

European Command and Control Console System

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Headquarters U.S. ARMY STRATEGIC COMMUNICATIONS COMMAND
by ITT FEDERAL LABORATORIES

INTRODUCTION

Versatile and dependable communication systems are the principal requisite of quick reaction defense installations. The European Command and Control Console System was developed to be completely responsive to the priority conferencing requirements of US and US/NATO military activities throughout the European Theater.

This brochure has been prepared to present a description of the Console System, and details of the constituent equipment elements. It is intended to show the comprehensive command and control capabilities of the Console System afforded by advanced supervisory control and status reporting, and circuit switching techniques.



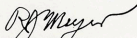
HEADQUARTERS
U.S. ARMY STRATEGIC COMMUNICATIONS COMMAND
WASHINGTON, D.C. 20315

SCCET

SUBJECT: European Command & Control Console System

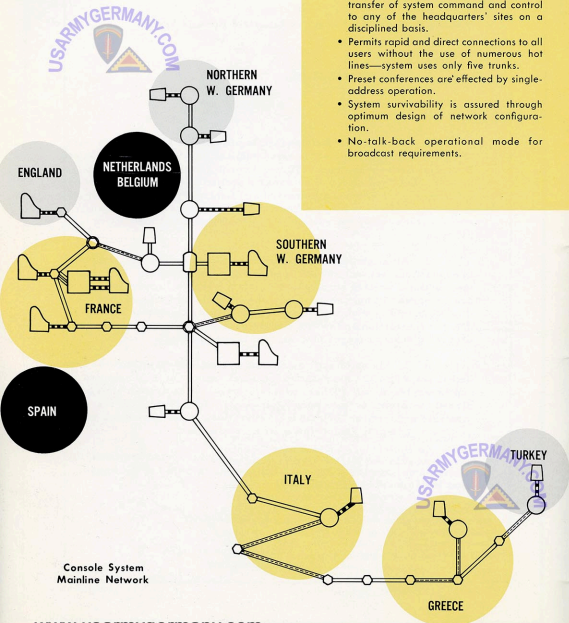
TO: SEE DISTRIBUTION

1. It is my extreme pleasure to present the United States Army Strategic Communications Command publication - "European Command & Control Console System." The equipment system described in this brochure has been designed as a major portion of the technical support required for the European Command and Control System. The purpose of this brochure is to present the capabilities of this sophisticated communications control system and to elicit specific constructive comment.
2. Although the basic design is now "frozen" and the equipment in production, several retrofit modifications are planned. Whenever the functional system requirements dictate additional modifications, we are prepared to implement these changes on a similar basis; however, this equipment system will generate the need for functional system design reevaluation and in this context care should be exercised in proposing design changes both functional and technical.
3. In this solid state automated system the communicator himself is not a "middle man" in the technical support of the Command and Control System. Rather, precise control of the system element is directly available to "war room" personnel. In turn this will place the strategic and tactical commanders' operations staffs in a better position to develop and fully exploit the system capabilities.
4. Accordingly, I anticipate that a sophisticated system of this nature cannot be static, but must be dynamic in terms of the future. That future must be defined.


R. J. MEYER
Major General, USA
Commanding

DISTRIBUTION: Special

- Capability to rapidly interconnect all users for command direction.
- Continuously updates system status display at all control center locations.
- Operational flexibility allows pushbutton transfer of system command and control to any of the headquarters' sites on a disciplined basis.
- Permits rapid and direct connections to all users without the use of numerous hot lines—system uses only five trunks.
- Preset conferences are effected by single-address operation.
- System survivability is assured through optimum design of network configuration.
- No-talk-back operational mode for broadcast requirements.



Console System
Mainline Network

EUROPEAN THEATER CONFERENCING NETWORK

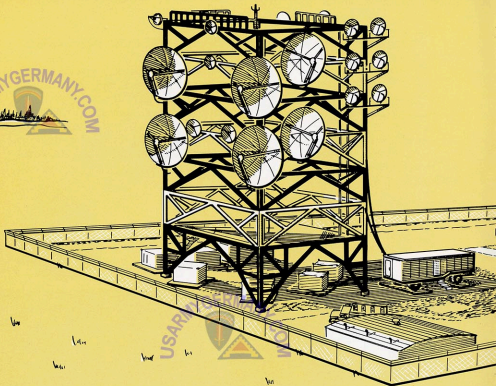
Military operations in the European Theater require rapid, direct and reliable voice communications between headquarters' locations and associated defense installations. In periods of emergency, the control centers and field installations must be quickly interconnected for priority addresses. The Console System permits a designated control center to rapidly establish circuits to any or all users of this European Theater conferencing network.

