UNIVAC®

491/492/494

REAL-TIME SYSTEMS

HIGH SPEED PRINTER SUBSYSTEM

TYPES 0751/0755/0758

PROGRAMMER/OPERATOR
REFERENCE MANUAL

UP-7571

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1. INTRODUCTION

This manual contains information for the programming and operation of the High Speed Printer Subsystem for the UNIVAC 491, 492, or 494 Real-Time System.

It is assumed that both the programmer and operator have sufficient background information on the Central Processor and Main Storage of the UNIVAC 491, 492, or 494 Real-Time System, and need only to be instructed in the use of the High Speed Printer Subsystem. Therefore, material already covered in the System Manuals will not be duplicated here.

This manual is divided into three basic sections:

- High Speed Printer Subsystem Description

  This section will acquaint the reader with the characteristics of the High Speed Printer Subsystem.

- Programming

  This section supplies the user with the information required for programming for the High Speed Printer Subsystem.

- Operation

  This section contains the information necessary for the operation of the High Speed Printer Subsystem.

Referencing the programming section within this manual on a regular basis is unnecessary when appropriate software is available as an interface to the High Speed Printer Subsystem.

2. SUBSYSTEM DESCRIPTION

2.1. GENERAL

The High Speed Printer Subsystem provides the UNIVAC 491, 492, or 494 Real-Time System with an output unit that is capable of printing single or multiple copies of data. Each line of output data may contain up to 132 printed characters. Printing operations occur on a request-acknowledge basis allowing the processor to perform other processing functions while the printer is printing data.

This subsystem is comprised of a High Speed Printer Control Unit, Type 8120-02, connected to either a High Speed Printer Type 0751, 0755, or 0758. The Type 0751 or Type 0755 High Speed Printer is capable of printing from 700 to 922 lines per minute, while Type 0758 High Speed Printer is capable of printing from 1200 to 1600 lines per minute.

This manual primarily describes High Speed Printer, Type 0755. Many of the characteristics of Type 0751 and Type 0758 High Speed Printers are identical to Type 0755. Characteristics unique to Type 0751 and Type 0758 are given in Appendix A and Appendix B, respectively.

The control unit may be connected to either a normal or compatible I/O channel of the processor. Output information is routed by the processor through the Printer Control Unit to the Printer. The Printer Control Unit contains a 132-character core buffer for accumulating a full line of information before printing.

The printer contains 63 printable characters – the 26 letters of the alphabet, the ten numerals, and 27 special characters. Different symbols may be factory supplied upon order.

The capabilities and salient features of the individual units of the Printer Subsystem are presented in Tables 2–1 and 2–2.

PARAMETER	SPECIFICATION
Printing Speed (with single-line spacing)	700–9200 lines per minute maximum, depending upon program and character contingencies.
Line Spacing Speed	20 ms for spacing first line and for spacing each subsequent line as follows: 8 ms at 6 lines per inch 6 ms at 8 lines per inch
Characters Per Line	132 characters (including spaces) per line.
Spacing of Characters	0.1 inch along print line.
Ribbon Feed	Bi-directional, self-reversing, self-correcting.
Type of Ribbon	Fabric ribbon interchangeable with carbon Mylar* ribbon (optional) for "one-time" operation.
Vertical Line Spacing	Manually selected. Either 6 lines per inch or 8 lines per inch.
Number of Characters	Up to 63 different characters: standard font consists of alphabetic characters A–Z, numeric characters 0–9, 27 punctuation marks and symbols. Modified fonts available upon request.
Print Format	Full print width of 132 characters can be placed anywhere on 16.5 inch form. With 22 inch width form, only central 13.2 inch portion can be used. Format variation under full control of programming.
Paper Forms	Continuous forms with standard edge sprocket holes from 4 to 22 inches in width. Carbons may be attached or unattached with multicopy forms up to a maximum of six parts. Recommended pack thickness up to .0155 inch for optimum print quality.
Paper Container	Maximum dimensions accommodated entirely within base of machine: 16 inches high, 16 inches long, and 22.5 inches deep.

Table 2–1. Type 0755 Printer Capabilities

*Trademark of DuPont Corporation

PARAMETER	SPECIFICATION
Processor Word Length	30 bits
Character Size	6 bits
Modes of Operation	Print with or without Interrupt
Data Modes:	
Processor to Control Unit	Data Words 30 bits parallel
Control Unit to Processor	Status Words 30 bits parallel

Table 2–2. Type 8120 Printer Control Unit Capabilities

2.2. CONFIGURATIONS

The configuration of the High Speed Printer Subsystem consists of one Printer Control Unit, Type 8120-02 and a Printer, Type 0755. Figure 2–1 shows the functional arrangement of the subsystem components with a UNIVAC 491, 492, or 494 Unit Processor. Component requirements for the Printer Subsystem are summarized in Table 2–3.

2.2.1. Dual Printer Subsystem

The Dual Printer Subsystem, which has been destandardized, expands the printing capability of the basic subsystem by utilizing two printers. The second printer is implemented in the subsystem by addition of an Auxiliary Control Unit, Type 8120-03. The control units may be connected to one I/O channel of two separate processors or two I/O channels of the same processor.

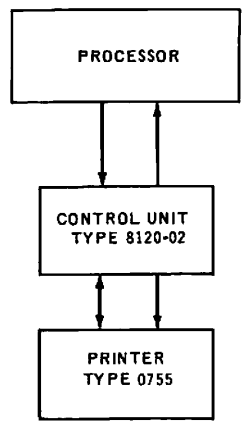


Figure 2–1. High Speed Printer Subsystem Configuration

Subsystem Component	Type Number		Number Required
	60 cps	50 cps	
Printer	0755-00	0755-07	1
Printer Control Unit	8120-02		1

Table 2–3. Printer Subsystem Components

2.3. SUBSYSTEM COMPONENTS

Subsystem components, described in the following paragraphs, include the High Speed Printer and the High Speed Printer Control Unit.

2.3.1. High Speed Printer, Type 0755

The High Speed Printer, Type 0755 (see Figure 2-2), is an "on-the-fly" impact printer. Its operation is based on a printer mechanism which consists of the following main parts:

- rotating type drum;
- printing actuators and hammers;
- ribbon-transport mechanism;
- paper-transport mechanism.

Figure 2–2. High Speed Printer, Type 0755

Figure 2–3 shows the general relationship of the parts of the printer mechanism.

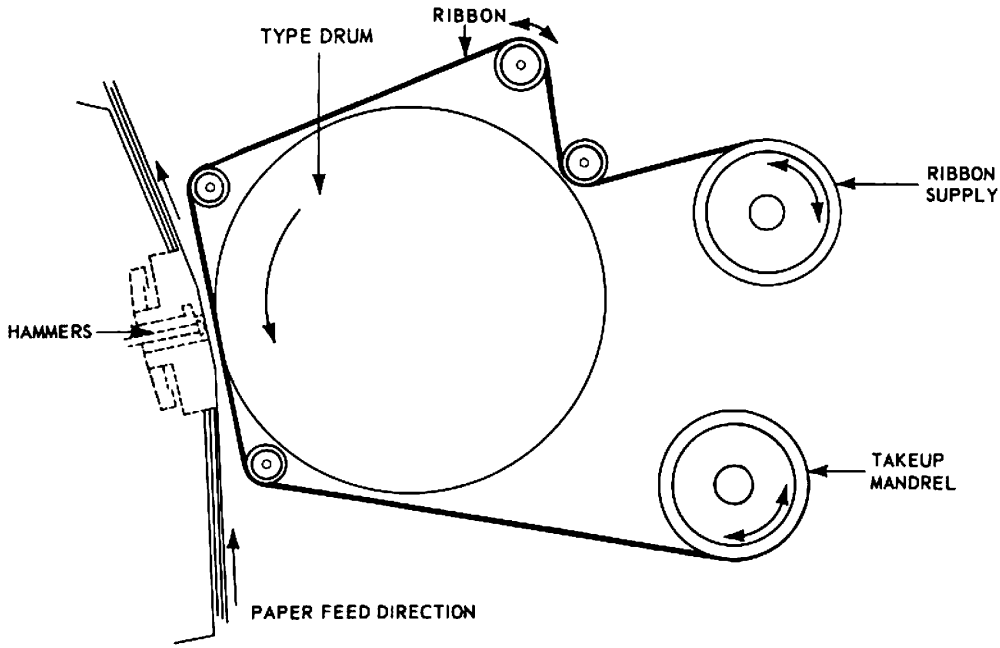


Figure 2–3. Printer Mechanism

The type drum is a cylinder with raised printing surfaces around its circumference. The individual characters of adjacent positions are staggered and form a checkerboard pattern on the type drum to prevent smudging or partial printing of adjacent characters. Table 2–4 shows the printed characters and their corresponding octal codes. As the type drum revolves, timing circuits control the action of each printing actuator and hammer. When the proper character is opposite the hammer, the hammer strikes the paper and pinches the ribbon between the paper and the type drum to print a character. The hammer plate and the paper transport are rigidly mounted to the frame of the printer. The type drum and the ribbon transport are in a movable carriage. The carriage moves in toward the hammer plate for printing, and out from the printing position for servicing. The space between the type drum and the hammers is adjustable, so that either single-thickness paper or multiple copy forms may be used.

The ribbon-transport mechanism moves the ribbon in front of the type drum. When all but a short length of ribbon has been wound off the supply mandrel, the ribbon-transport mechanism automatically reverses and winds the ribbon in the other direction. The ribbon transport starts and stops the ribbon each time the paper is moved by the paper-transport mechanism.

PROCESSOR OCTAL CODE	PRINTER SYMBOL	PROCESSOR OCTAL CODE	PRINTER SYMBOL
00	@	40	)
01	[	41	-
02	]	42	+
03	#	43	<
04	Δ	44	=
05	(space)	45	>
06	A	46	&
07	B	47	$
10	C	50	*
11	D	51	(
12	E	52	%
13	F	53	:
14	G	54	?
15	H	55	!
16	I	56	, (comma)
17	J	57	\
20	K	60	0
21	L	61	1
22	M	62	2
23	N	63	3
24	O	64	4
25	P	65	5
26	Q	66	6
27	R	67	7
30	S	70	8
31	T	71	9
32	U	72	' (apos.)
33	V	73	;
34	W	74	/
35	X	75	.
36	Y	76	¤
37	Z	77	≠ (or stop code)

Table 2–4. Processor Code/Printer Symbol Assignment

The paper-transport mechanism feeds paper, a line at a time, under subsystem control. A maximum number of 63 lines can be fed for each print function. The mechanism consists of two sets of pin-feed tractors, adjustable for form width from 4 through 22 inches and for margin placement. The lower set of tractors draws paper from the supply container and passes it to the upper tractor. The tension of the paper between the upper and lower tractors is adjustable and does not vary with the weight of the paper stock. Printed pages pass from the upper tractors over guides and out the rear of the printer, where they are collected on a shelf. Controls on the printer control panels provide adjustment for proper printing placement, paper tension, and margin settings.

2.3.2. High Speed Printer Control Unit

The control unit (see Figure 2-4) governs all the operations of the High Speed Printer Subsystem. Its principal functions are:

- to receive function words from the processor and translate them into control signals for the printer,
- to synchronize the flow of data between the processor and the printer,
- to accumulate a line of print in its buffer memory from the data transmitted by the processor,
- to interpret signals, both normal and abnormal, from the printer and to notify the processor of printer and control unit conditions.

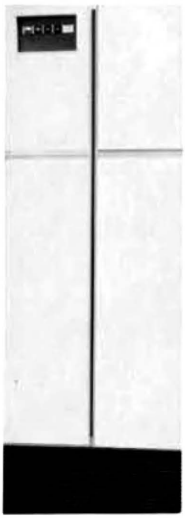


Figure 2-4. High Speed Printer Control Unit

2.3.2.1. Buffer Memory

The buffer memory used in the control unit is a random-access, ferrite-core memory with a usable storage capacity of 132 seven-bit characters.

