

Chapter 9. VAZ-21213 vehicle modifications, alternative and additional equipment

VAZ-21214 vehicle

The VAZ-21214 vehicle is fitted with 1.7-L engine, Central Fuel Injection (CFI). Instead of the carburettor, a single injector is used for injecting fuel into the central injection unit. Here fuel is mixed with air, the resulting combustion mixture is fed to the intake manifold and further to the engine cylinders.

The fuel injection system and catalytic converter in the exhaust system help reduce exhaust emission and improve vehicle performance.

This chapter provides a brief description of design features, operation and diagnostics of fuel injection system, removal and refitting procedures and methods for engine repair. Refer to Repair Manual for Central Fuel Injection System for a more detailed description of the system design, repair and diagnostics with the help of specialized tools and diagnostic charts.

Engine repair - description

Engine - removal and refitting

Before removing the engine, depressurize the fuel system. To do this, detach the fuel pump wiring plug from the injection wiring connector, start the engine, run it for a while, then stop the engine and operate the starter motor for 3 seconds to equalize the pressure in the line.

Disconnect the battery negative lead.

Slacken the nuts holding the air cleaner to the central injection unit and to the pin in the valve cover, detach the relevant hoses and remove the air cleaner. Detach the injector wiring; then temporarily plug the filler neck of the central injection unit.

Disconnect the fuel supply/return hoses from the pipes on the engine. Plug the open ends of the hoses and pipes to prevent dirt ingress or fuel leaking.

Disconnect the throttle cable from the central injection unit and from the bracket on the intake manifold.

On the central injection unit disconnect all vacuum hoses to the charcoal canister and MAP sensor, detach the crankcase vent hose. Disconnect the wiring from all injection-related units fitted to the engine.

Further steps for removing the engine are in accordance with the established procedure.

Refitting is the reverse order of removal. On completion adjust

the accelerator cable and check the operation of fuel injection system, as recommended in Repair Manual for Central Fuel Injection.

Engine - dismantling and reassembly

Remove bracket 3 (Fig.9-1) with ignition module 4, then plug 2 with gasket and detent 1 with the sealing ring.

Disconnect and remove the supply/return pipes from the central injection unit and from the bracket on the valve cover.

Undo the retaining pins and remove the central injection unit, withdraw the gasket from the intake pipe surface.

Remove intake manifold 2 (Fig.9-2) with preheater 1. When applicable, on a work bench, detach the preheater complete with the gasket and sealing ring from the intake manifold.

Unscrew the crankshaft position sensor, mounted on the timing cover.

Further dismantling of the engine is carried out in the usual order as outlined in section 2.

Reassembly is the reversal of dismantling. There is a disposal gasket under the central injection unit, always remember to renew it during reassembly.

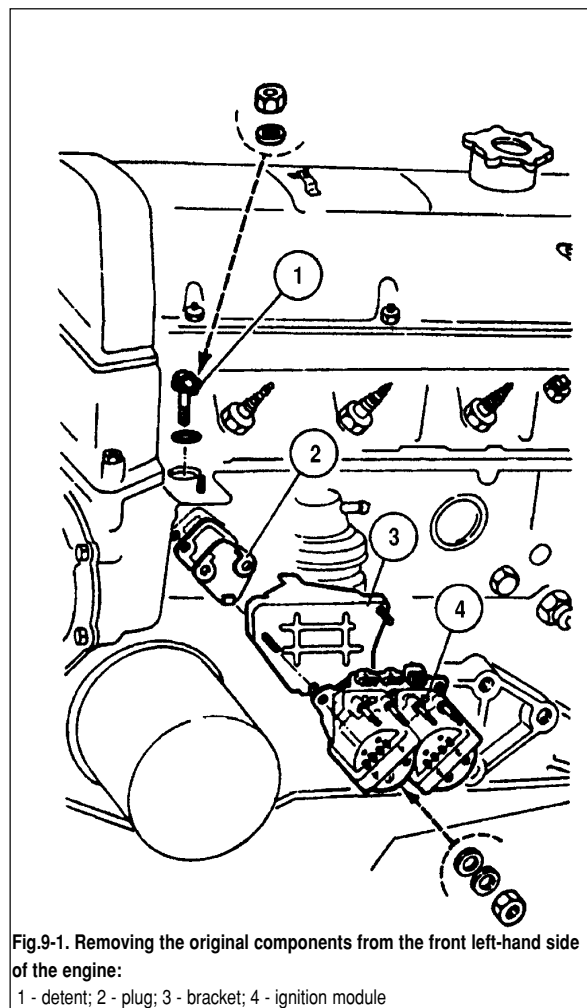


Fig.9-1. Removing the original components from the front left-hand side of the engine:

1 - detent; 2 - plug; 3 - bracket; 4 - ignition module

Central Injection Unit

Removal and refitting

Select the neutral position of the gearchange lever and apply the handbrake.

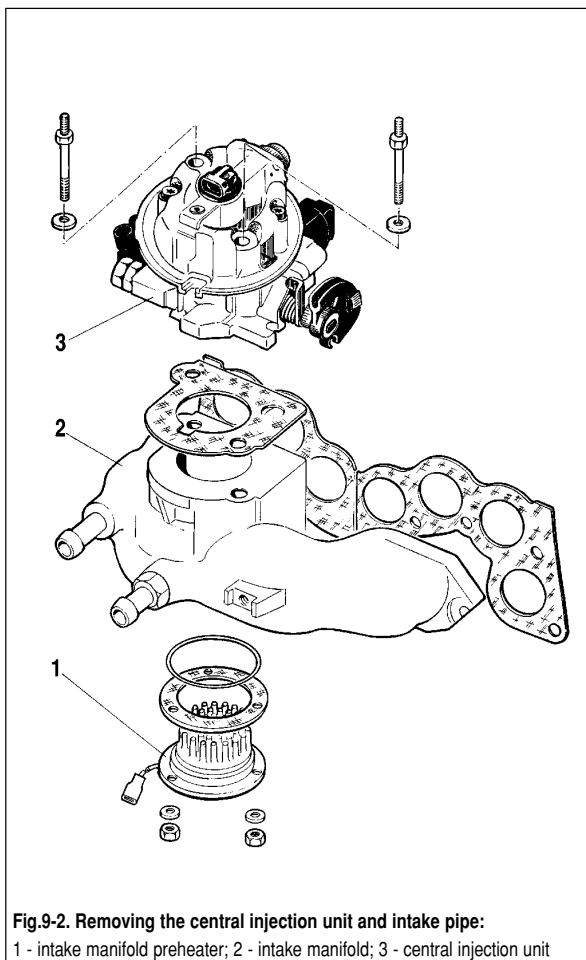
Since, after the engine is stalled, fuel remains under pressure, always depressurize the fuel system. To do this, disconnect the fuel pump wiring plug from the injection wiring harness. Start the engine and run it until it cuts off. Operate the starter motor for three seconds to equalize pressure in the pipework. Reconnect the fuel pump wiring plug to the injection wiring harness. Disconnect the battery negative lead.

Remove the air cleaner and disconnect the throttle cable from the central injection unit.

Detach the fuel pipes from the central injection unit and plug the pipe ends to prevent fuel leakage.

Disconnect the wiring plug (Fig.9-3) of throttle position sensor 4, injector 2 and idle air control valve 9.

On the central injection unit detach the vacuum hoses to the canister and MAP sender, along with the crankcase vent hose. Make certain everything is reconnected properly.



Undo the retaining pins and remove the central injection unit from the intake pipe complete with the gasket. Plug the intake pipe end to prevent entry of extraneous matter.

Refitting is the reverse order of removing. Pay attention to the condition of the seals and gaskets, renew if applicable.

On completion, check the fuel pressure as described below.

WARNING. Never re-use the gasket mounted under the central injection unit and sealing rings of fuel pipes.

Dismantling and reassembly.

Undo the retaining screws and remove throttle position (TP) sensor 10 (Fig. 9-4), injector 6, fuel pressure regulator, vacuum hose manifold housing 13 and idle air control valve 14.

Undo two retaining screws and disconnect the fuel supply part from the throttle housing.

Reassembly is a reverse of dismantling. Examine the seals, renew if applicable. When refitting the TP sensor, align the throttle shaft flats with the TP sensor pickup lever.

Examination and repair

Injector is a one-piece unit. When removing the injector, take care not to damage the wiring plug or atomizer head.

WARNING. Never clean or wash the injector with petrol or other cleaners.

Renew the injector seals. In the event of deposits on the injector filters (the major diameter filter is a purge filter, while the minor diameter filter is an intake filter), blow the filters with compressed air, then flush the fuel tank and fuel pipes.

Apply sealant on the retainer screw thread when refitting the injector.

Fuel pressure regulator. Remember that the spring under the regulator cover is compressed, so exercise care when unscrewing the cover.

When the regulator is removed, examine the valve seats, use a magnifying glass if necessary. The seat must not show any pitting, dents or surface irregularities, otherwise renew the fuel supply housing of the central injection unit.

It is recommended to renew the valve diaphragm after each dismantling. Always smear the thread of the regulator cover securing screw with sealant.

WARNING. When refitting the fuel pressure regulator check to see the diaphragm sits correctly without skewing.

Fuel supply housing of central injection unit. During reassembly of the central injection unit always renew the gasket between the fuel supply housings and throttle plate. Cut-outs in the gasket should be aligned with the bores in the throttle plate.

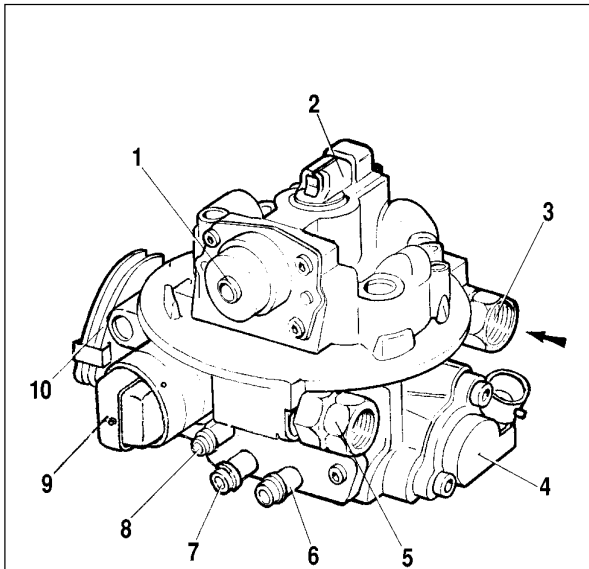


Fig.9-3. Central injection unit:

1 - fuel pressure gauge; 2 - injector; 3 - connection for fuel delivery pipe; 4 - throttle position sensor; 5 - connection for fuel return hose to tank; 6 - pipe union for canister purge hose; 7 - pipe union for crankcase vent hose; 8 - pipe union for MAP sensor hose; 9 - idle air control valve; 10 - quadrant for throttle actuation from pedal in the passenger compartment

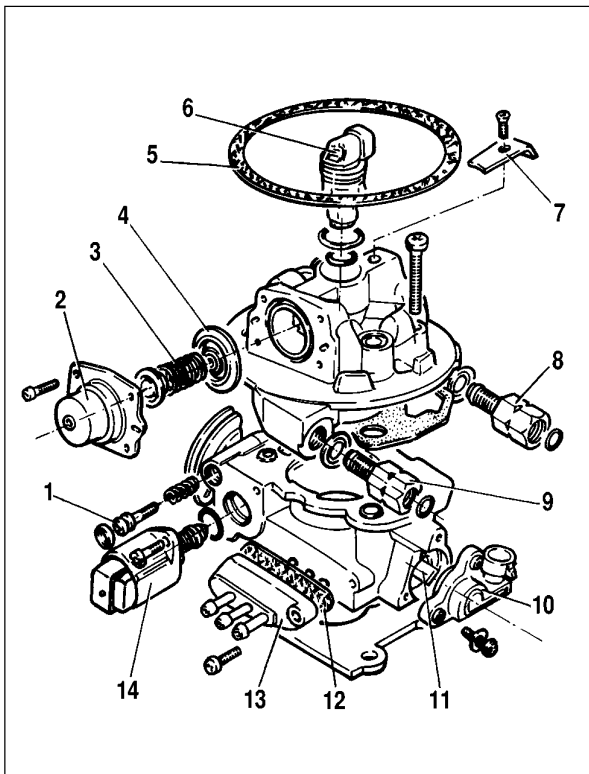


Fig.9-4. Components and assemblies of central injection unit:

1 - throttle stop screw (preset at the factory); 2 - fuel pressure regulator cover; 3 - spring; 4 - diaphragm; 5 - air cleaner gasket; 6 - injector; 7 - holder; 8 - fuel delivery pipe union; 9 - fuel return pipe union; 10 - throttle position sensor; 11 - throttle shaft; 12 - grommet; 13 - vacuum pipes housing; 14 - idle air control valve

Apply sealant on the thread of the housing securing screws.

Throttle position sensor. Before fitting the TP sensor, fully close the throttle, then turning the sensor anticlockwise, align the flats of the shaft with the sensor pickup lever.

Tighten the securing screws.

WARNING. Never clean or wash the TP sensor or idle air control valve with petrol or other cleaners.

Idle air control valve. Replace the sealing washers with new ones. The idle air control valve is of a taper shape, 10 mm diameter. Always replace it with a new valve of the respective model.

Before fitting the idle air control valve to the throttle housing, check the distance between the mounting flange and valve end. Remember, an excess protrusion of the valve can cause damages.

The distance should be less than 23 mm. When with a new idle air control valve it is in excess of 23 mm, sway the valve with your hand, pushing it in.

To avoid damage, do not hand push the valve which was in use. For this purpose it is recommended to use a diagnostic tool or specialized monitor.

After having refitted the idle air control valve and central injection unit, reconnect a diagnostic tool to the diagnostic plug and command the ECM to reset the parameters of the idle air control valve.

Throttle housing. When reassembling the central injection unit, it is a good practice to renew the sealing gasket of the fuel supply housing.

Scrape the gasket from the throttle housing and vacuum housing, fit a new gasket.

Fuel supply pressure - checking

Carry out the following checks: inspect the fuel delivery lines for leaks, check the fuel pressure regulator and electric fuel pump for satisfactory operation.

Relief the pressure in the fuel line, as described earlier for removal of the central injection unit.

Reconnect the wiring plug to the fuel pump.

Disconnect the fuel pipe from the fuel supply pipe union of the central injection unit, then using a T-piece connect a pressure gauge between the pipe union and fuel pipe.

Turn the ignition key to the position «Ignition».

Check the pressure gauge is functional, check its connection shows no leaks. The pressure should be within 190-210 kPa. When there is no pressure, listen to hear the fuel pump cuts in when the ignition key is turned to the position «Ignition» (the pump operation and its relay clicks can be distinctly heard in the passenger compartment).

Should the fuel pump fails to operate, check the pump circuit.

After two seconds of operation the fuel pump shuts off, as no

crankshaft position pulses are fed to the ECU when the engine is not running. To re-activate the fuel pump, switch off the ignition for ten seconds, then switch it on again.

After the fuel pump is shut off, the fuel pressure can slightly go down and then stabilizes; or it can go up, if the engine is warm. When the fuel pressure fails to stabilize and instead, goes down, operate the fuel pump and immediately after its stop, pinch the hose that supplies fuel to the central injection unit.

If no pressure drop is evident, check the fuel line for leaks between the fuel tank and central injection unit, check the gauze filter for tightness, then re-check pressure in the fuel delivery system.

A lower pressure (below 190 kPa) can be caused by a faulty fuel pressure regulator or by a restricted flow in the fuel delivery system.

The fuel delivery system capacity can be checked by return flow. When necessary, renew the gauze filter.

The fuel pressure regulator can be checked by a pressure gauge; for that disconnect the return hose and immerse it into a container. Operate the electric fuel pump, pinch the return hose and check the pump pressure by the pressure gauge. Release the hose. The pressure gauge reading is the pressure of the fuel pressure regulator valve actuation. Renew the fuel pressure regulator when applicable.

A higher pressure in the fuel supply system (in excess of 210 kPa) can be caused by a faulty fuel pressure regulator or a higher resistance to fuel return to the fuel tank. To check this, connect a pressure gauge to the system; then working in the engine bay, disconnect the return hose and immerse it to the container. Switch off the electric fuel pump and read the pressure gauge to check the pressure.

Should the pressure exceeds the normal value, renew the fuel pressure regulator, otherwise, identify and eliminate the cause of higher resistance to fuel return.

Electric fuel pump

Removal and refitting. Disconnect the wiring and depressurize the fuel delivery system as described in the procedure for removing the central injection unit.

Disconnect the fuel pipes from the fuel pump and undo the nuts holding it to the fuel tank. Withdraw the fuel pump unit from the fuel tank.

Refitting is a reversal of the removal procedure.

The electric pump cannot be dismantled or repaired. In case of failure, always replace it with a new one.

