DECsystem-10
and
DECSYSTEM-20

KL SYSTEM
REFERENCE CARD

digital

USER PROCESS TABLE

(ADDRESSED FROM UBR)

0	USER PAGE 0	USER PAGE 1
377	USER PAGE 776	USER PAGE 777
400	EXECUTIVE PAGE 340	EXECUTIVE PAGE 341
417	EXECUTIVE PAGE 376	EXECUTIVE PAGE 377
420	RESERVED	
421	USER ARITHMETIC OVERFLOW TRAP INSTRUCTION	
422	USER STACK OVERFLOW TRAP INSTRUCTION	
423	USER TRAP 3 TRAP INSTRUCTION	
424	MUUO STORED HERE	
425	MUUO OLD PC WORD	
426	MUUO PROCESS CONTEXT WORD	
427	RESERVED	
430	KERNEL NO TRAP MUUO NEW PC WORD	
431	KERNEL TRAP MUUO NEW PC WORD	
432	SUPERVISOR NO TRAP MUUO NEW PC WORD	
433	SUPERVISOR TRAP MUUO NEW PC WORD	
434	CONCEALED NO TRAP MUUO NEW PC WORD	
435	CONCEALED TRAP MUUO NEW PC WORD	
436	PUBLIC NO TRAP MUUO NEW PC WORD	
437	PUBLIC TRAP MUUO NEW PC WORD	
440 477	RESERVED	
500	PAGE FAIL WORD	
501	PAGE FAIL OLD PC WORD	
502	PAGE FAIL NEW PC WORD	
503	RESERVED	
504 505	USER PROCESS EXECUTION TIME	
506 507	USER MEMORY REFERENCE COUNT	
510 777	RESERVED	

TOPS – 10 PROCESS TABLE
CONFIGURATION

MR-3698

DEVICE CODE AND MNEMONICS

FIRST OCTAL DIGIT	00	04	10	14	20	24	30	34	40	44	50	54	60	64	70	74
0	APR CPA CENTRAL PROCESSOR	PI PRIORITY INTERRUPT	PAG KI10 PAGING	MCA20 CCA CACHE	TIM (KL10 ACCOUNTING LOGIC)	MTR	AD10 ADC2 ANALOG-DIGITAL CONVERTER	DX10 PDC3 MAGNETIC TAPE					DLB (PDP-11 DATA LINK)	DL10 DLC	DK10 CLK REAL TIME CLOCK	DK10 CLK2 REAL TIME CLOCK
1	PTP PAPER TAPE PUNCH	PTR PAPER TAPE READER	CP10 CDP CARD PUNCH		626 TTY CONSOLE TELETYPE	LP10 LPT LINE PRINTER	VP10 DIS DISPLAY	VP10 DIS2 DISPLAY	XY10 PLT PLOTTER	XY10 PLT2 PLOTTER	CR10 CR CARD READER	CR10 CR2 CARD READER	DLB2 (PDP-11 DATA LINK)	DL10 DLC2	RC10 DSK DISK/DRUM	RC10 DSK2 DISK/DRUM
2	DTE20 DTE 10/11 INTERFACE	DTE20 DTE2 10/11 INTERFACE	DTE20 DTE3 10/11 INTERFACE	DTE20 DTE4 10/11 INTERFACE	DX10 PDC MAGNETIC TAPE	DX10 PDC2 MAGNETIC TAPE		LP10 LPT2 LINE PRINTER	DC10 DLS DATA LINE SCANNER	DC10 DLS2 DATA LINE SCANNER	RP10 DPC DISK PACK SYSTEM	RP10 DPC2 DISK PACK SYSTEM	RP10 DPC3 DISK PACK SYSTEM	RP10 DPC4 DISK PACK SYSTEM	RH10 RMC DATA CONTROL	RH10 RMC2 DATA CONTROL
3		DX10 PDC4 MAGNETIC TAPE			DTC (DECTAPE)	TD10 DTS	DTC2 (DECTAPE)	TD10 DTS2	TMC (MAGNETIC TAPE)	TM10 TMS	TMC2 (MAGNETIC TAPE)	TM10 TMS2	RH10 RMC3 DATA CONTROL	RH10 RMC4 DATA CONTROL	RH10 RMC5 DATA CONTROL	RH10 RMC6 DATA CONTROL
4													DSS (SINGLE SYNCHRONOUS LINE UNIT)	DS10 DSI	DSS2 (SINGLE SYNCHRONOUS LINE UNIT)	DS10 DSI2
5		CODES IN THIS SECTION RESERVED FOR USER SPECIAL DEVICES							RH20 MBC MASSBUS CONTROL	RH20 MBC2 MASSBUS CONTROL	RH20 MBC3 MASSBUS CONTROL	RH20 MBC4 MASSBUS CONTROL	RH20 MBC5 MASSBUS CONTROL	RH20 MBC6 MASSBUS CONTROL	RH20 MBC7 MASSBUS CONTROL	RH20 MBC8 MASSBUS CONTROL
6																
7									KI10 UNRESTRICTED CODES RESERVED FOR USERS				KI10 UNRESTRICTED CODES RESERVED FOR DEC			

MR-2300

BASIC INSTRUCTIONS

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

| INSTRUCTION CODE (INCLUDING MODE) | A,F | I | X | Y |

KL10 IN-OUT INSTRUCTIONS

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

| 1 1 1 | DEVICE CODE | INSTR CODE | I | X | Y |

INSTRUCTIONS EXECUTED UNDER EXTEND

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

| INSTRUCTION CODE | 0 0 0 0 | I | X | Y |

LOCAL INDIRECT WORD

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

| 1 0 | RESERVED | I | X | Y |

GLOBAL INDIRECT WORD

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

| 0 | I | X | Y |

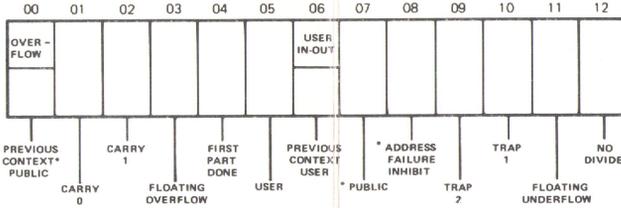## LOCAL INDEX REGISTER

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

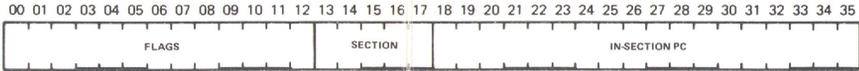| IN NONZERO SECTION MUST BE ≤0 OR BITS 6–17 = 0 | LOCAL INDEX |

GLOBAL INDEX REGISTER

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

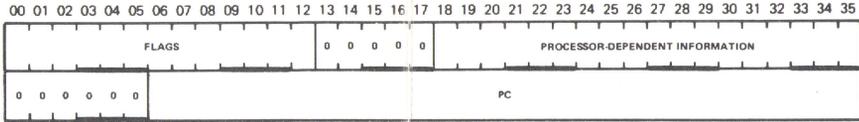| 0 0 0 0 0 0 | GLOBAL INDEX WITH NONZERO SECTION NUMBER |

MR-6484

SAVED FLAGS

00	01	02	03	04	05	06	07	08	09	10	11	12
OVER- FLOW						USER IN-OUT						

PREVIOUS CONTEXT* PUBLIC

CARRY 0

CARRY 1

FLOATING OVERFLOW

FIRST PART DONE

USER

PREVIOUS CONTEXT USER

* PUBLIC

* ADDRESS FAILURE INHIBIT

TRAP 2

TRAP 1

FLOATING UNDERFLOW

TRAP 1

NO DIVIDE

*KL10 ONLY

PC WORD

00 01 02 03 04 05 06 07 08 09 10 11 12	13 14 15 16 17	18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
FLAGS	SECTION	IN-SECTION PC

