

NABU-1200 ON BOARD  
MONITOR

## Functions of the PROM

- . Hardware Initialization
- . Self-test Diagnostics
- . Boot Sector Loading
- . Monitor

## Hardware Initialization

- . Memory Refresh through DMA Controller
- . Serial Ports
- . Hardware Timer
- . Interrupt Controller

## Self-test Diagnostics

- . 8086 Processor
- . On-Board RAM memory
- . PROM checksum
- . Hard Disk Controller

Identification Message:

NABU-1200 On-Board Monitor Version (1.0)

Prompt Character:

;

Command Format

Command Character(s) Parameter(s)

Special Keys:

Control-X Deletes whole line

Control-H \  
Backspace > Backspaces and deletes  
Del or Rub /

Control-S Suspends display until control-Q

Control-Q Resumes display suspended by Control-S

ESC Terminates display and return to prompt

? is command not recognized

Activation

Messages during reset:

CPU ..... Passed  
On-Board RAM ..... Passed  
PROM checksum ..... Passed  
Hard Disk Controller ... Passed  
Start up Diagnostics completed.

Insert System Diskette

ESC key to activate the monitor.

Control-T to activate the memory test.

## Monitor

- Memory manipulation
  - . Display / Substitute / Move / Verify
  - . Select Base Segment
- Disk Functions
  - . Select Disk
  - . Seek Track
  - . Read / Write
- Pre-defined Tests
  - . Memory Test
  - . Disk Tests
- I/O ports manipulation
  - . Examine Port
  - . Output to Port
- Other
  - . Start Execution
  - . Boot Operating System

### Points to Remember

1. Before using any of the command associated with the disk, always specified the base segment first, e.g. at segment 2000H.
2. The interrupt vectors are residing from absolute location 0 to 3FF.
3. The monitor uses location 400 to 4ff as its data area.
4. Disk write operation will replace information on disk. Always double check, especially when issuing the disk write test.

## Command Summary

<u>Description</u>	<u>Command Characters</u>
Display Memory	DM
Substitute Memory	SM
Move Memory	M
Verify Memory	V
Select Base Segment	P
Select Disk	A;/B;/C;/D;/E;/F;/G;/H;
Seek Track	S
Disk Read	RD/RS
Disk Write	.WD/WS
Examine Port	E
Output to Port	O
Start Execution	G
Boot Operating System	B
Disk Alignment	A
Memory Test	TM
Disk Test	T/TW

---

## Memory Manipulation

Display Memory

DM [starting offset] [ending offset]

Output:

```
PPPP:0000      xx xx xx xx ... xx xx      *****
```

PPPP - segment in hex

0000 - offset in hex

xx - content of memory

\*\*\*\* - ASCII representation of content



## Memory Manipulation

Substitute Memory

SM [starting offset]

Output:

PPPP:0000      cc      uu

cc      -    current content of memory  
uu      -    user changes

will prompt user for changes on subsequent memory location until a '.' is entered.

## Memory Manipulation

### Move Memory

M [source offset]S[size of block] [destination address]

move block of memory starting from [source offset] of current selected segment, for [size of block] number of bytes, to the memory specified by [destination address]

[destination address] -- [segment]:[offset]

### Verify Memory

V [source offset]S[size of block] [destination address]

same as move memory, except performing comparison.

### Select Base Segment

P [segment]

Disk Functions

Select Disk

[disk drive name];{[hard disk size]}

[disk drive name]:

A,B,C	--	5 1/4" dual density, dual sided floppy
D	--	8" single density, single sided floppy
E,F,G,H	--	hard disk

[hard disk size]:

5	--	5 MB
10	--	10 MB default

Seek Track

S [track number]

[track number]:

8"	--	0 to 76 default
5 1/4"	--	0 to 159
5 MB	--	0 to 615
10 MB	--	0 to 1219

## Disk Functions

### Disk Read

RD {[sector number]}

read in specified sector of current selected track

OR

read in all sectors of current selected track if no sector is specified

[sector number]:

8"	--	1 to 26	160000
5 1/4"	--	1 to 10	
5 MB	--	1 to 16	
10 MB	--	1 to 16	

RS

read in first two tracks of disk

### Disk Write

WD {[sector number]}

WS

same as disk read, except write operation

)

