

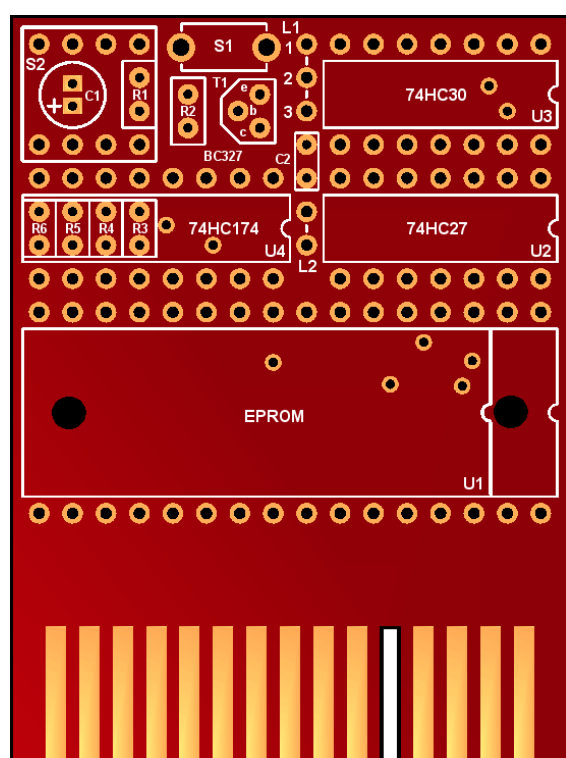
ZXC2 Interface 2 ROM Cartridge Configurations

The ZXC2 ROM cartridge PCB supports 8K (27C64), 16K (27C128), 32K (27C256), 64K (27C512), 128K (27C010/1001) and 256K (27C020/2001) EPROMs via three configurations:

- 8K / 16K cartridge
- 32K – 256K switched banks of 16K
- 32K – 256K software paged banks of 16K

The PCB can also be used as a 5 channel output controller board, and can also support the 29F010 128K FLASH memory.

The following diagram shows the PCB and indicates the function of the components.



U2 is required for all configurations. A 74LS27 should be fitted if the ROM cartridge needs to be compatible with 128K Spectrums.

U3 and U4 are required for the software banked configuration.

L1 1-2 shorted when using 27C64/128/256/512 EPROMs.

L1 2-3 shorted when using 27C010/1001/020/2001 EPROMs.

L2 shorted selects the switch banked configuration, open selects the software banked configuration.

T1 and R2 provide optional support for paging the Spectrum ROM in and out of the memory map when using the software banked configuration.

S1 is an optional reset button for use with the software banked configuration when the cartridge is used with a Spectrum+, Spectrum 128 or Spectrum +2.

C1 and R1 form a start up reset circuit used with the software banked configuration.

S2, R3, R4, R5, R6 are used in the switch banked configuration.

C2 is an optional power supply decoupling capacitor.

A labelling error exists on the PCB – the ‘c’ and ‘e’ terminals for T1 are swapped over.

8K / 16K Configurations

This configuration mimics a standard ROM cartridge by replacing the Spectrum ROM in the memory map. If the ROM cartridge needs to be compatible with the Spectrum 128 then U2 should be fitted with a 74LS27.

8K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, S2, T1, C1, R1, R2, R3, R4, R5, R6

Required: L1 1-2 shorted, L2 shorted, U1 (27C64), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, R3 shorted, R4 shorted

Optional: C2 (10nF)

16K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, S2, T1, C1, R1, R2, R3, R4, R5, R6
 Required: L1 1-2 shorted, L2 shorted, U1 (27C128), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, R3 shorted, R4 shorted
 Optional: C2 (10nF)

32K – 256K Switch Banked Configurations

This configuration uses switches to select a specific bank of 16K to page into the memory map instead of the Spectrum ROM. If the ROM cartridge needs to be compatible with the Spectrum 128 then U2 should be fitted with a 74LS27. S2 may be a 2-way, 3-way or 4-way switch depending on EPROM size and should be fitted such that the right hand holes of the footprint are always populated.

32K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, T1, C1, R1, R2, R5, R6
 Required: L1 1-2 shorted, L2 shorted, U1 (27C256), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, S2 2-way, R3 (10kΩ), R4 (10kΩ)
 Optional: C2 (10nF)

Only a 1-way switch is required but these are not readily available. A 2-way switch must be fitted instead, with the second switch set to the open position.

64K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, T1, C1, R1, R2, R5, R6
 Required: L1 1-2 shorted, L2 shorted, U1 (27C512), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, S2 2-way, R3 (10kΩ), R4 (10kΩ)
 Optional: C2 (10nF)

128K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, T1, C1, R1, R2, R6
 Required: L1 2-3 shorted, L2 shorted, U1 (27C010/1001), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, S2 3-way, R3 (10kΩ), R4 (10kΩ), R5 (10kΩ)
 Optional: C2 (10nF)

256K Configuration:

Omit: U3 (74HC30), U4 (74HC174), S1, T1, C1, R1, R2
 Required: L1 2-3 shorted, L2 shorted, U1 (27C020/2001), U2 (74HC27/74LS27), U3 7-8 shorted, T1 c-e shorted, T1 b-U4 pin 2 shorted, R2 shorted, S2 4-way, R3 (10kΩ), R4 (10kΩ), R5 (10kΩ), R6 (10kΩ)
 Optional: C2 (10nF)

32K – 256K Software Banked Configurations

This configuration allows software to select a specific bank of 16K to page into the memory map and can also page the Spectrum ROM in and out. If the ROM cartridge needs to be compatible with the Spectrum 128 then U2 should be fitted with a 74LS27. 5V LEDs with integral resistors can be optionally fitted in the footprint holes of S1 to indicate when bank paging occurs.

