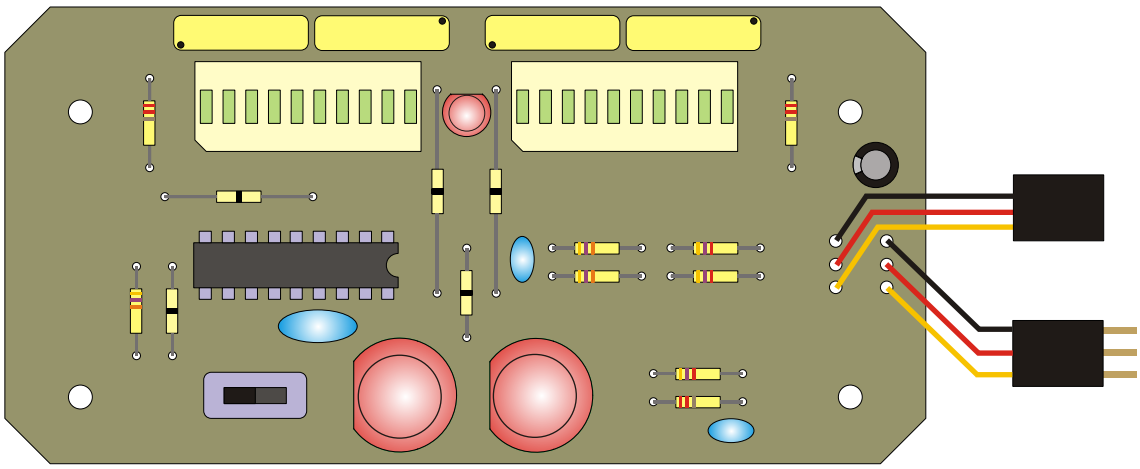
P59 'R/C MASTER' - SERVO & R/C TESTER

ACTion R/C ELECTRONICS

With a 21 step analogue display this microcomputer design project will simplify R/C test and calibration check duties. The unit takes its power from the radio control receiver pack from your outfit or a 4 x AA dry-cell pack. It will drive a servo or a switcher or a speed controller - in fact any item that is designed to run on a single radio control channel. In addition, it will check the central stick value and range of the transmitted pulses. It uses a simple 21 LED analogue display for the results, rather than the normal numeric display which means little to many modellers

Can be used for :- Testing servos, speed controllers, checking transmitter/receiver control pulses on both 2 channel and multi-channel sets; running-in motors; checking for intermittent servos speed controllers, switchers etc. It will also identify any R/C that does not comply with the normal centre stick pulse value or range. The central red LED flashes showing a fault condition i.e. no signal received.

Radio control channels checkable	**Any number**
Stick neutral value	**1.5ms (standard r/c)**
Working voltage (Nicad)	**4.8 volts**
Working voltage (Dry batt)	**6 volts**
Maximum current drawn	**0.1 amp (100ma) peak**
Input connector	**Male servo lead (to suit r/c)**
Output connector	**Female servo lead (to suit r/c)**
Case size	**110mm x 56.5mm x 21.5mm**



