Small Computer Central

SC126, v1.0, User Guide

SC126 (https://smallcomputercentral.wordpress.com/sc126-z180-motherboard-rc2014/)is a Z180 based motherboard. It can be used on its own as a Single Board Computer or it can be expanded using the built in module sockets. The Expansion sockets allow use of many modules designed for RC2014 and can be further expanded with a modular backplane, such as SC113 (https://smallcomputercentral.wordpress.com/sc113-modular-backplane-rc2014/).
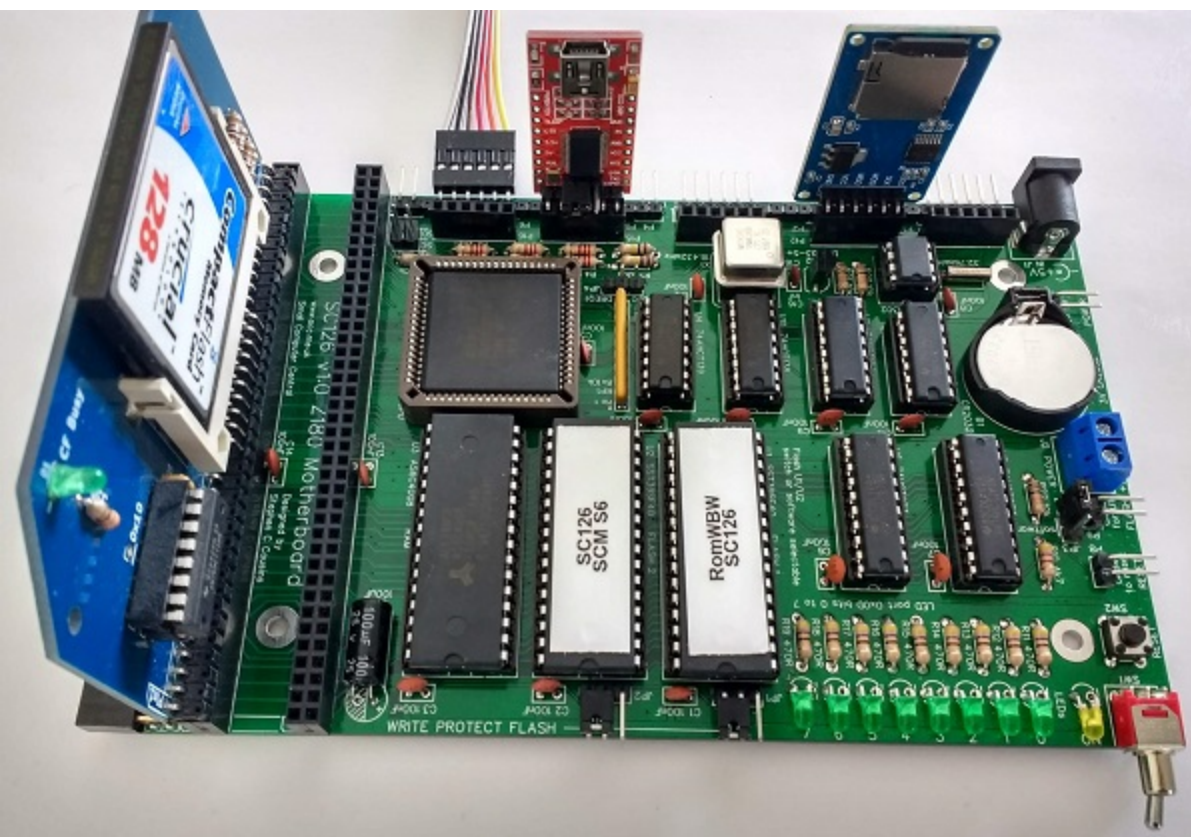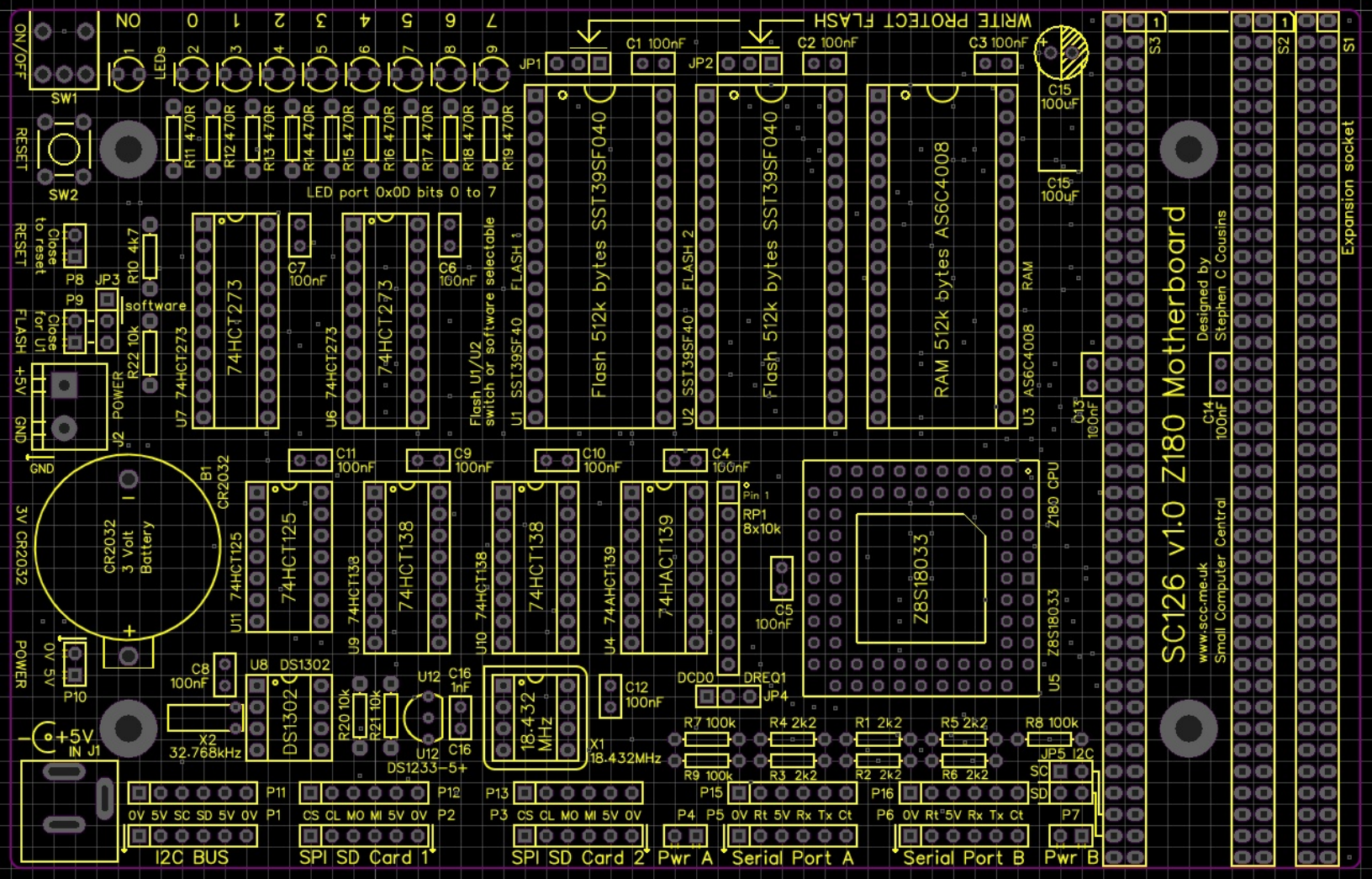

