V)1	(V)2,4	(V)3,5
	36	SDMX TDMX	2-13-12 14-23	2-13-12 14-23	2-13-12 14-23
	37	SDMX TDMX	3-03-11 14-24	3-03-11 14-24	(Note 1
	38	SDMX TDMX	3-04-11 14-25	3-04-11 14-25	
	39	SDMX TDMX	3-05-11 14-26	3-05-11 14-26	
	40	SDMX TDMX	3-06-11 14-27	3-06-11 14-27	
	41	SDMX TDMX	3-07-11 14-28	3-07-11 14-28	
	42	SDMX TDMX	3-08-11 14-29	3-08-11 14-29	
	43	SDMX TDMX	3-09-11 14-30	3-09-11 14-30	
	44	SDMX TDMX	3-10-11 14-31	3-10-11 14-31	
	45	SDMX TDMX	3-11-11 14-32	3-11-11 14-32	
	46	SDMX TDMX	3-12-11 14-33	3-12-11 14-33	
	47	SDMX TDMX	3-13-11 14-34	3-13-11 14-34	
	48	SDMX TDMX	3-01-12 14-35	3-01-12 14-35	
	49	SDMX TDMX	4-03-11 14-36	3-02-11 14-36	
	50	SDMX TDMX	4-04-11 14-37	3-03-12 14-37	
	51	SDMX TDMX	4-05-11 14-38	3-04-12 14-38	(Note 1)

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS		
			(V)1	(V)2,4	(V)3,5
	52	SDMX	4-06-11	3-05-12	(Note 1)
		TDMX	14-39	14-39	
	53	SDMX	4-07-11	3-06-12	
		TDMX	14-40	14-40	
	54	SDMX	4-08-11	3-07-12	
		TDMX	14-41	14-41	
	55	SDMX	4-09-11	3-08-12	
		TDMX	14-42	14-42	
	56	SDMX	4-10-11	3-09-12	
		TDMX	14-43	14-43	
	57	SDMX	4-11-11	3-10-12	
		TDMX	14-44	14-44	
	58	SDMX	4-12-11	3-11-12	
		TDMX	14-45	14-45	
	59	SDMX	4-13-11	3-12-12	
		TDMX	14-46	14-46	
	60	SDMX	4-01-12	3-13-12	
		TDMX	14-47	14-47	(Note 1)
LKG	1	Cipher Text	13-14	(Note 2) 13-14	13-14
Type 123		Plain Text	02-00	02-00	02-00
	2	Cipher Text	13-15	13-15	13-15
		Plain Text	02-01	02-01	02-01
	3	Cipher Text	13-16	13-16	13-16
		Plain Text	02-02	(Note 2) 02-02	02-02

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1	MATRIX ADDRESS (V)2,4	MATRIX ADDRESS (V)3,5
	4	Cipher Text	13-17	(Note 2) 13-17	13-17
		Plain Text	02-03	02-03	02-03
	5	Cipher Text	13-18	13-18	13-18
		Plain Text	02-04	02-04	02-04
	6	Cipher Text	13-19	13-19	13-19
		Plain Text	02-05	02-05	02-05
	7	Cipher Text	13-20	13-20	13-20
		Plain Text	02-06	02-06	02-06
	8	Cipher Text	13-21	13-21	13-21
		Plain Text	02-07	02-07	02-07
	9	Cipher Text	13-22	13-22	13-22
		Plain Text	02-08	02-08	02-08
	10	Cipher Text	13-23	13-23	13-23
		Plain Text	02-09	02-09	02-09
	11	Cipher Text	13-24	13-24	13-24
		Plain Text	02-10	(Note 2) 02-10	02-10

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		MATRIX ADDRESS (V)2,4		MATRIX ADDRESS (V)3,5	
	12	Cipher Text		13-25	(Note 2)	13-25		13-25
		Plain Text		02-11		02-11		02-11
	13	Cipher Text		13-26		13-26		13-26
		Plain Text		03-00		03-00		03-00
	14	Cipher Text		13-27		13-27		13-27
		Plain Text		03-01		03-01		03-01
	15	Cipher Text		13-28		13-28		13-28
		Plain Text		03-02		03-02		03-02
	16	Cipher Text		13-29		13-29		13-29
		Plain Text		03-03	(Note 2)	03-03		03-03
	17	Cipher Text	(Note 2)	13-30		13-30	(Note 2)	13-30
		Plain Text		03-04		03-04		03-04
	18	Cipher Text		13-31		13-31		13-31
		Plain Text		03-05		03-05		03-05
	19	Cipher Text		13-32		13-32		13-32
		Plain Text	(Note 2)	03-06		03-06	(Note 2)	03-06

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		MATRIX ADDRESS (V)2,4		MATRIX ADDRESS (V)3,5	
	20	Cipher Text	(Note 2)	13-33		13-33	(Note 2)	13-33
		Plain Text		03-07		03-07		03-07
	21	Cipher Text		13-34		13-34		13-34
		Plain Text		03-08		03-08		03-08
	22	Cipher Text		13-35		13-35		13-35
		Plain Text		03-09		03-09		03-09
	23	Cipher Text		13-36		13-36		13-36
		Plain Text		03-10		03-10		03-10
	24	Cipher Text		13-37	(Note 2)	13-37		13-37
		Plain Text		03-11		03-11		03-11
	25	Cipher Text		13-38		13-38		13-38
		Plain Text		01-00		01-00		01-00
	26	Cipher Text		13-39		13-39		13-39
		Plain Text		01-01		01-01		01-01
	27	Cipher Text		13-40		13-40		13-40
		Plain Text	(Note 2)	01-02	(Note 2)	01-02	(Note 2)	01-02

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS					
			(V)1		(V)2,4		(V)3,5	
	28	Cipher Text	(Note 2)	13-41	(Note 2)	13-41	(Note 2)	13-41
		Plain Text		01-03		01-03		01-03
	29	Cipher Text		13-42		13-42		13-42
		Plain Text		01-04		01-04		01-04
	30	Cipher Text		13-43		13-43		13-43
		Plain Text		01-05		01-05		01-05
	31	Cipher Text		13-44		13-44		13-44
		Plain Text		01-06		01-06		01-06
	32	Cipher Text		13-45		13-45		13-45
		Plain Text	(Note 2)	01-07		01-07	(Note 2)	01-07
	33	Cipher Text	(Note 8)	15-14		15-14	(Note 8)	15-14
		Plain Text		05-00		05-00		05-00
	34	Cipher Text		15-15		15-15		15-15
		Plain Text		05-01		05-01		05-01
	35	Cipher Text		15-16		15-16		15-16
		Plain Text	(Note 8)	05-02	(Note 2)	05-02	(Note 8)	05-02

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		(V)2,4		(V)3,5	
	36	Cipher Text	(Note 8)	15-17	(Note 2)	15-17	(Note 8)	15-17
		Plain Text		05-03		05-03		05-03
	37	Cipher Text		15-18		15-18		15-18
		Plain Text		05-04		05-04		05-04
	38	Cipher Text		15-19		15-19		15-19
		Plain Text		05-05		05-05		05-05
	39	Cipher Text		15-20		15-20		15-20
		Plain Text		05-06		05-06		05-06
	40	Cipher Text		15-21		15-21		15-21
		Plain Text		05-07	(Note 2)	05-07		05-07
	41	Cipher Text		15-22		15-22		15-22
		Plain Text		05-08		05-08		05-08
	42	Cipher Text		15-23		15-23		15-23
		Plain Text		05-09		05-09		05-09
	43	Cipher Text		15-24		15-24		15-24
		Plain Text	(Note 8)	05-10		05-10	(Note 8)	05-10

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		MATRIX ADDRESS (V)2,4		MATRIX ADDRESS (V)3,5	
	44	Cipher Text	(Note 8)	15-25		15-25	(Note 8)	15-25
		Plain Text		05-11		05-11		05-11
	45	Cipher Text		15-26		15-26		15-26
		Plain Text		06-00		06-00		06-00
	46	Cipher Text		15-27		15-27		15-27
		Plain Text		06-01		06-01		06-01
	47	Cipher Text		15-28		15-28		15-28
		Plain Text		06-02		06-02		06-02
	48	Cipher Text		15-29		15-29		15-29
		Plain Text		06-03		06-03		06-03
	49	Cipher Text		15-30	(Note 2)	15-30		15-30
		Plain Text		06-04		06-04		06-04
	50	Cipher Text		15-31		15-31		15-31
		Plain Text		06-05		06-05		06-05
	51	Cipher Text		15-32		15-32		15-32
		Plain Text	(Note 8)	06-06	(Note 2)	06-06	(Note 8)	06-06

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		(V)2,4		(V)3,5	
	52	Cipher Text	(Note 8)	15-33	(Note 2)	15-33	(Note 8)	15-33
		Plain Text		06-07		06-07		06-07
	53	Cipher Text		15-34		15-34		15-34
		Plain Text		06-08		06-08		06-08
	54	Cipher Text		15-35		15-35		15-35
		Plain Text		06-09		06-09		06-09
	55	Cipher Text		15-36		15-36		15-36
		Plain Text		06-10		06-10		06-10
	56	Cipher Text		15-37		15-37		15-37
		Plain Text		06-11		06-11		06-11
	57	Cipher Text		15-38		15-38		15-38
		Plain Text		04-00		04-00		04-00
	58	Cipher Text		15-39		15-39		15-39
		Plain Text		04-01		04-01		04-01
	59	Cipher Text		15-40		15-40		15-40
		Plain Text	(Note 8)	04-02	(Note 2)	04-02	(Note 8)	04-02

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		(V)2,4		(V)3,5	
	60	Cipher Text	(Note 8)	15-41	(Note 2)	15-41	(Note 8)	15-41
		Plain Text		04-03		04-03		04-03
	61	Cipher Text		15-42		15-42		15-42
		Plain Text		04-04		04-04		04-04
	62	Cipher Text		15-43		15-43		15-43
		Plain Text		04-05		04-05		04-05
	63	Cipher Text		15-44		15-44		15-44
		Plain Text		04-06		04-06		04-06
	64	Cipher Text		15-45		15-45		15-45
		Plain Text	(Note 8)	04-07	(Note 2)	04-07	(Note 8)	04-07
DTMF/MF	1			1-12-12		1-12-12		1-12-12
Receiver	2			2-01-11		2-01-11		2-01-12
	3		(Note 5)	1-06-10	(Note 5)	3-04-10	(Note 5)	1-06-10
Type:	4			3-09-10		1-06-10		(Note 3)
	5			(Note 3)		(Note 3)		
DTMF 111	6							
MF 112	7			(Note 3)		(Note 3)		(Note 3)
	8		(Note 5)	RMU 1	(Note 5)	RMU 1	(Note 5)	RMU 1
	9			1-13-12		1-13-12		1-13-12
	10			2-02-11		2-02-11		2-02-11
	11		(Note 5)	3-10-10	(Note 5)	3-05-10	(Note 5)	1-07-10
	12			3-11-10		3-06-10		(Note 3)
	13			4-09-10		(Note 3)		
	14			(Note 3)		(Note 3)		(Note 3)
	15			RMU 2		RMU 2		RMU 2
	16		(Note 5)	RMU 3	(Note 5)	RMU 3	(Note 5)	RMU 3

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS					
			(V)1		(V)2,4		(V)3,5	
	17		(Note 5)	1-07-10	(Note 5)	1-07-10	(Note 5)	1-08-10
	18			3-12-10		1-08-10		1-09-10
	19			4-10-10		3-07-10		1-10-10
	20			4-11-10		3-08-10		(Note 3)
	21			(Note 3)		(Note 3)		
	22			(Note 3)		(Note 3)		(Note 3)
	23			RMU 4		RMU 4		RMU 4
	24			RMU 5		RMU 5		RMU 5
	25			1-08-10		1-09-10		1-11-10
	26			1-09-10		1-10-10		1-12-10
	27			1-10-10		1-11-10		1-13-10
	28			(Note 3)		(Note 3)		(Note 3)
	29							
	30							
	31							
	32		(Note 5)	(Note 3)	(Note 5)	(Note 3)	(Note 5)	(Note 3)
DTMF/MF Sender	1			1-12-12		1-12-12		1-12-12
	2			1-13-12		1-13-12		1-13-12
	3			2-01-11		2-01-11		2-01-11
Type 116	4			2-02-11		2-02-11		2-02-11
	5		(Note 5)	1-06-10	(Note 5)	1-06-10	(Note 5)	1-06-10
	6			1-07-10		1-07-10		1-07-10
	7			1-08-10		1-08-10		1-08-10
	8			3-09-10		1-09-10		1-09-10
	9			3-10-10		1-10-10		1-10-10
	10			3-11-10		1-11-10		1-11-10
	11			3-12-10		3-04-10		1-12-10
	12			4-09-10		3-05-10		(Note 3)
	13			4-10-10		3-06-10		
	14			4-11-10		3-07-10		
	15			4-12-10		3-08-10		
	16		(Note 5)	1-12-10	(Note 5)	(Note 3)	(Note 5)	(Note 3)
Sender/Receiver Receiver Type 115	1		(Note 5)	1-11-10	(Note 5)	1-02-11	(Note 5)	1-01-11
Digital Receiver Type 113	1			14-58		14-58		14-58
	2			14-59		14-59		14-59
	3			14-60		14-60		14-60
	4			14-61		14-61		14-61
	5			14-62		14-62		14-62
	6			14-63		14-63		14-63
	7			01-63		01-63		01-63
	8			02-63		02-63		02-63
	9			03-63		03-63		03-63

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1	MATRIX ADDRESS (V)2,4	MATRIX ADDRESS (V)3,5
	10		13-63	13-63	13-63
	11		04-63	04-63	04-63
	12		05-63	05-63	05-63
	13		(Note 6) 06-63	06-63	(Note 6) 06-63
	14		15-63	15-63	15-63
	15		7-63	7-63	7-63
	16		8-63	(Note 6) 8-63	8-63
	17		9-63	9-63	9-63
	18		10-63	10-63	10-63
	19		11-63	11-63	11-63
	20		(Note 6) 12-63	(Note 6) 12-63	(Note 6) 12-63
TSB	1		13-00	13-00	13-00
	2		13-01	13-01	13-01
	3		(Note 4) 13-02	(Note 4) 13-02	(Note 4) 13-02
	4		13-03	13-03	13-03
Type:	5		13-04	13-04	13-04
DIBITS 110	6		(Note 4) 13-05	(Note 4) 13-05	(Note 4) 13-05
	7		13-06	13-06	13-06
Digital 117	8		13-07	13-07	13-07
	9		13-08	13-08	13-08
	10		13-09	13-09	13-09
	11		13-10	13-10	13-10
	12		13-11	13-11	13-11
	13		13-12	13-12	13-12
	14		13-13	13-13	13-13
	15		(Note 2) 15-00	(Note 2) 15-00	(Note 2) 15-00
	16		15-01	15-01	15-01
	17		15-02	15-02	15-02
	18		15-03	15-03	15-03
	19		15-04	15-04	15-04
	20		15-05	15-05	15-05
	21		15-06	15-06	15-06
	22		15-07	15-07	15-07
	23		15-08	15-08	15-08
	24		15-09	15-09	15-09
	25		15-10	15-10	15-10
	26		15-11	(Note 2) 15-11	15-11
	27		15-12	15-12	15-12
	28		(Note 2) 15-13	15-13	(Note 2) 15-13
DSVT (control shelter) Type 3	1		02-12	02-12	02-12

Table A-5. Signaling and common equipment addresses. (continued)

FUNCTION	UNIT NO	PORT	MATRIX ADDRESS (V)1		MATRIX ADDRESS (V)2,4		MATRIX ADDRESS (V)3,5	
DSVT (switching shelter Type 3	2			02-13		02-13		(Note 1)
Local CSP Type:	Signal Port			14-52		14-52		14-52
TDMX 121 SDMX 96	Port 1	SDMX	(Note 5)	1-04-10	(Note 5)	1-04-10	(Note 5)	1-04-10
		TDMX		14-53		14-53		14-53
	Port 2	SDMX		1-05-10		1-05-10		1-05-10
		TDMX	(Note 5)	14-54	(Note 5)	14-54	(Note 5)	14-54
RMU	1-8		(Note 7)	20-01	(Note 7)	20-01	(Note 7)	20-01
	2-15			20-02		20-02		20-02
	3-16			20-03		20-03		20-03
	4-23			20-04		20-04		20-04
	5-24		(Note 7)	20-05	(Note 7)	20-05	(Note 7)	20-05

NOTES:

1. Not supplied in (V)3 configuration.
2. Not entered in data base when delivered.
3. Not patched when delivered. Must be patched at common equipment distribution frame to implement function.
4. Assigned as analog trunk signaling buffer in data base.
5. Patched on common equipment distribution frame.
6. Equipment not supplied as part of configuration.
7. Internal address. Not related to TDSG address.
8. Not supplied in (V)1 or (V)3 configuration.

Table A-6. Load control relationships.

TRAFFIC LOAD CONTROL LEVEL	SUBSCRIBER CLASSMARK 1	2	3	4	5
2	No Restriction	No Restriction	No Trunk Calls Permitted; Local Calls Only	No Trunk Calls Permitted (Note 1)	No Trunk Calls Permitted (Note 1)
3	No Restriction	No Trunk Calls Permitted; Local Calls Only (Note 1)	No Trunk Calls Permitted; Local Calls Only	No Trunk Calls Permitted (Note 1)	No Trunk Calls Permitted (Note 1)
4	No Restriction	No Restriction	No Restriction	No Restriction	No Calls Permitted (Note 2)
5	No Restriction	No Restriction	No Restriction	No Calls Permitted (Note 2)	No Calls Permitted (Note 2)

NOTES:

1. A subscriber or PBX trunk attempting a trunk call is returning trunk busy tone; the call will not be completed.
2. A subscriber or PBX trunk attempting a call is not returning dial tone, or any other start dialing indication.

Table A-7 NCMD addresses.