FLAG-PC DOUBLE WORD

00 01 02 03 04 05 06 07 08 09 10 11 12	13 14 15 16 17	18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
FLAGS	0 0 0 0 0	PROCESSOR-DEPENDENT INFORMATION

0 0 0 0 0 0	PC

MR-6485

LOCAL STACK POINTER

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
CONTROL COUNT (IN NONZERO SECTION ≤ 0 OR BITS 6–17 =0)																	

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
IN-SECTION OF LAST ITEM																	

GLOBAL STACK POINTER

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
0	0	0	0	0	0			ADDRESS OF LAST ITEM (NONZERO SECTION)									

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
ADDRESS OF LAST ITEM (NONZERO SECTION)																	
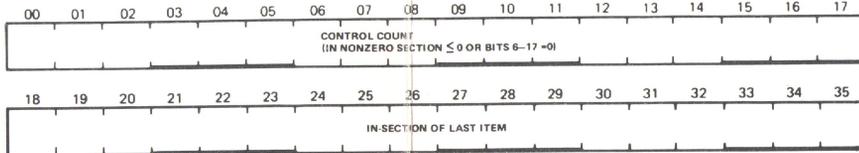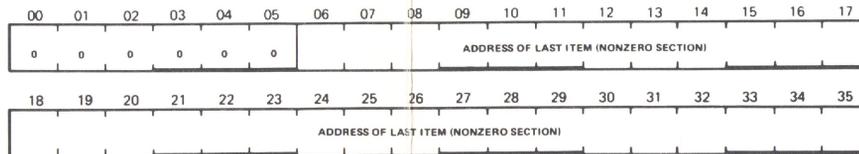
MR-6482

ONE-WORD BYTE POINTER
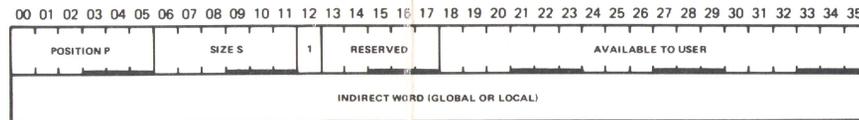
00 01 02 03 04 05	06 07 08 09 10 11	12	13	14 15 16 17	18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
POSITION P	SIZE S	0	I	X	Y

TWO-WORD BYTE POINTER

00 01 02 03 04 05	06 07 08 09 10 11	12	13 14 15 16 17	18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
POSITION P	SIZE S	1	RESERVED	AVAILABLE TO USER
INDIRECT WORD (GLOBAL OR LOCAL)				

BYTE STORAGE

S BITS — P BITS

00			35
	BYTE	NEXT BYTE	

35-P-S+1   35-P 35-P+1

MR-6483

FIXED POINT OPERANDS (SINGLE PRECISION OR HIGH ORDER WORD)

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

BINARY NUMBER (2'S COMPLEMENT)

SIGN
0+
1−
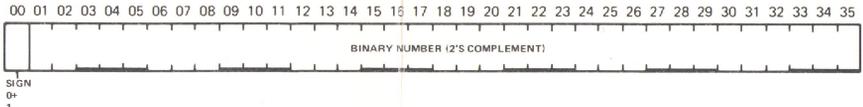
LOWER ORDER WORDS IN DOUBLE LENGTH FIXED POINT OPERANDS

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

LOWER ORDER EXTENSION OF FRACTION (2'S COMPLEMENT)

SIGN
COPY

FLOATING POINT OPERANDS (SINGLE PRECISION OR HIGH ORDER WORD)

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

EXCESS 128 EXPONENT (1'S COMPLEMENT)   FRACTION (2'S COMPLEMENT)

SIGN
0+
1−
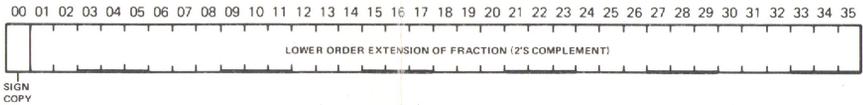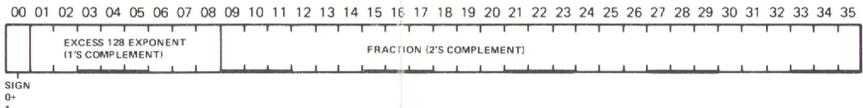
LOWER ORDER WORDS IN MULTIPLE LENGTH FLOATING POINT OPERANDS

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

0   LOWER ORDER EXTENSION OF FRACTION (2'S COMPLEMENT)

MR-6481
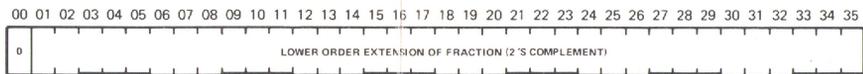
CONO PI — Conditions Out, Priority Interrupt

18   19   20   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35

WRITE EVEN PARITY   SELECTED LEVELS   PI SYSTEM   1   SELECT LEVELS FOR BITS 22, 24, 25, 26
                                                          2   3   4   5   6   7

ADDRESS   DIRCTRY
        DATA

DROP PROGRAM   INITIATE   TURN   TURN
REQUESTS ON   INTERRUPTS   OFF   ON
SELECTED LEVELS   ON

CLEAR   TURN
PI   ON
SYSTEM

TURN   TURN
OFF   ON

MR-6487
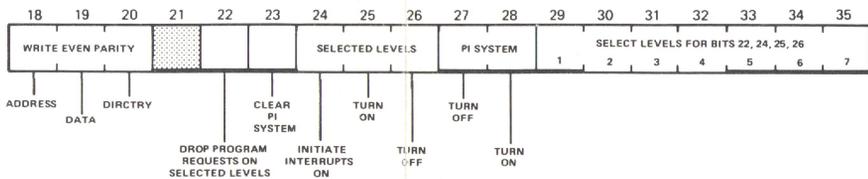
CONI PI — Conditions In, Priority Interrupt

00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17

                                                  1   PROGRAM REQUESTS ON LEVELS
                                                      2   3   4   5   6   7

18   19   20   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35

WRITE EVEN PARITY   1   INTERRUPT IN PROGRESS ON LEVELS   1   LEVELS ON
                       2   3   4   5   6   7   2   3   4   5   6   7

ADDRESS   DIRCTRY
        DATA

PI
SYSTEM
ON

MR-6488

API Word Format

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

ADDRESS   FUNCTION   Q   PHYSICAL   00   VIRTUAL ADDRESS
SPACE   CONTROLLER

ASSERTED
BY PI SYSTEM
0–7 = RH20
10–13 = DTE20
17 = DIA 20

ADDRESS SPACE*
(AS SPECIFIED BELOW)

ADDRESS CODE	DEFINITION
0	EPT
1	EXEC VIRTUAL
4	PHYSICAL
2,3,5–7	UNDEFINED

*THESE BITS ARE MICROCODE-DEPENDENT. CHECK THE
LATEST MICROCODE LISTING FOR POSSIBLE CHANGES.

