



Model 340
Intelligent
Communications
Terminal

System
Reference
Manual

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

*The information contained herein
is subject to change without notice.
Revision may be issued to advise of
such changes and/or additions.*

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SYSTEMS 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 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, a Sycor 610 Communications Station, or any central processor such as an IBM 360 Computer. It is a modular, general purpose terminal system designed for use in teleprocessing networks where: (1) information is collected and then transmitted in batch mode; (2) small amounts of information are transmitted in an inquiry-response type of communication; (3) information handling is an interspersed combination of these. The system is of modular design allowing it to be configured to meet specific requirements. A variety of firmware options allows more efficient and accurate remote preparation of computer input than has previously been possible.

SYSTEMS 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. This combination of logic and memory provides the basis of every terminal. In addition, a high speed random access memory is provided to allow buffering of data transfer operations between peripherals.

The basic 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, and the necessary logic for communication using binary synchronous procedures at various transmission speeds. The basic system can be expanded in several ways depending upon application requirements.

The keyboard in the system serves as the manual input to the 340 terminal. Unlike most devices used in source data collection, it does not feature a keypunch type keyboard. Rather, it features a standard typewriter keyboard with an additional ten (10) key numeric pad to the right of the typewriter keyboard.

The CRT in the system permits the display of status messages, format control information, and data keyed by the operator to allow efficient sight verification and correction of operator errors.

The tape cassette recorder provides the storage medium for source data collection. The recorder uses a cassette cartridge containing 280 feet of 0.150" magnetic tape. The terminal performs an automatic Read-After-Write check on all recorded data. It can store approximately 210,000 characters of data (900 - 200 character records) on an individual cassette tape. The basic communications feature allows transmission of data at 1200 baud, half duplex over the public switched network or private lines (point to point). Data is transmitted in the binary synchronous procedure to insure highest reliability of bulk data. Transmission code is USASCII or EBCDIC.

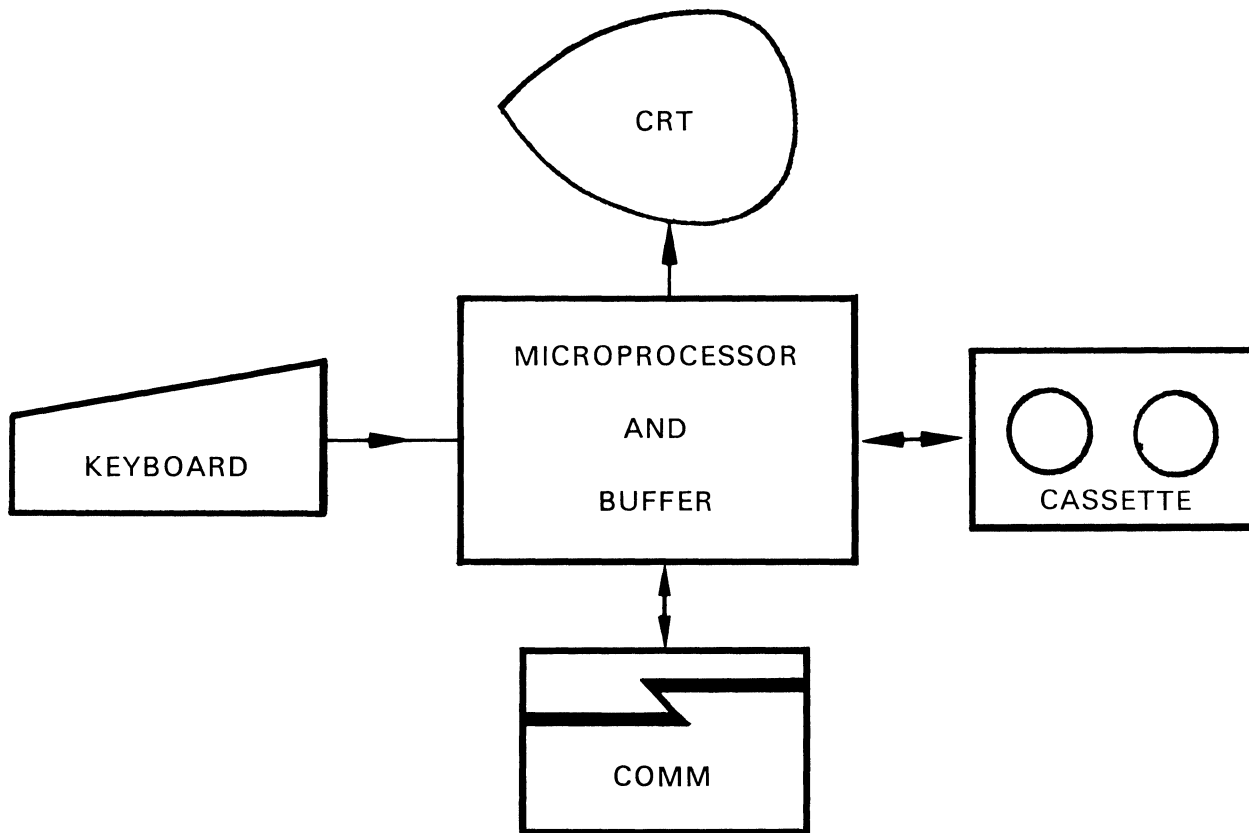


Figure 1: Basic System Block Diagram

SPECIAL FEATURES

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

OPTIONAL PERIPHERALS

OPTION NUMBER	DESCRIPTION
3402	Second Cassette Recorder
3440	80 Column Card Reader (250 C.P.M.)
3480	Printer (30 C.P.S.)

OPTIONAL FUNCTIONS

OPTION NUMBER	DESCRIPTION
3403	Omission Detection
3404	Data Compression
3405	Check Digit Verification (Modulo 10)
3406	Check Digit Verification (Modulo 11)
3407	Capacity Control
3410	Total Accumulator (10 Digit)
3411	Subtotal Accumulator (10 Digit)
3461	Unattended Communications
3465	1200 Baud Synchronous Adapter
3466	2000 Baud Synchronous Adapter
3467	2400 Baud Synchronous Adapter
3470	Multipoint Communications
3475	Conversational Mode
3481	Vertical Format Control for Printer

**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.

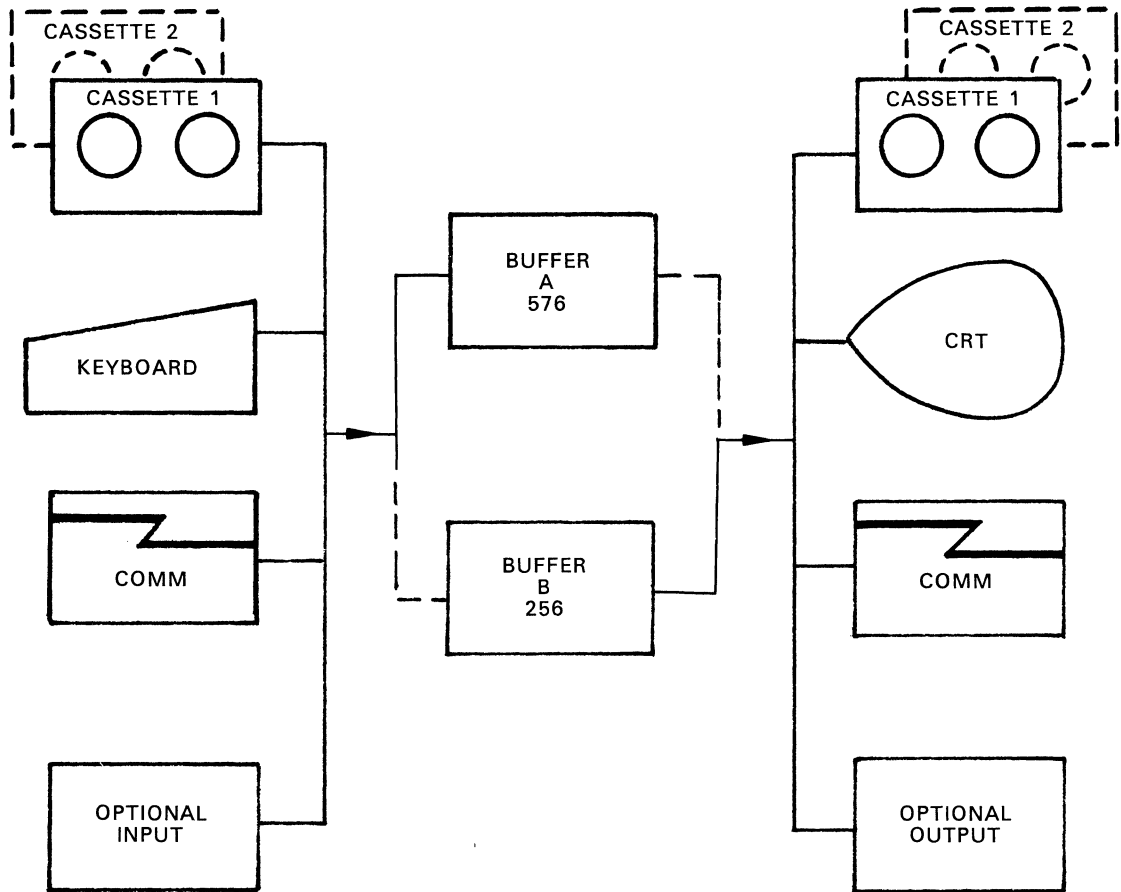


Figure 2: Model 340 System Schematic

Buffer A in the above diagram has a capacity of 576 characters and is used as display buffer to refresh the CRT display. Buffer B holds 256 characters and is used as an input/output buffer.

DATA FLOW

In a keyboard entry operation, once the operator has filled the entire display with data, the data is transferred to the input/output buffer and is written on the selected output device while the operator is again filling the CRT with data. To perform this overlapped operation, the number of output characters must be 256 or less. If more than 256 characters are to be transferred, the terminal will write two physical records on the selected output device with the required end of record codes to link the two physical records together as one logical record. During the writing of the first physical record, the keyboard will be inactive (non-overlapped). Once the second physical record has been transferred from the CRT to the input/output buffer the CRT will be cleared and the operator can resume keying.

Thus it is apparent that if the CRT format control programs are designed so that the number of output data characters is 256 or less, the operator's efficiency will be increased because she will not be interrupted by output operations.

Data from cassette tape is either transferred directly into the 576 character display buffer or into the input/output buffer. If more than 512 data characters are transferred to the CRT without an EOR character, an error condition will be indicated.

One or two output devices can be selected. If a second output device is selected, its data transfer will be executed after the successful completion of the transfer to the first output device.

All available peripherals on the 340 system have been assigned a one character identification code for use in the job selection sequence.

INPUT/OUTPUT DEVICE SELECTION CODES

INPUT	OUTPUT
C—Card Reader	P—Printer
1—Cassette Recorder 1	1—Cassette Recorder 1
2—Cassette Recorder 2	2—Cassette Recorder 2
L—Communications Line	L—Communications Line

OPERATIONAL MODES

The Model 340 Communications Terminal provides the user with three main modes of operation: A formatted mode, a batch mode and a search mode.

