

HOW TO CHANGE THE INTERIOR BUTTONS TO COLOURED LED

THIS JOB WOULD PROBABLY BE A LOT EASIER USING THE EXISTING PUSH-IN STYLE **BULB** HOLDER AND 12 VOLT LEDS WITH NO RESISTOR .

FIRST OFF TAKE THE SURROUND OFF FROM AROUND THE DIALS. 2 POSI SCREWS AT THE TOP OF THE FACIA, THEN LOWER THE STEERING WHEEL RIGHT DOWN AND PULL TOWARDS YOU.

NEXT TAKE THE SWITCHES OUT OF THE SURROUND BY PRESSING IN THE 2 TABS EITHER SIDE AND PULL OUT THE FRONT OF THE FACIA.

NOW GO INSIDE TO TAKE THE SWITCHES APART AS THERES LOADS OF LITTLE BITS THAT CAN FLY EVERYWHERE, AND FINDING THEM IN THE CAR WILL BE A NIGHTMARE!

CAREFULLY PRISE THE SWITCH APART BY INSERTING A SMALL FLATHEAD SCREWDRIVER BETWEEN THE 2 HOLES ON THE SIDE OF THE SWITCH.

YOU WILL NOW HAVE ALL THE DIFFERENT PARTS LIKE THIS: BE CAREFULL NOT TO LOSE THE LITTLE SPRINGS, THEY TEND TO FALL OFF.



NOW GET YOUR BLUE LEDS, I USED MY SPARE ONES WHICH I BELIEVE ARE T5 BULBS. THESE ONES HAVE A SMALL RESISTOR ON 1 LEG OF THE LED. NOTE THIS WOULD BE A LOT EASIER TO DO IF YOU BUY 12VOLT LEDS WHICH HAVE NO RESISTOR AS THE JOINT IN THE RESISTOR TO THE LED KEPT SNAPPING ON MINE AND AS I HAVE NO SOLDERING IRON I WENT THROUGH ABOUT 8 LEDS IN TOTAL.



NEXT I UNFOLDED THE LEGS OF THE LED AND TOOK IT OUT THE BLUE HOLDER. THEN I CUT DOWN THE HOLDER AS LOW AS POSSIBLE (WITH A FULL LENGTH T5 HOLDER THE LED WOULD STICK TOO FAR FORWARD AND NOT ALLOW THE SWITCH TO BE PRESSED. THREAD THE LED LEGS THROUGH THE CUT DOWN **BULB** HOLDER AND BEND UPWARDS. PUSH THE **BULB** AS FAR INTO THE SWITCH AS POSSIBLE (I PUSHED IT IN AGAINST 1 METAL PRONG AND THEN BENT THE OTHER METAL PRONG WITH A SCREWDRIVER TO TOUCH THE OTHER LED LEG. NOW GO AND PLUG THIS BIT OF THE SWITCH INTO THE CAR (TURN YOUR LIGHTS ON) TO CHECK IF YOU HAVE THE POLARITY OF THE **BULB** RIGHT. IF NOT REMOVE **BULB** AND SWITCH THE TERMINALS.



NOW I HAD TO CUT DOWN THE MAIN BODY OF THE SWITCH AT THE FRONT TO ALLOW THE LED TO PASS THROUGH. I FORGOT TO TAKE A PHOTO OF THIS BIT SO BELOW IS THE BIT I CUT OFF ARROWED. THIS IS ALSO MY SWITCH COMPLETED AND BACK TOGETHER, YOU CAN SEE THE LED UNDERNEATH THE ARROW.

TO GET IT BACK TOGETHER IS VERY COMPLICATED. IT TOOK ME A FEW TRY'S TO GET IT RIGHT AS THE **BULB** IS A LOT LARGER THAN THE ONE BEFORE SO YOU HAVE TO HALF ASSEMBLE THE SWITCH, PUSH THE MAIN BODY DOWN TO

CLICK IT IN, THEN PUSH THE SWITCH IN AND HOPE IT ALL FALLS BACK INTO PLACE IN THE RIGHT WAY. IF NOT GENTLY PRISE THE SWITCH APART AGAIN, AND TRY AGAIN. IT CAN GET QUITE FRUSTRATING, JUST KEEP AT IT AND EVENTUALLY YOU'LL GET IT.



NOW GO AND TRY THE SWITCHES IN THE CAR, HOPEFULLY THEY'LL LIGHT UP, IF NOT THEN THE PRONGS AREN'T TOUCHING PROPERLY IN WHICH CASE GO BACK AND TRY THE PREVIOUS STEP AGAIN. IF ALL WORKS THEN CAREFULLY PUT THE SWITCHES BACK INTO THE FACIA AND ASSEMBLE BACK ONTO THE DIALS.

*IF ALL IS OK THEN YOU'LL END UP WITH THIS....





THIS IS A GUIDE TO HELP CHANGE THE STANDARD GREEN (MINE WAS) DRIVERS WINDOW SWITCH LED WITH AN LED OF YOUR COLOUR CHOICE.

A QUICK PHYSICS LESSON.

IF YOU DO NOT NEED A RESISTOR (12VOLT LED) OR UNDERSTAND HOW TO CALCULATE THE RESISTOR VALUE, ROLL DOWN A LITTLE BIT YOU'LL SEE WHEN TO STOP!.

A NORMAL LOW VOLTAGE LED WITH EXPIRE RAPIDLY IF EXPOSED TO THE VOLTAGE FOUND IN A CAR. UNLESS YOU BUY A 12V LED YOU WILL NEED A RESISTOR.

TO WORK OUT JUST HOW "BIG" YOU WANT THIS RESISTOR FOLLOW THIS EASY BIT OF MATHS. A CAR BATTERY USUALLY GIVES 12 VOLTS OF ELECTRICITY. WHEN THE ENGINE IS RUNNING AND THE ALTERNATOR IS CHARGING, THE BATTERY VOLTAGE CAN GO UP TO AROUND 14V. MY CAR IS USUALLY 14.26V ISH AT TICKOVER. IT IS THIS HIGHER VOLTAGE FIGURE WE ARE INTERESTED IN. AN LED USUALLY EMITS LIGHT AT AROUND 1.7 TO 2.2 VOLTS OR EVEN 3.8 OR 4 VOLTS FOR SOME WHITE AND BLUE TYPES. ALSO LED'S ARE RATED FOR POWER, USUALLY EXPRESSED IN MILLI-AMPS OR MA FOR SHORT.

MOST LED USE AROUND 20 TO 30 MA (SOME ARE MUCH LOWER 3 TO 8 MA) EXPRESSED MATHEMATICALLY AS 0.020 OR 0.030MA. NOW YOU HAVE THE THREE FIGURES YOU CAN WORK OUT THE RESISTOR OHMS VALUE.

THE PLACE WHERE YOU PURCHASED THE LED SHOULD BE ABLE TO GIVE YOU THE MAXIMUM VOLTAGE AND MAXIMUM POWER FIGURES FOR YOUR LED.

SO NOW WE HAVE THREE SETS OF FIGURES;

AS AN EXAMPLE I WILL GIVE THEM THEORETICAL FIGURES ()

1 RUNNING SPEED VOLTAGE (14.26V)

2 LED MAXIMUM VOLTAGE (2.1V)

3 LED MAXIMUM POWER MA (25MA)

MINUS THE LED MAXIMUM VOLTAGE FROM THE RUNNING SPEED VOLTAGE TO GIVE LED OVER VOLTAGE. THIS IS THE BIT WE NEED TO RESIST.

$14.26V - 2.1V = 12.16VOLTS$

HIGHER VOLTAGE BLUE LED $14.26 - 3.8V = 10.46VOLTS$

NOW DIVIDE THE OVER VOLTAGE FIGURE BY THE LED MAXIMUM POWER (AS A NUMERICAL FIGURE IE 0.030MA) TO FIND OUT HOW MANY OHMS THE RESISTOR SHOULD BE

$12.16VOLTS$ DIVIDED BY $0.025MA = 486.4$ OHMS. RECOMMEND A 510OHM RESISTOR

HIGHER VOLTAGE BLUE LED $10.46VOLTS$ DIVIDED BY $0.025MA = 418.4$ OHMS. RECOMMEND A 430 OHM RESISTOR

NO RESISTOR EXISTS FOR THE TWO FIGURES, SO I WOULD AUTOMATICALLY CHOOSE THE NEXT HIGHEST RESISTOR AVAILABLE. THIS IS FOR LED SAFETY AS THE HIGHER FIGURE RESISTS MORE CURRENT, THE LED WILL BE MARGINALLY DIMMER, BUT WON'T GO POP LIKE IT WOULD IF YOU USED A LOWER RESISTOR VALUE. I USED A 560OHM AS THIS WAS ALL I COULD FIND.

PHYSICS LESSON OVER. LETS HAVE THOSE WHO DIDN'T LISTEN BACK IN THEIR SEATS!

SO HOW TO REMOVE AND REPLACE THE STANDARD (GREEN) LED

TOOLS REQUIRED

FLAT BLADE SCREWDRIVER

NUMBER 2 POZIDRIVE SCREWDRIVER

CUTTING IMPLEMENT, SCALPEL OR CRAFT KNIFE, STANLEY ETC

SOLDERING IRON, 18W SHOULD BE FINE, SMALL TIPPED IS BETTER.

THIN MUTLICORE SOLDER, ABOUT 2 FOOT

DE-SOLDER BRAID OR SOLDER SUCKER

WIRE SNIPS FOR CUTTING EXCESS COMPONENT LEGS AND/OR WIRE

1 LED OF YOUR CHOICE, AND IF YOU DON'T USE A 12VOLT LED;

2 RESISTORS TO SUIT THE LED (IF REQUIRED)((ONE FOR TESTING, IF FIXING TO CAR TO TEST ONLY 1 IS NEEDED))

9V BATTERY (FOR TESTING WITHOUT FIXING TO CAR, NOT REQUIRED)

9V BATTERY CLIP (FOR TESTING WITHOUT FIXING TO CAR, NOT REQUIRED)

1 REMOVE CIRCULAR PLUG FROM ABOVE THE DOOR BIN USING THE FLAT BLADE SCREWDRIVER. TAKE CARE NOT TO MARK THE PANEL. UNDO THE SCREW THAT HOLDS THE DOOR RELEASE COVER PLATE ON AND REMOVE THE COVER PLATE. (YOU WILL HAVE TO HOLD THE DOOR OPEN CATCH OPEN SLIGHTLY TO DO THIS)

REMOVE THE SMALL CIRCULAR COVERS FROM THE 2 SMALLER SCREWS ON THE DOOR LOCK EDGE AND THE 1 WHERE THE MIRROR IS, IF YOU ARE LUCKY TO STILL HAVE THESE! I HAVE TWO OF THEM. REMOVE THE 4 SCREWS YOU HAVE JUST UNCOVERED AND THEN REMOVE THE ONE BEHIND THE DOOR LOCK CATCH, THE ONE MOST TO THE RIGHT AND CLOSEST TO THE CENTRE OF THE RED CIRCLE.