FUNCTION
(AS SPECIFIED BELOW)

FUNCTION CODE	DEFINITION
0	STANDARD (40 + 2N) INTERRUPT
1	STANDARD INTERRUPT (40 + 2N)
2	VECTOR INTERRUPT [XCT (13—35)]
3	INCREMENT [QUAL = > DECREMENT]
4	DATAO (EXAMINE) [QUAL = > PROTECTED]
5	DATAI (DEPOSIT) [QUAL = > PROTECTED]
6	BYTE [QUAL + > TO -10]
7	STANDARD (40 + 2n) INTERRUPT

QUALIFIER
(AS SPECIFIED BELOW)

FUNCTION CODE	Q BIT INTERPRETATION
0,1,2,7	IGNORED
3	0 = ADD + 1
	1 = SUBTRACT + 1
4,5	1 = APPLY PROTECTION AND RELOCATION
6	1 = TO 10 BYTE TRANSFER
	0 = TO 11 BYTE TRANSFER

MR-6500

RDERA – Read Error Address Register (BLKI PI,)

00 01	02 03 04 05 06	07 08	09 10 11 12 13	14 15 16 17
WORD NUMBER	REFERENCE IDENTIFICATION	INDETERMINATE	0 0 0 0 0	HIGH ORDER ADDRESS BITS

SWEEP   DATA   WRITE
CHANNEL   SOURCE

18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
PHYSICAL ADDRESS OF FIRST WORD OF TRANSFER

DATA SOURCE CODE	WRITE REF	DATA SOURCE
4 5	6	
0 0	0	MEMORY (READ, RPW)
0 0	1	CHANNEL STORE STATUS (WRITE)
0 1	1	CHANNEL DATA (WRITE)
10	1	AR (EBOX WRITE)
11	0	CACHE (PAGE REFILL, CHANNEL READ)
11	1	CACHE WRITE

▨ EBOX RELATED EVENT

MR-6486

CONO APR – Conditions Out, Processor Flags

18 19	20 21 22 23	24 25 26 27 28 29 30 31	32	33 34 35
	SELECTED FLAGS	SELECT FLAGS FOR BITS 20–23		PRIORITY INTERRUPT ASSIGNMENT

CLEAR ALL IN-OUT DEVICES   DISABLE   SET   NO MEMORY   MB PARITY   ADDRESS PARITY   SWEEP DONE

ENABLE   CLEAR   S BUS ERROR   IN-OUT PAGE FAILURE   CACHE DIRCTRY   POWER FAILURE
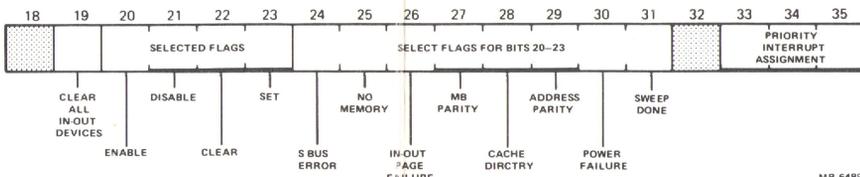
MR-6489

CONI APR – Conditions In, Processor Flags

00 01 02 03 04 05	06	07	08 09 10 11 12 13	14 15 16 17
			FLAG ENABLED TO INTERRUPT	

NO MEMORY (NXM)   MB PARITY   ADDRESS PARITY   SWEEP DONE

S BUS ERROR   IN-OUT PAGE FAILURE   CACHE DIRCTRY   POWER FAILURE

18 19	20 21 22 23	24	25	26	27	28	29	30	31	32	33 34 35
SWEEP BUSY		* S BUS ERROR		* IN-OUT PAGE FAILURE		* CACHE DIRCTRY PARITY ERROR		* POWER FAILURE		INTRUPT REQUEST	PRIORITY INTERRUPT ASSIGNMENT

* NO MEMORY (NXM)   * MB PARITY ERROR   * ADDRESS PARITY ERROR   * SWEEP DONE

NOTE: ASTERISKS INDICATE BITS THAT CAN CAUSE INTERRUPTS

MR-6490

BLKI APR,

	00	01	02	03	04 05 06 07	08	09 10 11 12 13 14 15 16 17
APRID (700000)	20 PAGE	EXT ADR	NON STD	EXT KL10		TRACK	MICROCODE VERSION NUMBER

	18	19	20	21	22	23	24 25 26 27 28 29 30 31 32 33 34 35
	50 HZ	CACHE INST	CHAN INST	MODEL PV	MSTR OSC		PROCESSOR SERIAL NUMBER
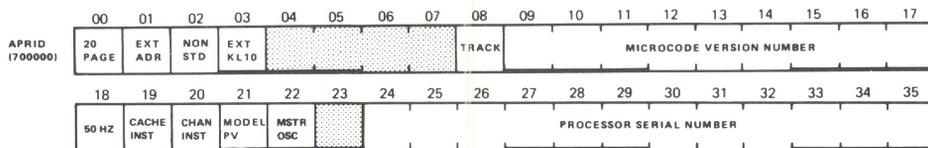
NOTE: BITS <00:08> ARE MICROCODE OPTIONS   BITS <18:23> ARE HARDWARE OPTIONS

00	MICROCODE IS FOR TOPS-20 PAGING	08	MICROCODE VERSION SUPPORTS TRACKING
01	MICROCODE HANDLES EXTENDED ADDRESSES	19	CACHE INSTALLED
02	NON-STANDARD MICROCODE	20	CHANNELS INSTALLED
03	MODEL PV TYPE PROCESSOR	21	CPU IS AN EXTENDED KL10

22   MASTER OSCILLATOR (KW20 OPTION)

MR-2067

CONO PAG – Conditions Out, Pager

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
CACHE STRATEGY								EXECUTIVE BASE ADDRESS (PAGE NUMBER)									

- LOOK
- LOAD
- TOPS-20 PAGING
- ENABLE PAGER
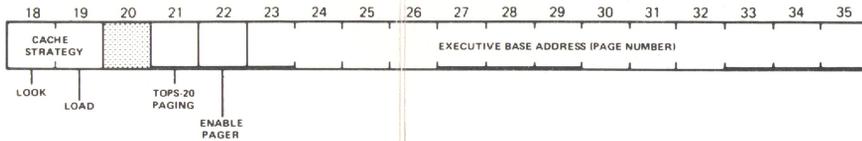
CONI PAG – Conditions In, Pager   (Same as CONO PAG)

DATAO PAG – Data Out, Pager

MR-6491

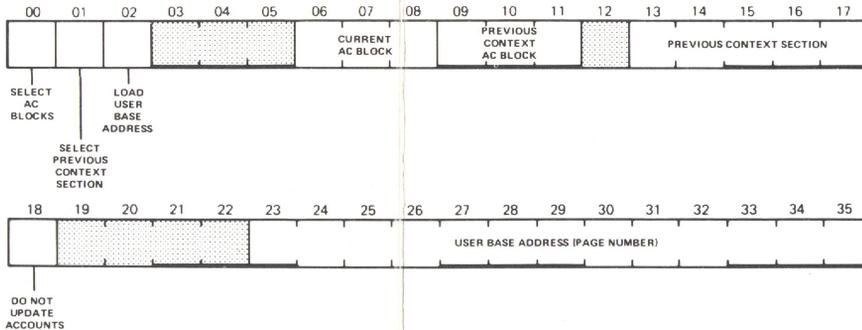| 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
						CURRENT AC BLOCK		PREVIOUS CONTEXT AC BLOCK					PREVIOUS CONTEXT SECTION			

- SELECT AC BLOCKS
- SELECT PREVIOUS CONTEXT SECTION
- LOAD USER BASE ADDRESS

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
								USER BASE ADDRESS (PAGE NUMBER)									

- DO NOT UPDATE ACCOUNTS

DATAI PAG – Data In, Pager   (Same format as DATAO PAG, Bits 0-2 are 1's and Bit 18 is 0
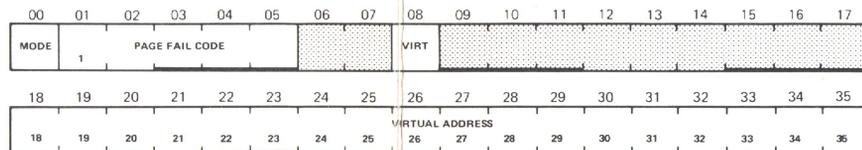
MR-6492