The formatted mode uses a control format, loaded into the display buffer from the keyboard, from cassette input or any other input peripheral. Programs are generated on the keyboard in a "transparent" mode, i.e., the format characters are not executed. These modes are controlled by a rocker switch located on the keyboard labeled Program Control ON/OFF. The batch mode is designed for fast, efficient data transfer without reformatting when data is transferred from one peripheral to another. The search mode is designed for manual search and selective copying of data from one input to an output device.

FORMATTED MODE

The formatted mode is used for keyboard data entry or when data read from one of the input devices is to be reformatted before being transferred to the selected output device. In this mode, a record of data is read into the input/output buffer from the selected input device. The program contained in the CRT buffer is then executed and the data transferred to the selected output device. This provides the user with the ability to add fields, change fields, or delete fields from an existing input file.

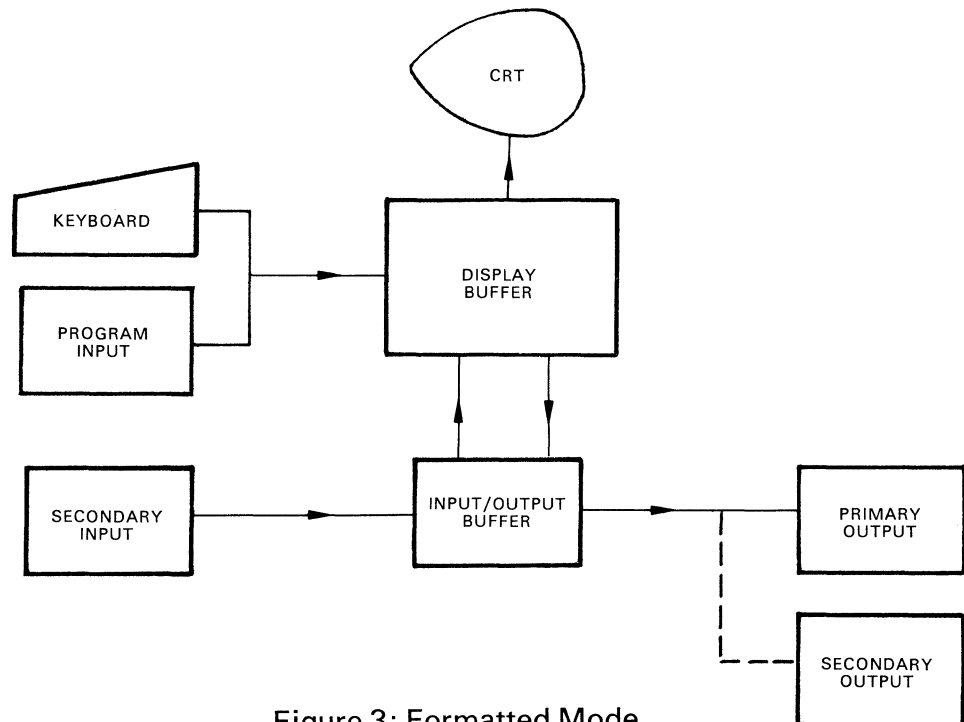


Figure 3: Formatted Mode

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 device.

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. No control program is loaded and the data format is not changed.

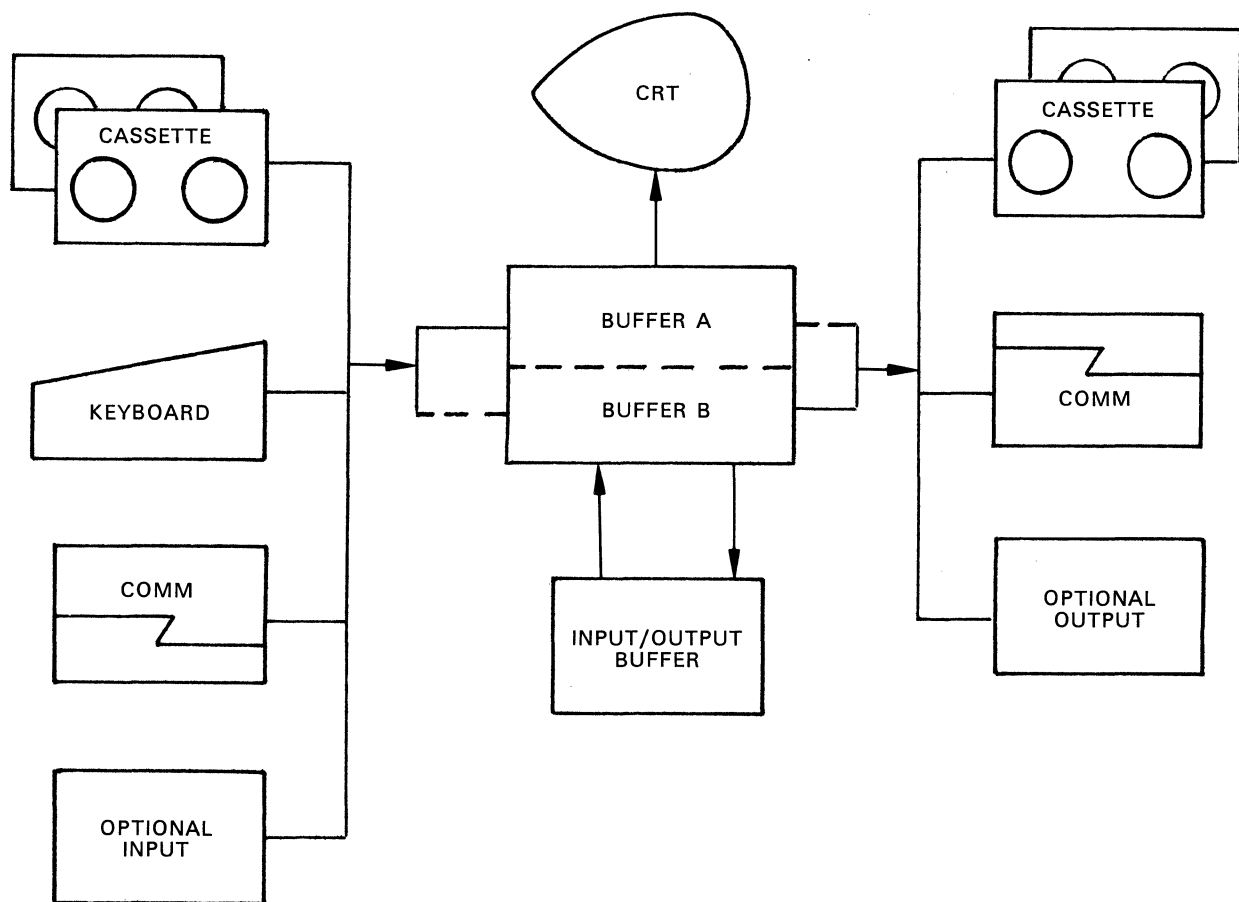


Figure 4: Batch Mode

SEARCH MODE

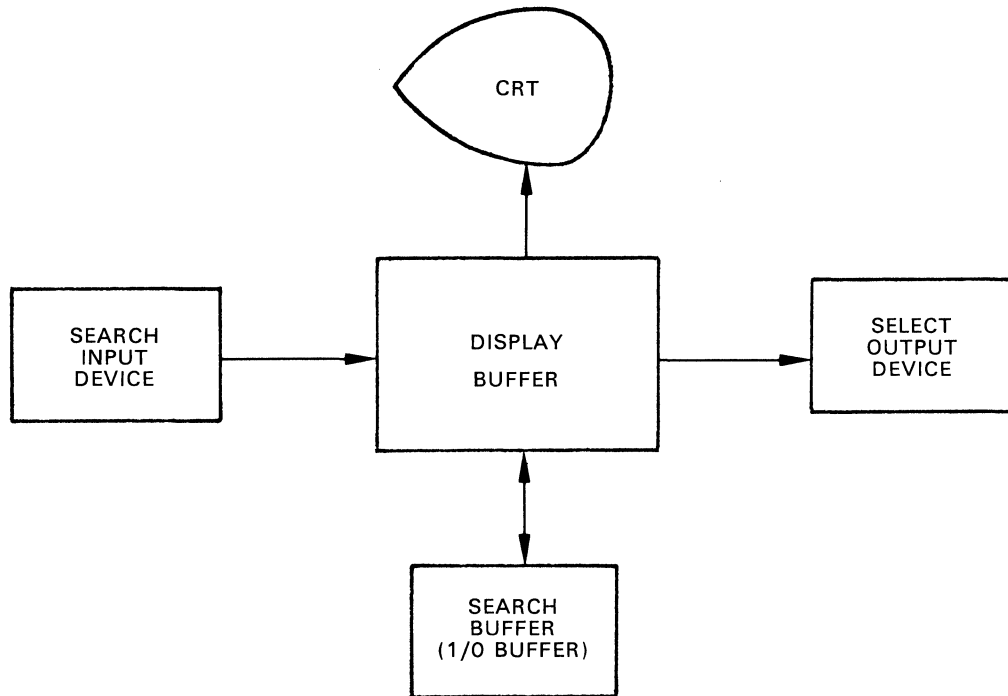


Figure 5: Search Mode

In the search mode, the 340 terminal is capable of automatically locating a specific record on cassette tape. In addition, an automatic or semi-automatic selective copying operation can be performed.

After depressing the JOB SELECT key and typing the appropriate selection sequence, a search identifier of up to 256 characters in length can be keyed. Different search identifiers are separated by a colon. Upon depression of the ENTER key, the search identifier will be loaded into the search buffer (Input/output buffer) and the search is initiated. If the record read from an input device matches the search identifier, the search is terminated. If an output device has been specified, the setting of the auto operation switch determines whether the data is automatically transferred to the output device (auto operation is on) or operator intervention is required (auto operation is off).

Sequence	Program	Input (2)	Output (1)	Output (2)
F 1→2P	1		2	P

Defines cassette one (1) as the input cassette containing the format program, cassette two (2) as the primary output device, the printer as the secondary output device and the keyboard is assumed as the primary input device.

F→2		1	2	
-----	--	---	---	--

Defines cassette one (1) as the secondary input device and cassette two (2) as the primary output device. The keyboard is assumed as the primary input.

F→12P		1	2	P
-------	--	---	---	---

Defines cassette one (1) as the secondary input device, cassette two (2) as primary output and the printer as the secondary output. The keyboard is assumed as primary input.

BATCH MODE:

Sequence	Input 1	Output (1)	Output (2)
B L 1→	L	1	

Communications input and cassette one (1) output.

B 1 L→	1	L	
--------	---	---	--

Cassette one (1) input and communications output.

B 2 P→	2	P	
--------	---	---	--

Cassette two (2) input and printer output.

B 1 2 P	1	2	P
---------	---	---	---

Cassette one (1) input and cassette two (2) and printer are output.

SEARCH MODE:

Sequence	Input	Output (1)	Output (2)
S 1 → →	1		
Search cassette 1			
S 2 → →	2		
Search cassette 2			
S 1 2 →	1	2	
Search cassette 1 and copy matching records to cassette 2			
S 1 P 2	1	P	2
Search cassette 1 and copy matching records to the printer and cassette 2.			

