NISSAN Learning Academy

Nissan Australia. July 2008.

T31 NISSAN X-TRAIL DIESEL (M9R)

Foreword

The information in this Training Manual should not be interpreted as a basis for warranty or goodwill claims against Nissan Motor Co. (Australia) Pty. Ltd. (NMA) unless so designated.

This Technical Training Manual is intended for use by NMA & Nissan Dealership Technical Personnel. It is not designed for the use by press or for customer distribution.

Before quoting any specifications be sure to check the relevant Service Manual and Technical Bulletins.

Right for alteration to data and specifications at any time is reserved. Any such alterations will be advised by Nissan through Technical and Sales Bulletins.

Ref: Technical Training Department.

ABOUT THIS TRAINING MANUAL

The purpose of this document is for Nissan Dealer Technical Staff SELF STUDY purposes. If anything contained within this document gives any doubt, please contact Nissan via a Non Vehicle related TechLine enquiry to clarify the information within this document.

The information in this training manual should not be interpreted as a basis for warranty or goodwill claims against Nissan Motor Co. (Australia) Pty. Ltd. (NMA) unless so designated.

FUTURE UPDATE'S OF THIS TRAINING MANUAL?

Additional information will be collated & added to this document at a later date. When this does occur, a special amendment document will be published on the new Nissan Learning Academy.

Go to **www.nissanlearningacademy.com.au** for more detail.

This actual Training Manual will also be readily available at anytime for download & printing within each Nissan Dealership.

T31 SERVICE MANUAL (ESM)

SM8E-1T31G2

Your dealership service department will have access to a Service Manual (ESM) for T31 in July 2008. If not, please contact TechLine via a non vehicle related enquiry.

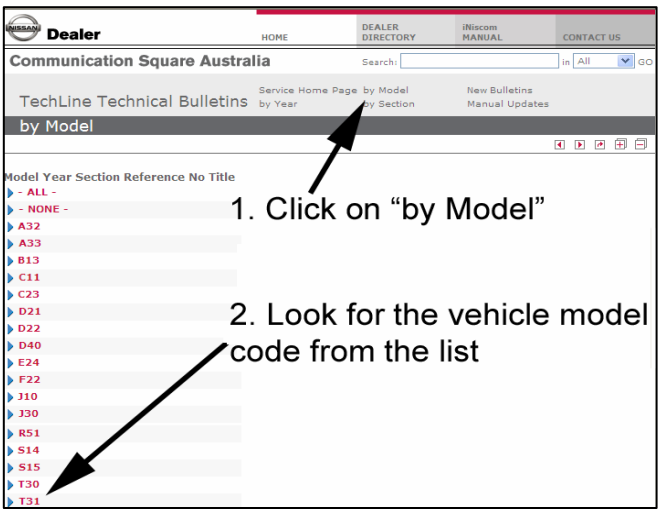
This Training Manual is designed for the purpose of relaying information about the vehicle & the systems within it. This Training Manual is NOT to be used as the Service Manual. Throughout this Training Manual, references are made to the Service Manual for additional information regarding fault diagnosis, repairs &/or maintenance.

Once again should there be any doubt, please contact TechLine.

T31 SERVICE TECHNICAL BULLETINS

Please ensure you familiarise yourselves with all STB's relating to T31.

Once the screen where all STB's are accessed, click on the "by Model" link & then all the STB's will be re-sorted so that all the T31 STB's are together.



M9R

The T31 X-TRAIL is now available with a 2.0L 4 cylinder turbo diesel engine.

The all new M9R engine is a jointly developed engine by Nissan & Renault. Various Renault models utilise this engine in the Australian market as well as the X-TRAIL. The engine is a 2.0L Common Rail Diesel engine with a maximum power / torque output of 127kW / 360Nm (M/T only).
The 127 kW engine can be identified via the red coloured "I" in the "dCi" badge on the tailgate.

direct Common-rail injection

T31 M9R Technical Features

- Displacement (Litres); 2.0.
- Bore x Stroke (mm) 84 x 90
- Compression Ratio; 15.6:1
- Direct Injection
- M/T Maximum Power (kW); 127 @ 3750 rpm.
  M/T Maximum Torque (Nm) 360 @ 2000 rpm.
- A/T Maximum Power (kW); 110 @ 4000 rpm.
  A/T Maximum Torque (Nm) 320 @ 2000 rpm.
- Bosch CP3 CRD (1600 BAR max pressure)
- Piezo type Injectors
- Variable Geometry Turbo controlled by the ECM
- Intercooler mounted in front of the radiator
- Diesel Particulate Filter
- Valve train; DOHC 4-valves-per-cylinder with hydraulic lash adjuster
- 1 x Single row Timing Chain (Small 2nd chain for Engine Oil Pump only)
- Piston Cooling Jets
- Gear driven Balance Shaft unit attached to the base of the engine.
- Engine Oil specification; 5W 30 ACEA C3 “Low Ash”. 10,000km service interval

R51 / D40 YD25 Technical Features

- Displacement (Litres); 2.5.
- Bore x Stroke (mm) 89 x 100
- Compression Ratio; 16.5:1
- Direct Injection
- Maximum Power (kW); 126 @ 4000 rpm.
  Maximum Torque (Nm) 403 @ 2000 rpm.
- Denso CRD (1800 BAR max pressure)
- Solenoid type Injectors
- Variable Geometry Turbo controlled by the ECM
- Intercooler mounted in front of the radiator
- Diesel Particulate Filter (A/T only)
- Valve train; DOHC 4-valves-per-cylinder, shim adjustable
- 2 x Dual row Timing Chains
- Piston Cooling Jets
- Gear driven Balance Shaft unit attached to the base of the engine.
- Engine Oil specification;
  A/T variants fitted with DPF; 5W 30 ACEA C3 “Low Ash”. 10,000km service interval
  M/T variants / variants without DPF;
  10W 40 ACEA B3. 10,000km service interval

SPECIAL PRECAUTIONS FOR THE M9R ENGINE

ENGINE FUEL SYSTEM

• Do NOT “crack open” an injector line (i.e.; loosen any steel fuel pipes / lines) or any fuel tube connected to the Fuel Rail whilst the engine is running or being cranked. Use CONSULT-III ENGINE – DATA MONITOR to determine if the engine has sufficient fuel pressure!

• Do NOT re-use any steel fuel tubes that form part of the high pressure fuel system once they have been loosened / removed!

• Do NOT disassemble the Fuel Rail. If components such as the Fuel Rail Pressure Sensor or the Pressure Regulating Solenoid Valve require replacement, the WHOLE FUEL RAIL is to be replaced!

• As a general rule, do NOT allow any fuel components (from the Fuel Filter through to the Injector) to be left open to the atmosphere. The atmosphere itself as well as airborne particles can damage the fuel system components. REFER TO THE SECTION OF THE SERVICE MANUAL TITLED **“PRECAUTIONS”** IN SECTIONS EM & EC for M9R ENGINE (ECR) FOR MORE DETAILS!

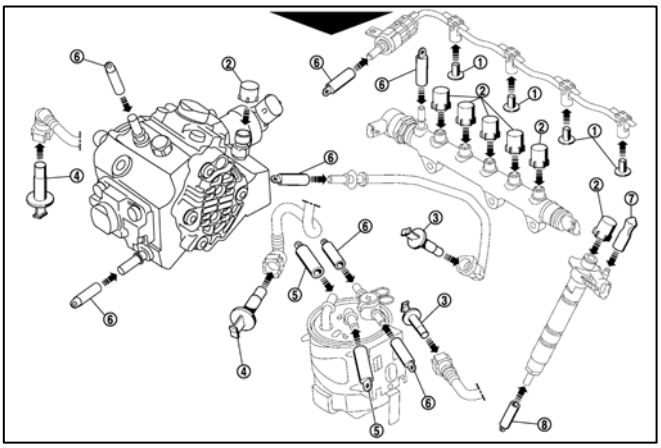
• Removed fuel system components must be placed in specially “HERMETICALLY SEALED BAGS”. Otherwise components must be plugged using special plugs from Nissan parts. Refer to **”PRECAUTIONS”** in the Service Manual as mentioned above.

