

Kia Carnival (GV6) - Replacing the Fuel Filter

V2, 24 November 2012

This procedure is an expansion of the procedure for removing and replacing the fuel filter provided in the Kia Carnival / Sedona GV6 workshop manual 'FL' section. It may not necessarily apply to vehicles with other than the 2.5 litre GV6/KV5/K5 engine.

This procedure applies to later production of the '99-06 Carnival/Sedona models. These have the paper element fuel filter as part of the fuel pump / level sender assembly in the fuel tank. Earlier models apparently have an inline paper element filter on the chassis rail under the floor-pan on the LH side of the vehicle, and only a screen on the fuel pump in the fuel tank. Thanks to Kia Forum member ClassicBoy for that information. I'm not sure of the model year that Kia cut over to the in-tank filter, all I can say is that ClassicBoy's is an '01 build, and mine (with in-tank filter) is '04.

If you have read the Kia 'FL' workshop manual section on fuel filter replacement this looks like a relatively straightforward job, and it is. However, it is a bit more involved than the manual would suggest - unfortunately, in common with a lot of manufacturer's workshop manuals, more lurks behind that deceptively simple word 'remove' and 'replace' than is apparent from the manual, and so I've tried to expand on the FL manual in this document.

The fuel filter for this vehicle should be replaced at 60,000km intervals, or more frequently if fuel particulate contamination is known to be a problem in your region.

The filter is located in the fuel tank in an assembly that includes the electric fuel pump and fuel level sender. The fuel tank is under the vehicle, almost in the middle, and the pump / filter / sender assembly is accessed from a service opening in the floor in front of and between the middle row seats.

It's not a bad idea to schedule this task when the fuel tank is nearly empty. Nevertheless, it's a job where you will have fuel everywhere. You'll think all the fuel in the pump / filter assembly has been completely drained, and then more will dribble out of somewhere. Therefore, make sure you have an appropriately ventilated workspace and, above all, keep in mind ignition hazards.

Releasing Fuel System Pressure

This procedure should be performed before opening up any of the fuel system lines. As the Kia manual says:

WARNING: THE FUEL SYSTEM REMAINS UNDER PRESSURE WHEN THE ENGINE IS NOT RUNNING. RELEASE FUEL SYSTEM PRESSURE BEFORE DISCONNECTING ANY FUEL LINE TO REDUCE THE CHANCE OF PERSONAL INJURY OR FIRE DAMAGE TO VEHICLE COMPONENTS.

1. With your fingers lift and swing open the carpeted hatch of the service opening in the floor just in front of the middle row of seats. The hatch opens toward the front of the vehicle – see photo below. This exposes the 4 screws used to remove the hatch.



Hatch in floor in front of and between the middle row of seats.



Hatch lifted. It just covers the screws.

2. Remove 4 screws and remove the hatch. The metal access panel can now be seen, with the fuel pump / level sender cable emerging from it.



Hatch removed – the metal panel in the floor pan can be seen. The cable is the electric pump and fuel level sender harness.

3. Remove the 4 screws securing the metal panel to the floor pan. Swing the panel to the RH side of the vehicle.



The top of the pump / filter / sender assembly and the fuel tank.

4. The top of the pump / filter / sender assembly and the fuel tank can now be seen. (It'll usually be covered in road dust).
5. Make sure you can remove the pump electrical connector (i.e. contacts not corroded, etc). It's released by depressing the plastic locking tang on top of the cable side. However leave the connector connected for the moment.
6. Start the engine.
7. Disconnect the fuel pump connector. The engine will run for a while and stall as the fuel pressure drops.

8. Turn the ignition off.
9. Remove the fuel filler cap to release any pressure in the fuel tank.
10. Disconnect the negative battery terminal before performing any work on the fuel system.
11. When work on the fuel system is complete, prime the fuel system – see *Priming the fuel system* below.

