This document has been written with the aid found on the following documents:

-"Third slot for MSX computers"
(for MSX with engine S3527 such as VG8235/45 and NMS8250/55/80)
philipsnms82xxslot3.pdf   Original design: (P.M. Rooijen?)
Enhanced, typed in, converted to English and PDF by HansO, 2001

-"How to make a third slot for NMS 82XX with the unused connector MY"
3rdslotNMS8250.pdf   Erik van Son, September 2008.

Just because none of them guided me successfully to build one third slot, it forced me to search a solution for my NMS8280. Written on 2023 by gflorez.

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Please, this hack is not for non-skilled persons. Some rudiments of electronics and soldering are needed. Also, the main PCB needs to be completely dismantled from the computer because some soldering is needed on the underside. I have filled this document with information and pictures to make the procedure clear and easy, but you can potentially break your computer if you make something bad. You are warned!

Have a look at the NMS8280 Service manual to understand the directions in this guide, pages 22 and 36 are the most important.

I have modified an area of page 22 to make a schematic of what we are going to add to the computer:
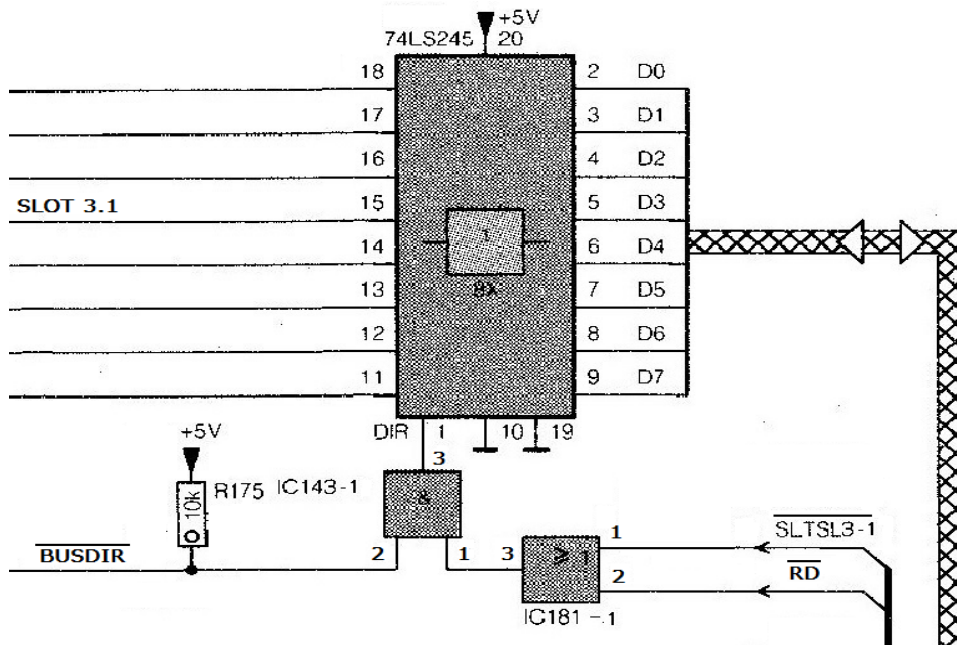
Now, we will work on page 36 turned 90 degrees clockwise for better marking the places of the solder points and the other elements. This is the PCB central area:
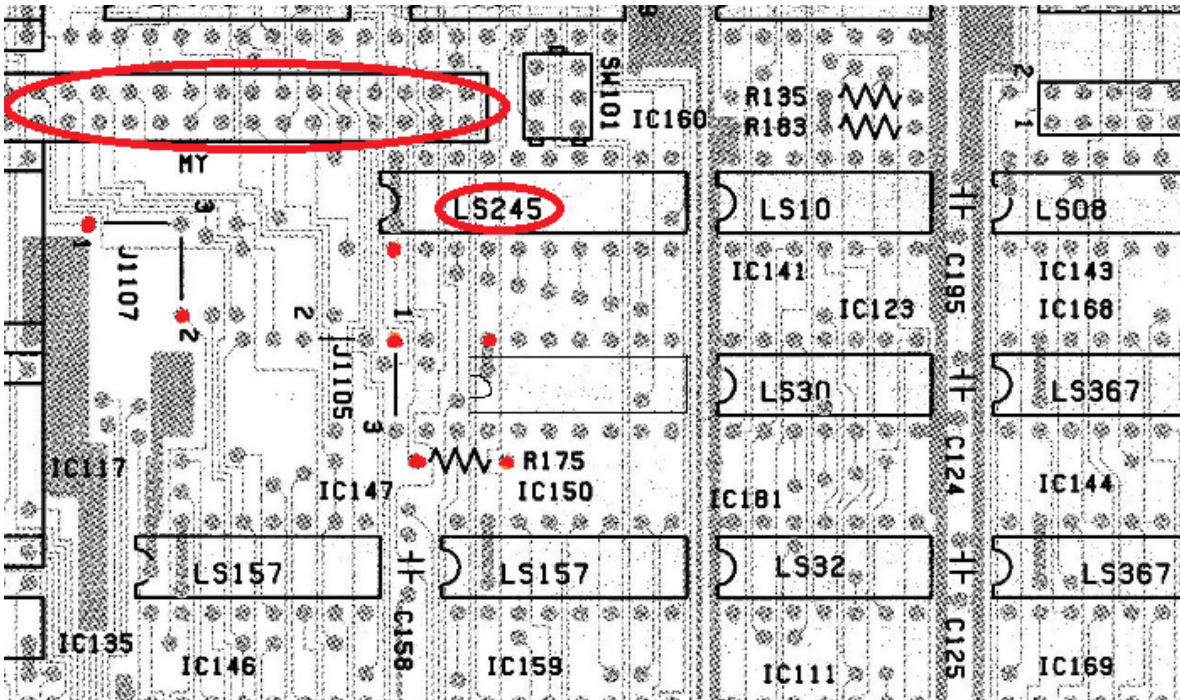
1. Remove the tin from the MY connector and solder a 40 pin IDC male connector in the empty holes.

