

BudgetTronics

ZXDELUXE BUILDING KIT

Do it yourself ZX81 clone single board computer with SD card drive and (optional) Zeddynet



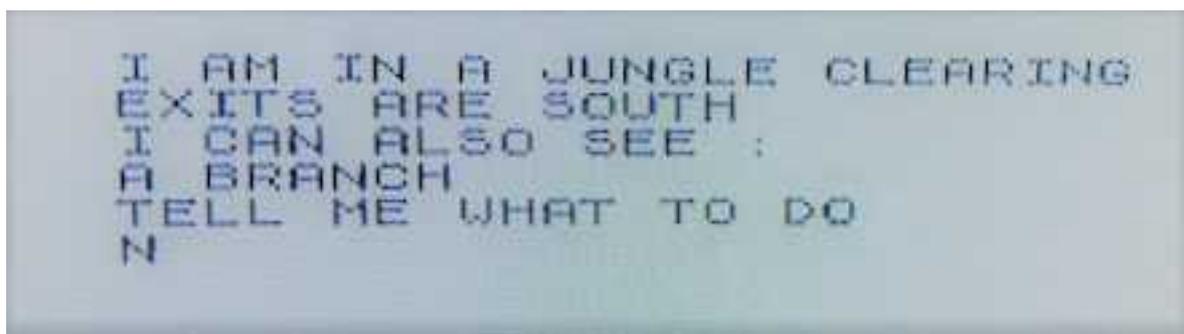
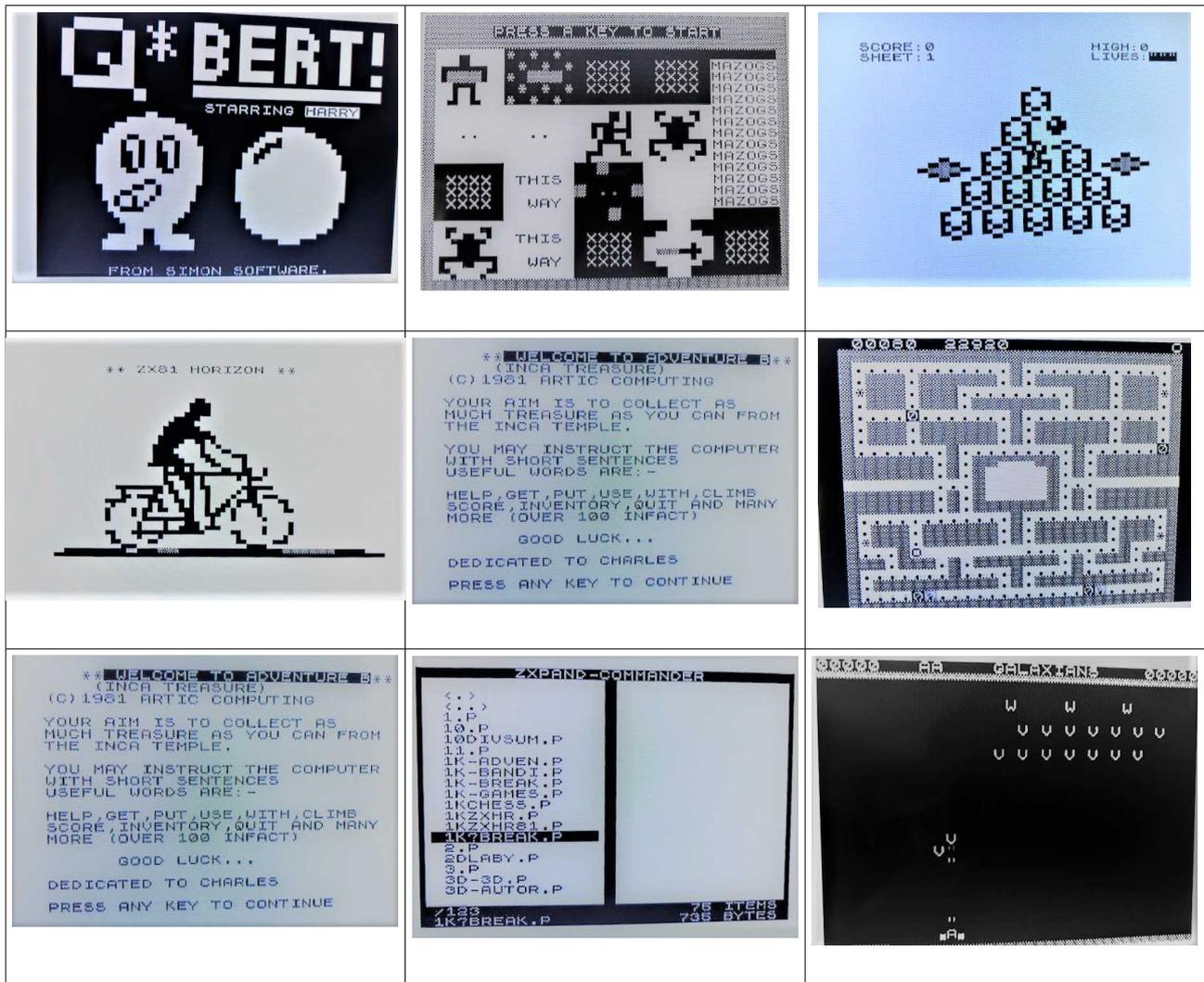
Zxpannd SD card drive designed by Charlie Robson, Zeddynet designed by Sigg.

A single board computer which takes you back to the early eighties driven by the good old Z80 CPU.

This single board computer contains:

- *The ZX81 clone computer*
 - *Integrated keyboard*
 - *Zxpannd SD card drive*
 - *Composite video out*
- *2x jack connections for saving and loading old tape images*
 - *32K RAM (More then the original 16K ram of the zx81)*
 - *ZX81 compatible edge connector*
 - *Joystick connection*
- *Optional Zeddynet internet connection (needs a WIZ8121MJ module not included)*

Play and enjoy those old retro games again with quick loading in seconds instead of the 15 minutes loading time in the eighties! Or just enjoy programming in BASIC again!



Text adventures or serious applications all with a retro look. All game images are easy to download from the internet after searching for zx81 programs and are easy transferred to SD card from a PC or laptop with SD card entry. Thousands of programs available.

Parts list

When you receive the building kit you get the following parts. Please check if all parts are there before you begin the construction of the kit.