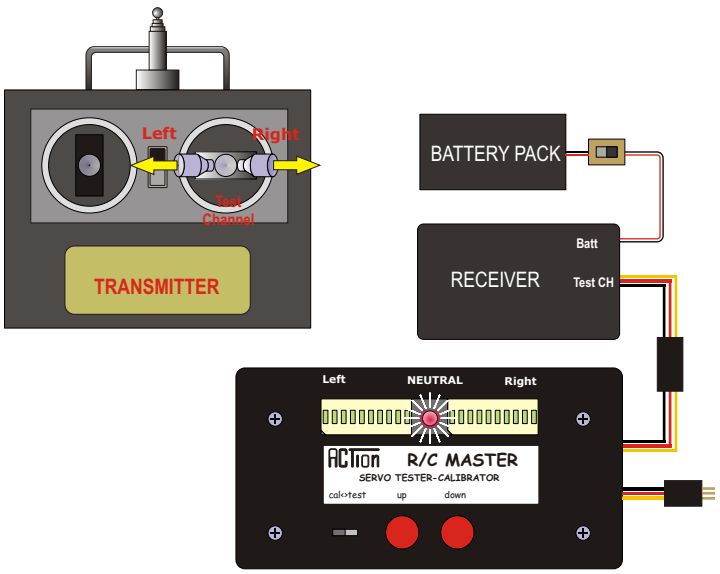


Fig 1 - Calibration Mode - Checking central pulse value of transmitter

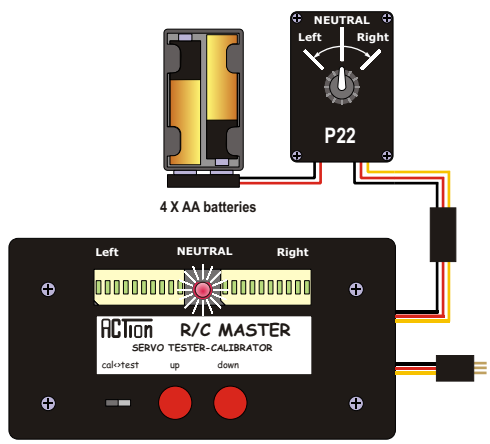


Fig 2 - Calibration Mode - Setting neutral value of P22 Servo Swinger

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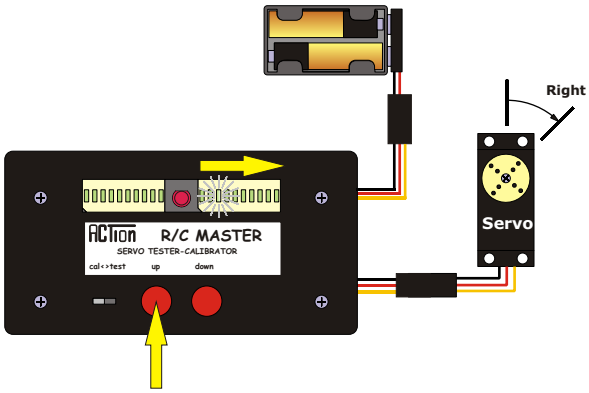


Fig 3 - Test Mode - Incremental checking servo

