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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 x100μF *(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)
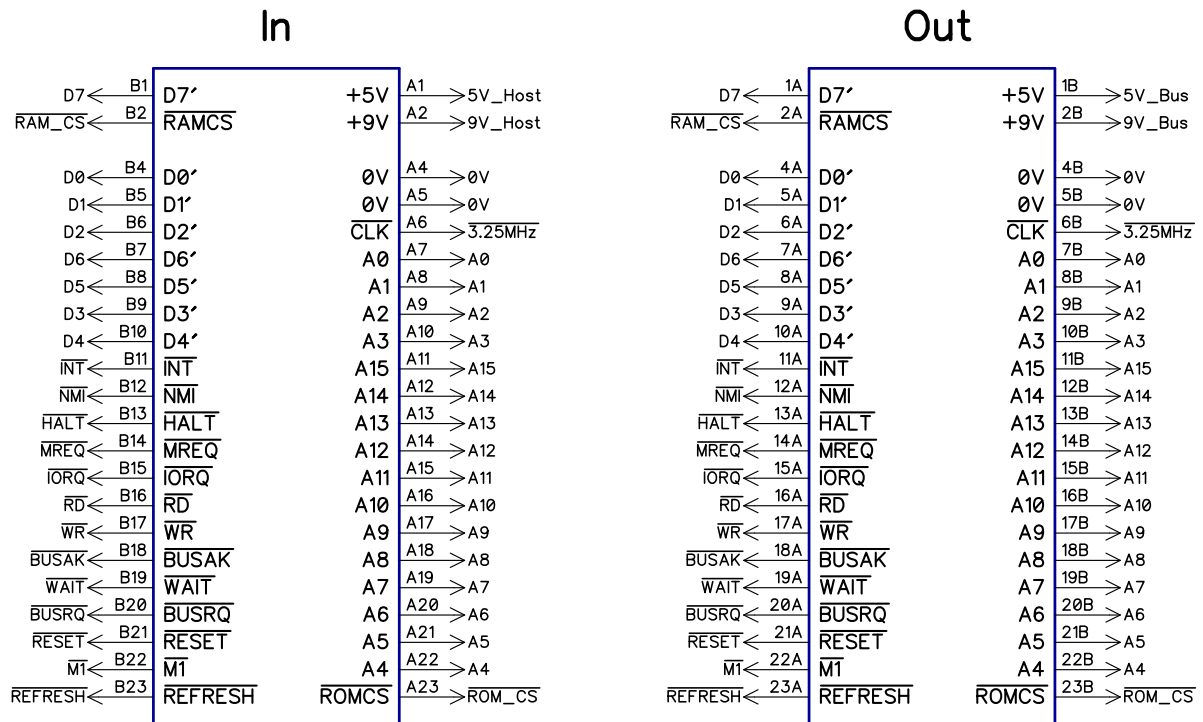1 x 5mm LED, green or the colour of your choice

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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In

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

Out

D7 ←	1A	D7′	+5V	1B	→5V_Bus
RAM_CS ←	2A	RAMCS	+9V	2B	→9V_Bus
D0 ←	4A	D0′	0V	4B	→0V
D1 ←	5A	D1′	0V	5B	→0V
D2 ←	6A	D2′	CLK	6B	→3.25MHz
D6 ←	7A	D6′	A0	7B	→A0
D5 ←	8A	D5′	A1	8B	→A1
D3 ←	9A	D3′	A2	9B	→A2
D4 ←	10A	D4′	A3	10B	→A3
INT ←	11A	INT	A15	11B	→A15
NMI ←	12A	NMI	A14	12B	→A14
HALT ←	13A	HALT	A13	13B	→A13
MREQ ←	14A	MREQ	A12	14B	→A12
IORQ ←	15A	IORQ	A11	15B	→A11
RD ←	16A	RD	A10	16B	→A10
WR ←	17A	WR	A9	17B	→A9
BUSAK ←	18A	BUSAK	A8	18B	→A8
WAIT ←	19A	WAIT	A7	19B	→A7
BUSRQ ←	20A	BUSRQ	A6	20B	→A6
RESET ←	21A	RESET	A5	21B	→A5
M1 ←	22A	M1	A4	22B	→A4
REFRESH ←	23A	REFRESH	ROMCS	23B	→ROM_CS

