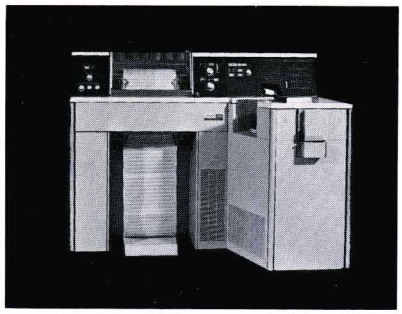


GENERAL DESCRIPTION MANUAL

UNIVAC® 1004 III

MAGNETIC TAPE SYSTEM

GENERAL DESCRIPTION MANUAL

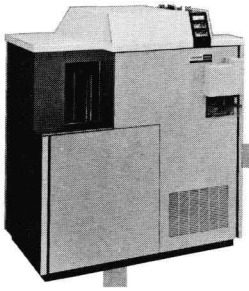
UNIVAC® 1004 III

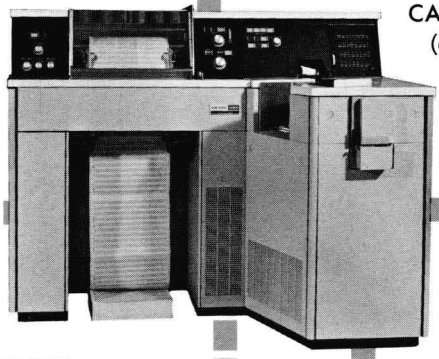
MAGNETIC TAPE SYSTEM

1004 III CONFIGURATIONS

MAGNETIC
TAPE SERVO *

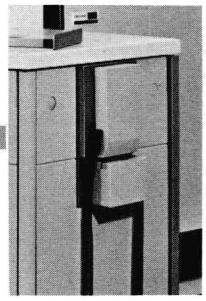
CARD PUNCH
or
READ/PUNCH
(200 CPM)



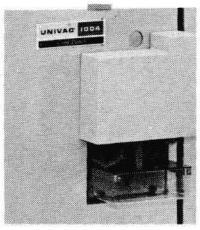


CARD READER
(615 CPM)

PAPER TAPE READER
(400 CPS)

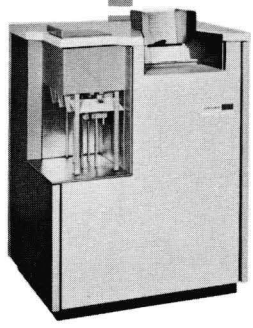


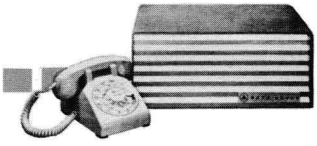
PRINTER
(600 LPM)



PAPER TAPE PUNCH
(110 CPS)

AUXILIARY READER
(400 CPM)





DATA LINE TERMINAL
(LINE SPEED)

Indicates minimum 1004-111 configuration

Indicates optional equipment available; all or in part

* 200,556,800 PPI @ 42.08 IPS

TABLE OF CONTENTS

INTRODUCTION

This manual will introduce the 1004 III. With it comes increased speed, expandability, and magnetic tape.

The 1004 tape unit offers a growth margin which is both practical and comfortable. It eliminates the need for massive card storage, expensive conversions, site preparation, and the inconveniences long accepted as a part of the expansion to tape systems. The 1004 III offers flexible compatibility with density levels of 200, 556, or 800 PPI and the ability to read and/or write in any combination of two concurrently.

The tape unit operates as an integral part of the processor, offering all the multi-operational features associated with magnetic tape. Print and/or card operations are performed up to 615 cards or lines per minute, with a tape transfer rate of up to 33,644 characters per second.

Because of its remarkable adaptability, the 1004 III is ideally suited for use with larger systems, on line, central site, or remote, as an input/output unit for more efficient channel utilization. It displays tremendous power equally well off line for editing, formatting and report generation, freeing larger systems for more efficient processing utilization.

GENERAL DESCRIPTION

The 1004 III consists of a card reader, printer and processor in a central unit and magnetic tape servo in another unit. A variety of optional input-output units are available including: card punch, auxiliary reader, read-punch unit, paper tape reader, paper tape punch and data line terminals.

MAGNETIC CORE STORAGE

The capacity of core storage is 961 locations. Each location is made up of magnetic cores, with each of the six cores in a separate core plane. Six 31 x 31 core planes make up the entire storage. Any single six-core storage location is directly addressable, and any number of adjacent locations is directly addressable as a single data unit. Memory has 6.5 microsecond cycle time.

Three portions of storage are allocated for reading cards and paper tape, punching cards and paper tape, and printing. These are referred to as: Read, Punch and Print Storage. The remaining area is working storage. Working storage may be expanded by utilizing unused portions of the above assigned areas.

Any areas of storage may be designated for magnetic tape, communications, etc.

PRINTER

The printer is attached to the left of the processor. (Fig. 1) A printing speed of 600 lines per minute may be maintained, with a maximum of 132 print positions per line. Character spacing is ten to the inch horizontally, with an option to the operator of six or eight lines to the inch vertically. Any one of sixty-three characters may be printed at each of the 132 print positions. Paper travel through the printer is controlled by a paper tape carriage control loop that may be punched in one or more of three available channels. Paper carriage control tape loops are easily created, stored, and can be utilized for a variety of forms. Forms from 4 to 22 inches in width may be handled by the carriage. Forms up to 22 inches long can be controlled by the paper loop mechanism. Longer forms may be handled by programming.

CHARACTERISTICS	1004 III PRINTER
PAPER STOCK	Forms from 4 to 22 inches may be accommodated by the carriage.
PROGRAMMED OPERATIONS	Print and space; space & sheet ejections.
PRINTABLE CHARACTERS	10 numeric, 26 alphabetic, and 28 special characters including space.
DATA FORMAT	132 print positions per line, 10 characters per inch. Standard vertical spacing is 6 or 8 lines per inch with operator option.
SPEED	Up to 600 lines per minute.
SIMULTANEITY	Printing, punching and reading may all occur simultaneously.
OUTPUT AREA	Programmer adjustable area of core memory.
REPRODUCTION SYSTEM	Hammer stroke against an etched drum.
MAXIMUM NUMBER PER SYSTEM	One

