

HORROR* 2 TBI

How a carburettor Niva was transformed into electronic injection by Mats Ahlberg, [AHMA]

* = The infamous lambda-controlled carburetter is known as "The Horror Carb"

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Introduction

About the contents of this document

This is a simple write-up about one method to transform a carburettor Niva to throttle body injection. This is one possible way to do the job, there are probably just as many ways as there are inventive and talented mechanics out there. I hope it will inspire more to do the transplant, maybe give some guidance and also help in avoiding some of the traps on the way. As usual, in this kind of document, the author takes no responsibility for the contents, neither regarding safety nor the legal aspects.

Pros and cons

What do we win by replacing the carburetor engine with an EFI (electronic fuel injection)? Not all will agree, but this is my document, so.. I would say that the fuel injected engine will give you better performance under most conditions. The ECU (electronic control unit) analyses many more factors compared to the carburetor and does it best to give the engine optimal AFR (air fuel ratio) all the time. It "knows" pressure in intake manifold, intake air temperature, throttle

position, engine temperature, engine speed, vehicle speed and most important it monitors remaining oxygen in exhaust. All this info is processed and taken into consideration before ECU decides how to set injection and ignition. This will give you more power, lower fuel consumption and better response and control.

So, is there a backside of the shining coin? Of course. Lots of information means lots of information sensors. This makes the system more vulnerable and more complicated to trouble shoot. You have to become friend with the multimeter - and maybe even to use diagnostic software. But, have no fear, we can solve most problems with just the multimeter and a paperclip. Even if we cant find the problem at once, the ECU will do the best it can to keep you mobile and to get you home. It will light up the "Check Engine" - but it will not let you down if you have to go on. Some will say that you will have problems finding spare parts - and that can be true, even if many parts are found on Opel/Vauxhall and other members of the GM family. On the other hand - there are very few moving parts in the TBI compared to the carb - so I would not worry too much about parts.

Some decisions before starting

To transform you Lada to fuel injection you can choose a few different paths. We will mention two briefly and then get going with the action. By the way - you have to use your imagination to understand this specific variation of English called "Swenglish".

A. Use your 1600-engine and replace only the necessary parts. It's doable, but you will need a lot of parts from a 1.7 TBI engine so consider using the complete 1.7. The TBI system is optimised for 1.7 - but will probably work OK also on a 1600. This option can be done with engine in car.

B. Use a complete 1.7 engine. Recommended. Makes everything much easier. This is the method described in this document.

Next decision - getting a complete donor car or getting just the parts you need? Guess it is a matter about how tolerant your partner is considering status of driveway or backyard. I will list the things you need here, with some pics, so you should be able to use it as a shopping list and get just what you need. Who knows, maybe this document may save a marriage or two?

Tools, parts and skills needed

Tools first. Most of the work can be done with standard tools, but I will try to list a few "extras" that makes the job easier

- rotating file, something like a big Dremel will help in enlarging some holes
- chain pulley or engine crane to get the engine in and out.
- O2-sensor long socket
- 38 mm 3/8" socket with long handle for crank pulley

- multimeter
- soldering tools

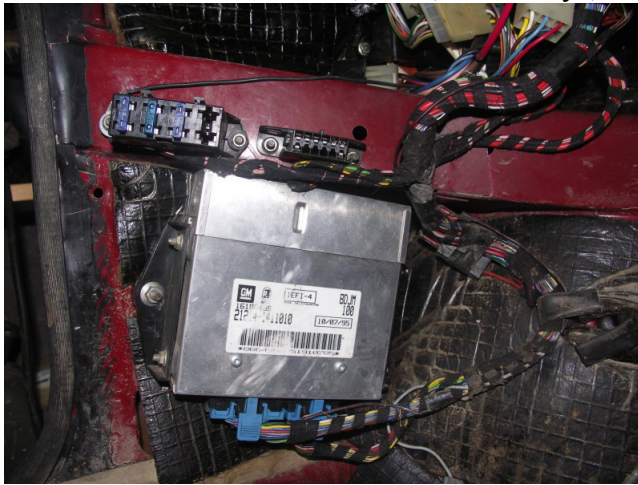
Parts. This is what you need from the donor. MARK ALL LOOSE ENDS!:

- a 1.7 TBI engine in good condition
- the fuel tank from a 1.7 including fuel pump
- the fuel ventilation stuff from rear inner wing (check black box for cracks)

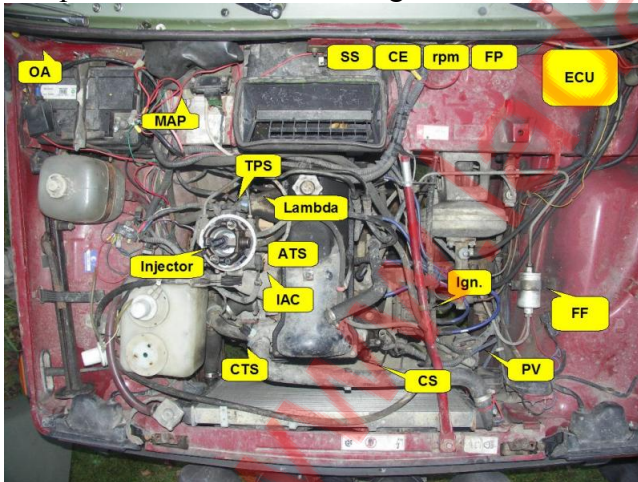


- the three fuel pipes from tank to engine bay including hoses
- the fuel filter and the hoses that leads to and from TBI-unit
- the complete GM wire harness for the TBI
- the coal cannister with PV, purge valve
- the ignition unit (coil pac)
- slotted crank pulley
- cover with holder for CSS (crank speed sensor)
- covers for distributor and fuel pump mountings
- upper coolant pipe with CTS mounting
- exhaust manifold with O2-sensor
- "first" exhaust pipe
- catalytic filter
- intake manifold
- throttle body unit
- MAP manifold air pressure sensor
- air cleaner box with ATS (air temperature sensor)
- OA, Octane adjuster
- the "twin drive" speed sensor cover from transfer box
- VSS, vehicle speed sensor

- the Electronic Control Unit, ECU, with relays, diagnostic outlet, and fuses



- cover for ECU (made from recycled yoghurt cans)
- electric cooling fans with relay
- accelerator pedal and cable
- complete kit of seals, including crank shaft



seals

So, how difficult is it? Do you need to be a trained mechanic or could a happy Sunday hobbyist get away with it? I would say that you have to be average skilled. It does not take complicated machines or space rocket science, but you should feel comfortable with the idea to disconnect 30 electric connections and with the other hand balance a 25 kilo gearbox while laying under the car. You get the idea?

The time schedule is very much depending on how much you want to do while you "have the engine out". Cleaning engine, maybe giving the gearbox an overhaul or even paint the engine bay? There is a lot of work to do - and I would guess that two medium skilled mechanics could use at least two weekends for the job - doing just the minimum to make it work. Plus, there is always some vital part missing.

Planning

The ideal is of course to prepare the 1.7 as much as possible before taking out the old 1600 and taking your Niva out of service. Giving the 1.7 a good maintenance is of course a good idea. New seals, maybe a new support bearing in flywheel, checking water pump, maybe replace the alternator with something beefier, maybe new timing chain and guidance and checking valve play under rocker cover.

Clean all things up, indentify all electric connections, mark them.

Make sure you have minimum of fuel in tank.

Check and double check that you have all components, all tools and a plan B if your car does not get ready in time.

Here we go!

- disconnect battery
- remove fuel tank and stuff in rear right wing
- remove the three fuel pipes in centre tunnel (with gearbox out it is VERY easy..)
- remove the three bolts for starter - take starter out halfway - disconnect two cables - remove starter
- remove four bolts between bell housing and engine (double extenders and u-joint needed)
- remove clutch slave cylinder
- remove all wires to engine - MARK them!
- remove fuel and vacuum hoses - burn them.
- keep all coolant hoses for spares/emergency use
- empty oil and coolant
- remove radiator - careful, we will use it again.
- release small coolant hoses to heater
- remove carburettor
- remove ignition coil, MARK wires + and -
- remove ignition module (horror only)
- remove AFR box under right seat and harness (horror only)
- remove full load sensor (horror only)
- remove exhaust manifold and exhaust including "first pipe"
- remove nuts to engine rubber supports and to front diff.
- support front diff to keep it from spinning
- lift engine while supporting gearbox until engine snaps free from supports
- wiggle and pull engine free from gearbox

- slowly lift engine while checking for forgotten wires and hoses



Mounting

- mount the three fuel lines, the hole in the floor under tank needs to be enlarged, a few mm forwards.