Evaporative emission control system

Examine the hoses and charcoal canister. If the housing is found cracked or damaged, renew the charcoal canister.

If leakage is evident, check the hose connections for tightness. Renew a leaking canister.

Electrical equipment

Refer to Fig.9-5 for electric wiring diagram that is complemented with the injection wiring harness routed between the injection electronic control unit (ECU) and various sensors and injection system actuators.

Through a separate connector, three wires of the injection wiring harness are linked to the low tension (LT) input of the tachometer in the instrument cluster, to the «CHECK ENGINE» lamp and terminal «15» of the ignition switch.

There are five fuses in the injection wiring harness.

Fuse 16 (50 amperes) is housed separately. It protects the intake manifold preheater. The remaining four fuses (15 amperes each) are located in a separate fusebox 17, on the left-hand side, under the facia console.

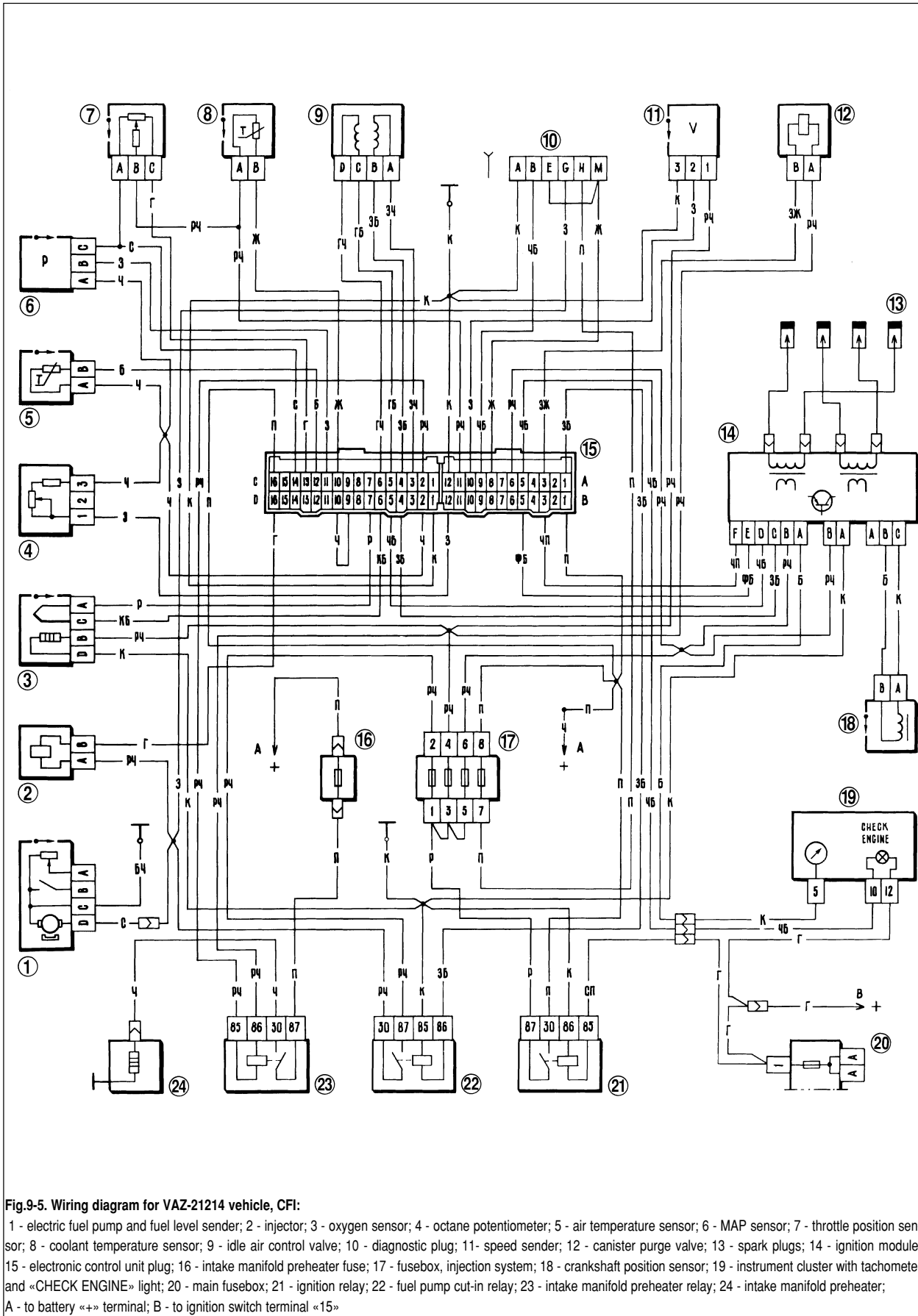
Refer to Table 9-1 for detailed information on the circuits fused.

Table 9-1

Injection system protective fuses

Fuse	Circuits protected
1-2	Fuel pump «on» relay (contacts) Electric fuel pump. Fuel injector.
3-4	Oxygen sensor. Vehicle speed sender. Canister valve. Intake manifold preheater relay (winding).
5-6	ECU. Ignition control module.
7-8	Reserve

In addition to fuses, there is «a fusible link» at the end of the red wire connected to the battery. This fusible link represents a length of black wire of 1 mm² cross-section, whereas the main red wire is of 6 mm² cross-section.



VAZ-21214-20 vehicle

The VAZ-21214-20 vehicle is fitted with a 1.7-L engine, Sequential Fuel Injection.

Engine 21214-10

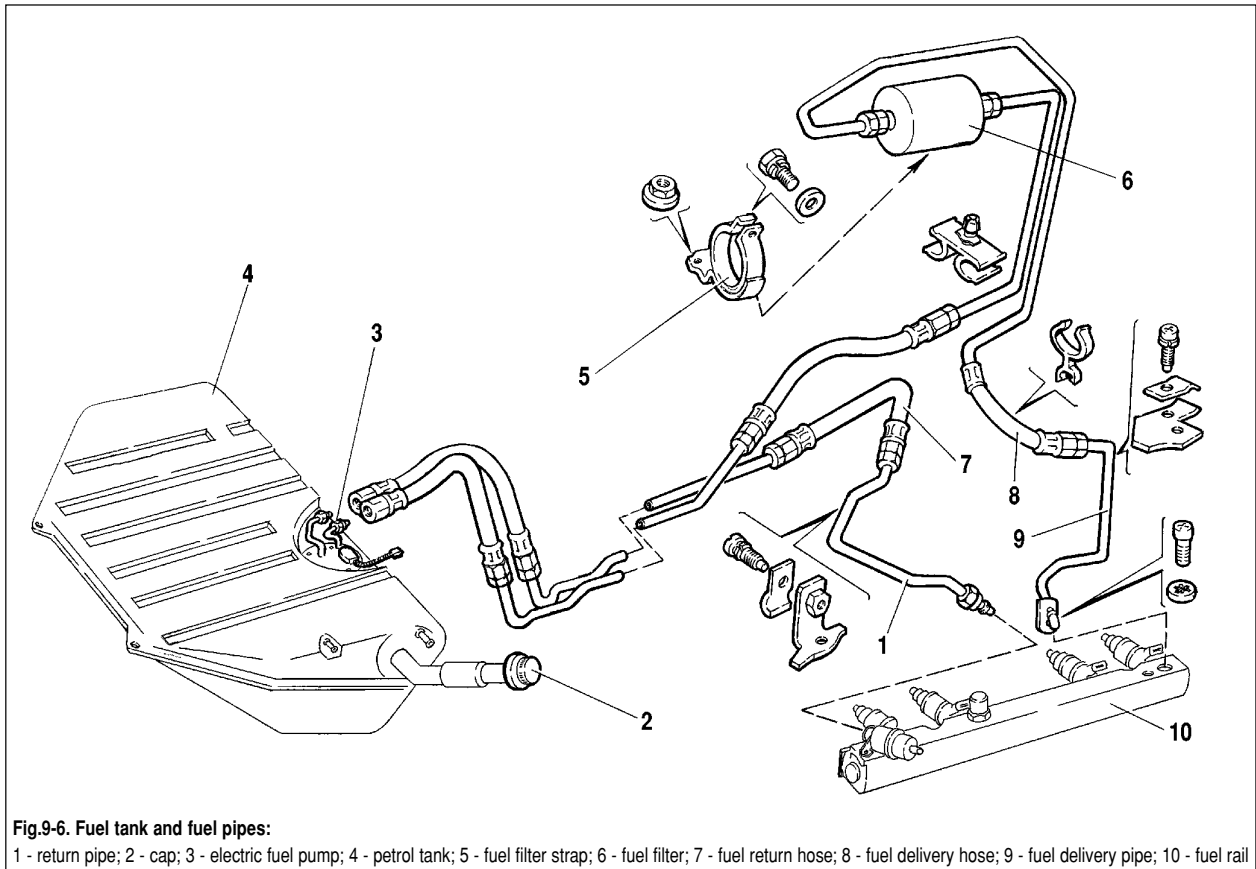
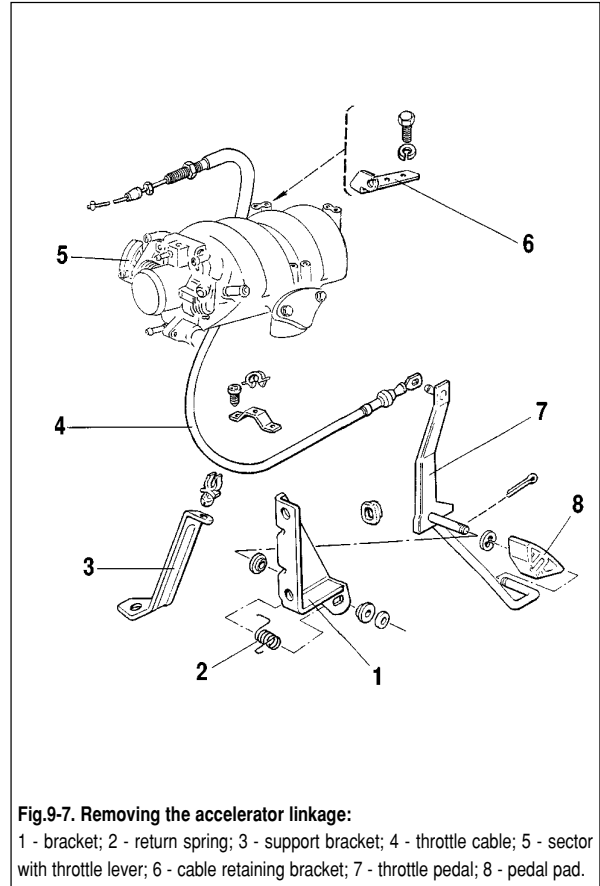
The engine 21214-10 is four-stroke, four-cylinder, in-line, SOHC, with Sequential Fuel Injection System.

The 21214-10 engine is based on the 21213 engine. Both engines have similar housing components, piston / connection rod mechanism and power unit mounting. The differences include the sequential ignition system used instead of the carburettor, the hydraulic valve lifters and hydraulic chain tensioner in the valve timing gear. All this results in different engine dismantling and reassembly, with respect to removal and refitting of air supply units, fuel metering system and lubrication system.

Power unit - removal and refitting

Before removing the power unit, depressurize the fuel supply system. For that disconnect the fuel pump wiring plug from the injection wiring harness, operate the engine, let it run until it stops, then operate the starter for three seconds to equalize pressure in the fuel lines.

Disconnect the battery negative lead.



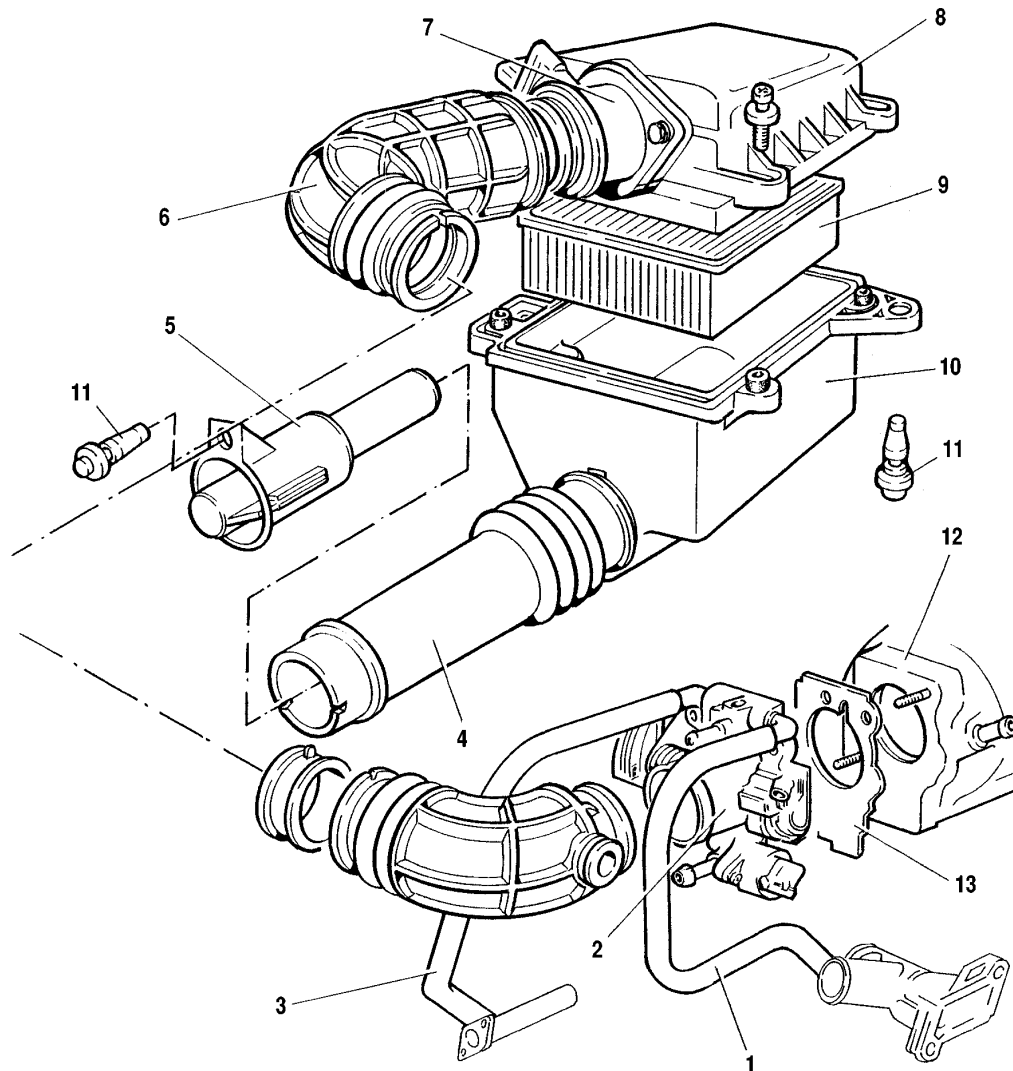


Fig.9-8. Removing the components and units of air intake system:

1 - part throttle channel heater hose; 2 - throttle body; 3 - return hose from throttle body; 4 - air intake; 5 - air intake end piece; 6 - intake manifold hose; 7 - MAF sensor; 8 - air cleaner cover; 9 - filtering element; 10 - air filter housing; 11 - filter mounting; 12 - receiver unit; 13 - gasket

Disconnect hoses 7 and 8 (supply and return) (Fig.9-6) from pipes 1 and 9. Plug the hose / pipe ends to prevent dirt ingress.

Disconnect accelerator cable 4 (Fig.9-7) from sector 6 on the throttle hosing, bracket 5 on the receiver unit and from bracket 3 on valve cover.

Disconnect the crankcase evap hose from hose 6 (Fig.9-8) connection, loosen two clips and remove hose 6 of the intake manifold. Cut off three rubber mountings 11 holding the air cleaner to the body and one mounting that retains the cold air intake end to the radiator, remove the air cleaner complete with mass air flow meter 7.

From the receiver unit disconnect the vacuum hose to the fuel pressure regulator and to the brake servo unit.

Disconnect the canister purge hose from the throttle housing (when the vehicle is fitted with the evaporative emission control system).

Disconnect the wiring from the throttle manifold, ignition module, injector wiring harness, all relevant sensors on the power unit and from reversing light switch on the transmission.

Next proceed with the usual removal procedure as described in chapter 2.

Refitting is the reverse order of removal. The rubber mountings of the air cleaner are disposal, so new mountings must be fitted when refitting the air cleaner.

After refitting the power unit, adjust the accelerator drive. At fully released accelerator pedal 7 (Fig. 9-7), the throttle should be fully closed. The cable should be taut. The cable deflection by hand force should be 10 mm as a maximum. When necessary, adjust the cable tension using the adjuster nuts at the cable end.

At fully depressed accelerator pedal, the throttle should be wide open, throttle sector 6 should have no further movement.

Check the injection system for satisfactory operation, as outlined in Repair Manual for Fuel Sequential Injection System.

