

MK 152 COMPUTER REPertoire OF INSTRUCTIONS

INSTRUCTION WORD		FORMAT I	17-f-12	11-u-0	FORMAT II	17-f-12	11-m-6	5-k-0
	f	m	SYMBOL	INSTRUCTION	DESCRIPTION	EXEC TIME		
ENTER	# 10*		ENTAU	ENTER AU WITH (Y)	(Y) → AU	4		
	# 12*		ENTAL	ENTER AL WITH (Y)	(Y) → AL	4		
	# 32*		ENTB	ENTER B REGISTER WITH (Y)	(Y) → B REGISTER	4		
	36*		ENTBK	ENTER B REGISTER WITH CONSTANT	Y → B REGISTER (Note 1)	2		
	70		ENTALK	ENTER AL WITH CONSTANT	Y → AL (Note 1)	2		
	50 72		ENTICR	ENTER INDEX CONTROL REGISTER	k ₂₋₀ → ICR	2		
	50 73		ENTSR	ENTER SPECIAL REGISTER	k ₄₋₀ → SR	2		
STORE	# 40*		CL	STORE ZERO (CLEAR Y)	0 → Y	4		
	# 42*		STRB	STORE B IN Y	B → Y	4		
	# 44*		STRAL	STORE (AL) IN Y	(AL) → Y	4		
	# 46*		STRAU	STORE (AU) IN Y	(AU) → Y	4		
	72		STRICR	STORE ICR IN Y _L	(ICR) → Y ₃₋₀ ; (Y) ₁₇₋₆ UNCHANGED (Y) ₄₊₅ = 0	4		
	75		STRSR	STORE SR IN Y _L	(SR) → Y ₅₋₀ ; (Y) ₁₇₋₆ UNCHANGED ; 0 → SR	4		
	74		STRADR	STORE ADDRESS IN Y _L	(AL) ₁₁₋₀ → Y ₁₁₋₀ ; (Y) ₁₇₋₁₂ UNCHANGED	4		
ARITHMETIC	# 14*		ADDAL	ADD (Y) TO AL	(AL) + (Y) → AL	4		
	# 16*		SUBAL	SUBTRACT (Y) FROM AL	(AL) - (Y) → AL	4		
	# 20*		ADDA	ADD (Y+1, Y) TO A	(A) + (Y+1, Y) → A	6		
	# 22*		SUBA	SUBTRACT (Y+1, Y) FROM A	(A) - (Y+1, Y) → A	6		
	# 24*		MULAL	MULTIPLY AL BY (Y)	(AL) × (Y) → A	14		
	# 26*		DIVA	DIVIDE A BY (Y)	(A) ÷ (Y) → AL; REMAINDER → AU	14		
	71		ADDALK	ADD CONSTANT TO AL	(AL) + Y → AL (Note 1)	2		
50 60		RND	ROUND AU	$\left. \begin{array}{l} +(AU) + AL_{17} \rightarrow AL; \text{ OR} \\ -(AU) - AL_{17} \rightarrow AL \end{array} \right\} \begin{array}{l} \text{IGNORE } k \\ AU_f - AU_i \end{array}$	2			
MODIFYING	37		ENTBKB	MODIFY B WITH CONSTANT	B + Y → B REGISTER (Note 1)	2		
	56		BSKP	B SKIP	$\left\{ \begin{array}{l} \text{IF } B = (Y), \text{ SKIP NI;} \\ \text{IF } B \neq (Y), B + 1 \rightarrow B \text{ REGISTER \& DO NI} \end{array} \right.$	4		
	57		ISKP	INDEX SKIP	$\left\{ \begin{array}{l} \text{IF } (Y) = 0, \text{ SKIP NI;} \\ \text{IF } (Y) \neq 0, (Y) - 1 \rightarrow Y \text{ \& DO NI} \end{array} \right.$	6		
	73		BJP	B JUMP	$\left\{ \begin{array}{l} \text{IF } B \neq 0, B - 1 \rightarrow B \text{ REGISTER AND } Y \rightarrow P \\ \text{IF } B = 0, \text{ DO NI} \end{array} \right.$	2		
Uncond.	30*		IRJP	INDIRECT RETURN JUMP	(P) + 1 → (Y); (Y) + 1 → P (Note 2)	6		
	34*		JP	UNCONDITIONAL JUMP	Y → P	2		
	54		IJPEI	IND. JUMP & ENABLE INT.	(Y) → P & ENABLE INTERRUPTS	4		
	55		IJP	INDIRECT JUMP	(Y) → P	4		
	76		RJP	DIRECT RETURN JUMP	(P) + 1 → Y; Y + 1 → P (Note 2)	4		
JUMP	JUMP TO Y (Y → P) IF COMPARISON DESIGNATOR IS:			SET COMPARE DESIGNATOR		EXEC TIME		
	NOT SET AND			WITH 02, 03 or 06, 07 INST.				
	SET AND							
	60	JPAUZ	(AU) = 0	JPEQ M = (AL) (EQUAL ff SET)	M = (Y), (AL) _f = (AL) _i	2		
	61	JPALZ	(AL) = 0			2		
	62	JPAUNZ	(AU) ≠ 0	JPNOT M ≠ (AL) (EQUAL ff NOT SET)	FOR f = 02, 03	2		
	63	JPALNZ	(AL) ≠ 0			2		
	64	JPAUP	(AL) POSITIVE	JPMLEQ M (AL) (GREATER ff SET)	M = L(Y) (AU), (AL) = L(AU)(AL)	2		
	65	JPALP	(AL) POSITIVE			2		
66	JPAUNG	(AU) NEGATIVE	JPMGR M > (AL) (GREATER ff NOT SET)	FOR f = 06, 07	2			
67	JPALNG	(AL) NEGATIVE			2			