<p>Miscellaneous: 1x PCB 6x rubber feet SD card holder Power entry bus 2x jack entry 1x video out connector 2x header female 2x10 6x 3pins male header 6x jumper 1x 9 pins joystick connector male 41x push buttons Quartz 6.55 mhz</p>	<p>Resistors: 2x 75 ohms (violet, green, black) 1x 180 ohms (brown, grey, brown) 3x 330 ohms (orange, orange, brown) 1x 470 ohms (yellow, violet, brown) 2x 680 ohms (blue, grey, brown) 12x1k ohms (brown, black, red) 3x 2k2 ohms (red, red, red) 1x 4k7 ohms (yellow, violet, red) 6x10k ohms (brown, black, orange) 1x220K ohms (red, red, yellow) 1x 1M ohms (brown, black, green) <i>Sometimes you get 2x 330 Ohm and 13x 1K ohms. Read instructions later for explanation)</i></p>
<p>Diodes: 9x 1n4148 1x bat42</p>	<p>LEDS: 1x red LED 1x yellow LED</p>
<p>Ceramic Capacitors: 4x 47pf 1x 100pF 2x 47nf 35x 100nf</p>	<p>IC sockets: 2x 40 pins ic socket 2x 28 pins ic socket 4x 20 pins ic socket 9x 16 pins ic socket 19x 14 pins ic socket</p>
<p>Elco Capacitors: 4x 1uf 1x 22uf</p>	<p>Integrated circuits: 1x 7805 voltage regulator 2x 78L33 voltage regulator 1x bc547 Transistor (looks the same as the 78L33 so do not mix them up!) 1x Z80A CPU 1x 27c512 programmed ROM 1x PIC18f452 I/P programmed 1x 62256 RAM 32K</p>

Integrated circuits:	1x 7411
1x 7805 voltage regulator	1x 7420
2x 78L33 voltage regulator	2x 7421
1x bc547 Transistor (looks the same as the 78L33 so do not mix them up!)	2x 7432
1x Z80A CPU	2x 7474
1x 27c512 programmed ROM	1x 7486
1x PIC18f452 I/P programmed with SD card interface software	1x 74138
1x 62256 RAM 32K	1x 74165
1x 4050	1x 74240
3x 7400	1x 74245
2x 7402	1x 74251
1x 7404	5x 74257
2x 7408	2x 74373
	2x 74393

The 74xx IC's can be of the LS type, the HC or HCT type or a mix depending on what was available when constructing the building kits. Read the instructions later on carefully because at some places a special type is needed where for example HC will not work but LS does. The kit always contains a working set of 74XX IC's.

Only extra needed is a 9 volts adapter 1A (power supply not included) with center tip + and outside mantle –.

Optional can be ordered seperatly but not needed for a working computer

Keyboard kit containing:

(the computer does have a Keyboard already but this kit is to put the familiar ZX81 keyboard layout on top of the keyboard switches nut is not needed for a complete working computer)

- Plexi keyboard plate
- Laminated ZX81 keyboard
- 4x keyboard pins

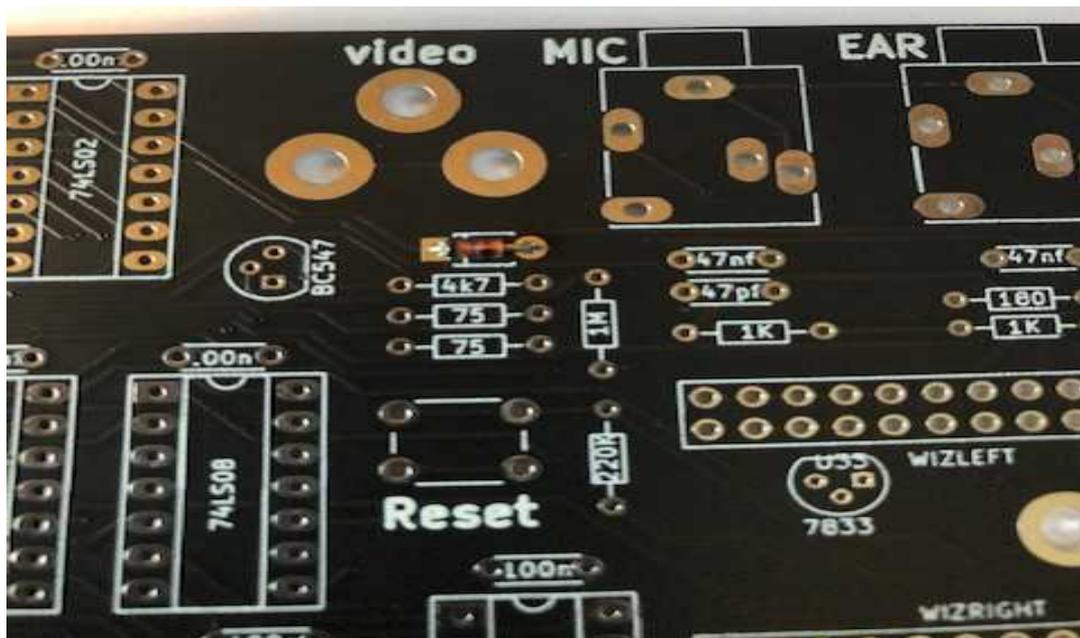
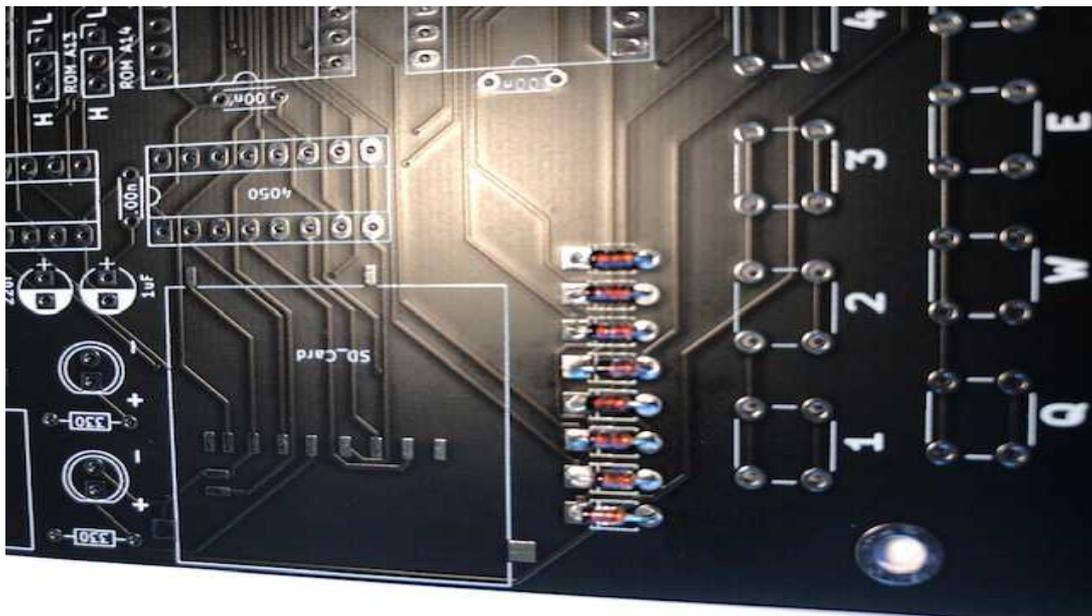
For Zeddynet:

- WIZ8121MJ internet module

Construction

The construction of the ZXDELUXE is a lot of work. Take things slow and enjoy the experience. Always double check what you are doing and remember one small mistake and the computer will not work. So take care and be sure to install all the parts in the right place and read all the instructions carefully.

