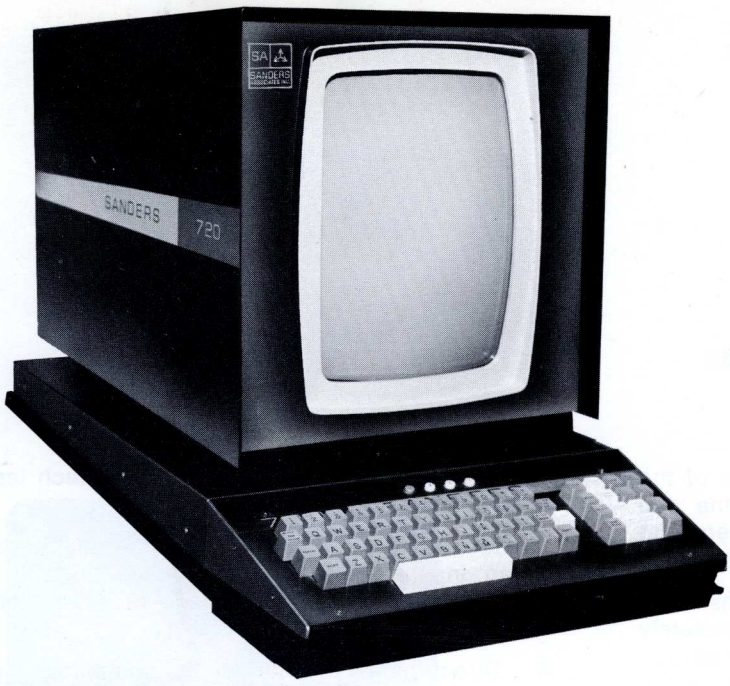
BULLETIN BT 193B

SANDERS 720 DATA DISPLAY SYSTEM
A PRODUCT DESCRIPTION



A Direct Link To Your Computer . . . Put Instant Information At Your Finger Tips

Sanders 720 Data Display system is a low cost display system particularly designed for use in business data processing, communications, and information retrieval operations. It permits visual access to most types of computers storing business records. Such records can be freely called up, entered, and updated from the desks and locations where availability of up-to-the-minute information is essential to customer service, decision making, and efficiency.

The 720 Data Display system employs standard ASCII coding and can communicate with computers via direct (local) connection or remotely via data communications equipment. It can be used to link many offices, warehouses, and plants into a complete network of communications.

Sanders 720 Data Display systems have many potentials for modern businesses, including improved management effectiveness, cost controls, customer service, operating efficiency, and record accuracy. They are economical, yet contain a number of highly advanced features. In fact, this system offers more powerful capabilities than any other competitively priced information display available today. Its advantages include:

- Complete editing features which give operators total control over displayed data (and format when desired); operators can correct, delete, add, and move data at will; new numbers, words, even sentences and paragraphs can be inserted into the middle of displayed messages and the text automatically opens up to make room.
- More usable data capacity (up to 50% more data per message) than competing systems with equivalent character memory capabilities, because the Sanders 720 Data Display systems permit data to be compressed through the use of special edit codes.
- Complete format flexibility allowing rows, columns, tables, headings, paragraphs, and forms to be set up, changed, and controlled by both keyboard and computer operations; a format "lockout" feature permits "supervisory" display consoles to create formats which can be filled in, but not changed, by "line" display consoles.
- Fully modular design which lets you buy just the capabilities you need . . . 256, 512, or 1024 character systems . . . partial or full editing . . . remote or attached keyboard installation . . . vertical (page appearance) or horizontal screen orientations . . . DATA-PHONE or direct interface capabilities.
- Minimum interruption of computer operations because each display has its own message buffer. The transfer of unique message editing permits messages to be "compressed" before communications with the computer.
- Reliable, silent, low power operation because only solid state and microcircuit electronics are employed.
- Clear, bright, high definition characters formed from continuous strokes.
- Simple operation using keyboard controls very similar to those on typewriters and adding machines; secretaries can operate all but the most complex models with a minimum of training.

These are some of the features of the Sanders 720 Data Display system which permit extremely fast data entry and file look-up concurrently by a large number of on-line operators.

