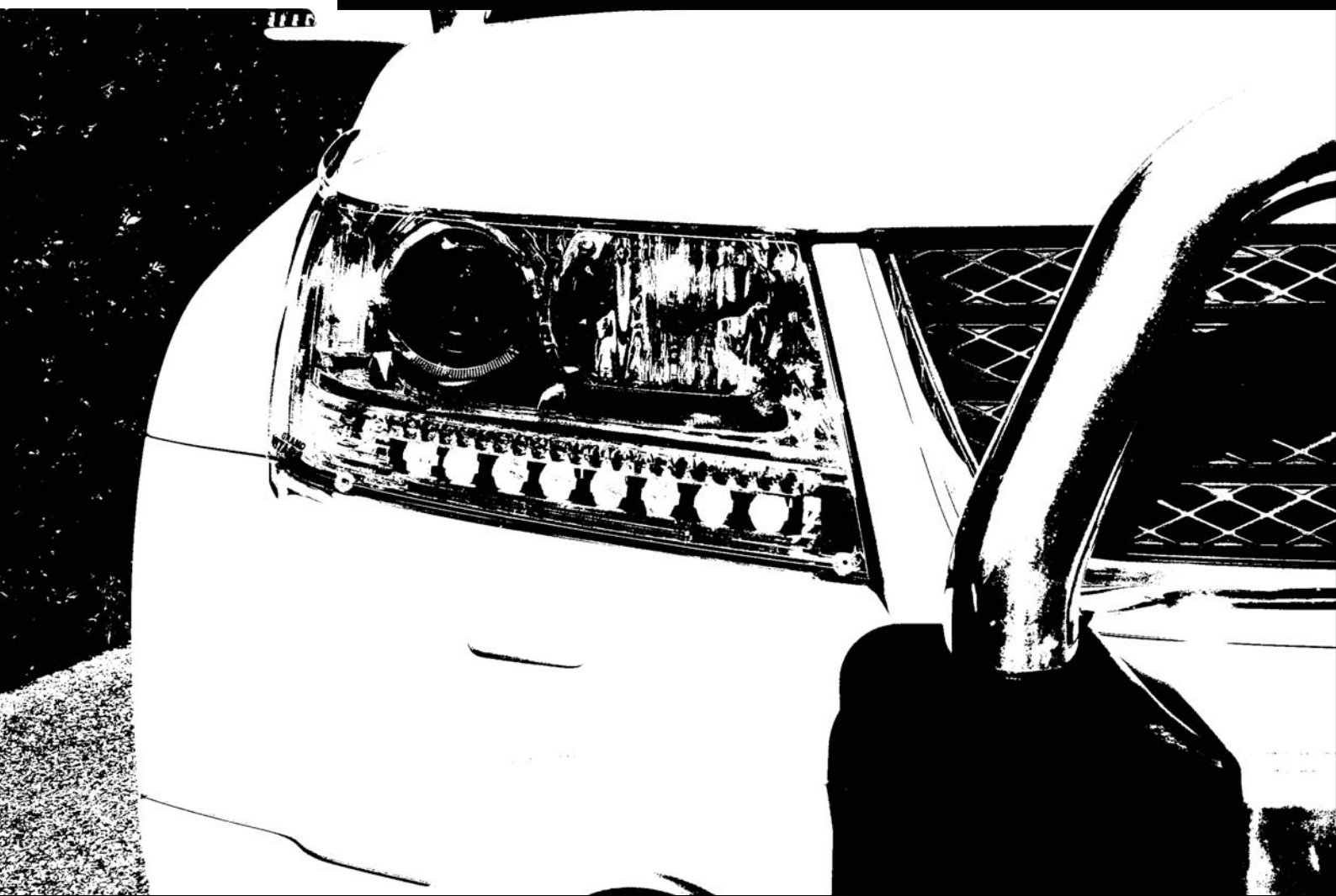




GRAND VITARA

DRL DIY Guide V.1.0



Introduction

I should start by stating that this is only intended as a rough guide for others who want to build similar DRL and LED indicator lights for their Grand Vitara to what I've done. There will be plenty of different ways to do things so don't feel you have to stick to the parts of the plan if you want to achieve similar results. Hopefully this will help you avoid some of the pitfalls and at least point you in the right direction in terms of buying parts etc that I know will work.

Disclaimer

In most countries, modifying your lights or vehicle is subject to stringent regulations or outlawed entirely. This type of modification may also affect or void your vehicle warranty. Before embarking on any modification ensure that you are aware of the risks, legality and impacts that this may have. This material is in no way endorsed by myself or any company or manufacturer.

Be aware that the CREE XML lamps are capable of extreme brightness (blinding even in full daylight) and heat. A significant fire risk could result if used incorrectly. Always ensure you know the risks and do not build lights that will be a danger or menace to other road users.