• A simple operation such as replacing the fuel filter at the 40,000km service can damage the fuel system if the operation is carried out in a contaminated environment!

• Ensure that the vehicle runs ONLY on good quality Diesel Fuel! Bio Diesel is in NO WAY suitable for this or any Nissan CRD engine!

• Do NOT in any way disassemble the Fuel Pump or Fuel injectors

• Petrol – EVEN IN TINY QUANTITIES – will damage the engine!



• Check that you have the plugs for the unions to be opened (bag of plugs sold at the Parts Stores - Nissan part No. 16609 00Q0A). Plugs are to be used once only. After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be thrown away.
• Check that you have hermetically re-sealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.
• Lint-free towelettes are to be used for fuel pump related service purpose. The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.

SPECIAL PRECAUTIONS FOR THE M9R ENGINE

ENGINE CONTROL SYSTEM

• Do NOT ever DISCONNECT the injector harness connectors whilst the ignition is ON or the engine is running on ANY CRD engine. **The Injector operating voltage reaches up to 120 VOLTS!**

• Do NOT wet the engine bay, especially using a high pressure water cleaner. Moisture will most likely cause corrosion issues with the electrical components.

• Always ensure all GROUND connections are clean & tight. Poor grounds will cause poor running issues, electrical noise / interference issues etc.

• Do NOT unscrew the Fuel Rail Pressure Sensor & the Fuel Pressure Regulating Solenoid from the Fuel Rail. The rail / sensor / solenoid can only be replaced as 1 part.

• Do NOT probe the Fuel Rail Pressure Sensor with ANY kind of Multimeter. This can damage the sensor. Carefully follow the directions in the Service Manual for the sensor inspection procedure.

DIESEL PARTICULATE FILTER (DPF) / EXHAUST SYSTEM

• Do NOT modify the exhaust system in anyway & do NOT remove or encourage the removal of ANY Heat Shields. Always ensure the Heat Shields are in a serviceable condition.

• Do NOT install OR allow the installation of accessories underneath the vehicle.

• Ensure the area around the exhaust system is clear of ANY debris whenever the vehicle is presented for service.

• Do NOT use exhaust extraction equipment whilst carrying out the “Service Regeneration” procedure using CONSULT-III.

• Ensure the vehicle is parked in a WELL VENTILATED area whilst the Regeneration process is being completed. Do NOT use exhaust extraction equipment. The engine needs to be left idling for 40 minutes.

• Whilst Regeneration is being performed, ensure the floor / ground below the vehicle is clear of ANY material / debris. Ensure the floor / ground surface beneath the vehicle is capable of withstanding high temperatures.

• Always replace engine oil and engine oil filter after a Service Regeneration using CONSULT-III. Fuel mixes with engine oil during service regeneration. Ensure the engine oil used is **5W 30 ACEA C3. (Full Synthetic)**

• Never perform “DPF DATA CLEAR” in “WORK SUPPORT” mode with CONSULT-III unless the DPF has been replaced with a new one. If the DATA CLEAR was performed with CONSULT-III, yet the DPF was a used / in service unit, it maybe damaged because Regeneration is not performed at appropriate timing.

SPECIAL PRECAUTIONS FOR THE M9R ENGINE

ENGINE MECHANICAL

• Do NOT re-use the drive belt once it has been removed.

• If the drive belt is to be replaced, the auto tensioner & pulleys have to be replaced as well.

• The drive belt, tensioner & pulleys are to be replaced every 100,000km's.

• Do NOT run the engine without the drive belt or the harmonic balancer will be damaged.

• Do NOT loosen / remove the fuel pump pulley.

ENGINE LUBRICATION & COOLING SYSTEMS

• Do NOT refill the engine with engine oil TOO FAST. During servicing, add the engine oil slowly, it otherwise will spill out of the filler neck.

• Do NOT start the engine until the new oil that was added to the engine has settled to the sump. If the engine is started too soon after filling, the oil may be sucked into the combustion chamber via the engine breathing system. Allow 10 minutes. After 10 minutes, start the engine, wait until the oil pressure light goes out (should only be a few seconds) & then stop the engine. Wait a further 10 minutes to ensure the engine oil has settled back into the sump. **Do NOT allow the engine to be overfilled. The Engine Oil Level must be EXACTLY ON THE FULL MARK.**

• It is quite common to find that most electronic oil dispensing systems utilised in many workshops are NOT ACCURATE! A slightly overfull oil level can CAUSE SERIOUS ENGINE DAMAGE!

• Ensure that ONLY a **5W 30 ACEA C3 Low Ash - Full Synthetic** engine oil is used in this engine.

• The Engine Coolant is not to be replaced until 80,000km's or 4 years – whichever occurs 1st. Once it has been drained, the engine properly flushed & 3 litres of new Nissan LLC has been added, (along with clean, good quality water) the coolant is to then be replaced every 40,000km's or 2 years.

• Do NOT mix any other brand of coolant with Nissan LLC & do NOT allow the coolant to be diluted.

• Ensure the cooling system has been properly bled after re-filling. Refer to section CO (ENGINE – ENGINE COOLING) of the Service Manual for details on how to bleed the cooling system.

AUTOMATIC TRANSMISSION

• Only EVER use **Nissan Matic J** Transmission Fluid. This is the same fluid that is required for R51 / D40 / Z33 / Y61 TB48.

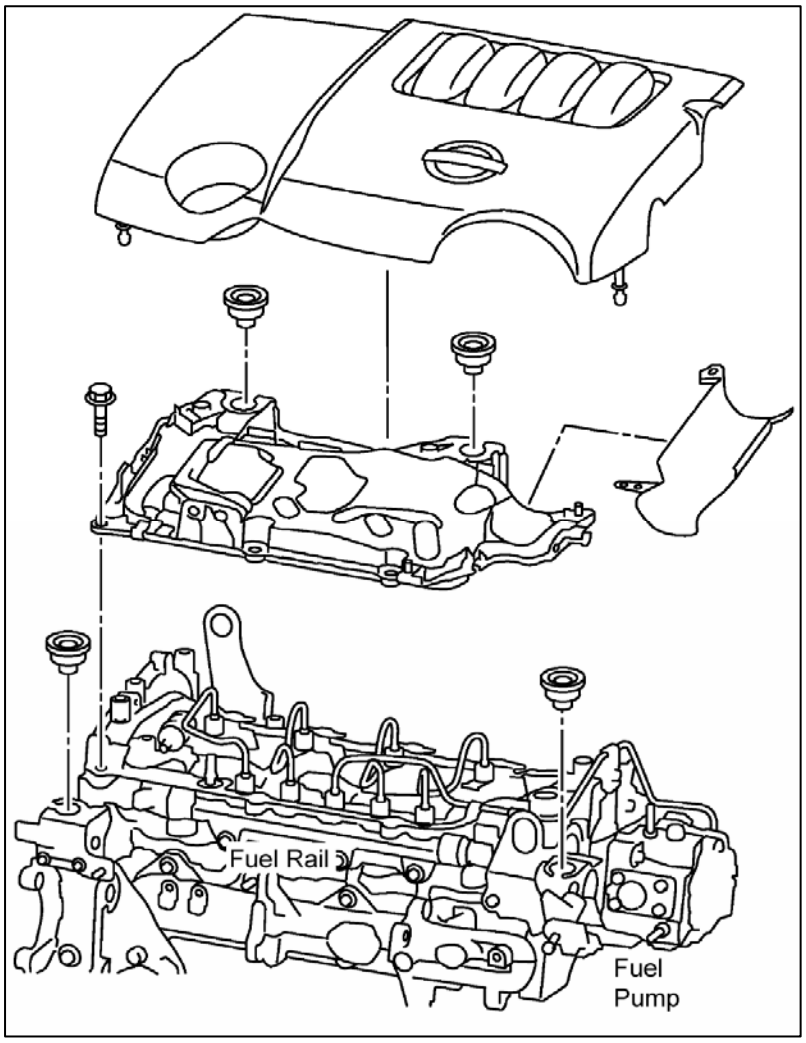
• Do NOT encourage the towing of loads above the maximum towing specification of 1350kg (braked trailer).