NCMD NO	ASSOCIATED ADDRESS	CARD LOCATION
1	01-15 to 01-23	A434
2	01-24 to 01-32	A435
3	01-33 to 01-41	A436
4	01-42 to 01-50	A437
5	01-51 to 01-59	A438
6 (Note 1)	01-60 to 02-19	A439
7	02-20 to 02-28	A440
8	02-29 to 02-37	A441
9	02-38 to 02-46	A534
10	02-47 to 02-55	A535
11	02-56 to 03-15	A536
12 (Note 2)	03-16 to 03-24	A537
13	03-25 to 03-33	A538
14	03-34 to 03-42	A539
15	03-43 to 03-51	A540
16	03-52 to 03-60	A541

NOTES:

1. Excluded terminals: 01-63, 02-00 to 02-13.
2. Excluded terminals: 02-63, 03-00 to 03-13.

APPENDIX B

Planning Example

B-1. Example Network

This appendix consists of a network plan (Figure B-l), a communications configuration diagram (Figure B-2), and completed worksheets for a single area node number 10 in an example network. The example network shown in this appendix is designed to illustrate the features of a tactical switched network using the Circuit Switch AN/TTC-39 as its basis. Planning and data entry worksheets are critical to the planning functions described in this manual and are used hereto show the process of planning and developing a network.

B-2. Scenario

The network for which the planning is done is that for a theater of operations in which the Army is the predominant service. However, other services and NATO allies are represented. There are three corps headquarters which make up the tactical Army

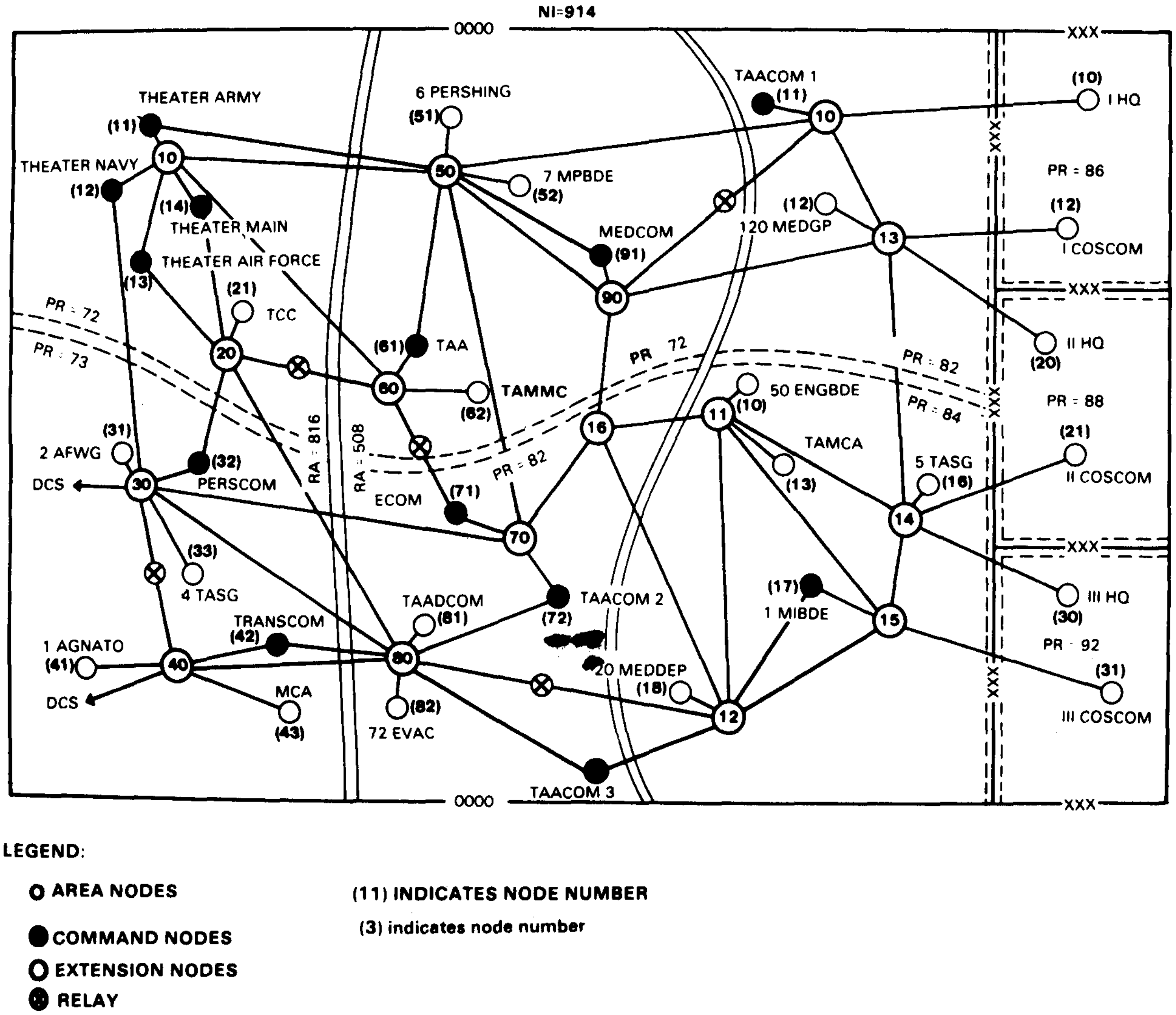


Figure B-1. Network numbering plan.

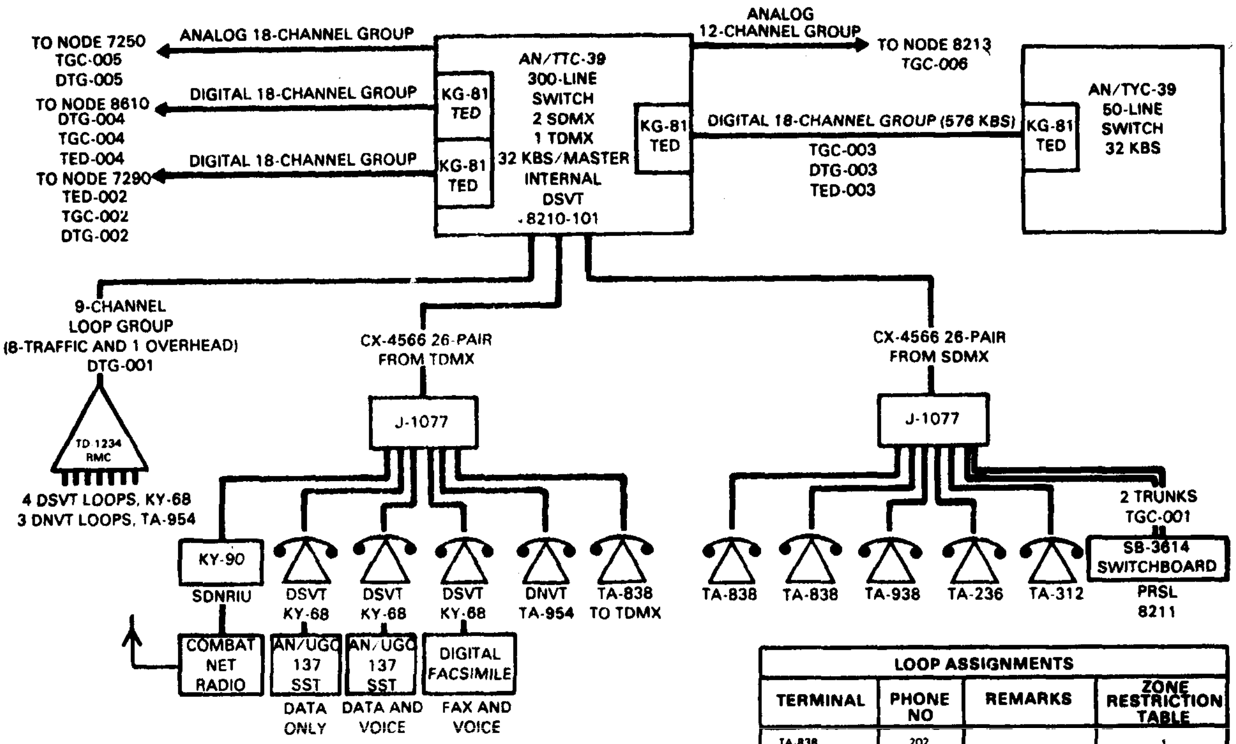
forces. The network consists of a number of area nodes, command nodes, and extension nodes with extension accesses to various types of headquarters. Each area node and command node uses the AN/TTC-39 circuit switch and certain nodes also have the AN/TYC-39 message switch.

B-3. Illustrations

Figure B-1 illustrates this network. Circuit switch 8210 located at node 10 is the switch for which the worksheets are filled out. Figure B-2 illustrates the technical connections at node 10 for this switch. This arrangement may be typical but it is not necessarily the only arrangement possible for the equipment used. Use Figure B-2 when referring to the worksheet entries.

B-4. Planning Worksheets

Figures B-3 to B-6 are the planning worksheets for this switch. Worksheet P-5 is not used here because it would contain details of the card population of a specific piece of equipment. The strapping worksheets are also not used here because the information on them results from decisions reflected on the planning and data entry worksheets,



LOOP ASSIGNMENTS			
TERMINAL	PHONE NO	REMARKS	ZONE RESTRICTION TABLE
TA-838	202		1
TA-838	311		1
TA-938	452		1
TA-236	411		1
TA 312	316		1
KY 90	605	DATA AND VOICE	2
KY 68	606	FAX AND VOICE	2
KY-68	605	VOICE	2
KY-68	301	DATA AND VOICE	2
KY 68	306	DATA ONLY	2
KY 68	201	VOICE	1
KY 68	206	VOICE	2
KY 68	266	VOICE	2
TA-954	401	GROUP	1
TA 954	607	LOOP	1
TA 954	611	GROUP	1
TA-954	519	GROUP	2
MESSAGE SWITCH	525		2
TA 838	391	ON TDMX	

NODE 10 DATA	
NATO HOME AREA	914
AREA CODE	214
PRSL	8210
GATEWAY	NO
SATELLITE LINKS	NO
NUMBERING PLAN	4 3
SPILL FORWARD	NO

AN/TTC-39 COMMON EQUIPMENT ASSIGNED		
TYPE	TERMINAL TYPE	NUMBER ASSIGNED
CBU	96	4
LKG	123	32
CSP TDMX	121	1
IMU	98	36
DTMF RECEIVER SENDER	111 116	9 9
MF RECEIVER SENDER	112 116	3 2
DIG RECEIVER	113	10
AUXILIARY SENDER RECEIVER	115	2
DTMF RECEIVER (RMU)	114	5
LOOP GROUP SIG CHAN (RMC)	119	1

Figure B-2. Example node configuration.

and also because they contain information for a specific piece of equipment. However, keep in mind that it would be necessary to use all the worksheets for an actual operation. Chapter 5 gives information about where these worksheets are filled out.

B-5. Data Worksheets

Figures B-7 through B-39 are the data entry and reporting worksheets. In some cases these worksheets are annotated to explain how they are being used or where it is necessary to explain the meaning of the entry or the column heading.

B-6. COMSEC Worksheets

Figures B-40 through B-41 are the COMSEC worksheets which are the basis for some of the data entries. These worksheets are not classified here because the information is not based on an actual situation. However, these worksheets would normally be classified because of COMSEC information. You may also find that all communications network information, such as these worksheets, must be classified in an actual situation because of the order of battle and operational information that they contain. This is usually determined in the operations order. (The tables in Appendix A are needed to develop the data in the worksheets described in this appendix.)

COMMAND: TAACOM I	NETWORK PLANNING AND CONFIGURATION DATA - SUBSCRIBER LIST			WORKSHEET NO. P-1
SWITCH NO. 8210	PREPARED BY SGT NETWORK	CHECKED BY SFC SMAT NCOIC	APPROVED BY	WORKSHEET 1 OF 1
REV NO. / DATE 30 MAR 87	REFERENCE WORKSHEETS			PAGE 1 OF 4

SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	EQUIPMENT	LINE HUNTING	DAS NO. CALLED	LOAD CON	SEC CALL	PREC	DATA USE (DVM)	HDX	MS COMPAT	FAX USE	CONF PROG PREPROG	CALL TRANSFER	COMPRESSED DIAL	ZONE RESTR	COMMERCIAL NET	EUB	FIXED DIRECTORY	CIRCUIT NO.
	202	TA 838	N	—	4	N	R	—	—	—	—	N	Y	N	1	N	N	N	
	311	TA 838	↑	—	4	N	R	—	—	—	—	N	N	N	1	N	N	N	
	452	TA 938		—	5	N	R	—	—	—	—	N	Y	N	1	N	N	N	
	411	TA 236		—	4	N	R	—	—	—	—	N	N	N	2	N	N	N	
	316	TA 312		—	5	N	R	—	—	—	—	N	N	N	2	N	N	N	
	391	TA 888		—	3	N	I	—	—	—	—	N	N	N	Ø	N	N	N	
	606	KY 68		—	1	E	F	M	N	N	Y	N	N	I	1	N	Y	N	
	301	KY 68		—	1	E	I	D	N	Y	N	N	N	C	1	N	N	N	
	306	KY 68		—	1	E	I	D	N	Y	N	N	N	C	1	N	N	N	
	505	KY 68		—	1	P	I	M	Y	Y	N	N	N	N	Ø	N	N	N	
	607	TA 954		—	3	N	P	—	—	—	—	N	N	N	Ø	N	N	N	
	101	KY 68		—	1	P	F	V	N	N	N	Y	Y	N	Ø	Y	Y	N	
	605	KY 68		—	3	P	I	V	N	N	N	N	N	N	1	N	N	Y	
	201	KY 68		—	3	P	I	V	N	N	N	N	N	N	1	N	N	N	
	206	KY 68		—	3	P	P	V	N	N	N	N	N	N	1	N	N	N	
	266	KY 68		—	3	P	P	V	N	N	N	N	N	N	1	N	N	N	
	401	TA 954	↓	—	4	N	P	—	—	—	—	N	N	N	2	N	N	N	
	611	TA 954	N	—	4	N	P	—	—	—	—	N	N	N	2	N	N	N	

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Figure B-3. Completed subscriber list.

COMMAND: TAACOM 1	NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER LIST			WORKSHEET NO.: P-2
SWITCH NO.: 8210	PREPARED BY: Sgt Network	CHECKED BY: SFC SMART NCOIC	APPROVED BY	WORKSHEET 1 OF 1
REV NO. / DATE: 30 MAR 82	REFERENCE WORKSHEETS			PAGE ___ OF ___

TGC NUMBER	DTG NUMBER	CHANNELS TRAFFIC	CHANNELS SIG	DESTINATION NYX-NNX(X)	DEST EQUIP-MENT	XMSN EQUIP-MENT	TRAFFIC LIMITS F	TRAFFIC LIMITS I	TRAFFIC LIMITS P	TRAFFIC LIMITS R	GLARE	SPILL FORWARD	ACCESS TGC	CIRCUIT NUMBERS
001	—	2	—	214-8211	SB 3614		—	—	1	1	—	Y	Y	
002	2	17	1	508-7290	TTC-39		—	—	—	—	A	Y	N	
003	3	17	1	214-8210 (MS)	TYC-39		—	—	—	—	A	Y	N	
004	4	17	1	214-8610	TTC-39		—	—	—	—	R	N	N	
005	—	17	1	508-7250	TTC-39		—	—	—	—	A	Y	N	
006	—	17	1	214-8213	TTC-39		—	—	—	—	R	N	N	

DD Form 2490-2, FEB 87

Figure B-4. Completed trunk group cluster list.

COMMAND: TAACOM	NETWORK PLANNING AND CONFIGURATION DATA - LOOP TERMINATIONS			WORKSHEET NO. P-3
SWITCH NO. 8210	PREPARED BY: Sgt Network	CHECKED BY: SFC Smart NCOIC	APPROVED BY	WORKSHEET 1 OF 1
REV NO. / DATE: 30 MAR 87	REFERENCE WORKSHEETS			PAGE 3 OF 4

SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	TERM EQUIP-MENT	TERM TYPE	TECHNICAL CHARACTERISTICS: 2W/4W	BATTERY	SIGNALING	SUPVN	SWITCH CONFIGURATION: SDSG/TDSG NO.	CABLE CONN	CABLE PAIR	MODEM/LTU: TYPE	NO.	CARD SLOT	ADDRESS	ADAPTER: TYPE	NUMBER	CARD SLOT
	202	TA 838	2	4W	CB	DTMF	DC	S1	J2	1-2	NWB	1	A 103	1-13-01			
	311	TA 838	2	4W	CB	DTMF	DC	S1	J2	3-4	NWB	1	A 103	1-01-02			
	452	TA 938	8	2W	CB	DC/20 Hz	DC	S1	J2	5-6	CB	1	A 203	1-02-02			
	411	TA 236	7	2W	CB	DC/20 Hz	DC	S1	J2	7-8	CB	1	A 203	1-03-02			
	316	TA 312	12	2W	RD	20 Hz RD	20Hz	S1	J2	9-10	20Hz	1	A 303	1-04-02			
	391	TA 838	1	4W	CB	DTMF	DC	T1	J4	1-2	CSVD	1	A 202	0108			
	606	KY 68	3	4W	CB	Digital	AC	T1	J4	5-6	Dilpa	1	A 204	01-10			
	301	KY 68	3	4W	CB	Digital	AC	T1	J4	7-8	Dilpa	1	A 204	01-11			
	306	KY 68	3	4W	CB	Digital	AC	T1	J4	9-10	Dilpa	2	A 206	01-12			
	505	KY 90	3	4W	CB	Digital	AC	T1	J4	11-12	Dilpa	2	A 206	01-13			
	607	TA 954	13	4W	CB	Digital	AC	T1	J4	13-14	Dilpa	3	A 208	01-14			
	101	KY 68	3	4W	CB	Digital	AC	T1	J4	15-16	Dilpa	3	A 208	01-15			

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Figure B-5. Completed loop terminations worksheet.

