DIEGO'S HP-41C MODULES
Part I
➤ Introduction
➤ Reference
➤ Overview
➤ Installation
➤ Configuration
➤ Programming

Part II
➤ NoV Runtime Configuration
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➤ QROM Transfer
➤ Live Demo
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INTRODUCTION
Overview

➤ This presentation is an introduction to a group of HP-41C plug-in modules designed by Diego Díaz.

➤ Diego Díaz Clonix, NoV & USB-41 modules allows to you to load several ROM images into one programmable module.

➤ NoV modules also emulate an Advanced HEPAX (16K) module and HEPAX Double Memory (16K) module.

➤ USB-41 module also emulate a HP-82143A thermal printer using a USB interface and a Windows application.

➤ More information is available at: www.clonix41.org
➤ All underlined text in this presentation represent a link to a web page or to a web downloadable document.

➤ July 2020, Diego is currently working on Clonix Configuration Utility v6.x, since that version is still in development, the last released version (v4.2, 2015) has been used throughout this presentation.
Acknowledgements

➤ Diego Díaz ...
➤ for having created these fantastic modules.
➤ for having created an easy to use application to configure them.
➤ for his invaluable inputs in making this presentation more accessible.
➤ for his patience, support & everything else.

➤ Monte Dalrymple ...
➤ for his dedication in keeping updated his HP-41 ROM's archive.
➤ for his work on his 41CL and on his new add-on modules project. (41CL Home)
➤ for his invaluable inputs in making this presentation more accessible.

➤ Robert Prosperi ...
➤ for his invaluable inputs in making this presentation more accessible.

➤ Ángel Martin ...
➤ for keeping the HP-41C alive by creating mind-blowing ROMs.
➤ for his invaluable inputs in making this presentation more accessible.

➤ HP-41C users ...
➤ for still using the HP-41C and keeping it alive.
➤ for buying Diego's modules allowing him to improve and release new versions.
Goals

➤ In this presentation we will ...
  ➤ Review some key informations about the HP-41C system.
  ➤ Discover Diego Díaz modules.
  ➤ Cover every options of three modules. *(Clonix-D, NoV-64d & USB-41)*
  ➤ Go through the programming process.
  ➤ Configure NoV HEPAX emulation.
  ➤ Clear NoV HEPAX RAM content.
  ➤ Transfer a QROM page from an HP-41 to a PC.
  ➤ See live how to program, configure and use some modules.
REFERENCE

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➤ MOD ROM Format
➤ MOD File Format
➤ MOD File Example
➤ LIF File Header
➤ HEPAX 4K RAM Structure
Memory Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Content at power lost</th>
<th>Erase</th>
<th>Write</th>
<th>Used in ...</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAM</td>
<td>Random Access Memory</td>
<td>Erased</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>n/a</td>
<td>This is a family type. RAM Technologies includes: SRAM, DRAM, SDRAM, RDRAM, FRAM &amp; others.</td>
</tr>
<tr>
<td>SRAM</td>
<td>Static RAM</td>
<td>Erased</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>Box: MLDL, RAMBOX Mod: HEPAX</td>
<td></td>
</tr>
<tr>
<td>FRAM</td>
<td>Ferroelectric RAM</td>
<td>Preserved</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>Box: Mod: NoV</td>
<td></td>
</tr>
<tr>
<td>QROM</td>
<td>Quasi-ROM</td>
<td>Follow RAM technology used</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>Box: MLDL, RAMBOX Mod: HEPAX, NoV</td>
<td></td>
</tr>
<tr>
<td>ROM</td>
<td>Read Only Memory</td>
<td>Preserved</td>
<td>n/a</td>
<td>at-creation</td>
<td>Box: Mod: HP, CMT-20</td>
<td></td>
</tr>
<tr>
<td>PROM</td>
<td>Programmable ROM</td>
<td>Preserved</td>
<td>n/a</td>
<td>out-of-circuit with a programmer (chip level)</td>
<td>Box: Mod: CMT-10</td>
<td>Also called OTP (One Time Programmable)</td>
</tr>
<tr>
<td>EPROM</td>
<td>Erasable PROM</td>
<td>Preserved</td>
<td>out-of-circuit ultraviolet light (chip level)</td>
<td>out-of-circuit with a programmer (chip level)</td>
<td>Box: MLDL, ROMBOX Mod: CMT-10, ZEPROM</td>
<td></td>
</tr>
<tr>
<td>EEPROM</td>
<td>Electrically EPROM</td>
<td>Preserved</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>Box: MLDL2000 Mod: NoV, Clonix</td>
<td></td>
</tr>
<tr>
<td>Flash</td>
<td>Flash</td>
<td>Preserved</td>
<td>in-circuit</td>
<td>in-circuit</td>
<td>Box: MLDL2000 Mod: NoV, Clonix Two types of Flash: NOR (memory mapped, same usage as EEPROM) NAND (used for mass storage)</td>
<td></td>
</tr>
</tbody>
</table>

word = 10 bits / cell = generally one byte / block = 2^n bytes (ex.: 256 or 512 bytes) / chip = entire space of the integrated circuit (IC) in-circuit : IC soldered on PCB or inserted in a socket / out-of-circuit : IC unsoldered from the PCB or removed from its socket
HP–41C ROM Words

➤ Access Type: direct
➤ Value Size: 10 bit words
➤ Addressing: 16 bit (4 bits for page & 12 bits for code = 16 pages of 4K word)
➤ Bank Switching: yes (4 banks for each 4K page)
➤ Notes:
  ➤ ROM can also be PROM, EPROM, EEPROM or QROM.
  ➤ A ROM page can be either statically or dynamically assigned to a page.
    ➤ Static page: the 4K printer ROM is hardwired to page 6 even though the printer is plugged in one of the 4 ports at the back of the calculator.
    ➤ Dynamic page: a standard 4K application module inserted into port 1 will normally be either mapped to page 8 or page 9.
  ➤ Currently, on Diego's modules, when a bank switch occurs all pages within the module switches to the selected bank not just the page where switch was requested. Diego is working on a new firmware that will allow bank switch to work at the page level instead of at module level.
HP–41C RAM Registers

➤ Access Type: peripheral
➤ Value Size: 56 bit registers (7 bytes)
➤ Addressing: 12 bit (4096 registers addressable but only 1024 available)
➤ Bank Switching: no
➤ Notes:

➤ 41C peripheral types:
    ➤ RAM Registers, Display, Printer, Card-Reader, Wand, Time, HP-IL, etc.

➤ Håkan Thörngren has modified the 41OS to access the full range of RAM addressable registers, but in order to use it you need an hardware device allowing 41OS replacement like the 41CL board or the MLDL2000 unit.
    Unfortunately none of Diego's modules has that capability.
    Alternative HP-41CL mainframe (OS ROMs) : [www.hpmuseum.org/forum/thread-13729.html](http://www.hpmuseum.org/forum/thread-13729.html)

➤ Ángel Martin has created for the 41CL several modules (CLMEM, SandMatrix, etc.) that uses either some or all of the addressable registers.
# HP–41C ROM Memory Map

<table>
<thead>
<tr>
<th>Page</th>
<th>Bank 1</th>
<th>Bank 2</th>
<th>Bank 3</th>
<th>Bank 4</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>#0</td>
<td>NUT OS 0 ROM</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Used by 41C/CV/CX OS</td>
</tr>
<tr>
<td>#1</td>
<td>NUT OS 1 ROM</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Used by 41C/CV/CX OS</td>
</tr>
<tr>
<td>#2</td>
<td>NUT OS 2 ROM</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Used by 41C/CV/CX OS</td>
</tr>
<tr>
<td>#3</td>
<td>X-Functions ROM (CX)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Avail. for 41C/CV Used by 41CX OS</td>
</tr>
<tr>
<td>#4</td>
<td>Disabled HP-IL Printer ROM, Diagnostic ROMs, Lib4 ROM</td>
<td>41CL Lib4 ROM</td>
<td></td>
<td>Takeover &amp; System ROMs</td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>Time ROM, CX Time ROM</td>
<td>CX Ext. Functions ROM</td>
<td></td>
<td></td>
<td>CAT 2 - Start Page Order: #5,.#F &amp; #3</td>
</tr>
<tr>
<td>#6</td>
<td>Printer ROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#7</td>
<td>HP-IL ROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 1 - Low</td>
</tr>
<tr>
<td>#9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 1 - High</td>
</tr>
<tr>
<td>#A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 2 - Low</td>
</tr>
<tr>
<td>#B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 2 - High</td>
</tr>
<tr>
<td>#C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 3 - High</td>
</tr>
<tr>
<td>#D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 3 - High</td>
</tr>
<tr>
<td>#E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 4 - Low</td>
</tr>
<tr>
<td>#F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Port 4 - High</td>
</tr>
</tbody>
</table>
EPROM ROM File Format

➤ Format used by EPROM boxes and emulators.

➤ The ten bits word value is broken into two bits upper and eight bits lower.

➤ The upper two bits is merged with three other upper two bits values to create an eight bits value. All merged two bits values are save in an U2 file.

➤ All lower eight bits values are save in one or multiple L8 files.

➤ The U2 and L8 files get written into two or more EPROMs. *(dictated by the box used)*

➤ Example: for a 4 K (4096 x 10 bits) ROM, these two EPROM would be needed
  ➤ 2708 for the U2 file. (8192 bits = 4096 x 2 bits = 1024 x 8 bits)
  ➤ 2732 for the L8 file. (32768 bits = 4096 x 8 bits)
ERAMCO ROM File Format

➤ Format used by ERAMCO MLDL, ZEPROM and emulators
➤ Four ten bits words are converted into five bytes.
➤ A 4096 words ROM is saved into a 5120 bytes file.
➤ HP-IL mass storage:
  ➤ Save to: ERAMCO SAVEROM & ZEPROM ILSAVE.
  ➤ Read from: ERAMCO GETROM & ZEPROM ILBURN.
➤ Tools:
  ➤ rom41er convert a padded ROM file into a ERAMCO ROM file with LIF header.
  ➤ er41rom convert a ERAMCO ROM file into a padded ROM file.
HEPAX ROM File Format

➤ Format used by HEPAX and emulators
➤ Four ten bits words are converted into five bytes.
➤ A 4096 words ROM is saved into a 5120 bytes file.
➤ HP-IL mass storage:
  ➤ Save to: HEPAX WRTROM.
  ➤ Read from: HEPAX READROM.
➤ Tools:
  ➤ rom41hx convert a padded ROM file into a HEPAX ROM file with LIF header.
  ➤ hx41rom convert a HEPAX ROM file with LIF header into a padded ROM file.
Padded ROM File Format

Format used by Clonix & NoV modules, 41CL, MLDL2000, some EPROM boxes and emulators.

The ten bits word value is left padded with zero's to create a sixteen bits value.

A 4096 words ROM is saved into a 8192 bytes file.

41CL:

- NEWT processor uses bit 13 & 12 (TT) to manage its turbo feature.
- 41CL CX system ROMs has been "turbo" modified.