ENGINE MECHANICAL

M9R Engine Cover & Injection System Cover

A majority of the injection system is contained underneath a specially designed cover. An additional plastic cover is then located on the top of the engine. These covers are designed to minimise engine noise.

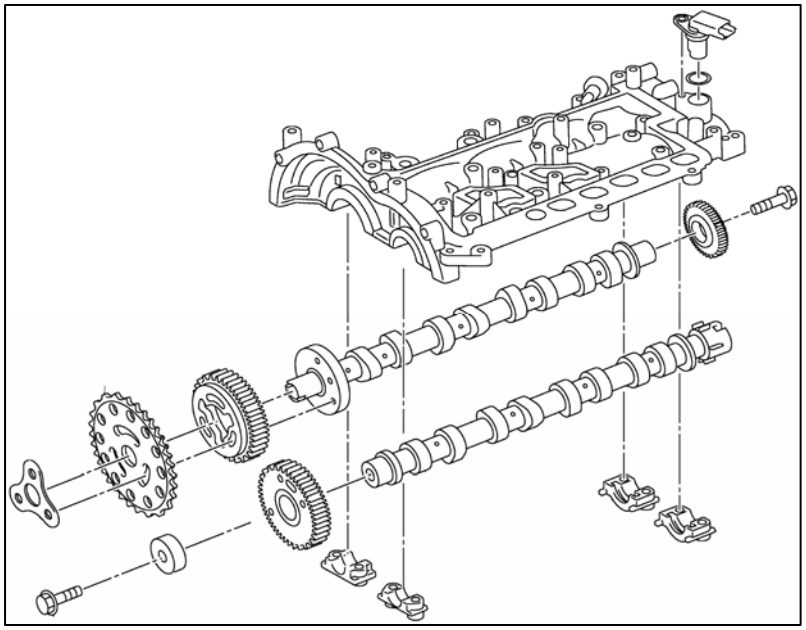
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



M9R Camshafts

There are 2 x camshafts given that the engine is a DOHC engine. Each camshaft opens & closes inlet & exhaust valves. Therefore each camshaft is identified as a left or right camshaft.
This design is very similar to ZD30 & YD25 engines.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

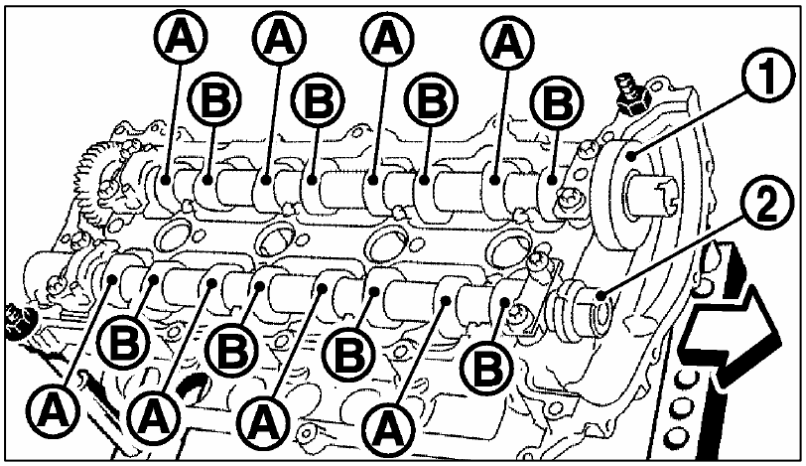


ENGINE MECHANICAL

M9R Inlet & Exhaust Valve Layout

1; Camshaft (right side)
2; Camshaft (left side)
A; Intake cam lobe
B; Exhaust cam lobe

Engine front



M9R Cylinder Head

The cylinder head is made of cast alloy. The valve train utilises hydraulic lifters instead of shims.

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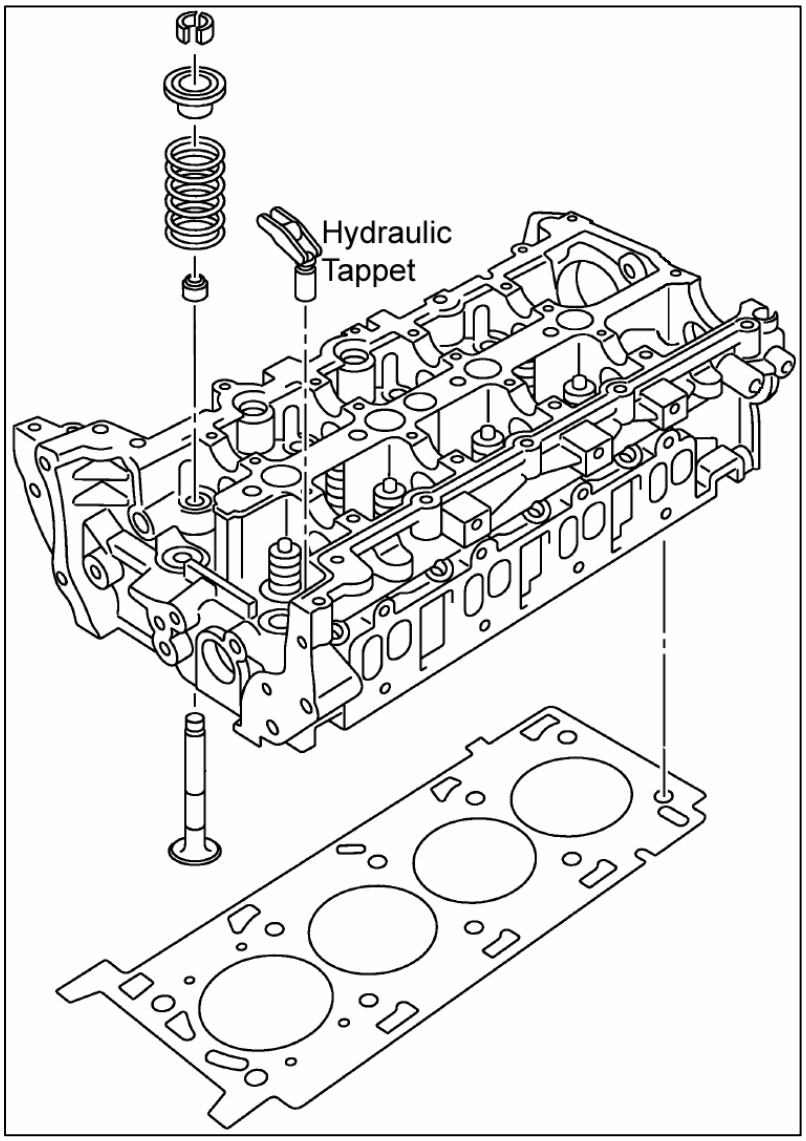
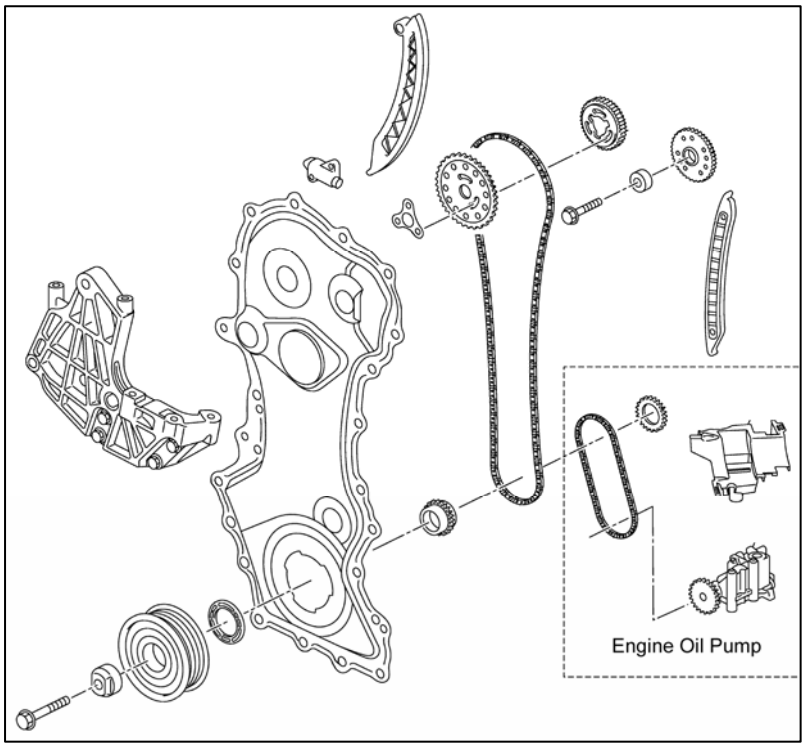


