

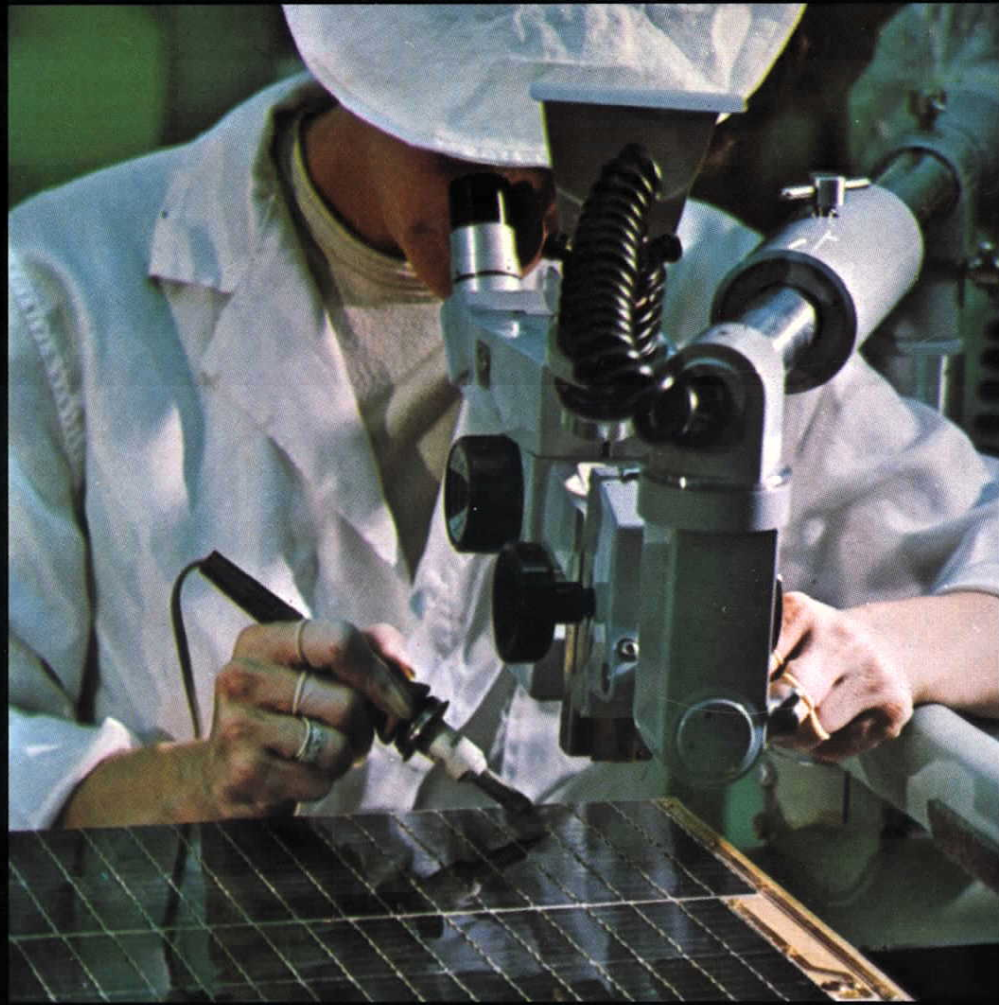
# CDC® SYSTEM 17™ SERIES

computer  
systems  
applications  
guide

for medicine



for electronics



for industry



for communications



# CDC® SYSTEM 17™ SERIES

computer  
systems  
applications  
guide









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## Introduction

The CDC SYSTEM 17 Series is a family of high-performance digital computers developed especially for growing organizations. Compact and competitively priced though it is, the speed and capability of this series exceeds that of many medium-sized computers.

Whatever your application — industrial control, high-speed data acquisition, analog-to-digital or digital-to-analog conversion, on-line, and/or real-time processing — what you are looking for is maximum efficiency. The CDC SYSTEM 17 Series is designed to give you just that. And, as a bonus, you may discover that extra processing time is available for many other jobs as well.

**COMPACT  
POWERFUL  
COMPETITIVELY  
PRICED**

**FAST INTERNAL SPEEDS  
MULTILEVEL INDIRECT  
ADDRESSABILITY  
BINARY ARITHMETIC  
EXPANDABLE MEMORY  
MEMORY PROTECTION  
INTERNAL ERROR CHECKING  
MULTISTATION I/O CAPABILITY  
FLEXIBLE INTERRUPT STRUCTURE  
WIDE RANGE OF PERIPHERAL  
EQUIPMENT  
SIMULTANEOUS JOB  
PROCESSING**

**MATCH IT TO YOUR  
PRESENT APPLICATION  
EXPAND IN INEXPENSIVE  
INCREMENTS  
GROW INTO LARGER  
SYSTEMS  
NO REPROGRAMMING  
COSTS**

For Applications Ranging from  
Complex Scientific and Engineering  
Problem Solving through Process  
Control to Batch Data Processing.



# Application Areas

The CDC SYSTEM 17 Series is demonstrating its extensive capability with day-in-day-out use in such varied fields as seismic data processing, jet engine testing and communications. It effectively handles data for chemical process control, message switching, and telemetry data processing. The versatile SYSTEM 17 Series may be applied to the following application areas.

## **INDUSTRIAL CONTROL**

Petrol-Chemical  
Steam Electric  
Glass Processing  
Paper Manufacturing  
Chromatography  
Metals Industry  
Oil and Gas Control  
Seismic Preprocessing  
Electric Utility Control

## **DATA ACQUISITION**

Data Acquisition and Analysis  
Telemetry  
Test Equipment  
Jet Engine Checkout  
Telephone Time and Charge Quote

## **COMMUNICATIONS**

Communications  
Message Switching

## **OPTICAL CHARACTER RECOGNITION**

Page and Document Reader  
OCR Message Entry

## **DIGIGRAPHICS**

## **TERMINALS**

## **HYBRID SYSTEMS**

## **HOSPITAL-MEDICAL**

Medicom  
Clinlab  
Cardiotest

## **AMUSEMENT AND RECREATION**

Pari-Mutuel Betting  
Ticket Reservation System  
Lottery Ticket Issuing



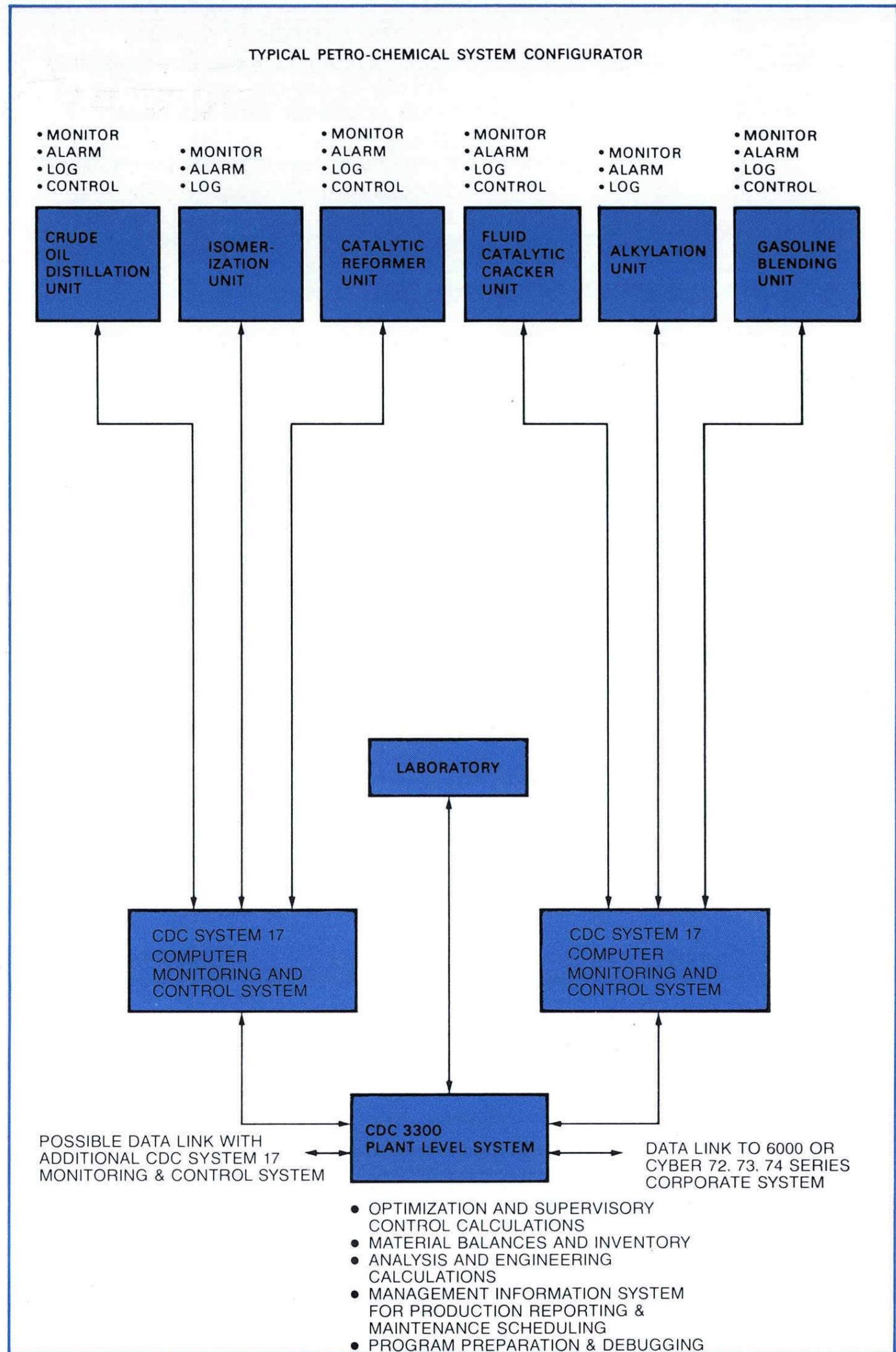
# CDC SYSTEM 17 SERIES

## Petro-Chemical Application

The CDC SYSTEM 17 Series meets the requirements for controlling and monitoring a petro-chemical refinery at any level of complexity. The standard hardware and standard software for the CDC SYSTEM 17 Computer has the speed, flexibility, and expandability to handle any application from single-unit monitoring and logging with a small computer, up to and including multi-level, multi-unit process control with an hierarchy system of several interconnected computers. Control Data can also provide any special hardware or software needed to tailor each system to individual user needs.

The configuration here depicts an ultimate hierarchy system which could develop by field expansion from an initial CDC SYSTEM 17 Computer on a crude-oil distillation unit. The initial system can expand to control and/or monitor other units in the same area until the work load warrants the installation of a second monitoring and control system. As the plant size, geographic location of units, and work load on individual systems continue to grow, additional systems can be added. A final plant expansion might be the installation of a Control Data 3300 plant-level system to take over unit system functions such as production reporting and maintenance scheduling. This would also provide optimization and supervisory control calculations to adjust the unit system programs for optimum total-plant performance. In addition, the central computer can be used to do any necessary accounting, data processing, and laboratory analysis, engineering and scientific calculations, and for process data analysis and developing mathematical models.

System expansion can continue further by data links to other plant computer systems or to corporate-level CDC 6000 Series or CDC Cyber 72, 73, 74 Computer Systems.









# CDC SYSTEM 17 SERIES

## Steam-Electric Application

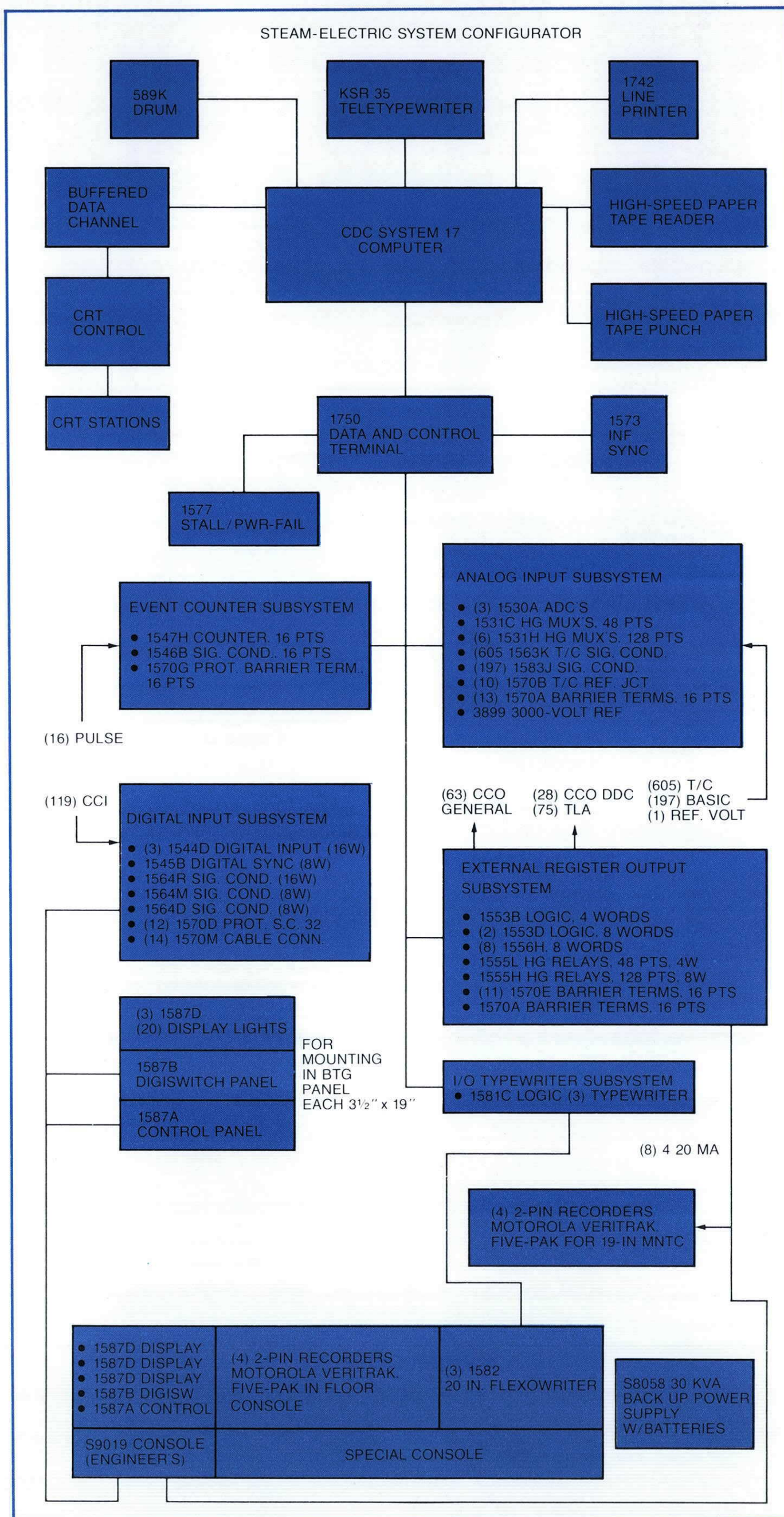
Using the CDC SYSTEM 17 Computer, power plant systems can be assembled from field-proven components to meet a wide variety of specific requirements. Small scanning, alarming and logging units, plus more comprehensive systems including performance calculations, trip sequence monitoring and closed loop or supervisory control, can be provided. Other features of the system include an analog scan for alarming and multiple ADC's of up to 1000 points at 190 points per second and compassed points including Milne and Anagree equations, and contact scan for uni-directional detection.

One system now in operation was developed for a modern, coal-fired, steam-electric generating unit capable of producing 550,000 KW. The unit consists of a B & W cyclone boiler producing 1000°F. steam at 3500 PSI, a Westinghouse turbine and generator, plus modern plant facilities, and an elaborate coal-handling system.

A large analog control system is used for automatic control of much of the plant equipment with the CDC SYSTEM 17 Computer supplying some of the analog set points and some direct control outputs.

The plant's 788 analog and 640 digital inputs are monitored constantly by the CDC SYSTEM 17 Computer. Any abnormal conditions, as well as startup and shutdown guide information, are printed out for the control room operator. Information about the 14 largest electric motors in the plant is analyzed by the computer which keeps track of their start-permissive conditions.

The computer makes information available to the plant personnel about almost all of the plant equipment and calculations of performance and efficiency.









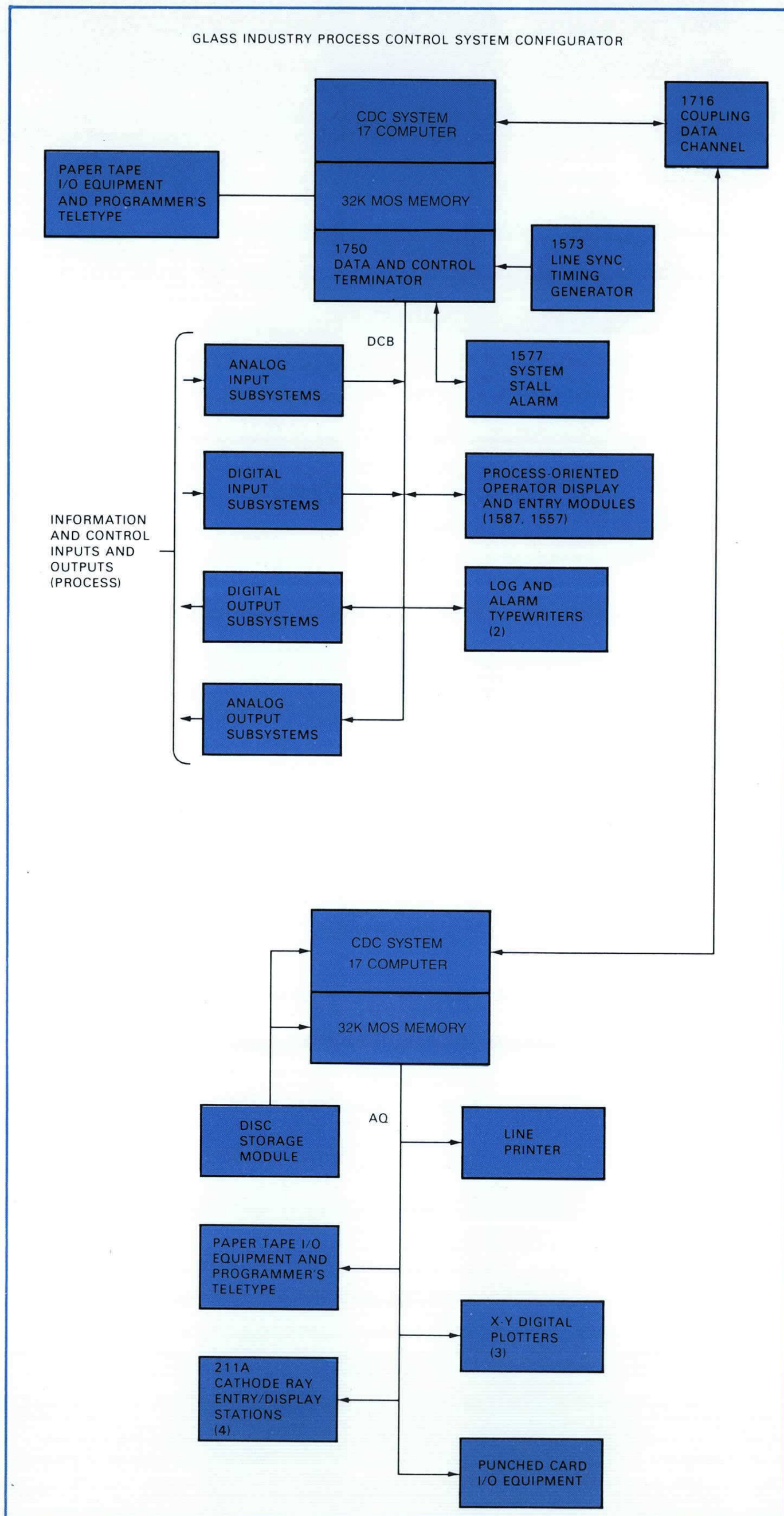
# CDC SYSTEM 17 SERIES

## Glass Industry Process Control Application

The CDC SYSTEM 17 Computer may also be applied to process control for the glass industry. Since the specific degree of automation to be accomplished in this process has not been defined fully, and since it is generally difficult to define in advance the degree of automation necessary for a large varied process, a project such as this is generally accomplished in several phases. The first phase encompasses the design and installation of a computer control system capable of data collection and basics of control. Later phases will implement direct digital control or a more sophisticated control of the various loops in the process. As shown, a dual CDC SYSTEM 17 mainframe is supplied to handle the management information, reporting, and off-line optimization calculations. The coupling data channel shown in the illustration provides direct communication between the computer mainframes. An option is provided to delete the second system and to connect the peripheral equipment to the single computer.

Preparation of programs for a Control Data computer system is simplified by a complete library of advanced programming aids. In addition to a Macro Assembler and an ASA FORTRAN Compiler with real-time subroutine capability, many utility routines and AUTRAN are also available to accomplish the standard operations occurring in process computer applications. Standard routines include Memory Dump, Relocatable Loader, Comparison Trace, Floating-Point Arithmetic, etc. A complete complement of standard arithmetic routines for the FORTRAN package is also available. As additional routines are developed they are made available to customers at no charge.

The Control Data AUTRAN System, for use with the CDC SYSTEM 17 Computer, allows the process engineer to program his computer system in a familiar language: English. The AUTRAN System can completely eliminate the need for often impossible coordination between process personnel and computer personnel. Now, the control or process engineer can completely program his own process control computer system without involving himself in the intricacies of the digital computer or becoming a computer expert.







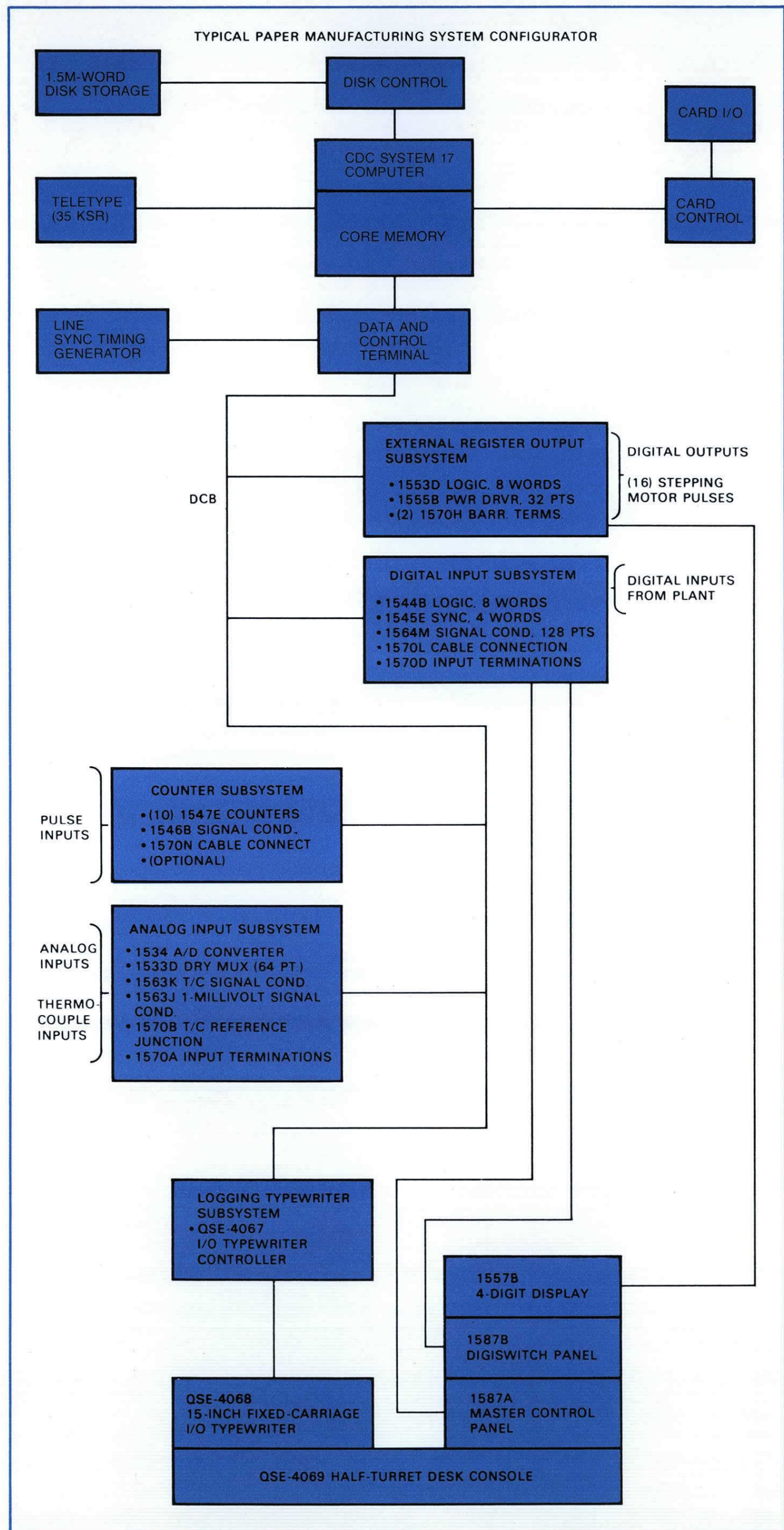


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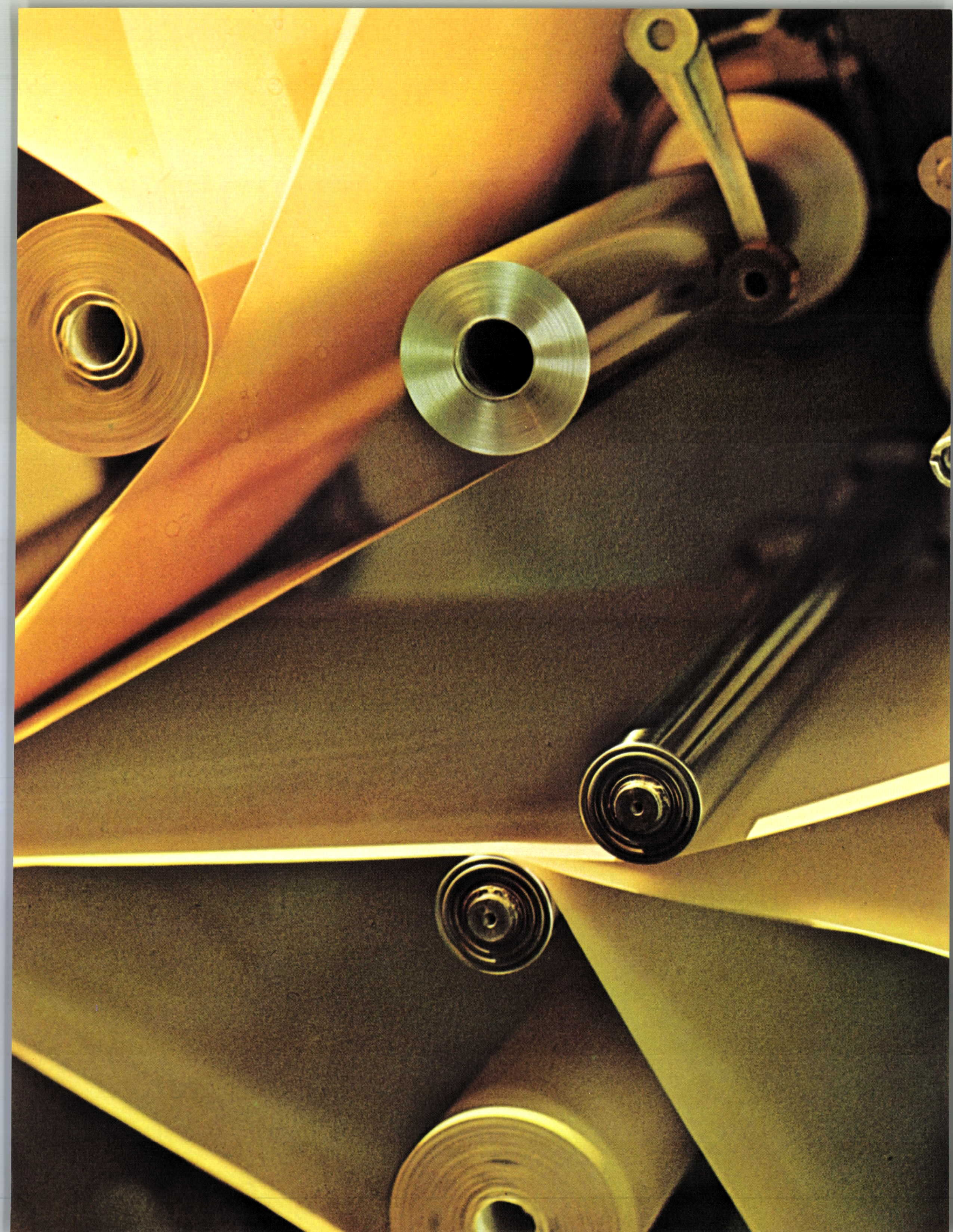
## Paper Manufacturing Application

This application consists of a typical process control computer system made up of standard hardware and software modules arranged in field-proven configurations. Augmenting the basic system is special application software used to solve various control problems and to achieve the economic and operational goals set by the customer.

The modular hardware and software in the system can be easily expanded in the field and are readily adapted not only to the specific control requirements of the three separate process control zones, but also to future paper making. The system is designed around a common central configuration which incorporates a central processor and basic input/output peripheral equipment.





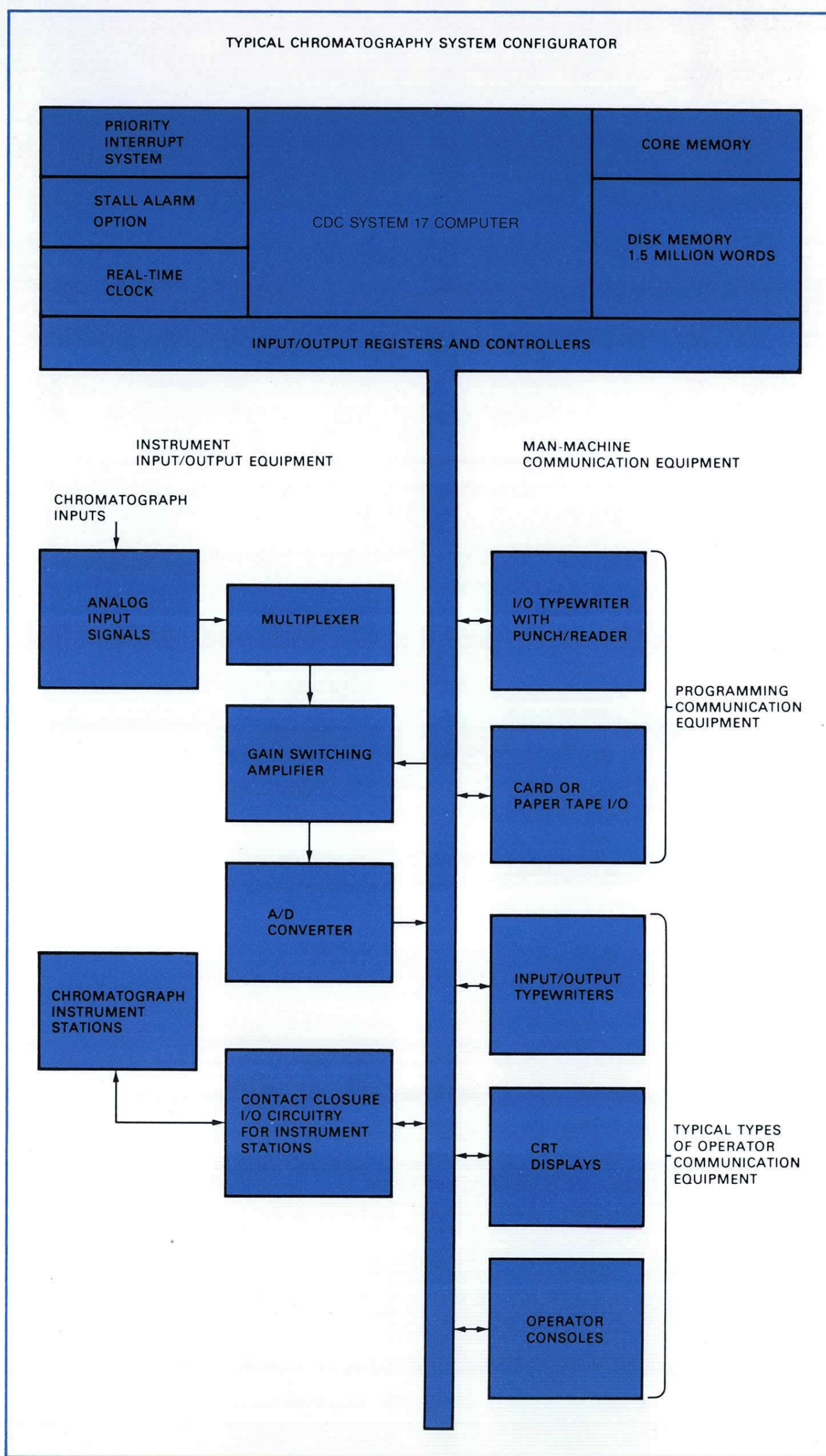




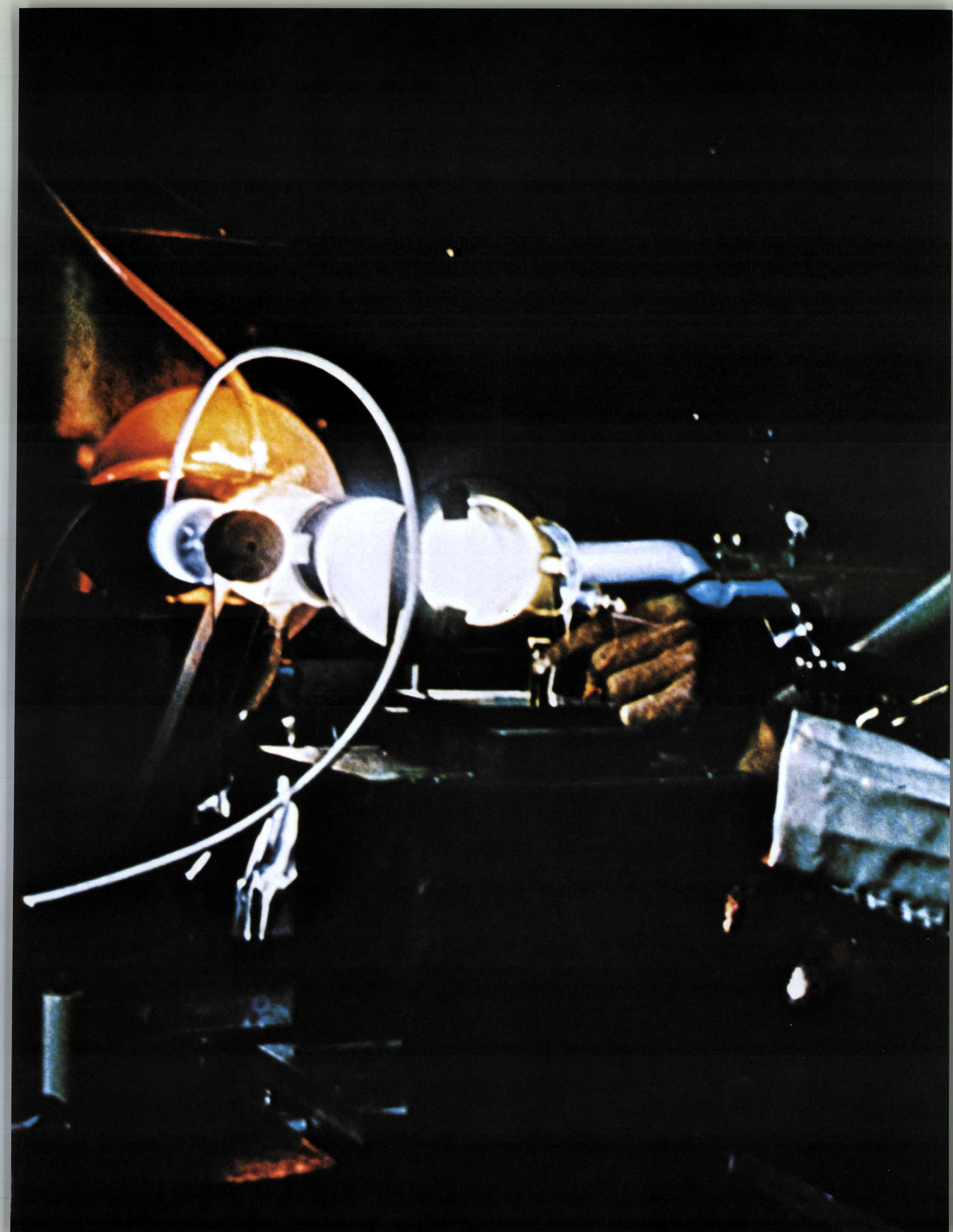
Control Data Corporation's Chromatography System provides on-line analysis of gas chromatograph data; it yields, as output, the identification and concentration of each component present in the output trace. Inputs from several instruments running concurrently is made possible by the CDC Chromatography Program. The program compensates automatically for baseline drift and handles significantly overlapped peaks and shoulders with accuracy not possible by other methods.

An analog signal from the detector circuit of each instrument is supplied to the computer. At fixed intervals, the program samples this signal to establish that these data are either on the baseline or defining a curve. The program performs an analysis for each curve segment and establishes the number of components and their area (baseline corrected), peak height, and retention time. If peak overlap time is significant, such as an overlap that produces shoulders, a special program routine determines the true peak heights, the areas, and the retention times of individual component peaks rather than the apparent values resulting from the overlap.

