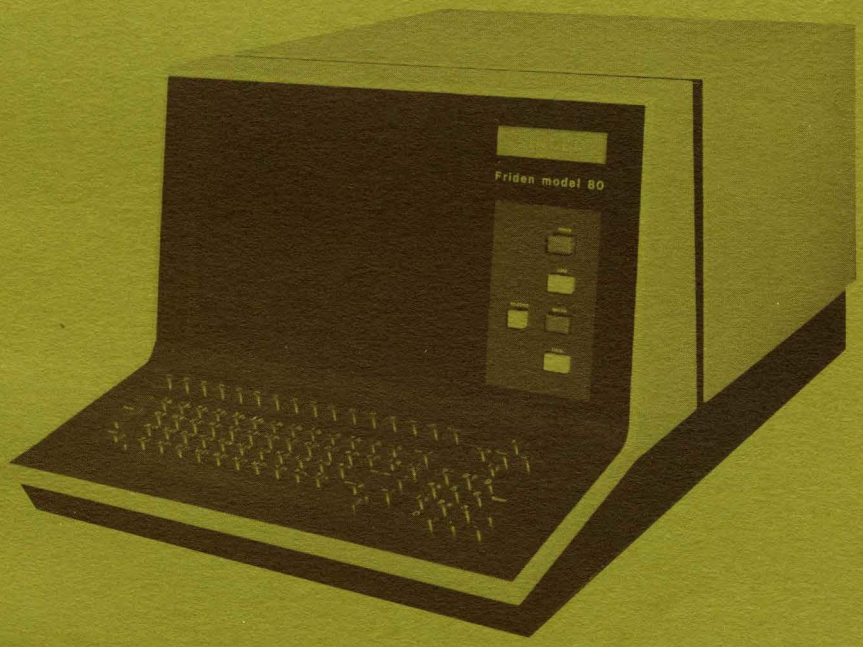
REFERENCE MANUAL

MODEL 80 DISPLAY

SYSTEM TEN COMPUTER BY SINGER



SINGER
FRIDEN DIVISION

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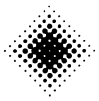

SYSTEM TEN COMPUTER BY SINGER

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PREFACE

This manual is intended for those who are interested in the operating and programming characteristics of the Model 80 Display. Included in the manual are a general description of the Model 80; a table of specifications; a functional description of all keys; a thorough discussion of Model 80 read, write, and write control operations; and a summary of all Condition Codes associated with the Model 80.

Less detailed information may be found in the Model 80 Display Operator Instructions, Publication No. 40-210.

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1. GENERAL DESCRIPTION

The Model 80 Display (Figure 1) is a cathode ray tube input/output device designed as a peripheral unit for the System Ten* computer. The screen contains 1600 character positions; that is, 20 lines of 80 positions

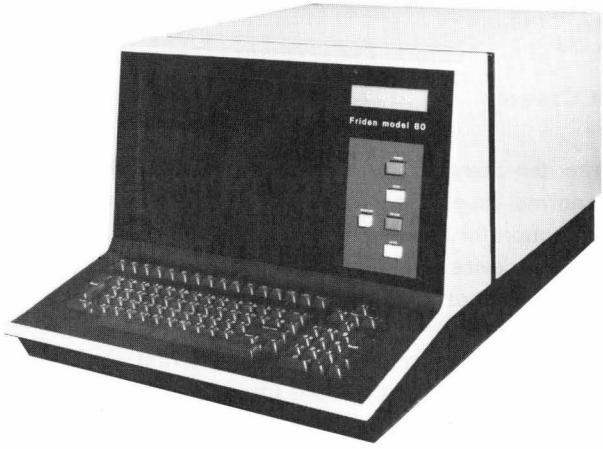

Figure 1. Model 80 Display.

each. When the power is on, a blinking marker called a *cursor* shows where the next character will be displayed. In addition to a full alphanumeric keyboard, the Model 80 has a 10-key numeric keyboard which is similar to those used on many adding machines and calculators, a set of cursor control keys, a set of editing control keys, and a set of program control (CTL) keys which are used for affecting program execution. The Model 80 is a free standing unit which is compact enough to fit on the top of a standard desk. Dimensions are included in the specifications of Table 1. The brightness control knob and the vertical hold and horizontal hold control screws are conveniently accessible to the operator (see Figure 2).