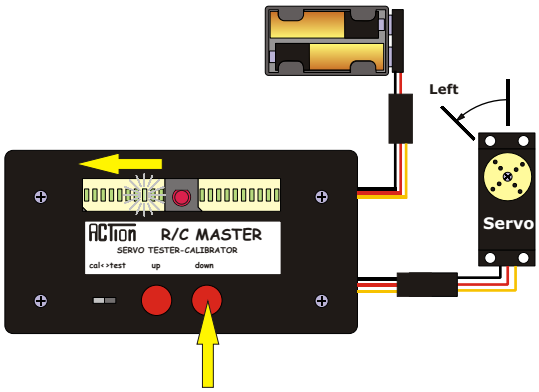


Fig 4 - Test Mode - Incremental checking servo for faults

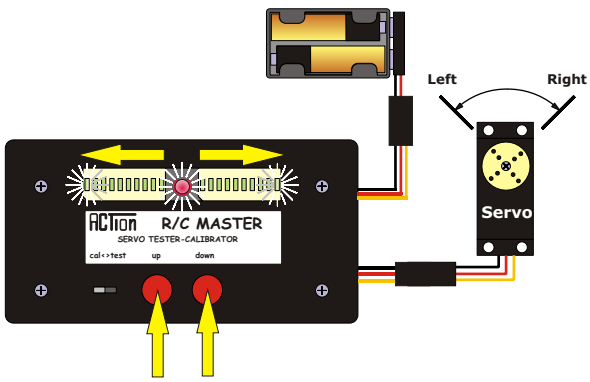


Fig 5 - Test Mode - Cyclical checking servo for faults

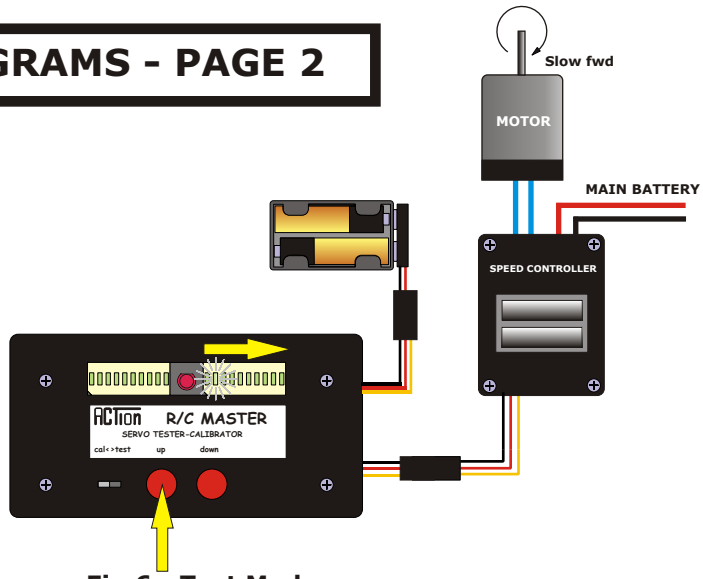


Fig 6 - Test Mode - Incremental checking Speed Controller (clockwise direction) Useful for running-

