2219 0383

INTERNAL SOFTWARE PRODUCT SPECIFICATIONS

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Product Specification

SYSTEM B1800/B1700

CONTROL DOC.

None

PL FILE NO. _____

PROJ. NO. _____ COORD. _____ CHKR. *J. Hull* TO RECORDS *10-20-77* DISTRIBUTION *10-20-77*

DOC PFX	DOCUMENT NUMBER	REV	UNIT NUMBER	DL NO.	PL FILE NO.	ENG. RECORDS ONLY						REMARKS
						QTY REV PAGE	COPIES EACH PAGE	SEPIAS	MT REQ'D	CD DK REQ'D		
IPS	2219 0383	A				12	24					
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SBP 1085 REV. 9-71

Burroughs Corporation Ⓑ

COMPUTER SYSTEMS GROUP
SANTA BARBARA PLANT

B1800/B1700 DESK/CALC

PRODUCT SPECIFICATION

REV LTR	REVISION ISSUE DATE	APPROVED BY	REVISIONS
A	10/10/77		Original Issue - MARK Level 7.0

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GENERAL DESCRIPTION

DESK/CALC is a program which provides the user with an interactive desk calculator capability from a B1800/B1700 SPO or remote terminal. It provides the following features.

1. Arithmetic operands may be arbitrarily long. Although there are initial defaults, the user can subsequently change the number of digits (bits) of precision.

2. Real (i.e., floating point) arithmetic is performed.

3. Twenty-six general registers are provided for intermediate results, constants, etc.

4. Includes operators for exponentiation, factorial, and real and integer division.

5. Includes functions for greatest common divisor (GCD) and least common multiple (LCM).

6. Overflow is checked for and reported.

Input in the form of expressions and assignment statements is entered to DESK/CALC. Results may be displayed for the user and/or printed on the printer in both decimal and/or hexadecimal; all options can be determined by the user.

RELATED DOCUMENTATION

Name	Number
B1700 Software Operational Guide	1068731

OPERATING INSTRUCTIONS

At BOJ, DESK/CALC interrogates the external name of the file
RMTE.   If this is blanks (which is the default), it assumes that
the user is running from a SPO and all further communication is
done via ACCEPTs and DISPLAYs at the SPO.   If the external name
of RMTE is non-blank, the user is assumed to be running from a
remote file of that name.

SAMPLE EXECUTE STATEMENTS

Execution from a SPO:

    ?EX DESK/CALC

Execution through CANDE:

    ?EX DESK/CALC FI RMTE NAM <remote filename>

Execution through M*A*S*H:

    RUN DESK/CALC FI RMTE NAME <any non blank text>

After DESK/CALC has been executed, the user may immediately begin
entering either program input or control options.   The default
size for all operands is a thirty-four digit number including
twenty-six integer digits plus eight fraction digits.

Example:

    12345678901234567890123456.12345678

The operand size may be changed using the RESTART control option.

PROGRAM INPUT

The user types in a line at the SPO or from a remote terminal. A
line may contain one or more expressions or assignment
statements, each separated by a semicolon. The final result of
the evaluation of each expression or statement will be displayed
for the user. Expressions consist of a sequence of operands and
binary and unary operators.

OPERANDS

Operands may be:

    1. decimal constants
    2. hexadecimal strings
    3. register references
    4. function invocations

DECIMAL CONSTANTS

Decimal constants may be entered with or without a decimal point
and fraction. If the fraction part is larger than the current
maximum, it will be truncated with a warning message. Results
are printed with a fraction part if the value is not an integer,
otherwise as an integer without a decimal point.

    Examples:

     4.32
     5.0 (input only - output would be "5")
    18.
     4
       .0012
    -7.2
     3.14159265358979

HEXADECIMAL CONSTANTS

A hexadecimal constant may be entered by enclosing it in "a"
signs.

        Examples:
        aF0a
        aFACE01a
        a065709a
        a04913794313ABCDEa

REGISTERS

Twenty-six general registers are included, named "A" through "Z".
Each is initialized to zero at BOJ (and also if the "RESTART"
option is used). A register may be used anywhere an operand is
required.

FUNCTIONS

A predefined function reference may be used anywhere an operand
is required. The BNF for a function reference is:

<FNC.REFERENCE> ::= <FNC.NAME>/<FNC.NAME> (<ARG.LIST>)

<ARG.LIST>   ::= <EXPRESSION>/<ARG.LIST> , <EXPRESSION>

<FNC.NAME>   ::= GCD / LCM / PI

SEMANTICS

As the syntax indicates, two functions are currently implemented:
the Greatest Common Divisor function and the Least Common
Multiple function.   Both are functions of exactly two arguments.
Also, the value of PI is available (up to fifty decimal digits).

