

**P78**

**Condor 2A Autaset Speed Controller**



The Condor 2 Autaset computer soft-start speed controller is a high quality, high performance electronic speed controller for use at 2 to 12 volts drive voltage. It is capable of handling a maximum current of 2 amps. Its miniature size and ease of use, together with state of the art performance will give you the controller that builders of small scale models will want. It is suitable for 280 type and 360 type (3 to 5 pole) motors. Not suitable for low current (7 to 12 pole) motors such as Buhler types as the back voltages produced by this type of motor can damage both the miniature powerfet and the miniature relay.

**MICROCOMPUTER & MOSFET DESIGN**

**Functions**

Radio control channels required

Neutral setup

Acceleration setting

Maximum receiver voltage\*

Minimum receiver voltage

Maximum motor current

Minimum motor voltage

Maximum motor voltage

Output connections

Forward & reverse/speed

1

Autaset (allow 2 seconds)

Fixed with soft start

6 volts\*

3.6 volts

2 amps

2 volts

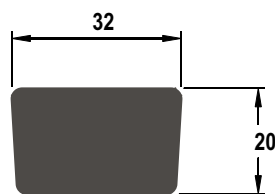
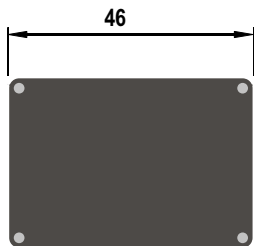
12 volts

Screw connectors

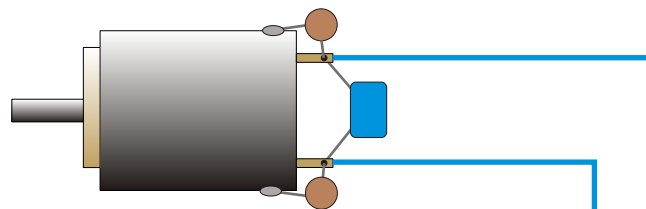
As supplied ready-built, the Condor 2 is set up to receive its power from a separate battery. If you wish to run it from the same battery you should fit a diode between the two holes above the relay. See the lower of the two drawings for details.

\*Do NOT use a 5-cell rechargeable pack or 6v Lead-acid battery to power the receiver *directly*; it will fatally damage the unit.

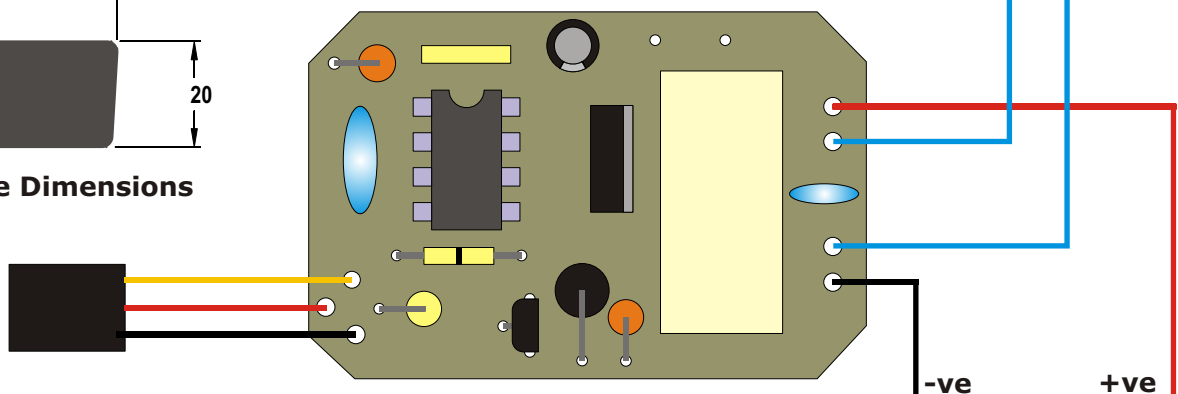
Power *via* a regulated 5v supply such as a separate BEC or ACTION power board will be fine.



