MACHINE REFERENCE MANUAL
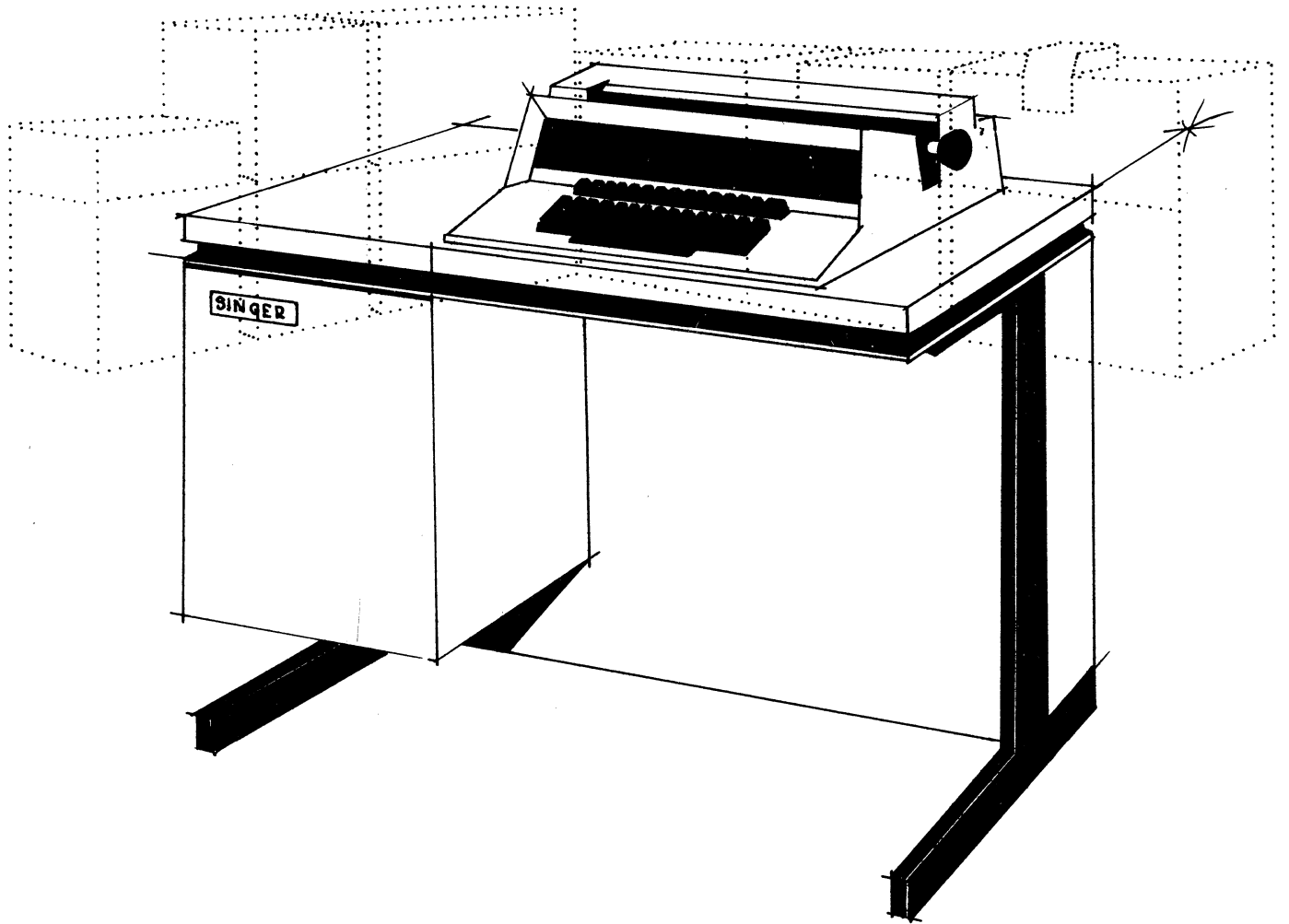
FRIDEN MODEL 70
WORKSTATION

SINGER
FRIDEN DIVISION

◆ SYSTEM TEN by SINGER

Friden Model 70

WORKSTATION

WORKSTATION (MODEL 70)

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CONDITION CODE SUMMARY

INTRODUCTION

The Model 70 Workstation is a low speed input/output device consisting of a keyboard, a row of control keys, a typebar printer, and a control panel containing various lights and toggle switches. The Model 70 Workstation's typebar printer and keyboard are much like those of an ordinary typewriter.

