DIEGO'S HP-41C MODULES

HHC 2020

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AGENDA

Part I

- Introduction
- Reference
- Overview
- Installation
- Configuration
- Programming

Part II

- NoV Runtime Configuration
- HEPAX RAM Clearing
- QROM Transfer
- Live Demo
- Closing Topics

Table of Content

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

Notes

- 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

Table of Content

Memory Types

Type	Name	Content at power lost	Erase	Write	Used in ...	Comment
RAM	Random Access Memory	Erased	in-circuit (cell level)	in-circuit (cell level)	n/a	This is a family type. RAM Technologies includes: SRAM, DRAM, SDRAM, RDRAM, FRAM & others.
SRAM	Static RAM	Erased	in-circuit (cell level)	in-circuit (cell level)	Box: MLDL, RAMBOX Mod: HEPAX	
FRAM	Ferroelectric RAM	Preserved	in-circuit (cell level)	in-circuit (cell level)	Box: Mod: NoV	
QROM	Quasi-ROM	Follow RAM technology used	in-circuit (word level)	in-circuit (word level)	Box: MLDL, RAMBOX Mod: HEPAX, NoV	Virtual type, build with one of RAM technology. HP-41C ROM cell size is 10 bits word QROM implements ROM word with RAM
ROM	Read Only Memory	Preserved	n/a	at-creation (chip level)	Box: Mod: HP, CMT-20	
PROM	Programmable ROM	Preserved	n/a	out-of-circuit with a programmer (chip level)	Box: Mod: CMT-10	Also called OTP (One Time Programmable)
EPROM	Erasable PROM	Preserved	out-of-circuit ultraviolet light (chip level)	out-of-circuit with a programmer (chip level)	Box: MLDL, ROMBOX Mod: CMT-10, ZEPROM	
EEPROM	Electrically EPROM	Preserved	in-circuit (cell level)	in-circuit (cell level)	Box: Mod:	
Flash	Flash	Preserved	in-circuit (block level)	in-circuit (cell level)	Box: MLDL2000 Mod: NoV, Clonix	Two types of Flash: NOR (memory mapped, same usage as EEPROM) NAND (used for mass storage)

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
- Ángel Martin has created for the 41CL several modules (CLMEM, SandMatrix, etc.) that uses either some or all of the addressable registers.
  Documents: systemyde.com/hp41/documents.html & ROM Images: systemyde.com/hp41/archive.html

HP-41C ROM Memory Map

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

EPROM ROM File Format

ADD	HEX	U2:L8	U2	L8
X000	2DC	2:DC	10	11011100
X001	11E	1:1E	01	00011110
X002	0A4	0:A4	00	10100100
X003	3A1	3:A1	11	10100001

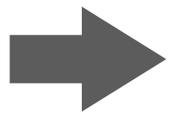
Offset	4xU2
0000	11000110
pos:	03020100

Offset	L8
0000	11011100
0001	00011110
0002	10100100
0003	10100001

- 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

ADD	HEX	BINARY
X000	2DC	1011011100
X001	11E	0100011110
X002	0A4	0010100100
X003	3A1	1110100001

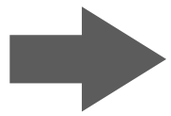


Offset	HEX	BINARY
0000	C6	11000110
0001	A1	10100001
0002	A4	10100100
0003	1E	00011110
0004	DC	11011100

- 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

ADD	HEX	BINARY
X000	2DC	1011011100
X001	11E	0100011110
X002	0A4	0010100100
X003	3A1	1110100001

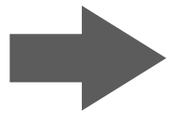


Offset	HEX	BINARY
0000	B7	10110111
0001	11	00010001
0002	E2	11100010
0003	93	10010011
0004	A1	10100001

- 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

ADD	HEX	BINARY
X000	2DC	1011011100
X001	11E	0100011110
X002	0A4	0010100100
X003	3A1	1110100001



Offset	HEX	BINARY
0000	02	00000010
0001	DC	11011100
0002	01	00000001
0003	1E	00011110
0004	00	00000000
0005	A4	10100100
0006	03	00000011
0007	A1	10100001

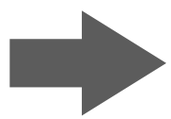
- Format used by Clonix & NoV modules, 41CL, MLDL2000, some EPROM boxes and emulators.
- The ten bits word value is left padded with zero's to create a sixteen bits value.
- A 4096 words ROM is saved into a 8192 bytes file.
- 41CL:
  - NEWT processor uses bit 13 & 12 (TT) to manage its turbo feature.
  - 41CL CX system ROMs has been "turbo" modified.

Offset	HEX	BIN
0000	02	00TT0010
0001	DC	11011100

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

MOD ROM Format

ADD	HEX	BINARY
X000	2DC	1011011100
X001	11E	0100011110
X002	0A4	0010100100
X003	3A1	1110100001



Offset	HEX	BINARY
0000	DC	11011100
0001	7A	01111010
0002	44	01000100
0003	4A	01001010
0004	E8	11101000

- 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.

ModuleFileHeader	ModuleFilePages [0..255]		
	ModuleFilePage 0	ModuleFilePage 1	ModuleFilePage X
729 Bytes	5188 Bytes	5188 Bytes	5188 Bytes

```
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
```

Category	
Value	Description
0	Undefined
1	Operating System
2	Application PAC
3	HP-IL Peripheral
4	Standard Peripheral
5	Custom Peripheral
6	Beta
7	Experimental

MemModules	
Value	Description
0	No Memory Module
1	1 Memory Module
2	2 Memory Modules
3	3 Memory Modules
4	4 Memory Modules

Original	
Value	Description
0	Updated
1	Original

Hardware	
Value	Description
0	None
1	82143A Printer
2	82104A Card Reader
3	82182A Time Module
4	82153A Barcode Wand
5	82160A HP-IL Module
6	82242A IR Printer Module
7	HEPAX Module
8	W&W RAMBox
9	MLDL2000
10	Clonix/NoV Modules

XMemModules	
Value	Description
0	None
1	X-Functions/Memory
2	XFM + 1 X-Mem Module
3	XFM + 2 X-Mem Modules

AppAutoUpdate	
Value	Description
0	Do Not Update
1	Overwrite

```
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
```

References:

hp.giesselink.com/v41.htm
www.hpcalc.org/details/3695
www.hp41.org/LibView.cfm?Command=View&ItemID=1352 (login required)

MOD File Example

ModuleFileHeader	ModuleFilePages [0..255]		
	ModuleFilePage 0	ModuleFilePage 1	ModuleFilePage X
729 Bytes	5188 Bytes	5188 Bytes	5188 Bytes

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 & Matrin Kroeker.

Offset	Length	Description
0	10	File name
10	2	File type (see table below)
12	4	Start block
16	4	Allocated length in blocks
20	6	Creation date & time [YYMMDDHHMMSS]
26	6	Miscellaneous data

Type	Name	Description
E020	WAXM41	HP-41 write all with X-Memory
E030	XM41	HP-41 write all with X-Memory
E040	ALL41	HP-41 write all
E050	KEY41	HP-41 user keys assignment
E060	STAT41	HP-41 status
E070	X-M41	HP-41 ROM ERAMCO
E080	PGM41	HP-41 FOCAL program
E0D0	SDATA	HP-41 data file

HEPAX 4K RAM Structure

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

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

Table of Content

OVERVIEW

Table of Content

MODULES

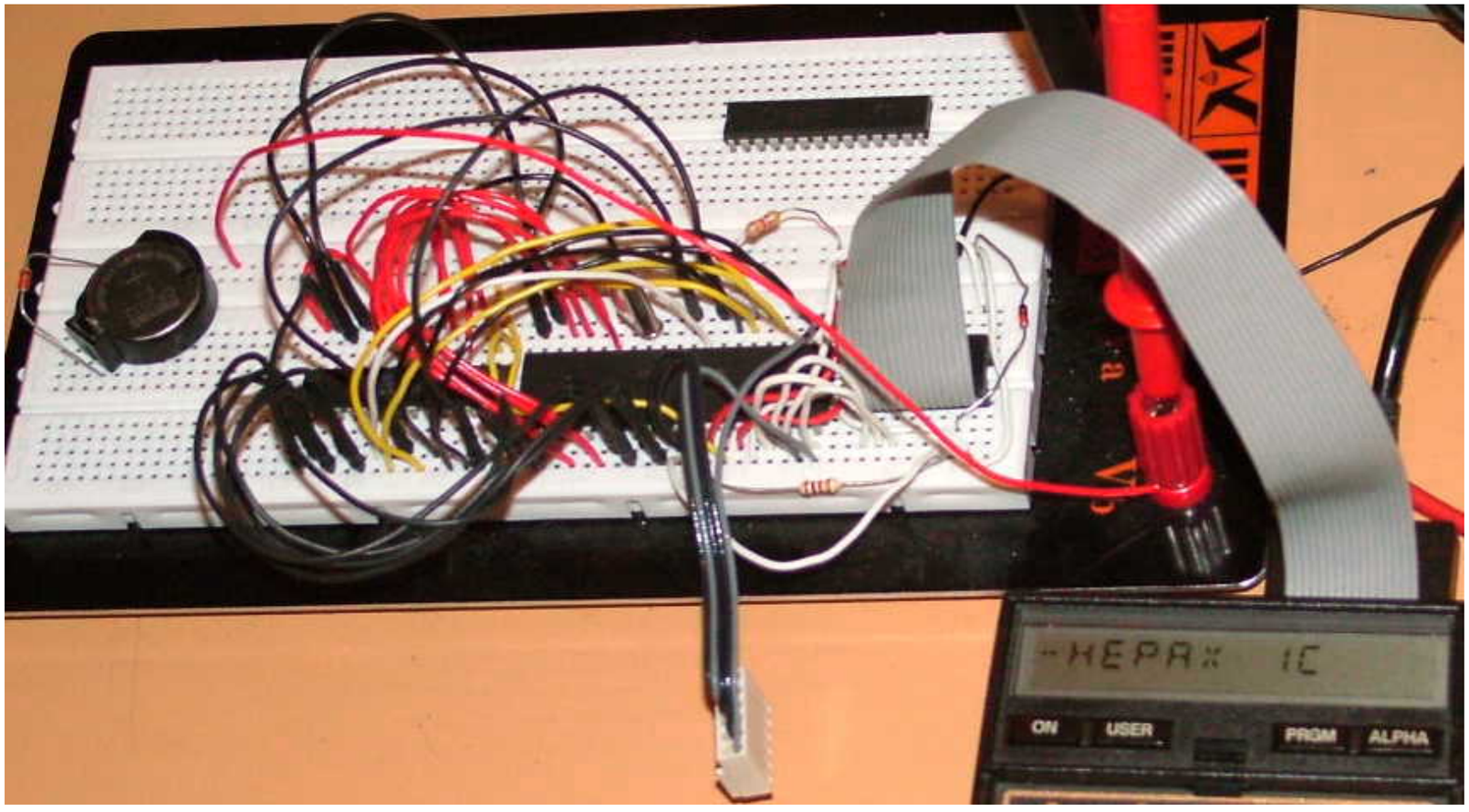
History

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

Main reference: Jeremy Smith, CHHU v2n7p59, Nov. 1985

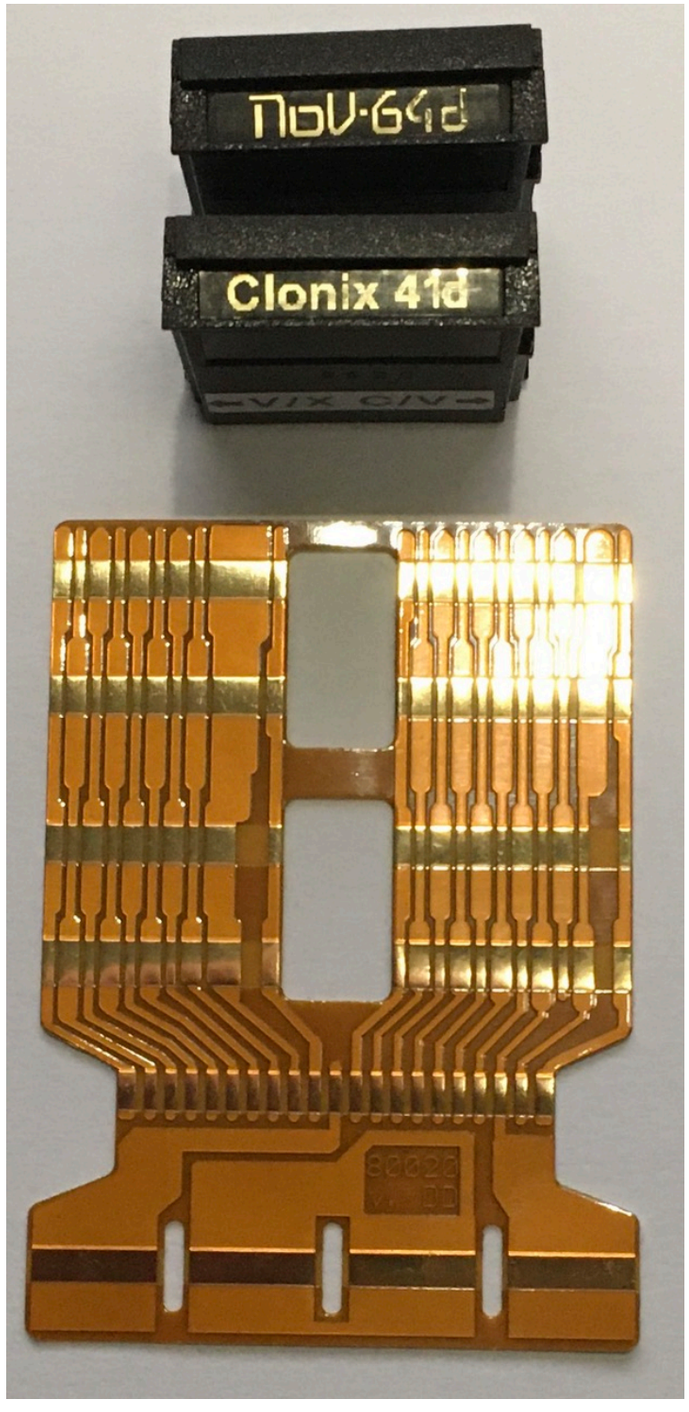
Timeline

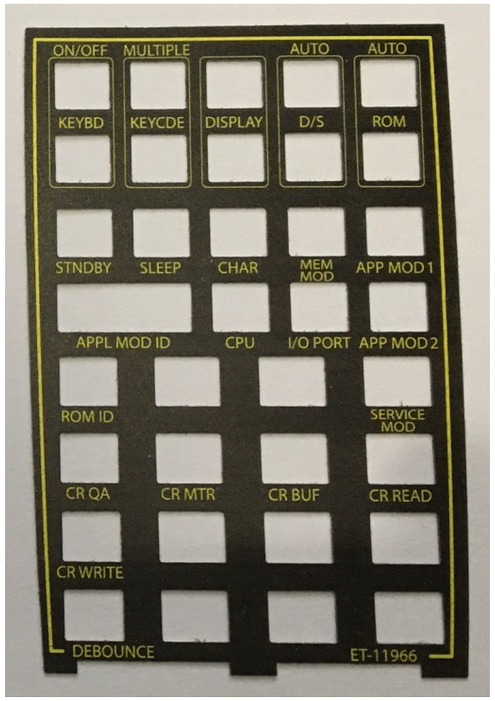
Date	Module	Event
Mar 2003	Clonix	project started
Jul 2003	1st MLDL	built (7)
Sep 2003	1st Module	built (8)
Dec 2003	Clonix 41	released (1 & 2)
Mar 2004	NoVRAM	project started
Jul 2004	NoVRAM	released (1 & 3)
Oct 2005	NoV-32	released (1 & 4)
May 2008	Clonix-D	released (1 & 5)
Sep 2008	NoV-64	released (1 & 5)
Apr 2012	USB-41	released (1 & 6)
Dec 2013	Clonix 41	discontinued
	NoVRAM	discontinued
	NoV-32	discontinued
	NoV-64	discontinued
	NoV-64d	released (1 & 5)
	Clonix 41d	Anniversary Ed.



Clonix 41d – 10th Anniversary Edition

Kit #3





Kit Includes: one Clonix 41d, one NoV-64d, two overlays and one Flex-PCB. Only 10 was made. Diego kept Kit #0

Specifications Table

Features \ Modules	Clonix 41 silver	Clonix 41 gold	Clonix 41d gold	Clonix-D *	USB-41 *	NoVRAM	NoV-32	NoV-64	NoV-64d *
Released ^ Discontinued	2003-12 ^ 2013-12	2003-12 ^ 2013-12	2013-12 ^ 2013-12	2008-05 ^ Available	2012-04 ^ Available	2004-07 ^ 2013-12	2005-10 ^ 2013-12	2008-09 ^ 2013-12	2013-12 ^ Available
Microcontroller	PIC18LF252	PIC18LF252	PIC18LF252	PIC18LF2620	PIC18LF2620	PIC18LF252	PIC18LF252	PIC18LF2620	PIC18LF2620
ROM size	24K words	24K words	24K words	48K words	48K words	24K words	24K words	48K words	48K words
ROM pages	6	6	6	6	12	6	6	6	6
ROM blocks	1	1	1	2	1	1	1	2	2
ROM hard preload	none	none	none	none	82143A (4x4K)	HEPAX (4x4K)	HEPAX (4x4K)	HEPAX (4x4K)	HEPAX (4x4K)
ROM pages available	6	6	6	12	8 (12-4)	2 (6-4)	2 (6-4)	8 (12-4)	8 (12-4)
ROM blocks mergeable	—	—	—	✓	×	—	—	✓	✓
ROM block select (a) (b)	—	—	Port Sensing	Port Sensing	—	—	—	Control Word	Control Word
RAM size	512 words	512 words	512 words	—	—	16K words	32K words	64K words	64K words
RAM pages (c)	0.125 or 1/8	0.125 or 1/8	0.125 or 1/8	—	—	4	4	4	4
RAM blocks	1	1	1	—	—	1	2	4	4
RAM block select (b)	—	—	—	—	—	—	Control Word	Control Word	Control Word
RAM type (d)	SRAM	SRAM	SRAM	—	—	FRAM	FRAM	FRAM	FRAM
Page shadowing (e)	ROM	ROM	ROM	ROM	ROM	ROM & RAM	ROM & RAM	ROM & RAM	ROM & RAM
HEPAX support	✓ (ROM only)	✓ (ROM only)	✓ (ROM only)	—	—	✓	✓	✓	✓
HEPAX ROM relocation	×	×	×	—	—	✓	✓	✓	✓
HEPAX RAM protection	—	—	—	—	—	✓	✓	✓	✓
HEPAX RAM max mapped	—	—	—	—	—	16K	16K	32K	32K
41C 1.7x turbo mode (f)	×	✓	✓	×	×	×	×	×	×
41CL compatible	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank switching (4 banks)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Diagnostic modules	single	single	single & double	single & double	×	single	single	single	single
Advantage module	✓	✓	✓	✓	×	✓	✓	✓	✓
Forth-41	✓	✓	✓	✓	×	×	×	×	×
Double HEPAX RAM	—	—	—	—	—	✓	✓	✓	✓
Double X-Memory	×	×	×	✓	×	×	×	✓	✓
W&W HP-41CY / RAMBox64	—	—	—	—	—	×	×	✓	✓
Page transfer to/from PC	×	×	×	×	✓ (g)	×	×	✓	✓
Alternate persona (h)	—	—	— (i)	—	—	Clonix 41	Clonix 41	Clonix-D (j)	Clonix-D (k)
Pwr: sleep^{uA}\standby^{uA}\run^{mA}	10 \ 100 \ 9.5	10 \ 100 \ 13.5	10 \ 100 \ 13.5	—	—	—	—	—	—
Module Price:	—	—	—	100.00 €	110.00 €	—	—	—	140.00 €
Adapter Price:	—	—	—	10.00 €	10.00 €	—	—	—	10.00 €
Programmer + Adapter Price:	—	—	—	30.00 €	30.00 €	—	—	—	30.00 €

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/Cloni41_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_Usr-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/NoV-64v08r_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-41-4.rar

   Other Projects & Files
   Modules Chart : *www.clonix41.org/Projects/Clonix-NoV_chart.pdf*
   I/O Block : *www.clonix41.org/Maintenance/IO_Block/IO_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
   www.embeddedcomponents.com/blogs/2007/09/introduction-to-hhp-16k-eprom-emulator/

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

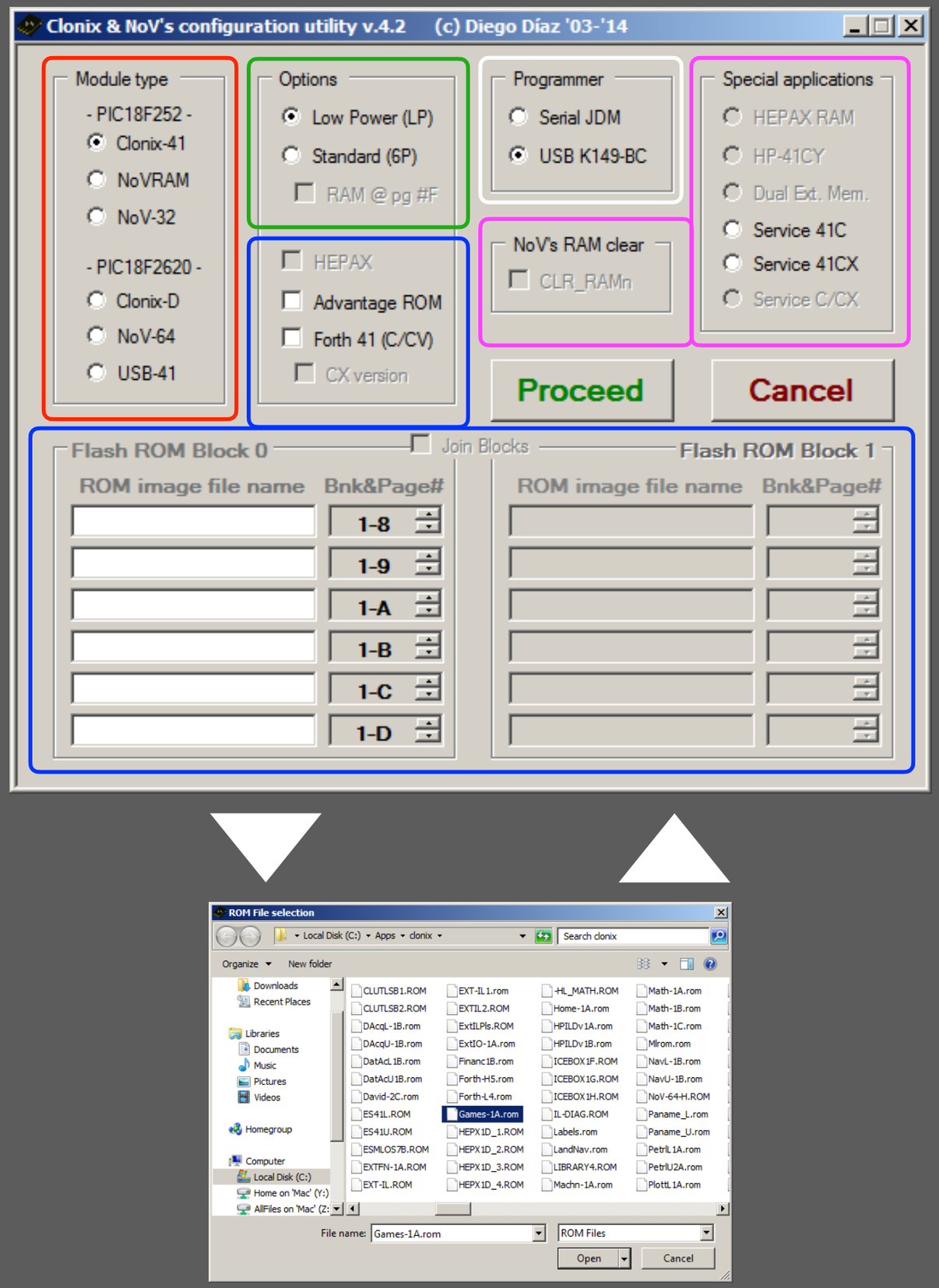
    HP Calculators Museum (David Hicks)
    www.hpmuseum.org
    www.hpmuseum.org/forum/index.php

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

    Silicium Forum (French Site, Hand Held Section)
    http://www.silicium.org/forum/viewforum.php?f=46

Table of Content

APPLICATIONS

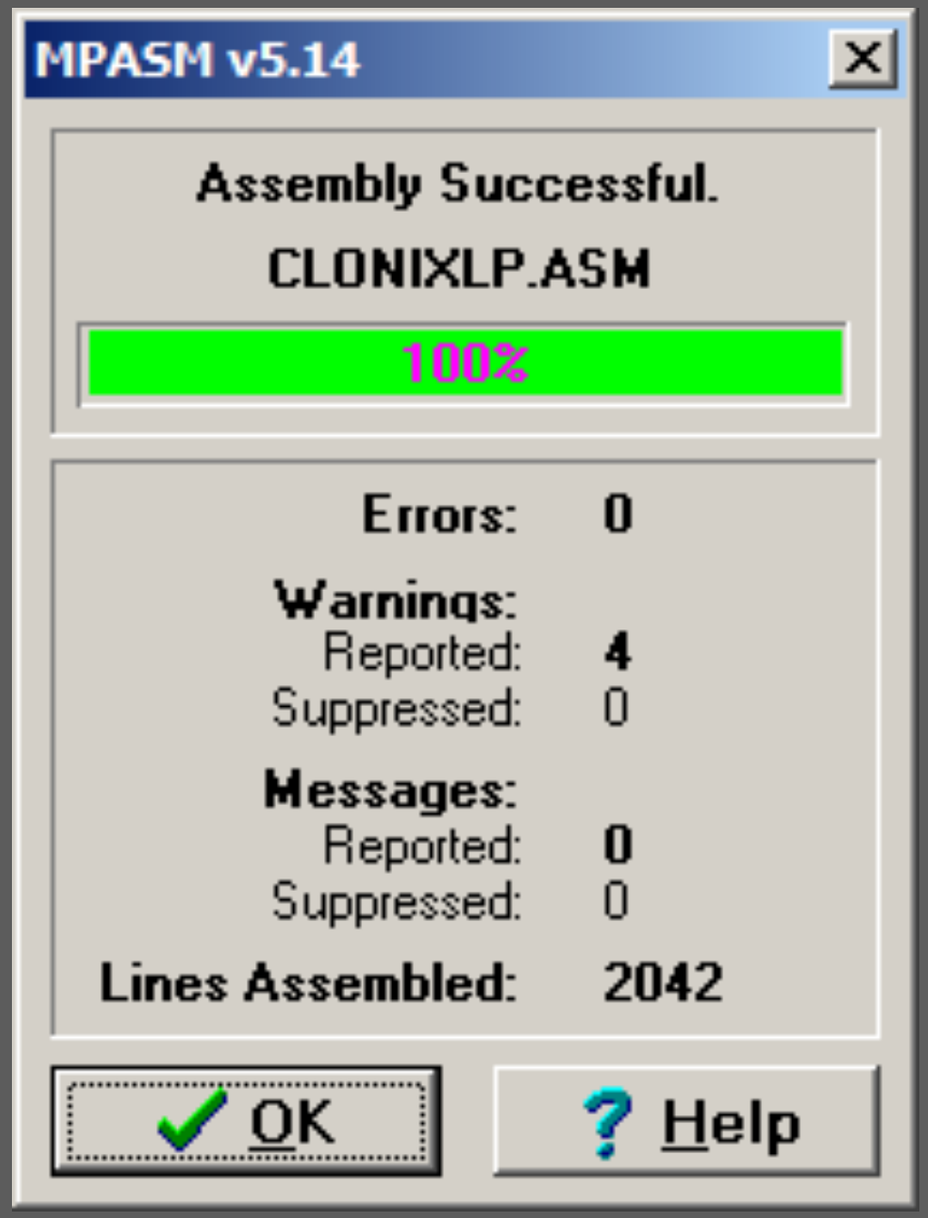


Clonix & NoV Configuration Utility

- 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)*

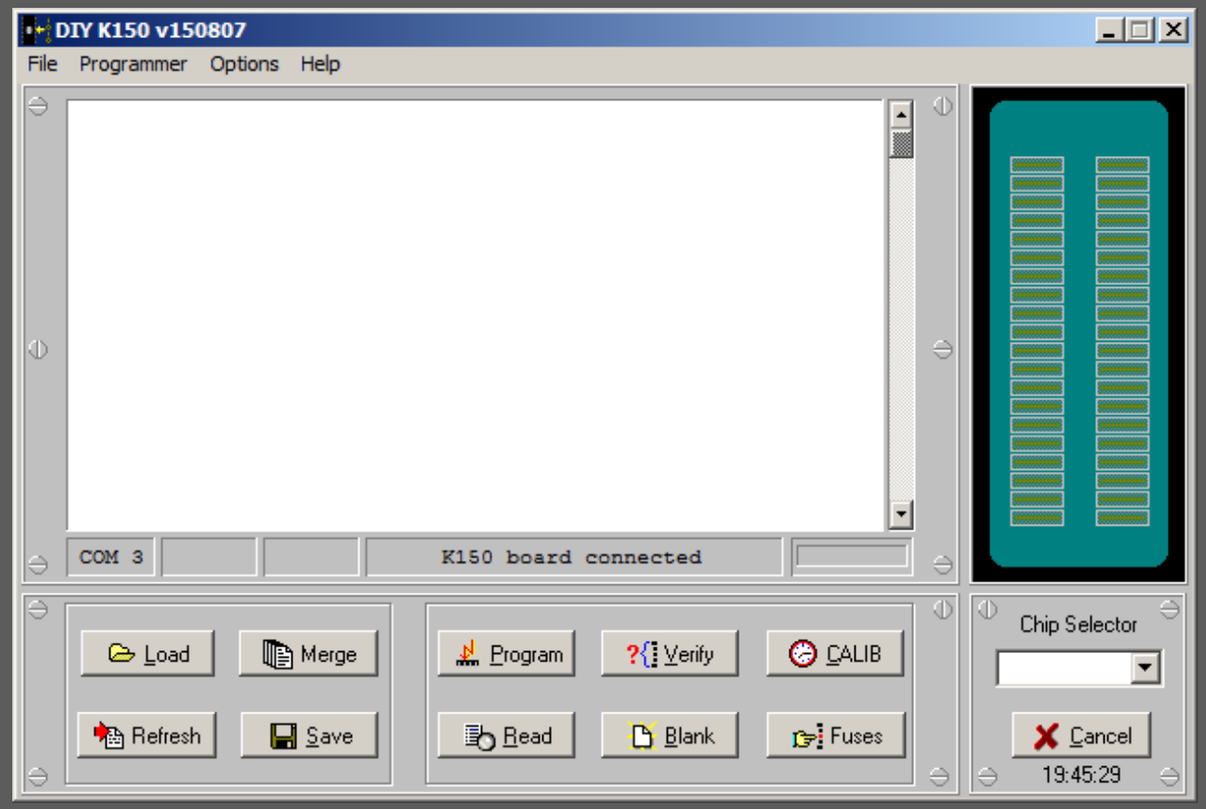
Pink rectangle and Blue/Green rectangles options are mutually exclusive.

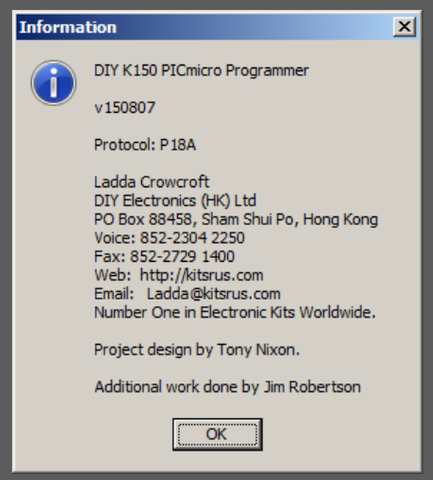
- **Programmer** group is where you select which type of PIC programmer you are using: RS-232 or USB. *(white rectangle)*
- **Proceed** button
  - generate an assembly file.
  - call the Microchip PIC assembler that compile the assembly source code and generate an Intel hex file.
  - call the PIC programming software to transfer the hex file to the module.
- **Cancel** button exit the application.



MPASM

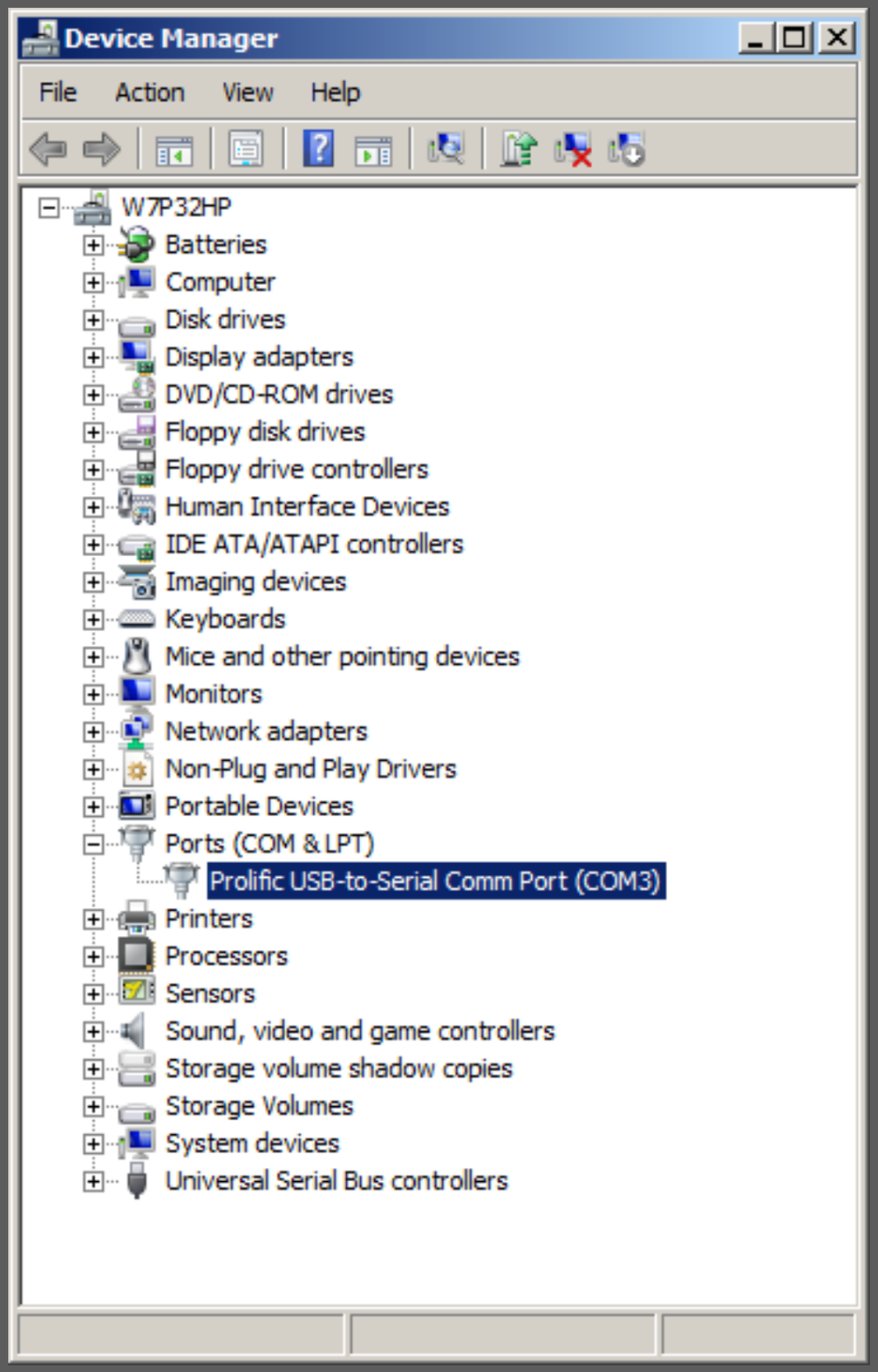
- PIC Assembler for Windows made by Microchip and called by Clonix & NoV Configuration Utility.
- MPASM take the assembly file created by Clonix & NoV Configuration Utility, generate an executable binary file for the PIC microcontroller then serialize it as an extended Intel HEX file format.





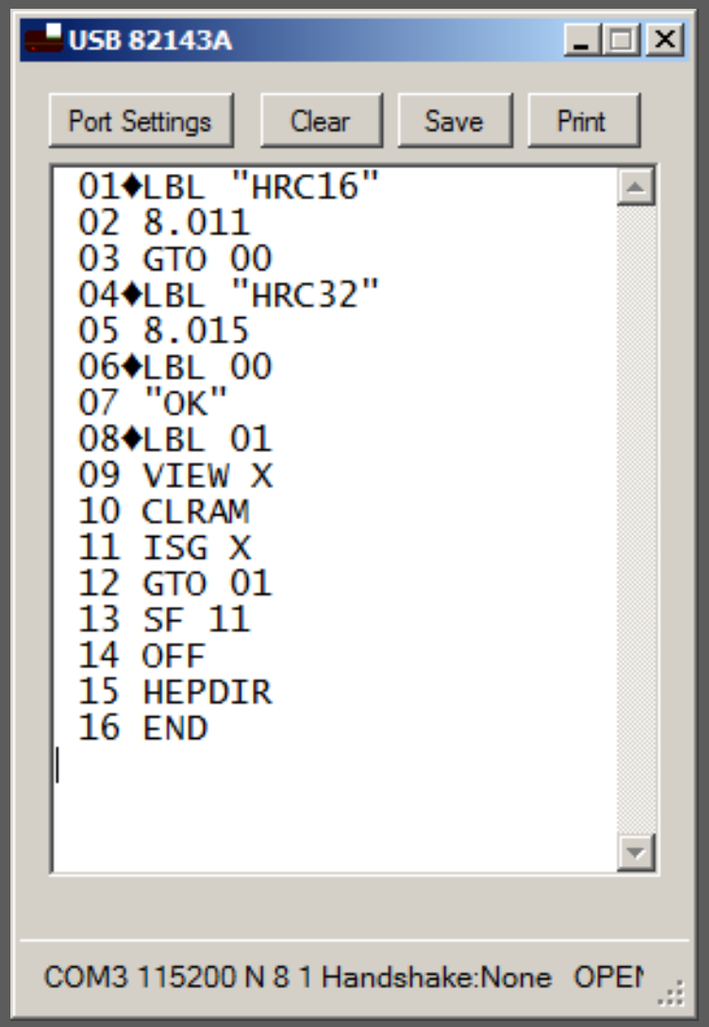
MicroBurn DIY K150

- 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 by DIY Electronics and by 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

INSTALLATION

Software Download

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

- Clonix & NoV Configuration Utility. (v4.2, Sept. 3rd, 2015)
  Manual: www.hhcworld.com/files/hhc2020/ClonixConfig.pdf
  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**
    2. Move **ClonixConfigAlt.exe** file to clonix folder.
    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.
    Overwriting existing ROM files in 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!

Table of Content

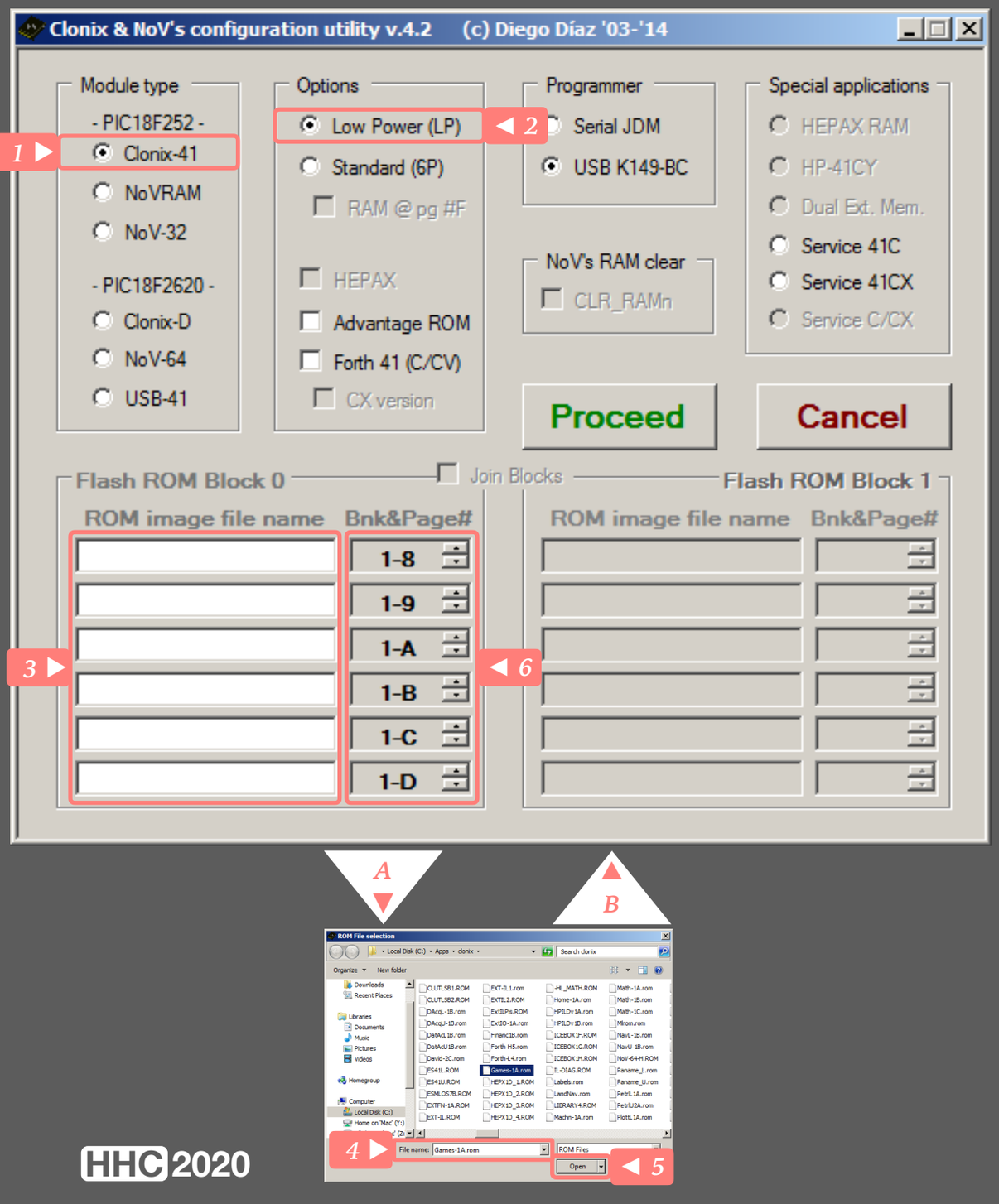
CONFIGURATION

Clonix/NoV Utility v4.2

CLONIX 41

Configuration

Table of Content



HHC 2020

Low Power [Silver Module]

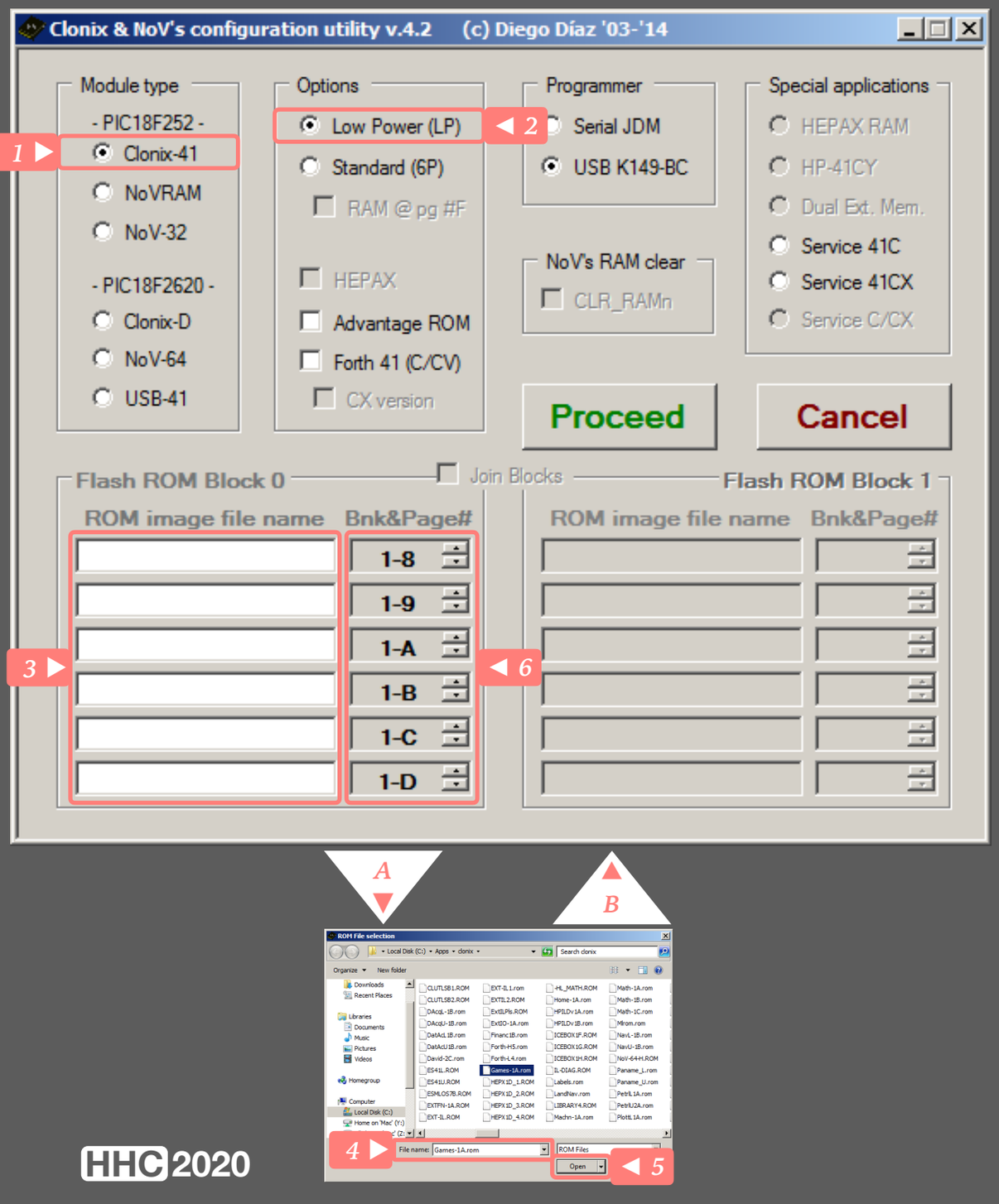
Goal: activating full low power mode and loading ROMs into the module.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



Low Power [Gold Module]

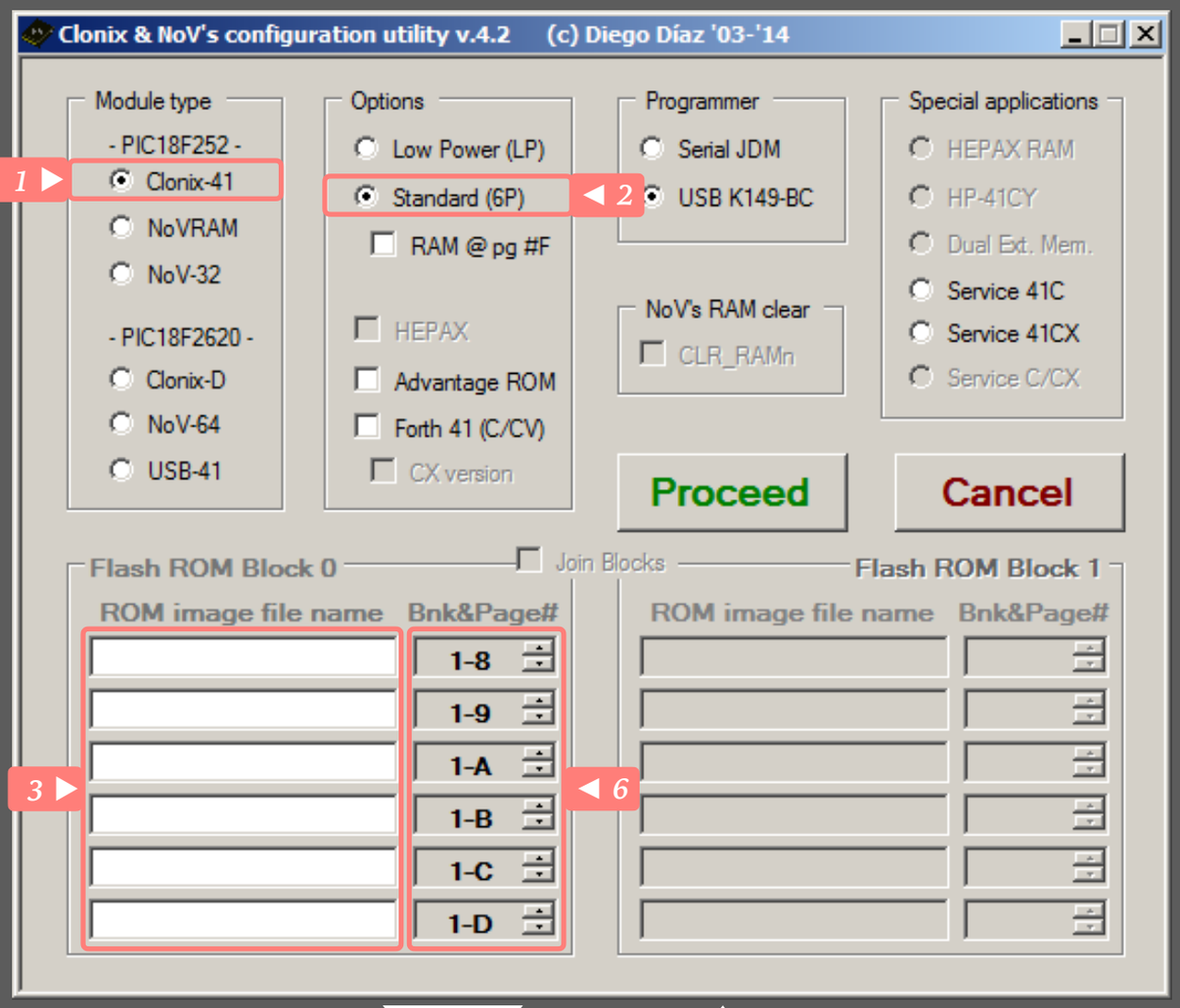
Goal: activating limited low power mode and loading ROMs into the module.

