CHAPTER 2

NAVY COMMAND AND CONTROL SYSTEM (NCCS)

For years the geographical scope of warfare and the mobility of forces have increased. However, the ability to collect information about a battle in a way that would present and transmit a coherent picture to a remote commander failed to keep pace. Land force commanders continued to move flags about on charts or sand tables to represent the combat theater. They used bits and pieces of intelligence data about enemy dispositions and operational reports from friendly forces. Naval and Air Defense Commands used similar methods to aid in monitoring and controlling their forces. It was commonly accepted that, all other factors being equal, the commander with the most accurate and timely information, and the best communications to issue commands and to support the feedback of information would have the best chance of winning. This led to a continuing operational requirement for increased information and better communications.

In more recent times, as computers were used for more diversified tasks, the potential to make use of them in command and control systems was investigated. It was determined that the capabilities of digital computers, and the expanded data handling capabilities of current communications systems were suitable for use in a command and control system. The World Wide Military Command and Control System (WWMCCS) was the result of this investigation and research. In 1973, during the Middle East crisis, the United States was able to notify all of its Unified and Specified Commands of a possible unilateral movement by an outside party in less than three minutes.

WWMCCS has existed since the early 1960's as a loose confederation of relatively autonomous systems. The Secretary of Defense recently directed that WWMCCS be developed into an integrated system with one primary mission—to provide command and control support to the President and the Secretary of Defense (SECDEF). As a secondary mission, WWMCCS supports the requirements of the Joint Chiefs of Staff (JCS), military service headquarters, unified and specified commanders, service component commanders, and DOD agencies. The command and control systems provided to the Fleet Commanders in Chiefs (FLTCINCs), must be responsive to the requirements of WWMCCS. Further, since it may be necessary at times to address directives from the President and SECDEF to individual force elements engaged in critical operations, all Navy command and control systems must be compatible with WWMCCS.

Three basic development criteria exert strong influence on the design of Navy command and control systems. Navy systems must:

- Be consistent with the policy and architecture of the WWMCCS and be compatible with it

- Recognize the existence of a large number of independent, single purpose systems already in service which have to be brought together and integrated

- Support the requirements of Navy tactical commands as their primary considerations

In 1975 a Navy Command and Control Architecture Group was formed to analyze command and control requirements and to formulate guidance for the development of an integrated Navy system. The Group compiled a list of 166 systems currently operating in support of command and control (C^2) requirements. A decision was made to integrate the outputs of

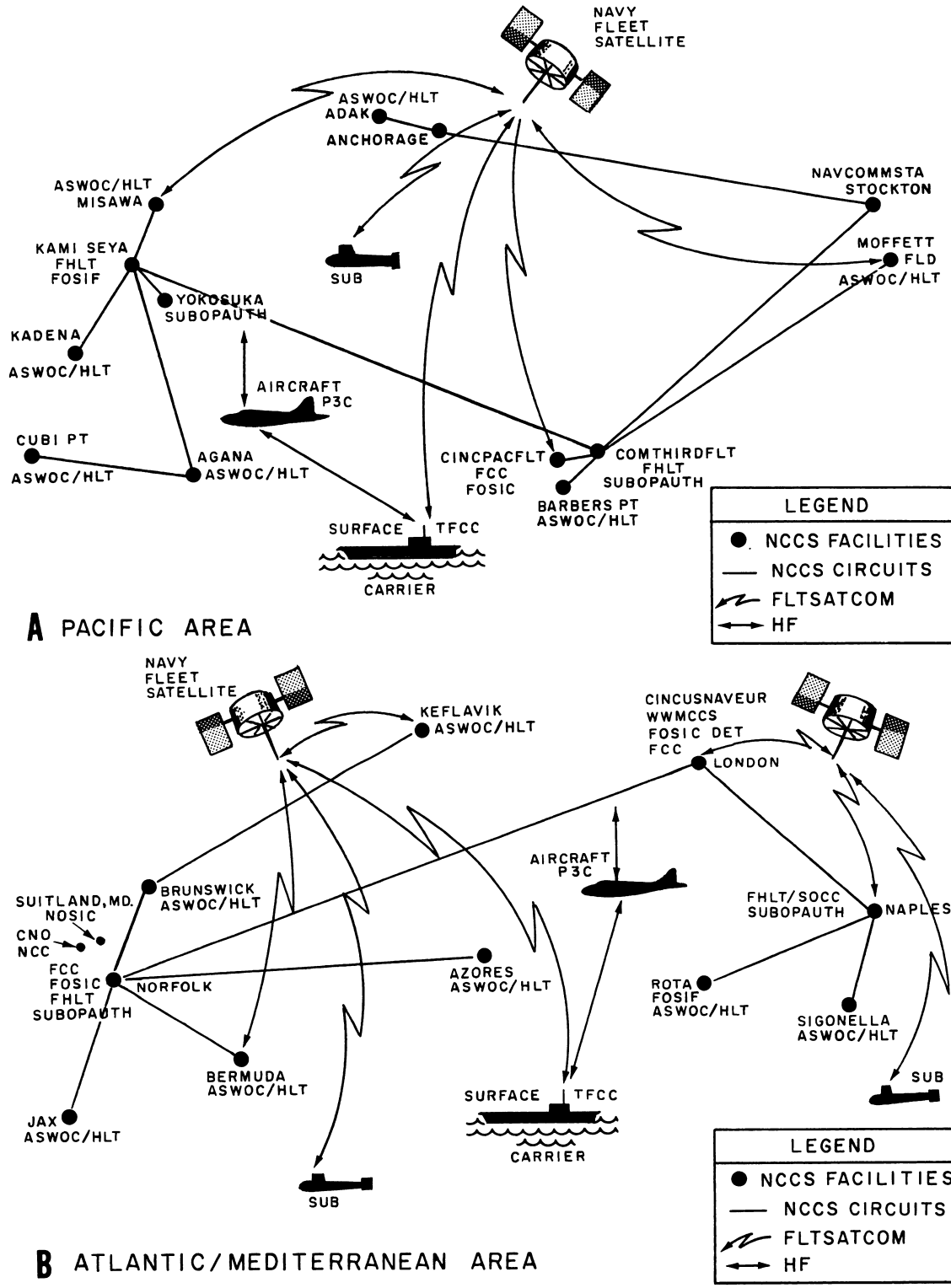

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Figure 2-1.—NCCS communications concept of operations.

certain of these systems rather than to try and design a completely new C^2 system. The Architecture Group identified two primary nodes ("nodes" are the command centers directly serving operational commanders) for the Navy's C^2 capability as:

- Fleet Command Centers (FCCs)—ashore sites at CINCLANTFLTHQ, CINCPACFLTHQ, CINCUSNAVEUR HQ, and CNO HQ

- Tactical Flag Command Centers (TFCCs)—afloat centers in appropriate flagships

The FLTCINCs are the key commanders in the Navy's C^2 architecture. Their headquarters are the points of interface upward via WWMCCS to national command authority and downward through the TFCC to the forces afloat.

Fifteen Navy systems were included in the baseline capability for support of the FCC/TFCC nodes. DSs are involved in the maintenance of six of these systems. This chapter will discuss the Navy Command and Control System (NCCS) and three of the component systems with which DSs are involved:

1. The Antisubmarine Warfare Operations Center (ASWOC)
2. The Force High Level Terminal (FHLT)
3. The Carrier Antisubmarine Warfare Module (CV-ASWM)

NAVY COMMAND & CONTROL SYSTEM (NCCS)

The Navy Command & Control System (NCCS) is a command system and a command support system. It is composed of two nodes (ashore and afloat) and provides the primary interface with WWMCCS via the major ashore nodes. Figure 2-1A depicts the concept of operations of the NCCS for the Pacific area. Figure 2-1B depicts the concept of operations of the NCCS for the Atlantic/Mediterranean area.

The NCCS is based on an organized, operational command hierarchy with four major ashore nodes and a number of major afloat nodes. The ashore nodes support the command centers of CINCLANT/CINCLANTFLT, Norfolk, Virginia; CINCUSNAVEUR, London, England; CINCPACFLT, Makalapa, Hawaii; and CNO, Washington, DC. The major afloat nodes support the embarked Officer in Tactical Command (OTC) of a battle group in a geographical area. Within the individual command structures are subordinate facilities supporting the NCCS. The major ashore facilities are the FLTCINC Command Centers (FCCs), which provide the primary interface between WWMCCS and the NCCS. The NCCS ashore will provide the afloat facilities with all the available, relevant, evaluated information on enemy, friendly, and ownforces during all conditions of fleet operations.

The NCCS is a network of facilities located at key geographic positions and aboard major combatants, designated as flagships in support of the OTC. Table 2-1 summarizes the NCCS ashore locations. The TFCCs, the major afloat node, will be located on CVs, CVNs, CGs, CGNs, and LCCs.

Within the NCCS ashore are several systems which perform functions useful to the fleet/force CINCs. They are OSIS, SUBOPAUTH, and ASWCCCS. OSIS (Ocean Surveillance Information System) is a shore-based supporting system that evaluates all-source information on ocean surveillance targets of interest. The OSIS program was implemented to automate the receipt, processing, and dissemination of information to maintain a world-wide, all-source data bank.

The SUBOPAUTHs (Submarine Operations Authority) are the principal advisors to the Fleet CINCs on submarines at sea. They control submarine operations, missions, and mission duration. They also monitor the operations of other naval forces and coordinate with other naval operating commanders to ensure submarine safety. The SUBOPAUTH is the ashore node for communications with submarines. Communications are performed by means of elf (extremely low frequency) and lf (low frequency) broadcasts, and by means of SSIXS (Subsurface Information Exchange System). SSIXS is a digital satellite link between submarines and SUBOPAUTH facilities. SUBOPAUTH facilities are being upgraded with the Shore Targeting Terminal (STT). An expanded mission for SUBOPAUTHs is providing Over the Horizon Targeting (OTH-T) support to assigned submarines. The STT hardware has been installed to support this requirement.

Table 2-1.—NCCS-Ashore Locations

NCCS NODE DESCRIPTIONS	COMMAND SUPPORTED	LOCATION
NCC/NWSS	CNO	WASHINGTON, DC
FCC/FHLT/OSIS (FOSIC)/NWSS	CINCLANT/CINCLANTFLT	NORFOLK, VA
FCC/OSIS (FOSIC)/NWSS	CINCPACFLT	PEARL HARBOR, HI
FCC/OSIS (FOSIC)/NWSS	CINCUSNAVEUR	LONDON, ENG
SUBOPAUTH	COMSUBLANT	NORFOLK, VA
SUBOPAUTH	COMSUBPAC	PEARL HARBOR, HI
SUBOPAUTH	COMSUBGRU EIGHT	NAPLES, ITALY
SUBOPAUTH	COMSUBGRU FIVE	SAN DIEGO, CA
SUBOPAUTH	COMSUBGRU SEVEN	YOKOSUKA, JAPAN
FHLT	COMTHIRDFLT	PEARL HARBOR, HI
FHLT	CTF-67	NAPLES, ITALY
FHLT	CTF-72	KAMI SEYA, JAPAN
OSIS (FOSIF)	COMSIXTHFLT	ROTA, SPAIN
OSIS (FOSIF)	CONSEVENTHFLT	KAMI SEYA, JAPAN
OSIS (NOSIC)	CNO/ALL NAVY	SUITLAND, MD
ASWOC/HLT	CTG 24.1	KEFLAVIK, ICELAND
ASWOC/HLT	CTG 24.2	LAJES, AZORES
ASWOC/HLT	CTG 24.3	BERMUDA
ASWOC/HLT	CTG 24.4	BRUNSWICK, ME
ASWOC/HLT	CTG 24.5	JACKSONVILLE, FL
ASWOC/HLT	CTU 67.1.2	SIGONELLA, ITALY
ASWOC/HLT	CTU 67.2.2	ROTA, SPAIN
ASWOC/HLT	CTG 32.1	MOFFETT FIELD, CA
ASWOC/HLT	CTG 32.2	BARBERS POINT, HI
ASWOC/HLT	CTG 32.3	ADAK, AK
ASWOC/HLT	CTU 72.2.6	KADENA, OKINAWA
ASWOC/HLT	CTG 72.3	CUBI POINT, RPI
ASWOC/HLT	CTG 72.4	MISAWA, JAPAN
ASWOC/HLT	CTG 72.5	AGANA, GUAM
ASWOC/HLT	CTG 72.8	DIEGO GARCIA

Ancillary equipment required to effect communications interface to this system will also be installed.

