DivMMC

SinDiKat edition

Brief instructions for use and basic technical information

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https://vym.cz/divmmc

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What is divMMC SinDiKat edition

The DivMMC SinDiKat edition is a microSD card(s) connection device, which can be used as a program and data storage for Sinclair ZX Spectrum computers and compatibles. It uses the esxDOS operating system, which takes care of working with memory cards, loading programs, managing files, etc.

DivMMC was created by enthusiasts from the SinDiKat group (Sinclair, Didaktik – Club of Active Technicians). It is based on the original divMMC by Mario Prato.

Overview of basic features

- NMI button to call up the file menu
- RESET button
- Connector for KEMPSTON joystick
- POWER indication LED
- LED indicating operation with memory cards - CARD0 and CARD1
- MAPCOND LED – indicates device and esxDOS operation; lit in MAPRAM mode
- Two microSD card slots for SD/SDHC
- RAM 512 kiB – used by esxDOS and possibly also special programs
- EEPROM memory 8 kiB – contains basic parts of esxDOS
- Pass-through edge connector for connecting other peripherals
- divMMC+RTC variant includes a battery-backed real-time clock
- Custom 4 MHz oscillator for higher stability
- Powered directly from the computer
- Jumpers for operation on Spectrum +2A/+3 machines, disable writing to EEPROM
- Possibility to deactivate Kempston interface – useful for Didaktik computers etc.
- Fully supported by esxDOS / fully supports esxDOS

Compatibility with ZX Spectrum and clones

The computers in the following list have been tested and are working with divMMC SinDiKat edition.

- Sinclair ZX Spectrum 48, Issue 2, 3, 4, 6
- Sinclair ZX Spectrum +, Issue 6 / Delta
- Sinclair ZX Spectrum +128K, Issue 6A, 9G
- Sinclair ZX Spectrum +2
- Sinclair ZX Spectrum +2A, +2B   - +2A/+3 jumper must be closed
- Sinclair ZX Spectrum +3   - +2A/+3 jumper must be closed
- Harlequin 48, Harlequin 128, Issue 2G *)
- Didaktik Gama 88, 89   - it is necessary to disable KEMPSTON
- Didaktik M 1992
- eLeMeNt ZX, v.1, v.2   - it is necessary to disable the internal divSD interface
- Timex TC2068A, **)

*) If you connect divMMC to Harlequin computers, pay attention to the settings of Kempston. In some versions, you need to remove the internal IO to operate the port (HC366) from the computer, unless there is a jumper on the board to block it.

**) Timex TC2068 – the TS-2068A board revision has the same bus as the Spectrum (just a bit extended) and works with divMMC SinDiKat Edition without hesitation. Attention! Timex TS2068 has the bus connected differently and the destruction is certain!

Compatible peripherals

Since the divMMC SinDiKat edition has a pass-through edge connector, it is possible to attach other peripherals designed for ZX Spectrum to it at the same time. The following list contains fully working peripherals with divMMC SinDiKat edition.

In some cases it is necessary to disconnect the KEMPSTON jumper and thus block the joystick port function in divMMC to avoid collision with the interface in the peripheral – in the list, this is marked as „disconnect KEMPSTON". If there is a „disable KEMPSTON" note, it means that the Kempston Joystick can be disabled in the peripheral and used in divMMC. Sometimes, the user can even choose from both possibilities.

- Didaktik Melodik
- SinDiKat Melodik II.
- Tesla UR-4   - disconnect KEMPSTON
- Velesoft K-Mouse Turbo   - disconnect or disable KEMPSTON
- ZX VGA-JOY   - disconnect or disable KEMPSTON
- Noby's „Ayčko" interface
- Sinclair ZX Interface 2   - without inserted ROM cartridge
- RAM Tubro Interface   - without inserted ROM cartridge
- and certainly many others

To connect peripherals that are not listed as compatible, please consult the online forums dedicated to Spectrum computers.

