

## SECTION D10A

# GENERAL INFORMATION

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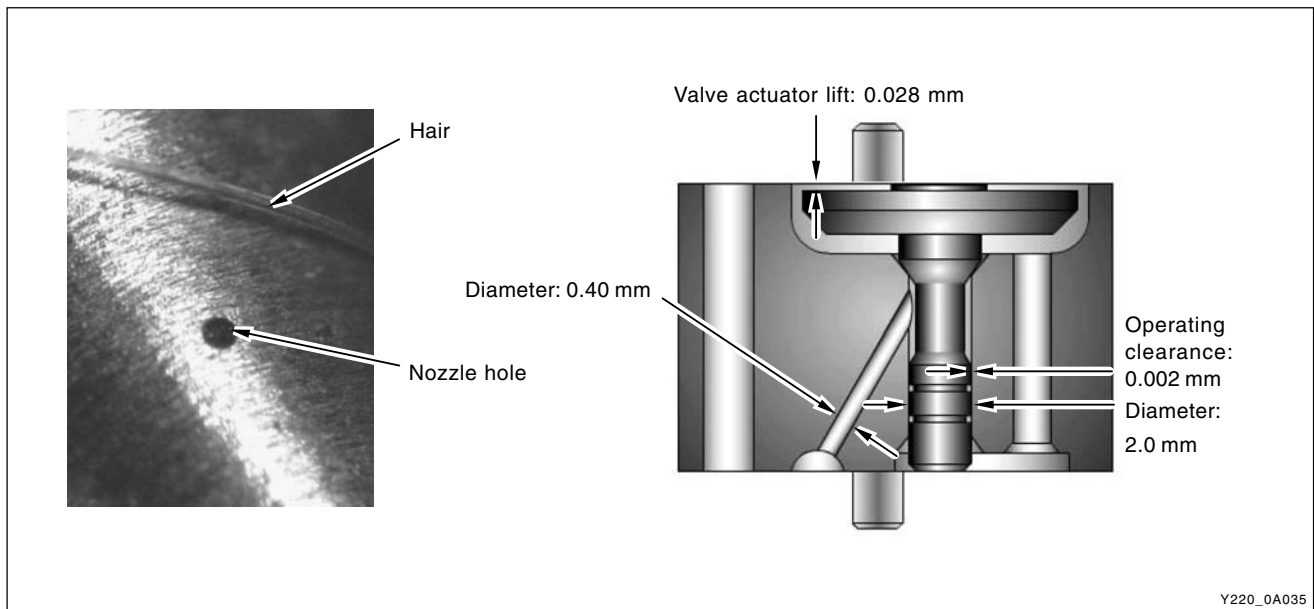


# CLEANNES

## Cleanness of DI Engine Fuel System and Service Procedures

The fuel system for DI engine consists of transfer (low pressure) line and high pressure line. Its highest pressure reaches over 1600 bar. Some components in injector and HP pump are machined at the micrometer 100 μm of preciseness. The pressure regulation and injector operation are done by electric source from engine ECU. Accordingly, if the internal valve is stucked due to foreign materials, injector remains open. Even in this case, the HP pump still operates to supply high pressurized fuel. This increases the pressure to combustion chamber (over 250 bar) and may cause fatal damage to engine.

You can compare the thickness of injector nozzle hole and hair as shown in below figure (left side). The right side figure shows the clearance between internal operating elements.

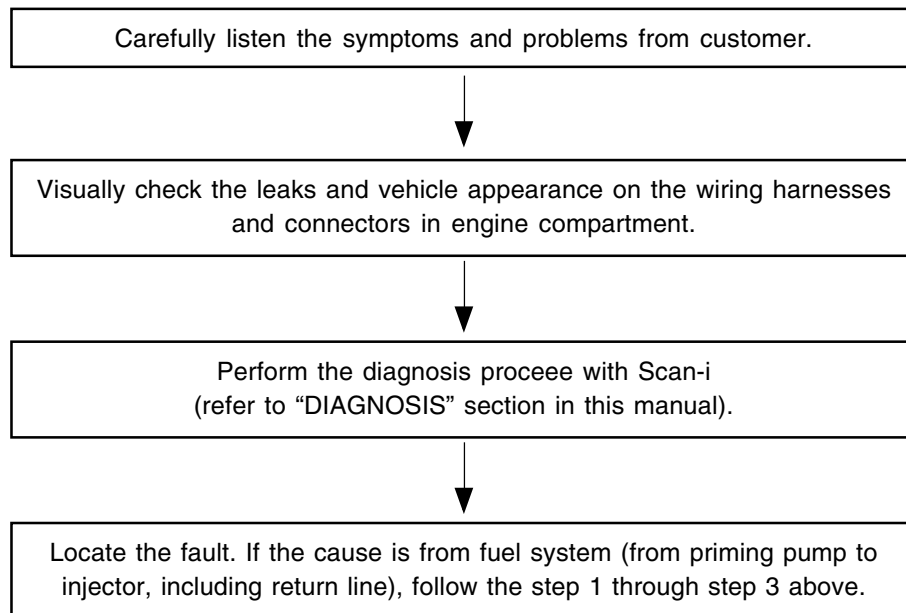


The core elements of fuel system has very high preciseness that is easily affected by dust or very small foreign material. Therefore, make sure to keep the preliminary works and job procedures in next pages. If not, lots of system problems and claims may arise.

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## Job procedures

1. Always keep the workshop and lift clean (especially, from dust).
2. Always keep the tools clean (from oil or foreign materials).
3. Wear a clean vinyl apron to prevent the fuzz, dust and foreign materials from getting into fuel system. Wash your hands and do not wear working gloves.
4. Follow the below procedures before starting service works for fuel system.