Engine - dismantling and reassembly

The main differences on dismantling and reassembly are related to alternative design of the air supply system.

Mount the engine on the test bench, drain oil from the oil pan, dismantle the engine in the order described below.

Disconnect supply 1/return 3 coolant hoses (Fig.9-8) and idle crankcase vent hose from throttle manifold 2. Undo the nuts holding the throttle housing to receiver unit 12 and withdraw the throttle housing with gasket 13.

Disconnect and remove supply 9/return 1 fuel pipes (Fig.9-6) from fuel rail 10, fuel pressure regulator and from the bracket on the receiver unit. Detach and remove vacuum hose 6 (Fig.9-9) from receiver unit 8 and fuel pressure regulator 5.

Undo five nuts holding the receiver unit to intake pipe 1 and withdraw the receiver unit complete with gasket 7.

Disconnect the wiring from the injectors, withdraw fuel rail 4 with pressure regulator 5, having undone two bolts 3 holding it to the intake pipe. Undo retaining nuts and bolts, withdraw the brackets, followed by the intake pipe with the shield. Detach the ignition module and knock sensor from the left-hand side of the engine.

Further engine dismantling is as described in chapter 2 of this Manual. The engine reassembly is reverse of the dismantling procedure. Before refitting the fuel rail, lubricate the injector sealing rings with motor oil.

Valve mechanism - design description

Valves 2 (Fig.9-10) are operated by the cams through rocker arms 3. One end of the lever presses down the valve, while the other end rests on the spherical head of the hydraulic lifter. The hydraulic lifters automatically eliminate the clearance in the valve train, so during technical service you do not need to check or adjust the valve clearances.

Lubricating oil through pipe 3 (Fig.9-11) flows to the tensioner cavity «E» (Fig. 9-12), through the bore «Д» and valve unit 2 into the working cavity «B» pushing down plunger 5. Tensioner housing 1 has a 1 mm bore to release air in the cavity «E».

The diameter clearance between housing 1 and plunger 5 should be 0.018-0.024 mm and is measured as a difference between the maximum measured diameter of plunger 5 and minimum measured diameter of housing 1.

The tensioner housing and plunger make a unit, where no replacement of either part is allowed once the clearance has been selected. Plunger 5 should easily stroke within housing 1 up to 16 mm.

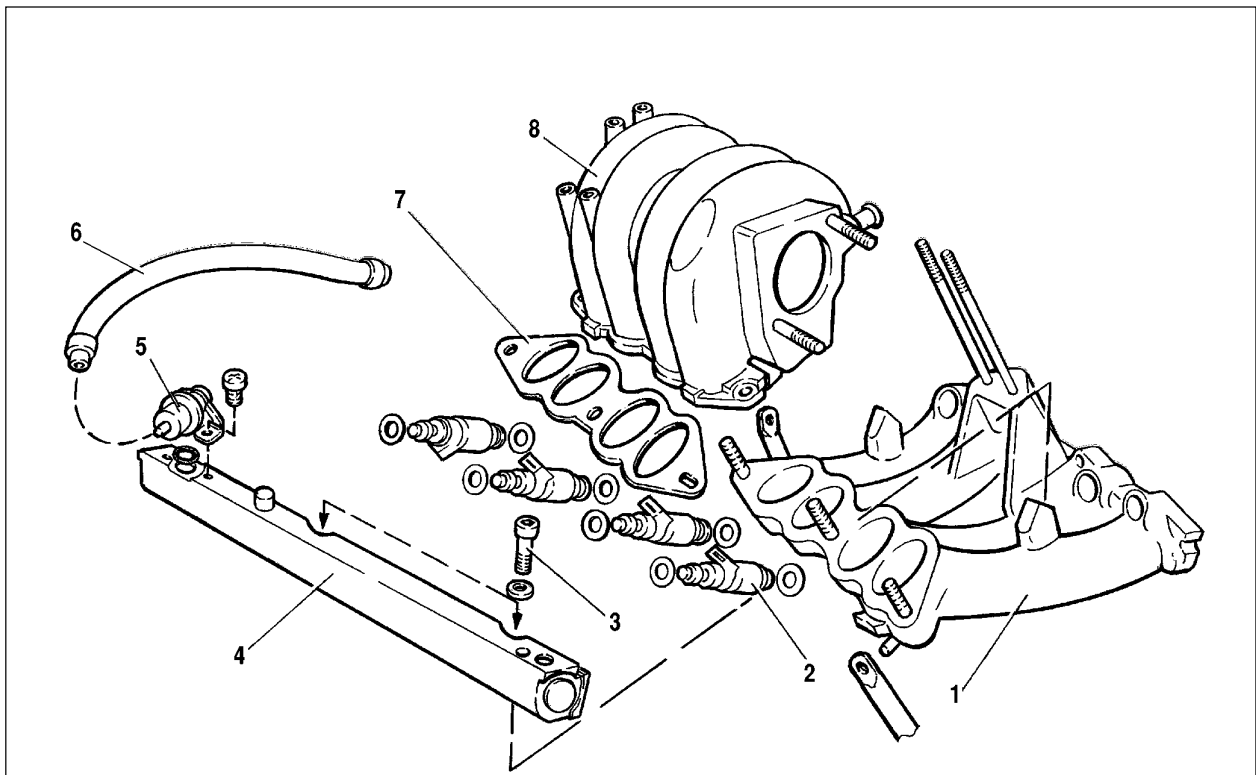


Fig.9-9. Removing the fuel system components:

1 - intake manifold; 2 - injector; 3 - bolt; 4 - fuel rail; 5 - fuel pressure regulator; 6 - vacuum hose; 7 - gasket; 8 - receiver unit

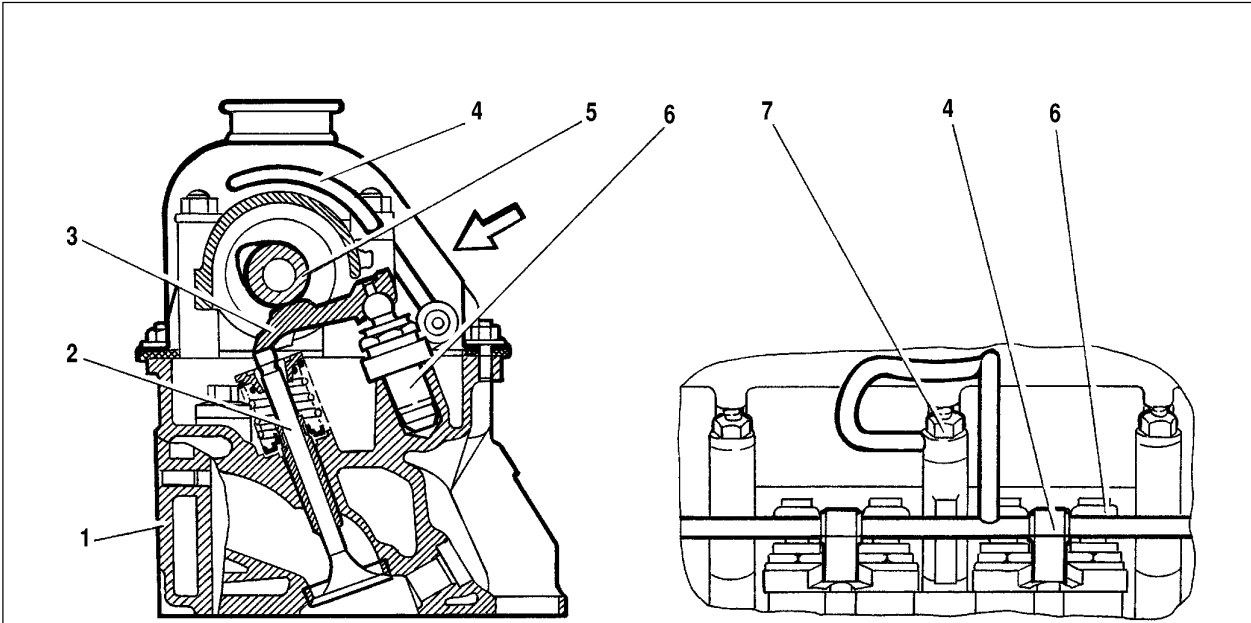


Fig.9-10. Valve actuation:

1 - cylinder head; 2 - valve; 3 - valve lever; 4 - rail, hydraulic valve lifter; 5 - camshaft; 6 - hydraulic valve lifter; 7 - nut

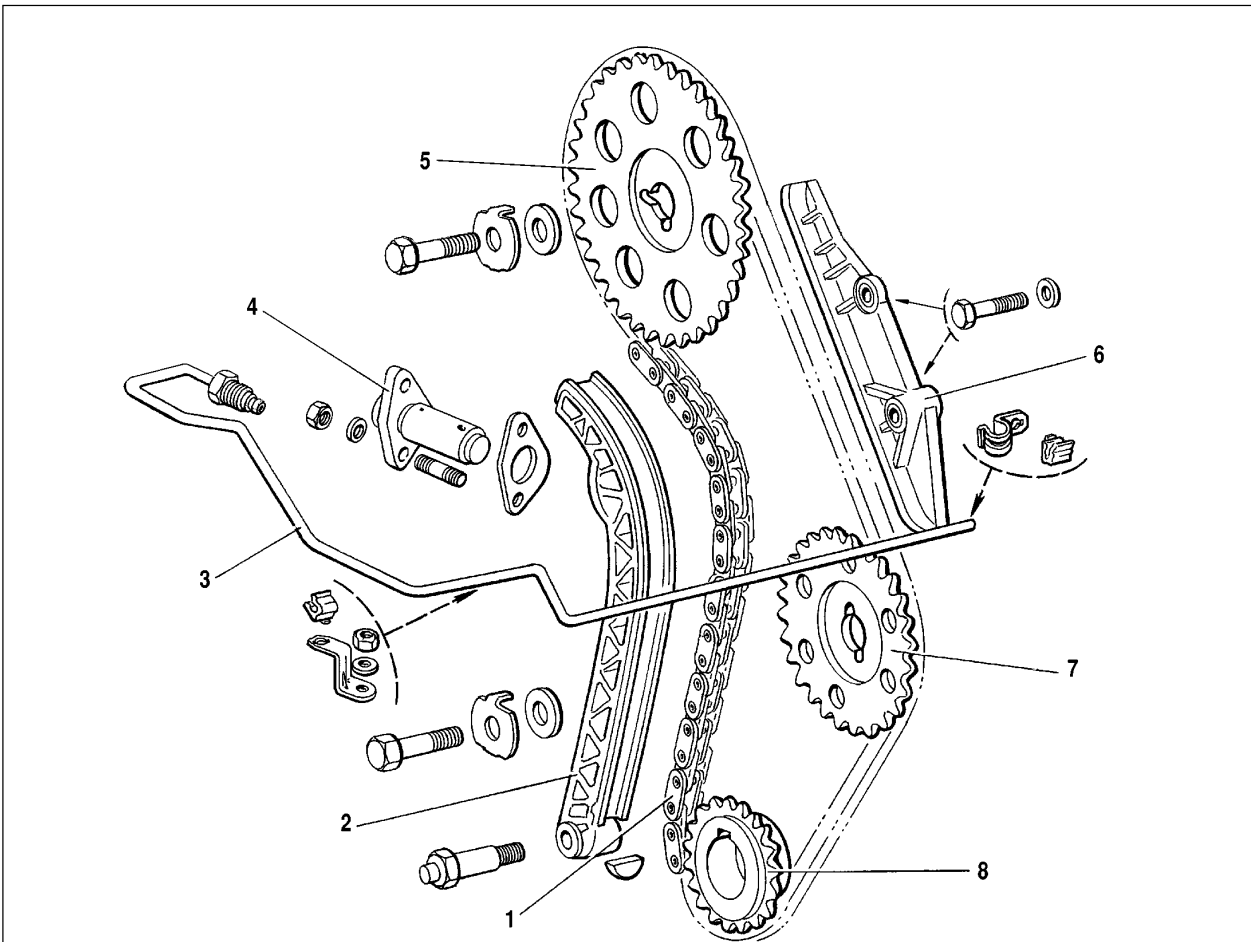


Fig.9-11. Exploded view of chain tensioner:

1 - chain; 2 - tensioner shoe; 3 - oil delivery pipe to tensioner; 4 - chain tensioner; 5 - camshaft sprocket; 6 - chain damper; 7 - oil pump shaft sprocket; 8 - crankshaft sprocket

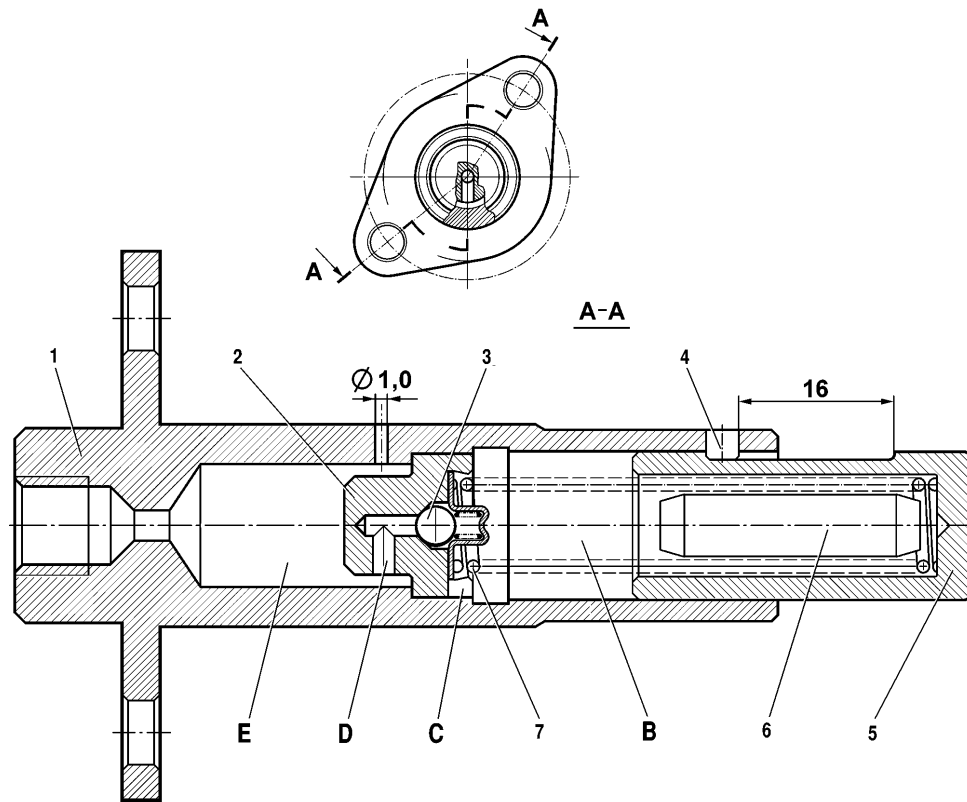


Fig.9-12. Hydraulic chain tensioner:
 1 - tensioner housing; 2 - valve unit; 3 - ball, non-return valve; 4 - stop pin; 5 - plunger; 6 - volume restrictor; 7 - spring;
 B - working cavity; C - locating slot; D - hole; E - reserve cavity

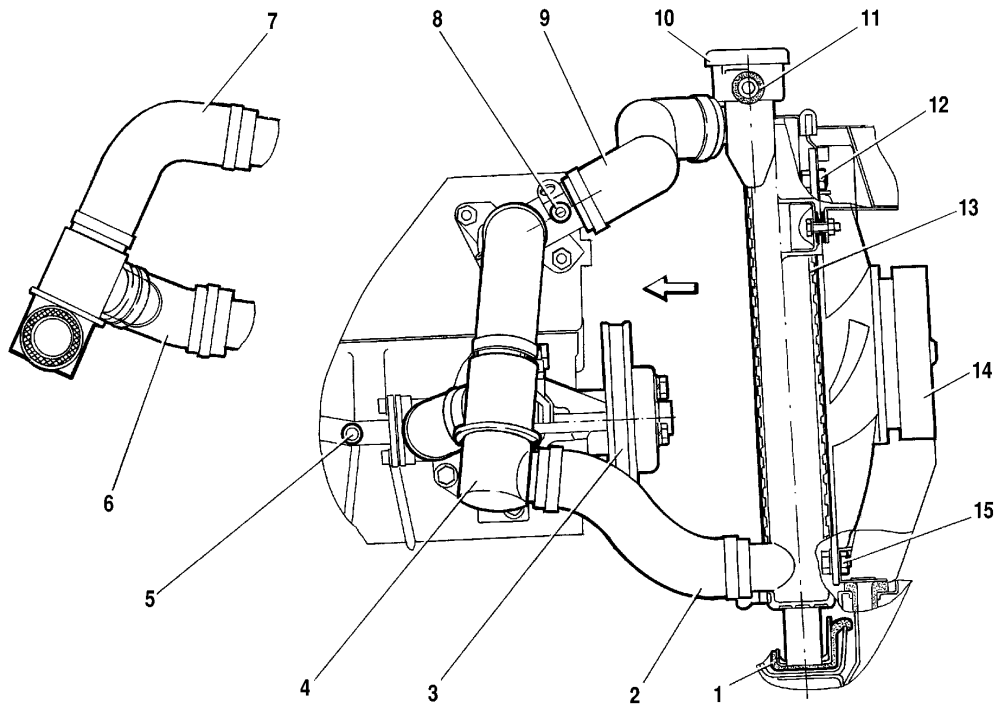


Fig.9-13. Cooling system:
 1 - radiator pad; 2 - radiator return hose; 3 - water pump pulley; 4 - thermostat; 5 - drain pipe from throttle housing; 6 - coolant delivery hose to pump; 7 - transfer hose, thermostat; 8 - coolant delivery pipe for part throttle channel preheating; 9 - radiator delivery hose; 10 - radiator cap; 11 - hose between radiator and expansion tank; 12 - top fan cowl securing nut; 13 - radiator; 14 - electric fan; 15 - bottom fan cowl securing nut

When refitting to the engine, the tensioner should be free from oil, dowel 4 should not protrude from the housing.