ENGINE MECHANICAL

M9R Timing Chain

A single chain is utilised in order to drive the camshafts.
A secondary chain is utilised to drive the Engine Oil Pump. The design is similar to that on the MR series petrol engine.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

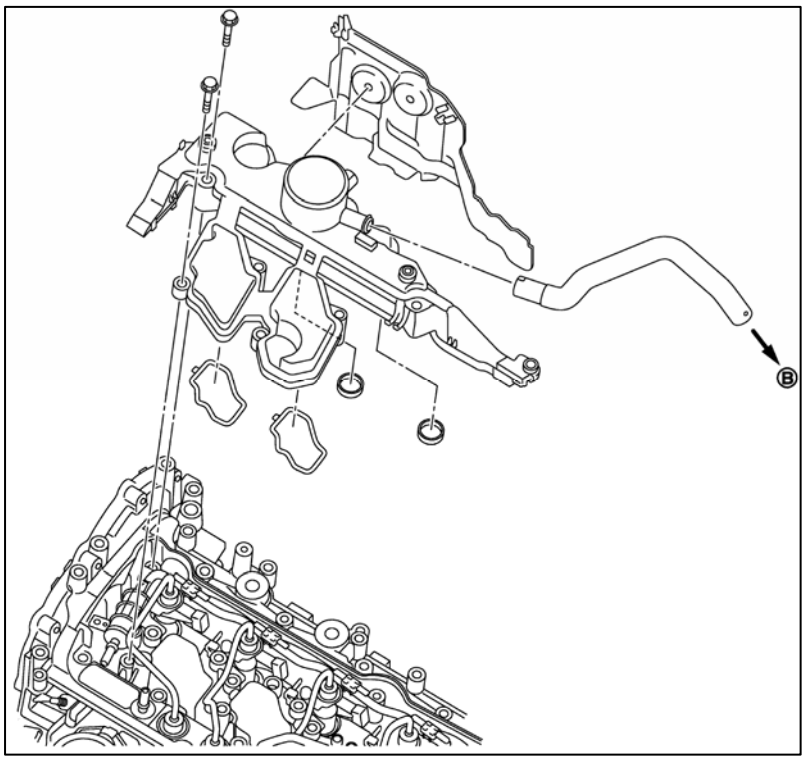


M9R Engine Oil Separator

An elaborate Engine Oil separator unit is installed in the top of the engine.
It controls the flow of the internal engine vapours that are created during the operation of the engine.

NOTE:
Due to the complex nature of the design – GREAT CARE MUST BE TAKEN WHEN RE-FILLING THE ENGINE WITH NEW ENGINE OIL DURING SERVICING.
• Do NOT fill the engine too fast.
• Do NOT start the engine until all of the oil has settled in the sump. Allow at least 10 minutes.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

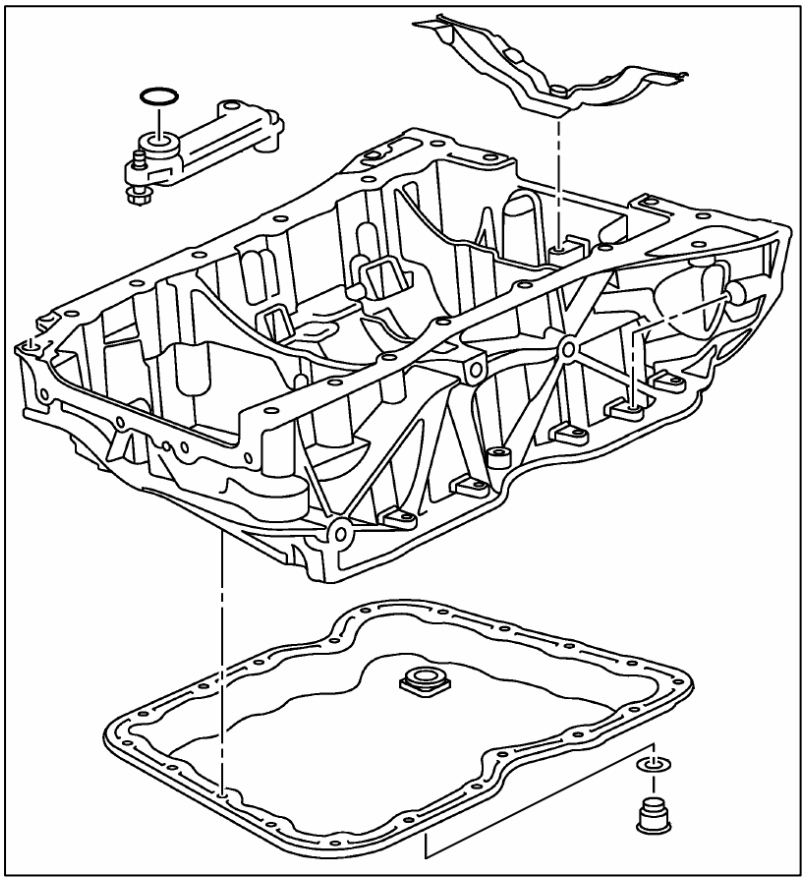


ENGINE MECHANICAL

M9R Oil Pan (Sump)

A 2 piece sump design is utilised. It is of similar construction to YD & ZD engines.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

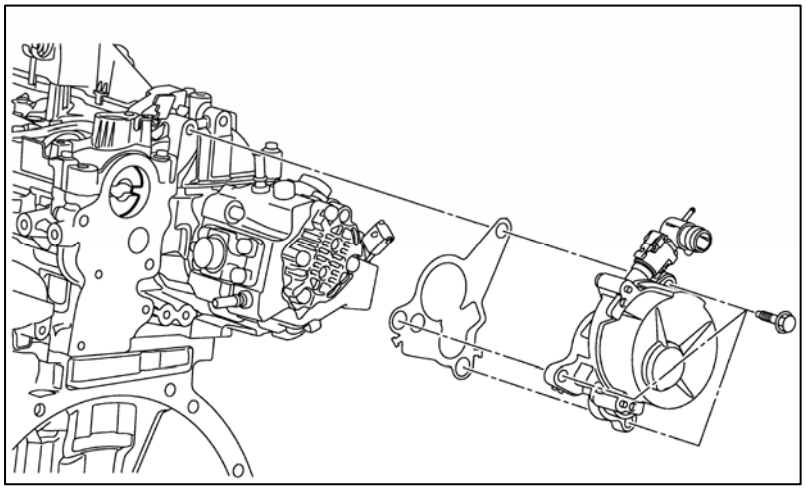


M9R Vacuum Pump

The vacuum pump is driven directly by the RH camshaft. It is located on the rear of the cylinder head adjacent to the Fuel Pump.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

NOTE:
As part of a “Lack of Power” trouble diagnosis, ALWAYS ensure that the vacuum pump is functioning OK.
If the vacuum pump is worn & it is not providing sufficient vacuum, the turbo will not operate properly. As a result the engine will lack power due to lack of Turbo Boost.



