

# UNIVAC

## 1224 A COMPUTER

## REPERTOIRE OF INSTRUCTIONS

### 1224 ORDER CODES

00	HLT		Select Stop	
01	LGN	B-1, I	Logical Negation (Complement A) $(A)_i \rightarrow A_i$	
02	TRF	NBI	Transfer on FF (FF Jump) if FF set NI = (P) FF not set NI = (Y)	
03	TSR	NBI	Transfer to Subroutine (Return Jump); (P) $\rightarrow I_{10} - 13$ NI = (Y)	
04	TRX	NBI	Transfer on Index (Index Jump) if: $(I_1) = 0$ NI = (P) $(I_1) \neq 0$ $(I_2)_1 - 1 \rightarrow I_{1f}$ & NI = (Y)	
05	TAX	NBI	Transfer and Augment Index, if: $(I_1) = 0$ NI = (P) $(I_1) \neq 0$ $(I_2)_1 - 1 \rightarrow I_{1f}$ & $(I_2)_1 + 1 \rightarrow I_{2f}$ & NI = (Y)	
06	SC D/N	S	Left, End Around (Cyclic) Accumulator, Shift by Y	T0
06	SA D/N	S	Left, End Off Accumulator, Shift by Y	T1
06	SK D/N	S	Left, End Off Index, Shift by Y	T2
06	SL D/N	S	Left, End Off Accumulator to Index (Long), Shift by Y	T3
07	EXF	E	External Function	
10	CLR	B-1, I	Clear Memory Address Y, $\beta \rightarrow Y_f$	
12	STR	B-1, I	Store A, (A) $\rightarrow Y$	
13	RPA	B-1, I	Replace Address, $(A_0-13) \rightarrow Y_0-13$ & $(Y_{14-23}) = (Y_{14-23})$	
14	TRU	B-1, I	Transfer Unconditional (Jump) NI = (Y)	
15	TRA	B-1, I	Transfer on Accumulator (Sign Jump): A > 0; NI = (Y) A < 0; NI = (P) + 1 A = 0; NI = (P)	
16	TRD	B-1, I	Transfer if Different (Jump), $A_{24} + A_{23}$ NI = (Y) $A_{24} + A_{23}$ NI = (Y)	
20	EXC	B-1, I	Exchange, $(A)_1 \rightarrow Y_f$ and $(Y)_1 \rightarrow A_f$	
22	ADO	B-1, I	Add One to Memory, $(Y)_1 + 1 \rightarrow Y_f$	
23	AID	B-1, I	Add if Different, if $A_{23} + A_{24}$ $(Y)_1 + 1 \rightarrow Y_f$	
24	RCA	B-1, I	Repeat Clear Add, (Y) $\rightarrow C_W$	
25	ERC	B-1, I	End Repeat Count, $(C_W)_1 \rightarrow Y_f$	
26	SRC	R/I	Store $I_{0-4}$ $(RC) \rightarrow Y_0-4$ & 0's to $Y_5-23$	
26	STX	R/I	Store Index, (I) $\rightarrow Y$	
27	LRC	R/I	Load $I_{0-4}$ $(Y)_0-4 \rightarrow RC$	
27	LDX	R/I	Load Index, (Y) $\rightarrow I$	
30	CLA	B-1, I	Clear Add, (Y) $\rightarrow A_f$	
31	ADD	B-1, I	Add, $(A)_1 + (Y) \rightarrow A_f$	
32	SUB	B-1, I	Subtract, $(A)_1 - (Y) \rightarrow A_f$	
33	COM	B-1, I	Compare (Threshold Jump) (A) = (Y) & NI = (P + 2) (A) > (Y) & NI = (P) (A) < (Y) & NI = (P + 1)	
34	LGA	B-1, I	Logical Add, $(A)_1 \oplus (Y) \rightarrow A_f$	
35	LGM	B-1, I	Logical Multiply (Mask), $(A)_1 \otimes (Y) \rightarrow A_f$	
37	HLI		Hold (For Debug)	

### FF DESIGNATIONS

00	End of magnetic tape output RS/S
01	MT Tape busy NRS/S
02	MT Parity error RS/S
03	MT Read NRS/S
04	MT input overflow RS/S
05	A24 NRS/S
06	Console switch input RS/S
07	Keyboard input RS/S
10	AUX Comp initiate NRS/S
11	AUX out busy NRS/S
12	AUX input busy NRS/S
14	RCA FF NRS/S
15	Type/PT in FF NRS/S
16	Type/PT out FF NRS/S