**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. The display buffer capacity can be expanded by up to two 256 character blocks to allow input of longer forms or buffering of larger communication messages. If the display buffer is expanded, the actual number of displayed characters is still 576, but the additional characters are displayed in 256 character blocks when the last line has been filled (scrolling effect). 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, 511 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 210,000 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

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. Only one recorder can be operating at any one time.

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 of data from one cassette to another.

80 COLUMN CARD READER

The card reader option provides for automatic reading of 80 column punched cards at a speed of up to 250 cards per minute. Cards can be read in an overlapped batch mode for subsequent transmission, for recording on cassettes, or they can be read one card at a time in a non-overlapped mode to enter fixed data on the CRT in support of a keyboard entry.

30 C.P.S. PRINTER

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

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

Carriage return and linefeed codes are executed immediately upon finding either a CR or an LF code in the data stream. A vertical format option allows efficient control of lengthy preprinted forms.

**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 with 7 data bits and 1 parity bit in a synchronous fashion.

**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 now 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 Sycor 610 Communications Station can communicate with a 340 terminal operating in unattended 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 the Sycor 610 Station, calls a terminal by dialing the telephone number corresponding to its data set (or business line in the case of a Data Access Arrangement).

**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.

**2400 BAUD
SYNCHRONOUS**

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

MULTIPOINT COMMUNICATION

If provided with this special option, a 340 terminal can operate with other 340 terminals, or a properly configured IBM 2770, or similar devices (such as IBM 1130 or 360 Model 20) in a mixed environment on a multidrop (multipoint) private line. The data flow is always between a control computer and remote terminals. This computer polls (invites to send) or selects (invites to receive) the remote terminal. The central computer precedes each transmission with an end of transmission character to ensure that all stations terminate transmission and monitor the communications line.

The end of transmission character is followed by a two character selection or polling sequence. The first character is the station selection code, an alphabetic character (upper case for polling, lower case for selecting), the second character is the device selection character to address a specific device on the terminal. This sequence is terminated by an ENQ character.

CONVERSATIONAL MODE

The Conversational mode option allows transmission of data directly from the CRT and receiving of data on the CRT from a central computer. The unattended communications feature is a prerequisite for this option.

FIRMWARE OPTIONS: DATA COMPRESSION

This feature, if present, compresses and decompresses space characters during 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 (octal 104 through 177) of the number of spaces deleted from transmission. If more than 63 continuous spaces are to be deleted, the sequence will be repeated.

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

**CHECK DIGIT
VERIFICATION**

The check digit options allow definition of a numeric check digit verification field through a special mode control character. Two different check digit options (Modulo 10 and Modulo 11) are available.

The terminal automatically calculates the check digit number and compares it to the least significant digit, keyed by the operator. If the calculated and keyed number do not compare, an operator error is indicated.

If the check digit agrees with the keyed check digit, the cursor automatically moves to the next field start position; if it does not agree, CHK error is displayed on the CRT. After depressing the ERROR RESET key, the operator can correct the check digit number or the base number. Skipping a complete check digit field does not generate an error condition. Skipping a partially filled field is possible, provided the entered portion of the field calculates to a legal check digit. Partially filled check digit fields are right justified.

TOTAL ACCUMULATOR

This option provides a ten digit accumulator to generate totals. Accumulator fields are defined by a special field control character; only these so defined fields can be added to or subtracted from the accumulator by an appropriate key depression. In the format mode, the accumulator may be loaded manually from the keyboard. The accumulator is displayed on line one of the CRT. The accumulator contents can be transferred into the data record by two program control characters.

**SUBTOTAL
ACCUMULATOR**

The Total Accumulator is a prerequisite for this option. The Subtotal Accumulator is loaded and used in a fashion identical to the Total Accumulator. A field is defined as Subtotal Accumulator by a special field control character. Additional control characters are available to add the Subtotal Accumulator to the Total Accumulator.

**FORMATTED
DATA ENTRY:
FIELD DEFINITIONS**

The 340 terminal allows for format control on data entry. This is accomplished through use of the Field Definitions provided on the display. Entry into the data fields is controlled through

use of Field Control characters contained within the Field Definitions (protected fields), preceding each data field. The last character within each protected field is used to define the field mode and type of entry allowable in the immediately following data field. The next to last character defines the Input/Output Device Control for the following data field. The preceding positions in the protected field are used for comments and labels. The use and length of these labels is optional.

The elements of a formatted field definition are illustrated below in Figure 6.

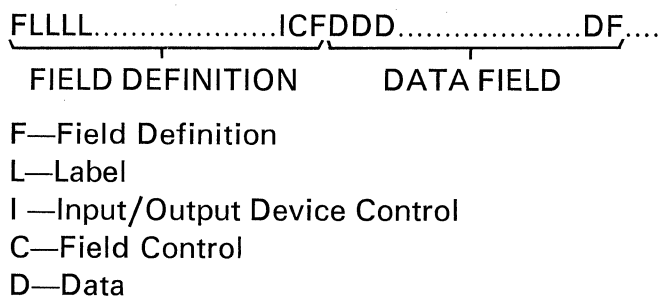


Figure 6: Format Controlled Field Definition

FIELD CONTROL

All data fields are controlled as to the type of characters which may be entered into the field. Three character modes are defined to control entry into a data field. An attempt to enter a character of improper mode into a field results in a MOD error, with the character being rejected. The three allowable character modes are as follows:

- Mixed — Any Character
- Alphabetic — Alphabetic and period (.), comma (,), and space
- Numeric — Numerics and period (.), comma (,), minus (—), and space

BASIC FIELD

CONTROL CHARACTERS:

NORMAL ENTRY FIELDS These fields may be partially filled by depressing the TAB/SKIP key. If skipped, they will be completed with spaces (left justified.) Field control characters are as defined below:

CHAR—FIELD TYPE

- M —Mixed entry field
- A —Alphabetic entry field
- N —Numeric entry field

RIGHT JUSTIFY FIELD These fields will be right justified. Leading spaces are always assumed. The TAB/SKIP key is used to exit from the field when it is partially filled.

CHAR—FIELD TYPE

R —Numeric right justify

SPECIAL FIELDS These field definitions are provided for terminal control purposes and do not allow data entry.

CHAR—FIELD TYPE

C—Constant field. This field is used to insert constant data into the output record and keyboard input into this field is prohibited.

* —Automatic Program Paging. This character causes the automatic chaining of the next format record. In addition, it can also be used as a constant field control character.

**OPTIONAL FIELD
CONTROL CHARACTERS:**

**OMISSION DETECTION
FIELDS** The operator is required to enter at least one data character of the proper mode into these fields. Any attempt to depress the TAB/SKIP key before entering at least one character will result in a TAB error. The control characters are defined below:

CHAR—FIELD TYPE

4 —Mixed Mode omission detection field

5 —Alpha Mode omission detection field

6 —Numeric Mode omission detection field

**CAPACITY CONTROL
FIELDS** These fields require that the operator fill each field to its defined "capacity". An attempt to depress the TAB/SKIP key prior to completion of the field will result in a TAB error.

CHAR—FIELD TYPE

7 —Mixed Mode Capacity Controlled Field

8 —Alpha Mode Capacity Controlled Field

9 —Numeric Mode Capacity Controlled Field

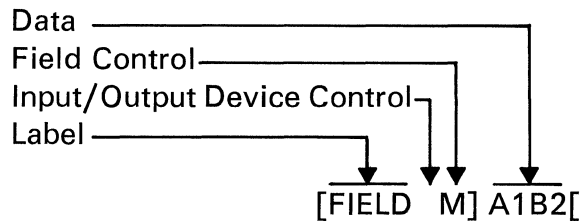
INPUT/OUTPUT DEVICE CONTROL

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 accommodates 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 device data is to be transferred to.

The Input/Output Device Control character immediately precedes the Field Control character.

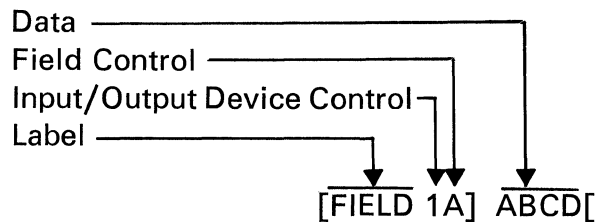
SYMBOL FUNCTION

(Space or [) Activates the keyboard as the current input device. Primary (keyboard) input, primary and secondary output.



1 Activates the input device specified as the secondary input in the job selection sequence as the input device and transfers the data to this field. The first time this appears in an individual page the terminal will read a record of data from the secondary input device into the input/output buffer. This field is read out to the primary and secondary output device as specified by the job selection sequence.

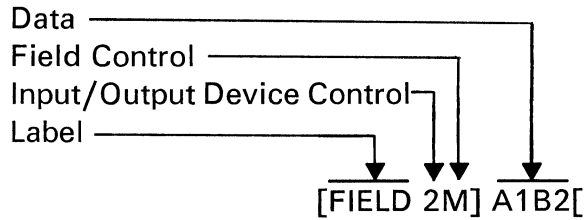
Secondary input, primary and secondary output.



SYMBOL FUNCTION

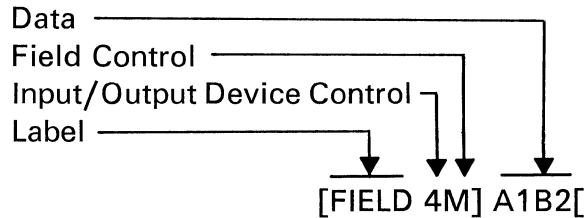
- 2 Qualifies that this field will be read out to the primary output device only, keyboard is assumed as primary input.

Primary input, primary output only



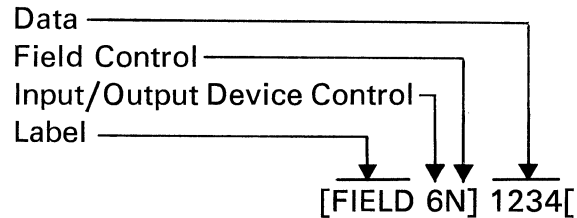
- 4 Qualifies that this field will be read out to the secondary output device only, keyboard is assumed as primary input.

Primary input, secondary output only



- 6 Qualifies that this field will be filled from the primary input device (keyboard) but will not be read out to either the primary or secondary output device.

Primary input, no output

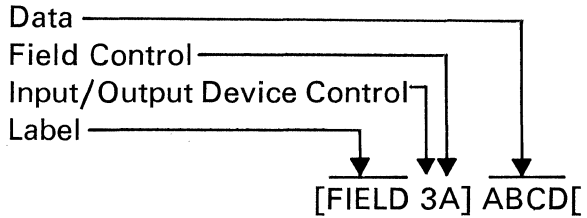


These codes may be used individually as defined above or a logical sum of the desired operations may be entered. A list of the valid combinations (sums) follows:

SYMBOL FUNCTION

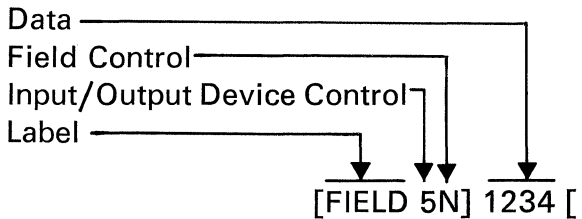
- 3 This field will be filled by the secondary input device and read out to the primary output device.

