

HP71 Ports 6 and 7

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From the user's point of view, the HP71 can manage 6 ports:

- port 0 is the internal RAM and HP-IL port,
- ports 1 to 4 are the four front-ports,
- port 5 is the card reader port.

However, the HP71 configuration code actually manages 8 ports from PORT(0) to PORT(7). The ports 6 and 7 are not physically existing, and the port numbers 6 and 7 are filtered out by the Basic parser in all port-related commands, such as CAT :PORT(6).

Each port (except port 0) is associated with a CPU OR line that enables the corresponding daisy chain.

Port 0 has no corresponding daisy chain enable line. Port 0 is always configured first, then the other ports are enabled in turn by driving the corresponding OR line.

Port	OR line
0	none
1	OR0
2	OR1
3	OR2
4	OR3
5	OR4
6	OR5
7	OR6

I recently succeeded to use the port 6 (port 7 would be possible too) in a physical HP71 machine. The OR5 and OR6 lines are not used in the HP71 and are available to drive a daisy chain.

To test it, I disconnected the HPIL DIN (daisy chain IN) signal from the port 0 chain and connected it to OR5, moving the HPIL module from port 0 to port 6. Details are given below.

Ports 6 and 7 could be used to install ROM module in the HP71 case, instead of wiring them into the port 0 chain that requires to cut the port 0 daisy chain.

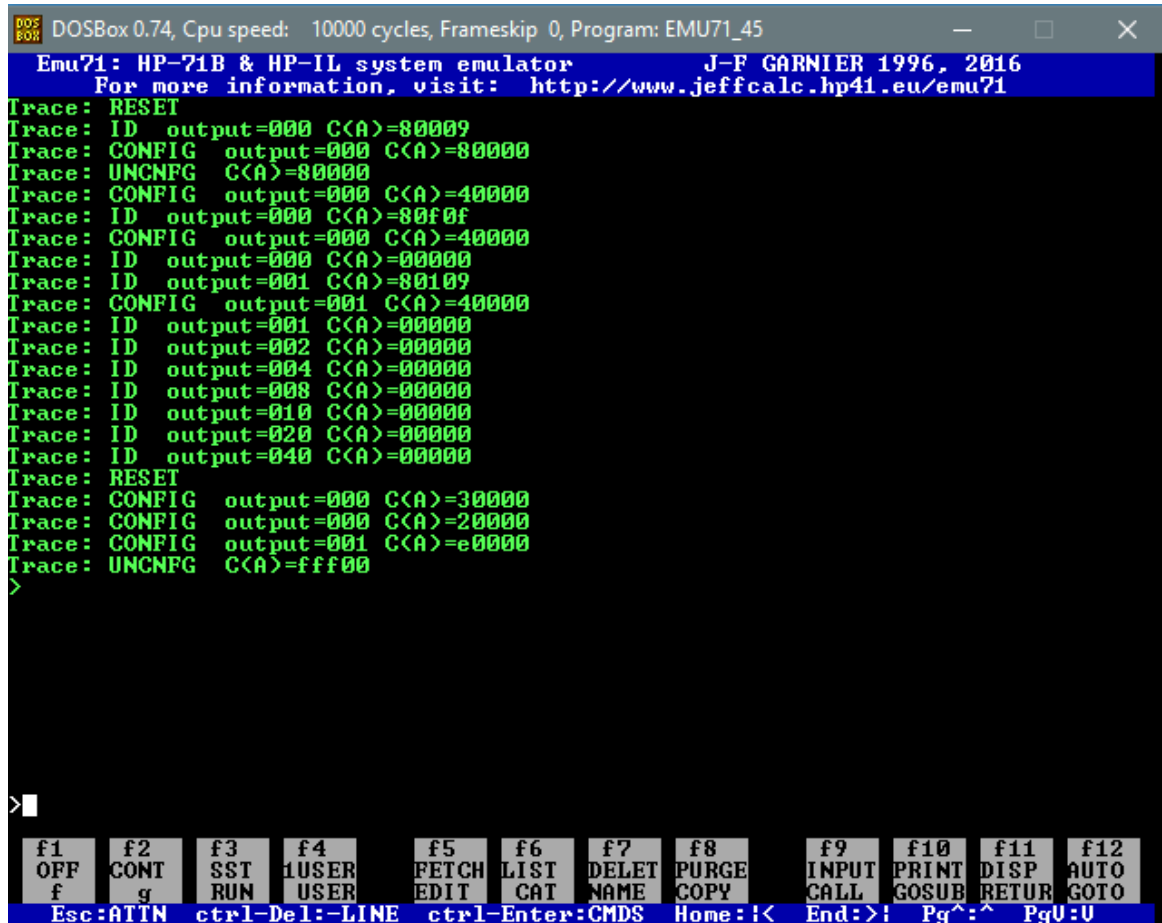
It is, however, not possible to install a RAM module in ports 6 or 7, because there would be no way to copy files into that port, since the command COPY file TO :PORT(6) would cause an 'Invalid Arg' error.

