I/O FUNCTION SPECIFICATION WORDS

	SALT CODE	FUNCTION SPECIFICATION OPERATION	FUNCTION SPECIFICATION OP CODE BIT POSITIONS 24	23	22	21	20	19	18	17	16
UNISERVO III TAPE UNITS	BCSR ①	Backward Contingency Scatter/Read from Tn	TAPE UNIT NUMBER 0-15				1	0	1	0	A ONE BIT IF AUTOMATIC INTERRUPT SPECIFIED.
	BBR ③	Backward 1 Block Read, Tn → L...L − (n − 1)					0	1	1	0	
	BSR ①	Backward Scatter/Read from Tn					0	0	1	0	
	BCBR	Backward Contingency Block Read, Tn → L... L + (n − 1)					1	1	1	0	
	FCSR ①	Forward Contingency Scatter/Read from Tn					1	0	0	0	
	FBR ③	Forward 1 Block Read Tn → L...L + (n − 1)					0	1	0	0	
	FSR ①	Forward Scatter/Read from Tn					0	0	0	0	
	FCBR	Forward Contingency Block Read, Tn → L...L − (n − 1)					1	1	0	0	
	GWT ①	Gather/Write Tn					0	0	0	1	
	OWT ①	Bad Spots → Tn, Gather/Write → Tn					0	1	0	1	
	RW ④	Rewind Tn to Load Point					0	0	1	1	
	RWI ④	Rewind Tn with Interlock					0	1	1	1	
HIGH-SPEED READER	CAD ②	R2 Image → L... L + 39	0	0	0	0	0	0	0	0	
	CS1	Select Stacker 1, R2 Image → L... L + 39	0	0	0	0	0	1	0	0	
	CS2	Select Stacker 2, R2 Image → L... L + 39	0	0	0	0	1	0	0	0	
	CT ②	Translate R2 Image → L... L + 19	0	0	0	0	0	0	1	0	
	CTS1	Translate R1 Image → L... L + 19, Select Stacker 1	0	0	0	0	0	1	1	0	
	CTS2	Translate R2 Image → L... L + 19, Select Stacker 2	0	0	0	0	1	0	1	0	
	FC ②	Feed 1 Card, R2 Image → L... L + 39	0	0	0	0	0	0	0	1	
	FCS1	Feed 1 Card, R2 Image → L... L + 39, Select Stacker 1	0	0	0	0	0	1	0	1	
	FCS2	Feed 1 Card, R2 Image → L... L + 39, Select Stacker 2	0	0	0	0	1	0	0	1	
	FCT	Feed 1 Card, Translate Image R2 → L... L + 19	0	0	0	0	0	0	1	1	
	FCTS1	Feed 1 Card, Translate Image R2 → L... L + 19, Select Stacker 1	0	0	0	0	0	1	1	1	
	FCTS 2	Feed 1 Card, Translate Image R2 → L... L + 19, Select Stacker 2	0	0	0	0	1	0	1	1	
CARD PUNCH	CCS	Select Stacker 1	0	0	0	0	Unassigned		0	0	
	PC ②	Feed 1 Card, Untranslate L... L + 39 Image → Punch	0	0	0	0			0	1	
	PCS	Feed 1 Card, Untranslate L... L + 39 Image → Punch, Select Stacker 1	0	0	0	0			1	0	
	PCT ②	Feed 1 Card, Translate L... L + 19 Image → Punch	0	0	0	0			0	1	
	PCTS	Feed 1 Card, Translate L... L + 19 Image → Punch, Select Stacker 1	0	0	0	0			1	1	
HSP	PAD	Paper Advance	Number of Lines						0	Unassg.	
	PRT	Paper Advance/Print 1 Line L... L + 31	Number of Lines						1		
UNISERVO II TAPE UNITS	CBRH	Compatible Backward/Read High, Tn → L... L − 179	TAPE UNIT NUMBER 0-5				1	0	1	0	
	CBRL	Compatible Backward/Read Low, Tn → L... L − 179					0	1	1	0	
	CBRN	Compatible Backward/Read Normal Tn → L... L − 179					0	0	1	0	
	CFRH	Compatible Forward/Read High Tn → L... L + 179					1	0	0	0	
	CFRL	Compatible Forward/Read Low Tn → L... L + 179					0	1	0	0	
	CFRN	Compatible Forward/Read Normal Tn... L + 179					0	0	0	0	
	CRW	Compatible Rewind					0	0	1	1	
	CRWI	Compatible Rewind with Interlock					1	0	1	1	
	CWRT	Compatible Write, L... L + 179 → Tn					0	0	0	1	
	CWSD	Compatible Write Subdivide, L... L + 179 → Tn					0	1	0	1	
PAPER TAPE	PTP	Punch (Specified Number of Words)	Number of Words							1	
	PTR	Read (Specified Number of Words)	Number of Words							0	
	PTB	Back Space (1 Frame)	1	1	1	1	1	1	1	0	