Absolute retention times can be corrected for column time lag and can also be converted to relative retention times for component identification. A dictionary contains the expected retention times for all possible components, their area, and/or their peak height factors; the dictionary is specified by the instrument operator. Dictionaries can also include constants to calculate other property values, such as average molecular weight and volume fraction.



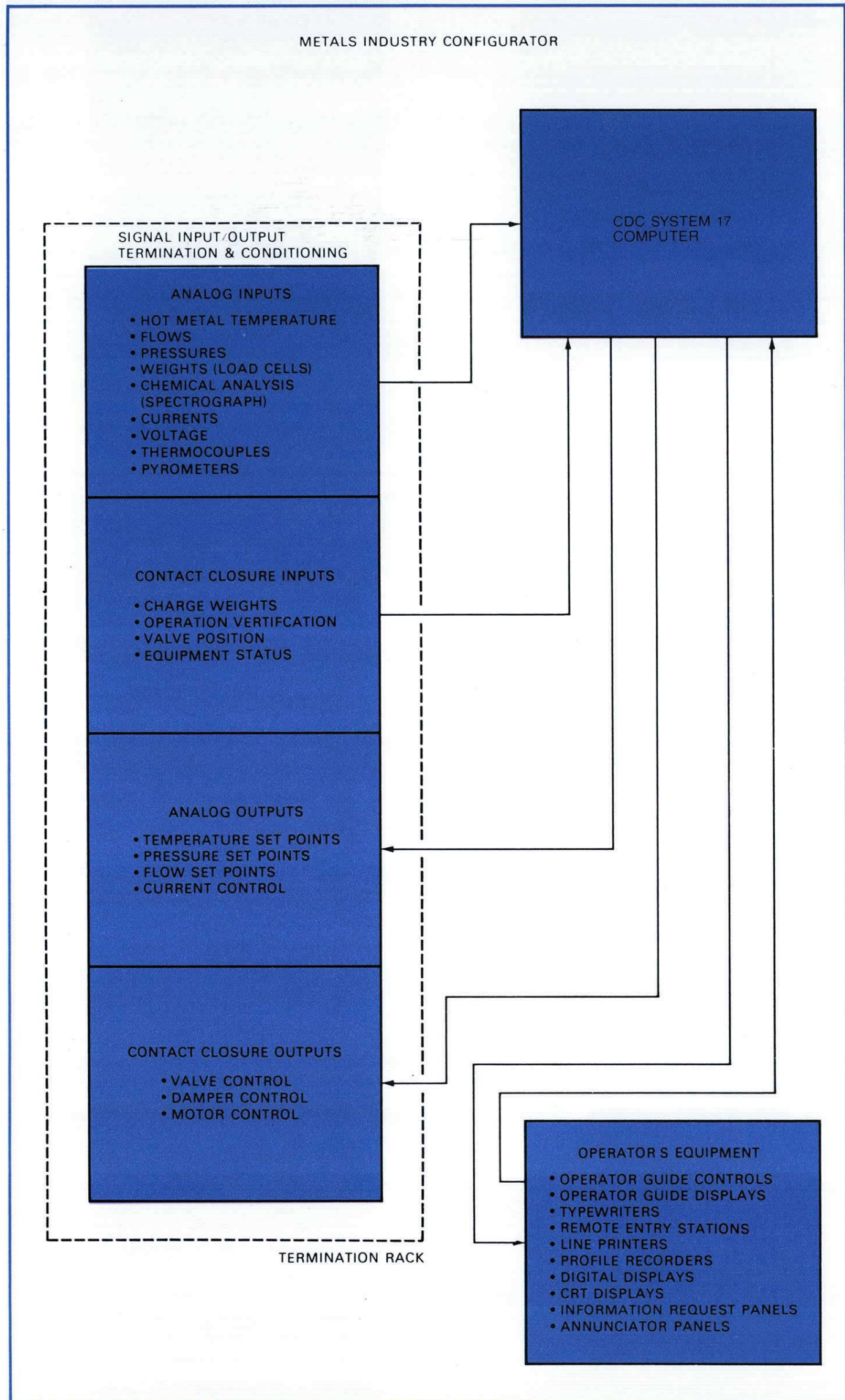




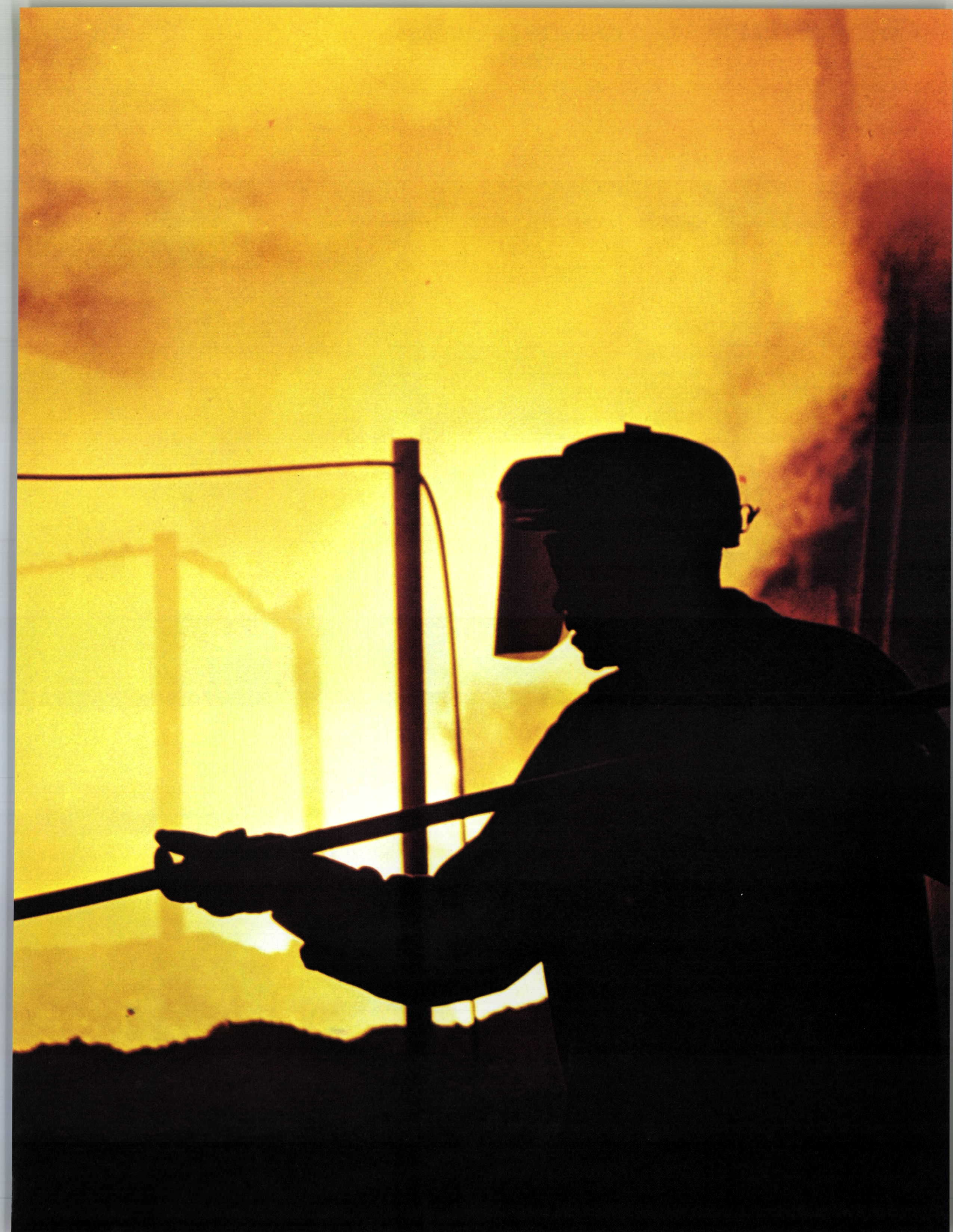


Plant computer systems for the metals industry can be assembled using the CDC SYSTEM 17 Computer and its many field-proven peripheral equipment items. Specific requirements for this application include small scanning, alarming and logging units, plus more comprehensive systems including closed-loop, supervisory, or direct digital control.

The CDC SYSTEM 17 Computer combines all of Control Data's experience in designing, manufacturing, programming, and installing on-line monitoring and control systems for the metals industry.





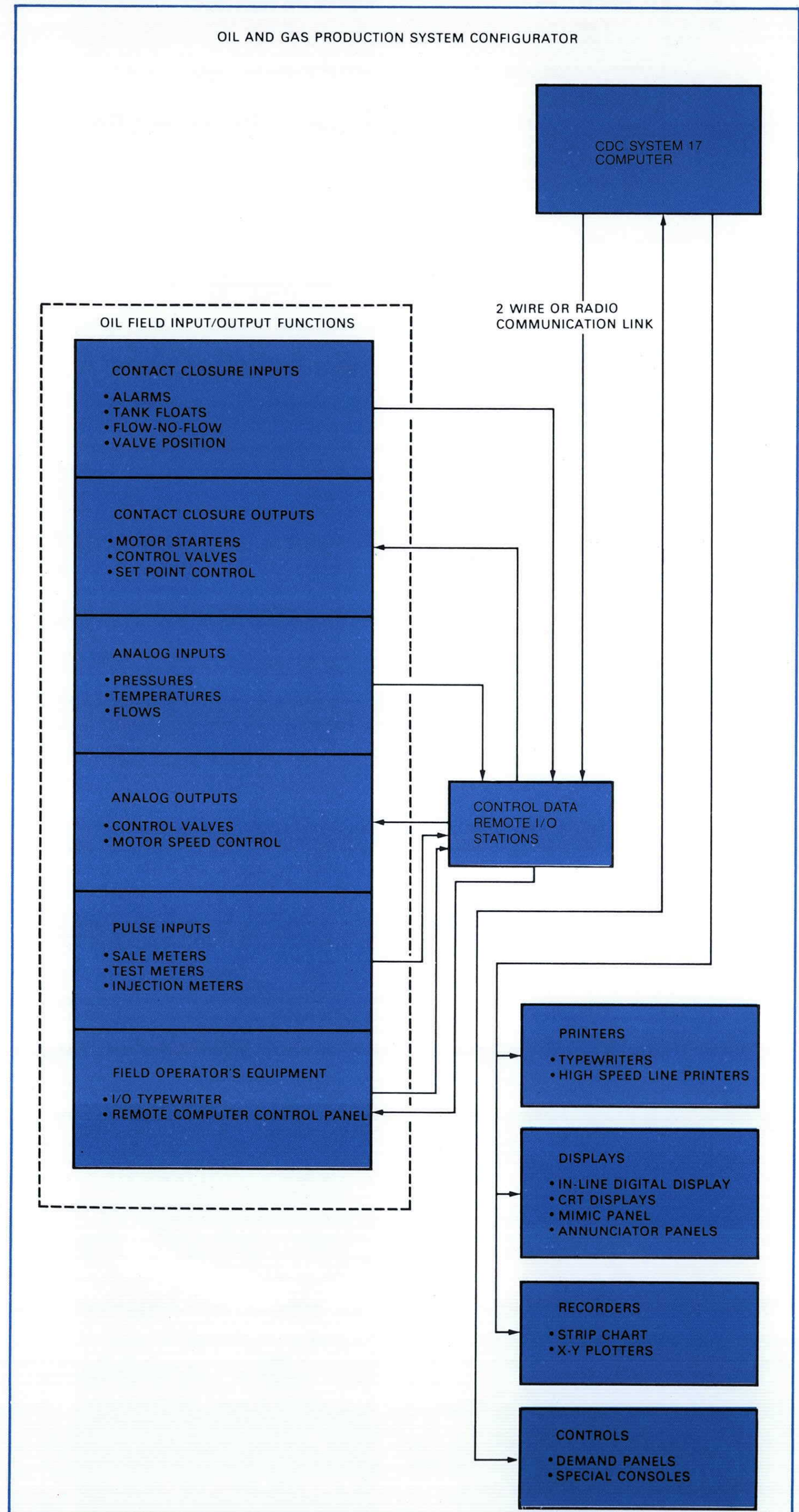




Using the CDC SYSTEM 17 Series, oil field computer systems can be assembled from field-proven components to meet a wide variety of specific requirements. The versatility of the system permits easy and inexpensive expansion of small initial pilot systems into comprehensive systems that include closed-loop supervisory control, on-line performance calculations, inventory control and accounting functions.

The unique program-protect feature of the system provides for secure execution of on-line monitoring and/or control programs with time-shared use of the computer for off-line programs or debugging of new programs.

The program protection prevents data storage in illegal areas, and secures against illegal execution of instructions in the working memory. Protection is also available for input/output systems to prevent illegal communications.







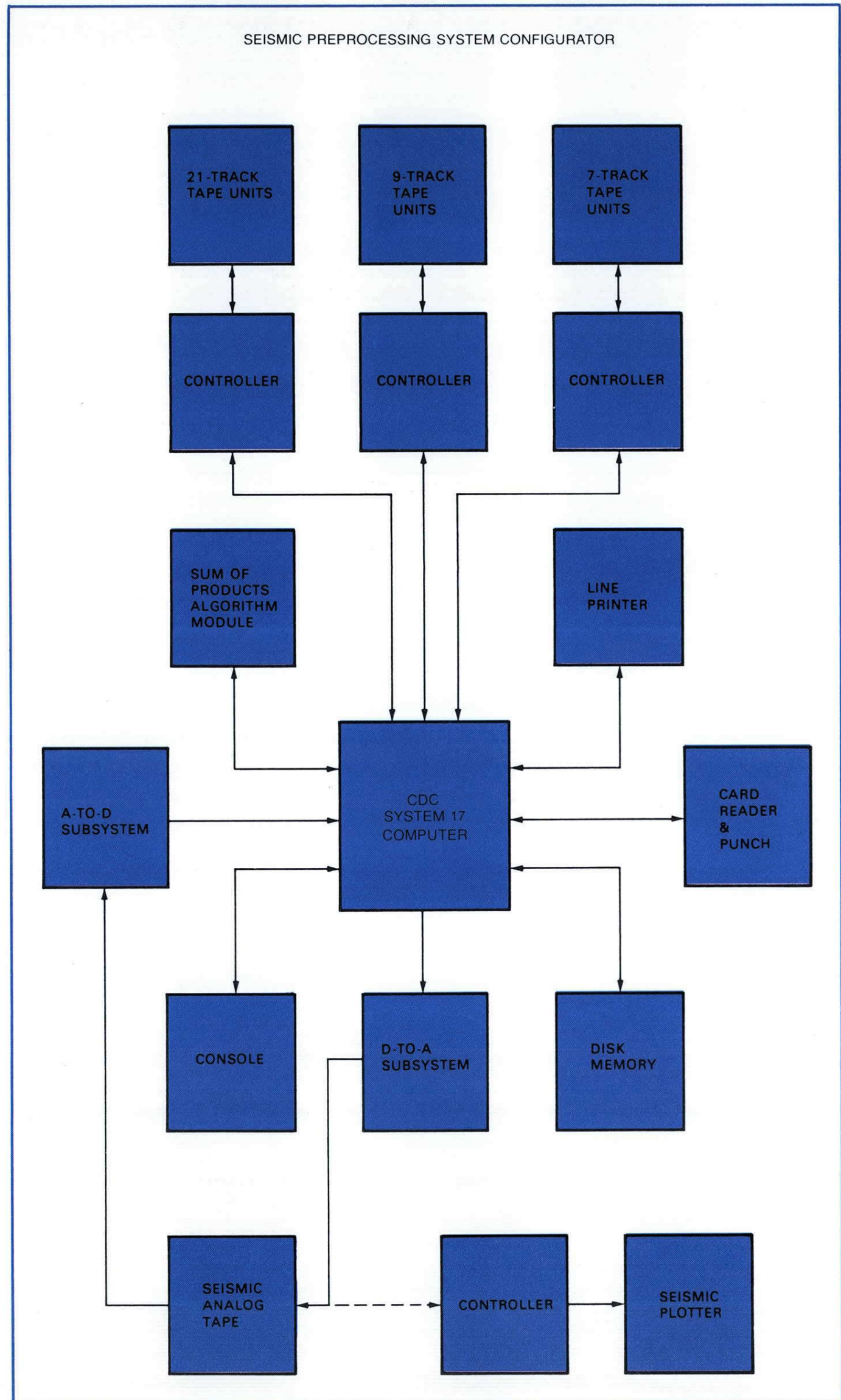


Control Data has emerged as a leader in the field of computerization of geophysical analyses because Control Data can supply all the hardware and software you need to do all your geophysical data processing. From the input of raw data, through processing, to the final output of your records, Control Data gives you total capability. The result is top operating-efficiency and low user-cost. Our one-source systems provide fast, accurate, versatile data handling all the way and eliminate the intermix of various suppliers' equipment.

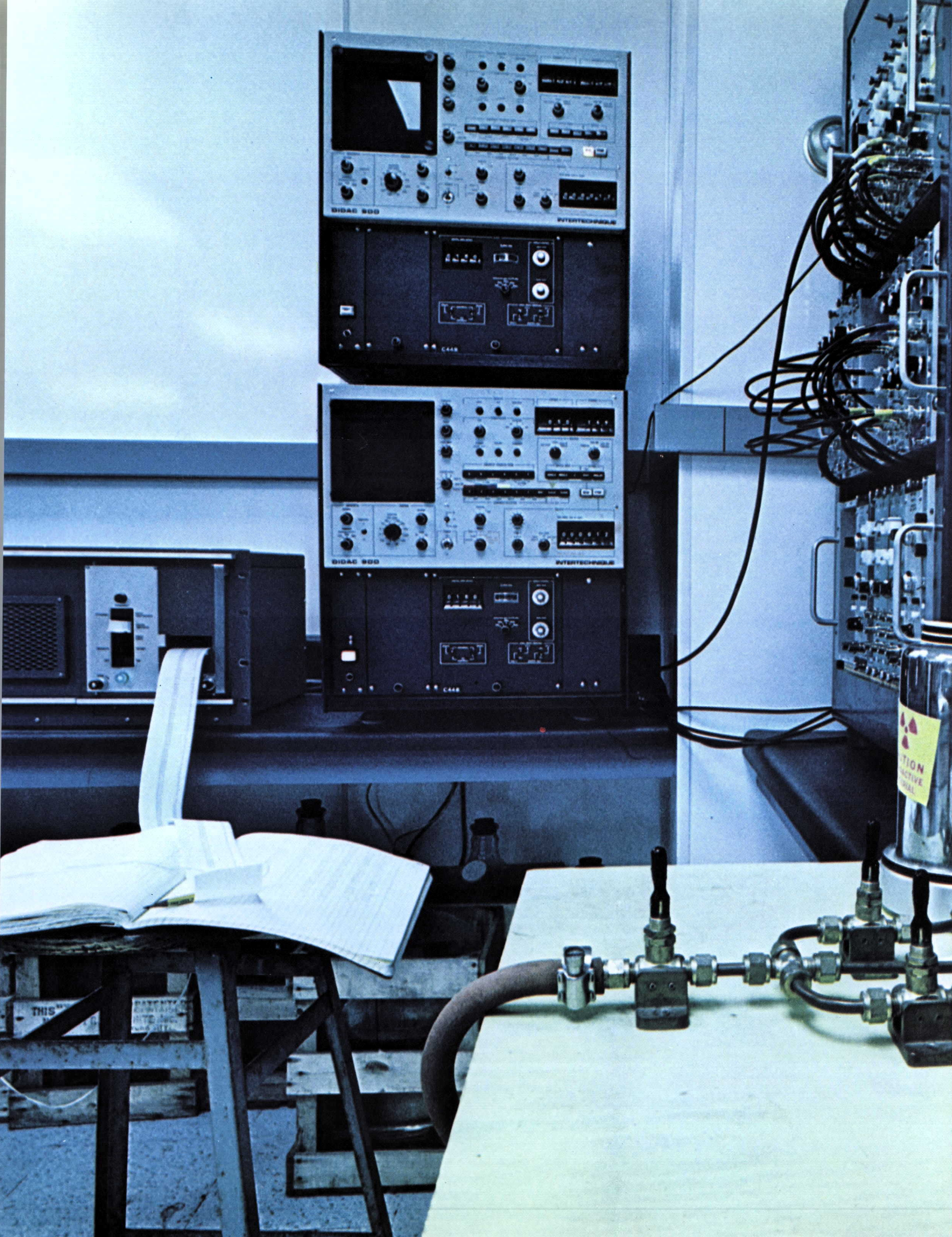
Control Data hardware for geophysical data processing includes algorithm modules; Fast Fourier Transform modules; analog-to-digital and digital-to-analog devices; 7-, 9-, or 21-track magnetic tape units; fast random-access devices; seismic data channels; display and plotting systems; high-speed random access devices, and a complete portable seismic data processing system. Records are processed quickly, accurately and automatically under program control.

Nowhere does Control Data's experience with geophysical data show up more clearly than in our software packages. Our versatile range of programs can handle virtually any application. Among them are normal moveout; static, amplitude and dynamic time correction; trace collection; trace blanking; horizontal and vertical stacking; convolute filtering; and time depth analysis. Output programs provide for conventional coverage, common depth point gather, stacked data, and digital-to-analog conversion — singly or in combination. A main control program directs all routines, and program use is simplified by computer languages such as FORTRAN.

The latest addition to the software for seismic data processing is a pre-processing package developed expressly for geophysical data reduction and providing maximum throughput at low cost.









# CDC SYSTEM 17 SERIES

## Electric Utility Control Application

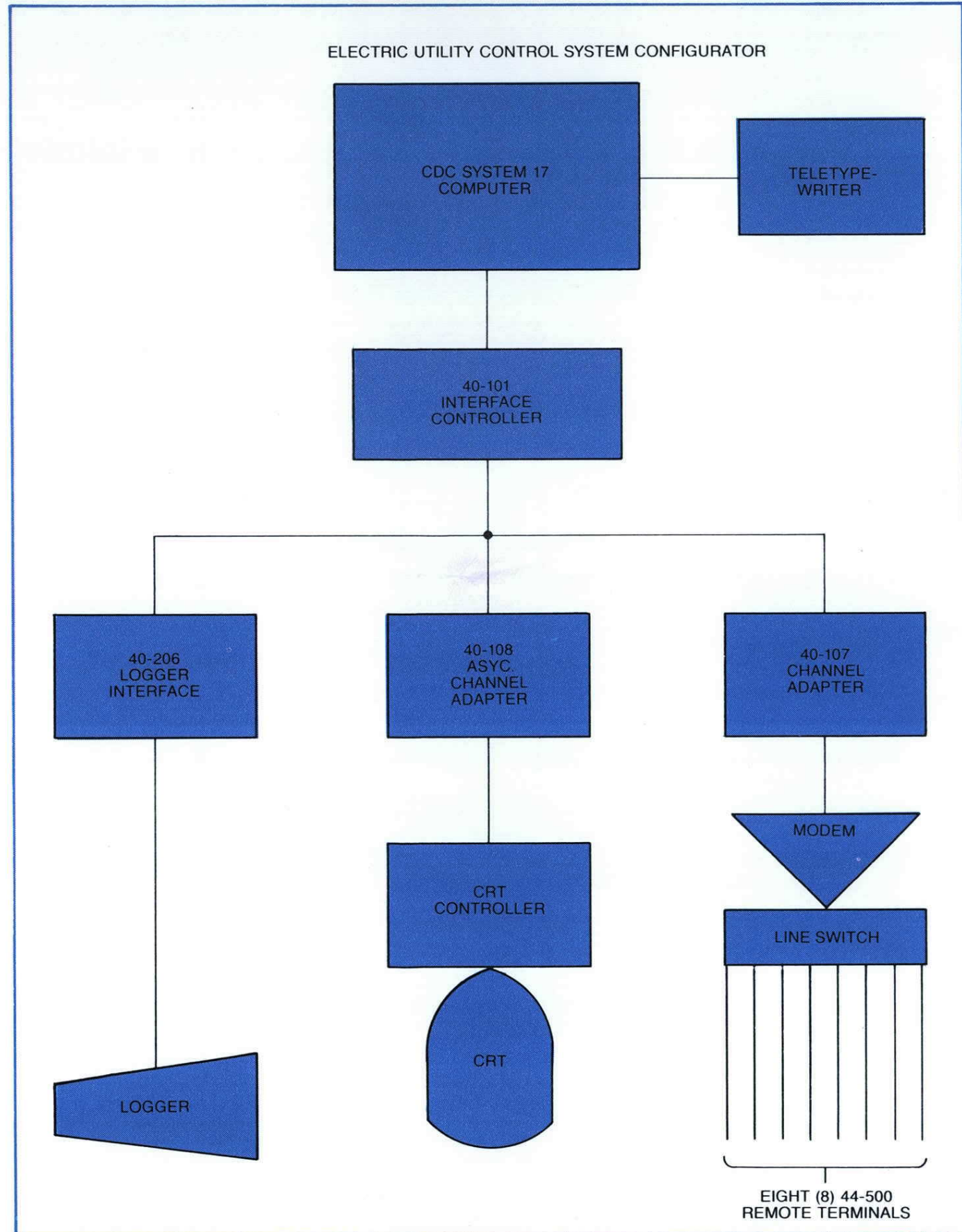
Control Data's state-of-the-art SYSTEM 17 Computer, along with its proven software, provides highly effective total power system control complexes for the electric utility industry. These systems perform all the classical supervisory control functions, such as control of circuit breakers, disconnect switches, and transformer tap changes for bulk power supply systems at both high-voltage and extra-high-voltage levels. In addition, all controlled devices and alarms are monitored and reported as well as being logged. This information is not only valuable for day-to-day operation of the power system, but also provides information for engineers planning future expansion.

In this application the CDC SYSTEM 17 process control computer is used, along with the CDC 44-500 Remote Terminal, to perform control, monitoring, data gathering and information display functions. Standard computer peripherals, such as line printers, typewriters, and cathode ray tube (CRT) displays are used for recording and monitoring data. Information can be printed or displayed automatically or upon request by using the CRT display keyboard and coded pushbuttons. One of the major features of this system is that actual on-line diagrams of the individual substation switching can be displayed upon request.

As a real-time digital process computer, the CDC SYSTEM 17 is ideally suited for solving additional power system problems such as load frequency control and economic dispatch. And, when Control Data's sophisticated programs are incorporated in the system, such problems as load flow and transient stability may be solved by the same computer system.

The equipment complement for this application consists of one or more CDC SYSTEM 17 Computers, CDC 40-100 Process Interface Controllers, channel adapters, modems and CDC 44-500 Remote Supervisory Terminals. Man-to-machine interface is accomplished via CRT displays and keyboards and logging output typewriters.

The 44-500 Remote Terminal system is a high-speed scanning system designed with the present and future needs of the user in mind. It features



three different data acquisition modes; two control methods; multiple security techniques, including Bose-Chandhuri cyclic error control; a choice of two communication techniques; "best-choice" hardware throughout; communication speeds of from 30 to 9600 bits per second; and a standard EIA RS-232-C communication interface. Furthermore, the system can be easily expanded to accommodate added functions as well as field

equipment input and output. Control Data Corporation has dedicated a portion of its resources to providing continuing services to the electrical utility market and has, over the years, supplied more than 4000 supervisory control systems to satisfied customers throughout the world. This experience, coupled with the fact that Control Data is a full-line computer system supplier, places us in a unique position to serve our customers.





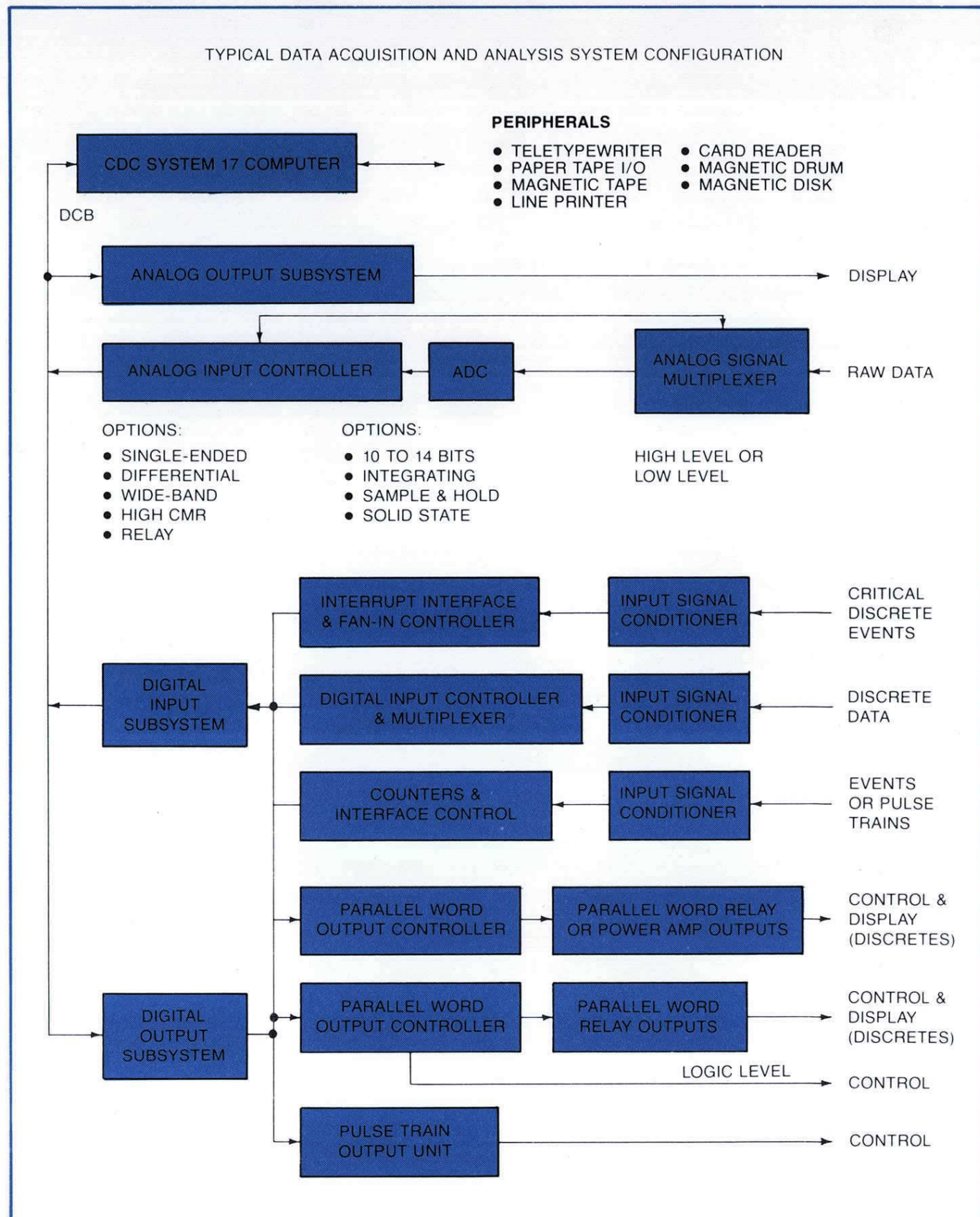


# CDC SYSTEM 17 SERIES

## Data Acquisition and Analysis Application

The CDC SYSTEM 17 Computer High-Speed Data Acquisition System has both the speed and flexibility necessary for handling a wide variety of data-acquisition applications. High-speed data-acquisition peripherals allow the system to input and output analog and digital data at the highest rates available today, with sufficient machine time in reserve for rigorous on-line computation. The large selection of standard options available makes it possible to assemble a special-purpose data-acquisition system composed almost entirely of standard equipment. A system for such typical applications as acoustical analysis, vibration analysis or thermodynamic studies is shown here.

Because of its ability to sample data at a high rate, the system can interrogate sequentially a large number of input channels and return before data on any channel can vary. High-speed multiplexing, therefore, permits a significant cost saving by reducing the number of amplifiers, filters, and converters required.









# CDC SYSTEM 17 SERIES

## Telemetry Application

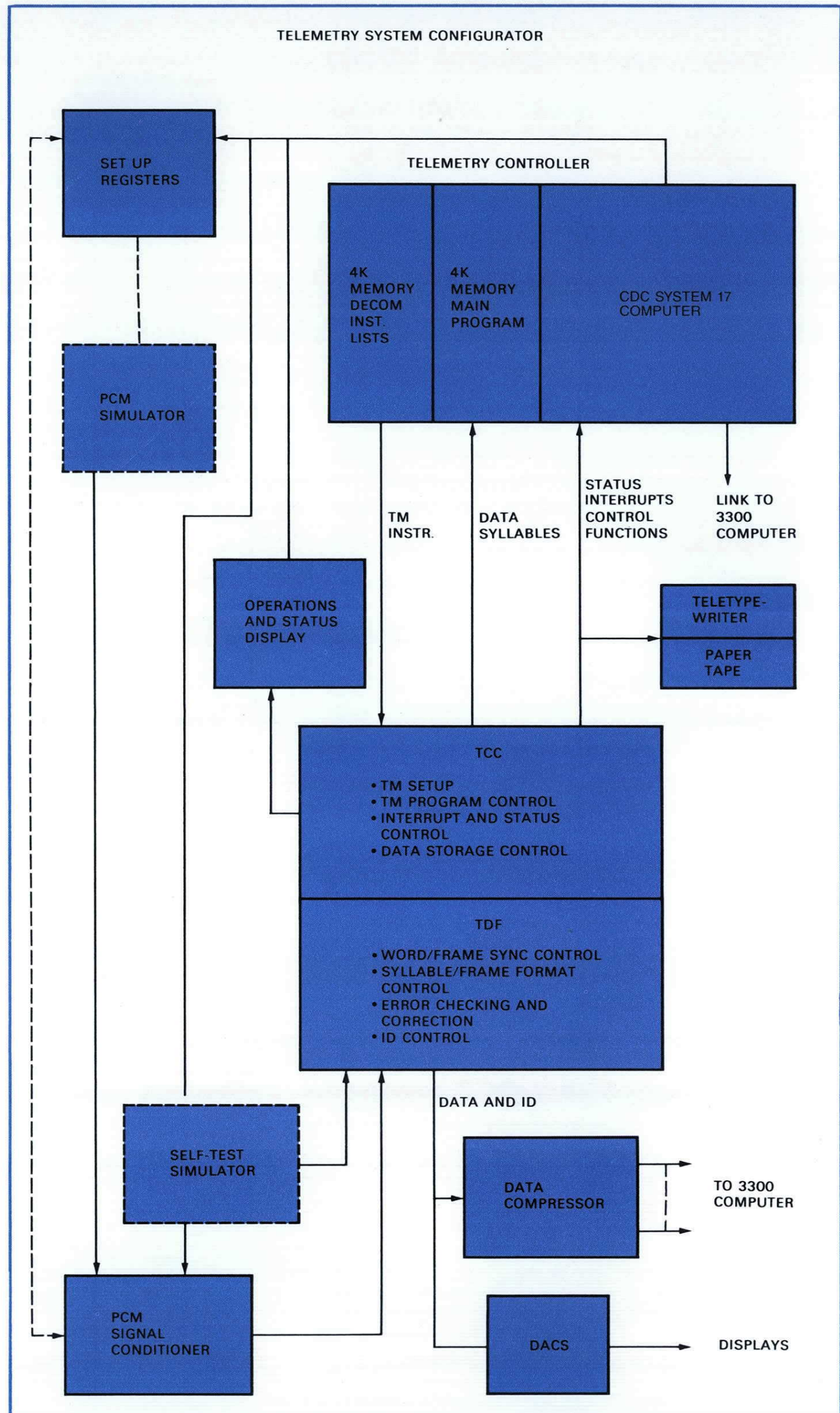
The CDC SYSTEM 17 Series Telemetry Acquisition / Reduction System encompasses the needs of the small-to-medium-scale range telemetry system. Although not necessarily a real-time data-reduction facility, the single CDC SYSTEM 17 Computer contains all the essentials of larger systems and may be expanded at any time to fulfill the needs of medium-to-large-scale, real-time systems.

The solid lines in the accompanying configuration depict a basic system with additional, optional equipment in dotted outline. The basic PCM system includes a Bit Synchronizer, PCM Telemetry Data Formatter, Telemetry Control Channel, CDC 1797 Buffered Input/Output Interface, CDC 1750 Data and Control Terminal, CDC SYSTEM 17 Computer, Paper Tape Punch/Reader, Teletypewriter I/O, and additional Storage Increments (4K core each) for a minimum total of 16K words. If the incoming data rate is beyond the on-line, real-time capabilities of the basic system, temporary storage of formatted data may be provided for with the addition of a high-speed magnetic tape subsystem. At the end of the data-collection cycle, incoming data stored temporarily by this medium can be replayed for off-line reduction.

Standard CDC SYSTEM 17 Computer System peripherals, which enable the system to provide faster data-reduction turn-around, include the High-Speed Line Printers (up to 1200 lines-per-minute), Card Reader and Punch, Random Access Disk Controller with Disk Units, and Magnetic Tape Subsystems.

Should the requirements of incoming data include more than PCM telemetry, it is suggested that the telemetry control channel (TCC) be replaced with more flexible programmed input/output channel (PIOC). The PIOC has all of the capabilities of multiple I/O to handle more than one type of input such as PAM, PDM, and FM/FM.

If a larger system is required, the CDC SYSTEM 17 Computer may be coupled with a CDC 3000 Series Computer, with the SYSTEM 17 Computer performing the control, decommutation and formatting functions and the 3000 performing the reduction and processing functions.