Information is transferred between the processor and the Printer Subsystem in the form of 30-bit data words. Each such word is disassembled into six-bit characters and stored in the buffer memory until a full line of print (132 characters) is accumulated in the buffer memory. When a stop code or a Terminate function is received by the control unit, the number of data words necessary to fill the buffer memory is reduced. For example, the control unit automatically fills the remaining memory positions with a nonprintable code, on the receipt of a stop code.

3. PROGRAMMING

3.1. SUBSYSTEM/PROCESSOR INTERFACE

Communications between the processor and the Printer Subsystem are over a pre-assigned input/output channel(s). Each channel contains 60 data lines (30 input and 30 output) and 6 control lines. The data lines provide for the parallel transfer of the basic UNIVAC 491, 492, or 494 processor word and the control lines provide various control signals that direct the communication between the processor and the control unit(s).

3.1.1. Communication Modes

Each channel is capable of operating in three different communication modes: function, output, or input. The function mode is the means by which the processor establishes communications with the Printer Subsystem. During this mode of transmission, the processor sends a function word to direct the control unit to perform the desired operation. The output mode is employed when data is transferred to the processor and the input mode is used to transmit status information to the processor.

3.1.2. Control Signals

Various control signals are provided to control and insure the orderly flow of information between the processor and the Printer Subsystem. These signals do not transmit data but are used to command and to identify the transfer of information words at the proper time and in the proper sequence. The control signals travel over the control lines of the channel(s) associated with the subsystem.

A listing of these signals follows:

- Output Request (OR) – indicates to the processor that the control unit will accept a function word or a data word that is to be printed.
- External Function (EF) – indicates to the control unit that the processor has placed a function word on the output lines.
- Output Acknowledge (OA) – indicates to the control unit that a word of data has been placed on the output lines.
- External Interrupt (EI) – indicates to the processor that the control unit has status information on the input lines.
- Input Acknowledge (IA) – indicates to the control unit that the processor has accepted the status word.
- Master Clear (MC) – clears the control unit.

3.1.3. Sequence of Operation

The Printer Subsystem gives the program the capability of spacing paper the desired number of lines and printing one line or multiple lines of data. The Printer Control Unit conforms to the following sequences during its operation:

- Function Handling – to receive, decode, and verify the legality of the function words that are transmitted by the processor.
- Paper Spacing – to control the paper spacing operation of the printer as specified by the function word.
- Data Handling – to receive and disassemble the data words into 6-bit characters for storage in the buffer memory until one full line of data is received from the processor.
- Printing – to initiate printing when the buffer memory has been fully loaded and the paper spacing operation is completed.

3.2. WORD FORMAT

The Printer Control Unit controls the operation of the Printer Subsystem through the following three types of 30-bit words: function words, data words, and status words. Each word type has its own format and each word is accompanied by a signal along one of the control lines to distinguish between the three types of words. Two of these (function word and data word) are processor-supplied words; the third (status word) originates in the subsystem.

3.2.1. Function Words

The function word instructs the control unit to initiate a subsystem operation. The six high order bits (29 thru 24) specify the operation to be performed, while bit positions 23 thru 18 specify the line spacing count (0 to 63 lines inclusive) for print functions only. The format of the function word is shown in Figure 3–1, as follows:

FUNCTION CODE	LINE SPACING COUNT	IGNORED BY SUBSYSTEM
29 24	23 18	17 0

Figure 3–1. Function Word Format

The function repertoire of the High Speed Printer Subsystem consists of four functions as follows:

- Print with Interrupt
- Print without Interrupt
- Terminate with Interrupt
- Terminate without Interrupt

Each of these functions is described in detail in the following paragraphs.

3.2.1.1. Print With Interrupt

Function Code: 12_8

The Print with Interrupt function instructs the subsystem to space paper as defined by the line spacing count of the function word and to print a single line of data.

Printing is initiated after both the line spacing and the data transfer are complete. Twenty-seven data words are required to complete the data transfer for a full line of print (132 characters). The data transfer for a partial line of print is complete when either a Terminate function is received following the transfer of one or more data words or a stop code (a character code of all 1 bits) is detected within a data word, providing the 62 CHAR/63 CHAR switch on the Maintenance Panel is in the 62 CHAR (up) position. Upon successful completion of printing the line, a status word containing the Normal Completion status code (40) is generated by the control unit and the External Interrupt signal is turned on.

The control unit does not turn on the Output Request signal following the receipt of the 27th data word for the line, or following receipt of a data word containing a stop code (when conditioned for 62 CHAR operation) until after the processor has either acknowledged receipt of a Normal Completion status code or sent a Terminate without Interrupt function to the subsystem.

3.2.1.2. Print Without Interrupt

Function Code: 02_8

The Print without Interrupt function instructs the subsystem to space paper as defined by the line spacing count of the function word and to print without interruption, any number of equally spaced lines. Printing is initiated after both the paper spacing and data transfer are complete.

Following receipt of the 27th data word for a line, or the receipt of a data word containing a stop code (when conditioned for a 62 CHAR operation), the control unit does not turn on the Output Request signal until after the line has been printed without detection of an error, or after a Terminate function has been received and the control unit is ready to accept the next print function.

Upon completion of the first and each successive line of printing, the control unit retains the original function word with the same line spacing count and waits for the data for the next line of print. The Print without Interrupt operation can be ended by one of the following conditions:

- Fault or abnormal condition
- Terminate function

If a fault or abnormal condition is detected, the operation is concluded when the External Interrupt signal is turned on and a status code representing the fault or abnormal condition is generated by the control unit. Otherwise, the Print without Interrupt must be concluded by a Terminate function when the data in the output buffer has been exhausted. The processor can anticipate the completion of the last line of printing by selecting the monitor interrupt feature when setting up the output data buffer for a Print without Interrupt function. When the control unit requests another data word after receiving the last data word in the output buffer, the Output Monitor Interrupt will occur. The program should then terminate the Print without Interrupt function. It is recommended that the Terminate with Interrupt function be used so the program will be informed when the Print without Interrupt function has been completed and the subsystem is ready to accept another print function.

3.2.1.3. Terminate With Interrupt

Function Code: 33_8

The Terminate with Interrupt function instructs the subsystem to conclude the function currently being performed by the subsystem and to establish readiness for another function. It may be issued by the processor at any time and brings about an orderly stop without the loss of data. The Terminate with Interrupt function will normally result in the External Interrupt signal being turned on and the transmission of a status word containing the Normal Completion status code (40).

If a Terminate with Interrupt function is received following one or more data words for either print function, the response to the Terminate function will occur after the words are printed. If an Interlock condition is detected, it will be reported immediately and replace the Normal Completion status code. Likewise, the Out of Forms condition will take precedence over the Normal Completion status code.

In the event that the Terminate with Interrupt function is received before a word of data is received by the control unit, the termination will take place as follows:

- If terminated within 6.5 microseconds of the receipt of the current print function, paper spacing is inhibited and the External Interrupt signal is turned on and the Normal Completion status (or Interlock, if appropriate) code is generated within .5 microseconds.
- If terminated 6.5 microseconds or more after the receipt of the current print function, the External Interrupt signal is turned on and the Normal Completion (or either Interlock or Out of Forms, if appropriate) status code is generated after paper spacing is completed.

3.2.1.4. Terminate Without Interrupt

Function Code: 23_8

The Terminate without Interrupt function concludes the previous print operation. Depending upon conditions, termination takes place as follows:

- If terminated within 6.5 microseconds of the receipt of a print function, paper spacing is inhibited and the OR signal is normally turned on within 1.8 microseconds to notify the processor that the control unit is ready to accept the next function word.
- If terminated 6.5 microseconds or more after the receipt of the current print function, the OR signal is normally turned on again after paper spacing is completed.
- If one or more data words are received by the control unit, termination becomes effective after printing is completed and the OR signal is normally turned on to notify the processor that the control unit is ready to accept the next function word.

If an Interlock or Out of Forms condition is detected during the execution of either print function, the condition is reported to the processor. If a Terminate without Interrupt is received before the processor acknowledges the Interlock or Out of Forms condition, the control unit's response to the Terminate without Interrupt function is to report the condition rather than to turn on the Output Request signal.

The primary use of the Terminate without Interrupt function is to clear the control unit following receipt of a status word containing a status code other than the Normal Completion status code.

3.2.2. Status Word

The status word is generated by the control unit to indicate the detection and nature of special conditions in the subsystem. The status word is transferred to the processor over the 30 input data lines, accompanied by a signal on the external interrupt line to inform the processor that a status word is available. The status code occupies the six most significant bit positions of the status word with the two least significant bits of the status code always containing 0 bits. The remainder of the status word also contains 0 bits. The format of the status word is as follows:

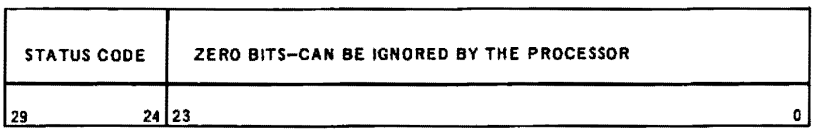


Figure 3–2. Status Code Format

The Printer Subsystem can generate any of four status codes reflecting the detection of the following conditions:

- Normal Completions
- Out of Forms
- Invalid Function
- Interlock Fault

Each of these conditions and the status codes associated with them are described in the following sections.

3.2.2.1. Normal Completion

Status Code: 40_8

The Normal Completion status code is possible only as a response to Print with Interrupt (12) function and a Terminate with Interrupt (33) function and indicates to the processor the successful completion of these functions. When a Normal Completion status word is acknowledged by the processor, the control unit turns on the Output Request signal and is ready to accept and initiate the next print function. If a data word rather than a function word is received in response to this Output Request signal, the control unit ignores the data word and does not request another data word but remains ready to accept and initiate a print function.

If a fault or abnormal condition occurs in the interval between receipt of a Terminate with Interrupt and the actual conclusion of a print operation, the fault condition takes precedence and the appropriate status code is presented to the processor.

3.2.2.2. Out of Forms

Status Code: 44_8

The Out of Forms status code is generated by the control unit when the printer determines there is insufficient paper to print a maximum of 15 single-spaced lines at 6 lines per inch or 20 single-spaced lines at 8 lines per inch (approximately 2.5 inches of paper). The condition is detected only when there is a transition from paper to no paper during the paper spacing sequence for the printing of a line. The status code is made available to the processor upon completion of printing that line. When the processor acknowledges receipt of an Out of Forms status word, the control unit does not turn on the Output Request signal. Before the control unit can accept a new print function word, a Terminate function (23 or 33) must be issued.

3.2.2.3. Invalid Function

Status Code: 50_8

The Invalid Function status code informs the processor that either the function word received by the control unit specifies a function code not included in the subsystem repertoire, or a data word was received in response to an Output Request signal which was turned on following a Terminate without Interrupt function, or a print function was received by the control unit when it was not ready for a print operation. Any one of these conditions causes the current function to be aborted and the External Interrupt and the Invalid Function status code to be presented to the processor immediately. When the processor acknowledges receipt of an Invalid Function status word, the control unit does not turn on the Output Request signal. Before the control unit can accept a new print function word, a Terminate function (23 or 33) must be issued.

3.2.2.4. Interlock Fault

Status Code: 74_8

The Interlock Fault status code informs the processor that one of the following abnormal conditions has occurred in the printer:

- Printer Power Fault
- Paper Runaway (paper feed greater than 22 inches)
- Ribbon Out
- Cabinet Interlocks Open
- Overheat
- Carriage Out

Manual intervention is required before further operations on the printer are attempted. When the control unit acknowledges receipt of an Interlock Fault status word, the control unit does not turn on the Output Request signal. Before the control unit can accept a new print function word, a Terminate function (23 or 33) must be issued.

