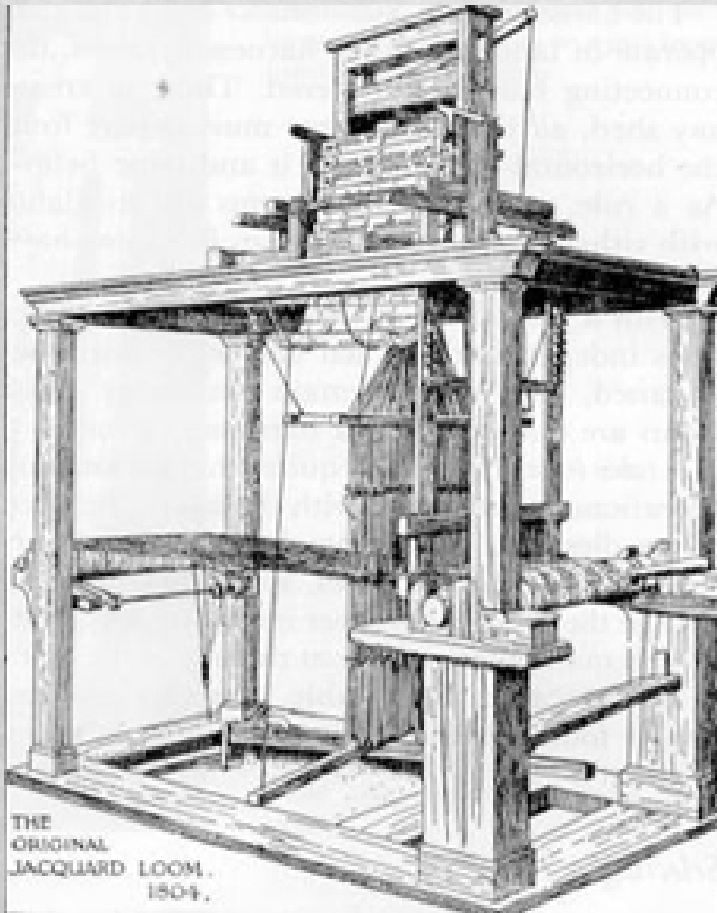


The Evolution of Information Technology: Origins

Ian King, Sr. Vintage Systems Engineer
Living Computer Museum
Vulcan, Inc.

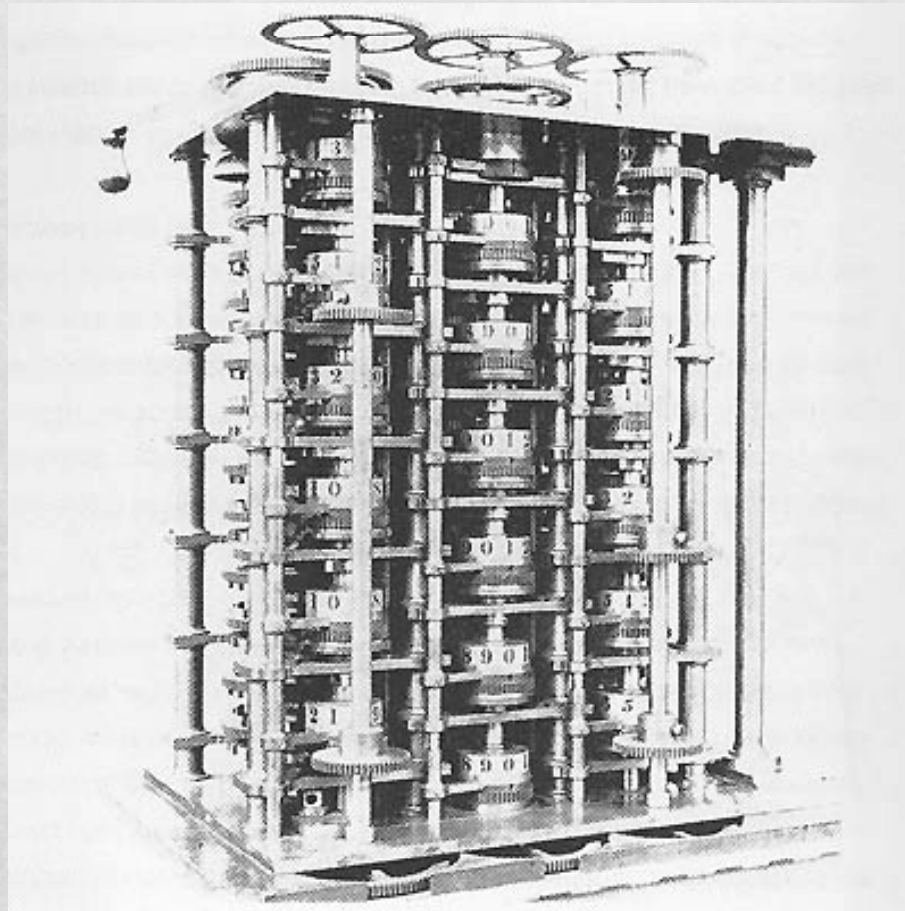
Before the beginning: process automation