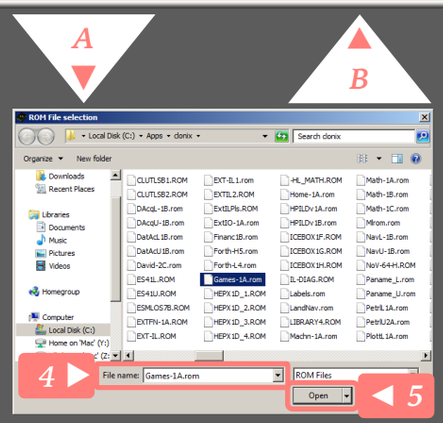
1. Select **Clonix-41** option.
2. Select **Low Power (LP)** option.
   When (LP) is selected, a power drain reduction is achieved (not as much as the Silver module) but noticeable. Also, when this option is active the module can only be plugged in a calculator running at original speed.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





Standard

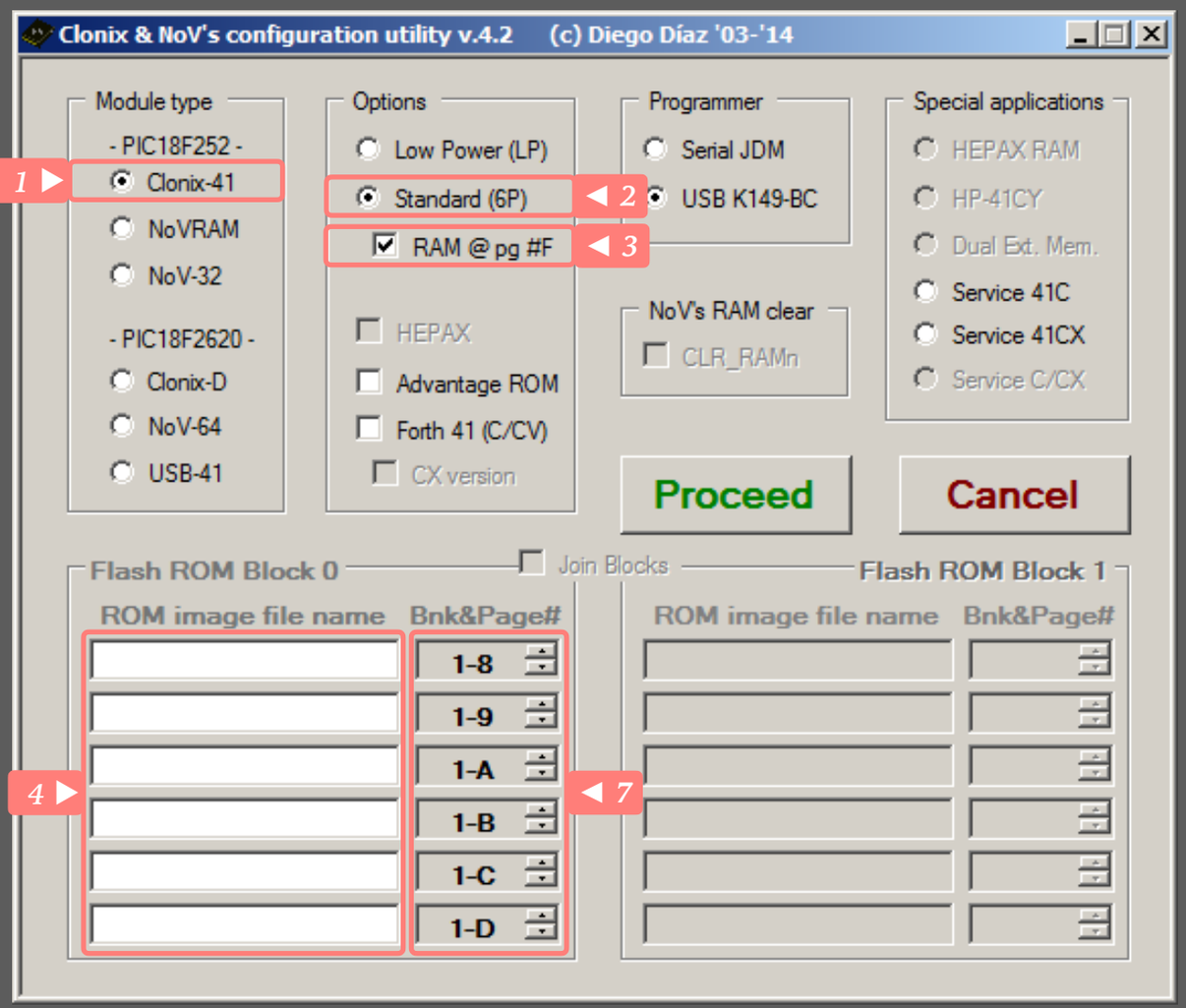
Goal: loading ROMs into the module.

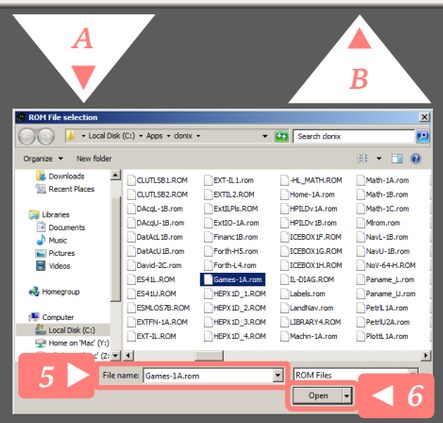
1. Select **Clonix-41** option.
2. Select **Standard (6P)** option.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





Standard + RAM

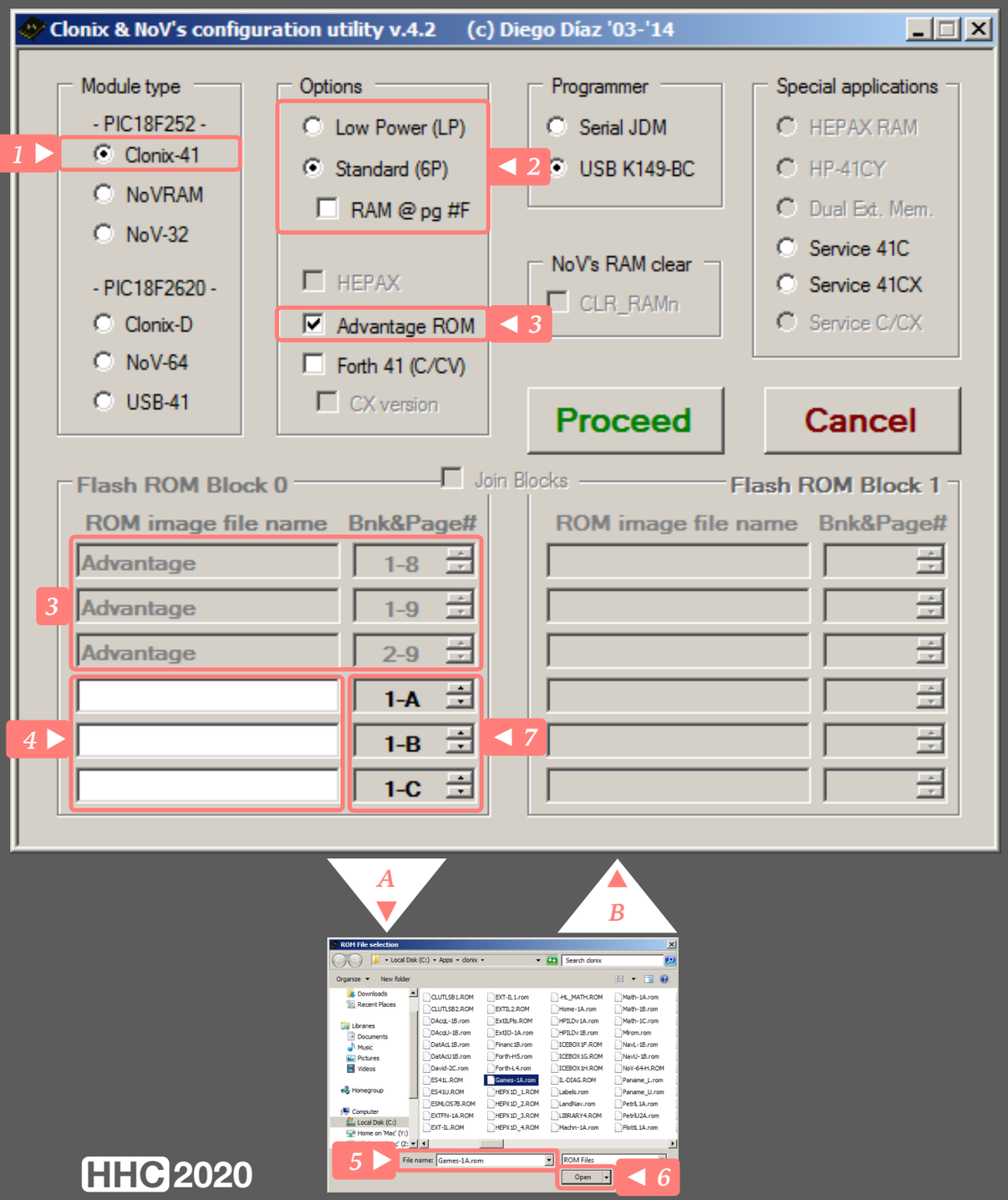
Goal: activating a 512 RAM space at page #F and optionally loading ROMs into the module.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



HHC 2020

Advantage

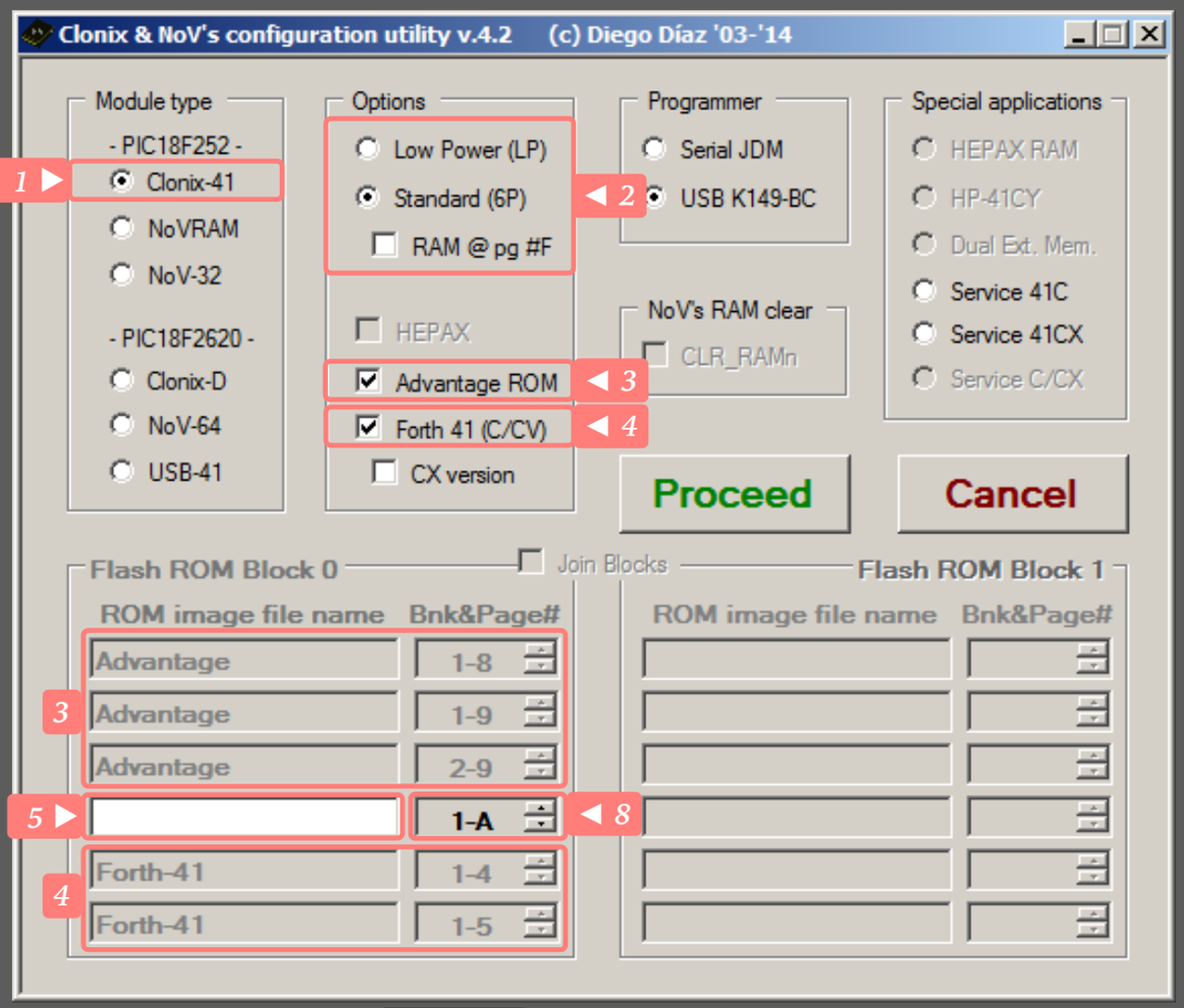
Goal: loading HP Advantage ROM and optionally other ROMs into the module.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



Advantage + Forth 41 C/CV

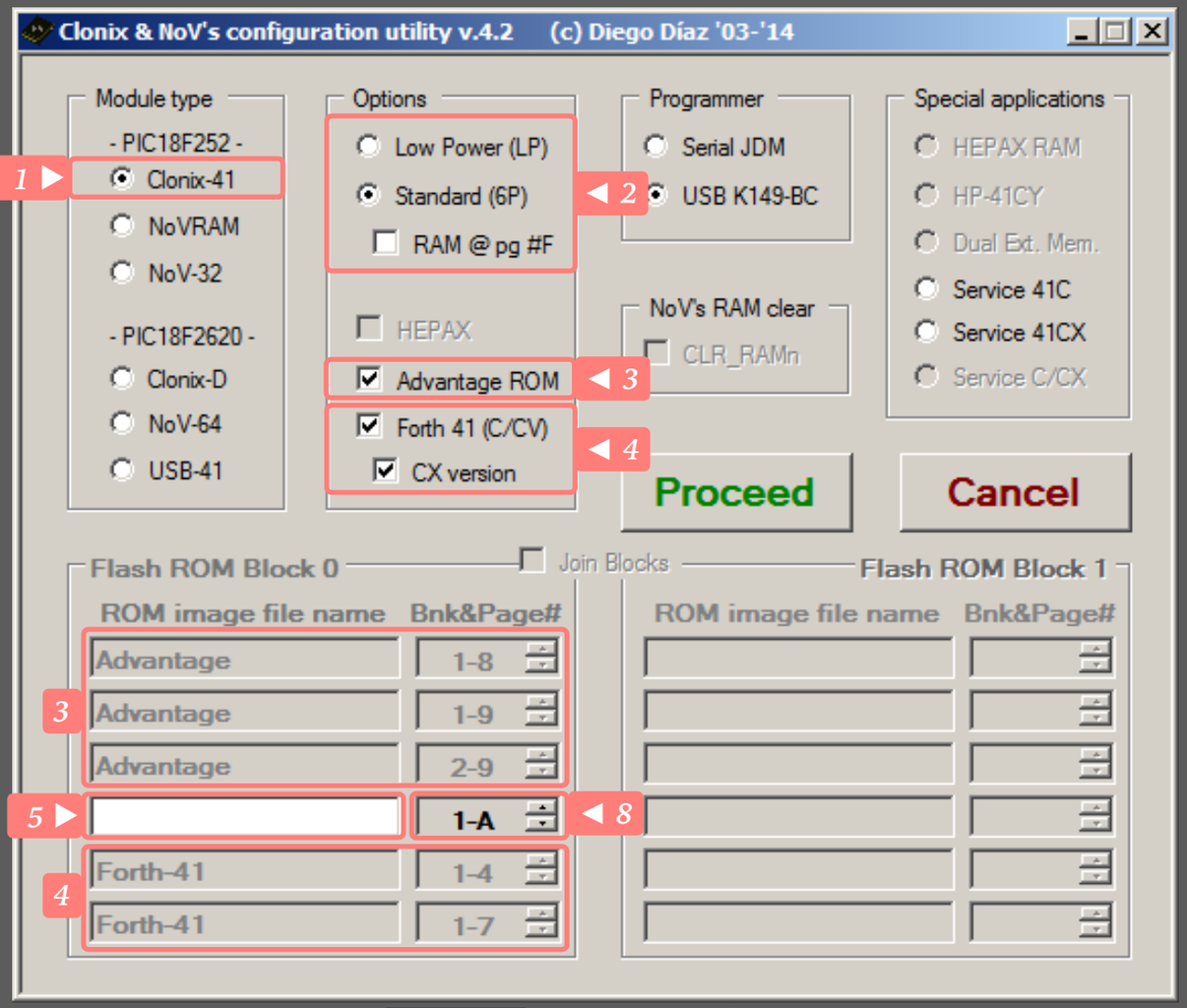
Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

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.
8. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



Advantage + Forth 41 CX

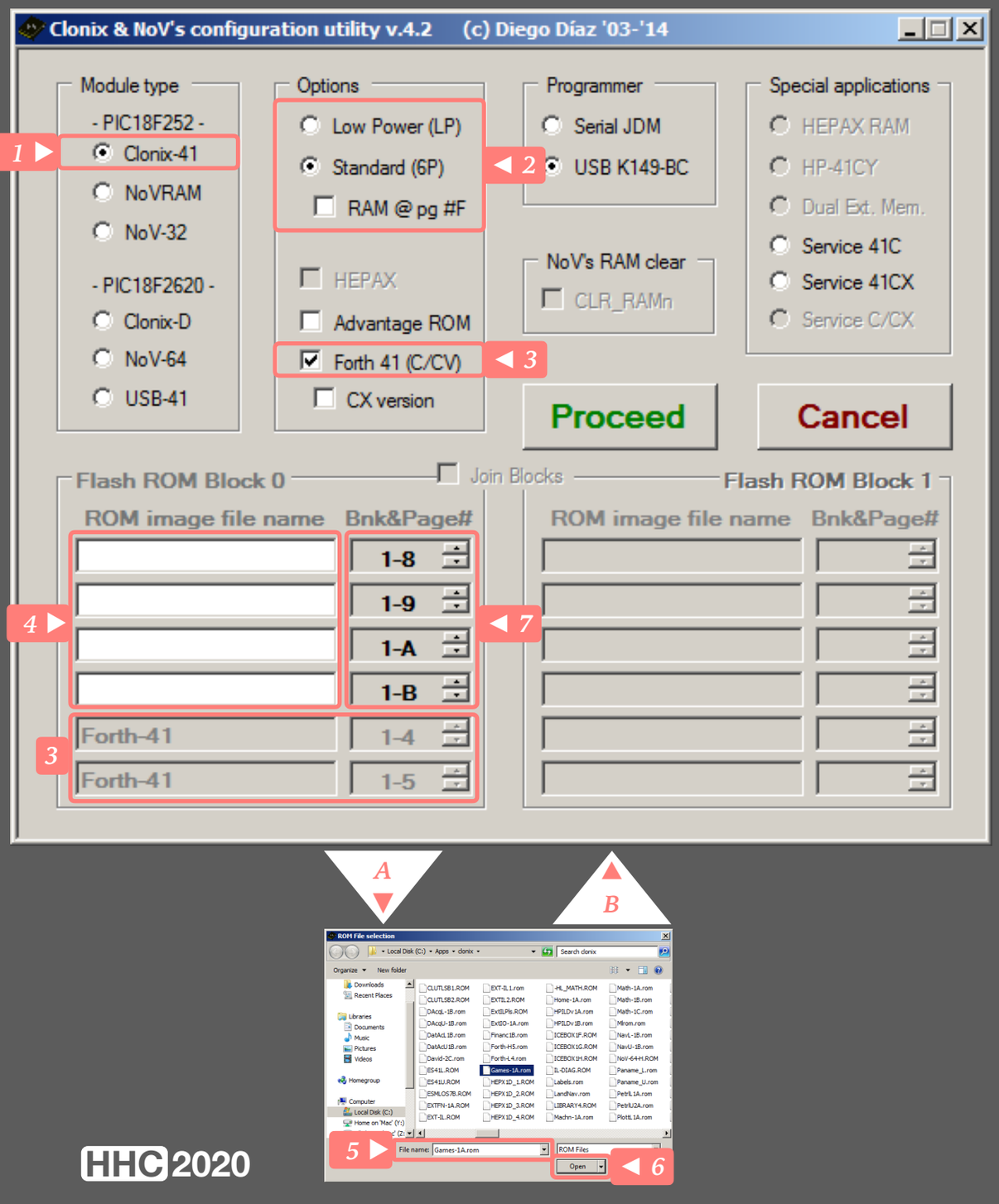
Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

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.
8. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



Forth 41 C/CV

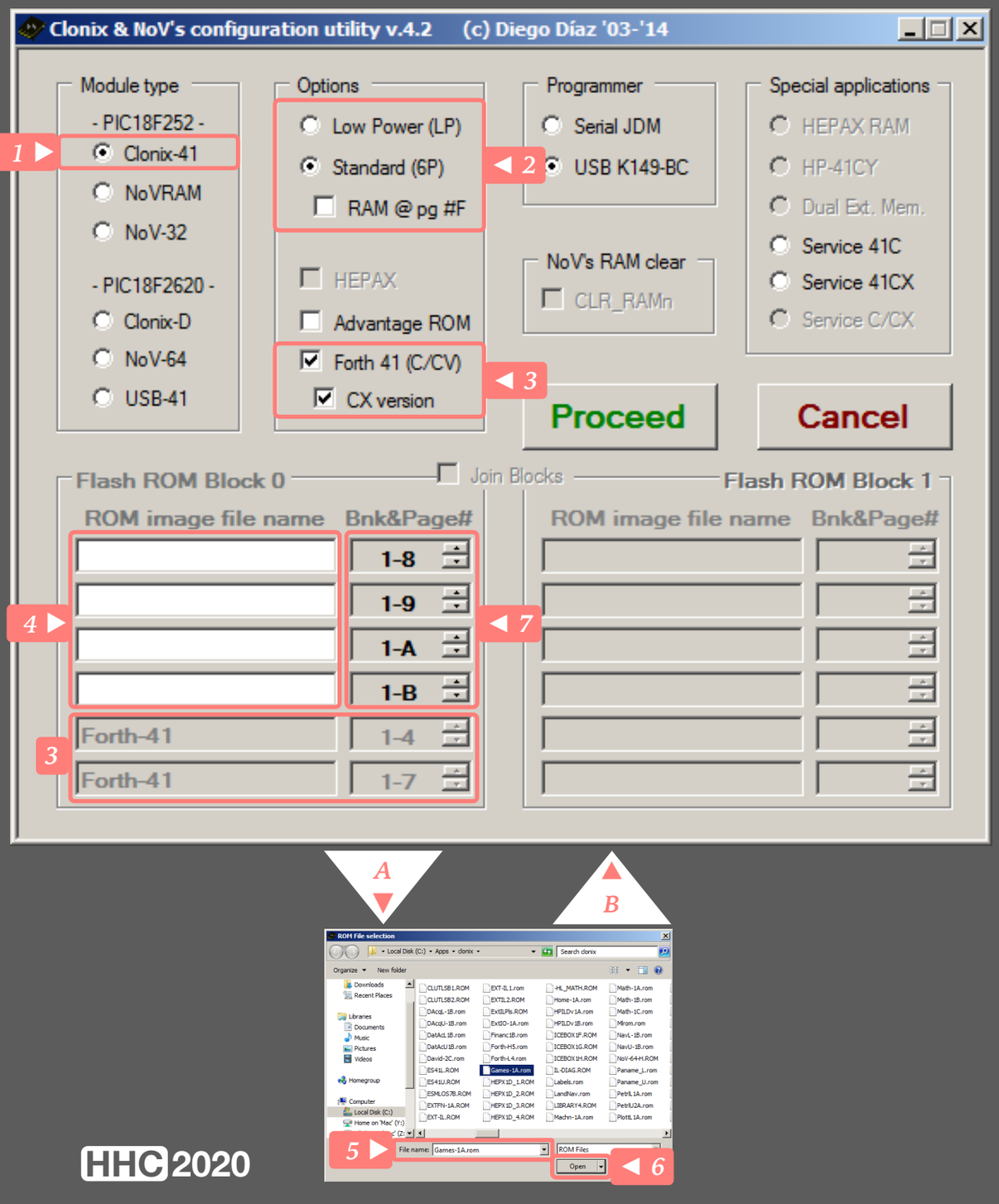
Goal: loading a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



Forth 41 CX

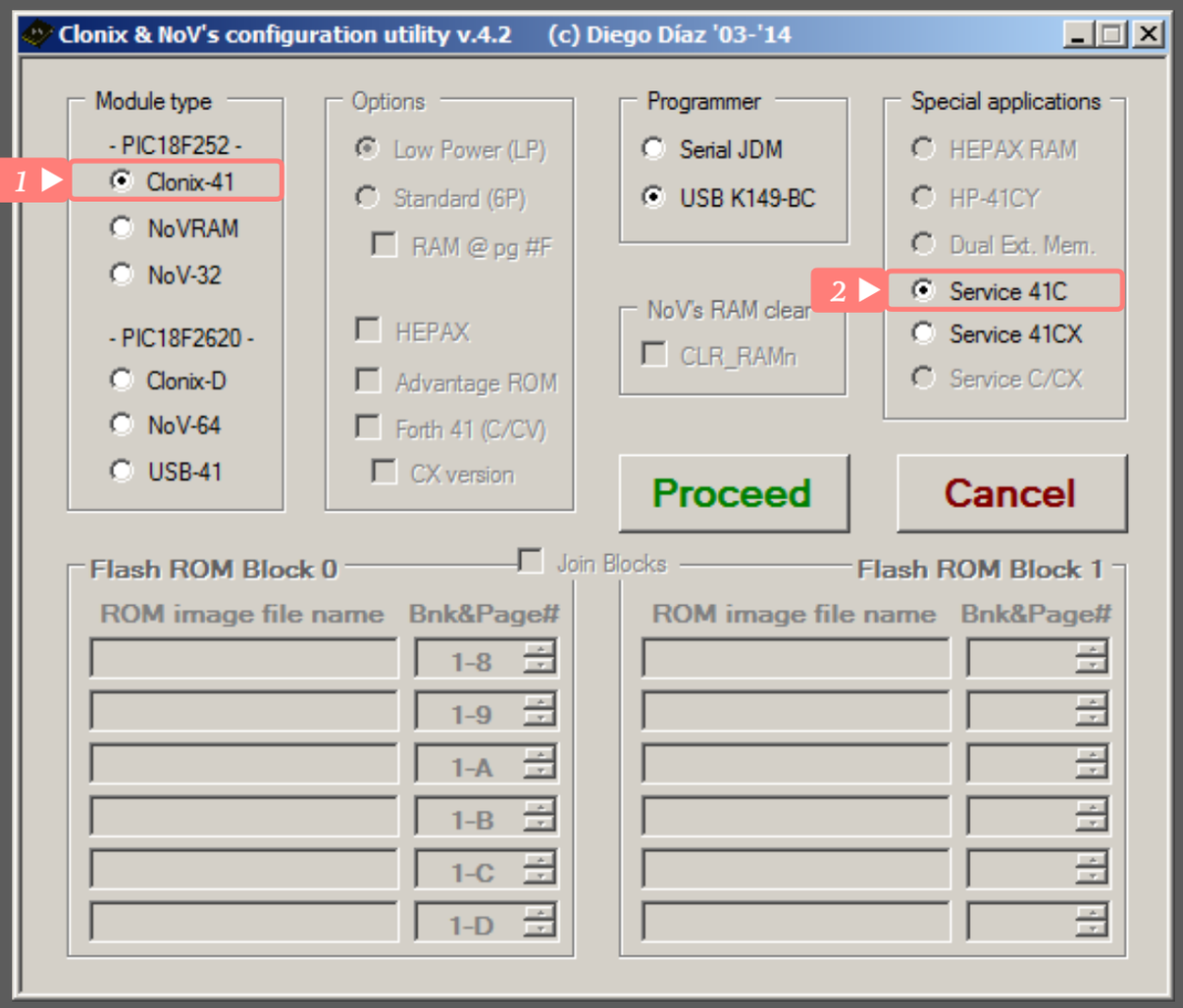
Goal: loading a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*

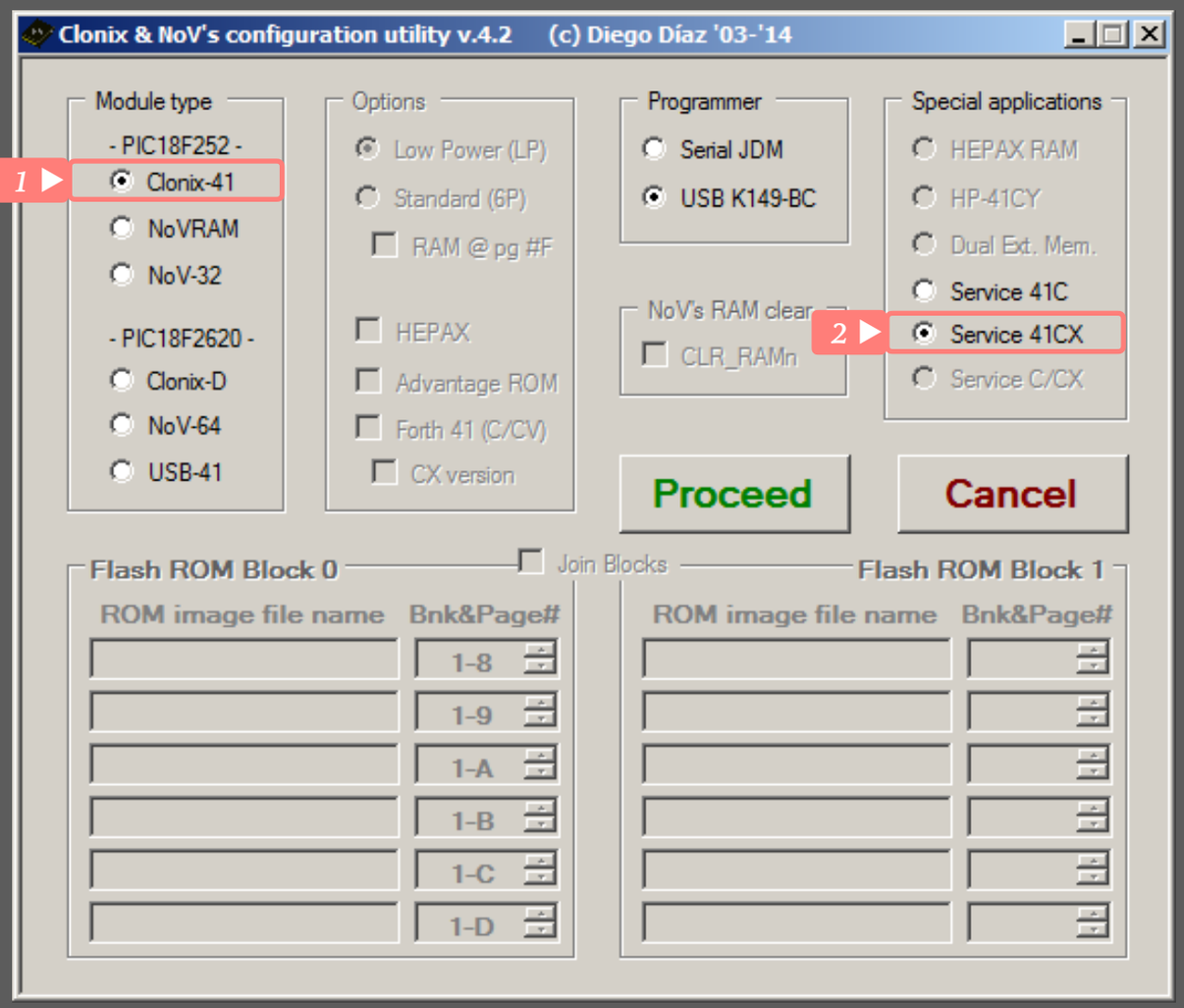


Service 41C/CV

Goal: loading HP Service ROM into the module. Support: 41C, 41CV, RAM (x1 & x4), ROM (4K & 8K) & Card Reader.

1. Select **Clonix-41** option.
2. Select **Service 41C**.
   Load HP Service ROM [SM-1C] image in page #4.

*Go to **Programming** section.*



Service 41CX

Goal: loading HP Service ROM into the module. Support: 41CV, 41CX, Time, X-Fnc, X-Mem, RAM (x1 & x4), ROM (4K to 16K).

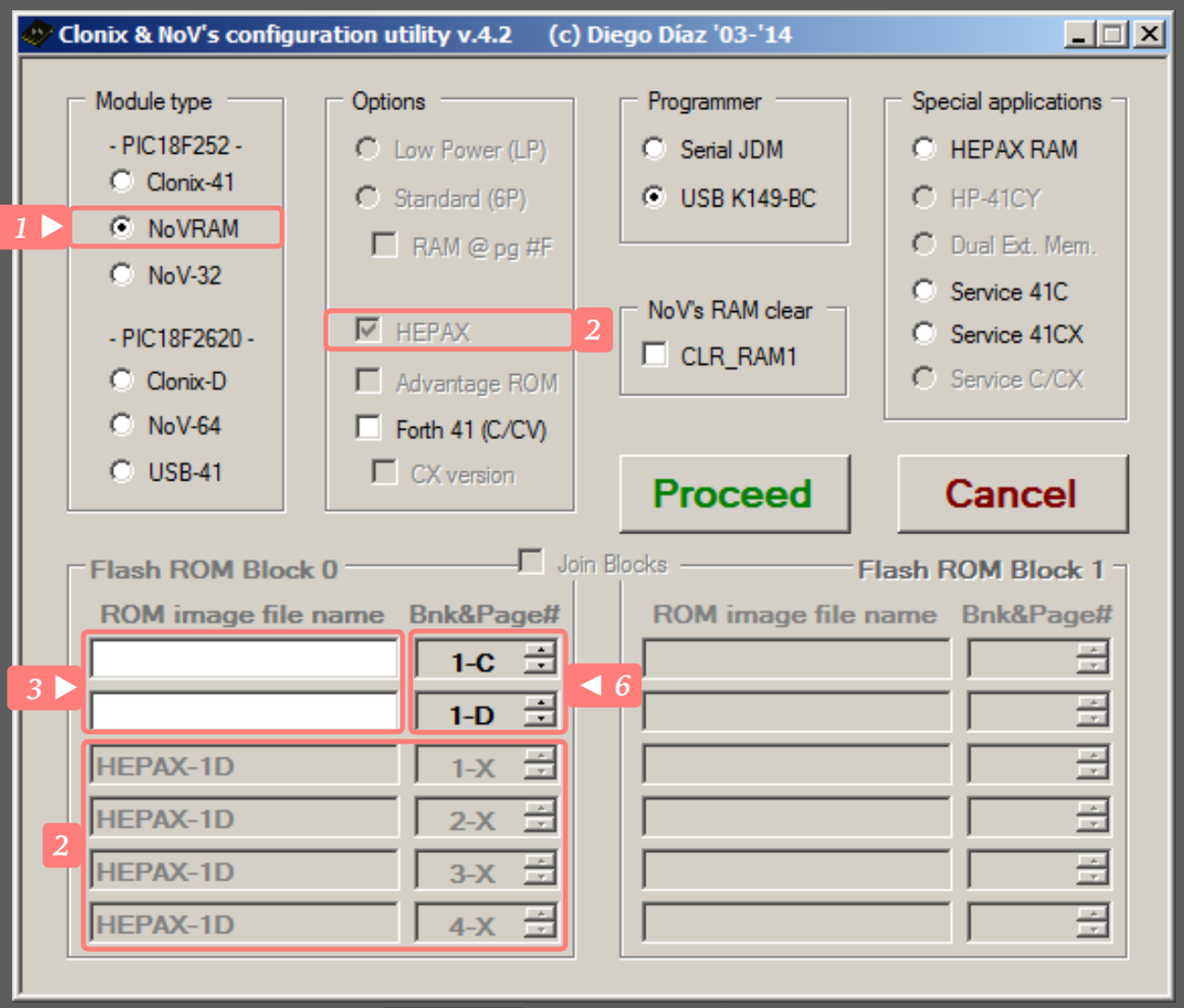
1. Select **Clonix-41** option.
2. Select **Service 41CX**.
   Load HP Service ROM [SM-2A] image in page #4.

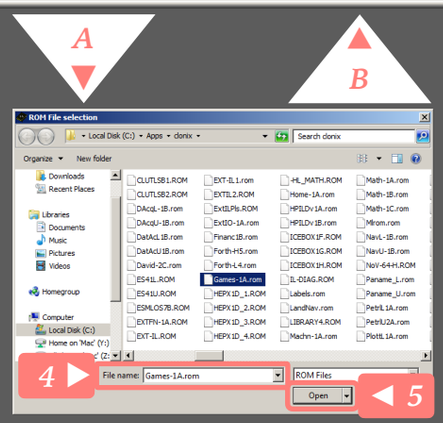
*Go to **Programming** section.*

Table of Content

NOVRAM

Configuration





HEPAX

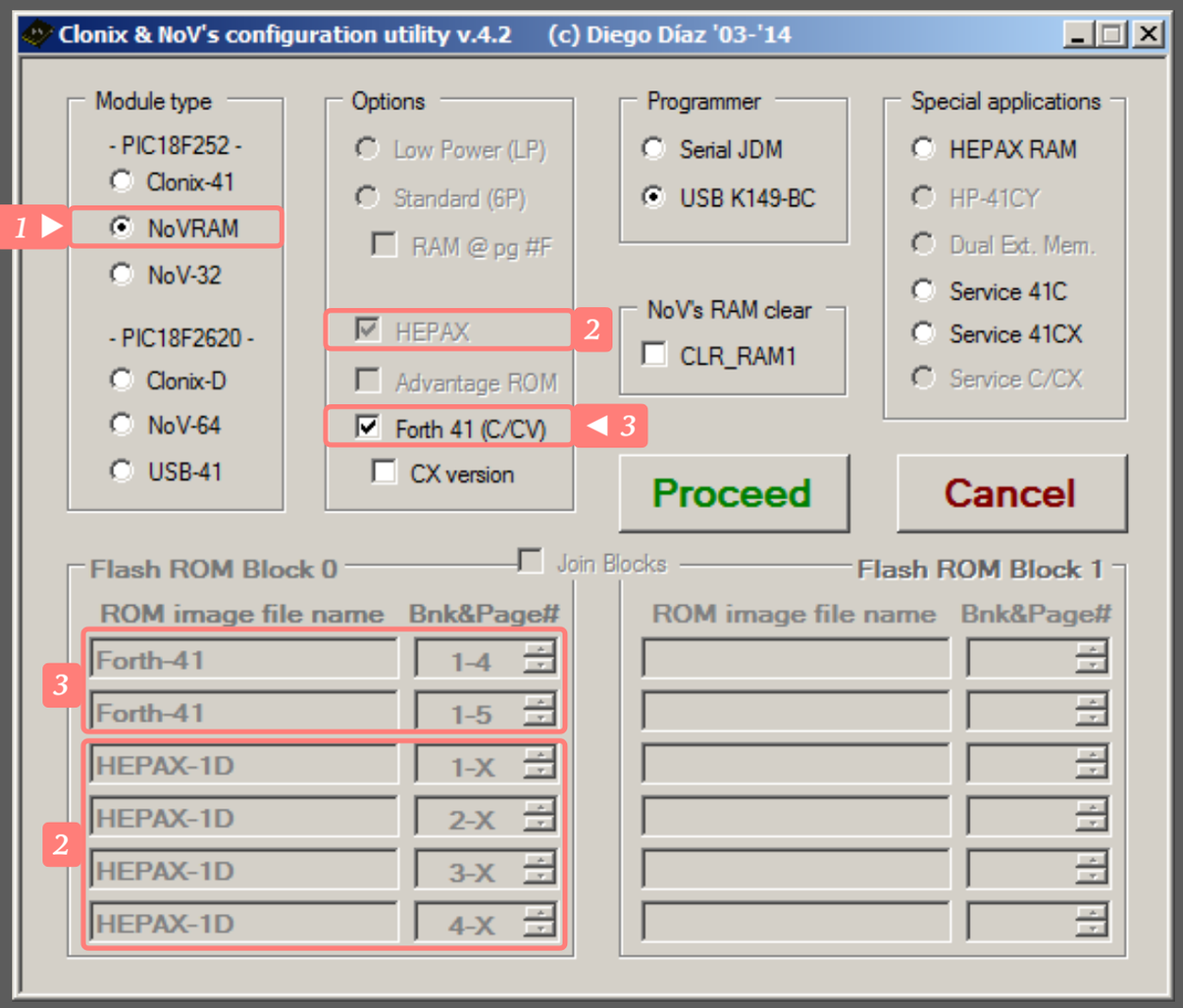
Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*

