

TYNEMOUTH MINSTREL ROM CART

OVERVIEW

This is a ROM replacement cartridge for Minstrel Expansion Bus which can be used with the Minstrel 2 and Minstrel 3, and with an edge connector or Minstrel Expansion Bus backplane with a ZX81 or TS1000.

It replaces the internal 8K ROM at \$0000-\$1FFF with one of up to 8 x 8K ROM images on the cartridge (jumper selectable).

It can also replace a further 8K from \$2000-\$3FFF to make a 16K block, with up to 4 x 16K ROM images on the cartridge. If there is RAM at this location (as there is on the Minstrel 3), it will be disabled, reducing the system RAM to 24K.

The ROM in this cartridge is enabled for instruction and data reads only. In display generation, the /Refresh signal is active, and the internal ROM in the host is enabled and the character set is accessed. The display has no access to the ROM in this cartridge, so the original ZX81 character set will always be used.

PARTS LIST

CAPACITORS – CERAMIC RATED 6.3V OR HIGHER

3 x 100nF axial (*usually marked 100n or 104*)

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

1 x 1KΩ 

SEMICONDUCTORS – NEW TEXAS INSTRUMENTS PARTS RECOMMENDED

1 x 74HC02
1 x 74HC20
2 x 1N4148 signal diode
1 x Green 5mm LED

CONNECTORS / JUMPERS

2 x 23 way 0.1" straight pin header or 2x23 way 0.1" card edge connector
1 x 28 way 600mil IC socket for ROM chip (*turned pin recommended*)
3 x 1x3 way pin headers with 3x jumpers (*or fit wire links*)
1 x 2x3 way pin header with 1x jumper (*or fit wire links*)

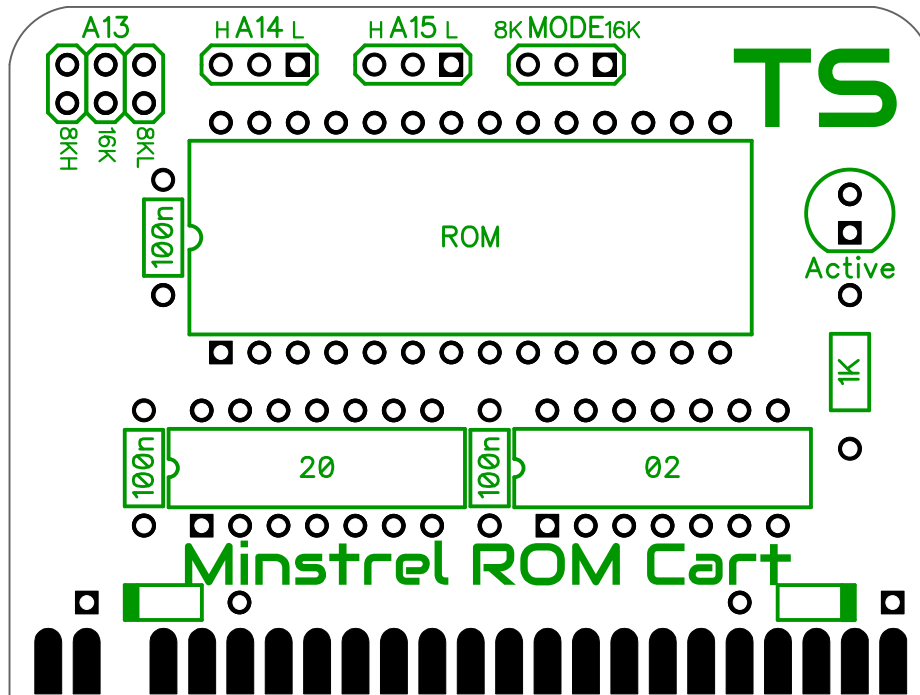
ASSEMBLY

Assembly should be straight forward, starting with the axial capacitors, diodes and resistor, then ICs and IC socket, and finally jumpers, LED and pin header or edge connector.

The pin header or edge connector is soldered to the pads at the bottom of the board. In both cases, the third pin from the left, front and back, should be removed for polarisation.

