DISCLAIMER

1620 USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter or pencil)

Program No._____   Date_____

Program Name:_____

1. Does the abstract adequately describe what the program is and what   Yes___ No___
   it does?
   Comment_____

2. Does the program do what the abstract says?   Yes___ No___
   Comment_____

3. Is the Description clear, understandable, and adequate?   Yes___ No___
   Comment_____

4. Are the Operating Instructions understandable and in sufficient detail?   Yes___ No___
   Comment_____
   Are the Sense Switch options adequately described (if applicable)?   Yes___ No___
   Are the mnemonic labels identified or sufficiently understandable?   Yes___ No___
   Comment_____

5. Does the source program compile satisfactorily (if applicable)?   Yes___ No___
   Comment_____

6. Does the object program run satisfactorily?   Yes___ No___
   Comment_____

7. Number of test cases run_____. Are any restrictions as to data,
   size, range, etc. covered adequately in description?   Yes___ No___
   Comment_____

8. Does the Program Meet the minimal standards of the 1620 Users
   Group?   Yes___ No___
   Comment_____

9. Were all necessary parts of the program received?   Yes___ No___
   Comment_____

10. Please list on the back any suggestions to improve the usefulness of the program.
    These will be passed onto the author for his consideration.

Please return to: Your Name   _____

   Mr. Richard L. Pratt   Company   _____
   Data Corporation
   7500 Old Xenia Pike   Address   _____
   Dayton, Ohio   45432
                                          _____

                              User Group Code_____

THIS REVIEW FORM IS PART OF THE 1620 USER GROUP ORGANIZATION'S PROGRAM
REVIEW AND EVALUATION PROCEDURE. NONMEMBERS ARE CORDIALLY INVITED
TO PARTICIPATE IN THIS EVALUATION.

ii

8/31/65

TABLE OF CONTENTS

Expensive Desk Calculator

Date: July 7, 1965

Program author: Stuart E. Madnick
Manual author: Larry-Stuart Deutsch

       Massachusetts Institute of Technology
       77 Massachusetts Avenue
       Cambridge, Massachusetts

Telephone: UN 4 6900

Direct Inquires to the Program author.

INTRODUCTION:

The Expensive Desk Calculator Program provides the 1620 user with a convenient, valuable calculating tool that is both versatile and easy to use. It is no longer necessary to waste the time involved in writing and compiling a FORTRAN program in order to perform simple numerical calculations.

This program combines the ease of a desk calculator with the power of a high speed computer. All output occurs via the console typewriter. Input is accepted from either cards or typewriter in the form of single arithmetic expressions involving the normal operations of algebra (+, -, X, /), including the use of parentheses, and any of 11 predefined arithmetic functions. Expressions are evaluated immediately as they occur. Provisions also exist for defining symbols and reiterating a group of expressions.

A number of simple input/output commands are provided in order to make input/output quite flexible.

Internal accuracy is variable from 2 to 20 places, although, unless modified by command, it is standardized at 8 places.

    Example: The expression:

                7*(9+PI/3)*SQRT(LOG(10.7-30*PI))/ATAN(.97)=RS

                could be evaluated in a fraction of a second.

REQUIRED EQUIPMENT:

    I.B.M. 1620 with 20K memory and indirect addressing feature.

EXPENSIVE DESK CALCULATOR

Program

Stuart E. Madnick

Manual

Larry-Stuart Deutsch

August 1965

Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, Massachusetts

KEY to CARD DECKS

DECK NUMBER	DECK CONTENTS
1	SPS 20 K source deck
2	20 K Auto-load object deck (not sequence numbered)
3	40 K Auto-load object deck (not sequence numbered)
4	20 K Monitor 1 system output object deck

PRELIMINARY NOTE:

All typewritten lines (expressions, control commands, format commands, symbol commands, and data read under program control) must be terminated by the RS character on the console typewriter. The RS character is a single character (not to be confused with the two characters R and S). Typing this character is equivalent to first depressing the RELEASE key and then the START key on the 1620 console. The RS character is the signal for the 1620 to start processing the line which it terminates.

EXPRESSIONS:

An expression is any mathematically valid combination of the operators

*	Multiplication	
/	Division	
+	Addition	
-	Subtraction	
P	Exponentiation	(i.e. "raised to the power of...")

with constants, and symbols, which the user has previously defined.
(see DEFINE/a/c command)

It should be noted that an operator can not directly follow another operator, nor can an operator be the first character in an expression (with the exception of a minus sign before a negative number), nor can a constant or symbol directly follow another constant or symbol as such combinations are not mathematically meaningful.

An expression may consist of a maximum of 72 characters including blanks which are permitted anywhere in an expression (except within a symbol or constant). Parentheses may be nested to a maximum depth of 5 levels. In the operation of the program the operator P (exponentiation) is mechanically similar to a level of parentheses thus decreasing the maximum depth of parentheses nesting by one level for each occurence.

Example: The expressions:
    1=RS
    1.=RS
    1.547=RS
    1.865*5/9-76.859*9/SQRT(6)=RS
    SQRT(DX P 2 + DY P 2)=RS   Assuming DX and DY are
                                       previously defined symbols
    SQRT(SIN((9-PI)/8)-COS(1.9)) =RS   Assuming PI is a
                                       previously defined symbol

    are VALID expressions

while the expressions:

TWOPI=RS   Assuming TWO and PI are
                           previously defined symbols
3PI=RS   Assuming PI is a previously
                           defined symbol
4*/2=RS
+-2/7=RS
(B+ - SQRT(B*B-4*A*C))/(2*A)=RS   Assuming A, B , C are
                                  previously defined symbols

are INVALID expressions.

EVALUATION OF EXPRESSIONS:

Expressions are evaluated from left to right according to the following hierarchy:

( )	Parentheses	
P	Exponentiation	
* /	Multiplication	Division
+ -	Addition	Subtraction

The operator P (exponentiation) is the only exception to the left-to-right rule. A grouping of P operators and variables is evaluated from right to left.

Example: The expression:
    5 P 76.9 P 6 P 87 =RS

    which appears mathematically ambiguous would be evaluated
    as though it were:

    5 P (76.9 P (6 P 87)) =RS

            or

    $5^{\{76.9^{(6^{87})}\}}$

NUMERIC REPRESENTATION:

Unlike the FORTRAN language, with which the user is probably familiar, there exists no distinction between fixed and floating point numbers (i.e. integers and numbers with decimal fractions). All numbers are treated as floating point.

Example:
    1=RS   is equivalent to   1.00=RS
    3/4=RS   is equivalent to   3./4.=RS

    3/4=RS   yields the result   .7500   not 0.00

INPUT/OUTPUT:

There exist two basic forms of input/output for numeric constants:

INPUT: F Format   A number with an optional decimal fraction

Example:

1.674	928
.973	9465
0.852	7463.00

E Format   A number with a decimal fraction and a characteristic exponent
                        (Scientific notation)

Example:

1.8549E+07	=	18549000.00
6.45E-03	=	.00645
-45.7509E3	=	-45750.900
75962E4	=	759620000.00

Note: Numerical accuracy is variable from 2 to 20 places and numbers are maintained only to the specified accuracy within the 1620. Thus if too many digits are provided in input, the low order digits are lost, although the is no error in the interpretation of the number.

Example: Assuming 8 place accuracy

.123456789 is maintained as .1234567800
123456789123456789   is maintained as
                            123456780000000000.

OUTPUT: F Format   A number with a decimal fraction as required

E Format   A decimal fraction with a characteristic exponent.

Example:

.76450000E-02	=	.00765400
-.95763000E+01	=	-9.576300

NOTE that, although almost any E Format is permissible for input, the E Format used by the output routines is standardized at a field width of W + 6 where W is the places of accuracy currently being maintained.

Example:

1.847	yields	.18470000E+01
45	yields	.45000000E+02
-.0065	yields	-.65000000E-02

SELECTION OF OUTPUT FORMAT:

The desired output format may be selected with the commands:

EFORM/ RS	E Format
FFORM/ RS	F Format

The occurrence of one of these commands causes all future output to be in the form selected until another format command is encountered. The output form can be changed at any point.

NOTE: Unless selected by command the programm assumes that F Format is desired and will produce all output in F Format.

SYMBOLS:

A symbol is any group of alphameric characters, the first of which is a letter , which does not exceed 5 characters. The symbol can be used anywhere a numeric constant can be used, assuming that its value has been previously defined.

The symbols:

Example:			
	I	RATE1	LEFT
	JDIST	RATE2	LEFTD
	TIME	RATE3	LEFTR

are VALID symbols
while the symbols:

++++	&CD	F+*T
6RATE	@RATE	EVALUATE
*90	$IBSYS	-TWO
H(IME)	T/8	45RAT
I(98)	7&DIST	(THING)

are INVALID symbols

NOTE: Special characters i.e. * / + - ' $ @ &) (are invalid characters for use in symbols.

As yet no provision exists for subscripting.

SYMBOL COMMANDS:

DEFINE/symb/c   where symb is any valid symbol and c is any valid
                 constant, expression, or previously defined symbol.
                 A maximum of 5 symbols may be defined.

        Example:
            DEFINE/DIST/SQRT(DX*DX + DY*DY) RS
                                assuming that DX and DY are previously
                                defined symbols

            DEFINE/PI/ATAN(1)*4 RS

            DEFINE/PI/3.1415926 RS

            DEFINE/TWO/IT RS   where IT is a previously defined
                                symbol

    NOTE that a DEFINE may occur anywhere in a program, and
         a DEFINE can redefine a previously defined symbol.

    Example:

        DEFINE/PI/9.85 RS
            ..
            ..
            ..
        DEFINE/PI/ATAN(1)*4 RS

                            the value of the symbol PI is now
                            3.1415926

DELETE/symb/   where symb is any valid symbol. This command deletes
                 the symbol given from the symbol table. If a DELETE
                 is used for a symbol that has not been previously
                 defined no action occurs.

        Example: DELETE/ONE/ RS causes all future references
                                        to the symbol ONE to be
                                        references to an undefined
                                        symbol unless the symbol
                                        ONE is redefined

CLEAR/   This command clears the entire symbol table.

        Example:
            CLEAR/RS   causes all future symbol references
                                to be references to undefined
                                symbols unless they are defined
                                somewhere later in the program.

PRINT/   This command causes a listing of all presently defined symbols
            and the values that have been assigned to them to be printed.

    Example: DEFINE/PI/2.1415926 RS
                PI/4=RS
                DEFINE/TWO/2
                ..
                ..
                ..
                DEFINE/TW6/7.1 RS
                DEFINE/PI/5.6
                DEFINE/THREE/3
                ..
                ..
                ..
                DELETE/THREE/RS
                PRINT/ RS

        would cause the following table to be printed

            PI   =   5.6
            TWO   =   7.1

SPECIAL SYMBOLS:

    Two special purpose symbols have been provided. These symbol names are
invalid for use as regular user-defined symbols as they will only function in
the special manner for which they were included in the system.

    READ   This symbol may occur anywhere in the program where a symbol
                or constant would be valid. When the statement in which
                it occurs is terminated by the RS character, a carrige
                return is generated on the console typewriter and the
                character R is typed. The console typewriter is now
                waiting to accept a value which it will substitute for the
                READ symbol in the preceeding statement. Multiple READ
                symbols in a statement cause multiple values to be accepted
                from the console typewriter which will be substituted for
                the READ symbols in the order of their occurence in the
                statement. The RS character must terminate each value accepted
                from the typewriter.

        Example:
                9+2*READ =RS

            R   7.1 RS
                        yields a result of 23.2

READ*READ   +READ/5 =RS
R   2 RS
R   5 RS
R   60 RS

   yields the result 22.00

DEFINE/X/READ RS
R 3.4657 RS
   causes X to be defined as 3.4657

SQRT(READ) =RS
R 625 RS
   yields the result 25.00

RESULT   This symbol may occur only in a DEFINE statement and refers to the result of the previous calculation. The value of the result of the preceeding calculation replaces the RESULT symbol.

Example:
   3 + SQRT(144)=RS
   DEFINE/RATE/RESULT RS

     causes the symbol RATE to be defined as 15

EDIT COMMANDS:

   Several editting and error correction features have been included in the program to save the effort of rewriting statements in order to correct careless mistakes or ommissions.

Deletion Characters:
  @ "at sign" causes the deletion of the last non-blank character. Multiple @ characters cause the deletion of multiple non-blank characters.

   Example:
   3+)@(LOG(*@SQRF@T((@9.8))))@=RS

   is equivalent to:

   3+(LOG(SQRT(9.8)))=RS

‡ "Record mark" causes the entire line in which it occurs to be ignored. This character may occur anywhere in a line and may be used to enter comments. After an = sign this character is ineffective and sense switch 4 must be used to ignore the line.

COFRM/   causes all commands to be retyped. This command can be used to check the results of using the deletion characters.

BRIEF/   negates the COFRM/ command.

NOTE that the 1620 does not normally retype all commands therefore if retyping is desired it must be requested using the COFRM/ command.

The edit commands may occur anywhere in a program.

CONTROL COMMANDS:

CARD/   causes input control to be transfered from the console typewriter to the 1622 card reader. The occurence of the CARD/ command on a card causes no action.

TYPE/   causes input control to be transfered from the 1622 card reader to the console typewriter. The occurence of this command in typed input causes no action.

