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No. 9

PDP 8 IMAGE TUBE SCANNER PROGRAM SYSTEM 59
Machine Language Listings 66

Lloyd B. Robinson 70

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Santa Cruz, California 67
May 1974 74

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PDP 8 IMAGE TUBE SCANNER PROGRAM SYSTEM
Machine Language Listings

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Introduction

The machine language programs listed in the booklet are those prepared to allow control of the Lick Image Tube Scanner by instructions in the Lick version of the FOCAL language on the PDP 8/I.

The PDP 8/I system for the scanner is also described in Lick Technical Report No. 1 and No. 2.

These programs are normally stored on the disc memory and are overlaid into core memory, locations 16042 to 16777 when referenced by a FOCAL instruction. Listings for the overlay software and other modifications to FOCAL are given in L.T.R. No. 3.

The ASCII source listings are available on DECtape 12R. Binary versions and the disc overlay image "SET1" is on File 2, Tape 12R.

Scanner System Map (Field 1)

6-10 -- 44	CONØ	6000-6041	ENTR
10-17	Temporary STORE	7000-7576	Lick FOCAL
45-47	XCON	7577-7777	Disc Buffer
50-61	ARG1--ARG10		
62-66	XCON		
67-	LOTEMP } Temp		
70-	HITEMP } Store		
71-	SIGN }		
72-75	XCON		
76-77	CONØ		
100-102	Temp (EDIT, DIVD)		
103-105	Empty		
106-112	XCON		
114-237	CONØ,KB1 Table		

6042-6120	TOTL (1)	6043-6075	SHIF (4)
6121-6140	ADSC	6100-6110	DIS
6141-6370	EDIT	6151-6177	VAR
6371-6377	ADSC	6200-6231	GOTO*
6400-6515	PEAK	—	
6520-6544	COMP	6304-6325	PUTN
6545-6577	STAP	6350-6570	TAPO
6600-6666	ADSC	6571-6577	ZCOM
6670-6761	(COMP)	6600-6774	CHAIN*
6765-6777	CLER		

6044-6343	LIST (2)	6044-6144	FORM (5)
—		6145-6164	LOOK
6400-6542	CRT*	—	
6545-6576	SAV4	6172-6377	NAME
6600-6765	(CRT)	6400-6572	CRT
6770-6777	(SAV4)	6600-6720	(NCRT)
		6722-6765	(LOOK)
7425-7434	Permanent CRT	6771-6777	PAUS
10770-776≡⟩	6370-6376		

6200-6376 }	(3)	6134-6177	REVR (6)
6042-6167 }	DIVD, MOVF	6200-6353	MEMF
6400-6421 }		6400-6453	
		6477-6777	SWEP
6422-6772	SWIT		
		N.B.-KB1+66 FF. for Prog. 6	

—Always load LABL last or XFOC is wrong!

*Uses Field Ø parts.

. FAST
. SET1
. TAPE
. XFOC
. STEN

sequence to build system

DISPATCH TABLE ALLOCATIONS

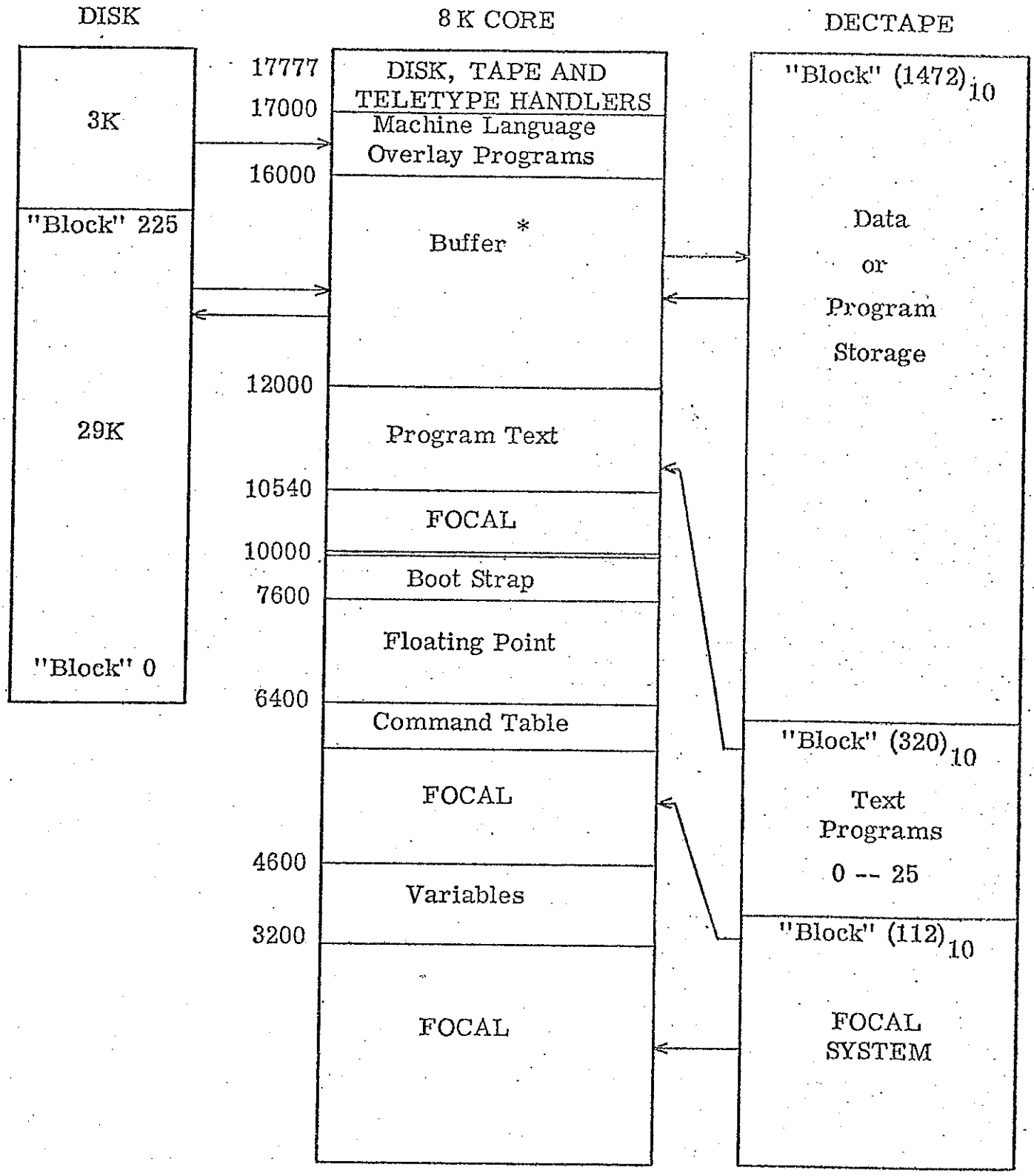
LICK FOCAL 1974

KB1 +	Scanner	Microphoto	AME
0	PUT	PUT	PUT
1	(F)TAK	(F)TAK	(F)TAK
2	CALL	CALL	CALL
3	FILE	FILE	FILE
4	END	END	END
5			JOY
6	STOR	STOR	STOR
7	(F)ASK	(F)ASK	(F)ASK
10	CRT		SAVX
11			SAVY
12	SWIT	SWIT	SWIT
13			STEP
14	MSAV	UP	COR
15	MGET	DN	GMIC
16	CLER	LFT	MICR
17		RIT	MICS
20	SAV	SHFT	LOC
21	PUL	SET	SCNR
22	CHAN	(F)UNC	GSCN
23	IN	IFIX	SCNS
24	OUT		
25	SHFT		SHFT
26	EDIT		PHOR
27	ERAS	[illegible]	GPHO
30	DIVD	DIVM	PHOS
31		ICRT	SWTA
32	MOVE	COMP	
33	PUTN	PUTN	PUTN

KB1 +	SCN	MIC	AME
34		PEN	SURV
35		PLOT	PLOT
36	DIS	DIS	DIS
37	STAT	STAT	STAT
40	NAME	NAME	NAME
41	WHAT	WHAT	WHAT
42		SHOW	IN
43		ADD	OUT
44		SUB	IOR
45			TEST
46	FORM		CLER
47	LOOK		AND
50		MINM	AME
51	TOTL	TOTL	TOTL
52	COMP	ZCOM	DISP
53	CPEN	CPEN	SWTS
54			ALOC
55	PAUS		MOV
56	GO	GO	GO
57	DO	DO	DO
60	ZCOM	PUTL	PUTL
61		TAKL	TAKL
62	PEAK	CONV	BUZ
63	VAR	MULT	VAR.
64	MPUT	MPUT	MPUT
65	MTAK	MTAK	MPUT

X NAME( ) overlays locations from KB1+66 to KB1+77.

PDP 8 Memory Utilization for Lick-FOCAL



*The buffer is used as a data buffer for the disk, DECtape and IBM tape. For the Microphotometer and Automatic Measuring Engine, part of the buffer (12000 - 12565) is used for FOCAL program text, and part (15000 - 15777 is used for core resident programs.

SCN 7.4 Cross file list

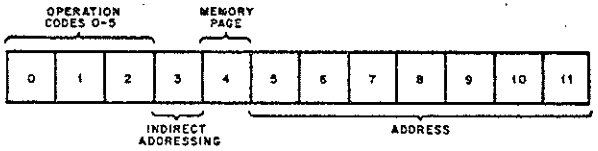
Aug 3/72

	COMMAND	Sub Routine	KBI +	CODE	Command	sub Routine	KBI +	CODE
					MGET	STAP	15	1274
X	ASK	SAV4	7	3643	MOVE	DIVD	32	2465
					MPUT	TAPE	76	
	CALL	CHAIN	2	2554	MSAV	STAP	14	2636
	CHAN	EDIR	22	3326	MTAR	TAPE	77	
	CLER	CLER	16	3772	NAME	NAME	40	1555
	COMP	COMP	52	370	OUT	ADSC	24	1474
	CPEN	COMP	53	366	PAUS	PAUS	53	3673
	CRT	NCRT	10	44	PEAK	PEAK	62	23
	DIS	DIS	36	0033	PULL	EDIR	21	2154
	DIVD	DIVD	30	664	PUTN	PUTN	33	2256
	DO	GOTO	57	3357	REVR	REVR	66	2302
	EDIT	EDIR	26	1034	SAV	EDIR	20	1636
	END	CHAIN	4	164	SHFT	SHIF	25	3404
	ERAS	EDIR	27	2533	STAT	CRT	37	734
					STOR	SAV4	6	1112
	FILE	CHAIN	3	2545				
	FORM	FORM	46	3435	SWIT	SWIT	12	1334
	GO	GOTO	56	3407	TOTL VAR	TOTL VAR	51	1454
	~~LCRT~~	~~PLOT~~	~~31~~	1044				
	IN	ADSC	23	3426	WHAT	NAME	41	3334
	LOOK	LOOK	47	1403				
X	MEMW	MEMF	67	1177	ZCOM	ZCOM	60	2005
	R		70	1172				
	X	SWEP	71	1200				
	Y	SWEP	72	1201				
	E		73	1155				
	C		74	1153				
	MLEN	SWEP	75					

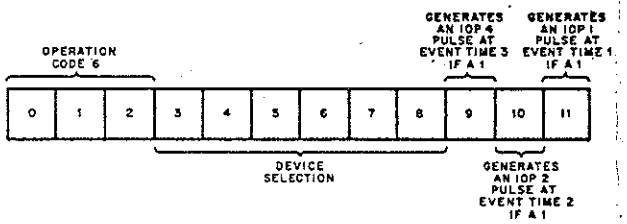
CODES FOR FUNCTIONS AND "X" COMMANDS

LICK FOCAL DEC 173

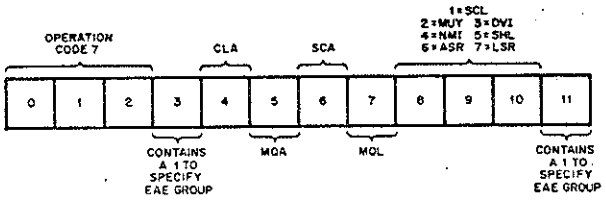
2	BUZ	1004	LFT	1474	OUT	2636	MSAV
12	COR	1034	EDIT			2710	SAVX
13	COS			1555	NAME	2711	SAVY
		1040	MAX				
23	PEAK			1574	PUT	2723	MTAK
		1044	ICRT				
33	DIS			1634	RIT	3002	SCNR
		1073	LOC	1636	SAV	3003	SCNS
44	CRT						
		1077	LOG	1666	SAVA	3030	FLIP
113	GMIC	1112	STOR	1674	SET	3164	MULT
* 160	HELP						
164	END	1114	PLOT	1706	SGN	3326	CHAN
254	TEST	1126	MIN	1723	TAK	3334	WHAT
320	EXP	1153	MEMC	1726	SIN	3356	DN
		1155	MEME			3357	DO
366	CPEN			1750	SKP		
370	COMP	1172	MEMR	1773	TES	3404	SHFT
				2005	ZCOM	3407	GO
403	LOOK	1177	MEMW	* 2025	DTIM		
406	CONV	1200	MEMX	2034	SQT	3426	IN
		1201	MEMY			3435	FORM
417	GPHO			2052	SUB		
444	SORT	1216	MOV			3443	ABS
512	PHOR			2073	ALOC	3444	ADD
513	PHOS	1240	IFIX	2077	ILOG		
* 563	TINC					3492	OR
574	SPVT	1246	SURV	2132	VAR		
						3516	SHOV
610	INX	* 1264	DMUL	2154	PULL	3517	SHOW
611	INY			2163	UNC		
		* 1272	LOGB			3544	TAKL
650	DISP	1270	?	2204	HUNT	3555	AME
		1271				3564	AND
662	ITR	1274	MGET	2254	PUTL	3570	UP
664	DIVD	1334	SWIT	2256	PUTN		
666	MCEN					3643	ASK
672	IBMR	1366	PEN	2302	REVR		
675	DIVM	* 1371	POLY			3656	ATN
677	IBMW	1437	MICG	2465	MOVE	3673	PAUS
721	JOY	1441	SWTA	2533	ERAS		
				2545	FILE		
723	STAK	1452	MICR				
		1453	MICS	2554	CALL		
734	STAT	1454	TOTL				
				2564	FILT	3772	CLER
770	STEP	1463	SWTS				
				2574	MPUT		



Memory Reference Instruction Bit Assignments



IOT Instruction Bit Assignments



Logical Sequence:

1 — CLA
2 — MQA, MQL, SCA
3 (Bits 8 thru 10=1) — SCL
3 (Bits 8 thru 10=2) — MUY
3 (Bits 8 thru 10=3) — DVI
3 (Bits 8 thru 10=4) — NMI
3 (Bits 8 thru 10=5) — SHL
3 (Bits 8 thru 10=6) — ASR
3 (Bits 8 thru 10=7) — LSR

EAE Microinstruction Bit Assignments

ASCII CODE

Character	Code	Character	Code
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	:	272
Q	321	;	273
R	322	<	274
S	323	=	275
T	324	>	276
U	325	?	277
V	326	@	300
W	327	[	333
X	330	\	334
Y	331	]	335
Z	332	↑	336
0	260	←	337
1	261	EOT	204
2	262	W RU	205
3	263	RU	206
4	264	BELL	207
5	265	Line Feed	212
6	266	Return	215
7	267	Space	240
8	270	ALT MODE	375
9	271	Rub Out	377
		Escape	233

Rim Loader (Low Speed)		Rim Loader (High Speed)	
7756/	6032	7756/	6014
7757/	6031	7757/	6011
7760/	5357	7760/	5357
7761/	6036	7761/	6016
7762/	7106	7762/	7106
7763/	7006	7763/	7006
7764/	7510	7764/	7510
7765/	5357	7765/	5357
7766/	7006	7766/	7006
7767/	6031	7767/	6011
7770/	5367	7770/	5367
7771/	6034	7771/	6016
7772/	7420	7772/	7420
7773/	3776	7773/	3776
7774/	3376	7774/	3376
7775/	5356	7775/	5357

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digital

PDP-8/I

(3)

INSTRUCTION LIST

Mnemonic	Code	Operation	Time (μsec.)
BASIC INSTRUCTIONS			
AND	0000	logical AND	3
TAD	1000	2's complement add	3
ISZ	2000	increment, and skip if zero	3
DCA	3000	deposit and clear AC	3
JMS	4000	jump to subroutine	3
JMP	5000	jump	1.5
IOT	6000	in/out transfer	4.25
OPR	7000	operate	1.5
GROUP 1 OPERATE MICROINSTRUCTIONS (1 CYCLE)			
			Sequence
NOP	7000	no operation	—
CLA	7200	clear AC	1
CLL	7100	clear link	1
CMA	7040	complement AC	2
CML	7020	complement link	2
RAR	7010	rotate AC and link right one	4
RAL	7004	rotate AC and link left one	4
RTR	7012	rotate AC and link right two	4
RTL	7006	rotate AC and link left two	4
IAC	7001	increment AC	3
GROUP 2 OPERATE MICROINSTRUCTIONS (1 CYCLE)			
			Sequence
SMA	7500	skip on minus AC	1
SZA	7440	skip on zero AC	1
SPA	7510	skip on plus AC	1
SNA	7450	skip on non zero AC	1
SNL	7420	skip on non-zero link	1
SZL	7430	skip on zero link	1
SKP	7410	skip unconditionally	1
OSR	7404	inclusive OR, switch register with AC	3
HLT	7402	halts the program	3
CLA	7600	clear AC	2

DIGITAL EQUIPMENT CORPORATION

COMBINED OPERATE MICROINSTRUCTIONS

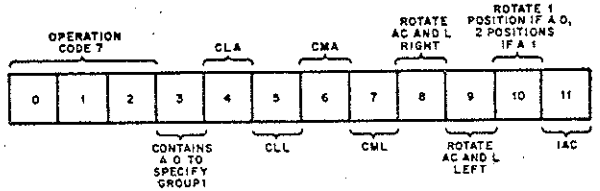
			Sequence
CIA	7041	complement and increment AC	2, 3
LAS	7604	load AC with switch register	2, 3
STL	7120	set link (to 1)	1, 2
GLK	7204	get link (put link in AC bit 11)	1, 4
CLA CLL	7300	clear AC and link	1
CLA IAC	7201	set AC = 1	1, 3
CLA CMA	7240	set AC = −1	1, 2
CLL RAR	7110	shift positive number one right	1, 4
CLL RAL	7104	shift positive number one left	1, 4
CLL RTL	7106	clear link, rotate 2 left	1, 4
CLL RTR	7112	clear link, rotate 2 right	1, 4
SZA CLA	7640	skip if AC = 0, then clear AC	1. 2
SZA SNL	7460	skip if AC = 0 or link is 1, or both	1
SNA CLA	7650	skip if AC ≠ 0, then clear AC	1, 2
SMA CLA	7700	skip if AC < 0, then clear AC	1, 2
SMA SZA	7540	skip if AC ≦ 0	1
SMA SNL	7520	skip if AC < 0 or link is 1, or both	1
SPA SNA	7550	skip if AC > 0	1
SPA SZL	7530	skip if AC ≧ 0, and if the link is 0	1
SPA CLA	7710	skip if AC ≧ 0, then clear AC	1, 2
SNA SZL	7470	skip if AC ≠ 0 and link = 0	1

Mnemonic	Code	Operation	Time (μsec.)
EAE MICROINSTRUCTIONS TYPE KE 8/I			
DVI	7407	divide	5.2—7.8
NMI	7411	normalize	1.5+0.25n
SHL	7413	shift left	3.0+0.25n
ASR	7415	arithmetic shift right	3.0+0.25n
LSR	7417	logical shift right	3.0+0.25n
MQL	7421	load AC into MQ, clear AC	1.5
MUY	7405	multiply	4.8—7.2
MQA	7501	inclusive OR, MQ with AC	1.5
CAM	7621	clear AC and MQ	1.5
SCA	7441	read SC into AC	1.5
CLA	7601	clear AC	1.5
SCL	7403	load the step counter	3.0

