

BASIC
(REV. A)

BINARY TAPE	20392-60001
SOURCE TAPES	20392 -80001
	20392-80002
	20392-80003
	20392-80004
	20392-80005
	20392-80006
	20392-80007
	20392-80008
	20392-80009
	20392-80010
	20392-80011
SOURCE LISTING	20392-90001

SYMBOL TABLE

ASMB,A,B,L,T

BASIC LANGUAGE -- JANUARY 1, 1970

0001	
PREAD	000101
WRITE	000102
PUNCH	000103
REED	000104
LWBM	000106
FWAM	000110
LHAM	000111
PBUFF	000112
PBPTR	000113
FWABP	000114
FCORE	000115
SYMTF	000116
SYMTA	000117
LSTAK	000120
ASBTB	000121
SBTBE	000122
IMOFF	000123
IMON	000124
TLINK	000125
PLSTR	000126
LISTR	000127
TLSTR	000130
.BUFA	000131
BADDR	000132
CCNT	000133
SBUFA	000134
SBPTR	000135
TFLAG	000136
TTYFL	000137
TSTPT	000140
LSTPT	000141
HSTPT	000142
PRADD	000143
NXTST	000144
.LNUM	000145
TYPE	000146
DSTRT	000147
NXTDT	000150
DCCNT	000151
KSYM	000152
SIGN	000153
EXP	000154
XH	000155
XL	000156
TEMPS	000157
MLBX1	000171
B1	000173
B2	000175
B3	000177
START	000201
RUNA	000202
FASE3	000203
PEXMA	000204
RDYDA	000205
DRQSA	000206

LISTA	000207
MATA	000210
EMATA	000211
TSRCH	000212
FNDPA	000213
CNSTA	000214
NUMCA	000215
INCHK	000216
ENOTA	000217
NUMOA	000220
PGINT	000221
OUTIA	000222
OUTSA	000223
OUTLA	000224
OUTCA	000225
GETCA	000226
DIGCA	000227
LETCA	000230
SSYMA	000231
FETCA	000232
FORMA	000233
.LOGA	000234
.EXPA	000235
.FADA	000236
.FSBA	000237
.FMPA	000240
.FDVA	000241
ARINA	000242
MPYA	000243
FLUNA	000244
PACKA	000245
FLT	000246
IFIXA	000247
PRNIA	000250
CHRSA	000251
ACCST	000252
DELST	000253
FDAT	000254
LCK2A	000255
XEC4A	000256
FSC1A	000257
FOR1A	000260
FOR0A	000261
FOR0B	000262
FOR1B	000263
FR12A	000264
EOF	000265
NOEOF	000266
E6M1A	000267
ESYN3	000270
FSCEF	000271
E6M1A	000272
EBUFA	000273
EBFA	000274
LBUFA	000275
LNBFA	000276

ERBS	000277
RECER	000300
FOPBS	000301
STBAS	000302
XECBR	000303
ARBAS	000304
PDFBS	000305
TBLAD	000306
STTYP	000307
MATIO	000310
MCBOP	000311
PDFNS	000312
MATFN	000313
ANEXT	000314
ADATA	000315
ATHEN	000316
ATO	000317
ASTEP	000320
ANOT	000321
ATAB	000322
MBXL	000323
.1	000324
.2	000325
.3	000326
.4	000327
.6	000330
.7	000331
.8	000332
.9	000333
.10	000334
.12	000335
.15	000336
.23	000337
.26	000340
.27	000341
.28	000342
.30	000343
.31	000344
.32	000345
.33	000346
.34	000347
.37	000350
.40	000351
.41	000352
.43	000353
.45	000354
.46	000355
.47	000356
.48	000357
.49	000360
.58	000361
.63	000362
B100	000363
E	000364
F	000365
.72	000366

.74	000367
.75	000370
N	000371
S	000372
B133	000373
B177	000374
B200	000375
MSK0	000376
B400	000377
B776	000400
MSK1	000401
B1000	000402
B2000	000403
B3000	000404
SCCNT	000405
B4000	000406
LF	000407
B1400	000410
UNMNC	000411
B2200	000412
B2300	000413
DEFOP	000414
REMOP	000415
RDOP	000416
TENTH	000417
OPMSK	000420
MSK4	000421
INF	000422
TYPFL	000423
TABCN	000424
OPDMK	000425
RMODE	000426
UNNRM	000427
HIMSK	000430
M1	000431
M2	000432
M3	000433
M4	000434
M5	000435
M6	000436
M7	000437
M8	000440
M9	000441
M10	000442
M11	000443
M15	000444
M16	000445
M21	000446
M25	000447
M32	000450
D53	000451
D72	000452
D100	000453
M72	000454
M73	000455
M76	000456

D133	000457
M256	000460
M310	000461
M1000	000462
MAXSN	000463
MSK3	000437
FN	000464
QMARK	000465
HALF	000466
HONE	000466
MNEG	000470
FLGBT	000470
MAXFX	000472
MINFX	000474
BLANK	000476
ERROR	000477
MVTOH	000554
MVTO1	000556
CONST	000567
CONS1	000602
CONS2	000605
CONS3	000611
SYE12	000614
NUMCK	000615
NUMC1	000626
NUMC2	000634
NUMC3	000652
NUMC4	000657
NUMC5	000664
NUMC6	000703
NUMC7	000706
NUMER	000716
NUMC8	000725
NUMC9	000727
NUM10	000751
NUM12	000755
NUM13	000772
NUM14	000776
NUM15	001005
.PACK	001020
PACK1	001040
PACK3	001073
UNDER	001074
PACK4	001077
OVRER	001100
OVFLW	001103
NORML	001113
NORM1	001125
NORM2	001127
NORM3	001130
MBY10	001147
DBY10	001200
MPY	001236
MPY1	001256
MPY2	001271
SYMCK	001274

SYMC1	001302
SYMC2	001312
FNDSB	001323
FNDS1	001326
CALER	001330
MDIM	001336
MER9	001352
SBFIX	001353
IFIX	001364
IFIX1	001404
IFIX2	001410
IFIX3	001414
ARINV	001423
ARIN1	001442
ARIN2	001452
.FLUN	001456
SLWST	001467
E1	001473
BHSTP	001476
STTOP	001505
OPCHK	001515
E8	001526
OPCH1	001527
RSCHK	001536
DIGCK	001570
LETCK	001603
GETCR	001614
BCKSP	001633
ENOUT	001643
EDELM	001656
EDEL1	001660
OUTLN	001677
OUTCR	001715
TEMP	000160
TEMP1	000161
TEMP2	000162
TEMP3	000163
TEMP4	000164
COUNT	000165
STEMP	000163
MANT1	001274
MANT2	001336
EXPON	001603
DPFLG	001633
ARYAD	001715
EOL	000567
FINBP	001734
RDYA	002000
READY	002001
LFEED	002004
QMRKA	002005
STOPA	002006
CMNDA	002007
ENTRY	002010
FLUSH	002020
RDYPT	002027

PEXMK	002041
DATAI	002046
GTRCD	002056
RPRCS	002064
RTLE	002066
RBOUT	002115
DRQST	002121
CKRCD	002126
INVSC	002137
CMNDS	002146
RUN	002146
SCRTH	002150
TLIST	002151
PLIST	002153
PTAPE	002160
PRERR	002170
EOTR	002174
STOP	002200
TAPE	002214
BYEC	002216
SYNTAX	002220
SYNE1	002236
SYNT1	002247
QUOTE	002257
COMMA	002261
SMCLN	002263
RPARN	002265
RBRAC	002267
SCMMA	002271
ASSOP	002273
PLUS	002275
MINUS	002277
TIMES	002301
DIV	002303
EXPS	002305
GTR	002307
LSS	002311
UNEQL	002313
EQUAL	002315
UNMIN	002317
LBRAC	002321
LPARN	002323
UPLUS	002325
OROP	002327
MSFLG	002330
ANDOP	002331
DFLAG	002332
NOTOP	002333
PFLAG	002334
GTREQ	002335
UFLAG	002336
LSSEQ	002337
LETS	002340
SYNE2	002346
EOST	002346
DIMS	002351

COMS	002355
SYNE3	002361
COMS1	002363
DEFS	002374
SYNE4	002405
SYNE5	002420
SYNE6	002424
REMS	002434
IFS	002437
SYNE7	002445
GOTOS	002445
FORS	002450
SYNE8	002452
SYNE9	002465
SYE10	002500
NXT6	002502
END6	002506
WAITS	002512
CALLS	002514
CALL2	002532
SYE11	002540
CALL3	002543
DATAS	002547
READS	002557
SYE13	002561
PRIN1	002573
PRINS	002577
PRIN2	002604
SYE14	002613
PRIN3	002623
SYE15	002625
PRIN4	002647
PRIN5	002651
MATS	002654
SYE16	002656
SYE17	002671
MATS0	002673
SYE18	002702
MATS1	002710
MATS2	002722
SYE19	002755
SYE20	002775
MATS3	002776
SYE21	003007
MATS4	003010
SYE22	003020
MATS5	003024
SYE23	003041
MATS6	003045
SYE24	003057
MATS7	003061
SYNTB	003067
FSC	003114
FSC1	003117
FSC2	003121
FSC3	003146

FSC4	003162
FSC5	003170
FSCE1	003201
FSC7	003210
FSC6	003227
FSC8	003253
FSCE2	003255
FSC9	003261
FSC10	003271
FSC11	003275
FSC12	003301
FSC13	003304
FSCE3	003305
FSC14	003317
MCBCK	003322
FPOP	003330
FRCUR	003353
SSOV	003371
FSCE4	003401
SBSC1	003403
SBSC2	003436
SBSC3	003450
SBSC4	003473
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ARRE1	003534
ARRID	003544
ARRE2	003547
VAROP	003556
VAR01	003600
VAR02	003604
VAR03	003616
VAR04	003620
VAR05	003624
LTR	003635
STROP	003650
LPCK	003661
RPCK	003671
MATSB	003704
GETPF	003734
NUMOP	003744
SYCMD	003755
STCMD	003776
LET	004006
DIM	004011
COM	004014
DEF	004017
REM	004022
GOTO	004025
IF	004030
FUR	004032
NEXT	004035
GUSUB	004040
RTRN	004044
END	004050
STP	004053
WAIT	004056

CALL	004061
DATA	004064
READ	004067
PRINT	004072
INPUT	004076
RSTOR	004102
MAT	004107
THEN	004112
TO	004115
STEP	004117
NOT	004122
AND	004125
OR	004130
GTE	004132
LTE	004134
AUNEQ	004136
TAB	004140
SIN	004143
COS	004146
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ATN	004154
EXPN	004157
LOG	004162
ABS	004165
SQR	004170
INT	004173
RND	004176
SGN	004201
ZER	004204
CON	004207
IDN	004212
INV	004215
TRN	004220
TBSRH	004223
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TSRC2	004262
TSR10	004265
TSRC3	004271
TSRC4	004276
TSRC5	004304
TSRC6	004310
TSRC7	004313
TSRC8	004321
TSRC9	004326
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INTCK	004351
INTC1	004354
INTC2	004373
CHRST	004410
CHRS1	004414
CHRS2	004432
CHRS3	004433
DLSTM	004437
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ACCS2	004474
ACCS3	004477
ACCS4	004507
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FNDP1	004516
FNDP2	004533
FNDP3	004534
FNDP4	004535
CLPRG	004537
CLPR1	004544
CLPR2	004553
OVCHK	004556
LIST	004572
LIST0	004607
LIST1	004614
LIST3	004635
LIST2	004640
LIST4	004644
LIST5	004670
LIST6	004703
LIST7	004710
LIST8	004725
LIST9	004732
LIS10	004751
LIS11	004765
LIS12	004772
LIS13	005003
LIS14	005011
OUTIN	005015
OUTI1	005024
OUTI2	005043
OUTI3	005046
OUTST	005055
OUTS1	005056
MCOU1	005077
MCOU2	005100
MCOU3	005112
MCOU3	005120
LDVSR	005132
SFLAG	003530
TABLE	004333
LNGTH	000167
SMEND	004351
SLENG	004556
TBLPT	004513
TSPTX	004537
INTGR	004556
LFLAG	004333
DIVSR	004351
LDZRO	004556
MIND	004513
MFASE	005137
MLOP1	005151
MLO10	005161
MLO12	005176

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MLOP2	005211
MLOP3	005244
MLOP4	005261
MER3	005264
MLOP5	005272
MLOP6	005301
MER4	005312
MLOP7	005320
MLOP8	005335
MLOP8	005370
MLOP9	005373
MER5	005377
M1LOP	005407
MER6	005413
M2LOP	005414
MER10	005431
M3LOP	005445
MER7	005464
M4LOP	005466
STDIM	005500
ESYMT	005501
MER8	005512
MSYMT	005522
MSYM	005541
MBUF	005543
MBOX1	000157
MBIN1	001467
MBIN2	001536
MPTR	000135
MNPTR	001515
COML	000170
MWDNO	000171
DI0CT	005522
FORMX	005544
FORM1	005547
FORM2	005567
FORM0	005612
FOR11	005617
FOR10	005626
FORM4	005636
FORM5	005645
FORM6	005651
FOR12	005714
FORM7	005726
FORM9	005751
XECTB	005761
XEC	006006
XEC2	006025
XEC4	006044
XEC5	006054
XEC6	006055
FETCH	006064
SETDP	006074
STSRH	006105
STSR1	006110

STSR2	006124
FDATA	006126
FDAT1	006127
E4	006135
FDAT2	006137
FLW8T	006147
FVSRH	006163
FVSR1	006173
FVSR2	006201
ELET	006203
EGOTO	006205
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EFOR	006216
EFOR1	006230
EFOR2	006263
EFOR3	006274
ENEXT	006312
ENEX1	006333
ENEX2	006340
ENEX3	006347
EGOSB	006353
E2	006363
ERTRN	006364
E3	006367
EWAIT	006373
EWA11	006404
ECALL	006412
ECAL1	006423
ECAL2	006431
EREAD	006441
PKNIN	006456
EPRIN	006474
EPRI0	006477
EPRI1	006502
EPRI2	006510
EPRI3	006527
EPRI4	006536
EPRI5	006542
EPRI6	006556
EPRI7	006565
EPRI8	006603
ETAB	006605
ETAB1	006627
IENTA	006631
EINP1	006632
EINP2	006634
EINPT	006643
EINP3	006652
ERSTR	006656
AROTB	006663
BINOP	006707
BIN01	006717
BIN02	006720
ESMA	006722
ESCM1	006747
E6	006760

ESBS	006771
ESTR	007002
ESTR1	007007
ESTR2	007022
EFAD	007026
EFSS	007031
EFMP	007034
FDV	007037
EPWR	007042
RPWR	007054
BASER	007057
EPWR1	007065
IPWR	007073
IPWR1	007103
IPWR2	007107
IPWR5	007117
IPWR3	007124
IPWR4	007135
PCHK	007144
POWER	007153
ZRTNG	007156
PCHK1	007161
EGTRT	007164
ELST	007171
EEQL	007176
EEQL1	007200
EGORE	007203
ELORE	007210
ENEQL	007215
ENEQ1	007217
FALSE	007221
TRUE	007224
EUMIN	007227
ELBRC	007232
EOR	007240
ORS	007242
OKS1	007244
EAND	007246
ANDS	007250
ENOT	007253
ADMUP	007257
ADMU1	007261
ADMU2	007302
ADMU3	007313
ADMU4	007334
ADMU5	007337
.FAD	007343
.FSB	007347
.FSB1	007362
UNPAK	007366
.FMP	007416
.FDV	007463
.FDV1	007543
.FDV2	007546
DBYZR	007547
IDIV	007552

IDIV1	007577
IDIV2	007601
SSYMT	007620
SYMT1	007640
SYMT2	007647
SYMT4	007667
SYMT3	007674
ERR	007701
RCERR	010001
EBUFF	010007
EBFF	010013
LBUFF	010015
LNBFF	010022
PDFT	010024
NUM0T	010040
NS1	010052
NS2	010055
NUM01	010101
NUM02	010110
NUM05	010127
NUM03	010135
EOUT2	010153
EOUT3	010164
EOUT4	010175
EOUT6	010213
EOUT5	010217
EOUT7	010223
EOUT8	010227
ERND1	010242
ERND2	010262
ERND3	010276
EOUT1	010303
EOUT9	010333
EOU10	010340
GETDG	010344
RETCR	010370
A1	006074
A2	006105
C1	006147
C2	006163
ETAN	010406
TRGER	010420
BOTH1	010441
ELSE1	010467
ELSE2	010472
FOPI	010475
K1	010477
XTEMP	010501
YTEMP	010503
UTEMP	010505
K2	010507
COEFF	010511
EATN	010532
BTH1	010546
ELS1	010576
ELS2	010601

EL83	010604
PIBY2	010611
MP2	010613
COEF	010615
EABS	010642
ECOS	010645
ESIN	010647
PAST	010702
TOPI	010717
MM4	010721
COEF1	010723
ERND	010736
ESQR	010765
SQRER	010771
BTH2	011005
SBOX	011032
ODD	011034
SA1	011045
SA2	011047
SB1	011051
SB2	011053
EINT	011055
EINT1	011065
ELOG	011070
.LOG	011072
LOGGER	011077
.LOG1	011150
LNZR	011151
R22	011154
LE2	011156
AAA	011160
MB	011162
CCC	011164
ESGN	011166
EEXP	011177
.EXP	011201
INTE	011274
ZERE	011276
.EXP1	011301
EXPER	011305
M124	011310
.244	011311
AAAA	011312
BBBB	011314
CCCC	011316
DDDD	011320
L2E	011322
.CHEB	011324
LOPC	011343
COUT	011371
X2TMP	011401
ATMP	011403
BTMP	011405
CTMP	011407
DTMP	011411
.IENT	011413

FLOAT	011432
.PWR2	011440
.RET	011454
TT1	007463
TT2	007552
TT3	000163
TT4	000164
FFLAG	011032
EMAT	011456
EMAT1	011471
EMAT2	011535
EMAT3	011540
EMAT4	011555
EMAT5	011561
EMAT6	011600
EMAT7	011610
EMAT8	011622
EMAT8	011626
EMAT9	011662
LMAP	011666
LBASE	011667
EMA10	011701
EMA11	011711
EMA12	011725
REDIM	011732
REDI1	011746
E7	011766
MCK3	011767
GENER	012000
GEN2	012004
LOOP	012013
MOD1	012017
MOD2	012025
COMPR	012032
LERR	012035
LCHK2	012045
LCHK1	012051
LCHK4	012061
LCHK6	012067
LCHK5	012100
ADD	012103
ADD1	012105
SUB	012116
REPLC	012123
REPL1	012130
SMULT	012137
LCON	012145
LCON1	012150
LCON2	012161
SZER	012170
LIDN	012176
LIDN1	012216
.DLD	012230
.DST	012240
GETAD	012250
GET	012253

ADRES	012264
TINY	012265
TRAN	012266
TRAN1	012302
LNEXT	012304
MULT	012331
MULT4	012361
MULT3	012366
MULT2	012374
LINV	012441
LIN11	012502
LIN10	012522
LINV1	012535
LINV2	012551
LINV7	012571
LINV8	012602
LINV3	012626
LDUM1	012704
LINV6	012716
LIN12	012733
LIN13	012740
LIN14	012752
LINV4	012760
LINV5	013006
LIN15	013033
LIN18	013040
LIN17	013062
LWHR	013067
LWHR2	013101
T1	013113
T2	013114
T3	013115
T4	013116
T5	013117
T6	013120
T7	013121
T8	013122
T9	013123
T10	013124
T11	013125
T12	013126
T13	013127
T16	013130
T18	013132
T19	013133
LPIV	013134
LPLUS	013135
LMIN	013137
LTIME	013140
INCB2	013141
FINIS	013142
** NO ERRORS*	

BASE PAGE LINKS AND CONSTANTS

BASE PAGE SUBROUTINES

PAGE 0019 #01 BASE PAGE LINKS AND CONSTANTS

0001		ASMB,A,B,L,T	BASIC LANGUAGE -- JANUARY 1, 1970
0003	00077	ORG 77B	
0004		SUP PRESS MULTIPLE OPERAND PRINTING	
0005	00077 102077	HLT 77B	CHANGED TO JSB 107B,I BY 'BOSS'
0006*			
0007**		ENTRY POINT FOR CONFIGURED BASIC	
0008*			
0009	00100 124201	JMP START,I	
0010*			
0011	00101 000000	PREAD BSS 1	PHOTO READER LINK
0012	00102 000000	WRITE BSS 1	TTY OUTPUT LINK
0013	00103 000000	PUNCH BSS 1	PUNCH LINK
0014	00104 000000	REED BSS 1	KEYBOARD LINK
0015	00105 002200	DEF STOP	STOP LINK
0016	00106 000000	LWEM BSS 1	LAST WORD OF AVAILABLE MEMORY
0017	00107 000000	BSS 1	'BOSS' DRIVER LINKAGE
0018	00110 013142	FWAM DEF FINIS	FIRST WORD OF AVAILABLE MEMORY
0019	00111 000000	LWAM BSS 1	LAST WORD OF AVAILABLE MEMORY
0020	00112 000000	PBUFF BSS 1	FIRST WORD OF USERS PROGRAM
0021	00113 000000	PBPTR BSS 1	LAST WORD+1 OF USER'S PROGRAM
0022	00114 001734	FWABP DEF FINBP	FIRST WORD AVAILABLE BASE PAGE
0023	00115 000000	FCORE BSS 1	START OF FREE CORE
0024	00116 000000	SYMTF BSS 1	START OF SYMBOL TABLE
0025	00117 000000	SYMTA BSS 1	SYMBOL TABLE END
0026	00120 000000	LSTAK BSS 1	LOW-CORE STACK ADDRESS
0027	00121 013142	ASBTB DEF FINIS	START OF CALL LINKAGE TABLE
0028	00122 013142	SBTBE DEF FINIS	LAST WORD +1 OF CALL TABLE
0029	00123 000000	IMOFF BSS 1	LINK TO INTERRUPT OFF
0030	00124 000000	IMCN BSS 1	LINK TO INTERRUPT ON
0031	00125 000000	TLINK BSS 1	TTY INTERRUPT LINK
0032	00126 100103	PLSTR DEF PUNCH,I	
0033	00127 100102	LISTR DEF WRITE,I	LIST DEVICE REFERENCE JSB,I
0034	00130 100102	TLSTR DEF WRITE,I	
0035	00131 000000	.BLFA BSS 1	I/O BUFFER ADDRESS
0036	00132 000000	BACDR BSS 1	I/O BUFFER
0037	00133 000000	CCNT BSS 1	POINTERS
0038	00134 000000	SBLFA BSS 1	SYNTAX BUFFER ADDRESS
0039	00135 000000	SBPTR BSS 1	SYNTAX BUFFER POINTER
0040	00136 000000	TFLAG BSS 1	
0041	00137 000000	TTYFL BSS 1	
0042	00140 000000	TSIPT BSS 1	TEMPORARY STACK POINTER
0043	00141 000000	LSTPT BSS 1	LOW-CORE STACK POINTER
0044	00142 000000	HSTPT BSS 1	HIGH-CORE STACK POINTER
0045	00143 000000	PRADD BSS 1	PROGRAM EXECUTION
0046	00144 000000	NXTST BSS 1	SEQUENCING INFORMATION
0047	00145 000000	.LNUM BSS 1	CURRENT LINE NUMBER
0048	00146 000000	TYPE BSS 1	CURRENT STATEMENT TYPE
0049	00147 000000	DSTRT BSS 1	DATA
0050	00150 000000	NXTDT BSS 1	STATEMENT
0051	00151 000000	DCCNT BSS 1	POINTERS
0052	00152 000000	RSYM BSS 1	
0053	00153 000000	SIGN BSS 1	
0054	00154 000000	EXP BSS 1	
0055	00155 000000	XH BSS 1	RANDOM
0056	00156 000000	XL BSS 1	VARIABLE
0057	00157 000000	TEMPS BSS 12	TEMPORARIES

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0058	00171		MLBX1	EQU	TEMPS+10
0059	00173	000000	B1	BSS	2
0060	00175	000000	B2	BSS	2
0061	00177	000000	B3	BSS	2

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0063	00201	002010	START	DEF	ENTRY	INITIATE BASIC SYSTEM
0064	00202	005137	RUNA	DEF	MFASE	PHASE 2: BUILD SYMBOL TABLE
0065	00203	006006	FASE3	DEF	XEC	PHASE 3: PROGRAM EXECUTION
0066	00204	002041	PEXMA	DEF	PEXMK	RETURN TO MONITOR FROM SYNTAX
0067	00205	002027	RDYDA	DEF	RDYPT	RETURN TO MONITOR FROM PHASE 3
0068	00206	002121	DRGSA	DEF	DRQST	REQUEST INPUT DATA
0069	00207	004572	LISTA	DEF	LIST	LIST OR PUNCH PROGRAM
0070	00210	004110	*MATA	DEF	MAT+1	MAT ENTRY IN PRINT-NAME TABLE
0071	00211	011456	EMATA	DEF	EMAT	FIRST WORD OF MATRIX EXECUTION
0072	00212	004223	TSRCH	DEF	TBSRH	SEARCH PRINT-NAME TABLE
0073	00213	004513	FNDPA	DEF	FNDPS	LOCATE STATEMENT SPECIFIED BY #
0074	00214	000567	CNSTA	DEF	CONST	SIGNED ASCII TO BINARY
0075	00215	000615	NUMCA	DEF	NUMCK	UNSIGNED ASCII TO BINARY
0076	00216	004351	INCHK	DEF	INTCK	ASCII TO INTEGER CONVERSION
0077	00217	001643	ENCTA	DEF	ENOUT	SIGNED BINARY NUMBER TO ASCII
0078	00220	010040	NUMOA	DEF	NUMOT	UNSIGNED BINARY NUMBER TO ASCII
0079	00221	004333	PGINT	DEF	PRGIN	FETCH PROGRAM INTEGER
0080	00222	005015	OUTIA	DEF	OUTIN	INTEGER TO ASCII CONVERSION
0081	00223	005055	OUTSA	DEF	OUTST	STRING TO BUFFER
0082	00224	001677	OUTLA	DEF	OUTLN	DUMP PRINT BUFFER WITH CR/LF
0083	00225	001715	OUTCA	DEF	OUTCR	PUT CHARACTER INTO PRINT BUFFER
0084	00226	001614	GETCA	DEF	GETCR	FETCH NEXT NON-BLANK CHARACTER
0085	00227	001570	DIGCA	DEF	DIGCK	SEE IF CHARACTER IS A DIGIT
0086	00230	001603	LETCA	DEF	LETCK	SEE IF CHARACTER IS A LETTER
0087	00231	007620	SSYMA	DEF	SSYMT	SEARCH SYMBOL TABLE FOR SYMBOL
0088	00232	006064	FETCA	DEF	FETCH	EVALUATE FORMULA & RETURN VALUE
0089	00233	005544	FORMA	DEF	FORMX	EVALUATE FORMULA
0090	00234	011072	.LCGA	DEF	.LOG	TAKE NATURAL LOG OF ARGUMENT
0091	00235	011201	.EXPA	DEF	.EXP	COMPUTE EXPONENTIAL OF ARGUMENT
0092	00236	007343	.FADA	DEF	.FAD	FLOATING ADD
0093	00237	007347	.FSBA	DEF	.FSB	FLOATING SUBTRACT
0094	00240	007416	.FMPA	DEF	.FMP	FLOATING MULTIPLY
0095	00241	007463	.FDVA	DEF	.FDV	FLOATING DIVIDE
0096	00242	001423	ARINA	DEF	ARINV	NEGATE FLOATING NUMBER
0097	00243	001236	MPYA	DEF	MPY	INTEGER MULTIPLY
0098	00244	001456	FLLNA	DEF	.FLUN	UNPACK FLOATING NUMBER
0099	00245	001020	PACKA	DEF	.PACK	PACK FLOATING NUMBER
0100	00246	011432	FLT	DEF	FLOAT	16-BIT INTEGER TO FLOATING
0101	00247	001364	IFIXA	DEF	IFIX	FLOATING TO INTEGER (TRUNCATION)
0102	00250	006456	PRNIA	DEF	PRNIN	INITIALIZE PRINT BUFFER
0103	00251	004410	CHRSA	DEF	CHRST	
0104	00252	004447	ACCST	DEF	ACTST	
0105	00253	004437	DELST	DEF	DLSTM	
0106	00254	006126	FDAT	DEF	FDATA	
0107	00255	012045	LCK2A	DEF	LCHK2	
0108	00256	006044	XEC4A	DEF	XEC4	
0109	00257	003317	FSC1A	DEF	FSC14	
0110	00260	005547	FOR1A	DEF	FORM1	
0111	00261	005612	FOR0A	DEF	FORM0	
0112	00262	005617	FOR0B	DEF	FOR11	
0113	00263	005626	FOR1B	DEF	FOR10	
0114	00264	005714	FR12A	DEF	FOR12	
0115	00265	014477	EOF	JSB	ERROR	
0116	00266	014477	NOEOF	JSB	ERROR	
0117	00267	001525	E8M1A	DEF	E8-1	
0118	00270	002360	ESYN3	DEF	SYNE3-1	

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0119	00271	003401	FSCEF	DEF	FSCE4
0120	00272	006757	E6+1A	DEF	E6-1
0121	00273	010007	EBLFA	DEF	EBUFF
0122	00274	010012	EBFA	DEF	EBFF-1
0123	00275	010015	LBUFA	DEF	LBUFF
0124	00276	010021	LNBFA	DEF	LNBFF-1
0125	00277	007700	ERBS	DEF	ERR-1
0126	00300	000100	RECER	DEF	RCERR-ERR
0127	00301	002255	FOPBS	DEF	QUOTE-2
0128	00302	103035	STBAS	DEF	SYNTB-26,1
0129	00303	105727	XECBR	DEF	XECTB-26,1
0130	00304	106655	ARBAS	DEF	AROTB-6,1
0131	00305	010023	PDFBS	DEF	PDFT-1
0132	00306	003755	TBLAD	DEF	SYCMD
0133	00307	004006	STTYP	DEF	LET
0134	00310	004067	MATIO	DEF	READ
0135	00311	004125	MCBOP	DEF	AND
0136	00312	004143	PDFNS	DEF	SIN
0137	00313	004204	*MATFN	DEF	ZER
0138	00314	004035	ANEXT	DEF	NEXT
0139	00315	004064	ADATA	DEF	DATA
0140	00316	004112	ATHEN	DEF	THEN
0141	00317	004115	ATC	DEF	TO
0142	00320	004117	ASTEP	DEF	STEP
0143	00321	004122	ANCT	DEF	NOT
0144	00322	004140	ATAB	DEF	TAB
0145	00323	000171	MBXL	DEF	MLBX1

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0147	00324	000001	.1	DEC 1
0148	00325	000002	.2	DEC 2
0149	00326	000003	.3	DEC 3
0150	00327	000004	.4	DEC 4
0151	00330	000006	.6	DEC 6
0152	00331	000007	.7	DEC 7
0153	00332	000010	.8	DEC 8
0154	00333	000011	.9	DEC 9
0155	00334	000012	.10	DEC 10
0156	00335	000014	.12	DEC 12
0157	00336	000017	.15	DEC 15
0158	00337	000027	.23	DEC 23
0159	00340	000032	.26	DEC 26
0160	00341	000033	.27	DEC 27
0161	00342	000034	.28	DEC 28
0162	00343	000036	.30	DEC 30
0163	00344	000037	.31	DEC 31
0164	00345	000040	.32	DEC 32
0165	00346	000041	.33	DEC 33
0166	00347	000042	.34	DEC 34
0167	00350	000045	.37	DEC 37
0168	00351	000050	.40	DEC 40
0169	00352	000051	.41	DEC 41
0170	00353	000053	.43	DEC 43
0171	00354	000055	.45	DEC 45
0172	00355	000056	.46	DEC 46
0173	00356	000057	.47	DEC 47
0174	00357	000060	.48	DEC 48
0175	00360	000061	.49	DEC 49
0176	00361	000072	.50	DEC 58
0177	00362	000077	.63	DEC 63
0178	00363	000100	B100	OCT 100
0179	00364	000105	E	OCT 105
0180	00365	000106	F	OCT 106
0181	00366	000110	.72	DEC 72
0182	00367	000112	.74	DEC 74
0183	00370	000113	.75	DEC 75
0184	00371	000116	N	OCT 116
0185	00372	000123	S	OCT 123
0186	00373	000133	B133	OCT 133
0187	00374	000177	B177	OCT 177
0188	00375	000200	B200	OCT 200
0189	00376	000377	MSK0	OCT 377
0190	00377	000400	B400	OCT 400
0191	00400	000776	B776	OCT 776
0192	00401	000777	MSK1	OCT 777
0193	00402	001000	B1000	OCT 1000
0194	00403	002000	B2000	OCT 2000
0195	00404	003000	B3000	OCT 3000
0196	00405	003002	SCCNT	OCT 3002
0197	00406	004000	B4000	OCT 4000
0198	00407	005000	LF	OCT 5000
0199	00410	014000	B1400	OCT 14000
0200	00411	021000	UNMNC	OCT 21000
0201	00412	022000	B2200	OCT 22000
0202	00413	023000	B2300	OCT 23000

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0203	00414	035000	DEFOP	OCT	35000	
0204	00415	036000	REMOP	OCT	36000	
0205	00416	052000	RDCP	OCT	52000	
0206	00417	063146	TENTH	OCT	63146	
0207	00420	077000	OPMSK	OCT	77000	
0208	00421	077600	MSK4	OCT	77600	
0209	00422	077777	INF	OCT	77777	
0210	00423	100017	TYPFL	OCT	100017	
0211	00424	100037	TABCN	OCT	100037	
0212	00425	100777	OPDMK	OCT	100777	
0213	00426	130000	RMODE	OCT	130000	
0214	00427	140000	UNARM	OCT	140000	
0215	00430	174000	HIMSK	OCT	174000	
0216	00431	177777	M1	DEC	-1	
0217	00432	177776	M2	DEC	-2	
0218	00433	177775	M3	DEC	-3	
0219	00434	177774	M4	DEC	-4	
0220	00435	177773	M5	DEC	-5	
0221	00436	177772	M6	DEC	-6	
0222	00437	177771	M7	DEC	-7	
0223	00440	177770	M8	DEC	-8	
0224	00441	177767	M9	DEC	-9	
0225	00442	177766	M10	DEC	-10	
0226	00443	177765	M11	DEC	-11	
0227	00444	177761	M15	DEC	-15	
0228	00445	177760	M16	DEC	-16	
0229	00446	177753	M21	DEC	-21	
0230	00447	177747	M25	DEC	-25	
0231	00450	177740	M32	DEC	-32	
0232	00451	177725	D53	OCT	-53	
0233	00452	177706	D72	OCT	-72	
0234	00453	177700	D100	OCT	-100	
0235	00454	177670	M72	DEC	-72	
0236	00455	177667	M73	DEC	-73	
0237	00456	177664	M76	DEC	-76	
0238	00457	177645	D133	OCT	-133	
0239	00460	177400	M256	DEC	-256	
0240	00461	177312	M310	DEC	-310	
0241	00462	176030	M1000	DEC	-1000	
0242	00463	154360	MAXSN	DEC	-10000	
0243	00437		MSK3	EQU	M7	
0244	00464	043116	FN	ASC	1, FN	
0245	00465	037440	QMARK	ASC	1, ?	
0246	00466	040000	HALF	OCT	40000	
0247	00467	000000		OCT	0	
0248	00466		HONE	EQU	HALF	
0249	00470	100000	MNEG	OCT	100000	MAXIMUM NEGATIVE FLOATING
0250	00471	000376		OCT	376	POINT NUMBER
0251	00470		FLGBT	EQU	MNEG	
0252	00472	102756	MAXFX	DEC	-999999.5	
0253	00474	114631	MINFX	DEC	-0.099999959	
0254	00476	000040	BLANK	OCT	40	

0256**

0257*** EMIT ERROR MESSAGE **

0258**

0259	00477	000000	ERROR NOP	
0260	00500	060130	LDA TLSTR	SHIFT TO
0261	00501	070127	STA LISTR	COMMAND MODE
0262	00502	060133	LDA CCNT	SAVE
0263	00503	071515	STA OPCHK	OUTPUT
0264	00504	060132	LDA BADDR	BUFFER
0265	00505	071536	STA RSCHK	POINTERS
0266	00506	060274	LDA EBFA	SET BUFFER
0267	00507	070132	STA BADDR	POINTER
0268	00510	060332	LDA .8	SET CHARACTER
0269	00511	070133	STA CCNT	COUNT
0270	00512	064477	LDB ERROR	ERROR SOURCE IN (B)
0271	00513	060277	LDA ERBS	ERROR ADDRESS IN (A)
0272	00514	002004	INA	MOVE TO NEXT ERROR
0273	00515	154000	CPB 0,I	SAME AS ACTUAL ERROR?
0274	00516	003005	CMA,INA,RSS	YES
0275	00517	024514	JMP *-3	NO
0276	00520	040277	ADA ERBS	COMPUTE ERROR
0277	00521	071643	STA ENOUT	SAVE NEGATIVE OF ERROR
0278	00522	003004	CMA,INA	NUMBER
0279	00523	114222	JSB OUTIA,I	NUMBER TO BUFFER
0280	00524	064273	LDB EBUFA	LOAD BUFFER ADDRESS
0281	00525	060133	LDA CCNT	LOAD NEGATIVE OF
0282	00526	003004	CMA,INA	CHARACTER COUNT
0283	00527	114102	JSB WRITE,I	OUTPUT ERROR MESSAGE
0284	00530	060276	LDA LNBFA	OUTPUT
0285	00531	070132	STA BADDR	
0286	00532	060334	LDA .10	
0287	00533	070133	STA CCNT	LINE
0288	00534	060145	LDA .LNUM	
0289	00535	114222	JSB OUTIA,I	
0290	00536	064275	LDB LBUFA	NUMBER
0291	00537	060133	LDA CCNT	
0292	00540	114102	JSB WRITE,I	
0293	00541	061643	LDA ENOUT	RETRIEVE NEGATIVE OF ERROR
0294	00542	040300	ADA RECER	RECOVERABLE
0295	00543	002021	SSA,RSS	ERROR?
0296	00544	124204	JMP PEXMA,I	NO, RETURN TO SYNTAX MODE
0297	00545	060426	LDA RMODE	RETURN TO
0298	00546	070127	STA LISTR	RUN MODE
0299	00547	061515	LDA OPCHK	RESTORE
0300	00550	070133	STA CCNT	OUTPUT
0301	00551	061536	LDA RSCHK	BUFFER
0302	00552	070132	STA BADDR	POINTERS
0303	00553	124477	JMP ERROR,I	RETURN TO PROGRAM

0305**

0306*** MOVE WORDS TO HIGHER CORE **

0307**

0308	00554	000000	MVTOH	NOP	
0309	00555	064162		LDB TEMP2	FETCH SOURCE ADDRESS
0310	00556	054163	MVTO1	CPB TEMP3	ALL RELOCATION DONE?
0311	00557	124554		JMP MVTOH,I	YES, EXIT
0312	00560	003400		CCA	BACK UP
0313	00561	040164		ADA TEMP4	SOURCE AND
0314	00562	070164		STA TEMP4	DESTINATION
0315	00563	044431		ADB M1	ADDRESSES
0316	00564	160001		LDA 1,I	MOVE
0317	00565	170164		STA TEMP4,I	WORD
0318	00566	024556		JMP MVTO1	

0319**

0320*** INPUT A CONSTANT **

0321**

0322	00567	000000	CONST	NOP	
0323	00570	015614		JSB GETCR	
0324	00571	124567		JMP CONST,I	
0325	00572	006400		CLB	SET SIGN
0326	00573	074153		STB SIGN	POSITIVE
0327	00574	006004		INB	
0328	00575	050353		CPA .43	'+' ?
0329	00576	024602		JMP CONS1	YES
0330	00577	050354		CPA .45	NO, '-' ?
0331	00600	007401		CCB,RSS	YES
0332	00601	024605		JMP CONS2	NO
0333	00602	074153	CONS1	STB SIGN	RECORD SIGN
0334	00603	015614		JSB GETCR	FETCH NEXT
0335	00604	024613		JMP SYE12-1	CHARACTER
0336	00605	014615	CONS2	JSB NUMCK	FETCH CONSTANT
0337	00606	024611		JMP CONS3	NONE FOUND
0338	00607	034567		ISZ CONST	SUCCESSFULLY FOUND,
0339	00610	124567		JMP CONST,I	EXIT VIA (P+2)
0340	00611	054153	CONS3	CPB SIGN	SIGN FOUND? ((B) = 0)
0341	00612	003401		CCA,RSS	NO
0342	00613	014477		JSB ERROR	YES, SOLITARY SIGN
0343	00614	124567	SYE12	JMP CONST,I	EXIT VIA (P+1)

0344**

0345*** FETCH NUMBER AND CONVERT TO BINARY **

0346**

0347	00615	000000	NUMCK	NOP	CHARACTER IN (A), SIGN SET
0348	00616	006400		CLB	
0349	00617	074154		STB EXP	ZERO
0350	00620	075274		STB MANT1	ALL
0351	00621	075336		STB MANT2	COMPONENTS
0352	00622	075603		STB EXPON	OF NUMBER
0353	00623	074163		STB TEMP3	SET 'NUMBER' FLAG FALSE
0354	00624	007400		CCB	SET 'DECIMAL POINT'
0355	00625	075633		STB DPFLG	FLAG FALSE
0356	00626	050355	NUMC1	CPA .46	DECIMAL POINT?
0357	00627	035633		ISZ DPFLG	YES, SET FLAG TRUE
0358	00630	024634		JMP NUMC2	NO
0359	00631	002400		CLA	INITIALIZE POST-DECIMAL DIGIT
0360	00632	071603		STA EXPON	DIGIT COUNTER TO ZERO

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0361	00633	024653		JMP NUMC3+1	FETCH A CHARACTER
0362	00634	015570	NUMC2	JSB DIGCK	DIGIT?
0363	00635	024706		JMP NUMC7	NO
0364	00636	035603		ISZ EXPON	YES, COUNT DIGIT
0365	00637	001727		ALF,ALF	LEFT-JUSTIFY
0366	00640	001723		ALF,RAR	DIGIT AND
0367	00641	070164		STA TEMP4	SAVE IT
0368	00642	015147		JSB MBY10	MULTIPLY PREVIOUS NUMBER BY 10
0369	00643	064154		LDB EXP	
0370	00644	006002		SZB	ZERO EXPONENT?
0371	00645	024657		JMP NUMC4	NO
0372	00646	060327		LDA .4	YES, SET
0373	00647	070154		STA EXP	EXPONENT TO 4
0374	00650	060164		LDA TEMP4	LOAD
0375	00651	006400		CLB	NUMBER
0376	00652	015113	NUMC3	JSB NORML	NORMALIZE THE NUMBER
0377	00653	034163		ISZ TEMP3	SET 'NUMBER OCCURRED' FLAG
0378	00654	015614		JSB GETCR	ANOTHER CHARACTER?
0379	00655	024755		JMP NUM12	NO
0380	00656	024626		JMP NUMC1	YES
0381	00657	044434	NUMC4	ADB M4	COMPUTE
0382	00660	007000		CMB	EXPONENT
0383	00661	060164		LDA TEMP4	BIAS AND
0384	00662	074164		STB TEMP4	SAVE IT
0385	00663	006400		CLB	
0386	00664	034164	NUMC5	ISZ TEMP4	DIGIT POSITIONED?
0387	00665	024703		JMP NUMC6	NO
0388	00666	000040		CLE	YES, ADD IN
0389	00667	045336		ADB MANT2	LOW PART
0390	00670	103101		CLO	OF NUMBER
0391	00671	002040		SEZ	OVERFLOW?
0392	00672	002004		INA	YES, BUMP (A)
0393	00673	041274		ADA MANT1	ADD IN HIGH PART OF NUMBER
0394	00674	102301		SOS	OVERFLOW?
0395	00675	024652		JMP NUMC3	NO
0396	00676	000065		CLE,ERA	YES, ROTATE
0397	00677	005500		ERB	DOWN AND
0398	00700	034154		ISZ EXP	BUMP
0399	00701	000000		NOP	EXPONENT
0400	00702	024652		JMP NUMC3	
0401	00703	000065	NUMC6	CLE,ERA	SHIFT
0402	00704	005500		ERB	DIGIT
0403	00705	024664		JMP NUMC5	RIGHT
0404	00706	006400	NUMC7	CLB	DECIMAL POINT
0405	00707	074164		STB TEMP4	
0406	00710	054163		CPB TEMP3	OR DIGIT FOUND?
0407	00711	124615		JMP NUMCK,I	NO, EXIT VIA (P+1)
0408	00712	050364		CPA E	YES, 'E' ?
0409	00713	002001		RSS	YES
0410	00714	024755		JMP NUM12	NO, NO EXPONENT PART
0411	00715	015614		JSB GETCR	
0412	00716	014477	NUMER	JSB ERROR	
0413	00717	050353		CPA .43	'+' ?
0414	00720	024725		JMP NUMC8	YES
0415	00721	050354		CPA .45	NO, '-' ?
0416	00722	003401		CCA,RSS	YES

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0417	00723	024727		JMP NUMC9	NO
0418	00724	070164		STA TEMP4	NOTE MINUS SIGN
0419	00725	015614	NUMC8	JSB GETCR	
0420	00726	024716		JMP NUMER	
0421	00727	015570	NUMC9	JSB DIGCK	DIGIT?
0422	00730	024716		JMP NUMER	NO
0423	00731	070163		STA TEMP3	YES, SAVE IT
0424	00732	015614		JSB GETCR	
0425	00733	024751		JMP NUM10	SECOND
0426	00734	015570		JSB DIGCK	DIGIT?
0427	00735	024751		JMP NUM10	NO
0428	00736	064163		LDB TEMP3	YES
0429	00737	005020		BLS,BLS	MULTIPLY
0430	00740	044163		ADB TEMP3	PRIOR DIGIT
0431	00741	005000		BLS	BY 10
0432	00742	040001		ADA 1	ADD NEW DIGIT
0433	00743	070163		STA TEMP3	SAVE EXPONENT
0434	00744	015614		JSB GETCR	
0435	00745	024751		JMP NUM10	THIRD
0436	00746	015570		JSB DIGCK	DIGIT?
0437	00747	002001		RSS	NO
0438	00750	024716		JMP NUMER	YES
0439	00751	060163	NUM10	LDA TEMP3	LOAD EXPONENT
0440	00752	034164		ISZ TEMP4	POSITIVE?
0441	00753	003004		CMA,INA	YES, COMPLEMENT IT
0442	00754	002001		RSS	NO
0443	00755	002400	NUM12	CLA	CLEAR IF NO EXPONENT PART
0444	00756	035633		ISZ DPFLG	DECIMAL POINT?
0445	00757	041603		ADA EXPON	YES, CORRECT EXPONENT
0446	00760	002003		SZA,RSS	ZERO EXPONENT?
0447	00761	024776		JMP NUM14	YES
0448	00762	002020		SSA	NO, NEGATIVE EXPONENT?
0449	00763	024772		JMP NUM13	NO
0450	00764	003004		CMA,INA	YES, SET
0451	00765	071603		STA EXPON	COUNTER
0452	00766	015200		JSB DBY10	DIVIDE NUMBER BY 10
0453	00767	035603		ISZ EXPON	DONE?
0454	00770	024766		JMP *-2	NO
0455	00771	024776		JMP NUM14	YES
0456	00772	071603	NUM13	STA EXPON	SET COUNTER
0457	00773	015147		JSB MBY10	MULTIPLY BY 10
0458	00774	035603		ISZ EXPON	DONE?
0459	00775	024773		JMP *-2	NO
0460	00776	061274	NUM14	LDA MANT1	YES, LOAD
0461	00777	065336		LDB MANT2	NUMBER
0462	01000	034153		ISZ SIGN	POSITIVE?
0463	01001	025005		JMP NUM15	YES
0464	01002	003000		CMA	NO,
0465	01003	007007		CMB,INB,SZB,RSS	COMPLEMENT
0466	01004	002004		INA	IT
0467	01005	015020	NUM15	JSB .PACK	PACK NUMBER INTO (A) AND (B)
0468	01006	034135		ISZ SBPTR	
0469	01007	170135		STA SBPTR,I	STORE
0470	01010	034135		ISZ SBPTR	NUMBER IN
0471	01011	174135		STB SBPTR,I	PROPER
0472	01012	034135		ISZ SBPTR	LOCATION

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0473	01013	015633	JSB BCKSP	FETCH
0474	01014	015614	JSB GETCH	FIRST
0475	01015	060334	LDA .10	UNUSED CHARACTER
0476	01016	034615	ISZ NUMCK	RETURN
0477	01017	124615	JMP NUMCK,I	VIA (P+2)
0478**				
0479***	NORMALIZE AND PACK FLOATING POINT NUMBER			**
0480**				
0481	01020	000000	.PACK NOP	MANTISSA IN (A) AND (B),
0482	01021	015113	JSB NORML	EXPONENT IN EXP, (E) CLEARED
0483	01022	002103	CLE,SZA,RSS	ZERO RESULT?
0484	01023	125020	JMP .PACK,I	YES
0485	01024	044374	ADB B177	NO, ROUND
0486	01025	002021	SSA,RSS	POSITIVE NUMBER?
0487	01026	006004	INB	YES, FINISH ROUND
0488	01027	103101	CLO	
0489	01030	002040	SEZ	OVERFLOW FROM (B)?
0490	01031	002104	CLE,INA	YES, BUMP (A)
0491	01032	102301	SOS	OVERFLOW? (A=100000, B=0)
0492	01033	001200	RAL	
0493	01034	002031	SSA,SLA,RSS	TWO HIGH BITS 1'S? (A=140000)
0494	01035	025040	JMP PACK1	NO
0495	01036	002300	CCE	YES
0496	01037	001130	ARS,SLA,ALS	SET (A) =100000 AND SKIP
0497	01040	001300	PACK1 RAR	COUNTERPART TO *-5
0498	01041	071147	STA MBY10	SAVE (A)
0499	01042	060001	LDA 1	DELETE 8 LOW
0500	01043	010460	AND M256	ORDER BITS OF MANTISSA
0501	01044	070001	STA 1	SAVE LOWER MANTISSA
0502	01045	060154	LDA EXP	FETCH EXPONENT
0503	01046	002040	SEZ	DECREMENT EXPONENT?
0504	01047	040431	ADA M1	YES
0505	01050	102201	SOC	NO, PRIOR OVERFLOW?
0506	01051	002004	INA	YES, INCREMENT EXPONENT
0507	01052	040375	ADA B200	NO, EXPONENT
0508	01053	002020	SSA	UNDERFLOW?
0509	01054	025073	JMP PACK3	YES
0510	01055	040460	ADA M256	NO, EXPONENT
0511	01056	002021	SSA,RSS	OVERFLOW?
0512	01057	025077	JMP PACK4	YES
0513	01060	040375	ADA B200	NO, RESTORE EXPONENT,
0514	01061	001200	RAL	POSITION SIGN,
0515	01062	010376	AND MSK0	MASK TO 8 BITS, AND
0516	01063	044000	ADB 0	COMBINE WITH LOW MANTISSA
0517	01064	061147	LDA MBY10	RETRIEVE HIGH MANTISSA
0518	01065	050470	CPA MNEG	
0519	01066	002001	RSS	NEGATIVE
0520	01067	125020	JMP .PACK,I	
0521	01070	054471	CPB MNEG+1	OVERFLOW?
0522	01071	025077	JMP PACK4	YES
0523	01072	125020	JMP .PACK,I	NO
0524	01073	014477	PACK3 JSB ERROR	
0525	01074	002400	UNDER CLA	ZERO RESULT
0526	01075	006400	CLB	ON UNDERFLOW
0527	01076	125020	JMP .PACK,I	
0528	01077	014477	PACK4 JSB ERROR	

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0529 01100 061147 OVRER LDA MBY10
0530 01101 015103 JSB OVFLW
0531 01102 125020 JMP .PACK,I
0532**
0533*** LOAD INFINITY ON OVERFLOW **
0534**
0535 01103 000000 OVFLW NOP
0536 01104 064432 LDB M2 LOAD
0537 01105 002020 SSA APPROPRIATE
0538 01106 064400 LDB B776 LOW MANTISSA
0539 01107 030422 IOR INF LOAD
0540 01110 002020 SSA APPROPRIATE
0541 01111 060470 LDA MNEG HIGH MANTISSA
0542 01112 125103 JMP OVFLW,I
0543**
0544*** NORMALIZE (A), (B), AND EXP **
0545**
0546 01113 000000 NORML NOP SET
0547 01114 071147 STA MBY10 LEFT-SHIFT
0548 01115 002400 CLA COUNTER
0549 01116 071236 STA MPY TO ZERO
0550 01117 061147 LDA MBY10
0551 01120 002003 SZA,RSS ON
0552 01121 006002 SZB ZERO
0553 01122 025130 JMP NORM3 CLEAR
0554 01123 070154 STA EXP EVERYTHING
0555 01124 071274 STA MANT1 STORE
0556 01125 075336 NORM1 STB MANT2 MANTISSA
0557 01126 125113 JMP NORML,I AND RETURN
0558 01127 035236 NORM2 ISZ MPY COUNT LEFT SHIFTS
0559 01130 004066 NORM3 CLE,ELB ROTATE (A) AND
0560 01131 001600 ELA (B) LEFT INTO (E)
0561 01132 002061 SEZ,SSA,RSS TWO HIGHEST BITS 0?
0562 01133 025127 JMP NORM2 YES, + UNNORMALIZED
0563 01134 002060 SEZ,SSA NO, TWO HIGHEST BITS 1?
0564 01135 025127 JMP NORM2 YES, - UNNORMALIZED
0565 01136 001500 ERA SHIFT TO
0566 01137 005540 ERB,CLE NORMALIZE MANTISSA
0567 01140 071274 STA MANT1 NO,
0568 01141 061236 LDA MPY COMPUTE
0569 01142 003004 CMA,INA CORRECTED
0570 01143 040154 ADA EXP EXPONENT
0571 01144 070154 STA EXP VALUE
0572 01145 061274 LDA MANT1
0573 01146 025125 JMP NORM1
0574**
0575*** MULTIPLY UNPACKED NUMBER BY 10 **
0576**
0577 01147 000000 MBY10 NOP
0578 01150 061274 LDA MANT1 RETURN ON
0579 01151 002003 SZA,RSS ZERO
0580 01152 125147 JMP MBY10,I MANTISSA
0581 01153 064154 LDB EXP MULTIPLY
0582 01154 044326 ADB .3 BY
0583 01155 074154 STB EXP 8
0584 01156 065336 LDB MANT2 LOAD MANTISSA

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0585	01157	000065	CLE,ERA	DIVIDE
0586	01160	005500	ERB	BY
0587	01161	000065	CLE,ERA	4
0588	01162	005540	ERB,CLE	
0589	01163	045336	ADB MANT2	DOUBLE
0590	01164	002040	SEZ	ADD TO
0591	01165	002004	INA	PRODUCE
0592	01166	041274	ADA MANT1	1.25 * MANTISSA
0593	01167	002021	SSA,RSS	CORRECT
0594	01170	025175	JMP **5	
0595	01171	000065	CLE,ERA	ON
0596	01172	005500	ERB	
0597	01173	034154	ISZ EXP	OVERFLOW
0598	01174	000000	NOP	
0599	01175	071274	STA MANT1	
0600	01176	075336	STB MANT2	
0601	01177	125147	JMP MBY10,I	
0602**				
0603**	DIVIDE UNPACKED NUMBER BY 10			**
0604**				
0605	01200	000000	DBY10 NOP	MULTIPLY BY DOUBLE-LENGTH TENTH
0606	01201	061274	LDA MANT1	RETURN
0607	01202	002003	SZA,RSS	ON ZERO
0608	01203	125200	JMP DBY10,I	MANTISSA
0609	01204	064432	LDB M2	ADD EXPONENT OF
0610	01205	044154	ADB EXP	'TENTH' TO
0611	01206	074154	STB EXP	MANTISSA EXPONENT
0612	01207	061336	LDA MANT2	JUSTIFY
0613	01210	000065	CLE,ERA	LOWER MANTISSA
0614	01211	015236	JSB MPY	MULTIPLY BY
0615	01212	000417	DEF TENTH	63146 (ONE-TENTH)
0616	01213	000066	CLE,ELA	SHIFT
0617	01214	005640	ELB,CLE	BACK
0618	01215	040001	ADA 1	ADD IN LOWER MANTISSA*
0619	01216	002040	SEZ	TENTH*(2)-16
0620	01217	006004	INB	AND ROUND
0621	01220	075336	STB MANT2	TO 16 BITS
0622	01221	061274	LDA MANT1	DO
0623	01222	015236	JSB MPY	SAME
0624	01223	000417	DEF TENTH	FOR
0625	01224	000040	CLE	HIGH
0626	01225	040001	ADA 1	MANTISSA
0627	01226	041336	ADA MANT2	(EFFECTIVELY) SUM
0628	01227	002040	SEZ	DOUBLE-LENGTH
0629	01230	006004	INB	PRODUCTS
0630	01231	075274	STB MANT1	EXCHANGE
0631	01232	070001	STA 1	(A) AND (B)
0632	01233	061274	LDA MANT1	REGISTERS
0633	01234	015113	JSB NORML	NORMALIZE RESULT
0634	01235	125200	JMP DBY10,I	