Required Knowledge/Skill

I often get asked; How difficult was it to build? It's a hard one to answer - basically you will want to have a rudimentary understanding of how electric circuits and components work, and how to read/understand circuit diagrams. You will also need to be able to solder, assemble connectors etc and have the tools or equipment to work with basic electronics.

There is nothing significantly complex about doing something like this, but you should feel comfortable at disassembling components or parts and have general tool skills. Basically if you don't feel at ease with any of the material written in this guide, then perhaps give it a miss.

Where can I find/buy parts?

There will be lots of options depending on where you're located, but for most things eBay will have virtually everything you'll ever need. Most electrical parts can be found at hobby stores or electrical component outlets. The rest you can just order through the web. Here are some vendors I've used:

LED Lights:

I bought most of my lights through an eBay vendor called "led-dna". They are a Chinese based outfit and carry not only the XML lamps in a variety of versions but also the PCB strips and the collimator lenses.

The latest build I used XML T6 lights on a 16mm aluminium base. The XML has been through a series of evolutionary steps (now XM-L2); don't be fooled into buying the latest and greatest because of the lumen output unless you want to build something that looks like a thermonuclear explosion at the front of the car. Even the early XML lamps were too bright in direct sunlight to run at full power. Save your money and buy wisely - all XML lights will do the job.

For the surface mount LEDs that I used in the indicators I found that the best results are achieved with a 3Watt emitter. My first indicators used a 10mm amber bullet style LED (i.e. like those used in traffic lights). The issue is that they have a very narrow field of view - meaning that anyone to the side or high/low position to the car will not see the full brightness of the lights which can be an issue during the day or when the lights are bathed in direct sunlight. The SMD type lights have 120° viewing angles which works very well.

Power Supply:

To give good consistent performance and luminous output you will need to have a power supply like the one suggested in the parts list. Do not wire your lights directly into your vehicle power supply - they won't last long if you do. The model I purchased was QS-1212CCBA-80W which gives stable configurable power in both amperage and/or voltage (8-30V input and 2-16V 6A output).

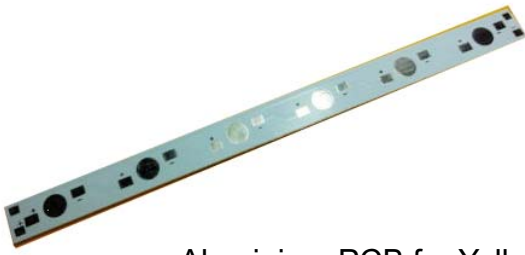
Relays & Diodes:

In my design I wanted the DRL to dimm whilst the indicator was blinking. The PWM which gives you the dimming can be bypassed by using an SPDT relay (meaning Single Pole Dual Throw). To keep the relay engaged whilst the indicator is turning on-off, you can factor in a delay by adding the capacitors which keeps the relay coil energised during the "OFF" state of the indicator flashing sequence. The size of the capacitor needed depends on the relays that you buy. Try to stick with the smallest 12V relay (i.e. below 10A) to avoid having to upsize the capacitor. I used a 5A relay and a 2200µF cap - which had enough power to hold the relay closed for about 1-2 seconds.

A quick but important note: Relays are all notorious for sending large voltage spikes back into your cars electrical system as the electromagnetic field on the coil collapses (i.e. turns off). It is crucial to ensure that you have diodes on all trigger (signal) wires leading into the relays to avoid damaging spikes into the car's electrical supply.

There's a huge variety of options - if you get something other than I suggested just make sure you test and re-test.

Required Parts:



Aluminium PCB for Yellow LEDs
(e.g. 15cm) - QTY: 6



3W Yellow SMD LED
QTY: 30



CREE XML
(Cool White)
QTY: 16



LED PWM Dimmer
(e.g. 12V 8A - QTY: 1)



TO-220 Heat Sink
QTY: 16



1N5404 Diode
QTY: 4



16V Capacitor
(e.g. 2200 μ F)
QTY: 2



12V DC-DC Converter
(Constant Current, Constant Voltage)
QTY: 1



Collimator Lens
(45° for CREE XML)
QTY: 16



SPST relay
(e.g. 12V 30A)
QTY: 1



SPDT relay
(e.g. 12V 5A)
QTY: 2

Other Bits & Pieces:

- 1m piece of Aluminium Strip (50mm wide, 2- 3mm thick)
- 1m aluminium angle bar (40mm x 12mm x 1.6)
- 10mm thick Acrylic Sheet (one A4 size piece)
- Double-sided thermal adhesive tape.
You can get TO-220 pads which makes thing quicker and easier.
- Automotive Electrical Wire
- Electrical Connectors (e.g. Crimp On type, water proof or resistant joiner plugs)
- Tube of clear silicone adhesive
- Electrical tape or heatshrink tubing

