HARDWARE ARITHMETIC TEST - INSTRUCTIONS FOR USE
NUS-204

Load the binary tape and begin executing at location zero. If all is well, the following messages should be typed:

TRANSFER OK
BIT-INVERT OK
MULTIPLY OK
DIVIDE OK

If an error occurs, one of the following messages will be typed:

1) TRANSFER FAILED
SOFTWARE XXXXXXX HARDWARE XXXXXXX
This signifies that either a TACMQ or a TMQAC failed in its operation. The Software # is what the program tried to load into the MQ and the Hardware # is what came out.

2) BIT-INVERT FAILED
SOFTWARE XXXXXXX HARDWARE XXXXXXX UNINVERTED XXXXXXX
This signifies an error in the bit interchanges; 19-Ø, 18-1, etc. The Software number is the simulated software result, the Hardware number is the hardware result and the Uninverted number is the initial operand.

3) NO SKIP
The contents of memory location following a MULT or DIVIDE instruction should be executed. This error message signifies failure of the computer to skip execution of these memory locations.

4) MULTIPLY FAILED
SOFTWARE XXXXXXX * XXXXXXX = XXXXXXX, XXXXXXX
HARDWARE XXXXXXX * XXXXXXX = XXXXXXX, XXXXXXX
This signifies a failure in the operation of the MULT instruction. If the second Software operand differs from the Hardware operand it means the hardware failed to restore it to memory. If the Hardware product is greater than the Software product by one, then the hardware failed to clear the accumulator prior to multiplication. All other differences signify other hardware failures.

5) DIVIDE FAILED
SOFTWARE XXXXXXX, XXXXXXX / XXXXXXX = XXXXXXX R XXXXXXX
HARDWARE XXXXXXX, XXXXXXX / XXXXXXX = XXXXXXX R XXXXXXX
This signifies a hardware failure in the DIVIDE instruction.

ASTROTEST - INSTRUCTIONS FOR USE
NUS-248

Abstract

Astrotest is a simple, minimum length program for testing, and diagnosing faults in core memory.

Loading

Astrotest starts at location ø and is only 150_8 instructions long. The block of memory to be tested is determined by two memory locations which must be accessed through the 291.

Location 46	size of block
Location 47	first address of block

Theory of Operation

Each location in the block of memory to be tested is set to a known state. Then the block of memory is read out and a comparison is made to determine if there was an error. The states are: 0, 3777777, 1, 2, 10, 20, 40, 100, 200, 400, 1000, 2000, 4000, 10,000, 20,000, 40,000, 100,000, and 200,000 followed by the compliment of these states. The entire sequence is repeated 40 times after which the program restarts itself.

If an error is detected, astrotest will print the address, the state the location should be set to, and the erred state. It does not restart after an error, but rather it continues from where the error was found.

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SWAP
NIC-04-11210

Introduction

SWAP is a very simple program allowing users having only low speed equipment to utilize their 1080 systems more effectively. It swaps the contents of the lowest 4K, excluding the loaders (locations 0 - 7577) with the 2nd 4K of data memory (locations 110000 - 117577).

The main advantage of SWAP is in saving a copy of the rather lengthy FFT program, while still having the program memory and 4K of data memory available for other programs, such as the Assembler. Since the Assembler utilizes only the first 4K of data memory (locations 100000 - 107777) for text storage, it can be used without destroying the copied FFT. When the user is done with the Assembler, he can simply run SWAP again to restore the FFT. As long as data is not acquired in the 2nd 4K of data memory, the Assembler also remains intact and can be recalled by running SWAP. However, since the Assembler is much shorter than the FFT program, it is not nearly as inconvenient to reload it as to reload the FFT.

Storage

SWAP is stored in unused locations reserved for the Binary Loaders, and occupies locations 7600 - 7625. Since no other NIC-supplied program utilizes this area, SWAP should be permanently resident once loaded, unless wiped out by experimental software. The minimum hardware required is a NIC 1083 computer and low speed reader.

Loading and Use

SWAP is loaded using the standard Binary Loader. The exchange of the contents of locations 0 - 7577 and 110000 - 117777 occurs each time it is run.

SWAP is run by starting the computer at 7600. Briefly, this is accomplished as follows:

a) Press STOP
b) Depress LOAD PC
c) Set the switch register to 0007600
d) Press Execute
e) Depress CONTINUE
f) Press Execute

The entire execution of SWAP requires approximately 0.19 seconds. The computer will halt with the PC set to 7620 when SWAP is finished. Then proceed to operate the just-swapped program as usual.