SC126 normally has the Small Computer Monitor (SCM) in one Flash chip and RomWBW in the other.

Documentation for the Small Computer Monitor can be found here (https://smallcomputercentral.wordpress.com/small-computer-monitor/).

Documentation for RomWBW can be found here (https://smallcomputercentral.wordpress.com/firmware-romwbw/).

A short guide to getting started with RomWBW on SC126 can be found here (https://smallcomputercentral.wordpress.com/sc126-z180-motherboard-rc2014/sc126-v1-0-software-romwbw/).

SC126 Printed Circuit Board Layout

Quick Guide to Jumpers

As a quick guide to getting started: Fit jumper shunts in the positions shown below and supply 5 volts to J1 or J2.
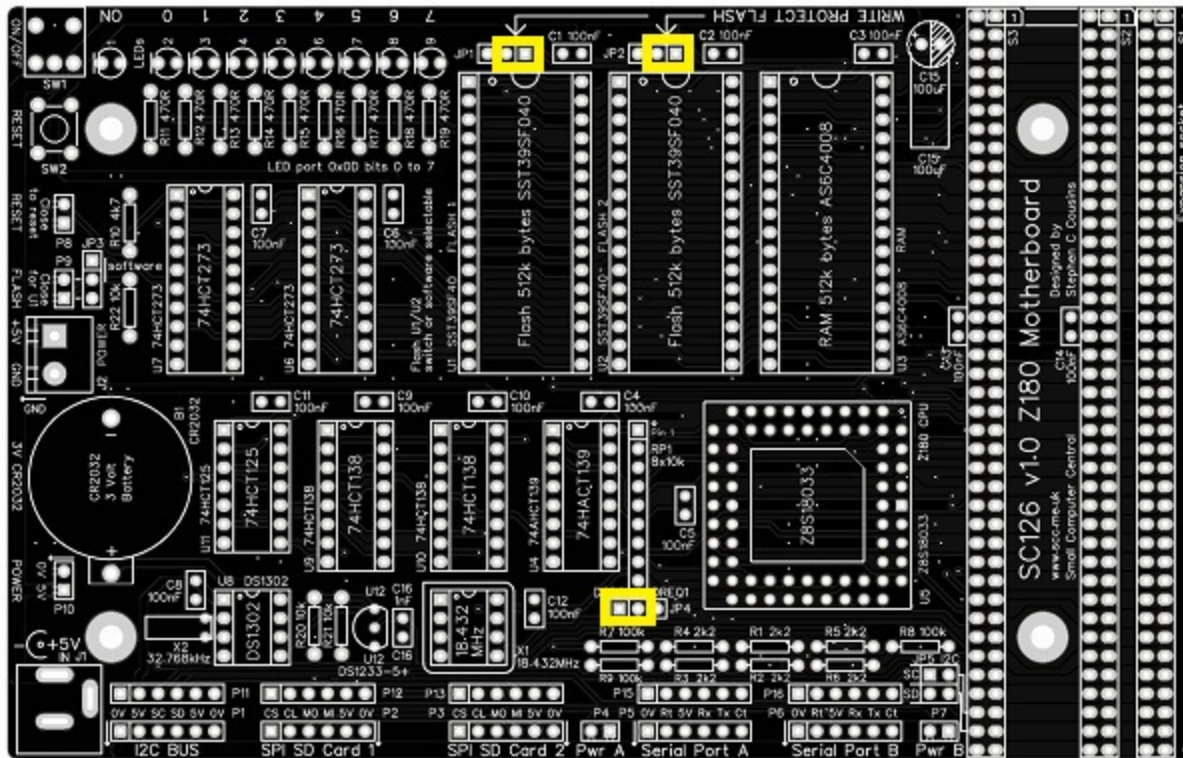
Quick guide to recommended jumper shunt positions

And for those who are sensible enough to read User Guides…

Power

The power required for this board is 5 V D.C. at 100 mA without SD cards or other accessories. With accessories and expansion boards fitted the current requirement could easily rise to 300 mA.

