

## TYNEMOUTH SOFTWARE MINSTREL ZXPAND

The Minstrel ZXpand is an implementation of the ZXpand interface specifically for the Minstrel computer. Unlike the normal ZXpand or ZXpand+ boards, it does not contain ROM or RAM. Sufficient RAM is already provided by the Minstrel, so this functionality is not duplicated on the Minstrel ZXpand. The Minstrel ZXpand is only suitable for use with the Minstrel 3. **It will not work on an unmodified ZX80 or ZX81.**

### PARTS LIST

#### CAPACITORS – AXIAL CERAMIC RATED 16V OR HIGHER

7 x 100nF (usually marked 100n or 104)

3 x 1uF (usually marked 1u or 105)

#### RESISTORS – ALL ¼W 5% OR BETTER (4 BAND RESISTOR COLOUR CODES SHOWN)

2 x 330Ω



2 x 10KΩ



#### SEMICONDUCTORS - NEW TEXAS INSTRUMENTS 74HC SERIES CHIPS RECOMMENDED.

1 x Red LED

1 x Green LED

1 x 74HC02

1 x 74HC20

2 x 74HC21

1 x 74HC240

1 x 74HC373

1 x 74HC4050

1 x PIC18F4525 (pre-programmed)

1 x 3V3 TO92 regulator, rated for 9V or higher input, current at 100mA. Centre pin negative (e.g. L4931CZ33-AP)

1 x ROM (to replace the existing ROM in the Minstrel)

#### CONNECTORS / SWITCHES

1 x 46 way (2x23) card edge connector or dual row pin header (for permanent installation - recommended)

1 x miniature tactile switch 6x6mm (e.g. Diptronics DTS-61N)

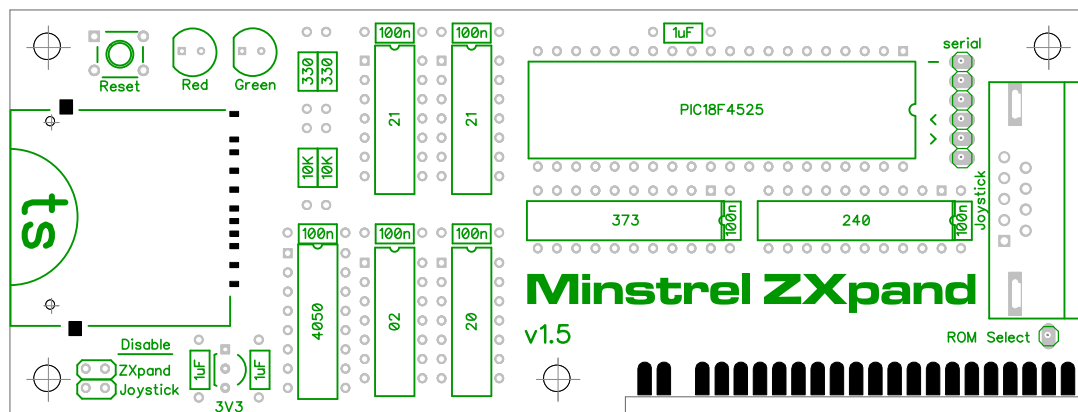
1 x 9 way D male connector (right angled PCB mount)

1 x Compact flash socket (e.g. TE Connectivity 2057184-1 - PCB supplied with this pre-soldered)

1 x 40pin IC socket (turned pin recommended)

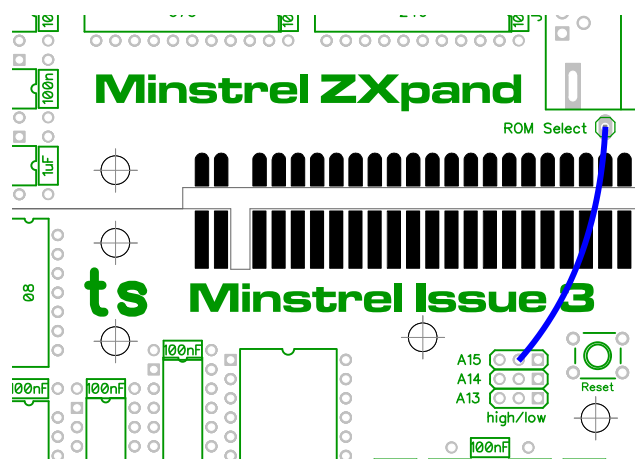
4 x 14pin, 1 x 16pin, 2 x 20pin IC sockets (optional, turned pin recommended)

### COMPONENT PLACEMENT



## ROM SELECTION

The ZXpand requires the ROM on the Minstrel board to be updated to add the additional commands required to access the SD card. The main ROM is replaced with a combined ROM which also contains the code for the additional commands. A wire link from the 'ROM Select' pin near the edge connector on the ZXpand is connected to the centre of the A15 jumper on the ROM select block. If using an edge connector, this can be a removable header. If using the pin header soldered to both boards, the wire can be fitted under the board. This signal will be high when the ZXpand overlay should be active and low when the normal ROM should be active.



The ROM operates in multiple modes; the A13 and A14 jumpers select the mode.