0001**

0002*** MULTIPLY INTEGER IN (A) **

0003**

0004	01236	000000	MPY	NOP	ADDRESS OF MULTIPLIER IN MPY, I
0005	01237	064432		LDB M2	SET -2 IN
0006	01240	075147		STB MBY10	SIGN TEMP
0007	01241	165236		LDB MPY, I	LOAD
0008	01242	164001		LDB 1, I	MULTIPLIER
0009	01243	002120		CLE, SSA	(A) NEGATIVE?
0010	01244	003204		CMA, CME, INA	YES, COMPLEMENT (A) AND (E)
0011	01245	006020		SSB	(B) NEGATIVE?
0012	01246	007204		CMB, CME, INB	YES, COMPLEMENT (B) AND (E)
0013	01247	002040		SEZ	(E) = 0?
0014	01250	035147		ISZ MBY10	NO, SET SIGN OF RESULT NEGATIVE
0015	01251	075113		STB NORML	SAVE MULTIPLIER
0016	01252	064445		LDB M16	SET
0017	01253	074554		STB MVTOH	COUNTER
0018	01254	006400		CLB	ZERO PRODUCT
0019	01255	001600		ELA	BIAS (A) TO LEFT
0020	01256	001550	MPY1	ERA, CLE, SLA	SHIFT, TEST,
0021	01257	045113		ADB NORML	AND ADD UPON
0022	01260	005500		ERB	NON-ZERO BIT
0023	01261	034554		ISZ MVTOH	DONE?
0024	01262	025256		JMP MPY1	NO
0025	01263	001540		ERA, CLE	YES, ADJUST FINAL RESULT
0026	01264	035147		ISZ MBY10	NEGATIVE RESULT?
0027	01265	025271		JMP MPY2	NO
0028	01266	007100		CMB	YES,
0029	01267	003007		CMA, INA, SZA, RSS	COMPLEMENT
0030	01270	006004		INB	RESULT
0031	01271	103101	MPY2	CLO	
0032	01272	035236		ISZ MPY	
0033	01273	125236		JMP MPY, I	

0034**

0035*** FIND AND STORE ONE-CHARACTER OPERATORS **

0036**

0037	01274	000000	SYMCK	NOP	CHARACTER IN (A)
0038	01275	074165		STB COUNT	-(ENTRIES TO BE SEARCHED)
0039	01276	001727		ALF, ALF	POSITION
0040	01277	030345		IOR .32	CHARACTER
0041	01300	165274		LDB SYMCK, I	STARTING TABLE ENTRY - 2
0042	01301	035274		ISZ SYMCK	SET RETURN ADDRESS
0043	01302	044325	SYMCK1	ADB .2	UPDATE TABLE POINTER
0044	01303	150001		CPA 1, I	MATCH?
0045	01304	025312		JMP SYMCK2	
0046	01305	034165		ISZ COUNT	NO, CONTINUE SEARCH?
0047	01306	025302		JMP SYMCK1	YES
0048	01307	001727		ALF, ALF	NO, RESTORE
0049	01310	010374		AND B177	CHARACTER
0050	01311	125274		JMP SYMCK, I	AND EXIT
0051	01312	003400	SYMCK2	CCA	GET
0052	01313	040001		ADA 1	INFORMATION
0053	01314	160000		LDA 0, I	WORD
0054	01315	010420		AND OPMSK	AND
0055	01316	170135		STA SBPTR, I	STORE IT
0056	01317	050410		CPA B1400	

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0057 01320 124257      JMP FBC1A,I
0058 01321 035274      ISZ SYNCK      RETURN VIA
0059 01322 125274      JMP SYNCK,I    (P+2)
0060**
0061*** FIND CALLED SUBROUTINE **
0062**
0063 01323 000000      FNDSB NOP
0064 01324 074162      STB TEMP2     SAVE SUBROUTINE NUMBER
0065 01325 064121      LDB ASBTB     LOAD (B) WITH SUBROUTINE TABLE
0066 01326 054122      FNDS1 CPB SBTBE END OF TABLE?
0067 01327 014477      JSB ERROR     YES
0068 01330 160001      CALER LDA 1,I  NO, EXTRACT
0069 01331 010362      AND .63       SUBROUTINE NUMBER
0070 01332 050162      CPA TEMP2     DESIRED ONE?
0071 01333 125323      JMP FNDSB,I   YES
0072 01334 044325      ADB .2        NO, MOVE TO
0073 01335 025326      JMP FNDS1     NEXT TABLE ENTRY

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0075*
0076*
0077*
0078*
0079*
0080*
0081*
0082*
0083*
0084 01336 000000      MDIM NOP
0085 01337 070001      STA 1         STORE PACKED DIMS. TEMPORALILY
0086 01340 010376      AND MSK0
0087 01341 071456      STA .FLUN     STORE # OF COLUMNS
0088 01342 060001      LDA 1
0089 01343 001727      ALF,ALF
0090 01344 010376      AND MSK0     A = # OF ROWS
0091 01345 001000      ALS         DOUBLE FOR FLOATING POINT
0092 01346 015236      JSB MPY
0093 01347 001456      DEF .FLUN     COMPUTE 2*ROWS*COLUMNS
0094 01350 002020      SSA         RESULT < 32768 ?
0095 01351 014477      JSB ERROR     NO, ERROR, DIMENSIONS TOO LARGE
0096 01352 125336      MER9 JMP MDIM,I YES, RETURN

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0098**
0099*** ROUND A SUBSCRIPT TO AN INTEGER **
0100**
0101*
0102* RETURNS INTEGER IN [1,32767] (BIASED BY -1)
0103* OR EXITS TO ERRCR.
0104*
0105 01353 000000 SBFIX NOP SUBSCRIPT IN (A) AND (B)
0106 01354 015364 JSB IFIX 24-BIT INTEGER?
0107 01355 124272 JMP E6M1A,I NO
0108 01356 002041 SEZ,RSS YES, ROUND AND
0109 01357 044431 ADB M1 BIAS BY -1
0110 01360 002003 SZA,RSS 15-BIT
0111 01361 006020 SSB POSITIVE INTEGER?
0112 01362 124272 JMP E6M1A,I NO
0113 01363 125353 JMP SBFIX,I YES
0114**
0115*** INTEGERIZE FLOATING POINT NUMBER **
0116**
0117 01364 000000 IFIX NOP
0118 01365 102101 STO
0119 01366 071614 STA GETCR SAVE (A)
0120 01367 015456 JSB .FLUN EXPONENT
0121 01370 002020 SSA NON-NEGATIVE?
0122 01371 025414 JMP IFIX3 NO
0123 01372 040445 ADA M16 YES, EXPONENT
0124 01373 002020 SSA <= 15?
0125 01374 103101 CLO YES
0126 01375 040440 ADA M8 EXPONENT
0127 01376 002021 SSA,RSS <= 23?
0128 01377 125364 JMP IFIX,I NO, ALL SIGNIFICANCE IS INTEGER
0129 01400 040440 ADA M8 MOVE BINARY POINT TO END OF (B)
0130 01401 071456 STA .FLUN SAVE SHIFT COUNT
0131 01402 061614 LDA GETCR RETRIEVE (A)
0132 01403 025410 JMP IFIX2
0133 01404 000071 IFIX1 CLE,SLA,ARS SHIFT (A) RIGHT
0134 01405 002200 CME SHIFT (B)
0135 01406 004035 SLB,ERB RIGHT
0136 01407 102101 STO NOTE IF A 1 IS LOST
0137 01410 035456 IFIX2 ISZ .FLUN DONE?
0138 01411 025404 JMP IFIX1 NO
0139 01412 035364 ISZ IFIX YES
0140 01413 125364 JMP IFIX,I
0141 01414 061614 IFIX3 LDA GETCR RETRIEVE (A)
0142 01415 002120 CLE,SSA TRUNCATE
0143 01416 003401 CCA,RSS TO
0144 01417 002401 CLA,RSS -1
0145 01420 007401 CCB,RSS OR
0146 01421 006400 CLB 0
0147 01422 025412 JMP IFIX2+2

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0149**

0150*** TAKE ARITHMETIC INVERSE **

0151**

0152	01423	000000	ARINV	NOP	NUMBER IN (A) AND (B)
0153	01424	071677		STA OUTLN	SWAP
0154	01425	060001		LDA 1	
0155	01426	065677		LDB OUTLN	REGISTERS
0156	01427	007100		CMB,CLE	COMPLEMENT HIGH PART
0157	01430	020460		XOR M256	COMPLEMENT LOW PART
0158	01431	040377		ADA B400	ADD IN 1
0159	01432	002041		SEZ,RSS	OVERFLOW?
0160	01433	025452		JMP ARIN2	NO
0161	01434	006004		INB	YES, INCREMENT HIGH MANTISSA
0162	01435	054470		CPB FLGBT	OVERFLOW?
0163	01436	025442		JMP ARIN1	YES
0164	01437	054427		CPB UNNRM	NO, NEGATIVE UNNORMALIZED?
0165	01440	002001		RSS	YES
0166	01441	025452		JMP ARIN2	NO
0167	01442	044427	ARIN1	ADB UNNRM	FIX HIGH MANTISSA
0168	01443	000033		SLA,RAR	POSITION EXPONENT
0169	01444	030421		IOR MSK4	FILL IN BITS IF NEGATIVE
0170	01445	006021		SSB,RSS	POSITIVE?
0171	01446	002005		INA,RSS	YES, BUMP EXPONENT
0172	01447	040431		ADA M1	NO, DECREMENT EXPONENT
0173	01450	001200		RAL	POSITION
0174	01451	010376		AND MSK0	EXPONENT
0175	01452	071677	ARIN2	STA OUTLN	SWAP
0176	01453	060001		LDA 1	
0177	01454	065677		LDB OUTLN	REGISTERS
0178	01455	125423		JMP ARINV,I	

0179**

0180*** UNPACK LOW WORD OF NUMBER **

0181**

0182	01456	000000	.FLUN	NOP	WORD IN (B)
0183	01457	060001		LDA 1	(A) = (B)
0184	01460	010376		AND MSK0	EXTRACT EXPONENT IN (A)
0185	01461	007000		CMB	SUBTRACT OFF
0186	01462	044000		ADB 0	EXPONENT FROM
0187	01463	007000		CMB	MANTISSA IN (B)
0188	01464	000033		SLA,RAR	NEGATIVE EXPONENT?
0189	01465	030421		IOR MSK4	YES, FILL IN LEADING BITS
0190	01466	125456		JMP .FLUN,I	NO

0191**

0192*** STACK (B) ON LOW-CORE STACK **

0193**

0194	01467	000000	SLWST	NOP	
0195	01470	034141		ISZ LSTPT	ADVANCE 'LOW
0196	01471	060141		LDA LSTPT	STACK' POINTER
0197	01472	050142		CPA HSTPT	STACK OVERFLOW?
0198	01473	014477	E1	JSB ERROR	YES
0199	01474	174141		STB LSTPT,I	NO, STACK (B)
0200	01475	125467		JMP SLWST,I	

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0202**
0203*** BUMP HIGH STACK POINTER **
0204**
0205 01476 000000 BHSTP NOP
0206 01477 007400 CCB ADVANCE
0207 01500 044142 ADB HSTPT
0208 01501 074142 STB HSTPT POINTER
0209 01502 054141 CPB LSTPT OVERFLOW?
0210 01503 025473 JMP E1 YES
0211 01504 125476 JMP BHSTP,I NO
0212**
0213*** FETCH TOP OF STACK **
0214**
0215 01505 000000 STTOP NOP
0216 01506 015515 JSB OPCHK VALIDATE
0217 01507 015536 JSB RSCHK OPERAND
0218 01510 164142 LDB HSTPT,I SAVE
0219 01511 160001 LDA 1,I LOAD
0220 01512 006004 INB
0221 01513 164001 LDB 1,I NUMBER
0222 01514 125505 JMP STTOP,I
0223**
0224*** VERIFY LEGITIMACY OF OPERAND **
0225**
0226 01515 000000 OPCHK NOP
0227 01516 164142 LDB HSTPT,I OPERAND ADDRESS TO (B)
0228 01517 160001 LDA 1,I HIGH PART OF
0229 01520 050470 CPA MNEG OPERAND 100000B?
0230 01521 006005 INB,RSS YES
0231 01522 025527 JMP OPCH1 NO
0232 01523 160001 LDA 1,I LOW PART
0233 01524 050471 CPA MNEG+1 776B?
0234 01525 014477 JSB ERROR YES
0235 01526 044431 E8 ADB M1
0236 01527 054140 OPCH1 CPB TSTPT TEMPORARY OPERAND?
0237 01530 002001 RSS YES
0238 01531 125515 JMP OPCHK,I NO
0239 01532 060140 LDA TSTPT UNSTACK
0240 01533 040432 ADA M2 THE TEMPORARY
0241 01534 070140 STA TSTPT OPERAND
0242 01535 125515 JMP OPCHK,I EXIT WITH ADDRESS IN (B)
0243**
0244*** ALLOT SPACE FOR INTERMEDIATE RESULT **
0245**
0246 01536 000000 RSCHK NOP
0247 01537 060140 LDA TSTPT ALLOT
0248 01540 040325 ADA .2
0249 01541 070140 STA TSTPT SPACE
0250 01542 040431 ADA M1 OVERFLOW INTO
0251 01543 050120 CPA LSTAK LOW-CORE STACK?
0252 01544 002001 RSS YES
0253 01545 125536 JMP RSCHK,I NO
0254 01546 060120 LDA LSTAK SAVE
0255 01547 002004 INA LOWER
0256 01550 070163 STA TEMP3 STACK BOUND
0257 01551 040333 ADA .9 UPDATE

```

PAGE 0037 #02 BASE PAGE SUBROUTINES

0258	01552	070120	STA LSTAK	STACK BOTTOM
0259	01553	060141	LDA LSTPT	SET
0260	01554	002004	INA	SOURCE
0261	01555	070162	STA TEMP2	ADDRESS
0262	01556	040333	ADA .9	UPDATE
0263	01557	070141	STA LSTPT	STACK TOP
0264	01560	002004	INA	SET DESTINATION
0265	01561	070164	STA TEMP4	ADDRESS
0266	01562	003004	CMA,INA	OVERFLOW
0267	01563	040142	ADA HSTPT	INTO
0268	01564	002020	SSA	HIGH-CORE STACK?
0269	01565	025473	JMP E1	YES
0270	01566	014554	JSB MVTOH	NO, MOVE
0271	01567	125536	JMP R0CHK,I	LOW-CORE STACK
0272**				
0273***	CHECK FOR DIGIT	**		
0274**				
0275	01570	000000	DIGCK NOP	CHARACTER IN (A)
0276	01571	064000	LDB 0	
0277	01572	044452	ADB D72	ASCII 72B
0278	01573	006021	SSB,RSS	OR GREATER?
0279	01574	125570	JMP DIGCK,I	YES, RETURN WITH CHARACTER
0280	01575	044334	ADB .10	NO, ASCII 60B
0281	01576	006020	SSB	OR GREATER?
0282	01577	125570	JMP DIGCK,I	NO
0283	01600	035570	ISZ DIGCK	YES, SET 'SUCCESS' EXIT,
0284	01601	060001	LDA 1	LOAD DIGIT INTO (A),
0285	01602	125570	JMP DIGCK,I	AND RETURN
0286**				
0287***	CHECK FOR LETTER	**		
0288**				
0289	01603	000000	LETCK NOP	CHARACTER IN (A)
0290	01604	064000	LDB 0	
0291	01605	044457	ADB D133	ASCII 133B
0292	01606	006021	SSB,RSS	OR GREATER?
0293	01607	125603	JMP LETCK,I	YES, EXIT WITH CHARACTER IN (A)
0294	01610	044340	ADB .26	NO, ASCII 101B
0295	01611	006021	SSB,RSS	OR GREATER?
0296	01612	035603	ISZ LETCK	YES
0297	01613	125603	JMP LETCK,I	NO
0298*				
0299*	ON END-OF-FILE CONDITION RETURN TO P+1 ELSE			
0300*	RETURN TO P+2 WITH NON-BLANK CHARACTER IN (A)			
0301*				
0302	01614	000000	GETCR .NOP	
0303	01615	034133	ISZ CCNT	ANY CHARACTERS LEFT?
0304	01616	002001	RSS	
0305	01617	125614	JMP GETCR,I	NO, END-OF-FILE EXIT
0306	01620	064132	LDB BADDR	LOAD BUFFER ADDRESS
0307	01621	034132	ISZ BADDR	UPDATE FOR NEXT TIME
0308	01622	004065	CLE,ERB	SET CHARACTER FLAG
0309	01623	160001	LDA 1,I	LOAD CURRENT BUFFER WORD
0310	01624	002041	SEZ,RSS	FIRST CHARACTER?
0311	01625	001727	ALF,ALF	YES, POSITION IT
0312	01626	010374	AND B177	MASK EXTRANEIOUS BITS
0313	01627	050476	CPA BLANK	BLANK?

PAGE 0038 #02 BASE PAGE SUBROUTINES

0314	01630	025615	JMP	GETCR+1	YES, FETCH NEXT CHARACTER
0315	01631	035614	ISZ	GETCR	UPDATE RETURN ADDRESS
0316	01632	125614	JMP	GETCR,I	AND EXIT
0317**					
0318*** BACKSPACE OVER ONE CHARACTER **					
0319**					
0320	01633	000000	BCKSP	NOP	
0321	01634	003400	CCA		BACKSPACE
0322	01635	040133	ADA	CCNT	OVER
0323	01636	070133	STA	CCNT	LAST
0324	01637	003400	CCA		CHARACTER IN
0325	01640	040132	ADA	BADDR	INPUT
0326	01641	070132	STA	BADDR	BUFFER
0327	01642	125633	JMP	BCKSP,I	
0328**					
0329*** PRINT A NUMBER **					
0330**					
0331	01643	000000	ENOUT	NOP	
0332	01644	002300	CCE		SET SIGN FLAG TRUE
0333	01645	114220	JSB	NUMOA,I	OUTPUT THE NUMBER
0334	01646	015677	JSB	OUTLN	END-OF-LINE ACTION
0335	01647	060345	LDA	.32	OUTPUT
0336	01650	015715	JSB	OUTCR	A BLANK
0337	01651	064172	LDB	MLBX1+1	FIELD
0338	01652	044133	ADB	CCNT	
0339	01653	006002	SZB		FULL?
0340	01654	025647	JMP	*-5	NO
0341	01655	125643	JMP	ENOUT,I	
0342**					
0343*** SPACE FOR A COMMA **					
0344**					
0345	01656	000000	EDELM	NOP	
0346	01657	064133	LDB	CCNT	NO, LOAD CHARACTER COUNT
0347	01660	006003	EDEL1	SZB,RSS	ZERO?
0348	01661	125656	JMP	EDELM,I	YES
0349	01662	044444	ADB	M15	NO, SUBTRACT ZONE WIDTH
0350	01663	006021	SSB,RSS		NEGATIVE RESULT?
0351	01664	025660	JMP	EDEL1	NO
0352	01665	075677	STB	OUTLN	YES, SAVE BLANK COUNT
0353	01666	060345	LDA	.32	FETCH BLANK
0354	01667	015715	JSB	OUTCR	OUTPUT
0355	01670	035677	ISZ	OUTLN	
0356	01671	025666	JMP	*-3	BLANKS
0357	01672	064133	LDB	CCNT	LINE
0358	01673	044456	ADB	M76	
0359	01674	006021	SSB,RSS		FULL?
0360	01675	015677	JSB	OUTLN	YES
0361	01676	125656	JMP	EDELM,I	

0363**

0364*** OUTPUT A COMPLETED LINE **

0365**

0366	01677	000000	OUTLN	NOP	
0367	01700	060146		LDA	TYPE
0368	01701	000010		SLA	
0369	01702	002004		INA	
0370	01703	040133		ADA	CCNT
0371	01704	064131		LDB	.BUFA
0372	01705	114102		JSB	WRITE,I
0373	01706	064172		LDB	MLBX1+1
0374	01707	044133		ADB	CCNT
0375	01710	074172		STB	MLBX1+1
0376	01711	002400		CLA	
0377	01712	070146		STA	TYPE
0378	01713	114250		JSB	PRNIA,I
0379	01714	125677		JMP	OUTLN,I

FETCH 'CHARACTERS PRINTED' COUNT
 CORRECT FOR START ON
 ODD PRINT POSITION
 OUTPUT
 A
 LINE
 CORRECT
 MARKER
 RESET COUNT OF
 CHARACTERS PRINTED
 CLEAN UP

0380**

0381*** ADD A CHARACTER TO OUTPUT BUFFER **

0382**

0383	01715	000000	OUTCR	NOP	
0384	01716	071364		STA	IFIX
0385	01717	034133		ISZ	CCNT
0386	01720	064133		LDB	CCNT
0387	01721	004010		SLB	
0388	01722	034132		ISZ	BADDR
0389	01723	160132		LDA	BADDR,I
0390	01724	004010		SLB	
0391	01725	001727		ALF,ALF	
0392	01726	010460		AND	M256
0393	01727	031364		IOR	IFIX
0394	01730	004010		SLB	
0395	01731	001727		ALF,ALF	
0396	01732	170132		STA	BADDR,I
0397	01733	125715		JMP	OUTCR,I

CHARACTER IN (A)
 SAVE CHARACTER
 COUNT IT
 FIRST CHARACTER
 OF BUFFER WORD?
 YES, MOVE TO FRESH WORD
 LOAD BUFFER WORD
 SAVE
 OTHER
 CHARACTER
 ADD NEW CHARACTER
 POSITION
 WORD AND
 STORE IT

0398*

0399*

0400	00160	TEMP	EQU	TEMPS+1
0401	00161	TEMP1	EQU	TEMPS+2
0402	00162	TEMP2	EQU	TEMPS+3
0403	00163	TEMP3	EQU	TEMPS+4
0404	00164	TEMP4	EQU	TEMPS+5
0405	00165	COLNT	EQU	TEMPS+6
0406	00163	STEMP	EQU	TEMPS+4
0407	01274	MANT1	EQU	SYMCK
0408	01336	MANT2	EQU	MDIM
0409	01603	EXPON	EQU	LETCK
0410	01633	DPFLG	EQU	BCKSP
0411	01715	ARYAD	EQU	OUTCR
0412	00567	EOL	EQU	CONST
0413	01734	FINBP	EQU	*

FIRST UNUSED WORD OF BASE PAGE

BASIC INTERPRETER CONTROL
CHECK SYNTAX AND TRANSLITERATE

PAGE 0041 #02 BASIC INTEPRETER CONTROL

0470	02046	066004	DATAI	LDB	LFEED	LOAD ADDRESS OF LINE FEED	
0471	02047	074152		STB	RSYM	STORE ADDRESS OF READY SYMBOL	
0472	02050	060137		LDA	TTYFL	TTY TAPE	
0473	02051	002002		SZA		INPUT?	
0474	02052	026056		JMP	GTRCD	YES, SUPPRESS LINE FEED	
0475	02053	003400		CCA		NO	
0476	02054	064152		LDB	RSYM	LOAD LF OR '?' ADDRESS	
0477	02055	114102		JSB	WRITE,I	PRINT LF OR '?', NO CR-LF	
0478*							
0479	02056	114123	GTRCD	JSB	IMOFF,I	TURN OFF KEYBOARD INTERRUPT MODE	
0480	02057	060366		LDA	.72		
0481	02060	064131		LDB	.BUFA		
0482	02061	114104		JSB	REED,I	GET RECORD FROM TTY	
0483	02062	050432		CPA	M2		
0484	02063	026115		JMP	RBOU	RUBOUT IN RECORD, INPUT AGAIN	
0485*							
0486	02064	003021	RPRCS	CMA,	SSA,RSS	SET A=-1-# CHARS AND CHECK FOR	
0487	02065	014477		JSB	ERROR	RECORD TOO LONG	
0488	02066	070133	RTLE	STA	CCNT	-1-# CHARACTERS < 0,SET CCNT	
0489	02067	060131		LDA	.BUFA	LOAD BUFFER ADDRESS	
0490	02070	000066		CLE,	ELA	SHIFT LEFT,LEAST BIT USED AS	
0491	02071	070132		STA	BADDR	ODD/EVEN FLAG	
0492	02072	015614		JSB	GETCR	FETCH FIRST CHARACTER	
0493	02073	026046		JMP	DATAI	NULL RECORD, INPUT AGAIN	
0494	02074	066121		LDB	DRQST		
0495	02075	006003		SZB,	RSS	DATA REQUEST?	
0496	02076	026126		JMP	CKRCD	NO DATA REQUEST,GO CHECK RECORD	
0497	02077	050372		CPA	S	ASCII S FIRST CHARACTER?	
0498	02100	016200		JSB	STOP	ASSUME STOP REQUESTED	
0499	02101	002400		CLA		LINE	
0500	02102	114102		JSB	WRITE,I	FEED	
0501	02103	015633		JSB	BCKSP	BACKSPACE	
0502	02104	060426		LDA	RMODE	RETURN TO	
0503	02105	070127		STA	LISTR	RUN MODE	
0504	02106	066121		LDB	DRQST		
0505	02107	002400		CLA			
0506	02110	072121		STA	DRQST	CLEAR DATA REQUEST FLAG	
0507	02111	114124		JSB	IMON,I	DATA REQUEST,TURN ON INTRPT MODE	
0508	02112	124001		JMP	1,I	GO TO DATA REQUEST CALLING POINT	
0509*							
0510	02113	056040		ASC	1,\		
0511	02114	002113		DEF	*-1		
0512	02115	066114	RBOU	LDB	*-1	OUTPUT '\ ' WITH	
0513	02116	002404		CLA,	INA	CARRIAGE RETURN	
0514	02117	114102		JSB	WRITE,I	AND LINE FEED	
0515	02120	026056		JMP	GTRCD		
0516*							
0517*	THIS SECTION REQUESTS DATA INPUT						
0518*							
0519	02121	000000	DRGST	NOP		EXIT/ENTRY AND FLAG	
0520	02122	064130		LDB	TLSTR	SHIFT TO	
0521	02123	074127		STB	LISTR	COMMAND MODE	
0522	02124	066005		LDB	QMRKA		
0523	02125	026047		JMP	DATAI+1	PRINT '?' AND WAIT	

0525*

0526* THIS SECTION CHECKS RECORD FOR SYSTEM COMMANDS.

0527*

0528	02126	064134	CKRCD	LDB	SBUFA	
0529	02127	074135		STB	SBPTR	INITIALIZE SYNTAX BUFFER POINTER
0530	02130	170135		STA	SBPTR,I	PUT FIRST CHAR IN SYNTAX BUFFER
0531	02131	015603		JSB	LETCK	IS CHARACTER A LETTER
0532	02132	026220		JMP	SYNTAX	NO, TRY SYNTAX
0533*						
0534	02133	060306		LDA	TBLAD	LOAD SYS CMND TABLE START POINT
0535	02134	064440		LDB	M8	LOOK FOR A
0536	02135	114212		JSB	TSRCH,I	SYSTEM COMMAND
0537	02136	014477		JSB	ERROR	NOT A VALID COMMAND
0538*						
0539	02137		INVSC	EQU	*	INVALID CMND ERROR REFERENCE
0540*						
0541	02137	001727		ALF,	ALF	ENTRY FOUND
0542	02140	001100		ARS		MOVE JMP ADDR TO LEAST BITS POS.
0543	02141	042007		ADA	CMNDA	ADD START ADDR. OF CMND ROUTINES
0544	02142	072200		STA	STOP	SAVE (A)
0545	02143	002400		CLA		OUTPUT
0546	02144	114102		JSB	WRITE,I	A CR-LF
0547	02145	126200		JMP	STOP,I	EXECUTE COMMAND

```

0549*
0550*   THIS SETS UP AND EXECUTES THE SYSTEM COMMANDS
0551*
0552   02146           CMADS EQU *           COMMAND LIST REFERENCE
0553*
0554   02146 114124   RUN   JSB IMON,I       TURN ON TTY INTERRUPT MODE
0555   02147 124202           JMP RUNA,I     GO TO RUN ENTRY POINT
0556*
0557   02150 026020   SCRTH JMP FLUSH       SCRATCH CURRENT PROGRAM
0558*
0559   02151 060130   TLIST LDA TLSTR       LIST PROGRAM, TFLAG = 0
0560   02152 006401           CLB,RSS
0561*
0562   02153 060126   PLIST LDA PLSTR       PUNCH PROGRAM, TFLAG # 0
0563   02154 070127           STA LISTR       SET DRIVER ADDRESS
0564   02155 074136           STB TFLAG       SET DEVICE FLAG
0565   02156 114124   JSB IMON,I       TURN ON TTY INTERRUPT MODE
0566   02157 124207           JMP LISTA,I     GO TO LIST ENTRY POINT
0567*
0568   02160 114124   PTAPE JSB IMON,I     PTAPE COMMAND
0569   02161 060366           LDA .72
0570   02162 064131           LDB .BUFA
0571   02163 114101   JSB PREAD,I     GET RECORD FROM PHOTO READER
0572   02164 050432           CPA M2         END OF TAPE?
0573   02165 026174           JMP EOTR       YES,GO SEE IF START OR END
0574   02166 050433           CPA M3         PHOTO READER READY?
0575   02167 014477           JSB ERROR      NO
0576   02170 002003   PRERR SZA,RSS   YES
0577   02171 026161   JMP PTAPE+1     NULL RECORD
0578   02172 070136   STA TFLAG       SET FLAG # 0
0579   02173 026064   JMP RPRCS       GO PROCESS RECORD
0580*
0581   02174 064136   EOTR  LDB TFLAG
0582   02175 006003           SZB,RSS       START OR END OF TAPE?
0583   02176 026161   JMP PTAPE+1     START
0584   02177 026027   JMP RDYPT       GO TO READY POINT
0585*
0586*   STOP COMMAND SERVICE
0587*
0588   02200 000000   STOP  NOP
0589   02201 114123   JSB IMOFF,I     TURN OFF KEYBOARD INTERRUPT MODE
0590   02202 064130   LDB TLSTR       SHIFT TO
0591   02203 074127   STB LISTR       COMMAND MODE
0592   02204 060470   LDA MNEG
0593   02205 002006   INA,SZA
0594   02206 026205   JMP *-1         DELAY FOR 100 MILLISECONDS
0595   02207 114102   JSB WRITE,I     CARRIAGE-RETURN LINE-FEED
0596   02210 060327   LDA .4
0597   02211 066006   LDB STOPA
0598   02212 114102   JSB WRITE,I     PRINT "STOP"
0599   02213 026027   JMP RDYPT

```

PAGE 0044 #02 BASIC INTERPRETER CONTROL

0601*
0602** SET LINE FEED SUPPRESSION
0603*
0604 02214 070137 TAPE STA TTYFL SET TO 'TAPE' MODE
0605 02215 026056 JMP 0TRCD
0606*
0607** RETURN TO 'BOSS' EXECUTIVE
0608*
0609 02216 002400 BYEC CLA
0610 02217 024077 JMP 77B

```

0002*
0003* *****
0004****
0005*** CHECK SYNTAX OF STATEMENT ***
0006****
0007* *****
0008*
0009**
0010*** DETERMINE SEQUENCE NUMBER **
0011**
0012 02220 114216 SYNTAX JSB INCHK,I RECORD
0013 02221 000463 DEF MAXSN SEQUENCE NUMBER
0014 02222 034135 ISZ SBPTR SAVE SPACE FOR LENGTH WORD
0015 02223 074145 STB .LNUM SAVE LINE NUMBER
0016 02224 064134 LDB SBUFA SET
0017 02225 006004 INB TEMP TO
0018 02226 074160 STB TEMP (SBUFF)+1
0019**
0020*** DETERMINE STATEMENT TYPE **
0021**
0022 02227 050334 CPA .10 NULL STATEMENT?
0023 02230 124253 JMP DELST,I YES, DELETE IT
0024 02231 170135 STA SBPTR,I NO, RECORD NEXT CHARACTER
0025 02232 060307 LDA STTYP PRINT-TABLE ADDRESS
0026 02233 064446 LDB M21 -(NUMBER OF ENTRIES)
0027 02234 114212 JSB Tsrch,I FIND STATEMENT TYPE
0028 02235 014477 JSB ERROR NOT FOUND
0029 02236 064441 SYNE1 LDB M9 SET MULTIPLE STORE
0030 02237 076330 STB MSFLG TO FALSE
0031 02240 064113 LDB PBPTR NULL
0032 02241 054112 CPB PBUFF PROGRAM?
0033 02242 002001 RSS YES
0034 02243 026247 JMP SYNT1 NO
0035 02244 064110 LDB FWAM INSURE NO
0036 02245 074112 STB PBUFF SPURIOUS COMMON
0037 02246 074113 STB PBPTR EXISTS
0038 02247 074157 SYNT1 STB TEMPS SET S-STACK POINTER
0039 02250 006400 CLB SET DEFINE FLAG
0040 02251 076332 STB DFLAG TO FALSE
0041 02252 076334 STB PFLAG SET PARAMETER FLAG TO FALSE
0042 02253 001727 ALF,ALF COMPUTE
0043 02254 001300 RAR ADDRESS OF
0044 02255 040302 ADA STBAS SYNTAX ROUTINE AND
0045 02256 124000 JMP 0,I BRANCH TO IT
0046**
0047*** SINGLE CHARACTER AND/OR FORMULA OPERATORS **
0048**
0049 02257 001000 QUOTE OCT 1000 BITS 15-9 OF THE LABELLED WORD
0050 02260 021040 ASC 1,"
0051 02261 002000 COMMA OCT 2000 ARE THE BASIC CODE OPERATOR
0052 02262 026040 ASC 1,,
0053 02263 003000 SMCLN OCT 3000 NUMBERS. BITS 3-0 ARE THE
0054 02264 035440 ASC 1,, OPERATOR'S HIERARCHICAL
0055 02265 004001 RPARN OCT 4001
0056 02266 024440 ASC 1,) PRECEDENCE FOR THOSE OPERATORS
0057 02267 005001 RBRAC OCT 5001

```

0058	02270	056440		ASC 1,1	
0059	02271	006002	SCMMA	OCT 6002	BELONGING TO FORMULAS. THE
0060	02272	026040		ASC 1,,	
0061	02273	007002	ASSOP	OCT 7002	UNLABELLED WORD GIVES THE
0062	02274	036440		ASC 1,=	
0063	02275	010007	PLLS	OCT 10007	ASCII REPRESENTATION OF THE
0064	02276	025440		ASC 1,+	
0065	02277	011007	MINUS	OCT 11007	SINGLE CHARACTER OPERATORS.
0066	02300	026440		ASC 1,-	
0067	02301	012010	TIMES	OCT 12010	
0068	02302	025040		ASC 1,*	
0069	02303	013010	DIV	OCT 13010	
0070	02304	027440		ASC 1,/	
0071	02305	014012	EXPS	OCT 14012	
0072	02306	057040		ASC 1,^	
0073	02307	015005	GTR	OCT 15005	
0074	02310	037040		ASC 1,>	
0075	02311	016005	LSS	OCT 16005	
0076	02312	036040		ASC 1,<	
0077	02313	017005	UNEQL	OCT 17005	
0078	02314	021440		ASC 1,#	
0079	02315	020005	EQUAL	OCT 20005	
0080	02316	036440		ASC 1,=	
0081	02317	021011	UNMIN	OCT 21011	
0082	02320	026440		ASC 1,-	
0083	02321	022020	LBRAC	OCT 22020	
0084	02322	055440		ASC 1,	
0085	02323	023020	LPARN	OCT 23020	
0086	02324	024040		ASC 1,(
0087	02325	024011	UPLUS	OCT 24011	
0088	02326	025440		ASC 1,+	
0089	02327	025003	ORCP	OCT 25003	
0090	02330	000000	MSFLG	NOP	
0091	02331	026004	ANDOP	OCT 26004	
0092	02332	000000	DFLAG	NOP	
0093	02333	027011	NOTOP	OCT 27011	
0094	02334	000000	PFLAG	NOP	
0095	02335	030005	GTREQ	OCT 30005	
0096	02336	000000	UFLAG	NOP	
0097	02337	031005	LSSEQ	OCT 31005	
0098*					
0099***				***	
0100**	LET	STATEMENT	SYNTAX	**	
0101***				***	
0102*					
0103	02340	077530	LETS	STB SFLAG	SET 'NO STORE' FLAG ((B) = 0)
0104	02341	060440		LDA MB	SET MULTIPLE STORE FLAG
0105	02342	072330		STA MSFLG	TO TRUE
0106	02343	017114		JSB FSC	FETCH FORMULA
0107	02344	057530		CPB SFLAG	DID STORE OCCUR? ((B)=0)
0108	02345	014477		JSB ERROR	NO
0109	02346		SYNE2	EQU *	
0110**					
0111***	CHECK	FOR	END	OF	STATEMENT **
0112**					
0113	02346	050334	EOST	CPA .10	END-OF-STATEMENT?

PAGE 0047 #03 CHECK SYNTAX AND TRANSLITERATE

0114	02347	124252	JMP ACCST,I	YES, ACCEPT STATEMENT
0115	02350	024266	JMP NOEOF	NO, ILLEGAL CHARACTER

```

0117*
0118***
0119** DIM STATEMENT SYNTAX **
0120***
0121*
0122 02351 036332 DIMS ISZ DFLAG SET DFLAG TO TRUE
0123 02352 017530 JSB ARRYS CHECK AN ARRAY
0124 02353 124252 JMP ACCST,I DONE
0125 02354 026352 JMP DIMS+1 WAS A COMMA, CONTINUE
0126*
0127***
0128** COM STATEMENT SYNTAX **
0129***
0130*
0131 02355 064113 COMS LDB PBPTR HAS PROGRAM BUFFER
0132 02356 054110 CPB FWAM BEEN MOVED?
0133 02357 002001 RSS NO
0134 02360 014477 JSB ERROR YES, ILLEGAL COM
0135 02361 074166 SYNE3 STB TEMPS+7 SET ARRAY POINTER
0136 02362 036332 ISZ DFLAG SET DEFINE FLAG TO TRUE
0137 02363 003400 COMS1 CCA SET COMMON FLAG
0138 02364 072334 STA PFLAG TO TRUE
0139 02365 017530 JSB ARRYS CHECK AN ARRAY
0140 02366 002001 RSS DONE
0141 02367 026363 JMP COMS1 MORE ARRAYS
0142 02370 064166 LDB TEMPS+7 FETCH UPDATED POINTER
0143 02371 074112 STB PBUFF SET PROGRAM BUFFER ADDRESS
0144 02372 074113 STB PBPTR SET PROGRAM BUFFER POINTER
0145 02373 124252 JMP ACCST,I EXIT
0146*
0147***
0148** DEF STATEMENT SYNTAX **
0149***
0150*
0151 02374 017635 DEFS JSB LTR
0152 02375 026405 JMP SYNE4 FIRST
0153 02376 060161 LDA TEMP1
0154 02377 001727 ALF,ALF TWO CHARACTERS
0155 02400 030162 IOR TEMP2
0156 02401 050464 CPA FN 'FN'?
0157 02402 002001 RSS YES
0158 02403 026405 JMP SYNE4 NO
0159 02404 017635 JSB LTR LETTER FOLLOWS?
0160 02405 014477 SYNE4 JSB ERROR NO
0161 02406 060161 LDA TEMP1 YES, RECORD A
0162 02407 064361 LDB .58 FUNCTION
0163 02410 017650 JSB STROP NAME
0164 02411 060162 LDA TEMP2 RETRIEVE CHARACTER
0165 02412 017661 JSB LPCK LEFT PARENTHESIS?
0166 02413 030470 IOR FLOBT YES, SET FORMAL
0167 02414 170135 STA SBPTR,I PARAMETER BIT
0168 02415 017556 JSB VAROP FETCH SIMPLE VARIABLE
0169 02416 000000 NOP NONE FOUND
0170 02417 014477 JSB ERROR SUBSCRIPTED VARIABLE FOUND
0171 02420 017671 SYNE5 JSB RPCK RECORD A RIGHT PARENTHESIS
0172 02421 007400 CCB ASSIGNMENT

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0173	02422	015274		JSB	SYMCK	
0174	02423	002272		DEF	ASSOP-1	OPERATOR?
0175	02424	014477	SYNE6	JSB	ERROR	NO
0176	02425	060432		LDA	M2	YES,
0177	02426	040135		ADA	SBPTR	RETRIEVE
0178	02427	160000		LDA	0,I	PARAMETER
0179	02430	010401		AND	MSK1	AND
0180	02431	072334		STA	PFLAG	SAVE IT
0181	02432	017114		JSB	FSC	FETCH DEFINING FORMULA
0182	02433	026346		JMP	EOST	END-OF-STATEMENT TEST
0183*						
0184***						***
0185**	REM	STATEMENT	SYNTAX	**		**
0186***						***
0187*						
0188	02434	060334	REMS	LDA	.10	DUMMY STRING TERMINATOR
0189	02435	114251		JSB	CHRSA,I	FETCH CHARACTER STRING
0190	02436	124252		JMP	ACCST,I	
0191*						
0192***						***
0193**	IF	STATEMENT	SYNTAX	**		**
0194***						***
0195*						
0196	02437	017114	IFS	JSB	FSC	GET DECISION FORMULA
0197	02440	170135		STA	SBPTR,I	TABLE
0198	02441	060316		LDA	ATHEN	SEARCH
0199	02442	007400		CCB		FOR
0200	02443	114212		JSB	TSRCH,I	'THEN'
0201	02444	014477		JSB	ERROR	NOT FOUND
0202	02445		SYNE7	EQU	*	GET STATEMENT LABEL NUMBER
0203*						
0204***						***
0205**	GO TO AND	GOSUB	STATEMENT	SYNTAX	**	**
0206***						***
0207	02445	114221	GOTOS	JSB	PGINT,I	FETCH AND RECORD
0208	02446	000463		DEF	MAXSN	SEQUENCE NUMBER
0209	02447	026346		JMP	EOST	END-OF-STATEMENT TEST
0210*						
0211*						
0212***						***
0213**	FOR	STATEMENT	SYNTAX	**		**
0214***						***
0215*						
0216	02450	017556	FORS	JSB	VAROP	FETCH SIMPLE VARIABLE
0217	02451	000000		NOP		NONE FOUND
0218	02452	014477	SYNE8	JSB	ERROR	SUBSCRIPTED VARIABLE FOUND
0219	02453	007400		CCB		
0220	02454	015274		JSB	SYMCK	ASSIGNMENT
0221	02455	002272		DEF	ASSOP-1	OPERATOR?
0222	02456	026424		JMP	SYNE6	NO
0223	02457	017114		JSB	FSC	YES, FETCH INITIAL VALUE FORMULA
0224	02460	170135		STA	SBPTR,I	LOOK
0225	02461	060317		LDA	ATO	FOR
0226	02462	007400		CCB		THE
0227	02463	114212		JSB	TSRCH,I	'TO'
0228	02464	014477		JSB	ERROR	MISSING

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0229	02465	017114	SYNE9	JSB	FSC	GET LIMIT FORMULA
0230	02466	050334		CPA	.10	END-OF-STATEMENT?
0231	02467	124252		JMP	ACCST,I	YES
0232	02470	007400		CCB		NO, ERASE
0233	02471	044135		ADB	SBPTR	ZERO
0234	02472	074135		STB	SBPTR	WORD
0235	02473	170135		STA	SBPTR,I	NOW
0236	02474	060320		LDA	ASTEP	LOOK
0237	02475	007400		CCB		FOR
0238	02476	114212		JSB	TBRCH,I	THE 'STEP'
0239	02477	014477		JSB	ERROR	MISSING
0240	02500	017114	SYE10	JSB	FSC	GET STEP SIZE FORMULA
0241	02501	026346		JMP	EOST	END-OF-STATEMENT TEST
0242*						
0243***						***
0244**	NEXT	STATEMENT	SYNTAX	**		
0245***						***
0246*						
0247	02502	017556	NXTS	JSB	VAROP	FETCH SIMPLE VARIABLE
0248	02503	000000		NOP		NONE FOUND
0249	02504	026452		JMP	SYNE6	SUBSCRIPTED VARIABLE FOUND
0250	02505	026346		JMP	EOST	END-OF-STATEMENT TEST
0251*						
0252***						***
0253**	END,	STOP,	RESTORE,	RETURN	STATEMENT	SYNTAX **
0254***						***
0255*						
0256	02506	034135	ENDS	ISZ	SBPTR	
0257	02507	015614		JSB	GETCR	END-OF-STATEMENT?
0258	02510	124252		JMP	ACCST,I	YES
0259	02511	024266		JMP	NOEOF	NO
0260*						
0261***						***
0262**	WAIT	STATEMENT	SYNTAX	**		
0263***						***
0264*						
0265	02512	017734	WAITS	JSB	GETPF	
0266	02513	026346		JMP	EOST	END-OF-STATEMENT TEST
0267*						
0268***						***
0269**	CALL	STATEMENT	SYNTAX	**		
0270***						***
0271*						
0272	02514	015614	CALLS	JSB	GETCR	FETCH AND
0273	02515	024265		JMP	EOF	RECORD
0274	02516	034135		ISZ	SBPTR	LEFT
0275	02517	017661		JSB	LPCK	PARENTHESIS
0276	02520	114221		JSB	PGINT,I	FETCH AND RECORD
0277	02521	000453		DEF	D100	SUBROUTINE NUMBER
0278	02522	070161		STA	TEMP1	SAVE NEXT CHARACTER
0279	02523	015323		JSB	FND88	FIND
0280	02524	160001		LDA	1,I	NUMBER
0281	02525	001727		ALF,	ALF	OF
0282	02526	010344		AND	.31	PARAMETERS
0283	02527	003000		CMA		RECORD
0284	02530	070166		STA	TEMPS+7	COMPLEMENT - 1

0285	02531	060161		LDA TEMP1	RETRIEVE CHARACTER
0286	02532	007400	CALL2	CCB	
0287	02533	015274		JSB SYMCK	COMMA?
0288	02534	002260		DEF COMMA-1	
0289	02535	026543		JMP CALL3	NO
0290	02536	034166		ISZ TEMPS+7	YES, MORE
0291	02537	002001		RSS	PARAMETERS PERMITTED?
0292	02540	014477	SYE11	JSB ERROR	NO
0293	02541	017114		JSB F8C	YES, FETCH
0294	02542	026532		JMP CALL2	PARAMETER FORMULA
0295	02543	034166	CALL3	ISZ TEMPS+7	ALL PARAMETERS PRESENT?
0296	02544	026540		JMP SYE11	NO
0297	02545	017671		JSB RPCK	YES, FETCH RIGHT PARENTHESIS
0298	02546	026346		JMP EOST	END-OF-STATEMENT TEST
0299*					
0300***				***	
0301**	DATA STATEMENT SYNTAX			**	
0302***				***	
0303*					
0304	02547	014567	DATAS	JSB CONST	FETCH A CONSTANT
0305	02550	024613		JMP SYE12-1	NONE FOUND
0306	02551	017744		JSB NUMOP	FIX UP PRECEDING OPERATOR
0307	02552	007400		CCB	CHECK
0308	02553	015274		JSB SYMCK	FOR A
0309	02554	002260		DEF COMMA-1	COMMA
0310	02555	026346		JMP EOST	END-OF-STATEMENT TEST
0311	02556	026547		JMP DATAS	FETCH ANOTHER NUMBER
0312*					
0313***				***	
0314**	READ AND INPUT STATEMENT SYNTAX			**	
0315***				***	
0316*					
0317	02557	017556	READS	JSB VAROP	RECORD VARIABLE OPERAND
0318	02560	014477		JSB ERROR	MISSING
0319	02561	000000	SYE13	NOP	
0320	02562	007400		CCB	CHECK
0321	02563	015274		JSB SYMCK	FOR A
0322	02564	002260		DEF COMMA-1	COMMA
0323	02565	002001		RSS	
0324	02566	026557		JMP READS	IS, FETCH NEXT ITEM
0325	02567	006400		CLB	APPEND
0326	02570	174135		STB SBPTR, I	END-OF-FORMULA
0327	02571	034135		ISZ SBPTR	OPERATOR
0328	02572	026346		JMP EOST	END OF STATEMENT TEST
0329*					
0330***				***	
0331**	PRINT STATEMENT SYNTAX			**	
0332***				***	
0333*					
0334	02573	064432	PRIN1	LDB M2	NO,
0335	02574	015274		JSB SYMCK	COMMA OR
0336	02575	002260		DEF COMMA-1	SEMICOLON?
0337	02576	026604		JMP PRIN2	NO
0338	02577	003400	PRINS	CCA	YES, ENABLE
0339	02600	170160		STA TEMP, I	FORMULA
0340	02601	034135		ISZ SBPTR	

0341	02602	015614		JSB GETCR	END-OF-STATEMENT?
0342	02603	124252		JMP ACCST, I	YES
0343	02604	007400	PRIN2	CCB	
0344	02605	015274		JSB SYMCK	QUOTE?
0345	02606	002256		DEF QUOTE-1	
0346	02607	026623		JMP PRIN3	NO
0347	02610	060347		LDA .34	YES, SET QUOTE AS TERMINATOR
0348	02611	114281		JSB CHRSA, I	CHARACTER AND FETCH STRING
0349	02612	014477		JSB ERROR	MISSING QUOTE
0350	02613	062257	SYE14	LDA QUOTE	RECORD
0351	02614	170135		STA SBPTR, I	QUOTE
0352	02615	034135		ISZ SBPTR	
0353	02616	015614		JSB GETCR	END-OF-STATEMENT?
0354	02617	124252		JMP ACCST, I	YES
0355	02620	007400		CCB	ENABLE
0356	02621	174160		STB TEMP, I	FORMULA
0357	02622	026573		JMP PRIN1	NO
0358	02623	134160	PRIN3	ISZ TEMP, I	TAB OR FORMULA PERMITTED?
0359	02624	014477		JSB ERROR	NO
0360	02625	170135	SYE15	STA SBPTR, I	SEARCH
0361	02626	060322		LDA ATAB	FOR
0362	02627	007400		CCB	'TAB'
0363	02630	114212		JSB TSRCH, I	
0364	02631	002401		CLA, RSS	NOT FOUND
0365	02632	060424		LDA TABCN	
0366	02633	007400		CCB	BACKUP
0367	02634	044135		ADB SBPTR	TO WORD WITH
0368	02635	074135		STB SBPTR	PREVIOUS OPERATOR
0369	02636	002003		SZA, RSS	'TAB' ?
0370	02637	026647		JMP PRIN4	NO
0371	02640	130135		IOR SBPTR, I	
0372	02641	170135		STA SBPTR, I	YES, RECORD IT
0373	02642	017734		JSB GETPF	FETCH PARAMETER
0374	02643	006400		CLB	FOLLOW
0375	02644	174135		STB SBPTR, I	WITH A
0376	02645	034135		ISZ SBPTR	ZERO
0377	02646	026651		JMP PRIN5	
0378	02647	015633	PRIN4	JSB BCKSP	BACKSPACE OVER LAST CHARACTER
0379	02650	017114		JSB F8C	FETCH FORMULA
0380	02651	050334	PRIN5	CPA .10	END-OF-STATEMENT?
0381	02652	124252		JMP ACCST, I	YES
0382	02653	026573		JMP PRIN1	NO
0383*					
0384***				***	
0385**	MAT	STATEMENT	SYNTAX	**	
0386***				***	
0387*					
0388	02654	017635	MATS	JSB LTR	FIRST
0389	02655	014477		JSB ERROR	TWO CHARACTERS
0390	02656	015603	SYE16	JSB LETCK	LETTERS?
0391	02657	026722		JMP MATS2	NO
0392	02660	034135		ISZ SBPTR	YES, MOVE TO FRESH S-BUFFER WORD
0393	02661	064161		LDB TEMP1	RETRIEVE FIRST LETTER AND
0394	02662	005727		BLF, BLF	PUT IT IN THE
0395	02663	030001		IOR 1	UPPER CHARACTER OF (A)
0396	02664	170135		STA SBPTR, I	SEARCH

0397	02665	060310		LDA MAT10	FOR
0398	02666	064432		LDB M2	'READ' OR
0399	02667	114212		JSB TSRCH,I	'PRINT'
0400	02670	014477		JSB ERROK	NOT FOUND
0401	02671	050416	SYE17	CPA RDOP	READ?
0402	02672	026710		JMP MATS1	YES
0403	02673	017544	MATS0	JSB ARRID	RECORD ARRAY
0404	02674	050334		CPA .10	END-OF-STATEMENT?
0405	02675	124252		JMP ACCST,I	YES
0406	02676	064432		LDB M2	NO,
0407	02677	015274		JSB SYMCK	COMMA OR
0408	02700	002260		DEF COMMA-1	SEMICOLON?
0409	02701	014477		JSB ERROR	NO
0410	02702	015614	SYE18	JSB GETCR	END-OF-STATEMENT?
0411	02703	026706		JMP *+3	YES
0412	02704	015633		JSB BCKSP	NO
0413	02705	026673		JMP MATS0	
0414	02706	034135		ISZ SBPTR	INCLUDE
0415	02707	124252		JMP ACCST,I	PARAMETER
0416	02710	017544	MATS1	JSB ARRID	RECORD ARRAY
0417	02711	017704		JSB MATS0	IF SUBSCRIPT,
0418	02712	000000		NOP	RECORD IT
0419	02713	050334		CPA .10	END-OF-STATEMENT?
0420	02714	124252		JMP ACCST,I	YES
0421	02715	007400		CCB	NO
0422	02716	015274		JSB SYMCK	
0423	02717	002260		DEF COMMA-1	COMMA?
0424	02720	026701		JMP SYE18-1	NO
0425	02721	026710		JMP MATS1	YES
0426	02722	070162	MATS2	STA TEMP2	
0427	02723	060135		LDA SBPTR	SAVE
0428	02724	071715		STA ARYAD	OPERAND ADDRESS
0429	02725	060161		LDA TEMP1	RETRIEVE FIRST LETTER
0430	02726	064355		LDB .46	RECORD AN
0431	02727	017650		JSB STROP	ARRAY
0432	02730	060162		LDA TEMP2	RETRIEVE CHARACTER
0433	02731	007400		CCB	ASSIGNMENT
0434	02732	015274		JSB SYMCK	
0435	02733	002272		DEF ASSOP-1	OPERATOR?
0436	02734	026424		JMP SYNE6	NO
0437	02735	161715		LDA ARYAD,I	YES, RETRIEVE
0438	02736	010401		AND MSK1	AND SAVE
0439	02737	170160		STA TEMP,I	PREVIOUS ARRAY IDENTIFIER
0440	02740	017635		JSB LTR	LETTER NEXT?
0441	02741	027010		JMP MATS4	NO
0442	02742	015603		JSB LETCK	YES, SECOND LETTER?
0443	02743	027024		JMP MATS5	NO
0444	02744	034135		ISZ SBPTR	YES,
0445	02745	064161		LDB TEMP1	CONCATENATE
0446	02746	005727		BLF,BLF	LETTERS
0447	02747	030001		IOR 1	AND
0448	02750	170135		STA SBPTR,I	SEARCH
0449	02751	060313		LDA MATFN	FOR
0450	02752	064435		LDB M5	ARRAY
0451	02753	114212		JSB TSRCH,I	FUNCTION
0452	02754	014477		JSB ERROR	NOT FOUND

0453	02755	001727	SYE19	ALF,ALF	FOUND
0454	02756	001723		ALF,RAR	POSITION IT,
0455	02757	040336		ADA .15	COMPLETE OPERAND,
0456	02760	007400		CCB	COMBINE
0457	02761	044135		ADB SBPTR	WITH
0458	02762	130001		IOR 1,I	OPERATOR,
0459	02763	030470		IOR FLGBT	ADD FLAG BIT,
0460	02764	170001		STA 1,I	AND STORE
0461	02765	010401		AND MSK1	'INV'
0462	02766	040460		ADA M256	OR
0463	02767	002021		SSA,RSS	'TRN?
0464	02770	026776		JMP MATS3	YES
0465	02771	015614		JSB GETCR	NO, END-OF-STATEMENT?
0466	02772	124252		JMP ACCST,I	YES
0467	02773	017704		JSB MATSB	NO, SUBSCRIPT?
0468	02774	014477		JSB ERROR	NO
0469	02775	024266	SYE20	JMP NOEOF	
0470	02776	015614	MATS3	JSB GETCR	
0471	02777	024265		JMP EOF	
0472	03000	017661		JSB LPCK	GET LEFT PARENTHESIS
0473	03001	017544		JSB ARRID	FETCH AND RECORD AN ARRAY
0474	03002	017671		JSB RPCK	RECORD A RIGHT PARENTHESIS
0475	03003	161715		LDA ARYAD,I	RETRIEVE
0476	03004	010401		AND MSK1	PREVIOUS ARRAY IDENTIFIER
0477	03005	150160		CPA TEMP,I	MATCH LEFT-HAND SIDE ARRAY?
0478	03006	014477		JSB ERROR	YES
0479	03007	124252	SYE21	JMP ACCST,I	NO
0480	03010	034135	MATS4	ISZ SBPTH	
0481	03011	017661		JSB LPCK	FETCH LEFT PARENTHESIS
0482	03012	017114		JSB FSC	FETCH FORMULA
0483	03013	017671		JSB RPCK	FETCH RIGHT PARENTHESIS
0484	03014	007400		CCB	MULTIPLICATION
0485	03015	015274		JSB SYMCK	OPERATOR?
0486	03016	002300		DEF TIMES-1	
0487	03017	014477		JSB ERROR	NO
0488	03020	017544	SYE22	JSB ARRID	YES, FETCH AND RECORD ARRAY
0489	03021	050334		CPA .10	END-OF-STATEMENT?
0490	03022	124252		JMP ACCST,I	YES
0491	03023	024266		JMP NOEOF	NO
0492	03024	070162	MATS5	STA TEMP2	
0493	03025	060135		LDA SBPTR	SAVE
0494	03026	071715		STA ARYAD	OPERAND ADDRESS
0495	03027	060161		LDA TEMP1	RETRIEVE
0496	03030	064355		LDB .46	AND RECORD
0497	03031	017660		JSB STROP	ARRAY
0498	03032	060162		LDA TEMP2	END-OF-
0499	03033	050334		CPA .10	STATEMENT?
0500	03034	124252		JMP ACCST,I	YES
0501	03035	064433		LDB M3	NO, MUST BE
0502	03036	015274		JSB SYMCK	A '+',
0503	03037	002274		DEF PLUS-1	'-', OR '*'
0504	03040	014477		JSB ERROR	ISN'T
0505	03041	006400	SYE23	CLB	IS, SET FOR FALSE
0506	03042	040332		ADA .8	
0507	03043	052301		CPA TIMES	'*'?
0508	03044	027061		JMP MATS7	YES

0509	03045	076334	MATS6	STB	PFLAG	NO, SET PFLAG
0510	03046	017544		JSB	ARRID	GET SECOND ARRAY
0511	03047	050334		CPA	.10	END-OF-STATEMENT?
0512	03050	002001		RSS		YES
0513	03051	024266		JMP	NOEOF	NO
0514	03052	036334		ISZ	PFLAG	WAS OPERATOR A '*'?
0515	03053	124252		JMP	ACCST,I	NO
0516	03054	161715		LDA	ARYAD,I	YES, RETRIEVE
0517	03055	010401		AND	MSK1	SECOND ARRAY
0518	03056	150160		CPA	TEMP,I	MATCH LEFT-HAND SIDE ARRAY?
0519	03057	014477	SYE24	JSB	ERROR	YES
0520	03060	124252		JMP	ACCST,I	NO
0521	03061	161715	MATS7	LDA	ARYAD,I	RETRIEVE
0522	03062	010401		AND	MSK1	ARRAY
0523	03063	007400		CCB		SET FOR TRUE
0524	03064	150160		CPA	TEMP,I	MATCH LEFT-HAND SIDE ARRAY?
0525	03065	027057		JMP	SYE24	YES
0526	03066	027045		JMP	MATS6	NO

0527**

0528** JUMP TABLE FOR STATEMENT SYNTAX **

0529**

0530	03067	002340	SYNTB	DEF	LETS	LET
0531	03070	002351		DEF	DIMS	DIM
0532	03071	002355		DEF	COMS	COM
0533	03072	002374		DEF	DEFS	DEF
0534	03073	002434		DEF	REMS	REM
0535	03074	002445		DEF	GOTOS	GO TO
0536	03075	002437		DEF	IFS	IF
0537	03076	002450		DEF	FORS	FOR
0538	03077	002502		DEF	NXTS	NEXT
0539	03100	002445		DEF	GOTOS	GOSUB
0540	03101	002506		DEF	ENDS	RETURN
0541	03102	002506		DEF	ENDS	END
0542	03103	002506		DEF	ENDS	STOP
0543	03104	002512		DEF	WAITS	WAIT
0544	03105	002514		DEF	CALLS	CALL
0545	03106	002547		DEF	DATAS	DATA
0546	03107	002557		DEF	READS	READ
0547	03110	002577		DEF	PRINS	PRINT
0548	03111	002557		DEF	READS	INPUT
0549	03112	002506		DEF	ENDS	RESTORE
0550	03113	002654		DEF	MATS	MAT

0551*

0552***

0553** FORMULA SYNTAX CHECKER **

0554***

0555*

0556	03114	000000	FSC	NOP	
0557	03115	002400		CLA	SET LEFT PARENTHESIS
0558	03116	170157		STA	TEMPS,I
0559	03117	003400	FSC1	CCA	COUNT TO ZERO
0560	03120	072336		STA	UFLAG
0561	03121	017556	FSC2	JSB	VAROP
0562	03122	027261		JMP	FSC9
0563	03123	027227		JMP	FSC6
0564	03124	015603		JSB	LETCK

SET UNARY FLAG
TO TRUE
LOOK FOR VARIABLE OPERAND
NOT FOUND
SUBSCRIPTED VARIABLE FOUND
FOLLOWED BY LETTER?