3.2.3. Data Word

The data word contains the information to be printed. After the function word is received and acted upon, data words are transferred from the processor to the subsystem. The data word is a 30-bit processor word. Characters within a series of data words are printed consecutively from left to right starting with the most significant character and ending with the least significant character.

3.3. TIMING

The variables which affect timing on the High Speed Printer Subsystem are described below.

3.3.1. General Characteristics

The increments of time which determine the printing speed upon receipt of a Print Function by the control unit are as follows:

- Line Spacing Sequence
- Buffer memory loading sequence
- Compare/print sequence
- Processor/program response time

3.3.1.1. Line Spacing Sequence

The control unit initiates the line spacing sequence when either form of print function is received. For the second or subsequent lines to be printed for a Print without Interrupt function, the sequence is initiated when the first word of data is received.

A print function with no line spacing encounters a 19-millisecond delay before the line spacing sequence is considered complete. For a print function with line spacing, the time is dependent on the spacing count and the setting of the 6 LI/8 LI (6-LINES/8-LINES) switch on the printer. Table 3–1 lists the time required for completion of the line spacing sequence for various line spacing parameters.

LINE SPACING COUNT	MILLISECONDS AT 6 LINES PER INCH	MILLISECONDS AT 8 LINES PER INCH
0	19	19
1	19	19
2	27	25
3	35	31
*4	43	37
.	.	.
.	.	.
63	515	391

*Each additional line requires 8 milliseconds for 6 lines per inch spacing and 6 milliseconds for 8 lines per inch spacing.

Table 3–1. Timing Requirements for the Line Spacing Sequence

3.3.1.2. Buffer Memory Loading Sequence

This sequence is performed as follows:

(1) The control unit turns on an Output Request signal asking for a data word.

(2) The processor responds by sending a data word and an Output Acknowledge signal.

(3) The control unit turns off the Output Request signal and stores each 6-bit character of the output data word in its buffer memory. For each character, an additional bit in the 7th level is stored in the buffer memory to indicate whether or not the character is to be printed. The 7th level will contain a 1 bit for printable characters and a 0 bit for all nonprintable characters.

(4) The control unit cycles through these steps until it has stored the data from 27 words in its buffer memory or until it receives a data word containing a stop code.

The buffer memory loading sequence is initiated following receipt of a print function word when the Output Request signal asking for the first data word is turned on (4 microseconds after the function is received).

If a stop code is detected in a character of any data word, the buffer memory position corresponding to that character and all subsequent buffer memory positions are padded out and include a 0 bit in the 7th level to indicate that a character is not to be printed for those positions.

For the second and each subsequent line to be printed for a Print without Interrupt function, the buffer memory loading sequence is normally initiated one microsecond after completion of the compare/print sequence for the previous line. However, if the compare/print sequence for the first line is completed within 60 milliseconds after receipt of the Print without Interrupt function, then initiation of the buffer memory loading sequence for the next line is delayed until the 60-millisecond delay timer has expired. If the compare/print sequence for the second or a subsequent line is completed within 60 milliseconds after receipt of the Print without Interrupt function, then initiation of the buffer memory loading sequence for the next line is subjected to the same time delay. It should be noted that if a Terminate function is received in lieu of the first data word for the second or a subsequent line while executing a Print without Interrupt function, the buffer memory loading sequence for that line is aborted and the Print without Interrupt function is considered complete.

The buffer memory loading sequence is considered complete when:

(1) data from 27 words have been stored in the buffer memory, or

(2) the control unit finishes loading the buffer memory by padding it with nonprintable codes after:

- detecting a stop code 77_8 in any character position of any word,

- receiving a Terminate function in lieu of any data word for a Print with Interrupt function or for the first line to be printed for a Print without Interrupt function, or

- receiving a Terminate function in lieu of the second or a subsequent data word for the second or a subsequent line for a Print without Interrupt function.

The time required for completion of the buffer memory loading sequence is dependent on how soon the processor responds to each request for an output data word. The minimum time required for completion is about 600 microseconds. The buffer memory loading sequence is normally overlapped by the line spacing sequence.

3.3.1.3. Compare/Print Sequence

The printing of a line is started when both the line spacing and loading sequences are completed. The compare/print sequence is comprised of the following factors:

- synchronization of the control unit with the print drum,

- comparison of each of the 132 codes stored in the buffer memory with each code read from the code wheel of the print drum,

- determining whether or not all printable codes stored in the buffer memory have been printed.

The print drum and code wheel turn at 922 revolutions per minute (65 milliseconds per revolution). The code wheel has the binary codes for 63 printable symbols equally spaced around its periphery with an interval of 1,033 microseconds between consecutive codes. Table 3–2 shows the sequence of the 63 printable symbols which appear on the standard print drum with the octal codes for each symbol.

Each time a code is read from the code wheel, the buffer memory is scanned. A comparison is made between the code read and the contents of each of the 132 positions in the buffer memory which contain a 1 bit in the 7th level. For each position in which the compare equal is detected, the corresponding print actuator is fired and the position in the buffer memory is charged to a nonprintable code (7th level = 0 bit). During each scan a check is made to determine whether or not any printable codes (7th level = 1 bit) were read from the buffer memory. If no printable characters are recognized, the compare/print sequence for the line is considered complete.

When the compare/print sequence is complete for a Print with Interrupt function, the status word is generated and the External Interrupt signal will be turned on within one microsecond after completion or 60 milliseconds after receipt of the print function, whichever is later. If the status code is Normal Completion, the Output Request signal is turned on and the control unit is conditioned to receive the next function within one microsecond of the time the External Interrupt signal is acknowledged.

When the compare/print sequence is completed for any line printed as a result of a Print without Interrupt function, the Output Request signal is normally turned on within one microsecond (subject to the 60-millisecond delay timer limitation) and the control unit is conditioned to receive the first data word for the next line to be printed.

PRINTER SYMBOL	PROCESSOR OCTAL CODE	PRINTER SYMBOL	PROCESSOR OCTAL CODE
@	00	0	60
%	52	1	61
#	03	2	62
¤	76	3	63
&	46	4	64
A	06	5	65
B	07	6	66
C	10	7	67
D	11	8	70
E	12	9	71
F	13	–	41
G	14	*	50
H	15	.	75
I	16	/	74
J	17	,	56
K	20	$	47
L	21	+	42
M	22	(	51
N	23	'	72
O	24	)	40
P	25	=	44
Q	26	;	73
R	27	>	45
S	30	:	53
T	31	<	43
U	32	[	01
V	33	!	55
W	34	?	54
X	35	]	02
Y	36	Δ	04
Z	37	\	57
		≠	77

Table 3–2. Sequence of Printer Symbols/Processor Code Assignments

In summary, the time required for the compare/print sequence consists of from 0 to 1,033 microseconds for synchronization between the control unit and the print drum; 1,033 microseconds times the number of scan cycles necessary to print all symbols; and 1,033 microseconds for the final scan cycle and the completion of the compare/print sequence.

3.3.1.4. Processor/Program Response Time

The processor/program response time is the interval from turn on of the External Interrupt signal until the time of receipt of the next print function by the control unit. It is significant in determining maximum printing rates.

The processor/program response time can be affected in varying degrees by any of the following:

(1) The delay encountered until the processor's priority circuitry permits recognition of the External Interrupt signal.

(2) Delays encountered while processing other higher priority interrupts or I/O operations.

(3) Analysis of the status word received from the control unit.

(4) Selection of the next print function and sending it to the control unit.

3.3.1.5. Printing Speed

The variables which determine the time to print a series of lines are:

- the line spacing sequence time,
- the buffer memory loading sequence time,
- the compare/print sequence time,
- the processor/program response time.

The following example discusses these variables and calculates the number of sequential symbols which can be printed at 922 lines per minute:

> Assume that the Print with Interrupt (12_8) function specifying single-line spacing is used, that the line-spacing sequence overlaps the buffer memory loading sequence, and that the processor/program response time is 300 microseconds.
>
> To print at 922 lines per minute, a line must be printed for each revolution of the drum (every 65.076 milliseconds). By subtracting 19 milliseconds for line-spacing time, 300 microseconds for the processor/program response time, and 1,033 microseconds (the time for completion of the final buffer memory scan of the compare/print sequence) from 65.076 milliseconds, one obtains the difference of 44.743 milliseconds for all but the final scan cycle of the compare/print sequence. Then, by dividing this value by 1,033 microseconds (the time required for each scan cycle), the result will be slightly more than 43.

Printing can proceed at 922 lines per minute using Print with Interrupt functions when the characters to be printed on each line fall within a consecutive range of 43 out of the 63 characters on the print drum.

Table 3–3 shows the range of characters permitted on each line to maintain a 922 lines per minute print speed for various line-spacing parameters based on the above assumptions.

The formula* for calculating additional entries in Table 3–3 is:

$$N = \frac{64.043 - (LSST + P/PRT)}{1.033}$$

where: N = allowable character range (within the 63 character set)

LSST = the line-spacing sequence time in milliseconds

P/PRT = the processor/program response time in milliseconds

For printing the full range of 63 characters on each line, the formula for the calculation of approximate print speed in lines per minute is:

$$S = \frac{60{,}000}{LSST + P/PRT + 66.626}$$

LINE SPACING PARAMETER	6 LINES PER INCH	8 LINES PER INCH
SINGLE SPACING	43	43
DOUBLE SPACING	35	37
TRIPLE SPACING	27	31

Table 3–3. Calculated Character Range for Maximum Print Speed

* The formula is not valid if P/PRT is greater than 5 milliseconds.

4. OPERATION

4.1. OPERATOR'S RESPONSIBILITIES

The Printer Subsystem operator is responsible for the following:

- Turning on and turning off the subsystem as required.
- Observing and responding to indications appearing on the various operator control panels described in this section.
- Performing the maintenance procedure described in this section.
- Seeing that the environment inside the room containing the subsystem is within the specification given in Appendix C3. Any deviation from these specifications may lead to a decrease in system reliability.

4.2. CONTROLS AND INDICATORS

Controls and indicators on the components of the High Speed Printer Subsystem are described in the following paragraphs.

4.2.1. Printer

The Printer is equipped with two control panels:

- The Operator's Control Panel which permits monitoring of the operations of the printer and physical adjustment of the printer mechanism and paper-transport mechanism;
- The new line Power Control Panel which provides voltage overload protection for the printer. There is also a switch, located within the printer cabinet, for controlling line spacing.

4.2.1.1. Printer Operator's Control Panel

The Printer Operator's Control Panel is divided into two separate panels: the Left-hand Control Panel (Figure 4–1) and the Right-hand Control Panel (Figure 4–2). Tables 4–1 and 4–2 give a description and operational summary of the items on both panels.

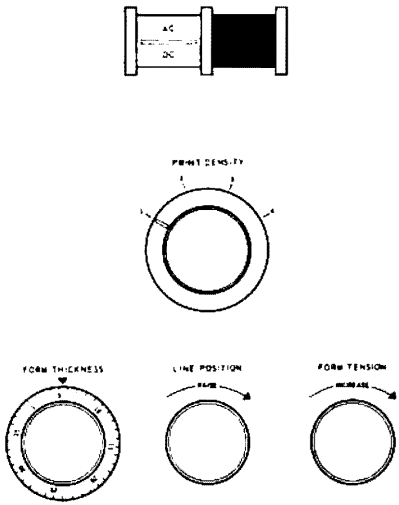


Figure 4–1. Left-Hand Control Panel

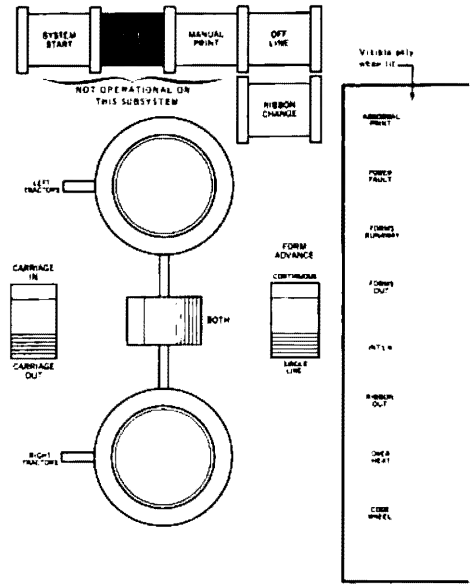


Figure 4–2. Right-hand Control Panel

4.2.1.2. Printer Power Control Panel

The Power Control Panel (Figure 4–3) contains circuit breakers for primary AC power distribution and application of power to the main blower, print-head fans, static eliminator, carriage motor, paper-feed motor, and print-drum motor. Each item on the control panel is described in Table 4–3.