NOTES: ① Scatter/Read, Gather/Write Control Word Starts at L.
② Stacker 0 will be utilized for this instruction.
③ n = Number of Words in Block
④ L Address is ignored

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WORD FORMATS

		25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
INSTRUCTION FORMAT	GENERAL	IA FS	IA	X			Operation Code						AR				m address									
	SHIFT	IA		X			Operation Code						AR				Shift Count/m Address									
	INDEX REGISTER	IA		X			Operation Code						XO				m Address									
	INDICATOR	IA		X			Operation Code						INDICATOR OR CHANNEL				Indicator/m Address									
	INITIATE I/O	IA		X			Operation Code						Channel				m Address									
	WRITE TYPEWRITER	IA		X			Operation Code						①				m Address									
	DISPLAY	IA		X			Operation Code						0	0	0	0	m Address									
	READ TYPEWRITER	0	0	0	0	0	Operation Code						AR				0	0	0	0	0	0	0	0	0	0
	CLOCK	0	0	0	0	0	Operation Code						AR				0	0	0	0	0	0	0	0	0	0
CONTROL WORDS	INDR. ADDR. (INAD)	IA FS		X			0	0	0	④			L													
	FIELD SELECT (FSEL)	0		X			Left Bit						Right Bit				m Address									
	IR MODIF. (XMOD)	S	COMPARISON AMOUNT This Portion not examined in incre. IR Instruction														Increment Amount									
	SCAT/R-GATH/W (SCAT)	②	Count										L (not indexable)													
I/O FUNCTION SPECIFICATIONS	TAPE UNITS	0	Servo Number				Function Code			③			L (not indexable)													
	CARD READERS	0	0	0	0	0	Function Code			③			L (not indexable)				0	0	0	0	0	0				
	CARD PUNCHES	0	0	0	0	0	④	Funct. Cd.		③			L (not indexable)				0	0	0	0	0	0				
	PRINTERS	0	NUMBER OF LINES VERTICAL SPACING				FUNCT CODE			③			L (not indexable)													
	PAPER TAPE	0	NUMBER OF WORDS				F.C.T. CD			③			L (not indexable)													

NOTES: ① Specifies character position to be printed.
② "1" means this is a Stop Read-Write Control Word, Bits 1-24 are ignored.
③ "1" bit means automatic interrupt if operation is successfully completed or initiated; "0" bit means no automatic interrupt.
④ Not Decoded.