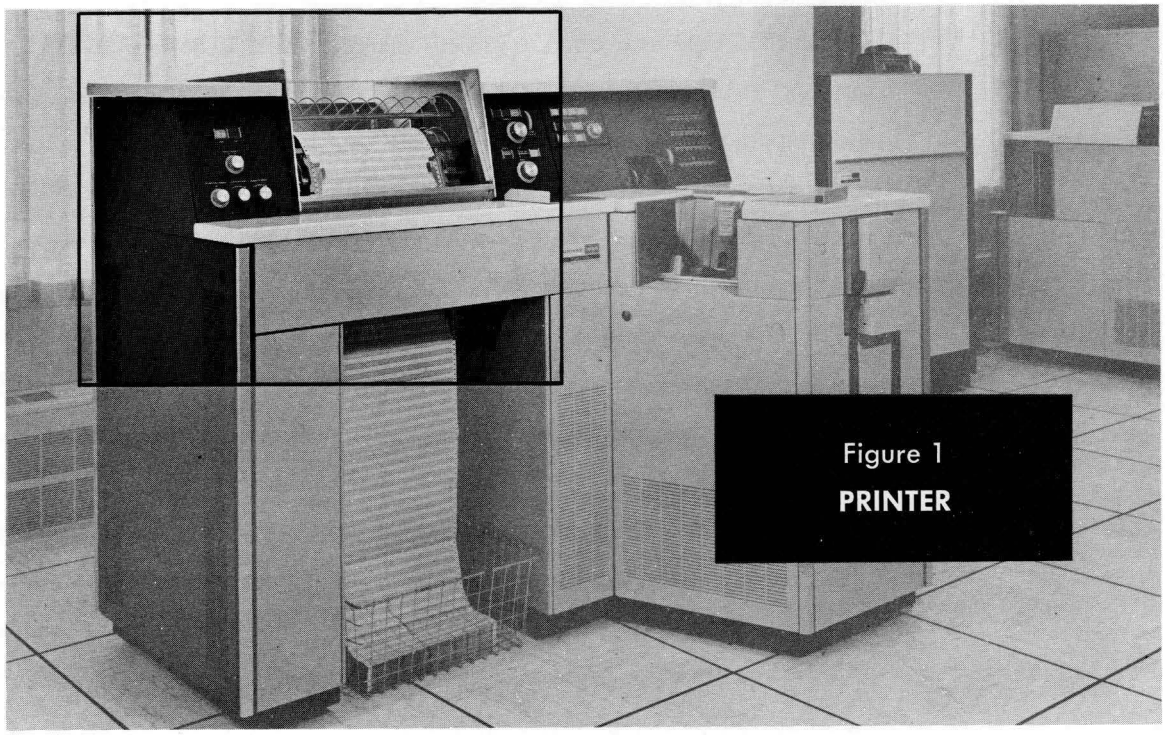


Figure 1
PRINTER

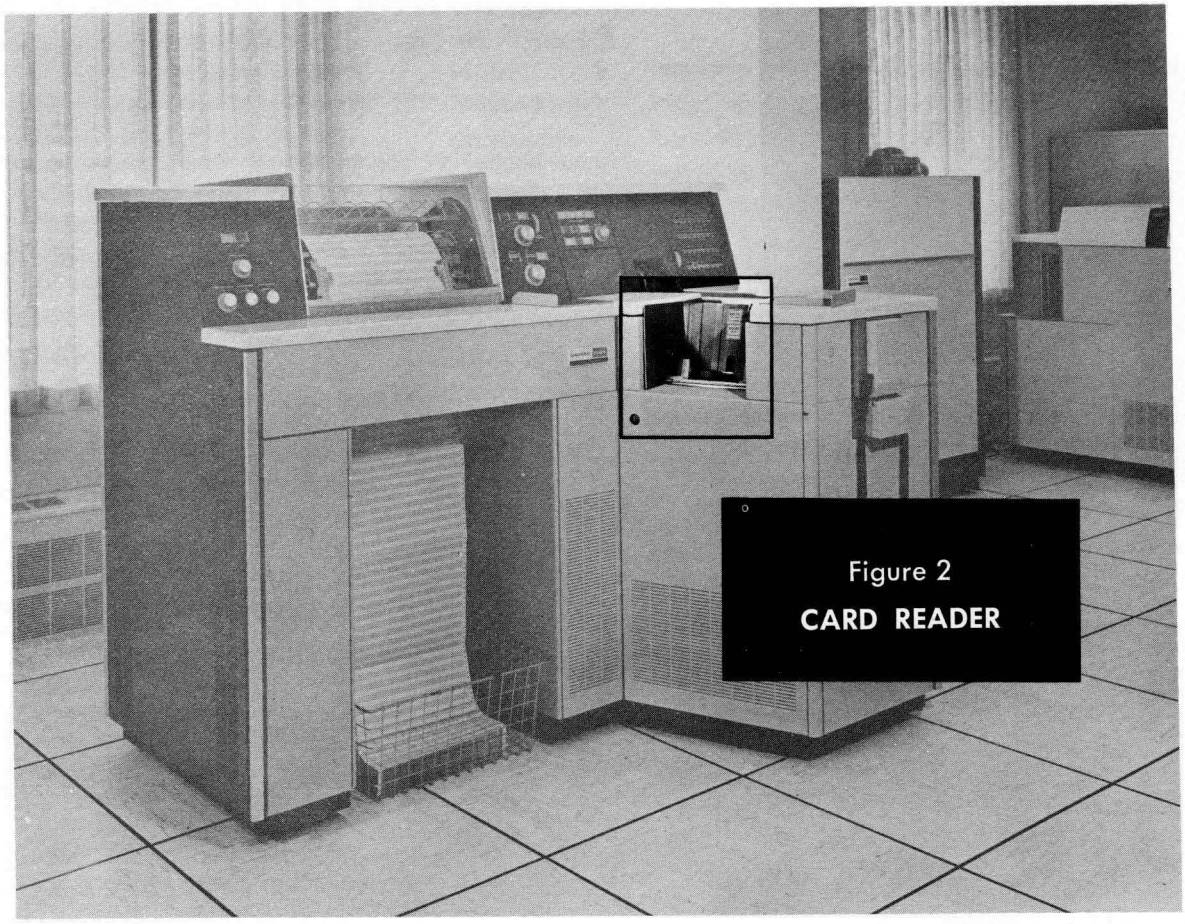


Figure 2
CARD READER

CARD READER

The card reader is located at the right front of the processor. (Fig. 2) Cards are read serially at the rate of 615 cpm on a demand basis. The cards are read as they pass the read station made up of 12 photo electric cells. During reading, the card image is transferred to a section of the core storage assigned to card reading. This area of storage is referred to as read storage.

The input magazine at the front of the read section has a capacity of approximately 1000 cards and is angled toward the centrally located operator controls for easy access. The card stacker, located above and to the rear of the input magazine, holds approximately 1,500 cards. A card is fed to the wait station where the direction of travel is altered to allow the cards to pass under the photo electric cells serially. After the card is read it is deposited "on end" in the card stacker.