Tools:
- rom41lif convert a padded ROM file into a ROM file with LIF header.
MOD ROM Format

- Format used in MOD file format.
- Four ten bits words are converted into five bytes.
- A 4096 words ROM is converted into a 5120 bytes array.
- Tools:
  - lifmod can export MOD ROM images to padded ROM files.
MOD File Format

- Format used by MLDL2000, DM41X and emulators.
- Can hold up to 255 ROMs.
- Tools:
  - lifmod can list the content of a MOD file.
  - MLDL2000 GUI can create, read and update a MOD file.

```c
typedef struct
{
    char FileFormat [5];
    char Title [50];
    char Version [10];
    char PartNumber [20];
    char Author [50];
    char Copyright [100];
    char License [200];
    char Comments [255];
    byte Category;
    byte Hardware;
    byte MemModules;
    byte xMemModules;
    byte Original;
    byte AppAutoUpdate;
    byte NumPages;
    byte HeaderCustom [32];
} ModuleFileHeader; // struct size = 729 bytes
```

```c
typedef struct
{
    char Name [20];
    char ID [9];
    byte Page;
    byte PageGroup;
    byte Bank;
    byte BankGroup;
    byte RAM;
    byte WriteProtect;
    byte FAT;
    byte Image [5120]; // MOD ROM Format
    byte PageCustom [32];
} ModuleFilePage; // struct size = 5188 bytes
```

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Undefined, Operating System, Application PAC, HP-IL Peripheral, Standard Peripheral, Custom Peripheral, Beta, Experimental</td>
</tr>
<tr>
<td>Hardware</td>
<td>None, 82143A Printer, 82104A Card Reader, 82182A Time Module, 82153A Barcode Wand, 82160A HP-IL Module, 82242A IR Printer Module, HEPAX Module, W5W RAMBox, MLDL2000, Clonix/NoV Modules</td>
</tr>
<tr>
<td>MemModules</td>
<td>No Memory Module, 1 Memory Module, 2 Memory Modules, 3 Memory Modules, 4 Memory Modules</td>
</tr>
<tr>
<td>XMemModules</td>
<td>None, X-Functions/Memory, XFM + 1 X-Mem Module, XFM + 2 X-Mem Modules</td>
</tr>
<tr>
<td>Original</td>
<td>Updated, Original</td>
</tr>
<tr>
<td>AppAutoUpdate</td>
<td>Do Not Update, Overwrite</td>
</tr>
</tbody>
</table>

References:
- hp.giesselink.com/v41.htm
- www.hp41.org/LibView.cfm?Command=View&ItemID=1352 (login required)
## MOD File Example

<table>
<thead>
<tr>
<th>ModuleFileHeader</th>
<th>ModuleFilePages [0..255]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ModuleFilePage 0</td>
</tr>
<tr>
<td></td>
<td>729 Bytes</td>
</tr>
</tbody>
</table>

### ModuleFileHeader

**FileName:** HPIL.MOD

**ModuleFileHeader**

- **FileFormat:** MOD1
- **Title:** HP-IL Module
- **Version:** EH
- **PartNumber:** 82160A
- **Author:** Hewlett-Packard
- **Copyright:** Hewlett-Packard
- **License:** Hewlett-Packard Company makes no warranty as to the accuracy or completeness of the foregoing information and hereby disclaims any responsibility therefore.

**Comments:**

- **Category:** 3 (HP-IL Peripheral)
- **Hardware:** 5 (82160A HP-IL Module)
- **MemModules:** 0 (no memory modules)
- **XMemModules:** 0 (no extended memory)
- **Original:** 1 (yes)
- **AppAutoUpdate:** 0 (no)
- **NumPages:** 2
- **HeaderCustom:**

### ModuleFilePage [0]

**Name:** ILPrinter-2E

- **ID:** PL2E
- **Page:** 6 (must be in this location)
- **PageGroup:** 0 (not grouped)
- **Bank:** 1
- **BankGroup:** 0 (not grouped)
- **RAM:** 0 (no)
- **WriteProtect:** 0 (no or not applicable)
- **FAT:** 1 (yes)

**Image:** [IL Printer rom image : 5120 bytes in MOD ROM format]

**PageCustom:**

### ModuleFilePage [1]

**Name:** ILModule-1H

- **ID:** CS1H
- **Page:** 7 (must be in this location)
- **PageGroup:** 0 (not grouped)
- **Bank:** 1
- **BankGroup:** 0 (not grouped)
- **RAM:** 0 (no)
- **WriteProtect:** 0 (no or not applicable)
- **FAT:** 1 (yes)

**Image:** [IL Module rom image : 5120 bytes in MOD ROM format]

**PageCustom:**
LIF File Header

➤ Logical Information Format.
➤ LIF Header length is 32 bytes.
➤ Craig A. Finseth's LIF Page.
  www.finseth.com/hpdata/lif.php
➤ Dan McDonald's HP-IL Files.
  www.hpmuseum.org/cgi-sys/cgiwrap/hpmuseum/articles.cgi?read=24
➤ Joachim Siebold's lifutils.
  github.com/bug400/lifutils

➤ Based on works from Tony Duell, Leo Duran, Warren Furlow, Christophe Gottheimer, Heinz W. Werntges & Martin Kroeker.
# HEPAX 4K RAM Structure

<table>
<thead>
<tr>
<th>Addr</th>
<th>HEX</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>X000</td>
<td></td>
<td>XROM Number, HEPAX assign an unused XROM ID</td>
</tr>
<tr>
<td>X001</td>
<td>000</td>
<td>CAT Entries, 00 = none, set to zero by HEPAX</td>
</tr>
<tr>
<td>X002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X...</td>
<td>000</td>
<td>FAT Space (64 fn + end-of-fat), unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>X083</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>X084</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>X...</td>
<td>000</td>
<td>Unused by HEPAX</td>
</tr>
<tr>
<td>X08F</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>X090</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X...</td>
<td></td>
<td>HEPAX Data</td>
</tr>
<tr>
<td>XFE5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XFE6</td>
<td>000</td>
<td>Unknown, spacer ?</td>
</tr>
<tr>
<td>XFE7</td>
<td>000</td>
<td>HEPAX pages linked list: previous page (000 = end of list)</td>
</tr>
<tr>
<td>XFE8</td>
<td>000</td>
<td>HEPAX pages linked list: next page (000 = end of list)</td>
</tr>
<tr>
<td>XFE9</td>
<td>091</td>
<td>HEPAX first file address</td>
</tr>
<tr>
<td>XFEA</td>
<td>000</td>
<td>0091</td>
</tr>
<tr>
<td>XFEB</td>
<td>000</td>
<td>HEPAX active File address</td>
</tr>
<tr>
<td>XFEC</td>
<td>000</td>
<td>0000 (0000 = None)</td>
</tr>
<tr>
<td>XFED</td>
<td>090</td>
<td>HEPAX usable space start address</td>
</tr>
<tr>
<td>XFEF</td>
<td>000</td>
<td>0090</td>
</tr>
<tr>
<td>XFEF</td>
<td>091</td>
<td>HEPAX next file address</td>
</tr>
<tr>
<td>XFF0</td>
<td>000</td>
<td>0091</td>
</tr>
<tr>
<td>XFF1</td>
<td>0E5</td>
<td>HEPAX usable space end address</td>
</tr>
<tr>
<td>XFF2</td>
<td>00F</td>
<td>0FE5</td>
</tr>
<tr>
<td>XFF3</td>
<td>200</td>
<td>Initial value = 100 and set to 200 after initialization</td>
</tr>
<tr>
<td>XFF4</td>
<td>000</td>
<td>IVT Pause Loop, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFF5</td>
<td>000</td>
<td>IVT Main Running Loop, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFF6</td>
<td>000</td>
<td>IVT Deep Sleep Wake up, no key down, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFF7</td>
<td>000</td>
<td>IVT Off, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFF8</td>
<td>000</td>
<td>IVT I/O Service, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFF9</td>
<td>000</td>
<td>IVT Deep Sleep Wake up, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFFA</td>
<td>000</td>
<td>IVT Cold Start, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFFB</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>XFFC</td>
<td>000</td>
<td>ROM Trailer, unused and set to zero by HEPAX</td>
</tr>
<tr>
<td>XFFD</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>XFFE</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>XFFF</td>
<td>000</td>
<td>Checksum, unused and normally set to zero by HEPAX</td>
</tr>
</tbody>
</table>

*Note: HEPAX RAM structure decoding is a work in progress and may contains invalid information, please use with caution.*
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## History

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<th>Date</th>
<th>EPROM Devices</th>
<th>MLDL Devices (RAM/EPROM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 1981</td>
<td>HHP-16K (16K)</td>
<td></td>
</tr>
<tr>
<td>Apr 1982</td>
<td></td>
<td>MLDL-I (4K)</td>
</tr>
<tr>
<td>Jun 1982</td>
<td>ProtoEPROM (4K,8K,16K)</td>
<td>ProtoCODER (4K)</td>
</tr>
<tr>
<td>??? 1982</td>
<td>HHP-32K (32K)</td>
<td></td>
</tr>
<tr>
<td>Jan 1983</td>
<td>HP-IL EPROM Programmer</td>
<td>MLDL-II</td>
</tr>
<tr>
<td>Jun 1983</td>
<td>ERAMCO (24K)</td>
<td>ESMLDL 1 (8K/24K)</td>
</tr>
<tr>
<td>Sep 1983</td>
<td>HHP-PE (32K)</td>
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<tr>
<td>Nov 1983</td>
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<td>ProtoCODER-2 (4K)</td>
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<tr>
<td>Jun 1984</td>
<td>MBK-16 (16K)</td>
<td>MBK-ProfiSET (16K/8K)</td>
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<tr>
<td>Aug 1984</td>
<td>ERAMCO (32K)</td>
<td>ESMLDL (8K/24K)</td>
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<td>Dec 1984</td>
<td>CMT-100 (4K,8K,16K)</td>
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<td>Aug 1985</td>
<td>CMT-110 (16K,32K)</td>
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<td>CMT-10 (4K,8K,16K)</td>
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<td>Dec 1985</td>
<td>W&amp;W EPROMBOX (32K)</td>
<td>W&amp;W RAMBOX (32K)</td>
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<td>Dec 1985</td>
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<td>ERAMCO RSU1 (16K)</td>
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<tr>
<td>Jan 1986</td>
<td>SOS HP-IL EPROM Programmer</td>
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<td>Apr 1988</td>
<td>ZEPROM (16K)</td>
<td>W&amp;W RAMBOX II (64K)</td>
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<td>??? 1988</td>
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<td>ES RAMBOX (32K,64K,128K)</td>
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<td>HEPAX (8K)</td>
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<td>HEPAX Memory (8K)</td>
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<td>Adv. HEPAX (16K)</td>
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<td>HEPAX Double Memory (16K)</td>
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<tr>
<td>Sep 2005</td>
<td></td>
<td>MLDL2000 (512K/2M Flash)</td>
</tr>
</tbody>
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### Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Module</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>Mar 2003</td>
<td>Clonix</td>
<td>project started</td>
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<tr>
<td>Jul 2003</td>
<td>1\textsuperscript{st} MLDL</td>
<td>built (7)</td>
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<tr>
<td>Sep 2003</td>
<td>1\textsuperscript{st} Module</td>
<td>built (8)</td>
</tr>
<tr>
<td>Dec 2003</td>
<td>Clonix 41</td>
<td>released (1 &amp; 2)</td>
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<tr>
<td>Mar 2004</td>
<td>NoVRAM</td>
<td>project started</td>
</tr>
<tr>
<td>Jul 2004</td>
<td>NoVRAM</td>
<td>released (1 &amp; 3)</td>
</tr>
<tr>
<td>Oct 2005</td>
<td>NoV-32</td>
<td>released (1 &amp; 4)</td>
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<tr>
<td>May 2008</td>
<td>Clonix-D</td>
<td>released (1 &amp; 5)</td>
</tr>
<tr>
<td>Sep 2008</td>
<td>NoV-64</td>
<td>released (1 &amp; 5)</td>
</tr>
<tr>
<td>Apr 2012</td>
<td>USB-41</td>
<td>released (1 &amp; 6)</td>
</tr>
<tr>
<td>Dec 2013</td>
<td>Clonix 41</td>
<td>discontinued</td>
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<td></td>
<td>NoVRAM</td>
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<td></td>
<td>NoV-32</td>
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<tr>
<td></td>
<td>NoV-64</td>
<td>discontinued</td>
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<tr>
<td></td>
<td>NoV-64d</td>
<td>released (1 &amp; 5)</td>
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<td></td>
<td>Clonix 41d</td>
<td>Anniversary Ed.</td>
</tr>
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</table>
Kit Includes: one Clonix 41d, one NoV-64d, two overlays and one Flex-PCB. Only 10 was made. Diego kept Kit #0
## Specifications Table

