



Installation instructions

**6 Cylinder Engine
Quick Conversion Kit**

Please Note:

It is not recommended to use waste oils in a new technology common rail diesel engine. If used as a stand alone conversion in an old technology engine, it is anticipated that a very clean dewatered waste vegetable oil filtered to max 5 micron will be used. It may be necessary to blend 5% kerosene with the oil to winterize the fuel, and blending with diesel fuel is advised for cool weather conditions or for use with viscous waste oils. Some vehicles may require a blend of 30% mineral fuels. Engine oil must be changed more regularly if using vegetable oil fuels due to polymerization. Vegiecars can not be held responsible for fuel quality or vehicle maintenance.

The components included with this kit:

Inline Glow Plug Heater

The body of the unit is constructed of a solid block of aluminum, with ports drilled for fuel to form a reservoir at the tip of the glow plug heating element while flowing past it reducing the flow rate to increase efficiency.

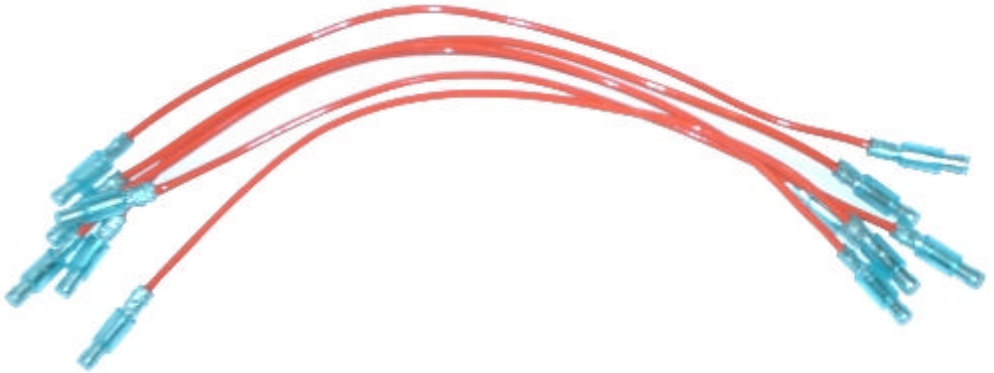
The glow plug (matches Toyota Landcruiser BJ60 3B

motor) comes complete with ring terminal attached for crimping by the installer. The thermostat switches off at 90°C and back on again at 75°C and comes with two yellow blade terminals attached for the installer to crimp at a later stage. The temperature indicator looks the same with blue terminals attached and will turn the “at temperature” lamps on when over 70°C. The foam cover is a specialist fire rated non-porous closed cell elastomeric foam. The green earth wire has been fixed at one end to the body.



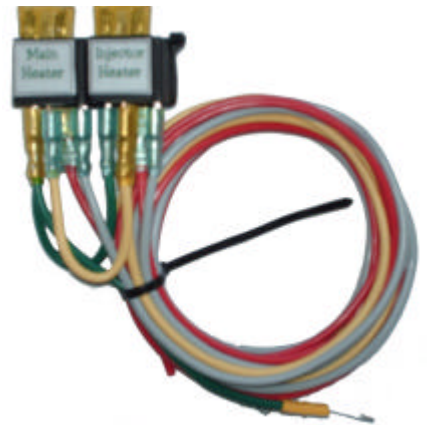
Heating Elements

These flexible elements are 300mm long with blue bullet connectors. The male connector is crimped to the element assembly, and the female connector has been inserted for crimping by the installer



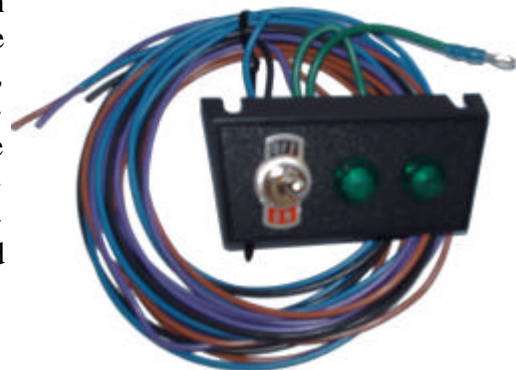
Relay loom

Includes two fused relays with 20amp blade fuses, a short length of green cable crimped with a yellow ring terminal, lengths of Red, Yellow and Grey cable for connecting by the installer. All of these cables have a blade terminal crimped to one end, fitted to the relay in the correct positions.



