

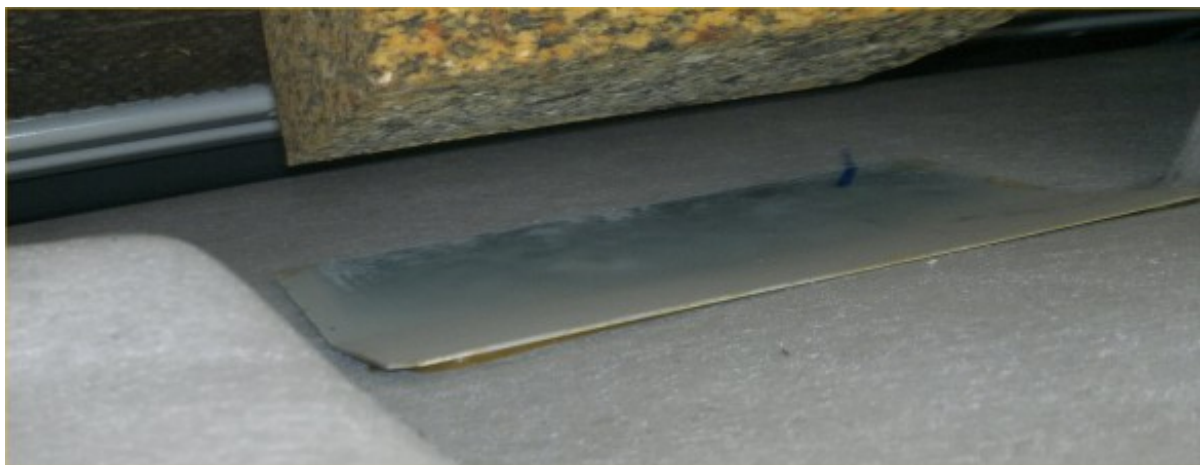
Fitment

Remove the mirror before you start any cutting.

Mark the outline with a pencil, using the template that I cut from the roof lining of the Patrol in the scrapyard. The template must be placed about a centimeter from the front edge of the roof lining. Use something like a Dremel tool (with cut wheel) or a Stanley knife to do the cutting. Cut a centimeter inside your template marking when doing the first cut - this is less stressful and allows you to see what's going on inside the lining.



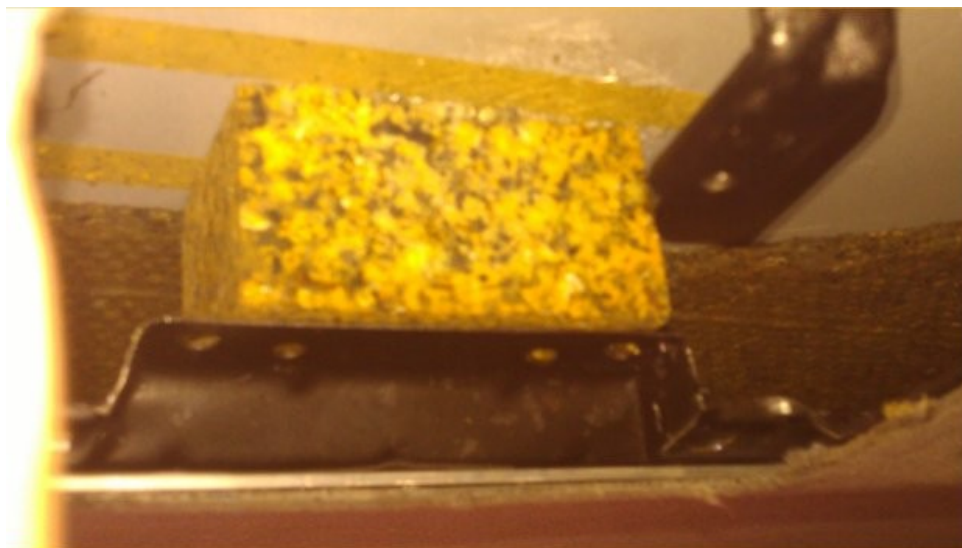
You'll notice that the back third can't be cut, due to a metal brace that's glued to the inside of the lining. Use a flat screwdriver and break it off by separating it from the lining bit by bit.