Safety notice

Before connecting or disconnecting any hardware to the computer bus, the computer must be powered off! This also applies to connecting any other peripheral to divMMC using its pass-through edge connector.

Before connecting to the computer bus – edge connector – make sure that the key is firmly seated in the connector. Then slide the connector onto the PCB so that the connector key fits into the slot on the computer's PCB. It is also possible to clean the computer connector as a precautionary measure using a cotton bud and pure isopropyl alcohol (IPA). Do everything with care and attention, the PCBs of our computers can be over 40 years old.

Verify that the computer you are using has a ZX Spectrum compatible bus, see the list of tested computers above. Also keep in mind that divMMC cannot be connected to a computer along with incompatible peripherals.

Incompatible peripherals

The following is a list of peripherals which are not compatible with divMMC. This is because they use their own ROM or RAM and have a similar principle of function, i.e. detection of their own commands, ROM mapping, etc. For the most part these are floppy or disk controllers or interfaces from the Multiface family.

- Sinclair ZX Interface 1
- Sinclair ZX Interface 2 / RAM Turbo interface with inserted ROM cartridge
- Sinclair ZX Printer *)
- Didaktik D40 / D80 **)
- Didaktik Interface M/P
- MB02+, MB03+ Ultimate
- Betadisk a jeho klony
- PlusD, PlusDLite
- Disciple
- ZX MMC+, ZX CF
- Spectranet
- Multiface 1, 128 a 3
- divIDE
- (another) divMMC – they cannot be daisy chained

*) ZX Printer is only partially compatible with divMMC. When working with recording media, the printer will output random clusters of dots and lines. After the recording is complete, the printer commands (LPRINT, LLIST and COPY) can be used as usual. Tested with a Timex Sinclair 2040 printer.

**) Note: For Didaktik D40 / D80 there is a described modification that allows to use D40 / D80 together with divIDE or divMMC. It is then not possible to use D40/D80 MDOS services and other controller management software must be used.

To connect peripherals that are not listed as incompatible (or compatible), please consult the online forums dedicated to Spectrum computers.

Preparing files for a new microSD card

If you don't have a ready-made microSD card (e.g. as part of the divMMC delivery), proceed as follows. Preparing the contents of the card consists of copying the esxDOS files to the FAT16/FAT32 partition of the microSD card. We recommend formatting the card first and then copying the /BIN and /SYS directories first. This will ensure that esxDOS finds these files on the card faster and therefore has a better response time. Finally, copy the rest of the files and directories of esxDOS to the card.

esxDOS files

The files are available for download at http://www.esxdos.org/files/esxdos089.zip
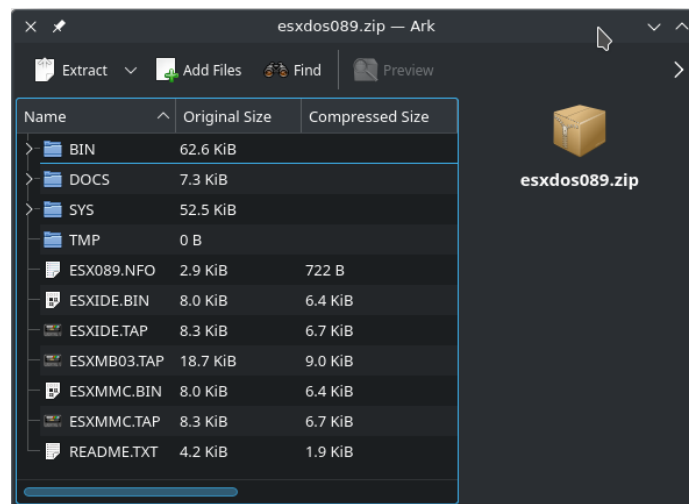
The version of the esxDOS files must match the version programmed in the EEPROM in divMMC. The version of the esxDOS including modification for a specific interface is displayed at the top right of the screen when esxDOS boots.

See the following image – here it is in version 0.8.9 for divMMC. So find the correct version of esxDOS at www.esxdos.org.