Switch Loom

Includes an on / off toggle switch mounted to a face plate with two green “at temperature” indicator lamps. The loom includes lengths of blue, black, purple and brown cable for connecting by the installer, and an earth wire to connect to the metal body of the vehicle. These cables have a blade terminal crimped to one end, and are fitted in the correct positions.



Element Connecting Wires.

The Bundle includes a length of green cable crimped with a yellow ring terminal at each end, and orange cable for connecting the heating elements in series.



Array Thermostats

The thermostat comes with two yellow blade terminals attached for the installer to crimp at a later stage. The thermostat switches off at 90°C and back on again at 75°C. The temperature indicator looks the same with blue terminals attached and will turn the “at temperature” lamps on when over 70°C.



Split Sleeve Tube

This fire retardant polypropylene tube is used to both insulate the heating elements and tidy up the wiring.



Aluminum Tape

This adhesive backed tape is used for lagging the thermometer probe to the fuel line, and a multitude of other uses.



Copper Tape

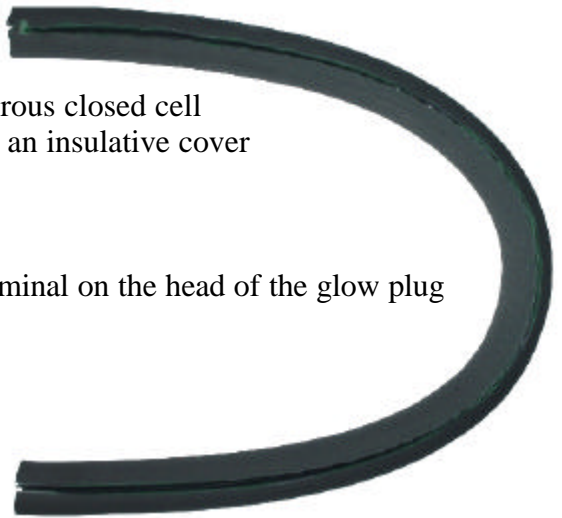
Used to assist in conducting the heat from the elements to the thermostats, and for holding the heating element in position under the thermostats.

Insulative Covering

This specialist fire rated non-porous closed cell elastomeric foam provides both an insulative cover and barrier to water vapor.

Terminal Insulator

Used to insulate the positive terminal on the head of the glow plug



Bag of Parts.

We know that when self installing, sometimes things go wrong, so we have supplied some spare bits and pieces to make the job a bit easier. The bag includes a terminal insulator for the head of the glow plug, hose clamps, self drilling screws for fixing earth wires to the body of the vehicle, white wire tap connectors for splicing into existing wires, and ezy tap connectors for connecting into the heating array, along with spare terminals and connectors.



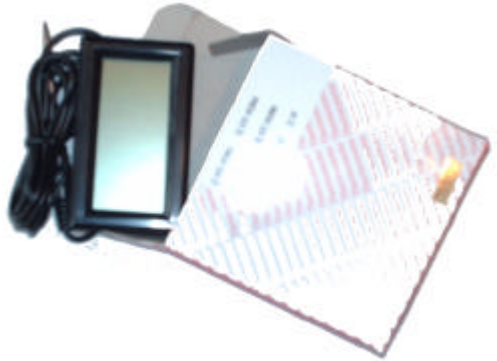
Cable Ties

140mm Black Cable Ties, for fixing the insulative coverings.



Thermometer with Probe (Optional)

This unit comes complete with long life battery, 900mm long cable and probe, the maximum temperature displayed is 150°C. The unit can be panel mounted or simply held in place with the removable suction cap provided. You will need to remove the plastic tab in the battery compartment before use.



What you will need to provide

Pliers or a crimping tool for cutting and crimping cables.

A pair of sharp scissors

A sharp blade knife

Electric screwdriver/drill

Spanners and screwdrivers

Getting Started

Read all of the instructions before starting, and study the area around the injector lines to work out how much equipment such as an air filter that it is sensible to strip away before starting to install the kit . It may be necessary to remove some clamps that will be in the way of the elements or insulation, these should be put aside for “safe keeping”.