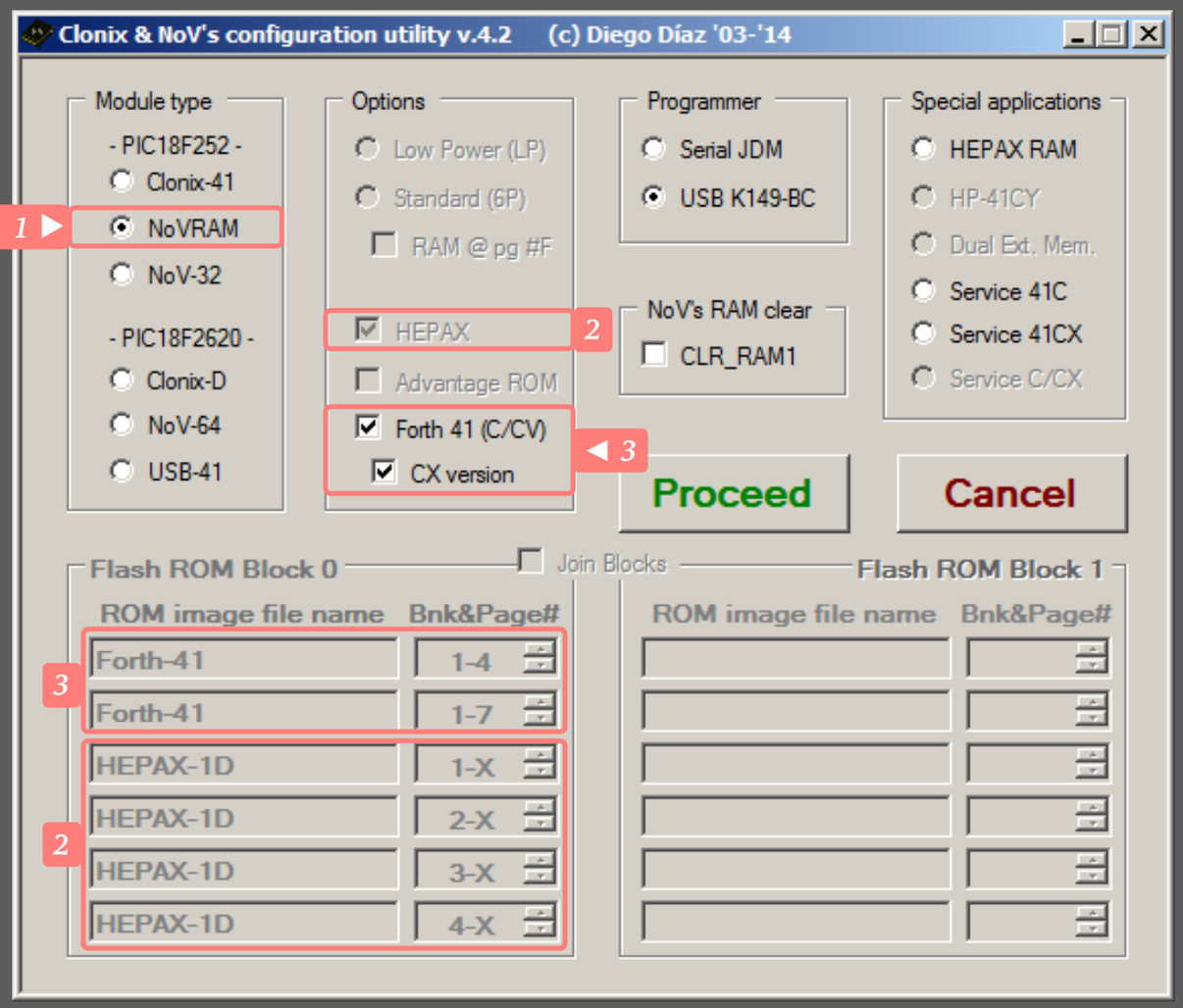


HEPAX + Forth 41 C/CV

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.*

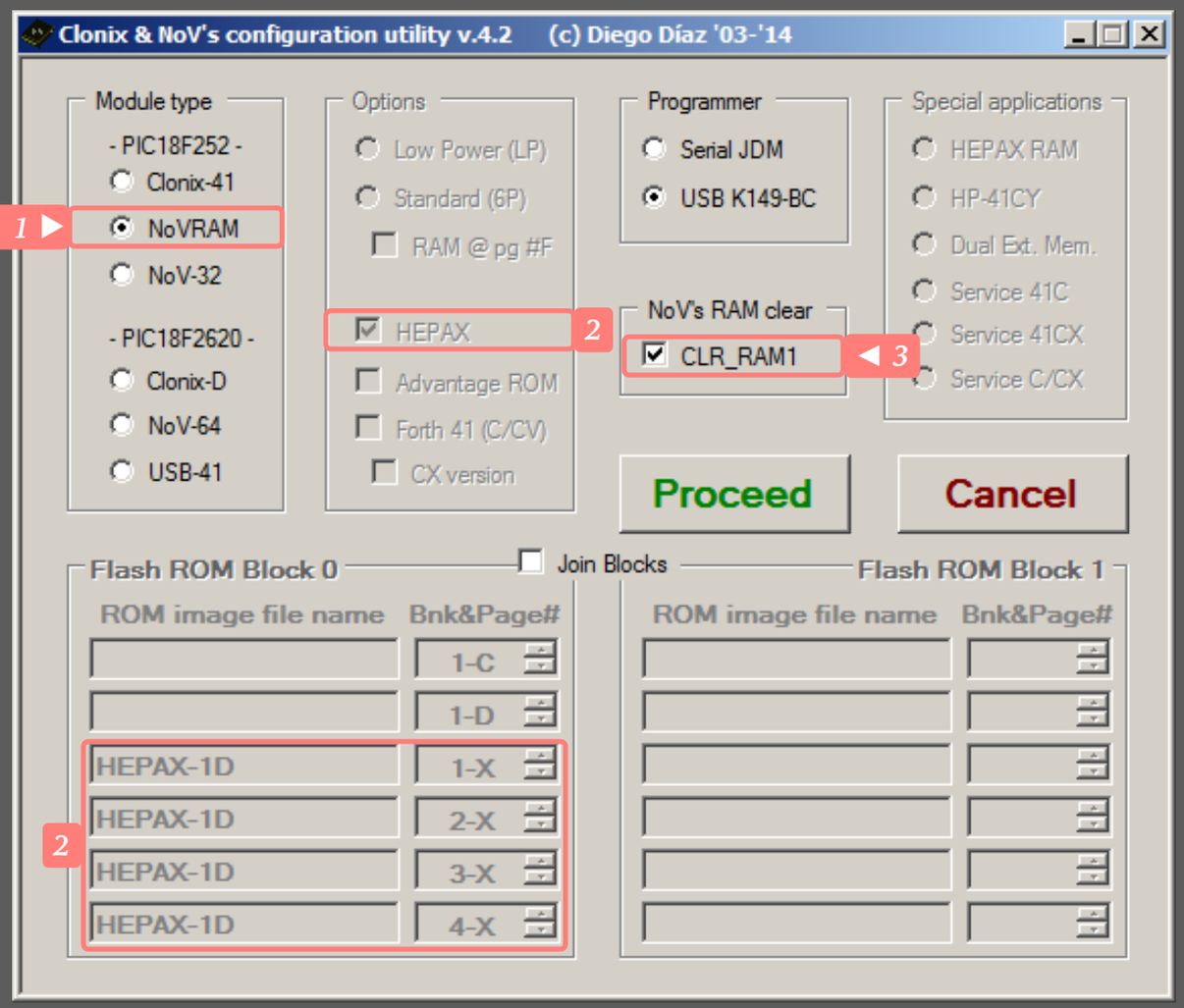


HEPAX + Forth 41 CX

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.*

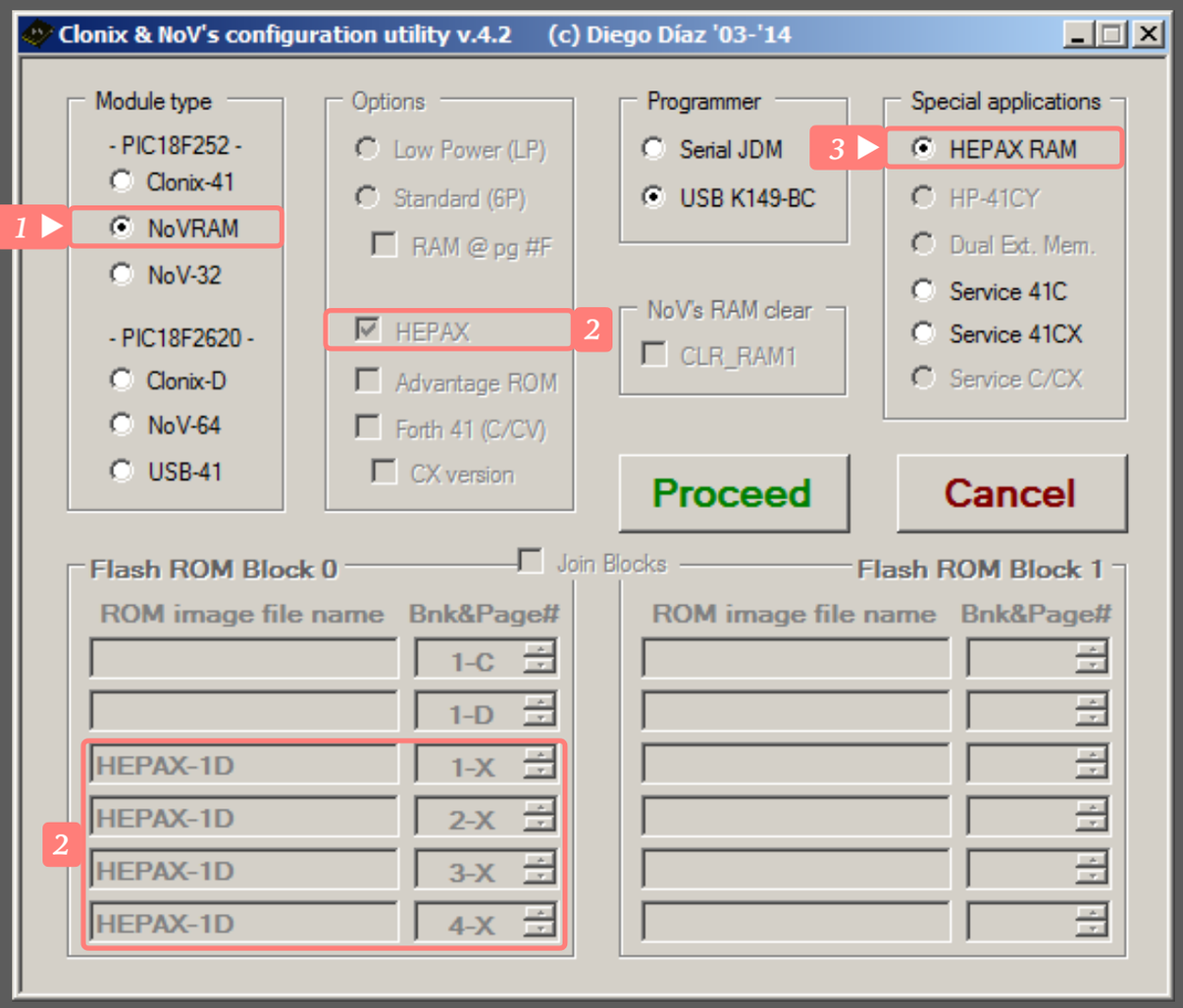


NoV's RAM Clear

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.*

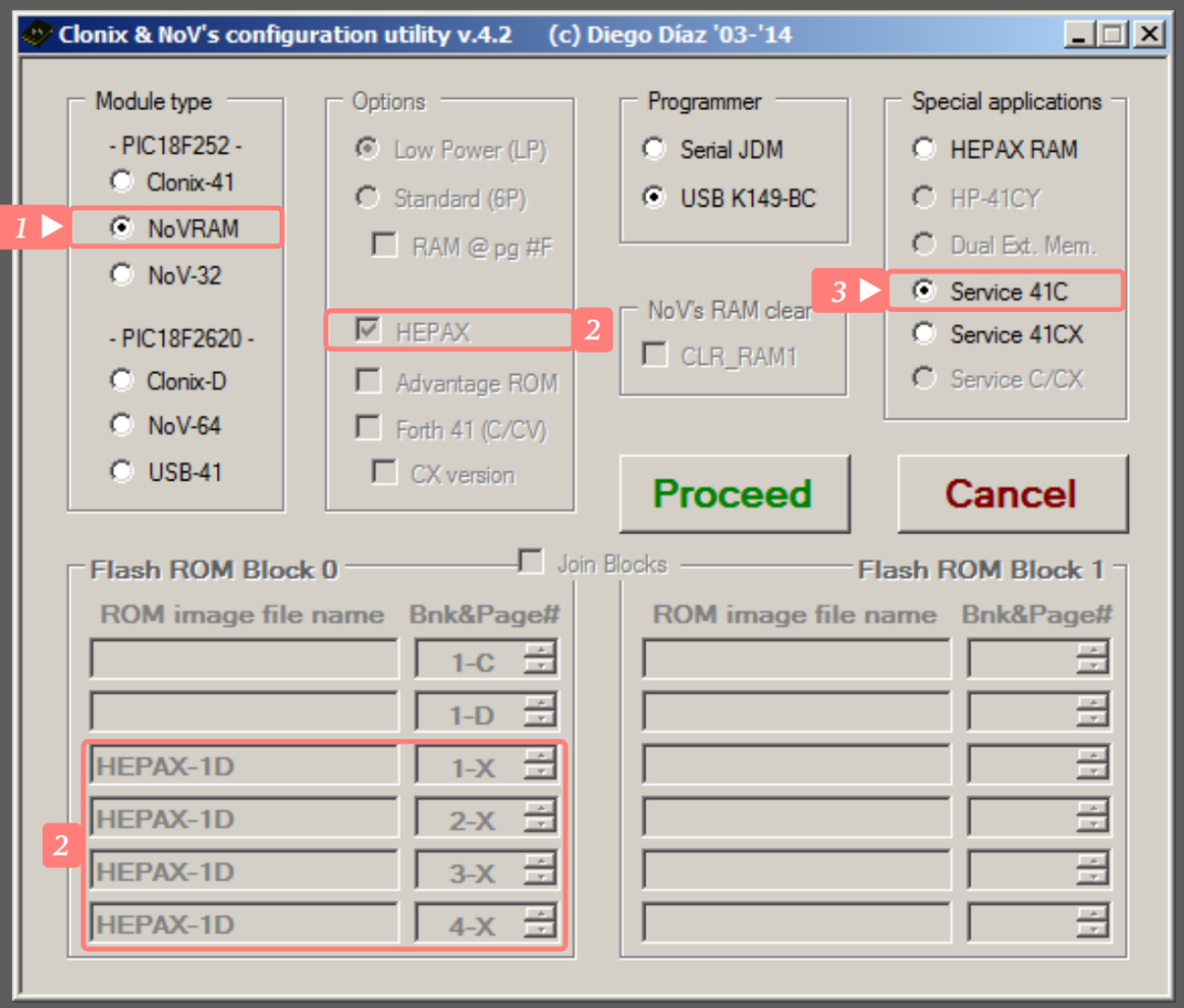


HEPAX RAM

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.*

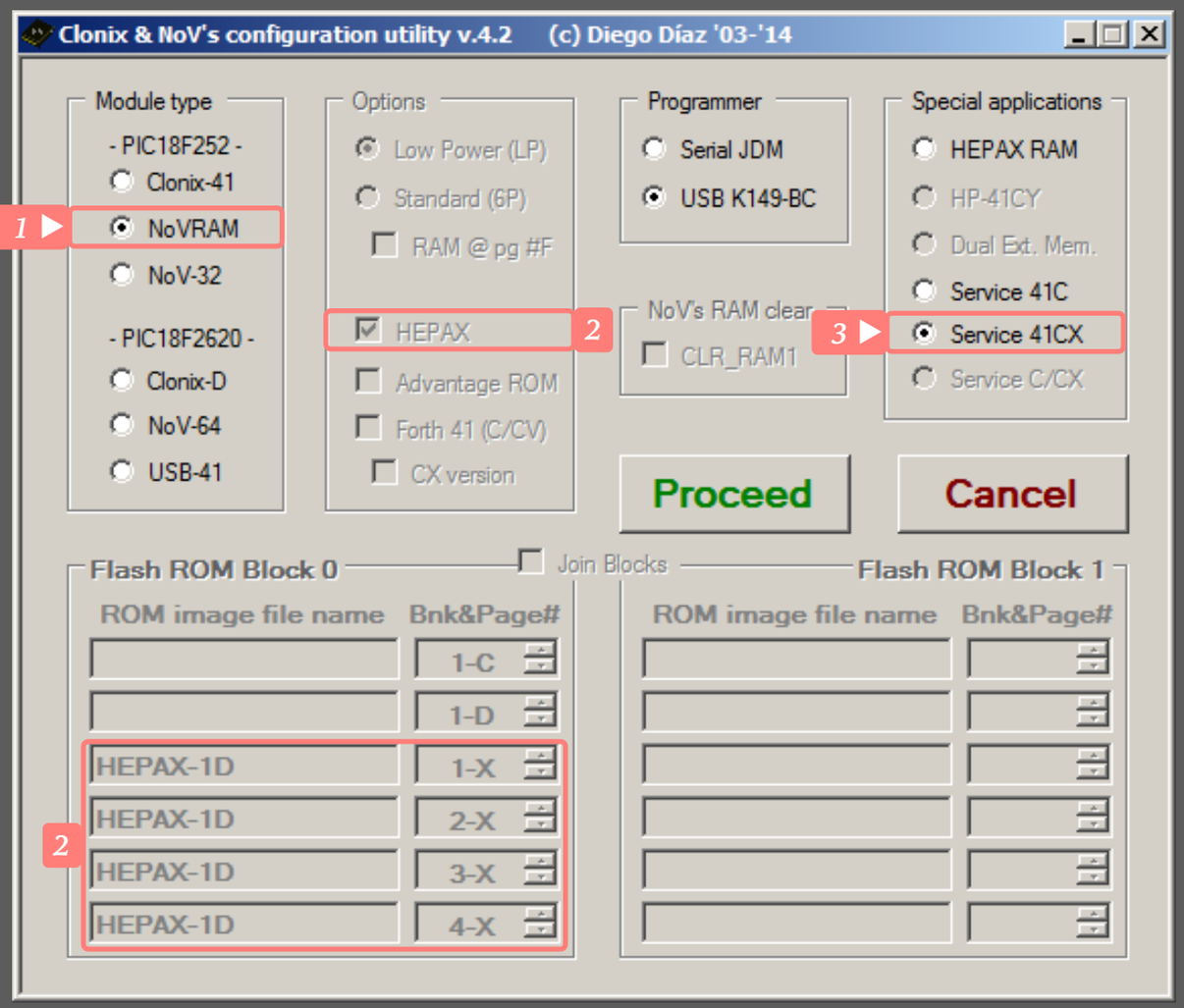


Service 41C/CV

Goal: loading HP Service ROM into the module. Support: 41C, 41CV, RAM (x1 & x4), ROM (4K & 8K) & Card Reader.

1. Select **NoVRAM** option.
2. **HEPAX** is automatically selected but unused.
3. Select **Service 41C**.
   Load HP Service ROM [SM-1C] image in page #4.

*Go to **Programming** section.*



Service 41CX

Goal: loading HP Service ROM into the module. Support: 41CV, 41CX, Time, X-Fnc, X-Mem, RAM (x1 & x4), ROM (4K to 16K).

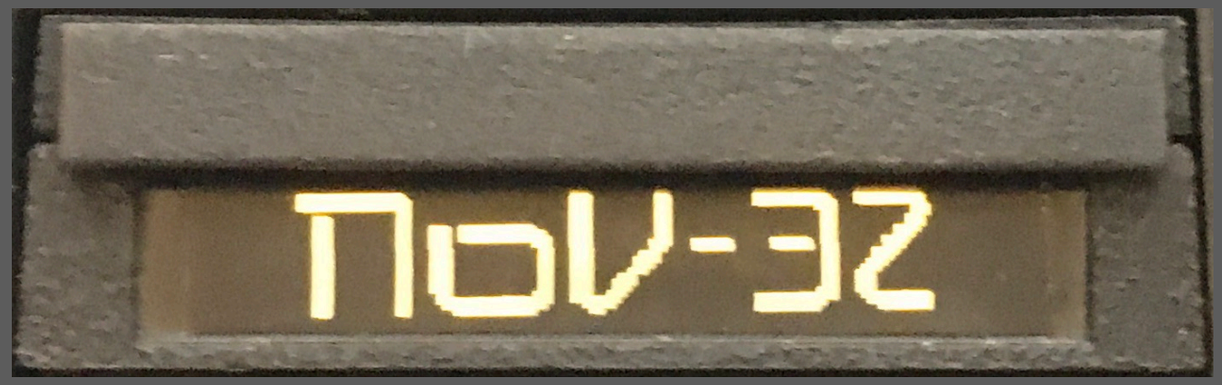
1. Select **NoVRAM** option.
2. **HEPAX** is automatically selected but unused.
3. Select **Service 41CX**.
   Load HP Service ROM [SM-2A] image in page #4.

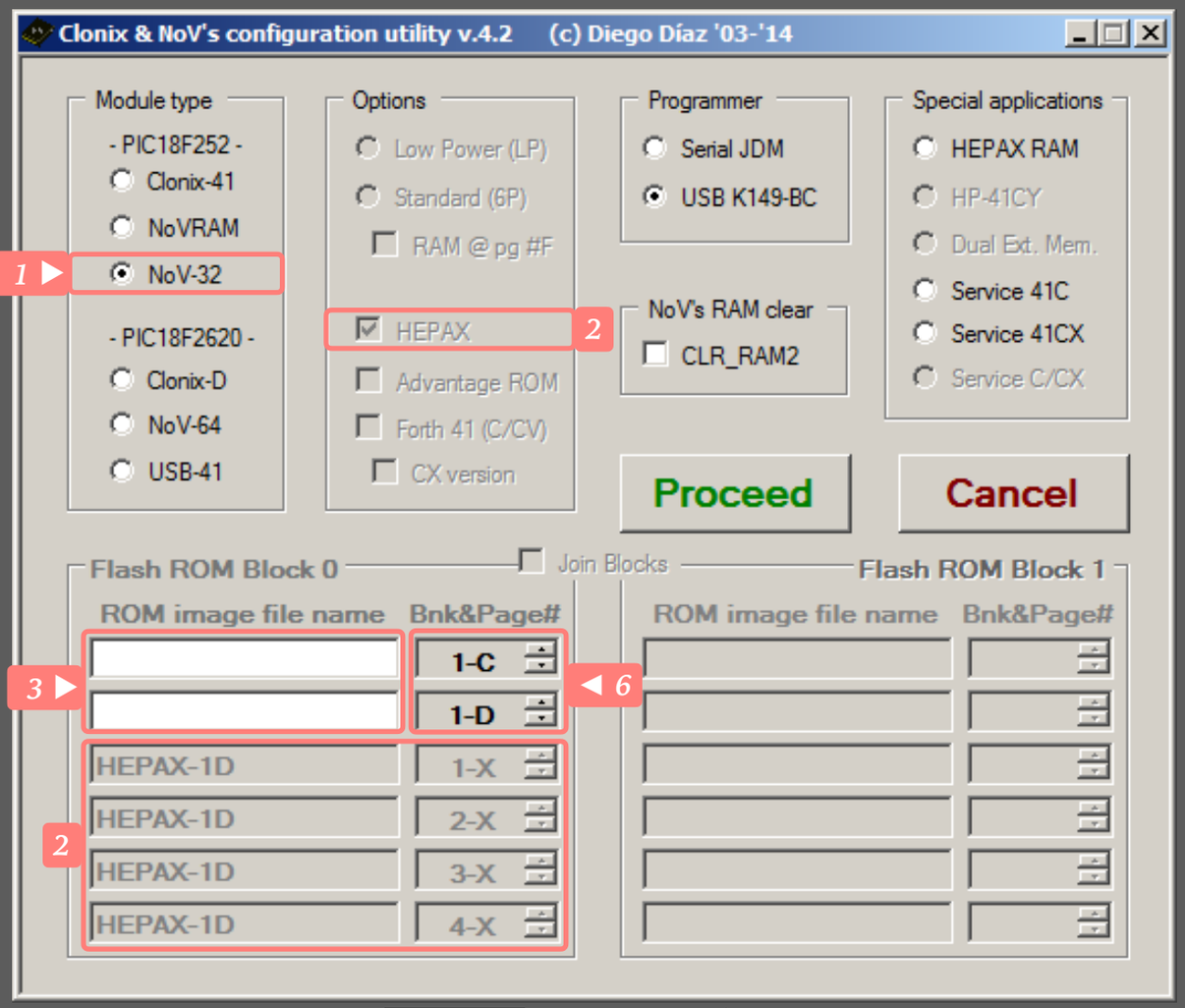
*Go to **Programming** section.*

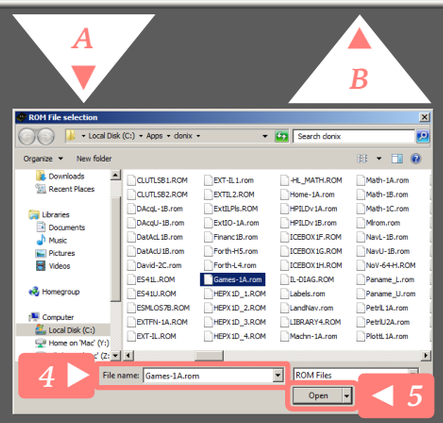
Table of Content

NOV-32

Configuration







HEPAX

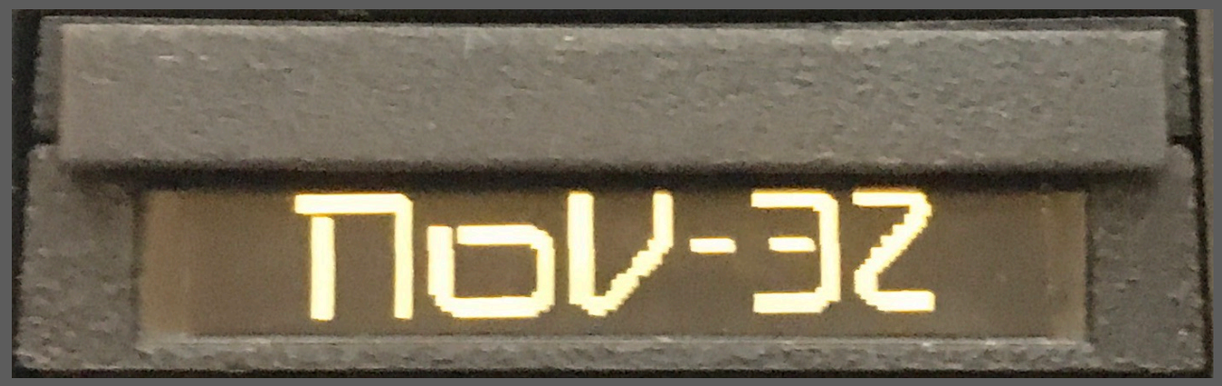
Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

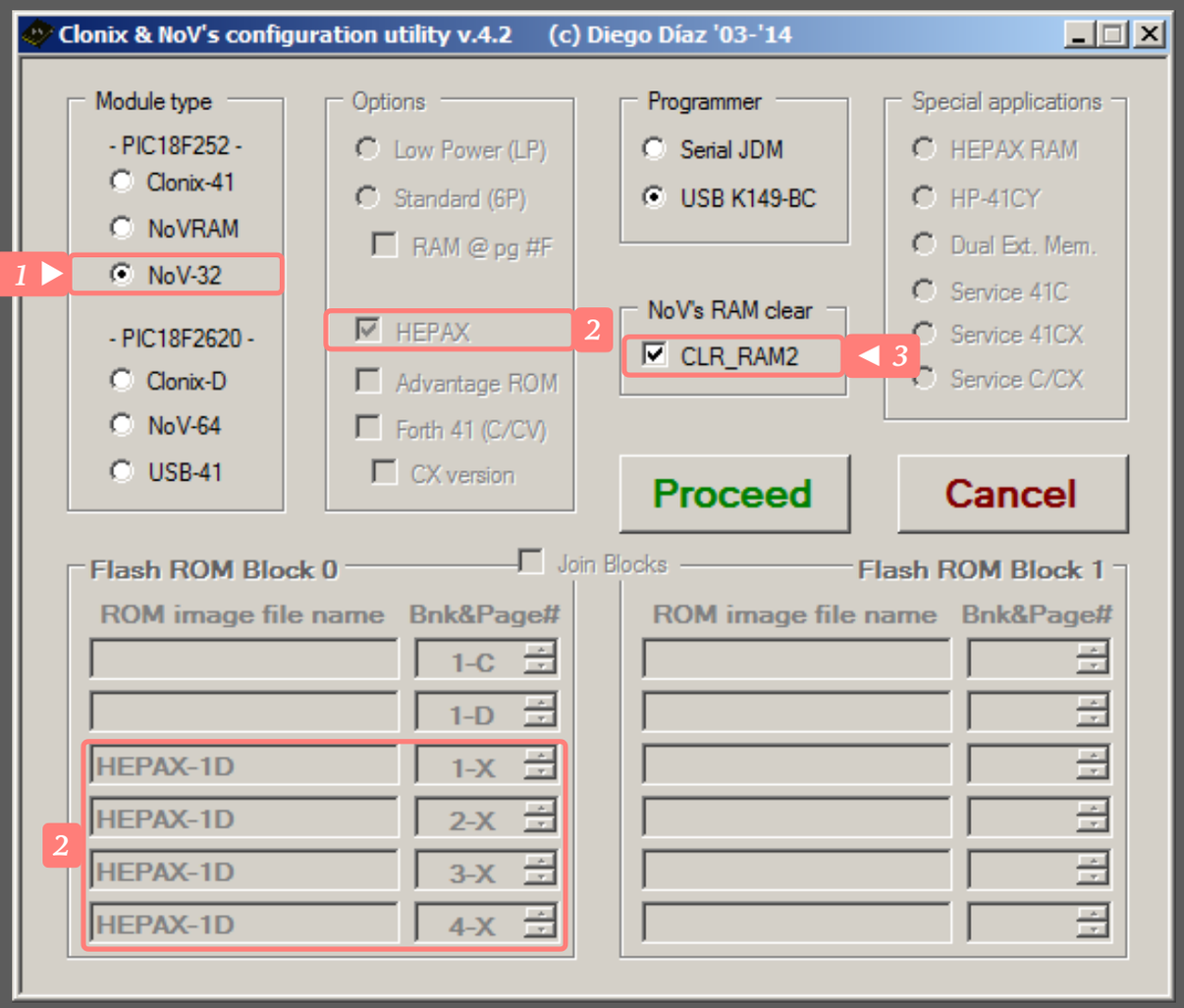
1. Select **NoV-32** option.
2. **HEPAX** is automatically selected.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



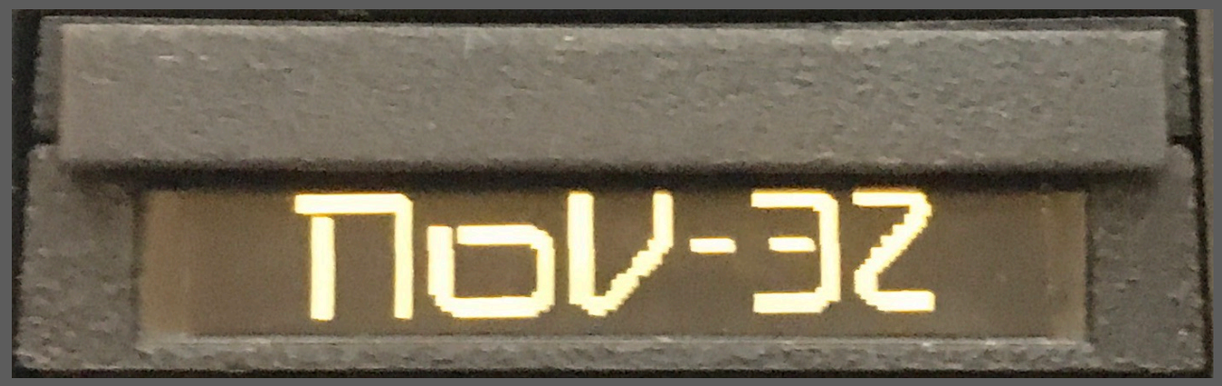


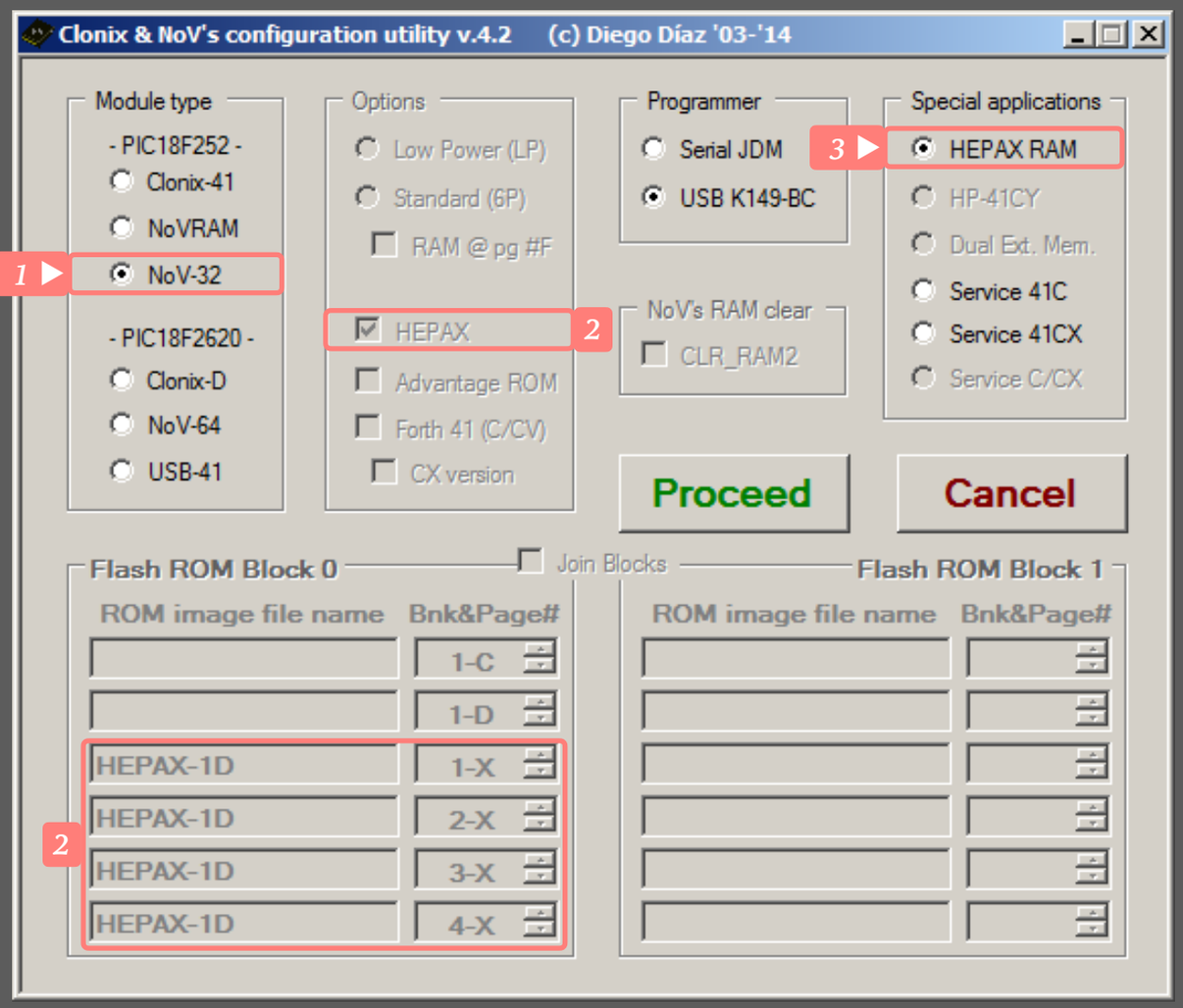
NoV's RAM Clear

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.*



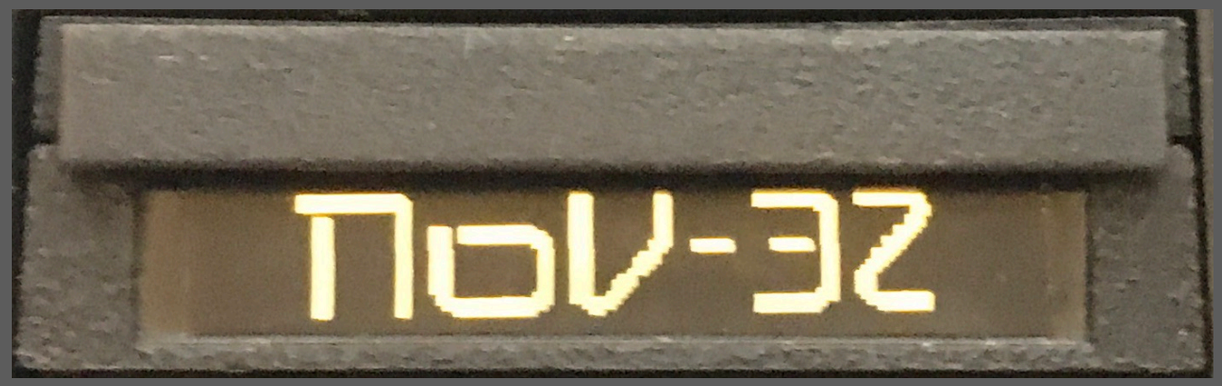


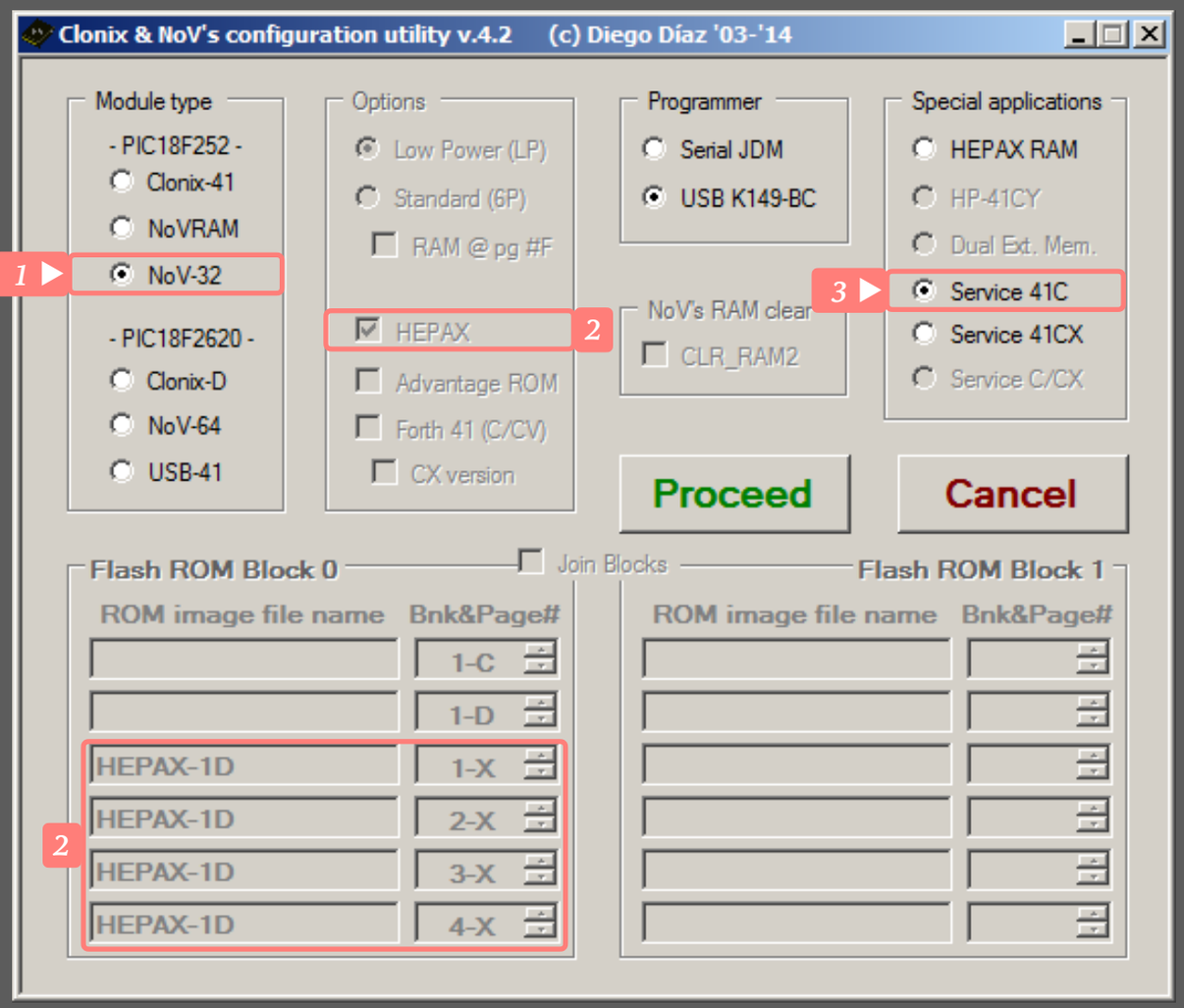
HEPAX RAM

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.*



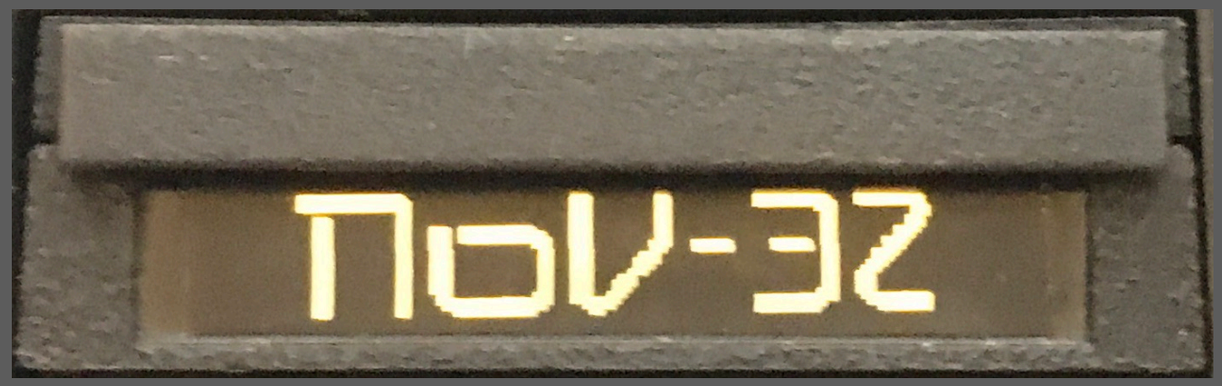


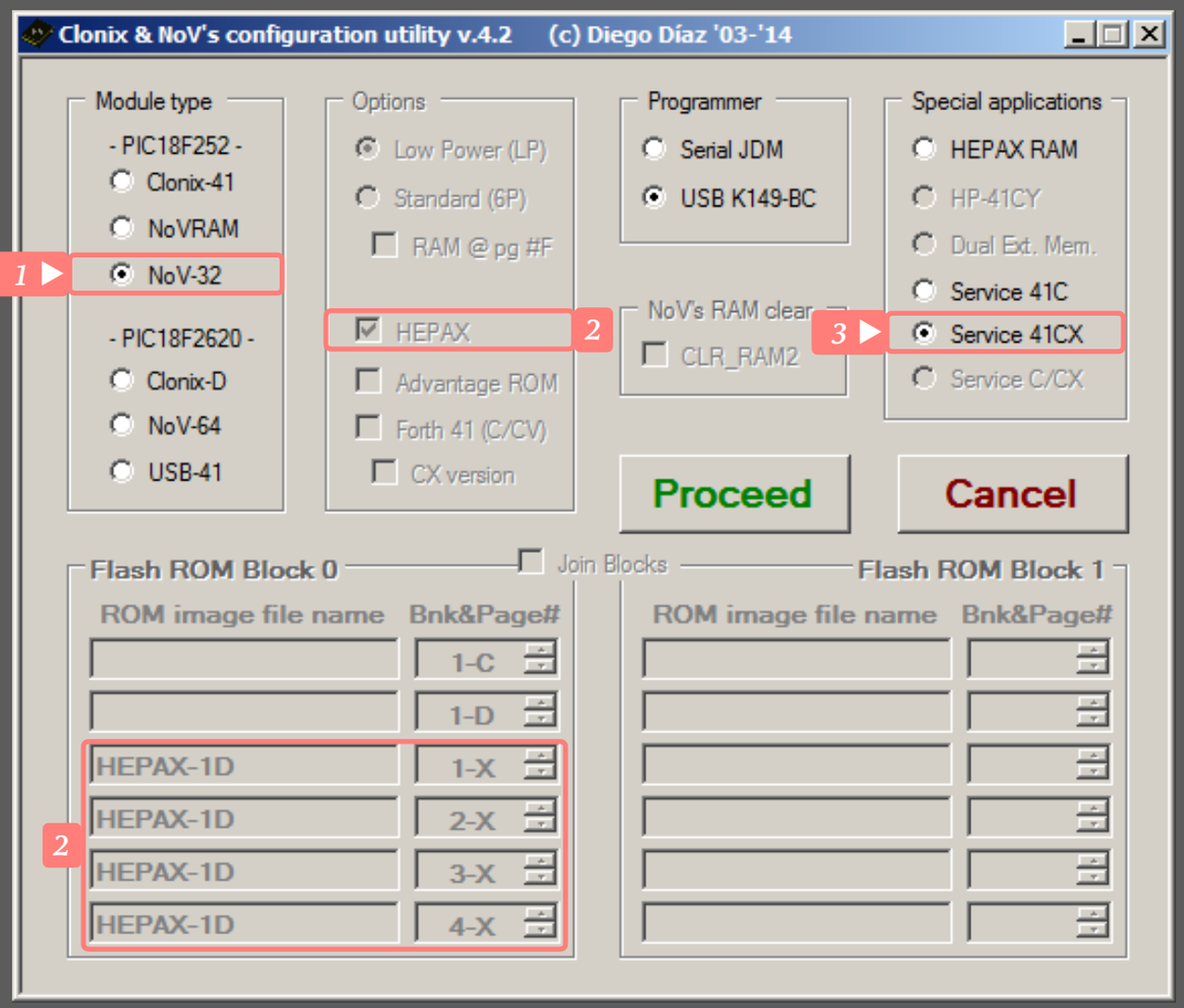
Service 41C/CV

Goal: loading HP Service ROM into the module. Support: 41C, 41CV, RAM (x1 & x4), ROM (4K & 8K) & Card Reader.

1. Select **NoV-32** option.
2. **HEPAX** is automatically selected but unused.
3. Select **Service 41C**.
   Load HP Service ROM [SM-1C] image in page #4.

*Go to **Programming** section.*





Service 41CX

Goal: loading HP Service ROM into the module. Support: 41CV, 41CX, Time, X-Fnc, X-Mem, RAM (x1 & x4), ROM (4K to 16K).

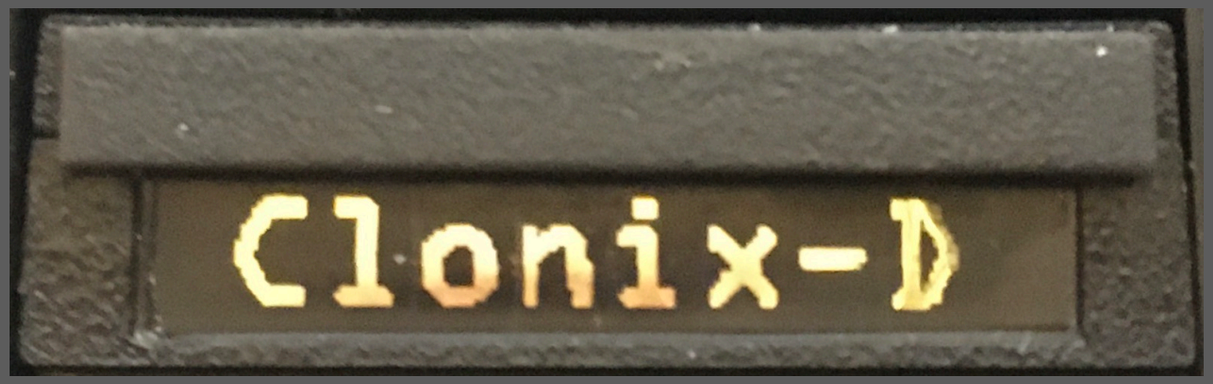
1. Select **NoV-32** option.
2. **HEPAX** is automatically selected but unused.
3. Select **Service 41CX**.
   Load HP Service ROM [SM-2A] image in page #4.

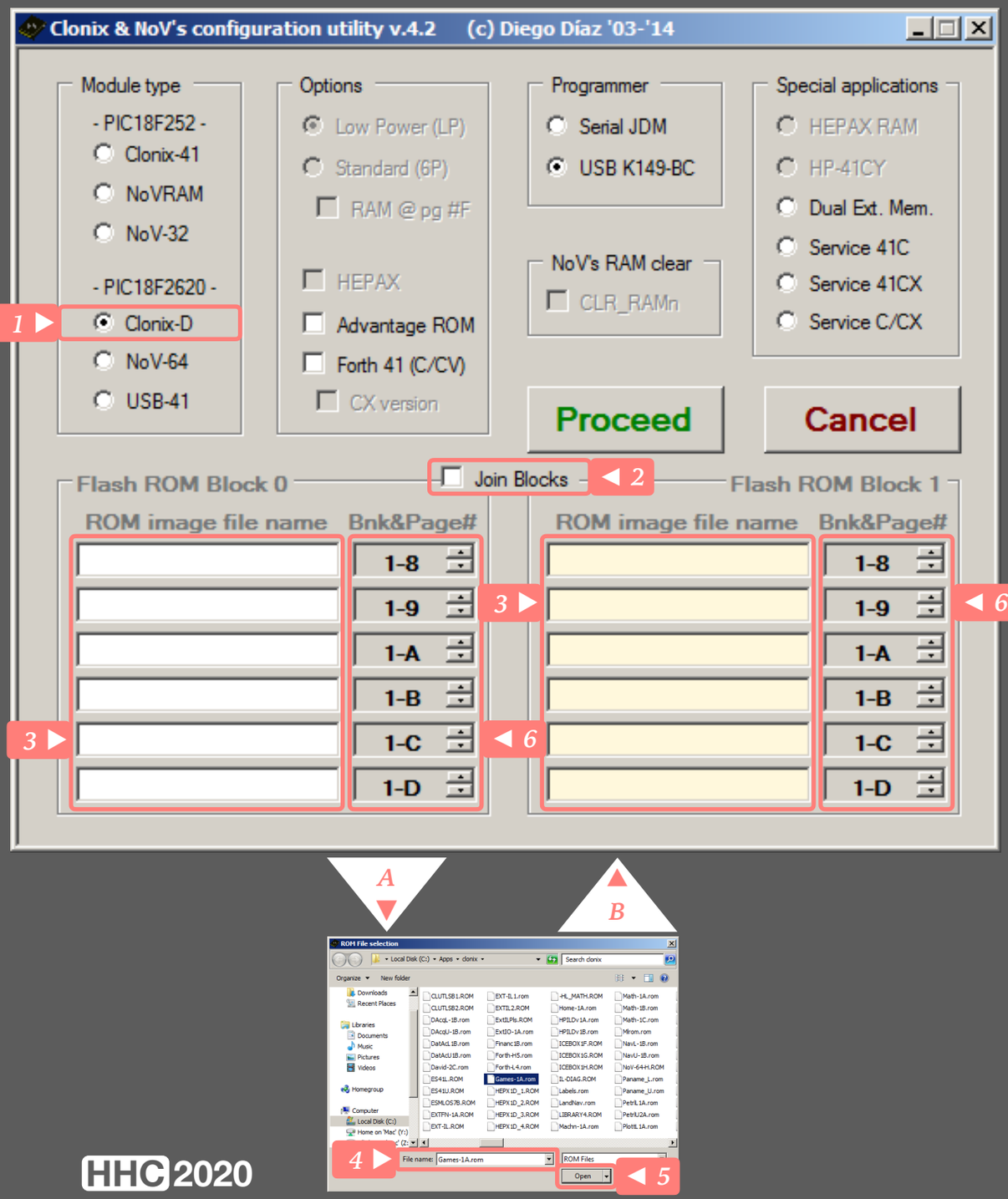
*Go to **Programming** section.*

CLONIX-D

Configuration

Table of Content





Standard

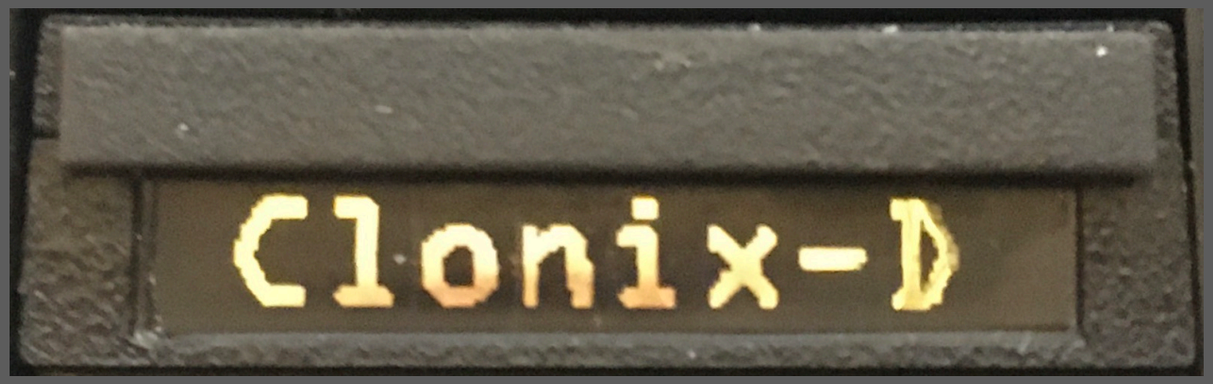
Goal: loading ROMs into the module.

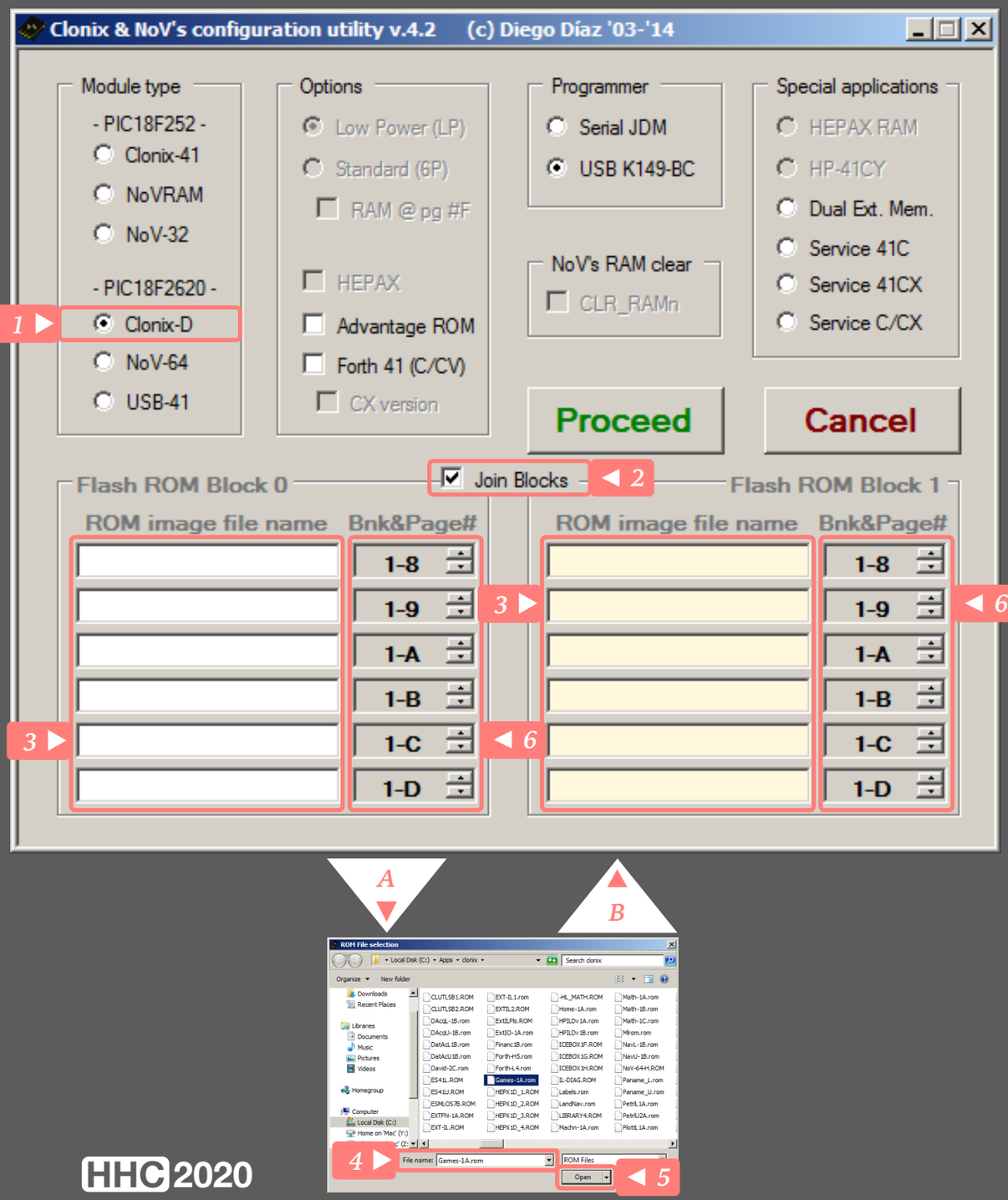
1. Select **Clonix-D** option.
2. Unselect **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are two separated blocks. ROM's specified in Flash ROM Block 0 (white) will be visible when the module is inserted into an odd port, while Flash ROM Block 1 (yellow) will be visible when the 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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





Standard + Merged Blocks

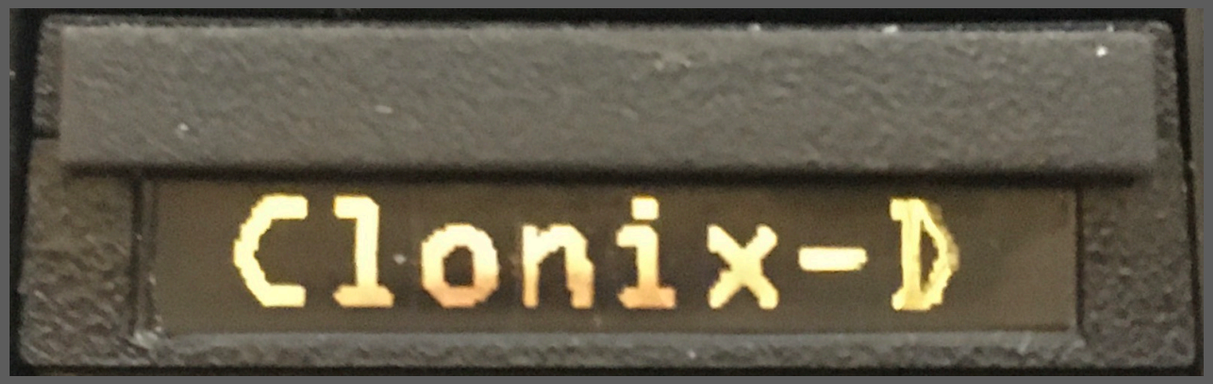
Goal: loading ROMs into the module. Flash blocks are merged allowing more ROM's to be mapped.