2. Solder a wire from spot "1" -> spot "2" at jumper J1107, close to MY connector (A13 is now present on pin 11 of the MY connector).

3. Remove the tin and solder a 74LS245 chip on the empty foot-print marked as 74LS245 (close to the MY connector), but leave pin 1 bent-up (not connected).

4. Solder a 10KOhm resistor on the empty R175 foot-print (near IC150). This is the pull-up for the /BUSDIR signal on the MY connector.

5. Solder a wire from jumper J1105 spot "1" to pin 14 on the unlabelled empty foot-print near R175 (+5v is now provided on pin 3 of the MY connector).

Ok, now the 74LS245 DIR signal (pin 1) needs to be created. The solder spots can be seen here:
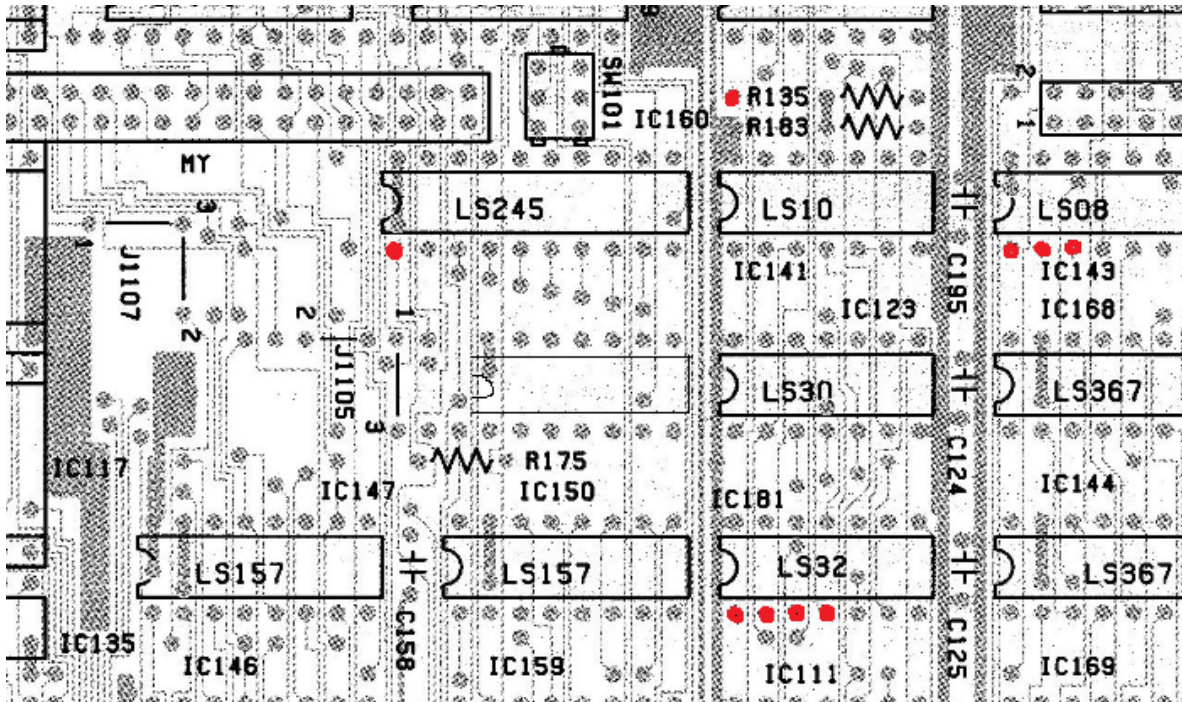
6. Near the "R" letter of the "R135" label there is a good point to take /SLT3.1, check continuity with pin 35 on the MY connector.