NOTE   The use of the TYPE/ and CARD/ commands is valid only for the 40K version of the Expensive Desk Calculator Program.

EXIT/   causes a program to be terminated.

FANDK/   causes the program to modify the number of places of numerical accuracy.

Example: FANDK/ RS causes the typing of the message:

TYPE TWO DIGIT NUMBER FROM 2 TO 20 INDICATING NUMBER OF SIGNIFICANT PLACES

as soon as this message is typed the 1620 will wait for a number to be typed in. (No carrige return will be generated and the RS character must terminate the typing of the input value).

NOTE   The use of the FANDK command is valid only for the 20 K version of the Expensive Desk Calculator Program designed for use with MONITOR 1

ITERATION COMMANDS:

PROG/ RS
..
..
..
#/ RS

causes all statements between the PROG/ command and the #/ character group to be reiterated until the sense switch #1 is turned on. Any statement, command, or expression may occur within the limits of a PROG/ except another PROG/. A maximum of 150 characters may occur in a prog (including blanks). (This usually means that approximately 5 statements may occur in a PROG/)

PROGn /

where n is a number between 1 and 4. This command alters the sense switch which turns off a PROG/.

NOTE that the PROGn/ command is <u>not</u> equivalent to the PROG/ command, and that it affects all future PROG/ commands, and that the PROG commands assume termination by sense switch # 1 in the absence of a PROGn/.

Example:

```
DEFINE/X/0 RS
PROG3/ RS
PROG/ RS
SQRT(X) =RS
DEFINE/X/X+1
#/   RS
```

generates a table of square roots which is terminated by turning on sense switch # 3.

```
PROG/  RS
COS(READ) RS
#/   RS
```

causes the 1620 to accept values for which it will compute cosines, until terminated by sense switch # 1.

```
COFRM/ RS
DEFINE/X/0 RS
define/x/0
PROG/  RS
prog/=
SIN(x)=RS
sin(x)=
COS(X)= RS
cos(x)=
DEFINE/X/X + 1
define/x/x+1
##/   RS
```

Note the retyping of each command. (Retyping is indicated by lower case although the 1620 actually has only upper case.)

causes the following output:

```
SIN(0)  =    xxxxxxx
COS(0)  =    aaaaaaa

DEFINE/X/1
SIN(1)  =    bbbbbbb
COS(1)  =    ccccccc

DEFINE/X/2
  ..
  ..
  ..
```

sense switch 1 will terminate this sequence.

APPENDIX

FUNCTIONS:

Eleven arithmetic functions have been provided for the convenience of the user.

SIN	sine	(radians)
ATAN	arctangent	(radians)
COS	cosine	(radians)
LOGN	logarithm	natural base E
LN	" "	" "
LOG	" "	common base 10
LOG10	" "	" "
SQRT	Square root	
EXP	exponent	base e i.e. e^x
EXP10	" "	base 10 i.e. 10^x
ABS	absolute value	

ERROR MESSAGES:

Several error checks have been written into the system for the convenience of the user. The following messages will be typed when the appropriate error condition is encountered:

INPUT OVERFLOW	Input restrictions have been exceeded
ILLEGAL STRUCTURE	Illegal command or command format, or improper arithmetic expression
PAREN ERROR	Improper use of parentheses – unmatched parentheses
PAREN OVERFLOW	Maximum depth of parentheses nesting has been exceeded
UNDEFINED VARIABLE	Variable has not as yet been defined
NAME TOO LONG	Symbol name exceeds 5 characters
PROG OVERFLOW	Too many characters included within the limits of a PROG/
SYMBOL TABLE OVERFLOW	Too many symbols have been defined
INFINITE	Division by zero

SYSTEM SUMMARY

RS character must terminate all typewritten lines

EXPRESSIONS:
*	Multiplication
/	Division
+	Addition
-	Subtraction
P	Exponentiation
()	Parentheses

72 character Maximum

All numbers are floating point

INPUT/OUTPUT:

| F Format | a number with an optional decimal fraction |
| E Format | a number with a decimal fraction and a characteristic exponent |

COMMANDS	EFORM/	requests output in E Format
	FFORM/	requests output in F format
		(F Format is assumed by the program unless EFORM/ command is used)

SYMBOLS:
1 to 5 alphameric characters   first character must be a letter
                                no special characters

SYMBOL COMMANDS:

DEFINE/symb/c	symb is any valid symbol c is any valid constant, expression, or previously defined symbol
DELETE/symb/	symb is any valid symbol
PRINT/	causes printing of symbol table
CLEAR/	clears symbol table

SPECIAL SYMBOLS:
| READ | causes value to be accepted from console typewriter and substituted for READ symbol   (Multiple READ symbols cause multiple values to be read) |
| RESULT | refers to result of last calculation permissible only in a DEFINE command |

EDIT COMMANDS:

@ character deletes last non-blank character (Multiple @
             characters delete multiple non-blank characters)

‡ Record   causes entire line in which it occurs to be ignored
  mark

COFRM/   causes all statements to be retyped
BRIEF/   negates COFRM/

             (1620 is normally in BRIEF/ mode)

CONTROL COMMANDS:

CARD/   Transfers input control to 1622 card reader

TYPE/   Transfers input control to console typewriter

FANDK/   Modifies number of places of numerical accuracy
                (available only with MONITOR L version)

EXIT/   Terminates program

ITERATION COMMANDS:

PROG/ RS   Reiterates all commands within its limits until
             appropriate sense switch is turned on
  ..
  ..
  ..
‡‡/ RS

PROGn/   sets sense switch which turns off a PROG/
             not identical with a PROG/
             (sense switch # 1 is assumed in the absence of
             a PROGn/ command)

PROGRAM NOTES:

I.   20 K and 40 K Auto-load versions

    The 20 K and 40 K Auto-load versions are self loading programs.
To load these programs the user does the following:

    1. Press INSTANT STOP key on 1620 console
    2. Press RESET key on 1620 console
    3. Place card deck in 1622 card reader hopper
    4. Press LOAD key on 1622 card reader
    5. Press READER START key on 1622 card reader to read last card

When the program has been loaded the message READY will be typed.

    WARNING: The 20 K and 40 K Auto-load versions are not sequence
               numbered, therefore caution should be excercised in handling
               these decks.

    The 20 K and 40 K versions are identical with the following exceptions:

	20 K version	40 K version
Maximum character imput	72	300
PROG/ length	5 statements 120 characters	50 statements 2500 characters
Maximum number of symbols	5	100

    II.   20 K MONITOR 1 version

        REQUIRED EQUIPMENT: I.B.M. 1620 with 1311 Disk, 20K memory, and
                              indirect addressing feature.

        The decks supplied consits of MONITOR 1 system output preceeded by
    the correct DUP (Disk Utility Program) cards necessary to load this
    program onto the disk .

            NOTE that this program must be loaded using the name DEMO in order
                 to take advantage of the FANDK/ command.

            Once located on Disk storage, the program may be called by using
        the appropriate ‡‡ XEQSDEMO   MONITOR 1 control card.

ADDITIONAL NOTES:

In the event of a program failure due to an infinite loop or a
CHECK STOP the program may be re-initialized by the following proceedure:

      1. Press INSTANT STOP key on 1620 console
      2. Press RESET key on 1620 console
      3. Press INSERT key on 1620 console
      3. TYPE 4902402   (no blanks and no carriage)
      4. TYPE the RS character

In the event that this proceedure fails, it will be necessary to reload
the Program using the proceedure outlined in the PROGRAM NOTES.

The SPS source deck supplied is the source deck for the 20 K MONITOR 1
version. If the program is too be modified for larger machines it will be
necessary to reassemble the program with the following parameters greatly
increased: INPUTZ   TOP   TAB1Z   PROGZ1   PROGZ2   DEFTB1   DEFTB2.

The significance of these parameters is explained at the beginning of the listing
of the SPS source deck.

The SPS source deck supplied is the source deck for the 20 K MONITOR 1
version. It should be noted that this program expects to be loaded starting
at location 02402 with the mantissa length located at location 02398. The
user has the choic of either loading the mantissa lenght (a two digit number)
into location 02398 or removing the two references to this location.

The program contains a special 16 digit entry table which defines
all functions,commands, and constants. The table has the following form:

Identifier 1st 10 digits   Alphameric name with flag over first letter
                      (right adjusted)

Type   11th digit   Record mark – command
                     Digit 1   – function
                     Digit 0   –constant

Location 11th-16th digits Location of command, function, or constant

This table is provided as a convenience to users who wish to modify the
program themselves.

The operation of exponentiation denoted by the operator P is subject
to slight roun-off errors.

No error checks exist for numeric overflow or underflow. Thus a number
that does not lie between 10^{+99} and 10^{-99} will be processed incorrectly.

Example:

    (1.3E+47*2.94E-58/2.94E-58)   will be processed correctly

    (1.3E+47/ 2.94E-58*2.94E-59)   will not be processed
                                     correctly

READY

***   EXPENSIVE DESK CALCULATOR SAMPLE PROGRAM   ***‡RS

THE CHARACTERS ‡ AND $ CAUSE THE LINE TO BE IGNORED‡RS
THIS PROVIDES AN EASY TO REMOVE ERRORS AND INSERT COMMENTS‡RS

INPUT CAN BE IN A VARIED STYLE, ALL THE FOLLOWING ARE LEGAL‡RS

5=RS 5.0000000
5.=RS 5.0000000
5.0=RS 5.0000000
+5.0=RS 5.0000000
0.5E1=RS 5.0000000
0.005E+3=RS 5.0000000
50E-1=RS 5.0000000

NOTE THAT THE OUTPUT IS IN *F* FORMAT   (DECIMAL NOTATION)‡RS
E FORMAT (SCIENTIFIC NOTATION) CAN BE OBTAINED BY THE (EFORM/)‡RS
COMMAND‡RS

EFORM/RS

SAMPLE *E* FORMAT OUTPUT‡RS

5=RS .50000000E+01
5.=RS .50000000E+01
0.005E3=RS .50000000E+01

OUTPUT CAN BE RETURNED TO *F* FORMAT BY THE COMMAND (FFORM/)‡RS

FFORM/RS

WHENEVER AN @ SIGN IS USED IN A LINE THE PRECEEDING CHARACTER IS‡RS
DELETED.‡RS
MULTIPLE @ SIGNS DELETE A CORRESPONDING NUMBER OF LETTERS.‡RS

THE COMMAND (COFRM/) CAUSES THE PROGRAM TO ECHO THE INPUT.‡RS

COFRM/RS

1+1=RS
1+1= 2.0000000

1+OOPS@@@@1=RS
1+1= 2.0000000

NOTE THAT THE LETTERS OOPS WERE DELETED.‡RS

SENSE SWITCH 4 CAN ALSO BE USED TO DELETE AN INPUT LINE.‡RS
THIS IS ESPECIALLY IMPORTANT SINCE THE ‡ AND $ HAVE NO EFFECT‡RS
ONCE THE = SIGN HAS BEEN INPUTED ON THE LINE.RS
(SENSE SWITCH 4 USED TO IGNORE ABOVE LINE.)‡RS

THE FOLLOWING FUNCTIONS ARE DEFINED IN THE SYSTEM.‡RS

SIN(2)=RS
SIN(2)= 0.90929742

(NOTE THAT THE COFRM/ MODE IS ON - ALL INPUT IS ECHOED).+RS

THE COFRM/ MODE CAN BE TURNED OFF BY THE COMMAND (BRIEF/).‡RS

BRIEF/RS
BRIEF/=

BACK TO THE FUNCTIONS AGAIN.‡RS

SIN(2)=RS 0.90929742
COS(2)=RS -0.41614683
SQRT(3)=RS 1.7320508
LN(4)=RS 1.3862943
LOGN(4)=RS 1.3862943
LOG(5)=RS 0.69897
LOG10(5)=RS 0.69897
EXP(6)=RS 403.42879
EXP10(7)=RS 10000000.0
ATAN(8)=RS 1.4464413

THE OPERATORS MULTIPLICATION (*), DIVISION (/), ADDITION (+),‡RS
     SUBTRACTION (-), AND ....TO THE POWER... (P) ARE AVAILABLE.‡RS

EXAMPLES.‡RS

ATAN(1)*4=RS 3.1415926

25*5*SQRT(4)+SIN(2.68)=RS 250.44537

SIN(25)P2+COS(25)P2)@=RS 0.99999999

(SINE SQUARED PLUS COSINE SQUARED EQUAL ONE.)‡RS

FACILITIES ARE ALSO AVAILABLE FOR DEFINING SYMBOLS.‡RS

DEFINE/PI/ATAN(1)*4RS
 3.1415926

THE ABOVE COMMAND DEFINED THE SYMBOL PI TO BE ATAN(1)*4 (3.1415926).‡RS

PI=RS 3.1415926
2*PI=RS 6.2831852
7*(9+PI/3)*SQRT(LOG(1.@0.7-30*PI))/ATAN(.97)=RS 126.59750

ADDITIONAL SYMBOLS CAN BE DEFINED.‡RS

DEFINE/ONE/1RS
 1.0000000
DEFINE/TWO/2RS
 2.0000000

ONE+TWO=RS 3.0000000

THE COMMAND (PRINT/) CAUSES THE ENTIRE SYMBOL TABLE TO BE PRINTED.‡RS

```
PRINT/RS
    PI= 3.1415926
    ONE= 1.0000000
    TWO= 2.0000000
```

