MultiMod Programming Pad

This document contains a blank summary programming page to plan and document a ROM layout in your MultiMod ROM emulator. Examples are provided to guide your own layout.

The first example is the layout and commands for J-F's Ultimate ROM. This example illustrates how the ROM structure description consists of different size ROM chips from the HP71B perspective. Each "chip" is the same size as the ROM image it holds, even though it maps to one or more internal 16KB flash blocks.

The second example shows how you can mix chip sizes, as well as create a sequence of 16KB chips to hold a large ROM (64KB C71 ROM in this case). A hard ROM is not needed so the space dedicated to its use can be repurposed to hold other ROMs.

At the end is a blank programming sheet that you can print and fill out for your own layout. The programming sheet consists of three tables. The first table is where you list the ROMs you want your MultiMod to host. You would normally have ROMs that total no more than seven 16KB "chips" but an 8KB ROM can be stored in the top half of flash block 0. It is marked as a 16KB ROM in this and subsequent blocks, even though only 8KB of content can be held.

The second block is the layout of the ROM Enumeration Table as it appears in MultiMod SRAM. Filling this out is somewhat optional, but very useful in visualizing what you are actually presenting to the HP-71B O/S during its startup processing. It also serves as a check on your ROM structure prior to filling out the last two tables.

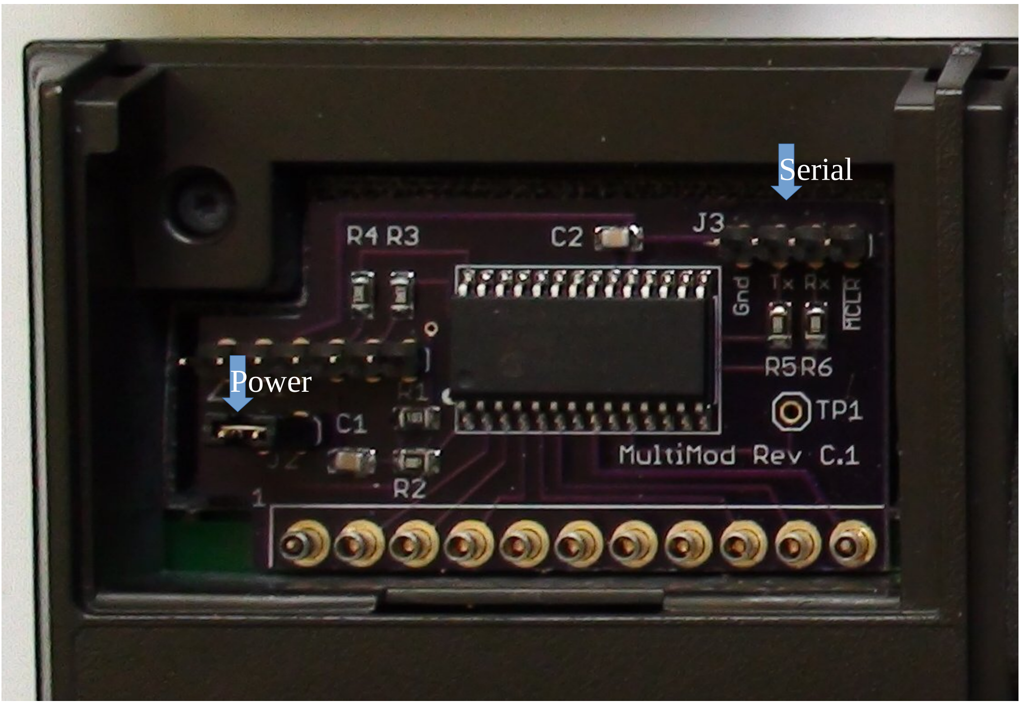
The last two tables are the serial monitor commands that you use to define the ROM structure and upload the ROM image data. The commands used are separated into two tables because you can often reuse the same structure to hold different ROM content. For example, replacing one ROM in the Ultimate ROM layout would only require the ERASE command and the IMAGE command to upload the new ROM image.