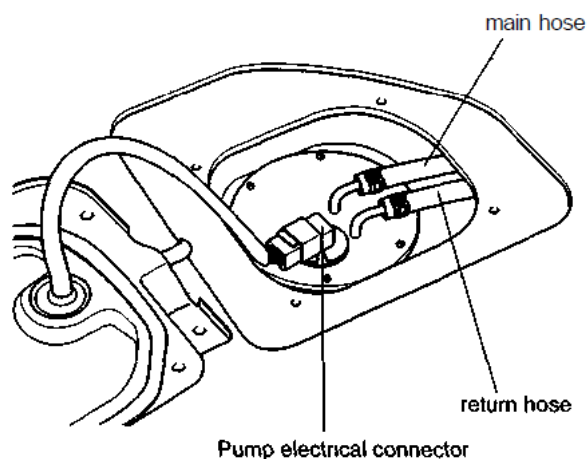
Fuel Filter Removal

1. Release the fuel system pressure - refer to "*Releasing fuel system pressure*" above. Per those instructions, be sure that the fuel filler cap has been removed to release any pressure in the fuel tank, and the negative battery terminal has been disconnected. (Do it in that order, otherwise you'll have to use the manual 'emergency' wire-pull release to open the fuel flap).
2. From the service opening in the cabin (opened as part of the procedure to release the fuel pressure), make sure the top of the pump / filter / sender assembly is clean to prevent FOD entering the fuel tank. Loosen dirt with a brush (a stiff paintbrush is good), and use a vacuum cleaner or air hose to remove the material. (There was even road gravel on mine).
3. Take all the usual prudent precautions regarding sources of ignition close by before the next step. E.g. if you used a vacuum cleaner to clean the top of the tank, disconnect it from the mains or move it well away.

Put a plastic sheet or similar between the service opening and the LH sliding door. This will protect the carpet from fuel drips as you remove the assembly from the vehicle.

4. Use pliers to compress and move the metal clamps on the main and return hoses. Have rags at the ready and slowly & carefully pull the rubber hoses off the pipes - although the pressure has been nominally released, plenty of fuel will still squirt from the hoses (gravity-feeding from the hoses, the regulator & injector rails) so be careful as the hose come off the pipes that fuel doesn't spray - particularly into your eyes. Catch as much as you can with the rags. If the hoses are hard to get off, twist them a bit to loosen any adhesion to the pipes.

I swung the panel back in position for a while to allow the rest to evaporate from the top of the tank (my wife hates the smell of fuel so I wanted to avoid too much permeating into the cabin).



5. Undo the 6 small screws securing the pump / filter / sender assembly to the fuel tank. The assembly is on springs to keep it firmly pressed to the bottom of the fuel tank. So as you undo the screws it may tend to spring up. Just keep it pressed down with your hand until all screws are removed.

6. Read all of this step before lifting the assembly out of the fuel tank. The gasket under the top may have adhered slightly to the tank and may provide a bit of initial resistance.

As you raise the assembly out of the tank, begin tilting it to the left side of the vehicle to allow the fuel level float and arm to come cleanly out of the tank. See my photo below so you know what to expect. Lifting the assembly straight up may damage the arm and level sender assembly.

Unfortunately the diagram in the 'FL' manual (reproduced below) doesn't give you a clue that the fuel level float and arm are there at all because of the aspect from which it is drawn.



Photo showing the float, arm and sender mechanicals and electronics on the side of the canister can be seen. This is pictured as if taken from the front of the vehicle (i.e. the float arm points to the left of the vehicle).