ASWCCCS (Antisubmarine Warfare Center Command & Control System) is a shore-based system designed to provide an integrated, near real-time command and control capability for ASW forces to evaluate and carry on attacks on submarine contacts on an ocean-wide basis.

The Navy WWMCCS Software Standardization (NWSS) consists of major software components which allow the Navy Command and Control users access to WWMCCS data. It supports the NCCS ashore nodes at CNO and the FLTCINCS. In addition, NWSS data is available at FHLT sites via dedicated terminals, at COMSUBLANT via a dedicated alpha-numeric terminal, and at SUBOPAUTHS via the Graphic Analysis and Display System (GADS) (both alphanumeric and graphic display). NWSS processes data in the areas of Naval Status of Forces (NSOF), Unit Tracking (UNITRACK), ASW, and Blue Force Characteristics File (BFCF). It provides for automatic receipt, processing, storage, and transfer of information reported via the Navy Reporting Structure (NRS) operational report messages. NWSS provides error detection and correction capabilities.

ANTISUBMARINE WARFARE CENTER COMMAND & CONTROL SYSTEM

ASWCCCS was developed with the following purposes in mind:

- To provide more timely and accurate ASW related data to ASW Force and sector commanders

- To optimize communications between and among the ASW Force and sector commanders

- To improve automatic data processing support available to the ASW Force and sector commanders

Two major components make up the ASWCCCS:

1. The ASWOC/HLT (Antisubmarine Warfare Operations Center/High-Level Terminal)

2. The FHLT (Force High-Level Terminal)

The FHLT provides the facility for the Force ASW Commander to communicate directly to the Sector ASW Commanders located at the ASWOC/HLT. The overall block diagram of the interconnection of the FHLTs, ASWOC/HLTs, and the FCCs is shown in figure 2-2. As shown in figure 2-2, the ASWOC/HLT is the lowest building block of the command pyramid. Each ASWOC/HLT provides data to the Force Commander via an FHLT site. This data is also sent to the Fleet Commanders (FCC), and on to the NCSC (Navy Command Support Center), where CNO has access to ASWCCCS data and recommendations. The function, configuration, and operation of the ASWOC/HLT and the FHLT will be covered in greater depth later in this chapter.

ASWCCCS Intersite Communications

Intersite communications for the ASWCCCS consist of a secure data network and a secure voice network. These networks provide the man-to-man and machine-to-machine communications paths needed to carry out the role of the ASWCCCS.

The secure data network uses data quality circuits at a 2400-9600 baud rate to transfer data between sites. It uses various media such as satellite communications, microwave, submarine cable, and landlines to transfer data between sites. The multiplexers, modems (modulator-demodulators), and cryptographic equipment used in the secure data network provide the interface, encryption, and selection functions required for the transfer of data from site-to-site. The Communications Line Interface (CLI) and the Programmable Terminal Control Interface (PTCI) are used to transfer data from site-to-site on their separate channels.

The secure voice network uses digitized, 2400 baud voice quality circuits to provide secure voice communications between various ASWCCCS sites. The media (microwave, satellite, and so forth) are often the same as for secure data, and the equipment used is the same as for the secure data network. The heart of the secure voice network is the Automated Digital Switch (ADS). The ADS is a digitized voice switching center which provides direct dialing in the secure voice

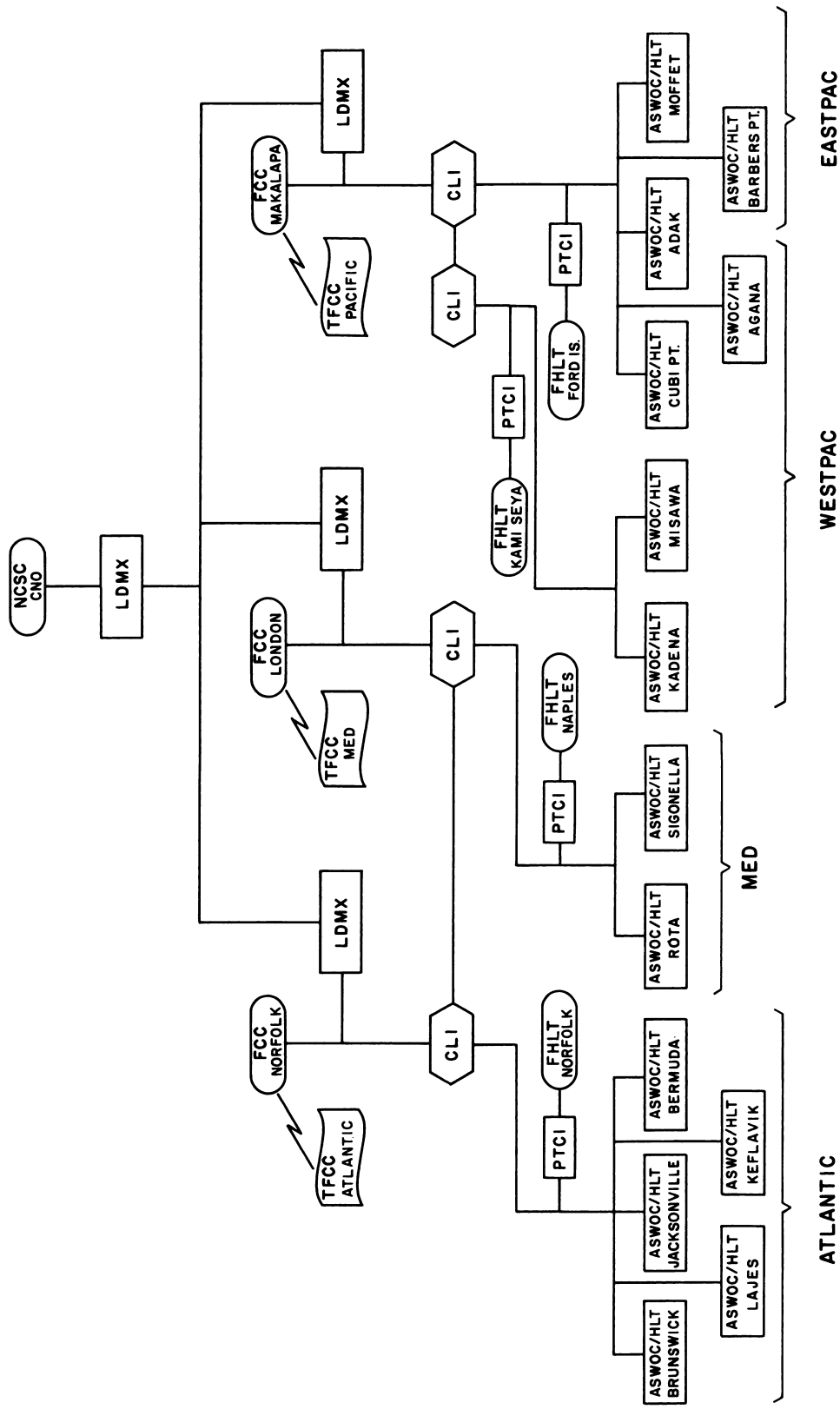

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Figure 2-2.—Navy Command and Control System (NCCS) simplified block diagram.

network. Precedence preemption is available in this system, and conference calls may be set up among various sites. There is at least one secure voice subscriber phone at each site.

TACTICAL FLAG COMMAND CENTER (TFCC)

The Tactical Flag Command Center is the battle station of the OTC and the primary afloat mode of the NCCS. The TFCC is the space where the OTC carries on command and control functions. It provides designated flagships with a tactical information and communications center for the OTC. Figure 2-3 shows the integration of the TFCC into the ships systems. The systems providing data to the TFCC are the CV-ASWM, SSES, CVIC, and NTDS. These systems have a data base which provides the overall picture to the OTC. From this data, a decision can be made as to the deployment of offensive or defensive forces.

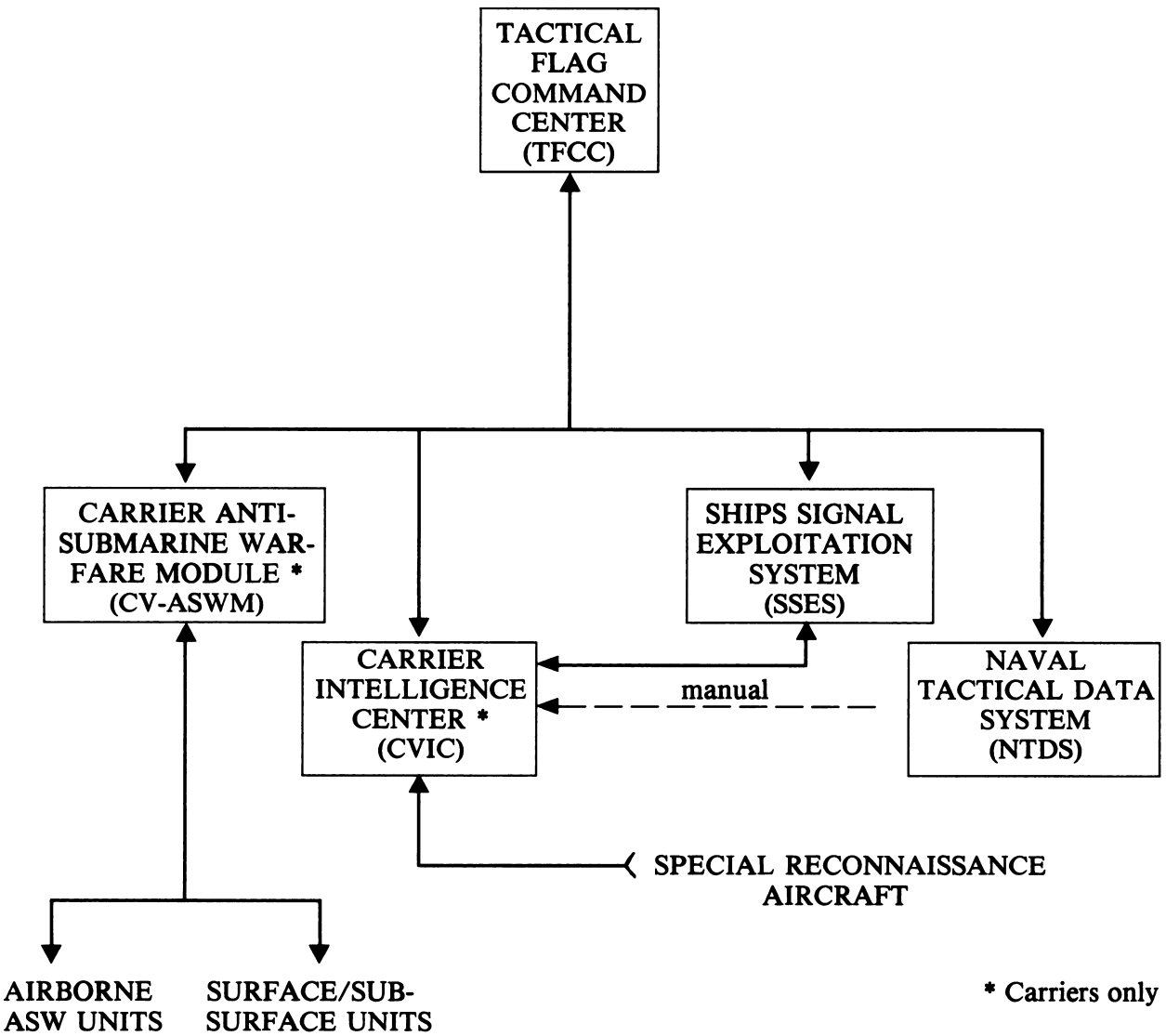


Figure 2-3.—Tactical Flag Command Center (TFCC) shipboard integration.