### WORD FORMATS

OP	B	I	A		
5	5	5	9	B-1	
OP	I	A			
5	5	14		I	
OP	B or I	Operand I	A		
5	5	5	9	B/I	
OP	Operand I	A			
5	5	14		NBI	
OP	I	Type	D/N	Blank	Shift Count
5	5	2	1	6	5
OP	Device	Blank	Designator		
5	5	3	3	8	E

## INDEX AND CONTROL WORDS

01 - 36 Index 01 thru 36  
 37 Index 37 and B Box  
 40, 41 RCA  
 100, 101 AUX Comp in  
 110, 111 AUX Comp out  
 120, 121 Paper Tape Reader  
 130, 131 Paper Tape Punch  
 140, 141 MT in  
 150, 151 MT out  
 200, 201 Printer 0  
 202, 203 Printer 1  
 376, 377 Printer 63

## CONSOLE CONTROL WORDS

4 -- Console 1  
 5 -- Console 2  
 6 -- Console 3  
 7 -- Console 4

00, 01 D1 }  
 02, 03 D2 } Data Input  
 04, 05 D3 }  
 06, 07 D4 }  
 40, 41 E1 }  
 42, 43 E2 } EYE OUTPUTS  
 44, 45 E3 }  
 46, 47 E4 }  
 50, 51 E5 }

10, 11 S1 }  
 12, 13 S2 } Switch Input  
 14, 15 S3 }  
 16, 17 S4 }  
 60 I1 }  
 62 I2 } Indicator Outputs  
 64 I3 }  
 66 I4 }

20, 21 Keyboard  
 30 Time (Bit 23 must be set)

Bits 22 & 23 Code Output:  
 01 = 8 - 15  
 10 = 0 - 7

## I/O DESIGNATORS

I/O DEVICE CODES	PPT & TYPEWRITER	PRINTER	MTCU
Magnetic Tape 01	2000 Computer Input ENABLE FF	3 -- Turn on	- (1 thru 4) Tape drive
Paper Tape/Typewriter 02	1000 Computer Output ENABLE FF	Unit 00 thru 77 (octal)	2 - 0 Stop
Printers 03	0400 Lock out FF		2 - 1 Write
AUX Comp Out 04	0200 Ext Function		2 - 2 Read
AUX Comp In 06	0040 Reader Select		2 - 4 Tape mark
	0020 Type In Select		2 - 5 Move backward
	0010 Reader or Type In Select Enable		2 - 6 Rewind
	0004 Punch Select		
	0002 Type Out Select		
	0001 Punch and/or Type Out Select Enable		

## SIGNAL DATA OUTPUT CHARACTERS

EYE

200 No Print  
 201 Lock On  
 202 Unlock  
 204 Reset Scan

0 -- Printer Character  
 1 --

PRINTER

200 No Print  
 240 Turn Off

1 -- Printer Character  
 0 --

## 1224 ASSEMBLER CODES

COR Program Correction	BLANK General Constant
ORIG Program Origin	XX Index Constant
BLR Block Reservation	MK Magnetic Tape Constant
EQU Equate	DK Data Input Constant (CW)
END	RK RCA Control Word
	PK PPT Control Word
	XX (op code is = # <sub>3</sub> # <sub>4</sub> )
	CK CHUNK NUMBER

## ASSEMBLER PRESET ACCUMULATOR

A	B	C	D	E
Not used	1	3	3	3

A	B	C	D	E
0	ASSEMBLE HLD INSTRUCTIONS	PPT Input	No MT Outputs	No Output
1	IGNORE HLD INSTRUCTIONS	Cor. PPT-Prog. MT.	SXB Listing - Printer code on MT	List PPT Out
2	-	-	Combine 1 & 3	Symb. PPT Out
3	-	-	Abs. Output on MT	Combine 1 & 2
4	-	-	Combine 1 & 4	Abs. PPT Out
5	-	-	Combine 2 & 4	Combine 1 & 4
6	-	-	Combine 1, 2, & 4	Combine 2 & 4
7	-	-	Combine 1, 2, & 4	Combine 1, 2, & 4

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