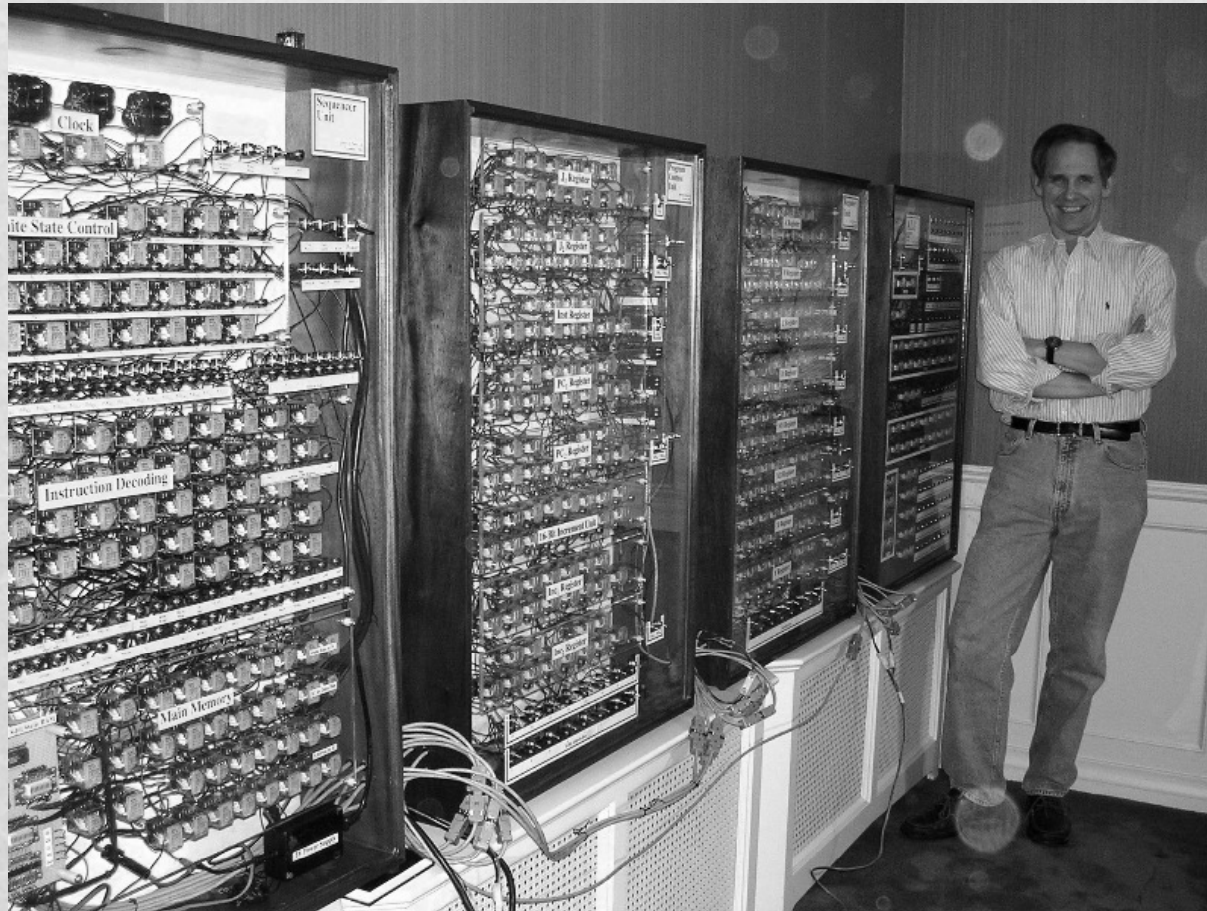
Before the beginning: tabulation



Before the beginning: automated calculation



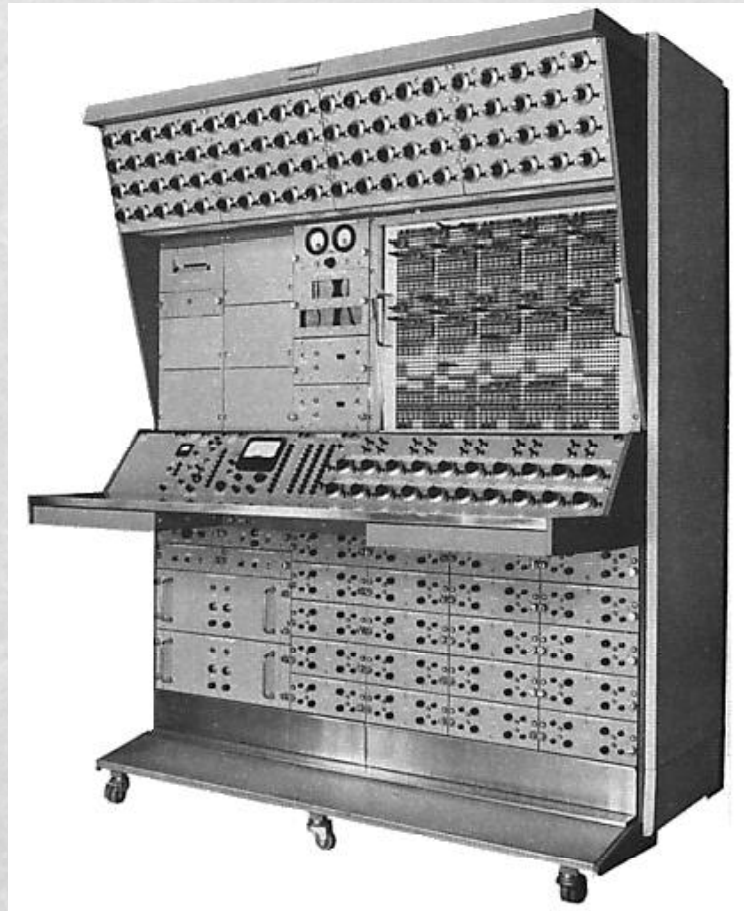
Electronic digital computer



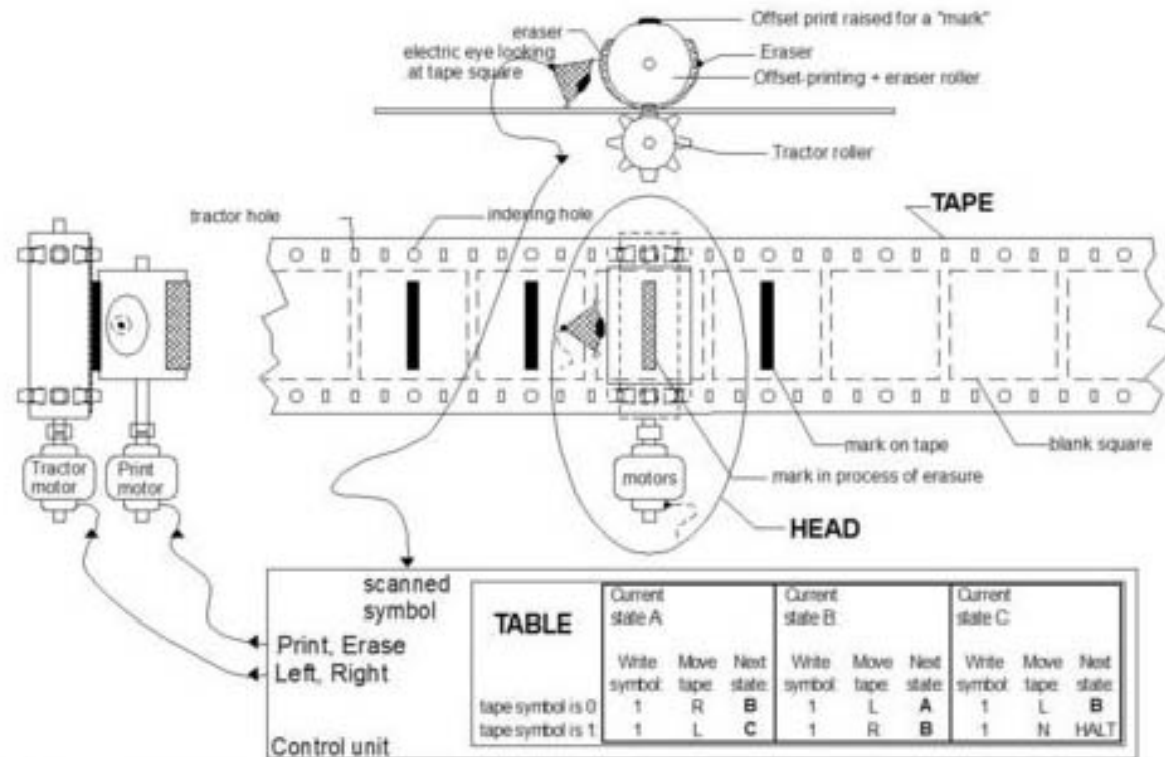
Electronic digital computer



Electronic digital computer

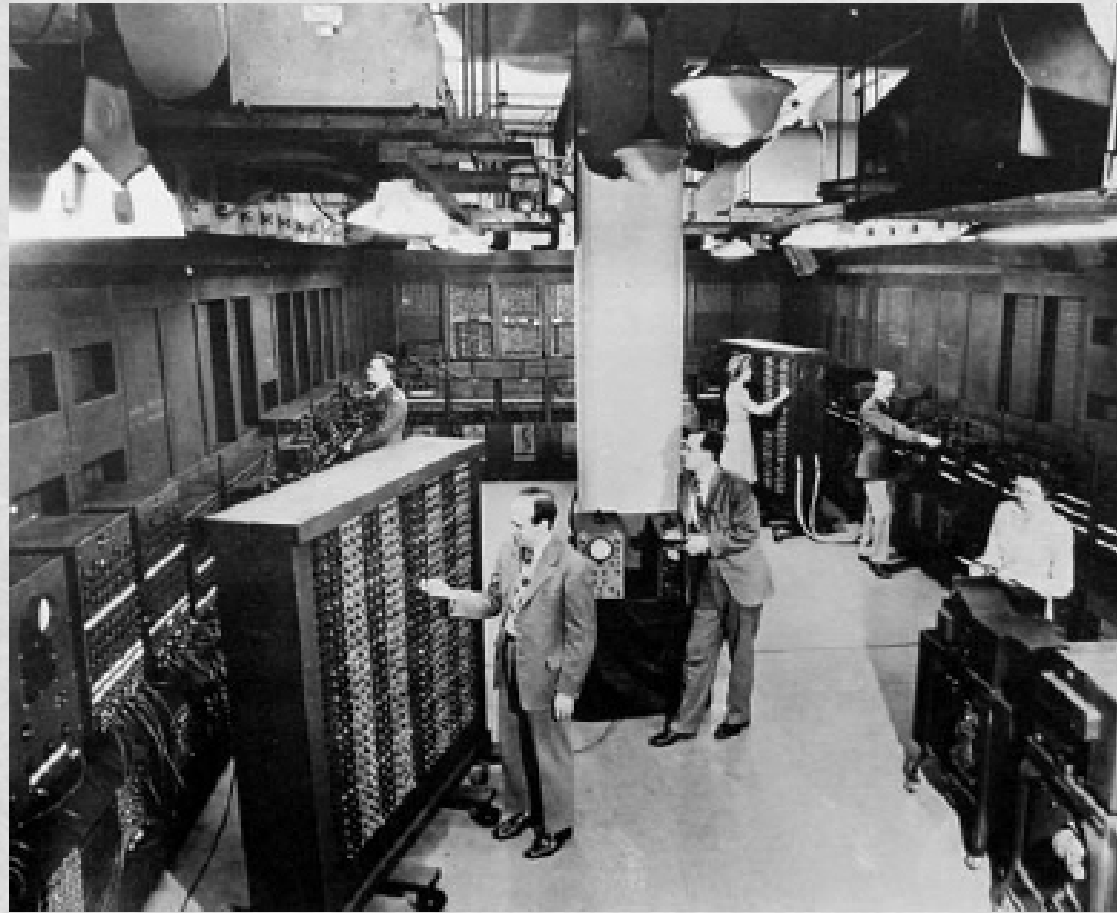


Electronic digital computer

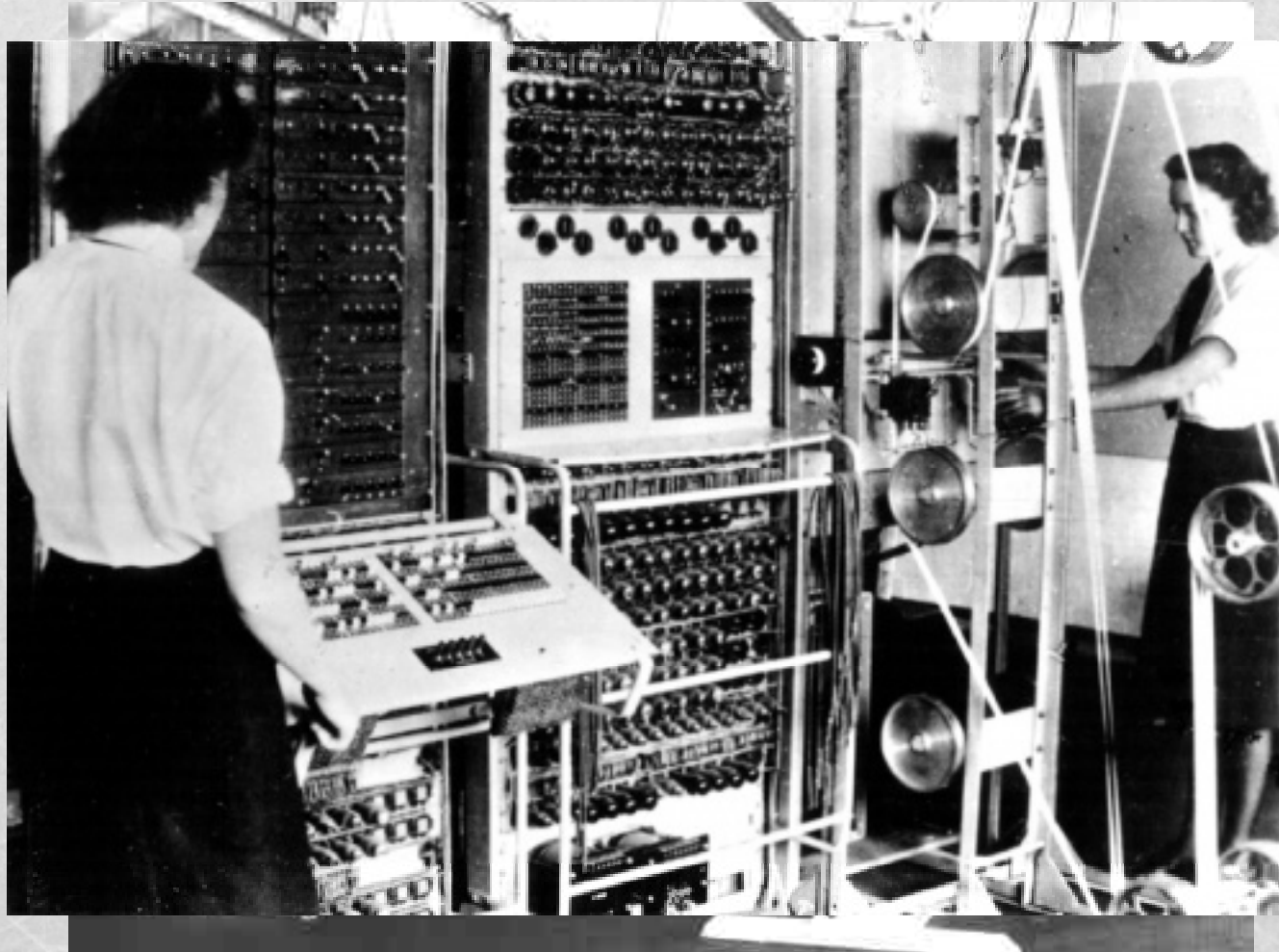


A fanciful mechanical Turing machine's TAPE and HEAD. The TABLE instructions might be on another "read only" tape, or perhaps on punch-cards. Usually a "finite state machine" is the model for the TABLE.