5. If the problem is from HP pump, fuel supply line or injector, prepare the clean special tools and sealing caps to perform the diagnosis for DI engine fuel system in "DIAGNOSIS" section in this manual. At this point, thoroughly clean the related area in engine compartment.

### Notice

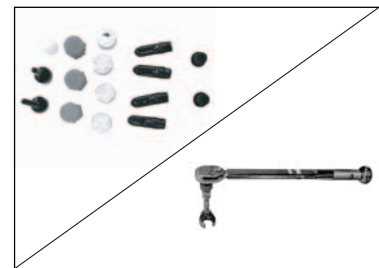
***Clean the engine compartment before starting service works.***



**Tool kit for high pressure line**



**Took kit for low pressure line**



**Removal tool box and cap kits**

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6. Follow the job procedures. If you find a defective component, replace it with new one.

Disconnect the negative battery cable.

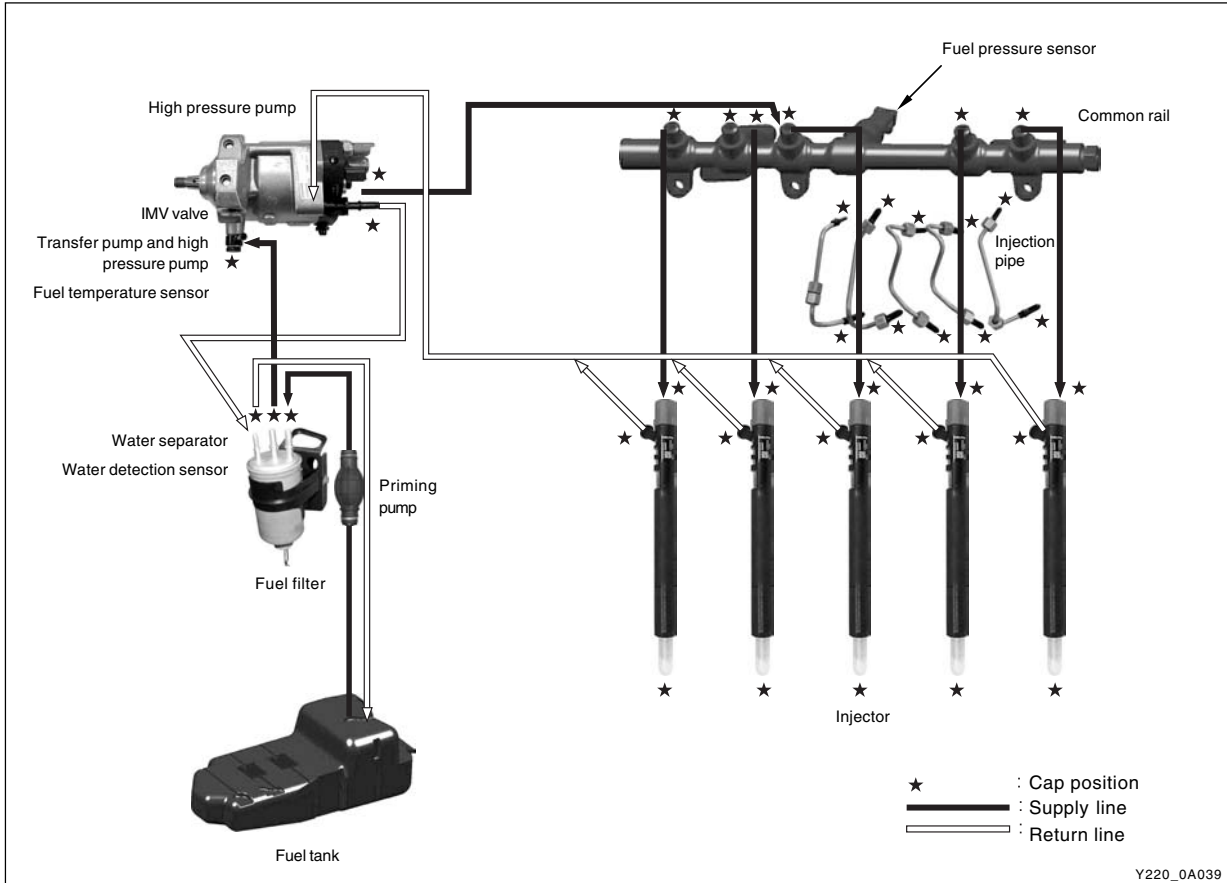
For safety reasons: check pressure is low before opening the HP systems (pipes)

Use special tools and torque wrench to perform the correct works.

Once disconnected, the fuel pipes between HP pump and fuel rail and between fuel rail and each injector should be replaced with new ones. The pipes should be tightened to specified tightening torques during installation. Over or under torques out of specified range may cause damages and leaks at connections. Once installed, the pipes have been deformed according to the force during installation, therefore they are not reusable.

The copper washer on injector should be replaced with new one. The injector holder bolt should be tightened to specified tightening torque as well. If not, the injection point may be deviated from correct position, and it may cause engine disorder.

Plug the disconnected parts with sealing caps, and remove the caps immediately before replacing the components.