If you are planning to have your injectors or glow plugs serviced at some stage soon, we would suggest that they be done prior to installing this kit as it may be more difficult to service after installation.

It is important that there are no fuel leaks around the area of the injectors and injector lines as the fuel lines will be getting rather hot, and leaking

fuel may ignite under these conditions.

Clean the area, there is nothing worse than trying to work in an area that is coated with a thick layer of built up grease and grime. This dirty oily film may ignite under extreme conditions., and will certainly make your installation more difficult.

If your purchase includes the thermometer, it has only a short length of cable being 900mm and may not reach the injector lines from your dash via the easiest route. If this is the case, you may need to drill a hole through the firewall for the shortest distance. If this is the case, be sure to run the cable through a grommet.

We suggest that you take some time to route this unit prior to installing any part of the kit, as the placement of the probe will determine where the thermostat switch will be located, which will impact on other elements of the installation.

The ideal place for the thermostats is on the end of the heating array where the active red wire will be inserted. This is usually one of the centre injector lines, cylinders 3 or 4.

After installing the thermometer, work out where would be a good location for the thermostats considering that the thermometer probe is best installed underneath it. The thermostats will be installed using a cable tie, wrapped around the injector line after the heating element has been installed. The thermostats will have cables crimped to the connectors, so ensure that you allow for any engine components that will have to be replaced after the kit has been installed, so as not to put physical pressure on the thermostats connectors once installed.

The inline heater uses a glow plug as a heating element. The heating element must be immersed in fuel before being switched on as it may burn out within 10 seconds if activated in air. **It is advised to have the fuel line primed with fuel before activating the glow plug heating element.**

The inline glow plug heater should be installed just before the injector pump, preferably at a low point of the fuel system in case there is air in the fuel lines which will then rise beyond it.

If you have a leaking injector pump, we would suggest that it be serviced or replaced prior to installing this kit, as air accumulating in the body of the pump may transfer to the heater, which may cause failure of the glow plug heating element.

Disconnect the battery before doing any work on your vehicle or your vehicles electrical system.

Installing The system

1. Heating elements & Thermometer Probe

If the orange coating has pulled away from the blue connector at any point on the heating elements, it will need to be cut and reconnected with a new connector, or replaced by your supplier. The enclosed wire will short out if it makes contact with earth, making the area before it run very hot, and the area after not run at all.

Use a piece of the aluminum tape to attach the thermometer probe to a fuel line with the plastic section of the probe sticking out beyond where the element is likely to stop.

Wind the first element around the injector line, starting at the injector and working your way back. Make sure that the blue connectors are pointing up to make it easier for crimping a wire into them later on.



Wind the element closer together (just 2 loops) at the point where you plan to place the thermostats to ensure that the surface of the thermostat will make direct contact with both loops of the element.



The thermometer probe will assist to make a flat spot for mounting. Wrap a piece of copper tape around the element at this point. Remember that the heating element has to transfer the heat to the thermostat via the copper tape so a thin layer is suggested.

2. Thermostat

After installing all of the 6 elements, install a thermostat by placing a cable tie through one hole in the thermostat housing. Run the cable tie around behind the fuel line and through the second hole in the housing.



Loop the tie back over the thermostat and push through the clasp on the tie. Using a pair of pliers, pull the tie up tight to secure the thermostat in place against the copper tape covering the heating element. Use some more aluminum tape around it to hold it firmly in this position. It doesn't really matter how you do it, just as long as it is held firm.