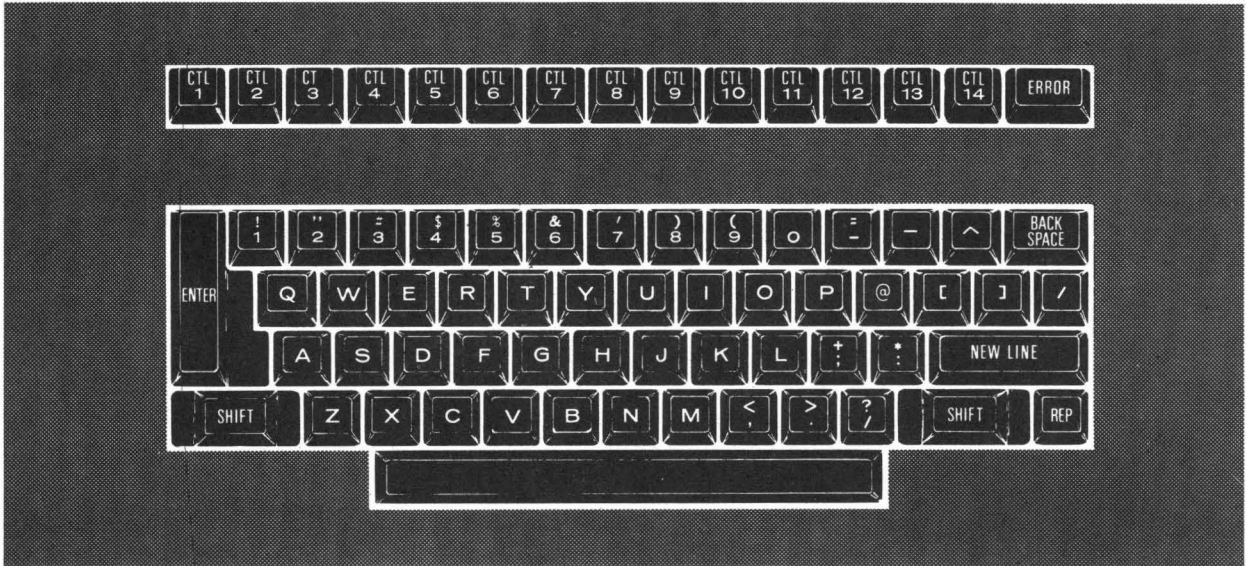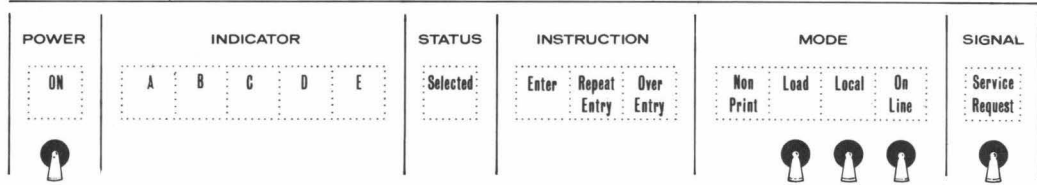A few of its more salient characteristics are as follows:

- 20" carriage (170 character positions).

- Printing speed: 15-25 characters per second (see the discussion of high speed characters, below).

- Prints the 64 characters shown in columns 2, 3, 4, and 5 of the USASCII code chart.

- Vertical spacing: 6 lines per inch.

- Horizontal spacing: 10 characters per inch.

- Keyboard locks mechanically as well as electrically.

- Keyboard is buffered to prevent loss of data when the operator is typing extremely fast.

- Non-Print Mode for keyboard entries.

- Tractor feed mechanism on typebar printer (optional).

