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Connect Spectrum to VC 1541 (part 3)

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In the previous magazines, we described the operation of the Spectrum Disk Interface (SDI).
A device that enables the connection of the Spectrum home computer to the Commodore VC 1541 diskette drive. We have also published instructions for making it.

In the last continuation, we will tackle the most interesting topic: the explanation of the possibility of working ith the VC 1541 diskette unit and the individualcommands executed by SDI. We have also attached alisting of the eprom content. In the text, we will often
mention the words diskette drive, diskette and file. We hope that today it is clear to everyone what these terms mean, but we think it will not be superfluous if we explain
mo, what we specifically mean in this article and what these concepts represent.

By the words «disk unit» we mean the VC 1541 device, the word «disk» refers to
a data storage medium (an analogy with a cassette tape), by the word «file» we mean
everything that can be stored on a disk: programs, variables and programs in code .

All commands for work in SDI begin with an asterisk. This is a common way to jump from
Spectrum's operating system to the one dedicated to new commands when entering the wrong syntax. We do not intend to describe the way of executing such orders, this has already been discussed a lot in foreign and our magazines. What you need to remember is to type
RANDOMIZE USR 16000
before starting to work with SDI, preferably immediately after turning on the computer
The same instruction must also be the first in the program that use SDI commands.
This is how we make the connection between SDI and the overlay operating
system. Since RUN breaks this connection, the first command in the program must re-establish this connection. Apart from the connection to SDI, the command also executes BORDER 1: PAPER 1: INK 7: CLS on first execution, which turned out to be the most favorable variant(?sure).

Let's go back to the commands: the asterisk is followed by a few letters that specify the command. In order for SDI to understand them, for most commands it is enough to type the first few letters. *CAT commands deviate from this rule. *FORMAT, *MOVE and *ERASE (which are keywords), and *ERROR and *EPROM. These commands must be typed in full. The table shows the minimum number of letters that must be entered for each of the commands.

Command	**Minimum**
*CAT	*CAT (keyword)
*SAVE	*S
*LOAD	*L
*VERIFY	*VE
*MERGE	*M

*FORMAT	*FORMAT (keyword)
*MOVE	*MOVE (keyword)
*RENAME	*R
*ERASE	*ERASE (keyword)
*INITIALIZE	*I
*VALIDATE	*VA
*ERROR	*ERROR
*EPROM	*EPROM

For commands that can be abbreviated, you canyou enter any number of letters, from the minimum to the full name of the command. The *VERIFY command can so enter in the following ways: *VE, *VER,*VERI, *VERIF and *VERIFY. There are all possibilities correct and permitted.

In some cases, the command must not be shortened to the minimum:the command *SAVEA$CODE A, B must not be shortened to *SA$CODE A,B, because SDI will understand *SA as the first letter of the *SAVE command and because it does not know what to do with the «$» sign on command.
Therefore, in this case, the abbreviated form of the command must be *SAA$CODE A, B. You can type spaces between individual parts of the command, which are ignored when viewing the command.

An excellent spectrum evaluator is used when calculating the arguments in the commands, so it is equally understandable for SDI as
*SAVEA$+CHR$(VAL B$-30)CODE 3*LN 2000,22-SQR 16
as well as easy
*SAVE"TEST"CODE 1,50.

As system variables, SDI uses addresses 23698 to 23727 (in other words, the MEMBOT system variable) and address 23728. Thus, it does not occupy even a single frame intended for the user.

Similar to microdrive, it is not possible to load a program in machine code (LOAD...CODE), which is loaded via system variables.

Example: *LOAD TEST CODE 16384,20000 causes the computer to freeze.
After these general notes, we can move on to explaining the commands.

Command * CAT (KEYWORD)

There are 683 blocks on one side of the disk, of which 664 are available to the user. The remaining blocks are occupied by DOS in the floppy drive for various purposes. One of these is a list of files stored on the floppy disk. This list is called the diskette directory, and it has room for 144 file names. We cannot store more than 144 files on a floppy disk.

You can see the diskette catalog by using the *CAT command. CAT is the «keyword» that you get by pressing both shifts (extended mode), by holding one shift and pressing key 9. If you want to see the list on the screen, use **PRINT: CAT**, if you want to print it out on the printer, use **OPEN #2, "P": *CAT:CLOSE #2**, or more simply **LPRINT: *CAT**, when is more convenient.