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<th>Clonix 41 gold</th>
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<tr>
<td>Microcontroller</td>
<td>PIC18LF252</td>
<td>PIC18LF252</td>
<td>PIC18LF252</td>
<td>PIC18LF2620</td>
<td>PIC18LF2620</td>
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<td>PIC18LF252</td>
<td>PIC18LF2620</td>
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<td>ROM size</td>
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<td>24K words</td>
<td>48K words</td>
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<td>24K words</td>
<td>48K words</td>
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<td>ROM pages</td>
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<td>6</td>
<td>12</td>
<td>6</td>
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<td>ROM hard preload</td>
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<td>none</td>
<td>none</td>
<td>82143A (4x4K)</td>
<td>HEPAX (4x4K)</td>
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<td>ROM pages available</td>
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<td>6</td>
<td>6</td>
<td>12</td>
<td>8 (12-4)</td>
<td>2 (6-4)</td>
<td>2 (6-4)</td>
<td>8 (12-4)</td>
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<td>ROM block select (a)[b]</td>
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<td>Port Sensing</td>
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<td>Control Word</td>
<td>Control Word</td>
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<td>16K words</td>
<td>32K words</td>
<td>64K words</td>
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<td>RAM pages (c)</td>
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<td>0.125 or 1/8</td>
<td>0.125 or 1/8</td>
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<td>Control Word</td>
<td>Control Word</td>
<td>Control Word</td>
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<td>RAM type (d)</td>
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<td>FRAM</td>
<td>FRAM</td>
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<td>Page shadowing (e)</td>
<td>ROM</td>
<td>ROM</td>
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<td>ROM</td>
<td>ROM &amp; RAM</td>
<td>ROM &amp; RAM</td>
<td>ROM &amp; RAM</td>
<td>ROM &amp; RAM</td>
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<td>HEPAX support</td>
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<td>✓ (ROM only)</td>
<td>✓ (ROM only)</td>
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<td>—</td>
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<td>✓</td>
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<td>16K</td>
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<td>41C 1.7x turbo mode (f)</td>
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<td>Bank switching (4 banks)</td>
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<td>Double HEPAX RAM</td>
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<td>Double X-Memory</td>
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<td>W&amp;R HP-41CY / RAMBox64</td>
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<tr>
<td>Page transfer to/from PC</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>(g)</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Alternate persona (h)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Clonix 41</td>
<td>Clonix 41</td>
<td>Clonix-D</td>
<td>Clonix-D</td>
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<tr>
<td>Pwr: sleep^a\standby^a\run^a</td>
<td>10 \ 100 \ 9.5</td>
<td>10 \ 100 \ 13.5</td>
<td>10 \ 100 \ 13.5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>Module Price:</td>
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<td>—</td>
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<td>—</td>
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<td>Adapter Price:</td>
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<td>—</td>
<td>—</td>
<td>—</td>
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<td>Programmer + Adapter Price:</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>30.00 €</td>
</tr>
</tbody>
</table>

Legend: [✓ : yes] [× : no] [— : n/a] *Available at www.clonix41.org*
Specifications Notes

a. A port sensing module is able to select a Flash block based on its plugged location (odd or even port).

b. Control word allows to choose which RAM and/or Flash block is mapped into the HP-41C memory space.

c. 4K RAM pages can be configured as HEPAX RAM (default) or QROM.

d. When module is unplugged SRAM content is lost while FRAM content is preserved.

e. Page shadowing allows a physical module to take precedence over a Clonix or NoV module mapped page.

f. When configured with the **Standard 6P** option, the module is able to work in a speed up HP-41C (1.7X turbo hardware upgrade).

g. USB-41 can transfer an HP-41 ROM to a Padded ROM file on a PC but need a RAMBox/MLDL/NoV unit to transfer a Padded ROM file from a PC to a QROM space on the HP-41.

h. NoV modules can be programmed and act as a Clonix module.

i. Clonix 41d Anniversary Edition was delivered pre-loaded with Service Module 1C (C/CV) active in even ports and Service Module 2A (CV/CX) active in odd ports. *Warning: if erased or reprogrammed, it is impossible to restore the module in the same state as it was delivered.*

j. NoV-64 lack the port sensing hardware of the Clonix-D module.

k. NoV-64d is in fact two modules in one. It can be either configured as a NoV-64 module or as a full Clonix-D module.
Resources and web links

➤ Diego Díaz Projects

1. Clonix & NoV Configuration Utility
   www.clonix41.org/Projects/Updates/Clonix_CD_090315.zip

2. Clonix 41 Project Page & Manual
   www.clonix41.org/Projects/Clonix-41/Clonix41_00.htm
   www.clonix41.org/Projects/Clonix-41/clonix_man.zip

3. NoVRAM Project Page & Support Files
   www.clonix41.org/Projects/Novram/Novram_00.htm
   www.clonix41.org/Projects/Novram/novram-hepax.zip

4. NoV-32 Project Page, Manual & Support Files
   www.clonix41.org/Projects/Nov32/Nov32_00.htm
   www.clonix41.org/Projects/Nov32/New_HW.htm
   www.clonix41.org/Projects/Nov32/Nov-32_Uso-man.pdf
   www.clonix41.org/Projects/Nov32/Nov-32_SW.zip

5. NoV-64 Project Page & Manual
   www.clonix41.org/Projects/Nov64/Nov64_00.htm
   www.clonix41.org/Projects/Nov64/Nov64v08r_Man3.pdf

6. USB-41 Application, Manual & Support Files
   www.clonix41.org/Projects/USB-82143A/USB-82143A.zip
   www.clonix41.org/Projects/USB-41/USB-41-rar

Other Projects & Files

Modules Chart: www.clonix41.org/Projects/Clonix-NoV_chart.pdf
I/O Block: www.clonix41.org/Maintenance/I0_Block/I0_Block.htm

➤ Other Projects & Web Sites

7. Based on Lynn A. Wilkins design, developer of the first Machine Language Development Lab. PPC Journal V9N3P27 (PAHHC Jake Schwartz)
   www.pahhc.org/ppccdrom.htm

8. Using the ROM-PAC emulation code for PIC18C252 written by John Ioannidis.
   archived.hpcalc.org/museumforum/thread-9845.html

9. HHP-16K EPROM Emulator Introduction

10. MLDL2000 (Meindert Kuiprs)
    hp41.kuiprs.nl/hp41.htm

    HP-41C Dedicated Site (Warren Furlow)
    www.hp41.org

    HP-41C ROM Images (Monte Dalrymple)
    systemyde.com/hp41/archive.html

    HP Calculators Museum (David Hicks)
    www.hpmuseum.org
    www.hpmuseum.org/forum/index.php

    HP Calc. Museum Archives (Eric Rechlin)
    archived.hpcalc.org/museumforum/

    Silicium Forum (French Site, Hand Held Section)
APPLICATIONS

Table of Content

➤ Clonix & NoV Config. Util.
➤ MPASM
➤ MicroBurn DIY K150
➤ Device Manager
➤ USB 82143A
Clonix & NoV Configuration Utility

- Windows application, written by Diego Díaz and used to configure Clonix and NoV modules.

  - **Module Type** group is where you select your module. *(red rectangle)*

  - **Options** group is specific to the Clonix-41 module. *(green rectangle)*

  - **Options** and **Flash ROM** groups is where you select pre-configured ROM images and/or manually loaded ROM images. *(blue rectangles)*

    - ROM File Selection dialog box appears each time you click in one of the ROM image file name text boxes.

  - **Special applications** and **NoV’s RAM clear** groups is where you select an atypical functionality. *(pink rectangles)*

  - **Pink rectangle and Blue/Green rectangles options are mutually exclusive.**

  - **Programmer** group is where you select which type of PIC programmer you are using: RS-232 or USB. *(white rectangle)*

  - **Proceed** button

    - generate an assembly file.

    - call the Microchip PIC assembler that compile the assembly source code and generate an Intel hex file.

    - call the PIC programming software to transfer the hex file to the module.

  - **Cancel** button exit the application.
MPASM

➤ PIC Assembler for Windows made by Microchip and called by Clonix & NoV Configuration Utility.

➤ MPASM take the assembly file created by Clonix & NoV Configuration Utility, generate an executable binary file for the PIC microcontroller then serialize it as an extended Intel HEX file format.
MicroBurn DIY K150

➤ The purpose of this application is to upload/download a PIC Extended Intel HEX file to/from the microcontroller.

➤ MicroBrn is a 32 bits Windows application that has been co-developed by DIY Electronics and Jim Robertson of Newfound Electronics.

➤ MicroBrn last release is 2007-08-23

➤ Available at www.kitsrus.com

➤ Included in Clonix & NoV Configuration Utility package.
Device Manager

- Windows Device Manager allows you to see on which virtual serial port the PIC programmer or the USB-41 module was assigned to.

- Both devices uses the Prolific USB-to-Serial communication integrated circuit.
USB 82143A

HP-82143A simulation includes:

➤ A USB-82143A Windows application on PC side.
➤ A USB-41 module on HP-41C side.
➤ Both pieces are needed to fully simulate a HP-82143A printer.

➤ Output text box content can be:
  ➤ Printed.
  ➤ Saved to a RTF file.
  ➤ Copied and pasted into another application.
Table of Content

➤ Software Download
➤ Software Installation
Software Download

➤ 7-Zip Compressor/Decompressor Utility.
   Home: www.7-zip.org
   Download: www.7-zip.org/download.html

   Download #1: www.clonix41.org/Projects/Updates/Clonix_CD_090315.zip
   Download #2: www.hhcworld.com/files/hhc2020/Clonix_CD_090315.zip

➤ Alternate Clonix & NoV Configuration Utility. (v4.2, May 20th, 2020)
   Description: Alternate version made by Diego to temporary address the missing support
                for NoVRAM & NoV-32 modules in the 2015 release of ClonixConfig.exe
   Download: www.hhcworld.com/files/hhc2020/ClonixConfigAlt.zip

➤ NoV-64 QROM Assembly. (June 18, 2014)
   Description: hpmuseum.org/forum/thread-1653.html
   Download #1: www.clonix41.org/Projects/Nov64/Non-HEPAX-64_Upgr.zip
   Download #2: www.hhcworld.com/files/hhc2020/Non-HEPAX-64_Upgr.zip

➤ USB-41 Page Transfer Utility. (April 14, 2014)
   Description: hpmuseum.org/forum/thread-995-post-8211.html
   Download #1: www.clonix41.org/Projects/USB-41/USB-41-4.rar
   Download #2: www.hhcworld.com/files/hhc2020/USB-41-4.rar

➤ Latest ROM files, updated monthly by Monte Dalrymple. (May 5, 2020)
   ROM Listing: systemyde.com/pdf/mem_ref.pdf
   Download #1: www.systemyde.com/zip/rom_files_200502.zip (or newer, filename pattern: rom_files_YYMMDD.zip)
   Download #2: www.hhcworld.com/files/hhc2020/rom_files_200502.zip

➤ LIF Utilities. (v1.7.10, February 26, 2020)
   Home: github.com/bug400/lifutils
   Download: github.com/bug400/lifutils/releases/tag/v1.7.10 (or newer version with Windows installer)
Software Installation

1. Create HP calculator tools folders:
   1. Main folder: c:\hpct
   2. Archive folder: c:\hpct\archive
   3. Clonix folder: c:\hpct\clonix
   4. LIF utilities folder: c:\hpct\lifutils

2. Download the specified files of the Download slide to the archive folder.

3. Install 7-Zip:
   1. Run 7z1900.exe (or newer version)
   2. Follow installation procedure.

4. 7-Zip Usage:
   1. In Windows Explorer
   2. Select the archive file you want to extract
   3. Press mouse right button to get context menu
   4. Select 7-Zip option
   5. Select one of the Extract 7-Zip sub-options.