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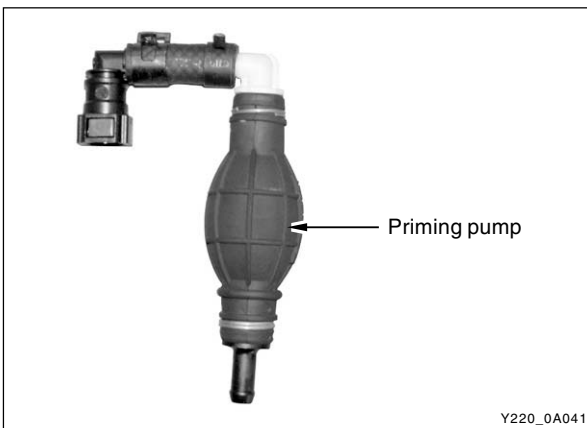
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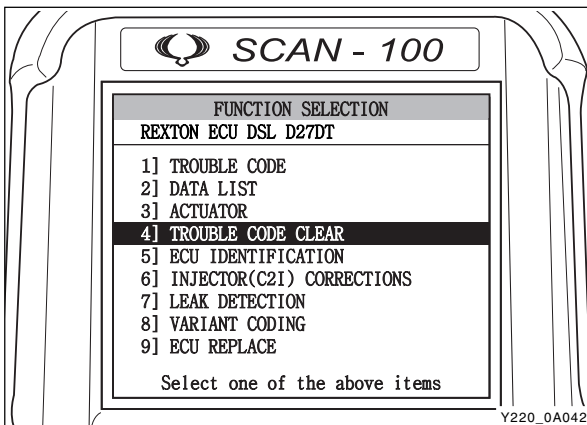
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7. Plug the removed components with clean and undamaged sealing caps and store it into the box to keep the conditions when it was installed.
8. Clear the high pressure offset value by Scan-100 after replacing the high pressure pump.

9. To supply the fuel to transfer line of HP pump press the priming pump until it becomes hard.

### Warning

***Do not crank engine before having filled pump.***

10. Check the installed components again and connect the negative battery cable. Start the engine and check the operating status.
11. With Scan-i, check if there are current faults and erase the history faults.

### Note

***For details, refer to "DI10 Diagnosis teable".***

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**DI Engine and Its Expected Problems and Remedies Can be Caused by Water in Fuel**

**SYSTEM SUPPLEMENT AGAINST PARAFFIN SEPARATION.**

In case of Diesel fuel, paraffin, one of the elements, can be separated from fuel during winter and then can stick on the fuel filter blocking fuel flow and causing difficult starting finally. Oil companies supply summer fuel and winter fuel by differentiating mixing ratio of kerosene and other elements by region and season. However, above phenomenon can be happened if stations have poor facilities or sell improper fuel for the season.

In case of DI engine, purity of fuel is very important factor to keep internal preciseness of HP pump and injector. Accordingly, more dense mesh than conventional fuel filter is used. To prevent fuel filter internal clogging due to paraffin separation, SYMC is using fuel line that high pressure and temperature fuel injected by injector returns through fuel filter to have an effect of built-in heater (see fuel system).

**SYSTEM SUPPLEMENT AND REMEDY AGAINST WATER IN FUEL**

As mentioned above, some gas stations supply fuel with excessive than specified water. In the conventional IDI engine, excessive water in the fuel only causes dropping engine power or engine hunting. However, fuel system in the DI engine consists of precise components so water in the fuel can cause malfunctions of HP pump due to poor lubrication of pump caused by poor coating film during high speed pumping and bacterization (under long period parking). To prevent problems can be caused by excessive water in fuel, water separator is installed inside of fuel filter. When fuel is passing filter, water that has relatively bigger specific gravity is accumulated on the bottom of the filter.



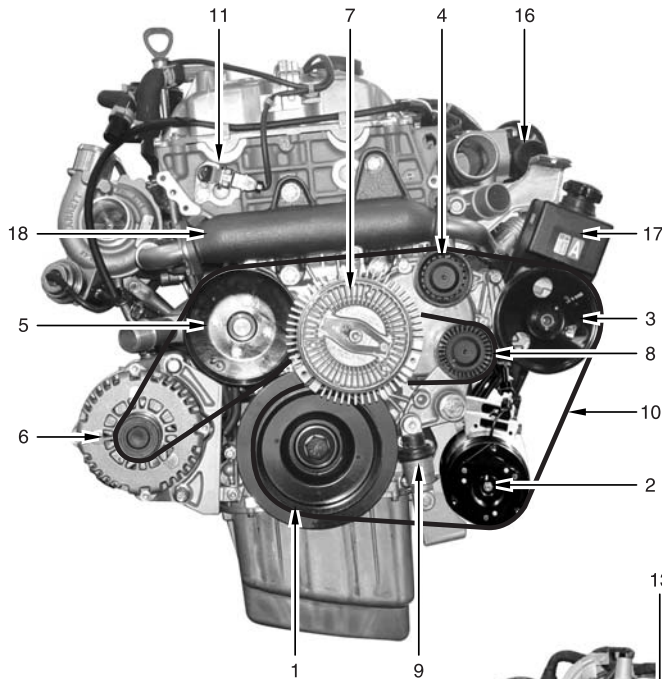
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If water in the separator on the fuel filter exceeds a certain level, it will be supplied to HP pump with fuel, so the engine ECU turns on warning light (☞) on the meter cluster and buzzer if water level is higher than a certain level. Due to engine layout, a customer cannot easily drain water from fuel filter directly, so if a customer checks in to change engine oil, be sure to perform water drain from fuel filter. (See fuel system for details.)