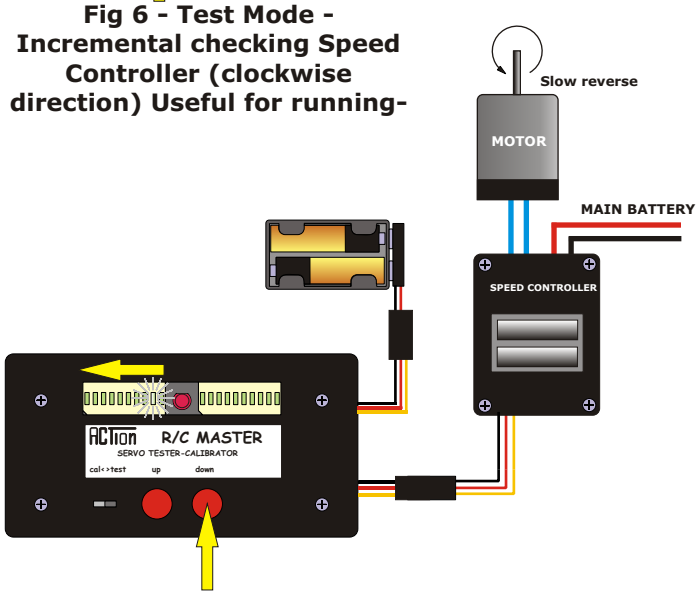


Fig 7 - Test Mode - Incremental checking Speed Controller (counter-clockwise direction)

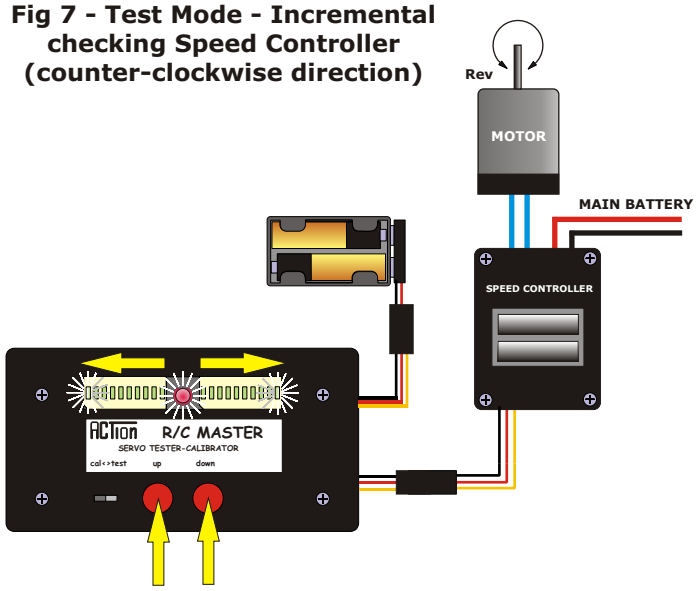


Fig 8 - Test Mode - Cyclical checking speed controller

P59 'R/C MASTER' - SERVO & R/C TESTER

Building Instructions (Kit only available)

ACTion R/C ELECTRONICS

With a 21 step analogue display this microcomputer design project will simplify R/C Test and Calibration check duties. The unit takes its power from the radio control receiver in your outfit. This should be 4.8 Volts (4 x 1.2 Volt NiCad Cells). It will drive a servo, a switcher or a speed controller; in fact, any item that is designed to run on a single radio control channel. In addition it will check the centre-stick signal pulse-width value and range of the transmitted pulses. It uses a simple 21 LED analogue display for the results, rather than the normal numeric display which means little to many modellers. The finished unit has the following functions:-

Servo tester and auto servo driver; this latter function is very useful for 'cycling' electronic speed controllers from full forward to full reverse - great for running in motors.