Cooling system

The cooling system features two electric fans 14 (Fig.9-13). The fan cowl is mounted in front of the radiator and is held by two top 12 and two bottom 15 nuts.

The introduction of the throttle housing in the cooling system has necessitated its heating-up by delivery of coolant via hose 8 from the cylinder head return pipe. The coolant is returned through hose 5 which connects the throttle housing to the heater matrix return pipe.

The cooling fan motor is operated by the electronic control unit, so there is no fan blower «cut-in» sensor.

Fuel system

The fuel system is within the Engine Management System (EMS) which is described in detail in a separate Repair and Service Manual for EMS, Sequential Fuel Injection, therefore this section describes only removal, refitting and replacement of the air cleaner filter element.

The air filter is mounted at the front right-hand side of the engine bay on three rubber mountings 11 (Fig.9-8).

Fresh air through air intake 5 and pipe 4 is drawn into air

cleaner housing 10. The air then flows through paper filter element 9, MAF sensor 7, hose 6 and throttle housing 2. From the throttle housing the warm air is directed to receiver unit 12 and intake pipe and further to the cylinder head and cylinders.

Filter element - renewal

1. Undo four retaining bolts, remove air cleaner cover 8 complete with MAF sensor 7 and intake pipe hose 6.
2. Renew filter element 9 so that its corrugation is parallel to the vehicle axial line.
3. Refit and secure the air cleaner cover.

Crankcase ventilation system

Draught ventilation is provided to expel crankcase gases and fuel vapours into the engine intake pipe.

Crankcase gases are drawn through hose 1 (Fig.9-14) into the intake pipe hose and further via the throttle housing and receiver unit into the intake pipe.

At low rpm and closed throttle, most of crankcase gases are drawn along hose 2 to the throttle housing.

Flushing. To flush the system disconnect vent hoses 1 and 2 from the intake pipe hose and throttle housing 3. Remove oil separator 8 cover 5 and wash both units with petrol or kerosine. Flush and blow with compressed air all hoses and connectors.

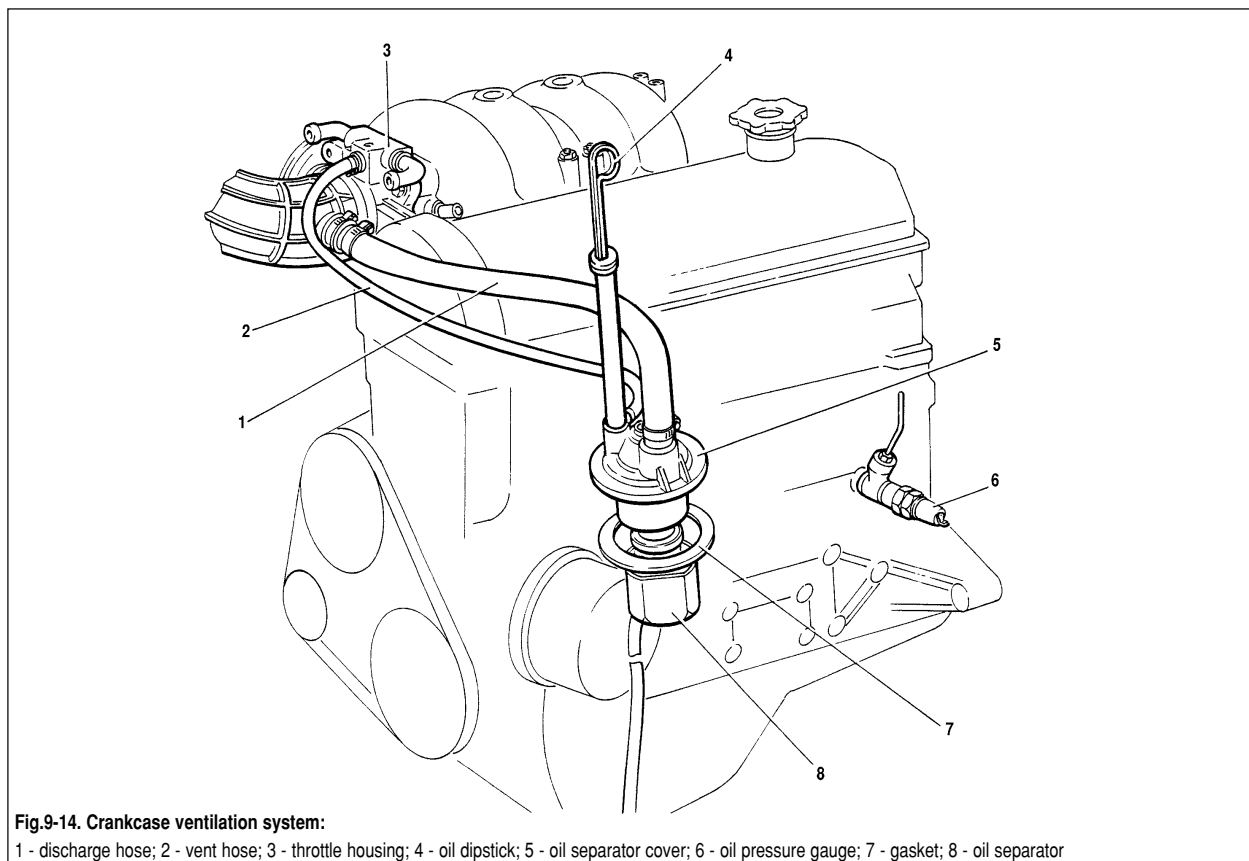


Fig.9-14. Crankcase ventilation system:

1 - discharge hose; 2 - vent hose; 3 - throttle housing; 4 - oil dipstick; 5 - oil separator cover; 6 - oil pressure gauge; 7 - gasket; 8 - oil separator

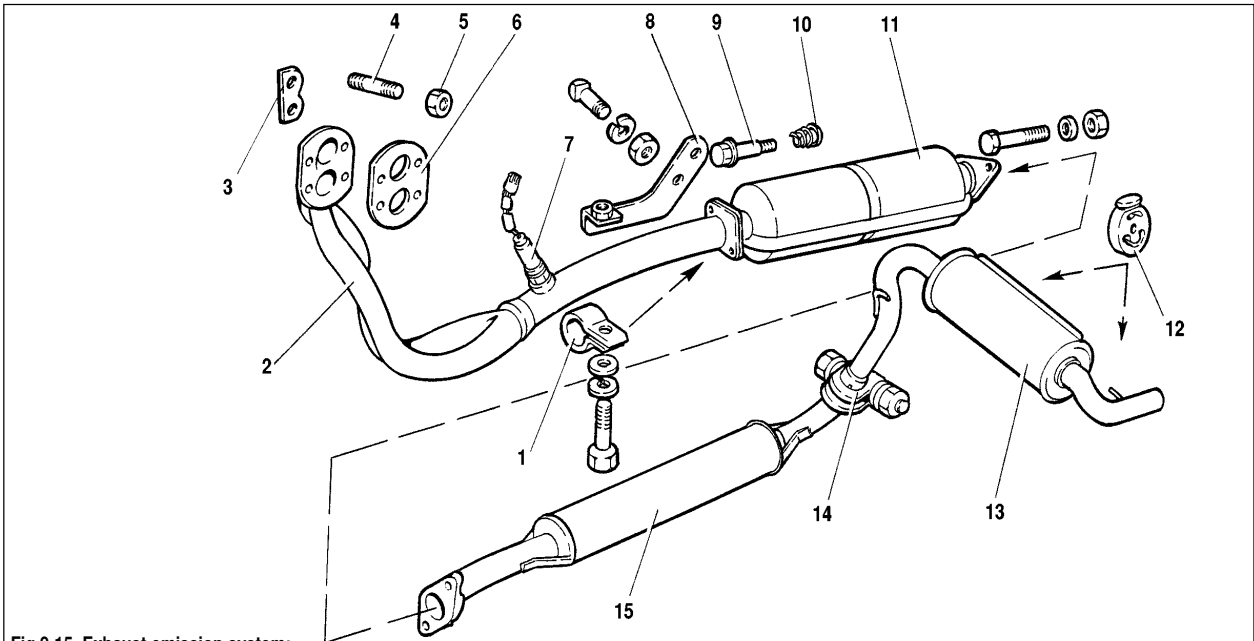


Fig.9-15. Exhaust emission system:

1 - clasp; 2 - front exhaust pipe; 3 - lock plate; 4 - pin; 5 - nut; 6 - gasket; 7 - oxygen sensor; 8 - bracket; 9 - bolt; 10 - conical string; 11 - catalytic converter; 12 - suspension loop; 13 - main silencer; 14 - clip; 15 - front silencer

Exhaust emission system

Exhaust gases are drawn from the engine through the exhaust manifold, front exhaust pipe 2 (Fig.9-15), catalytic converter 11, front silencer 15 and main silencer 13.

The downpipe is connected to the catalytic converter flange by means of a movable joint. Between the flanges there is a metal-graphite ring with a spherical surface.

Downpipe 2 is secured with nuts 5 onto exhaust manifold studs 4, gasket 6 is fitted between them. Lock plates 3 are placed under the nuts. The other end of the downpipe by means of clasp 1 is secured to bracket 8, fitted to the transmission cover.

Main silencer 13 is attached to the underbody by two suspension loops 12.

The silencers complete with pipes represent single units and should be renewed as such during repair.

Electrical system

An EMS wiring harness is added to the vehicle electrical system (Fig.9-16) to connect the ECU with EMS sensors and actuators. No headlamp wipe/wash is fitted to VAZ 21214-20 vehicle.

Three wires of the EMS wiring harness through a separate plug are connected to the tachometer LT input in the instrument cluster, to «CHECK ENGINE» lamp and to ignition switch terminal «15».

There are four fuses in the EMS wiring harness. They are located in a separate fusebox 26, underneath the left-hand end trim cover. Refer to Table 9-2 for details.

Table 9-2

Injection system fuses

Fuse	Circuits protected
1-2	Electric fuel pump relay (contacts). Electric fuel pump.
3-4	ECU.
5-6	Main relay (contacts). Oxygen sensor. Vehicle speed sender. Canister purge solenoid. Electric fuel pump relay (winding). Electrical fan blower relay (winding). ECM. MAF meter. Injection wiring harness.
7-8	Electric fan blower relay (contacts). Electric fans.

Besides the fuses there is «a fusible link» at the end of red wire, which is connected to the battery «+» terminal. The «fusible link» represents a length of black wire of 1 mm² cross-section, whereas the main red wire is 6 mm² cross-section.

Cooling fan motors. The cooling fans are operated by two dc motors (MP 8015 model) on permanent magnets.

The motors are triggered by EMS ECU via a relay. With the engine running the relay cuts in when the coolant temperature exceeds 105°C or cuts off when the coolant temperature goes below 101°C.

The motors are maintenance-free and must be renewed in case of failure.

Motor specification

Nominal shaft speed with impeller load, rpm 2000 - 2200
 Current consumption at speeds and loads
 as specified, amperes, not greater 15

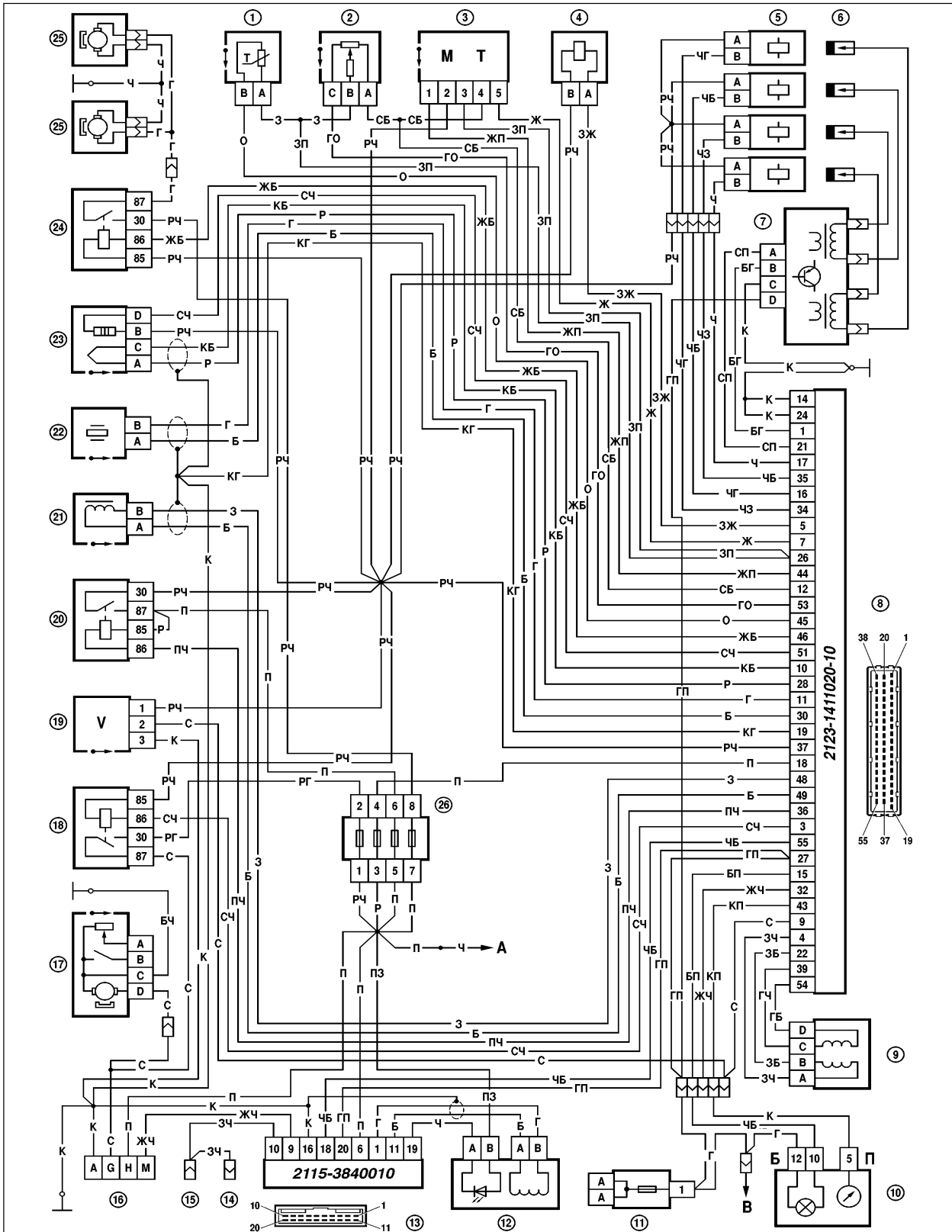


Fig.9-16. EMS wiring diagram (Sequential Fuel Injection), VAZ-21214-20 vehicle:

1 - coolant temperature sensor; 2 - throttle position sensor; 3 - mass airflow meter; 4 - canister purge solenoid; 5 - injectors; 6 - spark plugs; 7 - ignition module; 8 - electronic control unit; 9 - idle air control valve; 10 - instrument cluster with tachometer and CHECK ENGINE light; 11 - main fusebox; 12 - LED, antitheft system; 13 - control module, antitheft system; 14 - to door courtesy light switch; 15 - to interior light switch; 16 - diagnostic plug; 17 - electric fuel pump and fuel level sender; 18 - fuel pump relay; 19 - speed sender; 20 - main relay; 21 - crankshaft position sender; 22 - knock sensor; 23 - oxygen sensor; 24 - fan relay; 25 - electric fans; 26 - injection system fusebox; **A** - to power supply

VAZ-21215-10 vehicle

The VAZ-21215-10 vehicle is fitted with the diesel engine DHW (XUD-9SD).

The section gives a brief description of diagnostic procedures for fuel and electrical systems, engine removal and refitting, repair procedures for engine systems.