COMMAND: TAACOM	NETWORK PLANNING AND CONFIGURATION DATA - TRUNK TERMINATIONS			WORKSHEET NO. P-4
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ___ OF ___
REV NO. / DATE 30MAR87	REFERENCE WORKSHEETS			PAGE ___ OF ___

TGC NO	DTG NO	TRUNK NO	DEST EQUIP	TERMINAL TYPE	TED NO	OPERATIONAL TECHNICAL CHARACTERISTICS: TGC TYPE	TRUNK RATE	NO OF CHANNELS	SIG-NALING	CABLE LENGTH	SWITCH CONFIGURATION: SDSG TDSG NO	CABLE CONN	CABLE PAIR	MODEM LTU: TYPE	MODEM LTU: NO	MODEM LTU: CARD SLOT	NCMD NO (S)	ADDRESS	TSB NO	ADAPTER: TYPE	ADAPTER: NO	ADAPTER: CARD SLOT
001	—	1-2	SB 3614	31	—	P	—	—	DTMF	1/2 Mi	SI	J2	13 16	NWB	2	A 104	—	—	—	—	—	—
002	2	1-17	TTC-39	29	2	I	576	18	CCIS	1 mi	TI	A2	—	Diphase	2	A 104	8-9	02-29 02-46	1	—	—	—
003	3	1-17	TTC-39	29	3	I	576	18	CCIS	1/4 mi	TI	A3	—	Diphase	3	A 411	10-11	02-47 03-15	2	—	—	—
004	4	1-17	TTC-39	29	4	I	576	18	CCIS	1 mi	TI	A4	—	Diphase	4	A 415	12-13	03-16 03-33	7	—	—	—
005	—	1-11	TTC-39	28	—	I	—	—	CCIS	1 Mi	S1	J5	1-24	NWB	3-8	—	—	1-11-04 1-08-05	3	—	—	—
006	—	1-11	TTC-39	28	—	I	—	—	CCIS	1 Mi	S1	J6	1-24	NWB	9-14	—	—	1-09-05 1-09-06	4	—	—	—

DD Form 2490-4, FEB 87

83/027

Figure B-6. Completed trunk terminations worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - SWITCH INITIALIZATION AND CLASSMARK WORKSHEET

ASI / ASC	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-1 / D-4
	8210	TAACOM 1	30MAR 89		Sgt Network	SFC Smart NCOIC	1 OF 42	

ASI

2	SDSG MATRIX SIZE (0 - 4)
1	TDSG MATRIX SIZE (1 - 4)
Y	SINGLE SHELTER SWITCH (Y = Yes, N = No)
4/3	NUMBERING PLAN (3/4 or 4/3)
32	16/32 KBS SWITCH
	TIME DAY 1 - 366
	HOUR 0 - 23
	MINUTE 0 - 59
	TENTHS OF MINUTES 0 - 9

ENTER CURRENT → INFORMATION

FOR 3/4 NUMBERING PLAN, ALSO INCLUDE:

–	ABBREVIATED DIAL (Y = Yes, N = No)
– – – –	LOCAL SUBSCRIBER CODE (NNXG)

ASC

N	ALTERNATE ROUTING (Y = Yes, N = No)
N	GATEWAY CLASSMARK (Y = Yes, N = No)
– –	NN CODE FOR TTC - 30 TRUNKS
–	SATELLITE LINKS (1 - 4)
9 1 4	NATO HOMEAREA (9YX)
1 0 1	SWITCH SUPERVISOR LOOP DIGITS
N	SSB RESET Y = YES, N = NO (Always displayed as N)
N	TCCF INTERCEPT (Y = Yes, N = No)
– – –	TCCF ELEMENT ID
N	TCCF AUTO (Y = Yes, N = No)
Y	PERIODIC REPORT PRINT (Y = Yes, N = No)

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Figure B-7. Completed switch initialization and classmark worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - CONFERENCE BRIDGE AND CALL SERVICE POSITION WORKSHEET

ATT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-2A
	8210	TAA COM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	2 OF 42	

CONFERENCE BRIDGE (TYPE 95, 120)								CALL SERVICE POSITION SDMX/TDMX (TYPE 96, 121)								
			MATRIX ADDRESSES													
EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	VOICE PORT 1	VOICE PORT 2	TDMX SIGNAL TERMINAL	DIRECTORY NUMBER	DIGITAL RECEIVER	UNIT NO
95	1	I	1-02-12	1-03-12	1-04-12	1-05-12	1-06-12	121	1	I	14-53	14-54	14-52	100		1
↑	2	↑	1-08-12	1-08-12	1-09-12	1-10-12	1-11-12	—	—	—	—	—	—	—		—
↓	3	↓	2-05-10	2-05 10	2-06-10	2-07-10	2-08-10									
95	4	I	2-10-10	2-10-10	2-11-10	2-12-10	2-13-10									
—	—	—	—	—	—	—	—									

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146-027

Figure B-8. Completed conference bridge and call service position worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - LOOP KEY GENERATOR WORKSHEET
(KG - 82, TYPE 123)

ATT	PRSL / NNX 8210		SW LOCATION TAACOM 1		DATE 30MAR87	REV NO.		PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC		PAGE ___ OF ___		D-2B
EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL
123	1	I	13-14	02-00	123	19	I	13-32	03-06					
	2		13-15	02-01		20		13-33	03-07					
	3		13-16	02-02		21		13-34	03-08					
	4		13-17	02-03		22		13-35	03-09					
	5		13-18	02-04		23		13-36	03-10					
	6		13-19	02-05		24		13-37	03-11					
	7		13-20	02-06		25		13-38	01-00					
	8		13-21	02-07		26		13-39	01-01					
	9		13-22	02-08		27		13-40	01-02					
	10		13-23	02-09		28		13-41	01-03					
	11		13-24	02-10		29		13-42	01-04					
	12		13-25	02-11		30		13-43	01-05					
	13		13-26	03-00		31		13-44	01-06					
	14		13-27	03-01	123	32	I	13-45	01-07					
	15		13-28	03-02	—	—	—	—	—					
	16		13-29	03-03										
	17		13-30	03-04										
123	18	I	13-31	03-05										

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Figure B-9. Completed loop key generator worksheet (KG-82, type 123).

NETWORK PLANNING AND CONFIGURATION DATA - INTERMATRIX UNIT WORKSHEET
(TYPE 98)

ATT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-2C
	8210	TAACOM 1	30MAR87		Sgt Network	SFCSmart NCOIC	4 OF 42	

EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL
98	1	I	1-03-11	13-50	98	19	I	2-09-11	14-06
	2		1-04-11	13-51		20		2-10-11	14-07
	3		1-05-11	13-52		21		2-11-11	14-08
	4		1-06-11	13-53		22		2-12-11	14-09
	5		1-07-11	13-54		23		2-13-11	14-10
	6		1-08-11	13-55		24		2-01-12	14-11
	7		1-09-11	13-56		25		2-02-12	14-12
	8		1-10-11	13-57		26		2-03-12	14-13
	9		1-11-11	13-58		27		2-04-12	14-14
	10		1-12-11	13-59		28		2-05-12	14-15
	11		1-13-11	13-60		29		2-06-12	14-16
	12		1-01-12	13-61		30		2-07-12	14-17
	13		2-03-11	14-00		31		2-08-12	14-18
	14		2-04-11	14-01		32		2-09-12	14-19
	15		2-05-11	14-02		33		2-10-12	14-20
	16		2-06-11	14-03		34		2-11-12	14-21
	17		2-07-11	14-04	98	35	I	2-12-12	14-22
98	18	I	2-08-11	14-05	—	—	—	—	—

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Figure B-10. Completed intermatrix unit worksheet (type 98).

NETWORK PLANNING AND CONFIGURATION DATA - SIGNALING EQUIPMENT WORKSHEET

ATS | PRSL/NNX: 8210 | SW LOCATION: TAACOM 1 | DATE: 30MAR87 | REV NO. | PREPARED BY: Sgt Network | CHECKED BY: SFC Smart NCOIC | PAGE 5 OF 42 | D-3A

TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/OUT SERVICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/OUT SERVICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/OUT SERVICE
14-58	113	1	O	1-12-12	111	1	I	1-09-10	111	18	I
14-59		2	I	1-12-12	116	1	I	1-09-10	116	8	I
14-60		3									
14-61		4		2-01-11	111	2	I	1-10-10	111	19	I
14-62		5		2-01-11	116	3	I	1-10-10	116	9	I
14-63		6						—	—	—	—
01-63		7		1-06-10	111	3	I	1-11-10	112	25	I
02-63		8		1-06-10	116	5	I	1-11-10	116	10	I
03-63		9									
13-63	113	10	I	1-13-12	111	9	I	1-12-10	112	26	I
—	—	—	—	1-13-12	116	2	I	1-12-10	116	11	I
20-01	114	8	I								
20-02		15		2-02-11	111	10	I	1-13-10	112	27	I
20-03		16		2-02-11	116	4	I	—	—	—	—
20-04		23						02-20	119	—	—
20-05	114	24	I	1-07-10	111	11	I				
—	—	—	—	1-07-116	116	6	I				
1-01-11	115	1	I								
—	—	—	—	1-08-10	111	17	I				

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Digital Receivers

DTMF Rec.

TDSG

Aux Send./Rec.

MF Rec./Send. Pairs

MF Rec.

Lp. Group Sig. Chan.

DTMF Rec./Send Pairs

Figure B-11. Completed signaling equipment worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ANALOG LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-3B
	8210	TAA CoM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	6 OF 42	

ANALOG LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	DESIGNATION OFFICE	TYPE CIRCUIT	EQUIPMENT TYPE	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	TYPE/LOCATION ADAPTER	TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS NUMBER CALLED	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	NUMBER ADAPTER	PROGRESSIVE CONF	TRANSFER CALL	DIAL CLASS COMP	DIAL LIST COMP	RESTRICTION ZONE	CONF PREPROG ONLY	NET COMMERCIAL ACCESS
	1-2		L	TA-838	4W CB	N W	DC		—	1-13-01	2	202	Ø	—	4	N	R	I	—	N	Y	N	Ø	1	N	N
	3-4		L	TA-838	4W CB	B	DC	A103	—	1-01-02	2	311	Ø	—	4	N	R	I	—	N	N	N	Ø	1	N	N
	5-6		L	TA-938	2W CB	COMMON BALEY	DC		—	1-02-02	8	452	Ø	—	5	N	R	I	—	N	Y	N	Ø	1	N	N
	7-8		L	TA-236	2W CB		DC	A203	—	1-03-02	7	411	Ø	—	4	N	R	I	—	N	N	N	Ø	2	N	N
	9-10		L	TA-312	LB RD				—	1-03-02	12	316	Ø	—	5	N	R	I	—	N	N	N	Ø	2	N	N
	11-12					20 Hz	—	A303	—																	
	13-14	8211	T	SB-3614	4W CB	N W	AC		—	1-06-02	31	001	Ø	—	N	—	—	—	—	—	—	—	Ø	AN	—	—
	15-16	8211	T	SB-3614	4W CB	B	AC	A104	—	1-07-02	31	001	Ø	—	N	—	—	—	—	—	—	—	Ø	AN	—	—
	17-18																									
	19-20																									
	21-22																									
	23-24																									

NWLTU

MP NUMBER	SDSG	CABLE
2	1	J2

BOTTOM CIRCUIT AC	BOTTOM CIRCUIT DC	TOP CIRCUIT AC	TOP CIRCUIT DC
J11-J12	J13-J12	J5-J6	J7-J6
J8-J9	J10-J9	J2-J3	J4-J3

ANALOG TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	TSB NUMBER MASTER/SLAVE TYPE MODEM	SATELLITE TRUNK	IN/OUT SERVICE	39 TRUNK: TRUNK NUMBER	39 TRUNK: 16 KBS TRUNK	39 TRUNK: MS TRUNK	39 TRUNK: MS TRUNK CHAR	39 TRUNK: XMSN TYPE	NON 39: NUMBER ADAPTER	NON 39: ECHO SUPPRESSOR NO	NON 39: XMSN TYPE

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616/027

Figure B-12. Completed analog loop and trunk worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ANALOG LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	7 OF 42	D-3B

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	CIRCUIT TYPE	EQUIPMENT TYPE	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	ADAPTER TYPE/LOCATION	ANALOG LOOPS: DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC LOAD CONTROL	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	ADAPTER NUMBER	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL CLASS	COMP DIAL LIST	RESTRICTION ZONE	PREPROG CONF ONLY	COMMERCIAL NET ACCESS
	1-2	8213	T	TTC-39	TSB	N W	AC		1-09-05	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	3-4				4W AC	B		A-11	—	1-10-05	28	006	Ø	4M,2	N	I	1	N	N	—	AM	—	—	—	—	—
	5-6								—	1-11-05							2									
	7-8							A211	—	1-12-05							3									
	9-10								—	1-13-05							4									
	11-12							A311	—	1-01-06							5									
	13-14								—	1-02-06							6									
	15-16							A112	—	1-03-06							7									
	17-18								—	1-04-06							8									
	19-20							A212	—	1-05-06							9									
	21-22					N W			—	1-06-06							10									
	23-24					B	AC	A312	—	1-07-06	28	006	Ø	4M,2	N	I	11	N	N	—	AN	—	—	—	—	—

NWLTU		
MP NUMBER	SDSG	CABLE
2	1	J6

BOTTOM CIRCUIT		TOP CIRCUIT	
AC	DC	AC	DC
J11-J12 J8-J9	J13-J12 J10-J9	J5-J6 J2-J3	J7-J6 J4-J3

ANALOG TRUNKS							39 TRUNK					NON 39		
TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	TSB NUMBER MASTER/SLAVE MODEM TYPE	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE	ADAPTER NUMBER	SUPPRESSOR NO ECHO	XMSN TYPE

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Figure B-12. Completed analog loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - ANALOG LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-3B
	8210	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	8 OF 42	

ANALOG LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	TYPE CIRCUIT	EQUIPMENT TYPE	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	TYPE/LOCATION ADAPTER	DAS: TERMINAL ADDRESS	DAS: TERMINAL TYPE	DAS: DIRECTORY NUMBER	DAS: LINE HUNT GROUP	DAS: DAS CALLED NUMBER	DAS: TRAFFIC CONTROL LOAD	DAS: SECURE CALL	DAS: MAXIMUM PRECEDENCE	DAS: IN/OUT SERVICE	NUMBER ADAPTER	PROGRESSIVE CONF	CALL TRANSFER	DIAL CLASS COMP	DIAL LIST COMP	RESTRICTION ZONE	CONF ONLY PREPROG	COMMERCIAL NET ACCESS
	1-2	508 7250	T	TTC-39	TSB				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	3-4				AW AC	N W B	AC	A109	—	1-11-04	28	005	Ø	3,M,I	N	I	1	N	N	—	AN	—	—	—	—	—
	5-6								—	1-12-09							2			—						
	7-8							A209	—	1-13-04							3			—		—	—	—	—	—
	9-10								—	1-01-05							4			—						
	11-12							A309	—	1-02-05							5			—		—	—	—	—	—
	13-14								—	1-03-05							6			—		—	—	—	—	—
	15-16							A110		1-09-05							7			—		—	—	—	—	—
	17-18									1-05-05							8			—						
	19-20							A210		1-06-05							9			—						
	21-22									1-07-05							10			—						
	23-24	508 7250	T	TTC-39	4W AC	N W B	AC	A310		1-08-05	28	005	Ø	3,M,I	N	I	11	N	N	—	AN	—	—	—	—	—

NWLTU

MP NUMBER	SDSG	CABLE
2	1	5

BOTTOM CIRCUIT AC	BOTTOM CIRCUIT DC	TOP CIRCUIT AC	TOP CIRCUIT DC
J11 J12	J13 J12	J5-J6	J7-J6
J8-J9	J10-J9	J2-J3	J4-J3

ANALOG TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	TSB NUMBER / MASTER = M SLAVE = S / TYPE MODE	SATELLITE TRUNK	IN/OUT SERVICE	39 TRUNK: TRUNK NUMBER	39 TRUNK: 16 KBS TRUNK	39 TRUNK: MS TRUNK	39 TRUNK: MS CHAR TRUNK	39 TRUNK: XMSN TYPE	NON 39: NUMBER ADAPTER	NON 39: ECHO SUPPRESSOR NO	NON 39: XMSN TYPE

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Figure B-12. Completed analog loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-3C
	8210	TAACOM 1	30 MAR 87		SgtNetwork	SFC Smart NCOIC	9 OF 42	

DIGITAL LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO. LOCA-TION
	1-2		L	TA-838	4W AC	CV	—	A202	N/A
	3-4		—	—	—	SD	—	A202	—
	5-6		L	KY-68	4W DIG	DL	56V	A204	N/A
	7-8		L	KY-68	↕	PA	ON	A204	↕
	9-10		L	KY-68	↕	DL	56V	A206	↕
	11-12		L	KY-90	↕	PA	ON	A206	↕
	13-14		L	TA-954	4W DIG.	DL	56V	A208	N/A
	15-16		—	—	—	PA	ON	A208	—
	[illegible]	SWITCH SUPV.	L	KY-68	4W DIG.	DL	56V	CEG	N/A
	19-20					PA	ON	A402	
	21-22								
	23-24								

CABLE PAIR	DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL CLASS	COMP DIAL LIST	ZONE RESTRICTION	PREPROG CONF ONLY	COMMERCIAL NET ACCESS
1-2	01-08	1	391	Ø	—	3	N	I	—	—	—	—	—	—	N	Y	N	Ø	2	N	N
3-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5-6	01-10	3	606	Ø	—	1	E	F	I	M	N	N	Y	N	N	Y	I	1	2	N	N
7-8	0-11	3	301	↕		1	P	F	S	M	N	Y	N	N	N	Y	N	Ø	2	N	N
9-10	01-12	3	306	↕	—	1	E	I	I	O	N	Y	N	N	N	Y	C	1	2	N	N
11-12	01-13	3	505	↕	—	1	P	I	I	M	Y	Y	N	N	N	Y	N	Ø	2	N	N
13-14	01-14	13	607	Ø	—	3	N	P	I	—	—	—	—	—	N	Y	N	Ø	1	N	N
15-16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
[illegible]	02-12	3	101	Ø	—	1	P	F	I	V	N	N	N	N	Y	Y	N	Ø	Ø	N	Y
19-20																					
21-22																					
23-24																					

LOOP CLOCK LOCATION A213

MP NO	TDSG	CABLE
1	1	J4

STRAP

RED	BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DILPA

56 V ON	56 V OFF
J2-J3	J3-J4

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

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Figure B-13. Completed digital loop and trunk worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	10 OF 42	D-3C (CONT)

