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CONTROL DATA CORPORATION

HASP RJE WORKSTATION CONTROLWARE REFERENCE MANUAL

CDC® COMPUTER SYSTEMS

MODELS 5M/10M/20

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PREFACE

This manual provides reference information for the Control Data® HASP RJE workstation controlware package. It is intended for use by programmer analysts and customer engineers.

For additional information, refer to the manuals listed below.

Publication	Publication Number
HASP RJE Workstation Controlware Operators Guide	60475350
HASP RJE Workstation Controlware Installation Handbook	60475360

This product is intended for use only as described in this document. Control Data cannot be responsible for the proper functioning of undescribed features or parameters.

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GENERAL DESCRIPTION 1

The HASP (Houston automatic spooling protocol) workstation provides remote job entry access to a host processor or to another workstation for terminal-to-terminal file transfers in a point-to-point type of data configuration. The workstation's synchronous communications facilities are connected to a host processor either through dedicated lines or by manual dial-out across a switched network. HASP data rates range from 2000 bits per second (bps) to 9600 bps. If a micromemory board is installed in the processor (CYBER 18-10M/20 only), the maximum data rate is extended to 19.2K bps. HASP controlware is available on a deadstart card deck or on a deadstart flexible disk.

HASP WORKSTATION FUNCTIONS

A HASP Remote Job Entry (RJE) workstation, as simulated on the CYBER 18-5M/10M/20, is a controlware system that emulates the operation of an intelligent terminal using the HASP multileaving protocol.

The primary function of the HASP workstation is to submit data to a central computer system for processing and to output the processed data at the workstation site. The HASP controlware also supports file transfers between two HASP workstations.

In addition to sending punch-card, tape, and flexible disk data to a remote host and outputting data from the host to a line printer or magnetic tape unit, the HASP RJE workstation also performs offline operations. Offline operations that do not require the use of the central computer system and communications line are listed below:

- Card-to-print
- Card-to-tape
- Diskette-to-print†
- Diskette-to-tape
- Tape-to-print
- Tape-to-tape
- Tape motion

CONTROLWARE

The controlware is delivered on a deck of 80-column cards or a flexible diskette. The controlware provides the necessary internal program to control the terminal's interaction with a host processor or another terminal and its offline operations.

Figure 1-1 shows a typical controlware deck and flexible disk. The first card of the deck is an identification card bearing the part number of the controlware; it is usually a different color than the rest of the deck. The words HASP RJE WORKSTATION, the part number, the controlware equipment number with revision level, and a proof number (a number derived from the bit count of the deck) are printed on the first card of the deck. Before discarding the first card, always transfer the information from the card to the top of the deck. This information identifies the deck. Figure 1-1 also includes an illustration of the flexible diskette. Each diskette is labeled with similar information.

Card decks have a limited life. A duplicate deck should be made and maintained for future use. Duplicate controlware decks are also available from Control Data.

HASP controlware, as delivered, is configured for a maximum of six input streams and four output streams. Each stream is an independent path for the transmission of programs and data in remote batch mode to a host processor.

HASP WORKSTATION FEATURES

Features of the HASP workstation are as follows:

- Available on two media
  - Deadstart card deck
  - Deadstart flexible disk
- Communicates with any host, including the IBM 370 and the CYBER 170, utilizing HASP multileaving protocol.
- Supports one communication line with speeds up to 19,200 bits per second (bps) if the micromemory option is selected, and up to 9600 bps without micromemory. (The micromemory option is only available on the CYBER 18-10M/20 processors.)
- Uses the public mode of operation as follows:
  - Hot input stream - Reads the job as soon as the input is ready
  - Hot output stream - Continues the output as long as the stream is ready
- Allows the option for auto sign-on
- Displays peripheral errors as messages, not codes

†All diskettes used on the HASP workstation must be IBM formatted.

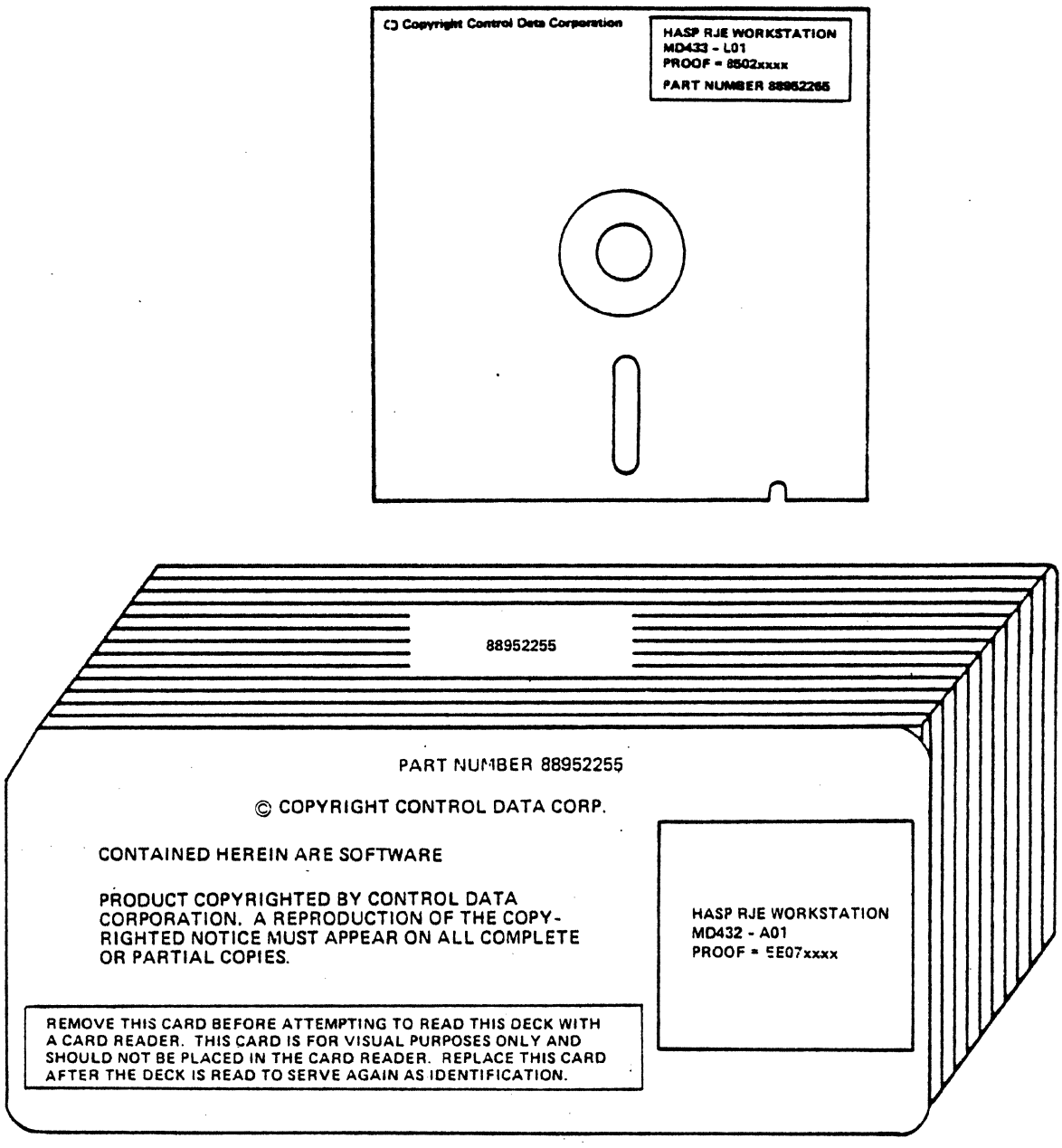

Figure 1-1. Typical Controlware Deck and Diskette

- Uses input streams, as follows:
  - Up to two card readers
  - Up to two magnetic tapes
  - Up to two flexible disks (only IBM format 3741 or 3742)
- Uses list streams, as follows:
  - Up to two line printers
  - Up to two magnetic tapes
- Uses punch streams - Up to two magnetic tapes
- Allows the user upon loading the system to reconfigure the hardware options as follows:
  - CLA equipment number and interrupt line
  - Micromemory option
  - Magnetic tape type (NRZI, 7- or 9-track and phase encode, 9-track)
  - 132 or 136 characters per print line
  - Flexible disk on A/Q or DMA
  - Patch memory locations
- Allows the user to reconfigure the software options upon loading the system. The options include all, but are not limited to, the following operator commands that are normally entered from the CRT console.
  - Card reader code set
  - Unit assignments
  - Disabling stream code translation
  - Printer code set
- Uses card reader code sets, which include the following:
  - CYBER 18 026 (ASCII 63)
  - CYBER 18 029 (ASCII 68)
  - UT200 026
  - UT200 029
  - UT200 mixed mode
  - EBCDIC
- Allows the card-reader-mode code set to be changed either by the operator or dynamically through a special control card in the input stream.
- Transmits binary card images to the host without requiring data transparency. (No checks are made to verify the validity of the binary cards; this must be determined by the host.)
- Uses the following line printer code sets:
  - 64 ASCII
  - 64 EBCDIC
  - 96 ASCII
- Allows printer code recognition mode to be modified by the operator or at load time.

HASP WORKSTATION EQUIPMENT

The HASP workstation (figure 1-2 and 1-3) requires the following equipment:

- One CYBER 18-5M/10M/20 CPU, with 64K (8-bit bytes) memory, which provides control and sequencing of online information exchanges between the CPU and the various peripheral devices as well as performing offline operations. These functions are accomplished via the controlware program, which is loaded into the HASP CPU memory as the terminal is brought up for operation.
- One conversational display terminal, which provides the operator with an interactive interface to the rest of the system. The keyboard of the 1811 models may be physically separated from the display unit by a 3-foot (1-meter) cable, allowing individual orientation of the keyboard and the display. The 722 model integrates the display and keyboard into one housing.
- One card reader or flexible disk drive for loading the controlware program. The card reader may also be used for submitting punched-card data to the host system for online processing. When a tape unit is provided, punched-card data may be read by the card reader (in an offline mode) and recorded on magnetic tape.
- One printer unit for printing the processed data returned from the system (online operation) and for performing offline card-to-print, and, where provided, tape-to-print and diskette-to-print operations.

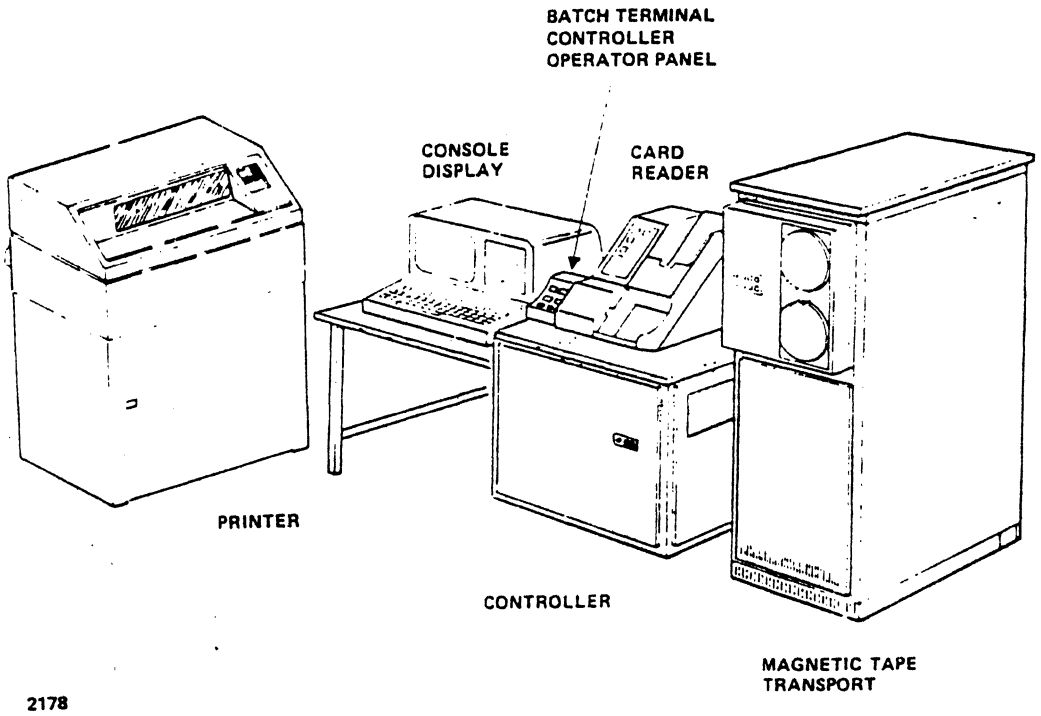

Figure 1-2. Typical CYBER 18-5M Batch Terminal

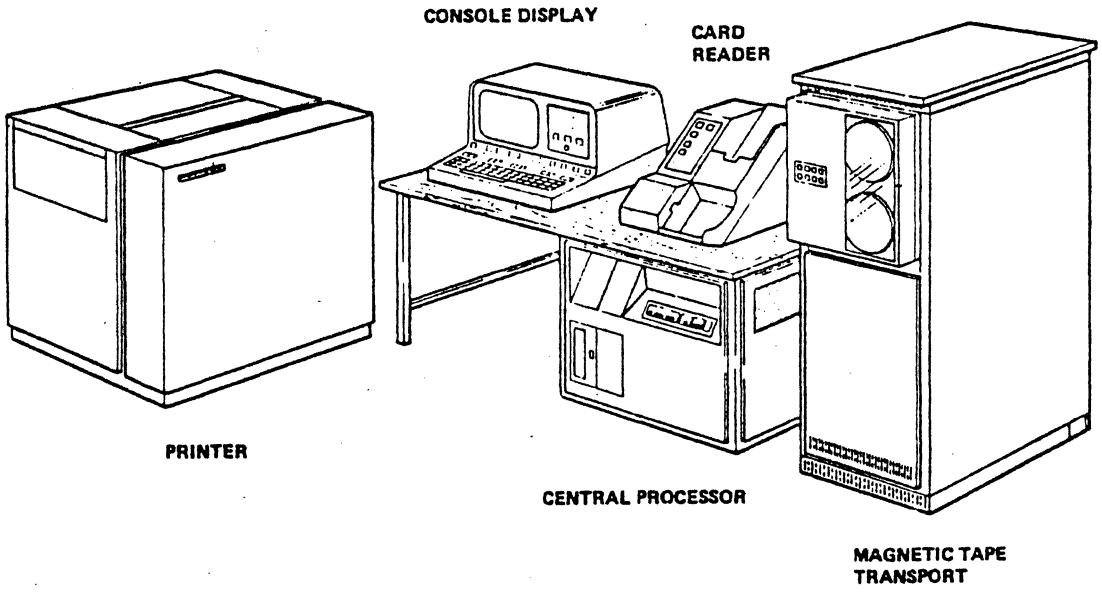

Figure 1-3. Typical CYBER 18-10M/20 System

- One CR/LP/CLA (card reader/line printer/communication line adapter) port for online data transmission. Normal data rates range from 2000 to 9600 bits per second.