80 col., 90 col. or code image cards may be read interchangeably.

CHARACTERSTICS	1004 III CARD READER
CARDS	80, 90 or code image cards.
PROGRAMMED OPERATIONS	Cards are read serially and transferred into memory until program specified column is read. Data is available as it is entering memory and may be bested for control.
SPEED	Up to 615 cards per minute.
READ SYSTEM	Demand basis, always a card at wait station to be read.
SIMULTANEITY	Reading, printing, and punching may occur on the same step.
I/O AREA	Programmer adjustable area of storage.
DATA PROTECTION	A Light-Dark Photocell Test is employed. The light test is automatically made between the reading of each card. If all photocell positions are not simultaneously reading (sensing light) during the card gap, an error condition is indicated and the processor is automatically stopped. The dark test is also automatically made at the end of each card gap time, immediately following the light test. If at the end of card gap time all photocell positions do not indicate a dark condition resulting from the sensing of the leading edge of the next card, an error condition is indicated and the processor is automatically stopped. Checks for card misfeed as well as an empty input hopper and full stacker are also provided.
FEED HOPPER/ STACKER CAPACITY	Feed Hopper Capacity 1000 cards Stacker Capacity 1500 cards

PAPER TAPE READER

The paper tape reader is available as an optional unit. (Fig. 3) It is located adjacent and in front of the card reader. It utilizes a photo electric read process and reads 5, 6, 7 or 8 channel paper or Mylar tape. It reads variable length blocks (Maximum 961 char) into magnetic core storage at the rate of 400 characters per second while checking odd parity. Paper tape can be read while printing and punching. Loading paper tape to be read is accomplished by a short movement of a lever. Only chad tape is read. The programmer is notified by the processor in case of parity error.

CHARACTERISTICS	PAPER TAPE READER
TAPE	11/16", 7/8" or 1" mylar or dry paper. Chad tape.
DATA FORMAT	5, 6, 7 and 8 level codes. 10 frames to the inch.
PROGRAMMED OPERATION	Read data into programmer adjustable area in core storage. Data is available for testing as it enters.
SPEED	400 frames per second.
SIMULTANEITY	Tape reading, punching and printing may occur simultaneously.
READ SYSTEM	Photo electric.
INPUT AREA	Programmer adjustable area in core memory.
DATA PROTECTION	Parity check.
MAXIMUM NUMBER PER SYSTEM	One

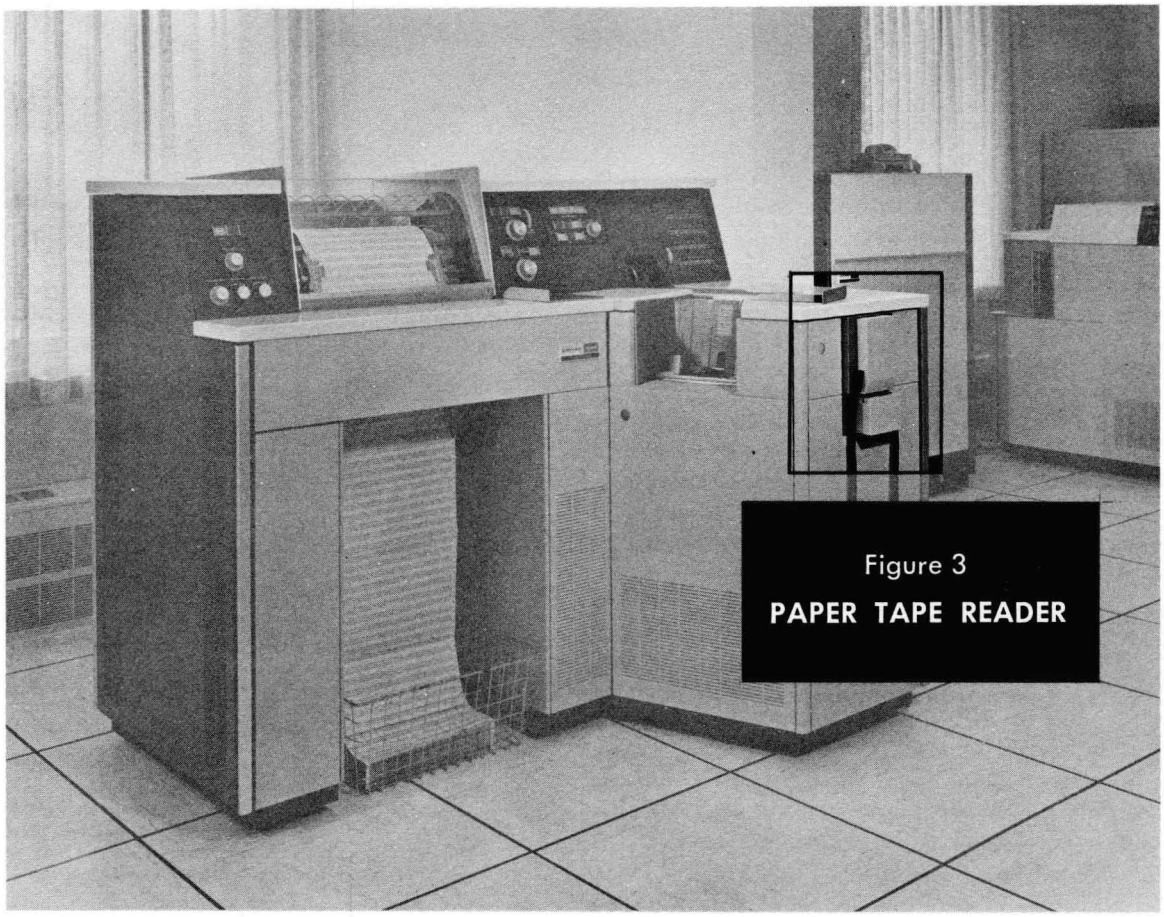
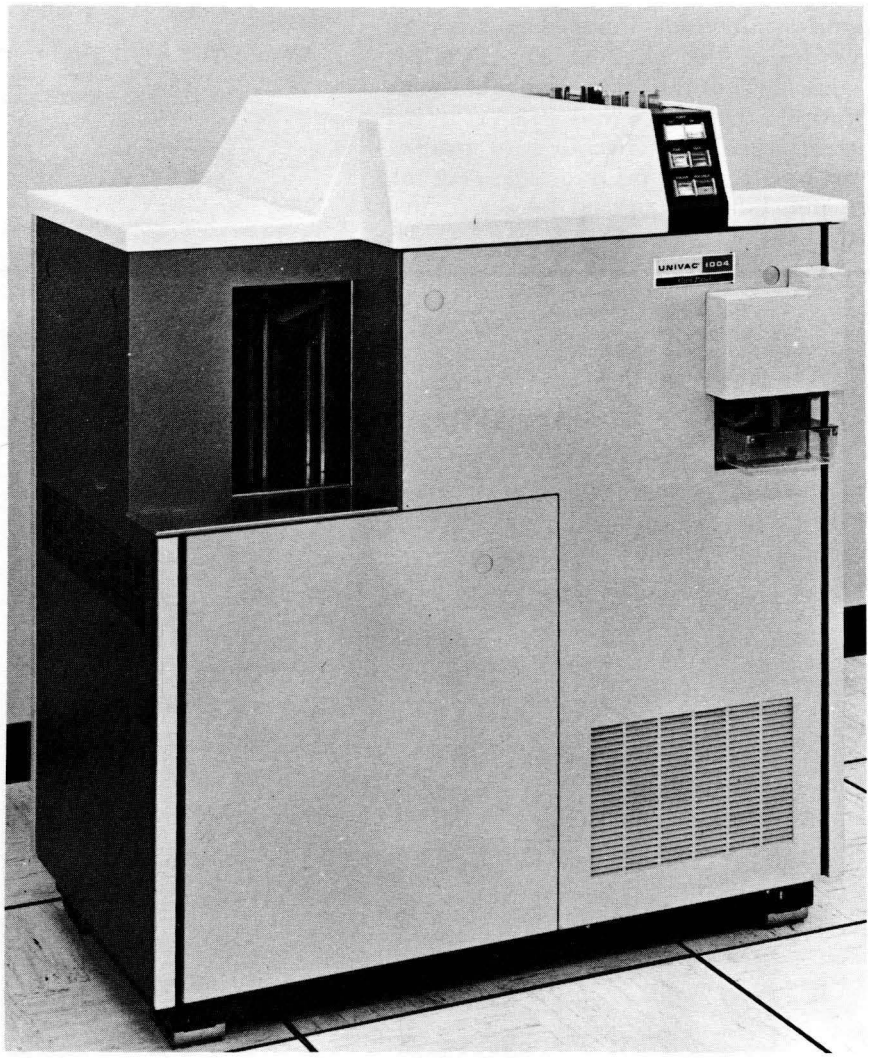