Page Fail Word (TOPS-10 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
MODE	1	PAGE FAIL CODE						VIRT									

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
18	19	20	21	22	23	24	25	VIRTUAL ADDRESS 26	27	28	29	30	31	32	33	34	35

NOTE: REFER TO OTHER PAGE FAIL WORD FOR BIT DEFINITIONS.
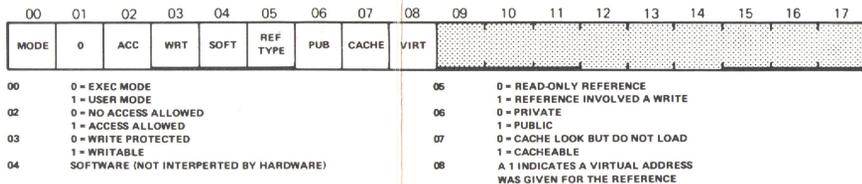
0 = EXEC MODE
1 = USER MODE

<01:05>   PAGE FAIL CODES
21   PROPRIETARY VIOLATION
22   REFILL ERROR
23   ADDRESS FAILURE

<01:05>   25   PAGE TABLE PARITY ERROR
CONT   36   AR DATA PARITY ERROR
37   ARX DATA PARITY ERROR
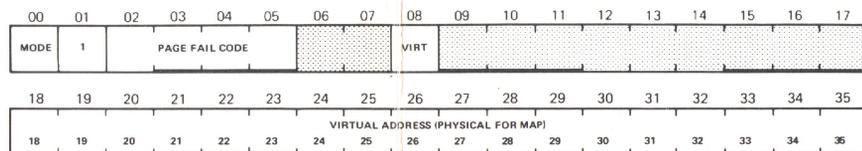
MR-3823

Page Fail Word (TOPS-10 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
MODE	0	ACC	WRT	SOFT	REF TYPE	PUB	CACHE	VIRT									

00	0 = EXEC MODE / 1 = USER MODE
02	0 = NO ACCESS ALLOWED / 1 = ACCESS ALLOWED
03	0 = WRITE PROTECTED / 1 = WRITABLE
04	SOFTWARE (NOT INTERPRETED BY HARDWARE)
05	0 = READ-ONLY REFERENCE / 1 = REFERENCE INVOLVED A WRITE
06	0 = PRIVATE / 1 = PUBLIC
07	0 = CACHE LOOK BUT DO NOT LOAD / 1 = CACHEABLE
08	A 1 INDICATES A VIRTUAL ADDRESS WAS GIVEN FOR THE REFERENCE

MR-6496

Page Fail Word (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
MODE	1	PAGE FAIL CODE						VIRT									

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
18	19	20	21	22	23	24	25	VIRTUAL ADDRESS (PHYSICAL FOR MAP) 26	27	28	29	30	31	32	33	34	35

NOTE: REFER TO OTHER PAGE FAIL WORD FOR BIT DEFINITIONS.

0 = EXEC MODE
1 = USER MODE

<01:05>   PAGE FAIL CODES
21   PROPRIETARY VIOLATION
23   ADDRESS FAILURE
24   ILLEGAL INDIRECT

<01:05>   25   PAGE TABLE PARITY ERROR
CONT   27   ILLEGAL ADDRESS - SECTION > 37
36   AR DATA PARITY ERROR
37   ARX DATA PARITY ERROR

MR-3827

Page Fail Word (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
MODE	0	ACC	MOD	WRT	REF TYPE	PUB	CACHE	VIRT					13	14	SECTION 15	16	17

00	0 = EXEC MODE 1 = USER MODE	05	0 = READ-ONLY REFERENCE 1 = REFERENCE INVOLVED A WRITE
02	0 = REFILL REQUIRED TO DETERMINE PAGE ACCESSIBILITY 1 = ACCESSIBLE	06	0 = PRIVATE 1 = PUBLIC
03	0 = PAGE NOT MODIFIED 1 = PAGE MODIFIED	07	0 = CACHE-LOOK BUT DO NOT LOAD 1 = CACHEABLE
04	0 = WRITE-PROTECTED 1 = WRITABLE	08	A 1 INDICATES A VIRTUAL ADDRESS WAS GIVEN FOR THE REFERENCE

MR-6497

Page Map Entry (TOPS-10 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
ACC	PUB	WRITE	SOFT	CACHE	14	15	16	17	PHYSICAL PAGE NUMBER (ODD VIRTUAL PAGE) 18 19 20 21 22 23 24 25 26								

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
ACC	PUB	WRITE	SOFT	CACHE	14	15	16	17	PHYSICAL PAGE NUMBER (EVEN VIRTUAL PAGE) 18 19 20 21 22 23 24 25 26								

00 & 18	0 = NO ACCESS ALLOWED 1 = ACCESS ALLOWED	02 & 20	0 = WRITE-PROTECTED 1 = WRITABLE
01 & 19	0 = PRIVATE 1 = PUBLIC	03 & 21	SOFTWARE (NOT INTERPERTED BY HARDWARE)
		04 & 22	0 = CACHE-LOOK BUT DO NOT LOAD 1 = CACHEABLE

MR-2194

SECTION POINTER — No Access (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE 0 0 0																	

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

MR-3832

SECTION POINTER — Immediate (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE 0 0 1			PUB	WRITE		CACHE		AVAILABLE TO SOFTWARE				STORAGE MEDIUM					

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
AVAILABLE TO SOFTWARE					14	15	16	17	PAGE NUMBER OF PAGE MAP 18 19 20 21 22 23 24 25 26								

03	0 = PRIVATE 1 = PUBLIC	06	0 = CACHE-LOOK BUT DO NOT LOAD 1 = CACHEABLE
04	0 = WRITE-PROTECTED 1 = WRITABLE	<12:17>	NON-ZERO INDICATES PAGE MAP IS NOT IN MEMORY

MR-3833

SECTION POINTER — Shared (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE 0 1 0			PUB	WRITE		CACHE		AVAILABLE TO SOFTWARE									

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
INDEX TO SPT LOCATION CONTAINING PAGE ADDRESS OF PAGE MAP																	

NOTE: REFER TO IMMEDIATE POINTER FOR BIT DEFINITIONS.

MR-3835

SECTION POINTER — Indirect (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE 0 1 1			PUB	WRITE		CACHE	AVAIL TO SOFTWARE		SECTION TABLE INDEX								

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
INDEX TO SPT LOCATION CONTAINING PAGE ADDRESS OF ANOTHER SECTION TABLE																	

NOTE: REFER TO IMMEDIATE POINTER FOR BIT DEFINITIONS.