# CDC SYSTEM 17 SERIES

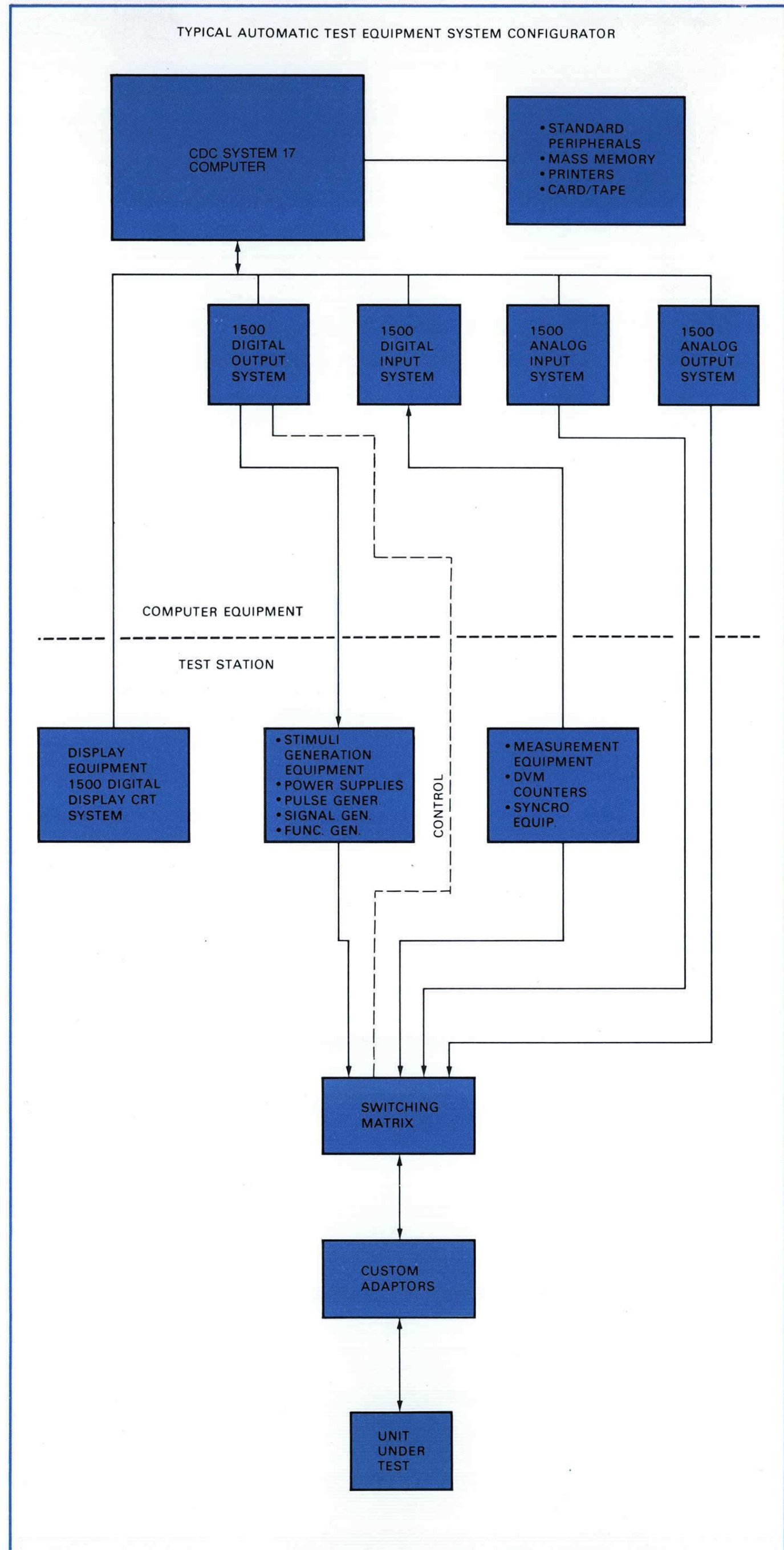
## Automatic Test Equipment Application

CDC SYSTEM 17 Series Automatic Test Equipment applications include those in which the computer controls repetitive tests by applying stimuli to the unit under test, gathers responses through its data acquisition channels, computes and displays results, and maintains statistical files of production and test results. The ATE field includes components, electronic subsystems, jet and reciprocal engines, mechanical subsystems, and hydraulic systems. The basic functional requirements — stimuli, data acquisition, computation, display and record-keeping — exist in each application area.

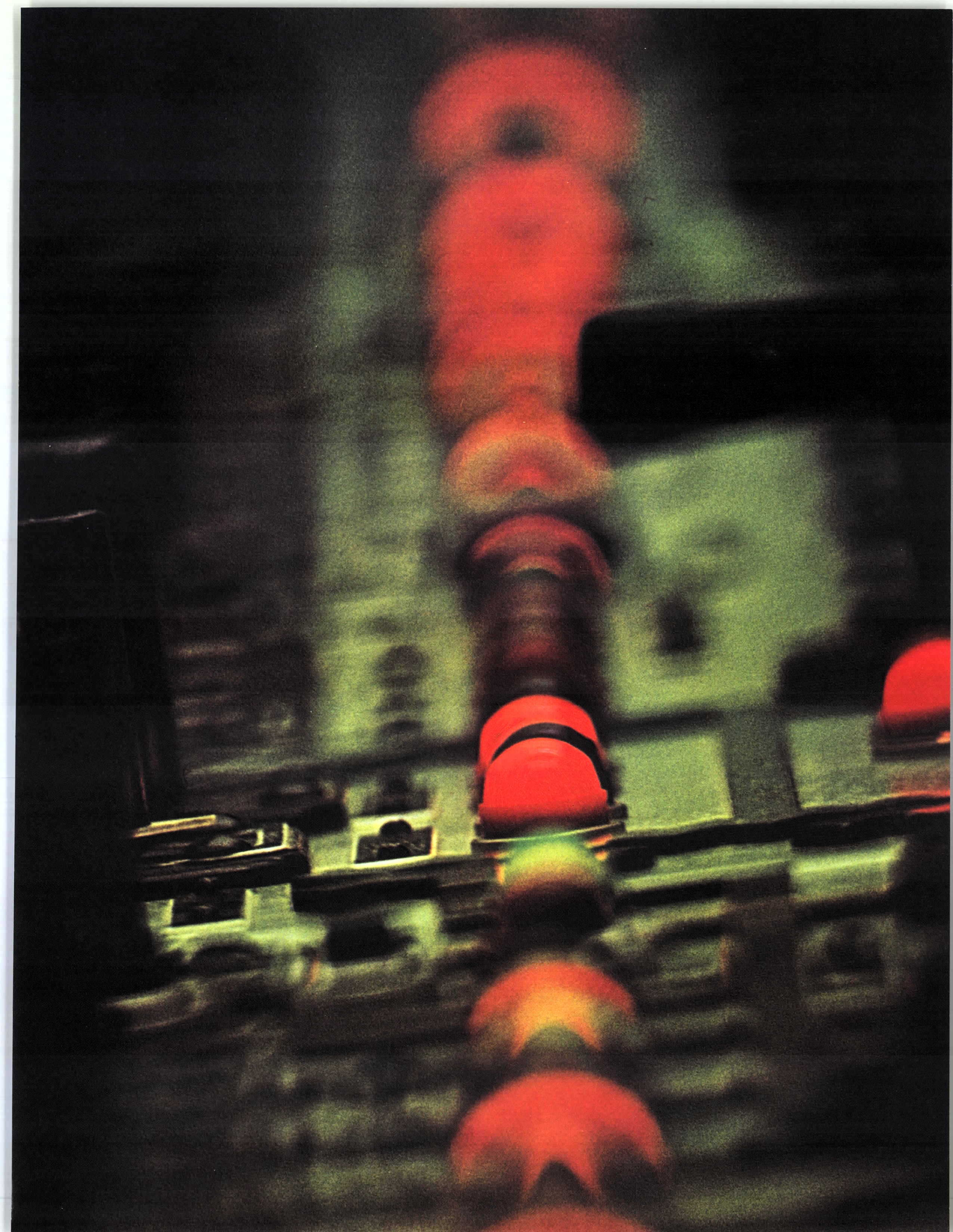
A typical configuration of an electrical ATE System is shown here. The computer equipment consists of a main frame, standard peripherals — magnetic tape and disks, drum printers, card equipment, and paper tape equipment. The peripheral equipment can be extensive if full test-program compiling and file maintenance is required. The computer can be configured to control several test stations or a single station as shown. The location of the test station is often remote from the main computer and may require various hardware, depending on distance to the remote stations.

Control of the stimuli and measurement equipment is provided by standard digital input and output equipment, though special equipment might be required to interface to special stimuli and test equipment. A great many of the newer test devices have provisions for remote digital control.

Most ATE Systems require some type of switching matrix to reconfigure quickly the stimulus inputs and measurement-equipment outputs. Inputs and outputs must be routed to different pins on boards and connectors for each test. Custom adaptors for the unit under test are usually designed and implemented by the customer, but can be provided by Control Data as special equipment.









# CDC SYSTEM 17 SERIES

## Jet Engine Checkout Application

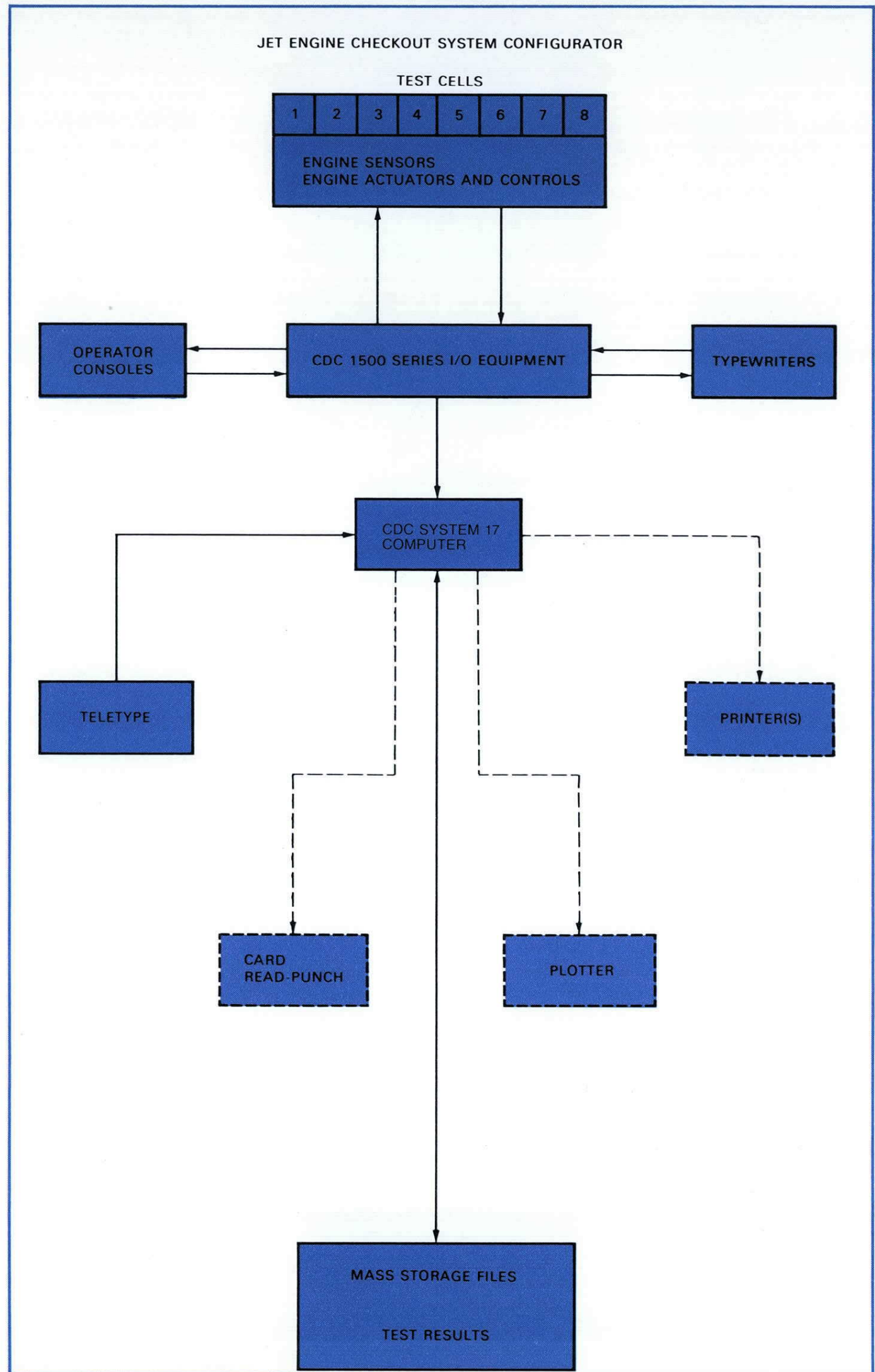
This application takes maximum advantage of the high-speed, general-purpose CDC SYSTEM 17 Computer to provide control, data collection, analysis, and printout of test results obtained from jet engine ground tests. In addition to the CDC SYSTEM 17 Computer, the system uses peripherals such as disk files and line printers, CDC 1500 Series input/output subsystems, and control and display panels located either in or near the computer room.

Fully automatic control of engine tests and data acquisition is provided for uniform testing and higher throughput rate. In addition, the system offers the following features:

- Tolerance limit checks of all engine parameters
- Closed-loop control of power lever, fuel control, starting ignition, and main power
- Concurrent testing and control of multiple test cells on a time-sharing basis
- Initiation of engine test programs or segments from the master control panel
- Smooth transition from automatic to manual testing and vice versa
- Computation, evaluation, and storage of engine-performance data
- On-line printout
- Diagnostics of engine malfunctions
- Test-cell instrumentation calibration

Abnormal conditions, such as excessively rapid turbine-discharge temperature rise or high stack temperatures, will be quickly and reliably detected by the computer, thus providing a greater safety factor over that obtained by manual cell operation.

The capability of the CDC SYSTEM 17 Computer Automatic Jet Engine Test System permits detailed and precise testing procedures, achieves significant reductions in unit testing costs, and provides for expansion to allow more sophisticated testing, on-line data reduction/analysis, and historical trend analysis, with test results in either typed or graphic form.









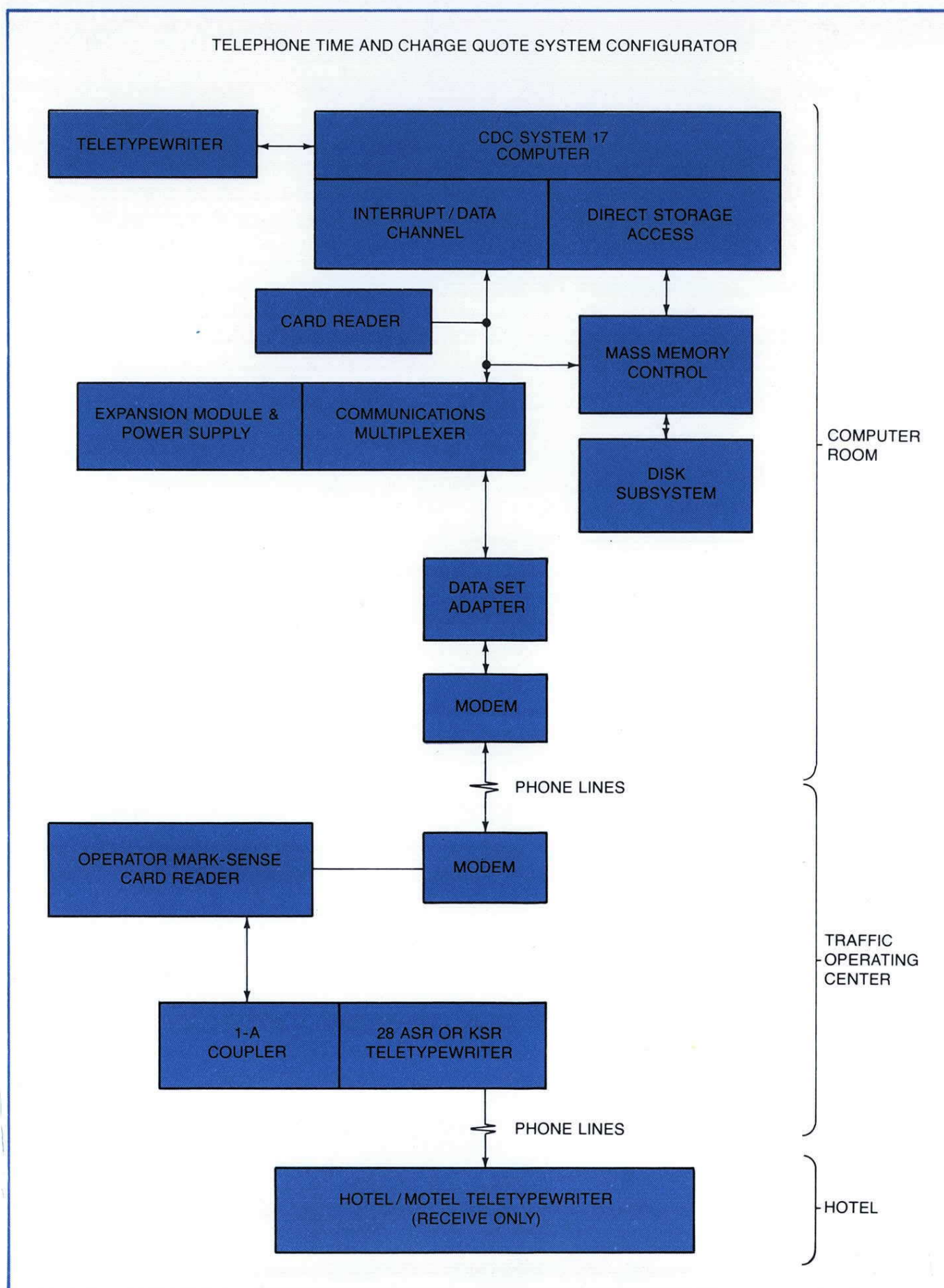
The problems inherent in quoting telephone service times and charges for calls made from hotels and motels frequently result in inaccuracies — and a resulting loss of revenue. In the manual mode of operation, response time and accuracy are affected by operator errors in filling out mark-sense cards, as well as by delays in processing during peak load periods. As a result, a discrepancy may exist between the times and charges quoted to the hotel by the toll operator and those billed by the accounting department. Since the toll operator quote is not transmitted on a real-time basis, the calling party at the hotel may not be billed in the required time.

The Control Data Time and Charge Quote System is an accurate, efficient, economical, and reliable solution to these problems. This system consists of a CDC SYSTEM 17 Computer with standard peripherals. A CDC Mark-Sense Card Reader at the telephone company's traffic operation center reads both sides of the operator's mark-sense card, the computer calculates the charges, and they are transmitted to the remote teletypewriter at the hotel. The system can be expanded to include 32 remote terminals in telephone traffic operating centers, servicing a large number of hotels and motels.

The system provides hotels and motels with the following advantages:

- Charges are calculated according to current tariffs. Operator errors on the mark-sense cards are detected and flagged.
- More calls can be handled within a given time than with manual methods.
- Present procedures and equipment for rating and message output to hotels are used, minimizing impact on existing procedures and training.
- Utility functions maintain the system tariff base.

Software for the system consists of the Mass Storage Operating System, Communications Handler, utility routines, and rate processor routines. The modular CDC software system provides maximum flexibility for modification and expansion of future rating requirements.





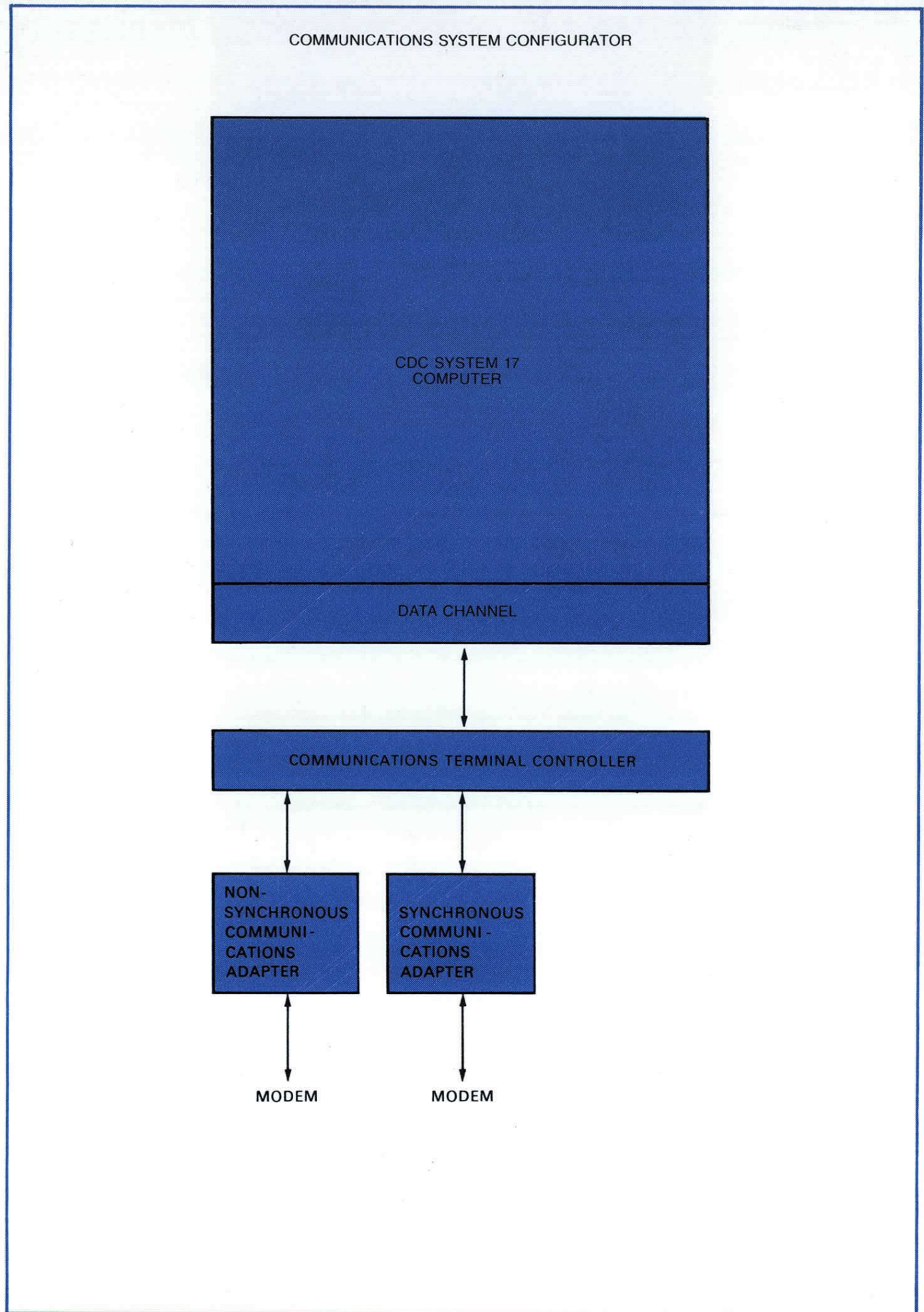




The CDC SYSTEM 17 Series Communications System provides for efficient management of information in special systems for a variety of operations including manufacturing, distribution, catalog and retail selling, and operations of airlines, railroads and financial institutions.

Standard communication peripherals such as communication multiplexer controllers, communication multiplexers, data set controllers, and data set adapters provide an interface between the computer and any combination of Bell data sets or their equivalent. One multiplexer can control up to 64 half-or-full-duplex teletype lines, or 32 half-or-full-duplex voice-grade lines, or a combination of these. When the CDC 364 Communications Multiplexer is used in conjunction with the CDC 1748 Multiplexer Controller, a maximum of 512 teletype lines or 256 voice grade lines can be connected to the computer.

Non-synchronous Communication Adapters will operate at speeds of from 50 to 2000 bits-per-second with five-to-eight-level codes in a half- or full-duplex mode. Synchronous Communication adapters will operate at speeds of from 600 to 200,000 bits-per-second with seven- or eight-level codes in a half- or full-duplex mode. Communication Adapters also allow connection of data-collection input stations and badge readers. The CDC SYSTEM 17 Series Communications System will operate with the standard mass-storage operating system, using special software to provide for handling the communication-line data.





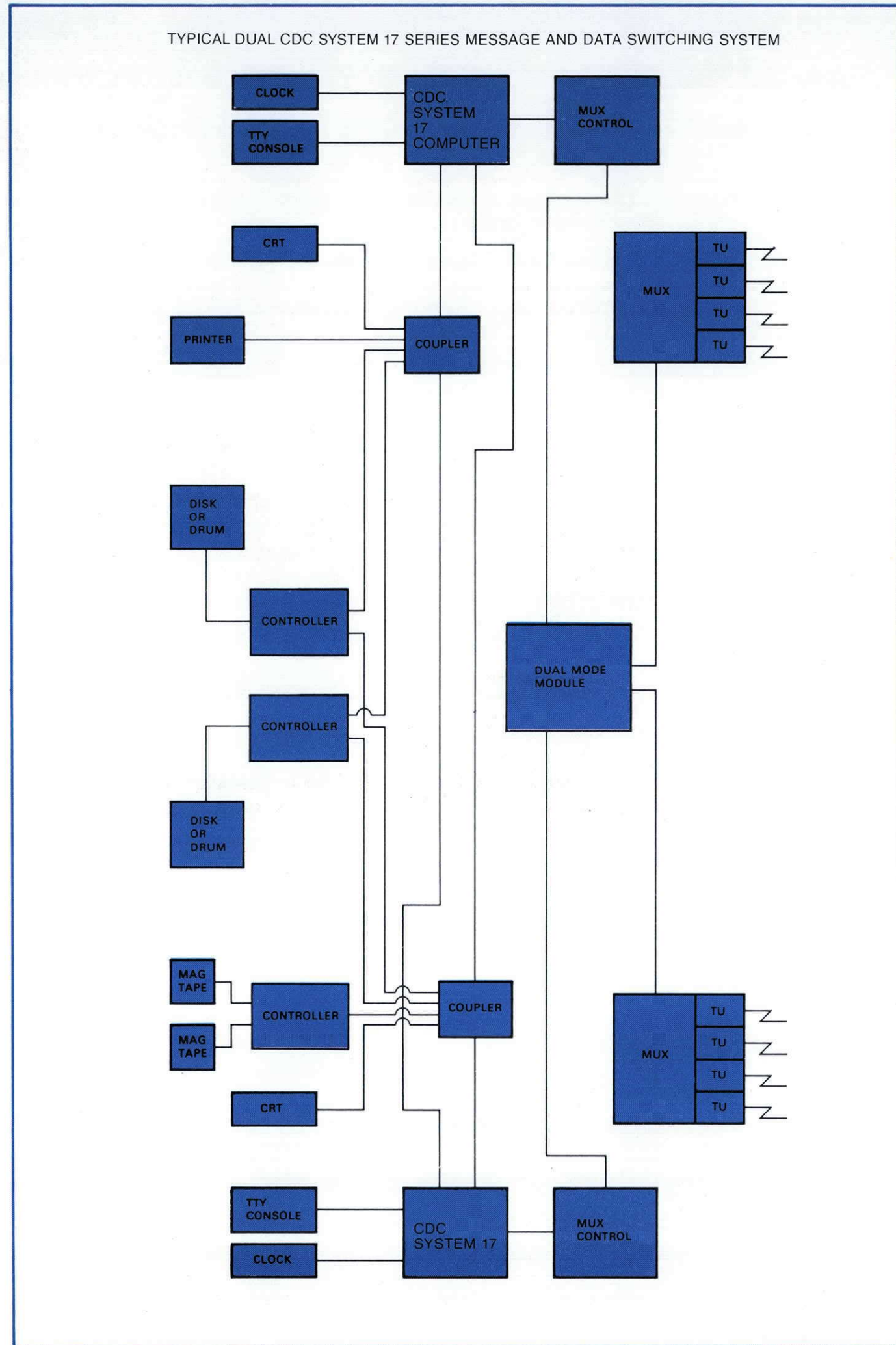




The CDC SYSTEM 17 Series Message and Data Switching System operates under control of a CDC Mass-Storage Operating System (MSOS). MSOS is especially designed for use in real-time environments and has been enhanced to provide users with a generalized message-switching capability. Programs are chosen and altered to fit each user's needs. As a user, you can exchange, add or delete routines in such a manner that the system can accommodate additional lines, devices and stations by adding the necessary program modules or modifying existing ones.

Some of the particular features that set the CDC SYSTEM 17 Series Message and Data Switching System apart from slower, more rigid systems are:

- A wide range of circuits can be connected, varying from low-speed teletypewriter-grade circuits to high-speed broadband circuits.
- Network control can be polled, free-wheeling or automatically dialed, and is compatible with both the TWX and Telex networks.
- A variety of terminals can be connected to this system, such as modems, teletypewriters, and/or data-collection stations, to name just a few.
- The system's multiple levels of priority send more important data and messages through the system ahead of messages of lesser consequence.
- Many kinds of message routing are possible, including single-address, multiple-address, group-address, broadcast, alternate-routine, routing to local peripherals such as tape, disks, printer or Satellite Coupler for direct transfer to another computer.
- Code and speed conversion are done automatically as is the time-dating of each message.
- Messages can be edited automatically, deleting the leader and trailer characters, spurious characters, blanks and call-directing codes, when rerouting is performed.
- All messages are automatically journaled on magnetic tape, drum or disks and are available for later retrieval.
- Network and systems failure as well as traffic and operator errors are automatically detected and reported to the sender and/or the message center operator.
- If a system becomes overloaded

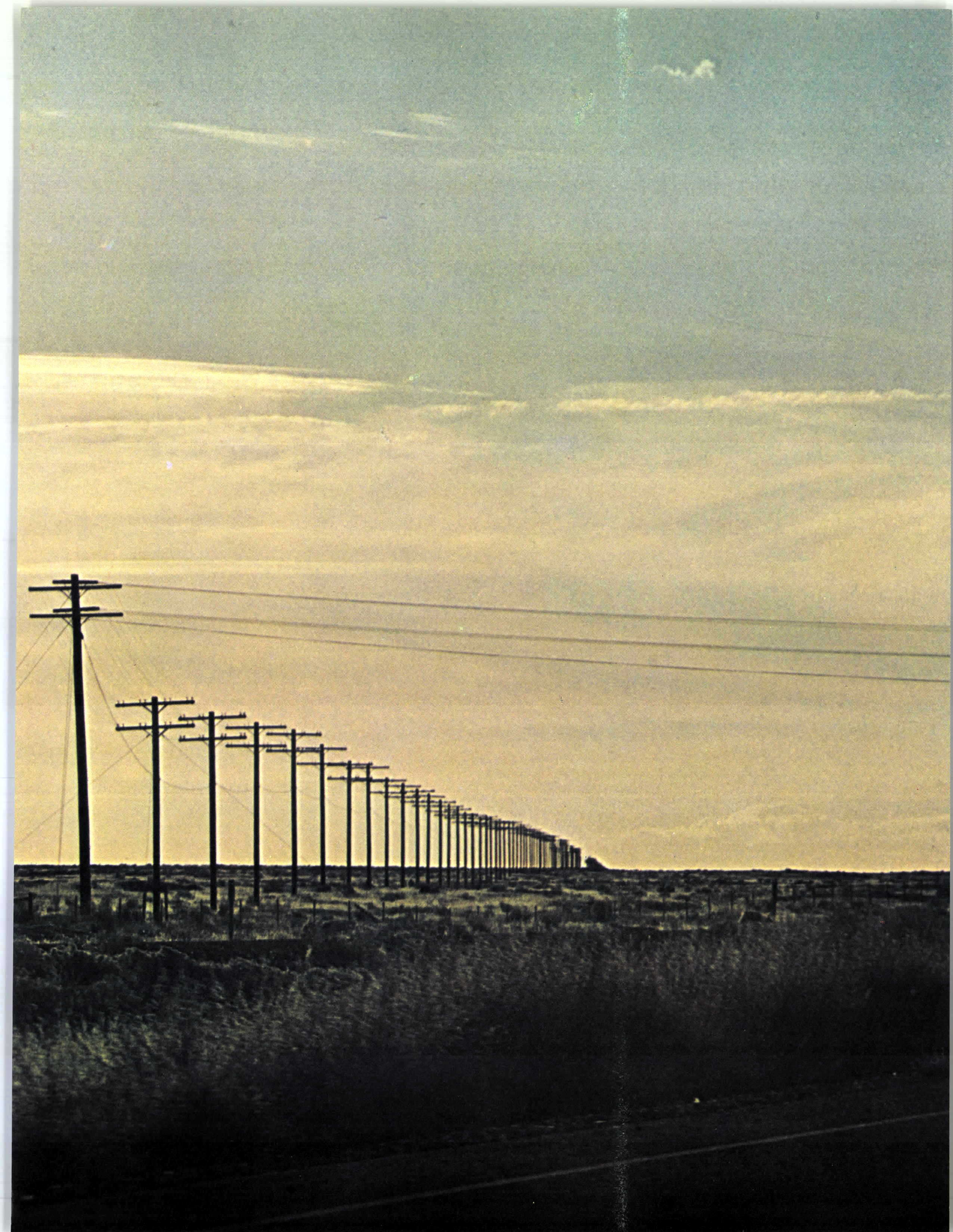


with incoming messages, it buffers storage overload by inputting at a slower rate and outputting at a faster rate until the situation is remedied. Thus, no messages are lost.

- The operator can manually control or modify the system, extract status and statistical information, and retrieve messages via a CRT entry/display station.
- Standard routines are available for

military users to handle messages arriving in JANAP 128 and ACP 127 formats. Routines are available for conversing with the AUTODIN network via the CDC 1717-1 Data Set Controller, and to process messages in accordance with procedures typically required in a military environment, such as security checking, precedence control and special handling of high-precedence messages.







Much of big business today consists of reading, recording, and processing the few bits of data involved in the billing, payments and renewals found in banking, publishing, utilities, insurance and credit card operations. Control Data's state-of-the-art optical character readers used with CDC's SYSTEM 17 Computer systems can ease the burden of this continuing succession of small transactions by recording, processing and proving results in a single, efficient operation.

Control Data's OCR systems for the CDC SYSTEM 17 Computers range from low-cost single-line readers to complete, stand-alone off-line systems capable of reading, processing, sorting, editing, updating and storing information from full pages of typewritten copy. The systems described here are representative of those available.

### CONTROL DATA 915 PAGE READER

The 915 System is a self-contained unit which uses the CDC SYSTEM 17 Computer to direct its reading operations. Under program control, the reader is fully automatic, and operator attendance is kept to a minimum for tasks such as document loading and removal. The unit contains the optical and electronic recognition systems, pneumatic and electrical power supplies, and document handling equipment.

The reader in the 915 System is interfaced through a controller to a CDC System 17 Computer which directs by program function codes the document position, reading, and sorting operations. The paper transport and the optics systems are directed by the program to read information on a line-by-line basis with no wasted motion. The 915 will scan only that portion of a line it is instructed to read, and will not read blank areas of unwanted data.

#### Software for the 915 System includes:

- GRASP — An interpretive computer program which allows the user to incorporate the 915 into his own data capturing system for special applications. New document formats are easily accommodated and existing formats changed by specification rather than by program modification.
- LIST PROCESSOR — An interpretive program for processing large quantities of data with a common format such as mailing lists and

parts listings. It manipulates input data and writes the data onto magnetic tape in the proper format.

- KEYPUNCH SIMULATOR — An interpretive program that permits the processing of typed data and enables data to be written onto magnetic tape in a punched-card format. It performs keypunch functions and also benefits users that already have keypunch capability.
- NIMP — A macro-processor-assembler which allows the user to generate programs for specific applications not adaptable to GRASP, List Processor or Keypunch Simulator. NIMP allows the user to write programs for complex tasks with a relatively small source program; it also contains a user exit for the insertion of assembly-language routines.
- DRAFT — A flexible macro-assembler language that reads and interprets source program statements to generate an object program in machine language for the computer. Various subroutines are called to perform the functions specified in the source.