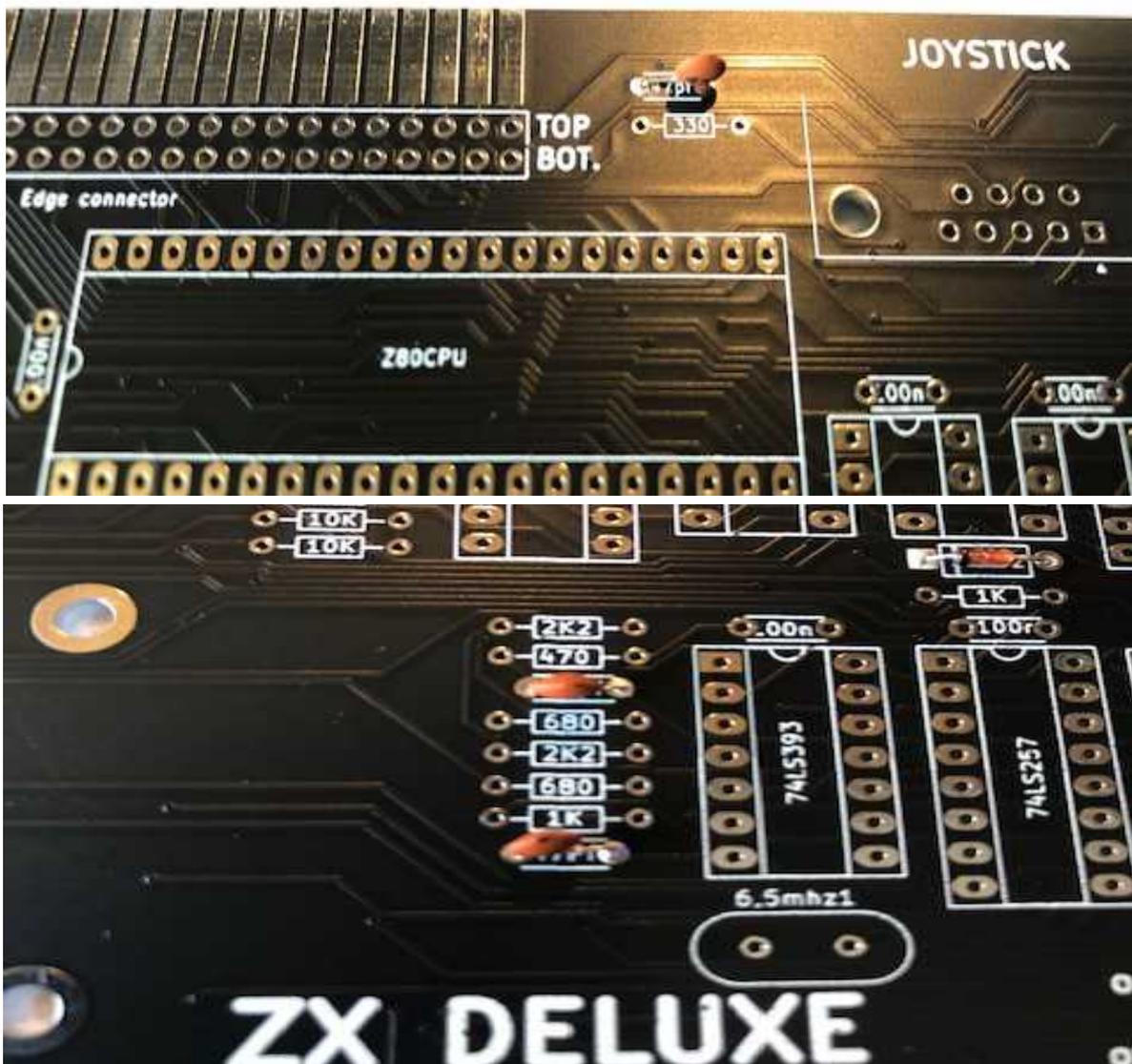
Begin by placing all the 1n4148 diodes in the right spot and take care you solder them in the correct way because they are polarized. You must solder them with the black band in the same direction as the white stripes shown on the PCB. Pictures below.



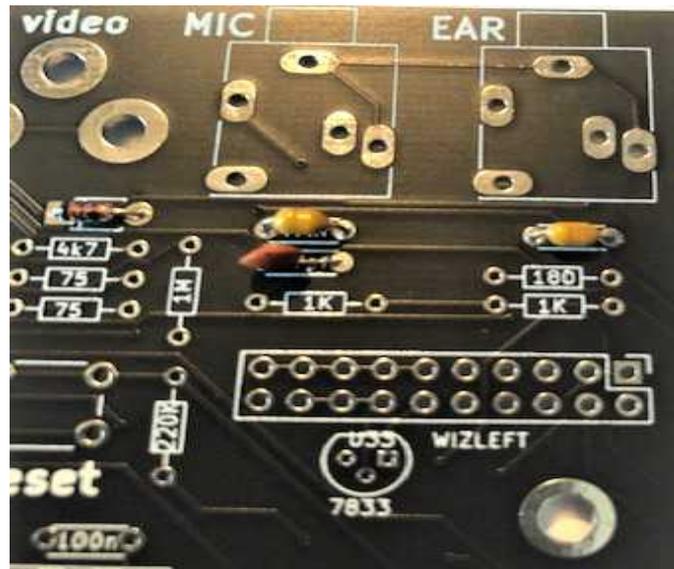
Also solder the BAT42 diode in place and the **100pF ceramic capacitor** as shown in the picture below. Make sure you put the right ceramic capacitor in place here. All the other capacitors left and right are 100nF and **NOT** 100pF. Ceramic capacitors have no polarity so you can solder them any way you want.



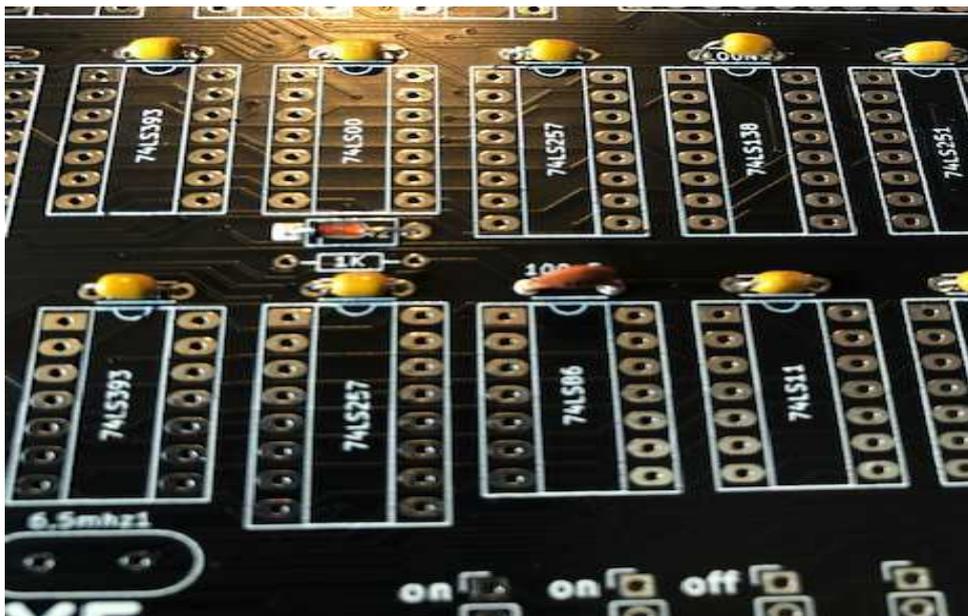
Place the four 47pF ceramic capacitors in place.