Maximum System Flexibility . . . Meet "Custom" System Requirements With Standard Modules

Sanders recognizes that no two applications of the 720 Data Display system are exactly the same and that each application requires different numbers and types of display capabilities.

Therefore, the 720 Data Display system has been designed with *flexibility* in mind. It is completely modular. You buy only the capabilities you need . . . from a 256-character retrieval-only system to a full editing, 1024-character retrieval/edit/data entry system.

The three basic modular units which comprise the 720 Data Display system's "mainframe" are:

- Model 701 Control Unit
- Model 708 Display Unit
- Model 722 Typewriter Style Keyboard Unit

The system is designed for your application by integrating different numbers of these basic units and including different modules in the system Control Unit. Such complete modularity also allows you to expand the system to new uses and greater capabilities should requirements change in the future.

The block diagram (right) illustrates the system as configured for a typical application. Each of the three display units in this system can employ up to 1024 characters and format control words, and each has complete editing control over both data and format.

Provisions are included for a variety of hard copy printers that print displayed data at the option of the operator or upon command of the computer.

The system shown can communicate with a remote data processor via standard or high speed DATA-PHONE type modems, or it can communicate directly via parallel high speed lines. Any operation on either data or format can be initiated by either the display operator or the computer.

The functions and characteristics of the system's modular components are described below.

Control Unit

All editing, memory, interfacing, communication, and similar functional components for up to 12 displays and keyboards are housed in a single Model 701 Control Unit. The attached displays time-share these common functional components in such a way that individual operators feel they alone are using the system.

This design uses one highly sophisticated edit/control module, yet is available at a lower price than many competing systems which have much less edit/control capability.

Attached displays also time-share the capabilities of an Input/Output Interface module in the Control Unit. This module may be one of three types depending on your requirements . . .

- Direct computer interface module employing parallel inputs and outputs for operation at rates as high as 47.5K characters per second, or
- Standard data modem interfaces for typical asynchronous data rates of 300, 1200, or 1800 bits-per-second. Synchronous data modems are available for speeds of 2000 or 2400 bits-per-second.

The number of Display Units which may be attached to a single Control Unit depends on your requirements. That is, up to three Memory modules (each with capacity to store 1024 characters) may be employed in a single Control Unit, and the capacity of each memory may be shared by up to four Display Units. Thus, a single Control Unit can drive up to:

- Three independent 1024-character Display Units, or
- Six independent 512-character Display Units, or
- Twelve independent 256-character Display Units.

Each display is completely independent of all others attached to its Control Unit. Failure of an individual display cannot affect the operation of the others.