- One micromemory board; on CPUs with the micromemory option, data rates up to 19.2K bits per second are supported. The micromemory option is only available on CYBER 18-10M/20 CPUs.

- When provided, magnetic tape units may be used as an extension of the card reader or line printer.

- A punched-card deck or flexible disk containing the controlware program for the HASP workstation.

Magnetic tape units expand the capability of the HASP workstation to include card-to-tape, diskette-to-tape, tape-to-print, and tape-to-tape operations. Figure 1-4 shows the configuration variations available from Control Data. The modem block on the diagram represents the unit that couples the terminal to the telephone transmission lines. The modem can be supplied by CDC, by the user, or by the commercial carrier leasing the transmission lines. The modem must conform to either EIA RS232-C or CCITT V.24.

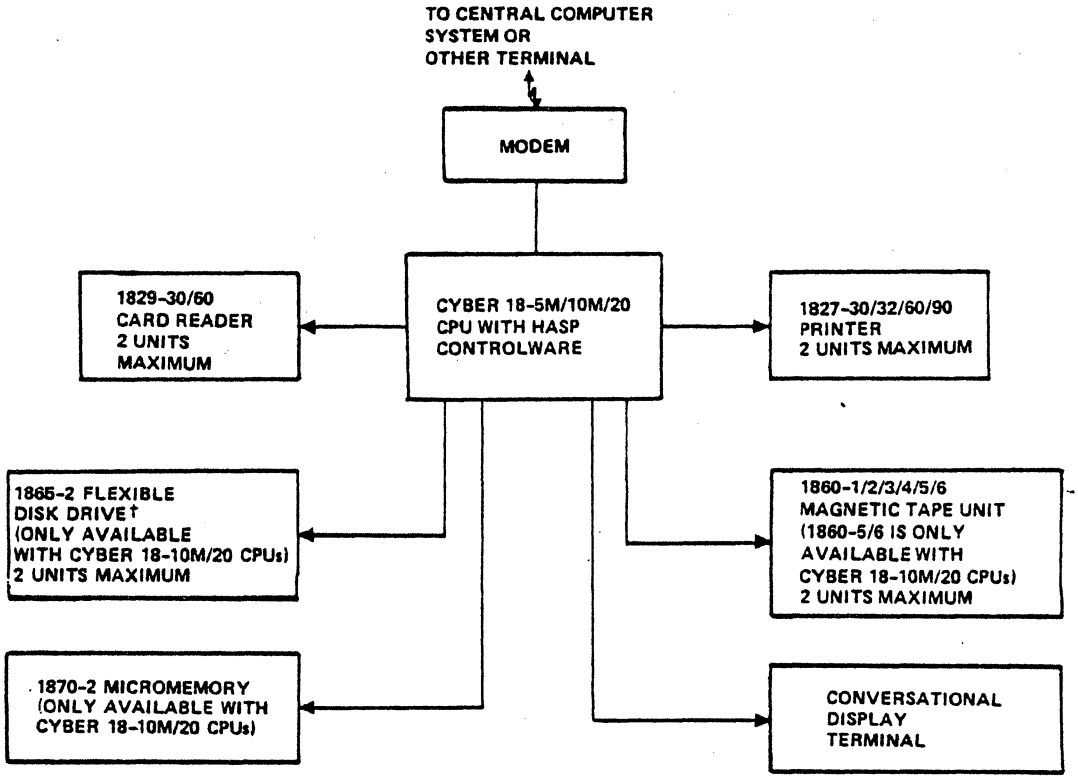

Figure 1-4. Block Diagram of Optional HASP Workstation Equipment

The minimum and maximum equipment configurations supported by the workstation are listed in table 1-1. HASP RJE workstation systems may be configured to support any peripheral complements within the minimum and maximum equipment configurations.

TABLE 1-1. HASP HARDWARE REQUIREMENTS

No. of Units		Description
Min	Max	
1	1	CYBER 18-5M/10M/20 CPU
1	1	64K byte memory (32K 16-bit word memory)
1	1	Conversational display terminal (CDT)
1	1	CLA port (CR/LP/CLA)
0	1	Micromemory board (only available on the CYBER 18-10M/20 CPUs)
1	6	Input streams
		Min Max Type
		0 2 Card reader
		0 2 Flexible disk drive (CYBER 18-10M/20 only)
		0 2 NRZI or phase encode† magnetic tape drive
1	4	Output (list and punch) streams
		Min Max Type
		0 2 Line printer (list stream)
		0 2 NRZI or phase encode† magnetic tape drive (list or punch stream)

†Phase encode magnetic tape drives are only available on CYBER 18-10M/20 processors.

HASP WORKSTATION CPU

The HASP workstation CPU, shown in figures 1-5 and 1-6, is a parallel-mode, stored-program, digital processor that coordinates communication between the conversational display terminal, card reader, flexible disk drive, line printer, and, where provided, magnetic tape unit(s). The CYBER 18-5M operators panel sits on top of a desk-like cabinet. The CYBER 18-10M/20 operators panel is located on the front of the controller cabinet. Upon command from the operator panel, the workstation controlware loads into the CPU's memory via the card reader or flexible disk drive.

FLEXIBLE DISK DRIVE

The CYBER 18-10M/20 controller is delivered with one or two flexible disk drives (FDDs) installed in the cabinet (figure 1-6). The first drive is designated drive 0; it is always mounted on the left drive slot, as you face the CPU. The second drive, if present, is designated drive 1 and is mounted in the right drive slot. The HASP workstation accepts inputs from either drive on a two-drive system.

The flexible disk drive controls and indicators are located on the processor cabinet operators panel.

CONVERSATIONAL DISPLAY TERMINAL

Three conversational display terminals are available with the HASP workstation: the 1811-1, 1811-2, and the 722-10. The 1811 models consist of separate display and keyboard units, and the 722 model integrates the display and keyboard into one unit.

Each display is a solid-state, CRT video display that, together with the keyboard, provides for interaction between the controlware and the terminal operator. As the keyboard data entry keys are pressed, the character for that key appears on the display screen. The terminal interacts with the operator by using the display to announce terminal status messages and to inform the operator of certain equipment malfunctions and other operational conditions.

During normal operation, the cursor (blinking underline) indicates where the next character entry will be displayed. As each data entry key is pressed, the character for that key appears on the screen at the present cursor position, erasing any character previously at that location. The cursor then advances one character position to the right. When the cursor reaches the end of a line, it moves to the first character position of the next line down. The HASP terminal normally operates best in scroll mode. As the cursor returns, each line of text moves one line up the screen. Thus, new lines are generated at the bottom of the display and scrolled up and off the screen.

The characteristics of each of these terminals are described in the following paragraphs.

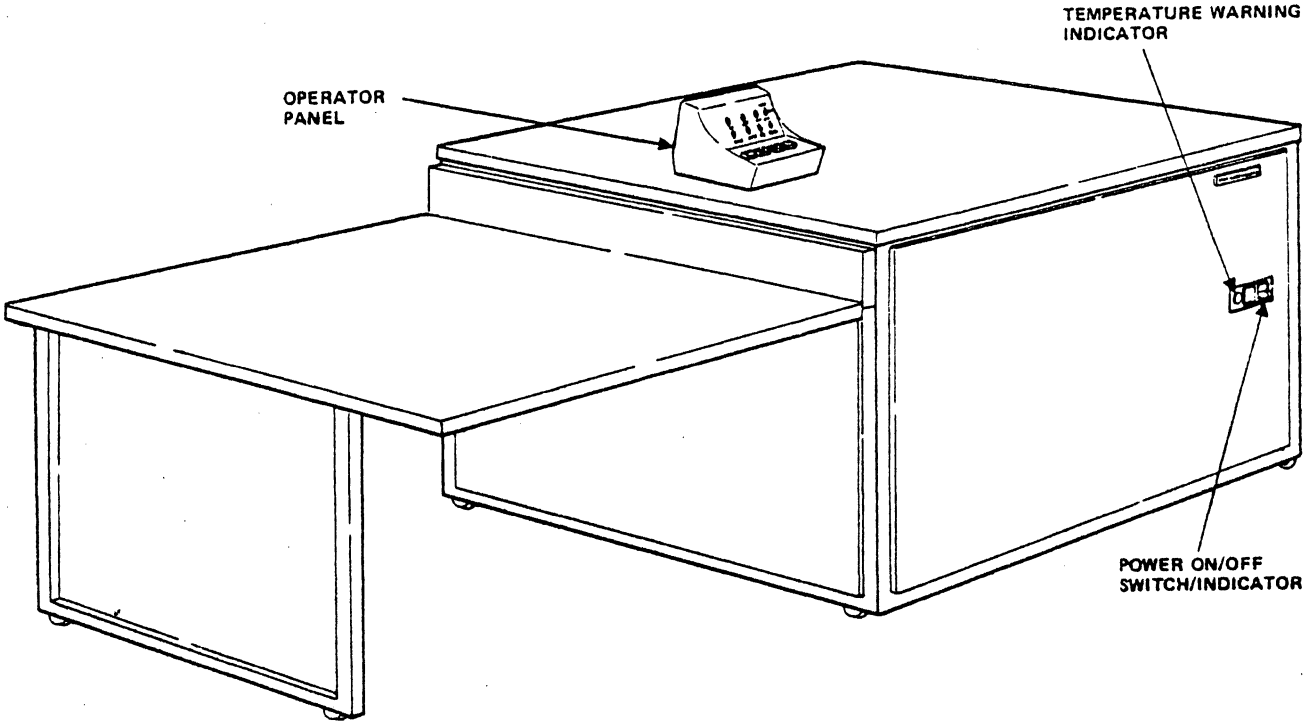

Figure 1-5. CYBER 18-5M Batch Terminal Controller

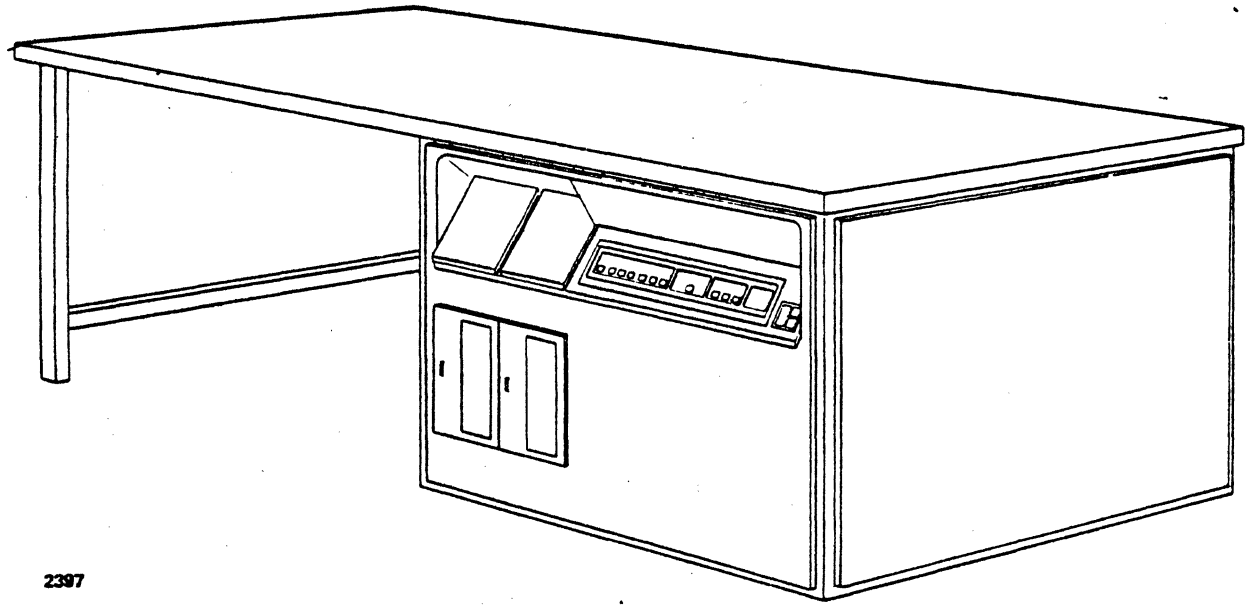

Figure 1-6. CYBER 18-10M/20 Processor Cabinet and Operators Panel

1811-1 Console Display

The 1811-1 display, shown in figure 1-7, may be attached to the keyboard or located within the length of the interconnecting cable (3 feet or 1 meter).

The 1811-1 display has the following features:

- 12-inch (31-millimeter) diagonal CRT screen
- 1920 characters (24 lines by 80 characters)
- Seven- by nine-dot matrix character
- Bonded nonglare faceplate
- White characters on dark background
- Operator-adjustable display brightness
- Audible alarm at seventy-third character and last line of page
- Blinking underline cursor
- Displayable control codes
- Self-test capability

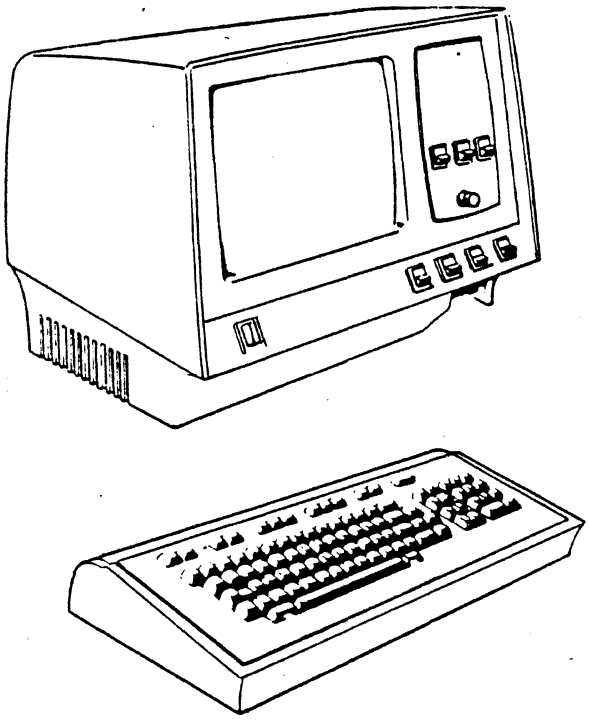

Figure 1-7. 1811-1 Display and Keyboard

1811-1 Keyboard

The silent, electronic 95-key keyboard (figure 1-7) of the 1811-1 includes a standard typewriter keyboard, an 11-key adding machine cluster, keys to control the display cursor, and special function keys. Not all keys are used in every application.