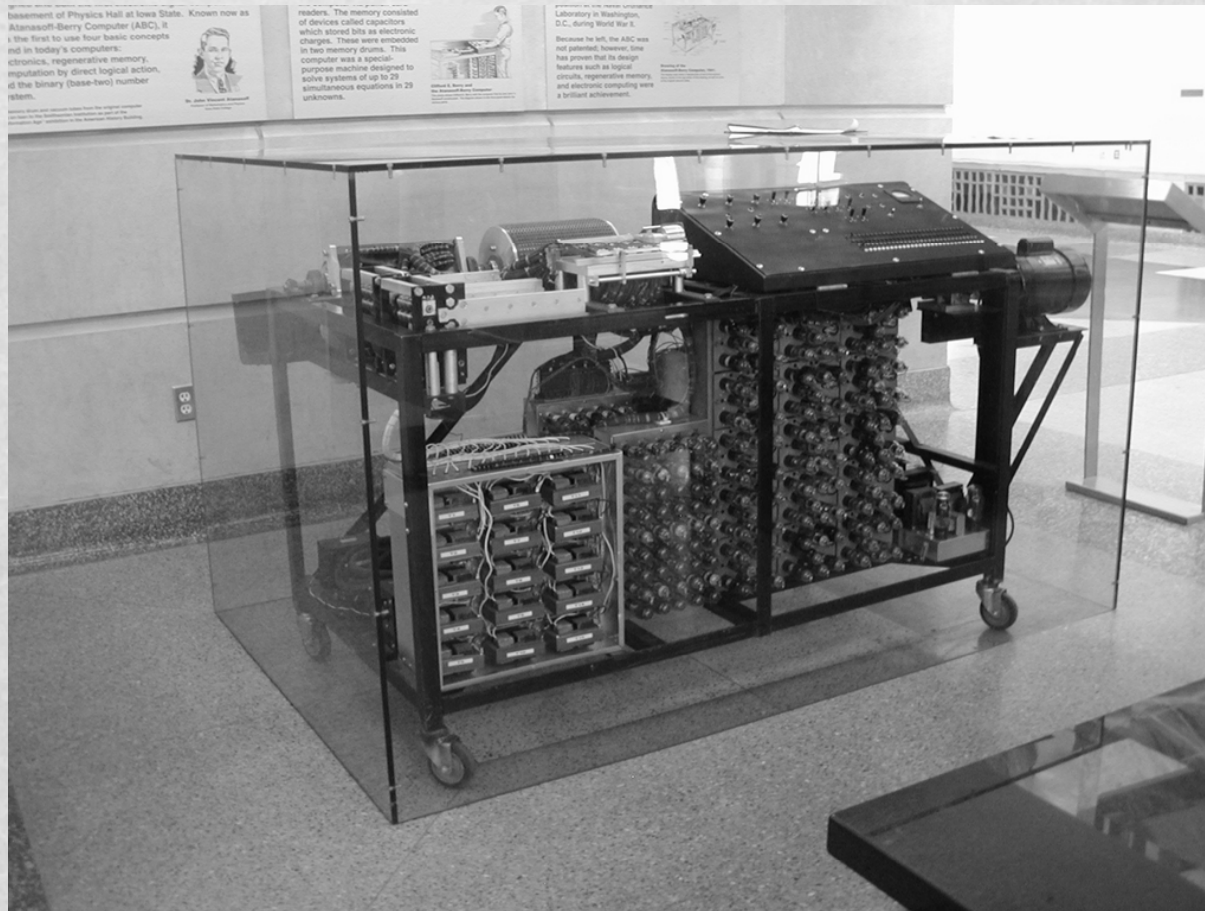
First (?) electronic digital computer



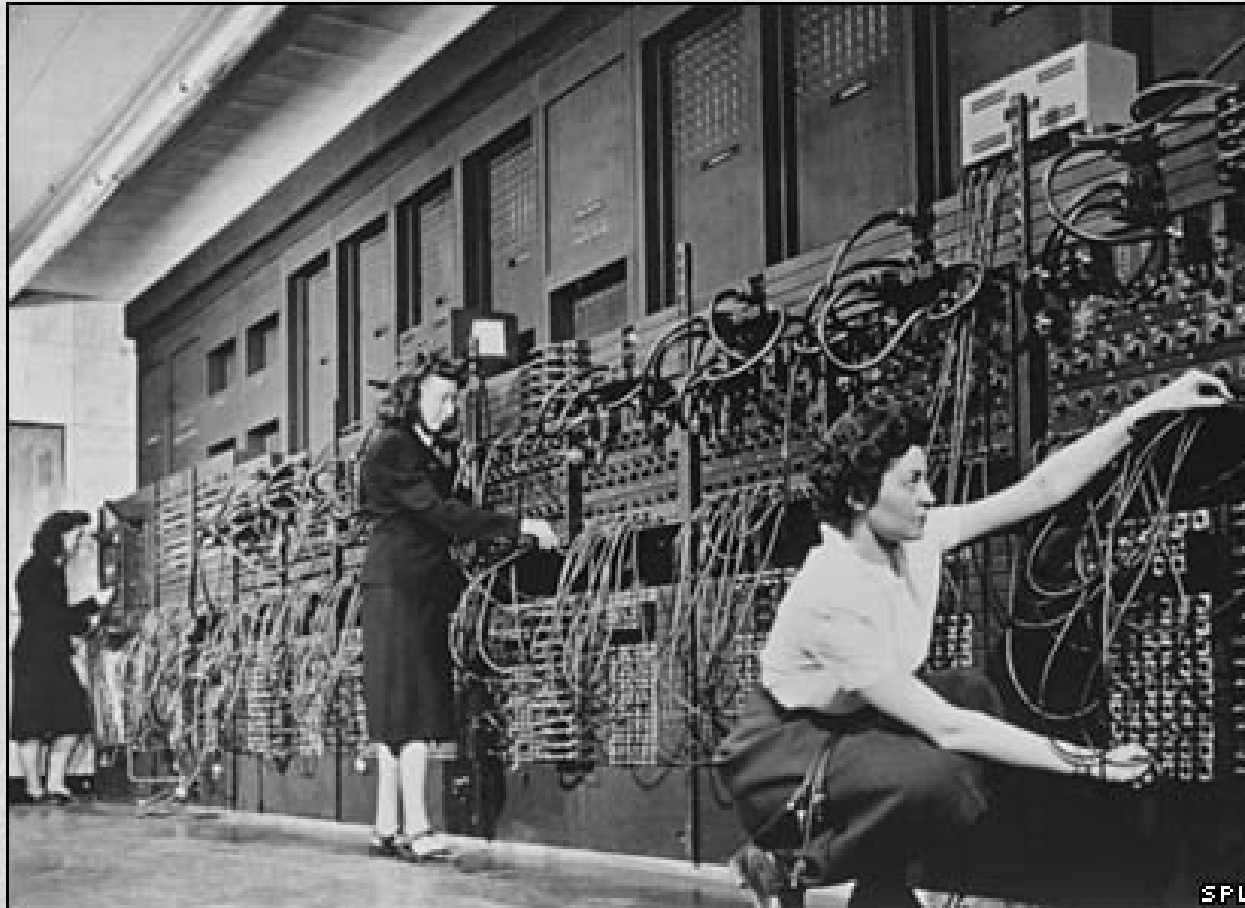
First (?) electronic digital computer



First (!) electronic digital computer



Programming the ENIAC



Program? Data?

The von Neumann approach

0010 0101 0001

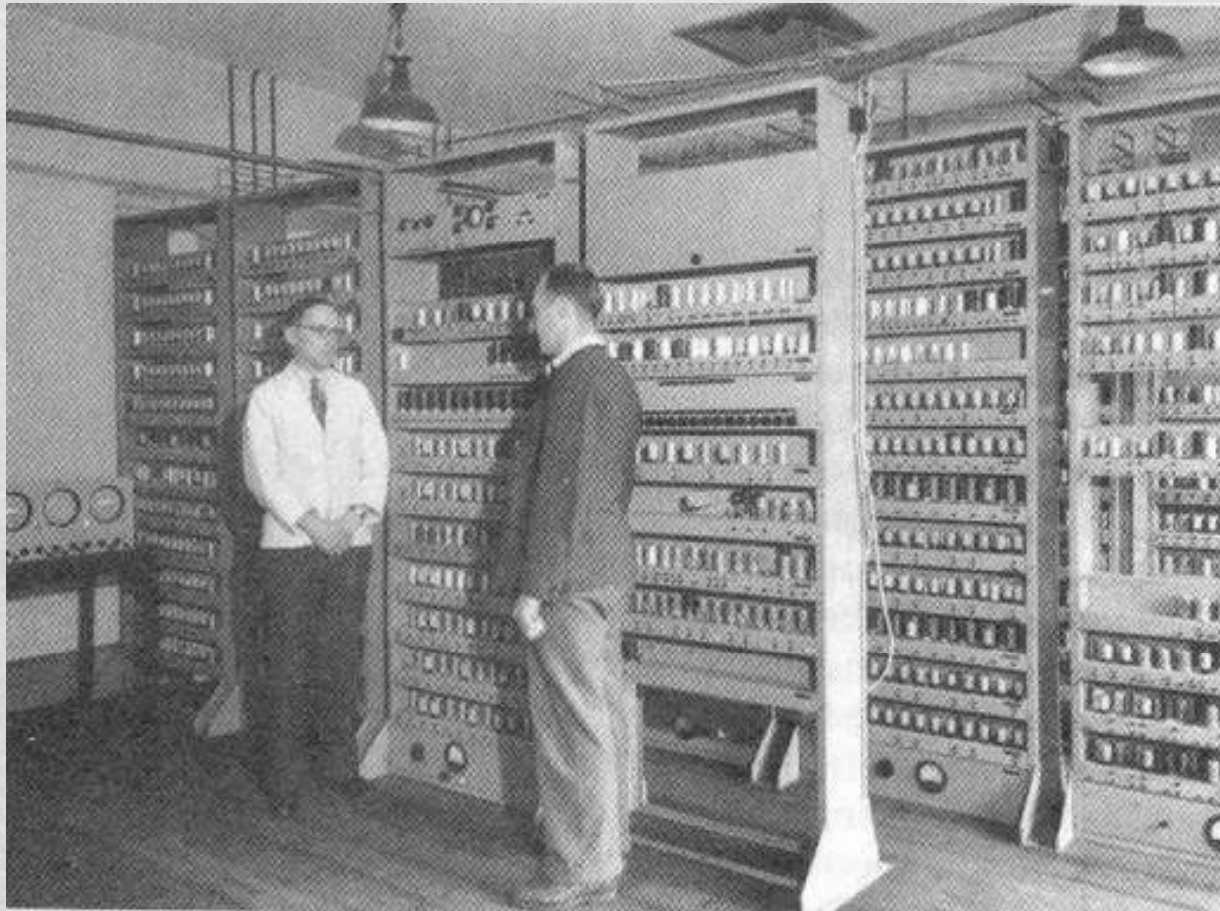
593₁₀

'IQ'