OPERATORS

Recognized binary operators include:

    +   addition
    -   subtraction
    *   multiplication
    /   real division
   //   integer division
   **   exponentiation
    #   modulo
   ->   left to right assignment
    =   intermediate assignment

Recognized unary operators are:

    +   identity
    -   negation
    !   factorial (exclamation point)

An arbitrary number of unary operators may precede an operand.
Expressions are evaluated using a pure left to right scan. There
is no operator precedence, but parentheses may be used to change
the order of evaluation.   Integer overflow is checked for on all
operations and will be reported if found.

ASSIGNMENTS

Three types of assignments are defined:

An _assignment statement (=)_ begins with a register name followed by an equal sign. The final value of the expression evaluation is stored in the designated register.

    Examples:

        R = 3
        A = 3.14159 * (R**2)

Intermediate assignment (=):   Since each binary operator has higher precedence than any operator to its right, a special convention holds for intermediate assignment: the intermediate assignment must be nested in parentheses. The result of the evaluation of the expression at that parenthesis level replaces the designated register.

    Examples:

        5 + 6 * (J =4)
        D=(A=J-1) + 7

Left to right assignment (->) The left to right assignment operator (the "DASH" character followed by a "greater than" character) assigns the value of the expression to its left to the register named on its right.

    Examples:

        4 -> R
        R**2 * (3.1415926535 -> F) -> A
        2 * P * R -> C

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MULTIPLE STATEMENTS

For convenience, several expressions (statements) may be entered
on one line. Each must be separated by a semicolon. The result
of each evaluation will be displayed.

    Examples:

        5 ; A = 17.1;   18.2 -> J
        1;2;3

RESTRICTIONS

Since the up arrow (used for exponentiation) is not available on
a TD800, either an apostrophe or double asterisk (**) may be used
instead.

User input is restricted to the top of the screen when terminal
input is used from a TD800.

CONTROL OPTIONS

The following are control options (those marked with an asterisk
are on by default). Preceding an option with "NO" or "NOT" turns
the option off. The options are listed in alphabetical order for
ease of reference.

AUDIT	provides hard copy on the line printer of the entire DESK/CALC session up to that point
*DECIMAL	results to be shown in decimal
HEX	results to be shown in hexadecimal
HISTORY (H)	displays on the screen the most recent terminal activity
LINES <#>	changes the number of lines of the screen to <#>. The default is 12, the maximum is 24.
*LIST	results of expressions and statements evaluated should be displayed (printed)
OPTIONS	displays the names of all known control options
PRINTER	print results on printer
REGISTERS (REGS)	displays the current values of the twenty-six DESK/CALC registers
RESTART	the user wishes to declare a new data size - all registers are zeroed and the program requests new operand sizes from the user
SCROLL	DESK/CALC will scroll all output. The terminal should be in non-SCROLL mode when sending the "SCROLL" command to DESK/CALC.
*SPO	display results on the SPO
SS <msg>	<msg> is displayed on the SPO
STATUS	displays the job's mix number, job number, terminal time, etc.

STOP   terminate the job

ZIP <msg>   <msg> is zipped to the MCP

EXAMPLE OF DESK/CALC USAGE

```
EX DESK/CALC
 DESK/CALC = 1 BOJ. #=238 PR=4 TIME = 17:33:17.6
 % DESK/CALC =1 DEFAULT OPERAND SIZE IS 26 INTEGER DIGITS PLUS 8
 FRACTION DIGITS
 % DESK/CALC =1 READY TO BEGIN SESSION
 DESK/CALC =1 ACCEPT.
1AX2 ** 21
 % DESK/CALC = 1 :  2097152
 DESK/CALC =1 ACCEPT.
1AX A = PI*(21.234**2)
 % DESK/CALC =1 :   1415.489953879919161
 DESK/CALC =1 ACCEPT.
1AX B=7; C =2
 % DESK/CALC = 1 :  7
 % DESK/CALC = 1 :  2
 DESK/CALC =1 ACCEPT.
1AX D = B**2 (4*A*C)
 % DESK/CALC =1 :   -11282.9919631039353288
 DESK/CALC =1 ACCEPT.
1AX PI
 % DESK/CALC =1 :  3.141592653589793
 DESK/CALC =1 ACCEPT.
1AXQ= GCD(7, 6#4) ; L = LCM(2.7)
 % DESK/CALC =1 :  1
 % DESK/CALC =1 :  14
 DESK/CALC =1 ACCEPT.
1AX GCD(23*1+1,LCM(9.2)) ; 22/7 -> P ; 22//7
 % DESK/CALC =1 :  6
 % DESK/CALC =1 :  3.142857142857143
 % DESK/CALC =1 :  3
 DESK/CALC =1 ACCEPT.
1AXSTOP
 DESK/CALC =1 ECJ. #=238 TIME = 17:37:32.9
```

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