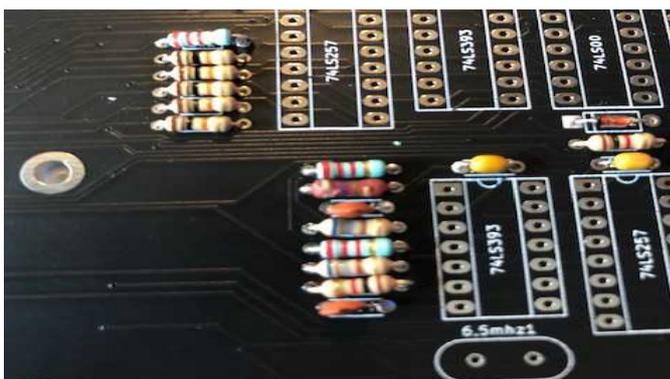
And also the two 47nF ceramic capacitors above the 47pF capacitor.



All other ceramic capacitors on the board are 100nF and you can solder them in place now.

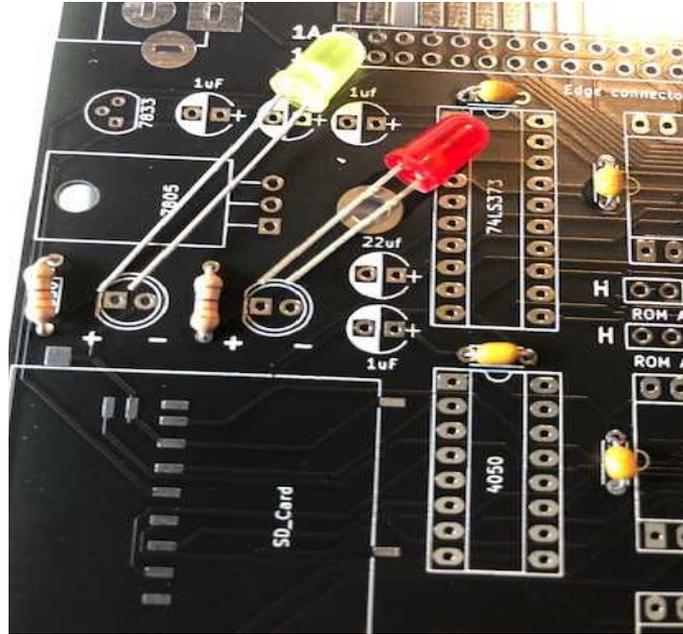


Now put all the resistors in the right place. Look very carefully at the color code as mentioned in the parts list to make sure you put the right value in the right spot.

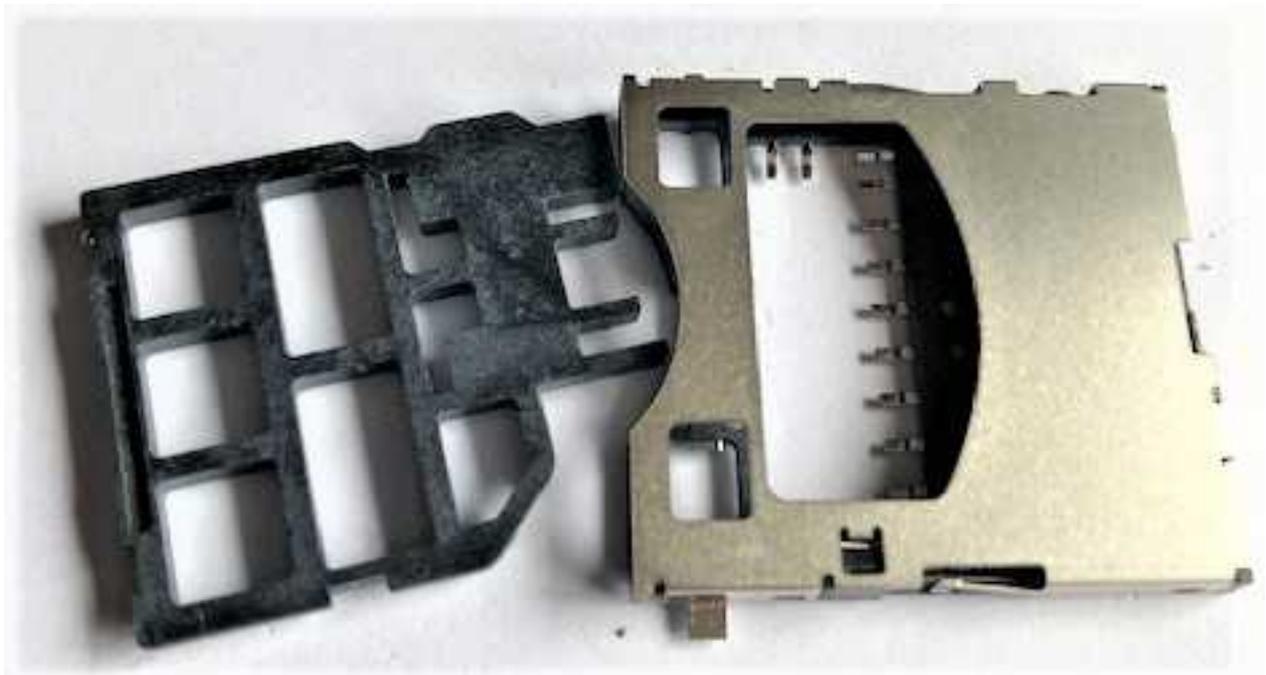


Resistors have no polarity so can be placed on the PCB as you like.. After you have placed all the resistors you can put the two LEDs in place. LEDs do have a polarity. So look carefully at the picture. The long leg of the LED goes in the + indicator.

The silkscreen shows a flat side on the left but you can ignore this. The + and- indicators on the PCB are correct.



Now we are going to solder the most difficult part and that is the SD card holder. On one of the pictures below you see an IC sockets already placed but it is much better to first put the SD card holder in place. So we are doing this now.



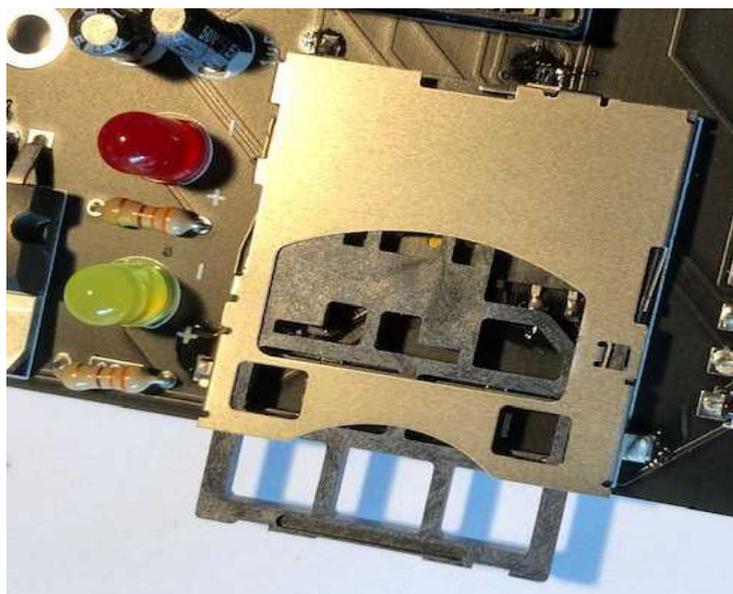
Take out the plastic protection from the SD card holder and put it aside. Do not throw it away yet.