    -Solder a wire from that point to pin 1 of IC181.

    /SLT3.1

    -Solder a wire between pin 4(/RD) and pin 2 of IC181.

    /RD

    -Solder a wire from pin 3 of IC181 to pin 1 of IC143.

    /SLT3.1 OR /RD

    -Solder a wire from the empty hole left on pin 1(/BUSDIR) of the added 74LS245 to pin 2 of IC143.

    /BUSDIR

    -Solder a wire from pin 2 of IC143 to the bent-up pin 1 on the added 74LS245 chip.

    (/SLT3.1 OR /RD) AND /BUSDIR

Now the MY male IDC connector carries the following signals:

```
                                    +---+
01 GND          02 D7          1 |= =|  2
03 D6           04 D5            |= =|
05 D4           06 D3            |= =|
07 D2           08 D1            |= =|
09 D0           10 GND           |= =|
11 A13          12 A12           |= =|
13 A11          14 A10           |= =|
15 A9           16 A8            |= =|
17 A7           18 A6            |= =|
19 A5           20 A4            |= =|
21 A3           22 A2            |= =|
23 A1           24 A0            |= =|
25 /RESET       26 /RD           |= =|
27 /WR          28 /IORQ         |= =|
29 /BUSDIR      30 GND           |= =|
31 A15          32 A14           |= =|
33 /M1          34 /INT          |= =|
35 /SLTSL3.1    36 +5V           |= =|
37 /CS2         38 /CS1          |= =|
39 CLOCK        40 GND        39 |= =| 40
                                    +---+
```