To enable the access to ports 6 and 7 in commands such as COPY file TO :PORT(6), all that is needed is to patch a single ROM location in the HP71 system ROM. This is done in Emu71/DOS (so RAM modules CAN be used in ports 6 and 7), and it could be possible to do it in a HP71 equipped with a FRAM71 and SYSRAM enabled, but I didn't test it.

The patch is to change the HP71 ROM location 09EC0 from 5 to 7.

Trace of the configuration code showing the built-in support of PORT(6) and PORT(7):

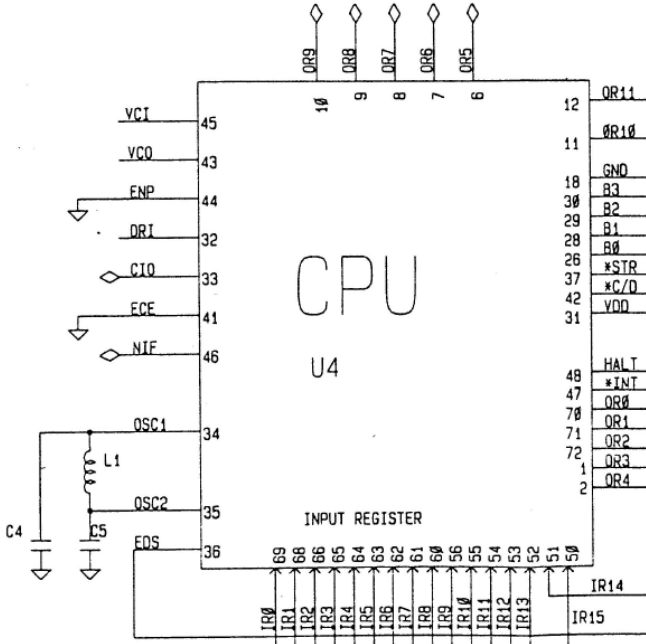
The screenshot below shows the trace of the RESET/ID/CONFIG/UNCNFG opcodes during the memory configuration, in Emu71/DOS (the trace is enabled by the command 'emu71 /t'). The HP71 first explores the port 0 (OR output = 0), then ports 1 to 7 (OR output = 1 to 0x40).



```
DOS BOX DOSBox 0.74, Cpu speed: 10000 cycles, Frameskip 0, Program: EMU71_45
Emu71: HP-71B & HP-IL system emulator J-F GARNIER 1996, 2016
For more information, visit: http://www.jeffcalc.hp41.eu/emu71
Trace: RESET
Trace: ID output=000 C(A)=80009
Trace: CONFIG output=000 C(A)=80000
Trace: UNCNFG C(A)=80000
Trace: CONFIG output=000 C(A)=40000
Trace: ID output=000 C(A)=80f0f
Trace: CONFIG output=000 C(A)=40000
Trace: ID output=000 C(A)=00000
Trace: ID output=001 C(A)=80109
Trace: CONFIG output=001 C(A)=40000
Trace: ID output=001 C(A)=00000
Trace: ID output=002 C(A)=00000
Trace: ID output=004 C(A)=00000
Trace: ID output=008 C(A)=00000
Trace: ID output=010 C(A)=00000
Trace: ID output=020 C(A)=00000
Trace: ID output=040 C(A)=00000
Trace: RESET
Trace: CONFIG output=000 C(A)=30000
Trace: CONFIG output=000 C(A)=20000
Trace: CONFIG output=001 C(A)=e0000
Trace: UNCNFG C(A)=fff00
>
f1 OFF f2 CONT f3 SST f4 1USER f5 FETCH f6 LIST f7 DELET f8 PURGE f9 INPUT f10 PRINT f11 DISP f12 AUTO
f OFF f CONT f SST f 1USER f FETCH f LIST f DELET f PURGE f INPUT f10 PRINT f11 DISP f12 AUTO
Esc:ATTN ctrl-Del:-LINE ctrl-Enter:CMDS Home:|< End:>| Pg^:^ PgU:U
```

Emu71/DOS supports the ports 6 and 7, it is possible to install ROM or RAM modules in the emu71.ini file using these additional ports.

