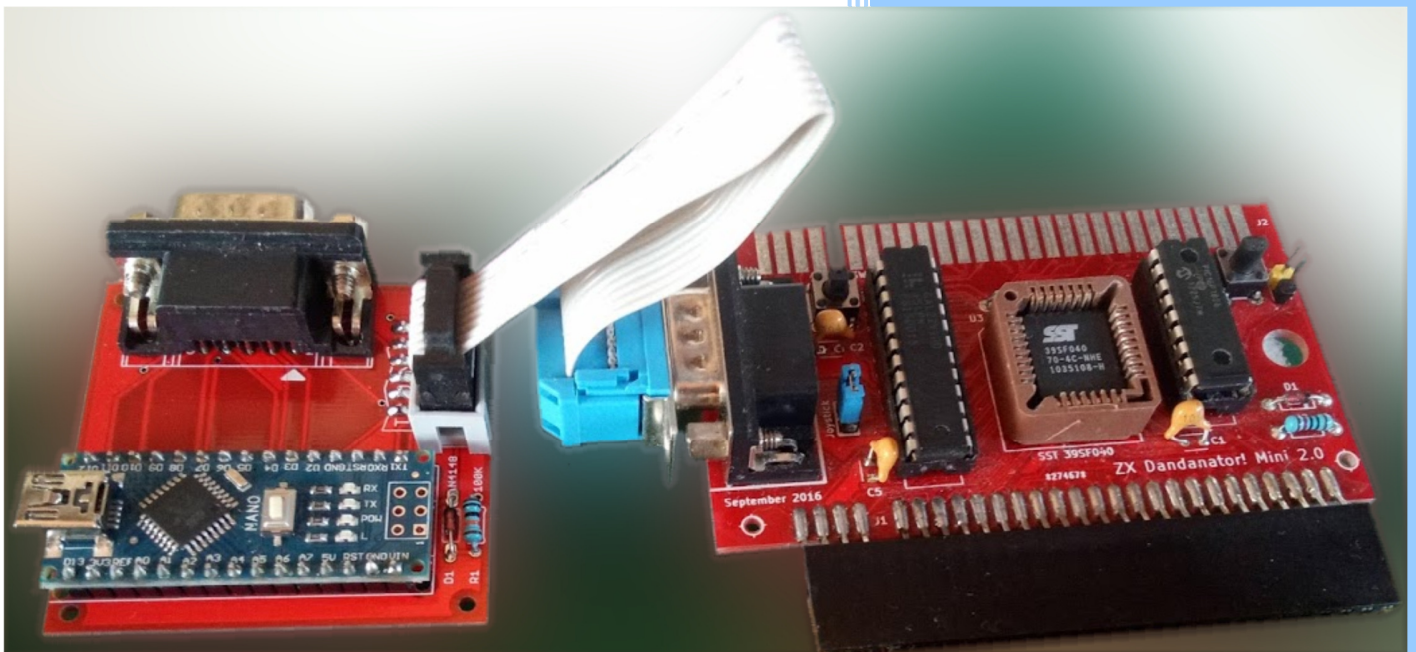


Multiply
v1.1b

Connecting a Multiply to a Dandanator v2.x



Mad3001,Dandare & OverCLK

Special collaboration Habi

Multiply v1.1b

Rev.0 28-Nov-2020 English

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REVISION HISTORY

Rev.0 28-Nov-2020 Initial English Version (equivalent to Spanish Rev.2)

LICENSING

Multiply is a team work by Dandare, Mad3001 and OverCLK.

If you are using any part of the code in this repository don't forget to mention it if you make it public.

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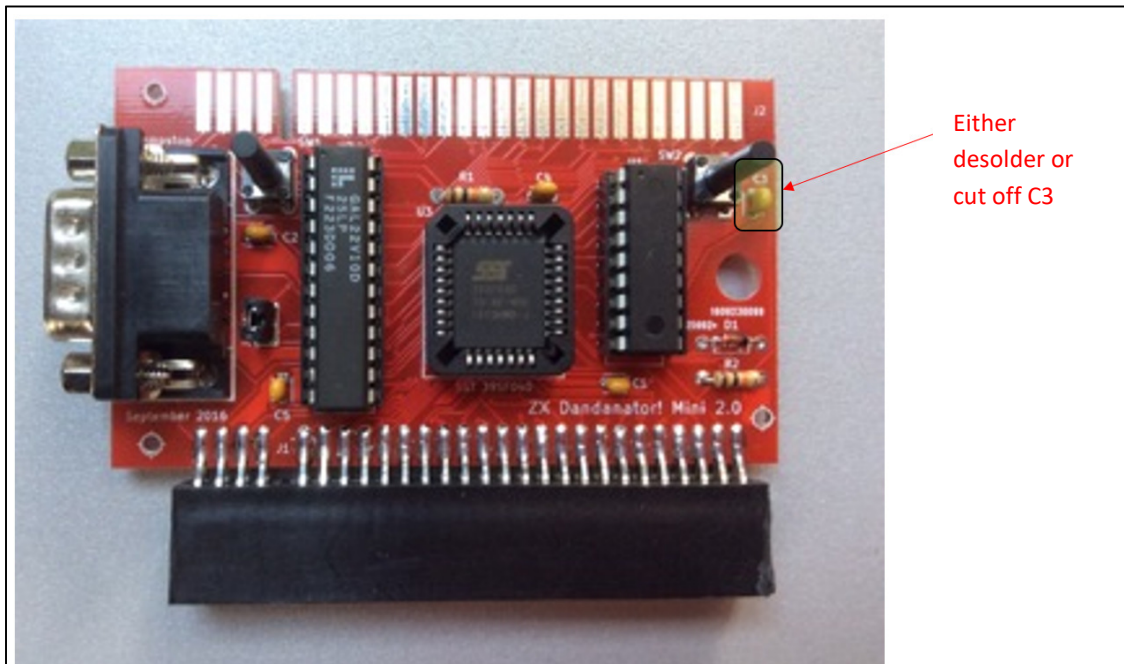