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/LOCA-TION	DAS: TERMINAL ADDRESS	DAS: TERMINAL TYPE	DAS: DIRECTORY NUMBER	DAS: LINE HUNT GROUP	DAS: DAS CALLED NUMBER	TRAFFIC LOAD CONTROL	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	COMP PASS DIAL	COMP MS DIAL	ZONE RESTRICTION	CONF PREPROG ONLY	COMMERCIAL ACCESS
	~~1-2~~		L	KY-68	4W DIG				2/A440	02-21	3	605	Ø	—	3	P	I	I	V	N	N	N	N	N	N	N	Ø	1	N	N
	~~3-4~~			KY-68						02-22	3	201			3	P	I		V	N	N	N	N					1		N
	~~5-6~~			KY-68						02-23	3	206			3	P	P		V	N	N	N	N					1		N
	~~7-8~~			KY-68						02-24	3	266			3	P	P		V	N	N	N	N					1		N
	~~9-10~~			TA-954						02-25	13	401			4	N	P		—	—	—	—	—					2		Y
	~~11-12~~			TA-954						02-26	13	611			4	N	P		—	—	—	—	—					2		Y
	~~13-14~~		L	TA-954	4W DIG				2/A440	02-27	13	519	Ø		4	N	R	I	—	—	—	—	—	N	N	N	Ø	2	N	Y
	15-16																													
	17-18																													
	19-20																													
	21-22																													
	23-24																													

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A 1

STRAP

RED	BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DHLPA

56 V ON	56 V OFF
J2-J3	J3-J4

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	11 OF 42	D-3C (CONT)

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO LOCA-TION	DIGITAL LOOPS: DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE GROUP HUNT	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	CON PROGRESSIVE	CALL TRANSFER	CC COMP DIAL	COMP DIAL	ZONE RESTRICTION	CON PREF PROG ONLY	COMMERCIAL ACCESS
	~~1-2~~	508 7290	T	TTC-39	DTG	—	—	—	8/A441	02-30	29	002	Ø	N	I	1	N	N	—	DN	—	—	—	—	—	—	—	—	—	—
	~~3-4~~	↑	↑	↑	↑				↑	02-31	↑	↑	↑	↑	↑	2	↑	↑	—	↑	—	—	—	—	—	—	—	—	—	—
	~~5-6~~									02-33						3			—		—	—	—	—	—	—	—	—	—	—
	~~7-8~~									02-32						4			—		—	—	—	—	—	—	—	—	—	—
	~~9-10~~									02-34						5			—		—	—	—	—	—	—	—	—	—	—
	~~11-12~~									02-35						6			—		—	—	—	—	—	—	—	—	—	—
	~~13-14~~								↓	02-36						7			—		—	—	—	—	—	—	—	—	—	—
	~~15-16~~								8/A441	02-37						8			—		—	—	—	—	—	—	—	—	—	—
	~~17-18~~								9/A441	02-38						9			—		—	—	—	—	—	—	—	—	—	—
	~~19-20~~								↑	02-39						10					—	—	—	—	—	—	—	—	—	—
	~~21-22~~	↓	↓	↓	↓				↓	02-40	↓	↓	↓	↓	↓	11	↓	↓		↓	—	—	—	—	—	—	—	—	—	—
	~~23-24~~	508 7290	T	TTC-39	DTG				9/A534	02-41	29	002	Ø	N	I	12	N	N	—	DN	—	—	—	—	—	—	—	—	—	—

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A2

STRAP	
RED	BLACK
J14 - 15	J2 - 3
J16 - 17	J4 - 5
J18 - 19	J6 - 7
J20 - 21	J8 - 9
J22 - 23	J10 - 11
J24 - 25	J12 - 13

SEE LPCLK WORKSHEET

DILPA	
56 V ON	56 V OFF
J2 - J3	J3 - J4

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

DIGITAL TRUNKS

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-3C
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	12 OF 42	(CONT)

DIGITAL LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	TYPE CIRCUIT	TYPE EQUIPMENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	NCMD NO. LOCATION	DAS: TERMINAL ADDRESS	DAS: TERMINAL TYPE	DAS: DIRECTORY NUMBER	DAS: LINE HUNT GROUP	DAS: DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HUX	MS COMPATIBLE	FAX	MS TYPE 2	CONF PROGRESSIVE	CALL TRANSFER	CALL COMP BUSY DIAL	CALL COMP DIAL	ZONE RESTRICTION	CONF PREPROG	NET COMMERCIAL ACCESS
	~~[illegible]~~	508 7290	T	TTC-39	DTG	—	—	—	9/A534	02-42	29	002	Ø	N	I	13	N	N	—	DN	—	—	—	—	—	—	—	—	—	—
	~~[illegible]~~	↕	↕	↕	↕	—	—	—	↕	02-43	↕		↕		↕	14	↕	↕	—	↕	—	—	—	—	—	—	—	—	—	—
	~~[illegible]~~	↕	↕	↕	↕	—	—	—	↕	02-44	↕		↕		↕	15	↕	↕	—	↕	—	—	—	—	—	—	—	—	—	—
	~~7-8~~	508 7290	T	TTC-39	DTG	—	—	—	9 A534	02-45	29	002	Ø	N	I	16	N	N	—	DN	—	—	—	—	—	—	—	—	—	—
	~~9-10~~	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	11-12																													
	13-14																													
	15-16																													
	17-18																													
	19-20																													
	21-22																													
	23-24																													

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A2

STRAP

RED	BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DILPA

56 V ON	56 V OFF
J2-J3	J3-J4

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	13 OF 42	D-3C (CONT)

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/ LOCA-TION	DIGITAL LOOPS: DAS: TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL	LIST COMP DIAL	ZONE RESTRICTION	PREPROG CONF ONLY	COMMERCIAL NET ACCESS
	1-2	8210MS	T	TYC-39	DTG	—	—	—	10/A535	02-48	29	003	Ø	N	I	1	N	Y	Ø	DN	—	—	—	—	—	—	—	—	—	—
	3-4	↑	↑	↑	↑	—	—	—	↑	02-49	↑	↑	↑	↑	↑	2	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	—
	5-6					—	—	—		02-50						3					—	—	—	—	—	—	—	—	—	—
	7-8					—	—	—		02-51						4					—	—	—	—	—	—	—	—	—	—
	9-10					—	—	—		02-52						5					—	—	—	—	—	—	—	—	—	—
	11-12					—	—	—		02-53						6					—	—	—	—	—	—	—	—	—	—
	13-14								↓	02-54						7					—	—	—	—	—	—	—	—	—	—
	15-16								10/A535	02-55						8					—	—	—	—	—	—	—	—	—	—
	17-18								11/A536	02-56						9					—	—	—	—	—	—	—	—	—	—
	19-20								↑	02-57						10					—	—	—	—	—	—	—	—	—	—
	21-22	↓	↓	↓	↓				↓	02-58	↓	↓	↓	↓	↓	11	↓	↓	↓	↓	—	—	—	—	—	—	—	—	—	—
	23-24	8210MS	T	TYC-39	DTG				11/A536	02-59	29	003	Ø	N	I	12	N	Y	Ø	DN										

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A-3

STRAP	
RED	BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DILPA	
56 V ON J2-J3	56 V OFF J3-J4

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	14 OF 42	D-3C (CONT)

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/ LOCA-TION
	~~[illegible]~~	8210MS	T	TYC-39	DTG	–	–	–	11/A536
	~~[illegible]~~	↕	↕	↕	↕				↕
	~~[illegible]~~	↕	↕	↕	↕				↕
	~~7-8~~	↕	↕	↕	↕				↕
	~~9-10~~	8210MS	T	TYC-39	DTG				11/A536
	11-12								
	13-14								
	15-16								
	17-18								
	19-20								
	21-22								
	23-24								

DIGITAL LOOPS

CABLE PAIR	DAS: TERMINAL ADDRESS	DAS: TERMINAL TYPE	DAS: DIRECTORY NUMBER	DAS: LINE GROUP HUNT	DAS: DAS CALLED NUMBER	DAS: TRAFFIC CONTROL LOAD	DAS: SECURE CALL	DAS: MAXIMUM PRECEDENCE	DAS: IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL CLASS	COMP DIAL LIST	ZONE RESTRICTION	PREPROG CONF ONLY	COMMERCIAL NET ACCESS
~~[illegible]~~	02-60	29	003	Ø	N	I	13	N	Y	Ø	ON	–	–	–	–	–	–	–	–	–	–
~~[illegible]~~	02-61	↕	↕	↕	↕	↕	14	↕	↕	↕	↕	–	–	–	–	–	–	–	–	–	–
~~[illegible]~~	02-62	↕	↕	↕	↕	↕	15	↕	↕	↕	↕	–	–	–	–	–	–	–	–	–	–
~~7-8~~	03-14	↕	↕	↕	↕	↕	16	↕	↕	↕	↕	–	–	–	–	–	–	–	–	–	–
~~9-10~~	03-15	29	003	Ø	N	I	17	N	Y	Ø	ON										
11-12																					
13-14																					
15-16																					
17-18																					
19-20																					
21-22																					
23-24																					

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A3

STRAP

RED	BLACK
J14-15	J2-3
J16-17	J4-5
J18-19	J6-7
J20-21	J8-9
J22-23	J10-11
J24-25	J12-13

SEE LPCLK WORKSHEET

DILPA

56 V ON	56 V OFF
J2 - J3	J3 - J4

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	15 OF 42	D-3C (CONT)

DIGITAL LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	TYPE CIRCUIT	TYPE EQUIPMENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	NCMD NO. LOCATION	DAS TERMINAL ADDRESS	DAS TERMINAL TYPE	DAS DIRECTORY NUMBER	DAS LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SCALE SECURE	MAXIMUM PRECEDENCE	IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	CONF PROGRESSIVE	CALL TRANSFER	CC COMPASS DIAL	COMP DIAL	ZONE RESTRICTION	CONF PREPROG	NET COMMERCIAL ACCESS
	[redacted]	8610	T	TTC-39	DTG				12/A537	03-17	29	004	Ø	N	I	1	N	N	-	DN										
	[redacted]									03-18						2			-											
	[redacted]									03-19						3			-											
	[redacted]									03-20						4			-											
	[redacted]									03-21						5			-											
	[redacted]									03-22						6			-											
	[redacted]									03-23						7			-											
	[redacted]								12/A537	03-24						8			-											
	[redacted]								13/A538	03-25						9			-											
	[redacted]									03-26						10			-											
	[redacted]									03-27						11			-											
	[redacted]	8610	T	TTC-39	DTG				13/A538	03-28	29	004	Ø	N	I	12	N	N	-	DN										

DIGITAL TRUNKS

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE
1	1	A4

STRAP

RED	BLACK
J14 - 15	J2 - 3
J16 - 17	J4 - 5
J18 - 19	J6 - 7
J20 - 21	J8 - 9
J22 - 23	J10 - 11
J24 - 25	J12 - 13

SEE LPCLK WORKSHEET

DILPA

56 V ON	56 V OFF
J2 - J3	J3 - J4

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	16 OF 42	D-3C (CONT)

DIGITAL LOOPS

CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/ LOCA-TION	DAS: TERMINAL ADDRESS	DAS: TERMINAL TYPE	DAS: DIRECTORY NUMBER	DAS: LINE GROUP HUNT	DAS: DAS CALLED NUMBER	DAS: TRAFFIC CONTROL LOAD	DAS: SECURE CALL	DAS: MAXIMUM PRECEDENCE	DAS: IN/OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	CONF PROGRESSIVE	CALL TRANSFER	COMP CLASS DIAL	COMP LIST DIAL	ZONE RESTRICTION	CONF PREPROG ONLY	COMMERCIAL NET ACCESS
	[redacted]	8610	T	TTC-39	DTG	—	—	—	13/A538	03-29	29	004	Ø	N	I	13	N	N	—	ON	—	—	—	—	—	—	—	—	—	—
	[redacted]	↑	↑	↑	↑				↑	03-30	↑	↑	↑	↑	↑	14	↑	↑	—	↑	—	—	—	—	—	—	—	—	—	—
	[redacted]									03-31						15			—		—	—	—	—	—	—	—	—	—	—
	[redacted]	↓	↓	↓	↓				↓	03-32	↓	↓	↓	↓	↓	16	↓	↓	—	↓	—	—	—	—	—	—	—	—	—	—
	[redacted]	8610	T	TTC-39	DTG				13/A528	03-33	29	004	Ø	N	I	17	N	N	-	ON	—	—	—	—	—	—	—	—	—	—
	11-12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	13-14																													
	15-16																													
	17-18																													
	19-20																													
	21-22																													
	23-24																													

LOOP CLOCK LOCATION

MP NO	TDSG	CABLE

STRAP: RED	STRAP: BLACK
J14 - 15	J2 - 3
J16 - 17	J4 - 5
J18 - 19	J6 - 7
J20 - 21	J8 - 9
J22 - 23	J10 - 11
J24 - 25	J12 - 13

SEE LPCLK WORKSHEET

DILPA	
56 V ON J2 - J3	56 V OFF J3 - J4

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	MSN TYPE

DIGITAL TRUNKS

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Figure B-13. Completed digital loop and trunk worksheet. (continued)

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL TRANSMISSION GROUP WORKSHEET

ADT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-5
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	12 OF 42	

DATA ENTRY								PLANNING INFORMATION				
DTG NUMBER	MESSAGE SWITCH DTG	START NCMD	END NCMD	KG-81	SYNC DELAY	IN/OUT SERVICE	AUTO SYNC DESIRED	NUMBER OF CHANNELS	MODEM TYPE	REPEATER IN USE	CABLE LENGTH	REMARKS
1	N	7	7	Ø	Ø	I	N	9	DiPhase	N	1/4 mile	* Cable Repeaters
2	N	8	9	2	Ø	I	N	18	DiPhase	N	1 mile	Only
3	N	10	11	3	Ø	I	N	18	Diphase	N	1/4 mile	
4	N	12	13	4	Ø	I	Y	18	DiPhase	N	1 mile	
—	—	—	—	—	—	—	—	—	—	—	—	

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82'027

Figure B-14. Completed digital transmission group worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER WORKSHEET

ATG	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart Neoze	18 OF 42	D-6

											INTERSWITCH									PBX				DIBITS					
TGC NO.	CLUSTER TYPE	SPILL FORWARD	DESTINATION NYX	ZONE RESTRICTION	ACCESS TGC	TRAFFIC LIMITS	F	I	P	R	KEY CHANGE	GLARE	TSB NO.	MESSAGE SWITCH TGC	CALL INHIBIT	DIGITAL TSB TDMX ADDRESS	PRIMARY SIG CHANNEL	SECONDARY SIG CHANNEL 1	SECONDARY SIG CHANNEL 2	SECONDARY SIG CHANNEL 3	NO OF OUTGOING DIGITS	MAXIMUM PRECEDENCE	SWITCH CODE NNXX	TRAFFIC CONTROL LEVEL	MAXIMUM PRECEDENCE	TRAFFIC CONTROL LEVEL	GLARE	CALL INHIBIT	SWITCH CODE	COMMERCIAL NET ACCESS
001	P	Y	214	2	Y	Y	—	—	—	—	-	-	—	—	-	—	—	—	—	—	3	P	8211	3	—	—	—	—	—	—
002	I	Y	508	Ø	N	N	—	—	—	—	N	A	1	N	N	13-00	02-29	—	—	—	—	—	—	—	—	—	—	—	—	—
003	I	Y	214	Ø	Y	N	—	—	—	—	N	A	2	Y	N	13-01	02-47	—	—	—	—	—	—	—	—	—	—	—	—	—
004	I	N	214	Ø	N	N	—	—	—	—	N	R	7	N	N	13-06	03-16	—	—	—	—	—	—	—	—	—	—	—	—	—
005	I	Y	508	Ø	N	N	—	—	—	—	N	A	3	N	N	13-02	—	—	—	—	—	—	—	—	—	—	—	—	—	—
006	I	N	214	Ø	N	N	—	—	—	—	N	R	4	N	N	13-03	—	—	—	—	—	—	—	—	—	—	—	—	—	—

DD Form 2490-23, FEB 87

302/027

Figure B-15. Completed trunk group cluster worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ESSENTIAL USER BYPASS WORKSHEET

AEU	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-7
	8210	TAACOM 1	30MAR87		SgtNetwork	SFCSmart NCOIC	19 OF 48	

SUBSCRIBER	SUBSCRIBER NO.	ADDRESS		SUBSCRIBER	SUBSCRIBER NO.	ADDRESS	
		FROM	TO			FROM	TO
CommANDER TAACOM 1	606	01-10	02-48				
G3 TAACOM 1	301	01-11	02-49				
Switch Supervisor	101	02-12	02-50				
—	—	—	—				

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39/027

Figure B-16. Completed essential user bypass worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN KEY LOCATION WORKSHEET

AVL	PRSL/NNX 8210	SW LOCATION TAACOM 1		DATE 30MAR87	REV NO.	PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC		PAGE 20 OF 42	D-8
COMSEC ID	DIR NO/BS LA	TYPE	NET NO.	COMSEC ID	DIR NO/BS LA	TYPE	NET NO.	COMSEC ID	DIR NO/BS LA	TYPE	NET NO.
001	505	TERV	02	600	02 48	MSRV	03				
002	606			601	02-49						
003	605			602	02-50						
004	301			603	02-51						
005	306			604	02-52						
006	201			605	02-53						
007	206			606	02-54						
008	266			607	02-55						
009	101	TERV	02	608	02-56						
—	—	—	—	609	02-57						
880	—	RH	—	610	02-58						
881	—	TERN	02	611	02-59						
—	—	—	—	612	02-60						
878	—	CIRV	—	613	02-61						
879	508	AIRV	—	614	02-62						
—	—	—	—	615	03-14						
883	—	TERN	04	616	03-15						
884	—	MSNV	05	—	—	—	—				
—	—	—	—	882	—	MSNV	03				

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Area Code

New X-TEKs that will be utilized when current X-TEK cryptoperiod expires

Figure B-17. Completed assign key location worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - NET REKEYING WORKSHEET											
ANR	PRSL/NNX 8210	SW LOCATION TAACOM 1		DATE 30MAR87	REV NO.	PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC		PAGE 21 OF 42	D-9
METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER
G	01	02	04								
G	02	03	05								
—	—	—	—								

DD Form 2490-26, FEB 87

56/027

Figure B-18. Completed net rekeying worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - COMMERCIAL NETWORK ROUTING WORKSHEET

ACN	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-10
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	22 OF 42	

0	0	5	PRIMARY TGC
0	0	2	ALTERNATE 1
			ALTERNATE 2
			ALTERNATE 3
			ALTERNATE 4
			ALTERNATE 5

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34/027

Figure B-19. Completed commercial network routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - NYX ROUTING WORKSHEET																				
ANY		PRSL/NNX 8210		SW LOCATION TAACOM 1		DATE 30MAR87		REV NO.		PREPARED BY Sgt Network			CHECKED BY SFC SMART NCOIC			PAGE 23 OF 42		D-11		
NYX CODE	HOME FOREIGN	NATO DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NYX CODE	HOME FOREIGN	NATO DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5			
214	14	914	—	—	—	—	—	—												
508	F	914	002	005	—	—	—	—												
816	F	914	005	002	—	—	—	—												

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96/027

Figure B-20. Completed NYX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - PR ROUTING WORKSHEET

APR	PRSL/NNX 8210	SW LOCATION TAACOM 1	DATE 30MAR87	REV NO.	PREPARED BY Sgt Network	CHECKED BY SFC Smart NCOIC	PAGE 24 OF 42	D-12

NN CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NN CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
82	H		—	—	—	—	—	—									
84		F	006	002	—	—	—	—									
86		F	004	006	—	—	—	—									
88		F	006	004	—	—	—	—									
92		F	006	004	—	—	—	—									

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66/027

Figure B-21. Completed PR routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - NNX ROUTING WORKSHEET													
ANN	PRSL / NNX 8210		SW LOCATION TAACOM 1		DATE 30 MAR 87	REV NO.	PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC			PAGE 25 OF 42	D-13
SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
—	—	—	—	—	—	—							
	SEE	CHAPTER		4									

DD Form 2490-30, FEB 87

44027

Figure B-22. Completed NNX routing worksheet.