Secondary input, primary output only



- 5 Input is from the secondary input device and output is to the secondary output device.

Secondary input, secondary output only



- 7 This field will be filled from the secondary input device but will not be transferred to any output device.

If the secondary input device is selected the field that is read from the input output buffer must meet the field control edit rules of the field on the CRT into which it is being transferred. If the field control character is an accumulator add/subtract field then the data field being transferred will be added or subtracted on the depression of the TAB/SKIP or MINUS key.

PROGRAMMING SYSTEMS

SYSTEM CONCEPT

As has been described previously, the Sycor Model 340 is a powerful modular terminal, designed for "program 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 the programming of the terminal.

PROGRAM DESIGN

A program consists of Field Definition characters which define the beginning and ending 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 override the job select definition for a specific field.

A program can consist of one or more pages where a page defines the portion of the program which can be displayed to the operator on the CRT at any one time. Provision is made to link these pages together, forming the program 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:

FLLLL.....ICFDD:.....DF....

F—Field definition

L—Label

I—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, cannot be filled from the keyboard, and cannot be transferred to an output device.

SYMBOL FUNCTION

-]
End of protected input and output field.
- ␣
New line symbol, outputs a CR code. 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 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 field.
- |
Automatic display advance to the next field, does not output. This code functions to partition the display.
- Record separator, outputs an RS code. Identifies that this position is the end of the current page of the program. 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 program.

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

FIELD CONTROL CHARACTERS

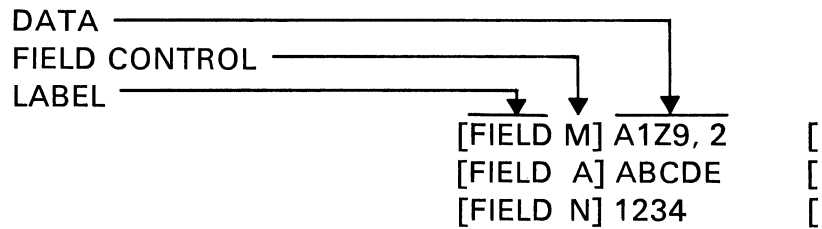
This character immediately precedes the "end of protected input and output field" definition characters. It is used by the terminal to control the type of input entered by the operator and to activate automatic operations.

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.

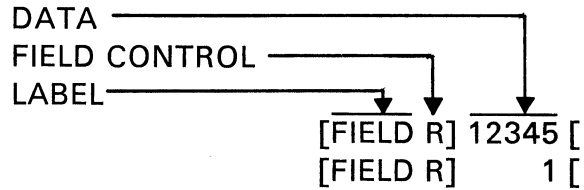
An example of these fields follows:



SYMBOL FUNCTION

- R** Numeric Field, right justify.
Numeric data only, right justify and fill the remaining positions of the field with spaces.

EXAMPLE:



- 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.

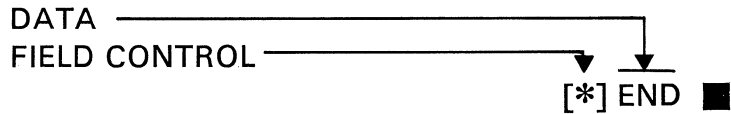
EXAMPLE:



SYMBOL FUNCTION

- * Automatic Program Paging Character. Automatically loads a new page from the input program device, may also be used as a constant field.

EXAMPLE:

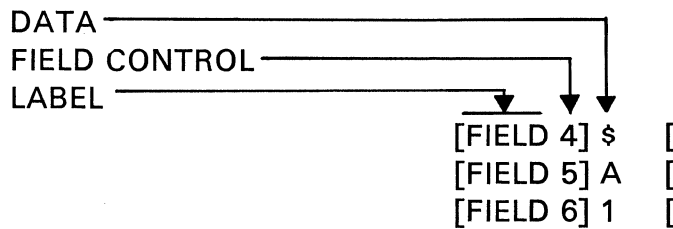


OMISSION DETECTION

SYMBOL FUNCTION

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

EXAMPLE:



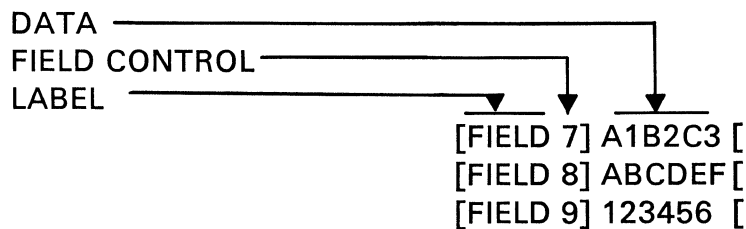
These fields require that the operator enter at least one data character of the proper mode. An attempt to omit entry will result in a TAB error.

CAPACITY CONTROL FIELD

SYMBOL FUNCTION

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

EXAMPLE:



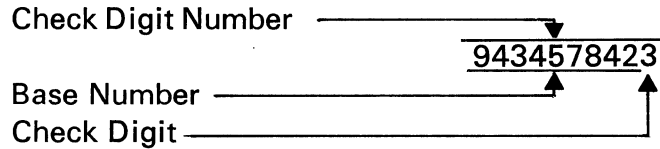
These fields must be filled to capacity. Any attempt to bypass the field or leave the field before it is completely filled will result in a TAB error.

CHECK DIGIT VERIFICATION

SYMBOL FUNCTION

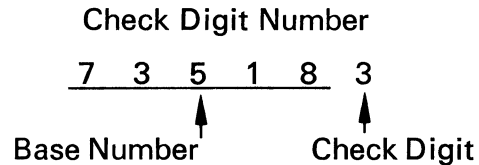
- D Modulo 10 Check Digit Verification
- E Modulo 11 Check Digit Verification

A check digit number is made up of two parts; a base number and a check digit. The check digit is always the last number (least significant digit) of a check digit number. All remaining digits make up the base number.



The Sycor 340 terminal can verify either Modulo 10 or Modulo 11 check digits.

MODULO 10 CHECK DIGIT



The computation of a Modulo 10 check digit value is illustrated below:

- A. Base Number
73518
- B. The units position digit and each alternate digit to the left is treated as one number (called the odd digits number).
758
- C. The tens position digit and each alternate digit to the left is treated as one number (called the even digits number).
31
- D. The odd digits number is multiplied by 2.
758
x 2
1516
- E. The individual digits in the product obtained in D. and the individual digits of the even digits (C). are added.
 $(1 + 5 + 1 + 6) + (3 + 1) = 17$

F. The sum obtained in E. is subtracted from the next higher number that ends in zero. The difference is $20 - 17 = 3$

G. The complete self-check number is, in this example: 735183

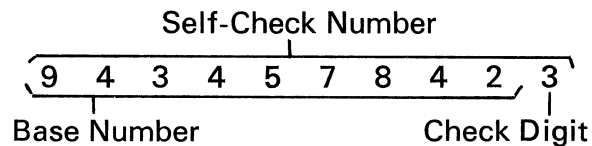
Other examples:

Base Number	Self-Check Number
13725	137257
49283	492835
63921	639211
97359	973594

Data is entered into the check digit field as in every numeric field. After the last digit (the check digit) has been entered the terminal calculates the check digit.

If the check digit agrees with the keyed check digit, the cursor automatically moves to the next field start position; if it does not agree, a CHK error is displayed on the CRT. After depressing the ERROR RESET key, the operator can correct the check digit or the base number. Skipping a complete check digit field does not generate an error condition. Skipping a partially filled field is possible providing the entered portion of the field calculates to a check digit. Partially filled fields are right justified.

MODULO 11 CHECK DIGIT



The computation of a Modulo 11 Check Digit value is as follows:

Base Number: 943457842

Write Digits of Base Number: 943457842

From right to left, write checking factors: 432765432

NOTE: The checking factors are consecutive digits 2 through 7 progressing from right to left. After digit 7, the series is repeated until all digits of the base number have been assigned a checking factor.

Multiply each digit by its corresponding checking factor:

4×9 3×4 2×3 7×4 6×5 5×7 4×8 3×4 2×2

Add the products:

$36 + 12 + 6 + 28 + 30 + 35 + 32 + 12 + 4 = 195$

Divide:

195 divided by 11 = 17 plus a remainder of 8

Subtract:

8 subtracted from 11 = 3 (the check digit)

The complete Modulo 11 self-checking number from the above example number is 9434578423.

If the sum of the products is evenly divisible by 11, the check digit value is zero (0).

Other Examples:

Base Number	Self-Check Number
8265426	83654267
6254321	62543213
7583412	75834128
0008261	00082619
6482533	*648253310

*A check digit with a value of 10 cannot be used. All basic numbers requiring a check digit value of 10 must be eliminated from the self-check numbering system.

TOTAL ACCUMULATOR The accumulator option provides the 340 terminal with one ten-digit accumulator (Total Accumulator). This accumulator can be used to generate totals or to execute a zero balancing operation.

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

ADD (TAB/SKIP KEY) Right justifies the data and adds the contents of the current field to the accumulator. Only fields designated as accumulator fields and not longer than 10 digits can be added.

SUBTRACT (MINUS KEY) Right justifies the data and subtracts the contents of the current field from the accumulator. Only fields designated as accumulator fields, and not longer than 10 digits can be subtracted.

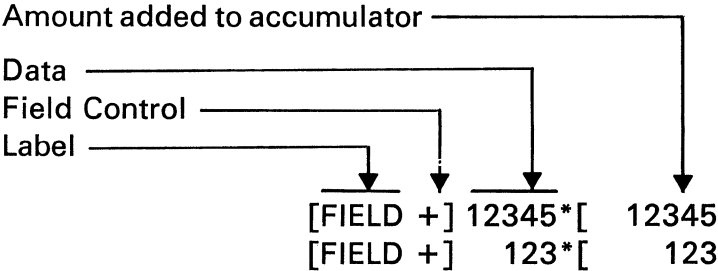
Fields are defined as accumulator fields by field control characters. The following field control characters are available:

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.

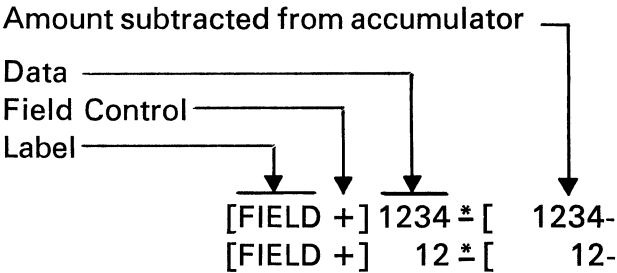
EXAMPLES:

ADD TO TOTAL ACCUMULATOR



* = depression of the TAB/SKIP key

SUBTRACT FROM ACCUMULATOR

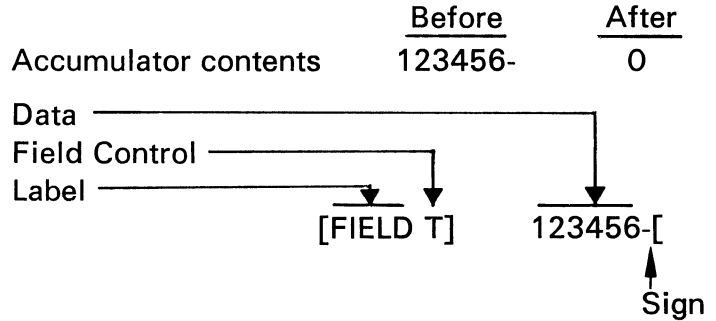


* = depression of MINUS key

SYMBOL FUNCTION

T Defines the following field as Total Field. Upon depression of the TAB/SKIP key the accumulator contents are automatically moved into this field.

