



Model 340
Intelligent
Communications
Terminal

System
Reference
Manual

SYCOR, INC.
SYSTEM REFERENCE MANUAL
Model 340
Communications Terminal System

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such changes and/or additions.*

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SYCOR MODEL 340
INTELLIGENT
COMMUNICATIONS TERMINAL
SYSTEM REFERENCE
MANUAL

The System Reference Manual includes the general characteristics and specifications for the Model 340 Communications System. Details of Model 340 operation and programming are given in the Operator's and Programmer's Manuals. The Terminal Application Language (TAL) Manual describes the current software library.

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SYSTEM DESCRIPTION

INTRODUCTION

Data terminals are moving away from the computer center and close to the sources of their data. They are leaving behind the highly skilled keypunch operators and rigidly structured routines for more conventional working environments. Consequently, terminals are being used by operators whose work skills include little or no knowledge of electronic data processing -- the typist in a branch office, an inventory clerk, the dispatcher in a truck terminal, the admitting clerk in a hospital, etc.

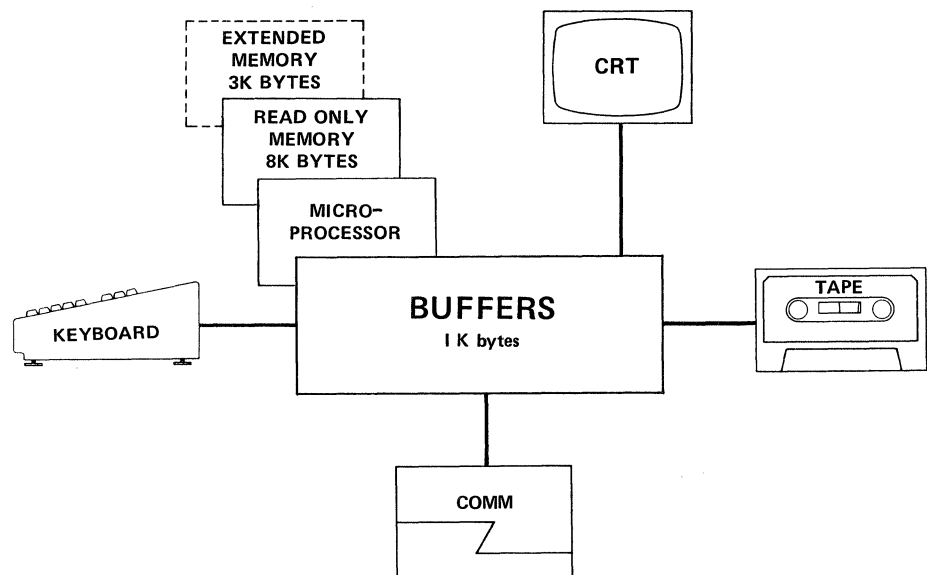
These users can be expected to have difficulty learning the unfamiliar codes, remembering formats, and generally exercising the discipline necessary to enter error-free data into a computer system. Under these conditions, experience indicates, error rates from 10% to 40% are not uncommon. Sycor foresaw in this situation the need to provide a terminal which would be easy to use and yet would contain the required logic to provide advanced capabilities in input and output error detection, data throughput, and the flexibility to perform a wide variety of jobs efficiently. As such, the Sycor Model 340 Intelligent Communications Terminal was developed.

The Sycor Model 340 Communications Terminal with its numerous types and combinations of input and output devices provides a powerful system for source data collection and communications with another Model 340 Communications Terminal, or any central processor such as an IBM 360/370 Computer. It is a modular, general purpose terminal system designed for use in teleprocessing networks where information handling is an interspersed combination of data collection and transmission.

The Model 340 system is of modular design allowing the customer to choose a configuration to meet specific requirements. The modular philosophy has been applied to all aspects of terminal design giving the customer a choice of hardware, firmware and software options. Hardware options include additional I/O devices such as a high speed printer and half-inch computer compatible tape. Firmware options (programs prepared by Sycor and available in a Read-Only Memory) control the basic operational modes and a variety of data editing and I/O control functions. Software options are provided on a library tape in the form of Sycor's Terminal Application Language (TAL) and various preprogrammed systems. The

software increases the number of operational modes and allows the user to tailor the data editing functions to meet specific data collection and processing needs. This philosophy of combining hardware, firmware and software options frees the user from the task of writing basic terminal operation programs without restricting the range of data editing and processing functions available

SYSTEM STRUCTURE



The basic terminal consists of control logic and peripherals. The control logic incorporates a powerful microprocessor which executes instructions stored in a high-speed Read-Only Memory. In addition, a high-speed Random Access Memory is provided to allow buffering of data transfer operations between peripherals.

The terminal contains the following peripherals: a keyboard, which serves as the manual input to the 340 terminal; a cathode ray tube; which displays all data entered via the keyboard, a magnetic tape cassette recorder for storage of data; the necessary logic for communication using binary synchronous procedures at various transmission speeds and the capacity for expanding the terminal to include Extended Read/Write Memory.

SPECIAL FEATURES

A variety of special features in the form of peripherals and functional options is available.

OPTIONAL PERIPHERALS

Second Cassette Recorder
80 Column Card Reader (250 CPM)
Card Punch Interface
7 Track Tape Drive
9 Track Tape Drive
Printer (30 CPS)
Printer (50 LPM)
Printer (200 LPM)
1200 Baud Synchronous Adapter
2000/2400 Baud Synchronous Adapter
3600/4800 Baud Synchronous Adapter
EBCDIC Communications Code
75/1200 Baud Asynchronous Adapter

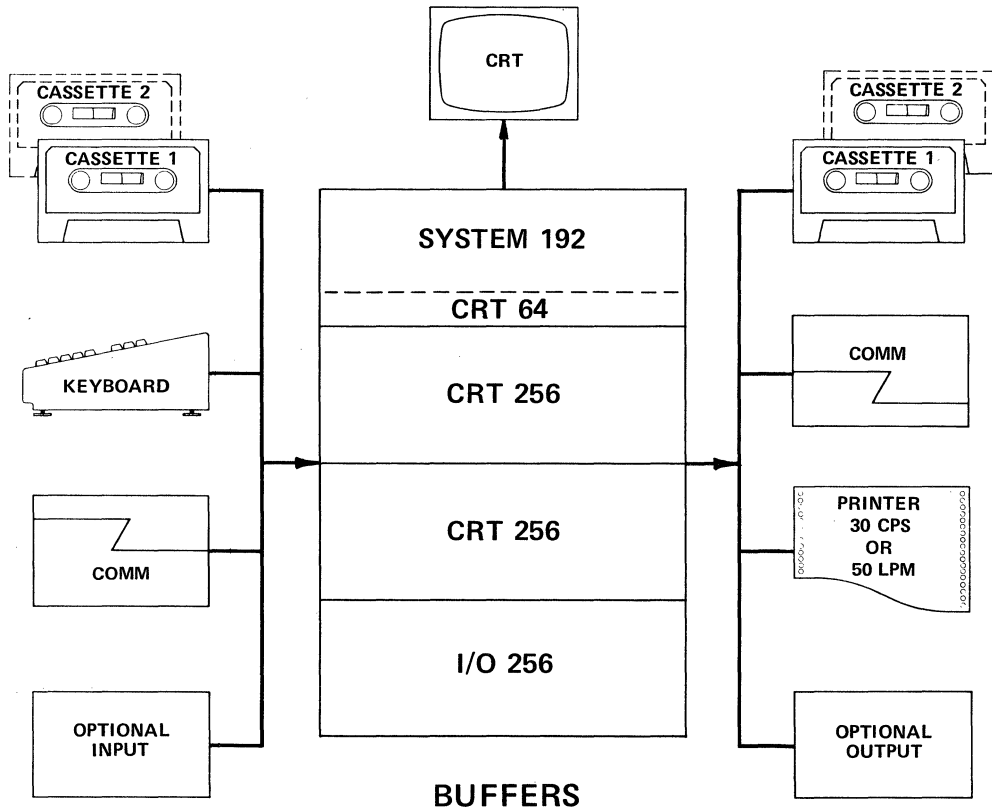
OPTIONAL FUNCTIONS

Data Compression
Tab Compression
Omission Detection and Capacity Control
Two 10 Digit Accumulators
Extended Memory (first 1024 bytes)
Extended Memory (next 2048 bytes)

SYSTEM CHARACTERISTICS

CONTROL LOGIC

The basic system can accommodate four (4) input and four (4) output devices. The cassette recorder represents an input and an output device. The keyboard represents an input. The CRT by itself is an assumed output. The communications feature also represents an input and an output.



The buffers in the above diagram have a 1K byte capacity. The data/format portion of the CRT uses 512 bytes to display and refresh 512 data/format characters. The input/output buffer uses 256 bytes and 256 bytes are reserved for system use. Sixty four of the system bytes are displayed in the top line of the CRT (called the Status Line).

Optional input/output devices may be chosen from among the following:

- 80 column card reader
- 200 LPM line printer
- Half-inch tape drive
- Card punch

Additional details on optional I/O devices will be given in the Software System Manual (TAL).

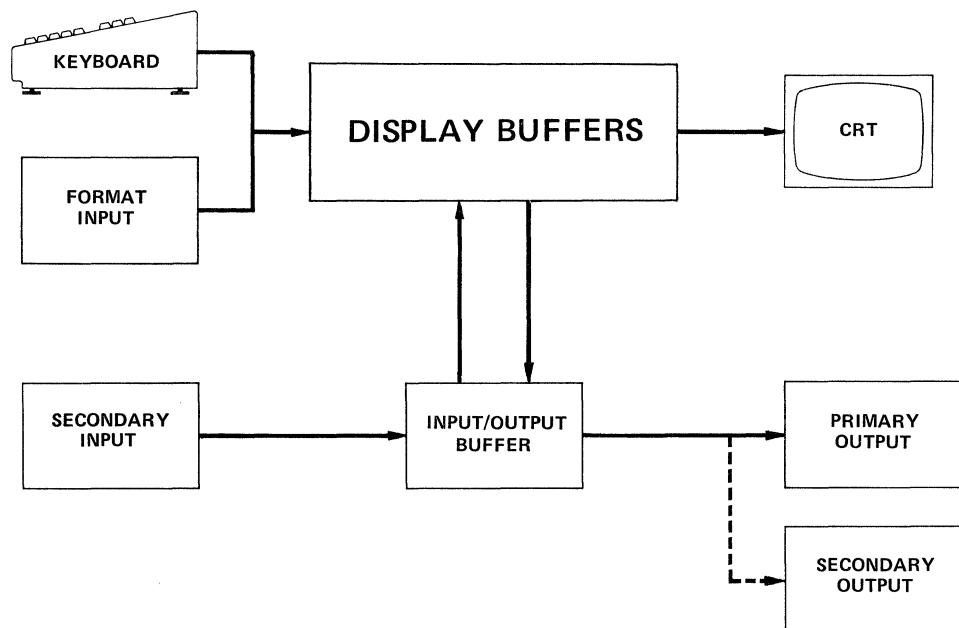
OPERATIONAL MODES

The Model 340 Communications Terminal provides the user with five modes of operation: a format mode, a search mode, a batch mode, an automatic communications mode, and a program mode.

The format mode uses a control format, loaded into the display buffer from the keyboard, from cassette input or any other input peripheral. Formats are created on the keyboard in a "free form" mode, i.e., the format characters are not executed. The terminal is in free form except when the mode is format and the program control switch is on. The search mode is designed for manual search and selective copying of data from one input to an output device. The batch mode is designed for fast, efficient data transfer without reformatting when data is transferred from one peripheral to another. The automatic communication mode is a special batch mode for unattended communications. The program mode is active only in terminals equipped with the extended memory feature.

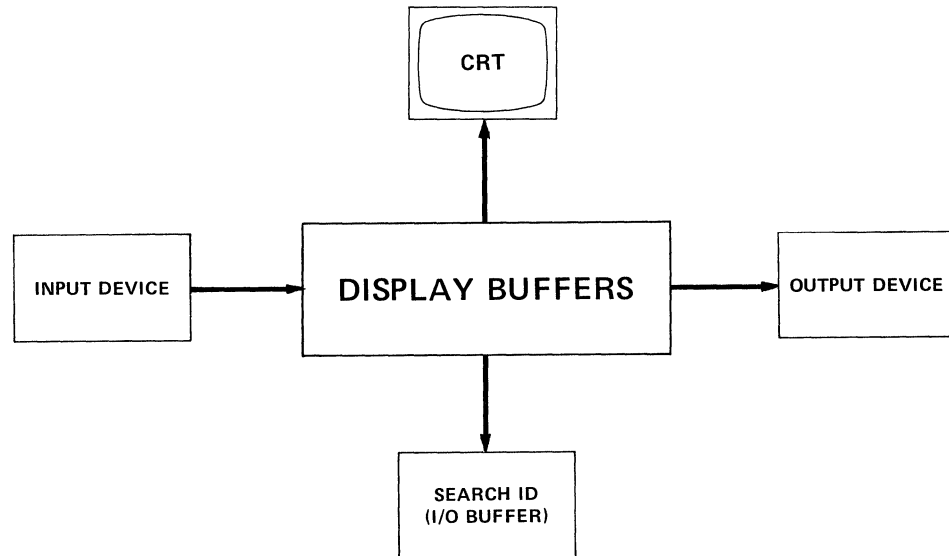
FORMAT MODE

The format mode, with program control on, is used for keyboard data entry or when data read from one of the input devices is to be reformatted or updated before being transferred to the selected output device. In data entry the format, stored and displayed on the CRT, guides the operator with field labels and controls the data entered with field mode and functional controls.



Each individual data field may be filled by the operator from the keyboard or by data from the secondary input. When all of the data fields have been filled, the data for the primary output is gathered in the input/output buffer and written on the primary output. If secondary output is specified, the input/output buffer will be filled again with data for the secondary output. Before the secondary data is written out, the CRT is prepared for the next input operation. Thus input/output operations are overlapped to maximize throughput.

SEARCH/EDIT MODE

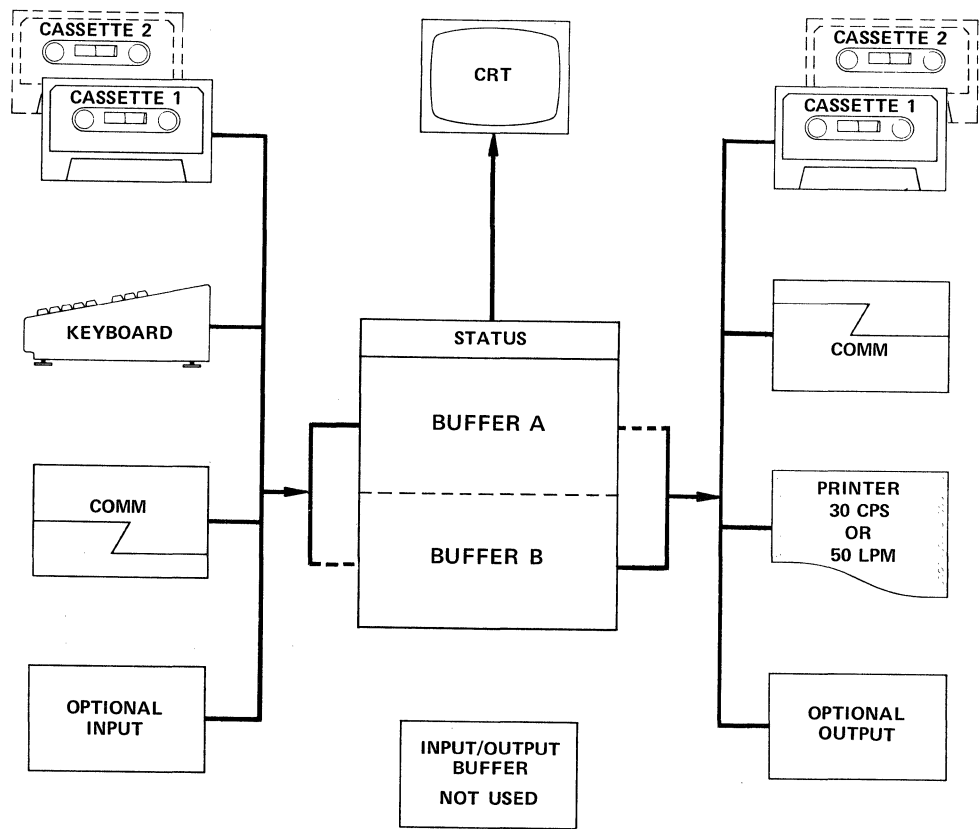


In the search/edit mode, the 340 terminal is capable of automatically locating and copying a specific record (search) or all records except a specific record (edit) from an input file. A search identifier of up to 256 characters in length can be keyed and loaded into the search buffer (input/output buffer); multiple search identifiers are separated by a colon. The search mode compares character by character and is not position sensitive.

BATCH MODE

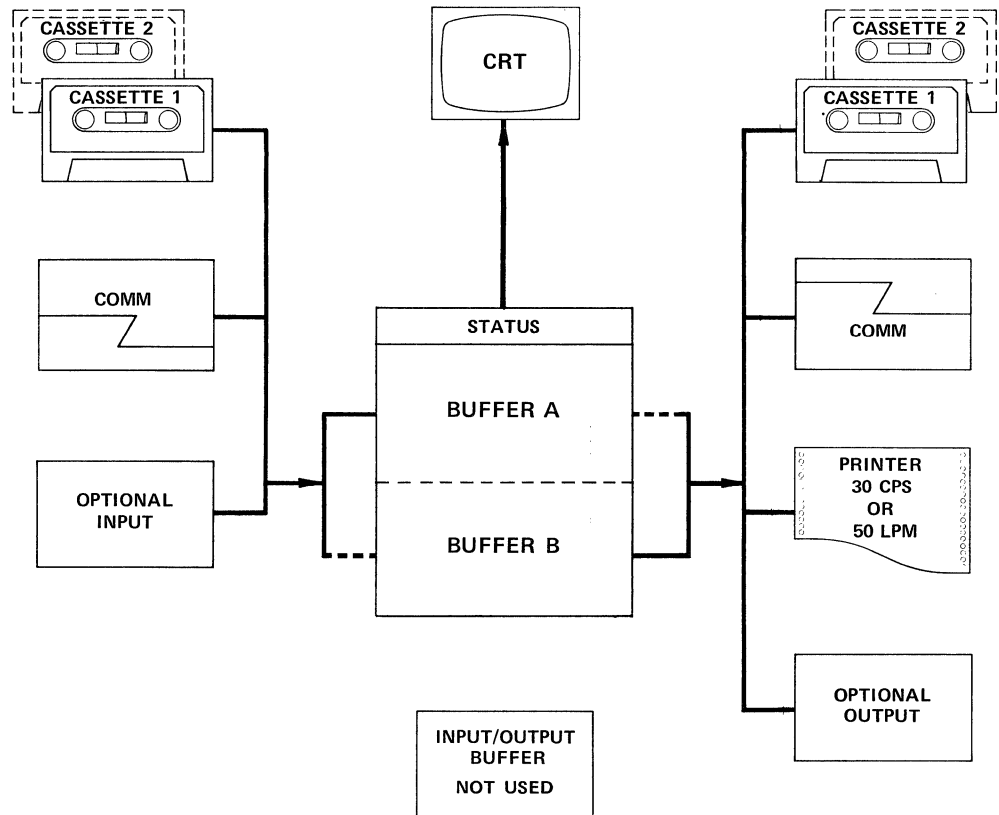
The batch mode of operation divides the CRT buffer into two (2) 256 character buffers to provide an overlapped double buffered operation between the selected input device and the selected output devices.

This mode is used for the most efficient transfer of data between peripherals including the transmission of cassette data or reception of data and output to the selected cassette or the printer.



AUTOMATIC UNATTENDED MODE

The automatic unattended mode is a special communications mode for communicating with a Sycor 340 Master Station or any central processor such as an IBM 360/370 Computer. The automatic mode operates like the batch mode except that the 340 terminal is unattended and peripheral device selection is a part of the communications procedure.