4.2.1.3. 6-Lines/8-Lines Switch

Located inside the upper panel on the left-hand side of the printer is the 6 LI/8 LI toggle switch. This switch controls the number of vertical spaces per inch (6 lines or 8 lines) to be used during a print operation.

a. Switch/Indicators

MARKING	COLOR	FUNCTION
AC DC	White	Alternate-action switch with a split indicator. Permits initial turn-on sequence when the main circuit breaker is closed. Operation of the switch causes the AC section to light and initiates the turn-on sequence. When the low voltage DC is stabilized, the DC section is lighted. Depressing the switch when both sections are lit turns off DC power.
READY	Green	Momentary-action switch. When indicator is lit, printer is ready for use. If the READY indicator is extinguished, the printer is not ready for use. When a fault (Interlock, Power Fault, etc.) occurs, manual intervention must be exercised. After correction of fault, depression of the READY switch should make the printer available to system and light the READY indicator.

b. Knobs and Rocker Pushbuttons

MARKING	TYPE	FUNCTION
FORM THICKNESS	Knob	Adjusts distance between print head and print drum. Rotate dial counterclockwise to accommodate increased form thickness. This adjustment varies position of carriage stops and must be done with carriage in the "out" position.
LINE POSITION	Knob	Adjusts vertical position of a preprinted form with respect to the print line (printer hammer line). Rotate dial clockwise to raise the preprinted form with respect to print line. Rotate dial counterclockwise to lower the preprinted form. This adjustment may be made while printer is in operation and may be varied until desired positioning is achieved.
FORM TENSION	Knob	Adjusts vertical tension on paper. Turn knob clockwise to increase tension; turn knob counterclockwise to decrease tension. The carriage must be out.
PRINT DENSITY	Four-position rotary switch	Four-position switch that may be set according to the desired print density. The density should be increased as the number of print copies increases. Rotating the switch clockwise causes the print hammers to move faster and strike harder.

Table 4–1. Left-hand Control Panel

a. Switch/Indicators

MARKING	COLOR	FUNCTION
SYSTEM START	Green	Not operational on this subsystem.
SYSTEM STOP	Red	Not operational on this subsystem.
MANUAL PRINT	White	Not operational on this subsystem.
OFF LINE	White	Alternate-action switch for activating FORM ADVANCE circuitry. The printer is operational regardless of the position of this switch.
RIBBON CHANGE	White	Alternate-action switch. Depressing switch lights indicator and causes ribbon to stop after it has reached maximum windup position on upper mandrel, at which time the printer goes to a nonready condition. Depression of lighted RIBBON CHANGE switch and READY switch in that order extinguishes RIBBON CHANGE indicator, lights READY indicator and restores printer to ready condition.

b. Knobs and Rocker Pushbuttons

MARKING	TYPE	FUNCTION
LEFT TRACTORS	Knob	A mechanical control which enables operator to adjust printer to take forms of various widths. When operated, it will move both upper and lower left-hand tractors. Clockwise rotation moves tractors to the right and counterclockwise rotation moves tractors to the left. *NOTE:* Tractor locks must be released by pressing them in toward the tractor shafts before attempting to position the tractors.
BOTH	Rocker Pushbutton	A two-position switch. When set in BOTH position, permits both sets of tractors (left and right) to be moved simultaneously with either dial. When set away from BOTH position, permits individual tractor adjustment.

Table 4–2. Right-hand Control Panel (Sheet 1 of 3)

b. Knobs and Rocker Pushbuttons (Cont.)

MARKING	TYPE	FUNCTION
RIGHT TRACTORS	Knob	Similar to LEFT TRACTORS dial except that control is maintained over the right set of tractors after the locks are released.
CARRIAGE IN/ CARRIAGE OUT	Rocker Push-button	A two-position switch. Setting this switch in the CARRIAGE OUT position will cause the carriage to move away from the paper and the READY indicator will be extinguished. Setting this switch in the CARRIAGE IN position will cause the carriage to move to printing position.
CONTINUOUS/ SINGLE LINE	Rocker Push-button	A momentary-action rocker-type switch pivoted at its center. Used to manually advance paper when the OFF LINE indicator is lit. Pressing switch below center (SINGLE LINE) causes paper to be advanced one line. Pressing switch above center (CONTINUOUS) advances paper continuously until switch is released. The switch returns to the center position when released. Do not activate during print operation.

c. Indicators

MARKING	FUNCTION
ABNORMAL PRINT	Lights when any actuator fuse is blown. The ready condition is restored when the fuse is replaced.
POWER FAULT	Lights to indicate DC fault. After correction of fault, the printer is ready after a 45-second timing cycle.
FORMS RUNAWAY	Lights whenever there has been 22 inches of continuous paper feed without an intervention. After the fault has been corrected, the READY switch must be depressed to clear indicator, and make the printer ready. (No error condition exists when paper is spaced manually.)
FORMS OUT	Lights when there are 2.5 inches of paper remaining below print head. When condition has been corrected, printer will become ready. When READY switch is depressed, the FORMS OUT indicator will be extinguished.

Table 4–2. Right-hand Control Panel (Sheet 2 of 3)

c. Indicators (Cont.)

MARKING	FUNCTION
INT'L'K	Lights to indicate printer interlock is open. This safety device automatically opens the AC supply circuit when a cabinet panel or upper carriage cover is opened. It is extinguished when the cause for the interlock is corrected or when the interlock is defeated. The printer becomes ready after 45-second timing cycle.
RIBBON OUT	Lights after depression of RIBBON CHANGE switch and when ribbon is just switching from upper takeup mandrel and preparing to wind down onto lower mandrel. After ribbon has been changed, RIBBON CHANGE switch must be pressed to clear indicator. Press READY switch to restore ready condition.
OVER HEAT	Lights to indicate excessive temperature or air flow failure. Correct the fault and printer becomes ready after 45-second timing cycle.
CODE WHEEL	Not operational on this subsystem.

Table 4–2. Right-hand Control Panel (Sheet 3 of 3)

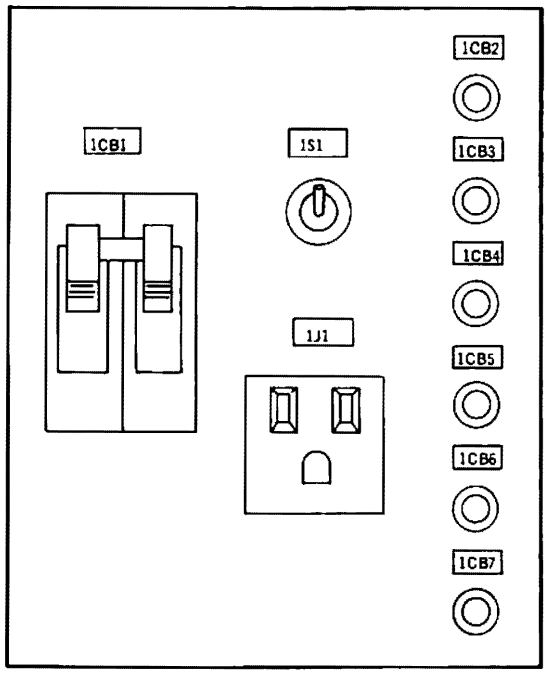


Figure 4–3. Printer Power Control Panel

MARKING	TYPE	FUNCTION
1CB1	Circuit Breaker	Combination switch and overload breaker for main AC power lines entering printer. Rating is 10 amps.
1CB2	Circuit Breaker	Limits main blower current.
1CB3	Circuit Breaker	Limits print-head fans and static-eliminator current.
1CB4	Circuit Breaker	Limits carriage motor current.
1CB5	Circuit Breaker	Limits current in relay circuits, remote/local power switch, and ribbon control circuits.
1CB6	Circuit Breaker	Limits paper-feed and print-drum motors current.
1CB7	Circuit Breaker	Limits convenience outlet current to 2 amps.
1J1	Receptacle	3-pole convenience outlet furnishing 115 VAC at maximum of 2 amps.
1S1	Toggle Switch	Selects mode of primary power application, either local (up position) or remote (down position).

Table 4–3. Printer Power Control Panel

4.2.2. Control Unit

The Control Unit contains two panels which permit the operator and the Univac Field Engineer to exercise offline and limited online control of the subsystem. Of the two, the more significant to the operator is the Control Unit's Operator Panel. The other is the Maintenance Panel which is used for diagnostic purposes.

4.2.2.1. Control Unit's Operator Panel

The Control Unit's Operator Panel, shown in Figure 4–4, gives the operator a means of turning off subsystem power and observing certain physical conditions within the printer and the control unit. This panel is located on the upper left-hand side on the front of the control cabinet. A description of the panel components is given in Table 4–4.

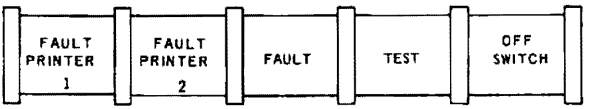


Figure 4–4. Control Unit's Operator Panel

MARKING	FUNCTION
FAULT PRINTER 1	These indicators light when any of the following conditions exist in the respective printer: Ribbon out Power fault Forms runaway Carriage out High temperature Interlock
FAULT PRINTER 2	Not used
FAULT	Lights when any of the following conditions exist in the control unit: Low voltage High current High temperature Loss of air
TEST	Lights when any of the switches on the Maintenance Panel, other than the 62 CHAR/63 CHAR switch, are improperly positioned.
OFF SWITCH	When depressed, turns the control unit off. Lights green when power is on and red when DC power is off.

Table 4–4. Control Unit's Operator Panel

4.2.2.2. Control Unit's Maintenance Panel

The Control Unit's Maintenance Panel, shown in Figure 4–5, is primarily of significance to the Univac Field Engineer, permitting him to control and observe certain subsystem operations. The panel is located behind the back cover of the control unit.

Two toggle switches (62 CHAR/63 CHAR and PTR) and two pushbutton switches (POWER CONTROL – OFF and ON) located at the bottom right side of this panel may be of significance to the operator. The functions of the switches are as follows:

62 CHAR/63 CHAR switch: In the 62 CHAR position, the 05_8 and 77_8 codes are nonprintable. The 77_8 code is defined as a stop code which causes all characters which follow it to be nonprintable . The 62 CHAR position is normal. The 63 CHAR position permits operating with the 05_8 code as the only nonprintable code.

POWER PTR/OFF switch: This switch should always be in OFF (down) position.

POWER CONTROL/OFF and POWER CONTROL/ON switches: These switches control the AC power applied to the control cabinet.

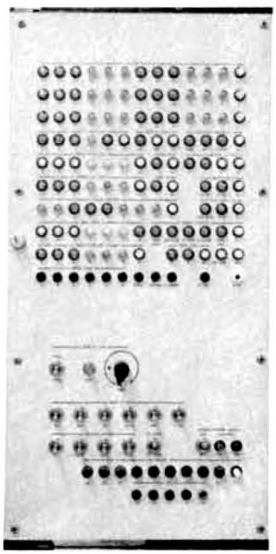


Figure 4–5. Control Unit's Maintenance Panel

4.3. SUBSYSTEM OPERATION

The following paragraphs describe the turn-on, turn-off, and paper loading procedures for the subsystem.