Because the Model 80 has a full page buffer (1600 characters) and is connected to the central processor through an Input/Output Channel (IOC), several displays may be attached to a single partition. The Model 80 may be located up to 2000 wire feet (610 meters) from the central processor.

Like all peripheral devices of the System Ten computer, the Model 80 is independently powered. To facilitate remote use, the Model 80 is turned on and off from its own operator control panel. With its power on, the Model 80 is in either of two states, called *local* and *on-line.*

When in local, the Model 80 is disconnected from the central processor.

When on-line, the Model 80 can pass data to main memory, display data sent from main memory, or perform certain control operations in response to Read, Write, and Write Control instructions executed in the central processor. Read, Write and Write Control instructions are discussed in detail in separate sections of this manual.

Through use of the Write Control instruction, the programmer may place the Model 80 in the *formatting mode.* This mode is used for establishing *protected fields.* A protected field cannot be destroyed either by operator entry or by a Write instruction. If the cursor encounters a protected field, the cursor automatically skips over the field. After the cursor movement is finished, the operation may continue. Protected fields are displayed with underscoring to differentiate them from unprotected data. The establishing of protected fields is discussed in the section of this manual entitled WRITE OPERATIONS.

The extreme upper left character position on the screen is known as the *home position.* By using the cursor control keys, the operator may move the cursor to the home position or to any position on the screen which does not lie within a protected field.

During either an output operation or operator entry, reaction of the cursor to the end of the bottom line on the screen is determined by whether the Model 80 is in the *scroll mode* or the *page mode.* If there is any protected data on the screen the Model 80 is automatically in the page mode; otherwise, it is always in the scroll mode. When the end of the bottom line is reached in the page mode, the cursor moves to the first unprotected position on the screen (most often, the home position is the first unprotected position on the screen). When the end of the bottom line is reached in the scroll mode, all lines on the screen move up one line, any data originally in the top line

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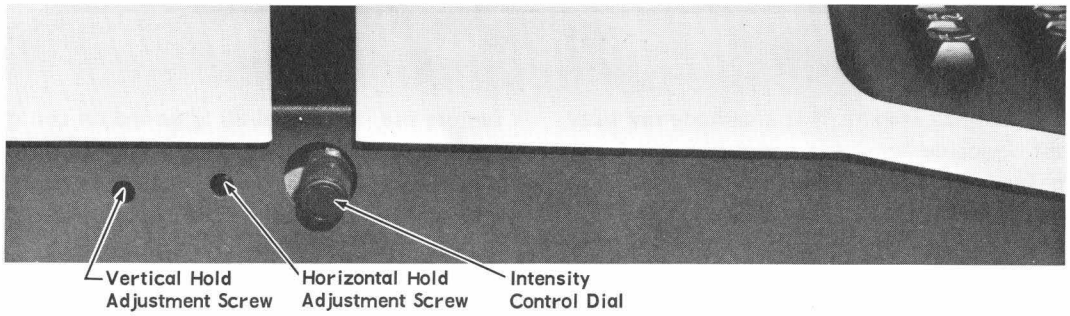

Figure 2. Adjustment Controls.

is lost, the bottom line is filled with spaces, and the cursor moves to the first position in the bottom line. In either case, the output operation or operator entry may continue as soon as the cursor movement is finished.

When the Model 80 is assigned device address 0 (zero), the operator can initiate a load sequence by simultaneously pressing the LOAD and LOCAL switches on the control panel. When the operator does this, the LOCAL light immediately turns on and the cursor moves to the first unprotected position on the screen. Shortly thereafter, the LOAD and SELECTED lights are also illuminated. At this point, the operator can clear the entire screen (protected as well as unprotected data) and move the cursor to the home position by simply pressing the CLEAR key. Regardless of whether this key is pressed, the processor waits to receive ten characters. The operator may place the display on-line, enter ten characters, and then press the ENTER key. In normal usage, the ten characters constitute a Read instruction for bringing a program into memory through an input device. *NOTE:* The ten characters must occupy consecutive positions on the screen in a single line.

However, if the cursor is in one of the first ten positions of a line and all the positions preceding the cursor position are unprotected and contain spaces, the operator may bring instructions into memory from a disc drive by placing the display on-line and then pressing the ENTER key. This causes the 100 characters contained in sector 0 of disc drive 0 to be read into partition locations 0-99 and causes control to be passed to the instruction which starts at location 10. *NOTE:* For this type of load sequence to work properly in the event of a read error and the resultant hardware re-try of the read operation, the first ten characters in sector 0 of disc drive 0 must all be numeric zeros.