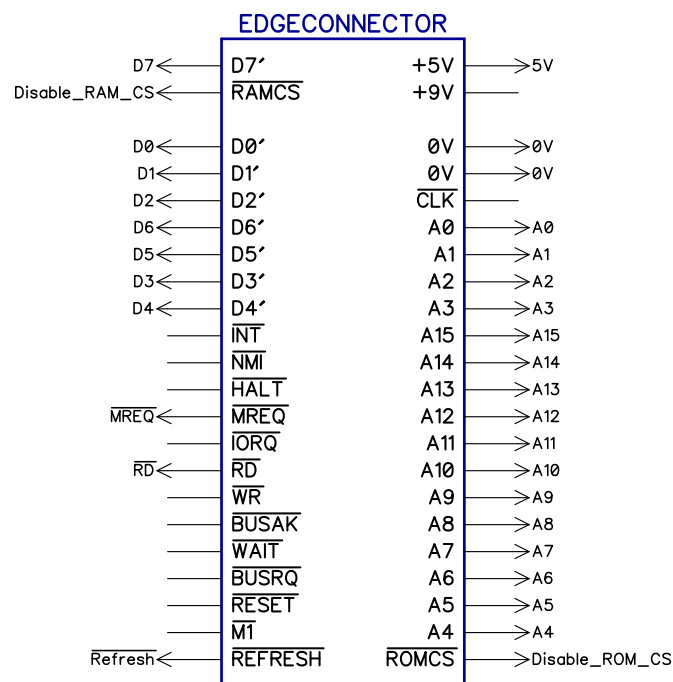
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COMPONENT PLACEMENT