MR-3834

MAP POINTER — No Access (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE																	
0	0	0															

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
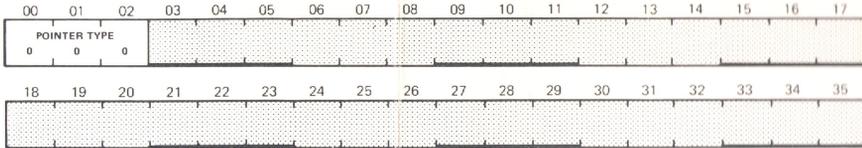
MR-3831

MAP POINTER — Immediate (TOPS-20 Only)
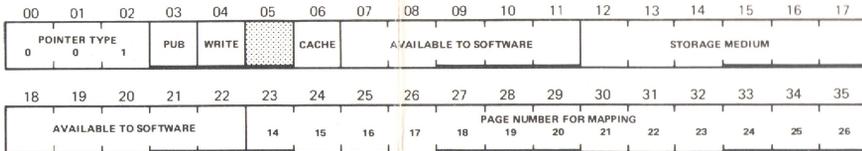
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE			PUB	WRITE		CACHE		AVAILABLE TO SOFTWARE				STORAGE MEDIUM					
0	0	1															

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
AVAILABLE TO SOFTWARE									PAGE NUMBER FOR MAPPING								
					14	15	16	17	18	19	20	21	22	23	24	25	26

03	0 = PRIVATE	06	0 = CACHE-LOOK BUT DO NOT LOAD
	1 = PUBLIC		1 = CACHEABLE
04	0 = WRITE PROTECTED	<12:17>	NON-ZERO INDICATES PAGE NOT IN MEMORY
	1 = WRITABLE		

MR-2149

MAP POINTER — Shared (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE			PUB	WRITE		CACHE		AVAILABLE TO SOFTWARE									
0	1	0															

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
INDEX TO SPT LOCATION CONTAINING PAGE ADDRESS FOR MAPPING																	
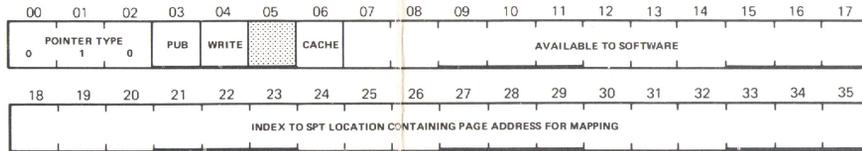
NOTE: REFER TO IMMEDIATE POINTER FOR BIT DEFINITIONS.

MR-2150

MAP POINTER — Indirect (TOPS-20 Only)

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
POINTER TYPE			PUB	WRITE		CACHE	AVAIL TO SOFTWARE	PAGE MAP INDEX									
0	1	1															

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
INDEX TO SPT LOCATION CONTAINING PAGE ADDRESS OF ANOTHER PAGE MAP																	
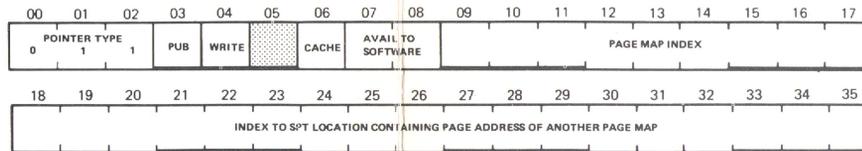
NOTE: REFER TO IMMEDIATE POINTER FOR BIT DEFINITIONS.

MR-2151

CST ENTRY

00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
PAGE AGE								AVAILABLE TO SOFTWARE									

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
AVAILABLE TO SOFTWARE																	
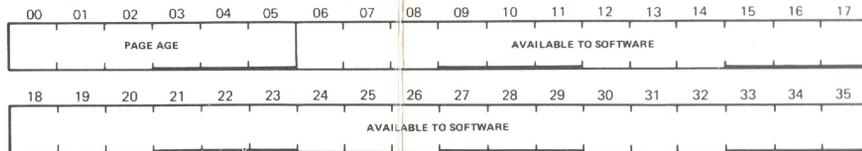
NOTE: AGE TRAP OCCURS IF BITS <00:05> EQUAL ZERO.

MR-2152

EXECUTIVE PROCESS TABLE

(ADDRESSED FROM EBR)

```
 0  ┌─────────────────────────────────────────────┐
    │ EIGHT CHANNEL LOGOUT AREAS                   │
    │    EACH:  0  INITIAL CHANNEL COMMAND         │
    │           1  GETS CHANNEL STATUS WORD        │
    │           2  GETS LAST UPDATED COMMAND       │
    │           3  RESERVED                        │
37  ├─────────────────────────────────────────────┤
40  │ RESERVED                                     │
41  ├─────────────────────────────────────────────┤
42  │                                              │
    │ STANDARD PRIORITY INTERRUPT INSTRUCTIONS     │
57  ├─────────────────────────────────────────────┤
60  │                                              │
    │ FOUR CHANNEL BLOCK FILL WORDS                │
63  ├─────────────────────────────────────────────┤
64  │ RESERVED                                     │
137 ├─────────────────────────────────────────────┤
140 │                                              │
    │ FOUR DTE20 CONTROL BLOCKS                    │
    │    EACH:  0  TO11 BYTE POINTER               │
    │           1  TO10 BYTE POINTER               │
    │           2  DTE INTERRUPT INSTRUCTION       │
    │           3  RESERVED                        │
    │           4  EXAMINE PROTECT                 │
    │           5  EXAMINE RELOCATION              │
    │           6  DEPOSIT PROTECT                 │
177 │           7  DEPOSIT RELOCATION              │
200 ├───────────────────────┬─────────────────────┤
    │ EXECUTIVE PAGE 400     │ EXECUTIVE PAGE 401  │
377 │ EXECUTIVE PAGE 776     │ EXECUTIVE PAGE 777  │
400 ├───────────────────────┴─────────────────────┤
    │ RESERVED                                     │
420 ├─────────────────────────────────────────────┤
421 │ EXECUTIVE ARITHMETIC OVERFLOW TRAP INSTRUCTION│
422 │ EXECUTIVE STACK OVERFLOW TRAP INSTRUCTION    │
423 │ EXECUTIVE TRAP 3 TRAP INSTRUCTION            │
424 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
507 ├─────────────────────────────────────────────┤
510 │ TIME BASE                                    │
511 ├─────────────────────────────────────────────┤
512 │ PERFORMANCE ANALYSIS COUNT                   │
513 ├─────────────────────────────────────────────┤
514 │ INTERVAL COUNTER INTERRUPT INSTRUCTION       │
515 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
577 ├───────────────────────┬─────────────────────┤
600 │ EXECUTIVE PAGE 0       │ EXECUTIVE PAGE 1    │
757 │ EXECUTIVE PAGE 336     │ EXECUTIVE PAGE 337  │
760 ├───────────────────────┴─────────────────────┤
    │ RESERVED                                     │
777 └─────────────────────────────────────────────┘
```
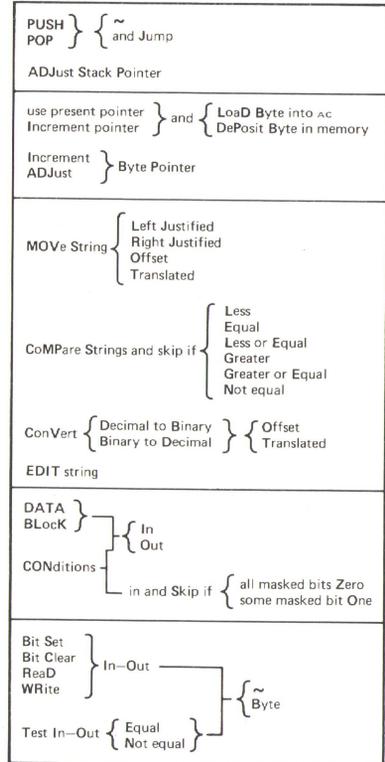
**TOPS – 10 PROCESS TABLE
CONFIGURATION (CONT)**