Carrier Antisubmarine Warfare Module (CV-ASWM)

The Carrier-Antisubmarine Warfare Module (CV-ASWM) provides the same afloat function as the landbased ASWOC. The CV-ASWM gives the carrier a highly advanced mission brief and debrief capability that matches the newest airborne Antisubmarine Warfare (ASW) weapon systems. The CV-ASWM gives both real-time and delayed analysis of ASW data from selected aircraft, before, during, and after their flight. This capability enables the carrier to locate and track enemy subs better and faster than before. It also automatically provides the flight crews with more data to make their jobs easier and faster. It enhances the multi-mission role of today's modern carriers. The CV-ASWM will be discussed in greater depth later in this chapter.

Naval Tactical Data System (NTDS)

The Naval Tactical Data System (NTDS) is a real-time command and control system designed to control the major weapons systems aboard combatant ships. It is the pioneer of the digitally controlled systems used in today's modern naval ships. Additional information on NTDS may be found in *Data System Technician 3 & 2*, Vol. 2, NAVEDTRA 10201 (Series) and *Data System Technician 1 & C*, Vol. 1, NAVEDTRA 10203 (Series). NTDS provides information to the TFCC obtained from ships sensors and from picket ships located around the task force perimeter. NTDS data may be also manually provided by magnetic tape to the Carrier Intelligence Center (CVIC).

Carrier Intelligence Center (CVIC)

The Carrier Intelligence Center (CVIC) is a computerized intelligence processing and generation system. The system processes locally collected tapes and film and intelligence information from other activities. Existing files are updated and new files are generated in support of tactical operations. The CVIC provides support for tactical naval operations by integrating up-to-the-minute tactical intelligence with national and fleet-produced data base intelligence information. Multisensor intelligence integration and data correlation, information retrieval, tactical updating, and order-of-battle generation are portions of the capabilities provided to the TFCC by the CVIC.

Ships Signal Exploitation System (SSES)

The Ships Signal Exploitation System provides interception and analysis of radio frequency messages transmitted by unfriendly or hostile forces. It provides the TFCC with intercept information derived from radio message traffic of hostile forces.

ANTISUBMARINE WARFARE OPERATIONS CENTER/HIGH LEVEL TERMINAL

The Antisubmarine Warfare Operations Center/High Level Terminal (ASWOC/HLT) is a combination of three independent supporting systems: Land-based Tactical Support Center (VP-TSC), ASW Support Communications (ASCOMM), and the High Level Terminal (HLT) of the ASWCCCS. The ASWOC/HLT is a display-augmented, computerized command and control system designed to support Sector ASW Commanders. The ASWOC supports ASW mission planning, mission briefing, and debriefing by providing information from local data base, as well as from the ASWCCCS data base at the Central Site (CS). A query/response package provides access to the CS for historical data and for processing and analysis capabilities not locally available. The dedicated ASWCCCS data network increases coordination and communication between superior and subordinate units for the shore based mode. The Data Link (Link 11) provides the same capability for the onstation platforms (P-3C or S-3A aircraft). The user's data analysis capability is enhanced by interactive geographic and alphanumeric displays. Computer-aided construction of RAINFORM messages and their delivery over a dedicated communications network improves the timely reporting of mission results. Sixteen ASWOC/HLTs have been installed under the ASTACS (Antisubmarine Tactical Analysis Centers Systems) program.

ASWOC PHYSICAL CONFIGURATION

The ASWOC is constructed in two physical configurations:

1. Fixed site
2. Modular site

The capability, equipment configuration, and system functions of these two types of sites are the same. Fixed and modular sites are located both in CONUS and abroad. The easily-relocatable modular units provide for a greater strategic flexibility.

ASWOC EQUIPMENT CONFIGURATION

The ASWOC equipment performs various roles needed to enhance the performance of the ASW mission. Physically the ASWOC system is divided into four subsystems:

1. Automatic Data Processing (ADP) Subsystem
2. Display Subsystem
3. Analysis Subsystem
4. Communications Subsystem

Each subsystem works in conjunction with the other subsystems to perform its unique role which contributes to the overall mission of the ASWOC. A simplified block diagram of the ASWOC system is shown in figure 2-4, a foldout at the end of this chapter.

ASWOC Automatic Data Processing (ADP) Subsystem

The ASWOC ADP Subsystem provides the central processing capability for all ASWOC system data base functions. The ASWOC ADP subsystem is comprised of the following hardware in the quantities indicated.

1. Avionics Unit Computer CP-901/ ASQ-114(V) (1)
2. Microprogrammable Processor CDC Model 560633A (1)
3. Disk Storage Unit CDC Model 567018A (1)
4. Magnetic Tape Transport Interface Compunetics 5670 (1)
5. Magnetic Tape Transport Potter Model SC 1051 (4)
6. High Speed Printer Data Products Model 4300 (1)
7. Digital Magnetic Tape Interface Compunetics Model 22500 (1)
8. Digital Magnetic Tape Unit RD-348/ASH (1)
9. Digital Input/Output Multiplexer Compunetics Model 35620 (1)
10. Signal Data Buffer Compunetics Model 5610A (4)
11. Compunetics Keyset (5)
12. Synchro-to-Digital Converter Compunetics Model 7067C01 (1)
13. Central Power Supply Compunetics Model 5691 (1)

The ASWOC system block diagram (fig. 2-4) shows the interface of the ADP Subsystem to the Display, Analysis, and Communications Subsystems.

AVIONICS UNIT COMPUTER CP-901/ ASQ-114(V).—The Avionics Unit Computer CP-901/ASQ-114(V) (CP-901) (fig. 2-4) is the ASWOC unit computer. It is the same type of computer as the ones used in the P-3C patrol aircraft. This computer performs the central processing, storage, and input/output functions for the ASWOC system. The CP-901 has 16 input channels and uses the signal data buffers to provide 16 output channels to the various peripheral equipment. These online peripheral equipment are under the direct control of the computer and are operated in response to either a manual entry command or a program requirement. The computer provides all display formatting, control for the data link, and message reports to various senior commands. The computer also provides a level of confidence in system operation by periodically executing a series of equipment test programs.

The CP-901 contains 65K of 30-bit core memory and is augmented by an 11.1 megaword, 32-bit word length, disk storage unit.

MICROPROGRAMMABLE PROCESSOR CDC MODEL 560633A.—The microprogrammable processor (MPP) (fig. 2-4) functions as a controller for the disk storage unit. The MPP is divided into five basic units: read-only memory (ROM), interface section, addressing and control section, arithmetic and logic section, and the transform matrix section. The ROM contains a 32-bit, 512-word firmware Read Start Program which cannot be altered by the operator. This program controls the function of the MPP as an interface device, controller, and buffer for up to four disk storage units.

DISK STORAGE UNIT CDC MODEL 567018A.—The disk storage unit (DSU) (fig. 2-4) is a mass memory unit using magnetic disk packs. The DSU is a flexible unit designed to fulfill mass memory requirements. The primary purpose of the DSU is to store and maintain large quantities of data until recalled by the computer. Whenever data is required by an operator entry or a program function, it is read from the disk, utilized, and then rewritten on the disk. The disk pack is capable of storing approximately 507.5 megabits of data. The DSU provides the capability of supplementing the software programming and data storage capacity of the CP-901 computer. It provides a method of random access for the rapid storage and retrieval of data. Additional information on the operation of disk storage units may be found in *Digital Computer Basics*, NAVEDTRA 10088 (Series) and *Data Systems Technician 3 & 2*, Vol. 2, NAVEDTRA 10201 (Series).

MAGNETIC TAPE TRANSPORT INTERFACE COMPUNETICS MODEL 5670.—The Magnetic Tape Transport Interface (MTTI) Compunetics Model 5670 (fig. 2-4), is required to format the data from tapes into a computer language or into discrete lines for the high speed printer.

The MTTI provides the following functions:

1. Establishes communications between the magnetic tape transports (MTTs) and the unit computer
2. Reformats data words between the CP-901 and the MTTs into words which can be used by each device
    a. Converts 6-bit character words from the MTT into 30-bit computer words
    b. Converts 30-bit computer words to 6-bit MTT words
3. Establishes communication between the MTTs and the high speed printer (HSP), formatting 6-bit character words from the MTTs to one line of 120 six-bit words for the HSP
4. Establishes communications between the CP-901 and the HSP, converting 30-bit computer words to one line of 120 six-bit words necessary for the HSP

MAGNETIC TAPE TRANSPORT POTTER MODEL SC 1051.—The Magnetic Tape Transport Potter Model SC 1051 (fig. 2-4) provides the capability of reading data into, or writing data from, the data base via the computer. Data from the tapes is placed in the DSU or reduced to hard copy by the high speed printer.

Some of the functions of the MTT include:

1. Reading data into the system data base
2. Reading into the replay data base
    a. Mission replay tapes of digital data extracted from the computer installed on the P-3C aircraft
    b. Manual plot entry (MPE) generated extraction tapes
3. Writing and reading the MPE generated data tape via the CP-901 computer
4. Writing data that has been retrieved from the system data base onto magnetic tape

HIGH SPEED PRINTER DATA PRODUCTS MODEL 4300.—The High Speed Printer (HSP) Data Products Model 4300 (fig. 2-4) provides a means of producing a hard copy of data extracted from the data base or from data extraction tapes. The HSP contains all the electrical and mechanical components required to:

1. Accept and store one line of data, serially by character, up to a maximum of 120 characters

2. Print up to 1000 lines per minute on multiple-part fanfold paper, or on tabulating stock

3. Provide vertical spacing to allow either six or eight lines per inch

4. Position the paper for the next line of print

The output to the HSP is provided via the MTTI buffer memory from the CP-901 computer or a Potter MTT.

The HSP provides a permanent hard copy of data presented on the DVC tableau display. The HSP also provides amplifying legends (supplemental data) to the hard copy plot reproduced on the X-Y plotter or displayed on the DVC situation display. It is a means of providing a hard copy of data presented on the communications data terminal.

DIGITAL MAGNETIC TAPE INTERFACE COMPUNETICS MODEL 22500.—The Digital Magnetic Tape Interface (DMTI) Compunetics Model 22500 (fig. 2-4) provides a means of converting data from mission tapes to a format usable by the CP-901 computer. It provides a means of inputting aircraft mission tapes into the system data base. The DMTI also acts as an intermediate buffer between the MTTI and the CP-901 computer.

Mission tapes from P-3C aircraft are formatted into 30-bit computer words and are routed either to the CP-901 computer or through the MTTI to the HSP. The HSP provides a hard copy of P-3C mission data. The CP-901 uses the mission data for debrief functions after a mission has been completed.

DIGITAL MAGNETIC TAPE UNIT RD-348/ASH.—The Digital Magnetic Tape Unit (DMTU) RD-348/ASH (fig. 2-4) allows S-3A mission tapes to be played back and inserted into the data base. Data from the DMTU is transferred to the DMTI where it is transferred to the CP-901 computer or the MTTI. The data from the mission tapes is used by the CP-901 computer for debriefing, updating the data base, and briefing crews for future missions. The MTTI then transfers the data to MTTs for recording or to the HSP where a hard copy of the mission data is produced.

DIGITAL INPUT/OUTPUT MULTIPLEXER COMPUNETICS MODEL 35620.—The Digital Input/Output Multiplexer Compunetics Model 35620 (fig. 2-4) is commonly referred to as the DIM/DOM. The DIM/DOM serves as a conversion and multiplexing device which permits communications between a number of keysets and the CP-901 computer. The DIM/DOM provides conversion and multiplexing functions for the following keysets:

1. Direct View Console (DVC) Keysets
2. Sonic Keysets
3. Manual Plot Entry (MPE) Keyset

The DIM/DOM receives 9-bit words from the peripheral equipment (keysets) and adds an identification code to form a 30-bit computer word. It also receives a 30-bit word from the computer, interprets the ID code, and routes a 9-bit word to the correct keyset. The DIM/DOM allows one computer I/O channel to be used by a number of low data rate devices.

SIGNAL DATA BUFFER COMPUNETICS MODEL 5610B.—The Signal Data Buffer Compunetics Model 5610B (fig. 2-4) is commonly referred to as the SDB. The SDBs provide a means of distributing the CP-901 computer outputs to the specified peripheral equipment.