Until a few years ago, such a conference system could be assembled only on a manual basis. At the distant stations of the various circuits, switchboard operators would be required to perform cord-switching operations for each conferee to connect control centers and tributary locations. However, the increasing speed of military operations requires more rapid and direct communication links than such facilities can provide. Now, through the use of digital control circuits, the Console System can directly establish theater-wide master conferences and present status data that indicates the disposition of all connected parties. Not only does the Console System permit all users to be immediately interconnected, *but also provides a selection of preset conference arrangements that interconnect programmed conferees.* Random conferencing capabilities allow local operators to establish unprogrammed conferences and to modify the composition of preset conferences on a demand basis. All conferences may be es-

tablished for either talk-back or no-talk-back modes of operation.

Five dedicated mainline trunks of the ET-A and 486L long-haul communication networks constitute the backbone transmission links of the Console System. Broadband multichannel microwave equipment is utilized in the transmission links. The concept of the Console System is unique to a long-haul communications network in providing automatic switching and communications via transmission links.

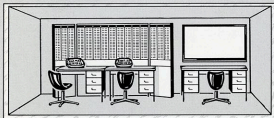
The Console System permits all control centers to operate the conferencing network independently. However, a designated control center maintains command of the system and may seize any or all conferencing circuits for emergency use. This pre-emptive type of switching allows an over-all reduction in the number of hot lines necessary to operate this theater-wide conferencing network.



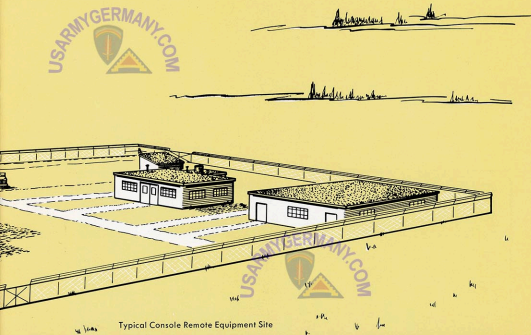
SYSTEM DELINEATION

Each control center of the Console System consists of an Operations Center and a Local Equipment Van. The Operations Center equipment is installed in a permanent building at primary headquarters' locations (normally in the War Room) and in a van at alternate locations. The system is equipped for the control of up to 240 tributary stations as well as a nominal number of telephones in each local area, and is expandable to 999 subscribers.

The system arrangement allows the grouping of tributaries to provide the most effective command communications commensurate with the quantity and complexity of equipment. Each tributary group is assigned to a nodal point station referred to as a Remote Equipment Van. Up to 24 tributaries can be accommodated by a Re-



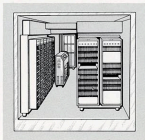
Operations Center



Typical Console Remote Equipment Site

mote Equipment Van. All Local Equipment and Remote Equipment sites are bridged across five dedicated trunks that carry all Console System mainline communications. The console mainline equipments are permanently bridged to allow conference access without switching or otherwise interrupting mainline traffic. The tributaries are serviced as spurs from the Console Remote Equipment sites.

The mainline trunks are utilized as dedicated interstation channels interconnecting the Console System. At any time the channels may be individually assigned to any system function. At the console local equipment sites, the terminating circuitry is the operator and local drop telephone equipment, while at the console remote sites it consists of spurs to tributary sites.



Local Equipment Van

THE OPERATIONAL CONCEPT

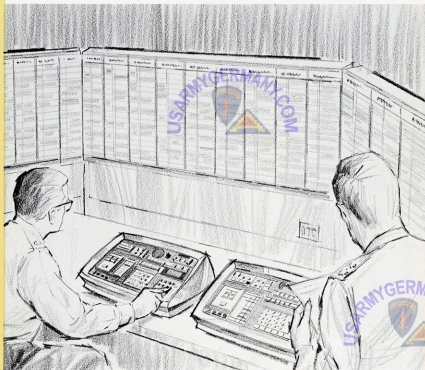
The Console System will establish up to four simultaneous telephone conferences, each of which may include any number of conferees. These conferences are established by means of the operator's console. Identical units are utilized at each Operations Center.

The console is used by the operator to enter instructions into the system so that the necessary connections can be established between stations. The status wall display provides a listing of all the network stations and displays the incoming requests and status information associated with each user. A cluster of visual indicators is associated with each station entry and serves to display the normal signaling and supervisory functions such as those associated with telephone circuits. Additionally, each busy station is identified with one of the four trunk circuits by means of colored lamps.

