

Nov-64

USER'S GUIDE

Introduction.

Your new NoV-64 module for the HP-41 is the latest implementation of the Clonix family. It is intended to provide you both the required storage capacity and the usage flexibility to face most every working scenario you may be involved in, while keeping the smallest form factor.

It has an overall memory size of 28 pages which can be directly managed from the HP-41 keyboard; allowing a wide range of on-the-fly user selectable configurations.

I sincerely hope this module will help you to get the most out of your HP-41 system.

Internal structure.

In order to help you make a clearer picture of the process involved in the managing of the NoV-64 internal memory, it is important to get acquainted with its internal memory structure and how it is organized to offer the user a flexible working environment.

The table 1 below shows the PIC18F2620 64KB Flash ROM as distributed for use in NoV-64 implementation.

Address range	Size	Function	Assigned Block	HP-41 Usage
0000-0FFF	4K	NoV-64's PIC executable code	-	-
1000-13FF	1K	Packed 2 uppermost bits of Page #0	0	HEPAX (U2)
1400-17FF	1K	Packed 2 uppermost bits of Page #1	0	HEPAX (U2)
1800-1BFF	1K	Packed 2 uppermost bits of Page #2	0	HEPAX (U2)
1C00-1FFF	1K	Packed 2 uppermost bits of Page #3	0	HEPAX (U2)
2000-23FF	1K	Packed 2 uppermost bits of Page #4	1	Page-C (U2)
2400-27FF	1K	Packed 2 uppermost bits of Page #5	1	Page-D (U2)
2800-2BFF	1K	Packed 2 uppermost bits of Page #6	1	Page-E (U2)
2C00-2FFF	1K	Packed 2 uppermost bits of Page #7	1	Page-F (U2)
3000-33FF	1K	Packed 2 uppermost bits of Page #8	2	Page-C (U2)
3400-37FF	1K	Packed 2 uppermost bits of Page #9	2	Page-D (U2)
3800-3BFF	1K	Packed 2 uppermost bits of Page #A	2	Page-E (U2)
3C00-3FFF	1K	Packed 2 uppermost bits of Page #B	2	Page-F (U2)
4000-4FFF	4K	Unpacked 8 lowermost bits of Page #0	0	HEPAX (L8)
5000-5FFF	4K	Unpacked 8 lowermost bits of Page #1	0	HEPAX (L8)
6000-6FFF	4K	Unpacked 8 lowermost bits of Page #2	0	HEPAX (L8)
7000-7FFF	4K	Unpacked 8 lowermost bits of Page #3	0	HEPAX (L8)
8000-8FFF	4K	Unpacked 8 lowermost bits of Page #4	1	Page-C (L8)
9000-9FFF	4K	Unpacked 8 lowermost bits of Page #5	1	Page-D (L8)
A000-AFFF	4K	Unpacked 8 lowermost bits of Page #6	1	Page-E (L8)
B000-BFFF	4K	Unpacked 8 lowermost bits of Page #7	1	Page-F (L8)
C000-CFFF	4K	Unpacked 8 lowermost bits of Page #8	2	Page-C (L8)
D000-DFFF	4K	Unpacked 8 lowermost bits of Page #9	2	Page-D (L8)
E000-EFFF	4K	Unpacked 8 lowermost bits of Page #A	2	Page-E (L8)
F000-FFFF	4K	Unpacked 8 lowermost bits of Page #B	2	Page-F (L8)

Table. 1 PIC physical memory usage.

There are 12 Flash ROM logical pages numbered #0 to #B into PIC18F2620 processor physical memory. Due to the different word size between HP-41 (10 bits/word) and PIC18F2620 (8bits/word), the memory area from 1000 to 3FFF (12KBytes in total) has been reserved to hold the two uppermost bits of every HP-41 word. Every byte in this area contains four pairs of upper bits.

In the current implementation of NoV-64 its twelve logical ROM pages have been organized into three blocks of 4 pages each. ROM Block 0 contains pages #0 to #3; ROM Block 1, pages #4 to #7 and ROM Block 2, pages #8 to #B.

ROM Block 0 is currently reserved for HEPAX-1D emulation. ROM Blocks 1 & 2 (8 Pages) are available for the user to burn .ROM image files. Please refer to the [ClonixCfgWin](#) configuration utility manual for details on how to burn image files into your module's Flash memory.

NoV-64 module adds Non-volatile RAM to the internal PIC18F2620 Flash memory. A count of four chips allow a total RAM memory of 64Kwords (10bits each) divided into four RAM blocks of 16Kwords each. Every RAM Block holds four HP-41 pages. These four pages are addressed into HP-41 pages #8 to #B in order to conform HEPAX RAM.

User can take any or all of these RAM pages out of the HEPAX File System in order to use them in a ROM-like fashion taking advantage of the non-volatile feature. Please refer to HEPAX module Owner's Manual for further info on File System and other HEPAX RAM usages.

The NoV-64 soft memory managment.