Press the roof console against the lining to test fit, then enlarge the hole gradually until the opening is about half a centimeter smaller than the console.

Fasten the front of the bracket to the two screw holes that are already drilled into the roof brace. I used flat, wide (so I don't need washers) pop rivets instead of screws to ensure that the bracket remains fixed to the roof. Make sure that the four square holes are visible from below - if they aren't, the console won't fit properly as the console's clips fit into them.

Break the dense bit of foam out from the roof and trim a piece off it in such a way that it fits tightly between the roof lining and the rear of the bracket. Using silicone on both sides, stick it between the lining and the roof so that it forms a sturdy brace above the rear of the bracket.



Test fit the console - it has four clips that should hold it very snugly in place. You should be able to put enough pressure on the rear to engage the clips because of the foam brace.

There's also a final screw inside the sunglasses compartment once you're done, but that should wait until you've completed the wiring....

Wiring

Remove the console again and start the wiring from the roof side of things (see, I told you to wait with that screw!).

I used some Cat 5 Ethernet cable to do all my wiring. It's got enough colour-coded conductors inside, and I have a big roll of the stuff. If you don't have any you can buy a 5m network cable ("fly-lead") to sort you out - just cut the ends off. It's major advantage is that you only need to run a single wire behind the roof lining and down the "A" pillar, and being computer network grade cable it is also relatively immune to interference (because of its twisted pair construction, not because it's shielded).

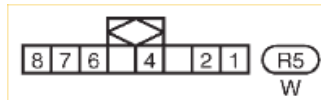
I created a little look-up table for myself so that I knew which of the wires from plugs R4 and R5 were soldered onto which of the wires in the Cat 5 cable. Just a simple table that says "Pin 8 ↔ blue/white", etc. will suffice.

Wiring from plug R4

There are thick red & black wires for the map reading lights leading from plug R4 on the right-hand side of the console (next to the damping mechanism for the sunglasses holder). A similar plug (R3) on the left is for the sun-roof mechanism. Plug R3 is not needed by us - I removed it completely and blanked the open area off from behind with a piece of plastic that I cut into shape, spray-painted black and glued into place. You can wedge it into place to some extent if you cut it to just the right size.

Wiring from plug R5

This is the larger, flat white plug that leads to the compass and thermometer display module - see graphic below:



The wiring is as follows:

Pin 8	speed sensor	Blue with orange (looked grey to me!) stripe.
Pin 7	ground	Black
Pin 6	ambient sensor (-)	Green with red stripe.
Pin 4	light switch	Blue with black stripe.
Pin 2	Accessory switch	Light green.
Pin 1	ambient sensor (+)	Blue with white stripe.

Connect the earth wire from pin 7 to the black earth wire from pin 4 (for the reading map lights). They are both ground wires and can be earthed by crimping a round lug onto them and fastening them somewhere on the bracket itself. I used one of the Cat 5 wires as my earth cable: I ran it down the A pillar and earthed it in the right front foot-well behind the kick-plate (there's an easily accessible earth screw in there). The bracket and roof area has so many layers of paint that needed removing (to ensure a good earth) that I gave up before I even started.

Solder all the wires from R5 onto your various Cat 5 wires, noting what colour wire you used for what function in your lookup table. Insulate the wires, then push the other end of the cable behind the lining so that it pops out at the front of the lining. Grab the bit that sticks out and pull it sideways along the windscreen to the A pillar, making sure that it slips behind the roof lining.

Now you may fit the console in place, remembering the screw behind the sunglasses holder.

“A” pillar

Remove the grab handle and unclip the “A” pillar trim. Run the Cat 5 cable down the A pillar, taping it onto the existing cable.



