Electronics Assembly and User Guide

1. Parts List

Part	Image	Description
Power Board		Regulates power to electronics, motors and servos. Home to radio module, power connectors and data cables.
Slug		Houses the main processor. USB ports for Memory and Webcam. Connects to power board using ribbon cable
Motor Controller		This board controls the main drive motors
Joint IO Board		Digital/analogue inputs (bump/position sensors) connect to this board.
PWM Board		Servos connect to this board
6 Data Cables	-	Connects PWM, Joint IO and Servo Controller boards to the Power Board
USB Memory Stick	-	Stores Program code and operating system
Web Camera	-	Provides input to vision system
PCB Standoffs	-	Bag of metal stand-offs with screws to securely mount boards to robot
Power Connectors	-	Insulated connectors for making connections to the terminals on the Power Board
Batter Charger	-	Mains powered battery charger.
Electrical Wire	-	Many coloured lengths of insulated electrical wire

Table 1.1 – List of electronic modules and kit supplied

2. Basic Configuration

2.1 Connections to Power Board

The (black) data cables are used to connect the Power Board to the Servo Controller, PWM Board and the Joint IO Board. Connect each board in turn to one of the four available sockets on the Power Board. The order does not matter.

Next, connect the Slug to the Power Board using the coloured ribbon cable. The socket is located at the centre of the Power Board. Be sure to line up the connector carefully, since it can only fit in one orientation (see Figure 2.11).
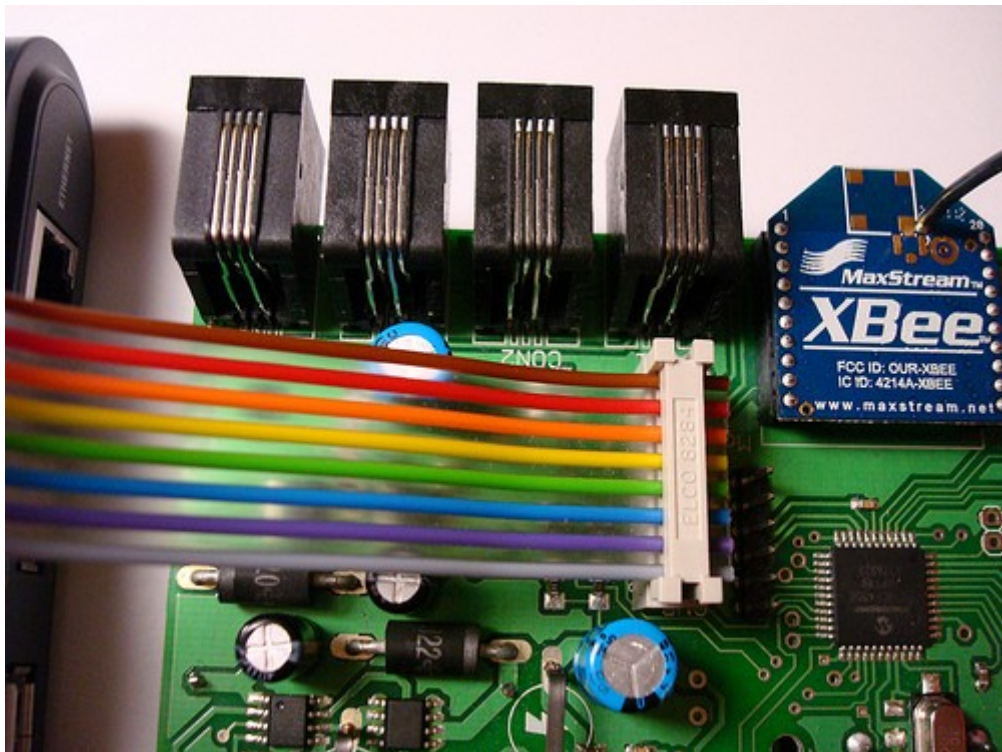

Figure 2.11 – Slug ribbon cable connected to Power Board.

Now insert the (orange) USB Memory Stick into USB port of the Slug labelled as 'Disk 2' (right-most USB port in Figure 2.12).

Connect the Webcam to the remaining, free USB port on the Slug; labelled as 'Disk 1'.

It is important that the USB Memory Stick is inserted into the 'Disk 2' slot.

Figure 2.12 – Side view of Slug. USB Memory Stick <u>MUST</u> plug into 'Disk 2' slot

2.2 Power Connections

Using the Power Connectors and Electrical Wire supplied, make the following connections (see Figure 2.11):

Connect LGP1 to LGP2 via the SPST (Single Pole Single Throw). This will allow power to the logic to be disconnect quickly if necessary.

Connect the positive terminal of the battery to BAT+. Connect the negative terminal of the battery to one of the GND terminals on the Power Board.

Connect CGCOM to CHRG and CG-RN via a single pole double throw switch. In Charge mode (CGCOM connected to CHRG) the logic can be powered but the motors are disabled, this stops the motor running away when plugged into charger. In Run mode (CGCOM connected to CG-RN) both the logic and the motors are powered and the battery stops charging.