The motherboard can be powered in a number of ways. The illustration below shows three places where 5 volts can be connected. When powered from any of these places the board can be turned on and off with the ON/OFF switch.
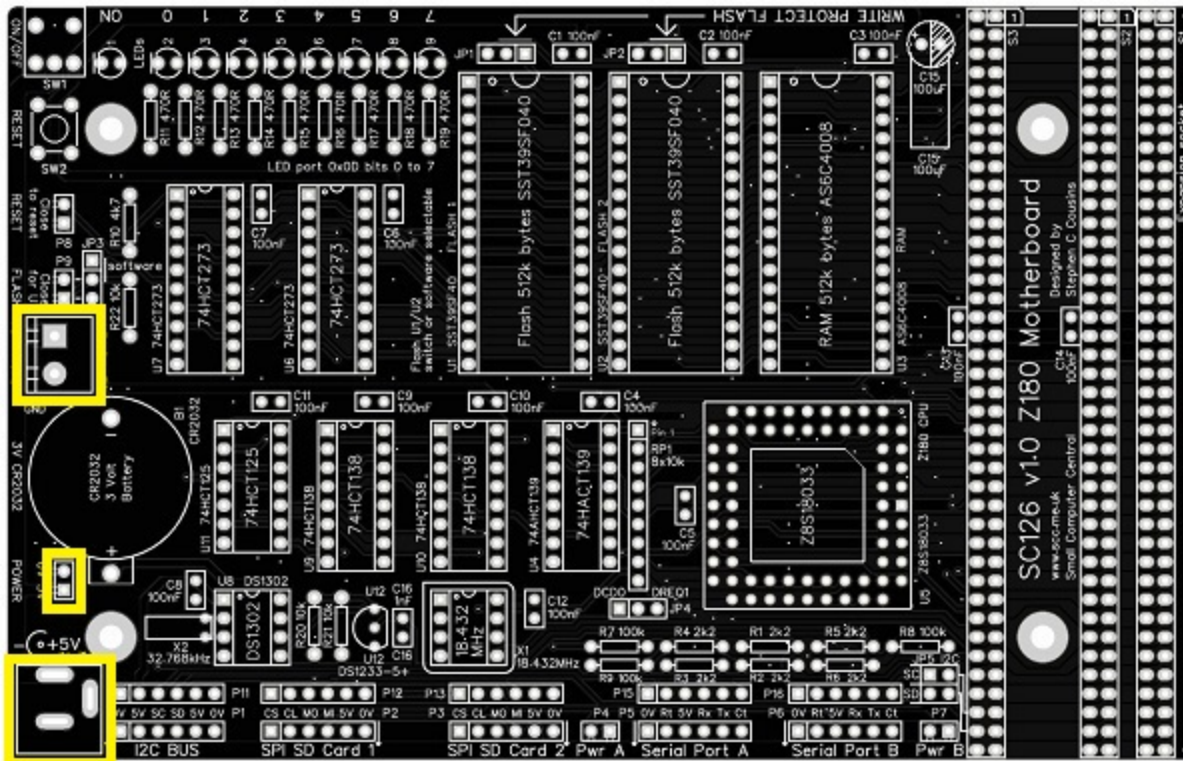
Power Input (5 Volt D.C.)

The board can also be powered from the serial ports, or even the SPI and I2C ports. Powering from any of these sources does not allow the board to be turn on and off with the ON/OFF switch.

The motherboard is typically connected to a computer or terminal with an FTDI style serial adapter. This can, optionally, also provide power for the motherboard. However, some USB sockets and some FTDI style adapters will not provide adequate power if accessories and expansion cards are connected.

Each serial port, highlighted below in red, can supply power to the system. To connect power from a serial port, fit a jumper shunt in the appropriate location, indicated below in yellow. The left jumper is for port A and the right jumper is for port B.
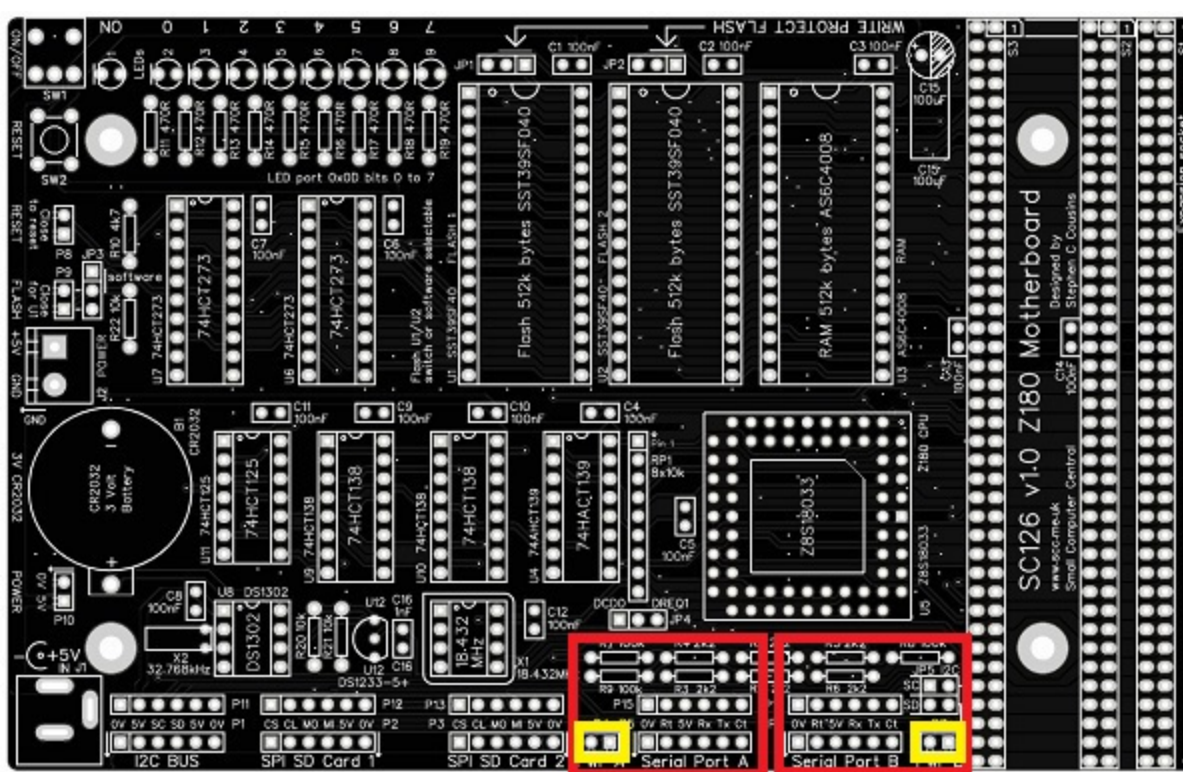

Serial Ports and Power Jumpers

WARNING: You should normally only connect one power source to the system, at any time.

As power can flow either way, these jumpers also enable serial devices to be powered from the motherboard. If such devices are used, fit a jumper shunt in the appropriate position, indicated above in yellow.