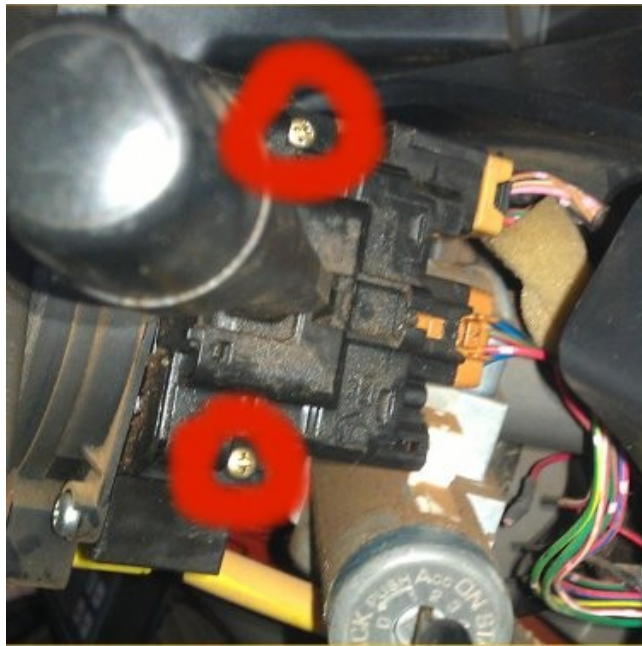
Push it down next to the useless empty plug in the corner of the windscreen and work it behind the the side of the dash so that it pops out underneath the dash (sort of next to the kick plate in the foot-well). Remove the kick-plate in the foot-well, you'll see a screw there that I used as an earth for the map lights and the temperature & compass unit.

Refit the A pillar cover and grab handle...

Speed sensor

Remove the five screws from the bottom of the steering wheel column's plastic cover. Unclip the top and wiggle it free from the instrument cowling. Remove the ignition lock's plastic surround. Unclip the bottom cover from the steering column.

Unscrew the indicator and wiper stalks from the steering wheel - two shiny copper screws on the sides (top & bottom) for each.



Pull them sideways to slide them off the column, then tuck them safely under the steering wheel. No need to unclip their wiring...