NETWORK PLANNING CONFIGURATION DATA - NNXX ROUTING WORKSHEET

ANX	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	821D	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	26 OF 42	D-14

NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
8211	001	—	—	—	—	—							

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43/027

Figure B-23. Completed NNXX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - XXX ROUTING WORKSHEET

AXX	PRSL/NNX 8210		SW LOCATION TAACOM 1		DATE 30Mar 87	REV NO.		PREPARED BY Sgt Network			CHECKED BY SFC Smart NCOIC		PAGE 27 OF 42		D-15
XXX CODE	HOME / FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XXX CODE	HOME / FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
525	N	003	—	—	—	—	—								

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66/027

Figure B-24. Completed XXX routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ALTERNATE AREA ROUTING WORKSHEET											
AAA	PRSL / NNX 8210	SW LOCATION TAACOM 1		DATE 30MAR87	REV NO.	PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC		PAGE 28 OF 42	D-16
ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC
508	7230	005	—								

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51/027

Figure B-25. Completed alternate area routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - SL ROUTING WORKSHEET

ASL	PRSL/NNX 8210	SW LOCATION TAACom 1		DATE 30MAR87	REV NO.		PREPARED BY Sgt Network			CHECKED BY SFC Smart NcoIC		PAGE 29 OF 42		D-17
XX CODE	HOME FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XX CODE	HOME FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5
10	H	—	—	—	—	—	—								
13	F	006	—	—	—	—	—								

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66/027

Figure B-26. Completed SL routing worksheet.

NETWORK PLANNING CONFIGURATION DATA - COMMON POOL COMPRESSED DIAL WORKSHEET

ACP	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	30 OF 42	D-18

LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER
1	20	8167210605		40			60			80	
1	21	5088270661		41			61			81	
1	22	5088280521		42			62			82	
1	23	8414321		43			63			83	
	24			44			64			84	
	25			45			65			85	
	26			46			66			86	
	27			47			67			87	
	28			48			68			88	
	29			49			69			89	
	30			50			70			90	
	31			51			71			91	
	32			52			72			92	
	33			53			73			93	
	34			54			74			94	
	35			55			75			95	
	36			56			76			96	
	37			57			77			97	
	38			58			78			98	
	39			59			79			99	

DD Form 2490-35, FEB 87

47/027

Figure B-27. Completed common pool compressed dial worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - FIXED DIRECTORY ROUTING WORKSHEET

AFD	PRSL / NNX 8210	SW LOCATION TAACOM 1	DATE 30MAR87	REV NO.	PREPARED BY Sgt Network	CHECKED BY SFC Smart NCOIC	PAGE 31 OF 42	D-19

LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD	LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD
S	76763	8210605	S				

DD Form 2490-36, FEB 87

43/027

Figure B-28. Completed fixed directory routing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - INDIVIDUAL COMPRESSED DIAL WORKSHEET

AIC	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR 87		Sgt Network	SFC Smart NCOIC	32 OF 42	D-20

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
20	605	X							
21	301	X							
22	201	X							
23	401	X							
24	8167210668	X							
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
91									
92									
93									
94									
95									
96									
97									
98									
99									

DD Form 2490-37, FEB 87

55/027

Figure B-29. Completed individual compressed dial worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - PREPROGRAMMED CONFERENCE WORKSHEET

APC	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	33 OF 42	D-21

PREPROG CONF GROUP NO.	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK	PREPROG CONF GROUP NO.	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK
20	Y	606	Y				
20	Y	301	N				
20	Y	605	N				
20	Y	306	N				
			N				

DD Form 2490-38, FEB 87

48/027

Figure B-30. Comnleted preprogrammed conference worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - DIGIT EDITING WORKSHEET

ADE	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	34 OF 42	D-22

NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE	NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE
—	—	—	—				
SEE	CHAPTER 4						

DD Form 2490-39, FEB 87

50/027

Figure B-31. Completed digit editing worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - CALL INHIBIT LISTS WORKSHEET

ACI	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart Ncozd	35 OF 42	D-23

NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E
—	—	—	—								
	SEE C	HAPTER	4								

DD Form 2490-40, FEB 87

51/027

Figure B-32. Completed call inhibit lists worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - SECONDARY TRAFFIC CHANNELS WORKSHEET

AST	PRSL / NNX	SW LOCATION	DATE	REV NO	PREPARED BY	CHECKED BY	PAGE	D-24
	8210	TAACOM 7	30MAR87		Sgt Network	SFC Smart NCOIC	36 OF 42	

PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE	PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE
—	—	—	—	—					
SEE	CHAPTER 4								

DD Form 2490-41, FEB 87

45/027

Figure B-33. Completed secondary traffic channels worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ZONE RESTRICTION WORKSHEET

AZR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	82/c	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	37 OF 42	D-25

LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE	LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE
1	P	816	816	—					
1	P	508	508	—					
1	P	916	916	—					
2	R	516	516	—					
		916	916	—					
		817	817	—					
		312	312	—					
		902	902	—					
		412	412	—					
		319	319	—					
		211	211	—					
		501	501	—					
2	R	608	608	—					

DD Form 2490-42, FEB 87

102/027

Figure B-34. Completed zone restriction worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN RECEIVED BYPASS WORKSHEET

ARB	PRSL/NNX 8210	SW LOCATION TAACOM 1	DATE 30MAR87	REV NO.	PREPARED BY Sgt Network	CHECKED BY SFC Smart NCOIC	PAGE 38 OF 42	D-26

SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.	SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.
—	—	—	—	—	—						
	SEE	CHAPTER	4								

DD Form 2490-43, FEB 87

49/027

Figure B-35. Completed assign received bypass worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN, ACCOMMODATE, AND RESTORE RECEIVED BYPASS WORKSHEET											
AAR	PRSL/NNX 8210	SW LOCATION TAACOM 1		DATE 30MAR87	REV NO.	PREPARED BY Sgt Network		CHECKED BY SFC Smart NCOIC		PAGE 39 OF 42	D-27
SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER	SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER
—	—	—	—	—	—						
	SEE	CHAPT	ER 4								

DD Form 2490-44, FEB 87

52/027

Figure B-36. Completed assign, accommodate, and restore received bypass worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN FREQUENCY FOR NETWORK REPORTING WORKSHEET

AFR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-28
	82/0	TAACOM 1	30 MAR 87		Sgt Network	SFC Smart NCOIC	40 OF 42	

[– –] ID

[– –] FREQUENCY ADJUSTMENT

SEE CHAPTER 4

ID		TIME (MINUTES)
48 = R3	CALLS TO OPERATOR	7 = 15
49 = R4	TGC CALLS BY PRECEDENCE	8 = 30
50 = R5	INDIVIDUAL TRUNK GROUP STATUS	9 = 60
51 = R6	TGC(S)/CALLS PREEMPTED	12 = 240
74 = R27	DTG(S)/AVERAGE ERROR RATE(S)	14 = 480
92 = R44	CALLS OFFERED	16 = 1440
95 = R47	CALLS OFFERED TO REMOTE SWITCH(ES)	

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71/027

Figure B-37. Completed assign frequency for network reporting worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - THRESHOLDS WORKSHEET

ATH	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	D-29
	8210	TAACOM 1	30MAR87		Sgt Network	SFC Smart NCOIC	41 OF 42	

Entry	Item	NORMAL ENTRY	RANGE OF ENTRIES
	DIAL TONE TIME-OUT	10 SECONDS	0 - 300
	NEXT DIGIT TIME-OUT	10 SECONDS	0 - 300
	RELEASE TIME-OUT	10 SECONDS	0 - 300
	RING / RINGBACK TIME-OUT	180 SECONDS	0 - 300
	LOCKOUT STATE OUT-OF-SERVICE TIME-OUT	60 SECONDS	0 - 300
	PRECEDENCE VIOLATION ANNOUNCEMENT TIME-OUT	10 SECONDS	0 - 300
1 5	TRAFFIC LOAD CONTROL TIME-OUT	1 MINUTE	1 - 15 MINUTES
- 6 0 0	TRAFFIC LOAD CONTROL THRESHOLD 2	2047 CALLS	0 - 2047
- 5 0 0	TRAFFIC LOAD CONTROL THRESHOLD 3	2047 CALLS	0 - 2047
- 8 0 0	TRAFFIC LOAD CONTROL THRESHOLD 4	2047 CALLS	0 - 2047
- 7 0 0	TRAFFIC LOAD CONTROL THRESHOLD 5	2047 CALLS	0 - 2047
	OTHER TIME-OUT NUMBER	SEE TEXT	1 - 9
	OTHER TIME-OUT VALUE	SEE TEXT	0 - 300

DD Form 2490-46, FEB 87

91/027

Figure B-38. Completed thresholds worksheet.

NETWORK PLANNING AND CONFIGURATION DATA - TRAFFIC METERING WORKSHEET

ATM	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE	
	8210	TAACOM 1	30MAR 87		Sgt Network	SFC Smart NCOIC	42 OF 42	D-30

15, 30, 60, 240, 480, 1,440 MINUTES

2 MODIFY (None = 1; Interval + Loops = 2; Trunks = 3; All = 4)

480 LOOP REPORT INTERVAL (15, 30, 60, 240, 480, 1,440 Minutes)

LOOPS	TGC NUMBERS					LOOPS	TGC NUMBERS				
301											
606											

DD Form 2490-47, FEB 87

43/027

Figure B-39. Completed traffic metering worksheet.

CONFIDENTIAL

Note 1

(CLASSIFIED WHEN FILLED IN)

CONAUTH KVM WORKSHEET

For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM 1 | CNCS: Switch 8210 | DATE: 14 OCT 85

VARIABLE ID a	VARIABLE TYPE b	CLAS c	EQUIPMENT TYPE d	CRYPTO PERIOD e	EFFECTIVE DATE f	ALT CNCS g	SUBSCRIBER ID h	DISTRIBUTION POC i	REMARKS j
505-U	U-KEK	S	KY-90	90 DAYS	0800Z 15 OCT 85	N/A	505	SP4 Robbins Radio Platoon	Radio Side Keys Controlled Elsewhere
606-U	U-KEK	S	KY-68	90 DAYS	0800Z 15 OCT 85		606	CSM Adams Phone 605	—
605-U	U-KEK	S	KY-68	90 DAYS	0800Z 15 OCT 85		605	CSM Adams Phone 605	—
301-U	U-KEK	S	KY-68	90 DAYS	0800Z 15 OCT 85		301	MSG Jones G-3 Phone 306	—
306-U	U-KEK	S	KY-68	90 DAYS	0800Z 15 OCT 85		306	MSG Jones G-3 Phone 306	—

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-R, Sep 83

(U) DA Form 5251-R, CONAUTH KVM Worksheet.

Note 1

(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL

Figure B-40. Completed CONAUTH KVM worksheet.

CONFIDENTIAL

Note 1
(CLASSIFIED WHEN FILLED IN)

CONAUTH KVM WORKSHEET
For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM 1 | CNCS: SWITCH 8210 | DATE: 14OCT85

VARIABLE ID a	VARIABLE TYPE b	CLAS c	EQUIPMENT TYPE d	CRYPTO PERIOD e	EFFECTIVE DATE f	ALT CNCS g	SUBSCRIBER ID h	DISTRIBUTION POC i	REMARKS j
COMMON REKEY	KEK	S	KG-82	90 DAYS	0800Z 15OCT85	SWITCH 7290	C1RV	N/A	—
INTER AREA REKEY	KEK	S	KG-82	90 DAYS	0800Z 15OCT85	SWITCH 7290	A1RV	N/A	—
MSNV	X-TEK	S	KG-82	90 DAYS	0800Z 15OCT85	AN/TYC-39	MSNV	SFC-BROWN AN/TYC-39	—
MSRV	U-KEK	S	KG-82	90 DAYS	0800Z 15OCT85		TRUNK NO. 1		—
MSRV	U-KEK	S	KG-82	90 DAYS	0800Z 15OCT85		MS TRUNK NO. 2		—

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-R, Sep 83

(U) DA Form 5251-R, CONAUTH KVM Worksheet.

Note 1
(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL

Figure B-40. Completed CONAUTH KVM worksheet. (continued)

CONFIDENTIAL

Note 1

(CLASSIFIED WHEN FILLED IN)

CONAUTH KVM WORKSHEET

For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH	CNCS	DATE
TAACOM 1	SWITCH 8210	14OCT85

VARIABLE ID a	VARIABLE TYPE b	CLAS c	EQUIPMENT TYPE d	CRYPTO PERIOD e	EFFECTIVE DATE f	ALT CNCS g	SUBSCRIBER ID h	DISTRIBUTION POC i	REMARKS j
MSRV	U-KEK	S	KG-82	90 DAYS	0800 Z 15OCT85	AN/TYC-39	MS TRUNK NO. 8	SFC Brown AN/TYC-39	—
MSRV	U-KEK	S	KG-82	↑	↑	↑	MS TRUNK No 9	↑	—
MSRV	U-KEK	S	KG-82				MS TRUNK NO. 10		—
MSRV	U-KEK	S	KG-82				MS TRUNK NO. 11		—
MSRY	U-KEK	S	KG-82				MS TRUNK NO. 12		—

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-R, Sep 83

(U) DA Form 5251-R, CONAUTH KVM Worksheet.

Note 1

(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL

Figure B-40. Completed CONAUTH KVM worksheet. (continued)

CONFIDENTIAL

Note 1

(CLASSIFIED WHEN FILLED IN)

CONAUTH KVM WORKSHEET For use of this form, see TB 380-40; the proponent agency is INSCOM.						CONAUTH TAACOM 1		CNCS SWITCH 8210	DATE 14 OCT 85
VARIABLE ID a	VARIABLE TYPE b	CLAS c	EQUIPMENT TYPE d	CRYPTO PERIOD e	EFFECTIVE DATE f	ALT CNCS g	SUBSCRIBER ID h	DISTRIBUTION POC i	REMARKS j
REENTRY	TEK	S	KY-68 KY-90	90 DAYS	0001 Z 12AUG85	N/A	N/A	N/A	N/A
TRUNK 8210-8610	TEK	S	KG-81		0800 Z 15OCT85	8610			DTG # 004 TED # 004
TRUNK 8210-TYC39	TEK	S	KG-81			AN/TYC-39			DTG # 003 TED # 003
TRUNK 8210-7290	TEK	S	KG-81			7290	N/A		DTG # 002 TED # 002
101-U	KEK	S	KY-68	90 DAYS	0800 Z 15OCT85	N/A	8210-101	N/A	SWITCH SUPERVISOR DSVT

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-R, Sep 83

(U) DA Form 5251-R, CONAUTH KVM Worksheet.

Note 1

(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL

Figure B-40. Completed CONAUTH KVM worksheet. (continued)

CONFIDENTIAL (FOR TRAINING ONLY)

Note 1

(CLASSIFIED WHEN FILLED IN)

CNCS KVM WORKSHEET

For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM 1 | CNCS: Switch 8210 | DATE: 15 OCT 85

VARIABLE ID a	VARIABLE ID b	CLASS c	EFFECTIVE DATE d	SUPERSESSION DATE e	DATE GENERATED f	HUS LOCATION g	KYK-13 SN h	KYK-13 LOC i	KYX-15 SN j	KYX-15 LOC k	COMSEC EQUIP l	SUBSCRIBER m	COURIER n	REMARKS o
505-U	U-KEK	S	0800Z 15OCT85	0001Z 11JAN86	14OCT85	001	6 4 3	1	—	—	KY 90	Sig Bn	—	Radio Side Keys Not Controlled By CNCS
606-U	↑	S	↑		↑	002	7 4 1	1	—	—	KY 68	TAACOM CDR	Pvt. R. Snave	—
605-U		S				003	7 4 1	2	—	—		TAACOM XO		—
301-U		S				004	7 4 1	3	—	—		TAACOM G-3		—
306-U		S				005	5 5 1	1	—	—		TAACOM G-3		—

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-1-R, Sep 83

(U) DA Form 5251-1-R, CNCS KVM Worksheet.

Note 1

(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL (FOR TRAINING ONLY)

Figure B-41. Completed CNCS KVM worksheet.

CONFIDENTIAL (FOR TRAINING ONLY)

Note 1

(CLASSIFIED WHEN FILLED IN)

CNCS KVM WORKSHEET

For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM | CNCS: Switch 8210 | DATE: 15 OCT 85

VARIABLE ID a	VARIABLE ID b	CLASS c	EFFECTIVE DATE d	SUPERSESSION DATE e	DATE GENERATED f	HUS LOCATION g	KYK-13 SN h	KYK-13 LOC i	KYX-15 SN j	KYX-15 LOC k	COMSEC EQUIP l	SUBSCRIBER m	COURIER n	REMARKS o
CIRV	KEK	S	0800Z 15OCT85	0001Z 11JAN86	14OCT85	879	–	–	305	2	KG-82	Switch 8210	–	–
AIRV	KEK	S				878	–	–		3		Switch 8210	–	–
MSNV	TEK	S				882	–	–		4		MS Net	–	–
MSRV	KEK	S				600	–	–		5		MS TRUNK No 1	–	–
		S				601	–	–		6		MS TRUNK No 2	–	–

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-1-R, Sep 83

(U) DA Form 5251-1-R, CNCS KVM Worksheet.

