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Animatronic & Puppet control systems for Film & Television

p.Brain-SMB V1.0 Motherboard – User Guide V1.5

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This motherboard is designed to take the p.Brain-ds24 robot controller, and will not function as a stand alone unit.

Description

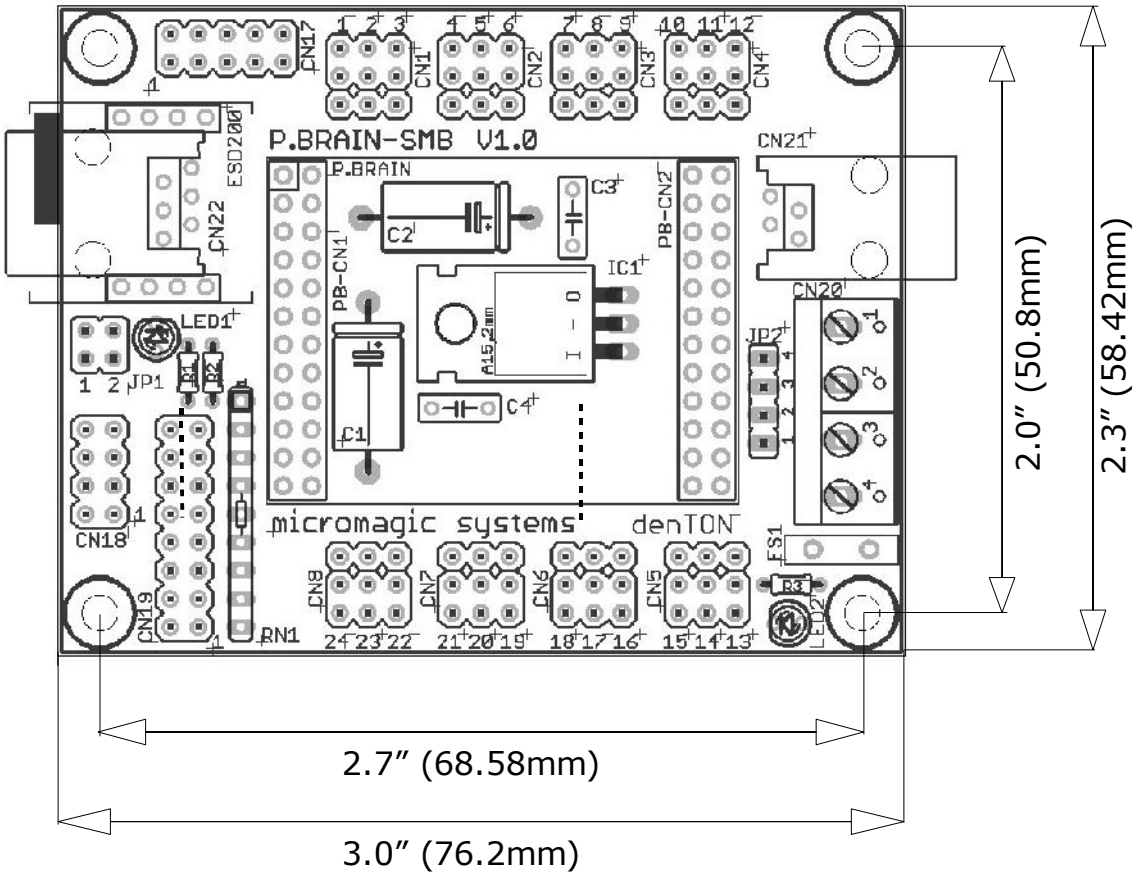
The p.Brain-SMB has been designed for use with the p.Brain-ds24 as a convenient development motherboard giving the user access to all of the I/O features of the p.Brain-ds24. Essentially the p.Brain-SMB routes all of the p.Brain-ds24 signals to convenient connectors.

p.Brain-SMB (v1.0) - User Guide V1.5

Key Features

- Servo Power Polyswitch Fused Input (VS) @ 5 Amp continuous trip
- Separate Logic Power Input (VL)
- LDO 5V Regulator for Logic Power
- Regulator feed selectable from either VS or VL
- RJ11 4/4 RS232 connector
- MPLAB RJ11 6/6 Programming connector (Supplied, not fitted)
- All 24 PWM channels routed to edge of PSB
- p.Brain I/O connectors
- VS LED indicator
- PCB socket for Parani ESD200 Bluetooth module
- Bluetooth LED indicator
- 2.7" x 2.0" Fixing holes
- 3" x 2.3" PCB dimensions

Board Layout



p.Brain-ds24 Insertion

When inserting the *p.Brain-ds24* into the *p.Brain-SMB*, make sure the "p.Brain" text on the ds24 matches the "p.Brain" text on the SMB. Pin 1 of the ds24 is the top left corner when viewed from above. See picture below.

Bluetooth ESD200 Fitting

An optional ESD200 bluetooth module can be user fitted. The initial release of the p.Brain-SMB did not come with the ESD200 sockets, in this case, it is strongly recommended that two 4x1 headers are used to mount the module such as these: RS 251-8193. **Do not solder the module directly into the p.Brain-SMB.**

You will also need to install jumper JP1-2 to connect the TX ouptut of the ESD200 to UART1 RX input. See page 26 of the *p.Brain-HexEngine* Configuration guide for further details.

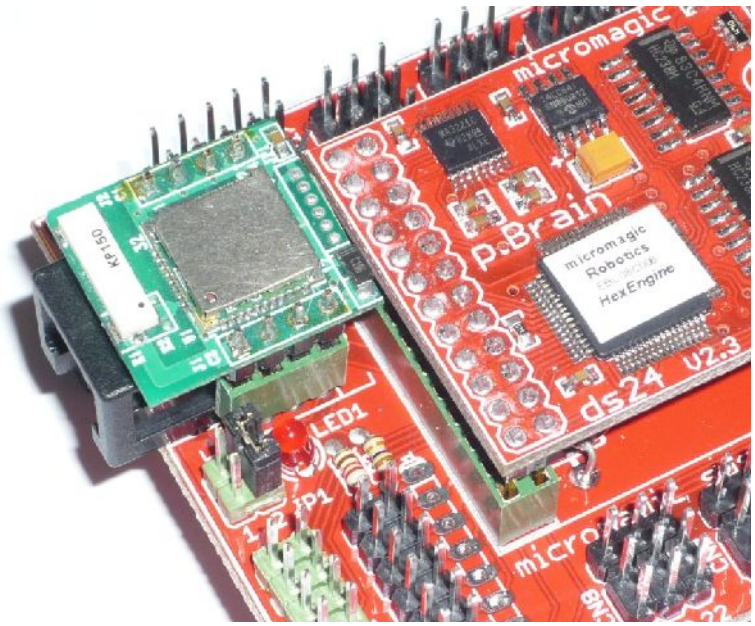
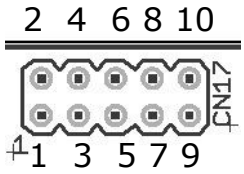


Image showing ESD200 fitted into 4 x 1 0.1" pitch header sockets. CN22b RJ11 6/6 has also been fitted below the ESD200 to facilitate ICSP facility. CN22b is not fitted as standard, and is not necessary for the ESD200 operation.

Connectors

Name	Description
CN1	Servo connectors 1,2,3
CN2	Servo connectors 4,5,6
CN3	Servo connectors 7,8,9
CN4	Servo connectors 10,11,12
CN5	Servo connectors 13,14,15
CN6	Servo connectors 16,17,18
CN7	Servo connectors 19,20,21
CN8	Servo connectors 22,23,24
CN17	ds24 Communications connector
CN18	ds24 4 x digital I/O, or SPI.
CN19	ds24 8 x Digital I/O, or analogue capture.
CN20	Power supply VS & VL
CN21	RS-232 RJ11 4/4 connector for ds24 UART2
CN22 (a)	RJ11 6/6 connector for microchip ICD2 programmer. (not fitted)
CN22 (b)	Parani ESD200 blue tooth socket.
JP1	ESD200 Receive enable & reset jumpers
JP2 or JP3	Logic supply select jumper (**Marked JP3 on some SMB boards**)
RN1	User fitted optional pull up resistors to CN19

Unless otherwise stated, all double row pin headers follow the standard numbering format, with pin one at the bottom right of the connector when viewed from above. For example CN17 would be:



LED's

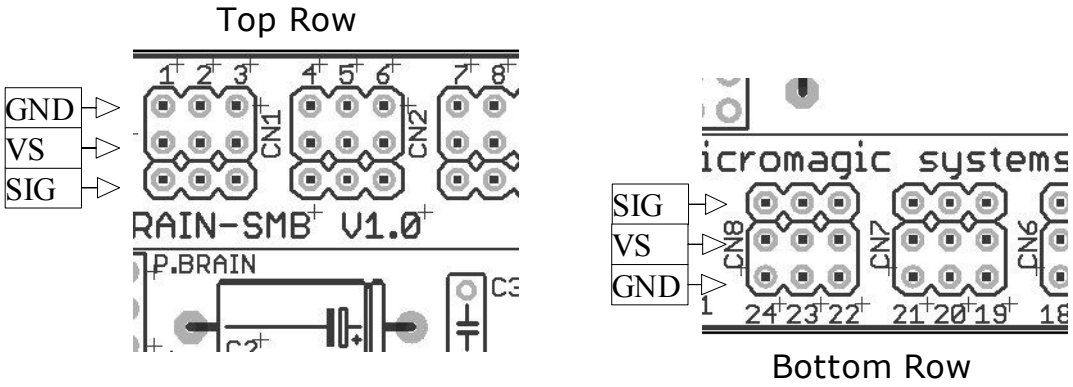
Name	Description
LED1	Blue tooth link indicator (Only if ESD200 fitted)
LED2	Servo power (VS) indicator

Connector Descriptions

CN1 -> CN8

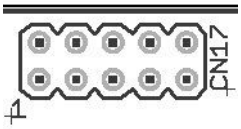
0.1” pitch 3 x 3 pin header

Each 3 pin servo connector has its signal pin closest to the middle of the SMB board, followed by servo power (VS) and ground (GND) on the outer most pin.



CN17

p.Brain-ds24 communications connector



0.1” pitch 2 x 5 pin header

Pin	Name	Description
1	U2RX	TTL UART2 Data in (RX)
2	U1RX	TTL UART1 Data in (RX) – p.Brain-ds24 dsPIC33 PGC
3	U2TX	TTL UART2 Data out (TX)
4	U1TX	TTL UART1 Data out (TX) – p.Brain-ds24 dsPIC33 PGD
5	SDA	I2C Serial Data (SDA)
6	GND	GND signal ground
7	SCL	I2C Serial Clock (SCL)
8	V3.3	3.3V power from p.Brain-ds24 on-board regulator (Max 100mA)
9	VOUT	JP2 1-2 or 2-3 = 5.0V power from SMB regulator (Max 200mA) JP2 3-4 = VS (servo power)
10	RESET	p.Brain-ds24 dsPIC33 MCLR

Notes:
U2RX Pin 1 is internally connected to the RS-232 transceiver on the p.Brain-ds24, therefore if the RS-232 transceiver is in use, this pin should be left floating. This pin can only be driven if the RS-232 transceiver has been disabled by user code. The RS-232 transceiver is used by the p.Brain-HexEngine.

U2TX Pin 3 can drive the RS-232 transceiver and other external TTL uarts simultaneously.

SDA Pin 5 & SCL Pin 7 have 10K pull up resistors on-board the p.Brain-ds24

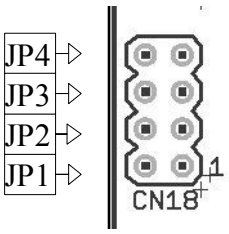
RESET Pin 10 should be left floating for normal operation, pulling this pin to ground will reset the p.Brain-ds24.

CN18

p.Brain-ds24 4 x digital I/O, used for UART configuration on p.Brain-HexEngine, JP1 to JP4 as follows:

0.1" pitch 2 x 4 pin header

Pin	Name	Description
1	DIG0	Digital 0
2	GND	GND Ground
3	DIG1	Digital 1
4	GND	GND Ground
5	DIG2	Digital 2
6	GND	GND Ground
7	DIG3	Digital 3
8	GND	GND Ground

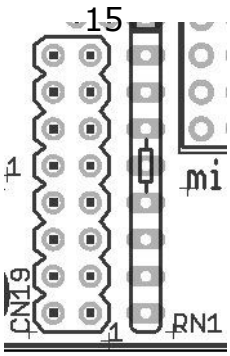


CN19

p.Brain-ds24 8 x digital I/O or analogue capture.

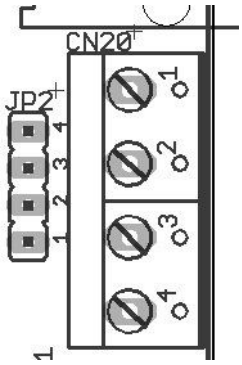
0.1" pitch 2 x 8 pin header

Pin	Name	Description
1	ANA7	Digital 11, Analogue 7
2	GND	GND Ground
3	ANA6	Digital 10, Analogue 6
4	GND	GND Ground
5	ANA5	Digital 9, Analogue 5
6	GND	GND Ground
7	ANA4	Digital 8, Analogue 4
8	GND	GND Ground
9	ANA3	Digital 7, Analogue 3
10	GND	GND Ground
11	ANA2	Digital 6, Analogue 2
12	GND	GND Ground
13	ANA1	Digital 5, Analogue 1
14	GND	GND Ground
15	ANA0	Digital 4, Analogue 0
16	GND	GND Ground



CN20

Servo & logic Power Connector.



Screw Terminal 0.2" pitch

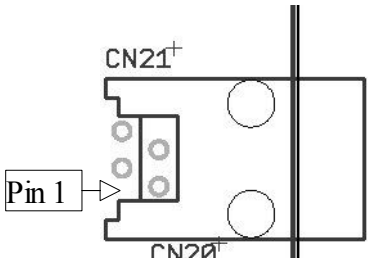
Pin	Name	Description
1	GND	Ground
2	VL	Positive logic supply
3	GND	Ground
4	VS	Positive Servo supply

VL Voltage range for VL can be 4.5 to 12V DC, however, at voltages below 5.5V the 5V output from the on-board regulator will be below 5V. This does not effect the 3.3V regulator on the p.Brain-ds24. The supply to the on-board regulator is selected using JP2/JP3, please see the section on JP2/JP3 for further details.

VS The servo voltage VS depends on the type of servos being used. For standard hobby style servos I would suggest a 4.8 or 6 NiCd or NiMh pack. *Note: Servo power is fused via a polyswitch. This fuse will trip at approx 8.5Amps, and will reset when the short circuit condition has been removed. The fuse is rated at 16V max.*

CN21

p.Brain-ds24 RS-232 terminal port.



RJ11 4/4 Right Angle Socket

Pin	Name	Description
1	TX_232	RS-232 Data out
2	RX_232	RS-232 Data in
3	GND	Ground
4	N/C	Not Connected

An RS-232 RJ11 to DB9 cable is available separately (p.Brain-RJ232) or you can make your own serial lead to connect to the p.Brain-SMB using the following wiring:

RJ11 to PC DB9 (Female)

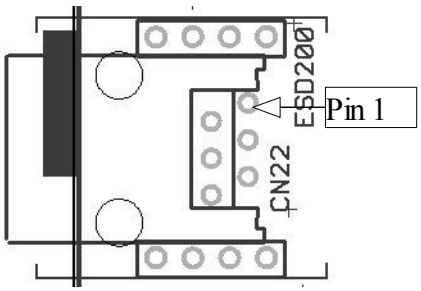
RJ11 Pin	Name	DB9 Pin
1	p.Brain TX	3
2	p.Brain RX	2
3	GND	5

CN22 (a)

ICD2 In Circuit Serial Programming (ICSP) Connector.

RJ11 6/6 Right Angle Socket

Pin	Name	Description
1	MCLR	Memory Clear / Reset
2	3.3V	3.3V power
3	GND	Ground
4	PGD	ICSP Programme Data
5	PGC	ICSP Programme Clock
6		Not Connected

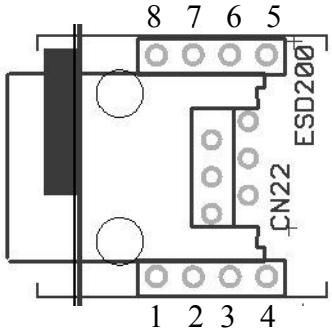


CN22 (b)

Parani ESD200 Blue tooth module pins.

2 x 0.1” pitch 1 x 4 holes.

Pin	Name	Description
1	GND	Ground
2	VDD	3.3V Power In
3	STATUS	Status Signal (connected to LED1)
4	RST	Reset factory defaults
5	CTS	Clear to Send (Tied to GND)
6	RTS	Request To Send (Not Used)
7	TXD	Data Out
8	RXD	Data In



Note:

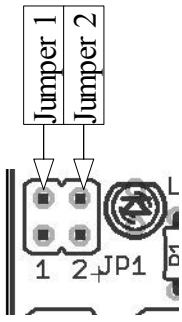
Pin 7 Data Out is routed through JP1 jumper 2, shorting jumper 2 out connects the ESD200 Data Out pin to the p.Brain-ds24 UART 1 Receiver (CN17 U1RX Pin 2). The reason this is a jumper link is to facilitate ICS programming without the need to remove the bluetooth module. JP1 jumper 2 must be removed in order to use the ICD2 ICSP via CN22 (a) for user development. **If you are not using CN22a, fit JP2 jumper 2 for bluetooth operation.**

JP1

Jumper block 1

0.1” pitch 2 x 2 pin header

link	Description
1 - 2	Reset Parani ESD200 to default settings
3 - 4	Connect ESD200 TX to p,Brain-ds24 U1RX



Note:
To reset ESD200 to factory defaults, insert jumper 1 for at least 1 second, and remove. Default ESD200 baud is 9600.

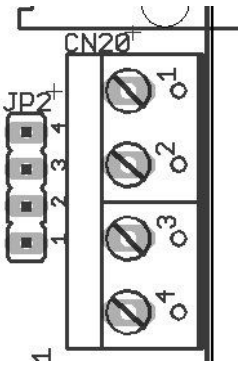
For normal operation insert Jumper 2. See note on CN22 (b) for further information.

JP2 / JP3 (This jumper is labelled JP3 on the SMB V1.x or higher)

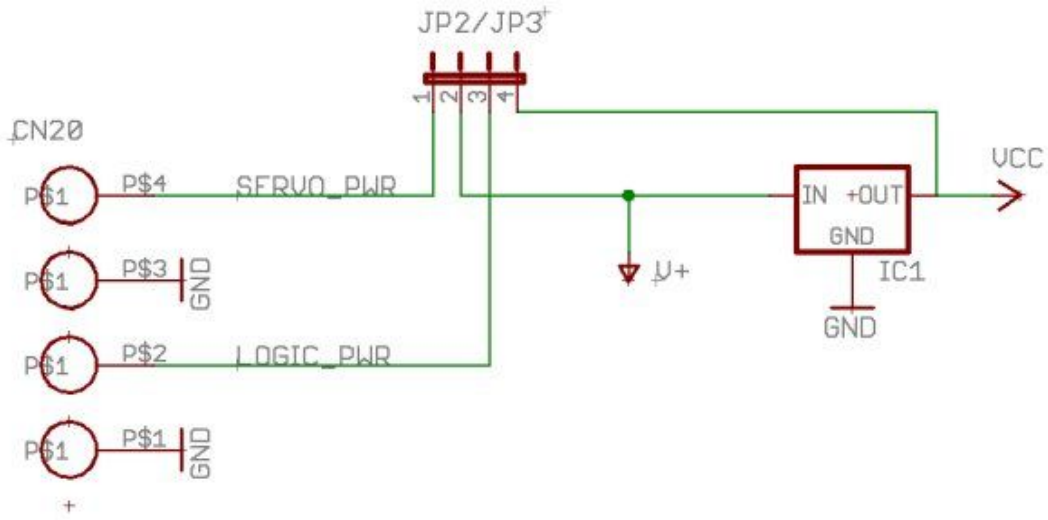
Jumper block 2. This jumper selects the power source to the on-board regulator, there are three ways to supply / use the regulator. For a better understanding, see the schematic below.

0.1" pitch 1 x 4 pin header

link	Description
1 - 2	Use VS (servo power) to drive 5.0V Regulator for logic supply.
2 - 3	Connects VL (logic power) to drive 5.0V Regulator for logic supply.
3 - 4	Connects VL (logic power) directly to p.Brain-ds24 power in, bypassing the 5.0V regulator.



VL Supply Selection Schematic



p.Brain-SMB - JP2/3 Logic Supply Schematic

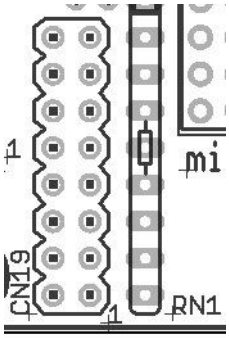
The output of the regulator VCC is connected to CN17 pin 9 (VOUT). As can be seen from the schematic, the regulator can be bypassed when the jumper is linked between 3-4. In this case the regulator is not in use, and the voltage on CN17 pin 9 (VOUT) is determined by the voltage fed in on CN20 pin 2 VL. This is useful if you have a system that already generates a 5V VCC supply.

RN1

Pull up Resistor net for CN19

01.” pitch 1 x 9 holes

Pin	Name	Description
1	3.3V	3.3V logic supply from ds24
2	PU_ANA0	Pull up to ANA0
3	PU_ANA1	Pull up to ANA1
4	PU_ANA2	Pull up to ANA2
5	PU_ANA3	Pull up to ANA3
6	PU_ANA4	Pull up to ANA4
7	PU_ANA5	Pull up to ANA5
8	PU_ANA6	Pull up to ANA6
9	PU_ANA7	Pull up to ANA7



This socket is provided for the user to add a SIL resistor net for a different pull up resistance value if required. The dsPIC33 already has pull up capabilities on ANA0 through to ANA5.

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