Figure 3
PAPER TAPE READER

Figure 4

CARD PUNCH



CARD PUNCH

The card punch is available as an optional unit (Fig. 4) The punch is directly connected to the 1004 III Processor through an electrical cable. A section of memory is set aside to be used as punch storage. Data to be punched is transferred to this section of storage prior to punching. Punching and processing may take place at the same time.

The speed of the card punch is 200 cards per minute regardless of the amount of information to be punched into the card a row at a time. The capacity of the input hopper is 1000 cards.

There are two output stackers, having a capacity of 1000 cards each. Output cards can be segregated under program control through the use of the optional stacker select feature.

An automatic weighted hole count check is made on all cards punched. If a card is incorrectly punched it will be automatically selected into the output error stacker.

CHARACTERISTICS	1004 III CARD PUNCH
CARDS	80, 90, code image.
PROGRAMMED OPERATIONS	Punch data from programmer adjustable memory into 80 or 90 or code image cards. (optional)
SPEED	200 cards per minute while punching 80 cols.
SIMULTANEITY	Punching overlaps reading, printing and processing.
INPUT/OUTPUT AREAS	A programmer adjustable area in core storage.
DATA PROTECTION	Post hole count is made. Error card is transported to select stacker.
FEED HOPPER/ STACKER CAPACITY	Feed hopper capacity 1000 cards Stacker capacity 1000 cards
NUMBER OF STACKERS	Two
MAXIMUM NUMBER PER SYSTEM	One

READ PUNCH

The read-punch unit reads input data from 80 or 90 column cards at the speed of 200 cards per minute and punches output data into the same cards. The processor may also read 615 cards per minute concurrently giving an overall card reading capability of up to 815 cards per minute. (Fig. 5)

Reading and punching are verified by a weighted hole-count check feature.

CHARACTERISTICS	READ-PUNCH
CARDS	80 to 90 column cards.
PROGRAMMED OPERATIONS	Read input data from, and punch output data into the same cards.
SPEED	200 cards per minute while reading and punching.
SIMULTANEITY	Read-Punch functions do not interlock processor, both reading and punching can overlap printing, processing and reading by the processor.
I/O AREAS	A programmer adjustable area in core memory.
DATA PROTECTION	Reading & Punching are verified by weighted hole count at the post punch station.
FEED HOPPER CAPACITY	1000 cards
NUMBER OF STACKERS	Two
MAXIMUM NUMBER PER SYSTEM	One