Table 1. Specifications.

Dimensions	Width	Depth	Height	
Inches	18¾	29	13¾	
Centimeters	47.6	73.6	34.9	
Minimum Service Clearances	Front	Rear	Right	Left
Inches	36	24	3	12
Centimeters	91.4	61.0	7.6	30.5
Approx. Weight	80 lb	36.3 kg		
Maximum Heat Output/hour	365 BTU			
Electrical Requirements				
Voltage Range	100 to 130V		230V ± 10%	
Frequency	60 ± 1 Hz		50 ± 1 Hz	
Current	1.6A		0.8A	
Maximum Current Surge	12A for 20 msec		6A for 20 msec	
Phases	single		single	
KVA	0.16		0.16	
Operating Environment				
Temperature	+32° to +100°F		+0° to +37.8°C	
Relative Humidity	20 to 90%			
Non-Operating (Storage) Environment				
Temperature	-25° to +150°F		-31.7° to +65.6°C	
Relative Humidity	5 to 95%			
Screen Size	Height		Width	
Inches	5¼ (± ¼)		7¾ (± ¼)	
Centimeters	13.3 (± 0.64)		19.7 (± 0.64)	

2. KEYBOARD AND OPERATOR CONTROL PANEL

The Friden Model 80 Display has five sets of keys as shown in Figure 3. These are:

1. Alphanumeric Keyboard

- letters A thru Z
- digits 0 thru 9
- special characters
  " ' ( ) $ % & . ,
  / @ * ! ; : + = _
  - ? < > [ ] ^ \ #
- space bar
- two SHIFT keys
- ENTER key
- NEW LINE key
- TAB key
- repeat (RP) key

2. Numeric Keyboard

The numeric keyboard is similar to those used on many adding machines and calculators. It contains:

- digits 0 thru 9
- special characters . -
- ENTER key

3. Cursor Control Keys

4. Program Control (CTL) Keys

5. Editing Control Keys

Alphanumeric Keyboard (Figure 4)

The following keys cause a character to be displayed on the screen in the position marked by the cursor, the character's six-bit code to be deposited in the associated position in the Model 80 buffer, and the cursor to move to the next subsequent unprotected position:

- alphabetic keys A thru Z
- numeric keys 0 thru 9
- special characters
  " ' . , ! ( ) % $
  & / + = - _ @ : ;
  ? * \ [ ] < > ^ #
- space bar

Some of the keys are imprinted with two characters. If it is desired to display the upper of the two characters, the operator must hold down one of the SHIFT keys and press the particular character key. The SHIFT keys have no effect if used with any of the single character keys.

Figure 3. Model 80 Keyboard.

Figure 4. Alphanumeric Keyboard.

Other keys on the alphanumeric keyboard are:

The ENTER key locks the keyboard, moves the cursor back to the first unprotected position in the line or on the screen (this is determined by the program which is using the Model 80), and makes the data entered by the operator available for transmission to main memory. After pressing the ENTER key, the operator cannot enter any more data until the previously entered data has been transmitted to main memory. Normally, all operator entries are terminated by pressing the ENTER key. Sometimes, however, the operator will be instructed to use one of the program control (CTL) keys instead of the ENTER key.

The NEW LINE key moves the cursor to the first unprotected position in the next lower line. If the cursor is in the bottom line and the display is in the scroll mode, all lines on the screen move up one line, all characters originally in the top line are lost, and the cursor moves to the first position in the bottom line. In the latter case, the bottom line contains all spaces after the cursor movement is finished.

The TAB key moves the cursor to the first unprotected position following the next subsequent protected field. If no protected field is encountered by the time the end of a line is reached, the scan continues in the next lower line. If no protected field is encountered by the time the end of the bottom line is reached, the cursor moves to (and halts at) the first unprotected position on the screen.

The RP key is used for repeatedly displaying a particular character or for repeatedly performing a cursor control function (such as cursor right, cursor down, etc.). When the RP key is held down and a character key is then held down, the character is automatically displayed in succeeding positions five times per second until either the RP key or the character key is released. When the RP key is held down and a cursor control key is then held down, the cursor control function is performed five times per second until either the RP key or the cursor control key is released.