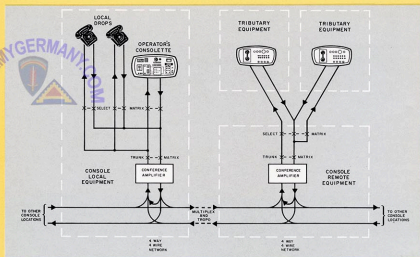
The Console System provides automatic communications capabilities between system users under the supervision of designated command and control headquarters. Operations Centers of graded seniority

participate in operation of the system. Through control console, operators have rapid and continuous communications access to local drop circuits and tributary sites.

The system is under command of a single Operations Center which has priority use of the system supervisory command channel. The remaining console local equipments will be in a NON COMMAND mode of operation. To provide organizational flexibility or during emergency circumstances, command of the system can be transferred to any one of the other Operations Centers. Whenever the system control is idle (floating), one of the STANDBY operators can obtain control of the system. The supervisory trunk can then be used by that operator to set up the desired communications. Upon completion the operator releases the supervisory command channel and allows control to be taken by one of the other console locations. However, in accordance with the command concept, the IN COMMAND operator can pre-empt control of the system by simply pressing the console CONTROL switch.



... conferences are established by means of the operator's consolette and status wall display



Conference Circuit Connections

CONFERENCING

Conferencing may be accomplished either on a pre-programmed basis or by building up a conference—adding tributaries, consoles, and local drops as required.

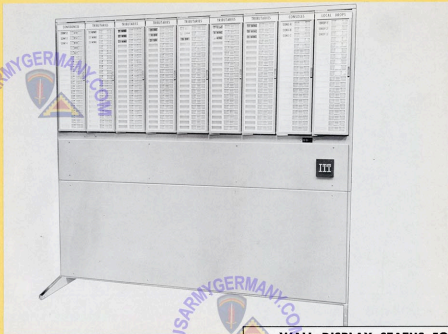
A master conference, the highest priority call, may be connected at any time by the IN CONTROL operator to a busy or ready circuit. Every tributary and console site in the system is automatically signalled and connected to the master conference circuit, pre-empting all other conferences. Local drops are addressed and connected to all conferences only by the operator of the console local site which services them.

A preset conference call may be connected to a ready circuit or added to a busy circuit. An addressed preset conference consists of tributaries and consoles which are programmed on a conference patch panel. A maximum of seventeen preset conferences and one master conference can be programmed. Again, local drops must be addressed and connected to the conference by

their respective console operators. The number of addresses connected to a preset conference may be modified for a particular connection by the IN CONTROL operator; individual subscribers may be added to or disconnected from a preset conference.

A built-up conference is established by adding tributaries, consoles, and local drops to a conference circuit, as requested. Each subscriber must be individually addressed and connected.

System operation accommodates two modes of conferencing. One is the arrangement where every member of the network can talk to or receive from all other members (TALK BACK); the other is with conferees connected by their receive paths permitting only the calling party to transmit (NO TALK BACK). In the course of any conference the mode may be switched from TALK BACK to NO TALK BACK. During this broadcast condition, a request for an automatic digital acknowledgment can be made for any voice command.



STATUS REPORTING

Continually updated status information is received at the console local sites from all system stations via the supervisory status channels. The data is decoded in local equipment logic circuitry and simultaneously compiled at all Operations Centers on wall displays. The status data contains all information descriptive of identity and state for the system's terminations and users. Since lamp indicators provide the interface between the system state and operator, it is important that information be displayed in a manner which is consistent with the anticipated type of operator response. To accomplish this, all conditions requiring immediate operator action are displayed in transient sequences (flashing slow or fast), while states which

WALL DISPLAY STATUS FORMAT

<i>Color</i>	<i>Temporal Pattern</i>	<i>Definition</i>
White	Steady on	Station idle, may be reached
White	Fast flashing	Station is being called by operator has not yet responded
Green	Steady on	Busy
Green	Fast flashing	Request for operator service, or recall if one of circuit indicators on wall display is also lit
Green	Slow flashing	Station is receiving "standby"
Yellow	Fast flashing	Priority request for service
Red	Steady on	Out of service, acknowledged
Red	Fast flashing	New failure, not acknowledged by operator
Unlighted		Lamp failure

can exist for indeterminate periods without requiring action are displayed in a steady condition. An individual wall display panel is provided for each tributary, each local drop served, each preset conference, and each console local. All information pertaining to a particular user or conference is displayed on a single panel using the listed wall display status format.

COMMAND AND CONTROL SWITCHING

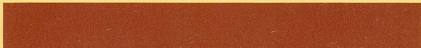
Command and control instructions are communicated between local, remote, and tributary sites using a number of carrier telegraph tone channels within the voice band. These channels may occupy the entire voice band, as in the case of the supervisory and ready circuits, or they may be used singly on a speech-plus-duplex basis. All supervisory and ready command signals emanate from the IN COMMAND console via programmed tone circuits. Each of the console local sites have identical command and control equipment.