MR-3699

EXECUTIVE PROCESS TABLE

(ADDRESSED FROM EBR)

```
 0  ┌─────────────────────────────────────────────┐
    │ EIGHT CHANNEL LOGOUT AREAS                   │
    │    EACH:  0  INITIAL CHANNEL COMMAND         │
    │           1  GETS CHANNEL STATUS WORD        │
    │           2  GETS LAST UPDATED COMMAND       │
    │           3  RESERVED                        │
37  ├─────────────────────────────────────────────┤
40  │ RESERVED                                     │
41  ├─────────────────────────────────────────────┤
42  │                                              │
    │ STANDARD PRIORITY INTERRUPT INSTRUCTIONS     │
57  ├─────────────────────────────────────────────┤
60  │                                              │
    │ FOUR CHANNEL BLOCK FILL WORDS                │
63  ├─────────────────────────────────────────────┤
64  │ RESERVED                                     │
137 ├─────────────────────────────────────────────┤
140 │                                              │
    │ FOUR DTE20 CONTROL BLOCKS                    │
    │    EACH:  0  TO11 BYTE POINTER               │
    │           1  TO10 BYTE POINTER               │
    │           2  DTE INTERRUPT INSTRUCTION       │
    │           3  RESERVED                        │
    │           4  EXAMINE PROTECT                 │
    │           5  EXAMINE RELOCATION              │
    │           6  DEPOSIT PROTECT                 │
177 │           7  DEPOSIT RELOCATION              │
200 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
420 ├─────────────────────────────────────────────┤
421 │ EXECUTIVE ARITHMETIC OVERFLOW TRAP INSTRUCTION│
422 │ EXECUTIVE STACK OVERFLOW TRAP INSTRUCTION    │
423 │ EXECUTIVE TRAP 3 TRAP INSTRUCTION            │
424 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
507 ├─────────────────────────────────────────────┤
510 │                                              │
    │ TIME BASE                                    │
511 ├─────────────────────────────────────────────┤
512 │                                              │
    │ PERFORMANCE ANALYSIS COUNT                   │
513 ├─────────────────────────────────────────────┤
514 │ INTERVAL COUNTER INTERRUPT INSTRUCTION       │
515 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
537 ├─────────────────────────────────────────────┤
540 │ EXECUTIVE SECTION 0 POINTER                  │
577 │ EXECUTIVE SECTION 37 POINTER                 │
600 ├─────────────────────────────────────────────┤
    │ RESERVED                                     │
777 └─────────────────────────────────────────────┘
```

**EXTENDED TOPS – 20 PROCESS TABLE
CONFIGURATION**

MR-3700

USER PROCESS TABLE

(ADDRESSED FROM UBR)

Address	Content	
0		
	RESERVED	
	NOTE: ASTERISKS INDICATE LOCATIONS WHOSE USE DIFFERS FROM THOSE IN THE SINGLE SECTION PROCESS TABLE LISTED ON THE NEXT PAGE.	
417		
420	ADDRESS OF LUUO BLOCK	*
421	USER ARITHMETIC OVERFLOW TRAP INSTRUCTION	
422	USER STACK OVERFLOW TRAP INSTRUCTION	
423	USER TRAP 3 TRAP INSTRUCTION	
424	MUUO FLAGS / MUUO OP CODE, A	*
425	MUUO OLD PC	*
426	E OF MUUO	*
427	MUUO PROCESS CONTEXT WORD	
430	KERNEL NO TRAP MUUO NEW PC	*
431	KERNEL TRAP MUUO NEW PC	*
432	SUPERVISOR NO TRAP MUUO NEW PC	*
433	SUPERVISOR TRAP MUUO NEW PC	*
434	CONCEALED NO TRAP MUUO NEW PC	*
435	CONCEALED TRAP MUUO NEW PC	*
436	PUBLIC NO TRAP MUUO NEW PC	*
437	PUBLIC TRAP MUUO NEW PC	*
440	RESERVED	
477		
500	PAGE FAIL WORD	*
501	PAGE FAIL FLAGS	*
502	PAGE FAIL OLD PC	*
503	PAGE FAIL NEW PC	*
504 505	USER PROCESS EXECUTION TIME	
506 507	USER MEMORY REFERENCE COUNT	
510	RESERVED	
537		
540	USER SECTION 0 POINTER	
577	USER SECTION 37 POINTER	
600	RESERVED	
777		

EXTENDED TOPS – 20 PROCESS TABLE CONFIGURATION (CONT)

MR-3701

EXECUTIVE PROCESS TABLE

(ADDRESSED FROM EBR)

Address	Content
0	EIGHT CHANNEL LOGOUT AREAS EACH: 0 INITIAL CHANNEL COMMAND / 1 GETS CHANNEL STATUS WORD / 2 GETS LAST UPDATED COMMAND / 3 RESERVED
37	
40 41 42	RESERVED
	STANDARD PRIORITY INTERRUPT INSTRUCTIONS
57	
60	FOUR CHANNEL BLOCK FILL WORDS
63 64	
	RESERVED
137 140	
	FOUR DTE20 CONTROL BLOCKS EACH: 0 TO11 BYTE POINTER / 1 TO10 BYTE POINTER / 2 DTE INTERRUPT INSTRUCTION / 3 RESERVED / 4 EXAMINE PROTECT / 5 EXAMINE RELOCATION / 6 DEPOSIT PROTECT / 7 DEPOSIT RELOCATION
177 200	
	RESERVED
420	
421	EXECUTIVE ARITHMETIC OVERFLOW TRAP INSTRUCTION
422	EXECUTIVE STACK OVERFLOW TRAP INSTRUCTION
423	EXECUTIVE TRAP 3 TRAP INSTRUCTION
424	RESERVED
507	
510 511	TIME BASE
512 513	PERFORMANCE ANALYSIS COUNT
514	INTERVAL COUNTER INTERRUPT INSTRUCTION
515	RESERVED
537	
540	EXECUTIVE SECTION 0 POINTER
577	EXECUTIVE SECTION 37 POINTER
600	RESERVED
777	

SINGLE—SECTION TOPS-20 PROCESS TABLE CONFIGURATION

MR-3702

USER PROCESS TABLE

(ADDRESSED FROM UBR)

0		
	RESERVED	NOTE: ASTERISKS INDICATE LOCATIONS WHOSE USE DIFFERS FROM THOSE IN THE EXTENDED PROCESS TABLE LISTED ON THE PRECEDING PAGE.	
420		*
421	USER ARITHMETIC OVERFLOW TRAP INSTRUCTION	
422	USER STACK OVERFLOW TRAP INSTRUCTION	
423	USER TRAP 3 TRAP INSTRUCTION	
424	RESERVED	*
425	MUUO STORED HERE	*
426	MUUO OLD PC WORD	*
427	MUUO PROCESS CONTEXT WORD	
430	KERNEL NO TRAP MUUO NEW PC WORD	*
431	KERNEL TRAP MUUO NEW PC WORD	*
432	SUPERVISOR NO TRAP MUUO NEW PC WORD	*
433	SUPERVISOR TRAP MUUO NEW PC WORD	*
434	CONCEALED NO TRAP MUUO NEW PC WORD	*
435	CONCEALED TRAP MUUO NEW PC WORD	*
436	PUBLIC NO TRAP MUUO NEW PC WORD	*
437	PUBLIC TRAP MUUO NEW PC WORD	*
440 477	RESERVED	
500	PAGE FAIL WORD	*
501	PAGE FAIL FLAGS	*
502	PAGE FAIL OLD PC WORD	*
503	PAGE FAIL NEW PC WORD	*
504 505	USER PROCESS EXECUTION TIME	
506 507	USER MEMORY REFERENCE COUNT	
510 537	RESERVED	
540 577	USER SECTION 0 POINTER	
577	USER SECTION 37 POINTER	
600 777	RESERVED	

PUSH
POP } { ~ and Jump

ADJust Stack Pointer

use present pointer
Increment pointer } and { LoaD Byte into AC
DePosit Byte in memory