Files to support RTC

Add the RTC.SYS file to the /SYS directory according to the divMMC type. If the RTC.SYS isn't present, esxDOS will work normally, but it will display an error when it is trying to load RTC.SYS.

In case we have divMMC without RTC circuit, it is advisable to use the dummy file RTC.SYS. Then the system always returns the time and date 23.4.1982 0:00:00.

The files can be downloaded here:

For divMMC without RTC: https://vym.cz/download/zx/dummy-rtc-esxdos-0.8.x.zip
For divMMC+RTC: https://vym.cz/download/zx/divmmc-sindikat-rtc-esxdos-0.8.x.zip

Files of programs, games and demos

Finally, copy the TAP, TRD, SCL, Z80, SNA, SCR and anything else you need to work or play on the ZX Spectrum to the card. Extensive and up-to-date archive of quality games, programs and demos can be found at:

https://github.com/z00m128/diso/archive/refs/heads/master.zip.
You can e.g. place it into /DISO directory to make it clear where the files come from.

Inserting the card into the slot

DivMMC SinDiKat edition has two slots for microSD cards. The card with serial number 0 - CARD0, which boots esxDOS, is inserted into the divMMC with the top side up as standard.

The second card CARD1 is inserted with the pins facing upwards by approx. 2 mm closer to the edge connector of the computer compared with the card on the top of the PCB.

Ejecting and inserting microSD cards can be done without powering down the computer, provided the card is not accessed, as there is a risk of file system corruption. When the device communicates with the card, the appropriate CARD0 or CARD1 LED is lit or flashing. After the card is connected, a cold start of esxDOS must be performed using RESET+SPACE, so that esxDOS would detect the newly inserted card(s) and load the system files.

Note: Not all microSD cards work reliably in pairs. Due to the large number of manufacturers and the difficulty of meeting SD/SDHC standards, some combinations fail to detect both cards correctly, even though each of the cards works when used separately.

Starting a computer with divMMC connected

Now we have the divMMC connected to the computer and we have a microSD card prepared with esxDOS and other programs for Spectrum. We can insert the card into the top slot of the divMMC and turn on the computer. Then we should see a screen similar to this:

Of course, there can be differences in the disk type, name, filesystem and also the capacity may vary. The important thing is that the system files are loaded correctly. Hold down the space bar to extend the time that this screen is displayed. This is especially useful when looking for a possible error when booting the system.

Pressing RESET while holding down the SPACE/BREAK key will cause esxDOS to cold start and re-detect the connected cards.

Occasionally, when you turn on your computer, you may not see this screen, but your computer remains stuck. Then it helps to hold down the SPACE/BREAK key while turning on the computer.

Starting in USR0 mode

Spectrum 128 users may find it confusing that the classic 128 menu is not displayed. However, this is correct, the computer is running in USR0 mode and the expanded memory and audio from the AY are available.

The computer is ready to work normally, it responds to extended BASIC commands and so-called dot commands, i.e. commands starting with a dot. For example: .ls .cd .cp .mv and many others. All available dot commands can be listed using .ls /bin, where they are stored and esxDOS searches for and executes them.