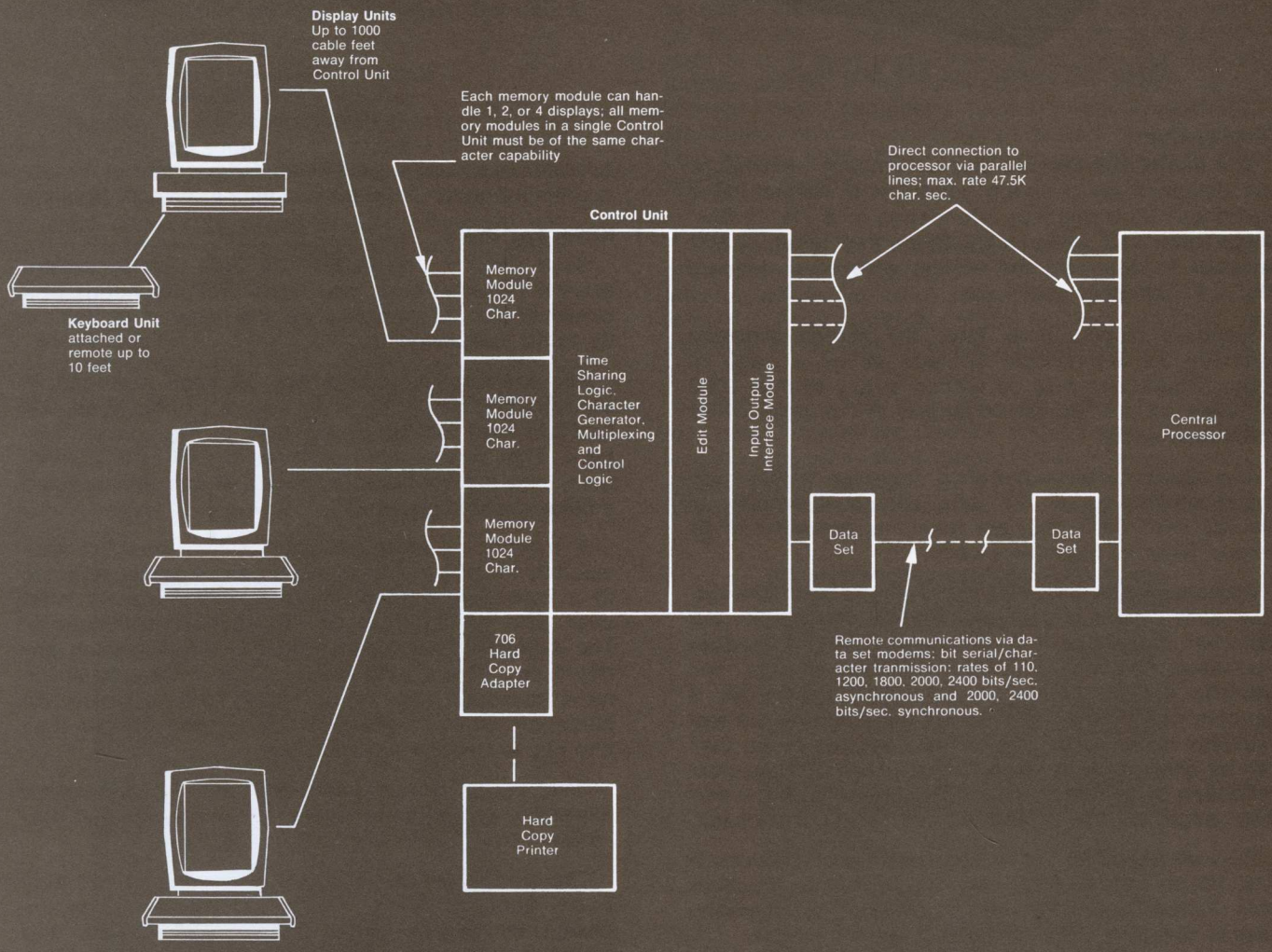
Each Display Unit generates a unique address code which identifies all transactions it originates and guides all requested computer outputs to their proper destination.

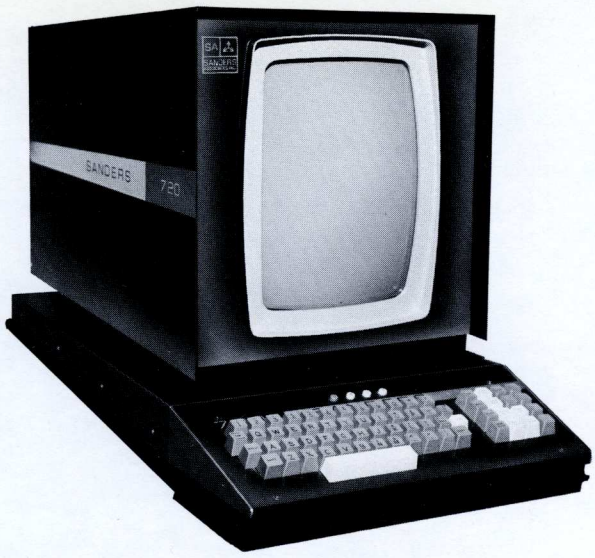
The 720 Data Display system Control Unit is extremely compact, requiring only 14 inches of panel height in a standard 19-inch rack. Up to three complete Control Units may be powered by a single, separate power supply requiring an additional 8½ inches of panel space.

A standard rack configuration is also available for driving up to 36 displays from three Control Units.

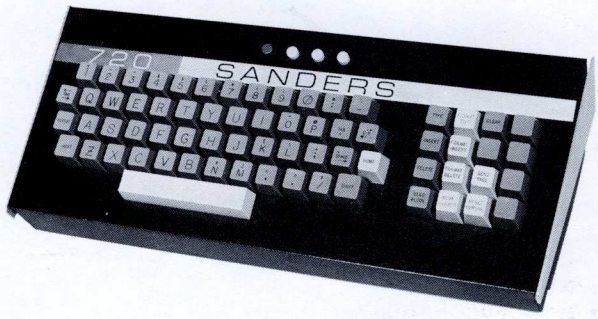
Microcircuits are used in all functional components to reduce heat dissipation problems and reduce cooling and space requirements.