Increment
ADJust } Byte Pointer

MOVe String { Left Justified
Right Justified
Offset
Translated

CoMPare Strings and skip if { Less
Equal
Less or Equal
Greater
Greater or Equal
Not equal

ConVert { Decimal to Binary
Binary to Decimal } { Offset
Translated

EDIT string

DATA
BLocK } { In
Out

CONditions ── in and Skip if { all masked bits Zero
some masked bit One

Bit Set
Bit Clear
ReaD
WRite } In─Out ── { ~
Byte

Test In─Out { Equal
Not equal }

MR-6499

SINGLE-SECTION TOPS-20 PROCESS
TABLE CONFIGURATION (CONT)

MOV { E / e Negative / e Magnitude / e Swapped } ——————————— { to AC / Immediate to AC / to Memory / to Self }

Half word { Right / Left } to { Right / Left } { no effect / Ones / Zeros / Extend sign }

BLock Transfer
EXCHange AC and memory

use present pointer / Increment pointer } and { LoaD Byte into AC / DePosit Byte in memory }

Increment Byte Pointer

PUSH down / POP up } { ~ and Jump }

SET to { Zeros / Ones / Ac / Memory / Complement of Ac / Complement of Memory }

AND / inclusive OR } { ~ / with Complement of Ac / with Complement of Memory / Complements of Both } to { AC / AC Immediate / Memory / Both }

Inclusive OR / eXclusive OR / EQui Valence }

SKIP if memory / JUMP if AC }

Add One to / Subtract One from } { memory and Skip / AC and Jump } if { never / Less / Equal / Less or Equal / Always / Greater / Greater or Equal / Not equal }

Compare Ac { Immediate / with Memory } and skip if AC

Add One to Both halves of AC and Jump if { Positive / Negative }

Arithmetic SHift / Logical SHift / ROTate } { ~ / Combined }

Test AC { with Direct mask / with Swapped mask / Right with E / Left with E } { No modification / set masked bits to Zeros / set masked bits to Ones / Complement masked bits } and skip { never / if all masked bits Equal 0 / if Not all masked bits equal 0 / Always }

ADD / SUBtract / MULtiply / Integer MULtiply / DIVide / Integer DIVide } and Round { ~ / Immediate / to Memory / to Both }

Floating AdD / Floating SuBtract / Floating MultiPly / Floating DiVide } { ~ / Long / to Memory / to Both }

Floating SCale

Double Floating Negate

Unnormalized Floating Add

FIX
FIX and Round

FLoaT and Round

Double Floating AdD
Double Floating SuBtract
Double Floating MultiPly
Double Floating DiVide

Double MOV { E / e Negative } { ~ / to Memory }

Jump, { to Sub Routine / and Save Pc / and Save Ac / and Restore Ac / if Find First One / on Flag and CLear it / on OVerflow (JFCL 10,) / on CaRrY 0 (JFCL 4,) / on CaRrY 1 (JFCL 2,) / on CaRrY (JFCL 6,) / on Floating OVerflow (JFCL 1,) / and ReSTore / and ReSTore Flags (JRST 2,) / and ENable PI channel (JRST 12,) }

HALT (JRST 4,)
PORTAL (JRST 1,)
eXeCuTe

DATA / BLocK } { In / Out }

CONditions { in and / Skip if } { all masked bits Zero / some masked bit One }

MR-6498

INSTRUCTION CODES

	--0	--1	--2	--3	--4	--5	--6	--7
00	ILLEGAL	CMPSL	CMPSE	CMPSLE	EDIT	CMPSGE	CMPSN	CMPSG
01	CVTDBO	CVTDBT	CVTBDO	CVTBDT	MOVSO	MOVST	MOVSLJ	MOVSRJ
02	XBLT							
03								
04	CALL	INIT	←————— RESERVED MUUO's —————→					CALLI
05	OPEN	TTCAL				RENAME	IN	OUT
06	SETSTS	STATO	GETSTS	STATZ	INBUF	OUTBUF	INPUT	OUTPUT
07	CLOSE	RELEAS	MTAPE	UGETF	USETI	USETO	LOOKUP	ENTER
10	UJEN				JSYS	ADJSP		
11	DFAD	DFSB	DFMP	DEDV				
12	DMOVI	DMOVN	FIX		DMOVEM	DMOVNM	FIXR	FLTR
13	UFA	DFN	FSC	IBP	ILDB	LDB	IDPB	DPB
14	FAD	-L	-M	-B	FADR	-I	-M	-B
15	FSB	-L	-M	-B	FSBR	-I	-M	-B
16	FMP	-L	-M	-B	FMPR	-I	-M	-B
17	FDV	-L	-M	-B	FDVR	-I	-M	-B
20	MOV	-I	-M	-S	MOVS	-I	-M	-S
21	MOVN	-I	-M	-S	MOVM	-I	-M	-S
22	IMUL	-I	-M	-B	MUL	-I	-M	-B
23	IDIV	-I	-M	-B	DIV	-I	-M	-B
24	ASH	ROT	LSH	JFFO	ASHC	ROTC	LSHC	
25	EXCH	BLT	AOBJP	AOBJN	JRST	JFCL	XCT	MAP
26	PUSHJ	PUSH	POP	POPJ	JSR	JSP	JSA	JRA
27	ADD	-I	-M	-B	SUB	-I	-M	-B
30	CAI	-L	-E	-LE	-A	-GE	-N	-G
31	CAM	-L	-E	-LE	-A	-GE	-N	-G
32	JUMP	-L	-E	-LE	-A	-GE	-N	-G
33	SKIP	-L	-E	-LE	-A	-GE	-N	-G
34	AOJ	-L	-E	-LE	-A	-GE	-N	-G
35	AOS	-L	-E	-LE	-A	-GE	-N	-G
36	SOJ	-L	-E	-LE	-A	-GE	-N	-G
37	SOS	-L	-E	-LE	-A	-GE	-N	-G
40	SETZ	-I	-M	-B	AND	-I	-M	-B
41	ANDCA	-I	-M	-B	SETM	-I	-M	-B
42	ANDCM	-I	-M	-B	SETA	-I	-M	-B
43	XOR	-I	-M	-B	IOR	-I	-M	-B
44	ANDCB	-I	-M	-B	EQV	-I	-M	-B
45	SETCA	-I	-M	-B	ORCA	-I	-M	-B
46	SETCM	-I	-M	-B	ORCM	-I	-M	-B
47	ORCB	-I	-M	-B	SETO	-I	-M	-B
50	HLL	-I	-M	-S	HRL	-I	-M	-S
51	HLLZ	-I	-M	-S	HRLZ	-I	-M	-S
52	HLLO	-I	-M	-S	HRLO	-I	-M	-S
53	HLLE	-I	-M	-S	HRLE	-I	-M	-S
54	HRR	-I	-M	-S	HLR	-I	-M	-S
55	HRRZ	-I	-M	-S	HLRZ	-I	-M	-S
56	HRRO	-I	-M	-S	HLRO	-I	-M	-S
57	HRRE	-I	-M	-S	HLRE	-I	-M	-S
60	TRN	TLN	TRNE	TLNE	TRNA	TLNA	TRNN	TLNN
61	TDN	TSN	TDNE	TSNE	TDNA	TSNA	TDNN	TSNN
62	TRZ	TLZ	TRZE	TLZE	TRZA	TLZA	TRZN	TLZN
63	TDZ	TSZ	TDZE	TSZE	TDZA	TSZA	TDZN	TSZN
64	TRC	TLC	TRCE	TLCE	TRCA	TLCA	TRCN	TLCN
65	TDC	TSC	TDCE	TSCE	TDCA	TSCA	TDCN	TSCN
66	TRO	TLO	TROE	TLOE	TROA	TLOA	TRON	TLON
67	TDO	TSO	TDO	TSOE	TDOA	TSOA	TDON	TSON

7 —— INPUT—OUTPUT INSTRUCTIONS

001—037 LUUO's, 001—020 codes under EXTEND, all others unassigned.

