FRAM71 Tool Kit

The FRAM71 Tool Kit is for use with the FRAM71 by Hans Brueggemann and consists of this document and the FRAM71TK LIF image. The LIF image is suitable for use with J-F Garnier's PIL-Box or it can be copied to a floppy disc for use with a 9114 disc drive.

Tool List:

1. ROMCOPY – *The* tool for copying ROM images and multiple files in IRAM images
   Syntax with notes on Rev E by Joe Horn:
   https://drive.google.com/open?id=0B-GPxmpKVCV0bUlzcjZXOGgwcVk
2. MEMBUF – Updated version of Paul Berger's program for displaying the memory configuration
3. F2R – Program for copying the hard-coded FORTH ROM to FRAM71
4. F2R2 – Same as F2R, but also patches two known bugs
5. T2R – Program for copying the hard-coded 41 Translator ROM to FRAM71
6. F2S – Program for copying a system ROM or the Diagnostic ROM to SYSRAM
7. DESAL – Needed for PEEKing and POKEing protected areas of memory
8. UNPROT – LEX file provided for removing the Math ROM

The LIF image contains the above files in the IRAM image FRAMTK. Included in the LIF image are the hard-configured ROM dumps and the soft-configured FORTH/Assembler and 41 Translator ROM's.

One should already be familiar with the FRAM71 manual before proceeding.

Topics covered:

1. Copying ROM images to FRAM71
2. Using the SYSRAM feature

Installing the Tools:

1. Connect either a PIL-Box or 9114 and mount FRAM71TK. In these examples it's assumed that a PIL-Box and ILPer are being used. ILPer provides a Printer on Device 1 and Mass Storage on Device 2.
2. If the 71B has 1BBBB firmware, COPY SHOWPORT:2.
3. Configure two 32K devices in FRAM71 by POKEing 2C000 with the Config String "9394000000000000". Cycle power. This creates Ports 5.00 and 5.01.
4. SHOWPORT.

```
>SHOWPORT
0.05  16384  2 ; HP-IL ROM
0      4096  0
0.01   4096  0
0.02   4096  0
0.03   4096  0
5     32768  0 ; Port 5.00
5.01  32768  0 ; Port 5.01
```

5. FREEPORT(5.01). This creates an IRAM to hold the Tool Kit.
6. COPY ROMCOPY:2

7. ROMCOPY FRAMTK:2 TO :PORT(5.01). This copies a 4K IRAM image to Port 5.01. The IRAM image contains the eight files listed above. This is the preferred method for copying multiple files or ROM images to an IRAM.

Copying a Hard-Configured ROM:

In this example the hard-configured portion of the FORTH/Assembler ROM is installed.

1. RUN MEMBUF.

```
Port Dev Seq Size Addr  Type
  0   0   0    4  40000  0
  0   1   0    4  42000  0
  0   2   0    4  44000  0
  0   3   0    4  46000  0
  5   0   0   32  30000  0    ; Chip_0 for HC ROM
  0   5   0   16  F0000  2    ; HP-IL ROM
  5   1   0   32  E0000  1    ; Tool Kit
```

   The above display shows a 32K RAM at Port 5.00 and address 30000, right where the FRAM71 manual states it needs to be. The IRAM is configured after all other RAM devices at address E0000, but that won't last for long. The above display shows the four memory devices, Ports 0.0 through 0.3 and the HP-IL ROM at Port 0.5. Where's Port 0.4? That's the HP-IL Mailbox – MEMBUF just doesn't decode that portion of the Configuration Buffer.