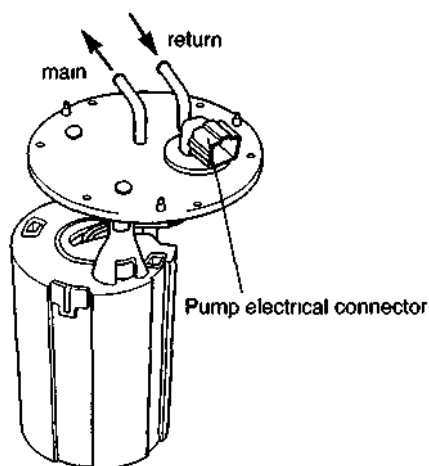
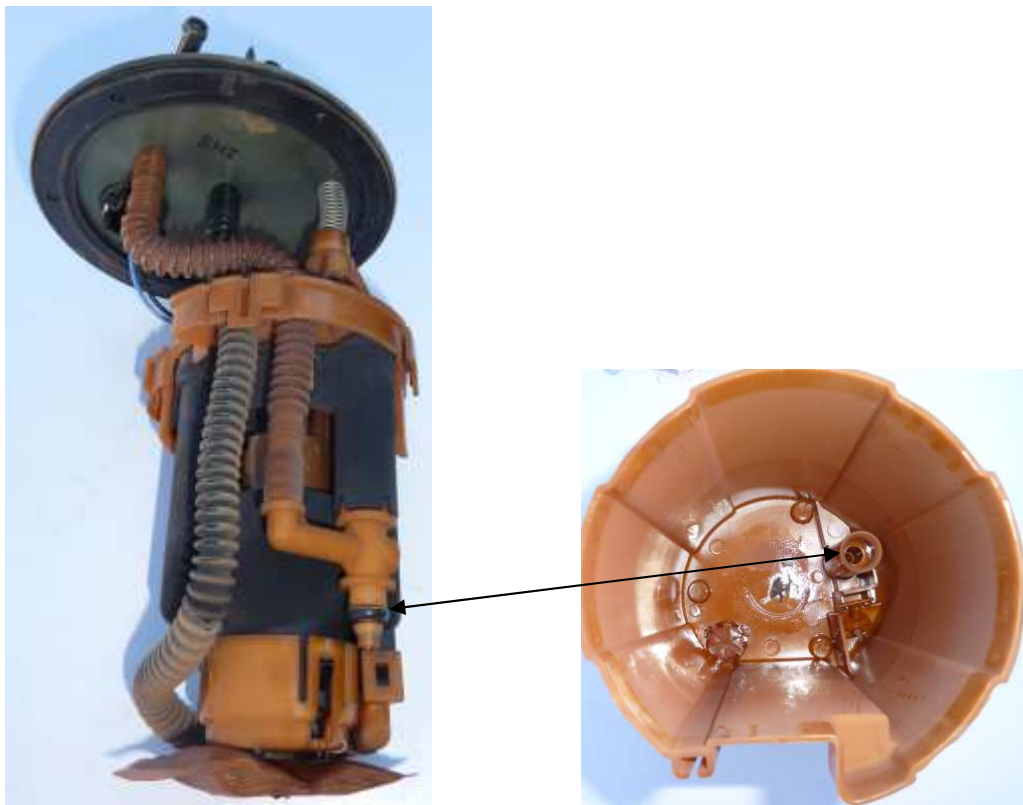
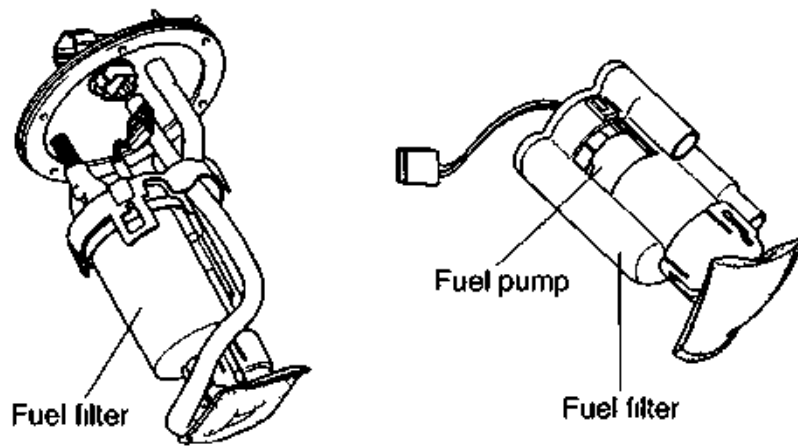


Diagram from the Kia workshop manual 'FL' section – the float and arm are not apparent.