UNIVAC® III REFERENCE CARD

INSTRUCTION LIST

	SALT CODE	INSTRUCTION OPERATION	INDICATOR LIST	INDIRECT ADDRESS	FIELD SELECT	EXEC. TIME: CYCLES PER WD. OF OPERAND 1	2	3	4	BIT POS.: IND. NO. 11-14	1-10	CH. DES. 11-14	OCTAL OP. CODE
ARITHMETIC	A	(ARi) + (m') → ARi		X	X	2	3	4	5				20
	AH①	(ARi) + (m') → ARi'; or (AR1, AR2) + (m'−1, m') → AR3, AR4		X X	X X	2	 3						22
	BA	Binary (ARi) + (m') → ARi		X	X	2	3	4	5				24
	BAH①	Binary (ARi) + (m') → ARi'; or (AR1, AR2) + (m'−1, m') → AR3, AR4		X	X	2	3						26
	BS	Binary (ARi) − (m') → ARi		X	X	2	3	4	5				25
	BSH①	Binary (ARi) − (m') → ARi'; or (AR1, AR2) − (m'−1, m') → AR3, AR4		X X	X X	2	 3						27
	D②	(AR1, AR2) ÷ (m') → AR1 remainder, AR2 quotient		X		17-36 DEPENDING ON QUOTIENT DIGITS							31
	M②	(m') x (AR1) → AR2 6MSD, AR3 6LSD.		X		12-31 DEP. ON MULTPLR. DIGITS							30
OPERAND TRANSFER	L	(m') → ARi		X	X	2	3	4	5				12
	LC3	−(m') → ARi		X	X	2	3	4	5				13
	EXT	Extract (m') → ARi		X	X	2	3	4	5				14
	ST	(ARi) → m'		X		2	3	4	5				10
	STCS	−(ARi) → m'		X		2	3	4	5				11
SHIFT	SR③	Shift (ARi) right SC decimal digits		X		4	7						40
	SL③	Shift (ARi) left SC decimal digits		X		3	6						41
	SAR④	Shift (ARi) right SC alpha-num. characters		X		4	9						42
	SAL④	Shift (ARi) left SC alpha-num. characters		X		3	8						43
	SBC	Shift (ARi) binary circ. right SC bit positions with sign		X		SC = 0-7, 4 CYC. 8-16, 5 CYC. ABOVE 16, 6 CYC.							44
COMPARE	C⑤	(ARi) : (m')		X	X	2	3	4	5				54
	CA⑤	|(ARi)| : |(m')|		X	X	2	3	4	5				55
	CONE④	1 bits (ARi) : (m') for 1 bits		X	X	2	3	4	5				57
	CZRO④	1 bits (ARi) : (m') for 0 bits		X	X	2	3	4	5				56
LOGICAL BRANCHING	TEQ⑦	Transfer if EQual. Test equal indicator; if set, m' → CC; if reset (CC) + 1 → CC	E	X		2				X			60
	THI⑦	Transfer if HIgh. Test high indicator, if set m' → CC; if reset (CC) + 1 → CC	E	X		2				X			60
	TLO⑦	Transfer if LOw, test low indicator, if set m' → CC; if reset (CC) + 1 → CC	E	X		2				X			60
	TPOS⑦	Transfer if POSitive, test sign of AR, if +, m' → CC; if −, (CC) + 1 → CC	E	X		2				X			60
	TUN⑧	Transfer UNconditionally, m' → CC		X		1							06
	TR⑨⑫	Transfer Return (MAC/CC) + 1 → m'; m' + 1 → CC	C	X		3				X			07
SENSE IND.	SSF⑩	Set Sense Indicator specified	E	X		2				X			62
	RSF⑩	Reset Sense Indicator specified	E	X		2				X			61
	TSI⑦	Transfer if Sense Indicator, test specified sense indicator, if set m' → CC; if reset (CC) + 1 → CC	E	X		2				X			60

