30 MAY 1973

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Burroughs Corporation

COMPUTER SYSTEMS GROUP
SANTA BARBARA PLANT

BASIC S-LANGUAGE

PRODUCT SPECIFICATION

30 MAY 1973

REVISIONS

REV LTR	REVISION ISSUE DATE	PAGES REVISED ADDED DELETED OR CHANGE OF CLASSIFICATION	PREPARED BY	APPROVED BY
A	2-20-73	Original Issue	WFK	
B	5-24-73	Sec. 1.1.1 Reversed order of items 2 & 3. Sec 2.4 Deleted requirement that value zero have exponent of zero. Sec 3.5 Fix: Clarified Sec 3.8 & 3.9 AND and OR: Deleted Sec 3.18 & 3.19 LA and LV changed OP codes. Sec 3.20 ERS: Stated subscript is out of bounds if it is equal to the bounds value. Sec 3.23 & 3.24 FOR and NEXT: Corrected order in which parameters are stored. Sec 3.28 & 3.29 CALL and NTR: Added statement that hardware stacks are stored in memory. Sec 3.29 RTN: Corrected to state that stack is cut back to RCW before STACK. CUT.VALUE is used. Sec 3.30 COMM: Deleted FIX bit. Address is always base relative in non-overlayable area and does not need conversion.	WFK	EDF 4/27/73 W.T.K. 4-27-73 5-5-73

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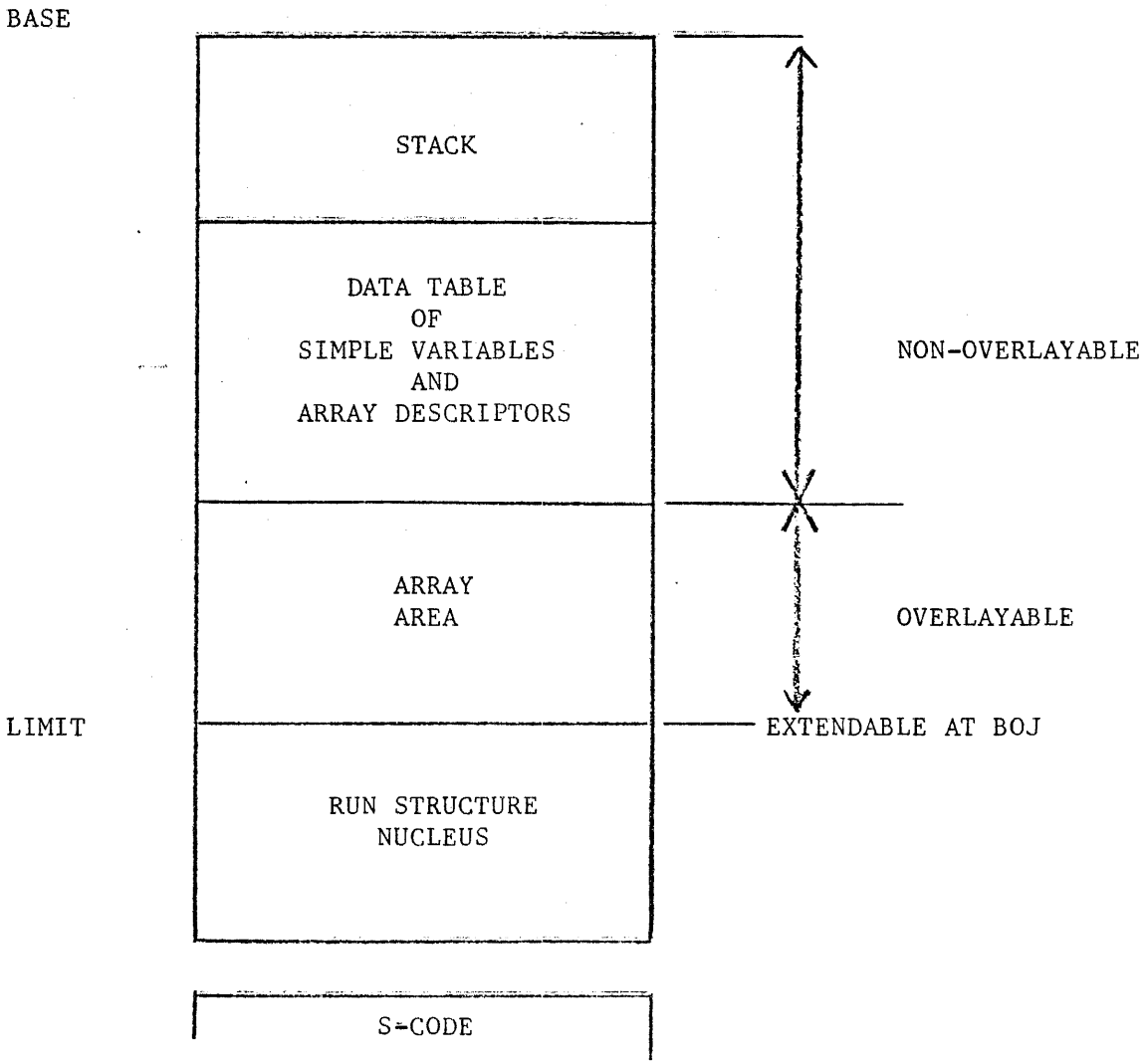
1.0 GENERAL DESCRIPTION