PROGRAM MODE

Program mode is used only on terminals equipped with extended memory and is defined by the program loaded in extended memory. The Master Station and HASP communication are two of the features that use program mode.

MASTER STATION

The Master Station feature is used to communicate with unattended Model 340 terminals operating in automatic mode. The Master Station controls input/output device selections for the unattended terminal.

HASP COMMUNICATION

Houston Automatic Spooling Program (HASP) is a IBM 360/370 computer program which provides efficient means of gathering jobs, scheduling their execution based on job priority and returning the output, grouped in punch and print jobs, to the submitter. The Model 340 HASP program allows the 340 to communicate with an IBM 360/370 computer operating under OS-HASP control.

JOB SELECTION

The job selection sequence provides the user with an easy to use, accurate method of defining the operation to be performed by the system.

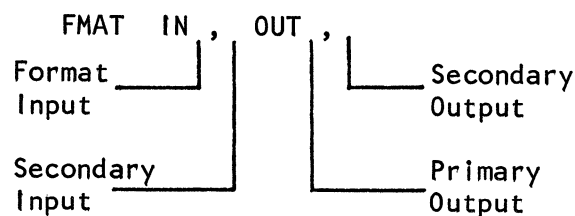
Job selection allows definition of Format, Search, Batch, Automatic, or Program mode of operation and in addition allows the operator to specify the input and output devices. The sequence is initiated by the depression of the JOB SELECT key.

Control of the system is given to the operator with the cursor positioned in the control area of the status line. The operator can now select any mode of operation. Depression of the F key activates the "format mode", the S key activates the "search mode", the B key activates the "batch mode" the A key the "automatic mode" and the P key, the "program mode". Following the F, S, B or P key, the operator selects the input and output devices. Where a device is not used, the operator must enter a space.

INPUT/OUTPUT DEVICE SELECTION CODES

<u>INPUT</u>		<u>OUTPUT</u>	
Cassette one	1	Cassette one	1
Cassette two	2	Cassette two	2
Communications Line	L	Communications Line	L
Optional input	C	Printer	P
None	Space	Optional Output	C
		None	Space

FORMAT MODE



The format mode provides for "format paging" by specifying a format input where additional format pages are stored. Normal input from the keyboard is implied and a secondary input from a peripheral

device may be defined via the input/output buffer. Primary and secondary outputs are provided and the format may designate individual data fields as both outputs, primary output only, secondary output only, or no output. Format mode job selection begins with the job select key followed by the F key, four peripheral device codes (1,2,P,C, or space) and the enter key.

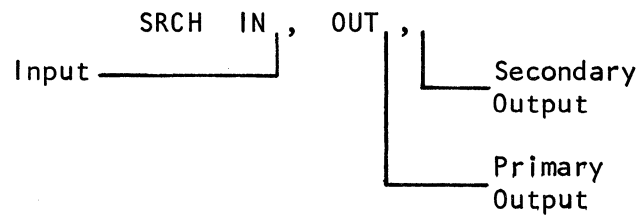
EXAMPLE:

Sequence: F, 1, Space, 2, P, Enter

Job Selection: FMAT IN1, OUT2,P

Formats from cassette one, data out to cassette two and the printer.

SEARCH/EDIT MODE



Search mode does not require a format and consequently requires only one input device; two outputs are provided but both outputs receive identical data.

Search mode job selection begins with the job select key followed by the S key, three peripheral device codes (1, 2, P, C or Space) and the enter key.

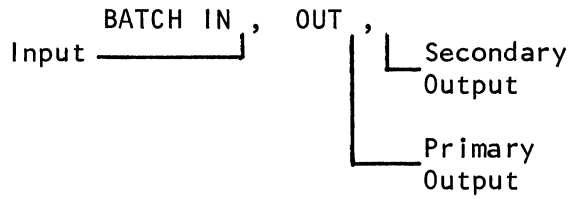
EXAMPLE:

Sequence: S, 1, 2, Space, Enter

Job Selection: SRCH IN1 OUT2,

Search cassette one and copy selected records on cassette two.

BATCH MODE



Batch mode does not use a format and consequently requires only one input device. Two outputs are provided but both outputs receive identical data.

Batch mode job selection begins with the job select key followed by the B key, three peripheral device codes (1, 2, P, C, L or space) and the enter key. For example:

EXAMPLE:

Sequence: B, 2, P, Space

Job Selection: BATCH IN2 OUTP,

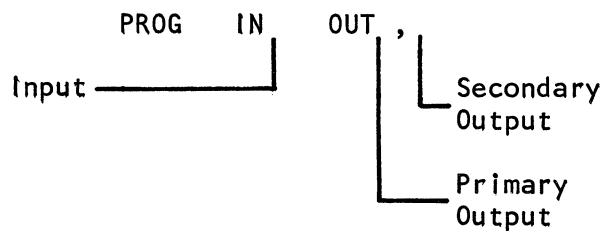
Printing the data from cassette two.

AUTOMATIC UNATTENDED MODE



Automatic mode is used only for unattended communications. The job selection sequence is simply the job select key followed by the A key. One input and one output peripheral device code will be selected as a part of the communications procedure.

PROGRAM MODE

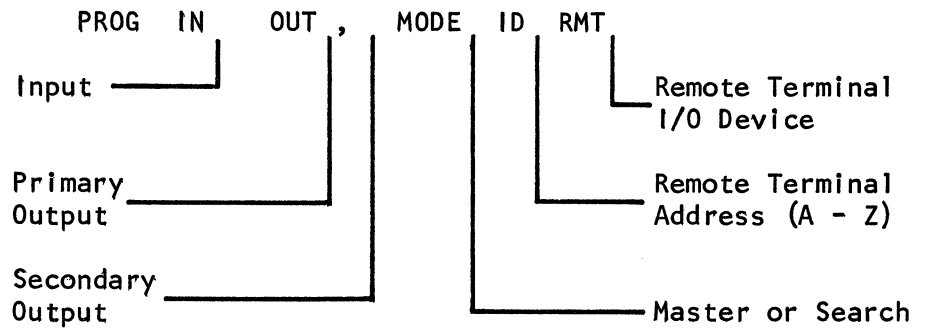


Program mode uses a single input and one or two outputs.

Program mode job selection begins with the job select key followed by the P key, three peripheral device codes (1, 2, P, C, L or space) and the enter key.

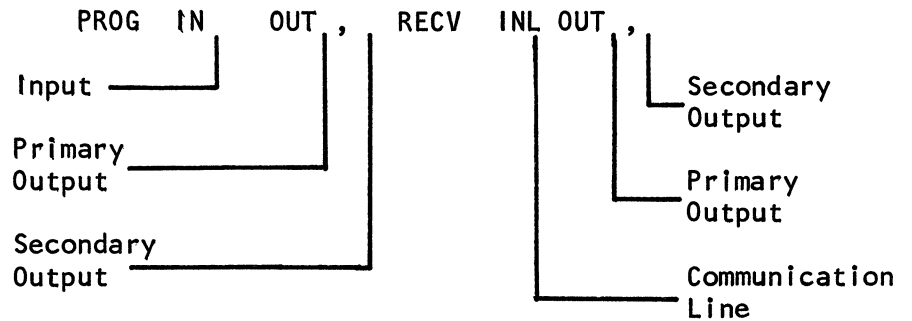
Job selections are illustrated for Master Station and HASP operation in program mode.

MASTER STATION



The Master Station job selection includes a file search capability and selection of a remote terminal and its I/O device.

HASP COMMUNICATION



The HASP job selection includes I/O device selection for transmitting to and receiving from the central computer.

EQUIPMENT DESCRIPTION

BASIC 340 TERMINAL

KEYBOARD

The keyboard is the manual input to the 340 terminal. It can be used for capturing data and displaying it on the CRT. It contains 26 capital (upper case) characters, 10 numeric, and 33 punctuation or special symbol characters. In addition, it contains all necessary control keys and switches required for operation of the basic terminal including a shift key. All displayable characters are arranged in a conventional typewriter-like fashion. All control keys are located directly above the displayable character keys. The keyboard is logically disconnected when its use is not allowed. A "click" is generated for each valid key depression.

CATHODE RAY TUBE DISPLAY (CRT)

The CRT allows display of alphanumeric data keyed by the operator, format control information and status indication. A minimum of nine (9) lines consisting of 8 data lines and 1 status line, with 64 characters each, can be displayed at one time for a total of 576 characters. Keyboarded data is always displayed on the CRT. Data can be transferred from the CRT under control of the format control program or by a manual key depression. Data is always transferred from the first character position up to the record separator code; if a Record Separator (RS) code is not present, 512 characters will be transferred.

CASSETTE RECORDER

The basic 340 terminal includes a cassette recorder for recording of keyboarded data and reception or transmission of data. The cassette recorder uses .15" magnetic tape in a standard cassette. Up to 200,000 characters can be recorded on one cassette in a bit serial format on two tracks at 800 bpi. The terminal provides for an automatic Read-After-Write check on all recorded data. WRITE errors are recovered automatically and READ errors are indicated to the operator.

OPTIONAL EQUIPMENT

EXTENDED MEMORY MODULES

Extended memory is available in 1024K or 2048K-byte modules. Extended memory is used to store a user programmed edit routine using TAL (Terminal Application Language) or Sycor provided Peripheral Control Routines or Preprogrammed Systems. Among the programs provided are: Drivers for the optional input/output devices (card reader, card punch, half-inch tape, line printer, etc.); Additional operational modes (master station, HASP, program generation, etc.) and the Terminal Application Language. The Terminal Application Language includes the following types of instructions:

- Arithmetic
- Branching
- Check Digit
- Data Manipulation
- Input/Output Controls
- Table Checking
- Testing
- Verification

A separate TAL Manual contains a complete list of programs and instructions currently available.

SECOND CASSETTE RECORDER

A second cassette recorder can be provided. The second recorder is not considered an additional input or output device because it utilizes the same controller as the first recorder.

The second cassette may be used to hold a format control program for "automatic paging", which allows continuous keyboarding of long forms. This format control program is automatically loaded into the display buffer through interpretation of a special program control character. The second recorder may also be used for pooling or copying data from one cassette to another.

FAST RECORDER

The fast recorder option increases the cassette tape transport rate from 3.9 to 12.5 ips with a corresponding increase in throughput for data collection, pooling and cassette copy operations.

PRINTERS

The printer option allows generation of hard copy on 6 part, preprinted sprocket fed forms up to 14 7/8" wide, or on stock paper.

The printer option incorporates horizontal and vertical format control. Before a print operation is initiated, the tab stop positions must be set in the corresponding column positions and the vertical tab channels must be specified. During the actual print operation, HT characters in the data stream initiate the spacing of the print carriage to the next tab position, and vertical tab sequences initiate line spacing to the vertical tab position where printing is resumed.

Carriage return codes are executed immediately upon finding a CR code in the data stream. Line feed codes are executed only after carriage return codes.

30 CPS

The 30 character per second printer operates with a single print wheel and hammer mechanism.

50 LPM

The 50 line per minute matrix printer uses seven print solenoids and wires to print the characters using a 5 x 7 matrix at a speed of 165 characters per second.

200 LPM

Extended memory is required to control the 200 line per minute printer.

Characters are printed by hammers impacting individual characters as a belt containing these characters rotates by the hammer bank.

CARD READER

Extended memory is required to control the 250 CPM card reader. The card reader allows reading of cards in format, search or program modes.

CARD PUNCH

Extended memory is required to control the 25 columns/second card punch. The card punch may be used as an output device in format, batch or search modes.

TAPE DRIVES

The Sycor Magnetic Tape Drive, is designed to read or write computer-compatible tapes. Two models are provided: nine-track and a seven-track. Extended memory is required.

The IBM compatible nine-track version uses EBCDIC code and writes at a density of 800 bpi with odd parity.

IBM BCD code with even parity, Honeywell code with odd parity or General Electric code with odd parity is available in the seven-track version with densities of 800 bpi or 556 bpi.

Tape is moved at 12.5 inches per second during a Read or Write operation and is rewound at a speed of 50 inches per second. An Automatic-Read-After-Write check is performed.

Approximately 15,000 records of 256 characters each for a total of 4 million characters can be written onto the tape. This is the equivalent of approximately 16 full cassettes with 256 character records.

COMMUNICATIONS INTERFACES

1200 BAUD SYNCHRONOUS

The 1200 baud synchronous communications adaptor allows for EIA RS-232-A connection of the terminal to an AT&T 202C data set or equivalent. This adaptor enables the terminal to receive and transmit data in a half duplex fashion at 1200 bits per second. The transmission code is USASCII or EBCDIC in a synchronous fashion.

2000 BAUD SYNCHRONOUS

The 2000 baud synchronous adaptor allows interfacing of the 340 terminal to an AT&T 201A data set or equivalent via its EIA RS-232-A interface. Transmission is at 2000 baud half duplex in a synchronous mode over the public switched network or private leased lines. Transmission code is USASCII or EBCDIC.

2400 BAUD SYNCHRONOUS

This adaptor allows communications at 2400 baud, connected to an AT&T 201B data set or equivalent, in half duplex mode, over private leased or switched lines. Transmission is synchronous USASCII or EBCDIC Code.

AUTOMATIC UNATTENDED OPERATION

The benefit of the communications system may be significantly increased with the addition of the unattended communications option. With this option it is possible to call remote terminals, from a central site, and collect their data without an operator present at the terminal. Later, when the data has been processed, the result can be sent back to the terminal. Thus, the work keyed by an operator during the day can be collected at night, processed, and the results transmitted back to the terminal prior to the beginning of business the following morning.

Only a computer or a Master Station can communicate with a 340 terminal operating in unattended automatic mode. Selection of the input or output device, and the transmitting or receiving function is done in a fashion similar to polling selection procedures. The computer or Master Station always calls a terminal by dialing the telephone number corresponding to its data set (or business line in the case of a Data Access Arrangement).

ASYNCHRONOUS COMMUNICATION

An asynchronous 75 to 1200 baud communications option is also available. This option, requiring extended memory, allows communications with teletype compatible terminals or computer systems. Terminals can be equipped with asynchronous and synchronous options simultaneously allowing dual communications capabilities.

DATA COMPRESSION

This feature, if present, compresses and decompresses space characters during synchronous communications operation.

If four (4) or more continuous space characters are to be transmitted, they will be transmitted as a data link escape (DLE) character followed by a group separator (GS) character followed by the binary count plus 100 octal of the number of spaces deleted from transmission (octal 104 through 177). If more than 63 continuous spaces are to be deleted, the sequence will be repeated.

In the communications receive mode, all terminals, upon receiving a DLE GS sequence, will output the specified number of space characters to the selected output device.

PROGRAMMING SYSTEM

SYSTEM CONCEPT

As has been described previously, the Sycor Model 340 is a powerful modular terminal, designed for "format controlled" data entry and/or multi-media batch operations. The key to the efficient use of the system is the care and thought given to programming the terminal.

FORMAT DESIGN

A format consists of Field Definition characters which define the beginning and end of all fields on the CRT. The label describes the field to the operator, Field Control characters specify the type of data to be entered into the field, and Input/Output Device Control characters specify a secondary input device and up to two output devices (primary and secondary output). The Input/Output Device Control characters refer to the peripherals defined in the job selection.

A format can consist of one or more pages where a page defines the portion of the format which can be displayed to the operator on the CRT at any one time. Provision is made to link these pages together, forming the format automatically, by entering a special field definition character or manually depressing a key on the keyboard labeled NEXT FORMAT.

The Field Definition, labels, Field Control, and Device Control characters are grouped together in a predefined sequence as shown below:

```
FLLLLLLLLLLlCFDDDDDFLLLLLLLLLLLLLLLLLlCFDD...
```

F - Field definition
L - Label
l - Input/Output Device Control
C - Field Control
D - Data

FIELD DEFINITION CHARACTERS

SYMBOL FUNCTION

[Start of protected input and output field, also end of previous field. A protected field, used to contain labels and field control characters and enclosed in brackets, is not filled from the keyboard, and is not transferred to an output device.

SYMBOL FUNCTION

-] End of protected input and output field.
-] New line symbol, outputs a CR code. Defines the beginning of a new data field of the same field control as the previous field. Serves as a stopping position on the CRT when the new line key is depressed. This character can be used to partition any type of data field.
- \ Display tab stop, outputs a horizontal tab code. Defines the beginning of a new data field of the same field control as the previous field. This character can be used to partition any type of data field.
- | Automatic cursor advance to the next field, does not output. This code functions to partition the display.
- Record separator, outputs an RS code. Identifies the last position of the current page of format. Data cannot be entered beyond this character.

An example of how the field definition characters are used follows:

```
[LABEL 1 M] D.....D [LABEL 2 M] DD|  
[LABEL 3 M] D.....D■
```

In the above example, data would be entered to the right of each end of protected field character.

In some cases, it will be more advantageous to display the labels to the operator on one line and allow data entry underneath (next line) the labels. This can be done as follows:

```
| ITEM #   MODEL #   QTY   PRICE  
[N]      [N]      [N]   [N]   |  
[N]      [N]      [N]   [N]   |  
[N]      [N]      [N]   [N]   ■
```

Both methods of displaying field names may be used within a format.

NOTE: Position one of line one on the display must always contain either [or | .

FIELD CONTROL CHARACTERS

This character immediately precedes the right bracket field definition character. It is used by the terminal to control the type of input entered by the operator and to activate automatic operations. The field control characters provided for the Model 340 system are defined below.

NORMAL DATA ENTRY

SYMBOL FUNCTION

- M Mixed field. Alphabetic, numeric or special symbols.
- A Alphabetic field. Alphabetic characters only (including space, comma and period).
- N Numeric field. Numeric characters only (including period, comma, minus and space).

Partial entries in these fields are left justified.

- R Numeric Field, right justify. Numeric data only, right justify and fill the remaining positions of the field with spaces.
- C Constant Data Field. The following data field contains constant data to be included in the output record. The operator is not permitted to enter this field under program control.
- * Automatic Program **Paging** Character. Automatically loads a new page from the input program device, may also be used to define a constant field.

TAB COMPRESSION

SYMBOL FUNCTION

- 1 Tab Compression for mixed data field.
- 2 Tab Compression for alphabetic data field.
- 3 Tab Compression for numeric data field.

These fields allow a tab character to replace unused spaces in the data field. Output from these fields does not include trailing spaces.

OMISSION DETECTION

SYMBOL FUNCTION

- 4 Omission Detection for mixed data field.
- 5 Omission Detection for alphabetic data field.
- 6 Omission Detection for numeric data field.

These fields require that the operator enter at least one data character of the proper mode. An attempt to omit entry will result in a TAB error.

CAPACITY CONTROL

SYMBOL FUNCTION

- 7 Capacity Control for mixed data fields.
- 8 Capacity Control for alphabetic data fields.
- 9 Capacity Control for numeric data field.

These fields must be filled to capacity. Any attempt to bypass the field or leave the field before it is completely filled will result in a TAB error.

ACCUMULATORS

The Accumulator Option provides two ten-digit plus Sign Accumulators: a Total Accumulator and a Subtotal Accumulator.

The accumulators are displayed in the status line and are controlled by accumulator fields in the format.

TOTAL ACCUMULATOR

The Total Accumulator is displayed on line one on the CRT in character positions 53-62. A sign is automatically displayed in position 63 if the value is negative.

Fields are defined as accumulator fields by field control characters. The following field control characters are available for controlling the total accumulator:

SYMBOL FUNCTION

- + Defines the following field as an add/subtract Total Accumulator field. Only numeric data is allowed. Depression of the TAB/SKIP key adds to the accumulator, MINUS (-) subtracts from the accumulator. If the entire field is skipped, no accumulator operation is executed. An OFL error is indicated if an operation exceeds the capacity of the accumulator.

- T Defines the following field as a Total Field. Upon depression of the TAB/SKIP key the accumulator contents are automatically moved into this field and the total accumulator is cleared.
- > Specifies that the following field is to be loaded with the contents of the Total Accumulator upon depression of the TAB/SKIP key. The accumulator is not cleared and its contents are left undisturbed, thus allowing generation of grand totals with one accumulator.