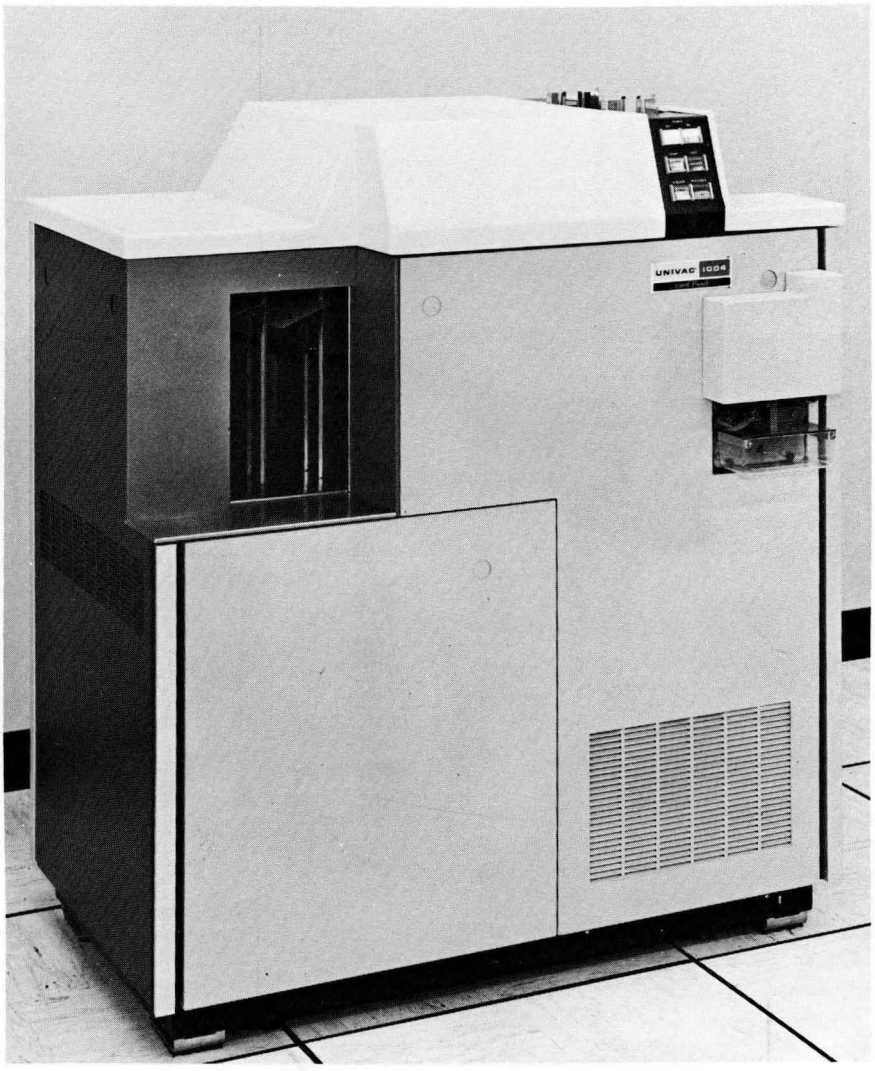


Figure 5

READ PUNCH

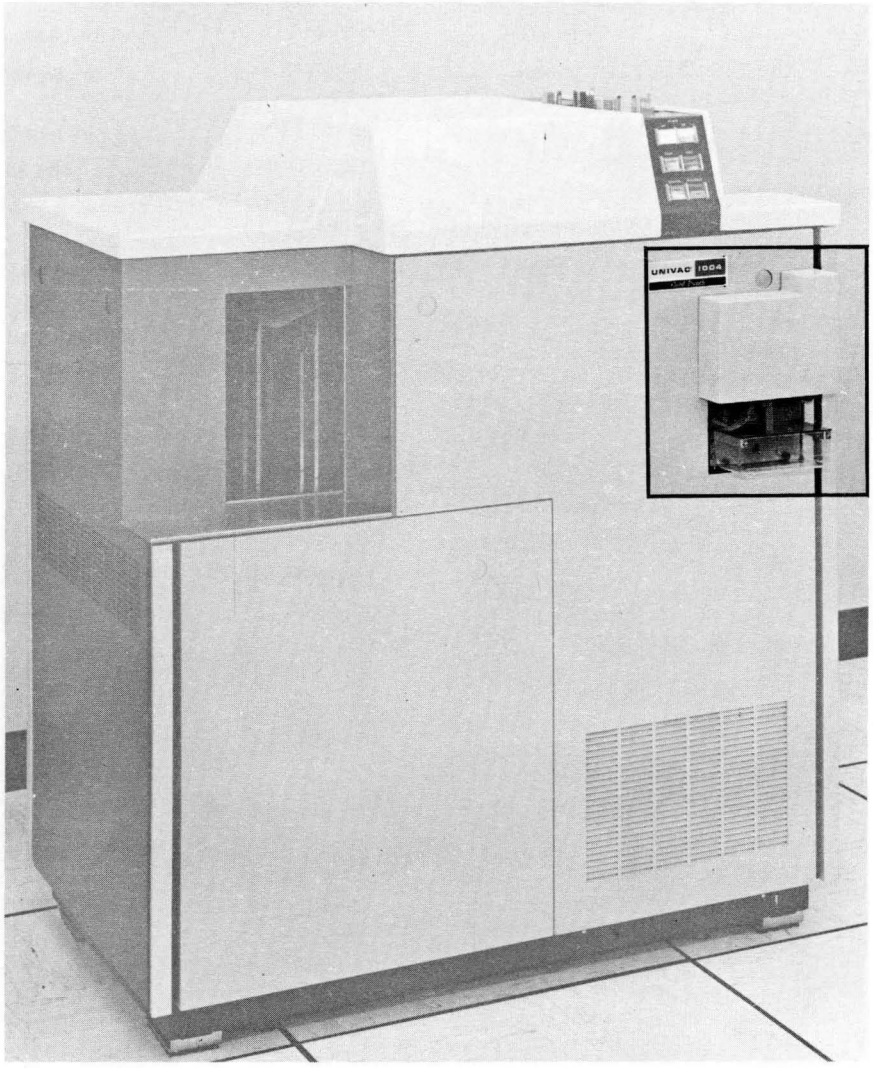


Figure 6

PAPER TAPE PUNCH

PAPER TAPE PUNCH

The paper tape punch is available as an optional unit. It is located on the right front of the card punch. (Fig. 6) 5, 6, 7 or 8 level tape can be punched at a speed of 110 characters per second. The punch is manually adaptable for tape widths of 11/16 and 1 inch.

The punch makes its own sprocket holes, and may be loaded with blank tape in a matter of seconds.

CHARACTERISTICS	PAPER TAPE PUNCH
TAPE	11/16" or 1" paper or mylar tape.
DATA FORMAT	5, 6, 7 and 8 level codes 10 frames per inch.
PROGRAMMED OPERATIONS	Punches variable length blocks of data into tape.
SPEED	110 characters per second.
SIMULTANEITY	Tape punching overlaps Reading, Printing, and Processing.
PUNCH SYSTEM	Die Punch, produces chad tape.
OUTPUT AREA	Programmer adjustable area of core memory.
MAXIMUM NUMBER PER SYSTEM	One

AUXILIARY CARD READER

The auxiliary card reader is a free-standing unit which can be cable-connected to a 1004 III Processor (Fig. 7)

The maximum card feeding rate is 400 cards per minute, reading 80 or 90 column cards serially. The Auxiliary Reader has an input magazine capacity of 1000 cards and three program selectable output stackers, each with a capacity of 1000 cards.

When the auxiliary card reader is used in conjunction with the read-punch unit, 3 input stations are available: processor reader, auxiliary reader and read-punch unit. The capability to read in three different input stations provides the 1004 with power and processing capabilities unobtainable in many large scale data processing systems.