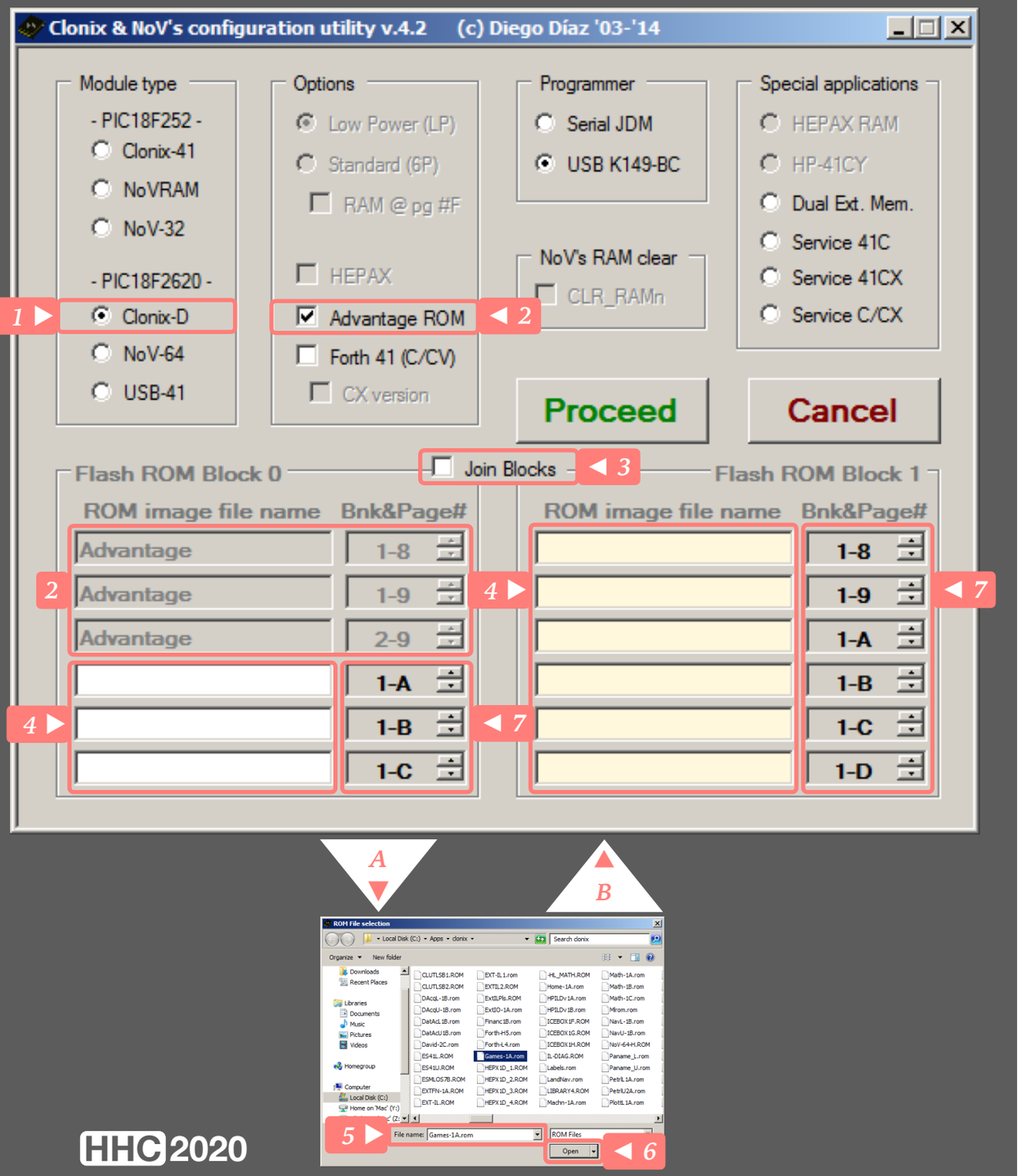
1. Select **Clonix-D** option.
2. Select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are merged into a single block.

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.
6. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





HHC 2020

Advantage

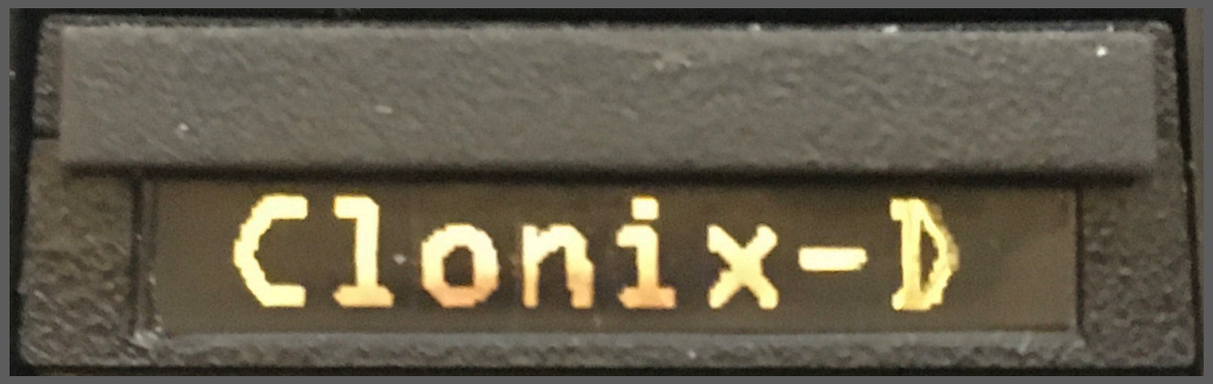
Goal: loading HP Advantage ROM and optionally other ROMs into the module.

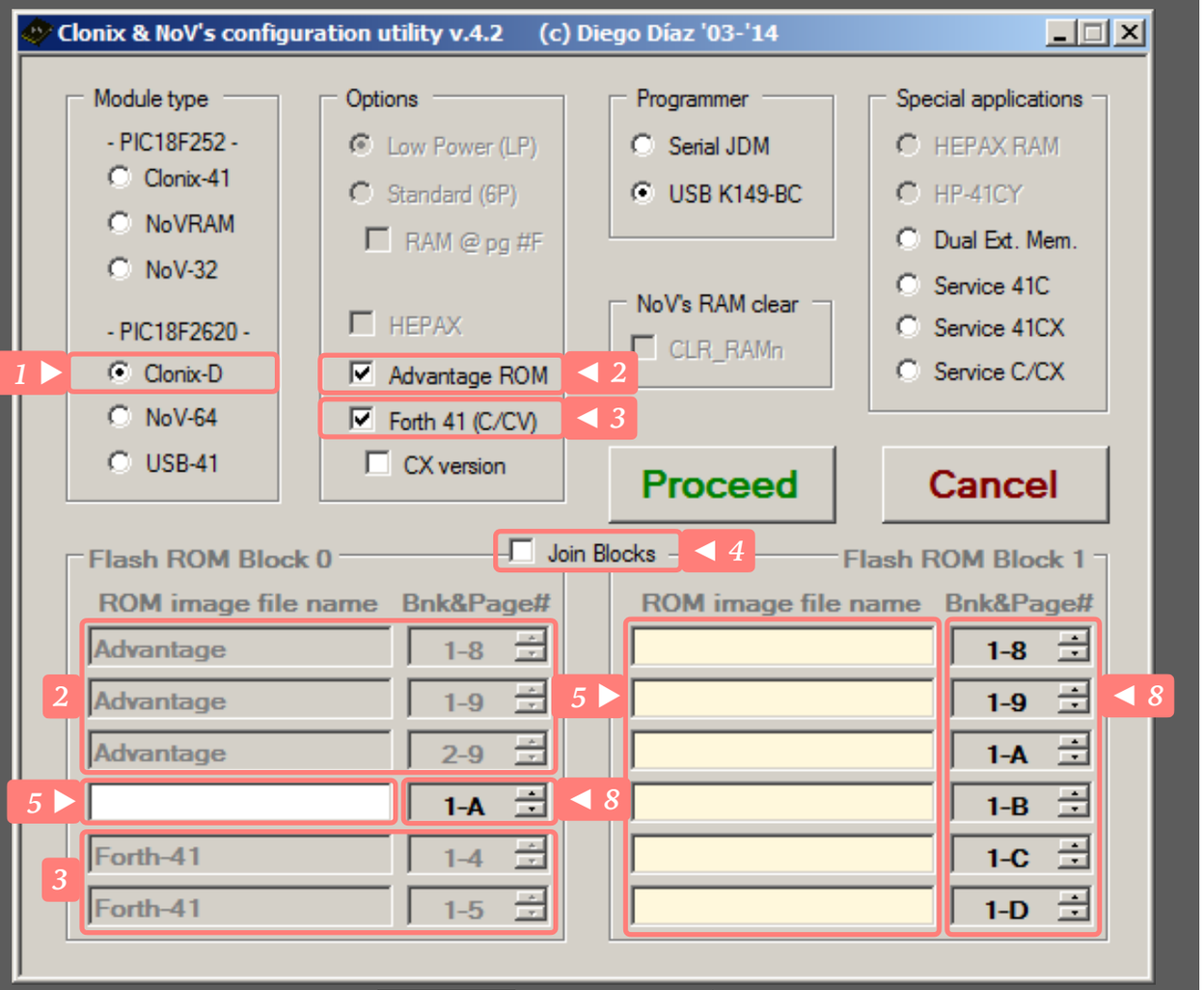
1. Select **Clonix-D** option.
2. Select **Advantage ROM**.
   Load ROM images at pages #8, #9 & #9 bank 2.
3. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

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.*





HHC 2020

Advantage + Forth 41 C/CV

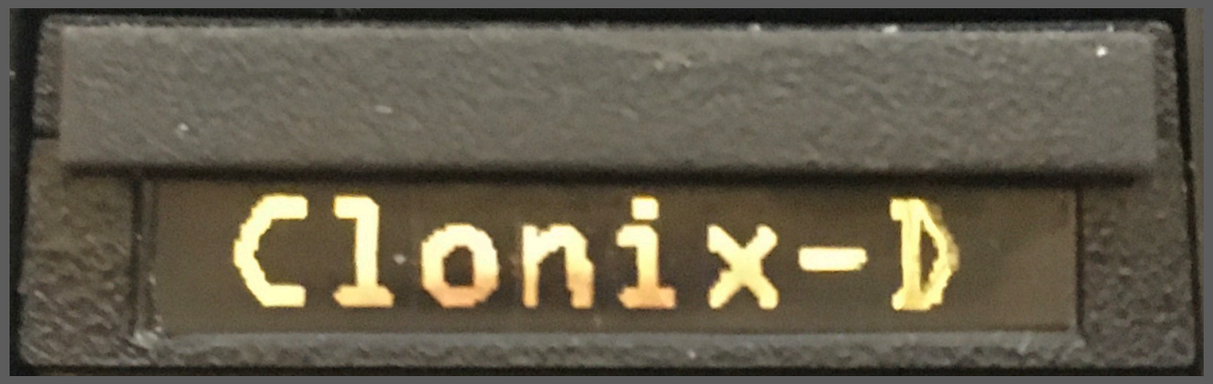
Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

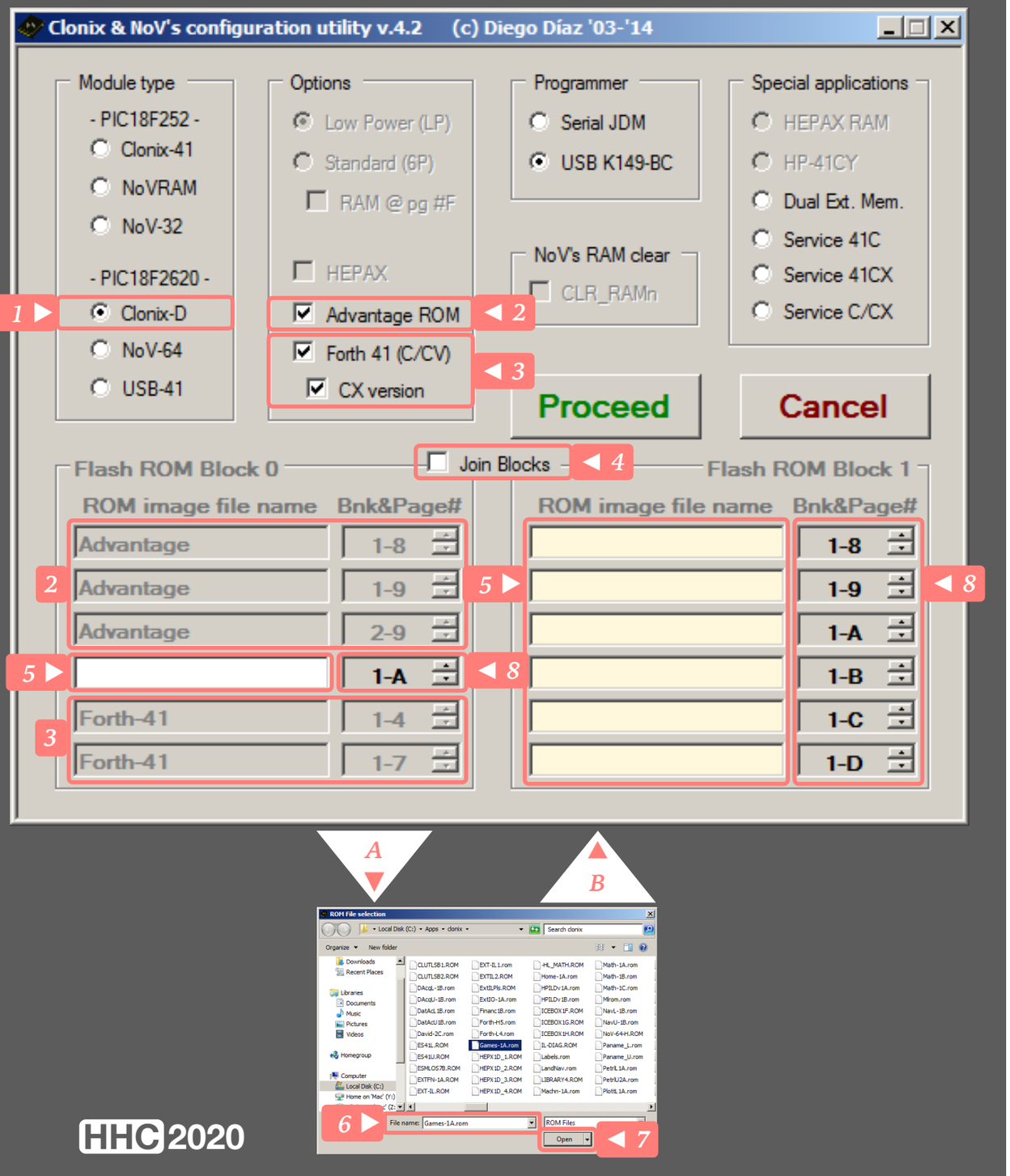
1. Select **Clonix-D** option.
2. Select **Advantage ROM**.
   Load ROM images at pages #8, #9 & #9 bank 2.
3. Select **Forth 41 (C/CV)**.
   Load ROM images at pages #4 & #5.
4. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks 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.
8. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





HHC 2020

Advantage + Forth 41 CX

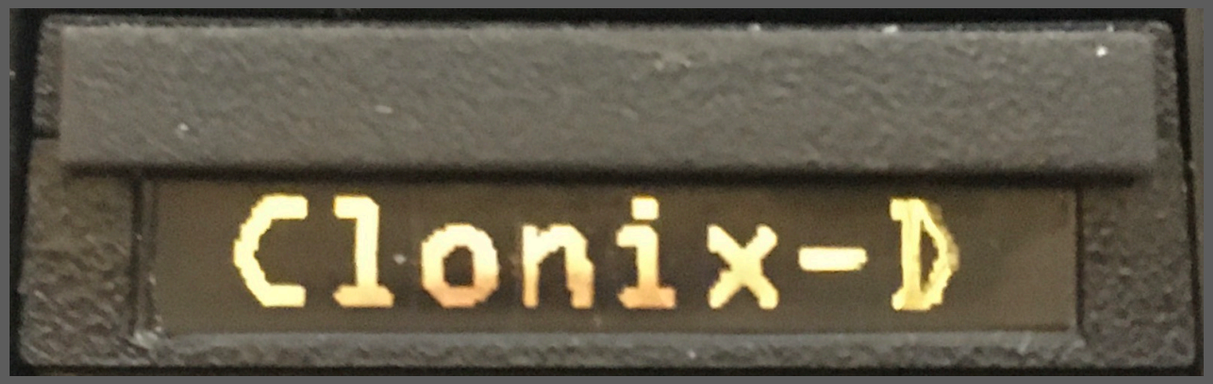
Goal: loading HP Advantage ROM, a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

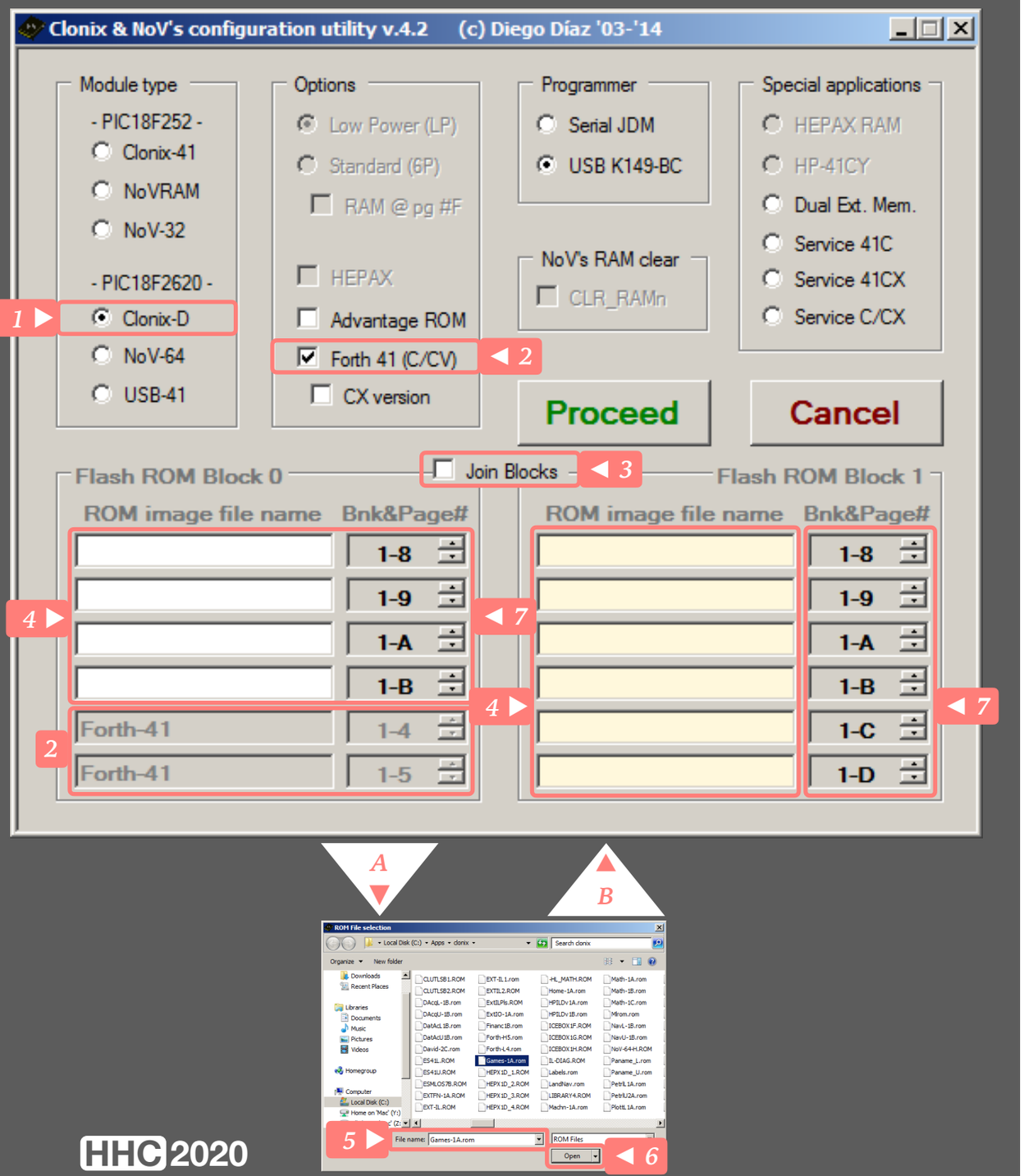
1. Select **Clonix-D** option.
2. Select **Advantage ROM**.
   Load ROM images at pages #8, #9 & #9 bank 2.
3. Select **Forth 41 (C/CV)** then **CX version**.
   Load ROM images at pages #4 & #7.
4. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either 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.
8. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





Forth 41 C/CV

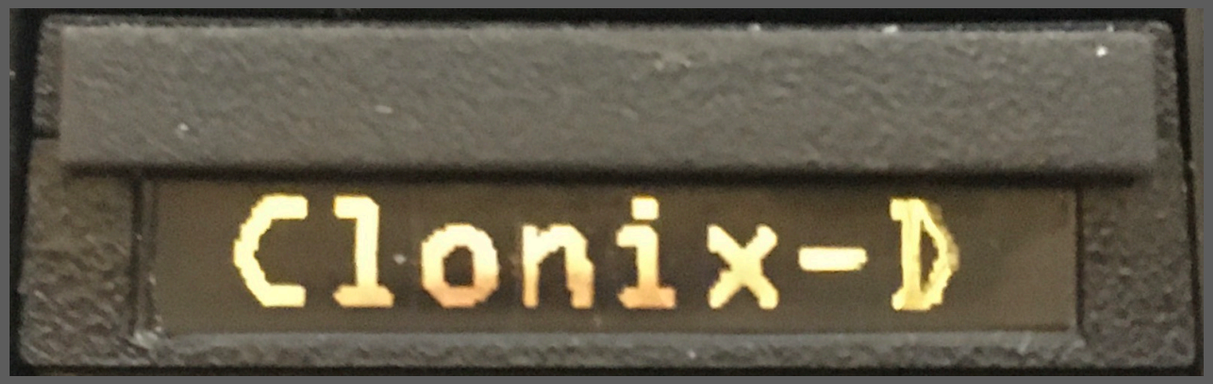
Goal: loading a subset version of the Forth language for the 41C/CV and optionally other ROMs into the module.

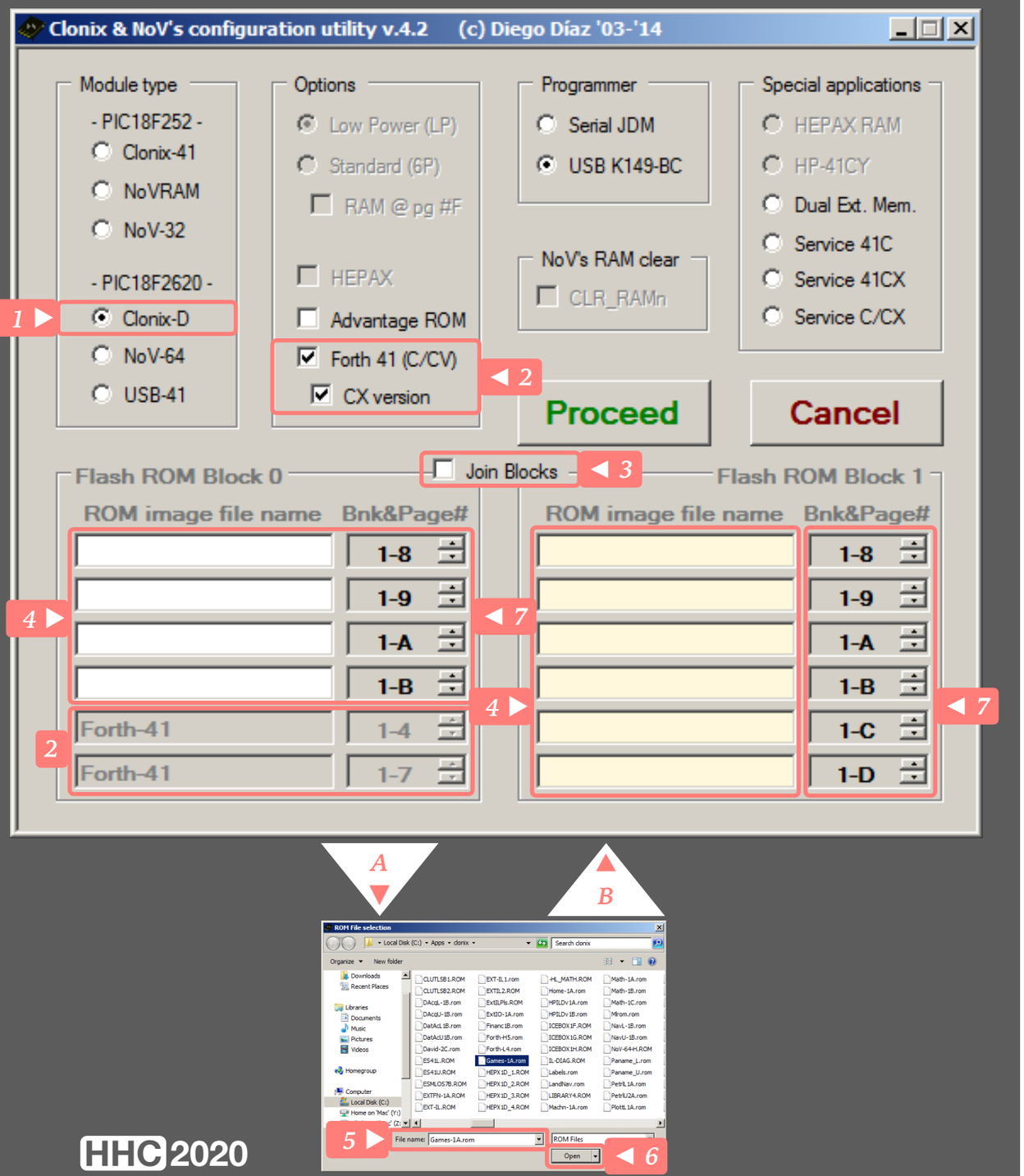
1. Select **Clonix-D** option.
2. Select **Forth 41 (C/CV)**.
   Load ROM images at pages #4 & #5.
3. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





Forth 41 CX

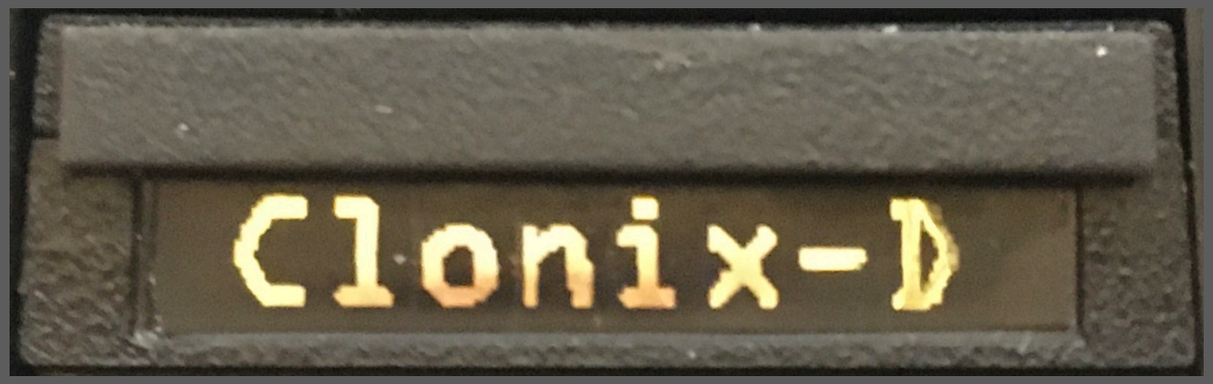
Goal: loading a subset version of the Forth language for the 41CX and optionally other ROMs into the module.

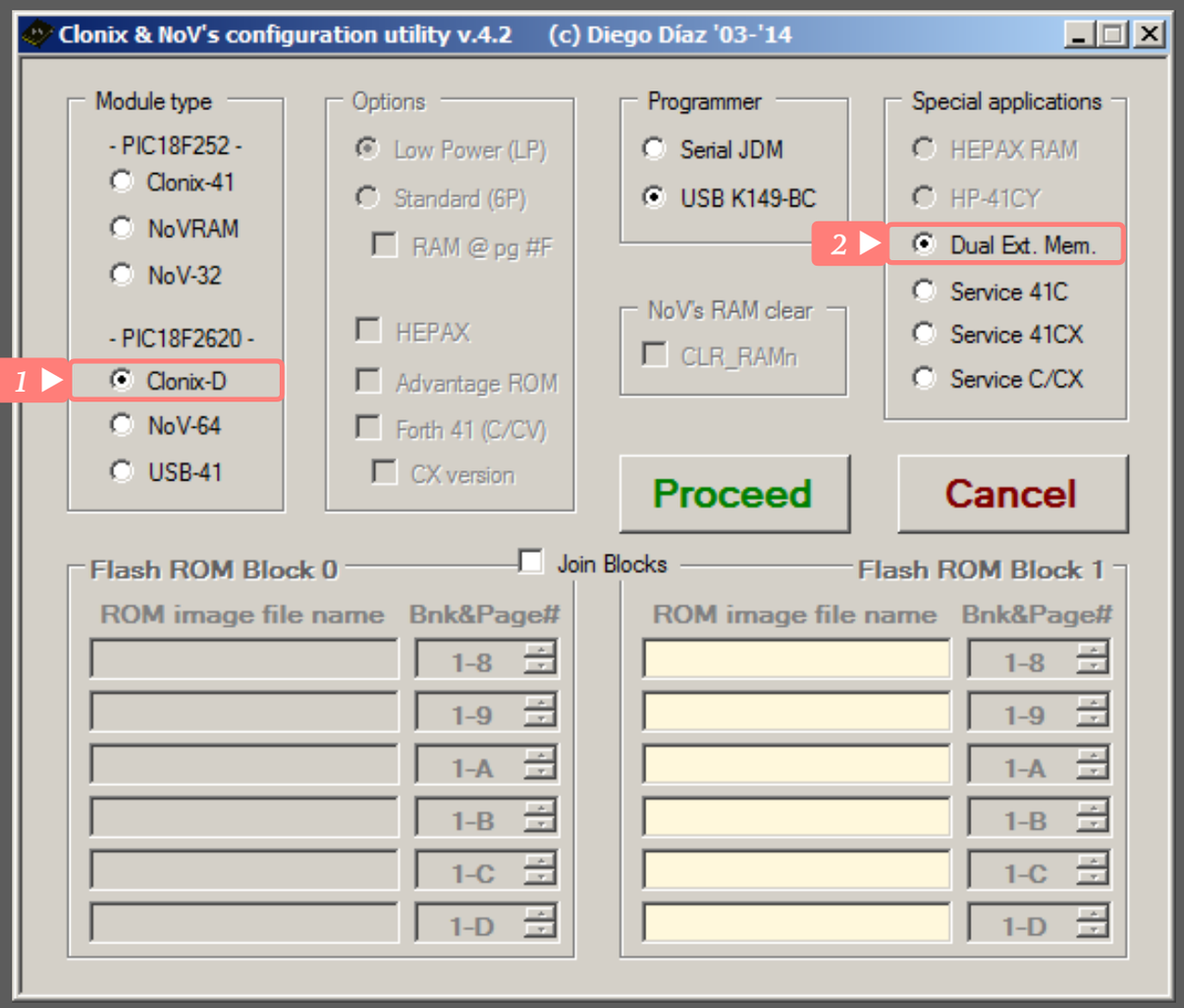
1. Select **Clonix-D** option.
2. Select **Forth 41 (C/CV)**.
   Load ROM images at pages #4 & #7.
3. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



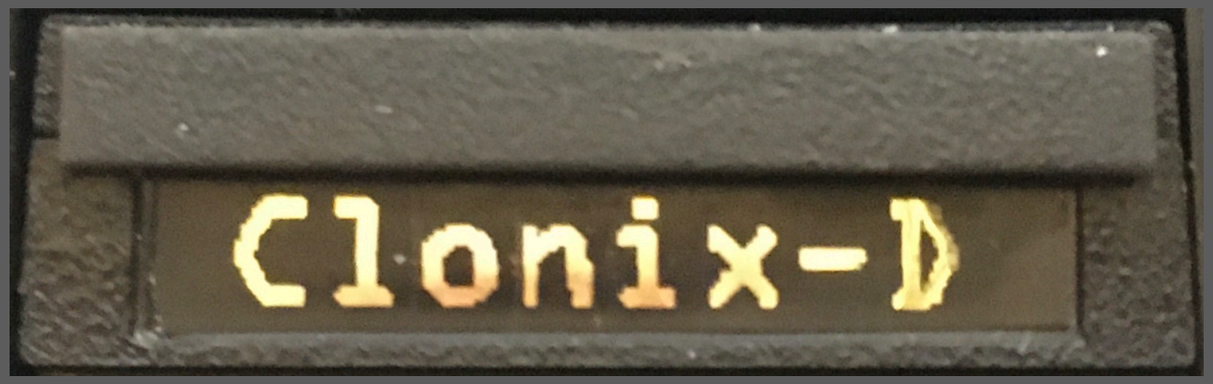


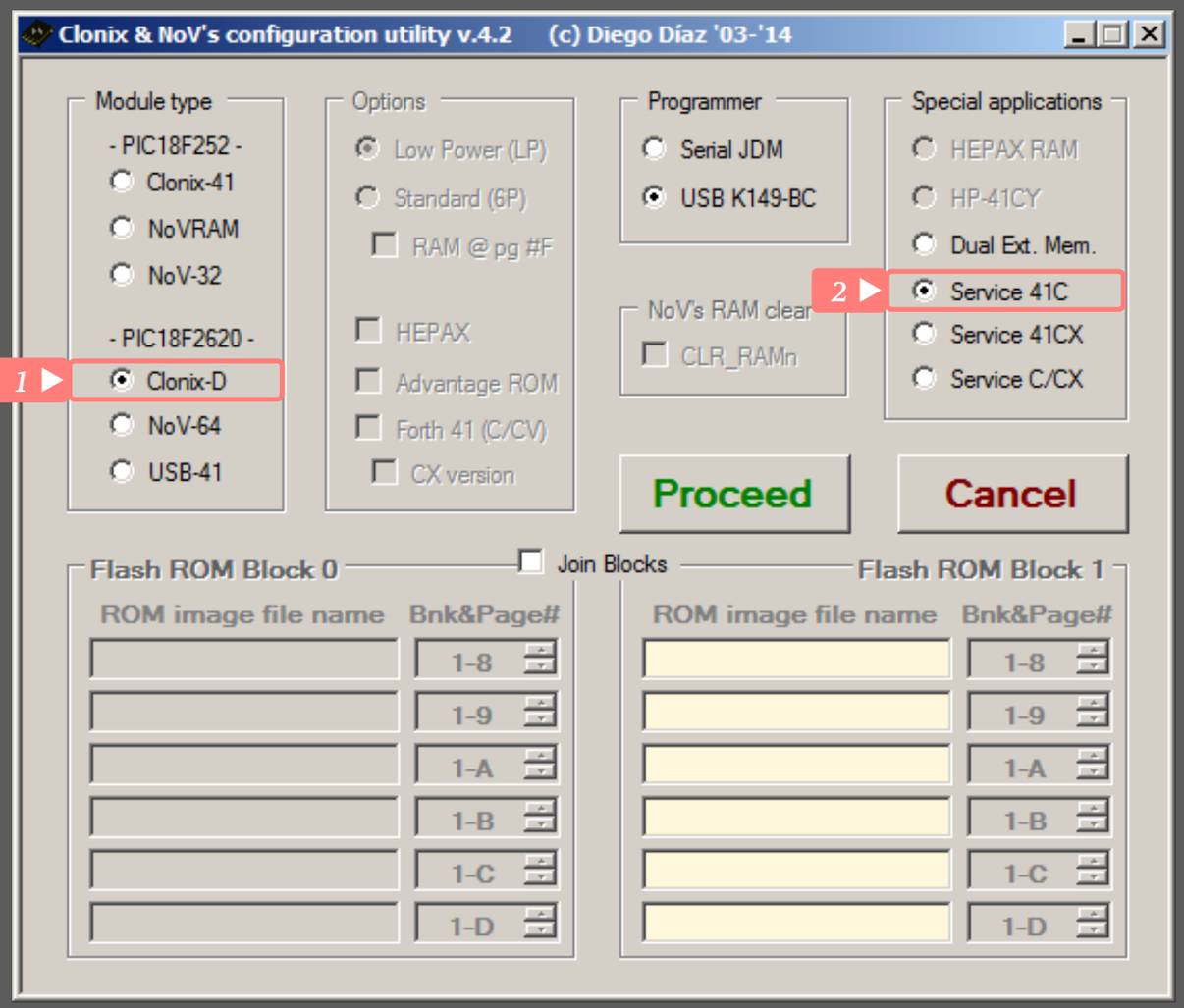
Dual X-Memory

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.*



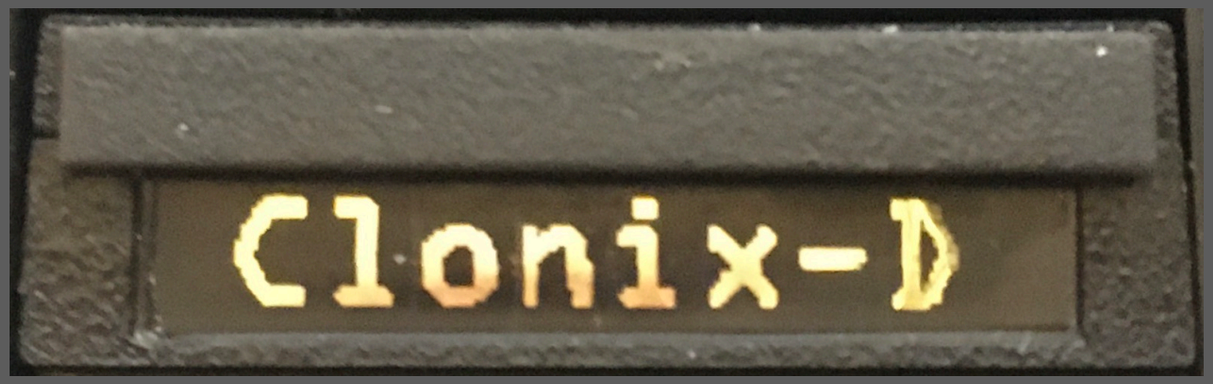


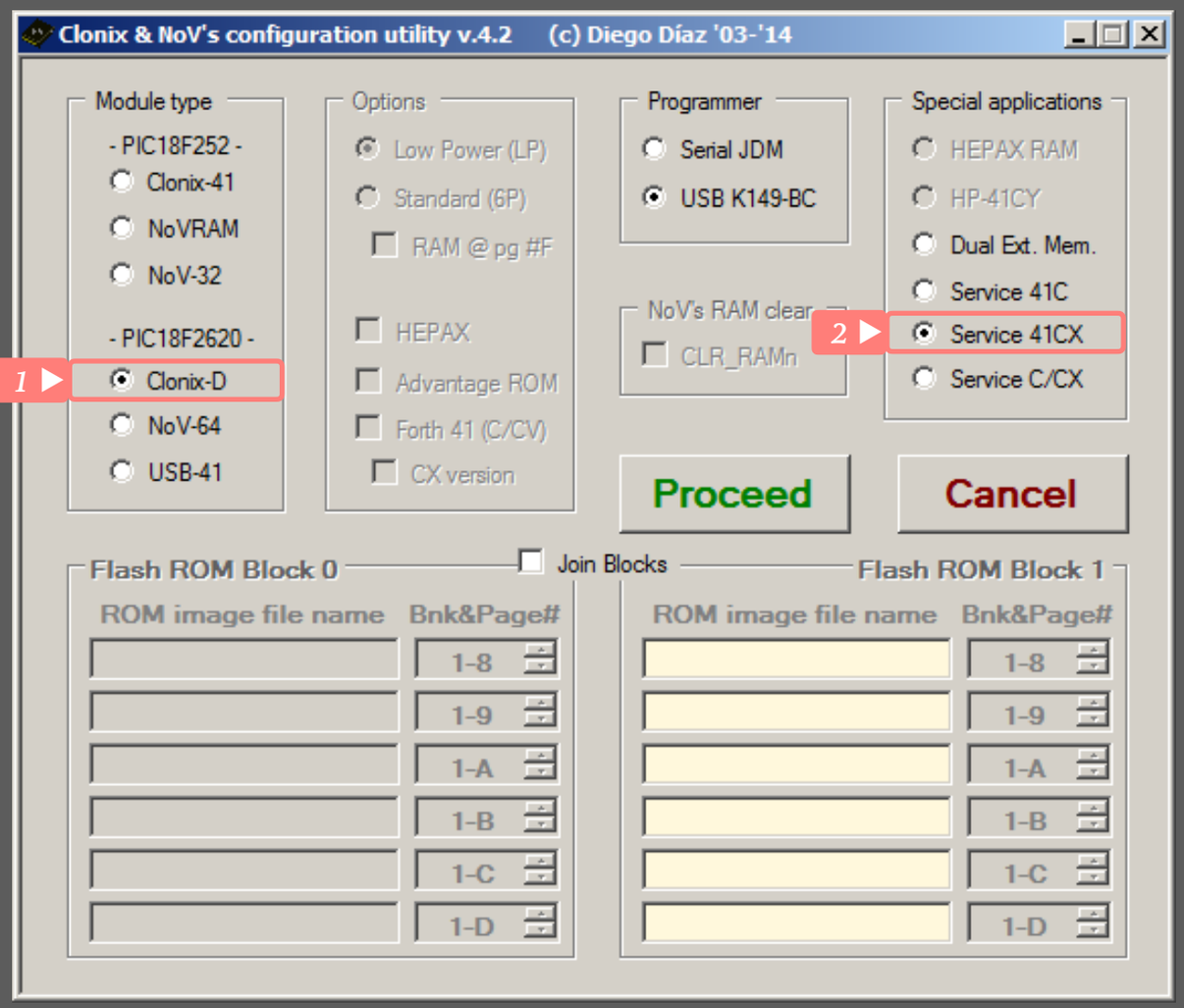
Service 41C/CV

Goal: loading HP Service ROM into the module. Support: 41C, 41CV, RAM (x1 & x4), ROM (4K & 8K) & Card Reader.

1. Select **Clonix-D** option.
2. Select **Service 41C**.
   Load HP Service ROM [SM-1C] image in page #4.

*Go to **Programming** section.*



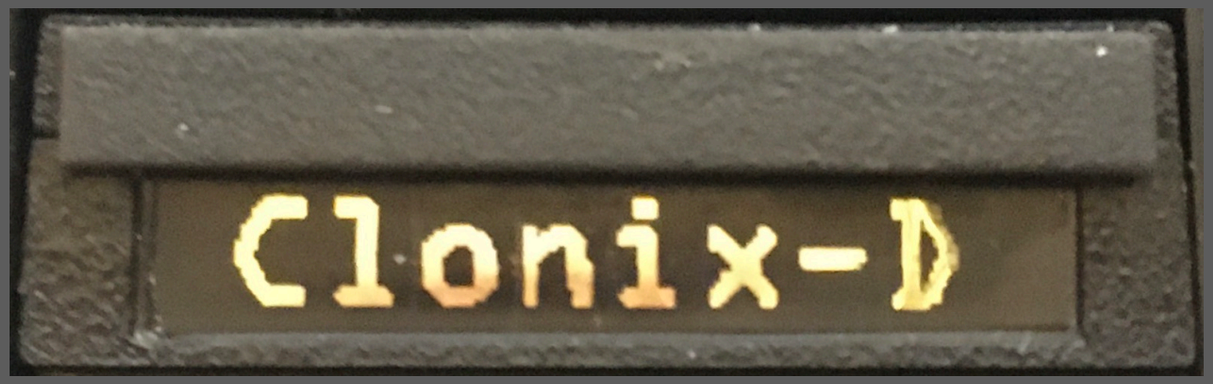


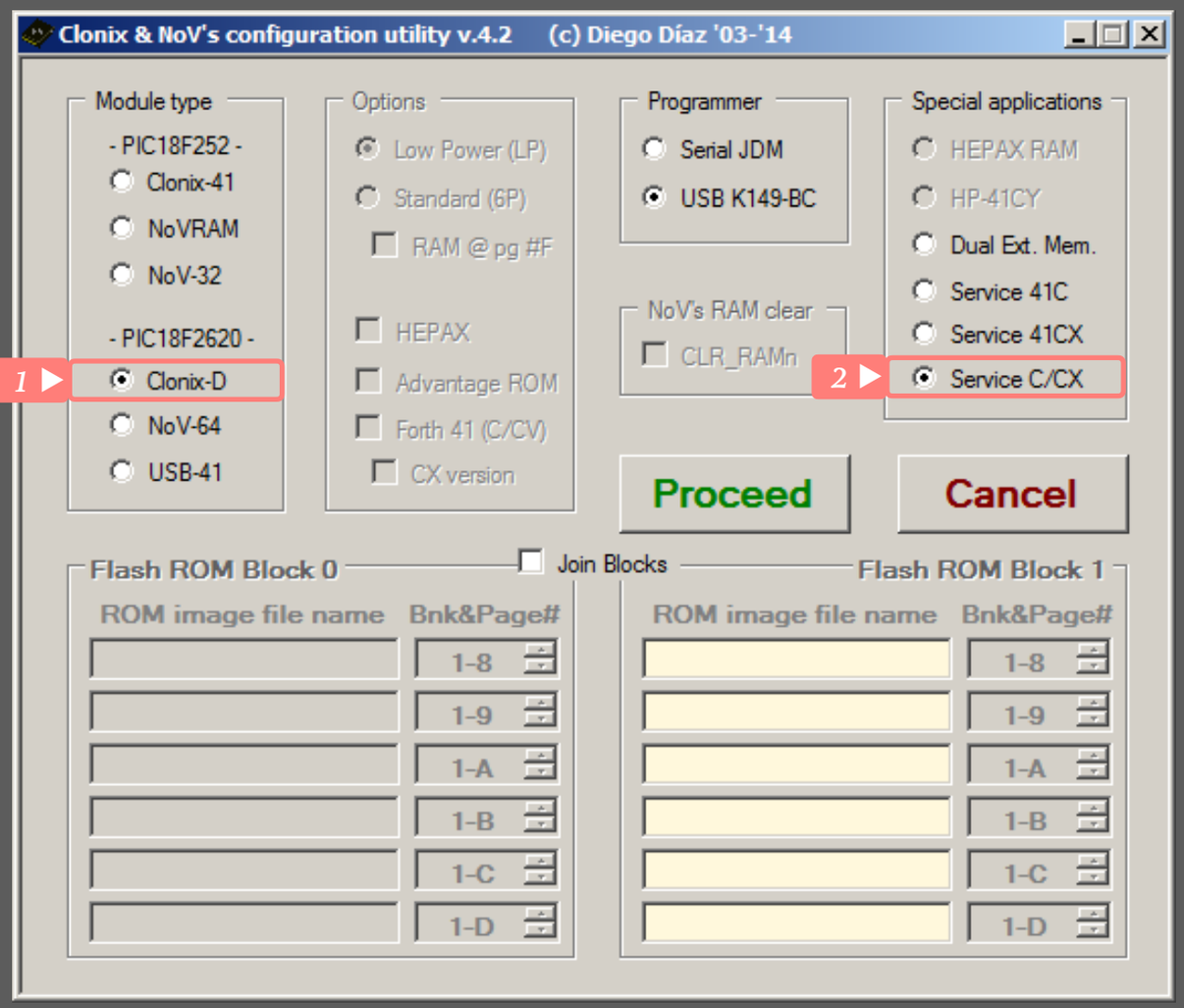
Service 41CX

Goal: loading HP Service ROM into the module. Support: 41CV, 41CX, Time, X-Fnc, X-Mem, RAM (x1 & x4), ROM (4K to 16K).

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

*Go to **Programming** section.*





Service C/CX

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

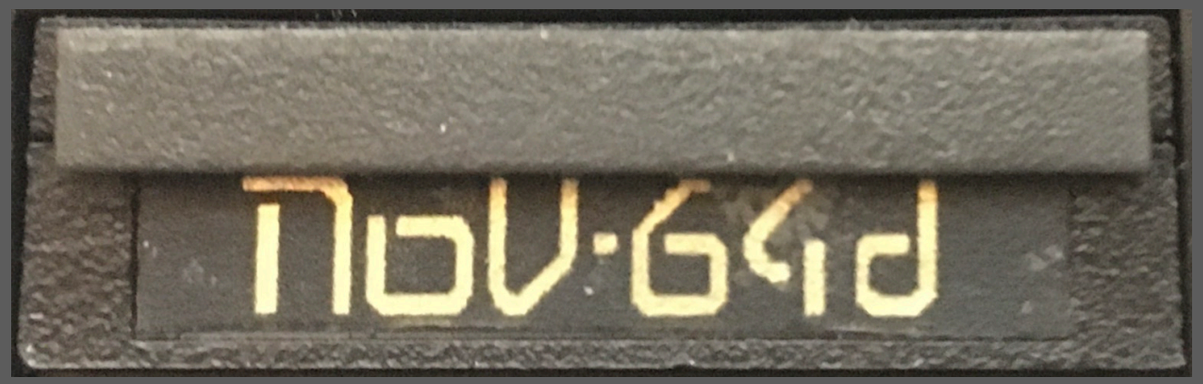
1. Select **Clonix-D** option.
2. Select **Service C/CX**.
   Load Service 41C/CV ROM [SM-1C] image in page #4 block 0.
   Load Service 41CX ROM [SM-2A] image in page #4 block 1.
   Inserting the module into an odd port activates block 0.
   Inserting the module into an even port activates block 1.

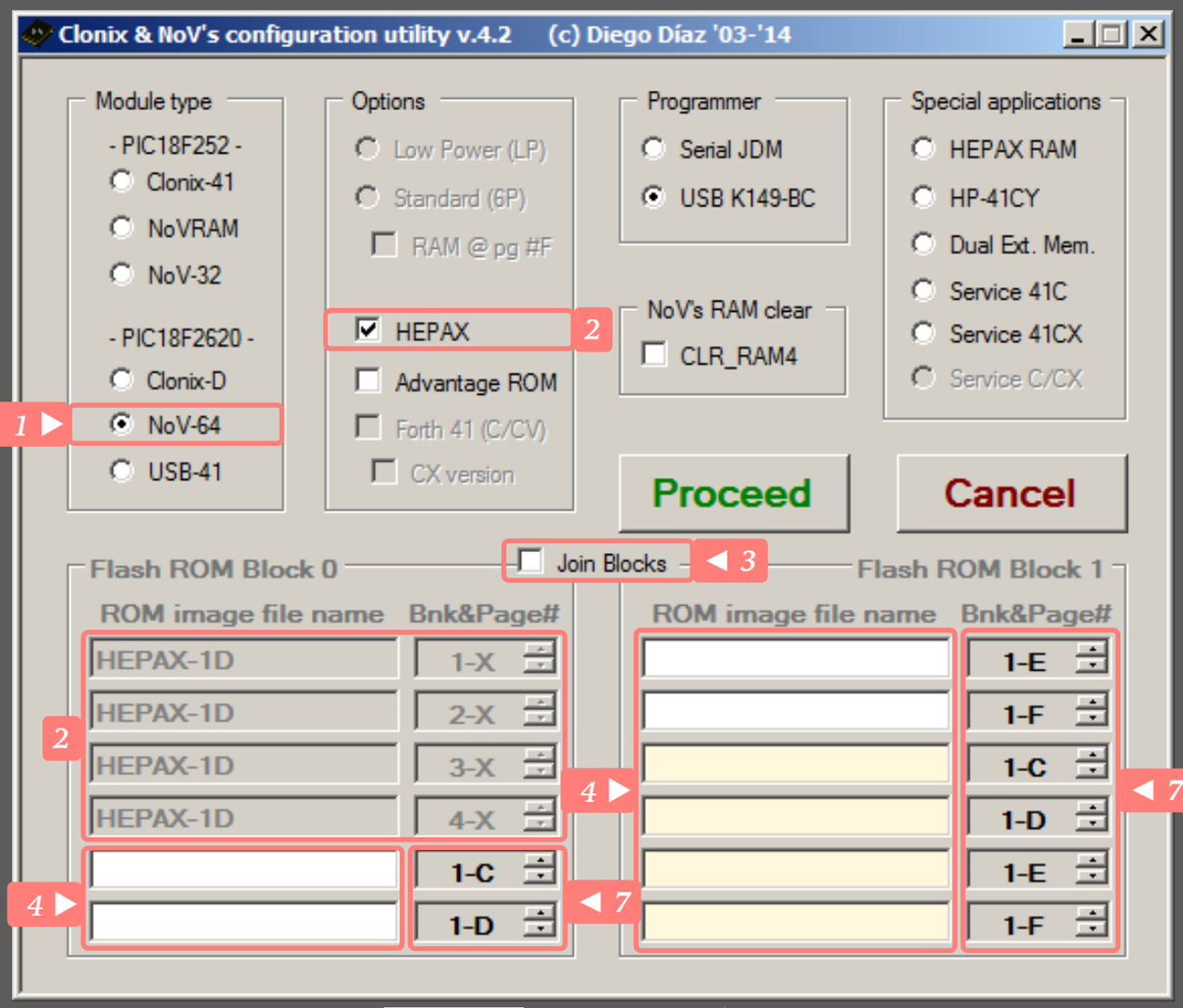
*Go to **Programming** section.*

NOV-64(D)

Configuration

Table of Content





HHC 2020

HEPAX

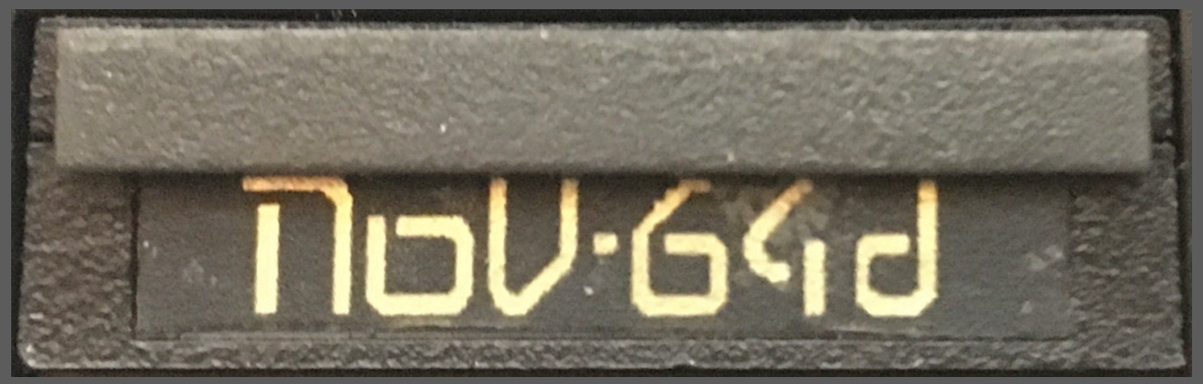
Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module.