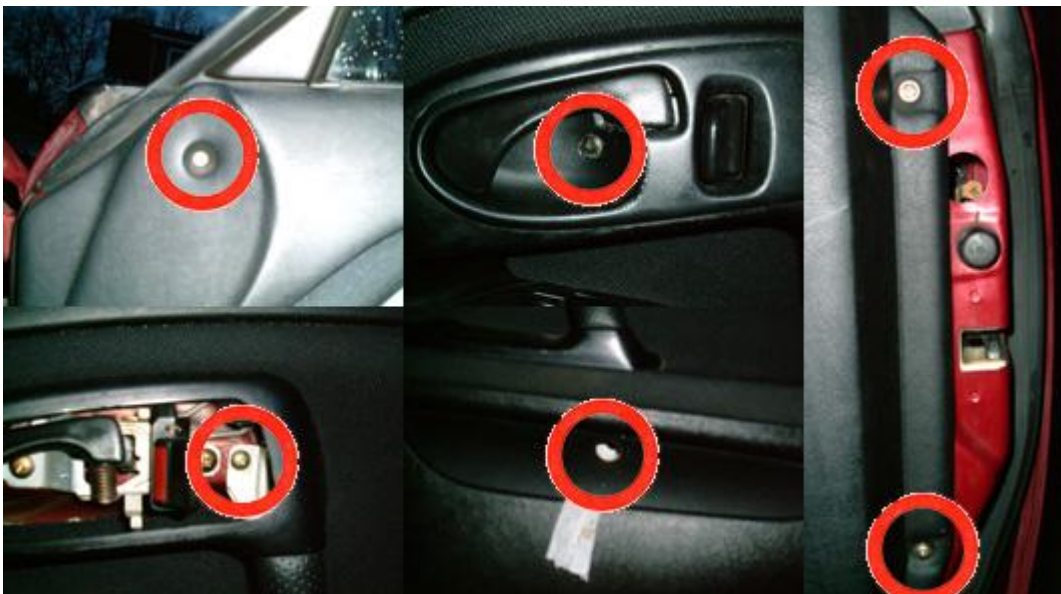
1: NEAR MIRROR

2: THE DOOR HANDLE SURROUND

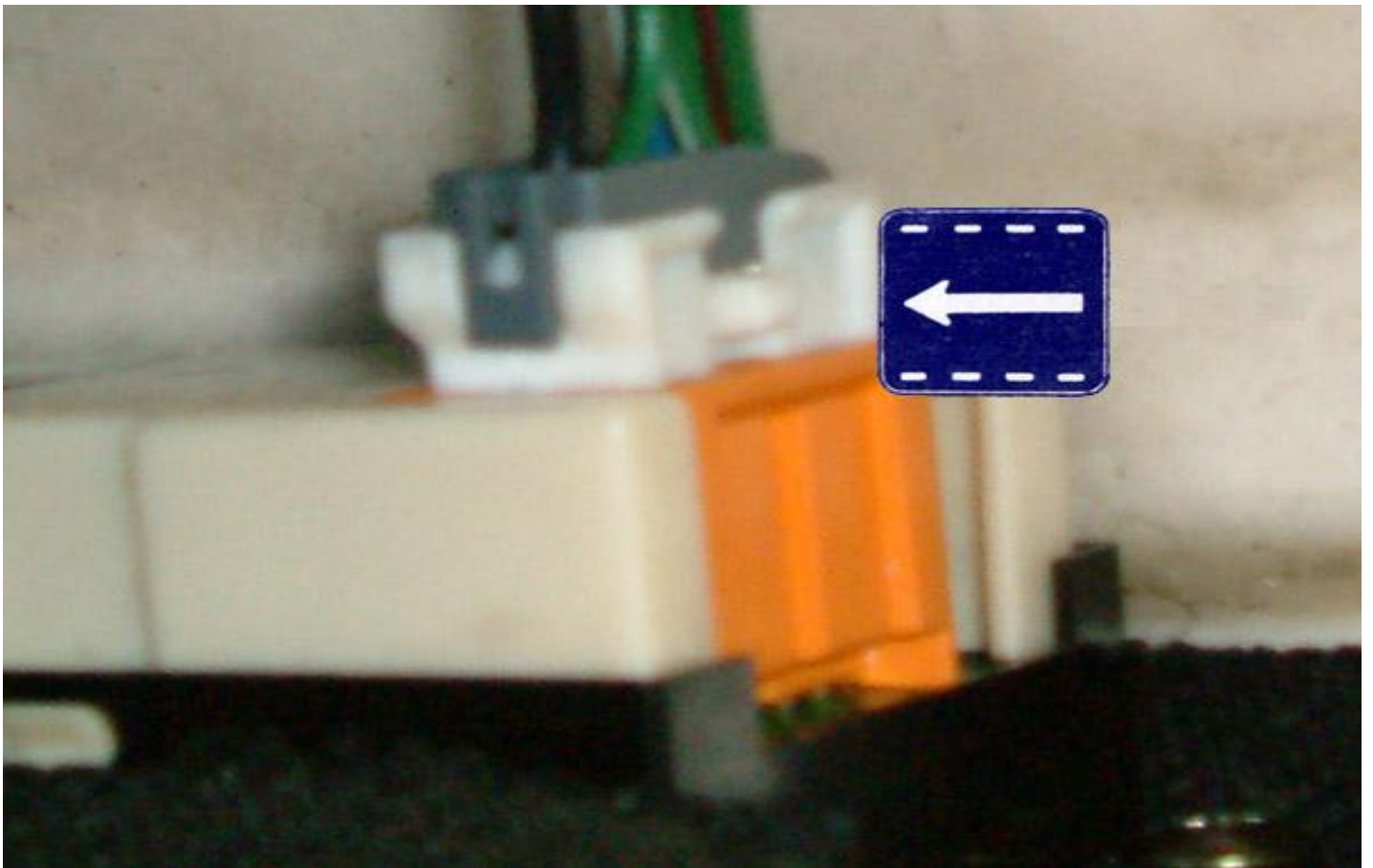
3: BEHIND THE DOOR HANDLE SURROUND

4: ABOVE THE DOOR BIN

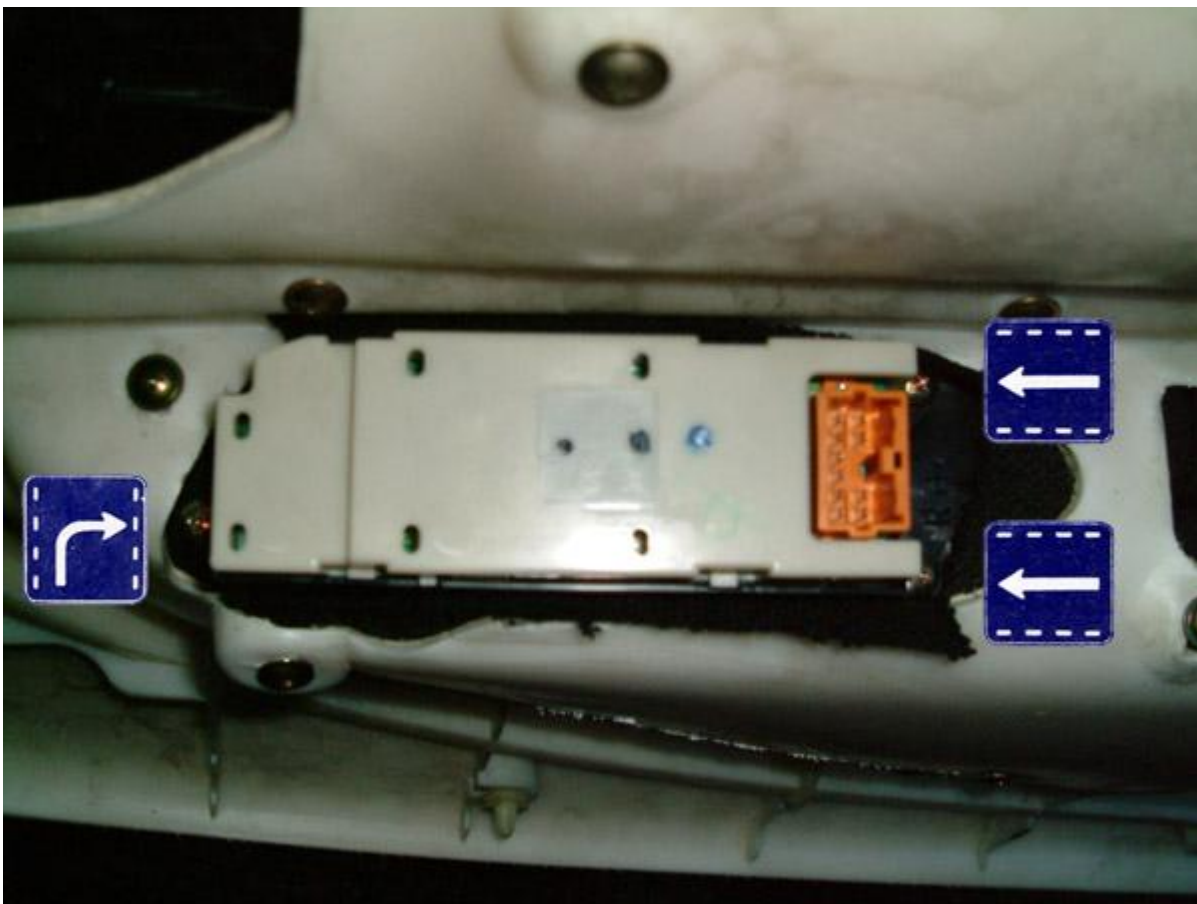
5 AND 6: TWO ON THE EDGE OF THE DOOR



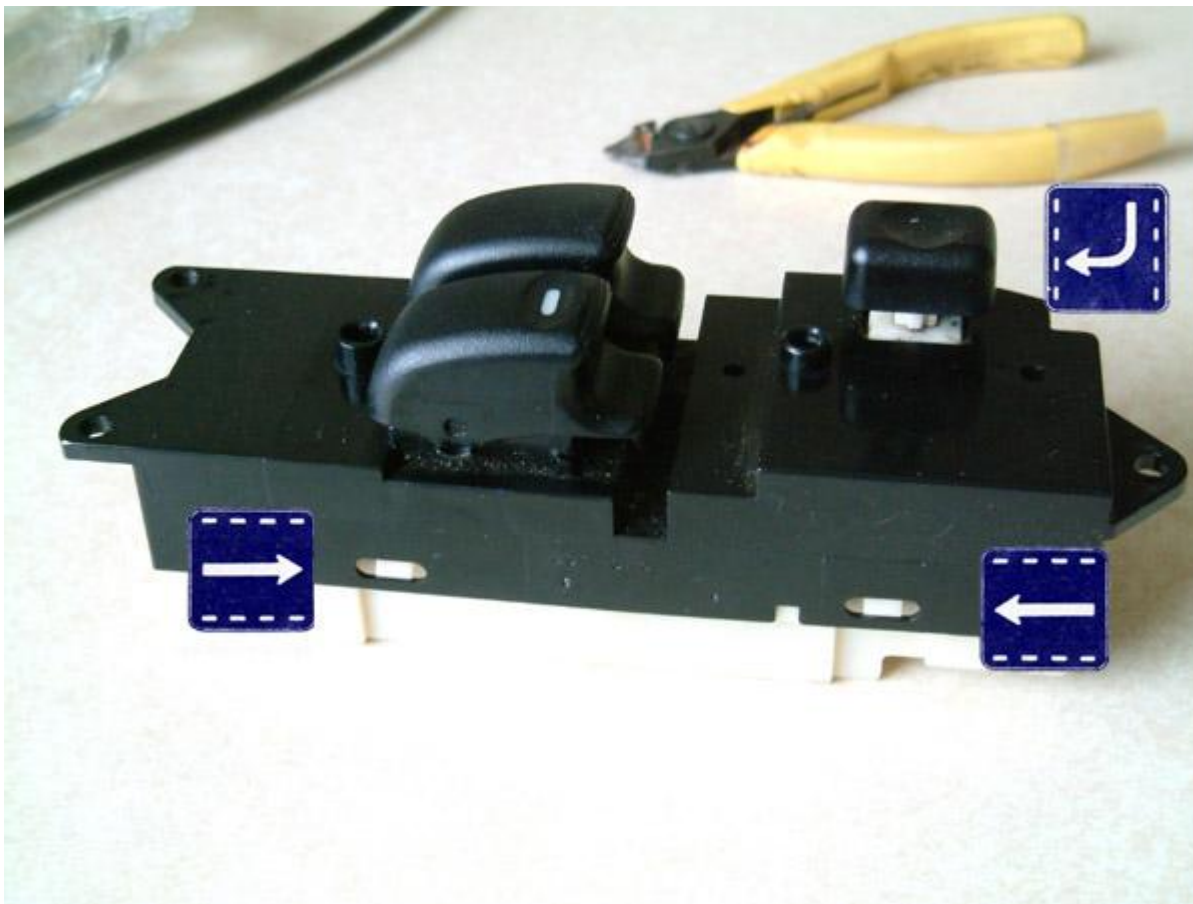
2 PULL THE DOOR LINING AWAY FROM THE DOOR AND PRESS THE HIGHLIGHTED KNOB ON THE CONNECTOR IN, PULL CONNECTOR BLOCK TO RELEASE THE SWITCH WIRING HARNESS FROM THE SWITCH CONNECTOR.



3 REMOVE THE THREE HIGHLIGHTED SCREWS AND TAKE THE SWITCH UNIT OFF THE DOOR PANEL, DISPOSE OF DOOR PANEL, PREFERABLY ONTO THE PASSENGER SEAT OR SOMEWHERE JUST AS OUT OF THE WAY!



4 YOU SHOULD NOW HAVE THE SWITCH UNIT IN YOUR HANDS. PULL THE PASSENGER WINDOW LOCK BUTTON OFF THE TOP OF THE SWITCH (IT WONT BREAK) AND REMOVE THE