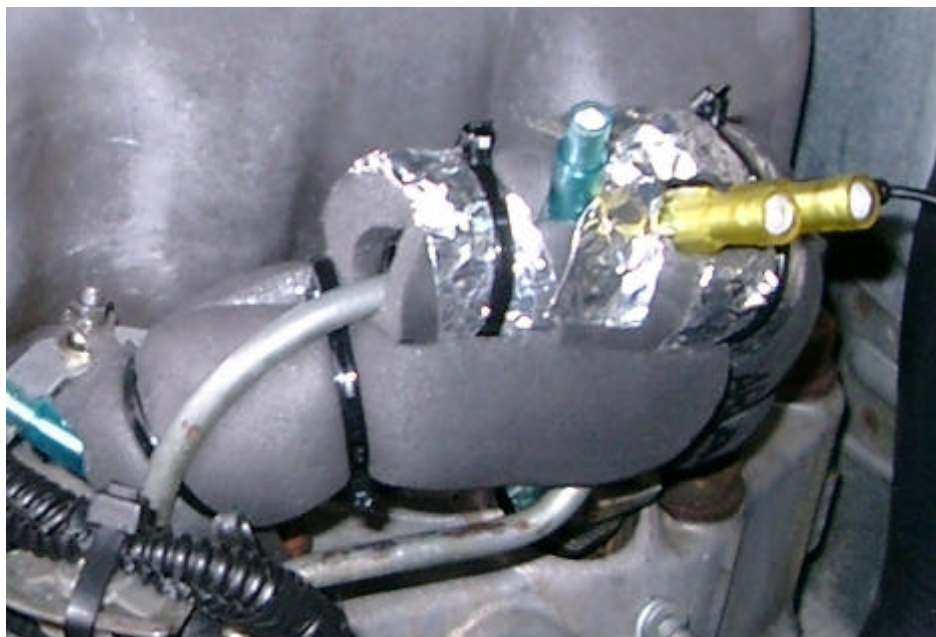
Repeat with the second thermostat, so that the two thermostats are next to each other.

3. Insulation

Measure the length of the heating element along the fuel line, and using a sharp pair of scissors or blade, cut a section of the split sleeve tubing a centimeter longer than the length of the element wound section.

Clip this tubing over the fuel line, allowing the blue connectors to stick out either at the end or through the split in the tube section.

When you come to the area around the thermostats, you may need to cut a round section out of the tube split opening with a pair of scissors so



that the thermostat housing is under the tube cover and the edge of your cut is “kissing” the black section of the thermostat.

If you have room, cut a section of the insulative foam cover 2 centimeters longer than that of the split tube. Pull the cover around the underside of the fuel line, trying to get a little bit of coverage around the head of the injector nut.

Allow the head of the blue connectors to poke out of the cover. Once you are happy with the positioning of the cover, remove the plastic glue strips and connect the two sides together. This is a high temperature applied contact adhesive, and once contact is made, it is very difficult to get apart, although may come apart once the engine heats up.

In places where there is pressure for the glued area to pull apart, tape it closed with some aluminium tape before strapping a cable tie over the top, being careful not to short out against the connectors of the thermostat. Strap a tie on either side of each connector and one in the centre of the cover. Don't do the tie up too tight as it may damage the cover, but be sure that it is tight enough to hold the cover together. You may need some extra ties around the thermostat section to hold the cover closed, and if the ties aren't long enough, feed one tie into a second to gain twice the length.

If you can't fit the foam insulation on your application, it's not the end of the world, it just means that you will draw more power to run the system due to atmospheric heat loss. If this is the case, clamp the split sleeve tube closed with cable ties.

4. Wiring the element array.

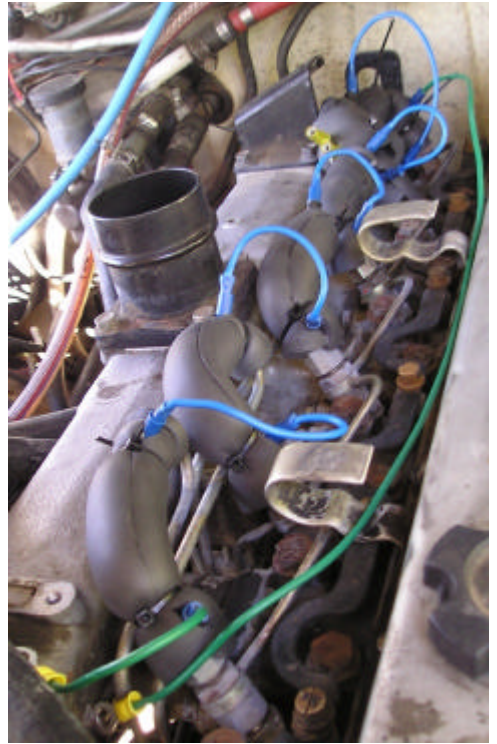
Cut a short section of the orange cable to join one heating element to the next. Strip the cover exposing the wire, insert into the



bullet connector and crimp in place. It should not be necessary to remove the male bullet connector from the female to crimp the wire in place.