ENGINE MECHANICAL

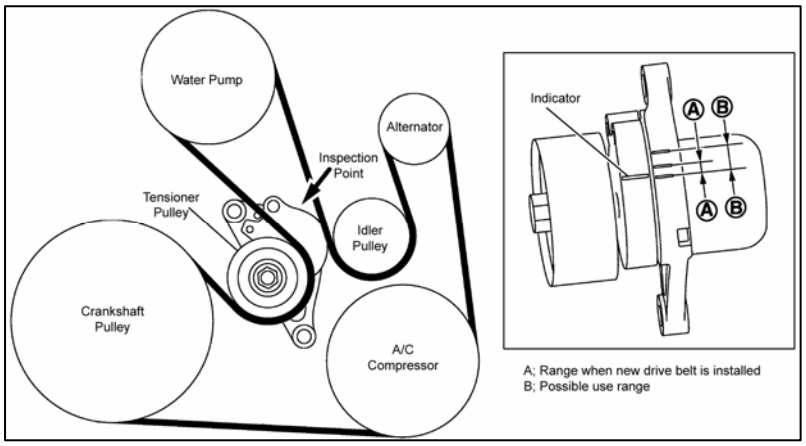
M9R Auxiliary Drive Belt, Idler Pulley & Tensioner

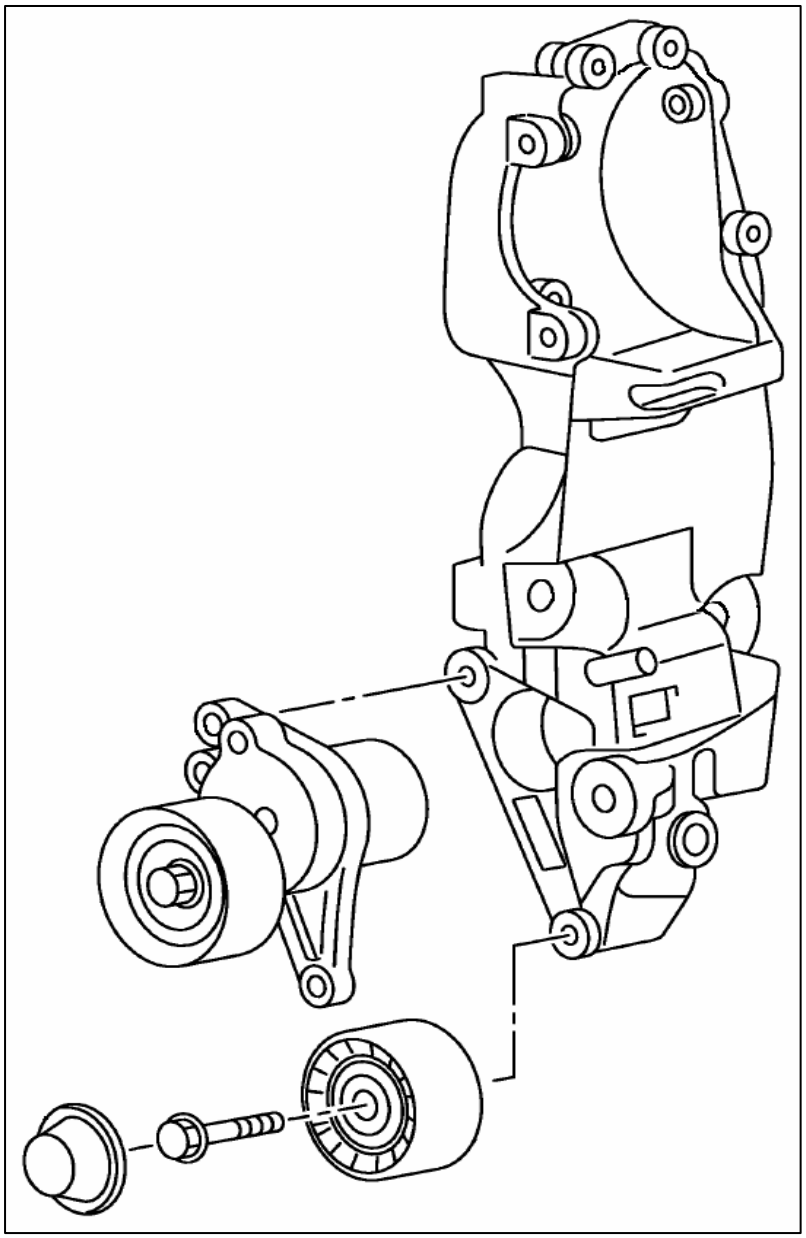
The auxiliary drive belt constantly has its tension adjusted to the correct specification due to the automatic tensioner unit.

NOTES:

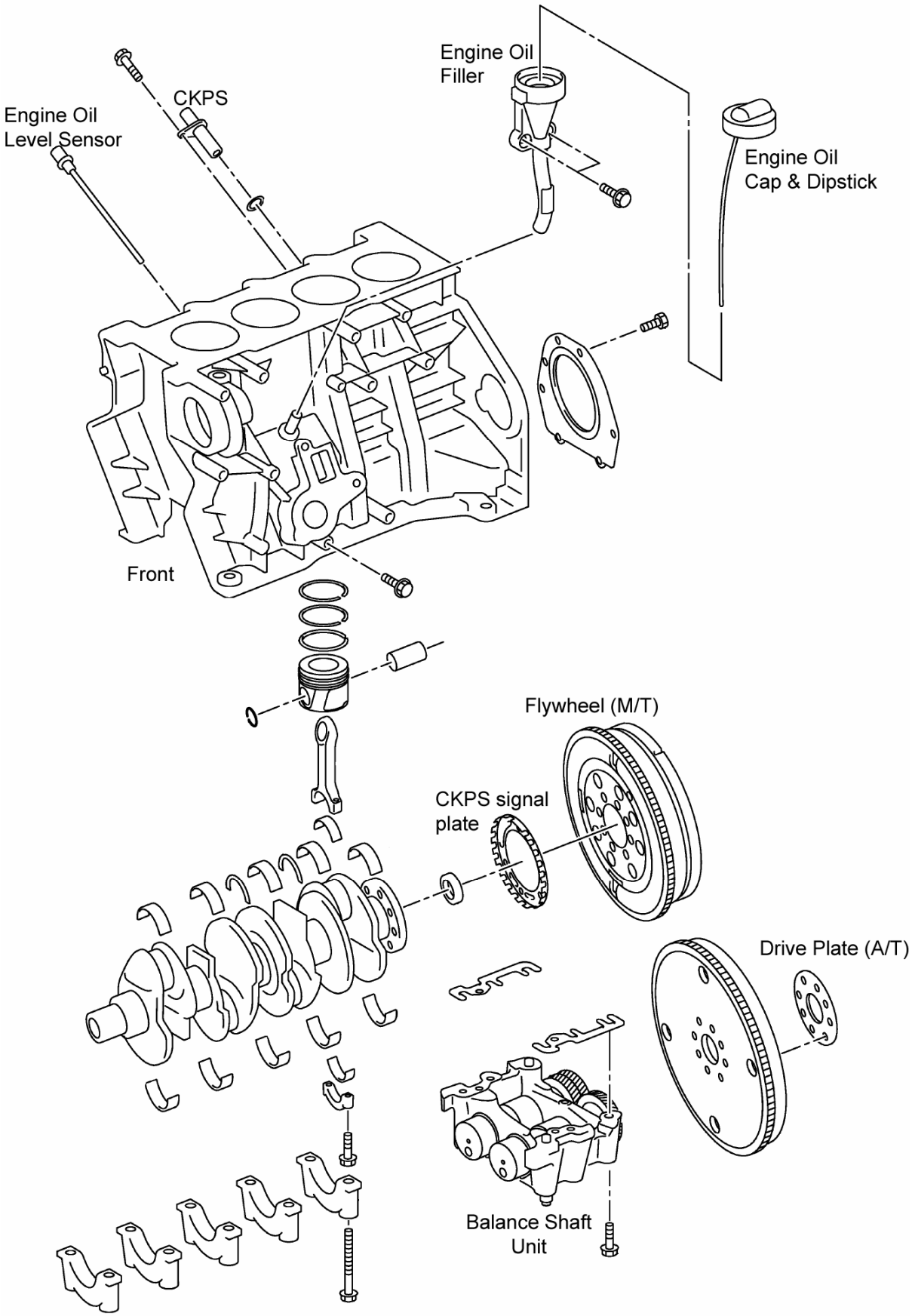
- Do NOT re-use the belt once it has been removed
- Always REPLACE the auto tensioner & idler pulley whenever a new belt is to be installed.
- The drive belt, tensioner pulley & idler pulley must be replaced as a complete set every 100,000km's.
- Do NOT run the engine without the drive belt or the **harmonic balancer will be damaged**.
- The alternator does NOT have a one way clutch fitted. The alternator pulley is a conventional type.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.