Numeric Keyboard (Figure 5)

The numeric keyboard is intended to facilitate the entry of large quantities of numeric data. During operator entry, the alphanumeric and numeric keyboards may be used interchangeably. *NOTE:* None of the keys in the numeric keyboard is affected by the SHIFT keys.

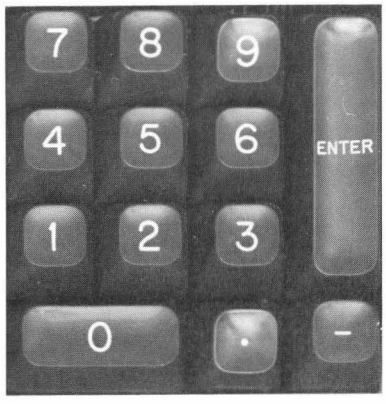

Figure 5. Numeric Keyboard.

Cursor Control Keys (Figure 6)

The HOME key moves the cursor to the home position. However, if the home position lies within a protected field, the HOME key moves the cursor to the first unprotected position following the home position.

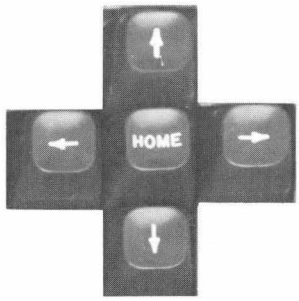

Figure 6. Cursor Control Keys.

The → key moves the cursor to the next subsequent unprotected position. If no unprotected position is encountered by the time the end of a line is reached, the scan continues in the next lower line. If the cursor is in the bottom line, the top line is **always** considered to be the next lower line.

The ← key moves the cursor one position to the left. However, if the position to which the cursor would move lies within a protected field, the cursor does **not** move. If the cursor is in the first position of a line, the final position of the next higher line is considered to be the next position to the left. If the cursor is in the top line, the bottom line is **always** considered to be the next higher line.

The ↑ key moves the cursor to the same position in the next higher line. However, if the position to which the cursor would move lies within a protected field, the cursor moves to the first unprotected position following the protected field. If no unprotected position is encountered by the time the end of a line is reached, the scan continues in the next lower line. If the cursor is in the top line, the bottom line is **always** considered to be the next higher line.

The ↓ key moves the cursor to the same position in the next lower line. However, if the position to which the cursor would move lies within a protected field, the cursor moves to the first unprotected position following the protected field. If no protected position is encountered by the time the end of a line is reached, the scan continues in the next lower line. If the cursor is in the bottom line, the top line is **always** considered to be the next lower line.

Program Control (CTL) Keys (Figure 7)

These keys perform basically the same functions as the ENTER key. However, the operator should not use the CTL keys in place of the ENTER key unless instructed to do so. The ENTER and CTL keys are discussed in detail in the section of this manual entitled READ OPERATIONS.

Editing Control Keys (Figure 8)

Figure 8. Editing Control Keys.

The INS CHAR key causes the character in the cursor position and all characters to the right up to the next protected field or the end of the line (whichever occurs first) to move one position to the right. The character originally in the rightmost affected position is lost. After the character movement is finished, the cursor position contains a space.

The INS LINE key causes all characters from the cursor position up to the next protected field or the end of the bottom line on the screen (whichever occurs first) to move 80 positions to the right. As a character passes the end of a line, the first position in the next lower line is considered to be the next position to the right. Any characters which

Figure 7. Program Control Keys.

attempt to move into a protected field or off the end of the bottom line on the screen are lost. After character movement is finished, up to 80 positions starting with the cursor position contain spaces. The actual number of positions depends upon where the next protected field is in relation to the cursor.

The DEL CHAR key causes all characters to the right of the cursor position up to the next protected field or the end of the line (whichever occurs first) to move one position to the left. The character originally at the cursor position is lost. After the character movement is finished, the rightmost affected position contains a space.

The DEL LINE key causes all characters from the cursor position up to the next protected field or the end of the bottom line on the screen (whichever occurs first) to move 80 positions to the left. As a character passes the first position in a line, the last position in the next higher line is considered to be the next position to the left. Any characters which attempt to move past the cursor position are lost. After character movement is finished, the last 80 affected positions contain spaces.