Tools Required (minimum)

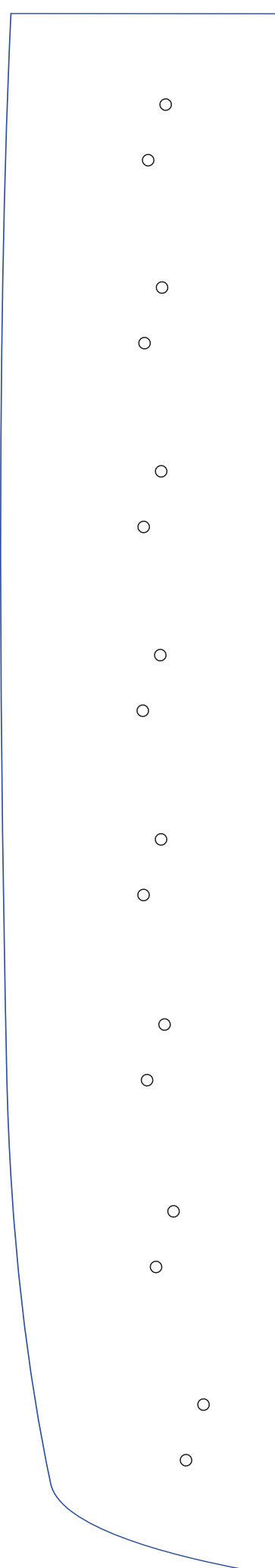
- Saw (e.g. Jig saw, band saw etc.)
- Drill and various drill bits
- A rotating multi-tool (e.g. Dremel)
- Soldering Iron / Solder
- Oven or heat gun
- Electrical multimeter

Although you can do without, other items that will make things easier and safer:

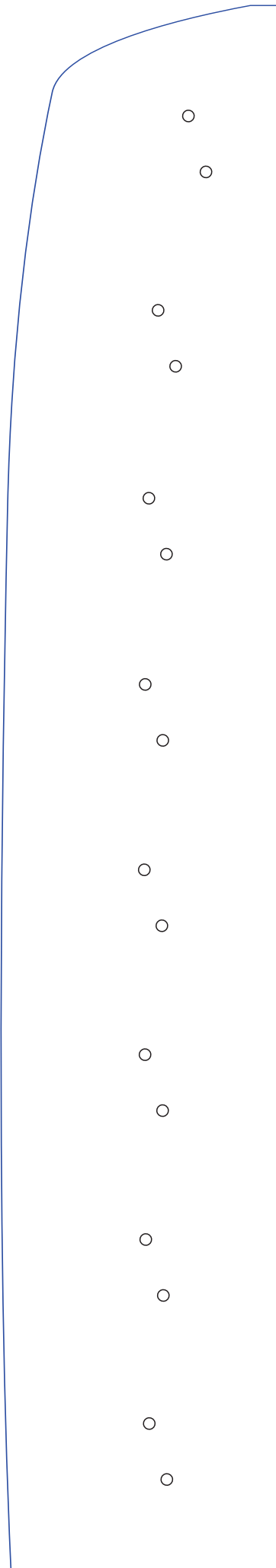
- Benchtop power supply (for testing)
- Spreading pliers (e.g. cast spreader)

Base Templates:

L



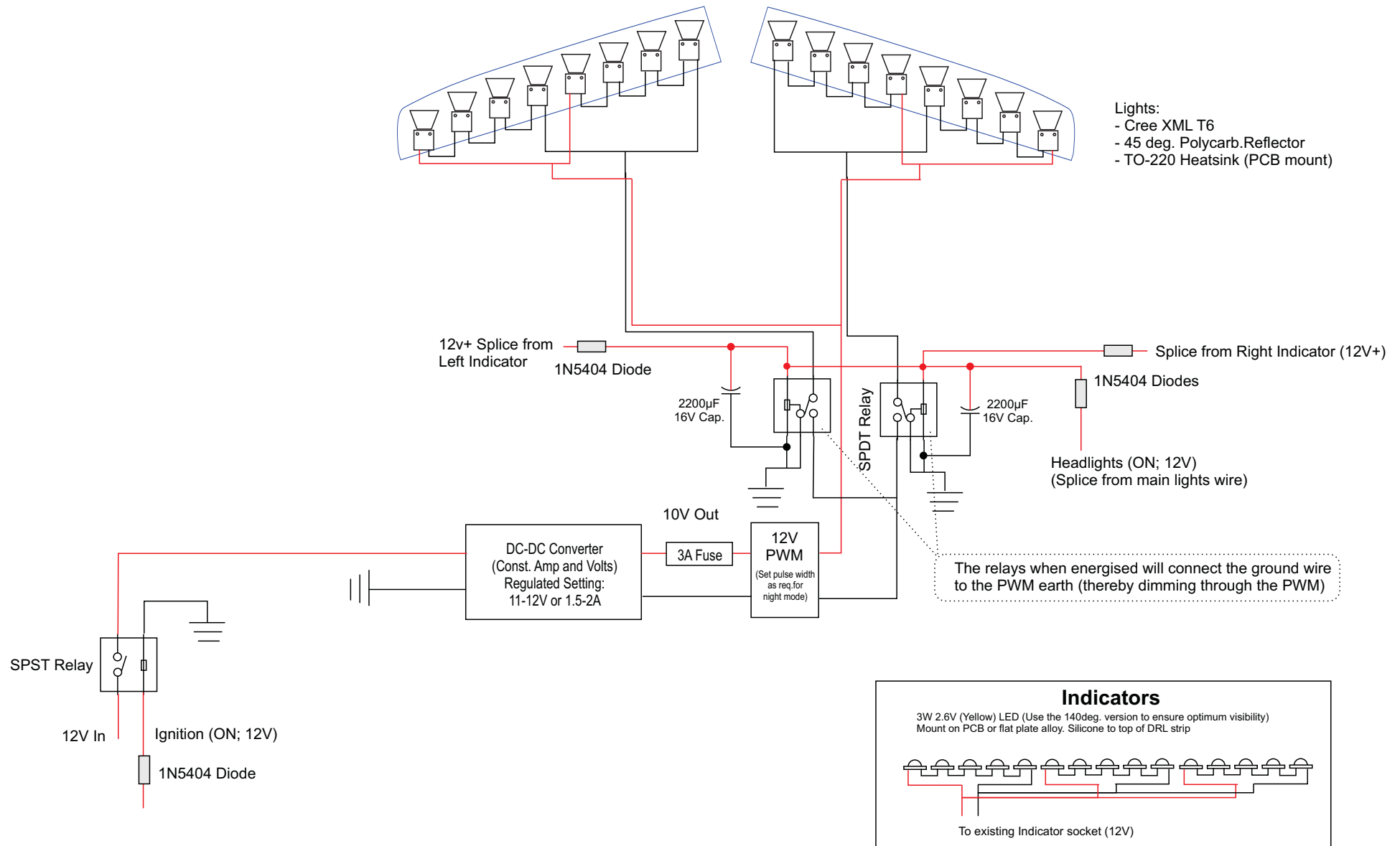
R



NOTE:

Cut the 40x12 angle bar to same length as these pieces. They will form the backing plates to mount the indicators against..

DRL Circuit



Step-by-Step:

1



- Print out the template sheet onto a piece of A4 adhesive label and stick them onto the alloy base strip.
- Cut out the strips and pre-drill the marked holes for the heat sinks.
- Insert the heat sinks into the base alloy

Tip: Try to make the holes snug for the pins on the heat sink, but If the holes end up too large, just use some silicon to make sure the heat sinks bond nicely to the base.

2



- Pop the lenses out of the collimator housings and clip the white outer shell to the XML lamps. You can use a tiny amount of silicone or super glue if you have trouble getting the shell to stay clipped to the LED base.