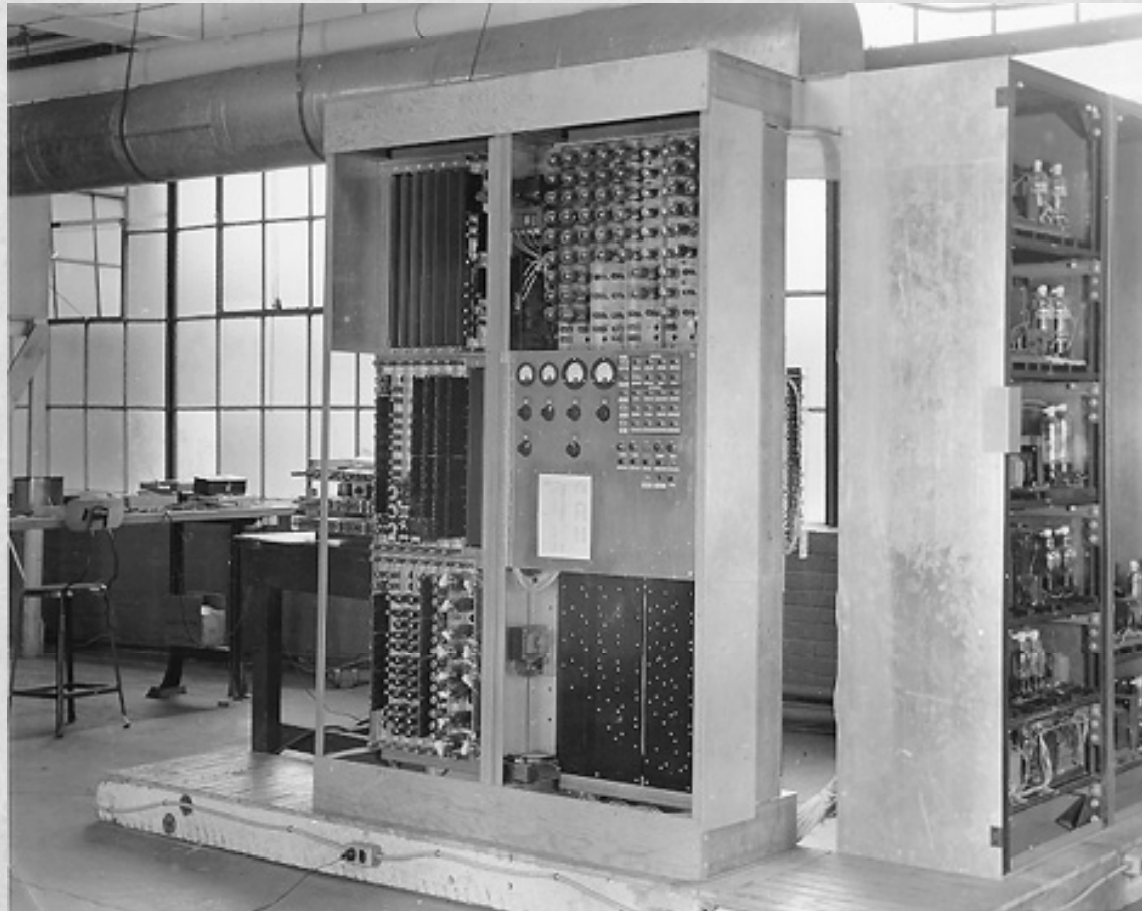
TAD 0001

➤ two's complement add, $AC \leftarrow (\text{location } 0001) + AC$

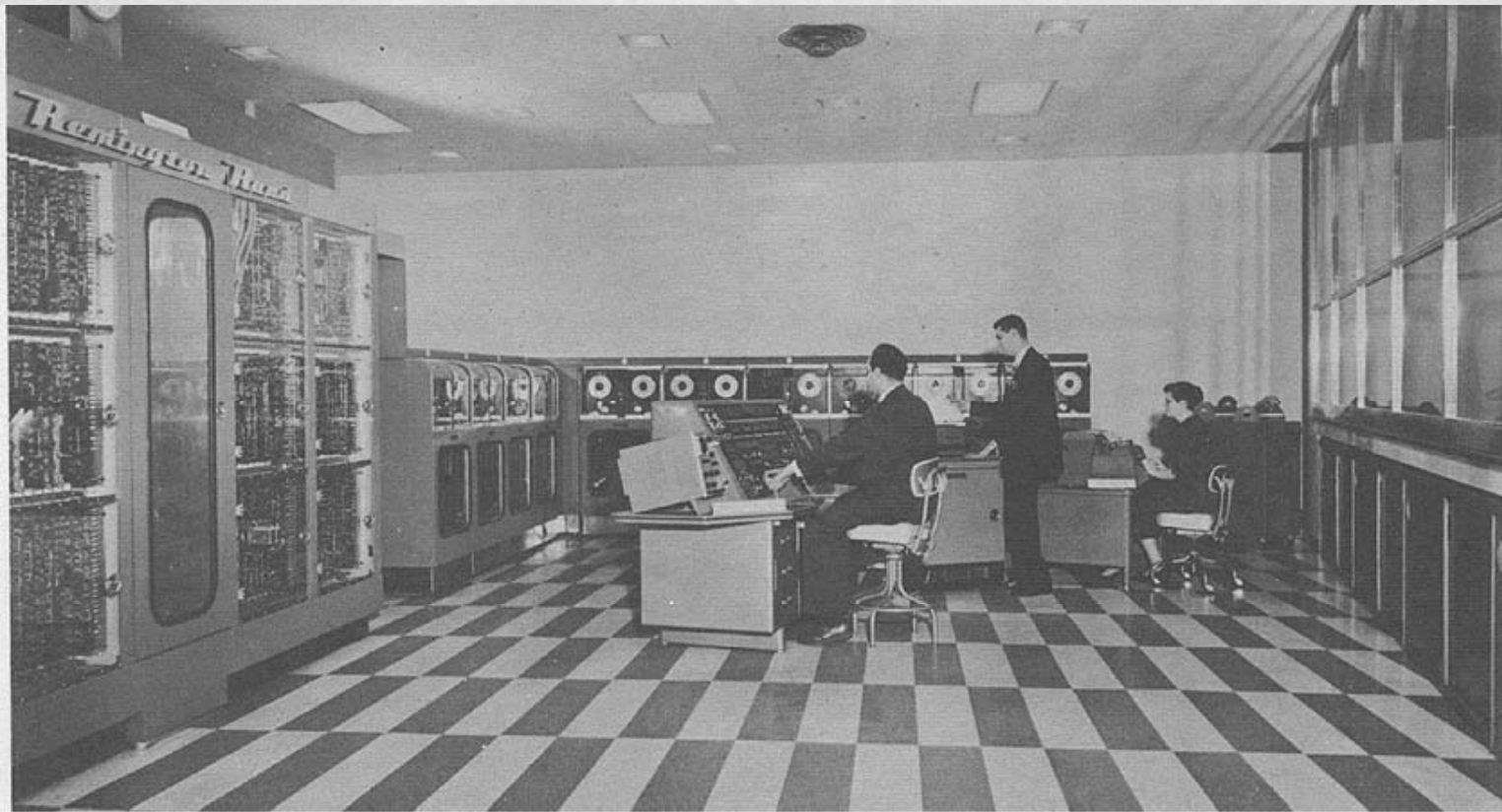
Stored Program Electronic Digital Computer



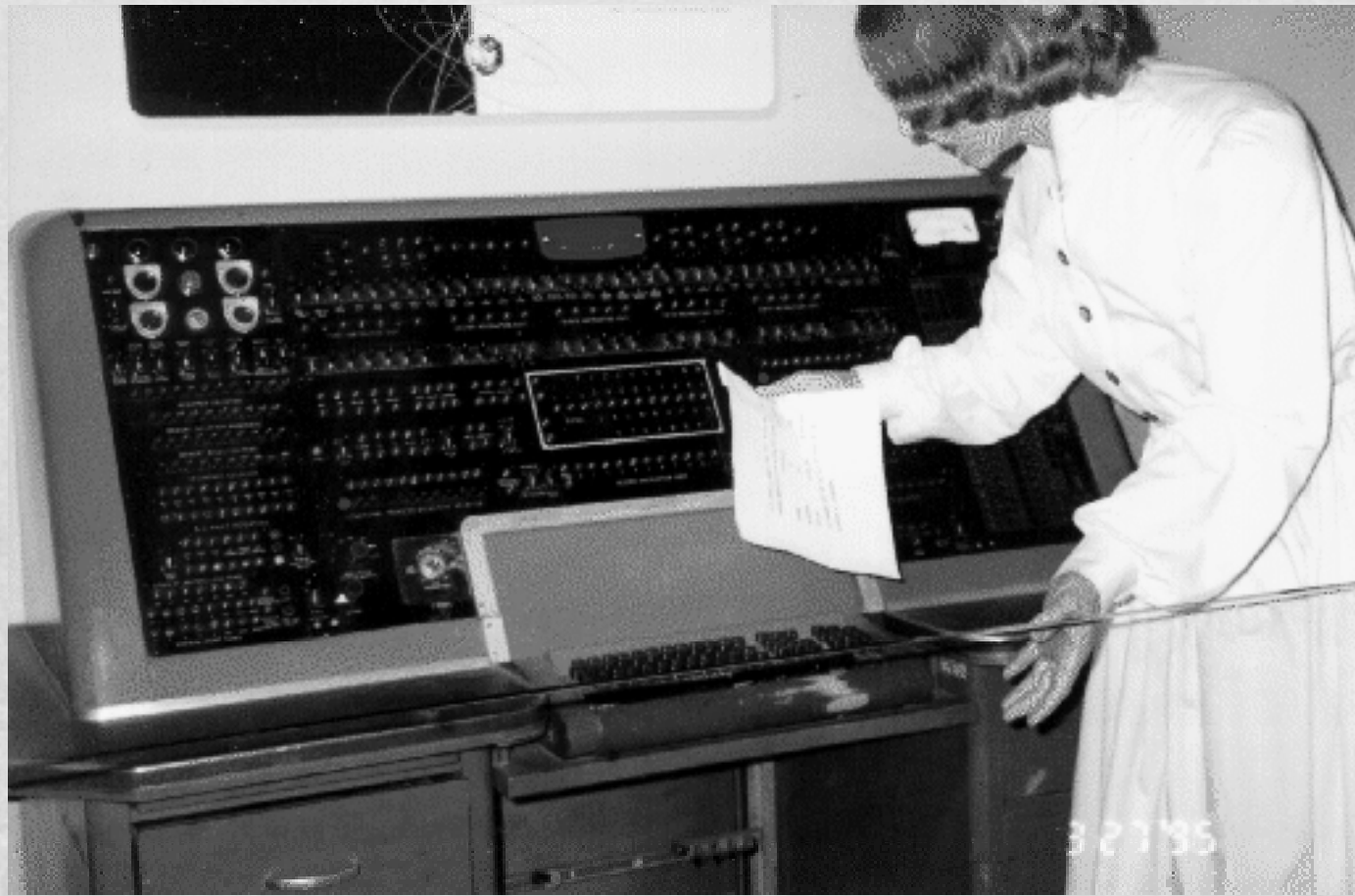
Stored Program Electronic Digital Computer