## I/O Ports Manipulation

Examine Port

E [port number] 000

Output to Port

O [output byte] [port number]

## Other

Start Execution

G [starting address]

[starting address] -- [segment]:[offset]

Boot Operating System

B [disk drive name]

[disk drive name]:

A,B,C	-	5 1/4" floppy
D	-	8" floppy
E,F,G,H	-	Hard Disk

Pre-defined Tests

Disk Alignment

A

continuous reading ignoring error status  
use ESC to exit from this command

Memory Test

TM

Disk Read Test

T

Disk Write Test

TW

Error messages

Memory Test

\*\*\* ERROR AT PPPP:0000 PATTERN: XX MEMORY: YY PASS#: NN

Disk Operation

DRIVE HAS NOT BEEN SELECTED

Seek Track

SEEK STATUS: XX

Disk Read/Write

RW STATUS: XX

Disk Test

RW ERROR: SECTOR NO. XX  
RW STATUS: YY

SEEK ERROR: TRACK NO. XX  
SEEK STATUS: YY

NABU-1200 ON-BOARD MONITOR

PAGE 1 OF 1  
PART FS-1200-XXX  
REV. 00  
DATE 1982-07-26

NABU-1200 ON-BOARD MONITOR PROGRAM

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TABLE OF CONTENTS		Page
1.0	Scope	3
2.0	Applicable Documents	4
3.0	Introduction	5
4.0	Commands Of The Monitor Program	6
4.1	Command Format	6
4.2	Display Memory	6
4.3	Substitute Memory	7
4.4	Move Memory	7
4.5	Verify Memory	7
4.6	Select Segment	8
4.7	Select Disk	8
4.8	Seek Track	8
4.9	Disk Read	8
4.10	Disk Write	9
4.11	Read System Tracks	9
4.12	Write System Tracks	9
4.13	Examine Port	9
4.14	Output To Port	9
4.15	Start Execution	10
4.16	Boot System	10
4.17	Memory Test	10
4.18	Disk Test	10
4.19	Disk Alignment	11
5.0	Error Messages	12

1.0 SCOPE

This document describes the use and commands of the NABU-1200 On-Board Monitor Program. (Version 1.0).

2.0 APPLICABLE DOCUMENTS

Existing NABU-1200 Software documents.

### 3.0 INTRODUCTION

This program is classified as part of the Level I Diagnostics for the NABU-1200. It is to be used by servicemen when they suspect something wrong with any of the elementary components of the 1200 (specifically the memory, the disk controller, or the serial ports.) It's stored on ROM, and is part of the bootstrap PROM; therefore no special diskettes or connections are required.

To enter the monitor program, hit the ESC key immediately after the system has completed the self-tests at system start up (ie: Hit the ESC key directly after the message "Start up diagnostics completed" has appeared.) The Identification message is:

#### NABU-1200 On-Board Monitor Version 1.0

The following command characters are used in the program:

Function	Command Character
-----	-----
Display memory	DM
Substitute memory	SM
Move memory	M
Verify memory	V
Select segment	P
Select disk	A;B;C;D;E;F;G;H;
Seek track	S
Disk read	RD
Disk write	WD
System tracks read	RS
System tracks write	WS
Examine port	E
Output to port	O
Start execution	G
Boot system	B
Memory test	TM
Disk test	T
Disk alignment	A

## 4.0 COMMANDS OF THE MONITOR PROGRAM

### 4.1 Command Format

All commands are not executed until followed by a Carriage Return Key.

The normal prompt of the monitor is a semicolon (;). By selecting a disk drive using the appropriate command, the monitor prompt will change to include the current drive name (for example, A;). Before executing any command involving a disk (eg. disk read), a disk drive must first be selected and this monitor prompt obtained.

The input routine echoes all displayable characters, both upper and lower case. (The lower case letters are translated to upper case before being processed.) For hexadecimal input, only the last four characters are recognized; therefore entering 012345Ab would be the same as entering 45Ab. The following edit commands are also available for use:

Control-X	Deletes whole line
Control-H Backspace Del or Rub	Backspaces and deletes
Control-S	Suspends display until Control-Q is entered
Control-Q	Resumes display suspended by Control-S
ESC	Terminates display and returns to monitor prompt

### 4.2 Display Memory

DM <starting offset> <ending offset>

In this command, the content of memory is displayed, from the starting offset of the current selected segment to the ending offset. The starting and ending offset must be specified in hexadecimal. The content is displayed in ASCII code with non-displayable characters shown as periods (.).

