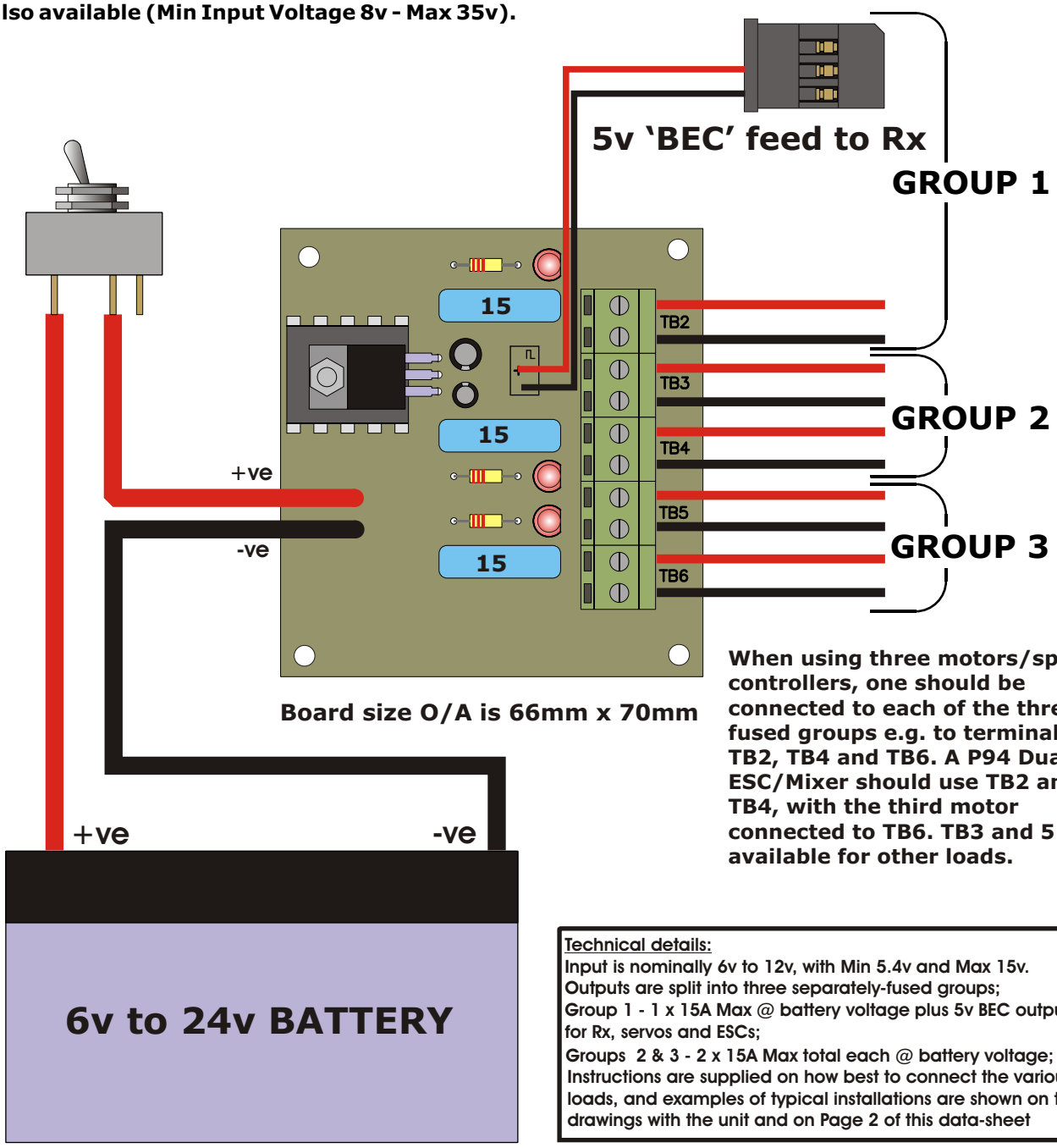
P102

3-Motor Power Distribution Board with BEC

The P102 has been developed from our very popular P92 Power Distribution Board, specifically for models which are running three motors. This combination really requires three separately fused groups of output terminals to avoid overloading one group with two motors. Such installations might be for a three-screw vessel or a twin-screw vessel with a powerful third motor e.g. a bow-thruster or fire monitor pumps. It takes the power from the main battery which can be either Sealed Lead Acid, Nickel Metal Hydride or LiPo - and routes it via the three fuses into five separate pairs of terminals plus a regulated 5v (nominal) 'BEC' supply to power your receiver, servos and other Rx-driven devices. Used in combination with our P103 Parallel Power Board you can connect two main batteries in parallel to increase the capacity of the model's electrical installation. When using three motors there are two spare pairs of output terminals for other functions e.g. sound system, lights etc.