10T MICROINSTRUCTIONS

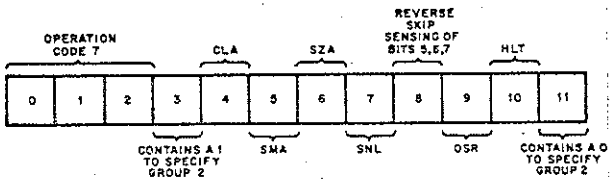
PROGRAM INTERRUPT			
ION	6001	turn interrupt on	1.5
IOF	6002	turn interrupt off	1.5
EXTENDED MEMORY TYPE MC8/I			
CDF	62n1	change to data field n	1.5
CIF	62n2	change to instruction field n	1.5
RDF	6214	read data field into AC 6-8	1.5
RIF	6224	read instruction field into AC 6-8	1.5
RMF	6244	restore memory field	1.5
RIB	6234	read interrupt buffer	1.5

Mnemonic	Code	Operation	Time μsec.)
TELETYPE KEYBOARD/READER			
KSF	6031	skip if keyboard/reader flag=1	4.25
KCC	6032	clear AC and keyboard/reader flag	4.25
KRS	6034	read keyboard/reader buffer, static	4.25
KRB	6036	Clear AC, read keyboard buffer clear keyboard flag	4.25
TELETYPE TELEPRINTER/PUNCH			
TSF	6041	skip if teleprinter/punch flag=1	4.25
TCF	6042	clear teleprinter/punch flag	4.25
TPC	6044	load teleprinter/punch buffer, select and print	4.25
TLS	6046	load teleprinter/punch buffer, select and print, and clear teleprinter/punch flag	4.25
HIGH SPEED PERFORATED TAPE READER TYPE PR8/I			
RSF	6011	skip if reader flag=1	4.25
RRB	6012	read reader buffer, and clear flag	4.25
RFC	6014	clear flag and buffer and fetch character	4.25
HIGH SPEED PERFORATED TAPE PUNCH TYPE PP8/I			
PSF	6021	skip if punch flag=1	4.25
PCF	6022	clear flag and buffer	4.25
PPC	6024	load buffer and punch character	4.25
PLS	6026	clear flag and buffer; load and punch	4.25
DECTAPE AND CONTROL TYPE TU55/TC01			
DTRA	6761	read status register A	4.25
DTCA	6762	clear status register A	4.25
DTXA	6764	load status register A	4.25
DTSF	6771	skip on flags	4.25
DTRB	6772	read status register B	4.25
DTLB	6774	load status register B	4.25
RANDOM ACCESS DISC FILE TYPE DF32			
DCMA	6601	clear disk memory address register, & disk flags	4.25
DMAR	6603	load disk memory address register & read	4.25
DMAW	6605	load disk memory address register and write	4.25
DCEA	6611	clear disk extended address register and memory address extension	4.25
DSAC	6612	skip on address confirmed flag	4.25
DEAL	6615	load disk extended address and memory address extension	4.25
DEAC	6616	read disk extended address register	4.25
DFSE	6621	skip on zero error flag	4.25
DFSC	6622	skip on data completion flag	4.25
DMAC	6626	read disk memory address register	4.25



Logical Sequences:
1—CLA, CLL
2—CMA, CML
3—IAC
4—RAR, RAL, RTR, RTL

Group 1 Operate Instruction Bit Assignments



Logical Sequences:
1 (Bit 8 is Zero)—Either SMA or SZA or SNL
1 (Bit 8 is One)—Both SPA and SNA and SZL
2 — CLA
3 — OSR, HLT

Group 2 Operate Instruction Bit Assignments

(7)

File 2 Tape 12R
Apr. 7/74.

```
.PALP
*OUT-S:ADSC
*
*IN-S:CON0,S:XCON,S:ADSC
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /ADSC
                /ADD OR SUBTRACT DISC DATA FROM CORE DATA
                / X IN(R,B,C,D,N) ADD RUN R TO BUFFER B
                /X OUT(R,B,C,D,N) TO SUBTRACT RUN R FROM CORE
                /START AT CHAN.C IN CORE,D ON DISC;N CHANNELS.
                /
                *KB1+23
0163    6600    DATADD
0164    6630    DATSUB
                /
                *FNKB1+23
0667    3426    3426    /IN
0670    1474    1474    /OUT
                /
                /
                *6600
6600    0000    DATADD,0            /ADD DISC TO CORE
6601    4511        JMS I BUFSTX /SET BUFFER TO 4000(0) OR 2000(1)
6602    1212        TAD OPRCOD
6603    3251    SETFUN,DCA ASFUNC       /CIA TO SUBTRACT
6604    4257      JMS PREP
6605    1055      TAD ARG6          /SET FIRST DISC CHANNEL
6606    3053       DCA ARG4
6607    4245    ARTLO,JMS ARITH
6610    7430       SZL
6611    2470       ISZ I HITEMP /OVERFLOW
6612    7000    OPRCOD,OPR
6613    2070      ISZ HITEMP
6614    2057      ISZ ARG8          /COUNTER
6615    5207       JMP ARTLO
6616    4257    ARTHI,JMS PREP
6617    1070      TAD HITEMP
6620    3067      DCA LOTEMP        /USED BY ARITH FOR UPPER HALF
6621    1060      TAD ARG9
6622    1053      TAD ARG4
6623    3053      DCA ARG4          /SET FIRST HI DISC ADDRESS
6624    4245       JMS ARITH
6625    2057       ISZ ARG8
6626    5224       JMP .-2
6627    5600       JMP I DATADD
               /
```

```
6630  0000  DATSUB,0          /SUBTRACT DISC FROM 512 CHANNEL DATA
6631  4511     JMS I BUFSTX
6632  4257     JMS PREP
6633  7240  SUBPRE,CLA CMA
6634  1470     TAD I HITEMP
6635  3470     DCA I HITEMP /PREPARE 'BORROW'
6636  2070     ISZ HITEMP
6637  2057     ISZ ARG8
6640  5233     JMP SUBPRE
6641  1230     TAD DATSUB
6642  3200     DCA DATADD
6643  1262     TAD CIACOD
6644  5203     JMP SETFUN
               /
6645  0000  ARITH,0
6646  4541  ARTNEX,JMS I GETWRX      /GET DISC WORD
6647  7300    CLL CLA          /ALLOW LINK TEST
6650  1051     TAD ARG2
6651  0000  ASFUNC,0          /CIA OR OPR
6652  1467     TAD I LOTEMP
6653  3467     DCA I LOTEMP /ONE CHANNEL DONE
6654  2067     ISZ LOTEMP
6655  2053     ISZ ARG4       /GET NEXT DISC WORD
6656  5645     JMP I ARITH
               /
6657  0000  PREP,0
6660  4666    JMS K DATSTX
6661  1057     TAD ARG8
6662  7041  CIACOD,CIA
6663  4665    JMS I TESTX
6664  5657    JMP I PREP
               /
6665  6371  TESTX,TEST
6666  6121  DATSTX,DATSET
               *6121
6121  0000  DATSET,0
6122  1045     TAD BUFRDX
6123  1054    TAD ARG5         /SET FIRST CORE CHANNEL
6124  3067     DCA LOTEMP
6125  1067     TAD LOTEMP
6126  1046     TAD P1000
6127  3070     DCA HITEMP
6130  1056    TAD ARG7
6131  7450    SNA
6132  1046    TAD P1000
6133  7041    CIA
6134  3057    DCA ARG8         /CHANNEL COUNT
6135  1057    TAD ARG8
6136  1046    TAD P1000
6137  3060    DCA ARG9         /SAVE 512-CHANNEL COUNT
6140  5721     JMP I DATSET
               /
               *6371
6371  0000  TEST,0
6372  1070    TAD HITEMP
6373  1377    TAD P1777
6374  7700    SMA CLA
6375  5532    JMP I KILALL   /WOULD WRITE PAST BUFFER END AT 5777
6376  5771    JMP I TEST
6377  1777  P1777,1777
```

(9)

Tape 14C
Nov. 3/72

```
.PALP
*OUT-S:CHAIN
*
*IN-S:CON0,S:CHAIN
*
*
*OPT-T

ALSET  6660

                /CON0
                XLIST
                PAUSE/
                /
                /CHAIN-CHAINING PROGRAM
                /X FILE(N) TO STORE PROGRAM N
                /X CALL(N,SB,Q) TO CALL PROGRAM N,SUBROUTINE SB
                /X END(0) WILL THEN CONTINUE ORIGINAL PROGRAM.
                /IF Q IS >0 CALLS CAN BE NESTED.
                /
                /PROGRAMS START AUTOMATICALLY IF SB IS NON-ZERO.
                /LINE AB.XY CAN BE CALLED BY SB=128*AB+XY
                /
                CHBUFR=7150
                ERR2=2726
                /
                *PGRETN
0135   7150     CHBUFR
                *KB1+2
0142   6616     CHACAL
0143   6671     CHAPUT
0144   6750     XEND
                /
                *FNKB1+2
0646   2554     2554     /CALL
0647   2545     2545     /FILE
0650   0164     164      /END
                /
                FIELD 0
                *3120    /ENTERED FROM ALSET
3120   3060     LINFIN,DCA BUFR /NEW END OF TEXT
3121   7501       MQA
3122   7450       SNA
3123   5177       JMP 177          /NO LINENO,DON'T START.
3124   3067       DCA LINENO       /NEW FIRST LINE NO.
3125   4555       FINDLN
3126   7000       OPR  /LINE NOT FOUND
3127   6774       DTLB /SET FIELD 0 FOR MONITOR IN CASE ARG4 IS 0
3130   7001       IAC
3131   3065       DCA NAGSW        /ALL TEXT
3132   6001       ION
3133   4540       PUSHJ
3134   0606       606              /GO, AFTER FINDLN
3135   5736       JMP I .+1
3136   0273       273
               /
                FIELD 1
                *6600
6600   0000     CHAIN,0
6601   1052       TAD ARG3
```

```
6602  7106      CLL RTL
6603  7004      RAL             /8 BLOCKS PER PROGRAM
6604  1044      TAD FSPROG      /FIRST BLOCK USED
6605  3027      DCA DTBLOK
6606  1006      TAD CLENGT      /CHAIN LENGTH
6607  3024      DCA DDWCNT
6610  3030      DCA DTUNIT      /TAPE 8
6611  1121      TAD LINPNT      /START OF TEXT (BFTEMP)
6612  3023      DCA DDCORE
6613  1346      TAD P10
6614  3026      DCA DSFELD
6615  5600      JMP I CHAIN
                /
6616  0000    CHACAL,0
6617  1054      TAD ARG5
6620  7640      SZA CLA
6621  5224      JMP NEST
6622  1372    FIXT,TAD PZERO
6623  3135      DCA PGRETN
6624  6203    NEST,CIF!CDF
6625  1135      TAD PGRETN
6626  1374      TAD MINMAX
6627  7700      SMA CLA
6630  4771      JMS I ERRORP    /TOO MANY NESTED CALLS
6631  1773      TAD I PCX       /SAVE PC
6632  6213      CDF!CIF 10
6633  3016      DCA 16
6634  1416      TAD I 16        /PC POINTS TO CURRENT LINENO
6635  7001      IAC             /X END(0) WILL RETURN TO NEXT LINE
6636  2135      ISZ PGRETN
6637  3535      DCA I PGRETN
6640  1042      TAD PGLAST
6641  2135      ISZ PGRETN
6642  3535      DCA I PGRETN
6643  4200    CDO,JMS CHAIN
6644  4421      JMS I DTAPX
6645  5243      JMP .-2         /TAPE ERROR
6646  1052      TAD ARG3        /RETURNS HERE WITH INTERRUPT OFF.
6647  3042      DCA PGLAST      /NEW PROGRAM NO.
6650  1053      TAD ARG4
6651  7421      MQL
6652  7501      MQA
6653  0266      AND P7600
6654  7640      SZA CLA
6655  5260      JMP ALSET       /GROUP NUMBER FOUND
6656  7413      SHL
6657  0006      6               /LESS THAN 200,CHANGE TO A GROUP NO.
6660  7200    ALSET,CLA
6661  1522      TAD I LØTPNT    /LØTEMP
6662  3747      DCA I LØPNT     /LINEØ
6663  1521      TAD I LINPNT    /BFTEMP
6664  6203      CDF CIF
6665  5667      JMP I LINFIX
                /
                /BFTEMP STORES "BUFR". LØTEMP STORES C(LINEØ)
                /
6666  7600    P7600,7600
6667  3120    LINFIX,LINFIN
6670  0060    BUFPNT,BUFR
                /
```

```
6671  0000  CHAPUT,0          /STORE FROM C(LINPNT) FOR 2010 WORDS
6672  4422     JMS I MESAGX
6673  0275  TEXT /B=
6674  6100  1/
6675  6201     CDF
6676  1670     TAD I BUFPNT
6677  6211     CDF 10
6700  3521     DCA I LINPNT /BFTEMP
6701  1521     TAD I LINPNT
6702  4536     JMS I OCTPNX /PRINT LAST TEXT ADDRESS
6703  4200     JMS CHAIN
6704  2053     ISZ ARG4     /FORCE GETWRX (NEEDS NON-ZERO)
6705  4541    JMS I GETWRX
6706  2116    ISZ BLOKIN    /IN CASE BLOKIN=ARG3
6707  4541    JMS I GETWRX  /SAVES DISK BUFFER AND SETS POINTERS.
6710  7240     CLA CMA
6711  3116     DCA BLOKIN   /DISC BUFFER TO BE ERASED
6712  4421     JMS I DTAPX  /READ FIRST BLOCK BEFORE CHANGING IT
6713  5312     JMP .-1      /TAPE ERROR
6714  1666     TAD I P7600  /SECOND BUFFER WORD IS L0TEMP
6715  7650     SNA CLA
6716  5336     JMP OK       /TAPE UNUSED
6717  1042     TAD PGLAST
6720  7041     CIA
6721  1052     TAD ARG3
6722  7650     SNA CLA
6723  5336     JMP OK       /SAME PROGRAM JUST CALLED FROM TAPE
6724  4422     JMS I MESAGX
6725  1713  TEXT /OK
6726  7700  ?/
6727  6002    IOF
6730  6031     KSF
6731  5330     JMP .-1
6732  6036     KRB
6733  1345     TAD M331     /TYPE Y TO STORE ANYWAY
6734  7640     SZA CLA
6735  5532     JMP I KILALL
6736  4200  OK, JMS CHAIN
6737  1747     TAD I L0PNT
6740  3522     DCA I L0TPNT /SETS LINE0 EXIT
6741  1037  CHWRIT, TAD P20 /WRITE IT
6742  4421     JMS I DTAPX
6743  5341     JMP .-2      /TAPE ERROR
6744  5671     JMP I CHAPUT
            /
6745  7447  M331,-331
6746  0010  P10,10
6747  0540  L0PNT,LINE0
            /
6750  0000  XEND,0
6751  1535    TAD I PGRETN
6752  3052    DCA ARG3
6753  7040    CMA
6754  1135    TAD PGRETN
6755  3135    DCA PGRETN
6756  1535    TAD I PGRETN
6757  3053    DCA ARG4
6760  7040    CMA
6761  1135    TAD PGRETN
6762  3135    DCA PGRETN
```

```
                /
6763  1135      TAD PGRETN
6764  7041      CIA
6765  1372      TAD PZERO
6766  7700      SMA CLA
6767  5222      JMP FIXT        /PGRETN =PZERO;INCREASE IT
6770  5243      JMP CDO
                /
6771  2726  ERRORP,ERR2
6772  7147  PZERO,CHBUFR-1
6773  0022  PCX,PC
6774  0603  MINMAX,-7175
```

File 2 Tape 12R
Apr. 6/74.

(13)

```
.PALP
*OUT-S:CLER
*
*IN-S:CONØ,S:XCON,S:CLER
*
*
*
*OPT-T

ARG1    ØØ5Ø

                /CONØ
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /CLER
                /ERASE STATED DATA BUFFER: X CLER(N)
                /
                *KB1+16
Ø156  6765      CLEAR
                *FNKB1+16
Ø662  3772      3772    /CLER
                /
                *6765
6765  ØØØØ      CLEAR,Ø
6766  1Ø52        TAD ARG3
6767  3Ø53        DCA ARG4
6770  3Ø52       DCA ARG3
6771  4511        JMS I BUFSTX /IN EDIT
6772  1Ø47        TAD M2ØØØ
6773  3Ø56        DCA ARG7     /TEMP STORE
6774  3415        DCA I 15     /ADDRESS SET BY BUFSET IN 'EDIT'
6775  2Ø56        ISZ ARG7
6776  5374        JMP .-2
6777  5765        JMP I CLEAR
```

(14)

Tape 12 R
File 2 - 1974

```
.PALP
*OUT-S:COMP
*
*IN-S:CON0,S:XCON,S:COMP
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /COMP
                /X COMP(X,Y,D) DRAWS LINE Y,THEN X.DIAGONAL UNLESS D=0.
                /X CPEN(P,T) RAISES OR LOWERS PEN FOR P=0 OR 1.
                /DELAYS A TIME 10*T MSEC.
                /
                *FNKB1+52
0716    0370    370     /COMP
0717    0366    366     /CPEN
                *KB1+52
0212    6670    CALCOM
0213    6520    CPEN
                /
                PLSF=6501       /KILLS 6511,6521
                PLCF=6502
                PLPD=6524
                PLPU=6504
                PLPR=6511
                PLPL=6521
                PLDU=6512
                PLDD=6514
                /
                CODLOD=6361
                READSW=6362
                /
                *6670
6670    0000    CALCOM,0
6671    1052      TAD ARG3
6672    7700      SMA CLA
6673    7126      STL RTL       /PLDD-PLDU=2
6674    1357      TAD UPSET
6675    3352      DCA XMOV
6676    1052      TAD ARG3
6677    7510      SPA
6700    1356      TAD M1
6701    7500      SMA
6702    7040      CMA
6703    3052      DCA ARG3
6704    1053      TAD ARG4
6705    7710      SPA CLA
6706    1360      TAD RITDIF    /-VE Y
6707    1361      TAD LEFSET
```

```
6710  3327    DCA YMOV
6711  1053    TAD ARG4
6712  7510    SPA
6713  1356    TAD M1
6714  7500    SMA
6715  7040    CMA
6716  3053    DCA ARG4
6717  5342    JMP XGO
6720  2053  YGO, ISZ ARG4
6721  5327    JMP YMOV
6722  3327    DCA YMOV
6723  2054    ISZ ARG5
6724  1352    TAD XMOV
6725  7650  ENTEST, SNA CLA
6726  5670    JMP I CALCOM
6727  0000  YMOV, 0
6730  1355    TAD M1500
6731  3010    DCA 10
6732  2010    ISZ 10
6733  5332    JMP .-1          /DELAY A BIT LESS THAN SPEC!
6734  1354    TAD P3
6735  6361    CODLOD
6736  6362    READSW
6737  0046    AND P1000
6740  7640    SZA CLA
6741  5670    JMP I CALCOM   /STOP BUTTON
6742  1054  XGO, TAD ARG5
6743  7650    SNA CLA
6744  5320    JMP YGO
6745  2052    ISZ ARG3
6746  5352    JMP XMOV
6747  3352    DCA XMOV
6750  1327    TAD YMOV
6751  5325    JMP ENTEST
6752  0000  XMOV, 0
6753  5320    JMP YGO
              /
6754  0003  P3, 3
6755  6300  M1500, -1500
6756  7777  M1, -1
6757  6512  UPSET, PLDU
6760  7770  RITDIF, PLPR-PLPL
6761  6521  LEFSET, PLPL
              /
              *6520
6520  0000  CPEN, 0
6521  1052  PENMOV, TAD ARG3
6522  7640    SZA CLA
6523  1343    TAD PENDIF
6524  1342    TAD PENUP
6525  3326    DCA PENOP
6526  7000  PENOP, OPR
6527  1053    TAD ARG4
6530  7040    CMA
6531  3010    DCA 10
6532  5337    JMP CTEST
6533  1344  WAIT, TAD P4000
6534  3011    DCA 11
6535  2011    ISZ 11
6536  5335    JMP .-1
6537  2010  CTEST, ISZ 10
6540  5333    JMP WAIT
6541  5720    JMP I CPEN
              /
6542  6504  PENUP, PLPU
6543  0020  PENDIF, PLPD-PLPU
6544  4000  P4000, 4000
```