ENGINE MECHANICAL

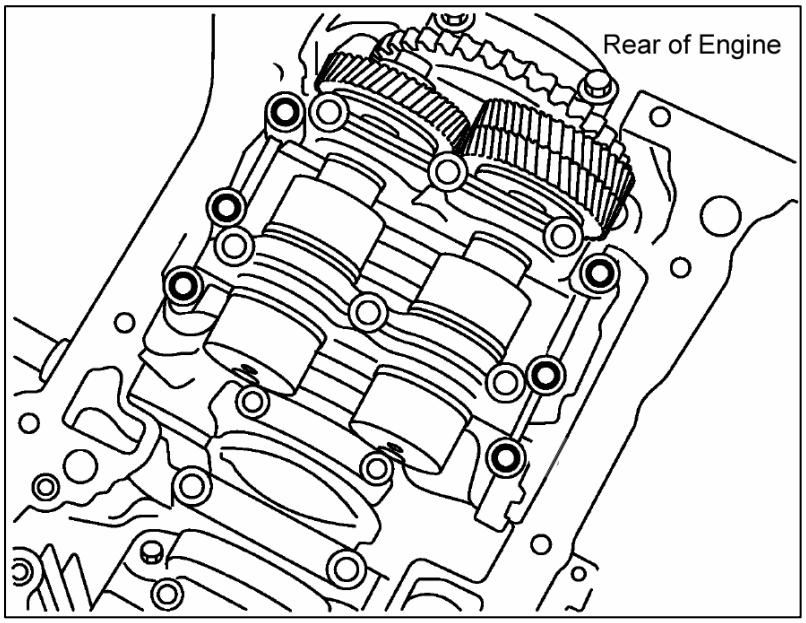


ENGINE MECHANICAL

M9R Balance Shaft Unit

The M9R consists of a gear driven Balance Shaft unit. It is attached to the bottom of the engine inside the sump. The design & operation is similar to that fitted to the YD25 engine.
The balance shaft unit is located at the rear of the engine & it is driven by a gear on the rear of the crankshaft, just forward of the CKPS signal plate.

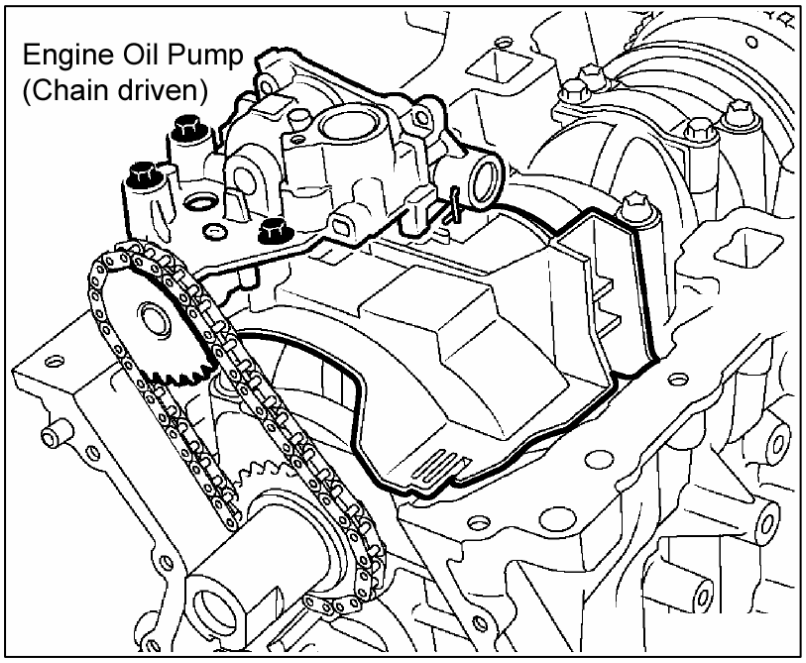
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



M9R Engine Oil Pump

The engine oil pump is mounted & driven in a similar manner to the engine oil pump on the MR series petrol engine. It is driven by a small chain from the front of the crankshaft.

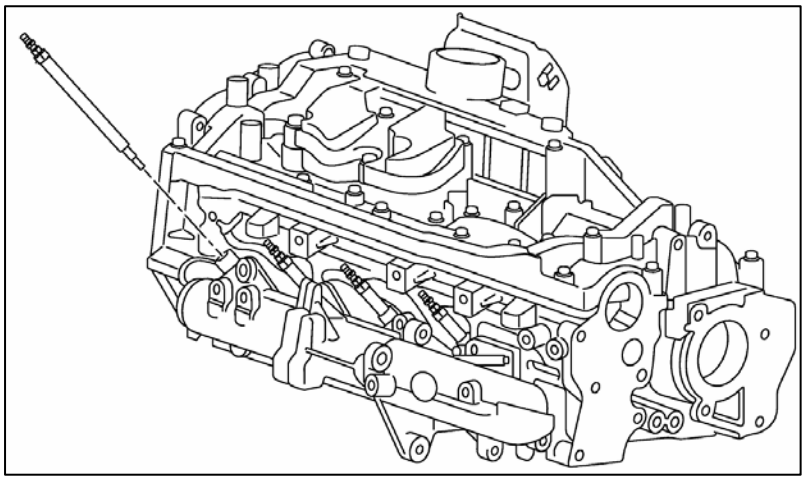
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



ENGINE MECHANICAL

M9R Glow Plugs

The Glow Plugs are a conventional type & are screwed into the cylinder head as shown. The Glow Plugs will need to be removed to carry out a compression test.



Checking Engine Compression

Ensure that the correct SST is utilised. Contact TechLine for the correct SST number.