P102 uses a high-quality epoxy-glass laminated board with extra-thick copper lands (4oz grade) to carry the rated maximum current of 15A per fuse group. The screw terminals are to professional specification and have rising clamp connections which will accept up to 12AWG silicon multi-strand.

The unit is supplied either built and tested or in kit form, and has a full set of 15A fuses and spares. The input to the board is via two 14AWG silicon cables which are already soldered into the PCB. These should be fitted with suitable connectors to the switch and battery. A version with a regulated 6v BEC is also available (Min Input Voltage 8v - Max 35v).



Board size O/A is 66mm x 70mm

When using three motors/speed controllers, one should be connected to each of the three fused groups e.g. to terminals TB2, TB4 and TB6. A P94 Dual ESC/Mixer should use TB2 and TB4, with the third motor connected to TB6. TB3 and 5 are available for other loads.

Technical details:
Input is nominally 6v to 12v, with Min 5.4v and Max 15v.
Outputs are split into three separately-fused groups;
Group 1 - 1 x 15A Max @ battery voltage plus 5v BEC output for Rx, servos and ESCs;
Groups 2 & 3 - 2 x 15A Max total each @ battery voltage;
Instructions are supplied on how best to connect the various loads, and examples of typical installations are shown on the drawings with the unit and on Page 2 of this data-sheet

P102

3-Motor Power Distribution Board with BEC

ACTion R/C ELECTRONICS

The P102 Distribution Board is able to supply a maximum of 15A current through each of three separately-fused groups of terminals. This allows the use of three motors in an installation, which would otherwise exceed the current limits of a P92 Distribution Board. When setting up the power system in your model it is important to consider how you will divide the power into the three groups.

Group 1 includes the terminals TB2 @ the same voltage as the battery; it also includes the BEC (Battery Eliminator Circuit) for the receiver and servos.

Group 2 includes terminals TB3 and TB4, while Group 3 includes Terminals TB5 and TB6. All of these pairs of terminals are at the same voltage as the main battery.

If the motors used are all the same type and current rating (see Example 2) then you should connect the three speed controllers to blocks TB2, TB4 and TB6. If one motor is rated at less current drain than the other two e.g. the bow-thruster in Example 1, then connect this to TB2 and the others to TB4 and TB6. Note that the fuse in Group 1 in this case has been reduced in size to suit the bow-thruster motor.

Use standard automotive blade fuses (available in various sizes from ACTion). As a rule of thumb, select the fuse to be the next size up from the normal operating current of the combined group; this gives the highest level of protection without giving rise to nuisance tripping.

NEVER REPLACE ANY OF THE FUSES WITH ONE WHICH EXCEEDS 15A. DOING SO WILL INVALIDATE THE WARRANTY OF P102 AND WILL SERIOUSLY RISK DAMAGING OR DESTROYING YOUR MODEL THROUGH FIRE! DON'T DO IT!

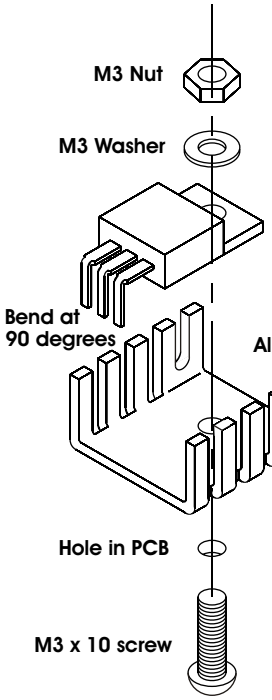
With three motors in circuit, there are two remaining pairs of terminals, TB3 and TB5, available for other loads @ the same voltage as the main battery e.g. lights, smoke generator, sound system. These are subject to the overall current limit of the group, so take care to allow for this when allocating loads to groups. Try to balance out the load currents evenly between groups, allowing for a maximum of about 1A for the receiver and servos on the BEC group 1.