### A14 = LOW, A13 = LOW - ZX80 INTEGER BASIC

This is the unmodified original 4K BASIC ROM with integer BASIC on the ZX80. There is no ZXpand support in this mode. NMI slow mode should be disabled on the Minstrel 3.

### A14 = LOW, A13 = HIGH - ZX80 INTEGER BASIC WITH ZXPAND

This is a modified version of the 4K BASIC ROM with integer BASIC to add the ZXpand commands. The ROM is now 8K to fit the extra commands. NMI slow mode should be disabled on the Minstrel 3.

### A14 = HIGH, A13 = LOW - ZX80 FLOATING POINT BASIC WITH ZXPAND

This is the unmodified original 8K BASIC ROM with floating point BASIC on the ZX80. The jumper wire is used to select an overlay ROM which includes the additional ZXpand commands. NMI slow mode should be disabled on the Minstrel 3. This is a special build of the ZXpand ROM for ZX80 hardware which does not require NMI slow mode.

### A14 = HIGH, A13 = HIGH - ZX81 BASIC WITH ZXPAND (MINSTREL 3 ONLY)

This option is only for the Minstrel 3, and contains the unmodified ZX81 BASIC ROM with floating point BASIC. The jumper wire is used to select an overlay ROM which includes the additional ZXpand commands. NMI slow mode should be enabled.

## SERIAL

The serial header can be used with a 5V FTDI cable to load programs from a PC. See the following page:

[https://github.com/charlierobson/ZXpand-Vitamins/wiki/Serial-Server-and-LOAD-\\$\\$\\$](https://github.com/charlierobson/ZXpand-Vitamins/wiki/Serial-Server-and-LOAD-$$$)

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## COMMANDS

Several new commands are added to BASIC. On the ZX81 / ZX80 8K BASIC, these replace the ZX Printer commands, if you need to use these, the ZXpand will need to be disabled either via it's jumper or in software.

Command	ZX80 4K BASIC	ZX81 / ZX80 8K BASIC	Replaces command
<b>CAT</b>	Z	Z	COPY
<b>LOAD</b>	W	J	
<b>SAVE</b>	E	S	
<b>DELETE</b>	P	SHIFT + S	LPRINT
<b>CONFIG</b>	L	SHIFT + G	LLIST

### CAT

**CAT** or **CAT** ""

Display the current directory. Press enter to view subsequent pages.

**CAT** "path"

Display the contents of a directory

### LOAD

**LOAD** or **LOAD** ""

Load from cassette as normal

**LOAD** "filename" or **LOAD** "path/filename"

Load a file from SD card in the current directory or path specified. The .o or .p extension can be omitted.

**LOAD** "filename ; X"

Load a program then disable the ZXpand interface (to use printer routines)

**LOAD** "filename ; address"

Load a program to a particular address (in decimal), rather than the default load address

### SAVE

**SAVE** or **SAVE** ""

Load from cassette as normal

**SAVE** "filename"

Save the file to SD in the current directory. The .o or .p extension can be omitted. Saving a file with a name that already exists will return an error. Delete the file first, or choose a different name or path.

**SAVE** "filename ; start ; length"

Save a block from memory to SD card.

### DELETE

**DELETE** "filename .ext"

Delete a file – note the .p or .o extension is explicitly required for safety.

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## CONFIG

### **CONFIG "V"**

Display the version number of the ZXpand 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 **U**p **D**own **L**eft **R**ight and **F**ire. The default is J=56780.

### **CONFIG "X"**

Disable the ZXpand interface until reset is pressed.

### **CONFIG "C=7F"**

Enable autoboot. A program called "menu.p" will automatically run on power on or reset. You can write your own, or for the Minstrel 3 in ZX81 mode only, you can use ZXpand Commander renamed to "menu.p".

### **CONFIG "C=FF"**

Disable autoboot. Power on or reset will bring up the **K** prompt.

## RESET

The reset button on the Minstrel ZXpand board replaces the one on the Minstrel board. It adds the following functionality:

- Short press – reset the Minstrel only
- Longer press (1-2 seconds) – reset the Minstrel and the ZXpand interface, return to SD root

If the ZXpand is disabled, BASIC will display the usual **K** prompt. If the ZXpand is enabled, a banner will appear on the screen displaying the version number, or if set above, the "menu.p" program will be loaded and run. Hold shift when resetting if you wish to bypass the menu and go directly to BASIC. Long press reset also changes to root directory, if you see 9/0 errors when using menu, you are probably in a sub folder, long press reset to change back to root.

## JOYSTICK

The joystick port supports 9 way D Atari / Commodore joysticks. These can be read in three ways:

- The ZXpand port, writing to the ZXpand port then reading the response.
- A replacement INKEY\$ function, this checks both the keyboard and the joystick
- The Kempston port. Reading from port 31 will return joystick status (can be disabled with a jumper)

## ACKNOWLEDGEMENTS

ZXpand was designed by Charlie Robson (Sir Morris on Sinclair ZX World forums). This modified version is produced with his approval and his support and assistance is greatly appreciated. Accordingly, the schematic has not been published, and the firmware is only available pre-programmed. If you enjoy the sample games on the SD card, search out the authors and maybe give them a bit of cash.