BASE (MINE IS COLOURED BEIGE) BY UNHOOKING THE BLACK PLASTIC SWITCH UNIT SIDES AS MARKED. ONCE THE TWO MARKED CLIPS HAD BEEN UNHOOKED MY BASE FELL OFF QUITE EASILY NOT NEEDING THE OTHER SIDE TO BE DONE, YOURS COULD DIFFER!



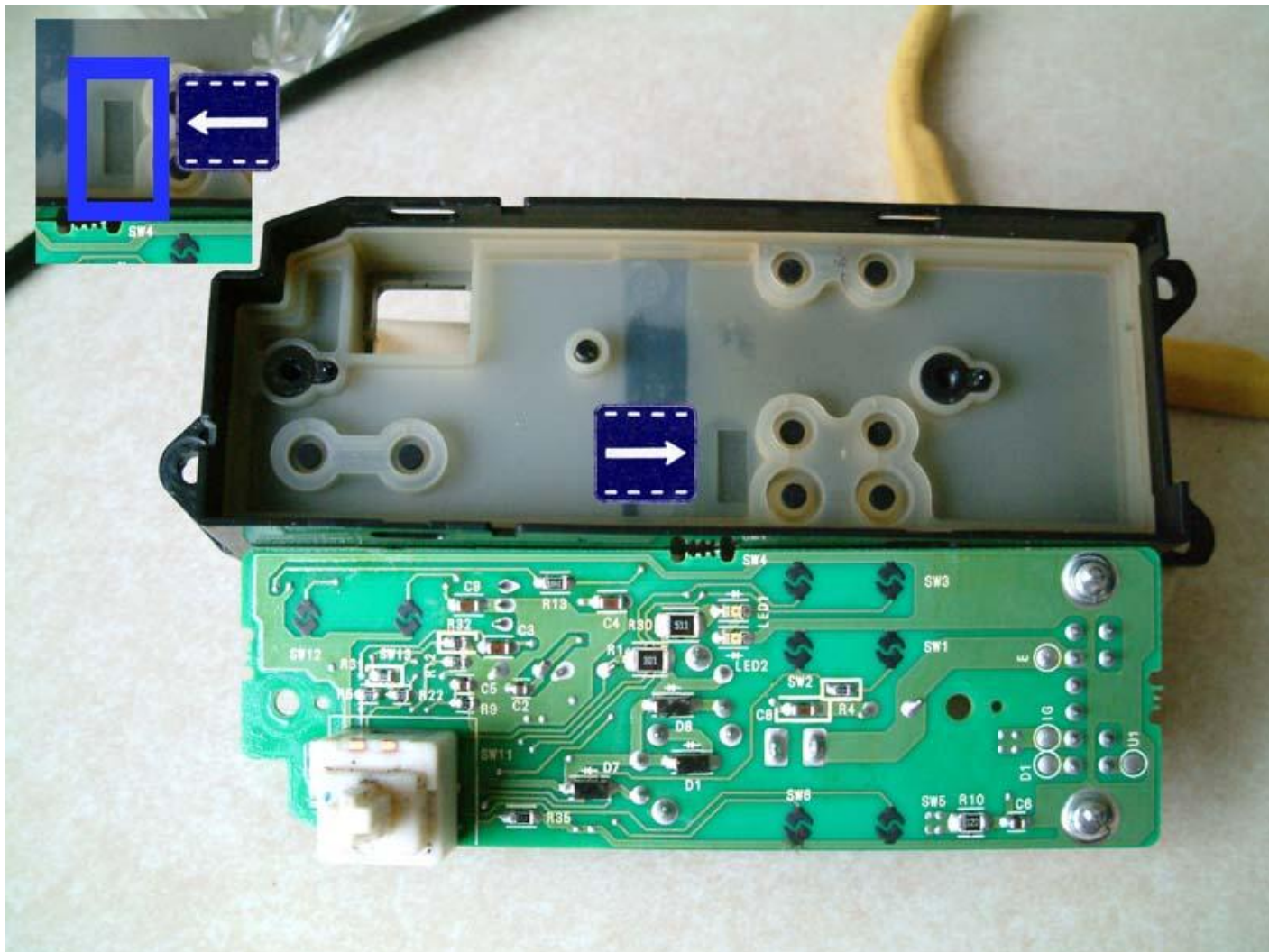
5 REMOVE THE TWO MARKED SCREWS AND THE CIRCUIT BOARD SHOULD FALL FREELY AWAY.



6-6B YOU SHOULD NOW HAVE SOMETHING LIKE THIS. PULL THE RUBBER LINER OUT AND LOOK AT THE AREA MARKED BY THE BLUE BOX IN THE CENTRE. THIS INSET THIN WINDOW NEEDS TO BE CUT OUT, IT IS ALSO HIGHLIGHTED UP IN THE TOP LEFT HAND CORNER OF THE PIC. USE A GOOD SHARP BLADE TO CUT OUT THE WINDOW, YOU CAN CUT OUT MORE THAN THE WINDOW, BUT THERE IS NO REAL NEED TO REMOVE MORE SO THE THIN WINDOW ON IT'S OWN SHOULD SUFFICE.

IT SHOULD LOOK LIKE THE MIDDLE PIC WHEN IT HAS BEEN REMOVED.