SYNCHRO-TO-DIGITAL CONVERTER COMPUNETICS MODEL 7067C01.—The Synchro-to-Digital Converter Compunetics Model 7067C01 (fig. 2-4) is a conversion and multiplexing device. It allows communication between the various synchro devices located in the ASWOC and the CP-901 computer. The synchro transmissions are primarily track ball, strobe roller, and HYFIX information. The S/D converter performs the following functions:

1. Receives synchro transmitter signals
2. Converts the synchro signals into a 14-bit word with a channel ID code
3. Stores the conversion words and ID codes in holding registers
4. Transfers selected channel digital data to the CP-901, when directed to do so by the computer

The S/D converter performs a function similar to the DIM/DOM for low data rate synchro signals.

COMPUNETICS KEYSETS.—The Compunetics keysets, commonly referred to as keysets, (fig. 2-4) provide a means of entering data into the CP-901 from the DVCs or other stations. The keysets are composed of the following units:

1. Keyboard Assembly Compunetics Model 5643—allows entry of data into system
2. Keyset Interface Compunetics Model 5642—changes the key data to a parallel data format for the computer or computer data to data usable at the keyboard
3. Keyset Power Supply Compunetics Model 5694—provides correct operating voltages to the keyboard and keyset interface

CENTRAL POWER SUPPLY COMPUNETICS MODEL 5691.—The Central Power Supply Compunetics Model 5691 (not shown) provides power and control for the following equipment:

1. Magnetic Tape Transport Interface (MTTI)
2. Synchro-to-Digital Converter
3. Signal Data Buffers
4. Digital Input/Output Multiplexer (DIM/DOM)
5. X-Y Plotter Interface

ASWOC Analysis Subsystem

The ASWOC Analysis Subsystem provides a means of analyzing data from sonobuoys, data links, and mission data tapes. The analysis subsystem is composed of the following equipment and systems:

1. Fast Time Analyzer System Rockwell Model VP
2. Manual Plot Entry Compunetics Model 5652
3. Digital Tablet Interface Compunetics Model 2020-1
4. X-Y Plotter CCI Model 1136
5. Plotter Interface Compunetics Model 5681

These units provide a display of data or provide a means of inputting data into the CP-901 computer for processing.

FAST TIME ANALYSIS SYSTEM ROCKWELL MODEL VP.—The Fast Time Analysis System Rockwell Model VP (fig. 2-4) is commonly referred to as the FTA. The FTA provides a means of analyzing sensor data and determining the identification and other characteristics of a suspected contact. The FTA is normally maintained by the Aviation Warfare Technician rating. Details of the exact operation of the FTA system and sensor inputs are classified.

MANUAL PLOT ENTRY COMPUNETICS MODEL 5652.—The Manual Plot Entry Compunetics Model 5652 (fig. 2-4) is normally referred to as the MPE. The MPE and its associated interface provide the means for manually entering data, primarily generated aboard non-P-3C aircraft, into the ASWOC system. The MPE unit consists of:

1. A coordinate digitizer
2. A stylus for selecting points on the coordinate digitizer
3. A console with associated electronics
4. A power supply module

The MPE unit is used in conjunction with an MPE interface unit, a keyset, a keyset interface unit, and a keyset power supply. The MPE provides the capability of entering the ASW data which is collected by non-P-3C aircraft. The data obtained by these aircraft can then be displayed and analyzed in the same manner as data from a P-3C aircraft. Also, the MPE provides a means of entering patrol zone areas, BT datum areas, grids, and geographic displays into the data base.

The functions of the MPE components are as follows:

1. Coordinate Digitizer—provides a translucent tablet containing a digital encoding matrix, upon which slides or films can be projected, or maps and tactical charts may be overlayed
2. Stylus—provides a probe which picks up coordinates of the digital coding matrix
3. Console—provides a working area and an enclosure for necessary electronics

4. MPE Interface Unit—provides a means by which the plot (X,Y) data can be entered into the computer and provides communications between the keyset and the computer
5. Keyset—provides for entry of data into the computer or data base

X-Y PLOTTER CI MODEL 1136 AND PLOTTER INTERFACE COMPUNETICS MODEL 5681.—The X-Y Plotter CCI Model 5652 (fig. 2-4) is a high-speed, two-axis recorder. It is designed to plot one variable against another. It can produce:

1. Line drawings such as patrol zones and BT areas
2. Pertinent symbology, numbers, and letters

The plotter operates either in an automatic or manual mode. In the automatic mode, output data from the computer are decoded by the plotter interface to provide the correct X-axis and Y-axis control signals to the plotter. The Y-axis is produced by the lateral movement of the pen carriage. The X-axis plot is produced by the rotary motion of the drum. Outputs from the plotter interface are also used to select and control the raising or lowering of one of the three pens to the plot surface. The plotter has the capability of reversing and changing axis. The plotter provides a hard copy plot of graphic information such as sonobuoy deployment and tactical situations contained in the system data base. A plot of all tactical data displayed on a DVC situation display can be reproduced on the plotter.

ASWOC Display Subsystem

The Display Subsystem is comprised of direct view consoles (DVCs), related displays, and data display terminals. These devices provide the capability to access, scan, edit, and update the ASWOC System data base. They also portray, in situation and/or tableau form, selected data from the system data base. A large screen display of the console presentation can be projected for use in command and in brief/debrief functions. The Display Subsystem also provides access and display of data from the WWMCCS computer through the ASWCCCS high level terminal (HLT) interaction functions. The DVC operator can format and edit messages and control real-time exchange of tactical data to and from mission aircraft or surface forces through Link 11.

The Display Subsystem consists of the following major equipment in the quantities indicated:

1. Direct View Console Aydin Model 8400 (5)
2. Display Interface Unit Aydin Model 8420 (3)
3. Large Screen Display Aydin Model 8060 (2)

The Display Subsystem is made up of three display chains, each of which has a dedicated output channel from the CP-901 computer (fig. 2-4). A display chain is composed of a DVC interface, a buffer memory, a display power supply, and one or two DVCs.

DIRECT VIEW CONSOLE AYDIN MODEL 8400.—The Direct View Console Aydin Model 8400 (fig. 2-4) is commonly called a DVC. A typical DVC is composed of the following subunits:

1. Two Crt Units
2. Strobe Roller
3. Track Ball
4. Character Generator
5. Function Generator
6. Alphanumeric Keyboard
7. Keyset Interface
8. LSD Control Panel

The functions of the major components comprising the DVC are as follows:

1. The left crt provides:

a. The presentation of ASWOC symbology representing information such as sonobuoy position, contact, fix, and track. The symbology is generated either by the operator or by a software program (upper three-quarters of crt)

b. The presentation of graphic information contained in the data base (upper three-quarters of crt)

c. The presentation of tactical plots generated by mission replay (upper three-quarters of crt)

d. The presentation of cueing sequences, alerts, and messages (lower quarter of crt)

2. The right crt provides:

a. The presentation of tableau information from magnetic extraction flight tapes, processed analog acoustic tapes, data link, ASW formatted messages, and tableau data entered by the operator (upper three-quarters of crt)

b. The presentation of alphanumeric and symbology verification of operator entries (lower quarter of crt)

3. The console keyset provides:

a. Access to and update and use of the ASWOC data base

b. Capability of performing specific task assignments through the use of operational software programs

4. The alphanumeric keyboard provides a means of entering data into the ASWOC data base

5. The strobe roller provides a means of vertically positioning a strobe symbol on the tableau (right crt) display

6. The synchro track ball provides a means of vertically positioning the hook symbol on the situation (left crt) display

7. The keyset interface unit provides a means by which the DVC operator can communicate with the computer

8. The image generators, consisting of the function and character generators, produce the symbology presented on the crt displays

9. The LSD control panels provide unblanking for the LSD projectors, focus and intensity for the DVC situation and tableau displays, and the capability to select a X2 display character size

DISPLAY INTERFACE UNIT AYDIN MODEL 8420.—The Display Interface Unit Aydin Model 8420, is a multiplex converter which permits communications between the CP-901 computer and DVCs. No data bit conversion is necessary.

LARGE SCREEN DISPLAY AYDIN MODEL 8060.—The Large Screen Display (LSD) Aydin Model 8060 subsystem projects on a large screen the data selected and displayed on the DVC situation and tableau crt's. This function is available on DVCs 3 and 4, and is controlled by an LSD control panel located on the DVC. With this subsystem, command and group viewing of a selected DVC is possible.

DISPLAY GROUP CONFIGURATION.—The display group is composed of five DVCs and two LSDs and their associated equipment. There are three display chains in the display group. Display chain 1 has two DVCs, located in the Analysis area (console #1) and the Brief/Debrief room (console #3). Display chain 2 has two DVCs, located in the Command/Evaluator area (console #2) and the Command/OPCON area (console #4). Display chain 3 has one DVC (console #5) which is used as the ASWCCCS high level terminal (HLT) console.

DVC FUNCTIONS AND CAPABILITIES.—The DVC provides the operator with a means to accomplish the following:

1. Access, update, and use the ASWOC data base
2. Display desired portions of the data base on the situation and tableau displays
3. Initiate the generation of hard copies of a desired portion of the ASWOC data base on the high speed printer and/or the X-Y plotter
4. Generate new data for entry into the ASWOC data base
5. Format and edit messages

The DVC provides the operator with a means to perform specific task assignments through use of operational software programs such as:

1. Data presentation
2. Data reduction
3. Mission replay
4. Sonic analysis
5. Data link operations
6. Interactions

ASWOC Communications Subsystem

The Communications Subsystem provides the ASWOC with a means of communicating both by secure data networks and secure voice networks. This assures two methods of communicating with subordinate aircraft and afloat units and with the Force Commander at the FCC. The following paragraphs will discuss the portion of the Communications Subsystem which deals with data communications to and from the ASWOC.

The Communications Subsystem consists of the following equipment:

1. Terminal Communications Interface
2. Teletype Interface
3. Data Link Interface
4. Data Terminal Multiplexer

The above units provide a means of communicating via Link 11, AUTODIN landlines, and teletype to and from other units external to the ASWOC.

TERMINAL COMMUNICATIONS INTERFACE.—The terminal communications interface is commonly referred to as the TCI. The TCI system (fig. 2-4) serves to interface the CP-901 central computer with serial data landlines using modified Autodin Mode I line discipline in full duplex. The TCI system is composed of the following equipment:

1. Terminal Communications Interface Federal Pacific Electric Model 21810
2. Data Network Controller Model 7500
3. Manually Programmable Diagnostic Terminal Compunetics Model 7501
4. Power Supply Compunetics Model 5696

The TCI continuously receives serial data from the landlines in the form of an 8-bit ASCII code (seven data bits plus a parity bit). The TCI converts these serial characters to a parallel format, removes the parity bit, holds them in a buffer and forwards them to the CP-901, four 7-bit characters at a time.

The TCI functions as a parallel to serial converter in the transmit mode of operation between the CP-901 and the landlines. The CP-901 sends data to the TCI four 7-bit characters at a time. The TCI converts the parallel data to 7-bit serial ASCII code, adds a parity bit, and transmits the 8-bit code over the landline.

TELETYPE INTERFACE COMPUNETICS MODEL 5662.—The Teletype Interface Compunetics Model 5662 (fig. 2-4) is a serial-to-parallel/parallel-to-serial converter and interface between the CP-901 computer and any standard tty circuit. The tty interface converts parallel 30-bit computer words into serial data for the teletype in the send mode. In the receive mode, the tty interface converts serial teletype data into a parallel 30-bit word for input into the CP-901 computer. The tty interface allows formatted messages to be transmitted and received by the ASWOC using conventional teletype circuits.

DATA LINK INTERFACE COMPUNETICS MODEL 67B0.—The Data Link Interface Compunetics Model 67B0 (fig. 2-4) is an interface unit between the CP-901 and the AN/USQ-76 Data Link Terminal Set. The data link interface provides the DVC operator with a means of controlling the two-way data flow between the ASWOC and mission aircraft or afloat forces. Additional information on Link 11 may be found in *Data Systems Technician 3 & 2*, Vol. 2, NAVEDTRA 10201 (Series).