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0565	03125	027227		JMP FSC6	NO
0566	03126	064432		LDB M2	YES, LOOK FOR
0567	03127	017322		JSB MCBCK	'AND' OR 'OR'
0568	03130	060161		LDA TEMP1	NOT FOUND, FETCH PREVIOUS
0569	03131	001727		ALF,ALF	CHARACTER AND LEFT-JUSTIFY IT
0570	03132	030162		IOR TEMP2	ADD LATEST CHARACTER
0571	03133	050464		CPA FN	'FN'?
0572	03134	027162		JMP FSC4	YES
0573	03135	170135		STA SBPTR,I	NO,
0574	03136	060312		LDA PDFNS	SEARCH FOR
0575	03137	064443		LDB M11	PREDEFINED
0576	03140	114212		JSB TSRCH,I	FUNCTION
0577	03141	027146		JMP FSC3	NOT FOUND
0578	03142	001727		ALF,ALF	ASSEMBLE
0579	03143	001723		ALF,RAR	OPERAND
0580	03144	030470		IOR FLGBT	ADD FLAG BIT
0581	03145	027170		JMP FSC5	
0582	03146	036336	FSC3	ISZ UFLAG	'NOT' PERMITTED?
0583	03147	027252		JMP FSC8-1	NO
0584	03150	060321		LDA ANOT	YES,
0585	03151	007400		CCB	SEARCH FOR
0586	03152	114212		JSB TSRCH,I	'NOT'
0587	03153	027252		JMP FSC8-1	'NOT' NOT FOUND
0588	03154	007400		CCB	RETRIEVE
0589	03155	044135		ADB SBPTR	PREVIOUS WORD
0590	03156	160001		LDA 1,I	WORD
0591	03157	010420		AND OPMSK	SET TO
0592	03160	170001		STA 1,I	NULL OPERAND
0593	03161	027317		JMP FSC14	
0594	03162	015614	FSC4	JSB GETCR	IDENTIFYING
0595	03163	026405		JMP SYNE4	FUNCTION
0596	03164	015603		JSB LETCK	LETTER?
0597	03165	026405		JMP SYNE4	NO
0598	03166	040453		ADA D100	YES,
0599	03167	001700		ALF	ASSEMBLE AND
0600	03170	040336	FSC5	ADA .15	SAVE
0601	03171	070161		STA TEMP1	FUNCTION IDENTIFIER
0602	03172	007400		CCB	RETRIEVE
0603	03173	044135		ADB SBPTR	PREVIOUS
0604	03174	160001		LDA 1,I	PROGRAM WORD
0605	03175	010420		AND OPMSK	EXTRACT OPERATOR,
0606	03176	030161		IOR TEMP1	APPEND OPERAND,
0607	03177	170001		STA 1,I	AND RECORD
0608	03200	015614		JSB GETCR	LEFT PARENTHESIS
0609	03201	014477	FSCE1	JSB ERROR	OR
0610	03202	017661		JSB LPCK	LEFT BRACKET?
0611	03203	017353		JSB FRCUR	YES, SAVE LOCAL VARIABLES OF FSC
0612	03204	017114		JSB FSC	FETCH ACTUAL PARAMETER
0613	03205	017330		JSB FPOP	RESTORE LOCAL VARIABLES OF FSC
0614	03206	017671		JSB RPCK	FETCH RIGHT PARENTHESIS
0615	03207	027272		JMP FSC10+1	
0616	03210	064432	FSC7	LDB M2	CHECK FOR
0617	03211	015274		JSB SYMCK	RIGHT PARENTHESIS
0618	03212	002264		DEF RPARN-1	OR RIGHT BRACKET
0619	03213	027253		JMP FSC8	NOT FOUND
0620	03214	060406		LDA B4000	RECORD A

0621	03215	170135		STA SBPTR,I	RIGHT PARENTHESIS
0622	03216	060352		LDA .41	RESTORE RIGHT PARENTHESIS
0623	03217	007400		CCB	MATCHING
0624	03220	144157		ADB TEMPS,I	LEFT
0625	03221	006020		SSB	PARENTHESIS?
0626	03222	027253		JMP FSC8	NO
0627	03223	174157		STB TEMPS,I	YES
0628	03224	034135		ISZ SBPTR	
0629	03225	015614		JSB GETCR	FETCH
0630	03226	060334		LDA .10	CHARACTER
0631	03227	050334	FSC6	CPA .10	END OF FORMULA?
0632	03230	027253		JMP FSC8	YES
0633	03231	072336		STA UFLAG	NO, SET UNARY FLAG TO FALSE
0634	03232	064435		LDB M5	SEARCH FOR A MULTICHARACTER
0635	03233	017322		JSB MCBCK	BINARY OPERATOR
0636	03234	160135		LDA SBPTR,I	NOT FOUND,
0637	03235	001727		ALF,ALF	RESTORE
0638	03236	010374		AND B177	CHARACTER
0639	03237	066330		LDB MSFLG	SEARCH
0640	03240	015274		JSB SYMCK	FOR A
0641	03241	002274		DEF PLUS-1	BINARY OPERATOR
0642	03242	002001		RSS	NOT FOUND
0643	03243	027301		JMP FSC12	FOUND
0644	03244	007400		CCB	ASSIGNMENT
0645	03245	015274		JSB SYMCK	
0646	03246	002272		DEF ASSOP-1	OPERATOR?
0647	03247	027210		JMP FSC7	NO
0648	03250	073530		STA SFLAG	YES, SET
0649	03251	027117		JMP FSC1	'STORE OCCURRED' FLAG
0650	03252	060162		LDA TEMP2	RETRIEVE LETTER
0651	03253	164157	FSC8	LDB TEMPS,I	ALL LEFT PARENTHESSES
0652	03254	006002		SZB	MATCHED?
0653	03255	014477	FSC2	JSB ERROR	NO
0654	03256	174135		STB SBPTR,I	YES, RECORD AN
0655	03257	034135		ISZ SBPTR	END-OF-FORMULA AND
0656	03260	127114		JMP FSC,I	EXIT WITH CHARACTER IN (A)
0657*					
0658	03261	050351	FSC9	CPA .40	LEFT
0659	03262	027275		JMP FSC11	PARENTHESIS
0660	03263	050373		CPA B133	OR LEFT BRACKET?
0661	03264	027275		JMP FSC11	YES
0662	03265	006400		CLB	NO, SET SIGN
0663	03266	074153		STB SIGN	POSITIVE
0664	03267	014615		JSB NUMCK	NUMBER?
0665	03270	027304		JMP FSC13	NO
0666	03271	017744	FSC10	JSB NUMOP	YES, FIX UP PRECEDING OPERATOR
0667	03272	064441		LDB M9	UPDATE
0668	03273	076330		STB MSFLG	MULTIPLE STORE
0669	03274	027227		JMP FSC6	FLAG
0670	03275	034135	FSC11	ISZ SBPTR	YES
0671	03276	060413		LDA B2300	RECORD
0672	03277	170135		STA SBPTR,I	IT AND
0673	03300	134157		ISZ TEMPS,I	COUNT IT
0674	03301	064441	FSC12	LDB M9	UPDATE
0675	03302	076330		STB MSFLG	MULTIPLE STORE FLAG
0676	03303	027117		JMP FSC1	FLAG

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0677	03304	036336	FSC13	ISZ	UFLAG	UNARY OPERATORS PERMITTED?
0678	03305	014477	FSCE3	JSH	ERROR	NO
0679	03306	064411		LDB	UNMNC	
0680	03307	050353		CPA	.43	'+'?
0681	03310	027314		JMP	**+4	YES
0682	03311	050354		CPA	.45	NO, '-'?
0683	03312	027315		JMP	**+3	YES
0684	03313	027305		JMP	FSCE3	NO
0685	03314	044404		ADB	B3000	STORE
0686	03315	034135		ISZ	SBPTR	UNARY
0687	03316	174135		STB	SBPTR,I	OPERATOR
0688	03317	064441	FSC14	LDB	M9	UPDATE
0689	03320	076330		STB	MSFLG	MULTIPLE STORE FLAG
0690	03321	027121		JMP	FSC2	FLAG
0691**						
0692*** CHECK FOR A MULTICHARACTER BINARY OPERATOR **						
0693**						
0694	03322	000000	MCBCK	NOP		
0695	03323	170135		STA	SBPTR,I	SEARCH
0696	03324	060311		LDA	MCBOP	FOR 'AND'
0697	03325	114212		JSH	TBRCH,I	OR 'OR'
0698	03326	127322		JMP	MCBCK,I	NOT FOUND
0699	03327	027301		JMP	FSC12	FOUND
0001**						
0002*** RESTORE FSC LOCAL QUANTITIES **						
0003**						
0004	03330	000000	FPOP	NOP		
0005	03331	070161		STA	TEMP1	SAVE CHARACTER
0006	03332	064157		LDB	TEMPS	
0007	03333	044435		ADB	M5	
0008	03334	074157		STB	TEMPS	RESTORE S-STACK TOP
0009	03335	006004		INB		
0010	03336	160001		LDA	1,I	
0011	03337	072330		STA	MSFLG	RESTORE MULTIPLE STORE FLAG
0012	03340	006004		INB		
0013	03341	160001		LDA	1,I	
0014	03342	072336		STA	UFLAG	RESTORE UNARY OPERATOR FLAG
0015	03343	006004		INB		
0016	03344	160001		LDA	1,I	
0017	03345	073114		STA	FSC	RESTORE FSC RETURN ADDRESS
0018	03346	006004		INB		
0019	03347	160001		LDA	1,I	RESTORE
0020	03350	073556		STA	VAROP	VAROP RETURN ADDRESS
0021	03351	060161		LDA	TEMP1	RETRIEVE CHARACTER
0022	03352	127330		JMP	FPOP,I	
0023**						
0024*** SAVE LOCAL QUANTITIES OF FSC **						
0025**						
0026	03353	000000	FRCUR	NOP		
0027	03354	064157		LDB	TEMPS	FETCH CURRENT S-STACK POINTER
0028	03355	006004		INB		UPDATE IT
0029	03356	062330		LDA	MSFLG	DUMP MULTIPLE STORE
0030	03357	170001		STA	1,I	FLAG ON S-STACK
0031	03360	006004		INB		
0032	03361	062336		LDA	UFLAG	STACK UNARY OPERATOR
0033	03362	170001		STA	1,I	FLAG

0034	03363	006004		INB	
0035	03364	063114		LDA FSC	STACK FSC
0036	03365	170001		STA 1,I	RETURN ADDRESS
0037	03366	063556		LDA VAROP	STACK VAROP RETURN ADDRESS
0038	03367	017371		JSB SSOV	AND CHECK FOR S-STACK OVERFLOW
0039	03370	127353		JMP FRCUR,I	
0040	**				
0041	*** PUT ITEM ON S-STACK AND CHECK FOR OVERFLOW **				
0042	**				
0043	03371	000000	SSOV	NOP	STORE QUANTITY
0044	03372	006004		INB	ADVANCE S-STACK POINTER
0045	03373	170001		STA 1,I	SAVE ITEM IN (A)
0046	03374	006004		INB	ADVANCE S-STACK POINTER
0047	03375	074157		STB TEMPS	AND RECORD IT
0048	03376	007004		CMB,INB	
0049	03377	044106		AD0 LWBM	LAST WORD
0050	03400	006020		SSB	EXCEEDED?
0051	03401	014477	FSCE4	JSB ERROR	YES
0052	03402	127371		JMP SSOV,I	
0053	**				
0054	*** CHECK FOR SUBSCRIPT PART **				
0055	**				
0056	03403	000000	SBSCK	NOP	CHARACTER IN (A)
0057	03404	064432		LDB M2	LEFT BRACKET
0058	03405	015274		JSB SYMCK	OR
0059	03406	002320		DEF LBRAC-1	LEFT PARENTHESIS?
0060	03407	127403		JMP SBSCK,I	NO, RETURN VIA (P+1)
0061	03410	037403		ISZ SBSCK	YES, SET RETURN TO (P+2)
0062	03411	161715		LDA ARYAD,I	SET
0063	03412	010445		AND M16	ARRAY
0064	03413	002004		INA	TO
0065	03414	171715		STA ARYAD,I	SINGLE SUBSCRIPT
0066	03415	060412		LDA B2200	RECORD A
0067	03416	170135		STA SBPTR,I	LEFT BRACKET
0068	03417	006400		CLB	DIM OR COM
0069	03420	056332		CP0 DFLAG	STATEMENT?
0070	03421	027473		JMP SBSCJ	NO
0071	03422	114221		JSB PGINT,I	FETCH INTEGER
0072	03423	000460		DEF M256	SUBSCRIPT BOUND
0073	03424	005727		BLF,BLF	SAVE
0074	03425	074161		STB TEMP1	BOUND
0075	03426	007400		CCB	IS THE
0076	03427	015274		JSB SYMCK	NEXT CHARACTER
0077	03430	002270		DEF SCMMA-1	A COMMA?
0078	03431	027436		JMP SBSC1	NO
0079	03432	135715		ISZ ARYAD,I	YES, NOTE SECOND SUBSCRIPT
0080	03433	114221		JSB PGINT,I	FETCH SECOND
0081	03434	000460		DEF M256	INTEGER SUBSCRIPT BOUND
0082	03435	002001		RSS	
0083	03436	006404	SBSC1	CLB,INB	SET ONE-DIMENSIONAL CASE
0084	03437	036334		ISZ PFLAG	COM STATEMENT?
0085	03440	027450		JMP SBSC2	NO
0086	03441	070162		STA TEMP2	SAVE CHARACTER
0087	03442	060001		LDA 1	
0088	03443	030161		IQR TEMP1	RETRIEVE FIRST BOUND
0089	03444	015336		JSB MDIM	FIND STORAGE NEED

0090	03445	040166		ADA TEMPS+7	UPDATE COM
0091	03446	070166		STA TEMPS+7	STORAGE POINTER
0092	03447	060162		LDA TEMP2	RETRIEVE NEXT CHARACTER
0093	03450	064432	SBSC2	LDB M2	RIGHT PARENTHESIS
0094	03451	015274		JSB SYMCK	OR
0095	03452	002264		DEF RPARN-1	RIGHT BRACKET?
0096	03453	027255		JMP FSCE2	NO
0097	03454	060407		LDA LF	YES, RECORD A
0098	03455	170135		STA SBPTR,I	RIGHT BRACKET
0099	03456	034135		ISZ SBPTR	ADJUST S-BUFFER POINTER
0100	03457	015614		JSB GETCR	FETCH FOLLOWING
0101	03460	060334		LDA .10	CHARACTER
0102	03461	060332		LDB DFLAG	DIM OR COM
0103	03462	006002		SZB	STATEMENT?
0104	03463	127403		JMP SBSCK,I	YES
0105	03464	017330		JSB FPOP	RESTORE FSC LOCAL VARIABLES
0106	03465	064432		LDB M2	RESTORE
0107	03466	044157		ADB TEMPS	S-STACK
0108	03467	074157		STB TEMPS	POINTER
0109	03470	006004		INB	FETCH
0110	03471	164001		LDB 1,I	RETURN ADDRESS
0111	03472	124001		JMP 1,I	AND EXIT
0112	03473	063403	SBSC3	LDA SBSCK	SAVE
0113	03474	064157		LDB TEMPS	RETURN ADDRESS
0114	03475	017371		JSB SSOV	ON S-STACK
0115	03476	017353		JSB FRCUR	SAVE FSC LOCAL VARIABLES
0116	03477	064441		LDB M9	SET MULTIPLE STORE FLAG
0117	03500	076330		STB MSFLG	TO FALSE
0118	03501	061715		LDA ARYAD	SAVE
0119	03502	064157		LDB TEMPS	OPERAND
0120	03503	017371		JSB SSOV	ADDRESS
0121	03504	017114		JSB FSC	GET SUBSCRIPT FORMULA
0122	03505	007400		CCB	CANCEL
0123	03506	044135		ADB SBPTR	END-OF-FORMULA
0124	03507	074135		STB SBPTR	OPERATOR
0125	03510	064432		LDB M2	RESTORE
0126	03511	044157		ADB TEMPS	S-STACK
0127	03512	074157		STB TEMPS	POINTER
0128	03513	006004		INB	RESTORE
0129	03514	164001		LDB 1,I	OPERAND
0130	03515	075715		STB ARYAD	ADDRESS
0131	03516	007400		CCB	IS THE
0132	03517	015274		JSB SYMCK	NEXT CHARACTER
0133	03520	002270		DEF SCMA-1	A COMMA?
0134	03521	027450		JMP SBSC2	NO
0135	03522	136715		ISZ ARYAD,I	YES, NOTE SECOND SUBSCRIPT
0136	03523	017114		JSB FSC	GET SUBSCRIPT FORMULA
0137	03524	007400		CCB	CANCEL
0138	03525	044135		ADB SBPTR	END-OF-FORMULA
0139	03526	074135		STB SBPTR	OPERATOR
0140	03527	027450		JMP SBSC2	

0142**

0143*** CHECK SYNTAX OF ARRAY DEFINITIONS **

0144**

0145	03530	000000	ARRYS	NOP	
0146	03531	017544	JSB	ARRID	FETCH ARRAY IDENTIFIER
0147	03532	017403	JSB	SBSCK	RECORD A SUBSCRIPT
0148	03533	014477	JSB	ERROR	MISSING SUBSCRIPT
0149	03534	050334	ARRE1	CPA .10	END-OF-STATEMENT?
0150	03535	127530	JMP	ARRYS,I	YES, RETURN VIA (P+1)
0151	03536	007400	CCB		NO,
0152	03537	015274	JSB	SYMCK	MUST BE
0153	03540	002260	DEF	COMMA-1	A COMMA
0154	03541	024266	JMP	NOEOF	ISN'T
0155	03542	037530	ISZ	ARRYS	IS, RETURN
0156	03543	127530	JMP	ARRYS,I	VIA (P+2)

0157**

0158*** FETCH ARRAY IDENTIFIER **

0159**

0160	03544	000000	ARRID	NOP	
0161	03545	017635	JSB	LTR	FETCH LETTER
0162	03546	014477	JSB	ERROR	NONE FOUND
0163	03547	060135	ARRE2	LDA SBPTR	SAVE
0164	03550	071715	STA	ARYAD	OPERAND ADDRESS
0165	03551	060161	LDA	TEMP1	RECORD
0166	03552	064355	LDB	.46	ARRAY
0167	03553	017650	JSB	STROP	IDENTIFIER
0168	03554	060162	LDA	TEMP2	RETRIEVE FOLLOWING CHARACTER
0169	03555	127544	JMP	ARRID,I	

0170**

0171*** CHECK FOR VARIABLE OPERAND **

0172**

0173	03556	000000	VAROP	NOP	
0174	03557	017635	JSB	LTR	LETTER?
0175	03560	127556	JMP	VAROP,I	NO, EXIT VIA (P+1)
0176	03561	037556	ISZ	VAROP	
0177	03562	050351	CPA	.40	LEFT PARENTHESIS?
0178	03563	027624	JMP	VAR05	YES
0179	03564	050373	CPA	B133	NO, LEFT BRACKET?
0180	03565	027624	JMP	VAR05	YES
0181	03566	037556	ISZ	VAROP	NO
0182	03567	015570	JSB	DIGCK	DIGIT?
0183	03570	027600	JMP	VAR01	NO
0184	03571	060161	LDA	TEMP1	YES, RETRIEVE LETTER,
0185	03572	044357	ADB	.48	AND RESTORE ASCII DIGIT
0186	03573	074161	STB	TEMP1	
0187	03574	017650	JSB	STROP	RECORD VARIABLE
0188	03575	015614	JSB	GETCR	FETCH FOLLOWING
0189	03576	060334	LDA	.10	CHARACTER
0190	03577	027604	JMP	VAR02	
0191	03600	060161	VAR01	LDA TEMP1	RETRIEVE LETTER,
0192	03601	064356	LDB	.47	SET 'NO DIGIT',
0193	03602	017650	JSB	STROP	AND RECORD VARIABLE
0194	03603	060162	LDA	TEMP2	RETRIEVE FOLLOWING CHARACTER
0195	03604	070162	VAR02	STA TEMP2	SAVE CHARACTER
0196	03605	006400	CLB		INSIDE A
0197	03606	056334	CPB	PFLAG	DEF STATEMENT?

0198	03607	127556		JMP VAROP,I	NO, EXIT VIA (P+3)
0199	03610	007400		CCB	
0200	03611	044135		ADB SBPTR	RETRIEVE
0201	03612	160001		LDA 1,I	
0202	03613	010401		AND MSK1	OPERAND
0203	03614	052334		CPA PFLAG	MATCH PARAMETER?
0204	03615	027620		JMP VARO4	YES
0205	03616	060162	VARO3	LDA TEMP2	NO, RETRIEVE
0206	03617	127556		JMP VAROP,I	CHARACTER AND EXIT VIA (P+3)
0207	03620	160001	VARO4	LDA 1,I	SET OPERAND TO
0208	03621	030470		IOR FLGBT	ACTUAL PARAMETER
0209	03622	170001		STA 1,I	AND RECORD IT
0210	03623	027616		JMP VARO3	
0211	03624	060135	VARO5	LDA SBPTR	SAVE
0212	03625	071715		STA ARYAJ	OPERAND ADDRESS
0213	03626	060161		LDA TEMP1	RETRIEVE LETTER
0214	03627	064355		LDB .46	RECORD
0215	03630	017650		JSB STROP	ARRAY IDENTIFIER
0216	03631	060373		LDA B133	RETRIEVE LEFT BRACKET
0217	03632	017403		JSB SBSCK	FETCH SUBSCRIPT
0218	03633	000000		NOP	
0219	03634	127556		JMP VAROP,I	EXIT VIA (P+2)
0220**					
0221***	FETCH A LETTER		**		
0222**					
0223	03635	000000	LTR	NOP	
0224	03636	015614		JSB GETCR	
0225	03637	060334		LDA .10	
0226	03640	015603		JSB LETCK	LETTER?
0227	03641	127635		JMP LTR,I	NO, EXIT VIA (P+1)
0228	03642	037635		ISZ LTR	YES,
0229	03643	070161		STA TEMP1	SAVE IT
0230	03644	015614		JSB GETCR	NEXT CHARACTER
0231	03645	060334		LDA .10	TO (A)
0232	03646	070162		STA TEMP2	SAVE SECOND CHARACTER
0233	03647	127635		JMP LTR,I	EXIT VIA (P+2)
0234**					
0235***	STORE AN OPERAND NAME		**		
0236**					
0237	03650	000000	STROP	NOP	LETTER IN (A), NUMBER IN (B)
0238	03651	040453		ADA D100	NUMERICALLY ADJUST THE
0239	03652	044451		ADB D53	OPERAND NAME
0240	03653	001700		ALF	COMBINE THE
0241	03654	030001		IOR 1	TWO PARTS
0242	03655	130135		IOR SBPTR,I	COMPLETE OPERAND-OPERATOR PAIR
0243	03656	170135		STA SBPTR,I	AND STORE IT
0244	03657	034135		ISZ SBPTR	UPDATE S-BUFFER POINTER
0245	03660	127650		JMP STROP,I	

0247**

0248*** CHECK FOR LEFT PARENTHESIS **

0249**

0250	03661	000000	LPCK	NOP	CHARACTER IN (A)
0251	03662	064432		LDB M2	LEFT PARENTHESIS
0252	03663	015274		JSB SYMCK	OR
0253	03664	002320		DEF LBRAC-1	LEFT BRACKET?
0254	03665	027201		JMP FSCE1	NO
0255	03666	060413		LDA B2300	YES, RECORD A
0256	03667	170135		STA SBPTR,I	LEFT PARENTHESIS
0257	03670	127661		JMP LPCK,I	EXIT

0258**

0259*** CHECK FOR RIGHT PARENTHESIS **

0260**

0261	03671	000000	RPCK	NOP	
0262	03672	064432		LDB M2	RIGHT PARENTHESIS
0263	03673	015274		JSB SYMCK	OR
0264	03674	002264		DEF RPARN-1	RIGHT BRACKET?
0265	03675	027255		JMP FSCE2	NO
0266	03676	060406		LDA B4000	YES, RECORD A
0267	03677	170135		STA SBPTR,I	RIGHT PARENTHESIS
0268	03700	034135		ISZ SBPTR	UPDATE SYNTAX BUFFER POINTER
0269	03701	015614		JSB GETCR	FETCH
0270	03702	060334		LDA .10	FOLLOWING CHARACTER
0271	03703	127671		JMP RPCK,I	

0272**

0273*** FETCH MAT STATEMENT SUBSCRIPT **

0274**

0275	03704	000000	MATSB	NOP	
0276	03705	064432		LDB M2	LEFT PARENTHESIS
0277	03706	015274		JSB SYMCK	OR
0278	03707	002320		DEF LBRAC-1	LEFT BRACKET?
0279	03710	127704		JMP MATSB,I	NO
0280	03711	037704		ISZ MATSB	YES, SET RETURN ADDRESS
0281	03712	060412		LDA B2200	RECORD A
0282	03713	170135		STA SBPTR,I	LEFT BRACKET
0283	03714	017114		JSB FSC	FETCH SUBSCRIPT
0284	03715	007400		CCB	
0285	03716	015274		JSB SYMCK	COMMA?
0286	03717	002260		DEF COMMA-1	
0287	03720	002001		RSS	NO
0288	03721	017114		JSB FSC	YES, FETCH SUBSCRIPT
0289	03722	064432		LDB M2	RIGHT PARENTHESIS
0290	03723	015274		JSB SYMCK	OR
0291	03724	002264		DEF RPARN-1	RIGHT BRACKET
0292	03725	027255		JMP FSCE2	
0293	03726	060407		LDA LF	RECORD A
0294	03727	170135		STA SBPTR,I	RIGHT BRACKET
0295	03730	034135		ISZ SBPTR	
0296	03731	015614		JSB GETCR	END-OF-STATEMENT?
0297	03732	124252		JMP ACCST,I	YES
0298	03733	127704		JMP MATSB,I	

0300**

0301*** FETCH PARENTHESIZED FORMULA **

0302**

0303	03734	000000	GETPF	NOP	
0304	03735	015614	JSB	GETCR	
0305	03736	024265	JMP	EOF	
0306	03737	034135	ISZ	SBPTR	
0307	03740	017661	JSB	LPCK	FETCH LEFT PARENTHESIS
0308	03741	017114	JSB	FSC	FETCH FORMULA
0309	03742	017671	JSB	RPCK	GET RIGHT PARENTHESIS
0310	03743	127734	JMP	GETPF,I	

0311**

0312*** FLAG OPERATOR WHICH PRECEDES NUMBER **

0313**

0314	03744	000000	NUMOP	NOP	
0315	03745	070164	STA	TEMP4	
0316	03746	064433	LDB	M3	FETCH
0317	03747	044135	ADB	SBPTR	PRECEDING
0318	03750	160001	LDA	1,I	OPERATOR
0319	03751	030470	IOR	FLGBT	ADD FLAG BIT
0320	03752	170001	STA	1,I	REPLACE OPERATOR
0321	03753	060164	LDA	TEMP4	
0322	03754	127744	JMP	NUMOP,I	


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0324*
0325*   SYSTEM COMMAND TABLE
0326*
0327  03755 000003 SYCMD OCT 00003
0328  03756 051125      ASC 2,RUN      EXECUTE PROGRAM
0329*
0330  03760 002003      OCT 02003
0331  03761 051503      ASC 2,SCR      SCRATCH PROGRAM
0332*
0333  03763 003004      OCT 03004
0334  03764 046111      ASC 2,LIST     LIST COMMAND
0335*
0336  03766 005005      OCT 05005
0337  03767 050114      ASC 3,PLIST    PUNCH LIST COMMAND
0338*
0339  03772 012003      OCT 12003
0340  03773 050124      ASC 2,PTA      ACTIVATE PHOTO-READER
0341*
0342  03775 033004      OCT 33004
0343  03776 051524 STCMD ASC 2,STOP      ABORT CURRENT ACTIVITY
0344*
0345  04000 046003      OCT 46003
0346  04001 052101      ASC 2,TAP      ACTIVATE TTY TAPE MODE
0347*
0348  04003 050003      OCT 50003
0349  04004 041131      ASC 2,BYE      EXIT SYSTEM
0350**
0351*** PRINT NAME TABLE FOR OPERATORS **
0352**
0353  04006 032003 LET   OCT 32003      BITS 15-9 OF THE LABELLED WORD
0354  04007 046105      ASC 2,LET
0355  04011 033003 DIM   OCT 33003      ARE THE BASIC CODE OPERATOR
0356  04012 042111      ASC 2,DIM
0357  04014 034003 COM   OCT 34003      NUMBERS. BITS 2-0 ARE THE
0358  04015 041517      ASC 2,COM
0359  04017 035003 DEF   OCT 35003      LENGTH IN CHARACTERS OF THE
0360  04020 042105      ASC 2,DEF
0361  04022 036003 REM   OCT 36003      SYMBOL. THE ASCII VERSION OF
0362  04023 051105      ASC 2,REM
0363  04025 037004 GOTO  OCT 37004      THE SYMBOL FOLLOWS.
0364  04026 043517      ASC 2,GOTO
0365  04030 040002 IF    OCT 40002
0366  04031 044506      ASC 1,IF
0367  04032 041003 FOR   OCT 41003
0368  04033 043117      ASC 2,FOR
0369  04035 042004 NEXT  OCT 42004
0370  04036 047105      ASC 2,NEXT
0371  04040 043005 GOSUB OCT 43005
0372  04041 043517      ASC 3,GOSUB
0373  04044 044006 RTRN  OCT 44006
0374  04045 051105      ASC 3,RETURN
0375  04050 045003 END   OCT 45003
0376  04051 042516      ASC 2,END
0377  04053 046004 STF   OCT 46004
0378  04054 051524      ASC 2,STOP
0379  04056 047004 WAIT  OCT 47004

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0380	04057	053501		ASC 2, WAIT
0381	04061	050004	CALL	OCT 50004
0382	04062	041501		ASC 2, CALL
0383	04064	051004	DATA	OCT 51004
0384	04065	042101		ASC 2, DATA
0385	04067	052004	READ	OCT 52004
0386	04070	051105		ASC 2, READ
0387	04072	053005	PRINT	OCT 53005
0388	04073	050122		ASC 3, PRINT
0389	04076	054005	INPUT	OCT 54005
0390	04077	044516		ASC 3, INPUT
0391	04102	055007	RESTOR	OCT 55007
0392	04103	051105		ASC 4, RESTORE
0393	04107	056003	MAT	OCT 56003
0394	04110	046501		ASC 2, MAT
0395	04112	057004	THEN	OCT 57004
0396	04113	052110		ASC 2, THEN
0397	04115	060002	TO	OCT 60002
0398	04116	052117		ASC 1, TO
0399	04117	061004	STEP	OCT 61004
0400	04120	051524		ASC 2, STEP
0401	04122	027003	NOT	OCT 27003
0402	04123	047117		ASC 2, NOT
0403	04125	026003	AND	OCT 26003
0404	04126	040516		ASC 2, AND
0405	04130	025002	OR	OCT 25002
0406	04131	047522		ASC 1, OR
0407	04132	030002	GTE	OCT 30002
0408	04133	037075		ASC 1, >=
0409	04134	031002	LTE	OCT 31002
0410	04135	036075		ASC 1, <=
0411	04136	017002	AUNEQ	OCT 17002
0412	04137	036076		ASC 1, <>
0413*				
0414	04140	001003	TAB	OCT 1003
0415	04141	052101		ASC 2, TAB
0416	04143	002003	SIN	OCT 2003
0417	04144	051511		ASC 2, SIN
0418	04146	003003	COS	OCT 3003
0419	04147	041517		ASC 2, COS
0420	04151	004003	TAN	OCT 4003
0421	04152	052101		ASC 2, TAN
0422	04154	005003	ATN	OCT 5003
0423	04155	040524		ASC 2, ATN
0424	04157	006003	EXP	OCT 6003
0425	04160	042530		ASC 2, EXP
0426	04162	007003	LOG	OCT 7003
0427	04163	046117		ASC 2, LOG
0428	04165	010003	ABS	OCT 10003
0429	04166	040502		ASC 2, ABS
0430	04170	011003	SQR	OCT 11003
0431	04171	051521		ASC 2, SQR
0432	04173	012003	INT	OCT 12003
0433	04174	044516		ASC 2, INT
0434	04176	013003	RND	OCT 13003
0435	04177	051116		ASC 2, RND

ALTERNATE UNEQUAL SIGN

THIS SECTION HAS THE PRE-DEFINED FUNCTIONS. HERE BITS 13-9 ARE THE IDENTIFYING NUMBER OF THE FUNCTION.

0436	04201	014003	SGN	OCT 14003	
0437	04202	051507		ASC 2,SGN	
0438	04204	015003	ZER	OCT 15003	MATRIX FUNCTIONS
0439	04205	055105		ASC 2,ZER	
0440	04207	016003	CON	OCT 16003	
0441	04210	041517		ASC 2,CON	
0442	04212	017003	IDN	OCT 17003	
0443	04213	044504		ASC 2,IDN	
0444	04215	020003	INV	OCT 20003	
0445	04216	044516		ASC 2,INV	
0446	04220	021003	TRN	OCT 21003	
0447	04221	052122		ASC 2,TRN	
0448**					
0449*** TABLE SEARCH FOR MULTICHARACTER SYMBOLS **					
0450**					
0451	04223	000000	TBSRH	NOP	
0452	04224	072333		STA TABLE	STORE TABLE ADDRESS
0453	04225	074167		STB LNPTH	STORE -(NUMBER OF ENTRIES)
0454	04226	060132		LDA BADDR	SAVE
0455	04227	070163		STA TEMP3	INPUT
0456	04230	060133		LDA CCNT	BUFFER
0457	04231	070164		STA TEMP4	STATUS
0458	04232	060135		LDA SBPTR	INITIALIZE END-OF-SYMBOL
0459	04233	072351		STA SMEND	POINTER
0460	04234	002404		CLA,INA	COUNT FIRST CHARACTER OF
0461	04235	072556		STA SLENG	SYMBOL
0462	04236	160135		LDA SBPTR,I	FETCH PARTIAL SYMBOL
0463	04237	010374		AND B177	TWO
0464	04240	150135		CPA SBPTR,I	CHARACTERS?
0465	04241	002001		RSS	NO
0466	04242	026265		JMP TSR10	YES
0467	04243	001727		ALF,ALF	LEFT-JUSTIFY
0468	04244	030345		IOR .32	FIRST CHARACTER AND
0469	04245	170135		STA SBPTR,I	APPEND BLANK
0470	04246	015614	TSRC1	JSB GETCR	FETCH NEXT CHARACTER
0471	04247	026326		JMP TSRC9	END-OF-STATEMENT
0472	04250	066556		LDB SLENG	CHECK FOR
0473	04251	054331		CPB .7	IMPOSSIBLE LENGTH
0474	04252	026326		JMP TSRC9	
0475	04253	004010		SLB	EVEN-NUMBERED CHARACTER?
0476	04254	026262		JMP TSRC2	YES
0477	04255	036351		ISZ SMEND	NO, FETCH FRESH WORD,
0478	04256	001727		ALF,ALF	LEFT-JUSTIFY CHARACTER,
0479	04257	030345		IOR .32	APPEND BLANK,
0480	04260	172351		STA SMEND,I	AND STORE
0481	04261	026265		JMP TSR10	
0482	04262	040450	TSRC2	ADA M32	DELETE BLANK,
0483	04263	142351		ADA SMEND,I	FILL SECOND CHARACTER,
0484	04264	172351		STA SMEND,I	AND STORE
0485	04265	036556	TSR10	ISZ SLENG	COUNT IT
0486	04266	064167		LDB LNPTH	INITIALIZE TABLE LENGTH
0487	04267	074165		STB COUNT	COUNTER
0488	04270	062333		LDA TABLE	
0489	04271	072513	TSRC3	STA TBLPT	SET TABLE POINTER
0490	04272	162513		LDA TBLPT,I	EXTRACT SYMBOL LENGTH
0491	04273	010331		AND .7	FROM TABLE AND COMPARE

0492	04274	052556		CPA SLENG	WITH CURRENT SYMBOL
0493	04275	026304		JMP TSRC5	EQUAL?
0494	04276	040326	TSRC4	ADA .3	DIFFERENT,
0495	04277	001100		ARS	UPDATE
0496	04300	042513		ADA TBLPT	TABLE POINTER
0497	04301	034165		ISZ COUNT	MORE ENTRIES?
0498	04302	026271		JMP TSRC3	YES
0499	04303	026246		JMP TSRC1	NO
0500	04304	066513	TSRC5	LDB TBLPT	SET POINTER TO
0501	04305	076537		STB TSPTR	TABLE SYMBOL
0502	04306	064135		LDB SBPTR	SET (B) TO INPUT
0503	04307	026313		JMP TSRC7	SYMBOL POINTER
0504	04310	056351	TSRC6	CPB SMEND	ALL OF SYMBOL CONSIDERED?
0505	04311	026321		JMP TSRC8	YES, MATCH OCCURRED
0506	04312	006004		INB	NO, INCREMENT
0507	04313	036537	TSRC7	ISZ TSPTR	SYMBOL POINTERS
0508	04314	162537		LDA TSPTR, I	FETCH WORD FROM TABLE
0509	04315	150001		CPA 1, I	MATCH WITH INPUT SYMBOL?
0510	04316	026310		JMP TSRC6	YES
0511	04317	062556		LDA SLENG	NO, WRONG
0512	04320	026276		JMP TSRC4	SYMBOL
0513	04321	162513	TSRC8	LDA TBLPT, I	EXTRACT
0514	04322	010420		AND OPMSK	SYMBOL CODE
0515	04323	170135		STA SBPTR, I	
0516	04324	036223		ISZ TBSRH	AND RETURN VIA
0517	04325	126223		JMP TBSRH, I	'SUCCESS' EXIT
0518	04326	060163	TSRC9	LDA TEMP3	RESTORE
0519	04327	070132		STA BADDR	INPUT
0520	04330	060164		LDA TEMP4	BUFFER
0521	04331	070133		STA CCNT	STATUS
0522	04332	126223		JMP TBSRH, I	'FAILURE' EXIT
0523**					
0524***	FETCH AND	RECORD	PROGRAM	INTEGER	**
0525**					
0526	04333	000000	PRGIN	NOP	
0527	04334	160135		LDA SBPTR, I	SET
0528	04335	030470		IOR FLOBT	'INTEGER
0529	04336	040326		ADA .3	FOLLOWS'
0530	04337	170135		STA SBPTR, I	OPERAND
0531	04340	162333		LDA PRGIN, I	GIVE ADDRESS
0532	04341	072346		STA PRGI1	TO INTCK
0533	04342	034135		ISZ SBPTR	
0534	04343	015614		JSB GETCK	
0535	04344	014477	SYE25	JSB ERROR	
0536	04345	016351		JSB INTCK	FETCH
0537	04346	000000	PRGI1	NOP	
0538	04347	036333		ISZ PRGIN	
0539	04350	126333		JMP PRGIN, I	
0540**					
0541***	BUILD AN	INTEGER	**		
0542**					
0543	04351	000000	INTCK	NOP	CHARACTER IN (A)
0544	04352	006400		CLB	STORE
0545	04353	076556		STB INTGR	PARTIAL RESULT
0546	04354	015570	INTC1	JSB DIGCK	DIGIT?
0547	04355	026373		JMP INTC2	NO

0548	04356	103101		CLO	
0549	04357	066556		LDB INTGR	MULTIPLY
0550	04360	044001		ADB 1	PARTIAL
0551	04361	044001		ADB 1	RESULT
0552	04362	046556		ADB INTGR	BY
0553	04363	044001		ADB 1	10
0554	04364	044000		ADB 0	ADD LATEST DIGIT
0555	04365	102201		SOC	OVERFLOW?
0556	04366	026344		JMP SYE25	YES
0557	04367	076556		STB INTGR	STORE PARTIAL RESULT
0558	04370	015614		JSB GETCR	NO, FETCH
0559	04371	060334		LDA .10	NEXT CHARACTER
0560	04372	026354		JMP INTC1	
0561	04373	066556	INTC2	LDB INTGR	ZERO
0562	04374	006003		SZB,RSS	INTEGER?
0563	04375	026344		JMP SYE25	YES
0564	04376	174135		STB SBPTR,I	NO, RECORD IT
0565	04377	166351		LDB INTCK,I	INTEGER
0566	04400	164001		LDB 1,I	TOO
0567	04401	046556		ADB INTGR	LARGE?
0568	04402	006021		SSB,RSS	
0569	04403	026344		JMP SYE25	YES
0570	04404	066556		LDB INTGR	NO,
0571	04405	034135		ISZ SBPTR	RETURN WITH
0572	04406	036351		ISZ INTCK	INTEGER
0573	04407	126351		JMP INTCK,I	IN (B)
0574**					
0575***	PROCESS CHARACTER STRING				
0576**					
0577	04410	000000	CHRST	NOP	
0578	04411	070162		STA TEMP2	RECORD TERMINATOR CHARACTER
0579	04412	060334		LDA .10	DUMMY
0580	04413	070476		STA BLANK	DELETE CHARACTER
0581	04414	015614	CHRS1	JSB GETCR	
0582	04415	026433		JMP CHRS3	TO END-OF-STATEMENT EXIT
0583	04416	050162		CPA TEMP2	TERMINATOR CHARACTER?
0584	04417	026432		JMP CHRS2	YES
0585	04420	130135		IOR SBPTR,I	NO, FILL
0586	04421	170135		STA SBPTR,I	SECOND CHARACTER
0587	04422	015614		JSB GETCR	
0588	04423	026433		JMP CHRS3	TO END-OF-STATEMENT EXIT
0589	04424	050162		CPA TEMP2	TERMINATOR CHARACTER?
0590	04425	026432		JMP CHRS2	YES
0591	04426	034135		ISZ SBPTR	NO, MOVE TO NEW WORD
0592	04427	001727		ALF,ALF	AND STORE
0593	04430	170135		STA SBPTR,I	FIRST CHARACTER
0594	04431	026414		JMP CHRS1	
0595	04432	036410	CHRS2	ISZ CHRST	SET (P+2) EXIT
0596	04433	034135	CHRS3	ISZ SBPTR	MOVE TO NEXT BUFFER WORD
0597	04434	060345		LDA .32	RESTORE BLANK AS
0598	04435	070476		STA BLANK	DELETE CHARACTER
0599	04436	126410		JMP CHRST,I	

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0601**
0602*** DELETE STATEMENT **
0603**
0604 04437 160134 DLSTM LDA SBUFA,I LOAD SEQUENCE NUMBER
0605 04440 016513 JSB FNDPS FIND STATEMENT TO BE DELETED
0606 04441 124204 JMP PEXMA,I DOESN'T
0607 04442 124204 JMP PEXMA,I EXIST
0608 04443 002400 CLA ZERO WORD SKIP FOR DESTINATION
0609 04444 006004 INB ADDRESS OF SOURCE WORD SKIP IN B
0610 04445 016537 JSB CLPRG CLOSE UP PROGRAM
0611 04446 124204 JMP PEXMA,I EXIT TO PHASE 1 WAIT
0612*
0613*** ***
0614** ACCEPT STATEMENT **
0615*** ***
0616*
0617 04447 060134 ACTST LDA SBUFA COMPUTE
0618 04450 003004 CMA,INA LENGTH
0619 04451 040135 ADA SBPTR OF STATEMENT
0620 04452 170160 STA TEMP,I AND RECORD IT
0621 04453 160134 LDA SBUFA,I LOAD SEQUENCE NUMBER
0622 04454 016513 JSB FNDPS SEARCH ON SEQUENCE NUMBER
0623 04455 026472 JMP ACCS1 APPEND STATEMENT TO PROGRAM
0624 04456 026507 JMP ACCS4 INSERT STATEMENT IN PROGRAM
0625 04457 006004 INB REPLACE STATEMENT IN PROGRAM
0626 04460 160001 LDA 1,I COMPARE LENGTHS OF
0627 04461 003004 CMA,INA STATEMENT BEING REPLACED
0628 04462 140160 ADA TEMP,I AND STATEMENT
0629 04463 002003 SZA,RSS REPLACING IT
0630 04464 026474 JMP ACCS2 EQUAL
0631 04465 002021 SSA,RSS
0632 04466 026510 JMP ACCS4+1 SHORTER
0633 04467 160160 LDA TEMP,I LONGER,
0634 04470 016537 JSB CLPRG CLOSE UP PROGRAM
0635 04471 026474 JMP ACCS2
0636 04472 160160 ACCS1 LDA TEMP,I LOAD PROGRAM SPACE REQUIREMENT
0637 04473 016556 JSB OVCHK SUFFICIENT PROGRAM SPACE LEFT?
0638 04474 006400 ACCS2 CLB YES, SET COUNTER TO ZERO
0639 04475 060134 LDA SBUFA INITIALIZE
0640 04476 070162 STA TEMP2 SOURCE ADDRESS
0641 04477 160162 ACCS3 LDA TEMP2,I TRANSFER WORD FROM
0642 04500 170163 STA TEMP3,I S-BUFFER TO PROGRAM SPACE
0643 04501 034162 ISZ TEMP2 INCREMENT SOURCE AND
0644 04502 034163 ISZ TEMP3 DESTINATION ADDRESSES
0645 04503 006004 INB BUMP COUNTER
0646 04504 154160 CPB TEMP,I ENTIRE STATEMENT MOVED?
0647 04505 124204 JMP PEXMA,I YES
0648 04506 026477 JMP ACCS3 NO
0649 04507 160160 ACCS4 LDA TEMP,I LOAD PROGRAM SPACE REQUIREMENT
0650 04510 016556 JSB OVCHK SUFFICIENT PROGRAM SPACE LEFT?
0651 04511 014554 JSB MYTOH MAKE
0652 04512 026474 JMP ACCS2 ROOM

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0654**

0655*** FIND SEQUENTIAL POSITION **

0656**

0657	04513	000000	FNIPS	NOP	
0658	04514	070163		STA TEMP3	SAVE SEQUENCE NUMBER
0659	04515	064112		LDB PBUFF	STARTING ADDRESS
0660	04516	054113	FNIP1	CPB PBPTR	END OF PROGRAM?
0661	04517	026535		JMP FNDP4	YES, EXIT VIA (P+1)
0662	04520	160001		LDA 1,I	SUBTRACT PROGRAM
0663	04521	003004		CMA,INA	SEQUENCE NUMBER FROM
0664	04522	040163		ADA TEMP3	S-BUFFER SEQUENCE NUMBER
0665	04523	002003		SZA,RSS	EQUAL?
0666	04524	026533		JMP FNDP2	YES, SET EXIT TO (P+3)
0667	04525	002020		SSA	NO, P-SEQ NO > S-SEQ NO ?
0668	04526	026534		JMP FNDP3	YES, SET EXIT TO (P+2)
0669	04527	060001		LDA 1	POINT (A) TO
0670	04530	002004		INA	PROGRAM ADDRESS INCREMENT
0671	04531	144000		ADB 0,I	COMPUTE NEW ADDRESS
0672	04532	026516		JMP FNDP1	
0673	04533	036513	FNIP2	ISZ FNDPS	
0674	04534	036513	FNIP3	ISZ FNDPS	
0675	04535	074163	FNIP4	STB TEMP3	SAVE STATEMENT ADDRESS
0676	04536	126513		JMP FNDP8,I	

0677**

0678*** DELETE SPACE IN PROGRAM **

0679**

0680	04537	000000	CLPRG	NOP	REFERENCE LOCATION IN TEMP3
0681	04540	040163		ADA TEMP3	SKIP (A) LOCATIONS FROM TEMP3
0682	04541	070164		STA TEMP4	AND SAVE DESTINATION ADDRESS
0683	04542	164001		LDB 1,I	SKIP TO END OF STATEMENT BEING
0684	04543	044163		ADB TEMP3	DELETED, SOURCE ADDRESS IN (B)
0685	04544	054113	CLPR1	CPB PBPTR	ALL OF PROGRAM MOVED?
0686	04545	026553		JMP CLPR2	YES
0687	04546	160001		LDA 1,I	NO, MOVE WORD FROM SOURCE TO
0688	04547	170164		STA TEMP4,I	DESTINATION ADDRESS
0689	04550	034164		ISZ TEMP4	INCREMENT DESTINATION ADDRESS
0690	04551	006004		INB	INCREMENT SOURCE ADDRESS
0691	04552	026544		JMP CLPR1	
0692	04553	060164	CLPR2	LDA TEMP4	SET END-OF-PROGRAM
0693	04554	070113		STA PBPTR	POINTER
0694	04555	126537		JMP CLPRG,I	

0695**

0696*** CHECK FOR PROGRAM SPACE OVERFLOW **

0697**

0698	04556	000000	OVCHK	NOP	NEW WORD REQUIREMENT IN (A)
0699	04557	064113		LDB PBPTR	SET SOURCE ADDRESS
0700	04560	074162		STB TEMP2	FOR PROGRAM RELOCATION
0701	04561	044000		ADB 0	SET DESTINATION
0702	04562	074164		STB TEMP4	ADDRESS
0703	04563	007004		CMA,INB	ENOUGH
0704	04564	044106		ADB LWBM	FREE
0705	04565	006020		SSB	SPACE?
0706	04566	124271		JMP FSCEF,I	NO, PROGRAM SPACE OVERFLOW
0707	04567	064164		LDB TEMP4	YES, RELOCATE FREE
0708	04570	074113		STB PBPTR	PROGRAM SPACE POINTER
0709	04571	126556		JMP OVCHK,I	

LIST PROGRAM
PRE-EXECUTION PROCESSING


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0002*
0003* *****
0004**** ***
0005** LIST THE PROGRAM ***
0006**** ***
0007* *****
0008*
0009 04572 064112 LIST LDB PBUFF INITIALIZE TO FIRST
0010 04573 074157 STB TEMPS STATEMENT OF PROGRAM
0011 04574 015614 JSB GETCR SEQUENCE NUMBER GIVEN?
0012 04575 026607 JMP LIST0 NO
0013 04576 064131 LDB .BUFA YES, SET FOR
0014 04577 074135 STB SBPTR SEQUENCE NUMBER
0015 04600 114216 JSB INCHK,I FETCH
0016 04601 000463 DEF MAXSN IT
0017 04602 160131 LDA .BUFA,I LOAD SEQUENCE NUMBER
0018 04603 016513 JSB FNDRS FIND INTIAL STATEMENT
0019 04604 124205 JMP RDYDA,I
0020 04605 000000 NOP SAVE
0021 04606 074157 STB TEMPS ADDRESS
0022 04607 006400 LIST0 CLB HIGH-SPEED
0023 04610 054136 CPB TFLAG PUNCH?
0024 04611 026614 JMP LIST1 NO
0025 04612 060373 LDA B133 YES, EMIT
0026 04613 114127 JSB LISTR,I LEADER
0027 04614 064157 LIST1 LDB TEMPS MORE
0028 04615 054113 CPB PBPTR PROGRAM?
0029 04616 027003 JMP LIS13 NO
0030 04617 003400 CCA INITIALIZE
0031 04620 040134 ADA SBUFA OUTPUT BUFFER
0032 04621 070132 STA BADDR POINTER
0033 04622 002400 CLA INITIALIZE
0034 04623 070133 STA CCNT CHARACTER COUNT
0035 04624 160157 LDA TEMPS,I OUTPUT
0036 04625 017015 JSB OUTIN SEQUENCE NUMBER
0037 04626 060476 LDA BLANK OUTPUT
0038 04627 015715 JSB OUTCR BLANK
0039 04630 034157 ISZ TEMPS FETCH
0040 04631 160157 LDA TEMPS,I STATEMENT LENGTH
0041 04632 003004 CMA,INA SET
0042 04633 002004 INA WORD
0043 04634 071467 STA SLWST COUNTER
0044 04635 034157 LIST3 ISZ TEMPS MORE
0045 04636 035467 ISZ SLWST STATEMENT?
0046 04637 026644 JMP LIST4 YES
0047 04640 064134 LIST2 LDB SBUFA OUTPUT
0048 04641 060133 LDA CCNT STATEMENT
0049 04642 114127 JSB LISTR,I
0050 04643 026614 JMP LIST1
0051 04644 160157 LIST4 LDA TEMPS,I
0052 04645 010420 AND OPMSK
0053 04646 002003 SZA,RSS NULL OPERATOR?
0054 04647 026670 JMP LIST5 YES
0055 04650 070162 STA TEMP2 NO, SAVE OPERATOR
0056 04651 001727 ALF,ALF SINGLE
0057 04652 001100 ARS

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0058	04653	064000	LDB 0	CHARACTER
0059	04654	040446	ADA M21	
0060	04655	002021	SSA,RSS	OPERATOR?
0061	04656	026772	JMP LIS12	NO
0062	04657	005000	BLS	YES
0063	04660	006004	INB	LOAD
0064	04661	044301	ADB FOPBS	SYMBOL'S
0065	04662	160001	LDA 1,I	ASCII WORD
0066	04663	001727	ALF,ALF	ADJUST
0067	04664	010376	AND MSK0	CHARACTER
0068	04665	050347	CPA .34	" ?
0069	04666	027011	JMP LIS14	YES
0070	04667	015715	JSB OUTCR	NO
0071	04670	160157	LIST5 LDA TEMPS,I	
0072	04671	010425	AND OPDMK	SAVE
0073	04672	070163	STA TEMP3	OPERAND
0074	04673	010423	AND TYPFL	EXTRACT OPERAND TYPE
0075	04674	072333	STA LFLAG	SET LFLAG FALSE
0076	04675	002020	SSA	FLAG BIT SET?
0077	04676	026732	JMP LIST9	YES
0078	04677	002003	SZA,RSS	NO, NULL OPERAND?
0079	04700	026635	JMP LIST3	YES
0080	04701	050336	CPA .15	FUNCTION?
0081	04702	026725	JMP LIST8	YES
0082	04703	040435	LIST6 ADA M5	
0083	04704	002020	SSA	LETTER-DIGIT COMBINATION?
0084	04705	026710	JMP LIST7	NO
0085	04706	003400	CCA	YES, SET
0086	04707	072333	STA LFLAG	LFLAG FALSE
0087	04710	060163	LIST7 LDA TEMP3	
0088	04711	001727	ALF,ALF	RESTORE AND
0089	04712	001700	ALF	
0090	04713	010374	AND B177	OUTPUT
0091	04714	040363	ADA B100	
0092	04715	015715	JSB OUTCR	LETTER
0093	04716	036333	ISZ LFLAG	DIGIT FOLLOWS?
0094	04717	026635	JMP LIST3	NO
0095	04720	060163	LDA TEMP3	YES
0096	04721	010336	AND .15	RESTORE
0097	04722	040353	ADA .43	DIGIT
0098	04723	015715	JSB OUTCR	OUTPUT DIGIT
0099	04724	026635	JMP LIST3	
0100	04725	060365	LIST8 LDA F	OUTPUT
0101	04726	015715	JSB OUTCR	'F'
0102	04727	060371	LDA N	OUTPUT
0103	04730	015715	JSB OUTCR	'N'
0104	04731	026710	JMP LIST7	
0105	04732	020470	LIST9 XOR FLGBT	
0106	04733	002102	CLE,SZA	NUMBER?
0107	04734	026751	JMP LIS10	NO
0108	04735	034157	ISZ TEMPS	YES
0109	04736	070153	STA SIGN	SET SIGN FLAG FALSE
0110	04737	160157	LDA TEMPS,I	
0111	04740	034157	ISZ TEMPS	
0112	04741	164157	LDB TEMPS,I	
0113	04742	035467	ISZ SLWST	