Introduced with the NoV-32 module, the soft memory managment conforms a useful and convenient on-the-fly configuration method. With NoV-64, this method has been enhanced to handle its four RAM Blocks as well as the two user available ROM Blocks.

The NoV-64 configuration can be checked/modified by means of a Control Word (CW) located at address H'4100.

Make sure your calculator is OFF prior to install or remove any module. Insert NoV-64 into port 1 or 2 (it can be inserted into ports 3 or 4 also but you'll be wasting that physical port) and turn your HP-41 ON.

HEPAX command HEXEDIT, allows direct access to any given memory address. (You may want to assign HEXEDIT to a user key for your convenience.)

Display: $\overline{0}.\overline{0}\overline{0}\overline{0}\overline{0}\overline{0}$ (assuming HP-41 is on a clean state)

Type: [XEQ] [ALPHA] HEXEDIT [ALPHA]

Display: $\overline{H}\overline{1}\overline{0}\overline{0}$ - - - -

Type: 4100

Display: $\overline{H}\overline{1}\overline{0}\overline{0}$ $\overline{1}\overline{0}\overline{0}$ - - - -

Meaning that current CW value is H'100. To interpret this value please take a look at the table 2 on the next page for details on the CW structure..

Bits	Meaning	Default	Range
b9	ROM Block 2 Enabled=1; Disabled=0	0	0-1
b8	ROM Block 1 Enabled=1; Disabled=0	1	0-1
b7-2	NOT USED	0	0
b1-0	RAM Block # enabled	0	0-3

Table 2. Control Word bits meaning.

According to this, the [4 100 100 - -] display means that ROM block 1 is enabled and also is RAM Block 0.

The full range of possible RAM and ROM blocks configurations is given below.

H'4100	ROM Block Enabled	RAM Block Enabled
000	None	0
001	None	1
002	None	2
003	None	3
100*	1	0
101	1	1
102	1	2
103	1	3
200	2	0
201	2	1
202	2	2
203	2	3

Table 3. Twelve possible configs

Note that you cannot set bits 9 and 8 simultaneously, doing so will only set bit 8; enabling ROM Block 1. Also b7-2 will always be 0 regardless the value you type in. (*) 100 is default configuration value at NoV-64 module plug in.

So, in our HP-41 we now have:

Display: 4 100 100 - - -

Meaning that ROM Block 1 and RAM Block 0 are enabled. (The default status at plug in)

Supposed we want to toggle to ROM Block 2 and enable RAM Block 1:

Type: 201

Display: 4 101 10000 - - - (Address will change to 4101 as you finish typing "201")

Press [TAN] to get back to address H'4100

Display: 4 100 200 1 - - - (Confirm that the CW contents has been updated to "201")

Press [←] (clx) twice, to exit HEXEDIT

Display: █.█ █ █ █

At this point, your RAM block has already been switched to Block 1, however, your ROM Block 1 still remains active. You'll need to turn your HP-41 OFF and back ON in order to actually toggle ROM Blocks.

The reason for that requirement is that, while changing RAM Blocks doesn't affect overall HP-41 memory mapping, as there will always be RAM at pages #8 to #B; ROM Blocks may or may not change overall HP-41 memory mapping.

Please consider the following example to get a clearer picture of the process.

HP-41CX + HP-IL (Printer switch ENABLE)

NoV-64: ROM Block 1 contents: #C: PPCL, #D: PPCU, #E: (empty), #F: MATH-1B
ROM Block 2 contents: #C: CCDL, #D: CCDU, #E: STRUCT-1B, #F: STRUCT-1A

At power ON with the above configuration, HEPAX code will be allocated into page #E, filling the empty page on ROM Block 1.

If we would toggle to ROM Block 2 without powering the calculator OFF and then ON, HEPAX code would collide with the lower page of the STRUCTURAL ANALISYS module, resulting in an immediate frozen HP-41.

Switching your HP-41 OFF and ON, will lead to a new re-allocation of the HEPAX code and, eventually, as in the example above, will also lead to an `ILL UNFIB` error message, as there is no free page for HEPAX to re-allocate itself..

You'll have to either remove HP-IL or, at least, set its printer switch to DISABLE in order to allow HEPAX the necessary space to allocate.

As a mnemonic help you may consider that toggling ROM Blocks is quite like physically removing and inserting ROM Pacs; thus, requires power cycling your HP-41.

Both ROM Blocks can also be disabled as shown in the four upper rows of Table 3, this allows you to use ports 3 & 4 to connect other physical modules or peripherals to your HP-41 system.

Also, as shown in the previous example, leaving a lower page empty, allows you to plug any 4k module or peripheral into the corresponding port.

Namely, leaving page #E empty granted the access to the Card Reader, or Wand, or (almost)* any 4K ROM Pac module plugged into port 4.

Hope you enjoy NoV-64 module.

Diego Díaz
Canary Islands, Sept. '08

* A few 4K ROM packs does not use the lower page, i.e. ZENROM, AUTOST.