

**MICROPROGRAMMED OPERATE INSTRUCTIONS**

Operation Code = 74g

CLA	CLL	Additional Rotate	0 = OR of 1 = AND of	SNL SZL SNA SPA	SMA	HLT	RAR RAL RTR RTL	OAS	CML	CMA
5	6	7	8	9 10 11	12	13	14	15	16	17

	0	2	3	5	8	9	11	12	14	15	17	Event Time
OPR } NOP }	7	4	0	0	0	0	0	0	0	0	0	---
CMA	7	4	0	0	0	0	1	3	No other operation may take place at the same event time as rotates.			3
CML	7	4	0	0	0	0	2	3	RAR, RAL may not be combined with:			3
OAS	7	4	0	0	0	0	4	3	OAS, CML, CMA,			3
RAL	7	4	0	0	0	1	0	3	RTR, RTL may not be combined with:			3
RAR	7	4	0	0	0	2	0	3	OAS may not be combined with CMA			3
HLT } XX }	7	4	0	0	4	0	0	---				0
SMA	7	4	0	1	0	0	0	1				0
SZA	7	4	0	2	0	0	0	1				0
SNL } SML }	7	4	0	4	0	0	0	1				0
SKP	7	4	1	0	0	0	0	1				0
SPA	7	4	1	1	0	0	0	1				0
SNA	7	4	1	2	0	0	0	1				0
SZL } SPL }	7	4	1	4	0	0	0	1				0
RTL	7	4	2	0	1	0	0	2,3				2,3
RTR	7	4	2	0	2	0	0	2,3				2,3
CLL	7	4	4	0	0	0	0	2				2
(CLL-CML) } CCL }	7	4	4	0	0	2	2,3	2,3				2,3
(CLL-RAL) } RCL }	7	4	4	0	1	0	2,3	2,3				2,3
(CLL-RAR) } RCL }	7	4	4	0	2	0	2,3	2,3				2,3
CLA	7	5	0	0	0	0	2	2				2
(CLA-CMA) } CLC }	7	5	0	0	0	1	2,3	2,3				2,3
(CLA-OAS) } LAS }	7	5	0	0	0	4	2,3	2,3				2,3
(CLA-RAL) } LAT }	7	5	0	0	0	4	2,3	2,3				2,3
GLK	7	5	0	0	1	0	2,3	2,3				2,3

Mnemonic Code Operation Cycles

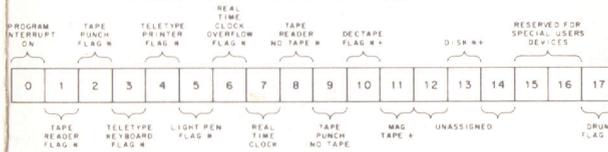
**MEMORY PROTECTION**

MPSK	701701	Skip on memory protection violation	
MPCV	701702	Clear memory protection flag	
MPLD	701704	Load boundary register	
MPSNE	701741	Skip on non-existent memory violation	
MPEU	701742	Enter user mode	
MPCNE	701744	Clear non-existent memory flag	

**TYPE 34 OSCILSCOPE DISPLAY**

DXC	700502	Clear X	4
DXL	700506	Load X from AC8-17	4
DXS	700546	Load X and display	4
DYC	700602	Clear Y	4
DYL	700606	Load Y from AC8-17	4
DYS	700646	Load Y and display	4
DLB	700704	Load brightness register from AC16-17	4

**IORS WORD-STATUS BIT ASSIGNMENT**



\* WILL CAUSE A PROGRAM INTERRUPT  
\* INCLUSIVE OR OF TRANSFER COMPLETION AND ERROR FLAGS

**MODEL 33, 35 ASR/KSR TELETYPE CODE (ASCII) IN OCTAL FORM**

Character	8-Bit Code (in Octal)	Character	8-Bit Code (in Octal)
@	300	Space	240
A	301	!	241
B	302	"	242
C	303	#	243
D	304	\$	244
E	305	%	245
F	306	&	246
G	307	'	247
H	310	(	250
I	311	)	251
J	312	*	252
K	313	+	253
L	314	,	254
M	315	-	255
N	316	.	256
O	317	/	257
P	320	0	260
Q	321	1	261
R	322	2	262
S	323	3	263
T	324	4	264
U	325	5	265
V	326	6	266
W	327	7	267
X	330	8	270
Y	331	9	271
Z	332	:	272
[	333	;	273
\	334	<	274
]	335	=	275
^	336	>	276
_	337	?	277
Horizontal Tab	211	Blank	000
Line-Feed	212	ALT Mode	375
Form-Feed	214	Rub-out	377
Carriage-Return	215		