LEGEND:

$$Y = v \oplus y + B$$

$$y = u_p \oplus u_{SR} \oplus u_x$$

B = CONTENTS OF INDEX REGISTER

NI = NEXT INSTRUCTION

* SR SENSITIVE (02 → 27, 32, 33, 40 → 47)

* B MODIFICATION of "y" REQUESTED: ADD SUFFIX "B" TO SYMBOL and "1" to EVEN f-codes 02 → 46

- NOTES: 1. For f- 36, 37, 70, 71; y - u extended with sign to 18 bits.
 2. RETURN JUMPS, executed from Interrupt Entrance Registers, Store (P).
 3. IGNORE k.
 4. CHANNEL GROUP SPECIFIED BY k.

REPERTOIRE OF INSTRUCTIONS

	f	m	SYMBOL	INSTRUCTION	DESCRIPTION	EXEC TIME
LOGICAL	#	02*	CMAL	COMPARE SET DESIGNATOR	(AL); (Y), (AL) _f = (AL) _i	4
	#	06*	CMSK	COMPARE WITH MASK SET DES.	L(AL) (AU):L(Y)(AU); (A) _f = (A) _i	4
	#	04*	SLSU	SELECTIVE SUBSTITUTE	L(AU)'(AL)+L(AU)(Y) → AL; (AU) _f = (AU) _i	4
	51	SLSET	SELECTIVE SET (INCLUSIVE OR)	(AL)v(Y) → AL; SET (AL) _n FOR (Y) _n = 1	4	
	52	SLCL	SELECTIVE CLEAR (LOGICAL PROD.)	L(AU)(Y) → AL; CLEAR (AL) _n FOR (Y) _n = 0	4	
	53	SLCP	SELECTIVE COMPLEMENT (EXCL OR)	(AL) (+) (Y) → AL; COMPLEMENT (AL) _n FOR (Y) _n = 1	4	
	50 61	CPAL	COMPLEMENT AL	(NOTE 3)	(AL)' → AL	2
	50 62	CPAU	COMPLEMENT AU		(AU)' → AL	2
	50 63	CPA	COMPLEMENT A		(A)' → A	2
	SHIFT	50 41	RSHAU	RIGHT SHIFT AU	SHIFT (REG.) RIGHT k BITS	4-10
50 42		RSHAL	RIGHT SHIFT AL	POSITIONS, END OFF & FILL THE	4-10	
50 43		RSHA	RIGHT SHIFT A	UPPER BITS WITH INITIAL SIGN	4-20	
50 44		SF	SCALE FACTOR SHIFT	LEFT CIRCULAR SHIFT A UNTIL A ₃₅ ≠ A ₃₄ OR k-SHIFTCOUNT = 0 THEN K - SHIFT COUNT → 00017	4-20	
50 45		LSHAU	LEFT SHIFT AU	SHIFT (REG.) LEFT k BIT	4-10	
50 46		LSHAL	LEFT SHIFT AL	POSITIONS CIRCULARLY	4-10	
50 47		LSHA	LEFT SHIFT A	01=X2 02=X4	4-20	
SKIP ARITH. I/O	50 51	SKPNBO	SKIP ON NO BORROW	(Note 3)	SKIP NI IF BORROW DESIGNATOR NOT SET	2
	50 52	SKPOV	SKIP ON OVERFLOW		SKIP NI IF OVERFLOW DESIGNATOR SET	2
	50 53	SKPNOV	SKIP ON NO OVERFLOW		SKIP NI IF OVERFLOW DESIGNATOR NOT SET	2
	50 54	SKPODD	SKIP ON ODD PARITY	SKIP NI IF SUM OF ONES IN L(AU)(AL) IS ODD	2	
	50 55	SKPEVN	SKIP ON EVEN PARITY	SKIP NI IF SUM OF ONES IN L(AU)(AL) IS EVEN	2	
	50 21	SKPIIN	SKIP ON INPUT INACTIVE	SKIP NI IF CHAN. k INPUT IS INACTIVE	2	
	50 22	SKPOIN	SKIP ON OUTPUT INACTIVE	SKIP NI IF CHAN. k OUTPUT IS INACTIVE	2	
	50 23	SKPFIN	SKIP ON EXT. FUNCT. INACTIVE	SKIP NI IF CHAN. k EXT. FUNCT. IS INACTIVE	2	
	50 50	SKP	SKIP ON KEY SETTING k	SKIP NI IF k = CONSOLE KEY SETTING	2	
	50 57	SKPNR	SKIP ON NO RESUME (NOTE 4)	SKIP NI IF RESUME DESIGNATOR NOT SET	2	
INPUT/OUTPUT MISC	50 01	SIN	SET INPUT ACTIVE	SET INPUT ACTIVE F/F CHANNEL k	2	
	50 02	SOUT	SET OUTPUT ACTIVE	SET OUTPUT ACTIVE F/F CHANNEL k	2	
	50 03	SEXF	SET EXTERNAL FUNCTION ACTIVE	SET EXTERNAL FUNCTION ACTIVE F/F CHANNEL k	2	
	50 11	IN	INPUT TRANSFER	(P+1) → 60+2k; (P+2) → 61+2k; SET INPUT ACTIVE F/F CHANNEL k	6	
	50 12	OUT	OUTPUT TRANSFER	(P+1) → 40+2k; (P+2) → 41+2k SET OUTPUT ACT. F/F CHANNEL k	6	
	50 13	EXF	EXT. FUNCT. TRANSFER	(P+1) → 20+2k; (P+2) → 21+2k SET EX. FUNCT. ACT. F/F CHANNEL k	6	
	50 14	RTC	ENABLE REAL TIME CLOCK MON. (Note 3)	ENABLE L(00015)(00014) & RTC OVERFLOW	2	
	50 15	INSTP	TERMINATE INPUT	CLEAR INPUT ACTIVE F/F CHANNEL k	2	
	50 16	OUTSTP	TERMINATE OUTPUT	CLEAR OUTPUT ACTIVE F/F CHANNEL k	2	
	50 17	EXFSTP	TERMINATE EXT. FUNCT.	CLEAR EXT. FUNCT. ACT. F/F CHANNEL k	2	
	50 20	SRSM	SET RESUME (NOTE 4)	SET THE RESUME DESIGNATOR (INTERCOMPUTER)	2	
	50 26	OUTOV	OUTPUT OVERRIDE	FORCE ONE WORD OUT CHAN. k WITH OUT. ACK.	2	
	50 27	EXFOV	FUNCTION OVERRIDE	FORCE ONE WORD OUT CHAN. k WITH EXT. FUNCT.	2	
	50 30	RIL	REMOVE INTERRUPT LOCKOUT	ENABLE ALL INTERRUPTS	2	
	50 32	RXL	REMOVE EXT. INT. LOCKOUT	ENABLE EXTERNAL INTERRUPTS	2	
	50 34	SIL	SET INTERRUPT LOCKOUT	DISABLE ALL INTERRUPTS	2	
	50 36	SXL	SET EXT. INT. LOCKOUT	DISABLE EXTERNAL INTERRUPTS	2	
50 24	WTFI	WAIT FOR INTERRUPT	STOP; THEN INTERRUPT ENTRANCE REG. FOR NI	2		
50 56	STOP	STOP ON KEY SETTING	STOP IF k = KEY SETTING	2		