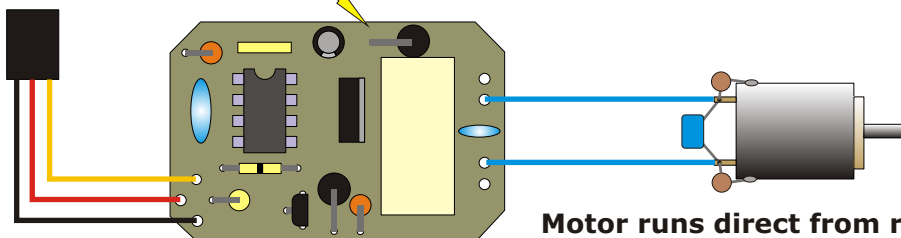
Case Dimensions



MOTOR (2A MAX CURRENT)



1N4003 DIODE



Motor runs direct from receiver supply, which must NOT exceed 6 volts

**P78**

**Condor 2A Autosect Speed Controller**



The Condor 2 Autosect computer soft-start speed controller is a high quality, high performance electronic speed controller for use at 2 to 12 volts drive voltage. It is capable of handling a maximum current of 2 amps. It is suitable for 280 type and 360 type (3 to 5 pole) motors. Not suitable for low current (7 to 12 pole) motors such as Buhler types as the back voltages produced by this type of motor can damage both the miniature powerfet and the miniature relay.

|                                 |                            |
|---------------------------------|----------------------------|
| Functions                       | Forward & reverse/speed    |
| Radio control channels required | 1                          |
| Neutral setup                   | Autosect (allow 2 seconds) |
| Acceleration setting            | Fixed, with soft start     |
| Receiver voltage                | 3.6v to 6 volts*           |
| Maximum motor current           | 2 amps                     |
| Motor voltage (Separate supply) | 2v to 12v                  |
| Case size (external)            | 46mm x 32mm x 20mm         |

**\*Do NOT use a 5-cell rechargeable pack or 6v Lead-acid battery to power the receiver *directly*; it will fatally damage the unit. Power *via* a regulated 5v supply such as a separate BEC or ACTION power board will be fine.**

**As supplied ready-built, the Condor 2 supplies power to the motor from a separate battery. If you wish to run the motor from the receiver supply you should fit a 1N4003 diode across the two holes above the relay. See the drawing below for details, and note the polarity of the diode (indicated by the silver bar at one end). The power to the motor now comes through the red and black wires of the receiver-connecting lead. Remove existing Red and Black wires from the printed circuit board.**