Transmitter pulse checker and pulse failure indicator

Transmitter stick centre checker

Neutral calibration aid

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.

TOOLS

For construction you will require, a soldering iron of about 25 Watts with a fine-pointed bit and flux cored solder (22 SWG recommended), a small pair of wire cutters and, as always, a good level of light.

PARTS

DO NOT HANDLE THE INTEGRATED CIRCUIT IN BLACK CONDUCTIVE FOAM UNTIL INSTRUCTED. (MOS DEVICE) I T IS SENSITIVE TO STATIC ELECTRICITY FROM YOUR BODY.

The short bars with a wire at each end and coloured bands are resistors. They are identified by these colours - see the drawing and the Parts List. The ones with single black bands are special resistors, Zero Ohms in value, and used as links in this project. See Component Layout and Wiring drawing and the Parts List.

The third type of resistor is an integrated pack of resistors. They are four small resin coated devices with 6 pins along one edge. The important thing when fitting these is the dot marked at one end (to the left of the printing); it signifies which way they should be fitted. This will be covered in the section called CONSTRUCTION.

The 18 pin Integrated Circuit (IC1) is marked with its type code. 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 two 20 pin devices with ten opaque windows on one face are 10 LEDs in a common package. They are chamfered on one corner to determine which way round they should be fitted. This will also be covered in the section called CONSTRUCTION.

The small aluminium can with two wires at one end and a plastic sleeve is an electrolytic capacitor C3. It has a band marked down one side of the sleeve with negative marks (-); this signifies which wire is negative - the opposite wire is obviously positive (+) See Component Mounting Details.

The little ceramic capacitors C1 & C2 (usually blue or tan in colour) can be fitted either way round.

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 4.0 MHz. It can be fitted either way round.

Switches SW1, SW2 and SW3 will be covered in the next section

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 resistors can now be fitted as per the layout and mounting details drawings. The drawing and Parts List show how to read the colour codes. 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. Links L1 to L5 can also be fitted and soldered as the resistors.

Fit and solder the XTAL at this point, either way round. Trim off spare from legs.

The resistor packs RP1 to RP4 can now be fitted and soldered. Note that a spot is clearly marked on Component Layout and a spot is printed on the resistor pack, just to the left of some printed text which identifies the component type and batch number (you needn't worry about these!). This spot signifies PIN 1. They must be fitted and soldered this way round.

The LED displays can be fitted next. There is a bevelled corner which corresponds with the drawing, and they must be fitted and soldered this way round i.e. with the chamfered corners on the lower LHS when you view the PCB as drawn. Make sure that the displays are pushed right down to the PCB as close as possible. The LED 1 comes next; note that it has a flat side on the moulding, shown on the layout drawing. It must be fitted this way round.

Capacitors C1 and C2 are the next to fit and solder, either way round. Cut off spare wire when soldered.

The electrolytic capacitor C3 is next. Note the negative band and fit as per Component Layout where the + & - are clearly marked. Solder and trim off excess lead.

The final parts to be soldered are the switches SW1, SW2 & SW3. SW1 can be soldered in either way round but SW2 and SW3 should be fitted taking note of the flat that is moulded on one side; see Component Layout.

NOTES ON CMOS 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, touch the metal with the soldering iron tip and then rest your hands on it, holding them there while you read through this part of the instructions. The PCB, any tools, the MOS IC and you are now all at the same potential, i.e. static neutralised.
Time to fit the IC in its socket. Ensure that the notch is exactly as per the drawing.

WIRING
This Unit has an IN lead (a standard servo lead) and an OUT lead to drive a servo (a servo socket lead). A Futaba type extension lead has been supplied in the kit. If this lead is cut in half it will serve as the two leads. Strip about six millimetres of covering from the end of each thin wire, then twist the strands together very tightly and tin them with a small amount of solder. The holes in the PCB and the solder pads are quite small, so you should take care to fit these leads neatly. Trim off the surplus when you're happy with the joints.Connect the servo Positive (+) lead (Red) and Negative (-) lead (Black) to the + and - as per the drawing. The third lead is the pulse signal lead which is often white or yellow in colour. It is connected to the outer hole as per the drawing. The servo socket lead should be connected in the same way. There are two different types of radio control servo lead configurations. They are either Centre pin = Positive or Centre pin = Negative. Probably the most difficult is the older Sanwa system as it uses two black wires and a red wire. The older Sanwa is Centre pin = Negative, as is Fleet. The shell of the SANWA plug is normally marked 1, 2, 3 . Pin 1 is the signal lead, Pin 2 is the negative lead and Pin 3 is the positive lead. **PLEASE NOTE THAT THE LATEST SANWA SYSTEMS MARKETED AFTER DECEMBER 1997 MAY BE THE CENTRE POSITIVE TYPE, LIKE FUTABA , HITEC and JR.**
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.