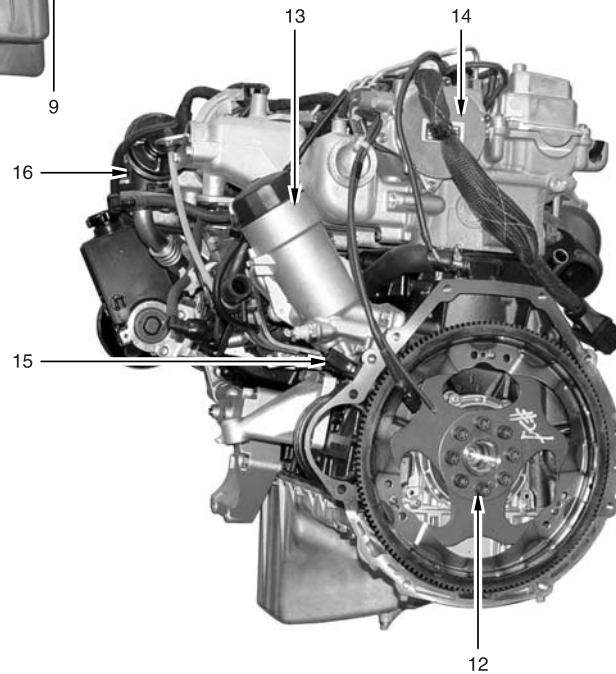
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# STRUCTURE

Front view



Rear view



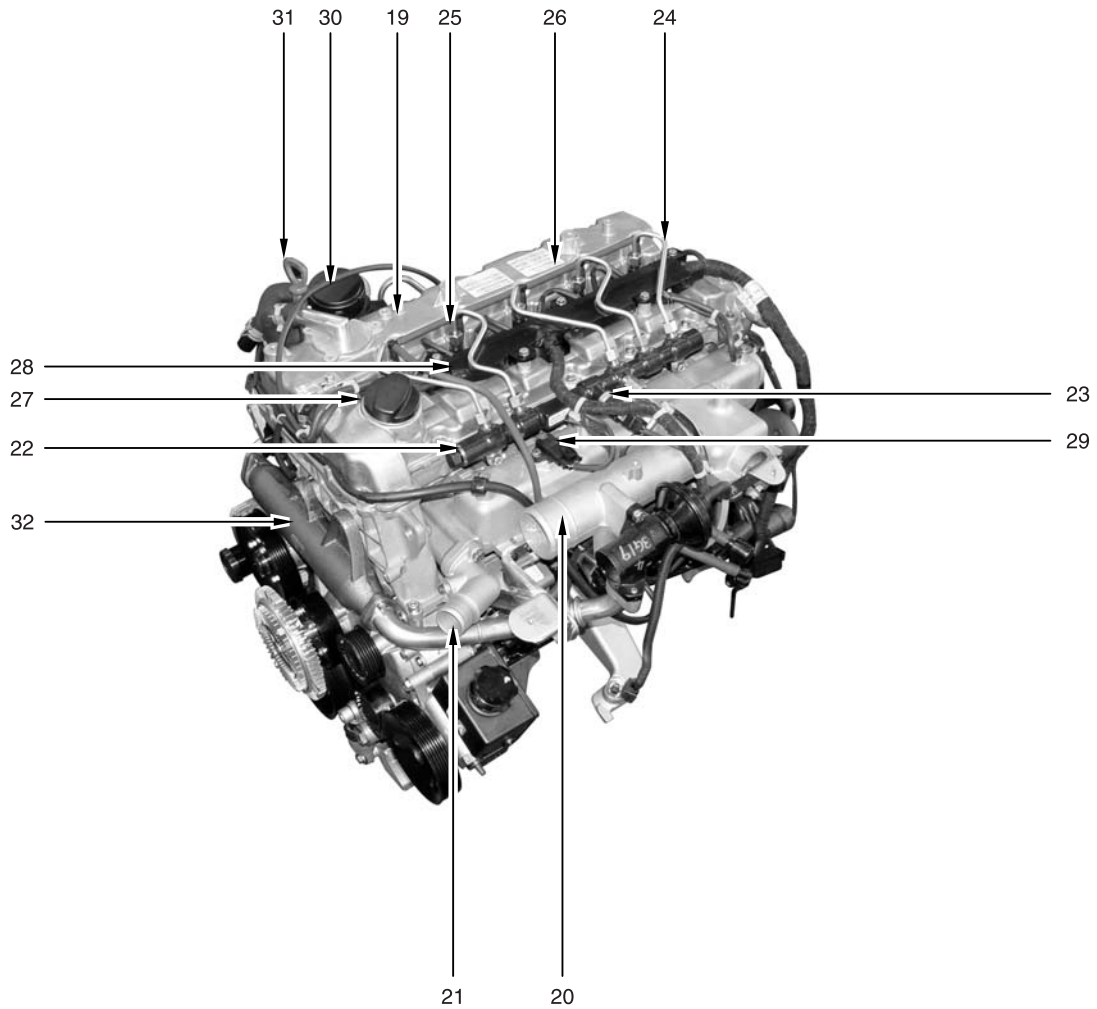
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- |                                     |                                       |                           |
|-------------------------------------|---------------------------------------|---------------------------|
| 1. TVD (Torsional Vibration Damper) | 7. Cooling fan pulley & viscos clutch | 13. Oil filter housing    |
| 2. Air conditioner compressor       | 8. Aut tensioner pulley               | 14. Vacuum pump           |
| 3. Power steering pump pulley       | 9. Auto tensioner                     | 15. Crank position sensor |
| 4. Idle pulley                      | 10. Poly-groove belt                  | 16. EGR valve             |
| 5. Water pump pulley                | 11. Cam position sensor               | 17. Power steering pump   |
| 6. Alternator                       | 12. Drive plate (M/T: DMF)            | 18. EGR center pipe       |