Naming and keeping a sheet for each ROM layout you create is a helpful reminder of what you have, or what you'd like to recreate. Build your own set of favorite layouts and quickly switch from one to the other using just a few serial monitor commands!

Terminal Emulator Settings
19200 baud
8 data bits, no parity, 1 stop bit (8N1)
Xon/Xoff software flow control protocol

Warning! Failure to use Xon/Xoff flow control will cause serious problems when uploading a ROM image! See below for recovery instructions.

Your 71B should be powered on briefly to wake the MultiMod from sleep before proceeding with making a serial connection. Connect a USB to TTL serial port cable to the J3 serial connector on the MultiMod board. You should connect ground to board ground, receive to board transmit (Tx), and transmit to board receive (Rx). Leave the $\overline{\text{MCLR}}$ pin unconnected. Tap return to get into the monitor.



Recovery Instructions

Your MultiMod is really a microcontroller system mimicking real ROM hardware. If your MultiMod should fail to respond to the POKE command, try resetting the board. You can do this either by removing the J2 power jumper for 5+ seconds, or by briefly shorting the Gnd and $\overline{\text{MCLR}}$ pins of the J3 serial connector. This is best done while the 71B is off and the bus is quiescent.

The MultiMod will power down into deep sleep mode 2-1/2 minutes after the 71B is turned off. Remember this should you wish to replace the batteries! In deep sleep the MultiMod draws no more current than the 71B, so you can safely replace batteries (quickly, or one at a time), but don’t do so immediately after turning off the 71B or a Memory Lost will occur.

MultiMod Programming Pad

Name: J-F’s Ultimate ROM using variable-sized chips

Content:

ROM Image File	**ROM Size**	**# of 16KB Chips**
HP-82478A_FORTH-ASSEMBLER_ROM.BIN	16KB	1
HP-82478A_FORTH-ASSEMBLER_HRD-FIX.BIN	32KB	2
MATH2B.BIN	32KB	2
JPCF05.BIN	32KB	2
ULIB52.BIN	8KB	1

Table Layout

ROM Image Filename	**Size**	**Resv**	**Type**	**Class**	**Last**	Flag	Addr	Chip	Line		Field	Data	Desc
forth1b.dat	0x0a	0x00	0x01	0x00	0x08	0	0x00	1	1		**Size**	0x0A	16KB
math2b.dat	0x09	0x00	0x01	0x00	0x08	0	0x00	2	2			0x09	32KB
jpcf05.dat	0x09	0x00	0x01	0x00	0x08	0	0x00	4	3			0x08	64KB
ulib52.dat	0x0a	0x00	0x01	0x00	0x08	1	0x00	0	4		**Last**	0x00	No
empty	0x0a	0x00	0x01	0x00	0x08	0	0x00	5	5			0x08	Yes
forth1bhrd.dat	0x0a	0x00	0x01	0x00	0x08	2	0x00	6	6		**Flag**	0x00	Cont.
forth1bhrd.dat	0x0a	0x00	0x01	0x00	0x08	2	0x00	7	7			0x01	Stop
MMIO Address	0x00	0x00	0x00	0x0C	0x02	0x00	0x00	0x00	8			0x02	H-Rom

ROM Structure Commands

Command				**Display**	**Content**
R	1	1	1	ROM 1 16K 1	forth1b
R	2	3	2	ROM 1 32K 2	math2b
R	3	3	4	ROM 1 32K 4	jpcf05
R	4	1	0	ROM 1 16K 0	ulib52
R					
R					
R					

Command		**Display**
L	4	Last 4
H	Y	Hard Yes

ROM Content Commands

Command		**Display**
E	0	Erase 0
E	1	Erase 1
E	2	Erase 2
E	3	Erase 3
E	4	Erase 4
E	5	Erase 5
E	6	Erase 6
E	7	Erase 7

Command		**Display**	**File Upload**
I	0	IMAGE 0	ulib52.dat
I	1	IMAGE 1	forth1b.dat
I	2	IMAGE 2	math2b.dat
I	4	IMAGE 4	jpcf05.dat
I	6	IMAGE 6	forth1bhrd.dat
I			
I			
I			