Line out the SD card holder so all contacts are lined up correctly and solder one corner in place. Now look if ALL contacts line up with the contacts on the PCB. The entry of the SD card holder lines up almost exactly with the edge of the PCB.

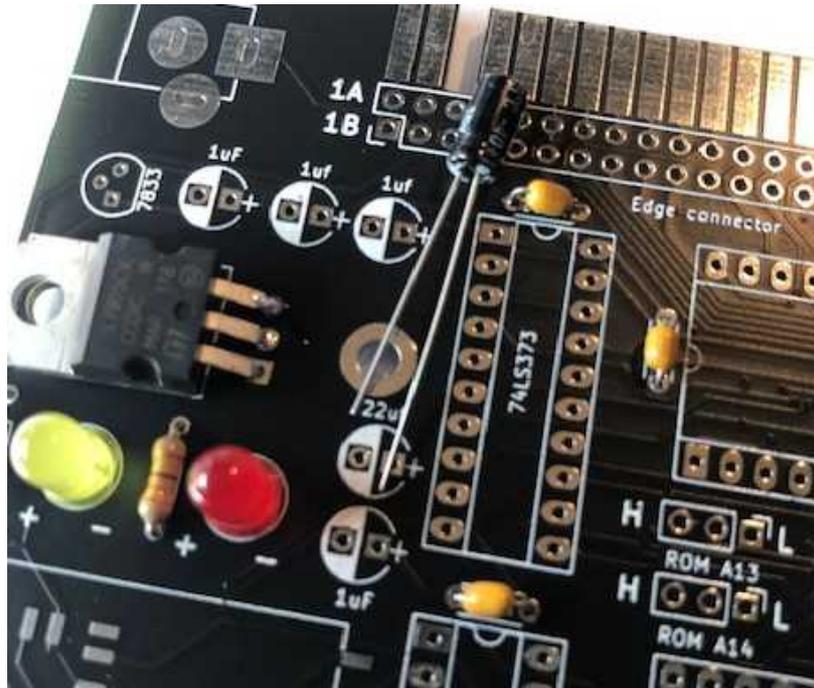


If you are satisfied with the lineout solder the other 3 outside clips of the holder to the PCB. After this solder the inside contacts and try to use not to much solder on the contacts because otherwise the SD card cannot be entered. If you have soldered all the contacts take a magnifying glass to check if all the contacts make a good connection and make no contact with each other due to solderbridges.

Now try to put in the SD card protection again. If you can put it in all the way you have soldered well. If it does not go in all the way you have used too much solder. In that case take some off.



The next thing to do is solder in the electrolytic capacitors. These are polarised so take care how you place them.



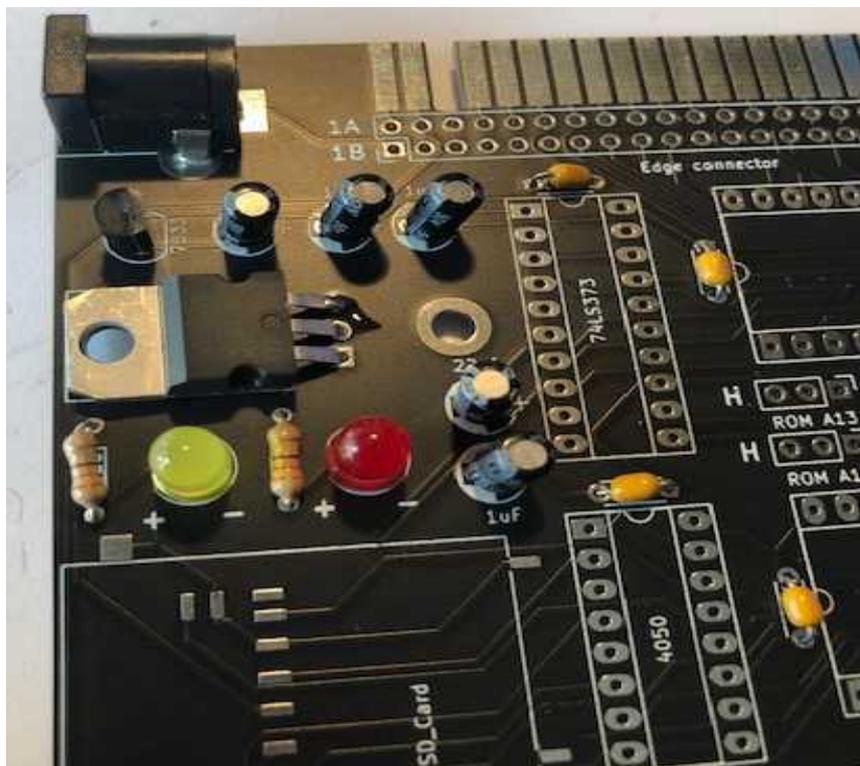
The long leg is the + and it is well indicated on the PCB and on the capacitor.



Now we are placing the voltage regulators 7805 and the two 78L33. Do look carefully at the codes on the 78L33. They look the same as the transistor BC547, **SO DO NOT MIX THEM UP!**

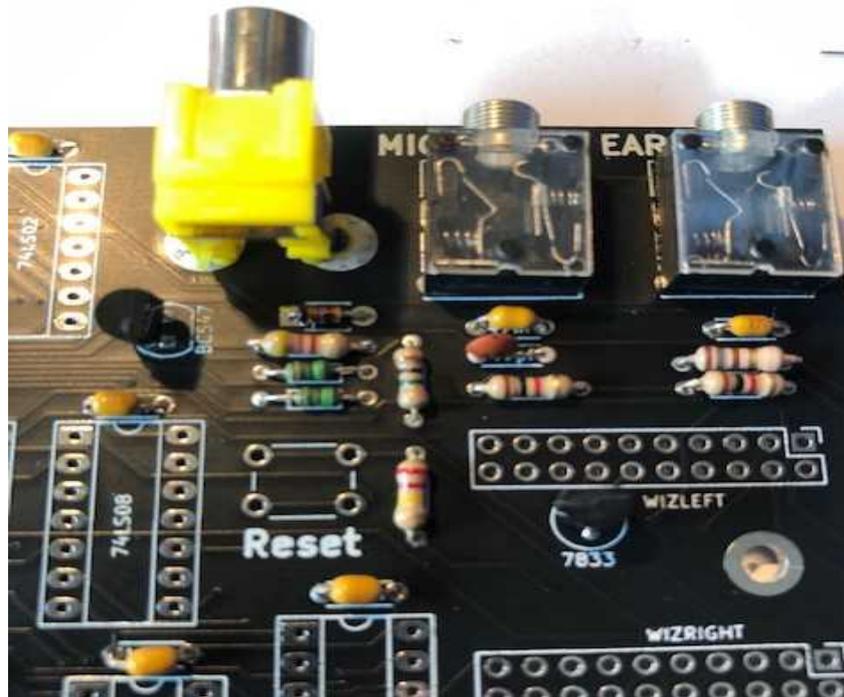


Place the flat side of the two 78133 exactly the same as indicated on the pcb.