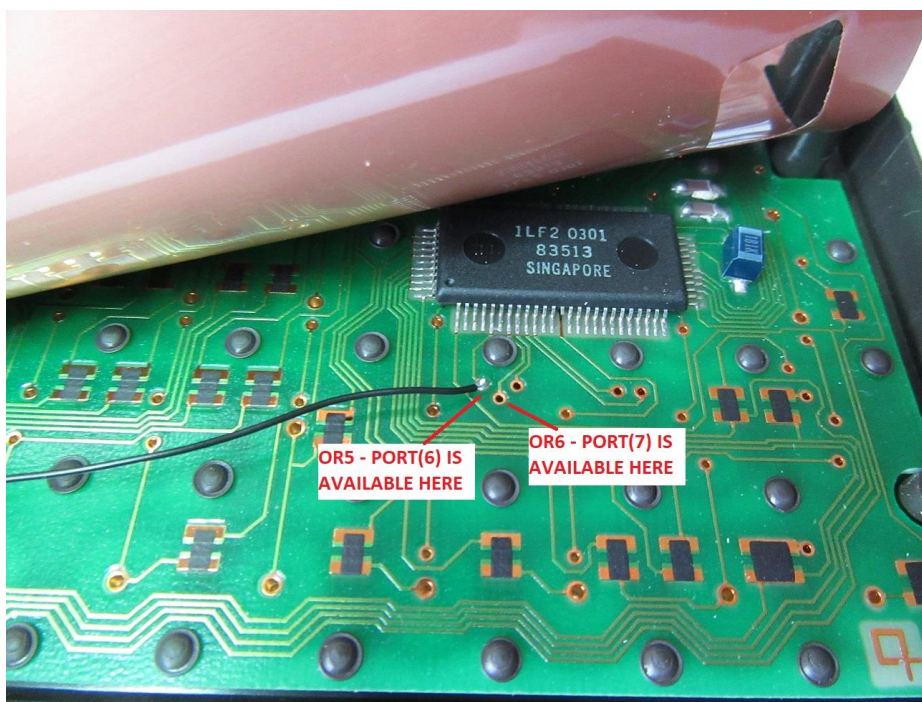
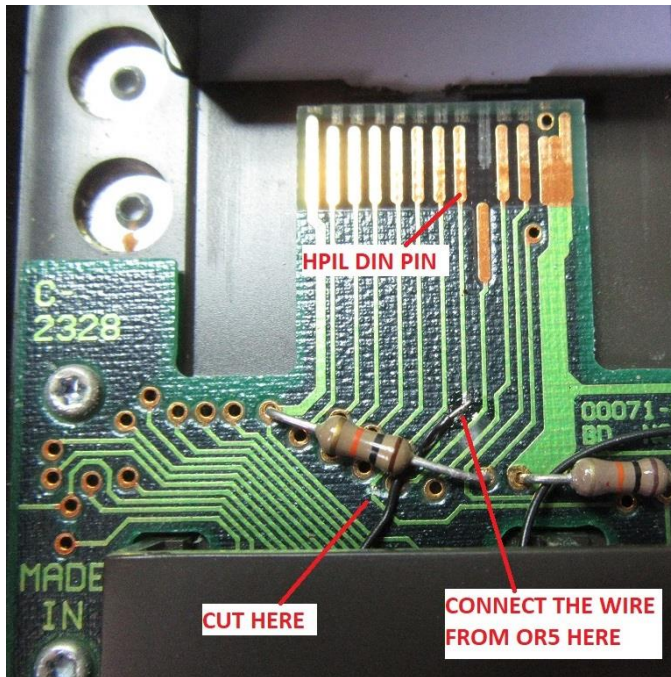
The OR5 and OR6 lines of the HP71 CPU:



OR5 and OR6 are the CPU pins 6 and 7 respectively.

Wiring of the HPIL ROM in the PORT(6) chain:

Cut the link between the HPIL port DIN pin and the chain from the internal RAM, connect the HPIL port DIN pin to the CPU OR5 pin.



Test:

```
>CAT HPILROM
```

```
HPILROM LEX 16361 08/07/84 12:00 6.01
```

The device 6.00 is now the HPIL mailbox, and device 6.01 is the HPIL ROM.