Project stored in <https://github.com/mad3001/Multiply>

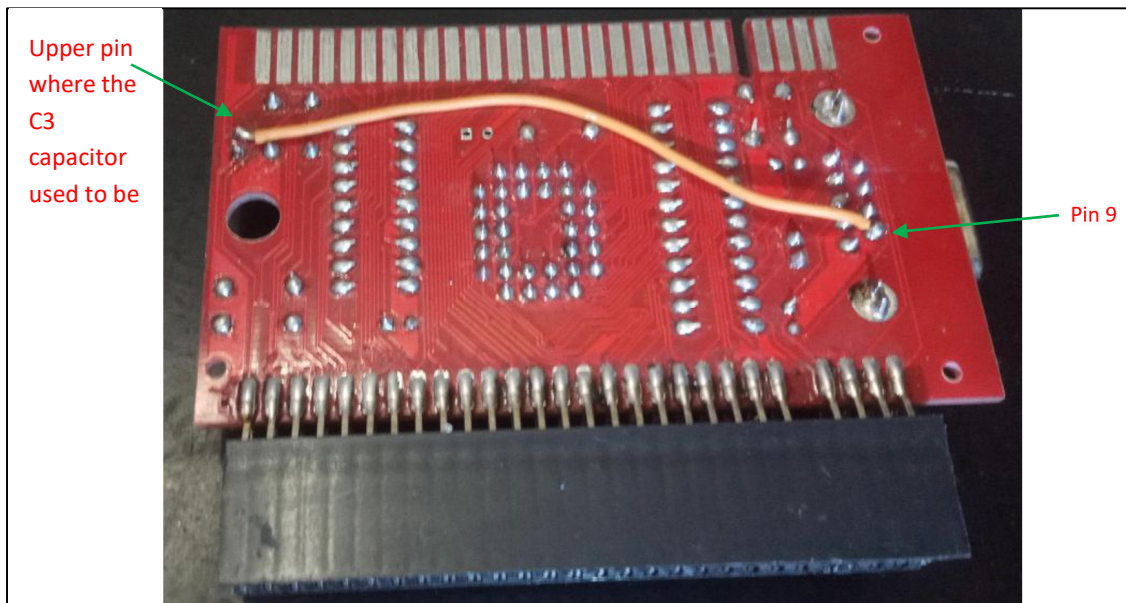
PREPARING DANDANATOR V2.X FOR MULTIPLY CONNECTION.

Before a Multiply can be used with a Dandanator v2.x, a small modification, which does not affect its normal operation, must be made (even if you do not have Multiply connected, the Dandanator will work correctly).

The capacitor next to the right-hand button SW2, which is marked **C3**:



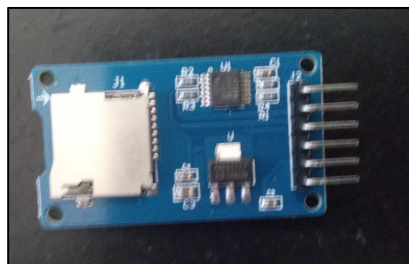
Then from the bottom of the PCB, solder a cable between the upper point where C3 was soldered (the one furthest from the "hole") to pin 9 of the joystick port:



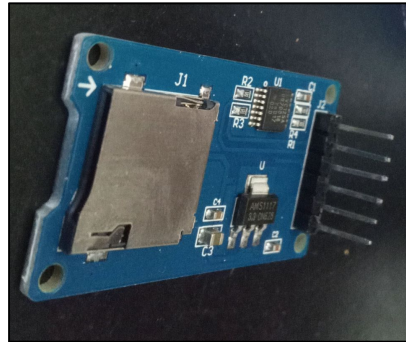
With this modification, the Dandanator V2.x is ready for connecting a Multiply, since we have just enabled a way for the dandanator PIC chip and the Multiply Arduino to communicate by a serial port.

PREPARING THE MICROSD MODULE.

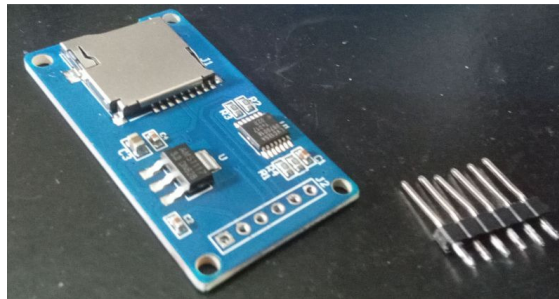
In order to make the microSD accessible, a change the pins that are soldered on the side of the components must be made:



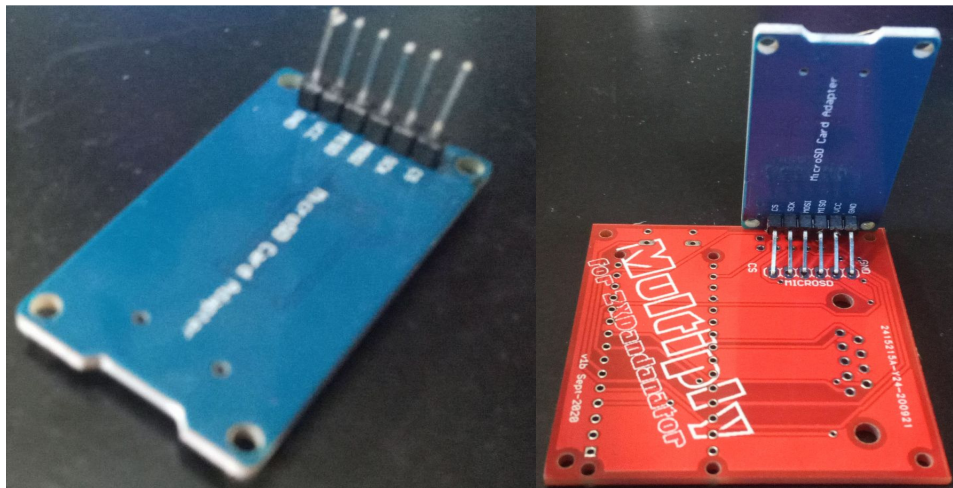
Before desoldering the pins, it is recommended to get the pins straight (or if you prefer you can use a new straight 6-pin strip and discard that one... that's up to you):



We recommend to use a decent desoldering gun/station, otherwise it is best to remove the pins one by one and use a new 6-pin strip:



Solder the 6-pin strip on the other side to match the CS and GND labels as shown below:



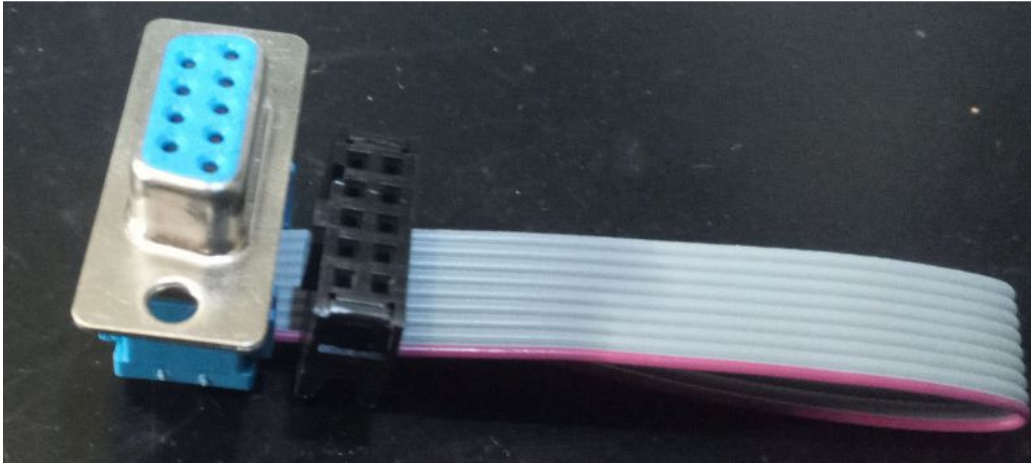
PREPARING THE RIBBON CABLE TO INTERCONNECT THE DANDANATOR V2.X AND THE MULTIPLY.

In case you do not have a cable like the one presented in the picture below, it can be easily assembled. You would only need these 3 pieces:

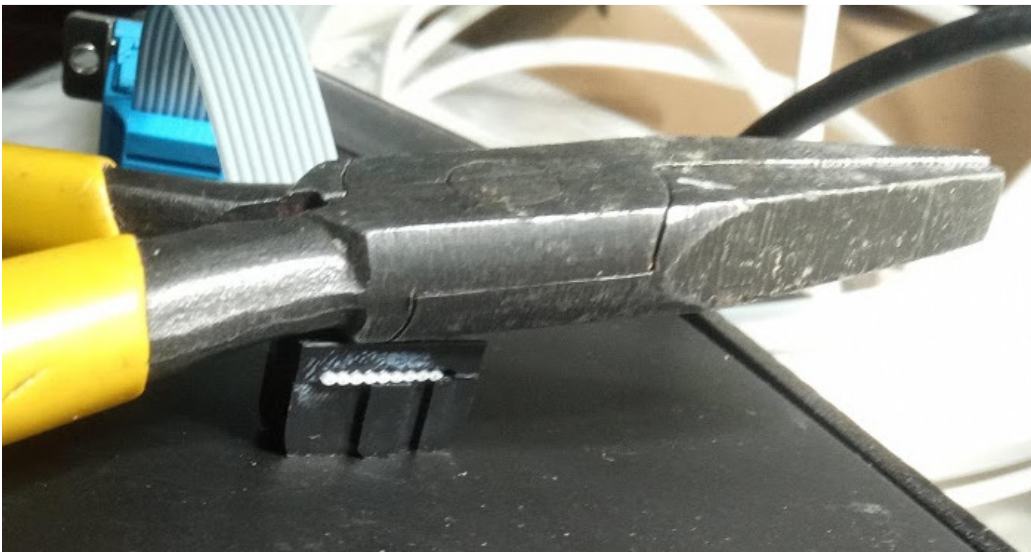
DB9 Female connector with 9-wire IDC ribbon "crimp" system (the blue one).

IDC10 female connector with IDC ribbon "crimp" system (the black one)

9-wire parallel ribbon about 10cm long.



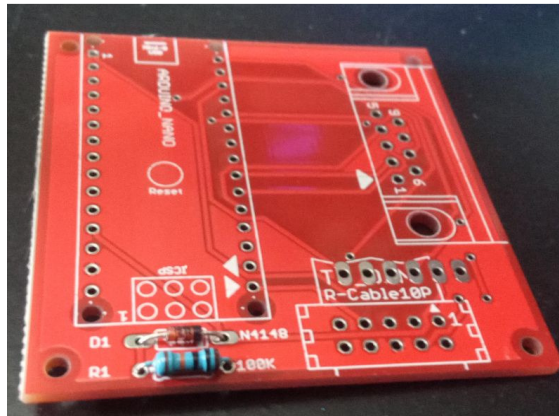
Although there are tools to tighten the connector and to "puncture" the ribbon cable, you can use any long flat plier and press slowly on the edges, ensuring that the ribbon cable doesn't move. Another alternative would be putting a flat plier on top of the connector and carefully hit it with a hammer, once the ribbon cable is placed in the connector.