A typical 720 Communicator system configuration.





Model 708 Display Unit with Keyboard.



Model 722 Keyboard Unit.

Display Unit

The Model 708 Display Unit is compact, lightweight, and designed for desk-top operation in normal office environments. It displays information in a 7½″ x 9½″ image area (12″ diagonal cathode ray tube), a size selected to duplicate the writing area of a standard 8½″ x 11″ sheet of paper.

Standard display units have the screen arranged vertically, so information appears as on a page of paper. Characters may be written at any of over 2000 locations on the screen arranged in 40 lines of 52 characters each.

The display may be supplied, however, with a horizontal orientation of the long screen dimension to provide over 2000 possible locations arranged in 32 lines of 64 or 84 characters each.

Alphanumerics and symbols are written on the display screen with exceptional clarity, sharpness, and definition. This important feature is achieved because characters are formed from continuous strokes, and because the 720 Data Display system employs a Sanders proprietary deflection yoke, which allows significantly higher writing speed and sharper focus than can be obtained with conventional yokes. The Sanders deflection system maintains sharp focus at the outermost edges of the screen as well as at the center.

Data displayed on the screen is refreshed (rewritten) 46.5 times per second, assuring complete freedom from flicker. High character positioning repeatability insures that characters are stable on the screen.

The cathode ray tube is a standard type of the variety developed for use in commercial TV monitors.

It uses highly efficient, long-life P31 phosphor to provide a bright green light output. A filter glass and implosion shield are built into the tube for low reflection, safe viewing under normal office lighting conditions.

Controls are available at each display for adjustment of focus, brightness, page size, page centering, and character size. An additional control allows the tilt of displayed characters to be varied from straight up and down to a sharp slant (italics) or any angle in between. Thus, the display can be set for optimum operator eye comfort, minimum fatigue, and maximum readability under different conditions of room lighting.

Keyboard Units

Each Display Unit in the 720 Data Display system can be provided with one Model 722 Keyboard Unit either physically attached to the display or remote up to 10 feet away.

The standard keyboard has 51 keys arranged in conventional typewriter style, with a cluster of special function keys located at the right of the conventional keys. This arrangement provides for 64 letters, numbers, and symbols plus a choice of full or restricted editing capabilities.

A number of spare special function keys are provided so that the basic keyboard can be readily adapted to a variety of custom uses, including direct control over data processor functions and communications. The keyboards produce an ASCII code for each key depressed plus control signals. Options are available for a keypunch style or an adder style keyboard. An electronic interlock prevents false codes if more than one key is struck inadvertently.

This design makes Sanders Model 722 keyboards extremely rugged and reliable, and it assures that they require very little adjustment in the field.

The simplicity and flexibility of the Model 722 keyboard concept allows Sanders to readily adapt the design for special keyboards requiring unique key arrangements, output codes, or special functions. This allows optimization of 720 Data Display system capabilities for different applications.

Typical features in the Model 722 keyboard include:

- Alphanumeric, block sequential style keyboard with 64 letters, numbers, symbols, and choice of restricted or full editing capabilities.
- Cursor control keys implementing 8 different functions for unique format generation.
- Additional keys, permitting modular expansion as needed.

Unique Logic Structure . . . Get More Usable Message Capacity

The 720 Data Display system employs logic/memory structure which organizes data into a compact arrangement for storage in the system memory and permits greater flexibility in positioning data on the screen.

This special feature allows the Sanders 720 Data Display system to display considerably more information in most formats than is possible with competing systems having similar memory capacities. We call it the "Page" display concept.

The "Page" Display Concept

The majority of low cost display systems available today are designed such that the number of characters they store in memory is equal to the number of screen positions in which the characters may be written. There is a fixed one-to-one correspondence between each character in memory and its position on the screen.