32K Configuration without Spectrum ROM Paging:

Omit: L2, S2, T1, R2, R3, R4, R5, R6
 Required: L1 1-2 shorted, U1 (27C256), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 c-e shorted, C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

32K Configuration with Spectrum ROM Paging:

Omit: L2, S2, R3, R4, R5, R6
 Required: L1 1-2 shorted, U1 (27C256), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 (BC327), R2 (1kΩ), C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

64K Configuration without Spectrum ROM Paging:

Omit: L2, S2, T1, R2, R3, R4, R5, R6
 Required: L1 1-2 shorted, U1 (27C512), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 c-e shorted, C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

64K Configuration with Spectrum ROM Paging:

Omit: L2, S2, R3, R4, R5, R6
 Required: L1 1-2 shorted, U1 (27C512), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 (BC327), R2 (1kΩ), C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

128K Configuration without Spectrum ROM Paging:

Omit: L2, S2, T1, R2, R3, R4, R5, R6
 Required: L1 2-3 shorted, U1 (27C010/1001), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 c-e shorted, C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

128K Configuration with Spectrum ROM Paging:

Omit: L2, S2, R3, R4, R5, R6
 Required: L1 2-3 shorted, U1 (27C010/1001), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 (BC327), R2 (1kΩ), C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

256K Configuration without Spectrum ROM Paging:

Omit: L2, S2, T1, R2, R3, R4, R5, R6
 Required: L1 2-3 shorted, U1 (27C020/2001), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 c-e shorted, C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

256K Configuration with Spectrum ROM Paging:

Omit: S2, R3, R4, R5, R6
 Required: L1 2-3 shorted, L2 open, U1 (27C020/2001), U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), T1 (BC327), R2 (1kΩ), C1 (1μF), R1 (100kΩ)
 Optional: C2 (10nF), S1

Software Control

Bank switching is controlled by memory accesses to the top 64 locations within the ROM area: 3FC0h – 3FFFh. This uses 6 address lines: A0 – A5. There is no differentiation between reading and writing to these locations.

A0 – A3 - Selects EPROM bank (0 – 15)
 A4 - Page Spectrum ROM in/out (1 = Select Spectrum ROM, 0 = Select EPROM bank)
 A5 - Lock paging mechanism (1 = Disable further paging)

Examples:

- LD A,(3FC1h) will select bank 1
- LD A,(3FC2h) will select bank 2
- LD A,(3FE5h) will select bank 5 and lock the paging mechanism
- LD A,(3FD0h) will page out the cartridge and enable the Spectrum ROM
- LD A,(3FF0h) will page out the cartridge, enable the Spectrum ROM and lock the paging mechanism

Note that it may be necessary to insert a small delay after paging in the Spectrum's ROM and before accessing it, e.g. to read the first byte of the Spectrum's ROM: LD A,(3FD0h), NOP, LD A,(0000h). A delay is not necessary when switching between EPROM banks.

At power up, bank 0 is selected, the Spectrum ROM is disabled and the banking mechanism is unlocked. Once the paging mechanism has been disabled, it cannot be re-enabled by writing a 0 to bit A5. It can only be re-enabled by power cycling the ROM cartridge or by using the optionally fitted button S1.

Button S1 is intended for when the ROM cartridge is used with a Spectrum+, Spectrum 128 or Spectrum +2. It resets the ROM cartridge circuitry but cannot reset the Spectrum CPU. It is therefore necessary to use button S1 in conjunction with the Spectrum+/128/+2 reset button as follows:

- Hold the Spectrum+/128/+2 reset button in.
- Press and release button S1.
- Release the Spectrum+/128/+2 reset button.

Output Channel Controller Configuration

The 6 address lines used for the bank switching mechanism can instead be used to turn the PCB into a 5 channel general purpose output controller. These channels are controlled using the top 64 locations within the ROM area: 3FC0h – 3FFFh.

- A0 - Output channel 1 (1 = 5V output, 0 = 0V output)
- A1 - Output channel 2 (1 = 5V output, 0 = 0V output)
- A2 - Output channel 3 (1 = 5V output, 0 = 0V output)
- A3 - Output channel 4 (1 = 5V output, 0 = 0V output)
- A4 - Output channel 5 (1 = 5V output, 0 = 0V output)
- A5 - Lock output channels (1 = Disable further changes to the output channels)

At power up, all output channels are set to 0 and unlocked. Once the output channels have been disabled, they cannot be re-enabled by writing a 0 to bit A5. They can only be re-enabled by power cycling the ROM cartridge or by using the optionally fitted button S1.

Omit: L2, U1, T1, S2, R2, R3, R4, R5, R6

Required: L1 2-3 shorted, U2 (74HC27/74LS27), U3 (74HC30), U4 (74HC174), C1 (1µF), R1 (100kΩ), C2 (10nF)

Optional: S1

If the ROM cartridge needs to be compatible with the Spectrum 128 then U2 should be fitted with a 74LS27.

Output channels 1 to 4 are available from the bottom set of holes of the footprint for S2, with the right hand hole corresponding to output channel 1 and the left hand hole corresponding to output channel 4. Output channel 5 is available from the bottom hole of the footprint for R2. 5V is available from L1 pin 1. 0V is available from any of the top set of holes of the footprint for S2.

Each output channel is capable of driving a maximum of 20mA.

Notes

EPROMs manufactured by Texas Instruments, identified by the designator TMS27Cxxx, appear to be incompatible with the Spectrum.