THE COMMAND (DELETE/SYMB/) CAN BE USED TO DELETE A SYMBOL.‡RS

DELETE/ONE/RS

```
PRINT/RS
    PI= 3.1415926
    TWO= 2.0000000
```

THE SYMBOL ONE HAS BEEN REMOVED FROM THE SYMBOL TABLE.‡RS

THE COMMAND (CLEAR/) WILL CLEAR THE ENTIRE SYMBOL TABLE.‡RS

CLEAR/RS

PRINT/RS

(NOTHING PRINTED - TABLE EMPTY).‡RS

```
DEEINE/PI/ATAN(1)*4RS
  3.1415926
```

THE SPECIAL SYMBOL (RESULT) GIVES THE ABILITY TO DEFINE SYMBOLS‡RS
AFTER THEY HAVE BEEN CALCULATED WITHOUT RE-CALCULATION.‡RS

EXAMPLE.‡RS

7*(9+PI/3)*SQRT(LOG(10.7-30*PI))/ARA@@TAN(.97)=RS 126.59750

DEFINE/ANSWR/RESULTRS

ANSWR=RS 126.59750

NOTE THE SAME EFFECT CAN BE ACCOMPLISHED BY THE FOLLOWING PROCEDURE.‡RS

```
DEFINE/ANSWR/126.5970RS
  126.59700
```

USE OF THE RESULT FEATURE SAVES THE BOTHER OF RETYPING NUMBERS.‡RS

THERE IS ANOTHER SPECIAL SYMBOL (READ).‡RS
FOR EVERY OCCURRENCE OF THE SYMBOL (READ) THE PROGRAM WILL BE‡RS
HALTED AND A VALUE WILL BE REQUESTED FOR INSERTION.‡RS

EXAMPLE‡RS

9+2*READ=RS

```
R
7.1=RS 7.1000000
 23.200000
```

THE VALUE OF 7.1 WAS INSERTED INTO THE EXPRESSION TO OBTAIN 23.2‡RS

SQRT(READ)=RS

```
R
16=RS 16.000000
 4.0000000
```

THE IMPORTANCE OF THIS SYMBOL WILL BE SEEN WITH THE NEXT COMMAND.‡RS

THE ITERATION COMMAND‡RS

THE COMMAND (PROG/) SWITCHES ON THE ITERATION MODE.‡RS
ALL EXPRESSIONS AND COMMANDS FOLLOWING THE (PROG/) WILL‡RS
BE READ IN, BUT NOT EXECUTED UNTIL A DOUBLE RECORD MARK ‡‡/RS
COMMAND IS RECEIVED. THEN ALL THE EXPRESSIONS AND COMMANDS‡RS
WILL BE EXECUTED REPEATEDLY UNTIL TERMINATED BY SENSE SWITCH‡RS
ONE TURNED ON.‡RS

EXAMPLE‡RS

```
DEFINE/X/0RS
  .00000000
```

```
PROG/RS
DEFINE/X/X+1DS
SORT(X)=RS
‡‡/RS
  1.0000000 1.0000000
  2.0000000 1.4142135
  3.0000000 1.7320508
  4.0000000 2.0000000
  5.0000000 2.2360679
  6.0000000 2.4494897
  7.0000000 2.6457513
  8.0000000 2.8284271
  9.0000000 3.0000000
READY
```

SENSE SWITCH ONE WAS TURNED ON TO TERMINATE ITERATION.‡RS
NOTE THAT A TABLE OF SQUARE ROOTS WAS PRODUCED.‡RS

THE USE OF THE (READ) CAN BE SEEN BELOW.‡RS

```
PROG/RS
COS(E@READ)=RS
‡‡/RS
```

```
R
3.14159=RSS 3.1415900
 -1.0000000
```

R

36.35=RS 36.350000
  0.21987319
READY

SENSE SWITCH ONE AGAIN TERMINATED ITERATION.‡RS

NOTE THAT THE ITERATION LOOP REQUIRED A NEW ARGUEMENT‡RS
FOR THE COSINE FUNCTION EACH TIME - THEN EVALUATED THE‡RS
FUNCTION.‡RS

THE COFRM/ MODE CAN ALSO BE APPLIED TO THE (PROG/) MODE‡RS
WITH INTERESTING RESULTS.‡RS

COFRM/RS

PROG/RS
PROG/=
DEFINE/X/X+0.5RS
DEFINE/X/X+0.5=
SIN(X)=RS
SIN(X)=
COS(X)=RS
COS(X)=
‡‡/RS
DEFINE/X/X+0.5=

X+0.5= 9.5000000
SIN(X)= -0.07515112
COS(X)= -0.99717215
DEFINE/X/X+0.5=

X+0.5= 10.000000
SIN(X)= -0.54402111
COS(X)= -0.83907152
DEFINE/X/X+0.5=

X+0.5= 10.500000
SIN(X)= -0.87969576
COS(X)= -0.47553692
DEFINE/X/X+0.5=

X+0.5= 11.000000
SIN(X)= -0.9999902
COS(X)= 0.00442569
READY

SENSE SWITCH ONE AGAIN TERMINATED LOOP.‡RS

THERE IS AN AUXILIARY COMMAND PROGN/ WHERE N=1,2,3, OR 4.‡RS
THEREISANAUXILIARYCOMMANDPROGN/WHEREN=
UNDEFINED VARIABLE

NOTE WHAT HAPPENS WHEN ‡ IS PLACED AFTER = SIGN (ABOVE).‡RS

THE PROGN/ COMMAND CHANGES THE TERMINATING CONDITION OF A‡RS
PROG/ FROM SENSE SWITCH 1 TO SENSE SWITCH N.‡RS

NOTE THIS COMMAND DOES NOT INITIATE THE PROG/ MODE.‡RS
IT ONLY CHANGES THE TERMINATING CONDITION.‡RS
ONCE A PROGN/ HAS BEEN USED IT PREVAILS UNTIL OVERRIDDEN‡RS
BY ANOTHER PROGN/. THE PROGN/ COMMAND CAN BE USED WITH PROG/‡RS

THERE ARE FOUR MORE CONTROL STATEMENTS.‡RS

CARD/‡RS
TYPE/‡RS
EXIT/‡RS
FANDK/‡RS

CARD/ AND TYPE/ TRANSFER INPUT CONTROL TO THE CARD READER OR ‡RS
TYPEWRITER RESPECTIVELY.‡RS

EXIT/ TRANSFER CONTROL TO THE MONITOR I SUPERVISOR (FOR SYSTEMS‡RS
THAT USE IT).‡RS

FANDK/ ALLOWS THE USER TO CHANGE THE NUMBER OF SIGNIFICANT PLACES‡RS
IN THE CALCULATIONS. THIS COMMAND SHOULD ONLY BE USED WITH‡RS
1620S UNDER MONITOR I SYSTEM - THE INSTRUCTIONS IN THE MANUAL‡RS
SHOULD BE READ FIRST.‡RS