3

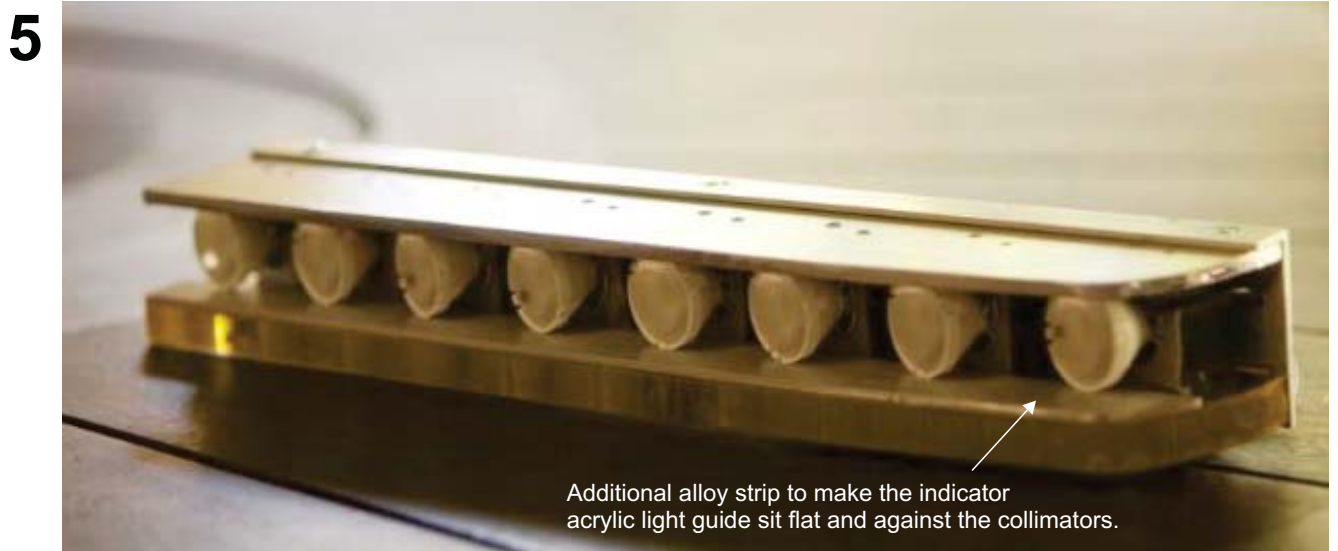


- Pre-drill the back piece and screw it to the base plate
- Solder the Yellow LEDs onto the PCBs
Note: The PCBs will have capacity for six LEDs, but use only five so you have boards that can run directly off 12V. Clip the end of the board using a pair of pliers.
- Solder the power and earth wires onto the board.

- Drill a couple of holes for the indicator strip wiring and then mount them onto the back plate using silicone or adhesive tape. Wire the two PCBs in parallel.
- Apply the thermal adhesive pads to the heat sinks



- Now it's time to solder the XML lamps. Use short joining wires to make two chains of four lights in series (i.e. the two chains will be wired in parallel but each of the four lights is in series)
- Remove the other side of the adhesive pads and then glue the assembled XML lamps (with collimator) to the heat sinks. To be sure they'll stay in place apply a drop of silicone under each of the collimators.



- To finish the light, cut a piece out of the 10mm acrylic that's the same as the base plate. It's up to you how you want to finish the edge (i.e. opaque or clear) - they can be flame polished very quickly or sanded etc., etc. The way it diffuses the light and how it looks is entirely up to you.

I wrapped mine with a 10mm wide strip of Yellow transparent vinyl (get good stuff like Avery brand if you intend doing the same so it has good UV resistance and longevity)

You'll notice a minor height discrepancy between the collimators and the top of the heat sinks. As you can see I cut another strip of 1.6mm alloy so that the acrylic can sit flat on the heat sinks and the top of the lights

- Once you're happy with fit and finish, glue the acrylic piece down onto the lights (with silicone or double sided tape)
- Done! .. make one more and you're almost there.

.. time to take the car apart :-)

6

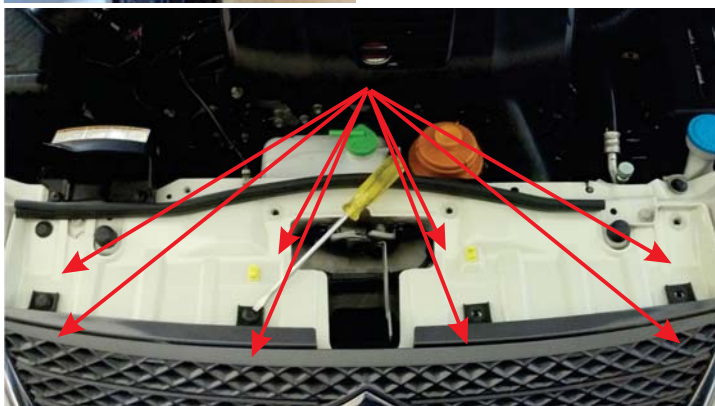


- Start at the wheel arches and undo all the black plastic clips around the front and lower leading edge. The clips are simple and undo by placing the flat blade screw driver against the centre pin of the clip and levering it up.

You will feel the front arch liner releasing from the bumper. There's also a few clips along the bottom which you will need to undo.

Note: If you have front fog lights installed, now is a good time to reach in and undo the wiring plugs so you don't pull them out when you lift the bumper away.

7



- Undo the all the clips at the top of the radiator grill.
- Pull the grill forward from the top until it snaps clear of the bumper assembly. This can feel really awkward at first but keep pulling from the top and then forward. The clips can be quite stubborn at first but will loosen up after a while.

8



- Undo the front two retaining screws in the bumper

Note: If you have a Prestige model, with the headlight washers, undo the junction clip on the pressure line before removing the bumper.



- Unclip the sides of the bumper by pulling from the edge of the wheel arch.
- Lift the bumper away from the car at the top and lower it to the ground on a soft surface so you don't scratch it.

Note: There are some lower retaining clips as well but you won't need to totally remove the assembly to get the headlights out.

9



- There are three bolts to undo in order to remove the headlight
- The light pulls free towards the front. Note, there's a friction clip (ball/socket) towards the lower centre of the light. The upper/outer mount also clips into the car. Both are visible and easily managed.
- Unclip all of your wiring connections from the headlight and then take it to a bench where you can work on it.