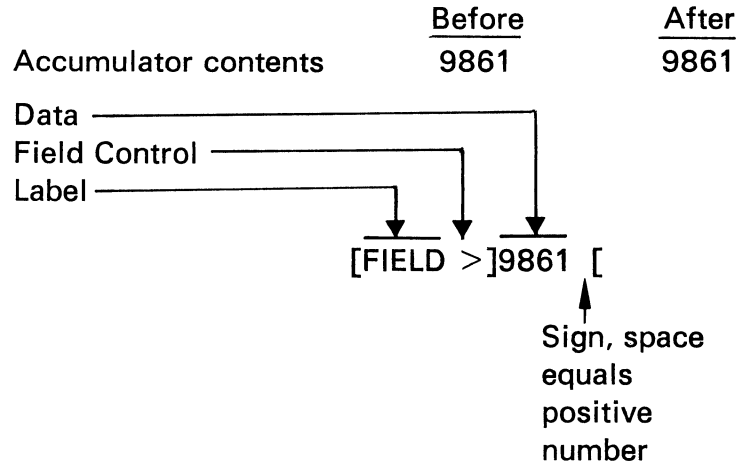
MOVE ACCUMULATOR AND CLEAR



SYMBOL FUNCTION

- > Defines that the following field is 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.

MOVE ACCUMULATOR



SUBTOTAL ACCUMULATOR

The second 10 digit accumulator (Subtotal) option allows generation of totals and subtotals. The second accumulator is displayed on positions 42 to 51 and the sign in position 52. An OFL error is indicated if the Subtotal Accumulator capacity is exceeded. 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.

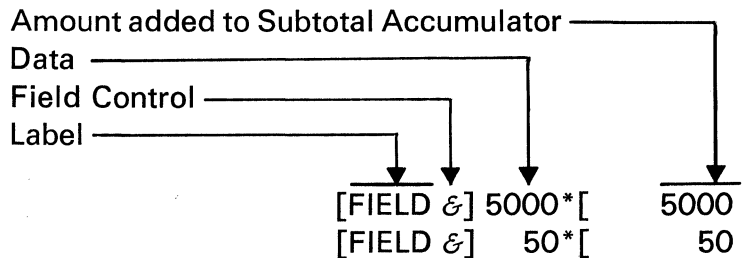
A set of control characters is available to allow controlling of the Subtotal Accumulator option.

SYMBOL FUNCTION

⌘ 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.

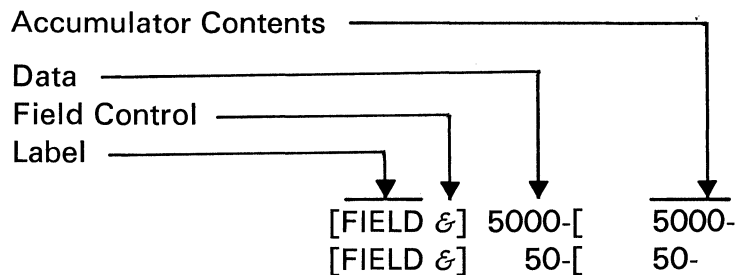
EXAMPLES:

ADD TO SUBTOTAL ACCUMULATOR



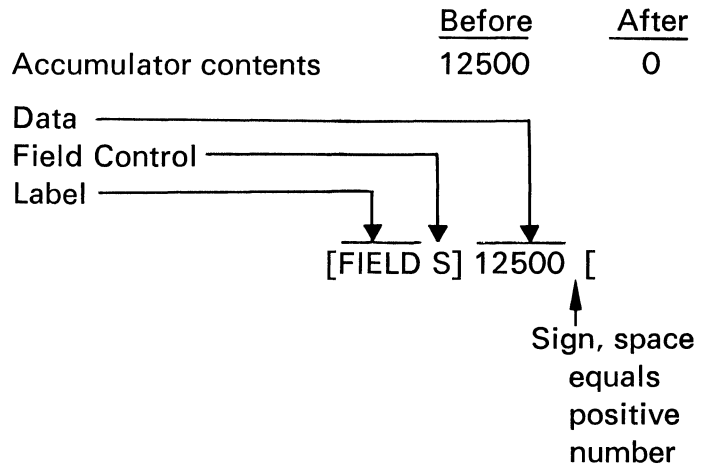
* = Depression of the TAB/SKIP key

SUBTRACT FROM SUBTOTAL ACCUMULATOR



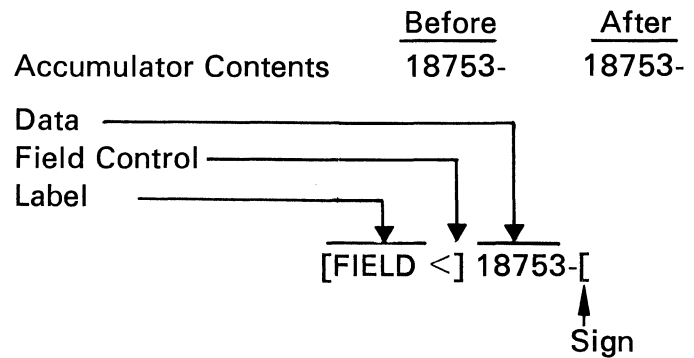
S Defines the following field as a Subtotal Field. The Subtotal Accumulator contents are automatically moved into this field upon depression of the TAB/SKIP key by the operator. After loading this field, the accumulator is cleared and loaded with zeros.

MOVE SUBTOTAL ACCUMULATOR AND CLEAR



< The Subtotal Accumulator is moved to this field upon depression of the TAB/SKIP key, but the accumulator is not cleared after the operation.

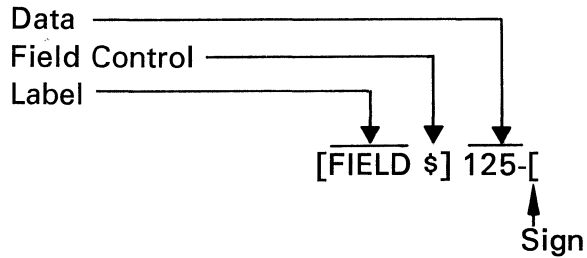
MOVE SUBTOTAL ACCUMULATOR



\$ The following field is loaded with the contents of the Subtotal Accumulator and the Subtotal Accumulator is added to the Total Accumulator and cleared.

MOVE SUBTOTAL ACCUMULATOR TO FIELD
AND ADD SUBTOTAL TO TOTAL AND CLEAR
SUBTOTAL

	<u>Subtotal</u>	<u>Total</u>
Accumulator contents Before	125-	375
Accumulator contents After	0	250



SAMPLE PROGRAM

To summarize what has been covered to this point a sample program is illustrated in the following pages. This program will use each of the program control codes previously described.

The program will collect inventory control data and will consist of three (3) pages. Remember a page is that portion of the "complete" program presented to the operator on the CRT at one time. Page one of the program will contain the batch header information as follows:

FIELD	DESCRIPTION
1-7	Job identification code — INV CTL
8-10	Batch number, numeric data right justified, left filled with spaces.
11	Operator code, alphabetic data
12-17	Current date, numeric data
18-40	Plant name, mixed data

After the operator completes page one of the program the terminal will automatically read page two onto the CRT because of the Automatic Program Load Field control character [*] in page one of the program.

Page two of the program collects the detail information on each part contained in the batch. The following fields are completed by the operator:

FIELD	DESCRIPTION
1-10	Part Number — the first nine (9) characters represent the base portion of a Modulo 10 check digit number.
11-12	Part Type — A two character alphabetic field that "must" have at least one character entered.
13-32	Part Description — Up to a twenty character description may be entered.
33-37	Quantity Ordered — A five (5) character numeric quantity. A total quantity will be accumulated in the Total Accumulator and read out into the batch trailer record.
38-42	Quantity Back-Ordered — A five (5) character numeric quantity, a total quantity will be accumulated in the Subtotal Accumulator and readout into the batch trailer record.

The operator will use page two of the program to enter the detail information for each part. After she has completed the last part in the batch, she depresses the NEXT FORMAT key to bring the trailer part of the program (page three) onto the CRT.

Page three of the program contains the total information for the preceding batch as follows:

FIELD	DESCRIPTION
1-7	The constant TRAILER to identify the record as a trailer.
8-18	Total Parts Ordered. The results of the Total Accumulator.
19-29	Total Parts Back-Ordered. The results of the Sub-total Accumulator.

The operator must depress the TAB/SKIP key to signal the terminal to read the accumulator out into the following field. If the output field is less than eleven positions in length the transfer will stop when the last position in the field is filled.

PERIPHERAL CONTROL & OPERATION

CASSETTE LOADING

A three (3) position REL/OP/PROT switch is provided to control the operation of the cassette recorder.

REL (Release) In this position the read/write head assembly is "pulled" away from its normal position, so that the cassette cartridge can be mounted and removed. If any of the tape movement keys are depressed with the head released a TP1 or TP2 error is displayed on the CRT.

OP (Operate) Initiates the terminal to engage the read/write head. Both reading and writing of the cassette is permitted.

PROT (Protect) The read/write head is engaged, but the cassette can be read only.

CASSETTE OPERATION

Tape control keys are provided to read a record from the cassette tape onto the CRT, and to write data from the CRT to the cassette.

ADVANCE RECORD — reads the next record from cassette tape onto the CRT.

BACK RECORD — The recorder is back spaced one record.

WRITE — The contents of the CRT are written to the cassette tape, the tape is backspaced, and the record read to verify that it was written on tape correctly.

INSERT — Backspaces the recorder and writes the content of the CRT in place of the old record.

REWIND—Rewinds the tape to the beginning of tape position.

RECALL — The recorder is backspaced one logical record and this record is read on the CRT.

PRINTER

PAPER LOADING

The form to be printed is loaded by inserting the form into a paper feed slot at the rear of the printer. Next, the paper is pushed up to the sprocket, the paper is fitted on the sprocket teeth and the plate is closed over the sprocket teeth.

MANUAL CONTROL

A print test switch is provided. When depressed it will print an entire line of the character E. This is used to aid the operator in the vertical form alignment.

A manual form feed switch is provided to advance the paper to the head of form position. This is used for 11" vertical forms only, and can be disconnected by a second switch when using vertical forms other than 11" in length.

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.
- 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 Space if a tab stop is not required. Letter X if a tab stop is required.

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*

*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 attached table)

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
- ITB — Intermediate Block Check
- 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 ETB or ETX.