FANDK/RS
FANDK/=
TYPE TWO DIGIT NUMBER FROM 02 TO 20 INDICATING NUMBER OF SIGNIFICANT FIGURES
READY

‡‡XEQSDEMO   20
EXECUTION

NOISE DIGIT 0
MANTISSA LENGTH 20
SUBR SET 02
READY

1=RS 1.0000000000000000000 _
NOTE TWENTY PLACE ACCURACY.‡RS

DEFINE/PI/ATAN(1)*4RS
  3.1415926535897932384

PI/2=RS 1.5707963267948966192

SIN(PI/2)=RS 1.0000000000000000000

2P2=RS 3.9999999999999999998

THIS ENDS THE TEST PROGRAM. GOOD LUCK.‡RS
**************************** S.E.M. ***********************‡RS

SYMBOL TABLE

VARMES	07601	START1	02522	RSLASH	05060	REQUAL	05068	READP2	08384
READP1	08254	PROG11	08814	PROGZ2	00150	PROGZ1	00005	PROGER	09146
PROGD2	10976	PROGD1	10975	PROERR	09179	PERIOD	10981	LSLASH	04474
LBRKST	06163	IOCHCK	03582	INSRT2	06908	INSRT1	06276	INPUT2	12251
INPUTZ	00072	EFFECT	05247	DEFTB2	00075	DEFTB1	00005	DEFERR	10430
DEFERM	10443	CARDER	08234	A	06185	ABSF	10794	AG1	07080
ALINT	11724	ALMIN	12075	ALPHA	12757	ARP	11532	AT	06181
ATANF	10642	AZERO	10978	A4	07567	BACK	02934	BCALC	05292
BEGN	08059	BLANK	12071	BRIEF	09306	CALC	05248	CANCL	11320
CARR	02758	CLAPR	08488	CLEAN	03486	CLEAR	06067	CNT	10209
COFRM	09286	COMM	10888	COMPR	07331	COMS	09237	CONEX	08157
CONST	10813	CONTR	07431	COSF	10718	DCODE	08211	DEFE	09558
DELE	09326	DELT	07979	DEL1	09346	DEL2	07588	DIGB	04348
DIGL	08163	DIGR	08164	DIGSV	04349	DOL	06171	DOWN	04756
DSAVE	09593	E	10991	ECNT	11471	EFORM	09246	END	06644
END2	06908	EQUAL	06177	EXPF	10680	EXPTN	10528	FADD	05172
FETCH	06204	FFKK	11251	FFKK2	11299	FFORM	09266	FILL	12677
FIND	04313	FINE	03776	FIRST	02602	FKCK	03708	FLAG	10994
FMUL	05210	FOO2	03350	FORM	10973	FRAC	12231	FRACT	06564
FSIGN	10971	FUDGE	12659	FULL	10970	FULLP	05844	FUNC	07440
FUNT	07396	GFFKK	02542	GOOP	06952	INC	11131	INDIC	08162
INERM	03633	INERR	03620	INFIN	04613	INLOP	06312	INPUT	12101
INSRT	13069	INT	12121	INTEX	08152	INTO	09666	INTO2	10162
INTO3	10284	INTO4	10150	INTST	12248	IR1	06943	KFRAC	10275
KINT	11891	LBK	03778	LBRK	06161	LEVEL	05894	LISTL	09214
LISTP	09117	LLPAR	04632	LMI	04026	LNGMS	08179	LOAD	12487
LOGNF	10566	LOGTN	10490	LOG10	07643	LOJP	04362	LOOP	06384
LOOPD	09774	LOOPR	03266	LOOPT	07200	LOPOT	08570	LPAR	06173
LPL	04006	LPOW	04110	LRPOW	04536	LSTAR	04090	MESS1	12759
MESS2	12853	MESS3	06187	MINUS	10989	MIXED	11900	MOVE	09490
NEG	04418	NUMB	10968	NUMBR	11107	OK	04430	OUTZE	12048
PARER	04744	PARFL	05857	PARMS	04813	PART2	12524	PCNT	06203
PDIG	10924	PEND	07020	PLUS	10985	POOP	03170	PQRM	10974
POW	06167	PRINF	08546	PRINT	11000	PROG	08722	PROG1	08966
PROG2	09034	PROG3	09126	PROG4	09070	PROTR	08533	PULL	05740
PUSH	05506	PUT	11644	PZER	12068	R	08381	RATY	02782
READG	10972	READR	02806	READY	11600	RELOC	07096	RMI	05036
RMK	12079	RPAR	06175	RPL	05016	RPOW	05052	RRPAR	05148
RSAVE	08873	RSCAN	05470	RSTAR	05044	RTRN	10923	SAVE	05897
SET	02854	SHUV	03382	SIGN	06752	SINF	10756	SKIPE	11388
SLASH	06169	SLEV	08379	SNUMB	05432	SQRTF	10604	SSUM	05344
STAR	06165	START	02402	STERM	05388	STOPL	09093	STRER	03954
STRMS	03967	SUM	06111	SVAL	05300	SWAP	12406	SWAP2	19502
SWAP3	12488	TABD	09890	TABD2	09902	TABN	07520	TAB1Z	00150
TCNT	09689	TEMP	12078	TERM	06134	TIT	12661	TOLNG	08166
TOP	20000	TRA1	12512	TSAVE	05733	TSX	04664	TYPE	12004
TYPER	08214	URP	07176	URP1	07376	VAL	06089	VARER	07588
WRITE	03672	ZERDV	04592	ZERO	10946	ZZERO	06156		

```
00010*
00020*          EXPENSIVE DESK CALCULATOR
00030*
00040*
00050*
00060*
```

```
00070*      INPUTZ = SIZE OF INPUT AREA
00080*      TOP = TOP OF CORE
00090*      TAB1Z = SIZE OF PAREN TABLE (NO. OF LEVELS = TAB1Z/2*FFKK)
00100*          THE 'P' (POWER) OPERATOR USES THE PAREN TABLE ALSO
00110*      PROGZ1 = NUMBER OF STATEMENTS IN PROG
00120*      PROGZ2 = TOTAL LENGTH OF PROG STATEMENTS
00130*      DEFTB1 = NO. OF DEFINE VARIABLES
00140*      DEFTB2 = LENGTH OF DEFINE VARIABLES (NO.=DEBFT2/FFKK)
00150*      FFKK = MANTISSA LENGTH (CALCULATED BY PROGRAM)
00160 INPUTZ DS    0,72,,                                          00072 00000
00170 TOP    DS    0,20000,,                                       20000 00000
00180 TAB1Z  DS    0,150,,                                         00150 00000
00190 PROGZ1 DS    0,5,,                                           00005 00000
00200 PROGZ2 DS    0,150,,                                         00150 00000
00210 DEFTB1 DS    0,5,,                                           00005 00000
00220 DEFTB2 DS    0,75,,                                          00075 00000
00230*
00240 START  TF    FFKK,2398     ,,MONITOR MANTISSA LENGTH AT LOC. 02398
                                                                   02402 26 11251 02398
00250        CF    FFKK-1                                          02414 33 11250 00000
00260        TF    FFKK2,FFKK                                      02426 26 11299 11251
00270        AM    FFKK2,2                                         02438 11 11299 -0002
00280        TFM   CNT,ZZERO-1                                     02450 16 10209 -6155
00290        S     CNT,FFKK                                        02462 22 10209 11251
00300        SF    -CNT                                            02474 32 1020R 00000
00310        TDM   RDIG,0                                          02486 15 05895 00000
00320        TFM   PROGD2,01100,7                                  02498 16 10976 -1100
00330        TDM   RATY+9,-1                                       02510 15 02791 0000J
00340 START1 TFM   PROGD2,00,10                                    02522 16 10976 000-0
00350*     END OF MONITOR SECTION
00360        B     FIRST-24                                        02534 49 02578 00000
00370C        DORG *-4                                             02541
00380*     IF SS3 ON MANTISSA LENGTH CAN BE CHANGED
00390*     APPROPRIATE ROUTINE MUST BE WRITTEN
00400 GFFKK  RCTY                                                  02542 34 00000 00102
00410        WATY  MESS1                                           02554 39 12759 00100
00420        RNTY  FFKK-1                                          02566 36 11250 00000
00430        BC4   *-12                                            02578 46 02566 00400
00440        BTM   WRITE,MESS3                                     02590 17 03672 -6187
00450 FIRST  BTM   FKCK,0                                          02602 17 03708 -0000
00460*
00470*          START OF MAIN PROGRAM
00480*
00490*          INITIALIZATION
00500        TFM   CNT,INPUT-9                                     02614 16 10209 J2092
00510        TFM   LEVEL,0                                         02626 16 05894 -0000
00520        AM    -CNT,8                                          02638 11 10209 -0008
00530        TR    -CNT,COMS-1                                     02650 31 1020R 09236
00540        CM    CNT,INPUT+2*INPUTZ-20                           02662 14 10209 J2225
00550        BNP   *-36                                            02674 47 02638 01100
00560        BTM   STERM,ZZERO                                     02686 17 05388 -6156
00570        BTM   SSUM,ZZERO                                      02698 17 05344 -6156
00580        BD    CARR,READG                                      02710 43 02758 10972
00590        TFM   TSAVE,SAVE                                      02722 16 05733 -5897
00600        BD    INTO4,DIGR                                      02734 43 10150 08164
00610        BD    PROG2,PROGD2                                    02746 43 09034 10976
00620 CARR   RCTY                                                  02758 34 00000 00102
00630        TDM   INTST,                                          02770 15 12248 00000
00640        DC    1,,,*                                           02781 00001
00650 READ   DS    1,FIRST                                         02602 00001
```

```
00660 RATY    RATY INPUT                                           02782 37 12101 00100
00670*     SPECIAL SYMBOLS $ OR REC.MK. - DELETE LINE, 'AT' SIGN - DELETE P
00680*     US CHARACTER
00690*     SS4 ON - IGNORE LINE
00700          BTM   IOCHCK,READ                                   02794 17 03582 -2602
00710 READR    BNR   *+24,INPUT+2                                  02806 45 02830 12103
00720          BD    PROG1,PROGD1                                  02818 43 08966 10975
00730          TDM   RDIG,1                                        02830 15 05895 00001
00740          TFM   CNT,INPUT-2                                   02842 16 10209 J2099
00750 SET      AM    CNT,2                                         02854 11 10209 -0002
00760          BNR   *+20,-CNT                                     02866 45 02886 1020R
00770          B     READ                                          02878 49 02602 00000
00780          DORG  *-4                                           02885
00790          C     EQUAL,-CNT                                    02886 24 06177 1020R
00800          BNE   SET                                           02898 47 02854 01200
00810          TR    -CNT,EQUAL                                    02910 31 1020R 06177
00820          TFM   CNT,INPUT-2                                   02922 16 10209 J2099
00830 BACK     AM    CNT,2                                         02934 11 10209 -0002
00840          C     AZERO,-CNT                                    02946 24 10978 1020R
00850          BL    BACK                                          02958 47 02934 01300
00860          C     DOL,-CNT                                      02970 24 06171 1020R
00870          BE    READ                                          02982 46 02602 01200
00880          C     AT,-CNT                                       02994 24 06181 1020R
00890          BE    CLEAN                                         03006 46 03486 01200
00900          C     BLANK,-CNT                                    03018 24 12071 1020R
00910          BE    SHUV                                          03030 46 03382 01200
00920          C     EQUAL,-CNT                                    03042 24 06177 1020R
00930          BNE   BACK                                          03054 47 02934 01300
00940          BNR   *+20,INPUT                                    03066 45 03086 12101
00950          B     READ                                          03078 49 02602 00000
00960          DORG  *-4                                           03085
00970          BD    *+36,PORM                                     03086 43 03122 10974
00980          RCTY                                                03098 34 00000 00102
00990          WATY  INPUT                                         03110 39 12101 00100
01000          C     EQUAL,INPUT                                   03122 24 06177 12101
01010          BE    READ                                          03134 46 02602 01200
01020          BD    PROG11,PROGD1                                 03146 43 08814 10975
01030          TFM   CNT,INPUT                                     03158 16 10209 J2101
01040*     CHECK FOR BREAK CHARACTERS
01050 POOP     TF    LBRK,PLUS                                     03170 26 06161 10985
01060          TF    LBRKST,LBRK                                   03182 26 06163 06161
01070          C     PERIOD,-CNT                                   03194 24 10981 1020R
01080          BE    LOOPR                                         03206 46 03266 01200
01090          C     A,-CNT                                        03218 24 06185 1020R
01100          BNP   LOOPR                                         03230 47 03266 01100
01110          TF    LBRK,-CNT                                     03242 26 06161 1020R
01120          AM    CNT,2                                         03254 11 10209 -0002
01130 LOOPR    C     LBRK,LPAR                                     03266 24 06161 06173
01140          BE    LLPAR                                         03278 46 04632 01200
01150          TF    LBRKST,LBRK                                   03290 26 06163 06161
01160          C     LPAR,-CNT                                     03302 24 06173 1020R
01170          BE    LOOPR-24                                      03314 46 03242 01200
01180*     FETCH IS FLEXIBLE ROUTINE TO CONVRT INPUT INTO FLOATING POINT NO
01190          TFM   IR1,*+24                                      03326 16 06943 -3350
01200          BT    FETCH,CNT                                     03338 27 06204 10209
01210 FOO2     BTM   SVAL,NUMB                                     03350 17 05300 J0968
01220          TF    CNT,PCNT                                      03362 26 10209 06203
01230          B     LBK                                           03374 49 03778 00000
01240          DORG  *-4                                           03381
01250 SHUV     TF    PCNT,CNT                                      03382 26 06203 10209
```

```
01260          SM    CNT,1                                         03394 12 10209 -0001
01270          AM    PCNT,2                                        03406 11 06203 -0002
01280          C     BLANK,-PCNT                                   03418 24 12071 0620L
01290          BE    *-24                                          03430 46 03406 01200
01300          SM    PCNT,1                                        03442 12 06203 -0001
01310          TR    -CNT,-PCNT                                    03454 31 1020R 0620L
01320          SM    CNT,1                                         03466 12 10209 -0001
01330          B     BACK                                          03478 49 02934 00000
01340          DORG  *-4                                           03485
01350 CLEAN    AM    CNT,1                                         03486 11 10209 -0001
01360          TF    PCNT,CNT                                      03498 26 06203 10209
01370          SM    CNT,4                                         03510 12 10209 -0004
01380          CM    CNT,INPUT-1                                   03522 14 10209 J2100
01390          BL    READ                                          03534 47 02602 01300
01400          TR    -CNT,-PCNT                                    03546 31 1020R 0620L
01410          SM    CNT,1                                         03558 12 10209 -0001
01420          B     BACK                                          03570 49 02934 00000
01430          DORG  *-4                                           03577
01440          DORG  *+6                                           03582
01450 IOCHCK   BC4   -IOCHCK+1                                     03582 46 0358J 00400
01460          BI    -IOCHCK+1,01600                               03594 46 0358J 01600
01470          BNR   INERR,INTST                                   03606 45 03620 12248
01480          BB                                                  03618 42 00000 00000
01490          DORG  *-9                                           03620
01500 INERR    BTM   WRITE,INERM                                   03620 17 03672 -3633
01510 INERM    DAC   17,*INPUT OVERFLOW*',                         03633 00034
01520          DS    5                                             03670 00005
01530 WRITE    RCTY                                                03672 34 00000 00102
01540          WATY  -WRITE+1                                      03684 39 0367J 00100
01550          B     READ                                          03696 49 02602 00000
01560          DORG  *-4                                           03703
01570          DORG  *+6                                           03708
01580*     FKCK IS USED FOR MONITOR I SYSTEMS, CHECKS MANTISSA LENGTHS AND
01590*     EXECUTES APPROPRIATE ACTIONS IF INCORRECT LENGTH
01600 FKCK     C     2398,FFKK          ,,,COMPARE MANTISSA LENGTHS   03708 24 02398 11251
01610          BE    FINE                                          03720 46 03776 01200
01620          TD    FUDGE,FFKK                                    03732 25 12659 11251
01630          TD    FUDGE-2,FFKK-1                                03744 25 12657 11250
01640          TR    SWAP2,SWAP,,    MOVE MONITOR SWAPPER INTO UPPER CORE   03756 31 19502 12406