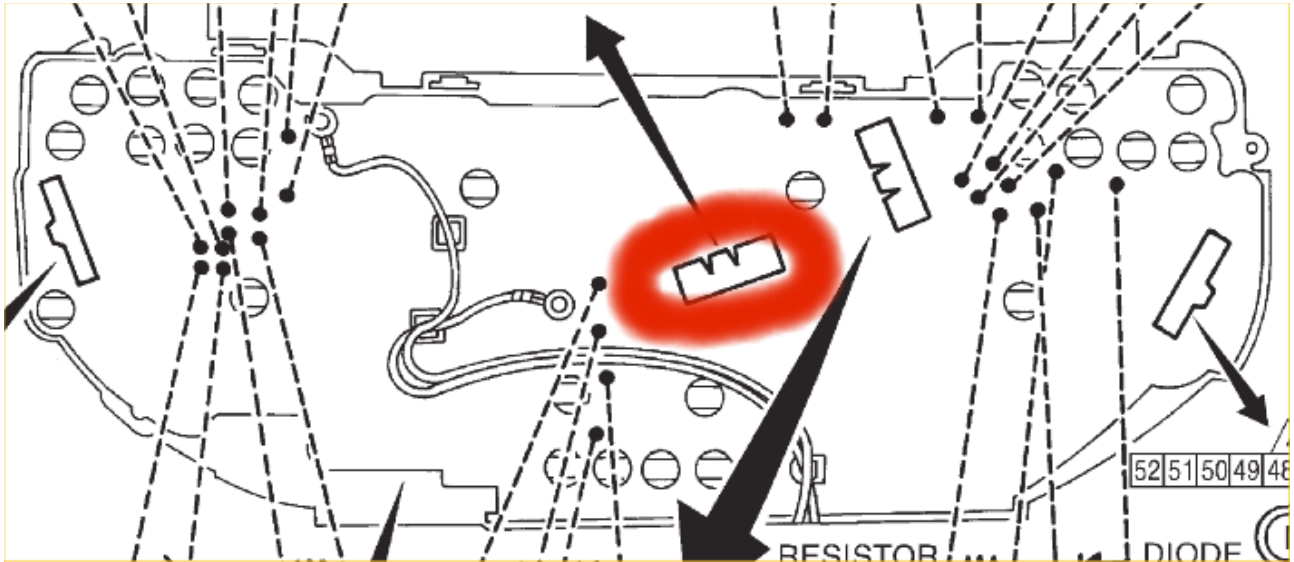


Unscrew two screws at top of instrument cowl and wiggle it out from behind the steering wheel. You'll need to have the steering wheel adjusted to its lowest point.

Unscrew the four screws that retain the instrument cluster (the manual calls it the "combination meter"). Leave it in place, but turn it face down with the top part towards you. You'll have just enough space to get to the speed sensor wire.

Push the wire that you've routed from the roof & A pillar up behind the dash and grab it. I removed the sheath from the Cat 5 at this point and ran the combined earth back down to the foot-well where I earthed it along with another wire.

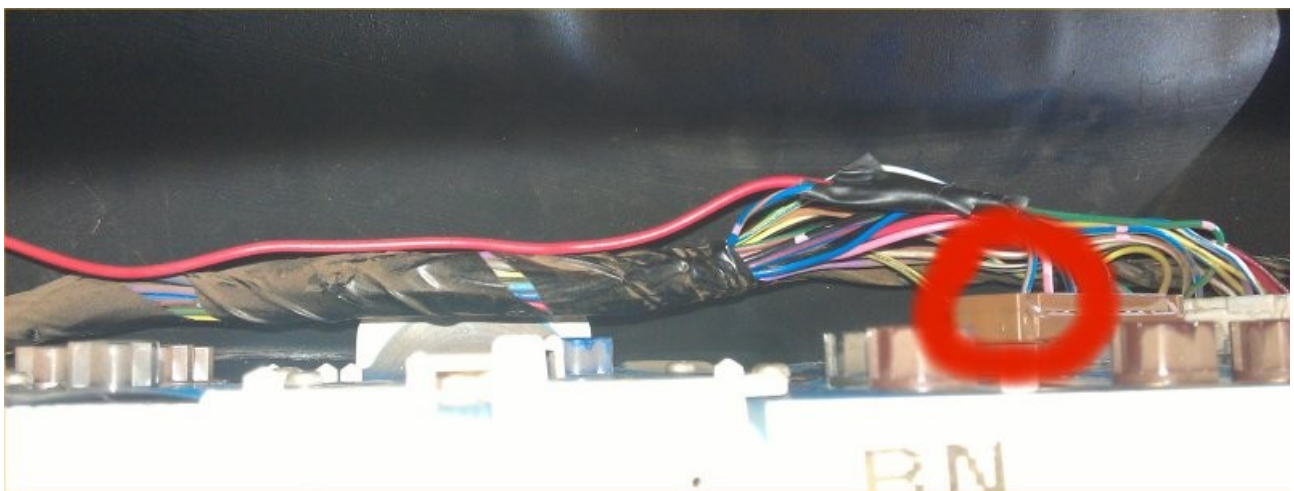
Unclip the brown plug (circled below) containing the speed sensor wire by pushing the clip on the side in and wiggling the plug out.



Don't yank too hard, or you'll pull the individual wiring clips out of the plug! The speed sensor wire is the blue one with the orange line (and occasional pink circle!) closest to you on the LH-side of the plug (when the plug is still in place – I flipped the picture for clarity).