SUBTOTAL ACCUMULATOR

The Subtotal Accumulator is displayed on the CRT in positions 42 to 51 and the sign in position 52 of the status line. Operation of the Subtotal Accumulator is accomplished through the same Add (TAB/SKIP) or Subtract (MINUS) keys as for the Total Accumulator. Only fields defined as Subtotal Accumulator fields can be added or subtracted from this accumulator. A set of control characters is available to control the Subtotal Accumulator.

- & Defines the following field as a Subtotal Field. Only numeric data is allowed. Depression of the ADD (TAB/SKIP) or SUBTRACT (MINUS) key adds or subtracts the contents of this field from the Subtotal Accumulator.
- S Defines the following field as a Subtotal Field. The Subtotal Accumulator contents are automatically moved into this field upon depression of the TAB/SKIP key by the operator. After loading this field, the accumulator is cleared and loaded with zeros.
- < The Subtotal Accumulator is moved to this field upon depression of the TAB/SKIP key, but the accumulator is not cleared after the operation.
- \$ The following field is loaded with the contents of the Subtotal Accumulator and the Subtotal Accumulator is added to the Total Accumulator and cleared.

EXTENDED MEMORY

The extended memory feature consists of memory modules, 1024 bytes or 2048 bytes each module, which can be added to the 340 terminal. This extended memory allows the user to expand the capabilities of the basic 340 terminal by

executing special functional data editing routines written in Terminal Application Language (TAL).

Programs written in TAL (source statements) are run through the Sycor provided program generator, the resulting object program can be loaded into extended memory via the Sycor provided loader.

Field edit programs can be written for all data entry fields requiring special data handling or checking. The TAL field programs are linked to the data entry format displayed on the CRT with special field control characters and labels.

Several examples of Model 340 formats using extended memory field control characters and TAL data editing program are given in the TAL manual.

MUST TAB

SYMBOL FUNCTION

- I Mixed Entry
- J Numeric Entry
- K Mixed Entry
- L Numeric Entry

These fields require that the operator TAB/SKIP to move to the next data field even if the must tab data field is completely filled. The additional data editing functions performed in these fields are defined by a TAL program loaded in extended memory. Each field control character may be used for many different data editing functions. A field label is required to distinguish between fields using the same field control letter for different data editing tasks.

MAY TAB

SYMBOL FUNCTION

- W Mixed Entry
- X Numeric Entry
- Y Mixed Entry
- Z Numeric Entry

These fields allow the operator to use the TAB/SKIP key to skip out of a partially filled data field

but do not require the TAB/SKIP key if the data field is completely filled. The additional data editing functions performed in these fields are defined by a TAL program loaded in extended memory. Each field control character may be used for many different data editing functions. A field label is required to distinguish between fields using the same field control letter for different data editing tasks.

INPUT/OUTPUT DEVICE CONTROL

Until now reference has been made only to manual input via the keyboard and to output as defined by the job selection sequence. As was described in the System Characteristics portion of this manual, the system accomodates up to two (2) input and two (2) output devices. It is, therefore, essential to provide the ability to control, by field, which input device data is to be taken from and which output device data is to be transferred to.

The Input/Output Device Control character immediately precedes the Field Control character in the protected format field. Eight I/O device controls are available.

Normal Input	Secondary Input	
[or Space	1	Both Outputs
2	3	Primary Output
4	5	Secondary Output
6	7	No Output

SYMBOL FUNCTION

Space
or [Activates the normal input device, primary and secondary output. Normal input is from the keyboard, an accumulator or a TAL program.

SYMBOL FUNCTION

- 1 Activates the input device specified as the secondary input in the job selection sequence and transfers data from the input to the field. The first time this appears in an individual format page the terminal will read a record of data from the secondary input device into the input/output buffer. If no secondary input is specified in the job selection, the data already in the input/output buffer will be used as input. This field is read out to the primary and secondary output devices if specified by the job selection sequence.
- 2 This field will be read out to the primary output device only. Normal input is from the keyboard, an accumulator or a TAL program.
- 3 This field will be filled by the secondary input device and read out to the primary output device. If no secondary input is specified in the job selection, the data in the input/output buffer will be used as input.
- 4 This field will be read out to the secondary output device only, normal input from the keyboard, an accumulator or a TAL program is assumed.
- 5 Input is from the secondary input device and output is to the secondary output device. If no secondary input is specified in the job selection, the data in the input/output buffer will be used.
- 6 This field will be filled from the normal input device but will not be read out to either the primary or secondary output device.
- 7 This field will be filled from the secondary input device but will not be transferred to either output device. If no secondary input is specified in the job selection, the data in the input/output buffer will be used as input.

FORMS CONTROL

The terminal contains the required logic to recognize and execute the following printer control codes:

- VT - Vertical Tabulation skips to channel two.
- HT - Horizontal Tabulation, the printer is spaced to the next horizontal tab stop position.
- FF - Form Feed, the form is advanced to channel one.
- CR - Carriage Return, the carriage is returned to position one (1) and the line is advanced one (1).
- LF - Line Feed, the line is advanced one position vertically. A line feed is valid only after a carriage return/line feed.
- ESC - Escape, identifies that a printer control sequence follows. Is not transferred to the printer.

Printer Escape Sequences:

- ESC, HT - Identifies that the remainder of the record contains horizontal tab stops to be loaded into the horizontal tab buffer.
- ESC, VT - Identifies that the remainder of the record contains vertical tab stops to be loaded into the vertical tab buffer.
- ESC, A - Skip to vertical forms position one (1).
- ESC, B - Skip to vertical forms position two (2).
- ESC, C - Skip to vertical forms position three (3).
- ESC, D - Skip to vertical forms position four (4).
- ESC, E - Skip to vertical forms position five (5).
- ESC, F - Skip to vertical forms position six (6).

Horizontal Tab Stop Record

POSITION DEFINITION

- 1 ESC (Escape) character
- 2 HT (Horizontal Tabulation) character
- 3-134 Any character but X if a tab stop is not required. Letter X if a tab stop is required, must be terminated by RS.

Vertical Tab Stop Record

POSITION DEFINITION

1	ESC (Escape) character
2	VT (Vertical Tabulation) character
3-4	Number of lines on the form*
5-6	Line number for channel one*
7-8	Line number for channel two*
9-10	Line number for channel three*
11-12	Line number for channel four*
13-14	Line number for channel five*
15-16	Line number for channel six*
17	RS character

*The actual vertical position is calculated from this two character sequence by combining the low order (1-4) bits of each character to form a binary value 0 to 255 (See the Appendix for a table of Vertical Tab Codes). All channels must be defined.

BINARY SYNCHRONOUS COMMUNICATIONS PROCEDURES (BSC)

REFERENCE

This system operates under the BSC procedures outlined in the IBM Reference Library Manual A27-3004.

COMMUNICATION FACILITIES

The communications facilities used by the Sycor Model 340 Communications Terminal can be either leased common-carrier switched telephone networks, or equivalent privately owned facilities. It can perform half duplex data transmission only.

CODE SET AND DATA

This system employs the USASCII 128 character code set in transmission. The following subset of these characters is used to control the link. A complete list of USASCII code set can be found in the Appendix. EBCDIC code is available as an option.

LINK CONTROL

Data Link Control Characters and Sequences

SYN	Synchronous Idle
SOH	Start of Header
STX	Start of Text
ETB	End of Transmission Block
ETX	End of Text
EOT	End of Transmission
ENQ	Inquiry
ACK	Affirmative Acknowledgement (Actually alternating replies of DLE 0 or DLE 1)
NAK	Negative Acknowledgement
TTD	Temporary Text Delay by Transmitting Station (Actually two character sequence, STX ENQ)
WACK	Temporary Text Delay by Receiving Terminal (Actually two character sequence, DLE ;)
DCMP	Data Compression (Actually two character sequence, DLE GS)
DISC	Disconnect (Actually two character sequence, DLE EOT)

POINT-TO-POINT OPERATION

This type of operation applies to either privately owned or leased lines. When transmission is started, an initialization sequence consisting of an ENQ is initiated by the station attempting to acquire the line. A station receiving this sequence must reply with DLE 0, WACK or NAK indicating it is now ready to receive, temporarily not ready, or not ready to receive.

TEXT

Text is transmitted in units called messages. Each message is considered an entity for BSC operation and is initiated by STX or SOH and ended by ETX or ETB.

Each message is subdivided into record size blocks for transmission to provide more accurate and efficient error control. Each block starts with STX or SOH and ends with ETB (except the last block which ends with ETX). A block check character (BCC), accumulated on the data in each record, is transmitted after each ETB or ETX. Following the transmission of the BCC, a line turnaround occurs to permit the receiving station to reply affirmatively or negatively to the received block.

SYNC PATTERN AND PAD CHARACTERS

Synchronism of the receiving station with the transmitting station is accomplished with the use of a "sync pattern". The sync pattern is used in synchronous transmission to establish both the character synchronism and bit synchronism. This pattern must always precede a transmission. The sync pattern consists of at least one pad character (octal 125 or SYN) followed by at least four consecutive SYN characters.

In order to assure full transmission and reception of every message, an entire pad character (177 octal) is added following each line turnaround character (e.g., NAK, EOT, ENQ, or the BCC). This ensures an extra character time prior to line turn around.

ERROR CHECKING

VRC

The VRC is an odd parity check performed on a per character basis. This bit is added to all characters transmitted including the LRC and stripped and checked when received.

LRC

The LRC is a longitudinal redundancy check on a record block. The LRC is accumulated at both the sending and receiving terminals during transmission. The accumulator is reset by the STX or SOH characters which start a block. It is transmitted immediately following the ETB or ETX characters which end the block and checked by the receiving terminal. SYN characters are not accumulated.

If the optional EBCDIC code set is used, the error checking function of CRC-16 is used.

EVEN/ODD RESPONSE

The BSC procedure provides for the use of alternating DLE 0, DLE 1 as affirmative responses to block checking sequences. This provides a sequential checking control for a series of replies. Thus, it shall be possible to maintain a running check to insure that each reply pertains to the immediately preceding block.

TRANSMISSION (ATTENDED OPERATION)

INITIATION

The transmit operation is initiated by entering the job selection sequence. Next, the transmit operation is enabled by depressing the ENTER key, causing the terminal to be readied. Finally, the operator must establish contact with the receiving station and this station must be enabled for data reception. Upon hearing a high frequency tone, indicating that the receiving terminal is ready, the transmit operation is initiated by depressing the DATA button on the modem.

LINE BID

Upon initiation of transmission, the status message B is placed on the screen and an inquiry (ENQ) sent to the receiving terminal. If, in response to this inquiry, the receive terminal responds with an acknowledge (ACK), indicating it is ready, data transmission begins. If, on the other hand, the receive terminal replies with a negative acknowledgement (NAK), indicating it is not ready, fails to respond for a period of one second, or gives an erroneous reply, up to three additional inquiries (ENQ's) are sent. If the receiving terminal still fails to respond properly, then the transmission terminates by sending an end of transmission (EOT). If the receive station responds with a delay sequence (WACK), the transmit terminal will again send the inquiry (ENQ). This sequence may be repeated indefinitely. An ERR RESET, ENTER is required to reinitiate the bid. A JOB SELECT reset is required to cancel the transmit operation.

DATA TRANSMISSION

Upon initiation of data transmission, the status message D is placed on the screen. Data transmission is accomplished by reading records into the input data buffer. While a second buffer is being filled, the record stored in the first input data buffer is transmitted. The transmission of each record is preceded by a start of text (STX) character and followed by an end of block (ETB) or end of text (ETX) and a longitudinal redundancy check character (LRC). As each character is transmitted onto the communications line, a vertical redundancy check bit (VRC) is added to the character.

The transmitting terminal keeps an even/odd count of the number of records transmitted. Immediately following the transmission of each record, a block checking response from the receiving terminal is expected, confirming that it has received an even/odd number of records. Upon receiving the proper response (DLE 0, DLE 1), the transmission process continues by transmitting the data from the alternate input buffer.

LINE ERROR

If, in a block checking sequence, a negative acknowledgement (NAK), is received, indicating the receive terminal has rejected the last record, then the status message L is displayed and up to three retransmissions of the record are made. If the receiving terminal still fails to acknowledge the record, then the transmission will be terminated by sending an end of transmission (EOT) and the error message INC will be displayed. An ERR RESET is required to reinitiate the transmission with the bidding sequence.

RECORD ERROR

If, in a block checking sequence, the receiving terminal replies with the incorrect even/odd acknowledgement or gives an erroneous response, then a status message R will be displayed and up to three (3) inquiries (ENQ's) sent to the receiving terminal. This inquiry causes the receive terminal to repeat its last response. If the receiving terminal still fails to respond properly, then transmission is terminated by sending an end of transmission (EOT), and an error message INC will be displayed. An ERR RESET is required to reinitiate the transmission with the bidding sequence.

NOTE: If the receive terminal initially fails to respond to a block checking sequence, but in response to the first inquiry responds with the wrong even/odd acknowl-

edgement, then it is assumed that the receiving terminal missed the previous record and retransmission is attempted.

INCOMPLETE TRANSMISSION

If, in a block checking sequence, an end of transmission (EOT) is received, then the INC error message is displayed, no further transmission takes place, and an ERR RESET is required to reinitiate the transmission with the bidding sequence.

TEMPORARY DELAY

If, at any time, a temporary delay is sent (TTD) or received (WACK), the communications status W will be displayed.

READ ERROR

If, upon completion of a cassette read operation, a read error is detected, three (3) additional attempts are made to read the record. If unsuccessful, then the RD error message is displayed. An ERR RESET is required to continue the transmission. NOTE: While processing read errors, the temporary text delay sequence (TTD) is idled on the transmit line to keep the receiving terminal from dropping out of the data reception mode.

END OF TRANSMISSION

If the AUTO OPRT switch is off, one EOF record (file separator), if it is on, two (2) consecutive EOF records cause termination of transmission and display of the message EOF. To indicate that this constitutes the end of the transmission message, the end of the text (ETX) character is transmitted with the last EOF record in place of the end of block (ETB). Upon receipt of the proper acknowledgement (DLE 0, DLE 1), the transmission is terminated by sending an end of transmission (EOT).

If a single end of file record is found, and AUTO OPRT is on, it is treated as normal data record, consisting of a one character file separator (FS) character, followed by the normal end of block character.

RECEIVING (ATTENDED OPERATION)

INITIATION

The receive operation is initiated by entering the job selection sequence. Next, the receive operation is enabled by depressing the ENTER key, causing the terminal to be readied. Finally, the operator must establish contact with the transmitting station. This is accomplished by either calling or receiving a call from the transmitting station. Upon establishing the call the terminal is placed in the data mode by depressing the DATA button on the modem.

CONTROL MODE

Upon enabling the modem, the terminal awaits an inquiry (ENQ) message from the transmitting station. Upon receipt of the inquiry message the terminal responds with the ready acknowledgement (DLE 0), the not ready acknowledgement (NAK), or the temporarily not ready (WACK).

DATA MODE

The status message D is placed on the screen to indicate that the terminal has entered the data reception state. Data reception begins when a start of text (STX) or start of header (SOH) character is received. A redundancy check character is accumulated on the received data, starting after SOH or STX up to and including ETB or ETX. This character is compared to the longitudinal redundancy check (LRC) character transmitted following ETB or ETX.

As each character is received the vertical redundancy bit (VRC) added at the time of transmission is also checked. An even/odd count of the number of records received will be maintained. Following the successful receipt of each record an affirming reply (DLE 0, DLE 1), reflecting this even/odd count, is sent to the transmitting terminal and the record is transferred to the defined output device, while a second record is received in the alternate input buffer.

If an inquiry is received while awaiting the receipt of the start of text (STX or SOH) character, the terminal responds with a repeat of the last block checking reply. Thus, should a portion of the transmission be missed, recovery is possible.

The operations of receiving and writing may be overlapped. While data is being received in one input data buffer, the data contained in the second data input

buffer is written on tape. In order to insure that data is not received faster than it can be written on the cassette, the block checking response following the receipt of each record may be delayed until the record contained in the input buffer has been successfully written. While this delay is taking place, the temporary delay sequence (WACK) is idled on the line.

LINE ERROR

If, during the receipt of a record, one of the two parity checks (LRC & VRC) fail, then the record is rejected and the L status message displayed. Retransmission of the record is requested by sending a negative acknowledgment (NAK) to the transmitting terminal. The L status will automatically be cleared to D upon successful retransmission of the record.

RECORD ERROR

If, at any time during the receipt of a record, the terminal fails to receive a character and times out three seconds, then synchronism is abandoned and an inquiry from the transmit terminal awaited.

COMPLETION

Receipt of an end of transmission (EOT) while awaiting the start of text terminates the transmission. If the final record received was an end of file record (FS with ETX), then an error message is not placed on the screen. Otherwise, the error message INC is placed on the screen to indicate an incomplete transmission. Upon completion an ERR RESET is required to re-enable the terminal for reception of another data file.

DISCONNECT

If at any time during a receiving operation, the sequence DLE EOT is received, the operation is terminated and the connection is disconnected.

WRITE ERRORS

If, during the read after write check on a cassette, a write error is encountered, then the response to the next received record may be delayed until the write error is corrected. Following each failure to write, the questionable section of tape is erased and the above error procedure continued until the record is written successfully, or the end of tape is encountered. Upon successful completion, the proper response is sent to the transmitting terminal. While this process is taking place the temporary delay (WACK) sequence is idled on the line until the proper response may be sent.

AUTOMATIC UNATTENDED COMMUNICATIONS

JOB SELECTION

The unattended communications option is selected via a job selection sequence.

Depression of the Job Select key, followed by the A key generates the following job setup:

B-AUT IN OUT , E

The terminal is now monitoring the communications line and only the Job Select key is active.

INITIATION OF TRANSMISSION

After initiating the line connection manually (master station or computer) or automatically (computer) the master station or computer always starts the operation by sending a normal ENQ character, preceded by the necessary SYN characters. This ENQ character, if properly acknowledged, is always followed by a record, called ID record, which identifies the terminal, the terminal peripheral and the desired mode of operation.

Each 340 terminal is capable of identifying one correct addressing character (see attached table 1) which is field changeable and wired into the communications logic board. This character is followed by one device selection character which identifies the peripheral device on the terminal (cassette 1, cassette 2, printer, etc.) and the operation to be accomplished.

The ID record has the following format:

SOH --Start of Record
 --Terminal Identification
 --Device Selection
ETB or ETX--End of Record

END OF TAPE

If, in the process of a cassette read operation, the end of tape is encountered, a temporary text delay (TTD) sequence is sent to the receiving terminal and the transmitting terminal automatically switches to the alternate recorder and continues transmission.

If, in the process of writing on the cassette, the end of the tape is encountered, instead of responding with the usual DLE0, DLE1 sequence at the next checking sequence, the terminal responds with temporary delay (WACK) characters and the receiving terminal automatically switches to the alternate recorder and continues to receive data.

TRANSMISSION FROM TERMINAL

As defined above, the central master station or computer always initiates the transmission by sending the ID record. The following device selection codes define the specified peripheral as Input and the communications as Output.

- 0 Optional Input
- 6 Cassette 1
- 7 Cassette 2

If one of these codes, together with the correct terminal address is received, the status line will be modified as follows:

CODE	STATUS LINE			
0	B-AUT	INC	OUTL,	
6	B-AUT	IN1	OUTL,	
7	B-AUT	IN2	OUTL,	

1. Normal Terminal Transmission

δ = Terminal address
 β = Device selection code

Master	E	S	E	E	A			A0	DE
or	N	O	$\delta\beta$ T	O	C0			C1	LO
Computer	Q	H	X	T	K			K	ET
		A		A	E	S		E	E
340		C0		C1	N	T	TEXT	N	T
		K		K	Q	X		X	T

2. Wrong Address

Master	E	S	E	DE
or	N	O	$\delta\beta$ T	LO
Computer	Q	H	X	ET

	A	E
340	CO	O
	K	T

3. Device not ready to transmit but correct address

Master	E	S	E	E	DE
or	N	O	$\delta\beta$ T	O	LO
Computer	Q	H	X	T	ET

	A	A	E
340	CO	C1	O
	K	K	T

SUCCESSFUL TERMINATION OF TRANSMISSION

After successful transmission of a file, one or two end of file marks are encountered, the position of the AUTO OPR switch defines the termination and both cassettes are rewound.