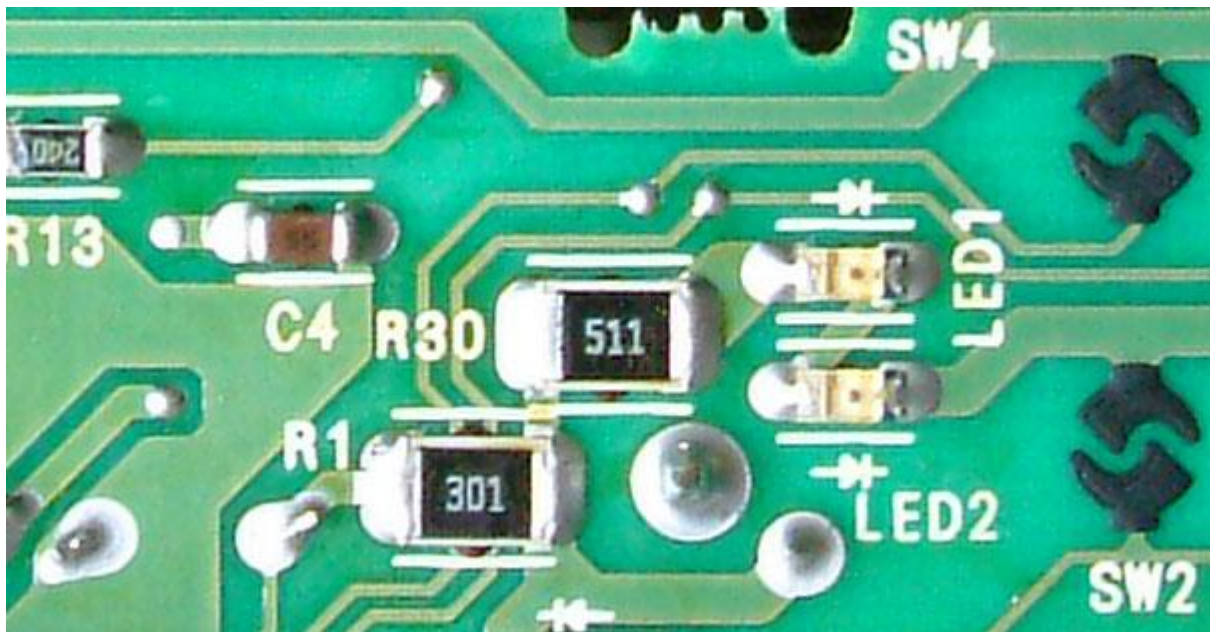
THE THIRD PIC SHOWS, HIGHLIGHTED IN BLUE, THE AREA OF THE CIRCUIT BOARD THAT WE ARE GOING TO BE WORKING ON.



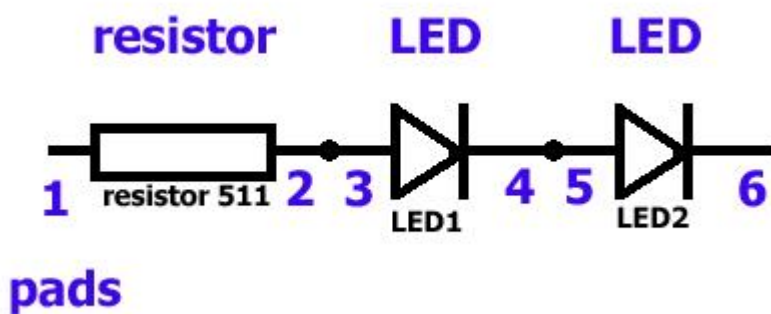


6C THIS IS A BLOWN UP PICTURE OF THE ABOVE BLUE HIGHLIGHTED AREA.
HERE YOU CAN SEE SIX SMALL COMPONENTS, 1 SMALL BLACK (UPPER LEFT), 1 SMALL DARK BROWN (UPPER CENTRE LEFT), 2 LARGER BLACK (CENTRE), 2 SMALL CREAM AND BLACK DOTTED (RIGHT).
WE ARE INTERESTED IN THE 2 SMALL CREAM ON THE RIGHT AND CENTRE LARGE BLACK

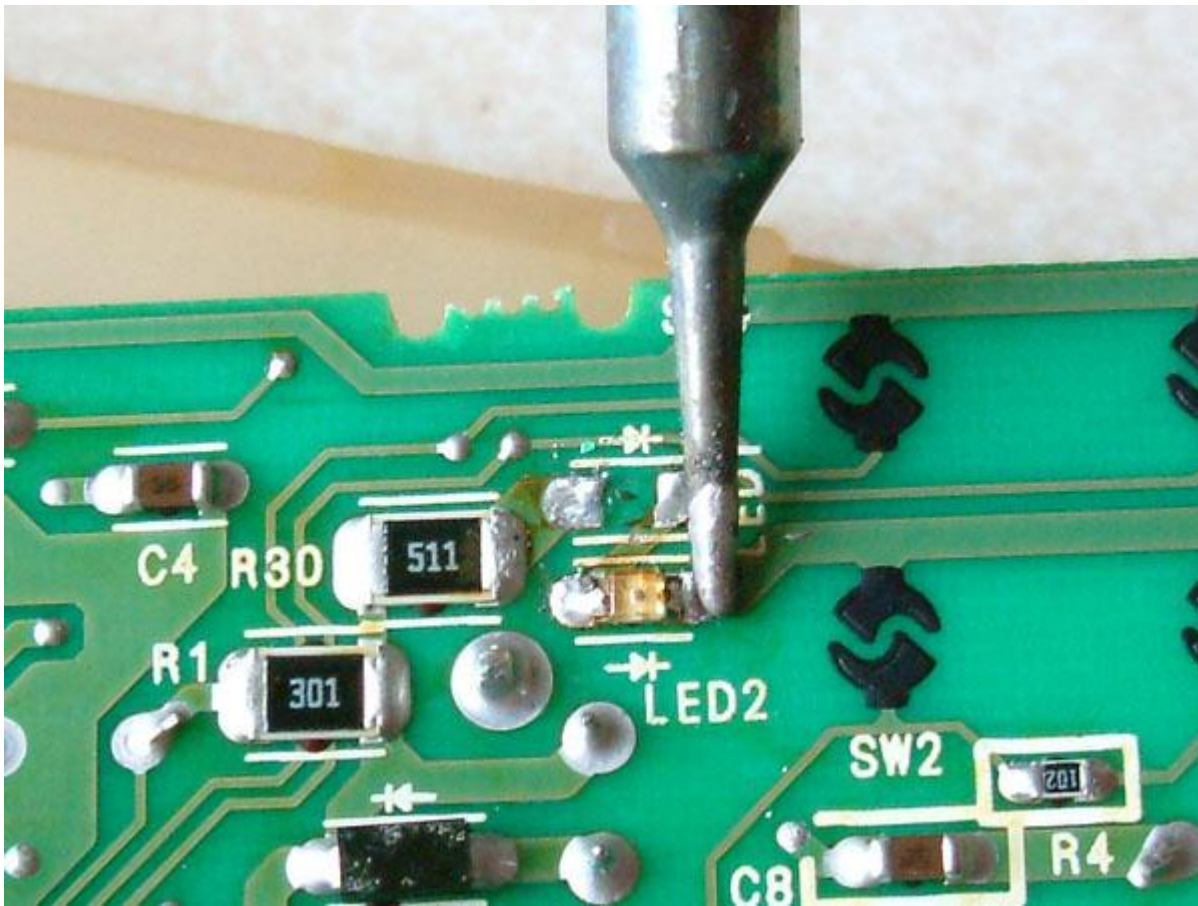
COMPONENTS. THE BLACK ONE, WITH MARKED 511 ON IT, AND R30 TO THE LEFT OF IT IS THE RESISTOR FOR THE TWO LEDS, WHICH ARE SET TO THE RIGHT, MARKED LED 1 (HIGHER AND HORIZONTAL) AND LED2 (LOWER AND VERTICAL). THESE ARE THE COMPONENTS WE WILL BE REMOVING.



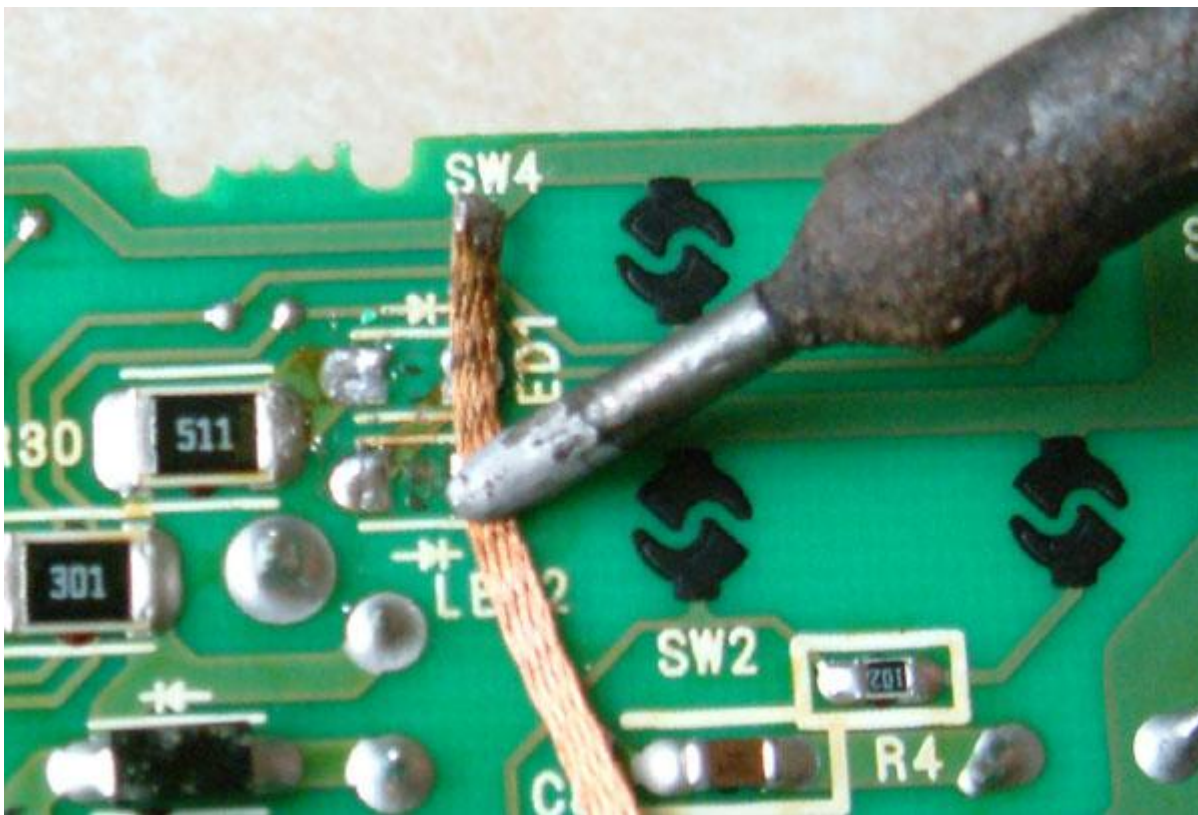
6D IF WE DREW A CIRCUIT DIAGRAM IT WOULD LOOK LIKE THIS;