Operating a data entry key results in that character appearing on the display screen. Operating a cursor positioning key results in movement of the display cursor. When the REPEAT key is pressed, all data entry keys and cursor positioning keys can repeat at the rate of 10 characters per second.

A 3-foot (1-meter) data cable connects the keyboard and the display, permitting separate orientation of the keyboard and the display for the operator's convenience.

The 1811-1 keyboard has the following features:

- Detachable with 3-foot (1-meter) extension cable
- Typewriter layout
- Generates 64 ASCII characters plus 32 control codes
- Transmission control keys
- Cursor controls
- All keys repeatable using REPEAT key
- Four deep-dished keys to aid the operator in locating keys by touch alone (J, K, and L on the typewriter keyboard, and 5 on the adding machine cluster)
- Keyboard lockout feature
- Adding machine cluster

1811-2 Console Display

The 1811-2 console display (figure 1-8) may be attached to the keyboard or located within the length of the 3-foot (1-meter) interconnecting cable.

The 1811-2 console display has the following features:

- 12-inch (31-millimeter) diagonal CRT screen
- 1920 characters (24 lines by 80)
- Seven- by nine-dot matrix character
- Uppercase/lowercase letters (uppercase selected for batch terminal)
- Bonded nonglare faceplace
- White characters on dark background
- Operator-adjustable display brightness
- Blinking underline cursor

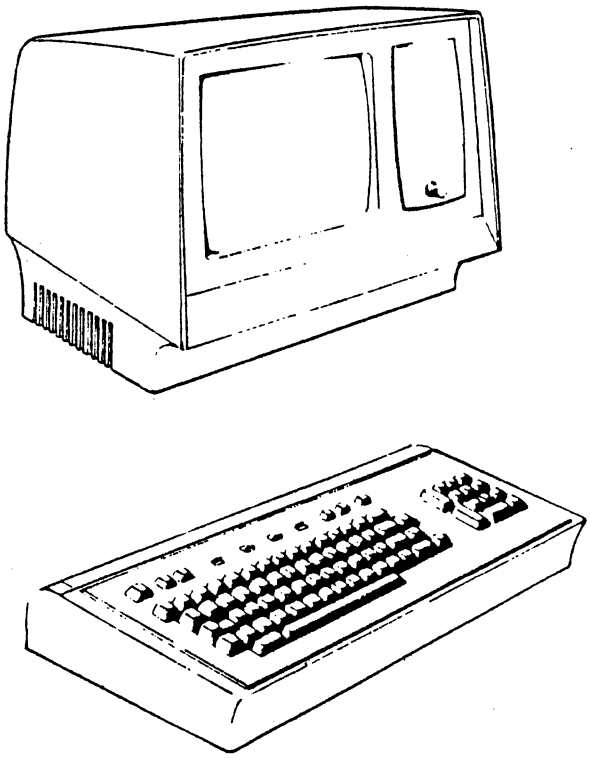

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Figure 1-8. 1811-2 Display and Keyboard

1811-2 Keyboard

The silent, electronic 80-key keyboard (figure 1-8) of the 1811-2 includes a standard typewriter keyboard, an 11-key adding machine cluster, keys to control the display cursor, and special function keys. Not all keys are used in every application.

Operating a data entry key results in that character appearing on the display screen. Operating a cursor positioning key results in movement of the display cursor. When the REPEAT key is pressed, all data entry keys and cursor positioning keys can repeat at the rate of 10 characters per second.

The 1811-2 keyboard has the following features:

- Detachable with 3-foot (1-meter) extension cable
- Typewriter layout
- Generates 64 ASCII characters plus 32 control codes
- Cursor controls
- All keys repeatable using REPEAT key
- Four deep-dished keys to aid the operator in locating keys by touch alone (J, K, and L on the typewriter keyboard, and 5 on the adding machine cluster)
- Keyboard lockout feature
- Adding machine cluster

722-10 Conversational Display Terminal

The display and keyboard modules of the 722-10 display terminal (figure 1-9) are described below.

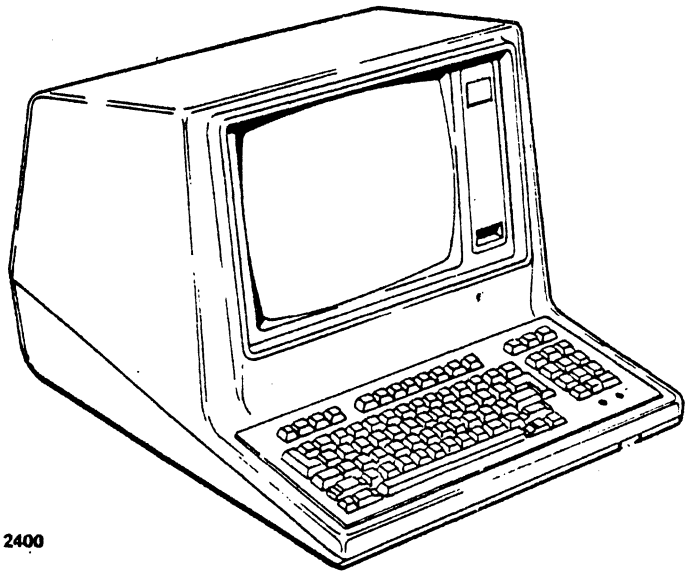

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Figure 1-9. 722-10 Display Terminal

Display Module

The 722-10 console display has the following features:

- 12-inch (31-millimeter) diagonal CRT screen
- 1920 characters (24 lines by 80 characters)
- Eight- by ten-dot matrix character
- Uppercase/lowercase letters
- Bonded nonglare faceplate
- White characters on dark background
- Operator-adjustable display brightness
- Audible alarm at seventy-third character and last line of page
- Blinking underline cursor
- Self-test capability

Keyboard Module

The silent, electronic 85-key keyboard includes a 58-key standard typewriter keyboard, a 12-key adding machine cluster, and special function keys. Not all keys are used in every application.

Operating a data entry key results in that character appearing on the display screen. Operating a cursor positioning key results in movement of the display cursor. Activating the REPEAT key enables all data entry keys and cursor positioning keys to repeat at the rate of 12 to 16 characters per second in local mode or at a rate not greater than the communications data rate in online mode.

The 722-10 keyboard has the following features:

- Typewriter layout
- Generates 128 discrete codes: 95 alphanumeric and 33 control codes
- Cursor controls
- All keys repeatable using REPEAT key
- Keyboard lockout feature
- Adding machine cluster

1829-30/60 CARD READER

The card reader, shown in figure 1-10, uses a reflected light technique to sense the presence or absence of punched holes in a card. For this reason, the cards used by the reader must be of a light-reflective color on the back (printed) side, and must not be printed on the back or marked on the front side with inks that can bleed through to the back. Other than these restrictions, the cards are standard, 80-column punched cards.

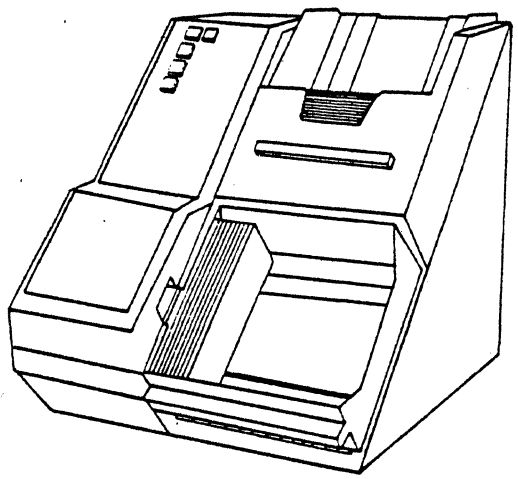


Figure 1-10. 1827-30/60 Card Reader

To operate the card reader, the operator places the deck of cards to be read into the hopper. Card reading is initiated by pressing the card reader RESET indicator/switch. As cards are read, they are pulled one at a time from the bottom of the deck in the hopper and are fed down through the read station, which is under the control panel. Once a card is read, it is moved into the card stacker in a vertical position. Card reading may continue until either the hopper is empty or the card stacker is full. The hopper and the stacker each hold 1000 cards. Cards may be added to the hopper during reader operation, providing there are at least 100 cards remaining in the hopper. Cards may also be removed from the stacker area during reader operation.

The card reader has the following features:

- Choice of 300- or 600-card-per-minute reader
- Reads standard 80-column cards
- Uses reflective light technique
- Dynamic read checking and error reporting
- Hopper and stacker capacity of 1000 cards each
- Hopper empty and stacker full sensing

1827-30 LINE PRINTER

The 1827-30 line printer (figure 1-11) uses the standard ASCII 64-character subset for printing data. Maximum printing speed is 300 lines per minute. Maximum line length is 136 characters.

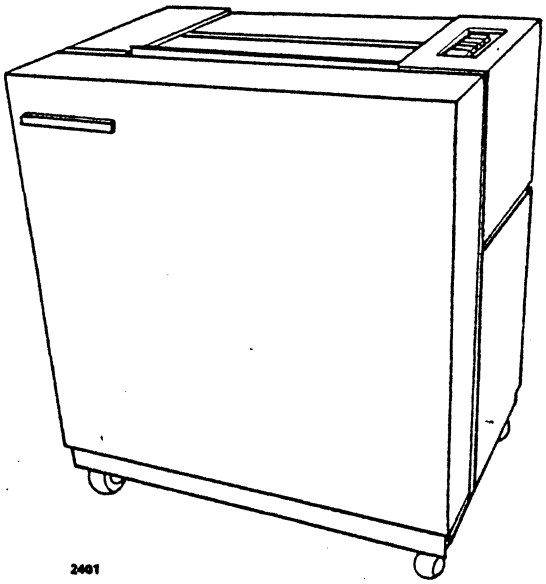


Figure 1-11. 1827-30 Line Printer

The principal tasks in operating the line printer are to make the printer ready for operation (load paper, power on, etc.) and to monitor it periodically during operation to ensure that it is working properly. Once the printer is ready, online or offline operation is initiated by the terminal operator via an entry on the keyboard.

The 1827-30 line printer has the following features:

- 300 line-per-minute capability
- 136 characters per line (maximum)
- Horizontal spacing of 10 characters per inch
- Selectable vertical spacing of six or eight lines per inch

- 64-character (ASCII) code set
- Operator adjustment
  - Horizontal forms positioning
  - Vertical forms vernier adjustment
  - Character phasing control
- 12-channel vertical format control via punched format tape
- Quietized cabinet

1827-32/60/90 LINE PRINTER

The 1827-32/60/90 line printer, shown in figure 1-12, uses the standard ASCII 64-character subset for printing data. A microprocessor-based format tape reader reads the format control tape once and saves the format tape information in a buffer. The buffer is used during printing for format control.

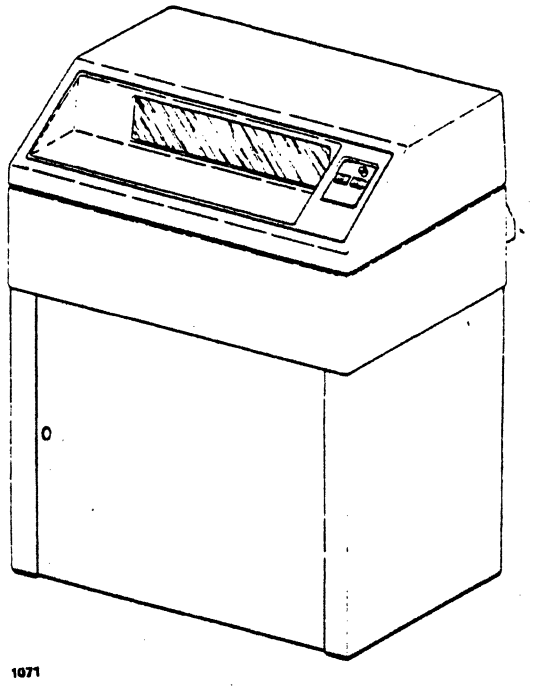


Figure 1-12. 1827-32/60/90 Line Printer

The 1827 line printer has the following features:

- Back printing, impact, two-position PBS band printer
- 300, 600, or 900 lines per minute (1827-32, -60, or -90 respectively)
- 136 characters per line (maximum)
- Horizontal spacing of 10 characters per inch
- Selectable vertical spacing of six or eight lines per inch
- 64-character ASCII code set
- Operator adjustment
  - Horizontal forms positioning
  - Vertical forms vernier adjustment
  - Character phasing control
- 12-channel vertical format control via punched format tape
- A microprocessor-based format tape reader
- Quietized cabinet

MAGNETIC TAPE TRANSPORT

The magnetic tape transport (figure 1-13) records data for later transmission to the central computer system (or another terminal), or stores online data for later output on the line printer. When more than one tape unit is provided, data may be transferred between tape units. The operator controls the magnetic tape unit from the conversational display terminal.

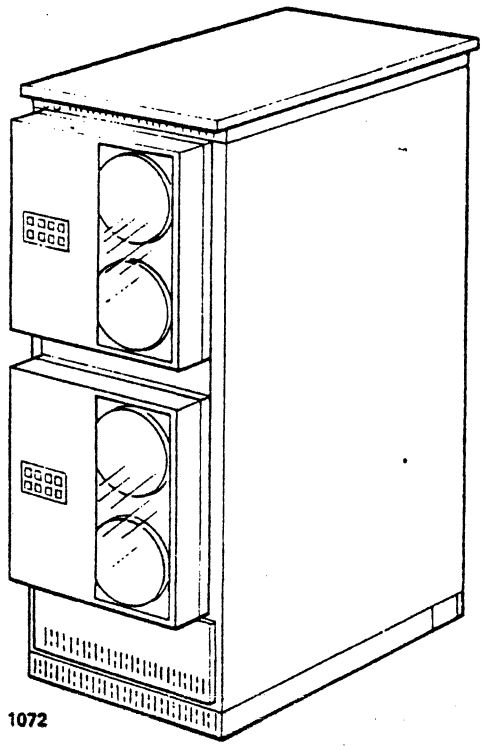


Figure 1-13. Magnetic Tape Unit

When provided, the optional magnetic tape transports may be either seven- or nine-track units. The tape transports operate at a maximum transfer rate of 25 inches (635 mm) per second (ips) recording at 800 bits per inch (bpi) for NRZI, and at a transfer rate of 50 ips and a recording density of 1600 bpi for phase encode recording. Only the 1850-5/6 magnetic tape transports are capable of phase encode recording; they are only available on CYBER 18-10M/20 processors.

The magnetic tape transports have the following features:

- Choice of seven- or nine-track transports
- Single-capstan NRZI ANSI or dual-mode phase encode NRZI compatible
- Accepts 10-1/2-inch (267 mm) ANSI standard tape supply reel or smaller
- Tape speed of 25 inches (635 mm) per second at 800 bpi (1860-1/2/3/4) and 50 ips at 1600 bpi (1860-5/6)
- Rewind time of 180 to 192 seconds for a 2400-foot (731.5-meter) reel
- Recording density of 800 bpi (NRZI), or 1600 bpi (phase encode). Phase encode tape units are only available on the CYBER 18-10M/20 CPUs.