MultiMod Programming Pad

Name: Example using a multi-chip sequence, no hard ROM

Content:

ROM Image File	ROM Size	# of 16KB Chips
MATH2B.BIN	32KB	2
HP-82485A_TEXT-EDITOR_ROM.BIN	16KB	1
C71.BIN	64KB	4
ULIB52.BIN	8KB	1

Table Layout

ROM Image Filename	**Size**	**Resv**	**Type**	**Class**	**Last**	Flag	Addr	Chip	Line	Field	Data	Desc
math2b.dat	0x09	0x00	0x01	0x00	0x08	0	0x00	1	1	**Size**	0x0A	16KB
text-edit.dat	0x0a	0x00	0x01	0x00	0x08	0	0x00	3	2		0x09	32KB
c71.dat	0x0a	0x00	0x01	0x00	0x00	0	0x00	4	3		0x08	64KB
c71.dat	0x0a	0x00	0x01	0x00	0x00	0	0x00	5	4	**Last**	0x00	No
c71.dat	0x0a	0x00	0x01	0x00	0x00	0	0x00	6	5		0x08	Yes
c71.dat	0x0a	0x00	0x01	0x00	0x08	0	0x00	7	6	**Flag**	0x00	Cont.
ulib52.dat	0x0a	0x00	0x01	0x00	0x08	1	0x00	0	7		0x01	Stop
MMIO Address	0x00	0x00	0x00	0x0C	0x02	0x00	0x00	0x00	8		0x02	H-Rom

Command				**Display**	**Content**
R	1	3	1	ROM 1 32K 2	math2b
R	2	1	2	ROM 2 16K 2	text-edit
R	3	c	4	ROM 3 CHIP 4	c71
R	4	c	5	ROM 4 CHIP 5	c71
R	5	c	6	ROM 5 CHIP 6	c71
R	6	1	7	ROM 6 16K 7	c71
R	7	1	0	ROM 7 16K 0	ulib52

ROM Structure Commands

Command		**Display**
L	7	Last 7
H	n	Hard No

Command		**Display**
E	0	Erase 0
E	1	Erase 1
E	2	Erase 2
E	3	Erase 3
E	4	Erase 4
E	5	Erase 5
E	6	Erase 6
E	7	Erase 7

ROM Content Commands

Command		**Display**	**File Upload**
I	0	IMAGE 0	ulib52.dat
I	1	IMAGE 1	math2b.dat
I	2	IMAGE 3	text-edit.dat
I	4	IMAGE 4	c71.dat
I			
I			
I			
I			

MultiMod Programming Pad

Name: ____

Content:

ROM Image File	ROM Size	# of 16KB Chips

Table Layout

ROM Image Filename	**Size**	**Resv**	**Type**	**Class**	**Last**	Flag	Addr	Chip	Line	Field	Data	Desc
		0x00	0x01	0x00			0x00		1	**Size**	0x0A	16KB
		0x00	0x01	0x00			0x00		2		0x09	32KB
		0x00	0x01	0x00			0x00		3		0x08	64KB
		0x00	0x01	0x00			0x00		4	**Last**	0x00	No
		0x00	0x01	0x00			0x00		5		0x08	Yes
		0x00	0x01	0x00			0x00		6	**Flag**	0x00	Cont.
		0x00	0x01	0x00			0x00		7		0x01	Stop
MMIO Address	0x00	0x00	0x00	0x0C	0x02	0x00	0x00	0x00	8		0x02	H-Rom

Command				Display	Content
R					
R					
R					
R					
R					
R					
R					

ROM Structure Commands

Command		Display
L		
H		

Command		Display
E		Erase
E		Erase
E		Erase
E		Erase
E		Erase
E		Erase
E		Erase
E		Erase

ROM Content Commands

Command		Display	File Upload
I		IMAGE	
I		IMAGE	
I		IMAGE	
I		IMAGE	
I		IMAGE	
I			
I			
I			