For detailed design, repair and diagnostic procedures with respect to all engine systems using specialized tools and diagnostic charts, refer to PEUGEOT Repair Manual for Diesel Engine.

The diesel engine operation depends much on the sound fuel injection system, this is why this section focuses on the fuel supply units and components.

In the event the injection system has failed, do not blame the high pressure pump, first check the following:

- fuel tank and fuel level;
- delivery and return fuel lines;
- fuel filter;
- injectors;
- glow plugs;
- engine stop solenoid resistance.

Examine the engine, since higher flash-point temperature depends on compression, valve and piston ring condition.

Inspect the air cleaner, battery, starter motor, check the oil level.

Major faults and remedial actions

1. Engine does not start, emitting no smoke:

- check fuel level in fuel tank;
- set engine manual stop device to normal position;
- check fuel delivery pipes; in case of leaks, tighten connections or replace pipes;
- check engine stop solenoid for resistance, wiring conductivity and fuel inflow.

If engine still fails to start after all these checks and remedial actions, remove high pressure pump and test it using specialized equipment.

2. Engine does not start, emitting black smoke:

- when engine speed is below 150 rpm, check condition and fitting of battery terminals and starter motor, battery charge, oil grade and oil level;
- when engine speed is over 150 rpm, start engine without using air cleaner; when no smoke is evident, renew filter element, check proper mounting of air cleaner housing;
- check injection timing is correct, check fuel injectors are sound;
- check valve adjustment and compression in cylinders.

Should smoke persists despite all remedial actions, remove and test pump using specialized equipment.

3. Engine does not start, emitting white smoke (cold engine):

Check the following items:

- glow plugs;
- secondary warming-up system;
- cylinder head gasket;
- injection timing.

If smoke persists after repair work, remove pump for inspection.

4. Difficult cold engine start with black smoke:

Check the following items:

- glow plugs;
- fast idle thermostat;
- injection timing;
- injectors;
- hydraulic lifters and valve clearances;
- compression.

Should smoke persists after repair, remove and test pump using specialist equipment.

5. Engine starts and stalls:

Check the following items:

- idle adjustment;
- oil grade and oil level;
- ventilation system;
- fuel feed system;
- solenoid;
- secondary warming-up system;
- air cleaner;
- non-return valve on LUCAS pump.

Should engine stalls despite repair performed, remove fuel pump.

6. Unstable idle:

Check the following items:

- settings of engine stop prevention system and idle (for LUCAS);
- settings for idle and fuel remainder return (for BOSCH);
- accelerator lever spring;
- fuel feed system;
- injectors;
- valve clearances;
- cam belt tension.

In case of failure to adjust idle speed, remove and examine pump on a specialist test bench.

Engine - removal and refitting

Place the vehicle on the lift or over an inspection pit, chock the front wheels and raise the rear axle from one or both sides.

Withdraw the bonnet, disconnect wiring from the battery and electrical units fitted to the vehicle. Remove the battery and underbonnet lamp.

Drain fluid from the cooling system and heater; to do this unplug the expansion tank, undo the drain plugs on the radiator (underneath, left-hand side) and on the cylinder block (left-hand side).

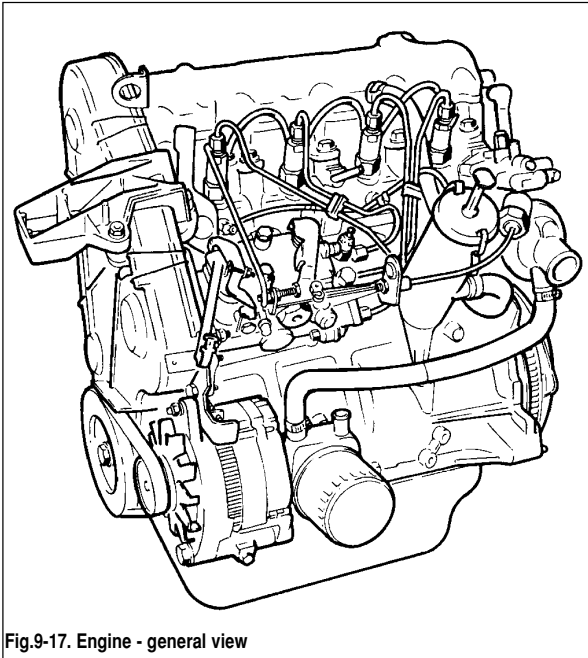


Fig.9-17. Engine - general view

From the engine (Fig.9-17) disconnect the coolant supply and return hoses, remove the radiator complete with the grille and fan cowl. Disconnect the cooling hoses from the thermostat. Disconnect the hoses between the engine and heater.

From the air cleaner (Fig.9-18) disconnect the crankcase vent hose, undo three securing nuts, remove the air cleaner cover complete with the gasket; extract the filter element. Undo four nuts which hold the air cleaner housing to the intake pipe and withdraw the air cleaner housing and gasket.

Disconnect the fuel delivery and return hoses from the high pressure fuel pump.

Using a box spanner, undo the nuts retaining the front exhaust pipe to the exhaust manifold.

Using a flat screwdriver, release the ball end and disconnect the fuel delivery operating cable from the high pressure pump.

Undo the retaining screw and release the end piece, then disconnect the cable from the timing advance lever.

Remove the transmission, working as described in section «Gearbox» in the Repair Manual.

Hoist the cross-piece TCO-3/379 and lock the engine on the right-hand side at the clamp, fitted to the front exhaust manifold securing stud, while on the left-hand side - at the hole for clutch housing fastening. Slightly tighten the hoist chain, undo the nuts securing engine mounting rubbers 2 (Fig.9-19) to the front suspension cross-member and lift the engine out.

Remove the heat shield of the starter motor and withdraw the starter motor. Undo the clutch retaining bolts and withdraw the clutch.

Refitting the engine is carried out as follows:

- refit the cooling hoses, connectors and clamps;
- check the radiator for deposits, leaks, damages;
- check the radiator cooling fan operation;
- check the radiator cap seal and valve;
- fit a new air cleaner and fuel filter elements;
- refill the engine with oil;
- adjust the controls;
- eliminate air pockets and refill the cooling system;
- start and warm-up the engine;
- adjust idle speed;
- check the lubricating and cooling systems for leaks.

Draw special attention to the engine / transmission connection: the input shaft must fully engage the splines of the clutch disc.

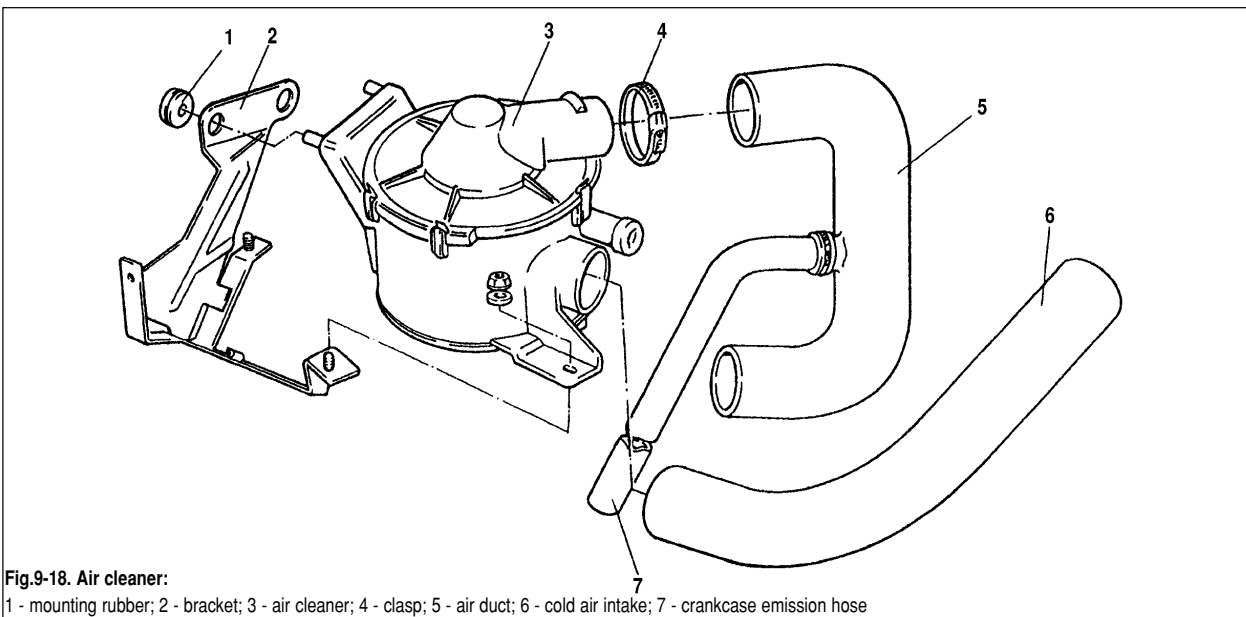


Fig.9-18. Air cleaner:

1 - mounting rubber; 2 - bracket; 3 - air cleaner; 4 - clasp; 5 - air duct; 6 - cold air intake; 7 - crankcase emission hose

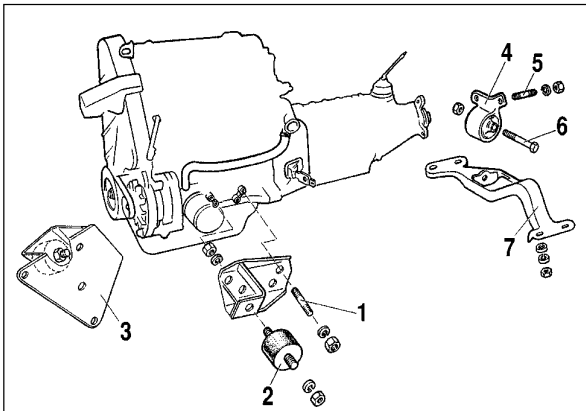


Fig.9-19. Engine support:

1 - left-hand bracket retaining pin; 2 - engine mounting rubber; 3 - right-hand bracket /rubber assembly; 4 - bracket with rear engine support mounting; 5 - pin; 6 - bolt; 7 - rear engine support cross-piece

Cooling system

Design description

The cooling system is of closed-, pressurized type, with expansion tank (Fig.9-20).

The coolant pump is of centrifugal type, driven by a V-belt from the crankshaft pulley.

The cooling system includes radiator 7 with expansion tank 5, thermostat 13, coolant temperature gauge, water jacket and connecting hoses.

During engine operation, water, warmed up in the water jacket, through the drain pipe flows to the radiator or thermostat, depending on the thermostat valve position. Then water is sucked by the pump and returned to the water jacket.

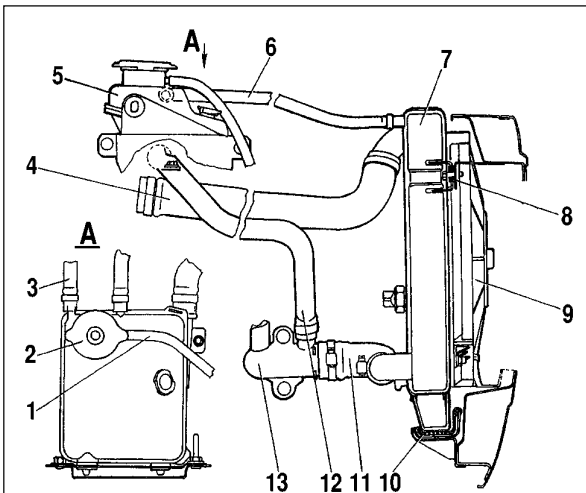


Fig.9-20. Cooling system:

1 - expansion tank vapour discharge pipe; 2 - expansion tank cap; 3 - engine vapour discharge hose; 4 - radiator delivery hose; 5 - expansion tank; 6 - radiator vapour discharge pipe; 7 - radiator; 8 - top radiator mounting rubber; 9 - electric fan blower; 10 - bottom mounting rubber; 11 - return hose; 12 - filler hose; 13 - thermostat

The cooling system is fitted with a built-in double-acting thermostat, the valve opening temperature is 83°C.

Coolant - level and density check

With the cold engine (15-20°C) the level of water in the expansion tank must be 25-30 mm above the «MIN» mark.

WARNING. It is recommended to check the water level on the cold engine, since on heating up water expands, so the fluid level can rise significantly on the warm engine.

When necessary, use areometer to check the coolant density to be 1.078-1.085 g/cm³ for Tosol A-40.

When the level in the expansion tank is below the norm, while the density exceeds the value required, add distilled water. In case of normal density top up the coolant of the same grade as the coolant in the cooling system.

Coolant change

Observe the following procedure when changing coolant:

- set the heater controls in the position «heating»;
 - undo the caps in the bottom radiator cooler and cylinder block, remove the expansion tank cap and drain coolant through two drain holes. Detach the expansion tank and lift it over the radiator, then remove the coolant remainder from the expansion tank;
 - to flush the cooling system, fill the system with clean water, start the engine and run it until the radiator bottom cooler is warm. With engine idling, drain water through the drain holes, stop the engine and let it cool;
 - repeat flushing steps as described above;
 - after flushing refit the caps and fill the system with new coolant 25-30 mm above the «MIN» mark on the expansion tank;
- Fill coolant through the filler neck of the expansion tank. Refit the cap, start the engine and allow it to idle for 1.5-2 minutes. Stop the engine and when necessary top up coolant.

Cambelt - removal and refitting

The cam removal procedure is as follows (Fig.9-21):

- remove covers 3, 5 и 6 of valve timing mechanism;
- fix the flywheel using tool OUT0000049;
- loosen the crankshaft pulley retaining bolts;
- remove the crankshaft pulley;
- fix the flywheel with tool OUT0000015;
- secure the camshaft and fuel pump pulleys with retaining bolts (the bolts should be hand tightened only);
- loosen nut 2 and bolt 4 (Fig.9-22);

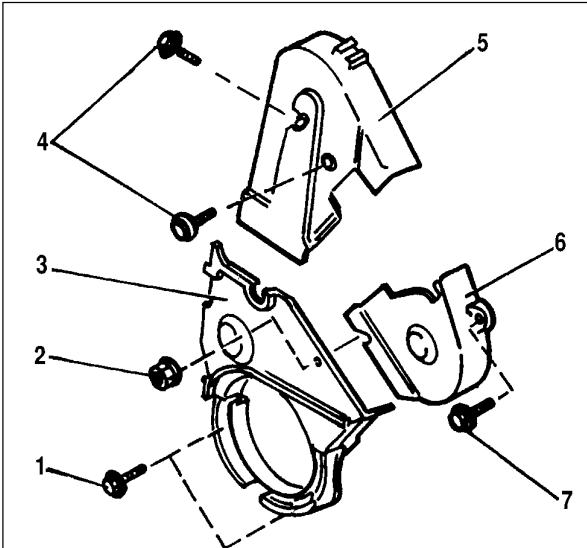


Fig.9-21. Removing and refitting the timing covers:
 1 - securing bolts, bottom cover; 2 - nut; 3 - bottom cover; 4 - securing bolts, left-hand cover; 5 - left-hand cover; 6 - right-hand cover; 7 - bolt

- use special wrench (of 10 mm square size) for 5 mm square hole and turn the bracket clockwise to remove spring 6;
- tighten bolt 4;
- remove the cambelt.

Refitting is the reversal of the removal procedure:

- make sure the camshaft and fuel pump pulleys are in the position required and secured, idler pulley 7 (Fig.9-22) and tensioner 3 rotate freely, while plunger 1 and spring 6 are free within the tensioner housing;
- refit the belt providing it is taut;

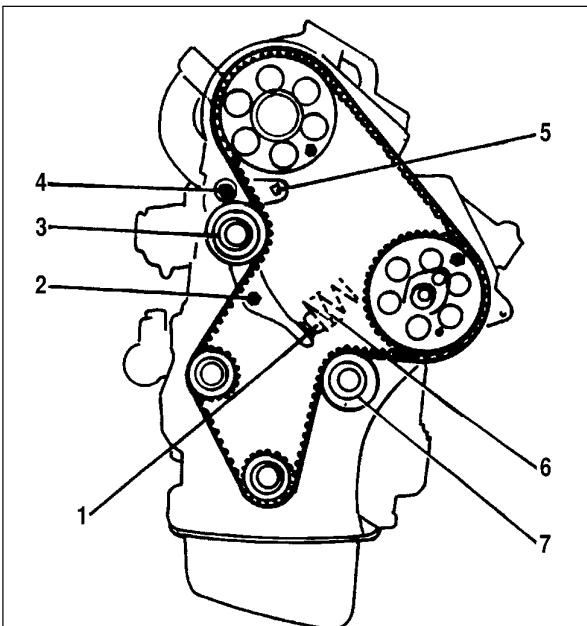


Fig.9-22. Removing and refitting the cambelt:
 1 - plunger; 2 - nut; 3 - tensioner roller; 4 - bolt; 5 - square-type hole; 6 - spring; 7 - idler pulley

- refit the timing belt over the pulleys in the following order: crankshaft pulley, idler pulley 7, fuel pump pulley, camshaft pulley, tensioner pulley, water pump;

- slacken bolt 4 to release the tensioner;
- remove the retaining bolts and flywheel retainer;
- tighten bolt 4 and nut 2;
- rotate the crankshaft two turns clockwise.