### CONTROL DATA 921 DOCUMENT READER

The CONTROL DATA 921 Document

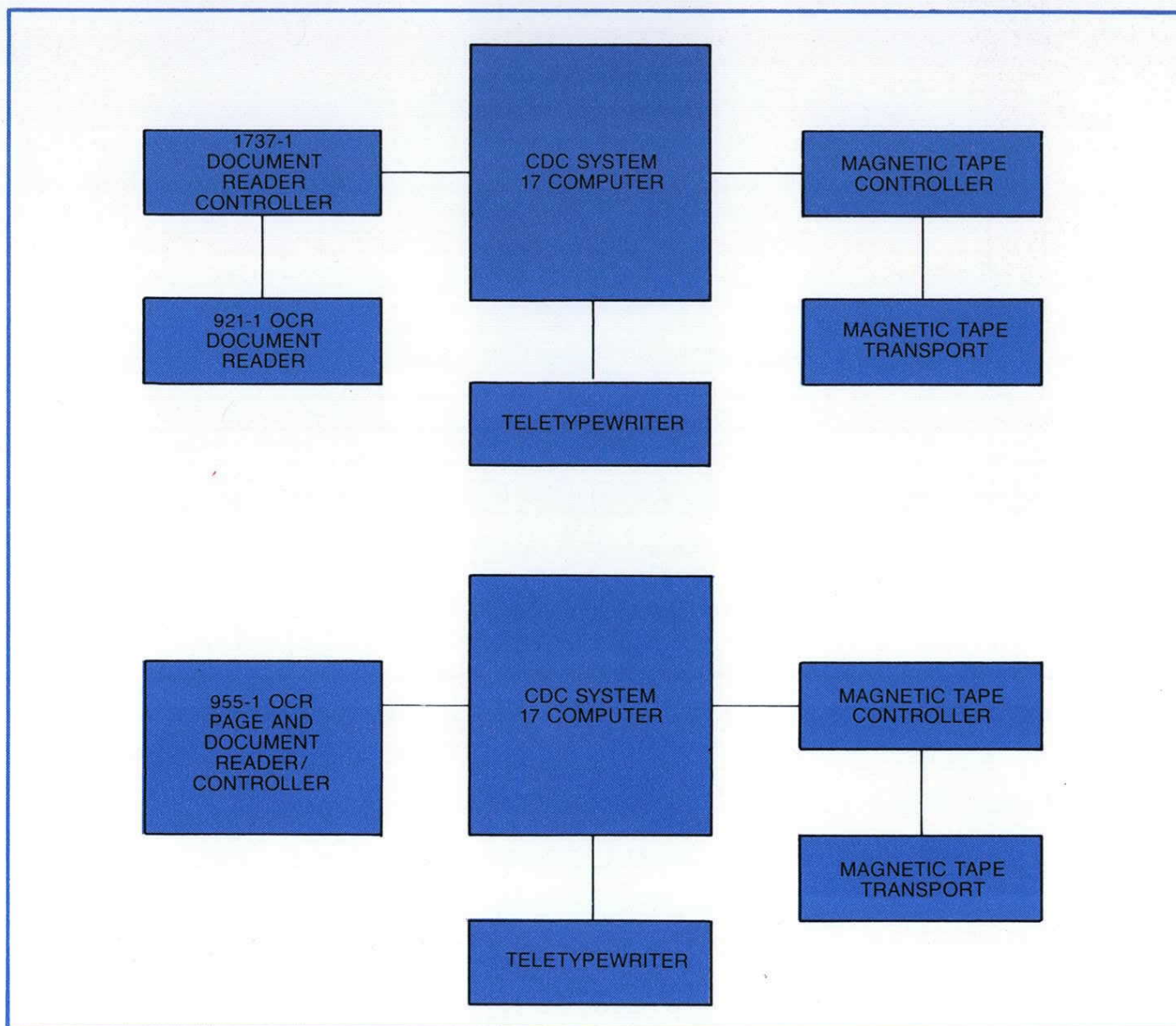
Reader employs a laser-beam light source to perform optical character recognition. This is a low-cost device which combines the laser's program-controlled, high-speed scanning capability with a proven document transport system capable of handling thin paper.

The 921 processes original documents — single sheets or cards from a non-intermixed stack. One line of printed or typewritten characters is read and converted to computer-compatible code for further processing. This high-performance document reader accommodates a variety of document sizes and popular numeric character sets. With a constant transport speed of 221 inches per second, up to 1200 documents per minute throughput can be achieved on this device.

The reader in the 921 System is interfaced through a controller to a CDC SYSTEM 17 Computer. The complete stand-alone system includes a reader, controller, processor, tape transport, and input/output console.

DRIVE, the software package developed for use with the 921 System, provides an easily implemented method of capturing single-line data at high speeds.

Character set recognition capabilities of the 921 are determined by the user.









# CDC SYSTEM 17 SERIES

## Page and Document Reader Application

They include: numerics and control symbols for ANSI OCR-A-I, ANSI OCR-A-IV, 7B, and ISO-B. Other features include superior resolution for handling degraded print quality, re-scan capability achieved through document recirculation and automatic adjust quantizing level, and double-document detection which provides lock-up if mis-feed or mis-stack conditions occur.

### CONTROL DATA 936 OCR DOCUMENT READER SYSTEM

The 936 OCR Document Reader System is a complete, stand-alone system for handling, reading, editing, sorting, listing, and proving entries from transaction documents in sizes and shapes generally used today. Entries can be imprinted, typewritten, printed on a high-speed printer, or manually entered in a mark-read or handprint mode, and the 936 can read 1, 2, or 3 lines from the document being processed.

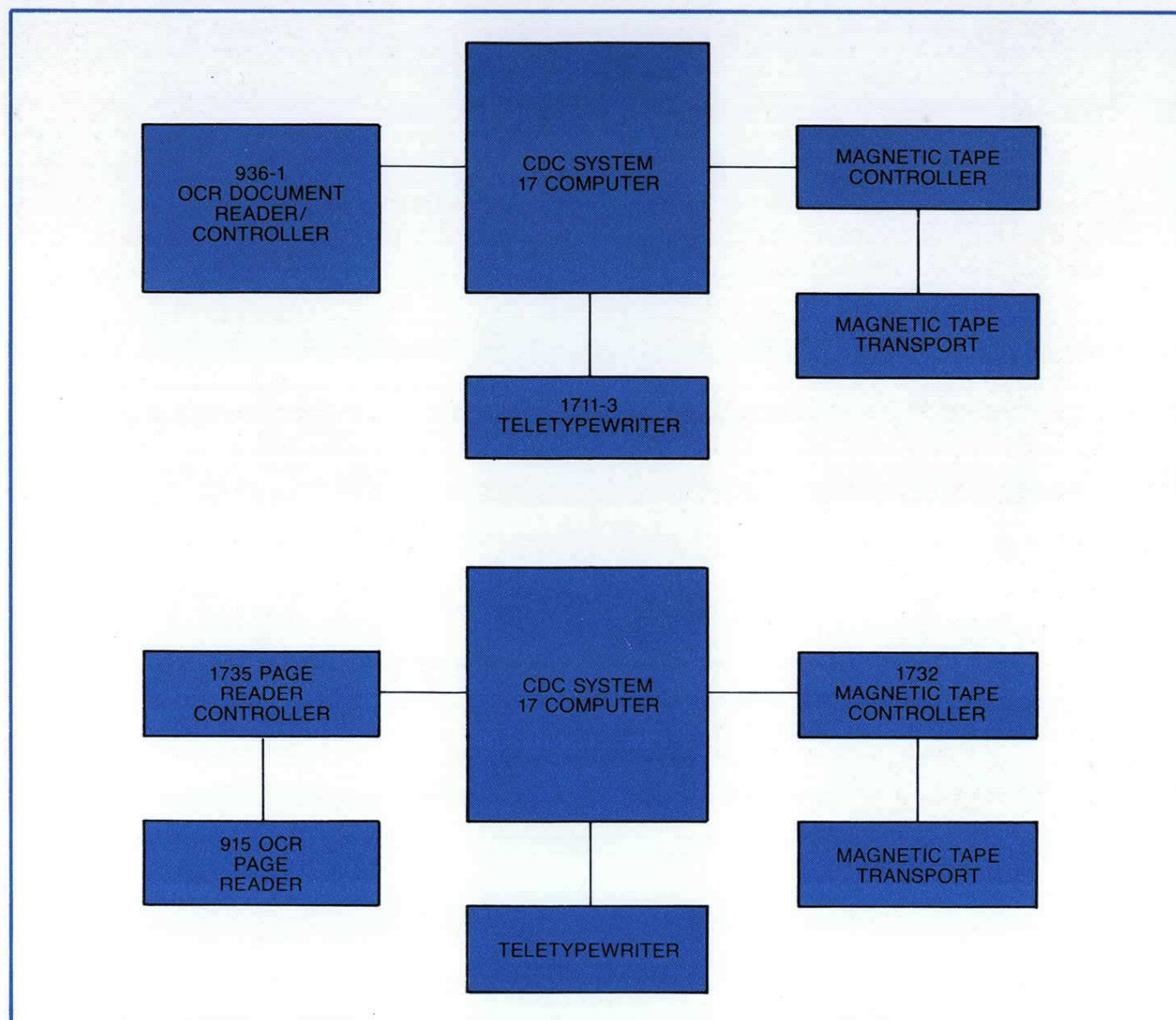
The 936 System can deal with as many as 90,000 documents an hour. Throughput depends on document width and the number and length of lines to be read.

The reader in the 936 System is interfaced through a controller to a CDC SYSTEM 17 Computer, and records onto a Control Data magnetic tape transport. Programming is usually handled through DRAFT, a flexible macro-assembler, especially written for the 936 System. A teletypewriter is provided for operator control.

The advantage of a stand-alone system approach to transaction documents is independence from larger, central computer systems. Documents are read, entries are edited, listed, totalled and proven, all with the documents at hand for ready reference. The result is input fully ready for final processing by a central computer system. Document conversion is handled with accuracy, speed, efficiency and economy.

The 936 System offers a variety of options which adapt it to demands of the individual user. These options cover such areas as reading manual notation entries, various fonts, two sizes of type, and multiple listers.

DRAFT, the software package developed for use with this system, provides either simple, straightforward document reading or editing, formatting, proving and listing of the 936's output. The development of DRAFT has proven to be a major step in moving up to more efficient handling of transaction documents.



### CONTROL DATA 955 PAGE AND DOCUMENT READER SYSTEM

The 955 is a complete off-line all-purpose data capturing system. This flexible system scans multi-line sheets of typewritten pages, computer print-outs, embossed card imprinter documents, cash register journal tapes, handprinted characters, and mark-read applications.

The 955 System's read unit performs paper-transport and scanning functions. Through user-selectable software, the CDC SYSTEM 17 Computer performs edit, format, arithmetic, and other routines on the data from the scanned pages, documents, or tapes. The output is transferred to magnetic tape for further processing.

The reader is interfaced through a controller to a CDC SYSTEM 17 Computer, releasing expensive central computers for other tasks. The standard 955 configurations consist of a reader, controller, processor, tape transport, and input/output console.

The software packages available for the 955 System provide great flexibility. These include:

- GRASP — A parameter-type package which captures data from the printed page and formats it for magnetic tape as the user specifies.

- SETUP — This package permits the user to create or update his assembly language source program directly onto magnetic tape without entering his entire program into central computer memory.
- SCOPE — A magnetic-tape oriented monitor system which provides input/output interface, enabling increased programming and operating efficiency for user programs. SCOPE also provides full capabilities for editing source programs and for assembling, loading, executing, and debugging programs.
- DRAFT — A flexible compiler-type procedural language; converts printed information into operating instructions. It also defines read parameters, reads and interprets source statements, chooses input and output devices, processes data, chooses operating sequence, and performs calculations.

High-resolution optics enable the 955 to read poorly printed data found on high-speed line-printer turnaround documents, imprinted credit-card copies or hand-printed documents. The 955's optional features make it adaptable to widely varying application requirements. These options include such areas as mirror-image recognition, dense-copy reading, on-line reject character correction, marking pen, and numerous popular fonts.







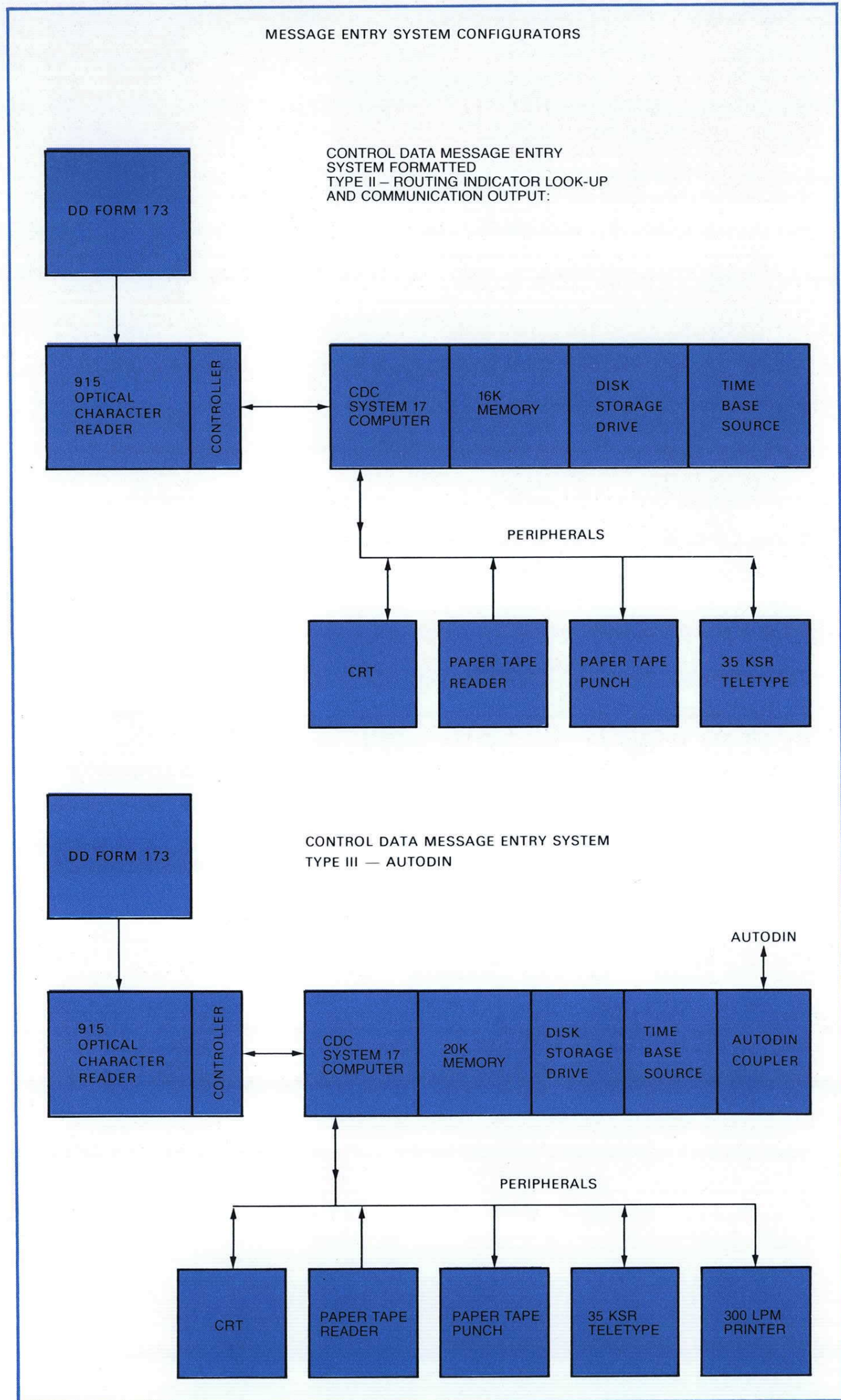
In a Control Data Message-Entry/Correction System (Type I), a message isn't stopped by the punch — the slow process of punching paper tape by hand. If it arrives at your communication center properly typed in the familiar framework of Form DD 173 or any other standard message form, it gets read — instantly and automatically, at an instantaneous read rate of 370 characters per second — by a Control Data 915 Page Reader. Then it goes right into a processor. There it's checked, reformatted into ACP-127 or JANAP 128 standard transmission format, and turned out again. It's ready, in any medium you need for transmission or distribution.

A Control Data Entry/Display Unit is used whenever any Form DD 173 brought into the Page Reader contains errors that the system can't interpret automatically. When the processor checks them and finds something wrong, such as a strikeover in typing or a format error, it relays the erroneous line to the display station, displaying the error on the screen.

Then, when the operator has anything on his screen corrected and ready to send, he just touches a button and it's sent. Most messages never go to your operator at all. When accurately typed by the originating office, they go right through your automatic reader, into your processor and out, ready to go on the air.

To the above features of Type I Message-Entry/Correction, Type II adds output for 5-, 7- or 8-level paper tape, hardcopy printed by a logging teletypewriter, appropriate message formatting, and text control. This system will read English-language routing instructions or AIG's on incoming messages, look up their corresponding ACP 117 codes, and insert them in its ACP 127 or JANAP 128 formatted output, properly paged and/or sectioned. In addition, the security levels of all stations receiving traffic are cross-checked by the system to insure eligibility prior to transmission of the message.

The Type III-Autodin system adds a CDC 1717-1 Data Set Controller and further core and disk capacity to the Type II System which permits introduction of the computer's output directly into the Autodin System. Input from Autodin is handled via the CDC 1742 Printer at 300 lines per minute.









# CDC SYSTEM 17 SERIES

## DIGIGRAPHIC® Display/Entry System Application

The CDC SYSTEM 17 Series Stand-Alone DIGIGRAPHIC System, operating under the real-time Mass Storage Operating System, MSOS, forms the processing and control center of a complete message and data switching system. The graphics system package provides for processing system library programs, such as FORTRAN & COMPASS, that generate relocatable binary object decks in the format required by the MSOS loader. Other features are: a centralized input/output routine (CIO) easily adaptable to a wide variety of non-mass-storage I/O equipment; a mass-storage input/output control routine (MSIO); high priority interrupts on data channels reserved for graphics processing or other real-time applications; and a program that updates a new library.

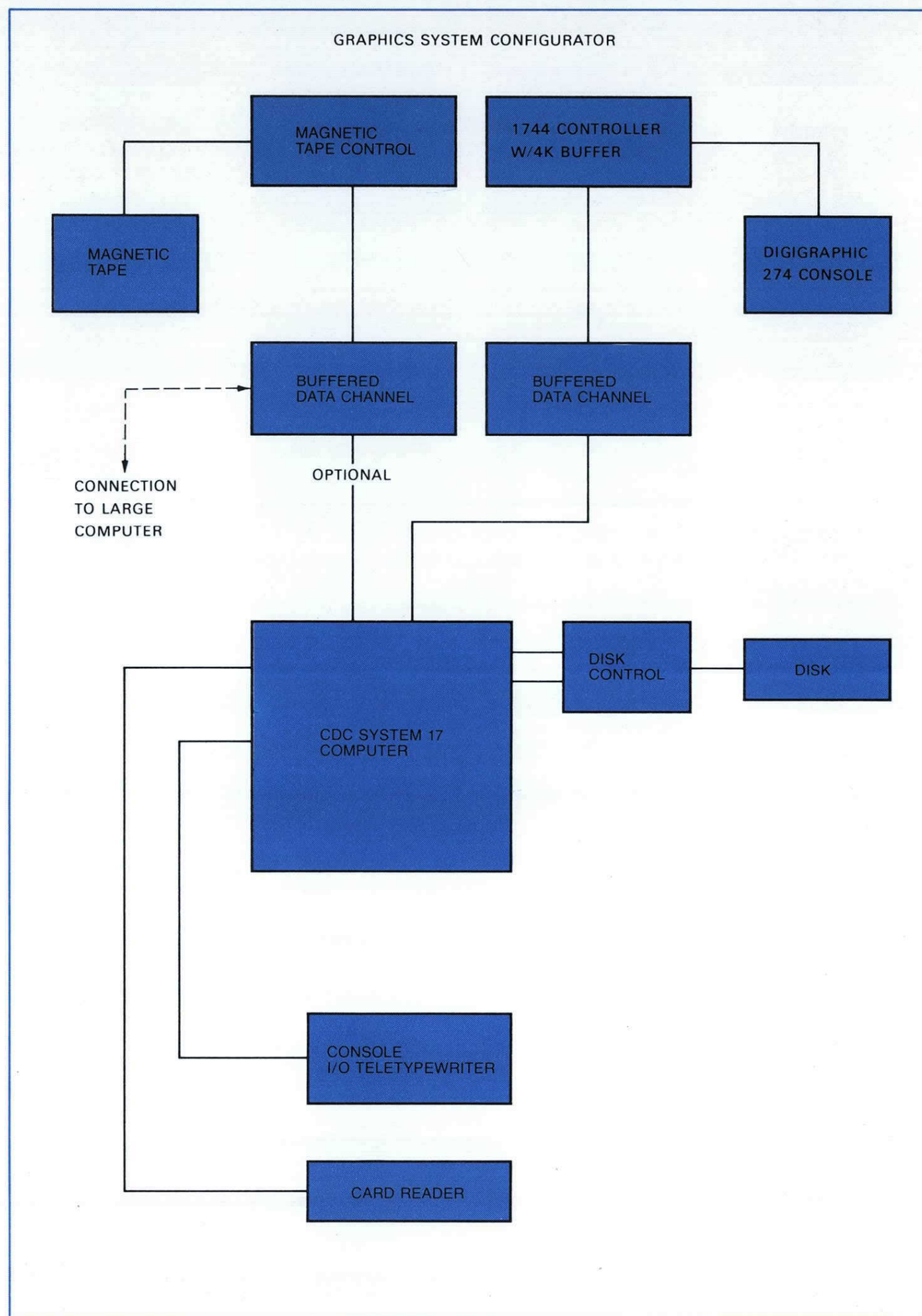
The system is controlled by control statements entered by card or by console typewriter.

The stand-alone graphic software offers a complete range of graphic data handling capabilities. The package is modularly structured to facilitate optional selection or rejection of its functional parts by DIGIGRAPHIC users. Principal functional parts of this software package are:

- A display generation package for reproducing all types of alphanumeric and geometric images at the CRT.
- An interrupt processing package which interprets all operator commands and display requests initiated via light pen/keyboard. Includes light pen tracking capability.
- An ID byte processing package which generates discrete identifiers for distinguishing between individual graphic symbols comprising the overall display and detects the identity of each graphic symbol on operator initiated interrupts for data entry, calling of application programs, retrieval of symbol parameters from data base, etc.
- An overlay processor which calls nonresident application overlay routines into core when operator action demands their execution.
- A data management package which provides list processor for data base entry/retrieval.

When resident in core, the complete graphics software package (along with operating system) requires a memory size of 24K.

The system has numerous applications where the efforts of man and machine



can combine toward more efficient design and analysis. A partial summary of application categories serviceable by the CDC SYSTEM 17 Series Stand-Alone DIGIGRAPHIC System includes: management systems, engineering design and analysis, data evaluation and reduction, process

control, and military command and control.

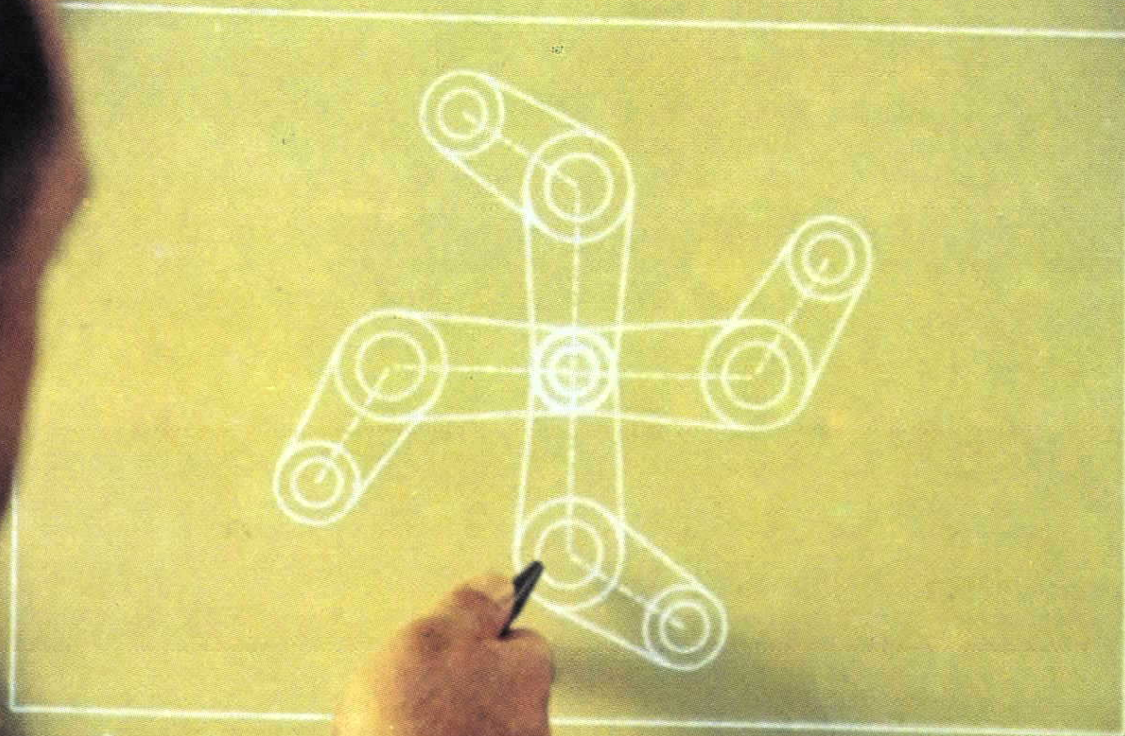
The CDC SYSTEM 17 Series Graphics System may optionally be connected either locally or remotely over a communication facility to a large computer for further processing.



CONTROL DATA DIGIGRAPHIC CONSOLE



END :  
NR ENTER PWD OF DESIRED  
LT 18.24 AM 274 ZI : -1 SC : 0.4000000000 00  
PICK :



+  
AC  
BC  
DC

AM : 0.8000000000 00 +  
LE :  
VI :  
VI :  
OR  
PR



# CDC SYSTEM 17 SERIES

## Terminals and Software Application

CDC's SYSTEM 17 Computer Systems may be used as remote terminals for the CDC 6000 or CYBER 70 Computer Series Computers. This application is supported by two standard software packages which are identified as High-Speed Import and Mass-Storage Operating System (MSOS) Import.

High-Speed Import software provides the equivalent of on-site batch-job submission and output at a CDC SYSTEM 17 Computer when used as a remote terminal, and allows job submission through a card reader directly into 6000 or CYBER 70 SCOPE's input queue. Output files from completed jobs are printed at the line printer. The CDC SYSTEM 17 computer need not be connected on-line while waiting for the output.

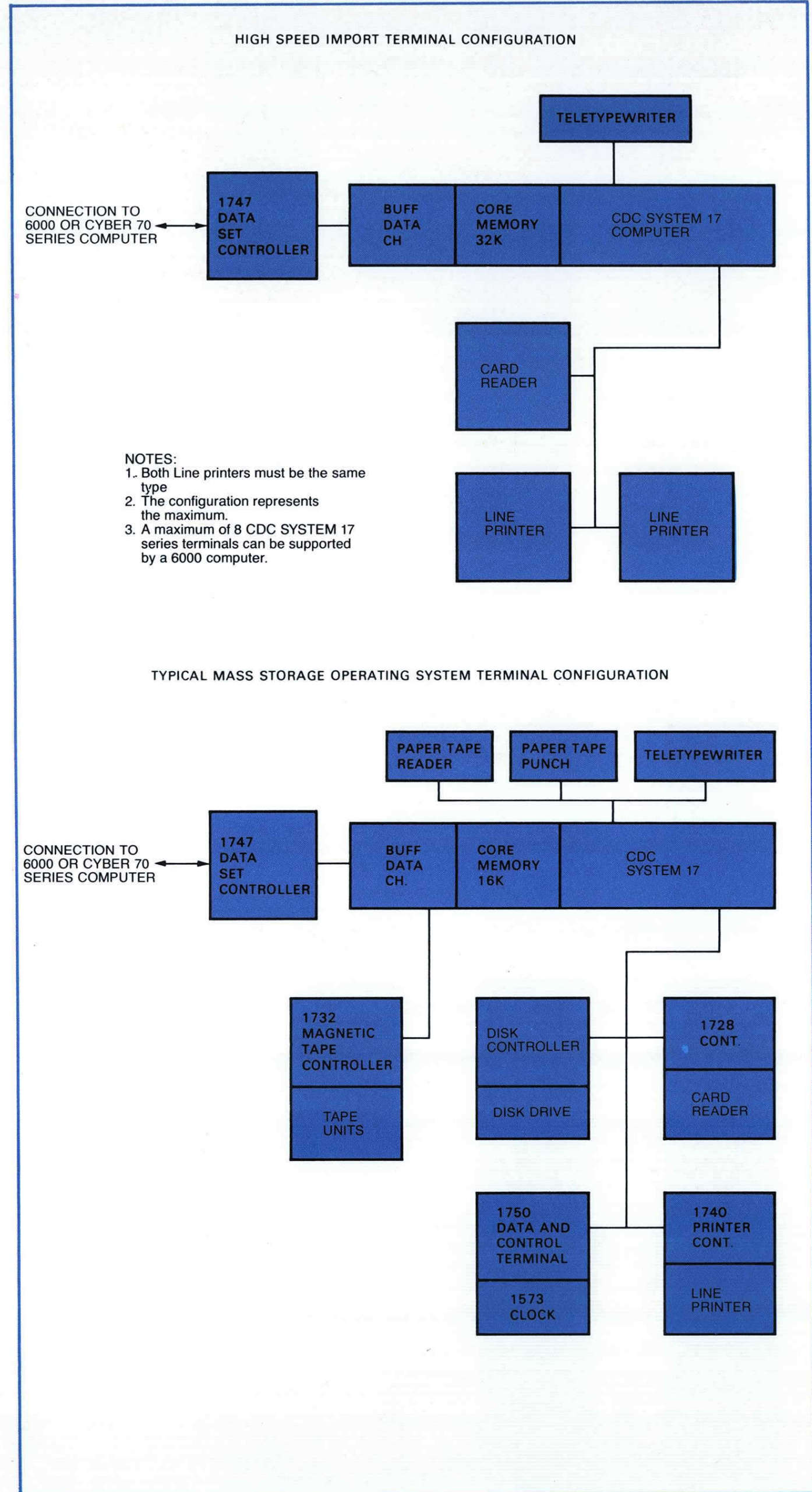
With the High-Speed Import software package the user can enter commands to control reading, execution, and printing of jobs from a remote terminal, as well as request status information regarding jobs submitted from the terminal. Output can be diverted to the central site by either the remote- or central-site operator.

Three concurrent data streams are provided: one card reader and two printers. Peripheral assignments are available as an assembly option. The software package is operable on a CDC SYSTEM 17 Computer with 8K of storage.

The MSOS Import package operates under the MSOS Operating System and permits all MSOS assembly, compilation, execution and utility routines concurrently with remote functions. The package provides for remote submission of jobs for the 6000 or CYBER 70 Computer in the same deck structure as the central site, and for remote reception of print and punch job-output.

Operation of up to six simultaneous data streams, plus operator communication, are permitted between remote and central sites. An operator control language allows operators to control jobs submitted to the central site: operators can cancel jobs in execution, cancel job output return, request job status, control job output priority, and divert job output. Input and output data streams may be diverted to or from magnetic tape.

Under MSOS Import, the operator controls peripheral equipment assignments, eliminating the need for dedicated peripherals. Expansion capability is also provided to allow processing data types other than card input and print output data.



The software package is operable on a CDC SYSTEM 17 Computer with 16K

of memory and 16K of Mass Storage (disk or drum).





IRCSA

COMPANY SPONSORED TOURS: AUTHORIZED

COMPUTER HOURS AND DOLLARS

	Jan. 83	Feb. 83	Mar. 83	Apr. 85	May 85	Jun. 85	6 Mos. 1983
Actual	86.5	73	57	77	99	128	XXXX XXXX
Cumulative Authorized	86.5	159.5	216.5	293.5	394.5	XXXX	XXXX XXXX
Cumulative Actual	87	168	217	294	395	XXXX	XXXX XXXX
Dollars, Cumulative Auth.	34	67	102	146	190	XXXX	XXXX XXXX

Price at \$487/HR

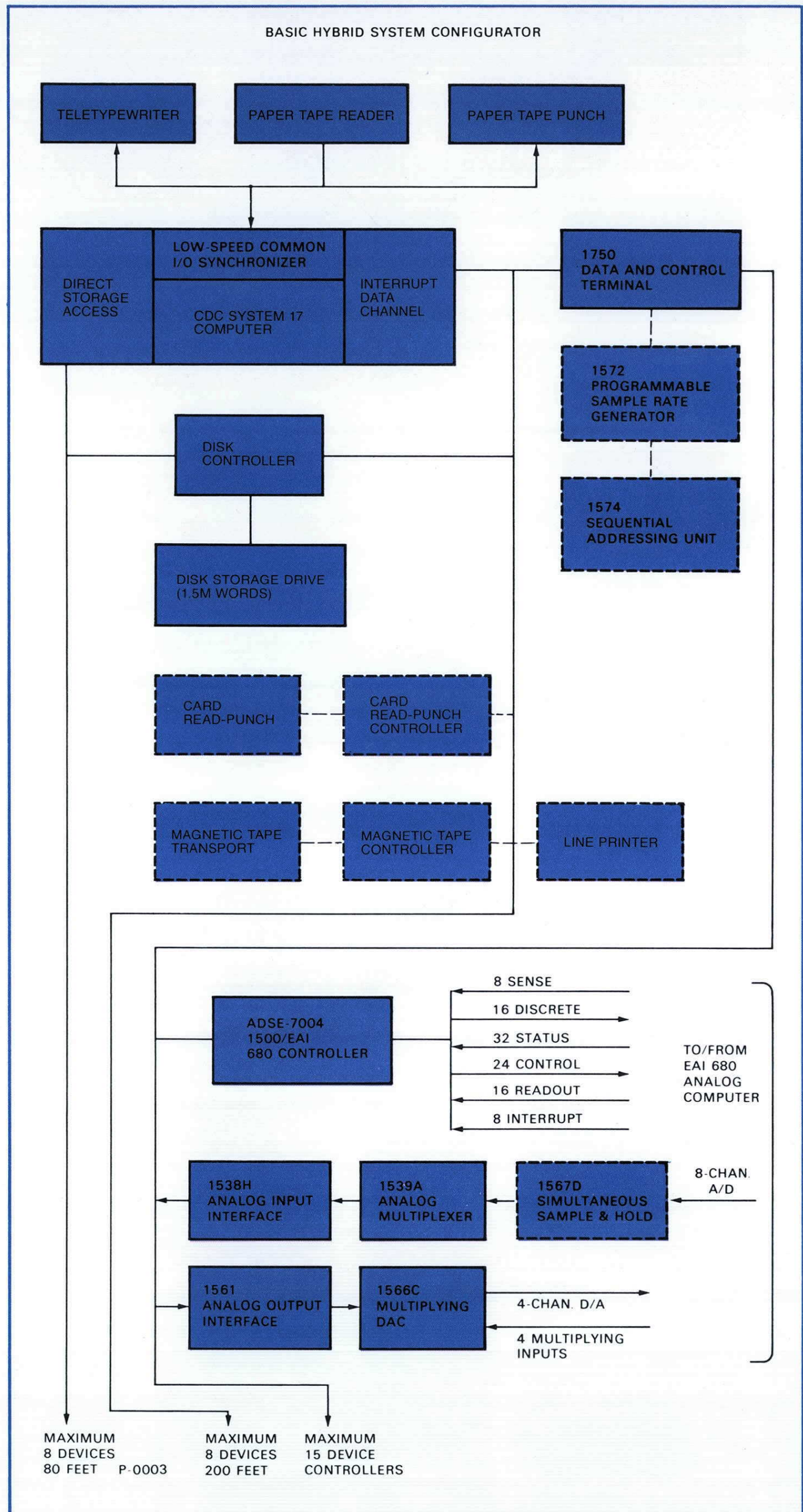


The proven capability of Control Data Corporation in a field so diverse as hybrid applications is a direct consequence of the modular design of Control Data hardware. This design-approach makes possible the wide variety of subsystem combinations which are necessary to meet the requirements of all prospective hybrid system users. Control Data offers a unique hybrid system for virtually any application area, using standard products and eliminating the possibility of overdesign. Sub-systems are composed of standard, interchangeable modules to allow maximum flexibility in the design of every hybrid system.

Modular hardware allows users of minimal hybrid system to easily expand an analog and/or digital computer sub-system as necessitated by diversification or application areas. Expansion is accomplished with a minimum expenditure of time and money by simple modification of the number or types of modules within the appropriate sub-system(s).

The analog software developed by CDC for use in hybrid systems provides diagnostics that ensure correct problem wiring, static test, pot settings, and rate test without the need of manual intervention. The amount of time saved in problem and component setup and checkout is significant and is a prime consideration of prospective hybrid users. CDC makes this software an integral part of its total software package as a standard service. However, this programming of user required digital computer application programs is a nonstandard service since these programs are largely one-of-a-kind and are usually developed by the user.

The hybrid system is representative of a basic hybrid system which allows complete control and monitoring of the analog computer by the CDC SYSTEM 17 Computer. The system, based on the modular design principle just described, is a minimum configuration with respect to the number of analog-to-digital (A/D) and digital-to-analog (D/A) channels employed since the number of these channels depends on the particular hybrid application being considered.