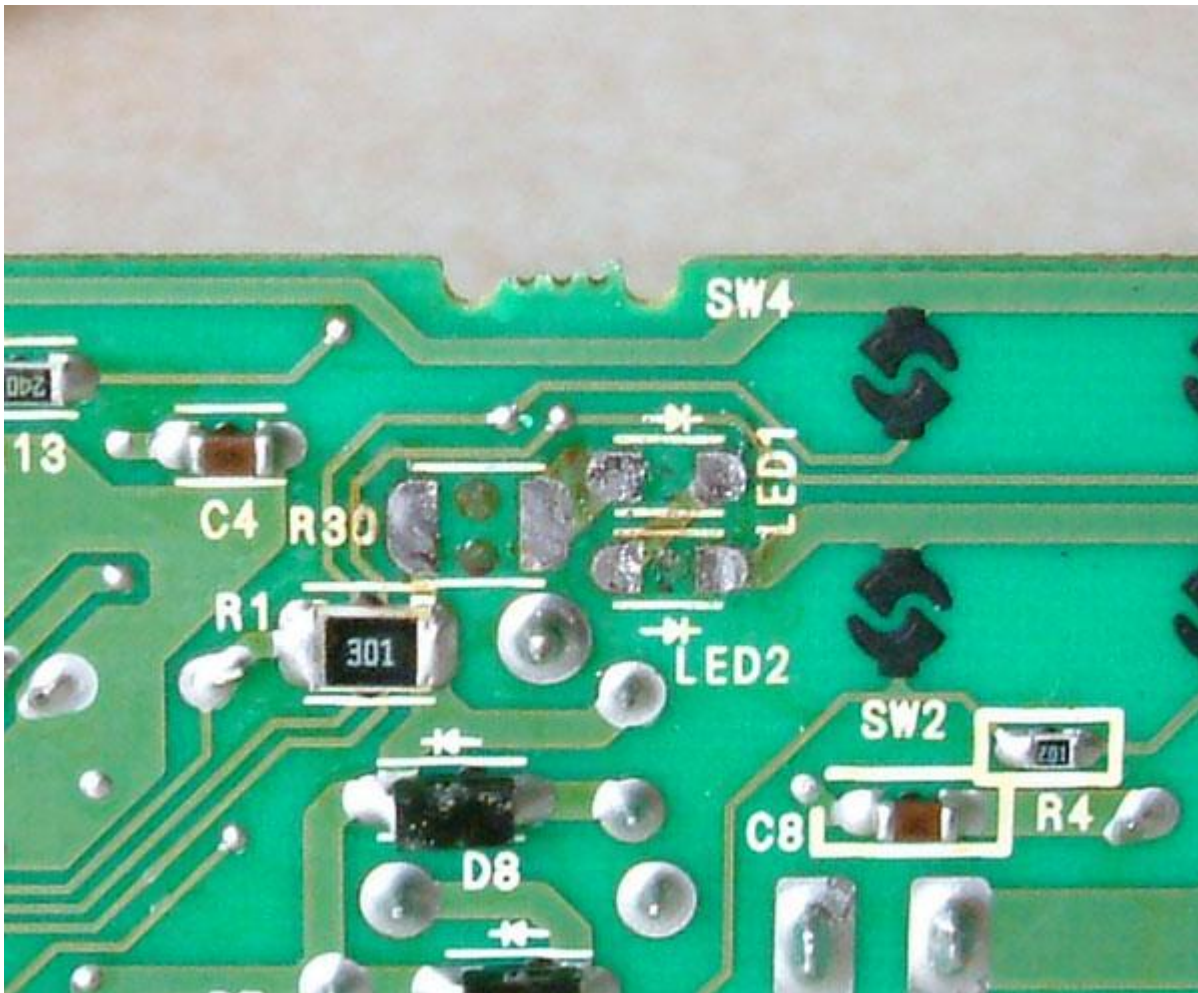
7 REMOVE THE LED'S AND RESISTOR BY USING A SOLDERING IRON AND SOME DE-SOLDER BRAID OR A SOLDER SUCKER TO REMOVE TO SOLDER. IF YOU HAVEN'T GOT EITHER OF THESE YOU CAN ALWAYS HEAT UP BOTH SIDES OF THE COMPONENT BY PRESSING THE SOLDERING IRON ALTERNATELY ON EACH END, BUT BE WARNED, YOU WILL HAVE TO BE QUICK! I USED DE-SOLDER BRAID TO DO MINE.



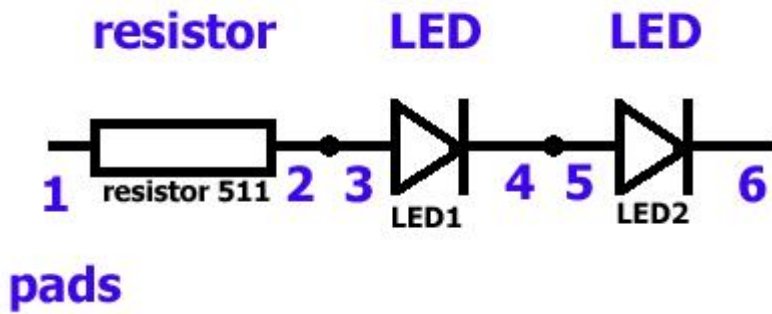
8 USE THE SOLDER BRAID TO CLEAN THE SURFACES WHERE THE LED'S AND RESISTOR SAT.

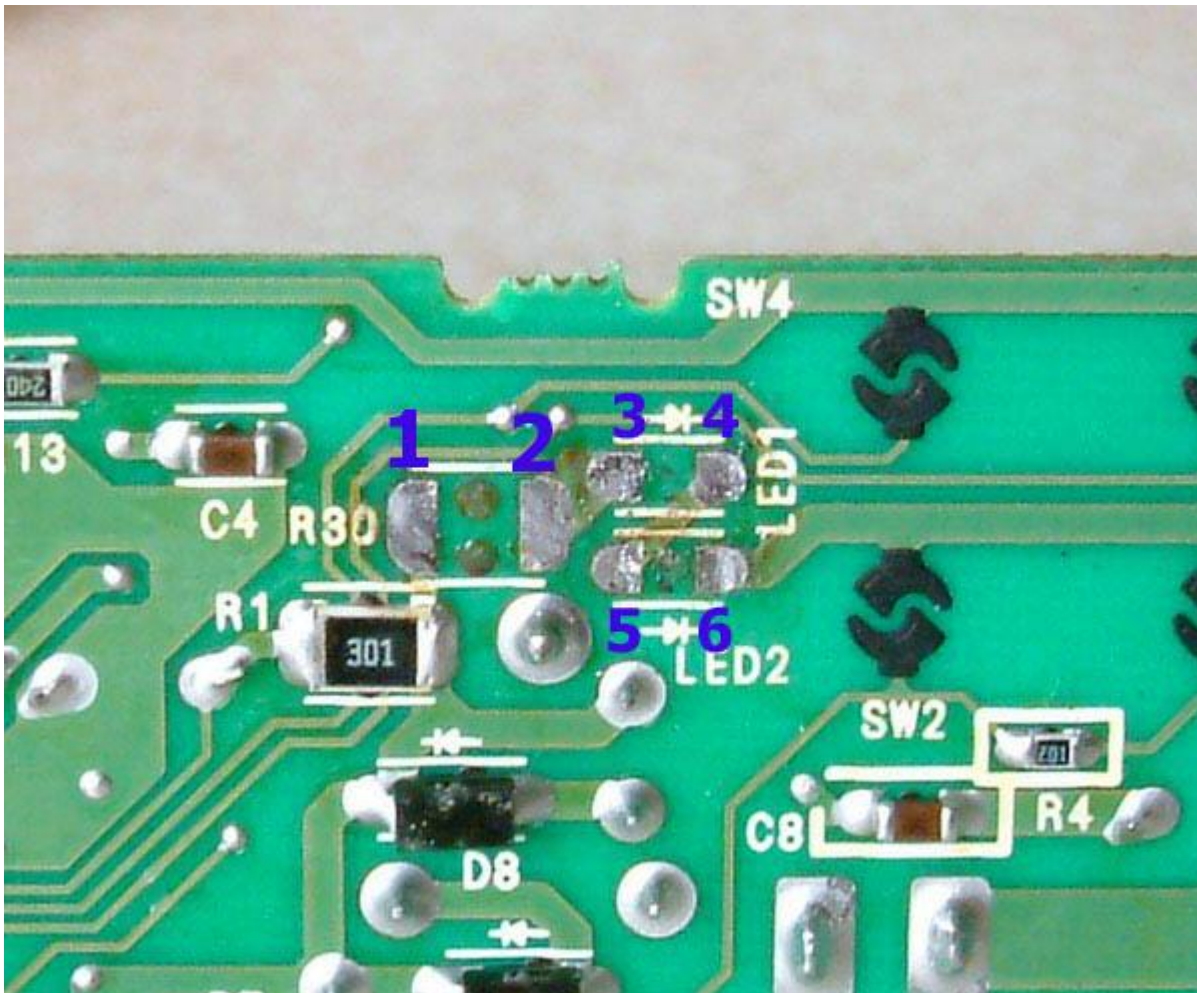


9 ONCE CLEAN THE BOARD SHOULD LOOK LIKE THIS



9A REMEMBER THE SIMPLE CIRCUIT DIAGRAM? THESE PADS ARE WHERE THE LED'S AND RESISTORS SIT.