A detailed description of esxDOS commands and BASIC command extensions is beyond the scope of this manual.
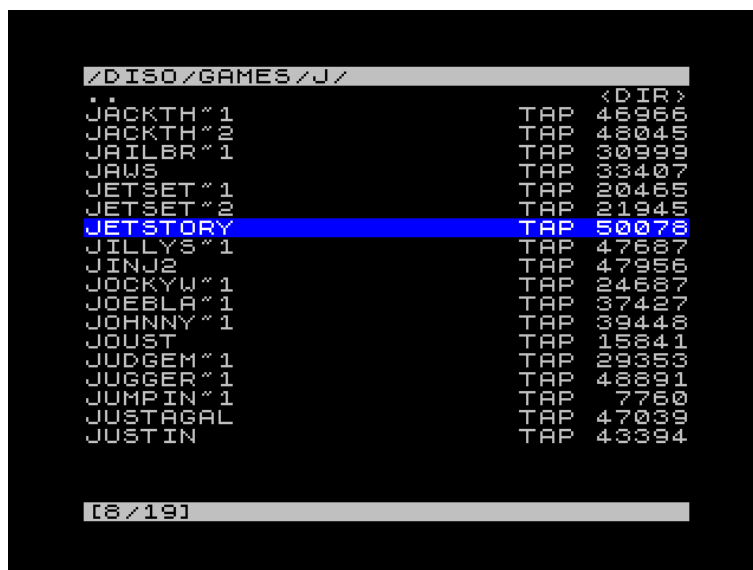
After a while, the esxDOS boot screen goes out and the classic greetings appears:

```
                        © 1982 Sinclair Research Ltd
```
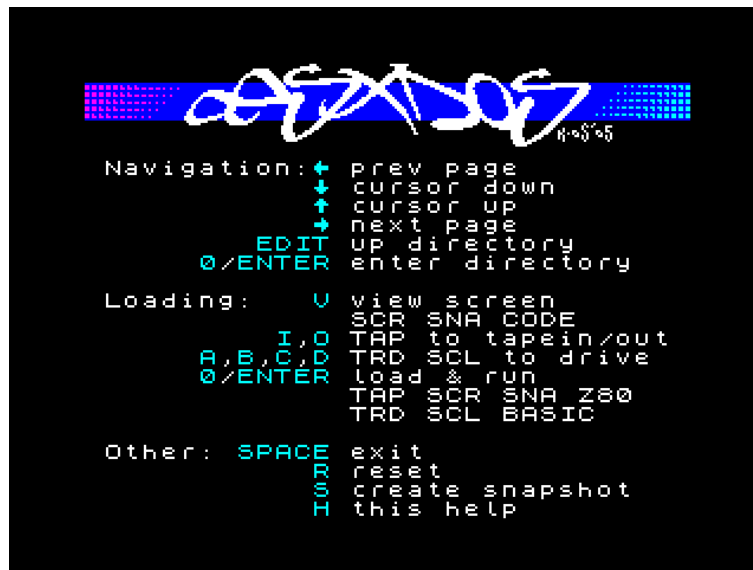
Of course, there can also be © 1986 Amstrad Plc. or © 1992 Didaktik Skalica and so on, depending on what type of computer you have or what ROM your computer has.