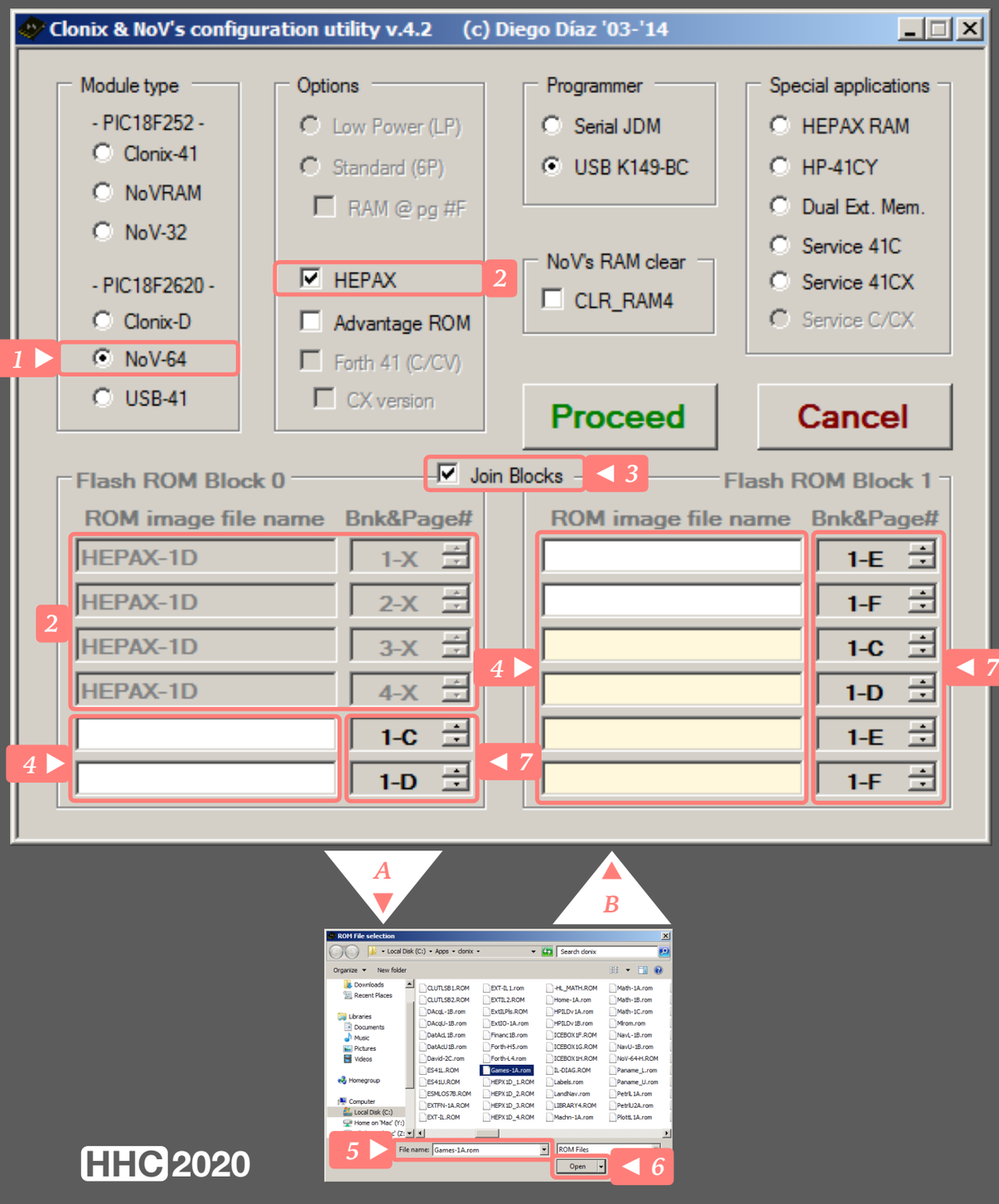
1. Select **NoV-64** option.
2. **HEPAX** is automatically selected.
3. Unselect **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are two separated blocks.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*





HHC 2020

HEPAX + Merged Blocks

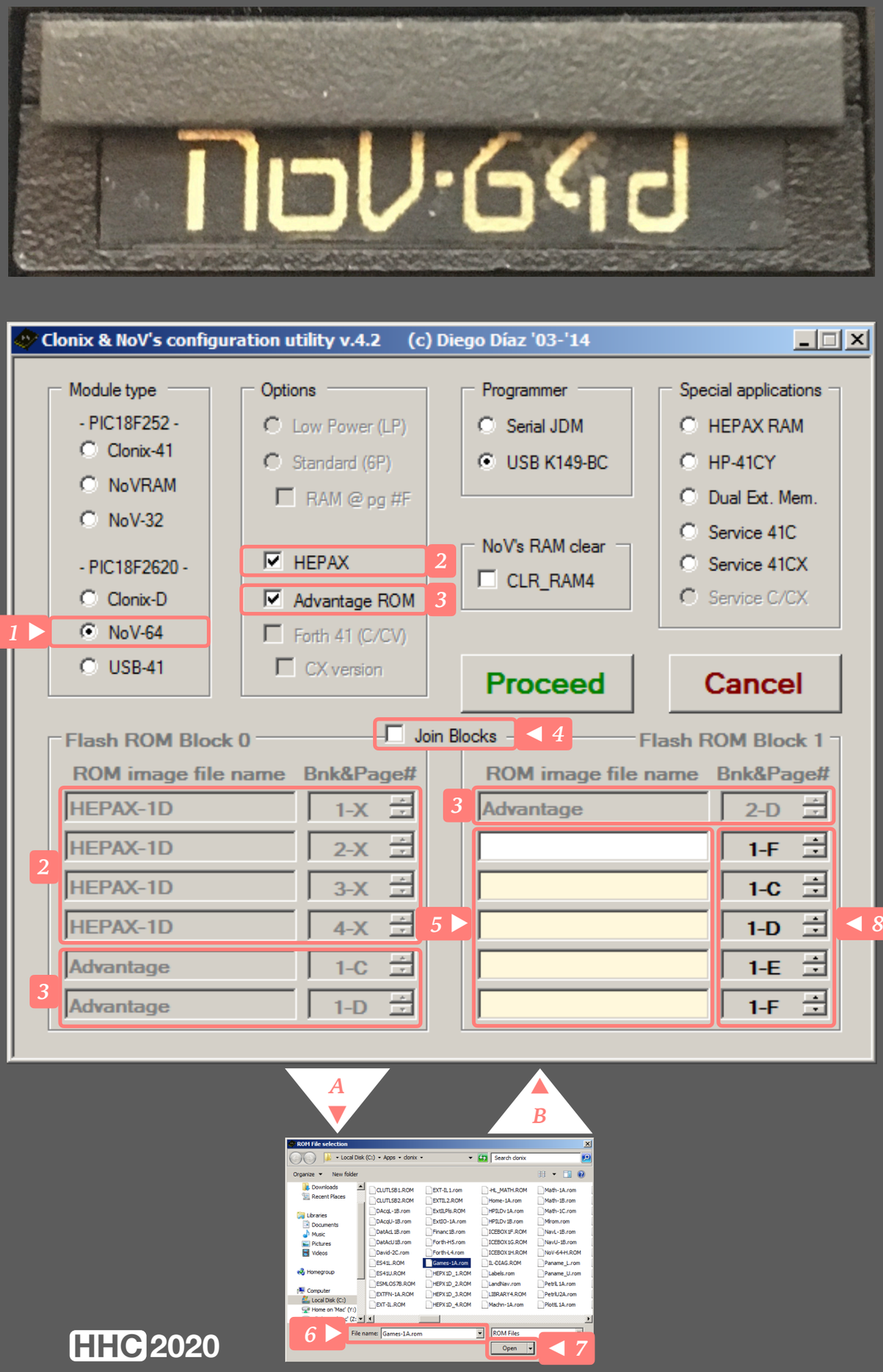
Goal: loading Advanced HEPAX ROM and optionally other ROMs into the module. Flash blocks are merged allowing more ROM's to be mapped.

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

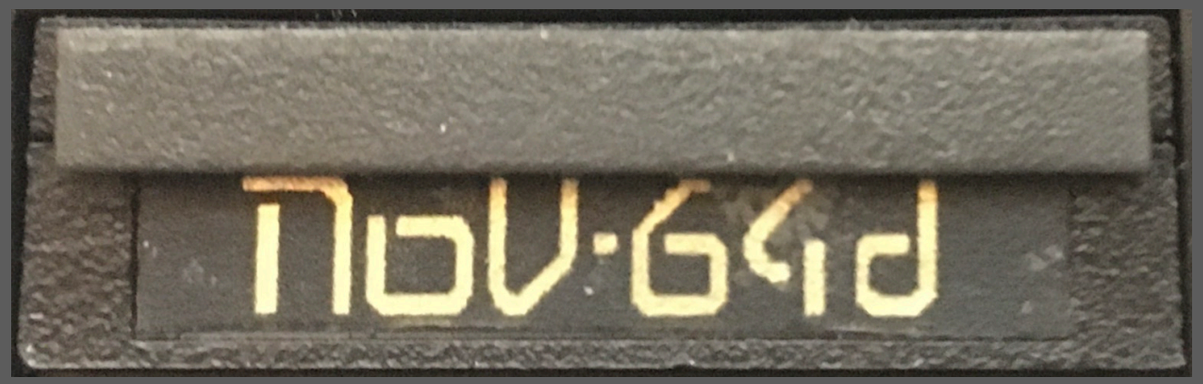
Goal: loading Advanced HEPAX ROM, HP Advantage ROM and optionally other ROMs into the module.

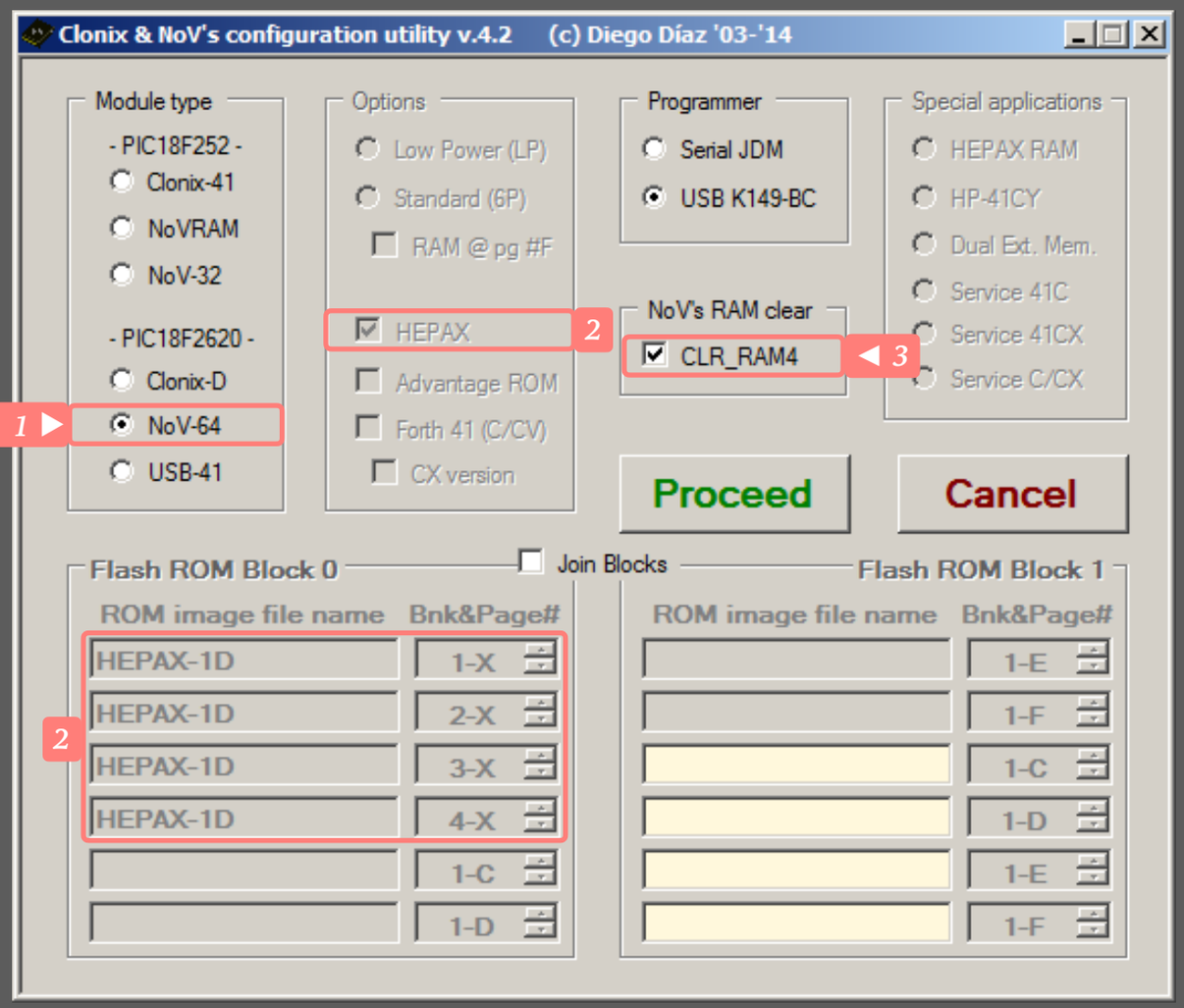
1. Select **NoV-64** option.
2. **HEPAX** is automatically selected.
3. Select **Advantage ROM**.
   Load ROM images at pages #C, #D & #D bank 2.
4. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single 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.
8. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*Go to **Programming** section.*



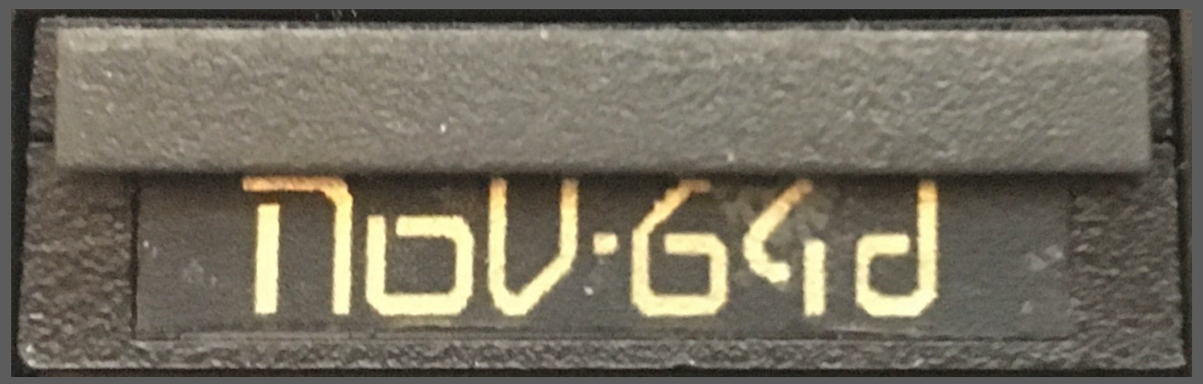


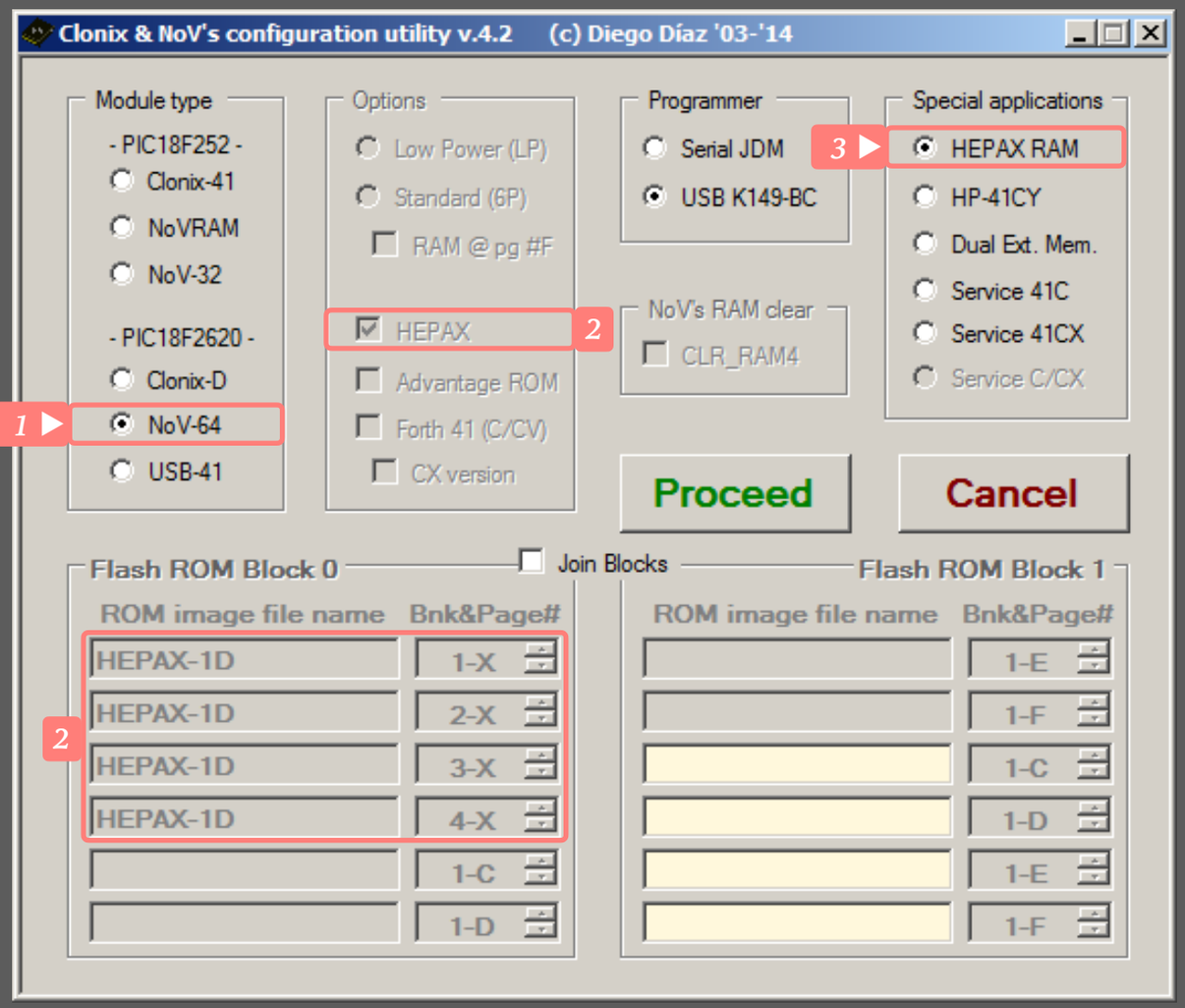
NoV's RAM Clear

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.*



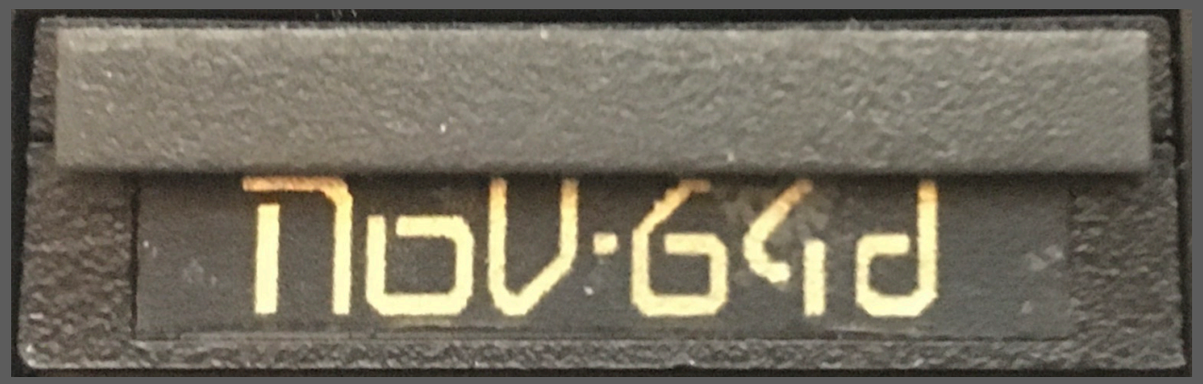


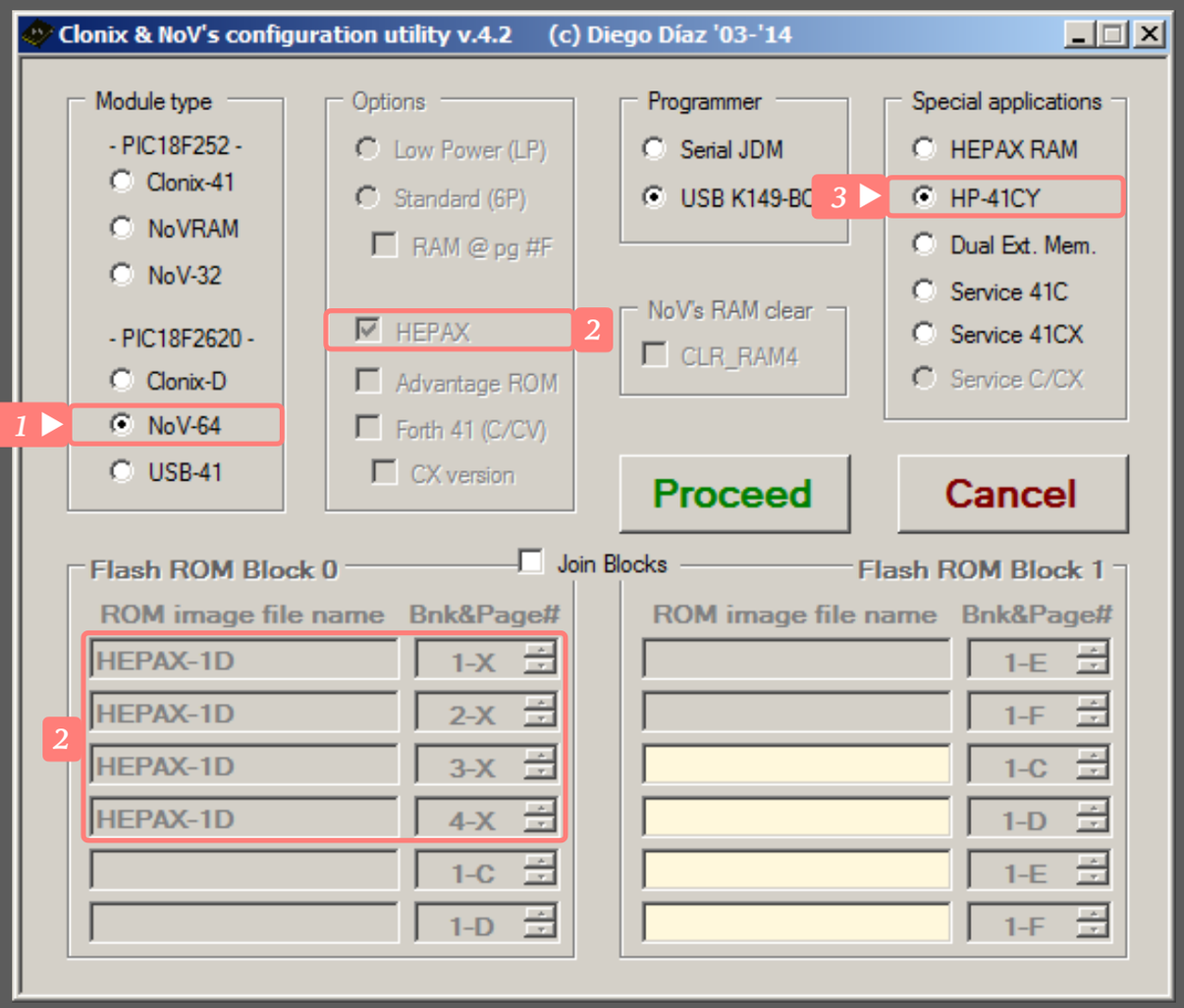
HEPAX RAM

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.*



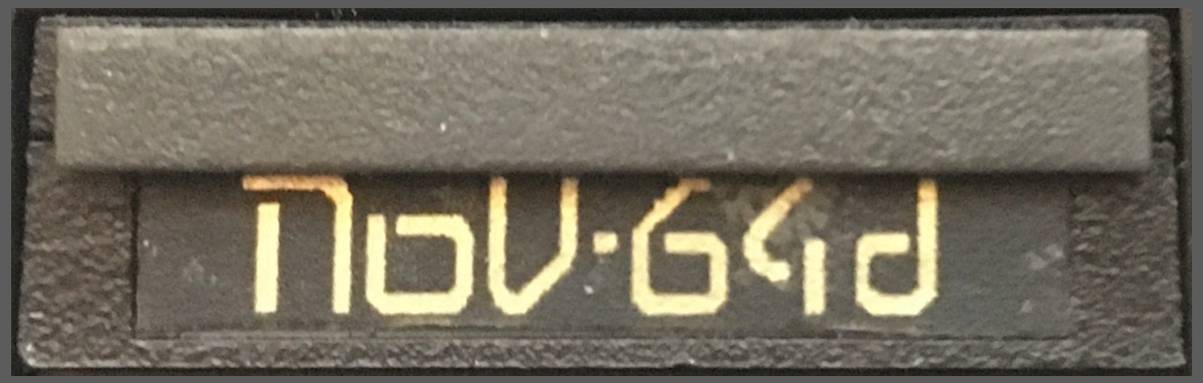


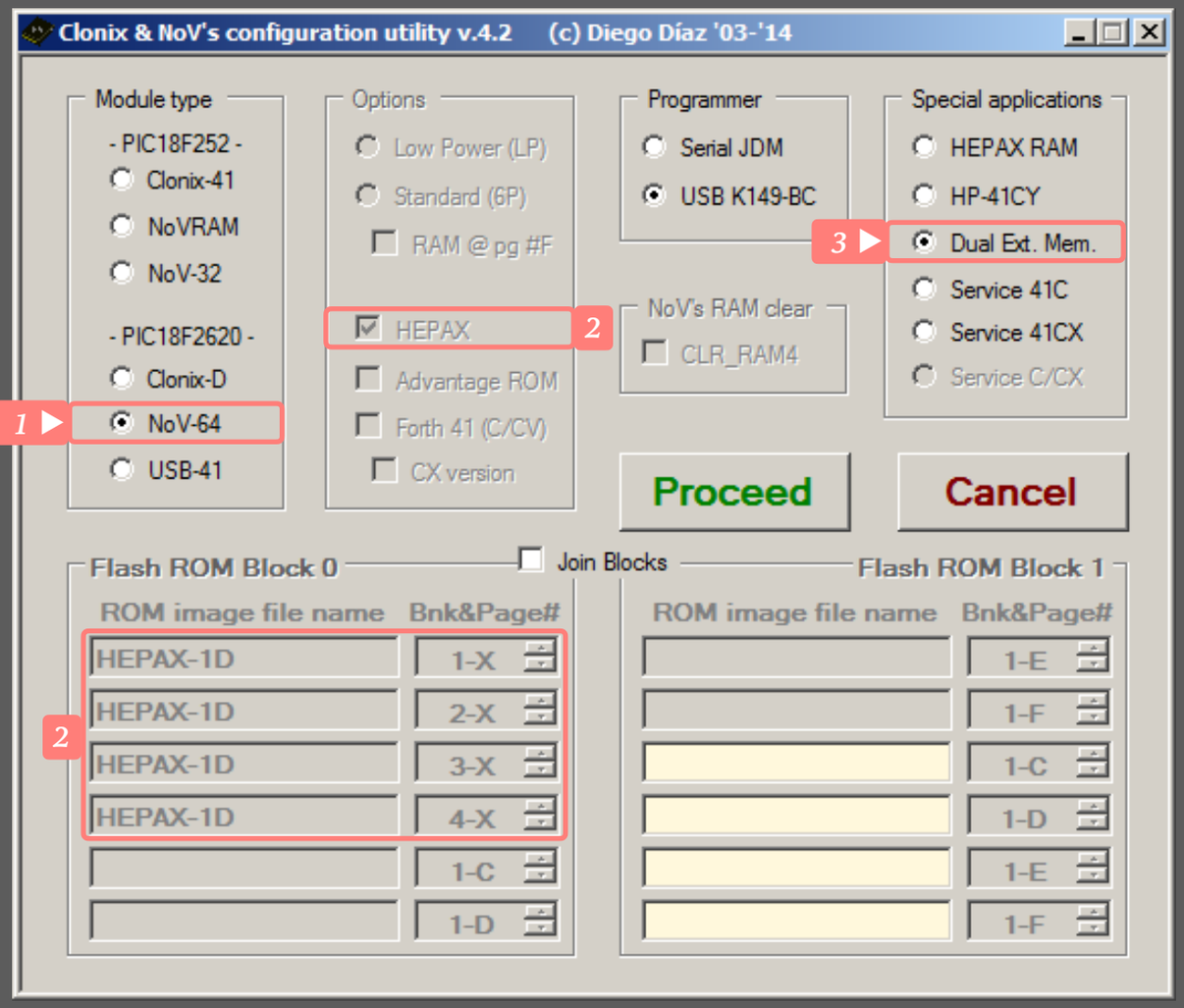
HP-41CY & RAMBOX64

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.*



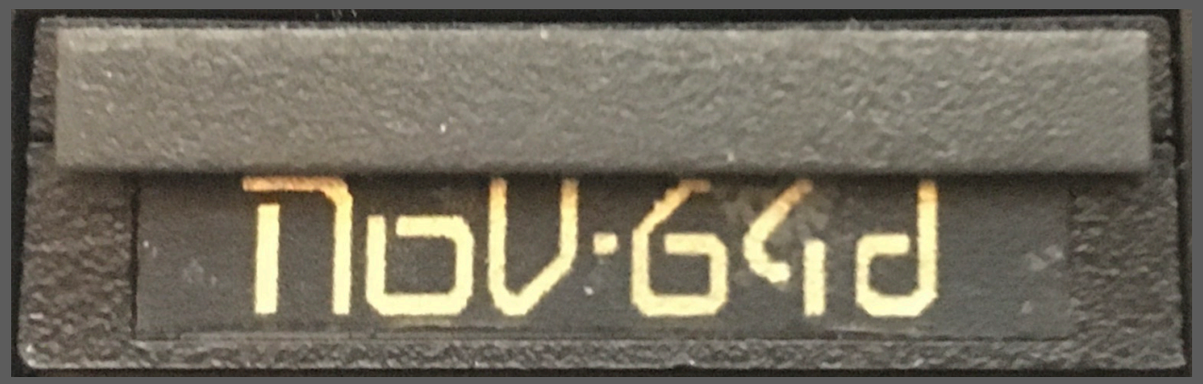


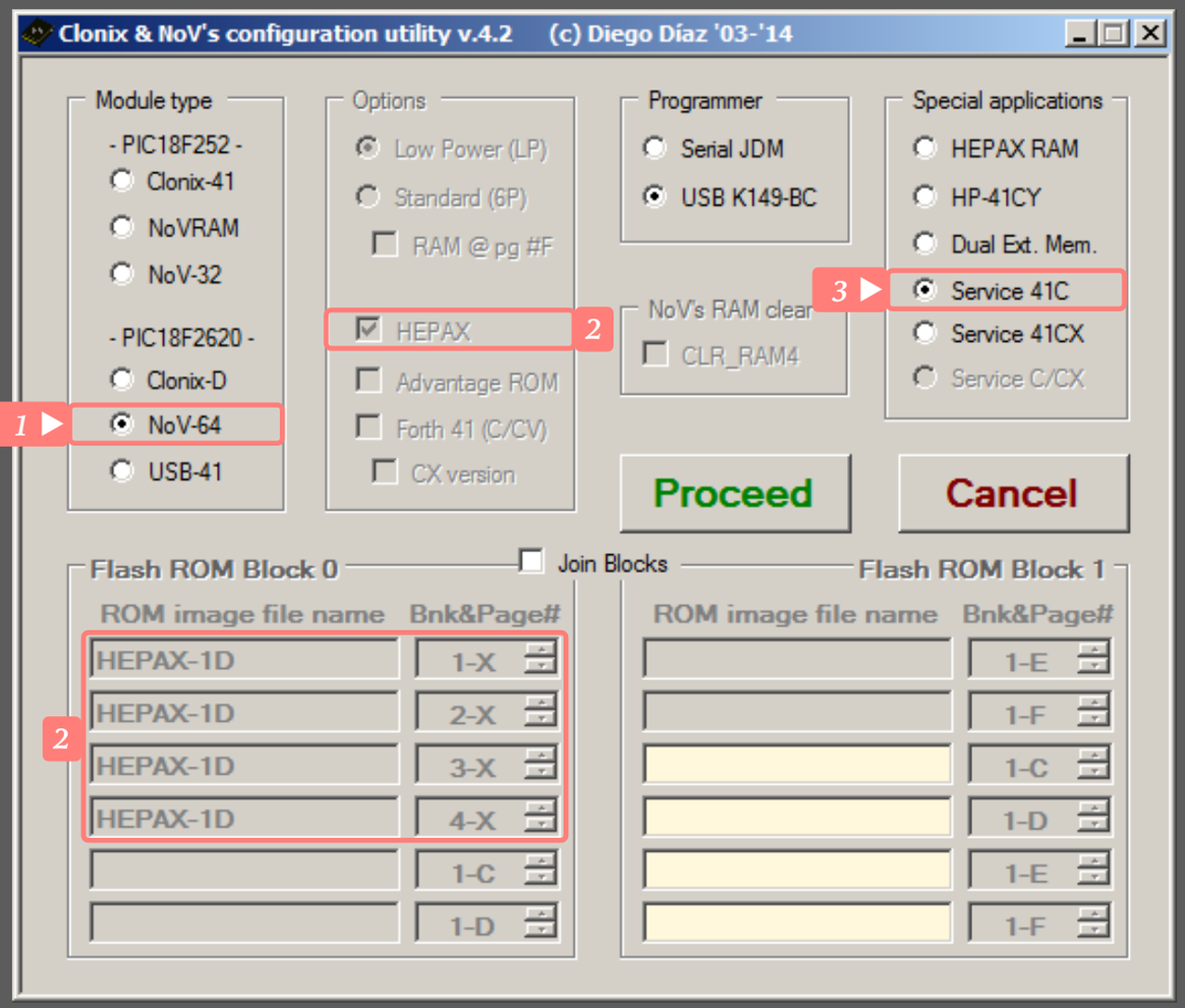
Dual X-Memory

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.*



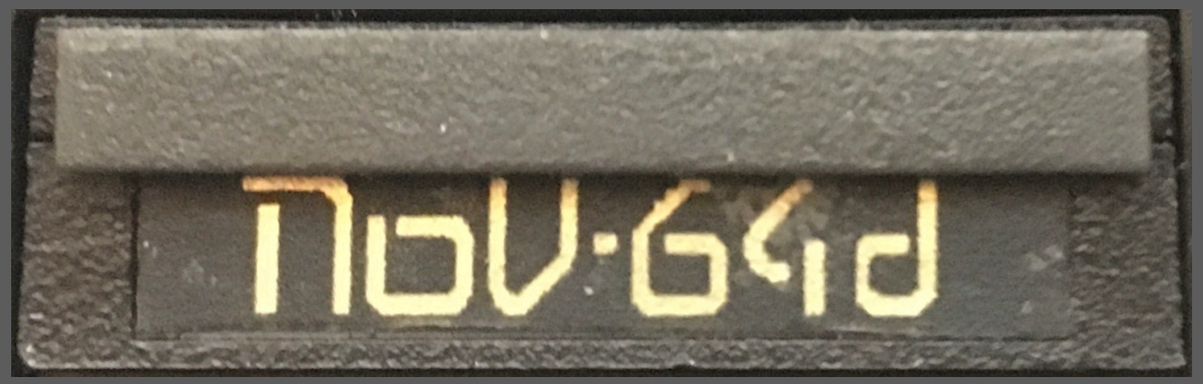


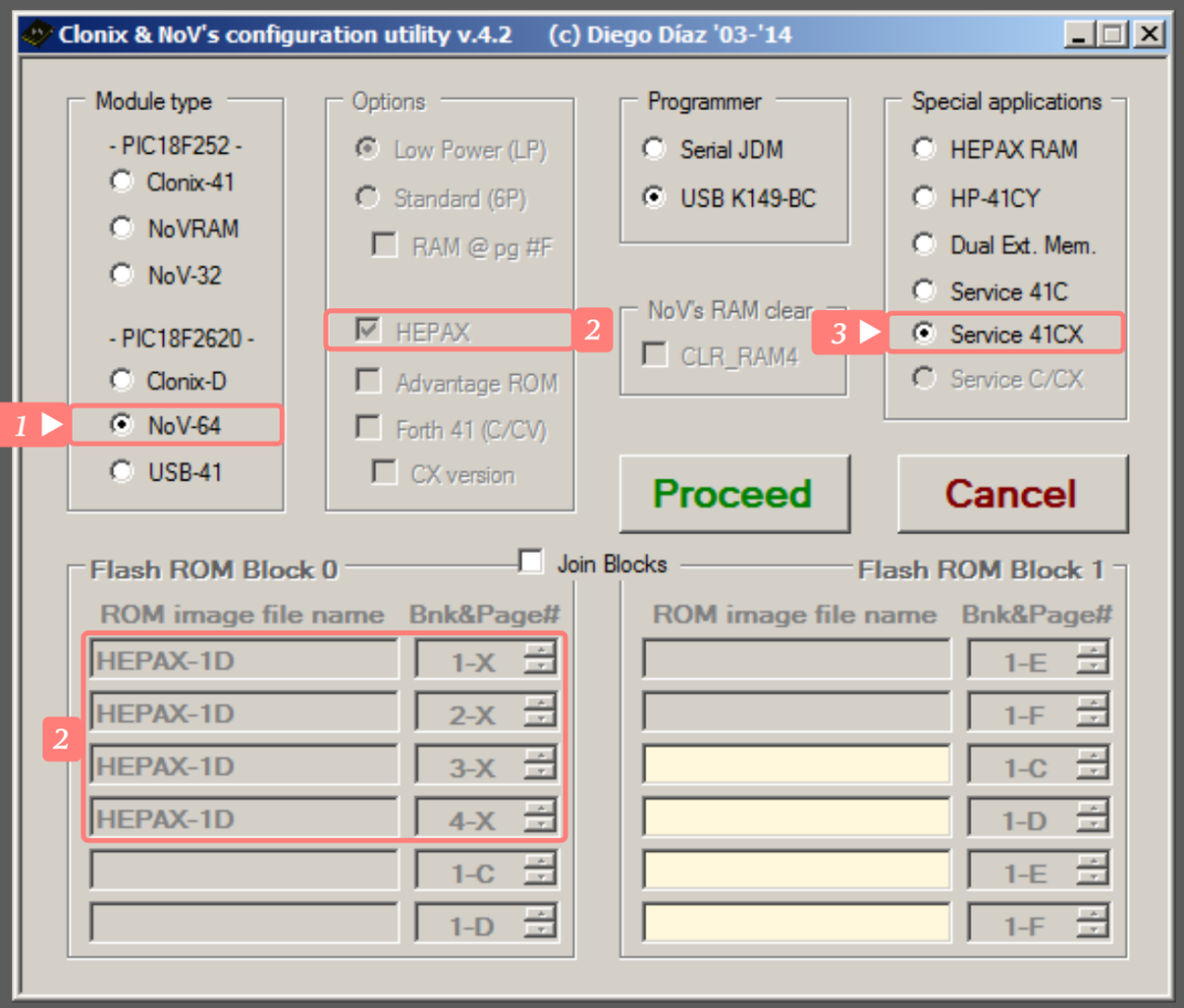
Service 41C/CV

Goal: loading HP Service ROM into the module. Support: 41C, 41CV, RAM (x1 & x4), ROM (4K & 8K) & Card Reader.

1. Select **NoV-64** option.
2. **HEPAX** is automatically selected but unused.
3. Select **Service 41C**.
   Load HP Service ROM [SM-1C] image in page #4.

*Go to **Programming** section.*



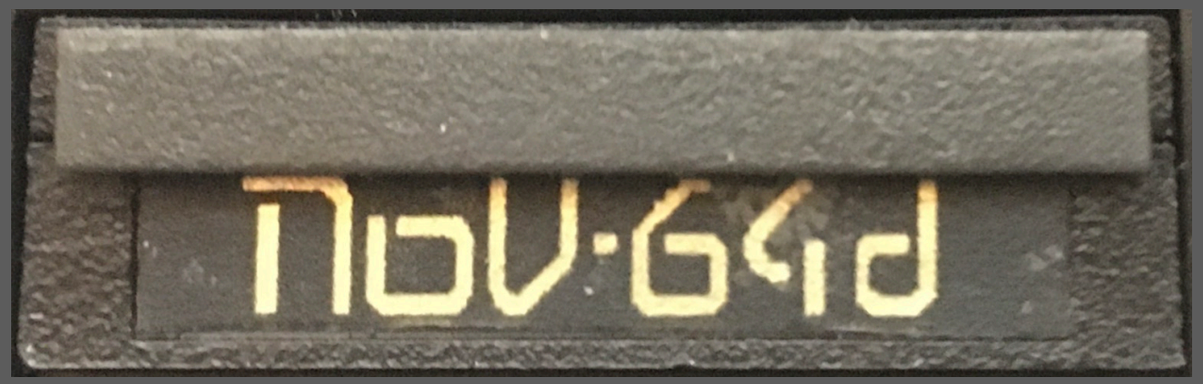


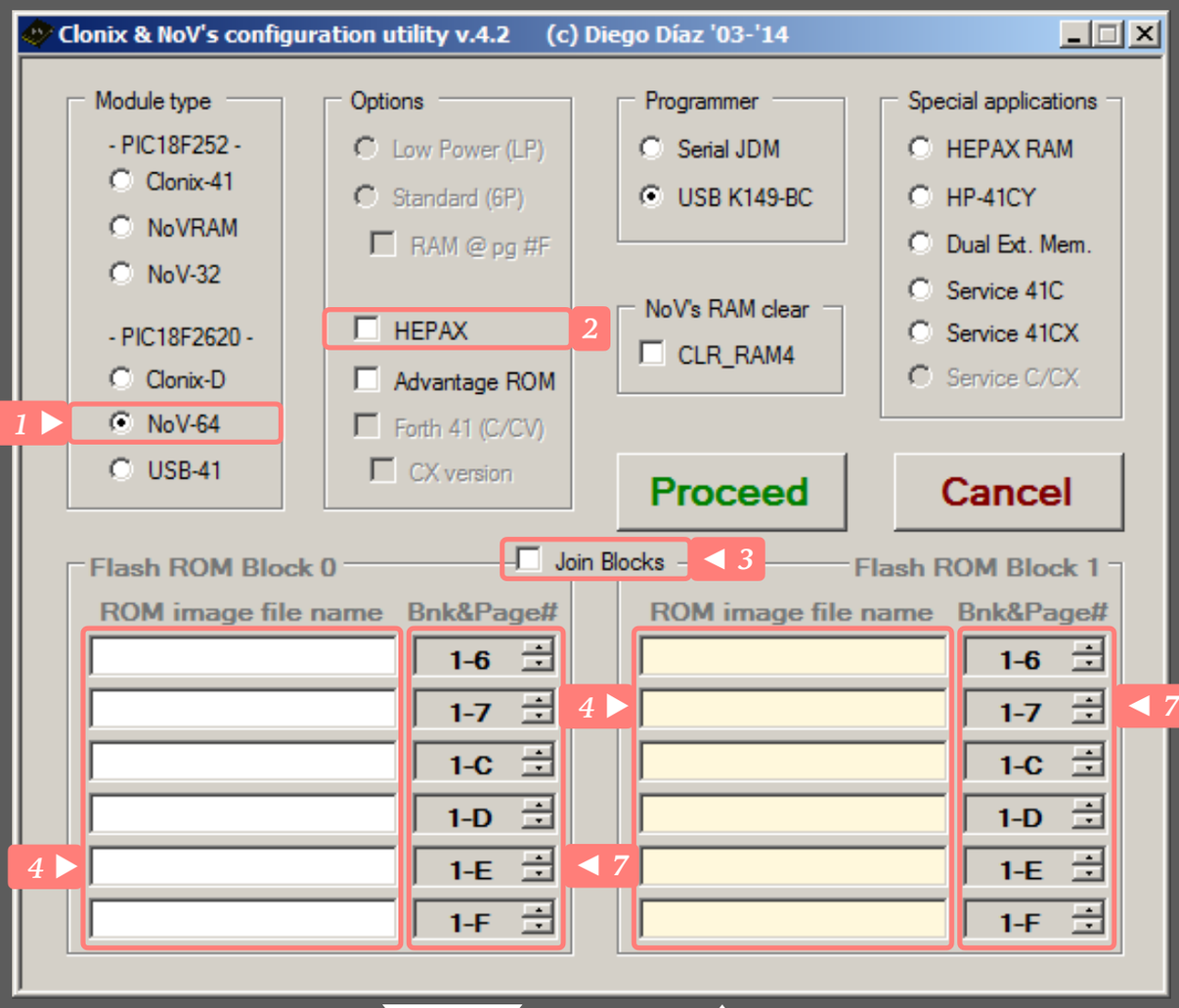
Service 41CX

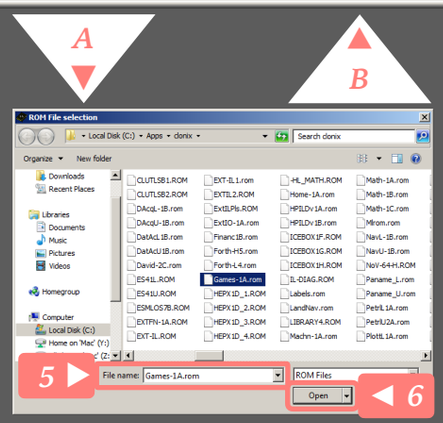
Goal: loading HP Service ROM into the module. Support: 41CV, 41CX, Time, X-Fnc, X-Mem, RAM (x1 & x4), ROM (4K to 16K).

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.*







HHC 2020

Quasi-ROM

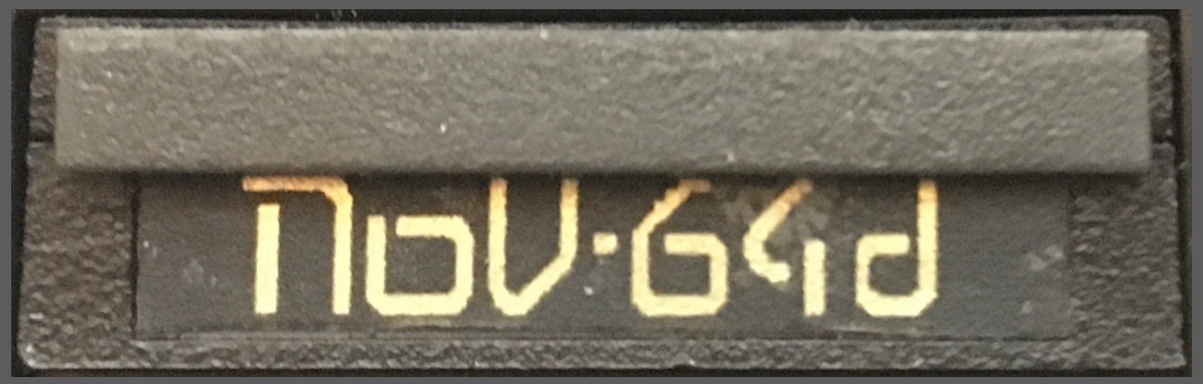
Goal: activating RAM/QROM pages #8 to #B and optionally loading ROMs into the module.