There should be 5 of these loops with the blue connector at each end left open for the green earth wire. It is important that you join one element directly to the next in line so, injector 1 to 2, 2 to 3 and so on.

Once this is done, take each green cable and work out where you can screw the ring terminals to earth. This may be an existing bolt hole on the engine, or by using one of the supplied self tapping screws to the body. There should be enough cable for each end of the element array to be connected to earth. Cut to length, strip and crimp as before.



5. Installing the Inline Heater.



Choose a position along the fuel hose as close to the injector pump as practical. This will hopefully be a point lower than the fuel hose before it, as the glow plug may burn out if air accumulates in the heating unit, especially at start up.

Using a sharp knife, cut the fuel hose and slip a hose clamp over each end. Fit the ends to the barbs at each end of the heating unit and tighten the clamps. The glow plug end should be the closest to the injector pump.

6. Wiring the Heater to Earth.

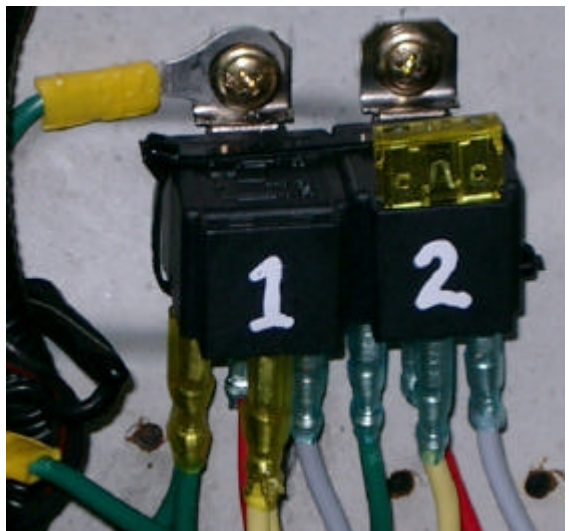
Take the green cable and work out where you can fix the ring terminals to earth. This may be an existing bolt hole on the engine, directly to the battery or by using one of the supplied self tapping screws to the body. Cut to length, strip and crimp a ring terminal to the end using a crimping tool or a pair of pliers. Fix the ring terminal to the body or engine.

7. Wiring the Relay Loom

The relay requires a power source, which could be directly off the positive battery terminal, or by splicing into a major current supply elsewhere in the engine bay

The relay will also have wires going to each of the thermostats and to a joiner in the centre of the element array. Find a suitable position in the engine bay to mount the relay, taking the above factors into account.

You might find a point that already has a screw in place, but we have supplied self drilling screws for mounting this unit.



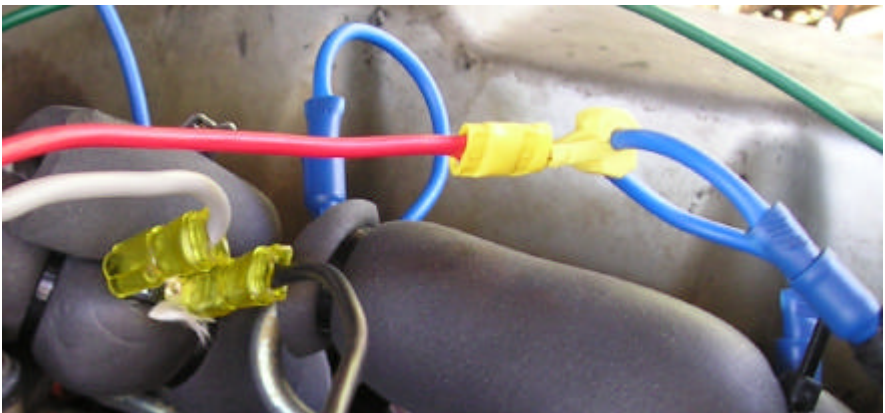
Start by mounting the bracket which you will find in the Parts Bag, and screw into place with a power drill or power driver, allowing room for the second bracket to be fitted beside.