0114	04743	035467		ISZ SLWST	
0115	04744	002020		SSA	NEGATIVE NUMBER?
0116	04745	002300		CCE	YES, SET SIGN FLAG TRUE
0117	04746	114220		JSB NUMOA,I	
0118	04747	000000		NOP	
0119	04750	026635		JMP LIST3	
0120	04751	050326	LIS10	CPA .3	INTEGER?
0121	04752	026765		JMP LIS11	YES
0122	04753	050336		CPA .15	NO, FUNCTION?
0123	04754	002001		RSS	YES
0124	04755	026703		JMP LIST6	NO, MUST BE A PARAMETER
0125	04756	060163		LDA TEMP3	COMPUTE
0126	04757	001722		ALF,RAL	PRINT
0127	04760	010420		AND OPMSK	TABLE
0128	04761	070162		STA TEMP2	CODE
0129	04762	064322		LDB ATAB	OUTPUT
0130	04763	017077		JSB MCOU	FUNCTION NAME
0131	04764	026635		JMP LIST3	
0132	04765	034157	LIS11	ISZ TEMPS	OUTPUT
0133	04766	035467		ISZ SLWST	
0134	04767	160157		LDA TEMPS,I	INTEGER
0135	04770	017015		JSB OUTIN	
0136	04771	026635		JMP LIST3	OPERAND
0137	04772	060476	LIS12	LDA BLANK	OUTPUT
0138	04773	015715		JSB OUTCR	BLANK
0139	04774	064307		LDB STTYP	OUTPUT
0140	04775	017077		JSB MCOU	OPERATOR
0141	04776	060415		LDA REMOP	WAS IT
0142	04777	050162		CPA TEMP2	A REM?
0143	05000	027056		JMP OUTS1	YES, OUTPUT REMARK
0144	05001	060476		LDA BLANK	NO, OUTPUT
0145	05002	026667		JMP LIST5-1	A BLANK
0146	05003	006400	LIS13	CLB	HIGH-SPEED
0147	05004	054136		CPB TFLAG	PUNCH?
0148	05005	124205		JMP RDYDA,I	NO
0149	05006	060373		LDA B133	YES, EMIT
0150	05007	114127		JSB LISTR,I	TRAILER
0151	05010	124205		JMP RDYDA,I	
0152	05011	015715	LIS14	JSB OUTCR	OUTPUT "
0153	05012	017055		JSB OUTST	OUTPUT QUOTE STRING
0154	05013	060347		LDA .34	OUTPUT
0155	05014	026667		JMP LIST5-1	
0156*				*	
0157**	OUTPUT AN INTEGER			**	
0158*				*	
0159	05015	000000	OUTIN	NOP	INTEGER IN (A)
0160	05016	064434		LDB M4	SET
0161	05017	077522		STB DI0CT	DIGIT COUNTER
0162	05020	067132		LDB LDVSR	SET DIVISOR
0163	05021	076351		STB DIVSR	ADDRESS
0164	05022	006400		CLB	SET LEADING
0165	05023	076556		STB LDZRO	ZERO FLAG
0166	05024	166351	OUTI1	LDB DIVSR,I	NEGATE
0167	05025	007004		CMB,INB	AND STORE
0168	05026	076513		STB MIND	DIVISOR
0169	05027	007400		CCB	SET QUOTIENT

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0170 05030 006004      INB          TO ZERO
0171 05031 042513      ADA MIND     SUBTRACT DIVISOR FROM INTEGER
0172 05032 002021      SSA,RSS     NEGATIVE RESULT?
0173 05033 027030      JMP *-3     NO, INCREMENT QUOTIENT
0174 05034 142351      ADA DIVSR,I YES, RECOVER REMAINDER
0175 05035 073077      STA MCOUT   AND SAVE IT
0176 05036 060001      LDA 1
0177 05037 002002      SZA        ZERO?
0178 05040 027043      JMP OUTI2   NO
0179 05041 052556      CPA LDZRO   YES, LEADING ZERO?
0180 05042 027046      JMP OUTI3   YES
0181 05043 040357      OUTI2 ADA .48 NO, COMPUTE ASCII FOR DIGIT
0182 05044 072556      STA LDZRU   SET 'ZEROES SIGNIFICANT'
0183 05045 015715      JSB OUTCR   OUTPUT DIGIT
0184 05046 063077      OUTI3 LDA MCOUT RETRIEVE REMAINDER
0185 05047 036351      ISZ DIVSR   SET FOR NEXT DIVISOR
0186 05050 037522      ISZ DIGCT   DIVISION NECESSARY?
0187 05051 027024      JMP OUTI1   YES
0188 05052 040357      ADA .48     NO, COMPUTE ASCII FOR LAST
0189 05053 015715      JSB OUTCR   DIGIT AND OUTPUT IT
0190 05054 127015      JMP OUTIN,I
0191*
0192**  OUTPUT A STRING **
0193*
0194 05055 000000      OUTST NOP   * ENTRY POINT
0195 05056 160157      OUTS1 LDA TEMPS,I REM ENTRY POINT
0196 05057 010374      AND B177   OUTPUT SECOND CHARACTER
0197 05060 002002      SZA        OF WORD IF
0198 05061 015715      JSB OUTCR   NOT NULL
0199 05062 034157      ISZ TEMPS  BUMP POINTER
0200 05063 035467      ISZ SLWST  REM COMPLETED?
0201 05064 002001      RSS       NO
0202 05065 026640      JMP LIST2  YES
0203 05066 160157      LDA TEMPS,I EXTRACT
0204 05067 001727      ALF,ALF   FIRST CHARACTER
0205 05070 010374      AND B177  OF WORD
0206 05071 050325      CPA .2     EXIT
0207 05072 127055      JMP OUTST,I IF A
0208 05073 050326      CPA .3     CLOSING
0209 05074 127055      JMP OUTST,I QUOTE
0210 05075 015715      JSB OUTCR  OUTPUT
0211 05076 027056      JMP OUTS1  CHARACTER
0212*
0213**  LIST A MULTICHARACTER SYMBOL **
0214*
0215 05077 000000      MCCUT NOP
0216 05100 160001      MCCU1 LDA 1,I  LOAD INFORMATION WORD
0217 05101 010420      AND OPMSK  COMPARE WITH
0218 05102 050162      CPA TEMP2  OPERATOR CODE
0219 05103 027112      JMP MCOU2  EQUAL
0220 05104 160001      LDA 1,I   UNEQUAL,
0221 05105 010331      AND .7    COMPUTE
0222 05106 040326      ADA .3    ENTRY
0223 05107 001100      ARS      LENGTH
0224 05110 044000      ADB 0    COMPUTE ADDRESS OF NEXT ENTRY
0225 05111 027100      JMP MCOU1

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0226	05112	160001	MCCU2	LDA 1,I	COMPUTE
0227	05113	010331		AND .7	ENTRY
0228	05114	003004		CMA,INA	LENGTH
0229	05115	073522		STA DIGCT	AND SAVE IT
0230	05116	006104		CLE,INB	SET FOR FIRST CHARACTER
0231	05117	074163		STB TEMP3	SAVE SYMBOL ADDRESS
0232	05120	160163	MCCU3	LDA TEMP3,I	LOAD WORD
0233	05121	002041		SEZ,RSS	FIRST CHARACTER?
0234	05122	001727		ALF,ALF	YES, POSITION IT
0235	05123	010374		AND B177	EXTRACT CHARACTER
0236	05124	015715		JSB OUTCR	OUTPUT IT
0237	05125	002240		SEZ,CME	SET FOR NEXT CHARACTER
0238	05126	034163		ISZ TEMP3	MOVE TO NEXT WORD OF SYMBOL
0239	05127	037522		ISZ DIGCT	MORE CHARACTERS?
0240	05130	027120		JMP MCOU3	YES
0241	05131	127077		JMP MCOU3,I	
0242*					
0243*					
0244	05132	005133	LDVSR	DEF **+1	
0245	05133	023420		DEC 10000	
0246	05134	001750		DEC 1000	
0247	05135	000144		DEC 100	
0248	05136	000012		DEC 10	
0249*					
0250*					
0251	04350		SFLAG	EQU	ARRYS
0252	04333		TABLE	EQU	PRGIN
0253	00167		LNGTH	EQU	TEMPS+8
0254	04351		SMEND	EQU	INTCK
0255	04556		SLENG	EQU	OVCHK
0256	04513		TBLPT	EQU	FNDPS
0257	04537		TSFTR	EQU	CLPRG
0258	04556		INTGR	EQU	OVCHK
0259	04333		LFLAG	EQU	PRGIN
0260	04351		DIVSR	EQU	INTCK
0261	04556		LDZRO	EQU	OVCHK
0262	04513		MIND	EQU	FNDPS

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0264* *****
0265* PHASE 2 OF THE COMPILER
0266* *****
0267*
0268* THIS PHASE HAS THE FOLLOWING 3 FUNCTIONS:
0269* 1. SYMBOL TABLE CONSTRUCTION
0270* 2. FOR LOOP CHECKING
0271* 3. ARRAY STORAGE ALLOCATION
0272*
0273 05137 060113 MFASE LDA PBPTR      NULL
0274 05140 050112      CPA PBUFF      PROGRAM?
0275 05141 124205      JMP RDYDA,I    YES
0276 05142 070115      STA FCORE      NO, SET FOR-TABLE POINTER
0277 05143 060110      LDA FWAM
0278 05144 070170      STA COML      INITIALIZE COMMON POINTER
0279 05145 060117      LDA SYMTA
0280 05146 070116      STA SYMTF     INITIALIZE SYMBOL TABLE POINTER
0281 05147 060112      LDA PBUFF
0282 05150 070135      STA MPTR      INITIALIZE PROGRAM POINTER
0283 05151 164135 MLCPI LDB MPTR,I
0284 05152 074145      STB .LNUM     SET LINE NUMBER
0285 05153 064135      LDB MPTR
0286 05154 034135      ISZ MPTR
0287 05155 144135      ADB MPTR,I    COMPUTE LOCATION OF NEXT
0288 05156 075515      STB MNPTR     STATEMENT AND STORE THIS
0289 05157 034135      ISZ MPTR
0290 05160 160135      LDA MPTR,I    FETCH THE FIRST WORD IN THE
0291 05161 001100 MLC10 ARS      STATEMENT AND SAVE
0292 05162 001727      ALF,ALF      THE STATEMENT TYPE
0293 05163 010362      AND .63
0294 05164 070146      STA TYPE
0295 05165 050355      CPA .46      MAT STATEMENT?
0296 05166 027176      JMP MLC12     YES
0297 05167 050343      CPA .30      NO, REM STATEMENT?
0298 05170 074135      STB MPTR     YES, SET TO SKIP IT
0299 05171 050353      CPA .43      NO, PRINT STATEMENT?
0300 05172 074135      STB MPTR     YES, SET TO SKIP IT
0301 05173 003400      CCA          NO, SET
0302 05174 070171      STA MWDNU    'FIRST VARIABLE'
0303 05175 027212      JMP MLOP2+1  FLAG
0304*
0305 05176 060135 MLC12 LDA MPTR      SEEK
0306 05177 002004      INA          SUBSIDIARY
0307 05200 160000      LDA 0,I     STATEMENT
0308 05201 027161      JMP MLC10   TYPE
0309*
0310 05202 010401 MLC13 AND MSK1      YES, ISOLATE OPERAND
0311 05203 064135      LDB MPTR     INDEX THE PROGRAM POINTER BY
0312 05204 002003      SZA,RSS     AN AMOUNT APPROPRIATE TO THE
0313 05205 044325      ADB .2      OPERAND. THE FOLLOWING APPLIES
0314 05206 050326      CPA .3      OPERAND = 0  ADD 2 TO POINTER
0315 05207 006004      INB         OPERAND =3  ADD 1 TO POINTER
0316 05210 074135      STB MPTR
0317*
0318 05211 034135 MLCPI ISZ MPTR     INCREMENT WORD-OF-STATEMENT PTR
0319 05212 060135      LDA MPTR     STATEMENT

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0320	05213	051515		CPA MNPTR	EXHAUSTED?
0321	05214	027272		JMP MLOP5	YES
0322	05215	160135		LDA MPTR,1	NO
0323	05216	002020		SSA	'CONSTANT' OPERAND?
0324	05217	027202		JMP MLO13	YES
0325	05220	010401		AND MSK1	NO
0326	05221	002003		SZA,RSS	NULL OPERAND?
0327	05222	027211		JMP MLOP2	YES
0328	05223	070157		STA MBOX1	NO, SAVE IT
0329	05224	010336		AND .15	PROGRAMMER-DEFINED
0330	05225	050336		CPA .15	FUNCTION?
0331	05226	027301		JMP MLOP6	YES
0332	05227	040434		ADA M4	NO
0333	05230	002020		SSA	ARRAY VARIABLE?
0334	05231	027320		JMP MLOP7	YES
0335	05232	060157		LDA MBOX1	NO, SIMPLE VARIABLE
0336	05233	114231		JSB SSYMA,1	ALREADY IN
0337	05234	006021		SSB,RSS	SYMBOL TABLE?
0338	05235	027244		JMP MLOP3	YES
0339	05236	060470		LDA MNEG	NO
0340	05237	064471		LDB MNEG+1	ENTER
0341	05240	070160		STA MBOX1+1	IT WITH
0342	05241	074161		STB MBOX1+2	'UNDEFINED'
0343	05242	060433		LDA M3	VALUE
0344	05243	017501		JSB ESYMT	
0345	05244	064146	MLCP3	LDB TYPE	
0346	05245	060157		LDA MBOX1	
0347	05246	054347		CPB .34	NEXT STATEMENT?
0348	05247	027261		JMP MLOP4	YES
0349	05250	054346		CPB .33	NO, FOR STATEMENT?
0350	05251	034171		ISZ MWDNO	YES, FIRST VARIABLE?
0351	05252	027211		JMP MLOP2	NO
0352	05253	034115		ISZ FCORE	DEMAND
0353	05254	064115		LDB FCORE	SPACE
0354	05255	054116		CPB SYMTF	FOR NEW
0355	05256	027511		JMP MER8-1	ENTRY
0356	05257	170115		STA FCORE,1	SAVE VARIABLE NAME
0357	05260	027211		JMP MLOP2	
0358*					
0359	05261	064115	MLCP4	LDB FCORE	FOR-TABLE
0360	05262	054113		CPB PBPTR	EMPTY?
0361	05263	014477		JSB ERROR	YES
0362	05264	150115	MER3	CPA FCORE,1	NO, MATCH LATEST ENTRY?
0363	05265	002001		RSS	YES
0364	05266	027263		JMP MER3-1	NO
0365	05267	044431		ADB M1	REMOVE
0366	05270	074115		STB FCORE	MATCHED
0367	05271	027211		JMP MLOP2	ENTRY
0368*					
0369	05272	050113	MLCP5	CPA PBPTR	PROGRAM EXHAUSTED?
0370	05273	002001		RSS	YES
0371	05274	027151		JMP MLOP1	NO
0372	05275	060146		LDA TYPE	YES
0373	05276	050350		CPA .37	END STATEMENT?
0374	05277	027407		JMP M1LOP	YES
0375	05300	014477		JSB ERROR	NO

0376	05301	160135	MLCP6	LDA MPTR,I	ISOLATE
0377	05302	010420		AND OPMSK	PRECEDING OPERATOR
0378	05303	050414		CPA DEFOP	'DEF' ?
0379	05304	002001		RSS	YES
0380	05305	027211		JMP MLOP2	NO GO TO PROCESS NEXT WORD
0381	05306	060157		LDA MBOX1	SEARCH SYMBOL TABLE FOR
0382	05307	114231		JSB SSYMA,I	THE FUNCTION
0383	05310	006021		SSB,RSS	
0384	05311	014477		JSB ERRUR	FOUND. ERROR MULTIPLY DEFINED
0385	05312	060135	MER4	LDA MPTR	
0386	05313	040326		ADA .3	ENTER THE FUNCTION INTO THE
0387	05314	070160		STA MBOX1+1	SYMBOL TABLE TOGETHER WITH
0388	05315	060432		LDA M2	ITS ENTRY POINT IN THE SOURCE
0389	05316	017501		JSB ESYMT	CODE
0390	05317	027211		JMP MLOP2	GO TO PROCESS THE NEXT WORD
0391*					
0392	05320	070001	MLCP7	STA 1	
0393	05321	060146		LDA TYPE	
0394	05322	050341		CPA .27	DIM STATEMENT?
0395	05323	027335		JMP MLOP8	YES
0396	05324	050342		CPA .28	NO, COM STATEMENT?
0397	05325	027335		JMP MLOP8	YES
0398	05326	017522		JSB MSYMT	NO, LOOK FOR IT IN SYMBOL TABLE
0399	05327	027211		JMP MLOP2	FOUND
0400	05330	002400		CLA	NOT THERE
0401	05331	070160		STA MBOX1+1	ENTER IT WITH
0402	05332	070161		STA MBOX1+2	DIMENSIONS AND
0403	05333	070162		STA MBOX1+3	DIMENSIONALITY
0404	05334	027370		JMP MLOP0	UNDEFINED
0405*					
0406	05335	034135	MLCP8	ISZ MPTR	PROCESS COM OR DIM STMT
0407	05336	034135		ISZ MPTR	
0408	05337	160135		LDA MPTR,I	PICK UP FIRST DIMENSION
0409	05340	001727		ALF,ALF	SHIFT TO M. S. PART OF WORD
0410	05341	054433		CPB M3	IS THIS A SINGLE DIMENSION ARRAY
0411	05342	027347		JMP **5	YES, JUMP
0412	05343	034135		ISZ MPTR	NO, INDEX POINTER TO THE LOC.
0413	05344	034135		ISZ MPTR	OF SECOND DIMENSION AND PACK
0414	05345	130135		IOR MPTR,I	INTO A WITH THE FIRST DIMENSION
0415	05346	002001		RSS	
0416	05347	030324		IOR .1	
0417	05350	070161		STA MBOX1+2	SET UP TO STORE PACKED
0418	05351	070162		STA MBOX1+3	DIMENSIONS IN FORMAL AND ACTUAL
0419	05352	002400		CLA	SLOTS AND UNDEFINED FLAG IN
0420	05353	070160		STA MBOX1+1	STORAGE ALLOCATION SLOT
0421	05354	017522		JSB MSYMT	IN SYMBOL TABLE?
0422	05355	027373		JMP MLOP9	NO
0423	05356	060146		LDA TYPE	YES
0424	05357	050342		CPA .28	
0425	05360	002001		RSS	IS STMT A COM
0426	05361	027370		JMP MLOP0	NO, JUMP
0427	05362	060161		LDA MBOX1+2	YES PICK UP PACKED DIMENSIONS
0428	05363	015336		JSB MDIM	COMPUTE STORAGE REQUIRED
0429	05364	064170		LDB COML	POINTER TO NEXT FREE LOC IN COM
0430	05365	074160		STB MBOX1+1	STORE IN STORAGE ALLOCATION SLOT
0431	05366	044000		ADB 0	UPDATE POINTER BY THE AMOUNT OF

0432	05367	074170		STB COML	STORAGE ASSIGNED.
0433	05370	060434	MLCP0	LDA M4	ENTER THE FOUR WORD ENTRY
0434	05371	017501		JSB ESYMT	PREVIOUSLY SET UP IN MBOX1 INTO
0435	05372	027211		JMP MLOP2	SYMBOL TABLE AND CONTINUE
0436*					
0437	05373	044325	MLCP9	ADB .2	CHECK THE FORMAL DIMENSIONS
0438	05374	160001		LDA 1,I	LOCATION TO SEE IF THE DIMENSION
0439	05375	002002		SZA	IS ALREADY DEFINED
0440	05376	014477		JSB ERROR	ERROR, DOUBLY DIMENSIONED
0441	05377	060146	MER5	LDA TYPE	
0442	05400	050342		CPA .28	COM STMT?
0443	05401	124270		JMP ESYN3,I	ERROR MISPLACED COM STMT
0444	05402	060161		LDA MBOX1+2	
0445	05403	170001		STA 1,I	STORE THESE DIMENSIONS IN FORMAL
0446	05404	006004		INB	AND ACTUAL SLOTS IN SYMBOL TABLE
0447	05405	170001		STA 1,I	ENTRY
0448	05406	027211		JMP MLOP2	GO TO PROCESS NEXT WORD
0449*					
0450*					
0451*					
0452*					
0453*					
0454*					
0455*					
0456*					
0457*					
0458	05407	060115	M1LOP	LDA FCORE	ALL FORS
0459	05410	050113		CPA PBPTR	MATCHED?
0460	05411	002001		RSS	YES
0461	05412	014477		JSB ERROR	NO
0462	05413	064116	MER6	LDB SYMTF	
0463*					
0464	05414	054117	M2LOP	CPB SYMTA	MORE SYMBOLS?
0465	05415	027466		JMP M4LOP	NO
0466	05416	160001		LDA 1,I	YES
0467	05417	010336		AND .15	ACCOUNT FOR
0468	05420	044325		ADB .2	A FUNCTION
0469	05421	050336		CPA .15	IS IT?
0470	05422	027414		JMP M2LOP	YES
0471	05423	006004		INB	NO, ACCOUNT FOR
0472	05424	040434		ADA M4	SIMPLE VARIABLE
0473	05425	002025		SSA,INA,RSS	IS IT?
0474	05426	027414		JMP M2LOP	YES
0475	05427	002003		SZA,RSS	NO, # OF SUBSCRIPTS KNOWN?
0476	05430	014477		JSB ERROR	NO
0477	05431	002004	MER10	INA	SAVE
0478	05432	070160		STA MBOX1+1	FLAG
0479	05433	074157		STB MBOX1	SAVE POINTER
0480	05434	160001		LDA 1,I	DEFINED
0481	05435	002002		SZA	ARRAY?
0482	05436	027445		JMP M3LOP	YES
0483	05437	063500		LDA STDIM	NO, LOAD
0484	05440	034160		ISZ MBOX1+1	APPROPRIATE
0485	05441	040333		ADA .9	STANDARD DIMENSIONS
0486	05442	170001		STA 1,I	RECORD AS
0487	05443	044431		ADB M1	FORMAL AND ACTUAL

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0488	05444	170001		STA 1,I	DIMENSIONS
0489	05445	015336	M3LOP	JSB MDIM	SAVE STORAGE
0490	05446	070160		STA MBOX1+1	REQUIREMENT
0491	05447	064157		LDB MBOX1	LOAD
0492	05450	044432		ADB M2	ADDRESS OF
0493	05451	160001		LDA 1,I	ELEMENT SPACE
0494	05452	002002		SZA	DEFINED IN COM?
0495	05453	027464		JMP MER7	YES
0496	05454	060115		LDA FCORE	NO, USE CURRENT
0497	05455	170001		STA 1,I	FREE-CORE ADDRESS
0498	05456	040160		ADA MBOX1+1	UPDATE FREE-CORE
0499	05457	070115		STA FCORE	ADDRESS
0500	05460	003004		CMA,INA	OUT
0501	05461	040116		ADA SYMTF	OF
0502	05462	002020		SSA	SPACE?
0503	05463	014477		JSB ERROR	YES
0504	05464	044326	MER7	ADB .3	NO, ADVANCE POINTER
0505	05465	027414		JMP M2LOP	TO NEXT ENTRY
0506*					
0507	05466	064113	M4LOP	LDB PBPTK	INITIALIZE ALL
0508	05467	054115		CPB FCORE	ARRAY ELEMENTS
0509	05470	124203		JMP FASE3,I	TO 'UNDEFINED'
0510	05471	060470		LDA MNEG	
0511	05472	170001		STA 1,I	
0512	05473	006004		INB	
0513	05474	060471		LDA MNEG+1	
0514	05475	170001		STA 1,I	
0515	05476	006004		INB	
0516	05477	027467		JMP M4LOP+1	
0517*					
0518	05500	005001	STEIM	OCT 5001	

```

0520* *****
0521* ENTER SYMBOL TABLE SUBROUTINE
0522* *****
0523*
0524* TRANSFER -(A) WORDS FROM THE BUFFER ADDRESSED
0525* BY MBUF TO THE TOP OF THE SYMBOL TABLE.
0526*
0527 05501 000000 ESYMT NOP
0528 05502 071467 STA MBIN1 SAVE NEGATIVE OF LENGTH OF ENTRY
0529 05503 040116 ADA SYMTF
0530 05504 070116 STA SYMTF MOVE SYMBOL TABLE START LOCATOR
0531 05505 071536 STA MBIN2 UP BY THE LENGTH OF ENTRY
0532 05506 003004 CMA,INA CHECK THAT THE SYMBOL TABLE AND
0533 05507 040115 ADA FCORE FOR TABLE DO NOT OVERLAP
0534 05510 002021 SSA,RSS
0535 05511 014477 JSB ERROR OVERLAP ERROR
0536 05512 067543 MER8 LDB MBUF POINTER TO REQD ENTRY
0537 05513 160001 LDA 1,I TRANSFER ENTRY TO THE SYMBOL
0538 05514 171536 STA MBIN2,I TABLE
0539 05515 006004 INB
0540 05516 035536 ISZ MBIN2
0541 05517 035467 ISZ MBIN1
0542 05520 027513 JMP MER8+1
0543 05521 127501 JMP ESYMT,I RETURN

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0544* *****
0545* SUBROUTINE TO SEARCH SYMBOL TABLE FOR AN ARRAY
0546* *****
0547*
0548 05522 000000 MSYMT NOP B GIVES ARRAY TYPE -3 = 1 DIM,
0549 05523 075467 STB MBIN1 -2 = 2DIM, -1 = UNDIMENSIONED
0550 05524 060157 LDA MBOX1 LOAD IDENTIFIER
0551 05525 114231 JSB SSYMA,I SEARCH SYMBOL TABLE
0552 05526 006021 SSB,RSS
0553 05527 127522 JMP MSYMT,I FOUND, RETURN
0554 05530 035467 ISZ MBIN1 IF ARRAY UNDIMENSIONED
0555 05531 002001 RSS
0556 05532 027541 JMP MSYM JUMP TO NOT FOUND EXIT
0557 05533 035467 ISZ MBIN1 SET UP TO CHECK THAT ARRAY DOES
0558 05534 040325 ADA .2 NOT APPEAR IN THE TABLE WITH
0559 05535 040431 ADA M1 DIFFERENT DIMENSIONS. CHANGE
0560 05536 114231 JSB SSYMA,I TYPE 2 TO 1 & TYPE 1 TO 2 AND
0561 05537 006021 SSB,RSS SEARCH AGAIN
0562 05540 014477 JSB ERROR FOUND, INCONSISTENT DIMENSIONS
0563 05541 037522 MSYM ISZ MSYMT NOT FOUND, INCREMENT RETURN
0564 05542 127522 JMP MSYMT,I ADDRESS AND RETURN

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0565*
0566*
0567 05543 000157 MBUF DEF TEMPS
0568 00157 MBCX1 EQU TEMPS
0569 01467 MBIN1 EQU SLWST
0570 01536 MBIN2 EQU RSCHK
0571 00135 MPTR EQU SBPTR
0572 01515 MNPTR EQU OPCHK
0573 00170 COML EQU TEMPS+9
0574 00171 MWDNO EQU TEMPS+10
0575 05522 DIGCT EQU MSYMT

```

EXECUTE THE PROGRAM

```

0002*
0003***
0004** EVALUATE A FORMULA **
0005***
0006*
0007 05544 000000 FORMX NOP FORMULA BEGINS IN (TEMPS)
0008 05545 006400 CLB INITIALIZE OPERATOR
0009 05546 015467 JSB SLWST STACK
0010 05547 160157 FORM1 LDA TEMPS,I FETCH OPERAND
0011 05550 034157 ISZ TEMPS SET FOR NEXT WORD OF FORMULA
0012 05551 010425 AND OPDMK EXTRACT OPERAND
0013 05552 070165 STA TEMPS+6 AND SAVE IT
0014 05553 002003 SZA,RSS NULL OPERAND?
0015 05554 027567 JMP FORM2 YES
0016 05555 015476 JSB BHSTP SET STACK FOR OPERAND ADDRESS
0017 05556 002020 SSA FLAG BIT SET?
0018 05557 027636 JMP FORM4 YES
0019 05560 114231 JSB SSYM,A,I FETCH OPERAND ADDRESS
0020 05561 006007 INB,SZB,RSS EXISTANT?
0021 05562 124267 JMP E8M1A,I NO
0022 05563 010336 AND .15 YES
0023 05564 050336 CPA .15 FUNCTION?
0024 05565 027651 JMP FORM6 YES
0025 05566 174142 STB HSTPT,I NO, STACK OPERAND ADDRESS
0026 05567 160157 FORM2 LDA TEMPS,I FETCH
0027 05570 010420 AND OPMSK OPERATOR
0028 05571 001727 ALF,ALF POSITION IT
0029 05572 064000 LDB 0 LOAD ADDRESS OF
0030 05573 044301 ADB FOPBS OPERATOR'S INFORMATION WORD
0031 05574 040440 ADA M8 NON-FORMULA
0032 05575 002020 SSA OPERATOR?
0033 05576 006400 CLB YES
0034 05577 040451 ADA D53 NO, NON-FORMULA
0035 05600 002021 SSA,RSS OPERATOR?
0036 05601 006400 CLB YES
0037 05602 002400 CLA NO
0038 05603 160001 LDA 1,I LOAD INFORMATION WORD
0039 05604 010401 AND MSK1 SAVE
0040 05605 070166 STA TEMPS+7 PRECEDENCE
0041 05606 120001 XOR 1,I SAVE
0042 05607 001100 ARS
0043 05610 070165 STA TEMPS+6 IDENTIFICATION
0044 05611 027617 JMP FOR11
0045 05612 170140 FORM0 STA TSTPT,I STACK HIGH WORD
0046 05613 060140 LDA TSTPT STACK OPERAND
0047 05614 170142 STA HSTPT,I ADDRESS
0048 05615 002004 INA STORE
0049 05616 174000 STB 0,I LOW WORD
0050 05617 160141 FOR11 LDA LSTPT,I DOES OPERATOR
0051 05620 010376 AND MSK0 ON TOP OF
0052 05621 003000 CMA OPERATOR STACK
0053 05622 040166 ADA TEMPS+7 HAVE HIGHER
0054 05623 002020 SSA PRECEDENCE?
0055 05624 027751 JMP FORM9 YES, EXECUTE IT
0056 05625 002001 RSS NO
0057 05626 034141 FOR10 ISZ LSTPT

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0058	05627	064166	LDB	TEMPS+7	RETRIEVE PRECEDENCE	
0059	05630	044444	ADB	M15	NO, LEFT PARENTHESIS	
0060	05631	006020	SSB		OR LEFT BRACKET?	
0061	05632	044336	ADB	.15	NO, RESTORE PRECEDENCE	
0062	05633	044165	ADB	TEMPS+6	COMBINE IDENTIFICATION	
0063	05634	015467	JSB	SLWST	WITH PRECEDENCE AND STACK	
0064	05635	027547	JMP	FORM1		
0065	05636	050470	FORM4	CPA	FLGBT	CONSTANT?
0066	05637	027645	JMP	FORM5	YES	
0067	05640	010336	AND	.15	NO, PRE-DEFINED	
0068	05641	050336	CPA	.15	FUNCTION	
0069	05642	027726	JMP	FORM7	YES	
0070	05643	064170	LDB	TEMPS+9	NO, MUST BE A	
0071	05644	027566	JMP	FORM2-1	PARAMETER	
0072	05645	064157	FORM5	LDB	TEMPS	LOAD CONSTANT ADDRESS
0073	05646	034157	ISZ	TEMPS	MOVE POINTER TO	
0074	05647	034157	ISZ	TEMPS	NEXT CODE WORD	
0075	05650	027566	JMP	FORM2-1		
0076	05651	074165	FORM6	STB	TEMPS+6	SAVE SYMBOL TABLE POINTER
0077	05652	064140	LDB	TSTPT	SAVE CURRENT POINTER	
0078	05653	015467	JSB	SLWST	TO TEMPORARY STACK	
0079	05654	164165	LDB	TEMPS+6, I		
0080	05655	015467	JSB	SLWST	SAVE FUNCTION ADDRESS	
0081	05656	063544	LDA	FORMX	SAVE CURRENT	
0082	05657	170142	STA	HSTPT, I	FORMX RETURN ADDRESS	
0083	05660	017544	JSB	FORMX	EVALUATE THE PARAMETER	
0084	05661	034157	ISZ	TEMPS	UPDATE FORMULA POINTER	
0085	05662	034157	ISZ	TEMPS	PAST RIGHT PARENTHESIS	
0086	05663	060157	LDA	TEMPS	SWITCH	
0087	05664	164141	LDB	LSTPT, I	FORMULA POINTER	
0088	05665	074157	STB	TEMPS	TO FUNCTION'S	
0089	05666	170141	STA	LSTPT, I	FORMULA	
0090	05667	064170	LDB	TEMPS+9	SET	
0091	05670	160142	LDA	HSTPT, I	PARAMETER POINTER	
0092	05671	034141	ISZ	LSTPT	TO NEW PARAMETER,	
0093	05672	034142	ISZ	HSTPT	SAVING PREVIOUS	
0094	05673	174141	STB	LSTPT, I	SETTING ON	
0095	05674	070170	STA	TEMPS+9	LOW-CORE STACK	
0096	05675	050140	CPA	TSTPT	PROTECT PARAMETER IF	
0097	05676	015536	JSB	RSCHK	ON TEMPORARY STACK	
0098	05677	017544	JSB	FORMX	EVALUATE FUNCTION	
0099	05700	160141	LDA	LSTPT, I	RESTORE OLD	
0100	05701	070170	STA	TEMPS+9	PARAMETER POINTER	
0101	05702	060141	LDA	LSTPT	CUT BACK	
0102	05703	040433	ADA	M3	LOW-CORE	
0103	05704	070141	STA	LSTPT	STACK	
0104	05705	002004	INA		RESTORE ORIGINAL	
0105	05706	164000	LDB	0, I	TEMPORARY STACK	
0106	05707	074140	STB	TSTPT	POINTER	
0107	05710	002004	INA		RESTORE	
0108	05711	164000	LDB	0, I	ORIGINAL	
0109	05712	074157	STB	TEMPS	FORMULA POINTER	
0110	05713	015505	JSB	STTOP	POP RESULT	

0112*

0113** PRE-DEFINED FUNCTIONS RETURN HERE WITH RESULT

0114*

0115	05714	170140	FOR12	STA	TSTPT,I	STORE HIGH WORD
0116	05715	060140		LDA	TSTPT	
0117	05716	002004		INA		STORE
0118	05717	174000		STB	0,I	LOW WORD
0119	05720	034142		ISZ	HSTPT	
0120	05721	164142		LDB	HSTPT,I	RESTORE FORMX
0121	05722	077544		STB	FORMX	RETURN ADDRESS
0122	05723	040431		ADA	M1	STACK ADDRESS
0123	05724	170142		STA	HSTPT,I	OF RESULT
0124	05725	027567		JMP	FORM2	
0125	05726	060165	FORM7	LDA	TEMPS+6	COMPUTE
0126	05727	001727		ALF,	ALF	
0127	05730	001700		ALF		FUNCTION
0128	05731	010344		AND	.31	
0129	05732	040305		ADA	PDFBS	ADDRESS
0130	05733	164000		LDB	0,I	
0131	05734	015467		JSB	SLWST	SAVE FUNCTION ADDRESS
0132	05735	063544		LDA	FORMX	SAVE CURRENT
0133	05736	170142		STA	HSTPT,I	FORMX RETURN ADDRESS
0134	05737	017544		JSB	FORMX	EVALUATE THE PARAMETER
0135	05740	034157		ISZ	TEMPS	UPDATE FORMULA POINTER
0136	05741	034157		ISZ	TEMPS	PAST RIGHT PARENTHESIS
0137	05742	164141		LDB	LSTPT,I	POP
0138	05743	003400		CCA		FUNCTION
0139	05744	040141		ADA	LSTPT	ENTRY
0140	05745	070141		STA	LSTPT	ADDRESS
0141	05746	077501		STB	ESYMT	SAVE
0142	05747	015505		JSB	STTOP	POP PARAMETER
0143	05750	127501		JMP	ESYMT,I	EVALUATE FUNCTION
0144	05751	160141	FORM9	LDA	LSTPT,I	UNSTACK
0145	05752	007400		CCB		OPERATOR
0146	05753	044141		ADB	LSTPT	INFORMATION
0147	05754	074141		STB	LSTPT	WORD
0148	05755	001727		ALF,	ALF	COMPUTE
0149	05756	010374		AND	B177	SUBROUTINE
0150	05757	040304		ADA	ARBAS	ADDRESS
0151	05760	124000		JMP	0,I	EXECUTE

0152**

0153*** EXECUTION BRANCH TABLE **

0154**

0155	05761	006203	XECTB	DEF	ELET	LET
0156	05762	006044		DEF	XEC4	DIM
0157	05763	006044		DEF	XEC4	COM
0158	05764	006044		DEF	XEC4	DEF
0159	05765	006044		DEF	XEC4	REM
0160	05766	006205		DEF	EGOTO	GO TO
0161	05767	006210		DEF	EIF	IF
0162	05770	006216		DEF	EFOR	FOR
0163	05771	006312		DEF	ENEXT	NEXT
0164	05772	006353		DEF	EGOSB	GOSUB
0165	05773	006364		DEF	ERTRN	RETURN
0166	05774	100205		DEF	RDYDA,I	END
0167	05775	100205		DEF	RDYDA,I	STOP

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0168 05776 006373      DEF EWAIT      WAIT
0169 05777 006412      DEF ECALL      CALL
0170 06000 006044      DEF XEC4       DATA
0171 06001 006441      DEF EREAD      READ
0172 06002 006474      DEF EPRIN      PRINT
0173 06003 006643      DEF EINPT      INPUT
0174 06004 006656      DEF ERSTR      RESTORE
0175 06005 011456      DEF EMAT       MAT
0176*
0177* *****
0178****                ***
0179*** EXECUTE THE PROGRAM ***
0180****                ***
0181* *****
0182*
0183**
0184***INITIALIZE FOR OUTPUT **
0185**
0186 06006 002400  XEC  CLA      SET COUNTER FOR
0187 06007 070146      STA TYPE      CHARACTERS OUTPUTTED
0188 06010 070155      STA XH        INITIALIZE
0189 06011 002004      INA          RANDOM
0190 06012 070156      STA XL        VARIABLE
0191**
0192*** INITIALIZE THE DATA POINTER **
0193**
0194 06013 003400      CCA          SET
0195 06014 070151      STA DCCNT    'NO
0196 06015 070147      STA DSTRT    DATA'
0197 06016 064112      LDB PBUFF    CONDITION
0198 06017 074150      STB NXTDT
0199 06020 160315      LDA ADATA,I  SEARCH FOR FIRST
0200 06021 016105      JSB STSRH    DATA STATEMENT
0201 06022 026025      JMP XEC2     NONE FOUND
0202 06023 074147      STB DSTRT    SAVE STATEMENT LOCATION
0203 06024 016074      JSB SETDP    SET DATA POINTER
0204**
0205*** INITIALIZE STACK POINTERS **
0206**
0207 06025 064116  XEC2  LDB SYMTF    INITIALIZE
0208 06026 074142      STB HSTPT    POINTERS TO
0209 06027 064115      LDB FCORE    'HIGH CORE' STACK,
0210 06030 074140      STB TSTPT    'TEMPORARY'
0211 06031 044337      ADB .23      STACK, AND
0212 06032 074120      STB LSTAK    'LOW CORE'
0213 06033 074141      STB LSTPT    STACK
0214 06034 007000      CMB
0215 06035 044142      ADB HSTPT    DO
0216 06036 006020      SSB          STACKS
0217 06037 025473      JMP E1       MEET?
0218 06040 064426      LDB RMODE    YES
0219 06041 074127      STB LISTR    NO, SHIFT TO
0220 06042 064112      LDB PBUFF    RUN MODE
0221 06043 026054      JMP XEC5     BEGIN
                                EXECUTION

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0223**
0224*** FIND NEXT STATEMENT TO BE EXECUTED **
0225**
0226 06044 060144 XEC4 LDA NXTST NEXT STATEMENT NUMBER
0227 06045 064143 LDB PRADD PROSPECTIVE ADDRESS
0228 06046 150001 CPA 1,I DESIRED STATEMENT?
0229 06047 026055 JMP XEC6 YES
0230 06050 064112 LDB PBUFF NO, FIND
0231 06051 114213 JSB FNDPA,I STATEMENT
0232 06052 000000 NOP NON-EXISTENT
0233 06053 014477 JSB ERROR STATEMENT
0234 06054 160001 XEC5 LDA 1,I SAVE NEW
0235 06055 070145 XEC6 STA .LNUM SEQUENCE NUMBER
0236**
0237*** SET SUCCESSOR STATEMENT **
0238**
0239 06056 016147 JSB FLWST
0240 06057 010420 AND OPMSK EXTRACT STATEMENT TYPE
0241 06060 001727 ALF,ALF POSITION
0242 06061 001300 RAR IT
0243 06062 040303 ADA XECBR COMPUTE EXECUTION ADDRESS
0244 06063 124000 JMP 0,I BRANCH TO EXECUTION CODE
0245**
0246*** EVALUATE FORMULA AND RETURN RESULT **
0247**
0248 06064 000000 FETCH NOP
0249 06065 114233 JSB FORMA,I EVALUATE FORMULA
0250 06066 015515 JSB OPCHK
0251 06067 034142 ISZ HSTPT UNSTACK RESULT ADDRESS
0252 06070 160001 LDA 1,I LOAD (A) WITH HIGH MANTISSA
0253 06071 006004 INB LOAD LOW PART
0254 06072 164001 LDB 1,I OF RESULT INTO (B)
0255 06073 126064 JMP FETCH,I EXIT
0256**
0257*** SET POINTER TO START OF DATA STATEMENT **
0258**
0259 06074 000000 SETDP NOP STATEMENT ADDRESS IN (B)
0260 06075 006004 INB LOAD
0261 06076 160001 LDA 1,I STATEMENT LENGTH
0262 06077 003004 CMA,INA SET
0263 06100 002004 INA DATA COUNTER
0264 06101 070151 STA DCCNT TO 1-STATEMENT LENGTH
0265 06102 006004 INB SET 'NEXT DATA' POINTER ONE
0266 06103 074150 STB NXTDT WORD ABOVE FIRST CONSTANT
0267 06104 126074 JMP SETDP,I
0268**
0269*** SEARCH FOR STATEMENT OF GIVEN TYPE **
0270**
0271 06105 000000 STSRH NOP TYPE IN (A), ADDRESS IN (B)
0272 06106 010420 AND OPMSK EXTRACT
0273 06107 070164 STA TEMP4 STATEMENT TYPE
0274 06110 060001 STSR1 LDA 1 EXTRACT
0275 06111 040325 ADA .2 PROGRAM
0276 06112 160000 LDA 0,I STATEMENT
0277 06113 010420 AND OPMSK TYPE
0278 06114 050164 CPA TEMP4 DESIRED TYPE?

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0279 06115 026124      JMP STSR2      YES
0280 06116 060001      LDA 1          NO, FETCH
0281 06117 002004      INA           STATEMENT LENGTH
0282 06120 144000      ADB 0,I       COMPUTE NEW ADDRESS
0283 06121 054113      CPB PBPTR     PAST LAST STATEMENT?
0284 06122 126105      JMP STSRH,I   YES
0285 06123 026110      JMP STSR1     NO
0286 06124 036105      STSR2 ISZ STSRH
0287 06125 126105      JMP STSRH,I

0288**
0289***  FETCH A DATA ITEM  **
0290**
0291 06126 000000      FDATA NOP
0292 06127 034151      FDATA1 ISZ DCCNT  MORE DATA?
0293 06130 026137      JMP FDATA2     YES
0294 06131 160315      LDA ADATA,I   NO, SEARCH
0295 06132 064150      LDB NXTDT     FOR NEXT
0296 06133 016105      JSB STSRH     DATA STATEMENT
0297 06134 014477      JSB ERROR     NONE FOUND
0298 06135 016074      E4 JSB SETDP   INITIALIZE THE
0299 06136 026127      JMP FDATA1     DATA POINTERS
0300 06137 034151      FDATA2 ISZ DCCNT  UPDATE
0301 06140 034151      ISZ DCCNT     POINTER
0302 06141 034150      ISZ NXTDT
0303 06142 160150      LDA NXTDT,I   LOAD
0304 06143 034150      ISZ NXTDT     DATA
0305 06144 164150      LDB NXTDT,I   ITEM
0306 06145 034150      ISZ NXTDT     UPDATE POINTER
0307 06146 126126      JMP FDATA,I

0308**
0309***  SET FOR FOLLOWING STATEMENT  **
0310**
0311 06147 000000      FLWST NOP      (B) HOLDS PRESENT ADDRESS
0312 06150 060001      LDA 1          COMPUTE
0313 06151 002004      INA           ADDRESS
0314 06152 160000      LDA 0,I       OF
0315 06153 040001      ADA 1         NEXT
0316 06154 070143      STA PRADD     STATEMENT
0317 06155 160000      LDA 0,I       RECORD THE
0318 06156 070144      STA NXTST     SEQUENCE NUMBER
0319 06157 044325      ADB .2        FETCH
0320 06160 074157      STB TEMPS     FIRST WORD
0321 06161 160001      LDA 1,I       OF CURRENT
0322 06162 126147      JMP FLWST,I   STATEMENT

0323**
0324***  SEARCH STACK FOR GIVEN FOR-VARIABLE  **
0325**
0326 06163 000000      FVSRH NOP
0327 06164 160157      LDA TEMPS,I   FETCH
0328 06165 010401      AND MSK1     FOR-VARIABLE
0329 06166 071656      STA EDELM    SAVE FOR-VARIABLE
0330 06167 114231      JSB SSYMA,I  FIND ADDRESS IN
0331 06170 006004      INB         SYMBOL TABLE
0332 06171 060142      LDA HSTPT    SAVE
0333 06172 070163      STA TEMP3    STACK TOP
0334 06173 050116      FVSR1 CPA SYMTF  STACK BOTTOM?

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0335	06174	126163		JMP FVSRH,I	YES, EXIT VIA (P+1)
0336	06175	154000		CPB 0,I	MATCHING FOR-VARIABLE?
0337	06176	026201		JMP FVSR2	YES
0338	06177	040330		ADA .6	NO, MOVE TO
0339	06200	026173		JMP FVSR1	NEXT STACK ENTRY
0340	06201	036163	FVSR2	ISZ FVSRH	EXIT
0341	06202	126163		JMP FVSRH,I	VIA (P+2)
0342*					
0343***					***
0344**	EXECUTE LET		**		**
0345***					***
0346*					
0347	06203	114233	ELET	JSB FORMA,I	
0348	06204	026044		JMP XEC4	
0349*					
0350***					***
0351**	EXECUTE GO TO		**		**
0352***					***
0353*					
0354	06205	006004	EGCTO	INB	LOAD SEQUENCE
0355	06206	160001		LDA 1,I	NUMBER
0356	06207	026045		JMP XEC4+1	FIND REFERENCED STATEMENT
0357*					
0358***					***
0359**	EXECUTE IF		**		**
0360***					***
0361*					
0362	06210	114232	EIF	JSB FETCA,I	FETCH VALUE OF FORMULA
0363	06211	002003		SZA,RSS	RESULTANT TRUE?
0364	06212	026044		JMP XEC4	NO
0365	06213	034157		ISZ TEMPS	YES, BRANCH TO
0366	06214	064157		LDB TEMPS	FOLLOWING
0367	06215	026205		JMP EGOTU	SEQUENCE NUMBER
0368*					
0369***					***
0370**	EXECUTE FOR		**		**
0371***					***
0372*					
0373	06216	016163	EFCR	JSB FVSRH	FOR-VARIABLE ALREADY IN STACK?
0374	06217	026230		JMP EFOR1	NO
0375	06220	070162		STA TEMP2	YES, SAVE SOURCE ADDRESS
0376	06221	040330		ADA .6	SAVE
0377	06222	070164		STA TEMP4	DESTINATION ADDRESS
0378	06223	074161		STB TEMP1	SAVE FOR-VARIABLE ADDRESS
0379	06224	014554		JSB MVTOH	COMPRESS STACK
0380	06225	064161		LDB TEMP1	RESTORE FOR-VARIABLE ADDRESS
0381	06226	002400		CLA	COMPUTE
0382	06227	002401		CLA,RSS	COMPUTE
0383	06230	060436	EFCR1	LDA M6	NEW TOP OF
0384	06231	040142		ADA HSTPT	FOR-STACK
0385	06232	070142		STA HSTPT	POINTER
0386	06233	070161		STA TEMP1	
0387	06234	003004		CMA,INA	STACK
0388	06235	040141		ADA LSTPT	
0389	06236	002021		SSA,RSS	OVERFLOW?
0390	06237	025473		JMP E1	YES

0391	06240	174161		STB TEMP1,I	NO, RECORD FOR-VARIABLE ADDRESS
0392	06241	114233		JSB FORMA,I	INITIALIZE FOR-VARIABLE
0393	06242	034157		ISZ TEMPS	
0394	06243	034161		ISZ TEMP1	SAVE
0395	06244	060161		LDA TEMP1	LIMIT
0396	06245	072340		STA ENEX2	ADDRESS
0397	06246	114232		JSB FETCA,I	FETCH
0398	06247	170161		STA TEMP1,I	AND
0399	06250	034161		ISZ TEMP1	STORE
0400	06251	174161		STB TEMP1,I	LIMIT
0401	06252	034161		ISZ TEMP1	
0402	06253	064432		LDB M2	SET FOR STEP SIZE
0403	06254	076126		STB FDATA	SIGN CHECK
0404	06255	160157		LDA TEMPS,I	LOOK FOR
0405	06256	002002		SZA	FOLLOWING 'STEP'
0406	06257	026263		JMP EFOR2	FOUND
0407	06260	060466		LDA HONE	NOT FOUND,
0408	06261	064325		LDB .2	DEFAULT
0409	06262	002001		RSS	IS 1.0
0410	06263	114232	EFCR2	JSB FETCA,I	
0411	06264	002020		SSA	STEP SIZE NEGATIVE?
0412	06265	036126		ISZ FDATA	YES
0413	06266	170161		STA TEMP1,I	SAVE
0414	06267	034161		ISZ TEMP1	STEP
0415	06270	174161		STB TEMP1,I	SIZE
0416	06271	034161		ISZ TEMP1	SET POINTER
0417	06272	060144		LDA NXTST	TO STATEMENT
0418	06273	170161		STA TEMP1,I	FOLLOWING THE FOR
0419	06274	160314	EFCR3	LDA ANEXT,I	FIND
0420	06275	064143		LDB PRADD	'NEXT'
0421	06276	016105		JSB STSRH	STATEMENT
0422	06277	000000		NOP	
0423	06300	016147		JSB FLWST	FIND FOLLOWING STATEMENT
0424	06301	010401		AND MSK1	SAME
0425	06302	051656		CPA EDELM	FOR-VARIABLE?
0426	06303	002001		RSS	YES
0427	06304	026274		JMP EFOR3	NO
0428	06305	164142		LDB HSTPT,I	LOAD
0429	06306	160001		LDA 1,I	VALUE
0430	06307	006004		INB	OF
0431	06310	164001		LDB 1,I	FOR-VARIABLE
0432	06311	026337		JMP ENEX2-1	CHECK ACCEPTABILITY
0433*					
0434***			***		
0435**	EXECUTE NEXT		**		
0436***			***		
0437*					
0438	06312	016163	ENEXT	JSB FVSRH	FIND CORRESPONDING STACK ENTRY
0439	06313	026044		JMP XEC4	NONE PRESENT
0440	06314	070142		STA HSTPT	RESET TOP OF STACK
0441	06315	076333		STB ENEX1	SAVE FOR-VARIABLE ADDRESS
0442	06316	002004		INA	SAVE LIMIT
0443	06317	072340		STA ENEX2	ADDRESS
0444	06320	040325		ADA .2	SAVE STEP SIZE
0445	06321	070161		STA TEMP1	ADDRESS
0446	06322	064432		LDB M2	SET STEP SIZE

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0447	06323	076126		STB FDATA	SIGN CHECK
0448	06324	160161		LDA TEMP1,I	LOAD
0449	06325	034161		ISZ TEMP1	STEP
0450	06326	164161		LDB TEMP1,I	SIZE
0451	06327	034161		ISZ TEMP1	
0452	06330	002020		SSA	CHECK
0453	06331	036126		ISZ FDATA	SIGN
0454	06332	017343		JSB .FAD	INCREMENT
0455	06333	000000	ENEX1	NOP	FOR-VARIABLE
0456	06334	172333		STA ENEX1,I	AND
0457	06335	036333		ISZ ENEX1	SAVE
0458	06336	176333		STB ENEX1,I	VALUE
0459	06337	017347		JSB .FSB	COMPUTE FOR-VARIABLE - LIMIT
0460	06340	000000	ENEX2	NOP	
0461	06341	036126		ISZ FDATA	POSITIVE STEP SIZE?
0462	06342	001600		ELA	YES, COMPLEMENT SIGN
0463	06343	002020		SSA	NO, NON-NEGATIVE RESULT?
0464	06344	026347		JMP ENEX3	NO
0465	06345	160161		LDA TEMP1,I	YES, GO TO FIRST
0466	06346	026045		JMP XEC4+1	STATEMENT OF LOOP
0467	06347	060142	ENEX3	LDA HSTPT	FAILS,
0468	06350	040330		ADA .6	ERASE
0469	06351	070142		STA HSTPT	STACK
0470	06352	026044		JMP XEC4	ENTRY
0471*					
0472***			***		
0473**	EXECUTE	GOSUB	**		
0474***			***		
0475*					
0476	06353	006004	EGCSB	INB	LOAD (A) WITH
0477	06354	160001		LDA 1,I	SEQUENCE NUMBER
0478	06355	064144		LDB NXTST	LOAD (B) WITH
0479	06356	070144		STA NXTST	RETURN SEQUENCE NUMBER
0480	06357	015467		JSB SLWST	STACK RETURN ON LOW-CORE STACK
0481	06360	040442		ADA M10	GOSUBS NESTED
0482	06361	050120		CPA LSTAK	10 DEEP?
0483	06362	014477		JSB ERROR	YES
0484	06363	026044	E2	JMP XEC4	NO
0485*					
0486***			***		
0487**	EXECUTE	RETURN	**		
0488***			***		
0489*					
0490	06364	064141	ERTRN	LDB LSTPT	RETURN STACK
0491	06365	054120		CPB LSTAK	EMPTY?
0492	06366	014477		JSB ERROR	YES
0493	06367	160141	E3	LDA LSTPT,I	NO, LOAD RETURN ADDRESS
0494	06370	044431		ADB M1	RESET
0495	06371	074141		STB LSTPT	STACK POINTER
0496	06372	026045		JMP XEC4+1	

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0498*
0499***
0500** EXECUTE WAIT **
0501***
0502*
0503 06373 034157 EWAIT ISZ TEMPS POINT (TEMPS) TO FORMULA
0504 06374 114232 JSB FETCA,I FETCH EVALUATED FORMULA
0505 06375 002020 SSA NEGATIVE?
0506 06376 026044 JMP XEC4 YES
0507 06377 015364 JSB IFIX CONVERT TO INTEGER
0508 06400 002404 CLA,INA LARGE INTEGER
0509 06401 002003 SZA,RSS SMALL
0510 06402 007021 CMB,SSB,RSS INTEGER?
0511 06403 064470 LDB MNEG NO
0512 06404 006007 EWAI1 INB,SZB,RSS WAIT?
0513 06405 026044 JMP XEC4 NO
0514 06406 060461 LDA M310 YES, SET INNER LOOP
0515 06407 002006 INA,SZA MORE?
0516 06410 026407 JMP *-1 YES
0517 06411 026404 JMP EWAI1 NO
0518*
0519***
0520** EXECUTE CALL **
0521***
0522*
0523 06412 034157 ECALL ISZ TEMPS FETCH
0524 06413 034157 ISZ TEMPS SUBROUTINE
0525 06414 164157 LDB TEMPS,I NUMBER
0526 06415 015323 JSB FNDSB FIND
0527 06416 006004 INB ENTRY
0528 06417 164001 LDB 1,I POINT AND
0529 06420 074172 STB TEMPS+11 SAVE IT
0530 06421 060142 LDA HSTPT SAVE HIGH CORE
0531 06422 070171 STA TEMPS+10 STACK POINTER
0532 06423 034157 ECAL1 ISZ TEMPS ANY
0533 06424 160157 LDA TEMPS,I PARAMETERS
0534 06425 050406 CPA B4000 LEFT?
0535 06426 026431 JMP ECAL2 NO
0536 06427 114233 JSB FORMA,I YES, EVALUATE
0537 06430 026423 JMP ECAL1 A PARAMETER
0538 06431 003400 ECAL2 CCA LOAD ADDRESS OF
0539 06432 040171 ADA TEMPS+10 PARAMETER ADDRESSES
0540 06433 114172 JSB TEMPS+11,I AND BRANCH TO SUBROUTINE
0541 06434 060171 LDA TEMPS+10 RESTORE
0542 06435 070142 STA HSTPT
0543 06436 064115 LDB FCORE POINTERS
0544 06437 074140 STB TSTPT
0545 06440 026044 JMP XEC4

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0547*
0548***
0549** EXECUTE READ **
0550***
0551*
0552 06441 054143 EREAD CPB PRADD END-OF-STATEMENT?
0553 06442 026044 JMP XEC4 YES
0554 06443 114233 JSB FORMA,I NO, EVALUATE NEXT ADDRESS
0555 06444 160142 LDA HSTPT,I RECORD
0556 06445 071677 STA OUTLN ADDRESS
0557 06446 016126 JSB FDATA GET DATA ITEM
0558 06447 171677 STA OUTLN,I STORE
0559 06450 035677 ISZ OUTLN DATA
0560 06451 175677 STB OUTLN,I ITEM
0561 06452 034142 ISZ HSTPT
0562 06453 064157 LDB TEMPS
0563 06454 006004 INB
0564 06455 026441 JMP EREAD
0565**
0566*** INITIALIZE FOR PRINT **
0567**
0568 06456 000000 PRNIN NOP
0569 06457 003400 CCA INITIALIZE
0570 06460 040131 ADA .BUFA BUFFER
0571 06461 070132 STA BADDR POINTER
0572 06462 060146 LDA TYPE INITIALIZE
0573 06463 003004 CMA,INA 'CHARACTERS OUTPUTTED'
0574 06464 070133 STA CCNT COUNTER
0575 06465 002011 SLA,RSS START ON ODD CHARACTER POSITION?
0576 06466 126456 JMP PRNIN,I NO
0577 06467 040431 ADA M1 YES, BIAS
0578 06470 070133 STA CCNT COUNTER
0579 06471 002400 CLA OUTPUT A
0580 06472 015715 JSB OUTCR NULL CHARACTER
0581 06473 126456 JMP PRNIN,I
0582*
0583***
0584** EXECUTE PRINT **
0585***
0586*
0587 06474 016456 EPRIN JSB PRNIN SET FOR PRINT
0588 06475 002400 CLA TURN ON
0589 06476 026503 JMP EPR11,I 'END-OF-LINE' FLAG
0590 06477 002400 EPR10 CLA EXECUTE COMMA
0591 06500 050567 CPA EOL IF NOT FOLLOWING
0592 06501 015656 JSB EDELM A TAB
0593 06502 003400 EPR11 CCA TURN OFF
0594 06503 070567 STA EOL 'END-OF-LINE' FLAG
0595 06504 160157 LDA TEMPS,I EXTRACT
0596 06505 010425 AND OPDMK OPERAND
0597 06506 002002 SZA NULL?
0598 06507 026527 JMP EPR13 NO, FORMULA OR TAB
0599 06510 034157 EPR12 ISZ TEMPS YES
0600 06511 064157 LDB TEMPS MORE
0601 06512 054143 CPB PRADD STATEMENT?
0602 06513 026565 JMP EPR17 NO

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0603	06514	160157	LDA TEMPS, I	YES, EXTRACT
0604	06515	010420	AND OPMSK	NEXT OPERATOR
0605	06516	050403	CPA B2000	' , ' ?
0606	06517	026477	JMP EPRI0	YES
0607	06520	050404	CPA B3000	NO, ' ; ' ?
0608	06521	026502	JMP EPRI1	YES
0609	06522	050402	CPA B1000	NO, " ?
0610	06523	026536	JMP EPRI4	YES
0611	06524	003400	CCA	NO, MUST BE +, -, OR (
0612	06525	040157	ADA TEMPS	BACKUP TO PRIOR
0613	06526	070157	STA TEMPS	NULL OPERAND
0614	06527	003400	EPRI3 CCA	SET
0615	06530	070567	STA EOL	TAB FLAG
0616	06531	114232	JSB FETCA, I	EVALUATE
0617	06532	034567	ISZ EOL	TAB?
0618	06533	026510	JMP EPRI2	YES
0619	06534	015643	JSB ENOUT	NO, PRINT NUMBER
0620	06535	026510	JMP EPRI2	
0621	06536	002400	EPRI4 CLA	TURN ON
0622	06537	070567	STA EOL	'END-OF-LINE' FLAG
0623	06540	071467	STA SLWST	ZERO
0624	06541	071677	STA OUTLN	CHARACTER COUNT
0625	06542	160001	EPRI5 LDA 1, I	
0626	06543	010376	AND MSK0	NON-NULL
0627	06544	002003	SZA, RSS	LOW CHARACTER?
0628	06545	026556	JMP EPRI6	NO
0629	06546	035677	ISZ OUTLN	YES, COUNT IT
0630	06547	006004	INB	
0631	06550	160001	LDA 1, I	
0632	06551	010420	AND OPMSK	
0633	06552	050402	CPA B1000	" NEXT?
0634	06553	026556	JMP EPRI6	YES
0635	06554	035677	ISZ OUTLN	NO, COUNT HIGH CHARACTER
0636	06555	026542	JMP EPRI5	
0637	06556	065677	EPRI6 LDB OUTLN	WILL
0638	06557	044133	ADB CCNT	LINE
0639	06560	044455	ADB M73	EXCEED
0640	06561	006021	SSB, RSS	72 CHARACTERS?
0641	06562	015677	JSB OUTLN	YES, GET FRESH LINE
0642	06563	114223	JSB OUTSA, I	OUTPUT STRING
0643	06564	026504	JMP EPRI1+2	
0644	06565	034567	EPRI7 ISZ EOL	'END-OF-LINE' ?
0645	06566	026603	JMP EPRI8	YES
0646	06567	064146	LDB TYPE	NO, LOAD COUNT OF
0647	06570	007004	CMB, INB	CHARACTERS OUTPUTTED
0648	06571	060133	LDA CCNT	LOAD LINE LENGTH
0649	06572	003004	CMA, INA	SAVE NEW COUNT OF
0650	06573	070146	STA TYPE	CHARACTERS OUTPUTTED
0651	06574	040001	ADA 1	COMPUTE CHARACTERS NOT YET OUT
0652	06575	004010	SLB	CORRECT FOR START ON
0653	06576	040431	ADA M1	ODD PRINT POSITION
0654	06577	064131	LDB .BUFA	OUTPUT
0655	06600	002002	SZA	NON-EMPTY
0656	06601	114102	JSB WRITE, I	BUFFER
0657	06602	026044	JMP XEC4	
0658	06603	015677	EPRI8 JSB OUTLN	PRINT LINE


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0659 06604 026044      JMP XEC4
0660**
0661***  TAB TELEPRINTER  **
0662**
0663 06605 116631  ETAB JSB IENTA,I  SMALL INTEGER?
0664 06606 026627      JMP ETAB1  NO
0665 06607 006400      CLB  YES, SET
0666 06610 074567      STB EOL  'TAB' FLAG TRUE
0667 06611 040454      ADA M72  EXCEED
0668 06612 002021      SSA,RSS  72?
0669 06613 026627      JMP ETAB1  YES
0670 06614 003004      CMA,INA  NO, COMPUTE
0671 06615 040454      ADA M72  BLANKS?
0672 06616 040133      ADA CCNT  REQUIRED
0673 06617 002021      SSA,RSS  ANY?
0674 06620 124264      JMP FR12A,I  NO
0675 06621 071677      STA OUTLN  YES,
0676 06622 060345      LDA .32  OUTPUT
0677 06623 015715      JSB OUTCR  REQUIRED
0678 06624 035677      ISZ OUTLN  NUMBER
0679 06625 026622      JMP *-3  OF BLANKS
0680 06626 124264      JMP FR12A,I
0681 06627 015677  ETAB1 JSB OUTLN  OUTPUT THE
0682 06630 124264      JMP FR12A,I  LINE
0683*
0684 06631 011413  IENTA DEF .IENT
0685*
0686***
0687**  EXECUTE INPUT  **
0688***
0689*
0690 06632 002006  EINP1 INA,SZA  END-OF-INPUT?
0691 06633 114206      JSB DRQSA,I  YES, CALL FOR MORE
0692 06634 014567  EINP2 JSB CONST  CONVERT AND STORE NUMBER
0693 06635 026632      JMP EINP1  NOT NUMBER
0694 06636 064157      LDB TEMPS  END-OF-
0695 06637 006004      INB
0696 06640 054143      CPB PRADD  STATEMENT?
0697 06641 026652      JMP EINP3  YES
0698 06642 050334      CPA .10  NO, INSURE MORE INPUT
0699 06643 114206  EINPT JSB DRQSA,I  CALL FOR INPUT
0700 06644 114233      JSB FORMA,I  COMPUTE VARIABLE ADDRESS
0701 06645 003400      CCA  STORE
0702 06646 140142      ADA HSTPT,I  ADDRESS-1
0703 06647 034142      ISZ HSTPT  IN
0704 06650 070135      STA SBPTR  POINTER
0705 06651 026634      JMP EINP2
0706 06652 002400  EINP3 CLA  RESET
0707 06653 070146      STA TYPE  OUTPUT BUFFER
0708 06654 026044      JMP XEC4

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0710**
0711*** EXIT FORMULA CN EMPTY STACK **
0712**
0713 06655 105544          DEF FORMX,I
0714*
0715***                    ***
0716** EXECUTE RESTORE **
0717***                    ***
0718*
0719 06656 064147  ERSTR LDB DSTRT      GET FIRST DATA STATEMENT ADDRESS
0720 06657 054431          CPB M1      IMPOSSIBLE ADDRESS?
0721 06660 026044          JMP XEC4      YES, DONE
0722 06661 016074          JSB SETDP     NO, SET DATA POINTER
0723 06662 026044          JMP XEC4      DONE
0001**
0002*** FORMULA OPERATOR JUMP TABLE **
0003**
0004 06663 006722  ARCTB DEF ESCMA      SUBSCRIPT SEPARATOR
0005 06664 007002          DEF ESTR      ASSIGNMENT OPERATOR
0006 06665 007026          DEF EFAD      '+'
0007 06666 007031          DEF EFSB      '-'
0008 06667 007034          DEF EFMP      '*'
0009 06670 007037          DEF EFDV      '/'
0010 06671 007042          DEF EPWR      '^'
0011 06672 007164          DEF EGTRT     '>'
0012 06673 007171          DEF ELST     '<'
0013 06674 007215          DEF ENEQL    '#'
0014 06675 007176          DEF EEQL     '='
0015 06676 007227          DEF EUMIN    UNARY '-'
0016 06677 007232          DEF ELBRC    '['
0017 06700 100260          DEF FOR1A,I  '('
0018 06701 100262          DEF FOR0B,I  UNARY '+'
0019 06702 007240          DEF EOR      OR
0020 06703 007246          DEF EAND     AND
0021 06704 007253          DEF ENOT     NOT
0022 06705 007203          DEF EGORE    '>='
0023 06706 007210          DEF ELORE    '<='
0024**
0025*** EXECUTE A BINARY OPERATOR **
0026**
0027 06707 000000  BINOP NOP          SAVE
0028 06710 162707          LDA BINOP,I  SUBROUTINE
0029 06711 072717          STA BIN01   CALL
0030 06712 036707          ISZ BINOP  SET RETURN ADDRESS
0031 06713 015515          JSB OPCHK   SAVE ADDRESS OF
0032 06714 076720          STB BIN02   TOP OPERAND
0033 06715 034142          ISZ HSTPT  UNSTACK ADDRESS
0034 06716 015505          JSB STTOP   LOAD SECOND OPERAND
0035 06717 000000  BIN01 NOP          PERFORM OPERATION
0036 06720 000000  BIN02 NOP          ADDRESS OF SECOND OPERAND
0037 06721 126707          JMP BINOP,I