NMI Menu

Pressing the NMI button on the divMMC brings up the NMI menu, where you can use the cursor keys to browse the directory structure, run programs, view images in SCR format, create snapshots, etc.

```
/DISO/GAMES/J/
..                                <DIR>
JACKTH~1                    TAP  46966
JACKTH~2                    TAP  48045
JAILBR~1                    TAP  30999
JAWS                        TAP  33407
JETSET~1                    TAP  20465
JETSET~2                    TAP  21945
JETSTORY                    TAP  50078
JILLYS~1                    TAP  47687
JINJ2                       TAP  47956
JOCKYW~1                    TAP  24687
JOEBLA~1                    TAP  37427
JOHNNY~1                    TAP  39448
JOUST                       TAP  15841
JUDGEM~1                    TAP  29353
JUGGER~1                    TAP  48891
JUMPIN~1                    TAP   7760
JUSTAGAL                    TAP  47039
JUSTIN                      TAP  43394


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The NMI menu has many options, so you can use the H key to bring up the Help. All the options of the NMI menu are described here:

There are already several types of NMI menus, the replacement consists in replacing the NMI.SYS file and sometimes even other files according to the project documentation.

Another option is to use the .browse program, which allows you to browse the filesystem and run programs. It can output file names in LFN – long file names, although esxDOS does not have this capability. Installing and running this program or the alternative NMI menu is beyond the scope of this manual. You can use search engines and internet forums dedicated to esxDOS to find out more about these subjects.

Updating esxDOS

To update the whole esxDOS, you need to place a new ESXMMC.TAP file on the card and run it on your computer. This file is included with every new release of esxDOS. After loading this program, you are prompted to remove the EEPROM write protection. Use tweezers or a pin to remove the red EEPROM jumper and then press any key.

This process is sometimes called flashing, even though it is written to EEPROM, which operates on a different principle than FLASH memory.
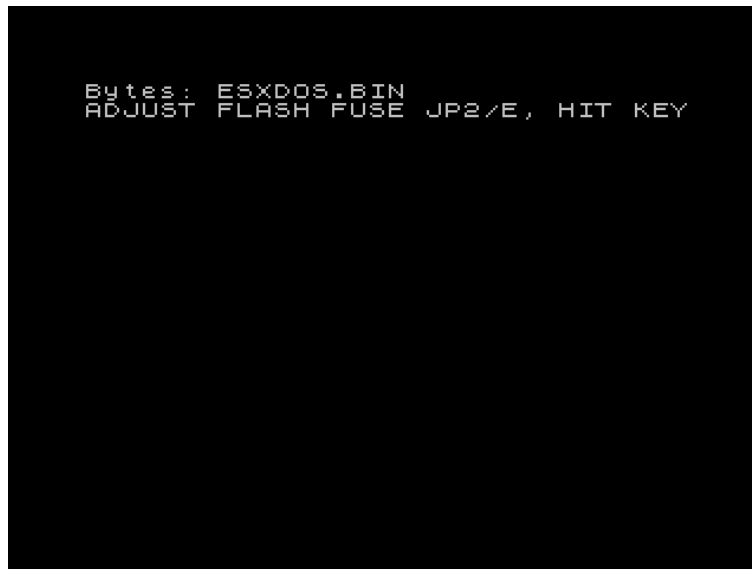
After pressing the key, the EEPROM in divMMC starts to be overwritten, which is indicated by colored bars in the border. The whole process takes about 50 seconds, at the end of the process, the classic message should be displayed: 0 OK 0:1

At this point, the red EEPROM jumper must be inserted back to disable writing to the EEPROM again.

Shut down the computer, unplug the card from divMMC and place completely new directories /SYS, /BIN and possibly others on the card according to the documentation of the new esxDOS. Then you can put the card back into the divMMC and power on the computer. The new esxDOS should boot.

In the event that programming with the ESXMMC.TAP program fails for some reason, it is possible to upload the correct program to the Spectrum via the casette input. With the tap2wav program, you can convert the correct ESXMMC.TAP to a WAV file (on your modern-day computer) and then you can load it into your Spectrum just like in the old days, providing you can connect your modern-day computer (or some other device capable of playing that WAV) to your Spectrum as it would be a casette player. Then the remaining procedure is identical as above.

Definition of liability

The divMMC interface carries the SinDiKat brand because of the interest, support and assistance of our civic association members in developing, testing and striving to increase the utility value of this remarkable extension to the ZX Spectrum and compatible computers.

SinDiKat does not conduct any business or support activities in connection with the commercial side of the project for end users of the interface. SinDiKat does not in any way profit or bear economic losses related to the production and distribution of the equipment, the provision of warranty, replacement, repair, etc.

Proper use of the interface according to these instructions is entirely up to the user. SinDiKat is not responsible for any damage caused by incorrect connection or use of the divMMC or the computer to which the device is connected.

https://sindik.at

Acknowledgement and credits

At this point, I would like to thank all those who have been and are involved in the development of hardware and software for the ZX Spectrum. Thanks to these people, who cannot all be named, the ZX Spectrum is still IN for the past 42 years.

Nevertheless, I would like to express my special thanks to the following people:

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Original divMMC	mprato - Mario Prato
esxDOS – ultimate OS for Spectrum and divMMC	lordcoxis – Miguel Guerreiro
Support, NMI.SYS, RTC.SYS, .tar, and other .commands	ub880d – Dušky
DivIDE – phenomenal predecessor of divMMC	Zilogator – Pavel Cimbál