BINARY PUNCH PROGRAM

The Nicolet Binary Punch program is designed to punch out regions of memory onto tape in a format that can be read by the Binary Loader. These regions of memory may contain either programs or spectral data. In this way accumulated data or programs which have been modified since they were loaded may be dumped onto tape for loading at some later date into any 1080 data system.

There are two existing versions of the Binary Punch program, a Low version occupying locations 0 - 252_8 and a High version occupying 5000 - 5252_8. They are otherwise identical. The version which is selected depends on the region of memory to be dumped onto tape.

Loading and Use

The Binary Punch program tape is loaded using the standard Binary Loader, as described under Loading Programs. The program is started as follows:

1. To start the Low version at location ∅

   Depress the Stored Program Start button on the 1080 console

2. To start the High version at location 5000

   a) Set the Switch Register to 5000_8
   b) Depress Load PC and press Execute
   c) Depress Continue and press Execute

The program will start by typing a carriage return-line feed and typing the letter P. This questions means "which punch are you using?"

In answer to the question P, type L to use the low speed punch mechanism of the Teletype and H to use the high speed punch. If H is typed and no high speed punch is available, nothing will seem to happen since the computer is looking for a high speed punch ready signal.

The program then types SA, asking for the Starting Address of the block to be punched. Enter this address in octal, followed by a carriage return. If a mistake is made in typing, type Rubout or any other illegal character. The program will respond with a question mark and a carriage return and allow the SA to be re-entered.

The program next types TA, asking for the Terminating Address of the block. It is assumed that the terminating address is greater than the starting address.

After entering the terminating address, but before typing a carriage return, turn on the punch. When the Return is typed, the program will begin punching the

leader and the specified block of data. The Return is not echoed on the Teletype as this would produce a spurious punch in the tape if the low speed punch is in use.

When the block has been punched, the program will wait for one of two instructions: T to terminate the tape, and type trailer tape or M to enter another memory block for punching. Do not remove the tape from the punch unless some trailer tape has been punched, as several rows of holes may still be inside the punch mechanism.

To punch out a second block, turn off the punch, and type M. Turning off the punch first assures that the M will not be punched on the tape. The program will then return to the beginning and type SA. Answer the questions as before.

When all blocks have been punched, type T to indicate that trailer is to be punched. The trailer section is exactly like the leader except that a Rubout is punched midway through it. This Rubout is a signal to the Binary Loader program, causing it to halt when this character is encountered.

OCTAL PRINT PROGRAM

The octal print program is used to produce an octal memory dump of any specified region of memory. The data is listed in five columns, where the first column is the octal address and the second column the contents of that address. The remaining three columns contain the contents of the next three addresses.

This program occupies locations 0 - 176 and can be loaded using the standard Binary Loader. The program starts at location Ø and can thus be started by pressing the Stored Program Start button on the 1080 console.

The program first asks for the starting address of the block by typing SA. Enter the octal address and terminate it by typing a Return. If any character other than an octal number is entered, the program will type a ? followed by a carriage return and line feed and allow the entire number to be re-entered. Thus, if any error is made, type some illegal character, such as a Rubout, and re-enter the number.

The program next asks for the terminating address of the data block by typing TA. Again, answer by entering this octal address followed by a Return. The program will type several line feeds and begin listing the block of data as shown below.

To dump additional data blocks onto the Teletype, type M when the listing is done. This will restart the program at the beginning. In the example below, the Octal Print program has been commanded to dump itself onto the Teletype:

```
SA 0
TA 176

   0    44453  2000120  2000120  2000120
   4   110323  2000055   110301  2000055
  10  2000173  2000062  2404126  2000120
  14   110324  2000055   110301  2000055
  20  2000173  2000062  2424127  2000120
  24  2000120   110004  2224131  2000120
  30  2110126  2000132  2000173  2000173
  34  3110126  2000132  2134126  2462127
  40   162000       45  2126131       32
  44       25  2000120  2000113   462315
  50   162000        3   462324       45
  54     5220      176     6444       56
  60     4443  1000055       22  2174130
  64  2000113   462215   162000      105
  70  2000055   470260     5144      107
  74  2404120   470010     5104      107
 100  2110130     5003  2510120  2404130
 104       64  2110130  1000062   110277
 110  2000055  2000120       63       65
 114     6454      114    44453  1000113
 120       30   110215  2000055   110212
 124  2000055  1000120      126      177
 130      176  3777775       36     5210
 134     5042  2404172   110005  2404171
 140  2110172    10003  2000160  2110172
 144     5043  2404172    10007  2000160
 150  2706171      143  2110172     5043
 154    10007   510260  2000055  1000132
 160      150   510260   462260     5204
 164     5141   162000   110240  2000055
 170  1000160        0        0       34
 174   110240  2000055  1000173
```