UNIVAC I

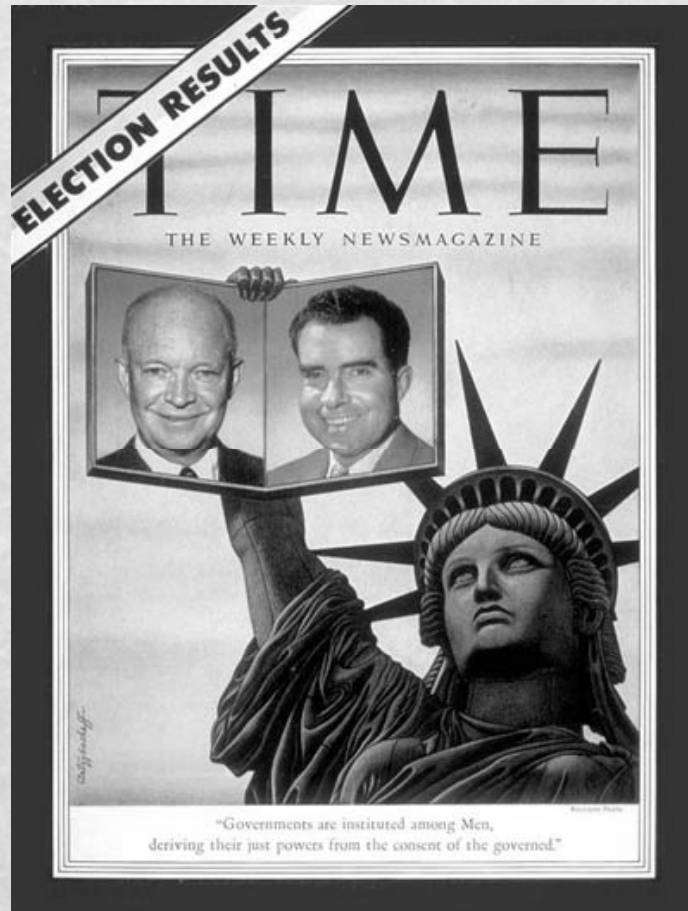


UNIVAC I



32195

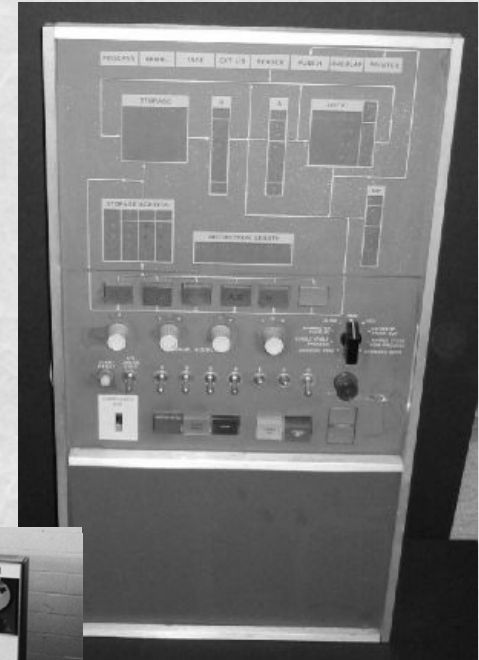
UNIVAC I



And what of IBM?



IBM's greatest hits



IBM System/360



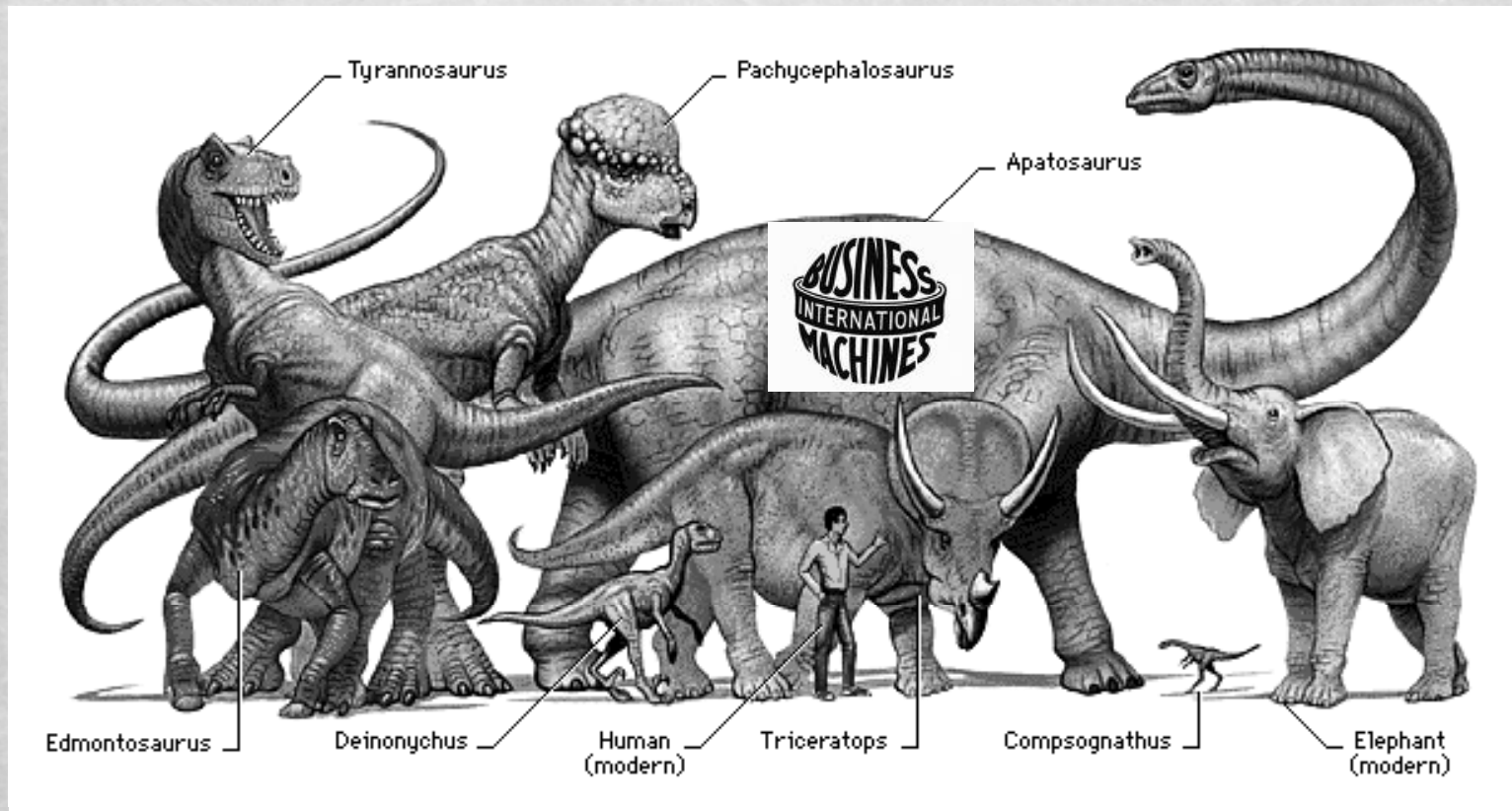
IBM System/360



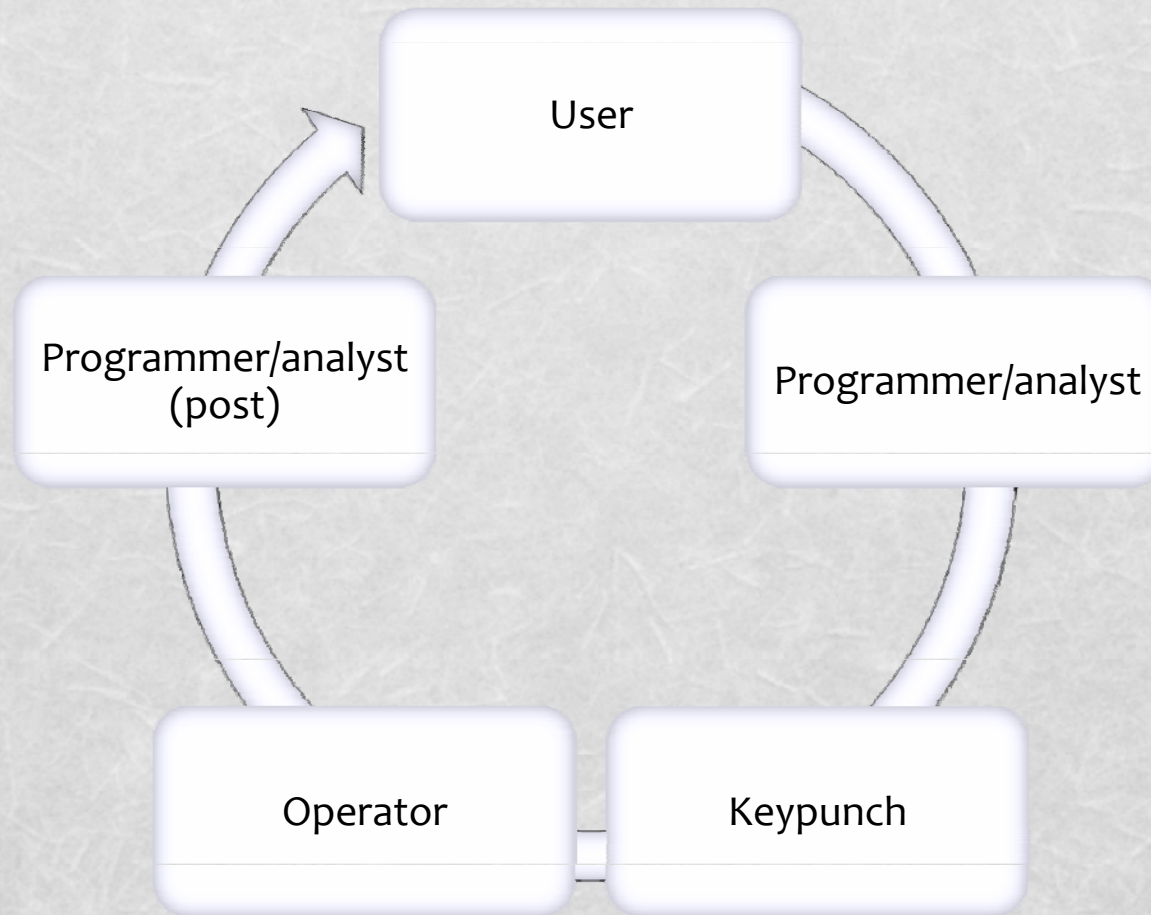
IBM System/360



When dinosaurs ruled the earth



When dinosaurs ruled the Earth



Programming paradigms

LQP-30 CODING SHEET Page 1 of 5

Job No. _____ Program No. 13.0 Prepared by W. Kaye Date 10/18/56

Problem HEXADECIMAL PUNCH OF PRINT Track

Program Input Codes	Stop	Location	Instruction Op. Address	Stop	Contents of Address	Notes
<u>0.0.0</u>						
<u>1.0.0</u>	<input checked="" type="checkbox"/>					
		<u>00.0.0</u>	<u>B.0.1.6.2</u>		<u>A0130</u>	
		<u>0.1</u>	<u>H.0.1.5.1</u>			<u>TO PRINT INIT. ZEROS</u>
		<u>0.2</u>	<u>B.0.1.4.5</u>		<u>6@27</u>	
		<u>0.3</u>	<u>V.0.0.0.4</u>	<input checked="" type="checkbox"/>		
		<u>0.4</u>	<u>H.0.1.2.8</u>		<u>word ctr.</u>	<u>Count words / line</u>
		<u>0.5</u>	<u>C.0.1.5.5</u>		<u>digit ctr.</u>	<u>Count digits / word</u>
		<u>0.6</u>	<u>x.P.0.0.0.0</u>			<u>{ Read Lo + Lf</u> <u>in decimal</u>
		<u>0.7</u>	<u>x.I.0.0.0.0</u>	<input checked="" type="checkbox"/>		
		<u>0.8</u>	<u>H.0.1.4.4</u>		<u>N</u>	<u>Lo + Lf (in decimal)</u>
		<u>0.9</u>	<u>R.0.0.3.8</u>			<u>{ Binarize Lf</u>
		<u>1.0</u>	<u>V.0.1.1.7</u>			
		<u>1.1</u>	<u>Y.0.2.1.2</u>	<input checked="" type="checkbox"/>	<u>Lf</u>	<u>Final location</u>
		<u>1.2</u>	<u>B.0.1.2.7</u>		<u>1014</u>	
		<u>1.3</u>	<u>V.0.0.1.5</u>			
		<u>1.4</u>	<u>x.Z.0.0.0.4</u>		<u>4@27 (0142)</u>	