MR-6494

7—   INPUT—OUTPUT INSTRUCTIONS

Code	Instruction(s)	Code	Instruction(s)
70000	[3]BLKI / [†]APRID	70204	[6]RDCSB / [5]RDTIME
70004	[3]DATAI / [4]DATAI APR,	70210	[6]RDPUR / [5]WRPAE
	[4]RSW	70214	[6]RDCSTM
70010	[3]BLKO / [5]WRFIL	70220	[6]RDTIM / [5]CONO TIM,
70014	[3]DATAO / [4]DATAO APR,	70224	[6]RDINT / [5]CONI TIM,
70020	[3]CONO / [6]WRAPR / [3]CONO APR,	70230	[6]RDHSB
70024	[3]CONI / [6]RDAPR / [3]CONI APR,	70240	[6]WRSPB / [5]RDMACT
70030	[3]CONSZ	70244	[6]WRCSB / [5]RDEACT
70034	[3]CONSO	70250	[6]WRPUR
70040	[5]RDERA	70254	[6]WRCSTM
70050	[5]SBDIAG	70260	[6]WRTIM / [5]CONO MTR,
70054	[4]DATAO PI,	70264	[6]WRINT / [5]CONI MTR,
70060	[6]WRPI / [3]CONO PI,	70270	[6]WRHSB
70064	[6]RDPI / [3]CONI PI,	704	[6]UMOVE
70104	[6]RDUBR / [1,3]DATAI PAG,	705	[6]UMOVEM
70110	[†]CLRPT	710	[6]TIOE
70114	[6]WRUBR / [1,3]DATAO PAG,	71054	[7]DATAO PTR,
70120	[6]WREBR / [1,3]CONO PAG,	711	[6]TION
70124	[6]RDEBR / [1,3]CONI PAG,	712	[6]RDIO
70144	[5†]SWPIA	713	[6]WRIO
70150	[5†]SWPVA	714	[6]BSIO
70154	[5†]SWPUA	715	[6]BCIO
70164	[5†]SWPIO	720	[6]TIOEB
70170	[5†]SWPVO	721	[6]TIONB
70174	[5†]SWPUO	722	[6]RDIOB
70200	[6]RDSPB / [5]RDPERF	723	[6]WRIOB
		724	[6]BSIOB
		725	[6]BCIOB

(x000x	[3]APR)
(x004x	[3]PI)
(x010x	[1,3]PAG)
(x014x	[5]CCA)
(x020x	[5]TIM)
(x024x	[5]MTR)

KEY

1 Not available in KA10.
3 No longer used in KS10 and future machines.
4 Used only in KA10 and KI10.
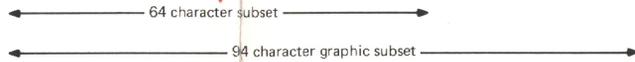5 Used only in KL10.
6 Used only in KS10.
7 Used only in KI10.
† Indicates a NOW-standard instruction code that is available in the KL10 and KS10 (and can be expected to be available in all future processors) but is unassigned in the earlier processors.

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ASCII CHARACTER SET
ASCII—1968 (ANSI X3.4—1968)

To obtain octal ASCII, decimal ASCII, or DECsystem-10 SIXBIT representation of a character, add the row value to the column value.

Column Value / Row Value	000 / 000	008 / 010	016 / 020	024 / 030	00 / 032 / 040	10 / 040 / 050	20 / 048 / 060	30 / 056 / 070	40 / 064 / 100	50 / 072 / 110	60 / 080 / 120	70 / 088 / 130	096 / 140	104 / 150	112 / 160	120 / 170
0	NUL	BS	DLE	CAN	space	(	0	8	@	H	P	X	` grave	h	p	x
1	SOH	HT	DC1	EM	!	)	1	9	A	I	Q	Y	a	i	q	y
2	STX	LF	DC2	SUB	''	*	2	:	B	J	R	Z	b	j	r	z
3	ETX	VT	DC3	ESC	#	+	3	;	C	K	S	[	c	k	s	{
4	EOT	FF	DC4	FS	$	,	4	<	D	L	T	\	d	l	t	|
5	ENQ	CR	NAK	GS	%	–	5	=	E	M	U	]	e	m	u	}
6	ACK	SO	SYN	RS	&	.	6	>	F	N	V	(↑)	f	n	v	(ESC)
7	BEL	SI	ETB	US	apos ,	/	7	?	G	O	W	(←)	g	o	w	DEL

SIXBIT octal (columns 00–70)
decimal ASCII
octal ASCII

◄——— 64 character subset ———►

◄——— 94 character graphic subset ———►

Differences in the ASCII Standard

Octal	(ASCII 1963)	ASCII 1968
136	↑	∧ (circumflex)
137	←	= (underline)
176	ESC	~

NUL	NULL	DLE	DATA LINK ESCAPE (↑P)
SOH	START OF HEADING (↑A)	DC1	DEVICE CONTROL 1 (↑Q)
STX	START OF TEXT (↑B)	DC2	DEVICE CONTROL 2 (↑R)
ETX	END OF TEXT (↑C)	DC3	DEVICE CONTROL 3 (↑S)
EOT	END OF TRANSMISSION (↑D)	DC4	DEVICE CONTROL 4 (STOP) (↑T)
ENQ	ENQUIRY (↑E)	NAK	NEGATIVE ACKNOWLEDGE (↑U)
ACK	ACKNOWLEDGE (↑F)	SYN	SYNCHRONOUS IDLE (↑V)
BEL	BELL (↑G)	ETB	END OF TRANSMISSION BLOCK (↑W)
BS	BACKSPACE (↑H)	CAN	CANCEL (↑X)
HT	HORIZONTAL TABULATION (↑I)	EM	END OF MEDIUM (↑Y)
LF	LINE FEED (↑J)	SUB	SUBSTITUTE (↑Z)
VT	VERTICAL TABULATION (↑K)	ESC	ESCAPE (↑[)
FF	FORM FEED (↑L)	FS	FILE SEPARATOR (↑\)
CR	CARRIAGE RETURN (↑M)	GS	GROUP SEPARATOR (↑])
SO	SHIFT OUT (↑N)	RS	RECORD SEPARATOR (↑↑)
SI	SHIFT IN (↑O)	US	UNIT SEPARATOR (↑←)
		DEL	DELETE (RUBOUT)

On most teleprinters, the ↑ x character is produced by depressing the CTRL key and at the same time depressing the x character key.

NOTES

1. SIXBIT is not part of any ASCII standard. It is used by DECsystem-10 programs as a code compression technique for the 64 character graphic subset of ASCII.

2. Teleprinters manufactured by Teletype Corporation, Skokie, Illinois, have used codes 175 (ALT) and 176 for ESC. Programs may forgo the use of } (175) and ~ (176) in order to use these codes as ESC on older teleprinters.

3. ASCII is a seven bit character code with an optional odd parity bit (200) added for many devices. Programs normally use just seven bits internally; the 200 bit is either stripped or added so the program will operate with either parity or non-parity generating devices.

4. ISO Recommendation R646 and CCITT Recommendation V.3 (International Alphabet No. 5) is identical to ASCII except that number sign (043) is represented as £ instead of # and certain characters are reserved for national use.

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