Display format:

PPPP:0000      xx xx xx xx ..... xx xx      \*\*\*\*\*

PPPP - segment in hex  
 O000 - offset in hex  
 xx - content of memory  
 \*\*\*\* - ASCII representation of content

#### 4.3 Substitute Memory

SM <starting offset>

This command displays the memory content at the starting offset of the current selected segment. Any changes required by the user may then be obtained one byte at a time, until a period is encountered. The starting offset must be specified in hex.

Display format:

PPPP:O000      cc      uu

PPPP - segment in hex  
 O000 - offset in hex  
 cc - current content in hex  
 uu - user changes in hex

#### 4.4 Move Memory

M<source address> S<size of block> <destination address>

The memory content from the starting offset of the current selected segment can be moved using this command. The block size (which must be specified), is moved to memory starting at the destination address (also specified).

For input purposes, the source address is defined as the offset (the base will be taken from the current selected segment). The block size is defined as the number of bytes (in hex), and the destination address is defined as the segment and the offset of the memory destination (in the form <segment>:<offset>).

#### 4.5 Verify Memory

V<source address> S<size of block> <destination address>

This command verifies the memory content from the starting offset of the current selected segment. The block size is specified, and verified against memory starting at the destination address (also specified). The source address, block size and destination address are defined as in 4.4 above.

## 4.6 Select Segment

P &lt;segment&gt;

This command will change the current selected segment to that specified. The segment must be specified in hex.

## 4.7 Select Disk

&lt;disk drive name&gt;;

This command is to be used to select a disk drive. To select a drive, type the drive name followed by a semicolon. Drives A,B,C, are configured for 5 1/4" double sided, double density disks. Drive D is configured for a 8" single sided, single density disk, and drives E,F,G, and H are configured for hard disk.

## 4.8 Seek Track

S &lt;track number&gt;

In this command, the track number specified is sought, and the status given if an error exists. If no track number is specified, the program defaults to track 0. The following are the valid ranges for track numbers (which are specified in decimal):

8" Disk Drive	-	0 to 76
5 1/4" Disk Drive	-	0 to 159
Hard Disk Drive	-	0 to 615

## 4.9 Disk Read

RD &lt;sector number&gt;

The sector specified in this command is read in, and the status given if an error exists. If no sector number is specified, the program defaults to reading all the sectors of the currently selected track. The memory starting at offset zero of the current selected segment is used. Following are the valid ranges for sector numbers (which are specified in decimal):

8" Disk Drive	-	1 to 26
5 1/4" Disk Drive	-	1 to 10
Hard Disk Drive	-	1 to 16

#### 4.10 Disk Write

WD <sector number>

Using this command, the sector specified is written to. If no sector is specified, the program writes to the currently selected tracks. The content of memory starting at the offset zero of the current selected segment is used. The valid ranges for sectors are the same as in 4.9 above.

#### 4.11 Read System tracks

RS

The system tracks of the currently selected disk are read into memory starting at offset zero of the current selected segment in use.

#### 4.12 Write System tracks

WS

The content of memory starting at offset zero of the current selected segment is written to the system tracks of the current selected disk.

#### 4.13 Examine Port

E <port number>

This command displays (in hex) the content of the port number specified. The port number must be specified in hex.

#### 4.14 Output To Port

O <output byte> <port number>

The output byte specified is sent to the port specified, using this command. Both the port number and the output byte must be specified in hex.



## 4.15 Start Execution

G &lt;starting address&gt;

This command starts execution of the contents of memory from the starting address specified. The starting address is defined as the segment and offset of the starting address (in the form <segment>:<offset>).

## 4.16 Boot System

B &lt;drive name&gt;

This command will boot up the CP/M Operating System from the drive selected. If not specified, the previously defined drive is used to boot from. Valid drive names are:

A,B,C - 5 1/4" Mini-Floppy Drive  
D - 8" Floppy Drive  
E to H - Hard Disk Drive

## 4.17 Memory Test

TM

This command tests the memory of the 1200, by filling all the available on-board RAM with a pattern and then comparing this pattern to the original, one location at a time. This is repeated 8 times (with 8 different patterns), which constitutes one pass. During the loading and verifying of the test pattern a '.' is displayed whenever 64K of memory is tested. Each completed pass is indicated on the console, and you may exit from the test by hitting the ESC key.