CON0

(16)

```
ARG1    0050
ARG10   0061

        /CON0
        /A LIST OF CONSTANTS AND ADDRESSES
        FIELD 1
        KB1=140
        FNTABL=6234      /NEW FUNCTION LIST
        FNTABF=6346
        FNKB1=-6200+600+FNTABL+10
        FLETER=FNTABL+10
        LISTSM=600                  /FUNCTION LIST
        ARG1=50
        ARG2=ARG1+1
        ARG3=ARG2+1
        ARG4=ARG3+1
        ARG5=ARG4+1
        ARG6=ARG5+1
        ARG7=ARG6+1
        ARG8=ARG7+1
        ARG9=ARG8+1
        ARG10=ARG9+1     /(=61)
        ARG3H=10
        ARG4H=ARG3H+1
        ARG5H=ARG4H+1
        ARG6H=ARG5H+1
        ARG7H=ARG6H+1
        ARG8H=ARG7H+1
        ARG9H=ARG8H+1
        ARG10H=ARG9H+1
        /
        GETWRX=KB1+1
        /
        DXS=6057
        DXL=6053
        DIX=6054
        DYS=6067
        DYL=6063
        MUY=7405
        DVI=7407
        SHL=7413
        ASR=7415
        LSR=7417
        MQL=7421
        MQA=7501
        CCEC=6136
        CSCF=6133
        CCFF=6132
        /
        MVSTOP=6316
        XPOWER=6313      /STOP MICROPHOTOMETER CODES
        /
```

```
                /FOCAL CONSTANTS
                XRT2=12
                TELSW=16
                LASTV=31
                T1=32
                BOTTOM=35
                T2=71
                CFRS=133
                END=134
                ENDT=135
                EFUN3I=136
                CHAR=66
                COMBUF=132
                DAXIN=173
                ERROR2=4566
                GETC=4545
                PUSHJ=4540
                POPJ=5541
                EFUN=1743
                EVAL=1613
                INTEGER=53
                THISLN=23
                FINDLN=4555
                PC=22
                NAGSW=65
                PROC=611
                BUFR=60
                LINENO=67
                XRT=11
                AXOUT=17
                /
                F1=5354 /NEW DISPATCHER
                /
                LINE0=540
                LINE1=560
                LVARIB=3200
                SPRINT=2600
                BUFERB=7577
                /
                DISCX=20
                DTAPX=21
                MESAGX=22
                *0      /LOADER MISSES FIRST WORD
0000    0000    0
                *6
0006    5770    CLENGT,-2010
0007    0132    CLOKGO,KILALL
                *23
0023    0400    DDCORE,400      /INITIAL TEST VALUES
0024    7570    DDWCNT,7570
0025    0000    DISADD,0
0026    0010    DSFELD,0010
0027    0004    DTBLOK,4
0030    0000    DTUNIT,0
0031    0000    TEMPS0,0
0032    7577    M201,-201
0033    0000    BWTEST,0        /PARTIAL DISC BUFFER PROTECT
0034    3200    LASVAR,LVARIB   /HOLDS CURRENT LAST VARIABLE
0035    0044    FLACR,44        /FLAC
0036    5216    BUFEMD,-2562    /-BFTEMP-2010+3:TEXT END
```

```
0037   0020   P20,20
0040   7067   DISEND,-711      /700777 SHOULD BE LAST DISC ADDRESS
0041   0000   DTEST,0
0042   0000   PGLAST,0         /FOR CHAINING
0043   0500   FSDATA,500
0044   3000   FSPROG,3000      /LABL MUST SET THIS TO 160 OR FOCAL FAILS!
              /
              *76
0076   0100   P100,100
0077   7700   M100,-100
              DCSETX=112
              CLKCNT=113
              DISPAX=114       /ENTRY TO LFOC DISPATCH
              GETPRX=115
              BLOKIN=116
              INTESX=117
              PUTWRX=120
              LINPNT=121
              LØTPNT=122       /POINTS TO TEMP STORE FOR LINEØ
              FLAGX=123
              MVBUFX=124
              WAITX=125
              *126
0126   0000   INTRUP,0
              TYPEX=127
              CRLFX=130
              KILALL=132
              FLSETX=133
              NOWNAM=134
              PGRETN=135       /ALSO FOR CHAINING
              OCTPNX=136       /USED TO PRINT CHAIN ADDRESS.
              BWRITX=137
```

Tape 12 M
Oct 26/72.

(19)

```
.PALP
*OUT-S:CRT
*
*IN-S:CON0,S:XCON,S:CRT1,S:CRT2
*
*
*
*
*OPT-T

ACFULL 6606

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /CRT1
                /LETTERING PROGRAM FOR MEM. SCOPE
                /X STAT(X,Y,S) SETS X,Y ORIGIN
                /SETS CRT OUTPUT FOR +VE X,TELETYPE OUTPUT FOR -VE X
                /S IS LETTER SIZE;   TYPE "C&" TO RESET PAGE
                /
                *KB1+37 /SEE LETPNT
0177   6400     SETCRT
                *FNKB1+37
0703   0734     734      /STAT
                /
                *CRTGOL+600-6200          /IN FUNCTION LIST TABLE
0770   0000     CRTGET,0          /MOVED TO FIELD 0 BY GODO
0771   7450        SNA
0772   1066        TAD CHAR
0773   6213        CDF!CIF 10
0774   4776        JMS I LETSEX
0775   5770     LETBAK,JMP I CRTGET'     /RETURN HERE FROM SPRIN
0776   7425     LETSEX,LETSET
                /
                *7425
7425   0000     LETSET,0          /ALWAYS IN CORE
7426   7450        SNA
7427   1234        TAD LETPNT     /JUNK IF NO CODE
7430   3017        DCA 17         /TEMP STORE****
7431   1234        TAD LETPNT
7432   3050        DCA ARG1       /NEEDED TO TEST CRT IN CORE
7433   5514        JMP I DISPAX   /ENTRY TO LFOC
7434   0040     LETPNT,40         /SETS KB1+37 FOR LFOC
                /
                *6400
6400   0000     SETCRT,0
6401   1017        TAD 17         /TEMP STORE****
6402   7440        SZA
6403   4742        JMS I SPRINX   /FOCAL LETTER ENTRY
6404   1052        TAD ARG3
6405   7700        SMA CLA
6406   5212        JMP SETOK
6407   1260        TAD PXOUT      /SWITCH TO TTY OUT
6410   6201        CDF
6411   5234        JMP SETGO
```

```
~~6411  5234      JMP SETOK~~
6412  1052  SETOK, TAD ARG3
6413  7450      SNA
6414  5221      JMP G04
6415  3062      DCA XBASE
6416  1062      TAD XBASE
6417  3064      DCA XLOC      /PRESET X POSITION
6420  3072      DCA XMAX
6421  1053  G04, TAD ARG4
6422  7450      SNA
6423  5227      JMP G05
6424  3063      DCA YBASE
6425  1063      TAD YBASE
6426  3065      DCA YLOC
6427  1054  G05, TAD ARG5
6430  7040      CMA
6431  3066      DCA SCALE
6432  4237      JMS TELTST
6433  1255  DOIT, TAD CRTXIT
6434  3657  SETGO, DCA I PRINGO       /CHANGE TYPE OUTPUT
6435  6211      CDF 10
6436  5600      JMP I SETCRT
                /
6437  0000  TELTST, 0
6440  6201  TELTRY, CDF
6441  6002      IOF
6442  1656      TAD I TELSWX /TYPING IN PROGRESS?
6443  7650      SNA CLA
6444  5637      JMP I TELTST
6445  6001      ION
6446  5240      JMP TELTRY
                /
                /                          not needed ?
                /
6447  4237  ENDIT, JMS TELTST            /SETS DATA FIELD 0!!
6450  1260      TAD PXOUT
6451  3657      DCA I PRINGO            /RESTORE OUTPUT TO TYPER
6452  1262      TAD P277
6453  4527      JMS I TYPEX
6454  5661      JMP I GETOTX
                /
6455  6370  CRTXIT, CRTGOL
6456  0016  TELSWX, TELSW
6457  0063  PRINGO, OUTDEV
6460  2676  PXOUT, XOUTL       /FOCAL OUT TO TELETYPE
6461  6672  GETOTX, GETOUT
6462  0277  P277, 277
                /
6463  0000  DOT, 0
6464  1730      TAD I COUN7X /COUNT7
6465  1331      TAD P7
6466  4332      JMS SCALEM
6467  7104      CLL RAL
6470  1065      TAD YLOC
6471  6063      DYL
6472  3325      DCA YTEMP
6473  1064  XSET, TAD XLOC
6474  4727      JMS I SCTESX
6475  6053      DXL
6476  6054      DIX
```

```
6477  3324      DCA XTEMP
6500  1066      TAD SCALE
6501  3031   DCA TEMPS0        /COUNTER
6502  1066   YLINE,TAD SCALE
6503  7104      CLL RAL        /DOUBLE Y SCALE
6504  3326      DCA SCOUN
6505  1325      TAD YTEMP
6506  7001   SPREDY,IAC
6507  6063      DYL            /FILL IN YLINE
6510  6054      DIX
6511  2326      ISZ SCOUN
6512  5306      JMP SPREDY
6513  7300      CLA CLL
6514  1324      TAD XTEMP
6515  7001      IAC
6516  4727      JMS I SCTESX /TEST EDGR OF SCREEN
6517  6053      DXL
6520  3324      DCA XTEMP
6521  2031      ISZ TEMPS0
6522  5302      JMP YLINE
6523  5663      JMP I DOT
                /
6524  0000   XTEMP,0
6525  0000   YTEMP,0
6526  0000   SCOUN,0
6527  6735   SCTESX,SCTEST
6530  6761   COUN7X,COUNT7
6531  0007   P7,7
                /
6532  0000   SCALEM,0
6533  3031      DCA TEMPS0
6534  1066      TAD SCALE
6535  3326      DCA SCOUN
6536  1031      TAD TEMPS0     /MULTIPLY BUT SAVE MQ
6537  2326      ISZ SCOUN
6540  5336      JMP .-2
6541  5732      JMP I SCALEM
                /
6542  6600   SPRINX,SPRIN
               PAUSE/
               /
               /CRT2
               FIELD 1
               /LETTER DECODE AND DISPLAY
               /
               PAGE
6600  0000   SPRIN,0
6601  1357      TAD P101
6602  7450      SNA
6603  5744      JMP I ENDITX /FOUND ERROR CODE '7677'
6604  1351      TAD M101
6605  0365      AND P377
6606  1352   ACFULL,TAD M246 /&
6607  7450      SNA
6610  5300      JMP SRESET
6611  1355      TAD P6
6612  7500      SMA
6613  5220      JMP LETTER
6614  1356      TAD P23
6615  7650      SNA CLA
```

```
6616  5313      JMP CR
6617  5315      JMP LF
                /
6620  7421  LETTER,MQL
6621  7405      MUY
6622  0003      3               /3 WORDS PER CHARACTER
6623  7701      CLA!MQA
6624  1364      TAD LSBASE
6625  3363      DCA POINT       /CHARACTER DESCRIPTOR
6626  1345  INIT,TAD M5
6627  3360      DCA COUNT5
6630  1346      TAD M7
6631  3361      DCA COUNT7
6632  1350  WORDON,TAD M14
6633  3362      DCA COUN12
6634  1763      TAD I POINT
6635  7421      MQL             /DESCRIPTOR WORD
6636  2363      ISZ POINT
6637  7413  BITEST,SHL
6640  0000      0               /SHIFT HIGHEST BIT TO AC
6641  7640      SZA CLA
6642  4676      JMS I DOTEX     /A '1'
6643  2361  TESTON,ISZ COUNT7
6644  5310      JMP TEST12
6645  1066      TAD SCALE       /ONE COLUMN DONE
6646  7041      CIA
6647  1064      TAD XLOC
6650  4335      JMS SCTEST
6651  3064      DCA XLOC
6652  1346      TAD M7
6653  3361      DCA COUNT7
6654  2360      ISZ COUNT5
6655  5310      JMP TEST12
6656  1353  FINISH,TAD P3
6657  4677  EXIT,JMS I SCALEX
6660  1064      TAD XLOC
6661  4335      JMS SCTEST      /AVOID WRAP AROUND
6662  3064  NOWGO,DCA XLOC
6663  1072  NOWGO2,TAD XMAX
6664  7041      CIA
6665  1064      TAD XLOC
6666  7710      SPA CLA
6667  5272      JMP GETOUT
6670  1064      TAD XLOC
6671  3072      DCA XMAX
6672  6203  GETOUT,CDF!CIF
6673  6001      ION
6674  5675      JMP I LETBAX
6675  6375  LETBAX,LETBAK+6200-600  /ALWAYS RETURN TO FOCAL PRINT
                /
6676  6463  DOTEX,DOT
6677  6532  SCALEX,SCALEM
                /
6700  1063  SRESET,TAD YBASE
6701  3065      DCA YLOC
6702  1355      TAD P6
6703  3062      DCA XBASE
6704  3072      DCA XMAX
6705  6362      ERASE
6706  1062      TAD XBASE
```

```
6707  5262      JMP NOWGO
                /
                /
6710  2362  TEST12, ISZ COUN12
6711  5237      JMP BITEST
6712  5232      JMP WORDON    /12 BIT WORD FINISHED
                /
6713  1062  CR, TAD XBASE
6714  5262      JMP NOWGO
                /
6715  7300  LF, CLA CLL
6716  1347      TAD M24
6717  4677      JMS I SCALEX
6720  1065      TAD YLOC
6721  4335      JMS SCTEST
6722  3065      DCA YLOC
6723  7420      SNL
6724  5263      JMP NOWG02
6725  1353      TAD P3        /END OF PAGE COLUMN
6726  4677      JMS I SCALEX
6727  1072      TAD XMAX
6730  3062      DCA XBASE
6731  1063      TAD YBASE
6732  3065      DCA YLOC
6733  1062      TAD XBASE
6734  5262      JMP NOWGO
                /
6735  0000  SCTEST, 0
6736  7104      CLL RAL
6737  7530      SZL SPA
6740  7340      CLA CLL CMA   /SET 3777 IF >1777
6741  7010      RAR
6742  5735      JMP I SCTEST
                /
6743  0066  CHARAC, CHAR      /FOCAL'S CHARACTER BUFFER
6744  6447  ENDITX, ENDIT
                /
6745  7773  M5, -5
6746  7771  M7, -7
6747  7754  M24, -24
6750  7764  M14, -14
6751  7677  M101, -101
6752  7532  M246, -246
6753  0003  P3, 3
6754  0005  P5, 5
6755  0006  P6, 6
6756  0023  P23, 23
6757  0101  P101, 101
6760  0000  COUNT5, 0
6761  0000  COUNT7, 0
6762  0000  COUN12, 0
6763  0000  POINT, 0
6764  6044  LSBASE, LISLET   /START OF LETTER LIST
6765  0377  P377, 377
```

File 2 Type 12-4
Jan 13/73

(24)

```
.PALP
*OUT-S:DIS
*
*IN-S:CON0,S:DIS
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /DIS
                /XDIS(X,Y) TO PUT A SPOT ON CRT.
                /
                *KB1+36
0176    6100    ONEDIS
                *FNKB1+36
0702    0033    33      /DIS
                /
                *6100
6100    0000    ONEDIS,0
6101    1052      TAD ARG3
6102    6053      DXL
6103    7200      CLA
6104    1053      TAD ARG4
6105    6063      DYL
6106    7200      CLA
6107    6054      DIX
6110    5700      JMP I ONEDIS
                /

.
```

```
.PALP
*OUT-S:DIVD + MOVF
*
*IN-S:CON0,S:XCON,S:DIVD,S:MOVF
*
*
*
*
*OPT-T

ALCW   0057

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /DIVD
                /X DIVD(RN,B,M,D,L,U)
                /DIVIDES BUFFER B BY LEAST SIGNIFICANT WORDS OF RUN RN
                /OR BY D IF RN=0.
                /FIRST MULTIPLIES BY M,TO ALLOW PRECISION
                /IF RN AND D ARE BOTH 0,NORMALIZES BUFFER TO MAKE
                /LARGEST VALUE<4096.OPERATES BETWEEN CHANNELS L,U.
                /
                HIGH=100
                LOW=101
                COUNTR=102
                OVRTEM=TEMPS0
                /
                *FNKB1+30
0674  0664      664      /DIVD
                *KB1+30
0170  6200      FASDIV
                /
                *6200
6200  0000      FASDIV,0
6201  1054        TAD ARG5
6202  7450        SNA
6203  7001        IAC
6204  3371        DCA MULTF       /MULTIPLY KEEPS PRECISION
6205  4537        JMS I BWRITX    /SAVE CURRENT DISC BUFFER. - Is this needs
6206  1052        TAD ARG3
6207  7106        CLL RTL
6210  7004        RAL
6211  3052        DCA ARG3
6212  1053        TAD ARG4
6213  7650        SNA CLA
6214  1237        TAD P2000X      /BUFFER AT 4000
6215  1237        TAD P2000X
6216  3045        DCA BUFRDX
6217  1056        TAD ARG7
6220  3053        DCA ARG4
6221  4776        JMS I SETUPX
6222  1052        TAD ARG3
6223  7650        SNA CLA
6224  5240        JMP NORMIZ
6225  4541    GETNEX,JMS I GETWRX     /*M/C(RN)
```