The CLEAR key changes all unprotected characters on the screen to spaces and moves the cursor to the first unprotected position on the screen. However, when the LOAD light is illuminated, the CLEAR key causes all characters on the screen (protected and unprotected) to change to spaces and causes the cursor to move to the home position.

OPERATOR CONTROL PANEL

The operator control panel of the Model 80 Display (Figure 9) comprises four switches (all of which can be illuminated) and one indicator light. The function of each is discussed briefly in Table 2.

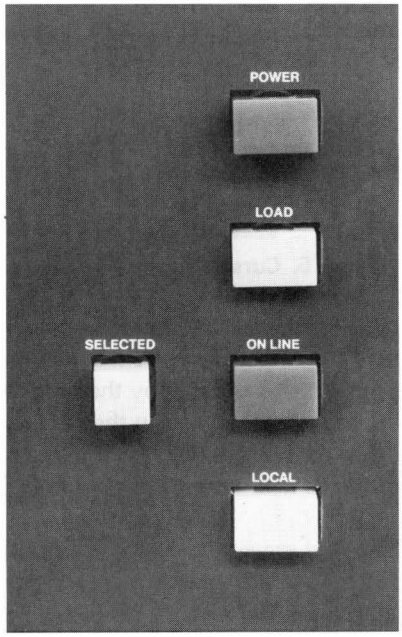

Figure 9. Operator Control Panel

Table 2. Operator Control Panel.

Control	Function
POWER Switch	Alternately turns the power on and off. Illuminated whenever the power is on.
LOCAL Switch	Places the display in local. Illuminated whenever the display is in local.
ON LINE Switch	Places the display on-line. Illuminated whenever the display is on-line.
LOAD Switch	Initiates a load sequence when pressed simultaneously with the LOCAL switch. Load sequences are discussed in the GENERAL DESCRIPTION section of this manual.
SELECTED Indicator Light	Illuminated whenever the display is addressed by an instruction which is being executed in the central processor.

3. READ OPERATIONS

When a Read instruction which addresses the Model 80 is executed, the SELECTED indicator light on the operator control panel is illuminated.

ENTER KEY

This key locks[1] the keyboard, makes the data in the Model 80 buffer available for transmission, deposits a non-displayed *unit separator code* in the cursor position in the buffer, and moves the cursor back to the first unprotected position in the line or on the screen, depending upon whether the Model 80 is in the *line mode* or the *block mode.* The line mode and the block mode are discussed later in this section.

During a read operation, as each character is sent to the IOC the cursor moves one position to the right. If the cursor reaches the position containing the unit separator code, the code is sent to the IOC and is cleared from the buffer. The unit separator code terminates the read operation and is **not** passed to the Read instruction input area. In such a case, the unused locations in the Read instruction input area are filled with spaces unless the instruction specified *non-fill.*

If the Read instruction does not ask for enough characters to cause the cursor to move to the position containing the unit separator code, the code will **not** be cleared from the buffer. The code can be cleared by being overwritten with another character or by use of the CLEAR key or the *clear* Write Control characters. *NOTE:* To ensure that the unit separator code is **not** left in the buffer after a read operation, it is advised that all Read instructions in the line mode always ask for 80 characters and all Read instructions in the block mode always ask for 1600 characters.

When a read operation is finished, the keyboard unlocks and the cursor moves to the first unprotected position of the next lower line. If the cursor is in the bottom line when a read operation finishes and the Model 80 is in the page mode, the cursor moves to the first unprotected position on the screen. If the Model 80 is in the Page Mode and the cursor moves from the bottom line to the top line during a read operation, Condition Code 1 (Error) in the central processor is set on at the end of the operation. If the cursor is in the bottom line when a read operation finishes and the Model 80 is in the Scroll Mode, all lines on the screen move up one line, any data originally in the top line is lost, and the cursor moves to the first position in the bottom line. In the latter case, the bottom line contains all spaces after the read operation.

If the Model 80 is **not** being selected by a Read instruction when the ENTER key is pressed, the ENTER key also turns on the *service request signal* in the central processor. The programmer may test the service request signal and turn it off by using the Branch On Service Request variant of the Branch instruction.