DIAGNOSTICS

Peripheral diagnostics run under the Operational Diagnostic System (ODS) of the HASP workstation controller. Diagnostics are provided for the card reader, line printer, conversational display terminal and magnetic tape units. Command, memory, and control tests are provided for the HASP workstation controller.

PERFORMANCE LIMITATIONS

Peripheral equipment operating speeds depend on the inherent capability of the equipment, and are directly affected by the throughput capabilities of the communications channel, turnaround rates, overhead, error rates, error detecting systems, and the use of compression and decompression. Therefore, transmission throughput data rates are not quoted for this product. Evaluating the performance of an individual piece of equipment requires the consideration of all the involved factors. The HASP controlware performs all necessary checks, then transmits and receives information according to its hardware capabilities.

HASP WORKSTATION COMMUNICATIONS 2

This section describes HASP workstation communications. The description includes a definition of multileaving, the byte formats for a typical multileaving message, and the control message blocks used in HASP communications.

MULTILEAVING

Multileaving is a technique used when communication between computers requires the use of two or more input and/or output devices. The HASP multileaving controlware interleaves the input from one or more devices, transmits the data to a host processor, sorts the return data transmission, and outputs the data to one or more output devices. Multileaving is the fully synchronized, pseudo-simultaneous, bidirectional transmission of a variable number of data streams between two or more computers utilizing binary synchronous communication (BSC) facilities.

MESSAGE FORMAT

Messages are transmitted and received by the workstation in data blocks consisting of 8-bit bytes. Each byte contains eight bits of data; parity bits are not used. A separate block check character (BCC) is used for parity checking. The BCC is determined by cyclic redundancy checking (CRC), described later in this section. Figure 2-1 shows a typical multileaved message format. The structure and the control characters used in the message are described below.

MULTILEAVING MESSAGE STRUCTURE

The HASP controlware bundles data with record-keeping and control information, then transmits it to a host processor. The following discussion of a typical HASP multileaved data transmission begins with the nucleus of the transmission, data, and describes how the complete transmission is assembled around the data.

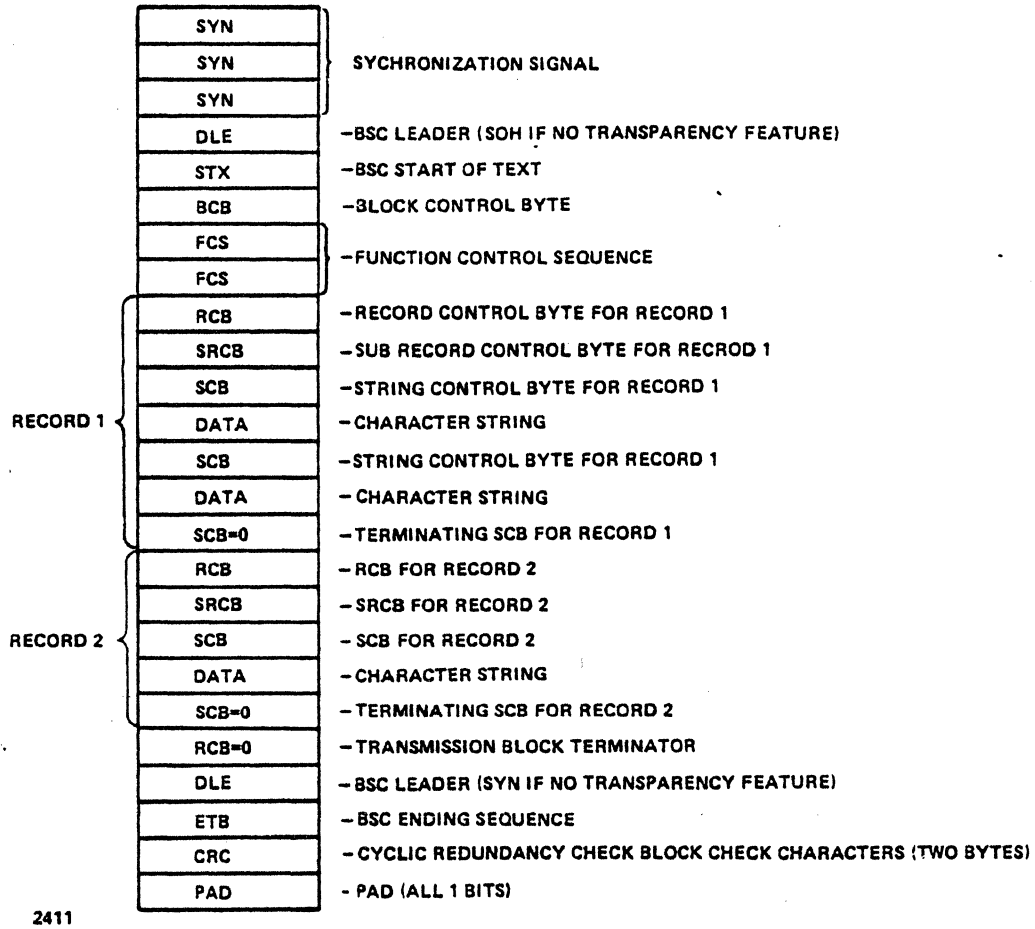


Figure 2-1. Typical Multileaving Transmission Block

Character String

The basic element for multileaved transmission is the character string. One or more character strings are formed from the smallest external element of transmission - the physical record. These physical records are inputs to the multileaving protocol and may be any of the classic record types (card images, printed lines, tape records, and so forth). For efficiency in transmission, each of these data records is compressed to a series of character strings of two basic types:

A. A variable-length series of nonidentical characters

B. A variable number of identical characters

String Control Byte (SCB)

An 8-bit control field, termed a string control byte (SCB), precedes each character string to identify the type and length of the string. Thus, a string (type A, above) is represented by a specific SCB containing the string length followed by the nonduplicate characters.

A string of consecutive, duplicate, nonblank characters (type B, above) can be represented by a different SCB followed by a single character. The SCB indicates the duplication count and the character immediately following the SCB indicates the character to be duplicated.

Because of the frequent occurrence of a series of blank characters, a special case is made for a type B transmission when the duplicate character is a blank. In the case of an all-blank character string, only an SCB is required to indicate both the type and number of blank characters.

A special terminating SCB is utilized to delimit character strings that compose the original physical record.

A data record to be transmitted is therefore segmented by the transmitting program into the optimum number of character strings, to take full advantage of the identical character compression. The receiving program reconstructs (expands) the original record for processing.

Record Control Byte (RCB)

So that multiple physical data records of various types may be multileaved in a single transmission block (see figure 2-1), an additional 8-bit control field, representing the original physical record, precedes the group of character strings. This field is the record control byte (RCB) and it identifies the general type and function of the physical record (input stream, print stream, data set, and so forth).

A particular RCB type has been designated to allow the passage of control information, in the form of a control record, between the conversing systems. To provide for simultaneous transmission of similar functions (for example, multiple card reader input streams), a stream identification code is included in all RCBs.

Subrecord Control Byte (SRCB)

A second 8-bit control field, the subrecord control byte (SRCB), is included immediately following the RCB. This field is used to supply additional information about the record to the receiving program. For example, in the transmission of data to be printed, the SRCB can be utilized for carriage control information.

For actual multileaving transmission, a variable number of records may be combined into a variable block size up to 400 characters as indicated previously, for example,

$$RCB_1, SRCB_1, SCB_1, SCB_2, \ldots SCB_n, RCB_2,$$
$$SRCB_2, SCB_1, \ldots \text{and so forth}$$

Function Control Sequence (FCS)

The multileaving protocol allows two computers, or a computer and a terminal, to exchange transmission blocks that contain multiple data streams in an interleaved fashion. For optimum use of this capability, however, the system must be able to control the flow of a particular data stream while continuing normal transmission of all others. This requirement becomes obvious for the case of the simultaneous transmission of two data streams to a computer, or terminal, for immediate transcription to physical input/output (I/O) devices of different speeds (such as two print streams). To provide for the metering of the flow of individual data streams, a function control sequence (FCS) is included in each HASP multileaved transmission block.

The FCS is a sequence of bits, each of which corresponds to a particular transmission stream. The receiver of several data streams can temporarily suspend the transmission of a particular stream by setting the corresponding FCS bit to the off position (binary 0) in the next transmission back to the sender of that stream. The stream may subsequently be resumed by setting the bit to the ON position (binary 1).

Block Control Byte (BCB)

To allow detection of lost data, a block control byte (BCB) is added as the first character of each block transmitted. The BCB, in addition to control information, contains a modulo-16 block sequence count. This count is maintained and verified by both the sending and receiving systems to exercise positive control over lost or duplicated transmission blocks.

Control Characters

Control characters are used on both sides of the data and record-keeping bytes. The control characters are a part of the binary synchronous communications character set and consist of the SYN, DLE, STX, SOH, ENQ, ACK0, NAK, ETB, and PAD characters.

TRANSPARENCY

When transparent EBCDIC-coded text is transmitted, all control characters are treated as data characters unless they are preceded by a DLE (data link escape) control character. This allows all 256 possible binary code combinations of EBCDIC to be used as data. The DLE control code signals the receiver that the following character is to be translated as a control character. A transparent text block begins with a DLE STX character sequence and ends with a DLE ETB character sequence. For a DLE character to be treated as data, it must be preceded by another DLE character. In transparent text mode, the initial DLE characters are automatically added to the transmitted data stream and automatically deleted from the received data stream. The format of the transparent text block is shown below:

SYN	$32	Synchronization signal
SYN	$32	
SYN	$32	
DLE	$10	
STX	$02	Begin transparent text block
.		Data and string control bytes
.		
.		
DLE	$10	
ETB	$26	End transparent text block
CRC		Two bytes, dependent on transmission content
PAD	$FF	End of transmission

CONTROL CHARACTER AND MULTILEAVING CONTROL FIELD DESCRIPTIONS

The following description of the HASP control characters and fields follows the order of transmission illustrated in figure 2-1.

CONTROL CHARACTERS

SYN - Synchronous Idle

The SYN character (bit pattern $32) establishes and maintains synchronization and serves as a time fill in the absence of any data or other control characters. Two contiguous SYNs (SYN SYN) at the start of each transmission are referred to as the character-phase sync pattern.

SOH – Start of Header

The SOH character (bit pattern $01) precedes a block of heading characters. A heading consists of control information necessary for the system to process the text portion of the message. The SOH character is used when transparency is not a selected configuration option.

DLE - Data Link Escape

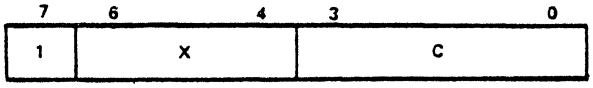
DLE is a control character (bit pattern $10) used exclusively to provide supplementary line control characters and transparent mode control characters. The sequences DLE STX and DLE ETB initiate and terminate transparent texts. In addition, other DLE control sequences (DLE ENQ, DLE DLE) provide active control characters within transparent text as required. For additional information, refer to the preceding discussion of transparency.

STX - Start of Text

The STX character (bit pattern $02) precedes a block of text characters. Text is that portion of a message treated as an entity to be transmitted through to the ultimate destination without change.

BLOCK CONTROL BYTE (BCB)

The BCB performs transmission block status and sequence count. The format is as follows:



Where:

bit 7 is 1 (must always be ON).

bits 6-4 (x) are the control information:

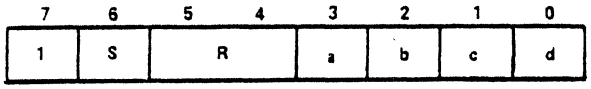
- 000 Normal block
- 001 Bypass sequence validation; ignore block count
- 010 Reset expected block sequence count to bits 3-0 (C)
- 011 Reserved
- 100 Reserved
- 101 Available for user modification
- 110 Available for user modification
- 111 Reserved for future expansion

bits 3-0 (C) are the modulo-16 block sequence count

FUNCTION CONTROL SEQUENCE (FCS)

The FCS is used to control the flow of individual function streams. The FCS is formatted in two bytes as follows:

FCS-1



Where:

bit 7 is 1 (must always on ON).

bit 6 (s) is as follows:

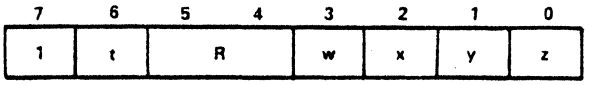
0 Normal state

1 Suspend all stream transmission (WAIT-A-BIT)

bits 5-4 (R) are 0, reserved for future expansion

bits 3-0 (abcd) are various function stream identifiers oriented only to the recipient

FCS-2



Where:

bit 7 is 1, must always be ON

bit 6 (t) is the remote console stream identifier

bits 5-4 (R) are 0, reserved for future expansion

bits 3-0 (wxyz) are various function stream identifiers oriented only to the recipient

Bits 3-0 of the FCS words (abcdwxyz) are combined to form the bit pattern describing the input and output streams that are currently enabled. Setting a bit to 1 enables the applicable stream as shown in table 2-1 below. Punch and list streams start from different ends of the abcdwxyz bit sequence; this allows for assignment of list and punch streams and eliminates the possibility of sending list data to an assigned punch device.

TABLE 2-1. FCS STREAM ASSIGNMENTS

	A	B	C	D	W	X	Y	Z
Input stream number	1	2	3	4	5	6	7	8
Punch stream number	8	7	6	5	4	3	2	1
List stream number	1	2	3	4	5	6	7	8

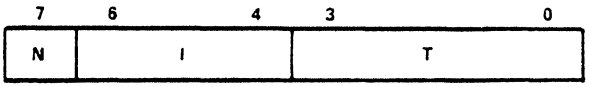
NOTE

A bit that is ON (1) indicates continue function transmission.

A bit that is OFF (0) indicates suspend function transmission.