UNRECOVERABLE ERRORS

An unrecoverable transmission error occurs if three retransmission attempts were unsuccessful, the carrier is lost or the time out is activated. In this case the terminal will automatically backspace the input recorder two (2) records and reset to an idle unattended operation.

If the auto operation switch is on and an unrecoverable read error occurs, a record containing 20 @ signs will be transmitted in place of the unreadable record.

TRANSMISSION TO TERMINAL

The following device control characters are used to define transmission to the terminal (reception).

DC1	Printer
DC2	Cassette 1
DC3	Cassette 2
DC4	Optional Output

If one of these codes, together with a correct terminal address is received, the status line will be modified as follows:

CODE STATUS LINE

DC1 B-AUT INL OUTP,
 DC2 B-AUT INL OUT1,
 DC3 B-AUT INL OUT2,
 DC4 B-AUT INL OUTC,

1. Normal Reception on Terminal

δ = Terminal address
 β = Device selection code

Master	E	S	E	S		E	DE	S
or	N	O	$\delta\beta$	T	T Record	N	T	LO or O
Computer	Q	H	B	X		X	ET	H

	A		A		AO
340	CO		C1		C1
	K		K		K

2. Wrong Address

Master	E	S	E	DE
or	N	O	$\delta\beta$	LO
Computer	Q	H	B	ET

	A		E
340	CO		O
	K		T

3. Terminal not ready to receive but correct address

Master	E	S	E	S		E	DE	S
or	N	O	$\delta\beta$	T	T Record 1	T	LO or O	
Computer	Q	H	B	X		B	ET	H

	A		A		E
340	CO		C1		O
	K		K		T

APPENDICES

JOB SELECT
MEMORY SELECT
NEXT FORMAT

CLEAR SCRN	CLEAR FIELD
BACK FIELD	ADV FIELD
←	→

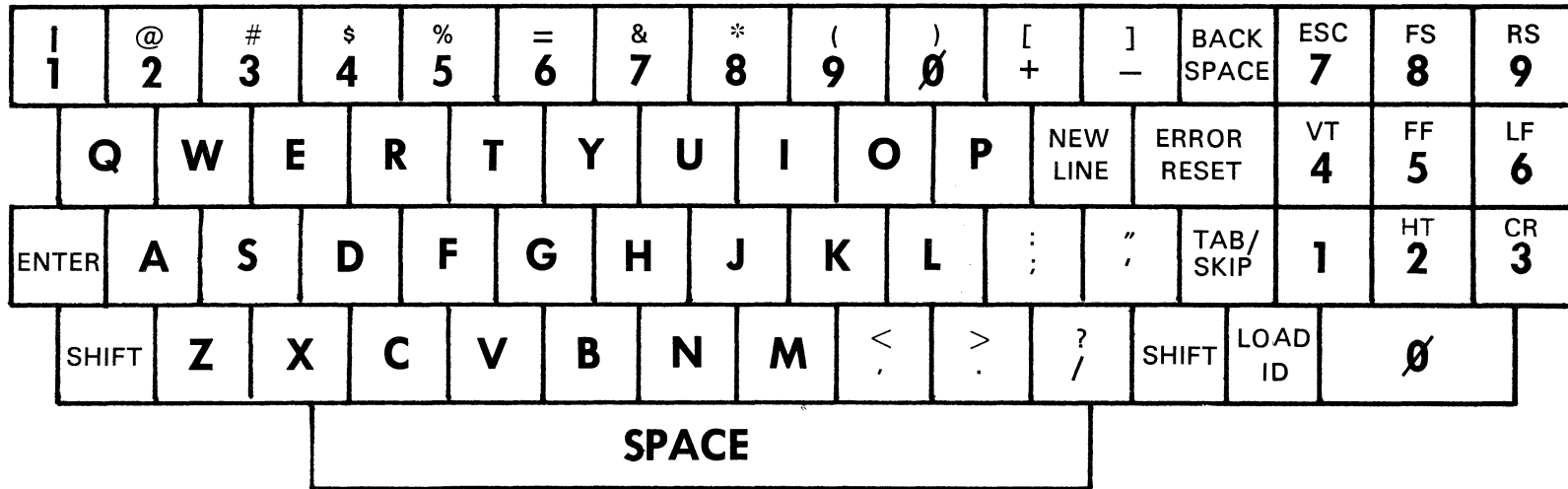
PROG
CTL ON

AUTO
OPRT ON

MEM
CTL ON

WRITE	TAPE 1	TAPE 2	REW
RE CALL	ADV RCD	BACK RCD	INSRT

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KEYBOARD LAYOUT

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
0-9	Displays the representative numeric character in the current position on the CRT.	Displays the representative numeric character in the current position on the CRT. Valid entry in a numeric or mixed field only.
A-Z	Displays the representative alphabetic character in the current position on the CRT.	Displays the representative alphabetic character in the current position on the CRT. Valid entry in alphabetic or mixed fields only.
Space	Displays a space on the CRT.	Displays a space on the CRT. Valid in numeric, alpha, or mixed fields.
.(Period)	Displays a period on the CRT.	Displays a period on the CRT. Valid in numeric, alpha, or mixed fields.
45 , (Comma)	Displays a comma on the CRT.	Displays a comma on the CRT. Valid in numeric, alpha, or mixed fields.
:(Colon)	Displays a colon on the CRT.	Displays a colon on the CRT. Valid in mixed fields only.
;(Semi-Colon)	Displays a semi-colon on the CRT.	Displays a semi-colon on the CRT. Valid in mixed fields only.
?(Question Mark)	Displays a question mark on the CRT.	Displays a question mark on the CRT. Valid in mixed fields only.
| (Cursor Advance)	Displays a cursor advance symbol on the CRT.	Inoperative.
[(Left Bracket)	Displays a left bracket on the CRT.	Inoperative.
@ (At Sign)	Displays an at sign on the CRT.	Displays an at sign on the CRT. Valid in mixed fields only.
# (Pound Sign)	Displays a pound sign on the CRT.	Displays a pound sign on the CRT. Valid in mixed fields only.

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
\$ (Dollar Sign)	Displays a dollar sign on the CRT.	Displays a dollar sign on the CRT. Valid in mixed fields only.
% (Percent Sign)	Displays a percent sign on the CRT.	Displays a percent sign on the CRT. Valid in mixed fields only.
] (Right Bracket)	Displays a right bracket on the CRT.	Inoperative.
& (Ampersand)	Displays an ampersand on the CRT.	Displays an ampersand on the CRT. Valid in mixed fields only.
* (Asterisk)	Displays an asterisk on the CRT.	Displays an asterisk on the CRT. Valid in mixed fields only.
((Left Parenthesis)	Displays a left parenthesis on the CRT.	Displays a left parenthesis on the CRT. Valid in mixed fields only.
) (Right Parenthesis)	Displays a right parenthesis on the CRT.	Displays a right parenthesis on the CRT. Valid in mixed fields only.
- (Minus)	Displays a minus on the CRT.	Displays a minus on the CRT. Valid in numeric and mixed fields only. Subtracts an accumulator add/subtract field from the specified accumulator.
+ (Plus)	Displays a plus on the CRT.	Displays a plus on the CRT. Valid in mixed fields only.
= (Equal Sign)	Displays an equal sign on the CRT.	Displays an equal sign on the CRT. Valid in mixed fields only.
" (Quotation Mark)	Displays a quotation mark on the CRT.	Displays a quotation mark on the CRT. Valid in mixed fields only.
< (Less Than Symbol)	Displays a less than symbol on the CRT.	Displays a less than symbol on the CRT. Valid in mixed fields only.
> (Greater Than Symbol)	Displays a greater than symbol on the CRT.	Displays a greater than symbol on the CRT. Valid in mixed fields only.

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
/ (Slash)	Displays a slash on the CRT.	Displays a slash on the CRT. Valid in mixed fields only.
' (Apostrophe)	Displays an apostrophe on the CRT.	Displays an apostrophe on the CRT. Valid in mixed fields only.
TAB/SKIP	Displays a \ (Horizontal Tab) symbol on the CRT.	Skips the remaining positions of the current field. If depressed in a capacity control field, or before a data character is entered in an omission detection field, the terminal will stop at that field with a TAB error. If depressed in a tab compression data field, a tab code (HT) will replace the remaining spaces in the data. Right justify, accumulator or extended memory fields are executed by tab/skip.
NEW LINE	Displays ¶ (New line stop code) symbol on the CRT.	Skips the remaining positions of the current field and all remaining fields up to the new line stop code character and outputs a CR/LF character in the position of the stop code. All skipped fields are executed or checked for omission detection, etc.
VERTICAL TAB (VT)	Outputs a VT character which is not displayed on the CRT.	Inoperative.
HORIZONTAL TAB (HT)	Outputs an HT character which is not displayed on the CRT.	Inoperative.
FORM FEED (FF)	Outputs a form feed character which is not displayed on the CRT.	Inoperative.

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
ENTER	Inoperative	Skips the remainder of the current field and all remaining fields of the record. All skipped fields are executed or checked for omission detection, etc. Executes the specified job. Repositions the cursor at the highest previous location on the CRT when the cursor has been positioned to the left for correction.
BACKSPACE	Basckspaces the cursor one position to the left.	Backspaces the cursor one position to the left within the current field. The cursor cannot move past the first position of the current field with the backspace key.
SHIFT	Defines the interpretation of keys which contain two (2) characters.	Defines the interpretation of keys which contain two (2) characters.
ESC	Outputs an ESC character which is not displayed on the CRT.	Inoperative.
RS	Outputs an RS (Record Separator) which is displayed on the CRT as a ■ and functions as the end of record symbol.	Inoperative.
LF	Outputs a Line Feed character which is not displayed on the CRT.	Inoperative.
ADVANCE RECORD	The advance record key preceded by either of the tape address keys initiates the addressed recorder to read the next logical record from tape onto the display.	The advance record key preceded by either of the tape address keys initiates the tape to read one logical record onto the display. Data is read into all data fields without regard to input/output controls.

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
BACK RECORD	The back record key preceded by either of the tape address keys initiates the tape to backspace one record. The entire CRT is cleared.	The back record key preceded by either of the tape address keys initiates the tape to backspace one record. The unprotected data fields are cleared.
INSERT RECORD	The addressed recorder is backspaced one or two records, depending on the number of characters on the CRT, and the contents of the CRT are written, starting in position one (1) to the end of the record character, over the previously recorded record.	The addressed recorder is backspaced one or two records, depending on the number of characters on the CRT, and the unprotected contents of the CRT are written, starting in position one (1) to the end of the record character, over the previous recorded record. Input/output controls are not recognized.
FS (End of File)	The end of file key preceded by a tape address key causes an end of file mark to be written on the addressed tape. This mark is used to indicate the end of a data file.	
REWIND	The rewind key causes the CRT to be cleared and the addressed recorder to rewind to beginning of tape.	The rewind key causes the unprotected data fields on the CRT to be cleared and the addressed recorder to rewind to beginning of tape.
WRITE	Writes the contents of the CRT from position one (1) through the RS code to the addressed recorder. The tape is backspaced and a read after write check is performed.	Writes the data fields on the CRT from position one (1) through the RS code to the addressed recorder. Special codes (\7) are converted to the required output codes. The tape is backspaced and a read after write check is performed. Input/output controls are not recognized.
RECALL	Clears the CRT and backspaces the addressed recorder one logical record and reads this logical record directly onto the CRT.	Clears the CRT and backspaces the addressed recorder one logical record and reads this logical record into the data fields on the CRT through the I/O buffer. Input/output controls are not recognized.

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
TAPE 1	Addresses the left hand recorder.	
TAPE 2	Addresses the right hand recorder.	
ERROR RESET	The error reset key will clear all error conditions resulting from operation errors. (See detailed error listing)	
NEXT FORMAT		Reads the next control format from the format tape to the CRT. The terminal remains in the program controlled mode of operation. Rewinds the format tape and advances the first record if a file separator is read.
50 ← (Cursor Left)	Moves the cursor left at 10 characters per second for as long as the key is held depressed.	Moves the cursor left within the current field. If held depressed the slew rate is 10 characters per second.
→ (Cursor Right)	Moves the cursor right at 10 characters per second for as long as the key is held depressed.	Moves the cursor right within the current field. If held depressed the slew rate is 10 characters per second.
CLEAR SCRN	Clears the entire CRT and positions the cursor at the home position.	Clears all unprotected data fields on the CRT, and positions the cursor at the first character of the first unprotected field.
CLEAR FIELD	Clears all data from the current position to the end of the line. The cursor position remains unchanged.	Clears all unprotected positions of the current data field. The cursor is positioned to the first unprotected position of the data field.

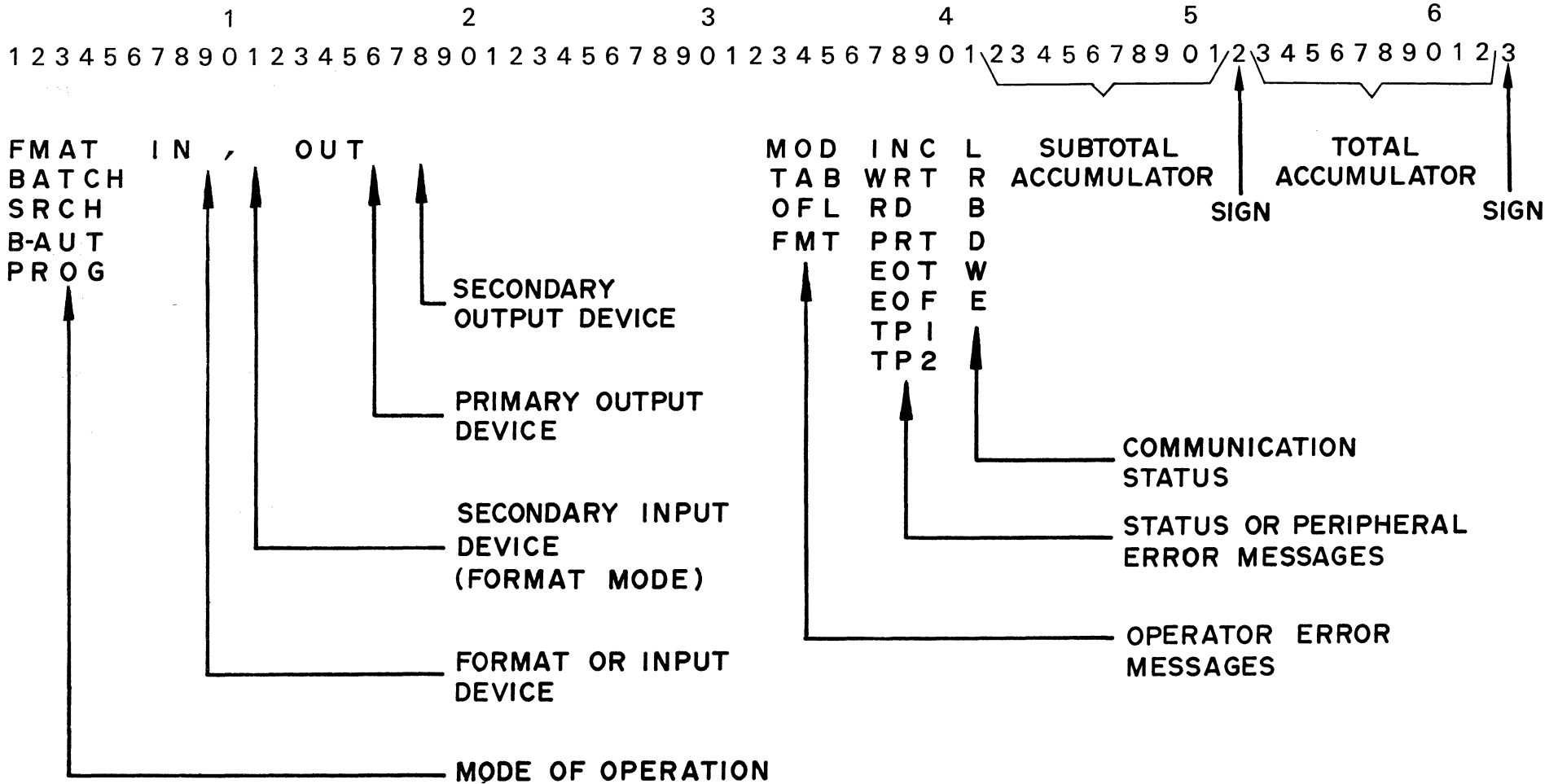
340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
BACK FIELD	The cursor is positioned to the first location of the current line. If the cursor is at the first position of a line, the depression of the Back Field key will move the cursor to the first position of the preceding line.	The cursor is backspaced automatically to the first position of the previous unprotected data field. Data entered will follow the same rules as the original data edited.
ADVANCE FIELD	The cursor is advanced to the first position of the next line.	The cursor is advanced automatically to the first position of the next unprotected data field. The field the cursor was in is not executed.
AUTO OPERATION	FORMAT MODE Inoperative.	<ol style="list-style-type: none"> 1. In the ON position every data record is output if an end of record character is detected. 2. In the OFF position a data record is output if the end of record character is detected and the ENTER key is then depressed.
	BATCH MODE	
	<ol style="list-style-type: none"> 1. In the ON position, two sequential file separator (FS) records terminate the operation. 2. In the OFF position, one file separator terminates the operation. 	
	SEARCH MODE	
	<ol style="list-style-type: none"> 1. In the ON position, matching data records (program control off) or non-matching records (program control on) are automatically transferred to the output device(s). 2. In the OFF position, depression of the ENTER key initiates transfer to the output device(s) thus allowing correction of data records. 	
	AUTOMATIC UNATTENDED COMMUNICATION	
	<ol style="list-style-type: none"> 1. In the ON position, two file separators terminate an operation and records containing unrecoverable read errors are replaced with records containing 20 @ signs. 	

340 KEY/SWITCH FUNCTION CHART

KEY/SWITCH	PROGRAM CONTROL--OFF	PROGRAM CONTROL--ON
	2. In the OFF position, one file separator or an unrecoverable read error terminates an operation.	
JOB SELECT	Activates the job selection sequence.	
PROGRAM CONTROL	SEARCH MODE Determines whether the terminal will seek matching records or non-matching records.	
MEMORY SELECT	The program loaded in extended memory defines the operation of this key.	
MEMORY CONTROL	The program loaded in extended memory defines the operation of this switch.	

DISPLAY STATUS LINE



DISPLAY STATUS AND ERROR MESSAGES

General Error Recovery Procedure -- In the Batch or Search modes of operation the following error recovery procedure is available. 1. Depress the ERROR RESET key to clear the error message. 2. Either depress the ENTER key to resume the operation (the operation will be continued), or, 3. Depress any keys required to correct the error condition, and then depress the ENTER key, which will restart the operation by reading the specified input device.

In the Formatted mode of operation, error conditions other than cassette write errors must be handled manually by the operator as described below.

54

DISPLAY	MESSAGE DEFINITION	ACTION REQUIRED
FMAT.	Terminal is in the Formatted Mode of operation.	None
BATCH	Terminal is in the Batch Mode of operation.	None
B-AUT	Terminal is in the Automatic Unattended Mode of operation.	None
SRCH	Terminal is in the Search Mode of operation.	None
PROG	Terminal is in the Program Mode of operation.	None
MOD	The operator has entered a character of the incorrect type, e.g., alphabetic in numeric field.	Depress the ERROR RESET key to clear the error message and enter a correct character.
TAB	An omission detection or capacity controlled field has not been filled to the required capacity.	Depress the ERROR RESET key to clear the error message; the cursor is positioned at the position of the TAB ERROR and the field must be completed.
OFL	The current operation would result in an overflow of the accumulator or register. The operation is not executed.	Depress the ERROR RESET key, clear the field and key the correction.