CTL KEYS

The CTL keys perform the same functions as the ENTER key except that a CTL key identifier character (see Table 3) is deposited into the buffer instead of a unit separator code. The CTL key identifier character, like the unit separator code, is not displayed. However, unlike the unit separator code, the CTL key identifier character may be transmitted to the Read instruction input area. The caution given for the ENTER key also applies to the

Table 3. CTL Key Identifier Characters

CTL Key	Identifier Character
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	:
11	;

[1] In this manual, locked means that the keyboard is inhibited electronically so that the functions associated with the various keys are not performed. When the keyboard is locked, the keys are not inhibited mechanically.

CTL keys with regard to the CTL key identifier character. The only other difference between the CTL keys and the ENTER key is that the CTL keys cause Condition Code 3 (Flag) in the central processor to be set on at the completion of the next subsequent read operation.

LINE MODE AND BLOCK MODE

There are two reading modes: the *line mode* and the *block mode.* When the Model 80 is in the line mode, all unprotected[2] positions from the first position in the line containing the cursor through the CTL key identifier character or the unit separator code are available for transmission. When the Model 80 is in the block mode, all unprotected positions from the home position through the CTL key identifier character or the unit separator code are available for transmission.

When the power-on sequence is completed, the Model 80 is always in the line mode. The programmer places the Model 80 in the block mode by sending an R to the Model 80 by a Write Control instruction. After every read operation, the Model 80 automatically reverts to the line mode.

When in local, the Model 80 is disconnected from the central processor.

[2]During read operations, protected fields are skipped over and do not affect the residual count in the central processor.

[3]*aborted* means that the instruction is terminated and Condition Codes 4 and 1 (Fault) in the central processor are set on. After an aborted operation, the residual count in the central processor is 9999, as though the operation had terminated normally.

OPERATOR INITIATED AND PROGRAM INITIATED READS

A Read instruction which addresses a Model 80 may be used either by itself or in conjunction with a Branch On Service Request instruction. The first is referred to as a *program initiated read* and the latter is referred to as an *operator initiated read.* The only difference between the two is that a program initiated read can be performed anytime, whereas an operator initiated read cannot be performed until the ENTER key or one of the CTL keys is pressed.

If the service request signal is on when a program initiated read is performed, Condition Code 1 (Error) in the central processor is set on at the end of the operation to so inform the program.

ABNORMAL EVENTS

If a Read instruction is executed which addresses a non-existent device or a Model 80 whose power is off, the instruction is *aborted*[3] and execution proceeds with the next sequential instruction.

If the operator initiates a load sequence while a read operation is in progress, the operation is terminated and the load operation is performed.

If the operator initiates a load sequence when the Model 80 is in local and being selected by a Read instruction, the instruction is terminated and the load operation is performed.

4. WRITE OPERATIONS

When a Write instruction which addresses the Model 80 is executed, the SELECTED indicator light on the operator control panel is illuminated. If the Model 80 is *selected* and in local, the partition cannot continue execution until the Model 80 is placed on-line and the write operation performed. If the Model 80 is selected and on-line, the characters pointed to by the Write instruction are accessed from memory and displayed in successive positions on the screen starting with the cursor position. After the operation is finished, the cursor is in the first unprotected position following the final character displayed by the write operation.

If a Write instruction is executed which addresses a non-existent device or a Model 80 whose power is off, the instruction is aborted and execution proceeds with the next sequential instruction.

If the Model 80 is in the Page Mode and the cursor moves from the bottom line to the top line during a write operation, Condition Code 3 (Flag) in the central processor is set on at the end of the operation.

If a Write instruction which addresses the Model 80 is executed when the service request signal is on, the operation is performed. However, at the end of the operation Condition Code 1 (Error) in the central processor is set on.

If the service request signal is on and a Branch On Service Request instruction is executed which branches to a Write instruction which, in turn, addresses the Model 80, the write operation is performed. However, at the end of the operation Condition Code 1 (Error) in the central processor is set on.

During a write operation, the keyboard is always locked. As soon as the operation is finished, the keyboard unlocks.

The programmer places the Model 80 in the formatting mode by sending an S to the Model 80 by a Write Control instruction. If the Model 80 is in the formatting mode, the next subsequent write operation can be used for establishing protected fields. During the operation, the characters *left parenthesis* and *right parenthesis* are interpreted as being special delimiter characters. In the formatting mode, parentheses sent by a Write instruction are not displayed and do not occupy locations in the Model 80 buffer. A left parenthesis signals that all subsequent characters through the next right parenthesis are to be displayed and are to be established as a protected field. Characters not contained within parenthesis are displayed but are not established as protected characters. After the write operation, the Model 80 automatically leaves the formatting mode.