5. Installing Clonix Configuration Utility:
   1. Using 7-Zip, extract Clonix_CD_090315.zip
   2. Move extracted all files and sub-folders to clonix folder.
   3. Remove extract folder, if any.

6. Add Alternate Clonix Configuration Utility:
   1. Using 7-Zip, extract ClonixConfigAlt.zip
   3. Remove extract folder, if any.

7. Add missing NoV-64 QROM file:
   1. Using 7-Zip, extract Non-HEPAX-64_Upgr.zip
   2. Move NoV-64-N.asm file to clonix folder.
   3. Remove leftover files and extract folder, if any.

8. Add missing USB-41 Page Transfer Utility:
   1. Using 7-Zip, extract USB-41-4.rar
   2. Move extracted all files to clonix folder.
   3. Remove extract folder, if any.

9. Update ROM files:
   1. Using 7-Zip, extract rom_files_200502.zip
   2. Move all extracted files to clonix folder.
   3. Remove extract folder, if any.

10. Install LIF utilities:
    1. Run lifutils installation program:
       Windows 32 bit: lifutils-win32-setup.exe
       Windows 64 bit: lifutils-win64-setup.exe
    2. Follow installation procedure:
       1. On Choose Components dialog, select the type of install to: FULL.
       2. On Choose Install Location dialog, modify destination folder to: c:\hpct\lifutils

11. Installation is now done!
CONFIGURATION

Clonix/NoV Utility v4.2
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➤ Low Power [Gold Module]
➤ Standard
➤ Standard + RAM
➤ Advantage
➤ Advantage + Forth 41 C/CV
➤ Advantage + Forth 41 CX
➤ Forth 41 C/CV
➤ Forth 41 CX
➤ Service 41C/CV
➤ Service 41CX
**Low Power [Silver Module]**

Goal: activating full low power mode and loading ROMs into the module.

1. Select Clonix-41 option.

2. Select Low Power (LP) option.

   Low Power (LP) is needed for Clonix 41 (silver) to run as expected. Also, this module can only be plugged in a calculator running at original speed.

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.

4. Select ROM file name.

5. Click on Open button.


Go to Programming section.
Low Power [Gold Module]

Goal: activating limited low power mode and loading ROMs into the module.

1. Select Clonix-41 option.
2. Select Low Power (LP) option.
   *When (LP) is selected, a power drain reduction is achieved (not as much as the Silver module) but noticeable. Also, when this option is active the module can only be plugged in a calculator running at original speed.*

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.
4. Select ROM file name.
5. Click on Open button.

Go to Programming section.
Standard

Goal: loading ROMs into the module.

1. Select Clonix-41 option.
2. Select Standard (6P) option.

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.
4. Select ROM file name.
5. Click on Open button.

Go to Programming section.
Standard + RAM

Goal: activating a 512 RAM space at page #F and optionally loading ROMs into the module.

1. Select Clonix-41 option.
2. Select Standard (6P) option.
3. Select RAM @ pg #F option to map the optional 512 RAM words to page #F.

Page F is no longer available for ROM mapping.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.
5. Select ROM file name.
6. Click on Open button.

Go to Programming section.
Advantage

Goal: loading HP Advantage ROM and optionally other ROMs into the module.

1. Select Clonix-41 option.
2. Select Low Power (LP) or select Standard (6P) (default) option with or without the RAM @ pg #F sub-option.
3. Select Advantage ROM.
   Load ROM images at pages #8, #9 & #9 bank 2.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.
5. Select ROM file name.
6. Click on Open button.

Go to Programming section.
Advantage + Forth 41 C/CV

Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

1. Select Clonix-41 option.

2. Select Low Power (LP) or select Standard (6P) (default) option with or without the RAM @ pg #F sub-option.

3. Select Advantage ROM.
   Load ROM images at pages #8, #9 & #9 bank 2.

4. Select Forth 41 (C/CV).
   Load ROM images at pages #4 & #5.

For each ROM file you want to map:

5. Click in one the ROM image file name white space to show file selection dialog.

6. Select ROM file name.

7. Click on Open button.


Go to Programming section.
Advantage + Forth 41 CX

Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

1. Select Clonix-41 option.

2. Select Low Power (LP) or select Standard (6P) (default) option with or without the RAM @ pg #F sub-option.

3. Select Advantage ROM.
   Load ROM images at pages #8, #9 & #9 bank 2.

4. Select Forth 41 (C/CV) then CX version.
   Load ROM images at pages #4 & #7.

For each ROM file you want to map:

5. Click in one the ROM image file name white space to show file selection dialog.

6. Select ROM file name.

7. Click on Open button.


Go to Programming section.
Forth 41 C/CV

Goal: loading a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

1. Select Clonix-41 option.

2. Select Low Power (LP) or select Standard (6P) (default) option with or without the RAM @ pg #F sub-option.

3. Select Forth 41 (C/CV).
   Load ROM images at pages #4 & #5.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.

5. Select ROM file name.

6. Click on Open button.


Go to Programming section.
Forth 41 CX

Goal: loading a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

1. Select Clonix-41 option.

2. Select **Low Power** (LP) or select **Standard** (6P) (default) option with or without the RAM @ pg #F sub-option.

3. Select Forth 41 (C/CV) then CX version.
   Load ROM images at pages #4 & #7.

   For each ROM file you want to map:
   
   4. Click in one the ROM image file name white space to show file selection dialog.

   5. Select ROM file name.

   6. Click on **Open** button.


   Go to **Programming** section.
Service 41C/CV


1. Select Clonix-41 option.

2. Select Service 41C.

Go to Programming section.
Service 41CX


1. Select Clonix-41 option.
2. Select Service 41CX.

Go to Programming section.
NOVRAM

Configuration

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➤ HEPAX
➤ HEPAX + Forth 41 C/CV
➤ HEPAX + Forth 41 CX
➤ NoV's RAM Clear
➤ HEPAX RAM
➤ Service 41C/CV
➤ Service 41CX
HEPAX

Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

1. Select NoVRAM option.
2. HEPAX is automatically selected.

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.
4. Select ROM file name.
5. Click on Open button.

Go to Programming section.
HEPAX + Forth 41 C/CV

Goal: loading Advanced HEPAX ROM and a subset version of the Forth language for the 41C/CV into the module.

1. Select NoVRAM option.
2. HEPAX is automatically selected.
3. Select Forth 41 (C/CV).
   
   Load ROM images at pages #4 & #5.

Go to Programming section.
HEPAX + Forth 41 CX

Goal: loading Advanced HEPAX ROM and a subset version of the Forth language for the 41CX into the module.

1. Select NoVRAM option.
2. HEPAX is automatically selected.
3. Select Forth 41 (C/CV) then CX version. Load ROM images at pages #4 & #7.

Go to Programming section.
NoV's RAM Clear

Goal: loading a program into the module that clears the NoV module RAM.

1. Select NoVRAM option.
2. HEPAX is automatically selected but unused.
3. Select CLR_RAM1 to load a specialized firmware that will clear HEPAX RAM.
   Note: this option has been proven to be unreliable, more details in Clearing HEPAX RAM section.

Go to Programming section.
HEPAX RAM

Goal: loading a program into the module that simulate an HEPAX Double Memory module.

1. Select NoVRAM option.
2. HEPAX is automatically selected but unused.
3. Select HEPAX RAM to configure the module as a HEPAX Double Memory unit.

Go to Programming section.
Service 41C/CV


1. Select NoVRAM option.
2. HEPAX is automatically selected but unused.
3. Select Service 41C.

Go to Programming section.

1. Select NoVRAM option.
2. HEPAX is automatically selected but unused.
3. Select Service 41CX.

Go to Programming section.
Table of Content

➤ HEPAX
➤ NoV’s RAM Clear
➤ HEPAX RAM
➤ Service 41C/CV
➤ Service 41CX

NOV-32

Configuration
Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

1. Select NoV-32 option.

2. HEPAX is automatically selected.

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.

4. Select ROM file name.

5. Click on Open button.


Go to Programming section.
NoV's RAM Clear

Goal: loading a program into the module that clears the NoV module RAM.

1. Select NoV-32 option.

2. HEPAX is automatically selected but unused.

3. Select CLR_RAM2 to load a specialized firmware that will clear HEPAX RAM.
   
   Note: this option has been proven to be unreliable, more details in Clearing HEPAX RAM section.

Go to Programming section.
HEPAX RAM

Goal: loading a program into the module that simulate an HEPAX Double Memory module.

1. Select NoV-32 option.

2. HEPAX is automatically selected but unused.

3. Select HEPAX RAM to configure the module as a HEPAX Double Memory unit.

Go to Programming section.
Service 41C/CV


1. Select NoV-32 option.

2. HEPAX is automatically selected but unused.

3. Select Service 41C.

Go to Programming section.
Service 41CX


1. Select NoV-32 option.
2. HEPAX is automatically selected but unused.
3. Select Service 41CX.

Go to Programming section.
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➤ Standard
➤ Standard + Merged Blocks
➤ Advantage
➤ Advantage + Forth 41 C/CV
➤ Advantage + Forth 41 CX
➤ Forth 41 C/CV
➤ Forth 41 CX
➤ Dual X-Memory
➤ Service 41C/CV
➤ Service 41CX
➤ Service C/CX
Standard

Goal: loading ROMs into the module.

1. Select Clonix-D option.

2. Unselect Join Blocks. 

   Flash ROM Block 0 (white) and Block 1 (yellow) are two separated blocks. ROM’s specified in Flash ROM Block 0 (white) will be visible when the module is inserted into an odd port, while Flash ROM Block 1 (yellow) will be visible when the module is inserted into an even port.

For each ROM file you want to map:

3. Click in one the ROM image file name white space to show file selection dialog.

4. Select ROM file name.

5. Click on Open button.


Go to Programming section.
Standard + Merged Blocks

Goal: loading ROMs into the module. Flash blocks are merged allowing more ROM's to be mapped.

1. Select Clonix-D option.

2. Select Join Blocks.
   Flash ROM Block 0 (white) and Block 1 (yellow) are merged into a single block.

   For each ROM file you want to map:

   3. Click in one the ROM image file name white space to show file selection dialog.

   4. Select ROM file name.

   5. Click on Open button.


   Go to Programming section.
**Advantage**

Goal: loading HP Advantage ROM and optionally other ROMs into the module.

1. Select Clonix-D option.

2. Select Advantage ROM.  
   Load ROM images at pages #8, #9 & #9 bank 2.

3. Optional: unselect or select Join Blocks.  
   *Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.*

4. Click in one the ROM image file name white space to show file selection dialog.

5. Select ROM file name.

6. Click on Open button.


*Go to Programming section.*
Advantage + Forth 41 C/CV

Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

1. Select Clonix-D option.
2. Select Advantage ROM.
   Load ROM images at pages #8, #9 & #9 bank 2.
3. Select Forth 41 (C/CV).
   Load ROM images at pages #4 & #5.
4. Optional: unselect or select Join Blocks.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

5. Click in one the ROM image file name white space to show file selection dialog.
6. Select ROM file name.
7. Click on Open button.

Go to Programming section.
Advantage + Forth 41 CX

Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

1. Select Clonix-D option.

2. Select Advantage ROM.
   *Load ROM images at pages #8, #9 & #9 bank 2.*

3. Select Forth 41 (C/CV) then CX version.
   *Load ROM images at pages #4 & #7.*

4. Optional: unselect or select Join Blocks.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

5. Click in one the ROM image file name white space to show file selection dialog.

6. Select ROM file name.

7. Click on Open button.


Go to Programming section.
Forth 41 C/CV

Goal: loading a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

1. Select Clonix-D option.

2. Select Forth 41 (C/CV).  
   Load ROM images at pages #4 & #5.

3. Optional: unselect or select Join Blocks.  
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.

5. Select ROM file name.

6. Click on Open button.


Go to Programming section.
Forth 41 CX

Goal: loading a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

1. Select Clonix-D option.

2. Select Forth 41 (C/CV).
   Load ROM images at pages #4 & #7.

3. Optional: unselect or select Join Blocks.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.

5. Select ROM file name.

6. Click on Open button.


Go to Programming section.
Dual X-Memory

Goal: loading a program into the module that simulate two 82181A X-Memory modules.