CASE
Time now to tackle the case. It appears to be quite a tall order but with the overlay it is made simple see Template drawing. Cut out the overlay drawing and make sure that the holes marked at the corners line up with the holes on the case lid. (You can hold it up to the light to see the holes projected through.) Sellotape this to the case lid and then mark the corners of the rectangular holes and the centres of the round holes with a sharp scriber or compass-point. The overlay and dimensioned drawings should make this easy. When completed, the overlay can be removed and the positions of all holes should be clearly marked (a series of dots). Alternatively you can cover the case lid temporarily with wide masking tape and use the dimensioned drawing to mark out the cut-outs it's up to you. The rectangular holes can have straight lines joined between the dots. Drill a series of holes within the rectangles formed in this way; remove the plastic with a craft knife and file as you do with your model construction. The round holes can simply be drilled with suitable sized drills.
Four M3 screws of suitable length are supplied with the kit, together with four spacers (moulded in nylon). The four screws should be fed into the four holes and four spacers fitted. Fit a washer to each screw and then slide the PCB onto the screws, when the LED displays will come close up to the rear of the case lid.
The four 3mm nuts can now be tightened on to the screws. You will need to file a couple of short slots at the top of one end of the main case body to feed the servo leads through when the case is screwed together. That's it - job done.

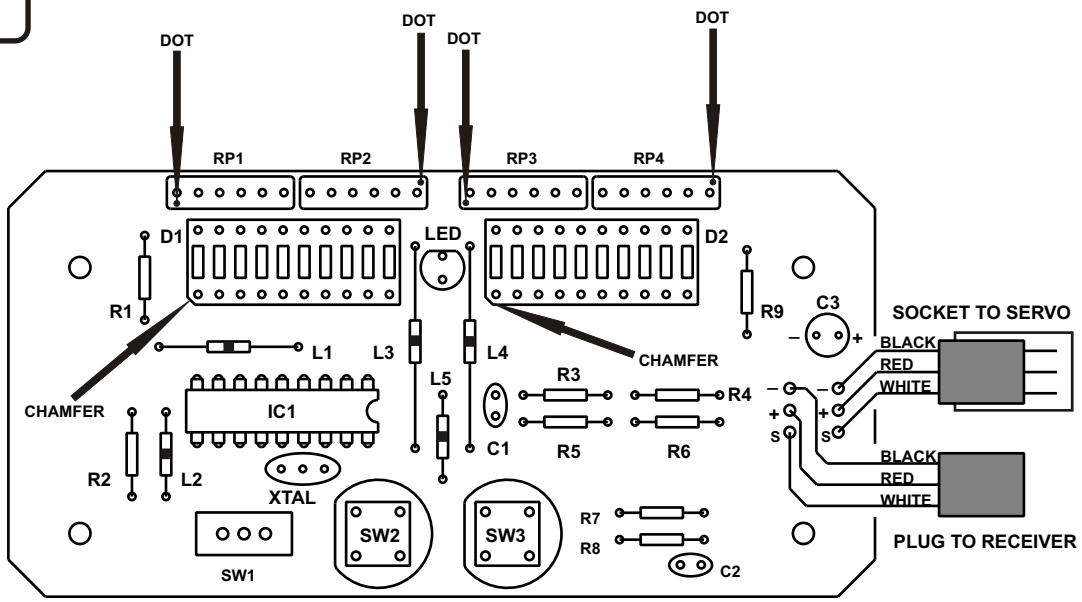
TESTING
The servo plug lead should now be connected to your receiver, ensuring that the receiver power switch is set to the OFF position. The servo socket lead should now be connected to a servo. Move SW1 to the left end. Next, switch on your transmitter, then receiver in that order. With no movement of stick the middle red led should light; this will tell you that the transmitter stick for the channel you are monitoring is a true R/C centre (plus or minus a small error). If one or other of the green displays has a segment lit, you should move the trim for the test channel until the red led comes on. By going through the procedure of switching off, connecting to another channel and testing, you can check the centre of each stick to see that it is set correctly. If the transmitter is turned off with SW1 in this position, the unit will no longer get a pulse from the channel and after a second or so the red LED will flash, telling you that no legitimate R/C-value pulse is being received. In other words, it is signifying a fault condition. WARNING - some receivers “twitch” frantically if left switched on when the transmitter is switched. This will cause random segments on the Green displays to light up. This is very pretty but a complete waste of time!
If SW1 is moved to the RIGHT end of its travel the “last stick position” value will be held by the unit even after the stick has been released.
With the switch in this position, the unit is now in Servo Test position. Switches SW2 and SW3 can now be used to run the servo tester up to either end of its travel. SW2 moves the display down (to 1mS); SW3 moves up to the other end (2mS) With both switches pressed at the same time, the unit will auto-scan up and down the pulse range; great for testing speed controllers.