Also solder in the power supply entry as shown above. Use enough solder so it makes a solid connection. The center point of the power entry is + and it needs a power supply of 6 to 9 volts 1A.

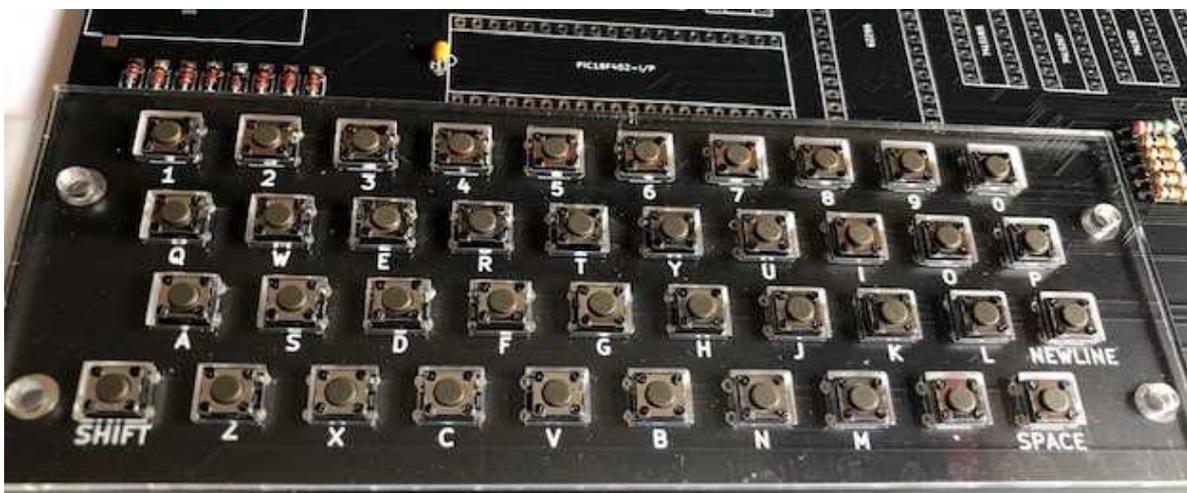
Put the composite video connector and the two 3.5 jack entries in place. The jack entries can be a bit fiddly to place but with a little bending and wiggling of the pins they will surrender. Also place the BC547 transistor on the left of the video output and make sure this is NOT a 78L33 regulator.



Now we are going to place all the switches but we DO NOT solder them in yet if you also bought the keyboard layout. Except for the RESET switch, you can solder that.

If you did not buy the extra keyboard layout you can solder the switches and can ignore this part.

Place the plexiglas keyboard layout on top and make sure all switches are straight and stick out at the same height. Also make sure the room between the plexiglas and the PCB is almost zero. Wiggle the switches a bit so they fit nicely in their sockets and when you are satisfied solder all switches and take care that they stay straight and flush with the plexiglas.



After this you can cut out the zx81 keyboard, line it out over the keyboard, make the holes

in the right place and fasten the keyboard with the four black rivets. Pushing hard until they get in.



Place the joystick connector.



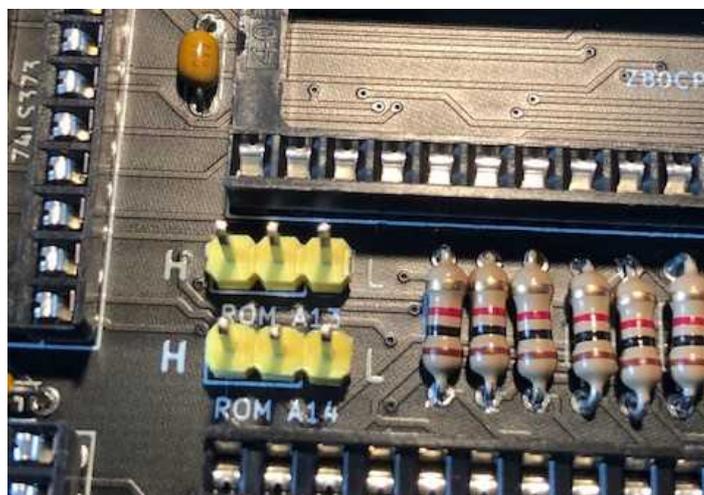
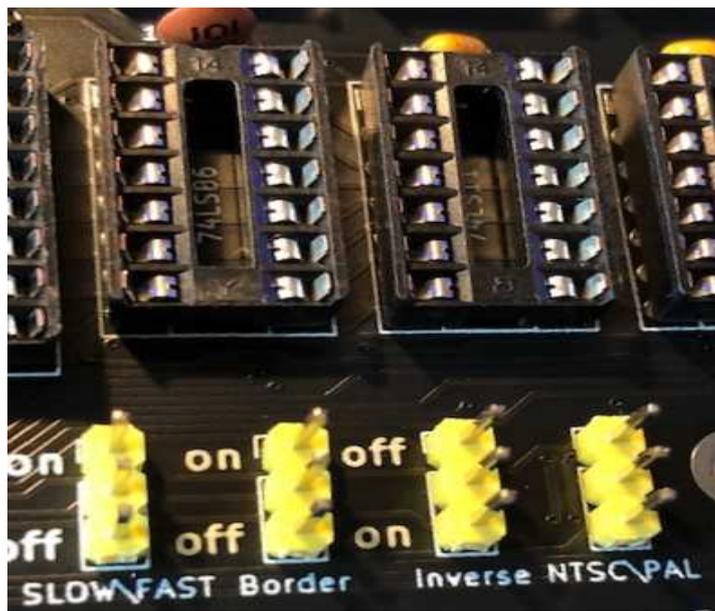
And the 6.55 mhz quartz crystal



Place the 2 Wiznet connectors for the optional Wiznet adapter.



Now solder in all the sockets and the headers.