SCHEMATIC

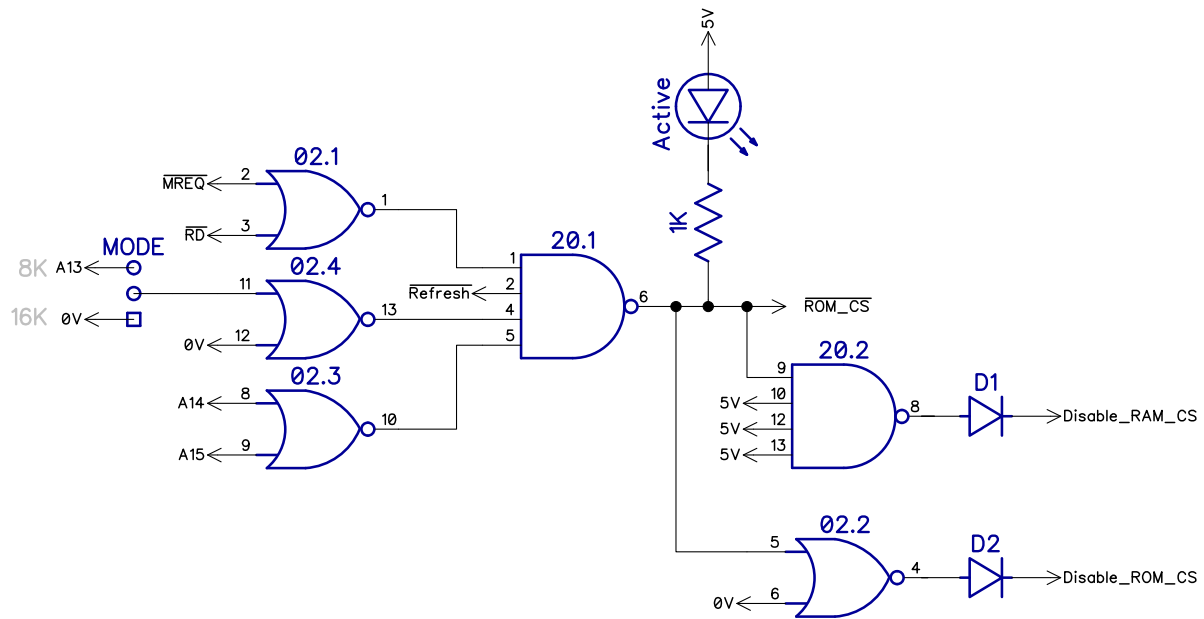
MINSTREL EXPANSION BUS



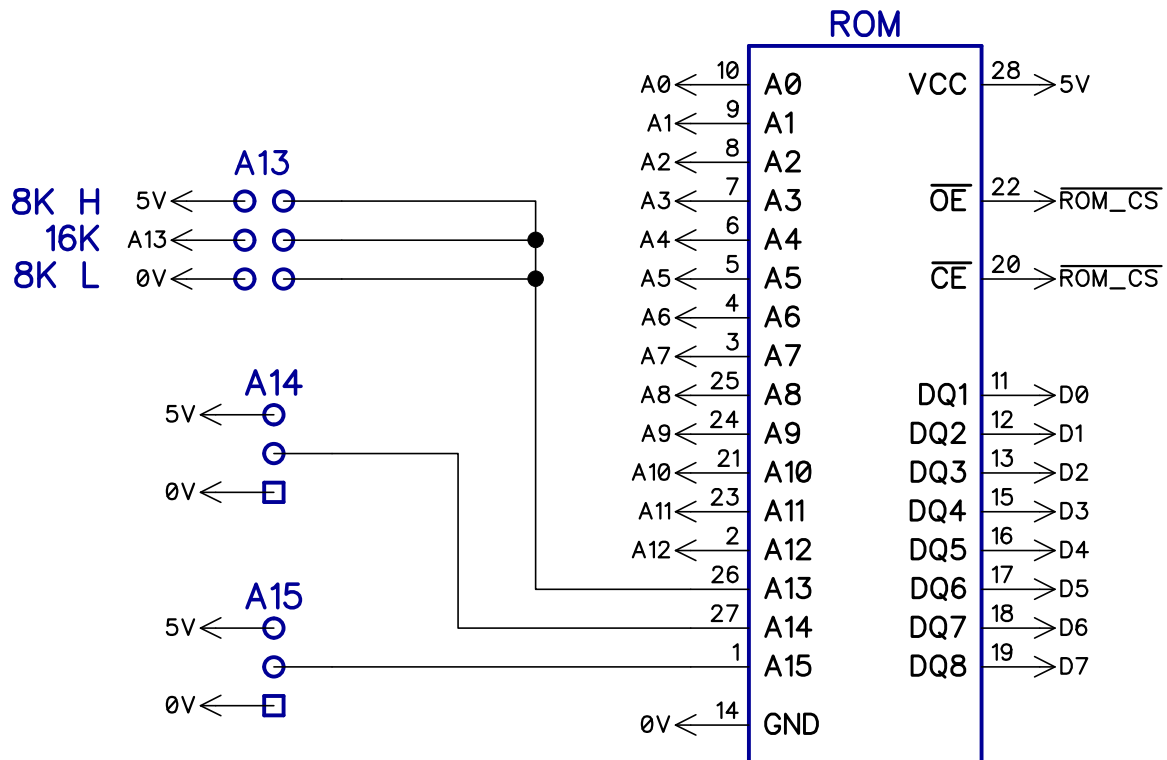
The signals shown are connected to the Minstrel Expansion Bus or ZX81 edge connector. Note /ROM_CS is not present on the ZX80, so should not be used with that. Minstrel 2 and 3, ZX81 and TS1000 all include /ROM_CS.

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ADDRESS DECODING



The ROM is enabled when there is a memory access to \$0000-1FFF if 8K mode, or \$0000-3FFF in 16K mode, it is a read operation and /Refresh is high. When the ROM is enabled, the two spare gates act as inverters to pull the /ROM_CS and /RAM_CS lines on the expansion bus high via the two diodes. /RAM_CS should only be active in certain cases, such as the Minstrel 3 which has RAM in the \$2000-\$3FFF range, so that range of RAM will be disabled when a 16K ROM is activated.



The three highest address lines on the ROM are selected by jumpers. Different types of EPROMs and EEPROMs use these pins differently, so refer to the following tables for jumper selections.

JUMPERS

The A13 jumper selects the signal on pin 26 of the ROM socket. This is either tied high or low to select an 8K image, or connected to the bus A13 in 16K mode.

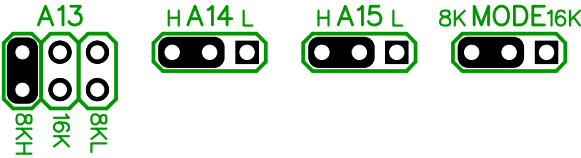
The A14 jumper sets the level on pin 27, and A15 jumper sets pin 1.

Where ROMs have VPP, /WE or /PGM inputs on those pins, they should be tied high.

Unconnected pins are also tied high.

27C64 / 28C64B

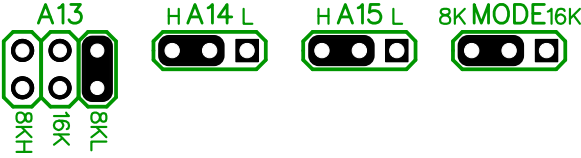
The 27C64 EPROM or 28C64B EEPROM can be used to hold a single 8K ROM image.