All BASIC S-Language programs have associated with them a Base Register and a Limit Register. The area between the Base and Limit is used as a data space. This data space includes a non-overlayable area which contains the STACK and the DATA TABLE. It also includes an overlayable area for data arrays.

Immediately above the data area defined by the program's Limit Register is an area known as the program's Run Structure Nucleus (RS. NUCLEUS). This RS. NUCLEUS contains the information necessary for the MCP and interpreter to execute the program.

All other object program modules such as code segments, code and data dictionaries, file information blocks and buffers are maintained outside the base and limit bounds by the MCP.



Basic Object Program Memory Layout.

FIGURE 1

1.1 RS.NUCLEUS Format

The RS.NUCLEUS is located immediately above the data defined by the program's limit register. The RS.NUCLEUS contains information necessary for the MCP and the interpreter to execute the program. A programmatic description of the RS.NUCLEUS is given in Figure 2.

```
    DECLARE RS.NUCLEUS TEMPLATE BIT (RS.N.SIZE);%
    DEFINE  RS.N.DECLARATION AS #%
DECLARE 01 DUMMY REMAPS RS.NUCLEUS,%
           02 RS.COMMUNICATE.MSG.PTR     BIT (48)      ,%
           02 RS.REPLY                   BIT (48)      ,%
           02 RS.COMMUNICATE.LR          ADDRESS,
           02 RS.REINSTATE.MSG.PTR       BIT (48)      ,%
           02 RS.MY.BASE                 ADDRESS       ,%
           02 RS.MY.LIMIT                ADDRESS       ,%
           02 RS.MCP.BIT                 BOOLEAN,
           02 RS.NIP                     BIT (32)      ,%
           02 RS.SEG.DIC.PTR             BIT (24)      ,%
           02 RS.DATA.DIC                ADDRESS       ,%
           02 RS.INTERP.ID               BIT (5)       ,%
           02 RS.INTRINSICS.LOC          BIT (10),
           02 RS.M.MACHINE               BIT(S.PAD.SIZE),%
           02 RS.FIB.DIC                 ADDRESS       ,%
           02 RS.PRIORITY.INTEGER        BIT (4),
           02 RS.PRIORITY.FRACTION       BIT (4),
           02 RS.LOG.PTR                 DSK.ADR.      ,%
           02 RS.WAIT.HDWR               BIT (6)       ,%
           02 RS.STATUS.SCRATCHPAD       WORD          ,%
           02 RS.NXT.RQ                  ADDRESS       ,%
           02 RS.LAST.OVLY               ADDRESS,
           02 RS.DATA.OVERLAYS           ADDRESS,
           02 RS.LAST.LINK               ADDRESS,
           02 RS.FIRST.AVAIL             ADDRESS,
           02 RS.OVLY.DISK.BASE          DSK.ADR,
           02 RS.OVLY.DISK.PTR           WORD,
           02 RS.OVLY.DISK.SIZE          WORD,
           02 RS.MIX.NMBR                BIT (8),      % INDEX TO "MIX" TABLE
           02 RS.NUMBER.FILES            BIT (8)       % 255 FILES ALLOWED
           02 RS.TRACK                   ADDRESS,      % TRACE INFO ADDRESS
           02 RS.OVLY.DESC               BIT (DESCRIPTOR.SIZE);
#;%
```