**digital**

**PDP-9 & 9/L**

**INSTRUCTION LIST**

**MEMORY REFERENCE INSTRUCTIONS\***

Mnemonic	Code	Operation	Cycles
CAL	00	Call subroutine	2
DAC	04	Deposit AC	2
JMS	10	Jump to subroutine	2
DZM	14	Deposit zero in memory	2
LAC	20	Load AC	2
XOR	24	Exclusive OR	2
ADD	30	Add, 1's complement	2
TAD	34	Add, 2's complement	2
XCT	40	Execute	1+
ISZ	44	Increment and skip if zero	2
AND	50	AND	2
SAD	54	Skip if AC different from memory	2
JMP	60	Unconditional jump	1

\*Add 1 cycle for indirect addressing or auto indexing

**OPERATE INSTRUCTIONS\***

Mnemonic	Code	Operation	Event Time
OPR or NOP	740000	Basic operate command	---
CMA	740001	Complement AC	3
CML	740002	Complement L	3
OAS	740004	OR AC switches to AC	3
RAL	740010	Rotate AC and L one left	3
RAR	740020	Rotate AC and L one right	3
HLT or XX	740040	Halt	1
SMA	740100	Skip if AC < 0	1
SZA	740200	Skip if AC = 0	1
SNL or SML	740400	Skip if L ≠ 0	1
SKP	741000	Skip	1
SPA	741100	Skip if AC > 0	1
SNA	741200	Skip if AC ≠ 0	1
SZL or SPL	741400	Skip if L = 0	1
RTL	742010	Rotate AC and L two left	2,3
RTR	742020	Rotate AC and L two right	2,3
CLL	744000	Clear L	2
STL or CCL	744002	Set L	2,3
RCL	744010	Clear L, rotate AC and L one left	2,3
RCL	744020	Clear L, rotate AC and L one right	2,3
CLA	750000	Clear AC	2
CLC	750001	Clear and complement AC	2,3
LAS or LAT	750004	Load AC from switches	2,3
GLK	750010	L → AC17	2,3
LAW	76XXXX	Load AC with 760000+XXXX	---

\* Operation time is one cycle

### EAE INSTRUCTIONS

Mnemonic	Code	Operation	Cycles
EAE	640000	Basic EAE command	2
LRS	640500	Long right shift	4-19
LRSS	660500	Long right shift, signed	4-19
LLS	640600	Long left shift	4-19
LLSS	660600	Long left shift, signed	4-19
ALS	640700	Accumulator left shift	4-19
ALSS	660700	Accumulator left shift, signed	4-19
NORM	640444	Normalize, unsigned	4-19
NORMS	660444	Normalize, signed	4-19
MUL	653122	Multiply, unsigned	5-13
MULS	657122	Multiply, signed	5-13
DIV	640323	Divide, unsigned	5-13
DIVS	644323	Divide, signed	5-13
IDIV	653323	Integer divide, unsigned	5-13
IDIVS	657323	Integer divide, signed	5-13
FRDIV	650323	Fraction divide, unsigned	5-13
FRDIVS	654323	Fraction divide, signed	5-13
LACQ	641002	Load AC with MQ	2
LACS	641001	Load AC with SC	2
CLO	650000	Clear MQ	2
ABS	644000	Load AC with IACI	2
GSM	664000	Get sign and magnitude	2
OSC	640001	OR SC to AC	2
OMQ	640002	OR MQ to AC	2
CMQ	640004	Complement MQ	2
LMQ	652000	Load MQ	2

### \*INPUT/OUTPUT TRANSFER INSTRUCTIONS

Mnemonic	Code	Operation	Cycles
IOT	700000	Basic I/O command	4
IOBS	700314	Read flags	4
CAF	703302	Clear all flags	4
TTS	703301	Skip if not type 28	
SKP7	703341	Skip if not PDP-4	

### PROGRAM INTERRUPT

IOF	700002	Turn interrupt off	4
ION	700042	Turn interrupt on	4

### AUTOMATIC PRIORITY INTERRUPT

DBK	703304	Debreak	4
DBR	703344	Debreak and restore	4
SPI	705501	Skip on priorities inactive	4
ISA	705504	Initiate selected activity	4