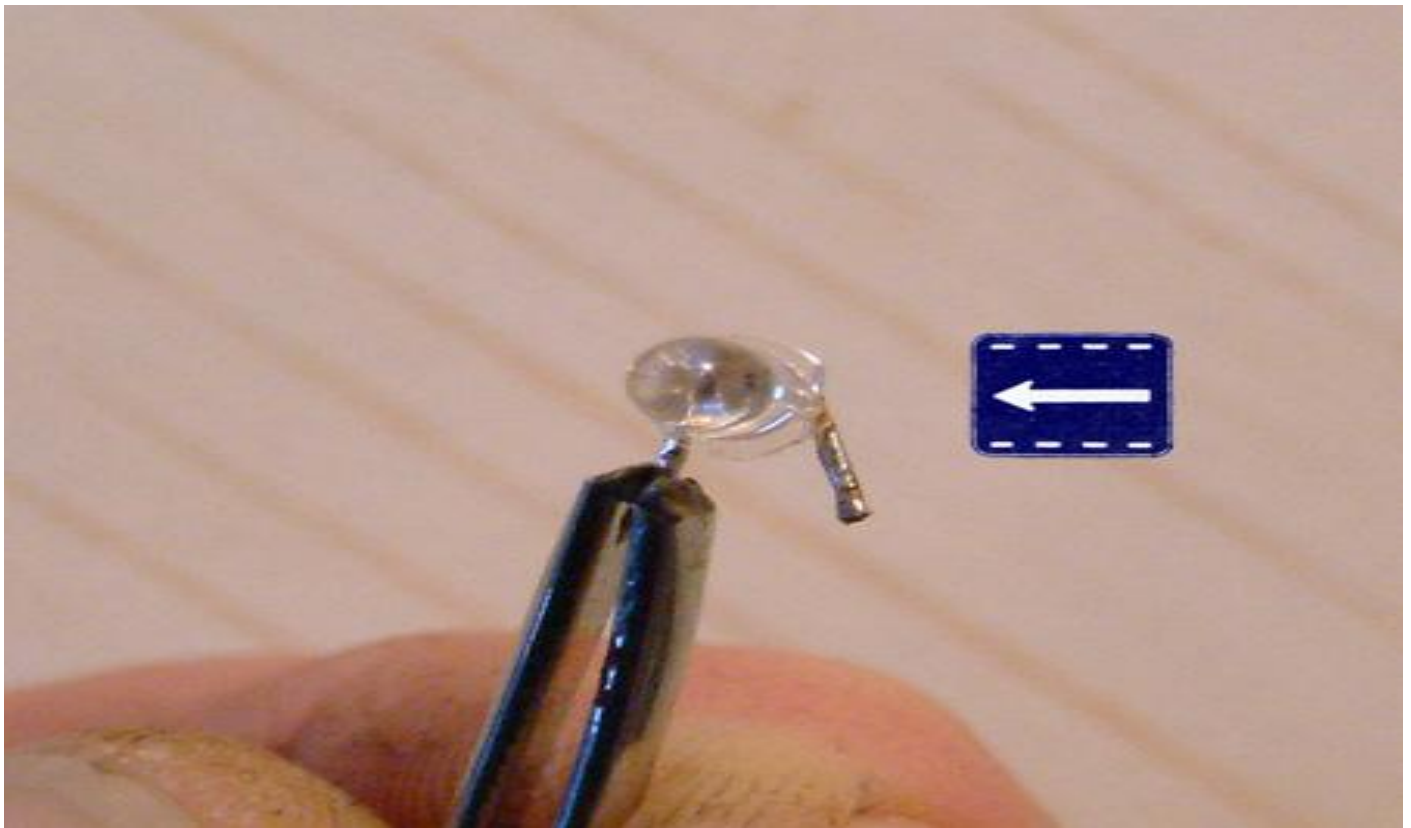
PAD 1 POSITIVE + VOLTAGE IS APPLIED HERE
 PAD 1 AND 2 OLD RESISTOR COVERED THESE PADS
 PAD 3 AND 4 OLD LED 1 COVERED THESE
 PAD 5 AND 6 OLD LED 2 COVERED THESE
 PAD 6 NEGATIVE - VOLTAGE IS APPLIED HERE

I HAVE USED A SURFACE MOUNT RESISTOR (ALL I HAD) SO I NEED TO UTILISE ALL OF THE PADS
 AS MY LED OR RESISTOR WON'T STRETCH ARCOSS PADS LIKE THE SPARE WIRE ON A NEW
 ROUND RESISTOR CAN, SO I LINKED;
 PAD 1 AND 2 WITH A SHORT PIECE OF WIRE
 PAD 3 AND 5 WITH MY SURFACE MOUNT RESISTOR
 PAD 4 AND 6 WITH THE LED

IF YOU USE A NORMAL ROUND RESISTOR, LINK;
 PAD 1 AND 5 WITH THE RESISTOR
 PAD 4 AND 6 WITH THE LED

IF YOU USE A 12V LED, LINK;
 PAD 1 AND 5 WITH WIRE
 PAD 4 AND 6 WITH THE LED.

10 YOU WILL HAVE NOTICED THAT IN EACH OPTION THE LED IS SITUATED IN THE SAME SPOT. IT
 NEEDS TO HAVE THE LEG WITH THE FLAT SIDE (NEGATIVE LEG) POSITIONED ON PAD 6.



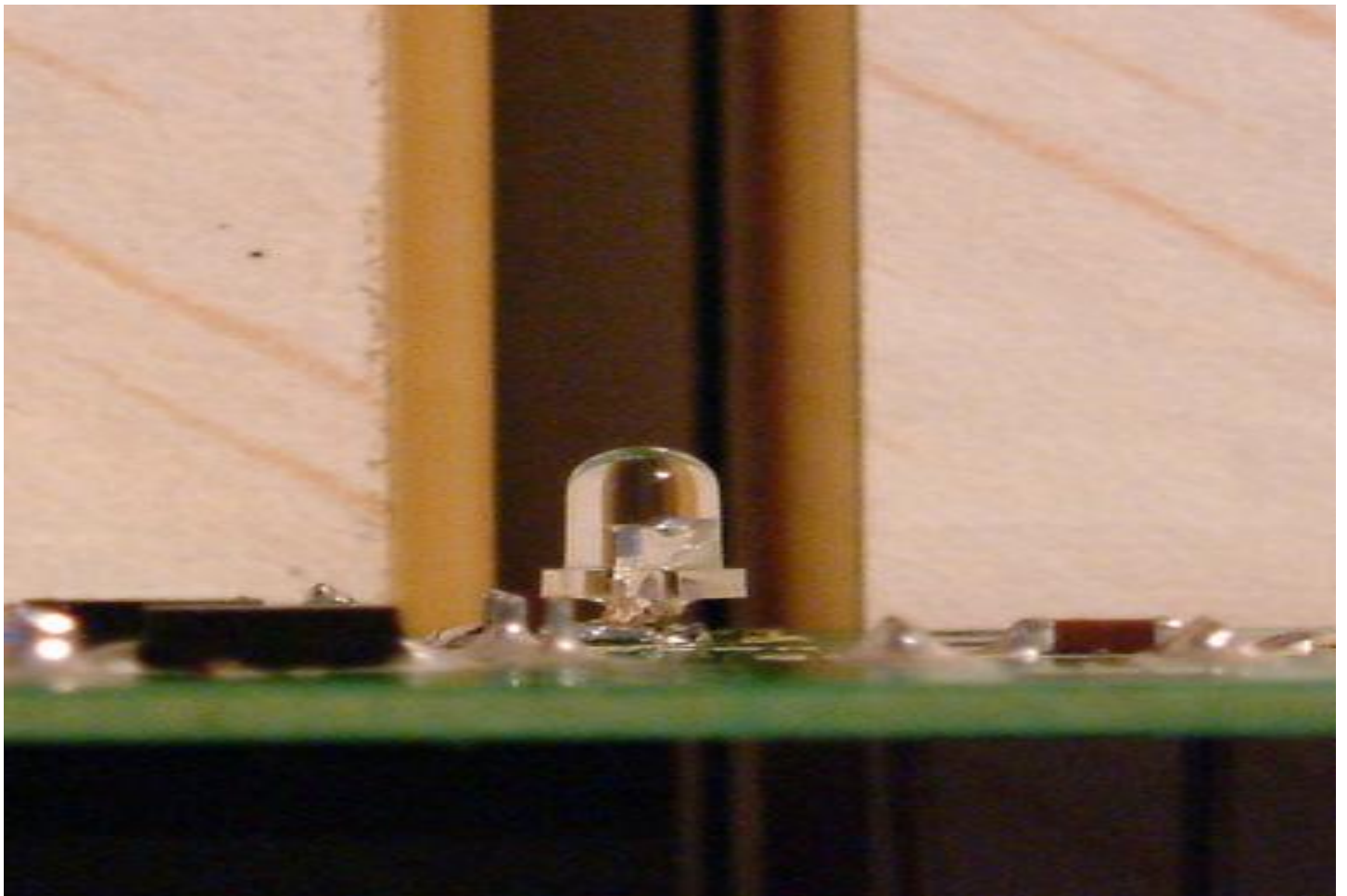
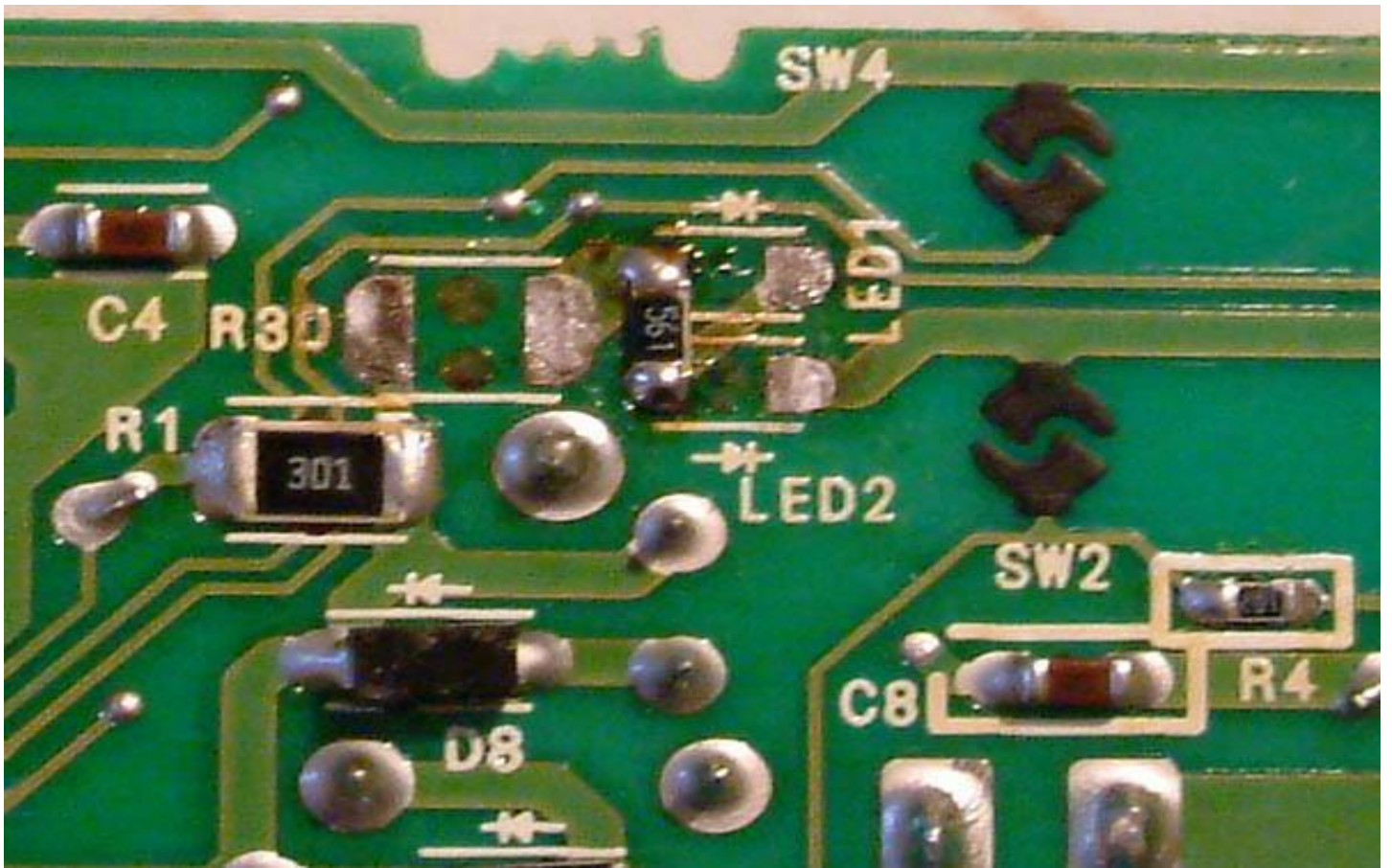
IT ALSO NEEDS TO BE HERE AS THIS IS THE OPTIMUM SPOT FOR IT TO SHINE UP TO THE TOP OF THE SWITCH.