In the 720 Data Display system, however, possible character positions on the screen exceed character storage capacity by over two-to-one. That is, 1024 characters can be stored in the memory and positioned *anywhere* on a screen having 2000 locations. Thus, the 720 Data Display system can write characters spaced over a larger area of the screen.

The advantage of this technical feature is shown in Figure 1 below. This picture shows the display limitations of ordinary systems; Figure 2 shows how much extra information can be displayed by the Sanders 720 Data Display system in this format.

A second factor limiting the quantity of displayable information in ordinary systems is the amount of available memory capacity which must be consumed to store the blank spaces (no characters present) on the screen. That is, most systems store the blank spaces as if they were true characters. Since most formats contain many blank spaces (in skipped lines, indents, column separators, gaps after short sentences, etc.), much memory capacity is "wasted" to remember only space. Each blank space means one less displayable character.

The Sanders 720 Data Display system, however, does not waste memory capacity storing every blank space. Instead, *whole blocks* of spaces are stored as single format control symbols. More memory capacity is available for storage of useful, displayable characters.

The Sanders 720 Data Display system is the only low cost information display system that will allow operators to use formats having blank character spaces without being penalized by a reduction in the number of displayable characters and/or usable screen area.

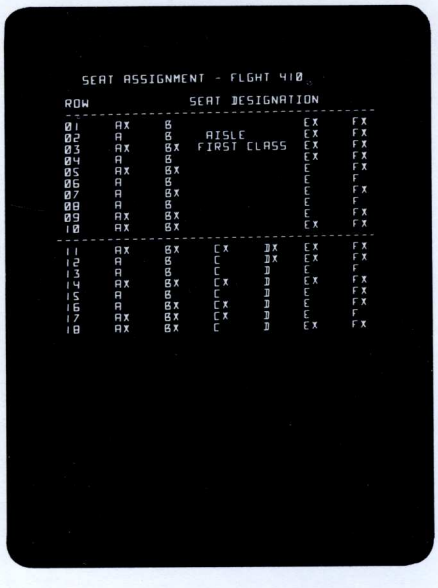


Figure 1. Without "Memory Save"

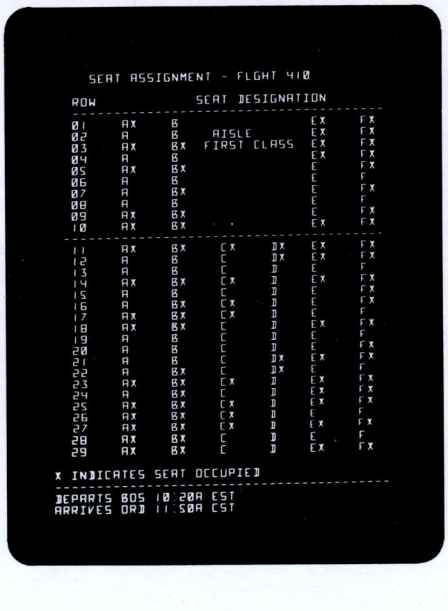


Figure 2. With "Memory Save"

Complete Editing Functions . . . Get Powerful Data Control Capabilities

The 720 Data Display system offers an exceptionally complete repertoire of editing operations. In fact, it offers greater editing capabilities and flexibility than any other low cost display system available today.

Furthermore, the 720 Data Display system has been specifically designed so that all operations, both editing and entry, can be easily and accurately performed by operators with relatively little training. Its operating complexity is less than that of a standard typewriter or adding machine.

The display has the appearance of a sheet of paper in a typewriter. A CURSOR (blinking underline symbol) shows the place on the page where the next character will be typed, erased, or moved. The CURSOR can be moved over the page using keys for left, right, up and down, single or multiple space motions.

Correction of mistakes, insertion of new material, deletion of unwanted material, and other operations can be performed more swiftly and efficiently than with a typewriter. For example, single characters, words, phrases, sentences, and whole paragraphs can be inserted in or deleted from the displayed message.

To insert new material, the CURSOR is positioned to the desired point on the page; the INSERT key is pressed, and the new data typed on the keyboard. All existing text to the right of the insertion automatically spaces to the right to make room for the new information.

Use of the DELETE key erases selected information from the displayed text and automatically closes the gap which is left.