Tension - checking:

- tighten the retaining bolts and refit the flywheel retainer;
- loosen bolt 4 and nut 2 to spread tension over the belt;
- tighten bolt 4 and nut 2 to 18 N•m;
- refit the crankshaft pulley;
- coat bolt 20 with Loctite 243;
- fix the flywheel with tool OUT000049;
- refit the pulley retaining bolt, torque to 40 N•m, turn to further 60°;
- refit bottom cover 3 (Fig.9-21), tighten bolts 1 to 15 N•m;
- refit cover 5, tighten bolts 4 to 15 N•m;
- tighten right-hand cover 6 bolt 7 to 10 N•m.

Note. When you fail to refit any securing bolt or a retainer, repeat the complete procedure for the cambelt refitting.

Alternator - removal and refitting

Removal. Loosen tensioner 2 bolt and bolt 9 (Fig.9-23). Tighten bolt 8 until it comes against the limiter. Remove the belt.

CHECK to see pulley 4 rotates easily without seizures.

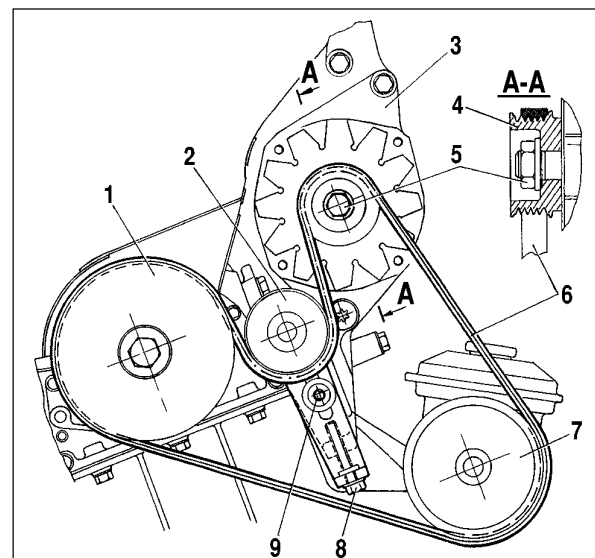


Fig.9-23. Removing and refitting the alternator drive belt:
 1 - crankshaft pulley; 2 - tensioner pulley; 3 - alternator; 4 - alternator pulley; 5 - nut; 6 - alternator drivebelt; 7 - vacuum pump pulley; 8 - tensioner bolt; 9 - tensioner fixing bolt

Refitting. Refit the belt over the pulleys and ensure the belt is located properly within the groove of each pulley.

Belt tensioning is carried out in the following sequence:

- tighten the belt through loosening bolt 8;
- locate tool OUT0000016;
- use bolt 8 to tighten the belt until the tool reads 115 ± 10 SEEM;
- remove the tool, tighten the tensioner bolt and bolt 9;
- turn the crankshaft clockwise four turns;
- locate tool OUT0000016, check the tension and adjust it as applicable;
- remove the tool, tighten bolts to 22 N•m.

Lubrication system

Design description

The lubrication system is of mixed type. The crankshaft and camshaft bearings, oil pump shaft and inner gear are pressure lubricated, while pistons, piston rings, gudgeon pins and cylinder walls are fling lubricated.

Oil change

Change oil on a warm engine only. Allow at least 10 minutes after opening the drain plug to completely drain oil.

Oil change should be accompanied by the oil filter renewal; use tool A.60312 to undo the filter. When refitting the filter into position, tighten the filter by hand only - do not use any tools.

Renew oil in the following sequence:

- stop the engine and drain oil; without removing the oil filter, pour in cleaning oil to the «MIN» mark of the oil dipstick. Use cleaning oils of ВНИИ НП-ФД, МСП-1 or МПТ-2М type;
- start the engine and run it at low rpm for 10 minutes;
- fully drain the cleaning oil and discard the old oil filter;
- fit a new filter and pour oil of required season grade.

Fuel system

Design description

Fuel system consists of a fuel tank, a fuel filter, a high pressure fuel pump, injectors, an air cleaner, an intake pipe and high / low pressure fuel pipes.

High pressure fuel pump is maintenance-free. To exclude air leaks resulting in higher fuel consumption, remember to check the pipes are properly tightened.

Injectors. In case of difficult engine start or black smoke form the silencer, remove, check and if necessary, renew the injectors.

When refitting the injectors always renew both copper and steel washers.

Fuel filter is one-stage with a replaceable filter element, a built-in water separator and a sludge discharge cap. Undo the central bolt, remove the housing and clean it in diesel fuel. Renew the filter element and oil seals.

Air cleaner has a replaceable filter element made of special cardboard and a gauge strainer from synthetic cotton.

WARNING. Fuel accessories (high pressure fuel pump, fuel injectors, fuel filter) must be repaired at specialist maker's workshops. This manual does not cover the relevant dismantling, repair and reassembly procedures.

Idle adjustment

No adjustments of maximum fuel supply and speed are possible. The adjustments can only be done by specialist dealers.

Idle speed can be adjusted. Any changes in adjustments can result in rapid engine wear and ensued loss of guarantee.

Fast idle - setting. With the cold engine, lever 10 (Fig.9-24) should touch limiter 9; when necessary, tighten cable 7 by tensioner 11. The cable movement should be more than 6 mm.

Accelerator - setting. Fully depress the accelerator pedal, lever 4 should touch limiter 5. Make sure that at idle lever 4 rests on limiter 9.

Warm up the engine, the electric fan blower must cut in.

Engine stall prevention system. Fit 4 mm gasket 8 between lever 4 and limiter. Depress stop lever 2.

Insert 3 mm pin 3 in lever 10. Set the crankshaft speed at 900 ± 100 rpm by turning limiter 9.

Remove gasket 8 and locating pin 3.

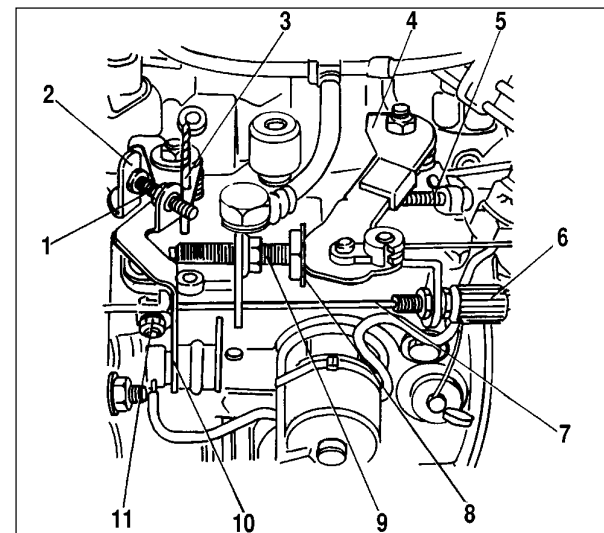
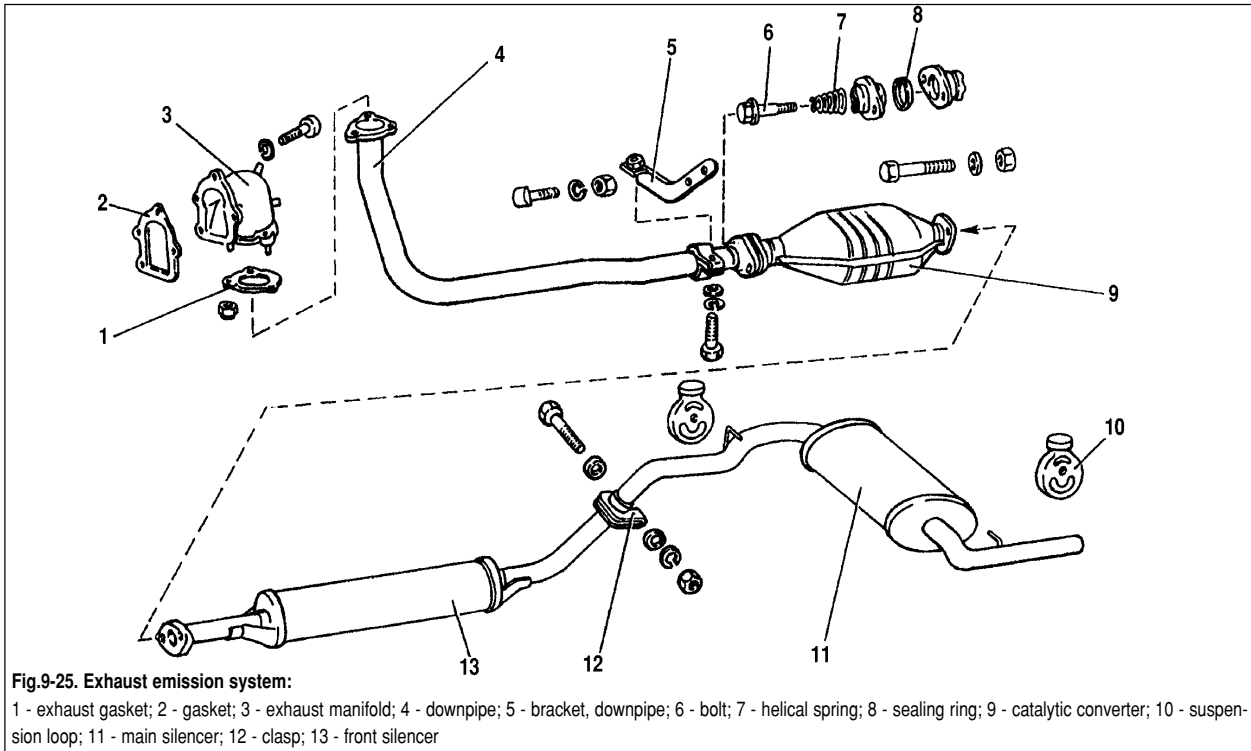


Fig.9-24. Idle control:

1 - throttle stop (CO adjustment) screw; 2 - stop lever; 3 - locating pin; 4 - load lever; 5 - limiter; 6 - outer cable tensioner; 7 - accelerator cable; 8 - gasket; 9 - limiter; 10 - fast idle lever; 11 - cable tensioner



Adjust idle with the help of screw 1. The idle speed should be 800-850 rpm.

Engine rundown - checking. Using load lever 4 set the engine speed at 3000 rpm. Release the load lever, the engine rundown should be 2.5 - 3.5 seconds.

After returning to idle, the speed difference should not exceed 50 rpm.

WARNING. The adjustment screws for maximum fuel feed and speed are sealed at the factory.

Exhaust emission system

Exhaust gases escape from the engine through exhaust manifold 3 (Fig.9-25), front exhaust pipe (downpipe) 4, catalytic converter 9, intermediate silencer 13 and front silencer 11.

There is a steel heat shield over the catalytic converter. Exhaust gasket 1 is fitted between the downpipe flange and exhaust manifold 1.

The downpipe is connected to the catalytic converter flange through a moving joint. Metal/graphite ring 8 with a spherical surface is placed between the flanges, an inner spherical surface is provided in the flange of the downpipe.

The silencer pipes are held together by means of clasp 12. Downpipe 4 is attached by three nuts to the exhaust manifold and in addition to bracket 5.

No dismantling or repair of the silencers or pipes is possible, have them always replaced with new ones.

Electrical system

Alternator. The Valeo alternator is supplied together with the engine. The wiring diagram for alternator is shown in Fig.9-26.

When the ignition is switched on, the alternator «B» terminal is powered through warning light 6. After the engine start current is not supplied through the warning light and it does not illuminate. The alternator «W» terminal is used for voltage supply to electronic tachometer 4.

Starter motor. The Valeo starter motor is supplied together with the engine. The wiring diagram for starter motor is shown in Fig.9-27.

Engine management system (EMS). The wiring diagram for the engine management system is shown in Fig.9-28.

The system design, operation and diagnostics are detailed in a separate «Peugeot» Manual for Diesel Engine Diagnostics.

Vehicle antitheft system. The vehicle VAZ-21215-10 is fitted with an antitheft system of relay type (АПС-2Р).

The antitheft system includes control module 1 (Fig.9-29), system state indication LED 2 and code key fobs 3. The theft-deterrent system represents an electronic control module, which allows in case of unauthorized use to inhibit the engine start through disconnecting the relevant electrical circuits.

Refer to Fig.9-30 for the wiring diagram of theft-deterrent system. The installation of the antitheft system brought alterations in operation of direction indicators and hazard flashers (Fig.9-31), windscreen wipe/wash (Fig.9-32), rear window wipe/wash and heating (Fig.9-33).

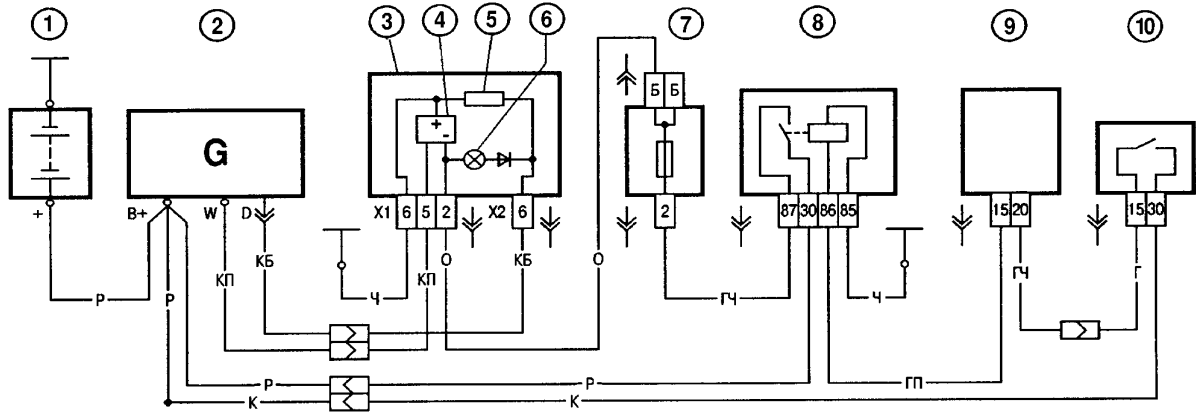


Fig.9-26. Wiring diagram for alternator:

1 - battery; 2 - alternator; 3 - instrument cluster; 4 - digital tachometer; 5 - resistor 50 Ohm, 5 W; 6 - low battery warning light; 7 - fusebox; 8 - ignition relay; 9 - control module, theft-deterrent system; 10 - ignition switch

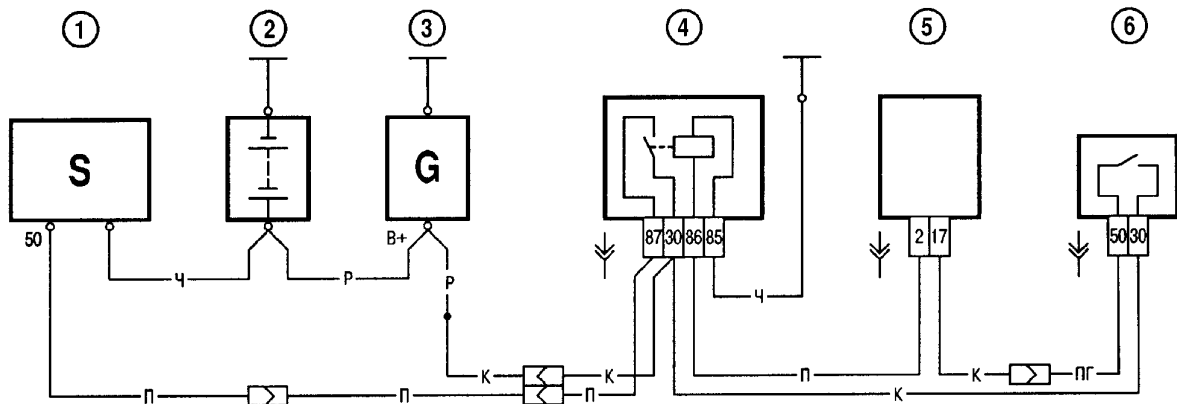


Fig.9-27. Wiring diagram for starter motor:

1 - starter motor; 2 - battery; 3 - alternator; 4 - ignition relay; 5 - control module, theft-deterrent system; 6 - ignition switch