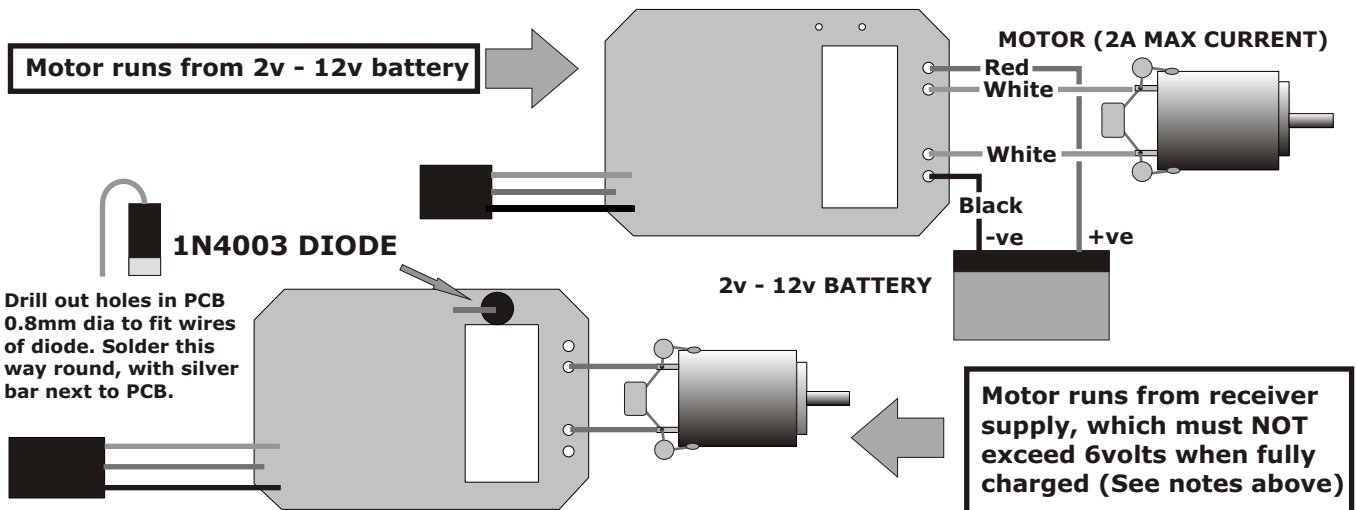
**Installation and Setup**

File small slots in the top edge of the case to allow the receiver connection cable and the motor/battery wiring to exit the case. Use Velcro pads to secure the case to the inside of the model.  
 Connect motor and battery leads (see wiring diagram).  
 Plug servo lead into the speed/direction channel you wish to use.  
 Set the stick and trim lever to centre setting; switch on transmitter then the receiver; *wait for about 2 seconds for the 'Autosect' to operate before moving the transmitter sticks.*  
 The controller will now give the full range of forward and reverse speed.  
 This is a low-frequency unit so will produce a slight "buzz" from the motor at low speed. This is better for scale models than the high-pitched squeal produced by some high-frequency ESCs!

**Recovery service**

A recovery or repairs service ensures that you will not be left with a dead unit for any reason. The Service Charge for this kit is £13.00 including parts (including return shipping cost IN UK).  
 All returns should include full Credit Card details (Name & Address of cardholder, Card Number, Expiry Date and Card Security Number)

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

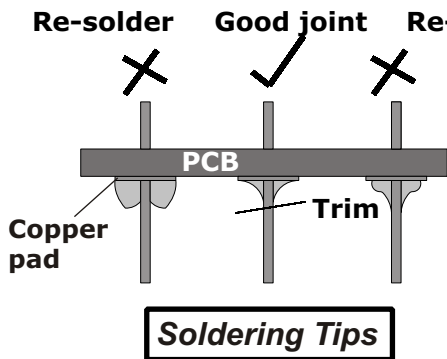


**ACTION units shown are polarity-critical! Take care to connect them correctly!**

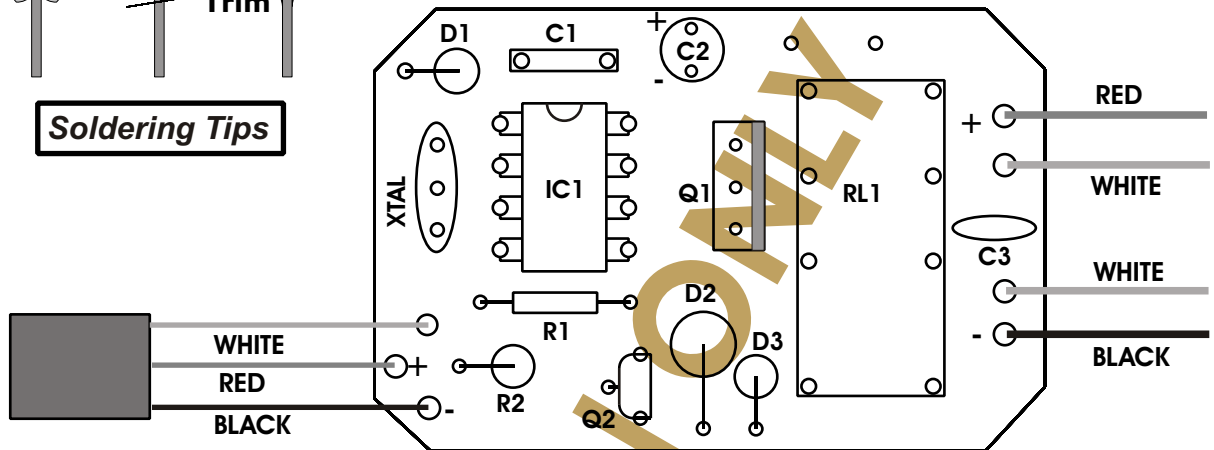
The small print.....  
 ACTION R/C Electronics guarantee all products to be free from manufacturing defects for 12 months from date of purchase. This does not cover suitability for specific applications; components worn or damaged by use, tampering or incorrect connection; alteration to original components; damage to batteries or other equipment through use; misuse, or shipping damage. Where goods are found to be faulty, the customer shall return them to ACTION R/C Electronics in their original condition and with their original instructions, packaging etc. Our liability is limited to repairing or replacing goods to their original specification and will not exceed the cost of the goods. By using the product the user accepts all liability. Where a fixed repair charge is applicable, ACTION R/C Electronics shall undertake repairs to the extent that they are judged economically viable. Where such is not the case then the customer will be offered the option of crediting the repair charge towards the cost of a new unit or having the faulty unit returned and the charge refunded (less the cost of return carriage). We reserve the right to modify this guarantee without notice.