Using these capabilities, the operator may enter information by typing (or retrieving information from computer storage) and then edit and correct the information. There is no need to retype an entire line or page to make corrections and changes.

The 720 Data Display system can be configured to provide different "levels" of editing and control capabilities to different displays. That is, some displays (termed Edit I type) can be restricted to retrieval, entry, and editing of data in fixed, previously prepared formats which cannot be altered from the keyboards of such displays. In the same system, other "supervisory" displays (termed Edit II type) can be given full capabilities for preparing, editing, and entering the formats as well as the data.

The Edit II displays (full format capabilities) can be used to make up forms which contain titles, headings, rows, columns, blocks, blank spaces to be filled in, etc. and to place such forms in computer storage.

All Edit I displays in the system can call up such standard forms and fill in blank "answer" spaces as needed. The 720 Data Display system automatically directs the operator's entries and changes to the allowable "answer" spaces on the form.

The form itself cannot be changed by the operators of Edit I displays, and when a completed form is outputed, only the "answer" data need be transmitted, not unused spaces or form data.

Forms are established with the Edit II displays much as a format is created on paper with a standard typewriter. Margins and tabs are set on the Model 722 keyboard as on a typewriter. However, format flexibility is much greater than that of a typewriter because tabs and carriage returns (margin sets) may be placed at different horizontal locations in different lines of text. The operator can establish a form on a line-by-line basis.

Additional data access control can also be built into a system. Access to various classes of data in computer storage can be restricted to selected displays in a system, for example, by use of suitable software in the processor. This type of operation assures that only individuals with appropriate qualifications and "need to know" can access privileged records. All other displays are locked out of such records.

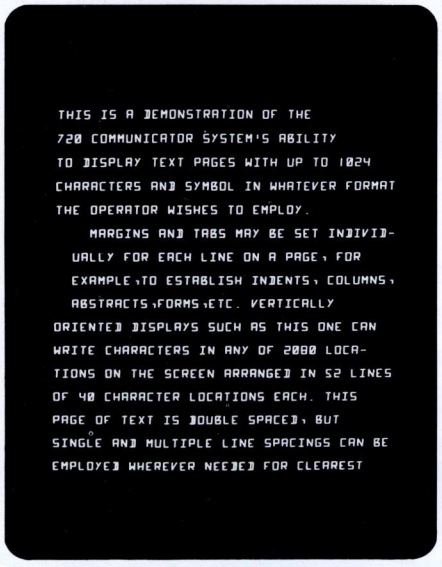
Summary

The 720 Data Display system may employ displays with two different editing modes of operation.

Edit I displays allow limited operations. They receive fixed, previously prepared formats from computer storage. Given a format, the Edit I display operator is restricted to working within the constraints set up by the format, but within these constraints the operator can edit (i.e., type, delete, insert, or erase) until satisfied with a message. The message can then be transmitted to a computer.

Edit II displays have all the capabilities of Edit I types and, in addition, can generate, edit, and enter formats.

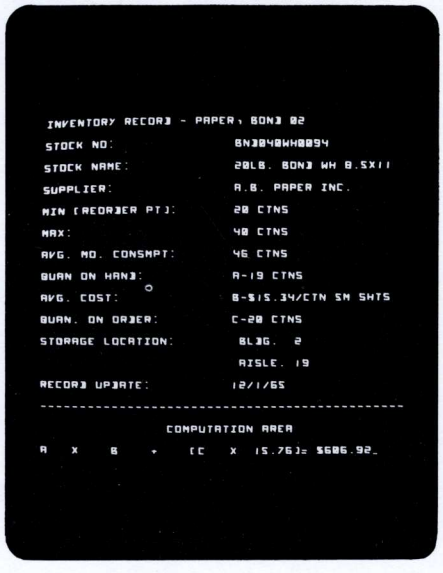
Any operation in either Edit I or Edit II mode which can be performed by an operator can also be performed automatically by the computer.



