

# Tynemouth Software

## TYNEMOUTH MINSTREL EXPANSION BUS

### OVERVIEW

This is a four slot expansion bus for the Minstrel 2, Minstrel 3 or ZX81.

It provides 4 2x23 way pin header slots, as found on later Minstrel 2 and 3 main boards, and one through edge connector as found on all these machines.

The expansion slots can be powered direct from the host machines, or if they need more power, the expansion bus backplane can optionally supply 9V and 5V to the slots.

### PARTS LIST

#### CAPACITORS – CERAMIC RATED 6.3V OR HIGHER

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

#### CONNECTORS / JUMPERS

4 x bus connectors, 2x23 way 0.1" vertical socket.  
2 x 2 way 0.1" jumper and caps or wire links

### OPTIONAL PARTS LIST

#### CAPACITORS – CERAMIC RATED 6.3V OR HIGHER

2 x 100nF axial (*usually marked 100n or 104*)  
1 x 100µF (*axial electrolytic rated 25V*)

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

1 x 1KΩ 

#### SEMICONDUCTORS

1 x 7805 or 7805 switching replacement (rated at least 250mA, more if using expansion port)  
1 x 5mm LED, green or the colour of your choice

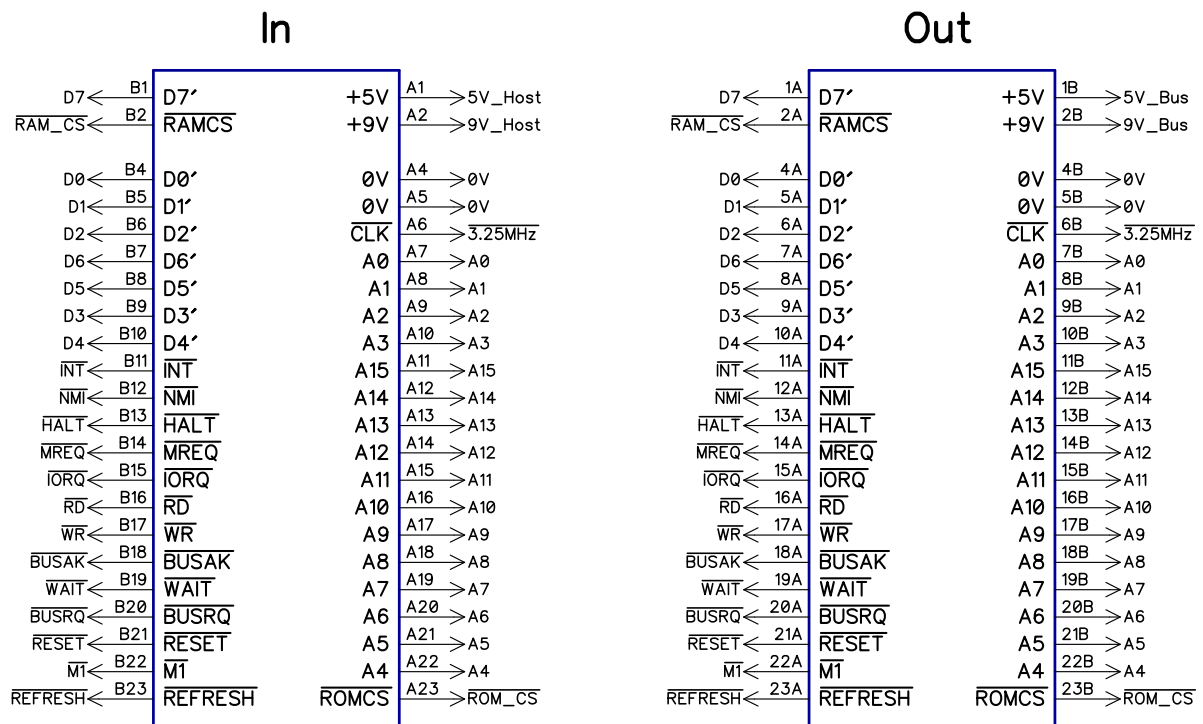
#### CONNECTORS / JUMPERS

1 x 2.1 mm DC Jack  
2 x 2 way 0.1" jumper and caps or wire links

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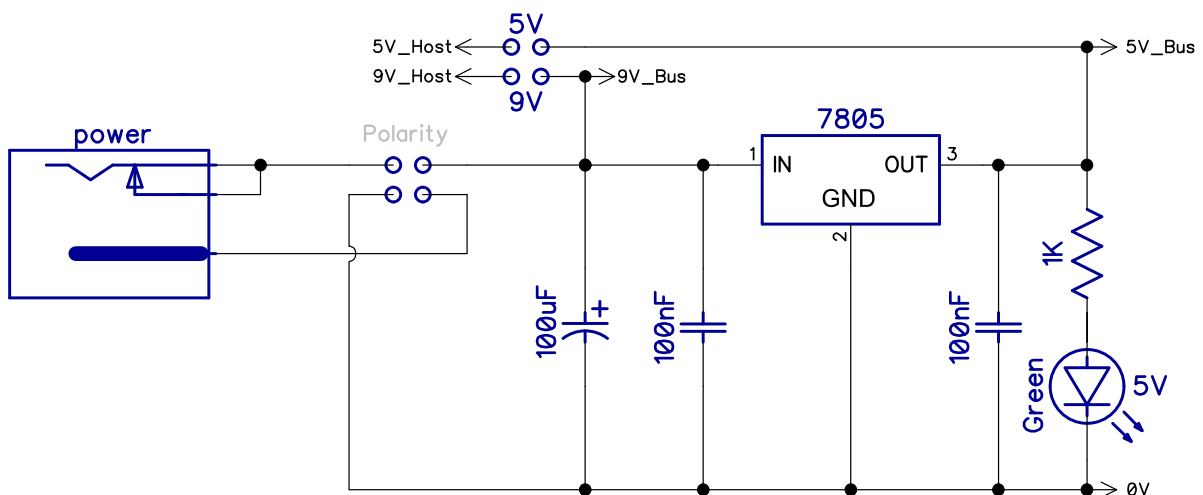
## SCHEMATIC

### MINSTREL EXPANSION BUS



This shows the input and output edge connectors. All are wired in parallel, with the exception of the 5V and 9V power pins which are different for the input edge connection only.