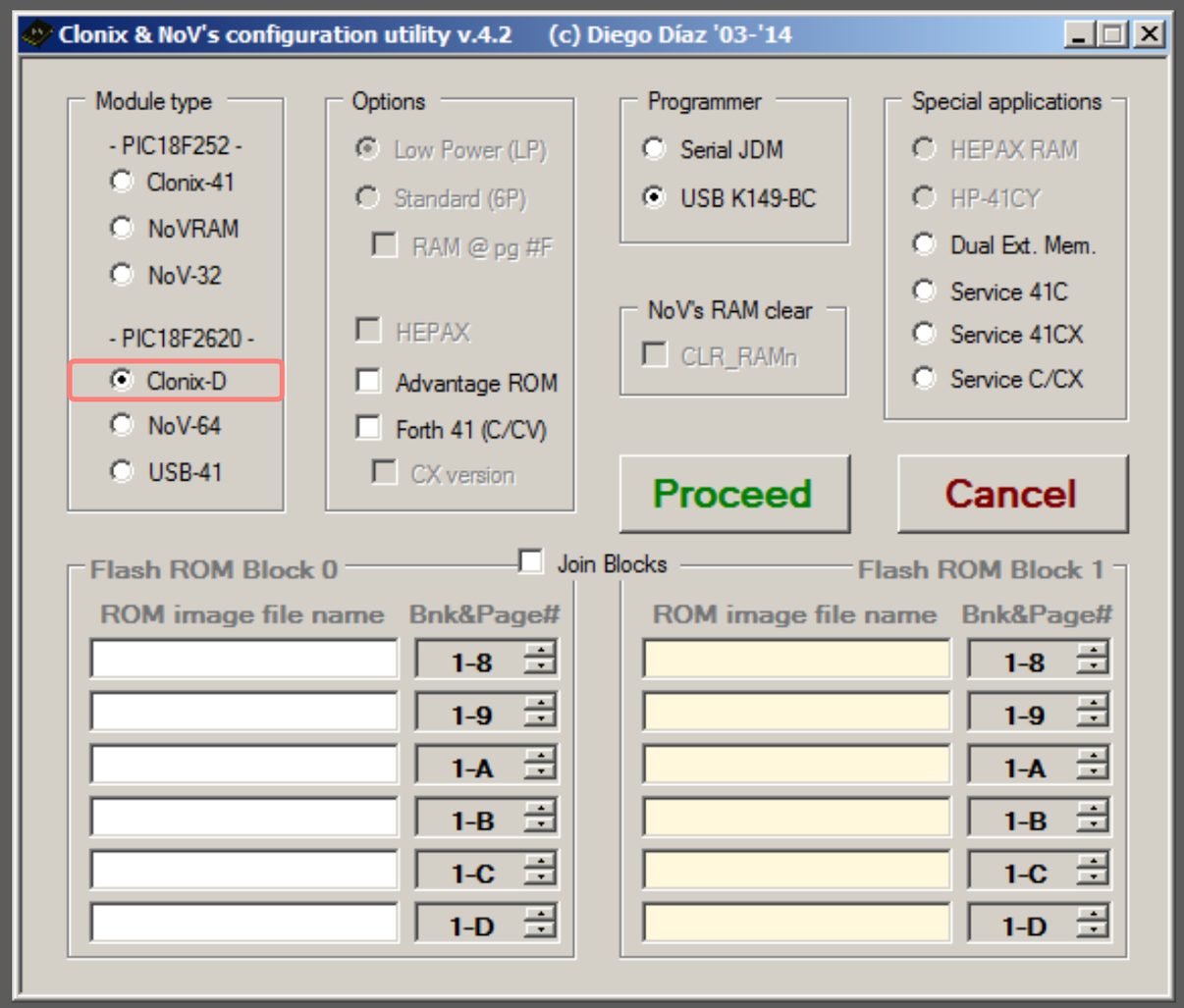
1. Select **NoV-64** option.
2. Unselect **HEPAX** option.
3. Optional: unselect or select **Join Blocks**.
   Flash ROM Block 0 (white) and Block 1 (yellow) are either two separated blocks or merged into a single block.

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.
7. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

*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)

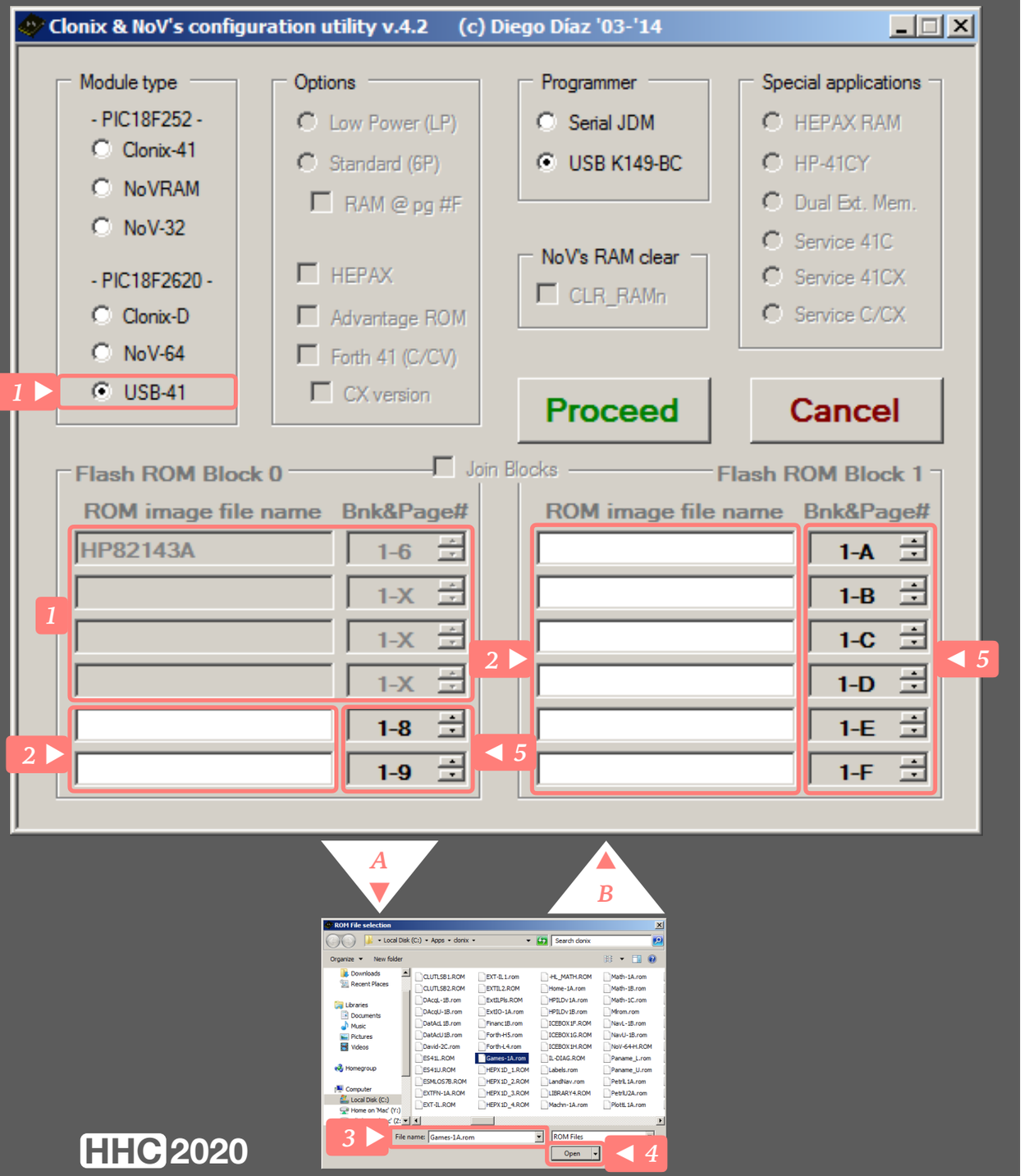
Join Blocks Selected

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

Table of Content

USB-41

Configuration



HP-82143A

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.
5. Select the **Bank [1..4] & Page [#4..#F]** you want to map you ROM image to.

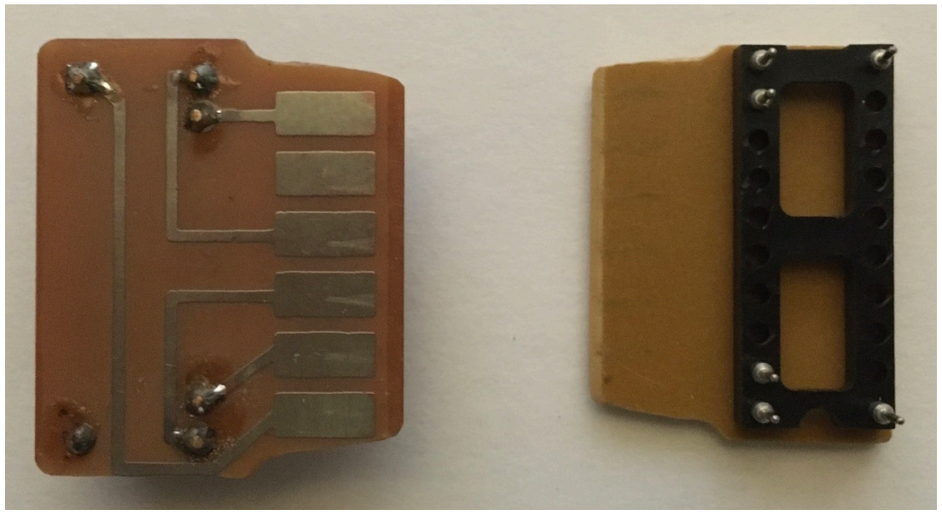
*Go to **Programming** section.*

PROGRAMMING

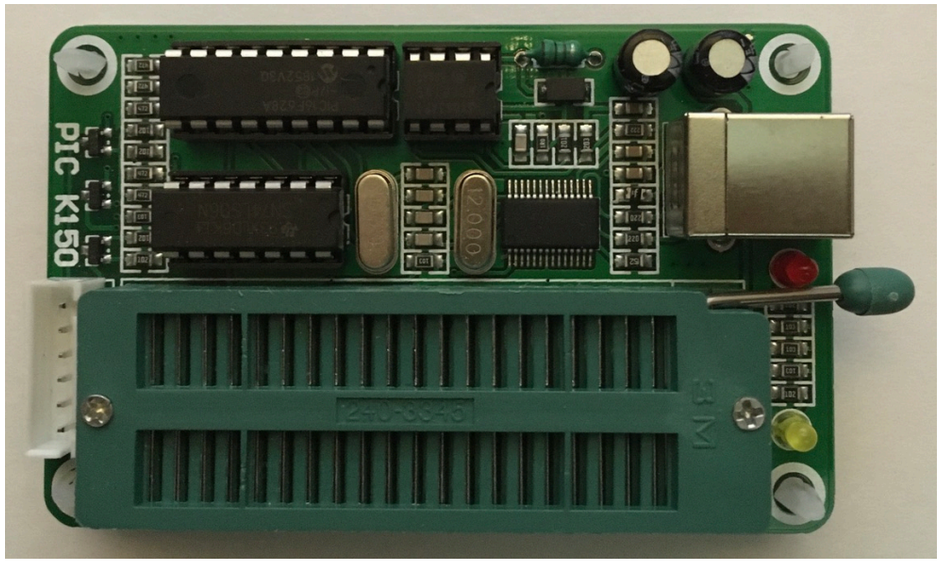
Table of Content

Hardware 1

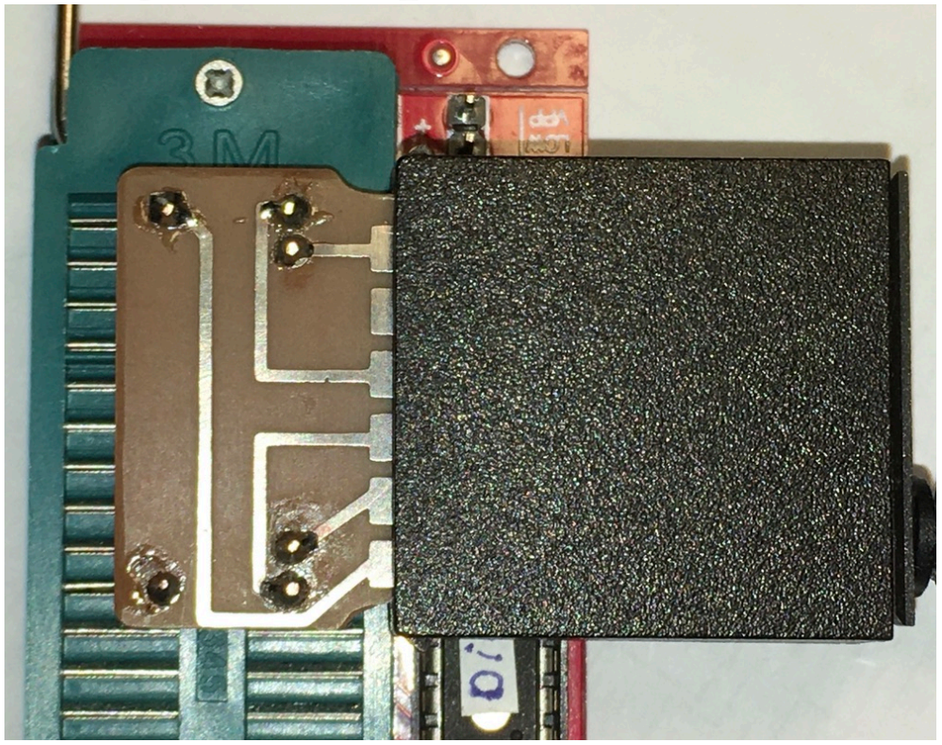
- Module Adapter



- K150 USB PIC Programmer



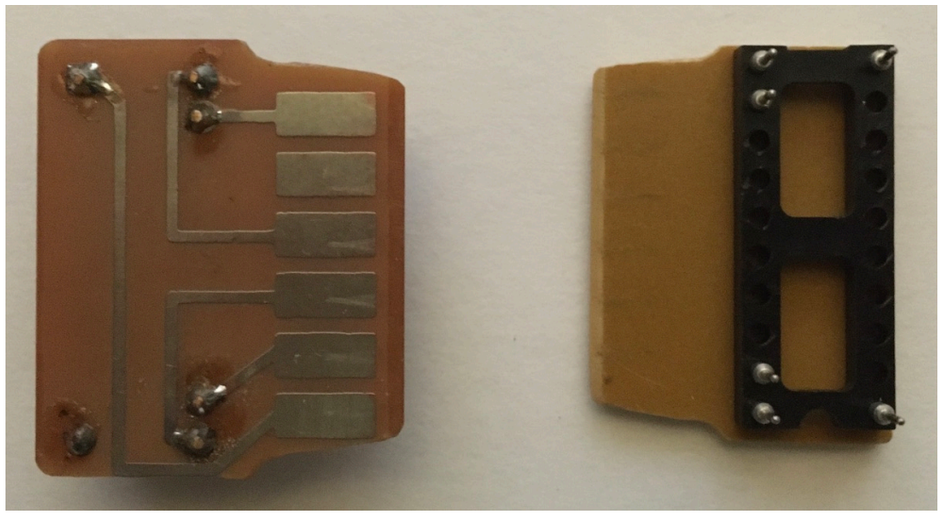
- Prog.+Adapter+Module



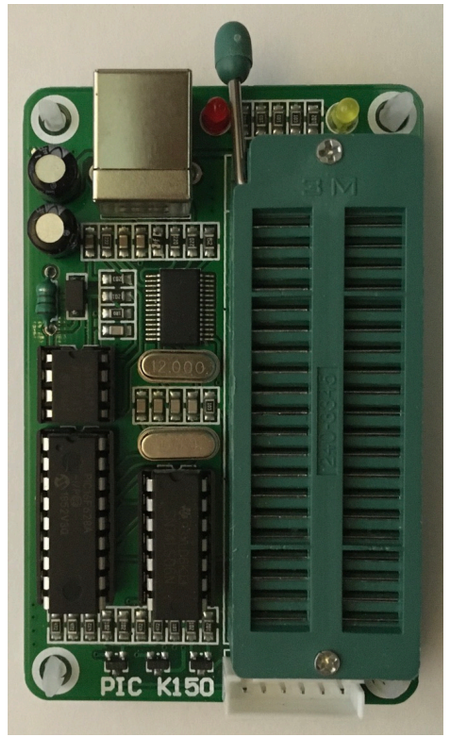
- K149 USB PIC Programmer

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*

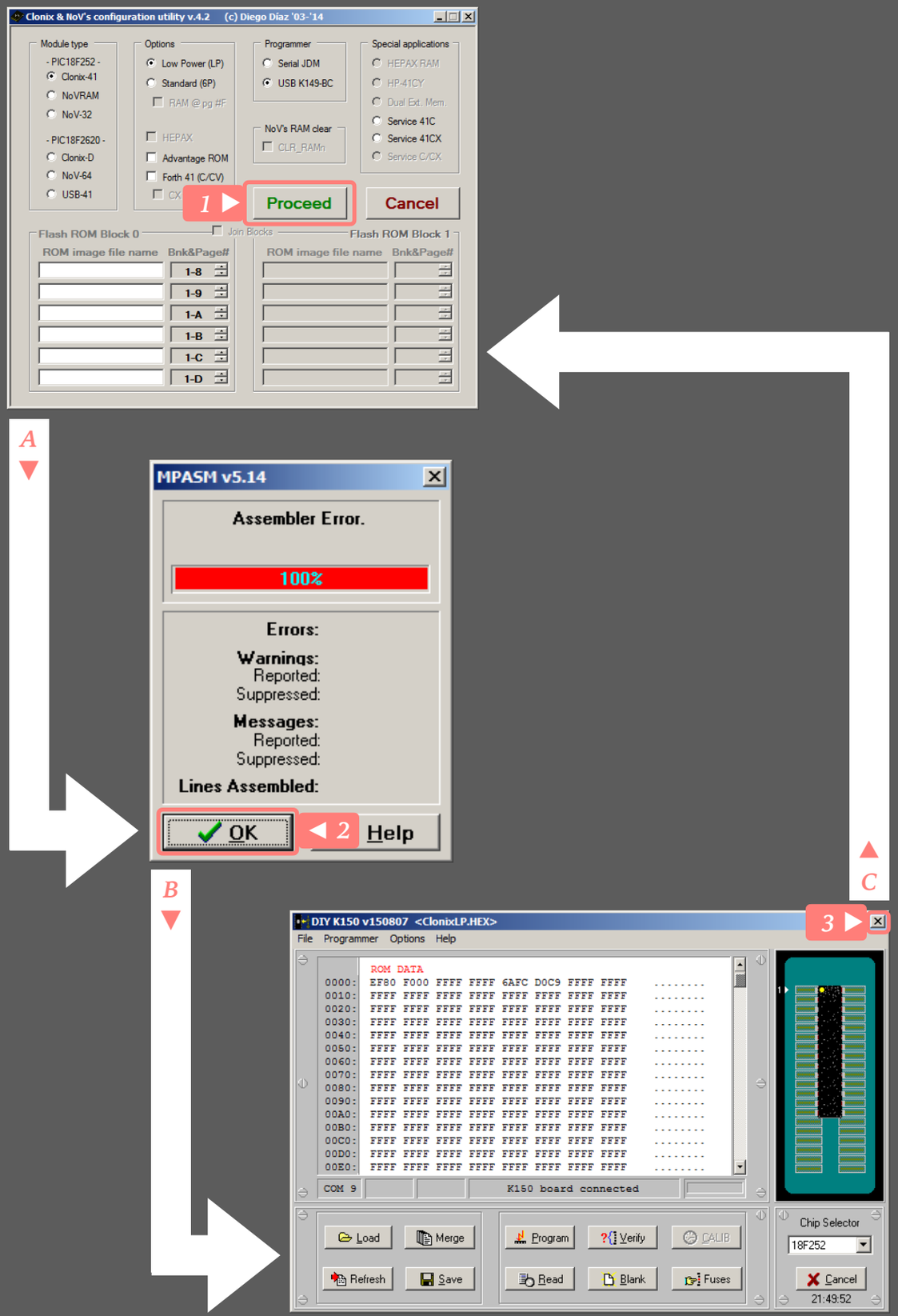
Minimum requirement:
K150 USB PIC programmer must have the 18A protocol firmware installed.

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
    ww1.microchip.com/downloads/en/devicedoc/33014g.pdf
  - MPLAB development system
    www.microchip.com/mplab/embedded-software-center
- PIC Programming Software (included in Clonix_CD_090315.zip)
  - K150 PIC Programmer Manual
    www.sigmaelectronica.net/manuals/K150.pdf
  - Micropro / MicroBurn DIY Software
    www.ozitronics.com/download/DIYpack25EP2.zip

PIC Assembly & Intel Hex Files

Filename	Module(s)	Description
CLONIXLP	Clonix 41	Clonix 41 Low Power
CLONIX6P	Clonix 41	Clonix 41 Standard (6 pages)
CLONIX6R	Clonix 41	Clonix 41 Standard (6 pages) with 512 words RAM
CLONIX-D	Clonix-D	Clonix-D
CLONIX-P	USB-41	HP-82143A Printer Simulation
CLONIXU4	USB-41	Page Transfer Utility : ROMCOPY piggyback firmware
NOVRAM-H	NoVRAM	HEPAX Emulation - Version 1D
NOV-32-H	NoV-32	HEPAX Emulation - Version 1D
NOV-64-H	NoV-64(d)	HEPAX Emulation - Version 1D
NOV-64H4	NoV-64(d)	HEPAX Emulation - Version 4H (need Library4)
CLR_RAM1	NoVRAM	HEPAX RAM Clear
CLR_RAM2	NoV-32	HEPAX RAM Clear
CLR_RAM4	NoV-64(d)	HEPAX RAM Clear
HPX25RAM	NoVRAM & NoV-32	HEPAX RAM Emulation
HPX26RAM	NoV-64(d)	HEPAX RAM Emulation
NOV-64CY	NoV-64(d)	W&W HP-41CY & RAMBOX II Emulation
NOV-64XM	NoV-64(d) & Clonix-D	Dual X-Memory Emulation
SERVC_C	All except USB-41	Service 41C
SERVC_CX	All except USB-41	Service 41CX
SRVCC_CX	Clonix-D	Service C/CX (even/odd port select service module)



File Generation Failed

In **Clonix & NoV Configuration Utility** ...

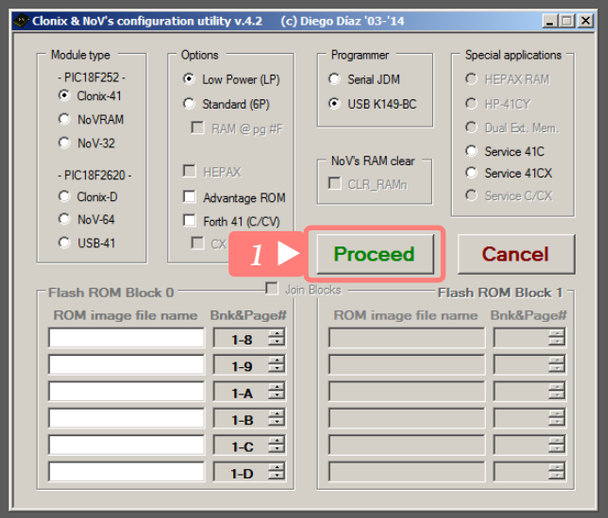
1. Press **Proceed** to start MPASM.

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

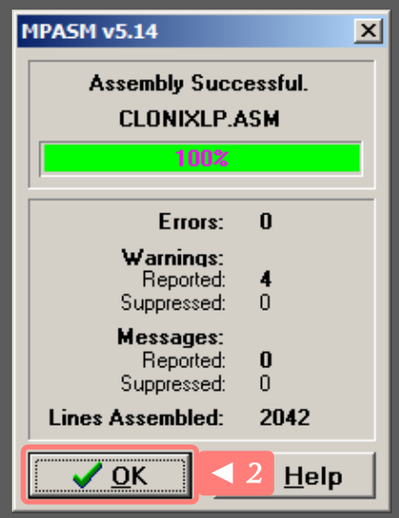
2. Press **OK** to start **MicroBurn (DIY K150)** application.

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

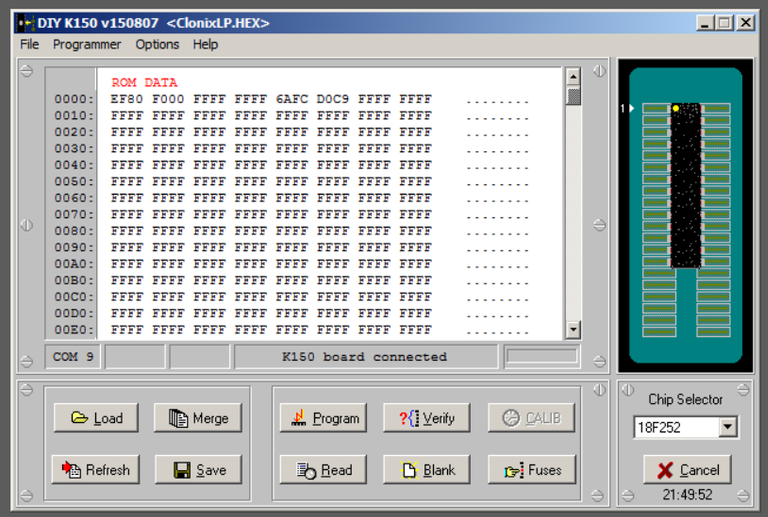
3. Close **MicroBurn (DIY K150)** to go back to **Clonix & NoV Configuration Utility** application and validate your configuration.



A



B



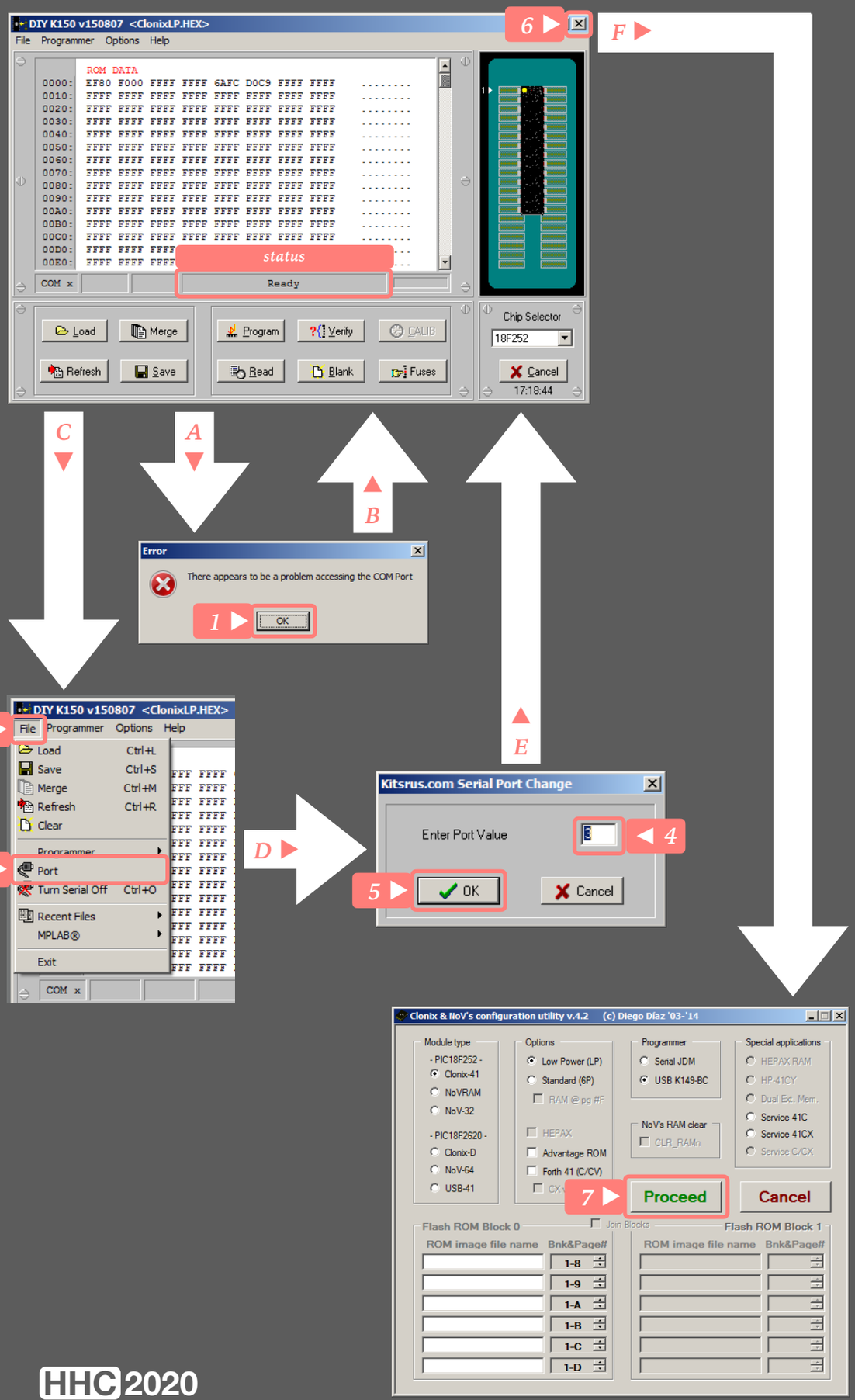
File Generation Successful

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.



Programmer Not Found

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.

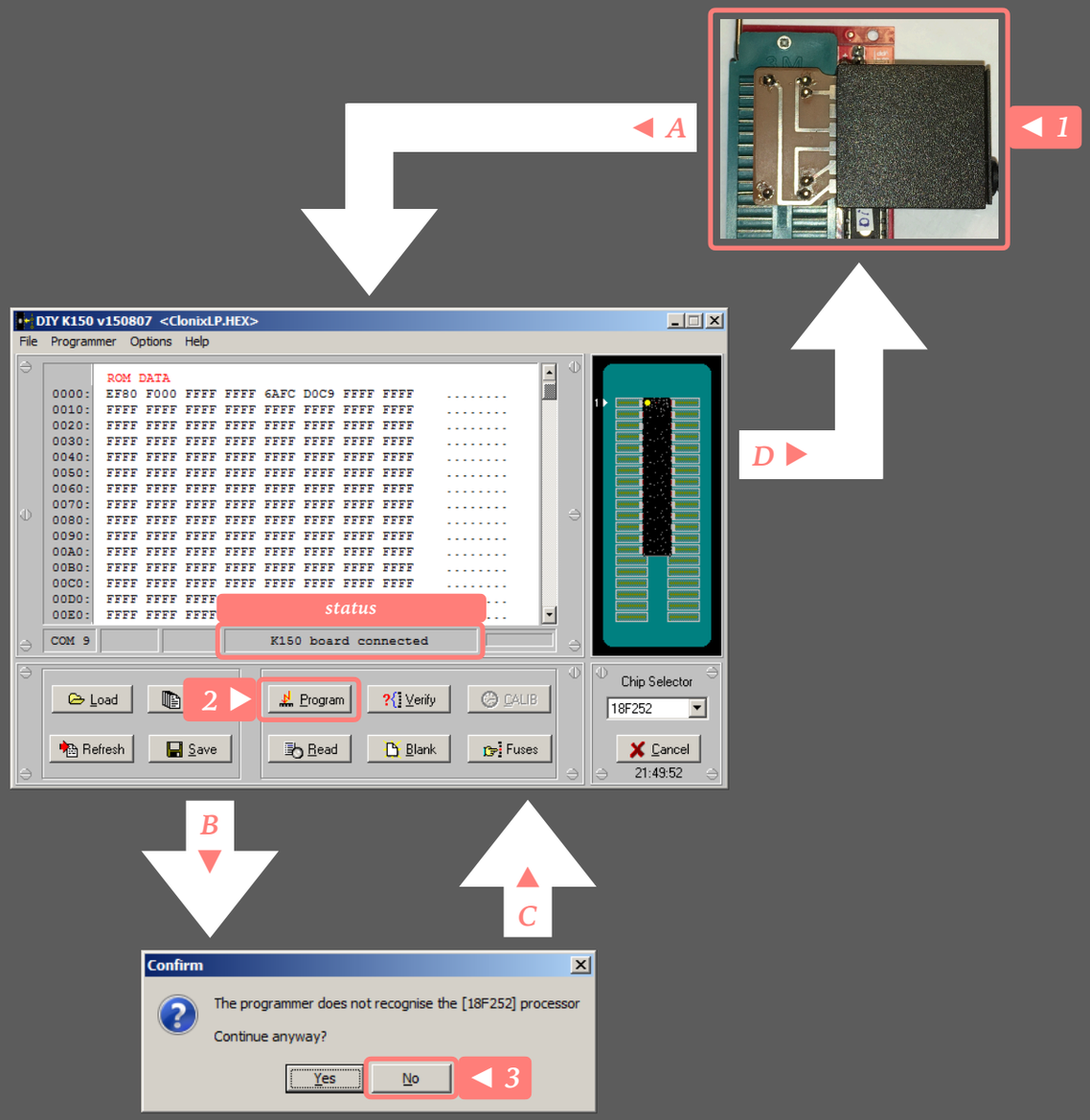
2. Select menu **File.**
3. Select sub-menu **Port.**

*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.

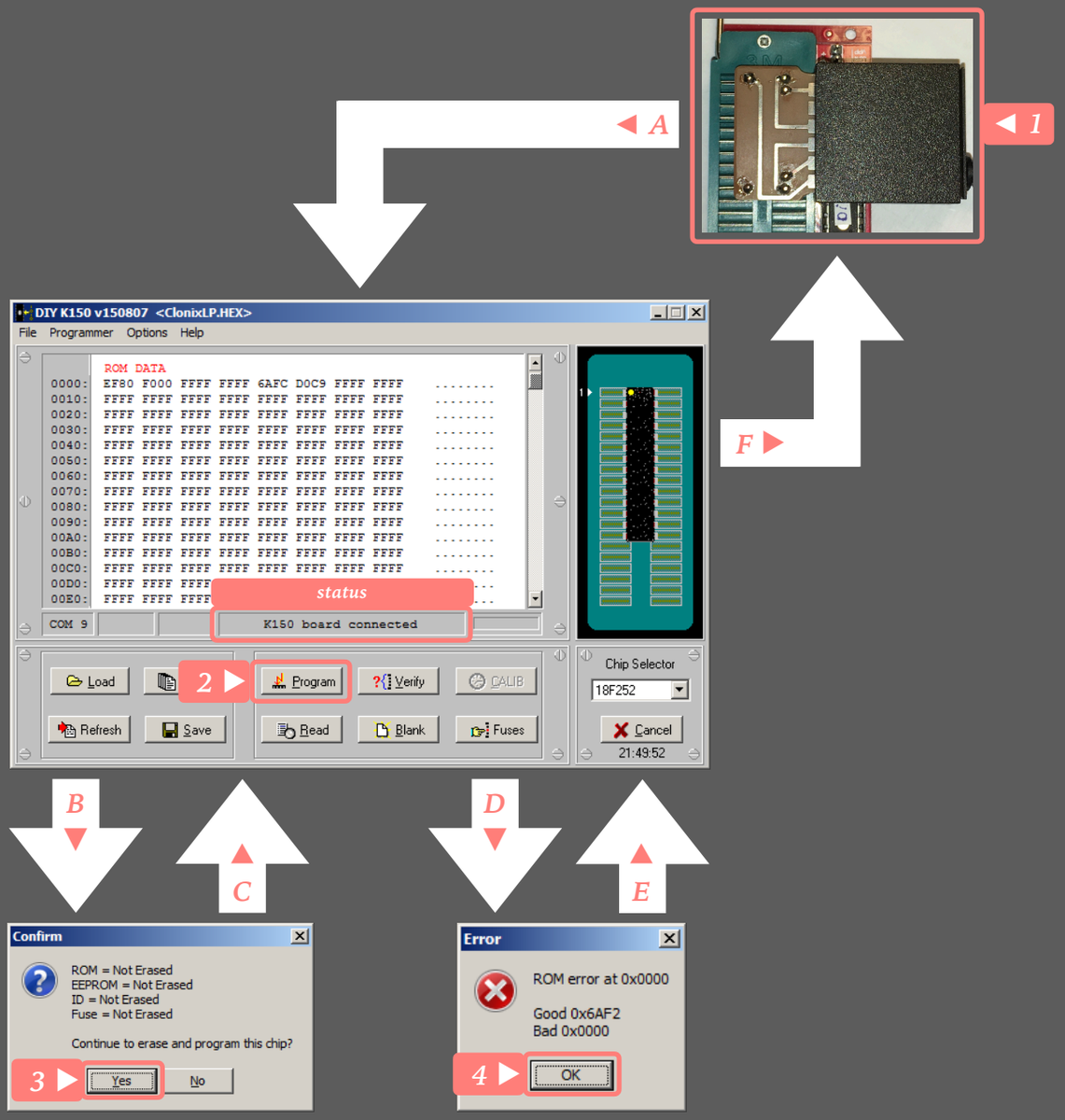
In **MicroBurn (DIY K150)** ...

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.



File Upload Failed 2

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

In **MicroBurn (DIY K150)** ...

2. Press **Program** to start programming.

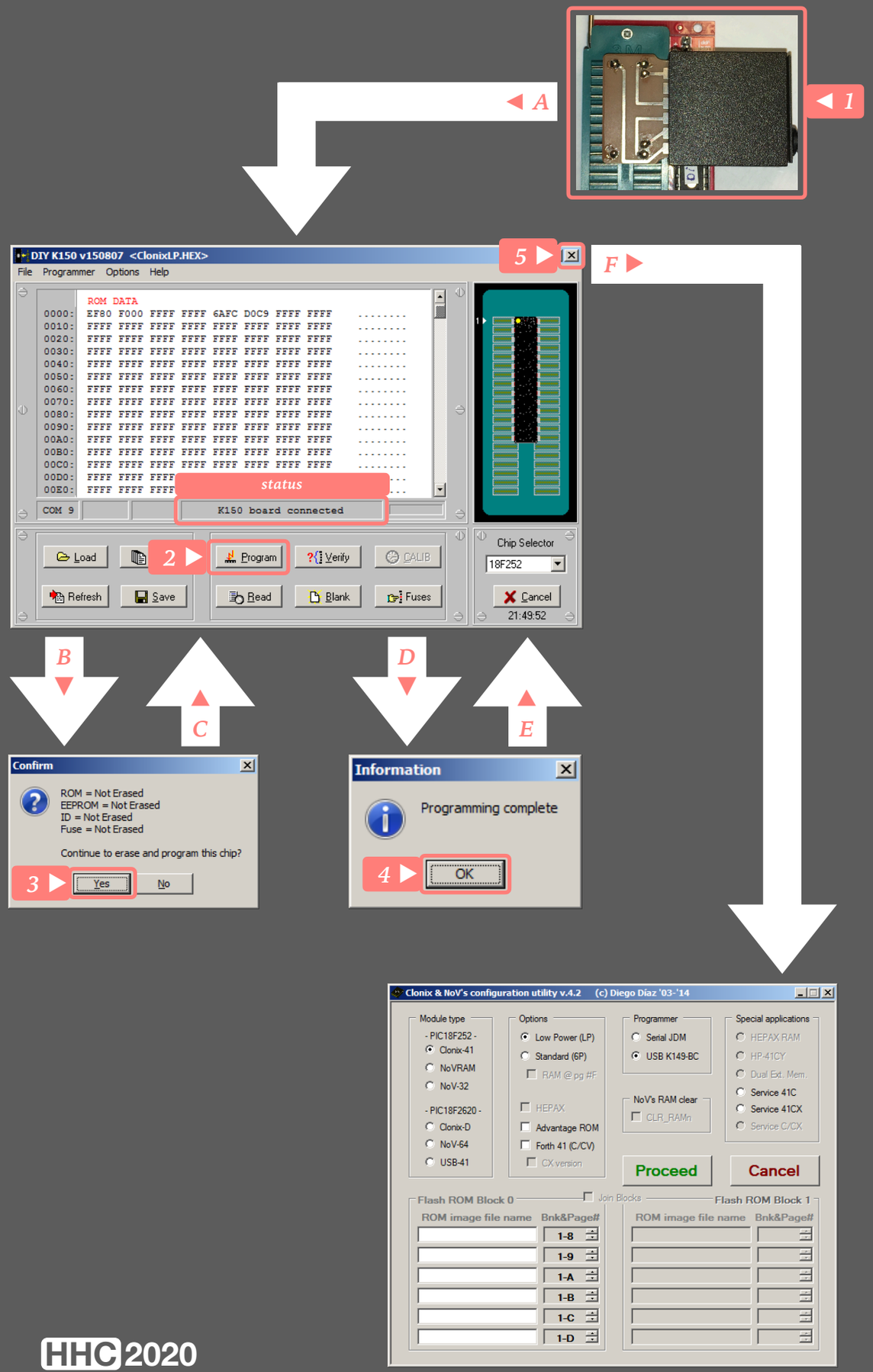
A confirm dialog box is telling us that the module is recognized.

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

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

4. Press **OK** in the **Error** dialog box.

Go back to step 1 until successful.



File Upload 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.

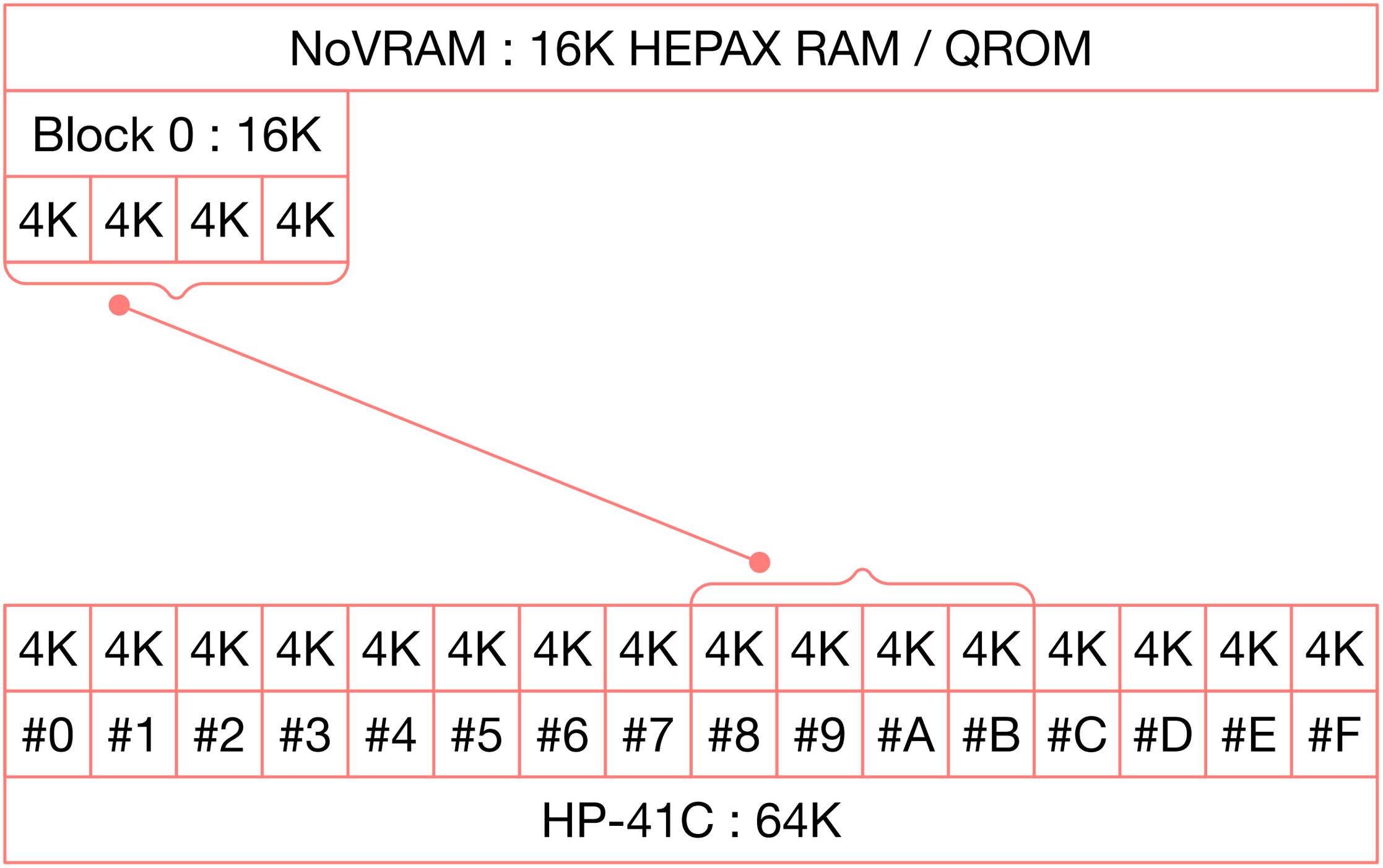
Remove your module from the adapter.