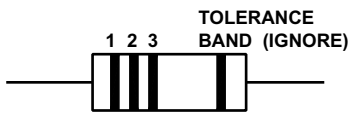
**P78 CONDOR 2 AUTOSET SPEED CONTROLLER**  
*Instructions for Kit version*



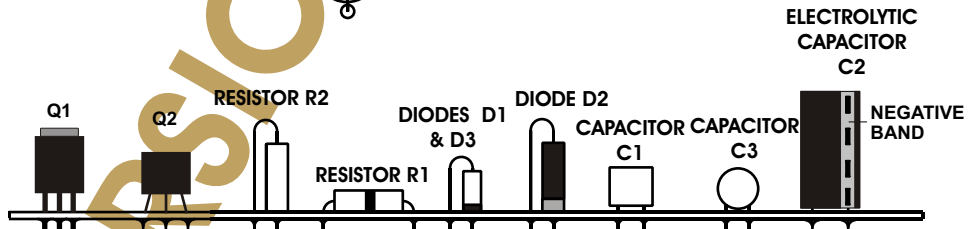
**Component Layout**



Alternative type of Q2 (2N7000)



**Resistor colour bands**



**Component mounting details**

**PARTS LIST**

|        |  |
|--------|--|
| IC1    | PIC12C508/04 (programmed) IC + 8 PIN IC socket (see notes on handling) |
| Q1     | MOS POWERFET P14N05L (see notes on handling)                           |
| Q2     | MOS transistor BS170P or 2N7000 (see notes on handling)                |
| D1,3   | Diode type 1N4148 (Glass)  |
| D2     | Diode type 1N4003 (Black Plastic)                                      |
| XTAL   | 4.0 MHz solid state crystal (blue, 3 legs)                             |
| R2     | 220 ohm resistor 1/4 watt (RED/RED/BROWN)                              |
| R1     | ZERO ohm resistor 1/4 watt (central BLACK bar)                         |
| C1     | 0.22uF poly capacitor (marked .22 63)                                  |
| C2     | 10uF min radial electrolytic capacitor                                 |
| C3     | 0.1uF disc ceramic capacitor (marked 104)                              |
| K1, K2 | Twin screw-connector blocks  |
| CASE   | TYPE RX2007  |
| RLA    | 2A relay type FINDER 20.32   |
| PCB    | TYPE P78   |
| LEAD   | Futaba generic type is supplied, with alternative HiTec/JR plug.       |
| WIRE   | Red, Black and 2 x White 22AWG silicon supplied                        |

# P78 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. 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. It is manufactured from high-grade glass fibre with double thickness copper layer.