Firmware Selection

The motherboard has two Flash ROM sockets, allowing two different firmware options to be installed at the same time.

The required firmware is selected with JP3 or P9.
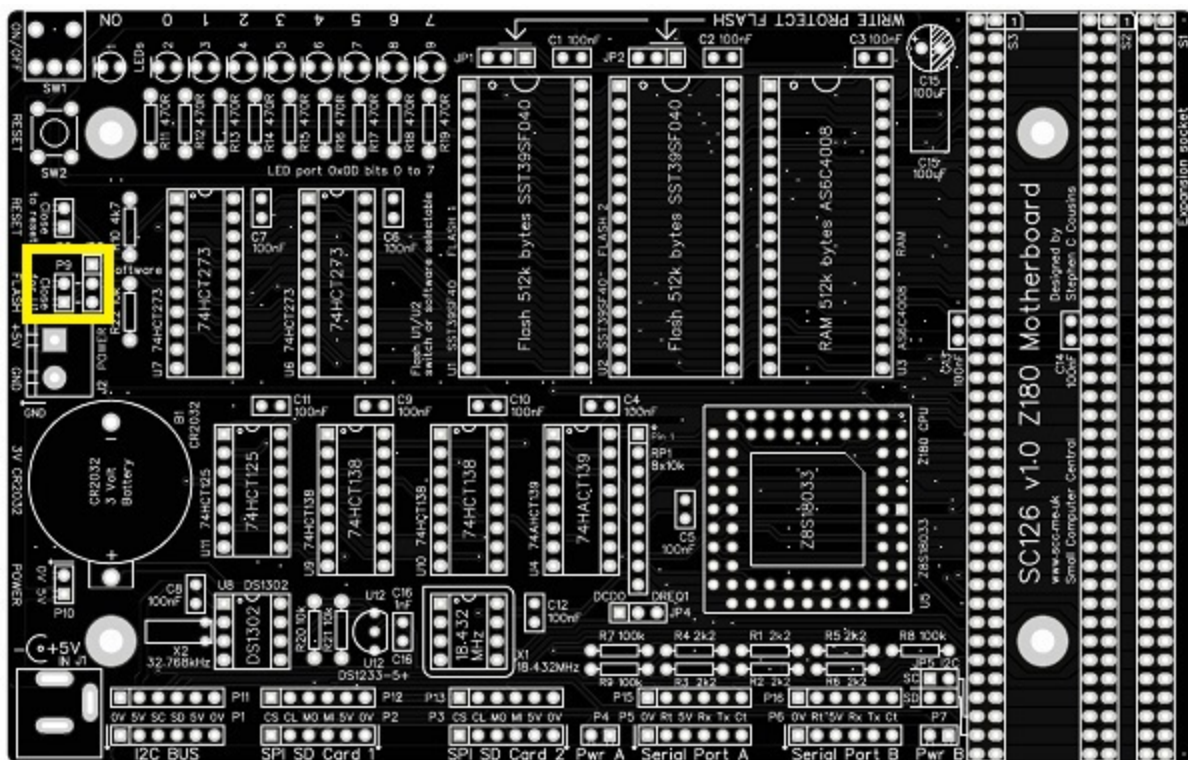
Flash ROM Chip Selection

If a jumper shunt or a closed external switch is fitted to P9, then socket U1 is selected. If there is no jumer shunt present or an external switch is open, the socket U2 is selected.

JP3 provides an alternative connection point for a jumper shunt or switch. In addition, it allows a jumper shunt to be fitted in the upper position to allow software control of the socket selection. Socket selection by software is not currently supported.

An external switch connected to P9 carries only a simple D.C. level, so cable length should not normally be a problem.

Write Protect Flash

Jumpers, JP1 and JP2, shown below in yellow, enable each Flash chip to be independently write protected. It is unlikely the Flash chip will be corrupted in normal operation, due to the software requirements to write to it. However, for peace of mind you can disable writing with jumper shunts.
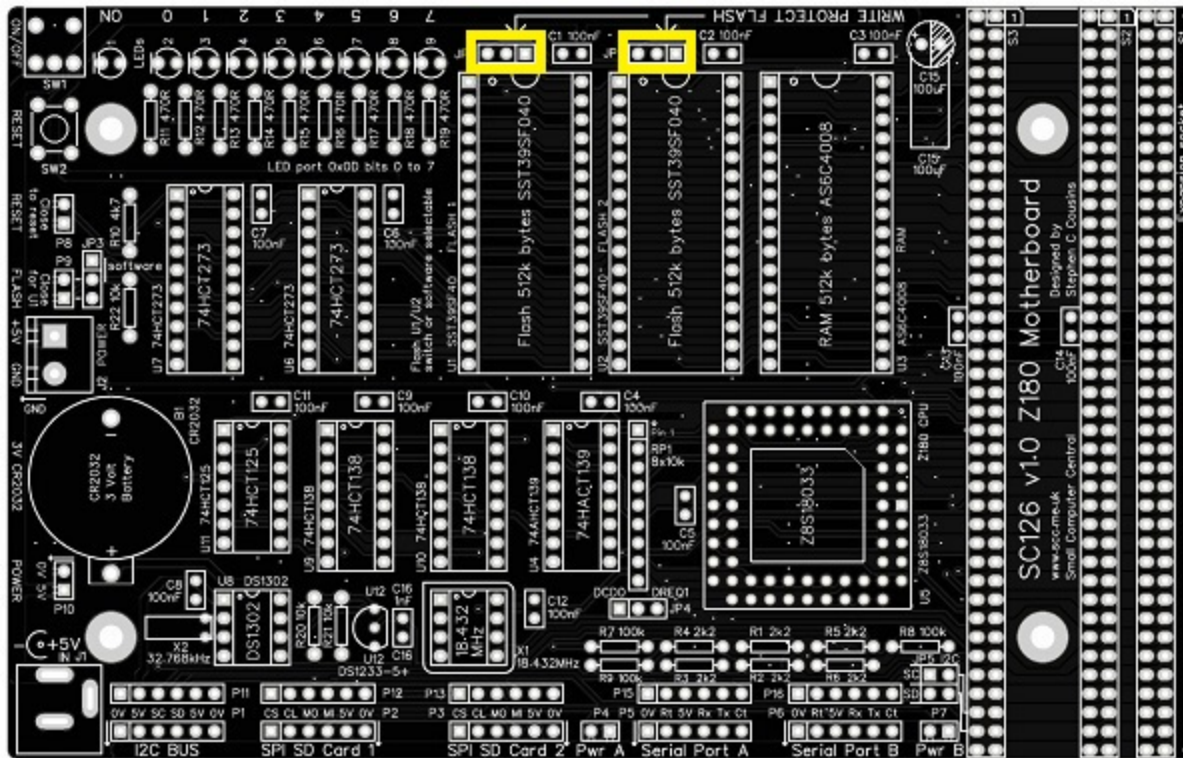
*Flash Write Protect*

Each Flash chip has its own write protection jumper. Fit the shunt in the position shown below in green to disable writing. Alternatively, fit the shunt in the position shown below in red to enable writing.
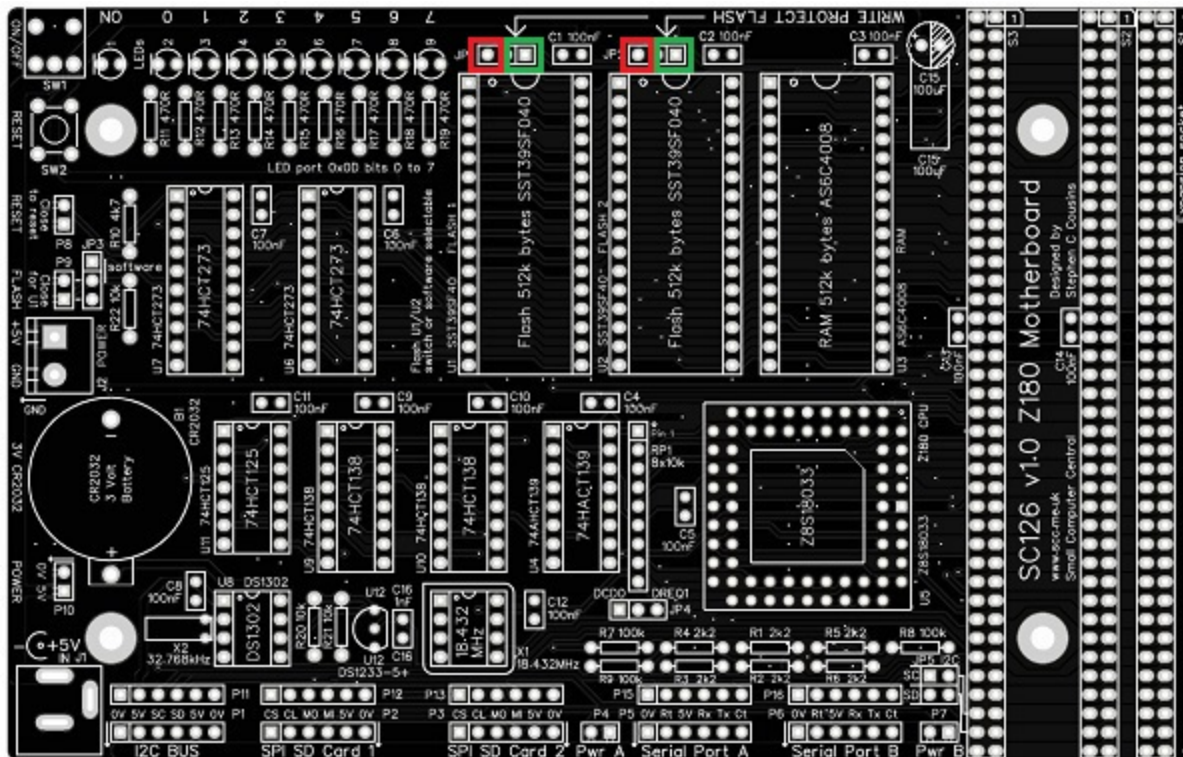
Write Enable/Disable Jumpers

Serial Ports

The motherboard has two asynchronous serial ports, with software selectable baud rate. These are 5 volt FTDI style ports.
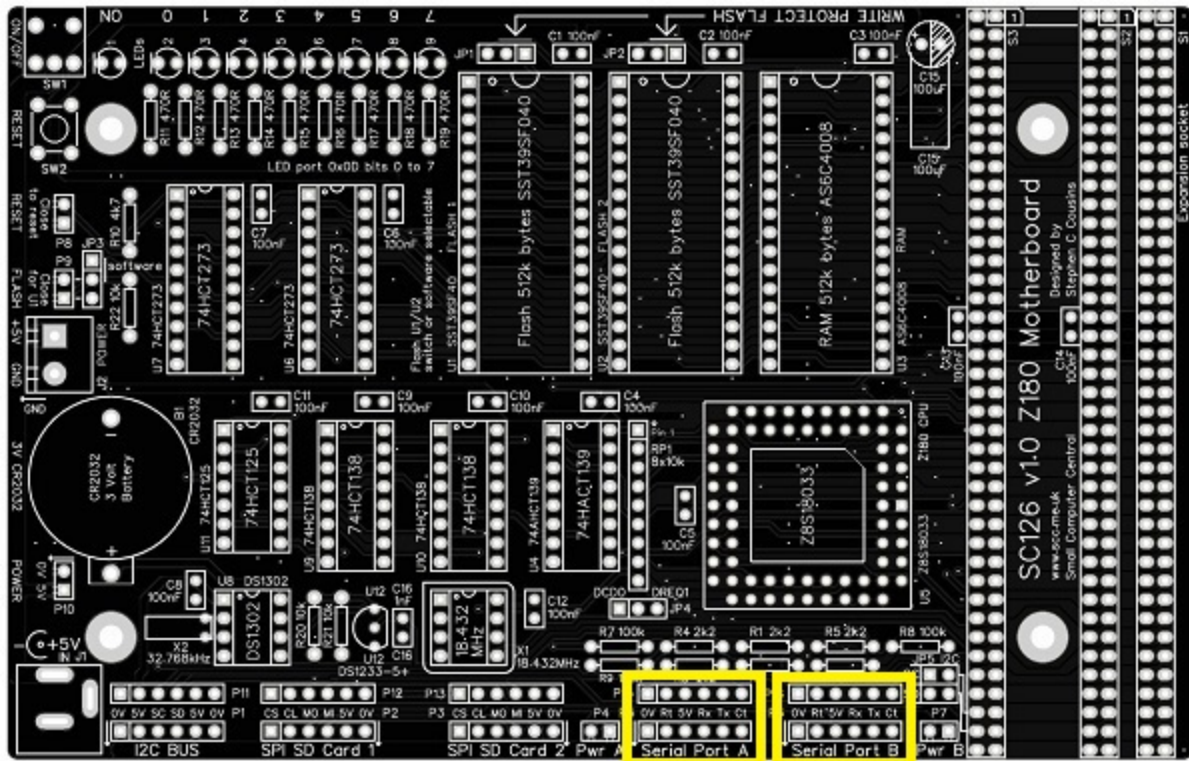
Serial Ports

The pin-out, below, describes signals with respect to the motherboard, so an output is a signal from the motherboard to a computer or terminal.

Pin	Function
1	Ground (GND)
2	Request To Send (RTS) output
3	Vcc (5V)
4	Recieve Data (RxD) input
5	Transmit Data (TxD) output
6	Clear To Send (CTS) input (not connected)

The ground terminal is marked with a small down arrow to help with cable orientation.

A typical FTDI style serial adapter is illustrated to the right.

This may be fitted directly to the motherboard or by a 6-way cable.
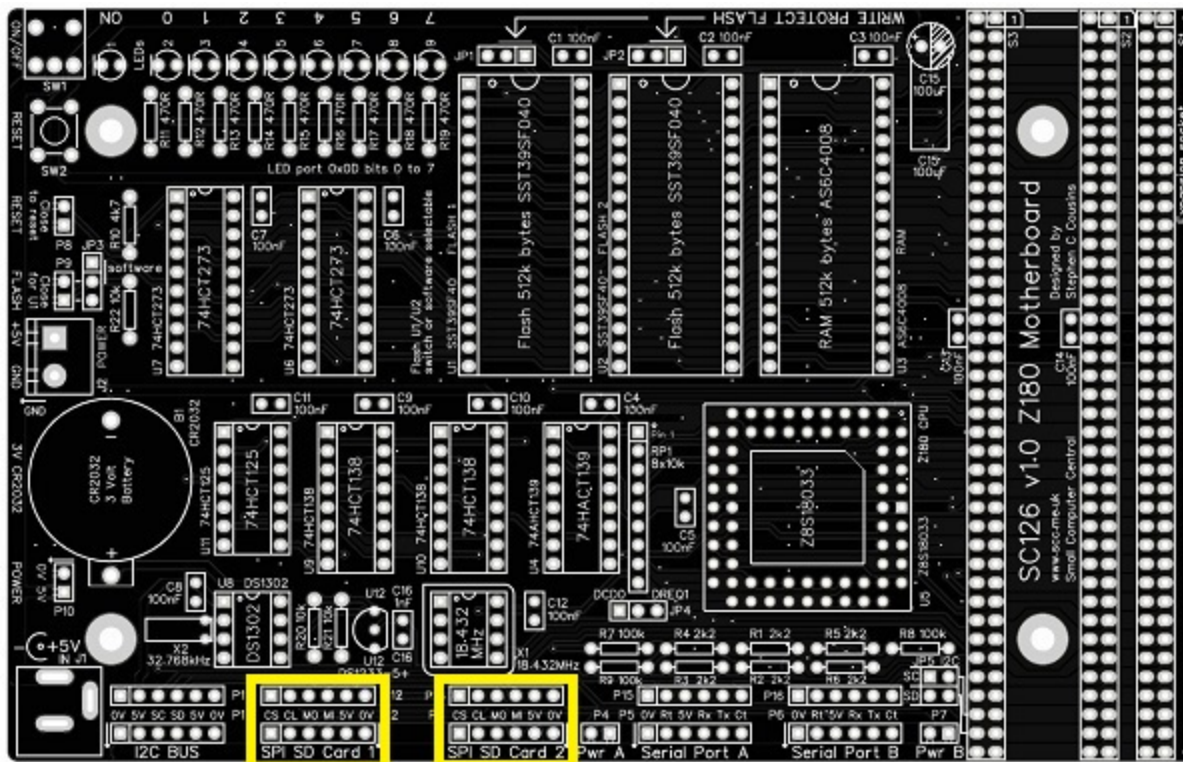

The default serial ports settings are as follows:

Setting	SCM	RomWBW
Baud rate	115200	115200 (v3.0) 38400 (pre-v3.0)
Data bits	8	8

Parity	none	none
Stop bits	1	1
Flow control	Hardware (recommended)	Hardware (recommended)

The default serial port is P5, Serial Port A.

SPI Ports

The motherboard has two SPI ports, primarily for connection to SD card adapters.

SPI Ports

The signals are 5 volt levels, with the following pin-out.

Pin	Function
1	Chip select (active low)
2	Clock
3	Master out, slave in
4	Master in, slave out
5	Vcc (5V)
6	Ground (GND)

The ground terminal is marked with a small down arrow to help with cable orientation.

A typical micro SD card adapter is illustrated to the right.

This may be fitted directly to the motherboard or by a 6-way cable.

Using the micro SD card adapter illustrated above, only one SPI device may be connected to the motherboard. This is because the adapter does not have a tri-state data output.

The default SD card position is P2, SPI SD Card 1.

I2C Port

The motherboard has a bit-bang I2C bus port. This is a very nice interface for connecting a whole range of slow to modest speed devices, such as digital I/O ports.