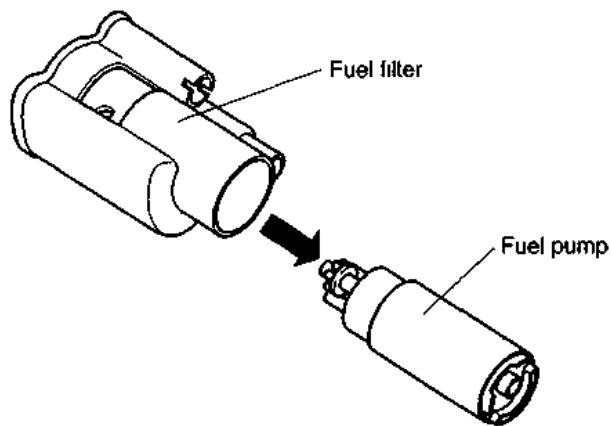
7. Put the panel back across the aperture in the tank to prevent any FOD falling into the fuel tank. Make sure the connector doesn't hang into the tank.
8. I removed the fuel level sender mechanism from the side of the canister as I was concerned that it could get damaged. Not really necessary though. It's removed by disconnecting the electrical connector under the top plate, depressing the plastic tang at the lower end of the sender assembly, and moving the assembly upwards until it clears the plastic rails in the canister.
9. Remove the canister from pump & filter assembly. If not already removed, the fuel level sender cable needs to be unplugged. Then the four plastic clips are raised gently with a screwdriver and the canister slipped off. Some resistance will be felt - you are also pulling an O-ring out of an internal fitting in the canister. See photos below – it helps to know what you are pulling against!



The left view shows the assembly with the canister removed. The right view is looking down into the canister. When pulling the canister off the assembly, the resistance felt is from pulling the return line connection out of its mating fitting in the canister. On reinstallation, these need to be aligned.

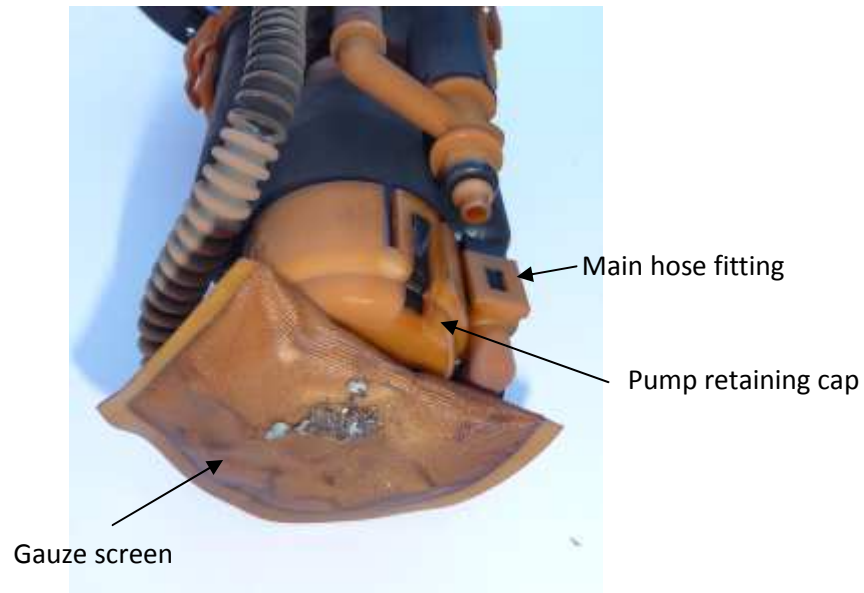


10. The Kia manual simply says “Disconnect fuel pump electrical connector and pull the fuel pump from the fuel filter” and presents the diagram below, but there’s a bit more to it.