4.3.1. Turn-On Procedure

Before initiating the procedure for turning on the subsystem, the condition of the 1S1 (local/remote) switch located on the printer and that of the PTR switch on the control unit must be determined. It is recommended that the conditions of these switches satisfy local turn-on and subsystem power be turned on at each unit.

For local turn-on, the recommended procedure is as follows:

4.3.1.1. The Control Unit

Before turning on the control unit make certain that all cabinet panels are in place, all interlocks are closed, and that maintenance work is not being done on the unit.

(1) If conditions are normal, ensure that the PTR switch, located on the Maintenance Panel, is in the OFF (down) position.

(2) Place the 62 CHAR/63 CHAR switch, located on the Maintenance Panel, in the desired position.

(3) Depress the POWER CONTROL ON switch. The OFF SWITCH indicator located on the Operator Panel will light green.

4.3.1.2. The Printer

Before attempting to turn power on to the printer, make certain that all cabinet panels are in place and closed, the interlocks are closed, and maintenance is not being done on the unit.

(1) If prepower conditions are normal at the printer, only the POWER FAULT indicator is lit on the Diagnostic Panel.

(2) Depress the AC/DC switch/indicator on the Left-hand Control Panel. If the AC indicator does not light immediately, check the circuit breaker panel on the rear of the printer.

(3) If a circuit breaker opens, its associated button on the circuit breaker panel pops out. Depress the circuit breaker button to reset the circuit breaker.

(4) If the DC portion of the AC/DC switch/indicator does not light, remove the rear paper guide, the paper-storage tray, and the guide adjusting bar from the rear of the printer. Open the access panel and locate the DC circuit breaker. The 1CB1 circuit breaker switch should be in the up position as shown in Figure 4–3.

CAUTION

If any circuit breaker cannot be reset or if, when reset, the fault persists, call a Univac Field Engineer.

(5) When the circuit breakers are all reset, close all the cabinet panels and again depress the AC/DC switch.

(6) If there are no further faults, the AC and DC indicators light and, after a 45-second delay, the READY indicator lights automatically. If the FORMS OUT fault indicator is lit, a new paper form must be loaded before operation.

4.3.2. Turn-Off Procedure

The procedure for turning off the subsystem involves taking the necessary precautions to insure that no print operations are in progress and then remove power from the units in the following sequence:

(1) Printer: Depress AC/DC switch located on Left-hand Control Panel; indicator extinguishes.

(2) Control Unit: Depress OFF switch located on Operator Panel; indicator lights red.

4.3.3. Paper Loading Procedure

(1) Depress the OFF LINE switch/indicator (indicator lights) so that the FORM ADVANCE switch can be activated.

(2) Depress the CARRIAGE OUT rocker pushbutton. Raise the transparent top cover, and lift the retaining clamps on both sides of the form.

(3) Lift the old paper off the sprockets; slide it through to the rear of the printer.

(4) If forms of the same width are to be loaded and the print line is not shifted right or left, ignore steps 5, 6, 8, 9, and 10 for releasing and repositioning the tractor locks. If forms of different widths are to be loaded, release the top tractor locks on the Type 0755 and 0758 Printers, and the top and bottom tractor locks on the Type 0751 Printer.

(5) Depress the rocker pushbutton labeled BOTH on the Right-hand Control Panel away from the BOTH position to uncouple the tractor control knobs.

(6) Position the tractor locks by means of the left and right tractor knobs on the Right-hand Control Panel so they are spaced approximately the width of the form to be loaded.

(7) Place a supply of paper on the floor in the recess in the front of the printer. Feed the paper up between the carriage and the ribbon and place the sprocket holes of the paper on the top and bottom sprockets.

(8) Position the left-hand tractor to align it with the left-hand sprocket holes of the paper. Close the retaining clamps and carefully move the right tractor to the right to place the form under slight horizontal tension.

(9) Depress the tractor-coupling pushbutton to the BOTH position and adjust the form horizontally to the position desired.

(10) Pull the tractor locks (two on Type 0755 and Type 0758 Printers, four on Type 0751 Printer) up to lock the form into position.

(11) Depress the CARRIAGE IN pushbutton and depress the CONTINUOUS part of the FORM ADVANCE pushbutton until the paper is at the required starting position.

(12) Depress the OFF LINE switch/indicator (indicator extinguishes) to deactivate the FORM ADVANCE rocker switch.

4.4. ERROR CONDITIONS AND CORRECTIONS

An error condition in the subsystem is reflected by a status word or fault indication on the Diagnostic Panel of the printer. Operator's procedures for correcting fault indications are described in Table 4–5.

FAULT	PROCEDURE
ABNORMAL PRINT	Indicates that a fuse is open on a circuit card or that a circuit card is missing. Call Univac Field Engineer.
POWER FAULT	Indicates an open circuit breaker (except for the main circuit breaker) or no power on at the printer. If circuit breakers are all closed and fault persists call a Univac Field Engineer.
FORMS RUNAWAY	Indicates 22 inches of continuous paper feed. First try to clear the fault by depressing the READY switch, but if fault reappears, call a Univac Field Engineer.
FORMS OUT	Lights when paper is about 2.5 inches from end. Reload paper. Depress READY switch/indicator (indicator extinguishes); otherwise, subsequent FORMS OUT will not be recognized.
INT'L'K	Lights when any cabinet interlock is open. Press each cabinet panel to make certain that the associated interlocks are closed. If the fault persists, call a Univac Field Engineer.
RIBBON OUT	Lights after the RIBBON CHANGE switch has been depressed and the ribbon has wound onto the top mandrel. Change the ribbon.
OVER HEAT	Lights when cabinet interior exceeds 120°F. Before calling a Univac Field Engineer, make certain that the front or side cabinet vents are not blocked. If any vents are blocked, remove the obstruction and wait a few minutes for the temperature to drop. If the fault indication remains lit, call a Univac Field Engineer.
CODE WHEEL	Not operational on this subsystem.

Table 4–5. Operator's Procedures for Printer Fault Corrections

4.5. OPERATOR PERFORMED MAINTENANCE

Operator performed maintenance instructions for the printer are presented in a step-by-step form with illustrations to augment the text. Operator performed maintenance instructions do not require the use of tools.

Inspection or preventive maintenance schedules may call for changing the ribbon of the printer. Change the ribbon as follows:

(1) Depress the RIBBON CHANGE switch/indicator; indicator lights and stays lit until the ribbon-reversing point is reached with the ribbon on the upper mandrel.

(2) When the ribbon is wound out and ready to be changed, the RIBBON OUT indicator lights and the READY indicator extinguishes.

(3) Depress the OFF LINE switch (indicator lights) and the CARRIAGE OUT pushbutton.

(4) Raise the hinged carriage cover to gain access to the ribbon.

(5) Lower the lower carriage to gain access to lower mandrel.

(6) Use the three-position inching switch (Figure 4–6a) to wind the ribbon completely around the top mandrel (Figure 4–6b).

(7) Unpack the new ribbon from its carton. Put on the plastic gloves that are packed in the carton and save the carton for the old ribbon.

(8) Remove front guide roller (Figure 4–6c); push roller to right to release left-hand end.

(9) Remove the old ribbon (Figure 4–6d); push ribbon to left to release right-hand end.

CAUTION

Use only a 45-yard ribbon with the Type 0755 or 0758 Line Printer.

(10) Unwrap the new ribbon and load it on the drive hubs. Install left end first. Ribbon must feed from the top of the roll in towards the printer.

(11) Thread the new ribbon as shown in Figure 4–6e and 4–6f.

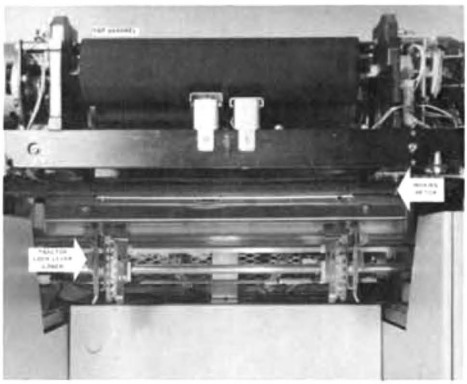
(12) Remove the takeup mandrel to wrap a few turns of the ribbon around it. Replace it as shown in Figure 4–6g.

(13) Replace the front guide roller. Make certain that the ribbon correction switch is on top of the ribbon as shown in Figure 4–6h.

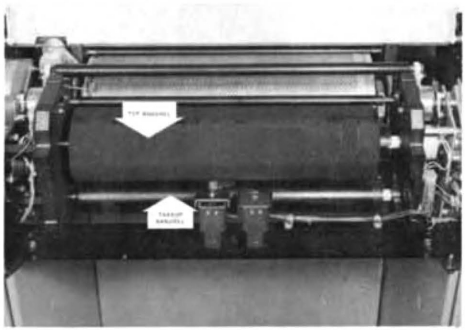
(14) Take up ribbon slack by turning the takeup mandrel manually. Wind the ribbon securely on the takeup mandrel by using the inching switch. When ribbon is secure, return the inching switch to the center position for normal operation.

(15) Lower the upper carriage cover, raise the lower carriage cover and depress the CARRIAGE IN pushbutton.

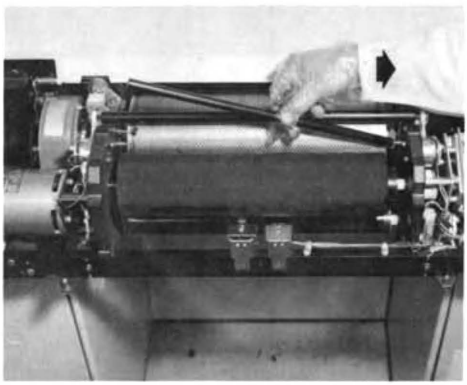
(16) A printing test cannot be run offline; it must be run in conjunction with a test program. One offline operational check that can be made is to depress both the CONTINUOUS and SINGLE LINE position of the FORM ADVANCE pushbutton. As the paper moves through the printer, the ribbon mechanism is activated. Ribbon movements may be visually inspected by dropping the lower carriage cover.



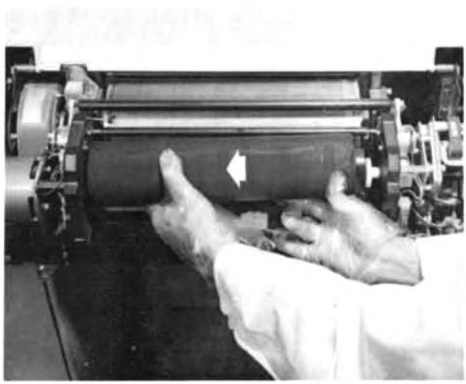
a. Complete Ribbon Transfer



b. Old Ribbon Wound on Top Mandrel

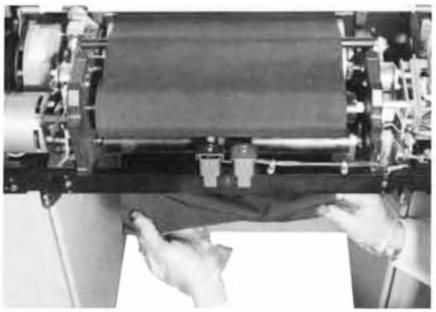


c. Remove Front Guide Roller

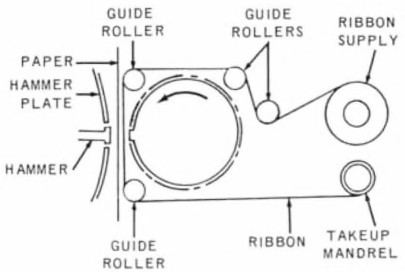


d. Remove Old Ribbon

Figure 4–6. Changing Ribbon (Sheet 1 of 2)

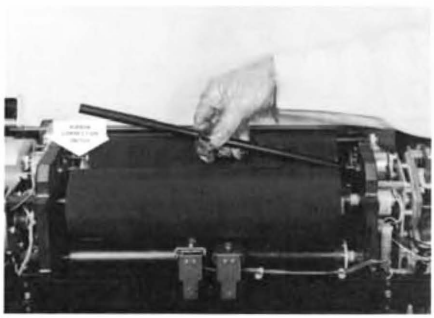


e. Thread New Ribbon



f. Ribbon Threading Path

g. Replace Take up Mandrel



h. Replace Front Guide Roller

Figure 4–6. Changing Ribbon (Sheet 2 of 2)

APPENDIX A. TYPE 0751 HIGH SPEED PRINTER

A1. DESCRIPTION

Appendix A contains information for operation of the High Speed Printer Subsystem which includes the Type 0751 High Speed Printer. Only the information which is uniquely associated with this printer is included in Appendix A. Details which apply equally well to the Type 0751 Printer will not be repeated.