DATA TERMINAL MULTIPLEXER.—Data terminal equipment (fig. 2-4) is used by the peripheral manager and at other stations. The peripheral manager station provides the capability of system initialization and recovery and the performance of specific operational tasks. The message stations provide the capability of displaying incoming RAINFORM message traffic, or construction of RAINFORM messages for transmission and provide the operator with a capability to generate a Preflight Data Insertion Program (PDIP) tape for P-3C and S-3A flights. The multiplexer converter permits communications between the CP-901 computer and the three data terminals. No data bit conversion is necessary. The peripheral manager (PM STATION) and the two message stations are identical in hardware configuration. They differ only in the functions they perform and the legends in the auxiliary switches.

Each terminal contains a display control section which generates all the timing and control signals for the display and keyboard unit. It also contains an interface unit and a memory. Data can be written into the memory from the keyboard of the display/keyboard unit or remotely from the computer via the interface unit.

ASWOC SYSTEM SUMMARY

Each component subsystem of the ASWOC provides a unique function toward the accomplishment of the operational goals of the system. The ADP Subsystem performs the following functions for the system:

1. Data manipulation
2. Data storage
3. Control and routing of data between various subsystems and ADP system components

The Display Subsystem provides a means of presenting data which has been processed and stored by the ADP Subsystem. The data comes from other subsystems, such as the Analysis Subsystem or the Communications Subsystem. Local data may also be entered by means of the Display Subsystem to update or modify the ASWOC data base.

The Communications Subsystem, under control of the ADP Subsystem, provides paths for data either coming into or leaving the ASWOC. The Communications Subsystem is a prime source of external data from other component systems of the NCCS.

The Analysis Subsystem provides a means of analyzing sensor data furnished by patrol aircraft. The Analysis Subsystem plays a large role in determining and interpreting sensor data.

FORCE HIGH LEVEL TERMINAL

The Force High Level Terminal (FHLT) has all the ASWOC/HLT capabilities except aircraft mission support and reduction. It also has the following capabilities:

1. Expanded local data base
2. Enhanced geographic display
3. ASWCCCS data base management
4. ASWCCCS monitor
5. Degraded mode capability
6. Report generation

Much of the same type of equipment used at the ASWOC is also used at an FHLT. The FHLT also has some equipment, not found in an ASWOC, needed to handle its additional role. The FHLT is an ADP system with supporting peripheral display, data storage, hardcopy, and communications subsystems. Each FHLT has an ADP Subsystem, a Display Subsystem, and a Communications Subsystem. For ease of explanation, the FHLT equipment will be grouped according to subsystem.

FHLT FUNCTIONS AND SUBSYSTEMS

The Force High Level Terminal (FHLT) (fig. 2-5, a foldout at the end of this chapter) portion of the NCCS is a display augmented computer system configured around an AN/UYK-7 three-bay computer. It is designed to give the ASW Force Commander the ADP tools necessary to integrate, correlate, analyze, control, and disseminate pertinent ASW data. The extensive man-machine interface capabilities are provided via direct view consoles (DVCs) alphanumeric crt terminals, high-speed printers, an online X-Y plotter, a manual plot entry (MPE) device, an online teletype, and DVC driven large group displays (LGDs). The FHLT is the hub of the ASW network in each geographic area (Atlantic, Mediterrranean, Eastern Pacific, and Western Pacific).

FHLT Automatic Data Processing (ADP) Subsystem

The ADP Subsystem is the center of the FHLT equipment suite. All data to and from the FHLT is stored, processed, and converted to usable formats in the ADP Subsystem. The ADP Subsystem consists of the central computer and its associated peripheral equipment. The FHLT ADP Subsystem consists of the following equipment in the quantities indicated:

1. AN/UYK-7(V) Computer Set (3 bays)

2. Magnetic Tape Controller Compunetics Model 28112 (1)
3. Magnetic Tape Transport Kennedy Model 9100 (3)
4. Disk Controller CDC Model 560533A (2)
5. Disk Storage Unit CDC Model 560718A (4)
6. X-Y Plotter Zeta Model 36005 (1)
7. Manual Plot Entry Compunetics Model 28140 (1)
8. High Speed Printer Data Products Model 2290 (2)
9. High Speed Printer Data Products Model 2230 (1)
10. Teletypewriter AN/UGC-48 (1)
11. Teletype Interface Compunetics Model 28150 (1)
12. Plotter Interface Compunetics Model 28122 (1)
13. High Speed Printer Interface Compunetics Model 1721020 (1)
14. Manual Plot Entry Interface Compunetics Model 28142 (1)

As mentioned previously, much of the equipment used in the FHLT is similar to that used in the ASWOC. The model number may be different, but the function of the X-Y plotter is the same at both sites. Figure 2-5 is a simplified block diagram of the FHLT. There are only a few additional equipment present at the FHLT, which perform functions or provide capabilities that the ASWOC does not have.

FHLT DIGITAL COMPUTER SET AN/UYK-7(V).—The AN/UYK-7(V) general purpose digital computer set (fig. 2-5) is the host computer at the FHLT. The FHLT configuration consists of a three-bay, dual CPU, dual IOC installation. The triple-bay AN/UYK-7(V) contains nine 16K CMUs which provides 147K of memory. The third bay provides an additional storage capacity of 49K. Use of the triple-bay AN/UYK-7(V) computer in the FHLT eliminates the need for the signal data buffers (SDBs) used with the ASWOC CP-901 computer (fig. 2-4). The AN/UYK-7(V) computer provides more data storage, computing power, and I/O channels for the FHLT ADP Subsystem. For additional information on the Digital Computer Set AN/UYK-7(V), refer to *Data Systems Technician 1 & C*, Vol. 1, NAVEDTRA 10203 (Series).

FHLT DISK CONTROLLERS AND DISK DRIVES.—The disk controllers and disk drive units (fig. 2-5) used in the FHLT are the same as those used at an ASWOC site (fig. 2-4). The only difference is that the FHLT configuration has four disk drive units. This feature provides the FHLT with four times the random access storage capacity of an ASWOC site.

FHLT HIGH SPEED PRINTERS & INTERFACE.—The FHLT high speed printers (HSPs) and printer interface (fig. 2-5) provide twice the capacity for producing hard copy material as the ASWOC ADP Subsystem. The FHLT contains a large Data Products Model 2230 HSP, and two smaller Data Products HSPs.

FHLT INTERFACE EQUIPMENT.—The FHLT has interface equipment (fig. 2-5) similar to the interface equipment found at ASWOC sites. The teletype (tty), MPE, and X-Y plotter interfaces all adapt the data outputs from or inputs to these devices (tty, MPE, and X-Y plotter) to the line logic used by the AN/UYK-7(V) computer. The interface units allow off-the-shelf commercial equipment to be used with military computers.

FHLT Display Subsystem

The FHLT Display Subsystem is comprised of the direct view consoles (DVCs), large group displays (LGDs), and data terminal displays (DTDs). These units provide visual displays of situations, data, and incoming messages.

The FHLT Display Subsystem is composed of the following equipment in the quantities indicated:

1. Direct View Console Raytheon Model OJ-448/FYQ (4)
2. Large Group Display Aydin Model 8063C (2)
3. Data Terminal Display UNIVAC Model U-2000 (5)
4. Liquid Crystal Light Valve Projector Hughes Model HPD 2000 (1)

The above-listed equipment are the major components of the Display Subsystem. There are also keysets, power supplies, and other off-the-shelf units used by the Display Subsystem.

FHLT DIRECT VIEW CONSOLE.—The Direct View Console (DVC) Raytheon Model OJ-448/FYQ (fig. 2-5) used at the FHLT is an improved multicolor capable DVC; rather than the monochromic unit used at ASWOC sites. The function and capabilities of the FHLT DVCs are similar to the units used at the ASWOC sites, except the FHLT DVCs are multicolor. Only four DVCs are used at the FHLT.

The FHLT DVCs contain a display generator which eliminates the need for the display equipment racks used in the ASWOC Display Subsystem.

FHLT LARGE GROUP DISPLAY/LIQUID CRYSTAL LIGHT VALVE PROJECTOR.—The large group display/liquid crystal light valve projector (LGD/LCLV) (fig. 2-5) projects the data presented on either the tactical display or tableau display of a selected DVC onto wall screens for training, briefing, critiquing, and command-associated functions. The display on the LGD/LCLV is controlled by the DVC operator through a video switcher. The operator of any DVC can select the tabular or tactical display and project it on one of the screens. The LGD can project either a tabular display or a tactical display. The LCLV has the same capability. The FHLT computer has neither interface with the LGD/LCLVs, nor control over their use.

FHLT DATA TERMINAL DISPLAY.—The data terminal displays (DTDs) (fig. 2-5) are UNIVAC U-2000 crt displays and keyboards used for equipment control and as message stations. The Peripheral Manager (PM) station provides a means for managing system peripheral performance and recovery and initiating standard ADP operations. The three message station DTDs provide a secondary capability of generating, reviewing, and modifying standard Navy message traffic processed by the FHLT system.

FHLT Communications Subsystem

The Communications Subsystem provides a method of transferring secure data between the FHLT and other units of the NCCS. (Refer to figure 2-2.) The FHLT has the capability of communicating with all ASWOC/HLTs in the geographic area at once.

The Communications Subsystem consists of the following equipment in the quantities indicated:

1. Programmable Terminal Communications Interface Compunetics Model 22300 (1)

2. Computer Communication Line Monitor Compunetics Model 22400 (1)

These units control the secure data communications to and from the FHLT subsystems.

PROGRAMMABLE TERMINAL COMMUNICATIONS INTERFACE.—The Programmable Terminal Communications Interface Compunetics Model 22300 (fig. 2-5) is commonly referred to as the PTCI. The PTCI provides an interface between the FHLT AN/UYK-7(V) computer and one to eight full duplex ASWCCCS communications lines. The PTCI can be expanded to handle up to 16 communications lines. In the case of a failure of the CLI (communications line interface), all of the data circuits to the ASWOC/HLTs will be routed to the FHLT through the PTCI. The PTCI is an automated unattended system.

COMPUTER COMMUNICATIONS LINE MONITOR.—The Computer Communications Line Monitor Compunetics Model 22400 (fig. 2-5) is commonly referred to as the CCLM. The CCLM is mounted in an equipment rack near the PTCI and provides a means of checking data out of the PTCI. The CCLM monitors the output of the PTCI at its modems and feeds the data back to the FHLT computer. The data provides the FHLT computer with a means of checking PTCI operation.

Communications Line Interface

The CLI serves as the hub of each of the four ASWCCCS secure data networks. Configured around a Honeywell Information System (HIS) 716 minicomputer, the CLI is the automatic store-and-forward, message-switching, control and routing station which provides the pathway for message communications between and among the FHLT, ASWOCs, and ASWCCCS Central Site.

Within each of the four ASWCCCS secure data networks, each node terminates on a different channel of the CLI. The Atlantic and the Europe/Mediterranean CLIs are interconnected via a separate channel. The same is true for the Eastern and Western Pacific CLIs. Each CLI channel can be independently monitored, controlled, opened, and closed by the CLI service station teletype (tty) operator.

FHLT SYSTEM SUMMARY

The relationship and functions of the FHLT Subsystems are similar to those of the ASWOC. The hardware functions are identical in many cases. The Subsystem roles are the same in both the ASWOC and the FHLT.

CARRIER-ANTISUBMARINE WARFARE MODULE

The Carrier-Antisubmarine Warfare Module (CV-ASWM) is the seagoing equivalent of the ASWOC. The CV-ASWM gives the fleet an up-to-the-second high data rate ASW capacity which is compatible with the most advanced airborne weapon systems presently in use or envisioned for the future. It has a fast and flexible display capability, which makes possible rapid target detection, classification, evaluation, and decision making. This means that the coordinated ASW force, when supported by the CV-ASWM, are more effective when hunting or tracking submarines than they previously were. The CV-ASWM is the carrier ASW nerve center of the future.