FIGURE 2. RUN STRUCTURE MAINTAINED BY MCP

1.1.1 Program Parameters

The following 24 bit parameters are included in the RS.NUCLEUS. These parameters, in the order given, are placed in the scratchpad disk segment of the object program by the compiler and are maintained in the RS.M.MACHINE area of the RS.NUCLEUS by the Basic Interpreter which updates them whenever control is transferred to the MCP.

1) DATA.TABLE.BASE	This is the Base relative bit address of the base of the data table. It is also the original stack size in bits.
2) STACK.LENGTH	This is maintained as the length of the stack not currently in use.
3) STACK.ADDRESS	This is maintained as the base relative address of the next available stack word. It is initially zero.
4) RETURN.CONTROL.REGISTER	This contains the current contents of the return control register which locates the stack location of the latest return control word. It is initially zero.
5) RELATIONAL.TOGGLES	This contains the current setting of the relational toggles. It has an initial value of zero.

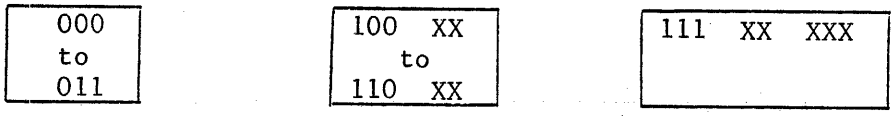
2.0 FORMATS

2.1 S-Instruction Format

Each BASIC S-Instruction consists of a variable length S-Operator followed by a variable number of arguments.

2.1.1 S-Instruction Operators

S-Operators are 3, 5 or 9 bits in length with the most frequently used S-Operators (on a static basis) being coded with the smaller number of bits. The length of the operator is determined by the operator itself as follows:



3-bit operator 5-bit operator 9-bit operator

2.1.2 S-Instruction Arguments

Each argument can consist of a variable number of bits. The format and interpretation of these arguments are described in detail with the description of the individual operators.

2.2 Stack Format

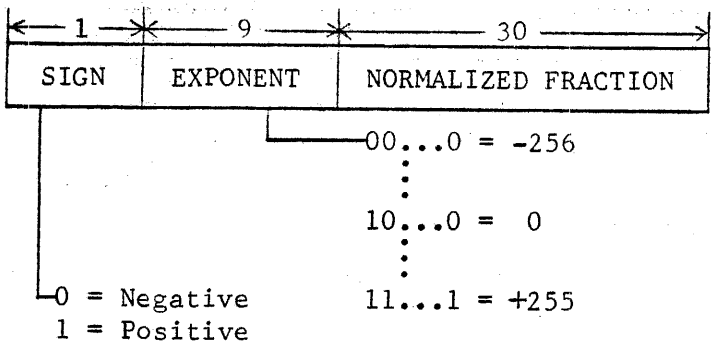
The width of the Stack is 40 bits. Its length is a program parameter determined at run time.

2.3 Data Table Format

The width of the Data Table is 40 bits. Its length is a program parameter determined at run time.

2.4 Floating Point Binary Number Format

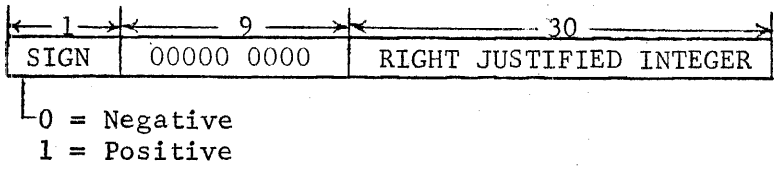
A floating point binary number has the following format:



The value zero has a fractional value of zero (0...0).