1. Select Clonix-D option.

2. Select Dual Ext. Mem. to configure the module as a Double X-Memory module. This configuration add 476 of Extended-Registers RAM to the system. RAM content is lost when the module is unplugged from the calculator.

Go to Programming section.
Service 41C/CV


1. Select Clonix-D option.

2. Select Service 41C.

Go to Programming section.
Service 41CX


1. Select Clonix-D option.

2. Select Service 41CX.
   

Go to Programming section.
Goal: loading HP Service ROMs into the module.
Note: this option was first created for the Clonix 41d Anniversary Ed.

1. Select Clonix-D option.

2. Select Service C/CX.
   Load Service 41C/CV ROM [SM-1C] image in page #4 block 0.
   Inserting the module into an odd port activates block 0.
   Inserting the module into an even port activates block 1.

Go to Programming section.
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- HEPAX
- HEPAX + Merged Blocks
- HEPAX + Advantage
- NoV's RAM Clear
- HEPAX RAM
- HP-41CY & RAMBOX64
- Dual X-Memory
- Service 41C/CV
- Service 41CX
- Quasi-ROM
- Clonix-D Persona

NOV-64(D)
Configuration
HEPAX

Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

1. Select NoV-64 option.
2. HEPAX is automatically selected.
   Flash ROM Block 0 (white) and Block 1 (yellow) are two separated blocks.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.
5. Select ROM file name.
6. Click on Open button.

Go to Programming section.
HEPAX + Merged Blocks

Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module. Flash blocks are merged allowing more ROM's to be mapped.

1. Select **NoV-64** option.
2. **HEPAX** is automatically selected.
3. Select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are merged into a single block.

For each ROM file you want to map:

4. Click in one the **ROM image file name** white space to show file selection dialog.
5. Select ROM file name.
6. Click on **Open** button.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

Go to **Programming** section.
HEPAX + Advantage

Goal: loading Advanced HEPAX ROM, HP Advantage ROM and optionally other ROMs into the module.

1. Select NoV-64 option.
2. HEPAX is automatically selected.
3. Select Advantage ROM.
   Load ROM images at pages #C, #D & #D bank 2.
4. Optional: unselect or select Join Blocks.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

5. Click in one the ROM image file name white space to show file selection dialog.
6. Select ROM file name.
7. Click on Open button.

Go to Programming section.
NoV’s RAM Clear

Goal: loading a program into the module that clears the NoV module RAM.

1. Select NoV-64 option.
2. HEPAX is automatically selected but unused.
3. Select CLR_RAM4 to load a specialized firmware that will clear HEPAX RAM.
   Note: this option has been proven to be unreliable, more details in Clearing HEPAX RAM section.

Go to Programming section.
HEPAX RAM

Goal: loading a program into the module that simulate an HEPAX Double Memory module.

1. Select NoV-64 option.
2. HEPAX is automatically selected but unused.
3. Select HEPAX RAM to configure the module as a HEPAX Double Memory unit.

Go to Programming section.
Goal: loading W&W RAMBOX64 ROM into the module to simulate a RAMBOX64 unit or an HP-41CY calculator.

1. Select NoV-64 option.

2. HEPAX is automatically selected but unused.

3. Select HP-41CY to configure the module as a W&W RAMBox64 unit.
   When inserted into a HP-41CX halfnut you get an HP-41CY replica without the turbo mode.

Go to Programming section.
Goal: loading a program into the module that simulate two 82181A X-Memory modules.

1. Select NoV-64 option.

2. HEPAX is automatically selected but unused.

3. Select Dual Ext. Mem. to configure the module as a Double X-Memory module. This configuration add 476 of Extended-Registers RAM to the system. RAM content is lost when the module is unplugged from the calculator.

Go to Programming section.
Service 41C/CV


1. Select NoV-64 option.
2. HEPAX is automatically selected but unused.
3. Select Service 41C.

Go to Programming section.
Service 41CX


1. Select **NoV-64** option.

2. **HEPAX** is automatically selected but unused.

3. Select **Service 41CX**.
   
   *Load HP Service ROM [SM-2A] image in page #4.*

Go to Programming section.
Quasi-ROM

Goal: activating RAM/QROM pages #8 to #B and optionally loading ROMs into the module.

1. Select NoV-64 option.
2. Unselect HEPAX option.
3. Optional: unselect or select Join Blocks. Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

For each ROM file you want to map:

4. Click in one the ROM image file name white space to show file selection dialog.
5. Select ROM file name.
6. Click on Open button.

Go to Programming section.
Clonix-D Persona

NoV-64d module has the ability to behave exactly like a Clonix-D. If you want that persona, go to the Clonix-D section and configure the module without any restrictions.

NoV-64 module has the ability to behave partially like a Clonix-D. If you want that persona, go to the Clonix-D section and configure the module with these restrictions:

Join Blocks Unselected

- You can specify a maximum of 6 pages (24K) in Flash ROM Block 1
- Flash ROM Block 0 must contains the same ROM images at the same place as specified in Flash ROM Block 1. (Flash ROM Block 0 is a clone of Flash ROM Block 1)

Join Blocks Selected

- You can specify a maximum of 12 pages (48K) in Flash ROM Block 0+1
USB-41

Configuration
Goal: loading a modified 82143A printer ROM and optionally other ROMs into the module.

1. Select USB-41 option.
   Load printer ROM image at page #6.

For each ROM file you want to map:

2. Click in one the ROM image file name white space to show file selection dialog.
3. Select ROM file name.
4. Click on Open button.

Go to Programming section.
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Hardware 1

➤ Module Adapter

➤ Prog. + Adapter + Module

➤ K150 USB PIC Programmer

➤ K149 USB PIC Programmer
Hardware 2

- Modules & PIC Programmer Adapter by Diego Díaz
- Clonix-D cost is 100 €
- USB-41 cost is 110 €
- NoV-64d cost is 140 €
- Adapter cost is 10 €
- K150 PIC Programmer + Adapter cost is 30 €
- Ordering information at www.clonix41.org

*Minimum requirement: K150 USB PIC programmer must have the 18A protocol firmware installed.*
Software

- Clonix & NoV Configuration Utility v4.2
  - Windows utility written by Diego Díaz to configure Clonix and NoV modules.
  - Read Installation section for software download and installation procedures.
- MPASM (included in Clonix_CD_090315.zip)
  - Microchip Assembler for PIC microcontrollers
  - MPASM User's Guide with MPLINK and MPLIB
  - MPLAB development system
- PIC Programming Software (included in Clonix_CD_090315.zip)
  - K150 PIC Programmer Manual
    [www.sigmaelectronica.net/manuals/K150.pdf](www.sigmaelectronica.net/manuals/K150.pdf)
  - Micropro / MicroBurn DIY Software
## PIC Assembly & Intel Hex Files

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File Generation Failed

In Clonix & NoV Configuration Utility ...

1. Press **Proceed** to start MPASM.

   *Assembler was unable to compile the source file, progress bar is red, hex file generation was unsuccessful.*

2. Press **OK** to start **MicroBurn (DIY K150)** application.

   *MPASM failed its file generation, we cannot continue further.*

3. Close **MicroBurn (DIY K150)** to go back to Clonix & NoV Configuration Utility application and validate your configuration.
File Generation Successful

In Clonix & NoV Configuration Utility ...

1. Press **Proceed** to start MPASM.

   *Assembler was able to compile the source file, progress bar is green, hex file generation was successful.*

2. Press **OK** to start **MicroBurn (DIY K150)** application.
In MicroBurn (DIY K150) ...

Upon application start, a communication error dialog box is telling us that the application is not able to communicate with the PIC programmer.

1. Press OK to acknowledge the error.

Verify that your RS-232 or USB PIC programmer is correctly connected. Verify that serial communication port number is valid.

2. Select menu File.

3. Select sub-menu Port.

In the Serial Port Change dialog box:

4. Enter PIC Programmer COM Port

5. Press OK to accept and close the dialog box.

If connection is established you should see K150 board connected displayed in the status field.

6. Close MicroBurn (DIY K150) to go back to Clonix & NoV Configuration Utility

7. Press Proceed again.
File Upload Failed 1

1. Verify that your module is correctly inserted in the adapter.

   In MicroBurn (DIY K150) ...

2. Press Program to start programming.

   A confirm dialog box is telling us that the module is not recognized.

3. Press No in the Confirm dialog box.

   Go back to step 1 until successful.
1. Verify that your module is correctly inserted in the adapter.

In MicroBurn (DIY K150) ...

2. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

3. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. Here, module programming failed.


Go back to step 1 until successful.
1. Verify that your module is correctly inserted in the adapter.

In MicroBurn (DIY K150) ...  

2. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

3. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. Module programming worked.

4. Press OK in the Information dialog box.

Remove your module from the adapter.

5. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.
NOV RUNTIME CONFIGURATION

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➤ 16K RAM Mapping
➤ 32K RAM Mapping
➤ 64K RAM Mapping
➤ 24K Flash Mapping
➤ 48K Flash Mapping
➤ Control Word
➤ Control Word : NoV-32
➤ Control Word : NoV-64(d)
➤ Crash Recovery Function
➤ ROM Shadowing : NoV-64(d)
➤ QROM Protection : NoV-64(d)
➤ NoV Modes
16K RAM Mapping

NoVRAM : 16K HEPAX RAM / QROM

Block 0 : 16K

4K 4K 4K 4K

HP-41C : 64K

4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K

#0 #1 #2 #3 #4 #5 #6 #7 #8 #9 #A #B #C #D #E #F
32K RAM Mapping

NoV-32 : 32K HEPAX RAM / QROM

Block 0 : 16K

4K 4K 4K 4K

Block 1 : 16K

4K 4K 4K 4K

HP-41C : 64K

4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K 4K

#0 #1 #2 #3 #4 #5 #6 #7 #8 #9 #A #B #C #D #E #F
# 64K RAM Mapping

<table>
<thead>
<tr>
<th>Block 0 : 16K</th>
<th>Block 1 : 16K</th>
<th>Block 2 : 16K</th>
<th>Block 3 : 16K</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K</td>
<td>4K</td>
<td>4K</td>
<td>4K</td>
</tr>
<tr>
<td>4K</td>
<td>4K</td>
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<tr>
<td>4K</td>
<td>4K</td>
<td>4K</td>
<td>4K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HP-41C : 64K</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K</td>
</tr>
<tr>
<td>4K</td>
</tr>
<tr>
<td>4K</td>
</tr>
<tr>
<td>4K</td>
</tr>
<tr>
<td>#0</td>
</tr>
<tr>
<td>#1</td>
</tr>
<tr>
<td>#2</td>
</tr>
<tr>
<td>#3</td>
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<tr>
<td>#4</td>
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<td>#5</td>
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<td>#6</td>
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<td>#7</td>
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<td>#8</td>
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<td>#9</td>
</tr>
<tr>
<td>#A</td>
</tr>
<tr>
<td>#B</td>
</tr>
<tr>
<td>#C</td>
</tr>
<tr>
<td>#D</td>
</tr>
<tr>
<td>#E</td>
</tr>
<tr>
<td>#F</td>
</tr>
</tbody>
</table>

**NoV-64 : 64K HEPAX RAM / QROM**
24K Flash Mapping

Flash : 24K

Block 0 : 24K

4K 4K 4K 4K 4K 4K

HP-41C : 64K

Banks 1 to 4
48K Flash Mapping

Flash : 48K

<table>
<thead>
<tr>
<th>Block 0 : 24K</th>
<th>Block 1 : 24K</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K</td>
<td>4K</td>
</tr>
<tr>
<td>4K</td>
<td>4K</td>
</tr>
</tbody>
</table>