Push the Injector Heater relay labeled 2 up onto the mounting bracket which will click home into place. The illustration shows the relay having been pushed up into position.

Remove the fuse from the Main Heater relay (1). And push the bracket in. Put the ring terminal from the relay over the screw, and screw into place as illustrated. Replace the fuse when complete.

Find a high current power source, and cut the yellow cable to length to attach to this source. You could mount either a ring terminal to the end of the cable and attach to the battery, or use one of the white wire tap connectors to splice it into an existing similar sized cable. Direct connection to the battery is preferred.

Run the red cable from The Main Heater relay off to a small ring terminal secured to the end of the glow plug on the heater unit. Slip the red terminal insulator over the cable. Cut the cable to length, strip and crimp. Pull the insulator up over the head of the glow plug.



Crimp the blue ezy connector (pictured as yellow) to the centre orange loop wire pictured as blue (3rd loop wire along), as illustrated. This

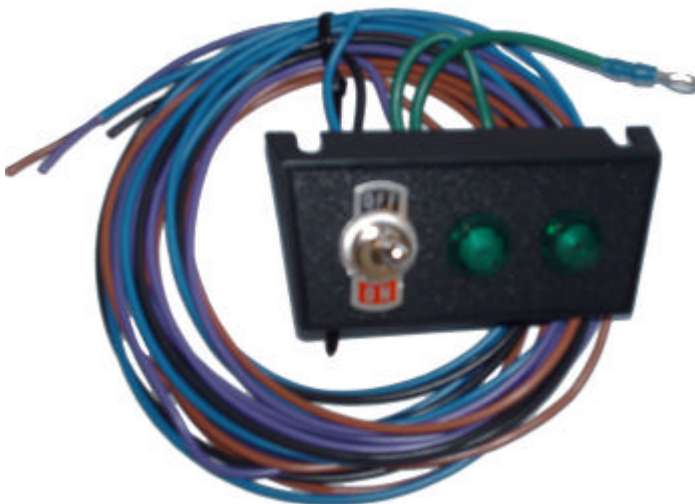
should be the loop wire that connects the elements for cylinders 3 and 4. Run the red cable from the Injector Heater relay off to the Ezy joiner in the element array and cut to length. Crimp the shielded blue male blade terminal to the end of the cable and insert into the ezy connector.

Run the grey cable from the Main Heater relay off to the thermostat on the inline glow plug heater and cut to length. Crimp into one of the Yellow blade terminals that are fitted on the thermostat. You may find that you need to take the terminal off the thermostat to crimp it onto the wire.

Run the grey cable from the Injector Heater relay off to the thermostat on the heating array and cut to length. Crimp into one of the yellow female blade terminals that are on the thermostat.

8. Wiring the Switch Loom

The switch and indicator lamps come prewired and mounted on a three hole panel for easy fitting. Find a suitable location for the panel, and fit using two of the self drilling screws provided. If fixing to a steel surface, place the earth wire ring terminal over a screw prior to fixing. If fixing to plastic, use a wire tap connector and wire off cut to extend the earth to a metal part connected to the body and fix using a ring terminal and self drilling screw.



The switch requires an active power source that only comes on when the ignition is in the on position, as we want the heating elements to turn off when the ignition is off. There are many places that you could “pick up” a supply with the most universal being at the cigarette lighter or stereo, although the switch may then also operate in the accessories position.

If you hunt around in the engine bay or under the dash with a multimeter, you are very likely to find an ignition cable that is only on when the key is in the on position, and this will be the best cable to splice into. There is usually one of these cables extending from the injector pump, or at the ignition.

Pull through the blue cable to the point where you intend to “pick up” the active line, and cut to length. Use a white wire tap or eze tap connector to splice into the existing cable. The blue cable should be attached to the top of the switch.

Pull the other three cables through to the engine bay. Run the black to to the remaining Main Heater yellow thermostat terminal and cut to length. Use a short length of the black off cut to bridge from the yellow terminal to a blue terminal on the other thermostat. Crimp both into the one yellow female blade terminal that is on the thermostat, then crimp the other end to the blue terminal on the other thermostat.

Use one of the white wire tap or eze tap connectors to connect some more black off cut into the black wire at the point closest to the Injector Heaters thermostats, and repeat as for the Main Heater.