01650          B     SWAP2                                         03768 49 19502 00000
01660          DORG  *-4                                           03775
01670 FINE     BB                                                  03776 42 00000 00000
01680          DORG  *-9                                           03778
01690*     END OF FKCK
01700*     LEFT BREAK DETERMINATION
01710 LBK      TF    80,CLEAR                                      03778 26 00080 06067
01720          TF    RBRK,-CNT                                     03790 26 06159 1020R
01730          C     RBRK,POW                                      03802 24 06159 06167
01740          BE    LRPOW                                         03814 46 04536 01200
01750          C     LBRK,PLUS                                     03826 24 06161 10985
01760          BE    LPL                                           03838 46 04006 01200
01770          C     LBRK,MINUS                                    03850 24 06161 10989
01780          BE    LMI                                           03862 46 04026 01200
01790          C     LBRK,STAR                                     03874 24 06161 06165
01800          BE    LSTAR                                         03886 46 04090 01200
01810          C     LBRK,POW                                      03898 24 06161 06167
01820          BE    LPOW                                          03910 46 04110 01200
01830          C     LBRK,SLASH                                    03922 24 06161 06169
```

```
01840        BE    LSLASH
01850        B     STRER
01860        DORG  *-4
01870 STRER  BTM   WRITE,STRMS
01880 STRMS  DAC   20,*ILLEGAL STRUCTURE*,
01890*       LEFT BREAK OPERATION
01900 LPL    BTM   STERM,VAL
01910        B     RBK
01920        DORG  *-4
01930 LMI    BTM   STERM,VAL
01940        BNF   *+32,TERM-2
01950        CF    TERM-2
01960        B     RBK
01970        DORG  *-4
01980        SF    TERM-2
01990        B     RBK
02000        DORG  *-4
02010 LSTAR  BTM   FMUL,0
02020        B     RBK
02030        DORG  *-4
02040 LPOW   TD    DIGSV,TERM-2
02050        FLN   TERM,TERM

02060        TF    80,CLEAR
02070        BTM   FMUL,0
02080        FEX   TERM,TERM

02090        BNF   OK,DIGSV
02100        CM    VAL,00,10
02110        BL    OK
02120        C     VAL,FFKK
02130        BP    OK
02140        TFM   FIND,VAL
02150        S     FIND,FFKK2
02160        A     FIND,VAL
02170        SF    -FIND
02180 FIND   DS    5,*
02190        AM    FIND,1
02200        TF    DIGSV,-FIND
02210        CF    DIGB
02220 DIGSV  DC    3,000,*
02230 DIGB   DS    0,DIGSV-1
02240        AM    DIGSV,05,10
02250 LOJP   CM    DIGB,0,10
02260        BE    OK
02270        BL    NEG
02280        SM    DIGB,02,10
02290        B     LOJP
02300        DORG  *-4
02310 NEG    SF    TERM-2
02320 OK     BTM   SVAL,TERM
02330        SM    LEVEL,1
02340        BTM   PULL,*+12
02350        B     LBK
```

```
03934 46 04474 01200
03946 49 03954 00000
03953
03954 17 03672 -3967
03967 00040

04006 17 05388 -6089
04018 49 04840 00000
04025
04026 17 05388 -6089
04038 44 04070 06132
04050 33 06132 00000
04062 49 04840 00000
04069
04070 32 06132 00000
04082 49 04840 00000
04089
04090 17 05210 -0000
04102 49 04840 00000
04109
04110 25 04349 06132
04122 10 02375 -4141
04134 49 0230- 00000
04141 00005 -6134
04146 00005 -6134
04151 00001 '
04152 26 00080 06067
04164 17 05210 -0000
04176 10 02375 -4195
04188 49 0231- 00000
04195 00005 -6134
04200 00005 -6134
04205 00001 '
04206 44 04430 04349
04218 14 06089 000-0
04230 47 04430 01300
04242 24 06089 11251
04254 46 04430 01100
04266 16 04313 -6089
04278 22 04313 11299
04290 21 04313 06089
04302 32 0431L 00000
04313 00005
04314 11 04313 -0001
04326 26 04349 0431L
04338 33 04348 00000
04349 00003
04348 00000
04350 11 04349 000-5
04362 14 04348 000-0
04374 46 04430 01200
04386 47 04418 01300
04398 12 04348 000-2
04410 49 04362 00000
04417
04418 32 06132 00000
04430 17 05300 -6134
04442 12 05894 -0001
04454 17 05740 -4466
04466 49 03778 00000
```

```
02360        DORG  *-4
02370 LSLASH C     VAL-2,ZZERO-2
02380        BE    ZERDV
02390        FD    TERM,VAL

02400        B     RBK
02410        DORG  *-4
02420 LRPOW  AM    LEVEL,1
02430        TF    LBRKST,LBRK
02440        BTM   PUSH,*+12
02450        BTM   STERM,VAL
02460        B     RSCAN
02470        DORG  *-4
02480 ZERDV  WATY  INFIN
02490        B     FIRST
02500        DORG  *-4
02510 INFIN  DAC   10, INFINITE',
02520 LLPAR  AM    LEVEL,1
02530        BTM   PUSH,*+12
02540        B     POOP
02550        DORG  *-4
02560 TSX    BTM   SVAL,SUM
02570        SM    LEVEL,1
02580        BL    PARER
02590        BTM   PULL,*+12
02600        BD    DOWN,PDIG
02610        AM    CNT,2
02620        B     LBK
02630        DORG  *-4
02640 PARER  BTM   WRITE,PARMS
02650 DOWN   BTM   SNUMB,VAL
02660        AM    CNT,2
02670        TDM   PDIG,0
02680        TF    PCNT,CNT
02690        B     -RTRN
02700        DORG  *-4
02710 PARMS  DAC   14,*PAREN ERROR*,
02720*       RIGHT BREAK DETERMINATION
02730 RBK    C     RBRK,EQUAL
02740        BE    REQUAL
02750        C     RBRK,PLUS
02760        BE    RPL
02770        C     RBRK,MINUS
02780        BE    RMI
02790        C     RBRK,STAR
02800        BE    RSTAR
02810        C     RBRK,POW
02820        BE    RPOW
02830        C     RBRK,SLASH
02840        BE    RSLASH
02850        C     RBRK,RPAR
02860        BE    RRPAR
02870        B     STRER
02880        DORG  *-4
02890*       RIGHT BREAK OPERATION
02900 RPL    BTM   FADD,0
02910        B     RSCAN
```

```
04473
04474 24 06087 06154
04486 46 04592 01200
04498 10 02375 -4572
04510 49 0234- 00000
04517 00005 -6134
04522 00005 -6089
04527 00001 '
04528 49 04840 00000
04535
04536 11 05894 -0001
04548 26 06163 06161
04560 17 05506 -4572
04572 17 05388 -6089
04584 49 05470 00000
04591
04592 39 04613 00100
04604 49 02602 00000
04611
04613 00020
04632 11 05894 -0001
04644 17 05506 -4656
04656 49 03170 00000
04663
04664 17 05300 -6111
04676 12 05894 -0001
04688 47 04744 01300
04700 17 05740 -4712
04712 43 04756 10924
04724 11 10209 -0002
04736 49 03778 00000
04743
04744 17 03672 -4813
04756 17 05432 -6089
04768 11 10209 -0002
04780 15 10924 00000
04792 26 06203 10209
04804 49 1092L 00000
04811
04813 00028

04840 24 06159 06177
04852 46 05068 01200
04864 24 06159 10985
04876 46 05016 01200
04888 24 06159 10989
04900 46 05036 01200
04912 24 06159 06165
04924 46 05044 01200
04936 24 06159 06167
04948 46 05052 01200
04960 24 06159 06169
04972 46 05060 01200
04984 24 06159 06175
04996 46 05148 01200
05008 49 03954 00000
05015

05016 17 05172 -0000
05028 49 05470 00000
```

```
02920        DORG *-4
02930 RMI    B    RPL
02940        DORG *-4
02950 RSTAR  B    RSCAN
02960        DORG *-4
02970 RPOW   B    RSCAN
02980        DORG *-4
02990 RSLASH B    RSCAN
03000        DORG *-4
03010 REQUAL CM   LEVEL,0
03020        BNE  PARER
03030        BTM  FADD,0
03040        BTM  PRINT,*+12
03050        BD   READP2,READG
03060        BD   INTO2,DIGR
03070        B    FIRST
03080        DORG *-4
03090 RRPAR  BTM  FADD,0
03100        B    TSX
03110        DORG *-4
03120        DS   5
03130 FADD   FA   SUM,TERM

03140        BB
03150        DORG *-9
03160        DS   5
03170 FMUL   FM   TERM,VAL

03180        BB
03190        DORG *-9
03200*       CALCULATES EFFECTIVE ADDRESS FOR INDIRECT ADDRESSED OPS
03210        DS   5
03220 CALC   BNF  BCALC,CALC-1
03230        CF   CALC-1
03240        TF   CALC-1,-CALC+1
03250        B    CALC
03260        DORG *-4
03270 BCALC  BB
03280        DORG *-9
03290 EFFECT DS   0,CALC-1
03300*       SPECIAL TFL COMMANDS
03310        DS   5
03320 SVAL   TF   VAL,-SVAL+1
03330        SM   SVAL-1,2
03340        TF   VAL-2,-SVAL+1
03350        BB
03360        DORG *-9
03370        DS   5
03380 SSUM   TF   SUM,-SSUM+1
03390        SM   SSUM-1,2
03400        TF   SUM-2,-SSUM+1
03410        BB
03420        DORG *-9
03430        DS   5
```

```
05035
05036 49 05016 00000
05043
05044 49 05470 00000
05051
05052 49 05470 00000
05059
05060 49 05470 00000
05067
05068 14 05894 -0000
05080 47 04744 01200
05092 17 05172 -0000
05104 17 11000 -5116
05116 43 08384 10972
05128 43 10162 08164
05140 49 02602 00000
05147
05148 17 05172 -0000
05160 49 04664 00000
05167
05171 00005
05172 10 02375 -5191
05184 49 0235- 00000
05191 00005 -6111
05196 00005 -6134
05201 00001 '
05202 42 00000 00000
05204
05208 00005
05210 10 02375 -5229
05222 49 0234N 00000
05229 00005 -6134
05234 00005 -6089
05239 00001 '
05240 42 00000 00000
05242
05246 00005
05248 44 05292 05247
05260 33 05247 00000
05272 26 05247 0524P
05284 49 05248 00000
05291
05292 42 00000 00000
05294
05247 00000
05298 00005
05300 26 06089 0529R
05312 12 05299 -0002
05324 26 06087 0529R
05336 42 00000 00000
05338
05342 00005
05344 26 06111 0534L
05356 12 05343 -0002
05368 26 06109 0534L
05380 42 00000 00000
05382
05386 00005
```

```
03440 STERM  TF   TERM,-STERM+1
03450        SM   STERM-1,2
03460        TF   TERM-2,-STERM+1
03470        BB
03480        DORG *-9
03490        DS   5
03500 SNUMB  TF   NUMB,-SNUMB+1
03510        SM   SNUMB-1,2
03520        TF   NUMB-2,-SNUMB+1
03530        BB
03540        DORG *-9
03550*       RSCAN ROUTINE
03560 RSCAN  AM   CNT,2
03570        TF   LBRK,RBRK
03580        B    LOOPR
03590        DORG *-4
03600*       PUSH SAVES SUM,TERM,LBRKST
03610*       USED WITH ( ) FOR RECURSIVENESS
03620        DORG *+6
03630 PUSH   A    TSAVE,FFKK2
03640        TF   *+35,TSAVE
03650        TFLS -TSAVE,SUM


03660        A    TSAVE,FFKK2
03670        TF   *+35,TSAVE
03680        TFLS -TSAVE,TERM


03690        AM   TSAVE,6
03700        TF   -TSAVE,PDIG
03710        AM   TSAVE,2
03720        TF   -TSAVE,LBRKST
03730        CM   TSAVE,SAVE+TAB1Z
03740        BNL  FULLP
03750        BTM  SSUM,ZZERO
03760        BTM  STERM,ZZERO
03770        TDM  PDIG,0
03780        B    -PUSH+1
03790        DORG *-4
03800 TSAVE  DS   5
03810*       PULL RESTORES SUM,TERM,LBRK
03820*       SEE ABOVE
03830        DORG *+6
03840 PULL   TF   LBRK,-TSAVE
03850        SM   TSAVE,2
03860        TF   PDIG,-TSAVE
03870        SM   TSAVE,6
03880        BT   STERM,TSAVE
03890        S    TSAVE,FFKK2
03900        BT   SSUM,TSAVE
03910        S    TSAVE,FFKK2
03920        B    -PULL+1
03930        DORG *-4
03940 FULLP  BTM  WRITE,PARFL
03950 PARFL  DAC  17,*PAREN OVERFLOW*,
```

```
05388 26 06134 0538P
05400 12 05387 -0002
05412 26 06132 0538P
05424 42 00000 00000
05426
05430 00005
05432 26 10968 0543J
05444 12 05431 -0002
05456 26 10966 0543J
05468 42 00000 00000
05470

05470 11 10209 -0002
05482 26 06161 06159
05494 49 03266 00000
05501


05506

05506 21 05733 11299
05518 26 05553 05733
05530 10 02375 -5549
05542 49 0228N 00000
05549 00005 -573L
05554 00005 -6111
05559 00001 '
05560 21 05733 11299
05572 26 05607 05733
05584 10 02375 -5603
05596 49 0228N 00000
05603 00005 -573L
05608 00005 -6134
05613 00001 '
05614 11 05733 -0006
05626 26 0573L 10924
05638 11 05733 -0002
05650 26 0573L 06163
05662 14 05733 -6047
05674 46 05844 01300
05686 17 05344 -6156
05698 17 05388 -6156
05710 15 10924 00000
05722 49 0550N 00000
05729

05733 00005

05739
05740 26 06161 0573L
05752 12 05733 -0002
05764 26 10924 0573L
05776 12 05733 -0006
05788 27 05388 05733
05800 22 05733 11299
05812 27 05344 05733
05824 22 05733 11299
05836 49 0573R 00000
05843
05844 17 03672 -5857
05857 00034
```

```
03960 LEVEL DS   5                                           05894 00005
03970 RDIG  DS   1                                           05895 00001
03980 SAVE  DS   2,,,DORG STATEMENT MUST FOLLOW              05897 00002
03990       DORG *+TAB1Z                                     06047
04000*       VARIABLES
04010 CLEAR DC   21,000000000000000000000,                  06067 00021
04020       DC   20,0,                                       06087 00020
04030 VAL   DC   2,1,                                        06089 00002
04040       DC   20,0,                                       06109 00020
04050 SUM   DC   2,1,                                        06111 00002
04060       DC   1,',                                        06112 00001
04070       DC   20,0,                                       06132 00020
04080 TERM  DC   2,1,                                        06134 00002
04090       DC   20,0,                                       06154 00020
04100 ZZERO DC   2,-99,                                      06156 00002
04110*       END OF FLOATING POINT VARIABLES
04120 RBRK  DAS  1                                           06159 00002
04130 LBRK  DAS  1                                           06161 00002
04140 LBRKST DAS 1                                           06163 00002
04150 STAR  DAC  1,*,                                        06165 00002
04160 POW   DAC  1,P,                                        06167 00002
04170 SLASH DAC  1,/,                                        06169 00002
04180 DOL   DAC  1,$,                                        06171 00002
04190 LPAR  DAC  1,(,                                        06173 00002
04200 RPAR  DAC  1,),                                        06175 00002
04210 EQUAL DAC  2,=',                                       06177 00004
04220 AT    DAC  2,' ,                                        06181 00004
04230 A     DAC  1,A,                                        06185 00002
04240 MESS3 DAC  6,READY',                                   06187 00012
04250       DORG *+6                                         06203
04260*
04270*    FETCH CONVRTS NUMERICAL INPUT INTO FLOATING POINT NOTATION AND
04280*        ADJUSTS FOR MANTISSA LENGTH (FFKK)
04290*
04300 FETCH CF   FSIGN                                       06204 33 10971 00000
04310       TFM  INC,1,10                                    06216 16 11131 000-1
04320       TFM  CNT,NUMB-1                                  06228 16 10209 J0967
04330       S    CNT,FFKK                                    06240 22 10209 11251
04340       TF   INSRT2+6,CNT                                06252 26 06914 10209
04350       TDM  FULL,0                                      06264 15 10970 00000
04360 INSRT1 TF  NUMBR,CNT                                   06276 26 11107 10209
04370       BTM  SNUMB,ZERO                                  06288 17 05432 J0946
04380       B    *+24                                        06300 49 06324 00000
04390 INLOP AM   PCNT,2                                      06312 11 06203 -0002
04400       C    PERIOD,-PCNT                                06324 24 10981 0620L
04410       BE   FRACT                                       06336 46 06564 01200
04420       C    AZERO,-PCNT                                 06348 24 10978 0620L
04430       BE   INLOP                                       06360 46 06312 01200
04440       BP   PEND                                        06372 46 07020 01100
04450*       PEND HANDLES FUNCTIONS
04460 LOOP  BD   *+24,FULL                                   06384 43 06408 10970
04470       TD   -NUMBR,-PCNT                                06396 25 1110P 0620L
04480       AM   PCNT,2                                      06408 11 06203 -0002
04490       C    PERIOD,-PCNT                                06420 24 10981 0620L
04500       BNE  *+36                                        06432 47 06468 01200
04510       TFM  INC,0,10                                    06444 16 11131 000-0
04520       B    *-48                                        06456 49 06408 00000
04530       C    AZERO,-PCNT                                 06468 24 10978 0620L
04540       BP   END                                         06480 46 06644 01100
04550       A    NUMB,INC                                    06492 21 10968 11131
```

```
04560       AM   NUMBR,1                                     06504 11 11107 -0001
04570       CM   NUMBR,NUMB-1                                06516 14 11107 J0967
04580       BNE  *+24                                        06528 47 06552 01200
04590       TDM  FULL,1                                      06540 15 10970 00001
04600       B    LOOP                                        06552 49 06384 00000