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Top view



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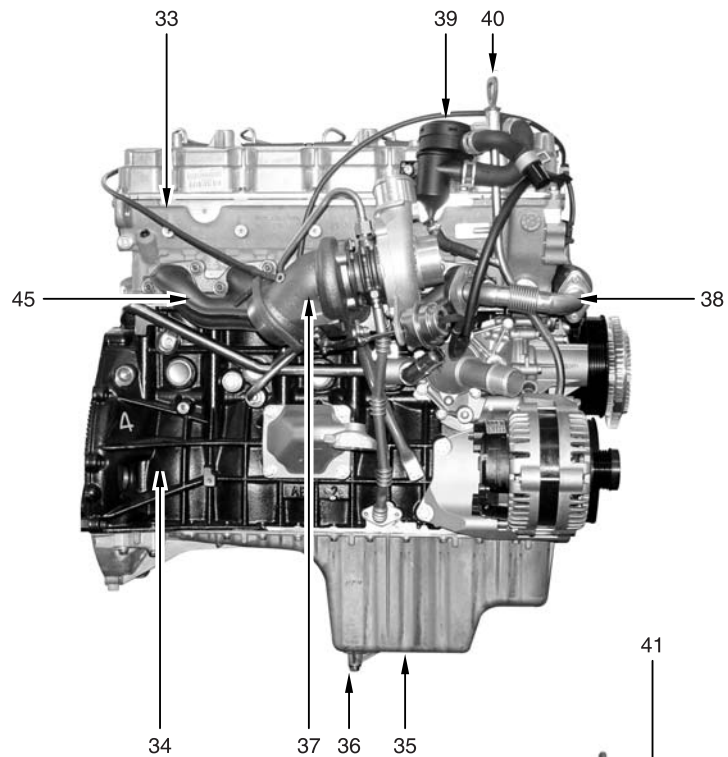
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|--------------------------|----------------------|-----------------------------|
| 19. Cylinder head cover  | 24. Fuel pipe        | 29. Booster pressure sensor |
| 20. Intake manifold      | 25. Injector         | 30. Oil separator           |
| 21. Water outlet port    | 26. Fuel return line | 31. Oil dipstick            |
| 22. Common rail          | 27. Oil filler cap   | 32. EGR center pipe         |
| 23. Fuel pressure sensor | 28. Glow plug        |                             |

GENERAL INFORMATION

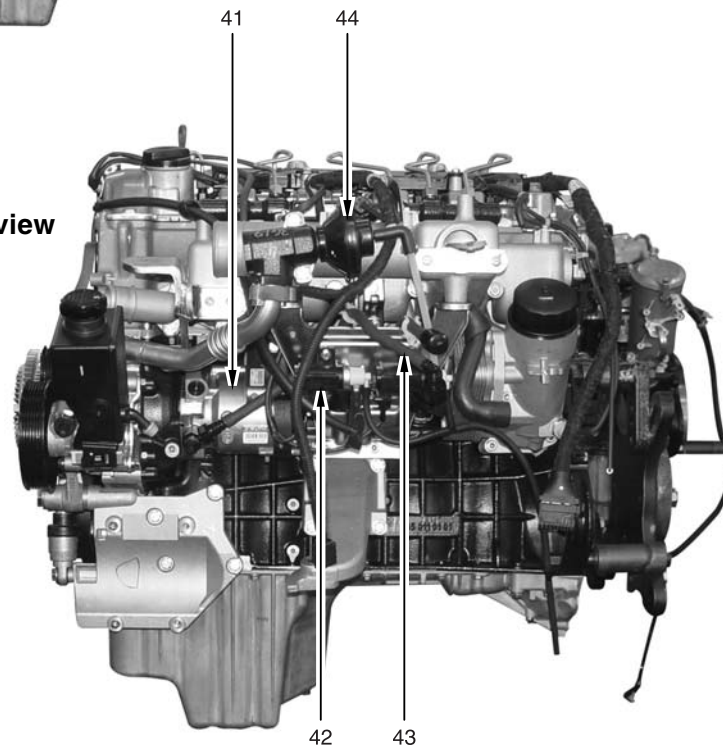
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## Left side view



## Right side view



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33. Cylinder head  
 34. Cylinder block  
 35. Oil pan  
 36. Drain plug  
 37. Turbocharger