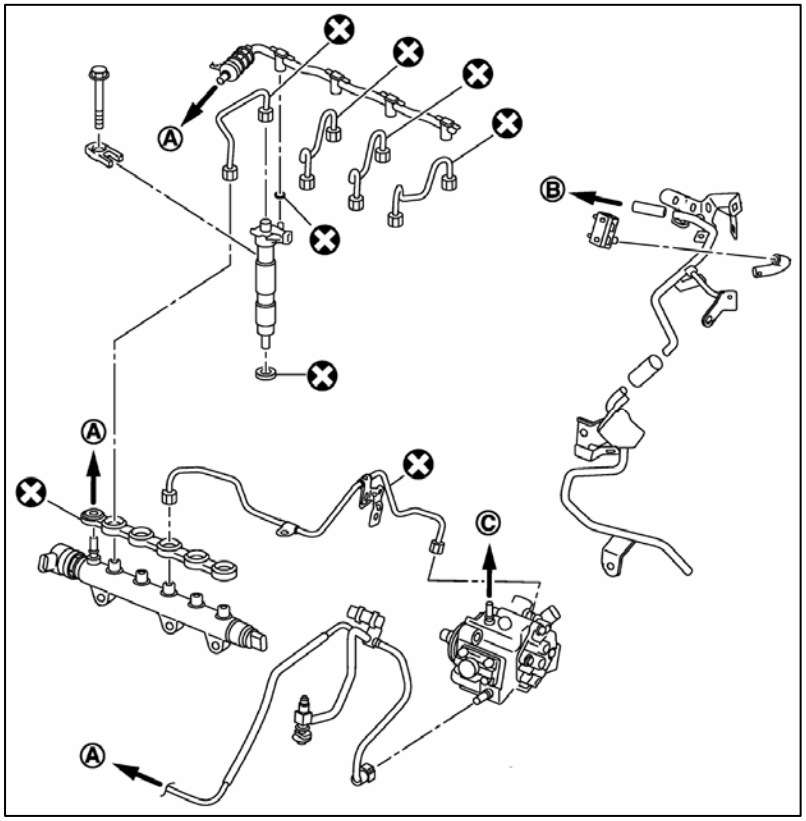
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

M9R Fuel Pump, Fuel Rail & Fuel Injectors

The Fuel Pump is attached to the rear of the cylinder head & is driven directly by the RH camshaft.

The Fuel Rail **WHICH STORES FUEL UP TO A MAXIMUM PRESSURE OF 1600 BAR (23,200 PSI)** is located on the top LH side of the cylinder head.

The Fuel Injectors are inserted into the cylinder head from the top of the engine.



Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

NOTE:

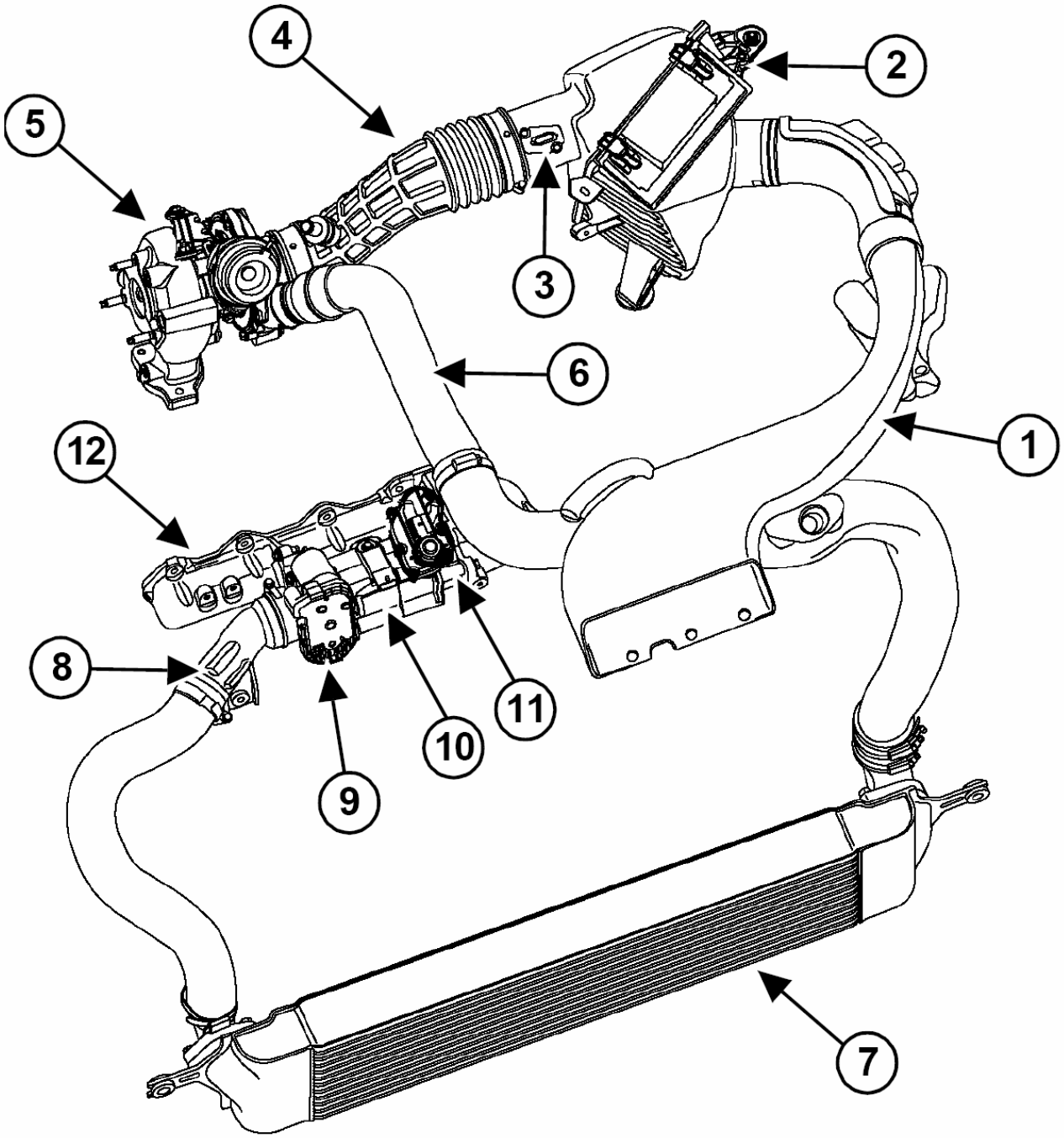
Never reuse components marked with ⊗

DO NOT EVER LOOSEN ANY FUEL SYSTEM COMPONENTS CONTAINING HIGH PRESSURE FUEL WHILST THE ENGINE IS RUNNING. SEVERE INJURY WILL MOST LIKELY RESULT!