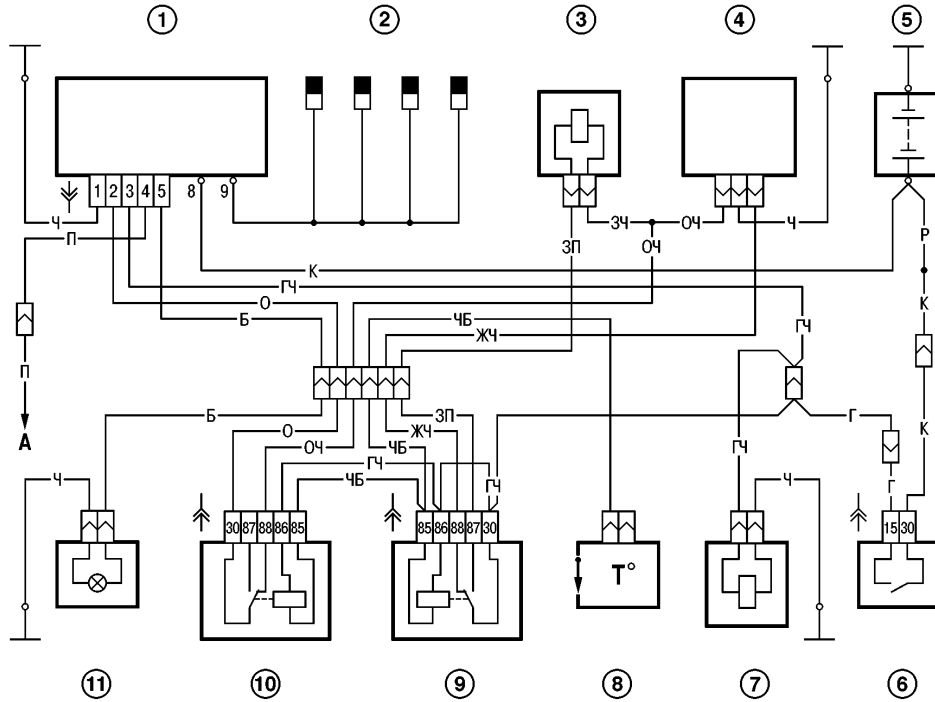


Fig.9-28. Wiring diagram for Engine Management System:

1 - glow plug control module; 2 - glow plugs; 3 - EGR valve; 4 - fuel pump; 5 - battery; 6 - ignition switch; 7 - breaker; 8 - thermostatic switch; 9 - relay, EGR valve; 10 - relay, thermostatic switch; 11 - glow plug warning light

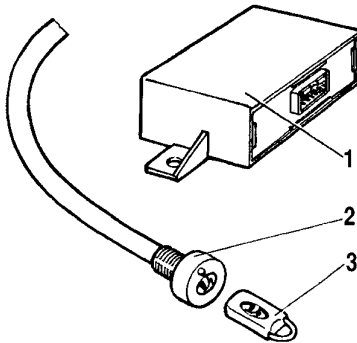


Fig.9-29. Automotive theft-deterrent system:

1 - control module; 2 - LED for system state indication; 3 - key fob

Headlight wipe/wash. The vehicle VAZ-21215-10 is not fitted with the headlight wipe/wash.

Cooling fan motor. Two dc motors powered from constant magnets of MP 8019/37 type are provided to operate the engine cooling fan blower. The wiring diagram for cooling fan motor is shown in Fig.9-34.

The motors are triggered by sensor 1 through complementary relay 3. The sensor is fitted to the right-hand radiator cooler. The sensor contacts close at $(99 \pm 3)^\circ\text{C}$ and open at $(94 \pm 3)^\circ\text{C}$. The relay is housed in the engine bay and is bolted to the top bulk-head reinforcement.

The motors are maintenance-free and must always be renewed in case of failure.

Motor specification

Nominal motor shaft speed with impeller	
load, rpm600-2800
Current consumption at speed and	
load as specified, ampere, not greater14

Instrument cluster. The instrument cluster includes: speedometer with trip counter, coolant temperature gauge, fuel gauge, tachometer, 13 warning lights (Fig.9-35). The wiring diagram for instrument cluster is shown in Fig.9-36. The instrument panel pin assignment is shown in Table 9-3.

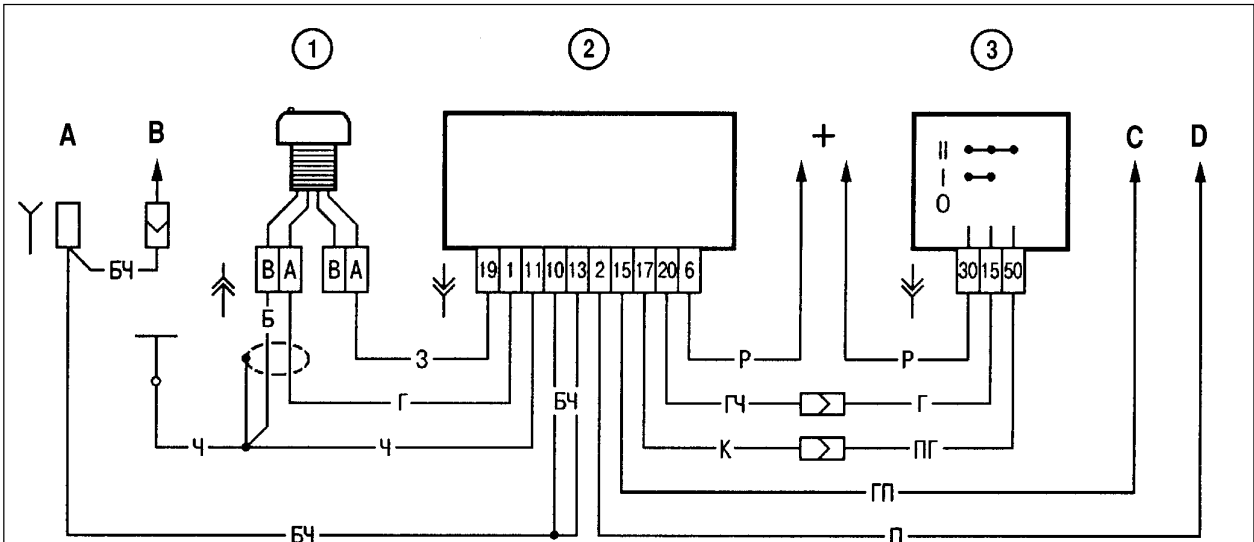


Fig.9-30. Wiring diagram for theft-deterrent system:

1 - LED for system state indication; 2 - control module; 3 - ignition switch;
 A - to interior light switch; B - to interior light; C - to ignition relay terminal 86; D - to starter relay terminal 86

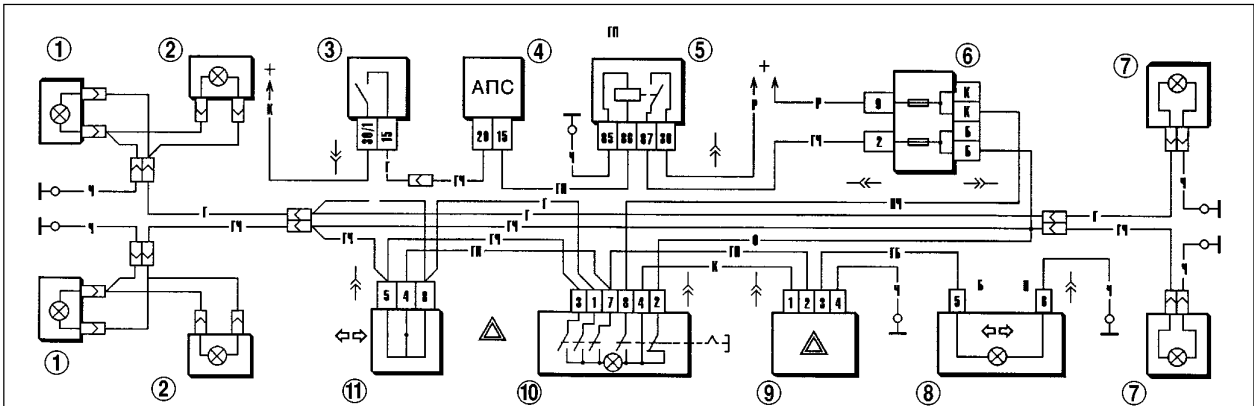


Fig.9-31. Wiring diagram for direction indicators and hazard warning flashers:

1 - direction indicators, front lights; 2 - side repeat indicators; 3 - ignition switch; 4 - control module, theft-deterrent system; 5 - ignition relay; 6 - fuse and relay box; 7 - direction indicators, rear lights; 8 - direction indicator warning light in instrument cluster; 9 - indicators flasher relay; 10 - hazard warning flasher switch; 11 - direction indicator switch

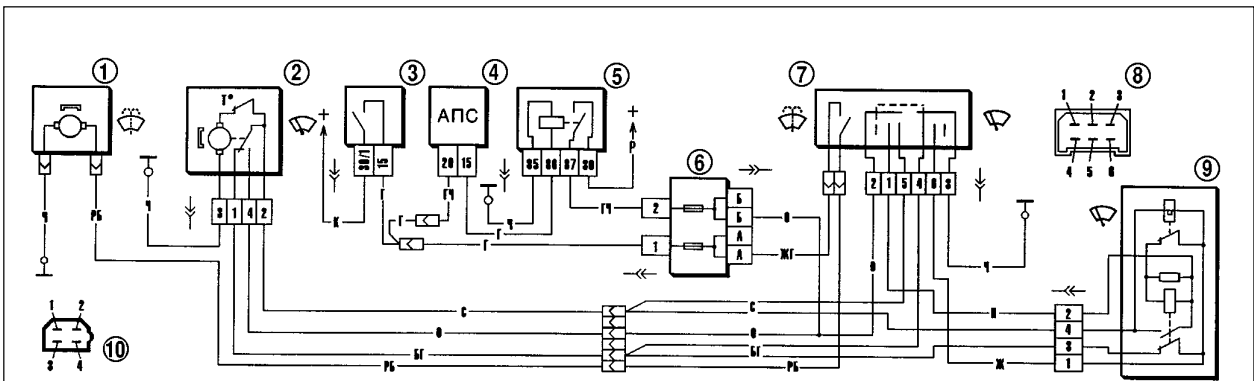


Fig.9-32. Wiring diagram for windscreen wipe/wash:

1 - windscreen washer motor; 2 - windscreen wiper motor; 3 - ignition switch; 4 - control module, anti-theft system; 5 - ignition relay; 6 - fusebox; 7 - windscreen wipe/wash switch; 8 - pin assignment in switch connector; 9 - windscreen wiper relay; 10 - pin assignment in windscreen wiper relay and motor connectors.

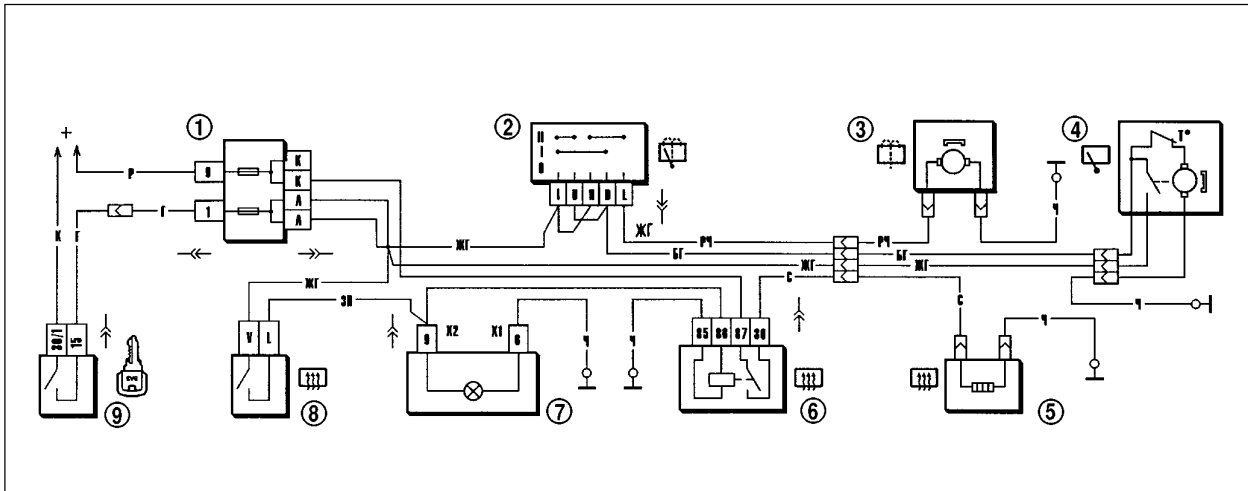


Fig.9-33. Wiring diagram for tailgate wipe/wash and heating element:

1 - fusebox; 2 - wipe/wash switch; 3 - rear window washer motor; 4 - rear window wiper motor; 5 - rear window heating element; 6 - heated rear window relay; 7 - heated rear window warning light; 8 - heated rear window switch; 9 - ignition switch

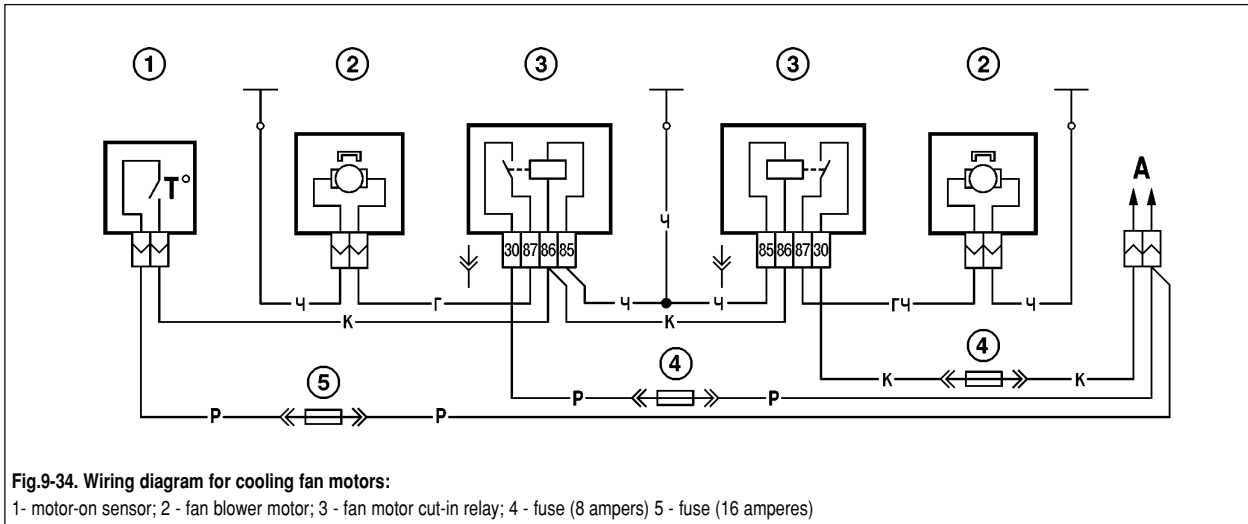


Fig.9-34. Wiring diagram for cooling fan motors:

1 - motor-on sensor; 2 - fan blower motor; 3 - fan motor cut-in relay; 4 - fuse (8 amperes) 5 - fuse (16 amperes)

Table 9-3.

Instrument cluster pin assignment

Pin No	Pin assignment
	Connector X1 (red or amber)
1	-
2	To ignition switch terminal «15»
3	Spare
4	To instrument cluster lighting switch
5	To alternator terminal «W»
6	To housing
7	To ignition switch terminal «50»
8	To handbrake warning light switch
9	To seat belt relay
10	To fuel gauge terminal «W»
11	To differential lockup sensor
12	To low oil pressure sensor
13	To brake fluid level sensor

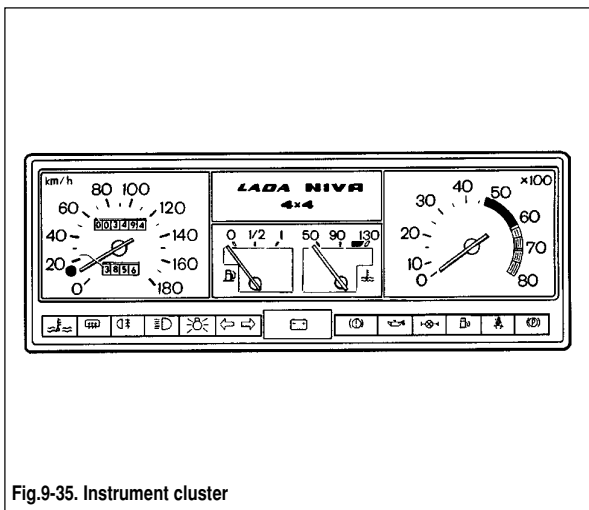
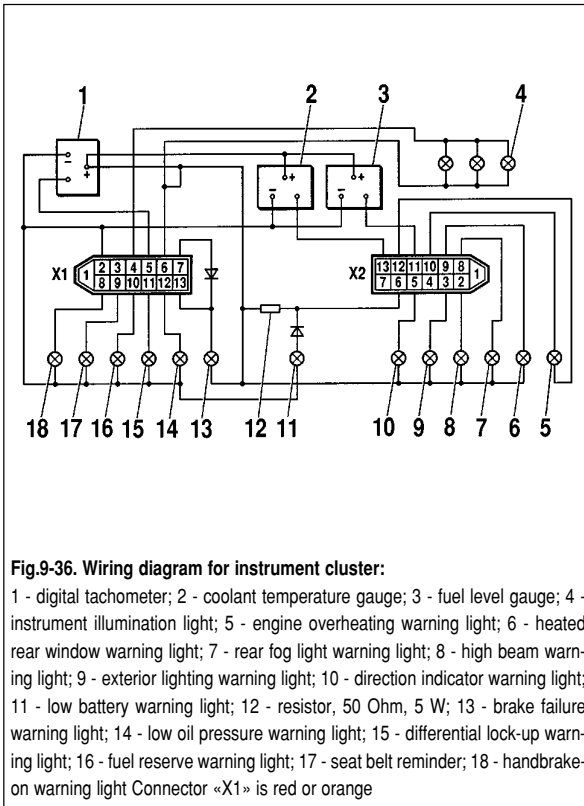


Fig.9-35. Instrument cluster



Connector X2 (any colour, except red and amber)

- 1 -
- 2 To high beam relay
- 3 To exterior lighting switch
- 4 -
- 5 To indicators flasher relay
- 6 To alternator terminal «B»
- 7 -
- 8 To rear foglight switch
- 9 To heated rear window switch
- 10 To ignition switch terminal «15»
- 11 To fuel level sensor terminal «T»
- 12 To coolant temperature sender
- 13 To coolant temperature sender

Coolant temperature gauge - checking. The coolant temperature gauge is associated with the relevant sender in the cylinder head. At the sensor resistance of 640-1320 Ohm the needle should be at the low end of scale, at 77-89 Ohm it should rest at the front of the red area, at resistance of 40-50 Ohm the needle should go to the end of the red area.