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)

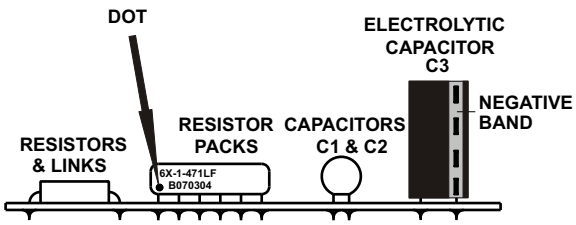
ACTION R/C ELECTRONICS, 1 Llwyn Bleddyn, Llanllechid, Bangor LL57 3EF, United Kingdom

ACTion
R/C ELECTRONICS

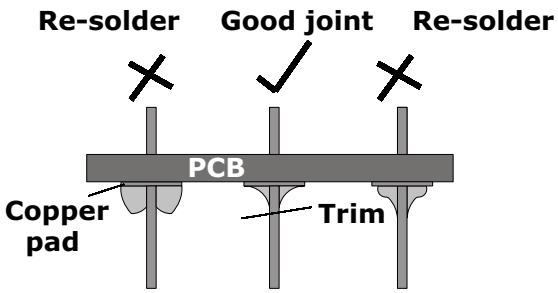
P59 R/C MASTER



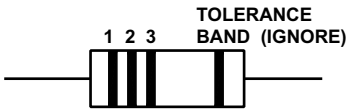
Component layout and wiring



Component mounting details



Soldering Tips



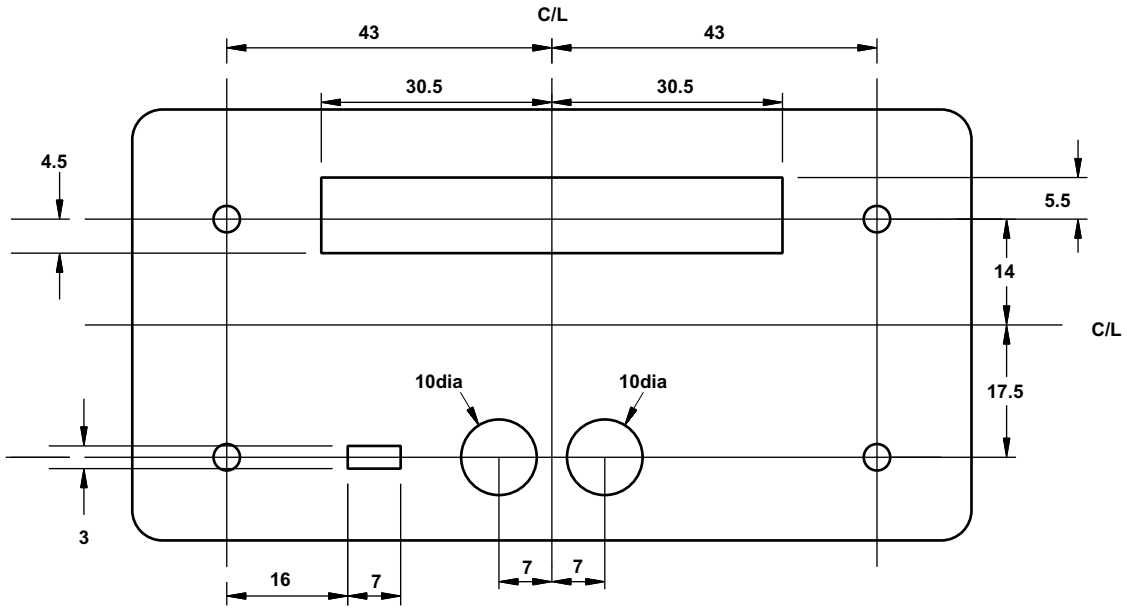
Resistor colour bands

PARTS LIST

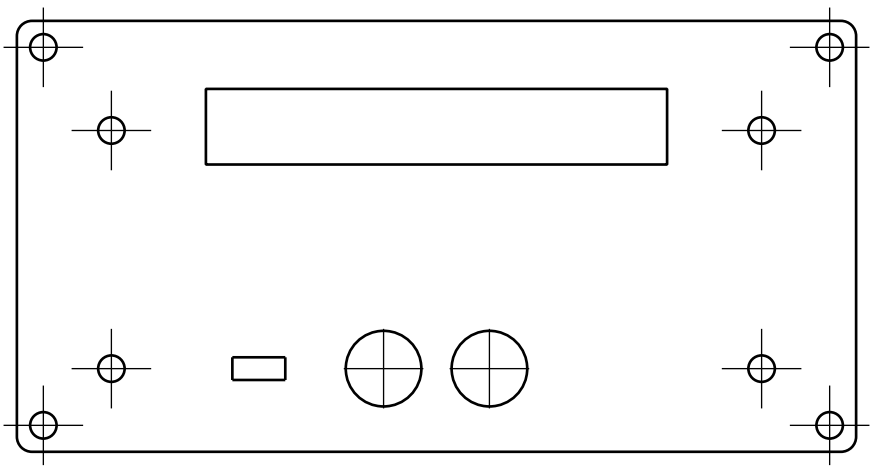
IC1	PIC12C508/04 (PROGRAMMED) IC + 18 PIN IC SOCKET
XTAL	4.0MHz SOLID STATE CRYSTAL (blue, 3 legs)
R1,8,9	220 OHM RESISTOR 1/4 WATT (RED/REDBROWN)
R2,3,5	47K RESISTOR 1/4 WATT (YELLOW/MAUVE/ORANGE)
R4,6,7	4K7 RESISTOR 1/4 WATT (YELLOW/MAUVE/RED)
RP1,2,3,4	470 OHM RESISTOR PACKS (5 resistors per pack)
L1,2,3,4,5	ZERO OHM LINKS (SINGLE BLACK CENTRAL BAND)
C1, C2	0.1 uF CERAMIC CAPACITOR (marked 104)
C3	10uF MIN RADIAL ELECTROLYIC CAPACITOR
D1,2	GREEN TEN SEGMENT DISPLAYS
LED 1	RED STANDARD LED
SW1	MINIATURE TWO WAY PCB SLIDE SWITCH
SW2,3	MINIATURE PUSH TO MAKE SWITCH