10



- Remove all of the electrical components on the headlight.

Note: the HID version has the ballast underneath. It is held in by three screws and then pulls free.

- Unclip the wiring harness and then feed it back in through the headlight. It needs to be removed from the back of the housing.

11



- Remove the bulb and the HID connection harness if you have HID lights.
- Take out the indicators and the position/parking lamps
- Remove any of the plastic/foam plugs as well as rubber gaskets.
- Unscrew the two phillips head screws at the corner of the headlight housing.
- Turn on your oven and pre-heat to 100°Deg.C (by the way.. it's a real good idea to test and make sure your headlight fits in it!). If you cannot squeeze them into the oven, you can also use a heat gun but it's far more difficult to do the job. If you do use a gun, don't rush it or heat one spot - take your time (i.e. 10 minutes of consistently working the entire edge of the housing)

12



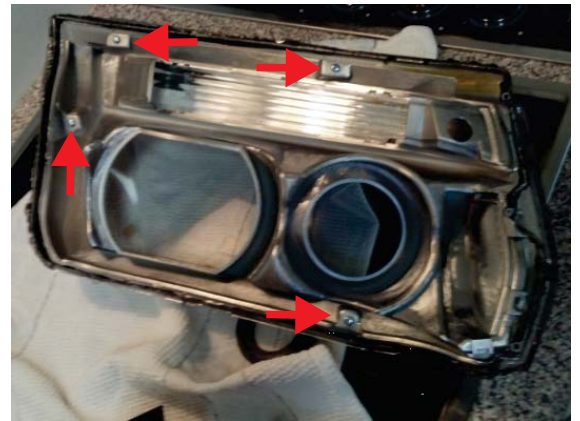
- Bake the headlight for approximately 10-15 minutes
- Take it out with some oven gloves and start to work the front of the glass away from the housing. I suggest you start at the outer top of the light and work through the upper clips.

Use a large screw driver - or.. the best tool in the world for this job is a surgical cast spreader which you can buy from eBay for around \$50

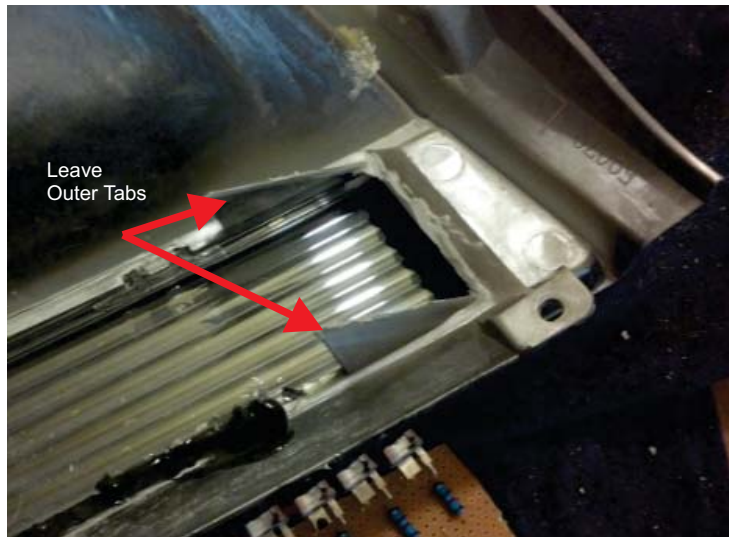
13



- Remove the screws from the indicator reflector and simply take that piece out.
- Also remove the screws holding the front fascia onto the glass and then pull the piece clear of the front assembly.



14



- Some minor surgery is required to cut away the small piece of reflector on the front fascia. This will allow the DRL to slot fully into that recess.

Tip: Leave the side (i.e. upper and lower sections as tabs) A dremel with a rotary cutter or cutting disc is perfect for this job.

- Now slot the completed light into the recess. You can glue or silicone the light into place against the tabs left over from the cutting.

15



- Whilst you have the front piece out, remove the clear plastic diffuser lens from the side and then drill a set of five holes to suit the additional five indicator LEDs

Note: Although optional, I found these particularly effective for visibility of the indicator because you get separation from the DRL and more angles of visibility. You can mount the lights on a PCB and bend it to suit, then silicone or glue into place from behind (make sure you replace the lens once finished).