DISPLAY	MESSAGE DEFINITION	ACTION REQUIRED
OFL	The operator has depressed a key other than TAB/SKIP, NEW LINE, or ENTER in a field requiring accumulator input.	Depress the ERROR RESET key, depress TAB/SKIP, NEW LINE or ENTER.
OFL	The operator has depressed a data character instead of TAB/SKIP, NEW LINE or ENTER at the end of a must tab data field.	Depress the ERROR RESET key, depress TAB/SKIP, NEW LINE or ENTER.
OFL	The operator has depressed a key other than the ENTER key in the end of record position.	Depress the ERROR RESET key to clear the error message, and either position the cursor to the correct field to be entered or depress the ENTER key to release the record.
FMT	The format control program contains an invalid format control character.	Turn the PROGRAM CTL switch off, correct the error and resume.
55 INC	The line error condition was unable to be corrected by retransmitting the record, and data transmission has been terminated.	<ol style="list-style-type: none"> 1. If the unattended operation feature is present the terminal will position the cassette tape to the correct position, so that when the transmission is re-initiated, the terminal will be ready to continue. 2. In the attended mode of operation the operator must depress the ERROR RESET key to clear the error and position the tape correctly before transmission can continue.
WRT	The current record was not written to tape correctly, the tape is backspaced, the bad record erased, and the record is rewritten. This process is performed until the record is written on tape correctly.	None

DISPLAY	MESSAGE DEFINITION	ACTION REQUIRED
RD	The terminal was unable to read the current record correctly in four attempts.	Depress the ERROR RESET key to clear the error message and either accept the record or depress the BACK RECORD key, followed by the ADVANCE RECORD key, to re-read the record.
PRT	Indicates an error on the printer, either form out, printer check, or temperature warning.	Depress the ERROR RESET key to clear the error, correct the printer error, reposition the input print medium and advance the last record printed onto the CRT, position the printer form, clear screen, and depress the ENTER key to continue.
EOT	The addressed input/output device has detected the physical end of medium.	Depress the ERROR RESET key to clear the error message.
56 EOF	The input device has read the logical end of file.	Depression of the ERROR RESET key will reset the terminal.
TP 1	A hardware error or a protect signal has occurred on tape recorder one.	Depress ERROR RESET and ENTER to continue.
TP 2	A hardware error or protect signal has occurred on tape recorder two.	Depress ERROR RESET and ENTER to continue.
L	A line error has been detected during data transmission.	The terminal will automatically re-transmit the last record.
R	The receiving terminal has responded with the incorrect odd/even acknowledgement or has given an erroneous response.	The transmitting terminal will send up to three additional ENQ's in an attempt to resume transmission. If transmission cannot be resumed the error message shall remain on the CRT and transmission will be terminated by the transmitting terminal.

DISPLAY	MESSAGE DEFINITION	ACTION REQUIRED
B	Indicates the terminal is performing the Binary Synchronous Communications Handshake Procedure required before data transmission.	None
D	Indicates data communication is in progress.	None
W	The communication operation is currently in a 'wait' mode.	None
E	Indicates that the terminal is enabled for communication but a connection has not yet been established.	Initiate line connection. i.e. dial.

TERMINAL SPECIFICATIONS

GENERAL CHARACTERISTICS

SIZE	See outline dimensions specified on page 94.
WEIGHT	110 pounds
POWER	Input 400 watts with a 115 V AC input, exclusive of peripheral devices.
LINE VOLTAGE	115 \pm 10% volt, 60 Hz, single phase. Voltage transients shall not exceed 100 volts peak or 8 millisecc duration.
OPERATING TEMPERATURE	Ambient temperature range of +50°F to +100°F.
HUMIDITY	Relative humidity range of 20 to 95 percent.
DUTY CYCLE	The terminal shall be operable for a continuous 24 hour/day cycle.

KEYBOARD

Type	Reed Switch
Number of Character Keys	56
Number of Control Keys	25
Key size	0.710" square
Key spacing	0.75" o/c
Key arrangement	Straight vertical or staggered 3/8" per key rows 1 to 2 and 3 to 4 3/16" rows 2 to 3
Actuating pressure	2.5 oz. Typical
Key travel	3/16" Maximum
Roll over control	Electronic
Life	10 million cycles/key min.
Size	15.3" length x 7.5" width x 2.85" height
Color	Black with 5 gray control keys separating Alpha keyboard from Numeric Pad

CRT

Type	9" diagonal implosion protected Aluminized
Viewing area	5 1/2" width x 4 3/4" height
Display capacity	576 characters
Characters per line	64
Lines per display	9
Refresh rate	68 Hz
Character set	Refer to Code Chart
Character size	Nominally .25" height and .16" width
Character formation technique	5 x 8 Dot Matrix
Viewing distance	8-41 inches

CASSETTE RECORDER

Type	Magnetic Tape Cassette Recorder/ Reproducer IC
Operating Modes	Rewind-read/record
Tape speed (Read/Record) (Rewind)	3.9 ips or 12.5 ips nominal 120 ips nominal
Start/stop time	Start - 20 ms nominal Stop - 25 ms nominal
Inter-record gap	1.5" nominal
Data transfer rate	10,000 bps
Cassette capacity	200,000 characters
Rewind time	30 sec.
Data format	Serial by bit
Bit packing density	800 bpi nominal
Recording method	Dual track NRZI

PRINTERS

30 CPS

Speed	30 characters per second
Medium	Pin-fed, fanfold, multi-part forms up to 14 7/8 inches wide with 132 print positions
Character set	64 printable characters
Printing system	An ink-impregnated roller, a helical type print wheel and a single print hammer actuator
Roller	A special roller eliminates the need for the conventional ribbon system. Black is the standard color. The roller can be changed by the operator in a matter of seconds.
Typewheel	Standard typewheel font available is USASCII
Character	Characters are spaced horizontally at ten (10) per inch
Line Spacing	Lines are spaced vertically at six (6) per inch
Width	26 1/2 inches
Height	36 inches
Depth	36 inches (includes paper rack)
Weight	Approximately 100 pounds
AC Input Voltage	120 V AC (+10%-5%) single phase, 60 Hz ($\pm .5$ Hz) or 220 V AC (+10%-5%) single phase, 50 Hz (± 1.0 Hz) as specified
Current	.60 Hz units 3.7 amperes
Power Consumption	225 Watts
Heat Dissipation	Less than 800 BTU per hour

50 LPM

Speed	50 lines per minute
Medium	Pin-fed, fanfold, multi-part forms up to 14 7/8 inches wide with 132 print positions
Character Set	64 printable USASCII character set
Printing System	Print head, 7 print solenoids and attached print wires for 5 x 7 matrix printing
Ribbon	1 inch fabric ribbon, on standard 3 inch spools

200 LPM

Character	Characters are spaced horizontally at ten (10) per inch
Line spacing	Lines are spaced vertically at six (6) per inch
Width	27 1/2 inches
Height	11 1/4 inches
Depth	19 1/4 inches
Weight	Approximately 155 pounds
AC Input Voltage	117 VAC \pm 10% 60 Hz or 117/234 VAC \pm 10% 50 Hz as specified

Printing speed	Average 200 lpm
Line length	Up to 132 columns
Character set	64 USASCII Character Set
Character spacing	10 characters per inch
Line spacing	6 lines per inch
Character size	.096 x .059 inches
Printing Technique	Individual characters on belt, driven on the fly by hammers
Forms	Continuous fan fold, 1 to 6 part, pin fed
Right and Left Margins	Variable by moving paper tractors
Inking method	Multipass carbon coated Mylar ribbon, 50,000 lines minimum
Line voltage	115 VAC \pm 10%, 60 Hz
Environment	50°F to 110°F 30% to 95% humidity
Weight	110 lbs.
Size	27 5/8" W x 11 1/2" H x 20" D
Connection	Sycor provided 10 ft. cable

CARD READER

Speed	250 CPM
Hoppers	450 cards input 500 cards output
Operation type	Continuous
Reading method	Photoelectric

Width	19 1/4"
Height	13 1/2" (overall)
Depth	14 3/4" (total)
Weight	35 lbs.
Electrical Specifications	48 to 66 Hz, 115 VAC $\pm 10\%$, 175 Watts
Environmental Conditions	50°F to 95°F 20 to 80% relative humidity

CARD PUNCH

Punching speed	25 column/second
Punch cycle	40 milliseconds
Skip speed	80 columns/second maximum
Read time	1/3 second between cards
Hopper capacity	500 cards
Code	Hollerith
Width	35 1/2" 49" with table
Depth	27 1/4" 34 3/4" with table
Height	43", overall table height 25 3/4"
Weight	Approximately 400 pounds
Electrical Specifications	Single phase, 60 Hz, 115V $\pm 10\%$ 850 VA maximum, $\cos \phi \geq 0.7$
Environmental Conditions	60° to 86°F 35 to 60% relative humidity

TAPES

NINE TRACK

Number of tracks	9; 8 Data 1 Parity
Density	800 bpi
Parity	Odd
Code	EBCDIC
Data Capacity	Over 4 million characters 15,000 records of 256 characters each
Tape Read/Write speed	12.5 inches per second Automatic Read-After-Write Check
Rewind speed	50 inches per second
Inter-Record gap	0.6 inches
Recording mode	NRZI
Tape specifications	Computer grade 0.5" wide; 1.5 mil thick Mylar base

SEVEN TRACK

Reel size	8.5 inch diameter maximum IBM hub compatible
Reel capacity	1200 feet maximum.
Switches/Indicators	Power File Protect Load Reverse On Line Forward Rewind Reset
Dimensions	Height - 13.0 inches Width - 19.50 inches Depth - 12.25 inches Weight - 45.0 lbs.
Number of Tracks	7; 6 Data 1 Parity
Density	800 bpi; 556 bpi
Parity	IBM, Even Honeywell, Odd General Electric, Odd
Code	IBM BCD Honeywell BCD General Electric BCD
Data Capacity	Over 4 million characters 15,000 records of 256 characters each
Tape Read/Write Speed	12.5 inches per second Automatic Read-After-Write Check
Rewind speed	50 inches per second
Inter-Record gap	0.75 inches
Recording mode	NRZI
Tape Specifications	Computer grade 0.5" wide; 1.5 mil thick Mylar base
Reel size	8.5 inch diameter maximum IBM hub compatible
Reel capacity	1200 feet maximum
Switches/Indicators	Power File Protect Load Reverse On Line Forward Rewind Reset
Dimensions	Height - 13.0 inches Width - 19.50 inches Depth - 12.25 inches Weight - 45.0 lbs.

TERMINAL ADDRESSING SEQUENCE

(Unattended Operation)

Symbol	Addressing Character USASCII Code (Octal)
A	101
B	102
C	103
D	104
E	105
F	106
G	107
H	110
I	111
J	112
K	113
L	114
M	115
N	116
O	117
P	120
Q	121
R	122
S	123
T	124
U	125
V	126
W	127
X	130
Y	131
Z	132

UNITED STATES OF AMERICA STANDARD CODE
for
INFORMATION INTERCHANGE
(USASCII)

Bit Positions				b7	b6	b5	0	0	0	0	1	1	1	1
				0	0	1	1	0	0	1	1			
b4	b3	b2	b1											
0	0	0	0	NUL	DLE	SP	0	@	P				p	
0	0	0	1	SOH	DC1	|	1	A	Q	a			q	
0	0	1	0	STX	DC2	..	2	B	R	b			r	
0	0	1	1	ETX	DC3	#	3	C	S	c			s	
0	1	0	0	EOT	DC4	\$	4	D	T	d			t	
0	1	0	1	ENQ	NAK	%	5	E	U	e			u	
0	1	1	0	ACK	SYN	&	6	F	V	f			v	
0	1	1	1	BEL	ETB	'	7	G	W	g			w	
1	0	0	0	BS	CAN	(	8	H	X	h			x
1	0	0	1	HT	EM	)	9	I	Y	i			y
1	0	1	0	LF	SUB	*	:	J	Z	j			z	
1	0	1	1	VT	ESC	+	;	K	[	k			
1	1	0	0	FF	FS	,	<	L	\	l			|	
1	1	0	1	CR	GS	-	=	M	]	m			
1	1	1	0	SO	RS	.	>	N	⌋	n				
1	1	1	1	SI	US	/	?	O	\	o			DEL	

SYCOR CODE SET

DISPLAY	SYCOR KEY	SYCOR PRINT GRAPHIC	USASC II TRANSMISSION CODE	
			Octal	Hex
0	0	0	60	30
1	1	1	61	31
2	2	2	62	32
3	3	3	63	33
4	4	4	64	34
5	5	5	65	35
6	6	6	66	36
7	7	7	67	37
8	8	8	70	38
9	9	9	71	39
Space	Space	Space	40	20
A	A	A	101	41
B	B	B	102	42
C	C	C	103	43
D	D	D	104	44
E	E	E	105	45
F	F	F	106	46
G	G	G	107	47
H	H	H	110	48
I	I	I	111	49
J	J	J	112	4A
K	K	K	113	4B
L	L	L	114	4C
M	M	M	115	4D
N	N	N	116	4E
O	O	O	117	4F
P	P	P	120	50
Q	Q	Q	121	51
R	R	R	122	52
S	S	S	123	53

SYCOR CODE SET

DISPLAY	SYCOR KEY	SYCOR PRINT GRAPHIC	USASCII TRANSMISSION CODE	
			Octal	Hex
T	T	T	124	54
U	U	U	125	55
V	V	V	126	56
W	W	W	127	57
X	X	X	130	58
Y	Y	Y	131	59
Z	Z	Z	132	5A
.	.	.	56	2E
,	,	,	54	2C
:	:	:	72	3A
;	;	;	73	3B
|	|	|	47	27
"	"	"	42	22
?	?	?	77	3F
\$	\$	\$	44	24
AT	@	@	100	40
#	#	#	43	23
%	%	%	45	25
&	&	&	46	26
(	(	(	50	28
)	)	)	51	29
*	*	*	52	2A
+	+	+	53	2B
-	-	-	55	2D
/	/	/	57	2F
=	=	=	75	3D
>	>	>	76	3E
<	<	<	74	3C

SYCOR CODE SET

DISPLAY	SYCOR KEY	SYCOR PRINT FUNCTION	USASCII TRANSMISSION CODE	
			Octal	Hex
Carriage Return	CR	Carriage Return/Line Feed	015	0D
Line Feed	LF	Line Feed	012	0A
Form Feed	FF	Skip to Channel A	014	0C
Vertical Tabulation	VT	Skip to Channel B	013	0B
Horizontal Tabulation	HT	Horizontal Tab Skip	011	09
Record Separator █	RS	None	036	1E
Escape	ESC	Identifies HT or VT Printer Stop Record or Print Channels A-F	033	1B
68 Group Separator	Generated by terminal with data compres- sion option	None	035	1D
File Separator	FS	Carriage Return/Line Feed	034	1C
*Display Tab Stop \	TAB/SKIP (Prog Ctl Off)	\	134	5C
*Left Bracket [	[	[	133	5B
*Right Bracket ]	]	]	135	5D
*Auto Display Advance |	|	!	041	21
*New Line Code 7	New Line (Prog Ctl Off)	^	136	5E

*These characters are program control codes for the Formatted Mode of operation.
 The New Line Code is translated to a Carriage Return/Line Feed Code and the Display Tab Stop to a Horizontal Tab during the output operation in the formatted mode.
 NOTE: When generating print data the characters asterisked should not be used.

CONVERSION TABLE

Char-acter	USASCII (Octal) (Hex)	9 Track EBCDIC (Hex)	7 Track BCD IBM Even Parity (Octal)	7 Track BCD Honeywell Odd Parity (Octal)	7 Track BCD G.E.Odd Parity (Octal)	Hollerith
NUL	000	00	32-40	72-40	72-40	12-0-9-8-1
SOH	001	01	32-01	72-01	72-01	12-9-1
STX	002	02	32-02	72-02	72-02	12-9-2
ETX	003	03	32-03	72-03	72-03	12-9-3
EOT	004	04	32-04	72-04	72-04	9-7
ENQ	005	05	32-05	72-05	72-05	0-9-8-5
ACK	006	06	32-06	72-06	72-06	0-9-8-6
BEL	007	07	32-07	72-07	72-07	0-9-8-7
BS	010	08	32-10	72-10	72-10	11-9-6
HT	011	09	32-11	72-11	72-11	12-9-5
LF	012	0A	32-12	72-12	72-12	0-9-5
VT	013	0B	32-13	72-13	72-13	12-9-8-3
FF	014	0C	32-14	72-14	72-14	12-9-8-4
CR	015	0D	32-15	72-15	72-15	12-9-8-5
SO	016	0E	32-16	72-16	72-16	12-9-8-6
SI	017	0F	32-17	72-17	72-17	12-9-8-7
DLE	020	10	32-20	72-20	72-20	12-11-9-8-1
DC1	021	11	32-21	72-21	72-21	11-9-1
DC2	022	12	32-22	72-22	72-22	11-9-2
DC3	023	13	32-23	72-23	72-23	11-9-3
DC4	024	14	32-24	72-24	72-24	9-8-4
NAK	025	15	32-25	72-25	72-25	9-8-5
SYN	026	16	32-26	72-26	72-26	9-2
ETB	027	17	32-27	72-27	72-27	0-9-6
CAN	030	18	32-30	72-30	72-30	11-9-8
EM	031	19	32-31	72-31	72-31	11-9-8-1
SUB	032	1A	32-32	72-32	72-32	9-8-7
ESC	033	1B	32-33	72-33	72-33	0-9-7
FS	034	1C	32-35	72-35	72-35	11-9-8-4
GS	035	1D	32-41	72-41	72-41	11-9-8-5
RS	036	1E	32-36	72-36	72-36	11-9-8-6
US	037	1F	32-37	72-37	72-37	11-9-8-7

CONVERSION TABLE

Char-acter	USASCII		9 Track EBCDIC	7 Track BCD IBM Even Parity	7 Track BCD Honeywell Odd Parity	7 Track BCD G.E. Odd Parity	Hollerith
	(Octal)	(Hex)	(Hex)	(Octal)	(Octal)	(Octal)	
Space	040	20	40	20	15	20	
!	041	21	4F	52	40	77	12-8-7
"	042	22	7F	57	52	76	8-7
#	043	23	7B	13	13	13	8-3
\$	044	24	5B	53	53	53	11-8-3
%	045	25	6C	34	74	74	0-8-4
&	046	26	50	60	37	32	12
'	047	27	7D	77	32	57	8-5
(	050	28	4D	35	75	35	12-8-5
)	051	29	5D	74	34	55	11-8-5
*	052	2A	5C	54	54	54	11-8-4
+	053	2B	4E	37	77	60	12-8-6
,	054	2C	6B	33	73	73	0-8-3
-	055	2D	60	40	57	52	11
.	056	2E	4B	73	33	33	12-8-3
/	057	2F	61	21	61	61	0-1
0	060	30	F0	12	00	00	0
1	061	31	F1	01	01	01	1
2	062	32	F2	02	02	02	2
3	063	33	F3	03	03	03	3
4	064	34	F4	04	04	04	4
5	065	35	F5	05	05	05	5
6	066	36	F6	06	06	06	6
7	067	37	F7	07	07	07	7
8	070	38	F8	10	10	10	8
9	071	39	F9	11	11	11	9
:	072	3A	7A	15	60	15	8-2
;	073	3B	5E	56	56	56	11-8-6
<	074	3C	4C	76	36	36	12-8-4
=	075	3D	7E	17	17	75	8-6
>	076	3E	6E	16	16	16	0-8-6
?	077	3F	6F	72	20	17	0-8-7