2.5 Binary Integer Format

A binary integer on the stack has the following format:



3.0 INSTRUCTION SET

Arithmetic

Name	Mnemonic	Op Code	Argument
Add	ADD	110 00	
Subtract	SUBT	110 01	
Multiply	MULT	110 10	
Divide	DIV	110 11	
Complement Sign	CSGN	111 00 110	
Set Sign Positive	PSGN	111 00 111	
Float	FLT	111 01 011	
Fix	FIX	111 01 010	
Convert to Decimal	CONV	111 10 001	
Compare Numeric	CMPN	101 11	

Stack Operations

Name	Mnemonic	Op Code	Argument
Exchange	EXCH	111 10 000	
Push	PUSH	111 10 100	NUMBER.OF.WORDS

Store Operators

Name	Mnemonic	Op Code	Argument
Store Destructive	STD	010	
Store Non-Destructive	STN	111 00 011	
Store Bits	STB	111 01 111	CHARACTER.FLAG

3.0 Cont'd.

Load Operators

Name	Mnemonic	Op Code	Argument
Load Bits	LDB	111 01 110	CHARACTER.FLAG
Large Literal	LIT	100 01	40-BIT LITERAL
Small Literal	SLIT	011	10-BIT LITERAL
Load Address	LA	000	STACK.FLAG, WORD.DISP
Load Value	LV	001	STACK.FLAG, WORD.DISP
Array Load Address	ALA	100 10	DATA.TABLE.INDEX
Array Load Value	ALV	100 11	DATA.TABLE.INDEX
Evaluate Right Subscript	ERS	111 01 000	DIMENSION.LENGTH, ROW. DIMENSION

Branch Operators

Name	Mnemonic	Op Code	Argument
For	FOR	111 01 100	NEXT, LIA, LPA, LEA
Next	NEXT	111 01 101	LIA, LPA, LEA
Case	ON	111 00 010	NO.OF.ADDRESSES, BRANCH. DISP
Bun	BUN	100 00	DISP.LENGTH, BRANCH.DISP
Branch Conditional	BXXX	101 00	BRANCH.MASK, DISP. LENGTH, BRANCH.DISP
Call	CALL	101 01	SEGMENT, DISP.FLAG, CALL. DISP
Enter	NTR	111 00 000	DISP.LENGTH, BRANCH.DISP
Return	RTN	111 00 001	STACK.CUT.VALUE
Return Value	RTNV	101 10	STACK.CUT.VALUE
Communicate	COMM	111 10 010	

Miscellaneous

Name	Mnemonic	Op Code	Argument
Load Communicate Reply	LDCR	111 10 011	
Hardware Monitor	HMON	111 10 101	

3.1 ADD, SUBTRACT, MULTIPLY, DIVIDE

FORMAT:

OP CODE	
ADD	110 00
SUBT	110 01
MULT	110 10
DIV	111 11

Perform the indicated algebraic operation on the top two items on the stack and replace them on the stack with the result.

Both input items must be normalized floating point numbers. The result is a normalized and rounded floating point number.

In subtraction, the top most stack item is subtracted from the second top most item. In division, the top most stack item is divided into the second top most item.

If the exponent of the result overflows, or underflows, or if the divisor in division is equal to zero, a runtime error is generated.

3.2 Complement Sign (CSGN)

FORMAT:

OP CODE
111 00 110

Complement the sign (leftmost bit) of the value on the top of the stack, i.e. change a positive value to a negative value and vice-versa.

3.3 Set Sign Positive (PSGN)

FORMAT:

OP CODE
111 00 111

Set the sign (leftmost bit) of the value on the top of the stack to indicate a positive value.

3.4 Float (FLT)

FORMAT:

OP CODE
111 01 011

Replace the signed 30-bit binary integer on the top of the stack with its normalized floating point number equivalent by shifting the integer Z places to the left, by supplying Z trailing zero bits and by supplying an exponent equal to 30-Z+256. Z equals the number of leading zero bits in the integer.