Banks 1 to 4

HP-41C : 64K
Control Word

- NoV-32 & NoV-64(d) modules has the ability to change their configuration at runtime.
- The configuration space (aka Control Word) is located at address 4100.
- Next slides provide the details of what the configuration value means.
- Assuming the module is configured in HEPAX mode, the procedure to change the configuration is ...
  - [XEQ] [ALPHA] HEXEDIT [ALPHA]
    - You should see: ADR: _ _ _ _
  - Enter 4100
    - You should see: ADR: 4100 then 4100 CCC _ _ _ (CCC is the current configuration value).
  - Enter the new configuration value: NNN
    - You should see: 4100 CCC NNN then next address location 4101 ?? _ _ _
  - [←]
    - You should see: ADR: _ _ _ _
  - [←] to go back to normal mode.
  - The new configuration is now active for the RAM part, but a power cycle is needed for the Flash configuration to become active (if modified).
Control Word: NoV-32

<table>
<thead>
<tr>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>RAM Block 0 mapped to pages #8 to #B in bank 1, 16K HEPAX RAM</td>
</tr>
<tr>
<td>001</td>
<td>RAM Block 1 mapped to pages #8 to #B in bank 1, 16K HEPAX RAM</td>
</tr>
</tbody>
</table>

000 Value at module insertion

Examples

<table>
<thead>
<tr>
<th>Hex</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>16K HEPAX RAM [block 0, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>001</td>
<td>16K HEPAX RAM [block 1, pages #8..#B, bank 1]</td>
</tr>
</tbody>
</table>
Control Word: NoV-64(d)

### Hex/Description

<table>
<thead>
<tr>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>1st 16K HEPAX RAM mapped [block 0, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0001</td>
<td>1st 16K HEPAX RAM mapped [block 1, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0010</td>
<td>1st 16K HEPAX RAM mapped [block 2, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0011</td>
<td>1st 16K HEPAX RAM mapped [block 3, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0000</td>
<td>2nd 16K HEPAX RAM unmapped</td>
</tr>
<tr>
<td>0001</td>
<td>2nd 16K HEPAX RAM mapped [block 1, pages #C..#F, bank 1] (Flash must be unmapped)</td>
</tr>
<tr>
<td>0010</td>
<td>2nd 16K HEPAX RAM mapped [block 2, pages #C..#F, bank 1] (Flash must be unmapped)</td>
</tr>
<tr>
<td>0011</td>
<td>2nd 16K HEPAX RAM mapped [block 3, pages #C..#F, bank 1] (Flash must be unmapped)</td>
</tr>
<tr>
<td>00</td>
<td>16K Flash unmapped</td>
</tr>
<tr>
<td>1000</td>
<td>16K Flash mapped [block 0, any unused pages/bank] (2nd 16K HEPAX RAM must be unmapped)</td>
</tr>
<tr>
<td>1000</td>
<td>16K Flash mapped [block 1, any unused pages/bank] (2nd 16K HEPAX RAM must be unmapped)</td>
</tr>
<tr>
<td>1000</td>
<td>Copy RAM page PP (0..3) in block BB (0..3) to Flash page 5 in block 1</td>
</tr>
<tr>
<td>1111</td>
<td>Erase Flash page 5 in block 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hex</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>No Flash, 16K HEPAX RAM [block 0, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0001</td>
<td>No Flash, 16K HEPAX RAM [block 1, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0010</td>
<td>No Flash, 16K HEPAX RAM [block 2, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0011</td>
<td>No Flash, 16K HEPAX RAM [block 3, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0000</td>
<td>No Flash, 32K HEPAX RAM [block 0, pages #C..#F, bank 1] &amp; [block 0, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0001</td>
<td>No Flash, 32K HEPAX RAM [block 1, pages #C..#F, bank 1] &amp; [block 1, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>0100</td>
<td>16K Flash [block 0], 16K HEPAX RAM [block 2, pages #8..#B, bank 1]</td>
</tr>
<tr>
<td>1000</td>
<td>16K Flash [block 1], 16K HEPAX RAM [block 3, pages #8..#B, bank 1]</td>
</tr>
</tbody>
</table>
Crash Recovery Function

➤ The goal of this feature is to put the module in safe/recovery mode.
  ➤ Great to get out of a dead lock situation when you have a polling point bug in your mcode.
  ➤ When a corrupted 4K RAM/QRAM page is creating a calculator lockup.
  ➤ Works on all NoV modules. (NoVRAM, NoV-32, NoV-64 & NoV-64d)

➤ When this mode is activated:
  ➤ HEPAX RAM/QROM read is disabled.  
    *Port catalog [HEPAX 002] no longer shows these pages.*
  ➤ HEPAX RAM/QROM write is enabled.  
    *Allowing you to clear or to overwrite the content of pages #8 to #B.*
  ➤ HEPAX ROM is mapped to page #C.  
    *Temporary overwriting Flash mapping for that page.*
  ➤ Control Word 4100 configuration is unchanged

➤ Manual Activation:
  ➤ In OFF mode, hold [ENTER] key down and press [ON] key twice in quick succession.
  ➤ Not working when inside a 41CL.

➤ Automatic Activation:
  ➤ CRF is automatically enabled after a memory lost. (Including the 41CL)

➤ Validation:
  ➤ #1: XEQ "HEPAX" then 002 to execute a port catalog.  
    *You should see that ports #8 to #B are empty and that HEPAX ROM is mapped to port #C.*
  ➤ #2: XEQ "HEPDIR" to list HEPAX RAM content.  
    *If successful, "H:NO FILESYS" should be displayed on the screen.*

➤ Deactivation:
  ➤ Do a power cycle: [ON][ON]
ROM Shadowing & QROM Protection : NoV-64(d)

- RAM & ROM Shadowing
  - When a physical module is inserted and a page conflict arise with the NoV configuration, the firmware give precedence to the physical module and temporary unmapped the page from the NoV module.
  - *Warning*: if the physical module page address is in conflict with a HEPAX RAM page, you should manage the issue otherwise you may lose some files or the entire HEPAX filesystem.

- QROM Protection
  - The NoV module fully support HEPAX RAM write protection.
  - *Usage*: X must contain the page number to be protected (8..15) then you execute RAMTOG to activate or deactivate write protection.
  - *Warning*: never activate write protection on a HEPAX RAM filesystem page.
NoV Notes

➤ NoV configured as Clonix:
  ➤ Control word not available.

➤ NoV configured as NoV:
  ➤ Control word value manage module memory mapping & behavior.
  ➤ Control word value is lost when module is unplugged.

➤ NoV-64 configured as Clonix-D:
  ➤ Odd/even port sensing not working.
  ➤ Blocks unmerged: 24K usable. *(Flash ROM Block 0 must match Flash ROM Block 1.)*
  ➤ Blocks merged: 48K usable.

➤ NoV-64d configured as Clonix-D:
  ➤ Odd/even port sensing working.
  ➤ Blocks unmerged: 2 x 24K usable.
  ➤ Blocks merged: 48K usable.
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➤ HEPAX vs NoV Modules
➤ Clearing with Config. Utility
➤ Clearing with MicroBurn
➤ Manual Clearing
HEPAX vs NoV Modules

➤ The RAM type used in the original HEPAX module was SRAM, so to clear its content, you simply had to remove the module from the calculator, wait a bit, reinsert it back and it was cleared.

➤ The RAM type used in the NoV modules is FRAM, the benefit of this technology is that it keep its content even when unplugged. The downside of it, is that the above procedure no longer works.

➤ The next slides shows how to clear NoV HEPAX RAM, they assume that your module is configured as HEPAX.
CLEARING WITH CONFIGURATION UTILITY

This method is here for completeness sake, it has been proven to be unreliable, please use manual clearing for better results.
**Goal:** loading clear HEPAX RAM firmware into NoV module.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select the NoV module that matches your module.

3. HEPAX is automatically selected but unused.

4. Select CLR_RAMx to load a specialized firmware that will clear HEPAX RAM.

5. Press **Proceed** to start MPASM.

In MicroBurn (DIY K150):

6. Press **Program** to start programming.

   *A confirm dialog box is telling us that the module is recognized.*

7. Press **Yes** in the **Confirm** dialog box.

   *Several status are displayed in the status field during hex file uploading. A information dialog box is telling us that the module had been successfully programmed.*

8. Press **OK** in the **Information** dialog box.

Remove your module from the adapter

9. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.

Clearing

➤ Make sure the calculator is off.

➤ Insert your NoV module into any port.

➤ Do NOT press the [ON] button.

➤ Wait for about 25 seconds for the erasing procedure to complete.

➤ CLR OK message will be displayed if clearing has been successful.

➤ NO CLR message will be displayed if clearing has failed.

*If you consistently get NO CLR message then use one of the other clear methods.*
CLEARING WITH MICROBURN

This method is here for completeness sake, it has been proven to be unreliable, please use manual clearing for better results.
Configuration 1

Goal: loading clear HEPAX RAM firmware into NoV module.

In MicroBurn (DIY K150) ...

1. Select menu **File**.
2. Select sub-menu option **Clear**.
   The ROM DATA space should now be empty.
3. Press **Load** button to load NoV Clear RAM file.
   The **Open HEX File** dialog should be displayed.
4. Select the appropriate CLR_RAM file.
   - **CLR_RAM1.HEX** for NoVRAM,
   - **CLR_RAM2.HEX** for NoV32 or
   - **CLR_RAM4.HEX** for NoV64 & NoV64d.
   The selected filename should appear in the **File name:** text box.
5. Press **Open** to confirm the file selection.
   ROM DATA space should shows the opened file content.
Configuration 2

1. Verify that your module is correctly inserted in the adapter.

In MicroBurn (DIY K150) ...

2. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

3. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. Module programming worked.

4. Press OK in the Information dialog box.

Remove your module from the adapter.

5. Close MicroBurn (DIY K150) application
Clearing

➤ Make sure the calculator is off.

➤ Insert your NoV module into any port.

➤ Do NOT press the [ON] button.

➤ Wait for about 25 seconds for the erasing procedure to complete.

➤ CLR OK message will be displayed if clearing has been successful.

➤ NO CLR message will be displayed if clearing has failed.

*If you consistently get NO CLR message then use one of the other clear methods.*
MANUAL CLEARING

Works in normal mode and in crash recovery mode
Goal: loading default HEPAX firmware into NoV module.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select the NoV module that match your module.

3. HEPAX is automatically selected.

4. Press Proceed to start MPASM.

In MicroBurn (DIY K150):

5. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

6. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading.

A information dialog box is telling us that the module had been successfully programmed.

7. Press OK in the Information dialog box.

Remove your module from the adapter

8. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.

FOCAL Program

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBL &quot;HCLR16&quot;</td>
<td>HEPAX Clear RAM 16K configuration.</td>
</tr>
<tr>
<td>8.011</td>
<td>Clear page 8 to 11 inclusively.</td>
</tr>
<tr>
<td>GTO 00</td>
<td>Goto clear common code.</td>
</tr>
<tr>
<td>LBL &quot;HCLR32&quot;</td>
<td>HEPAX Clear RAM 32K configuration.</td>
</tr>
<tr>
<td>8.015</td>
<td>Clear page 8 to 15 inclusively.</td>
</tr>
<tr>
<td>LBL 00</td>
<td>Clear common code.</td>
</tr>
<tr>
<td>&quot;OK&quot;</td>
<td>CLRAM confirmation.</td>
</tr>
<tr>
<td>LBL 01</td>
<td>Clear loop.</td>
</tr>
<tr>
<td>VIEW X</td>
<td>Show which page is being cleared.</td>
</tr>
<tr>
<td>CLRAM</td>
<td>Clear page specified in X.</td>
</tr>
<tr>
<td>ISG X</td>
<td>Have we finish clearing ?</td>
</tr>
<tr>
<td>GTO 01</td>
<td>No, go clear another page.</td>
</tr>
<tr>
<td>SF 11</td>
<td>Set autoexec flag.</td>
</tr>
<tr>
<td>OFF</td>
<td>Rebuild HEPAX pages tags (press ON to complete execution).</td>
</tr>
<tr>
<td>HEPDIR</td>
<td>Rebuild HEPAX pages links.</td>
</tr>
<tr>
<td>END</td>
<td>Program end. → X should have 2610 (16K cfg) or 5222 (32K cfg)</td>
</tr>
</tbody>
</table>
Clearing : NoVRAM & NoV-32

➤ Clearing a NoVRAM module (16K):

➤ XEQ "HCLR16"
  
you should see "H:DIR EMPTY"
  and have 2610 free HEPAX reg. in X.