If a large number of files are stored on the diskette, only the first few will be displayed on the screen, then the computer will ask SCROLL?, and the diskette will continue to rotate. If you want to see the continuation of the list, press ENTER, otherwise press BREAK and type *I.

The printout of the diskette catalog consists of: in the first row, the name of the diskette, the identification number and the DOS version of the diskette unit (2A) are displayed in inverted letters. In the following order: on the left, the length of the file in blocks (a block of 254 carcters). then the file name between quotation marks, and on the right side is the file type: in this case -PRG.
In the catalog there is no information about the type of file (program, variable or code),
so the user must keep records himself. This will probably be easiest if you append the abbreviations file type to the end of the file name. We recommend:
TEST.PRG for programs
TEST.DAT for variables
TEST.COD for code
TEST.SCR for screen
For this way of marking, 16 characters in the file name will probably be sufficient
At the end of the list of file names, the total free blocks on the disk (out of 664)/

Command * SAVE

Storing files on a floppy disk is done in a similar way as with a cassette tape. Here, the SAVE command (keyword) must be replaced with the *SAVE command (type character by character). The rest of the command is unchanged. This means that you can save a program (with or without autostart), previously dimensioned variables, programs in machine code or screen content
to the diskette. The file name can consist from 1 to 16 characters. If there is already a file with that name on the diskette, SDI will report the error “FILE ALREADY EXISTS”.

If the file you are saving to the diskette is the 145th in sequence, SDI will report a “DISK FULL” error. It will report the same if it finds that there are no more free blocks on the diskette while saving the file to the diskette. The file, that caused such an error will be marked with an asterisk before PRG in the catalog, which means that it is incomplete and therefore unusable. So will be better to immediately execute command *ERASE filename.

It is safest to use characters with codes 48-57 (numbers), 65-90 (uppercase letters), and 97-122 (lowercase letters) in file names. Using other characters can cause problems. The use of characters with codes 128-255 is prohibited!

SDI supports another way of saving files. If there is already a file with the desired name on the disk, and you want to save the file under the same name, you can use the following form of the command ***SAVE:*SAVE “0@:FILENAME”** .

In this case, 18 characters are allowed for a string of characters between quotation marks. The old file with the name FILENAME will be deleted, and a new one with the same name will be saved in its place. Wonderful, you will say. However, we do not advise you to use this method of saving files, because it sometimes happens that due to an error in the operating system in the diskette drive, the file is saved with an error and is therefore unusable. Therefore, it will be best if you save the new file with a different name, delete the old one and, if possible, change the name of the saved file to the desired one.

Command * LOAD

The syntax of the *LOAD command is exactly the same as that of the *SAVE command. This means that we can load programs, variables or programs in machine code. You can use two special characters inside the file name: Question mark (?) and asterisk (*). A question mark in a file name replaces any character at that point, and an asterisk replaces all characters from that point to the end of the file name.

If there is only an asterisk ***LOAD "*"** in the file name, SDI will assume that you want to load the file with the last used name. If the floppy drive is on or initialized, SDI will understand that you want to load the first file listed in the catalog.

If a file with a selected name is not on the diskette, SDI will report an error with "FILE NOT FOUND". If you try to load a file with the wrong file type, example ***LOAD "TEST"**,
and TEST is saved with ***SAVE "TEST" CODE 1,50** , SDI will report an error with "WRONG FILE TYPE".

Command * VERIFY

The syntax of the *VERIFY command is the same as that of the *LOAD command. Even in this case, you can use special characters (question mark and asterisk), as in the *LOAD command.

If you attempt to verify the wrong file type, SDI will report an error with WRONG TYPE FILE. If you try to verify a file of the same type but of different lengths, SDI will report an error with "FILES NOT EQUAL IN LENGTH". If an error is found during verification, SDI will report an error with "VERIFYING ERROR".

Command * MERGE

This command has the same effect as when working with a cassette player. When SDI finishes loading the program, it will announce the message "NOW MERGING" and from that moment of doing the actual MERGE. You can also use special characters (question mark and asterisk) in this command.

Command *FORMAT (keyword)

This command is required the first time you use a disk. With this command, the entire disk is erased and synchronization and block markers are set. You can also use the command to erase an already formatted disk, which is faster than formatting, which takes about 80 seconds.