CHARACTERISTICS	AUXILIARY READER
CARDS	80 or 90 column cards
PROGRAMMED OPERATIONS	Three programmer selectable stackers. Number of card columns to be read on each card.
SPEED	400 cards per minute.
SIMULTANEITY	Reading, punching and printing may occur simultaneously.
INPUT AREA	Programmer adjustable area in core memory.
DATA PROTECTION	LIGHT-DARK TEST
FEED HOPPER CAPACITY	1000 cards
STACKER CAPACITY	1000 cards
NUMBER OF STACKERS	Three
MAXIMUM NUMBER PER SYSTEM	One

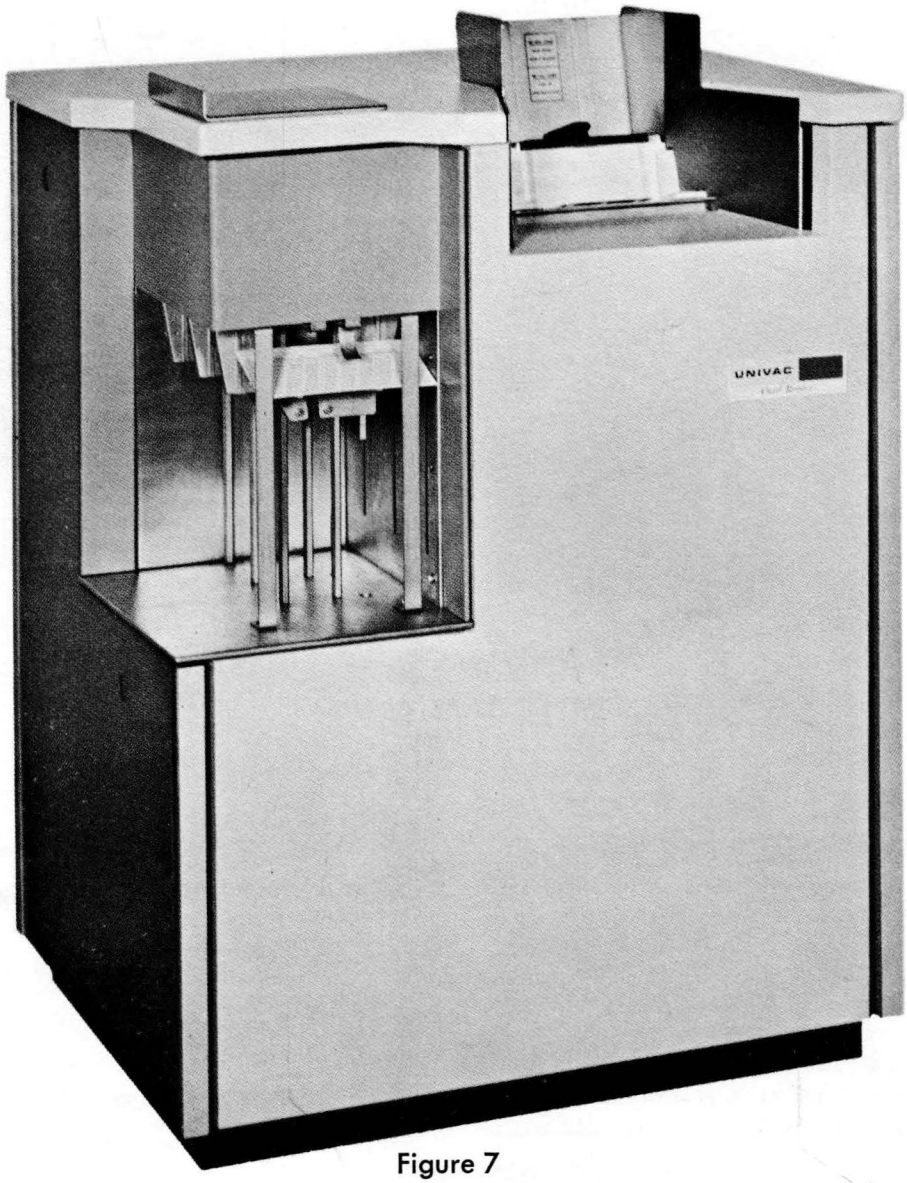


Figure 7

AUXILIARY CARD READER

MAGNETIC TAPE SERVO *

The Magnetic Tape Servo provides the 1004 III the capability of reading and writing IBM compatible tapes at densities of 200, 556 and 800 characters per inch in the IBM NRZI fashion.

This format is used directly by the 1004 III system; no conversion on other equipment is required. One or two magnetic tape servos may be connected to the 1004 III. It is possible to use a UNIVAC compatible tape on one servo while another IBM compatible tape is in use on the other servo, i.e., Read/Write BCD on servo #1 and Read/Write 1004 internal code or another 6 level code on servo #2.

Hardware checks odd or even parity at programmer's option.

Data is protected by the removal of the write ring. Servo control panel indicates write ring insertion.

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* Refer to Sec. 3 for detailed information.

CHARACTERISTICS	1004 III MAGNETIC TAPE SERVO
TAPE	2400' reels of Mylar tape
DATA FORMAT	Variable blocks separated by 3/4" interblock gap. 6 bit characters may be read or written at 200, 556 or 800 characters per inch.
PROGRAMMED OPERATIONS	Read forward, write forward, backspace one block, transport select and rewind.
READ/WRITE SPEED	42.08 inches per second
REWIND SPEED	Less than 3 minutes per 2400 foot reel.
DATA TRANSFER	
200 PPI	8416 characters per second
556 PPI	23396 characters per second
800 PPI	33664 characters per second
I/O AREA	May be any area in storage designated by the programmer.
DATA PROTECTION	Write ring must be inserted before servo will accept data. Servo control panel warns operator of insertion of write ring. Parity check
MAXIMUM NUMBER OF UNITS	Two units per system.
SIMULTANEITY	Reading/Writing, Punching, may occur on same step.

Figure 8

MAGNETIC TAPE SERVO

DATA LINE TERMINAL

The UNIVAC 1004 Data Line Terminal is designed to operate with the Bell System 201A or 201B DATA PHONE Data Set or its equivalent for the direct transmission of data between UNIVAC 1004 Card Processors regardless of their distance of separation. This intercommunication can also be between a UNIVAC 1004 and a UNIVAC 490 Real-Time System or a UNIVAC 1107 System.

This direct and immediate data communication, coupled with the many editing and processing abilities of the UNIVAC 1004, can result in a high degree of efficiency in the data transmission and reduction in the overall cost of the data processing operation.

1004 III MAGNETIC TAPE SYSTEM

MAGNETIC TAPE CHARACTERISTICS

Magnetic tape is used for permanent storage of large files and recording intermediate computation of data.

A 1004 III may have 1 or 2 servos (Fig. 8). A single servo accepts a 2400 ft. reel of plastic tape with data recorded (or to be recorded) at a density of 200,556 or 800 PPI.

One 2400 ft. reel of UNIVAC magnetic tape weighs 45 ozs., is 10½" in diameter and will record data that would fill 175,000 to 225,000 90 or 80 column cards.

Magnetic tape servos do actual reading and writing of data as directed by the computer.

Information may be erased and corrected or updated when working with magnetic tape so that it can be used again and again.