CONVERSION TABLE

Char-acter	USASCII (Octal) (Hex)	9Track EBCDIC (Hex)	7 Track BCD IBM Even Parity (Octal)	7 Track BCD Honeywell Odd Parity (Octal)	7 Track BCD G.E.Odd Parity (Octal)	Hollerith	
@	100	40	7C	14	14	14	8-4
A	101	41	C1	61	21	21	12-1
B	102	42	C2	62	22	22	12-2
C	103	43	C3	63	23	23	12-3
D	104	44	C4	64	24	24	12-4
E	105	45	C5	65	25	25	12-5
F	106	46	C6	66	26	26	12-6
G	107	47	C7	67	27	27	12-7
H	110	48	C8	70	30	30	12-8
I	111	49	C9	71	31	31	12-9
J	112	4A	D1	41	41	41	11-1
K	113	4B	D2	42	42	42	11-2
L	114	4C	D3	43	43	43	11-3
M	115	4D	D4	44	44	44	11-4
N	116	4E	D5	45	45	45	11-5
O	117	4F	D6	46	46	46	11-6
P	120	50	D7	47	47	47	11-7
Q	121	51	D8	50	50	50	11-8
R	122	52	D9	51	51	51	11-9
S	123	53	E2	22	62	62	0-2
T	124	54	E3	23	63	63	0-3
U	125	55	E4	24	64	64	0-4
V	126	56	E5	25	65	65	0-5
W	127	57	E6	26	66	66	0-6
X	130	58	E7	27	67	67	0-7
Y	131	59	E8	30	70	70	0-8
Z	132	5A	E9	31	71	71	0-9
[	133	5B	4A	75	35	12	12-8-2
\	134	5C	6A	32-34	72-34	37	0-8-2
]	135	5D	5A	55	55	34	11-8-2
^	136	5E	5F	36	76	40	11-8-7
_	137	5F	40	20	15	20	0-8-5

CONVERSION TABLE

Character	USASCII (Octal) (Hex)	9 Track EBCDIC (Hex)	7 Track BCD IBM Even Parity (Octal)	7 Track BCD Honeywell Odd Parity (Octal)	7 Track BCD G.E. Odd Parity (Octal)	Hollerith
	140	60	40	20	20	8-1
a	141	61	40	20	20	12-0-1
b	142	62	40	20	20	12-0-2
c	143	63	40	20	20	12-0-3
d	144	64	40	20	20	12-0-4
e	145	65	40	20	20	12-0-5
f	146	66	40	20	20	12-0-6
g	147	67	40	20	20	12-0-7
h	150	68	40	20	20	12-0-8
i	151	69	40	20	20	12-0-9
j	152	6A	40	20	20	12-11-1
k	153	6B	40	20	20	12-11-2
l	154	6C	40	20	20	12-11-3
m	155	6D	40	20	20	12-11-4
n	156	6E	40	20	20	12-11-5
o	157	6F	40	20	20	12-11-6
p	160	70	40	20	20	12-11-7
q	161	71	40	20	20	12-11-8
r	162	72	40	20	20	12-11-9
s	163	73	40	20	20	11-0-2
t	164	74	40	20	20	11-0-3
u	165	75	40	20	20	11-0-4
v	166	76	40	20	20	11-0-5
w	167	77	40	20	20	11-0-6
x	170	78	40	20	20	11-0-7
y	171	79	40	20	20	11-0-8
z	172	7A	40	20	20	11-0-9
|	173	7B	40	20	20	12-0
!	174	7C	40	20	20	12-11
-0	175	7D	00	52	40	11-0
	176	7E	40	20	20	11-0-1
DEL	177	7F	40	20	20	12-9-7

NOTE: On the Honeywell and General Electric odd parity BCD tapes the tape mark is written in even parity.

EBCDIC TRANSMISSION CODE

<u>EBCDIC</u>			<u>ASCII</u>		<u>EBCDIC</u>	
Hex	Octal		Octal		Octal	
00	000	NUL	000	NUL	000	NUL
01	001	SOH	001	SOH	001	SOH
02	002	STX	002	STX	002	STX
03	003	ETX	003	ETX	003	ETX
04	004	PF	040	SPACE	100	SPACE
05	005	HT	011	HT	005	HT
06	006	LC	040	SPACE	100	SPACE
07	007	DEL	177	DEL	100	SPACE
08	010		040	SPACE	100	SPACE
09	011	RLF	040	SPACE	100	SPACE
0A	012	SMM	040	SPACE	100	SPACE
0B	013	VT	013	VT	013	VT
0C	014	FF	014	FF	014	FF
0D	015	CR	015	CR	015	CR
0E	016	SO	016	SO	016	SO
0F	017	S1	017	S1	017	S1
10	020	DLE	020	DLE	020	DLE
11	021	DC1	021	DC1	021	DC1
12	022	DC2	022	DC2	022	DC2
13	023	DC3	023	DC3	023	DC3
14	024	RES	040	SPACE	100	SPACE
15	025	NL	040	SPACE	100	SPACE
16	026	BS	010	BS	026	BS
17	027		040	SPACE	100	SPACE
18	030	CAN	030	CAN	030	CAN
19	031	EM	031	EM	031	EM
1A	032	CC	040	SPACE	100	SPACE
1B	033		040	SPACE	100	SPACE
1C	034	IFS	034	FS	042	FS
1D	035	IGS	035	GS	035	IGS
1E	036	IRS	036	RS	036	IRS
1F	037	IUS	037	US	037	IUS

<u>EBCDIC</u>			<u>ASCII</u>		<u>EBCDIC</u>	
Hex	Octal		Octal		Octal	
20	040	DS	040	SPACE	100	SPACE
21	041	SOS	040	SPACE	100	SPACE
22	042	FS	034	FS	042	FS
23	043		040	SPACE	100	SPACE
24	044	BYP	040	SPACE	100	SPACE
25	045	LF	012	LF	045	LF
26	046	ETB	027	ETB	046	ETB
27	047	ESC	033	ESC	047	ESC
28	050		040	SPACE	100	SPACE
29	051		040	SPACE	100	SPACE
2A	052	SM	040	SPACE	100	SPACE
2B	053		040	SPACE	100	SPACE
2C	054		040	SPACE	100	SPACE
2D	055	ENQ	005	ENQ	055	ENQ
2E	056	ACK	006	ACK	056	ACK
2F	057	BEL	007	BEL	057	BEL
30	060		040	SPACE	100	SPACE
31	061		040	SPACE	100	SPACE
32	062	SYN	026	SYN	062	SYN
33	063		040	SPACE	100	SPACE
34	064	PN	040	SPACE	100	SPACE
35	065	RS	040	SPACE	100	SPACE
36	066	UC	040	SPACE	100	SPACE
37	067	EOT	004	EOT	067	EOT
38	070		040	SPACE	100	SPACE
39	071		040	SPACE	100	SPACE
3A	072		040	SPACE	100	SPACE
3B	073		040	SPACE	100	SPACE
3C	074	DC4	024	DC4	074	DC4
3D	075	NAK	025	NAK	075	NAK
3E	076		040	SPACE	100	SPACE
3F	077	SUB	032	SUB	077	SUB

		<u>EBCDIC</u>			<u>ASCII</u>		<u>EBCDIC</u>			
	Hex		Octal	Graphic	Octal	Graphic	Hex	Octal	Graphic	
	40	80	C0	100	SPACE	040	SPACE	40	100	SPACE
	41	81	C1	101	A	101	A	C1	301	A
	42	82	C2	102	B	102	B	C2	302	B
	43	83	C3	103	C	103	C	C3	303	C
	44	84	C4	104	D	104	D	C4	304	D
	45	85	C5	105	E	105	E	C5	305	E
	46	86	C6	106	F	106	F	C6	306	F
	47	87	C7	107	G	107	G	C7	307	G
	48	88	C8	110	H	110	H	C8	310	H
	49	89	C9	111	I	111	I	C9	311	I
	4A	8A	CA	112	[	133	[	4A	112	[
	4B	8B	CB	113	.	056	.	4B	113	.
	4C	8C	CC	114	<	074	<	4C	114	<
	4D	8D	CD	115	(	050	(	4D	115	(
	4E	8E	CE	116	+	053	+	4E	116	+
	4F	8F	CF	117	!	041	!	4F	117	!
	50	90	**	120	&	046	&	50	120	&
	51	91	D1	121	J	112	J	D1	321	J
	52	92	D2	122	K	113	K	D2	322	K
	53	93	D3	123	L	114	L	D3	323	L
	54	94	D4	124	M	115	M	D4	324	M
	55	95	D5	125	N	116	N	D5	325	N
	56	96	D6	126	O	117	O	D6	326	O
	57	97	D7	127	P	120	P	D7	327	P
	58	98	D8	130	Q	121	Q	D8	330	Q
	59	99	D9	131	R	122	R	D9	331	R
	5A	9A	DA	132	]	135	]	5A	132]
	5B	9B	DB	133	\$	044	\$	5B	133	\$
	5C	9C	DC	134	*	052	*	5C	134	*
	5D	9D	DD	135	)	051	)	5D	135)
	5E	9E	DE	136	;	073	;	5E	136	;
	5F	9F	DF	137	⌋	136	⌋	5F	137	⌋
		**D0		120	-0	175		D0	120	-0

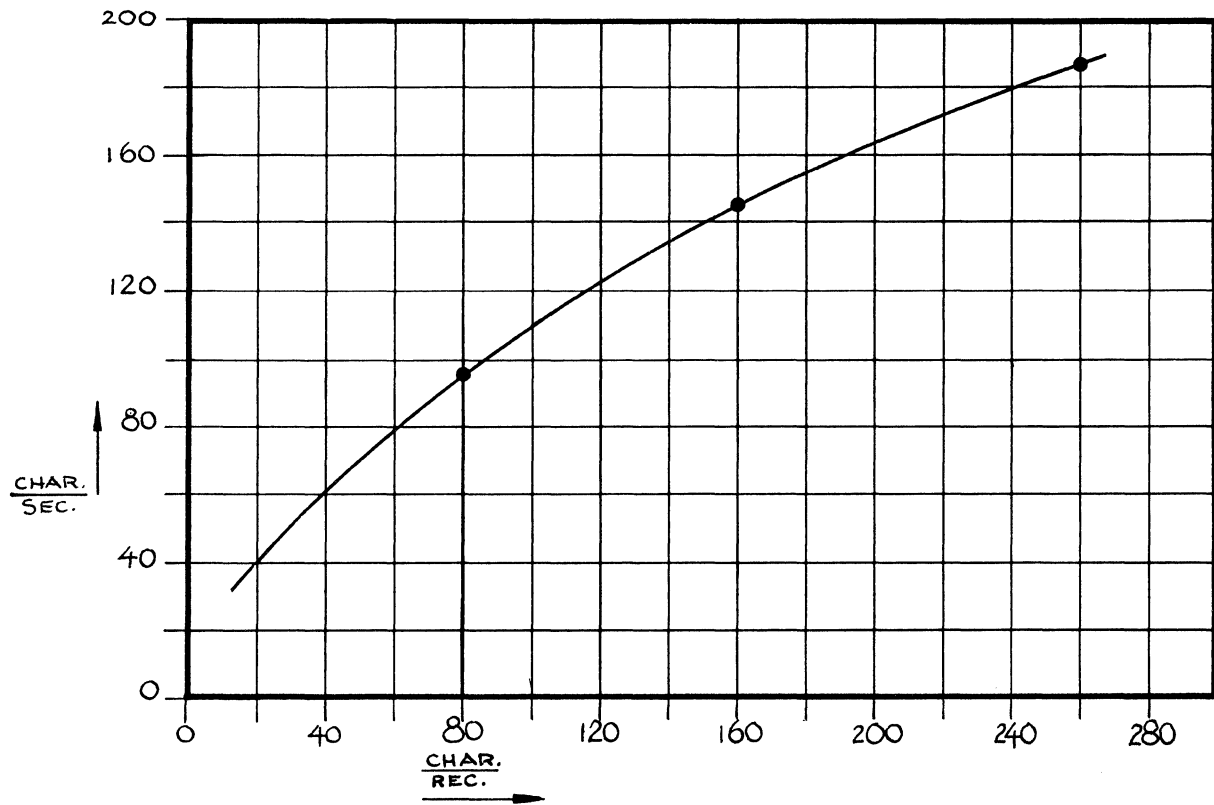
In order to limit memory requirements, the section of the EBCDIC table Hex 40 through Hex 7F and the Section Hex 80 through Hex BF were folded into the Section Hex C0 through Hex FF.

<u>EBCDIC</u>				<u>ASCII</u>		<u>EBCDIC</u>			
Hex			Octal	Graphic	Octal	Graphic	Hex	Octal	Graphic
60	A0	E0	140	-	137	\	60	100	SPACE
61	A1	E1	141	/	055	-	61	140	-
62	A2	E2	142	S	057	/	E2	141	/
63	A3	E3	143	T	123	S	E3	342	S
64	A4	E4	144	U	124	T	E4	343	T
65	A5	E5	145	V	125	U	E5	344	U
66	A6	E6	146	W	126	V	E6	345	V
67	A7	E7	147	X	127	W	E7	346	W
68	A8	E8	150	Y	130	X	E8	347	X
69	A9	E9	151	Z	131	Y	E9	350	Y
6A	AA	EA	152	\	132	Z	E9	351	Z
6B	AB	EB	153	,	134	\	6A	152	\
6C	AC	EC	154	%	054	,	6B	153	,
6D	AD	ED	155	≡	045	%	6C	154	%
6E	AE	EE	156	>	040	SPACE	6D	100	SPACE
6F	AF	EF	157	?	076	>	6E	156	>
70	B0	F0	160	0	077	?	6F	157	?
71	B1	F1	161	1	060	0	F0	360	0
72	B2	F2	162	2	061	1	F1	361	1
73	B3	F3	163	3	062	2	F2	362	2
74	B4	F4	164	4	063	3	F3	363	3
75	B5	F5	165	5	064	4	F4	364	4
76	B6	F6	166	6	065	5	F5	365	5
77	B7	F7	167	7	066	6	F6	366	6
78	B8	F8	170	8	067	7	F7	367	7
79	89	F9	171	9	070	8	F8	370	8
7A	BA	FA	172	:	071	9	F9	371	9
7B	BB	FB	173	#	072	:	7A	172	:
7C	BC	FC	174	@	043	#	7B	173	#
7D	BD	FD	175	'	100	@	7C	174	@
7E	BE	FE	176	=	047	'	7D	175	'
7F	BF	FF	177	"	075	=	7E	176	=
					042	"	7F	177	"

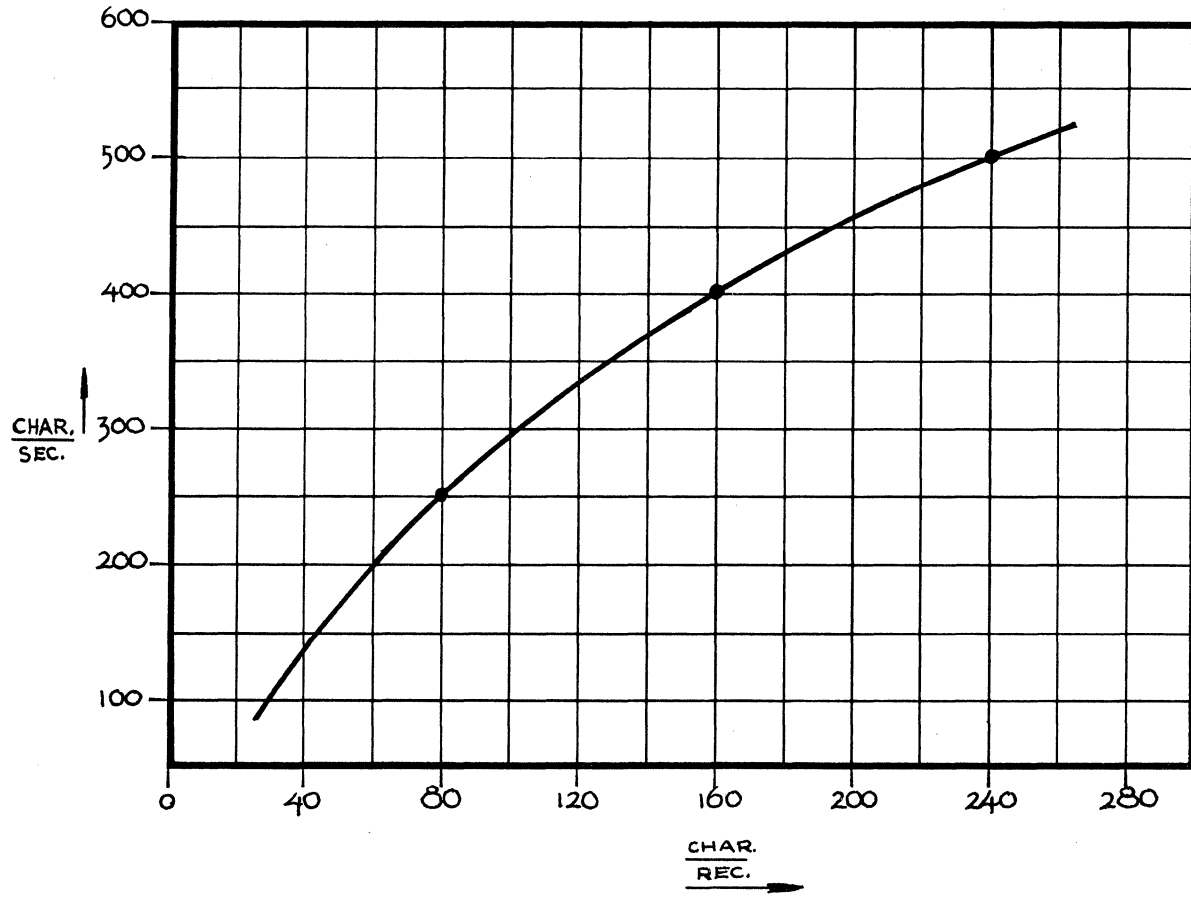
In order to limit memory requirements, the section of the EBCDIC table Hex 40 through Hex 7F and the Section Hex 80 through Hex BF were folded into the Section Hex C0 through Hex FF.