➤ Clearing a NoV-32 module (16K):

➤ Clearing HEPAX RAM Block 0:

➤ If CRF needed, do the CRF procedure below.

➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]

➤ 4100 then 000 then [←] and [←]
  new configuration is now active.

➤ XEQ "HCLR16"
  
you should see "H:DIR EMPTY"
  and have 2610 free HEPAX reg. in X.

➤ Clearing HEPAX RAM Block 1:

➤ If CRF needed, do the CRF procedure below.

➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]

➤ 4100 then 001 then [←] and [←]
  new configuration is now active.

➤ XEQ "HCLR16"
  
you should see "H:DIR EMPTY"
  and have 2610 free HEPAX reg. in X.

CRF Activation: Power off, hold [ENTER] key down and press [ON] key twice in quick succession

CRF Validation: XEQ "HEPDIR" should display "H:NO FILESYS", if not, redo the CRF Activation.
Clearing : NoV–64(d) [16K HEPAX RAM Mapped]

➤ Clearing HEPAX RAM Block 0:
   ➤ If CRF needed, do the CRF procedure below.
   ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
   ➤ 4100 then 000 then [←] and [←]
      new configuration is now active
   ➤ XEQ "HCLR16"
      you should see "H:DIR EMPTY"
      and have 2610 free HEPAX reg. in X.

➤ Clearing HEPAX RAM Block 1:
   ➤ If CRF needed, do the CRF procedure below.
   ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
   ➤ 4100 then 001 then [←] and [←]
      new configuration is now active
   ➤ XEQ "HCLR16"
      you should see "H:DIR EMPTY"
      and have 2610 free HEPAX reg. in X.

➤ Clearing HEPAX RAM Block 2:
   ➤ If CRF needed, do the CRF procedure below.
   ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
   ➤ 4100 then 002 then [←] and [←]
      new configuration is now active
   ➤ XEQ "HCLR16"
      you should see "H:DIR EMPTY"
      and have 2610 free HEPAX reg. in X.

➤ Clearing HEPAX RAM Block 3:
   ➤ If CRF needed, do the CRF procedure below.
   ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
   ➤ 4100 then 003 then [←] and [←]
      new configuration is now active
   ➤ XEQ "HCLR16"
      you should see "H:DIR EMPTY"
      and have 2610 free HEPAX reg. in X.

CRF Activation: Power off, hold [ENTER] key down and press [ON] key twice in quick succession
CRF Validation: XEQ "HEPDIR" should display "H:NO FILESYS", if not, redo the CRF Activation.
Clearing : NoV-64(d) [32K HEPAX RAM Mapped]

➤ There are multiple configuration possible here:
  ➤ Config Pair #X (Double Block 0 & Double Block 1).
  ➤ Config Pair #1 (DB0: 010 & DB1: 032).
  ➤ Config Pair #2 (DB0: 020 & DB1: 031).
  ➤ Config Pair #3 (DB0: 030 & DB1: 021).

➤ Clearing HEPAX RAM Config Pair #X (Double Block 0):
  ➤ If CRF needed, do the CRF procedure below.
  ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
  ➤ 4100 then 010 or 020 or 030 then [←] and [←] 
      new configuration is now active.
  ➤ XEQ "HCLR32"
    you should see "H:DIR EMPTY"
    and have 5222 free HEPAX reg. in X.

➤ Clearing HEPAX RAM Config Pair #X (Double Block 1):
  ➤ If CRF needed, do the CRF procedure below.
  ➤ [XEQ] [ALPHA] HEXEDIT [ALPHA]
  ➤ 4100 then 032 or 031 or 021 then [←] and [←] 
      new configuration is now active.
  ➤ XEQ "HCLR32"
    you should see "H:DIR EMPTY"
    and have 5222 free HEPAX reg. in X.

CRF Activation: Power off, hold [ENTER] key down and press [ON] key twice in quick succession
CRF Validation: XEQ "HEPDIR" should display "H:NO FILESYS", if not, redo the CRF Activation.
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➤ Introduction
➤ QROM to PC with NoV-64(d)
➤ QROM to PC with USB-41
➤ PC to QROM with USB-41
Introduction

➤ Of the modules created by Diego, two modules (NoV-64(d) & USB-41) offer the possibility to transfer a QROM page between an HP-41 and a Windows PC.

➤ QROM Transfer Summary

➤ NoV-64(d) has the capability to indirectly transfer a HP-41 4K QROM page to a padded ROM image on your PC.

➤ USB-41 has the capability to directly transfer a HP-41 4K QROM (or ROM) page to a padded ROM image on your PC.

➤ USB-41 has the capability to directly transfer a 4K padded ROM image from your PC to a HP-41 QROM page.

➤ USB-41 Limitations

➤ A specialized copy firmware must be loaded into the USB-41.

➤ HEXPAX ROM must be present.
  Note: the copy firmware is piggybacking on HEPAX ROMCOPY function to do its magic.

➤ Since the module does not have QROM built-in, it need the assistance of an external MLDL, RAMBOX, HEPAX or NoV modules to provide the missing QROM memory.

➤ USB-41-4_Notes.txt file contains a detailed explanation of the transfer feature.

Note: this feature is not compatible with some specific 41CL ROMs. The transfer support the standard 4K by 10 bits words only and not the 4K by 16 bits words used by some 41CL ROMs.
QROM TO PC

with NoV-64(d)
Summary

➤ Goals:
  ➤ On a HP-41, copy a 4K ROM page to a 4K QROM page.
  ➤ Transfer a 4K QROM page from an HP-41 to a padded ROM image file on a PC running Windows.

➤ Steps:
  ➤ On Windows PC side:
    ➤ Setup the NoV-64(d) module as a NoV-64 with HEPAX module.
  ➤ On HP-41 side:
    ➤ QROM preparation:
      ➤ Copy a 4K ROM into one of HEPAX RAM pages. (if doing ROM transfer)
      ➤ Erase an HEPAX RAM page and load code in it. (if doing in-place editing)
    ➤ Erase last Flash page. (if needed)
    ➤ Copy QROM page to last Flash page.
  ➤ On Windows PC side:
    ➤ Read the whole NoV-64(d) Flash content and save it to an hex file.
    ➤ Extract the last 4k page of the hex file and save it to a padded ROM file.
Goal: loading default HEPAX firmware into NoV module.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select NoV-64 option.

3. HEPAX is automatically selected.

4. Keep last page of Flash ROM block 1 empty.

5. Press **Proceed** to start MPASM.

Hex file generation was successful.

6. Press **OK**

In MicroBurn (DIY K150):

7. Press **Program** to start programming.

A confirm dialog box is telling us that the module is recognized.

8. Press **Yes** in the **Confirm** dialog box.

Several status are displayed in the status field during hex file uploading. Module programming worked.

9. Press **OK** in the **Information** dialog box.

Remove your module from the adapter.

10. Close **MicroBurn (DIY K150)** application to go back to **Clonix & NoV Configuration Utility** application.

11. Close **Clonix & NoV Configuration Utility**.
ROM to QROM to Flash Copy

➤ Hardware setup:
   ➤ Press OFF
   ➤ Insert your NoV-64 module in port 1
   ➤ Insert your ROM to copy in port 4
   ➤ Press ON

➤ Mapping 16K HEPAX RAM from block 0:
   ➤ HEXEDIT (you should see: "ADR: _ _ _ _")
   ➤ Enter 4100 (you should see "4100 100 _ _ _")
   ➤ Enter 000 for no Flash and 16K HEPAX RAM from block 0
   ➤ Press [←] then [←] to exit HEXEDIT
   ➤ Press OFF then ON to activate config

➤ Finding ROM to copy location:
   ➤ HEXEDIT (you should see: "ADR: _ _ _ _")
   ➤ Enter E000 (you should see "E000 vvv _ _ _")
   If vvv is not equal to 000 then you found your ROM
   If vvv is equal to 000 then try address F000
   ➤ Press [←] then [←] to exit HEXEDIT

The following steps assume the 4K ROM is at E000

➤ Copying ROM to HEPAX RAM making it a QROM:
   ➤ Encoding source & destination address
      Encoding format: "00[begin-addr] [end-addr] [dest-addr]"
      ➤ "00E000EFFFB000" CODE
   ➤ COPYROM
      Copying 4K ROM at page #E to QROM at page #B

➤ Hardware reconfiguration:
   ➤ Press OFF remove ROM from port 4 then press ON

➤ Erasing target Flash page [block 1 , page 5]: (if needed)
   ➤ HEXEDIT (you should see: "ADR: _ _ _ _")
   ➤ Enter 4100 (you should see "4101 vvv _ _ _")
   If vvv is not equal to 000 then the page need to be erased.
   ➤ Press [←] to go back to address entering
   ➤ Enter 4100 (you should see "4100 000 _ _ _")
   ➤ Enter 3FF (you should see "4101 vvv _ _ _")
      If vvv is equal to 000 then the page was successfully erased.
      If vvv is equal to 0FD then the erasing failed, retry the procedure.

➤ Press [←] then [←] to exit HEXEDIT

➤ Copy QROM [block 0 , page 3] to Flash [block 1 , page 5]:
   ➤ HEXEDIT (you should see: "ADR: _ _ _ _")
   ➤ Enter 4100 (you should see "4100 000 _ _ _")
   ➤ Enter 330 (you should see "4101 vvv _ _ _")
      If vvv is equal to 000 then the copy was successful.
      If vvv is equal to 0FD then the copy failed, page was already used, erase the page and retry the copy.

➤ Press [←] then [←] to exit HEXEDIT

➤ Releasing QROM so that HEPAX can reclaim it as HEPAX RAM:
   ➤ "OK" 11 CLRAM

➤ Moving to computer side:
   ➤ OFF remove NoV-64 module from the calculator

Note: the above procedures (mapping, finding, etc) has been setup to be autonomous, optimization can be achieved by removing extra steps, like leaving and entering HEXEDIT between some procedures.
Flash to Padded ROM File

Goal: importing whole Flash content and save it into an HEX file.

1. Verify that your module is correctly inserted in the adapter.

In MicroBurn (DIY K150):

2. Select menu File.

3. Select sub-menu option Clear.

The ROM DATA space should now be empty.

4. Press Read to import the module whole Flash content into memory.

5. Press Save to export memory content to a file.

6. Enter a filename with a maximum of eight characters and with an .HEX extension. (ex.: MYROM.HEX)

7. Press Save button.

8. Close MicroBurn (DIY K150) application.

Goal: extract the last page of the HEX file to a padded ROM file.

Start RAM2ROM4.EXE:

9. Enter the HEX filename without extension and press the keyboard RETURN key. (ex.: MYROM [RETURN])

You now have successfully backed up a 4K module into a padded ROM file. (ex.: MYROM.ROM)

TOC
Summary

➤ Goals:
   ➤ Transferring a 4K ROM page from an HP-41 to a padded ROM image file on a PC running Windows.
   ➤ Transferring a 4K QROM page from an HP-41 to a padded ROM image file on a PC running Windows.