COMPATIBILITY

The Magnetic Tape system makes the UNIVAC 1004-III completely compatible with IBM Non-Return-To-Zero mode of recording, used by a number of business, industry and government offices for data handling. This format is used directly by the 1004 III system, no conversion on other equipment is required. Tapes may be written or read by unrelated data processing equipment (IBM, CDC, Honeywell, etc.) in the binary coded decimal/binary, non-return-to-zero format. It is possible to use a UNIVAC 1004 tape on one servo while using an IBM Compatible tape on the other servo.

INPUT/OUTPUT AREAS

Any area in storage may be designated as input or output areas when reading or writing with 1004 Magnetic Tape Servos. Input or output area may consist of 1 to 961 characters.

When reading from magnetic tape, the area which is designated in operand 2 will receive the data read from tape, i.e., data may be read directly into Print Storage and printed without another transfer. Data in Read Storage may be designated as operand 1 and transferred to tape.

When reading or writing on magnetic tape operand 1 may be any location. The operand 1 location will have not any effect on data transfer.

TRANSFER RATES

The table below shows the character transfer rate for the 1004 III Magnetic Tape Servo.

Reading or Writing at 200 PPI provides 8,416 character per second transfer rate.

Reading or Writing at 556 PPI provides 23,396 character per second transfer rate.

Reading or Writing at 800 PPI provides 33,640 character per second transfer rate.

THROUGH-PUT SPEED EXAMPLES

A. CARD-TO-TAPE
In the card-to-tape operation a block may be written on to tape at the rate of up to 615 cards per minute.

B. TAPE-TO-PRINT
In the tape-to-print operation tape may be read from 80 character blocks and printed up to 600 lines per minute, the maximum printing speed.

C. CARD-TO-TAPE and TAPE-TO-PRINT (SIMULTANEOUSLY)
The 1004 III has the capability of reading and writing tape concurrently. The speeds that can be attained are writing up to a rate 615 cards per minute and printing up to a rate of 600 lines per minute.

INSTRUCTIONS

HUB SIGNAL	HUB LOCATION	FUNCTION
Transport Select	A9	When pulsed, indicates 2nd magnetic tape unit
Release Hub	A12	Release a A pulse during any tape operation
Data Ignore Control	A13	Selective reading of mag tape blocks in excess of 961 char.
Last Character	A14	Signals last character on write operation
Even Parity Check (EVP)	A32	Allows selection for even parity check
High Gain (H/G)	A40	Determines high gain
Read Mag Tape (AD)	A75	Magnetic Tape Read Order
Write Mag Tape (WR)	A76	Magnetic Tape Write Order
Backspace (B)	A77	Magnetic Tape Backspace Order
Tape Interlock (TINT)	A78	Interlocks processor
Tape Error	A79	Parity error check
End of Tape	A80	Indicates end of tape

Refer to fold-out connection panel at the back of the manual. 1004 III Magnetic Tape Servo Operations

OPERATIONS

Tape Read

Step Output to	AD SI D 80/90 End Compress
T'INT.	D INS Start Compress

Tape Write

Step Output to	W Trf. (A or D) 80/90 End Compress
T'INT.	D INS Start Compress
Address Combines to	Last Char. Hub
Operand 2	Allow four spaces to follow last character.

Backspace

Step Output to	AD SI D 80/90 End Compress
T'INT.	D INS Start Compress

Tape Write

Step Output to	W Trf. (A or D) 80/90 End Compress
T'INT.	D INS Start Compress
Address Combines to	Last Char. Hub
Operand 2	Allow four spaces to follow last character.
Step Output to	B

operands should be one character in length for spacing back one block

Rewind

Step Output to	B W AD

operands should be one character in length

DATA PROTECTION

When a read error, write error or bad spot occurs on the tape an impulse is available for program recovery.

Data is protected by the removal of the write ring. The UNIVAC 1004 III Magnetic Tape Servo Control panel warns operator of write ring insertion.

SERVO OPTIONS

The 1004 III can be equipped with one or two magnetic tape servos.

The 1004 III Magnetic Tape Servo is 69 inches high by 24¾ inches wide by 31½ inches and weighs approximately 470 pounds. A dual unit will increase the width by 25 inches and the weight by 450 pounds.

The 1004 III Magnetic Tape Servos are finished to match the 1004 III System.

The servos operate on 115 volts as does the rest of the 1004 III System.

CODES

The 1004 III processor is a character oriented machine. The machine code of the processor is XS-3 or 90-column card code. Figure 9 shows the card, tape and processor codes possible with the 1004 III.

80 Column	BCD	XS3	90 Column
A 12-1	A 11 0001	A 01 0100	A 1-5-9
B 12-2	B 11 0010	B 01 0101	B 1-5
C 12-3	C 11 0011	C 01 0110	C 0-7
D 12-4	D 11 0100	D 01 0111	D 0-3-5
E 12-5	E 11 0101	E 01 1000	E 0-3
F 12-6	F 11 0110	F 01 1001	F 1-7-9
G 12-7	G 11 0111	G 01 1010	G 5-7
H 12-8	H 11 1000	H 01 1011	H 3-7
I 12-9	I 11 1001	I 01 1100	I 3-5
J 11-1	J 10 0001	J 10 0100	J 1-3-5
K 11-2	K 10 0010	K 10 0101	K 3-5-9
L 11-3	L 10 0011	L 10 0110	L 0-9
M 11-4	M 10 0100	M 10 0111	M 0-5
N 11-5	N 10 0101	N 10 1000	N 0-5-9

80 Column	BCD	XS3	90 Column
O 11-6	O 10 0110	O 10 1001	O 1-3
P 11-7	P 10 0111	P 10 1010	P 1-3-7
Q 11-8	Q 10 1000	Q 10 1011	Q 3-5-7
R 11-9	R 10 1001	R 10 1100	R 1-7
S 0-2	S 01 0010	S 11 0101	S 1-5-7
T 0-3	T 01 0011	T 11 0110	T 3-7-9
U 0-4	U 01 0100	U 11 0111	U 0-5-7
V 0-5	V 01 0101	V 11 1000	V 0-3-9
W 0-6	W 01 0110	W 11 1001	W 0-3-7
X 0-7	X 01 0111	X 11 1010	X 0-7-9
Y 0-8	Y 01 1000	Y 11 1011	Y 1-3-9
Z 0-9	Z 01 1001	Z 11 1100	Z 5-7-9
∅ 0	∅ 00 1010	∅ 00 0011	∅ 0
1 1	1 00 0001	1 00 0100	1 1