2. Perform an INIT:3 to clear RAM. The Tool Kit is in an IRAM and isn't deleted by the INIT:3.
3. RUN F2R. This program, File-2-RAM, reads the hard-coded FORTH/Assembler ROM dump from the LIF image and POKE's it into Port 5.00 at the address range 30000-3FFFF. The time it takes is about 13 minutes depending on computer hardware. During this time the 71's display shows the address being written and acts as a progress indicator.
4. After the download is complete the display will show 3FFC0.
5. Continuing from Step 12 on p.21 of the FRAM71 Manual:
   12. *[ON] [ON] [f] [OFF]. Insert jumper at position CN2-5.*
   13. *[ON]. From now on, removal of jumper CN2-5 may cause "Memory Lost". Always make sure that you have backed up all contents of your FRAM71 prior to reconfiguring Chip_0 to RAM.*
   14. *Verify that Chip_0 is now no longer visible as RAM: [MEM] [ENDLINE] = 16440.*
   15. *Quick-check that the download was successful: compare line 1 and line 1021 of MYROM.DMP on your PC to the contents on your HP-71B:*
       a. *[PEEK$] ("E0000",16) [ENDLINE] = "6400E4050E8F11EB",*
       b. *[PEEK$] ("EFF00",16) [ENDLINE] = "0F9CEFEADE1DADE6"*
   16. *DONE! You now have the hard-configured portion of the ROM module installed in your system. Remember to install all extra LEX files that are required before trying to use the ROM.*

6. RUN MEMBUF.

```
Port Dev Seq Size Addr Type
  0   0   0    4  30000 0
  0   1   0    4  32000 0
  0   2   0    4  34000 0
  0   3   0    4  36000 0
  0   5   0   16  40000 2     ; HP-IL ROM
  5   0   0   32  D0000 1     ; Tool Kit
```

   Chip_0 did indeed transform into the HC portion of the ROM at E0000 and the Tool Kit IRAM is now Port 5.00 and got bumped down to address D0000.

7. POKE”2C000”,”D394” to convert the HC image to ROM and cycle power.

Copying a Soft-Configured ROM:

In this example the soft-configured portion of the FORTH/Assembler ROM is installed.

1. Create a 16K IRAM to hold the SC portion of the ROM. POKE “2C000”,”D394A5” and cycle power.
2. FREEPORT(5.01) to make it an IRAM.
3. ROMCOPY FORTH1B:2 TO :PORT(5.01). This takes about 17 seconds to copy a 16K ROM image depending on computer hardware.
4. RUN MEMBUF.

```
Port Dev Seq  Size Addr  Type
  0   0   0    4  30000  0
  0   1   0    4  32000  0
  0   2   0    4  34000  0
  0   3   0    4  36000  0
  0   5   0   16  40000  2   ; HP-IL ROM
  5   0   0   32  D0000  1   ; Tool Kit
  5   1   0   16  48000  1   ; SC FORTH/Asm ROM
```

   The 16K FORTH ROM is now at 48000.

5. PEEK$(“48000”,8). The first 8 nibbles of the IRAM contain “B3DDDDDE”, the IRAM identifier or Stand Alone Module ID.
6. Optional: POKE”48000”,”00000000”. To remove the identifier.
7. POKE”2C000”,”D394E5” and cycle power. This reconfigures the IRAM to ROM.
8. VER$ should now report “FTH: 1A”!

Using the SYSRAM feature:

In this example the HP-71 Diagnostic ROM is installed.

IMPORTANT: Before proceeding with this example a means of disabling the SYSROM output by one of the two methods described in Ch. 9 of the FRAM71 manual must be available.

1. Turn the 71B OFF.
2. Install jumper CN2-4, ENA_HPSYSRAM_WRT. This is the SYSRAM Write Enable. The LED illuminates.
3. Turn the 71B ON.

4. RUN F2S. This program, File-2-SYSRAM, reads the ROM dump from the LIF image and POKE's it into the SYSRAM address range 00000-07FFF. The time it takes is about 6 1/2 minutes depending on computer hardware. During this time the 71's display shows the address being written, acting as a progress indicator, and the LED blinks.
5. After the download is complete the display will show 07FC0.
6. Turn the 71B OFF.
7. Remove the SYSRAM Write Enable jumper, CN2-4.
8. Disable the SYSROM output by one of the two methods described in Ch. 9 of the FRAM71 manual.
9. Move jumper J2 to J1 to enable the SYSRAM output.
10. Turn the 71B ON. It should beep a couple of times, check the CPU, indicate the clock speed, and wait for input. Refer to the 71 Service Manual for Diagnostic ROM operating procedures.