Note 1

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CONFIDENTIAL (FOR TRAINING ONLY)

Figure B-41. Completed CNCS KVM worksheet. (continued)

CONFIDENTIAL (FOR TRAINING ONLY)

Note 1

(CLASSIFIED WHEN FILLED IN)

CNCS KVM WORKSHEET

For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM 1 | CNCS: Switch 8210 | DATE: 15 OCT 85

VARIABLE ID a	VARIABLE ID b	CLASS c	EFFECTIVE DATE d	SUPERSESSION DATE e	DATE GENERATED f	HUS LOCATION g	KYK-13 ● h	KYK-13 LOC i	KYX-15 SN j	KYX-15 LOC k	COMSEC EQUIP l	SUBSCRIBER m	COURIER n	REMARKS o
MSRV	U-KEK	S	0800Z 15OCT85	0001Z 11JAN86	14OCT85	607	—	—	305,1	12	KG-82	MS TRUNK No. 8	—	—
		S				608	—	—		13		MS TRUNK No. 9	—	—
		S				609	—	—		14		MS TRUNK No. 10	—	—
		S				610	—	—		15		MS TRUNK No. 11	—	—
		S				611	—	—	305,1	16		MS TRUNK No. 12	—	—

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-1-R, Sep 83

(U) DA Form 5251-1-R, CNCS KVM Worksheet.

Note 1

(CLASSIFIED WHEN FILLED IN)

CONFIDENTIAL (FOR TRAINING ONLY)

Figure B-41. Completed CNCS KVM worksheet. (continued)

CONFIDENTIAL (FOR TRAINING ONLY)
Note 1
(CLASSIFIED WHEN FILLED IN)

CNCS KVM WORKSHEET
For use of this form, see TB 380-40; the proponent agency is INSCOM.

CONAUTH: TAACOM I | CNCS: Switch 8210 | DATE: 15 OCT 85

VARIABLE ID a	VARIABLE ID b	CLASS c	EFFECTIVE DATE d	SUPERSESSION DATE e	DATE GENERATED f	HUS LOCATION g	KYK-13 SN h	KYK-13 LOC i	KYX-15 SN j	KYX-15 LOC k	COMSEC EQUIP l	SUBSCRIBER m	COURIER n	REMARKS o
Reentry	TEK	S	0001Z 12AUG85	0001Z 10NOV85	7AUG-85	880	–	–	3 4 6 2	6	KY-68 KY-90	–	–	–
Trunk 8210-8610	TEK	S	0800Z 15OCT85	0001Z 11JAN86	14OCT85	1019	–	–		7	KG81	Switch 8210	–	DTG #004 TED #004
Trunk 8210-TYC-39	TEK	S				1020	–	–		8	KG81	Switch 8210	–	DTG #003 TED #003
Trunk 8210-7290	TEK	S				1021	–	–		9	KG81	Switch 8210	–	DTG #002 TED #002
101-U	KEK	S	0800Z 15OCT85	0001Z 11JAN86	14OCT85	009	–	–	3 4 6 2	10	KY68	Switch 8210	–	Switch Supervison DSVT

SAMPLE

Note 1: These forms were prepared from "UNCLASSIFIED" data and are not classified. Your forms may be classified when filled in.

Note 2: Instructions for completing DA Forms 5251-R and 5251-1-R are contained in FM 24-27A.

DA FORM 5251-1-R, Sep 83

(U) DA Form 5251-1-R, CNCS KVM Worksheet.

Note 1
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Figure B-41. Completed CNCS KVM worksheet. (continued)

APPENDIX C

Reproducible Forms

This appendix provides blank copies of forms mentioned in this publication. The forms are not available through normal supply channels. They may be reproduced locally. The form numbers and titles are listed below:

DD Form 2490-1, Network Planning and Configuration Data—Subscriber List

DD Form 2490-2, Network Planning and Configuration Data–Trunk Group Cluster List

DD Form 2490-3, Network Planning and Configuration Data—Loop Terminations

DD Form 2490-4, Network Planning and Configuration Data—Trunk Terminations

DD Form 2490-5, Network Planning and Configuration Data—Circuit Card Inventory

DD Form 2490-6, Network Planning and Configuration Data—Matrix Strapping

DD Form 2490-7, Network Planning and Configuration Data-Modem/ Clock Strapping

DD Form 2490-8, Network Planning and Configuration Data—MUX/DEMUX Strapping

DD Form 2490-9, Network Planning and Configuration Data–Normal Wideband LTU

DD Form 2490-10, Network Planning and Configuration Data—Type II Modem

DD Form 2490-11, Network Planning and Configuration Data—Trunk Signaling Buffer B

DD Form 2490-12, Network Planning and Configuration Data—Switch Memory Control

DD Form 2490-13, Network Planning and Configuration Data—Loop Clock Selector

DD Form 2490-14, Network Planning and Configuration Data—Diphase Loop Modem A

DD Form 2490-15, Network Planning and Configuration Data—Switch Initialization and Classmark Worksheet

DD Form 2490-16, Network Planning and Configuration Data–Conference Bridge and Call Service Position Worksheet

DD Form 2490-17, Network Planning and Configuration Data—Loop Key Generator Worksheet (KG-82, Type 123)

DD Form 2490-18, Network Planning and Configuration Data—Intermatrix Unit Worksheet (Type 98)

DD Form 2490-19, Network Planning and Configuration Data—Signaling Equipment Worksheet

DD Form 2490-20, Network Planning and Configuration Data—Analog Loop and Trunk Worksheet

DD Form 2490-21, Network Planning and Configuration Data—Digital Loop and Trunk Worksheet

DD Form 2490-22, Network Planning and Configuration Data—Digital Transmission Group Worksheet

DD Form 2490-23, Network Planning and Configuration Data—Trunk Group Cluster Worksheet

DD Form 2490-24, Network Planning and Configuration Data—Essential User Bypass Worksheet

DD Form 2490-25, Network Planning and Configuration Data—Assign Key Location Worksheet

DD Form 2490-26, Network Planning and Configuration Data—Net Rekeying Worksheet

DD Form 2490-27, Network Planning and Configuration Data—Commercial Network Routing Worksheet

DD Form 2490-28, Network Planning and Configuration Data—NYX Routing Worksheet

DD Form 2490-29, Network Planning and Configuration Data—PR Routing Worksheet

DD Form 2490-30, Network Planning and Configuration Data—NNX Routing Worksheet

DD Form 2490-31, Network Planning and Configuration Data—NNXX Routing Worksheet

DD Form 2490-32, Network Planning and Configuration Data—XXX Routing Worksheet

DD Form 2490-33, Network Planning and Configuration Data—Alternate Area Routing Worksheet

DD Form 2490-34, Network Planning and Configuration Data—SL Routing Worksheet

DD Form 2490-35, Network Planning and Configuration Data—Common Pool Compressed Dial Worksheet

DD Form 2490-36, Network Planning and Configuration Data—Fixed Directory Routing Worksheet

DD Form 2490-37, Network Planning and Configuration Data—Individual Compressed Dial Worksheet

DD Form 2490-38, Network Planning and Configuration Data—Preprogrammed Conference Worksheet

DD Form 2490-39, Network Planning and Configuration Data—Digit Editing Worksheet

DD Form 2490-40, Network Planning and Configuration Data—Call Inhibit Lists Worksheet

DD Form 2490-41, Network Planning and Configuration Data—Secondary Traffic Channels Worksheet

DD Form 2490-42, Network Planning and Configuration Data—Zone Restriction Worksheet

DD Form 2490-43, Network Planning and Configuration Data—Assign Received Bypass Worksheet

DD Form 2490-44, Network Planning and Configuration Data—Assign, Accommodate, and Restore Received Bypass Worksheet

DD Form 2490-45, Network Planning and Configuration Data—Assign Frequency for Network Reporting Worksheet

DD Form 2490-46, Network Planning and Configuration Data—Thresholds Worksheet

DD Form 2490-47, Network Planning and Configuration Data—Traffic Metering Worksheet

GLOSSARY

Abbreviations and Acronyms

A	analog
AAA	assign alternate area routing list
AAR	assign, accommodate and restore bypass list
AC	aternate current
ACI	assign call inhibit list
ACN	assign and display commercial network routing
ACP	assign common pool compressed dial list
ACR	assign channel reassignment
ACXN	analog call extension
ADA	assign directive acknowledgement
adapt	adapter
ADB	assign data base transfer
ADE	assign digit editing list
adj	adjutant
admin	administration
ADP	automatic data processor
ADT	assign digital transmission group
AEI	assign equipment in/out-of-service
AEU	assign and display EUB configuration
AFD	assign fixed directory routing
AFFOR	Air Force forces
AFR	assign frequency for network reporting
AFWG	Air Force wing group
AG	Adjutant General
AGNATO	Army group NATO
AIC	assign individual compressed dial list
ALCG	analog line conditioner group
altn	alternate
AM	amplitude modulated
ammo	ammunition
ANN	assign NNX routing
ANR	assign net rekeying
ANX	assign NNXX routing
ANY	assign NYX routing
AOD	assign on-line diagnostics
AOI	assign other equipment in/out-of-service
AOR	assign and display operator routing
APC	assign preprogrammed conference list
APR	assign NN routing
ARB	assign received bypass list
ARFOR	Army forces
arty	artillery
ASC	assign switch classmarks
ASCP	auxiliary special circuits patch panel
ASI	assign switch initialization
ASL	assign XX routing
ASSP	analog scanner signal processor
asst	assistant

AST	assign secondary traffic channels
ATB	all trunks busy
ATG	assign trunk group cluster
ATH	assign variable thresholds
ATM	assign traffic metering
ATS	assign terminal service
ATT	assign terminal type
auto	automatic
AUTOSEVOCOM	automatic secure voice communications
AUTOVON	automatic voice network
AV	AUTOVON telephone
AVL	assign variable key location
avn	avionics
AVOW	analog voice orderwire
AXX	assign XXX routing
AZR	assign zone restriction
BITE	built-in test equipment
BNRID	basic net radio interface device
BS	bit select
btry	battery
CAP	control and alarm panel
CAP/CTL	control and alarm panel / control transfer logic
CB	common battery
CBS	common battery signaling
CBU	conference bridge unit
CCS	common channel signaling
ccs	hundred call seconds
CCS 1	common channel signaling 1 (input)
CCS 2	common channel signaling 2 (output)
CCSD	common channel signaling data
CDN	compressed dial number
CDO	conditioned diphase group
CE	communications-electronics
CEDF	common equipment distribution frame
CEF	common equipment facility
CEG	common equipment group
CEMS	Communications-Electronics Management System
CEOI	Communications-Electronics Operation Instructions
CESE	communications equipment support element
CEWI	combat electronics warfare intelligence
CG	commanding general
chan	channel
char	characteristics
ci	counterintelligence
CIR	common interface rekey
clas/class	classification
cmd	command
CNCE	communications nodal control element
CNCS	cryptonet control station
co	company
CofS	Chief of Staff
Comdt	Commandant
comm	communication
comp	compressed

compat	compatibility
COMSEC	communications security
COMXC	COMSEC transmit controller
con	control
CONAUTH	controlling authority
conf	conference
conn	connector
coord	coordinator
COSCOM	corps support command
CP	command post
CPG	central processor group
CPU	central processor unit
CSAP	call service attendant position
CSCE	communications system control element
CSM	Command Sergeant Major
CSP	call service position
CSPE	communications system planning element
CSPMD	call service position modem
CSPS	circuit switch power subsystem
CTL	control transfer logic
CTL 6	control unit 6
CVSD	continuously variable slope delta
D	digital
DA	Department of the Army
DAA	display alternate area routing lists
DAMP	digit analysis
DAS	direct access service
DC	direct current
DCG	deputy commanding general
DCR	display channel reassignment
DCS	Defense Communications System
DCXN	digital call processing
DEMUX	demultiplex/demultiplexer
dest	destination
DGM	digital group multiplex
DIB	digital in-band signaling
DIB 1	digital in-band signaling (input)
DIB 2	digital in-band signaling (output)
DIBTS	digital in-band trunk signaling
DIGPM	diphase group modem
DILPA	diphase loop modem A
DIM	digital group or supergroup modem
DINBS	digital in-band signaling system
dir	directory
DISCOM	division support command
DISGM	diphase supergroup modem
DLS	display XX routing
DME	display major equipment status
DNN	display NNX routing
DNVT	digital nonsecure voice terminal
DNX	display NNXX routing
DNY	display NYX routing
DP	dial pulsing
DPL	dipulse group

DPLSM	dipulse group modem
DPR	display PR routing
DR	digital receiver
DSB	digital in-band signaling buffer
DSCNB	digital scanner B
DSG	digital signal generator
DSVT	digital subscriber voice terminal
DTG	digital transmission group
DTGP	digital trunk group
DTMF	dual tone multifrequency
DVM	digital, voice, message
DVOW	digital voice orderwire
E	eliminate
ECOM	interprocessor communication
ECU	environmental control unit
elec	electronic
EM	E&M adapter
E&M	signaling leads in 6-wire circuit (ear-receive; mouth transmit)
emerg	emergency
EMP	electromagnetic pulse
ENCOM	engineer command
ENGBDE	engineer brigade
engr	engineer
ENH	input/output interrupts
ENH 1	input/output program 1
ENH 2	input/output program 2
ENH 3	input/output program 3
EO	equal opportunity
EOW	engineering orderwire
equip	equipment
ESCH	executive scheduler
ESTR	startup/recovery
EU	essential user
EUB	essential user bypass
evac	evacuation
EW	electronic warfare
F	Flash
fax	facsimile
FDSL	fixed directory subscriber list
FDUL	fixed directory unit list
1SG	first sergeant
FO	Flash Override
frag	fragmentary
GCLK	group clock
GCS	group clock selector
GM	group modem
GOS	grade of service
GRPBF	group buffer
HDX	half duplex
hel	helicopter
HF	high frequency
HN	home net
HQ	headquarters

HR	human relations
HSCDM	high speed cable driver modem
HSPR	high speed pulse restorer
HUS	hardened unique storage
Hz	hertz
I	Immediate
IAC	international access code
ID	identification
IG	inspector general
IMU	intermatrix unit
info	information
INID	intercept network inward dialing
I/0	input/output
intell	intelligence
intercomm	intercommunication
JANAP	Joint Army-Navy-Air Force Publications
JTF	joint task force
KB	keyboard
kbs	kilobits per second
kHz	kilohertz
KP	key pulse
KVM	key variable management
kw	kilowatts
LA	location address
LB	local battery
LCSP	local call service position
LDI	line driver interface
LGM	loop group multiplexer
LKG	loop key generator
LO	liaison officer
loc	location
LPCLK	loop clock selector
LSCDM	low speed cable driver modem
LSPR	low speed pulse restorer
LTG	local timing generator
LTU	line termination unit
M	main
maint	maintenance
MAMA	operator/machine program
MASH	mobile army surgical hospital
mbs	megabits per second
MCA	Management Control Agency
MEDCOM	medical command
MEDDEP	medical depot
MF	multifrequency
MGM	master group multiplexer
MHz	megahertz
MI	military intelligence
MIBDE	military intelligence brigade
mod	modem
MOD 21	type II-1 modem
MOD 22	type II-2 modem
MP	master panel
MPBDE	military police brigade

MPDU	master power distribution unit
MS	message switch
msg	message
MTC	magnetic tape controller
MTG	master timing generator
MTT	magnetic tape transport
MTX-G	matrix interface G
MUX	multiplex/multiplexer
MXC	matrix controller
MXRCA	matrix receiver controller A
NA	not authorized
NAC	national access code
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NCMD	nine channel multiplex/demultiplex or multiplexer/demultiplexer
net	network
NI	national identification
NICS	NATO Integrated Communications Systems
NIU	NATO interface unit
no	number
NRZ	nonreturn to zero
NSN	national stock number
NW	normal wideband
NWLTU	normal wideband line termination unit
ob	observers
OCU	orderwire control unit
off	officer
OLCOP	on-line control and operational program
ONLFD	on-line fault detection
op	operation
ord	ordnance
P	Priority
PABX	private automatic branch exchange
PBI	push-button indicator
PBX	private branch exchange
PCB	printed circuit board
PCBS	printed circuit board strap
PEP	power entry panel
pers	personnel
PERSCOM	personnel command
PIP	peripheral interface panel
plt	platoon
PNID	precedence network inward dialing
POC	point of contact
PPI	processor to processor interface
PR	primary zone
prec	precedence
preprog	preprogrammed
pri	primary
prog	progressive
PRSL	primary switch location
ps	processor
PTC	primary traffic channel

PUNT	erase memory
QM	quartermaster
qtr	quarter
R	Routine
RA	regional area
RCSP	remote call service position
RD	ringdown
rec	receive
recon	reconnaissance
restr	restrictive
rev	revision
RH	reentry home
RLGM	remote loop group multiplexer
RLGMCD	remote loop group multiplexer cable driver
RMAX	routing matrix management program
RMC	remote multiplexer combiner
RMU	receiver matrix unit
rptr	repeater
RSBMD	remote signaling buffer controller multiplexer/ demultiplexer
RWI	radio wire integration
SCAN	scanning
SCG	switching controller group
SCS	silicon-controlled switch
scty	security
SDMX	space division matrix
SDNRIU	secure digital net radio interface unit
SDSG	space division switching group
sec	section
SECP	on-line maintenance and diagnostics
SEP	signal entry panel
SF	single frequency
sig	signaling
SJA	Staff Judge Advocate
SL	switch location
SMD	switch multiplexer/demultiplexer
SN	serial number
SOP	standing operating procedure
SPCG	special circuits group
SRWBR	short-range wideband radio
SSB	SYSCON signaling buffer
SST	single subscriber terminal
STANAG	standardization agreement
STC	secondary traffic channel
supvn	supervision
survl	surveillance
sw	switch
SWMCT	switch memory control
sync	synchronization
TAA	theater Army alternate
TAACOM	theater Army area command
TAADCOM	theater Army air defense command
TACC	tactical air control center
TAMCA	Theater Army Movement Control Agency

TAMMC	theater Army materiel management center
TASG	theater Army support group
TB	technical bulletin
TC	traffic channel
TCC	tactical communications center
TCC(A)	theater communications command (Army)
TCCF	tactical communications control facility
TDMM	time division memory module
TDMX	time division matrix
TDSG	time division switching group
TDSGM	time division switching group modified
TED	trunk encryption device
tel	telephone
telecom	telecommunications
TEM	trunk encryption module
term	terminal
TGC	trunk group cluster
TGMX	trunk group multiplexer
TM	technical manual
tng	training
TOC	tactical operations center
TOE	table(s) of organization and equipment
trans	transportation
TRANSCOM	transportation command
trfc	traffic
TRI-TAC	Tri-Service Tactical Communications
TSB	trunk signaling buffer
TSBFB	trunk signaling buffer B
TTNP	tactical telephone numbering plan
TTY	teletypewriter
ULCS	unit level circuit switch
ULMS	unit level message switch
V	volt
VDU	visual display unit
VDU/KB	visual display unit/keyboard
W	wire
weco	Western Electric Company
xmit	transmit
xmsn	transmission
XO	executive officer

Definitions

AC SUPERVISION. Indication of off-hook by presence or absence of tones.