The supervisory channel issues and receives commands to and from all sites to establish talking paths, to update the system status displays, and to verify the qual-

ity of the supervisory trunk.

The ready channel issues commands to all mainline sites to select a new circuit, to identify the circuit it is on, to establish the system's next talking path, to update its own status, and to verify the quality of the ready trunk transmission and reception.

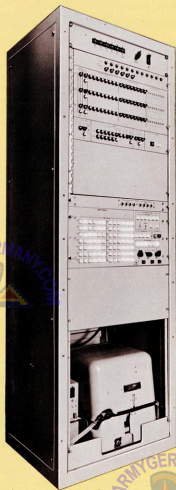
Command of the system is maintained by one console site only, but the command frequency transmitter of this site may be accessed by any one of the standby console local sites. The console in control can only be pre-empted by the command operator; otherwise an operator must relinquish control before another can take control. Command may be transferred between console local equipments on a pre-arranged schedule or to accommodate emergency situations.





FAULT SUMMARY

A fault status condition is displayed at the fault summary display of the local fixed maintenance cabinet. The fault summary indicators show when the power to any unit has failed and when the logic signaling is faulty. Another section of the panel gives an indication of why the logic is faulty, while a third group of indicators locates the type and location of a system fault. Using a combination of indications, sufficient information is presented to make a comprehensive fault diagnosis of the malfunction. When a fault occurs, a large red fault indicator lights and a buzzer sounds in the Local Equipment Van and at the sites maintenance van. The Remote Equipment Vans have maintenance cabinets housing circuitry which is functionally similar to the local equipment.



Fixed Maintenance Cabinet

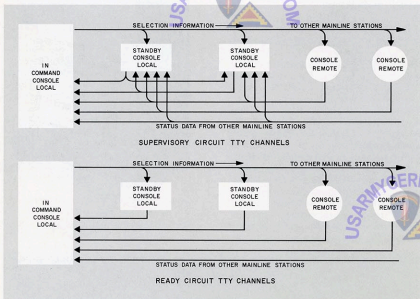


SYSTEM CONTROL CIRCUITS

System control of console local and remote equipment operation is accomplished by the supervisory and ready data circuits. The supervisory teletype circuit is a 24-channel FSK multiplexed system, each channel capability being 60 wpm (45 baud). One of the TTY channels is assigned the supervisory command function. Other TTY channels in the group are assigned, one to each node and console, for the purpose of reporting status and supervisory information. The supervisory data may be transmitted on any one of the five system mainlines; the other four would be utilized as conference circuits. The supervisory channel controls select matrix connections, tributary signaling messages, and trunk matrix disconnects.

The ready channel designates which conference channel is ready to be used in setting up the next system talking path. If the system line designated as the Conference A channel is ready, the IN COMMAND console site is transmitting an FSK tone on that system line to all console sites; all console sites are returning a tone over the same line to the IN COMMAND console site; consequently, an operational transmit and receive path is available. The ready channel controls trunk matrix connections and in addition, parallels supervisory channel operation when an emergency master conference is initiated. Initial connection of supervisory and ready command transmitters to system lines is detected by the per-line supervisory and ready channel detectors. This information is then fed to the trunk matrix control which acts to connect the proper receive data circuits to their respective lines.

The ready channel designates which con-



SUPERVISORY SIGNALING

Control of system operation is asserted by means of the supervisory command message, which is generated by the console local equipment that is IN CONTROL. It is by means of this message that all conference connections are established, all instructions and orders pertaining to system operation are issued, and established connections are broken down. The generation of the supervisory command message is governed by the controls of the operator console.

The instructions for system operation originating with the IN CONTROL operator are introduced into the system through the use of the consolette pushbuttons. Operation of the pushbuttons causes the information to be inserted into storage circuits in the console local equipment. The lighting of indicator lamps on the consolette confirms that the information is contained in the storage circuits. The storage feature allows the operator to inspect the makeup of a message before placing it on the line. This permits a set-check-send routine by the operator in which he sets instructions, checks equipment response, and finally transmits the supervisory information.

The retention of the supervisory command message in storage remains under the control of the operator. Not until he presses the EXECUTE pushbutton will the supervisory command message be transferred to the line from storage. The message is released serially from storage to the command channel information selector. To further guard against generating erroneous messages, the individual characters that constitute the outgoing message are checked for parity before transmission. Any error will suspend the generation of the supervisory command message and will cause a fault signal to be produced.