ACTion
R/C ELECTRONICS

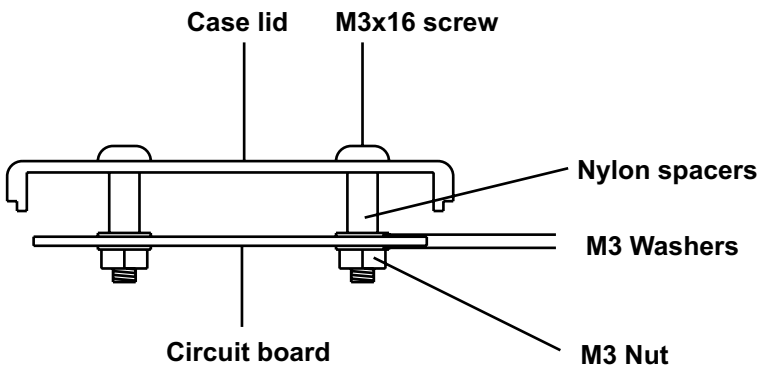
P59 R/C MASTER



DIMENSIONS FOR CASE LID CUTTING/DRILLING

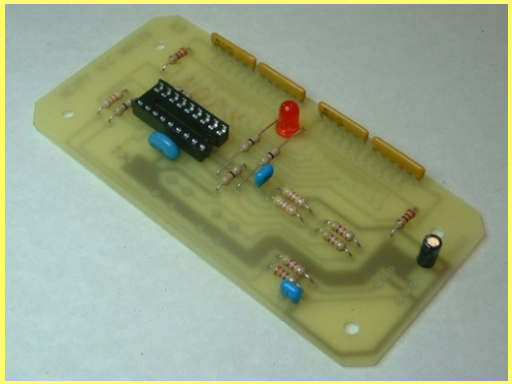


TEMPLATE DRAWN FULL-SIZE

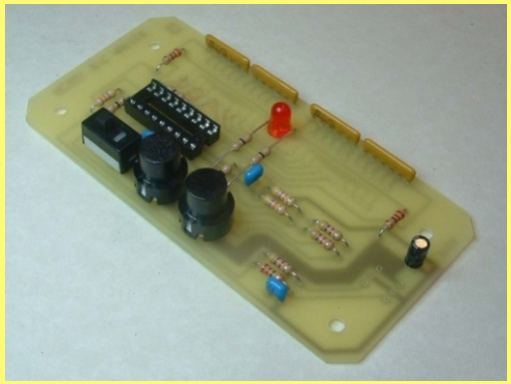


MOUNTING PCB

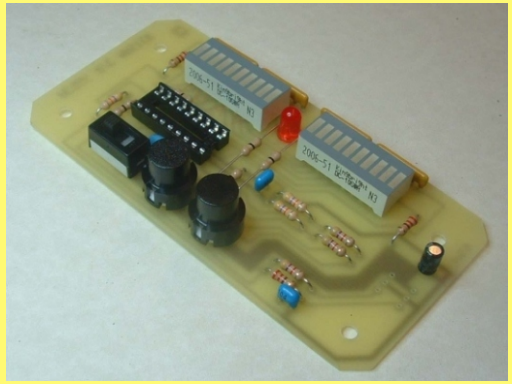
P59 “R/C MASTER” UNIT



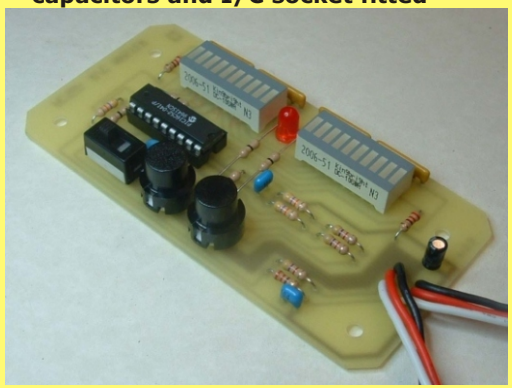
PICTURE 1: PCB with resistors, LED, capacitors and I/C socket fitted



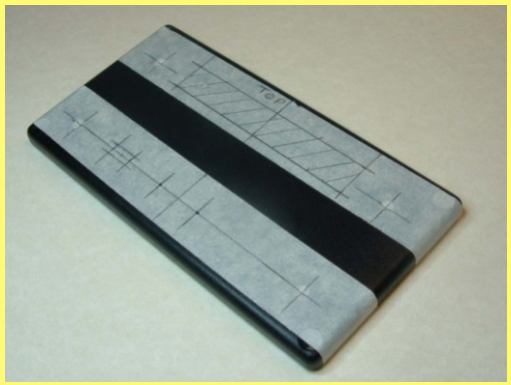
PICTURE 2: Push-buttons & switch fitted



PICTURE 3: Fit 10-segment LED displays



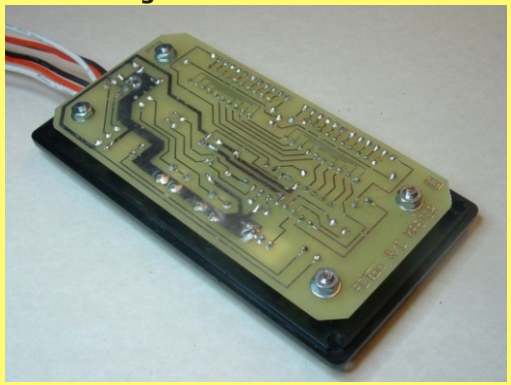
PICTURE 4: Fit leads and PIC chip. NOTE! ANTI-STATIC PRECAUTIONS REQUIRED



PICTURE 5: Masking tape used for marking-out holes etc

PICTURE 6: Drill holes to marked lines

PICTURE 7: Snip out waste and file cut-outs back to lines. Deburr holes



PICTURE 8: Fit PCB to case with screws, washers, nuts and spacers as drawing

PICTURE 9: Fit into case and add label