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, ITB 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 (character phase) and bit synchronism (bit phase). This pattern must always precede a transmission. The sync pattern consists of at least one pad character followed by at least seven consecutive SYN characters.

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

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 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, fails to respond for a period of three (3) seconds, 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 acknowledgement, 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 and the transmission is terminated by sending an end of transmission (EOT). An ERR RESET is required to reinitiate the transmission with a bidding sequence. **NOTE:** While processing read errors, synchronism (SYN) characters and the temporary text delay sequence (TTD) are 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, ITB 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, synchronism (SYN) characters and temporary delay characters (WACK) are 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 acknowledgement (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, or receives an end of transmission (EOT), 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), 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 synchronism (SYN) or temporary delay (WACK) characters are idled on the line until the proper response may be sent.

UNATTENDED
COMMUNICATIONS
OPTION:

JOB SELECTION

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

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

B-AUT IN OUT

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 (610 or computer) or automatically (computer) the 610 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, card reader) and the operation to be accomplished. The ID record can be made up to 20 characters long by repeating the peripheral device selection code.

The record has the following format:

SOH — Start of Record
 δ — Terminal Identification
 β — 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. The tape is rewound at the completion of a successful transmit operation.

TRANSMISSION FROM
TERMINAL

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.

As defined above, the central master station (610 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 line as Output.

- 0—Card Reader
- 5—Keyboard
- 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	IN C	OUT L,
5	B-AUT	IN	OUT L,
6	B-AUT	IN 1	OUT L,
7	B-AUT	IN 2	OUT L,

1. Normal Terminal Transmission

δ = Terminal address

β = Device selection code

Computer

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

2. Wrong Address

Computer

or
610

	E	S	E	DE
	N	O	$\delta\beta$	T
	Q	H	X	ET
340	A		E	
	C0		O	
	K		T	

3. Device not ready to transmit but correct address

Computer
or
610

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

340

A A E
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 the cassettes are rewound.

UNRECOVERABLE
TRANSMISSION
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.

TRANSMISSION
TO TERMINAL

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

DC1—Printer and CRT

DC2—Cassette 1

DC3—Cassette 2

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	OUT P,
DC2	B-AUT	INL	OUT 1,
DC3	B-AUT	INL	OUT 2,

1. Normal Reception on Terminal

δ = Terminal address

β = Device selection code

Computer

or

610

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

340

A	A	AO
CO	C1	C1
K	K	K

2. Wrong Address

Computer

or

610

E	S	E	DE
N	O $\delta\beta$	T	LO
Q	H	B	ET

340

A	E
CO	O
K	T

3. Terminal not ready to receive but correct address

Computer

or

610

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

340

A	A	E
CO	C1	O
K	K	T

MULTIPOINT COMMUNICATIONS

The Multipoint Data Link Control feature on the Model 340 Communication Terminal equips it to operate on a communications line with multiple stations.

This feature equips the Model 340 to operate multidropped on the same leased private communications line with other properly featured Model 340 terminals, or with IBM equipment such as 1130, System/360 Model 20, 2770, 2780, and a properly featured System 360 processor. The processor is the "control station" of the multipoint, centralized network. All other stations are "tributary stations". The control station is the focal point of the network and maintains an orderly plan of network traffic by initiating all data transfers. The control station is either the transmitter or receiver of every communication.

The control station precedes each network activity with EOT, this insures that all stations are in the control state and monitoring the line. Then one of two line-bid sequences is transmitted to alert a particular station.

1. Normal Terminal Transmission

A = Terminal identification address (upper case alpha)
 N = Device selection code (numeric character 0, 5, 6, 7)

Computer:

E	E		A		A0	E
O	AN	N	C1		C1	O
T	Q		K		K	T

340:

	S		E		S		E
	T	RECORD	T		T	RECORD	T
	X	1	B		X	N	X

2. Device not ready

Computer:

E	E	E
O	AN	N
T	Q	T

340:

N
A
K

3. Normal Terminal Reception

a = Terminal Address (lower case alphabetic character a-z)

d = Device address code (DC 1, DC 2, DC 3)

Computer:

E	E	S	E	S	E	E			
O	ad	N	T	Record 1	T	T	Record n	T	O
T	Q	X	B	X	X	T			

340:

A	A	A0
CO	C 1	C1
K	K	K

4. Device not ready

Computer:

E	E	E	
O	ad	N	O
T	Q	T	

340:

N
A
K

A "selection" sequence alerts a tributary station that it is to receive; a "polling" sequence requests a tributary station to transmit. The station address in the line-bid sequence is an alphabetic character (A-Z) preceding the line-bid ENQ, encoded in upper case for a poll, or in lower case for a selection. Each tributary station has its own alphabetic-character address, assigned and built into each terminal at the time it is built.

APPENDICES

JOB SELECT
NEXT FORMAT

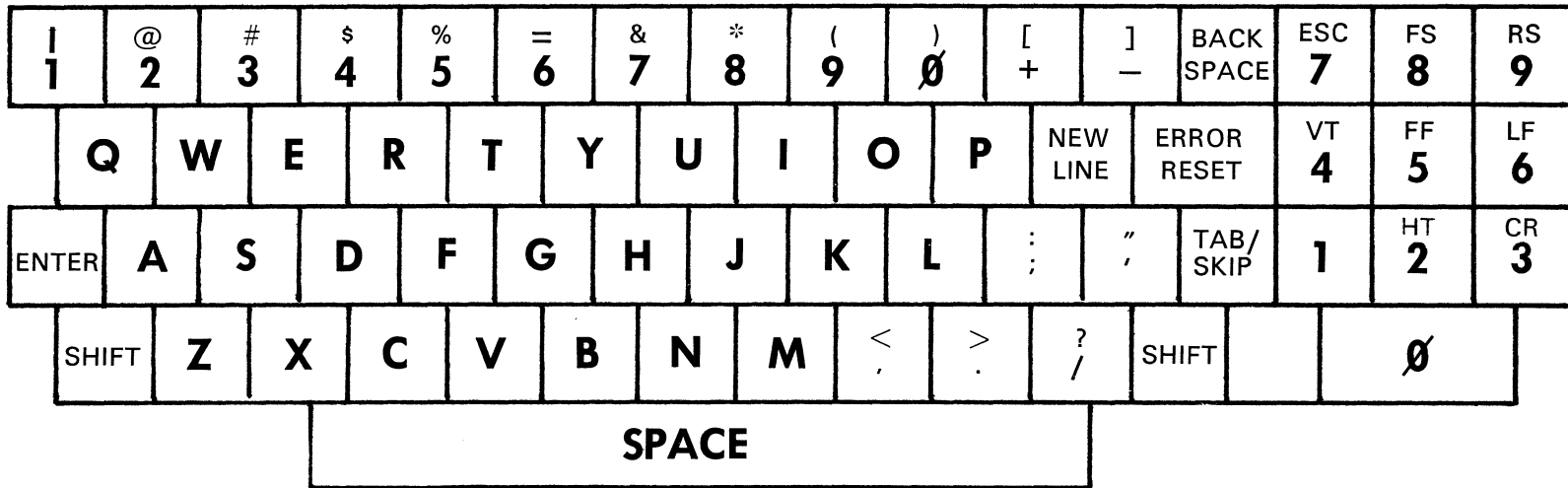
CLEAR SCRN	CLEAR FIELD
BACK FIELD	ADV FIELD
←	→

PROG CTL	ON
-------------	----

AUTO OPRT	ON
--------------	----

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

58



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.
, (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.
| (Display Tab)	Displays a display tab stop 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.

KEY/SWITCH**PROGRAM CONTROL — OFF**

\$ (Dollar Sign)	Displays a dollar sign on the CRT.
% (Percent Sign)	Displays a percent sign on the CRT.
] (Right Bracket)	Displays a right bracket on the CRT.
& (Ampersand)	Displays an ampersand on the CRT.
* (Asterisk)	Displays an asterisk on the CRT.
((Left Parenthesis)	Displays a left parenthesis on the CRT.
) (Right Parenthesis)	Displays a right parenthesis on the CRT.
- (Minus)	Displays a minus on the CRT.
+ (Plus)	Displays a plus on the CRT.
= (Equal Sign)	Displays an equal sign on the CRT.
“ (Quotation Mark)	Displays a quotation mark on the CRT.
< (Less Than Symbol)	Displays a less than symbol on the CRT.
> (Greater Than Symbol)	Displays a greater than symbol on the CRT.

PROGRAM CONTROL — ON

Displays a dollar sign on the CRT. Valid in mixed fields only.
Displays a percent sign on the CRT. Valid in mixed fields only.
Inoperative.
Displays an ampersand on the CRT. Valid in mixed fields only.
Displays an asterisk on the CRT. Valid in mixed fields only.
Displays a left parenthesis on the CRT. Valid in mixed fields only.
Displays a right parenthesis on the CRT. Valid in mixed fields only.
Displays a minus on the CRT. Valid in numeric and mixed fields only. Subtracts an accumulator add/subtract field from the specified accumulator.
Displays a plus on the CRT. Valid in mixed fields only.
Displays an equal sign on the CRT. Valid in mixed fields only.
Displays a quotation mark on the CRT. Valid in mixed fields only.
Displays a less than symbol on the CRT. Valid in mixed fields only.
Displays a greater than symbol on the CRT. Valid in mixed fields only.

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. Right justify, accumulator or check digit fields are executed.
NEW LINE	Displays $\overline{\text{I}}$ (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.
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.	Inoperative.
ENTER	Inoperative	Skips the remainder of the current field and all remaining fields of the record. If an omission detection or capacity control field is encountered, a TAB error will occur. 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	Backspaces 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.

KEY/SWITCH	PROGRAM CONTROL — OFF	PROGRAM CONTROL — ON
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 unprotected fields only.
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.
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.
FS (End of File)		The end of file key causes an end of the file mark to be written on the currently 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.

WRITE RECORD	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 unprotected positions on the CRT from position one (1) through the RS code. Special codes (\7) are converted to the required output codes. The tape is backspaced and a read after write check is performed.
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 unprotected fields on the CRT through the I/O buffer.
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 program from the program tape to the CRT. The terminal remains in the program controlled mode of operation.	
←(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 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 field. The cursor is positioned to the first unprotected position of the field.

KEY/SWITCH**PROGRAM CONTROL — OFF****BACK FIELD**

The cursor is positioned to the first character 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.

ADVANCE FIELD

The cursor is advanced to the first position of the next line.

AUTO OPERATION (AUTO-OPRT)**FORMATTED MODE**

Inoperative.

PROGRAM CONTROL — ON

The cursor is backspaced automatically to the first unprotected position of the previous field. Data entered will follow the same rules as the original data edited.

The cursor is advanced automatically to the first unprotected position of the next field.

1. In the ON position every record is written to tape if an end of record character is detected.
2. In the OFF position a record is written to tape if the end of record character is detected and the ENTER key is then depressed.