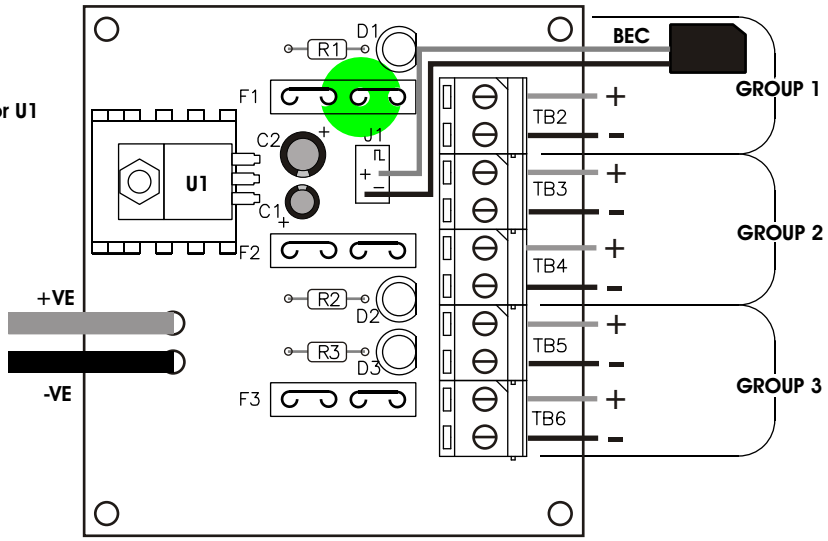
The BEC regulator reduces the main battery voltage to supply the receiver and servos etc with a constant 5 volts, irrespective of the battery voltage which is supplied to the other terminals. The main battery voltage limits are 5.5v minimum and *15*v maximum. A 6v BEC version of P102 is also available, in which case the battery limits are 8v and 35v. To use the BEC, connect the flying lead into the 'BEC' or 'Battery' socket of the receiver or, if it doesn't have one, use an unused set of servo output pins. *Make sure that the black wire of the flying lead aligns with the black leads of the servo cables;* this is usually onto the pin nearest the edge of the receiver case. If all the servo outputs are in use then it will be necessary to use a "Y" lead to patch in the BEC. The BEC is rated @ 1A maximum; this is a short-term rating designed to meet the transient loads of standard servos. If this current is drawn from the BEC continuously, the regulator IC will overheat and shutdown to protect itself. If you are using high-load servos such as sail winches or digital servos then you are advised to use an alternative power supply for the receiver etc.

RECOVERY SERVICE
Our recovery or repairs service ensures that you will not be left with a dead unit for any reason. The standard Service Charge for P102 is £14.00, including all parts (and return shipping to a UK address). All returns are Payment with Order. Credit/Debit Card payment details should include Name and Address of Cardholder, Card Number, Expiry Date (and Start Date/Issue number if shown) and the last 3 digits of the Security Number on the Signature Strip on the reverse of the card.

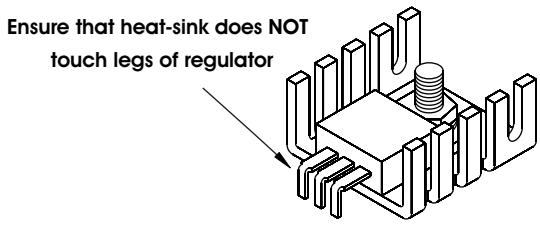
ACTION R/C ELECTRONICS, 1 Llwyn Bleddyn, Llanllechid, Bangor LL57 3EF, United Kingdom

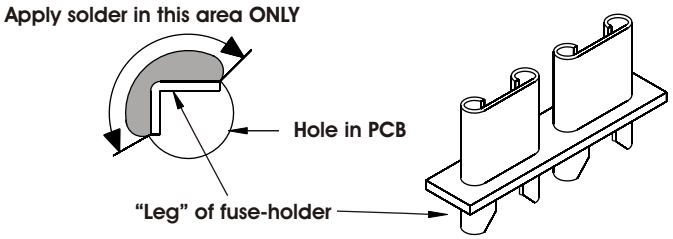
P102 POWER DISTRIBUTION BOARD (Drawn Full-Size)