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

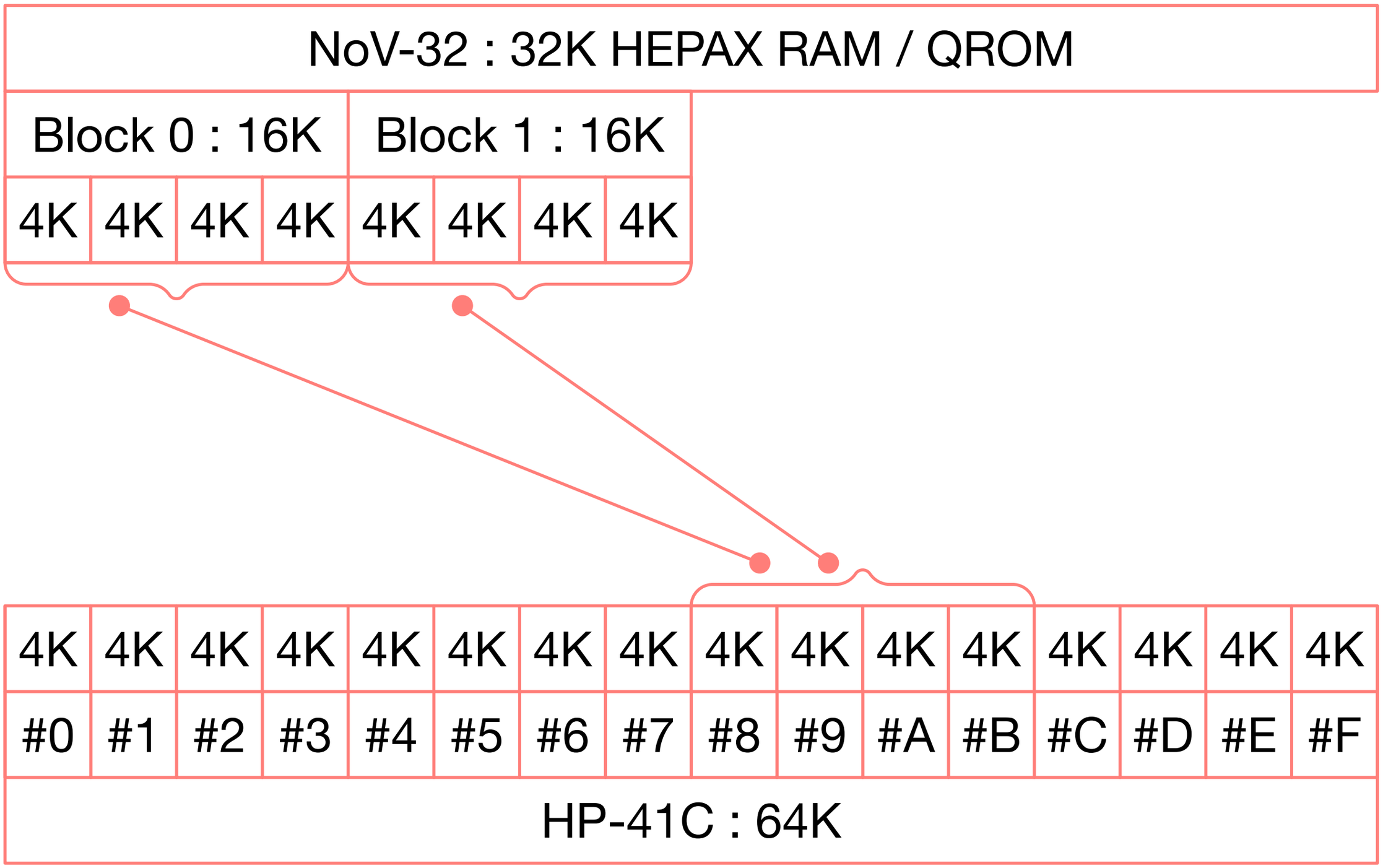
NOV RUNTIME CONFIGURATION

Table of Content

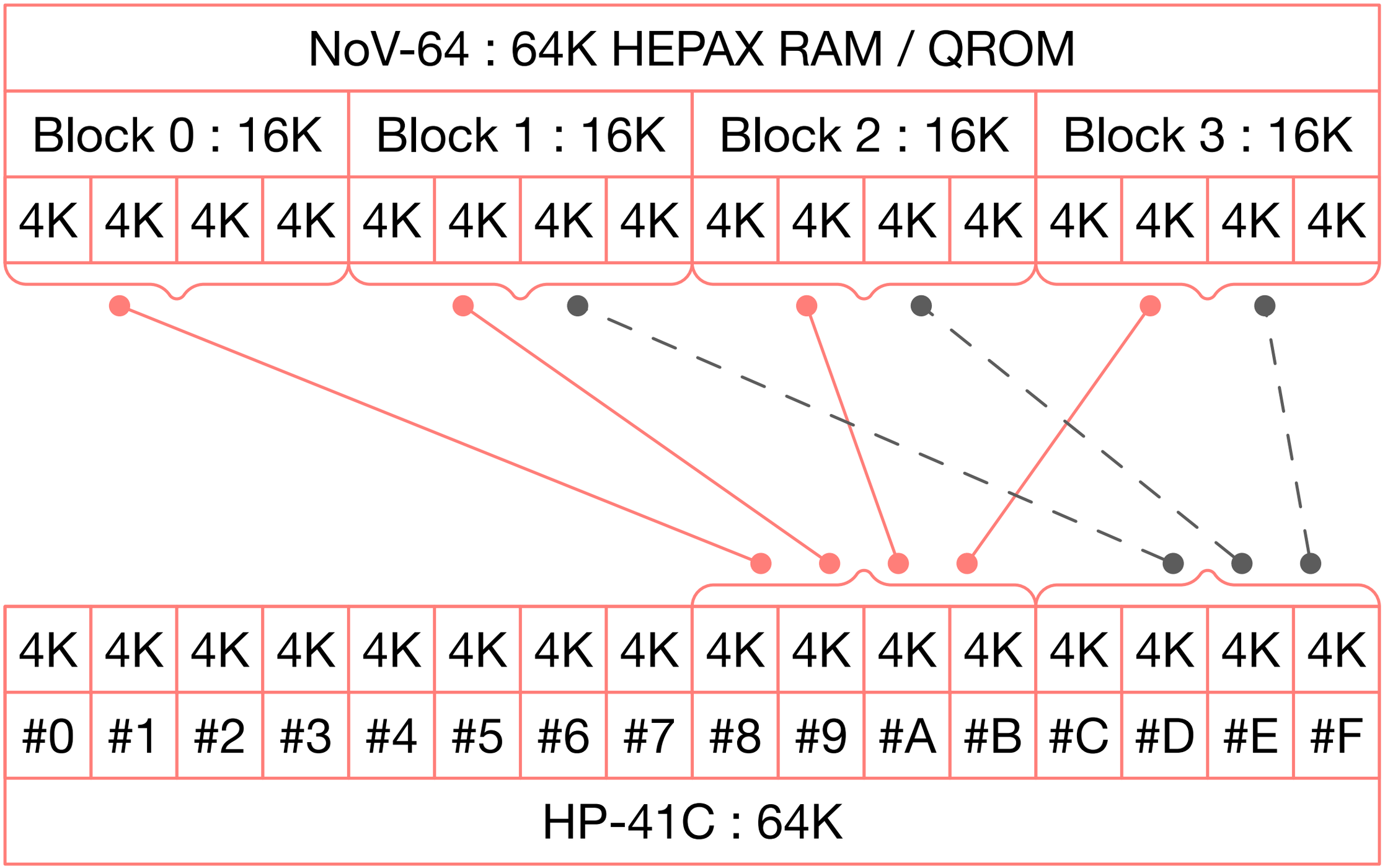
16K RAM Mapping



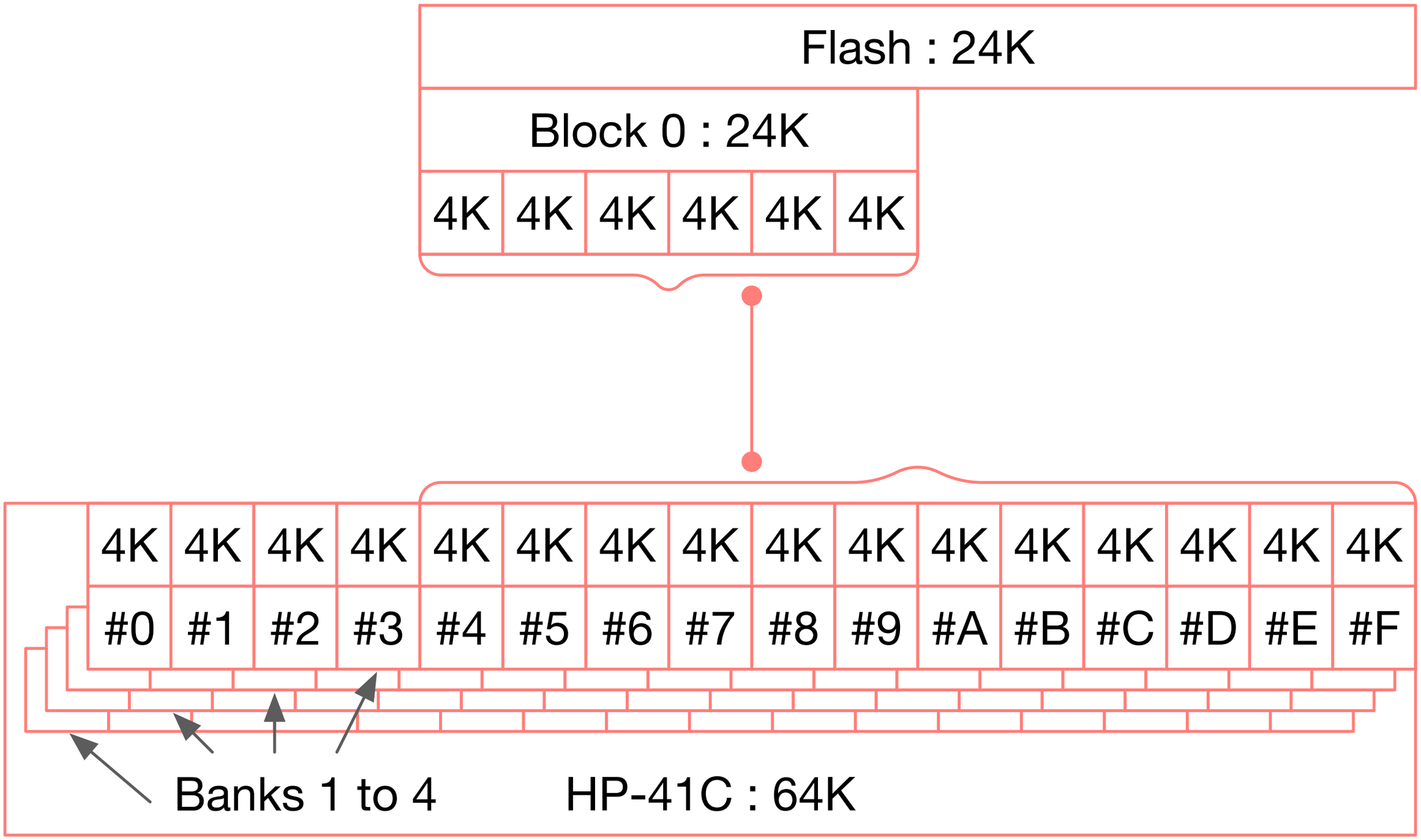
32K RAM Mapping



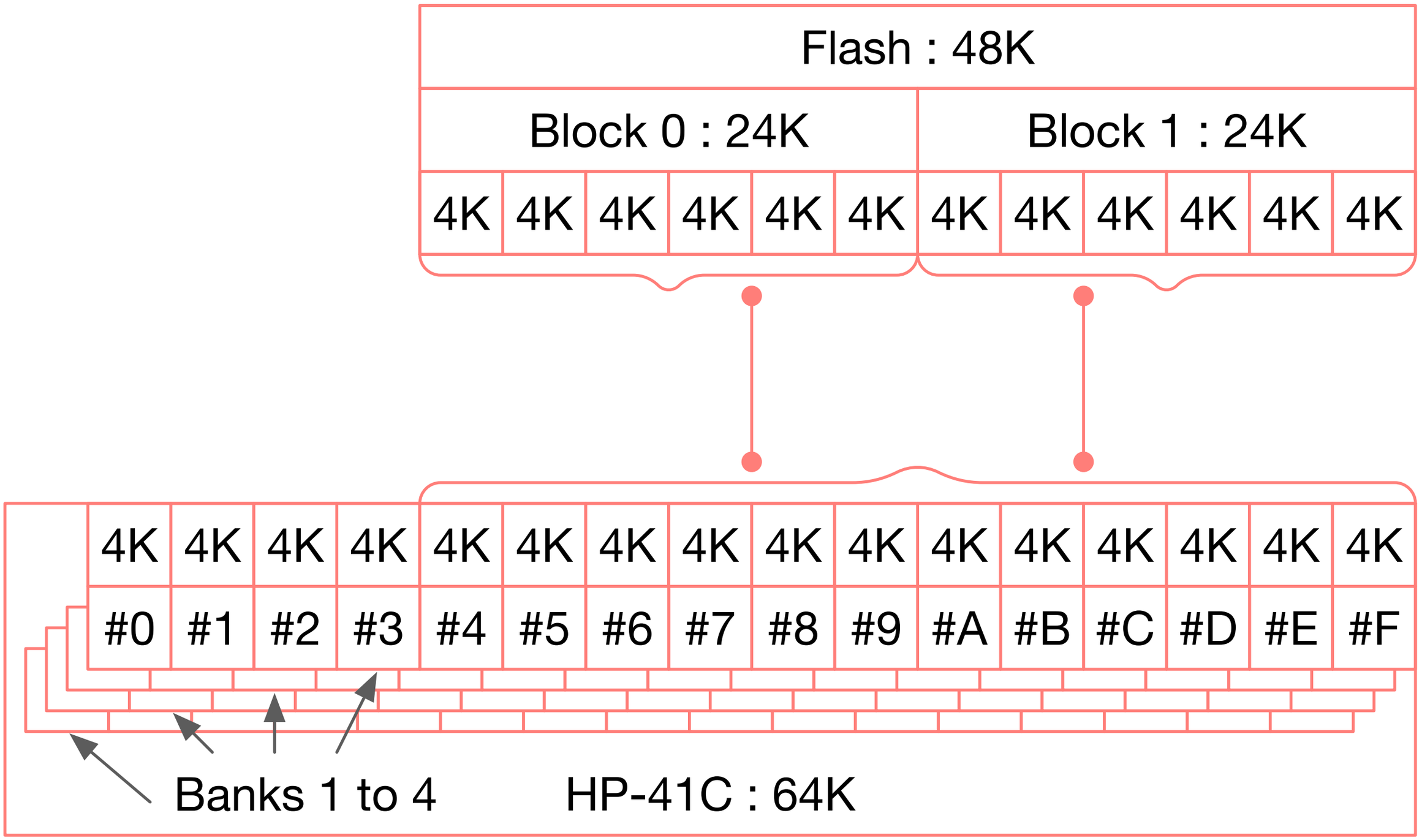
64K RAM Mapping



24K FLash Mapping



48K FLash Mapping



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**

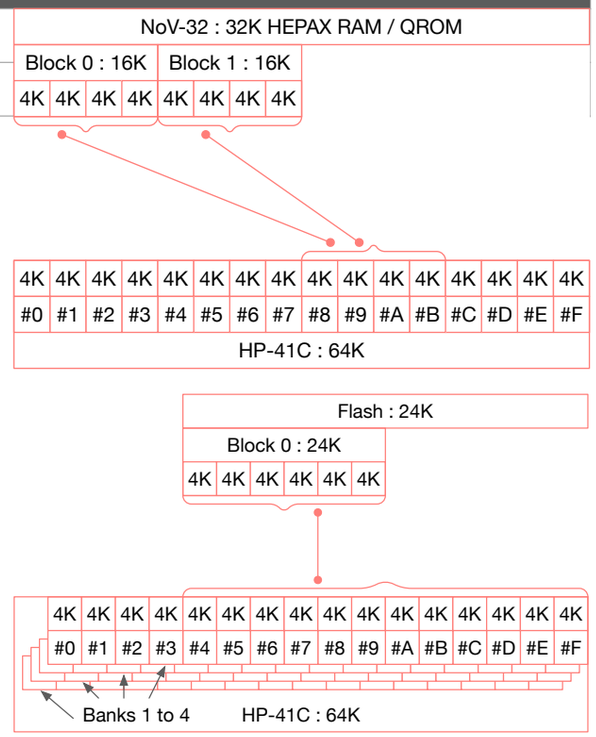
    You should see: ***ADR: 4100*** *then* ***4100 CCC*** _ _ _ *(CCC is the current configuration value).*
  - Enter the new configuration value: **NNN**

    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

9	8	7	6	5	4	3	2	1	0	Hex	Description
0	0	0	0	0	0	0	0	0	0	#000	RAM Block 0 mapped to pages #8 to #B in bank 1, 16K HEPAX RAM
0	0	0	0	0	0	0	0	0	1	#001	RAM Block 1 mapped to pages #8 to #B in bank 1, 16K HEPAX RAM

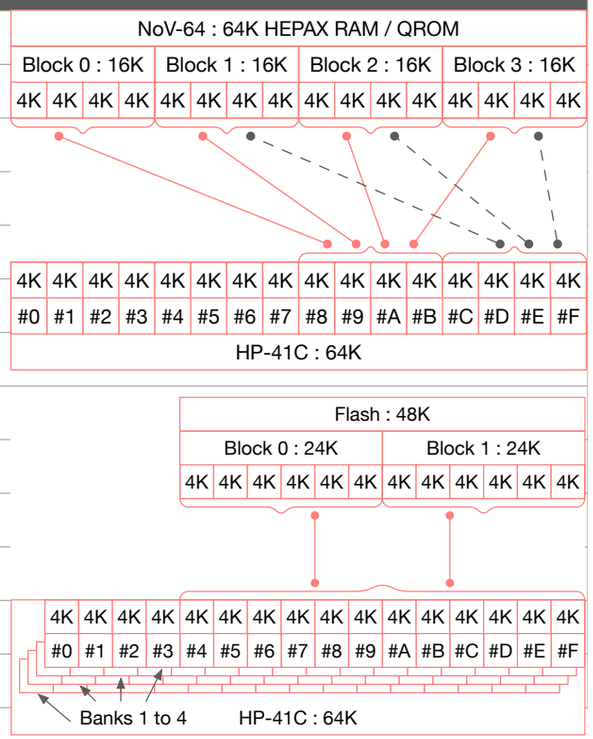


0	0	0	0	0	0	0	0	0	0	#000	Value at module insertion

9	8	7	6	5	4	3	2	1	0		Examples
1	1	1	1	1	1	1	1	1	0	#000	16K HEPAX RAM [block 0, pages #8..#B, bank 1]
1	0	1	0	1	0	1	0	0	1	#001	16K HEPAX RAM [block 1, pages #8..#B, bank 1]

Control Word : NoV-64(d)

9	8	7	6	5	4	3	2	1	0	Hex	Description
						0	0	0	0	#xx0	1st 16K HEPAX RAM mapped [block 0, pages #8..#B, bank 1]
						0	0	0	1	#xx1	1st 16K HEPAX RAM mapped [block 1, pages #8..#B, bank 1]
						0	0	1	0	#xx2	1st 16K HEPAX RAM mapped [block 2, pages #8..#B, bank 1]
						0	0	1	1	#xx3	1st 16K HEPAX RAM mapped [block 3, pages #8..#B, bank 1]
		0	0	0	0					#x0x	2nd 16K HEPAX RAM unmapped
0	0	0	0	0	1					#01x	2nd 16K HEPAX RAM mapped [block 1, pages #C..#F, bank 1] (Flash must be unmapped)
0	0	0	0	1	0					#02x	2nd 16K HEPAX RAM mapped [block 2, pages #C..#F, bank 1] (Flash must be unmapped)
0	0	0	0	1	1					#03x	2nd 16K HEPAX RAM mapped [block 3, pages #C..#F, bank 1] (Flash must be unmapped)
0	0									#0xx	16K Flash unmapped
0	1	0	0	0	0					#10x	16K Flash mapped [block 0, any unused pages/bank] (2nd 16K HEPAX RAM must be unmapped)
1	0	0	0	0	0					#20x	16K Flash mapped [block 1, any unused pages/bank] (2nd 16K HEPAX RAM must be unmapped)
1	1	0	0	P	P	0	0	B	B	#3PB	Copy RAM page PP (0..3) in block BB (0..3) to Flash page 5 in block 1
1	1	1	1	1	1	1	1	1	1	#3FF	Erase Flash page 5 in block 1



0	1	0	0	0	0	0	0	0	0	#100	Value at module insertion

9	8	7	6	5	4	3	2	1	0		Examples
0	0	0	0	0	0	0	0	0	0	#000	No Flash, 16K HEPAX RAM [block 0, pages #8..#B, bank 1]
0	0	0	0	0	0	0	0	0	1	#001	No Flash, 16K HEPAX RAM [block 1, pages #8..#B, bank 1]
0	0	0	0	0	0	0	0	1	0	#002	No Flash, 16K HEPAX RAM [block 2, pages #8..#B, bank 1]
0	0	0	0	0	0	0	0	1	1	#003	No Flash, 16K HEPAX RAM [block 3, pages #8..#B, bank 1]
0	0	0	0	1	0	0	0	0	0	#020	No Flash, 32K HEPAX RAM [block 2, pages #C..#F, bank 1] & [block 0, pages #8..#B, bank 1]
0	0	0	0	1	1	0	0	0	1	#031	No Flash, 32K HEPAX RAM [block 3, pages #C..#F, bank 1] & [block 1, pages #8..#B, bank 1]
0	1	0	0	0	0	0	0	1	0	#102	16K Flash [block 0], 16K HEPAX RAM [block 2, pages #8..#B, bank 1]
1	0	0	0	0	0	0	0	1	1	#203	16K Flash [block 1], 16K HEPAX RAM [block 3, pages #8..#B, bank 1]

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.

HEPAX RAM CLEARING

Table of Content

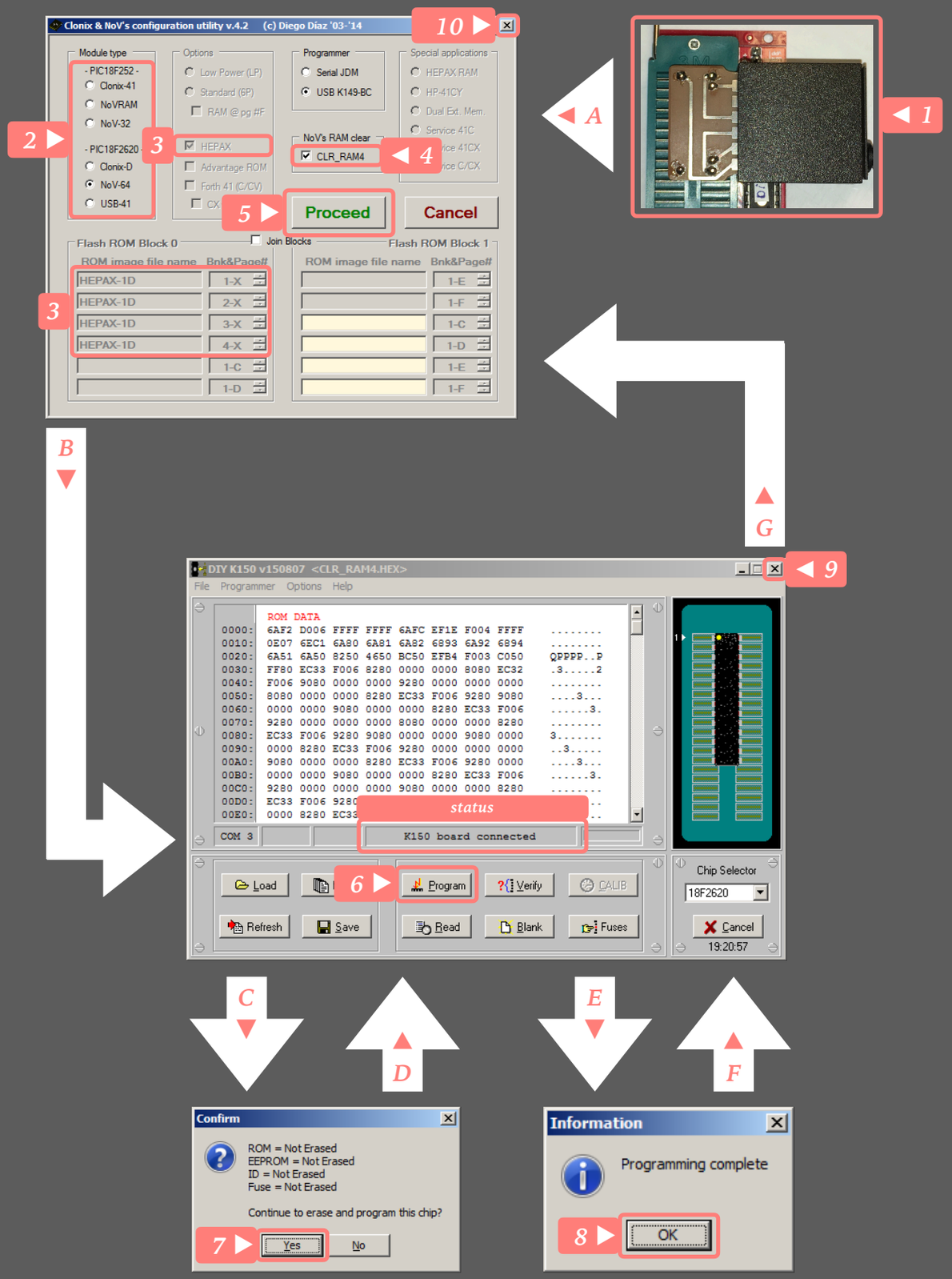
HEPAX vs NoV Modules

- 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.

Table of Content

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.



Configuration

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 match you're 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.
10. Close **Clonix & NoV Configuration Utility**.

Clearing

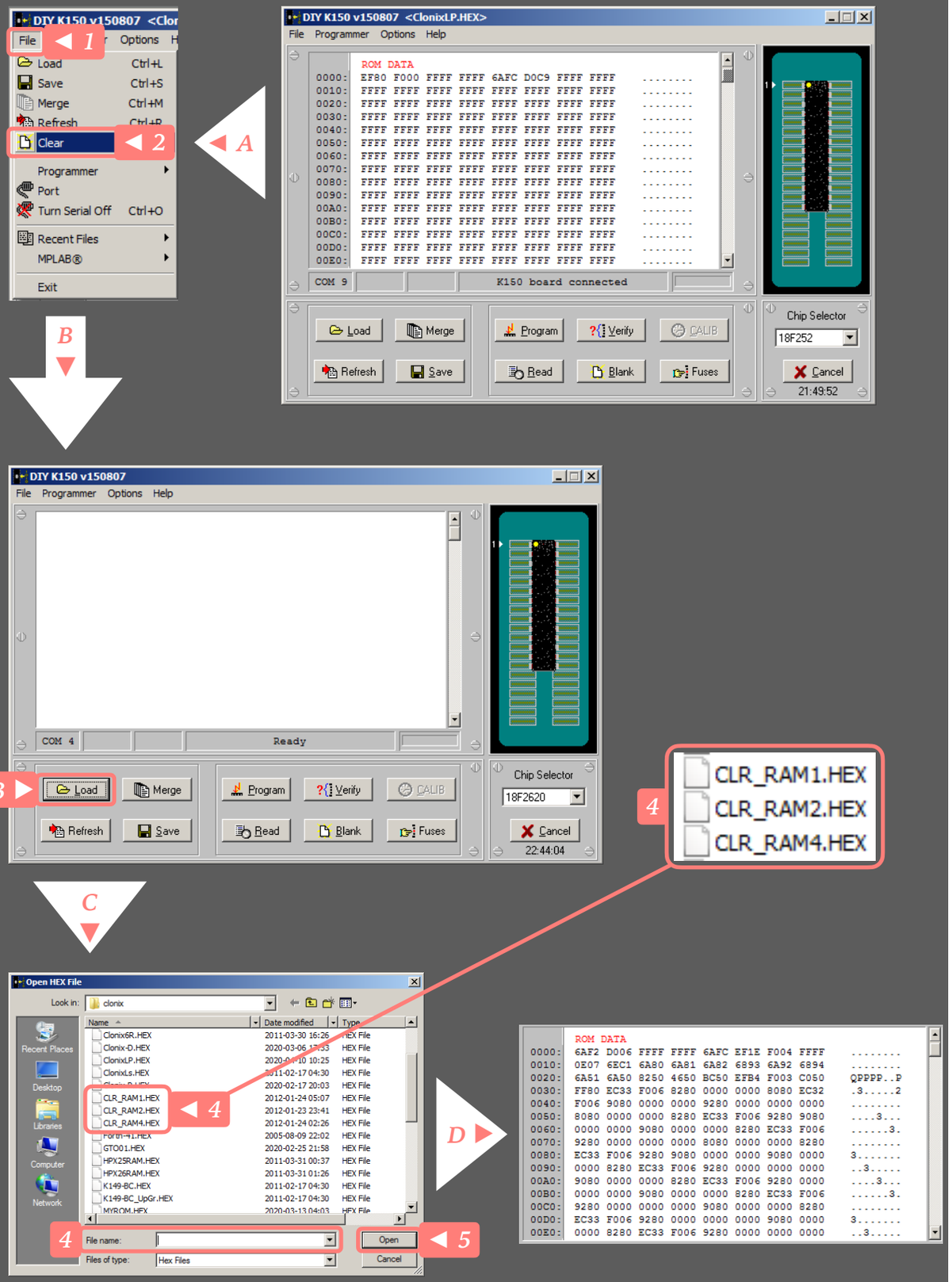
- Make sure the calculator is off.
- Insert you're NoV module into any port.
- Do **NOT** press the **[ON]** button.
- Wait for about 25 seconds for the erasing procedure to complete.
- **CLR OK** message will be displayed if clearing has been successful.
- **NO CLR** message will be displayed if clearing has failed.

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

Table of Content

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.**

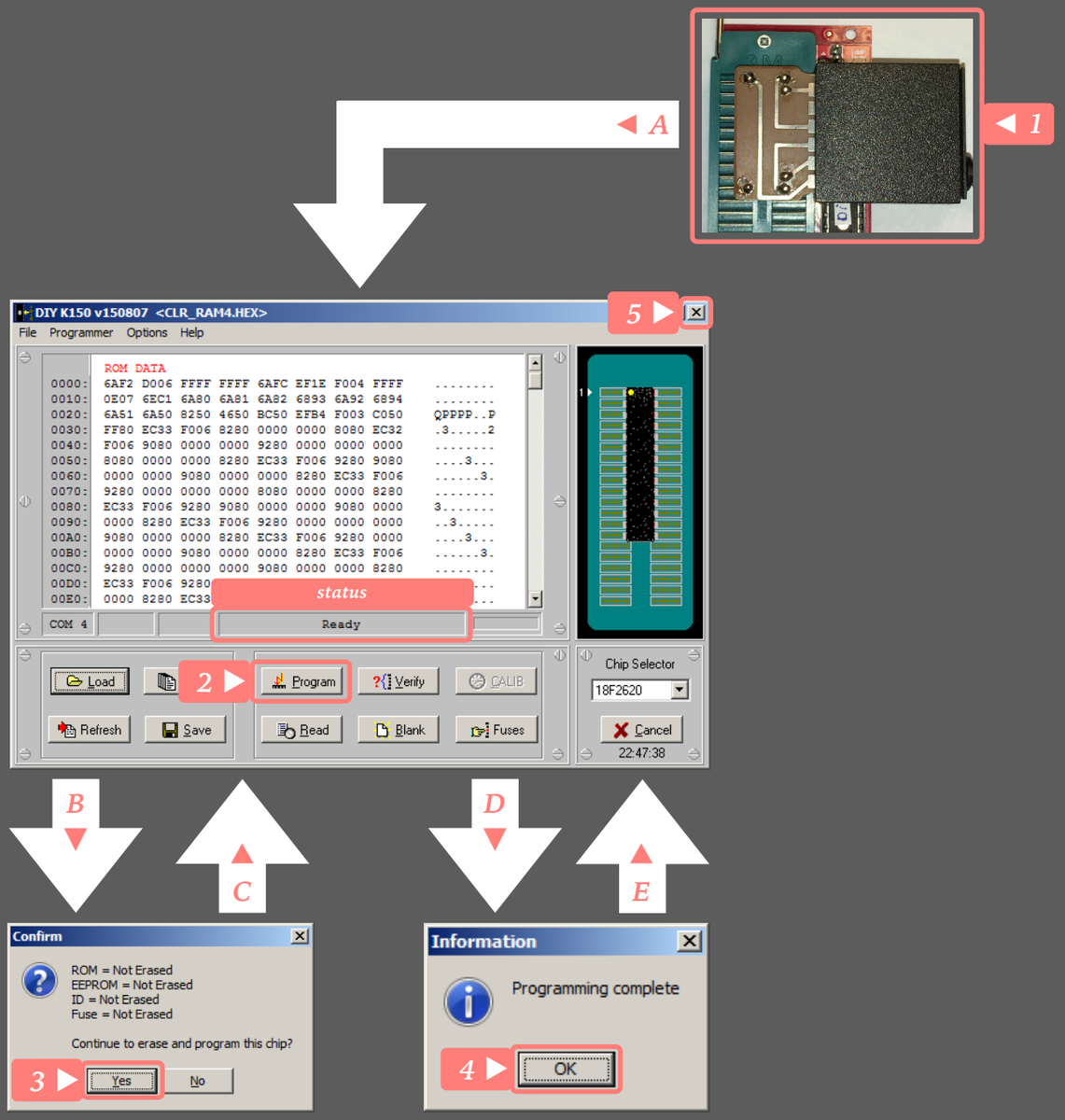
The ROM DATA space should now be empty.

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

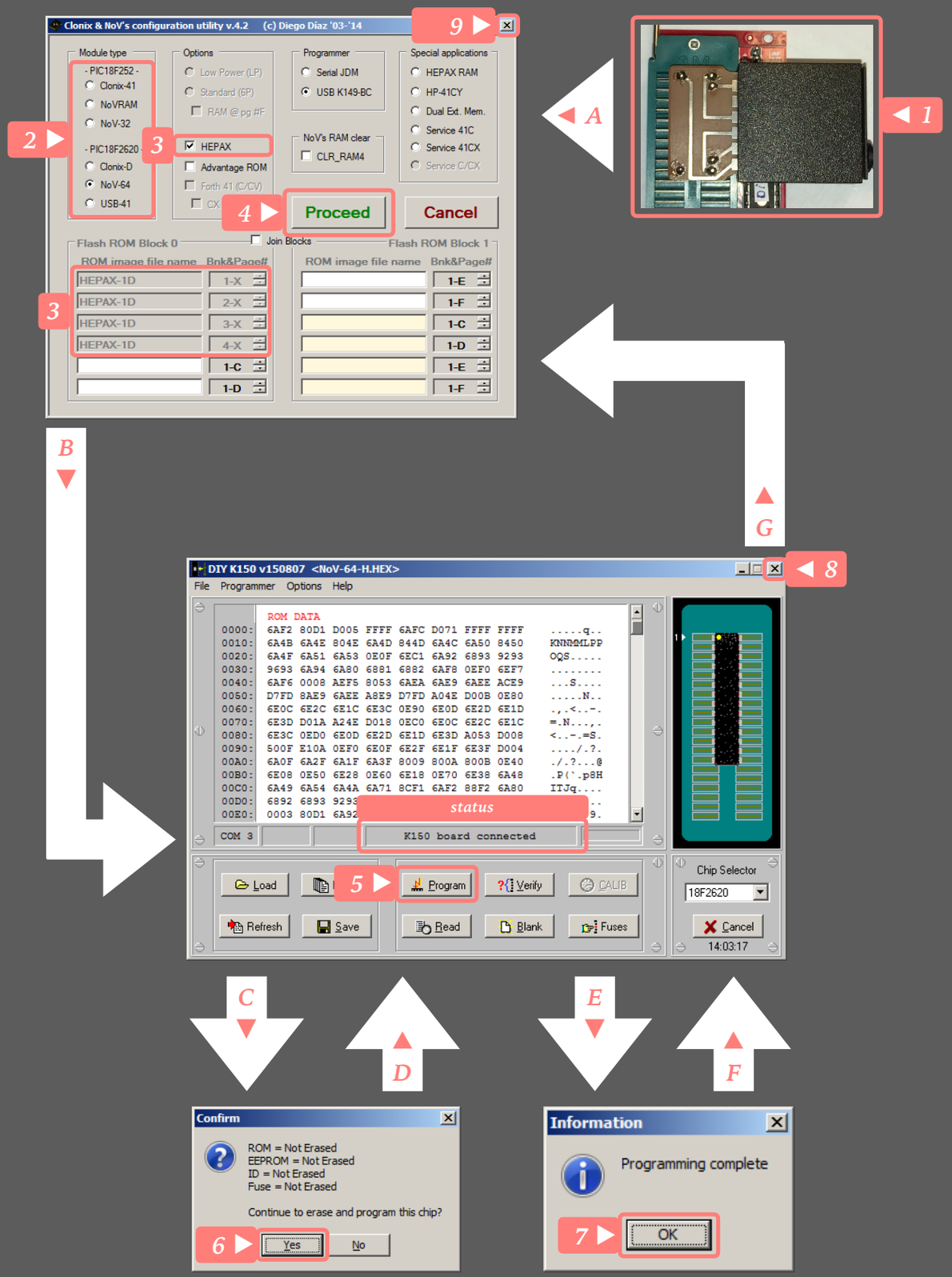
- Make sure the calculator is off.
- Insert you're NoV module into any port.
- Do **NOT** press the **[ON]** button.
- Wait for about 25 seconds for the erasing procedure to complete.
- **CLR OK** message will be displayed if clearing has been successful.
- **NO CLR** message will be displayed if clearing has failed.

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

Table of Content

MANUAL CLEARING

Works in normal mode and in crash recovery mode



Configuration

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 you're 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.
9. Close **Clonix & NoV Configuration Utility**.

FOCAL Program

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

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.

Table of Content

QROM TRANSFER

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.

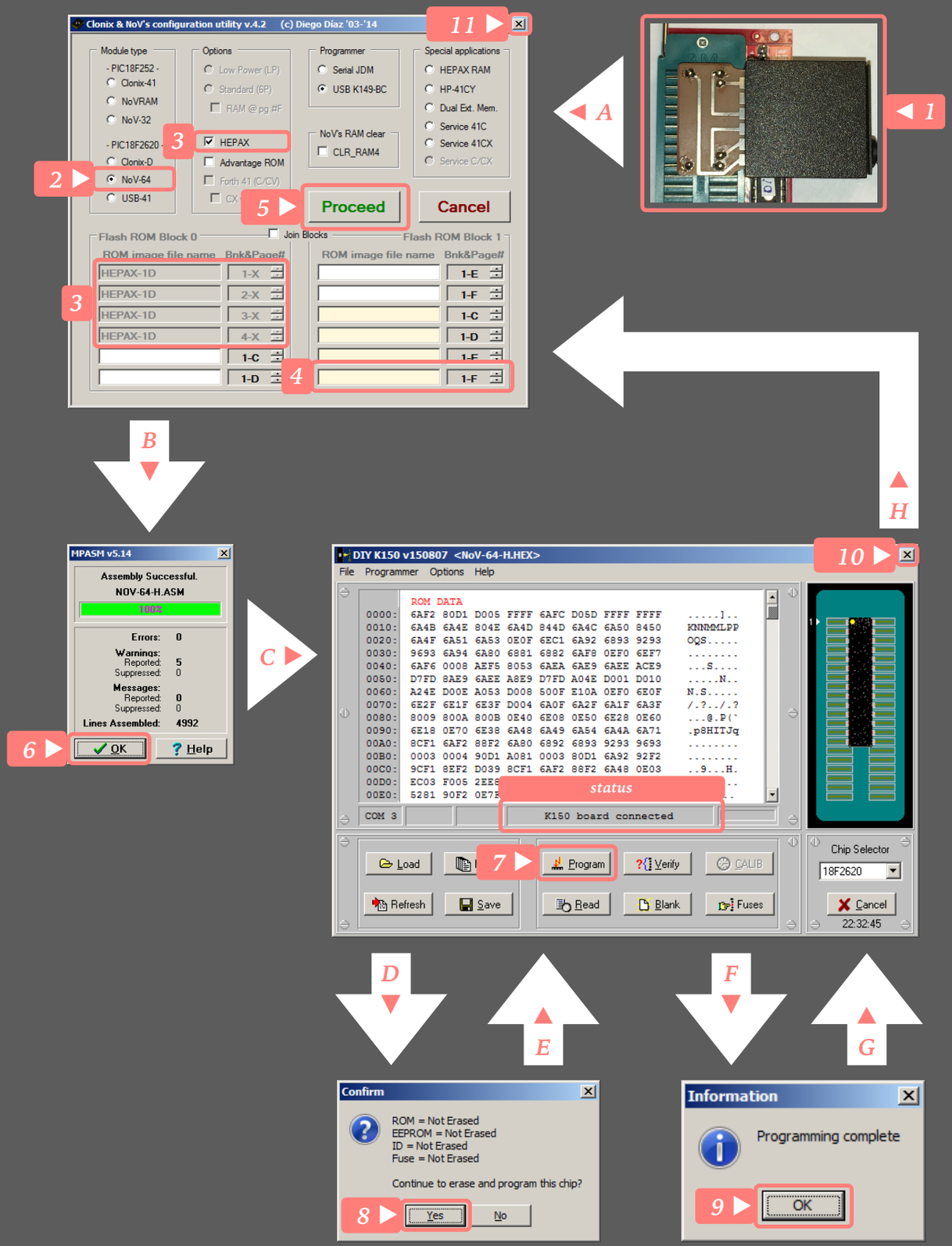
QROM TO PC

with NoV-64(d)

Table of Content

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.



Configuration

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.

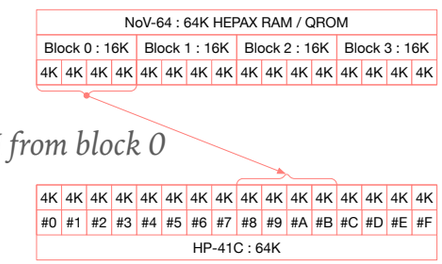
9. Press **OK** in the **Information** dialog box.

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**.

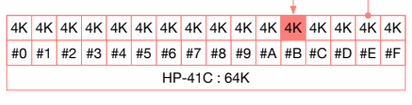
ROM to QROM to Flash Copy

- 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*

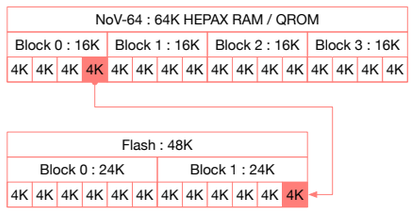


- Finding ROM to copy location:
  - **HEXEDIT** *(you should see: "ADR: _ _ _ _")*
  - *Enter* **E000** *(you should see "E000 vvv _ _ _")*
    If vvv is not equal to 000 then you found your ROM
    If vvv is equal to 000 then try address F000
  - *Press* **[←]** *then* **[←]** *to exit HEXEDIT*

  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]"
    - "00**E000EFFFB000**" **CODE**
  - **COPYROM**
    Copying 4K ROM at page #E to QROM at page #B

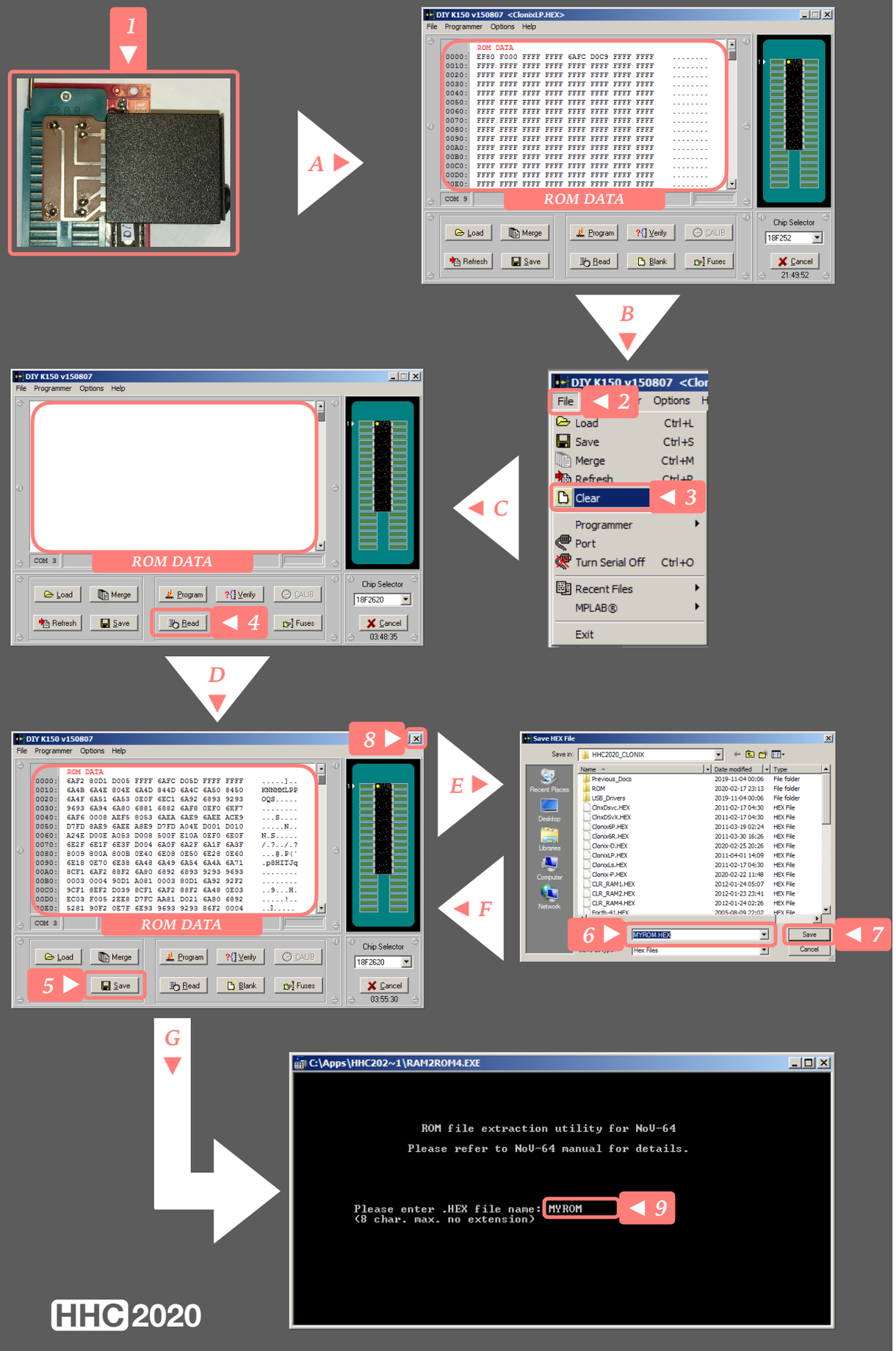


- Hardware reconfiguration:
  - *Press* **OFF** *remove ROM from port 4 then press* **ON**
- Erasing target Flash page [block 1 , page 5]: *(if needed)*
  - **HEXEDIT** *(you should see: "ADR: _ _ _ _")*
  - *Enter* **4101** *(you should see "4101 vvv _ _ _")*
  - *If vvv is not equal to 000 then the 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)

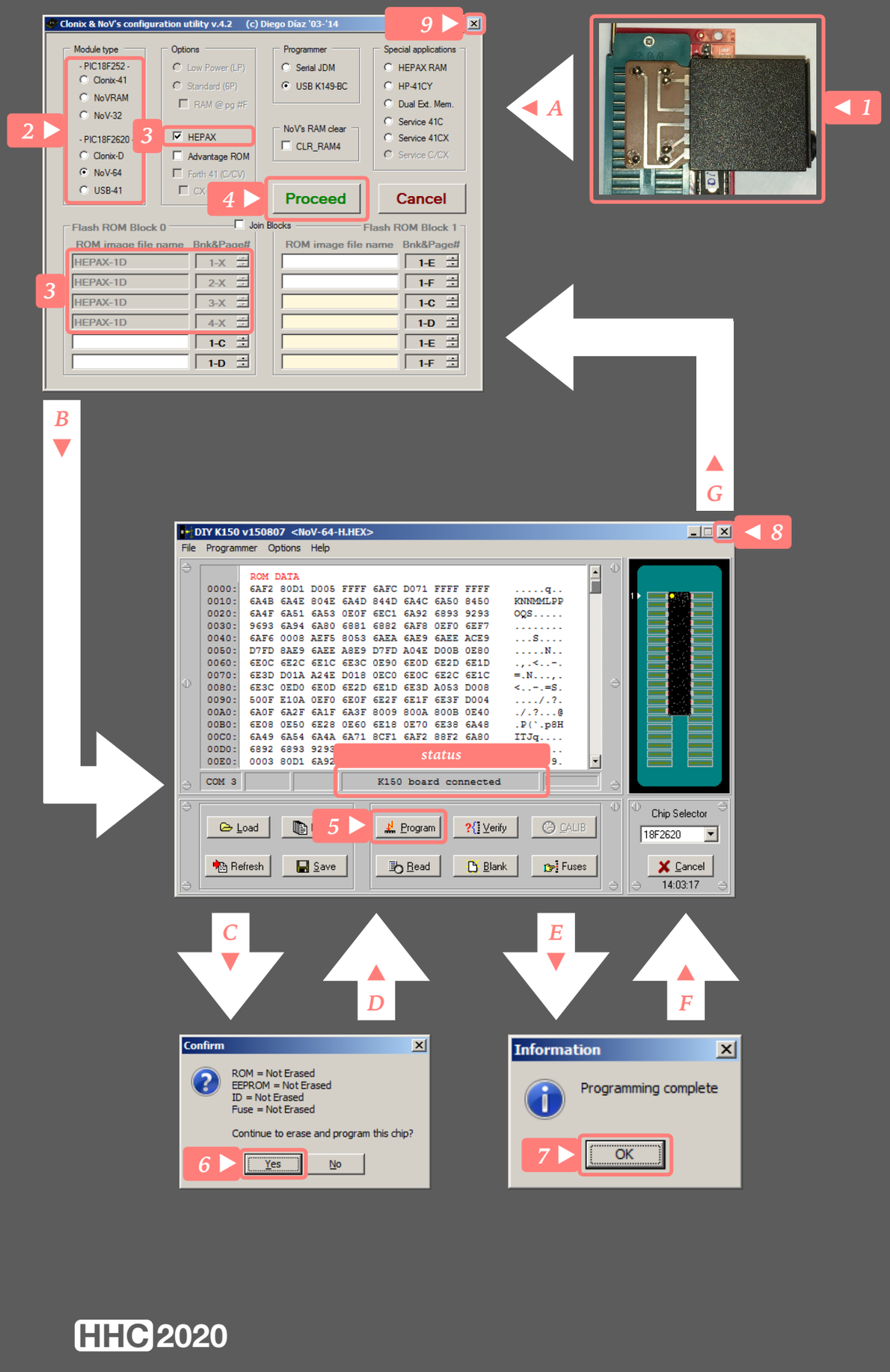
QROM TO PC

with USB-41

Table of Content

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. *(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. *(if doing a ROM transfer)*
    - Erase an HEPAX RAM page and load code in it. *(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.



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 you're 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.

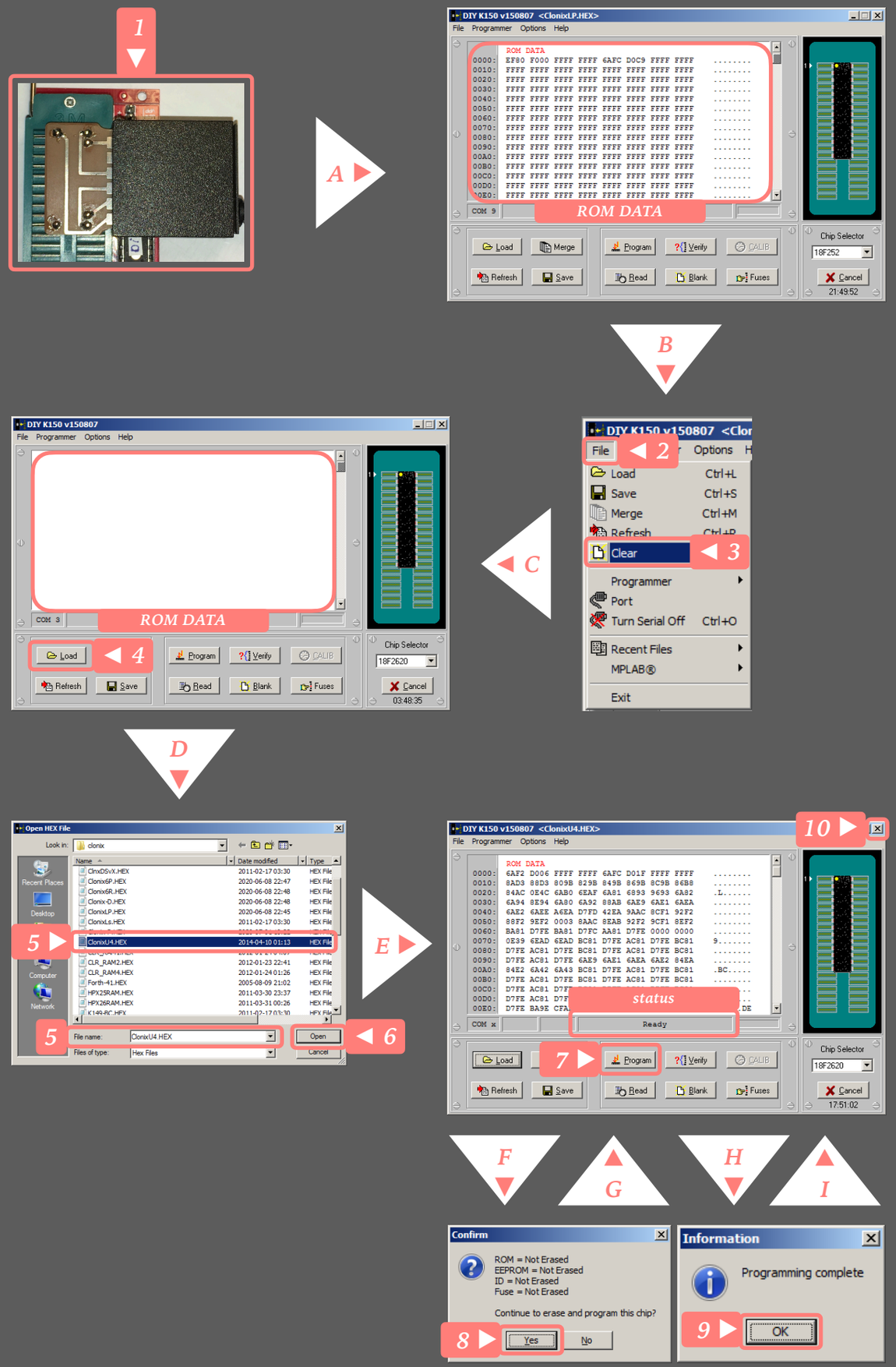
6. Press **Yes** in the **Confirm** dialog box.

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.
9. Close **Clonix & NoV Configuration Utility**.



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.

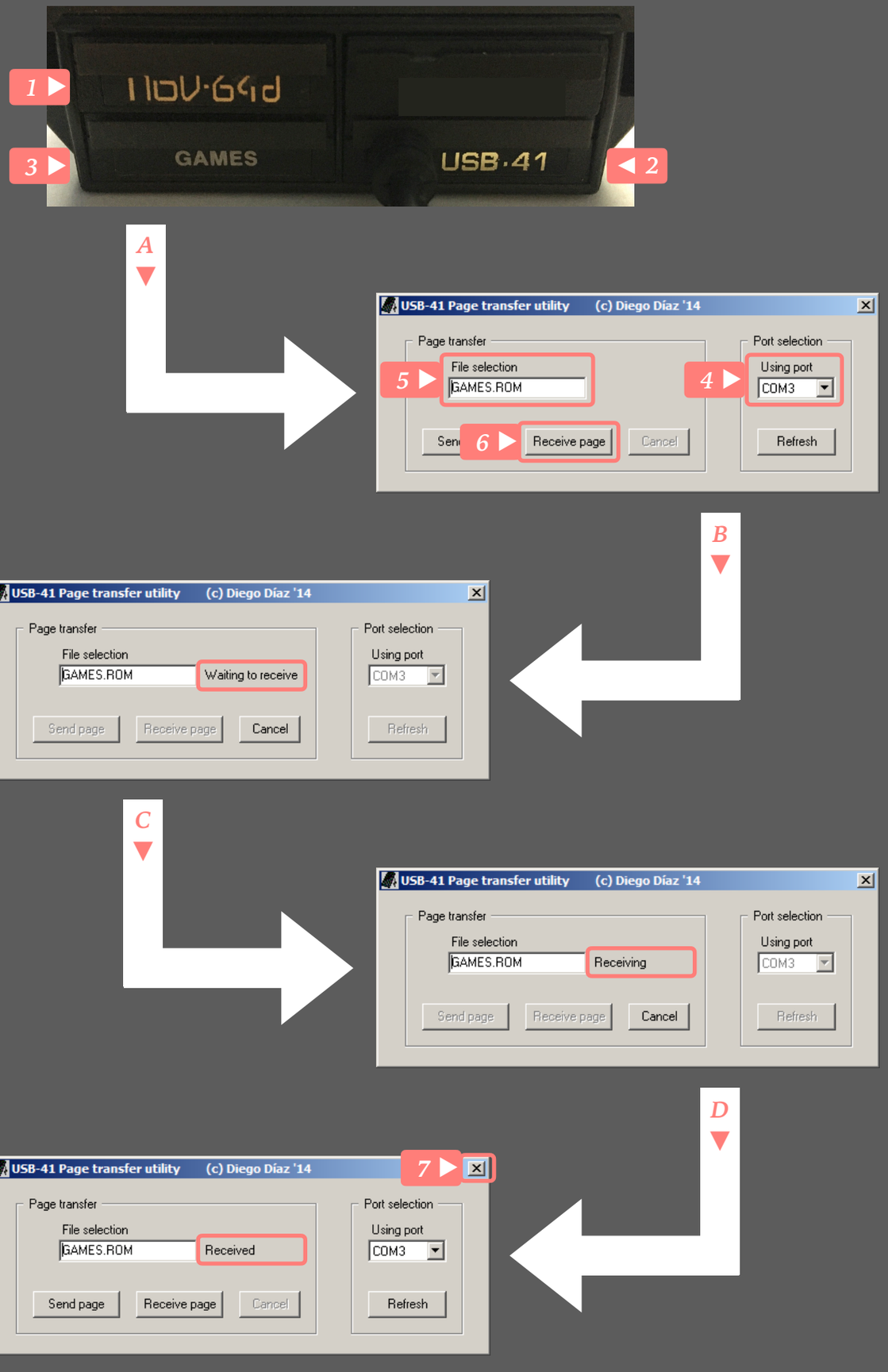
8. Press **Yes** in the **Confirm** dialog box.