BUSY HOUR. That hour in a 24-hour period during which the traffic load offered to a switch is at a maximum.

CALL FORWARDING. Capability to forward a call via an operator.

CALL TRANSFER. Capability of having calls transferred automatically.

CIRCUIT BOARD. Printed circuit card usually capable of being unplugged.

CIRCUIT CARD. Printed circuit boards or printed circuit cards.

CLASSMARKS. Termination identifier for use, service features, security, classification, restrictions, signaling, and supervision.

COMMON BATTERY. Battery which serves as central source of energy for many circuits.

COMPRESSED DIALING. Ability to dial a 2-digit number to reach another subscriber.

DC SUPERVISION. Indication of off-hook by presence or absence of DC voltage.

DIRECT ACCESS SERVICE. Capability to call a predesignated subscriber by going off-hook.

E&M. Designation of signaling leads at a switch. E for recEiving (Ear). M for transmitting (Mouth).

ERLANG. Unit of telephone traffic numerically equal to percentage of occupancy of a trunk.

EXTRASWITCH TRUNK GROUP. Interconnects an AN/TTC-39 to a non-AN/TTC-39 switch.

FRAME RATE. The basic channel rate at which the switch operates. Either 16 or 32 kbs.

GLARE. The condition that exists when two switches simultaneously attempt to use the same trunk to access each other.

GRADE-OF-SERVICE. Probability of a call being blocked.

HOLDING TIME. Elapsed time of a telephone call.

INTERFACE. Consists of the electrical and mechanical connections, and the procedures necessary to make these connections functional.

INTERSWITCH TRUNK GROUP. Interconnects two AN/TTC-39s or AN/TTC-39 and AN/TYC-39.

KEY. A sequence of random binary digits used to set up and/or periodically change the existing electronic key settings in COMSEC equipment.

LINE. Transmission circuit.

LINE DRIVER INTERFACE. Provides logic level conversion from TTL to bipolar voltages.

LOCAL BATTERY. Source of talking power located at subscriber's telephone.

LOOP. A circuit from a switch to the subscriber.

LOOPBACK. Ability to connect transmit and receive portions at a termination.

MODEM. Single unit which combines the function of modulation and demodulation.

MODULAR. Having dimensions or characteristics which allow expansion or contraction in whole units.

OBJECTIVE SYSTEM. All-digital communication system of the future.

OFF-HOOK SERVICE. Automatic establishment of a connection between specified subscribers by lifting handset.

ORIGINATING OFFICE CONTROL. Routing method where originating office retains control of directing a call.

PRINTED CIRCUIT BOARD. Circuit card usually designed to be easily replaceable with boards with different functions. They are called PCB.

QUEUE PROCESSING. Element of software design. Events are queued as they occur and then processed.

RAMIFICATION MESSAGE. A message to the operator showing data base discrepancies and possible results. It also shows when an action cannot be taken.

RECONFIGURATION. (1) Changes made to a circuit switching network. (2) Changes made to a switch (number of matrices, cards, modules and other equipment.)

RINGDOWN. Method of signaling where one incoming signal is activated by alternating (ringing) current over the circuit.

SPILL FORWARD CONTROL. Transfer routing control on a call to a succeeding switch by sending forward the complete telephone address.

TECHNICAL CONTROL (TECH CONTROL). Central facilities used for testing, patching, troubleshooting, circuit conducting, status reporting, and technical management.

TERMINATIONS. The connection of a line to a terminal, a switch, a distribution frame or a matrix.

TRUNK. Single or multichannel communication patch between switches or switching centers.

TRUNK GROUP. Trunks which have identical characteristics - destination, signaling, and traffic route.

TRUNK GROUP CLUSTER. Set of trunks with different transmission characteristics (including analog and digital types) with the same destination.

VALIDATION. The checking of a data entry to determine its acceptability, size, and range.

WINK START. A timed off-hook signal indicating readiness to receive pulses.

REFERENCES

Required Publications

Required publications are sources that users must read to understand or comply with this publication.

Technical Manuals (TM)

11-5805-628-12	Operator's and Organizational Maintenance Manual for Automatic Telephone Central Offices AN/TTC-38(V)l and AN/TTC-38(V)2
1l-5805-681-12-Series	Operator's and OrganizationaL Maintenance Manual for Central Office, Telephone, Automatic, AN/TTC-39(V)
11-5805-681-12-1	Operator's and Organizational Maintenance Manual for Central Office, Telephone, Automatic, AN/TTC-39(V)2 through 5
ll-5805-683-12-Series	Operator's and Organizational Maintenance Manual, Central, Message Switching, Automatic, AN/TYC-39(V)
11-5805-695-12	Operator's and Organizational Maintenance Manual for Switchboard, Telephone, SB-3614(V)/TT
11-5810-329-10	Operator's Manual: DSVT, TSEC/KY-68 and Auxiliary Power Supply HYP-71/TSEC
11-5895-799-14	Operator's, Organizational, DS, and GS Maintenance Manual: Communications Technical Control Center AN/TSQ-84
750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)

Forms

DA Forms

2028	Recommended Changes to Publications and Blank Forms
5251-R	CONAUTH KVM Worksheet
5251-1-R	CNCS KVM Worksheet

DD Forms

2490-1	Network Planning and Configuration Data—Subscriber List
2490-2	Network Planning and Configuration Data—Trunk Group Cluster List
2490-3	Network Planning and Configuration Data—Loop Terminations
2490-4	Network Planning and Configuration Data—Trunk Terminations
2490-5	Network Planning and Configuration Data—Circuit Card Inventory
2490-6	Network Planning and Configuration Data—Matrix Strapping
2490-7	Network Planning and Configuration Data—Modem/Clock Strapping
2490-8	Network Planning and Configuration Data—MUX/DEMUX Strapping

2490-9	Network Planning and Configuration Data—-Normal Wideband LTU
2490-10	Network Planning and Configuration Data—Type II Modem
2490-11	Network Planning and Configuration Data—Trunk Signaling Buffer B
2490-12	Network Planning and Configuration Data—Switch Memory Control
2490-13	Network Planning and Configuration Data—-Loop Clock Selector
2490-14	Network Planning and Configuration Data—Diphase Loop Modem A
2490-15	Network Planning and Configuration Data—Switch Initialization and Classmark Worksheet
2490-16	Network Planning and Configuration Data—Conference Bridge and Call Service Position Worksheet
2490-17	Network Planning and Configuration Data—Loop Key Generator Worksheet (KG-82, Type 123)
2490-18	Network Planning and Configuration Data—Intermatrix Unit Worksheet (Type 98)
2490-19	Network Planning and Configuration Data—Signaling Equipment Work-sheet
2490-20	Network Planning and Configuration Data—Analog Loop and Trunk Worksheet
2490-21	Network Planning and Configuration Data—Digital Loop and Trunk Worksheet
2490-22	Network Planning and Configuration Data—Digital Transmission Group Worksheet.
2490-23	Network Planning and Configuration Data—Trunk Group Cluster Worksheet
2490-24	Network Planning and Configuration Data—Essential User Bypass Worksheet
2490-25	Network Planning and Configuration Data—Assign Key Location Worksheet
2490-26	Network Planning and Configuration Data—Net Rekeying Worksheet
2490-27	Network Planning and Configuration Data—Commercial Network Routing Worksheet
2490-28	Network Planning and Configuration Data—NYX Routing Worksheet
2490-29	Network Planning and Configuration Data—PR Routing Worksheet
2490-30	Network Planning and Configuration Data—NNX Routing Worksheet
2490-31	Network Planning and Configuration Data—NNXX Routing Worksheet
2490-32	Network Planning and Configuration Data—XXX Routing Worksheet
2490-33	Network Planning and Configuration Data—Alternate Area Routing Worksheet
2490-34	Network Planning and Configuration Data—SL Routing Worksheet

2490-35	Network Planning and Configuration Data—Common Pool Compressed Dial Worksheet
2490-36	Network Planning and Configuration Data—Fixed Directory Routing Worksheet
2490-37	Network Planning and Configuration Data—Individual Compressed Dial Worksheet
2490-38	Network Planning and Configuration Data—Preprogrammed Conference Worksheet
2490-39	Network Planning and Configuration Data—Digit Editing Worksheet
2490-40	Network Planning and Configuration Data—Call Inhibit Lists Worksheet
2490-41	Network Planning and Configuration Data—Secondary Traffic Channels Worksheet
2490-42	Network Planning and Configuration Data—Zone Restriction Worksheet
2490-43	Network Planning and Configuration Data—Assign Received Bypass Worksheet
2490-44	Network Planning and Configuration Data—Assign, Accommodate, and Restore Received Bypass Worksheet
2490-45	Network Planning and Configuration Data—Assign Frequency for Network Reporting Worksheet
2490-46	Network Planning and Configuration Data—Thresholds Worksheet
2490-47	Network Planning and Configuration Data—Traffic Metering Worksheet

Related Publications

Related publications are sources of additional information. They are not required in order to understand this publication.

Allied Communications Publications (ACP)

121 (US Suppl 1)	(C) Communications Instructions—General (U)

Army Regulations (AR)

380-5	Department of the Army Information Security Program
380-40	(C) Policy for Safeguarding and Controlling COMSEC Information (U)
530-2	Communications Security

COMSEC Publications

KAO-193A/TSEC	(C) Guidelines for the Use and Operation of the TRI-TAC COMSEC Equipment (U)

Field Manuals (FM)

11-23	Theater Communications Command (Army)
11-50 (HTF)	Combat Communications Within the Division (How to Fight)
11-92 (HTF)	Combat Communications Within the Corps (How to Fight)
11-486-2	Telecommunications Engineering: Traffic
11-486-3	Telecommunications Engineering: Transmission and Circuit Layout
11-486-13	Telecommunications Engineering: Digital Communications
24-1	Combat Communications
24-16	Communications-Electronics: Operations, Orders, Records and Reports
24-22	Communications-Electronics Management System (CEMS)
24-26	Tactical Automatic Switching
24-27A	(C) Communications Security Applications for TRI-TAC Equipment (U)

Technical Bulletins (TB)

380-40	(C) Key Variable Management and Cryptosetting for Electronically Keyed COMSEC Systems (U)
380-41	(O) Procedures for Safeguarding, Accounting and Supply Control of COMSEC Material

Command Publications

Command publications cannot be obtained through Armywide resupply channels. Determine availability by contacting the address shown. Field Circulars expire three years from the date of publication, unless sooner rescinded.

Field Circulars (FC)

11-92	Combat Communications Within the Corps. January 1985. Commander, USASC&FG, ATTN: ATZH-DTL, Fort Gordon, GA 30905-5070
24-3	Automatic Network Interconnectivity/Management Manual. October 1984. Commander, USASC&FG, ATTN: ATZH-DTL, Fort Gordon, GA 30905-5070

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COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - SUBSCRIBER LIST			WORKSHEET NO. P-1
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	EQUIPMENT	LINE HUNTING	DAS NO. CALLED	LOAD CON	SEC CALL	PREC	DATA USE (DVM)	HDX	MS COMPAT	FAX USE	CONF PROG PREPROG	CALL TRANSFER	COMPRESSED DIAL	ZONE RESTR	COMMERCIAL NET	EUB	FIXED DIRECTORY	CIRCUIT NO.

COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER LIST			WORKSHEET NO. P-2
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

TGC NUMBER	DTG NUMBER	CHANNELS		DESTINATION NYX-NNX(X)	DEST EQUIP-MENT	XMSN EQUIP-MENT	TRAFFIC LIMITS				GLARE	SPILL FORWARD	ACCESS TGC	CIRCUIT NUMBERS
		TRAFFIC	SIG				F	I	P	R				

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COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - LOOP TERMINATIONS			WORKSHEET NO. P-3
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

				TECHNICAL CHARACTERISTICS				SWITCH CONFIGURATION									
											MODEM/LTU				ADAPTER		
SUBSCRIBER DESIGNATION	DIRECTORY NUMBER	TERM EQUIP-MENT	TERM TYPE	2W/4W	BATTERY	SIGNALING	SUPVN	SDSG/ TDSG NO.	CABLE CONN	CABLE PAIR	TYPE	NO.	CARD SLOT	ADDRESS	TYPE	NUMBER	CARD SLOT

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NETWORK PLANNING AND CONFIGURATION DATA - TRUNK TERMINATIONS

COMMAND		WORKSHEET NO. P-4
SWITCH NO.	PREPARED BY / CHECKED BY / APPROVED BY	WORKSHEET ____ OF ____
REV NO. / DATE	REFERENCE WORKSHEETS	PAGE ____ OF ____

TGC NO	DTG NO	TRUNK NO	DEST EQUIP	TERMINAL TYPE	TED NO	OPERATIONAL TECHNICAL CHARACTERISTICS					SWITCH CONFIGURATION											
														MODEM LTU						ADAPTER		
						TGC TYPE	TRUNK RATE	NO OF CHANNELS	SIG-NALING	CABLE LENGTH	SDSG TDSG NO	CABLE CONN	CABLE PAIR	TYPE	NO	CARD SLOT	NCMD NO (S)	ADDRESS	TSB NO	TYPE	NO	CARD SLOT

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COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - CIRCUIT CARD INVENTORY			WORKSHEET NO. P-5
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ___ OF ___
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ___ OF ___

CARD TYPE	CARD NO.	NO. OF CARDS	LOCATIONS	SDSG/ TDSG/ CEG	STRAPPED	CARDS IN USE	SPARES	CARD COUNT

COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - MATRIX STRAPPING			WORKSHEET NO. S-1
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

CARD ID	SDSG OR TDSG NO.	UNIT OR CARD NO.	NEST LOC	CONFIGURATION	LOOP/BAUD RATE	STATUS	FUNCTION	STRAPS			
COMXC		A									
		B									
CTLU 6		A									
		B									
CAPO 9											
CSPMD		L									
		R1									
		R2									
		R3									
MXRCA		A									
		B									
LTG		1									
		2									
		3									
MTX - G	SDSG 1										
	2										
	3										
	4										
RSBMD	TDSG 1										
	TDSG 2										
DSCNB	TDSG 1										
	TDSG 2										

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COMMAND	NETWORK PLANNING AND CONFIGURATION DATA - MODEM / CLOCK STRAPPING			WORKSHEET NO. S-2
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

CARD ID	TDSG NO.	UNIT OR CARD NO.	NEST LOCATION	CHANNELS	LOOP RATE	CABLE LENGTH	EQUIP	CLOCK	STRAPS
GRPBF	1	1							
		2							
		3							
		4							
	2	1							
		2							
		3							
		4							
DISGM	1	1							
		2							
		3							
		4							
	2	1							
		2							
		3							
		4							
GCLK	1	1							
		2							
		3							
		4							
	2	1							
		2							
		3							
		4							

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COMMAND		NETWORK PLANNING AND CONFIGURATION DATA - MUX / DEMUX STRAPPING			WORKSHEET NO. S-3
SWITCH NO.		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO.	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

CARD ID	TDSG NO.	UNIT OR CARD NO.	NEST LOC	NO. OF NCHMX	NO. CHAN-NELS	LOOP RATE	INTER-FACE	FIRST CARD	STRAPS								
NCMD																	

CARD ID	TDSG NO.	UNITS OR CARD NO.	NEST LOC	MODU-LATOR CABLE LENGTH	DEMOD-ULATOR CABLE LENGTH	LOOP RATE	INFO RATE	RPTR POWER	STRAPS									
DPLSM	1	1																
		2																
		3																
		4																
	2	1																
		2																
		3																
		4																

CARD ID	TDSG NO.	UNITS OR CARD NO.	NEST LOC	CABLE LENGTH	LOOP RATE	NO. CHAN-NELS	RPTR POWER	STRAPS										
DIGPM	1	1																
		2																
		3																
		4																
	2	1																
		2																
		3																
		4																

NETWORK PLANNING AND CONFIGURATION DATA - NORMAL WIDEBAND LTU

COMMAND NWLTU		PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET NO S-4
SWITCH NO					WORKSHEET ____ OF ____
REV NO	DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

SDSG	CARD NO	NEST LOCATION	SUPVN	STRAPS			
				LTU 1		LTU 2	

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COMMAND MOD 21 - 22	NETWORK PLANNING AND CONFIGURATION DATA - TYPE II MODEM			WORKSHEET NO. S-5
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO. / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

SDSG NO.	MODEM NO.	NEST LOCATION	MOD 21				MOD 22											
			INTER-FACE	STRAP	EQUAL-IZER	STRAP	MODE	STRAP	BAUD RATE	STRAP	XMIT DATA	STRAP	XMIT CLOCK	STRAP	REC DATA	STRAP	REC CLOCK	STRAP

DD Form 2490-10, FEB 87

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COMMAND TSBFB	NETWORK PLANNING AND CONFIGURATION DATA - TRUNK SIGNALING BUFFER B			WORKSHEET NO S-6
SWITCH NO.	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

TDSG NO	NEST LOCATION	INTERFACE	TSB BIT RATE	SWITCH BIT RATE	TRUNK BIT RATE	STRAPS		

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COMMAND SWMCT			NETWORK PLANNING AND CONFIGURATION DATA - SWITCH MEMORY CONTROL				WORKSHEET NO S-7
SWITCH NO.			PREPARED BY	CHECKED BY	APPROVED BY		WORKSHEET ___ OF ___
REV NO.	DATE		REFERENCE WORKSHEETS				PAGE ___ OF ___