3.5 Fix (FIX)

FORMAT:

OP CODE
111 01 010

Replace the floating point value on the top of the stack with a signed 30-bit binary integer, which is equal to its entire value by shifting its fractional part 30-P places to the right, by supplying 30-P leading zero bits and by changing its exponent part to zero (0...0) unless P exceeds 30 or P is negative. If P is negative, the integer zero is left on the stack. If P exceeds 30 no conversion is performed and the operation is terminated. P equals the exponent part of the floating point number minus 256.

3.6 Convert To Decimal (CONV)

FORMAT:

OP CODE
111 10 001

Replace the floating point value on the top of the stack with an unsigned five character decimal integer, which is equal to its entier value and which is coded in EBCDIC.

The results are undefined if the input value exceeds 99999_{10}.

Note: EBCDIC 0 through 9 is coded 1111 0000 through 1111 1001.

3.7 Compare Numeric (CMPN)

FORMAT:

OP CODE
101 11

Compare algebraically the top two items on the stack and set the relational toggles to indicate whether the first item is greater than (>), equal to (=) or less than (<) the second item.

Both input items must be normalized floating point numbers.

Plus and minus zero are, by definition, equal.

The two items are deleted from the stack.

3.10 Exchange (EXCH)

FORMAT:

OP CODE
111 10 000

Exchange the relative position of the top two items on the stack.

3.11 Push (PUSH)

FORMAT:

OP CODE	NUMBER.OF.WORDS
111 10 100	5 BITS

Push all occupied hardware stack registers to memory and then bump up the stack pointer by the number of words indicated by NUMBER.OF. WORDS, an unsigned 5 bit binary integer.

3.12 Store Destructive (STD)

FORMAT:

OP CODE
010

Remove the top two items from the stack and copy the second item (40 bits) removed into the location specified by the address contained in the first item removed.

The address gives the relative displacement in bits from the DATA. TABLE.BASE.

3.13 Store Non-Destructive (STN)

FORMAT:

OP CODE
111 00 011

Remove the top item containing an address from the stack and copy the next item (40 bits) from the top of the stack into the location specified by that address. The copied item remains on the stack.

The address gives the relative displacement in bits from the DATA.TABLE.BASE.

3.14 Store Bits (STB)

FORMAT:

OP CODE	CHARACTER.FLAG
111 C1 111	0 = bits 1 = characters

Store the specified number of bits or characters from the stack into a data area.

There are four items on the top of stack, which are required by this operation and which are cut back from the stack at the completion of the operation. They are from top to bottom as follows:

1) The base relative bit address of the beginning of the data area.

2) A floating point value which is used to algebraically modify the above address. The value denotes the number of bits (CHARACTER.FLAG = 0) or the number of 8-bit characters (CHARACTER.FLAG = 1) by which the address is modified.

3) A floating point value indicating the number (0 to 40) of bits (CHARACTER.FLAG = 0) or the number (0 to 5) of 8-bit characters (CHARACTER.FLAG = 1) which are to be stored.

4) A 40-bit word containing the data, right justified, which is to be stored.

3.15 Load Bits (LDB)

FORMAT:

OP CODE	CHARACTER.FLAG
111 01 110	0 = bits 1 = characters

Load the specified number of bits or characters from a data area onto the top of the stack, right justified with leading zero fill in a 40-bit word.

There are three items on the top of stack which are required by this operation and which are replaced on the stack by the data. They are from top to bottom, as follows:

1) The base relative bit address of the beginning of a data area.

2) A floating point value which is used to algebraically modify the above address. The value denotes the number of bits (CHARACTER.FLAG = 0) or the number of 8-bit characters (CHARACTER.FLAG = 1) by which the address is modified.

3) A floating point value indicating the number (0 to 40) of bits (CHARACTER.FLAG = 0) or the number (0 to 5) of 8-bit characters (CHARACTER.FLAG = 1) which are to be loaded.

3.16 Large Literal (LIT)

FORMAT:

OP CODE	LARGE.LITERAL
100 01	40 bits

Load the 40-bit LARGE.LITERAL from the instruction onto the top of the stack.