Tape 12 M
Nov. 16/72

(25)

```
6226  3052      DCA ARG3
6227  3053      DCA ARG4        /GET SUCCESIVE WORDS
6230  1051      TAD ARG2
6231  3366      DCA DIVISR
6232  4265      JMS DIVNEX
6233  4354      JMS DIVSAV
6234  2102      ISZ COUNTR
6235  5225      JMP GETNEX
6236  5600      JMP I FASDIV
                /
6237  2000    P2000X, 2000
                /
6240  1055    NORMIZ, TAD ARG6 /DIVISOR
6241  7440      SZA
6242  5256      JMP PUTDIV
6243  7041    TESNEX, CIA
6244  1500      TAD I HIGH
6245  7710      SPA CLA
6246  5251      JMP SMALER      /GET LARGEST HIGH PART
6247  1500      TAD I HIGH
6250  3055      DCA ARG6
6251  2100    SMALER, ISZ HIGH
6252  1055      TAD ARG6
6253  2102      ISZ COUNTR
6254  5243      JMP TESNEX
6255  7001      IAC
6256  3366    PUTDIV, DCA DIVISR
6257  4776      JMS I SETUPX
6260  4265    DIVDO, JMS DIVNEX
6261  4354      JMS DIVSAV
6262  2102      ISZ COUNTR
6263  5260      JMP DIVDO
6264  5600      JMP I FASDIV
                /
6265  0000    DIVNEX, 0
6266  1500      TAD I HIGH
6267  7004      RAL             /L=1 FOR -VE
6270  7200      CLA
6271  1501      TAD I LOW
6272  7430      SZL
6273  7061      CIA CML         /L=0 UNLESS C(LOW)=0
6274  3067      DCA LOTEMP
6275  1500      TAD I HIGH
6276  7510      SPA
6277  7040      CMA             /INVERT TO USE +VE ARITH.
6300  7430      SZL
6301  7001      IAC             /CARRY FROM CIA LOW=0
6302  7421      MQL
6303  4364    PASS1, JMS FRACTN
6304  3070      DCA HITEMP
6305  1031      TAD OVRTEM
6306  7650    OVERFL, SNA CLA
6307  5313      JMP PASS2
6310  7140      CMA CLL
6311  3070      DCA HITEMP      /OVERFLOW
6312  5340      JMP DIVDON
6313  1067    PASS2, TAD LOTEMP
6314  7421      MQL
6315  1375      TAD REMAIN
6316  4364      JMS FRACTN
```

```
6317  3067      DCA LOTEMP
6320  1031      TAD OVRTEM
6321  1070      TAD HITEMP
6322  7430      SZL
6323  5306      JMP OVERFL
6324  3070      DCA HITEMP
6325  7421    PASS3, MQL
6326  1375      TAD REMAIN      /AVOID TRUNCATION,
6327  4364      JMS FRACTN
6330  7004      RAL
6331  7204      CLA RAL         /1 IF >2047
6332  1067      TAD LOTEMP
6333  1031      TAD OVRTEM
6334  3067      DCA LOTEMP
6335  7430      SZL
6336  2070      ISZ HITEMP
6337  7100      CLL
6340  1500    DIVDON, TAD I HIGH
6341  7700      SMA CLA
6342  5665      JMP I DIVNEX   /POSITIVE
6343  1067      TAD LOTEMP
6344  7041      CIA
6345  3067      DCA LOTEMP
6346  7430      SZL
6347  7040      CMA
6350  1070      TAD HITEMP
6351  7040      CMA
6352  3070      DCA HITEMP
6353  5665      JMP I DIVNEX   /NEGATIVE RE-INVERTED.
                /
6354  0000    DIVSAV, 0
6355  1067      TAD LOTEMP
6356  3501      DCA I LOW
6357  1070      TAD HITEMP
6360  3500      DCA I HIGH
6361  2100      ISZ HIGH
6362  2101      ISZ LOW
6363  5754      JMP I DIVSAV
                /
                /
6364  0000    FRACTN, 0
6365  7407      DVI
6366  0000    DIVISR, 0
6367  3375      DCA REMAIN
6370  7405      MUY
6371  0000    MULTF, 0
6372  3031      DCA OVRTEM
6373  7501      MQA
6374  5764      JMP I FRACTN
6375  0000    REMAIN, 0
6376  6400    SETUPX, SETUP
                /
                PAGE
6400  0000    SETUP, 0          /SET DATA POINTERS
6401  1056      TAD ARG7
6402  1045      TAD BUFRDX
6403  3101      DCA LOW
6404  1101      TAD LOW
6405  1046      TAD P1000
6406  3100      DCA HIGH
```

```
6407  1057      TAD ARG8
6410  0221      AND P777        /DEFAULT-USE ALL CHANNELS
6411  7450      SNA
6412  1221      TAD P777
6413  7140      CLL CMA
6414  1056      TAD ARG7
6415  7430      SZL
6416  7240      CLA CMA         /ARG7>ARG8
6417  3102      DCA COUNTR
6420  5600      JMP I SETUP
                /
6421  0777    P777,777
                /
                /
                /
                /
                PAUSE/
                /
                /MOVF
                /X MOVE(NØ,NF,SØ,SF)  SHIFTS BY SØ/1000 AT NØ
                /WITH AN INCREMENTAL SHIFT PER CHANNEL OF SF/1000
                /FOR NF CHANNELS.
                /MOVES DATA FROM BUFFER 1 TO BUFFER Ø
                /IF >1 CHANNEL ASKED,MOVES 1 CHANNEL,GIVES ERROR COUNT
                /TO FOCAL
                /
                OUTLOW=ARG9
                OUTHIH=ARG10    /SAVE SPACE
                ALOW=ARG8
                /
                *KB1+32
0172  6042    MOVE
                *FNKB1+32
0676  2465    2465     /MOVE
                /
                *6042
6042  0000    MOVE,0
6043  1366      TAD P1777
6044  3010      DCA 10
6045  1367      TAD P3777
6046  3011      DCA 11
6047  1047      TAD M2000
6050  3012      DCA 12
6051  1410      TAD I 10
6052  3411      DCA I 11      /PREFILL OUTPUT BUFFER
6053  2012      ISZ 12
6054  5251      JMP .-3
              /
6055  1053      TAD ARG4
6056  7040      CMA  CIA ✓
6057  3053      DCA ARG4      /COUNTR
6060  1362      TAD P1750
6061  3763      DCA I DIVISX  /DIVISR
6062  1052      TAD ARG3
6063  1361      TAD P2000     /LOWER BUFFER(NO.1)
6064  3057      DCA ALOW
6065  1057    PRESHF,TAD ALOW
6066  1361      TAD P2000
6067  3060      DCA OUTLOW
6070  1060      TAD OUTLOW
```

```
6071  1046     TAD P1000
6072  3061     DCA OUTHIH
6073  1054      TAD ARG5
6074  7100      CLL
6075  7510      SPA
6076  7161      CIA STL
6077  3764      DCA I MULTFX
6100  7001      IAC
6101  7420      SNL
6102  7041      CIA              /+1 OR -1
6103  1057      TAD ALOW         /ALOW IS HIGHER OR LOWER THAN LOW
6104  3101      DCA LOW          /FOR + SHIFT;B=A+1
6105  1764      TAD I MULTFX
6106  7041      CIA
6107  1362      TAD P1750        /CHECK FOR >1 CHANNEL
6110  7700      SMA CLA
6111  5315      JMP OK
6112  1362      TAD P1750
6113  3764      DCA I MULTFX     /SET 1 CHANNEL EXACTLY
6114  2051      ISZ ARG2         /RECORD ERROR COUNT
6115  1061   OK,TAD OUTHIH
6116  1361     TAD P2000
6117  7700     SMA CLA
6120  5642     JMP I MOVE       /DON'T GO PAST 5777
6121  1101     TAD LOW
6122  1046     TAD P1000
6123  3100     DCA HIGH
6124  4765     JMS I DVNEXX     /FRACTION OF FIRST CHANNEL
6125  1070     TAD HITEMP       /RESULT
6126  3461     DCA I OUTHIH
6127  1067     TAD LOTEMP
6130  3460     DCA I OUTLOW
6131  1764     TAD I MULTFX     /SET OTHER HALF OF FRACTION
6132  7041     CIA
6133  1362     TAD P1750
6134  3764     DCA I MULTFX
6135  1057     TAD ALOW
6136  1046     TAD P1000
6137  3100     DCA HIGH
6140  1057     TAD ALOW
6141  3101     DCA LOW
6142  4765     JMS I DVNEXX
6143  1460     TAD I OUTLOW
6144  1067     TAD LOTEMP
6145  3460     DCA I OUTLOW
6146  7004     RAL
6147  1461     TAD I OUTHIH
6150  1070     TAD HITEMP
6151  3461     DCA I OUTHIH
6152  2057   POSTSH,ISZ ALOW
6153  1054     TAD ARG5
6154  1055      TAD ARG6
6155  3054      DCA ARG5        /INCREMENT SHIFT AMOUNT
6156  2053     ISZ ARG4
6157  5265      JMP PRESHF
6160  5642      JMP I MOVE
          /
6161  2000   P2000,2000
6162  1750   P1750,1750
6163  6366   DIVISX,DIVISR
```

```
6164   6371   MULTFX,MULTF
6165   6265   DVNEXX,DIVNEX
6166   1777   P1777,1777
6167   3777   P3777,3777
```

File 2 Tape 12R
Apr. 6/74

(31)

```
.PALP
*OUT-S:EDIT
*
*IN-S:CON0,S:XCON,S:EDIT
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /EDIT
                /X EDIT(C,B+100R,M);S D=FCHAN(C,B+100R);CHANGES AND
                /RECALLS CHANNEL C,BUFFER B .IF R>0 IT IS
                /USED AS FIRST SCAN,AND FOR C<4095,EXCHANGE BETWEEN
                /512 CHANNEL CORE AND DISC IS AUTOMATIC.
                /
                /X SAV(R,B);X PULL(R,B) SAVE AND RECALL RUN R IN
                /BUFFER B.
                /
                /X ERAS(C0,B+100R,N) CLEAR N CHANNELS,FROM C0;
                /
                *BUFSTX
0111    6253    BUFSET
                *KB1+20
0160    6162    SAVE
0161    6200    PULL
0162    6141    CHANEL
                *KB1+26
0166    6213    EDITOR
0167    6232    ERASER
                *FNKB1+20
0664    1636    1636    /SAV
0665    2154    2154    /PULL
0666    3326    3326    /CHAN
                *FNKB1+26
0672    1034    1034    /EDIT
0673    2533    2533    /ERAS
                /
                NOWRUN=ARG10    /POINTS TO RBUFR0 OR 1
                RQTEMP=100
                CNTEMP=101      /TEMPORARY STORAGE
                EXTEND=102
                /ALSO USES ARG8H,ARG9H,ARG10H (-15,16,17) FOR BUFFERS
                /
                *RBUFR0
0107    0000    0
0110    0000    0
                /
                *6141
6141    0000    CHANEL,0
6142    4511      JMS I BUFSTX
```

```
6143  1415    TAD I 15
6144  3051    DCA ARG2
6145  1416    TAD I 16
6146  3050    DCA ARG1
6147  5741    JMP I CHANEL
              /
6150  0000    PRESET,0
6151  1100    TAD RQTEMP      /RECORD REQUESTED
6152  7104    CLL RAL
6153  7006    RTL             /8 BLOCKS PER RECORD
6154  4512    JMS I DCSETX    /SET DISC ADDRESSES
6155  1047    TAD M2000
6156  3024    DCA DDWCNT
6157  1045    TAD BUFRDX
6160  3023    DCA DDCORE
6161  5750    JMP I PRESET
              /
6162  0000    SAVE,0
6163  4511    JMS I BUFSTX
6164  4366    JMS SAVIT
6165  5762    JMP I SAVE
              /
6166  0000    SAVIT,0
6167  4350    JMS PRESET
6170  7126    STL RTL
6171  4420    JMS I DISCX
6172  5370    JMP .-2         /DISC ERROR
6173  1461    TAD I NOWRUN
6174  0377    AND PP777
6175  3461    DCA I NOWRUN    /UPDATING SAVED.
6176  5766    JMP I SAVIT
              /
6177  0777    PP777,777
              /
              *6200
6200  0000    PULL,0
6201  4511    JMS I BUFSTX
6202  4204    JMS GETIT
6203  5600    JMP I PULL
              /
6204  0000    GETIT,0
6205  1100    TAD RQTEMP
6206  3461    DCA I NOWRUN    /CURRENT RECORD IN CORE
6207  4765    JMS I PRSETX
6210  4420    JMS I DISCX
6211  5207    JMP .-2
6212  5604    JMP I GETIT
              /
6213  0000    EDITOR,0
6214  4253    JMS BUFSET
6215  1054    TAD ARG5
6216  3415    DCA I 15
6217  1012    TAD ARG5H
6220  3416    DCA I 16
6221  1102    TAD EXTEND
6222  7650    SNA CLA
6223  5613    JMP I EDITOR    /ONLY PROTECT EXTENDED FUNCTIONS.
6224  1461    TAD I NOWRUN
6225  7500    SMA
6226  1231    TAD P4000
```

```
6227  3461     DCA I NOWRUN  /RECORD BUFFER UPDATED
6230  5613     JMP I EDITOR
               /
6231  4000     P4000,4000
               /
6232  0000     ERASER,0
6233  1054       TAD ARG5
6234  7450       SNA
6235  1046       TAD P1000
6236  7041       CIA
6237  3017       DCA 17
6240  3054       DCA ARG5
6241  1052       TAD ARG3
6242  3067       DCA LOTEMP
6243  4213     NEXT,JMS EDITOR
6244  2067       ISZ LOTEMP
6245  1067       TAD LOTEMP
6246  3052       DCA ARG3
6247  2017       ISZ 17
6250  5243       JMP NEXT
6251  5632       JMP I ERASER
               /
6252  2000     P2000,2000
               /
6253  0000     BUFSET,0
6254  1367       TAD P10
6255  3026       DCA DSFELD
6256  1052       TAD ARG3
6257  0363       AND P777
6260  3101       DCA CNTEMP     /CHANNEL NO.
6261  1101       TAD CNTEMP
6262  3100       DCA RQTEMP     /RECORD NO. IF NON-EXTENDED.
6263  4537       JMS I BWRITX   /FORCE  CORE  TO DISC
6264  7240       CLA CMA
6265  3116       DCA BLOKIN     /FORCE DISC TO CORE LATER ON.
6266  1053       TAD ARG4
6267  7427       MQL!DVI
6270  0144       144            /DIVIDE BY 100 FOR EXTENDED ADDRESS.
6271  7701       CLA!MQA
6272  3102       DCA EXTEND     /FOR EXTENDED FUNCTINS.
6273  7201       CLA IAC
6274  0053       AND ARG4       /SELECT BUFFER 1 OR 0
6275  7650       SNA CLA
6276  1252       TAD P2000
6277  1252       TAD P2000
6300  3045       DCA BUFRDX
6301  7201       CLA IAC
6302  0053       AND ARG4
6303  1362       TAD RBUFRX
6304  3061       DCA NOWRUN
6305  1461       TAD I NOWRUN
6306  0363       AND P777
6307  3364       DCA NOWTEM
6310  1052       TAD ARG3
6311  7104       CLL RAL
6312  7006       RTL
6313  3052       DCA ARG3
6314  1102       TAD EXTEND
6315  7650       SNA CLA
6316  5334       JMP TESDIS     /NOT EXTENDED,STORE ANY UPDATING.
```

```
6317  1052     TAD ARG3
6320  7004     RAL
6321  0361     AND P7
6322  1102     TAD EXTEND
6323  3100     DCA RQTEMP     /RECORD NO. IF EXTENDED.
6324  1364     TAD NOWTEM
6325  7041     CIA
6326  1100     TAD RQTEMP
6327  7650     SNA CLA
6330  5335     JMP EXIT       /REQUIRED RECORD IN CORE
6331  4345     JMS OLDSAV
6332  4204     JMS GETIT
6333  5335     JMP EXIT
               /
6334  4345   TESDIS, JMS OLDSAV
6335  7240   EXIT, CLA CMA
6336  1101     TAD CNTEMP
6337  1045     TAD BUFRDX
6340  3015     DCA 15
6341  1015     TAD 15
6342  1046     TAD P1000
6343  3016     DCA 16
6344  5653     JMP I BUFSET
               /
6345  0000   OLDSAV, 0
6346  1461     TAD I NOWRUN
6347  7700     SMA CLA
6350  5745     JMP I OLDSAV   /NO UPDATE, NO SAVE.
6351  1100     TAD RQTEMP
6352  3366     DCA RQSAV
6353  1364     TAD NOWTEM
6354  3100     DCC RQTEMP
6355  4770     JMS I SAVITX
6356  1366     TAD RQSAV
6357  3100     DCA RQTEMP     /RESTORE DEMAND ADDRESS
6360  5745      JMP I OLDSAV
               /
6361  0007   P7, 7
               /
6362  0107   RBUFRX, RBUFR0
6363  0777   P777, 777
6364  0000   NOWTEM, 0
6365  6150   PRSETX, PRESET
6366  0000   RQSAV, 0
6367  0010   P10, 10
6370  6166   SAVITX, SAVIT
```

File 3 Tape 12G
Apr 19/72

(337)

```
.PALP
*OUT-S:FORM
*
*IN-S:CON0,S:XCON,S:FORM
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /FORM
                /X FORM(N)  COMPRESSES N WORDS PER WORD. REARRANGES 1024
                /WORD BUFFER INTO 2 512 WORD BUFFERS OR CONVERSELY!
                /
                HIGHIN=ARG10
                LOWIN=ARG9
                LOWOUT=ARG8
                HIOUT=ARG7
                AVCONL=ARG6
                AVCONH=ARG5
                COUNTR=ARG4
                /
                *FNKB1+46
0712    3435    3435     /FORM
                *KB1+46
0206    6044    AVERAG
                /
                *6044
6044    0000    AVERAG,0
6045    7240        CLA CMA
6046    1052        TAD ARG3
6047    7750        SPA SNA CLA
6050    5320        JMP MOVE
6051    1341        TAD P2000
6052    3057        DCA LOWOUT
6053    1057        TAD LOWOUT
6054    3060        DCA LOWIN
6055    1343        TAD P4000
6056    3056        DCA HIOUT
6057    1056        TAD HIOUT
6060    3061        DCA HIGHIN
6061    1047        TAD M2000
6062    3053        DCA COUNTR
6063    1052    WORD,TAD ARG3
6064    7450        SNA
6065    7001        IAC
6066    7041        CIA
6067    3055        DCA AVCONL
6070    1055        TAD AVCONL
6071    3054        DCA AVCONH
6072    7100        CLL
```

```
6073  1460  NEXLOW,TAD I LOWIN
6074  7430     SZL
6075  2461     ISZ I HIGHIN
6076  7000    OPR   /ALLOW OVERFLOW
6077  2060     ISZ LOWIN
6100  7100     CLL
6101  2055     ISZ AVCONL
6102  5273     JMP NEXLOW
6103  3457     DCA I LOWOUT
6104  2057     ISZ LOWOUT
6105  1461  NEXHI,TAD I HIGHIN
6106  2061     ISZ HIGHIN
6107  2053     ISZ COUNTR
6110  5313     JMP ONGO
6111  3456     DCA I HIOUT
6112  5320     JMP MOVE
6113  2054  ONGO,ISZ AVCONH
6114  5305     JMP NEXHI
6115  3456  SAVHI,DCA I HIOUT
6116  2056     ISZ HIOUT
6117  5263     JMP WORD
            /
6120  1342  MOVE,TAD P3000
6121  3057     DCA LOWOUT
6122  1343     TAD P4000
6123  3056     DCA HIOUT
6124  1344     TAD M1000
6125  3053     DCA COUNTR
6126  1457  FORM,TAD I LOWOUT
6127  7421     MQL
6130  1456     TAD I HIOUT
6131  3457     DCA I LOWOUT
6132  7501     MQA
6133  3456     DCA I HIOUT
6134  2057     ISZ LOWOUT
6135  2056     ISZ HIOUT
6136  2053     ISZ COUNTR
6137  5326     JMP FORM
6140  5644     JMP I AVERAG
            /
6141  2000  P2000,2000
6142  3000  P3000,3000
6143  4000  P4000,4000
6144  7000  M1000,-1000
```

File 4 Tape 12 E
Jan. 27/72.