Figure 9

80 Column	BCD	XS3	90 Column
2 2	2 00 0010	2 00 0101	2 1-9
3 3	3 00 0011	3 00 0110	3 3
4 4	4 00 0100	4 00 0111	4 3-9
5 5	5 00 0101	5 00 1000	5 5
6 6	6 00 0110	6 00 1001	6 5-9
7 7	7 00 0111	7 00 1010	7 7
8 8	8 00 1000	8 00 1011	8 7-9
9 9	9 00 1001	9 00 1100	9 9
& 12	+ 11 0000	& 01 0000	& 0-1-3-5-7
— 11	— 10 0000	— 00 0010	— 0-3-5-7
? 12-0	? 11 1010	? 01 0011	? 0-1-3
! 11-0	! 10 1010	! 10 0011	! 0-3-7-9
/ 0-1	/ 01 0001	/ 11 0100	/ 3-5-7-9
+ 2-8	↯ 01 0000	+ 11 0011	+ 1-5-7-9
# 3-8	# 00 1011	# 01 1101	# 0-1-5-7
@ 4-8	‘ 00 1100	@ 10 1110	@ 0-1-3-7
: 5-8	: 00 1101	: 01 0001	: 1-3-7-9
>6-8	>00 1110	>11 1110	>0-3-5-7-9

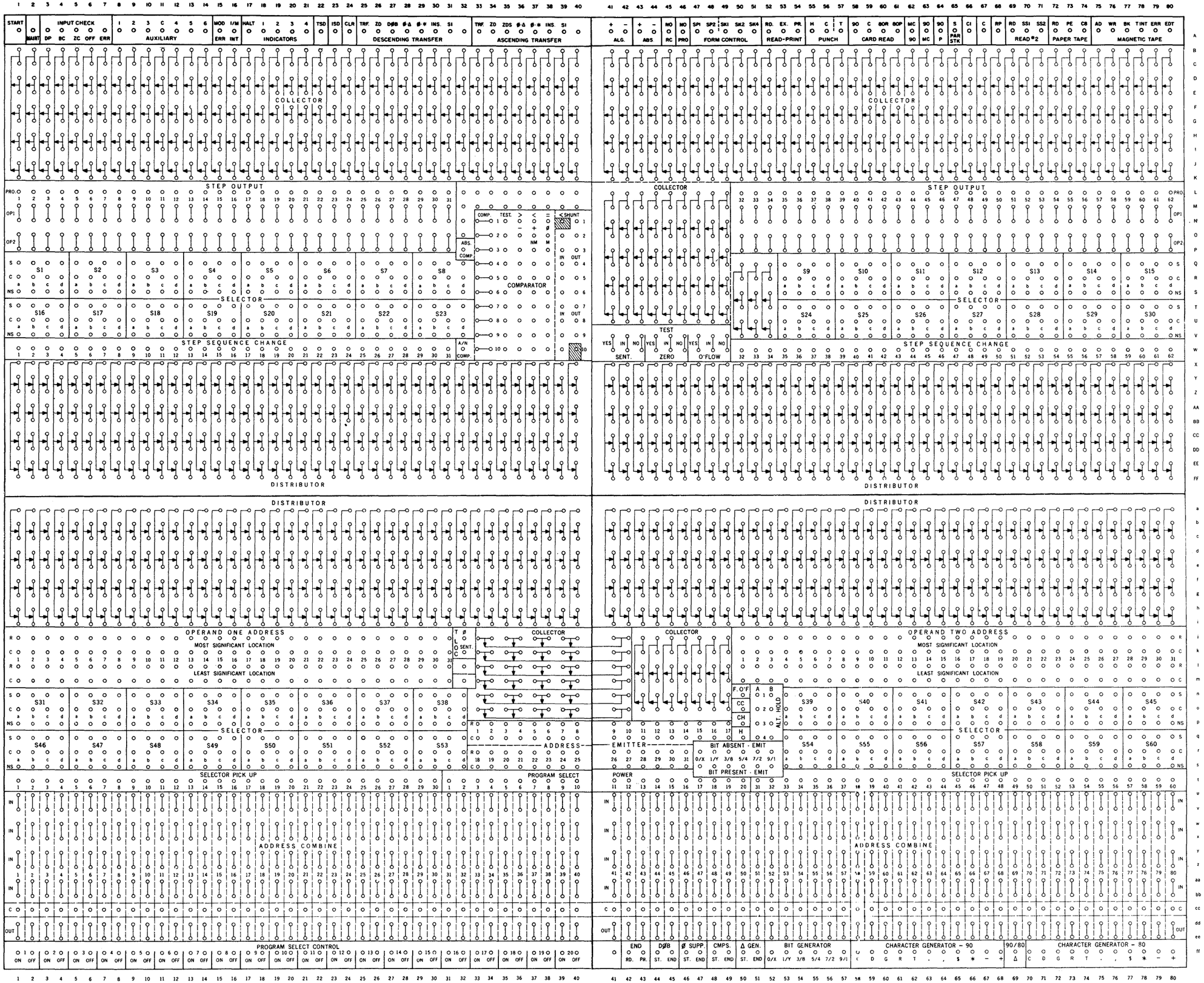
80 Column	BCD	XS3	90 Column
’ 7-8	√ 00 1111	’ 10 0000	’ 0-1-5-7-9
· 12-3-8	· 11 1011	· 01 0010	· 1-3-5-9
✧ 12-4-8	) 11 1100	✧ 11 1101	✧ 0-1-3-9
[12-5-8	[11 1101	[00 1111	[0-5-7-9
< 12-6-8	< 11 1110	< 01 1110	< 0-1-5-9
= 12-7-8	≠ 11 1111	= 01 1111	= 0-1-3-5-7-9
$ 11-3-8	$ 10 1011	$ 10 0010	$ 0-1-3-5-9
* 11-4-8	* 10 1100	* 10 0001	* 0-1
] 11-5-8	] 10 1101	] 00 0001	] 1-3-5-7
; 11-6-8	; 10 1110	; 00 1110	; 1-3-5-7-9
▲ 11-7-8	▲ 10 1111	▲ 10 1111	▲ 0-1-7
≠ 0-2-8	‡ 01 1010	≠ 11 0000	≠ 0-1-7-9
’ 0-3-8	’ 01 1011	’ 11 0010	’ 0-3-5-9
% 0-4-8	% 01 1100	% 11 0001	% 0-1-5
(0-5-8	¥ 01 1101	(10 1101	(0-1-9
\ 0-6-8	\ 01 1110	\ 00 1101	\ 0-1-3-7-9
) 0-7-8	⧺ 01 1111	) 11 1111	) 0-1-3-5
Space N.P. 01 0000	Space N.P. 00 0000	Space N.P.	Space N.P.

1004 III CONNECTING PANEL

FOLD OUT

UNIVAC® 1004
CARD PROCESSOR

CONNECTION PANEL DIAGRAM



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