Mounting hole dimensions are 3mm dia; 60mm x 64mm spacing





ASSEMBLY OF 5V REGULATOR AND HEAT-SINK

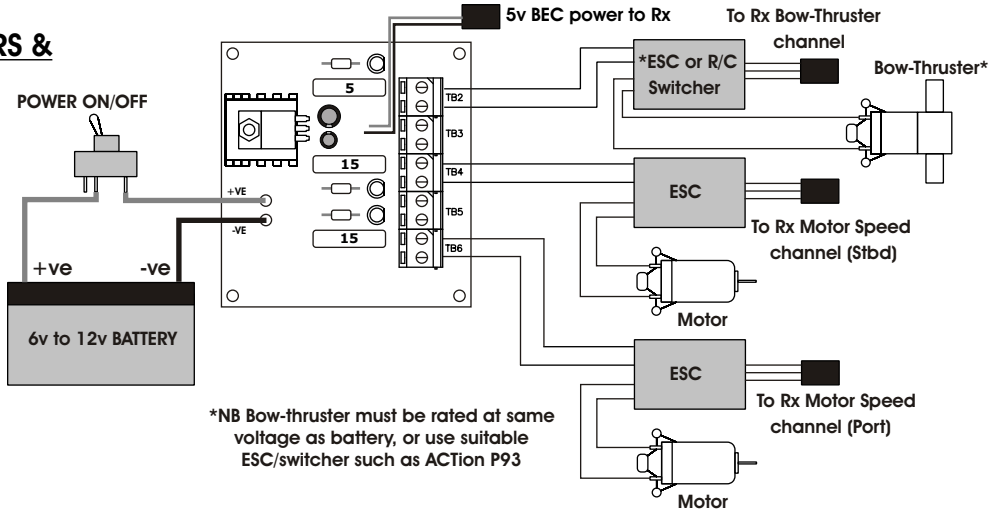
(Applies only to kit version)

SOLDERING FUSE-HOLDERS

(Applies only to kit version)

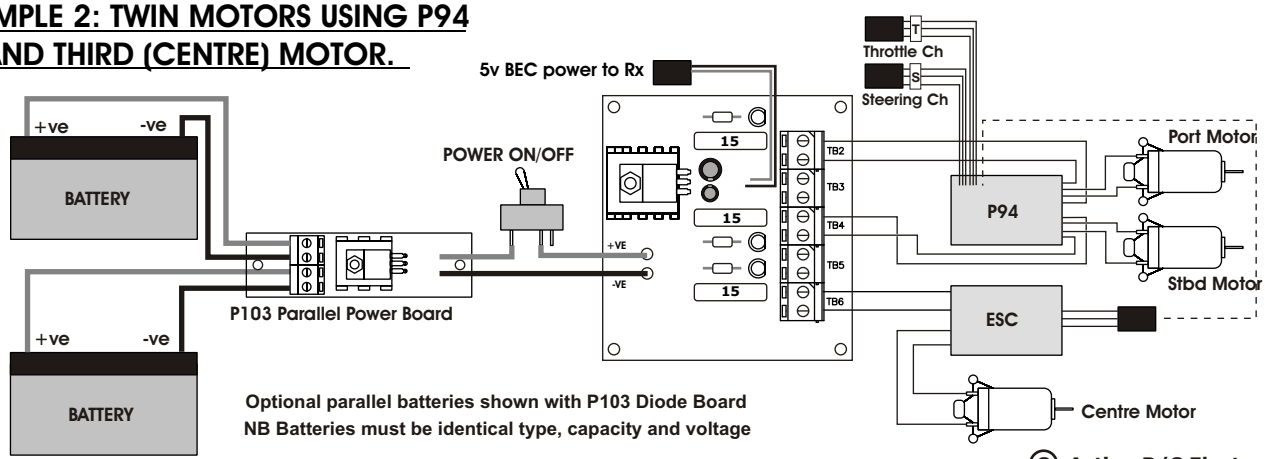
EXAMPLE 1: TWIN MOTORS & BOW THRUSTER UNIT

Speed controllers shown in both examples are ACTion type, without built-in BEC. If using BEC-equipped speed controllers, disable BEC in two of the three ESCs and don't connect the 5v lead from the P102 to the Rx.
Alternatively, disable BEC in all three ESC units and use the 5v supply from P102 for the Rx power.