(37)

```
.PALP
*OUT-S:GOTO
*
*IN-S:CON0,S:GOTO
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /GOTO
                /X GO(S,L) WILL START SUBROUTINE
                /S AT L;X DO(S,L) WILL DO A LINE OR SUBROUTINE.
                /
                *KB1+56
0216    6200    GOTO
0217    6223    DO
                *FNKB1+56
0722    3407    3407    /GO
0723    3357    3357    /DO
                /
                *6200
6200    0000    GOTO,0
6201    1227      TAD P604
6202    7421    SETIT,MQL
6203    1052      TAD ARG3
6204    7106      CLL RTL
6205    7006      RTL
6206    7006      RTL
6207    7004      RAL
6210    6201      CDF
6211    1053      TAD ARG4
6212    3630      DCA I LINENX
6213    1053      TAD ARG4
6214    7640      SZA CLA
6215    7130      STL RAR           /SET FOR ONE LINE(4000)
6216    3631      DCA I NAGSWX      /0 FOR GROUP
6217    6203      CDF!CIF
6220    7501      MQA               /GET ENTRY ADDRESS
6221    5622      JMP I .+1
6222    1553      GOPUSH
                /
6223    0000    DO,0
6224    1226      TAD P421
6225    5202      JMP SETIT         /RETURN IS VIA 'EXIT'
                /
6226    0421    P421,421          /ENTRY TO DO ROUTINE
6227    0604    P604,604          /ENTRY TO GO ROUTINE
6230    0067    LINENX,LINEN0
6231    0065    NAGSWX,NAGSW
                /
                FIELD 0
                *1553   /THIS IS LOADED TO STEN AND STAR.
1553    3357    GOPUSH,DCA GODO
1554    6001      ION
1555    4545      GETC  /BYPASS ')'
```

```
1556  4540     PUSHJ
1557  0000  GODO,0   /421 OR 604
1560  5761  EXIT, JMP I .+1
1561  0273     273    /THIS SEEMS TO CARRY ON CLEANLY(INPUTX+2)
```

(39)

File 2 Tape 12 R
May 22/74

```
.PALP
*OUT-S:LABL
*
*IN-S:CON0,S:XCON,S:LABL
*
*
*
*OPT-T

ARG 1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /APR. 26/74
                /LABL
                FIELD 1
                *550
0550   4023     4023      / S
0551   0316     0316      /CN
0552   6764     6764      /74
0553   5506     5506      /-F
                /
                *CLENGT
0006   6555     -1223     /CHAIN LENGTH=1777-555+1
                *BUFEMD
0036   6002     -1776     /-1777+1
                *DISEND
0040   7067     -711      /END OF DISC DATA AREA
                *FSDATA
0043   0500     500       /FIRST DATA BLOCK
                *FSPROG
0044   0160     160       /FIRST PROG. BLOCK
                /
                /LOAD OVER XFOC TO LABEL NEW VERSION.
                /AND TO PRESET DISC AND TAPE CONSTANTS

.
```

Nov. 23/72

(40)

```
.PALP
*OUT-S:LIST
*
*IN-S:MCON,S:LIST
*
*
*OPT-T

ADCV    6532

                /
                /
                /MCON
                XLIST
                PAUSE/
                /
                /LIST=LIST OF CHARACTER CODES FOR CRT LETTERING
                /
                FIELD 1
                *LISLET
6044    0000    SPACE,0
6045    0000    0
6046    0000    0
6047    0000    0
6050    1170    1170
6051    0000    0           /!=241
6052    0001    0001
6053    6000    6000
6054    3400    3400        /"
6055    1237    1237
6056    6247    6247
6057    7450    7450        /#
6060    2322    2322
6061    3774    3774
6062    4542    4542        /$
6063    4154    4154
6064    6106    6106
6065    3302    3302        /%
6066    0000    0
6067    0000    0
6070    0000    0
6071    0000    0000
6072    0070    0070
6073    0000    0000        /'
6074    1610    1610
6075    5014    5014
6076    0400    0400        /(
6077    0020    0020
6100    3012    3012
6101    1070    1070        /)
6102    0412    0412
6103    4342    4342
6104    5020    5020        /*
6105    0402    0402
6106    0760    0760
6107    4020    4020        /+
6110    0020    0020
6111    1603    1603
6112    4000    4000
6113    0002    0002
```

5 x 7 matrix for each character.

```
6114  0100  0100
6115  4020  4020     /-
6116  0030  0030
6117  1400  1400
6120  0000  0000     /.
6121  6016  6016
6122  0160  0160
6123  1400  1400     / /=257
                     /
6124  3724  3724
6125  3114  3114
6126  2574  2574     /0
6127  0020  0020
6130  5774  5774
6131  0000  0000     /1
6132  4130  4130
6133  3214  3214
6134  4614  4614     /2
6135  2120  2120
6136  3114  3114
6137  4554  4554     /3
6140  1405  1405
6141  0227  0227
6142  7440  7440     /4
6143  2361  2361
6144  3052  3052
6145  2461  2461     /5
6146  3722  3722
6147  3114  3114
6150  4540  4540     /6
6151  0070  0070
6152  2710  2710
6153  6406  6406     /7
6154  3322  3322
6155  3114  3114
6156  4554  4554     /8
6157  0322  0322
6160  3114  3114
6161  4574  4574     /9
                     /
6162  0000  0000
6163  0241  0241
6164  2000  2000     /:
6165  4031  4031
6166  0640  0640
6167  0000  0000     /;
6170  0405  0405
6171  0424  0424
6172  0400  0400     /<
6173  0005  0005
6174  0241  0241
6175  2050  2050     /=
6176  0020  0020
6177  2421  2421
6200  2020  2020     />
6201  0100  0100
6202  3310  3310
6203  4414  4414     /?
6204  0000  0
6205  0000  0
```

```
6206   0000   0          /e
                /
6207   7604   7604
6210   4211   4211
6211   1370   1370       /A
6212   7762   7762
6213   3114   3114
6214   4554   4554       /B
6215   3720   3720
6216   3014   3014
6217   0504   0504       /C
6220   7760   7760
6221   3012   3012
6222   1070   1070       /D
6223   7762   7762
6224   3114   3114
6225   0602   0602       /E
6226   7742   7742
6227   2110   2110
6230   0402   0402       /F
6231   3720   3720
6232   3215   3215
6233   0504   0504       /G
6234   7742   7742
6235   0100   0100
6236   4376   4376       /H
6237   0020   0020
6240   3774   3774
6241   0400   0400       /I
6242   1010   1010
6243   1002   1002
6244   0076   0076       /J
6245   7743   7743
6246   0222   0222
6247   0600   0600       /K
6250   7760   7760
6251   1004   1004
6252   0200   0200       /L
6253   7741   7741
6254   4300   4300
6255   3376   3376       /M
6256   7741   7741
6257   4103   4103
6260   0376   0376       /N
6261   3720   3720
6262   3014   3014
6263   0574   0574       /O
6264   7742   7742
6265   2110   2110
6266   4414   4414       /P
6267   3720   3720
6270   3216   3216
6271   0774   0774       /Q
6272   7742   7742
6273   2312   2312
6274   4614   4614       /R
6275   6322   6322
6276   3114   3114
6277   4546   4546       /S
6300   0040   0040
```

```
6301   3770   3770
6302   0402   0402     /T
6303   3760   3760
6304   1004   1004
6305   0176   0176     /U
6306   0754   0754
6307   1003   1003
6310   0036   0036     /V
6311   7754   7754
6312   0143   0143
6313   0376   0376     /W
6314   6145   6145
6315   0101   0101
6316   2306   2306     /X
6317   0141   0141
6320   1700   1700
6321   2006   2006     /Y
6322   6066   6066
6323   3114   3114
6324   6606   6606     /Z
                /
6325   7760   7760
6326   3010   3010
6327   0000   0000     /SQUARE OPEN BRACKET
6330   0041   0041
6331   6347   6347
6332   4200   4200     /BACK SLASH
6333   0000   0000
6334   1030   1030
6335   0776   0776     /SQUARE CLOSE BRACKET
6336   0200   0200
6337   5770   5770
6340   1010   1010     /↑
6341   0407   0407
6342   0520   0520
6343   4020   4020     /BACK ARROW
```

File 3 Tape 12 G
Apr. 19/72

(44)

```
.PALP
*OUT-S:LOOK
*
*IN-S:CON0,S:XCON,S:LOOK
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /LOOK
                /X LOOK(X,Y,ST,N,SC,CH)  FOR MAPPING: PLOTS N VERTICAL LINES
                /OF VARYING DENSITY,STARTING AT X,Y;X SPACING ST,INTENSITY
                /SCALE FACTOR SC,STARTING AT CHANNEL CH.
                /
                POINT=ARG10
                YSTEP=ARG9
                /
                *FNKB1+47
 0713   1403    1403     /LOOK
                *KB1+47
 0207   6145    LOOK
                /
                *6145
 6145   0000    LOOK,0
 6146   1055       TAD ARG6
 6147   7040       CMA
 6150   3055       DCA ARG6       /COUNT
 6151   1045       TAD BUFRDX
 6152   1057       TAD ARG8
 6153   3061       DCA POINT
 6154   1056       TAD ARG7
 6155   3764       DCA I SCALRX
 6156   2061    NEXTP,ISZ POINT
 6157   4763       JMS I CHANLX
 6160   2055     ISZ ARG6
 6161   5356     JMP NEXTP
 6162   5745       JMP I LOOK
                /
 6163   6722    CHANLX,CHANL
 6164   6731    SCALRX,SCALER
                /
                *6722
 6722   0000    CHANL,0
 6723   1052      TAD ARG3
 6724   6053       DXL
 6725   1054       TAD ARG5
 6726   3052       DCA ARG3       /NEXT X POSITION
 6727   1461       TAD I POINT
 6730   7427       MQL!DVI
 6731   0000    SCALER,0
```

```
6732  7701      CLA!MQA
6733  7450      SNA
6734  5722      JMP I CHANL
6735  3340      DCA DVISOR
6736  1364      TAD PLUS
6737  7427      MQL!DVI
6740  0000  DVISOR,0
6741  7701      CLA!MQA
6742  7450      SNA
6743  7001      IAC
6744  3060      DCA YSTEP
6745  3363      DCA YADD
6746  1363  DOT,TAD YADD
6747  1060      TAD YSTEP
6750  3363      DCA YADD
6751  1365      TAD MINUS
6752  1363      TAD YADD
6753  7700      SMA CLA
6754  5722      JMP I CHANL
6755  1363      TAD YADD
6756  1053      TAD ARG4
6757  6063      DYL
6760  7200      CLA
6761  6054      DIX
6762  5346      JMP DOT
                /
6763  0000  YADD,0
6764  0020  PLUS,20
6765  7757  MINUS,-21
```

```
.PALP
*OUT-S:MEMF
*
*IN-S:CON0,S:XCON,S:MEMF
*
*
*
*CPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /MEMF
                /X MEMW(W,N,OR)  WRITE  N WORDS
                /STARTING AT WORD W
                /X MEMR(W,0,H) READ 1024 WORDS,STARTING AT W.
                /READS LOW 12 BITS IF H>0.SETS D IF COUNTING (IN S L=FMEMR..
                /IN EXTERNAL MEMORY TO OR FROM CORE DATA BUFFER #1
                /OR IS NON-ZERO TO WRITE HI 12 BIT PART
                /X MEME(0) ERASE;X MEMX(N) LOAD X REGISTER WITH SWEEP IF N=0
                /X MEMC(N) SET COUNTING TIME N CYCLES(<2↑23),RETURN 1
                /IF COUNTING,0 IF NOT.STOP FOR N=0.DON'T LOAD IF COUNTING.
                /
                *FNKB1+67
0733    1177    1177        /MEMW
0734    1172    1172        /MEMR
                *FNKB1+73
0737    1155    1155        /MEME
0740    1153    1153        /MEMC
                /
                *KB1+67
0227    6204    MEMW
0230    6232    MEMR
                *KB1+73
0233    6401    MEME
0234    6414    MEMC
                /
                *NORMAL
0075    7232    7232
                /
                FUNCP=ARG10
                MCOUNT=ARG9
                CNTEST=ARG2
                /
                *6200
6200    5226    FUNCWL,5226         /FUNCWH=5252
6201    5232    FUNCR,5232
6202    5232    MEMCPU,5232
6203    3232    NORM0,3232
                /
6204    0000    MEMW,0
6205    4323        JMS MSETUP
6206    4260        JMS PASWOR
```

Edit 3 Tape 12 Q
Nov. 25/73 Jan. 10/74.
- For new Sweep Box

(46)

```
6207  1010      TAD 10
6210  1046      TAD P1000
6211  3011      DCA 11          /SET AUTO INDEX REGISTER
6212  1313      TAD WRITIT
6213  3224      DCA WRITER
6214  1054      TAD ARG5
6215  7650      SNA CLA
6216  5221      JMP LOW
6217  2224      ISZ WRITER      /HI PART
6220  1312      TAD P24
6221  1200  LOW, TAD FUNCWL
6222  6453      FUNLOD
6223  7200  WRITE, CLA
6224  1410  WRITER, TAD I 10  /OR TAD I 11 FOR HI PART
6225  6454      MCSTEP
6226  2060      ISZ MCOUNT
6227  5223      JMP WRITE
6230  4267      JMS MRESET
6231  5604      JMP I MEMW
                /
6232  0000  MEMR, 0
6233  1054      TAD ARG5
6234  7640      SZA CLA
6235  1310      TAD P2          /READ LOW PART ONLY:SAVE TIME
6236  1257      TAD READAL
6237  3254      DCA READER
6240  4323      JMS MSETUP
6241  1010      TAD 10
6242  1311      TAD P2000
6243  3011      DCA 11          /CHANGE TO 1024 WORD FORMAT
6244  1047      TAD M2000
6245  3060      DCA MCOUNT
6246  4260      JMS PASWOR
6247  6465  READ, READHI
6250  3411      DCA I 11
6251  6464      READLO          /TRIGGERS MCSTEP
6252  3410      DCA I 10
6253  2060      ISZ MCOUNT
6254  5247  READER, JMP READ  /OR JUMP READ+2
6255  4267      JMS MRESET
6256  5632      JMP I MEMR
                /
6257  5247  READAL, JMP READ
                /
6260  0000  PASWOR, 0
6261  2307      ISZ DCOUNT
6262  7410      SKP
6263  5660      JMP I PASWOR
6264  6454      MCSTEP
6265  5261      JMP .-4
6266  5660      JMP I PASWOR
                /
6267  0000  MRESET, 0
6270  7330      CLA STL RAR
6271  1203      TAD NORM0       /NORMAL SWEEP MODE TO END CYCLE
6272  6453      FUNLOD
6273  6452      SYNSKP
6274  5273      JMP .-1
6275  7200      CLA
6276  1051      TAD CNTEST
```

```
6277  7650      SNA CLA
6300  6455      SCOUNT          /REENABLE COUNTING
6301  1075      TAD NORMAL
6302  6453      FUNLOD          /SELECTED SWEEP MODE
6303  7300      CLA CLL
6304  3050      DCA ARG1
6305  5667      JMP I MRESET
                /
6306  0777    P777,777
6307  0000    DCOUNT,0
6310  0002    P2,2
6311  2000    P2000,2000
6312  0024    P24,24
6313  1410    WRITIT, TAD I 10
                /
6314  0000    SYNC,0
6315  6452      SYNSKP
6316  5315      JMP .-1
6317  6452      SYNSKP
6320  7410      SKP
6321  5317      JMP .-2         /WAIT TILL 50 USEC. PAST
6322  5714      JMP I SYNC
                /
6323  0000    MSETUP,0
6324  6002      IOF   /PROGRAM IS ENTERED WITH INT. ON
6325  1053      TAD ARG4
6326  0306      AND P777
6327  7450      SNA
6330  1046      TAD P1000
6331  7041      CIA
6332  3060      DCA MCOUNT
6333  1311      TAD P2000
6334  3045      DCA BUFRDX      /ALWAYS USE BUFFER 1
6335  7240      CLA CMA
6336  1045      TAD BUFRDX
6337  3010      DCA 10
6340  1052      TAD ARG3
6341  7040      CMA
6342  3307      DCA DCOUNT
6343  4314      JMS SYNC
6344  6462      CONSKP
6345  7001      IAC
6346  3051      DCA CNTEST      /1 FOR NOT COUNTING
6347  6456      MSTOP           /DON'T COUNT WHILE READING
6350  1202      TAD MEMCPU      /INHIBIT 1 USEC CLOCK
6351  6453      FUNLOD
6352  7300      CLA CLL
6353  5723      JMP I MSETUP
                /
                /
                /
                PAGE
6400  6314    SYNCX,SYNC
                /
6401  0000    MEME,0  /ERASE MEMORY
6402  4600      JMS I SYNCX
6403  1213      TAD ERASR
6404  6453      FUNLOD
6405  7200      CLA
6406  4600      JMS I SYNCX
```

```
6407   1075      TAD NORMAL
6410   6453      FUNLOD
6411   7200      CLA
6412   5601      JMP I MEME
                 /
6413   7202   ERASR,7202
                 /
6414   0000   MEMC,0   /LOAD COUNTING TIME
6415   3050      DCA ARG1
6416   3051      DCA ARG2
6417   6201      CDF
6420   1653      TAD I P45
6421   6211      CDF 10
6422   1052      TAD ARG3
6423   7640      SZA CLA
6424   5227      JMP CTEST
6425   6456      MSTOP
6426   5614      JMP I MEMC
6427   6462   CTEST,CONSKP
6430   5233      JMP FREE       /NOT COUNTING
6431   2051      ISZ ARG2       /SET 1 FOR COUNTING
6432   5614      JMP I MEMC
6433   1052   FREE,TAD ARG3
6434   7141      CLL CIA
6435   6452      SYNSKP
6436   5235      JMP .-1
6437   6457      TIMELO
6440   7204      CLA RAL        /GET CARRY
6441   6201      CDF
6442   1653      TAD I P45
6443   6211      CDF 10
6444   7040      CMA
6445   1252      TAD PP4000     /LAST BIT FOR HALT
6446   6467      TIMEHI
6447   6455      SCOUNT
6450   7300      CLA CLL
6451   5614      JMP I MEMC
                 /
6452   4000   PP4000,4000
6453   0045   P45,45
```

TAD AR63H

TAD AR63H

File 4 Tape 12N
June 19/73.