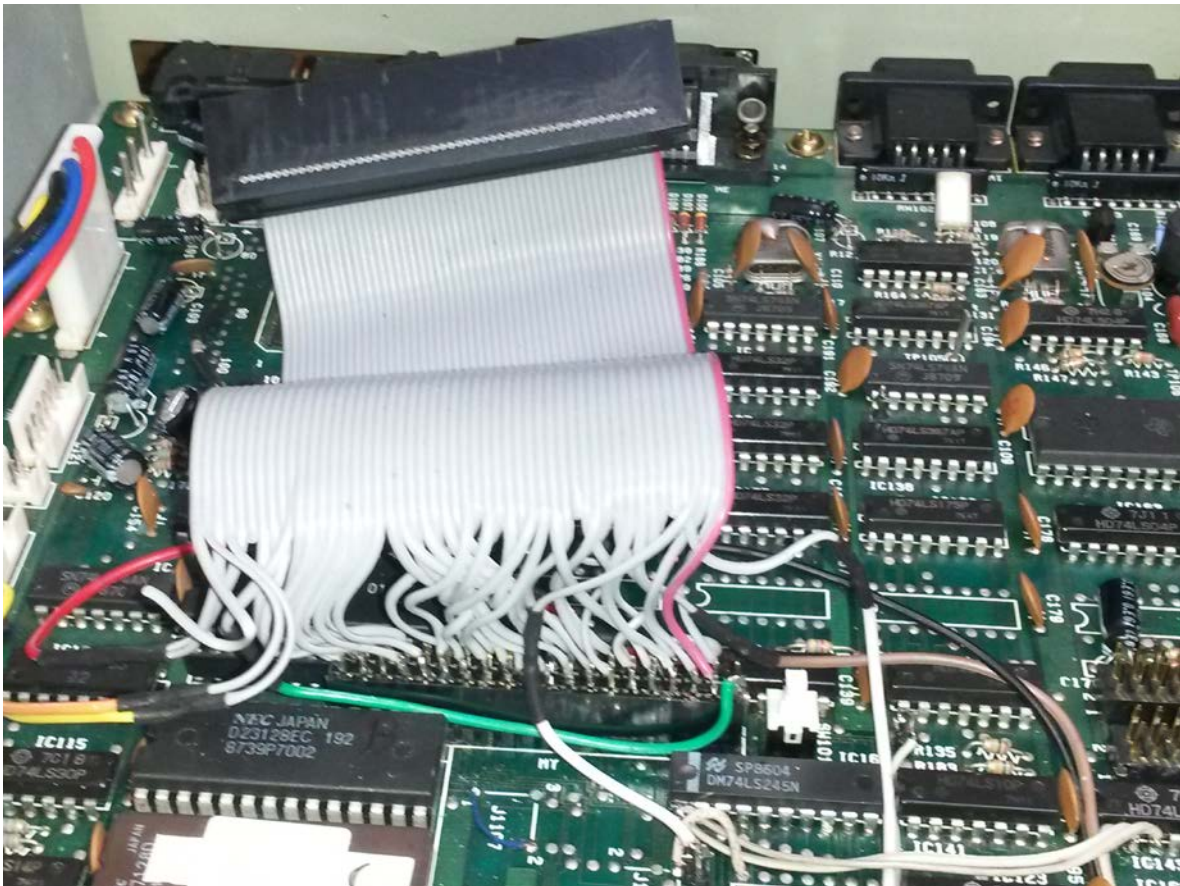And a MSX Cartridge slot pin-out is like this:

```
                                    +---+
50: -12V        49: SOUNDIN   50 |= =| 49
48: +12V        47: +5V          |= =|
46: SW2         45: +5V          |= =|
44: SW1         43: GND          |= =|
42: CLOCK       41: GND          |= =|
40: D 6         39: D 7          |= =|
38: D 4         37: D 5          |= =|
36: D 2         35: D 3          |= =|
34: D 0         33: D 1          |= =|
32: A 4         31: A 5          |= =|
30: A 2         29: A 3          |= =|
28: A 0         27: A 1          |= =|
26: A13         25: A14          |= =|
24: A 8         23: A12          |= =|
22: A 6         21: A 7          |= =|
20: A10         19: A11          |= =|
18: A15         17: A 9          |= =|
16: RSV(N.C)    15:/RESET        |= =|
14:/RD          13:/WR           |= =|
12:/MREQ        11:/IORQ         |= =|
10:/BUSDIR      9:/M1            |= =|
8:/INT          7:/WAIT          |= =|
6:/RFSH         5: RSV(N.C)      |= =|
4:/SLTSL        3:/CS12          |= =|
2:/CS2          1:/CS1         2 |= =|  1
                                    +---+
```
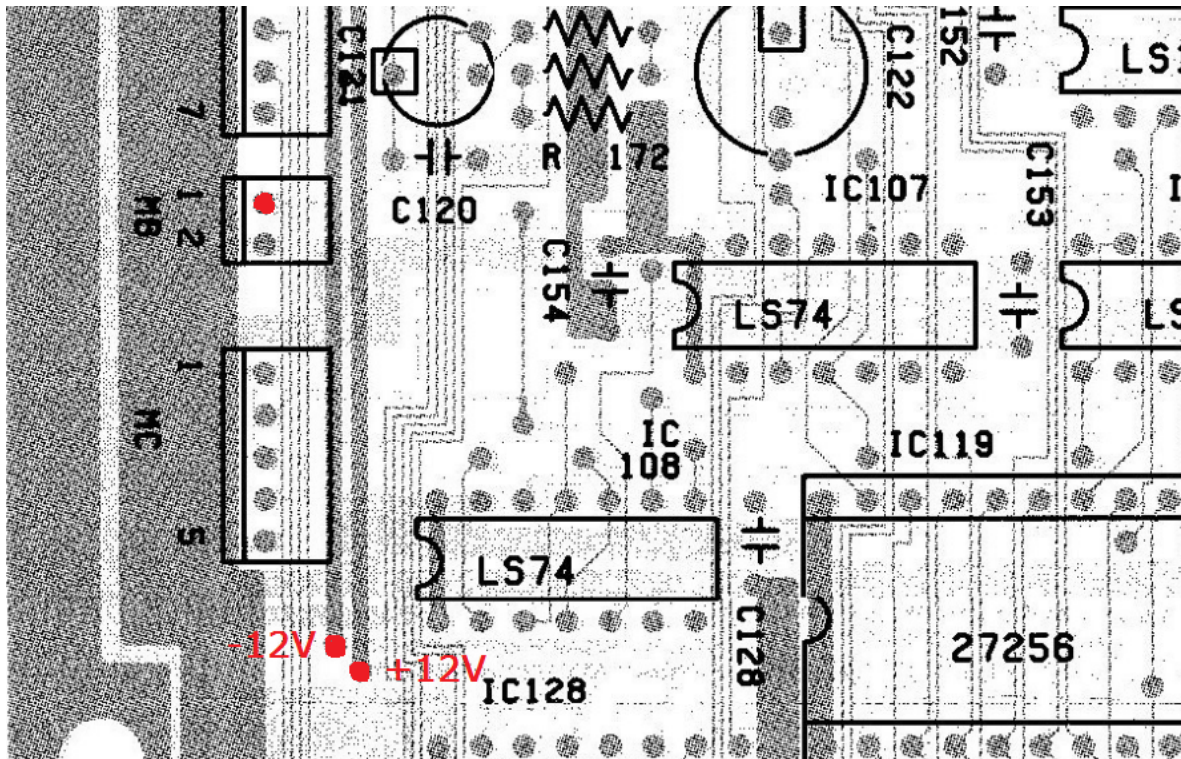
As you can see, the pin numbers start on the contrary extreme of the two connectors… but at least the signals are on similar places.