3.17 Small Literal (SLIT)

FORMAT:

OP CODE	SMALL.LITERAL.
011	10 bits

Convert the 10-bit SMALL.LITERAL. consisting of 3 exponent bits followed by 7 fraction bits to a positive floating point value and load it onto the top of the stack.

3.18 Load Address (LA)

FORMAT:

OP CODE	STACK.FLAG	WORD.DISPLACEMENT
000	0 = data table 1 = stack	S.F=0: 9 bits 1: 5 bits

Load the base relative bit address of a data table or a stack word onto the top of the stack in the following format:

16	24
ZERO	ADDRESS

If the STACK.FLAG = 0, the address to be loaded is the address of a data table word. In this case the WORD.DISPLACEMENT value is 9 bits long and indicates a word displacement from the base of the data table.

If the STACK.FLAG = 1, the address to be loaded is the address of a stack word. In this case the WORD.DISPLACEMENT value is 5 bits long and is signed. The first bit is the sign. The remaining 4 bits indicate a word displacement from the current setting of the return control register. If the sign bit = 1, the word displacement is a positive word displacement. If the sign bit = 0, the word displacement is a negative word displacement.

3.19 Load Value (LV)

FORMAT:

OP CODE	STACK.FLAG	WORD.DISPLACEMENT
001	0 = data table 1 = stack	S.F=0: 9 bits 1: 5 bits

Load a 40-bit value from the data table or the stack to the top of the stack.

This operator is functionally the same as the load address operator (see section 3.18) except the actual word, rather than the address of that word, is loaded onto the stack.

3.20 Array Load Address (ALA)

FORMAT:

OP CODE	DATA.TABLE.INDEX
100 10	9 bits

Load the base relative bit address of an array element to the top of the stack and insure that the array is present in memory.

The DATA.TABLE.INDEX, an unsigned binary integer, is multiplied by 40 and used as a displacement into the data table to locate an array descriptor with the following format:

1	1	2	18	12	6
DD.BIT	STRING.BIT	NOT USED	BOUNDS	SEGMENT	DISPLACEMENT

The floating point number on the top of the stack is an array subscript which is truncated to an integer and compared to the bounds field of the array descriptor and with zero. If this converted subscript is less than zero or greater than or equal to the bounds value, a run-time error is generated; otherwise, it is added to the segment and displacement fields (taken as one 18 bit field) of the array descriptor. The resultant 12 bit segment value is used to index into the program's data dictionary, and the resultant 6 bit displacement value, multiplied by 40, is added to the memory address taken from that data dictionary entry to produce the base relative address of the desired array element. This address replaces the original subscript value on the top of the stack.

The format of a data dictionary entry is:

1	1	1	2	28	31
SY.LOCK	SY.MEDIA	SY.IN.PROCESS	UNUSED	SY.ADDRESS	

- 0 SY.ADDRESS = DISK ADDRESS
- 1 SY.ADDRESS = MEMORY ADDRESS

3.21 Array Load Value (ALV)

FORMAT:

OP CODE	DATA.TABLE.INDEX
100 11	9 bits

Load a 40-bit array element to the top of the stack.

This operator is functionally the same as the array load address operator (see section 3.20), except that the actual array element, rather than the address of that element, replaces the subscript on the top of the stack.

3.22 Evaluate Right Subscript (ERS)

FORMAT:

OP CODE	DIMENSION.LENGTH	ROW.DIMENSION
111 01 000	2 bits	4,7,10 or 18 bits

Convert the two subscripts for a two dimensional array into a single subscript suitable for use by the array load operators.

The two values on the top of the stack are as follows:

Top word: Column subscript
2nd word: Row subscript

DIMENSION.LENGTH specifies the container size of ROW. DIMENSION as follows:

00 = 4 bits
01 = 7 bits
10 = 10 bits
11 = 18 bits

ROW.DIMENSION is a binary integer which specifies the number of 40-bit words in an array row.

The two stack subscript values are first truncated to an integer. Then the product of the row subscript times the ROW.DIMENSION is added to the column subscript. This result is then converted to a normalized, rounded floating point subscript value which replaces the two original subscript values on the stack.