Throughout the Console System, status

and command information must be exchanged between the component equipments of which the system is comprised. This information in the form of digital characters, is converted into audio frequency-shifted signals in a standard teletype (TTY) code and processed to modulate an rf carrier. Upon reception of the transmitted signals, the TTY information is extracted from the rf carrier and reconverted into digital characters. Data to be exchanged is first encoded into eight-digit characters consisting of six data bits, and start and stop bits for inter-equipment message synchronization. In order to eliminate any errors introduced during transmission, the three-out-of-six code used is checked for parity before being accepted by the receiving equipment. To increase the capacity so that the required exchange of information can be accommodated, the transmitted characters are arranged in a time-division sequence message frame. With such an arrangement, the significance attached to a character depends not only on the data bit coding, but also on the position occupied by the character in the message.

The Console System makes use of a variety of frame, or message formats. A 44-character format is used to provide control and status information from remote equipment to tributary equipment and to report status of tributaries to the local equipment. Status information from each tributary serviced by a single remote equipment uses a discrete message format directly related to the 44-character format received from the remote equipment. At the local equipment, information is assembled into one of three message formats depending on the information being encoded. In addition, the system uses a ready circuit acknowledge signal to denote the condition of the ready signal. Unlike other messages, this signal does not use digitally encoded characters, but rather employs one of the two FSK tones to transfer information.

SYSTEM ELEMENTS

LOCAL EQUIPMENT

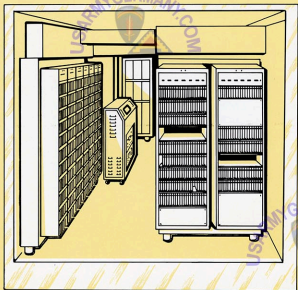
The console local equipment establishes the nerve center for system operations. Essentially, it consists of a control Operations Center and a mobile Local Equipment Van. The van contains the logic and signaling circuitry that responds to commands from the Operations Center, processes voice communications, and reports system status. Included in the classification of local equipment are local drop telephones which may be interconnected to each other, and to tributary sites throughout the system. The local equipment implements performance of the listed Console System functions.

CAPABILITIES

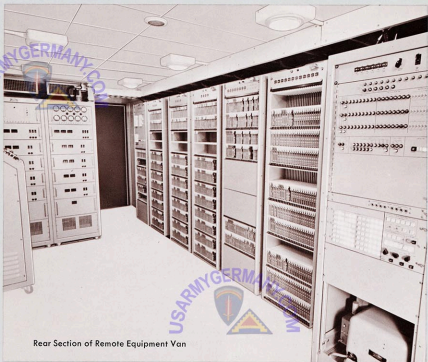
- Issue commands to the system to establish, modify, and terminate calls.
- Accept commands from the system and act on them to the extent that they pertain to the site at which the van is located.
- Accept and process status information from all sites.
- Display status of all system sites on the status display for use by the operators.
- Accept input commands from operators via the consolettes.
- Provide means for moving system command between the console local sites.
- When in command, provide means for delegating system operational control to various console local sites.
- When in command, provide means for maintaining system connectivity to the maximum extent possible.
- When in command, maintain the supervisory circuits necessary to perform command and status functions.
- When in command, maintain the ready circuit.
- When in command, issue status information regarding all existent conferences in the system.
- Provide means for recording system conferences.
- Provide means for calling the local drops either locally or on a system conference.
- Accommodate the assignment of digital addresses to subscribers in a random manner and display related status information in numerical order on the status display.
- Accommodate the assignment of tributaries to the preset conferences.
- Record on tape voice communications.
- Issue status to all other console sites.
- Display fault summary indications.
- Program preset conference and address functions.



Operations Center Van



Local Equipment Van



Rear Section of Remote Equipment Van

REMOTE EQUIPMENT

The console remote equipment provides automatic connection of main line conference trunks to tributary equipment spur circuits under control of the supervisory and ready channels. The remote equipment is configured for unattended operation and completely contained in a single mobile van. A console remote site effects the main line interface to three sectors, each containing a group of up to eight tributary sites.

The five main line trunks are bridged to the remote equipment circuits. The supervisory channel transmits the command data message from the IN COMMAND console local to remote equipment digital data and switching equipment. This cir-

cuitry decodes the message and routes the resultant action, conference, and address selection signals to matrix and tributary control circuits. Accordingly, one of the four conference channels is connected to the appropriate tributary spur circuit and command data is converted to the remote-to-tributary message format.

Each addressed tributary then transmits back to the remote equipment, on a separate return link, a message comprised of digital data and audio portions. The remote TTY modem equipment separates the data and audio portions. The audio portion is connected to the designated conference, and the digital data (tributary status characters) is arranged into the proper format and applied to the supervisory status channel to update status displays.