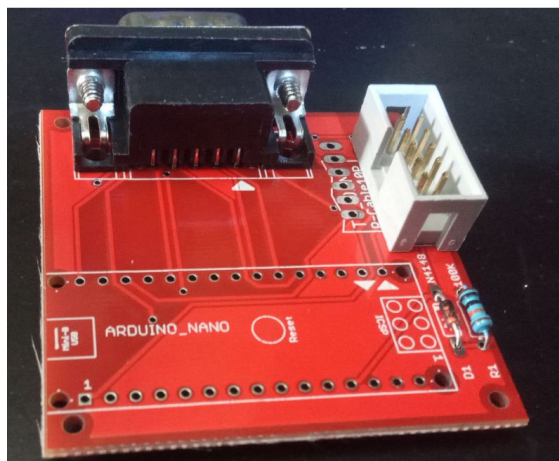
If you a factory-built cable, make sure it is properly aligned as some have one of the connectors installed the other way around.

SOLDERING THE COMPONENTS.

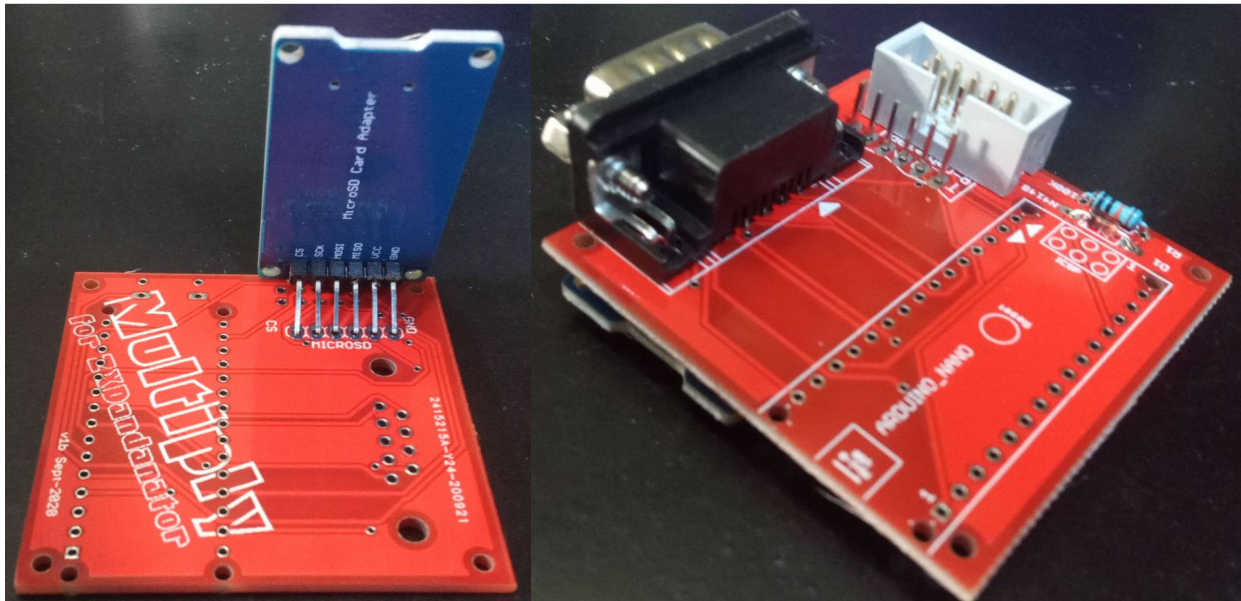
First, solder the 100K resistor and the 1N4148 diode (check that the "white stripe" on the PCB matches the black stripe on the diode itself):



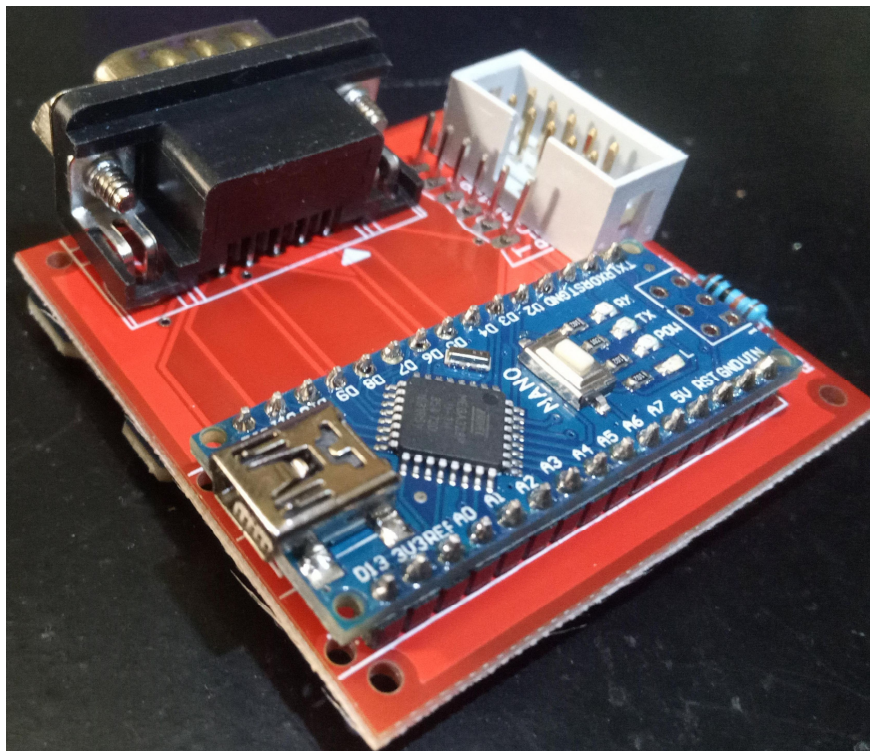
You can then solder the IDC10 (the 2 x 5 pin one) and the DB9 connector (for the joystick)... WARNING: DO NOT SOLDER the microSD daughter board before the DB9 connector:



Now, it is time to solder the microSD on the back side of the board, noticing that it "covers" the DB9 solder points (that's why the DB9 should always be soldered in advance). As you can see it corresponds to those 6 pins seen to the top-right in the picture below):



And finally the Arduino:

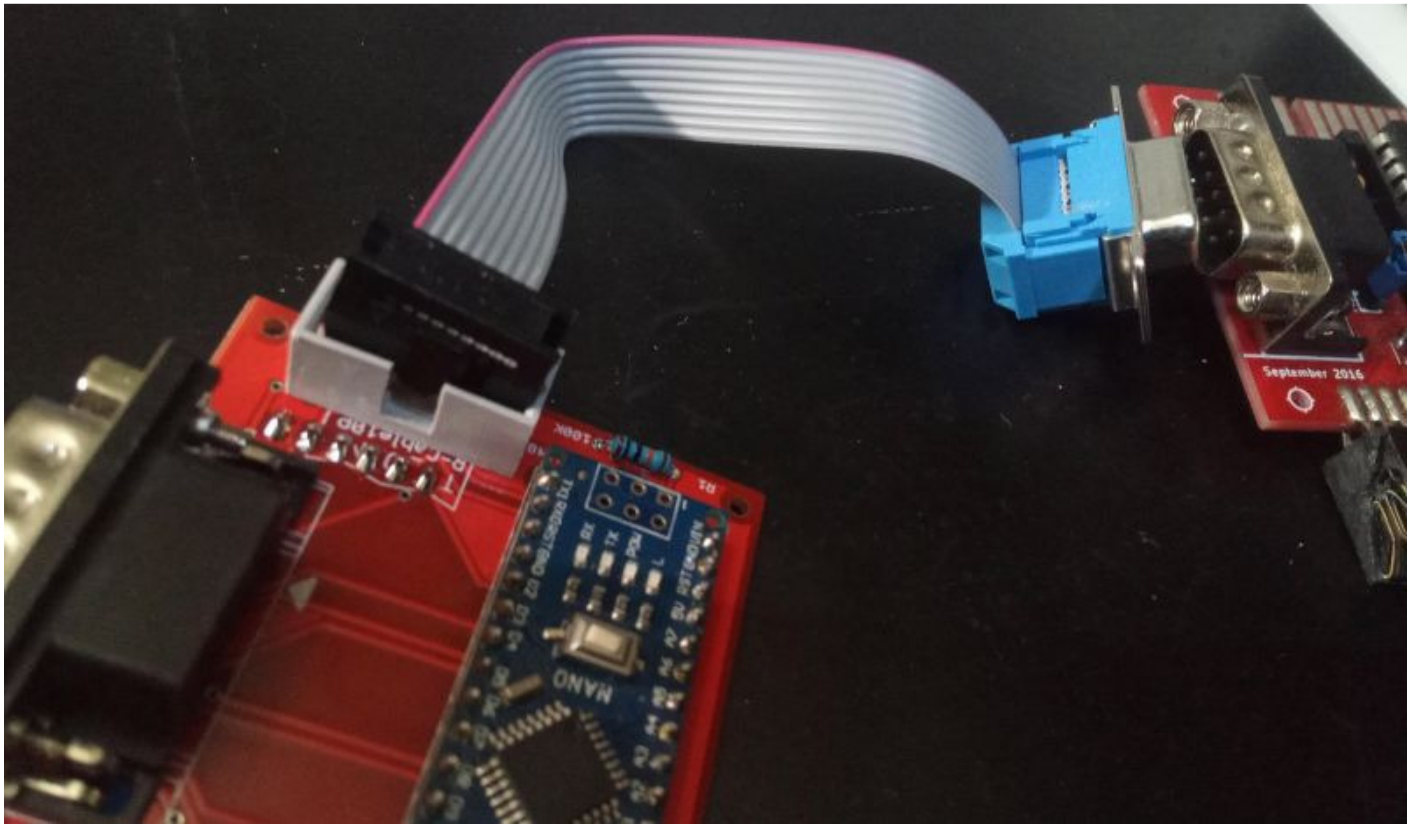


You could cut away the 6 pins of the microsd, so the multiply will look like this:



DANDANATOR – MULTIPLY INTERCONNECTION.

As with every ZX Spectrum peripheral, **remember that the connection must be made with everything turned off** (even if the Dandanator is already plugged on the zx spectrum). Although the circuit has many ESD and voltage protections, shorting terminals when plugging the board is something common. Should this happen, it will most likely damage the Multiply, the Dandanator and even the ZX Spectrum in the worst case scenario.



MICROSD, CONTENT REQUIRED.

Unlike other SDCard based systems, Multiply does not require any particular file to be placed in the microSD.

The card, however, must be formatted in either FAT16 or FAT32.

You can include in the microSD the program files you want to load to your Spectrum.