MEDICOM is a complete computer-centered hospital communication system. It provides for:

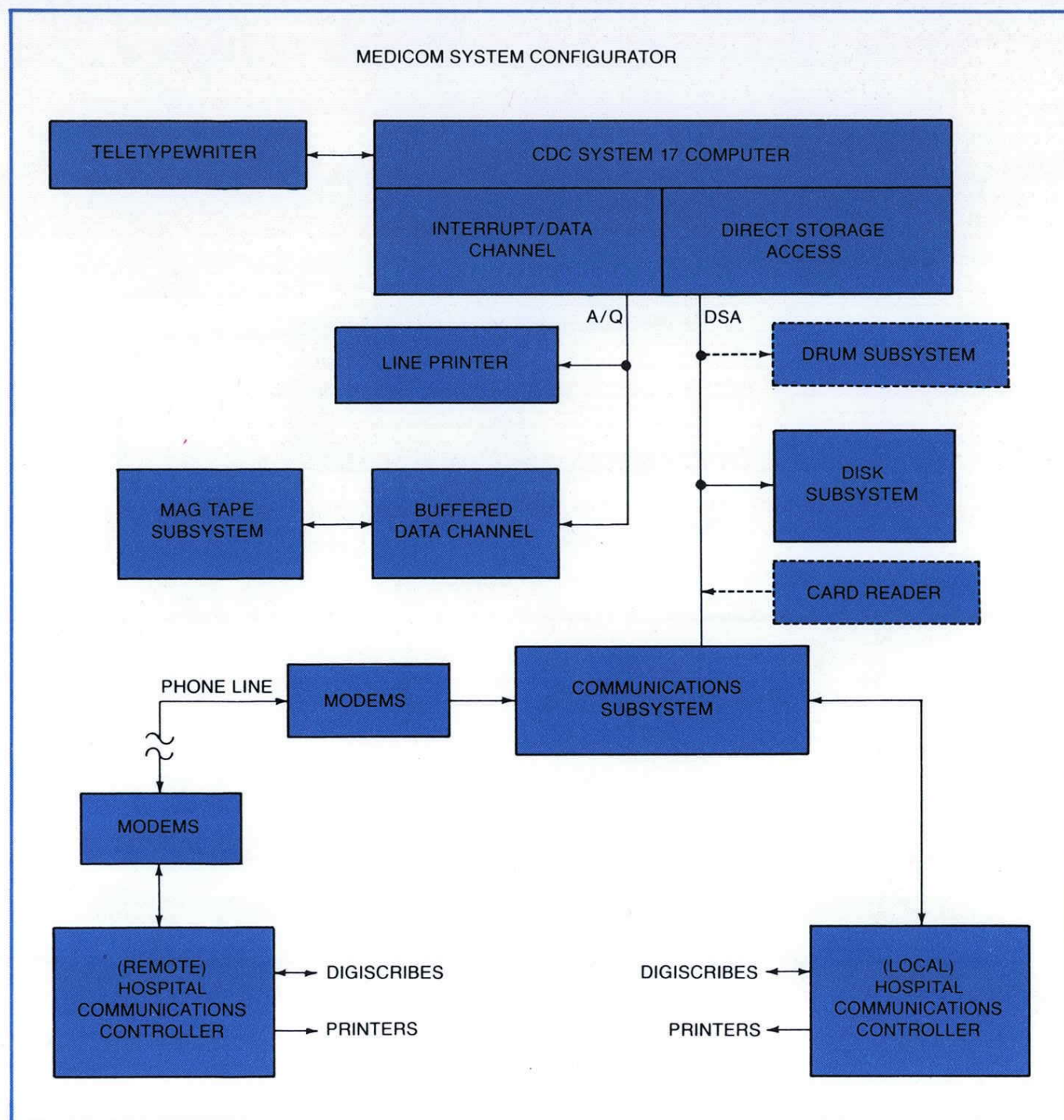
- Point-to-point message switching
- Census, on-line update, and inquiry
- Medical order entry and distribution
- Result reporting
- Scheduling patients, personnel, and facilities
- Patient summaries
- Capturing accounting data for patient billing and inventory control.

Although MEDICOM is a hospital innovator, it requires little reorganization of routines. Physicians continue to write orders into the patient's chart, and ward clerks or nurses enter them into the system via DIGISCRIBE® display terminals. When the user has confirmed the entries, MEDICOM checks the validity of the order before distributing it to the affected departments and files. For example, a medication order would be routed directly to the pharmacy after its validity had been checked for such things as duplicate orders or pre-defined allergenic reactions. The system also produces labels for drug containers.

The MEDICOM hardware structure consists of:

- A CDC SYSTEM 17 Computer system for overall control, data processing, and message routing.
- A Hospital Communication Controller (HCC), which, upon instructions from the computer, retrieves the proper display from its own mass memory.
- DIGISCRIBE and printing terminals—the operator can call up and manipulate pre-programmed material or enter data simply by touching one of the transparent strips on the CRT screen.

The entire system may be installed at one location; or several institutions, each with its own HCC, may share the computer and system. The only requirement for communication between hospitals is full-duplex telephone lines, transparent to the system. To meet hospital requirements for equipment availability, portions or all of the system may be redundant.









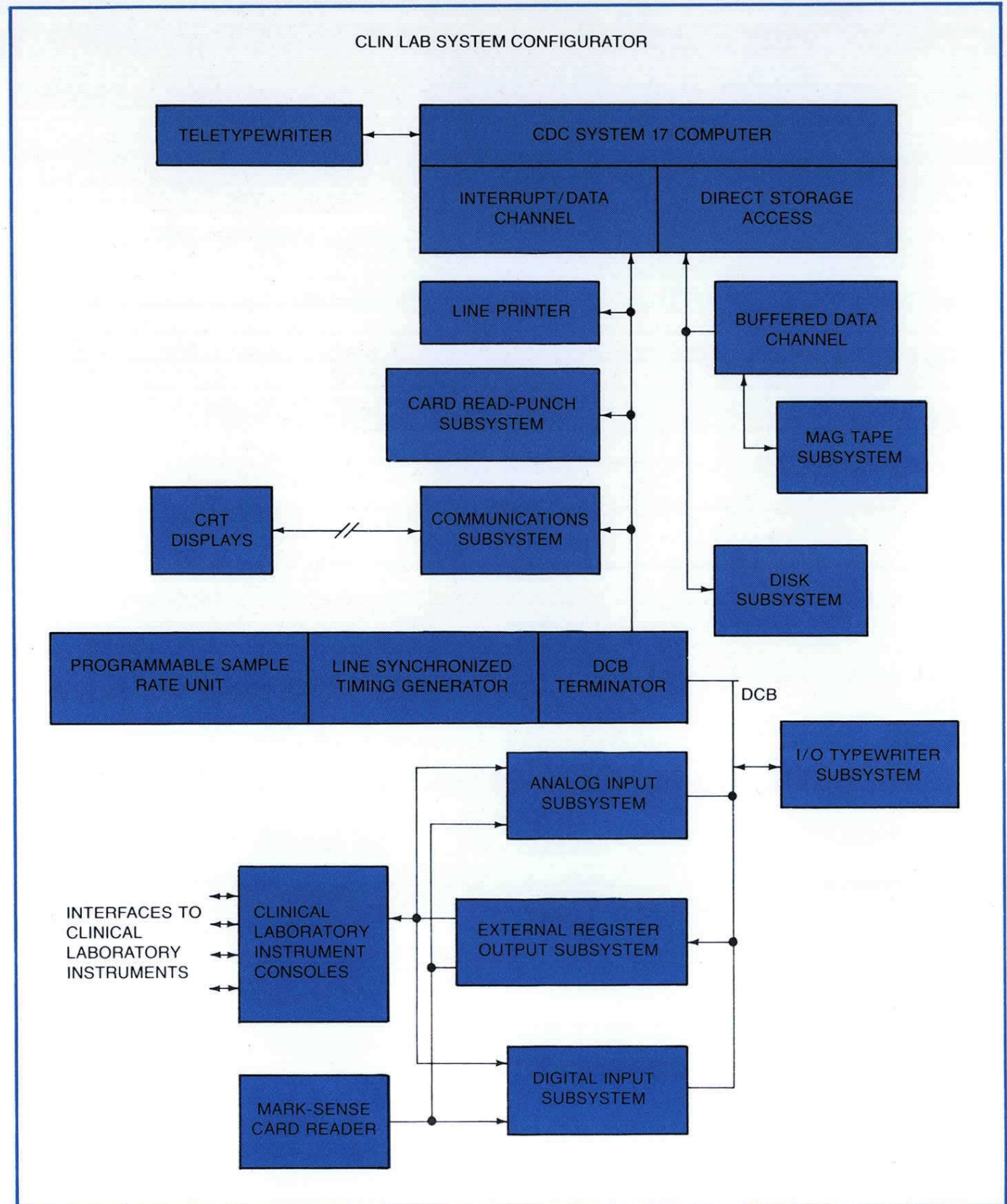
CLINLAB is the CDC SYSTEM 17 Computer system for clinical laboratory management and automation. It provides:

- Efficient use of laboratory manpower
- Immediate, accurate, and legible reports
- Sample collection lists, work lists, and patient summary reports
- Management reports on the status of work in progress
- Concise information for forecasting laboratory loads
- Program modularity to permit ease of expansion
- Rapid test data processing with minimal errors
- On-line data acquisition from a large variety of laboratory instruments
- Manual test results in free text, alphanumeric, or symbolic forms
- Built-in quality control through calibration, drift compensation, limit checks, and result verification
- Capture of pertinent billing data for accounting
- Continuous journaling to provide an audit trail and restart

CLINLAB operates in real time, executing several functions independently of each other in a multiprogramming fashion. At any given moment, system users may request a patient summary report, interrogate the status of any connected work station, request a number of tests, admit or discharge a patient, receive a quality control report, enter manual analysis data, run analyses on several automated and semi-automated instruments, and automatically receive reports on the behavior of the instruments or lists of missing samples, work lists, and sample collection lists.

The CLINLAB software and hardware are truly modular. The system supports a variety of data input devices, including on-line instruments, CRT displays, typewriters, and mark-sense and punched-card readers. Laboratory operations are not limited to chemistry, but extend to hematology, bacteriology, serology, and even outside pathology, permitting ECG interpretation with the CARDIOTEST II system.

CLINLAB's sophisticated file manager and report generator enable the system to produce over 20 reports whose arrangement and content can readily be changed, as well as to create new ones. The computer and the technician "converse" via an I/O terminal in



requesting reports, entering data, changing files, or modifying laboratory test methodologies.







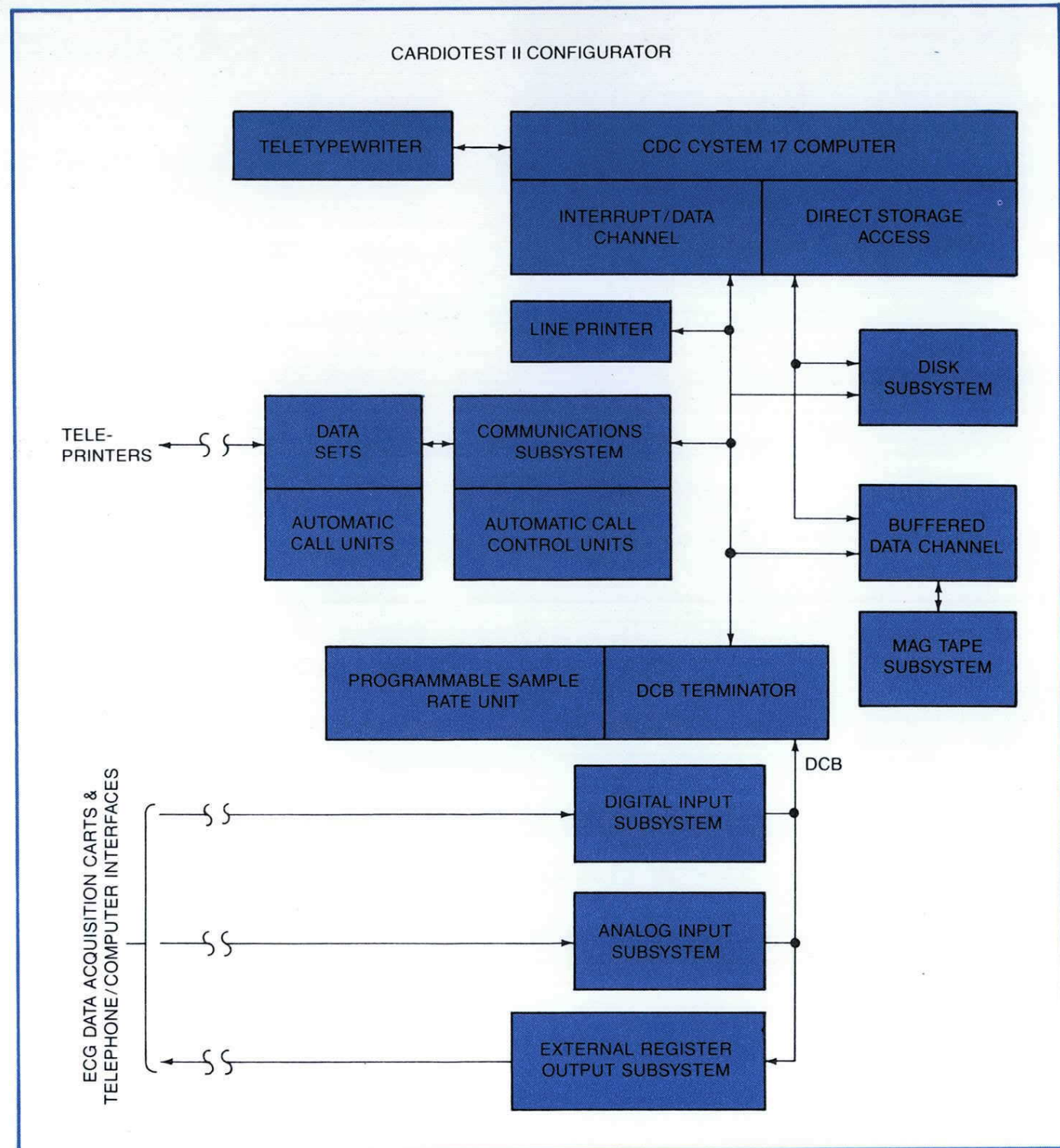
CARDIOTEST I and II are Control Data's SYSTEM 17 Computer systems for electrocardiogram interpretation. The CARDIOTEST I system provides batch processing of analog and digital tape pre-recorded from a variety of ECG acquisition equipment.

CARDIOTEST II is capable of acquiring up to 11 ECGs concurrently over a switched telephone network, interpreting their waveforms, and automatically dialing and transmitting the completed reports back to their respective remote teleprinters. CARDIOTEST II also maintains an historical file of reports which may be retrieved for manual comparison with new interpretations. When the system is shared by a number of organizations, or operated as a service bureau, a record is maintained of the services rendered to each location.

CDC SYSTEM 17 CARDIOTEST can:

- Interpret up to 120 ECGs per hour
- Return reports to remote locations within seconds after receipt of the ECG
- Acquire data from a variety of ECG acquisition gear, including single- and three-channel on-line instruments, and from data pre-recorded on analog or digital magnetic tape.

CARDIOTEST II was designed to operate in an environment without professional computer personnel. Only minor modifications in the ECG recording procedure are required. Interaction between the CARDIOTEST system and the technician is maintained during data acquisition to apprise him of the completion of each task.









# CDC SYSTEM 17 SERIES

## Pari-Mutuel Betting Application

Control Data has taken the lead in developing computer centered systems for both on- and off-track pari-mutuel betting operations. In this endeavor, the CDC SYSTEM 17 Computer plays a significant part in providing modular configurations designed to meet and exceed customer requirements.

The two principal components of these systems are:

- One or more CDC SYSTEM 17 Computers, with associated peripheral equipment, and
- A specially designed Control Data ticket issuing machine which can be easily operated by non-technical personnel with a minimum of instruction.

The ticket issuing machine (TIM) is a terminal consisting of a keyboard, a ticket printer, and an electronics unit. It operates by accomplishing two basic types of transactions: Sale of bets, and payment of winning bets.

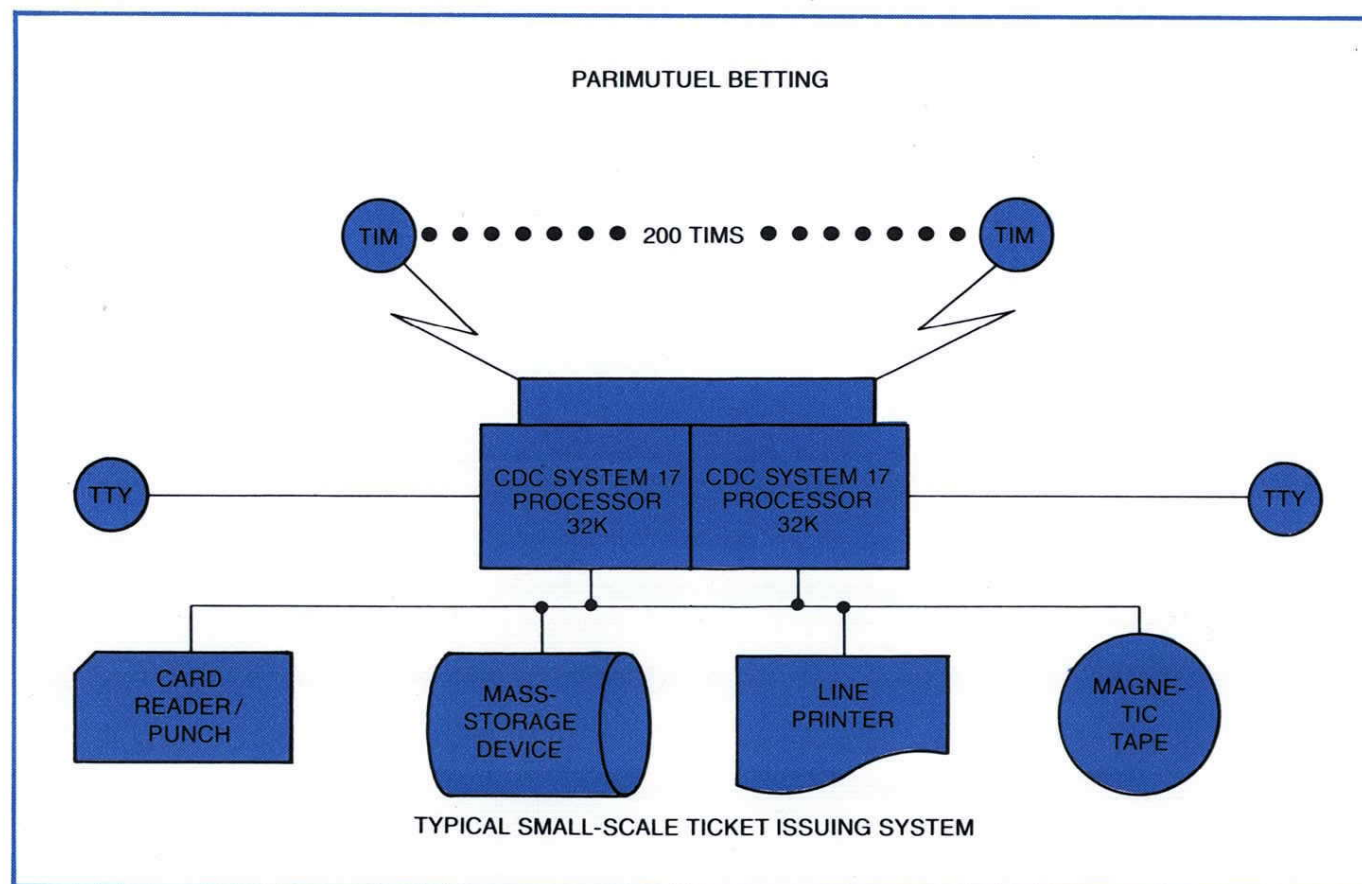
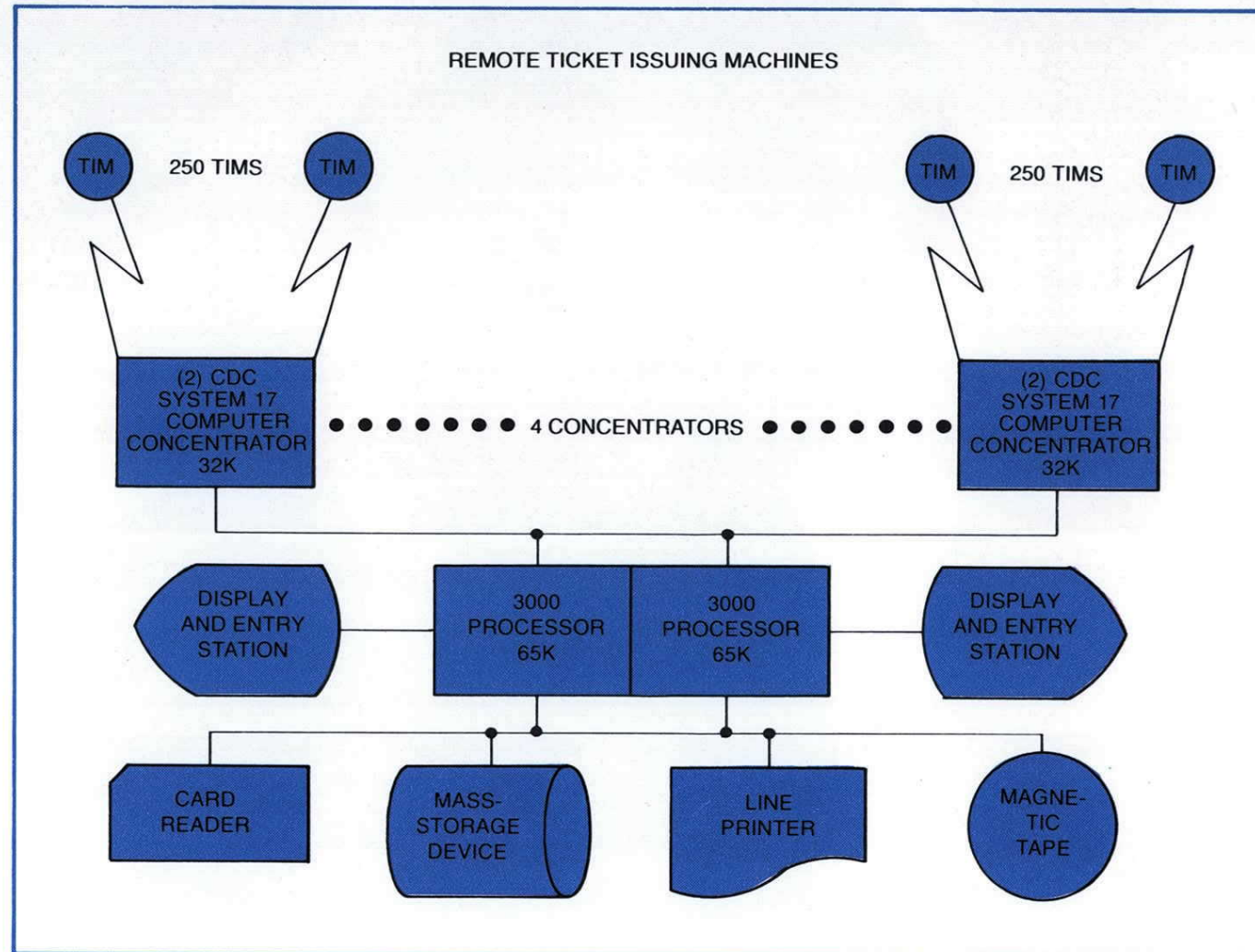
As a bettor places the bet request, the TIM operator enters the request information on the TIM keyboard and sends the bet details to the central computer system. The system validates the meeting, race, horse numbers, type of bet and bet amount; assigns a serial number and directs the TIM to print a sell ticket.

Winning bettors can collect their dividends simply by presenting the winning ticket to the TIM operator who sends the ticket serial number to the central system. The system validates the winning number and directs the TIM to print a pay ticket. The TIM operator then pays the dividend amount printed on the pay ticket.

Both transactions are accomplished by the operator keying information via the keyboard, the terminal exchanging messages with the computer, and concluding with a ticket being printed at the terminal reflecting the details of the transaction.

The flexibility of these systems permits economical growth from a small-scale system to a large-scale system. Even a small-scale system, using dual CDC SYSTEM 17's, can control up to 300 TIM's; with the addition of CDC 3000 Series processors and CDC SYSTEM 17 computers, systems can be configured which will control up to 2400 TIMs throughout the country.

Both ticket issuing systems accommodate all of the usual bet transactions provided at most racetracks, including

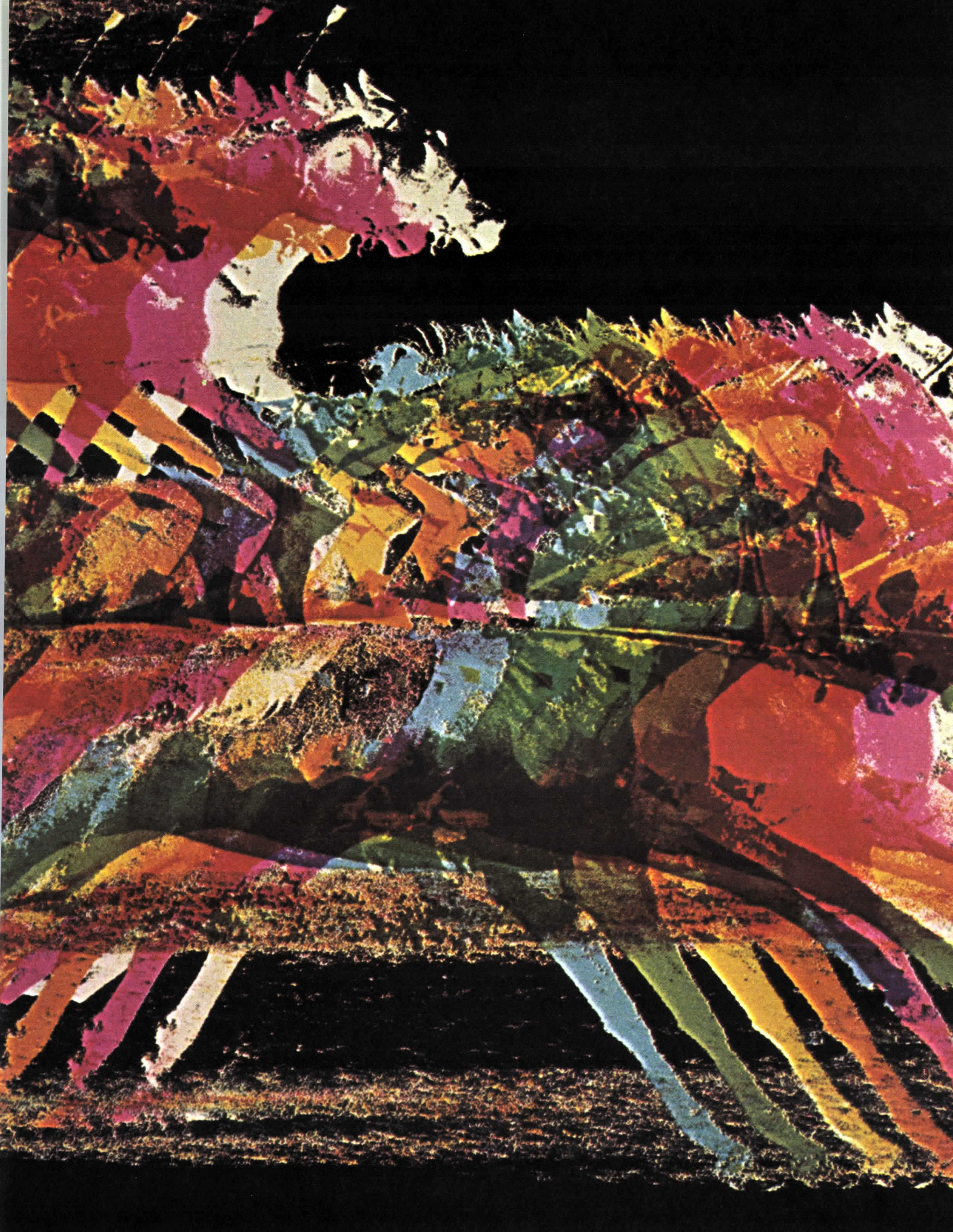


bet refunds for bets placed on scratched horses and bet cancellations if the bettor cancels his bet before the race is closed. The large- and small-scale ticket issuing systems:

- Accept and validate bets and issue a ticket showing investment detail and security information.
- Accept and validate the authenticity of a ticket presented for payout and indicate the dividend payable. This is accomplished by using an automatic ticket reader.

- Record all transactions accepted into the system in such a manner as to satisfy audit requirements.
- Perform error checks and error recovery, and display error conditions to ensure the highest practicable degree of accuracy.
- Produce a comprehensive set of management reports, including accounting and statistical information, in a format and at such time as it is required. Accept, process, and communicate control information.







# CDC SYSTEM 17 SERIES

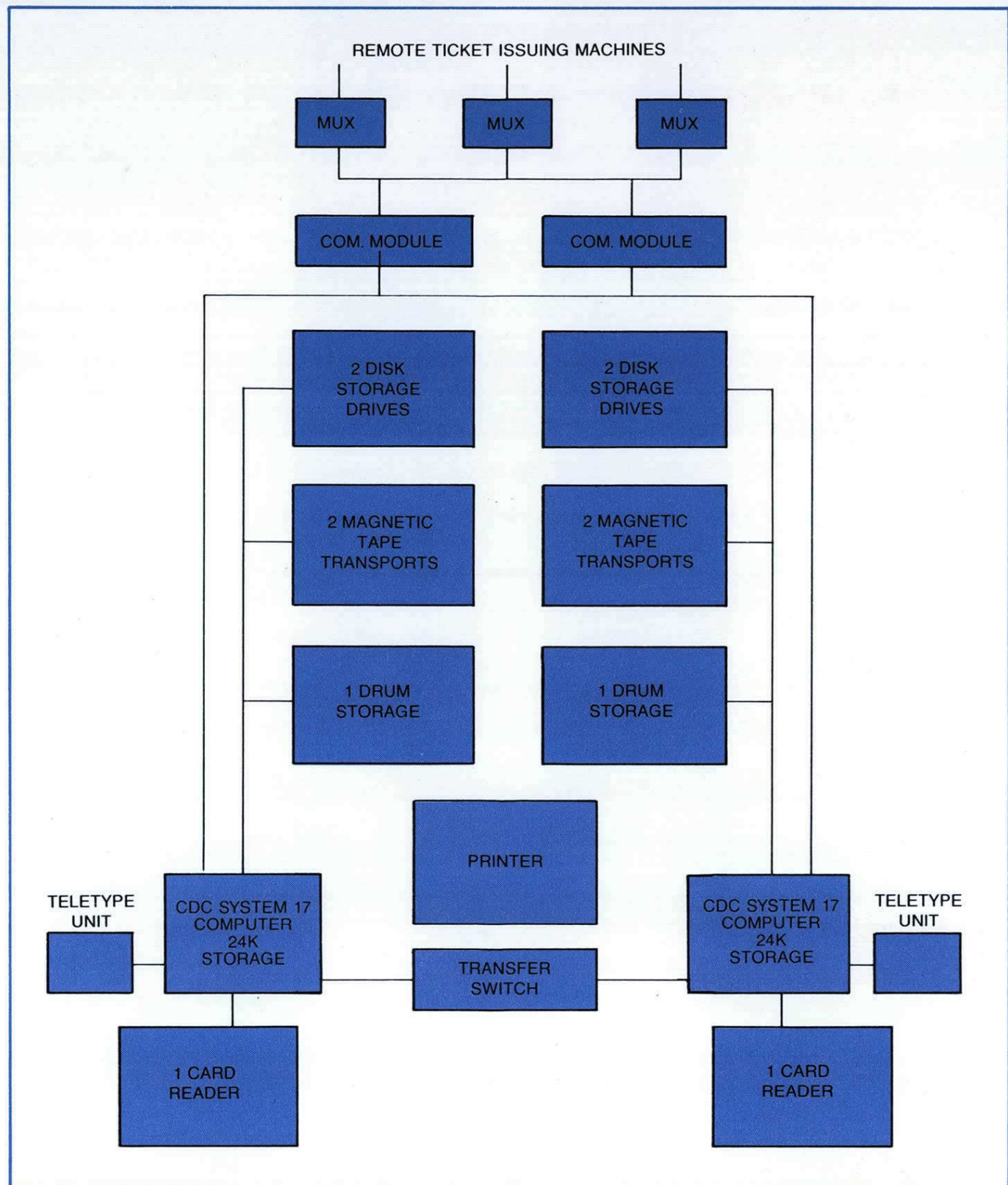
## Lottery Ticket Issuing Application

The speed, capacity and reliability of the CDC SYSTEM 17 Series are the primary reasons it was selected as the central computer system for the world's first computerized lottery system. This state-operated system consists of a network of free-standing, coin-operated ticket printing and dispensing machines connected to the central computer site by standard telephone lines. Up to 600 Ticket Issuing Machines (TIM) can be included in the accompanying configuration.

To purchase a ticket, a customer simply deposits coins in the correct amount of the ticket. The TIM then imprints the ticket with the date of issue and unique computer-assigned lottery and serial numbers. The ticket is ejected into the ticket slot; removal of the ticket by the customer completes the transaction.

The lottery terminals can operate 24 hours a day without an appreciable time lapse between lottery periods. For example, a lottery period of one-million tickets can end and the next lottery of equal size can start within a matter of seconds. The computer, which continuously monitors the network of terminals, senses the sale of the millionth ticket of the current lottery and assigns the next network transaction a new lottery number.

The installation of Control Data's SYSTEM 17 Lottery Ticket Issuing system has reduced the operation costs of the lottery and, at the same time, improved customer service. The result has been a dramatic increase in the state's operating revenue.







# Lottery

## TICKETS

### HERE

#### HOW TO GET YOUR TICKET

- 1 Press Button to select Lottery
- 2 Deposit Money
- 3 Press "Buy" Button
- 4 For Additional Tickets Repeat Steps 1, 2 and 3

Amount Deposited

Change Exact Amount - No Change Returned

CANCEL BUY

How To Buy Your Tickets

50¢

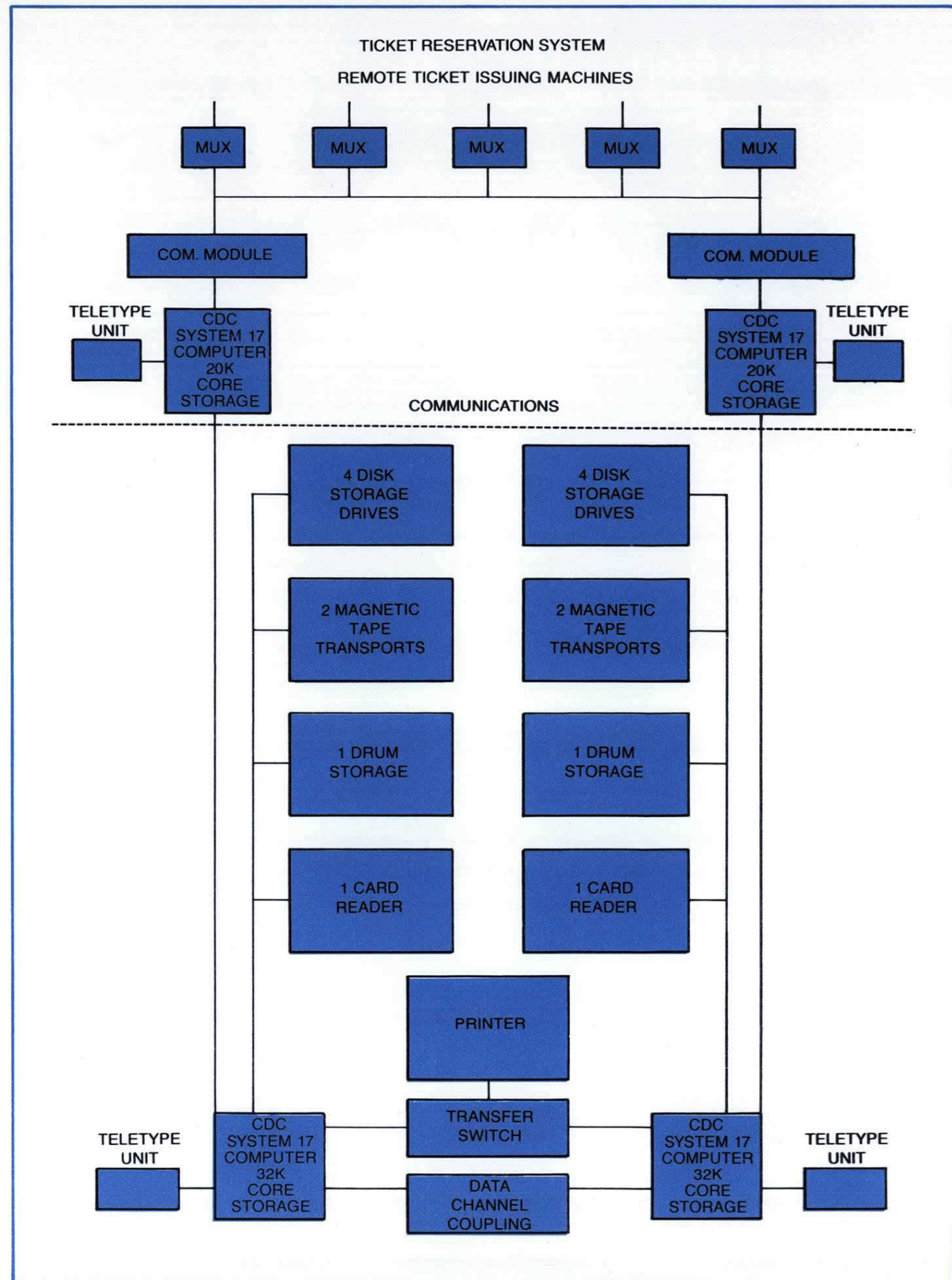
Ticket Dispenser



Another everyday problem presently being solved by CDC's SYSTEM 17 computers is the sale of reserved seat entertainment tickets throughout the nation. These Control Data systems are now being used by Ticketron to make reserved-seat tickets immediately available to a wide-spread public.

A typical system, located in a major entertainment center, uses CDC SYSTEM 17 Series quad systems to control an area-wide network of remote inquiry and ticket-printing stations. These remote outlets are installed in department stores, banks, supermarkets, airports, and at regular entertainment ticket windows. This approach provides computer-controlled ticket printing and box office control to fill thousands of seats at a large number of sports and cultural events as well as for camping reservations, golf course tee-off time reservations, and airline ticket reservations. By providing ticketing services to a far wider audience than ever before — and with much greater convenience — subscribers to the service have greatly increased their attendance.

Customers can make advance reservations for any event that subscribes to the reservation service anywhere in the country. He simply makes his request to a terminal operator who relays the request information to the system. The system responds by temporarily reserving the best available seats while the customer decides whether or not he will buy them. If he decides to buy them, the operator presses a button on the terminal and the ticket printer prints the specific data on blank ticket stock. The customer pays for and receives his ticket to complete the transaction. The computer removes the tickets from its ticket inventory and records the transaction.