TRIBUTARY EQUIPMENT

The tributary equipment provides the facilities to allow the subscriber at a tributary site to have access to the Console System communications network. Tributary equipment is linked to the network through nodal console remote equipment. The tributary receives two audio frequency channels, a carrier derived channel and an order wire channel, and returns a single audio channel. The audio component is a composite speech and digital data signal appearing on the carrier derived and return channels. The information exchanged between a tributary and the network consists of oral communications between subscribers to the system and supervisory data in the form of frequency-shift keying (FSK) signals.

The tributary equipment consists of the maintenance panel, the TTY and audio circuits, the tributary control logic, the tributary control unit, and the power distribution. The TTY and audio circuits separate the FSK signal from the carrier channel, convert the FSK signal to dc digital data, and process the audio signals. The digital data is applied to the tributary control logic and indicator lamps while the audio signal is applied to the audio circuits of the tributary control unit.

The tributary control unit serves as the operator device for the tributary equipment. It provides indicator lamps for the presentation of incoming supervisory data and pushbuttons for the subscriber to insert supervisory data for signaling the operator at the console site. The tributary control unit also includes a telephone handset.

The maintenance panel is used in service routines to exercise the tributary control logic. The maintenance panel incorporates switches to permit maintenance personnel to insert simulated digital data as an input to the tributary control logic. The maintenance panel also contains indicator lamps to indicate equipment malfunctions and to monitor operation of the logic circuits.



Tributary Terminal Set

CONSOLE COMPONENTS

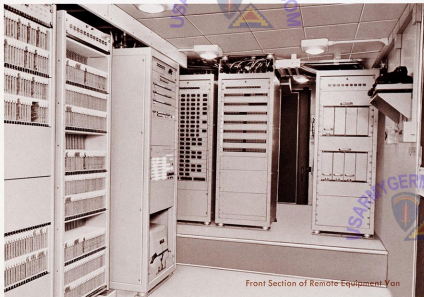
The console local equipment comprises two equipment areas, a console Operations Center and a Local Equipment Van. The Operations Center, installed in either a permanent building at primary headquarters locations or in a twenty-six foot van at alternate locations, consists of two adjacent operator's console positions overlooking a system status wall display. The Local Equipment Van consists of audio circuitry and switching logic equipment. Cables channeled above the equipment via overhead troughs provide intercabinet wiring. The equipment is installed in a thirty-foot van configuration which is common to all console local sites.

The console remote equipment is entirely contained in the Remote Equipment Van and consists of audio circuitry and switching logic equipment which are, to a limited

degree, similar and reciprocal in function to the local equipment. All van installations include air conditioning units to maintain a nominal temperature of 70° F.

Two basic types of equipment cabinet structures have been designed for use with local and remote equipments. The type used for audio circuitry (voice, TTY modem, and switching matrix), is a shock-mounted, fixed cabinet which variously allows equipment access with swinging panels, sliding drawers, and removable plug-in modules. The type used for logic circuitry utilizes a swing-out equipment bay which gives access to back-plane wiring.

The tributary equipment terminal set consists of a logic cabinet and a control unit. The equipment is packaged in a free-standing cabinet.



Front Section of Remote Equipment Van

COMPLEMENT OF MAJOR COMPONENTS

	Logic Cabinet	Audio Circuitry Cabinet	Power Supply Cabinet	Maintenance Cabinet	Tape Recorder Cabinet	Operator's Console	Wall Display	Control Unit
<i>Console Local Equipment-</i>								
<i>Van</i>	22	3	3	2	1			
<i>Operations Center</i>						2	1	
<i>Console Remote Equipment-</i>	6	3	2	2				
<i>Tributary Terminal Set-</i>	(Logic, audio, and power circuitry contained in a single cabinet)							1

CONSOLE EQUIPMENT OPERATING REQUIREMENTS

	Power	Voltage	Space		Temperature
			Van	Building	
<i>Console Local Equipment-</i>					
<i>Van</i>	53.6 kw	120/208 volts, 50 or 60 cps, three phase	30 ft. van	550 sq. ft.	20°C ± 10°C
<i>Operations Center</i>	15.2 kw (van) 0.6 kw (bldg.)	120 volts, 50 or 60 cps, single phase	26 ft. van	225 sq. ft.	20°C ± 10°C
<i>Console Remote Equipment-</i>	27.3 kw	120/208 volts, 50 or 60 cps, three phase	26 ft. van	450 sq. ft.	20°C ± 10°C
<i>Tributary Terminal Set-</i>					
<i>Cabinet</i>	1.5 kw	120 volts, 50 or 60 cps, single phase	—	12 sq. ft.	20°C ± 10°C
<i>Control Unit</i>	—	—	—	Desk-top mounting	20°C ± 10°C

LOGIC CABINETS

The logic cabinets house all electronic logic circuits needed for operation of the system. These semiconductor logic circuits are built on printed circuit plug-in cards which can be inserted and removed from the front of the cabinets. Cards are packaged 27 to a row with 2 rows to a nest and 6 nests to a bay.