- Print mechanism locks during carriage return to prevent printing "on-the-fly".

On-Line and Local

When attached to a System Ten, the Workstation may be in either of two states: On-Line or Local.

When On-Line, it is (insofar as the transfer of data is concerned) connected to the central processor. In this state, the keyboard is locked both mechanically and electrically except when the Workstation has been selected by a Read instruction.

POWER	INDICATOR						STATUS	INSTRUCTION			MODE				SIGNAL
ON	A	B	C	D	E		Selected	Enter	Repeat Entry	Over Entry	Non Print	Load	Local	On Line	Service Request

When in Local, it is (insofar as the transfer of data is concerned) disconnected from the central processor. In this state, the keyboard is always unlocked, and the Workstation serves as an ordinary typewriter. In Local, the only switches which have any effect are POWER and ON LINE.

Non-Print Mode for Keyboard Entries

When On-Line, a Workstation normally prints everything which is entered through the keyboard (in addition to transmitting it to the central processor). The Workstation may, however, be placed in what is called the Non-Print Mode. In this mode, characters entered through the keyboard are still transmitted to the central processor, but they are not printed, and the carriage is not moved. This mode is useful, for instance, if forms are mounted, and it is desired that the operator pass input data to the central processor without printing on the forms.

A Workstation is placed in the Non-Print Mode by sending it a left parenthesis via the Write Control variant of the Write instruction. Similarly, a Workstation is removed from the Non-Print Mode by sending it a right parenthesis.

When a Workstation is in Local, everything entered through the keyboard is always printed. If a Workstation is in the Non-Print Mode when switched to Local, it will be returned to the Non-Print Mode when subsequently placed On-Line.

High Speed Characters

The Workstation uses the standard System Ten character set (i.e., the characters in columns 2, 3, 4 and 5 of the USASCII code chart). The following 28 characters are categorized as "high speed characters".

Ø 1 2 3 4 5 6 7 8 9 . , $ _ A D E F G H I L N O P R S T

A high speed character is represented twice in the Workstation's set of typebars: once on the far left of the typebar basket, and again on the far right. The two sets of high speed typebars are used alternately: first a typebar from the left, then one from the right, etc.

Because of their positions in the typebar basket relative to the "normal typebars", and because the two sets of high speed typebars are used alternately, high speed typebars can (with no danger of hitting the preceding typebar) start towards the paper sooner, and travel towards the paper faster, than normal typebars.

If printing only high speed characters, the Workstation prints at a constant rate of 25 characters per second. If printing only normal characters, it prints at a constant rate of 15 characters per second. If printing a combination of high speed and normal characters, it prints at a variable rate of 15-25 characters per second, depending upon the ratio of high speed to normal characters.

The Indicator Lights

There are five lights on the Workstation's control panel (labeled A, B, C, D, and E, respectively) which provide programs in the central processor with a non-printing means of communicating with the operator. These lights may be set ON and OFF in any of 32 combinations by merely sending a pair of characters to the Workstation via the Write Control variant of the Write instruction. The first character in the pair must be a G, while the second varies according to which lights are to be set ON, and which are to be set OFF. Figure H8-1 shows all the possible combinations, and the character associated with each.

For example, to set ON lights A and D (and to set OFF lights B, C, and E), one would send the pair of characters GY to the Workstation via the Write Control variant of the Write instruction. Lights A and D will remain ON, and lights B, C, and E will remain OFF, until another pair of characters (e.g., Gⓐ, GT, G4, etc.) is sent to the Workstation.