➤ Steps:
   ➤ On Windows PC side:
      ➤ Setup an NoV module with its default configuration. \(\text{if needed}\)
      ➤ Load the page transfer ROM into the USB-41 module.
      ➤ Plug USB-41 module into a USB port.
      ➤ Start USB-41 Page transfer utility application.
   ➤ On HP-41 side:
      ➤ Plug the HEPAX or NoV module in port 1 and the USB-41 module in port 4.
      ➤ Plug the ROM module to copy in port 3. \(\text{if doing a ROM transfer}\)
      ➤ Erase an HEPAX RAM page and load code in it. \(\text{if doing QROM copy}\)
   ➤ On Windows PC side:
      ➤ Select COM port, specify destination filename and press the Receive Page button.
   ➤ On HP-41 side:
      ➤ Put in X and Y the ROM/QROM page address to be transferred and execute ROMCOPY.
Goal: loading default HEPAX firmware into NoV module.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select the NoV module that matches your module.

3. HEPAX is automatically selected.

4. Press Proceed to start MPASM.

In MicroBurn (DIY K150):

5. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

6. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. A information dialog box is telling us that the module had been successfully programmed.

7. Press OK in the Information dialog box.

Remove your module from the adapter

8. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.

USB-41 Configuration

Goal: loading ROMCOPY piggyback firmware into the module.

1. Verify that your module is correctly inserted in the adapter.

2. In MicroBurn (DIY K150):
   a. Select menu File.
   b. Select sub-menu option Clear.

3. The ROM DATA space should now be empty.

4. Press Load button to load page transfer utility file.

5. The Open HEX File dialog should be displayed.


7. Press Open to confirm the file selection.

8. ROM DATA space should shows the opened file content.

9. Press Program to start programming.

10. A confirm dialog box is telling us that the module is recognized.

11. Press Yes in the Confirm dialog box.

12. Several status are displayed in the status field during hex file uploading.

13. Module programming worked.


15. Remove your module from the adapter.


17. Close MicroBurn application.
Goal: transferring a 4K ROM/QROM page to a file on a Windows PC.

HP-41 must be off before adding or removing modules.

On the HP-41 side ...
1. Insert an HEPAX or an NoV module in port 1.
2. Insert an USB-41 module in port 4.
3. Insert the module to copy in port 3 (we use Game ROM here) or load machine into one of the HEPAX QROM page.

On the Windows PC side ...
➤ Connect USB-41 to the PC.
➤ Start USB-41 Page transfer utility. (USB-41-4.exe)
4. Select the COM port assigned to USB-41.
5. Type or select the filename where the ROM image will be saved.
6. Press the Receive Page button.

On the HP-41 side ...
➤ Type: 12 ENTER XEQ "ROMCOPY"
    Note: Games module is a 4K ROM mapped to the lowest page.

On the Windows PC side ...
You will see Waiting to received until the USB-41 start sending data, at that point the status will change to Receiving until all data has been received, at that point the status will change to Received to indicate that the ROM has been completely received and saved in the specified filename.

7. Close application.
PC TO QROM

with USB-41
Summary

➤ Goal:
   ➤ Transferring a padded ROM image from a PC running Windows to an HP-41 QROM page.

➤ Steps:
   ➤ On Windows PC side:
      ➤ Setup an NoV module with its default configuration. *(if needed)*
      ➤ Load the page transfer ROM into the USB-41 module.
      ➤ Plug USB-41 module into a USB port.
   ➤ On HP-41 side:
      ➤ Plug the HEPAX or NoV module in port 1 and the USB-41 module in port 4.
   ➤ On Windows PC side:
      ➤ Start USB-41 Page transfer utility application.
      ➤ Select COM port, specify source filename and press the Send Page button.
   ➤ On HP-41 side:
      ➤ Put in 15 in Y, the QROM page address in X and execute ROMCOPY.
NoV Configuration (Opt.)

Goal: loading default HEPAX firmware into NoV module.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select the NoV module that match your module.

3. HEPAX is automatically selected.

4. Press Proceed to start MPASM.

In MicroBurn (DIY K150):

5. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

6. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading.
A information dialog box is telling us that the module had been successfully programmed.

7. Press OK in the Information dialog box.

Remove your module from the adapter

8. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.

**USB-41 Configuration**

**Goal:** loading ROMCOPY piggyback firmware into the module.

1. Verify that your module is correctly inserted in the adapter.

   In **MicroBurn (DIY K150)**:

2. Select menu **File**.

3. Select sub-menu option **Clear**.

   *The ROM DATA space should now be empty.*

4. Press **Load** button to load page transfer utility file.

   *The Open HEX File dialog should be displayed.*

5. Select **CLONIXU4.HEX** file.

   *The selected filename should appear in the File name: text box.*

6. Press **Open** to confirm the file selection.

   *ROM DATA space should shows the opened file content.*

7. Press **Program** to start programming.

   *A confirm dialog box is telling us that the module is recognized.*

8. Press **Yes** in the **Confirm** dialog box.

   *Several status are displayed in the status field during hex file uploading. Module programming worked.*

9. Press **OK** in the **Information** dialog box.

   *Remove your module from the adapter*

10. Close **MicroBurn (DIY K150)** application.
ROM Image Transfer

Goal: transferring a ROM/QROM page to a file on a Windows PC.
HP-41 must be off before adding or removing modules.

On the HP-41 side ...
1. Insert HEPAX or NoV module in port 1.
2. Insert USB-41 module in port 4.

On the Windows PC side ...
➤ Connect USB-41 to the PC.
➤ Start USB-41 Page transfer utility. *(USB-41-4.exe)*
3. Select the COM port assigned to USB-41.
4. Type or select the ROM image filename to send.
   Example: we are sending the Games ROM image.
5. Press the Send Page button.

On the HP-41 side ...
➤ Type: 15  ENTER  11  XEQ "ROMCOPY"
   Example: the Games ROM image is stored in QROM page 11.

On the Windows PC side ...
You will see Waiting to send until the USB-41 start requesting data, at that point the status will change to Sending until all data has been sent, at that point the status will change to Sent to indicate that the ROM image has been completely sent.
6. Close application.
Table of Content

➤ Clonix-D Live Demo
➤ USB-41 Live Demo
➤ NoV-64(d) Live Demo
Configuration

Goal: configuring a Clonix-D module to host the Advantage ROM and PPC ROM images for odd port insertion and to host some of Ángel Martin ROM images (Warp Core, AMC/OSX, Library4) for even port insertion.

In Clonix & NoV Configuration Utility:

1. Select Clonix-D option.
2. Select Advantage ROM.

Add these files to Flash ROM Block 0:

3. PPCL.ROM to Bank 1, Page A.
4. PPCU.ROM to Bank 1, Page B.

Add these files to Flash ROM Block 1:

5. LIBRARY4.ROM to Bank 1, Page 4.
6. AMCOSX4.ROM to Bank 1, Page 8.
7. WARB1.ROM to Bank 1, Page 9.
Goal: loading the configuration into the Clonix-D module

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:
2. Press Proceed to start MPASM.

Hex file generation was successful.

3. Press OK

In MicroBurn (DIY K150):
4. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

5. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. Module programming worked.

6. Press OK in the Information dialog box.

Remove your module from the adapter

7. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.
Testing

Goal: testing odd port or Flash block 0 images

➤ OFF
➤ Insert the module into an odd port.
➤ ON
➤ CAT 2

Your listing should look like the one in box 1.

Goal: testing even port or Flash block 1 images

➤ OFF
➤ Insert the module into an even port.
➤ ON
➤ CAT 2

Your listing should look like the one in box 2.
Table of Content

➤ Configuration & Programming
➤ Running Printer Simulator
➤ Printing
Goal: configuring a USB-41 module with its default config.

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:

2. Select USB-41 option.

3. Press Proceed to start MPASM.

Hex file generation was successful.

4. Press OK

In MicroBurn (DIY K150):

5. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.

6. Press Yes in the Confirm dialog box.

Module programming worked.

7. Press OK in the Information dialog box.

Remove your module from the adapter

8. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.
Running Printer Simulator

Goal: finding COM port value and configuring USB 82141A application accordingly.

On the Windows/PC side ...

Plug the USB-41 USB cable in a USB port of your computer.

Start Windows Device Manager.

1. Find which COM port is assigned to the Prolific driver.

Start USB 82143A Application.

2. Click on Port Settings.


4. Press OK.
Goal: validating if ROM image is in the module and testing if the simulated printer is working.

On the HP-41C side ...

Plug the USB-41 module in your calculator

➤ OFF

➤ Insert the module into a port

➤ ON

Validate module presence

1. CAT 2
   Your listing should look like the one in white box.

Test virtual printer

➤ CLST
   Clear stack content

➤ PRSTK
   Print stack content

On the Windows/PC side ...

2. You should have the same output as the window on the left
Table of Content

➤ Configuration
➤ Programming
➤ Testing

NOV-64(D) LIVE DEMO
Configuration

Goal: configuring a NoV-64d module to host the HEPAX ROM and PPC ROM images in Flash block 0 and to host the HEPAX ROM and CCD ROM images in Flash block 1.

In Clonix & NoV Configuration Utility:

1. Select NoV-64 option.
   - HEPAX option is automatically selected.

Add these files to Flash ROM Block 0:

2. PPCL.ROM to Bank 1, Page C.
3. PPCU.ROM to Bank 1, Page D.

Add these files to Flash ROM Block 1:

4. CCDL.ROM to Bank 1, Page C.
5. CCDU.ROM to Bank 1, Page D.
Programming

Goal: loading the configuration into the NoV-64 module

1. Verify that your module is correctly inserted in the adapter.

In Clonix & NoV Configuration Utility:
2. Press Proceed to start MPASM.

Hex file generation was successful.
3. Press OK

In MicroBurn (DIY K150):
4. Press Program to start programming.

A confirm dialog box is telling us that the module is recognized.
5. Press Yes in the Confirm dialog box.

Several status are displayed in the status field during hex file uploading. Module programming worked.
6. Press OK in the Information dialog box.

Remove your module from the adapter
7. Close MicroBurn (DIY K150) application to go back to Clonix & NoV Configuration Utility application.
Testing

» Configuration summary for this demo
  » Flash Block 0 contains HEPAX ROM & PPC ROM
  » Flash Block 1 contains HEPAX ROM & CCD ROM
  » HEPAX RAM Block 0 & 1 will be used

» Validating default configuration:
  Flash block 0 is mapped and HEPAX RAM block 0 is mapped.
  OFF, insert the module into a port, ON
  CAT 2
  You should see HEPAX & PPC ROMs in the listing:
  HEPDIR
  You should see "H:DIR EMPTY"
  and have 2610 free HEPAX reg. in X.

» Activating Flash Block 0 & HEPAX RAM block 1
  HEXEDIT, enter 4100, 101, [<−], [<−], OFF, ON
  CAT 2
  You should see HEPAX & PPC ROMs in the listing:
  HEPDIR
  You should see "H:DIR EMPTY"
  and have 2610 free HEPAX reg. in X.

» Creating a data file in HEPAX RAM block 1
  75, "DEF", HCRFLD
  HEPDIR
  You should see "DEF DA"
  and have 2533 free HEPAX reg. in X.

» No Flash Block & activating HEPAX RAM block 0
  HEXEDIT, enter 4100, 000, [<−], [<−], OFF, ON
  CAT 2
  You should see HEPAX but no PPC nor CCD ROMs in the listing:
  HEPDIR
  You should see "ABC DA"
  and have 2558 free HEPAX reg. in X
CLOSING TOPICS
In this presentation we have ...

- Reviewed some key informations about the HP-41C system.
- Discovered Diego Díaz modules.
- Covered every options of three modules.
- Gone through the programming process.
- Configured NoV HEPAX emulation.
- Cleared NoV HEPAX RAM content.
- Transferred a QROM page from an HP-41 to a PC.
- Had quick demo of three modules. *(Clonix-D, NoV-64d & USB-41)*
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