CV-ASWM OPERATIONAL CONCEPT

The basic function of the CV-ASWM is to provide an advanced mission brief/debrief capability as an aid to the newest carrier ASW airborne systems. It also provides real-time and delayed-time data processing from airborne ASW platforms. The CV-ASWM enhances the capabilities of the flight crews by quickly processing and displaying critical sensor input data, so that the ASW team can make fast and accurate evaluations and decisions.

The major aircraft associated with the CV-ASWM are the SH-3, S-3A, P-3C, and the Light Airborne Multipurpose System (LAMPS) helo. During the mission, each aircraft transmits data to the carrier. This is in the form of an acoustic link from the SH-3 and LAMPS helos, voice link (uhf, secure uhf, and hf) from all aircraft, and digital data link from the S-3A and the P-3C. Selected digital data is transmitted via Link 11 to the CIC (combat information center) and relayed through the NTDS computers to the computers in the CV-ASWM.

During the ASW mission, the S-3A aircraft's magnetic tape recorders store acoustic data and mission profile data. When the S-3A returns to the carrier, the tape-stored data is brought to the CV-ASWM and processed. The processed data is then displayed for post-engagement analysis, briefing/debriefing flight crews, and preparing preflight tapes for the S-3A. The preflight tapes contain mission related data such as contact information, communications frequencies, and environmental conditions which is entered into the aircrafts computer prior to launch. Tactical and intelligence data derived from mission aircraft is also exchanged with NTDS, CVIC, and the TFCC.

The locating of a submarine is a group effort. Inputs concerning the whereabouts of a submarine can be reported to the CV-ASWM from outlying surface units that make sonar contact, from an aircraft that visually spots a submarine, and by analyzing the data from sonobuoys dropped into the water by an ASW aircraft. The CV-ASWM evaluates this data and recommends a course of action.

The CV-ASWM consists of three distinct subsystems. Each performs a portion of the overall CV-ASWM task of analyzing, evaluating, displaying, and communicating information. The three subsystems of the CV-ASWM are:

1. The Automatic Data Processing Subsystem
2. The Display Subsystem
3. The Communications Subsystem

CV-ASWM Automatic Data Processing (ADP) Subsystem

The CV-ASWM Automatic Data Processing Subsystem stores, reduces, converts, and routes

data to the various displays and peripherals of the CV-ASWM. The ADP system is composed of the following equipment in the quantities indicated:

1. Digital Computer AN/UYK-7(V) (1)
2. Digital Computer AN/UYK-20(V) (1)
3. Teletypewriter Set OJ-212(V)/UYK (1)
4. Magnetic Disk Recorder/Reproducer AN/UYH-3(V) (1)
5. Digital Magnetic Tape Controller (1)
6. Digital Magnetic Tape Unit RD-348/ASH (2)
7. High Speed Printer RD-280/UYK (1)
8. Magnetic Tape Unit RD-358(V)/UYK (1)
9. I/O Console OA-7984/UYK(V) (1)
10. Fast/Slow Adapter (1)

CV-ASWM DIGITAL COMPUTER AN/UYK-7(V).—The CV-ASWM Digital Computer AN/UYK-7(V) (fig. 2-6, a foldout at the end of this chapter) is the center of the CV-ASWM system. It is responsible for the control of all data flow within the CV-ASWM. It also accomplishes most of the tactical computations used in the system. The AN/UYK-7(V) configuration used with the CV-ASWM is a two-bay installation. One bay consists of a single CPU, single IOC, single IOA, triple CMU configuration. The other bay is an expanded memory bay containing three Core Memory Units (CMUs). Additional information on the AN/UYK-7(V) computer set may be found in *Data Systems Technician 1 & C*, Vol. 1, NAVEDTRA 10203 (Series).

CV-ASWM DIGITAL COMPUTER AN/UYK-20(V).—The Digital Computer AN/UYK-20(V) (fig. 2-6) is used for the buffer operations between the AN/UYK-7(V) computer and the Hughes Display Subsystem. It also is directly responsible for controlling the audio switching matrix in the Communications Subsystem.

The AN/UYK-20(V) is a 16-bit microprogram controlled computer set. It has a memory capacity of 65K data words and can control up to 16 full-duplex I/O channels. Available I/O channel interface levels are NTDS SLOW, NTDS FAST, ANEW in parallel data. Serial data channels are available for up to four channels and are available in NTDS serial, MIL-STD-188C, EIA Standard RS-232C and VACALES (Variable Character Length Synchronous). For additional details refer to *AN/UYK-20(V) Data Processing Set*, Vol. 1, NAVELEX 0967-LP-598-1010.

TELETYPEWRITER SET OJ-212(V)/UYK.—The Teletypewriter Set OJ-212(V)/UYK is commonly referred to as the OJ-212. The OJ-212 (fig. 2-6) is a computer interfaced, 100 words-per-minute teletype machine. It is used to provide an interface into the communications net for generation and reception of message traffic. For additional information on the OJ-212(V)/UYK teletypewriter set, refer to *Data Systems Technician 3 & 2*, Vol. 1, NAVEDTRA 10201 (Series).

MAGNETIC DISK RECORDER/REPRODUCER AN/UYH-3(V).—The Magnetic Disk Recorder/Reproducer AN/UYH-3(V) (fig. 2-6) is commonly referred to as the UYH-3 disk file. The UYH-3 disk file is a high density random access magnetic disk storage unit capable of storing 642 megabits of data.

The UYH-3 consists of a disk drive control unit and two RD-448(V)/U disk drive units. Disk packs used in the UYH-3 contain five 14-inch disks which have eight writing surfaces. Only five writing surfaces are used for data.

The UYH-3 stores all of the nonresident data used by the AN/UYK-7 computer for a tabular display. The TAC/TAB console operator can call up this data for a particular mission or sortie. The access time of the disk file gives the operator almost an immediate response to a request. For additional information on disk operation, refer to *Data Systems Technician 3 & 2*, Vol. 2, NAVEDTRA 10201 (Series).

CV-ASWM DIGITAL MAGNETIC TAPE CONTROLLER/UNIT RD-348/ASH.—The Digital Magnetic Tape Controller/Unit (DMTC/DMTU) RD-348/ASH (fig. 2-6) is responsible for writing preflight data onto the S-3A aircraft cassette tape for its inflight data. After the aircraft returns to the ship, the data recorded onto the cassette during the S-3A flight is read and transmitted to the CV-ASWM computers for evaluation and dissemination to ASW operations.

The DMTC/DMTU consists of three units: the digital magnetic tape controller and two digital

magnetic tape units. The controller converts the data from the S-3A cassette tape into a format usable by the AN/UYK-7(V) computer. It also converts computer data to a format which can be entered into the S-3A computer. The DMTU records and plays back preflight and flight data from the S-3A aircraft.

CV-ASWM HIGH SPEED PRINTER RO-280/UYK.—The High Speed Printer (HSP) RO-280/UYK (fig. 2-6) is used to produce the mission data in a hard copy form. This allows the data to be analyzed at a later time without tying up an entire system while a mission is replayed. The RO-280 HSP is capable of producing copy at a rate of 600 lines per minute. For additional information on high-speed printers, refer to *Data Systems Technician 3 & 2*, Vol. 2, NAVEDTRA 10201 (Series).

CV-ASWM MAGNETIC TAPE UNIT RD-358(V)/UYK.—The Magnetic Tape Unit (MTU) RD-358(V)/UYK (fig. 2-6) is a UNIVAC Model 1840M autoloading tape unit that is responsible for the initial loading of the CV-ASWM computer programs. During normal operation one tape drive is used for the system program tape and the other drive is used for a system save tape. All information in the system that might be used at a later date can be saved by loading the data onto the system save tape.

CV-ASWM I/O CONSOLE OA-7984/UYK(V).—The I/O Console OA-7984/UYK(V) (fig. 2-6) is commonly referred to as the I/OC. The I/OC is a UNIVAC Model 1532 I/O Console. It is the manual interface device between the operator and the program. It allows the user to enter parameters and other data necessary to initialize the CV-ASWM operational program.

The I/OC consists of a teletype keyboard and a paper tape reader as input devices. A tty page printer and a high-speed punch provide output capabilities. An interface and timing unit converts serial tty data to a parallel format for transmission to the computer. Parallel computer data is converted to serial tty data for use by the tty page printer. The interface/timing unit provides all timing signals for internal operation and external communication with the CV-ASWM computer.

CV-ASWM FAST/SLOW ADAPTER.—The Fast/Slow Adapter (fig. 2-6) converts the AN/UYK-7(V) FAST I/O logic levels to NTDS SLOW logic levels. This allows the CV-ASWM to transfer data to NTDS via bidirectional intercomputer link.

The fast/slow adapter contains input and output buffers and timing circuits to provide the logic levels and timing required for the respective computers. The fast/slow adapter also converts logic levels between the OJ-212 and the AN/UYK-7(V). This allows the generation of tty tapes, by program control, for transmission by the ship's communications facility.

CV-ASWM Display Subsystem

The Data Display Subsystem in the CV-ASWM is the Tactical/Tabular Display System AN/SSQ-78(V). This display system is responsible for presenting a tactical ASW picture of any specified operational area within a range of 1024 miles. The Display Subsystem is composed of the following equipment in the quantities indicated:

1. TAC/TAB Display Generator Unit AN/SSQ-78(V) (1)
2. Data Display Console OJ-374/SSQ-78(V) (5)
3. Data Display Console OJ-375/SSQ-78(V) (1)
4. Digital Television Projection Unit IP-1231/SSQ (1)
5. Hard Copy Unit Versatech Model 1100 (2)

TAC/TAB DISPLAY GENERATOR UNIT AN/SSQ-78(V).—The TAC/TAB Display Generator Unit AN/SSQ-78(V) (fig. 2-6) is commonly referred to as the DGU. The DGU provides the timing, symbol forming voltages, and multiplexing functions of the Display Subsystem. Data transferred between the CV-ASWM computer and the data display consoles and hard copy units is via the DGU. The DGU allows one computer I/O channel to interface with six consoles and two hard copy units.

The DGU also provides signal timing and symbol forming voltages for the five tactical/ tabular display consoles.

DATA DISPLAY CONSOLE OJ-374/ SSQ-78(V).—The Data Display Console OJ-374/SSQ-78(V) (fig. 2-6) is the main man-machine interface unit of the Display Subsystem. It contains two crt's which provide both a tabular data display and a tactical situation display for the operator. Their functions are similar to the DVCs mentioned previously in this chapter. The presentation an operator sees is a regular television picture consisting of 1024 lines of interlaced video. The console operator of the Brief/Debrief Console #1 has the additional capability of displaying either a tactical or tabular picture on a large screen display.

DATA DISPLAY CONSOLE OJ-375/ SSQ-78(V).—The Data Display Console OJ-375/SSQ-78(V) (fig. 2-6) is a single crt console used for the display of tabular data. It is referred to as the ADP operator console and is located in the same spaces with the data processing equipment. The ADP operator can analyze data and cause a hard copy of the tactical or tabular data to be printed out on the hard copy unit for future use by the CV-ASWM.

DIGITAL TELEVISION PROJECTION UNIT IP-1231/SSQ.—The Digital Television Projection Unit IP-1231/SSQ is commonly referred to as the DTVPU. The DTVPU provides the same brief/debrief capabilities to the CV-ASWM as is provided to the ASWOC and FHLT by their respective LSDs and LGDs. A tactical or tabular display of interest to the assembled personnel can be selected by the operator of Brief/Debrief Console #1 for display by means of the DTVPU on a large screen.

HARD COPY UNIT VERSATECH MODEL 1100.—The Versatech Model 1100 hard copy unit (fig. 2-6) is commonly referred to as the HCU. The HCU is a medium speed printer which provides the CV-ASWM with a hard copy of tactical or tabular data for use at a later date. The HCU performs the same function at the CV-ASWM as the HSPs at the ASWOCs and FHLTs.

CV-ASWM Communications Subsystem

The CV-ASWM Communications Subsystem provides for audio communications between the various console operators and allows the console operator to use ship's external communication equipment. The CV-ASWM Communications Subsystem consists of the Audio Switching Matrix SA-2033/SYQ.