38. EGR - RH pipe  
 39. Oil separator  
 40. Oil dipstick  
 41. HP pump

42. Turbocharger vacuum modulator  
 43. EGR valve vacuum modulator  
 44. EGR valve  
 45. Exhaust manifold

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# ENGINE CONTROLS

## ECU RELATED COMPONENTS

**ECU/barometric sensor**



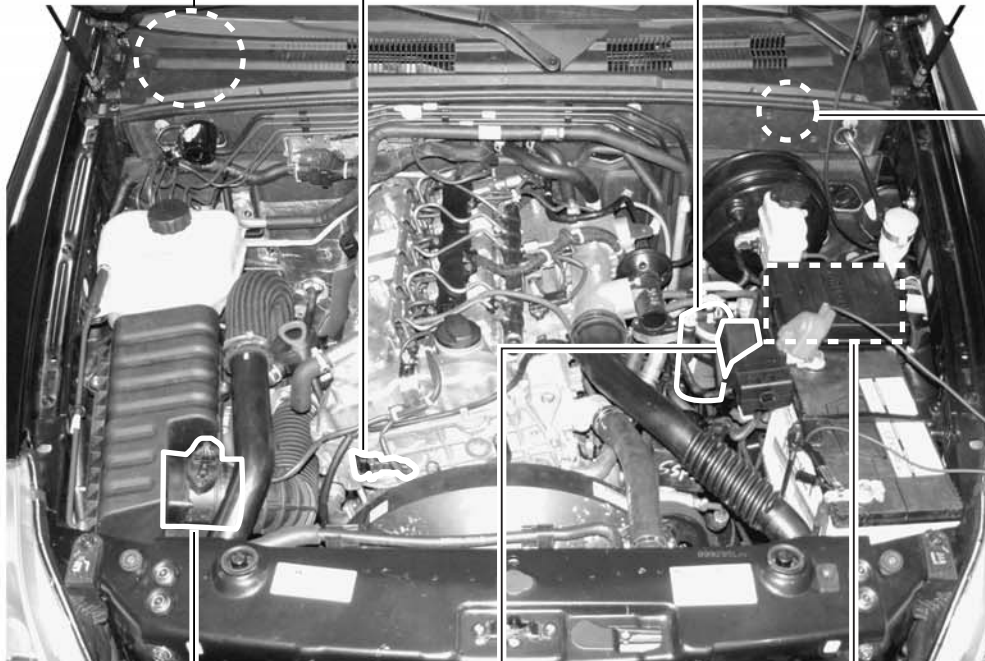
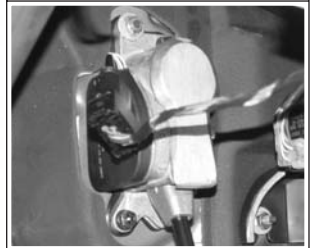
**Cam position sensor**



**Fuel filter (water detection sensor)**



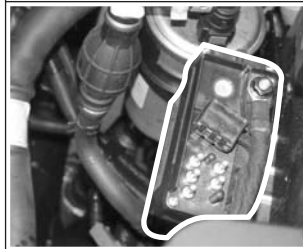
**Accelerator pedal sensor**



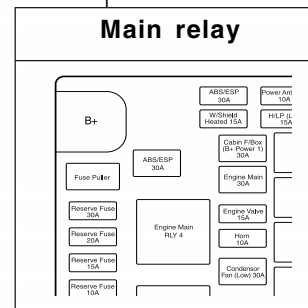
**HFM sensor/intake air temperature sensor**



**Pre heating time relay**



**Main relay**



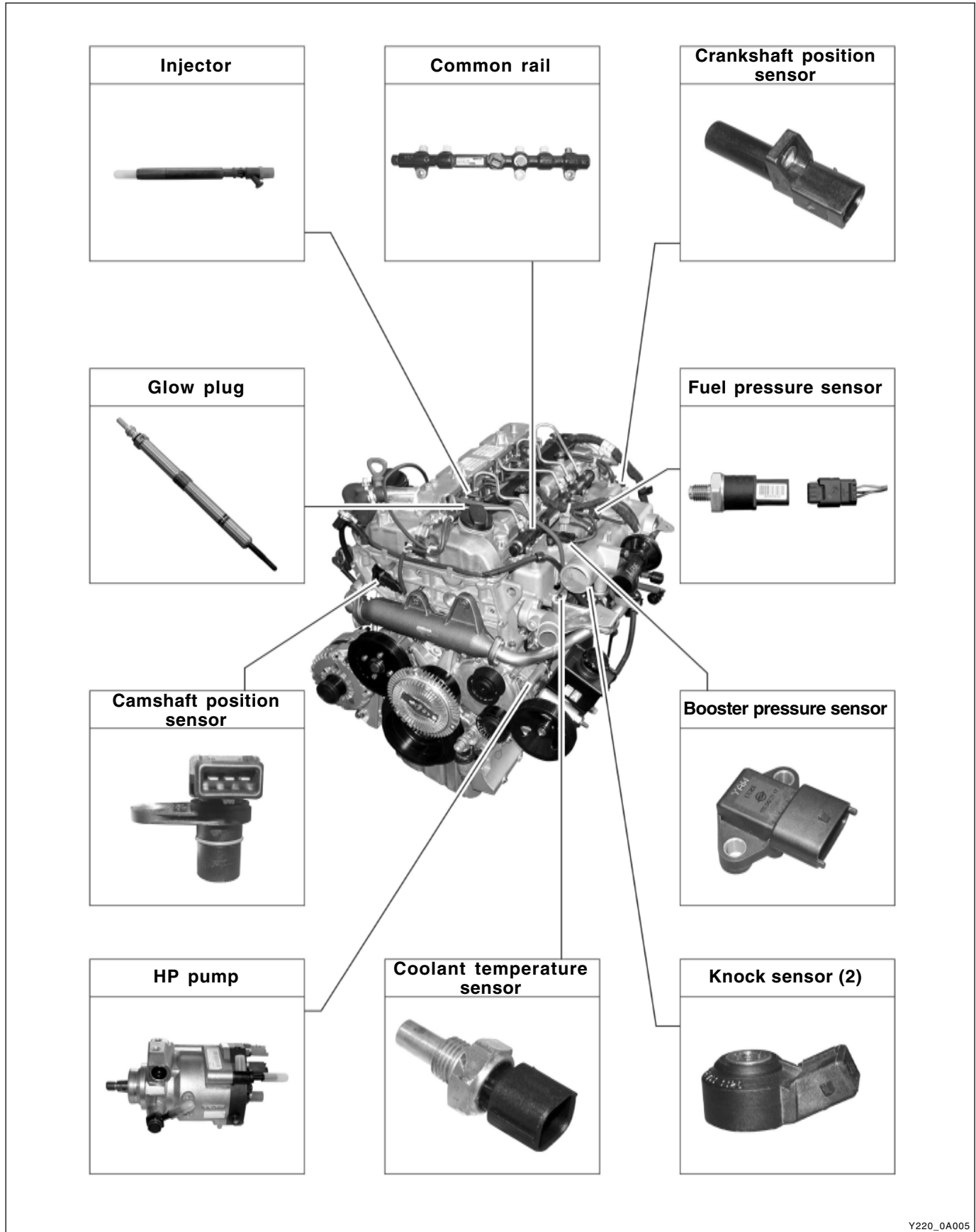
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# ENGINE AND SENSORS