INDICATOR LIGHT   **CHARACTER**   **INDICATOR LIGHT**   **CHARACTER**

A	B	C	D	E	CHARACTER		A	B	C	D	E	CHARACTER
☐	☐	☐	☐	☐	@		☐	☐	☐	☐	■	o
■	☐	☐	☐	☐	Q		■	☐	☐	☐	■	1
☐	■	☐	☐	☐	R		☐	■	☐	☐	■	2
■	■	☐	☐	☐	S		■	■	☐	☐	■	3
☐	☐	■	☐	☐	T		☐	☐	■	☐	■	4
■	☐	■	☐	☐	U		■	☐	■	☐	■	5
☐	■	■	☐	☐	V		☐	■	■	☐	■	6
■	■	■	☐	☐	W		■	■	■	☐	■	7
☐	☐	☐	■	☐	X		☐	☐	☐	■	■	8
■	☐	☐	■	☐	Y		■	☐	☐	■	■	9
☐	■	☐	■	☐	Z		☐	■	☐	■	■	:
■	■	☐	■	☐	[		■	■	☐	■	■	;
☐	☐	■	■	☐	\		☐	☐	■	■	■	<
■	☐	■	■	☐	]		■	☐	■	■	■	=
☐	■	■	■	☐	∧		☐	■	■	■	■	>
■	■	■	■	☐	_		■	■	■	■	■	?

■ = LIGHT ON

☐ = LIGHT OFF

Note:

The above 32 characters are the ones recommended for controlling the indicator lights. The other 32 System Ten internal characters exert similar control over the lights, but some have a secondary effect. For example, an H illuminates the same lights as does an X, but in addition it causes a backspace. Under no circumstances, however, should the characters D or P be sent to the Workstation via the Write Control variant of the Write instruction. These two characters have special meanings to the Workstation's Line Unit, and their effects are unspecified.

Figure H8-1   Indicator Light Control Characters

Horizontal and Vertical Tabulation

Horizontal and vertical tabulation are achieved through use of the Write Control variant of the Write instruction (there is no way to directly trigger tabulation from the keyboard). Instead of conventional mechanical "tab stops", the Workstation uses a pair of electrical counters called the Vertical Tab Register and Horizontal Tab Register. Each register can hold a two character number which, because of a special notation system, can represent any value from zero through 159. The values zero through 99 (by far the most frequently used) are expressed as standard two digit decimal numbers. The values 100 through 159 are expressed as follows:

$$N_1 \, N_2$$

Where n_2 is a digit (0-9); and

n_1 is one of the following characters:

CHARACTER	VALUE	
	Hundreds	Tens
:	1	0
;	1	1
<	1	2
=	1	3
>	1	4
?	1	5

A few examples are:

CHARACTERS	DECIMAL VALUE
64	64
01	1
:0	100
?9	159
=1	131

The Horizontal Tab Register is loaded by sending a dash followed by the two character number to the Workstation via the Write Control variant of the Write instruction. Once the register is loaded with a particular value, the value is decremented by one for each character position which the carriage moves to the left (normal printing direction), and incremented by one for each character position which the carriage moves to the right (backspace or carriage return). The value can neither be incremented past 159, nor decremented past zero (i.e., there is no "wrap-around" effect). Once the value has been decremented to zero, it remains at zero until the register is loaded with a new value.

The Vertical Tab Register is loaded by sending a slash followed by the two character number to the Workstation via the Write Control variant of the Write instruction. Once the register is loaded with a particular value, the value is decremented by one for each line which the paper is electronically advanced. Once the value has been decremented to zero, it remains at zero until the register is loaded with a new value.

Once a register has been loaded, tabulation is triggered by sending a character to the Workstation via the Write Control variant of the Write instruction. The character for triggering a horizontal tab is an I, and the character for triggering a vertical tab is a K. In normal usage, one would use a single instruction to both load a tab register and trigger the tabulation (in this regard, it might be noted here that a string of control characters may be sent to the Workstation by a single instruction).

Signalling A Service Request

When the Workstation is On-Line, the operator may raise the "service request signal" in the central processor by depressing the SERVICE REQUEST switch on the control panel. This also illuminates the SERVICE REQUEST light, which remains ON until the "service request signal" has been accepted by the IOC. The IOC, in turn, passes the signal on to the central processor where it can be tested for by the Branch On Service Request variant of the Branch instruction.

Initiating A Load Sequence

When the Workstation is assigned device address 0 (zero), the operator may initiate a load sequence by simultaneously depressing the LOAD and LOCAL switches on the control panel. When the operator does this, the LOCAL light illuminates immediately. Shortly thereafter, the LOAD, SELECT, and ENTER lights also illuminate, at which time the operator depresses the ON LINE switch and enters ten characters through the keyboard. In normal usage, these ten characters are a Read instruction.