# System Software

The scope of programs available to users of the CDC SYSTEM 17 Family is already extensive and is continually increasing. The standard software is designed for flexibility and operating efficiency and is constructed to meet the stringest computing requirements of today's advanced data-processing problems. It provides the necessary operating links between the Control Data SYSTEM 17 Computer's power and the customers' unique and variable data-processing problems.

The standard software offerings have been complemented by a wide variety of application programs which optimize the inherent capabilities of the computer and related peripherals.

In developing the CDC SYSTEM 17 Series software, Control Data has drawn upon its extensive experience in on-line multi-programming and communications-oriented systems. As a result, each system is easy to operate yet assures program integrity for its user in a demanding data-processing environment for which the system was designed.

## STANDARD SYSTEM SOFTWARE

- Assembly System
- Utility System
- Mass Storage Operating System (MSOS)
- Reduced Core Monitor Assembler (BASIC)
- Macro Assembler (COMPASS)
- Mass Storage FORTRAN
- Tape FORTRAN
- COSY
- System Configuration
- System Checkout
- MSOS High Speed Import
- High Speed Import

## TYPICAL APPLICATION ORIENTED SOFTWARE

- MEDICOM
- Process Control (AUTRAN)
- Supervisory Control
- Seismic Pre-Processing
- Message Switching
- OCR (DRAFT)
- GRASP
- Graphics
- Hybrid (COMANCHE)







# System Software

## ASSEMBLY SYSTEM

An assembly system provides all essentials for assembling, loading, executing, and processing input/output on a 4K CDC SYSTEM 17 Computer with paper tape and teletypewriter equipment. It is also intended for use as a basic programming tool.

### Minimum Hardware Requirements

CDC SYSTEM 17 Computer with 4K Core Memory  
Paper Tape Reader  
Paper Tape Punch  
Teletypewriter

## UTILITY SYSTEM

The CDC SYSTEM 17 Utility System is designed for preparing and executing programs without mass-storage equipment. A linking loader is provided to relocate binary subprograms from both a library and from user-assembled programs. This system also provides internal and external interrupt processing, field-proven debugging aids, and standardized requests for I/O operations. The system's minimum configuration consists of a CDC SYSTEM 17 Computer with 8,192 words of storage and a 1713 Teletypewriter. The system features a loader, input/output drivers, and interrupt service routines.

### Minimum Hardware Requirements

CDC SYSTEM 17 Computer with 8K Core Memory  
Paper Tape Reader  
Paper Tape Punch  
Teletypewriter

## MASS STORAGE OPERATING SYSTEM (MSOS)

A combined on-line/real-time job processing structure, either core or mass-memory resident, this system operates in protected core under control of the monitor modules, providing an interrupt-responsive multiprogramming environment. Any real-time program, once initiated, retains control until interrupted or completed. Request stacks for individual I/O devices are maintained; order is determined by the priority specified in each request. Job processing operates concurrently in unprotected core, isolating the real-time system from errant, undebugged jobs. MSOS provides full capability for compiling, assembling, executing, and debugging, as well as a powerful editing technique for modification of system and user libraries.

Modules providing specific capabilities may be deleted or added. A specific

example is the Operating Monitor for dedicated applications such as industrial control, data acquisition and communications.

### Minimum Hardware Requirements

CDC SYSTEM 17 Computer with 16K Core Memory  
Paper Tape Reader  
Paper Tape Punch  
Teletypewriter (KSR)  
Disk Drive

## REDUCED CORE MONITOR

The CDC SYSTEM 17 Reduced Core Monitor (RCM), Version 1.0, uses a minimum amount of core memory to provide the CDC SYSTEM 17 Computers with real-time monitoring capability. The RCM is completely core resident and can be initialized in 4,096 words of core memory. The system will handle from 6 to 16 levels of software priority on up to 16 different interrupt lines. Interrupt response time never exceeds 50 micro-seconds.

The RCM was designed to require little or no human intervention; therefore few conditions are reported on the comment device. However, programs may be loaded and executed or scheduled by the operator. And, should a hang-up occur, the system may be restarted without reloading if the RCM has not been overwritten.

The system is modularly structured to allow several optional configurations of features and equipment; it need never include features which are not used.

Software which runs on any other standard CDC 1700 Operating System will also run in the RCM with little or no modification. The RCM is completely upward compatible with 1700 MSOS.

### Minimum Hardware Requirements

CDC SYSTEM 17 Computers with 4,096 words of core memory  
Paper tape reader or punch and teletypewriter  
Card reader/punch and line printer, with appropriate interrupt data channel, may be substituted for the paper tape reader and punch indicated above.

## ASSEMBLER (BASIC)

The CDC SYSTEM 17 Assembler provides a complete, machine-oriented programming language. It offers paper-tape input; relocatable program, data and common storage; optional absolute loading; free-field source statements; symbolic operation codes; assembler-



directed pseudo instructions; assembly listing on paper tape or typewriter; binary output or paper tapes input/output control; and paper tape editing.

#### **Minimum Hardware Requirements**

Operates under the assembly system above.

#### **MACRO ASSEMBLER (COMPASS)**

The Macro Assembler operates under either the Utility System or the Operating System in a configuration containing mass storage. It is a versatile assembly system providing programmer-defined macro-instruction capabilities, as well as symbolic operating codes and assembler-directed pseudo-instructions. Features are: optional absolute loading, relocatable program, data and common storage, free field source statements, symbolic operation codes, assembler-directed pseudo instructions, assembly diagnostics, programmer and library macro instructions, and variable field definition.

#### **Minimum Hardware Requirements**

Operates under the Utility System (disk drive required) or Operating System.

#### **MASS STORAGE FORTRAN**

Mass-Store FORTRAN for the CDC SYSTEM 17 Series features a multi-pass compiler, library functions, a highly-efficient object code (ASA FORTRAN), ability to bypass FORTRAN formatting I/O capabilities when not required, and disk input/output statements. Tape FORTRAN has the same language, structure, and features as Mass-Store FORTRAN, excluding the disk input/output statements.

#### **Minimum Hardware Requirements**

Operates under the Operating System (MSOS)

#### **TAPE FORTRAN**

This is ASA BASIC FORTRAN with the additional features of relational and logical expressions, block data and other capabilities, but without complex and double-precision arithmetic. A library of functions is provided. The multi-pass compiler stores intermediate data on paper tape, magnetic tape, or sequentially on disks, depending on drivers and devices included in the system. Final output is on paper tape. The object code produced is highly efficient, and is designed to be used as a programming tool for control processing by the addition of bit and byte handling statements and monitor

communication facilities.

#### **Minimum Hardware Requirements**

Operates under the Utility System

#### **CDC SYSTEM 17 COSY**

COSY operates under the Mass Storage Operating System (MSOS) and provides capability for processing program decks in compressed symbolic form.

#### **CDC SYSTEM 17 CONFIGURATION/MSOS**

This system provides a simplified automatic procedure for generating a configured and parameterized Mass Storage Operating System, and allows the user to describe hardware configuration and desired software capabilities. Output from the program includes a list of programs required, a source of customized systems tables, exact figures on core and mass memory requirements, and an optional relocatable binary output for input to the System Initializer. System Configurator will detect all possible input control statement errors and inform the user via diagnostic messages.

#### **CDC SYSTEM 17 CHECKOUT/MSOS**

System Checkout 1.0 is an on-line checkout program capable of diagnosing failures in the MSOS operating system. This is accomplished by writing the failed image on mass memory using a bootstrap program. This is followed by a system restart (AUTO LOAD) and call-up of the on-line checkout program. The checkout program executes at a low level, on-line with other programs, fetching its information from the image on mass memory to isolate the system problems. No more than 500 words of core are required to run the System Checkout program.

System Checkout provides error detection by interrogating the standard operating system's critical constants, I/O traps and tables, and system lists and stacks. Diagnostics are produced when errors are encountered.

The system also detects all input control statement errors and informs the user via a diagnostic message. Speed is established by the peripheral configuration and the complexity of the system being interrogated. When no other system functions are operative, checkout of standard operating system should not exceed 10 minutes on the minimum configuration.

#### **CDC SYSTEM 17 MSOS HIGH SPEED IMPORT**

The MSOS HIGH SPEED IMPORT system provides a CDC SYSTEM 17 Computer operating under MSOS, with the capability of acting as a remote terminal for CDC 6000 Series Computers. This capability is in addition to control and operation under MSOS: utility routines and MSOS functions, such as assemblies, compilations, and job executions, can be run locally and concurrently with remote functions.

Remote terminal functions include remote submission of 6000 jobs in the same deck structure as at the central site and reception of printed and punched job output. The program also provides a control language which allows operators to control jobs submitted to the central site. Operators can thus control the priority of output among their own jobs, request job status, cancel jobs in execution, cancel return of job output, and divert job output to the central site. The operator controls peripheral equipment assignments, eliminating need for dedicated peripherals.

The program can support operation of up to six simultaneous data streams, plus operator communication between remote and central site. Both input and output data streams can be diverted to or from magnetic tape.

#### **Hardware Requirements**

See terminal configuration on page 93.

#### **CDC SYSTEM 17 HIGH SPEED IMPORT**

This system supports the application of a CDC SYSTEM 17 Computer simply as a remote terminal for a CDC 6000 Computer, providing the equivalent of on-site batch-job submission to the 6000 with output delivered to the CDC SYSTEM 17 Computer. Jobs can be submitted via card reader directly into the 6000 Computer's input queue.

Under HIGH SPEED IMPORT, commands entered at the CDC SYSTEM 17 Series can (within the limits of 6000 Series computer priorities) control the reading, execution and printing of jobs submitted from there, and can inquire about the status of those jobs. Output can be received at the terminal location or diverted to the central site by either the remote or central site operator.

#### **Hardware Requirements**

See terminal configuration on page 93.



# Application Software

## MEDICOM PACKAGE

A Control Data innovation in operating systems design enables the MEDICOM System to offer:

- Fast response
- Improved effectiveness of personnel
- Economic justification of a real-time, time-shared system

Standard CDC operating systems give the user the advantage of all MEDLAB and ECG analysis programs that have been written for medical systems and general applications. The Control Data SHORT Operating System translates selections made from the consoles into whatever action has been pre-programmed for those selections. Reaction to the user can be in his individual vernacular and is so swift and comfortable that many have cited this clinical and research tool as a natural extension of human senses. An extremely useful part of the SHORT Operating System is a Selectable Element Translator (SETRAN™) which allows the user to construct display sequences. The versatile DIGISCRIBE® software is adaptable to a wide range of uses; additional applications programs may be written in assembly language. See page 50.

## PROCESS CONTROL LIBRARY

This library consists of functional programs for industrial control and data acquisition systems. The parts of this library that are appropriate to a given application and hardware configuration are combined with standard 1500 series equipment drivers to generate systems programs on a special basis. The library operates under the standard operating system with 1500 series hardware.

## PROCESS CONTROL COMPILER (AUTRAN)

The CDC SYSTEM 17 AUTRAN System allows a process engineer to program his CDC SYSTEM 17 Computer in a familiar language: English. The AUTRAN System can completely eliminate the need for often impossible coordination between process personnel and computer personnel.

AUTRAN is dedicated to the process control field, and uses the common English terms and phrases familiar to the industrial process engineer such as VALVE, POSITION, START, PUMP, SENSOR, etc.

In contrast to the usual combined force of engineers, operators, computer analysts, and programmers, the Process Engineer himself can write total monitoring and control programs for his CDC SYSTEM 17 System using AUTRAN. In fact, anyone who can understand the process and the standard nomenclature of the plant can write control programs, and AUTRAN programs are completely self-checking. Diagnostics performed during compilation detect errors in semantics, vocabulary, syntax and ambiguity. More than 350 different diagnoses are provided to ensure ease of recovery from discovered errors.

The AUTRAN System has been designed to work under the direction of the CDC SYSTEM 17 Operating System (Real-Time Executive) and to interface directly with the CDC FORTRAN Compiler. The CDC Operating System provides the various bookkeeping services such as mass memory transfer, input/output functions, standard peripheral drivers, etc., as required by the AUTRAN System. Interface with FORTRAN provides the Process Engineer with a convenient means of performing mathematical operations within the structure of his AUTRAN programs.



## **SUPERVISORY CONTROL PACKAGE**

Control Data's supervisory control programs combine complex feed-forward process model solutions with feedback adjustments to model parameters. Where required, and especially in the pulp and paper industry, process variables are time-correlated before being used in the programs. This ensures that disturbances occurring in the process are properly compensated for at the controlled unit. In the case of paper machines, for example, disturbances in thick stock variables are properly accounted for when they reach the headbox, slice, fordrinier, presses, and dryers. Each supervisory program repeatedly checks all essential inputs and outputs. If any of the critical inputs either is bad or becomes bad, as detected by high- and low-limit checks or out-of-range checks, messages may be printed and exception processing scheduled. A similar sequence results if any essential outputs become inaccessible.

## **SEISMIC PRE-PROCESSING PACKAGE**

This software package was developed expressly for geophysical data reduction and provides maximum throughput at a reduced cost. This package includes the following features:

### **Pre-processing Monitor**

- Performs record search under software control
- Performs record verification
- Follows a restart procedure
- Performs sink checking

### **Input Format Capability**

- SEG A, 9-track
- SEG B, 9-track
- TIAC 9,000, 21-track
- TIAC 10,000, 21-track
- A/D-1-, or 2-, or 4-millisecond sample rate with a maximum of 6000 samples per trace

### **Application Processes**

- Multiplexing and demultiplexing of data
- Vertical stacking of SEG A, SEG B, and TIAC 10,000 formats
- Vertical stacking with gain standardization
- Water break correction on SEG B format
- Reformatted record written on 7-track tape in demultiplex form

## **Output**

- Output from 7-track demultiplex tape to D/A converter with overlapping tape I/O. Forty-eight traces maximum per record, with a maximum of 6000 samples per trace. Samples can be 12-bit or 16-bit.

## **Portable Seismic Data Processing System**

A specially designed algorithm module, coupled with a CDC SYSTEM 17 Series, is an ideal unit for portable field use in seismic exploration. This system makes it practical, for the first time, to process seismic data in the field for site evaluation and data validation. The full line of peripheral equipment available on the CDC SYSTEM 17 Series enables Control Data to provide portable seismic processing systems tailored to your requirements.

## **MESSAGE SWITCHING PACKAGE**

A Message Switching Package operates under the control of the CDC SYSTEM 17 Mass Storage Operating System (MSOS) and is designed especially for use in real-time environments. The package provides CDC SYSTEM 17 Computer users with a generalized message switching capability, including those programs germane to switching applications in general, such as communications interrupt response, terminal unit control, terminal conversation, message input/output, message processing and queuing, systems operator status and control, and restart and recovery procedures. Programs such as header analysis, routing, etc. that are particular to individual operations can be added to the general package. Segregating the programs specific to a particular user enables each user to be provided with an efficient and flexible system which meets his individual needs at a minimum cost. The modular construction of the system enables users to exchange, add, or delete routines so that additional lines, devices, and stations can be easily accommodated by adding the necessary program modules or modifying existing tables. The system is so designed that the routines particular to an individual installation, or special routines, can be provided by CDC, with complete systems responsibility assumed by CDC, or by the user, at his option.

## **OCR DOCUMENT READER-COMPILER**

DRAFT (Document Read and Format Translator) is a general-purpose, data-capturing compiler language which permits programmers to:

- Select input from an OCR device, magnetic tape, or paper tape;
- Format output records and fields;
- Compute and move data and convert characters;
- Specify the output device;
- Interleaf files on a single output device.

No knowledge of machine language is necessary to use DRAFT effectively. The DRAFT language consists of a series of source statements which are divided into several fields: location, op code, address, comments, and sequence. Often only the op code field (operation) must be specified; DRAFT defines the others by default if they are necessary to the program.

DRAFT is divided into three divisions: File Control, Data, and Procedure. File Control statements provide the parameters for input data and assign the output device. Thus, these statements describe input and output file characteristics. Data Division statements describe the information the programmer wishes to process. Procedure Division statements control the sequence of operations, make calculations, and test the validity of the input.



### OCR PAGE READER-GENERATOR

GRASP (Generalized Read And Simulate Program) is an interpretive computer program that allows the user to specialize the page reader into his own data-capturing system via typed specifications. Features are:

- Reads stock or preprinted forms
- Edits and checks fields for —
  - zero or blank fill
  - exact field size
  - alphanumeric or numeric characters
  - left or right justification
- Eight to ten record types per job
- Eight to ten header fields per job
- Character, field, line, record, or page deletion
- Output fields resequenced as required
- Fields masked and accumulated into one of four counters
- Error checking and sort control with diagnostics
- Compatible with 7- and 9-track tape drives

GRASP reads the specification sheet with the 915. A GRASP program is then generated by the computer and used for reading the specified set of documents according to the format defined. Requested data manipulation and editing are performed, and the data is written on magnetic tape.

### GRAPHICS PROCESSING PACKAGE

The CDC SYSTEM 17 Series stand-alone graphic software offers a complete range of graphic data-handling capabilities. The package is modularly structured to facilitate optional selection or rejection of its functional parts by DIGIGRAPHIC users. Principal functional parts of this software package are:

- Display Generation Package — Produces all types of alphanumeric and geometric images, at the CRT.
- Interrupt Processing Package — Interprets all operator commands and display requests initiated via light pen or keyboard. Includes light-pen tracking capability

- ID Byte Processing Package — Generates discrete identifiers for distinguishing between individual graphic symbols comprising the overall display. Detects identity of each graphic symbol on operator initiated interrupt for: data entry, calling of application programs, retrieval of symbol parameters from data base, etc.
- Overlay Processor — Calls nonresident application overlay routines into core when operator action demands their execution.
- Data Management Package — Provides list processor for data base entry/retrieval.
- When resident in core, the complete graphics software package (along with operating system) requires a memory size of 24K.

### HYBRID PACKAGE

The Hybrid Package provides a comprehensive analog check program called COMANCHE. COMANCHE provides users of a CDC SYSTEM 17 Computer Hybrid System with the ability to apply the digital computer as a tool for setup and checkout of analog computer programs and components. The value of COMANCHE is most evident in large analog programs when considerable time is spent by the analog programmer to verify correct wiring and the static test. The resultant economy of time and effort realized by COMANCHE users with respect to a specific analog program is easily extended to analog component checkout and maintenance. By using an analog test board, the ANDIG program performs a routine test of all analog components in a matter of minutes so that only faulty equipment requires manual servicing.

### COMANCHE Compiler

The compiler provides the following:

- Hard copy of analog circuits
  - Setting of potentiometers
- Verification of the correct patching and the correct static operation of each element
- Integrator rate test
  - Symbolic and hardware identification of analog circuits
- Automatic updating of parameters and static test
- Engineering units and voltage values for the simulated variable

COMANCHE is best used when a card reader and a line printer are available with the system, although the operation can be performed completely with a typewriter and/or paper tape equipment.

The program is somewhat nonprocedural in nature: Each wire in the analog circuit is represented by a single card in the program deck and these cards may be read in any order; removing a card from the deck is equivalent to removing a patchboard from the analog circuits.

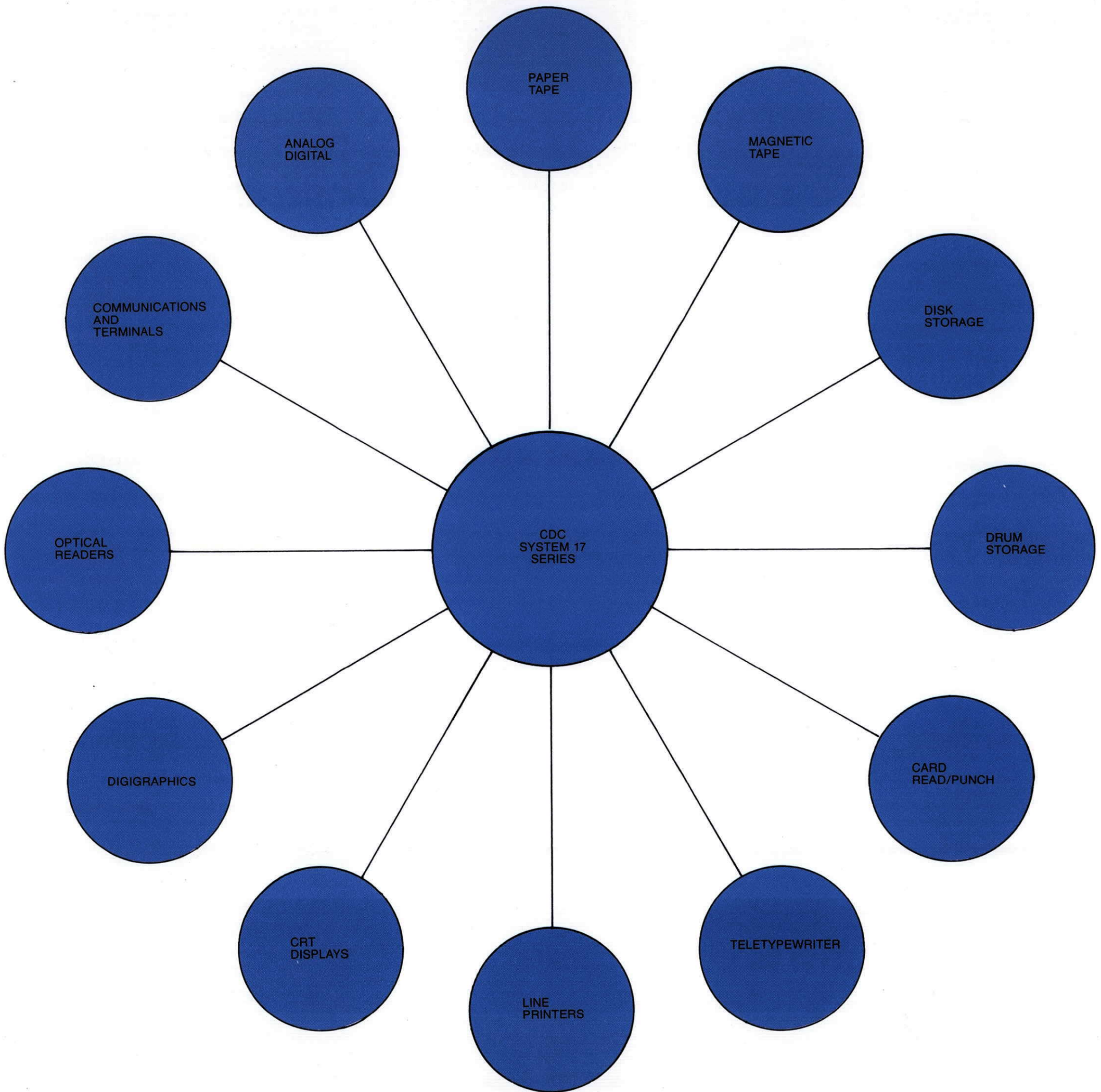
Essentially, any standard analog element is allowed and new elements may be added to the program. Mnemonics are used to identify analog elements.

The program design has been formulated from the standpoint of utmost flexibility. Written mostly in FORTRAN, the program is open-ended to include future expansions planned for incorporating a super-APACHE type of program, to allow operator-defined analog elements and to use almost any hardware configuration available with a given installation (e.g., the full range of I/O devices and either tape- or disk-oriented systems).

COMANCHE is designed to operate under the hybrid monitors in conjunction with FORTRAN. The program fits well into the recommended total operating procedure and into the corresponding body of software.



CDC SYSTEM 17 SERIES  
EQUIPMENT CONFIGURATOR





# System Components

The CDC SYSTEM 17 Computer consists of a central processor together with a wide variety of complementary peripheral components and terminals. The central processor consists of a control unit, an arithmetic unit, a 4096-word memory, and a display console. Peripheral components consist of mass storage (disk and drum), magnetic tape, card equipment, paper tape equipment, line printers, teletypewriters, visual displays, optical readers, analog/digital, inter-computer couplers, communications equipment and terminals. All components will operate with the CDC SYSTEM 17 Computer and can be configured in any combination to meet specific user requirements.

## SYSTEM COMPONENTS (SUMMARY DESCRIPTIONS)

### Processors

- 1784-1
- 1784-2

### Storage Media

- Disk
- Drum
- Magnetic Tape
- Paper Tape

### Card Units

- Readers
- Punches
- Read/Punches

### Printers

- Line
- Character

### Visual Displays

- Cathode Ray Tube
- DIGIGRAPHICS

### Optical Character Recognition

- Page Reader
- Document Reader

### Communications

- Controllers
- Multiplexers
- Communication Line Adapters
- Transceivers (Short Haul Modems)

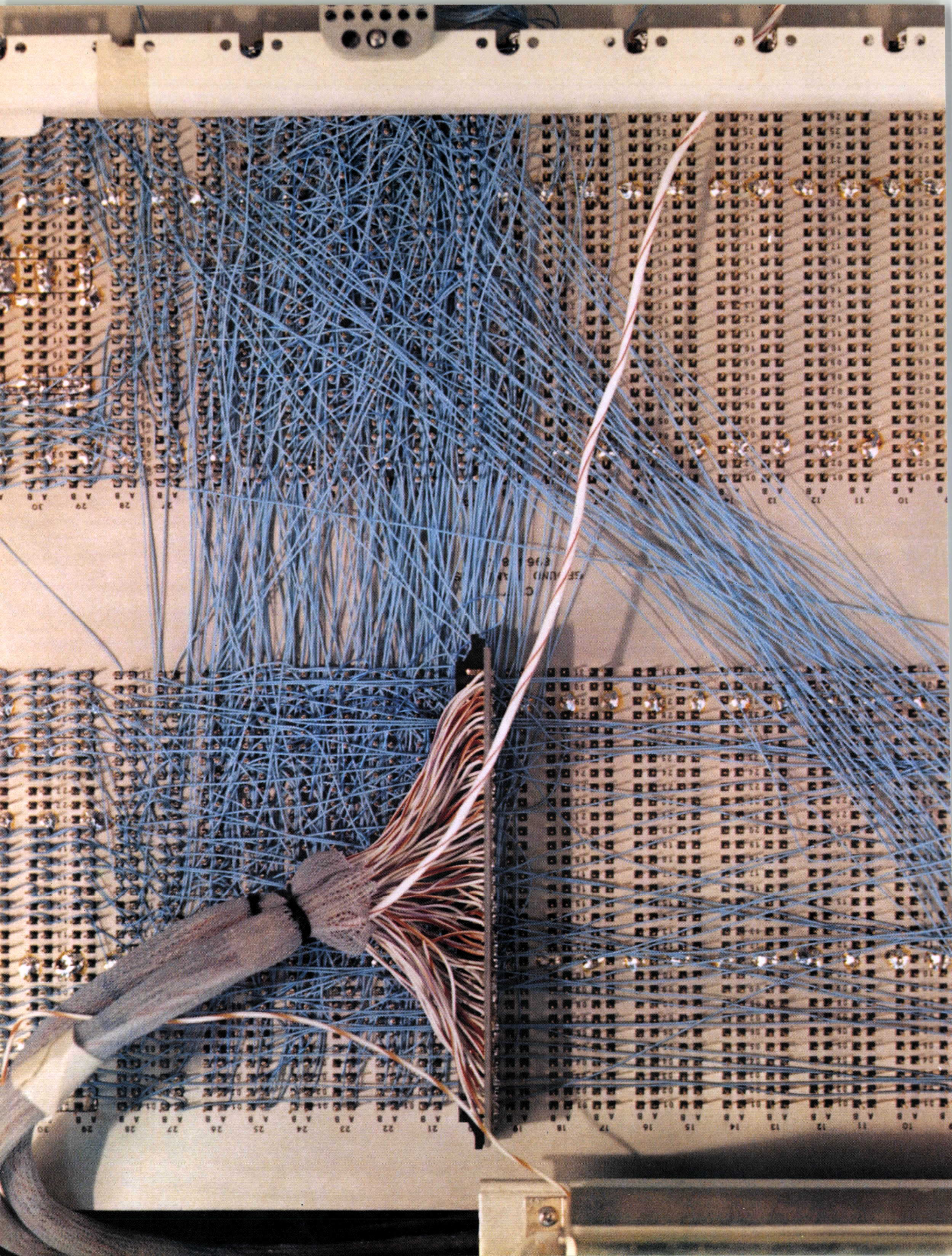
### Analog-to-Digital

- Analog Input (Raw Data)
- Analog Output (Display)
- Digital Input (Raw Data & Control)
- Digital Output (Display & Control)

### Inter-Computer

- SYSTEM 17 to SYSTEM 17
- SYSTEM 17 to 3000
- SYSTEM 17 to 6000



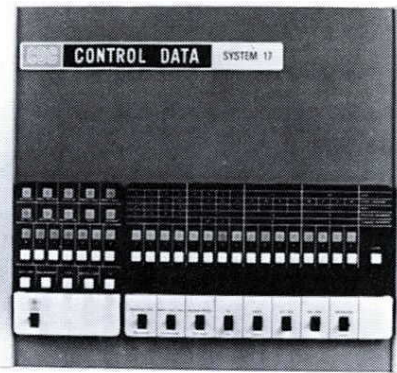




**CENTRAL PROCESSOR**

**Summary Description**

**1784**



Storage Capacity	4096 to 65,526 words
Cycle Time	900 or 600 nanoseconds
Word Length	18 bits*
Average Instruction Execution Time	3.0 microseconds (900) or 1.6 microseconds (600)
Addressability	word, relative
Memory Protect	Yes
Number of Interrupts	16
Number of Channels	1 buffered 1 unbuffered
Number of Peripherals per Channel	8
Memory Parity Check	Yes
Number of Registers	9

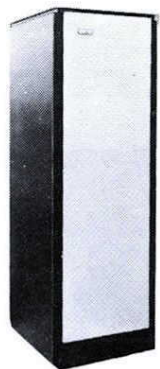
\*Includes one parity and one memory protect bit.

**INTERCOMPUTER COUPLERS**

**Summary Description**

**1716**

**1718**



Computer Interface	1704/1705/1775	1705/1706/1716 and 3000 or 6000 computer
Memory Access	Yes	Yes
Data Format	16-bit word	12-bit word
Word Transfer Rate	Max. 900,000 words per second	300,000 average words per second
Peripheral Interface	Yes	No
Number of Peripherals	8	N/A

**MASS STORAGE – DISK**

**Summary Description**

**853 Disk Drive**

**854 Disk Drive**

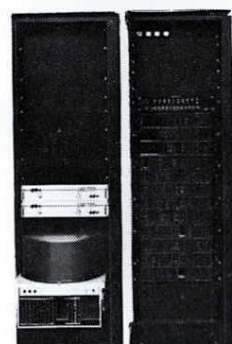


Controller Model Number	1733-1	1733-1
Number of Controllers Per Channel	8	8
Number of Disk Drives Per Controller	1 to 8	1 to 8
Capacity (16-bit words)	1,500,000	3,100,000
Average Access Time	110 milliseconds	110 milliseconds
Maximum Access Time	220 milliseconds	220 milliseconds
Storage Transfer Rate	78,000 words per second	78,000 words per second

**MASS STORAGE – DRUM**

**Summary Description**

**1752-1, 2, 3, 4**



Controller Model Number	Drum and Controller included as one unit
Number of Controllers per Channel	8
Number of Drums per Controller	1
Capacity (16-bit words)	196,608 words; 589,824 words; 1,179,698 words; or 1,572,864 words
Average Access Time	8 milliseconds
Maximum Access Time	16 milliseconds
Storage Transfer Rate	185,000 words per second

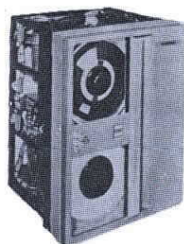
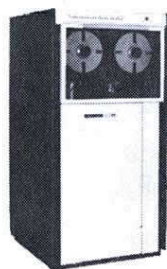


## CARTRIDGE DISK SUBSYSTEM



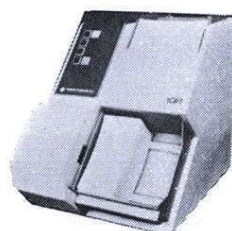
Summary Description	1739-1	856-2	856-4
Controller Model Number	Disk and Controller included as one unit		
Number of Controllers per Channel	8	1733-2 8	1733-2 8
Number of Disk Drives per Controller	1	Up to 4	Up to 4
Number of Cartridges per Drive	1 Fixed and 1 Removable	1 Fixed and 1 Removable	1 Fixed and 1 Removable
Capacity per Cartridge (16-bit words)	1.1 million	1.1 million	2.2 million
Average Access Time	47 milliseconds	47.5 milliseconds	47.5 milliseconds
Maximum Access Time	82 milliseconds		
Storage Transfer Rate	156,000 words per second	156,000 words per second	156,000 words per second

## MAGNETIC TAPE TRANSPORT



Summary Description	608	609	615-73	615-93
Controller Model Number	1732	1732	1732-2	1732-2 (with 10300-1)
Number of Controllers per Channel	8	8	8	8
Number of Tape Drives per Controller	Up to 8	Up to 8	Up to 4	Up to 4
Tape Speed	37.5 inches per sec	37.5 inches per sec	37.5 inches per sec	37.5 inches per sec
Operational Modes	Forward, Reverse, Read Reverse and High-Speed Rewind	Forward, Reverse, Read Reverse and High-Speed Rewind	Forward, Reverse, Read Reverse and High-Speed Rewind	Forward, Reverse, Read Reverse and High-Speed Rewind
Recording Mode	NRZI	NRZI	NRZI	NRZI/PE
Pulse Density	200, 556 or 800 characters per inch	800 characters per inch	556/800 characters per inch	800 (NRZI), 1600 (PE) characters per inch
Number of Tracks	7	9	7	9
Data Transfer Rate	7,500; 20,800; or 30,000 characters per second	30,000 characters per second	20,800 or 30,000 characters per second	30,000 or 60,000 characters per second
Rewind Time (2400 est)	210 Seconds	210 Seconds	200 Seconds	200 Seconds

## CARD READERS



Summary Description	405	1729-2	1729-3
Controller Model Number	1726	Included in 1729-2	Included in 1729-3
Number of Controllers per Channel	8	8	8
Number of Card Readers per Controller	1	1	1
Card Read Speed	1200 cpm	330 cpm	300 cpm
Read Check	Light/Dark Probe	Light/Dark Probe	Light/Dark Probe
Input Stacker Capacity	4000 Cards	1200 Cards	1000 Cards
Output Stacker Capacity	4000 Cards	1300 Cards	1000 Cards
Secondary Output Stacker Capacity	240 Cards	N/A	N/A

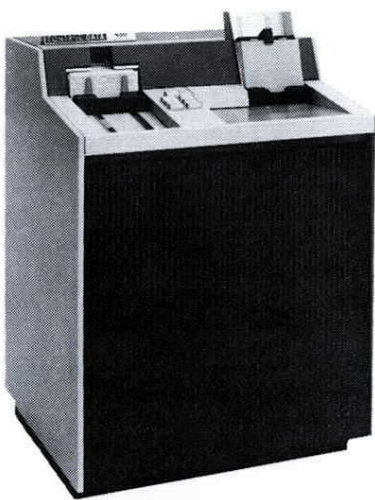
## CARD PUNCH



Summary Description	415
Controller Model Number	17XX
Number of Controllers per Channel	8
Number of Card Punches per Controller	1
Card Punching Speed	250 CPM
Punch Modes	Row Punching
Input Hopper Capacity	1200 Cards
Output Hopper Capacity	1500 Cards



**CARD READER/PUNCH**



**Summary Description**

**430**

Controller Model Number	1728
Number of Controllers per Channel	8
Number of Card Readers per Controller	1
Card Read Speed	500 cards per minute
Card Punch Speed	100 cards per minute (80 columns)
Punch Mode	Column by Column
Read Check	Light Dark Probe
Punch Check	Yes
Input Hopper Capacity	1200 Cards
Output Hopper Capacity	1300 Cards

**LINE PRINTERS**

**Summary Description**

**501**

**1742**

**1742-30**

**1742-120**



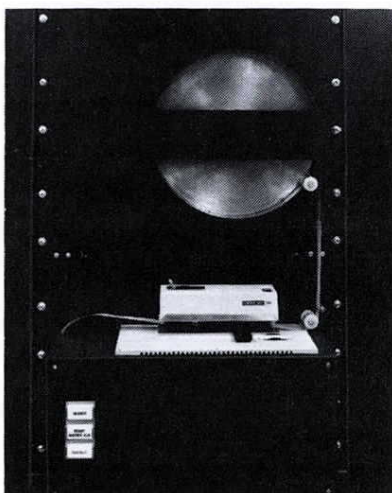
Controller Model Number	1740	Included in 1742	Included in 1742-30	Included in 1742-120
Number of Controllers per Channel	8	8	8	8
Number of Printers per Controller	1	1	1	1
Printing Speed	1000 lines per minute with 48 character font	300 lines per minute	300 lines per minute	1200 lines per minute
Number of Characters per Line	136	136	136	136
Number of Printable Characters	64	64	64	48
Horizontal Spacing	10 characters per inch	10 characters per inch	10 characters per inch	10 characters per inch
Vertical Spacing	6 lines per inch	6 or 8 lines per inch	6 or 8 lines per inch	6 or 8 lines per inch
Form Advance Rate	25 inches per second nominal	20 inches per second	15 inches per second	70 inches per second
Form Width	3½ to 18¾ inches wide	3½ to 20½ inches wide	3½ to 20½ inches wide	4 to 20 inches wide
Form Length	Up to 12 inches maximum	Up to 22 inches maximum	Up to 22 inches maximum	Up to 22 inches maximum
Number of Copies	Up to 6 copies	Up to 6 copies	Up to 6 copies	Up to 6 copies
Form Advance Control	Format Tape	Format Tape	Format Tape	Format Tape
Line Advance	Single Space, Double Space	Single Space, Double Space	Single Space	Single Space