RECORD CONTROL BYTE (RCB)

The RCB identifies each record type within a transmission block. The format is as follows:



Where:

bit 7 (N) is one of the following:

0 End of transmission block (bits 6-0 (IT) = 0)

1 All other RCBs

bits 6-4 (I) indicate the following:

If bits 3-0 (T) not = 0

I is a stream identifier used to identify streams of multiple, identical functions (such as multiple print streams to a multiple printer terminal)

If 3-0 (T) = 0

I is the control information (control record), where:

000 Reserved for future expansion

001 Request to initiate a function transmission (RCB for function contained in SRCB).

010 Permission to initiate a function transmission (RCB for function contained in SRCB)

011 Reserved

100 Reserved

101 Available for local modification

110 Bad BCB in the last block received

111 General control record (type indicated in SRCB)

bits 3-0 (T) are the record type identifier, as follows:

0000 Control

0001 Operator message display request

0010 Operator command

0011 Normal input record

0100 Print record

0101 Punch record

0110 Data set record (not supported)

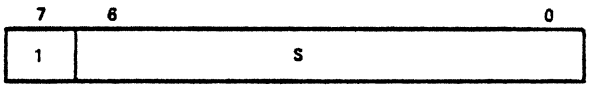
0111 Terminal message routing request (not supported)

1000 to 1100 Reserved for future expansion

1101 to 1111 Available for local modification

SUBRECORD CONTROL BYTE (SRCB)

The subrecord control byte is used to provide supplemental information about a record. It has the following format:



Where:

bit 7 is 1 (must always be ON).

bits 6-1 (S) are additional record information. Actual content is dependent on record type. Examples of typical SRCBs are listed below.

SRCB for General Control Record

This SRCB is used to identify the type of generalized control record. The format is as follows:

Where:

bits 7-0 are the EBCDIC characters as follows:

A Initial terminal sign-on ($C1)

B Final terminal sign-off

C Print initialization record

D Punch initialization record

E Input initialization record

F Data set transmission initialization

G System configuration status

H Diagnostic control record

I - R Reserved

S - Z Available for local modification

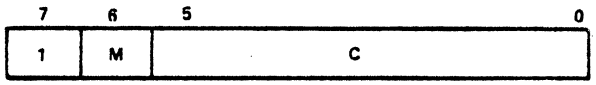
The bit in position 7 is set to one by default when the EBCDIC character in A equals $C1.

NOTE

Only type A is supported.

SRCB for Downline Print Records

The SRCB for downline print records provides additional information for print records. The format is as follows:



Where:

bit 7 is 1 (must always be ON).

bit 6 (M) is one of the following:

0 Normal carriage control
1 Reserved for future use

bits 5-0 (C) are carriage control information as follows:

1000nn Space immediately nn spaces

11nnnn Skip immediately to channel nnnn

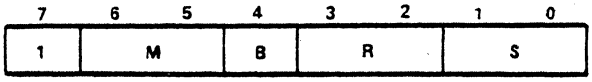
0000nn Space nn lines after print

01nnnn Skip to channel nnnn after print

000000 Suppress space

SRCB for Downline Punch Records

This SRCB is used to provide additional information for punch records. It has the following format:



Where:

bit 7 is 1 (must always be ON).

bits 6-5 (M) are one of the following:

00 SCB count units, 1†
01 SCB count units, 2
10 SCB count units, 4
11 Reserved

bit 4 (B) is one of the following:

0 Normal EBCDIC card image
1 Column binary card image

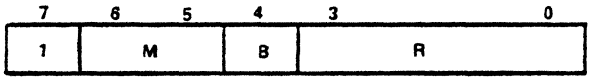
bits 3-2 (R) are 0, reserved for future expansion

bits 1-0 (S) are ignored

The M and S fields are ignored. Column binary (B = 1) is supported.

SRCB for Input (Upline) Record

This SRCB is used to provide additional information for input records. It has the following format:



Where:

bit 7 is 1 (and must always be ON).

bits 6-5 (M) are one of the following:

00 SCB count units, 1†
01 SCB count units, 2
10 SCB count units, 4
11 Reserved

bit 4 (B) is as follows:

0 Normal EBCDIC card image
1 Column binary card image

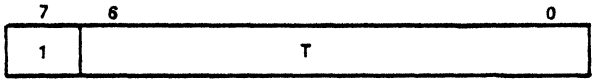
bits 3-0 (R) are 0, reserved for future expansion

Field M is ignored. Column binary (B = 1) is supported.

†Only SCB units equal to 1 are supported in this unit.

SRCB for Terminal Message Routing Record

This SRCB indicates the destination of a terminal message. It has the following format:



Where:

bit 7 is 1 (must always be ON)

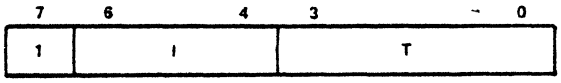
bits 6-0 (T) are the remote terminal number. When equal to 0, indicates broadcast to all remote systems.

NOTE

This SRCB is not supported.

SRCB for Request and Permission Records

This SRCB is used to provide additional information for request and permission to initiate transmission function blocks. It has the following format:



Where:

bit 7 is 1 (must always be ON).

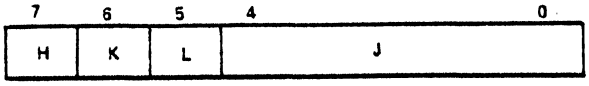
bits 6-4 (I) are a stream identifier used to identify streams of multiple, identical functions; such as multiple print streams to a multiple printer terminal.

bits 3-0 (T) are one of the following indicating stream type.

0011 Input stream
0100 List stream
0101 Punch stream

STRING CONTROL BYTE (SCB)

The SCB is used as a control field for data character strings. The format is as follows:



Where:

bit 7 (H) is one of the following:

- 0 End of record (KLJJJJJ=0). (This terminating SCB is generated on output as needed, and detected on input.)
- 1 All other SCBs

bit 6 (K) is one of the following:

- 0 Duplicate character string
- 1 Nonduplicate character string

bit 5 (L) is one of the following:

- 0 Duplicate character is blank.
- 1 Duplicate character is nonblank (and follows SCB).

bits 5-0 (LJ) are the character string length (up to 63 characters). Applicable if bit 6 equals 1.

bits 4-0 (J) are the duplication count (up to 31 characters). Applicable if bit 6 equals 0.

NOTE

If bits 6-0 (KLJ) = 0 and bit 7 = 1, SCB indicates that the record is continued in the next transmission block. (This SCB is not supported in this implementation.)

ETB - End of Transmission Block

The ETB character (bit pattern $26) indicates the end of a block of characters that started with SOH/STX or DLE/STX. The blocking structure is not necessarily related to the processing format. The block check character is sent immediately following ETB. ETB requires a reply indicating the status of the receiving station (ACK or NAK).

CRC

The block check character is based upon a CRC computation. A cyclic redundancy check is a polynomial division performed by both the transmitting and receiving stations using the numeric binary value of the message as a dividend, which is divided by a constant. The quotient is discarded, and the remainder serves as the 2-byte check character, which is transmitted as the block check character (BCC) immediately following an ETB character. The receiving station compares the transmitted remainder to its own computed remainder and, if they are equal, accepts the transmission.

PAD

A PAD character (bit pattern $FF) appears at the end of each transmission block to ensure that the last check character of a block is received in its entirety. The PAD character is an 8-bit byte of all ones.

ACK, NAK, AND ENQ CONTROL CHARACTERS

In addition to the binary synchronous text control characters listed above, the multileaving protocol utilizes three other BSC control characters - ACK, ENQ, and NAK.

ACK (two character bit pattern $1070) is utilized as an idle by all systems; it is transmitted every 2 seconds to maintain communication when data is not available for transmission.

NAK (bit pattern $3D) is used as the only negative response and indicates that the previous transmission was not successfully (correctly) received.

ENQ (bit pattern $2D) is transmitted to establish communication.

MULTILEAVING CONTROL BLOCKS

Four control blocks and six short blocks are used in conjunction with data blocks in the multileaving protocol. These are defined in the subsections below.

ACKNOWLEDGE BLOCK (ACK)

ACK is transmitted to indicate that the previous block was received without error, no data is available for transmission, and the receiver is ready to accept the next transmission block. Refer to table 2-2 for the block format.

TABLE 2-2. ACKNOWLEDGE BLOCK FORMAT

Code Description	8-Bit EBCDIC	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
DLE	10	0	0	0	1	0	0	0	0
ACK	70	0	1	1	1	0	0	0	0
PAD	FF	1	1	1	1	1	1	1	1

NEGATIVE ACKNOWLEDGE BLOCK (NAK)

NAK is transmitted to indicate that the previous block was received in error and should be retransmitted. NAK is never transmitted in response to a NAK block. Refer to table 2-3 for the block format.

TABLE 2-3. NEGATIVE ACKNOWLEDGE BLOCK

Code Description	8-Bit EBCDIC	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
NAK	3D	0	0	1	1	1	1	0	1
PAD	FF	1	1	1	1	1	1	1	1

ENQUIRY BLOCK (ENQ)

The enquiry block (ENQ) is transmitted to establish communications and to obtain a repeat transmission of the response to a message block if the original response was garbled or was not received when expected. Refer to table 2-4 for the block format.

TABLE 2-4. ENQUIRY BLOCK FORMAT

Code Description	8-Bit EBCDIC	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
SYN	32	0	0	1	1	0	0	1	0
SOH	01	0	0	0	0	0	0	0	1
ENQ	2D	0	0	1	0	1	1	0	1
PAD	FF	1	1	1	1	1	1	1	1

IDLE BLOCK

The idle block is used to maintain communication when there is no data to transmit. The idle block must be transmitted at least once every 2 seconds from each end to avoid a receive time-out. The format is the same as the ACK block format. Refer to table 2-2 for the format.

MULTILEAVING SHORT BLOCKS

Several special-case data blocks, called short blocks, are used in the multileaving protocol. They are defined below.

Operator Console Blocks

Console messages for the host processor are inserted in the transmission block, as they become available, in the same way as all other input streams. A request to initiate a transmission function is not required to transmit console records. The only restriction is that the WAIT-A-BIT is not set in the last FCS received.

NOTE

In some implementations no data records for any other stream are placed after a console record, hence the term short block. However, neither the protocol nor the IBM implementations require this. For efficiency, in this implementation data records may follow a console record in the same data block.

End of File Blocks (EOF)

Blocks containing EOFs are special in that no additional records from the same device stream are packed into the data block following an EOF. Data blocks that are terminated by an EOF contain a final record, as follows:

For card reader stream number 1

SYN = $32 SYN = $32 SYN = $32	Synchronization
DLE = $10	Begin transparency
STX = $02	Start of text
BCB = 1000xxxx	Normal block count = xxxx
FCS-1 = 1000abcd	Active stream identifiers = abcd
FCS-2 = 1t00wxyz	Active stream identifiers = twxyz
RCB = 10010011	Normal input stream number 1
SRCB = 10000000	SCB count units = 1, EBCDIC card images
SCB = 0	EOF
. . .	Records for a device stream other than stream 1 may be inserted here
RCB = 0	Transmission block terminator
DLE = $10	End of transparency
ETB = $26	DLE if transparent mode
CRC	Two bytes, dependent on message transmitted
PAD = $FF	End of transmission

To transmit more records for a device stream that contained an EOF, the request to initiate a function transmission must be transmitted again.

FCS Change Block

The FCS change block is transmitted when the status of one or more of the incoming streams must be changed and there is no data to transmit. The FCS change block is as follows:

SYN = $32 SYN = $32 SYN = $32	Synchronization signal
SOH	Begin non-transparent text transmission
STX = $02	Start of text
BCB = 1000xxxx	
FCS-1, FCS-2	Change in FCS-1 bits 3-0 or FCS-2 bits 6, 3-0
RCB = 0	Transmission block terminator
SYN = $32	End of a nontransparent transmission
ETB = $26	End of text
CRC	CRC check characters
PAD = $FF	End of transmission

Sign-On Blocks

A sign-on block transmitted to the central processor informs it that a terminal is signing on. The data portion of the sign-on block is the sign-on record. One format of the sign-on card is as follows:

SON,rr,ppp------ppp(CR)

Where:

rr is a one- or two-digit remote number assigned by host site personnel.

ppp - ppp is password and security information assigned by host site personnel.

NOTE

Although eight characters make up the specified maximum password entry under the protocol, some variations do exist in various host processors. For flexibility, therefore, this implementation allows the password entered to range up to 55 characters starting from column 25 as required by the host processor.

Other sign-on record formats may be used, depending on the host processor requirements. Those formats may be entered by using different forms of the sign-on command, as described in the operators guide.

The sign-on block format is as follows:

SYN = $32 SYN = $32 SYN = $32	Synchronization signal
DLE = $10	Start of transparent text block
STX = $02	Start of text
BCB = 1010xxxx	Reset count to xxxx
FCS-1, FCS-2	Depends on the terminal state; stored by the host to control downline streams
RCB = 11110000	General control record
SRCB = 11000001	Initial sign on (Character = A)
SIGN-ON record	Note that this record is not compressed
RCB = 0	Transmission block terminator
DLE = $10	End of transparent text block
ETB = $26	End of text
CRC	Two bytes of message-dependent information
PAD = $FF	

BCB Error Block

Every data block contains a BCB. In each BCB there is a block sequence count. The data blocks are transmitted in sequentially ascending order unless an ignore BCB or reset BCB is transmitted. If the block sequence count in the data block is not equal to the block sequence count expected by the receiving processor, a BCB error occurs.

If a BCB error occurs and the block sequence count is a duplicate of a block sequence count previously received (that is, the expected block sequence count minus the received block sequence count is less than or equal to 2) the data block is ignored and processing continues as if an ACK block had been received.

If a BCB error occurs and the block sequence count is not a duplicate block sequence count, as described in the previous paragraph, a BCB error block is transmitted. This informs the other processor that the BCB error occurred; the other end is to back up to the missing block or to transmit a reset BCB.

The format of the BCB error block is as follows:

SYN = $32 SYN = $32 SYN = $32	Synchronization signal
SOH = $01	Non-transparent block
STX = $02	Start of text
BCB = 1001xxxx	Ignore sequence checking, xxxx indicates received block sequence count
FCS-1, FCS-2	Two bytes stating active streams
RCB = 11100000	Bad BCB on last block
SRCB = 1000yyyy	yyyy is the expected block sequence count
SCB = 0	Terminating SCB (record terminator)
RCB = 00000000	Transmission block terminator
SYN = $10	End of nontransparent block
ETB = $26	End of text
CRC	Two bytes of message-dependent information
PAD = $FF	End of transmission

Request and Permission Block

Request and permission blocks are any data blocks that contain a request, or permission, to initiate a function transmission. Although the protocol does not restrict these data blocks, some implementations ignore all characters following the first request or permission to initiate in a data block. As a result, each request or permission to initiate is sent alone in a separate block.

However, this implementation accepts any combination of requests or permissions to initiate and data in a single block sent from the host site.

Example 1:

A request to initiate a transmission function for printer number 2 as transmitted by this implementation.