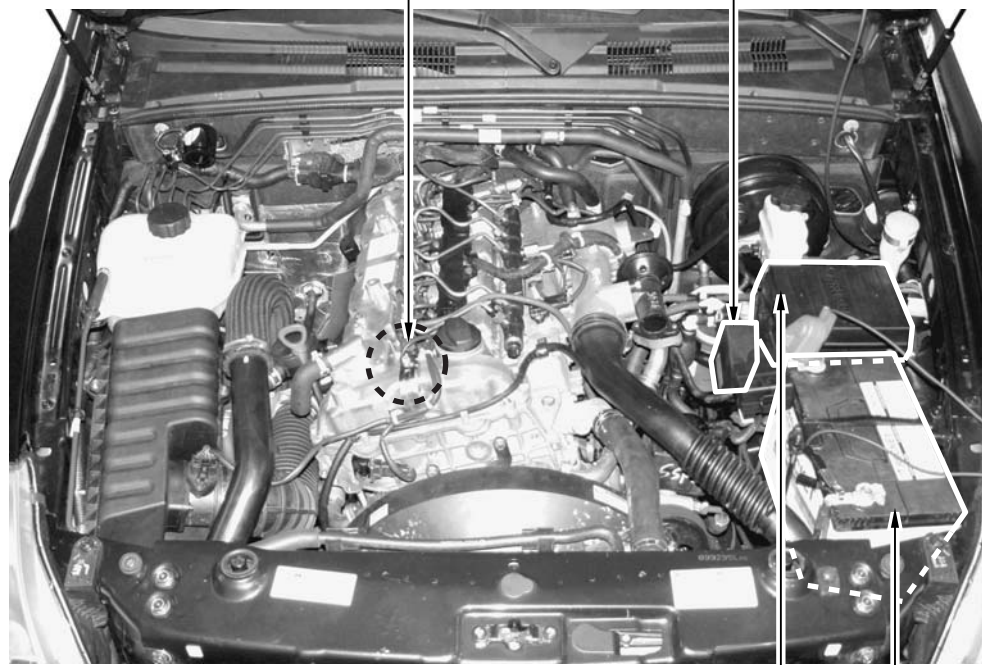
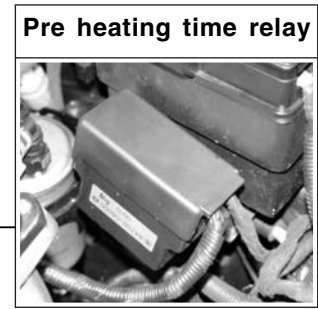
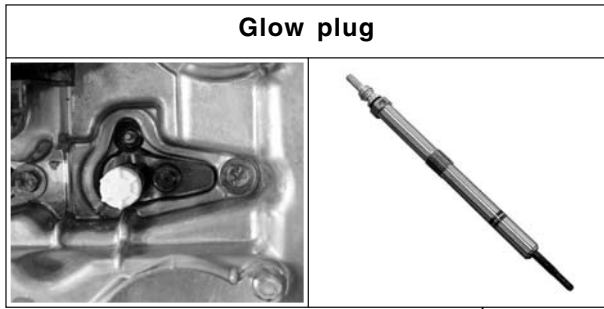


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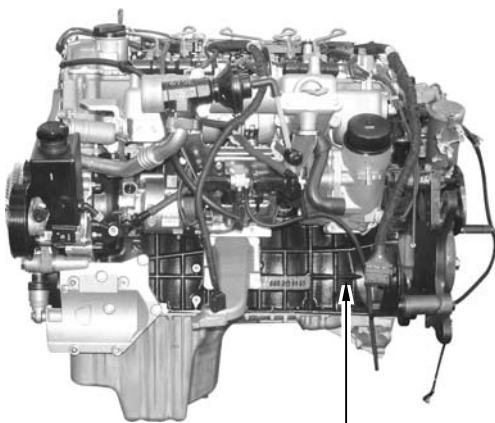
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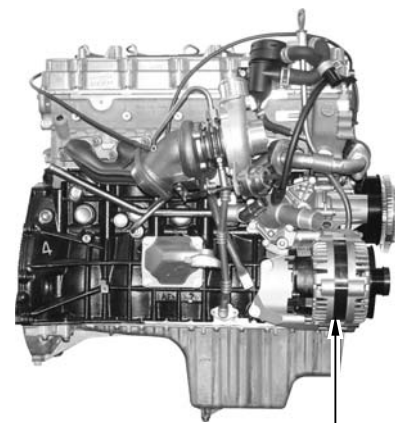
# ELECTRICAL COMPONENTS AND PRE HEATING SYSTEM