**PAPER TAPE READER**

**Summary Description**

**1721**

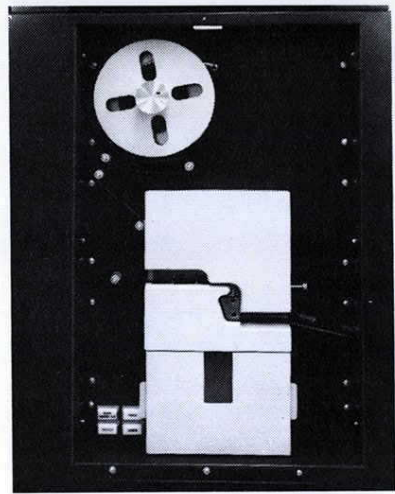
**1722**



Controller Model Number	Included in 1721	Included in 1722
Number of Controllers per Compute Module	1 (interfaces directly to compute module)	1 (interfaces directly to compute module)
Number of Punches per Controller	1	1
Tape Read Speed	400 characters per second	400 characters per second
Character Format	5, 7, or 8 level	5, 7, or 8 level
Supply Reel	No	Yes
Take-Up Reel	No	Yes

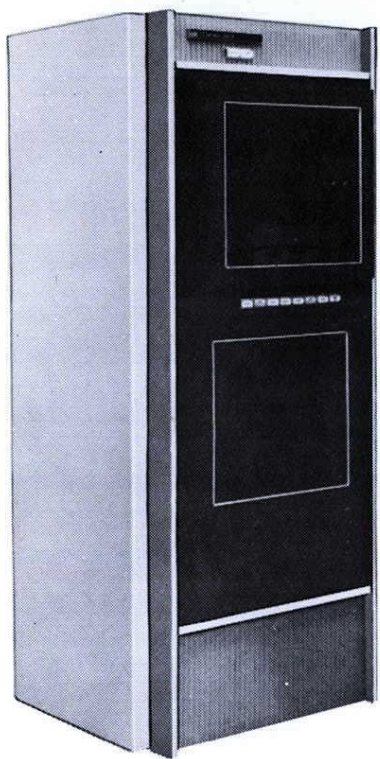


**PAPER TAPE PUNCH**



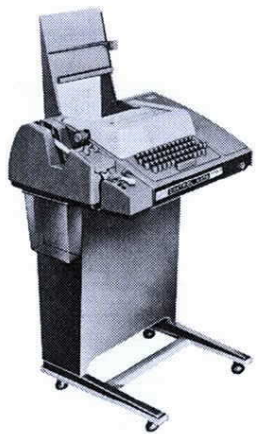
Summary Description	1723	1724
Controller Model Number	Included in 1723	Included in 1724
Number of Controllers per Compute Module	1 (interfaces directly to compute module)	1 (interfaces directly to compute module)
Number of Punches per Controller	1	1
Tape Punch Speed	120 Characters per second	120 Characters per second
Character Format	5, 7, or 8 level	5, 7, or 8 level
Supply Reel	No	Yes
Take-Up Reel	No	Yes

**PAPER TAPE READ/PUNCH**



Summary Description	1777-1	1777-2
Controller Model Number	Included in 1777-1	Included in 1777-2
Number of Controllers per Channel	1	1
Number of Reader/Punches per Controller	1	1
Tape Read Speed	400 characters per second	400 characters per second
Reach Check		
Tape Punch Speed	150 characters per second	150 characters per second
Punch Check	No	Yes
Character Format	5, 7, or 8 level tape	5, 7, or 8 level tape
Supply Reel 1778-2	Optional	Optional
Take-Up Reel 1778-1	Optional	Optional

**TELETYPEWRITER**



Summary Description	1711	1713	1711-4, 5	1713-4, 5
Controller Model Number	Included in 1711	Included in 1713	Included with cpu	Included with cpu
Number of Controllers per Compute Module	1 (interfaces directly to compute module)	1 (interfaces directly to compute module)	1	1
Number of Teletypewriters per Controller	1	1	1	1
TTY Model No.	—	—	Model 33	Model 35
KSR	—	—	1711-4	1713-4
ASR	—	—	1711-5	1713-5
Keyboard	Yes	Yes	Yes	Yes
Printer	Yes	Yes	Yes	Yes
Printer Speed	100 wpm (10 characters per sec)	100 wpm (10 characters per sec)	100 wpm (10 characters per sec)	100 wpm (10 characters per sec)
Paper Tape Reader	No	Yes	No	No
Reader Speed	N/A	100 wpm	N/A	N/A
Paper Tape Punch	No	Yes	No	No
Punch Speed	N/A	100 wpm	N/A	N/A

**CRT CONSOLE**



Summary Description	713-10
Controller Model Number	Included with cpu
Number of Controllers per Channel	1
Number of CRT's per Controller	1
Size of Display Area	10 by 8 inches
Maximum Number of Characters Displayed	640
Character Repertoire	64 characters
Maximum Speed	30 character per second
Option: 711-100	Increases display to 1280 characters
Option: 713-120	30-character-per-second non-impact printer



**ENTRY/DISPLAY (CRT)****Summary Description****211-2 Display Entry****218-2 Output Station**

Controller Model Number	1745-1	1745-1
Number of Controllers per Channel	8	8
Number of 211's per Controller	Up to 12*	Up to 12*
Size of Display Area	6 by 8 inches	N/A
Maximum Number of Characters Displayed	1000 (20 lines with 50 characters)	N/A
Character Repertoire	64 characters	64 characters
Printer Speed	N/A	15.5 characters per second
Option 10033		
Maximum Number of Characters Displayed	1040 (13 lines with 80 characters)	N/A

\*Combined total of 211's and 218's cannot exceed 12.

**VISUAL DISPLAY (CRT)****Summary Description****1746-1**

Controller Model Number	Included in 1746-1
Number of Controllers per Channel	8
Number of CRT's per Controller	1
Size of Display Area	6 by 8 inches
Maximum Number of Characters Displayed	1000 (20 lines with 50 characters)
Character Repertoire	64 characters
Option 10033	
Maximum Number of Characters Displayed	1040 (13 lines with 80 characters)

**DIGIGRAPHIC CONSOLE****Summary Description****274**

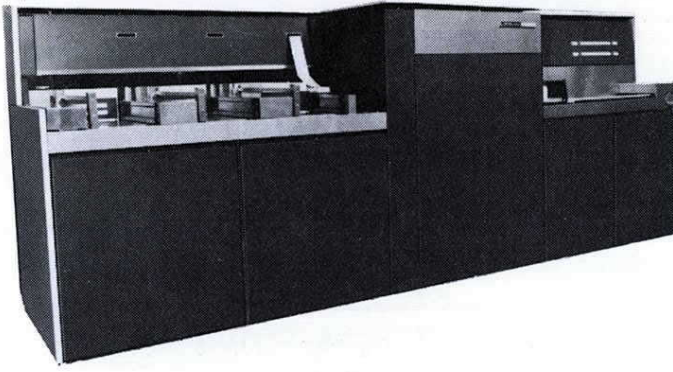
Controller Model Number	1744
Number of Controllers per Channel	8
Number of DIGIGRAPHIC Consoles per Controller	1
Display Surface Area	300 square inches with 20 inch diameter. Flat faced surface
Display Capacity	Up to 2000 inches of curves or up to 1800 characters of any size or font

**PAGE READER (OCR)****Summary Description****915**

Controller Model Number	1735
Number of Controllers per Channel	8
Number of Optical Readers per Controller	1
Readable Characters	ANSI OCR-A-I Standard Alphabet Numerics 0 thru 9. Standard Punctuation and Special Symbols
Print Quality Required	Electric Typewriter
Font	ANSI OCR-A-I
Form Width	From 4¼ to 12 inches
Form Length (Height)	From 2¾ to 14 inches, or continuous
Reading Rate	370 characters per second
Fanfold Read	Yes



**DOCUMENT READER  
CONTROLLER (OCR)**



**Summary Description**

**936-1**

Controller Model	Included in 936-1
Number of Optical Readers per Channel	8
Number of Output Stackers	3 basic; 12 maximum
Readable Characters	ANSI OCR-A-I standard character subset; others optional
Print Quality Required	Typewriters, high speed printers, embossed card imprinters
Fonts	ANSI OCR-A-I numerics standard; ANSI OCR-A-I alphanumerics, ANSI OCR-A-IV, ISO-B, 7B, 7B inverted, 12F, 407-1, 407E-1, 1428, 1428E, NOF, E13B, Handprint optional
Number of Lines Read	1 standard; 3 maximum
Form Width	2.25 to 8.5 inches
Form Height	3.00 to 5.5 inches
Reading Rate	750 characters per second
Paper Caliper	0.0024 to 0.010 inches
Optional Features	Numeric lister, mark read capability

**DOCUMENT READER (OCR)**



**Summary Description**

**921-1**

Controller Model	1737-1
Number of Controllers per Channel	8
Number of Optical Readers per Controller	1
Number of Output Stackers	1
Readable Characters	ANSI OCR-A and 7B standard character subsets; others optional
Print Quality Required	Typewriters, high speed printers, embossed card imprinters
Fonts	ANSI OCR-A-I, ANSI OCR-A-IV, 7B standard; ISO-B optional
Number of Lines Read	1
Form Width	4.5 to 9.0 inches
Form Height	2.6 to 4.5 inches
Reading Rate	1200 documents per minute
Paper Caliper	0.0025 to 0.0074 inches

**PAGE AND DOCUMENT  
READER/CONTROLLER (OCR)**



**Summary Description**

**955-1**

Controller Model	Included in 955-1
Number of Optical Readers per Channel	8
Readable Characters	ANSI OCR-A-I standard character subset; others optional
Print Quality Required	Typewriters, high speed printers, embossed card imprinters
Fonts	ANSI OCR-A-I standard; ANSI OCR-A-IV, ANSI lower case, Rabinow characters, ISO-B, 7B, 7B inverted, 12F, 407-1, 1428, 1428 with alphameric, E13B, NOF, handprint optional
Form Width	4 <sup>7</sup> / <sub>8</sub> to 11 <sup>1</sup> / <sub>8</sub> inches
Form Height	3 <sup>1</sup> / <sub>4</sub> to 12 <sup>5</sup> / <sub>8</sub> inches
Reading Rate	750 characters per second
Optional Features	Journal tape capability, handprint recognition, dense-copy (6 per inch), on-line error correction, marking pen, mirror image recognition



**COMMUNICATIONS – SINGLE LINE DATA SET CONTROLLER**



Summary Description	1717-1	1747
Controller Model Number	Included in 1717-1	Included in 1747
Number of Controllers per Channel	8	8
Synchronization	Synchronous	Synchronous
Operating Mode	Full Duplex	Half Duplex
Operating Speed	Up to 40,800 BPS	Up to 60,800 BPS
Character Format	8-Bit Characters	12-Bit Characters, Any Code
Timing Source	External	External (Data set)
Compatible Modem	Government Provided	301 B Data Set or Equivalent
Error Detection	Government Specified	Cyclic Code

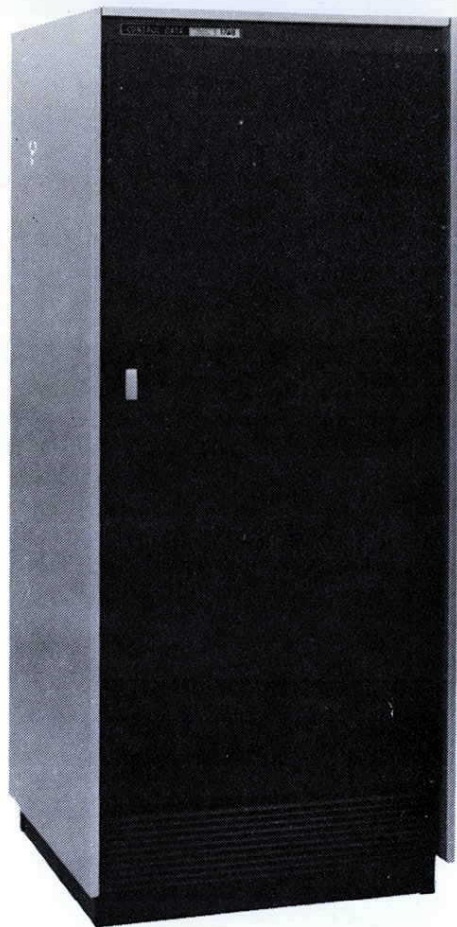
**COMMUNICATIONS – TRANSCEIVER**



Summary Description	358-1	358-2	358-3	358-4
Transmission Rate (BPS)	Up to 9600	1200 2400 4800 9600	40,800 163,200	50,000 200,000
Data Set Plug Interchangeability	103 or 202	201	301	303
Full Duplex or Half Duplex Operation	Yes	Yes	Yes	Yes
Multipoint Operation (up to 8 Units)	Yes	Yes	Yes	Yes
Compatible CDC Communications Equipment	361-1 361-2 361-3 361-4 713	216 361-5 361-6 711 731 732	361-5 361-6 733 792-3 3275-C	361-5 361-6 733 792-3 3275-C
Requires Customer Owned Transmission Lines	Yes	Yes	Yes	Yes
Twisted Pair Wire or Coaxial Cable	Yes	Yes	Yes	Yes



**COMMUNICATIONS —  
COMMUNICATION  
MULTIPLEXERS**



Summary Description	364-1, 364-2	364-4, 364-5
Controller Model Number	1748-2	N/A
Number of Multiplexers per controller	8	N/A
Number of Multiplexers per computer channel	N/A	8
Quantity and type of Communication Adapters which may be accommodated per multiplexer		
361-1	8	8
361-2	8	8
361-3	8	8
361-4	4	4
361-5	4	4
361-6	4	4
Applicable automatic dialing adapter	361-7	361-7
Applicable telegraphic line converter	362-1 362-2	362-1 362-2

Note: See complete listing of communication adapters which can be accommodated by the 364 series multiplexers together with their functional capabilities below.

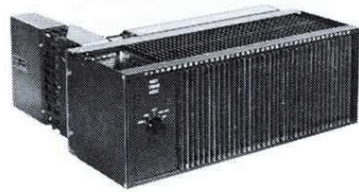
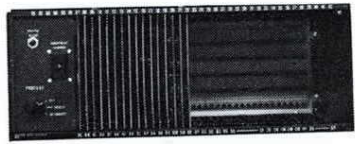
**COMMUNICATIONS ADAPTERS**

Functional Capability	Low to Medium Speed Non Synchronous			Medium to High Speed Synchronous		
Product Model Number	361-1	361-2	361-3	361-4	361-5	361-6
Speed (BPS)	50 to 2000	50 to 2000	40 to 2000	50 to 2000	0.6 to 203.4K	0.6 to 203.4K
Mode	HDX/FDX	Simplex (Rcv only)	Simplex (Send only)	HDX/FDX	HDX/FDX	HDX/FDX
Synchronization Interface	Non Sync 103/202 (TTY)	Non Sync 103/202 (TTY)	Non Sync 103/202 (TTY)	Non Sync 103/202 (TTY)	Sync 201/203 301/303	Sync 201/203 301/303
Data Set Control	No	No	No	Yes	Yes	Yes
Auto Answer	No	No	No	Yes	Yes	Yes
Char. Parity	No	No	No	Yes	Yes	Yes
Hardware Message Parity Check	No	No	No	No	Yes	No
Hardware Cyclic Code Check	No	No	No	No	No	Yes
Address/CA	1	1	1	2	2	2

**1700 CHANNEL ADAPTER**

Summary Description	1785-3	1785-4
Type of Channel	AQ	DSA
Number of AQ or DSA Positions Required	2	2
Function	Converts 1784 AQ bus to standard 1700 I/O bus	Converts 1784 DSA bus to standard 1700 I/O bus



**ANALOG/DIGITAL****Summary Description****1750****1797**

Computer Interface  
Peripheral Interface  
  
Number of Peripherals

1705  
1500 Series  
Devices  
15

DCB  
1500 Series  
Devices  
8, three of which  
may be 1571  
buffer chaining  
channels

Note: See complete listing  
of the 1500 series Analog/Digital  
Hardware products below.

**1500 SERIES HARDWARE PRODUCT LIST**

1797 Buffered I/O Interface  
1571 Chaining Buffer Channel  
1530 Integrating ADA Analog Input Interface  
1534 Low-Level Analog Input Interface  
1533 Dry Contact Relay Multiplexer Unit  
1535 Solid State Multiplexer  
1563 Analog Input Signal Conditioning  
1570 Termination Panels; A & B  
1538 High-Speed, High-Level Analog Input Interface  
1539 Solid State Multiplexer Unit  
1567 Simultaneous Sample-and-Hold  
1544 Digital Input Interface  
1545 Digital Input Sync Unit  
1564 Digital Input Signal Conditioning  
1570 Termination Panels; C & D  
1547 Digital Events Counting Interface  
1546 Events Counter Signal Conditioning  
1570 Termination Panels; G & Y  
1553 External Register Output Interface  
1554 External Register Output Sync Unit  
1555 Digital Output Unit  
1556 Analog (DAC) Output Unit  
1557 Digital Display Unit  
1570 Termination Panels; A, E & H

1558 Latching Relay Output Interface  
1559 Latching Relay Output Unit  
1560 Latching Relay Analog (DAC) Output Unit  
1570 Termination Panels; A & E  
1561 High-Speed DAC Analog Output Interface  
1565 Direct Digital Control Station Controller  
1566 High-Speed DAC Analog Output Unit  
1568 Analog Analog Memory Output  
1549 Interrupt Interface  
1548 Interrupt Signal Conditioning  
1570 Termination Panels; G & Y  
1572 Programmable Sample Rate Option  
1573 Line Synchronized Timing Option  
1574 Sequential Addressing Option  
1577 Stall Alarm  
1581 Logging Typewriter Interface  
1582 Logging Typewriter  
1583 Input/Output Typewriter Interface  
1584 Input/Output Typewriter  
1585 Incremental Plotter  
1587 Operator Entry/Control Panel  
1590 Remote I/O Local Adaptor  
1591 Remote I/O Station

**Summary Description**

Products in the 1500 Series are attached to the 1705 Data Channel via a Data and Control Bus (DCB). Products in this series may also be attached to the 1700 Direct Storage Access via the 1797 Input/Output Interface, and the 1571 Chaining Buffer Channel which provides the Buffered Data and Control Bus (BDCB). Equipment diagnostics and drivers are furnished. Sub-routines such as the Operating Monitor and the Process Control Package used to compile or develop customer oriented systems which reduces the overall software cost to the customer.







# Hardware Configurations and Configurators

## **OVERALL SYSTEM**

CDC SYSTEM 17 Series

## **ANALOG/DIGITAL SYSTEMS**

Industrial Control

Data Acquisition

## **A/D HYBRID SYSTEMS**

Standard Buffered Hybrid (System I & II)