Some typical formats which may be set up on the 720 Data Display system, showing:

1. *Single page of text, such as an abstract, memorandum, report, or other written document.*

2. *List of customer accounts with format of headings and spaces between columns permanently "fixed." Operators who update the list can manipulate only the information in the open, uncolored blocks.*



3. *Inventory record with fixed heading and tab format as in 2; bottom of page is computation area allowing display's use as a powerful desk calculator; sample calculation shows determination of present inventory value plus cost of new stock ordered at a new price.*

Display-Oriented System for IBM-System/360

The digital logic structure of the 720 Data Display system is designed to provide maximum flexibility for connecting the system to standard computers, communications modems, and other currently available data handling equipment . . . printers, teletypes, and buffer storage devices.

The system employs American Standard Code for Information Interchange (ASCII) Message Format and Communication Control Characters for internal communications and at the input/output interface.

For applications calling for interface with the IBM System/360, Sanders has developed the Model 731 Display Communications Buffer. These products when combined with the Model 720 Display, form a display oriented data retrieval/entry system. They may also be used individually to meet specific user requirements.

Model 731 Display Communications Buffer

In Local/Direct Installations . . .

The Model 731 D.C.B. will service up to 8 Model 701 Display Control Units — up to 192 Model 708 Display Terminals with 256 character capacity. Data transfer is accomplished in the burst mode at 47,500 characters per second, the 720 system's standard transfer rate.

In Remote/Data Set Installations . . .

The Model 731 will operate over standard 2000 or 2400 bit-per-second modems. The Model 731 may be equipped with up to 8 half duplex or 4 full duplex lines. In the remote environment, the Model 731 operates in a multiplex mode and interleaves data from the various 720 systems it services. The Model 731 provides both horizontal and vertical parity checking of all data.

Interface Software

The Model 731 Display Communications Buffer will communicate with the System/360 using the following telecommunications programs:

Local

DOS BTAM

OS Graphic Programming Services — Express and Basic

Remote

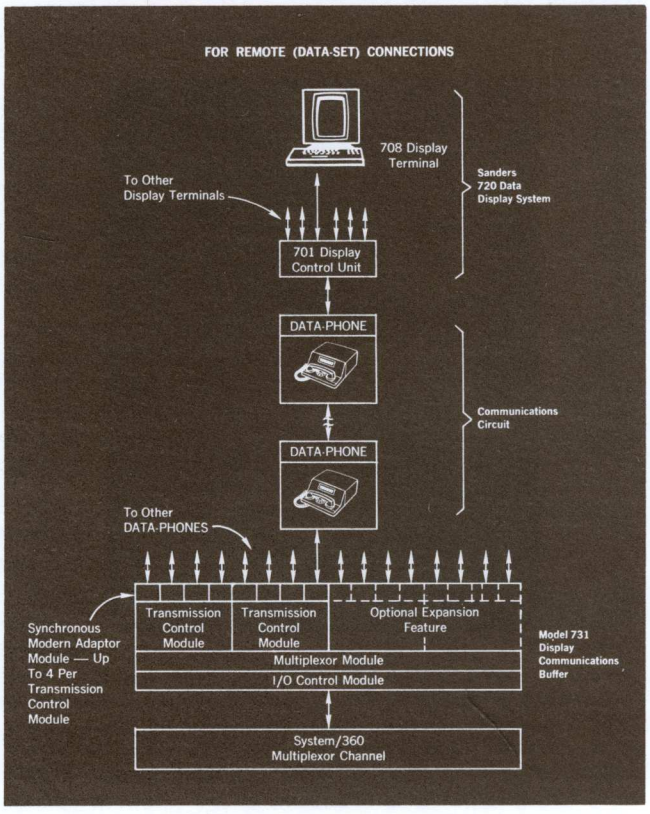
DOS BTAM

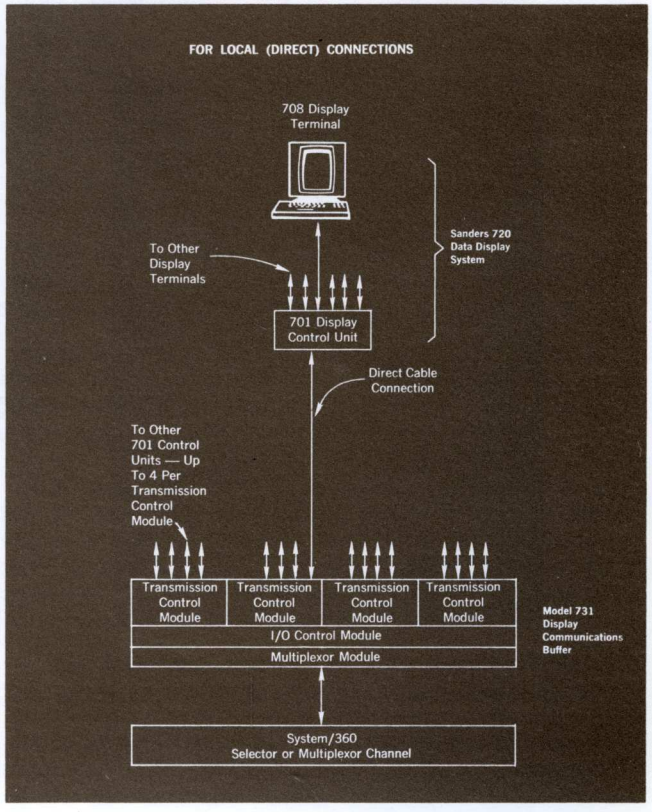
OS BTAM

OS QTAM

DOS QTAM

A complete description of and specifications for the Model 731 Display Communications Buffer are available on request.





SANDERS "SYSTEM BACKUP" CAPABILITIES

Sanders can provide you with a complete systems service — from selection and interfacing of computers to generation of required software, installation, check-out and personnel training.

System Planning

The optimum data systems solution to business problems must be considered as complete networks of input-output points, processing and storage units, communication links, control centers, software, and people. To this end Sanders has developed an experienced staff of systems design engineers whose services are available to your data processing staff. The 720 Data Display system is not treated as just a a computer appendage, but rather a vital element of the total system within the complete data network.

Field Service and Training

Sanders Field Service Department provides all necessary training of customer personnel at your office and/or in the classroom facilities at Sanders Nashua headquarters. Field Service engineers are located in major cities across the United States. They are factory trained and fully equipped to provide all maintenance and continuing service support required by the 720 system. In addition, factory customer service engineers are on hand at headquarters in Nashua, N. H. to provide supplementary support.

System Specifications

Characters per Display:	1024, 512, or 256 are available
Characters per Line:	
Vertical Displays:	52
Horizontal Displays:	64 84 (optional)
Lines per Page:	
Vertical Displays:	40
Horizontal Displays:	32
Character Repertoire:	64 ASCII alphanumerics
Character/Function Code:	ASCII standard
Viewing Area:	7½ x 9½ inches vertical or horizontal
Refresh Rate:	46.5 CPS
Character Height:	0.12 inch nominal
Character Width:	0.09 inch nominal
Character to Character Spacing:	0.05 inch nominal
Line to Line Spacing:	0.08 inch nominal
Character Generation Method:	synchronous, continuous strokes
Character Write Time:	21 microseconds
Deflection Method:	magnetic
Spot Size:	0.020 inch max.
Brightness:	30 foot lamberts min. (with a 6″ x 8″ raster)
CRT Filter:	gray, 49% light transmission min.
Storage Method:	recirculating magneto-strictive delay line
Communications:	
Control Unit to Display:	up to 1000 cable feet
Keyboard to Display:	up to 10 cable feet; ASCII code
Control Unit to Computer:	direct or remote; ASCII code standard
Keyboard:	attached or remote
Max. Serial I/O Rate:	5 characters every 21.5 milliseconds
Max. Parallel I/O Rate:	47.5 K characters per second
Parity:	inserted in I/O logic before transmission
Input Power:	
Display Unit:	115 VAC ±10% @ approx. 200 watts, 60 CPS
Control Unit:	115 VAC ±10% @ approx. 150 watts, 60 CPS
Keyboard Unit:	+10 VDC unregulated and +4.5 VDC (supplied by Display Unit)

REGIONAL SALES AND SERVICE OFFICES

Waltham, Massachusetts 02154
400 Totten Pond Road
Phone (617) 891-1710
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Atlanta, Georgia 30303
1800 Peachtree Center Bldg.
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For further information, please contact the Marketing Manager,
Data Systems Division, Sanders Associates, Inc., Daniel Webster
Highway-South, Nashua, New Hampshire 03060. Telephone (603) 885-4220.

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