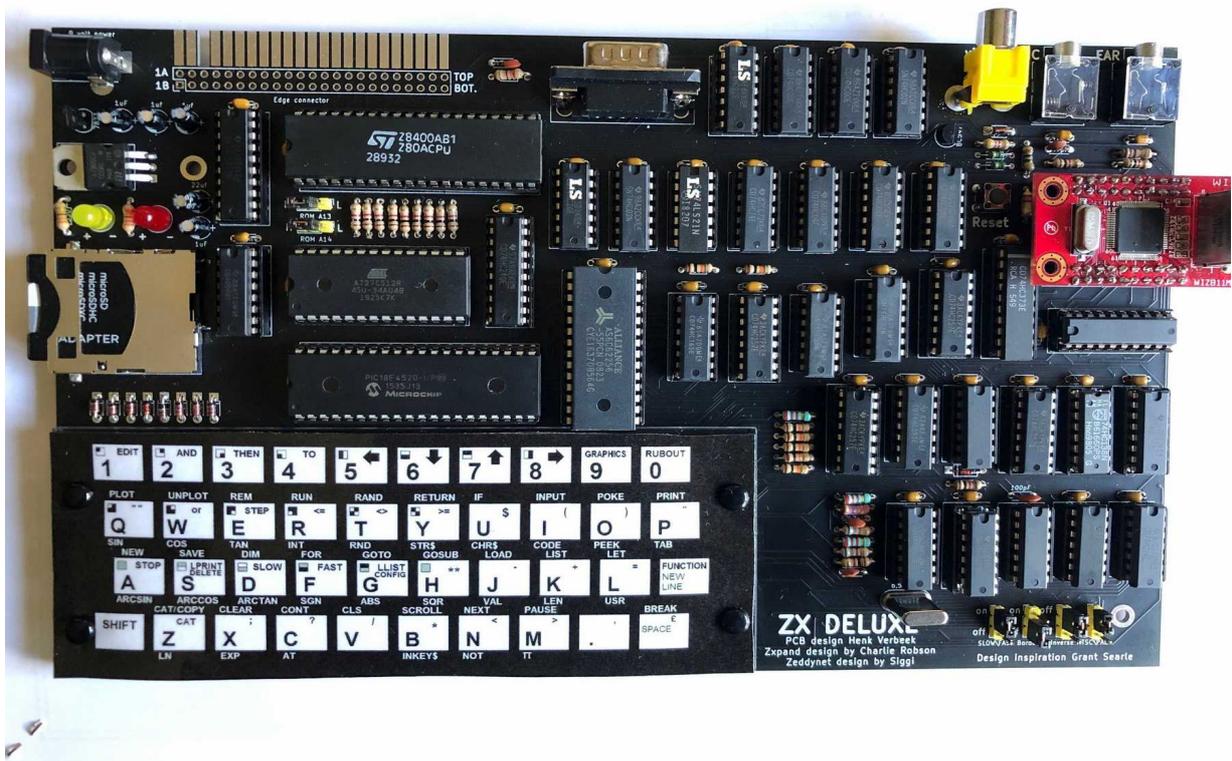


After you have soldered in all the parts check if you have not forgotten something. Also check all solder connections with a magnifying glass to check for good connections and no shorts between pins. Remember a small short between pins, a connection not well made or a part wrongly placed will result in a non working computer.

Now you can put in all the IC's in their right place. Normally the pins of IC's are a bit wider than the sockets and must be straightend out. Just press them gently on a hard surface and bend the pins a little bit to a 90 degrees angle. See picture.



On the PCB all 74 serie IC's are indicated with LS in the middle. But this can also be HCT or HC parts. If you have mostly HC parts in the building kit there are 3 places you will need to put in LS parts to make things work perfect. These are indicated below with a white LS indicator. The other parts can be HC, If you have only LS parts or HCT parts in the building kit this does not matter. Picture shows ZXDELUXE with optional WIZ811 internet module.



Put all the IC's in and make sure you put them in the right position. All IC's have a small

cutout on top which indicates the top. On the PCB this cutout is also indicated.

In short if you put the PCB in front of you all vertical IC's have the cutout on top and all horizontal IC's have the cutout to the left.

Press all IC's tight in their feet and make sure all pins are inside the sockets and not bend.. Now make a last check. See if all components are in the right place and correctly soldered, no solder bridges, all wires cut short and so on.

Placing the jumpers

Before we startup we have to put the jumpers in the right place.

Set both the A13 and A14 jumpers to the H (High) side so jumpers to the left. Set the Slow/fast jumper to ON, Border and inverse OFF for standard zx81 screen and NTSC / PAL to what you need but both work most of the times on monitors, just try out what works best.

Other settings for the A13 and A14 jumpers will be explained further on.

STARTING UP

Connect the ZXDELUXE to a monitor and a 6 to 9 volts 1A power supply center positive and without SD card.

If all is well you get a message on top of the screen saying ZXDELUXE 1.0 and the familiar ZX81 K cursor in the left bottom corner.

Congratulations your computer works!

If it does not work do not disappear, check your work, there is just something wrong, maybe a bad connection or maybe a short somewhere. Are the jumpers placed in the right way? Check with a multimeter if there is power. Just read the construction manual again and see where the fault may be.

If all works you can read about using the Zxpan SD card and start searching for ZX81 programs and putting them on the SD card.

Some important information

To make it ZX81 compatible we have provided the ZXDELUXE with exactly the same edge connector as the ZX81. But remember we have NOT tested all add-ons which were made for the ZX81 so try them out at your own risk and we do not guarantee they will work.

The most used was the 16K ram expansion on this edge connector but you will understand that there is no reason to plug that into the ZXDELUXE because it already has 32K of RAM memory so we do not advise to use RAM extensions.

Inside the provided ROM there is also a surprise extra, a ZX80 without ZXpand support but you can use the 3.5 jacks to Load and Save tapes.. So if you want to experiment with a ZX80 you have to set the A13 and A14 jumpers.

Possible jumper settings are:

1. A14 = LOW, A13 = LOW - ZX80 mode without ZXpand support in this mode. Fast / Slow mode jumper must be OFF
2. A14 = HIGH, A13 = HIGH - ZX81 BASIC with ZXPAND support. Fast / Slow mode jumper must be ON

In ZX80 mode you can Load from and Save to tape by typing Load or Save.

In ZX81 mode you can Load from tape by typing Load"" (so without program name) and the tapeloading routine will start. Saving to tape will not be possible in ZX81 Zxpand mode because you can only save to the SD card. And let's be honest why would you want to save to tape now you can save the programs to an SD card.

If you type Load with a program name then it will always load from SD card.

Using the Zxpend SD card drive

Zxpend Designed by Charlie Robson

GETTING STARTED

Format an SD card - you can use any of the standard FAT format types: 12, 16 and 32 are supported. Windows based PCs can generally format cards directly.

Once formatted, you can save some ZX81 programs to your card. These are widely available around the internet. They typically have the extension '.P'. If you come across files with the .81 extension, these should be renamed to have a 'P' extension – the formats are identical.

Long filenames are not supported. Filenames should use **a maximum of 8 characters** followed by the extension, the DOS short name standard.

You may want to organise your files on the card by creating directories, again using a maximum of 8 characters maximum in the name, and putting a few files in each. This should make finding the file you want much easier.

Just insert the SD card and switch on.

To load (for example) the program called 'MAZOGS.P' enter the command:

```
LOAD "MAZOGS"
```

It is not normally necessary to add the .P extension, it is generally assumed.

COMMAND REFERENCE

The built-in commands relating to the ZX printer have been replaced with those required to usefully operate the ZXpend interface. For example the CAT command replaces COPY - therefore to get CAT, you press the Z key in K mode.

CONFIG

Press shift-G in K mode – replaces 'LLIST' command

The CONFIG command is used to configure the ZXpend interface and how the ZX81 works with it.

Parameters to the command and their effects are:

CONFIG "V"	Display the version number of the ZXpend firmware
CONFIG "D=path"	Set the current directory
CONFIG "D=" or CONFIG "D=/"	Change to the root directory
CONFIG "J=UDLRF"	The joystick port is scanned during the INKEY\$ command, select the keys returned for Up Down Left Right and Fire . The default is J=5678.
CONFIG "C=7F"	Enable autoboot. A program called "menu.p" will automatically run on power on or reset.
CONFIG "C=FF"	Disable autoboot. Power on or reset will bring up the K prompt.

Configuration bits are used to specify certain operating modes of the ZX81. The bits are combined into the configuration byte.