**Fuse box    Battery**



**Starter motor**



**Alternator**

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# INTAKE SYSTEM

**Air cleaner assembly**



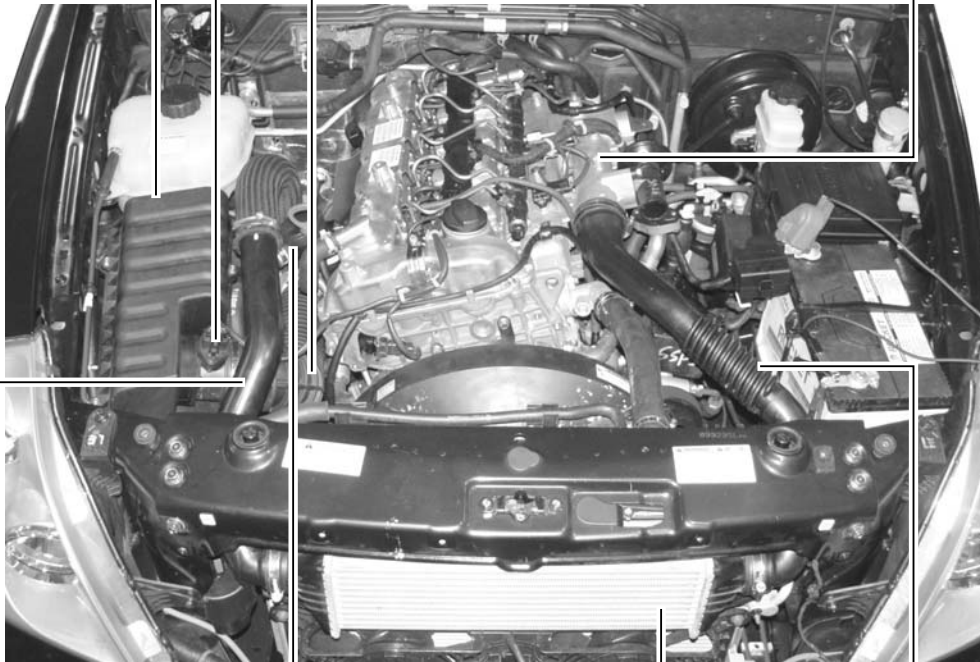
**HFM sensor**



**Intake duct hose**



**Intake manifold**



**Intake outlet hose**



**Turbocharger**



**Intercooler**



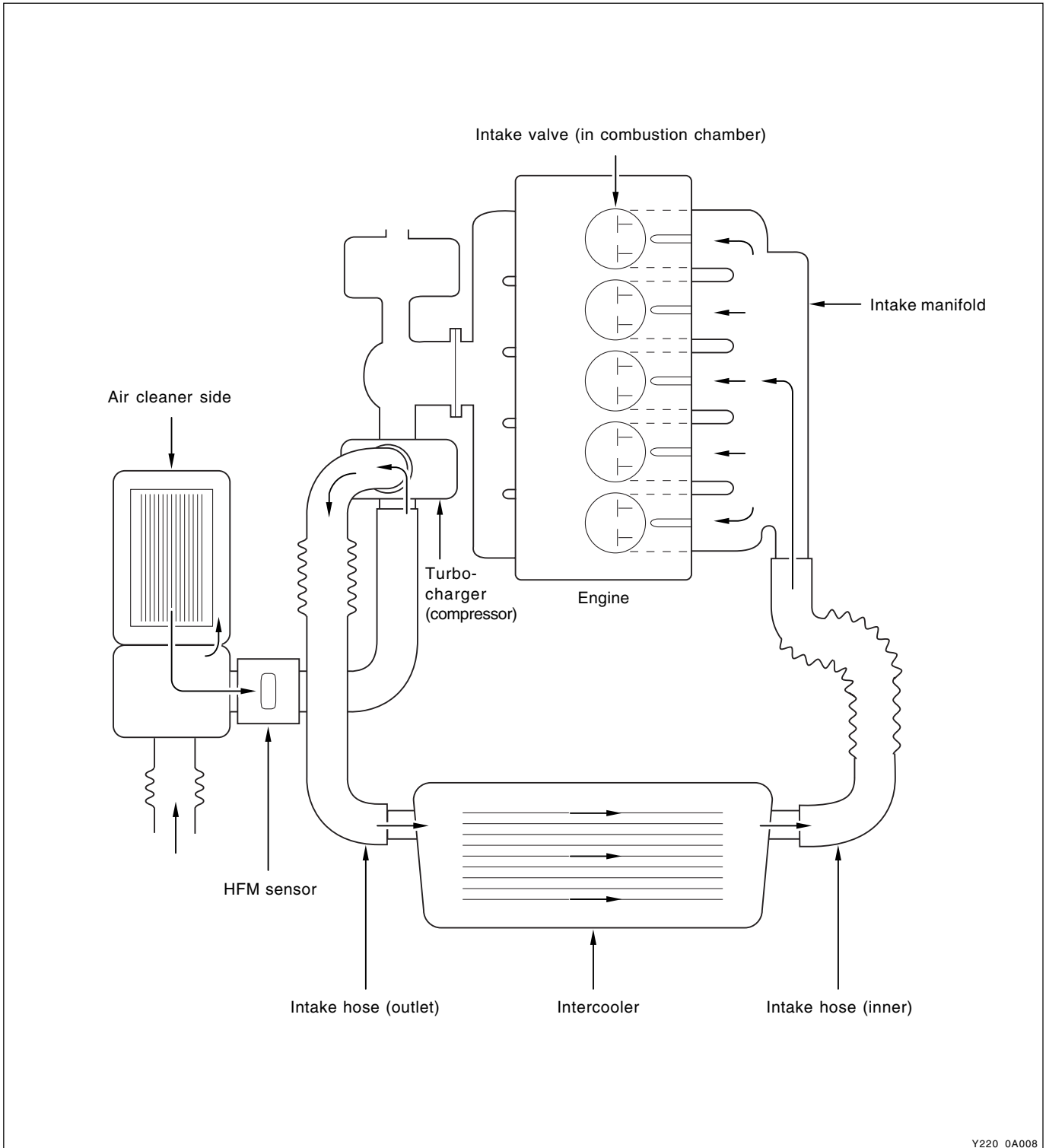
**Inlet hose**



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# INTAKE AIR FLOW CHART



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