The currently supported formats are:

- 48k Snapshot. SNA Extension.
- 128k Snapshot. SNA Extension.
- 16k Snapshot. Z80 Extension.
- 48k Snapshot. Z80 Extension.
- 128k Snapshot. Z80 Extension.
- TAP files, whether single-loaded for play or multi-loaded. Taps that use a custom loader (that does not use the spectrum ROM, like turbo games) will not work.
- SCR files. Zx spectrum screens with length 6912 bytes.
- ROM files that have been generated with the Romset Generator. Length 512Kbytes.

FIRST BOOT OF THE DANDANATOR V2.X + MULTIPLY SYSTEM.

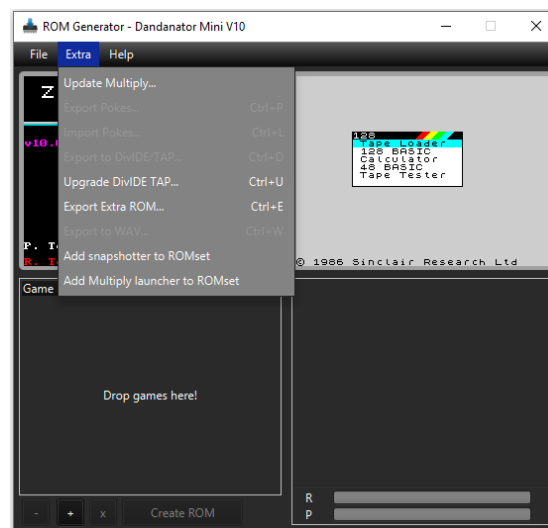
The first time (and only the first time) that you are going to use Multiply you have to do a few steps to prepare the Dandanator and the Multiply.

Before updating the Dandanator you would probably have a romset and firmware that do not support the Multiply extension.

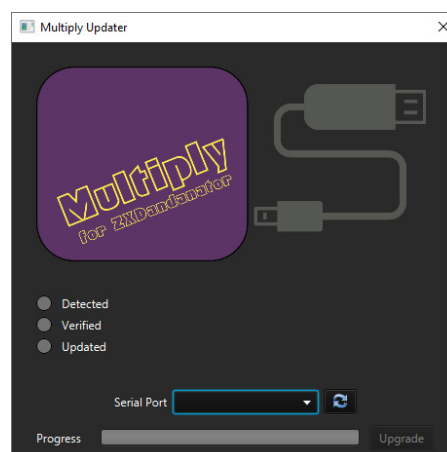
Version 10.0 of both the romset and the Dandanator firmware is required. This version 10.0 of both adds the extra functionalities that Multiply requires to work properly. Therefore, you will have to use version 10.0 of the romset generator for the following steps.

Open the ROMset generator v10.0 and proceed to configure the Multiply.

Open the Romset generator and in the upper menu option "Extra" choose "Update Multiply"



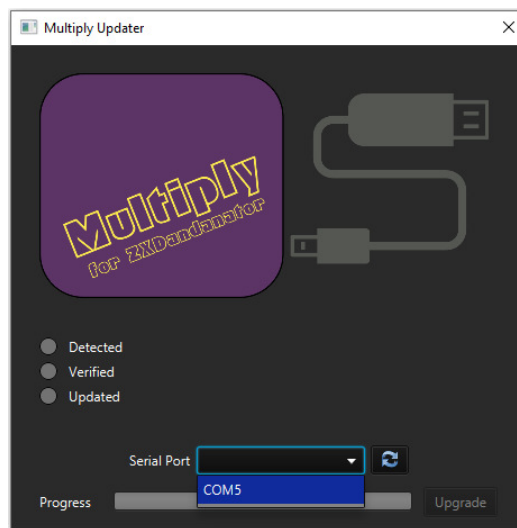
A new window like the one shown below will appear:



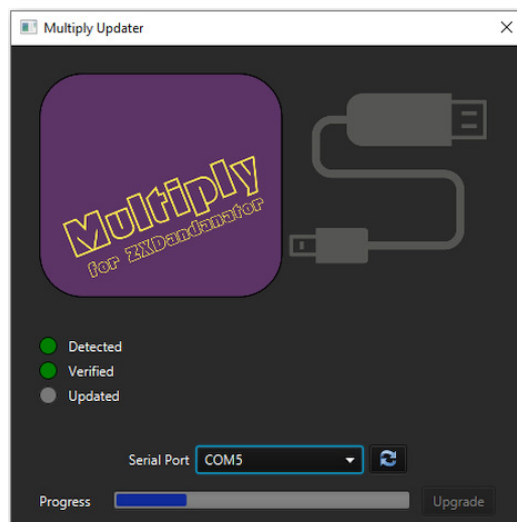
Deploy "Serial Port" and it should be empty or maybe some serial port you already have in your PC will come out, in that case look at the ones you have and write them down (sometimes bluetooth ports appear as serial ports).

With the Multiply "WITHOUT CONNECTING TO THE DANDANATOR", connect the USB cable between your computer and the Arduino of the Multiply. The computer will detect the USB and add a new COM port.