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.
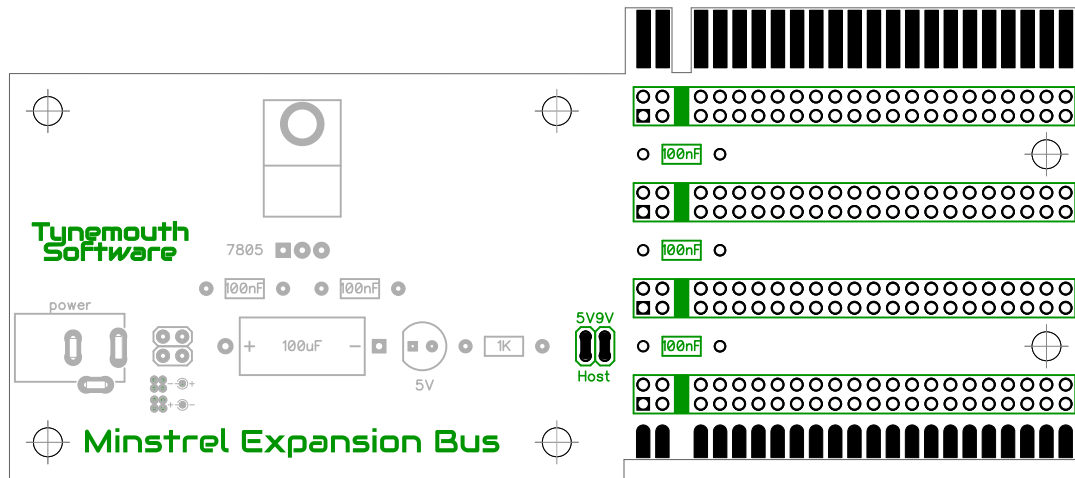
OPTIONAL POWER SUPPLY SCHEMATIC
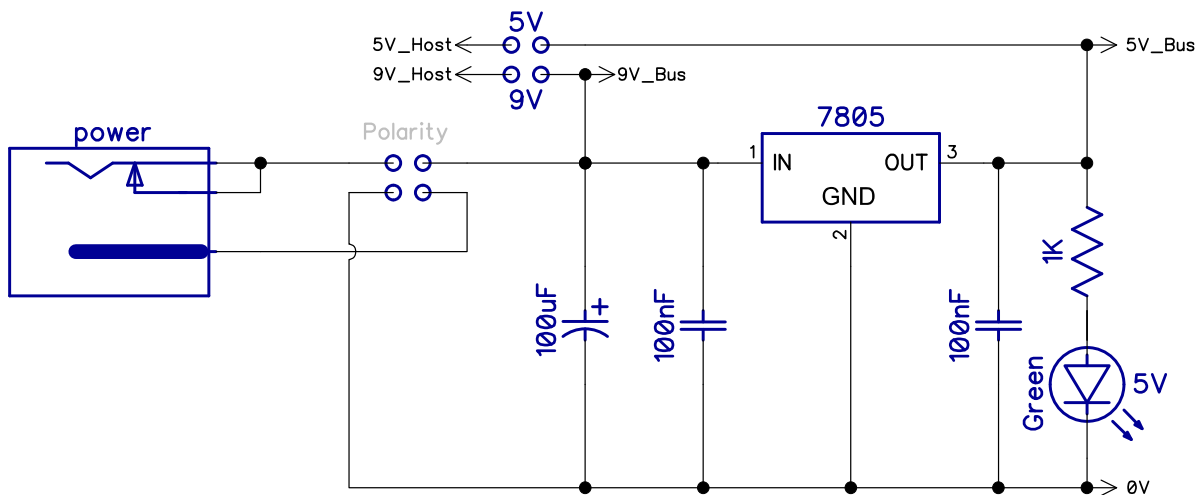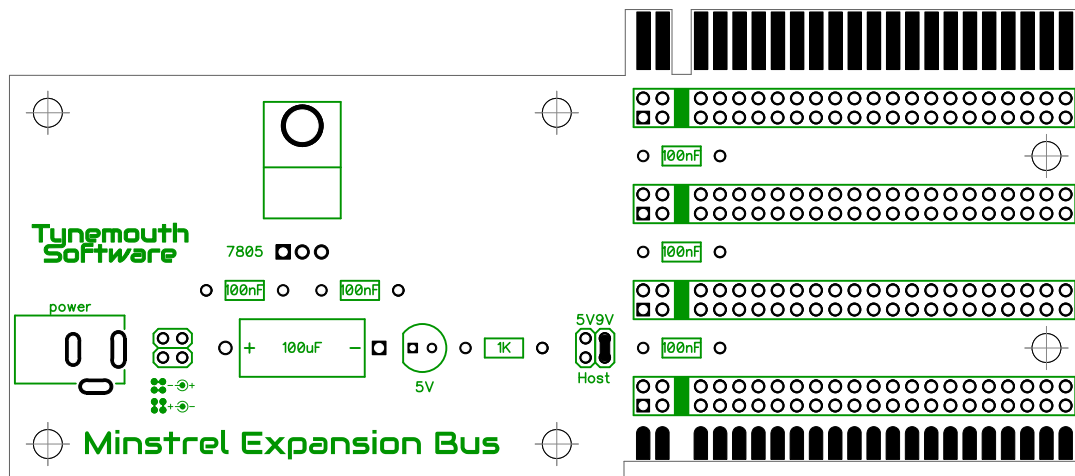
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HOST POWERED

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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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 to replace it fully, or in part (as it used to add commands to BASIC for example).

/RAM_CS can be used to disable the system RAM.