This port can only act as an I2C bus master and does not support other bus masters being connected to it.
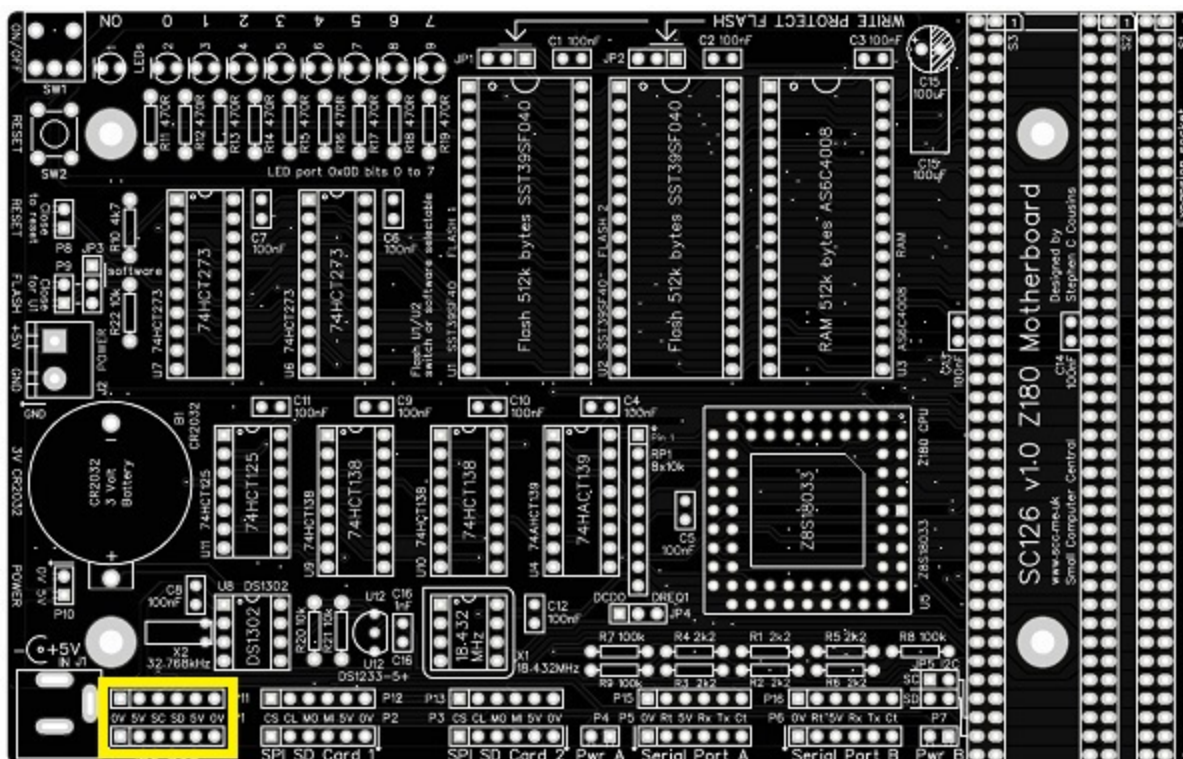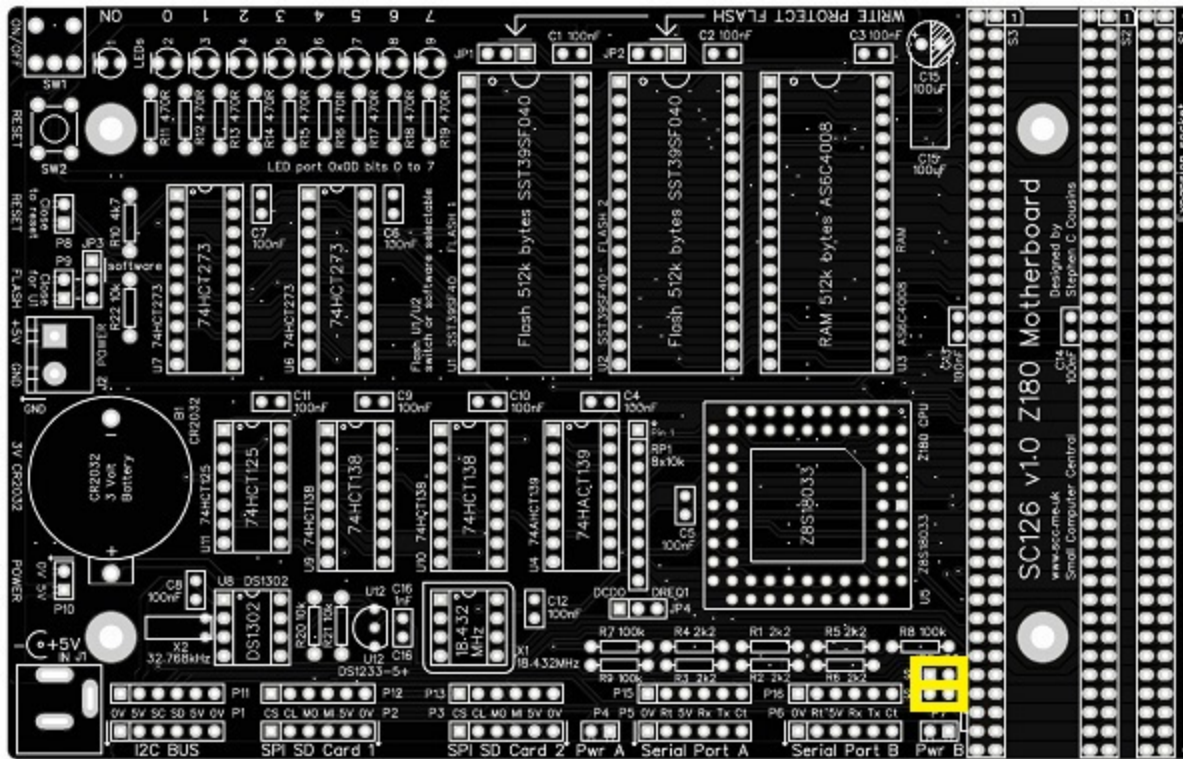

I2C Port

The signals are 5 volt levels, with the following pin-out.

Pin	Function
1	Ground (GND)
2	Vcc (5v)
3	Clock (SCL)

4	Data (SDA)
5	Vcc (5V)
6	Ground (GND)

The I2C signals, SCL and SDA, can be connected to the expansion bus, pins 78 and 79, via two jumpers, JP5 (shown below in yellow).

I2C Jumpers

Expansion Bus Sockets

This is an unofficial variant of the RC2014 Bus. It is essentially an RC2014 Bus with extra pins.