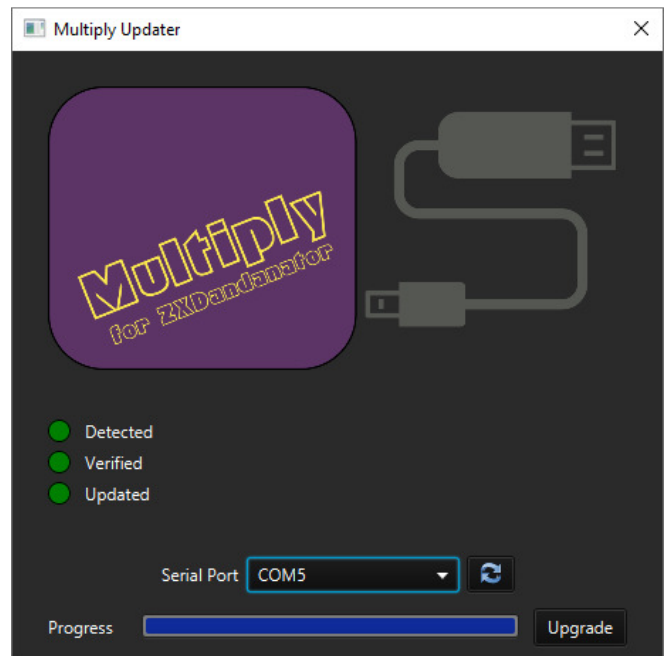
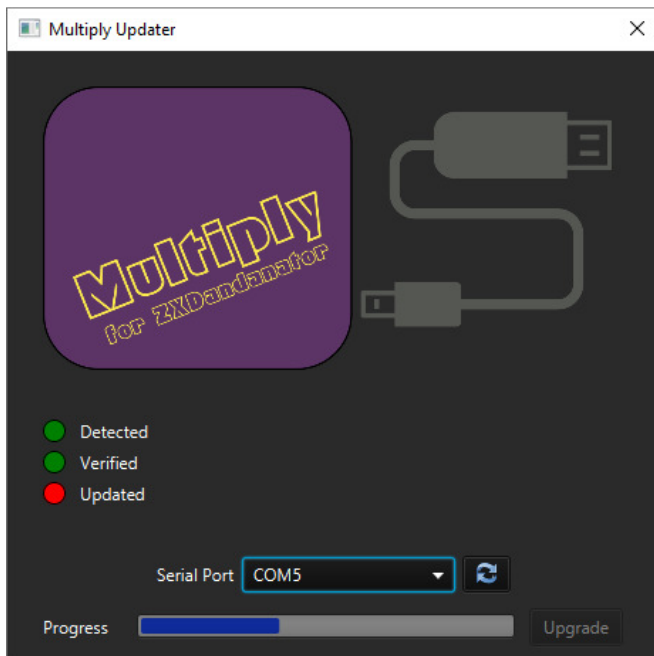
In the previous window of the ROMSET generator, click on the "refresh" icon next to "Serial Port", a new serial port will appear (in this example COM6). If you already had other serial ports in the previous step, the correct one will be the new port that did not exist before (by default):



Once the serial port has been chosen, click on Update. Wait a little, depending on the bootloader that the Arduino Nano has (old or new bootloader) it may take a little longer or a little less time to update, during the programming you will see the progress bar advancing:



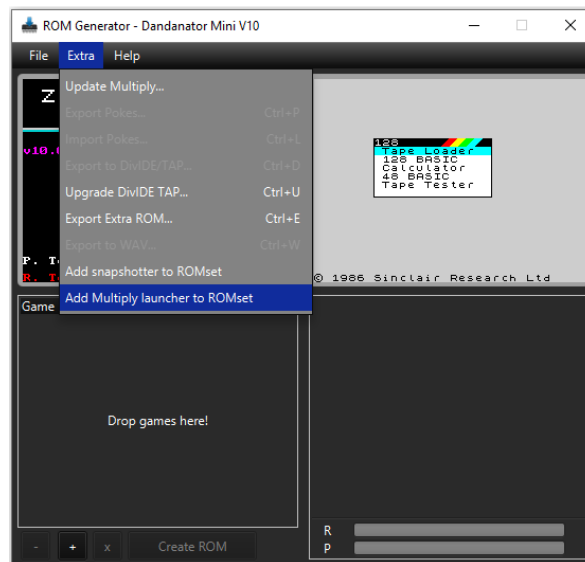
In case of failure in the recording process of the Arduino, the circle next to "Updated" will be red (left image) and if it ends well it will be green (right image):



If everything went well (updated in green) the Multiply is ready, but the correct ROMset is still missing.

CREATION OF THE ROMSET AND SENDING TO DANDANATOR

When creating a romset (you can import a previous one that you have already created so that it can be updated to v10.0), you must include the Multiply function, which "consumes", in the current version, 32Kb of the EEPROM (of the 512Kb that it has). To do this, go to the "Extra" menu and choose "Add Multiply launcher to ROMset":



Once you have prepared your ROMset, and only if it is in a version lower than 6.0 (v4.x and v5.x), you should use the usual ROMset recording system in Dandanator, either by sending it through the serial port, using Divide or the slow (but grating) audio system.