50

```
.PALP
*OUT-S:NAME
*
*IN-S:CON0,S:NAME
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /NAME
                /X NAME(N) REPLACES DISC OVERLAY#6 FROM TAPE 8.
                /N=0 GIVES ORIGINAL SYSTEM OVERLAY.
                /X WHAT(G,N) TYPES I.D. FOR N OVERLAYS,STARTING AT G
                /
                POUT=10
                PIN=11
                COUNT=ARG5
                /
                /
                *NOWNAM
0134    0000    0
                *FNKB1+40
0704    1555    1555    /NAME
0705    3334    3334    /WHAT
                *KB1+40
0200    6224    NAME    /THIS LOC IS USED BY PCAL (CALCOMP LETTERS.)
0201    6327    WHAT
                /
                *6172
6172    1377    PATCH,TAD P710
6173    3026      DCA DSFELD
6174    3030      DCA DTUNIT
6175    5776      JMP I .+1
6176    6203    BACK,OVER
6177    0710    P710,710
                /
                *6200
6200    0000    GTAPE,0 /READ FROM TAPE
6201    5602      JMP I .+1
6202    6172      PATCH
6203    1323    OVER,TAD M1065
6204    3024      DCA DDWCNT
6205    1052      TAD ARG3
6206    7450      SNA
6207    5220      JMP RESTOR    /GET ORIGINAL
6210    7106      CLL RTL       /X 4 BLOCKS
6211    1326      TAD OVBLOK
6212    3027      DCA DTBLOK
6213    1325      TAD P4066
6214    3023    GODOIT,DCA DDCORE
6215    4421      JMS I DTAPX   /GET NEW OVERLAY
6216    5215      JMP .-1
6217    5600      JMP I GTAPE
6220    1324    RESTOR,TAD P65  /PART OF INITIAL OVERLAY
6221    3027      DCA DTBLOK
```

```
6222  7330     CLA STL RAR    /4000,PART OF BLOCK IS UNUSED.
6223  5214     JMP GODOIT
               /
6224  0000   NAME,0
6225  1052     TAD ARG3
6226  7041     CIA
6227  1134     TAD NOWNAM
6230  7650     SNA CLA        /IS IT ALREADY ON DISK?
6231  5624     JMP I NAME     /YES
6232  4200     JMS GTAPE
6233  1052     TAD ARG3
6234  7650     SNA CLA
6235  5244     JMP OK         /DON'T TEST ORIGINAL,NO 1234 THERE.
6236  1725     TAD I P4066
6237  1317     TAD M1234
6240  7650     SNA CLA
6241  5244     JMP OK
6242  4530     JMS I CRLFX    /SO ERROR PRINT IS SEEN
6243  5532     JMP I KILALL   /MAGIC WORD WRONG
6244  1315   OK,TAD KB65
6245  3010     DCA POUT
6246  1321     TAD M12
6247  3054     DCA COUNT
6250  1267     TAD P60
6251  3410     DCA I POUT     /RESETTING DISPATCH TABLE.
6252  2054     ISZ COUNT
6253  5250     JMP .-3
6254  1316    TAD P4101       /KB1+66
6255  3023     DCA DDCORE
6256  1320     TAD M752
6257  3024     DCA DDWCNT
6260  1322     TAD P7026      /OVERLAY 6 ADDRESS ON DISC
6261  3025     DCA DISADD
6262  6002     IOF
6263  3126     DCA INTRUP     /MUST GO TO COMPLETION
6264  3041     DCA DTEST      /ALLOW SYSTEM REWRITE
6265  7326     CLA STL RTL    /2 IN AC TO WRITE
6266  4420     JMS I DISCX    /REWRITE DISC
6267  0060   P60,60           /DISC ERROR-NEVER GETS HERE!
6270  2041     ISZ DTEST      /RESTORE PROTECTION.
6271  1052     SETNAM,TAD ARG3
6272  7650     SNA CLA
6273  1313     TAD DIFREN     /NAMES #0 AT END OF OVERLAY
6274  1325     TAD P4066
6275  3011     DCA PIN
6276  1314     TAD FTAB65
6277  3010     DCA POUT
6300  1321     TAD M12
6301  3054     DCA COUNT
6302  1411   NEXNAM,TAD I PIN
6303  6201     CDF
6304  3410     DCA I POUT     /CHANGING NAME TABLE
6305  6211     CDF 10
6306  2054     ISZ COUNT
6307  5302     JMP NEXNAM
6310  1052     TAD ARG3
6311  3134     DCA NOWNAM     /RECORD CURRENT OVERLAY.
6312  5624     JMP I NAME
               /
6313  0764   DIFREN,5052-4066
```

```
6314  6331  FTAB65,FLETER+65
6315  0225  KB65,KB1+65
6316  4101  P4101,4101
6317  6544  M1234,-1234
6320  7026  M752,-752
6321  7766  M12,-12
6322  7026  P7026,7026
6323  6713  M1065,-1065
6324  0065  P65,65
6325  4066  P4066,4066
6326  0130  OVBLOK,134-4
            /
6327  0000  WHAT,0
6330  1053    TAD ARG4
6331  7041    CIA
6332  3054    DCA COUNT       /NAME COUNT
6333  4200  LOADIT,JMS GTAPE
6334  1725    TAD I P4066
6335  1317    TAD M1234
6336  7640    SZA CLA
6337  5357    JMP NEXT        /NOT AN OVERLAY
6340  4530    JMS I CRLFX     /LINE FEED BEFORE NO.
6341  1052    TAD ARG3
6342  7427    MQL!DVI
6343  0144    144
6344  4371    JMS DIGIT
6345  7427    MQL!DVI
6346  0012    12
6347  4371    JMS DIGIT
6350  1370    TAD P260
6351  4527    JMS I TYPEX
6352  1363    TAD MESDO
6353  3766    DCA I P5050
6354  1364    TAD RETRN1
6355  3767    DCA I P5071
6356  4765    JMS I P5047
6357  2052  NEXT,ISZ ARG3
6360  2054    ISZ COUNT
6361  5333    JMP LOADIT
6362  5727    JMP I WHAT
            /
6363  4422  MESDO,JMS I MESAGX
6364  5647  RETRN1,5647     /JMP I 5047(SUBROUTINE EXIT)
6365  5047  P5047,5047
6366  5050  P5050,5050
6367  5071  P5071,5071
6370  0260  P260,260
            /
6371  0000  DIGIT,0
6372  3061    DCA ARG10
6373  7501    MQA
6374  1370    TAD P260
6375  4527    JMS I TYPEX
6376  1061    TAD ARG10
6377  5771    JMP I DIGIT
```

File 3 Tape 12R
Feb 24/74

(53)

```
.PALP
*OUT-S:NCRT
*
*IN-S:CON0,S:XCON,S:NCRT,S:NCR2
*
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /NCRT
                /X CRT(SC,N,X1,B,SW,OF,P,D)-P=CALC. SCALE;D=DOTS.
                /DISPLAYS FOR SW SWEEPS: N POINTS,STARTING AT X1,
                /FULL SCALE IS SC X 1024 OFFSET=OF.
                /IF N=0,DISPLAY 512 POINTS
                /IF I=0,USE 1 SWEEPS
                /STOP PLOTTING IF STOP (3,10) SWITCH IS PRESSED.
                /
                /
                PENUP=6504
                DDOWN=6514
                PDOWN=6524
                XPOINT=ARG3
                /
                *KB1+10
0150    6400    GRAPH   /FOCAL FUNCTION FGRA
                *FNKB1+10
0654    0044    44      /CRT
                /
                *6400
6400    0000    GRAPH,0 /DISPLAY SEQUENCE OF POINTS
6401    1060      TAD ARG9
6402    7640      SZA CLA
6403    1370      TAD PLOPNT
6404    1371      TAD DISP
6405    3372      DCA FUNC
6406    1056       TAD ARG7
6407    7040      CMA
6410    3056       DCA ARG7      /SWEEP COUNTER
6411    3327      DCA SHIFTR
6412    1052      TAD ARG3
6413    7421      MQL
6414    1010      TAD ARG3H
6415    7450    NEXTD,SNA
6416    5223      JMP DIVOK
6417    7417      LSR
6420    0000      0             /SHIFT OVER UNTIL <4095
6421    2327      ISZ SHIFTR
6422    5215      JMP NEXTD
6423    7501    DIVOK,MQA
6424    3331       DCA SCALEG
```

```
6425  1053  GRAN,TAD ARG4
6426  7450     SNA
6427  1046     TAD P1000
6430  3234     DCA XDIV
6431  1306     TAD P2000
6432  7421     MQL
6433  7407     DVI
6434  0000  XDIV,0
6435  7701     CLA!MQA
6436  3305     DCA XSTEP
6437  1055  SWEEP,TAD ARG6
6440  7650     SNA CLA
6441  1306     TAD P2000
6442  1306     TAD P2000
6443  1054     TAD ARG5        /START A DISPLAY SWEEP
6444  3310     DCA DATLOW
6445  1310     TAD DATLOW
6446  1046     TAD P1000
6447  3311     DCA DATHI
6450  3052     DCA XPOINT
6451  1234     TAD XDIV
6452  7141     CIA CLL
6453  3304     DCA XCOUNT
6454  4313  PCYCLE,JMS GETPNT
6455  4772     JMS I FUNC
6456  1305  NOTEN,TAD XSTEP
6457  1052     TAD XPOINT
6460  3052     DCA XPOINT
6461  2310     ISZ DATLOW
6462  2311     ISZ DATHI
6463  1311     TAD DATHI
6464  1303     TAD M4000
6465  7650     SNA CLA
6466  5274     JMP HALF2
6467  2304  ONGO,ISZ XCOUNT
6470  5254     JMP PCYCLE
6471  2056     ISZ ARG7
6472  5237     JMP SWEEP
6473  5600     JMP I GRAPH
               /
6474  1046  HALF2,TAD P1000
6475  1310     TAD DATLOW
6476  3310     DCA DATLOW
6477  1046     TAD P1000
6500  1311     TAD DATHI
6501  3311     DCA DATHI
6502  5267     JMP ONGO
               /
6503  4000  M4000,-4000
               /
6504  0000  XCOUNT,0
6505  0000  XSTEP,0
6506  2000  P2000,2000
6507  6000  P6000,6000
6510  0000  DATLOW,0
6511  0000  DATHI,0
6512  0000  SETHI,0
               /
6513  0000  GETPNT,0
6514  7240     CLA CMA
```

```
6515  3360     DCA DSIGN
6516  1711     TAD I DATHI
6517  7710     SPA CLA
6520  5361     JMP NEG
6521  1710      TAD I DATLOW          /DISPLAY A POINT
6522  7421      MQL
6523  1711      TAD I DATHI
6524  7413   DIVIDE,SHL        /SHIFT LEFT ONCE,SINCE MIN. RIGHT
6525  0000     0                 /SHIFT IS 1.
6526  7417     LSR
6527  0000   SHIFTR,0
6530  7407     DVI
6531  0000   SCALEG,0
6532  7630     SZL CLA
6533  5354     JMP TOOBIG      /DIVIDE OVERFLOW
6534  1360     TAD DSIGN
6535  3031     DCA TEMPS0
6536  7100     CLL
6537  7701      CLA!MQA
6540  2360     ISZ DSIGN
6541  7061     CIA CML
6542  1057     TAD ARG8
6543  7420     SNL
6544  5347     JMP POSIT
6545  7200     CLA
6546  1031     TAD TEMPS0      /OVER OR UNDER FLOW
6547  7421   POSIT,MQL
6550  7501     MQA
6551  0307      AND P6000
6552  7650     SNA CLA
6553  5713     JMP I GETPNT
6554  7350   TOOBIG,CLA CMA CLL RAR
6555  7110     CLL RAR          /SET 1777
6556  7421     MQL    /OVERFLOW
6557  5713     JMP I GETPNT
               /
6560  0000   DSIGN,0
               /
6561  3360   NEG,DCA DSIGN
6562  1710     TAD I DATLOW
6563  7041     CIA
6564  7421     MQL
6565  1711     TAD I DATHI
6566  7040     CMA
6567  5324     JMP DIVIDE     /NEGATIVE NUMBERS ARE CONVERTED,THEN DIVIDED
               /
6570  7676   PLOPNT,PLOT-ONEPNT
6571  6702   DISP,ONEPNT
6572  6702   FUNC,ONEPNT
               PAUSE/
               /
               /NCR2
               /CALCOMP PART OF IT.
               CODLOD=6361
               READSW=6362
                 PAGE
6600  7000   PLOT,OPR          /Y VALUE IN MQ
6601  7501     MQA
6602  7041     CIA
6603  1106     TAD COMLOC
```

```
6604  7100     CLL
6605  7500     SMA
6606  7061     CIA CML
6607  3200     DCA PLOT
6610  1276     TAD LEFT
6611  7430     SZL
6612  1275     TAD RIGHTD
6613  3225     DCA COMPY
6614  1061     TAD ARG10       /DOT TEST
6615  7650     SNA CLA
6616  5222     JMP YDO
6617  6504     PENUP
6620  1301     TAD P24
6621  4252     JMS DELAY
6622  1200  YDO,TAD PLOT
6623  7650     SNA CLA
6624  5233     JMP COMP
6625  0000  COMPY,0
6626  4252     JMS DELAY
6627  2200  YTEST,ISZ PLOT
6630  5225     JMP COMPY
6631  7501     MQA
6632  3106     DCA COMLOC
6633  1060  COMP,TAD ARG9
6634  7041     CIA
6635  3200     DCA PLOT
6636  6514  COMPX,DDOWN     /X MOTION LAST
6637  4252     JMS DELAY
6640  2200     ISZ PLOT
6641  5236     JMP COMPX
6642  1061  DONE,TAD ARG10
6643  7650     SNA CLA
6644  5651     JMP I RETN
6645  6524     PDOWN          /DOTS
6646  1301     TAD P24
6647  4252     JMS DELAY
6650  5651     JMP I RETN
           /
6651  6456  RETN,NOTEN
           /
6652  0000  DELAY,0
6653  7040     CMA
6654  3277     DCA TEMP1
6655  1320     TAD P3
6656  6361     CODLOD         /READ SWITCHES
6657  6362     READSW
6660  0046     AND P1000      /TEST STOP SWITCH
6661  7450      SNA
6662  5265     JMP GOOK
6663  3051     DCA ARG2       /TELL FOCAL
6664  5651     JMP I RETN
6665  1274  GOOK,TAD TIME
6666  3300     DCA TEMP2
6667  2300  WAIT,ISZ TEMP2
6670  5267     JMP .-1
6671  2277     ISZ TEMP1
6672  5265     JMP GOOK
6673  5652     JMP I DELAY
           /
6674  6400  TIME,-1400
```

```
6675  7770  RIGHTD,-10
6676  6521  LEFT,6521
6677  0000  TEMP1,0
6700  0000  TEMP2,0
6701  0024  P24,24
            /
6702  0000  ONEPNT,0
6703  7501    MQA
6704  6063  SHOWL,DYL
6705  7300      CLA CLL
6706  1052      TAD XPOINT
6707  6053      DXL
6710  7300      CLA CLL
6711  1317      TAD M6
6712  3010      DCA 10
6713  2010      ISZ 10
6714  5313      JMP .-1       /DELAY FOR MEMORY SCOPE
6715  6054      DIX
6716  5702      JMP I ONEPNT
6717  7772  M6,-6
6720  0003  P3,3
```

File 4 Tape 10 S
Apr 20/72

(38)

```
.PALP
*OUT-S:PAUS
*
*IN-S:CON0,S:XCON,S:PAUS
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /PAUS
                /STOP COUNTING IF N=0;CONTINUE IF N=1
                /NO CHANGE IN ACTUAL LIVE TIME.
                /
                *KB1+55
0215    6771    PAUSER
                *FNKB1+55
0721    3673    3673    /PAUS
                /
                *6771
6771    0000    PAUSER,0
6772    1052      TAD ARG3
6773    7450      SNA
6774    6456      MSTOP
6775    7640      SZA CLA
6776    6455      SCOUNT
6777    5771      JMP I PAUSER

.
```

File 4 Tape 12H
July 26/72.

(5-9)

```
.PALP
*OUT-S:PEAK
*
*IN-S:CON0,S:XCON,S:PEAK
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /PEAK
                /S D=FPEAK(L,B+100R,H,M,PK) RETURNS HIGHEST VALUE
                /BETWEEN CHAN.L..H,IF M=0.IF NOT,RETURNS CHAN. NO.
                /USES EDIR,SO KEEP IN SAME OVERLAY!
                /IF PK NON-ZERO,GIVES NO. OF MONOTONICALLY
                /INCREASING CHANNELS FROM L;(MAX=H-L).
                /
                *KB1+62
0222    6400    PEAK
                *FNKB1+62
0726    0023    23      /PEAK
                /
                CHANLX=KB1+22   /SEE EDIR
                /
                *6400
6400    0000    PEAK,0
6401    3236      DCA HIGH
6402    3235      DCA LOW
6403    1055      TAD ARG6
6404    3277      DCA MONOT     /SAVE IT
6405    1052      TAD ARG3
6406    3300      DCA CHAN
6407    1054      TAD ARG5
6410    7040      CMA
6411    1052      TAD ARG3
6412    3275      DCA COUNTR
6413    1056      TAD ARG7
6414    7640      SZA CLA
6415    5301      JMP MONO      /REPORT NO. OF MONOTONIC INCREASES.
                  /
6416    4237      JMS GOGET
6417    2275      ISZ COUNTR
6420    5216      JMP .-2
6421    1236      TAD HIGH
6422    3050      DCA ARG1
6423    1235      TAD LOW
6424    3051      DCA ARG2
6425    1277      TAD MONOT
6426    7650      SNA CLA
6427    5600      JMP I PEAK
6430    1234      TAD LOCATN
```

```
6431  3051     DCA ARG2
6432  3050     DCA ARG1
6433  5600     JMP I PEAK
               /
6434  0000   LOCATN,0
6435  0000   LOW,0
6436  0000   HIGH,0
               /
6437  0000   GOGET,0
6440  4562     JMS I CHANLX
6441  1050     TAD ARG1
6442  7510     SPA
6443  5270     JMP GETOUT     /IGNORE NEGATIVES
6444  7140     CMA CLL
6445  1236     TAD HIGH
6446  7430     SZL
6447  5270     JMP GETOUT     /HIGH IS BIGGER
6450  7001     IAC
6451  7640     SZA CLA
6452  5260     JMP TAKIT      /HIGH IS  SMALLER
6453  1051     TAD ARG2
6454  7140     CMA CLL
6455  1235     TAD LOW
6456  7630     SZL CLA
6457  5270     JMP GETOUT     /LOW IS BIGGER
6460  1050   TAKIT,TAD ARG1
6461  3236     DCA HIGH
6462  1051     TAD ARG2
6463  3235     DCA LOW
6464  1300     TAD CHAN
6465  3234     DCA LOCATN
6466  7001     IAC
6467  3276     DCA INCR
6470  7300   GETOUT,CLA CLL
6471  2300     ISZ CHAN
6472  1300     TAD CHAN
6473  3052     DCA ARG3
6474  5637     JMP I GOGET
               /
6475  0000   COUNTR,0
6476  0000   INCR,0
6477  0000   MONOT,0
6500  0000   CHAN,0
               /
6501  3277   MONO,DCA MONOT
6502  3276   TEST1,DCA INCR
6503  4237     JMS GOGET
6504  1276     TAD INCR
6505  7650     SNA CLA
6506  5312     JMP EXITM      /NOT MONOTONIC INCREASE.
6507  2277     ISZ MONOT
6510  2275     ISZ COUNTR
6511  5302     JMP TEST1
6512  1277   EXITM,TAD MONOT
6513  3051     DCA ARG2
6514  3050     DCA ARG1
6515  5600     JMP I PEAK
```

Tape 125
Aug 28/7

(61)

```
.PALP
*OUT-S:PUTN
*
*IN-S:CON0,S:PUTN
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /PUTN
                /X PUTN(B,W,X0,N,I)
                /LOADS N SUCCESSIVE DISC WORDS,STARTING AT BLOCK B,
                /WORD W,WITH NUMBERS: X0,X0+I,X0+2*I ETC
                /
                *KB1+33
0173    6304    PUTTER
                *FNKB1+33
0677    2256    2256    /PUTN
                /
                *6304
6304    0000    PUTTER,0
6305    4540        JMS I KB1       /"PUT" IN GWRD
6306    3052        DCA ARG3
6307    3053        DCA ARG4
6310    1055        TAD ARG6
6311    7450        SNA
6312    5704        JMP I PUTTER
6313    7041        CIA
6314    3055        DCA ARG6
6315    5322        JMP TEST
6316    1054    NEXT,TAD ARG5
6317    1056        TAD ARG7
6320    3054        DCA ARG5
6321    4540        JMS I KB1
6322    2055    TEST,ISZ ARG6
6323    5316        JMP NEXT
6324    4537        JMS I BWRITX    /PUT LAST BLOCK ON DISK
6325    5704        JMP I PUTTER
```

File 2 Tape 12 R
Apr. 26/74

(62)

```
.PALP
*OUT-S:REVR
*
*IN-S:CON0,S:REVR
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /REVR
                /REVR(W,N)  REVERSE THE SEQUENCE OF N CHANNELS
                /STARTING AT CHANNEL W.  1024 CHANNEL FORMAT
                /
                *FNKB1+66
0732    2302    2302    /REVR
                *KB1+66
0226    6134    REVERS
                /
                *6134
6134    0000    REVERS,0
6135    1052        TAD ARG3
6136    1377        TAD P2000
6137    3052        DCA ARG3        /CORE ADDRESS,BUFFER 1
6140    1052        TAD ARG3
6141    1053        TAD ARG4
6142    3054        DCA ARG5        /END WORD LOCATION
6143    1052    NEXT,TAD ARG3       /FRONT WORD
6144    1377        TAD P2000
6145    3055        DCA ARG6        /HI ORDER
6146    1054        TAD ARG5
6147    1377        TAD P2000
6150    3057        DCA ARG8
                /
6151    1452        TAD I ARG3
6152    7421        MQL
6153    1454        TAD I ARG5
6154    3452        DCA I ARG3
6155    7501        MQA
6156    3454        DCA I ARG5
6157    2052        ISZ ARG3
6160    7240        CLA CMA
6161    1054        TAD ARG5
6162    3054        DCA ARG5
                /
6163    1455        TAD I ARG6
6164    7421        MQL
6165    1457        TAD I ARG8
6166    3455        DCA I ARG6
6167    7501        MQA
6170    3457        DCA I ARG8
                /
6171    1052        TAD ARG3
6172    7141        CLL CIA         /SETS LINK IF AC=0,OTHERWISE CLEARS IT.
6173    1054        TAD ARG5
6174    7630        CLA SZL

                                    6175    5343        JMP NEXT
                                    6176    5734        JMP I REVERS
                                                    /
                                    6177    2000    P2000,2000
```