AUDIO SWITCHING MATRIX SA-2033/ SYQ.—The Audio Switching Matrix SA-2033/ SYQ (fig. 2-6) is commonly referred to as the ASM. The ASM operates under the control of the AN/UYK-20(V) computer. When a switch is depressed in the COMMUNICATIONS section of a display console, a digital code is sent to the AN/UYK-20(V). The AN/UYK-20(V) converts the code into crosspoint data and sends the two crosspoints to the ASM. The audio switching matrix then selects the circuit, as directed by the AN/UYK-20(V) computer, and communications between the console operator and another console or radio is established.

NCCS SUMMARY

There are striking similarities and differences in the three NCCS subsystems that we have discussed in this chapter. The task of the ASWOC and the CV-ASWM are very similar. The equipment located at ASWOCs and FHLTs is the same in many cases.

As a DS1 or DSC your prime job is overseeing the maintenance of these systems. The maintenance techniques required to maintain each of these systems do not vary greatly from the techniques required to maintain a shipboard NTDS system or a TRIDENT submarine Command and Control System. Although the equipment nomenclature may change from site-to-site or system-to-system, the same sound, common sense maintenance practices are required universally. As a DS1 or DSC, you must know your system thoroughly, keep your technical documentation and knowledge up-to-date, and practice sound maintenance policies. Above all else, you must ENSURE the personnel you supervise do the same thing.

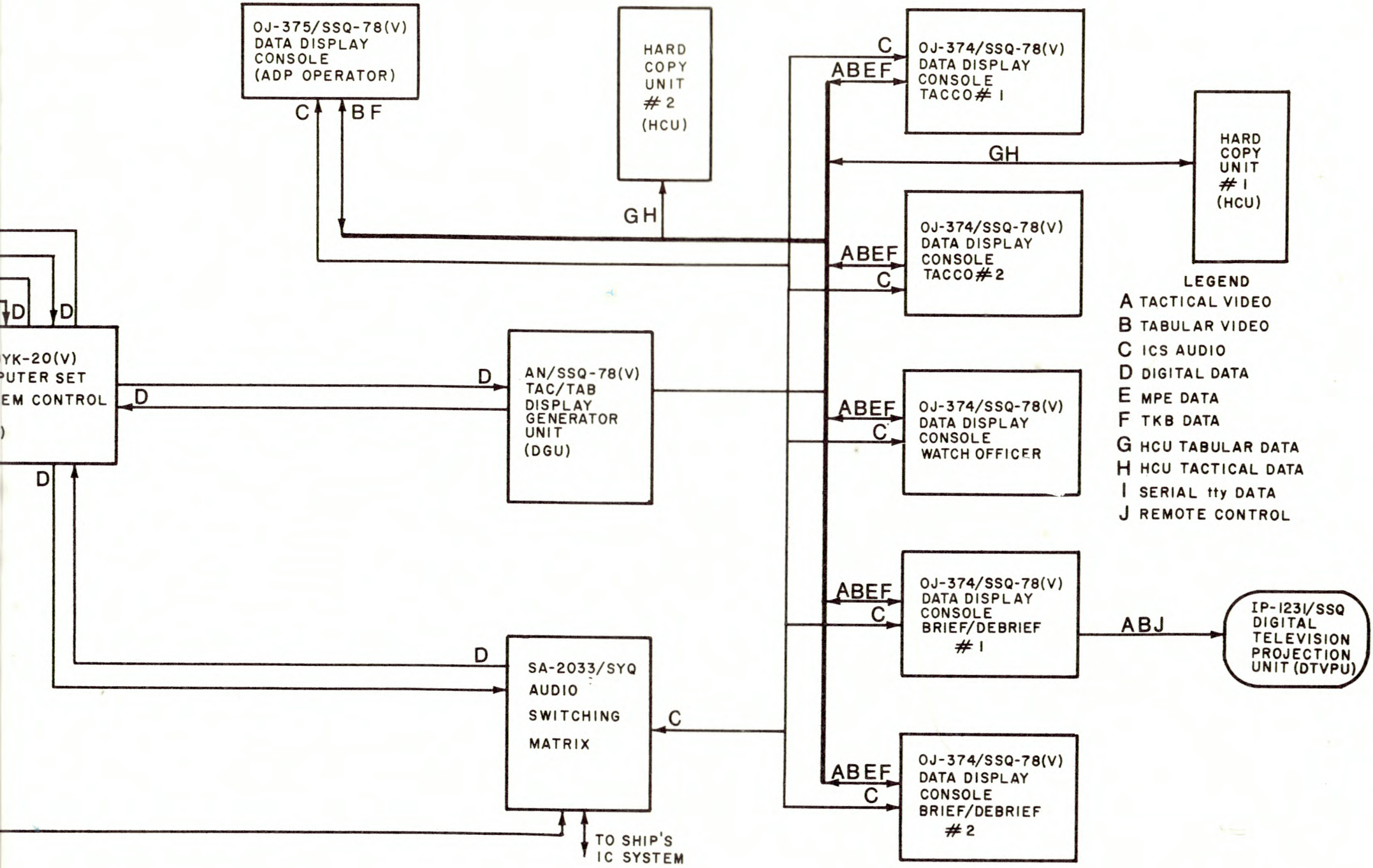
GLOSSARY OF ABBREVIATIONS

ABBREVIATION	DEFINITION
ADP	Automatic Data Processing
ADS	Automatic Digital Switch
ASM	Audio Switching Matrix
ASV	ASWCCCS Secure Voice
ASWCCCS	Antisubmarine Warfare Center Command & Control System
ASWIXS	Antisubmarine Warfare Information Exchange System
ASWOC	Antisubmarine Warfare Operations Center
AUTODIN	Automatic Digital Information Network
B/DB	Brief/Debrief
BFCF	Blue Force Characteristic File
C^2	Command and Control
CCLM	Computer Communications Line Monitor
CIC	Combat Information Center
CLI	Communications line interface
CPU	Central processing unit
CS	Central Site
CV-ASWM	Carrier-Antisubmarine Warfare Module
DCU	Disk control unit
DER	Display electronics rack
DGU	Display generator unit
DIM/DOM	Digital input multiplexer/digital output multiplexer
DMTC	Digital magnetic tape controller

ABBREVIATION	DEFINITION
DMTI	Digital magnetic tape interface
DMTU	Digital magnetic tape unit
DPE	Data processing equipment
DSU	Disk storage unit
DTD	Data terminal display
DTVPU	Digital television projection unit
DVC	Direct view console
FCC	Fleet Command Centers
FHLT	Force High Level Terminal
FLTSATCOM	Fleet Satellite Communications
FOSIC	Fleet Ocean Surveillance Information Center
FOSIF	Fleet Ocean Surveillance Information Facility
FTA	Fast Time Analysis System
GADS	Graphic Analysis and Display System
HCU	Hard copy unit
HLT	High-level terminal
HSP	High speed printer
ICS	Integrated Command System
IID	Integrated information display
LAMPS	Light Airborne Multipurpose System
LCLV	Liquid Crystal Light Valve
LDMX	Local Digital Message Exchange
LGD	Large group displays
LLT	Low-level terminal

ABBREVIATION	DEFINITION
LSD	Large screen display
MIP	Message input processor
MMP	Mass memory and microprogrammable processor
MPE	Manual plot entry
MPP	Microprogrammable processor
MTT	Magnetic tape transport
MTTI	Magnetic tape transport interface unit
MTU	Magnetic tape unit
NAVMACS	Navy Modular Automated Communications System
NCC	Navy Command Center
NCCS	Navy Command and Control System
NCSC	Navy Command Support Center (CNO)
NOSIC	Naval Ocean Surveillance Information Center
NRS	Navy Reporting Structure
NSOF	Naval Status of Forces
NTS	Naval Telecommunications System
NWSS	Navy WWMCCS Software Standardization
OPCON	Operations Control Center
OSIS	Ocean Surveillance Information System
OTC	Officer in Tactical Command
OTH-T	Over the Horizon Targeting
PM	Peripheral Manager
PTCI	Programmable Terminal Control Interface
S/D	Synchro-to-digital

ABBREVIATION	DEFINITION
SDB	Signal data buffer
SOSUS	Sound and Surveillance System
SSES	Ship's Signal Exploitation Space
SSIXS	Subsurface Information Exchange System
STT	Shore Targeting Terminal
SUBOPAUTH	Submarine Operations Authority
TAC/TAB	Tactical/tabular
TACCO	Tactical Control Officer
TCI	Terminal Communications Interface
TFCC	Tactical Flag Command Center
UNITRACK	Unit Tracking
VIP	Visual information processor
WWMCCS	World Wide Military Command & Control System



dule (CV-ASWM) simplified block diagram.