BATCH MODE

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

1. In the ON position, matching data records 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.

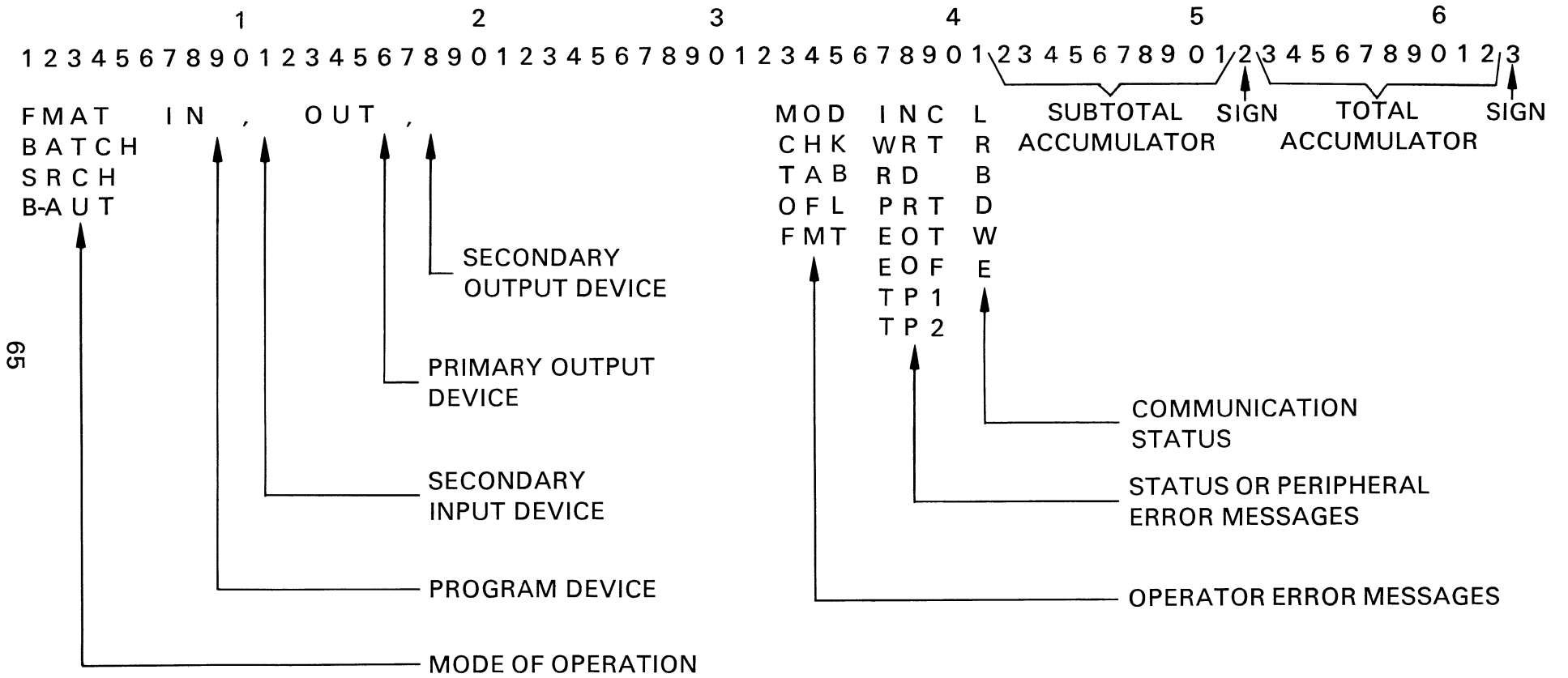
UNATTENDED COMMUNICATION

1. In the ON position, two file separators terminate an operation and records, containing unrecoverable read errors, are replaced with records containing 20 @ signs.
2. In the OFF position, one file separator or an unrecoverable read error terminates an operation.

JOB SELECT

Activates the job selection sequence.

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.

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
SRCH	Terminal is in the Search 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 the correct type of character.
CHK	The entered check digit does not agree with the calculated check digit.	Depress the ERROR RESET key to clear the error message and rekey either the correct base or check digit number.
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 accumulator operation would result in an overflow of the accumulator. 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 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 to tape.
FMT	The format control program contains an invalid format control character.	Turn the PROGRAM CTL switch off, correct the error and resume.
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
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 first record to be printed onto the CRT, position the printer form, and depress the ENTER key to continue.

DISPLAY	MESSAGE DEFINITION	ACTION REQUIRED
EOT	The addressed input/output device has detected the physical end of medium.	Depress the ERROR RESET key to clear the error message and continue on new cassette.
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 protected signal has occurred on tape recorder one.	Depress ERROR RESET and ENTER to continue. If the condition persists call field service.
TP 2	A hardware error or protect signal has occurred on tape recorder two.	Same as above.
L	A line error has been detected during data transmission.	The terminal will automatically retransmit the last record.
R	The receiving terminal has responded with the incorrect odd/even acknowledgement, has failed to respond for 3 seconds, 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.
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 a connection has not yet been established.	Initiate line connection. i.e. dial.

STANDARD COMMUNICATIONS TERMINOLOGY

Point-to-Point Network	A data connection between only two stations (can be switched or leased connection).
Switched Network	A system capable of completing a dialed, point-to-point connection between any two stations of the network.
Control State	A data line status during which message transmission is arranged for.
Message-Transfer State	The data link status during which a message or batch message segment is transmitted. Starts with the first STX and ends with EOT.
Line Bid	A request by a station to initiate transmissions.
Timeout	A measured waiting period.
Contention	A situation characterized by simultaneous line bids on the same line.
Transmission (Text) Block	Data or text framed by STX or SOH and ETB or ETX.
Redundancy Check	The matching at the receiver of a numerical value, computed from the binary content of a received block, against a numerical value computed from the same block by the transmitter and sent to the receiver. The receiver returns an affirmative acknowledgement if the values match, a negative acknowledgement if they do not. These check values are redundant to the message, hence the term redundancy check.
Turnaround	Reversal in the direction of transmission between two stations.
Pad Character	A time-field character that buffers turnaround.

TERMINAL SPECIFICATIONS

GENERAL CHARACTERISTICS

SIZE	The size of the terminal shall not exceed the outline dimensions specified in Figure 5-1.
WEIGHT	The weight of the terminal shall not exceed 110 pounds.
POWER	Input power shall not exceed 400 watts with a 115 V AC input, exclusive of peripheral devices.
LINE VOLTAGE	The terminal shall operate from a 115 volt, 60 Hz, single phase source with voltage variations of $\pm 10\%$. Voltage transients shall not exceed 100 volts peak or 8 milli-sec duration.

OPERATING TEMPERATURE	The terminal shall be operable over an ambient temperature range of +50 to +100 degrees fahrenheit.
HUMIDITY	The terminal shall be operable over a relative humidity range of 20 to 95 percent exclusive of dew point over the operating range.
DUTY CYCLE	The terminal shall be operable for a continuous 24 hour/day cycle.

KEYBOARD

a. Type	— Reed Switch
b. Number of Character Keys	— 56
c. Number of Control Keys	— 25
d. Key size	— 0.710" square
e. Key spacing	— 0.75" o/c
f. Key arrangement	— Straight vertical or staggered 3/8" per key rows (Rows 1 & 3)
g. Actuating pressure	— 2 oz. Typical
h. Key travel	— 3/16" Maximum
i. Roll over control	— Electronic
j. Life	— 10 million cycles/key min.
k. Size	— 15.3" length x 7.5" width x 2.85" height
l. Color	— SYCOR Gray

CRT

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

CASSETTE RECORDER

a. Type	— Magnetic Tape Cassette Recorder/Reproducer, 1B.
b. Operating modes	— Rewind — read/record

PRINTER

- c. Tape speed
 - (Read/Record) — 3.9 ips nominal
 - (Rewind) — 50 ips nominal
- d. Start/stop time — Start—200 ms nominal
Stop—25 ms nominal
- e. Inter-record gap — 1.5" nominal
- f. Data transfer rate — 3120 bps
- g. Cassette capacity — 210,000 characters
- h. Read/record time — 15 minutes per side
- i. Rewind time — 70 sec. maximum
- j. Data format — Serial by bit
- k. Bit packing density — 800 bpi nominal
- l. Recording method — Dual track NRZI

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	27 ⁷ / ₈ inches
Height	35 ⁵ / ₈ inches
Depth	31 inches (includes paper rack)
Weight	Approximately 100 pounds
AC Input Voltage	120 V AC (+10%-5%) single phase, 60 Hz (± .5 Hz) or 220 V AC (+10%-5%) single phase, 50 Hz (± .0 Hz) as specified.
Current	60 Hz units: 4.8 amperes
Power Consumption	575 Watts
Heat Dissipation	Less than 1,000 BTU per hour

Table 1
TERMINAL ADDRESSING SEQUENCE

610 File Number	Addressing Character	
	Symbol	USACII Code (Octal)
01	A	101
02	B	102
03	C	103
04	D	104
05	E	105
06	F	106
07	G	107
08	H	110
09	I	111
10	P	120
11	Q	121
12	R	122
13	S	123
14	T	124
15	U	125
16	V	126
17	W	127
18	X	130
19	Y	131
20	\	140
21	a	141
22	b	142
23	c	143
24	d	144
25	e	145
26	f	146
27	g	147
28	h	150
29	i	151

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

Bit Positions				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
b4	b3	b2	b1	b5	0	1	0	1	0	1	0	1
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	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	

**Table 3
SYCOR CODE SET**

DISPLAY	SYCOR KEY	SYCOR PRINT GRAPHIC	USASCII TRANSMISSION		610 INPUT/OUTPUT	
			Octal	CODE Hex	9 TRACK (HEX)	7 TRACK (OCTAL)
0	0	0	60	30	F0	12
1	1	1	61	31	F1	01
2	2	2	62	32	F2	02
3	3	3	63	33	F3	03
4	4	4	64	34	F4	04
5	5	5	65	35	F5	05
6	6	6	66	36	F6	06
7	7	7	67	37	F7	07
8	8	8	70	38	F8	10
9	9	9	71	39	F9	11
Space	Space	Space	40	20	40	20
A	A	A	101	41	C1	61
B	B	B	102	42	C2	62
C	C	C	103	43	C3	63
D	D	D	104	44	C4	64
E	E	E	105	45	C5	65
F	F	F	106	46	C6	66
G	G	G	107	47	C7	67
H	H	H	110	48	C8	70
I	I	I	111	49	C9	71
J	J	J	112	4A	D1	41
K	K	K	113	4B	D2	42
L	L	L	114	4C	D3	43
M	M	M	115	4D	D4	44
N	N	N	116	4E	D5	45
O	O	O	117	4F	D6	46
P	P	P	120	50	D7	47
Q	Q	Q	121	51	D8	50
R	R	R	122	52	D9	51
S	S	S	123	53	E2	22
T	T	T	124	54	E3	23
U	U	U	125	55	E4	24
V	V	V	126	56	E5	25
W	W	W	127	57	E6	26
X	X	X	130	58	E7	27
Y	Y	Y	131	59	E8	30
Z	Z	Z	132	5A	E9	31