Programming paradigms

						9/05/62	PAGE 1
00000	0774 00 1 00000	START	AXT	0,1			
00001	0774 00 2 01750		AXT	1000,2			
00002	0500 00 2 02030	LOOP	CLA	AREA+1000,2	IS IT THE END		
00003	0402 00 0 02040		SUB	=0777777777777777	WORD.		
00004	0100 00 0 00007		TZE	TNIB	YES		
00005	1 00001 1 00006		TXI	*+1,1,1	NO, BUMP THE COUNT OF NIB		
00006	1 77777 2 00002		TXI	LOOP+2,-1	TRY NEXT WORD		
00007	0754 00 1 00000	TNIB	PXA	,1	PUT COUNT IN AC		
00010	0634 00 1 02030		SXA	FXNIB,1	SAVE FIXED POINT COUNT		
00011	-0501 00 0 02044		QSA	=02330000000000	CONVERT FIXED POINT TO		
00012	0300 00 0 02042		FAD	=0	FLOATING POINT		
00013	0601 00 0 02031		STO	NIB	SAVE FLOATING POINT NIB		
00014	0600 00 0 02032		STZ	TOTAL	PRESET SUM TO ZERO		
00015	0774 00 2 00000		AXT	0,2	PRESET TAG FOR ADDING AREA, AREA+1, ETC.		
00016	0500 00 2 00060	LOOP1	CLA	AREA,2	SUM THE		
00017	0300 00 0 02032		FAD	TOTAL	BLOCK OF NUMBERS		
00020	1 77777 2 00021		TXI	*+1,2,-1	BUMP TAG FOR AREA		
00021	2 00001 1 00016		TXI	LOOP1,1,1	ALL THRU SUMMING, NO		
00022	0241 00 0 02031		FDP	NIB	YES, CALCULATE		
00023	-0600 00 0 02033		STO	FAVE	AVERAGE AND SAVE		
00024	0600 00 0 02034		STZ	PTOT	PRESET TOTALS		
00025	0600 00 0 02035		STZ	HTOT	AND COUNTS		
00026	0600 00 0 02036		STZ	PCNT			
00027	0600 00 0 02037		STZ	MCNT			
00030	0534 00 1 02030		LXA	FXNIB,1	PICK UP NUMBER IN BLOCK		
00031	0774 00 2 00000		AXT	0,2	PRESET TAG FOR AREA		
00032	0500 00 2 00060	LOOP2	CLA	AREA,2	PICK UP NUMBER		
00033	0120 00 0 00052		TPL	PLUS	IS IT PLUS, YES		
00034	0300 00 0 02035		FAD	HTOT	NO		
00035	0601 00 0 02035		STO	HID1			
00036	0500 00 0 02037		CLA	MCNT	BUMP COUNT OF		
00037	0300 00 0 02043		FAD	=1,0	MINUS NUMBERS		
00040	0601 00 0 02037		STO	MCNT			
00041	1 77777 2 00042	TEST	TXI	*+1,2,-1			
00042	2 00001 1 00016		TXI	LOOP2,1,1	THRU, NO		
00043	0500 00 0 02034		CLA	PTOT	YES, CALCULATE		
00044	0241 00 0 02036		FDP	PCNT	PLUS AVERAGE		
00045	-0600 00 0 02040		STO	PAVE			
00046	0500 00 0 02035		CLA	HTOT	CALCULATE MINUS		
00047	0241 00 0 02037		FDP	MCNT	AVERAGE		
00050	0601 00 0 02041		STO	HAVE			
00051	0000 00 0 00051	STOP	HTR	*	ALL THRU STOP		
00052	0300 00 0 02034	PLUS	FAD	PTOT	SUM PLUS NUMBERS		

Programming paradigms

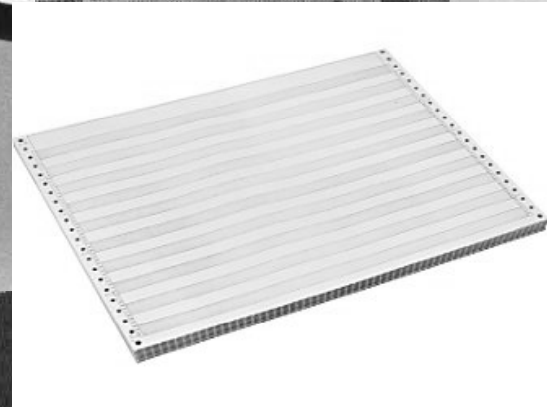
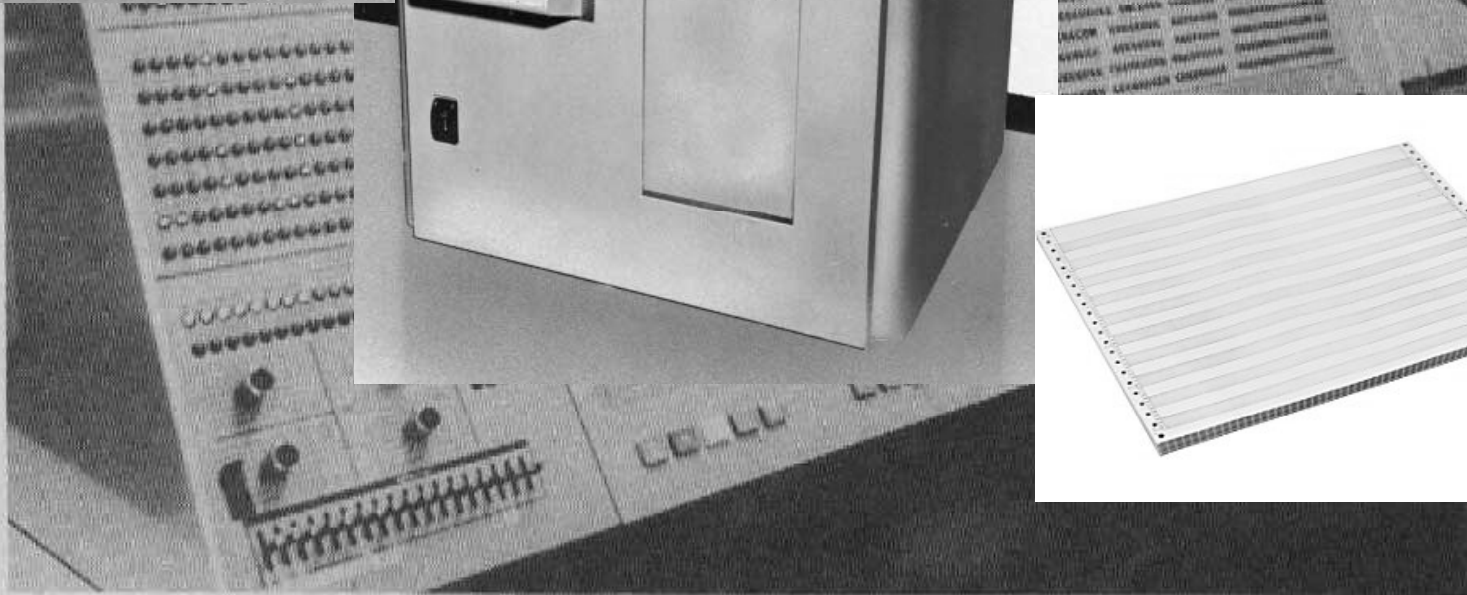
File Description Specifications

For the valid character exceptions, refer to the PDC reference manual for that system.

Line	Form Type	File Name	File Type		File Designation		Mode of Processing		Device	Symbolic Device	Language	Name of Label	Extent	Storage Index	File Address/Recorded	
			File Format	Block Length	Record Length	Length of Key Field or of Record Address Field	Record Address Type	Type of File Organization or Addressing Scheme							Number of Tracks or Cylinder Coordinate	Number of Entries
01	C	▲														
02	C	▲	SAMPLE	RPG	PROGRAM	TO	TEST	APPENDIX	B							
03	C	▲														
04	C	▲														
05	C	F	CUSMST	UF	L				K		DISK					A
06	C	F	CUSDSPF	CF	L	2					WORKSTN					
07	C	F	CUSPRTF	O	L		10				PRINTER					

Line	Form Type	Control Sequence (L, U, S, R, W, C)	Indicators		Factor 1	Operation	Factor 2	Result Field		Resulting Indicators		Comments
			And	And				Name	Length	Arithmetic	Logical	
01	C				START	TAG						
02	C				EXFMT	PROMPT						
03	C		N2	1	ACTNUM	CHAINCUSMST			30			
04	C				ADD	JFME "A"						
05	C				AIN30	ANDLEQ "1"						4
06	C				SECTION				40			
07	C		N2	1	GOTO	START						
08	C				END							
09	C		N2	1	EXFMT	REFORMSE						
10	C		N2	1	WRITE	CUSMST						
11	C		N2	1	UPDATE	CUSMST						5
12	C		N2	1	GOTO	START						
13	C				WRITE	HEADER						
14	C				PRINT	TAG						
15	C				READ	CUSMST						45
16	C		N4	5	WRITE	HEADER						
17	C		N4	5	WRITE	DETAIL						
18	C		N4	5	GOTO	PRINT						
19	C				CLOSE	ALL						
20	C				SECTION							LR