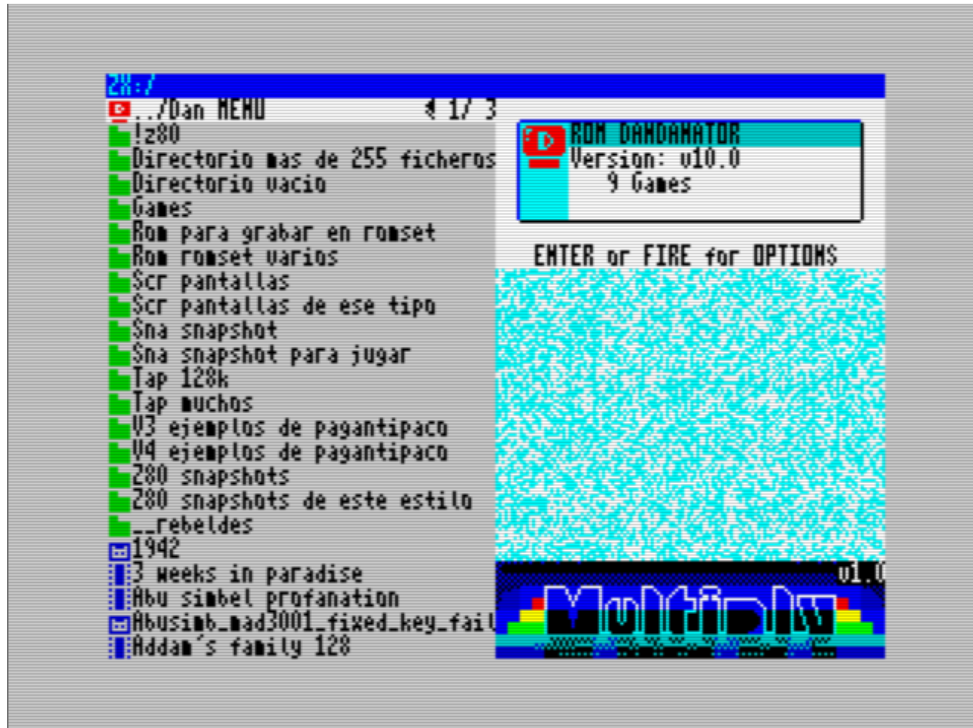
Once Dandanator has the romset in version 10.0 the Dandanator firmware must be updated. To do this, switch off the ZX spectrum and switch it on with the 2 dandanator buttons pressed. In a few seconds the firmware will be updated.

Remember that you can continue to use Dandanator as before, whether it is Multiply connected or not.

To access Multiply in the Dandanator menu choose "Launch Multiply" (or the name of it if you changed the name in the ROMset generator):



If everything is correct and the microSD has valid files, the Multiply menu will appear:



The navigation through this menu can be done with a joystick (if you have one connected in the Multiply) or with keys:

- Q-W-E-R-T keys or Joystick Up.
- A-S-D-F-G keys or Joystick Down.
- I-P-SYMB SHIFT keys or Joystick Right (go to next page)
- U-O-CAPS SHIFT keys or Joystick Left (go to previous page)
- ENTER key or shoot on the Joystick to enter directories or launch snapshots, etc...
- - SPACE key or 2nd Fire Button, if you have a Sega type joystick with more than 1 button, to return to the first element of the current folder or to return to the previous directory if it is already located in the first element of the current folder.
- The arrow keys (or keys 5-6-7-8) can also be used for up, down and page turning.

The permitted joysticks (without requiring any changes to either the joystick or the Multiply) are

- Joystick standard atari
- Joystick SJS (Sinclair Joystick). It is enough that it has GND on pin 8..
- Joystick SMS (Sega Master System) with 2 fire buttons (both can be used)
- Joystick Sega Megadrive with 3 fire buttons (button B and C are used)
- Joystick Sega Megadrive with 6 fire buttons (button B and C are used)

Keep in mind! Always connect the joystick BEFORE switching on the ZX Spectrum.

The information displayed in the multiply menu is as follows:

The blue bar at the top indicates the path in the microSD, initially it is ZX:/ and as you "enter" folders it will indicate the full path. If the number of characters on the screen is exceeded, only the final part of the path will be displayed (the ~ symbol after ZX:/ indicates that the path is longer than it should be):



Just below the "path" we have the indicator of the current page of files in the current folder and the number of pages in it. The maximum is 99 pages. If there are more than $(23 \times 99) - 1 = 2276$ files, we can only see the first 2276. In any case, even though there is this possibility, in order not to slow down the file system, we recommend a maximum of 11 pages $(23 \times 11) - 1 = 252$ files. Every 11 pages another group of files is "read" from the directory and this content is ordered, which can slow down the navigation at that time.



The first icon ".../Dan MENU" allows you to exit Multiply and return to the usual Dandanator menu.

Folders have a green folder icon. You can enter to navigate through them.

The other icons indicate the different types of file allowed (browse, look in the right box for the information offered by each type of file).

Please note that Multiply will only display the files it can handle, excluding any other files that are not supported, . The filtering level also excludes hidden files and files that, although they have the correct extension, have invalid content. For example, an SCR file must measure 6912 bytes, a Snapshot or TAP file must have a valid header. In addition, if the file is for a Spectrum 128k and you are using a Spectrum 48k, the file will not be listed either.

When entering each folder (or the root folder), Multiply will indicate if the browsing performance in the current folder is degraded because it contains many invalid files: deleted, wrong or not compatible.

The SCR, SNA and Z80 files offer a preview of the screen in the small window on the right. TAP files will only offer the same type of preview if they have a valid screen inside. ROM files that are valid ROMSet files (generated in the generator) can be previewed and saved in the Dandanator (replacing the current romset). If you select a ROMSet of version prior to 10.0 you can also save it but you will be told that it is NOT compatible with Multiply. That means that to use Multiply again you will have to re-record a ROMSET of version 10.0 or higher. Unlike the first time (when Multiply was not yet ready), now with Multiply you will be able to record via serial from the Dandanator menu with the option "L=Loader" even if you installed a romset lower than 10.0, so you can forget about the previous methods of recording by serial, split or audio. As you can see, the only requirement is that the Dandanator firmware is 10.0

or higher, so if after installing a ROMset lower than 10.0 you do an update of the PIC, you will need to perform the step of recording a ROMset by the previous methods (serial, divide or audio) and update the PIC again to firmware 10.0 or higher.

The system starts up as soon as the last time it was switched off. In any of these three options:

- basic spectrum
- dandanator menu
- multiply menu

To switch from dandanator to multiply, simply launch it as if it were just another game.

To go from multiply to dandanator, you "upload" a directory from the root in the multiply navigation. It appears as ".../ZX Dandanator" where the "..." would be, at the beginning of the list.