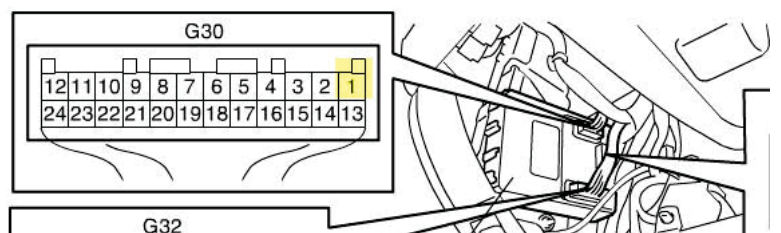
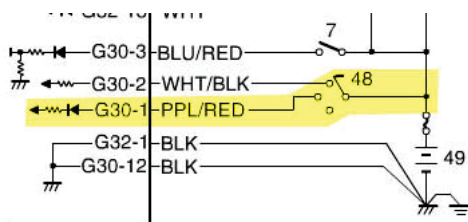
- 16**
- Drill a hole in the back of the light housing to run your main DRL wires through there. A good spot for this is near the inner edge (near the high beam).
 - Take the DRL light wires and run them to a dual pin connector on the inside, then connect the external side to a water resistant dual pin plug or socket (you can get these from eBay).
 - For the indicator wires, feed these through the indicator socket hole. Wire then into the headlight socket so you can refit that straight back onto the headlight.



Tip: If you want a plug-in type connections to the default socket, buy yourself some cheap LED WY21W type LED lamps (as seen in the pic here). Just cut the wedge part out of the light and then solder your wires into that. The wedge will then clip straight into the Suzuki indicator. You can get the blank housings (without the LED), but they are generally only sold in bulk and harder to source. A twin set of LED bulbs will only cost a few bucks out of China (i.e. eBay)



- 17**
- Before full reassembly, bench test your lights to ensure all the wiring is correct.
 - Re-assemble your light housing by performing the reverse of the above actions. You can dry-fit the housing together and then put it back in the oven for a few minutes to soften the butyl rubber. Make sure you have a nice firm seal and that the front polycarbonate lense sits fully into the housing.
 - Generally the lights have enough sealant remaining in the housing and the lens to re-seal fully, but apply butyl rubber sealant to any area that is suspect (i.e. especially the hole drilled for your LED wires)
- 18**
- Mount the lights back in the car and get ready to start your wiring. It's entirely up to you how you wire things, but here's the approach I took. Make sure you understand how things need to be wired up (i.e review wiring diagram on page 5). Double and triple check everything before applying power - you don't want to blow up your new lights now!



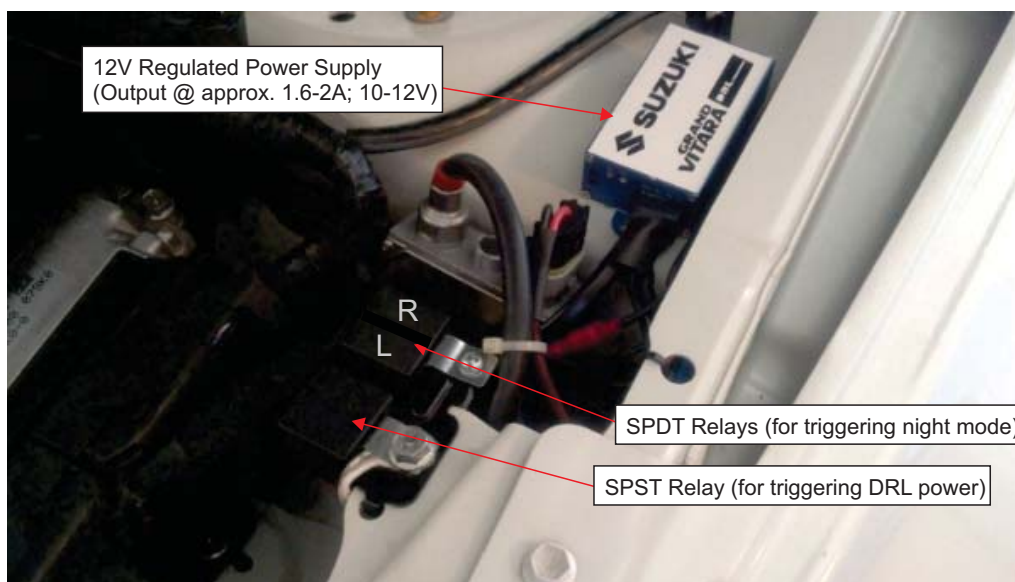
- **VERY IMPORTANT:** Whenever you take a 12V trigger (signal) wire for a relay, ensure you run a protection diode to stop high voltages (from the relay coil) coming back into your circuit ! This circuit uses three relays (one for power, left dimming, right dimming) so this needs to be observed at all three locations.

19

- Run the ignition trigger to your power relay and then wire up your DC-DC power converter.
- Take a splice off the 12V positive lines coming from the indicators and one from the low beam headlights.
- Take the SPDT relays (used to switch the lights to a dimmed state) and solder in the capacitors and your trigger (signal) pins. The capacitors act like a mini battery and keeps the relay engaged for a short time (e.g. the relay will stay on whilst the indicator trigger line blinks ON/OFF). Again, follow the wiring diagram!