TDSG NO	NEST LOC	TDMM NO.	STRAPS				

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COMMAND LPCLK	NETWORK PLANNING AND CONFIGURATION DATA - LOOP CLOCK SELECTOR			WORKSHEET NO S-8
SWITCH NO	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET OF
REV NO / DATE	REFERENCE WORKSHEETS			PAGE OF

TDSG NO	NEST LOCATION	CARD NO	LOOP CLOCK	STRAPS					

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42-027

COMMAND DILPA	NETWORK PLANNING AND CONFIGURATION DATA - DIPHASE LOOP MODEM A			WORKSHEET NO. S-9
SWITCH NO	PREPARED BY	CHECKED BY	APPROVED BY	WORKSHEET ____ OF ____
REV NO / DATE	REFERENCE WORKSHEETS			PAGE ____ OF ____

TDSG NO	CARD NO	NEST LOCATION	CONNECT / DISCONNECT -56 V	STRAP

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NETWORK PLANNING AND CONFIGURATION DATA - SWITCH INITIALIZATION AND CLASSMARK WORKSHEET

ASI / ASC	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-1 / D-4

ASI

- SDSG MATRIX SIZE (0 - 4)
- TDSG MATRIX SIZE (1 - 4)
- SINGLE SHELTER SWITCH (Y = Yes, N = No)
- NUMBERING PLAN (3/4 or 4/3)
- 16/32 KBS SWITCH
- TIME
  DAY 1 - 366
- HOUR 0 - 23
- MINUTE 0 - 59
- TENTHS OF MINUTES 0 - 9

FOR 3/4 NUMBERING PLAN, ALSO INCLUDE:

- ABBREVIATED DIAL (Y = Yes, N = No)
- LOCAL SUBSCRIBER CODE (NNXG)

ASC

- ALTERNATE ROUTING (Y = Yes, N = No)
- GATEWAY CLASSMARK (Y = Yes, N = No)
- NN CODE FOR TTC - 30 TRUNKS
- SATELLITE LINKS (1 - 4)
- NATO HOMEAREA (9YX)
- SWITCH SUPERVISOR LOOP DIGITS
- SSB RESET Y = YES, N = NO (Always displayed as N)
- TCCF INTERCEPT (Y = Yes, N = No)
- TCCF ELEMENT ID
- TCCF AUTO (Y = Yes, N = No)
- PERIODIC REPORT PRINT (Y = Yes, N = No)

DD Form 2490-15, FEB 87

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NETWORK PLANNING AND CONFIGURATION DATA - CONFERENCE BRIDGE AND CALL SERVICE POSITION WORKSHEET

ATT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-2A

CONFERENCE BRIDGE (TYPE 95, 120)								CALL SERVICE POSITION SDMX/TDMX (TYPE 96, 121)							
			MATRIX ADDRESSES												
EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	EQUIPMENT TYPE	UNIT NUMBER	IN/OUT SERVICE	VOICE PORT 1	VOICE PORT 2	TDMX SIGNAL TERMINAL	DIRECTORY NUMBER	DIGITAL RECEIVER UNIT NO

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NETWORK PLANNING AND CONFIGURATION DATA - LOOP KEY GENERATOR WORKSHEET

(KG - 82, TYPE 123)

ATT	PRSL / NNX		SW LOCATION		DATE	REV NO.		PREPARED BY		CHECKED BY		PAGE ____ OF ____		D-2B
EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN/ OUT SER- VICE	CIPHER TERMINAL	PLAIN TERMINAL

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NETWORK PLANNING AND CONFIGURATION DATA - INTERMATRIX UNIT WORKSHEET
(TYPE 98)

ATT	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-2C

EQUIPMENT TYPE	UNIT NUMBER	IN / OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL	EQUIPMENT TYPE	UNIT NUMBER	IN / OUT SERVICE	SDMX TERMINAL	TDMX TERMINAL

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49/027

NETWORK PLANNING AND CONFIGURATION DATA - SIGNALING EQUIPMENT WORKSHEET

ATS	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-3A

TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE	TERMINAL ADDRESS	TERMINAL TYPE	UNIT NUMBER	IN/ OUT SER-VICE

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53/027

NETWORK PLANNING AND CONFIGURATION DATA - ANALOG LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-3B

										ANALOG LOOPS																
										DAS																
CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIGNATION	TYPE CIRCUIT	TYPE EQUIPMENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCATION	ADAPTER TYPE/LOCATION	TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/OUT SERVICE	ADAPTER NUMBER	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL CLASS	COMP DIAL LIST	ZONE RESTRICTION	PREPROG CONF ONLY	COMMERCIAL NET ACCESS
	1-2																									
	3-4																									
	5-6																									
	7-8																									
	9-10																									
	11-12																									
	13-14																									
	15-16																									
	17-18																									
	19-20																									
	21-22																									
	23-24																									

NWLTU			
MP NUMBER	SDSG	CABLE	
BOTTOM CIRCUIT		TOP CIRCUIT	
AC J11-J12 J8-J9	DC J13-J12 J10-J9	AC J5-J6 J2-J3	DC J7-J6 J4-J3

ANALOG TRUNKS														
							39 TRUNK					NON 39		
TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	TSB NUMBER MASTER/SLAVE TYPE II MODEM	SATELLITE TRUNK	IN/OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE	ADAPTER NUMBER	ECHO SUPPRESSOR NO	XMSN TYPE

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NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL LOOP AND TRUNK WORKSHEET

ATS	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-3C

										DIGITAL LOOPS																				
										DAS																				
CCSD CIRCUIT NUMBER	CABLE PAIR	OFFICE DESIG-NATION	TYPE CIRCUIT	TYPE EQUIP-MENT	TECHNICAL CHARACTERISTICS	LTU TYPE	LTU STRAP	CARD LOCA-TION	NCMD NO/ LOCA-TION	TERMINAL ADDRESS	TERMINAL TYPE	DIRECTORY NUMBER	LINE HUNT GROUP	DAS CALLED NUMBER	TRAFFIC CONTROL LOAD	SECURE CALL	MAXIMUM PRECEDENCE	IN/ OUT SERVICE	TERM CHAR	16 KBS HDX	MS COMPATIBLE	FAX	MS TYPE 2	PROGRESSIVE CONF	CALL TRANSFER	COMP DIAL CLASS	COMP DIAL LIST	ZONE RESTRICTION	CONF PREPROG ONLY	NET COMMERCIAL ACCESS
	1 - 2																													
	3 - 4																													
	5 - 6																													
	7 - 8																													
	9 - 10																													
	11 - 12																													
	13 - 14																													
	15 - 16																													
	17 - 18																													
	19 - 20																													
	21 - 22																													
	23 - 24																													

LOOP CLOCK LOCATION		
MP NO	TDSG	CABLE

STRAP	
RED	BLACK
J14 - 15	J2 - 3
J16 - 17	J4 - 5
J18 - 19	J6 - 7
J20 - 21	J8 - 9
J22 - 23	J10 - 11
J24 - 25	J12 - 13

SEE LPCLK WORKSHEET

DILPA	
56 V ON J2 - J3	56 V OFF J3 - J4

TERMINAL ADDRESS	TERMINAL TYPE	TGC NUMBER	PATH DELAY	SATELLITE TRUNK	IN/ OUT SERVICE	TRUNK NUMBER	16 KBS TRUNK	MS TRUNK	MS TRUNK CHAR	XMSN TYPE

DIGITAL TRUNKS

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490/027

NETWORK PLANNING AND CONFIGURATION DATA - DIGITAL TRANSMISSION GROUP WORKSHEET

ADT	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-5

DATA ENTRY								PLANNING INFORMATION				
DTG NUMBER	MESSAGE SWITCH DTG	START NCMD	END NCMD	KG - 81	SYNC DELAY	IN/OUT SERVICE	AUTO SYNC DESIRED	NUMBER OF CHANNELS	MODEM TYPE	REPEATER IN USE	CABLE LENGTH	REMARKS

DD Form 2490-22, FEB 87

82027

NETWORK PLANNING AND CONFIGURATION DATA - TRUNK GROUP CLUSTER WORKSHEET

ATG	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-6

												INTERSWITCH										PBX				DIBITS					
TGC NO.	CLUSTER TYPE	SPILL FORWARD	DESTINATION	NYX	ZONE RESTRICTION	ACCESS TGC	TRAFFIC LIMITS	F	I	P	R	KEY CHANGE	GEAR	TSB NO	MESSAGE SWITCH TGC	CALL INHIBIT	DIGITAL TSB TDMX ADDRESS	PRIMARY SIG CHANNEL	SECONDARY SIG CHANNEL 1	SECONDARY SIG CHANNEL 2	SECONDARY SIG CHANNEL 3	NO OF OUTGOING DIGITS	MAXIMUM PRECEDENCE	SWITCH CODE NNXX	TRAFFIC LOAD CONT LEVEL	MAXIMUM PRECEDENCE	TRAFFIC LOAD CONT LEVEL	GEAR	CALL INHIBIT	SWITCH CODE	COMMERCIAL NET ACCESS

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302/027

NETWORK PLANNING AND CONFIGURATION DATA - ESSENTIAL USER BYPASS WORKSHEET

AEU	PRSL/NNX	SW LOCATION	DATE	REV NO	PREPARED BY	CHECKED BY	PAGE ____OF____	D-7

SUBSCRIBER	SUBSCRIBER NO	ADDRESS		SUBSCRIBER	SUBSCRIBER NO.	ADDRESS	
		FROM	TO			FROM	TO

DD Form 2490-24, FEB 87

39027

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN KEY LOCATION WORKSHEET

AVL	PRSL / NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ____ OF ____	D-8
COMSEC ID	DIR NO / BS LA	TYPE	NET NO.	COMSEC ID	DIR NO / BS LA	TYPE	NET NO.	COMSEC ID	DIR NO / BS LA	TYPE	NET NO.

DD Form 2490-25, FEB 87

S4027

NETWORK PLANNING AND CONFIGURATION DATA - NET REKEYING WORKSHEET

ANR	PRSL/NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ____ OF ____	D-9
METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER	METHOD	REKEY CYCLE NUMBER	CURRENT NET NUMBER	NEW NET NUMBER

DD Form 2490-26, FEB 87

56/027

NETWORK PLANNING AND CONFIGURATION DATA - COMMERCIAL NETWORK ROUTING WORKSHEET

ACN	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-10

			PRIMARY TGC
			ALTERNATE 1
			ALTERNATE 2
			ALTERNATE 3
			ALTERNATE 4
			ALTERNATE 5

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34/027

NETWORK PLANNING AND CONFIGURATION DATA - NYX ROUTING WORKSHEET

ANY	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-11

NYX CODE	HOME	FOREIGN	NATO	DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NYX CODE	HOME	FOREIGN	NATO	DESIGNATION	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

NETWORK PLANNING AND CONFIGURATION DATA - PR ROUTING WORKSHEET

APR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____OF____	D-12

NN CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NN CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

NETWORK PLANNING AND CONFIGURATION DATA - NNX ROUTING WORKSHEET

ANN	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-13

SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	SWITCH CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

NETWORK PLANNING CONFIGURATION DATA - NNXX ROUTING WORKSHEET

ANX	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-14

NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	NNXX CODE	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

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43/027

NETWORK PLANNING AND CONFIGURATION DATA - XXX ROUTING WORKSHEET

AXX	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-15

XXX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XXX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

66/027

NETWORK PLANNING AND CONFIGURATION DATA - ALTERNATE AREA ROUTING WORKSHEET

AAA	PRSL / NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ___ OF ___	D-16
ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC	ALTN AREA CODE	SWITCH CODE/ NAC	1ST TGC	2D TGC

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51/027

NETWORK PLANNING AND CONFIGURATION DATA - SL ROUTING WORKSHEET

ASL	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-17

XX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5	XX CODE	HOME	FOREIGN	PRI TGC	ALTN 1	ALTN 2	ALTN 3	ALTN 4	ALTN 5

NETWORK PLANNING CONFIGURATION DATA - COMMON POOL COMPRESSED DIAL WORKSHEET

ACP	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-18

LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER	LIST NO.	CDN	DIRECTORY NUMBER
	20			40			60			80	
	21			41			61			81	
	22			42			62			82	
	23			43			63			83	
	24			44			64			84	
	25			45			65			85	
	26			46			66			86	
	27			47			67			87	
	28			48			68			88	
	29			49			69			89	
	30			50			70			90	
	31			51			71			91	
	32			52			72			92	
	33			53			73			93	
	34			54			74			94	
	35			55			75			95	
	36			56			76			96	
	37			57			77			97	
	38			58			78			98	
	39			59			79			99	

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NETWORK PLANNING AND CONFIGURATION DATA - FIXED DIRECTORY ROUTING WORKSHEET

AFD	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-19

LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD	LIST TYPE	INDEX CODE	DIRECTORY NUMBER	SIGNAL FORWARD

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43/027

NETWORK PLANNING AND CONFIGURATION DATA - INDIVIDUAL COMPRESSED DIAL WORKSHEET

AIC	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-20

CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8	CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8	CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8	CDN	SUBSCRIBER DIRECTORY NO.	SUBSETS 1	2	3	4	5	6	7	8
20										40										60										80									
21										41										61										81									
22										42										62										82									
23										43										63										83									
24										44										64										84									
25										45										65										85									
26										46										66										86									
27										47										67										87									
28										48										68										88									
29										49										69										89									
30										50										70										90									
31										51										71										91									
32										52										72										92									
33										53										73										93									
34										54										74										94									
35										55										75										95									
36										56										76										96									
37										57										77										97									
38										58										78										98									
39										59										79										99									

NETWORK PLANNING AND CONFIGURATION DATA - PREPROGRAMMED CONFERENCE WORKSHEET

APC	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-21

PREPROG CONF GROUP NO	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK	PREPROG CONF GROUP NO.	SECURITY REQUIRED	MEMBER DIRECTORY NUMBERS	INITIAL CLASSMARK

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NETWORK PLANNING AND CONFIGURATION DATA - DIGIT EDITING WORKSHEET

ADE	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-22

NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE	NYX, NNX OR NNXX CODE	LOOP AROUND EQUIPMENT	EDIT TYPE	PREFIX CODE

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50/027

NETWORK PLANNING AND CONFIGURATION DATA - CALL INHIBIT LISTS WORKSHEET

ACI	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-23

NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E	NYX AREA CODE	START NNX	END NNX	E

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51/027

NETWORK PLANNING AND CONFIGURATION DATA - SECONDARY TRAFFIC CHANNELS WORKSHEET

AST	PRSL / NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-24

PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE	PTC TERMINAL ADDRESS	STC 1	STC 2	STC 3	IN / OUT SERVICE

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NETWORK PLANNING AND CONFIGURATION DATA - ZONE RESTRICTION WORKSHEET

AZR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-25

LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE	LIST NUMBER	PERMISSIVE / RESTR	START CODE	END CODE	ELIMINATE

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102/027

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN RECEIVED BYPASS WORKSHEET

ARB	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____OF____	D-26

SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.	SWITCH CODE	GXXX/ GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NO.

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49/027

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN, ACCOMMODATE, AND RESTORE RECEIVED BYPASS WORKSHEET

AAR	PRSL/NNX	SW LOCATION		DATE	REV NO.	PREPARED BY		CHECKED BY		PAGE ____ OF ____	D-27
SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER	SWITCH CODE	GXXX/GXX	MATRIX LOCATION	TERM TYPE	SCTY	ADAPTER NUMBER

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52/027

NETWORK PLANNING AND CONFIGURATION DATA - ASSIGN FREQUENCY FOR NETWORK REPORTING WORKSHEET

AFR	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-28

☐☐ ID

☐☐ FREQUENCY ADJUSTMENT

ID			
48 = R3	CALLS TO OPERATOR		
49 = R4	TGC CALLS BY PRECEDENCE		
50 = R5	INDIVIDUAL TRUNK GROUP STATUS		
51 = R6	TGC(S)/CALLS PREEMPTED		
74 = R27	DTG(S)/AVERAGE ERROR RATE(S)		
92 = R44	CALLS OFFERED		
95 = R47	CALLS OFFERED TO REMOTE SWITCH(ES)		

TIME (MINUTES)
7 = 15
8 = 30
9 = 60
12 = 240
14 = 480
16 = 1440

NETWORK PLANNING AND CONFIGURATION DATA - THRESHOLDS WORKSHEET

ATH	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ___ OF ___	D-29

	NORMAL ENTRY	RANGE OF ENTRIES
DIAL TONE TIME-OUT	10 SECONDS	0 - 300
NEXT DIGIT TIME-OUT	10 SECONDS	0 - 300
RELEASE TIME-OUT	10 SECONDS	0 - 300
RING / RINGBACK TIME-OUT	180 SECONDS	0 - 300
LOCKOUT STATE OUT-OF-SERVICE TIME-OUT	60 SECONDS	0 - 300
PRECEDENCE VIOLATION ANNOUNCEMENT TIME-OUT	10 SECONDS	0 - 300
TRAFFIC LOAD CONTROL TIME-OUT	1 MINUTE	1 - 15 MINUTES
TRAFFIC LOAD CONTROL THRESHOLD 2	2047 CALLS	0 - 2047
TRAFFIC LOAD CONTROL THRESHOLD 3	2047 CALLS	0 - 2047
TRAFFIC LOAD CONTROL THRESHOLD 4	2047 CALLS	0 - 2047
TRAFFIC LOAD CONTROL THRESHOLD 5	2047 CALLS	0 - 2047
OTHER TIME-OUT NUMBER	SEE TEXT	1 - 9
OTHER TIME-OUT VALUE	SEE TEXT	0 - 300

NETWORK PLANNING AND CONFIGURATION DATA - TRAFFIC METERING WORKSHEET

ATM	PRSL/NNX	SW LOCATION	DATE	REV NO.	PREPARED BY	CHECKED BY	PAGE ____ OF ____	D-30

15, 30, 60, 240, 480, 1,440 MINUTES

__________ MODIFY (None = 1; Interval + Loops = 2; Trunks = 3; All = 4)
__________ LOOP REPORT INTERVAL (15, 30, 60, 240, 480, 1,440 Minutes)

LOOPS	TGC NUMBERS					LOOPS	TGC NUMBERS				

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27 FEBRUARY 1987

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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