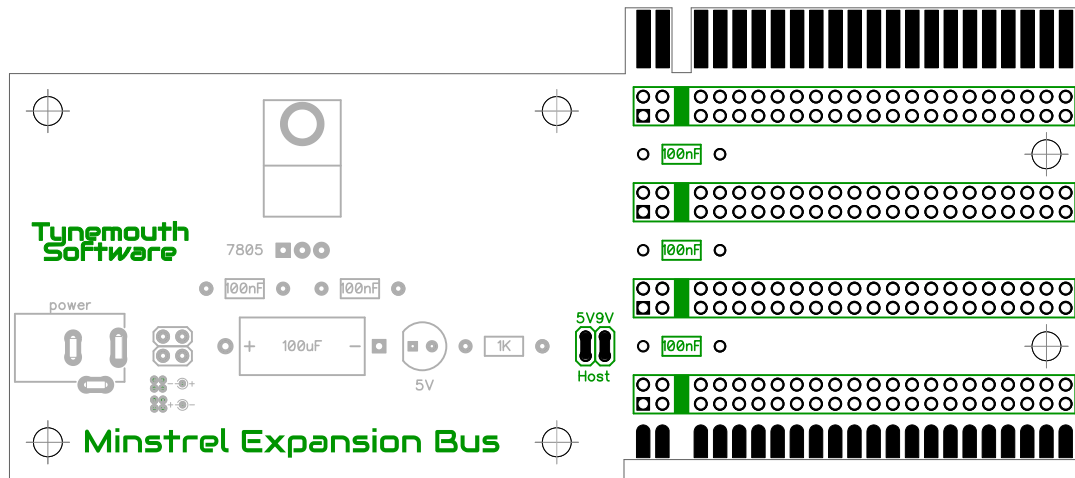
### OPTIONAL POWER SUPPLY SCHEMATIC



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## BUILD OPTIONS

### HOST POWERED



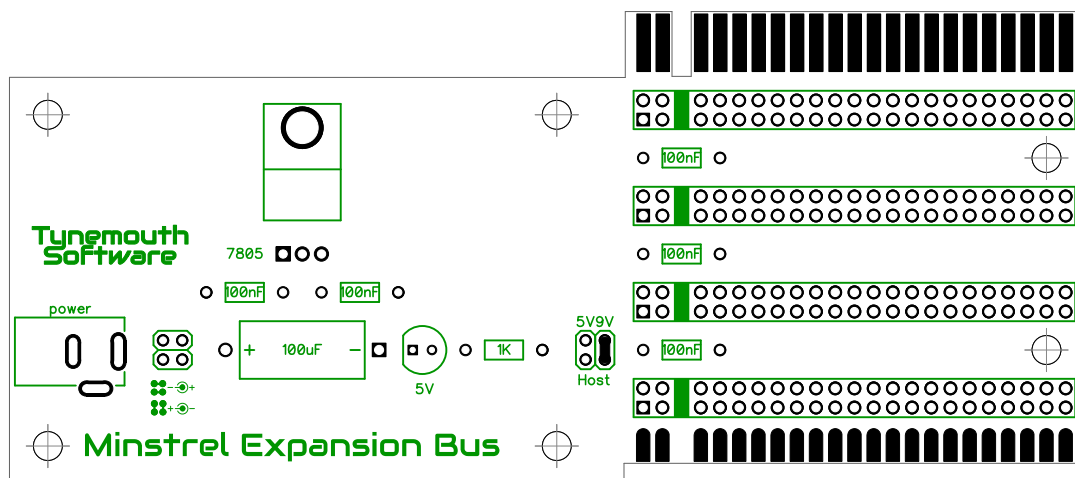
If none of the optional power parts are installed, then the 5V and 9V jumpers can be installed to power the 4 expansion slots and the edge connector from the host power. You could optionally add the 1K resistor and LED if you wish.

### SEPARATE POWER

If the 5V jumper is not fitted, then the 7805 and associated components should be installed, and the 4 slots and rear edge connector will be provided with their own 5V supply, with no additional loading on the host.

A 7805 mounted direct to the board can be used for smaller loads (up to around 200mA). Add a heatsink for larger loads, or a 7805 replacement switching regulator.

If the 9V jumper is fitted, then 9V DC can be connected to either the host or the expansion bus power connectors (this can be useful for a ZX81 to provide a more reliable power connection).



If the 9V jumper is not fitted, then both the host and the expansion bus need their own 9V power supplies to be connected.

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## EXPANSION BUS PINOUT

The expansion bus pinout is identical to that used on the Minstrel 2 and 3 and the ZX81. The ZX80 is the same but without the /ROM\_CS pin, but you aren't using this on a ZX80, are you?

Signal (Top / Front)	Pin		Signal (Bottom / Rear)
D7	B1	A1	5V
/RAM_CS	B2	A2	9V
-			-
D0	B4	A4	0V
D1	B5	A5	0V
D2	B6	A6	3.25MHz
D6	B7	A7	A0
D5	B8	A8	A1
D3	B9	A9	A2
D4	B10	A10	A3
/INT	B11	A11	A15
/NMI	B12	A12	A14
/HALT	B13	A13	A13
/MREQ	B14	A14	A12
/IORQ	B15	A15	A11
/RD	B16	A16	A10
/WR	B17	A17	A9
/BUSAK	B18	A18	A8
/WAIT	B19	A19	A7
/BUSRQ	B20	A20	A6
/RESET	B21	A21	A5
/M1	B22	A22	A4
/REFRESH	B23	A23	/ROM_CS

### NOTES:

**/INT** is hard wired to **A6** inside all of the machines, and is integral to the display mechanism.

**/NMI** is likewise integral to the display on the ZX81. Neither are therefore easily available for reuse.

**/ROM\_CS** is not connected on the ZX80, but is present on the Minstrel 2 and 3 and the ZX81. It can be used to disable the system ROM. It would therefore be possible to override the ROM **/INT** and **/NMI** handlers this way by pulling this pin high when those addresses are accessed.

**/RAM\_CS** can be used to disable the system RAM.