A load sequence on the Workstation may be used to bootstrap instructions from a disc drive into the central processor. To do this, the operator need only depress the ENTER key instead of entering ten characters. This causes the 100 characters contained in sector 0 of disc drive 0 to be read into locations 0-99 of the partition attached to the Workstation, and control to be passed to the instruction which begins at location 10. However, for this to work properly in the event of a Read error (and the resultant hardware re-try of the Read operation) the first ten characters contained in sector 0 of disc drive 0 must all be numeric zeros.

READ OPERATION

When a Workstation is addressed by a Read instruction, the SELECT and ENTER lights on its control panel illuminate. If the Workstation is On-Line, the keyboard automatically unlocks so that the operator may enter characters. If the Workstation is in Local, the host partition cannot resume execution until the Workstation has been placed On-Line and the Read operation performed. Unless the operator depresses one of the control keys, the ERROR key, or the ENTER key (all of which are discussed below), a Read operation is terminated when the operator has entered the number of characters requested by the Read instruction. As soon as the operation is terminated, the keyboard once again locks.

If a Read instruction addresses a non-existant Workstation, or one whose power is off, the instruction is aborted*, the Fault Condition Indicator (Condition Code 4) in the central processor is set ON, and execution proceeds with the next sequential instruction in the host partition.

*   "aborted" means that the IOC goes through the motions of completing the operation without actually transfering any data.

If the Workstation's power is turned off during a Read operation, the instruction is aborted, the Fault Condition Indicator (Condition Code 4) in the central processor is set ON, and execution proceeds with the next sequential instruction in the host partition.

If the Workstation is switched to Local during a Read operation, the operation is halted (not aborted). When the Workstation is subsequently placed On-Line, the Read operation resumes at the point where it was interrupted.

Over-Entry

If, at the end of a Read operation, the operator manages to enter an extra character or two before the keyboard locks, the OVER ENTRY light on the control panel illuminates and the Error Condition Indicator (Condition Code 1) in the central processor is set ON. The extra characters are cleared from the keyboard's buffers without being either transmitted or printed. While the OVER ENTRY light is illuminated, the Workstation is able to respond normally to a Write instruction, but the keyboard will <u>not</u> unlock if the Workstation is selected by a Read instruction. To extinguish the OVER ENTRY light, the operator must switch the Workstation to Local, and back On-Line. This forces her to realize that she attempted to enter too many characters.

The following keys have no effect unless depressed while the Workstation is both On-Line and being selected by a Read instruction. They are used by the operator to prematurely terminate a Read operation, and they do <u>not</u> cause anything to be printed.

The ENTER Key

This key transmits a Unit Separator character. The Unit Separator terminates the Read operation, and it is <u>not</u> passed to the Read instruction's input area. Unless the Read instruction specified "non-fill", the remaining unused locations of its input area are filled with blanks.

The ERROR Key

This key transmits a Unit Separator character, and sets ON the Error Condition Indicator (Condition Code 1) in the central processor. The Unit Separator terminates the Read operation, and it is <u>not</u> passed to the Read instruction's input area. Unless the Read instruction specified "non-fill", the remaining unused locations of its input area are filled with blanks.

The Control Keys

A control key transmits an identifier character and a Unit Separator character and sets ON the Flag Condition Indicator (Condition Code 3) in the central processor. The identifier character (see Table H8-1) is passed to the central processor where it is stored in the next available unused location of the Read instruction's input area. The Unit Separator terminates the Read operation, and it is <u>not</u> passed to the Read instruction's input area. Unless the Read instruction specified "non-fill", the remaining unused locations of its input area are filled with blanks.

CONTROL KEY	IDENTIFIER CHARACTER
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	0
11	:
12	;
13	<
14	=

Table H8-1   Control Key Identifier Characters

WRITE OPERATION

When a Workstation is addressed by a Write instruction, the SELECT light on the control panel illuminates. If the Workstation is On-Line, the data pointed to by the Write instruction is printed by the Workstation's typebar printer. If the Workstation is in Local, the host partition cannot resume execution until the Workstation has been placed On-Line and the Write operation performed.