   7. Next step is to take a 50 ways flat-cable, crimp or solder a 50 pin female EDGE connector on one side, and then rearrange the wires to the signals on the other side for the 40 pin female IDC connector(for the male MY connector on the PCB).

Leave the not provided signal wires long enough on the flat-cable for later. This is the most problematic step, because a lot of errors can be introduced while braiding all the cables.

8. The following signals are not provided at the MY connector and should
be taken from the mainboard:


```
/CS12        a point near J1105
/RFSH        pin 4 on IC169
/MREQ        pin 4 on IC170
/WAIT        pin 24 on IC145(Z80)


SW1          GND
SW2          not connected
```

+12V -12V fat cooper tracks at the left and between IC108 and IC128.
Be careful to not swap the voltages on the MSX slot. Test them.

SOUNDIN   MB connector pin 1, but there is no spot accessible on the
upper side of the PCB. If sound is important for you, take a wire from
the external slots block.

If you have reached here, please check and recheck all the modifications
several times before switching on the computer.

Other considerations: This NMS8280 is the only MSX I own, but maybe
this information can serve for other models, especially those fitted
with the S3527 MSX engine. This affirmation is not mine, it is said
on the two existing documents and has a lot of logic.

But not all models can benefit, only those with an unused expanded or
unexpanded slot, and the S3527 can manage to expand the 0 or the 3 slot.
Every one of the 4 slots produced can be the objective, but this
information and the slot-map is needed just before attempting the hack.

What could change in the present procedure is only the signal used for
/SLTSL in the new slot, and there is a good description on page 7 of
the S3527 data-sheet.

Two more pictures: