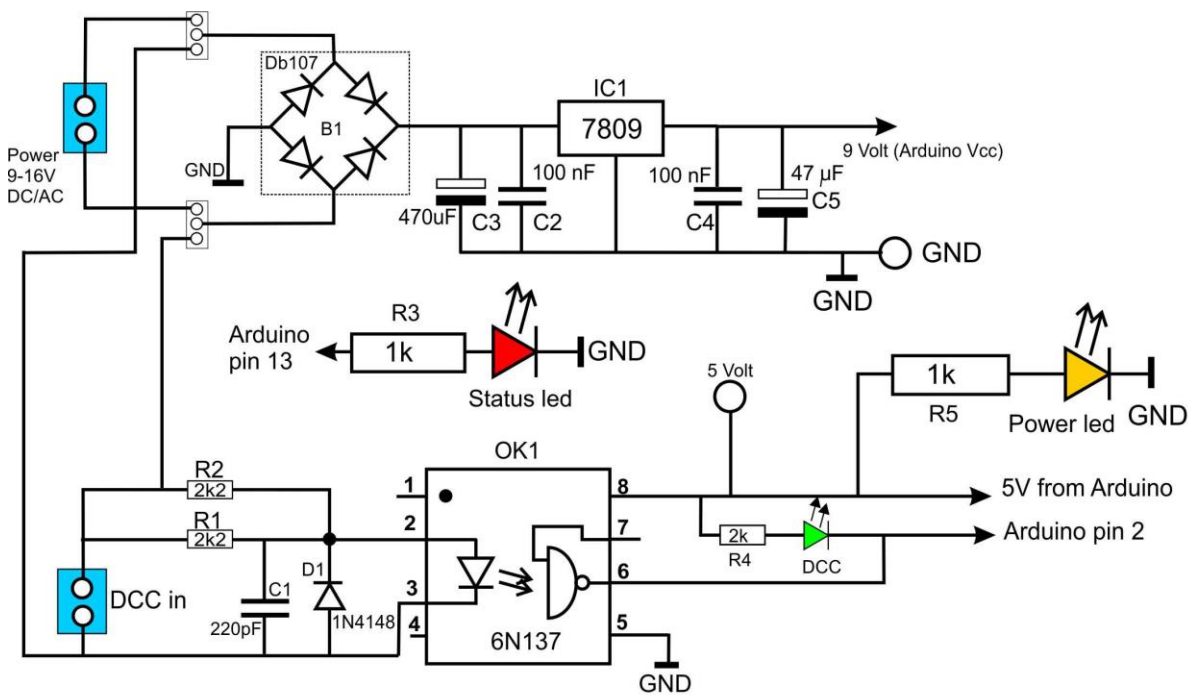


# Installation/assembly manual for DCC/Power shield

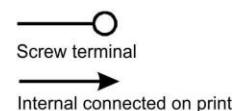


**DCC circuit:**  
 R1/R2 2k2 1/2 Wat  
 R3/R5 1k  
 R4 2K  
 C1 220pF  
 D1 1N4148  
 OK1 6N137

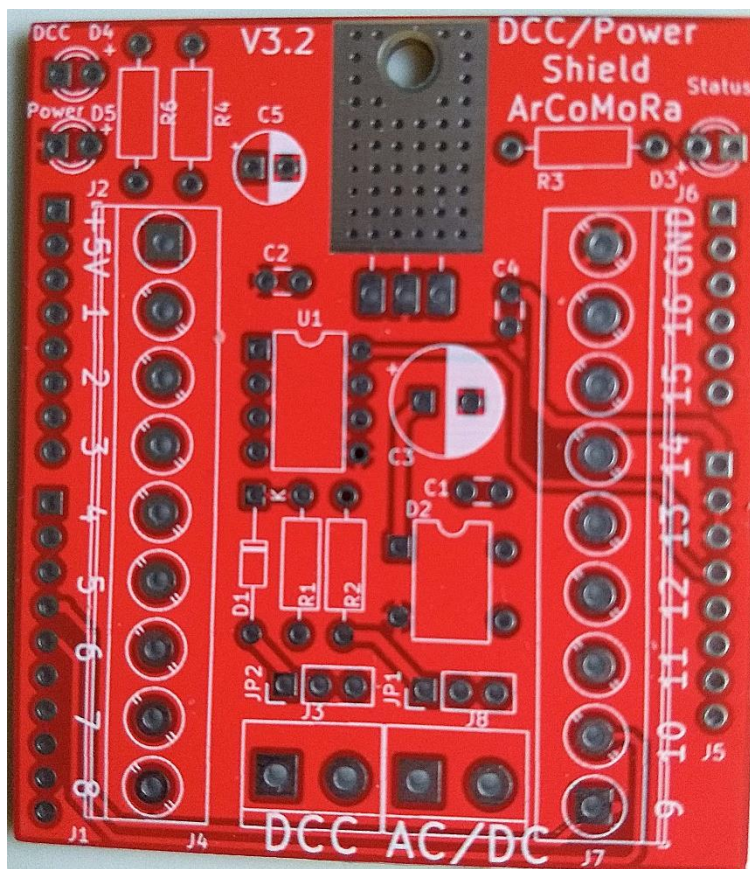
**Power unit:**  
 B1 DB107 or similar  
 C2 100nF  
 C3 470 uF  
 C4 100 nF  
 C5 47 uF  
 C6 10 uF  
 IC1 LM7809

**Other:**  
 8 pins IC-socket  
 6 pcs. 3 pin screw terminal  
 2 pcs. 2 pin screw terminal  
 Breakable pin header  
 connector strips

**Note:**  
 The screw terminals to the Arduino output pins are not drawn.



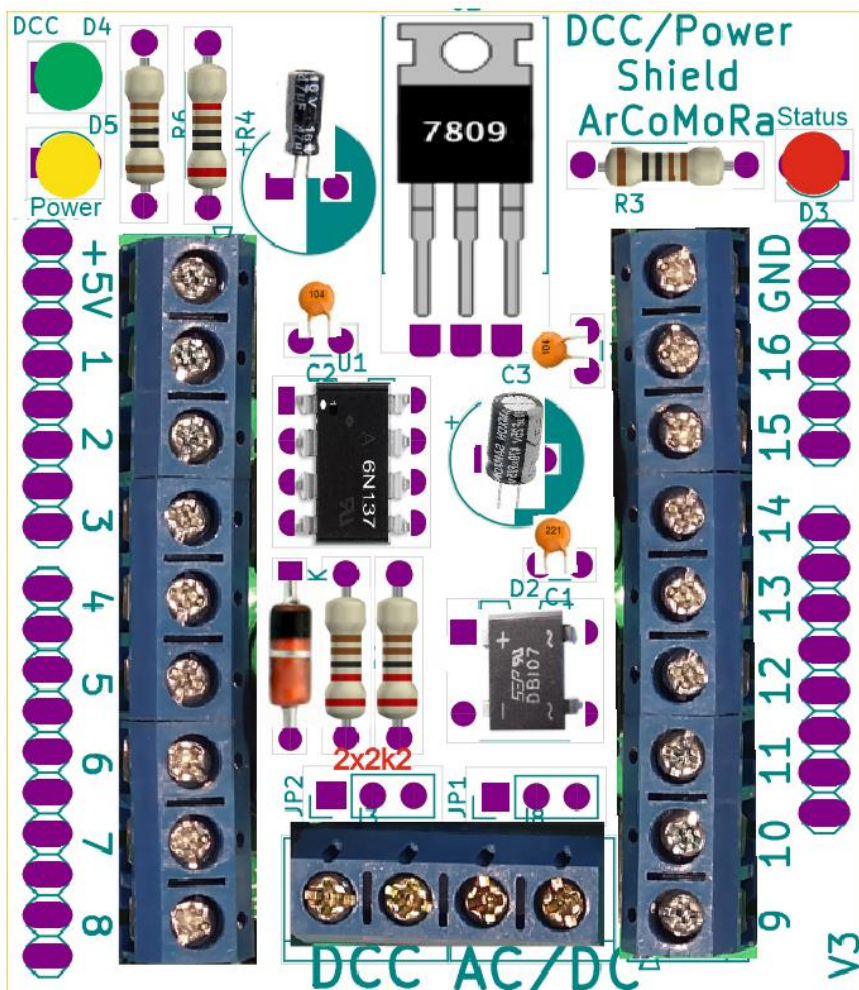
## Partslist



## The DCC shield consists of the following components:

- R1/R2 2.2 kΩ resistor ½ Watt (colour code Red/ Red /Black/Brown/Brown)
- R3/R5 1 kΩ resistor colour code Orange/Orange/Black/Black/Brown
- R4 2 kΩ resistor (colour code Red /Black/Black/Brown/ Brown)
- D1 1N4148 diode
- OK1 6N137 optocoupler (also white version)
- Led 3 mm LED yellow, red and green
- IC-socket (DIP8 for 6N137)
- B1 DB107 1 Amp Bridge rectifier.
- C1 220pF ceramic capacitor (text: 221 or nothing)
- C3 470 μF electrolytic capacitor
- C2/C4 100 nF ceramic capacitor (text 104)
- C5 47 μF electrolytic capacitor
- IC1 LM7809 9 volt linear voltage regulator
  
- 6 x 3 pin terminal block (TB)
- 2 x 2 pin terminal block (TB), (or 1 with 4)
- 1 x DuPont male headers, strip of 40 pins.
- 1 x M2.5x5 mm bolts & nuts
- 2 x jumper

All components are placed on the printed side of the board. The location of each component is indicated by the component code.



## Assembly order:

- 1) Place and solder resistors R1 to R5. (Note the correct colour code).
- 2) Insert and solder diode D1. Please note the correct orientation!
- 3) Place and solder the IC socket for 6N137.
- 4) Place and solder capacitor C1 (text: 104)
- 5) Place and solder the LEDs. Please note the correct orientation! The short leg (cathode) is near the edge of the board!
- 6) Insert the 6N137 into the IC socket. Please note the correct orientation!

The next steps depend on how you want to use the power supply on the board.

### Option 1: External power supply on Jack plug

Connect a DC power supply of 7-12V to the jack plug of the Arduino. The DCC circuit is powered by the 5 Volt output from the Arduino.

Continue to point 12.

### Option 2:

Power supply using the power components on the board.

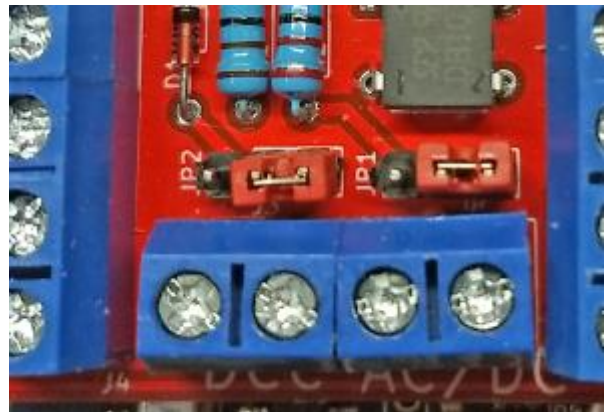
You can apply an external power in two ways:

- A) with the DCC signal from the DCC terminals
- B) with an external power from ac/dc terminals

For both options place and solder 2 x 3 Dupont pins.

For ac/dc power place the jumpers over the middle and right Dupont pins

For DCC power place the jumpers over the middle and left pins



- 7) Place and solder the bridge rectifier B1. Please note the correct orientation!
- 8) Place and solder the capacitors C2 and C4, each 100 nF
- 9) Place IC1 (7809). First bend all three pins, with suitable pliers or tweezers, to 90 degrees, so that, when the pins are inserted into their relevant holes, the mounting hole lines up with the mounting hole on the PCB. Solder the connections and fix the IC with the M2.5 bolt and nut.
- 10) Place and solder capacitor C5 (47  $\mu$ F) Please note the correct orientation. The positive (+) of the capacitor in the little hole goes to the (+) on the PCB. The capacitors are marked with negative (-).

### For both options:

11) Connect 3 x 3 pin TBs together (now a 9 pin TB). Each TB has a slot on one side and a vertical lug on the other, allowing them to slide together. Do the same with the other three. Do the same with 2 x 2 pin TBs. If you are just using Option 1, then you only need 1 x 2 pin TB in the place marked DCC.

12) Insert the 2 x 9 pin TBs in the board, ensuring the cable entry holes face outwards and turn the board over. Because none of the components are higher than the top of the TBs then the board should be flat lying on the top of the TBs.



13) Solder the TBs.

**Tip:** first solder the outermost pins of the three blocks. They are then fixed and can no longer fall out. Check whether they are nice and straight. Correct if necessary, and solder the other pins.

14) With snips or cable cutters, cut 4 pieces from the 40 pin male headers strip, with lengths of 6, 8, 8 and 10 pins. Fit the header pieces to the Arduino (long pin) and place the PCB on the pins (short pin). Now solder just two end pins of each header strip. Ensure that the connectors are tight against the board. To prevent excess heat to the Arduino, remove the board with the headers from the Arduino. Check the header strips are tight against the board, and correct as necessary. Then solder the rest of the header pins. After that you can fit the board on the Arduino.

**Only for option 2:**

16) Place capacitor C3 (470  $\mu$ F). Please note the correct orientation. The positive (+) of the capacitor in the little hole goes to the (+) on the PCB. The capacitors are marked with negative (-).

**The board is now finished.**

Connect the DCC signal to the screw connectors marked DCC.

**Option 1:**

If you use an external power supply for the Arduino (7-12 volts DC) then connect it to the jack plug of the Arduino.

**Option 2:**

If you are using power supplied by the board:

- A) Connect a power supply of 12-16V AC or 12-20V DC. The polarity is not important as the bridge rectifier will handle the polarity and place the jumpers over the middle and right pin.
- OR
- B) Connect the DCC signal to the DCC terminals and set the jumpers over the middle and left pin

The power supply for servos and relays can now be connected to the + 5V and GND screw connectors on the board.

**Note:** Make sure you do not draw more than 0.5A from the on-board 5 V power supply. More than 0.5A cannot be delivered! If you have a lots of servos and relays, then use a separate power supply.

**Make sure that any external power supply is also grounded using the GND connection on the board.**