More detailed steps are:

- Disconnect the fuel pump connector from under the top plate.
- Remove the main hose fitting from the filter housing by gently lifting up the two plastic retainers (see photo below)
- Remove the filter (containing the pump) from the canister top (on mine, the plastic clips barely retained it).
- Remove the pump retaining cap (see photo) by gently prying up the retainers. Be careful not to lose the rubber pad between cap and the pump.



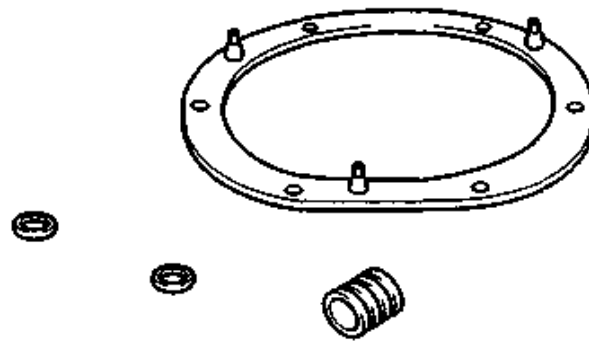
- With a small screwdriver, depress the metal tang on the electrical connection on the side of the filter and remove the contact (see photo):



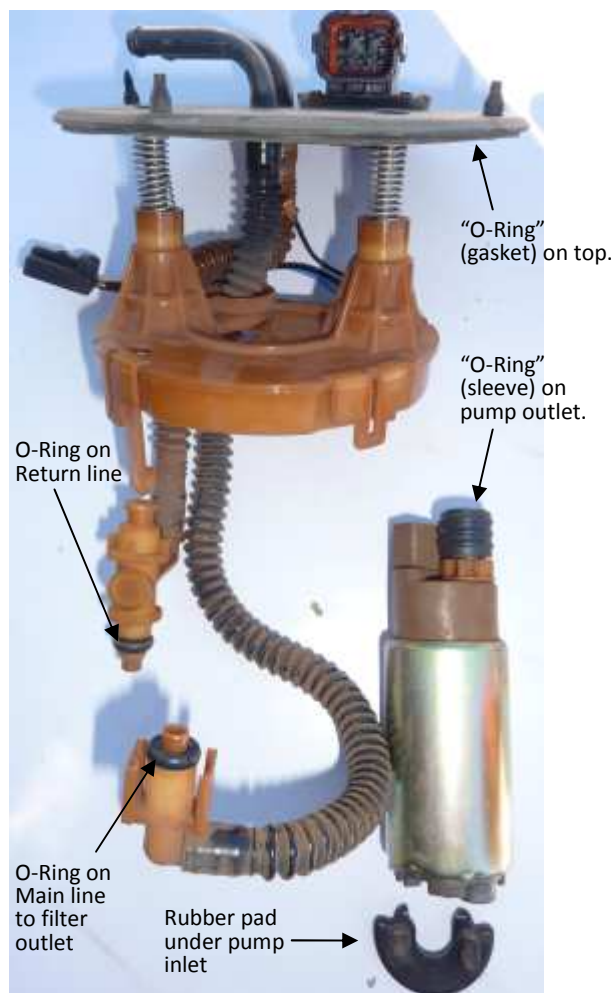
- Slide the pump out of the filter assembly.

The cable connection on the pump body is designed to be removed, but is not easy in situ as it is buried in the filter. I left it on and extracted the cable & connector through the opening in the filter, then disconnected the cable from the pump.

11. The manual says *"Be careful not to lose the 4 O-Rings."* and presents the diagram reproduced below:



Here's where the 'O-Rings' are located (the sleeve and gasket don't seem much like 'O-rings' to me, but what's in a name).



Interpretation of Kia's "O-Ring" diagram. The pump and top "O-Rings" are more appropriately described as a sleeve and gasket respectively.