File 4 Tape 12C
Aug 23/71

(63)

```
.PALP
*OUT-S:SAV4
*
*IN-S:CON0,S:SAV4
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /SAV4
                /STORE AND RETRIEVE FLOATING VARIABLES FROM DISC-3 OR 4 WOR
                /X STOR(B,W;V) STORES VARIABLE V STARTING
                /AT WORD W OF BLOCK B.  S D=FASK(B,W) PUTS IT IN D
                /
                *KB1+6
0146    6546    FSTORE
0147    6562    FDISC
                /
                *FNKB1+6
0652    1112    1112    /STOR
0653    3643    3643    /ASK
                /
                *6770
6770    0000    FLSET,0
6771    7240        CLA CMA
6772    1035        TAD FLACR
6773    3016        DCA 16
6774    1377        TAD M4
6775    3017        DCA 17
6776    5770        JMP I FLSET
6777    7774    M4,-4
                /
                *6545
6545    6770    FLSETG,FLSET
6546    0000    FSTORE,0
6547    4745        JMS I FLSETG
6550    6201    FONEXT,CDF
6551    1416        TAD I 16
6552    6211        CDF 10
6553    3051        DCA ARG2
6554    4520        JMS I PUTWRX
6555    3052        DCA ARG3
6556    3053        DCA ARG4        /0 IS USED TO SELECT NEXT ADDRESS
6557    2017        ISZ 17
6560    5350        JMP FONEXT
6561    5746        JMP I FSTORE
                /
6562    0000    FDISC,0             /VARIABLE FROM DISC
6563    4745        JMS I FLSETG
6564    4541    FINEXT,JMS I GETWRX
6565    1051        TAD ARG2
6566    6201        CDF
6567    3416        DCA I 16
6570    6211        CDF 10
6571    3052        DCA ARG3
```

```
6572  3053      DCA ARG4      /GET SEQUENTIAL ADDRESSES
6573  2017      ISZ 17
6574  5364      JMP FINEXT
6575  2362      ISZ FDISC     /SO LFOC DOESN'T CHANGE FLAC
6576  5762      JMP I FDISC
                /
```

File 4 Tape 12D
Oct 26/71

(65)

```
.PALP
*OUT-S:SHIF
*
*IN-S:CON0,S:XCON,S:SHIF
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /SHIF
                / X SHFT(NB,NS) SHIFTS BLOCK NB BY NS WORDS
                /USE: E.G.  FOR J=1,20;X SHFT(NB-J+20,NS) WILL
                /SHIFT 20 BLOCKS STARTING AT BLOCK NB BY NS WORDS.
                /IF NS IS  -VE,START AT LOWEST BLOCK
                /
                *KB1+25
0165    6043    SHIFTR
                *FNKB1+25
0671    3404    3404    /SHFT
                /
                *6043
6043    0000    SHIFTR,0
6044    4537        JMS I BWRITX /PROTECT CORE BUFFER
6045    1052        TAD ARG3
6046    3116        DCA BLOKIN
6047    7100        CLL
6050    4524        JMS I MVBUFX
6051    7577        BUFERB
6052    1053        TAD ARG4
6053    7100        CLL
6054    1025        TAD DISADD
6055    3025        DCA DISADD
6056    7420        SNL
6057    5263        JMP DWRITE
6060    1076        TAD P100
6061    1026        TAD DSFELD
6062    3026        DCA DSFELD    /HIGH PART OF DISC ADDRESS
6063    1053    DWRITE,TAD ARG4
6064    7710        SPA CLA
6065    1077        TAD M100
6066    1026        TAD DSFELD
6067    3026        DCA DSFELD
6070    7326        CLL CML CLA RTL
6071    4420        JMS I DISCX  /REWRITE BUFFER IN NEW SPOT
6072    7000        OPR          /IGNORE DISC ERRORS
6073    7330        CLL CML CLA RAR
6074    3116        DCA BLOKIN           /FORCE DISC BUFFER INITIALIZE
6075    5643        JMP I SHIFTR
                /
```

Tape 125
Sept 6/72

(66)

```
.PALP
*OUT-S:STAP
*
*IN-S:CON0,S:XCON,S:STAP
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /STAPE-READS AND WRITES SCANNER RUNS TO DECTAPE
                /
                /X MSAV(R,B,T) PUT BUFFER B ON TAPE T AS RUN R
               /X MGET(R,B,T) SET BUFER B TO CONTENT OF TAPE T RUN R
                /
                *KB1+14
0154    6545    TSAVE
0155    6553    TGET
                *FNKB1+14
0660    2636    2636    /MSAV
0661    1274    1274    /MGET
                /
                *6545
6545    0000    TSAVE,0
6546    4360        JMS TSETUP
6547    1037        TAD P20
6550    4421        JMS I DTAPX
6551    5347        JMP .-2         /TAPE ERROR
6552    5745        JMP I TSAVE
                /
6553    0000    TGET,0
6554    4360        JMS TSETUP
6555    4421        JMS I DTAPX
6556    5355        JMP .-1         /READ ERROR
6557    5753        JMP I TGET
                /
6560    0000    TSETUP,0
6561    4511        JMS I BUFSTX /SELECT BUFFER
6562    1052        TAD ARG3
6563    1043        TAD FSDATA    /FIRST BLOCK FOR DATA
6564    3027        DCA DTBLOK
6565    1045        TAD BUFRDX
6566    3023        DCA DDCORE
6567    1047        TAD M2000
6570    3024        DCA DDWCNT
6571    1054        TAD ARG5
6572    0377       AND P7          /TAPE8=TAPE0
6573    7112        CLL RTR
6574    7012        RTR
6575    3030        DCA DTUNIT
6576    5760        JMP I TSETUP
6577    0007    P7,7
```

(67)

File 2 Tape 12R
May 22/74.

```
.PALP
*OUT-S:SWEP
*
*IN-S:CON0,S:XCON,S:SWP1,S:SWP2
*
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /SWP1
                /X MCEN(D) OFFSETS CENTER BY + OR - D
                /S D=FMEMX(N,C,R,S,P,K);X MEMY(0,C,R--)--LOAD SWEEPS
                /MUX NO. IS 3;OR S IF NON-ZERO...P=1 TO BYPASS ERROR PRINT.
                /N=1 FOR NORMAL SWEEP..R=1 TO READ,0 TO SEND.
                /.K=1 TO BYPASS 4K SCANNER MEMORY.
                /C IS SWEEP CENTER
                /INPUT CABLE 7;OUTPUT CABLE 18.
                /
                /ASSUMES MUX CYCLE TIME<20 MICROSEC.
                /WILL HANG IN XMIT IF ARG7 SET AND MUX DISABLED.
                /
                DATA=ARG10
                FUNCP=ARG10H
                COUNT8=ARG9
                FUNC=ARG9H
                COUNT=ARG8H
                UNIT=ARG7H
                BYPASS=ARG6H
                /
                MUX=6350
                OKSKIP=1
                DUNSKP=2
                DAREAD=3
                FREAD=4
                FLOAD=5
                LAMOFF=6
                DLOAD=7
                GRAB=4
                /
                SYNSKP=6452
                FUNLOD=6453
                /
                *FNKB1+71
0735    1200    1200        /MEMX
0736    1201    1201        /MEMY
                *FNKB1+75
0741    0661    661         /MCEN
                *KB1+75
0235    6477    CENTER
                *KB1+71
```

```
0231  6515  MEMX
0232  6531  MEMY
            /
            *6477
6477  0000  CENTER,0
6500  1052    TAD ARG3
6501  3053    DCA ARG4
6502  1075    TAD NORMAL
6503  4744    JMS I SETUPX
6504  5677  CENGO,JMP I CENTER      /THIS ROUTINE SETS CENTER COUNTER ON
            /
6505  0300  UNIT0,300
6506  0200  UNIT1,200
6507  0100  UNIT2,100
6510  0300  UNIT3,300
6511  0040  UNIT4,40
6512  0240  UNIT5,240
6513  0140  UNIT6,140
6514  0340  UNIT7,340
6515  0000  MEMX,0
6516  1052    TAD ARG3
6517  7440    SZA
6520  7330    STL CLA RAR    /4000
6521  1345    TAD NORM0
6522  3075    DCA NORMAL
6523  1054    TAD ARG5
6524  7640    SZA CLA
6525  1340    TAD XREAD      /READ,NOT WRITE
6526  1342    TAD FUNCX
6527  4744    JMS I SETUPX
6530  5715    JMP I MEMX
            /
6531  0000  MEMY,0
6532  1054    TAD ARG5
6533  7640    SZA CLA
6534  1341    TAD YREAD      /READ,NOT WRITE
6535  1343  TAD FUNCY
6536  4744    JMS I SETUPX
6537  5731    JMP I MEMY
            /
6540  0400  XREAD,1000-400   /CHANGE WRITE TO READ
6541  0100  YREAD,200-100
6542  6630  FUNCX,6630
6543  7131  FUNCY,7131
6544  6644  SETUPX,SETUP
6545  3230  NORM0,3230
            /
6546  0000  SFUNL,0          /PUT FUNCTION IN SWEEP BOX
6547  7421  SETIN,MQL
6550  1777    TAD PORT18     /CABLE SELECT
6551  4776    JMS XMIT
6552  5347    JMP SETIN      /ERROR
6553  1775    TAD CABLE7
6554  7421    MQL
6555  7330    CLA STL RAR    /4000 FOR PULSE 1
6556  4776    JMS XMIT
6557  5347    JMP SETIN      /ERROR
6560  5746    JMP I SFUNL
            /
6561  0000  DELAY,0 /LENGTH IN AC=12+N*4.5 MICRO SEC
```

```
6562  3031     DCA TEMPS0
6563  2031     ISZ TEMPS0
6564  5363     JMP .-1
6565  5761     JMP I DELAY
               /
6566  0000   SYNC,0
6567  6452     SYNSKP
6570  5367     JMP .-1
6571  6452     SYNSKP          /WAIT FOR 4K MEM. CYCLE
6572  7410     SKP
6573  5371     JMP .-2
6574  5766     JMP I SYNC
               /
6575  6771
6576  6600
6577  6766
               *6600
6600  0000   XMIT,0
6601  1037     TAD P20         /SEND
6602  1014     TAD UNIT
6603  6355     MUX FLOAD       /FUNCTION
6604  3016     DCA FUNC
6605  6354     MUX FREAD
6606  7041     CIA
6607  1016     TAD FUNC        /BE SURE CORRECT CODE LOADED
6610  7450     SNA
6611  5214     JMP GO
6612  4536     JMS I OCTPNX    /IF PDP 8 IO BAD PRINTS DELTA
6613  5231     JMP FAULT
6614  7501   GO,MQA
6615  6357     MUX DLOAD       /"DATA" AND TRANSMIT
6616  7344     CLA CMA CLL RAL         /-2 IN AC FOR 21 USEC.
6617  4775     JMS I DELAYX
6620  6352     MUX DUNSKP
6621  5231     JMP FAULT
6622  6354     MUX FREAD
6623  7041     CIA
6624  1016     TAD FUNC
6625  6351     MUX OKSKIP
6626  7240     CLA CMA         /ERROR
6627  7650     SNA CLA
6630  5242     JMP OK
6631  1013   FAULT,TAD BYPASS
6632  1056     TAD ARG7
6633  7640     SZA CLA
6634  5600     JMP I XMIT      /BYPASS ERROR MESSAGE
6635  4422     JMS I MESAGX
6636  1525   TEXT /MU
6637  3077   X?
6640  0000   /
6641  5600     JMP I XMIT
6642  2200   OK,ISZ XMIT
6643  5600     JMP I XMIT
               PAUSE/
               /
               /SWP2
6644  0000   SETUP,0
6645  3017     DCA FUNCP
6646  6002     IOF
6647  6354     MUX GRAB        /STOP OTHER COAX USER
```

```
6650  7350     CLA CMA CLL RAR          /SET A LONG DELAY
6651  4775     JMS I DELAYX  /WAIT FOR SPECTRGRAPH CONTROL TO FINISH
6652  1055     TAD ARG6
6653  0374     AND P7
6654  1365     TAD LIST
6655  3031     DCA TEMPS0
6656  1431     TAD I TEMPS0
6657  3014     DCA UNIT
6660  2013  TEST, ISZ BYPASS /SET ERROR PRINT BYPASS
6661  2015     ISZ COUNT
6662  7410     SKP
6663  5266     JMP GOSYNC
6664  4200  INIT, JMS XMIT    /PUTS MPX IN PHASE, WITH NO ERROR PRINT
6665  5260     JMP TEST
6666  3013  GOSYNC, DCA BYPASS          /CLEAR ERROR PRINT BYPASS
6667  1057     TAD ARG8
6670  7650     SNA CLA
6671  4776     JMS I  SYNCX   /WAIT FOR 4K SCANNER MEMORY CYCLE
6672  1017     TAD FUNCP
6673  0363     AND P5777      /MEM. CLOCK OFF
6674  6453     FUNLOD         /STOP 4K MEM.
6675  7200     CLA
6676  1017     TAD FUNCP
6677  4764     JMS I SFUNLX
6700  1372     TAD M1000
6701  3015     DCA COUNT
6702  7332     CLA STL RTR    /CORE BUFFER 1, ADDRESS 2000
6703  3061     DCA DATA
6704  1053  SETIT, TAD ARG4
6705  7421     MQL
6706  1366     TAD PORT18     /SETTING 'CENTER' FOR SWEEPS
6707  4200     JMS XMIT
6710  5304     JMP SETIT      /ERROR
6711  1370     TAD CABL18
6712  7421     MQL
6713  7330     CLA STL RAR    /4000 FOR PULSE1
6714  4200     JMS XMIT
6715  5304     JMP SETIT      /ERROR
6716  1244     TAD SETUP
6717  1377     TAD CENTES     /CHECK FOR CENTERING ONLY
6720  7650     SNA CLA
6721  5354     JMP GETOUT     /YES
6722  1373  NEXT, TAD M10
6723  3060     DCA COUNT8
6724  1054     TAD ARG5
6725  7650     SNA CLA
6726  5341     JMP PUTING     /SETTING SWEEPS(SEND)
6727  6454  STEPRD, MCSTEP
6730  2060     ISZ COUNT8
6731  5327     JMP STEPRD
6732  1373  GET, TAD M10      /CHANGE SEND TO RECEIVE
6733  1367     TAD PORT7
6734  4200     JMS XMIT
6735  5332     JMP GET        /ERROR
6736  6353     MUX DAREAD     /READ 12 BIT WORD
6737  3461     DCA I DATA
6740  5351     JMP ONGO
6741  1461  PUTING, TAD I DATA
6742  7421     MQL
6743  1366     TAD PORT18
```

```
                    XMIT
6744  4200          JMS XMIT
6745  5341          JMP PUTING      /ERROR
6746  6454    STEPW,MCSTEP
6747  2060          ISZ COUNT8
6750  5346          JMP STEPW       /8 PULSES PER STEP
6751  2061    ONGO,ISZ DATA
6752  2015          ISZ COUNT
6753  5322          JMP NEXT
6754  1075    GETOUT,TAD NORMAL
6755  4764          JMS I SFUNLX
6756  1075          TAD NORMAL
6757  6453          FUNLOD
6760  7300          CLA CLL
6761  6356          MUX LAMOFF
6762  5644          JMP I SETUP
                    /
6763  5777    P5777,5777
6764  6546    SFUNLX,SFUNL
6765  6505    LIST,UNIT0
6766  0400    PORT18,400        /CABLE FOR DATA
6767  7000    PORT7,7000
6770  0020    CABL18,20         /CABLE FOR PULSES
6771  0040    CABLE7,40
6772  7000    M1000,-1000
6773  7770    M10,-10
6774  0007    P7,7
6775  6561    DELAYX,DELAY
6776  6566    SYNCX,SYNC
                    /
                    /
6777  1274    CENTES,-CENGO
```

File 4 Tape 12M
Jan 10/73

(72)

```
.PALP
*OUT-S:SWIT
*
*IN-S:CON0,S:SWIT,S:JOY1,S:JOY2
*
*
*
*
*OPT-T

APOINT 6554

            /CON0
            XLIST
            PAUSE/
            /
            /SWIT
            /S D=FSWIT(SW,SH,X,Y,M,Q);IF SW -VE,ERASE CRT
            /IF SW 0,LOAD LIGHTS FROM SH
            /..FSWIT(3,10,X,Y,0,Q) RETURNS 1024*X+Y WHEN SWITCH
            /3,10 IS PUSHED. IF Q NON ZERO,SWITCH CAN
            /BE HELD ON FOR FAST REPETITION
            /M IS A MASK IF NON-ZERO
            /
            /
            CODLOD=6361
            READSW=6362
            LITSET=6367
            ERASE=6362
            /
            *KB1+12
0152  6422  SWITCH
            *FNKB1+12
0656  1334  1334    /SWIT
            /
            *6422
6422  0000  SWITCH,0
6423  1052     TAD ARG3
6424  7700     SMA CLA
6425  5231     JMP OK
6426  1325     TAD P16
6427  6361     CODLOD        /SET GATE FOR ERASE
6430  6362    ERASE
6431  1053  OK,TAD ARG4
6432  7450     SNA
6433  7001     IAC           /ALLOW 0 SHIFT READOUT FOR SH=0
6434  3317     DCA SHIFT
6435  1054     TAD ARG5
6436  3050     DCA ARG1
6437  1055     TAD ARG6
6440  7440     SZA
6441  5254     JMP JOYCAL
6442  1052     TAD ARG3
6443  7650     SNA CLA
6444  5250     JMP LIGHTS
6445  4300     JMS SWTRED
6446  3051     DCA ARG2
6447  5622     JMP I SWITCH
            /
6450  1053  LIGHTS,TAD ARG4
6451  6367     LITSET
6452  7200     CLA
```

```
6453  5622      JMP I SWITCH
                /
6454  3051  JOYCAL,DCA ARG2 /INITIAL MARK LOCATION
6455  1057      TAD ARG8
6456  7650      SNA CLA
6457  4300      JMS SWTRED
6460  7640      SZA CLA
6461  5257      JMP .-2         /WAIT TILL SWITCH OFF UNLESS ARG8 SET
6462  4727  JOYTES,JMS I JOYSTX
6463  4300      JMS SWTRED
6464  7650      SNA CLA
6465  5262      JMP JOYTES      /SWITCH NOT CLOSED
6466  1051      TAD ARG2        /CONVERT TO 1024*X+Y
6467  7106      CLL RTL         /FROM 4096*X+Y
6470  7421      MQL
6471  1050      TAD ARG1
6472  7417      LSR
6473  0001      1
6474  3050      DCA ARG1
6475  7501      MQA
6476  3051      DCA ARG2
6477  5622      JMP I SWITCH
                /
6500  0000  SWTRED,0
6501  1052      TAD ARG3
6502  6361      CODLOD          /SELECT SWITCH GROUP
6503  7041      CIA
6504  3017      DCA 17
6505  1326      TAD P17
6506  7110  MVMASK,CLL RAR    /GENERATE MASK
6507  2017      ISZ 17
6510  5306      JMP MVMASK
6511  3324      DCA MASK        /3 BITS FOR 1,2 FOR 2,1 FOR 3
6512  1056      TAD ARG7
6513  7440      SZA
6514  3324      DCA MASK
6515  6362      READSW
6516  7417      LSR
6517  0000  SHIFT,0
6520  7413      SHL
6521  0001      1
6522  0324      AND MASK
6523  5700      JMP I SWTRED
                /
6524  0000  MASK,0
6525  0016  P16,16
6526  0017  P17,17
6527  6600  JOYSTX,JOYSTK
                PAUSE/
                /
                /JOY1
                /
6530  0000  ARMAKE,0          /DRAW A DIAMOND
6531  3372      DCA XTEMP
6532  1375      TAD P2
6533  3370      DCA XMOVE
6534  1375      TAD P2
6535  3371      DCA YMOVE
6536  4351      JMS DIAGON
6537  1373      TAD M2
```