If a Write instruction addresses a non-existant Workstation, or one whose power is off, the instruction is aborted, the Fault Condition Indicator (Condition Code 4) in the central processor is set ON, and execution proceeds with the next sequential instruction in the host partition.

If the Workstation's power is turned off during a Write operation, the instruction is aborted, the Fault Condition Indicator (Condition Code 4) in the central processor is set ON, and execution proceeds with the next sequential instruction in the host partition.

If the Workstation is switched to Local during the Write operation, the operation is halted (not aborted). When the Workstation is subsequently placed On-Line, the Write operation resumes at the point where it was interrupted.

WRITE CONTROL OPERATIONS

There are several operations which the programmer may initiate by sending a control character to the Workstation via the Write Control variant of the Write instruction.

Character Definition	Internal Character
Carriage Return	M
Backspace	H
Load Horizontal Tab Register	-nn
Horizontal Tab	I
Load Vertical Tab Register	/nn
Vertical Tab	K
Illuminate Indicator Lights	Gx
Illuminate REPEAT ENTRY Light	'
Enter Non-Print Mode	(
Leave Non-Print Mode	)
Local Query	?

Several such operations may be initiated by a single instruction. For example, to cause both a carriage return and a horizontal tab to character position 25 of the new line, one would send the following five characters to the Workstation via a single Write Control instruction:

M-24I

The various Write Control operations are described on the following pages. Some of the descriptions (such as those for the Non-Print Mode operations) assume that the reader is already familiar with the related introductory section.

M   Carriage Return

Advances the paper one line, and positions the carriage for printing in the leftmost character position of the new line.

The key labeled NEW LINE on the keyboard has exactly the same effect whenever the Workstation is in Local, or whenever it is On-Line and being selected by a Read instruction.

The Workstation automatically triggers a carriage return whenever an attempt is made to advance the carriage beyond the rightmost character position in the line.

H   Backspace

>   Moves the carriage one character position to the right
>   (i.e., backspaces it one character position).

-nn   Load Horizontal Tab Register

>   Loads the pair of characters nn into the Horizontal Tab
>   Register.

I   Horizontal Tab

>   Moves the carriage 0-159 character positions to the left
>   (i.e., in the normal printing direction). The number of
>   character positions is governed by the contents of the
>   Horizontal Tab Register. After use of this control
>   character, the Horizontal Tab Register contains zero. Care
>   should be taken not to tab past the rightmost character
>   position in the line. To do so could damage the carriage
>   mechanism.

/nn   Load Vertical Tab Register

>   Loads the pair of characters nn into the Vertical Tab
>   Register.

K   Vertical Tab

>   Advances the paper 0-159 lines. The number of lines is
>   governed by the contents of the Vertical Tab Register.
>   After use of this control character, the Vertical Tab
>   Register contains zero.

Gx   Illuminate Indicator Lights

> Sets the indicator lights ON and OFF in any of 32 combinations depending upon what character is supplied in place of x.

'   Illuminate REPEAT ENTRY Light

> Illuminates the REPEAT ENTRY light. The light is automatically extinguished at the completion of the next subsequent Read operation.

(Enter Non-Print Mode

> Places the Workstation in the Non-Print Mode.

)   Leave Non-Print Mode

> Removes the Workstation from the Non-Print Mode.

?   Local Query

> Sets ON the Fault Condition Indicator (Condition Code 4) in the central processor if the Workstation is in Local.

WORKSTATION (MODEL 70)

CONDITION CODE SUMMARY

Condition Code 1   (ERROR)

> Over-entry.
>
> ERROR key depressed.

Condition Code 3   (FLAG)

> One of the 14 control keys depressed.

Condition Code 4   (FAULT)

> Local Query performed when Workstation was in Local.
>
> Instruction addressed a non-existant Workstation, or one whose power was off.
>
> Power turned off during a Read or Write operation.