Fuel level gauge - checking. The fuel gauge is associated with the relevant sensor in the petrol tank. The same sensor operates the fuel reserve warning light, when 4 to 6 litres are left in the petrol tank. At the sensor resistance of 200-238 Ohm the needle should be at the low end of scale, at 59-71 Ohm - at the middle scale, while at 17-23 Ohm the needle should go to the high end of scale (mark 1).

Speedometer - checking. Check the speedometer turning its drive shaft at various speeds. The data required for checking is shown in Fig.9-4.

Table 9-4

Speedometer specification

Speedometer readings, km/h	Drive shaft speed, rpm
30	433 - 500
40	600 - 667
50	766 - 833
60	933 - 1000
80	1250 - 1333
100	1567 - 1667
120	1883 - 2000
140	2200 - 2333
160	2517 - 2667

Tachometer - checking. The tachometer operates on the principle of measuring the voltage pulse frequency in the alternator field winding.

The tachometer is checked on a test bench simulating the vehicle ignition system. Connect the tachometer as applicable, apply 14 volts to the primary circuit and set the spark gap at 7 mm. Turn the ignition distributor shaft at such a speed to bring the tachometer needle to one of main scale divisions. At this moment the ignition distributor shaft speed should be within the permissible limits (Refer to Table 9-5).

Table 9-5

Tachometer specification

Tachometer reading, rpm	Ignition distributor shaft speed, rpm
1000	900 - 1100
2000	1900 - 2250
3000	2950 - 3300
4000	3950 - 4300

Fuel level sender - checking. With an empty tank the sensor resistance should be (250±10) Ohm, with a half-filled tank - (66±6) Ohm, with a full tank - (20±2) Ohm.

Steering with *BREED «SRS-40»* driver's airbag in the steering wheel

Design description

The SRS-40 system is housed in the steering wheel, being an additional protection to the seat belt, the system is intended to prevent serious chest and head injuries to the driver.

The system is activated at the frontal impact and at 30° impact leftward and rightward to the vehicle centre line. The system is not activated during:

- impacts at more than 30° to the vehicle centre line;
- side impacts;
- rear impacts;
- rollover;
- minor frontal impacts.

The SRS-40 system consists of the following main components:

- gas generator (inflator) with a built-in impact sensor;
- airbag module;
- special steering wheel with fixtures.

The system is activated by inertial impact force via triggering a mechanical sensor (opposite to electrical pulse), which operates the gas generator, thus making redundant wiring and power supply. Since the system is mechanical, there is no need in the warning light or diagnostic unit. The system is always ready to operate, it is maintenance-free, though after seven years in field the gas generator is subject to mandatory replacement.

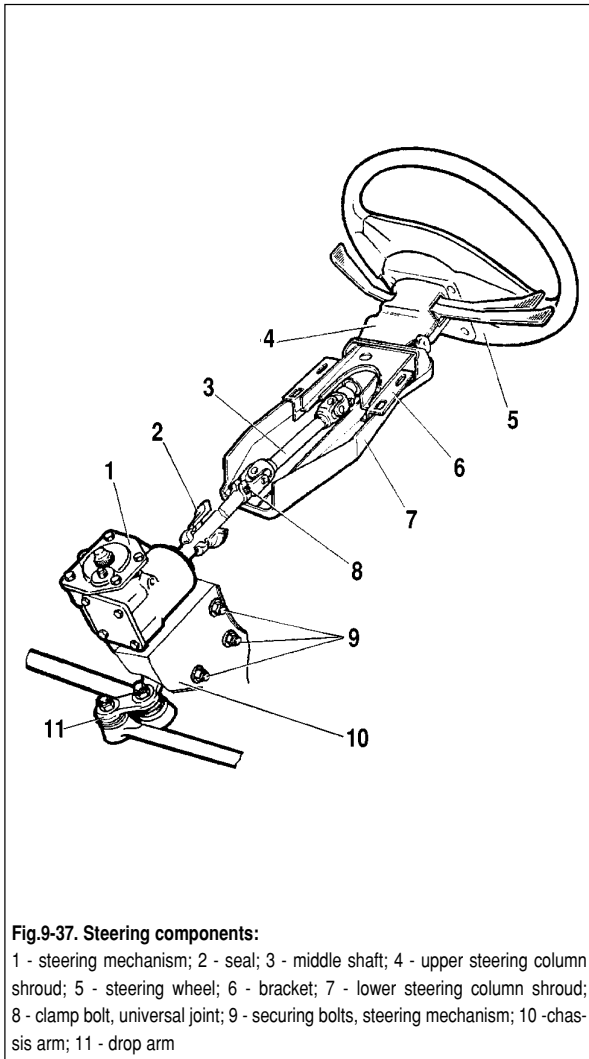


Fig.9-37. Steering components:

1 - steering mechanism; 2 - seal; 3 - middle shaft; 4 - upper steering column shroud; 5 - steering wheel; 6 - bracket; 7 - lower steering column shroud; 8 - clamp bolt, universal joint; 9 - securing bolts, steering mechanism; 10 - chassis arm; 11 - drop arm

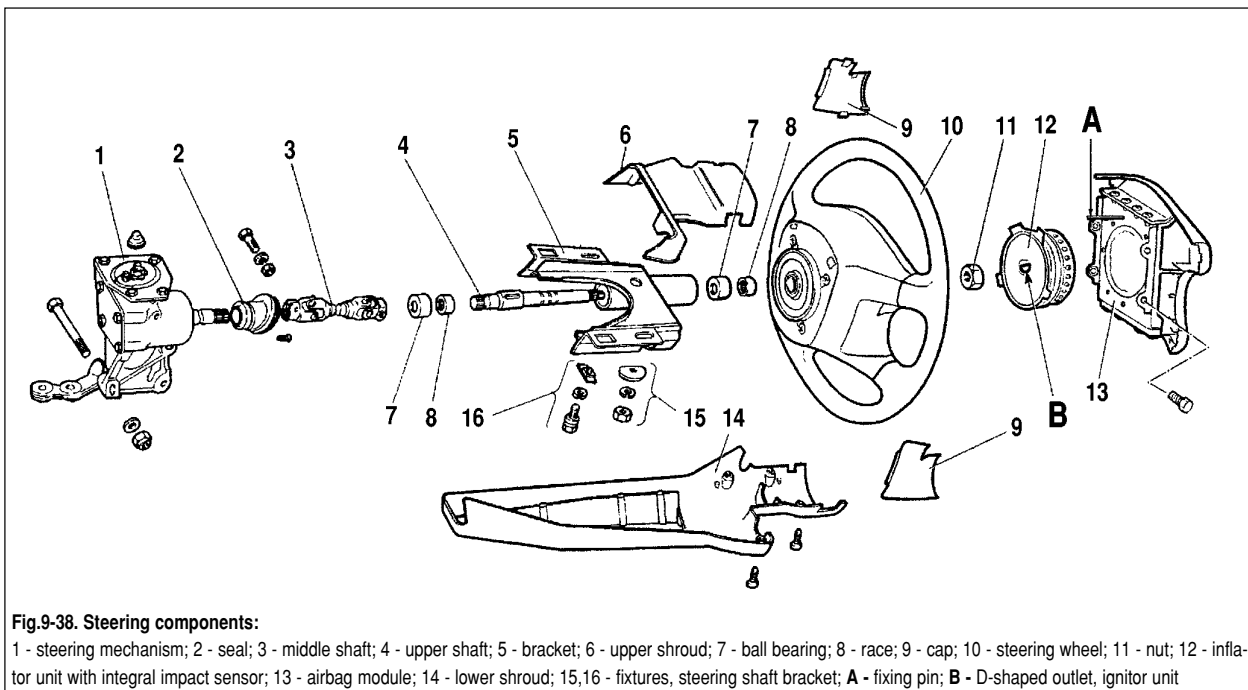


Fig.9-38. Steering components:

1 - steering mechanism; 2 - seal; 3 - middle shaft; 4 - upper shaft; 5 - bracket; 6 - upper shroud; 7 - ball bearing; 8 - race; 9 - cap; 10 - steering wheel; 11 - nut; 12 - inflator unit with integral impact sensor; 13 - airbag module; 14 - lower shroud; 15,16 - fixtures, steering shaft bracket; A - fixing pin; B - D-shaped outlet, ignitor unit

WARNING. Never fit the steering wheel SRS-40 to other vehicle models, since the impact sensor in the gas generator is tailored to parameters and characteristics of VAZ-21213 vehicle and its versions.

Due to variations in parameters and characteristics among vehicle models and within similar models of different production years, NEVER use the SRS-40 components for other vehicles. In the event the adjustments are lost or a component is damaged in an accident or during dismantling, do not reuse the SRS-40 components.

In case of an accident the impact sensor inside the inflator module receives an impact force pulse and at the preset pulse level activates the system, releasing gas (nitrogen) through the holes in the housing, filling the airbag that is folded inside the module. During the airbag filling, it breaks through the central seam on the steering wheel trim pad, which halves go open up and down respectively. The airbag of 40 litre capacity is deployed in front of the steering wheel.

The protective function of the steering wheel with the SRS-40 airbag is intended for one application only, therefore after the accident renew the steering wheel complete with the inflator, airbag module and other steering-related parts damaged.

The steering fitted with an airbag features a different, original steering wheel, which houses the gas generator and airbag module unit, there is also an original bracket to secure the steering column. Refer to chapter 5 for design description and repair instructions with respect to other steering-associated units and components.

Removal and refitting

WARNING

1. Always use eye protection and wear gloves when working with the gas generator or airbag module.
2. Always keep on the lateral side of the steering wheel when working with the gas generator or airbag module. Never place anything on the steering wheel or between the steering wheel and a worker.
3. Never use the gas generator unit when it happened to fall from over 1 meter height or has evident damages.
4. Do not store the gas generator at temperatures above 52°C.
5. When handling the gas generator, always keep the holes outward; on any surfaces position the holes upward; never put anything on the gas generator.

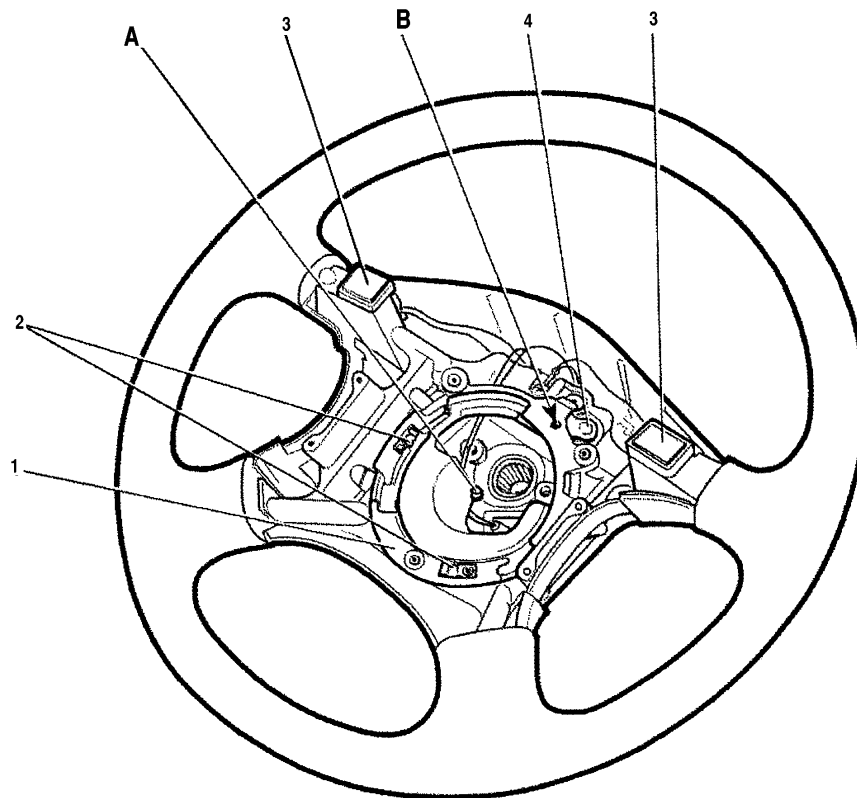


Fig.9-39. Steering wheel:

1 - adapter (for inflator unit fitting); 2 - lock spring; 3 - horn button; 4 - locking tab;
A - device for setting system to ready position - D-shaped lug; B - hole in adapter

6. Always check the steering wheel is reliably secured before fitting the gas generator, never pierce or rotate the ignitor unit through the D-shaped hole in the housing.

7. Store the gas generator in a box, while the airbag module in a plastic bag. Do not dismantle; protect the gas generator from damages, since inside its sealed housing there are solid chemicals being poisonous, inflammable and potentially health hazardous.

8. To exclude any misuse of the SRS-40 system, do not employ impact tools on steering elements.

Removal. Open the bonnet and disconnect the battery negative lead. Position the front wheels in the straight-ahead position so that steering wheel 5 top elements (Fig.9-37) are horizontal. Next carry out the following:

- remove two caps 9 (Fig.9-38) from the steering wheel side trim;
- working from the side of the steering wheel, unscrew four bolts securing airbag module 13; carefully withdraw the airbag module from the steering wheel;
- using a screwdriver, retract spring-type locking tab 4 (Fig.9-39), then turn inflator unit 12 (Fig.9-38) anticlockwise to align its base with recesses in steering wheel adapter 1 (Fig.9-39);

WARNING. Never apply excessive force to the inflator unit when dismantling. If the inflator unit doesn't turn, make certain the locking tab is fully retracted.

- exercise care and withdraw the gas generator from the steering wheel adapter;
- undo nut 11 (Fig.9-38) and remove the steering wheel. Refer to chapter 5 of Repair Manual for further dismantling of steering-associated parts and units.

Refitting of the steering is a reversal of the removal procedure observing the following:

- before refitting the steering wheel, make sure the unit «A» (Fig.9-39) for putting the system in the ready-to-work position (D-shaped projection in the centre of the steering wheel adapter) is not bent or broken, otherwise renew the steering wheel;
- refit the steering wheel to the steering shaft so that the top elements of the steering wheel are horizontal. Torque the steering wheel nut to 31.4-51 N•m (3.2-5.2 kgf•m) and bend it up at one point;
- before refitting the gas generator, make certain there are no knocks or sticking, check the steering wheel rotates smoothly lock-to-lock; swing the steering wheel to see there is no radial or axial steering wheel play; eliminate all defects found;
- fit the gas generator to the steering wheel adapter with your right hand. Position the gas generator in the adapter recesses and turn clockwise about 40° to the full lock. A click should be heard, the hole in locking tab 4 (Fig.9-39) should coincide with the

hole «B» in the steering wheel adapter. In this position the gas generator is set to working order. During installation turn the gas generator by hand only. The gas generator should never be forced into the position;

- working from the outside of the vehicle, place the airbag module to the gas generator unit, while matching the «A» fixture (Fig.9-38) on the module with the hole «B» (Fig.9-39) in the steering wheel adapter;
- tighten airbag module 13 securing bolts (Fig.9-38) to 7-11 N•m;
- do not cut, drill or pierce any part of the SRS-40 system under any circumstances.