## TOOLS

For construction you will require a soldering iron with a fine pointed bit and flux cored solder (22 SWG recommended); a small pair of wire cutters, a small screwdriver for screw connectors and a good level of light.

## PARTS

**DO NOT HANDLE ITEMS IN BLACK CONDUCTIVE FOAM AND CONDUCTIVE BAG UNTIL INSTRUCTED. (MOS DEVICES) THEY ARE SENSITIVE TO STATIC ELECTRICITY FROM YOUR BODY.**

- The short bar with colour bands and a wire at each end is a resistor R2. Its value is 220 OHMS. The one with only one central black band is a Zero ohm resistor R1. It is used as a shorting link in this design.
  - The tubular electrolytic capacitors C2 is marked with the value and working voltage, it also has a band down one side of the plastic sleeve with (-) Negative signs on it which signifies which leg goes to the negative. The opposite leg (long one) of the capacitor, of course, goes to the positive. Capacitor polarisation (+ and -) is clearly shown on the drawing.
  - The square component with two wires marked .22 63 is a poly capacitor. It can be fitted either way round.
  - The small round flat component with 2 wires is a disc Capacitor marked 104. It can also be fitted either way round.
  - The 8-pin integrated circuit (IC1) is marked with its type code; see the drawing and the Parts List. It is delivered in conductive foam and should be left in the foam until you are about to fit it. Being a MOS device, it can be damaged by static electricity and care must be exercised when handling. It is supplied with a socket. This will enable the builder to solder in the socket during construction, then fit the IC at the end of construction.
  - The 3-legged black plastic moulded part with two rounded edges, is a MOS Transistor Q2 (marked BS170P). An alternative type, also with a flat side, may be supplied (2N7000).
  - The other device that is also subject to damage by static is the 3-legged black square moulding with an integrated metal panel (Q1). It is a MOS Powerfet; again, leave it where it is until required for fitting.
  - The black plastic rod with a wire each end and the type code printed on it (1N4003) is a diode (D2). It also has a bar printed around one end which is used to identify which way round it goes. The other diodes (D1 & D3) are glass components with a dark bar at one end. As with D2, it shows which way round to fit it.
  - The 3-legged blue part with something like 4.0 marked on it, is a type of crystal to ensure that the MicroComputer is always running at exactly 4.0 MHz. It can be fitted either way round.
  - The 8-pin relay is easy to identify; it has a white case and is marked FINDER. It will only fit one way round in the PCB.
  - The 2-way screw connectors are also easily identified and are marked on the drawing as K1 and K2.