04610 FRACT S    NUMB,INC                                    06564 22 10968 11131
04620       AM   PCNT,2                                      06576 11 06203 -0002
04630       C    AZERO,-PCNT                                 06588 24 10978 0620L
04640       BE   FRACT                                       06600 46 06564 01200
04650       BP   END                                         06612 46 06644 01100
04660       TFM  INC,0,10                                    06624 16 11131 000-0
04670       B    LOOP                                        06636 49 06384 00000
04680       DORG *-4                                         06643
04690 END   C    E,-PCNT                                     06644 24 10991 0620L
04700       BNE  END2                                        06656 47 06908 01200
04710       AM   PCNT,2                                      06668 11 06203 -0002
04720       CF   FLAG                                        06680 33 10994 00000
04730       C    PLUS,-PCNT                                  06692 24 10985 0620L
04740       BE   SIGN                                        06704 46 06752 01200
04750       C    MINUS,-PCNT                                 06716 24 10989 0620L
04760       BNE  SIGN+12                                     06728 47 06764 01200
04770       SF   FLAG                                        06740 32 10994 00000
04780 SIGN  AM   PCNT,2                                      06752 11 06203 -0002
04790       TFM  INC,0,10                                    06764 16 11131 000-0
04800       TD   INC,-PCNT                                   06776 25 11131 0620L
04810       AM   PCNT,2                                      06788 11 06203 -0002
04820       C    AZERO,-PCNT                                 06800 24 10978 0620L
04830       BP   END2-36                                     06812 46 06872 01100
04840       TD   INC-1,INC                                   06824 25 11130 11131
04850       TD   INC,-PCNT                                   06836 25 11131 0620L
04860       AM   PCNT,2                                      06848 11 06203 -0002
04870       SF   INC-1                                       06860 32 11130 00000
04880       BNF  END2-12,FLAG                                06872 44 06896 10994
04890       SF   INC                                         06884 32 11131 00000
04900       A    NUMB,INC                                    06896 21 10968 11131
04910 END2  SF   NUMB-9                                      06908 32 10959 00000
04920       BNF  *+24,FSIGN                                  06920 44 06944 10971
04930       SF   NUMB-2                                      06932 32 10966 00000
04940 IR1   DS   5,*                                         06943 00005
04950       B    -IR1                                        06944 49 0694L 00000
04960       DORG *-4                                         06951
04970*
04980*    PEND HANDLES FUNCTIONS AS LONG AS ARGUEMENTS ARE NOT FUNCTIONS
04990*
05000*    THE FOLLOWING FUNCTIONS ARE ALLOWED
05010*       SIN,COS,SQRT,ATAN,LN,LOGN,LOG,LOG10,EXP,EXP10
05020*       NOTE LN AND LOGN ARE THE SAME, SAME FOR LOG AND LOG10
05030 GOOP  SM   PCNT,2                                      06952 12 06203 -0002
05040       C    AZERO,-PCNT                                 06964 24 10978 0620L
05050       BNE  STRER                                       06976 47 03954 00000
05060       AM   PCNT,2                                      06988 11 06203 -0002
05070       SF   -END2-6                                     07000 32 0691M 00000
05080       B    -IR1                                        07012 49 0694L 00000
05090       DORG *-4                                         07019
05100 PEND  C    A4,-PCNT                                    07020 24 07567 0620L
05110       BP   GOOP                                        07032 46 06952 01100
05120       TF   TCNT,PCNT                                   07044 26 09689 06203
05130       TFM  CONTR,2                                     07056 16 07431 -0002
05140       SM   TCNT,1                                      07068 12 09689 -0001
05150 AG1   AM   TCNT,3                                      07080 11 09689 -0003
```

```
05160       C    A4,-TCNT
05170       BP   URP1
05180       SM   TCNT,1
05190       CF   -TCNT
05200       AM   CONTR,2
05210       CM   CONTR,10
05220       BNE  AG1
05230 URP   AM   TCNT,1
05240       TF   COMPR,INTEX
05250 LOOPT AM   COMPR,16
05260       BNR  *+24,-COMPR
05270       B    TABN
05280       BV   *+12
05290       C    -TCNT,-COMPR
05300       BV   LOOPT
05310       BNE  LOOPT
05320       AM   COMPR,1
05330       BD   FUNT,-COMPR
05340       AM   COMPR,5
05350       SF   COMPR
05360 COMPR DS   5,*
05370       BT   CALC,COMPR
05380       BT   SNUMB,EFFECT
05390       A    PCNT,CONTR
05400       B    -IR1
05410       DORG *-4
05420 URP1  SM   TCNT,2
05430       B    URP+12
05440       DORG *-4
05450 FUNT  BNR  FUNC,-COMPR
05460       AM   COMPR,5
05470       SF   COMPR
05480 CONTR DS   5,*
05490       B    -COMPR
05500       DORG *-4
05510 FUNC  AM   COMPR,5
05520       TF   RTRN,-COMPR
05530       A    PCNT,CONTR
05540       C    LPAR,-PCNT
05550       BNE  PARER
05560       AM   PCNT,2
05570       B    COMM
05580       DORG *-4
05590 TABN  SM   CONTR,2
05600       BZ   VARER
05610       SM   TCNT,1
05620       SF   -TCNT
05630 A4    DC   2,40,*
05640       SM   TCNT,1
05650       B    LOOPT-12
05660       DORG *-4
05670 VARER BTM  WRITE,VARMES
05680 VARMES DAC 21,*UNDEFINED VARIABLE*',
05690 LOG10 DAC  5,LOG10,
05700       DC   1,1,
05710       DSA  LOGTN
05720       DAC  5,EXP10,
05730       DC   1,1,
05740       DSA  EXPTN
05750       DAS  1
```

```
07092 24 07567 0968R
07104 46 07376 01100
07116 12 09689 -0001
07128 33 0968R 00000
07140 11 07431 -0002
07152 14 07431 -0010
07164 47 07080 01200
07176 11 09689 -0001
07188 26 07331 08152
07200 11 07331 -0016
07212 45 07236 0733J
07224 49 07520 00000
07236 46 07248 01400
07248 24 0968R 0733J
07260 46 07200 01400
07272 47 07200 01200
07284 11 07331 -0001
07296 43 07396 0733J
07308 11 07331 -0005
07320 32 07331 00000
07331 00005
07332 27 05248 07331
07344 27 05432 05247
07356 21 06203 07431
07368 49 0694L 00000
07375
07376 12 09689 -0002
07388 49 07188 00000
07395
07396 45 07440 0733J
07408 11 07331 -0005
07420 32 07331 00000
07431 00005
07432 49 0733J 00000
07439
07440 11 07331 -0005
07452 26 10923 0733J
07464 21 06203 07431
07476 24 06173 0620L
07488 47 04744 01200
07500 11 06203 -0002
07512 49 10888 00000
07519
07520 12 07431 -0002
07532 46 07588 01200
07544 12 09689 -0001
07556 32 0968R 00000
07567 00002
07568 12 09689 -0001
07580 49 07188 00000
07587
07588 17 03672 -7601
07601 00042
07643 00010
07652 00001
07657 00005 J0490
07659 00010
07668 00001
07673 00005 J0528
07675 00002
```

```
05760       DAC  4,LOGN,
05770       DC   1,1,
05780       DSA  LOGNF
05790       DAS  1
05800       DAC  4,ATAN,
05810       DC   1,1,
05820       DSA  ATANF
05830       DAS  1
05840       DAC  4,SQRT,
05850       DC   1,1,
05860       DSA  SQRTF
05870       DAS  3
05880       DAC  2,LN,
05890       DC   1,1,
05900       DSA  LOGNF
05910       DAS  2
05920       DAC  3,EXP,
05930       DC   1,1,
05940       DSA  EXPF
05950       DAS  2
05960       DAC  3,LOG,
05970       DC   1,1,
05980       DSA  LOGTN
05990       DAS  2
06000       DAC  3,COS,
06010       DC   1,1,
06020       DSA  COSF
06030       DAS  2
06040       DAC  3,SIN,
06050       DC   1,1,
06060       DSA  SINF
06070       DAS  2
06080       DAC  3,ABS,
06090       DC   1,1,
06100       DSA  ABSF
06110       DAC  5,CLEAR,
06120       DC   1,',
06130       DSA  CLAPR
06140       DAC  5,PRINT,
06150       DC   1,',
06160       DSA  PRINF
06170       DAC  5,DEFIN,
06180       DC   1,',
06190       DSA  DEFE
06200       DAC  5,EFORM,
06210       DC   1,',
06220       DSA  EFORM
06230       DAC  5,FFORM,
06240       DC   1,',
06250       DSA  FFORM
06260       DAC  5,COFRM,
06270       DC   1,',
06280       DSA  COFRM
06290       DAC  5,BRIEF,
06300       DC   1,',
06310       DSA  BRIEF
06320       DAC  5,FANDK,
06330       DC   1,',
06340       DSA  GFFKK
06350       DAS  1
```

```
07677 00008
07684 00001
07689 00005 J0566
07691 00002
07693 00008
07700 00001
07705 00005 J0642
07707 00002
07709 00008
07716 00001
07721 00005 J0604
07723 00006
07729 00004
07732 00001
07737 00005 J0566
07739 00004
07743 00006
07748 00001
07753 00005 J0680
07755 00004
07759 00006
07764 00001
07769 00005 J0490
07771 00004
07775 00006
07780 00001
07785 00005 J0718
07787 00004
07791 00006
07796 00001
07801 00005 J0756
07803 00004
07807 00006
07812 00001
07817 00005 J0794
07819 00010
07828 00001
07833 00005 -8488
07835 00010
07844 00001
07849 00005 -8546
07851 00010
07860 00001
07865 00005 -9558
07867 00010
07876 00001
07881 00005 -9246
07883 00010
07892 00001
07897 00005 -9266
07899 00010
07908 00001
07913 00005 -9286
07915 00010
07924 00001
07929 00005 -9306
07931 00010
07940 00001
07945 00005 -2542
07947 00002
```

```
06360        DAC   4,PROG,
06370        DC    1,',
06380        DSA   PROG
06390        DAC   5,RESUL,
06400        DC    1,',
06410        DSA   INTO2
06420 DELT   DAC   5,DELET,
06430        DC    1,',
06440        DSA   DELE
06450        DAS   1
06460        DAC   4,EXIT,
06470        DC    1,',
06480        DSA   00796
06490        DAS   1
06500        DAC   4,READ,
06510        DC    1,',
06520        DSA   READP1
06530        DAS   1
06540        DAC   4,TYPE,
06550        DC    1,',
06560        DSA   TYPER
06570        DAS   1
06580        DAC   4,CARD,
06590        DC    1,',
06600        DSA   CARDER
06610 BEGN   DAC   5,    ',
06620        DSS   DEFTB1*16
06630 INTEX  DSA   LOG10-8
06640 CONEX  DSA   BEGN-8
06650 INDIC  DSA   CONST
06660 DIGL   DS    1
06670 DIGR   DS    1
06680 TOLNG  BTM   WRITE,LNGMS
06690 LNGMS  DAC   16,*NAME TOO LONG*,
06700 DCODE  DAC   2,E/,
06710 TYPER  TDM   RATY+9,-1
06720        B     READ
06730        DORG  *-4
06740 CARDER TDM   RATY+9,5
06750        B     READ
06760        DORG  *-4
06770 READP1 TR    INPUT2-1,INPUT-1
06780        RCTY
06790        A     PCNT,CONTR
06800        TF    RTRN,PCNT
06810        TDM   READG,1
06820        BTM   PUSH,*+12
06830        TF    RSAVE,TSAVE
06840        TF    SLEV,RDIG
06850        TFM   LEVEL,0
06860        BTM   WRITE,R
06870 SLEV   DS    6
06880 R      DAC   2,R',
06890 READP2 TR    INPUT-1,INPUT2-1
06900        TDM   READG,0
06910        BTM   SNUMB,VAL
06920        TF    TSAVE,RSAVE
06930        BTM   PULL,*+12
06940        TF    RDIG,SLEV
06950        TF    PCNT,RTRN
```

```
07949 00008
07956 00001
07961 00005 -8722
07963 00010
07972 00001
07977 00005 J0162
07979 00010
07988 00001
07993 00005 -9326
07995 00002
07997 00008
08004 00001
08009 00005 -0796
08011 00002
08013 00008
08020 00001
08025 00005 -8254
08027 00002
08029 00008
08036 00001
08041 00005 -8214
08043 00002
08045 00008
08052 00001
08057 00005 -8234
08059 00010
08068 00080
08152 00005 -7635
08157 00005 -8051
08162 00005 J0813
08163 00001
08164 00001
08166 17 03672 -8179
08179 00032
08211 00004
08214 15 02791 0000J
08226 49 02602 00000
08233
08234 15 02791 00005
08246 49 02602 00000
08253
08254 31 12250 12100
08266 34 00000 00102
08278 21 06203 07431
08290 26 10923 06203
08302 15 10972 00001
08314 17 05506 -8326
08326 26 08873 05733
08338 26 08379 05895
08350 16 05894 -0000
08362 17 03672 -8381
08379 00006
08381 00004
08384 31 12100 12250
08396 15 10972 00000
08408 17 05432 -6089
08420 26 05733 08873
08432 17 05740 -8444
08444 26 05895 08379
08456 26 06203 10923
```

```
06960        RCTY
06970        B     FOO2
06980        DORG  *-4
06990 CLAPR  RCTY
07000        TD    BEGN+8,RMK
07010        TFM   INDIC,CONST
07020        B     READ
07030        DORG  *-4
07040 PROTR  DAC   7,     =',
07050 PRINF  TF    COMPR,CONEX
07060        AM    COMPR,6
07070 LOPOT  AM    COMPR,10
07080        BNR   *+24,-COMPR
07090        B     READ
07100        RCTY
07110        TF    PROTR+8,FILL+8
07120        TF    PROTR+8,-COMPR
07130        WATY  PROTR
07140        AM    COMPR,6
07150        TF    CONTR,-COMPR
07160        BT    CALC,CONTR
07170        BT    SSUM,EFFECT
07180        BTM   PRINT,*+12
07190        B     LOPOT
07200        DORG  *-4
07210 PROG   C     AZERO,INPUT+8
07220        BNL   *+36
07230        TD    PROG4+9,INPUT+8
07240        B     READ
07250        TFM   PROGD2,10,10
07260        TFM   LISTP,LISTL
07270        TFM   -LISTP,TOP-2
07280        B     READ
07290        DORG  *-4
07300 PROG11 SM    CNT,INPUT-4
07310        S     -LISTP,CNT
07320        CM    -LISTP,TOP-PROGZ2
07330        BL    PROGER
07340        SF    LISTP
07350 RSAVE  DS    5,*
07360        TR    -LISTP,INPUT-1
07370        CF    LISTP
07380        TF    CNT,-LISTP
07390        AM    LISTP,5
07400        CM    LISTP,LISTL+5*PROGZ1-5
07410        BP    PROGER
07420        TF    -LISTP,CNT
07430        B     READ
07440        DORG  *-4
07450 PROG1  TFM   PROGD2,01,10
07460        TF    STOPL,LISTP
07470        TFM   LISTP,LISTL-5
07480        CM    STOPL,LISTL
07490        BE    START1
07500        B     READ
07510        DORG  *-4
07520 PROG2  AM    LISTP,5
07530        C     LISTP,STOPL
07540        BE    PROG3
07550 PROG4  BC1   START1
```

```
08468 34 00000 00102
08480 49 03350 00000
08487
08488 34 00000 00102
08500 25 08067 12079
08512 16 08162 J0813
08524 49 02602 00000
08531
08533 00014
08546 26 07331 08157
08558 11 07331 -0006
08570 11 07331 -0010
08582 45 08606 0733J
08594 49 02602 00000
08606 34 00000 00102
08618 26 08541 12685
08630 26 08541 0733J
08642 39 08533 00100
08654 11 07331 -0006
08666 26 07431 0733J
08678 27 05248 07431
08690 27 05344 05247
08702 11 11000 -8714
08714 49 08570 00000
08721
08722 24 10978 12109
08734 46 08770 01300
08746 25 09079 12109
08758 49 02602 00000
08770 16 10976 000J0
08782 16 09117 -9214
08794 16 0911P J9998
08806 49 02602 00000
08813
08814 12 10209 J2097
08826 22 0911P 10209
08838 14 0911P J9850
08850 47 09146 01300
08862 32 09117 00000
08873 00005
08874 31 0911P 12100
08886 33 09117 00000
08898 26 10209 0911P
08910 11 09117 -0005
08922 14 09117 -9234
08934 46 09146 01100
08946 26 0911P 10209
08958 49 02602 00000
08965
08966 16 10976 000-1
08978 26 09093 09117
08990 16 09117 -9209
09002 14 09093 -9214
09014 46 02522 01200
09026 49 02602 00000
09033
09034 11 09117 -0005
09046 24 09117 09093
09058 46 09126 01200
09070 46 02522 00100
```

```
07560          SF    LISTP
07570 STOPL    DS    5,*
07580          TR    INPUT-1,-LISTP
07590          CF    LISTP
07600 LISTP    DS    5,*
07610          B     READR
07620          DORG  *-4
07630 PROG3    TFM   LISTP,LISTL
07640          B     PROG4
07650          DORG  *-4
07660 PROGER   RCTY
07670          WATY  PROERR
07680          B     START1
07690          DORG  *-4
07700 PROERR   DAC   16,*PROG OVERFLOW*,
07710 LISTL    DSB   5,PROGZ1
07720 COMS     DAC   1,=,
07730          DAC   1,=,
07740          DAC   1,=,
07750          DAC   2,=',
07760 EFORM    TDM   FORM,0
07770          B     READ
07780          DORG  *-4
07790 FFORM    TDM   FORM,1
07800          B     READ
07810          DORG  *-4
07820 COFRM    TDM   PORM,0
07830          B     READ
07840          DORG  *-4
07850 BRIEF    TDM   PORM,1
07860          B     READ
07870          DORG  *-4
07880 DELE     TDM   DIGL,1
07890          B     DEFE+12
07900          DORG  *-4
07910 DEL2     DS    0,VARER
07920 DEL1     AM    COMPR,6
07930          TF    TCNT,-COMPR
07940          AM    TCNT,1
07950          TF    CONTR,TCNT
07960          S     TCNT,FFKK2
07970          TR    -TCNT,-CONTR
07980          AM    COMPR,1
07990          TF    CONTR,COMPR
08000          SM    COMPR,16
08010          TR    -COMPR,-CONTR
08020          S     INDIC,FFKK2
08030          AM    COMPR,9
08040 MOVE     BNR   *+24,-COMPR
08050          B     READ
08060          AM    COMPR,6
08070          S     -COMPR,FFKK2
08080          AM    COMPR,10
08090          B     MOVE
08100          DORG  *-4
08110 DEFE     TDM   DIGL,0
08120          AM    TCNT,3
08130          CF    -TCNT
08140 DSAVE    DS    5,*
08150          AM    TCNT,1
```