Problem is that symbol nearly identical whether STOP is found or not

```
6540  3371      DCA YMOVE
6541  4351      JMS DIAGON
6542  1373      TAD M2
6543  3370      DCA XMOVE
6544  4351      JMS DIAGON
6545  1375      TAD P2
6546  3371      DCA YMOVE
6547  4351      JMS DIAGON
6550  5730      JMP I ARMAKE
                /
6551  0000    DIAGON,0
6552  1376      TAD M4
6553  3374      DCA COUNTA
6554  1372    APOINT,TAD XTEMP
6555  1370      TAD XMOVE
6556  6053      DXL
6557  3372      DCA XTEMP
6560  7501      MQA
6561  1371      TAD YMOVE
6562  6063      DYL
6563  7421      MQL
6564  6362      BRITEN
6565  2374      ISZ COUNTA
6566  5354      JMP APOINT
6567  5751      JMP I DIAGON
                /
6570  0000    XMOVE,0
6571  0000    YMOVE,0
6572  0000    XTEMP,0
6573  7776    M2,-2
6574  0000    COUNTA,0
6575  0002    P2,2
6576  7774    M4,-4
                PAUSE/
                /
                /JOY2
                /MOVES A MARKER FOR THE JOYSTICK
                /
                CODLOD=6361
                BRITEN=6362
                XJOY=6363
                YJOY=6364
                SKPJOY=6365
                /
                COUNTM=ARG9
                SIGN=ARG10
                *6600
6600  0000    JOYSTK,0
6601  1273      TAD P26       /SET BRITEN
6602  6361      CODLOD
6603  7200      CLA
6604  6363      XJOY
6605  1050      TAD ARG1
6606  4305      JMS MOVER     /READ JOYSTICK
6607  0000    XADDER,0
6610  3050      DCA ARG1      /X TO ARG1,Y TO ARG2
6611  1233      TAD XSET
6612  3252      DCA MLINE
6613  1051      TAD ARG2
6614  6063    YSET,DYL
```

```
6615  4277      JMS JSETUP
6616  1050      TAD ARG1
6617  4247      JMS LINER
6620  7450      SNA
6621  5223      JMP XDISP
6622  4772      JMS I ARMAKX /X IN AC,Y IN MQ
6623  6364  XDISP,YJOY
6624  1051      TAD ARG2
6625  4305      JMS MOVER
6626  0000  YADDER,0
6627  3051      DCA ARG2
6630  1214      TAD YSET
6631  3252      DCA MLINE
6632  1050      TAD ARG1
6633  6053  XSET,DXL
6634  4277      JMS JSETUP
6635  1051      TAD ARG2
6636  4247      JMS LINER
6637  7450      SNA
6640  5246      JMP ENDIT
6641  1275      TAD P6
6642  7421      MQL
6643  1050      TAD ARG1
6644  1271      TAD M10
6645  4772      JMS I ARMAKX
6646  5600  ENDIT,JMP I JOYSTK
            /
6647  0000  LINER,0
6650  3031      DCA TEMPS0
6651  1031      TAD TEMPS0
6652  0000  MLINE,0           /DYL OR DXL
6653  6014      RFC             /DELAY
6654  6362      BRITEN
6655  1276      TAD PP3
6656  2060      ISZ COUNTM
6657  5252      JMP MLINE
6660  7200      CLA
6661  1061      TAD SIGN
6662  7450      SNA
6663  5647      JMP I LINER
6664  7700      SMA CLA
6665  1270      TAD P110
6666  1031  AROCAL,TAD TEMPS0
6667  5647      JMP I LINER
            /
6670  0110  P110,110
6671  7770  M10,-10
6672  7744  M34,-34
6673  0026  P26,26
6674  7726  M52,-52
6675  0006  P6,6
6676  0003  PP3,3
            /
6677  0000  JSETUP,0
6700  7421      MQL
6701  1272      TAD M34
6702  3060      DCA COUNTM
6703  1274      TAD M52
6704  5677      JMP I JSETUP
            /
```

```
6705  0000  MOVER,0
6706  3277     DCA JSETUP    /TEMPORARY STORE
6707  7240     CLA CMA
6710  3061     DCA SIGN
6711  7330     CLA STL RAR
6712  7450  TIME1,SNA
6713  5320     JMP ZEROED
6714  7010     RAR
6715  6365     SKPJOY
6716  5312     JMP TIME1     /MEASURING TIME DELAY
6717  5330     JMP DONE
6720  3061  ZEROED,DCA SIGN
6721  7004  TIME2,RAL
6722  7510     SPA
6723  7050     CMA RAR
6724  6365     SKPJOY
6725  5321     JMP TIME2
6726  3061     DCA SIGN
6727  1061     TAD SIGN
6730  7450  DONE,SNA
6731  3061     DCA SIGN
6732  7100     CLL
6733  1705     TAD I MOVER
6734  3705     DCA I MOVER
6735  7430     SZL
6736  5345     JMP STEP
6737  1705     TAD I MOVER
6740  1367     TAD M400
6741  7700     SMA CLA
6742  5345     JMP STEP
6743  2305  LEAVE,ISZ MOVER
6744  5365     JMP EXIT
              /
6745  3705  STEP,DCA I MOVER        /CLEAR ADDER
6746  2305     ISZ MOVER
6747  1061     TAD SIGN
6750  7710     SPA CLA
6751  7144     CLL CMA RAL  /-2
6752  7001     IAC  /+ OR -1 TO ARG1 OR ARG2 IF ADDER OVERFLOWS
6753  1277     TAD JSETUP
6754  7510     SPA
6755  7200     CLA
6756  3277  SAVIT,DCA JSETUP        /MOVE MARK CENTER
6757  1277     TAD JSETUP
6760  0371     AND P6000
6761  7650     SNA CLA
6762  5365     JMP EXIT
6763  1370     TAD P1777
6764  5356     JMP SAVIT
6765  1277  EXIT,TAD JSETUP
6766  5705     JMP I MOVER
              /
6767  7400  M400,-400
6770  1777  P1777,1777
6771  6000  P6000,6000
6772  6530  ARMAKX,ARMAKE
              /
```

Tape 12 N
June 14/73
Same as "TAPE" but for overlay #4

(77)

```
.PALP
*OUT-S:TAPO
*
*IN-S:CON0,S:TAPO
*
*
*OPT-T

ADDRES 6350

                /CON0
                XLIST
                PAUSE/
                /
                /TAPO
                /COPIES  TO TAPE FROM DISC AND BACK
                /X MPUT(D,T,N,U) COPIES N BLOCKS DISC TO TAPE  STARTING
                /AT DISC BLOCK D AND TAPE BLOCK T,UNIT U.
                /X MTAK(D,T,N,U) TAPE TO DISC!
                /USES TAPE FROM BLOCK 500
                /DISC BLOCKS 213-225 ARE LOST
                /
                /
                *KB1+64
0224   6400     MPUT
0225   6412     MTAK
                /
                *FNKB1+64
0730   2574     2574     /MPUT
0731   2723     2723     /MTAK
                /
                *6350
6350   0000     ADDRES,0          /FOR SAVING FIELD 0
6351   3024       DCA DDWCNT      /WORD COUNT IN AC.
6352   1363       TAD P600
6353   3026       DCA DSFFLD
6354   1362       TAD P5655
6355   3025       DCA DISADD
6356   1764      ,TAD I P200X
6357   3023       DCA DDCORE
6360   3041       DCA DTEST       /ALLOW WRITING IN PROTECTED AREA
6361   5750       JMP I ADDRES
                /
6362   5655     P5655,5655        /SAVES 6300 WORDS FOR OVERLAY+3617 HERE.
6363   0600     P600,600
6364   6533     P200X,P200
                /
6365   0000     WAIT,0
6366   6002       IOF
6367   6201       CDF
6370   1776       TAD I TELSWX    /PROTECTING AGAINST 'TYPE' TURNING  ION.
6371   6211       CDF 10
6372   7650       SNA CLA
6373   5765       JMP I WAIT
6374   6001       ION
6375   5366       JMP WAIT+1
                /
6376   0016     TELSWX,TELSW
                /
                /
```

```
                PAGE
6400  0000      MPUT,0
6401  4226        JMS READY
6402  4311      WXFER,JMS SETLNG
6403  4420      DISRED,JMS I DISCX
6404  5203          JMP .-1       /DISC ERROR
6405  1037          TAD P20
6406  4421          JMS I DTAPX
6407  5203          JMP DISRED    /TAPE ERROR
6410  4274          JMS ADVANCE
6411  5202          JMP WXFER
                /
6412  0000      MTAK,0
6413  1212          TAD MTAK
6414  3200          DCA MPUT
6415  4226          JMS READY
6416  4311      RXFER,JMS SETLNG
6417  4421      DISWRT,JMS I DTAPX
6420  5217          JMP .-1
6421  1335          TAD P2        /NOW WRITE DISK
6422  4420          JMS I DISCX
6423  5217          JMP DISWRT    /ERROR
6424  4274          JMS ADVANCE
6425  5216          JMP RXFER
                /
6426  0000      READY,0
6427  4770        JMS I TWAITX    /FINISH TYPING.
6430  4537        JMS I BWRITX    /BE SURE LAST BLOCK IS ON DISK
6431  1132          TAD KILALL
6432  3342          DCA KILSAV
6433  1344          TAD KILTMX
6434  3132          DCA KILALL    /SET TEMPORARY EXIT FOR ERROR
6435  3126        DCA INTRUP      /LOCK INTERRUPT OFF
6436  1332        TAD M3617
6437  4745          JMS I ADRESX
6440  1335          TAD P2
6441  4420          JMS I DISCX   /SAVE FIELD 0
6442  5240          JMP .-2       /ERROR
6443  2041        ISZ DTEST       /RESTORE DISK PROTECT.
6444  1331          TAD P500
6445  1053          TAD ARG4
6446  3027          DCA DTBLCK
6447  1055          TAD ARG6
6450  7112          CLL RTR
6451  7012          RTR
6452  3030          DCA DTUNIT
6453  1052        TAD ARG3
6454  4512        JMS I DCSETX    /SETS DISC ADDRESS
6455  7352        CLL CLA CMA RTR
6456  3116        DCA BLOKIN      /DISK MAY GET CHANGED.
6457  1040        TAD DISEND
6460  3343        DCA DISTEM
6461  1040        TAD DISEND
6462  1340        TAD P104
6463  3040        DCA DISEND      /PROTECT EXTRA 2K FOR FIELD 0
6464  1026          TAD DSFELD
6465  0341          AND P700
6466  3026          DCA DSFELD    /FIELD 0
6467  1332          TAD M3617     /17 OCTAL BLOCKS
6470  3024          DCA DDWCNT
```

```
6471  1333     TAD P200
6472  3023      DCA DDCORE
6473  5626      JMP I READY
               /
6474  0000   ADVANCE,0
6475  7300      CLL CLA
6476  1025      TAD DISADD
6477  1334      TAD P3617
6500  3025      DCA DISADD
6501  7430      SZL
6502  1076      TAD P100
6503  1026      TAD DSFELD
6504  3026      DCA DSFELD
6505  1337      TAD P17
6506  1027      TAD DTBLOK
6507  3027      DCA DTBLOK
6510  5674      JMP I ADVANCE
               /
6511  0000   SETLNG,0
6512  1054      TAD ARG5
6513  7450      SNA
6514  5353      JMP EXIT       /ALL DONE
6515  1336      TAD M17
6516  7510      SPA
6517  5322      JMP LAST
6520  3054   EXSET, DCA ARG5
6521  5711      JMP I SETLNG
6522  1337   LAST, TAD P17
6523  7425      MQL!MUY
6524  0201      201
6525  7701      CLA!MQA
6526  7041      CIA
6527  3024      DCA DDVCNT
6530  5320     JMP EXSET
6531  0500   P500,500
6532  4161   M3617,-3617
6533  0200   P200,200
6534  3617   P3617,3617
6535  0002   P2,2
6536  7761   M17,-17
6537  0017   P17,17
6540  0104   P104,104          /PROTECTS DISC AFTER BLOCK 209
6541  0700   P700,700
6542  0000   KILSAV,0
6543  0000   DISTEM,0
               /
6544  6546   KILTMX,KILTEM
6545  6350   ADRESX,ADDRES
               /
6546  6601   KILTEM, DCMA
6547  1030     TAD DTUNIT
6550  6766     DTCA!DTXA       /KILL FLAGS
6551  4355     JMS RECOVR
6552  5532      JMP I KILALL
               /
6553  4355   EXIT, JMS RECOVR
6554  5600      JMP I MPUT
               /
6555  0000   RECOVR,0
6556  1332     TAD M3617
```

```
6557   4745       JMS I ADRESX
6560   1343       TAD DISTEM
6561   3040       DCA DISEND    /NORMAL DISC AREA AGAIN
6562   4420       JMS I DISCX   /RESTORE FIELD 0
6563   5362       JMP .-1
6564   2041      ISZ DTEST      /RESTORE DISC PROTECT.
6565   1342       TAD KILSAV
6566   3132       DCA KILALL
6567   5755       JMP I RECOVR
                 /
6570   6365    TWAITX,WAIT
                 /
```

Tape 12 M
Oct. 24/72

(81)

```
.PALP
*OUT-S:TOTL
*
*IN-S:CON0,S:XCON,S:TOTL
*
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /XCON
                FIELD 1
                XLIST
                PAUSE/
                /
                /TOTL
                /SET D=FTOTL(C,B+100R,N)
                /FOR TOTAL OF N CHANNELS,STARTING AT CHANNEL C,BUFFER B
                /RESULT DIRECT TO FLOATING AC.
                /
                /
                *KB1+51
0211    6042    TOTAL
                *FNKB1+51
0715    1454    1454    /TOTL
                /
                *6042
6042    0000    TOTAL,0
6043    1054      TAD ARG5
6044    7450      SNA
6045    1046      TAD P1000
6046    7041      CIA
6047    3054      DCA ARG5
6050    6201      CDF
6051    1314      TAD P43
6052    3435      DCA I FLACR
6053    3715      DCA I FLAC1
6054    3716      DCA I FLAC2
6055    3717      DCA I FLAC3
6056    6211      CDF 10
6057    1052      TAD ARG3
6060    3320      DCA WORD
6061    4562    NEXT,JMS I KB1+22         /FCHAN
6062    7100      CLL
6063    6201      CDF
6064    1051      TAD ARG2
6065    1717      TAD I FLAC3
6066    3717      DCA I FLAC3
6067    7004      RAL
6070    1050      TAD ARG1
6071    1716      TAD I FLAC2
6072    3716      DCA I FLAC2
6073    1050      TAD ARG1
6074    7710      SPA CLA
6075    7240      CLA CMA         /NEGATIVE INPUT
6076    7430      SZL
```

```
6077  7001    IAC             /CARRY FROM FLAC2
6100  1715    TAD I FLAC1
6101  3715    DCA I FLAC1
6102  6211    CDF 10
6103  2320    ISZ WORD
6104  1320    TAD WORD
6105  3052    DCA ARG3
6106  2054    ISZ ARG5
6107  5261    JMP NEXT
6110  2242    ISZ TOTAL       /HOLD FLAC UNCHANGED.
6111  5642    JMP I TOTAL
              /
6112  7777    M1,-1
6113  7763    M15,-15
6114  0043    P43,43
6115  0045    FLAC1,45        /FLOATING MANTISSA
6116  0046    FLAC2,46
6117  0047    FLAC3,47        /ASSUMES THAT 4 WORD FOCAL IS USED
6120  0000    WORD,0
```

File 2 Page 12
Nov. 23/73

(83)

```
.PALP
*OUT-S:VAR
*
*IN-S:CON0,S:VAR
*
*
*OPT-T

ARG1    0050

                /CON0
                XLIST
                PAUSE/
                /
                /VAR
                /S D=FVAR(0);RECORDS LAST VARIABLE POSITION
                /X VAR(D) ERASES VARIABLES PAST LOC. D
                *FNKB1+63
0727    2132    2132    /VAR
                *KB1+63
0223    6151    VARFIX
                *6151
6151    0000    VARFIX,0
6152    6201    CDF
6153    1775      TAD I LASVRX
6154    6211      CDF 10
6155    3051      DCA ARG2
6156    1052      TAD ARG3
6157    7450      SNA
6160    5751      JMP I VARFIX
6161    1376      TAD M3200
6162    7710      SPA CLA
6163    5532      JMP I KILALL  /BELOW  3200-ILLEGAL
6164    1052      TAD ARG3
6165    1377      TAD M4600
6166    7700      SMA CLA
6167    5532      JMP I KILALL  /ABOVE 4600-ILLEGAL
6170    1052      TAD ARG3
6171    6201      CDF
6172    3775      DCA I LASVRX
6173    6211      CDF 10
6174    5751      JMP I VARFIX
                /
6175    0031    LASVRX,LASTV    /LAST VARIABLE IN FOCAL
6176    4600    M3200,-3200
6177    3200    M4600,-4600
```

File 2 Tape 124
Jan 13/73

XCON

(84)

```
L
/
/
/XCON
FIELD 1
XLIST
/
*45
BUFRDX,4000
P1000,1000
M2000,-2000
/
*62
XBASE,0
YBASE,0
XLOC,0
YLOC,0
SCALE,0
LOTEMP,0
HITEMP,0
SIGN,0
XMAX,0
P40,40
M40,-40
NORMAL=75
/
COMLOC=106        /CALCOMP LOCATION
RBUFR0=107
RBUFR1=110        /FOR EDIR
BUFSTX=111
DCSETX=112
/
LISLET=6044       /CRT LETTER LIST
CRTGOL=6370
TELSW=16
OUTDEV=63
XOUTL=2676
/
ERASE=6362
LODBF1=6351
REDBUF=6353
PLSTEP=6317
SYNSKP=6452
PROSKP=6461
DATSKP=6451
CONSKP=6462
MCSTEP=6454
MSTOP=6456
SCOUNT=6455
READLO=6464
READHI=6465
FUNLOD=6453
TIMEHI=6467
TIMELO=6457
XLIST
PAUSE
```

File 3 Tape 12 Q
Jan. 18/74.

(85)

```
PALF
*OUT-S:ZCOM
*
*IN-S:CCNO,S:XCCN,S:ZCOM
*
*
*
*OPT-T

ARG1    0050

                /CCNO
                XLIST
                PAUSE/
                /
                /XCCN
                FIELD 1
                XLIST
                PAUSE/
                /
                /ZCOM
                /S L=PZCOM(Y)SETS CALCOMP ZERO LOCATION TO Y
                /D BECOMES PREVIOUS LOCATION
                /
                *KB1+60
0220    6571    ZCOM
                *ENAB1+60
0724    2005    2005    /ZCOM
                /
                *6571
6571    0000    ZCOM,0
6572    1106      TAD COMLOC
6573    3051      DCA ARG2
6574    3050      DCA ARG1
6575    1052      TAD ARG3
6576    3106      DCA COMLOC
6577    5771      JMP I ZCOM
```