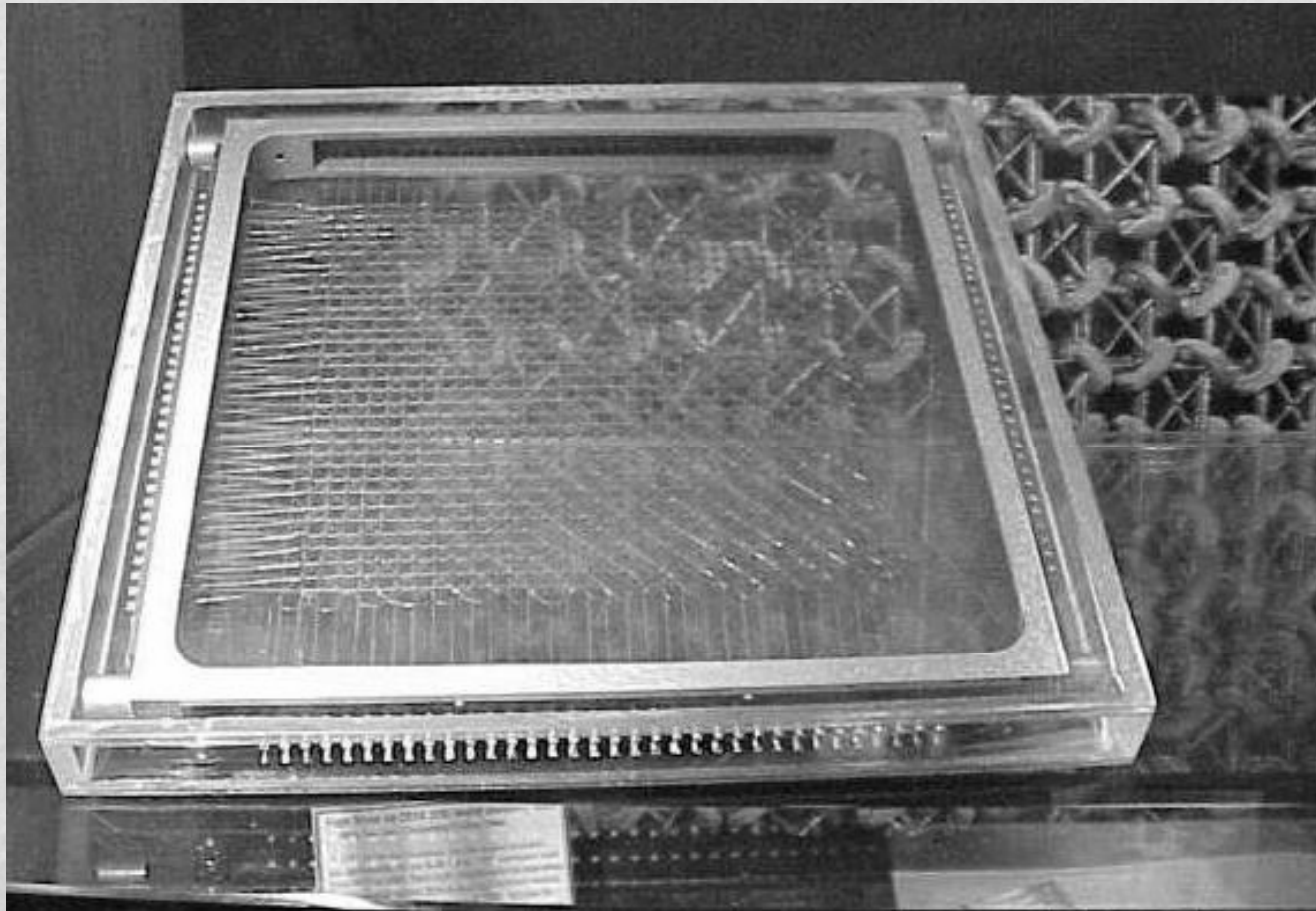
Computer/human interaction



Outliers: Whirlwind



Outliers: Whirlwind



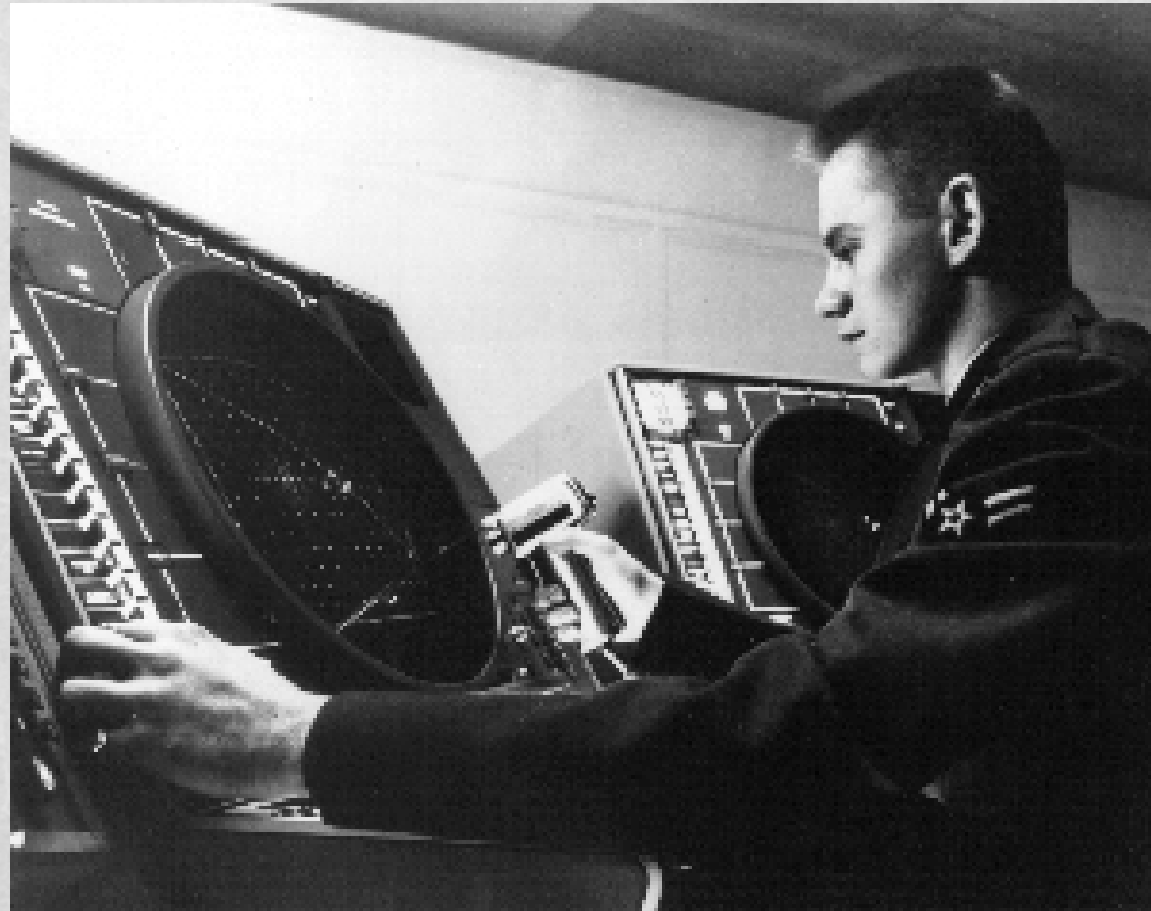
Outliers: SAGE



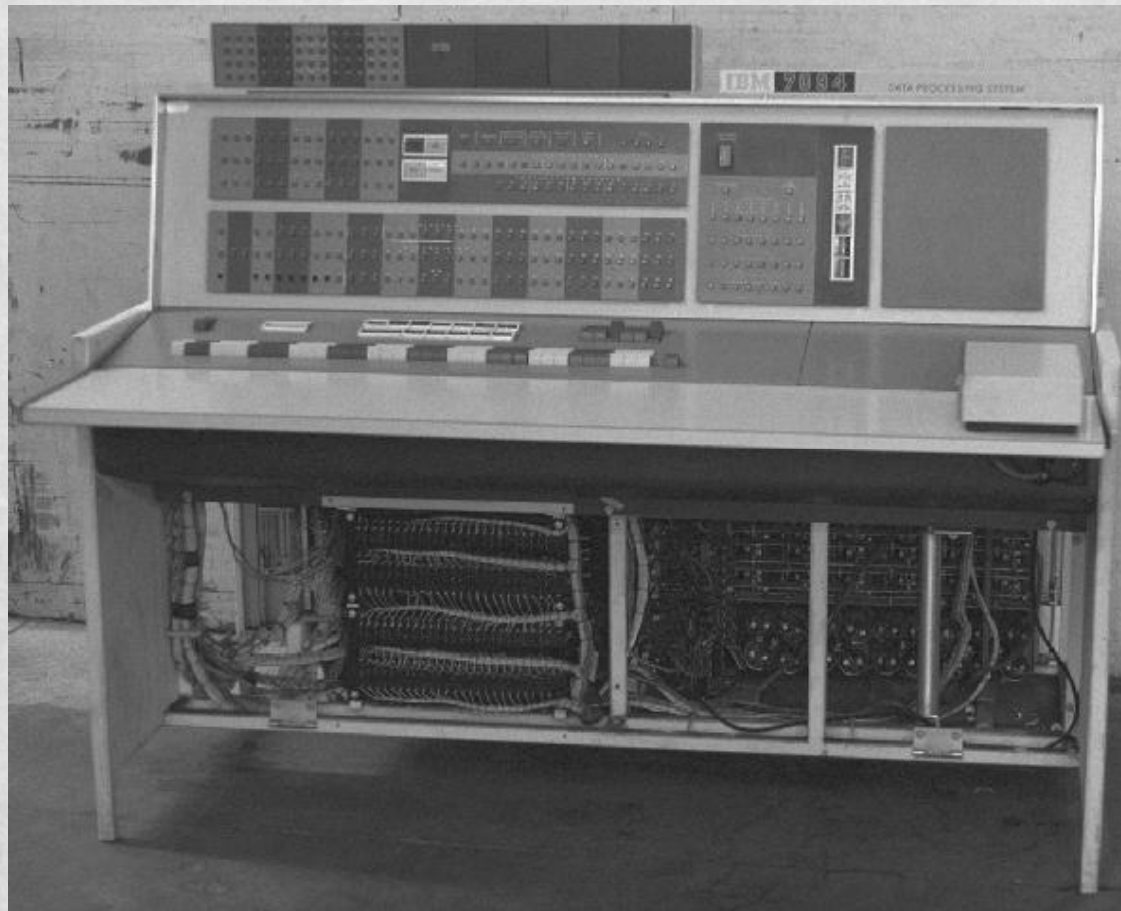
First powered: 1963
Retired: 1983

Weight: ~250 tons
Tube count: ~60,000

Outliers: SAGE

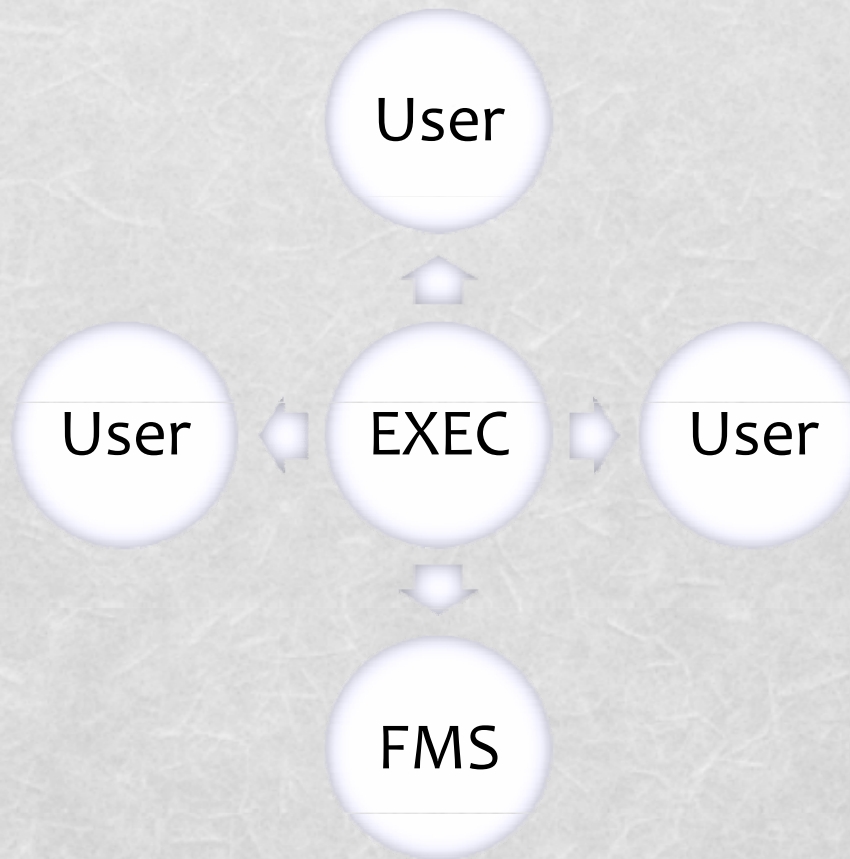


Outliers II



Outliers II:

Compatible Time Sharing System

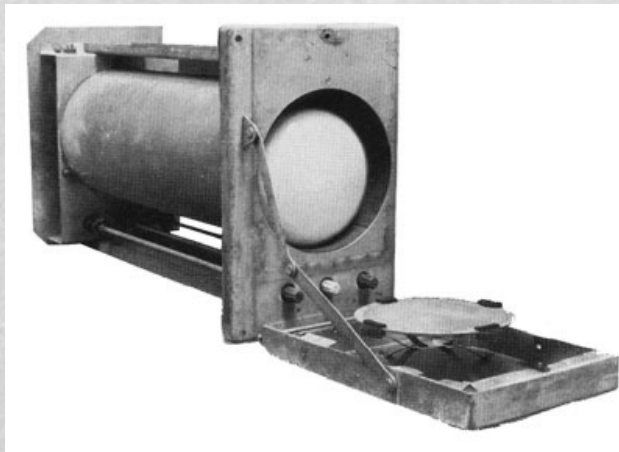


Under the hood: working store

- ◆ Acoustic delay lines



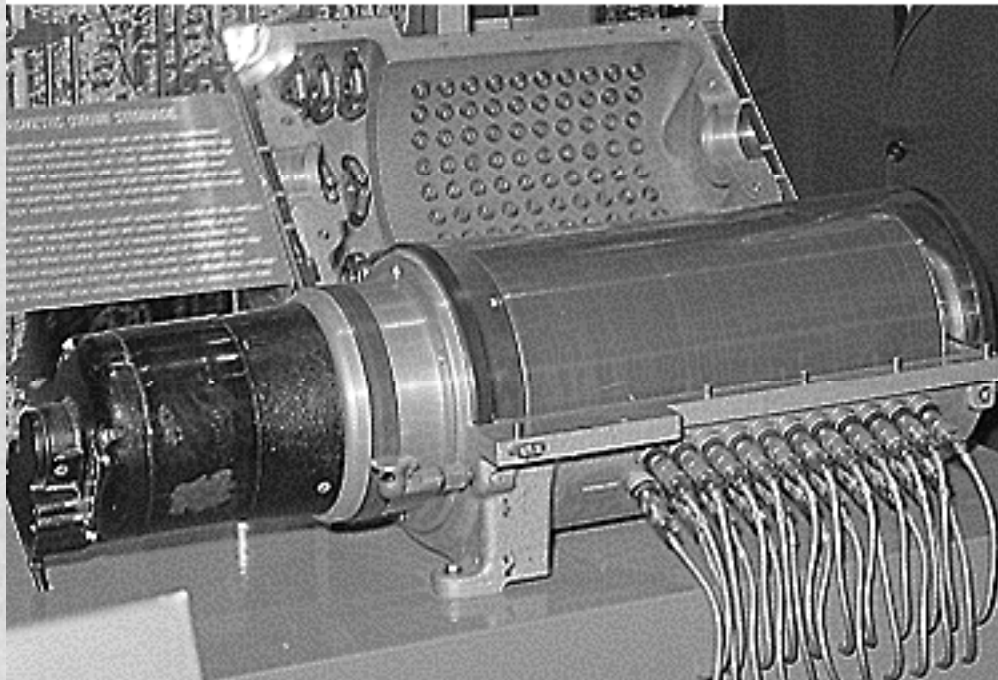
- ◆ Williams tubes



Building the machine: working store

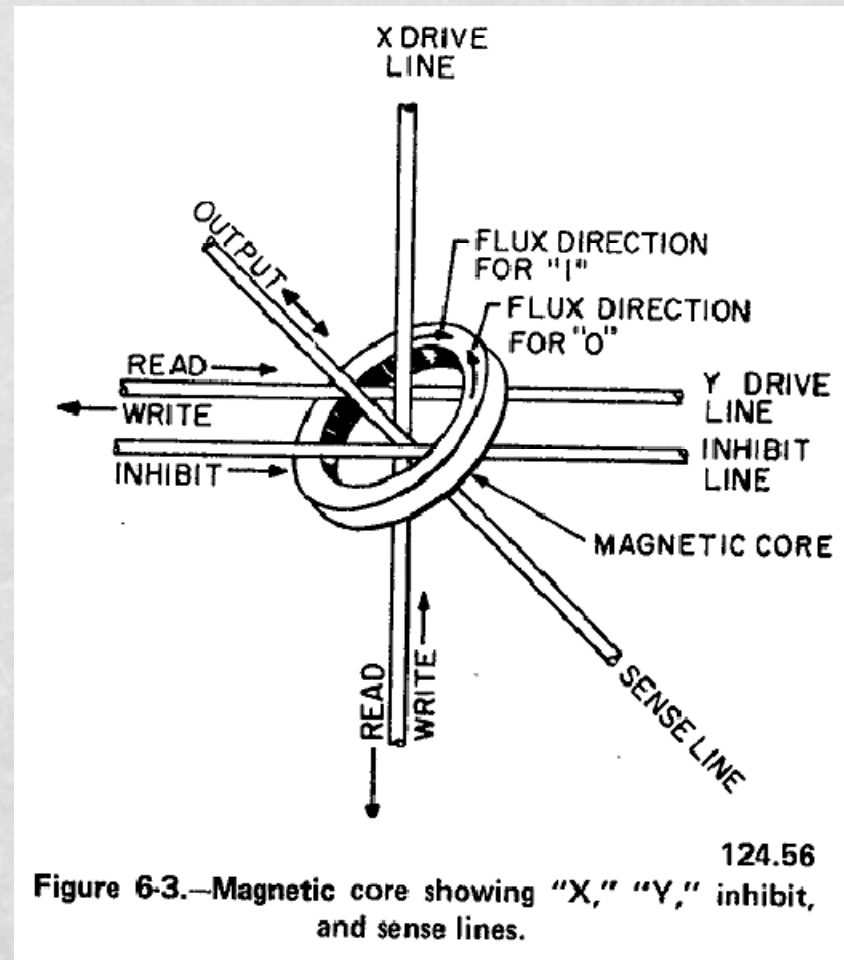
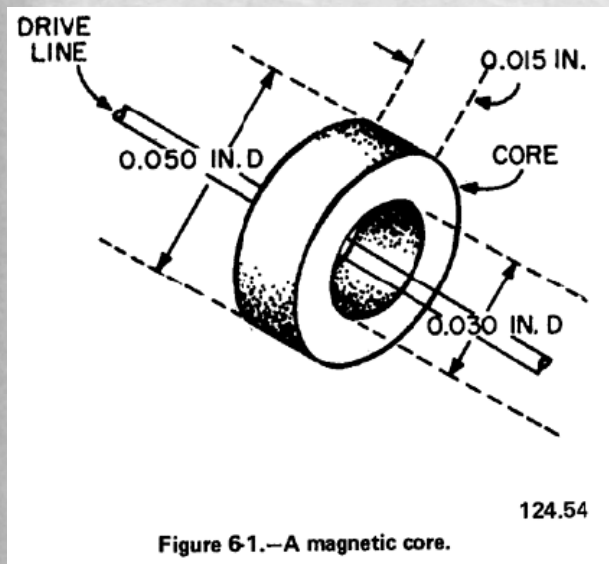
- ◆ Magnetic drum

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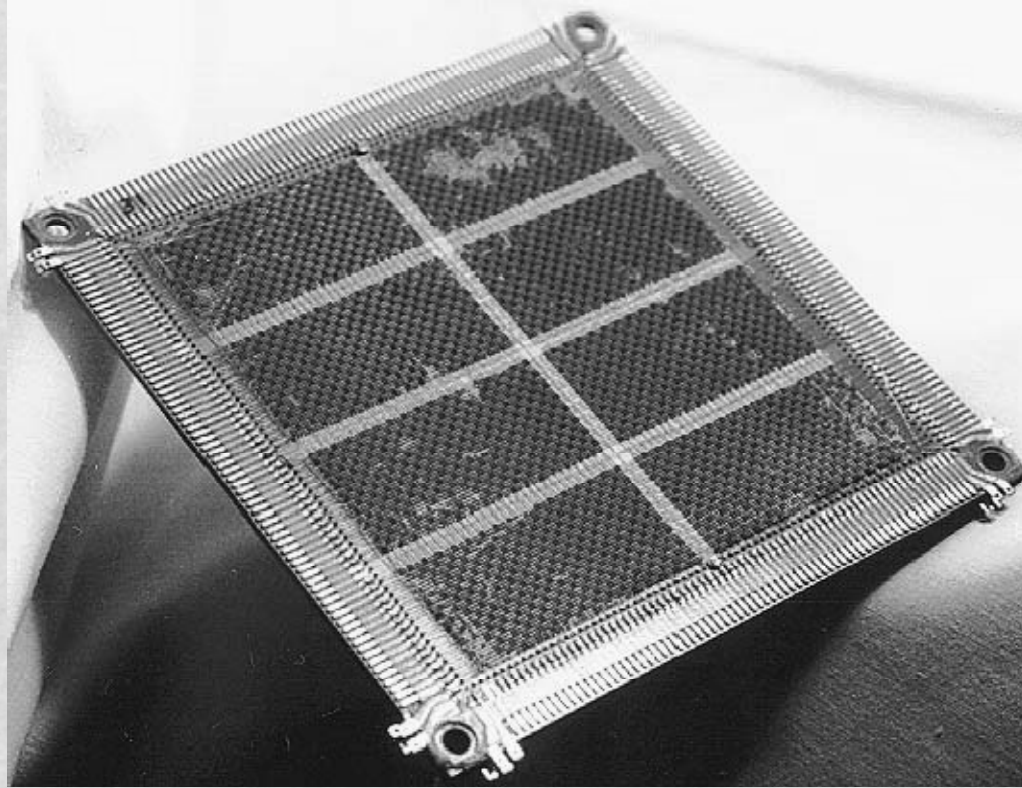
Building the machine: working store

- ◆ Magnetic core



Building the machine: working store

- ◆ Magnetic core



Questions?