Use a Stanley knife or something similar and scrape the insulation off, then solder your speed sensor wire coming from the roof onto the speed sensor wire in the dash (plug, wire and joint visible below). Tape it up nicely afterwards, then re-insert the plug into the cluster.



Push the remainder of the Cat 5 cables to the centre of the dash where you'll get the rest of the wiring done. Tape them together every so often so that they stay in a nice bundle.

Re-assemble the dash in reverse order: instrument cluster, cowling, stalks, bottom cover (3 screws to hold it in place, top cover, then final two screws to hold covers together, then insert the plastic ignition lock surround.

Power, accessories and lights

You'll need to remove the centre console (two screws under the radio, then unclip it from its four clips by pulling it straight towards you. Unclip the wires going to the rear window demister and the power antenna before removing the console completely. Unscrew the radio carrier - two screws at the top and two more at the bottom, then pull it gently towards you. Let it hang carefully - the wiring should be sufficient to support the weight of your radio.

Use a multimeter (or one of those cheap continuity tester thingies with a probe and a small bulb) to identify a wire in the demister plug that goes +12 V when you turn the lights on. Clear a bit of the wire's insulation using a Stanley knife, solder the wire coming from pin 4 of plug R5 onto this wire and insulate it again afterwards.

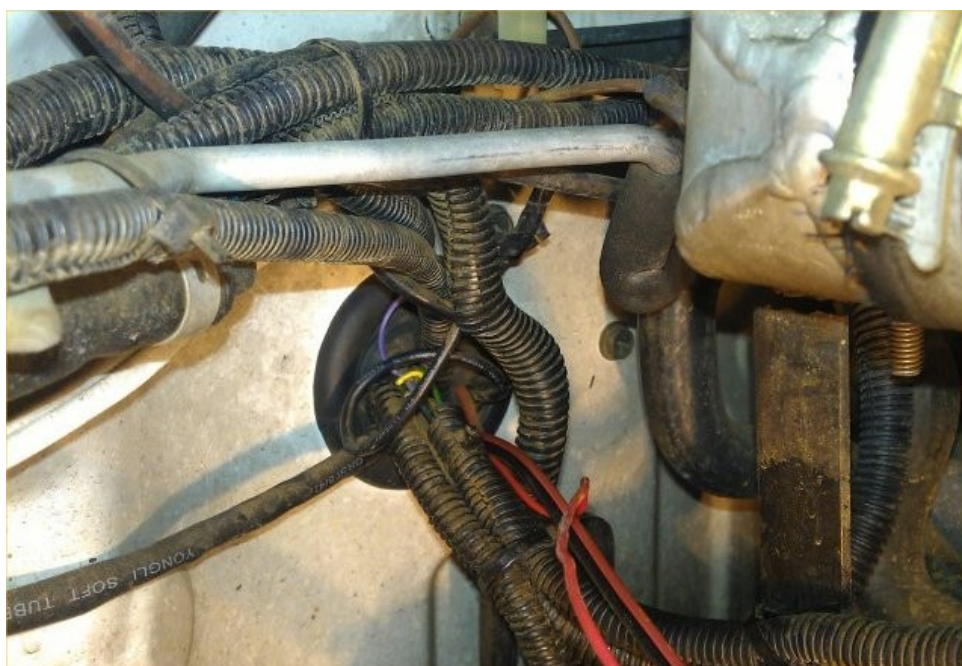
Scrounge around the rear of the radio and find a wire that goes +12 V when you turn the ignition key to the Acc position. May be orange (depends on the radio make) and will be a tad thicker than the other cables. Clear a bit of the wire's insulation using a Stanley knife, solder the wire coming from pin 2 of plug R5 onto this wire and insulate it again afterwards.

Scrounge around some more and find the permanent +12 V wire going to the radio (also a thick wire, likely to be red on the radio side). Clear a bit of the wire insulation using a Stanley knife, solder the red wire coming from plug R4 onto this wire and insulate it again afterwards. This way you'll have reading map lights available without the need to turn the ignition on, a major advantage over the guys who didn't build their consoles in themselves :-)

Don't re-assemble yet, you'll need the clear working space to access the thermo sender wires...