*NB Bow-thruster must be rated at same voltage as battery, or use suitable ESC/switcher such as ACTion P93

EXAMPLE 2: TWIN MOTORS USING P94 AND THIRD (CENTRE) MOTOR.



Optional parallel batteries shown with P103 Diode Board
NB Batteries must be identical type, capacity and voltage

P102 KIT INSTRUCTIONS

PCB
The PCB has an insulated (Component Side) and a tinned track side. Components are mounted on the insulated side and soldered on the track side. The PCB for this project is fully prepared and requires no additional work. It is manufactured from high-grade epoxy-glass laminate with an extra-thick copper layer. The layout of the components is printed onto the face of the board, but you should refer to the Parts section of these notes to confirm their values etc. Look carefully at the area of the PCB you are working on when soldering to ensure that you do not apply an extra connection with a splash of solder during the operation.

TOOLS
For construction you will require a soldering iron of about 25 Watts with a 2.53.5mm chisel-shaped bit, and flux cored solder (22 SWG recommended). The thick copper on this PCB requires a little more heat than other ACTion kits, so don't go straight for the 1mm pointed bit it won't do the job! If you are fortunate enough to have a temperature-controlled iron, then set the bit temperature for approx 300 degrees. A small pair of wire cutters; a terminal-sized screwdriver for screw connectors and a good level of light complete the tool kit.

PARTS
There are relatively few parts involved and most are difficult to confuse, but a short description won't hurt:
C1 and C2 are electrolytic capacitors; they are small black tubes with a pale grey stripe down one side which has negative (minus) symbols printed within it. This indicates the negative lead, which should be soldered into the hole closest to the other capacitor see Drawing. The larger one is C2 and has a value of 100uF x 25v printed on it; C1 is 10uF x 35v.

D1, D2 and D3 are the LEDs (Light Emitting Diodes) which indicate power flowing to the three fused circuits. They are translucent red or green dome-shaped little devices and are polarised, so they should be fitted with the "flat" side of the circular base towards the green terminal blocks. This corresponds with the negative battery input connection.

R1, R2 and R3 are the resistors and are small tubular components with a wire coming out of each end. They are a cream colour and have three red bands around them, towards one end. This indicates their value (in this case they are all 2.2K Ohms). They can be fitted either way around in the board.

U1 is the voltage regulator and should be handled with care; static electricity can damage it, so do follow the precautions described later on when handling it. It is fitted as per the drawing, with the metal tab flat down against the alloy heat sink, and secured with a M3 screw, washer and nut.

The cable which connects P102 to the main battery is 14AWG silicon multi-strand. The Red cable is used for the positive line while the Black one is negative. These are soldered into P102 and suitable connectors (not supplied) are fitted to the other ends.

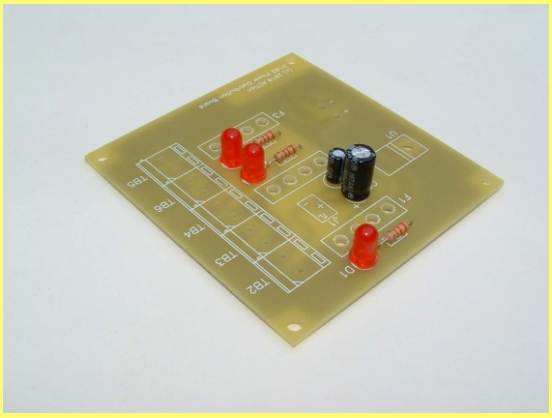
The fuses are standard automotive blade types; two values are supplied. The blue ones are 15 Amps while the red ones are 10 Amps. They are a tight push-fit into the fuse-holders, which are soldered into the board as shown in the drawing. Finally, the big pale-green screw terminals (5) are pretty difficult to mistake. These are slotted together to form the main output terminal pairs. Make sure you fit them with the cable holes facing *outwards*.....!