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.
11.



ROM/QROM Image Transfer

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

HP-41 must be is 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.

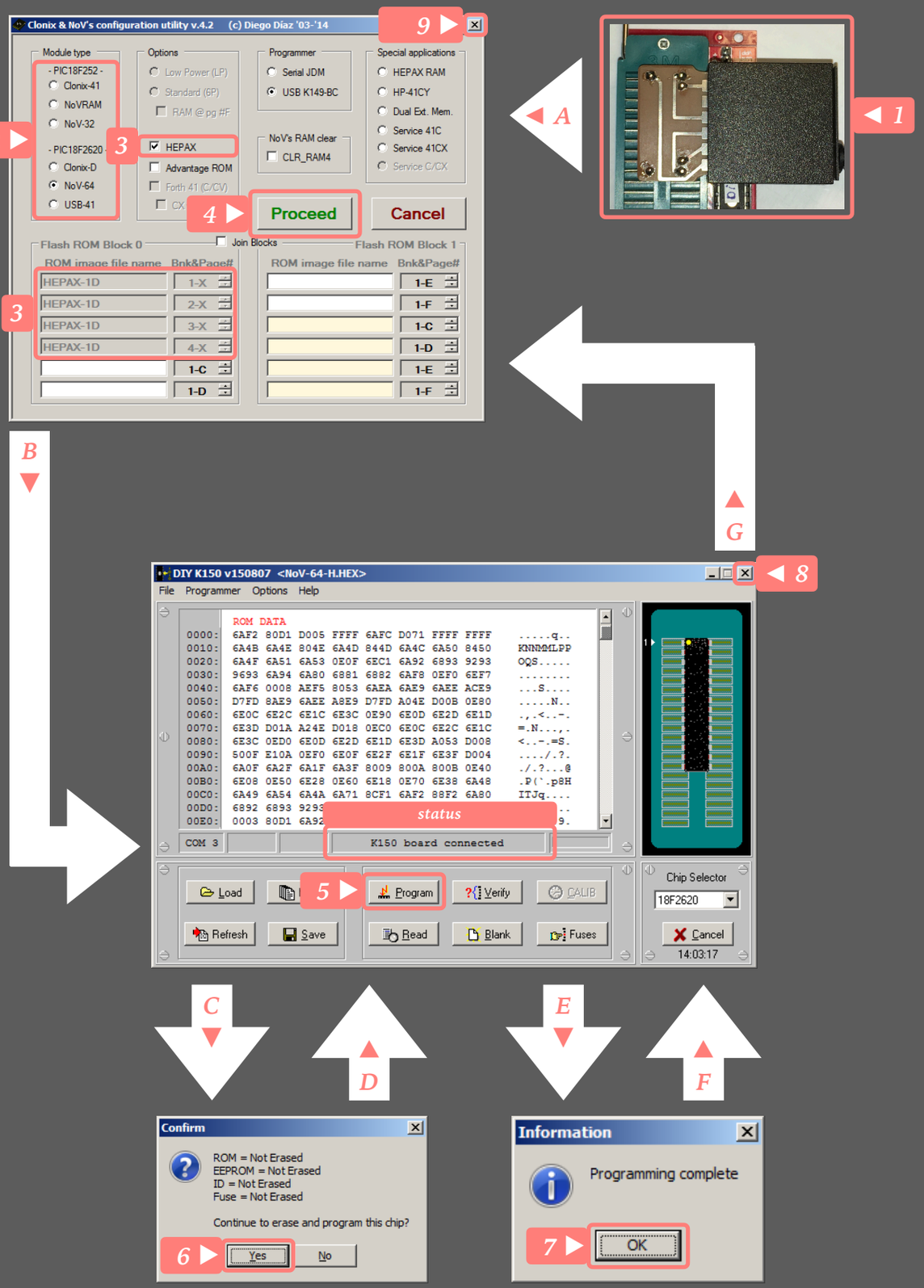
PC TO QROM

with USB-41

Table of Content

Summary

- Goal:
  - Transfering 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 you're 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.

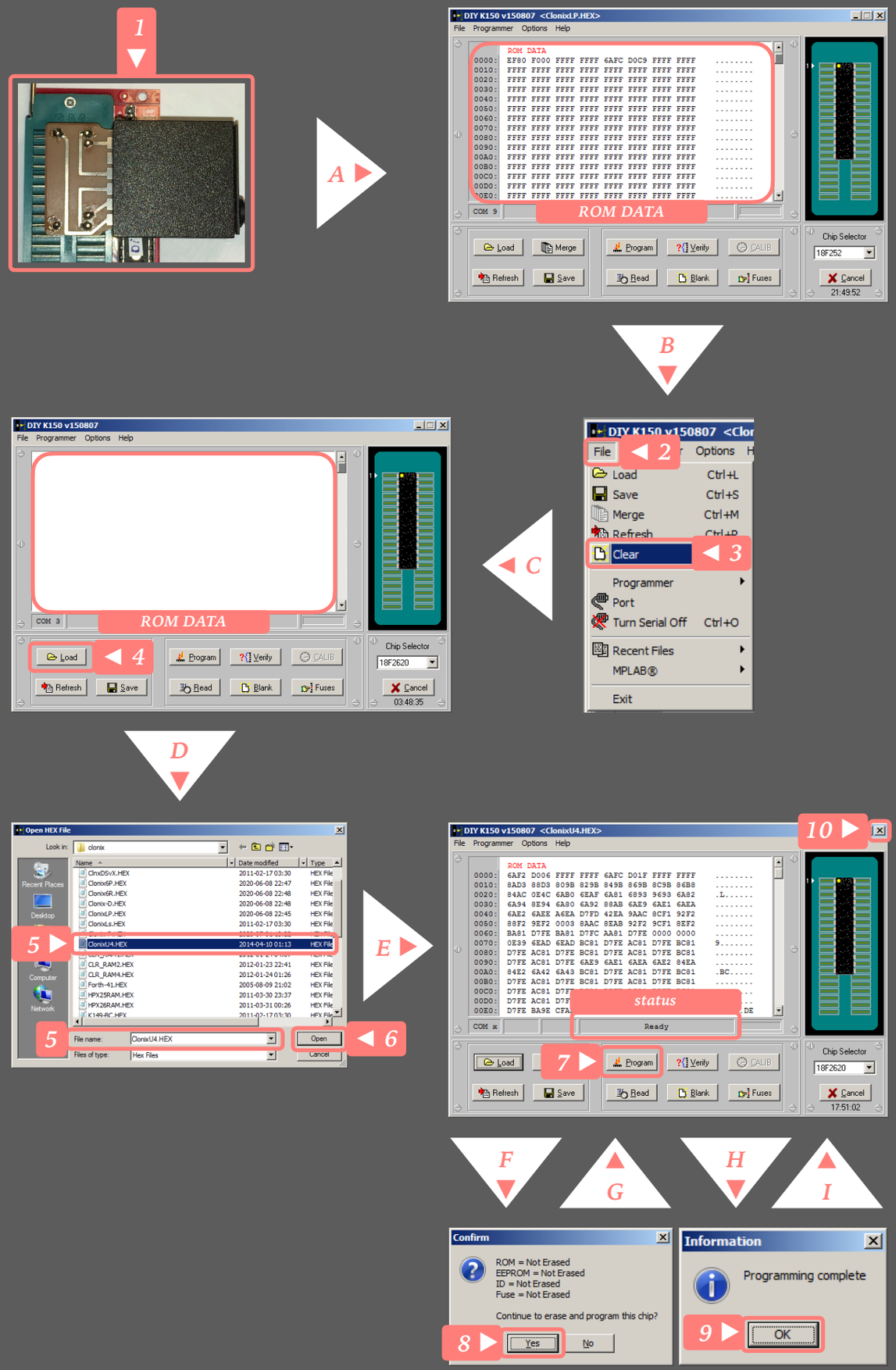
6. Press **Yes** in the **Confirm** dialog box.

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.
9. Close **Clonix & NoV Configuration Utility**.



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.

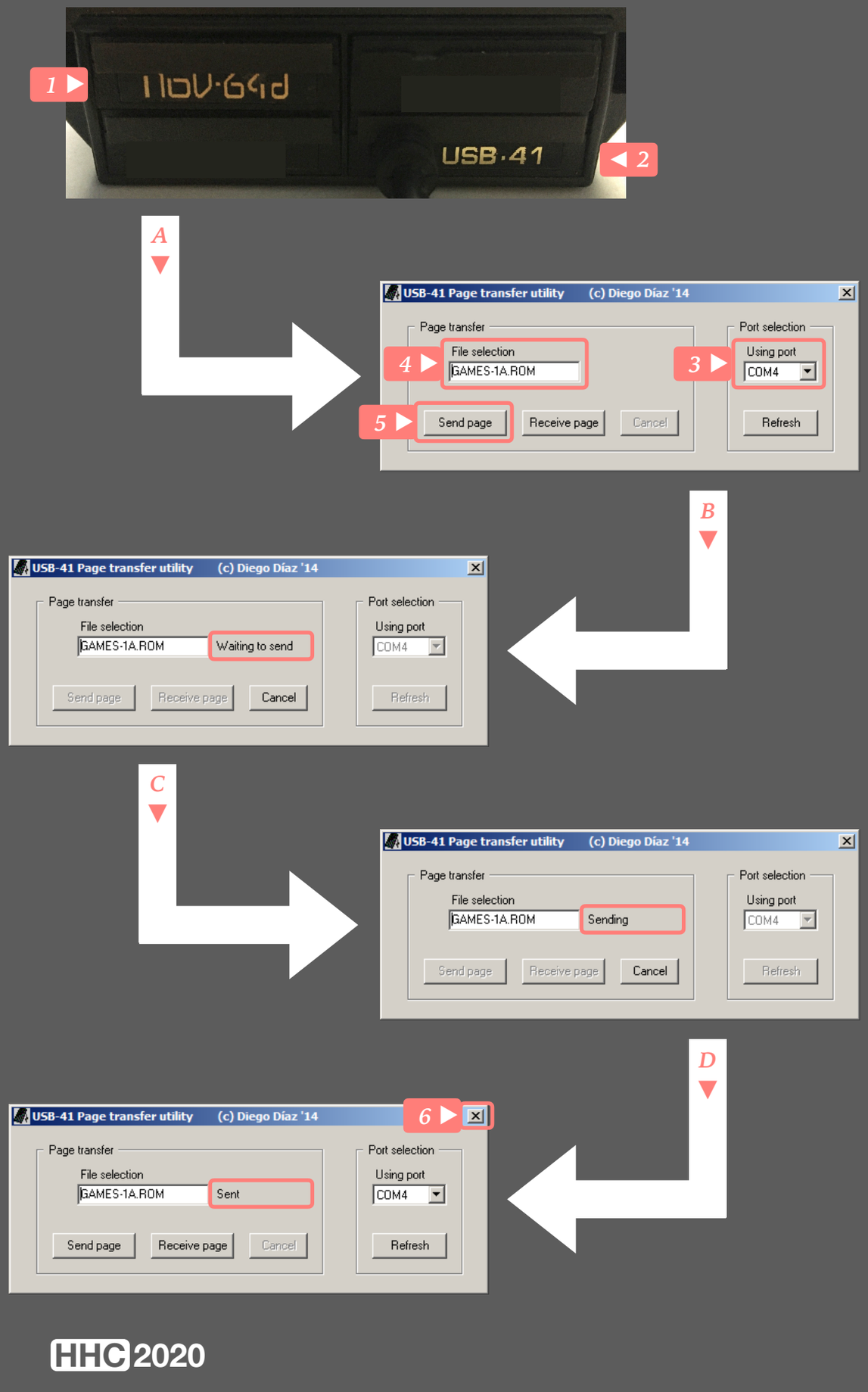
8. Press **Yes** in the **Confirm** dialog box.

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 is 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.*

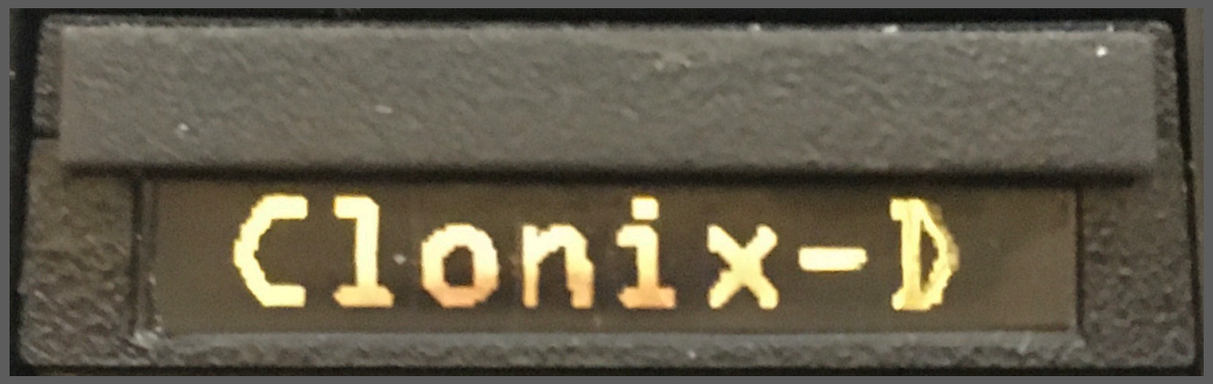
6. Close application.

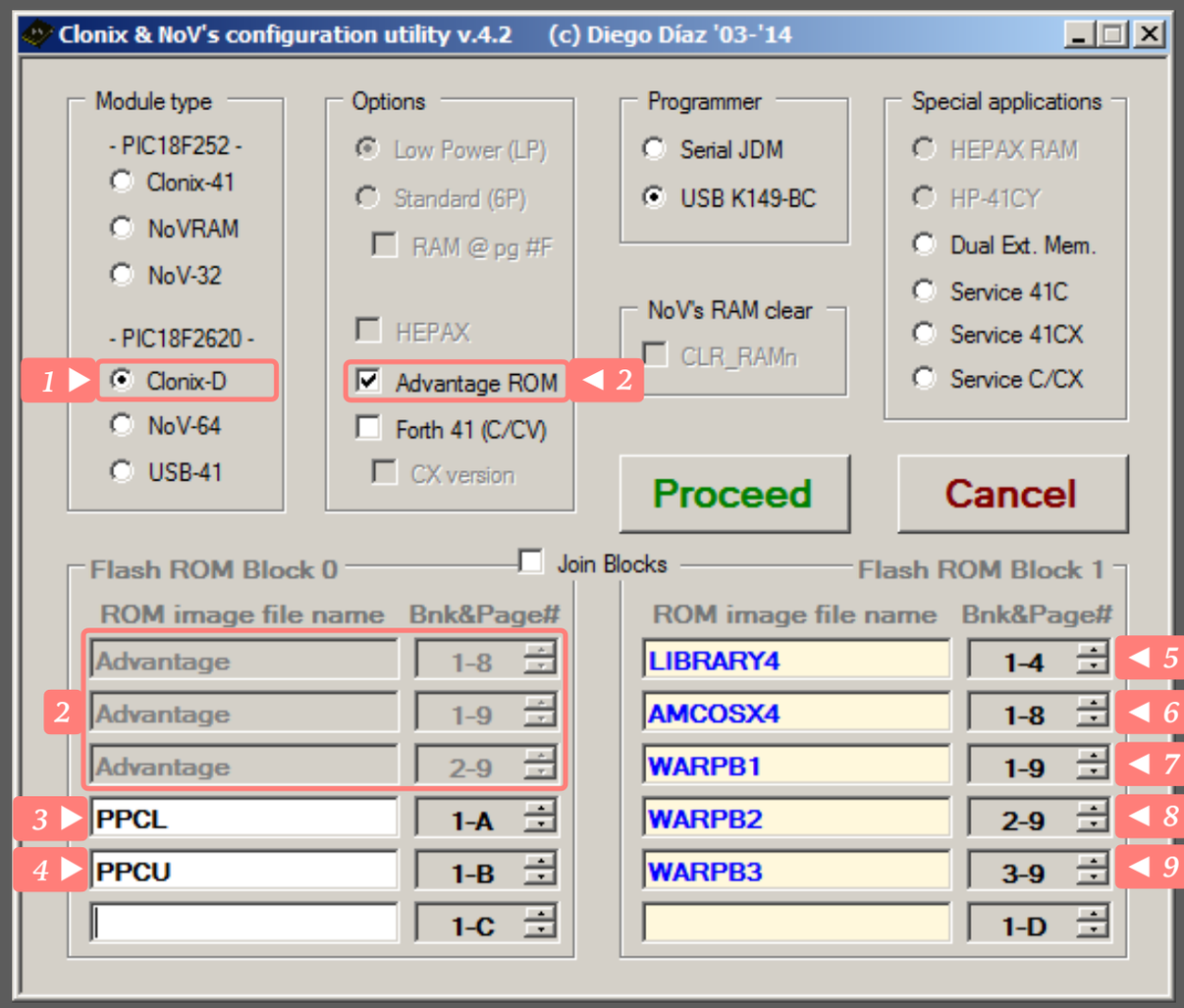
Table of Content

LIVE DEMO

Table of Content

CLONIX-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**:

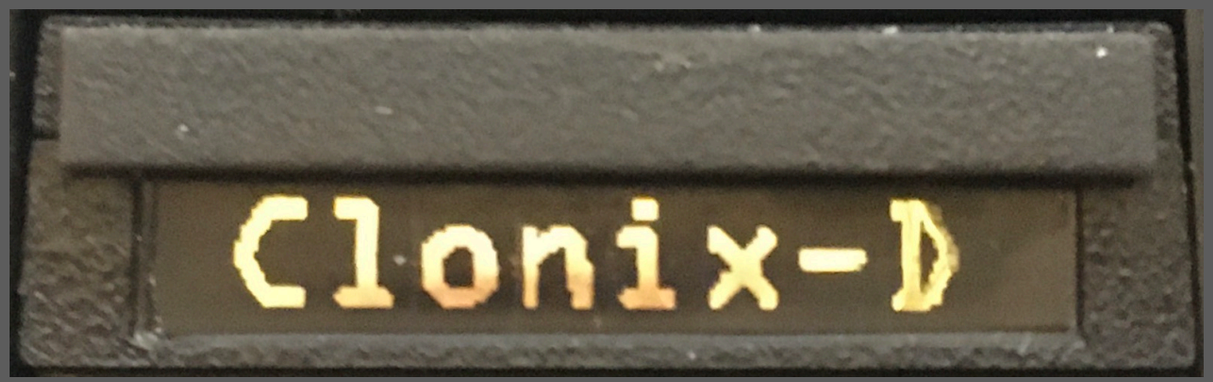
1. Select **Clonix-D** option.
2. Select **Advantage ROM.**

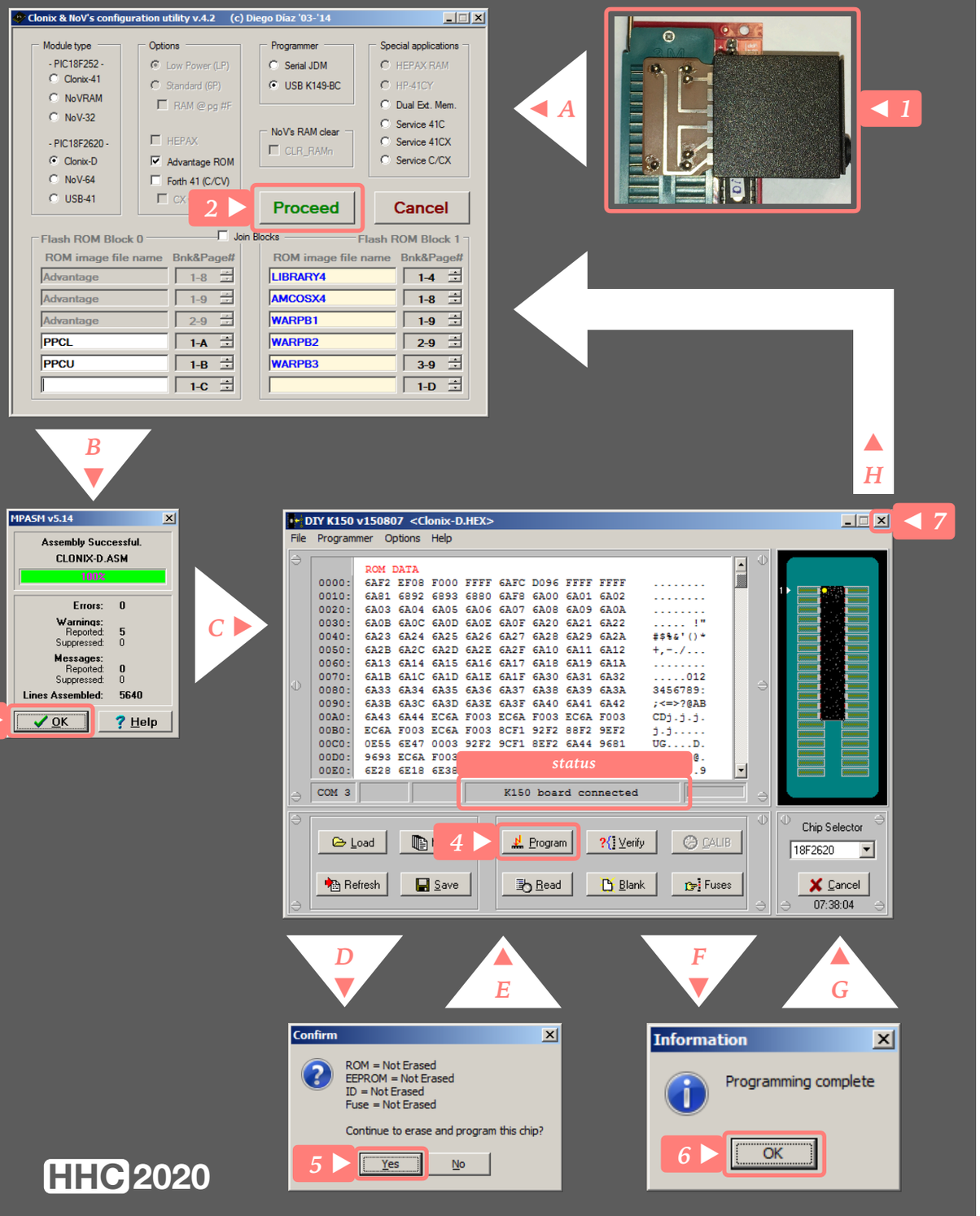
Add these files to **Flash ROM Block 0**:

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. **WARPB1.ROM** to **Bank 1, Page 9.**
8. **WARPB2.ROM** to **Bank 2, Page 9.**
9. **WARPB3.ROM** to **Bank 3, Page 9.**





Programming

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.

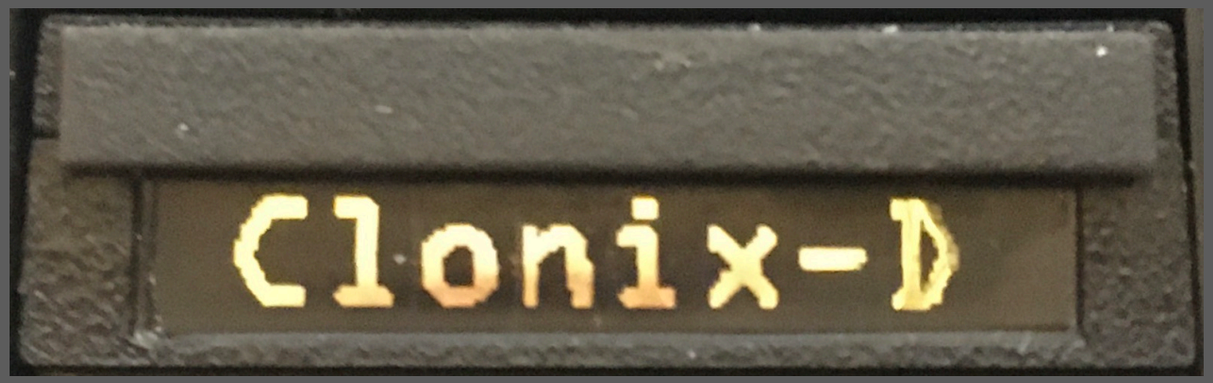
5. Press **Yes** in the **Confirm** dialog box.

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.




```
CAT 2
...
-ADV CONV B
-ADV MTRX
-ADV MATH
-ADV TVM
C PPC 1981
...
```

1

```
CAT 2
...
-AMC"OS/X
-WARP CORE+
-STKT
...
```

2

Testing

Goal: testing odd port or Flash block 0 images

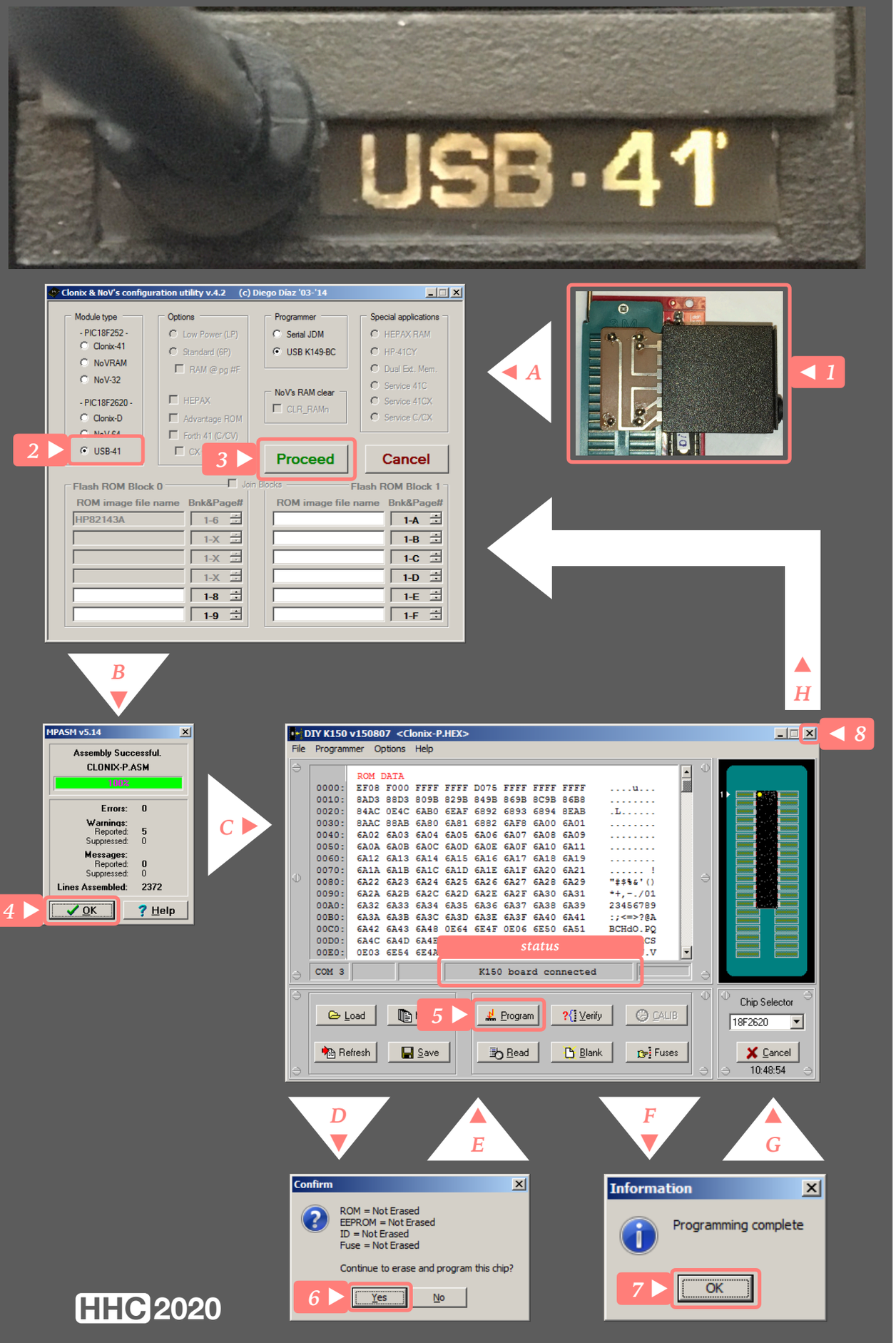
- OFF
- Insert the module into an odd port.
- ON
- CAT 2
  Your listing should look like the one in box 1.

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

USB-41 LIVE DEMO



Configuration & Prog.

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.

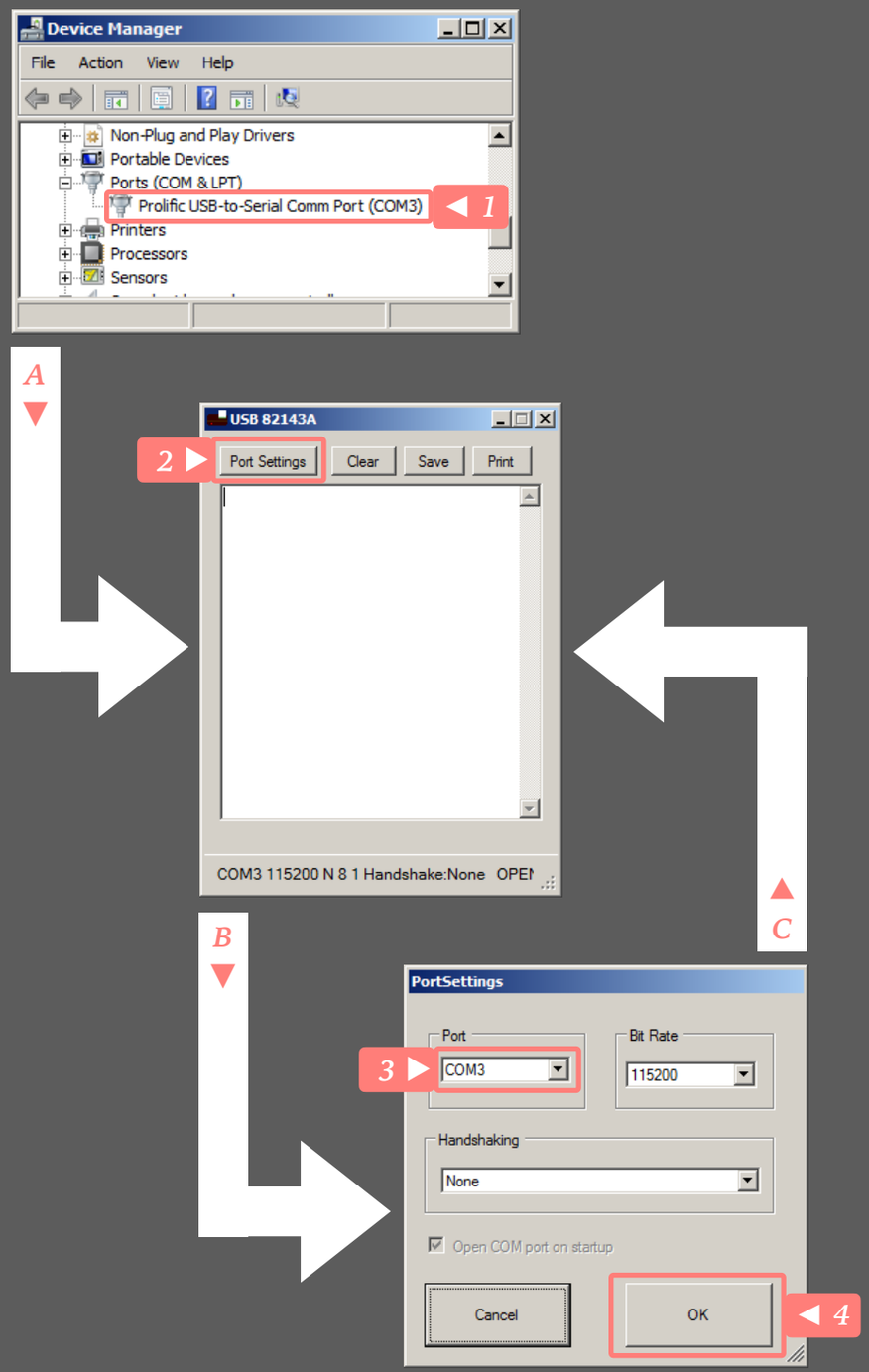
6. Press **Yes** in the **Confirm** dialog box.

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**.

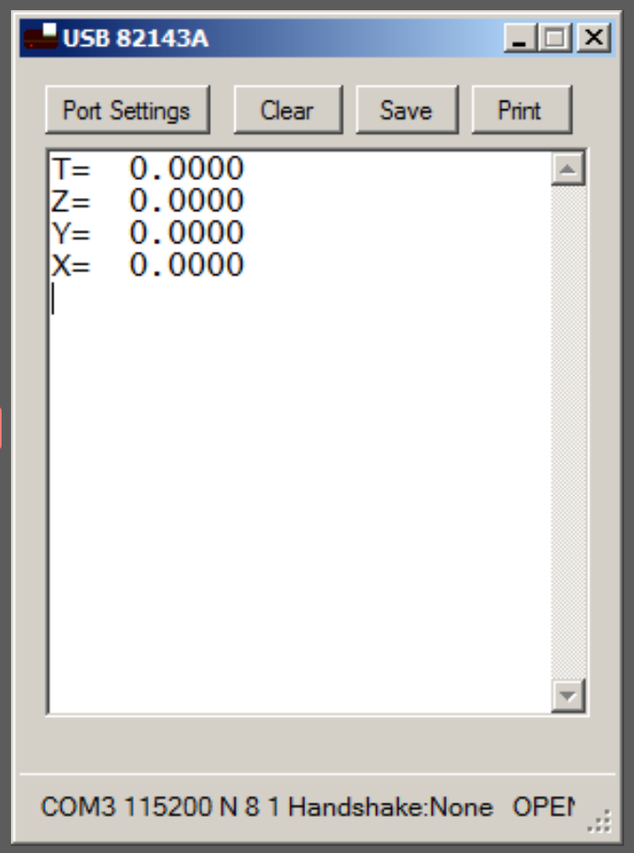
1. Find which COM port is assigned to the Prolific driver.

Start **USB 82143A** Application.

2. Click on **Port Settings**.
3. Select **COM port**.
4. Press **OK**.


```
CAT 2
...
-PRINTER-
...
```

1 ▶



2 ▶

Printing

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

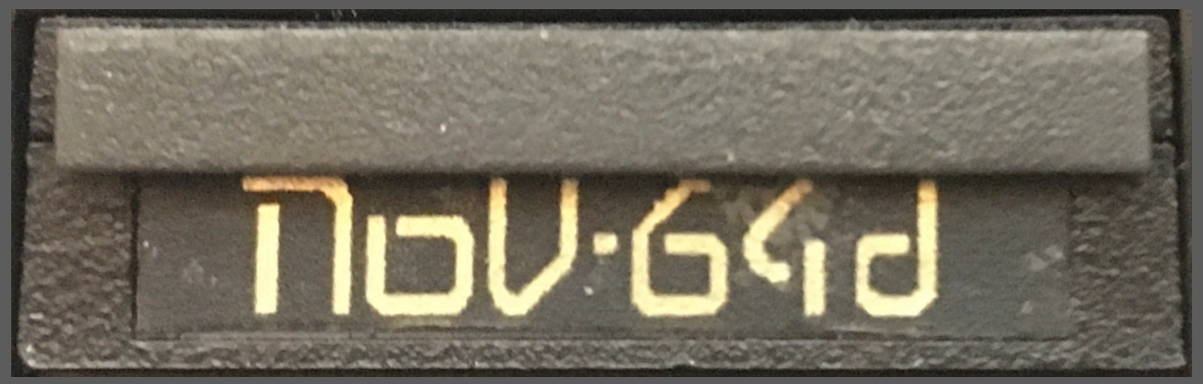
- **CLST**
  Clear stack content
- **PRSTK**
  Print stack content

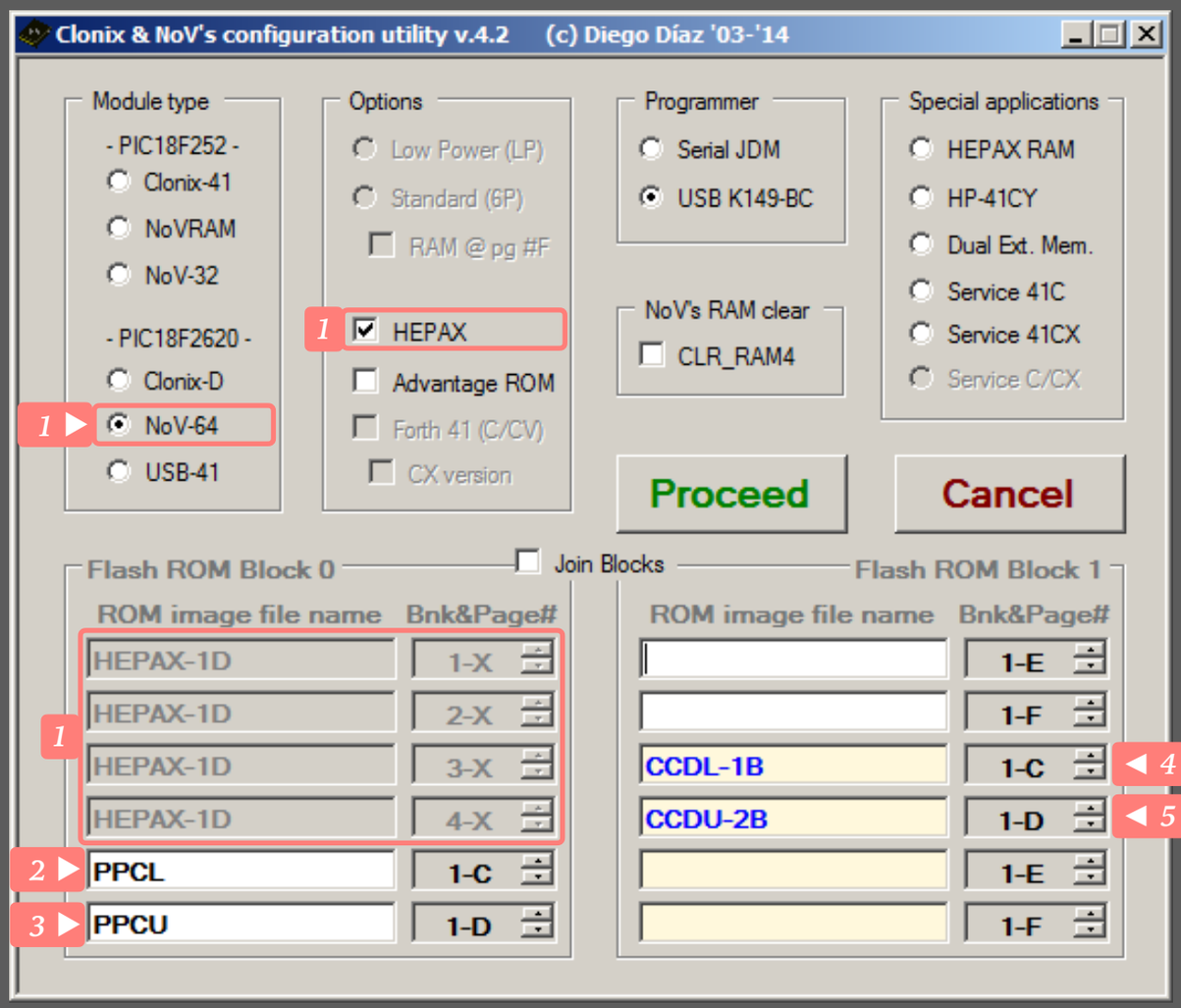
*On the **Windows/PC** side ...*

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

Table of Content

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**:

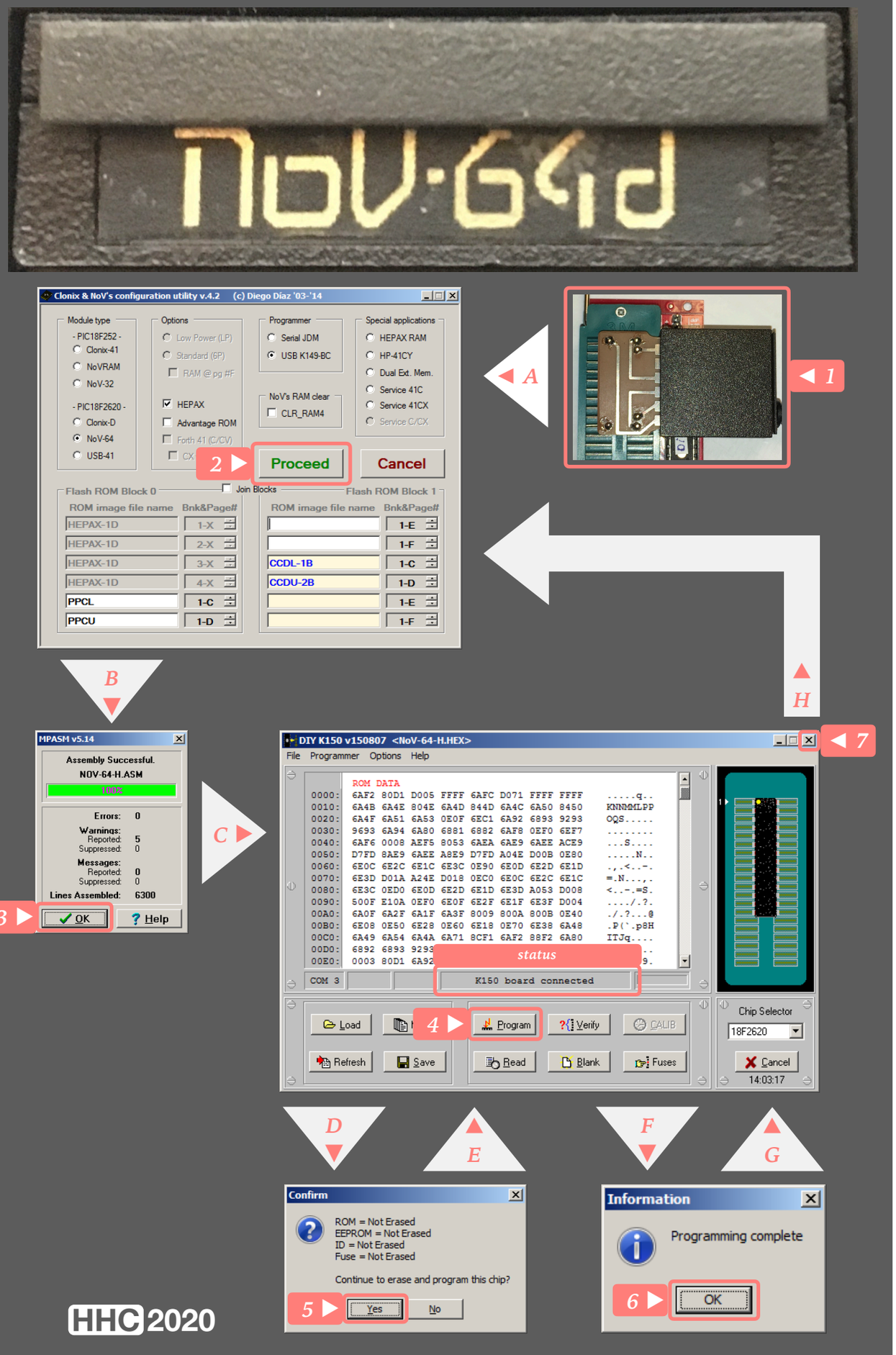
1. Select **NoV-64** option.
   HEPAX option is automatically selected.

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.

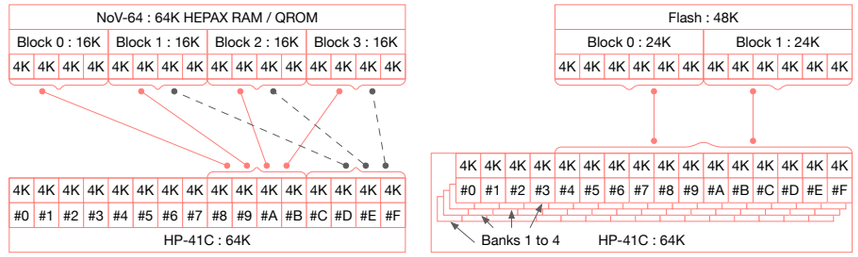
Several status are displayed in the status field during hex file uploading. Module programming worked.

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:

    ```
    ...
    -HEPAX 1D
    C PPC 1981
    ...
    ```
  - **HEPDIR**
    You should see ***"H:DIR EMPTY "***
    and have 2610 free HEPAX reg. in X.

    ```
    H:DIR EMPTY
    ```
- Activating Flash Block 1 & HEPAX RAM block 0:
  - **HEXEDIT** , enter **4100** , **200** , [←] , [←] , **OFF** , **ON**
  - **CAT 2**
    You should see HEPAX & CCD ROMs in the listing:

    ```
    ...
    -HEPAX 1D
    -W&W CCD B
    ...
    ```
- Creating a data file in HEPAX RAM block 0:
  - 50 , "ABC" , **HCRFLD**
  - **HEPDIR**
    *You should see "**ABC DA** "*
    and have 2558 free HEPAX reg. in X

    ```
    ALPHA
    CONTENT
    ```
- *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:

    ```
    ...
    -HEPAX 1D
    C PPC 1981
    ...
    ```
  - **HEPDIR**
    You should see "H:DIR EMPTY"
    and have 2610 free HEPAX reg. in X.

    ```
    H:DIR EMPTY
    ```
- 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.

    ```
    ALPHA
    CONTENT
    ```
- 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:

    ```
    ...
    -HEPAX 1D
    ...
    ```
  - **HEPDIR**
    *You should see "**ABC DA** "*
    and have 2558 free HEPAX reg. in X

    ```
    ALPHA
    CONTENT
    ```

Table of Content

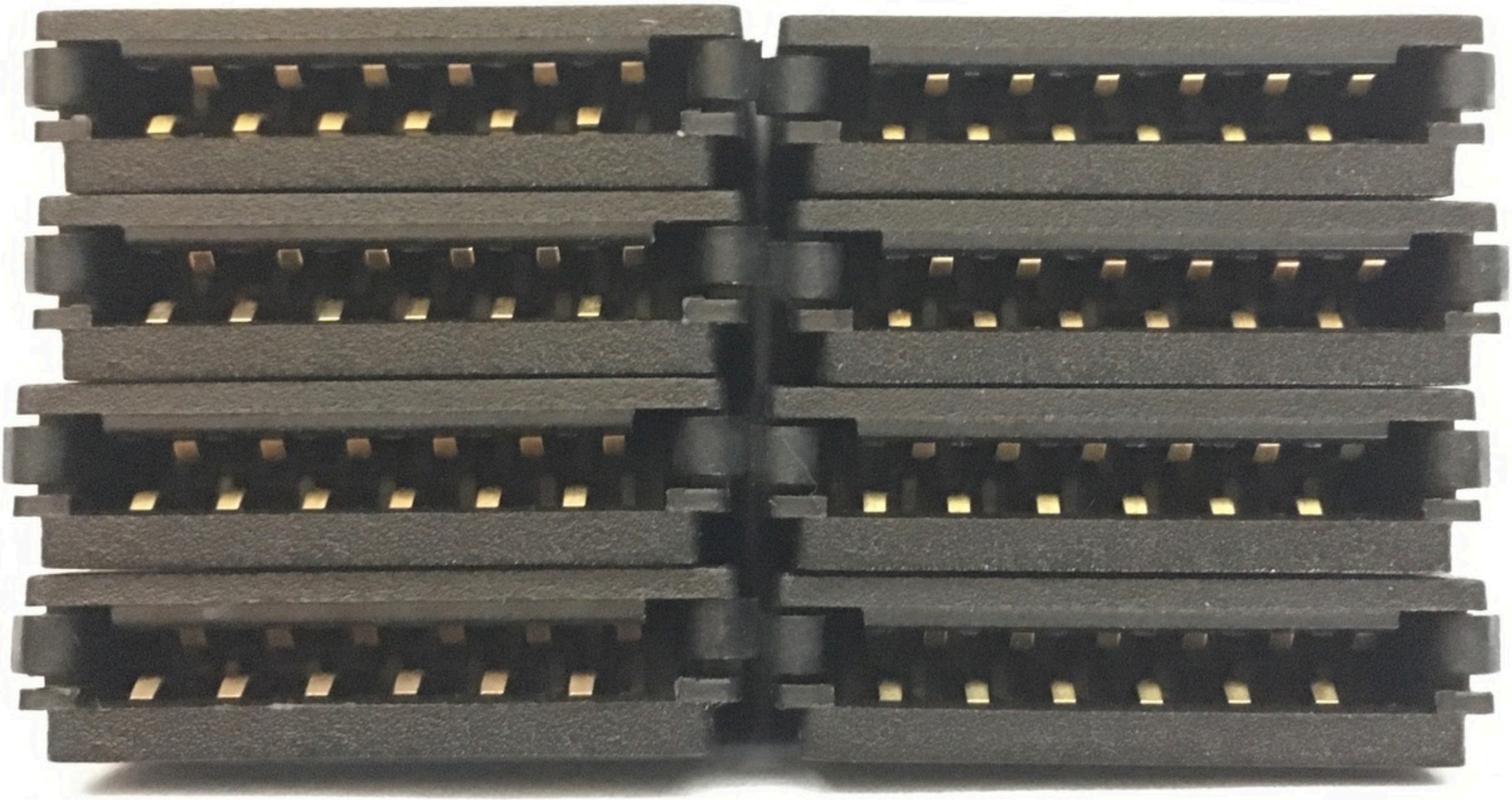
CLOSING TOPICS

Review

- 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)*

Questions & Answers

Index



DIEGO'S HP-41C MODULES

HHC 2020

2020-08-11

By Sylvain Côté