Thermistor

Run your two ambient temp sender wires through the large rubber grommet in the centre of the bulkhead/firewall into the car.



I found it easier to pull the grommet out of the bulkhead from the engine side, then man-handle (woman-handle, smack, shove, whatever...) the two wires through the grommet, then

re-insert it back into the bulkhead. I used thicker flex wires here, and taped them together to make it easier to force them through the grommet.

Find the wires by reaching in behind the radio area, then solder them onto the wires coming from pins 1 & 6 of plug R5.

You're welcome to re-assemble the dash at this point and proceed to the engine bay for the rest of the exercise...

Run the other side of the wire pair along the sides of the engine compartment and all the way to the vertical brace for the grille. Once there, solder the thermistor onto the wires. It's not polarised (being a passive component) and can't be wired in reverse. Put some insulation tape around the legs to prevent them from shorting, then put a length of heat shrink tubing around it to protect it against the elements. If you look through the grille from the front of the car, you should be able to see the thermistor in its rubber jacket once you're done.

PS: I put the whole run of wiring in the engine bay inside the black corrugated "gorrel-pyp" insulating stuff that you can get at your local Builder's Warehouse - it gets hot under that bonnet without protection! Just leave the tip of the thermistor exposed from the "gorrel-pyp" so that it can experience the climate unhindered...

Testing

Some simple tests to confirm that the wiring has been done correctly:

- Turn the map lights on - they should work without the ignition being in the On or Acc positions.
- Turn the ignition key to Acc - the display should light up and display a direction and temperature reading.
- Turn the lights on - the display should dim.

Calibration

The thermistors are not manufactured to close tolerances and may need calibration – the ones I bought all showed <2k Ohm readings at 25 degrees C. The most accurate way of calibrating them is to do this after you've installed the whole system, because your efforts will then also take the resistance of the wiring between the console and the thermistor into account.

You will need a couple of small valued resistors – 47 Ohm (either ¼ or ½ Watt) ones work perfectly and sell for about 50 cents each. In my case I left the vehicle overnight and compared the display reading with a hand-held thermometer. As a result of the thermistor's value being too low, the temperature reading was about 3 deg C too high.

Remove the console from the roof, then cut the wire going to pin 1 of R5 (blue with white stripe) and connect a single 47 Ohm resistor in series. Refit the plug, turn the ignition key to Acc and check the temperature reading.

If it's still too high, add another 47 Ohm resistor in series (for a total of 94 Ohm) and check the display again. Continue this way until the displayed temperature matches the hand-held thermometer. In my case that meant adding five 50 Ohm resistors (for a total of 235 Ohm).

Once you're done, solder the legs of the resistors to ensure a good, lasting contact and insulate them with tape to protect them. Refit the console and verify the temperature.

Operation

The maximum display range is -30 to +55 deg C. A faulty/missing thermistor, or extreme temperatures outside of this range shows "---" in display.

When the temperature changes down, it is indicated immediately. When the temperature

increases, the change will only display if the console has been powered up for >100 seconds and the road speed exceeded 24km/h, and then it will change by a maximum of +1 degree C every 40 seconds.

If the console is off for less than 4 hours, the temperature display resumes from the last displayed temperature. If the console is off for more than 4 hours (i.e. cold engine), the display takes a new reading at start-up.

To operate the console, do the following:

- Press the Mode switch to toggle between degrees F, degrees C and display off.
- Press & hold the Mode switch for 5 seconds to enter calibration mode. Select zone 12 for Limpopo, 13 for Gauteng and 14 for Cape. Leave the switch a while to accept the current zone.
- Press & hold the Mode switch for 10 seconds until the direction bar starts to blink, then drive vehicle slowly through two complete turns to perform initial calibration.