MODEL 340 DATA CONVERSION RATE

Tape To High Speed Cassette



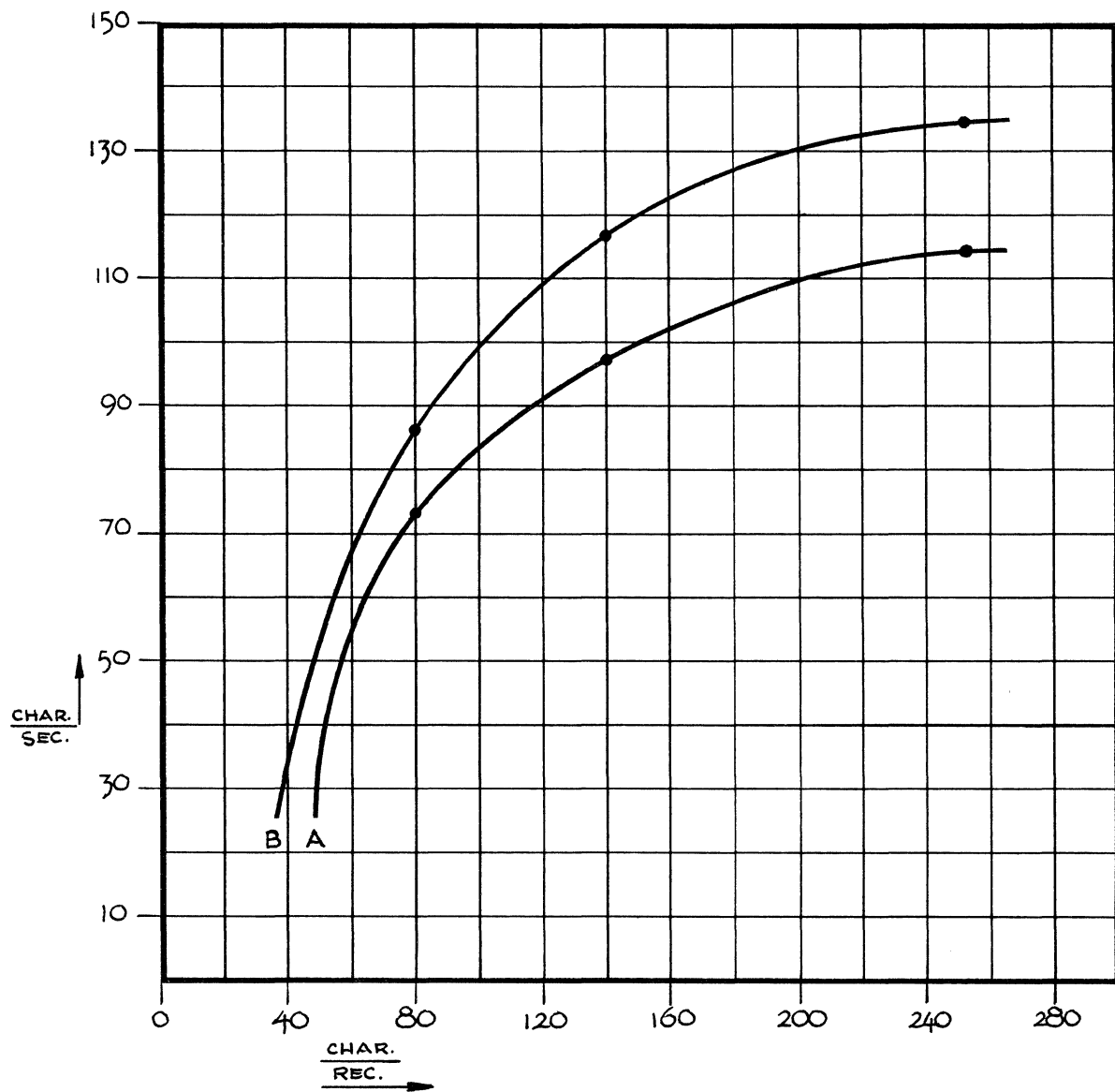
MODEL 340 DATA CONVERSION RATE
High Speed Cassette To Tape



MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

1200 bd

(340/Cassette to and from 340/Mag Tape)



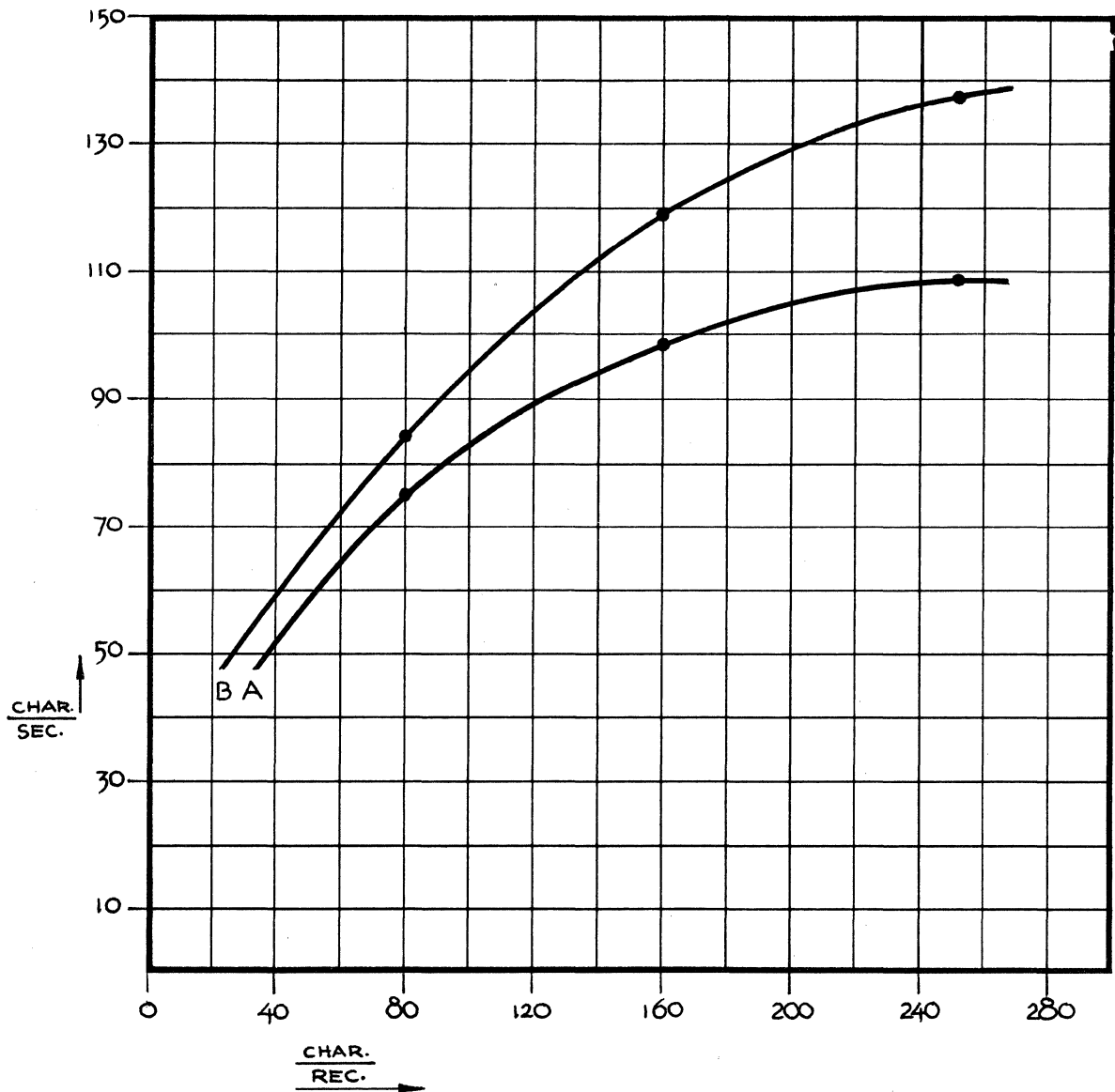
A-NO DATA COMPRESSION

B-25% DATA COMPRESSION

MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

1200 bd

(340 to and from CPU)



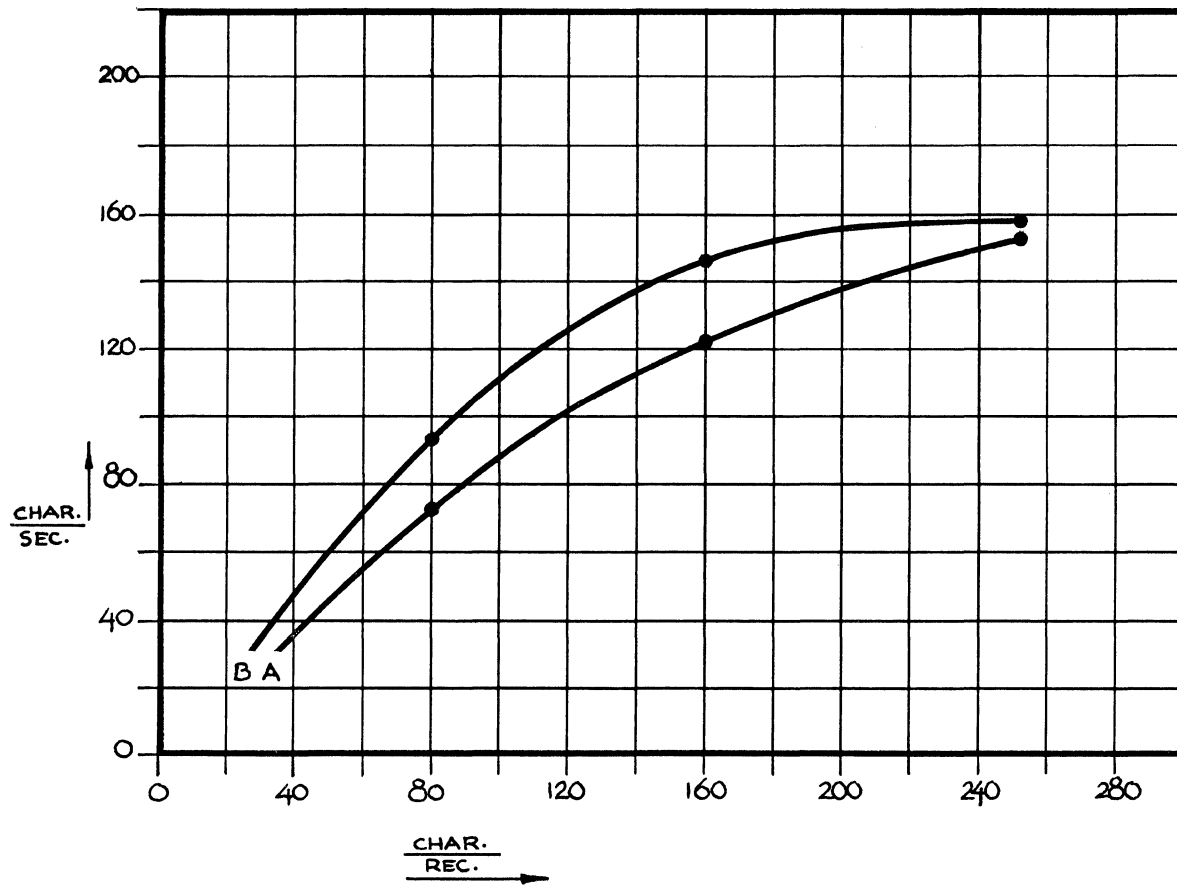
A-NO DATA COMPRESSION

B-25% DATA COMPRESSION

MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

2000 bd

(340/Cassette to and from 340/Mag Tape)

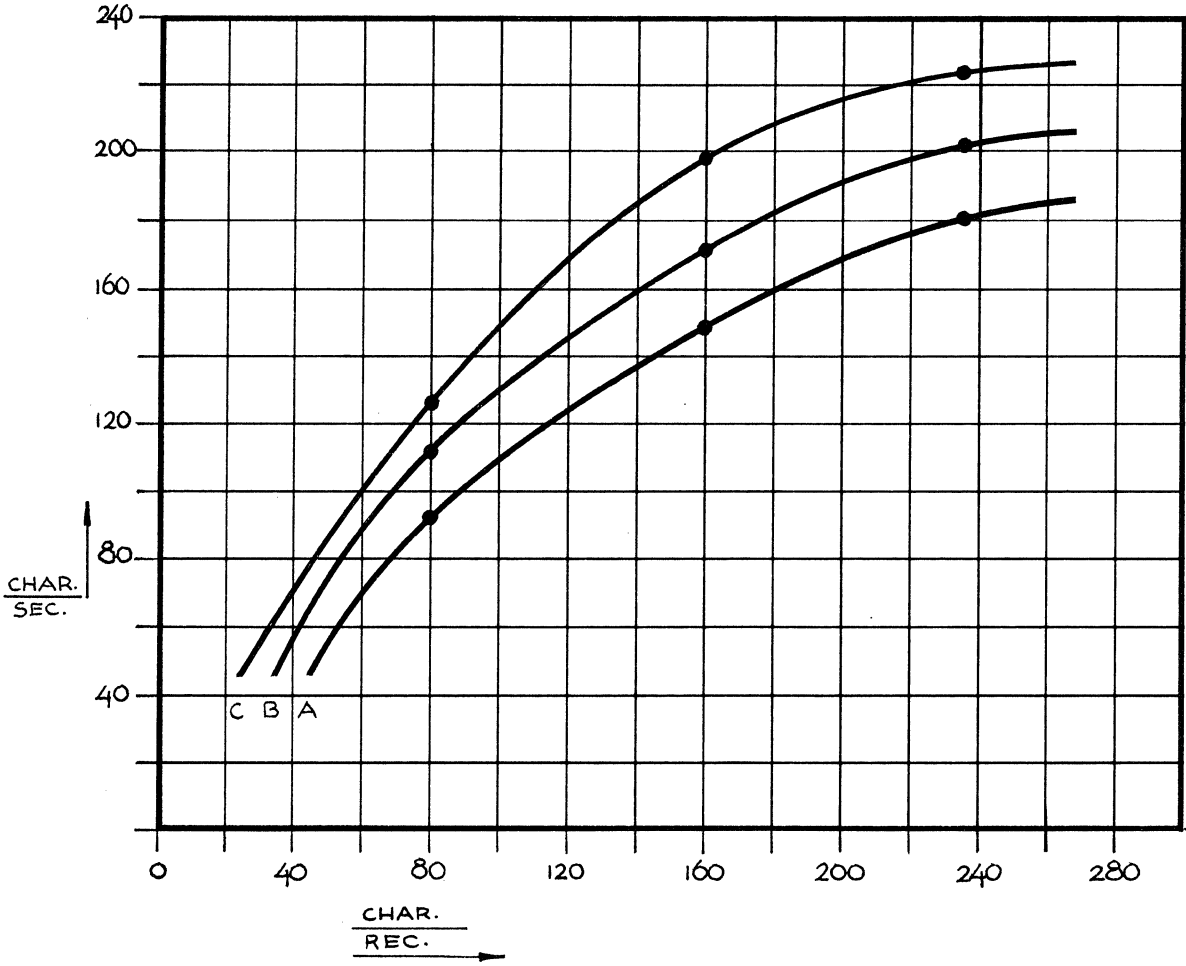


A-MAG TAPE TO CASSETTE (With and Without 25% DCP)
B-CASSETTE TO MAG TAPE

MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

2400 bd

(340 to and from Cpu)

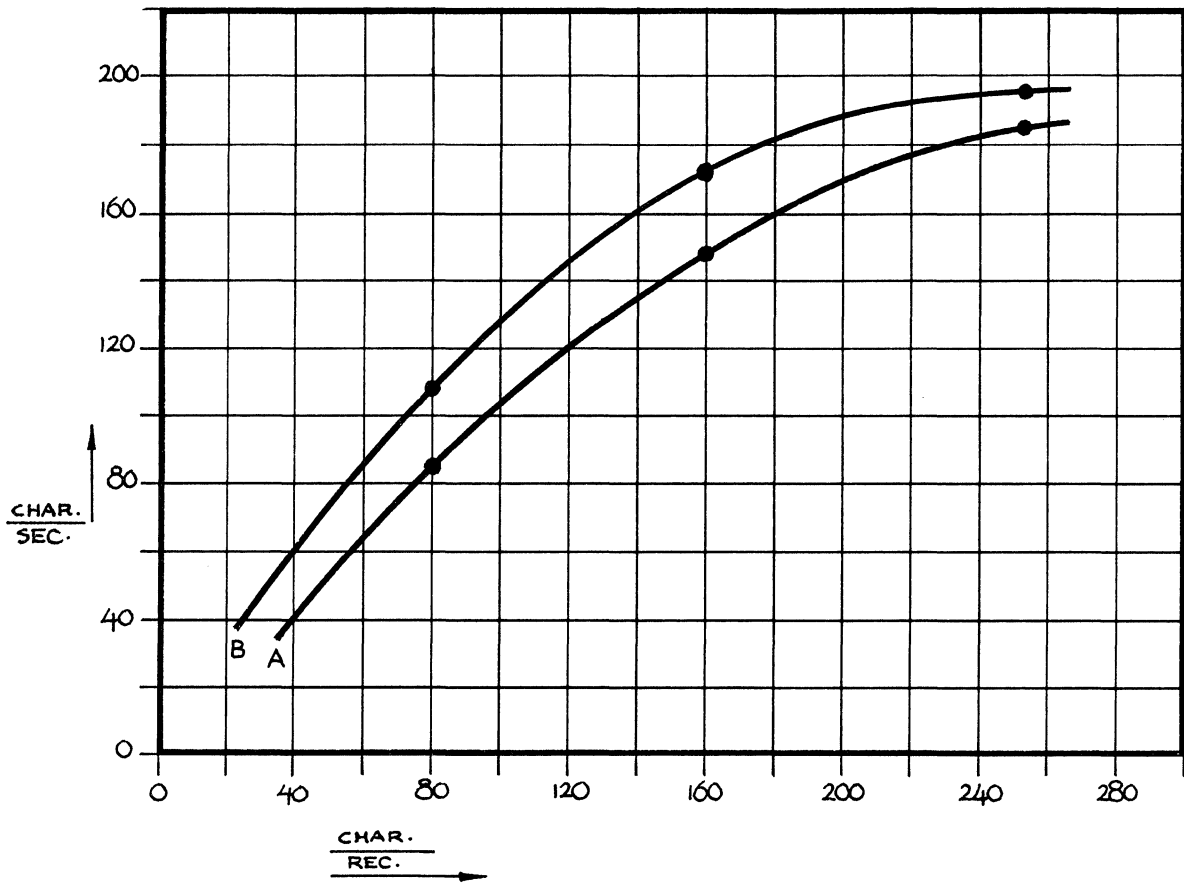


- A-CPU TO CASSETTE (With and Without 25% DCP)
- B-CASSETTE TO CPU
- C-CASSETTE TO CPU (25% DCP)

MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

2400 bd

(340/Cassette to and from 340/Mag Tape)



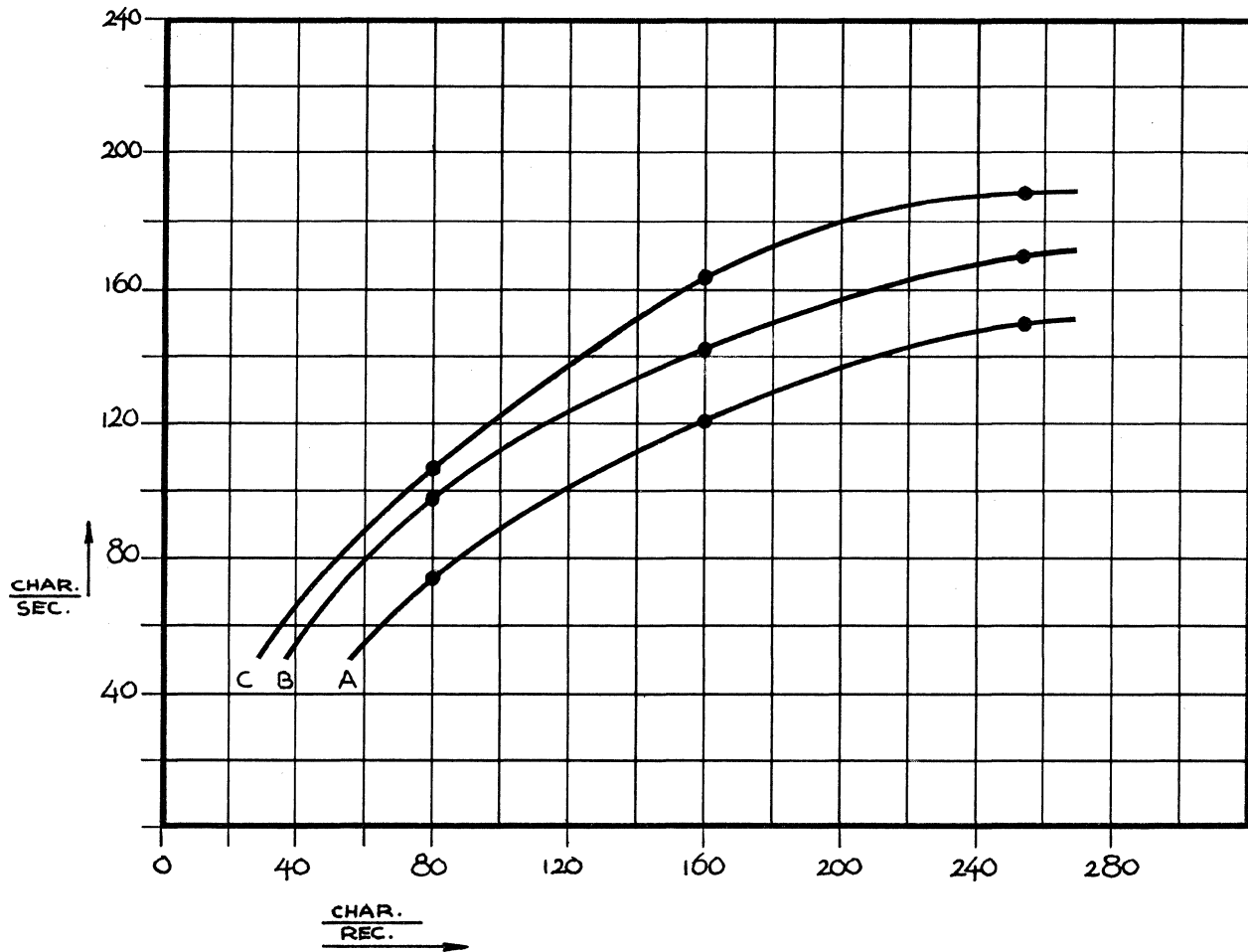
A-MAG TAPE TO CASSETTE (With and Without 25% DCP)