```

0039**

0040*** EXECUTE SUBSCRIPT COMMA **

0041**

0042	06722	016771	ESCMA	JSB	ESBS	INTEGERIZE COLUMN SUBSCRIPT
0043	06723	034141		ISZ	LSTPT	
0044	06724	016771		JSB	ESBS	INTEGERIZE ROW SUBSCRIPT
0045	06725	164142		LDB	HSTPT,I	FETCH
0046	06726	044325		ADB	.2	SUBSCRIPT
0047	06727	160001		LDA	1,I	ROUNDS
0048	06730	010376		AND	MSK0	SAVE
0049	06731	071677		STA	OUTLN	COLUMN BOUND
0050	06732	160001		LDA	1,I	EXTRACT
0051	06733	001727		ALF	ALF	ROW
0052	06734	010376		AND	MSK0	BOUND
0053	06735	003004		CMA	INA	ACTUAL
0054	06736	140141		ADA	LSTPT,I	ROW SUBSCRIPT
0055	06737	002021		SSA	RSS	LEGAL?
0056	06740	026757		JMP	E6-1	NO
0057	06741	061677		LDA	OUTLN	YES
0058	06742	050324		CPA	.1	COLUMN MATRIX?
0059	06743	026747		JMP	ESCM1	YES
0060	06744	015236		JSB	MPY	NO, COMPUTE ADDRESS
0061	06745	100141		DEF	LSTPT,I	DISPLACEMENT
0062	06746	002001		RSS		DUE TO ROWS
0063	06747	160141	ESCM1	LDA	LSTPT,I	
0064	06750	007400		CCB		UNSTACK
0065	06751	044141		ADB	LSTPT	ROW
0066	06752	074141		STB	LSTPT	SUBSCRIPT
0067	06753	065677		LDB	OUTLN	ACTUAL
0068	06754	007004		CMB	INB	COLUMN
0069	06755	144141		ADB	LSTPT,I	SUBSCRIPT
0070	06756	006021		SSB	RSS	LEGAL?
0071	06757	014477		JSB	ERROR	NO
0072	06760	140141	E6	ADA	LSTPT,I	YES, ADD IN COLUMN DISPLACEMENT
0073	06761	001000		ALS		DOUBLE DISPLACEMENT
0074	06762	164142		LDB	HSTPT,I	COMPUTE
0075	06763	140001		ADA	1,I	ACTUAL
0076	06764	170142		STA	HSTPT,I	ADDRESS
0077	06765	064141		LDB	LSTPT	UNSTACK
0078	06766	044431		ADB	M1	
0079	06767	074141		STB	LSTPT	
0080	06770	124260		JMP	FOR1A,I	

0081**

0082*** INTEGERIZE A SUBSCRIPT **

0083**

0084	06771	000000	ESBS	NOP		
0085	06772	015515		JSB	OPCHK	VALIDATE SUBSCRIPT
0086	06773	160001		LDA	1,I	FETCH
0087	06774	006004		INB		SUBSCRIPT
0088	06775	164001		LDB	1,I	
0089	06776	015353		JSB	SBFIX	INTEGERIZE
0090	06777	174141		STB	LSTPT,I	SAVE IN OPERATOR STACK
0091	07000	034142		ISZ	HSTPT	POP OPERAND STACK
0092	07001	126771		JMP	ESBS,I	

```

0094**
0095*** EXECUTE STORE **
0096**
0097 07002 064166 ESTR LDB TEMPS+7 IS NEXT OPERATOR
0098 07003 006002 SZB AN END-OF-FORMULA?
0099 07004 124263 JMP FOR10,I NO, DEFER STORE
0100 07005 054165 CPB TEMPS+6 YES, FIRST STORE OPERATOR USED?
0101 07006 027022 JMP ESTR2 YES
0102 07007 160142 ESTR1 LDA HSTPT,I SET
0103 07010 070170 STA TEMPS+9 DESTINATION
0104 07011 060165 LDA TEMPS+6 SOURCE ADDRESS IN (A)
0105 07012 164000 LDB 0,I TRANSFER HIGH
0106 07013 174170 STB TEMPS+9,I PART OF SOURCE
0107 07014 034170 ISZ TEMPS+9 UPDATE
0108 07015 002004 INA POINTERS
0109 07016 164000 LDB 0,I TRANSFER LOW
0110 07017 174170 STB TEMPS+9,I PART OF SOURCE
0111 07020 034142 ISZ HSTPT POP STACK
0112 07021 124262 JMP FOR00,I
0113 07022 015515 ESTR2 JSB OPCHK SAVE ADDRESS
0114 07023 074165 STB TEMPS+6 OF QUANTITY
0115 07024 034142 ISZ HSTPT YES, POP HIGH-CORE
0116 07025 027007 JMP ESTR1 STACK AND EXECUTE STORE
0117**
0118*** CALL ADD **
0119**
0120 07026 016707 EFAD JSB BINOP
0121 07027 017343 JSB .FAD
0122 07030 124261 JMP FOR0A,I
0123**
0124*** CALL SUBTRACT **
0125**
0126 07031 016707 EFSB JSB BINOP
0127 07032 017347 JSB .FSB
0128 07033 124261 JMP FOR0A,I
0129**
0130*** CALL MULTIPLY **
0131**
0132 07034 016707 EFMP JSB BINOP
0133 07035 017416 JSB .FMP
0134 07036 124261 JMP FOR0A,I
0135**
0136*** CALL DIVIDE **
0137**
0138 07037 016707 EFIV JSB BINOP
0139 07040 017463 JSB .FDV
0140 07041 124261 JMP FOR0A,I
0141**
0142*** EXECUTE + **
0143**
0144 07042 164142 EPWR LDB HSTPT,I LOAD
0145 07043 160001 LDA 1,I
0146 07044 006004 INB POWER
0147 07045 164001 LDB 1,I
0148 07046 015364 JSB IFIX
0149 07047 027052 JMP **3

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0150	07050	102301		SOS	INTEGER?
0151	07051	027065		JMP EPWR1	YES
0152	07052	016707		JSB BINOP	NO
0153	07053	027054		JMP RPWR	
0154	07054	017144	RPWR	JSB PCHK	CHECK ARGUMENTS
0155	07055	002020		SSA	NEGATIVE BASE?
0156	07056	014477		JSB ERROR	YES
0157	07057		BASER	EQU *	
0158	07057	066717		LDB BIN01	NO, LOAD BASE
0159	07060	114234		JSB .LOGA,I	TAKE NATURAL LOG
0160	07061	017416		JSB .FMP	MULTIPLY
0161	07062	106720		DEF BIN02,I	BY POWER
0162	07063	114235		JSB .EXPA,I	EXPONENTIATE
0163	07064	124261		JMP FOR0A,I	RESULT
0164	07065	077463	EPWR1	STB TT1	SAVE SIGN
0165	07066	006020		SSB	SAVE
0166	07067	007004		CMB,INB	ABSOLUTE VALUE
0167	07070	077552		STB TT2	OF POWER
0168	07071	016707		JSB BINOP	
0169	07072	027073		JMP IPWR	
0170	07073	017144	IPWR	JSB PCHK	CHECK ARGUMENTS
0171	07074	066717		LDB BIN01	STORE
0172	07075	072717		STA BIN01	
0173	07076	076720		STB BIN02	BASE
0174	07077	060466		LDA HONE	INITIALIZE
0175	07100	070163		STA TT3	RESULT
0176	07101	060325		LDA .2	TO
0177	07102	070164		STA TT4	1.0
0178	07103	067552	IPWR1	LDB TT2	DIVIDE POWER
0179	07104	004031		SLB,BRS	BY 2
0180	07105	027124		JMP IPWR3	WAS ODD
0181	07106	077552		STB TT2	WAS EVEN
0182	07107	006002	IPWR2	SZB	ZERO?
0183	07110	027135		JMP IPWR4	NO
0184	07111	063463		LDA TT1	YES
0185	07112	002020		SSA	POSITIVE POWER?
0186	07113	027117		JMP IPWR5	NO
0187	07114	060163		LDA TT3	YES,LOAD
0188	07115	064164		LDB TT4	RESULT
0189	07116	124261		JMP FOR0A,I	
0190	07117	060466	IPWR5	LDA HONE	LOAD
0191	07120	064325		LDB .2	1.0
0192	07121	017463		JSB .FDV	DIVIDE BY
0193	07122	000163		DEF TT3	RESULT
0194	07123	124261		JMP FOR0A,I	
0195	07124	077552	IPWR3	STB TT2	SAVE POWER
0196	07125	062717		LDA BIN01	LOAD
0197	07126	066720		LDB BIN02	BASE
0198	07127	017416		JSB .FMP	MULTIPLY BY
0199	07130	000163		DEF TT3	RESULT-SO-FAR
0200	07131	070163		STA TT3	SAVE PARTIAL
0201	07132	074164		STB TT4	RESULT
0202	07133	067552		LDB TT2	LOAD POWER
0203	07134	027107		JMP IPWR2	
0204	07135	062717	IPWR4	LDA BIN01	LOAD
0205	07136	066720		LDB BIN02	BASE

0206	07137	017416		JSB .FMP	SQUARE
0207	07140	006717		DEF BIN01	IT
0208	07141	072717		STA BIN01	SAVE
0209	07142	076720		STB BIN02	RESULT
0210	07143	027103		JMP IPWR1	
0211	**				
0212	*** INSURE VALID CPERATION **				
0213	**				
0214	07144	000000	PCHK	NOP	
0215	07145	076717		STB BIN01	LOAD
0216	07146	166720		LDB BIN02,I	POWER
0217	07147	002002		SZA	BASE ZERO?
0218	07150	027161		JMP PCHK1	NO
0219	07151	006003		SZB,RSS	YES, POWER ZERO?
0220	07152	014477		JSB ERROR	YES
0221	07153		POWER	EQU *	
0222	07153	006021		SSB,RSS	NO, POWER POSITIVE?
0223	07154	027221		JMP FALSE	YES
0224	07155	014477		JSB ERROR	NO
0225	07156	060422	ZRTNG	LDA INF	USE POSITIVE
0226	07157	064432		LDB M2	INFINITY
0227	07160	124261		JMP FOR0A,I	
0228	07161	006003	PCHK1	SZB,RSS	POWER ZERO?
0229	07162	027224		JMP TRUE	YES, RETURN 1.0
0230	07163	127144		JMP PCHK,I	NO
0231	**				
0232	*** EXECUTE > **				
0233	**				
0234	07164	016707	EGRT	JSB BINOP	COMPUTE OPERAND
0235	07165	017347		JSB .FSB	DIFFERENCE
0236	07166	002020		SSA	NEGATIVE?
0237	07167	027221		JMP FALSE	YES
0238	07170	027217		JMP ENEQ1	NO
0239	**				
0240	*** EXECUTE < **				
0241	**				
0242	07171	016707	ELST	JSB BINOP	COMPUTE OPERAND
0243	07172	017347		JSB .FSB	DIFFERENCE
0244	07173	002020		SSA	NEGATIVE?
0245	07174	027224		JMP TRUE	YES
0246	07175	027221		JMP FALSE	NO
0247	**				
0248	*** EXECUTE = **				
0249	**				
0250	07176	016707	EEGL	JSB BINOP	COMPUTE OPERAND
0251	07177	017347		JSB .FSB	DIFFERENCE
0252	07200	002002	EEGL1	SZA	ZERO?
0253	07201	027221		JMP FALSE	NO
0254	07202	027224		JMP TRUE	YES

```

0256**
0257*** EXECUTE >= **
0258**
0259 07203 016707 EGCRC JSB BINOP COMPUTE OPERAND
0260 07204 017347 JSB .FSB DIFFERENCE
0261 07205 002020 SSA POSITIVE?
0262 07206 027221 JMP FALSE NO
0263 07207 027224 JMP TRUE YES
0264**
0265*** EXECUTE <= **
0266**
0267 07210 016707 ELCRC JSB BINOP COMPUTE OPERAND
0268 07211 017347 JSB .FSB DIFFERENCE
0269 07212 002020 SSA NEGATIVE?
0270 07213 027224 JMP TRUE YES
0271 07214 027200 JMP EEQL1 NO
0272**
0273*** EXECUTE # **
0274**
0275 07215 016707 ENEQL JSB BINOP COMPUTE OPERAND
0276 07216 017347 JSB .FSB DIFFERENCE
0277 07217 002002 ENEW1 SZA NON-ZERO?
0278 07220 027224 JMP TRUE YES
0279**
0280*** SET LOGICAL VALUES **
0281**
0282 07221 002400 FALSE CLA LOAD
0283 07222 006400 CLB ZERO
0284 07223 124261 JMP FOR0A,I
0285 07224 060466 TRLE LDA NONE LOAD
0286 07225 064325 LDB .2 ONE
0287 07226 124261 JMP FOR0A,I
0288**
0289*** EXECUTE UNARY - **
0290**
0291 07227 015505 EUMIN JSB STTOP LOAD NUMBER
0292 07230 015423 JSB ARINV NEGATE NUMBER
0293 07231 124261 JMP FOR0A,I
0294**
0295*** EXECUTE LEFT BRACKET **
0296**
0297 07232 034141 ELBRC ISZ LSTPT LOAD SUBSCRIPT COMMA
0298 07233 064405 LDB SCCNT INFORMATION WORD
0299 07234 015467 JSB SLWST STACK IT
0300 07235 015476 JSB BHSTP STACK
0301 07236 015536 JSB RSCHK
0302 07237 027224 JMP TRUE 1
0303**
0304*** EXECUTE OR **
0305**
0306 07240 016707 EOR JSB BINOP VALIDATE
0307 07241 027242 JMP ORS OPERANDS
0308 07242 002002 ORS SZA SECOND OPERAND NON-ZERO?
0309 07243 027224 JMP TRUE YES
0310 07244 162720 ORS1 LDA BIN02,I NO, CHECK SECOND
0311 07245 027217 JMP ENEQ1 OPERAND

```

0312**

0313*** EXECUTE AND **

0314**

0315	07246	016707	EAND	JSB BINOP	VALIDATE
0316	07247	027250		JMP ANDS	OPERANDS
0317	07250	002003	ANIS	SZA,RSS	SECOND OPERAND ZERO?
0318	07251	027221		JMP FALSE	YES
0319	07252	027244		JMP ORS1	NO

0320**

0321*** EXECUTE NOT **

0322**

0323	07253	015505	ENCT	JSB STTOP	LOAD OPERAND
0324	07254	002002		SZA	ZERO?
0325	07255	027221		JMP FALSE	NO
0326	07256	027224		JMP TRUE	YES

0327**

0328*** ADD TWO FLOATING POINT QUANTITIES **

0329**

0330	07257	000000	ADMUP	NOP	
0331	07260	061677		LDA OUTLN	COMPUTE
0332	07261	003004	ADMU1	CMA,INA	EXPONENT
0333	07262	040154		ADA EXP	DIFFERENCE
0334	07263	002021		SSA,RSS	ARG 1 LARGER?
0335	07264	027302		JMP ADMU2	YES
0336	07265	062074		LDA A1	NO,
0337	07266	066105		LDB A2	SWAP
0338	07267	072105		STA A2	ARGUMENTS
0339	07270	076074		STB A1	
0340	07271	062147		LDA C1	
0341	07272	066163		LDB C2	
0342	07273	072163		STA C2	
0343	07274	076147		STB C1	
0344	07275	060154		LDA EXP	
0345	07276	065677		LDB OUTLN	
0346	07277	071677		STA OUTLN	
0347	07300	074154		STB EXP	
0348	07301	027261		JMP ADMU1	
0349	07302	040447	ADMU2	ADA M25	SHIFT COUNT >=
0350	07303	066147		LDB C1	
0351	07304	002021		SSA,RSS	25 ?
0352	07305	027334		JMP ADMU4	YES, IGNORE SMALLER ARGUMENT
0353	07306	003100		CMA,CLE	NO, COMPUTE
0354	07307	040447		ADA M25	SHIFT COUNT
0355	07310	071677		STA OUTLN	AS NEGATIVE
0356	07311	062105		LDA A2	LOAD SMALLER
0357	07312	066163		LDB C2	MANTISSA
0358	07313	035677	ADMU3	ISZ OUTLN	MORE SHIFTS?
0359	07314	027337		JMP ADMU5	YES
0360	07315	046147		ADB C1	NO, ADD LOW MANTISSAS
0361	07316	103101		CLO	
0362	07317	005326		RBR,ELB	SAVE (E) IN B(0)
0363	07320	000040		CLE	
0364	07321	042074		ADA A1	ADD HIGH MANTISSAS
0365	07322	004010		SLB	OVERFLOW FROM LOWER MANTISSA?
0366	07323	002004		INA	YES, ADD IT IN
0367	07324	005566		ERB,CLE,ELB	ERASE B(0)


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0368 07325 102301      SOS      OVERFLOW?
0369 07326 027335      JMP ADMU4+1      NO
0370 07327 001500      ERA      YES, SHIFT
0371 07330 005500      ERB      MANTISSA DOWN AND
0372 07331 034154      ISZ EXP      CORRECT EXPONENT
0373 07332 027335      JMP ADMU4+1
0374 07333 002001      RSS
0375 07334 062074      ADMU4 LDA A1      RETRIEVE HIGH MANTISSA
0376 07335 015020      JSB .PACK      NORMALIZE AND PACK
0377 07336 127257      JMP ADMUP,I
0378 07337 000071      ADMU5 CLE,SLA,ARS  ARITHMETIC
0379 07340 002200      CME      DOUBLE
0380 07341 005540      ERB,CLE      SHIFT
0381 07342 027313      JMP ADMU3
0382**
0383***  ADD TWO FLOATING POINT NUMBERS  **
0384**
0385 07343 000000      .FAD  NOP
0386 07344 017366      JSB UNPAK      UNPACK THE ARGUMENTS
0387 07345 017257      JSB ADMUP      ADD THEM UP
0388 07346 127343      JMP .FAD,I
0389**
0390***  SUBTRACT TWO FLOATING POINT NUMBERS  **
0391**
0392 07347 000000      .FSB  NOP
0393 07350 017366      JSB UNPAK      UNPACK THE ARGUMENTS
0394 07351 062105      LDA A2      TWO'S COMPLEMENT
0395 07352 003000      CMA      THE SECOND ARGUMENT
0396 07353 007006      CMB,INB,SZB  LOW PART ZERO?
0397 07354 027362      JMP .FSB1     NO
0398 07355 002025      SSA,INA,RSS  YES, ORIGINAL NUMBER NEGATIVE?
0399 07356 002021      SSA,RSS     YES, STILL NEGATIVE?
0400 07357 027362      JMP .FSB1     NO
0401 07360 001300      RAR      YES, SHIFT DOWN AND
0402 07361 035677      ISZ OUTLN    CORRECT EXPONENT
0403 07362 076163      .FSB1 STB C2  SAVE COMPLEMENTED
0404 07363 072105      STA A2      NUMBER
0405 07364 017257      JSB ADMUP    ADD ARGUMENTS
0406 07365 127347      JMP .FSB,I
0407**
0408***  UNPACK ARGUMENTS FOR ARITHMETIC OPERATIONS  **
0409**
0410 07366 000000      UNPAK NOP
0411 07367 072074      STA A1      SAVE HIGH PART OF ARG 1
0412 07370 002003      SZA,RSS     UNPACK
0413 07371 006404      CLB,INB     SECOND
0414 07372 015456      JSB .FLUN   WORD
0415 07373 076147      STB C1      SAVE LOW PART OF ARG 1
0416 07374 070154      STA EXP     SAVE EXPONENT OF ARG 1
0417 07375 063366      LDA UNPAK   COMPUTE ADDRESS OF
0418 07376 040432      ADA M2      CALLING ROUTINE
0419 07377 164000      LDB 0,I
0420 07400 134000      ISZ 0,I    SET CALLING ROUTINE'S RETURN
0421 07401 164001      LDB 1,I    LOAD
0422 07402 005275      RBL,CLE,SLB,ERB  ADDRESS OF
0423 07403 027401      JMP *-2    ARG 2

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0424	07404	160001	LDA 1,I	LOAD
0425	07405	006004	INB	ARG 2
0426	07406	164001	LDB 1,I	
0427	07407	072105	STA A2	SAVE HIGH PART OF ARG 2
0428	07410	002003	SZA,RSS	UNPACK
0429	07411	006404	CLB,INB	SECOND
0430	07412	015456	JSB .FLUN	WORD
0431	07413	076163	STB C2	SAVE LOW PART OF ARG 2
0432	07414	071677	STA OUTLN	SAVE EXPONENT OF ARG 2
0433	07415	127366	JMP UNPAK,I	
0434**				
0435***	MULTIPLY TWO FLOATING POINT NUMBERS **			
0436**				
0437	07416	000000	.FMP NOP	UNPACK THE
0438	07417	017366	JSB UNPAK	ARGUMENTS
0439	07420	040154	ADA EXP	ADD EXPONENTS
0440	07421	002004	INA	PLUS 1 FOR
0441	07422	070154	STA EXP	NORMALIZATION
0442	07423	005300	RBR	POSITION LOW PART OF ARG 2
0443	07424	060001	LDA 1	COMPUTE A
0444	07425	015236	JSB MPY	CROSS PRODUCT
0445	07426	006074	DEF A1	
0446	07427	072163	STA C2	SAVE RESULT
0447	07430	062147	LDA C1	LOAD AND POSITION
0448	07431	001300	RAR	LOW PART OF ARG 1
0449	07432	076147	STB C1	SAVE REST OF PRIOR RESULT
0450	07433	015236	JSB MPY	COMPUTE SECOND
0451	07434	006105	DEF A2	CROSS PRODUCT
0452	07435	046147	ADB C1	ADD
0453	07436	000040	CLE	CROSS
0454	07437	042163	ADA C2	PRODUCTS
0455	07440	002040	SEZ	CORRECT
0456	07441	006004	INB	FOR CARRY
0457	07442	076163	STB C2	SAVE RESULT
0458	07443	062074	LDA A1	COMPUTE
0459	07444	015236	JSB MPY	HIGH PART
0460	07445	006105	DEF A2	OF PRODUCT
0461	07446	000065	CLE,ERA	POSITION LOW PART
0462	07447	042163	ADA C2	ADD IN CROSS TERMS
0463	07450	000066	CLE,ELA	REPOSITION
0464	07451	002041	SEZ,RSS	CARRY FROM LOW PART?
0465	07452	027456	JMP **4	NO
0466	07453	102201	SOC	YES, POSITIVE CARRY?
0467	07454	006005	INB,RSS	YES
0468	07455	044431	ADB M1	NO
0469	07456	072074	STA A1	EXCHANGE
0470	07457	060001	LDA 1	
0471	07460	066074	LDB A1	REGISTERS
0472	07461	015020	JSB .PACK	NORMALIZE AND PACK
0473	07462	127416	JMP .FMP,I	

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0475**
0476***  PERFORM FLOATING DIVIDE  **
0477**
0478 07463 000000 .FLV NOP
0479 07464 017366 JSB UNPAK UNPACK ARGUMENTS
0480 07465 066105 LDB A2 DIVISOR
0481 07466 006003 SZB,RSS ZERO?
0482 07467 027546 JMP .FDV2 YES
0483 07470 066074 LDB A1 NO, DIVIDEND
0484 07471 006003 SZB,RSS ZERO?
0485 07472 027543 JMP .FDV1 YES
0486 07473 003004 CMA,INA NO, COMPUTE
0487 07474 002004 INA EXPONENT
0488 07475 040154 ADA EXP DIFFERENCE
0489 07476 070154 STA EXP PLUS 1
0490 07477 062147 LDA C1 LOAD DIVIDEND
0491 07500 004071 CLE,SLB,BRS ARITHMETIC
0492 07501 002200 CME RIGHT SHIFT
0493 07502 001500 ERA TWICE TO
0494 07503 004071 CLE,SLB,BRS PREVENT
0495 07504 002200 CME DIVISION
0496 07505 001500 ERA OVERFLOW
0497 07506 017552 JSB IDIV DIVIDE
0498 07507 071677 STA OUTLN SAVE QUOTIENT
0499 07510 005100 BRS DIVIDE REMAINDER BY 2 TO
0500 07511 002400 CLA PREVENT DIVISION OVERFLOW
0501 07512 017552 JSB IDIV DIVIDE REMAINDER AND
0502 07513 070615 STA NUMCK SAVE LOW PART OF QUOTIENT
0503 07514 066163 LDB C2
0504 07515 002500 CLA,CLE SCALE TO
0505 07516 005521 ERB,BRS PREVENT
0506 07517 005100 BRS OVERFLOW
0507 07520 017552 JSB IDIV COMPUTE B2/A2 = Q
0508 07521 003004 CMA,INA COMPUTE
0509 07522 015236 JSB MPY -HIGH QUOTIENT*Q
0510 07523 001677 DEF OUTLN
0511 07524 005066 BLS,CLE,ELB SHIFT SIGN TO (E)
0512 07525 060615 LDA NUMCK LOW QUOTIENT
0513 07526 002020 SSA NEGATIVE?
0514 07527 003401 CCA,RSS YES, SET (A)=-1 (EXTEND
0515 07530 002400 CLA NO, SET (A)=0 SIGN)
0516 07531 003040 CMA,SEZ IF (E)=1 SUBTRACT
0517 07532 002004 INA 1 AS EXTENSION
0518 07533 003100 CMA,CLE OF PRODUCT
0519 07534 044615 ADB NUMCK ADD IN LOW QUOTIENT
0520 07535 002040 SEZ CARRY
0521 07536 002004 INA INTO (A)
0522 07537 004066 CLE,ELB POSITION
0523 07540 001600 ELA REGISTERS
0524 07541 041677 ADA OUTLN ADD IN HIGH QUOTIENT
0525 07542 002001 RSS
0526 07543 002400 .FLV1 CLA SET MANTISSA TO ZERO
0527 07544 015020 JSB .PACK NORMALIZE AND PACK
0528 07545 127463 JMP .FDV,1
0529 07546 014477 .FLV2 JSB ERROR DIVIDE-BY-ZERO
0530 07547 062074 DBYZR LDA A1

```

0531	07550	015103		JSB OVFLW	RETURN INFINITY
0532	07551	127463		JMP .FDV,I	
0533	**				
0534	***	INTEGER DIVIDE	**		
0535	**				
0536	07552	000000	IDIV	NOP	DIVIDEND IN (B) AND (A)
0537	07553	076074		STB A1	SAVE HIGH DIVIDEND
0538	07554	066105		LDB A2	
0539	07555	006120		CLE,SSB	SET (B) TO ABS(B)
0540	07556	007204		CMB,CME,INB	AND (E) TO SIGN(B)
0541	07557	077343		STB .FAD	SAVE POSITIVE DIVISOR
0542	07560	007004		CMB,INB	SAVE
0543	07561	077347		STB .FSB	NEGATIVE DIVISOR
0544	07562	064445		LDB M16	SET
0545	07563	076147		STB C1	COUNTER
0546	07564	064432		LDB M2	SET
0547	07565	074153		STB SIGN	
0548	07566	077416		STB .FMP	SIGNS
0549	07567	066074		LDB A1	RETRIEVE HIGH DIVIDEND
0550	07570	006021		SSB,RSS	POSITIVE?
0551	07571	027577		JMP IDIV1	YES
0552	07572	037416		ISZ .FMP	NO, SET REMAINDER SIGN
0553	07573	007200		CMB,CME	NEGATIVE AND COMPLEMENT
0554	07574	002002		SZA	THE DIVISOR
0555	07575	003005		CMA,INA,RSS	AND (E)
0556	07576	006004		INB	
0557	07577	002040	IDIV1	SEZ	QUOTIENT POSITIVE?
0558	07600	034153		ISZ SIGN	NO
0559	07601	000066	IDIV2	CLE,ELA	SHIFT
0560	07602	005600		ELB	DIVIDEND
0561	07603	047347		ADB .FSB	SUBTRACT DIVISOR
0562	07604	006021		SSB,RSS	OK?
0563	07605	002005		INA,RSS	YES
0564	07606	047343		ADB .FAD	NO, RESTORE DIVIDEND
0565	07607	036147		ISZ C1	DONE?
0566	07610	027601		JMP IDIV2	NO
0567	07611	003004		CMA,INA	YES, NEGATE QUOTIENT
0568	07612	034153		ISZ SIGN	RESULT TO BE POSITIVE?
0569	07613	003004		CMA,INA	YES
0570	07614	037416		ISZ .FMP	NO, REMAINDER POSITIVE?
0571	07615	127552		JMP IDIV,I	YES
0572	07616	007004		CMB,INB	NO
0573	07617	127552		JMP IDIV,I	

```

0575*
0576*
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0579*
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0581*
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0588*
0589*
0590*
0591*
0592*
0593*
0594*
0595*
0596 07620 000000
0597 07621 070163
0598 07622 010336
0599 07623 040434
0600 07624 002024
0601 07625 027631
0602 07626 060163
0603 07627 070001
0604 07630 027643
0605 07631 002020
0606 07632 027640
0607 07633 060163
0608 07634 010437
0609 07635 070001
0610 07636 006004
0611 07637 027643
0612 07640 007400
0613 07641 060326
0614 07642 030163
0615 07643 070164
0616 07644 074165
0617 07645 064116
0618 07646 027667
0619 07647 160001
0620 07650 050163
0621 07651 127620
0622 07652 050164
0623 07653 027674
0624 07654 050165
0625 07655 027674
0626 07656 160001
0627 07657 010336
0628 07660 050336
0629 07661 027666
0630 07662 040434

```

 SYMBOL TABLE SEARCH SUBROUTINE

THE SUBROUTINE IS CALLED WITH THE IDENTIFIER TO BE SEARCHED FOR IN A . THE SUBROUTINE RETURNS WITH THE ADDRESS OF THE MATCHING ENTRY IN B OR -1 IN B IF THERE IS NO MATCHING ENTRY
 THE FOLLOWING RULES APPLY WHEN SEARCHING FOR ARRAYS

TYPE 1 (1 DIMENSION) SEARCH FOR CORRESPONDING TYPE 1 OR TYPE 3 ARRAY. IF TYPE 3 IS FOUND CHANGE THE ENTRY TYPE TO TYPE 1

TYPE 2 (2 DIMENSIONS) SEARCH FOR CORRESPONDING TYPES OR TYPE 3 ARRAY. IF TYPE 3 IS FORND CHANGE THE ENTRY TYPE TO TYPE 2

TYPE 3 (UNDIMENSIONED) SEARCH FOR CORRESPONDING TYPE 3 OR TYPE 1 OR TYPE 2 ARRAY

```

SSYMT NOP
      STA STEMP      STORE IDENTIFIER
      AND .15        ISOLATE IDENTIFIER TYPE
      ADA M4
      SSA,INA
      JMP **4        JUMP IF ARRAY TYPE
      LDA STEMP      RESTORE A
      STA 1          STORE IN B
      JMP SYMT1+3
      SSA           SKIP IF UNDIMENSIONED
      JMP SYMT1
      LDA STEMP      RESTORE A
      AND MSK3       1777718 SET TYPE TO 1
      STA 1
      INB           SET TYPE IN B TO 2
      JMP **4
SYMT1 CCB          SET DIMENSIONED FLAG IN B
      LDA .3
      IOR STEMP      SET TYPE TO UNDEFINED
      STA STEMP+1    STORE A
      STB STEMP+2    STORE B
      LDB SYMTF      START OF SYMBOL TABLE
      JMP SYMT4
SYMT2 LDA 1,I      PICK UP 1ST WORD OF ENTRY
      CPA STEMP      COMPARE WITH IDENTIFIER
      JMP SSYMT,1    MATCH ? RETURN
      CPA STEMP+1    COMPARE WITH DIFFERENT DIM.
      JMP SYMT3
      CPA STEMP+2    COMPARE WITH DIFFERENT DIM.
      JMP SYMT3
      LDA 1,I
      AND .15        ISOLATE ENTRY TYPE
      CPA .15        FUNCTION ?
      JMP **5        YES
      ADA M4

```

0631	07663	002020		SSA	ARRAY ?
0632	07664	006004		INB	YES INCREMENT POINTER
0633	07665	006004		INB	INCREMENT POINTER
0634	07666	044325		ADB .2	ADD 2 TO POINTER
0635	07667	054117	SYMT4	CPB SYMTA	SYMBOL TABLE EXHAUSTED?
0636	07670	007401		CCB,RSS	YES
0637	07671	027647		JMP SYMT2	NO, CHECK NEXT ENTRY FOR MATCH
0638	07672	060163		LDA STEMP	RETRIEVE SYMBOL
0639	07673	127620		JMP SSYM1,1	RETURN WITH B NEGATIVE
0640	07674	060163	SYMT3	LDA STEMP	RESTORE A
0641	07675	034165		ISZ STEMP+2	DIMENSIONED IDENTIFIER?
0642	07676	002001		RSS	NO, SKIP
0643	07677	170001		STA 1,1	YES CHANGE 1ST WORD OF ENTRY TO
0644	07700	127620		JMP SSYM1,1	APPROPRIATE DIMENSION TYPE

0002**

0003*** ERROR TABLE **

0004**

0005	07701	000266	ERR	DEF EOF+1	PREMATURE STATEMENT END
0006	07702	002066		DEF RTLE	INPUT EXCEEDS 71 CHARACTERS
0007	07703	002137		DEF INVSC	SYSTEM COMMAND NOT RECOGNIZED
0008	07704	002236		DEF SYNE1	NO STATEMENT TYPE FOUND
0009	07705	000717		DEF NUMER+1	BAD EXPONENT PART
0010	07706	002656		DEF SYE16	NO LETTER WHERE EXPECTED
0011	07707	002346		DEF SYNE2	LET STATEMENT HAS NO STORE
0012	07710	002361		DEF SYNE3	ILLEGAL COM STATEMENT
0013	07711	002406		DEF SYNE4+1	NO FUNCTION IDENTIFIER (OR BAD)
0014	07712	002420		DEF SYNE5	MISSING PARAMETER
0015	07713	002425		DEF SYNE6+1	MISSING ASSIGNMENT OPERATOR
0016	07714	002445		DEF SYNE7	MISSING 'THEN'
0017	07715	002453		DEF SYNE8+1	MISSING OR IMPROPER FOR-VARIABLE
0018	07716	002465		DEF SYNE9	MISSING 'TO'
0019	07717	002500		DEF SYE10	BAD 'STEP' PART IN FOR STATEMENT
0020	07720	001330		DEF CALER	CALLED ROUTINE DOES NOT EXIST
0021	07721	002541		DEF SYE11+1	WRONG NUMBER OF CALL PARAMETERS
0022	07722	000614		DEF SYE12	NO CONSTANT WHERE EXPECTED
0023	07723	002561		DEF SYE13	NO VARIABLE WHERE EXPECTED
0024	07724	002613		DEF SYE14	NO CLOSING QUOTE FOR STRING
0025	07725	002625		DEF SYE15	PRINT JUXTAPOSES FORMULAS
0026	07726	002671		DEF SYE17	IMPROPER WORD IN MAT STATEMENT
0027	07727	002702		DEF SYE18	NO COMMA WHERE EXPECTED
0028	07730	002755		DEF SYE19	IMPROPER ARRAY FUNCTION
0029	07731	002775		DEF SYE20	NO SUBSCRIPT WHERE EXPECTED
0030	07732	003007		DEF SYE21	ARRAY INVERSION INTO SELF
0031	07733	003020		DEF SYE22	MISSING MULTIPLICATION OPERATOR
0032	07734	003041		DEF SYE23	IMPROPER ARRAY OPERATOR
0033	07735	003060		DEF SYE24+1	ARRAY MULTIPLICATION INTO SELF
0034	07736	003202		DEF FSCE1+1	MISSING LEFT PARENTHESIS
0035	07737	003256		DEF FSCE2+1	MISSING RIGHT PARENTHESIS
0036	07740	003306		DEF FSCE3+1	UNRECOGNIZED OPERAND
0037	07741	003534		DEF ARRE1	MISSING SUBSCRIPT
0038	07742	003547		DEF ARRE2	MISSING ARRAY IDENTIFIER

0039	07743	004345	DEF	SYE25+1	MISSING OR BAD INTEGER
0040	07744	000267	DEF	NOEOF+1	CHARACTERS AFTER STATEMENT END
0041	07745	003402	DEF	FSCE4+1	OUT OF CORE DURING SYNTAX
0042	07746	002170	DEF	PRERR	PHOTO READER NOT READY
0043	07747	005312	DEF	MER4	FUNCTION MULTIPLY DEFINED
0044	07750	005413	DEF	MER6	UNMATCHED FOR STATEMENT
0045	07751	005264	DEF	MER3	UNMATCHED NEXT
0046	07752	005512	DEF	MER8	OUT OF STORAGE-SYMBOL TABLE
0047	07753	005541	DEF	MSYM	INCONSISTENT DIMENSIONS
0048	07754	005301	DEF	MLOP6	LAST STATEMENT IS NOT 'END'
0049	07755	005377	DEF	MER5	ARRAY DOUBLE DIMENSIONED
0050	07756	005431	DEF	MER10	NO OF DIMENSIONS UNSPECIFIED
0051	07757	001352	DEF	MER9	ARRAY TOO LARGE
0052	07760	005464	DEF	MER7	OUT OF STORAGE-ARRAY ALLOCATION
0053	07761	006760	DEF	E6	SUBSCRIPT TOO LARGE
0054	07762	001526	DEF	E8	UNDEFINED OPERAND ACCESSED
0055	07763	007057	DEF	BASER	NEGATIVE BASE POWERED TO REAL
0056	07764	007153	DEF	POWER	ZERO TO ZERO POWER
0057	07765	006054	DEF	XEC5	MISSING STATEMENT
0058	07766	006363	DEF	E2	GOSUBS NESTED 10 DEEP
0059	07767	006367	DEF	E3	RETURN FINDS NO ADDRESS
0060	07770	006135	DEF	E4	OUT OF DATA
0061	07771	001474	DEF	E1+1	OUT OF STORAGE - EXECUTION
0062	07772	011766	DEF	E7	RE-DIMENSIONED ARRAY TOO LARGE
0063	07773	012036	DEF	LERR+1	DIMENSIONS NOT COMPATIBLE
0064	07774	012100	DEF	LCHK5	MATRIX UNASSIGNED
0065	07775	012704	DEF	LDUM1	NEARLY SINGULAR MATRIX
0066	07776	010420	DEF	TR0ER	ARGUMENT TOO LARGE
0067	07777	010771	DEF	SQRER	SQRT HAS NEGATIVE ARGUMENT
0068	10000	011077	DEF	LOGER	LOG OF NEGATIVE ARGUMENT
0069	10001		RCERK	EQU *	** RECOVERABLE ERRORS FOLLOW **
0070	10001	001100	DEF	OVRER	OVERFLOW
0071	10002	001074	DEF	UNDER	UNDERFLOW
0072	10003	011151	DEF	LNZR	LOG OF ZERO
0073	10004	011305	DEF	EXPER	EXPONENTIAL OVERFLOW
0074	10005	007547	DEF	DBYZR	DIVIDE BY ZERO
0075	10006	007156	DEF	ZRTNG	ZERO TO NEGATIVE POWER
0076*					
0077*					
0078	10007	006412	EBLFF	OCT 6412	
0079	10010	042522		ASC 3,ERROR	
0080	10013	000000	EBFF	BSS 2	
0081	10015	020111	LBUFF	ASC 5, IN LINE	
0082	10022	000000	LNBFF	BSS 2	

0064**

0085*** PREDEFINED FUNCTION JUMP TABLE **

0086**

0087	10024	006605	PDFT	DEF	ETAB
0088	10025	010647		DEF	ESIN
0089	10026	010645		DEF	ECOS
0090	10027	010406		DEF	ETAN
0091	10030	010532		DEF	EATN
0092	10031	011177		DEF	EEXP
0093	10032	011070		DEF	ELOG
0094	10033	010642		DEF	EABS
0095	10034	010765		DEF	ESQR
0096	10035	011055		DEF	EINT
0097	10036	010736		DEF	ERND
0098	10037	011166		DEF	ESGN

0099**

0100*** OUTPUT A NUMBER **

0101**

0102	10040	000000	NUMOT	NOP	NUMBER IN (A) AND (B)
0103	10041	071603		STA EXPON	SAVE NUMBER
0104	10042	002041		SEZ,RSS	SIGN?
0105	10043	026055		JMP NS2	NO
0106	10044	002021		SSA,RSS	YES, NEGATIVE NUMBER?
0107	10045	026052		JMP NS1	NO
0108	10046	015423		JSB ARINV	YES, INVERT IT
0109	10047	071603		STA EXPON	
0110	10050	060354		LDA .45	
0111	10051	002001		RSS	
0112	10052	060345	NS1	LDA .32	STORE
0113	10053	070153		STA SIGN	SIGN
0114	10054	061603		LDA EXPON	
0115	10055	076344	NS2	STB GETDG	SAVE NUMBER
0116	10056	015364		JSB IFIX	INTEGERIZE
0117	10057	000000		NOP	
0118	10060	162040		LDA NUMOT,I	SET
0119	10061	072101		STA NUM01	END-OF-LINE
0120	10062	072135		STA NUM03	OPERATION
0121	10063	036040		ISZ NUMOT	BUMP RETURN ADDRESS
0122	10064	102201		SOC	WAS IT AN INTEGER?
0123	10065	026110		JMP NUM02	NO

0124**

0125*** OUTPUT AN INTEGER **

0126**

0127	10066	002400		CLA	SAVE
0128	10067	074174		STB B1+1	INTEGER
0129	10070	044462		ADB M1000	5 OR MORE
0130	10071	006021		SSB,RSS	CHARACTERS?
0131	10072	040326		ADA .3	YES
0132	10073	040330		ADA .6	COMPUTE
0133	10074	040133		ADA CCNT	END-OF-FIELD
0134	10075	003004		CMA,INA	SAVE MARKER TO
0135	10076	070172		STA MLBX1+1	END-OF-FIELD
0136	10077	040367		ADA .74	ENOUGH
0137	10100	002020		SSA	ROOM?
0138	10101	000000	NUM01	NOP	NO
0139	10102	060153		LDA SIGN	

0140	10103	002002		SZA	SIGN?
0141	10104	015715		JSB OUTCR	YES, OUTPUT IT
0142	10105	060174		LDA B1+1	OUTPUT
0143	10106	114222		JSB OUTIA,I	THE INTEGER
0144	10107	126040		JMP NUMOT,I	
0145	10110	003400	NUM02	CCA	SET 'FIXED'
0146	10111	073032		STA FFLAG	FLAG FALSE
0147	10112	061603		LDA EXPON	LOAD
0148	10113	066344		LDB GETDG	NUMBER
0149	10114	114236		JSB .FADA,I	IS NUMBER
0150	10115	000472		DEF MAXFX	LESS THAN
0151	10116	002021		SSA,RSS	999999.5 ?
0152	10117	026127		JMP NUM05	NO
0153	10120	061603		LDA EXPON	YES, IS
0154	10121	066344		LDB GETDG	NUMBER
0155	10122	114236		JSB .FADA,I	LESS
0156	10123	000474		DEF MINFX	THAN
0157	10124	064335		LDB .12	0.09999995?
0158	10125	002021		SSA,RSS	
0159	10126	037032		ISZ FFLAG	NO, SET FFLAG = 0 AND SKIP
0160	10127	064336	NUM05	LDB .15	YES, LOAD 'FLOATING' FIELD WIDTH
0161	10130	044133		ADB CCNT	SAVE
0162	10131	007004		CMB,INB	END-OF-FIELD
0163	10132	074172		STB MLBX1+1	MARKER
0164	10133	044370		ADB .75	ROOM
0165	10134	006020		SSB	ENOUGH?
0166	10135	000000	NUM03	NOP	NO
0167**					
0168***	OUTPUT A FLOATING POINT NUMBER				**
0169**					
0170	10136	061603		LDA EXPON	
0171	10137	071274		STA MANT1	
0172	10140	066344		LDB GETDG	UNPACK
0173	10141	015456		JSB .FLUN	
0174	10142	075336		STB MANT2	NUMBER
0175	10143	070154		STA EXP	
0176	10144	060153		LDA SIGN	
0177	10145	002002		SZA	SIGN?
0178	10146	015715		JSB OUTCR	YES, OUTPUT IT
0179	10147	002400		CLA	INITIALIZE COUNTER
0180	10150	071603		STA EXPON	FOR DECIMAL EXPONENT
0181	10151	050154		CPA EXP	EXPONENT ZERO?
0182	10152	026175		JMP EOUT4	YES
0183	10153	015147	EOUT2	JSB MBY10	NO,
0184	10154	060154		LDA EXP	MULTIPLY
0185	10155	003004		CMA,INA	NUMBER BY 10
0186	10156	002020		SSA	UNTIL
0187	10157	026162		JMP **+3	IT IS
0188	10160	035603		ISZ EXPON	GREATER
0189	10161	026153		JMP EOUT2	THAN 1
0190	10162	015200		JSB DBY10	DIVIDE BY 10
0191	10163	061603		LDA EXPON	
0192	10164	064154	EOLT3	LDB EXP	DIVIDE
0193	10165	007004		CMB,INB	NUMBER
0194	10166	006021		SSB,RSS	BY 10
0195	10167	026175		JMP EOUT4	UNTIL

0196	10170	071603	STA EXPON	IT IS
0197	10171	015200	JSB DBY10	LESS
0198	10172	003400	CCA	THAN
0199	10173	041603	ADA EXPON	1
0200	10174	026164	JMP EOUT3	
0201	10175	003000	EOUT4 CMA	SET EXPONENT
0202	10176	071603	STA EXPON	TO TRUE VALUE-1
0203	10177	064437	LDB M7	SET DIGIT
0204	10200	076370	STB RETCR	COUNTER
0205	10201	007400	CCB	SET DECIMAL
0206	10202	075677	STB OUTLN	POINT FLAG
0207	10203	057032	CPB FFLAG	FIXED POINT?
0208	10204	026213	JMP EOUT6	NO
0209	10205	003000	CMA	YES, SET
0210	10206	071677	STA OUTLN	DECIMAL POINT FLAG
0211	10207	050324	CPA .1	.1?
0212	10210	026217	JMP EOUT5	YES
0213	10211	002021	SSA, RSS	LEADING DECIMAL POINT?
0214	10212	026225	JMP EOUT7+2	YES
0215	10213	016344	EOUT6 JSB GETD0	OUTPUT
0216	10214	040357	ADA .48	A
0217	10215	015715	JSB OUTCR	DIGIT
0218	10216	026227	JMP EOUT8	
0219	10217	060355	EOUT5 LDA .46	OUTPUT
0220	10220	015715	JSB OUTCR	DECIMAL POINT
0221	10221	060357	LDA .48	OUTPUT
0222	10222	026226	JMP EOUT8-1	LEADING ZERO
0223	10223	035677	EOUT7 ISZ OUTLN	DECIMAL POINT NEXT?
0224	10224	026213	JMP EOUT6	NO
0225	10225	060355	LDA .46	YES,
0226	10226	015715	JSB OUTCR	OUTPUT IT
0227	10227	036370	EOUT8 ISZ RETCR	MORE MANTISSA?
0228	10230	026223	JMP EOUT7	YES
0229	10231	060133	LDA CCNT	NO,
0230	10232	072101	STA NUM01	SAVE
0231	10233	060132	LDA BADDR	OUTPUT
0232	10234	072135	STA NUM03	POINTERS
0233	10235	016344	JSB GETDG	NEXT DIGIT
0234	10236	040435	ADA M5	FIVE OR
0235	10237	002020	SSA	GREATER?
0236	10240	026303	JMP EOUT1	NO
0237	10241	003400	CCA	SET DECIMAL
0238	10242	071274	ERND1 STA SYMCK	POINT COUNTER
0239	10243	016370	JSB RETCR	RETRIEVE CHARACTER
0240	10244	050355	CPA .46	DECIMAL POINT?
0241	10245	026241	JMP ERND1-1	YES, FLAG IT
0242	10246	015570	JSB DIGCK	NO, DIGIT?
0243	10247	026262	JMP ERND2	NO
0244	10250	050333	CPA .9	YES, 9?
0245	10251	026254	JMP **3	YES
0246	10252	040360	ADA .49	NO, BUMP
0247	10253	026276	JMP ERND3	DIGIT 1
0248	10254	060357	LDA .48	OVERLAY
0249	10255	015715	JSB OUTCR	A ZERO
0250	10256	016370	JSB RETCR	BACKSPACE
0251	10257	003400	CCA	DECREMENT