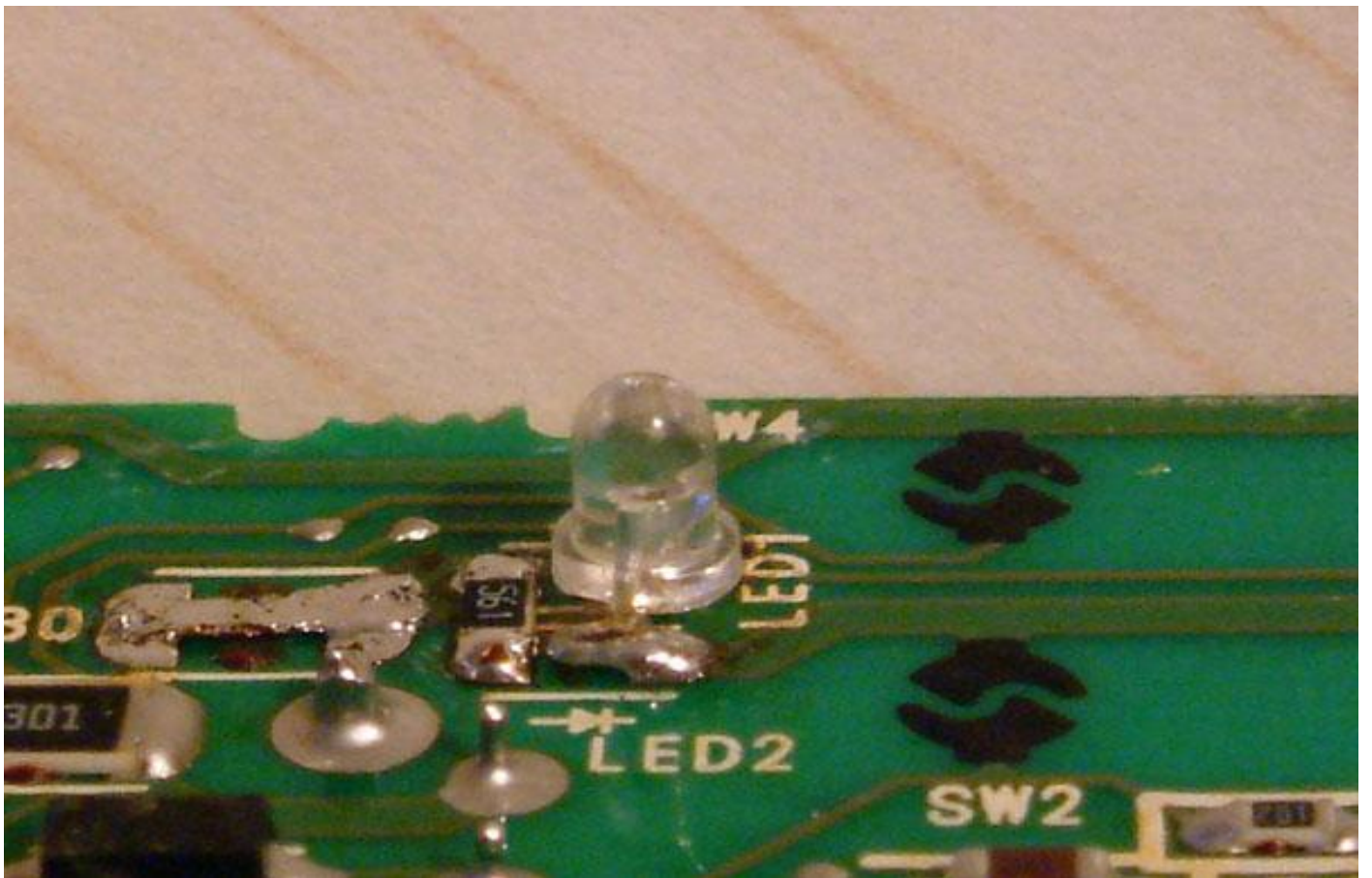
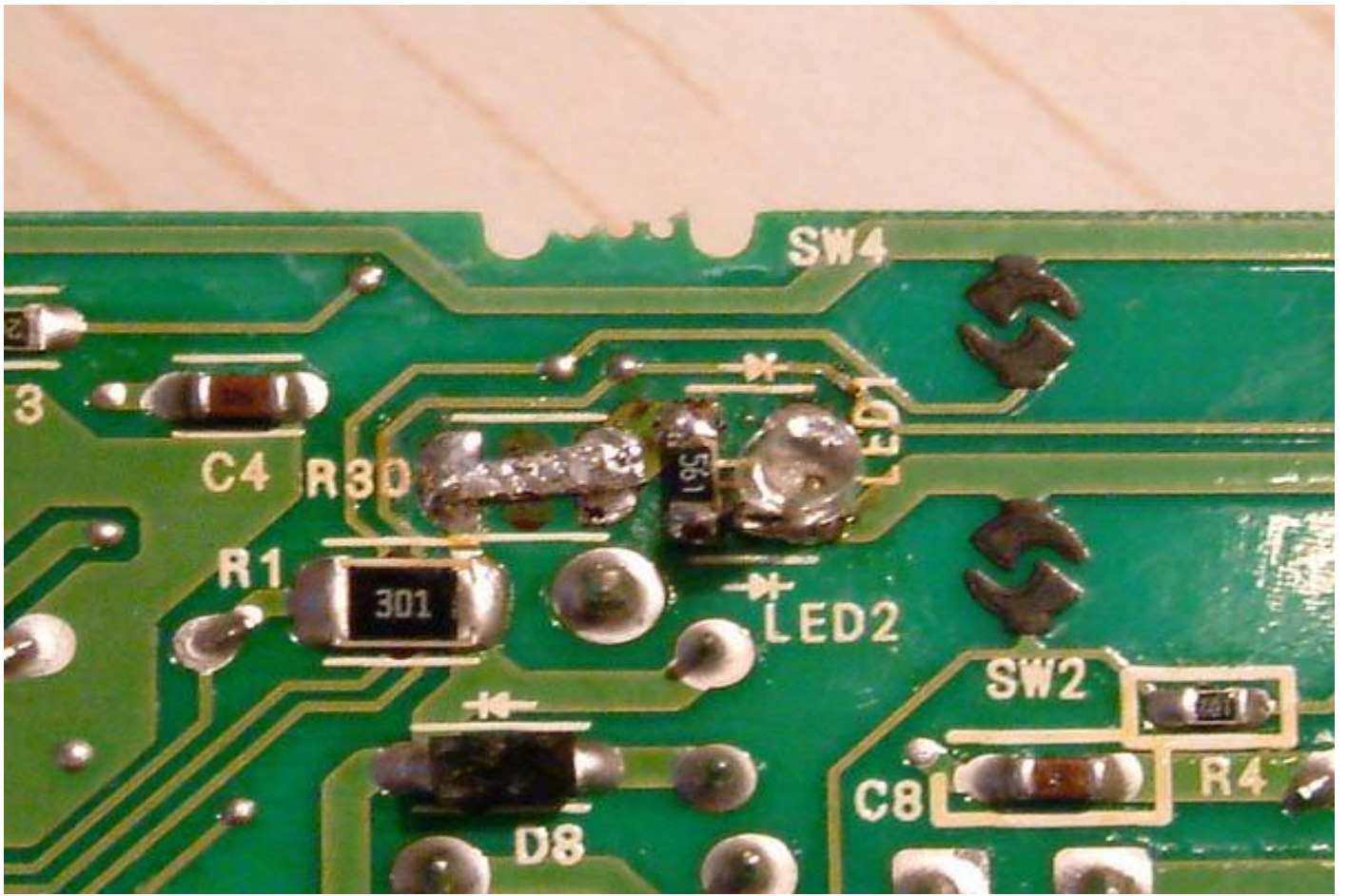
I USED WHAT I HAD, A BRAND NEW LED HAS AROUND 20MM OF LEG METAL, THE TOP OF THE LED CAN BE NO MORE THAN 15MM ABOVE THE TOP OF THE BOARD OR IT MAY INTERFERE WITH THE SWITCH OPERATION.

I HAD TO MOUNT MY LED CLOSE AS THE LEGS HAD ALREADY BEEN CUT DOWN. A SMALL DISTANCE BETWEEN THE BOARD AND LED MAKES SOLDERING IT A LOT EASIER, JUST REMEMBER THAT THE LED TOP MUST NOT BE MORE THAN 15MM ABOVE THE BOARD

11 IF REQUIRED, SOLDER THE RESISTOR IN PLACE, AND IF REQUIRED, SOLDER A SMALL PIECE OF WIRE ACROSS FROM PAD 1 TO PAD 2. I USED A 560 OHM RESISTOR AS IT IS WHAT I HAD AND KEEPS POWER AND VOLTAGE LOWER THAN THE TOLERANCE LIMITS.