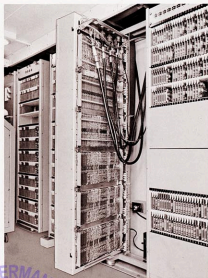
The bay is approximately 20-inches wide by 62-inches high by 7-inches deep. For shipping, the swinging bay is secured to the main structure with pawl fasteners. When the equipment reaches the site, a simple latch is used on the door to keep it closed.

Four bays are mounted to the structure which is fabricated from steel channels welded into a rigid frame. Each structure is approximately 72-inches high x 88-inches long with shock mounts at the base of the frame and between the wall of the van and the structure.

AUDIO CIRCUITRY CABINETS

The audio, TTY, and matrix switching cabinets are structurally similar. The audio cabinet for the system exists in two basic configurations, one for the console local sites and another for the remote sites. Both versions are identical in interface characteristics with the main line trunking system and both have a capacity for bridging onto five independent trunk lines. Any site can accommodate up to two branches in the five main line trunks through the use of a second bridging circuit per trunk.

The cabinet at the local site is capable of servicing two operator consolettes and up to 24 local drops. The cabinet at the remote site is capable of servicing groups of up to 24 tributaries each. Both cabinets have similar mechanical characteristics but differ in wiring and labeling. Specific variation between the various local and remote sites can be achieved by card complement and placement. The local cabinets also contain all necessary equipment to permit individual console operators access to five HF/SSB networks.



Logic Cabinets

DUPLEXED POWER SUPPLY

The basic function of the duplexed power supply is to convert 3-phase, 50/60 cps unregulated line voltage from two separate sources, to several regulated dc voltages. By connecting the outputs of two similar dc supplies (each receiving power from a completely separate source) to a common load, failure of either primary source or either dc regulator will not interrupt the power being delivered to the load. Thus, the design of the power supply utilizes full redundancy.

The duplexed power supply assembly is housed in two identical cabinets.

Each cabinet contains 15 individual regulated power supplies for 15 load channels.

MOBILE MAINTENANCE TEST CABINET

To facilitate maintenance on the individual cabinets while the system is in operation, a mobile test cabinet is provided that can be brought to any of the fixed cabinets. The cabinet contains a transmission test set, an oscilloscope, a square wave generator and a circuit-breaker utility-outlet panel. This unit is part of the equipment complement of both the local and remote equipment vans.

FIXED MAINTENANCE CABINET

Both the local and remote equipment vans include a fixed maintenance cabinet as part of the equipment complement. The primary function of these units is to facilitate system as well as site fault diagnosis and troubleshooting. The fixed maintenance cabinet in the local and remote equipment van contain fault summary and status indicators, message simulation character generator, and TTY printer.



Duplexed Power Supply

TAPE RECORDER CABINET

Any of the four conference lines can be monitored by a tape recorder located in the local equipment van. The control console operator has the option of switching the tape recorder to any conference line with indications of the tape recorder operation displayed at each consolette.

OPERATOR CONSOLETTA

The operator consolette is a desk-top unit utilizing a fiberglass housing. It provides all controls required to perform the various operational functions of which the system is capable. Since the system was first designed to be reliable and accurate and second to be used as rapidly as possible, all operator sequences that initiate or modify system operation are of the set-check-send procedure. The ability to visually check an instruction set prior to execution provides the feedback needed to prevent accidental or erroneous executions and addressing.



Operator Consolette

TRIBUTARY CONTROL UNIT

Similar in form to the operator consolette, the tributary control unit is also a desk-top unit on which supervisory data is displayed with indicator lamps and responses initiated with control pushbuttons. The unit includes a telephone handset for voice communications.



Tributary Control Unit

LOCAL DROPS

At each console local equipment location, provision has been made for up to 24 local drop telephones. These units are similar to the standard desk telephone and utilize a RECALL pushbutton and STANDBY indicator. Any local drop can request a conference or be included in any system conference.