CONSTRUCTION

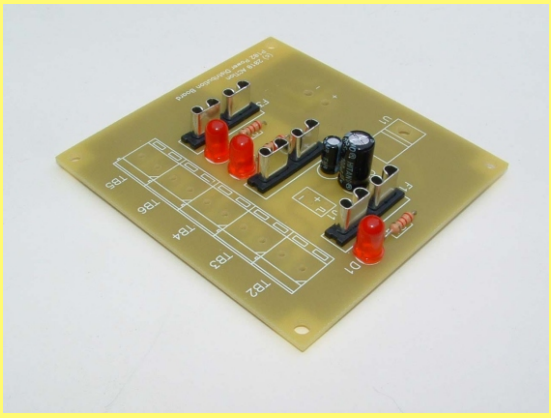
- First stage is to insert R1-R3, C1 & C2, D1-D3. We like to place the parts in by height order - this way you can flip the board over to solder the leads and the weight of the board holds the components in place. So put in the resistors and solder them; then the LEDs, then the capacitors. Remember when inserting the diodes that they go flat to the board. Also they are polarized; make sure you align the flat on the package with the little line on the outline on the PCB. Once they are all soldered in place, crop the leads just at the top of the solder bead.
- Next stage is to insert the fuse holders. These fit snugly into the board and need a bit of a firm push to get them in place. You must not solder the holders so that the hole is filled the solder will 'wick' up inside the holder and make it useless if you try. Just solder the bits of the pins that are closest to the pad; the small sketch shows what I mean.
- Clip the five terminal blocks together, making sure they are all at the same level. Insert them into the board and solder them up.
- Now the difficult bit.....mounting the regulator. Try and avoid touching the legs with your fingers if you can, to minimize any possibility of static damage. We use a wooden clothes peg to hold the legs while they are bent at 90° where shown, just at the point where the leads narrow. If you do this the hole in the regulator will line up with the hole in the PCB. Place the heat-sink on the PCB with the hole over the PCB hole. Insert the bolt from the rear of the PCB, then place the regulator in place. Put on the washer and nut and tighten firmly. Once the heat-sink and the regulator are tightened up solder the regulator leads and crop off the surplus from the back of the board. *Don't solder the regulator until it is bolted into place.*
- Next stage is to solder in the BEC lead. Note that there are only two wires to this plug; the normal third white wire is not required and is omitted, and the corresponding small hole in the PCB marked with a 'signal' symbol is left empty. Strip the leads about 10mm and twist them firmly. Tin the ends with the soldering iron and a dab of solder, then crop the end off at 45 degrees. The leads should then fit into the board quite nicely. Use the legend on the board to get the correct leads in the correct holes; red is + while black is -. Once they are soldered up, crop them off and all is done. Now you may twist the red and black wires tightly together to form a neat cable.
- The main power cables can be a real pain if you don't approach the job correctly. First strip off about 12mm of the insulation from the end of each cable. Next, twist the stranded cable as tightly as you can get it. Use a wide bit on the soldering iron (we use a 3.2mm screwdriver-tip type) and tin the bit well. Hold it against the twisted cable for a few moments, allowing the heat to transfer to the wire. Touch the solder against the hot cable and it should start to flow into the strands. Continue holding the bit in place and feeding the solder into the heated cable until the strands are *just* filled don't overdo it. Allow the cable to cool then crop off the end at about 45°. Test the fit in the hole in the PCB and chamfer the edges of the cable end with a Swiss file if necessary to permit the wire to be inserted right up to the insulation. Turn the PCB over and solder the joint using plenty of solder (but don't allow it to bridge over onto adjoining copper tracks). Crop off to leave about 2mm proud of the board and the job's done.
- You should clean off any remaining flux from the back of the PCB with a spirit cleaner and something like an old toothbrush; meths is fine but Isopropyl Alcohol is better.