## 4.18 Disk Test

T

*Select a page # first eg P2000*

This command reads all the sectors of the previously selected disk. A read status is displayed if a read error is encountered. The track number is displayed continuously, acting as an activity indicator; and the command repeats itself until the ESC key is hit. The ESC key exits from the command and redisplay the monitor prompt.

## 4.19 Disk alignment

A

On receiving this command, all sectors of the previously selected track are read into memory starting at offset zero of the current selected segment. All errors are ignored. The read operation repeats until an 'ESC' is entered at the console.

## 5.0 ERROR MESSAGES

Following are descriptions and examples of the error messages you are likely to encounter when using the On-Board Monitor Program of the NABU-1200.

"\*\*\* ERROR AT XXXX:XXXX"

PATTERN: YY MEMORY: ZZ  
PASS #: NN

This messages will appear during the Memory Test to indicate a memory error at the hex address given. YY is the current test pattern.

ZZ is the content of the memory at the address displayed.

NN is the pass number.

"RW STATUS: XX"

This status is given (in hex) if an error is found during the execution of either a Disk Read or Disk Write.

"SEEK STATUS: XX"

This status is given (in hex) if an error appears during the Seek Track operation.

"DRIVE HAS NOT BEEN SELECTED"

This appears if the user attempts to access a command that involves a disk drive, without first specifying one.

"SEEK ERROR: TRACK NO. XX"

"RW ERROR: SECTOR NO. XX"

Either of these messages may appear during the Disk Test if a Seek or RW error is found. The corresponding status message is also displayed.

## EXERCISER PROGRAM

### Objective:

The purpose of the exerciser program is not to diagnose the 1600 system but rather to exercise the system continuously.

### Description:

The exerciser program takes the 1600 system through a sequence of tests: Input/Output, memory, floppy disk and hard disk tests.

#### Input/Output Test:

All three I/O ports (printer, spare 1 and spare 2) are tested. A stream of test characters are sent to each port and received from each port through its loopback adaptor. The received characters are compared against the test characters for correctness.

#### Memory Test:

Memory locations starting from 2000H to 3FFFFH (or 7FFFFH) are tested. The memory is filled with "A5" pattern and then each location is read back for comparison. The test is repeated once more for "5A" pattern.

#### Floppy Disk Test:

The entire disk is written with a data pattern of 512 "6D" bytes in each sector. This pattern was chosen because it contains the worst-case bit-shift patterns. The data on the entire disk is read back for verification.

#### Hard Disk Test:

Same as floppy disk test.

The test will run continuously. Any error encountered will be printed out on the console, and at the same time it will flash the LED on the CPU box to indicate the error occurrence. Therefore, it is not necessary to have one display terminal on each system during burn-in test.

How To Run The Exerciser:

The following procedure is to run the exerciser program:

1. Install adaptors onto the printer, spare 1 and spare 2 ports.
2. Reset the system.
3. Get into the monitor by hitting an ESC key on the console keyboard.
4. Place the exerciser disk into drive "A".
5. Type the following lines:

```
A;  
P60 ◀  
RS  
G0:600
```

6. Replace the exerciser disk with a test disk (good formatted diskette) and hit any key to start the test.

NOTES:

1. Use ROM VER. 1.0
2. T18 plug is OFF

Disk questions - Alan Chan July 29/82

Floppy controller  
179? → ~~1993~~ 1793 he thinks

mini floppy

how many sides? 2  
how many cylinders? 80  
how many bytes/sector? 512  
sectors per track 10

which side does boot in monitor use? <sup>st</sup> cylinder

2 tracks per cylinder

side 0  
first  
side 1  
second

hard disk

how many heads? 4  
cylinders? 154  
bytes/sector? 512  
sectors per track 16

which head does boot in monitor use?  
track 0, head 0, track 0 head 1.

use 8255 for side select for  
minifloppy

10 meg

heads 4  
cylinders 306