Connect SERV+ on the Power Board to the ******** on the Servo Controller Board. Connect GND on the Power Board to ****** on the Servo Controller Board. This provides power to the servos.

Connect MOT+ on the Power Board to the ******** on the PWM Board. Connect GND on the Power Board to ***** on the PWM Board. This provides power to the motors.

It is advisable to use battery the mains adaptor for charging of the battery only, i.e. not as a secondary power supply.

2.3 Safety

- · **<u>Always remove the power supply</u>** before making **<u>ANY</u>** modifications to your robot.

- Stick to a colour convention for wiring. For example use Red for all positive connections and Black for connections to ground. This should help prevent accidentally shorting the battery and potentially damaging the electronics.
- Do not place the Power Board inside any metal enclosures as this will prevent the built in radio module from working.
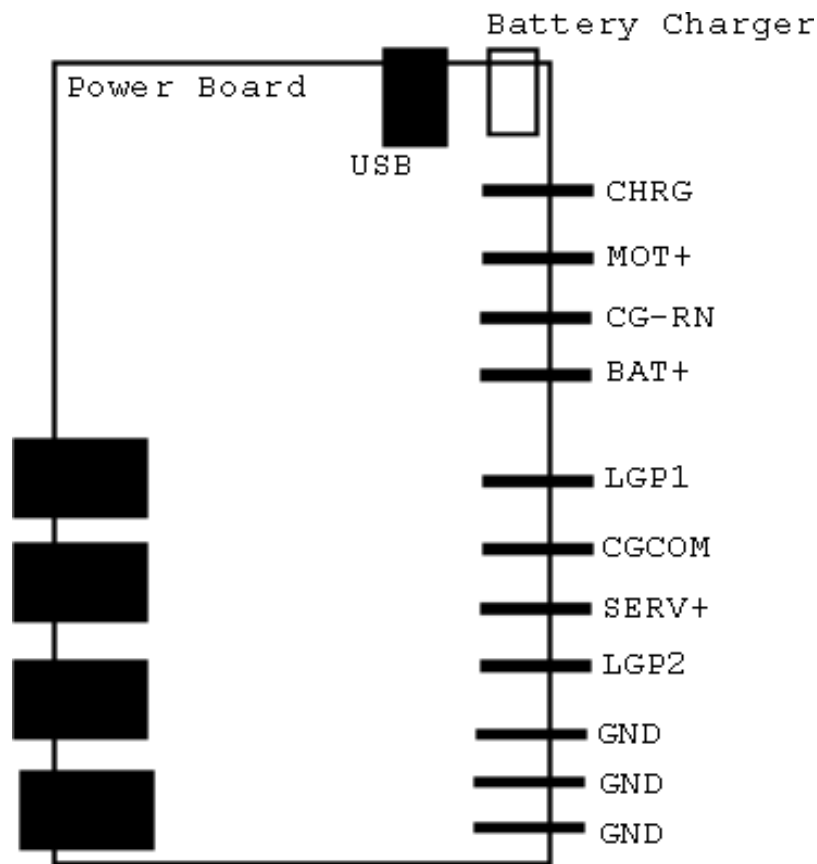

Figure 2.11 – Power Board Connections

3. Joint IO Board – Analogue/Digital Inputs and outputs

The Joint IO Board provides 8 Analogue or Digital inputs and 4 digital outputs. The Inputs are numbered in ascending order from left to right in the diagram. To connect digital devices such as bump sensors (push switches), use the wire supplied to connect the terminals of the switch as show in Figure 3.1, with one to positive supply, and the other to one of the inputs.

Analogue inputs are connected in a similar way, illustrated in Figure 3.1 by the variable resistor which could be used to measure the position of an arm.

Finally, digital outputs such as LEDs can be connected to the Joint IO as illustrated in Figure 3.1. Note that it is necessary to place a resistor in series with the LED to reduce the current.