Jumpers	ROM Address	Mode	Host Address
	0000-1FFF	8K ROM	0000-1FFF

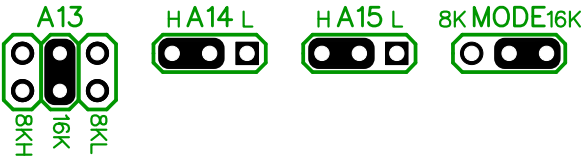
27C128

The 27C128 can hold two 8K ROM images, or a single 16K ROM image

27C128 2x 8K ROM

Jumpers	ROM Address	Mode	Host Address
	0000-1FFF	8K ROM #1	0000-1FFF
	2000-3FFF	8K ROM #2	0000-1FFF

27C128 16K ROM

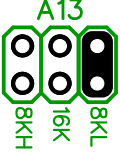
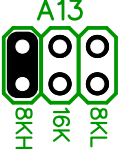
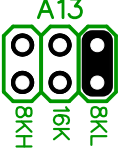
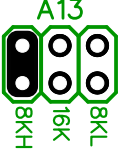
Jumpers	ROM Address	Mode	Host Address
	0000-3FFF	16K ROM	0000-3FFF

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27C256

The 27C256 can hold four 8K ROM images or two 16K ROM images. Pin 1 is VPP, so the jumper marked A15 should be tied high.

27C256 4x 8K ROM

Jumpers				ROM Address	Mode	Host Address
				0000-1FFF	8K ROM #1	0000-1FFF
				2000-3FFF	8K ROM #2	0000-1FFF
				4000-5FFF	8K ROM #3	0000-1FFF
				6000-7FFF	8K ROM #4	0000-1FFF

27C256 2x 16K ROM

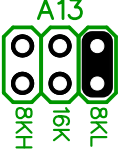
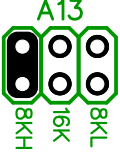
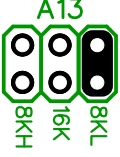
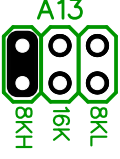
Jumpers				ROM Address	Mode	Host Address
				0000-3FFF	16K ROM #1	0000-3FFF
				4000-7FFF	16K ROM #2	0000-3FFF

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28C256

The 28C256 has a slightly different pinout the others, with /WE on pin 27 (which should be tied high) and A14 on pin 1, which is labelled A15 on this board.

28C256 4x 8K ROM

Jumpers				ROM Address	Mode	Host Address
				0000-1FFF	8K ROM #1	0000-1FFF
				2000-3FFF	8K ROM #2	0000-1FFF
				4000-5FFF	8K ROM #3	0000-1FFF
				6000-7FFF	8K ROM #4	0000-1FFF

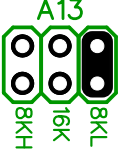
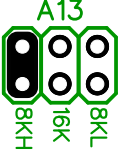
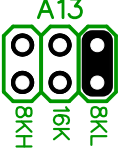
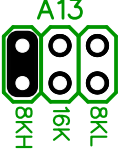
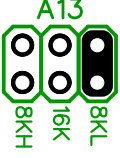
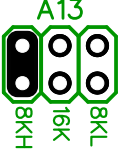
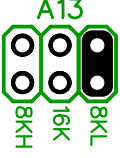
28C256 2x 16K ROM

Jumpers				ROM Address	Mode	Host Address
				0000-3FFF	16K ROM #1	0000-3FFF
				4000-7FFF	16K ROM #2	0000-3FFF

27C512

The 27C512 can hold eight 8K ROM images, or four 16K ROM images. The Winbond W27C512 EEPROM uses the same setting.

27C512 8x 8K ROM

Jumpers				ROM Address	Mode	Host Address
				0000-1FFF	8K ROM #1	0000-1FFF
				2000-3FFF	8K ROM #2	0000-1FFF
				4000-5FFF	8K ROM #3	0000-1FFF
				6000-7FFF	8K ROM #4	0000-1FFF
				8000-9FFF	8K ROM #5	0000-1FFF
				A000-BFFF	8K ROM #6	0000-1FFF
				C000-DFFF	8K ROM #7	0000-1FFF
				E000-FFFF	8K ROM #8	0000-1FFF

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27C512 4x 16K ROM

Jumpers				ROM Address	Mode	Host Address
				0000-3FFF	16K ROM #1	0000-3FFF
				4000-7FFF	16K ROM #2	0000-3FFF
				8000-BFFF	16K ROM #3	0000-3FFF
				C000-FFFF	16K ROM #4	0000-3FFF