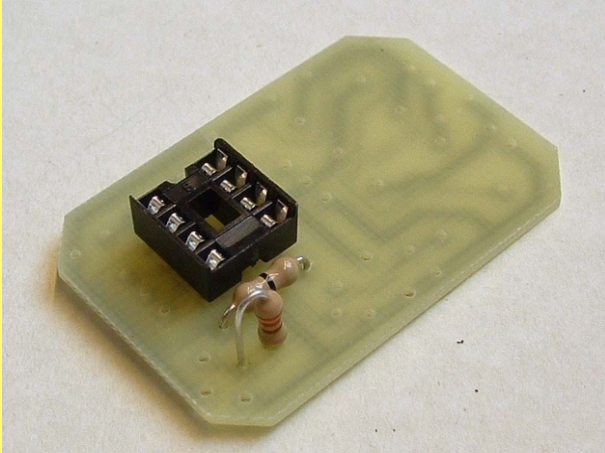
## CONSTRUCTION

- I would suggest that you fit the socket for IC1 first, it will help to give you your bearings as to what goes where. Note the small notch at one end of the plastic moulding and ensure that it is fitted as shown in the drawing, soldering all pins carefully. The IC should be plugged into the socket as the last operation of construction.
  - The two resistors can now be fitted as per the Layout drawing and Component Mounting Details. The drawing and the Parts List show the colour codes. Note the one with one black bar only is R1. As each resistor is fitted and soldered, the spare wire should be cut off close to the PCB to keep the whole job looking tidy. "Soldering Tips" may help if you are inexperienced with a soldering iron.
  - Fit and solder the XTAL at this point (three legs, blue case). It can be fitted either way around.
  - Next component to be fitted should be the diodes D1, D2 & D3. **IMPORTANT** Bend the wire as per Component Mounting Details then solder as per the layout. If this is done exactly as described, the components will be the right way round. Again cutting off the spare wires.
  - The electrolytic capacitor C2 10uF can now be fitted, and this type has to be fitted the correct way round; the negative is marked on the component and the longer lead is positive. Positive and negative signs are marked on the layout diagram, see also Component Mounting Detail, to make sure you identify and connect it correctly.
  - The poly capacitor C1 and disc C3 can now be soldered in and trimmed.
  - The two twin connector blocks can now be soldered into the four larger holes at one end of the PCB. Note that the wire insertion holes should face to the outside of the PCB.
  - Fit and solder the relay RL1. Push it right down to the PCB surface, it only goes one way round.
  - **NOTES ON MOS DEVICE HANDLING. USE A SHEET OF ALUMINIUM, COOKING METAL FOIL WILL DO.**
  - Place it on the work surface. Place the PCB, solder side down on it. Place the black conductive foam on it and rest your hands on it, holding them there while you read through this part of the instructions. The PCB, MOS IC and you are now all at the same potential, i.e. any static voltage difference is now neutralised. Touch the soldering iron tip on to the metal sheet to neutralise any static it may have. Q1 & Q2 are also MOS devices.
  - The small 3 legged transistor Q2 can now be fitted and soldered. The shape, and hence fitting direction, is shown clearly on the drawing. Cut off the spare wires.
- Last component to solder is the Powerfet Q1. Ensure that the legs go right down to the PCB as far as possible; they are a little wider at the top and will go no further than that.
  - Time to fit the IC into its socket. Ensure that the notch is aligned as per the drawing.
  - A 3-wire ribbon lead is supplied for the connection to the receiver. Connect the Negative - lead (Black) and Positive + lead (Red) to the - and + holes as per the layout drawing. The third lead is the pulse signal lead (White).
  - That's it; the PCB construction is complete. The rear of the board can now be cleaned with something like an old toothbrush and some spirit cleaner. Meths will do but Isopropyl is very much better. Then check all over the soldered side of the board for good joints and no solder bridges between tracks or round pads.

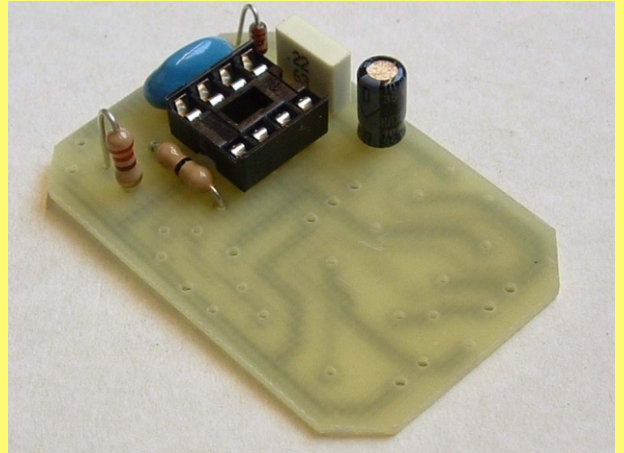
**WARNING - DO NOT use the black foam as a packing foam in the finished unit, it is CONDUCTIVE.**