Row 2 Pin #s	Signal Name		Row 1 Pin #	Signal Name
41	Not yet assigned		1	A15
42	Not yet assigned		2	A14
43	Not yet assigned		3	A13
44	Not yet assigned		4	A12
45	Not yet assigned		5	A11
46	Not yet assigned		6	A10
47	Not yet assigned		7	A9
48	Not yet assigned		8	A8
49	A23 (not used)		9	A7
50	A22 (not used)		10	A6

51	A21 (not used)		11	A5
52	A20 (not used)		12	A4
53	A19		13	A3
54	A18		14	A2
55	A17		15	A1
56	A16		16	A0
57	GND		17	GND
58	5V		18	5V
59	/RFSH		19	/M1
60	PAGE (not used)		20	/RESET
61	CLK2 (not used)		21	CLK
62	/BUSAK		22	/INT
63	/HALT		23	/MREQ
64	/BUSRQ		24	/WR
65	/WAIT		25	/RD
66	/NMI		26	/IORQ
67	D8 (not used)		27	D0
68	D9 (not used)		28	D1
69	D10 (not used)		29	D2
70	D11 (not used)		30	D3
71	D12 (not used)		31	D4
72	D13 (not used)		32	D5
73	D14 (not used)		33	D6
74	D15 (not used)		34	D7
75	TX2		35	TX
76	RX2		36	RX
77	USER5 (not used)		37	USER1 (not used)
78	USER6 (I2C SCL)		38	USER2 (not used)
79	USER7 (I2C SDA)		39	USER3 (not used)
80	USER8 (IEI)		40	USER4 (IEO)

The I2C signals, SCL and SDA, can be connected to USER6 (pin 78) and USER7 (pin 79) by fitting jumper shunts to JP5.

Bus pins USER8 and USER4 are used as a Z80 mode 2 interrupt daisy chain, so are not wired straight through link the other signals. Instead USER4 of one socket is connected to USER8 of the next, forming a daisy chain.

DCD0 and DREQ1 Inputs

Header JP4 provides access to the DCD0 input and the DREQ1 input.

With some Z180 processors the DCD0 input must be pulled low (fit jumper shunt) to enable the serial port to receive data. With other Z180 processors this input can be read by suitable software.

Fit a shunt in the DCD0 position to pull the DCD0 input low.
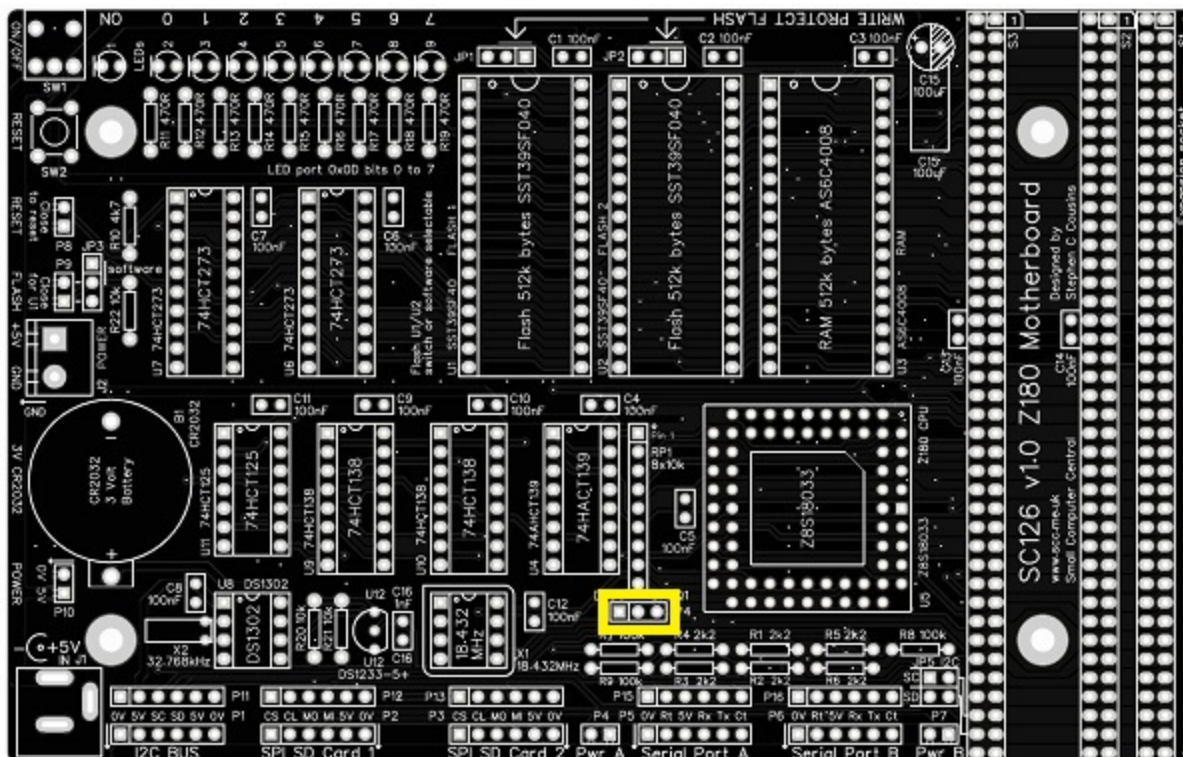
DCD0 and DREQ1 Jumpers

This header should normally have a jumper shunt fitted in the DCD0 position.

Memory Map

The physical memory map is simply 512k byte of Flash ROM at the bottom of memory and 512k bytes of RAM at the top of memory.

The Z180's memory management unit deals with mapping chunks of this memory into the logical 64k memory map supported by the Z80/Z180 instruction set.

Address	Function
0x80000 to 0xFFFFF	RAM (512k bytes)
0x00000 to 0x7FFFF	Flash ROM (512k bytes)

Input / Output Ports

The motherboard's I/O port addresses are as follows.

Address	Function

0xC0 to 0xFF	Z180's internal I/O registers
0x0D	LED output port
0x0C	System I/O port (RTC, SPI and I2C)

All other I/O addresses are available for use by expansion modules.

The LED port has 8 LEDs which are free for use. These can be written to with simple input and output statements or instructions.

- From BASIC:
  - OUT 13, <byte-to-be-output>

- From the Small Computer Monitor
  - O D <byte-to-to-output>

- From assembler:
  - LD A, <byte-to-be-output>
  - OUT ($D), A