SOLDER ONE LEG OF THE LED IN PLACE (EITHER WILL DO AS LONG AS THE FLAT SIDE OF LED IS ON PAD 6!) AND CHECK THAT THE LED IS POINTING STRAIGHT UP FROM ALL SIDES. IT IS MUCH EASIER TO ALIGN IT WITH JUST ONE LEG SOLDERED. WHEN SATISFIED SOLDER SECOND LEG ONTO BOARD.

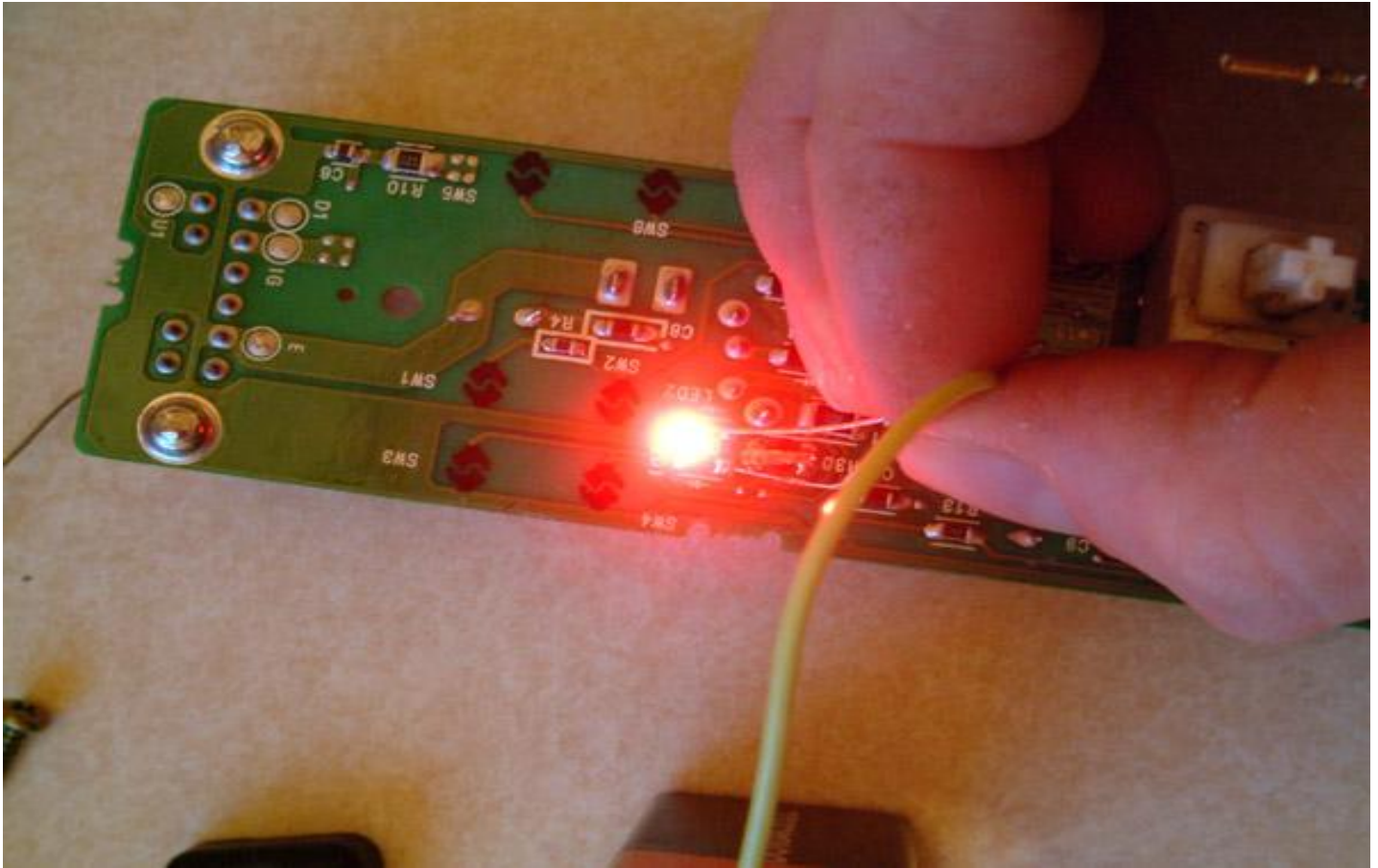




12 TRY THE RUBBER ON, THE LED SHOULD BE CLOSE TO THE EDGE OF THE RUBBER, AROUND THE PART WHERE THE RUBBER BULGES IN TOWARDS THE RUBBER SWITCH CONTACT BLOBS

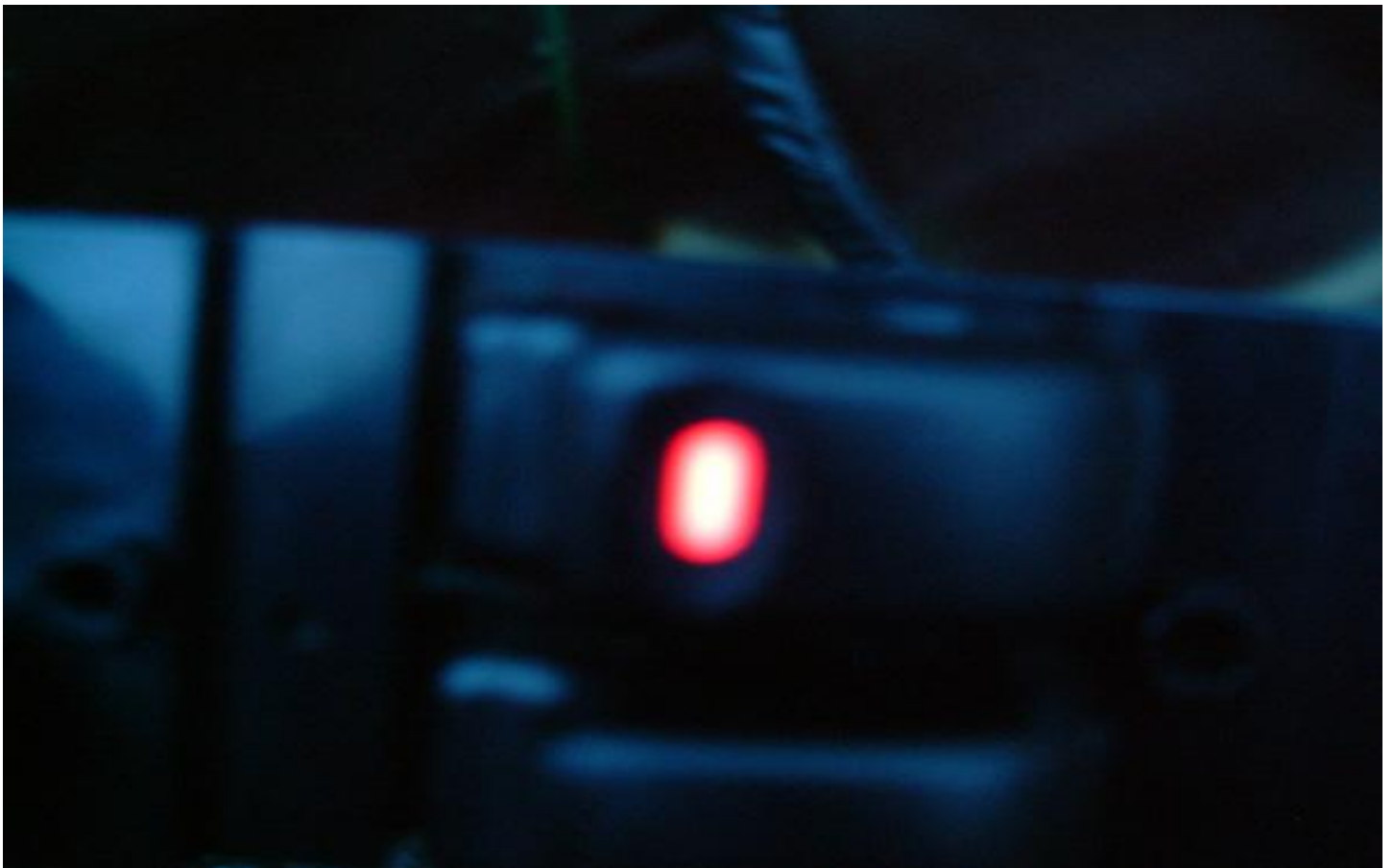


13 PRE-RE-FIT TESTING OR CLIP IT TO THE CAR, AS BELOW!
TO TEST YOU WILL REQUIRE A 9V BATTERY, BATTERY CLIP/CONNECTOR WITH RED/BLACK WIRES AND A RESISTOR OF EQUAL VALUE TO THE ONE USED ON THE NEW LED
STRIP THE RED WIRE AND WRAP AROUND 1 LEG OF THE SPARE RESISTOR. STRIP THE BLACK AND TWIST THE BLACK STRANDS TOGETHER. PUT THE RESISTOR NON WRAPPED LEG (SO THE VOLTAGE GOES THROUGH THE RESISTOR) ONTO PAD 1 AND THE BLACK WIRE ONTO PAD 6 AND YOU SHOULD GET THIS (BUT IN YOUR COLOUR!) IF IT DOES NOT WORK, CHECK YOU HAVE SOLDERED THE FLAT SIDE LED LEG TO PAD 6 AND SEE THAT ALL OTHER SOLDERED CONNECTIONS ARE OK.



RE-BUILD THE UNIT BY REVERSING STEPS 6-5-4.

14 CLIP THE UNIT ONTO THE SWITCH HARNESS AND TURN THE IGNITION ON. THE SWITCH SHOULD LIGHT UP IN YOUR DESIRED COLOUR. IF IT DOES NOT UNCLIP IT AND UNDO IT, CHECK ALL SOLDERED CONNECTONS AND MAKE SURE LED IS SOLDERED TO CORRECT PADS (FLAT SIDE LEG TO PAD 6!)



IF ALL IS WELL, REVERSE STEPS 3-2-1 TO RE-FIT DOOR PANEL.