- mount the new fuel tank and new vent hoses.



- Mount the "twin drive" for VSS on the transfer case

- Reroute the wires to VSS and lead them out with wires for reverse gear



- Mount the coilpac at a suitable



position

- find a good home for the coal



cannister



- accelerator pedal is bolt-on

- ...and the accelerator cable fits in a hole after enlarging it



- cooling fan (two for hot climates)



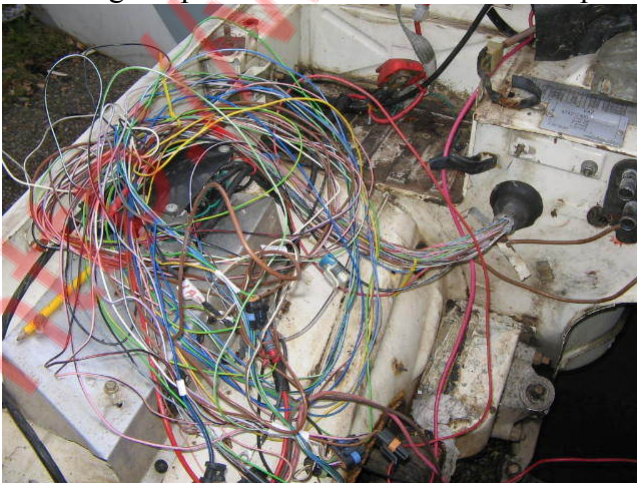
- lift the new engine into position and start connecting hoses and cables



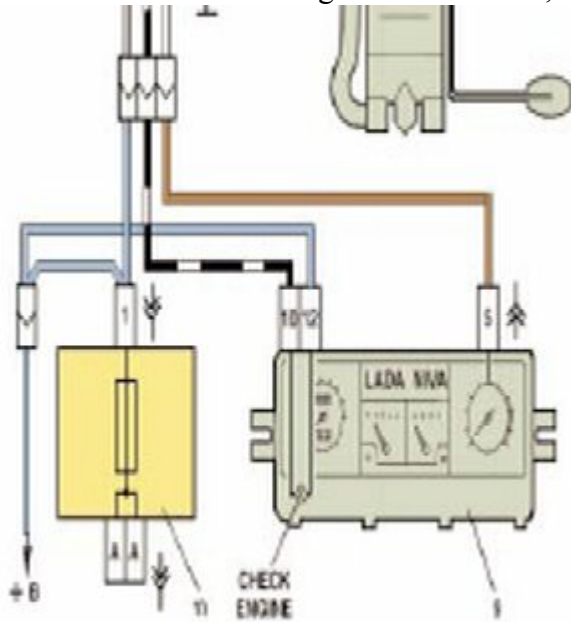
- get the oil pressure sensor and switch from the 1600 and mount it on the



- locate a good place for the TBI-harness to pass into cabin



- the rest is about connecting wires and hoses, here is the GM-Lada interface



- The blue (+B) should be connected to the wire that once was on ignition coil +.
- There are two or three red wires that should be connected to battery +
- There are several ways so solve the cooling fan - most simple is to use the belt driven fan from the 1600.
- the tachometer will not work
- Check Engine - you can use any 12V signal light

Links

You better face it - car projects are made for internet! Share your project and get some good advice in return

www.turbo-nutter.com - all the manuals and papers you need

<http://www.lada.co.uk/forum/> - creme de la creme of English speaking Lada knowledge

[Baxter's Lada Niva site](#) - a great collection of links, docs, pics, mods - open that toolbox!

www.lada-niva.se - the home of the author - for Niva loving Vikings