Column 2 (page 38):

```
09082 32 09117 00000          C     -TCNT,DCODE+2
09093 00005            08170          BNE   READ
09094 31 12100 0911P    08180          BD    STRER,DIGR
09106 33 09117 00000    08190          RCTY
09117 00005             08200          AM    TCNT,2
09118 49 02806 00000    08210 INTO    AM    TCNT,1
09125                   08220          CF    -TCNT
09126 16 09117 -9214    08230 TCNT    DS    5,*
09138 49 09070 00000    08240          AM    TCNT,1
09145                   08250          C     EQUAL,-TCNT
09146 34 00000 00102    08260          BE    READ
09158 39 09179 00100    08270          C     SLASH,-TCNT
09170 49 02522 00000    08280          BNE   INTO
09177                   08290          SM    TCNT,2
09179 00032             08300          TF    COMPR,CONEX
09214 00025             08310 LOOPD   AM    COMPR,16
09237 00002             08320          BNR   *+24,-COMPR
09239 00002             08330          B     TABD
09241 00002             08340          BV    *+12
09243 00004             08350          C     -TCNT,-COMPR
09246 15 10973 00000    08360          BV    LOOPD
09258 49 02602 00000    08370          BNE   LOOPD
09265                   08380          BD    DEL1,DIGL
09266 15 10973 00001    08390          TD    DIGL,RMK
09278 49 02602 00000    08400          B     TABD2
09285                   08410          DORG  *-4
09286 15 10974 00000    08420 TABD    BD    DEL2,DIGL
09298 49 02602 00000    08430 TABD2   CM    TCNT,INPUT+22
09305                   08440          BP    TOLNG
09306 15 10974 00001    08450          CM    COMPR,BEGN+DEFTB1*16-16
09318 49 02602 00000    08460          BP    DEFERR
09325                   08470          TF    -COMPR,-TCNT
09326 15 08163 00001    08480          AM    COMPR,1
09338 49 09570 00000    08490          TDM   -COMPR,0
09345                   08500          TDM   DIGR,1
07588 00000             08510          AM    COMPR,5
09346 11 07331 -0006    08520          BNR   *+24,DIGL
09358 26 09689 0733J    08530          B     *+24
09370 11 09689 -0001    08540          TFM   -COMPR,ZZERO
09382 26 07431 09689    08550          TF    DSAVE,COMPR
09394 22 09689 11299    08560          AM    COMPR,10
09406 31 0968R 0743J    08570          BNR   *+24,DIGL
09418 11 07331 -0001    08580          B     *+24
09430 26 07431 07331    08590          TD    -COMPR,RMK
09442 12 07331 -0016    08600          AM    TCNT,3
09454 31 0733J 0743J    08610          TR    INPUT-1,-TCNT
09466 22 08162 11299    08620          TDM   RDIG,0
09478 11 07331 -0009    08630          B     SET-12
09490 45 09514 0733J    08640          DORG  *-4
09502 49 02602 00000    08650 INTO4   BTM   SVAL,ZZERO
09514 11 07331 -0006    08660 INTO2   BD    READ,RDIG
09526 22 0733J 11299    08670          TDM   DIGR,0
09538 11 07331 -0010    08680          BNR   INTO3,DIGL
09550 49 09490 00000    08690          SF    DSAVE
09557                   08700 CNT     DS    5,*
09558 15 08163 00000    08710          BT    CALC,DSAVE
09570 11 09689 -0003    08720          TF    *+35,EFFECT
09582 33 0968R 00000    08730          TFLS  -DSAVE,VAL
09593 00005
09594 11 09689 -0001
```