SYN = $32 SYN = $32 SYN = $32	Synchronization signal
DLE = $10	Begin transparent text block
STX = $02	Start of text
BCB = 1000xxxx	Normal block count = xxxx
FCS1 = 1000abcd	Normal state identifiers a,b,c,d
FCS2 = 1t00wxyz	Normal state identifiers t,w,x,y,z
RCB = 10010000	Request to initiate
SRCB = 10100100	List stream number 2
SCB = 0	Terminating SCB (record terminator)
RCB = 0	Terminating RCB (block terminator)
DLE = $10	End of transparent text block
ETB = $26	End of text
CRC	Two bytes of message-dependent information
PAD = $FF	End of transmission

Example 2:

A permission to initiate a transmission function for card punch number 1 as transmitted by this implementation.

SYN = $32 SYN = $32 SYN = $32	Synchronization signal
DLE = $10	Start of transparent text
STX = $02	Start of text
BCB = 1000xxxx	Normal block count = xxxx
FCS1 = 1000abcd	Normal state identifiers abcd
FCS2 = 1t00wxyz	Normal state identifiers t,w,x,y,z
RCB = 10100000	Permission to initiate
SRCB = 10010101	Card punch stream number 1
SCB = 0	Terminating SCB (record terminator)
RCB = 0	Terminating RCB (block terminator)
DLE = $10	End of transparent text block
ETB = $26	End of text
CRC	Two bytes of message-dependent information
PAD = $FF	End of transmission

MESSAGES, ERROR MESSAGES AND RECOVERY 3

The HASP workstation error messages are described in this section. Each of the HASP error messages is followed by a three-part series of information:

a. The command(s) that probably caused the error message

b. The action taken by the system

c. A suggested course of action to correct the situation

Several of these messages do not require any action by the operator; all recovery is handled by the system. However, the frequency of occurrence of these errors may indicate various problems. There are three types of frequencies:

- Regular - The errors are logged on the CRT at approximately 1- to 2-second intervals until the maximum number of allowed errors is logged and communications are terminated. Usually only one error type is involved (that is, RECEIVE TIME OUT, NAK, and so forth).
- Frequent - The errors occur at a frequency of about one error burst every 5 seconds to 15 minutes. The errors usually come in bursts that often include several error types. The bursts of errors generally occur randomly.
- Infrequent - No more than one error or burst occurs in every 15 minutes of operation. The errors may occur singly or in short bursts of mixed error types.

If regular errors occur during a sign-on attempt, it generally indicates one or several of the following conditions:

- Improper terminal setup - Make sure the terminal configuration matches the host's expected configuration.
- Improper communications line initialization - Check the communications line for obvious faults, such as not dialed in or modem power off; re-establish communications if necessary.
- Wrong sign-on parameters - Check the remote number and password on the sign-on card; make sure both are valid on the host system.
- Host system down - Establish communications when the host is up.
- Host software error - If communications are terminated without a sign-off (that is, hanging up the phone on the host from a dial-up terminal), certain host processors may not recognize the situation. When the communications line is initialized, the host will be transmitting NAKs due to an assumed time-out condition. This results in the display of several different errors on the console at regular intervals before sign on. Ignore these errors.
- Hardware failure - This may be a failure of the host, the communications line, or the remote equipment; take the appropriate action.
- Software incompatibility or failure - Take the appropriate corrective action.

If regular errors occur during communications, it is an indication that the communications line failed (for example, the host hung up, the local site hung up or there was a legitimate communications line hardware failure), or the host processor went down.

Frequent errors usually occur on dial-up lines over a switched network. They are caused by noise on the communications line, which reduces the efficiency of the line, due to retransmissions, and may result in the loss of data. Allow current operations to terminate, sign off, hang up the phone, and then repeat the line initialization procedure to get an alternate path to the host. If this does not succeed, or if dedicated communications lines are being used, contact the common carrier for repairs.

Infrequent errors are normal and occur occasionally on all systems. They are usually due to individual noise bursts, called line hits. Another source of this type of error is the peculiarity of some host processors, which for no apparent reason fail to respond within the required time period, resulting in a RECEIVE TIME OUT message. If this occurs occasionally, it is not serious and may be ignored.

HASP WORKSTATION MESSAGES

The HASP workstation messages and their descriptions are given below.

ATTEMPTED UNIT SWITCH TO BUSY LU ON STREAMx - IGNORED.

a. Unit switch from card reader.

b. The unit selected by the logical unit switch card is busy; the unit switch is ignored.

c. The selected switch unit must not be actively reading on another stream. Terminate input on that stream and check for the proper unit on the unit switch card. Rerun the job.

BAD BCB BLOCK ERROR

a. N/A

b. A bad block control byte (BCB) block was received from the host.

c. No operator action is required. All recovery is handled by the system.

BAD BCB RECEIVED

a. N/A

b. The host has sent a block with a BCB count out of step with the workstation's count. The system recovers, but one transmission block of data may have been lost.

c. Rerun all jobs currently being transmitted or received; if none are currently in progress, no action needs to be taken.

BLOCKS MISSED BY HASP - RECOVERY NOT POSSIBLE

a. N/A

b. The terminal has detected that the host missed a transmission block. This message usually occurs in conjunction with BAD BCB BLOCK ERROR and BAD BCB RECEIVED messages.

c. Rerun all jobs currently being transmitted or received; if none are currently in progress, no action needs to be taken.

BUFFER BUSY - COMMAND IGNORED

a. CMD,...message..., or C,...message..., or ...message.

b. The last message to the host had not been transmitted when this message was entered, resulting in a buffer busy condition. The previous message is transmitted intact. This condition occurs if multiple CMD, commands are linked in the same command string.

c. Re-enter the command.

COMMAND PROCESSED

a. All

b. The command has been successfully processed.

c. No operator action is required. All recovery is handled by the system.

COMMUNICATIONS TERMINATED

a. N/A

b. Communications for the specified terminal have been terminated as a result of a line failure, too many repeated errors, or the terminal being released.

c. If this occurred as a result of errors or line failure, communications must be re-established with the host to continue processing.

CRC ERROR

a. N/A

b. A CRC error was detected during data reception from the host. Recovery action is automatically taken by the system to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

DATA SENT ON DISABLED STREAM - IGNORED

a. N/A

b. Data has been transmitted on a data stream currently disabled under the protocol; the data has been ignored.

c. Refer this error to your CDC customer engineer.

DOWNED DEVICE RELEASED - OUTPUT WILL RESTART WHEN LU ASSIGNED

a. N/A

b. This message appears when an irrecoverable device failure is detected on magnetic tape. The assigned device has been released.

c. Output restarts automatically when a unit is assigned to this stream.

FORMAT ERROR

a. N/A

b. A format error was detected during data reception from the host. Recovery action is automatically taken by the system to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

HASP WS TERMINAL ID = x

a. N/A

b. The HASP terminal has been successfully loaded.

c. None

ILLEGAL BLOCK MAKE-UP ERROR

a. N/A

b. An illegal block makeup error was detected during data reception from the host. The system automatically takes recovery action to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

INSUFFICIENT BUFFER SPACE - CMD IGNORED

a. HWS, loader card

b. The required amount of memory space for this terminal configuration exceeds that available.

c. Redefine the terminal with fewer streams or smaller transmit and/or receive buffers.

INVALID COMMUN. CHANNEL LOGICAL UNIT - CMD IGNORED

a. HWS, loader card

b. Logical unit xx is not a valid communications channel.

c. Reload the system with a valid HWS, loader record of the format:

HWS,,i,l,p,rrrr,tttt

INVALID FORMAT TAPE CHANNEL SELECTED

a. N/A

b. The host has specified an invalid line printer format tape channel; 1 through 12 are valid.

c. Refer this error to your host site analyst.

INVALID PARAMETER - CMD IGNORED

a. All commands

b. A command parameter was detected to be not valid (that is, non-numeric data in a numeric field).

c. Check the command syntax and re-enter the command.

KEYBOARD LOCKED - COMMAND IGNORED

a. All commands

b. The system was still processing the last sequence of commands when this command string was entered. The system only accepts the next sequence of commands after the last sequence has been processed. The entire command string has been ignored.

c. Wait a moment, then re-enter the command string.

LIST ACTIVE - COMMAND IGNORED

a. LST,ii,oo,b

b. The list processor was busy performing another offline list operation.

c. Only one offline list process may be active on the system.

LIST COMPLETED

a. LST,ii,oo,b

b. The offline list is complete.

c. No operator action is required. All recovery is handled by the system.

LIST INACTIVE - COMMAND IGNORED

a. DLST

b. No off-line list operation in progress.

c. No operator action is required. All recovery is handled by the system.

LU x DEVICE TYPE INVALID FOR INPUT, LIST, PNCH, KYBD, DISPY STREAM - COMMAND IGNORED

a. LST,ii,oo,b
UNIT,Ii/u/Ll/v,Pp/w
ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
REW,lu
WEF,lu

b. Logical unit x does not have the appropriate read/write/punch capabilities needed for the desired unit assignment.

Stream Type	R/W	Device Types
Input	R	Card reader Magnetic tape (7- or 9-track) Flexible disk
List	W	Line printer Magnetic tape (9-track)
Punch	W	Magnetic tape (7- or 9-track) Line printer

c. Select a device with the appropriate capabilities and re-enter the command.

MISSING TEXT - COMMAND IGNORED

a. CMD, message ... or C, message ...

b. The message portion of the command was missing.

c. Re-enter the command with the desired message.

MOTION ABORTED

a. WEF,lu
ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
REW,lu

b. The motion request was aborted because the output device went NOT READY.

c. Re-execute the necessary commands. Magnetic tape should be rewound to load point before the command are re-entered.

MOTION ACTIVE

a. WEF,lu
ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
REW,lu

b. The motion command was rejected because another motion request is currently active. Only one motion request is allowed at a time.

c. Wait until the current request is completed, then reissue the command.

MOTION COMPLETED

a. WEF,lu
ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
REW,lu

b. The motion request has completed successfully.

c. No operator action is required. All recovery is handled by the system.

NAK

a. N/A

b. A NAK was received from the host. The system automatically takes recovery action to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

RECEIVE TIME OUT

a. N/A

b. The host processor did not give a response within the required 2-second time-out period. The system automatically takes recovery action to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

REMOTE SIGN-ON FAILED

a. N/A

b. Another remote processor attempted to sign on to this system, but the sign-on failed due to line errors, incorrect procedure, and so forth.

c. Notify the operator of the other remote system of the sign-on failure and attempt to sign on again. If the sign on still fails after repeated attempts, notify your CDC customer engineer.

REMOTE TERMINAL SIGNED-ON

a. N/A

b. A remote site has successfully signed on to the specified terminal.

c. None

REQUEST BY HOST TO SIGN-ON ACTIVE TERMINAL

a. N/A

b. The host has attempted to sign on to a terminal with which it is currently communicating. The sign-on is rejected by the simulator.

c. Refer this error to your host site analyst.

REQUEST TO XMIT BY HOST - LU NOT ASSIGNED LIST, PNCH STREAM x

a. N/A

b. The host processor has data to send on stream x and no unit is assigned to that stream. Transmission of the data from the host starts automatically when a logical unit is assigned to that stream.

c. Assign a unit to stream x.

SIGN-ON FAILED

a. N/A

b. The attempted sign-on failed, probably due to an incorrect remote number or an incorrect password. Another possibility is that the communications line failed or that communications were not properly established before to the sign-on attempt.

c. Check the conditions listed in b and correct the format of the sign-on card image.

STREAM x ACTIVE - COMMAND IGNORED

a. UNIT,Ii/u,LI/v,Pp/w
DAC,Ii

b. An attempt was made to assign a unit to an active stream.

c. For input streams, wait until the stream is inactive before reassigning units. For list or punch streams, either wait until the stream is inactive or issue a DAC,tx command and wait until the next EOF is transmitted. If the unit must be assigned immediately, issue a DRN,tx command to make the stream inactive, and then perform the unit assignment.

STREAM x INACTIVE - COMMAND IGNORED

a. DEL,x

b. Stream x is not active, so the command cannot be processed.

c. No operator action required. All recovery is handled by the system.

STREAM x INVALID LU FOR UNIT SWITCH - IGNORED

a. Logical unit switch from card reader

b. An attempted unit switch was performed on input stream x but the logical unit selected was invalid. The unit switch card is ignored.

c. Abort input on stream x, correct the unit switch, and rerun.

STREAM x READING ON SECONDARY UNIT - LU SWITCH IGNORED

a. Logical unit switch from card reader.

b. Stream x had already performed a logical unit switch and was reading on the secondary device when a logical unit switch card was encountered. This second switch card is ignored, as only one level of unit switching is supported.

c. Structure the reading sequence to avoid multilevel unit switching.

STREAM x UNDEFINED - COMMAND IGNORED

a. UNIT,Ii/u,Ll/v,Pp/w
DEL,i
DAC,tx
DRN,tx
RST,tx

b. The stream selected in the command is not defined on this terminal.

c. Select an available stream or re-configure the terminal as required.

STREAM WILL BE DE-ACTIVATED PENDING EOF

a. DAC,tx

b. The stream selected was active when the DAC,tx command was given. The deactivation of this stream occurs when the host transmits an EOF.

c. No operator action is required. All recovery is handled by the system.

STRING AREAS DEPLETED

a. N/A

b. No buffers were available during a transmission. The system automatically takes corrective action.

c. N/A

TERMINAL IDLE - COMMAND IGNORED

a. CMD, message ... or C, message ... or message ...

b. The terminal was not signed on to the host when this command was entered. The terminal must be active before a message may be sent to the host.

c. Wait until the terminal signs on to the host, then re-enter the command.

TERMINAL ABORTED - TOO MANY ERRORS

a. N/A

b. The same error has occurred on 16 consecutive transmissions. When this occurs, further communications are terminated and the terminal is reinitialized.

c. When the terminal has been reinitialized an attempt may be made to re-establish communications.

TERMINAL SIGNED ON

a. N/A

b. The sign-on attempt was successful.

c. No operator action is required. All recovery is handled by the system.

TEXT TOO LONG - COMMAND IGNORED

a. CMD, message... or C, message... or ...message...

b. The message was greater than 80 characters in length. No portion of the message was transmitted.

c. Re-enter the appropriately shortened command.

UNIT x BUSY - COMMAND IGNORED

a. ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
LST,ii,oo,b
UNIT,Ii/u,Ll/v,Pp/w
REW,lu
WEF,lu

b. Unit x is busy. It is not currently available for online or offline use due to the exclusivity of device use under HASP controlware.

c. If the device required is currently assigned to any I/O data stream, the device must be deactivated before it may be reassigned for on- or offline use. If the device is busy doing an offline list, wait until the list finishes or use DLST to abort it. If the device is busy doing tape motion, wait until the motion is completed or make the device not ready to abort the motion request.

UNIT x INVALID - COMMAND IGNORED

a. LST,ii,oo,b
UNIT,Ii/u/Ll/v,Pp/w
ADF,lu,nnnn
ADR,lu,nnnn
BSF,lu,nnnn
BSR,lu,nnnn
REW,lu
WEF,lu

b. Unit x is not a valid logical unit on this system.

c. Select an appropriate unit and re-enter the command.