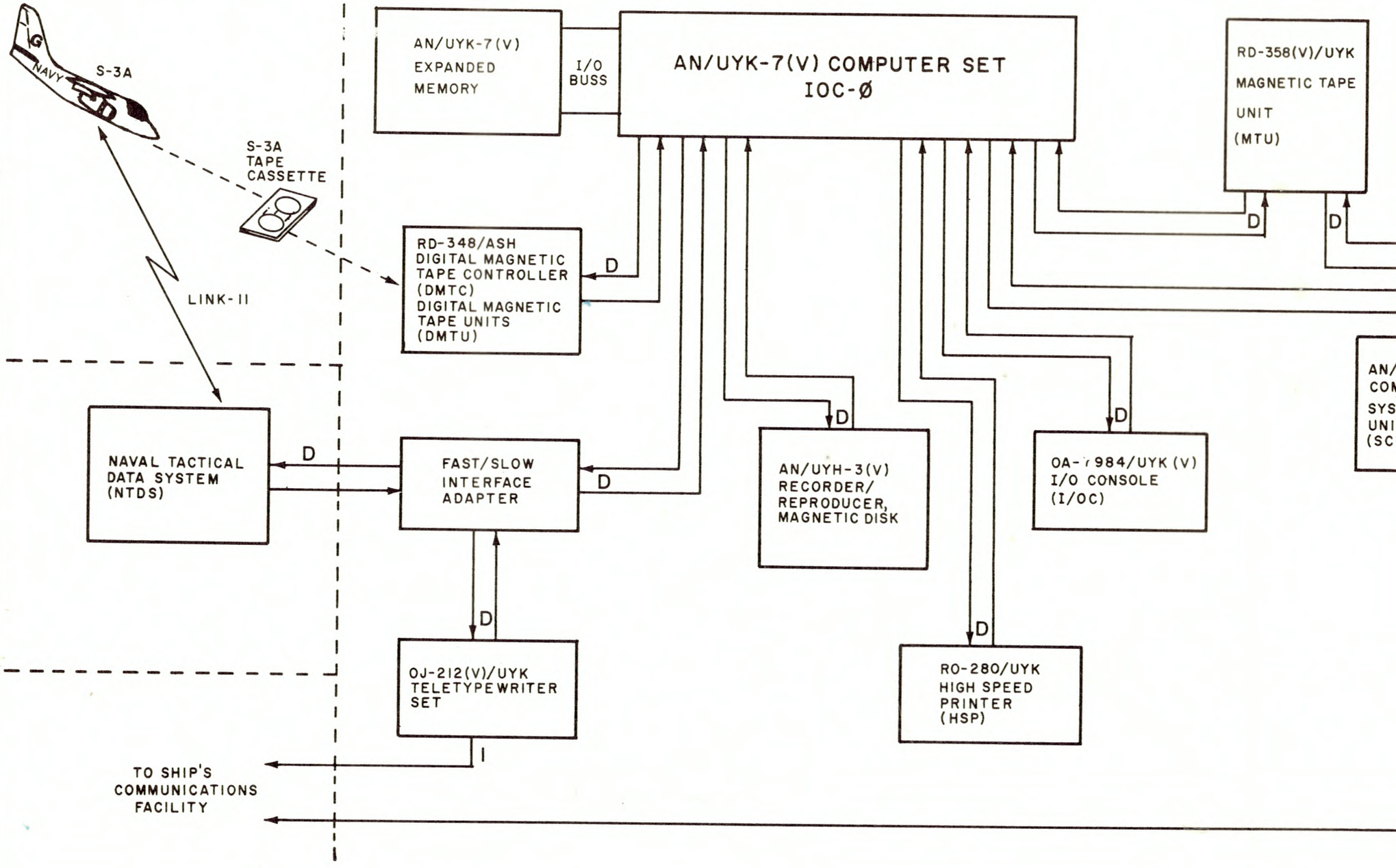


Figure 2-6.—Carrier Antisubmarine Warfare Mo

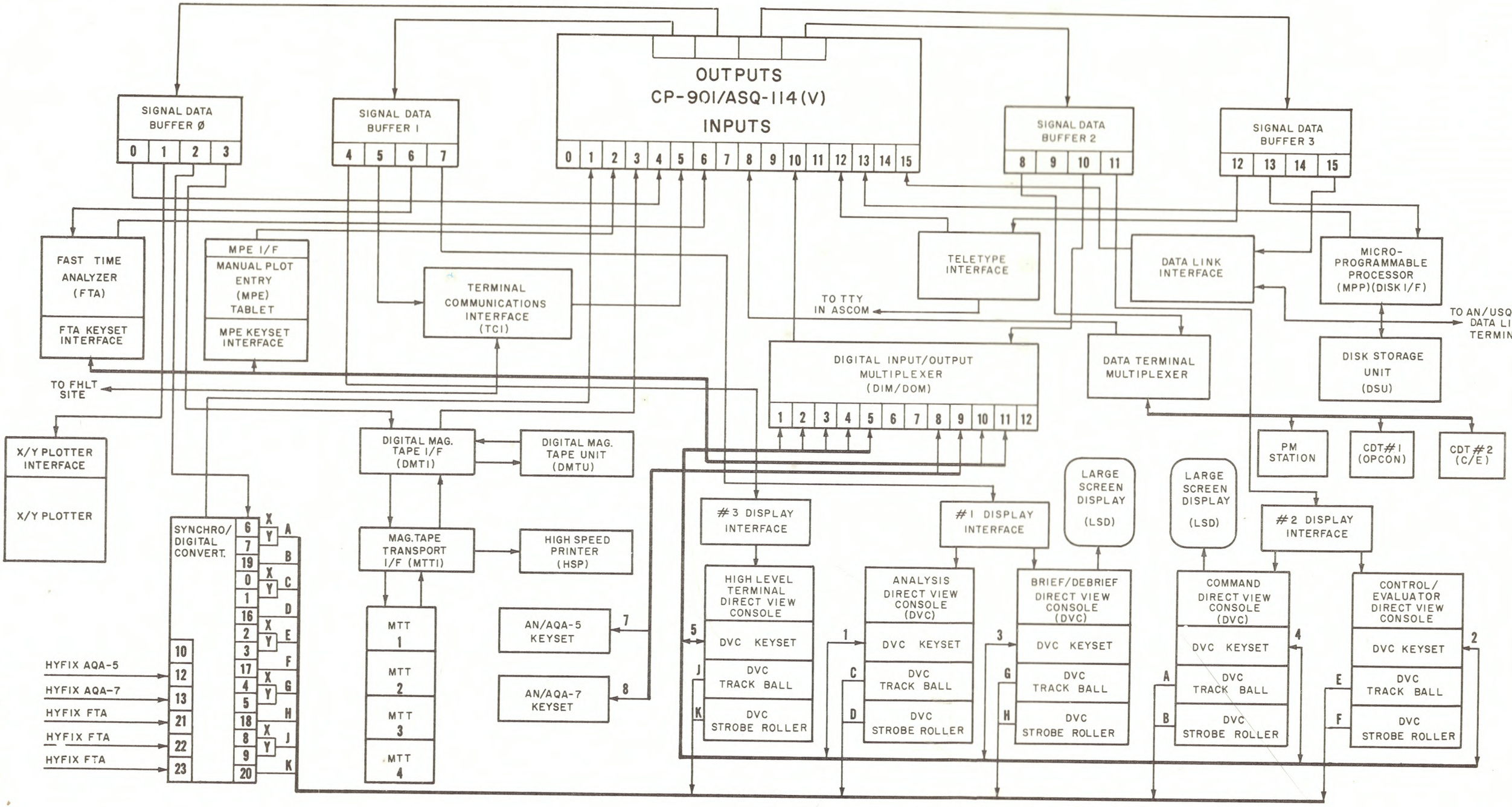


Figure 2-4.—Antisubmarine Warfare Operations Center (ASWOC) system block diagram.

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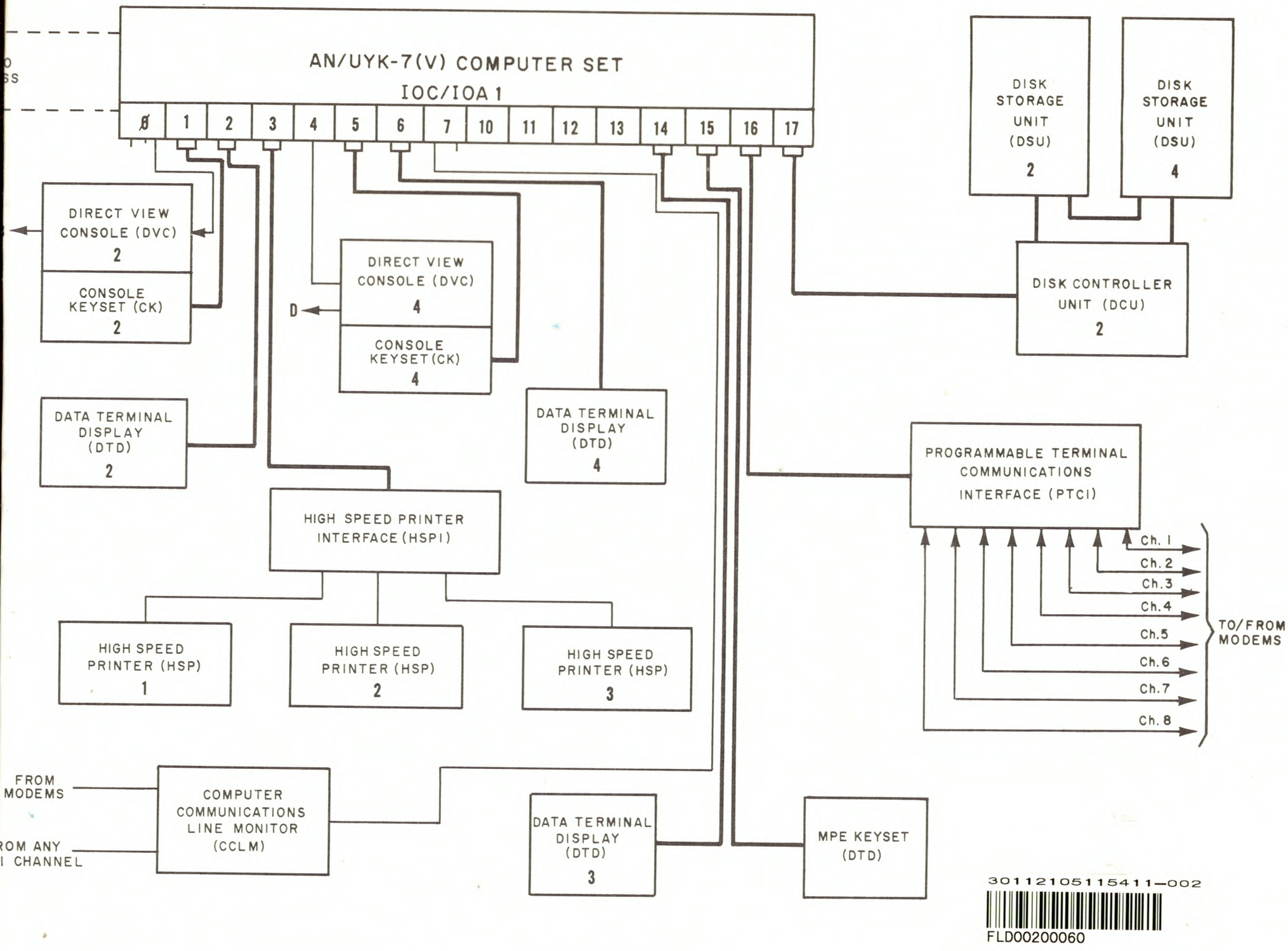

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T) simplified system block diagram.

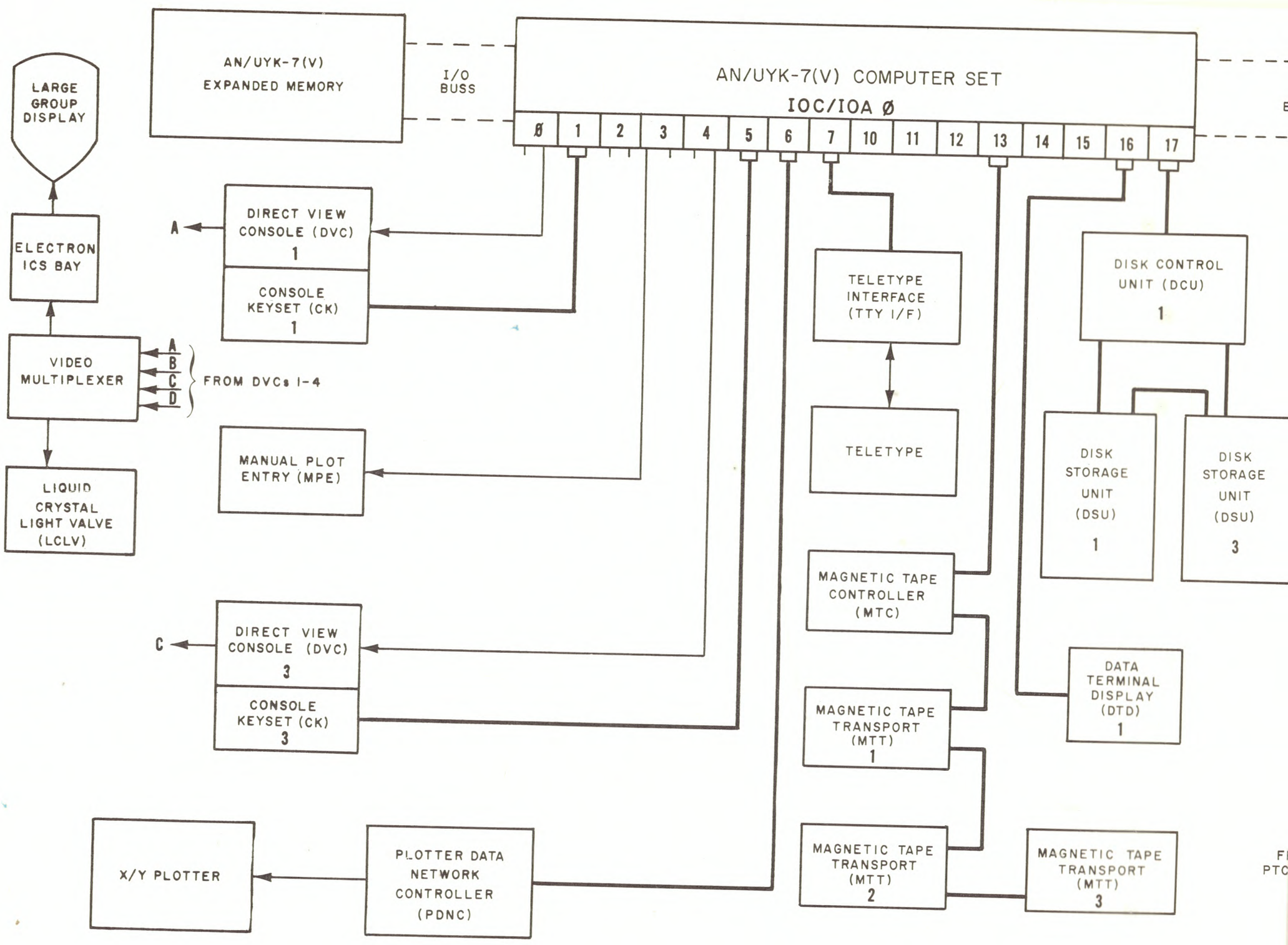

Figure 2-5. Force High Level Terminal (FHI