AUTOBOOT

The ZXpand can be configured to automatically run a program called 'menu.p' when the ZX81 is switched on or reset. Nominally the ZXpand is set to autoboot when the SHIFT key is pressed during power on.

However, you can force the ZXpand to always autoboot by clearing bit 7 in the configuration parameters:

`CONFIG "C=7F"`

`CONFIG "C=FF"` will re-enable it.

Bit 6 controls the behaviour of space/break during program execution. With bit 6 set, behaviour is as normal. With bit 6 clear, you must press shift & space in order to break into the running BASIC code.

INKEY\$ can be used to detect the directions of an attached joystick. No diagonals are usable at this time. The default joystick codes are 6, 7, 5, 8 and . which map to the cursor directions.

CAT

`CAT` or `CAT ""` Display the current directory. Press enter to view subsequent pages.

`CAT "path"` Display the contents of a directory

Press Z in K mode - replaces 'COPY' command

It is sometimes useful to know what files are available on the card. The CAT command will do this. It can also be used for directory navigation.

The CAT command without a parameter or an empty string will list the content of the Current Working Directory (CWD). To list the content of directories relative to this then you must specify the path as you might for a DOS based system.

Directories are identified by a following forward slash.

For example:

`CAT ""`

... might display:

```
GAMES/  
UTILITY/  
MYPROG.P    11K
```

Subsequently typing:

`CAT "GAMES"`

... might then display:

```
../  
MAZOGS.P    15K  
3DMONST.P   13K
```

To change the CWD you prefix the directory name with '>'. This implies 'going to' the directory.

CAT ">GAMES"

Having changed working directory then issuing one of the following commands:

CAT
CAT ""

... might show:

```
../  
MAZOGS.P  
3DMONST.P
```

... and from there:

CAT "../UTILITY"

... would show the content of the folder but not change to it.

There is support for wildcards when CATting files. Wildcard operators are similar to those used in DOS.

'*' will match with any sequence of characters
'?' will match with a single character.

CAT "ST*"

... will show all files beginning with 'ST'.

CAT "S?T*"

... will show all files having S & T as the 1st and 3rd characters.

Wild cards may be used in conjunction with directory specifications.

CAT "../GAMES/S/STAR*"

... will show all the star-based games in the sub-folder specified.

To create a folder in the CWD you would issue the command:

CAT "+dirname"

Many filing systems automatically add folders for internal housekeeping and these may have combinations of naming and flags which produces seemingly corrupt output. It is safe to ignore these, e.g:

/TRASH-?1

LOAD

```
LOAD "filename"  
LOAD "filename;address"  
LOAD "filename:argument"  
LOAD "$"  
LOAD ""
```

LOAD will take data from the file with the specified name on the card and place it in memory. The basic LOAD command will work just as you expect. Specifying an empty

name will invoke the tape loader as normal to allow you to load a program from cassette.

To put data into specific locations in memory you can use the following form:

```
LOAD "filename;nnnnn"
```

... where nnnnn represents a decimal number specifying the target address.

Folders other than the CWD can be specified.

```
LOAD "../GAMES/MAZOGS"
```

To prevent a program from auto-running append the keyword STOP (shift-A) to the end of the filename. E.g:

```
LOAD "MAZOGS STOP "
```

SAVE

```
SAVE "filename"
```

```
SAVE "filename;sssss,llll"
```

```
SAVE "+filename"
```

```
SAVE ">filename"
```

SAVE writes data to the specified file on the card. As with the LOAD command, the basic SAVE invocation will do as you expect. You will not be able to SAVE to cassette tape.

An alternate form of the command is used to save a specific memory location to the card, with a start address specified by ssss, and a length of llll bytes. All numbers are specified in decimal.

```
SAVE "filename;0,8192"
```

Options exist to control how existing files are treated when SAVEing. Similar to the CAT command, the characters '>' and '+' modify the SAVE behaviour.

```
SAVE "+filespec"
```

Prefixing any valid SAVE specification with '+' will rename any existing file with the same name with a .BAK extension. If the backup file already exists, however, then an error will be generated.

```
SAVE ">filespec"
```

The '>' prefix will unconditionally overwrite any existing file with the same name.

DELETE "filename.p"

(Press shift-S in K mode – replaces 'LPRINT' command)

Unlike LOAD and SAVE, the .P extension is not assumed

BASIC ERROR CODES

The interface can report the following errors. They are shown in inverse video to distinguish them from standard system report codes.

Code	Meaning	Explanation
1	Fatal disk error	The card is unreadable due to a hardware problem or unformatted card.
2	Internal error	The card file system structures are inconsistent. Reset should fix this.
3	Not ready	The card is not responding or no card is present.
4	Not found	No such file exists.
5	No path	No such directory exists.
6	Invalid name	The specified name contains illegal characters.
7	Write protect	An attempt has been made to open a read-only file for writing.
8	Exists	An attempt was made to open a file for writing but the name is already used.
9	Boot error	Menu.p not found on the card root directory.
D	No FS	Card is not formatted or is damaged.
F	Timeout	A timed operation took too long to complete.

TROUBLESHOOTING

I see error 9 when I boot

ZXpand is set to auto-boot but there is no 'menu.p' file in the root directory of the sd card. See section on the CONFIG command.

My program won't run or looks weird

- Some programs access the ROM directly. The ROM changes for the ZXpand overlay/driver mean code has been moved or deleted. This usually leads to a crash.
- Some hires programs access the character set in ROM, they will show up with corrupted text. ZXpand uses the character set area of ROM for code.

Using the optional Zeddynet

Zeddynet made by Siggi

To use Zeddynet you have to install a WIZ811 internet module on the ZXDELUXE. All hardware is ready for it so you just have to plug it in.

The internet connection works through a small program called "tnfsd" which must be installed on a Windows PC which can be downloaded from: <http://spectrum.alioth.net/doc/index.php/Downloads> or from our Budgetronics website together with the Zeddynet programs. This program is originally made for working with a Zxspectrum but it also works with the ZX81.

After installing this program you have to start it up on the PC and make sure it is running.

Now connect the WIZ module with an ethernet cable to the same network hub where also your PC is connected to. Start the ZXDELUXE and load the Zeddynet program IPCONFIG and type RUN. You get a message which ask to press a key for menu but ignore this for now and do not touch the keyboard. After a few seconds the program tries to configure the WIZNET module and give it its own IP address. If this succeeds the programs finishes and you can use the keyboard to load another program to use Zeddynet. If the programs stays stuck and does not succeed the tnfsd program is not running on the PC or the ethernet cables are not connected in the right way and PC and ZXDELUXE do not see each other.

Remember that each time you power down the ZXDELUXE or reset it you have to run IPCONFIG again before you are going to use Zeddynet.

If all is oke you can try out the other programs which are made for Zeddynet. Some have an E extension like NFM and NFME. The E means English otherwise it will be German.

We are not involved with writing these programs they are done by others some can not guarantee they all will work.

You can experiment with Telnet, IRC client, pinging, emailing and so on. Do not expect to get a real internet experience because the graphics of a ZX81 are not that great and you cannot compare this with the internet we have today on a PC. So only text and no graphics at all or it must be ASCII graphics. It is just a bit of fun to experiment with but do not expect that you are going to use it in your normal internet life.