0252	10260	041274		ADA SYMCK	DECIMAL POINT
0253	10261	026242		JMP ERND1	COUNTER
0254	10262	015715	ERND2	JSB OUTCR	RESTORE CHARACTER
0255	10263	035603		ISZ EXPON	CORRECT
0256	10264	000000		NOP	EXPONENT
0257	10265	060360		LDA .49	OVERLAY A 1
0258	10266	067032		LDB FFLAG	FIXED
0259	10267	006002		SZB	POINT?
0260	10270	026276		JMP ERND3	NO
0261	10271	015715		JSB OUTCR	YES, OUTPUT CHARACTER
0262	10272	060357		LDA .48	PREPARE TO OVERLAY A ZERO
0263	10273	035274		ISZ SYMCK	DECIMAL POINT NEXT?
0264	10274	026271		JMP *-3	NO
0265	10275	060355		LDA .46	YES
0266	10276	015715	ERND3	JSB OUTCR	
0267	10277	062101		LDA NUM01	RESTORE
0268	10300	070133		STA CCNT	OUTPUT
0269	10301	062135		LDA NUM03	POINTERS
0270	10302	070132		STA BADDR	
0271	10303	037032	EOLT1	ISZ FFLAG	NO, FIXED POINT?
0272	10304	026333		JMP EOUT9	YES
0273	10305	060364		LDA E	NO,
0274	10306	015715		JSB OUTCR	OUTPUT 'E'
0275	10307	060354		LDA .45	LOAD '-'
0276	10310	065603		LDB EXPON	POSITIVE
0277	10311	006020		SSB	EXPONENT?
0278	10312	007005		CMR, INB, RSS	NO
0279	10313	060353		LDA .43	YES, LOAD '+'
0280	10314	075603		STB EXPON	
0281	10315	015715		JSB OUTCR	OUTPUT SIGN
0282	10316	065603		LDB EXPON	
0283	10317	060357		LDA .48	COMPUTE
0284	10320	044442		ADB M10	
0285	10321	006020		SSB	EXPONENT
0286	10322	026325		JMP **3	
0287	10323	002004		INA	DIGIT
0288	10324	026320		JMP *-4	
0289	10325	044361		ADB .58	COMPUTE
0290	10326	075603		STB EXPON	SECOND DIGIT
0291	10327	015715		JSB OUTCR	OUTPUT
0292	10330	061603		LDA EXPON	
0293	10331	015715		JSB OUTCR	EXPONENT
0294	10332	126040		JMP NUMOT, I	
0295	10333	016370	EOLT9	JSB RETCR	RETRIEVE CHARACTER
0296	10334	050357		CPA .48	ZERO?
0297	10335	026340		JMP EOU10	YES
0298	10336	015715		JSB OUTCR	NO, RESTORE CHARACTER
0299	10337	126040		JMP NUMOT, I	
0300	10340	060345	EOL10	LDA .32	OVERLAY
0301	10341	015715		JSB OUTCR	A BLANK
0302	10342	016370		JSB RETCR	BACKSPACE
0303	10343	026333		JMP EOUT9	

0305**

0306*** GET DIGIT TO CUTPUT **

0307**

0308	10344	000000	GETDG	NOP	
0309	10345	015147	JSB	MBY10	MULTIPLY BY 10
0310	10346	064154	LDB	EXP	GET EXPONENT IN (B)
0311	10347	007004	CMB,	INB	AS NEGATIVE
0312	10350	010430	AND	HIMSK	KEEP 5 HIGH BITS OF (A)
0313	10351	001200	RAL		NORMALIZE TO BIT 15
0314	10352	006024	SSB,	INB	ROTATE INTEGER
0315	10353	026351	JMP	*-2	INTU (A)
0316	10354	010376	AND	MSK0	EXTRACT
0317	10355	070615	STA	NUMCK	DIGIT
0318	10356	064154	LDB	EXP	ROTATE
0319	10357	007004	CMB,	INB	
0320	10360	001300	RAR		BACK
0321	10361	006024	SSB,	INB	
0322	10362	026360	JMP	*-2	
0323	10363	021274	XOR	MANT1	REMOVE
0324	10364	065336	LDB	MANT2	DIGIT
0325	10365	015113	JSB	NORML	NORMALIZE REMAINDER
0326	10366	060615	LDA	NUMCK	LOAD (A) WITH DIGIT
0327	10367	126344	JMP	GETDG,I	

0328**

0329*** RETRIEVE CHARACTER FROM OUTPUT BUFFER **

0330**

0331	10370	000000	REICR	NOP	
0332	10371	064133	LDB	CCNT	DECREMENT
0333	10372	044431	ADB	M1	CHARACTER
0334	10373	074133	STB	CCNT	COUNT
0335	10374	160132	LDA	BADDR,I	POSITION
0336	10375	006011	SLB,	RSS	AND
0337	10376	001727	ALF,	ALF	EXTRACT
0338	10377	010376	AND	MSK0	CHARACTER
0339	10400	004010	SLB		FIRST CHARACTER OF WORD?
0340	10401	126370	JMP	REICR,I	NO
0341	10402	064132	LDB	BADDR	YES, DECREMENT
0342	10403	044431	ADB	M1	BUFFER
0343	10404	074132	STB	BADDR	POINTER
0344	10405	126370	JMP	REICR,I	

0345*

0346*

0347	06074	A1	EQU	SETDP
0348	06105	A2	EQU	STSRH
0349	06147	C1	EQU	FLWST
0350	06163	C2	EQU	FVSRH

LIBRARY ROUTINES

```

0352*          *****
0353*          SUBROUTINE TO CALCULATE TAN(X)
0354*          *****
0355*
0356*          CALLED BY A JMP ETAN WITH THE ARGUMENT
0357*          IN FLOATING RADIAN IN THE REGISTERS.
0358*          THE FLOATING RESULT IS RETURNED IN A & B
0359*
0360  10406  114240  ETAN  JSB .FMFA,I
0361  10407  010475          DEF FOPI      4/PI
0362  10410  072501          STA XTEMP
0363  10411  076502          STB XTEMP+1
0364  10412  114236          JSB .FADA,I
0365  10413  010477          DEF K1
0366  10414  017440          JSB .PWR2
0367  10415  177776          DEC -2
0368  10416  017413          JSB .IENT
0369  10417  014477          JSB ERROR
0370  10420  017432  TRGER JSB FLOAT
0371  10421  015423          JSB ARINV
0372  10422  017440          JSB .PWR2
0373  10423  000002          DEC 2
0374  10424  114236          JSB .FADA,I
0375  10425  010501          DEF XTEMP
0376  10426  072501          STA XTEMP
0377  10427  076502          STB XTEMP+1      X=X-4*ENTIER((X+1)/4)
0378  10430  114237          JSB .FSBA,I
0379  10431  010477          DEF K1
0380  10432  073032          STA SBOX      TEMPORARY
0381  10433  002020          SSA          X<1?
0382  10434  026467          JMP ELSE1      YES
0383  10435  062507          LDA K2          NO
0384  10436  066510          LDB K2+1
0385  10437  114237          JSB .FSBA,I
0386  10440  010501          DEF XTEMP
0387  10441  072503  BOTH1 STA YTEMP
0388  10442  076504          STB YTEMP+1      Y= 2-X
0389  10443  114240          JSB .FMFA,I
0390  10444  010503          DEF YTEMP
0391  10445  114240          JSB .FMFA,I
0392  10446  010507          DEF K2
0393  10447  114237          JSB .FSBA,I
0394  10450  010477          DEF K1
0395  10451  017324          JSB .CHEB
0396  10452  010511          DEF COEFF
0397  10453  114240          JSB .FMFA,I
0398  10454  010503          DEF YTEMP
0399  10455  072503          STA YTEMP
0400  10456  076504          STB YTEMP+1      Y=Y+CHEBY(2*Y**2-1)
0401  10457  063032          LDA SBOX
0402  10460  002020          SSA          X<1 ?
0403  10461  026472          JMP ELSE2      YES
0404  10462  062477          LDA K1
0405  10463  066500          LDB K1+1
0406  10464  114241          JSB .FDVA,I
0407  10465  010503          DEF YTEMP

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PAGE 0116 #08 LIBRARY ROUTINES

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0408 10466 124264          JMP FR12A,I    ANS = 1/Y
0409 10467 062501  ELSE1 LDA XTEMP
0410 10470 066502          LDB XTEMP+1
0411 10471 026441          JMP BOTH1     Y=X
0412 10472 062503  ELSE2 LDA YTEMP
0413 10473 066504          LDB YTEMP+1
0414 10474 124264          JMP FR12A,I    ANS = Y
0415*
0416 10475 050574  FOPI  DEC 1.273239545    4/PI
0417 10477 040000  K1    DEC 1.
0418 10501 000000  XTEMP BSS 2
0419 10503 000000  YTEMP BSS 2
0420 10505 000000  UTEMP BSS 2
0421 10507 040000  K2    DEC 2.
0422 10511 076061  COEFF DEC 1.4458E-8
0423 10513 066034          DEC 2.013766E-7
0424 10515 057035          DEC 2.804816E-6
0425 10517 050755          DEC 3.906637E-5
0426 10521 043523          DEC 5.4417038E-4
0427 10523 076112          DEC 7.586101578E-3
0428 10525 066520          DEC .10675392857
0429 10527 070512          DEC 1.7701474227
0430 10531 000000          OCT 0

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0432*
0433*
0434*
0435*
0436*
0437*
0438*
0439*
0440*
0441 10532 072501 EATN STA XTEMP
0442 10533 076502 STB XTEMP+1
0443 10534 060001 LDA 1
0444 10535 010376 AND MSK0
0445 10536 073032 STA SBOX TAN = EXP OF (X)
0446 10537 002002 SZA
0447 10540 000010 SLA ABS (X) > 1 ?
0448 10541 026576 JMP ELS1 NO
0449 10542 062477 LDA K1
0450 10543 066500 LDB K1+1
0451 10544 114241 JSB .FDVA,I
0452 10545 010501 DEF XTEMP U=1/X
0453 10546 072505 BTF-1 STA UTEMP
0454 10547 076506 STB UTEMP+1
0455 10550 114240 JSB .FMFA,I
0456 10551 010505 DEF UTEMP
0457 10552 114240 JSB .FMFA,I
0458 10553 010507 DEF K2
0459 10554 114237 JSB .FSBA,I
0460 10555 010477 DEF K1
0461 10556 017324 JSB .CHEB
0462 10557 010615 DEF COEF
0463 10560 114240 JSB .FMFA,I
0464 10561 010505 DEF UTEMP
0465 10562 072503 STA YTEMP
0466 10563 076504 STB YTEMP+1 Y=U*CHEBY(2*U**2-1)
0467 10564 063032 LDA SBOX
0468 10565 002002 SZA
0469 10566 000010 SLA ABS(X)>1 ?
0470 10567 026601 JMP ELS2 NO
0471 10570 062501 LDA XTEMP
0472 10571 002020 SSA X<0 ?
0473 10572 026604 JMP ELS3 YES
0474 10573 062611 LDA PIBY2
0475 10574 066612 LDB PIBY2+1
0476 10575 026606 JMP ELS3+2 ANS = PI/2 - Y
0477 10576 062501 ELS1 LDA XTEMP U=X
0478 10577 066502 LDB XTEMP+1
0479 10600 026546 JMP BTH1
0480 10601 062503 ELS2 LDA YTEMP
0481 10602 066504 LDB YTEMP+1
0482 10603 124264 JMP FR12A,I ANS = Y
0483 10604 062613 ELS3 LDA MP2
0484 10605 066614 LDB MP2+1
0485 10606 114237 JSB .FSBA,I
0486 10607 010503 DEF YTEMP ANS=-PI/2-Y
0487 10610 124264 JMP FR12A,I

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0488*
0489 10611 062207 PIBY2 DEC 1.5707963268 PI/2
0490 10613 115570 MP2 DEC -1.5707963268 -PI/2
0491 10615 106671 COEF DEC -1.33034E-8
0492 10617 056335 DEC 8.64888E-8
0493 10621 131601 DEC -56.99186E-8
0494 10623 040033 DEC 3.821037E-6
0495 10625 111013 DEC -2.6215196E-5
0496 10627 060542 DEC 1.8574297E-4
0497 10631 122573 DEC -1.381195004E-3
0498 10633 055471 DEC .01113584206
0499 10635 111620 DEC -.1058929245
0500 10637 070320 DEC 1.762747174
0501 10641 000000 OCT 0
    
```

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0503*
0504* *****
0505* SUEROUTINE TO COMPUTE ABS(X)
0506* *****
0507*
0508* CALLED BY A JMP EABS WITH THE ARGUMENT
0509* IN FLOATING POINT FORM IN THE REGISTERS.
0510* THE ABSOLUTE VALUE IN FLOATING POINT
0511* IS RETURNED IN A & B
0512 10642 002020 EABS SSA NEGATIVE?
0513 10643 015423 JSB ARINV YES, NEGATE IT
0514 10644 124264 JMP FR12A,I
    
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0002*          *****
0003*          SUBROUTINE TO CALCULATE SIN(X)
0004*          *****
0005*
0006*          CALLED BY A JMP ESIN WITH THE ARGUMENT
0007*          IN FLOATING RADIANS IN THE REGISTERS.
0008*          THE FLOATING RESULT IS RETURNED IN A & B
0009*
0010  10645  114236  ECCS   JSB  .FADA,I
0011  10646  010611          DEF  PIBY2
0012  10647  114240  ESIN   JSB  .FMPA,I
0013  10650  010717          DEF  TOPI
0014  10651  072501          STA  XTEMP
0015  10652  076502          STB  XTEMP+1      X=2*X/PI
0016  10653  114236          JSB  .FADA,I
0017  10654  010477          DEF  K1
0018  10655  017440          JSB  .PWR2
0019  10656  177776          DEC  -2
0020  10657  017413          JSB  .IENT
0021  10660  026417          JMP  TRBER-1      ERROR IF EXPONENT >= 15
0022  10661  017432          JSB  FLOAT
0023  10662  114240          JSB  .FMPA,I
0024  10663  010721          DEF  MM4
0025  10664  114236          JSB  .FADA,I
0026  10665  010501          DEF  XTEMP
0027  10666  072501          STA  XTEMP
0028  10667  076502          STB  XTEMP+1      X=X-4*ENTIER((X+1)/4)
0029  10670  114237          JSB  .FSBA,I
0030  10671  010477          DEF  K1
0031  10672  002020          SSA          X<1 ?
0032  10673  026702          JMP  PAST        YES
0033  10674  062507          LDA  K2
0034  10675  066510          LDB  K2+1
0035  10676  114237          JSB  .FSBA,I
0036  10677  010501          DEF  XTEMP
0037  10700  072501          STA  XTEMP
0038  10701  076502          STB  XTEMP+1      X=2-X
0039  10702  062501  PAST   LDA  XTEMP
0040  10703  066502          LDB  XTEMP+1
0041  10704  114240          JSB  .FMPA,I
0042  10705  010501          DEF  XTEMP
0043  10706  017440          JSB  .PWR2
0044  10707  000001          DEC  1
0045  10710  114237          JSB  .FSBA,I
0046  10711  010477          DEF  K1
0047  10712  017324          JSB  .CHEB
0048  10713  010723          DEF  COEF1
0049  10714  114240          JSB  .FMPA,I
0050  10715  010501          DEF  XTEMP
0051  10716  124264          JMP  FR12A,I      ANS=X+CHEBY(2*X**2-1)
0052*
0053  10717  050574  TOPI   DEC  .636619772      2/PI
0054  10721  100000  MM4    DEC  -4.
0055  10723  047605  COEF1  DEC  1.18496E-6
0056  10725  134143          DEC  -1.365875E-4
0057  10727  045261          DEC  9.118016E-3

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0058 10731 133371 DEC -.2862615692
 0059 10733 050656 DEC 2.5525579248
 0060 10735 000000 OCT 0

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0062*          *****
0063*          SUBROUTINE TO COMPUTE RND(X)
0064*          *****
0065*
0066*          THE ARGUMENT OF RND IS A DUMMY ONE
0067*          THE ROUTINE GENERATES A RANDOM NUMBER
0068*          IN THE A & B REGISTERS
0069*
0070*          R=X/M, X=C*X MOD M, M=2^31, C=2^15 + 3
0071*
0072 10736 002400 ERNU CLA          X IS INITIALLY 1
0073 10737 070154 STA EXP        INITIALIZE EXPONENT
0074 10740 060155 LDA XH         COMPUTE
0075 10741 001000 ALS          HIGH
0076 10742 040155 ADA XH         PART
0077 10743 064156 LDB XL         2*XH
0078 10744 004065 CLE,ERB       + XH +
0079 10745 040001 ADA 1          XL*2^15
0080 10746 064156 LDB XL
0081 10747 005275 RBL,CLE,SLB,ERB ADD XL[15] TO
0082 10750 002004 INA          (A) (FROM 2*XL)
0083 10751 004066 CLE,ELB       2*XL
0084 10752 044156 ADB XL         + XL
0085 10753 001675 ELA,CLE,SLA,ERA ADD OVERFLOW
0086 10754 002104 CLE,INA       TO (A)
0087 10755 044470 ADB FLGBT     ADD IN TRAILING BIT OF XL*2^15
0088 10756 002040 SEZ          ADD OVERFLOW
0089 10757 002004 INA          TO (A)
0090 10760 001665 ELA,CLE,ERA   ERASE A[15]
0091 10761 070155 STA XH         STORE
0092 10762 074156 STB XL         INTEGER
0093 10763 015020 JSB .PACK     NORMALIZE AND PACK
0094 10764 124264 JMP FR12A,I
    
```

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0096*
0097*
0098*
0099*
0100*
0101*
0102*
0103*
0104 10765 002003  ESCR  SZA,RSS      X=0 ?
0105 10766 124264      JMP FR12A,I      YES, ANS = 0
0106 10767 002020      SSA             X<0 ?
0107 10770 014477      JSB ERROR      YES ERROR
0108 10771 072501  SQRER  STA XTEMP
0109 10772 015456      JSB .FLUN
0110 10773 000031      SLA,ARS        EXP(X) ODD?
0111 10774 027034      JMP ODD
0112 10775 040431      ADA M1
0113 10776 073032      STA SBOX       SBOX=EXPO(X)/2-1
0114 10777 076502      STB XTEMP+1    LOW MANTISSA/2
0115 11000 062501      LDA XTEMP
0116 11001 114240      JSB .FMFA,I
0117 11002 011047      DEF SA2
0118 11003 114236      JSB .FADA,I
0119 11004 011053      DEF SB2        Y=SB2+SA2+X
0120 11005 072503  BTH2  STA YTEMP
0121 11006 076504      STB YTEMP+1
0122 11007 062501      LDA XTEMP
0123 11010 066502      LDB XTEMP+1
0124 11011 114241      JSB .FDVA,I
0125 11012 010503      DEF YTEMP
0126 11013 114236      JSB .FADA,I
0127 11014 010503      DEF YTEMP
0128 11015 017440      JSB .PWR2
0129 11016 177777      DEC -1
0130 11017 072503      STA YTEMP
0131 11020 076504      STB YTEMP+1    Y=(Y+X/Y)/2
0132 11021 062501      LDA XTEMP
0133 11022 066502      LDB XTEMP+1
0134 11023 114241      JSB .FDVA,I
0135 11024 010503      DEF YTEMP
0136 11025 114236      JSB .FADA,I
0137 11026 010503      DEF YTEMP
0138 11027 072503      STA YTEMP
0139 11030 076504      STB YTEMP+1
0140 11031 017440      JSB .PWR2
0141 11032 000000  SBCX  OCT 0
0142 11033 124264      JMP FR12A,I      ANS=(P+F/P)*2**SBOX
0143 11034 073032  ODD   STA SBOX       SBOX = EXP(X)/2
0144 11035 044376      ADB MSK0
0145 11036 076502      STB XTEMP+1    LOW MANTISSA/2
0146 11037 062501      LDA XTEMP
0147 11040 114240      JSB .FMFA,I
0148 11041 011045      DEF SA1
0149 11042 114236      JSB .FADA,I
0150 11043 011051      DEF SB1
0151 11044 027005      JMP BTH2        Y=SB1+SA1+X

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0152*

0153	11045	070000	SA1	DEC	.875
0154	11047	045000	SA2	DEC	.578125
0155	11051	043524	SB1	DEC	.27863
0156	11053	066000	SB2	DEC	.421875

0158*

0159*

0160*

0161*

0162*

0163*

0164*

0165*

0166*

0167*

0168*

 SUBROUTINE TO CALCULATE INT(X)

CALLLED BY A JMP EINT WITH THE ARGUMENT
 IN FLOATING POINT FORM IN THE REGISTERS.
 ENTIER(X) IS FLOATED AND RETURNED IN A & B

CALCULATES THE FLOATING POINT EQUIVALENT
 OF ENTIER(X)

0169	11055	077032	EINT	STB	SBOX	SAVE LOW WORD
0170	11056	064344		LDB	.31	PRESET BIAS FOR
0171	11057	074154		STB	EXP	BINARY POINT
0172	11060	067032		LDB	SBOX	24-BIT
0173	11061	015364		JSB	IFIX	INTEGER?
0174	11062	027065		JMP	EINT1	NO
0175	11063	015020		JSB	.PACK	YES, PACK IT
0176	11064	124264		JMP	FR12A,I	
0177	11065	061614	EINT1	LDA	GETCR	RETRIEVE
0178	11066	067032		LDB	SBOX	NUMBER
0179	11067	124264		JMP	FR12A,I	

```

0181*
0182*
0183*
0184*
0185*
0186*
0187*
0188*
0189 11070 017072 ELCG JSB .LOG
0190 11071 124264 JMP FR12A,I
0191 11072 000000 .LCG NOP
0192 11073 002003 SZA,RSS NON-ZERO ARGUMENT?
0193 11074 027150 JMP .LOG1 NO
0194 11075 002020 SSA YES, POSITIVE ARGUMENT?
0195 11076 014477 JSB ERROR NO
0196 11077 072501 LOGER STA XTEMP YES
0197 11100 015456 JSB .FLUN
0198 11101 076502 STB XTEMP+1
0199 11102 017432 JSB FLOAT
0200 11103 072503 STA YTEMP
0201 11104 076504 STB YTEMP+1 Y=EXPO(X)
0202 11105 062501 LDA XTEMP
0203 11106 066502 LDB XTEMP+1
0204 11107 114236 JSB .FADA,I
0205 11110 011154 DEF R22
0206 11111 072505 STA UTEMP
0207 11112 076506 STB UTEMP+1 U=X+SQR(0.5)
0208 11113 062501 LDA XTEMP
0209 11114 066502 LDB XTEMP+1
0210 11115 114237 JSB .FSBA,I
0211 11116 011154 DEF R22
0212 11117 114241 JSB .FDVA,I
0213 11120 010505 DEF UTEMP
0214 11121 072505 STA UTEMP
0215 11122 076506 STB UTEMP+1 U=(X-SQR(0.5))/U
0216 11123 114240 JSB .FMFA,I
0217 11124 010505 DEF UTEMP
0218 11125 114237 JSB .FSBA,I
0219 11126 011164 DEF CCC
0220 11127 072501 STA XTEMP
0221 11130 076502 STB XTEMP+1
0222 11131 063162 LDA MB
0223 11132 067163 LDB MB+1
0224 11133 114241 JSB .FDVA,I
0225 11134 010501 DEF XTEMP
0226 11135 114236 JSB .FADA,I
0227 11136 011160 DEF AAA
0228 11137 114240 JSB .FMFA,I
0229 11140 010505 DEF UTEMP
0230 11141 114237 JSB .FSBA,I
0231 11142 000466 DEF HALF
0232 11143 114236 JSB .FADA,I
0233 11144 010503 DEF YTEMP
0234 11145 114240 JSB .FMFA,I
0235 11146 011156 DEF LE2
0236 11147 127072 JMP .LOG,I ANS=LOG(2)+(EXPO(X)-0.5+U*

```

0237*					(A-B/X)
0238	11150	014477	.LCG1	JSB ERROR	LOG OF ZERO
0239	11151	060470	LNZR	LDA MNEG	RETURN
0240	11152	064400		LDB B776	NEGATIVE
0241	11153	127072		JMP .LOG,I	INFINITY
0242*					
0243	11154	055202	R22	DEC .707106781	SQR(0.5)
0244	11156	054271	LE2	DEC .6931471806	LOG BASE E OF 2
0245	11160	051260	AAA	DEC 1.2920070987	
0246	11162	125606	MB	DEC -2.6398577035	
0247	11164	065010	CCC	DEC 1.6567626301	

0249*				*****	
0250*				SUEROUTINE TO COMPUTE SGN(X)	
0251*				*****	
0252*					
0253*				CALL BY A JMP ESGN WITH THE ARGUMENT	
0254*				IN FLOATING POINT FORM IN THE REGISTERS.	
0255*				ON RETURN A & B CONTAIN THE FOLLOWING:	
0256*					
0257*				IF X>0 THEN +1.	
0258*				IF X=0 THEN 0	
0259*				IF X<0 THEN -1.	
0260*					
0261	11166	006400	ESGN	CLB	
0262	11167	002003		SZA,RSS	ZERO?
0263	11170	124264		JMP FR12A,1	YES
0264	11171	002021		SSA,RSS	NO, POSITIVE?
0265	11172	064325		LDB .2	YES, SET EXPONENT
0266	11173	060470		LDA FLGBT	LOAD MANTISSA
0267	11174	006002		SZB	POSITIVE?
0268	11175	001300		RAR	YES, CORRECT MANTISSA
0269	11176	124264		JMP FR12A,1	

```

0271*          *****
0272*          SUBROUTINE TO CALCULATE EXP(X)
0273*          *****
0274*
0275*          CALLED BY A JMP EEXP WITH THE ARGUMENT
0276*          IN FLOATING POINT FORM IN THE REGISTERS.
0277*          THE FLOATING RESULT IS RETURNED IN A & B
0278*
0279 11177 017201 EEXP JSB .EXP
0280 11200 124264 JMP FR12A,I
0281 11201 000000 .EXP NOP
0282 11202 114240 JSB .FMFA,I
0283 11203 011322 DEF L2E
0284 11204 072501 STA XTEMP
0285 11205 076502 STB XTEMP+1 X=Z*LOG2(E)
0286 11206 017413 JSB .IENT
0287 11207 027301 JMP .EXPI
0288 11210 073274 STA INTE INTE = ENTIER(X)
0289 11211 017432 JSB FLOAT
0290 11212 072503 STA YTEMP
0291 11213 076504 STB YTEMP+1 Y=ENTIER(X)
0292 11214 063274 LDA INTE
0293 11215 043310 ADA M124
0294 11216 002021 SSA,RSS INTE >=124 ?
0295 11217 027304 JMP EXPR-1 YES,ERROR
0296 11220 043311 ADA .244 INTE <-120 ?
0297 11221 002020 SSA
0298 11222 027276 JMP ZERE YES,ANS=0
0299 11223 062501 LDA XTEMP
0300 11224 066502 LDB XTEMP+1
0301 11225 114237 JSB .FSBA,I
0302 11226 010503 DEF YTEMP
0303 11227 072501 STA XTEMP
0304 11230 076502 STB XTEMP+1 X=X-ENTIER(X)
0305 11231 114240 JSB .FMFA,I
0306 11232 010501 DEF XTEMP
0307 11233 072505 STA UTEMP
0308 11234 076506 STB UTEMP+1 U=X**2
0309 11235 114236 JSB .FADA,I
0310 11236 011312 DEF AAAA
0311 11237 072503 STA YTEMP
0312 11240 076504 STB YTEMP+1 Y=X**2+AAAA
0313 11241 063314 LDA BBBB
0314 11242 067315 LDB BBBB+1
0315 11243 114241 JSB .FDVA,I
0316 11244 010503 DEF YTEMP
0317 11245 072503 STA YTEMP
0318 11246 076504 STB YTEMP+1 Y=BBBB/Y
0319 11247 063316 LDA CCCC
0320 11250 067317 LDB CCCC+1
0321 11251 114240 JSB .FMFA,I
0322 11252 010505 DEF UTEMP
0323 11253 114236 JSB .FADA,I
0324 11254 011320 DEF DDDD
0325 11255 114237 JSB .FSBA,I
0326 11256 010501 DEF XTEMP

```


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0327	11257	114237		JSB	.FSBA,I	
0328	11260	010503		DEF	YTEMP	
0329	11261	072503		STA	YTEMP	
0330	11262	076504		STB	YTEMP+1	Y=-X+DDDD+CCCC*X**2-Y
0331	11263	062501		LDA	XTEMP	
0332	11264	066502		LDB	XTEMP+1	
0333	11265	114241		JSB	.FDVA,I	
0334	11266	010503		DEF	YTEMP	
0335	11267	114236		JSB	.FADA,I	
0336	11270	000466		DEF	HALF	
0337	11271	037274		ISZ	INTE	
0338	11272	000000		NOP		
0339	11273	017440		JSB	.PWR2	
0340	11274	000000	INTE	OCT	0	
0341	11275	127201		JMP	.EXP,I	ANS=(0.5+X/Y)*2**INTE
0342	11276	002400	ZERE	CLA		
0343	11277	006400		CLB		
0344	11300	127201		JMP	.EXP,I	ANS=0
0345	11301	063401	.EXPI	LDA	X2TMP	
0346	11302	002020		SSA		
0347	11303	027276		JMP	ZERE	
0348	11304	014477		JSB	ERROR	
0349	11305	060422	EXPER	LDA	INF	
0350	11306	064432		LDB	M2	
0351	11307	127201		JMP	.EXP,I	
0352*						
0353	11310	177604	M124	DEC	-124	
0354	11311	000364	.244	DEC	244	
0355	11312	053552	AAAA	DEC	87.417497202	
0356	11314	046477	BBBB	DEC	617.9722695	
0357	11316	043372	CCCC	DEC	.03465735903	
0358	11320	047643	DDDD	DEC	9.9545957821	
0359	11322	056125	L2E	DEC	1.4426950409	

```

0361*          *****
0362*          SUBROUTINE TO COMPUTE CHEBY(X)
0363*          *****
0364*
0365*          CALLING SEQUENCE:
0366*
0367*          LDA X          (FLOATING)
0368*          LDB X+1
0369*          JSB .CHEB      (RESULT FLOATING)
0370*          DEF C          (TABLE OF CHEBY.COEFFS.,FLOATING)
0371*
0372 11324 000000 .CHEB NOP
0373 11325 114240          JSB .FMFA,I
0374 11326 010507          DEF K2
0375 11327 073401          STA X2TMP
0376 11330 077402          STB X2TMP+1      X2 =X*2
0377 11331 167324          LDB .CHEB,I
0378 11332 077407          STB CTMP          C POINTS TO COEFFICIENT TABLE
0379 11333 160001          LDA 1,I
0380 11334 006004          INB
0381 11335 164001          LDB 1,I          GET FIRST COEFF
0382 11336 073411          STA DTMP
0383 11337 077412          STB DTMP+1      D=C(N)
0384 11340 002400          CLA
0385 11341 073405          STA BTMP
0386 11342 073406          STA BTMP+1      B=0
0387 11343 037407 LOPC  ISZ CTMP
0388 11344 037407          ISZ CTMP          N=N-1
0389 11345 163407          LDA CTMP,I
0390 11346 002003          SZA,RSS          C(N)=0 ?
0391 11347 027371          JMP COUT      ZERO FLAGS END OF TABLE
0392 11350 063405          LDA BTMP          NO
0393 11351 067406          LDB BTMP+1
0394 11352 073403          STA ATMP
0395 11353 077404          STB ATMP+1      A=B
0396 11354 063411          LDA DTMP
0397 11355 067412          LDB DTMP+1
0398 11356 073405          STA BTMP
0399 11357 077406          STB BTMP+1      B=D
0400 11360 114240          JSB .FMFA,I
0401 11361 011401          DEF X2TMP
0402 11362 114237          JSB .FSBA,I
0403 11363 011403          DEF ATMP
0404 11364 114236          JSB .FADA,I
0405 11365 111407          DEF CTMP,I
0406 11366 073411          STA DTMP
0407 11367 077412          STB DTMP+1      D=C(N) -A+B*X2
0408 11370 027343          JMP LOPC
0409 11371 063411 COLT  LDA DTMP
0410 11372 067412          LDB DTMP+1
0411 11373 114237          JSB .FSBA,I
0412 11374 011403          DEF ATMP
0413 11375 114240          JSB .FMFA,I
0414 11376 000466          DEF HALF
0415 11377 037324          ISZ .CHEB
0416 11400 127324          JMP .CHEB,I      ANS=(D-A)/2

```

```

0417*
0418 11401 000000 X2TMP BSS 2
0419 11403 000000 ATMP BSS 2
0420 11405 000000 BTMP BSS 2
0421 11407 000000 CTMP BSS 2
0422 11411 000000 DTMP BSS 2

```

```

0424* *****
0425* SUBROUTINE TO COMPUTE THE ENTIER OF A NUMBER
0426* WHOSE EXPONENT IS LESS THAN 15
0427* *****
0428*
0429* CALLING SEQUENCE:
0430*
0431* LDA X (FLOATING)
0432* LDA X+1
0433* JSB .IENT. (RESULT INTERGER)
0434* JSB ERROR (EXIT IF EXPO(X)>14)
0435*
0436*
0437 11413 000000 .IENT NOP
0438 11414 073401 STA X2TMP STORE HIGH PART
0439 11415 060001 LDA 1 MOVE LOW PART TO A
0440 11416 010376 AND MSK0 ISOLATE EXPONENT
0441 11417 000033 SLA,RAR
0442 11420 027424 JMP **4 IF NEGATIVE OK
0443 11421 040444 ADA M15
0444 11422 002021 SSA,RSS EXPO(X) > 14
0445 11423 127413 JMP .IENT,I YES, ERROR RETURN
0446 11424 037413 ISZ .IENT NO BUMP RETURN POINT
0447 11425 063401 LDA X2TMP RESTORE HIGH PART
0448 11426 015364 JSB IFIX CALL ENTIER
0449 11427 000000 NOP
0450 11430 060001 LDA 1 PUT RESULT INTO (A)
0451 11431 127413 JMP .IENT,I

```

```

0453*          *****
0454*          SUBROUTINE TO FLOAT AN INTEGER
0455*          *****
0456*
0457*          CALLED BY JSB FLOAT WITH INTEGER IN A
0458*          THE FLOATING POINT EQUIVALENT IS RETURNED
0459*          IN A & B
0460*
0461  11432 000000  FLCAT NOP
0462  11433 064336          LDB .15
0463  11434 074154          STB EXP
0464  11435 006400          CLB
0465  11436 015020          JSB .PACK
0466  11437 127432          JMP FLOAT,I
    
```

```

0468*          *****
0469*          SUBROUTINE TO MULTIPLY BY A POWER OF TWO
0470*          *****
0471*
0472*          CALLING SEQUENCE
0473*
0474*          LDA X          (FLOATING)
0475*          LDB X+1
0476*          JSB .PWR2      (RESULT FLOATING)
0477*          DEC N          (INTEGER POWER)
0478*
0479*          RETURNS WITH X*2^N IN A&B
0480*          NO CHECK IS MADE FOR EXPONENT
0481*          OVERFLOW OR UNDERFLOW
0482*
0483  11440 000000  .PWR2 NOP
0484  11441 002003          SZA,RSS          X=0 ?
0485  11442 027454          JMP .RET          YES, ANS=0
0486  11443 073401          STA X2TMP
0487  11444 015456          JSB .FLUN
0488  11445 077402          STB X2TMP+1
0489  11446 143440          ADA .PWR2,I
0490  11447 001200          RAL
0491  11450 010376          AND MSK0          NEW EXPO = (OLD EXPO) +N
0492  11451 070001          STA 1
0493  11452 047402          ADB X2TMP+1      KEEP OLD MANTISSA
0494  11453 063401          LDA X2TMP
0495  11454 037440  .RET  ISZ .PWR2
0496  11455 127440          JMP .PWR2,I
    
```

```

0498  07463  TT1 EQU .FDV
0499  07552  TT2 EQU IDIV
0500  00163  TT3 EQU TEMPS+4
0501  00164  TT4 EQU TEMPS+5
0502  11032  FFLAG EQU SBOX
    
```

```

0002*
0003*
0004*
*****
MATRIX STMT EXECUTION CONTROL
*****
0005 11456 160157 EMAT LDA TEMPS,I
0006 11457 034157 ISZ TEMPS MAT READ
0007 11460 010401 AND MSK1 OR
0008 11461 002002 SZA MAT PRINT?
0009 11462 027610 JMP EMAT7 NO
0010 11463 160157 LDA TEMPS,I YES
0011 11464 010420 AND OPMSK SAVE
0012 11465 070171 STA MLBX1 TYPE
0013 11466 050416 CPA RDOP PRINT?
0014 11467 002001 RSS NO
0015 11470 114250 JSB PRNIA,I YES
0016*
0017 11471 160157 EMAT1 LDA TEMPS,I LOAD
0018 11472 010401 AND MSK1 OPERAND
0019 11473 002003 SZA,RSS NULL? (END OF MAT PRINT)
0020 11474 124256 JMP XEC4A,I YES
0021 11475 114231 JSB SSYMA,I NO, SEARCH SYMBOL TABLE
0022 11476 006007 INB,SZB,RSS FOUND?
0023 11477 124267 JMP E0M1A,I NO
0024 11500 034157 ISZ TEMPS YES
0025 11501 160001 LDA 1,I SAVE ARRAY
0026 11502 070173 STA B1 BASE ADDRESS
0027 11503 060171 LDA MLBX1
0028 11504 050416 CPA RDOP READ?
0029 11505 027561 JMP EMAT5 YES
0030 11506 044325 ADB .2 NO
0031 11507 160001 LDA 1,I SAVE
0032 11510 070174 STA B1+1 DIMENSIONS
0033 11511 010376 AND MSK0 SET
0034 11512 003004 CMA,INA COLUMN
0035 11513 070175 STA B2 COUNTERS
0036 11514 070176 STA B2+1
0037 11515 160001 LDA 1,I SET
0038 11516 001727 ALF,ALF
0039 11517 010376 AND MSK0 ROW
0040 11520 003004 CMA,INA
0041 11521 070177 STA B3 COUNTER
0042 11522 114255 JSB LCK2A,I ENSURE ARRAY IS DEFINED
0043 11523 002400 CLA SET DELIMITER
0044 11524 073767 STA MCKS AS COMMA
0045 11525 060157 LDA TEMPS MORE
0046 11526 050143 CPA PRADD STATEMENT?
0047 11527 027540 JMP EMAT3 NO
0048 11530 160157 LDA TEMPS,I YES
0049 11531 010420 AND OPMSK EXTRACT DELIMITER
0050 11532 050404 CPA B3000 SEMICOLON?
0051 11533 037767 ISZ MCKS YES
0052 11534 027540 JMP EMAT3
0053 11535 006400 EMAT2 CLB COMMA
0054 11536 057767 CPB MCKS DELIMETER?
0055 11537 015656 JSB EDELM YES
0056 11540 160173 EMAT3 LDA B1,I LOAD
0057 11541 034173 ISZ B1 NEXT

```

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0058	11542	164173	LDB B1,I	ELEMENT
0059	11543	034173	ISZ B1	
0060	11544	015643	JSB ENOUT	OUTPUT IT
0061	11545	034175	ISZ B2	ROW COMPLETE?
0062	11546	027535	JMP EMAT2	NO
0063	11547	015677	JSB OUTLN	YES, DO
0064	11550	015677	JSB OUTLN	SPACING
0065	11551	060176	LDA B2+1	RESET
0066	11552	070175	STA B2	COLUMN COUNTER
0067	11553	034177	ISZ B3	ARRAY EXHAUSTED?
0068	11554	027540	JMP EMAT3	NO
0069	11555	064157	EMAT4 LDB TEMPS	YES, MORE
0070	11556	054143	CPB PRADD	STATEMENT?
0071	11557	124256	JMP XEC4A,I	NO
0072	11560	027471	JMP EMAT1	YES
0073*				
0074	11561	074175	EMAT5 STB B2	SAVE SYMBOL TABLE POINTER
0075	11562	160157	LDA TEMPS,I	EXTRACT
0076	11563	010420	AND OPMSK	NEXT OPERATOR
0077	11564	064157	LDB TEMPS	STATEMENT
0078	11565	054143	CPB PRADD	EXHAUSTED?
0079	11566	002400	CLA	YES
0080	11567	050412	CPA B2200	'I' ?
0081	11570	017732	JSB REDIM	YES, REDIMENSION ARRAY
0082	11571	060175	LDA B2	LOAD
0083	11572	040325	ADA .2	ARRAY
0084	11573	160000	LDA 0,I	DIMENSIONS
0085	11574	015336	JSB MDIM	SET
0086	11575	001100	ARS	ARRAY
0087	11576	003004	CMA,INA	ELEMENT
0088	11577	070177	STA B3	COUNTER
0089	11600	114254	EMAT6 JSB FDAT,I	FETCH VALUE
0090	11601	170173	STA B1,I	STORE
0091	11602	034173	ISZ B1	
0092	11603	174173	STB B1,I	IT
0093	11604	034173	ISZ B1	
0094	11605	034177	ISZ B3	ARRAY EXHAUSTED?
0095	11606	027600	JMP EMAT6	NO
0096	11607	027555	JMP EMAT4	YES
0097*				
0098	11610	114231	EMAT7 JSB SSYMA,I	SAVE
0099	11611	006004	INB	BASE ADDRESS
0100	11612	160001	LDA 1,I	OF DESTINATION
0101	11613	070177	STA B3	ARRAY
0102	11614	074175	STB B2	SAVE SYMBOL TABLE ADDRESS
0103	11615	044325	ADB .2	SAVE
0104	11616	160001	LDA 1,I	ITS
0105	11617	070200	STA B3+1	DIMENSIONS
0106	11620	002404	CLA,INA	ASSUME MAT
0107	11621	071656	STA EDELM	REPLACEMENT
0108	11622	160157	EMAT8 LDA TEMPS,I	LOAD NEXT
0109	11623	034157	ISZ TEMPS	OPERAND
0110	11624	002020	SSA	ARRAY FUNCTION?
0111	11625	027711	JMP EMA11	YES
0112	11626	010401	EMAT8 AND MSK1	NO
0113	11627	002003	SZA,RSS	SCALAR MULTIPLICATION?

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0114	11630	027701		JMP EMA10	YES
0115	11631	114231		JSB SSYMA,I	NO
0116	11632	006004		INB	SAVE
0117	11633	160001		LDA 1,I	BASE
0118	11634	070173		STA B1	ADDRESS AND
0119	11635	044325		ADB .2	DIMENSIONS
0120	11636	160001		LDA 1,I	OF FIRST
0121	11637	070174		STA B1+1	SOURCE ARRAY
0122	11640	064157		LDB TEMPS	STATEMENT
0123	11641	054143		CPB PRADD	EXHAUSTED?
0124	11642	027662		JMP EMAT9	YES
0125	11643	160157		LDA TEMPS,I	NO
0126	11644	001100		ARS	EXTRACT
0127	11645	001727		ALF,ALF	AND
0128	11646	010362		AND .63	RECORD
0129	11647	040436		ADA M6	EMAT
0130	11650	071656		STA EDELM	OPERATOR
0131	11651	160157		LDA TEMPS,I	SAVE
0132	11652	010401		AND MSK1	
0133	11653	114231		JSB SSYMA,I	BASE ADDRESS
0134	11654	006004		INB	
0135	11655	160001		LDA 1,I	AND DIMENSIONS
0136	11656	070175		STA B2	
0137	11657	044325		ADB .2	OF SECOND
0138	11660	160001		LDA 1,I	
0139	11661	070176		STA B2+1	SOURCE ARRAY
0140*					
0141	11662	061656	EMAT9	LDA EDELM	TRANSFER TO
0142	11663	043666		ADA LMAP	APPROPRIATE
0143	11664	114000		JSB 0,I	ROUTINE
0144	11665	124256		JMP XEC4A,I	
0145*					
0146	11666	111666	LMAP	DEF LBASE-1,I	
0147	11667	012123	LBASE	DEF REPLC	
0148	11670	012103		DEF ADD	
0149	11671	012116		DEF SUB	
0150	11672	012331		DEF MULT	
0151	11673	012170		DEF SZER	
0152	11674	012145		DEF LCON	
0153	11675	012176		DEF LIDN	
0154	11676	012441		DEF LINV	
0155	11677	012266		DEF TRAN	
0156	11700	012137		DEF SMULT	
0157*					
0158	11701	060334	EMA10	LDA .10	SET SMULT
0159	11702	071656		STA EDELM	OPERATOR
0160	11703	114232		JSB FETCA,I	EVALUATE
0161	11704	070171		STA MLBX1	AND SAVE
0162	11705	074172		STB MLBX1+1	SCALAR
0163	11706	034157		ISZ TEMPS	GO TO
0164	11707	034157		ISZ TEMPS	PROCESS
0165	11710	027622		JMP EMAT0	SOURCE ARRAY
0166*					
0167	11711	001727	EMA11	ALF,ALF	EXTRACT
0168	11712	001700		ALF	
0169	11713	010344		AND .31	TYPE

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0170	11714	040440	ADA M8	RECORD EMAT
0171	11715	071656	STA EDELM	OPERATOR TYPE
0172	11716	040440	ADA M8	INV OR
0173	11717	002020	SSA	TRN?
0174	11720	027725	JMP EMA12	NO
0175	11721	160157	LDA TEMPS,I	YES, LOAD
0176	11722	034157	ISZ TEMPS	SOURCE
0177	11723	034157	ISZ TEMPS	ARRAY
0178	11724	027626	JMP EMAT6	SYMBOL
0179*				
0180	11725	064157	EMA12 LDB TEMPS	REDIMENSIONING
0181	11726	054143	CPB PRADD	PART?
0182	11727	027662	JMP EMAT9	NO
0183	11730	017732	JSB REDIM	YES
0184	11731	027662	JMP EMAT9	

0186*			*****	
0187*			SUBROUTINE TO REDIMENSION ARRAY	
0188*			*****	
0189	11732	000000	REDIM NOP	
0190	11733	017767	JSB MCKS	EVALUATE
0191	11734	005727	BLF, BLF	AND SAVE
0192	11735	074200	STB B3+1	ROW COUNT
0193	11736	006404	CLB, INB	LOAD DEFAULT COLUMN COUNT
0194	11737	034157	ISZ TEMPS	SINGLE
0195	11740	160157	LDA TEMPS,I	DIMENSION
0196	11741	010420	AND OPMSK	ARRAY?
0197	11742	050407	CPA LF	
0198	11743	027746	JMP REDII	YES
0199	11744	017767	JSB MCKS	NO, EVALUATE COLUMN COUNT
0200	11745	034157	ISZ TEMPS	MOVE PAST
0201	11746	034157	REDII ISZ TEMPS	RIGHT BRACKET
0202	11747	044200	ADB B3+1	PACK
0203	11750	074200	STB B3+1	DIMENSIONS
0204	11751	060175	LDA B2	STORE IN
0205	11752	040325	ADA .2	SYMBOL
0206	11753	174000	STB 0,I	TABLE
0207	11754	040431	ADA M1	COMPUTE
0208	11755	160000	LDA 0,I	PHYSICAL
0209	11756	015336	JSB MDIM	ARRAY SPACE
0210	11757	070172	STA MLBX1+1	SIZE
0211	11760	060200	LDA B3+1	COMPUTE
0212	11761	015336	JSB MDIM	NEW SIZE
0213	11762	003004	CMA, INA	NEW
0214	11763	040172	ADA MLBX1+1	SIZE
0215	11764	002020	SSA	ACCEPTABLE?
0216	11765	014477	JSB ERROR	NO
0217	11766	127732	E7 JMP REDIM,I	YES


```
0219*
0220*
0221*
0222 11767 000000 MCKS NOP
0223 11770 114232 JSB FETCA,I CALL FOR EVALUATION
0224 11771 015353 JSB SBFIX CONVERT TO INTEGER (ROUNDED)
0225 11772 006004 INB UNBIAS SUBSCRIPT
0226 11773 060001 LDA 1 PUT INTO (A)
0227 11774 040460 ADA M256 LESS THAN
0228 11775 002021 SSA,RSS 256?
0229 11776 124272 JMP E6M1A,I NO
0230 11777 127767 JMP MCKS,I YES, RETURN SUBSCRIPT IN (B)
```

0232 12000

ORG 12000B

0233*

0234*****

0235***** MATRIX ROUTINES *****

0236*****

0237*CALL FOR MATRIX OPERATION IS MADE WITH FOUR*

0238*PARAMETERS,ROUTINE NUMBER AND ADDRESS OF *

0239*SYMBOL TABLE OF THREE MATRICES. FOR SCALAR *

0240*MULT, LAST IS ADDRESS OF SCALAR VALUE *

0241*OPERATION IS OF FORM B3=B1 OP B2 *

0242*THE ADDRESS OF THE BASE ADDRESS OF MATRICES*

0243*IS GIVEN IN B1,B2,B3. THE DIMENSIONS OF A *

0244*MATRIX IS GIVEN IN B(1)+1, ROWS IN MOST SIG*

0245*PART(MSP) AND COLUMN IN LEAST SIG PART(LSP)*

0246*****

0247*

0248*

0249*

0250*****

0251*** SUBROUTINE GENERAL ***

0252*****

0253*B3=B1 OP B2 SUBROUTINE COMPUTES AN ELEMENT*

0254*OF B3 AND INCREMENTS TO NEXT ELEMENT. THE *

0255*OPERATION THAT IS PERFORMED AND *

0256* THE MATRICES INCREMENTED ARE *

0257* MODIFIED BY ROUTINES ADD, SUB, REPL *

0258*SCALAR MULT, CON,ZERO, IDN. ROUTINE CHECKS *

0259*COMPATIBILITY OF THREE MATRICES USING SUB *

0260*COMPARE (PARAMETERS SUPPLIED IN REG A,B) *

0261*****

0262*

0263	12000	000000	GENER	NOP	SUBROUTINE GENERAL
0264	12001	060176		LDA B2+1	LOAD DIM FOR MATRIX 2
0265	12002	064174		LDB B1+1	LOAD DIM FOR MATRIX 1
0266	12003	016032		JSB COMPR	CHECKS ROW AND COL DIM
0267*					ARE COMPATIBLE
0268	12004	060174	GEN2	LDA B1+1	LOAD DIM FOR MATRIX 1
0269	12005	064200		LDB B3+1	LOAD DIM FOR MATRIX 3
0270	12006	016032		JSB COMPR	CHECK ROW AND COL DIM
0271	12007	015236		JSB MPY	COLUMNS IN (A)
0272	12010	013115		DEF T3	ROWS IN T3
0273	12011	003004		CMA,INA	
0274	12012	073134		STA LPIV	-ROWS*COLUMNS
0275*					COMPUTES B3=B1 OP B2
0276	12013	160173	LOOP	LDA B1,I	LOAD
0277	12014	034173		ISZ B1	NEXT
0278	12015	164173		LDB B1,I	SOURCE
0279	12016	034173		ISZ B1	ELEMENT
0280	12017	000000	MUL1	NOP	USUALLY A JSB
0281	12020	000000		NOP	USUALLY DEF B2,I
0282	12021	170177		STA B3,I	STORE
0283	12022	034177		ISZ B3	NEXT
0284	12023	174177		STB B3,I	DESTINATION
0285	12024	034177		ISZ B3	ELEMENT
0286	12025	000000	MOD2	NOP	ISZ B2 FOR
0287	12026	000000		NOP	MAT ADD OR SUB

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```

0288 12027 037134      ISZ LPIV
0289 12030 026013      JMP LOOP      COMPUTE NEXT ELEMENT
0290 12031 126000      JMP GENER,I
0291*
0292*
0293*****
0294****      SUBROUTINE COMPARE      ****
0295*****
0296*ROUTINE COMPARES DIM OF TWO MATRICES GIVEN *
0297*THEIR DIM IN REGISTERS A,B      *
0298*DIMENSIONS ARE GIVEN IN B(I)+2      *
0299*****
0300*
0301 12032 000000      COMPR NOP
0302 12033 050001      CPA 1      EQUAL?
0303 12034 002001      RSS      YES
0304 12035 014477      LEERR JSB ERROR      NO
0305 12036 001727      ALF,ALF      SAVE
0306 12037 010376      AND MSK0      # OF
0307 12040 073115      STA T3      ROWS
0308 12041 060001      LDA 1
0309 12042 010376      AND MSK0      SAVE #
0310 12043 073116      STA T4      OF COLUMNS
0311 12044 126032      JMP COMPR,I
0312*
0313*
0314*****
0315*****      SUBROUTINE LCHK      *****
0316*****
0317*TESTS THAT NO ELEMENT IN A MATRIX IS      *
0318*UNASSIGNED. ENTRY1 CHECKS MATRICES GIVEN BY*
0319*B1 AND B2 AND ENTRY 2 CHECKS ONLY B1      *
0320*****
0321*
0322 12045 000000      LCHK2 NOP
0323 12046 062045      LDA LCHK2
0324 12047 072051      STA LCHK1
0325 12050 026055      JMP ++5
0326 12051 000000      LCHK1 NOP
0327 12052 064175      LDB B2      BASE ADDR
0328 12053 060176      LDA B2+1      ROW AND COL DIM.
0329 12054 016061      JSB LCHK4      TEST EACH TERM OF B2
0330 12055 064173      LDB B1      BASE ADDR
0331 12056 060174      LDA B1+1      ROW AND COL DIM.
0332 12057 016061      JSB LCHK4      TEST EACH TERM OF B1
0333 12060 126051      JMP LCHK1,I
0334*
0335 12061 000000      LCHK4 NOP      SUBROUTINE TO TEST TERMS
0336 12062 077120      STB T6      SAVE
0337 12063 015336      JSB MDIM      COMPUTE SIZE OF MATRIX
0338 12064 001100      ARS      SET NEGATIVE
0339 12065 003004      CMA,INA
0340 12066 073121      STA T7      COUNTER FOR ELEMENTS
0341 12067 163120      LCHK6 LDA T6,I      LOAD
0342 12070 037120      ISZ T6
0343 12071 167120      LDB T6,I      ELEMENT

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0344 12072 037120      ISZ T6
0345 12073 050470      CPA MNEG          COMPARE WITH PRESET QTY.
0346 12074 026076      JMP **2
0347 12075 026100      JMP LCHK5
0348 12076 054471      CPB MNEG+1
0349 12077 014477      JSB ERROR        ERROR 'MAT UNASSIGNED'
0350 12100 037121      LCHK5 ISZ T7     DONE?
0351 12101 026067      JMP LCHK6        NO
0352 12102 126061      JMP LCHK4,I     YES
0353*
0354*
0355*****
0356****  SUBROUTINE  MATRIX  ADD          ****
0357*****
0358*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*
0359*THREE MATRICES. ROUTINE EXECUTES B3=B1+B2 *
0360*BY MODIFYING INSTR IN ROUTINE GENERAL *
0361*****
0362*
0363 12103 000000      ADD  NOP
0364 12104 063135      LDA LPLUS        JSB .FAD
0365 12105 072017      ADD1 STA MOD1      SET IN GENER
0366 12106 063136      LDA LPLUS+1     DEF OF B2,I
0367 12107 072020      STA MOD1+1      MODIFY ROUTINE GENERAL
0368 12110 063141      LDA INCB2       ISZ B2
0369 12111 072025      STA MOD2
0370 12112 072026      STA MOD2+1
0371 12113 016051      JSB LCHK1       TEST B1,B2 FOR UNASSIGNED TERMS
0372 12114 016000      JSB GENER       ROUTINE GENERAL
0373 12115 126103      JMP ADD,I       EXIT TO MAIN PROGRAM
0374*
0375*
0376*****
0377****  SUBROUTINE  MATRIX  SUBTRACT    ****
0378*****
0379*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*
0380*THREE MATRICES. ROUTINE EXECUTES B3=B1-B2 *
0381*BY MODIFYING INSTR IN ROUTINE GENERAL *
0382*****
0383*
0384 12116 000000      SUB  NOP          LET
0385 12117 062116      LDA SUB          ADD DO
0386 12120 072103      STA ADD          RETURN
0387 12121 063137      LDA LMIN        JSB .FSB
0388 12122 026105      JMP ADD1