	SALT CODE	INSTRUCTION OPERATION	INDICATOR LIST	INDIRECT ADDRESS	FIELD SELECT	EXEC. TIME: CYCLES PER WD. OF OPERAND 1	2	3	4	BIT POS.: IND. NO. 11-14	1-10	CH. DES. 11-14	OCTAL OP. CODE
CONVERSION	ATD	Alpha-numeric To Decimal (m' − 2, m' − 1, m') → ARi − 1, ARi		X				8					72
	DTA	Decimal To Alpha-numeric (ARi − 1, ARi) → m' − 2, m' − 1, m'		X				8					71
	ZUP⑪	Zero sUPpress (m') → ARi		X		2	3	4	5				73
LOG.	SUP	SUPerimpose 1 bits of (m') → (ARi)		X	X	2	3	4	5				15
	ERS	ERaSe 0 bits of (m') → (ARi)		X	X	2	3	4	5				16
INDEX REG.	LX	(m') 15 LSB → XO		X		3							51
	STX⑨	(XO) → m' 15 LSB		X		3							50
	IX	(XO) ± (m') 9 LSB → XO		X		3							52
	ICX⑤	(XO) ± (m') 9 LSB → XO; |(XO)| : |(m')| bits 10-24		X		4							53
PROCESSOR INTERRUPT	TCI	Transfer if Contingency Indicator(s), test contingency indicator(s) specified if any specified are set, (CC) + 1 → CC; if all specified are reset (CC) + 2 → CC	A	X		2					X	X	64
	RCI	Reset Contingency Indicator(s) specified	A	X		2					X	X	65
	TPE	Transfer if Processor Error(s), test processor error indicator(s) specified, if any specified are set (CC) + 1 → CC; if all specified are reset (CC) + 2 → CC	A	X		2					X	X	64
	RPE	Reset Processor Error indicator(s) specified	A	X		2					X	X	65
INPUT/OUTPUT INTERRUPT	TIO⑫	Transfer if I/O indicator(s), test I/O indicator(s) specified, if any specified are set (CC) + 1 → CC; if all specified are reset (CC) + 2 → CC	A	X		2					X	X	64
	RIO⑫	Reset I/O Indicator(s) specified	A	X		2					X	X	65
	AIO	Allow I/O interrupt	E	X		2				X			61
	PIO	Prevent I/O interrupt	E	X		2				X			62
	TIOP⑦	Transfer if I/O interrupt Prevented, test inhibit I/O interrupt indicator, if set m' → CC; if reset (CC) + 1 → CC	E	X		2				X			60
CON'SL. TYPE.	ACT⑩	ACTivate Keyboard				2							66
	WT⑬	Write Typewriter Char., (m') → typewriter, (CC) + 2 → CC Bits 11, 12 select character	D	X		2				X			02
	RT	Read Typewriter character; (TBR) + ARi bits 1-6 → ARi bits 1-6				2							01
INIT. I/O	IOF⑫	Initiate I/O Function (m') → channel stand-by location; set stand-by location interlock indicator	C	X		3						X	70
MISCELLANEOUS	NOP⑩	No OPeration				2							00
	STMC⑨⑫	STore Memory address Counter (MAC) → m' 15 LSB	C	X		3						X	04
	STCR	Store Tape Control word Register (TCWR) → m'	C	X		3						X	05
	WAIT	m' → CC, then stop		X		3							77
	LT⑩	Load Time Clock → ARi; time valid (CC) + 2 → CC, time invalid (CC) + 1 → CC				2							76
	DIS⑭	DISplay memory (m') → display		X		2							03

NOTES:

1. Where i' ≠ i.
2. Zeros in both operands of multiplication and division must be decimal (0011).
3. If Shift Count on 2 words is > 6, use one word time.
4. If Shift Count on 2 words is > 4, use one word time.
5. If >, high indicator is set; if =, equal indicator is set; if <, low indicator is set.
6. If =, equal indicator is set; if ≠, high indicator is set.
7. Cycle time if m' → CC is one.
8. If overflow occurs on a line preceding a TUN instruction, control reverts to (CC) + 2. TUNS is employed immediately after a line of coding which may cause *unexpected* overflow to ensure that the contingency routine will revert to an unexpected overflow routine. In compiling, a 1-bit is added to bit position 11 to signify a TUNS.
9. 10 MSB of m' replaced with binary zeros.
10. m' is ignored.
11. In multi-word operands m' is the address of the most significant word.
12. A File Designation should be used in lieu of a channel designation. If an asterisk is used, eg. TR*, see Chart C for channel designation.
13. If typewriter off-line, character not printed and (CC) + 1 → CC.
14. Engineer's Console Switch must be in 00 position.