3.1 Safety

- Do not connect servos or motors directly to the Joint IO board because the large currents will damage the board. Instead, speak to your mentors/teachers about using a relay to switch the motor on and off.
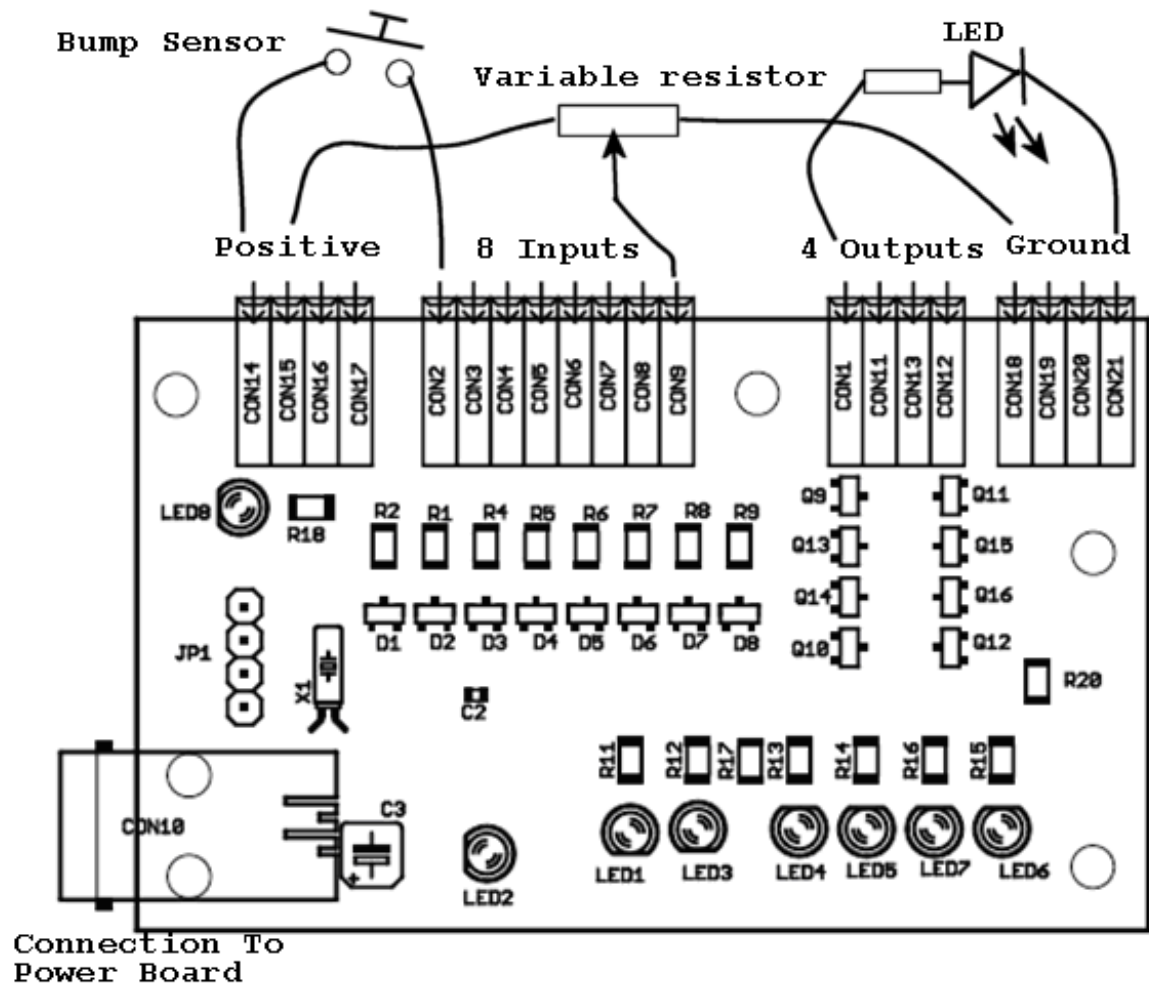

Figure 3.1 – Overview of Joint IO Board with bump sensor, variable resistor and LED connected

4. Connecting Motors

The PWM board can control (with variable speed) two DC motors. The positive and negative leads from the motor should be screwed into the grey terminal blocks on the PWM board. It is recommended that you connect the two drive motors to the Motor Controller Board.

4.1 Safety

- **Nothing** should be connected directly to the battery. This includes additional motors and circuitry.
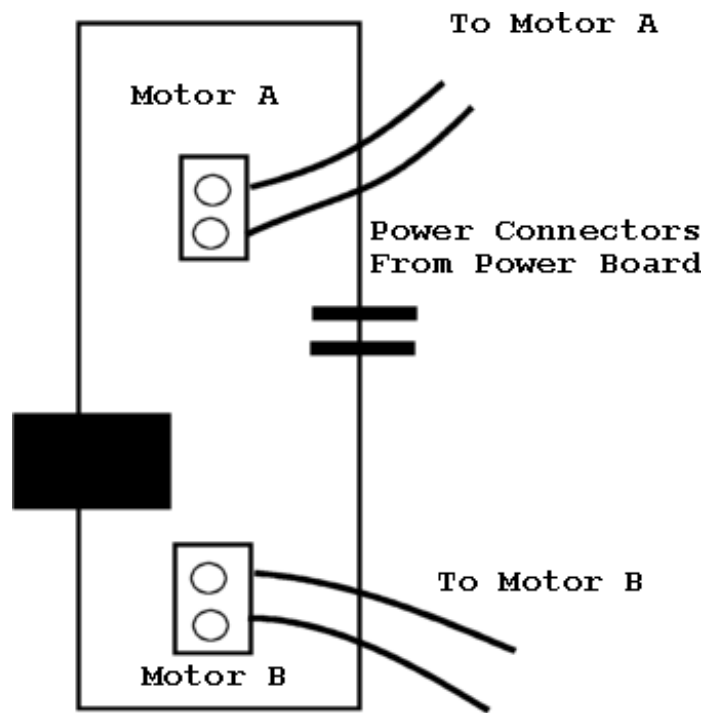
Figure 4.1 – Overview of Motor Controller Board

5. Connecting Servos

There is provision for up to eight servos to be added to the Servo Controller board. You should connect the servo to the board using the standard connector which comes with most servos. ******polarity?! +diagram