In addition to any errors which may be encountered in the arithmetic routines (add and multiply), a runtime error will be generated if the column subscript is found to be less than zero or greater than or equal to the ROW.DIMENSION value.

3.23 For (FOR)

FORMAT:

OP CODE 111 01 100	OP CODE(NEXT) 111 01 10	LOOP INDEX ADDRESS 9 bits	LOOP PARAMETERS ADDRESS 9 bits	LOOP ENDING ADDRESS 18 bits

Store the step size and then the ending index value into the data table at the location specified by the loop parameters address and then compare the beginning index value with the ending index value.

The following three floating point values are required to be on the top of the stack. They are removed at the end of the operation:

Top Word: Step Size
2nd Word: Ending Index Value
3rd Word: Beginning Index Value

The loop is satisfied if, for a positive step size, the beginning index value is greater than the ending index value; or, for a negative step size, the beginning index value is less than the ending index value.

If the loop is not satisfied, the beginning index value is stored in the data table at the location specified by the loop index address and the instruction following the FOR instruction is then selected. If the loop is satisfied, the next instruction is selected from the code location specified by the loop ending address.

3.24 Next (NEXT)

FORMAT:

OP CODE	LOOP INDEX	LOOP PARAMETERS	LOOP ENDING
111 01 101	ADDRESS	ADDRESS	ADDRESS
	9 bits	9 bits	18 bits

Add the current loop index value and the step size to form a new loop index value and then compare this new loop index value with the ending index value.

The current loop index value is found in the data table at the location specified by the loop index address. The step size and the ending index value, in that order, are found in the data table at the location specified by the loop parameters address.

All values are in floating point format.

The loop is satisfied if, for a positive step size, the new loop index value is greater than the ending index value; or, for a negative step size, the new loop index value is less than the ending index value.

If the loop is not satisfied, the new loop index value is stored in the data table at the location specified by the loop index address and the instruction following the FOR instruction is then selected. If the loop is satisfied, the next instruction is selected from the code location specified by the loop ending address.

3.25 ON (ON)

FORMAT:

OP CODE	NUMBER.OF.	BRANCH.DISPLACE-	...	BRANCH.DISPLACE-
111 00 010	ADDRESSES	MENT.1		MENT.N
	6 bits	18 bits		18 bits

Select the next instruction from the location determined by adding the unsigned binary integer BRANCH.DISPLACEMENT to the base address of the current code segment.

The particular BRANCH.DISPLACEMENT used is determined by the integer value of the floating point number found on the top of the stack. This item is deleted from the stack.

If this floating point value after conversion to a signed integer (see section 3.5 Fix), is less than one or greater than the unsigned 6-bit binary integer given by NUMBER.OF.ADDRESSES, a runtime error is generated.

3.26 Branch Unconditionally (BUN)

FORMAT:

OP CODE	DISPLACEMENT.LENGTH	BRANCH.DISPLACEMENT
100 00	1 bit	12 or 18 bits

Select the next instruction from the location determined by adding the unsigned binary integer BRANCH.DISPLACEMENT to the base address of the current code segment.

If DISPLACEMENT.LENGTH = 1, the length of the BRANCH.DISPLACEMENT value is 18 bits; otherwise, it is 12 bits long.

3.27 Branch Conditional (Bxxx)

FORMAT:

OP CODE	BRANCH.MASK	DISPLACEMENT.LENGTH	BRANCH.DISPLACEMENT
101 00	3 bits	1 bit	12 or 18 bits

Compare the BRANCH.MASK to the current setting of the relational toggles. If any "one" bit in the BRANCH.MASK is matched by a corresponding "one" bit in the relational toggles, select the next instruction from the location determined by adding the unsigned binary integer BRANCH.DISPLACEMENT to the base address of the current code segment; otherwise terminate the instruction.

The following table gives the binary values of the BRANCH.MASK required to implement the given branch type:

BNUN = 000 = NO OPERATION (NO BRANCH),

BGTR = 001 = GREATER THAN,

BLSS = 010 = LESS THAN,

BNEQ = 011 = NOT EQUAL,

BEQL = 100 = EQUAL,

BGEQ = 101 = GREATER THAN OR EQUAL,

BLEQ = 110 = LESS THAN OR EQUAL, and

BANY = 111 = BRANCH UNCONDITIONALLY UNLESS THE RELATIONAL TOGGLES ARE UNINITIALIZED (= ZERO).