INDICATOR LISTS

A — INDICATOR LIST

INSTRUCTIONS	CONDITIONS	BIT POSITIONS 14	13	12	11	10	9	8	7	6	5	4	3	2	1	SALT
TPE	Memory Address Error During:															
Test Processor Error	Instruction Access	0	0	0	1										1	1
	Operand Access	0	0	0	1									1		2
	Synchronizer Access Of:															
	UNISERVO III Basic Write	0	0	0	1									1	1	12
	UNISERVO III Basic Read	0	0	0	1								1			3
	General Purpose #1	0	0	0	1								1		1	13
	General Purpose #2	0	0	0	1								1	1		23
	General Purpose #3	0	0	0	1								1	1	1	123
	General Purpose #4	0	0	0	1							1				4
	General Purpose #5	0	0	0	1							1			1	14
RPE	General Purpose #6	0	0	0	1							1		1		24
Reset Processor Error	General Purpose #7	0	0	0	1							1		1	1	124
	General Purpose #8	0	0	0	1							1	1			34
	UNISERVO II	0	0	0	1							1	1		1	134
	UNISERVO III Additional Write	0	0	0	1							1	1	1		234
	UNISERVO III Additional Read	0	0	0	1							1	1	1	1	1234
	Modulo 3 Check on Instruction	0	0	0	1						1					5
	Modulo 3 Check on Operand	0	0	0	1					1						6
	Adder Error Check	0	0	0	1				1							7
TCI	Arith. Overflow, Clock Power Lost	0	0	1	0										1	1
Test Cont'gcy Indicator	Invalid OP Code	0	0	1	0									1		2
	Typewriter (Print-Type)	0	0	1	0								1			3
RCI	Keyboard Request	0	0	1	0							1				4
Reset Cont'gcy Indicators	Keyboard Release	0	0	1	0						1					5
	Contingency Stop (Stop Button)	0	0	1	0					1						6
TIO	Stand-by Location Indicator	See List B For Proper Synch. Channel Des.													1	1
Test I/O Indicator	Interrupt Indicator													1		2
	Error A (UNISERVO Units Only)												1			3
	Busy (UNISERVO Units Only)											1				4
RIO	Error B("Error" G.P. Chan'l. Synch.)										1					5
Reset I/O Indicator	End File 727 Tape															
	End of Tape (UNISERVO III Only)									1						6
	Fault Indicator								1							7
	Out of Paper (HSP) Wired Stop Char. (PPT)									1						6
	Bad Line Printed (HSP)							1		1						57
	Low on Paper (PPT)									1					1	26

B — INDICATOR LIST

SYNCHRONIZER CHANNEL	SALT	BITS 14	13	12	11	IND. DES. FOR STCR: SALT	BITS 14	13	12	11
Basic Write, UNISERVO III	1	0	0	1	1	4	1	0	0	0
Basic Read, UNISERVO III	2	0	1	0	0	3	0	1	0	0
Eight General-Purpose Channels	3	0	1	0	1					
	4	0	1	1	0					
	5	0	1	1	1					
	6	1	0	0	0					
	7	1	0	0	1					
	8	1	0	1	0					
	9	1	0	1	1					
	10	1	1	0	0					
Read-Write, UNISERVO II	11	1	1	0	1					
Add'l. Write, UNISERVO III	12	1	1	1	0	2	0	0	1	0
Add'l. Read, UNISERVO III	13	1	1	1	1	1	0	0	0	1
Control Counter	14	0	0	0	1					
Memory Address Register	15	0	0	1	0					

INDICATOR LISTS (CONT'D)

C — LIST

INST.	BITS 14	13	12	11
TR*	See List B For: Synch. Chan. Des.			
IOF*				
STMC*				
STCR				

D — LIST

INST.	PRINT CHARACTER POSITION	SALT	BITS 14	13	12	11
WT	CHAR. 4 (19-24)	1	Not Examined		1	1
	CHAR. 3 (13-18)	2			1	0
	CHAR. 2 (7-12)	3			0	1
	CHAR 1. (1-6)	4			0	0

E — INDICATOR LIST

INST.	INDICATOR SPECIFIED	SALT	BITS 14	13	12	11
AIO, PIO, TIOP	Inhibit I/O Interrupt Indicator		0	0	0	0
TPOS	Sign of AR1 (set if plus)	1	0	0	0	1
	Sign of AR2 (set if plus)	2	0	0	1	0
	Sign of AR3 (set if plus)	3	0	0	1	1
	Sign of AR4 (set if plus)	4	0	1	0	0
TLO	Low Indicator		0	1	0	1
TEQ	Equal Indicator		0	1	1	0
THI	High Indicator		0	1	1	1
TSI, SSI, RSI	Sense Indicator 1	1	1	0	0	0
	Sense Indicator 2	2	1	0	0	1
	Sense Indicator 3	3	1	0	1	0
	Sense Indicator 4	4	1	0	1	1
	Sense Indicator 5	5	1	1	0	0
	Sense Indicator 6	6	1	1	0	1
	Sense Indicator 7	7	1	1	1	0
	Sense Indicator 8	8	1	1	1	1

DATA WORD FORMATS:

DECIMAL

S	DIGIT 6	DIGIT 5	DIGIT 4	DIGIT 3	DIGIT 2	DIGIT 1
25	24 21	20 17	16 13	12 9	8 5	4 1

A N

S	CHAR. 4	CHAR. 3	CHAR. 2	CHAR. 1
25	24 19	18 13	12 7	6 1

BINARY

S	24-BIT BINARY NUMBER
25	24 1