The switch part of these relays controls how the earth wire from the DRL's run to ground. In the OFF state your earth should run straight to ground (i.e. your DRL will be given the full power set at the DC-DC converter). When the relays are ON, the earth for your DRL should run through the PWM. The PWM basically pulses the path to ground - thereby dimming the lights. The dimmer has a trimpot potentiometer so you can set how dimm you want your lights to be when triggered. I have mine set at about 400-500 milliamps current draw in night mode.

- Mount your relays, power supply and the PWM somewhere. Here's how I've done it. The PWM is just outside of the picture near the battery).



20

- Connect power/ground wires to the PWM and install the DC-DC power supply. It's all wiring and cabling from herein, so just take it step-by-step and ensure everything is wired correctly.
- First test: The smoke test (.. hopefully not). Take your power output wire out of the DC-DC converter. Now switch on your ignition and test that the power relay engages and starts up the DC-DC converter. If it does, then measure the output pins on the converter and set the power to approx 10V.

Re-connect the power wire going to your light circuit and re-test. You should now see some nice blinding light. if you get any flickering or instability, disconnect everything and check all your connections (especially those to ground).

- 2nd Test: Indicators - that's an easy one since you should just be splicing into the regular circuit. Make sure both sides work and that both SPDT relays engage properly with the indicators and the headlights.
- Finally, power everything up and adjust the amperage on the light circuits under day/night mode to suit your needs.

DONE

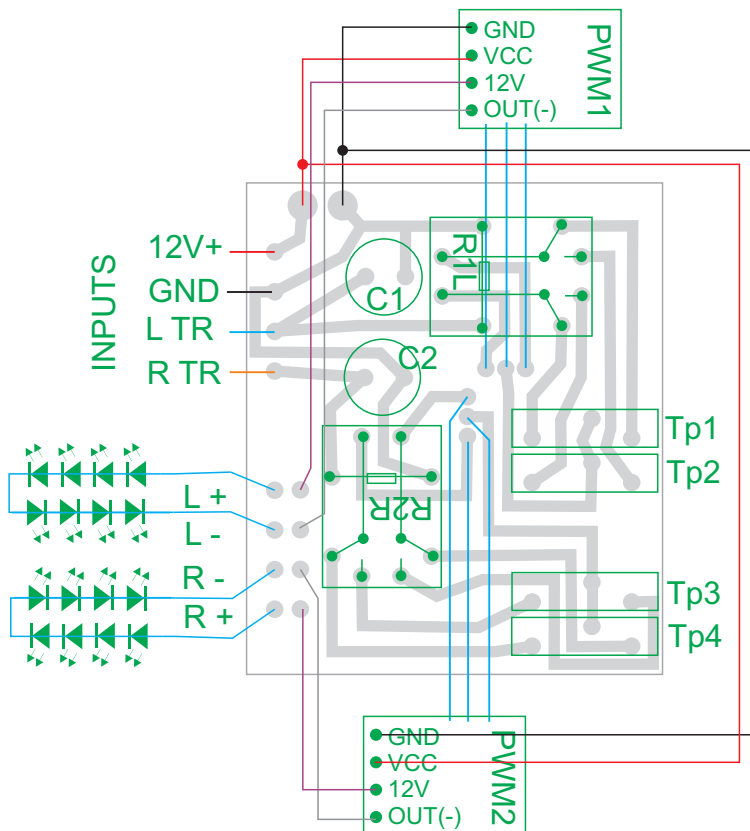
I hope the guide has provided enough information to be of sufficient help, but if you have questions or need further advice I can be contacted via the Suzuki forum <http://www.suzuki-forums.com/2g-2006-grand-vitara/> (my username is DBO). I hope to see some more DRL builds out there - make sure to post some details on the forum if you build anything similar.



APPENDIX - Advanced Circuits

After I build my latest set of lights I was keen to try and emulate a more condensed circuit design. Further to this I wanted to create a circuit which runs twin PWMs so that I could use a triple-state for the DRLs (i.e. night mode, normal mode, light bar - ultra bright mode). This involved using DPDT relays to the twin PWMs using a custom built circuit board.

The following are some details of what I undertook, but I should add that this is currently not in my car. I had issues with running dual PWMs whereby they would somewhat interfere with each other and cause the lights to pulse slightly. Unfortunately I haven't resolved the issues just yet, so if anyone reading this comes up with an idea on how to avoid the PWM circuit issue, please contact me via the forum.



- R1L & R2R - DPDT Relay
- Tp1-4 - 1K Trim Pots
- C1 & C2 - 16V 2200µF Capacitor
- TR - Trigger lines (12V)