Table 3 (Continued)
SYCOR CODE SET

DISPLAY	SYCOR KEY	SYCOR PRINT GRAPHIC	USASCII TRANSMISSION CODE		610 INPUT/OUTPUT	
			Octal	Hex	9 TRACK (HEX)	7 TRACK (OCTAL)
.	.	.	56	2E	4B	73
,	,	,	54	2C	6B	33
:	:	:	72	3A	7A	15
;	;	;	73	3B	5E	56
'	'	'	47	27	7D	77
"	"	"	42	22	7F	57
?	?	?	77	3F	6F	72
\$	\$	\$	44	24	5B	53
@	@	@	100	40	7C	14
#	#	#	43	23	7B	13
%	%	%	45	25	6C	34
&	&	&	46	26	50	60
(	(	(	50	28	4D	35
)	)	)	51	29	5D	74
*	*	*	52	2A	5C	54
+	+	+	53	2B	4E	37
-	-	-	55	2D	60	40
/	/	/	57	2F	61	21
=	=	=	75	3D	7E	17
<	<	<	74	3C	4C	76
>	>	>	76	3E	6E	16

SYCOR CODE SET

DISPLAY	SYCOR KEY	SYCOR PRINT FUNCTION	USASCII TRANSMISSION CODE		610 INPUT/OUTPUT		
			Octal	Hex	9 TRACK (HEX)	7 TRACK (OCTAL) (2 Character Sequence)	
Control Characters						Char 1	Char 2
Carriage Return	CR	Carriage Return/Line Feed	15	0D	0D	32	15
Line Feed	LF	Line Feed	12	0A	25	32	12
Form Feed	FF	Skip to Channel 1	14	0C	0C	32	14
Vertical Tabulation	VT	Skip to Channel 2	13	0B	0B	32	13
Horizontal Tabulation	HT	Horizontal Tab Skip	11	09	05	32	11
Record Separator	RS	None	36	1E	1E	32	36
Escape	ESC	Identifies HT or VT Printer Stop Record	33	1B	27	32	33
Group Separator	Generation by terminal with data compression option	None	35	1D	N/A		N/A
File Separator	FS	Identifies End of Job	34	1C	22	32	35
* Display Tab Stop \	TAB/SKIP	Horizontal Tab Skip	134	5C	6A	32	34
* Left Bracket	[	None	133	5B	4A		75
* Right Bracket	]	None	135	5D	5A		55
* Auto Display Advance		!	41	21	4F		52
* New Line Code ⌋	New Line	Carriage Return/Line Feed	136	5E	5F		36

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TAPEMARKS are generated on the Model 610 by depressing the WRT EOF key.

*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.

**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

U N I T S V A L U E		100	110	120	130	140	150	160	170	180	190
	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
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	

EXAMPLES:

Decimal #	Table Value
01	PA
25	AI
46	BN
62	CN

**COMMUNICATIONS CHARTS
POINT-TO-POINT**

A. Normal Message Transmission

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

B. Unanswered Line Bid

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

C. Retransmission Accepted

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

Footnote: ① No LRC, BCC, PAD, or SYN characters are shown in these sequences.
 ② 20-seconds after communication has ended the 340 disconnects the phone.

D. Retransmission Rejected

		ODD			ODD			ODD			ODD		
Transmitting Station sends:	E	S	E	S	E	S	E	S	E	S	E	E	
	N	T (Text-A)	T	T (Text-A)	T	T (Text-A)	T	T (Text-A)	T	T (Text-A)	T	O	
	Q	X	B	X	B	X	B	X	B	X	B	T	
Receiving Station sends:	A		N		N		N		N		N		
	CO		A		A		A		A		A		
	K		K		K		K		K		K		

E. Processor-to-Terminal Retransmission Rejected

		ODD			ODD			ODD		
Processor Station sends:	E	S	E	S	E	(Repeat "N" times,	S	E	E	
	N	T (Text-A)	T	T (Text-A)	T	counted by proc-	T (Text-A)	T	O	
	Q	X	B	X	B	essor program).	X	B	T	
Terminal Station sends:	A		N		N				N	
	CO		A		A				A	
	K		K		K				K	

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F. Receive-Initiated Transmission Delay

		ODD			EVEN			ODD			EVEN		
Transmitting Station sends:	E	S	E	S	E	S	E	E	E	E	S	E	
	N	T (Text)	T	T (Text)	T	T (Text)	T	N	N	T (Text)	T	T	
	Q	X	B	X	B	X	B	Q	Q	X	B	B	
Receiving Station sends:	A		A		A	(2-sec. W	(2-sec. W	A	A		A		
	CO		C1		CO	interval) A	interval) A	C1	C		C		
	K		K		K			K	K		K		

Note: Allows receiver to clear buffer block. ENQ may be an immediate response to WACK.
WACK-ENQ sequences are not counted by 340.

G. Transmitter-Initiated Transmission Delay

Transmitting Station sends:	E	S	E	S	E	T	T	T	S	E	E	
	N	T (Text)	T	T (Text)	T	(2-sec. interval)	T	(2-sec. interval)	T	T (Text)	T	O
	Q	X	B	X	B		D		D	X	X	T
Receiving Station sends:	A		A		A	N		N		N		A
	C0		C1		C0	A		A		A		C1
	K		K		K	K		K		K		K

Note: Allows transmitter to fill buffer block. TTD-NAK sequences are not counted by 340. If transmitter is unable to continue it sends EOT instead of TTD and transmission ends incomplete. (See L.)

H. STX Format Error, Data Ignored by Slave Station

Transmitting Station sends:		ODD		EVEN			EVEN		ODD			
	E	S	E	E	E	E	S	E	S	E	E	
	N	T (Text-A)	T	(Text-B)	T	(3-sec. response timeout)	N	T (Text-B)	T	T (Text-C)	T	O
	Q	X	B	B	B		Q	X	B	X	X	T
Receiving Station sends:	A		A		A	(No response)	A		A		A	
	C0		C1		C1		C1		C0		C0	
	K		K		K		K		K		K	

Note: Receiver did not synchronize nor did it receive Text-B the first time. The transmitter retransmits.

J. Data Link Aborted on No-Response from Receiver

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

K. Data Link Aborted on Request on Receiver

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

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L. Data Link Aborted on Request of Transmitter

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

M. Data Link Aborted on No-Continuation by Transmitter

Transmitting Station sends:	E	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.)

POINT-TO-POINT UNATTENDED

1. TRANSMISSION FROM TERMINAL

A. Normal Operation

Master Station: E S E E A A A DE S
 N O $\delta\beta$ T O CO C1 CO LO or O
 Q H X T K K ,K1 ET H

340: A A E S E S E E
 CO C1 N T TEXT A T T TEXT N T O
 K K Q X B X X T

B. Wrong Address

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

340: A E
 CO O
 K T

C. Correct Address,
 but device not ready

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

340: A A E
 CO C1 O
 K K T

2. RECEPTION TERMINAL

A. Normal Operation

Master Station: E S E S E S E DE S
N O $\delta\beta$ T T TEXT A T T TEXT N T LO or O
Q H B X B X X ET H

340: A A A A
CO C1 CO CO
K K K K1

B. Wrong Address

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

340: A E
CO O
K T

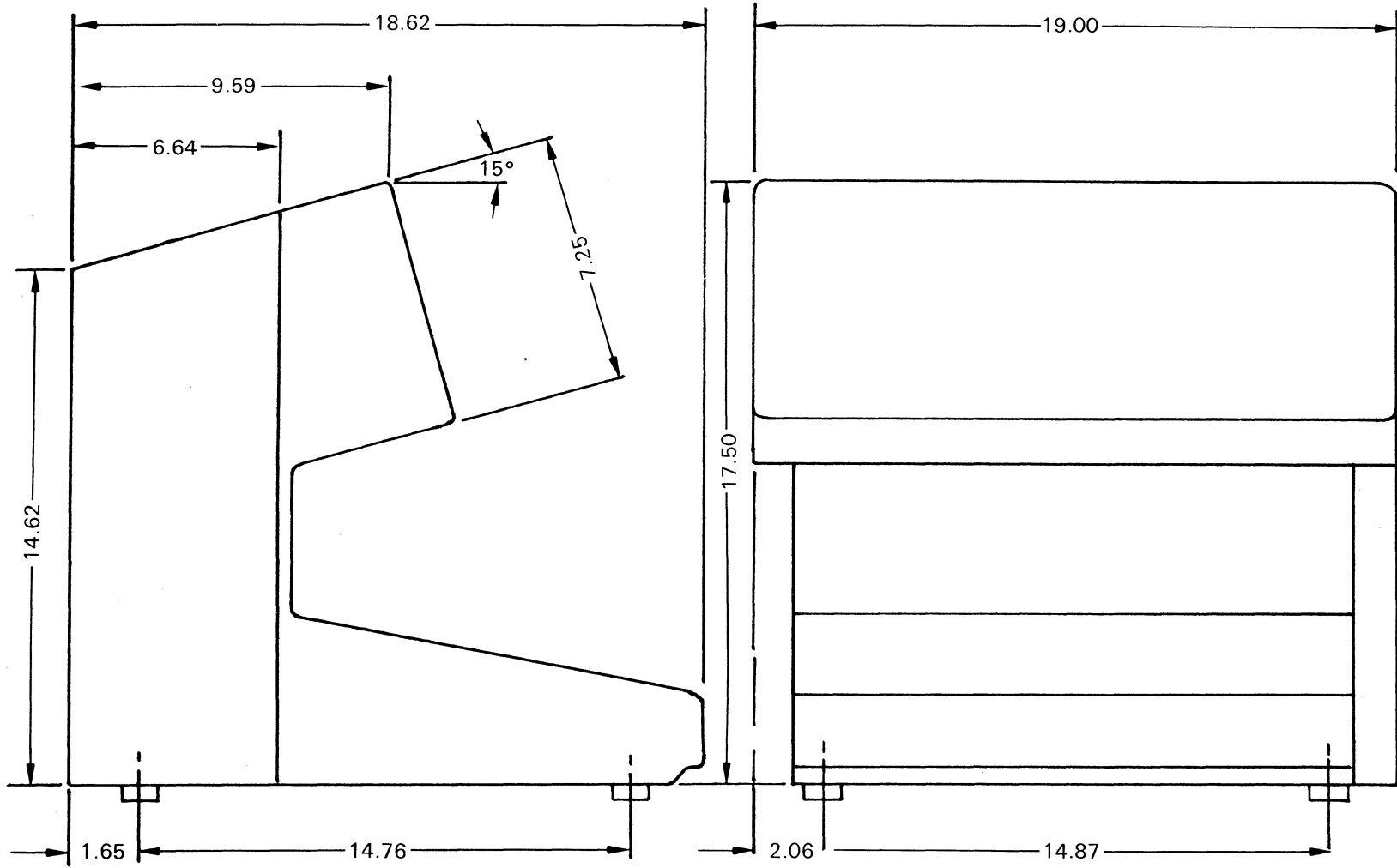
C. Correct Address, but device not ready

Master Station: E S E S E DE S
N O $\delta\beta$ T T TEXT A T LO or O
Q H B X B ET H

340: A A E
CO C1 O
K K T

UNIT OUTLINE DRAWING

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NOTES

NOTES

READERS COMMENT FORM
SYCOR 340 SYSTEM
REFERENCE MANUAL
ISSUED MARCH 1971

fold here

Suggested improvements:

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Errors noted:

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General comment:

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