B-CASSETTE TO MAG TAPE

MODEL 340 DATA COMMUNICATIONS TRANSFER RATE

2000 bd

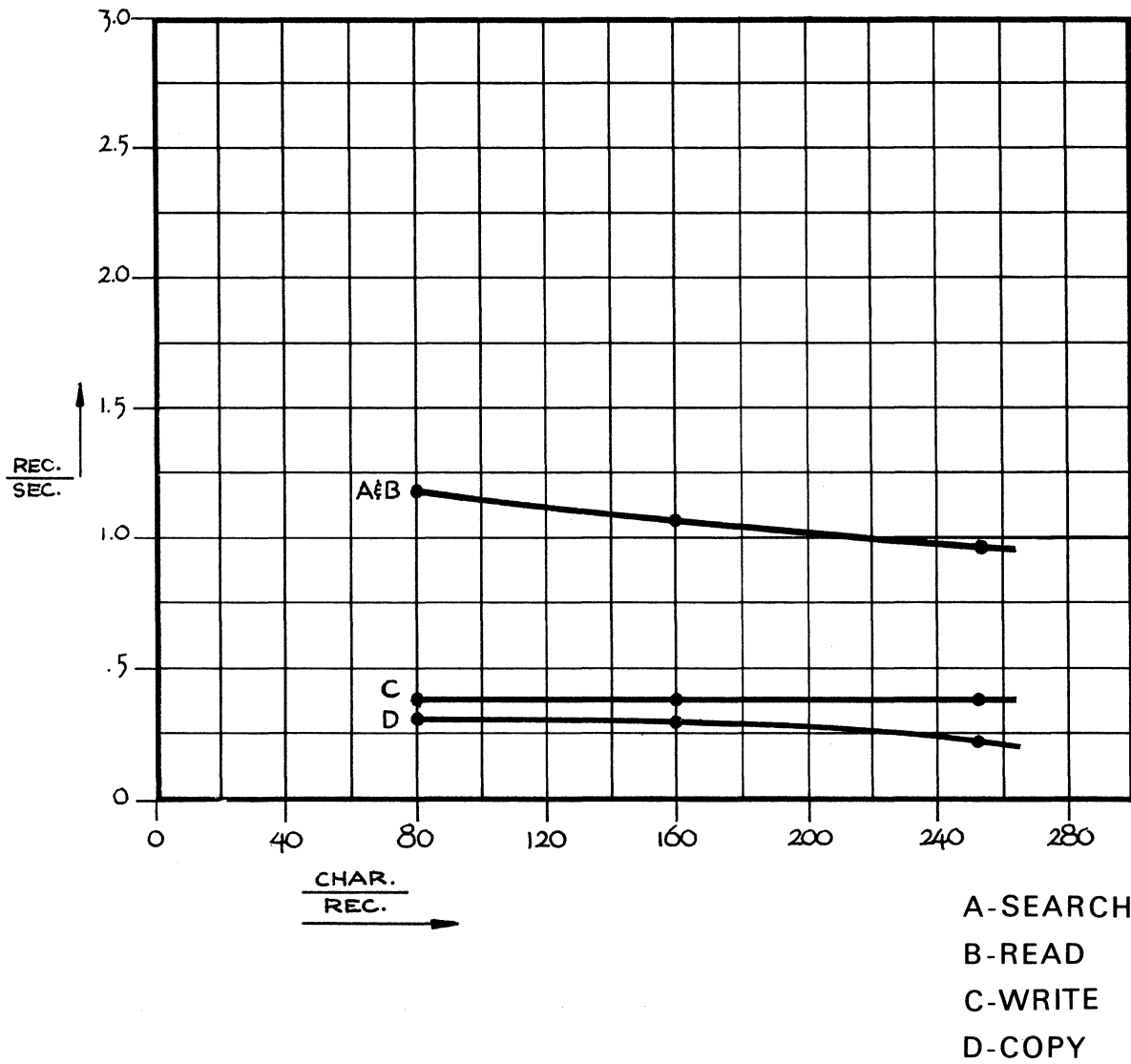
(340 to and from CPU)



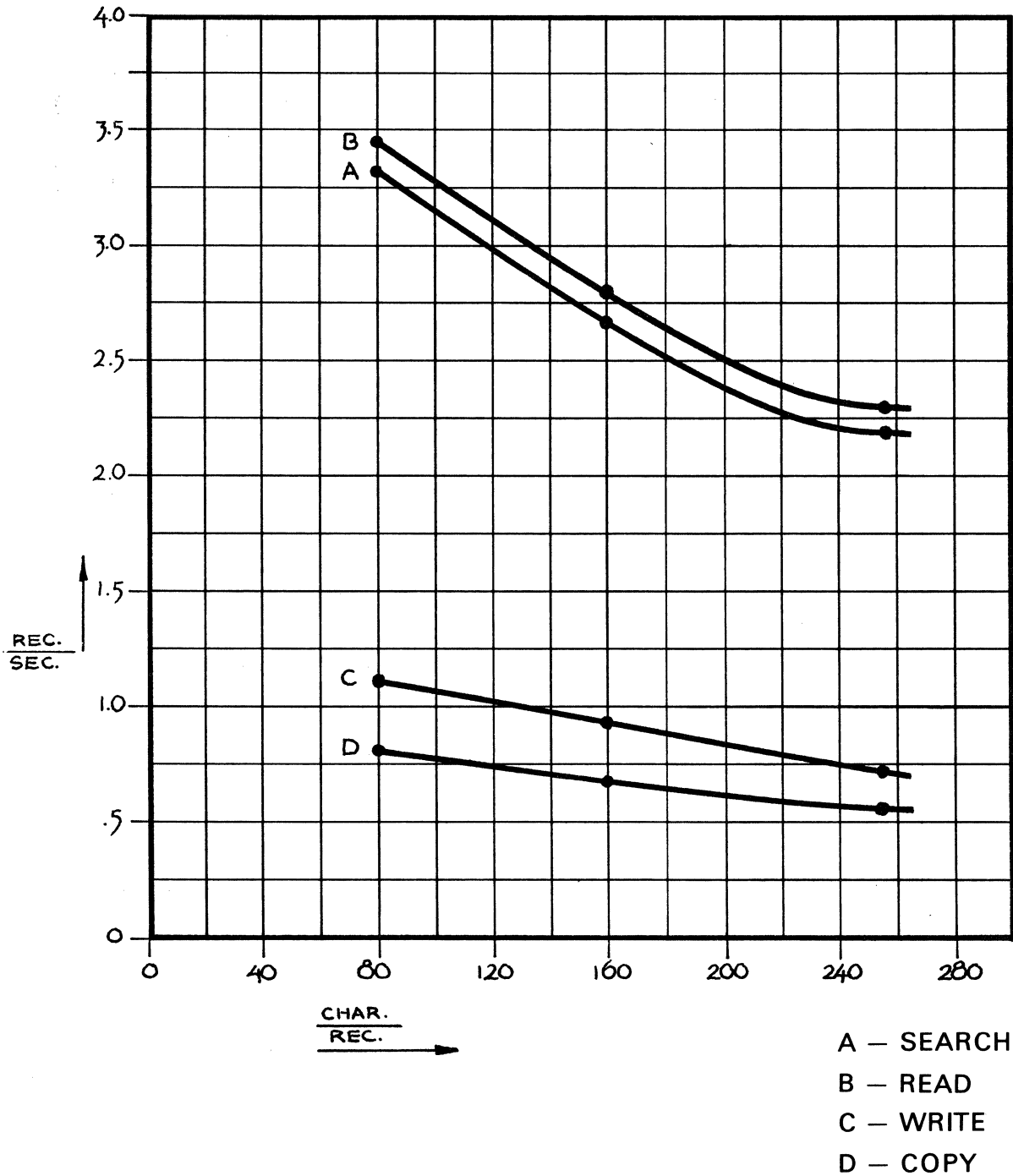
- A-CPU TO CASSETTE (With and Without 25% DCP)
- B-CASSETTE TO CPU
- C-CASSETTE TO CPU (25% DCP)

MODEL 340 CASSETTE DATA RECORDER RATE

1C Recorder (Slow Speed)



MODEL 340 CASSETTE DATA RECORDER RATE
 1C Recorder (High Speed)



Vertical Format Control Code Table

Tens & Hundreds Value

		0	10	20	30	40	50	60	70	80	90										
	0	N/A	PJ	AD	AN	BH	CB	CL	DF	EP	EJ										
	1	PA	PK	AE	AO	BI	CC	CM	DG	EA	EK										
	2	PB	PL	AF	BP	BJ	CD	CN	DH	EB	EL										
	3	PC	PM	AG	BA	BK	CE	CO	DI	EC	EM										
	4	PD	PN	AH	BB	BL	CF	DP	DJ	ED	EN										
	5	PE	PO	AI	BC	BM	CG	DA	DK	EE	EO										
	6	PF	AP	AJ	BD	BN	CH	DB	DL	EF	FP										
	7	PG	AA	AK	BE	BO	CI	DC	DM	EG	FA										
	8	PH	AB	AL	BF	CP	CJ	DD	DN	EH	FB										
	9	PI	AC	AM	BG	CA	CK	DE	DO	EI	FC										
		100	110	120	130	140	150	160	170	180	190										
U N I T S V A L U E	0	FD	FN	GH	HB	HL	IF	JP	JJ	KD	KN										
	1	FE	FO	GI	HC	HM	IG	JA	JK	KE	KO										
	2	FF	GP	GJ	HD	HN	IH	JB	JL	KF	LP										
	3	FG	GA	GK	HE	HO	II	JC	JM	KG	LA										
	4	FH	GB	GL	HF	IP	IJ	JD	JN	KH	LB										
	5	FI	GC	GM	HG	IA	IK	JE	JO	KI	LC										
	6	FJ	GD	GN	HH	IB	IL	JF	KP	KJ	LD										
	7	FK	GE	GO	HI	IC	IM	JG	KA	KK	LE										
	8	FL	GF	HP	HJ	ID	IN	JH	KB	KL	LF										
	9	FM	GG	HA	HK	IE	IO	JI	KC	KM	LG										
		200	210	220	230	240	250														
	0	LH	MB	ML	NF	OP	OJ	EXAMPLES: <table style="margin-left: auto; margin-right: auto;"><thead><tr><th style="text-align: center;">Decimal #</th><th style="text-align: center;">Table Value</th></tr></thead><tbody><tr><td style="text-align: center;">01</td><td style="text-align: center;">PA</td></tr><tr><td style="text-align: center;">25</td><td style="text-align: center;">AI</td></tr><tr><td style="text-align: center;">46</td><td style="text-align: center;">BN</td></tr><tr><td style="text-align: center;">62</td><td style="text-align: center;">CN</td></tr></tbody></table>				Decimal #	Table Value	01	PA	25	AI	46	BN	62	CN
Decimal #	Table Value																				
01	PA																				
25	AI																				
46	BN																				
62	CN																				
	1	LI	MC	MM	NG	OA	OK														
	2	LJ	MD	MN	NH	OB	OL														
	3	LK	ME	MO	NI	OC	OM														
	4	LL	MF	NP	NJ	OD	ON														
	5	LM	MG	NA	NK	OE	OO														
	6	LN	MH	NB	NL	OF															
	7	LO	MI	NC	NM	OG															
	8	MP	MJ	ND	NN	OH															
	9	MA	MK	NE	NO	OI															

COMMUNICATIONS CHARTS POINT-TO-POINT ATTENDED

No LRC, BCC, PAD, or SYN characters are shown in these sequences.
20-seconds after communication has ended the 340 disconnects the phone.
A 340 will answer an EOT with an EOT.

A. Normal Message Transmission

	B	D	D	D	C						
Transmitting Station sends:	E N Q	S T (Text) X	ODD T B	E T B	S T (Text) X	ODD T B	E T X	S T (Text) X	EVEN T (Text) X	E T X	E O T
Receiving Station sends:		A C 0 K	A C 1 K	A C 0 K	A C 1 K	A C 0 K					
	B	D									C

B. Unanswered Line Bid

	B				INC B
Transmitting Station sends:	E (1-sec. N bid timeout) Q	E (1-sec. N bid timeout) Q	E (1-sec. N bid timeout) Q	E (1-sec. N bid timeout) Q	E O T
Receiving Station sends:	(No response)				

C. Retransmission Accepted

	B	D	L	D	C					
Transmitting Station sends:	E N Q	S T (Text-A) X	ODD T B	E T B	S T (Text-A) X	ODD T B	E T X	S T (Text-B) X	EVEN T X	E O T
Receiving Station sends:		A C 0 K	N A K		A C 1 K				A C 0 K	
	B	D	L	D	C					

J. Data Link Aborted on No-Response from Receiver

Transmitting Station sends:	B	E	D	S	ODD	E	(3-sec.	E	E	E	INC D
		N		T (Text)	T	T	response	N	(3-sec. ENQ	N	(3-sec. ENQ
		Q		X	B		timeout)	Q	timeout)	Q	timeout)
Receiving Station sends:			A			(No	(No	(No	(No		
			CO			response)	response)	response)	response)		
			K								INC D
	B		D								

K. Data Link Aborted on Request on Receiver

Transmitting Station sends:	B	E	D	S	E	S	INC D
		N		T (Text)	T	T (Text)	
		Q		X	B	X	
Receiving Station sends:			A		A	E	
			CO		C1	O	
			K		K	T	
	B		D			INC D	

L. Data Link Aborted on Request of Transmitter

Transmitting Station sends:	B	E	D	S	E	W	INC W
		N		T (Text)	T	S E	
		Q		X	B	T N	
						X Q	
Receiving Station sends:			A		A	N	
			CO		C1	A	
			K		K	K	
	B		D			W	INC W

M. Data Link Aborted on No-Continuation by Transmitter

Transmitting Station sends:	B	E	D	S	E		
		N		T (Text)	T		
		Q		X	B	(No continuation)	
Receiving Station sends:			A		A		
			CO		C1		
			K		K	(12 sec. wait for continuation.)	
	B		D				INC D

2. RECEPTION TERMINAL

A. Normal Operation

Master Station:	B	D					C		
	E	S	$\delta\beta$	E	S	E	S	E	DE S*
	N	O		T	T	TEXT	A	T	LO or O
	Q	H		B	X		B	X	ET H
340:		A			A		A		A
		CO			C1		CO		CO
		K			K		K		K1
	B			D					C

B. Wrong Address

Master Station:	B	D			INC D	
	E	S	$\delta\beta$	E	DE	S*
	N	O		T	LO	or O
	Q	H		B	ET	H
340:		A			E	
		CO			O	
		K			T	

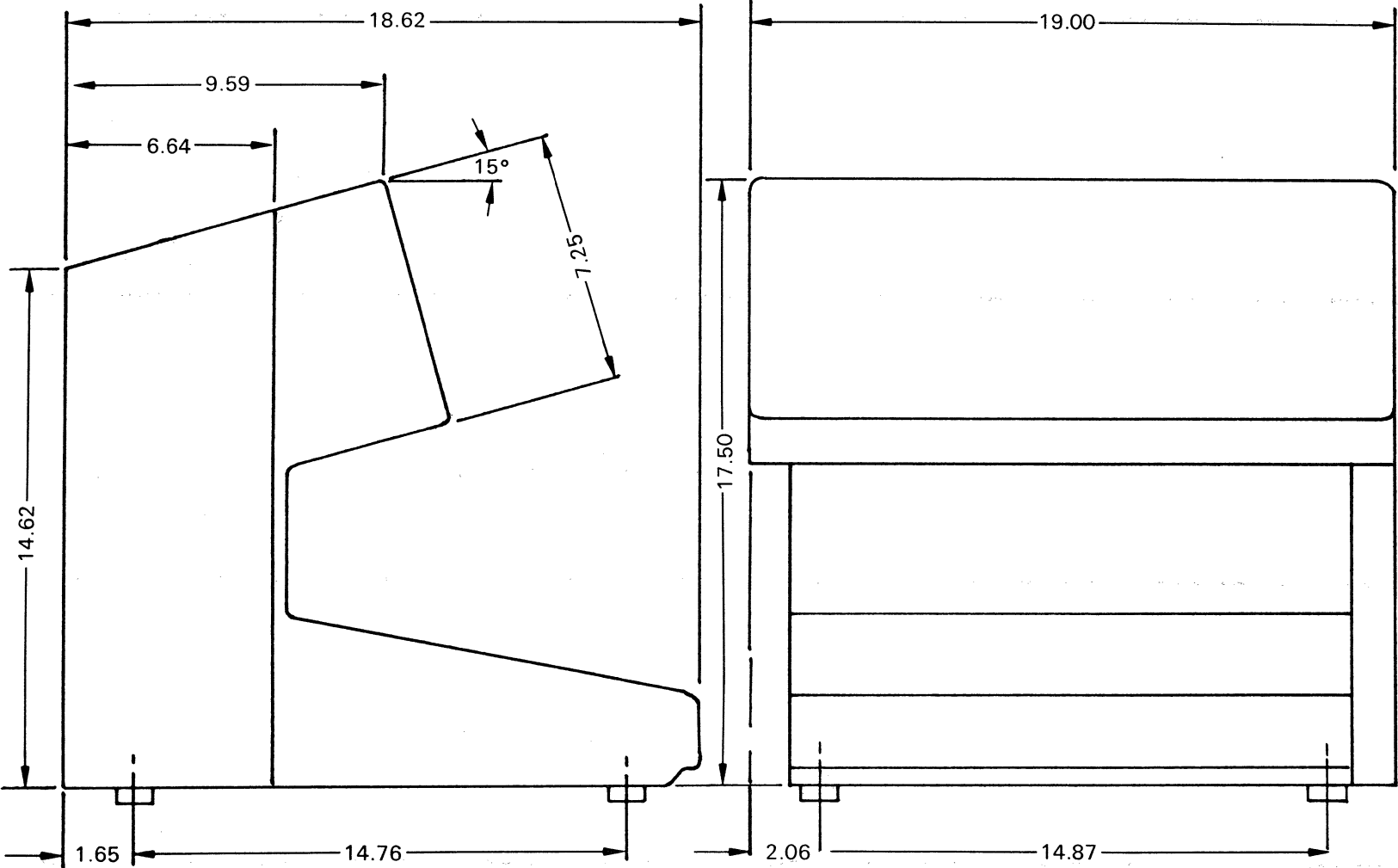
C. Correct Address, but device not ready

Master Station:	B	D					W
	E	S	$\delta\beta$	E	S	E	E
	N	O		T	T	TEXT	A
	Q	H		B	X		B
340:		A			A		W
		CO			C1		A
		K			K		C
	B			D			W

* Only a computer, acting as the master station, can transmit an S0H instead of a DLE E0T.

UNIT OUTLINE DRAWING

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READERS COMMENT FORM
SYCOR 340 SYSTEM
REFERENCE MANUAL

ISSUED JULY 1972

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Suggested improvements:

Errors noted:

General comment:

fold here

Please print or type:

Name:

Title: Phone:

Company:

Address:

City: State: Zip code:

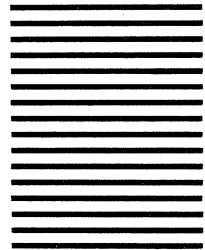
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