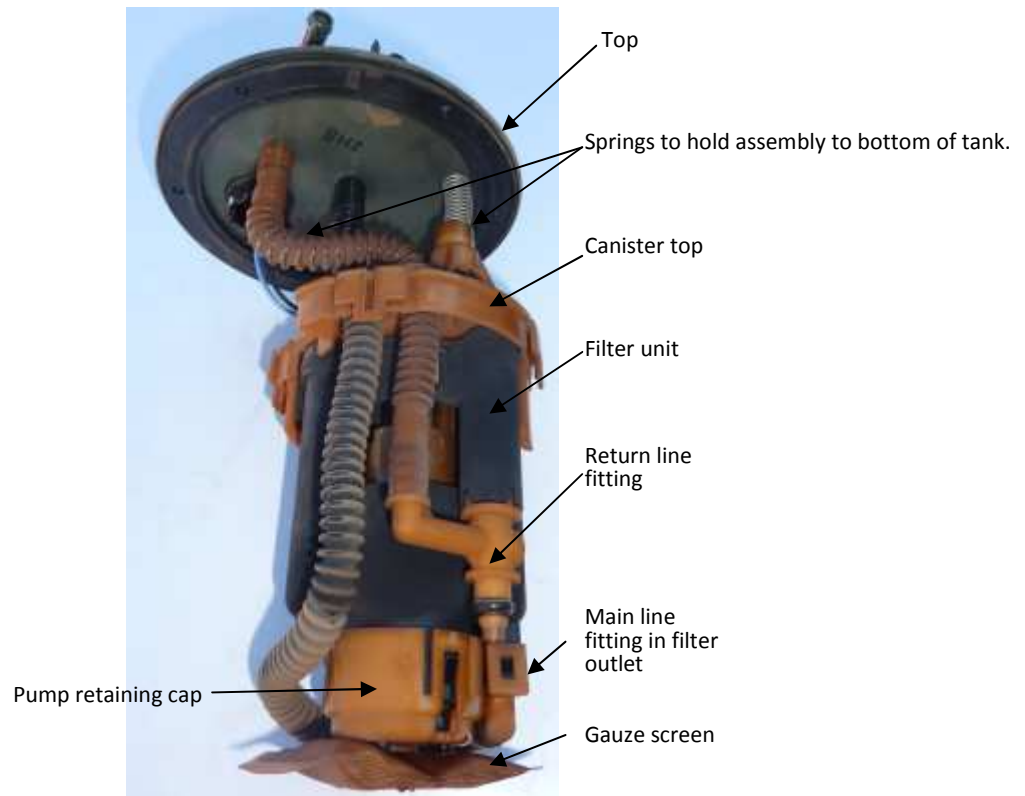
With mine, the main line O-ring stayed in the filter and needed to be gently pried out with a screwdriver. See below:



New filter on the left, old on the right. You can just see the O-Ring that has been retained in the old filter. This is one of the O-Rings referred to in the FL manual needs to be removed before discarding the old filter.

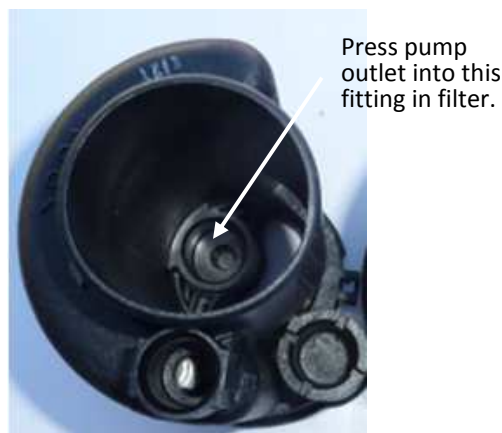
Details for replacing the fuel filter follow.

Fuel Filter Replacement



Pump and filter assembly before canister is slipped on.

1. Remove the fuel pump / filter / sender assembly per instructions above.
2. Gently clean any particulate matter off the gauze pre-filter screen with a brush. And clean any particulate out of the bottom of the canister. (Be careful not to damage or dislodge the flapper valve in the canister).
3. Make sure the rubber sleeve (and the funny little 'gear' spacer) are on the pump outlet, align the outlet with the new filter's inlet and press the pump firmly into the new filter until it seats.