A1.1. General

The High Speed Printer Subsystem equipped with Type 0751 Printer provides printing capabilities equal to those already described in the manual. The differences between the Types 0751 and 0755 Printers include a slight variation in the control panel and hardware characteristics which do not affect the programmer or operator.

A1.2. Configurations

Table A–1 identifies by name and type numbers the units which make up the printer subsystem. It should be noted that the control unit has a type number identical to that for the subsystem equipped with the Type 0755 Printer but requires field modification before being used with the Type 0751 Printer.

SUBSYSTEM COMPONENT	TYPE NUMBER	NUMBER REQUIRED
Printer	0751–00	1
Printer Control Unit	8120-02	1

Table A–1. Printer Subsystem Components, Type 0751

A2. OPERATION

A2.1. Controls and Indicators

Controls and indicators on the components of the Type 0751 Printer are described in the following paragraphs.

A2.1.1. Printer

The Type 0751 Printer is equipped with two control panels; the Operator Control Panel, which permits monitoring of the operations of the printer and physical adjustment of the printer mechanism and paper-transport mechanism, and the Power Control Panel which provides voltage overload protection for the printer.

A2.1.1.1. Printer Operator's Control Panel

The Printer Operator's Control Panel is divided into two separate panels: the Left-hand Control Panel (Figure A–1) containing four manual controls; and the Right-hand Control Panel (Figure A–2) containing seven switch/indicators, three toggle switches, two control dials, and eight indicating lamps (mounted on a smaller panel, called a Diagnostic Panel). Tables A–2 and A–3 give a description and operational summary of the items on both panels.

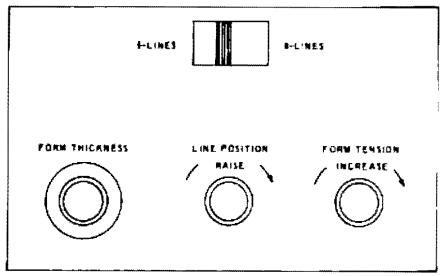


Figure A–1. Left-hand Control Panel

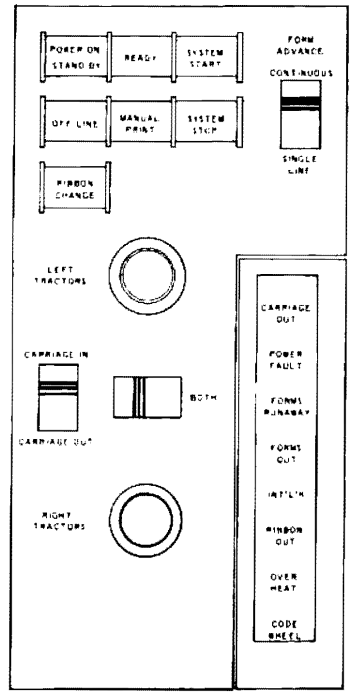


Figure A–2. Right-hand Control Panel

MARKING	TYPE	FUNCTION
FORM THICKNESS	Knob	Adjusts distance between print head and print drum. Rotate dial counterclockwise to accommodate increased form thickness. This adjustment varies position of carriage stops and must be done with carriage in the "out" position.
LINE POSITION	Knob	Adjusts vertical position of a preprinted form with respect to the print line (printer hammer line). Rotate dial clockwise to raise the preprinted form with respect to print line. Rotate dial counterclockwise to lower the preprinted form. This adjustment may be made while printer is in operation and may be varied until desired positioning is achieved.
FORM TENSION	Knob	Adjusts vertical tension on paper. Turn knob clockwise to increase tension; turn knob counterclockwise to decrease tension. The carriage must be out.
6 LINES/ 8 LINES	Rocker Pushbutton	Controls the number of vertical spaces per inch (6 lines or 8 lines) to be used during a print operation.

Table A–2. Left-hand Control Panel

a. Switch/Indicators

MARKING	COLOR	FUNCTION
POWER ON STANDBY	White	Alternate-action switch with split indicator. The STANDBY section is illuminated when DC power is applied to the printer. Depressing switch lights POWER ON portion of the indicator and initiates the power sequence on the printer. When the sequence is complete, the READY indicator lights. Depressing the POWER ON/STANDBY switch when both indicators are lit causes AC power to be removed from the printer; the POWER ON indicator is extinguished.
READY	Green	Momentary-action switch. When indicator is lit, printer is ready for use. If the READY indicator is extinguished, the printer is not ready for operation. When a fault (Interlock, Power Fault, etc.) occurs, manual intervention must be exercised. After correction of fault, depression of the READY switch should make the printer available to system and light the READY indicator.
SYSTEM START	Green	Not operational on this subsystem.
OFF LINE	White	Alternate-action switch for activating FORM ADVANCE circuitry. Printer is operational regardless of the position of this switch.
MANUAL PRINT	White	Not operational on this subsystem.
SYSTEM STOP	Red	Not operational on this subsystem.
RIBBON CHANGE	White	Alternate-action switch. Depressing switch lights indicator and causes ribbon to stop after it has reached maximum windup position on upper mandrel at which time the printer goes to a nonready condition. Depression of lighted RIBBON CHANGE switch and READY switch, in that order, extinguishes RIBBON CHANGE indicator, lights READY indicator, and restores printer to ready condition.

Table A–3. Right-hand Control Panel (Sheet 1 of 3)

b. Knobs and Rocker Pushbuttons

MARKING	TYPE	FUNCTION
LEFT TRACTORS	Knob	A mechanical control which enables operator to adjust printer to take forms of various widths. When operated, it will move both upper and lower left-hand tractors. Clockwise rotation moves tractors to the right and counterclockwise rotation moves tractors to the left. *NOTE:* Tractor locks must be released by pressing them in toward the tractor shafts before attempting to position the tractors.
BOTH	Rocker Pushbutton	Two-position switch. When set in BOTH position, permits both sets of tractors (left and right) to be moved simultaneously with either dial. When set away from BOTH position, permits individual tractor adjustment.
RIGHT TRACTORS	Knob	Similar to LEFT TRACTORS dial except that control is maintained over the right set of tractors after the locks are released and the BOTH switch is off.
CARRIAGE IN/ CARRIAGE OUT	Rocker Pushbutton	A two-position switch. Setting this switch in the CARRIAGE OUT position will cause the carriage to move away from the paper and the READY indicator will be extinguished. Setting this switch in the CARRIAGE IN position will cause the carriage to move to printing position.
FORM ADVANCE CONTINUOUS/ SINGLE LINE	Rocker Pushbutton	A momentary-action rocker-type switch pivoted at its center. Used to manually advance paper when OFF LINE indicator is lit. Pressing switch below center (SINGLE LINE) causes paper to be advanced one line. Pressing switch above center (CONTINUOUS) advances paper continuously until switch is released. The switch returns to the center position when released. Do not activate during print operation.

Table A–3. Right-hand Control Panel (Sheet 2 of 3)

c. Indicators*

MARKING	FUNCTION
CARRIAGE OUT	Lights when carriage is out. Extinguishes when carriage is moved in.
POWER FAULT	Lights to indicate DC fault. After correction of fault, the printer is ready after a 45-second timing cycle.
FORMS RUNAWAY	Lights whenever there has been 22 inches of continuous paper feed without an intervention. After the fault has been corrected, the READY switch must be depressed to clear indicator and make the printer ready.
FORMS OUT	Lights when there are 2.5 inches of paper remaining below print head. When condition has been corrected, printer will become ready. When READY switch is depressed, the FORMS OUT indicator will be extinguished.
INT'L'K	Lights to indicate printer interlock is open. This safety device automatically opens the AC supply circuit whenever a cabinet panel or upper carriage cover is opened. It is extinguished when the cause for the interlock opening is corrected or when the interlock is defeated. The printer becomes ready after 45-second timing cycle.
RIBBON OUT	Lights after depression of RIBBON CHANGE switch and when ribbon is just switching from upper takeup mandrel and preparing to wind down on lower mandrel. After ribbon has been changed, RIBBON CHANGE switch must be pressed to clear indicator. Press READY switch to restore ready condition.
OVER HEAT	Lights to indicate excessive temperature or air flow failure. Correct the fault and printer becomes ready after 45-second timing cycle.
CODE WHEEL	Not operational on this subsystem.

*Since the indicators on the Type 0751 Printer are the same as the Type 0755 Printer but positioned differently, the operator procedures for printer fault corrections listed in Table 4–5 also apply to the Type 0751 Printer.

Table A–3. Right hand Control Panel (Sheet 3 of 3)

A2.1.1.2. Printer Power Control Panel

The Printer Power Control Panel (Figure A–3) contains control devices and fuses and blown fuse indicators. The items on the control panel which are of interest to the operator are described in Table A–4.

A2.1.1.3. Density Control

The DENSITY control is a four-position rotary switch, used to vary the print density of the Type 0751 Printer. The density should be increased as the number of print copies increases. Rotating the switch clockwise causes the print hammers to move faster and strike harder. This switch is located on the rear of the printer, inside the little square door on the left-hand side.

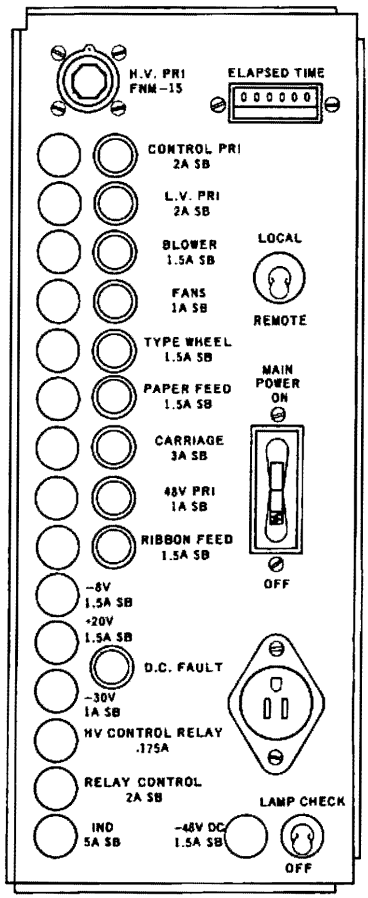


Figure A–3. Printer Power Control Panel

MARKING	FUNCTION
ELAPSED TIME	This meter indicates the hours and tenths of hours that the printer has been energized, regardless of whether it is printing or not. The meter cannot be reset.
LOCAL/REMOTE	This switch is a single-pole, toggle switch which controls the mode of operation, either local or remote. In the LOCAL position, control of power is maintained through the POWER ON/STAND BY switch on the printer control panel. It is recommended that the position of this switch remain in local turn-on.
MAIN POWER	This switch is a 25-ampere overload breaker. When in the OFF position, interrupts all power with the exception of convenience outlet power. When in the ON position, standby power is applied.
CONVENIENCE OUTLET	This is a three-pole outlet providing 117 VAC and an equipment ground. The outlet is always energized regardless of the position of the MAIN POWER ON/OFF switch. It is rated for 15 amps.
LAMP CHECK	This switch is a two-position, toggle switch. When in the LAMP CHECK position, the switch energizes all the lamps on the Right-hand Control Panel for checking purposes.