UNKNOWN RESPONSE ERROR

a. N/A

b. An unknown response error was detected during a data reception from the host. The system automatically takes recovery action to avoid data loss.

c. No operator action is required. All recovery is handled by the system.

OF INPT, LIST, PNCH STREAMS REQUESTED OUT OF RANGE - CMD IGNORED

a. HWS, loader card

b. The i, l, or p parameter was greater than the maximum allowed. These maximums are six input streams, four list streams, and four punch streams.

c. Check the parameters on the HWS card and reload the firmware.

HARDWARE ERROR MESSAGES 4

The hardware error messages are of the following form:

device lu error message xx

Where:

device is the device type on which an error occurred:

Card reader
Line printer
Magnetic tape
Flexible disk
Device type unknown to the system

lu is the two-digit logical unit number of the unit that failed.

error message is the type of error that occurred:

Parity error
Device not available
Bad punch
Write not enabled
Not ready
End of tape
Stacker full
Hopper empty
I/O error

xx is a one- or two-digit error code:

3 Parity error, magnetic tape:

On input, this is a fatal error and operation is terminated.

On output, a noise record is written over the bad spot on the tape and output continues. The message is a warning only; no data is lost.

5 Device not available - The requested device is not connected to the system.

8 Bad punch - The last card read had an invalid Hollerith punch. Check the read mode and/or repunch and reread the cards.

13 Write not enabled - Output was requested on a magnetic tape without a write ring inserted. Insert a write ring and continue.

14 Not ready - The device is not ready; ready the device to continue I/O.

21 End of tape - The end of a magnetic tape reel was detected. Rewind and unload the tape. Mount the next tape and make it ready to continue I/O.

22 Stacker full - The card reader stacker is full. Remove the cards and ready the device to continue.

23 Hopper empty - The input hopper of the card reader was emptied, with EOF disabled on that device. To read more jobs, simply place them in the input hopper and ready the device. To terminate transmission, an EOF card must be read or the card reader must have EOF enabled.

Any other number I/O error - All other I/O errors are reported under this message. The error is considered catastrophic and the I/O operation is terminated.

COMMAND SUMMARIES A

HASP WORKSTATION COMMAND SUMMARY

The HASP workstation commands are summarized below.

COMMAND	EXPLANATION
CMD,command or C,command or command ...message...	Transmit keyboard command to the host processor (all unrecognized command strings are assumed to be host commands and are automatically transmitted to the host).
CRn,xx	The command to change card reader translation mode; CRn,xx where: n is 1 or 2 for card reader 1 or 2. xx is as follows: 26 CYBER 18 026 (ASCII 63) 29 CYBER 18 029 (ASCII 68) U6 UT200 026 U9 UT200 029 UM UT200 mixed mode EB EBCDIC
CRn,DE	Disable EOF on card reader n.
CRn,EE	Enable EOF on card reader n.
DAC,tn	Deactivate (release) the device on input or output stream type t (I, L or P) and stream number n.
DCT,tn	Disable the code translation on stream type t (I, L, or P) and stream number n.
DEL,i	Abort reading data from input stream i.
DLST	Abort the offline list operation.
DRN,tn	Drain buffers and halt the output stream type t (L or P) and stream number n.
ECT,tn	Enable code translation on stream type t (I, L, or P) and stream number n.
LPn,xx	The command to change the line printer translation mode; where: n is 1 or 2 for line printer 1 or 2. xx is the two-character mode: AS ASCII 64-character band EB EBCDIC band EX ASCII 96-character band
LST,ii,oo,b	The command to perform offline list from input device ii to output device oo, where b is the binary mode indicator.
MODE	Display the card reader/line printer translation mode status.
RST,tn	Restart the output on drained output stream type t (L or P) and stream number n.
SON,I	Enter the sign-on image from the terminal keyboard.
SON,rr, ppp...ppp	Sign on to the host processor with a remote number (rr) and password (ppp...ppp).
STAT	Display device assignments and terminal status.
TRN,t	Change transmission mode to transparency ON or OFF.
UNIT,Ii/u, Ll/v,Pp/w	Assign device logical units to input (I), list (L) and punch (P) devices. The variables i, l, and p are stream numbers. The variables a, v, and w are logical unit numbers.

MAGNETIC TAPE MOTION COMMAND SUMMARY

The magnetic tape motion commands are summarized below.

COMMAND	EXPLANATION
ADF,lu,.nnnn	Advance past nnnn file marks on unit lu.
ADR,lu,nnnn	Advance past nnnn records on unit lu.
BSF,lu,nnnn	Backspace past nnnn file marks on unit lu.
BSR,lu,nnnn	Backspace past nnnn records on unit lu.
REW,lu	Rewind unit lu.
WEF,lu	Write two EOF marks and backspace over the second to unit lu.

CHARACTER SETS AND TRANSMISSION CONTROL CHARACTERS

B

CARD READER CHARACTER SETS

The character sets available for reading on a card reader consist of the following:

Name	Description
26	CYBER 18 026 (ASCII 63)
29	CYBER 18 029 (ASCII 68)
U6	200 User Terminal 026
U9	200 User Terminal 029
UM	200 User Terminal Mixed Mode
EB	EBCDIC

TRANSMISSION CONTROL CHARACTERS

Transmission control characters are listed in table B-1.

TABLE B-1. TRANSMISSION CONTROL CHARACTERS

Character	Description	EBCDIC Code
PAD	Time fill	FF
SYN	Synchronous idle	32
ENQ	Enquiry (bid or solicit response)	2D
ACK 0 (two characters)	Positive acknowledge	10 70 (two characters)
NAK	Negative acknowledge	3D
STX	Start of text	02
ETB	End of text block	26
SOH	Start of header	01
DLE	Data link escape	10

TRANSMISSION CODE SET C

If data is being read in ASCII code (see table C-1), the input stream must be set to operate in translation mode. Each of the ASCII codes generated from the peripheral device is translated to a corresponding EBCDIC code (table C-2) based on table C-3. When reading from a card reader, while any of the ASCII translation modes can be used, it is recommended that reading be performed using 029 read mode to provide compatibility with IBM-oriented card decks.

All ASCII characters that are outside the range of the following table are converted to the EBCDIC code $4F for a vertical bar (|).

If the peripheral device is reading data in EBCDIC code, the input stream must be set to operate in no translation mode. In this case, the data is transmitted as read from the peripheral device.

TABLE C-1. ASCII CARD READER CHARACTER SETS

Punched Card Code	CYBER 18 026 (26)		CYBER 18 029 (29)		UT200 026 (U6)		UT200 029 (U9)		UT200 MIXED MODE (UM)	
	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII
No Punch	Space	20	Space	20	Space	20	Space	20	Space	20
1	1	31	1	31	1	31	1	31	1	31
2	2	32	2	32	2	32	2	32	2	32
3	3	33	3	33	3	33	3	33	3	33
4	4	34	4	34	4	34	4	34	4	34
5	5	35	5	35	5	35	5	35	5	35
6	6	36	6	36	6	36	6	36	6	36
7	7	37	7	37	7	37	7	37	7	37
8	8	38	8	38	8	38	8	38	8	38
9	9	39	9	39	9	39	9	39	9	39
8-2	&	26	:	3A	:	3A	:	3A	:	3A
8-3	=	3D	#	23	=	3D	#	23	=	3D
8-4	'	27	@	40	"	22	@	40	"	22
8-5	:	3A	'	27	@	40	'	27	"	22
8-6	>	3E	=	3D	%	25	=	3D	=	3D
8-7	"	22	"	22	[	5B	"	22	"	22

TABLE C-1. ASCII CARD READER CHARACTER SETS (Cont'd)

Punched Card Code	CYBER 18 026 (26)		CYBER 18 029 (29)		UT200 026 (U6)		UT200 029 (U9)		UT200 MIXED MODE (UM)	
	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII
0	0	30	0	30	0	30	0	30	0	30
0-1	/	2F	/	2F	/	2F	/	2F	/	2F
0-2	S	53	S	53	S	53	S	53	S	53
0-3	T	54	T	54	T	54	T	54	T	54
0-4	U	55	U	55	U	55	U	55	U	55
0-5	V	56	V	56	V	56	V	56	V	56
0-6	W	57	W	57	W	57	W	57	W	57
0-7	X	58	X	58	X	58	X	58	X	58
0-8	Y	59	Y	59	Y	59	Y	59	Y	59
0-9	Z	5A	Z	5A	Z	5A	Z	5A	Z	5A
0-8-2	\	5C	\	5C	\	5D	\	5C	\	5D
0-8-3	,	2C	,	2C	,	2C	,	2C	,	2C
0-8-4	(	28	%	25	(	28	%	25	(	28
0-8-5	%	25	_	5F	_	5F	_	5F	_	5F
0-8-6	_	5F		3E	#	23		3E	#	23
0-8-7	@	40	?	3F	&	26	?	3F	&	26
11	-	2D	-	2D	-	2D	-	2D	-	2D
11-1	J	4A	J	4A	J	4A	J	4A	J	4A
11-2	K	4B	K	4B	K	4B	K	4B	K	4B
11-3	L	4C	L	4C	L	4C	L	4C	L	4C
11-4	M	4D	M	4D	M	4D	M	4D	M	4D
11-5	N	4E	N	4E	N	4E	N	4E	N	4E
11-6	O	4F	O	4F	O	4F	O	4F	O	4F
11-7	P	50	P	50	P	50	P	50	P	50
11-8	Q	51	Q	51	Q	51	Q	51	Q	51
11-9	R	52	R	52	R	52	R	52	R	52
11-8-2	!	21	]	5D	!	21	]	5D	!	21

TABLE C-1. ASCII CARD READER CHARACTER SETS (Cont'd)

Punched Card Code	CYBER 18 026 (26)		CYBER 18 029 (29)		UT200 026 (U6)		UT200 029 (U9)		UT200 MIXED MODE (UM)	
	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII	Graphic	ASCII
11-8-3	$	24	$	24	$	24	$	24	$	24
11-8-4	*	2A	*	2A	*	2A	*	2A	*	2A
11-8-5	]	5D	)	29	'	27	)	29	)	29
11-8-6	;	3B	;	3B	?	3F	;	3B	?	3F
11-8-7	^	5E	^	5E	>	3E	^	5E	>	3E
12	+	2B	&	26	+	2B	&	26	+	2B
12-1	A	41	A	41	A	41	A	41	A	41
12-2	B	42	B	42	B	42	B	42	B	42
12-3	C	43	C	43	C	43	C	43	C	43
12-4	D	44	D	44	D	44	D	44	D	44
12-5	E	45	E	45	E	45	E	45	E	45
12-6	F	46	F	46	F	46	F	46	F	46
12-7	G	47	G	47	G	47	G	47	G	47
12-8	H	48	H	48	H	48	H	48	H	48
12-9	I	49	I	49	I	49	I	49	I	49
12-8-2	?	3F	[	5B	<	3C	[	5B	<	3C
12-8-3	.	2E	.	2E	.	2E	.	2E	.	2E
12-8-4	)	29		3C	)	29		3C	)	29
12-8-5	[	5B	(	28	\	5C	(	28	(	28
12-8-6	<	3C	+	2B	^	5E	+	2B	+	2B
12-8-7	#	23	!	21	;	3B	!	21	;	3B
11-0	}	7D	}	7D	!	21	!	21	!	21
12-0	{	7B	{	7B	<	3C		3C	<	3C
7-8-9		04		04		04		04		04
6-7-8-9		02		02		02		02		02
All holes (lace)		FF		FF		FF		FF		FF

TABLE C-2. EBCDIC CARD READER CHARACTER SET

Hex Code	Graphic/ Function	Punched Card Code	Hex Code	Graphic/ Function	Punched Card Code
00	NUL	12-0-1-8-9	20	DS	11-0-1-8-9
01	SOH	12-1-9	21	SOS	0-1-9
02	STX	12-2-9	22	FS	0-2-9
03	ETX	12-3-9	23		0-3-9
04	PF	12-4-9	24	BYP	0-4-9
05	HT	12-5-9	25	LF	0-5-9
06	LC	12-6-9	26	ETB	0-6-9
07	DEL	12-7-9	27	ESC	0-7-9
08	VT	12-0-8-9	28		0-8-9
09	RLF	12-1-8-9	29		0-1-8-9
0A	SMM	12-2-8-9	2A	SM	0-2-8-9
0B	VT	12-3-8-9	2B	CU2	0-3-8-9
0C	FF	12-4-8-9	2C		0-4-8-9
0D	CR	12-5-8-9	2D	ENQ	0-5-8-9
0E	SO	12-6-8-9	2E	ACK	0-6-8-9
0F	SI	12-7-8-9	2F	BEL	0-7-8-9
10	DLE	12-11-1-8-9	30		12-11-0-1-8-9
11	DCI	11-1-9	31		1-9
12	DC2	11-2-9	32	SYN	2-9
13	TM	11-3-9	33		3-9
14	RES	11-4-9	34	PN	4-9
15	NL	11-5-9	35	RS	5-9
16	BS	11-6-9	36	UC	6-9
17	IL	11-7-9	37	EOT	7-9
18	CAN	11-8-9	38		8-9
19	EM	11-1-8-9	39		1-8-9
1A	CC	11-2-8-9	3A		2-8-9
1B	CUI	11-3-8-9	3B	CU3	3-8-9
1C	IFS	11-4-8-9	3C	DC4	4-8-9
1D	IGS	11-5-8-9	3D	NAK	5-8-9
1E	IRS	11-6-8-9	3E		6-8-9
1F	IUS	11-7-8-9	3F	SUB	7-8-9

TABLE C-2. EBCDIC CARD READER CHARACTER SET (Cont'd)

Hex Code	Graphic/ Function	Punched Card Code	Hex Code	Graphic/ Function	Punched Card Code
40	Blank	No punches	60	-	11
41		12-0-1-9	61	/	0-1
42		12-0-2-9	62		11-0-2-9
43		12-0-3-9	63		11-0-3-9
44		12-0-4-9	64		11-0-4-9
45		12-0-5-9	65		11-0-5-9
46		12-0-6-9	66		11-0-6-9
47		12-0-7-9	67		11-0-7-9
48		12-0-8-9	68		11-0-8-9
49		12-1-8	69		0-1-8
4A	¢	12-2-8	6A	¦	0-2-8
4B	.	12-3-8	6B	,	0-3-8
4C	<	12-4-8	6C	%	0-4-8
4D	(	12-5-8	6D	_	0-5-8
4E	+	12-6-8	6E	>	0-6-8
4F	|	12-7-8	6F	?	0-7-8
50	&	12	70		12-11-0
51		12-11-1-9	71		12-11-0-1-9
52		12-11-2-9	72		12-11-0-2-9
53		12-11-3-9	73		12-11-0-3-9
54		12-11-4-9	74		12-11-0-4-9
55		12-11-5-9	75		12-11-0-5-9
56		12-11-6-9	76		12-11-0-6-9
57		12-11-7-9	77		12-11-0-7-9
58		12-11-8-9	78		12-11-0-8-9
59		11-1-8	79		1-8
5A	!	11-2-8	7A	:	2-8
5B	$	11-3-8	7B	#	3-8
5C	*	11-4-8	7C	@	4-8
5D	)	11-5-8	7D	'	5-8
5E	;	11-6-8	7E	=	6-8