Standard Non-Buffered Hybrid

## **COMMUNICATIONS SYSTEMS**

Common Carrier Based Communications

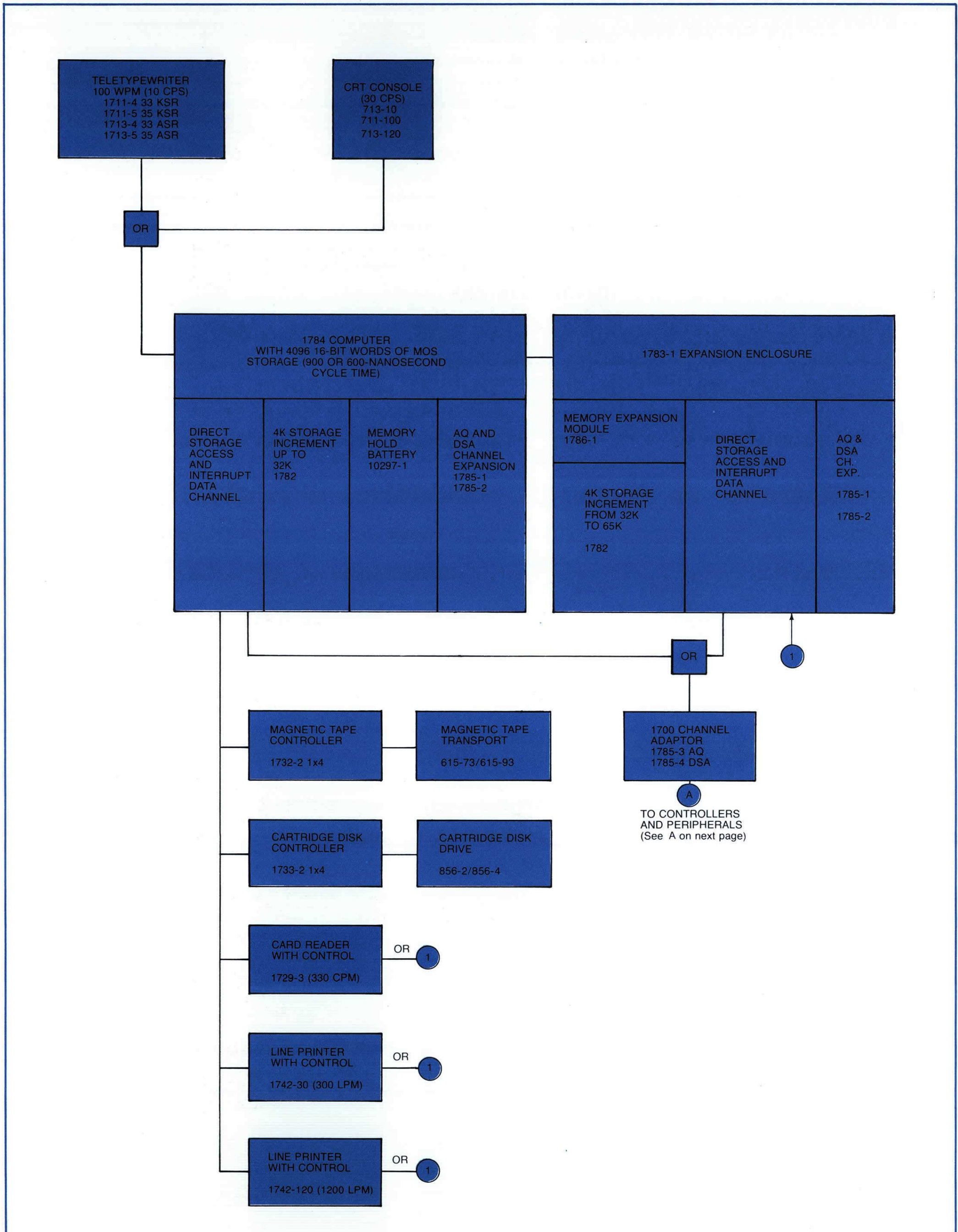
CDC Transceiver Based Communications

## **TERMINAL SYSTEMS**

CDC SYSTEM 17 Import

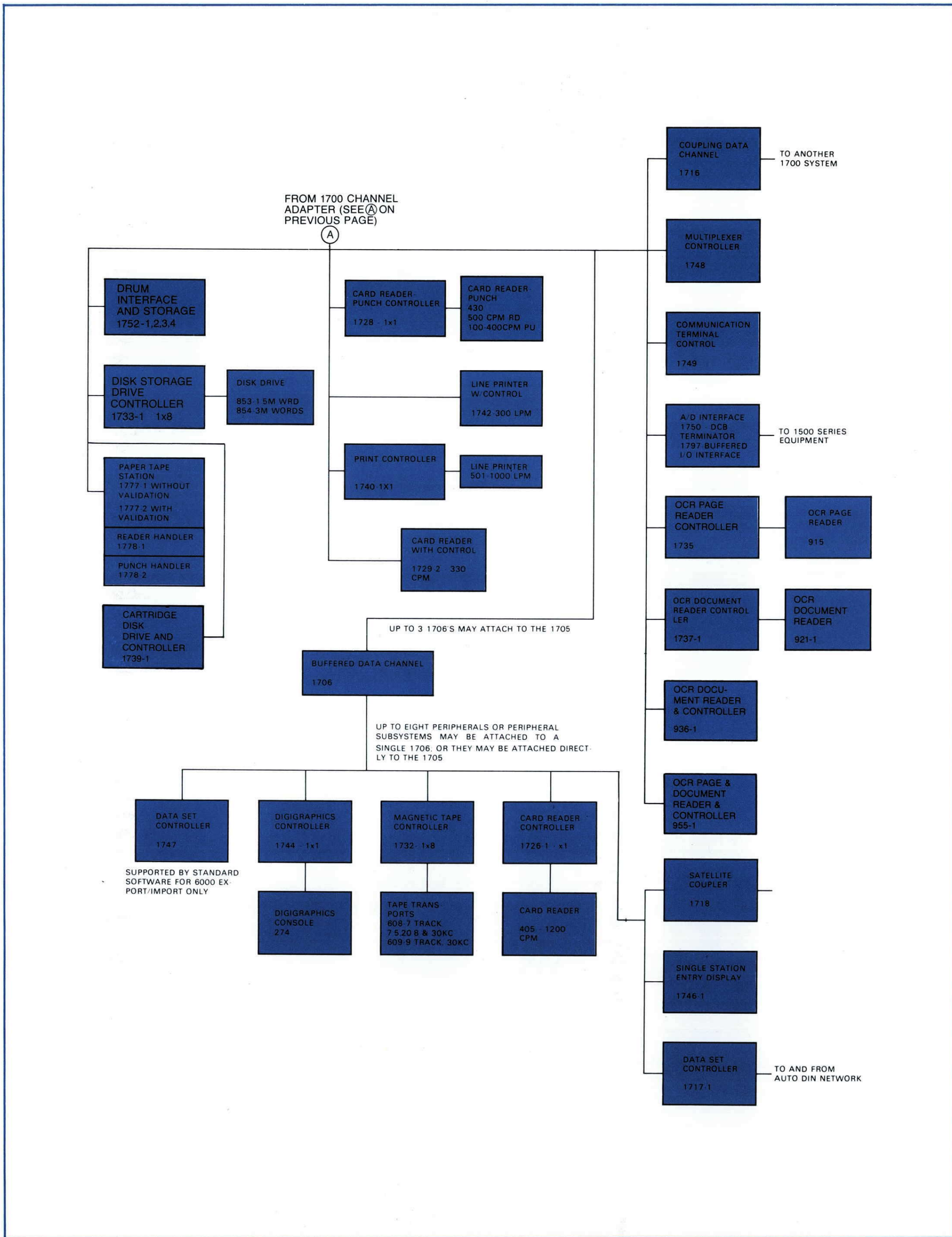


# CDC SYSTEM 17 SERIES Hardware Configuration

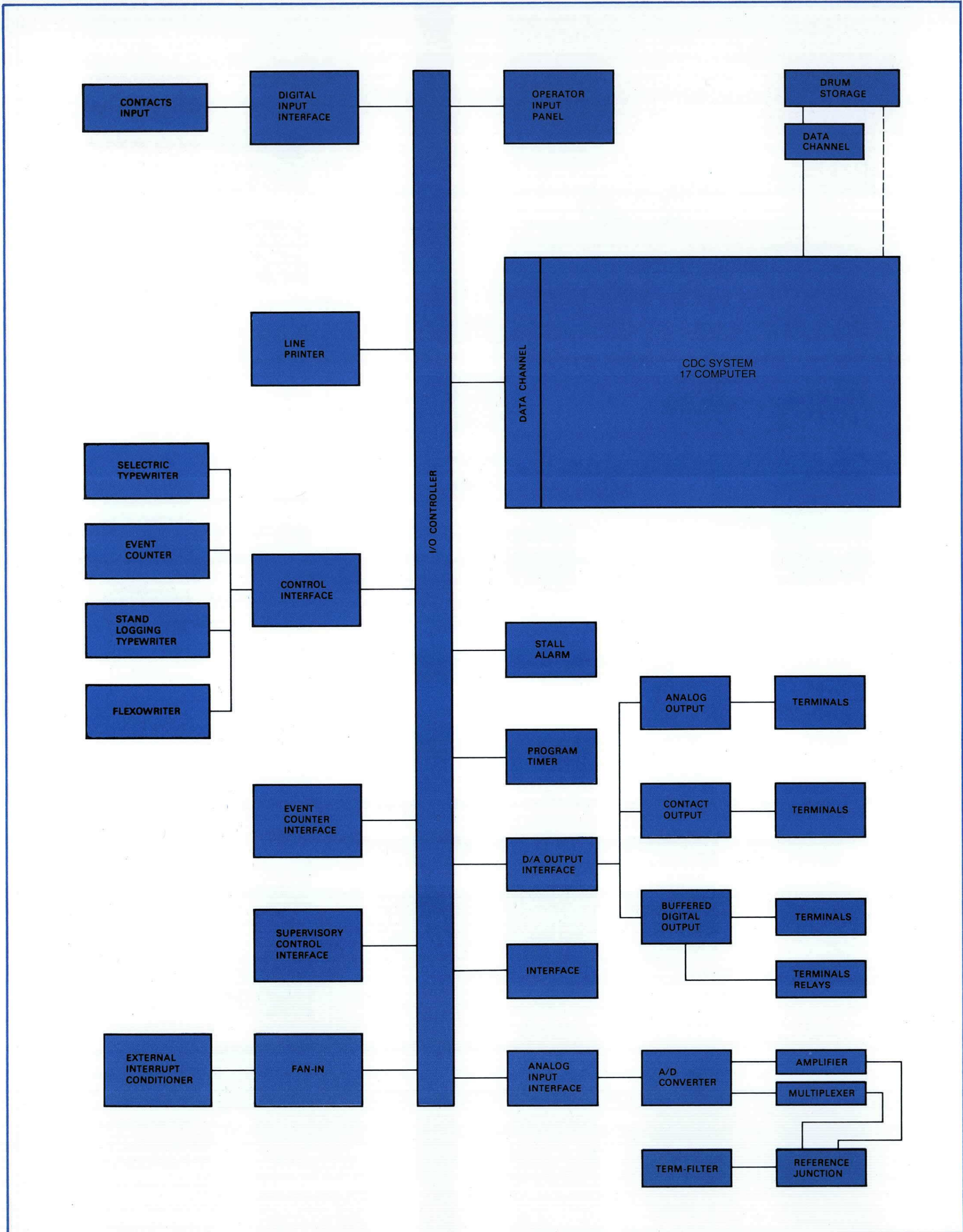




# CDC SYSTEM 17 SERIES Hardware Configurator

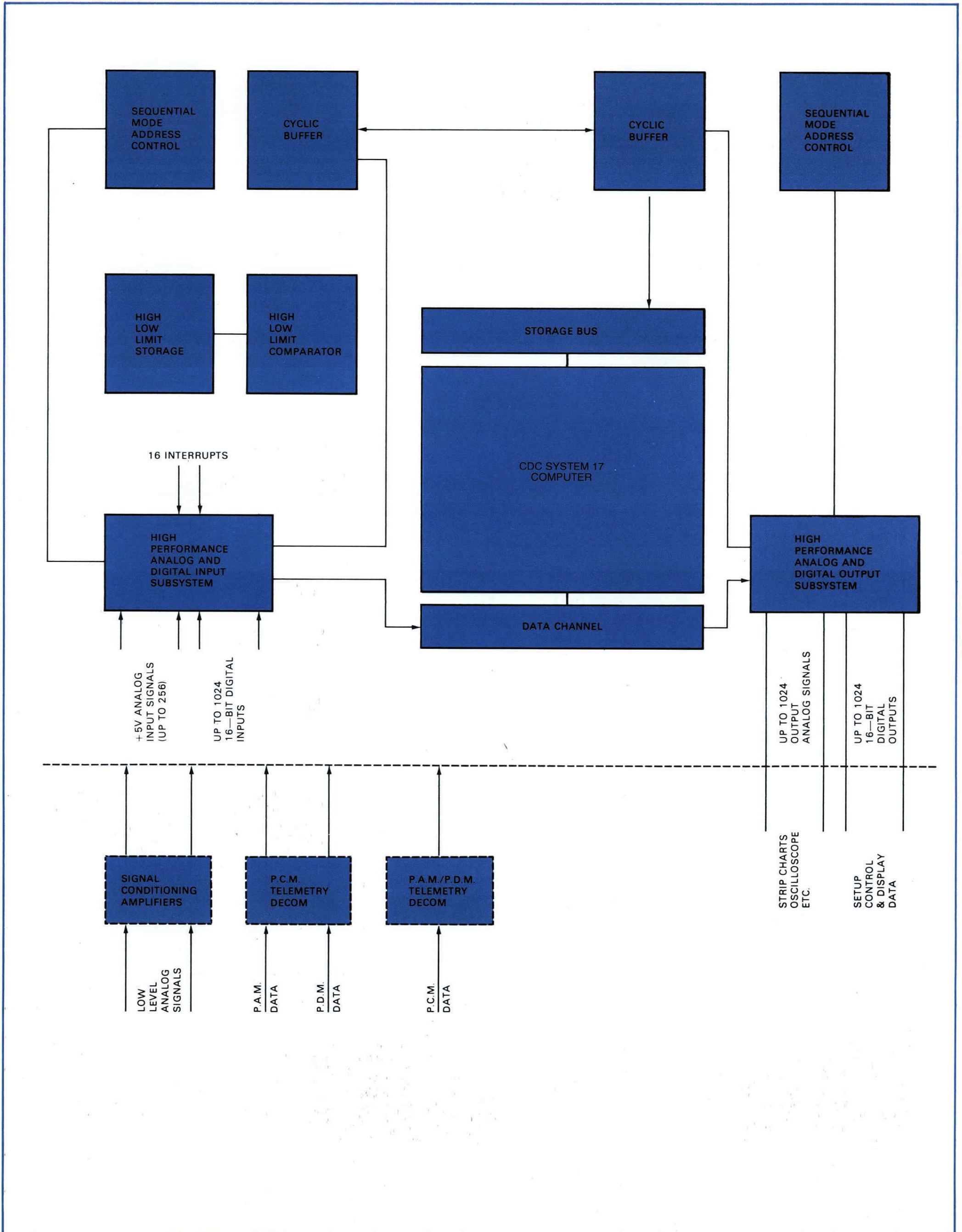






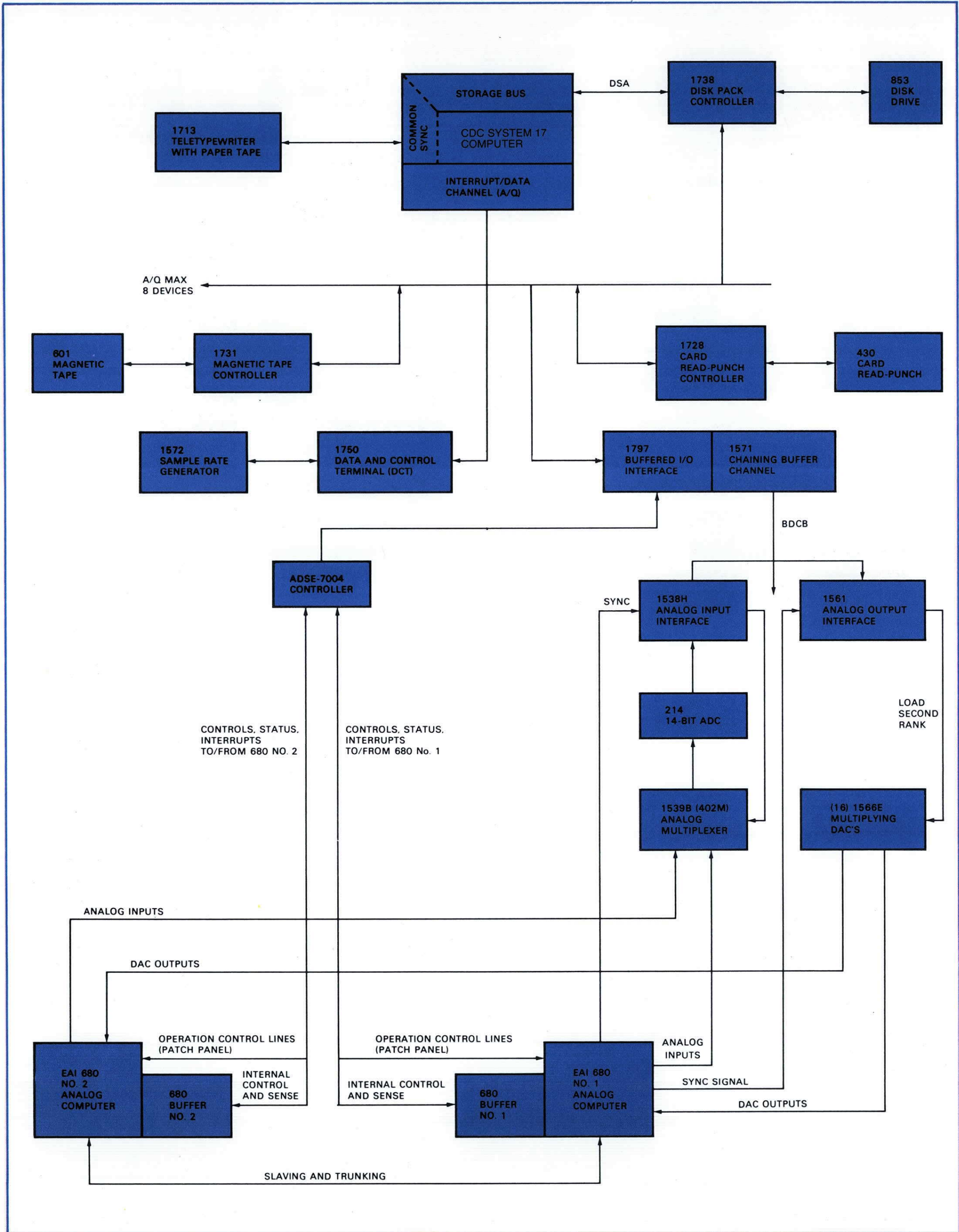


# Data Acquisition System Configurator



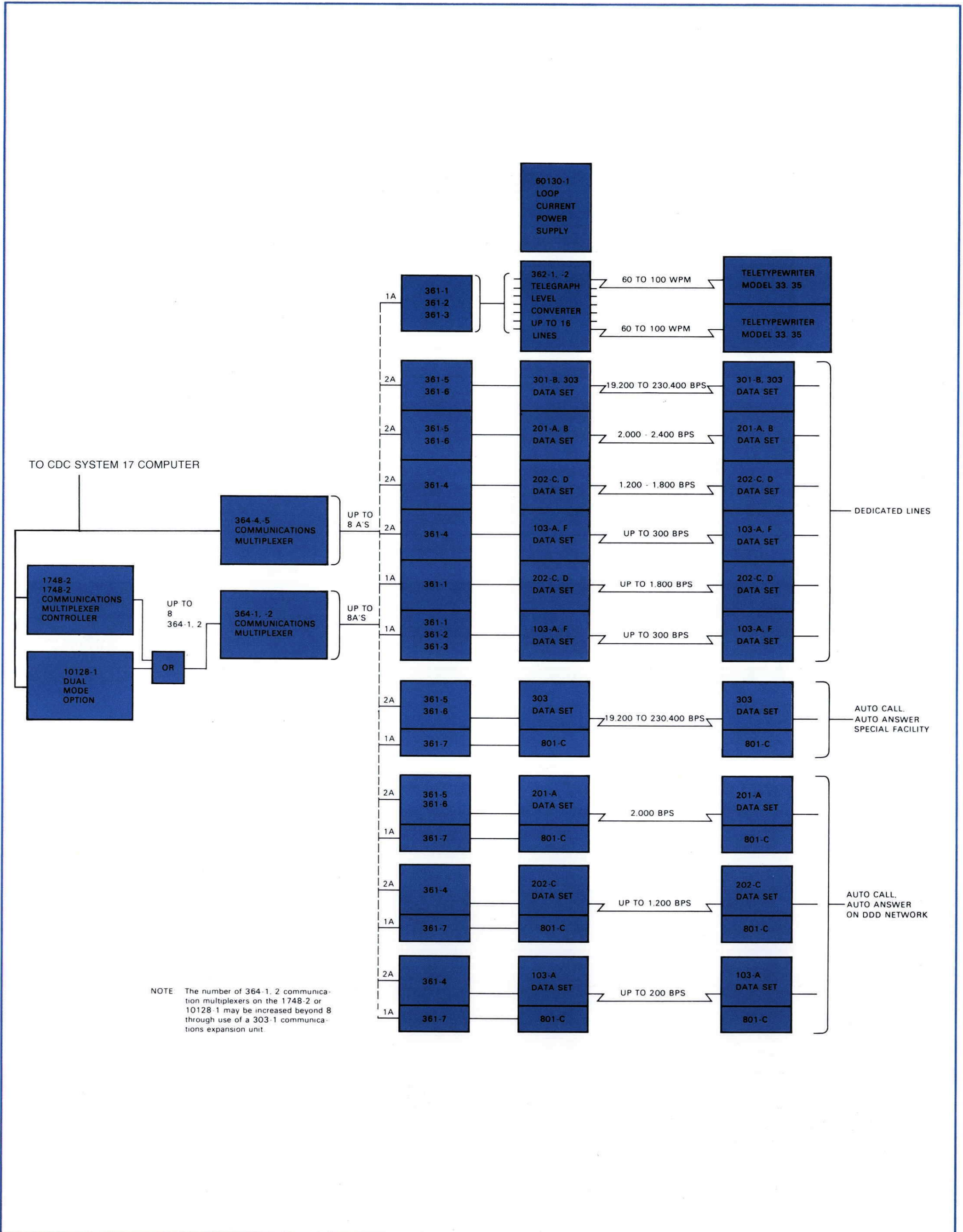


# Standard Buffered Hybrid System I Configurator





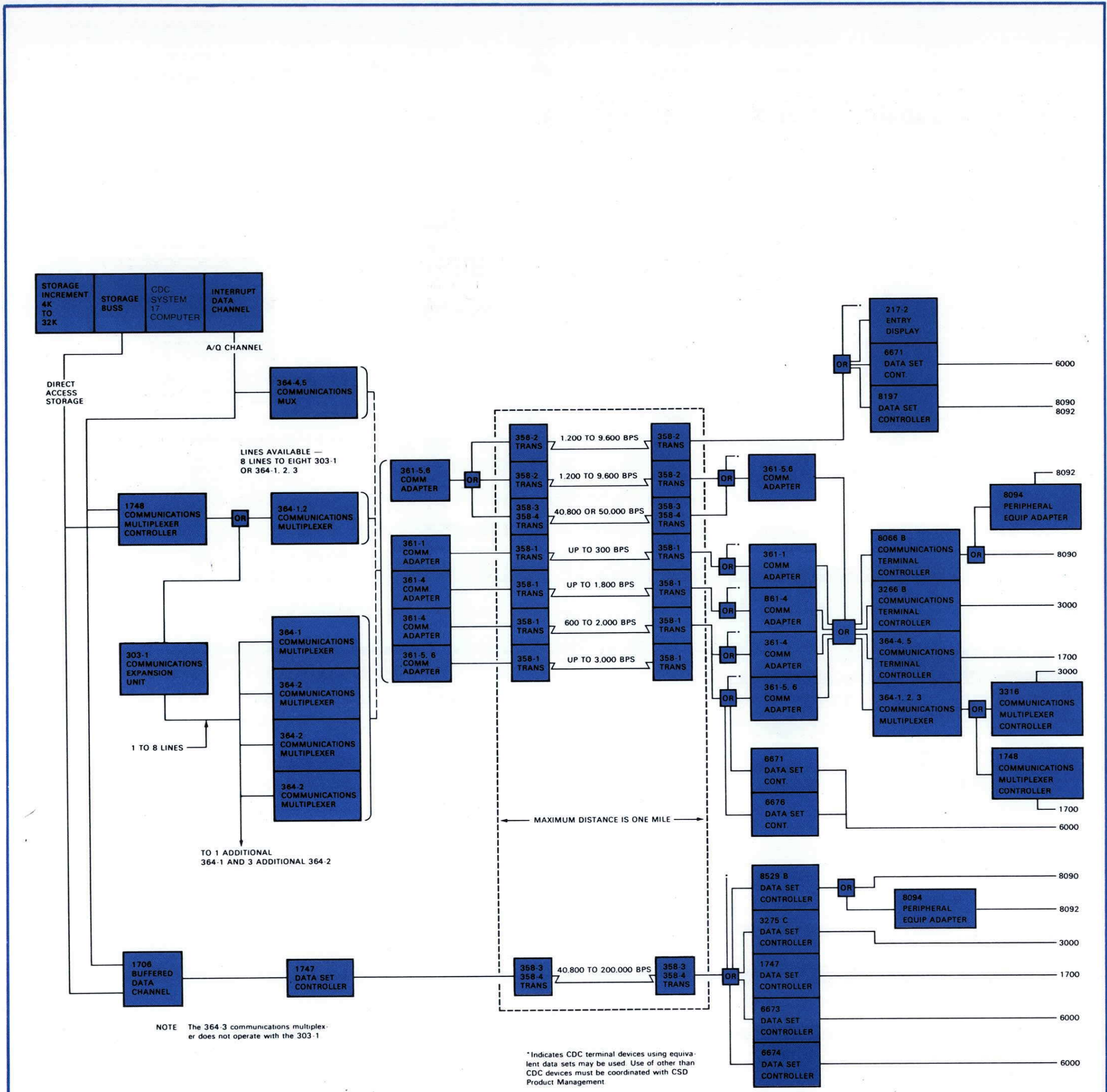
# Communication System Configurator – Carrier-Based



NOTE: The number of 364-1, 2 communication multiplexers on the 1748-2 or 10128-1 may be increased beyond 8 through use of a 303-1 communications expansion unit.

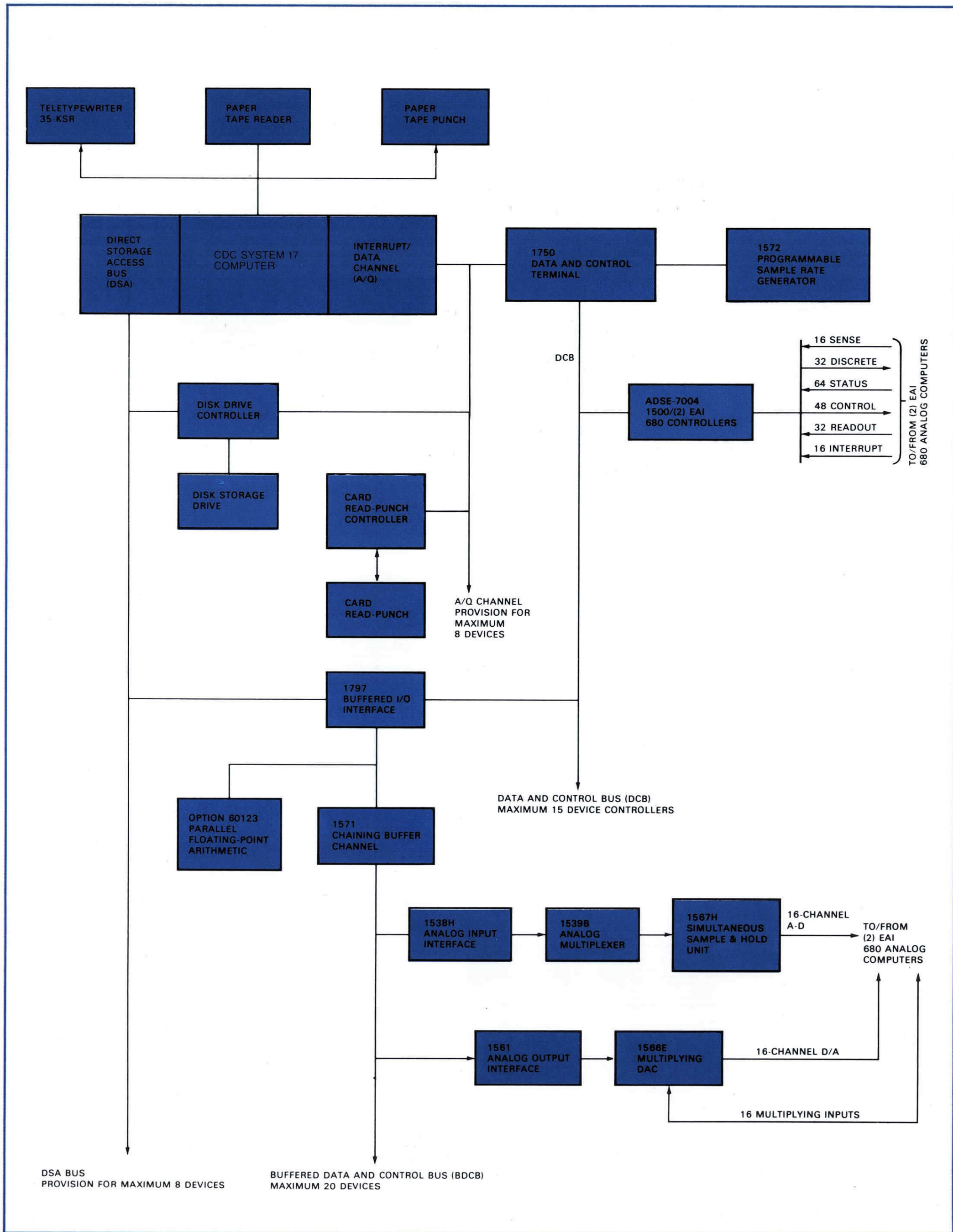


# Transceiver Communications System Configurator



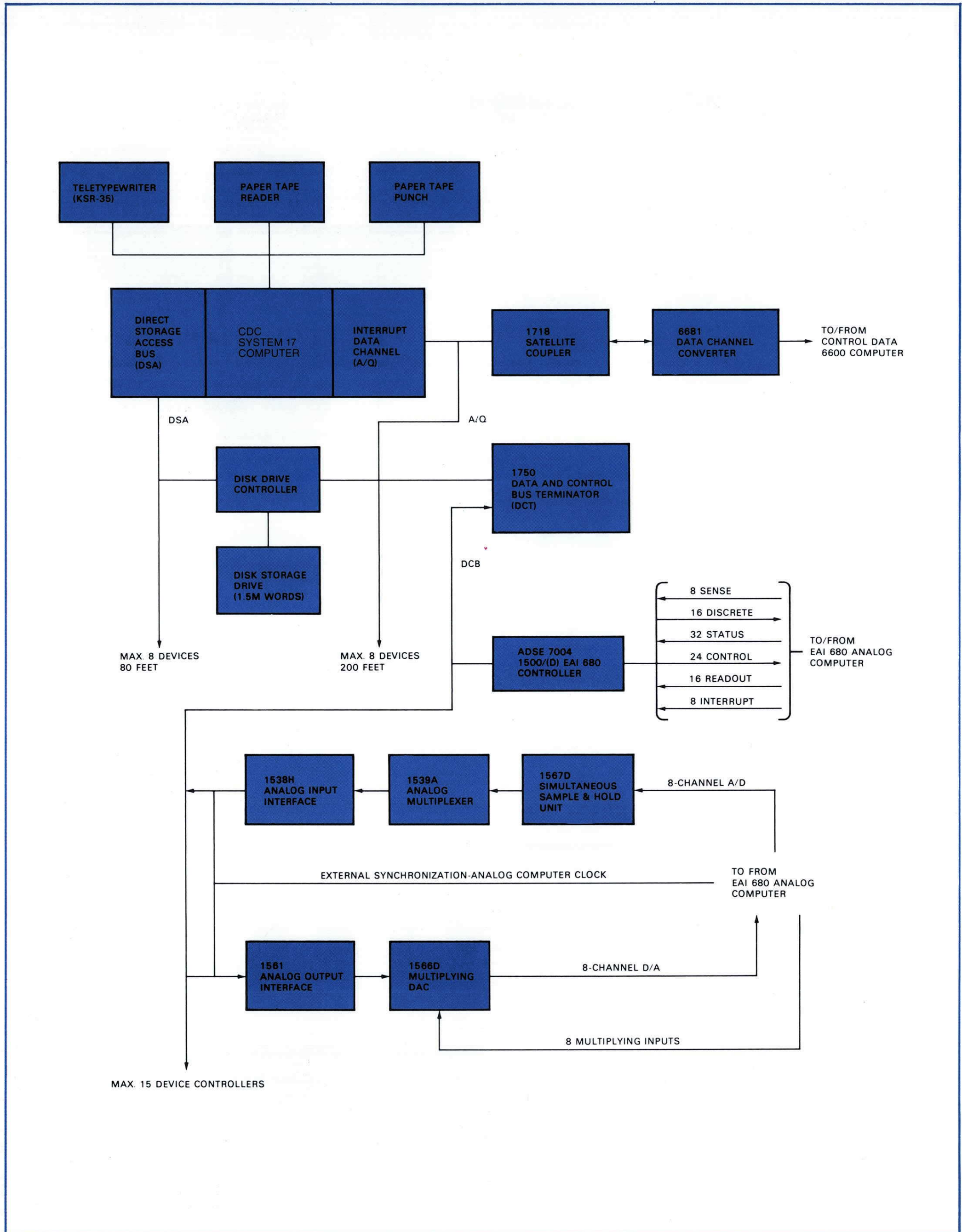


# Standard Buffered Hybrid System II Configurator





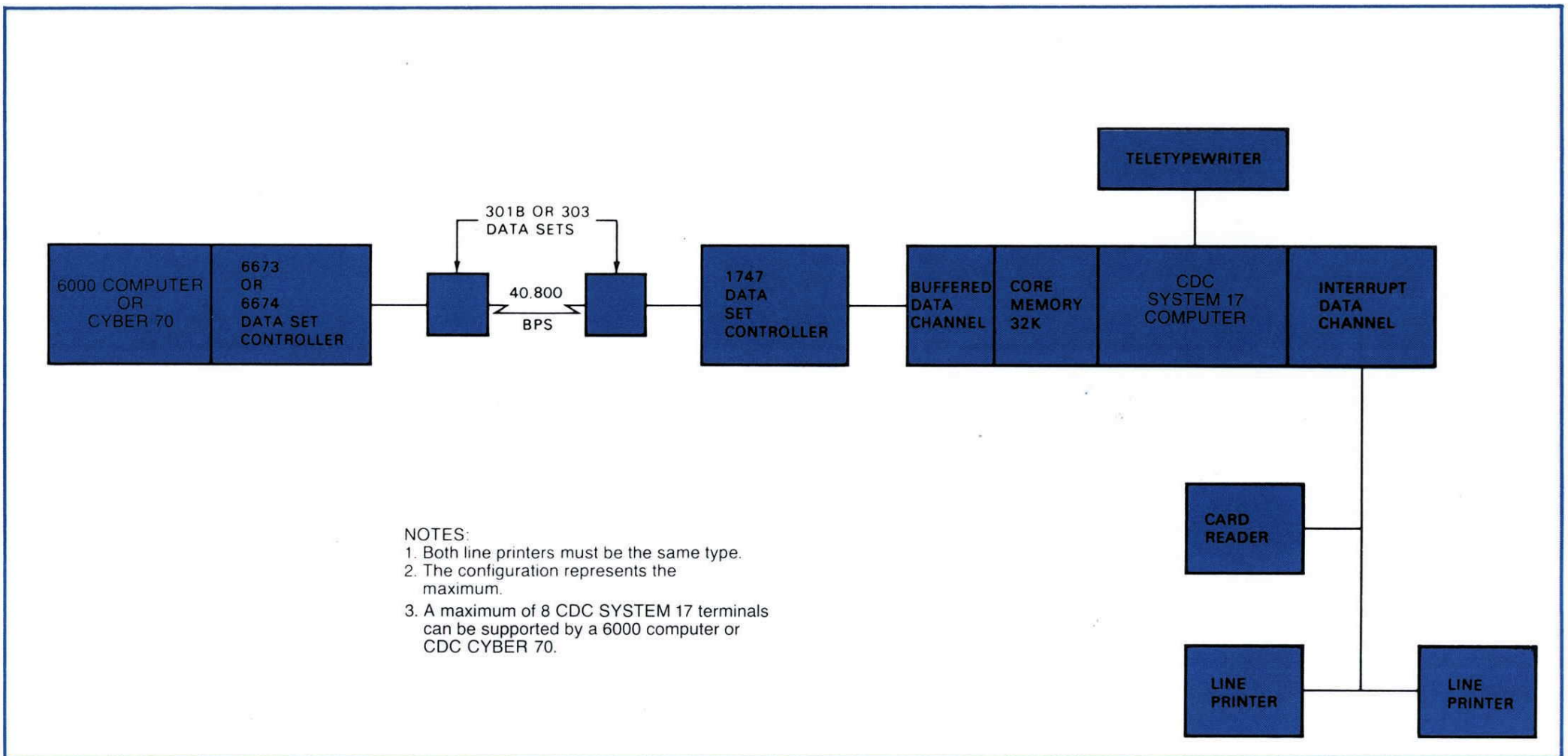
# Standard Non-Buffered Hybrid System Configurator



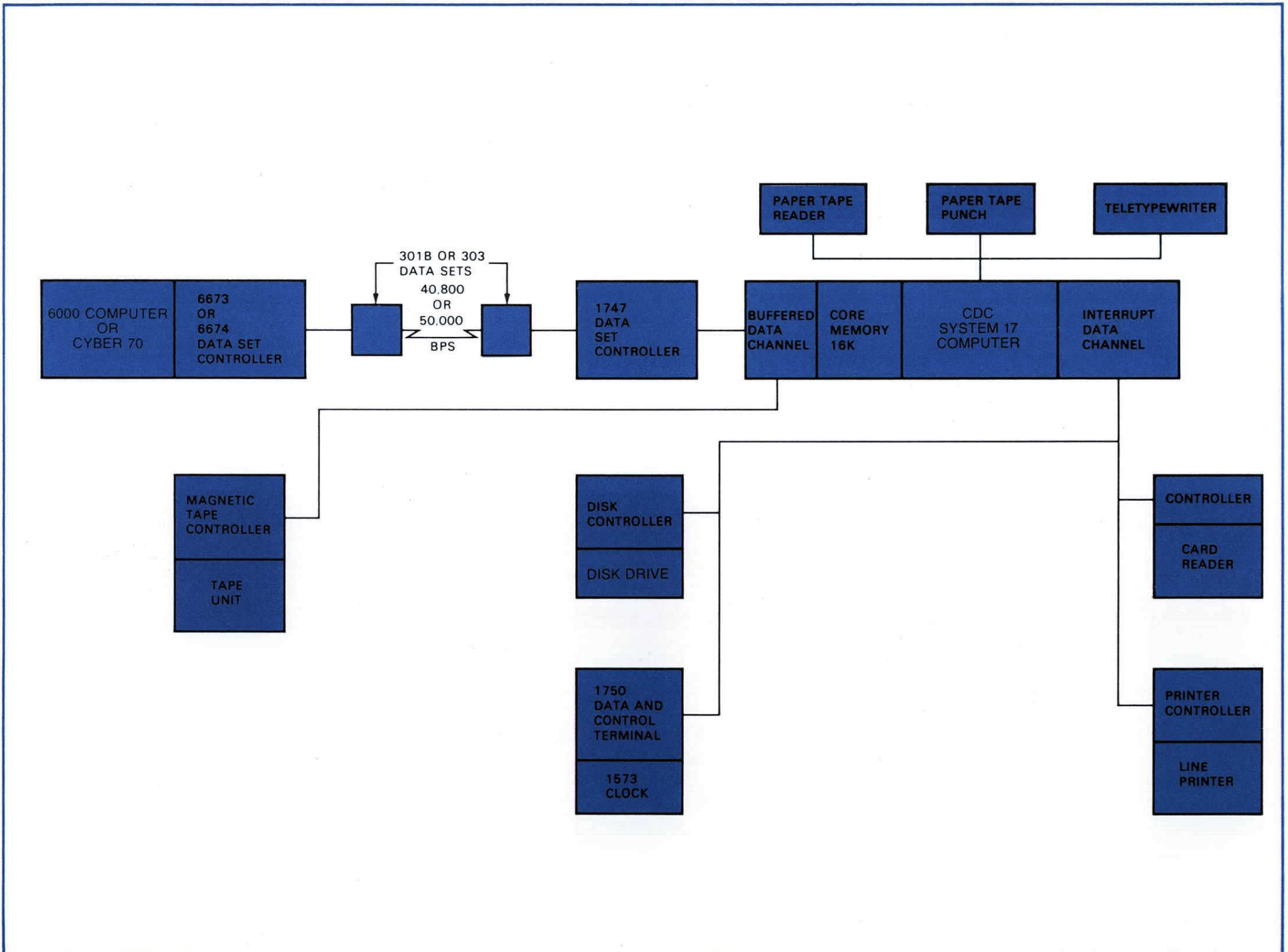


# Remote Terminal Configurators

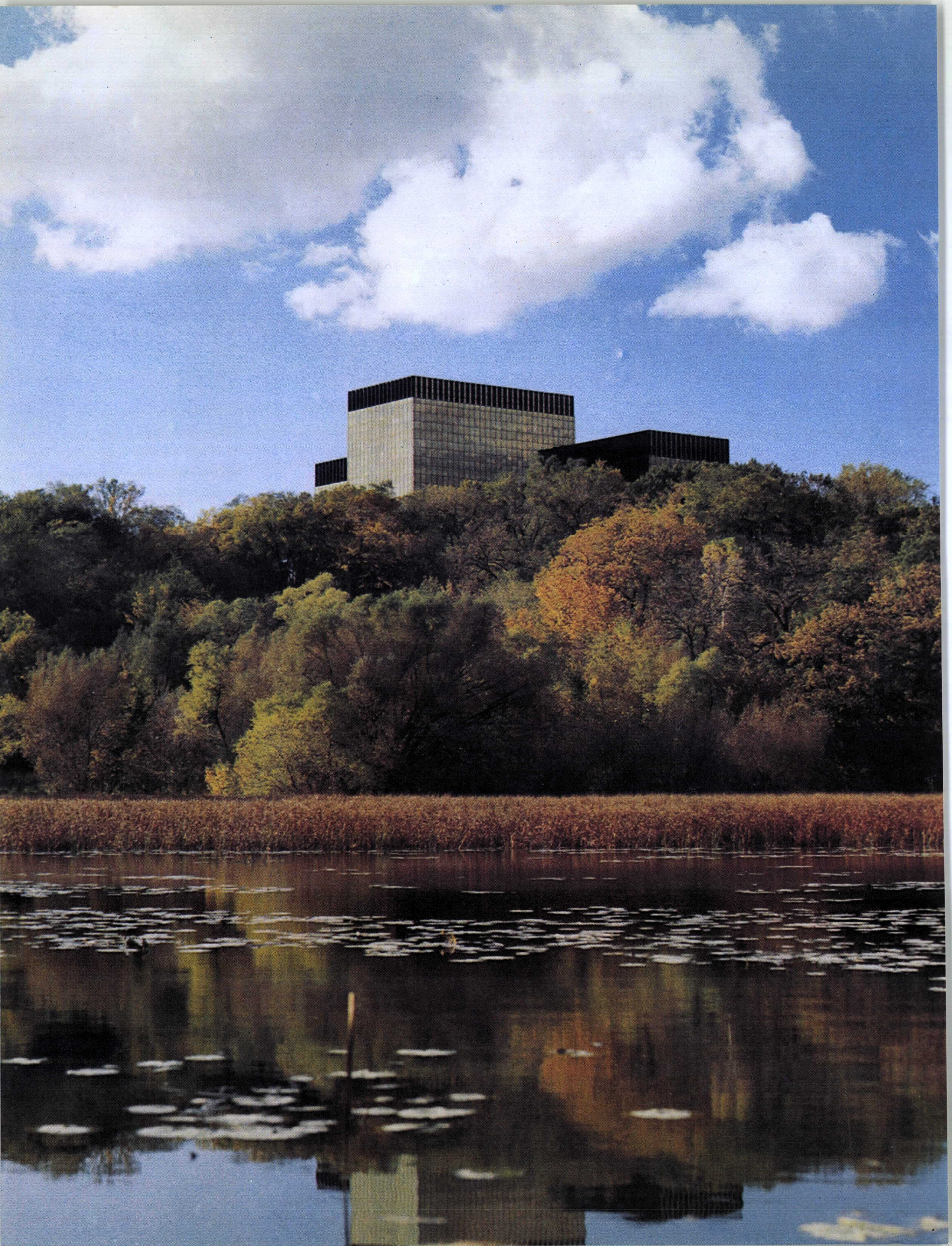
## Maximum High-Speed Import Terminal Configuration



## Typical Mass Storage Operating System Terminal Configuration









Through the years in which Control Data has been making the world's fastest and most effective computer systems, we have continually aimed at broadening our line of services relating to the field of data processing. Today this line is accurately referred to as "total services."

One of the aspects of CDC Total Services that has led to greatest customer satisfaction is "the end of overbuy" — the end of commitment to more hardware or service than a user needs in order to get the specific problem-solving capacity that he does need. Instead of offering rigid, prepackaged arrays of goods and services, Control Data tailors solutions to individual problems, providing exactly — and only — what is needed.

Nowhere is this better exemplified than by the right mixture of CDC computer systems and CYBERNET services.

### **CYBERNET SERVICES**

CYBERNET is CDC's trademark used to identify our unique coast-to-coast network of data centers. Nowhere else is so much computer power available for time-rental use.

CDS users have various reasons for finding CYBERNET valuable. The most common reason is routine overload service during peak processing periods. Another is system workloads growing beyond a system's capacity before its user is ready to move on up to a larger one. In either case, the solution is the same. Customers use CYBERNET to keep processing stable.

Similarly, some users have occasional jobs which demand central memory capacity beyond that required by their usual needs. Here again, CYBERNET can be the answer. Specialized software available from CDC's Data Services over the CYBERNET system is still another reason for calling on the convenience of these facilities.

In addition to a large professional staff, CYBERNET Service offers a library of supported application programs adapted to the needs of virtually all technical disciplines. This library includes programs to solve problems in:

- Medical research
- Civil, mechanical, structural, and electrical engineering
- Petro-chemical technology
- Nuclear research
- Hospital administration
- Demographic research
- Funds management
- Banking and finance
- Electrical power generation

### **SYSTEMS ANALYSIS AND CONSULTING SERVICES**

The starting point for any computer acquisition is complete systems analysis. Users have determined their objectives and can get them readily translated into computer system terms by a CDC systems analyst.

Many firms and institutions find it valuable to remember that a computer is only part of their operational picture. When they see an opportunity for improving the total picture, they can turn to Control Data's Consulting Services. They benefit from having our analysts evaluate their methodology and procedures.

Control Data's consultants in systems analysis start out with concern for basics. Before going into the details of a computer, they examine their client's overall way of operating. In a bank, for example, electronic computation may be highly important in research but equally important is filing and retrieval of data from terminals, the recording of data picked up by magnetic ink or optical readers. So opening questions relate to what information a client needs, what form is it available in, and what is its flow from its origin as raw data to its summary in informative reports.

In approaching such matters for specific clients, our analysts have accumulated expertise in the basics of various industries and enterprises. Areas such as manufacturing, medical facilities, financial institutions, atomic utilities and others all have their specialists among our more than 1,000 analysts.



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## **SITE PLANNING AND CONSTRUCTION**

Characteristic of the flexibility in services available from Control Data is preparation of a suitable site. To prepare a site for a CDC computer system, or for any computer system, CDC's involvement may be to make comparatively slight modifications of an existing location, major renovation, or complete design and construction of a whole new building. Numerous advantages are provided by our Engineering and Architectural Services Division, including:

- The right solution, based on years of specialized experience
- Single source of responsibility, conducive both to smoother schedules and to earlier availability
- Attention to possibility of future system expansion
- Cost savings from volume buying of components.

## **TRAINING, EDUCATION AND PERSONNEL RESOURCES**

Because of variability in customers' procedures and demands, training of user personnel is arranged for on a customized basis through Control Data Education Institutes. CDEI provides courses and seminars for all levels of EDP people — systems analysts, programmers, operators, electronic technicians, and management personnel.

Courses run from entry-level to highly sophisticated technical and management seminars. Moreover, graduates of CDEI entry-level courses are trained computer professionals. Their availability through CDEI's Placement Offices constitutes an unparalleled resource for competent computer-system personnel.

Our education programs, offered on an individual-enrollment or exclusive-class basis, may provide the solutions to some of your data-processing problems. As part of the industry, we are in a strong position to offer the most advanced and sophisticated instruction. Seminars can be offered at the user's facility or at any of our education centers located throughout the United States, Canada, and overseas.

## **FINANCIAL SERVICES**

Offered through CDC's subsidiary, Commercial Credit Corporation (CCC), CDC's financial services stand alone in the industry. CCC's lease plans cover an exceptionally broad range of approaches to lower cost and ease of payment for financing systems and services. CCC's financial counseling is also helpful to users.

## **EQUIPMENT MAINTENANCE**

CDC's Engineering Services have developed over the years an outstanding reputation for the installation, maintenance and repair of data processing systems. In the past their activities were limited to CDC installations. Now, however, other manufacturers have begun turning over the maintenance of their customers' equipment to Control Data's Engineering Services.

## **A WHOLE THAT'S GREATER THAN THE SUM OF ITS PARTS**

This summary deals with various services in necessarily brief and general terms. To be effective, though, any service must be specific to the needs of one individual customer. That is what Control Data aims at. Our services are intended to be total not only in breadth but in depth. No one knows this better than users of CDC Computer Systems.

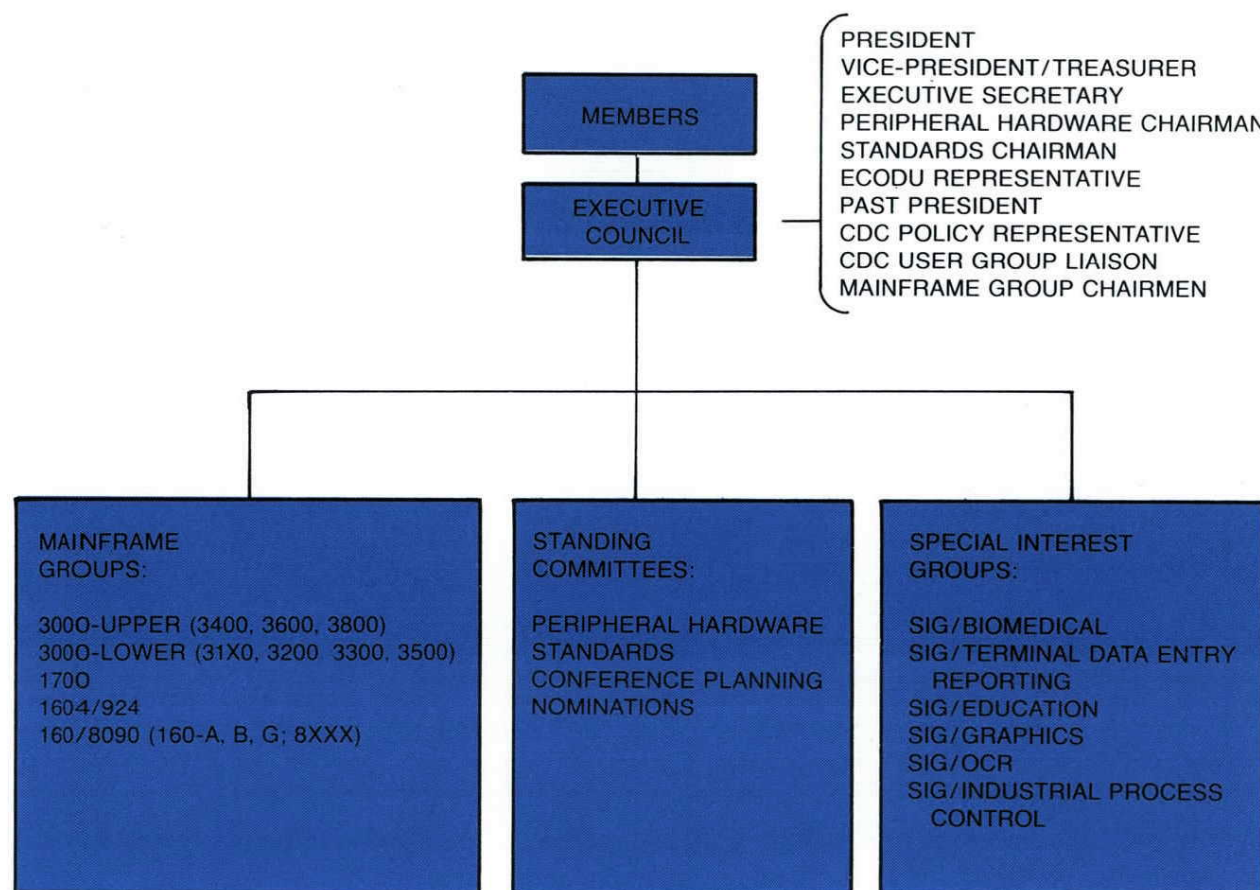






# Control Data User Organization

FOCUS/INTERNATIONAL ORGANIZATION CHART



FOCUS, the International FORum of Control Data USers, was formed in 1968 when several unassociated CDC User Groups agreed to join together in order to more effectively devote their energies and resources to matters of common interest among all CDC computer users. At the FOCUS-2 Conference, 27-29 October 1969, the organization name "FOCUS" was changed to FOCUS/International Forum of Control Data Users. FOCUS/International provides a medium for the exchange of ideas, experiences, and computer programs, among user installations, and also between members of Control Data.

The organizational structure of FOCUS/International is particularly well suited to members who have many problems that are common only among those with similar computer systems, and other matters of interest to a wider spectrum of computer users. The Constitution and By-Laws provide for the establishment of two types of working committees:

- Mainframe Groups whose members have or use like computer systems; and
- Special Interest Groups whose members share common interests independent of their computing equipment.

Each of these Groups operates essentially as an autonomous unit, with a self-determined structure and policy that is consistent with over-all FOCUS/International objectives. In addition to the Mainframe and Special Interest Groups, there are four FOCUS/International standing committees: Peripheral Hardware, Standards, Conference Planning, and Nominations.

Control Data Corporation supports and participates widely in FOCUS/International affairs with an official representative assigned to each Mainframe and Special Interest Group. In addition, CDC publishes all FOCUS/International documents, and maintains the FOCUS/International Program Library.

Conferences are held semi-annually, with the Spring Meeting located in St. Paul, Minnesota. Conference sessions deal with software, hardware, applications, operations, and standards. Official resolutions of the membership are transmitted to Control Data for their consideration. A comprehensive report is published after each conference.

The FOCUS/INTERNATIONAL NEWS-LETTER, published monthly, contains reports of Mainframe and SIG activities, member correspondence, description of new Library Programs, and other matters of interest to members.

Membership in FOCUS/International is available to all organizations which have or make use of any CDC computer. There are no dues requirements, the only charges being registration fees for the attendees at each conference.

Further information concerning FOCUS/International can be obtained by contacting the FOCUS/International Executive Secretary or the Control Data Office of User Group Liaison, whose addresses appear in the Directory herein.



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