Table A–4. Printer's Power Control Panel

A2.2. Subsystem Components

Although the Type 0751 Printer maintains the same basic components as the Type 0755, the ribbon idler arms are located differently. Figure A–4 shows the basic relationship of the parts of Type 0751 printer mechanism.

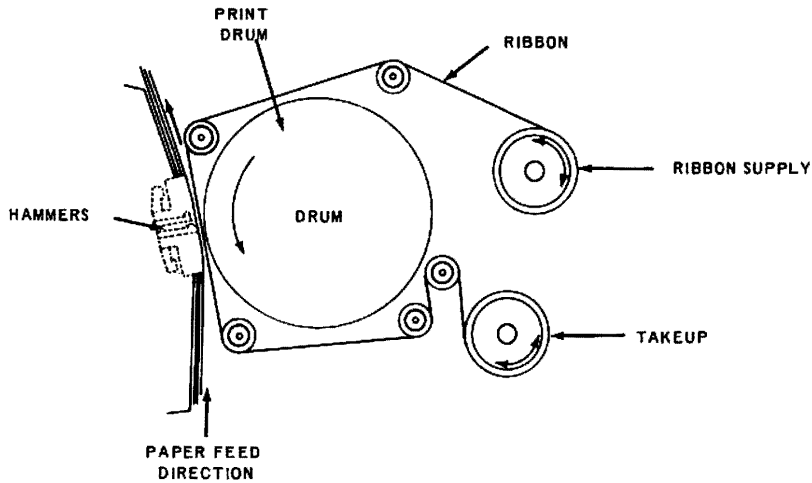


Figure A–4. Type 0751 Printer Mechanism

APPENDIX B. TYPE 0758 HIGH SPEED PRINTER

B1. DESCRIPTION

Appendix B contains information for operation of the High Speed Printer Subsystem which includes the Type 0758 High Speed Printer. Only the information which is uniquely associated with this printer is included in Appendix B. Details which apply equally well to the Type 0758 Printer will not be repeated.

B1.1. General

The Type 0758 Printer (Figure B–1) is basically a modified version of the Type 0755 Printer. A High Speed Printer Subsystem equipped with Type 0758 Printer provides printing capabilities equal to those already described in this manual (see Table 2–1), except for its printing and line spacing speeds. The Type 0758 Printer is capable of printing the full 63 alphanumeric character set at a rate of 1200 lines per minute. There are 43 contiguous alphanumeric characters in this set which may be printed at a rate of 1600 lines per minute. The printer has a line spacing speed of 11.5 milliseconds for spacing the first line and 5.06 milliseconds at a rate of 6 lines per inch or 5.7 milliseconds at a rate of 8 lines per inch for the second or each subsequent line. The differences between the other printers (Type 0751 and 0755) and the Type 0758 Printer include a slight variation in the control panel, hardware and timing characteristics. These variations, which are discussed in the subsequent paragraphs, concern both the programmer and operator.

Figure B–1. High Speed Printer, Type 0758

B1.2. Configurations

Table B–1 identifies the name and type numbers of the units which make up the printer subsystem. It should be noted that the control unit has a type number identical to the control unit used in the subsystem equipped with the Type 0755 Printer, but requires inclusion of Feature F0965-00 when used with a Type 0758 Printer to compensate for timing differences.

SUBSYSTEM COMPONENT	TYPE NUMBER	NUMBER REQUIRED
Printer	0758–00	1
Printer Control Unit	8120-02*	1

*With the inclusion of Feature F0965–00

Table B–1. Printer Subsystem Components, Type 0758

B2. TIMING

The variables affecting timing on the High Speed Printer Subsystem are described below.

B2.1. General Characteristics

The increments of time which determine the printing speed upon receipt of a Print Function by the control units are as follows:

- Line spacing sequence
- Buffer memory loading sequence
- Compare/print sequence
- Processor/program response time

B2.1.1. Line Spacing Sequence

The control unit initiates the line spacing sequence when a space function is received. For the second or subsequent lines to be printed for a Print without Interrupt function, the sequence is initiated when the first word of data is received.

A print function with no line spacing encounters an 11.5-millisecond delay before the line spacing sequence is considered complete. For a print function with line spacing, the time is dependent on the line count and the setting of the 6-LINES/8-LINES switch on the printer. Table B–2 lists the time required for completion of the line spacing sequence of various line spacing parameters.

LINE SPACING COUNT	SPACING TIME IN MILLISECONDS AT 6 LINES PER INCH	SPACING TIME IN MILLISECONDS AT 8 LINES PER INCH
0	11.5	11.5
1	11.5	11.5
2	16.5	17.2
3	21.6	22.9
*4	26.7	28.6
.	.	.
.	.	.
.	.	.
63	325.2	364.9

*Each additional line requires 5.06 milliseconds for 6 lines per inch spacing and 5.7 milliseconds for 8 lines per inch spacing.

Table B–2. Timing Requirements for the Line Spacing Sequence for Type 0758 Printer

B2.1.2. Buffer Memory Loading Sequence

This sequence is performed as follows:

(1) The control unit turns on an Output Request signal asking for a data word.

(2) The processor responds by sending a data word and an Output Acknowledge signal.

(3) The control unit turns off the Output Request signal and stores each 6-bit character of the output data word in its buffer memory. For each character, an additional bit in the 7th level is stored in the buffer memory to indicate whether or not the character is to be printed. The 7th level will contain a 1 bit for each character to be printed and a 0 bit for each character that is not to be printed.

(4) The control unit cycles through these steps until it has stored the data from 27 words in its buffer memory or until it receives a data word containing a stop code.

The buffer memory loading sequence is initiated following receipt of a print function word when the Output Request signal, asking for the first data word, is turned on (4 microseconds after the function is received).

If a stop code is detected in a character of any data word, the buffer memory position corresponding to that character, and all subsequent buffer memory positions, are padded out and include a 0 bit in the 7th level to indicate that a character is not to be printed for those positions.

For the second and each subsequent line to be printed for a Print without Interrupt function, the buffer memory loading sequence is normally initiated one microsecond after completion of the compare/print sequence for the previous line. However, if the compare/print sequence for the first line is completed within 30 milliseconds after receipt of the Print without Interrupt function, then initiation of the buffer memory loading sequence for the next line is delayed until the 30-millisecond delay timer has expired. If the compare/print sequence for the second or a subsequent line is completed within 30 milliseconds after receipt of the Print without Interrupt function, then initiation of the buffer memory loading sequence for the next line is subjected to the same time delay. It should be noted that if a Terminate function is received in lieu of the first data word for the second or a subsequent line while executing a Print without Interrupt function, the buffer memory loading sequence for that line is aborted and the Print without Interrupt function is considered complete.

The buffer memory loading sequence is considered complete when:

(1) data from 27 words have been stored in the buffer memory, or

(2) the control unit finishes loading the buffer memory by padding it with the nonprintable code after:

(a) detecting a stop code 77_8 in any character position of any word when the 62 CHAR/63 CHAR switch is set to 62 CHAR,

(b) receiving a Terminate function in lieu of any data word for a Print with Interrupt function or for the first line to be printed for a Print without Interrupt function, or

(c) receiving a Terminate function in lieu of the second or a subsequent data word for the second or a subsequent line for a Print without Interrupt function.

The time required for completion of the buffer memory loading sequence is dependent on how soon the processor responds to each request for an output data word. The minimum time required for completion is about 600 microseconds. The buffer memory loading sequence is normally overlapped by the line spacing sequence.

B2.1.3. Compare/Print Sequence

The printing of a line is started when both the line spacing and loading sequences are completed. The compare/print sequence is comprised of the following factors:

(1) Synchronization of the control unit with the print drum,

(2) Comparison of each of the 132 codes stored in the buffer memory with each code read from the code wheel of the print drum,

(3) Determining whether or not all printable codes stored in the buffer memory have been printed.

The print drum and code wheel turn at 1600 or 800 revolutions per minute; 37.5 or 75 milliseconds per revolution, respectively, depending upon the position of the Print Drum Speed Control. The code wheel has the binary codes for 63 printable symbols equally spaced around its periphery with an interval of 595 microseconds between consecutive codes when operated at 1600 rpm. Table 3–2 shows the sequence of the 63 printable symbols which appear on the standard print with the octal codes for each symbol.

Each time a code is read from the code wheel, the buffer memory is scanned. A comparison is made between the code read and the contents of each of the 132 positions in the buffer memory which contain a 1 bit in the 7th level. For each position in which the compare equal is detected, the corresponding print actuator is fired and the position in the buffer memory is changed to a nonprintable code (7th level = 0 bit). During each scan a check is made to determine whether or not any printable codes (7th level = 1 bit) remain in the buffer memory. If not, the compare/print sequence for the line is considered complete.

When the compare/print sequence is complete for a Print with Interrupt function, the status word is generated and the External Interrupt signal will be turned on within one microsecond after completion or 30 milliseconds after receipt of the print function, whichever is later. If the status code is Normal Completion, the Output Request signal is turned on and the control unit is conditioned to receive the next function within one microsecond of the time the External Interrupt signal is acknowledged. When the compare/print sequence is completed for any line printed as a result of a Print without Interrupt function, the Output Request signal is normally turned on within one microsecond (subject to the 30-millisecond delay timer limitation) and the control unit is conditioned to receive the first data word for the next line to be printed.

In summary, the time required for the compare/print sequence consists of from 0 to 595 microseconds for synchronization between the control unit and the print drum; 595 microseconds times the number of scan cycles necessary to print all symbols; and 595 microseconds for the final scan cycle and the completion of the compare/print sequence.

B2.1.4. Processor/Program Response Time

The processor/program response time is the interval from turn on of the External Interrupt signal until the time of receipt of the next print function by the control unit. It is significant in determining maximum printing rates.

The processor/program response time can be affected in varying degrees by any of the following:

(1) The delay encountered until the processor's priority circuitry permits recognition of the External Interrupt signal.

(2) Delays encountered while processing other higher priority interrupts or I/O operations.

(3) Analysis of the status word received from the control unit.

(4) Selection of the next print function and sending it to the control unit.

B2.1.5. Printing Speed

The variables which determine the time to print a series of lines are:

- the line spacing sequence time
- the buffer memory loading sequence time
- the compare/print sequence time
- the processor/program response time
- the print drum revolution time

The following example discusses these variables and calculates the number of sequential symbols which can be printed at 1600 lines per minute.

> Assume that the Print with Interrupt (12_8) function specifying single line spacing is used, that the line spacing sequence overlaps the buffer memory loading sequence, and that the processor/program response time is 300 microseconds.
>
> To print at 1600 lines per minute, a line must be printed for each revolution of the drum (every 37.5 milliseconds). By subtracting 11.5 milliseconds for line spacing time and 300 microseconds for the processor/program response time from 37.5 milliseconds, one obtains the difference of 25.7 milliseconds for the compare/print sequence. Then, by dividing this value by 595 microseconds (the time required for each scan cycle), the result will be slightly more than 43.

Printing can proceed at 1600 lines per minute using Print with Interrupt functions when the characters to be printed on each line fall within a consecutive range of 43 out of the 63 characters on the print drum.

Table B–3 shows the number of contiguous characters permitted in each line to maintain a 1600 lines per minute print speed for various line spacing parameters based on the above assumptions.

The formula* for calculating additional entries in Table B–3 is:

$$N = \frac{36.904 - (LSST + P/PRT)}{.595}$$

where: N = number of contiguous characters within the 63 character set

LSST = the line spacing sequence time in milliseconds

P/PRT = the processor/program response time in milliseconds

LINE SPACING PARAMETER	6 LINES PER INCH	8 LINES PER INCH
SINGLE SPACING	43	43
DOUBLE SPACING	34	33
TRIPLE SPACING	26	24

Table B–3. Calculated Character Range for Maximum Print Speed

*The formula is not valid if P/PRT is greater than 7.5 milliseconds.