Column 3 (page 39):

```
09606 24 0968R 08213
09618 47 02602 01200
09630 43 03954 08164
09642 34 00000 00102
09654 11 09689 -0002
09666 11 09689 -0001
09678 33 0968R 00000
09689 00005
09690 11 09689 -0001
09702 24 06177 0968R
09714 46 02602 01200
09726 24 06169 0968R
09738 47 09666 01200
09750 12 09689 -0002
09762 26 07331 08157
09774 11 07331 -0016
09786 45 09810 0733J
09798 49 09890 00000
09810 46 09822 01400
09822 24 0968R 0733J
09834 46 09774 01400
09846 47 09774 01200
09858 43 09346 08163
09870 25 08163 12079
09882 49 09902 00000
09889
09890 43 07588 08163
09902 14 09689 J2123
09914 46 08166 01100
09926 14 07331 -8123
09938 46 10430 01100
09950 26 0733J 0968R
09962 11 07331 -0001
09974 15 0733J 00000
09986 15 08164 00001
09998 11 07331 -0005
10010 45 10034 08163
10022 49 10046 00000
10034 16 0733J -6156
10046 26 09593 07331
10058 11 07331 -0010
10070 45 10094 08163
10082 49 10106 00000
10094 25 0733J 12079
10106 11 09689 -0003
10118 31 12100 0968R
10130 15 05895 00000
10142 49 02842 00000
10149
10150 17 05300 -6156
10162 43 02602 05895
10174 15 08164 00000
10186 45 10284 08163
10198 32 09593 00000
10209 00005
10210 27 05248 09593
10222 26 10257 05247
10234 10 02375 J0253
10246 49 0228N 00000
10253 00005 -959L
```

```
08740       CF   DSAVE
08750 KFRAC DS   5,*
08760       B    READ
08770       DORG *-4
08780 INTO3 CM   INDIC,CONST+DEFTB2-21
08790       BP   DEFERR
08800       A    INDIC,FFKK2
08810       BT   CALC,INDIC
08820       TF   *+35,EFFECT
08830       TFLS -INDIC,VAL


08840       TF   -DSAVE,INDIC
08850       AM   INDIC,1
08860       TD   -INDIC,RMK
08870       SM   INDIC,1
08880       B    READ
08890       DORG *-4
08900 DEFERR BTM  WRITE,DEFERM
08910 DEFERM DAC  24,*SYMBOL TABLE OVERFLOW*,
08920 LOGTN FLOG NUMB,NUMB


08930       B    FOO2
08940       DORG *-4
08950 EXPTN FEXT NUMB,NUMB


08960       B    FOO2
08970       DORG *-4
08980 LOGNF FLN  NUMB,NUMB


08990       B    FOO2
09000       DORG *-4
09010 SQRTF FSQR NUMB,NUMB


09020       B    FOO2
09030       DORG *-4
09040 ATANF FATN NUMB,NUMB


09050       B    FOO2
09060       DORG *-4
09070 EXPF  FEX  NUMB,NUMB
```

```
10258 00005 -6089
10263 00001 '
10264 33 09593 00000
10275 00005
10276 49 02602 00000
10283
10284 14 08162 J0867
10296 46 10430 01100
10308 21 08162 11299
10320 27 05248 08162
10332 26 10367 05247
10344 10 02375 J0363
10356 49 0228N 00000
10363 00005 -816K
10368 00005 -6089
10373 00001 '
10374 26 0959L 08162
10386 11 08162 -0001
10398 25 0816K 12079
10410 12 08162 -0001
10422 49 02602 00000
10429
10430 17 03672 J0443
10443 00048
10490 10 02375 J0509
10502 49 0230N 00000
10509 00005 J0968
10514 00005 J0968
10519 00001 '
10520 49 03350 00000
10527
10528 10 02375 J0547
10540 49 0231N 00000
10547 00005 J0968
10552 00005 J0968
10557 00001 '
10558 49 03350 00000
10565
10566 10 02375 J0585
10578 49 0230- 00000
10585 00005 J0968
10590 00005 J0968
10595 00001 '
10596 49 03350 00000
10603
10604 10 02375 J0623
10616 49 0233N 00000
10623 00005 J0968
10628 00005 J0968
10633 00001 '
10634 49 03350 00000
10641
10642 10 02375 J0661
10654 49 0232- 00000
10661 00005 J0968
10666 00005 J0968
10671 00001 '
10672 49 03350 00000
10679
10680 10 02375 J0699
```

```
09080       B    FOO2
09090       DORG *-4
09100 COSF  FCOS NUMB,NUMB


09110       B    FOO2
09120       DORG *-4
09130 SINF  FSIN NUMB,NUMB


09140       B    FOO2
09150       DORG *-4
09160 ABSF  CF   NUMB-2
09170       B    FOO2
09180       DORG *-4
09190 CONST DSS  DEFTB2
09200 COMM  TDM  PDIG,1
09210       TF   CNT,PCNT
09220       B    LLPAR
09230       DORG *-4
09240 PCNT  DS   1,FETCH-1
09250 RTRN  DC   5,0,
09260 PDIG  DC   1,0,
09270 INSRT2 DS  1,END2
09280       DC   20,0,
09290 ZERO  DC   2,1,
09300       DC   20,0,
09310 NUMB  DC   2,1,
09320       DC   1,',
09330 FULL  DS   1
09340 FSIGN DS   1
09350 READG DS   1
09360 FORM  DS   1
09370 PORM  DS   1
09380 PROGD1 DS  1
09390 PROGD2 DS  1
09400 AZERO DC   2,70,
09410 PERIOD DAC 2,.,
09420 PLUS  DAC  2,+,
09430 MINUS DAC  1,-,
09440 E     DAC  2,E,
09450 FLAG  DC   1,0,
09460       DORG *+6
09470*      OUPUT ROUTINE - HANDLES BOTH F AND E FORMATS
09480 PRINT TFM  TCNT,SUM-22
09490       BTM  SVAL,SUM
09500       WATY BLANK
09510       C    SUM-2,ZZERO-2
09520       BE   CANCL
09530       AM   TCNT,1
09540       BD   *+24,-TCNT
09550       B    *-24
```

```
10692 49 0231- 00000
10699 00005 J0968
10704 00005 J0968
10709 00001 '
10710 49 03350 00000
10717
10718 10 02375 J0737
10730 49 0233- 00000
10737 00005 J0968
10742 00005 J0968
10747 00001 '
10748 49 03350 00000
10755
10756 10 02375 J0775
10768 49 0232N 00000
10775 00005 J0968
10780 00005 J0968
10785 00001 '
10786 49 03350 00000
10793
10794 33 10966 00000
10806 49 03350 00000
10813
10813 00075
10888 15 10924 00001
10900 26 10209 06203
10912 49 04632 00000
10919
06203 00001
10923 00005
10924 00001
06908 00001
10944 00020
10946 00002
10966 00020
10968 00002
10969 00001
10970 00001
10971 00001
10972 00001
10973 00001
10974 00001
10975 00001
10976 00001
10978 00002
10981 00004
10985 00004
10989 00002
10991 00004
10994 00001
11000
11000 16 09689 -6089
11012 17 05300 -6111
11024 39 12071 00100
11036 24 06109 06154
11048 46 11320 01200
11060 11 09689 -0001
11072 43 11096 0968R
11084 49 11060 00000
```

```
09560        CF    -TCNT
09570 NUMBR  DS    5,*
09580        BNF   *+36,SUM-2
09590        CF    SUM-2
09600 INC    DS    5,*
09610        WATY  ALMIN
09620        BD    SKIPE,FORM
09630        WATY  PERIOD
09640        TD    TEMP,SUM-1
09650        TD    SUM-1,RMK
09660        WNTY  -TCNT
09670        TD    SUM-1,TEMP
09680        WATY  E
09690        BNF   *+48,SUM
09700        CF    SUM
09710 FFKK   DC    5,8,*
09720        WATY  ALMIN
09730        B     *+24
09740        WATY  PLUS
09750        CF    SUM-1
09760 FFKK2  DC    5,10,*
09770        WNTY  SUM-1
09780        B     -PRINT+1
09790        DORG  *-4
09800 CANCL  TFM   TCNT,PZER+1
09810        CF    PZER-19
09820        S     TCNT,FFKK
09830        WATY  PERIOD
09840        WNTY  -TCNT
09850        B     -PRINT+1
09860        DORG  *-4
09870 SKIPE  CF    OUTZE-1
09880        TR    INT,OUTZE-1
09890        TR    FRAC,OUTZE-1
09900        TFM   KINT,INT
09910        TFM   KFRAC,FRAC
09920        TF    ECNT,SUM
09930        CF    ECNT-1
09940 ECNT   DC    3,0,*
09950        C     ECNT,FFKK
09960        BP    ALINT
09970        BE    ALINT
09980        CM    ECNT,0,10
09990        BP    MIXED
10000 ARP    CM    ECNT,0,10
10010        BE    READY
10020        TDM   -KFRAC,0
10030        AM    KFRAC,1
10040        AM    ECNT,1,10
10050        B     ARP
10060        DORG  *-4
10070 READY  TFM   CNT,SUM-2
10080        BD    PUT,-CNT
10090        SM    CNT,1
10100        B     *-24
10110        DORG  *-4
10120 PUT    AM    CNT,1
10130        TD    -CNT,RMK
10140        TFM   CNT,SUM-1
10150        S     CNT,FFKK
```

```
11096 33 0968R 00000
11107 00005
11108 44 11144 06109
11120 33 06109 00000
11131 00005
11132 39 12075 00100
11144 43 11388 10973
11156 39 10981 00100
11168 25 12078 06110
11180 25 06110 12079
11192 38 0968R 00100
11204 25 06110 12078
11216 39 10991 00100
11228 44 11276 06111
11240 33 06111 00000
11251 00005
11252 39 12075 00100
11264 49 11288 00000
11276 39 10985 00100
11288 33 06110 00000
11299 00005
11300 38 06110 00100
11312 49 1099R 00000
11319
11320 16 09689 J2069
11332 33 12049 00000
11344 22 09689 11251
11356 39 10981 00100
11368 38 0968R 00100
11380 49 1099R 00000
11387
11388 33 12047 00000
11400 31 12121 12047
11412 31 12231 12047
11424 16 11891 J2121
11436 16 10275 J2231
11448 26 11471 06110
11460 33 11470 00000
11471 00003
11472 24 11471 11251
11484 46 11724 01100
11496 46 11724 01200
11508 14 11471 000-0
11520 46 11900 01100
11532 14 11471 000-0
11544 46 11600 01200
11556 15 1027N 00000
11568 11 10275 -0001
11580 11 11471 000-1
11592 49 11532 00000
11599
11600 16 10209 -6109
11612 43 11644 1020R
11624 12 10209 -0001
11636 49 11612 00000
11643
11644 11 10209 -0001
11656 25 1020R 12079
11668 16 10209 -6110
11680 22 10209 11251
```

```
10160        CF    -CNT
10170        TR    -KFRAC,-CNT
10180        B     TYPE
10190        DORG  *-4
10200 ALINT  TD    SUM-1,RMK
10210        TFM   PCNT,SUM-1
10220        S     PCNT,FFKK
10230        TR    INT,-PCNT
10240        AM    ECNT,1,10
10250        TFM   PCNT,INT-1
10260        A     PCNT,FFKK
10270        AM    PCNT,1
10280        SM    ECNT,1,10
10290        TDM   -PCNT,0
10300        C     ECNT,FFKK
10310        BNE   *-48
10320        TD    -PCNT,RMK
10330        CF    INT
10340 KINT   DS    5,*
10350        B     TYPE
10360        DORG  *-4
10370 MIXED  TFM   CNT,SUM-1
10380        S     CNT,FFKK
10390        TF    PCNT,CNT
10400        A     PCNT,FFKK
10410        TD    SUM-1,RMK
10420        TR    FRAC,-PCNT
10430        TD    -PCNT,RMK
10440        TR    INT,-CNT
10450        B     TYPE
10460        DORG  *-4
10470 TYPE   WNTY  INT
10480        WATY  PERIOD
10490        WNTY  FRAC
10500        B     -PRINT+1
10510        DORG  *-4
10520 OUTZE  DC    2,0,
10530 PZER   DC    20,0,
10540        DC    1,',
10550 BLANK  DAC   2,' ,
10560 ALMIN  DAC   2,-',
10570 TEMP   DS    1
10580 RMK    DC    1,',
10590        DORG  *+20
10600 INPUT  DAS   INPUTZ+3
10610 INPUT2 DAS   INPUTZ
10620 INTST  DS    0,INPUT2-3
10630        NOP
10640 RELOC  DS    ,TOP-*-499
10650 SWAP   TF    45,LOAD+RELOC
10660        TFM   30,SWAP3
10670        B     0
10680 LOAD   DC    46,3400032007013600032007024919600511963611300102,
10690 SWAP3  TF    1924,TRA1+6+RELOC
10700        B     2402
10710 TRA1   B     PART2+RELOC,,0
10720 PART2  TR    13000,ALPHA-1+RELOC
10730        TR    13002,ALPHA-1+RELOC
10740        TF    13099,FILL+78+RELOC
```

```
11692 33 1020R 00000
11704 31 1027N 1020R
11716 49 12004 00000
11723
11724 25 06110 12079
11736 16 06203 -6110
11748 22 06203 11251
11760 31 12121 0620L
11772 11 11471 000-1
11784 16 06203 J2120
11796 21 06203 11251
11808 11 06203 -0001
11820 12 11471 000-1
11832 15 0620L 00000
11844 24 11471 11251
11856 47 11808 01200
11868 25 0620L 12079
11880 33 12121 00000
11891 00005
11892 49 12004 00000
11899
11900 16 10209 -6110
11912 22 10209 11251
11924 26 06203 10209
11936 21 06203 11471
11948 25 06110 12079
11960 31 12231 0620L
11972 25 0620L 12079
11984 31 12121 1020R
11996 49 12004 00000
12003
12004 38 12121 00100
12016 39 10981 00100
12028 38 12231 00100
12040 49 1099R 00000
12047
12048 00002
12068 00020
12069 00001
12071 00004
12075 00004
12078 00001
12079 00001
12099
12101 00150
12251 00144
12248 00000
12394 41 00000 00000
07096 00000
12406 26 00045 19583
12418 16 00030 J2488
12430 49 00000 00000
12487 00046
12488 26 01924 19614
12500 49 02402 00000
12512 M9 19620 00000
12524 31 13000 19852
12536 31 13002 19852
12548 26 13099 19851
```

```
10750          TF    13019,TIT+14+RELOC          12560 26 13019 19771
10760          TF    INSRT,FUDGE+RELOC           12572 26 13069 19755
10770          TFM   RCNT,12998                  12584 16 12655 J2998
10780          AM    RCNT,2                      12596 11 12655 -0002
10790          SF    -RCNT                       12608 32 1265N 00000
10800          CM    RCNT,13160                  12620 14 12655 J3160
10810          BNE   *-36+RELOC                  12632 47 19692 01200
10820          B     1942                        12644 49 01942 00000
10830          DORG  *-4                         12651
10840 RCNT     DS    5                           12655 00005
10850 INSRT    DS    4,13069                     13069 00004
10860 FUDGE    DSAC  2,08,                       12659 00004
10870 TIT      DAC   8,XEQSDEMO,                 12661 00016
10880 FILL     DAC   40,                             ,
                                                 12677 00080
10890 ALPHA    DAC   1,',                        12757 00002
10900 MESS1    DAC   47,TYPE TWO DIGIT NUMBER FROM 02 TO 20 INDICATING ,
                                                 12759 00094
10910 MESS2    DAC   31,NUMBER OF SIGNIFICANT FIGURES ,, 12853 00062
10920 SWAP2    DS    1,SWAP+RELOC                19502 00001
10930 INT      DS    1,INPUT+20                  12121 00001
10940 FRAC     DS    1,INPUT+130                 12231 00001
10950          DEND  START                       02402
```