During a Formatting Mode write operation, the status (i.e., protected or unprotected) of any character position on the screen may be reversed and/or the contents of any character position on the screen may be changed.

If a Write instruction causes the entire screen to be filled with protected characters, the screen is cleared and Condition Code 1 (Error) in the central processor is set on. If this condition occurs in the middle of a write operation, the operation continues with characters being displayed starting in the home position.

If the operator initiates a load sequence while a Write operation is in progress, the operation is allowed to finish and then the load sequence is performed.

If the operator initiates a load sequence while the Model 80 is in local and being selected by a Write instruction, the write operation is performed as soon as the operator places the Model 80 on-line and then the load sequence is performed.

5. WRITE CONTROL OPERATIONS

There are several operations which the programmer initiates by sending characters to the Model 80 by a Write Control instruction. They are summarized in Table 4.

Table 4. Write Control Operations.

Operation	System Ten Internal Character
Lock	Q
Unlock	T
Initiate Block Mode	R
Initiate Formatting Mode	S
Cursor Home	^
Cursor Up	\
Cursor Down	]
Cursor Right	Y
Cursor Left	H
New Line	J
Tab	I
Clear All Unprotected Characters	L
Clear All Characters	X
Local Query	?

Several such operations may be initiated by a single instruction. For example, to erase the entire screen and position the cursor in the tenth position of the top line, send the following ten characters to the Model 80 by one Write Control instruction: XYYYYYYYYY

The various write control operations are discussed on the following pages. Some of the descriptions (such as the cursor control characters) assume that the reader is already familiar with related discussions earlier in this manual.

If a control character causes the cursor to move from the bottom line to the top line, Condition Code 3 (Flag) in the central processor is set on at the end of the operation.

Q Lock

This character locks all five sets of keys. The keys are always unlocked whenever the Model 80 is in local.

If the keys are locked when the Model 80 is switched to local, they will be locked when the Model 80 is subsequently placed on-line.

T Unlock

This character unlocks all five sets of keys.

R Initiate Block Mode

This character places the Model 80 in the block mode. After the next subsequent read operation, the Model 80 automatically reverts to the line mode. Refer to the section of this manual entitled READ OPERATIONS.

S Initiate Formatting Mode

This character places the Model 80 in the formatting mode. The Model 80 automatically leaves the formatting mode after the next subsequent write operation. Refer to the section of this manual entitled WRITE OPERATIONS.

^ Cursor Home

This character performs the same as the HOME key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

\ Cursor Up

This character performs the same as the ↑ key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

] Cursor Down

This character performs the same as the ↓ key. Refer to the sections of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

Y Cursor Right

This character performs the same as the → key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

H Cursor Left

This character performs the same as the ← key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

J New Line

This character performs the same as the NEW LINE key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

If a "new line" control character is sent to the Model 80 immediately after a write operation, and if the cursor was left in the first unprotected position of a line at the completion of the write operation, the "new line" control character is ignored and execution proceeds with the next subsequent control character or instruction.

I Tab

This character performs the same as the TAB key. Refer to the section of this manual entitled KEYBOARD AND OPERATOR CONTROL PANEL.

L Clear All Unprotected Characters

This character changes all unprotected characters on the screen to spaces and moves the cursor to the first unprotected position on the screen.

X Clear All Characters

This character changes all characters on the screen (protected and unprotected) to spaces and moves the cursor to the home position.

? Local Query

This character turns on Condition Codes 4 and 1 (Fault) in the central processor if the Model 80 is not on-line.

6. CONDITION CODE SUMMARY

Table 5 summarizes the various Condition Codes associated with the Model 80 Display.

Table 5. Condition Code Summary.

Condition Codes	Meaning
1 (Error)	Screen entirely filled with protected characters or Read or Write instruction executed when service request signal was on or Branch On Service Request instruction which branches to a Model 80 Write instruction executed when the service request signal was on
2 (Normal)	OK
3 (Flag)	One of the 11 CTL keys pressed
4 and 1 (Fault)	? sent by a Write Control instruction when the Model 80 was not on-line or Instruction addressed a non-existent device or a Model 80 whose power was off or Power turned off during an operation or Persistent transmission errors occurred

MODEL 80 REFERENCE MANUAL
Publication No. 40-209

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