For printing the full range of 63 characters on each line at either of the two drum speeds, the formula for the calculation of approximate print speed in line per minute is:

$$S = \frac{60{,}000}{LSST + P/PRT + PDRT}$$

where: LSST = the line spacing sequence time in milliseconds

P/PRT = the processor/program response time in milliseconds

PDRT = the print drum revolution time in milliseconds: 37.5 msec. at 1600 rpm, or 75 msec. at 800 rpm.

B3. OPERATION

B3.1. Controls and Indicators

Controls and indicators on the components of the Type 0758 Printer are described in the following paragraphs.

B3.1.1. Printer

The Type 0758 Printer is equipped with two control panels: the Operator Control Panel, which permits monitoring of the operations of the printer and physical adjustment of the printer mechanism and paper-transport mechanism; and the Power Control Panel which provides voltage overload protection for the printer. The printer has two additional controls: one located at the rear of the printer to control the print density; the other, located inside the printer to control the speed of the print drum.

B3.1.1.1. Printer Operator's Control Panel

The Printer Operator's Control Panel is divided into two separate panels: the Left-hand Control Panel (Figure B–2) containing four manual controls and two switch/indicators; and the Right-hand Control Panel (Figure B–3) containing five switch/indicators, three toggle switches, two control dials, and eight indicating lamps (mounted on a smaller panel, called a Diagnostic Panel). Table B–4 gives a description and operational summary of the items on the Left-hand Control Panel. For a description and operational summary of the items on the Right-hand Control Panel, see Table 4–2. In the Type 0758 Printer, the display of the FORMS RUNAWAY indicator shows that there has been 50 inches of paper fed without intervention, as compared with 22 inches, for the Type 0755 Printer.

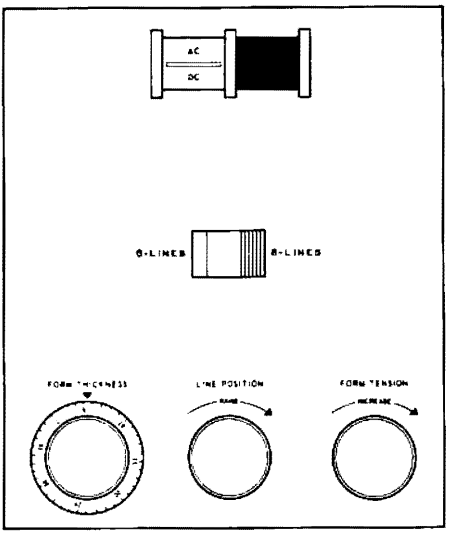


Figure B–2. Left-hand Control Panel

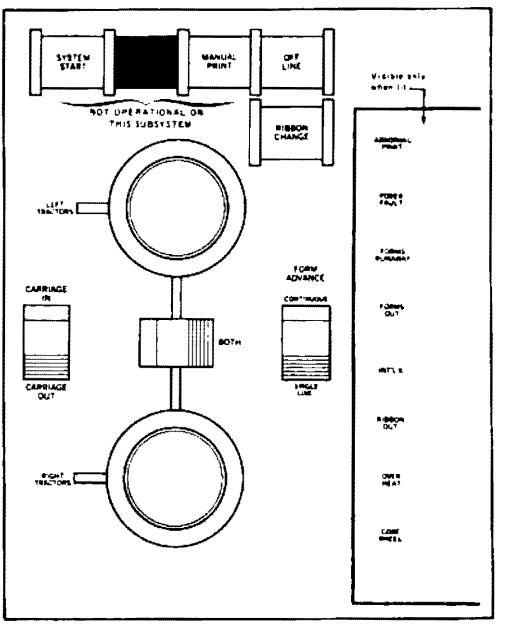


Figure B–3. Right-hand Control Panel

a. Switch/Indicators

MARKING	COLOR	FUNCTION
AC DC	White	Alternate-action switch with a split indicator. Permits initial turn-on sequence when the main circuit breaker is closed. Operation of the switch causes the AC section to light and initiates the turn-on sequence. When the low voltage DC is stabilized, the DC section is lighted. Depressing the switch when both sections are lit turns off DC power.
READY	Green	Momentary-action switch. When indicator is lit, printer is ready for use. If the READY indicator is extinguished, the printer is not ready for use. When a fault (Interlock, Power Fault, etc.) occurs, manual intervention must be exercised. After correction of fault, depression of the READY switch should make the printer available to the system, and light the READY indicator.

b. Knobs and Rocker Pushbuttons

MARKING	TYPE	FUNCTION
FORM THICKNESS	Knob	Adjusts distance between print head and print drum. Rotate dial counterclockwise to accommodate increased form thickness. This adjustment varies position of carriage stops and must be done with carriage in the "out" position.
LINE POSITION	Knob	Adjusts vertical position of a preprinted form with respect to the print line (printer hammer line). Rotate dial clockwise to raise the preprinted form with respect to print line. Rotate dial counterclockwise to lower the preprinted form. This adjustment may be made while printer is in operation and may be varied until desired positioning is achieved.
FORM TENSION	Knob	Adjusts vertical tension on paper. Turn knob clockwise to increase tension; turn knob counterclockwise to decrease tension. The carriage must be out.
6-LINES/ 8-LINES	Rocker Pushbutton	A two-position switch. The setting of this switch determines the number of vertical spaces per inch (either 6 lines or 8 lines) to be used during a print operation.

Table B–4. Left-hand Control Panel

B3.1.1.2. Printer Power Control Panel

The Printer Power Control Panel (Figure B–4) contains circuit breakers for primary AC power distribution and application of power to the main blower, print-head fans, static eliminator, carriage motor, paper-feed motor, and print-drum motor. This panel is identical to that used for the Type 0755 Printer, except for an additional circuit breaker, 1CB8, which provides overload protection for the high voltage sensing relay. For a description of all other controls on this panel, refer to Table 4–3.

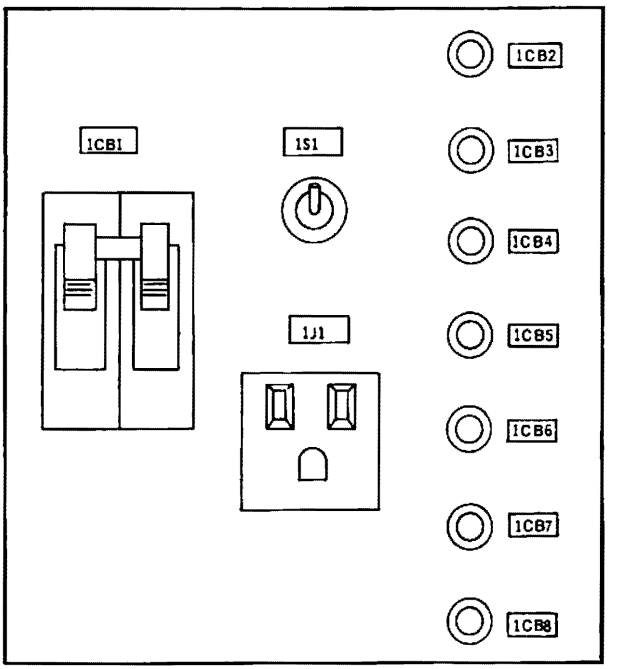


Figure B–4. Printer Power Control Panel

B3.1.1.3. Density Control

Located at the rear of the printer is a DENSITY control to vary the print density. This control is a four-position rotary switch, even though there are only two positions, 1 and 2, marked on the panel. Rotating the switch clockwise to the two unmarked positions, beyond the 2 position, has the same effect as setting the switch at the 2 position. No useful purpose is served by rotating switch beyond the 2 position.

The density should be increased with an increased number of print copies. Rotating the switch clockwise to the 2 position causes the print hammers to move faster and strike harder.

B3.1.1.4. Print Drum Speed Control

The Print Drum Speed Control is a two-position toggle switch, used to control the speed of the print drum of the Type 0758 Printer. Setting the switch to the HIGH (up) position causes the print drum to rotate at 1600 revolutions per minute, and setting the switch to the LOW (down) position causes the print drum to rotate at 800 revolutions per minute, giving the ultimate in print quality. This switch is located under the drive motor.

B3.1.2. Control Unit

The controls and indicators of the Control Unit used with the Type 0758 Printer are functionally identical to those of the Control Unit used with the Type 0755 Printer. For particulars regarding the Control Unit, refer to 4.2.2.

B3.2. Error Conditions and Corrections

Since the controls and indicators of the Type 0758 Printer are identical to the Type 0755 Printer, except for their layout, the error conditions and corrections for the Type 0758 Printer are identical to the Type 0755 Printer. Therefore, for operator's procedures for printer fault corrections, refer to Table 4–5.

APPENDIX C. SUMMARY OF PHYSICAL CHARACTERISTICS AND OPERATIONAL REQUIREMENTS

C1. PHYSICAL CHARACTERISTICS

The physical characteristics of the individual units comprising the Printer Subsystem are contained in Table C–1.

DIMENSIONS	CONTROL UNIT	PRINTER
Height (inches)*	64	55
Width (inches)	24	44
Depth (inches)	36	34
Weight (pounds)	700	1250

*plus jackpads with 0 to 2 inches of adjustment

Table C–1. Physical Characteristics

C2. HEAT DISSIPATION

The amount of heat dissipation of the various units is as follows:

Printer Control Cabinet – 2150 Btu/hr

Printer Cabinet (Type 0751 or 0755) – 4800 Btu/hr

Printer Cabinet (Type 0758) – 6700 Btu/hr

C3. ENVIRONMENTAL REQUIREMENTS

The environmental requirements for the Printer Subsystem consist of supplying its components with air conditioning to the specifications in Table C–2.

REQUIREMENTS	CONTROL CABINET	PRINTER CABINET
Operating Temperature	60° to 85° F	60° to 85° F
Humidity	20% to 85%	40% to 70%*

*20% to 85% for Type 0758

Table C–2. Environmental Requirements

Each unit is equipped with its own blower for the proper utilization of conditioned air. The amount of air required for proper cooling is:

Printer Control Cabinet – 500 cfm

Printer Cabinet (Type 0751 or 0755) – 900 cfm

Printer Cabinet (Type 0758) – 830 cfm

C4. ELECTRICAL REQUIREMENTS

The electrical requirements for the units comprising the Printer Subsystem are given below in Table C–3.

PARAMETERS	CABINET	SPECIFICATION
INPUT VOLTAGE	Control	A. 24 VDC ± 10% B. 208 VAC ± 2%, 3-phase, 60 ± 0.5 CPS, unregulated C. 208 VAC + 18V – 21V, 3-phase, 60/400 CPS, regulated D. 120 VAC, single-phase, 60 ± 0.5 CPS
	Printer	Input taps from 190 to 260 VAC, in 10 VAC increments, ± 15%, single-phase, 60 ± 0.5 CPS 117 VAC (Type 0751 Printer)
LINE CURRENT	Control	A. 0.4 A (maximum) (24 VDC) B. 0.8 A (maximum) (208 VAC Unregulated) C. 1.5 A (single control) (208 VAC Regulated) D. 20 A (maximum) (120 VAC) (convenience outlets)
	Printer	7 amperes (maximum, rms) while printing in all columns at 922 lpm and at + 15% (maximum) of voltage selected at input tap, except for the Type 0758 Printer which is 12 amperes (maximum, rms) at 1600 lpm.
POWER INPUT	Control	627 W
	Printer	1400 W (maximum power requirement for Type 0751 and Type 0755 Printers) 2100 W (maximum power requirement for Type 0758 Printer)
POWER FACTOR	Control	83% (minimum)
	Printer	83% (minimum)

Table C–3. Electrical Requirements

C5. SUBSYSTEM CABLING

Power and interunit cables enter each cabinet at the bottom, either from a false or by a surface raceway. Maximum cable lengths are given in Table C–4.

USED BETWEEN	MAXIMUM LENGTH
Processor and Printer Control Unit	200 feet
Printer Control Unit and Printer	100 feet

Table C–4. Allowable Cable Lengths

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