If DISPLACEMENT.LENGTH = 1, then the length of the BRANCH.DISPLACEMENT value is 18 bits; otherwise, it is 12 bits long.

3.28 Call (CALL)

FORMAT:

OP CODE	CALLED.SEGMENT	DISPLACEMENT.FLAG	CALL.DISPLACEMENT
101 01	7 bits	1 bit	0 or 16 bits

Branch to a subroutine in the specified code segment after forcing all occupied hardware stack registers to memory and after placing a return control word onto the top of the stack in memory.

The format of the return control word is as follows:

15	7	18
RETURN CONTROL REGISTER	SEGMENT	DISPLACEMENT

The current contents of the return control register, and the segment and displacement pointing to the location of the next in line s-operator following the call is placed into the return control word. This return control word will be used by a return or return value operator to exit from the subroutine back to the next in line s-operator following the call.

The return control register is, after saving its contents in the return control word, updated to point to the location in the stack of the newly formed return control word.

If DISPLACEMENT.FLAG = 1, then the 16-bit CALL.DISPLACEMENT field is present; otherwise, a DISPLACEMENT value of 48 is assumed.

The actual branch is performed by using the CALLED.SEGMENT field as an index into the code segment dictionary and then adding the absolute address found therein to the CALL.DISPLACEMENT to obtain the address of the next operator to be executed.

3.29 Enter (NTR)

FORMAT:

OP CODE	DISPLACEMENT.LENGTH	BRANCH.DISPLACEMENT
111 00 000	1 bit	12 or 18 bits

Branch to a subroutine or a function routine in the current code segment after forcing all occupied hardware stack registers to memory and after placing a return control word onto the top of the stack in memory.

If DISPLACEMENT.LENGTH = 1, then the length of the BRANCH.DISPLACEMENT field is 18 bits; otherwise, it is 12 bits long.

See the "Call" operator (section 3.28) for a description of the enter operation. The operations are identical. Only the format of the instruction differs.

3.30 Return (RTN)

FORMAT:

OP CODE	STACK.CUT.VALUE
111 00 001	0000 to 1111

Return from a subroutine or a function routine by using the return control register to obtain the latest return control word and to cut the stack back to just below it. Then cut the stack back beyond this point by the number of words indicated by STACK.CUT.VALUE.

From the return control word restore to the return control register the pointer to the location of the previous return control word and use the code segment and displacement fields to locate the next instruction to be executed.

3.31 Return Value (RTNV)

FORMAT:

OP CODE	STACK.CUT.VALUE
101 10	0000 to 1111

Save the item on the stack found immediately on top of the latest return control word, perform a return (see section 3.30), and then place the saved item on the top of the stack.

3.32 Communicate (COMM)

FORMAT:

OP CODE
111 10 010

Load the 48 bit RS.COMMUNICATE.MSG.PTR area of the RS.NUCLEUS with an SDL type data descriptor indicating a length of 120 bits and containing the absolute address of the data table. The first 120 bits of the data-table is reserved for use as a communicate message area.

The format of this SDL type data descriptor is as follows:

8	16	24
Type 0100 0000	Length 0...01111000	Absolute Address of data-table

Store the status of the M-Machine in the appropriate parts of this program's RS.NUCLEUS.

Instate the program (MCP) whose RS.NUCLEUS address is given in the RS.COMMUNICATE.LR field of this program's RS.NUCLEUS.

3.33 Load Communicate Reply (LDCR)

FORMAT:

OP CODE
111 10 011

Load the low order 40 bits of the 48 bit RS.REPLY area of the RS.NUCLEUS to the top of the stack.

3.34 Hardware Monitor (HMON)

FORMAT:

OP CODE
111 10 101

Remove the floating point number on the top of the stack and convert it to an integer (see FIX Section 3.5). Use the lower order 8 bits of the resultant integer as variants in the hardware monitor micro instruction.