TABLE C-2. EBCDIC CARD READER CHARACTER SET (Cont'd)

Hex Code	Graphic/ Function	Punched Card Code	Hex Code	Graphic/ Function	Punched Card Code
5F	¬	11-7-8	7F	"	7-8
80		12-0-1-8	A0		11-0-1-8
81	a	12-0-1	A1		11-0-1
82	b	12-0-2	A2	s	11-0-2
83	c	12-0-3	A3	t	11-0-3
84	d	12-0-4	A4	u	11-0-4
85	e	12-0-5	A5	v	11-0-5
86	f	12-0-6	A6	w	11-0-6
87	g	12-0-7	A7	x	11-0-7
88	h	12-0-8	A8	y	11-0-8
89	i	12-0-9	A9	z	11-0-9
8A		12-0-2-8	AA		11-0-2-8
8B		12-0-3-8	AB		11-0-3-8
8C		12-0-4-8	AC		11-0-4-8
8D		12-0-5-8	AD		11-0-5-8
8E		12-0-6-8	AE		11-0-6-8
8F		12-0-7-8	AF		11-0-7-8
90		12-11-1-8	B0		12-11-0-1-8
91	j	12-11-1	B1		12-11-0-1
92	k	12-11-2	B2		12-11-0-2
93	l	12-11-3	B3		12-11-0-3
94	m	12-11-4	B4		12-11-0-4
95	n	12-11-5	B5		12-11-0-5
96	o	12-11-6	B6		12-11-0-6
97	p	12-11-7	B7		12-11-0-7
98	q	12-11-8	B8		12-11-0-8
99	r	12-11-9	B9		12-11-0-9
9A		12-11-2-8	BA		12-11-0-2-8
9B		12-11-3-8	BB		12-11-0-3-8
9C		12-11-4-8	BC		12-11-0-4-8
9D		12-11-5-8	BD		12-11-0-5-8
9E		12-11-6-8	BE		12-11-0-6-8
9F		12-11-7-8	BF		12-11-0-7-8

TABLE C-2. EBCDIC CARD READER CHARACTER SET (Cont'd)

Hex Code	Graphic/ Function	Punched Card Code	Hex Code	Graphic/ Function	Punched Card Code
C0	{	12-0	E0	\	0-2-8
C1	A	12-1	E1		11-0-1-9
C2	B	12-2	E2	S	0-2
C3	C	12-3	E3	T	0-3
C4	D	12-4	E4	U	0-4
C5	E	12-5	E5	V	0-5
C6	F	12-6	E6	W	0-6
C7	G	12-7	E7	X	0-7
C8	H	12-8	E8	Y	0-8
C9	I	12-9	E9	Z	0-9
CA		12-0-2-8-9	EA		11-0-2-8-9
CB		12-0-3-8-9	EB		11-0-3-8-9
CC		12-0-4-8-9	EC		11-0-4-8-9
CD		12-0-5-8-9	ED		11-0-5-8-9
CE		12-0-6-8-9	EE		11-0-6-8-9
CF		12-0-7-8-9	EF		11-0-7-8-9
D0	}	11-0	F0	0	0
D1	J	11-1	F1	1	1
D2	K	11-2	F2	2	2
D3	L	11-3	F3	3	3
D4	M	11-4	F4	4	4
D5	N	11-5	F5	5	5
D6	O	11-6	F6	6	6
D7	P	11-7	F7	7	7
D8	Q	11-8	F8	8	8
D9	R	11-9	F9	9	9
DA		12-11-2-8-9	FA		12-11-0-2-8-9
DB		12-11-3-8-9	FB		12-11-0-3-8-9
DC		12-11-4-8-9	FC		12-11-0-4-8-9
DD		12-11-5-8-9	FD		12-11-0-5-8-9
DE		12-11-6-8-9	FE		12-11-0-6-8-9
DF		12-11-7-8-9	FF		12-11-0-7-8-9

TABLE C-3. ASCII TO EBCDIC CONVERSION TABLE

ASCII Code (Hex)	ASCII Graphic	EBCDIC Code (Hex)	EBCDIC Graphic
02		4F (Illegal)	!
04		3F	SUB_
20	Space	40	Space
21	!	4F	
22	"	7F	"
23	#	7B	#
24	$	5B	$
25	%	6C	%
26	&	50	&
27	'	7D	'
28	(	4D	(
29	)	5D	)
2A	*	5C	*
2B	+	4E	+
2C	,	6B	,
2D	-	60	-
2E	.	48	.
2F	/	61	/
30	0	F0	0
31	1	F1	1
32	2	F2	2
33	3	F3	3
34	4	F4	4
35	5	F5	5
36	6	F6	6
37	7	F7	7
38	8	F8	8
39	9	F9	9
3A	:	7A	:
3B	;	5E	;
3C	<	4C	
3D	=	7E	=
3E	>	6E	>
3F	?	6F	?

TABLE C-3. ASCII TO EBCDIC CONVERSION TABLE (Cont'd)

ASCII Code (Hex)	ASCII Graphic	EBCDIC Code (Hex)	EBCDIC Graphic
40	@	7C	@
41	A	C1	A
42	B	C2	B
43	C	C3	C
44	D	C4	D
45	E	C5	E
46	F	C6	F
47	G	C7	G
48	H	C8	H
49	I	C9	I
4A	J	D1	J
4B	K	D2	K
4C	L	D3	L
4D	M	D4	M
4E	N	D5	N
4F	O	D6	O
50	P	D7	P
51	Q	D8	Q
52	R	D9	R
53	S	E2	S
54	T	E3	T
55	U	E4	U
56	V	E5	V
57	W	E6	W
58	X	E7	X
59	Y	E8	Y
5A	Z	E9	Z
5B	[	4A	¢
5C	\	E0	\
5D	]	5A	!
5E	^	5F	¬
5F	-	6D	_

CONTROLWARE LOADING PROCEDURE D

The controlware tells the terminal how to load information, how to operate on it, and how to produce the desired results. This section describes how to load the controlware into the terminal.

To load the controlware into the HASP terminal, verify or perform the system startup procedure. (Refer to HASP Operators Guide listed in the preface.)

NOTE

Because the card reader interprets card data by sensing the presence or absence of light reflected from the back of a card, do not write on the back of any card or on the front of any card if the writing can bleed through to the back. Any writing or smudge on the back of a card can result in erroneous reading of card data.

LOADING HASP RJE WORKSTATION CONTROLWARE

The following procedures provide instructions for loading from a card reader and a flexible disk drive. Loader error codes are listed and defined, and procedures for deadstart and restart are then described.

LOADING FROM CARDS

To load from cards, perform the following:

1. Obtain a vaild sign-on image from host site personnel and replace the old sign-on card with the valid image. (The sign-on card is the last card in the deck.)
2. Fan both ends of the controlware card deck to break any bond between cards. Align the cards in the deck by jogging the card deck on a smooth, flat surface.
3. Insert the HASP controlware card deck into the card reader hopper, face down, column 9 to the rear.
4. Press the RESET button on the card reader.
5. Initiate a deadstart sequence. (Refer to Deadstart Sequence later in this section.)

The cards should be completely read and the HASP workstation automatically started. If the workstation is on a dedicated communication line, sign-on occurs immediately. If it is on a dial-out line, the sign-on occurs when communication has been established with the host.

NOTE

On workstations configured with two active card readers, the controlware may only be loaded from card reader 1 (logical unit 10). This is the unit associated with macro interrupt 11/ micro interrupt 11/equipment code 11.

If the deadstart loader hangs after its load with the RUN light left on, look at the console CRT for a two-character error message. The message indicates the type of loader error (refer to Loader Errors below).

LOADING FROM FLEXIBLE DISK

Insert a flexible disk into the drive and close the door. Set the unit select pushbutton to the flexible diskette unit in use and initiate a deadstart sequence. (If the diskette is being used for the first time, be prepared to write a valid sign-on record onto the diskette. Refer to HASP Operators Guide listed in the preface for information on updating the configuration on flexible disk.) The flexible disk is read and the HASP workstation is automatically started. If the workstation is on a dedicated line, sign-on occurs immediately; if it is on a dial-out line, the sign-on occurs when communication is established with the host.

LOADER ERRORS

The loader errors displayed on the console CRT are as follows:

- DC - A bad checksum on the deadstart loader. The Q register contains the bad checksum value (it should be 0). Reload the card deck. If the error persists, discard the deck and use another. (Card reader only.)
- DP - A parity error was found while performing a checksum of the deadstart loader. The Q register contains the address of the parity error location relative to the start of the deadstart loader. The deadstart loader begins at 7A00. Reload the controlware; the parity error should disappear. If not, there is a solid parity error in memory.
- MP - A parity error was found while performing a checksum of the main program of the controlware. The Q register contains the address containing the parity error. Try reloading the controlware. If the parity error persists, a solid parity error exists at this address.

- SQ - A sequence error has occurred while loading the system binaries. Either the deck has been shuffled or a mispunch was detected in column 1 of the last card read. Discard the deck and use another. (Card reader only.)

- RJ - A hardware reject was detected from the card reader controller while reading the HASP binaries. This error occurs only if a hardware fault exists in the card reader controller itself. Call for service. (Card reader only.)

- CS - A checksum error has been detected after loading the system binaries. This means that there are mispunched or misread cards in the HASP binary deck. If the error persists on subsequent loads, discard the deck and use another. (Card reader only.)

- OP - An illegal configuration option selection.

NOTE

Only the DP, MP, and OP error messages are displayed when the controlware is loaded from flexible diskette.

If the console message does not occur within 15 seconds, an error has occurred and the controlware must be reloaded. If the controlware continually hangs, verify that the equipment configuration is valid for use with the controlware. A card reader error, such as a mispick, hangs the loader with no indication. Check the card reader for illuminated error-indicator lights to determine the type of error. Make the card reader ready and the load will continue.

DEADSTART SEQUENCE

To initiate a deadstart sequence for the CYBER 18-5M, perform the following:

1. Press the STOP and MASTER CLEAR buttons on the operators panel.
2. Press the AUTOLOAD button on the operators panel.

To initiate a deadstart sequence for the CYBER 18-10M/20, perform the following:

1. Press the STOP and MASTER CLEAR buttons on the operators panel.
2. Press the DEADSTART button on the operators panel.

RESTART HASP RJE WORKSTATION CONTROLWARE

If the HASP workstation controlware has already been loaded into memory, restart the system by performing the following:

1. Press the STOP button on the operators panel.
2. Press the MASTER CLEAR button on the operators panel.
3. Press the RUN button on the operators panel. The HASP workstation controlware should be restarted automatically.
4. If the system does not appear to restart correctly, reload the deadstart card deck/flexible disk as previously described.

If error message codes occur after loading the controlware, reload and verify that the error code has cleared. If the error persists, report the error condition to the customer engineer, since knowing the error condition represented by the code may help locate the cause of the error. Loader error codes and their meanings are included in this section under LOADER ERRORS.

When the controlware has been successfully loaded, there is a line on the display containing an eight-digit proof number. The first four digits represent the sum of all the checksums in the deck. The second four digits represent the deck checksum plus the checksum for all selected hardware configuration options including memory patches. The first four digits of the proof number are constant, providing assurance that the controlware loaded properly. The second four digits change as configuration options and patches are selected. After loading the controlware, the normal procedure would be to establish terminal status in preparation for online processing. Refer to the HASP Operators Guide for configuration options and patches and keyboard entries used in establishing terminal status.

TAPE TRANSPORTABILITY E

The degree of tape transportability between the CYBER 18-10 HASP workstation and any other system depends on the ability of the other system to read or generate HASP workstation tape format. The HASP workstation itself reads and writes a relatively fixed format.

Tape transportability is the responsibility of the user. The user must ensure that tapes to be read on the HASP workstation are in the HASP workstation tape format, and that if tapes generated by the HASP workstation are to be read on other systems, that those systems accept the HASP workstation tape format.

The user should also read the manuals applicable to the system to which or from which he wants to transport tapes and should be familiar with the operating characteristics of that system.

TAPE FORMAT

The following information applies both to what the HASP workstation writes and to what it expects to read, unless otherwise noted.

The tapes are unlabeled, unblocked, and have fixed-length records.

The maximum transmitted record length is 80 characters. The maximum received record length is 144 characters. Off line transfers are limited to 146 characters (formatted ASCII) or 120 bytes (unformatted binary).

The tapes have two file marks to indicate end-of-information. One file mark indicates an end-of-file. Seven-track tapes are written in even parity, external BCD, 800 bpi; nine-track tapes are written in odd parity, ASCII, 800 bpi or 1600 bpi.

The following characteristics apply to both seven- and nine-track tapes unless otherwise noted.

- Labels - None are generated by the HASP workstation. If labels appear on a non-HASP workstation generated tape, they are treated as regular data.
- Density: 800 bpi or 1600 bpi
- Parity: Seven-track, even;
  Nine-track, odd
- Recording Mode: Seven-track, external BCD;
  Nine-track, ASCII
- Record Type: Fixed length (usually 80 to 146 characters, but it can vary)
- Tape End-of-File: One tape mark
- Tape End-of-Information: Two tape marks

USE OF TAPES ON OTHER SYSTEMS

	Activity	Possible Limitations
1.	Use tape as data input for a program	No problem as long as the program can specify tape format within itself.
2.	Use tape as source input for a program	Depends on what format the assembler or compiler expects the source input to be in. May be necessary to write a short program to convert the tape to the format expected by the assembler or compiler.
3.	Use tape as source and data input for a program	Same comments apply as above. If a conversion is required for the source statements, care should be taken that the tape is positioned correctly at the data after the conversion.
4.	List tape on another system(s)	Depends on what format the utility/program doing the listing expects the tape to be in.
5.	Use tape as control card input	Depends on what format the operating systems expect control information to be in. Also depends on whether the operating system can reassign an input device to accept control card information from tape.

USE OF TAPES GENERATED ON OTHER SYSTEMS

	Creation Method	Limitations
1.	Tape generated as output from a program	No problem as long as program can specify output format.
2.	Tape generated as output from a utility	Depends on utility's output format

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