# P78 CONDOR 2 AUTOSET SPEED CONTROLLER

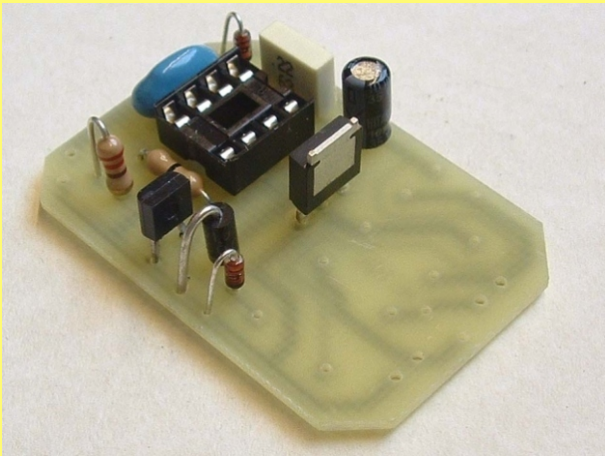
## PHOTOGRAPHIC BUILD SEQUENCE FOR KIT VERSION ONLY



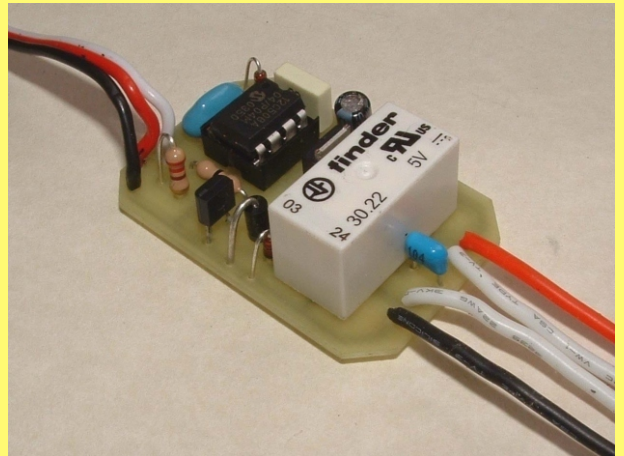
**PICTURE 1: PCB with I/C socket and resistors fitted**



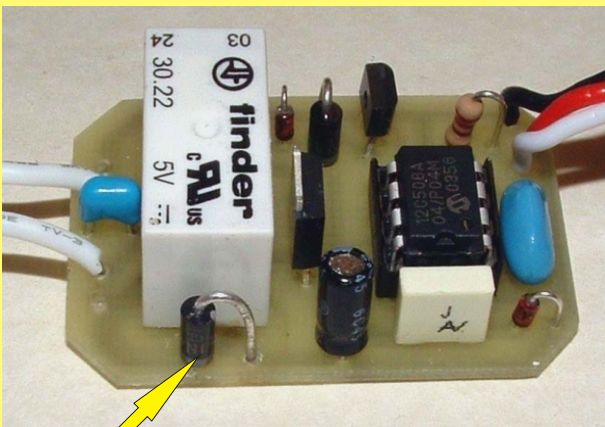
**PICTURE 2: Diode, capacitors & crystal added**



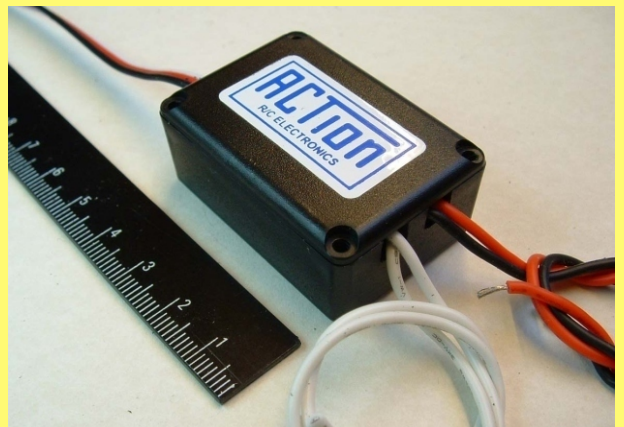
**PICTURE 3: MOSFETs & remaining diodes**



**PICTURE 4: Completed version as supplied for use with separate battery. Insert PIC chip last. NB! ANTI-STATIC PRECAUTIONS REQUIRED**



**PICTURE 5: Version modified for use with receiver battery. Arrow indicates 1N4003 Diode; see instructions for correct orientation**



**PICTURE 6: File slots in case for leads.**