To format the disk for the first time, use ***FORMAT "DISKNAME, NN"** where NN is the identification number of the disk (Example 00), which must be two digits.

To delete the catalog on already formatted disk, use:
***FORMAT "DISKNAME"**
ATTENTION: the *FORMAT command destroys all the contents of the diskette!

Command *MOVE (keyword)

This command lets you copy files on a disk to files with a different name. Example:

*** MOVE "NEWFILE=OLDFILE"** the file named "NEWFILE" will be saved on the diskette, which will have the same content and be of the same type as the file "OLDFILE" which is already on the diskette.

If the red LED on the diskette drive flashes after executing the command, type PRINT:*ERROR

Command *RENAME

This command allows you to change the name of the files on the disk. Command:

*** RENAME "NEWNAME=OLDNAME"**

will rename the file named OLDNAME to NEWNAME.

If the red LED on the diskette drive flashes after the command is executed, type PRINT: * ERROR.

Command *ERASE (keyword)

This command allows you to delete an unwanted file from a floppy disk. You can delete a single file by specifying its exact name, or you can use a question mark and an asterisk to delete all files that meet the set criteria.
If an error (PRINT:ERROR) appears after executing the command and the message "FILES SCRATCHED", the first number will represent the number of deleted files.
ATTENTION : the command *** ERASE "*"** will cancel all files on the disk

Command *INITIALIZE

If an unpredictable error occurs (the red LED on the floppy drive flashes after the command is executed), this command can prevent the execution of further commands. The * INTIALIZE command returns the diskette drive to the state it was in when you turned it on, and you can then resume normal operation. It will be better if you find out the cause of the error with the command PRINT: * ERROR, which will also turn off the red LED.

Command *VALIDATE

After using the diskette for some time, after repeatedly saving and deleting files, scattered blocks appear that we cannot use because they are isolated and therefore it is not expedient to move the head to access such blocks. This command will move all the blocks so that it collects used and unused blocks, which will increase the number of free blocks and at the same time somewhat shorten the time of loading files.

The command will also free any blocks that were used for improperly terminated files (they are marked with an asterisk before PRG).

Command *ERROR

The purpose of this command is to inform the user where the error is in some unpredictable situations. The error should be read when the red LED on the floppy drive flashes.
After using the command, the following information is reported: error number, text (description) of the error, track number on which the error occurred and block number on which the error occurred.
To get the error message printed on the screen, type:

PRINT:* ERROR

To print an error message on the printer, use

OPEN #2, "P": *ERROR:CLOSE #2

or more simply
LPRINT: *ERROR

Command *EPROM

This command overwrites routine number n from eprom number 3 in RAM, and also starts it if necessary. This possibility was discussed in the first continuation of this article.
Command:
***EPROM, n**

HEX-DUMP EPROM-a

Finally, we publish the listing of the program that must be written into the EPROM type 2732 (4K). HEX-DUMP contains the absolute addresses on which the programming of the circuit is pprogrammed. The entire program consists of a larger part programmed- it should therefore be noted that the complete software consists of a larger part that is programmed in the first 3Kb and a smaller part that starts in the last 1Kb of the EPROM. The programmed EPROM is inserted into the base marked with E1.

Instead of a conclusion

We hope that with the help of the published texts, sketches and instructions, you will assemble your own Spectrum Disk Interface and that you will enjoy using it, just like the author of this article. Experience has convinced us that you will only be USING your spectrum and that SDI will be a qualitatively new beginning. Don't forget: apart from communication with the diskette drive, your SDI also allows you to connect a standard printer with a Centronics interface and two Commodore printers from the MPS series, add eproms with TOOLKIT, BETA BASIC, DEVPAC or some other program in machine language (the already mentioned command * EPROM, n), and there is also an EPROM in preparation that supports working with files such as those supported by the VC 1541, an NLQ add-on for printers with a Centronics input, etc. We look forward to your suggestions and interest.
A s a help and to collect further information about SDI, we publish the author's address:
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The printed circuit board for SDI is offered by Printronic, a work organization for the production of printed circuits for electrical devices, Fruškogorska 13, 22428 Popinci. They expect the plate to cost from 2,000 to 2,500 dinars.