P102 3- MOTOR POWER DISTRIBUTION BOARD

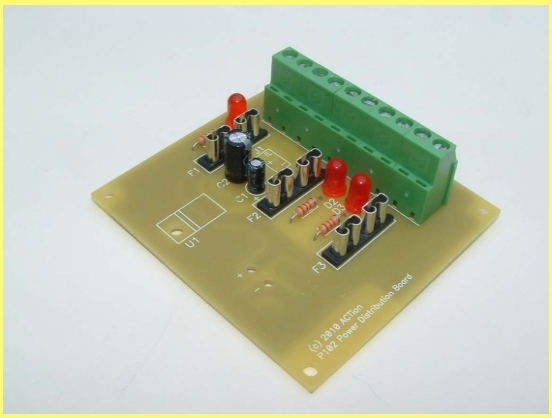
PHOTOGRAPHIC BUILD SEQUENCE FOR KIT VERSION ONLY



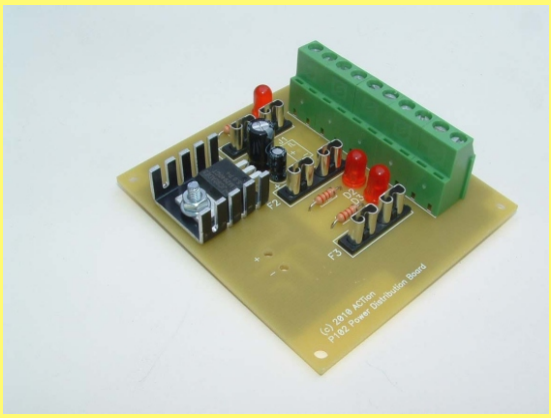
PICTURE 1: PCB with LEDs, resistors and capacitors fitted



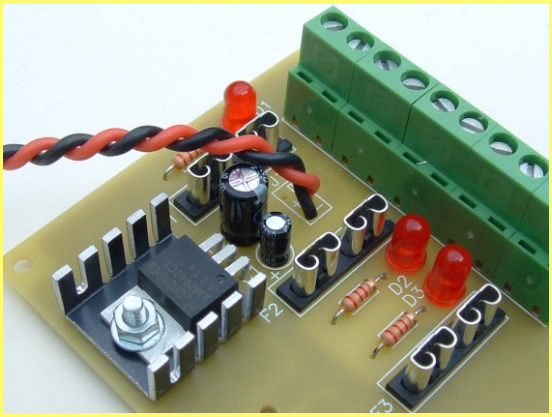
PICTURE 2: Fuse holders added



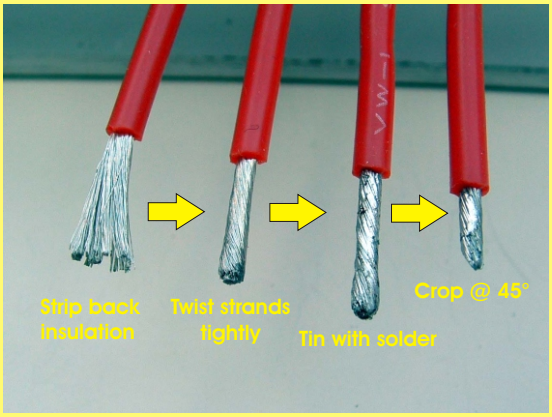
PICTURE 3: Fit bank of five screw terminal blocks together and solder into PCB



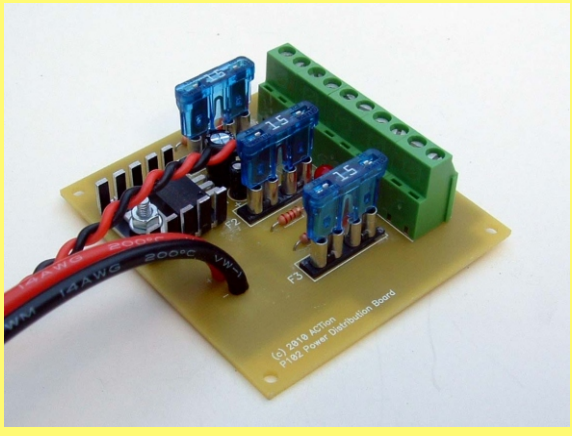
PICTURE 4: Fit regulator into holes in PCB. DO NOT SOLDER until you have fitted the heat-sink and screwed it firmly in place.



PICTURE 5: Fit receiver "BEC" lead



PICTURE 6: Stages in preparing power leads



PICTURE 7: Fit fuses to suit circuit (15A max)