4. Slip the gauze screen into the pump retaining cap (assuming that it has fallen off), put the rubber pad into the cap, and clip the cap onto the filter.
5. Plug the cable into the pump and slide the electrical contact into its location into the filter until it clicks.
6. Feed the connector & cable through the canister lid.
7. Ensure the o-ring is in place on the main line fitting, and press the fitting into to the filter's outlet until the tangs click on both sides.
8. Sit the return line hose fitting into the fitting in the filter, making sure it is engaged fully in the four slots. (The fitting looks like it's part of the fuel system, but it's in fact 'blind').
9. Hold the assembly upside down, and lower the canister onto it, aligned so that the return line engages with the tube in the canister. Press firmly until the clips on the canister lid engage.
10. Reinstall the fuel level sender onto the side of the canister if you removed it.
11. Reconnect the fuel level sender connector on the underside of the top. The sender connector is on the sender side of the top:



12. Recheck the security of all fittings etc, and lower the assembly into the fuel tank (pipes point to the vehicle left side).
13. Hold the top down against the springs, align the holes and install the 6 screws.
14. Put the clamps onto the rubber hoses (I replaced the originals with stainless steel screw type clamps), reconnect to the pipes, and reconnect the pump/sender cable.



Cleaned up, with new stainless steel hose clamps.

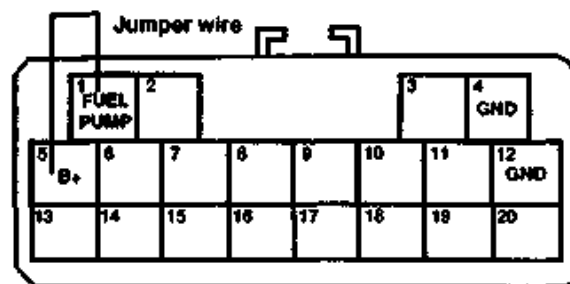
15. Prime the fuel system – see *Priming the fuel system* below.
16. Test drive the vehicle, preferably by driving up a steep, relatively prolonged hill (no better way of ensuring that fuel flow is up to scratch). Make sure the fuel gauge is still working.
17. After checking for leaks, replace the service cover and hatch.

Priming the fuel system

Update: I'm not totally convinced this is necessary. When I turn the ignition on, I can hear the pump run for about 10 seconds. I think the ECU software is set up to run the pump for about that time after the ignition switch is turned on, and this is sufficient to prime and pressurise the system even after its been opened. However, the following is noted anyway as it's in the workshop manual.

After the fuel pressure has been released, the fuel system should be primed to avoid excessive cranking to restart the engine.

1. Make sure all spilled fuel has been cleaned up and the area is well ventilated.
2. Reconnect the negative battery terminal and fuel pump / sender connector.
3. Using a short jumper wire, connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of the Diagnostics connector in the right front of the engine compartment. This will apply power to the fuel pump as soon as the ignition is turned on (i.e. it bypasses the ECU-controlled fuel pump relay). See connector diagram below:



View of diagnostic connector near radiator ca (Kia diagrams are 'upside down' from this perspective).

4. Turn Ignition ON for no longer than 10 seconds. This will pressurize the system. The FL manual contains a note "Jumper wire gets if it is left in for longer than 10 seconds" – obviously a word missing there – 'hot' perhaps? It didn't get hot for me.

5. Once pressurised, check all fuel lines that have been opened for fuel leaks.
6. Remove the jumper wire.
7. Start the engine and check the fuel lines again for leaks.

Revisions

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|----|-----------|--|
| V1 | 09 Oct 12 | Original |
| V2 | 24 Nov 12 | Updated due to advice from ClassicBoy that this does not apply to earlier models.
Added a note that the priming procedure may not be necessary.
Changed 'pre-filter' to 'screen' for consistent terminology. |