Fault 00, 01, 77 FAULT - 2 usec JUMP TO ADDRESS 00000 or 00500 if AUTO RECOVERY is UP.

ASSIGNED CORE MEMORY LOCATIONS (OCTAL)

00000	FAULT ENTRANCE REGISTER
00001-00010	INDEX REGISTERS
00011	INTERCOMPUTER TIME-OUT INT. REG.
00012	RTC INTERRUPT REGISTER
00013	CLOCK OVERFLOW INT. REG.
00014	RTC MONITOR WORD REGISTER
00015	RTC INCREMENTING REGISTER
00016	SYN. INTERRUPT REGISTER
00017	SCALE FACTOR SHIFT COUNT
00020-00037	EF & CONT. DATA MODE (CHAN 0-7)
00040-00057	OUT. BUFFER CONT. REG. (CHAN 0-7)
00060-00077	IN. BUFFER CONT. REG. (CHAN 0-7)

00100-00117	EXT. INT. REGISTERS (CHAN 0-7)
00120-00137	EF MONITOR REGISTERS (CHAN 0-7)
00140-00157	OUT. MON. REGISTERS (CHAN 0-7)
00160-00177	IN. MON. REGISTERS (CHAN 0-7)
00220-00237	EF & CIM BUFF. CONT. REG. (CHAN 10-17)
00240-00257	OUT. BUFF. CONT. REGISTERS (CHAN 10-17)
00260-00277	IN. BUFF. CONT. REGISTERS (CHAN 10-17)
00300-00317	EXT. INT. REGISTERS (CHAN 10-17)
00320-00337	EXF. MON. REGISTERS (CHAN 10-17)
00340-00357	OUT. MON. REGISTERS (CHAN 10-17)
00360-00377	IN. MON. REGISTERS (CHAN 10-17)
00500-00537	BOOTSTRAP PROG. LOAD & AUTO RECOVERY