Connect the Purple wire to the remaining blue Main Heater thermostat terminal, and the Brown wire to the remaining Blue Injector Line thermostat terminal.

Use the remaining loom tube to tidy up the wiring from the relays, and use cable ties to clamp the loom tube closed.

Operating the System

Reassemble all of the equipment that you removed to fit the kit and ensure that the fuel line and inline glow plug heater unit is primed with fuel, checking for leaks at the new connections.

Reconnect the battery and turn the ignition to on - not start, just on and flick the switch to the on position. If you have fitted the optional thermometer, after a brief pause you should notice the temperature on the thermometer start to rise. This will pick up pace and may rise to levels much higher than you were expecting, which is often the case when starting from cold.

You might notice a burning smell - ignore it. All of the products involved in the installation will release some gasses until they are a bit worn in, so the first few times might smell a bit odd, but it's unlikely to be starting a fire.

It is important to note that the thermometer is not picking up the temperature of your fuel, simply of the hottest point that it may be in contact with, so if it goes above 140°C it's not the end of the world, but could indicate that you need to reposition the thermostat as it should be turning off well before then. The thermostats should be turning off at about 90°C and back on again around 75°C, so we hope that the thermometer will reflect this but once again may not be in contact as well, and may show a lower reading.

Touch your finger quickly against a metal side of the inline glow plug heater unit to see if it is warming up. The thermostat should be turning off at about 90°C so it will quickly become too hot to touch.

When the heaters are at temperature, the indicator lamps on the switch panel will light up green one at a time for each of the thermostats with the blue connectors, showing that the operating temperature is now over 70°C.

If these lamps switch off during operation, it will indicate that either one of the heaters has failed, or that the indicator thermostat isn't positioned

properly, or that your fuel flow is too great for the heaters to keep up.

The pre heating process usually takes about a minute. Once the lamps are showing, turn the ignition off and back on to glow the plugs, and start the engine. Warm the engine to operating temperature before driving.

Fuel Blending

It is of vital importance that you are using a clean dewatered vegetable oil. Oil with water in it will corrode the shiny surfaces on your injector pump and pit your injectors. For information on dewatering, see the Vegiecars Website.

All vehicles are different. My Nissan Patrol will start and operate well on 100% Vegetable oil, whereas my other vehicle requires the oil to be blended with mineral fuels to both start and run as normal.

I suggest that you start with a blend of 5% Heating Fuel Kerosene to stop the oil going thick, 5% Petrol to make it more volatile for starting, 20% Diesel to thin it out to help it get through your fuel filter and 70% vegetable oil. On this blend your vehicle should operate much the same as usual, given that you preheat the fuel lines before starting.

In colder conditions where overnight temperatures drop below 10°C, it may be necessary to increase the kerosene to 10% or blend with more diesel fuel to assist with starting.

As you become more confident with your fuel blending, you can start to reduce the ratio of Mineral fuels and increase the Vegetable Oil. I suggest that you do this slowly, until you are having starting difficulties or feel that the vehicle is sluggish or starving for fuel. At this point, pour some diesel into the tank and stick with the last blend that worked for you.

When blending your fuels, it is best to blend in a drum before pouring the VegieFuel into your fuel tank. If you pour all of the ingredients into

your tank with an expectation that they will mix, it may not happen as you expected and this might cause some problems with starting and operation.

It is recommended that the vehicle be garaged, as this will lessen the effects of overnight temperatures.

After driving on blended fuel and recovering your conversion costs, you may consider upgrading some components in your fuel system to improve fuel flow and reduce the mineral fuel component.

This may include replacing your fuel filter with a fuel processor or installing a fuel filter heater or coolant heat exchanger. You might decide to upgrade to a diesel purge system, which will give you greater flexibility and reliability if traveling.

When using vegetable oil as fuel, it is important to increase the regularity of your engine oil changes by at least 10%, as the oil will polymerise causing it to lose its lubricating qualities, and if left in this condition may even go solid. This condition is increased with worn motors.

It is recommended to regularly check your engine oil, and to change it before a regular service is due.

If requiring assistance, email marcus@vegiecars.com and leave a contact phone number. We will return the call as soon as possible.