```

```

0390*
0391*****
0392***  SUBROUTINE MATRIX REPLACE  ***
0393*****
0394*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*
0395*MATRIX AND RECEIVING MATRIX RESPECTIVELY *
0396*****
0397 12123 000000 REPLC NOP LET
0398 12124 062123 LDA REPLC GENER DO
0399 12125 072000 STA GENER RETURN
0400 12126 002400 CLA NO
0401 12127 006400 CLB OPERATION
0402 12130 072017 REPL1 STA MOD1 SET
0403 12131 076020 STB MOD1+1 OPERATION
0404 12132 002400 CLA B2
0405 12133 072025 STA MOD2 NOT
0406 12134 072026 STA MOD2+1 USED
0407 12135 016045 JSB LCHK2 TEST B1 FOR UNASSIGNED ELEMENTS
0408 12136 026004 JMP GEN2
0409*
0410*
0411*****
0412***  SUBROUTINE MATRIX SCALAR MULT  ***
0413*****
0414*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*
0415*MATRIX AND RECEIVING MATRIX RESPECTIVELY *
0416*MBXL HOLDS ADDRESS OF SCALAR VALUE *
0417*****
0418*
0419 12137 000000 SMULT NOP LET
0420 12140 062137 LDA SMULT GENER DO
0421 12141 072000 STA GENER RETURN
0422 12142 063140 LDA LTIME SET FOR
0423 12143 064323 LDB MBXL MULTIPLY
0424 12144 026130 JMP REPL1
0425*
0426*
0427*****
0428***  SUBROUTINE MATRIX CON  ***
0429*****
0430*SETS MATRIX TO ALL ONES. B3 IS ADDRESS OF *
0431*BASE ADDRESS OF MATRIX. *
0432*****
0433*
0434 12145 000000 LCON NOP
0435 12146 060466 LDA HONE
0436 12147 064325 LDB .2
0437 12150 070171 LCCN1 STA MLBX1 SET
0438 12151 074172 STB MLBX1+1 CONSTANT
0439 12152 060200 LDA B3+1
0440 12153 015336 JSB MDIM SET
0441 12154 001100 ARS ELEMENT
0442 12155 003004 CMA,INA COUNTER
0443 12156 073134 STA LPIV
0444 12157 060171 LDA MLBX1 LOAD
0445 12160 064172 LDB MLBX1+1 CONSTANT

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0446 12161 170177 LCCN2 STA B3,I      STORE
0447 12162 034177          ISZ B3      IN
0448 12163 174177          STB B3,I      NEXT
0449 12164 034177          ISZ B3      ELEMENT
0450 12165 037134          ISZ LPIV     DONE?
0451 12166 026161          JMP LCON2    NO
0452 12167 126145          JMP LCON,I   YES
0453*
0454*
0455*****
0456***      SUBROUTINE MATRIX ZERO      ****
0457*****
0458*SETS MATRIX TO ZERO. B3 IS ADDRESS OF BASE *
0459*ADDRESS OF MATRIX. B1,B2 ARE REDUNDANT *
0460*SET B1=0 AND USE SUBROUTINE CON,ENTRY2 *
0461*****
0462*
0463 12170 000000 SZER  NOP
0464 12171 062170      LDA SZER      CONVERT
0465 12172 072145      STA LCON
0466 12173 002400      CLA          LCON
0467 12174 006400      CLB
0468 12175 026150      JMP LCON1    TO SZER
0469*
0470*
0471*****
0472***      SUBROUTINE MATRIX IDN      ****
0473*****
0474*ROUTINE SETS UP IDENTITY MATRIX *
0475*B3 IS ADDRESS OF BASE ADDRESS OF MATRIX *
0476*USE SZER TO SET MATRIX TO ALL ZEROS. ON *
0477*RETURN CHECK FOR SQUARE MATRIX. *
0478*****
0479*
0480 12176 000000 LIDN  NOP
0481 12177 060177      LDA B3
0482 12200 073123      STA T9      SAVE BASE ADDRESS
0483 12201 016170      JSB SZER    SET ALL MATRIX TO ZERO
0484 12202 060200      LDA B3+1   IS
0485 12203 001727      ALF,ALF   ARRAY
0486 12204 050200      CPA B3+1   SQUARE?
0487 12205 001010      ALS,SLA   YES
0488 12206 026035      JMP LERR   NO
0489 12207 010401      AND MSK1   SAVE ROW
0490 12210 070171      STA MLBX1  LENGTH
0491 12211 001100      ARS       SAVE
0492 12212 003004      CMA,INA   ROW
0493 12213 070172      STA MLBX1+1 COUNTER
0494 12214 067123      LDB T9     RESTORE
0495 12215 074177      STB B3     B3
0496 12216 060466 LIDN1 LDA HONE STORE
0497 12217 170001      STA 1,I
0498 12220 006004      INB       1.0 ON
0499 12221 060325      LDA .2
0500 12222 170001      STA 1,I   DIAGONAL
0501 12223 006004      INB

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0502 12224 044171      ADB MLBX1      MOVE TO NEXT DIAGONAL ELEMENT
0503 12225 034172      ISZ MLBX1+1    DONE?
0504 12226 026216      JMP LIDN1      NO
0505 12227 126176      JMP LIDN,I     YES
0506*
0507*
0508*****
0509*****      SUBROUTINES DLD AND DST      *****
0510*****
0511*
0512*
0513*
0514 12230 000000      .DLD  NOP
0515 12231 016250      JSB GETAD      GET ADDRESS
0516 12232 112230      DEF .DLD,I
0517 12233 036230      ISZ .DLD      BUMP RETURN ADDRESS
0518 12234 162264      LDA ADRES,I   LOAD HIGH PART.
0519 12235 036264      ISZ ADRES
0520 12236 166264      LDB ADRES,I   LOAD LOW PART.
0521 12237 126230      JMP .DLD,I
0522*
0523 12240 000000      .DST  NOP
0524 12241 016250      JSB GETAD      GET ADDRESS.
0525 12242 112240      DEF .DST,I
0526 12243 036240      ISZ .DST      BUMP RETURN ADDRESS.
0527 12244 172264      STA ADRES,I   STORE HIGH PART.
0528 12245 036264      ISZ ADRES
0529 12246 176264      STB ADRES,I   STORE LOW PART.
0530 12247 126240      JMP .DST,I
0531*
0532 12250 000000      GETAD NOP      COMPUTES EFFECTIVE ADDRESS.
0533 12251 072265      STA TINY      SAVE A REGISTER.
0534 12252 162250      LDA GETAD,I   GET POINTER TO ADDRESS.
0535 12253 072264      GET  STA ADRES  STORE IN ADRES.
0536 12254 062265      LDA TINY      RESTORE A REGISTER.
0537 12255 162264      LDA ADRES,I
0538 12256 001275      RAL,CLE,SLA,ERA  TEST FOR INDIRECT
0539 12257 026253      JMP GET      IT IS INDIRECT.
0540 12260 072264      STA ADRES      EFFECTIVE ADDRESS.
0541 12261 062265      LDA TINY
0542 12262 036250      ISZ GETAD      RETURN
0543 12263 126250      JMP GETAD,I
0544 12264 000000      ADRES BSS 1
0545 12265 000000      TINY  BSS 1

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0547*
0548*****
0549****          SUBROUTINE  TRANSPOSE          *****
0550*****
0551*TRANSPOSE OF FORM B3(M,N)=T(B1(N,M))      *
0552*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*
0553*AND RECEIVING MATRICES RESPECTIVELY.      *
0554*****
0555*
0556 12266 000000  TRAN  NOP
0557 12267 016045  JSB  LCHK2          TEST B1 FOR UNASSIGNED TERMS
0558*                                     CHECK DIMENSIONS
0559 12270 060200          LDA B3+1      PARAMETERS OF B3
0560 12271 001727          ALF,ALF      INTERCHANGE ROW AND COLUMN
0561 12272 064174          LDB B1+1      PARAMETERS OF B1
0562 12273 016032  JSB  COMPR          SUBROUTINE COMPARE
0563*                                     DIMENSIONS COMPATIBLE
0564 12274 015236          JSB MPY       # OF COLUMNS IN (A)
0565 12275 013115          DEF T3        # OF ROWS IN T3
0566 12276 073134          STA LPIV      PRODUCT OF ROW*COL
0567 12277 063116          LDA T4        SET
0568 12300 003004          CMA,INA       COLUMN
0569 12301 073117          STA T5        COUNTER
0570*                                     T6 IS INDICATOR TO SELECT
0571*                                     WHICH ELEMENT IN A COL OF
0572*                                     B1 IS TO BE TRANSPOSED
0573 12302 002400  TRAN1 CLA
0574 12303 073120          STA T6        SET T6=0
0575 12304 067120  LNEXT LDB T6        LOAD
0576 12305 005000          BLS
0577 12306 044173          ADB B1        NEXT ELEMENT
0578 12307 160001          LDA 1,I
0579 12310 006004          INB
0580 12311 164001          LDB 1,I
0581 12312 170177          STA B3,I      STORE
0582 12313 034177          ISZ B3        IN
0583 12314 174177          STB B3,I      ROW
0584 12315 034177          ISZ B3
0585 12316 063120          LDA T6        SET T6=T6+T4
0586 12317 043116          ADA T4        T6 POINTS TO NEXT TERM IN
0587 12320 073120          STA T6        A COLUMN TO BE TRANSPOSED
0588 12321 053134          CPA LPIV      TEST FOR LAST IN COL
0589 12322 026324          JMP **2
0590 12323 026304          JMP LNEXT
0591*
0592*
0593 12324 034173          ISZ B1
0594 12325 034173          ISZ B1
0595 12326 037117          ISZ T5
0596 12327 026302          JMP TRAN1      TRANSPOSE NEXT COL
0597 12330 126266          JMP TRAN,I    EXIT TO MAIN PROGRAM

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0002*
0003*****
0004***      SUBROUTINE MATRIX MULT      ****
0005*****
0006*ROUTINE IS OF FORM B3(M,P)=B1(M,N)*B2(N,P) *
0007*B1,B2,B3 ARE ADDRESSES OF BASE ADDRESSES OF*
0008*THREE MATRICES                          *
0009*****
0010*
0011 12331 000000 MULT NOP
0012 12332 016051          JSB LCHK1      TEST B1,B2 FOR UNASSIGNED TERMS
0013*                                CHECK DIMENSIONS
0014 12333 060200          LDA B3+1      PARAMETERS OF B3
0015 12334 010376          AND MSK0     SAVE COLUMN COUNT
0016 12335 073120          STA T6
0017 12336 060176          LDA B2+1      PARAMETERS OF B2
0018 12337 010376          AND MSK0
0019 12340 053120          CPA T6        COLUMNS EQUAL
0020 12341 002001          RSS          IN NUMBER?
0021 12342 026035          JMP LERR     NO
0022*                                COMBINE B3,B2 PARAMETERS
0023*                                INTO (M,N) AND COMPARE
0024*                                WITH THOSE OF B1
0025 12343 060200          LDA B3+1      PARAMETERS OF B3
0026 12344 010460          AND M256
0027 12345 070001          STA 1        STORE ROW IN MSP OF B
0028 12346 060176          LDA B2+1      PARAMETERS OF B2
0029 12347 001727          ALF,ALF      GET ROW COUNT
0030 12350 010376          AND MSK0     IN (A)
0031 12351 040001          ADA 1        COMBINE A AND B
0032 12352 064174          LDB B1+1      PARAMETERS OF B1
0033 12353 016032          JSB COMPR   COMPARE ROW AND COL
0034*                                DIMENSIONS ARE COMPATIBLE
0035*                                M,N ARE STORED IN T3,T4
0036*                                SAVE B2 AS DESTROYED IN
0037 12354 060175          LDA B2        MULT
0038 12355 073117          STA T5
0039 12356 063115          LDA T3        SET
0040 12357 003004          CMA,INA     ROW
0041 12360 073123          STA T9        COUNTER
0042 12361 063120 MULT4 LDA T6
0043 12362 003004          CMA,INA
0044 12363 073124          STA T10     SET COUNTER
0045 12364 063117          LDA T5
0046 12365 070175          STA B2        RESTORE BASE ADDRESS B2
0047 12366 002400 MULT3 CLA
0048 12367 073125          STA T11     COUNTER FOR B2. INCR BY
0049*                                2*P AND POINTS TO NEXT TERM
0050*                                IN COL TO BE MULTIPLIED
0051 12370 073126          STA T12     COUNTER FOR B1. INCR BY 2
0052*                                AND POINTS TO NEXT TERM
0053*                                IN ROW TO BE MULTIPLIED
0054 12371 000400          CLB
0055 12372 016240          JSB .DST   CLEAR TO ZERO
0056 12373 100177          DEF B3,I
0057 12374 064173 MULT2 LDB B1        COMPUTE PROD OF ONE TERM

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0058	12375	047126	ADB T12	IN ROW BY ONE TERM IN COL
0059	12376	077132	STB T18	
0060	12377	064175	LDB B2	
0061	12400	047125	ADB T11	
0062	12401	016230	JSB .DLD	
0063	12402	100001	DEF 1,I	
0064	12403	114240	JSB .FMPA,I	
0065	12404	113132	DEF T18,I	
0066	12405	114236	JSB .FADA,I	COMPUTES RUNNING SUM
0067	12406	100177	DEF B3,I	
0068	12407	016240	JSB .DST	
0069	12410	100177	DEF B3,I	
0070	12411	037126	ISZ T12	SELECT NEXT TERM IN ROW
0071	12412	037126	ISZ T12	
0072	12413	063120	LDA T6	SELECT NEXT TERM IN COL
0073	12414	001000	ALS	
0074	12415	043125	ADA T11	
0075	12416	073125	STA T11	
0076*				TEST IF HAVE MULT ONE ROW
0077*				BY ONE COLUMN
0078	12417	063116	LDA T4	
0079	12420	001000	ALS	
0080	12421	053126	CPA T12	
0081	12422	026424	JMP ++2	
0082	12423	026374	JMP MULT2	MULT AND ADD IN NEXT TERM
0083*				SUMMATION OF PRODUCTS FOR
0084*				ONE TERM OF B3 IS DONE
0085*				MULT SAME ROW BY NEXT COL
0086	12424	034177	ISZ B3	INCR RECEIVING MAT
0087	12425	034177	ISZ B3	
0088	12426	034175	ISZ B2	BASE ADDRESS OF NEXT COL
0089	12427	034175	ISZ B2	
0090*				TEST IF HAVE MULT ONE ROW
0091*				BY ALL COLUMNS
0092	12430	037124	ISZ T10	SKIP IF INNERPRODUCT DONE
0093	12431	026366	JMP MULT3	COMPUTE SAME ROW*NEXT COL
0094*				SELECT NEXT ROW
0095	12432	063116	LDA T4	
0096	12433	001000	ALS	
0097	12434	040173	ADA B1	
0098	12435	070173	STA B1	ADDRESS OF NEXT ROW
0099	12436	037123	ISZ T9	
0100	12437	026361	JMP MULT4	MULT ROW BY ALL COLUMNS
0101	12440	126331	JMP MULT,I	EXIT TO MAIN PROGRAM

0103*

0104*****

0105**** SUBROUTINE MATRIX INVERT ****

0106*****

0107*OPERATION OF FORM MAT B3 = INV B1 *

0108*B1,B3 ARE ADDRESSES OF BASE ADDRESS OF *

0109*MATRIX TO BE INVERTED AND RECEIVING MATRIX *

0110*RESPECTIVELY. B2 IS REDUNDANT. METHOD USED *

0111*IS GAUSSIAN ELIMINATION WITH COLUMN *

0112*PIVOTING *

0113*****

0114*

0115	12441	000000	LIN V	NOP	SUBROUTINE MATRIX INVERT
0116	12442	016045		JSB LCHK2	TEST B1 FOR UNASSIGNED TERMS
0117	12443	060174		LDA B1+1	DIMENSIONS OF MATRIX B1
0118	12444	064200		LDB B3+1	DIMENSIONS OF MATRIX B3
0119	12445	016032		JSB COMPR	CHECK DIMENSIONS
0120*					ROW AND COL VALUES T3,T4
0121*					MAKE COPY OF MATRIX B1
0122*					IN FREE CORE
0123	12446	060177		LDA B3	SAVE
0124	12447	073127		STA T13	B3
0125	12450	060174		LDA B1+1	COMPUTE SIZE
0126	12451	015336		JSB MDIM	OF MATRIX
0127	12452	003004		CMA,INA	
0128	12453	001100		ARS	SAVE
0129	12454	073114		STA T2	ELEMENT
0130	12455	001000		ALS	COUNTER
0131	12456	064141		LDB LSTPT	SAVE
0132	12457	006004		INB	ADDRESS OF
0133	12460	074175		STB B2	FREE CORE
0134	12461	074177		STB B3	
0135	12462	007004		CMB,INB	COMPUTE SIZE OF
0136	12463	044142		ADB HSTPT	FREE CORE AREA
0137	12464	040001		ADA 1	ENOUGH
0138	12465	002020		SSA	CORE LEFT?
0139	12466	025473		JMP E1	NO
0140	12467	016123		JSB REPLC	YES, COPY SOURCE MATRIX
0141	12470	063127		LDA T13	RESTORE
0142	12471	070177		STA B3	B3
0143	12472	016176		JSB LIDN	SET DESTINATION TO IDENTITY
0144	12473	063127		LDA T13	RESTORE ITS
0145	12474	070177		STA B3	BASE ADDRESS
0146	12475	002400		CLA	INITIALIZE
0147	12476	073126		STA T12	MAXIMUM
0148	12477	073127		STA T13	ELEMENT
0149	12500	060175		LDA B2	COPY B2 INTO B1 AS
0150	12501	070173		STA B1	B2 NEEDED LATER
0151	12502	160173	LIN11	LDA B1,I	LOAD
0152	12503	034173		ISZ B1	NEXT
0153	12504	164173		LDB B1,I	ELEMENT
0154	12505	034173		ISZ B1	
0155	12506	002020		SSA	GET ABSOLUTE VALUE
0156	12507	015423		JSB ARINV	IF NUMBER IS NEGATIVE
0157	12510	073132		STA T18	SAVE NUMBER
0158	12511	077133		STB T19	

0159	12512	114237		JSB .FSBA,I	SUBTRACT EXISTING MAX.
0160	12513	013126		DEF T12	VALUE
0161	12514	002020		SSA	SKIP AND SWAP IF POSITIVE
0162	12515	026522		JMP LIN10	
0163	12516	063132		LDA T18	SWAP
0164	12517	067133		LDB T19	
0165	12520	073126		STA T12	
0166	12521	077127		STB T13	
0167	12522	037114	LIN10	ISZ T2	ALL ELEMENTS EXHAUSTED?
0168	12523	026502		JMP LIN11	NO
0169	12524	063126		LDA T12	COMPUTE RELATIVE TOLERANCE
0170	12525	067127		LDB T13	TOL=ABSOLUTE TOL * MAX VALUE
0171	12526	114240		JSB .FMPA,I	
0172	12527	015130		DEF T16	ABSOLUTE TOLERANCE
0173	12530	070171		STA MLBX1	RELATIVE
0174	12531	074172		STB MLBX1+1	TOLERANCE
0175	12532	002400		CLA	INITIALIZE PIVOT
0176	12533	073134		STA LPIV	
0177	12534	037116		ISZ T4	REQUIRE CONSTANT (ROW+1)
0178	12535	037134	LINV1	ISZ LPIV	SELECT NEXT PIVOT
0179	12536	063134		LDA LPIV	TEST IF HAVE PROCESSED
0180	12537	053116		CPA T4	LAST PIVOT
0181	12540	126441		JMP LINV,I	NORMAL EXIT TO MAIN PROG
0182*					SCAN PIVOTAL COLUMN FOR
0183*					LARGEST ELEMENT
0184	12541	063134		LDA LPIV	COMPUTE ADDRESS OF PIVOT
0185	12542	067134		LDB LPIV	COLUMN USING ROUTINE LWHR
0186	12543	073114		STA T2	ROW COUNTER
0187	12544	017067		JSB LWHR	ON RETURN, ADDRESS IN A
0188	12545	073113		STA T1	
0189	12546	002400		CLA	
0190	12547	073126		STA T12	T12,T13 IS STORE
0191	12550	073127		STA T13	FOR GREATEST VALUE
0192	12551	016230	LINV2	JSB .DLD	LOAD FP NUMBER
0193	12552	113113		DEF T1,I	
0194	12553	002020		SSA	OBTAIN ABSOLUTE VALUE
0195	12554	015423		JSB ARINV	IF NUMBER IS NEGATIVE
0196	12555	073132		STA T18	STORE VALUE OF FP NUMBER
0197	12556	077133		STB T19	
0198	12557	114237		JSB .FSBA,I	SUBTR EXISTING LARGEST VALUE
0199	12560	013126		DEF T12	
0200	12561	002020		SSA	SKIP AND SWAP IF POSITIVE
0201	12562	026571		JMP LINV7	T2 STILL CONTAINS MAX VALUE
0202	12563	063132		LDA T18	STORE NEW MAX VALUE
0203	12564	067133		LDB T19	
0204	12565	073126		STA T12	
0205	12566	077127		STB T13	
0206	12567	063114		LDA T2	SET T5 TO POSITION IN
0207	12570	073117		STA T5	COLUMN OF MAX VALUE
0208	12571	037114	LINV7	ISZ T2	
0209	12572	063114		LDA T2	TEST FOR LAST TERM IN COL
0210	12573	053116		CPA T4	
0211	12574	026602		JMP LINV8	SWAP ROWS
0212	12575	063115		LDA T3	COMPUTE
0213	12576	001000		ALS	NEXT ADDRESS
0214	12577	043113		ADA T1	IN PIVOT

0215	12600	073113		STA T1	COLUMN
0216	12601	026551		JMP LINV2	SELECT NEXT TERM
0217*					SWAP ROWS LPIV AND T5
0218	12602	063134	LINV8	LDA LPIV	COMPUTE ADDRESS
0219	12603	006404		CLB,INB	OF PIVOTAL ROW
0220	12604	017067		JSB LWHR	
0221	12605	073113		STA T1	ADDRESS OF PIVOTAL ROW
0222	12606	063117		LDA T5	
0223	12607	006404		CLB,INB	
0224	12610	017067		JSB LWHR	
0225	12611	073114		STA T2	ADDR OF ROW TO BE SWAPPED
0226	12612	063134		LDA LPIV	
0227	12613	006404		CLB,INB	COMPUTE ADDRESS OF
0228	12614	017101		JSB LWHR2	PIVOTAL ROW IN I-MATRIX
0229	12615	073123		STA T9	
0230	12616	073124		STA T10	KEEP COPY
0231	12617	063117		LDA T5	
0232	12620	006404		CLB,INB	COMPUTE ADDR OF ROW TO
0233	12621	017101		JSB LWHR2	BE SWAPPED IN I-MATRIX
0234	12622	073125		STA T11	
0235	12623	063115		LDA T3	
0236	12624	003004		CMA,INA	
0237	12625	073126		STA T12	COUNTER FOR TERMS IN A ROW
0238	12626	016230	LINV3	JSB .DLD	SWAP ONE ELEMENT OF ROW
0239	12627	113113		DEF T1,I	
0240	12630	073132		STA T18	
0241	12631	077133		STB T19	
0242	12632	016230		JSB .DLD	
0243	12633	113114		DEF T2,I	
0244	12634	173113		STA T1,I	
0245	12635	037113		ISZ T1	
0246	12636	177113		STB T1,I	
0247	12637	037113		ISZ T1	
0248	12640	063132		LDA T18	
0249	12641	067133		LDB T19	
0250	12642	173114		STA T2,I	
0251	12643	037114		ISZ T2	
0252	12644	177114		STB T2,I	
0253	12645	037114		ISZ T2	
0254	12646	016230		JSB .DLD	SWAP ONE ELEMENT IN A ROW
0255	12647	113123		DEF T9,I	OF I-MATRIX
0256	12650	073132		STA T18	
0257	12651	077133		STB T19	
0258	12652	016230		JSB .DLD	
0259	12653	113125		DEF T11,I	
0260	12654	173123		STA T9,I	
0261	12655	037123		ISZ T9	
0262	12656	177123		STB T9,I	
0263	12657	037123		ISZ T9	
0264	12660	063132		LDA T18	
0265	12661	067133		LDB T19	
0266	12662	173125		STA T11,I	
0267	12663	037125		ISZ T11	
0268	12664	177125		STB T11,I	
0269	12665	037125		ISZ T11	
0270	12666	037126		ISZ T12	SKIP IF DONE

0271	12667	026626		JMP LINV3	SWAP NEXT ELEMENT
0272*					HAVE LARGEST ELEMENT IN
0273*					PIVOTAL POSITION. FIND
0274*					VALUE AND TEST TO ZERO
0275*					FOR SINGULAR MATRIX
0276	12670	063134		LDA LPIV	COMPUTE
0277	12671	067134		LDB LPIV	ADDRESS OF
0278	12672	017067		JSB LWHR	PIVOT
0279	12673	073113		STA T1	ELEMENT
0280	12674	016230		JSB .DLD	PIVOT VALUE
0281	12675	113113		DEF T1,I	
0282	12676	002020		SSA	OBTAIN ABSOLUTE VALUE
0283	12677	015423		JSB ARINV	IF NUMBER IS NEGATIVE
0284	12700	114237		JSB .FSBA,I	SUBTRACT TOLERANCE AND
0285	12701	000171		DEF MLBX1	
0286	12702	002020		SSA	COMPARE TO ZERO
0287	12703	014477		JSB ERROR	PRINT 'NEARLY SING MATRIX'
0288*					DIVIDE PIVOT ROW AND ROW
0289*					IN I-MAT BY PIVOT VALUE
0290	12704	063113	LDLM1	LDA T1	ADDRESS OF PIOT ELEMENT
0291	12705	073114		STA T2	
0292	12706	060466		LDA HONE	LOAD
0293	12707	064325		LDB .2	1.0
0294	12710	114241		JSB .FDVA,I	
0295	12711	113113		DEF T1,I	
0296	12712	073132		STA T18	INVERSE OF PIVOT
0297	12713	077133		STB T19	
0298*					MULT ROW BY 1/PIVOT
0299*					STARTING AT PIVOT+1
0300	12714	063134		LDA LPIV	
0301	12715	073125		STA T11	COUNTER FOR ROW
0302	12716	037125	LINV6	ISZ T11	INCREMENT COUNTER
0303	12717	063125		LDA T11	
0304	12720	053116		CPA T4	TEST FOR END OF ROW
0305	12721	026733		JMP LIN12	
0306	12722	037114		ISZ T2	ADDRESS OF NEXT ELEMENT
0307	12723	037114		ISZ T2	
0308	12724	016230		JSB .DLD	
0309	12725	113114		DEF T2,I	
0310	12726	114240		JSB .FMPA,I	
0311	12727	013132		DEF T18	
0312	12730	016240		JSB .DST	
0313	12731	113114		DEF T2,I	
0314	12732	026716		JMP LINV6	
0315*					MULT ROW IN I-MATRIX BY
0316*					1/PIVOT. SKIP IF ELEMENT=0
0317	12733	063124	LIN12	LDA T10	ADDRESS OF PIVOT ROW
0318	12734	073117		STA T5	IN I-MATRIX
0319	12735	063115		LDA T3	
0320	12736	003004		CMA,INA	SET
0321	12737	073125		STA T11	ROW COUNTER
0322	12740	016230	LIN13	JSB .DLD	
0323	12741	113117		DEF T5,I	
0324	12742	002003		SZA,RSS	SKIP MULTIPLICATION IF ZERO
0325	12743	006002		SZB	
0326	12744	026746		JMP ++2	NOT ZERO

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0327 12745 026752      JMP LIN14      ZERO
0328 12746 114240      JSB .FMPA,I
0329 12747 013132      DEF T18
0330 12750 016240      JSB .DST
0331 12751 113117      DEF T5,I
0332 12752 037117      LIN14 ISZ T5      NEXT ELEMENT IN I-MATRIX
0333 12753 037117      ISZ T5
0334 12754 037125      ISZ T11      DONE?
0335 12755 026740      JMP LIN13      NO
0336*
0337*
0338*
0339 12756 002400      CLA
0340 12757 070173      STA B1
0341 12760 034173      LINV4 ISZ B1      SELECT NEXT ROW
0342 12761 060173      LDA B1
0343 12762 053116      CPA T4      TEST FOR LAST ROW
0344 12763 026535      JMP LINV1      SELECT NEXT PIVOT
0345 12764 053134      CPA LPIV      TEST TO SKIP PIVOTAL ROW
0346 12765 026760      JMP LINV4      SKIP PIVOTAL ROW
0347 12766 060173      LDA B1
0348 12767 006404      CLB,INB
0349 12770 017101      JSB LWHR2      ADDRESS OF ROW TO BE TRANSFORMED
0350 12771 073125      STA T11      IN I-MATRIX
0351*
0352*
0353*
0354*
0355 12772 060173      LDA B1
0356 12773 067134      LDB LPIV
0357 12774 017067      JSB LWHR
0358 12775 073123      STA T9      SAVE ADDRESS
0359 12776 016230      JSB .DLD
0360 12777 100000      DEF 0,I
0361 13000 073121      STA T7      VALUE OF MULTIPLIER
0362 13001 077122      STB T8
0363*
0364*
0365*
0366 13002 063134      LDA LPIV
0367 13003 073127      STA T13      COUNTER
0368 13004 063113      LDA T1
0369 13005 073114      STA T2
0370 13006 037127      LINV5 ISZ T13
0371 13007 063127      LDA T13
0372 13010 053116      CPA T4      TEST FOR LAST TERM IN ROW
0373 13011 027033      JMP LIN15
0374 13012 037123      ISZ T9      T9 IS ADDRESS OF
0375 13013 037123      ISZ T9      ELEMENT TO BE CHANGED
0376 13014 037114      ISZ T2      T2 IS ADDR OF CORRESPONDING
0377 13015 037114      ISZ T2      ELEMENT IN PIVOTAL ROW
0378 13016 063121      LDA T7
0379 13017 067122      LDB T8
0380 13020 114240      JSB .FMPA,I
0381 13021 113114      DEF T2,I
0382 13022 073132      STA T18      MULTIPLIER+VALUE IN

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0383 13023 077133      STB T19              PIVOT ROW
0384 13024 016230      JSB .DLD
0385 13025 113123      DEF T9,I
0386 13026 114237      JSB .FSBA,I
0387 13027 013132      DEF T18
0388 13030 016240      JSB .DST            TRANSFORMED ELEMENT
0389 13031 113123      DEF T9,I
0390 13032 027006      JMP LINV5           SELECT NEXT TERM
0391*
0392*
0393*
0394*
0395*
0396 13033 063124      LIN15 LDA T10        ADDRESS OF
0397 13034 073117      STA T5              PIVOTAL ROW
0398 13035 063115      LDA T3
0399 13036 003004      CMA,INA            SET
0400 13037 073127      STA T13            COUNTER
0401 13040 163117      LIN18 LDA T5,I
0402 13041 037117      ISZ T5
0403 13042 167117      LDB T5,I
0404 13043 037117      ISZ T5
0405 13044 002003      SZA,RSS           SKIP IF ZERO
0406 13045 006002      SZB
0407 13046 027050      JMP ++2           NOT ZERO
0408 13047 027062      JMP LIN17         ZERO
0409 13050 114240      JSB .FMPA,I       MULTIPLY BY
0410 13051 013121      DEF T7             MULTIPLIER
0411 13052 073132      STA T18
0412 13053 077133      STB T19
0413 13054 016230      JSB .DLD
0414 13055 113125      DEF T11,I
0415 13056 114237      JSB .FSBA,I
0416 13057 013132      DEF T18
0417 13060 016240      JSB .DST
0418 13061 113125      DEF T11,I
0419 13062 037125      LIN17 ISZ T11
0420 13063 037125      ISZ T11
0421 13064 037127      ISZ T13
0422 13065 027040      JMP LIN18         SELECT NEXT TERM
0423 13066 026760      JMP LINV4         ELIMINATE NEXT ROW
0424*
0425*
0426*****
0427*****      SUBROUTINE LWHR      *****
0428*****
0429*SUBROUTINE COMPUTES ADDRESS OF AN ELEMENT *
0430*IN MATRIX GIVEN BY B2. ROW AND COL VALUES *
0431*ARE SUPPLIED IN A,B. ADDRESS IS LEFT IN A *
0432*ENTRY LWHR2 COMPUTES ADDR IN MAT B3 *
0433*****
0434*
0435 13067 000000      LWHR NOP
0436 13070 077121      STB T7             SAVE COLUMN #
0437 13071 040431      ADA M1
0438 13072 015236      JSB MPY

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PREPARE BASIC SYSTEM
(REV. A)

BINARY TAPE	20392-60002
SOURCE TAPES	20392-80012 20392-80013 20392-80014
SOURCE LISTING	20392-90002

PAGE 0001

0001

** NO ERRORS*

ASPB,A,B,L

PREPARE BASIC SYSTEM--JANUARY 1, 1970

0001 ASMB,A,B,L PREPARE BASIC SYSTEM--JANUARY 1, 1970
 0003 00002 ORG 2

0004*
 0005* THIS PRUGKAM WILL CONFIGURE AND PUNCH AS AN ABSOLUTE TAPE THE
 0006* HP BASIC SYSTEM COMPATIBLE WITH 'BOSS'; INCLUSION OF THE 'BOSS'
 0007* VERSION OF THE BASIC INTERPRETER IS OPTIONAL. TELETYPE,
 0008* PHOTOREADER, AND PUNCH DRIVERS ARE SUPPLIED BY THIS PROGRAM.
 0009* CUSTOM 'CALL' RCUTINES MAY BE INCLUDED IF THE BASIC INTERPRETER
 0010* IS PRESENT. OPTIONS INCLUDE CHOICE OF BUFFERED OR SERIAL
 0011* TELETYPE AND CONFIGURATION FOR 8, 16, 24, OR 32K OF
 0012* MEMORY.

0013*
 0014* THE AREAS PUNCHED ARE 4 THROUGH 'CONTENTS OF FWAM' -1 AND
 0015* 'CONTENTS OF LWAM' +1 THROUGH 'CONTENTS OF LWM'; I.E., SYSTEM
 0016* CODE AND DRIVER CODE.

0017*
 0018* TO OPERATE -

- 0019*
 0020* 1) LOAD THE PBS TAPE WITH THE PROTECTED LOADER.
 0021* 2) (OPTIONAL) LOAD BASIC INTERPRETER ('CALL ROUTINES
 0022* MAY ALSO BE LOADED IF DESIRED).
 0023* 3) 'LOAD ADDRESS' 2 AND 'PRESET'.
 0024* 4) SET SELECT CODE OF TELETYPE (IN OCTAL) INTO THE
 0025* SWITCH REGISTER. SET SWITCH 15 TO 1 IF USING A
 0026* SERIAL TELETYPE BOARD.
 0027* 5) SET TELETYPE TO 'LINE,' TURN ON HIGH-SPEED TAPE PUNCH
 0028* IF PRESENT, AND PRESS 'RUN'.
 0029* 6) ANSWER TELETYPE REQUESTS APPROPRIATELY.
 0030* 7) AFTER THE FLT 778, PRESS 'RUN' FOR EXTRA COPIES.

0031*
 0032 SUP SUPPRESS LISTING OF MULTIPLE OPERANDS
 0033*
 0034 00002 124003 JMP 3,I BEGIN
 0035 00003 016333 DEF START EXECUTION
 0036*
 0037 00004 103004 HLT 4,C IN CASE OF POWER FAIL
 0038 00005 102005 HLT 5 IN CASE OF PARITY FAULT
 0039 00006 000000 OCT 0,0,0,0,0,0,0,0,0 NOP ALL MAIN-FRAME
 0040 00017 000000 OCT 0,0,0,0,0,0,0,0,0 INTERRUPT LOCATIONS

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0042 16333          CRG 16333B
0043*
0044 16333 107700  START CLC 0,C      TURN OFF INTERRUPT, ALL DEVICES
0045 16334 102501          LIA 1      LOAD FROM SWITCH REGISTER
0046 16335 001623          ELA,RAR    PUT A(15) INTO (E)
0047 16336 013223          AND B77    MASK TO 6 BITS
0048 16337 073244          STA IOADR  SAVE I/O ADDRESS
0049 16340 001121          ARS,ARS   SHIFT OUT FIRST OCTAL DIGIT
0050 16341 001100          ARS
0051 16342 002002          SZA      IS I/O ADDRESS GT 7
0052 16343 026346          JMP GOMAN YES THEN OK
0053*
0054 16344 102055          HLT 55B   INVALID TTY ADDRESS HALT
0055 16345 026334          JMP START+1 TRY AGAIN
0056*
0057*  SET TELETYPE I/C INSTRUCTION ADDRESSES
0058*
0059 16346 002040  GOMAN SEZ      BUFFERED TELETYPE?
0060 16347 127240          JMP SERLA,I NO
0061 16350 063210          LDA M24   YES, LOAD # OF INSTRUCTIONS
0062 16351 067301          LDB LST1A ADDRESS OF INSTRUCTION LIST
0063 16352 016646          JSB SETI  SET TTY I/O ADDRESSES
0064*
0065*  CALL FOR PHOTOREADER ADDRESS INPUT
0066*
0067 16353 016642  PHRDR JSB CRLFD    DO A CR/LF
0068 16354 063206          LDA M27   MESSAGE LENGTH, NEGATIVE NO CRLF
0069 16355 067056          LDB MA1   MESSAGE ADDRESS
0070 16356 016571          JSB GETAD GET ADDRESS
0071 16357 026371          JMP NORDR ADDRESS =0, NO READER
0072 16360 063214          LDA M5    VALID READER ADDRESS
0073 16361 067310          LDB LST2A READER INSTRUCTION ADDRESS LIST
0074 16362 016646          JSB SETI  SET READER I/O INSTRUCTIONS
0075 16363 063307          LDA R0    SET CLC RDR
0076 16364 073524  PHRD1 STA R,OFF    INSTRUCTION
0077 16365 063247          LDA LWAMR
0078 16366 070111          STA LWAM  SET LAST WORD AVAILABLE MEMORY
0079 16367 002004          INA
0080 16370 070101          STA 101B SET READER LINK
0081*
0082*  CALL FOR PUNCH ADDRESS INPUT
0083*
0084 16371 016642  NORDR JSB CRLFD
0085 16372 063211          LDA M20
0086 16373 067075          LDB MA2
0087 16374 016571          JSB GETAD CALL FOR PUNCH ADDRESS INPUT
0088 16375 026407          JMP SYSDP NO PUNCH
0089 16376 063214          LDA M5    VALID PUNCH ADDRESS
0090 16377 067317          LDB LST3A PUNCH INSTRUCTION ADDRESS LIST
0091 16400 016646          JSB SETI  SET PUNCH I/O INSTRUCTIONS
0092 16401 063316          LDA P0    SET CLC PNCH
0093 16402 073525  NORD1 STA P,OFF    INSTRUCTION
0094 16403 063250          LDA LWAMP
0095 16404 070111          STA LWAM  SET LWAM
0096 16405 002004          INA
0097 16406 070103          STA 103B SET PUNCH LINK

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0098*
0099* CALL FOR DUMP DEVICE ADDRESS
0100*
0101 16407 016642 SYSDP JSB CRLFD CR/LF
0102 16410 063207 LDA M25
0103 16411 067143 LDB MA5
0104 16412 016571 JSB GETAD GET DUMP I/O ADDRESS
0105 16413 026421 JMP CORAD NO SYSTEM DUMP DEVICE AVAILABLE
0106 16414 063215 LDA CM.4 SYSTEM DUMP DEVICE AVAILABLE
0107 16415 067324 LDB LST4A SET DEVICE'S I/O INSTRUCTIONS
0108 16416 016646 JSB SETI
0109 16417 063246 LDA PNCHI SET PUNCH OUTPUT TO REFERENCE
0110 16420 073245 STA PNCHO HIGH SPEED PUNCH ROUTINE
0111*
0112* CALL FOR CORE SIZE
0113*
0114 16421 016642 CORAD JSB CRLFD
0115 16422 063213 LDA M12 REQUEST
0116 16423 067161 LDB MA6
0117 16424 017445 CORA1 JSB TTY.P CORE
0118 16425 063221 LDA .20 SIZE
0119 16426 067010 LDB BUF
0120 16427 000000 CORA2 NOP
0121 16430 017426 JSB TTY.1
0122 16431 000000 NOP
0123 16432 002003 SZA,RSS NULL ANSWER?
0124 16433 026532 JMP DUMP YES, ASSUME 8K
0125 16434 163010 LDA BUF,I NO
0126 16435 053227 CPA C8K '8 NULL'?
0127 16436 026532 JMP DUMP YES
0128 16437 006400 CLB NO
0129 16440 053230 CPA C16K '16'?
0130 16441 026455 JMP RELOC YES
0131 16442 006004 INB NO
0132 16443 053231 CPA C24K '24'?
0133 16444 026455 JMP RELOC YES
0134 16445 006004 INB NO
0135 16446 053232 CPA C32K '32'?
0136 16447 026455 JMP RELOC YES
0137 16450 016642 JSB CRLFD NO
0138 16451 063212 LDA M15
0139 16452 067170 LDB MA7 PRINT
0140 16453 017445 CORA3 JSB TTY.P ERROR
0141 16454 026421 JMP CORAD TRY AGAIN

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0143*
0144* RELOCATE DRIVERS
0145*
0146 16455 047233 RELOC ADB INCIN LOAD
0147 16456 164001 LDB 1,I DISPLACEMENT
0148 16457 063237 LDA LWM ADJUST
0149 16460 040001 ADA 1
0150 16461 073237 STA LWM ABSOLUTE
0151 16462 063672 LDA CRLF A POINTERS
0152 16463 040001 ADA 1
0153 16464 073672 STA CRLF A
0154 16465 060101 LDA 101B
0155 16466 040001 ADA 1
0156 16467 002021 SSA,RSS
0157 16470 070101 STA 101B
0158 16471 060102 LDA 102B
0159 16472 040001 ADA 1
0160 16473 070102 STA 102B
0161 16474 060103 LDA 103B
0162 16475 040001 ADA 1
0163 16476 002021 SSA,RSS
0164 16477 070103 STA 103B
0165 16500 060104 LDA 104B
0166 16501 040001 ADA 1
0167 16502 070104 STA 104B
0168 16503 060111 LDA LWAM
0169 16504 073241 STA SOURC SAVE ADDRESS OF DRIVER MODULE
0170 16505 040001 ADA 1
0171 16506 070111 STA LWAM
0172 16507 073242 STA DEST SET DESTINATION ADDRESS
0173 16510 060123 LDA IMOFF
0174 16511 040001 ADA 1
0175 16512 070123 STA IMOFF
0176 16513 060124 LDA IMON
0177 16514 040001 ADA 1
0178 16515 070124 STA IMON
0179 16516 060125 LDA TLINK
0180 16517 040001 ADA 1
0181 16520 070125 STA TLINK
0182 16521 067237 LDB LWM COMPUTE
0183 16522 007004 CMB,INB # OF WORDS
0184 16523 044111 ADB LWAM TO BE MOVED
0185 16524 037241 MOREM ISZ SOURC ADVANCE
0186 16525 037242 ISZ DEST POINTERS
0187 16526 163241 LDA SOURC,I MOVE A
0188 16527 173242 STA DEST,I WORD
0189 16530 006006 INB,SHB DONE?
0190 16531 026524 JMP MOREM NO

```

0192*

0193*

THIS SECTION DUMPS THE ELEMENTS OF THE SYSTEM LOADED

0194*

0195	16532	016642	DUMP	JSB	CRLFJ	
0196	16533	060111		LDA	LWAM	SET STARTING
0197	16534	043204		ADA	M36	ADDRESS FOR
0198	16535	070131		STA	IOBFA	I/O BUFFER
0199	16536	070117		STA	SYMTA	SET SYMBOL TABLE POINTER
0200	16537	043203		ADA	M97	SET STARTING ADDRESS
0201	16540	070134		STA	SBUFA	FOR SYNTAX BUFFER
0202	16541	043216		ADA	M1	
0203	16542	070111		STA	LWAM	SAVE VALUE CORRECTED FOR BUFFERS
0204	16543	070106		STA	LWBM	FOR STAND-ALONE OPERATION
0205	16544	063245		LDA	PNCHO	
0206	16545	053246		CPA	PNCHI	SYSTEM DUMP DEVICE AVAILABLE?
0207	16546	026555		JMP	COPY	PUNCH IS AVAILABLE
0208*						
0209	16547	063222		LDA	.30	
0210	16550	067110		LDB	MA3	
0211	16551	017445	DUMP1	JSB	TTY.P	REQUEST TTY PUNCH ON
0212*						
0213	16552	060126	DUMP2	LDA	PLSTR	PREPARE TO
0214	16553	070127		STA	LISTR	PUNCH
0215	16554	102011		HLT	11B	
0216*						
0217	16555	017004	COPY	JSB	LTG	GENERATE LEADER
0218	16556	063220		LDA	.4	DUMP
0219	16557	007400		CCB		LOCATIONS 4
0220	16560	044110		ADB	FWAM	THROUGH
0221	16561	016734		JSB	PNCHA	(FWAM)-1
0222	16562	060111		LDA	LWAM	DUMP
0223	16563	043224		ADA	.135	DRIVER
0224	16564	067237		LDB	LWM	AREA
0225	16565	016734		JSB	PNCHA	
0226	16566	017004		JSB	LTG	GENERATE TRAILER
0227	16567	102077		HLT	77B	END OF DUMP ROUTINE
0228	16570	026555		JMP	COPY	GO MAKE ANOTHER COPY


```

0230*
0231* SUBROUTINE GETAD
0232*
0233* THIS SUBROUTINE CALLS FOR I/O ADDRESS INPUT, PROCESSES THE
0234* INPUT AND IF INPUT VALID RETURNS TO P+2. IF NOTHING IS
0235* INPUTED IT RETURNS TO P+1 WITH LINK TO STOP IN A
0236*
0237* CALL: JSB GETAD
0238* (A) = LENGTH OF MESSAGE ASKING FOR I/O ADDRESS
0239* (B) = ADDRESS OF MESSAGE
0240*
0241* RETURN: ZERO INPUT - P+1 (A) = LINK TO STOP
0242* VALID ADDRESS - P+2 (A) = I/O ADDRESS
0243*
0244* I/O ADDRESS IS SAVED IN LOCATION IOADR
0245*
0246* IF INPUT IS INVALID (IE NOT TWO NUMBERS 10-77)
0247* "INVALID I/O ADDRESS" IS TYPED AND IT WAITS
0248* FOR FURTHER INPUT.
0249*
0250 16571 000000 GETAD NOP
0251 16572 017445 JSB TTY.P PRINT INPUT REQUEST MESSAGE
0252 16573 063221 INPUT LDA .20
0253 16574 067010 LDB BUF
0254 16575 000000 GETA1 NOP WAIT
0255 16576 017426 JSB TTY.I FOR
0256 16577 000000 NOP INPUT
0257 16600 002003 SZA,RSS ANY ADDRESS?
0258 16601 126571 JMP GETAD,I NO ADDRESS
0259 16602 053656 CPA .2 TWO CHARACTERS INPUT?
0260 16603 020612 JMP TWOCH TWO CHARACTERS INPUTTED
0261*
0262 16604 016642 ERRO. JSB CRLFD INVALID INPUT ERROR
0263 16605 063221 LDA .20
0264 16606 067130 LDB MA4
0265 16607 017445 GETA2 JSB TTY.P PRINT 'INVALID INPUT'
0266 16610 016642 JSB CRLFD DO A RETURN AND LINE FEED
0267 16611 026573 JMP INPUT RETURN FOR MORE INPUT
0268*
0269 16612 163010 TWCCH LDA BUF,I GET FIRST TWO CHARACTERS
0270 16613 001727 ALF,ALF LOOK AT FIRST CHARACTER
0271 16614 016631 JSB NBER CHECK FOR VALID OCTAL,YES,CONVRT
0272 16615 026604 JMP ERRO. NOT OCTAL
0273 16616 002003 SZA,RSS ADDRESS > 7 ?
0274 16617 026604 JMP ERRO. NO
0275 16620 001723 ALF,RAR MOVE FIRST DIGIT 3 BITS LEFT
0276 16621 073244 STA IOADR AND SAVE
0277 16622 163010 LDA BUF,I
0278 16623 016631 JSB NBER CHECK SECOND CHARACTER
0279 16624 026604 JMP ERRO. NOT OCTAL
0280 16625 033244 IOR IOADR FORM TWO DIGIT OCTAL NUMBER
0281 16626 073244 STA IOADR SAVE I/O ADDRESS
0282 16627 036571 ISZ GETAD NON-ZERO I/O ADDRESS
0283 16630 126571 JMP GETAD,I RETURN

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0285*
0286* SUBROUTINE NBER
0287*
0288* THIS SUBROUTINE CHECKS WHETHER THE CHARACTER IN A REPRESENTS
0289* A VALID OCTAL DIGIT. IF THE CHARACTER IS VALID IT IS
0290* CONVERTED TO AN OCTAL DIGIT.
0291*
0292* RETURN: P+1 INVALID OCTAL CHARACTER
0293*         P+2 VALID OCTAL CHARACTER
0294*         (A) = OCTAL DIGIT
0295*
0296*
0297 16631 000000 NBER NOP
0298 16632 013666 AND B177 MASK TO ONE CHARACTER
0299 16633 043205 ADA N60 SUBTRACT OCTAL 60
0300 16634 070001 STA 1 TRANSFER TO B
0301 16635 005121 BRS,BRS
0302 16636 005100 BRS SHIFT OUT FIRST 3 BITS
0303 16637 006003 SZB,RSS IS B ZERO
0304 16640 036631 ISZ NBER B=0, VALID DIGIT, RETURN TO P+2
0305 16641 126631 JMP NBER,I RETURN

```

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0307*
0308* SUBROUTINE CRLFD OUTPUTS A CARRIAGE RETURN AND LINE FEED.
0309*
0310 16642 000000 CRLFD NOP EXIT/ENTRY
0311 16643 002400 CLA
0312 16644 017445 CRLF1 JSB TTY.P DO CR/LF
0313 16645 126642 JMP CRLFD,I EXIT

```

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0315*
0316* SUBROUTINE SETI
0317*
0318* THIS SUBROUTINE MODIFIES THE ADDRESSES SPECIFIED IN A LIST
0319*
0320* CALL: JSB SETI
0321* (A) = NUMBER OF LOCATIONS TO BE MODIFIED (2'S COMP)
0322* (B) = STARTING ADDRESS OF LIST OF ADDRESSES
0323*
0324*
0325 16646 000000 SETI NOP EXIT/ENTRY
0326 16647 073676 STA COUNT SAVE LENGTH OF LIST
0327 16650 077675 STB BADDR SET LIST STARTING ADDRESS
0328 16651 167675 LOCP LDB BADDR,I LOAD ADDRESS OF INSTRUCTION
0329 16652 160001 LDA I,I LOAD INSTRUCTION TO BE MODIFIED
0330 16653 013201 AND MASK ZERO I/O PART, MASK=177700
0331 16654 033244 IOR IOADR INSERT I/O ADDRESS
0332 16655 170001 STA I,I SET MODIFIED INSTRUCTION
0333 16656 037675 ISZ BADDR INDEX LIST POINTER
0334 16657 037676 ISZ COUNT
0335 16660 026651 JMP LOOP GO DO NEXT LOCATION
0336 16661 126646 JMP SETI,I RETURN

```

```

0338*
0339* SUBROUTINE (TOUT) TO OUTPUT ONE CHARACTER
0340* TO TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0341*
0342 16662 000000 TOLT NOP
0343 16663 102600 TP,11 OTA TTY LOAD BOARD BUFFER
0344 16664 103700 STC TTY,C GIVE PUNCH COMMAND
0345 16665 102300 SFS TTY WAIT FOR
0346 16666 026665 JMP *-1 COMPLETION
0347 16667 126662 JMP TOUT,I

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```

0349*
0350* SUBROUTINE (POUT) TO OUTPUT ONE CHARACTER TO
0351* PUNCH DEVICE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0352*
0353 16670 000000 POUT NOP
0354 16671 102600 OTA PNCH FILL BOARD BUFFER
0355 16672 103700 STC PNCH,C REQUEST PUNCH
0356 16673 102300 SFS PNCH WAIT UNTIL
0357 16674 026673 JMP *-1 DONE
0358 16675 126670 JMP POUT,I

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0360*
0361*   SUBROUTINE PUNCH
0362*
0363*   THIS SUBROUTINE PROVIDES THE MEANS OF PUNCHING BINARY
0364*   RECORDS ON THE TELETYPE OR HIGH SPEED PUNCH.
0365*
0366*   CALLING SEQUENCE   JSB PUNCH
0367*
0368*       (A) = LENGTH (AND MODE) OF RECORD TO BE OUTPUT
0369*       (B) = STARTING ADDRESS OF DATA BUFFER
0370*
0371*   BINARY OUTPUT IS INDICATED BY A NEGATIVE (2S COMPLE-
0372*   MENT) VALUE IN A. THIS NEGATIVE VALUE IS THE
0373*   NUMBER OF WORDS TO BE OUTPUT.
0374*
0375*   IF A = 0 ON ENTRY 10 INCHES OF FEED FRAMES ARE PUNCHED
0376*
0377   16676 000000 PUNCH NOP           EXIT/ENTRY
0378   16677 077050           STB BUFF       SAVE STARTING ADDRESS OF BUFFER
0379   16700 067515           LDB PMODE
0380   16701 106600 TP.9  OTB TTY       SET TTY TO PUNCH MODE
0381   16702 002002           SZA           CHECK FOR FEED FRAMES ONLY
0382   16703 026706           JMP *+3       NOT FEED FRAME MODE
0383   16704 063202           LDA .200
0384   16705 026724           JMP PP03+1   DO FEED FRAMES ONLY
0385*
0386   16706 001000           ALS           CONVERT COUNT TO CHARACTERS (X2)
0387   16707 073243           STA CHC1      AS COUNTER FOR OUTPUT SECTION.
0388   16710 067226           LDB UL52       SET UPPER/LOWER INDICATOR
0389*
0390*   CHARACTER OUTPUT SECTION
0391*
0392   16711 163050 PP02 LDA BUFF,I     GET WORD CONTAINING CHARACTER
0393   16712 006021           SSB,RSS      IF UPPER/LOWER FLAG SAYS UPPER
0394   16713 001727           ALF,ALF      (SIGN = 0) ROTATE TO LOWER
0395   16714 013225           AND M377     REMOVE UPPER CHARACTER
0396   16715 117245           JSB PNCHO,I  OUTPUT CHARACTER
0397   16716 006020           SSB           IF CHAR. OUTPUT WAS LOWER CHAR.,
0398   16717 037050           ISZ BUFF      ADD 1 TO BUFFER ADDRESS.
0399   16720 005200           RBL           SET UPPER/LOWER FLAG FOR NEXT CHA
0400   16721 037243           ISZ CHC1     INDEX CHARACTER COUNTER.
0401   16722 026711           JMP PP02      NOT ZERO, MORE TO OUTPUT.
0402*
0403*   COMPLETION SECTION
0404*
0405   16723 063215 PP03 LDA CM.4       BINARY SECTION. SET BUFF = -4
0406   16724 073050           STA BUFF      FOR COUNTER FOR FEED-FRAMES
0407   16725 002400           CLA           SET A = ZERO( FEED-FRAME).
0408   16726 117245           JSB PNCHO,I  OUTPUT FEED FRAME
0409   16727 037050           ISZ BUFF      INDEX COUNTER
0410   16730 026725           JMP *-3       CONTINUE OUTPUT
0411   16731 106700 TP.10 CLC TTY       TURN OFF TTY
0412   16732 106700 PNE   CLC PNCH      TURN OFF PUNCH
0413   16733 126676           JMP PUNCH,I  EXIT

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0415*
0416* SUBROUTINE- PNCHA (PUNCH ABSOLUTE BLOCK)
0417*
0418* UPON ENTRY --
0419* (A) = ADDRESS OF FIRST WORD OF BLOCK
0420* (B) = ADDRESS OF LAST WORD OF BLOCK
0421*
0422 16734 000000 PNCHA NOP
0423 16735 006004 INB SET = TO LAST +1M FOR EOB CHECK
0424 16736 073051 STA T1 SAVE FIRST AND LAST WORD
0425 16737 077052 STB T2 ADDRESSES OF BLOCK.
0426 16740 063206 P1 LDA M27 SET T3 = -27 AS INDEX FOR
0427 16741 073053 STA T3 FILLING BUFFER.
0428 16742 063051 LDA T1 SET BUF+1 FOR LOAD ADDRESS
0429 16743 173011 STA BUF,I OF CURRENT BLOCK.
0430 16744 073055 STA CKSUM INITIALIZE CHECKSUM WORD.
0431 16745 002400 CLA INITIALIZE
0432 16746 173010 STA BUF,I WORD COUNT
0433 16747 063010 LDA BUF SET T4 = ADDRESS
0434 16750 043656 ADA .2 OF WORD 3 OF BUFFER
0435 16751 073054 STA T4 FOR STORING WORDS.
0436*
0437 16752 163051 P2 LDA T1,I STORE CURRENT WORD FORM MEMORY
0438 16753 173054 STA T4,I BLOCK IN BUFFER.
0439 16754 037051 ISZ T1 BUMP BLOCK ADDRESS
0440 16755 037054 ISZ T4 ADD 1 TO BUFFER ADDR950J3
0441 16756 043055 ADA CKSUM ADD WORD TO CUMULATED
0442 16757 073055 STA CKSUM CHECKSUM
0443 16760 137010 ISZ BUF,I COUNT WORD STORED IN BUFFER.
0444 16761 063051 LDA T1 CHECK FOR END OF BLOCK.
0445 16762 053052 CPA T2
0446 16763 026766 JMP P3 YES, FWA = LWA.
0447 16764 037053 ISZ T3 INDEX BUFFER COUNTER.
0448 16765 026752 JMP P2 BUFFER NOT YET FILLED.
0449*
0450 16766 063055 P3 LDA CKSUM BUFFER FILLED, SET CHECKSUM IN
0451 16767 173054 STA T4,I LAST WORD IN BUFFER.
0452 16770 163010 LDA BUF,I POSITION RECORD
0453 16771 001727 ALF,ALF WORD COUNT TO
0454 16772 173010 STA BUF,I UPPER CHARACTER IN WORD 1.
0455 16773 001727 ALF,ALF REPOSITION, ADD 3 FOR
0456 16774 043217 ADA C.03 TOTAL RECORD LENGTH, SET
0457 16775 003004 CMA,INA NEGATIVE FOR OUTPUT.
0458 16776 067010 LDB BUF (B) = ADDR. OF BUFFER.
0459 16777 016676 JSB PUNCH PUNCH RECORD
0460*
0461 17000 063051 LDA T1 CHECK AGAIN FOR COMPLETION OF
0462 17001 053052 CPA T2 PUNCHING BLOCK.
0463 17002 126734 JMP PNCHA,I YES, EXIT.
0464 17003 026740 JMP P1 NO, SET NEXT RECORD.

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0466*
0467* SUBROUTINE: LTG (LEADER/TRAILER GENERATOR)
0468*
0469*
0470* LTG PRODUCES APPROXIMATELY 10-INCHES
0471* OF BLANK TAPE (FEED-FRAMES)
0472*
0473 17004 000000 LTG NOP
0474 17005 002400 CLA SET FEED FRAME MODE A=0
0475 17006 016676 JSB PUNCH PUNCH FEED FRAMES
0476 17007 127004 JMP LTG,I EXIT.

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```

0478*
0479* PUNCH BUFFER
0480*
0481 17010 017012 BUF DEF BUFFER
0482 17011 017013 BUF1 DEF BUFFER+1
0483*
0484 17012 000000 BUFFER BSS 30
0485 17050 000000 BUFF NOP
0486 17051 000000 T1 NOP
0487 17052 000000 T2 NOP
0488 17053 000000 T3 NOP
0489 17054 000000 T4 NOP
0490 17055 000000 CKSUM NOP

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0492*
0493* MESSAGE STORAGE SECTION
0494*
0495 17056 017057 MA1 DEF MSG1
0496 17057 020120 MSG1 ASC 14, PHOTO READER I/O ADDRESS?
0497 17075 017076 MA2 DEF MSG2
0498 17076 020120 MSG2 ASC 10, PUNCH I/O ADDRESS?
0499 17110 017111 MA3 DEF MSG3
0500 17111 020124 MSG3 ASC 15, TURN ON TTY PUNCH, PRESS RUN
0501 17130 017131 MA4 DEF MSG4
0502 17131 020111 MSG4 ASC 10, INVALID I/O ADDRESS
0503 17143 017144 MA5 DEF MSG5
0504 17144 020123 MSG5 ASC 13, SYSTEM DUMP I/O ADDRESS?
0505 17161 017162 MA6 DEF MSG6
0506 17162 020103 MSG6 ASC 6, CORE SIZE?
0507 17170 017171 MA7 DEF MSG7
0508 17171 020111 MSG7 ASC 8, IMPROPER INPUT

```

0510*						
0511*	CONSTANT AND DATA SECTION					
0512*						
0513	17201	177700	MASK	OCT	177700	
0514	17202	177470	.200	DEC	-200	
0515	17203	177637	M97	DEC	-97	
0516	17204	177734	M36	DEC	-36	
0517	17205	177720	N60	OCT	-60	
0518	17206	177745	M27	DEC	-27	
0519	17207	177747	M25	DEC	-25	
0520	17210	177750	M24	DEC	-24	
0521	17211	177754	M20	DEC	-20	
0522	17212	177761	M15	DEC	-15	
0523	17213	177764	M12	DEC	-12	
0524	17214	177773	M5	DEC	-5	
0525	17215	177774	CM.4	DEC	-4	
0526	17216	177777	M1	DEC	-1	
0527	17217	000003	C.03	DEC	3	
0528	17220	000004	.4	DEC	4	
0529	17221	000024	.20	DEC	20	
0530	17222	000036	.30	DEC	30	
0531	17223	000077	B77	OCT	77	
0532	17224	000207	.135	DEC	135	
0533	17225	000377	M377	OCT	377	
0534	17226	052525	UL52	OCT	52525	
0535*						
0536	17227	034000	C8K	OCT	34000	ACCEPTABLE
0537	17230	030466	C16K	OCT	30466	CORE
0538	17231	031064	C24K	OCT	31064	SIZE
0539	17232	031462	C32K	OCT	31462	ANSWERS
0540*						
0541	17233	017234	INCIN	DEF	**1	
0542	17234	020000		OCT	20000	RELOCATION
0543	17235	040000		OCT	40000	
0544	17236	060000		OCT	60000	INCREMENTS
0545*						
0546	17237	017677	LWF	DEF	EOTC	LAST WORD AVAILABLE
0547	17240	015073	SERLA	DEF	SRIAL	
0548*						
0549	17241	000000	SOURC	NOP		
0550	17242	000000	DEST	NOP		
0551	17243	000000	CHC1	NOP		
0552	17244	000000	LOADR	NOP		
0553*						
0554	17245	016662	PNCHO	DEF	TOUT	PUNCH LINK LOCATION
0555	17246	016670	PNCHI	DEF	POUT	PUNCH REFERENCE INSTRUCTION
0556*						
0557	17247	017367	LWAMR	DEF	.HSPR-1	LWAM IF PHOTO READER
0558	17250	017346	LWAMP	DEF	.PNCH-1	LWAM IF PUNCH

0560*

0561* LIST OF INSTRUCTIONS (ADDRESSES) TO BE SET

0562*

0563*

0564* TELETYPE INSTRUCTIONS ADDRESS LIST

0565*

0566	17251	017433	LIST1	DEF	TI.1
0567	17252	017434		DEF	TI.2
0568	17253	017435		DEF	TI.2+1
0569	17254	017437		DEF	TI.3
0570	17255	017442		DEF	TI.4
0571	17256	017522		DEF	TI.5
0572	17257	017523		DEF	TI.5+1
0573	17260	017531		DEF	TI.6
0574	17261	017533		DEF	TI.7
0575	17262	017534		DEF	TI.7+1
0576	17263	017447		DEF	TP.1
0577	17264	017456		DEF	TP.2-1
0578	17265	017457		DEF	TP.2
0579	17266	017462		DEF	TP.4
0580	17267	017463		DEF	TP.4+1
0581	17270	017464		DEF	TP.5
0582	17271	017471		DEF	TP.6
0583	17272	017500		DEF	TP.7
0584	17273	017502		DEF	TP.8
0585	17274	016701		DEF	TP.9
0586	17275	016731		DEF	TP.10
0587	17276	016663		DEF	TP.11
0588	17277	016664		DEF	TP.11+1
0589	17300	016665		DEF	TP.11+2

0590*

0591 17301 017251 LST1A DEF LIST1

0592*

0593* PHOTO READER INSTRUCTIONS ADDRESS LIST

0594*

0595	17302	017407	LIST2	DEF	PR3
0596	17303	017413		DEF	PR5
0597	17304	017415		DEF	PR6
0598	17305	017422		DEF	PR7
0599	17306	017307		DEF	RO

0600*

0601	17307	106700	RO	CLC	RDR
0602	17310	017302	LST2A	DEF	LIST2

0603*

0604* HIGH SPEED PUNCH INSTRUCTIONS ADDRESS LIST

0605*

0606	17311	017353	LIST3	DEF	PN3
0607	17312	017354		DEF	PN4
0608	17313	017355		DEF	PN5
0609	17314	017362		DEF	PN7
0610	17315	017316		DEF	PO

0611*

0612	17316	106700	PO	CLC	PNCH
0613	17317	017311	LST3A	DEF	LIST3

0615*

0616* SYSTEM DUMP INSTRUCTIONS ADDRESS LIST

0617*

0618 17320 016732 LIST4 DEF PNB

0619 17321 016671 DEF POUT+1

0620 17322 016672 DEF POUT+2

0621 17323 016673 DEF POUT+3

0622*

0623 17324 017320 LST4A DEF LIST4

0625*

0626* SKIP DIFFERENCE IN WORDS BETWEEN PARALLEL AND

0627* SERIAL TELETYPE PACKAGES.