Local Drop

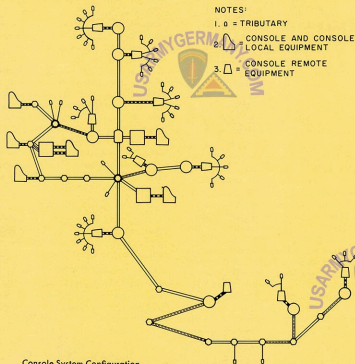
OTHER SYSTEM CONSIDERATIONS

FLEXIBLE EXPANSION

The Console System is designed in accordance with current DCA transmission interface requirements and is compatible with other DCA transmission systems.

The present configuration of the Console System can be expanded to accommodate more tributaries and local drops:

- The tributary address can range from 100 to 799, thus permitting the use of 700 tributaries.
- The number of remote units can increase from the present 10 Console Remote Equipments requirement.
- Under the present concept, the system has built into it the capability of providing for the expansion of each console remote equipment to accommodate its full complement of 24 tributaries.
- The number of local equipments in the system can also be expanded from the present complement of six.



Console System Configuration

ALTERNATE ROUTING

Alternate routing is provided on a per-line basis for that portion of the Console System circuit completing a closed-loop which exists in a portion at the console mainline network. Loop control circuits are implemented at Site 5.1 to prevent a mainline closed-loop condition. During a complete failure of one or all of the five dedicated lines within the loop portion of the mainline, contacts close automatically to provide an alternate route. Line failure detection is accomplished by line monitoring.

INTERFACE WITH OTHER SYSTEMS

Although the ET-A System is a complete communication system within itself, the mainline stations will ultimately form part of a long-haul intertheater communications network. Interface with other systems in compliance with DCA standards can be made at the voice channel level on a 4-wire basis or at the channel group level. The multiplex equipment does not include accommodations for in-band signaling. This must be provided by the terminating equipment. The ET-A Console System includes in-band teletype channels for supervisory signals. An out-of-band signaling facility is included with each channel in the multiplex equipment. Therefore, a signaling interface using E and M techniques is provided for interconnection with other systems on a 4-wire basis.

AUTOVON

The capability of interworking with the

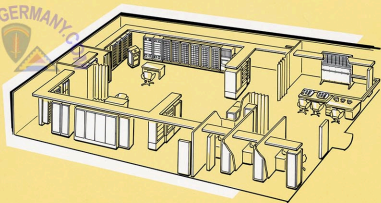
DCA's automatic voice network, AUTOVON, is being introduced to the Console System to have:

- Primarily, an increased systems survivability through the alternate routing on a per-channel basis of the Console System's five dedicated channels.
- Secondly, the tributary access to and from the AUTOVON subscribers for administrative traffic is pre-emptable for command and control traffic.

Each mainline console site will have access to AUTOVON via five dedicated tie lines. All console local sites may access and be accessed by AUTOVON to maintain Console System continuity while all console remote sites can only be accessed by AUTOVON for this service. A request by a console local site for a trunk is accommodated on a preprogrammed priority basis at the AUTOVON switch. A maximum of five trunks can be requested for use between sites. This use of common-user-switched trunks allows these trunks to be used for other services when they are not being used by the Console System. Automatic pre-emption of busy trunks for command and control console system traffic is accomplished by the AUTOVON switch whenever a console local operator requests a trunk.

Administrative traffic tie lines to AUTOVON are terminated only at each of the console remote sites.

The connections to AUTOVON add to the survivability of the Console System and provide channels for administrative traffic to and from tributaries without impairing the operation of the Console System.



TRAINING FACILITY

A Console System training facility to be centrally located in Europe has the primary purpose of instructing technicians in the maintenance, repair and operation of the Console System equipment. An additional mission is to train local and tributary operators in the Console System operational procedure.

Although the traffic handling capability is somewhat restricted to the use of three tributaries and three local drops, there is no restriction on the demonstration capabilities of various system functions relating to the normally busy system. The Training Facility consists of:

1. A console local site including the Operations Center equipment and its associated console local equipment and

three local drop sets serviced by the console site.

2. A console remote site to perform the necessary remote switching.
3. A standby console site to provide demonstration of command and control switching.
4. Three tributary terminal sets to implement two sectors of simultaneous operation.

Maintenance personnel are trained in service procedures, and trouble-shooting techniques. They obtain a firm understanding of the philosophy and limitations of on-site maintenance.

Operators learn system control functions, over-all system operation, programming and use of the diode patch fields, and the philosophy and use of the cable patch fields in the console local and remote equipments.

EUROPEAN COMMAND and CONTROL CONSOLE SYSTEM
EUROPEAN TROPOSPHERIC SCATTER COMMUNICATIONS SYSTEM—ARMY PORTION
developed for the
U.S. ARMY STRATEGIC COMMUNICATIONS COMMAND CONTRACT NO. DA36-039-SC88783
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