### MEMORY EXTENSION CONTROL

SEM	707701	Skip if in extend mode	4
EEM	707702	Enter extend mode	4
LEM	707704	Leave extend mode	4

### CONSOLE TELETYPE KEYBOARD

KSF	700301	Skip on keyboard flag	4
KRB	700312	Read keyboard to AC10-17	4
KRS	700322	Select Keyboard reader(9/L only)	4

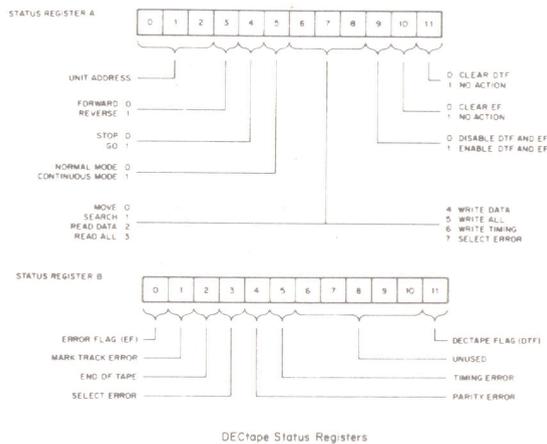
### CONSOLE TELETYPE TELEPRINTER

TSF	700401	Skip on teleprinter flag	4
TCF	700402	Clear teleprinter flag	4
TLS	700406	load teleprinter buffer and print	4

\* — Refer to User Handbook for options not listed

### INPUT/OUTPUT TRANSFER INSTRUCTIONS (cont.)

Mnemonic	Code	Operation	Cycles
<b>PAPER TAPE READER</b>			
RSF	700101	Skip on reader flag	4
RCF	700102	OR reader buffer to AC	4
RSA	700104	Select alphanumeric mode	4
RRB	700112	Read reader buffer	4
RSB	700144	Select binary mode	4
<b>PAPER TAPE PUNCH</b>			
PSF	700201	Skip on punch flag	4
PCF	700202	Clear punch flag	4
PSA	700204	Punch, alphanumeric	4
PSB	700244	Punch, binary	4
<b>REAL TIME CLOCK</b>			
CLSF	700001	Skip on clock flag	4
CLOF	700004	Disable clock	4
CLON	700044	Enable clock	4
<b>DECTAPE CONTROL</b>			
DTCA	707541	Clear status register A	4
DTXA	707544	XOR to status register A	4
DTLA	707545	Load status register A	4
DTRA	707552	Read status register A	4
DTEF	707561	Skip on error flag	4
DTRB	707572	Read status register B	4
DTDF	707601	Skip on DECTape flag	4



### POWER FAILURE DETECTION

PFSF	703201	Skip on power-low flag	
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### CHANNEL AND PRIORITY ASSIGNMENTS

Channel Number	Trap Address	Standard Device	Suggested Priority Level
0	40	Software channel 0	4
1	41	Software channel 1	5
2	42	Software channel 2	6
3	43	Software channel 3	7
4	44	DECTape (TC02)	1
5	45	Magtape (TC59)	1
6	46	Drum (RM09)	1
7	47	Disk	1
10	50	Papertape Reader	2
11	51	Clock Overflow	3
12	52	Power Fail (KP09)	0
13	53	Parity (MP09)	0
14	54	Light Pen (34H)	2
15	55	Card Readers (CR02B)	2
16	56	Line Printer (647)	2
17	57	A/D (AF01)	0
20	60	DB99A/DB98A	3
21	61	Data Link to System 360	3
22	62	Data Phone (DP09A)	2
23	63	Reserved for Systems Device	
24	64		
25	65		
26	66		
27	67		
30	70		
31	71		
32	72	Unassigned	
33	73		
34	74		
35	75		
36	76		
37	77		

### STATUS BITS ASSOCIATED WITH RPL INSTRUCTIONS

AC Bit	Function
0	API enabled (1)
1	Unused
2	Device requesting service on priority level 0
3	Device requesting service on priority level 1
4	Device requesting service on priority level 2
5	Device requesting service on priority level 3
6	Device requesting service on priority level 4
7	Device requesting service on priority level 5
8	Device requesting service on priority level 6
9	Device requesting service on priority level 7
10	Priority level 0 active
11	Priority level 1 active
12	Priority level 2 active
13	Priority level 3 active
14	Priority level 4 active
15	Priority level 5 active
16	Priority level 6 active
17	Priority level 7 active