0628*

0629 17325 000000 BSS 22B (STOPI-SPNCH)-(TT.II-.PNCH)

0002*
 0003***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****

0004*
 0005* OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH

0006*
 0007* CALL: JSB 103B,I

0008*
 0009* (A) = NUMBER OF CHARACTERS TO BE PUNCHED
 0010* (B) = STARTING ADDRESS OF BUFFER

0011*
 0012*
 0013* IF (A) IS ≥ 0 THEN OUTPUT (A) CHARACTERS
 0014* FOLLOWED BY A CARRIAGE RETURN-LINE FEED.

0015*
 0016* IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.

0017*
 0018* BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.

0019*
 0020* IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
 0021* IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.

```

0022*
0023*
0024 17347 000000 .PNCH NOP
0025 17350 017636 PN1 JSB INIT INITIALIZE FOR PUNCHING
0026 17351 017622 PN2 JSB GETCH GET NEXT CHARACTER FROM BUFFER
0027 17352 027360 JMP PN6 BUFFER EMPTY
0028 17353 102600 PN3 OTA PNCH LOAD PUNCH BUFFER
0029 17354 103700 PN4 STC PNCH,C GIVE PUNCH COMMAND
0030 17355 102300 PN5 SFS PNCH
0031 17356 027355 JMP *-1 WAIT FOR PUNCH READY
0032 17357 027351 JMP PN2 GET NEXT CHARACTER
0033*
0034 17360 063671 PN6 LDA IORI RESTORE IOR INSTRUCTION
0035 17361 073633 STA FINSH+1 TURN OFF PUNCH
0036 17362 106700 PN7 CLC PNCH RECORD COMPLETE? CLEAR E
0037 17363 002141 SEZ,CLE,RSS E=0, OUTPUT COMPLETE
0038 17364 127347 JMP .PNCH,I E=1, APPEND CR AND LF
0039 17365 063655 LDA M2 LOAD ADDRESS OF CR AND LF
0040 17366 067672 LDB CRLFA DO CR/LF
0041 17367 027350 JMP PN1
    
```

0043*
 0044***** BASIC SYSTEM PHOTO READER DRIVER *****

0045*
 0046* INPUTS TAPE RECCRDS THROUGH THE PHOTO READER

0047*
 0048* CALL: JSB 1010,I

0049*
 0050* (A) = MAXIMUM NUMBER CHARS IN RECORD
 0051* (B) = BUFFER STARTING ADDRESS

0052*
 0053* ON RETURN (A)= -1 TOO MANY CHARACTERS IN RECORD
 0054* (A)= -2 END OF TAPE DETECTED
 0055* (A)= -3 NO TAPE OR GATE DOWN
 0056* (A)= NUMBER OF CHARACTERS IN RECORD

0057*
 0058* INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.

0059*
 0060* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
 0061* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.

0062*
 0063* THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).

0064*
 0065* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
 0066* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.

0067*
 0068* IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
 0069* READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.

0070*
 0071*
 0072 17370 000000 .HSPR NOP
 0073 17371 073676 STA COUNT SAVE LENGTH
 0074 17372 077674 STB BUFSA SAVE BUFFER STARTING ADDRESS
 0075 17373 063653 PR1 LDA M11
 0076 17374 073677 STA EOTC INITIALIZE EOT COUNTER
 0077 17375 067674 LDB BUFSA
 0078 17376 077675 STB BADDR INITIALIZE BUFFER POINTER
 0079 17377 006400 CLB INITIALIZE CHARACTER COUNT
 0080 17400 006003 PR2 SZB,RSS ANY NON-NULL CHARACTERS YET?
 0081 17401 002002 SZA NO, SKIP IF NULL
 0082 17402 027407 JMP PR3
 0083 17403 037677 ISZ EOTC COUNT NULL
 0084 17404 027407 JMP PR3 NOT YET 10 NULLS
 0085 17405 063655 LDA M2 SET A TO INDICATE EOT (-2)
 0086 17406 027422 JMP PR7 10 NULLS, TURN OFF READER & EXIT
 0087 17407 103700 PR3 STC RDR,C REQUEST CHARACTER
 0088 17410 002400 CLA SET DELAY COUNT
 0089 17411 002007 PR4 INA,SZA,RSS DELAY = 6.4 * 65K = .41 SECONDS
 0090 17412 027424 JMP PR8 (A)=0, NO TAPE OR GATE DOWN
 0091 17413 102300 PR5 SFS RDR
 0092 17414 027411 JMP PR4 NO FLAG, CHECK DELAY COUNT
 0093 17415 103500 PR6 LIA RDR,C LOAD CHARACTER
 0094 17416 017537 JSB PROCS PROCESS CHARACTER
 0095 17417 027400 JMP PR2 GET NEXT CHARACTER
 0096 17420 057655 CPB M2 RUBOUT IN THIS RECORD?
 0097 17421 027373 JMP PR1 YES, IGNORE RECORD
 0098 17422 100700 PR7 CLC RDR TURN OFF READER

```
0099 17423 127370      JMP .HSPK,I
0100*
0101 17424 063654  PR8  LDA M3          LOAD 'NO TAPE' STATUS
0102 17425 027422      JMP PR7
```

```

0104*
0105***** BASIC SYSTEM TELETYPE INPUT DRIVER *****
0106*
0107*   INPUTS FROM AN ASR 33/35 THROUGH THE
0108*   TELETYPE CONTROL BOARD FROM TAPE OR KEYBOARD.
0109*
0110*   CALL:   JSB 104B,1
0111*
0112*           (A) = MAXIMUM NUMBER CHARS IN RECORD
0113*           (B) = BUFFER STARTING ADDRESS
0114*
0115*   RETURN: (A) = -1 TOO MANY CHARACTERS IN RECORD
0116*           (A) = -2 RECORD DELETED
0117*           (A) = NUMBER OF CHARACTERS IN RECORD
0118*
0119*
0120*           THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0121*
0122*           ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0123*           THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0124*
0125*           THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0126*
0127*           AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0128*           CHARACTERS IN THE RECORD, THE RECORD IS IGNORED.
0129*
0130*
0131 17426 000000 TTY.1 NOP
0132 17427 073676 STA COUNT SAVE LENGTH
0133 17430 077675 STB BADDR SET BUFFER ADDRESS
0134 17431 006400 CLB SET CHARACTER COUNTER
0135 17432 063444 LDA IMODE
0136 17433 102600 TI.1 OTA TTY SET TTY TO INPUT MODE
0137 17434 103700 TI.2 STC TTY,C REQUEST CHARACTER
0138 17435 102300 SFS TTY
0139 17436 027435 JMP *-1 WAIT FOR CHARACTER INPUT
0140 17437 102500 TI.3 LIA TTY LOAD CHARACTER
0141 17440 017537 JSB PROCS PROCESS CHARACTER
0142 17441 027434 JMP TI.2 GET NEXT CHARACTER
0143 17442 106700 TI.4 CLC TTY
0144 17443 127426 JMP TTY.1,1 RECORD COMPLETE RETURN
0145*
0146 17444 160000 IMCDE OCT 160000 LIST ONLY (INPUT-ASR 35)

```

0148*
 0149* ***** BASIC SYSTEM TELETYPE OUTPUT DRIVER *****

0150*
 0151* OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
 0152* PUNCH, OR BOTH.
 0153*
 0154* CALL: JSB 102B,I
 0155*
 0156* (A) = NUMBER OF CHARACTERS TO BE OUTPUT
 0157* (B) = STARTING ADDRESS OF BUFFER
 0158*
 0159*
 0160* IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
 0161* FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
 0162*
 0163* IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
 0164*
 0165* BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
 0166*
 0167* IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
 0168* IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
 0169*
 0170*

0171	17445	000000	TTY.P	NOP	
0172	17446	017636		JSB INIT	INITIALIZE AND SETUP
0173	17447	060000	TP.1	LDA TTY	SAVE TTY INTERRUPT
0174	17450	073517		STA TEMPI	INSTRUCTION
0175	17451	060127		LDA LISTR	
0176	17452	050126		CPA PLSTR	PLISTR?
0177	17453	063515		LDA PMODE	YES
0178	17454	050130		CPA TLSTR	LISTR?
0179	17455	063516		LDA LMODE	YES
0180	17456	102600		OTA TTY	SET TTY TO OUTPUT MODE
0181	17457	074000	TP.2	STB TTY	PUT NOP INTO INTERRUPT CELL
0182	17460	017622	TP.3	JSB GETCH	GET NEXT CHARACTER
0183	17461	027502		JMP TP.8	BUFFER EMPTY
0184	17462	102600	TP.4	OTA TTY	LOAD TTY BOARD BUFFER
0185	17463	103700		STC TTY,C	GIVE PRINT COMMAND
0186	17464	102300	TP.5	SFS TTY	WAIT FOR
0187	17465	027464		JMP *-1	FLAG
0188	17466	063517		LDA TEMPI	
0189	17467	002003		SZA,RSS	IS INTERRUPT ENABLED?
0190	17470	027460		JMP TP.3	NO

0191*
 0192* THIS SECTION CHECKS IF A CHARACTER HAS BEEN TYPED FROM THE
 0193* KEYBOARD DURING OUTPUT ON TELETYPE.
 0194*

0195	17471	102500	TP.6	LIA TTY	LOAD FROM BOARD BUFFER
0196	17472	003000		CMA	FIRST 8 BITS SHOULD BE 1'S
0197	17473	013666		AND B177	
0198	17474	002003		SZA,RSS	
0199	17475	027460		JMP TP.3	NO KEY STRUCK, CONTINUE
0200	17476	063671		LDA IORI	
0201	17477	073633		STA FINSH+1	RESTORE IOR INSTRUCTION
0202	17500	106700	TP.7	CLC TTY	TURN OFF TTY
0203	17501	114105		JSB I.STP,I	GO TO STOP

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```

0204 17502 106700 TP.8 CLC TTY          TURN OFF TTY
0205 17503 063517      LDA TEMPI
0206 17504 053536      CPA TT.II      IS INTERRUPT MODE SET?
0207 17505 017527      JSB I.ON       YES, RE-ENABLE KEYBOARD
0208 17506 063671      LDA IORI
0209 17507 073633      STA FINSH+1    RESTORE IOR INSTRUCTION
0210 17510 002141      SEZ,CLE,RSS    RECORD COMPLETE?  CLEAR E
0211 17511 127445      JMP TTY.P,I    E=0, RECORD OUTPUT COMPLETE
0212 17512 063655      LDA M2         E=1, ADD A RETURN AND LINE FEED
0213 17513 067672      LDB CRLFA     LOAD ADDRESS OF CR AND LF
0214 17514 027446      JMP TTY.P+1    DO CR/LF
0215*
0216 17515 110000      PNCDE OCT 110000 PUNCH ONLY (ASR 35)
0217 17516 120000      LMCDE OCT 120000 LIST ONLY (ASR 35)
0218*
0219 17517 000000      TEMPI NOP

```

0221*

0222* THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE

0223*

```

0224 17520 000000      I.CFF NOP
0225 17521 002400      CLA
0226 17522 070000      TI.5 STA TTY          SET NOP INTO INTERRUPT CELL
0227 17523 106700      CLC TTY       TURN OFF READ MODE
0228 17524 000000      R.CFF NOP     SET TO CLC RDR IF RDR EXISTS
0229 17525 000000      P.CFF NOP     SET TO CLC PNCH IF PNCH EXISTS
0230 17526 127520      JMP I.OFF,I   RETURN

```

0232*

0233* THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE

0234*

```

0235 17527 000000      I.CN  NOP
0236 17530 063536      LDA TT.II
0237 17531 070000      TI.6 STA TTY          SET JSB INTO INTERRUPT CELL
0238 17532 063444      LDA IMODE
0239 17533 102600      TI.7 OTA TTY    SET TTY TO INPUT MODE
0240 17534 103700      STC TTY,C     SET TTY TO LOOK FOR INPUT
0241 17535 127527      JMP I.ON,I    RETURN
0242*
0243 17536 114105      TT.II JSB I.STP,I INTERRUPT LOCATION CODE

```

```

0245*
0246* CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0247*
0248* CALL: JSB PROCS
0249* (A) HOLDS CHARACTER
0250*
0251* RETURN: F+1 - GET NEXT CHARACTER
0252* F+2 - RECORD COMPLETE
0253*
0254 17537 000000 PRCCS NOP
0255 17540 013666 AND B177 STRIP BIT 7
0256 17541 002003 SZA,RSS NULL?
0257 17542 127537 JMP PROCS,I YES, IGNORE
0258 17543 053656 CPA .2 NO, CONTROL B ?
0259 17544 127537 JMP PROCS,I YES, IGNORE
0260 17545 053657 CPA .3 NO, CONTROL C ?
0261 17546 127537 JMP PROCS,I YES, IGNORE
0262 17547 053660 CPA LNFD NO, LINE FEED?
0263 17550 127537 JMP PROCS,I YES, IGNORE
0264 17551 053666 CPA B177 NO, RUBOUT?
0265 17552 127537 JMP PROCS,I YES, IGNORE
0266 17553 053665 CPA AMODE NO, ALT MODE?
0267 17554 027616 JMP CMPLT-1 YES, CANCEL RECORD
0268 17555 053664 CPA OMODE NO, OLD ALT MODE?
0269 17556 027616 JMP CMPLT-1 YES, CANCEL RECORD
0270 17557 053662 CPA EMODE NO, ESCAPE MODE?
0271 17560 027616 JMP CMPLT-1 YES, CANCEL RECORD
0272 17561 053661 CPA CRTN NO, CARRIAGE RETURN?
0273 17562 027617 JMP CMPLT YES, COMPLETE RECORD
0274 17563 057676 CPB COUNT NO, BUFFER OVERFLOW?
0275 17564 007400 CCB YES, LOOK FOR CARRIAGE RETURN
0276 17565 006020 SSB LOOKING FOR CARRIAGE RETURN?
0277 17566 127537 JMP PROCS,I YES, RETURN
0278 17567 053663 CPA LFTAR NO, LEFT ARROW?
0279 17570 027602 JMP DLETE YES, DELETE PREVIOUS CHARACTER
0280 17571 006014 SLB,INB NO, CHECK ODD/EVEN FLAG
0281 17572 027576 JMP PROC2 B0 = 0, EVEN CHARACTER
0282 17573 001727 PRCC1 ALF,ALF B0 = 1, ODD CHARACTER
0283 17574 173675 STA BADDR,I RECORD HIGH CHARACTER
0284 17575 127537 JMP PROCS,I
0285 17576 133675 PRCC2 IOR BADDR,I PACK TWO CHARACTERS
0286 17577 173675 STA BADDR,I PUT IN BUFFER
0287 17600 037675 ISZ BADDR INDEX BUFFER ADDRESS POINTER
0288 17601 127537 JMP PROCS,I

```



```

0290*
0291* THIS SECTION DELETES PREVIOUS CHARACTER(S)
0292*
0293 17602 006003 DLETE SZB,RSS IS BUFFER EMPTY?
0294 17603 127537 JMP PROCS,I YES, RETURN
0295 17604 003400 CCA NO
0296 17605 044000 ADB 0 DECREMENT CHARACTER COUNT
0297 17606 006011 SLB,RSS LOW CHARACTER?
0298 17607 127537 JMP PROCS,I YES
0299 17610 043675 ADA BADDR NO, DECREMENT
0300 17611 073675 STA BADDR ADDRESS POINTER
0301 17612 163675 LDA BADDR,I GET LAST TWO CHARACTERS
0302 17613 001727 ALF,ALF
0303 17614 013666 AND B177 DELETE LAST CHARACTER
0304 17615 027573 JMP PROC1 STORE NEXT-TO-LAST CHARACTER

```

```

0305*
0306* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0307*
0308 17616 067655 LDB M2 SET DELETE FLAG
0309 17617 060001 CMPLT LDA 1 PUT CHARACTER COUNT IN A
0310 17620 037537 ISZ PROCS
0311 17621 127537 JMP PROCS,I

```

```

0313*
0314* SUBROUTINE GETCH
0315*
0316* RETURN TO P+1 ON EMPTY BUFFER
0317* IF THE BUFFER IS NOT EMPTY, ELSE
0318* RETURN TO P+2 WITH CHARACTER IN (A).
0319*
0320 17622 000000 GETCH NOP
0321 17623 057676 CPB COUNT
0322 17624 127622 JMP GETCH,I BUFFER EMPTY, P+1 RETURN
0323 17625 163675 LDA BADDR,I GET TWO CHARACTERS
0324 17626 006011 SLB,RSS
0325 17627 001727 ALF,ALF B EVEN, POSITION CHARACTER RIGHT
0326 17630 006014 SLB,INB CHECK O/E, AND INDEX COUNT
0327 17631 037675 ISZ BADDR B ODD, INCREMENT ADDRESS POINTER
0328 17632 013666 FINSH AND B177 STRIP LEFT CHARACTER
0329 17633 033667 IOR B200 ADD BIT 7
0330 17634 037622 ISZ GETCH
0331 17635 127622 JMP GETCH,I RETURN TO P+2

```

0333*

0334* INITIALIZES FOR OUTPUTTING A RECORD

0335*

0336	17636	000000	INIT	NOP	
0337	17637	002320		CCE,SSA	SET E=1, CHECK FOR (A) < 0
0338	17640	003104		CMA,CLE,INA	SET (E) = 0, (A) = -(A)
0339	17641	073676		STA COUNT	SAVE CHARACTER COUNT
0340	17642	077675		STB BADDR	SET BUFFER STARTING ADDRESS
0341	17643	002002		SZA	
0342	17644	006002		SZB	LEADER/TRAILER ONLY?
0343	17645	027651		JMP ++4	NO
0344	17646	063670		LDA CLAI	YES, (B) = 0
0345	17647	073633		STA FINSH+1	SET CLEAR INSTRUCTION
0346	17650	000040		CLE	SET NO CR/LF
0347	17651	006400		CLB	INITIALIZE OUTPUT COUNT
0348	17652	127636		JMP INIT,I	

0350*

0351* COMMUN DRIVER CCNSTANTS AND ADDRESSES

0352*

0353	17653	177765	M11	DEC	-11	
0354	17654	177775	M3	DEC	-3	
0355	17655	177776	M2	DEC	-2	
0356	17656	000002	.2	DEC	2	
0357	17657	000003	.3	DEC	3	
0358	17660	000012	LNFD	OCT	12	LINE FEED
0359	17661	000015	CRIN	OCT	15	CARRIAGE RETURN
0360	17662	000033	EMCDE	OCT	33	ESCAPE
0361	17663	000137	LFTAR	OCT	137	LEFT ARROW
0362	17664	000175	OMCDE	OCT	175	OBSOLETE ALT MODE
0363	17665	000176	AMCDE	OCT	176	ALT MODE
0364	17666	000177	B177	OCT	177	RUBOUT
0365	17667	000200	B200	OCT	200	
0366	17670	002400	CLAI	CLA		
0367	17671	033667	IORI	IOR	B200	ADD IN BIT 7

0368*

0369	17672	017673	CRLFA	DEF	CRLF	
0370	17673	106612	CRLF	OCT	106612	

0371*

0372	17674	000000	BUFSA	NOP		INITIAL BUFFER ADDRESS
0373	17675	000000	BALDR	NOP		CURRENT BUFFER ADDRESS
0374	17676	000000	COLNT	NOP		HOLDS RECORD LENGTH
0375	17677	000000	EOTC	NOP		END-OF-TAPE COUNTER

0376*

0377* BASE PAGE REFERENCE ENTRIES

0378*

0379	00101			ORG	101B	
0380	00101	100105		DEF	1.STP,I	READER LINK INITIALIZED TO STOP
0381	00102	017445		DEF	TTY.P	TTY OUTPUT ENTRY ADDRESS
0382	00103	100102		DEF	102B,I	PUNCH LINK INITIALIZED TO TTY
0383	00104	017426		DEF	TTY.I	TTY INPUT ENTRY ADDRESS
0384	00105	000000	1.STP	NOP		LINK TO STOP ROUTINE
0385	00106	000000	LWBM	NUP		LAST WORD OF USER SPACE
0386	00107	000000		NOP		
0387	00110	000135	FWAM	DEF	135B	FIRST WORD OF AVAILABLE MEMORY
0388	00111	017425	LWAM	DEF	TTY.I-1	LAST WORD OF AVAILABLE MEMORY

0389*

0390	00123			ORG	123B	
0391	00123	017520	IMCFF	DEF	1.OFF	DISABLE KEYBOARD INTERRUPT
0392	00124	017527	IMCN	DEF	1.ON	SET KEYBOARD INTERRUPT
0393	00125	017424	TLINK	DEF	1.TTY+2000B	TTY INPUT INTERRUPT LINK
0394	00126	100103	PLSTR	DEF	103B,I	PLIST OUTPUT ADDRESS
0395	00127	100102	LISTR	DEF	102B,I	LIST DEVICE LINK
0396	00130	100102	TLSTR	DEF	102B,I	LIST OUTPUT ADDRESS

0397*

0398	00117		SYMTA	EQU	117B	
0399	00131		IOBFA	EQU	131B	BUFFER ADDRESS
0400	00134		SBLFA	EQU	134B	SYNTAX BUFFER ADDRESS
0401	00000		RDR	EQU	0	
0402	00000		PNCH	EQU	0	
0403	00000		TTY	EQU	0	
0404	00001		TTYI	EQU	TTY+1	

```

0002*
0003*  MODIFY PBS FOR SERIAL TELETYPE
0004*
0005  15073                ORG 15073B
0006*
0007  15073 063653  SRJAL LDA SM11      SET
0008  15074 067302          LDB LST5A    TTY PUNCH
0009  15075 117257          JSB SETIA,I  ADDRESSES
0010  15076 137260          ISZ IOADA,I  INCREMENT SELECT CODE
0011  15077 063262          LDA SM5     SET
0012  15100 067310          LDB LST6A    TTY READER
0013  15101 117257          JSB SETIA,I  ADDRESSES
0014  15102 063263          LDA TT.IS    SET INTERRUPT
0015  15103 070001  T16    STA TTYI     CELL
0016*
0017  15104 063241          LDA TTYPI    SET OUTPUT
0018  15105 173221          STA COR1A,I
0019  15106 173223          STA CUR3A,I  TELETYPE CALLS
0020  15107 173224          STA DMP1A,I
0021  15110 173226          STA GETAA,I  TO SERIAL
0022  15111 173230          STA GET2A,I
0023  15112 173231          STA CRL1A,I  DRIVER
0024*
0025  15113 063243          LDA STF0     SET INPUT
0026  15114 173222          STA COR2A,I
0027  15115 173227          STA GET1A,I  TELETYPE CALLS
0028  15116 037222          ISZ COR2A
0029  15117 037227          ISZ GET1A   TO SERIAL
0030  15120 063242          LDA TTYII
0031  15121 173222          STA COR2A,I  DRIVER
0032  15122 173227          STA GET1A,I
0033  15123 037222          ISZ COR2A
0034  15124 037227          ISZ GET1A
0035  15125 063244          LDA CLF0
0036  15126 173222          STA COR2A,I
0037  15127 173227          STA GET1A,I
0038*
0039  15130 002400          CLA         CLEAR
0040  15131 173232          STA TP9A,I
0041  15132 037232          ISZ TP9A    BUFFERED TELETYPE
0042  15133 173232          STA TP9A,I
0043  15134 173233          STA TP10A,I  INSTRUCTIONS
0044  15135 173225          STA DMP2A,I
0045  15136 037225          ISZ DMP2A
0046  15137 173225          STA DMP2A,I
0047*
0048  15140 063245          LDA STOUA   SET FOR POSSIBLE
0049  15141 173234          STA TOUTA,I TTY PUNCHING
0050*
0051  15142 063316          LDA LST7A   USE READER AND PUNCH
0052  15143 173237          STA PHRLA,I DRIVERS IN
0053  15144 063324          LDA LST8A   SERIAL TELETYPE
0054  15145 173240          STA PNCLA,I PACKAGE

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0056 15146 063246 LDA ROFFA PREPARE TO SET
0057 15147 173217 STA PHR1A,I INTERRUPT-OFF INSTRUCTIONS
0058 15150 063247 LDA POFFA IN SERIAL TELETYPE
0059 15151 173220 STA NOR1A,I PACKAGE
0060*
0061 15152 063250 LDA SLWMT SET SERIAL
0062 15153 070111 STA LWAM
0063 15154 063251 LDA SLWMR TELETYPE VALUES
0064 15155 173235 STA LWMRA,I
0065 15156 063252 LDA SLWMP IN LWAM CONSTANTS
0066 15157 173236 STA LWMRA,I
0067 15160 063253 LDA STTYP
0068 15161 070102 STA 102B
0069 15162 063254 LDA STTYI
0070 15163 070104 STA 104B
0071 15164 063255 LDA SIOFF
0072 15165 070123 STA IMOFF
0073 15166 063256 LDA SION
0074 15167 070124 STA IMON
0075*
0076* OVERLAY PARALLEL DRIVERS WITH SERIAL DRIVERS
0077*
0078 15170 163264 SRIA1 LDA MOVES,I MOVE A
0079 15171 173265 STA DESTS,I WORD
0080 15172 037264 ISZ MOVES BUMP
0081 15173 037265 ISZ DESTS POINTERS
0082 15174 037266 ISZ SMCNT SERIAL DRIVERS MOVED?
0083 15175 027170 JMP SRIA1 NO
0084 15176 127261 JMP PHRDA,I YES, RETURN TO MAIN SEQUENCE

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0086*
0087* SUBROUTINE (STOUT) TO OUTPUT ONE CHARACTER TO THE
0088* TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0089*
0090 15177 000000 STOUT NOP
0091 15200 073455 STA TCHAR
0092 15201 063653 LDA SM11 SET BIT
0093 15202 073517 STA BCNT COUNTER
0094 15203 063455 LDA TCHAR
0095 15204 001000 ALS ADD
0096 15205 033520 IOR B3000 CONTROL BITS
0097 15206 102700 TP7 STC TTY TURN ON TELETYPE
0098 15207 103600 TP8 OTA TTY,C OUTPUT BIT
0099 15210 001300 KAR POSITION NEXT BIT
0100 15211 102300 TP9 SFS TTY WAIT FOR
0101 15212 027211 JMP *-1 COMPLETION FLAG
0102 15213 037517 ISZ BCNT DONE?
0103 15214 027207 JMP TP8 NO
0104 15215 106700 TP10 CLC TTY YES, TURN OFF TELETYPE
0105 15216 127177 JMP STOUT,I

```

0107*

0108* MODIFICATION ADDRESSES

0109*

0110	15217	016364	PHR1A	DEF	PHRD1
0111	15220	016402	NOR1A	DEF	NORD1
0112	15221	016424	COR1A	DEF	CORA1
0113	15222	016427	COR2A	DEF	CORA2
0114	15223	016453	COR3A	DEF	CORA3
0115	15224	016551	DMP1A	DEF	DUMP1
0116	15225	016552	DMP2A	DEF	DUMP2
0117	15226	016572	GETAA	DEF	GETAD+1
0118	15227	016575	GET1A	DEF	GETA1
0119	15230	016607	GET2A	DEF	GETA2
0120	15231	016644	CRL1A	DEF	CRLF1
0121	15232	016700	TP9A	DEF	TP.9-1
0122	15233	016731	TP10A	DEF	TP.10
0123	15234	017245	TOUTA	DEF	PNCHO
0124	15235	017247	LWPA	DEF	LWAMK
0125	15236	017250	LWMPA	DEF	LWAMP
0126	15237	017310	PHRLA	DEF	LST2A
0127	15240	017317	PNCLA	DEF	LST3A

0128*

0129* MODIFICATION INSTRUCTIONS

0130*

0131	15241	017466	TTYPI	JSB	.TTYP
0132	15242	017404	TTYII	JSB	.TTYI
0133	15243	102100	STF0	STF	0
0134	15244	103100	CLF0	CLF	0
0135	15245	015177	STCUA	DEF	STOUT
0136	15246	073524	RUFFA	STA	.ROFF
0137	15247	073525	POFFA	STA	.POFF
0138	15250	017403	SLWMT	DEF	.TTYI-1+2000B
0139	15251	017345	SLWMR	DEF	HSPR-1+2000B
0140	15252	017324	SLWMP	DEF	SPNCH-1+2000B
0141	15253	017466	STTYP	DEF	.TTYP+2000B
0142	15254	017404	STTYI	DEF	.TTYI+2000B
0143	15255	017521	SICFF	DEF	.IOFF+2000B
0144	15256	017531	SICN	DEF	.ION+2000B

LWAM OPTIONS
FOR SERIAL
TELETYPE

0145*

0146* COMMUNICATION LINKS

0147*

0148	15257	016646	SETIA	DEF	SETI
0149	15260	017244	IOADA	DEF	IOADR
0150	15261	016353	PHRDA	DEF	PHRDR

0151*

0152* LOCAL CONSTANTS AND ADDRESSES

0153*

0154	15262	177773	SM5	DEC	-5
0155	15263	114125	TT.IS	JSB	TLINK,I TTY INTERRUPT INSTRUCTION
0156	15264	015325	MOVES	DEF	SPNCH
0157	15265	017325	DESTS	DEF	SPNCH+2000B
0158	15266	177566	SMCNT	ABS	SPNCH-SPROC

0160*
 0161* TELETYPE OUTPUT INSTRUCTION LIST
 0162*
 0163 15267 015476 LIST5 DEF TP2-1
 0164 15270 015477 DEF TP2
 0165 15271 015501 DEF TP2+2
 0166 15272 015505 DEF TP3-1
 0167 15273 015506 DEF TP3
 0168 15274 015456 DEF TP5
 0169 15275 015523 DEF TP6
 0170 15276 015206 DEF TP7
 0171 15277 015207 DEF TP8
 0172 15300 015211 DEF TP9
 0173 15301 015215 DEF TP10
 0174*
 0175 15302 015267 LST5A DEF LIST5
 0176*
 0177* TELETYPE INPUT INSTRUCTION LIST
 0178*
 0179 15303 015426 LIST6 DEF TI2
 0180 15304 015437 DEF TI3
 0181 15305 015462 DEF TI4
 0182 15306 015522 DEF TI5
 0183 15307 015103 DEF TI6
 0184*
 0185 15310 015303 LST6A DEF LIST6
 0186*
 0187* PHOTOREADER INSTRUCTION LIST
 0188*
 0189 15311 017365 LIST7 DEF PR.3+2000B
 0190 15312 017371 DEF PR.5+2000B
 0191 15313 017373 DEF PR.6+2000B
 0192 15314 017400 DEF PR.7+2000B
 0193 15315 017307 DEF RU
 0194*
 0195 15316 015311 LST7A DEF LIST7
 0196*
 0197* HIGH-SPEED PUNCH INSTRUCTION LIST
 0198*
 0199 15317 017331 LIST8 DEF PN.2+2000B
 0200 15320 017332 DEF PN.3+2000B
 0201 15321 017333 DEF PN.4+2000B
 0202 15322 017340 DEF PN.6+2000B
 0203 15323 017316 DEF P0
 0204*
 0205 15324 015317 LST8A DEF LIST8

```

0207*
0208***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****
0209*
0210*  OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0211*
0212*  CALL:  JSB 1038,I
0213*
0214*          (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0215*          (B) = STARTING ADDRESS OF BUFFER
0216*
0217*
0218*  IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0219*  FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0220*
0221*  IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0222*
0223*  BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0224*
0225*  IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0226*  IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0227*
0228*
0229  15325 000000  SPNCH NOP
0230  15326 017636          JSB SINIT      INITIALIZE FOR PUNCHING
0231  15327 017622  PN.1  JSB SGTCH      GET NEXT CHARACTER FROM BUFFER
0232  15330 027336          JMP PN.5      BUFFER EMPTY
0233  15331 102600  PN.2  OTA PNCH      LOAD PUNCH BUFFER
0234  15332 103700  PN.3  STC PNCH,C    GIVE PUNCH COMMAND
0235  15333 102300  PN.4  SFS PNCH
0236  15334 027333          JMP *-1      WAIT FOR PUNCH READY
0237  15335 027327          JMP PN.1      GET NEXT CHARACTER
0238*
0239  15336 063671  PN.5  LDA SIORI
0240  15337 073633          STA SFNSH+1  RESTORE IOR INSTRUCTION
0241  15340 106700  PN.6  CLC PNCH      TURN OFF PUNCH
0242  15341 002141          SEZ,CLE,RSS  RECORD COMPLETE? CLEAR E
0243  15342 127325          JMP SPNCH,I  E=0, OUTPUT COMPLETE
0244  15343 063655          LDA SM2      E=1, APPEND CR AND LF
0245  15344 067672          LDB SCRLA   LOAD ADDRESS OF CR AND LF
0246  15345 027326          JMP SPNCH+1  DO CR/LF

```



```

0248*
0249****** BASIC SYSTEM PHOTO READER DRIVER *****
0250*
0251* INPUTS TAPE RECCRDS THROUGH THE PHOTO READER
0252*
0253* CALL: JSB 101B,I
0254*
0255* (A) = MAXIMUM NUMBER CHARS IN RECORD
0256* (B) = BUFFER STARTING ADDRESS
0257*
0258* ON RETURN (A)= -1 TOO MANY CHARACTERS IN RECORD
0259* (A)= -2 END OF TAPE DETECTED
0260* (A)= -3 NO TAPE OR GATE DOWN
0261* (A)= NUMBER OF CHARACTERS IN RECORD
0262*
0263* INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
0264*
0265* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0266* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0267*
0268* THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).
0269*
0270* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0271* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0272*
0273* IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
0274* READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
0275*
0276*
0277 15346 000000 HSPR NOP
0278 15347 073676 STA SCNT SAVE LENGTH
0279 15350 077674 STB SBFSA SAVE BUFFER STARTING ADDRESS
0280 15351 063653 PR.1 LDA SM11
0281 15352 073677 STA SEOTC INITIALIZE EOT COUNTER
0282 15353 067674 LDB SBFSA
0283 15354 077675 STB SBDDR INITIALIZE BUFFER POINTER
0284 15355 006400 CLB INITIALIZE CHARACTER COUNT
0285 15356 006003 PR.2 SZB,RSS ANY NON-NUL CHARACTER YET?
0286 15357 002002 SZA NO, SKIP IF NULL
0287 15360 027365 JMP PR.3
0288 15361 037677 ISZ SEOTC COUNT NULL
0289 15362 027365 JMP PR.3 NOT 10 NULLS
0290 15363 063655 LDA SM2 SET A TO INDICATE EOT (-2)
0291 15364 027400 JMP PR.7 10 NULLS, TURN OFF READER & EXIT
0292 15365 103700 PR.3 STC RDR,C REQUEST CHARACTER
0293 15366 002400 CLA SET DELAY COUNT
0294 15367 002007 PR.4 INA,SZA,RSS DELAY = 6.4 * 65K = .41 SECONDS
0295 15370 027402 JMP PR.8 (A)=0, NO TAPE OR GATE DOWN
0296 15371 102300 PR.5 SFS RDR
0297 15372 027367 JMP PR.4 NO FLAG, CHECK DELAY COUNT
0298 15373 103500 PR.6 LIA RDR,C LOAD CHARACTER
0299 15374 017537 JSB SPROC PROCESS CHARACTER
0300 15375 027356 JMP PR.2 GET NEXT CHARACTER
0301 15376 057655 CPB SM2 RUBOUT IN THIS RECORD?
0302 15377 027351 JMP PR.1 YES, IGNORE RECORD
0303 15400 106700 PR.7 CLC RDR TURN OFF READER

```

```
0304 15401 127346      JMP HSPR,I
0305*
0306 15402 063654  PR.8  LDA SM3      LOAD 'NO TAPE' STATUS
0307 15403 027400      JMP PR.7
```

```

0309*
0310***** BASIC SYSTEM TELETYPE INPUT DRIVER *****
0311*
0312*   INPUTS FROM AN ASR 33/35 THROUGH THE
0313*   TELETYPE CONTRCL BOARD FROM TAPE OR KEYBOARD.
0314*
0315*   CALL:   JSB 1048,I
0316*
0317*           (A) =   MAXIMUM NUMBER CHARS IN RECORD
0318*           (B) =   BUFFER STARTING ADDRESS
0319*
0320*   RETURN:  (A)= -1   TOO MANY CHARACTERS IN RECORD
0321*           (A)= -2   RECORD DELETED
0322*           (A)=   NUMBER OF CHARACTERS IN RECORD
0323*
0324*
0325*           THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0326*
0327*           ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0328*           THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0329*
0330*           THE LEFT ARROW(S) ~ DELETE THE PREVIOUS CHARACTER(S).
0331*
0332*           AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0333*           CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0334*
0335*
0336  15404 000000 .TTYI NOP
0337  15405 073676      STA SCONT      SAVE LENGTH
0338  15406 077675      STB SBDDR      SAVE BUFFER ADDRESS
0339  15407 006400      CLB          ZERO CHARACTER COUNT
0340  15410 063456      LDA TP5       SET
0341  15411 073434      STA OUTB     ECHO
0342  15412 017457  TII  JSB TTINT    INITIALIZE FOR INPUT CHARACTER
0343  15413 063454      LDA BITS     WAIT FOR
0344  15414 002002      SZA          CHARACTER
0345  15415 027413      JMP *-2     COMPLETE
0346  15416 063455      LDA TCHAR    PROCESS
0347  15417 017537      JSB SPROC    CHARACTER
0348  15420 027412      JMP TII     GET NEXT CHARACTER
0349  15421 006400      CLB          CLEAR
0350  15422 077434      STB OUTB     ECHO
0351  15423 127404      JMP .TTYI,I

```

0353*
 0354* THIS SECTION PROCESSES EACH BIT AS IT BECOMES AVAILABLE.
 0355* RETURN THROUGH 105B IF THE INTERRUPT MODE FLAG IS SET UPON
 0356* CHARACTER COMPLETION.

```

0357*
0358 15424 000000 I.TTY NOP
0359 15425 073453 STA ATEMP SAVE (A)
0360 15426 103501 TI2 LIA TTYI,C MERGE
0361 15427 033455 IOR TCHAR NEW BIT
0362 15430 001300 RAR INTO
0363 15431 073455 STA TCHAR CHARACTER
0364 15432 001727 ALF,ALF POSITION BIT
0365 15433 001222 RAL,RAL FOR ECHO
0366 15434 000000 OUTB NOP OUTPUT INSTRUCTION
0367 15435 037454 ISZ BITS BIT 11?
0368 15436 027451 JMP EXIT NO
0369 15437 106701 TI3 CLC TTYI YES
0370 15440 063455 LDA TCHAR ALIGN
0371 15441 001723 ALF,RAR COMPLETED
0372 15442 073455 STA TCHAR CHARACTER
0373 15443 063536 LDA STOPI STOP FLAG
0374 15444 002003 SZA,RSS SET?
0375 15445 027451 JMP EXIT NO
0376 15446 063671 LDA SIORI YES, RESTORE
0377 15447 073633 STA SFNSH+1 IOR INSTRUCTION
0378 15450 114105 JSB I.STP,I GO TO STOP
0379 15451 063453 EXIT LDA ATEMP RESTORE (A)
0380 15452 127424 JMP I.TTY,I
0381*
0382 15453 000000 ATEMP NOP
0383 15454 000000 BITS NOP
0384 15455 000000 TCHAR NOP
0385*
0386 15456 102600 TP5 OTA TTY ECHO BIT INSTRUCTION
    
```

0388*
 0389* THIS ROUTINE INITIALIZES THE SERIAL TELETYPE INPUT ROUTINE
 0390* AND SETS TELETYPE TO ACCEPT INPUT.

```

0391*
0392 15457 000000 TTINT NOP
0393 15460 063653 LDA SM11 SET
0394 15461 073454 STA BITS BIT COUNTER
0395 15462 103701 TI4 STC TTYI,C DEMAND INPUT
0396 15463 002400 CLA ZERO OUT
0397 15464 073455 STA TCHAR CHARACTER REPOSITORY
0398 15465 127457 JMP TTINT,I
    
```

0400*

0401***** BASIC SYSTEM TELETYPE OUTPUT DRIVER *****

0402*

0403* OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0404* PUNCH, OR BOTH.

0405*

0406* CALL: JSB 102B,I

0407*

0408* (A) = NUMBER OF CHARACTERS TO BE OUTPUT

0409* (B) = STARTING ADDRESS OF BUFFER

0410*

0411*

0412* IF (A) IS \geq 0 THEN OUTPUT (A) CHARACTERS

0413* FOLLOWED BY A CARRIAGE RETURN-LINE FEED.

0414*

0415* IF (A) $<$ 0 THEN PUNCH -(A) CHARACTERS ONLY.

0416*

0417* BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.

0418*

0419* IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.

0420* IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.

0421*

0422*

0423	15466	000000	.TTYP	NOP	
0424	15467	017636		JSB	SINIT INITIALIZE FOR OUTPUT
0425	15470	063653	TP1	LDA	SM11 SET BIT
0426	15471	073517		STA	BCNT COUNTER
0427	15472	017622		JSB	SGTCH FETCH NEXT CHARACTER FROM BUFFER
0428	15473	027510		JMP	TP4 BUFFER EMPTY
0429	15474	001000		ALS	
0430	15475	033520		IOR	B3000 ADD BIT 7 AND CONTROL BITS
0431	15476	102700		STC	TTY REQUEST PRINT
0432	15477	103600	TP2	OTA	TTY,C OUTPUT BIT
0433	15500	001300		RAR	
0434	15501	102300		SFS	TTY POSITION NEXT BIT
0435	15502	027501		JMP	*-1 WAIT FOR BIT OUT FLAG
0436	15503	037517		ISZ	BCNT CHARACTER OUT?
0437	15504	027477		JMP	TP2 NO
0438	15505	106700		CLC	TTY YES, TURN OFF TTY
0439	15506	102100	TP3	STF	TTY SET FLAG BUFFER (RESETS TIMER)
0440	15507	027470		JMP	TP1
0441*					
0442	15510	063671	TP4	LDA	SIORI RESTORE IOR
0443	15511	073633		STA	SFNSH+1 INSTRUCTION
0444	15512	002141		SEZ,CLE,RSS	
0445	15513	127466		JMP	.TTYP,I DONE?
0446	15514	063655		LDA	SM2 YES
0447	15515	067672		LDB	SCRLA NO
0448	15516	027467		JMP	.TTYP+1 DO CR/LF
0449*					
0450	15517	000000	BCNT	NOP	
0451	15520	003000	B3000	OCT	3000

```

0476*
0477* CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0478*
0479* CALL: JSB PROCS
0480* (A) HOLDS CHARACTER
0481*
0482* RETURN: P+1 - GET NEXT CHARACTER
0483* F+2 - RECORD COMPLETE
0484*
0485 15537 000000 SPROC NOP
0486 15540 013666 AND SB177 STRIP BIT 7
0487 15541 002003 SZA,RSS NULL?
0488 15542 127537 JMP SPROC,I YES, IGNORE
0489 15543 053656 CPA S,2 NO, CONTROL B?
0490 15544 127537 JMP SPROC,I YES, IGNORE
0491 15545 053657 CPA S,3 NO, CONTROL C?
0492 15546 127537 JMP SPROC,I YES, IGNORE
0493 15547 053660 CPA SLNFD NO, LINE FEED?
0494 15550 127537 JMP SPROC,I YES, IGNORE
0495 15551 053666 CPA SB177 NO, RUBOUT?
0496 15552 127537 JMP SPROC,I YES, IGNORE
0497 15553 053665 CPA SAMDE NO, ALT MODE?
0498 15554 027616 JMP SCMPL-1 YES, CANCEL RECORD
0499 15555 053664 CPA SOMDE NO, OLD ALT MODE?
0500 15556 027616 JMP SCMPL-1 YES, CANCEL RECORD
0501 15557 053662 CPA SEMDE NO, ESCAPE MODE?
0502 15560 027616 JMP SCMPL-1 YES, CANCEL RECORD
0503 15561 053661 CPA SCRTN NO, CARRIAGE RETURN?
0504 15562 027617 JMP SCMPL YES, COMPLETE RECORD
0505 15563 057676 CPB SCONT NO, BUFFER OVERFLOW?
0506 15564 007400 CCB YES, LOOK FOR CARRIAGE RETURN
0507 15565 006020 SSB LOOKING FOR CARRIAGE RETURN?
0508 15566 127537 JMP SPROC,I YES, RETURN
0509 15567 053663 CPA SLFTA NO, LEFT ARROW?
0510 15570 027602 JMP SDLTE YES, DELETE PREVIOUS CHARACTER
0511 15571 006014 SLB,INB NO, CHECK ODD/EVEN FLAG
0512 15572 027576 JMP SPRO2 B0 = 0, EVEN CHARACTER
0513 15573 001727 SPRO1 ALF,ALF B0 = 1, ODD CHARACTER
0514 15574 173675 STA SBDDR,I RECORD HIGH CHARACTER
0515 15575 127537 JMP SPROC,I
0516 15576 133675 SPRU2 IOR SBDDR,I PACK TWO CHARACTERS
0517 15577 173675 STA SBDDR,I PUT IN BUFFER
0518 15600 037675 ISZ SBDDR INDEX BUFFER ADDRESS POINTER
0519 15601 127537 JMP SPROC,I

```

```

0453*
0454*      THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE
0455*
0456 15521 000000 .ICFF NOP
0457 15522 106701 TIS   CLC TTYI      TURN OFF KEYBOARD
0458 15523 106700 TP6   CLC TTY      TURN OFF PRINTER
0459 15524 000000 .RCFF NOP      SET TO CLC RDR IF READER EXISTS
0460 15525 000000 .PCFF NOP      SET TO CLC PNCH IF PUNCH EXISTS
0461 15526 002400      CLA          CLEAR
0462 15527 073536      STA STOPI     STOP FLAG
0463 15530 127521      JMP .IOFF,I
    
```

```

0465*
0466*      THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE
0467*
0468 15531 000000 .ICN  NOP
0469 15532 003400      CCA          SET STOP FLAG
0470 15533 073536      STA STOPI     FOR INTERRUPTS
0471 15534 017457      JSB TTINI    ENABLE KEYBOARD
0472 15535 127531      JMP .ION,I
0473*
0474 15536 000000 SIOPI NOP      STOP FLAG (INITIALIZED OFF)
    
```

```

0521*
0522* THIS SECTION DELETES PREVIOUS CHARACTER(S)
0523*
0524 15602 006003 SDLTE SZB,RSS IS BUFFER EMPTY?
0525 15603 127537 JMP SPROC,I YES, RETURN
0526 15604 003400 CCA NO
0527 15605 044000 ADB 0 DECREMENT CHARACTER COUNT
0528 15606 006011 SLB,RSS LOW CHARACTER?
0529 15607 127537 JMP SPROC,I YES
0530 15610 043675 ADA SBDDR NO, DECREMENT
0531 15611 073675 STA SBDDR ADDRESS POINTER
0532 15612 163675 LDA SBDDR,I GET LAST TWO CHARACTERS
0533 15613 001727 ALF,ALF
0534 15614 013666 AND SB177 DELETE LAST CHARACTER
0535 15615 027573 JMP SPRO1 STORE NEXT-TO-LAST CHARACTER
0536*
0537* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0538*
0539 15616 067655 LDB SM2 SET DELETE STATUS
0540 15617 060001 SCPL LDA 1 PUT CHARACTER COUNT INTO (A)
0541 15620 037537 ISZ SPROC
0542 15621 127537 JMP SPROC,I

```

```

0544*
0545* SUBROUTINE GETCH
0546*
0547* RETURN TO P+1 ON EMPTY BUFFER
0548* IF THE BUFFER IS NOT EMPTY, ELSE
0549* RETURN TO P+2 WITH CHARACTER IN (A).
0550*
0551 15622 000000 SGTCH NOP
0552 15623 057676 CPB SCNT
0553 15624 127622 JMP SGTCH,I BUFFER EMPTY, P+1 RETURN
0554 15625 163675 LDA SBDDR,I GET TWO CHARACTERS
0555 15626 006011 SLB,RSS
0556 15627 001727 ALF,ALF B EVEN, POSITION CHARACTER RIGHT
0557 15630 006014 SLB,INB CHECK O/E, AND INDEX COUNT
0558 15631 037675 ISZ SBDDR B ODD, INCREMENT ADDRESS POINTER
0559 15632 013666 SFASH AND SB177 STRIP LEFT CHARACTER
0560 15633 033667 IOR SB200 ADD BIT 7
0561 15634 037622 ISZ SGTCH
0562 15635 127622 JMP SGTCH,I RETURN TO P+2

```



```

0564*
0565*  INITIALIZES FOR OUTPUTTING A RECORD
0566*
0567  15636 000000  SINIT NOP
0568  15637 002320          CCE,SSA      SET E=1, CHECK FOR (A) < 0
0569  15640 003104          CMA,CLE,INA  SET (E) = 0, (A) = -(A)
0570  15641 073676          STA SCNT     SAVE CHARACTER COUNT
0571  15642 077675          STB SBDDR   SAVE BUFFER STARTING ADDRESS
0572  15643 002002          SZA
0573  15644 006002          SZB          LEADER/TRAILER ONLY?
0574  15645 027651          JMP ++4     NO
0575  15646 063670          LDA SCLAI  YES, (B) = 0
0576  15647 073633          STA SFNSH+1 SET CLEAR INSTRUCTION
0577  15650 000040          CLE        SET NO CR/LF
0578  15651 006400          CLB        INITIALIZE OUTPUT COUNT
0579  15652 127636          JMP SINIT,I

```

```

0581*
0582* COMMON DRIVER CONSTANTS AND ADDRESSES
0583*
0584 15653 177765 SM11 DEC -11
0585 15654 177775 SM3 DEC -3
0586 15655 177776 SM2 DEC -2
0587 15656 000002 S.2 DEC 2
0588 15657 000003 S.3 DEC 3
0589 15660 000012 SLNFD OCT 12 LINE FEED
0590 15661 000015 SCR TN OCT 15 CARRIAGE RETURN
0591 15662 000033 SEMDE OCT 33 ESCAPE
0592 15663 000137 SLFTA OCT 137 LEFT ARROW
0593 15664 000175 SOMDE OCT 175 OBSOLETE ALT MODE
0594 15665 000176 SAMDE OCT 176 ALT MODE
0595 15666 000177 SB177 OCT 177 RUBOUT
0596 15667 000200 SB200 OCT 200
0597 15670 002400 SCLAI CLA
0598 15671 033667 SICRI IOR SB200 ADD IN BIT 7
0599*
0600 15672 015673 SCRLA DEF SCRLF
0601 15673 106612 SCRLF OCT 106612
0602*
0603 15674 000000 SBFSA NOP INITIAL BUFFER ADDRESS
0604 15675 000000 SBDDR NOP CURRENT BUFFER ADDRESS
0605 15676 000000 SCCNT NOP HOLDS RECORD LENGTH
0606 15677 000000 SECTC NOP END-OF-TAPE COUNTER
0607*
0608 END
** NO ERRORS*

```