The Fuel Pump outputs fuel to the fuel rail under EXTREMELY HIGH PRESSURE! (1600BAR or 23,200PSI)

ENGINE MECHANICAL

Air Intake System



1. Air Inlet Duct	5. Variable Geometry Turbo	9. Electric Throttle Unit
2. Air Cleaner Housing	6. Intercooler Inlet Pipe	10. Turbo Boost Sensor
3. Mass Air Flow Senor	7. Intercooler (behind front bumper)	11. EGR Valve Unit
4. Air Duct	8. Intercooler Outlet Pipe	12. Inlet Manifold

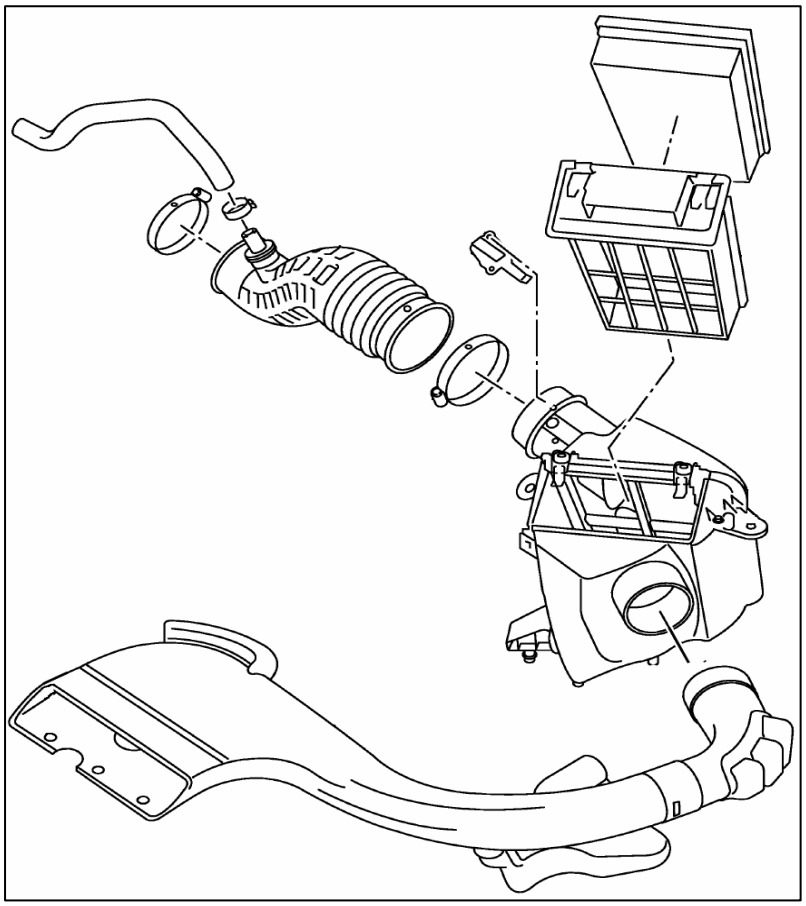
ENGINE MECHANICAL

M9R Air Cleaner housing & Air Duct

Air Cleaner housing & ducting is similar in design to what is installed on QR25 variants.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

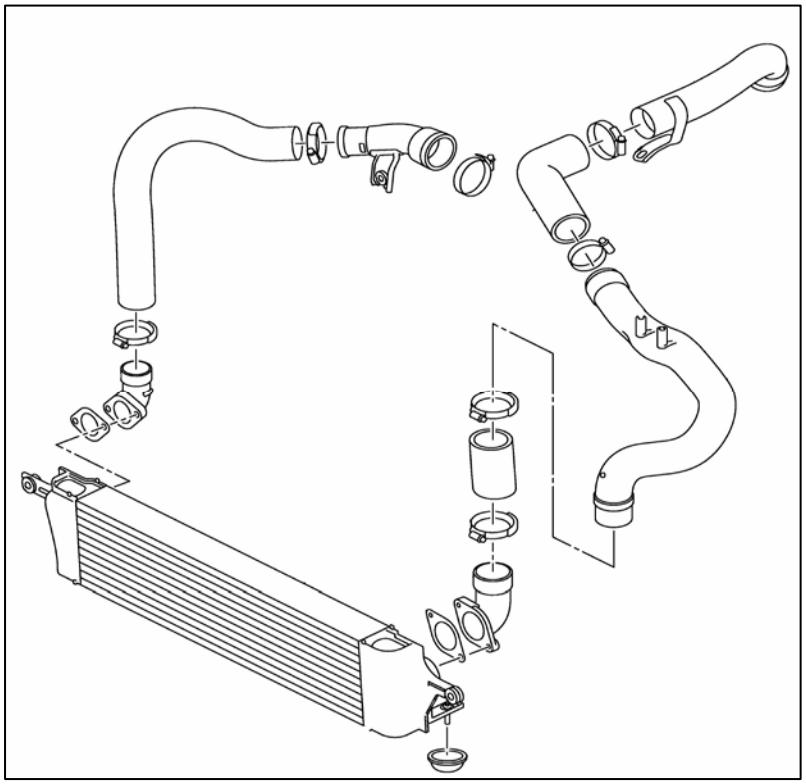
NOTE:
The Air Filter element is NOT the same as fitted to QR25 variants.



M9R Intercooler

The intercooler is fitted behind the front grille / bumper in a similar manner to R51 / D40.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

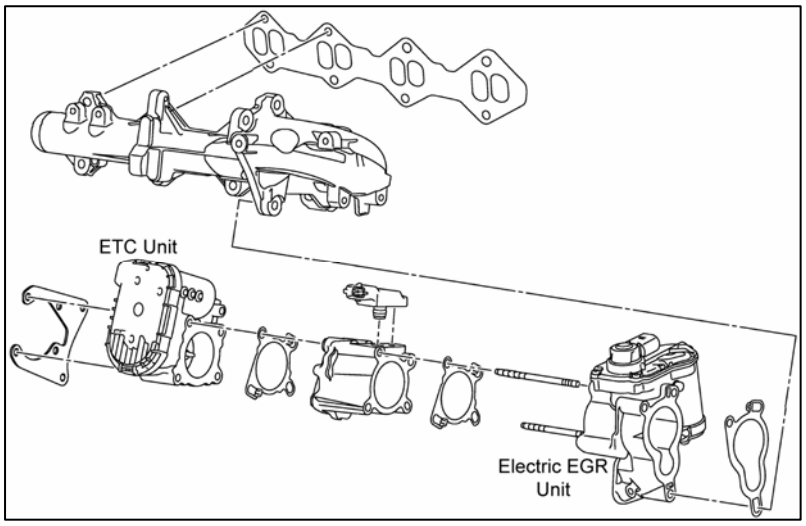


ENGINE MECHANICAL

M9R Intake Manifold

The Intake Manifold is of a cast alloy construction. The ETC unit & the electrically operated EGR volume control valve form part of the inlet manifold.
The ETC unit is utilised during DPF regeneration, EGR control & engine shut down.

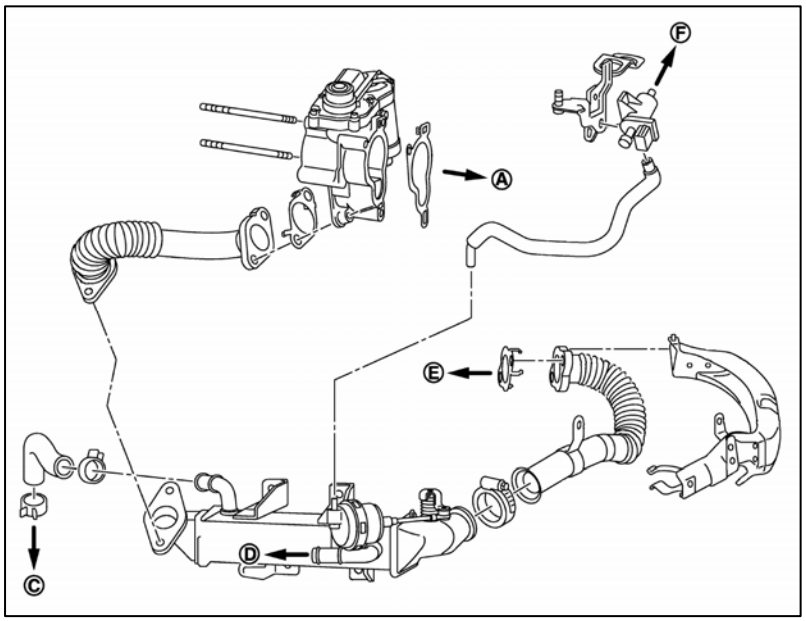
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.
The electrical operation of these components is detailed in section EC of the Service Manual.



M9R EGR System

An EGR system is utilised as is the case with all modern CRD engines. The design & operation of the system is similar to that fitted on ZD30-CRD & the current YD25 engine.

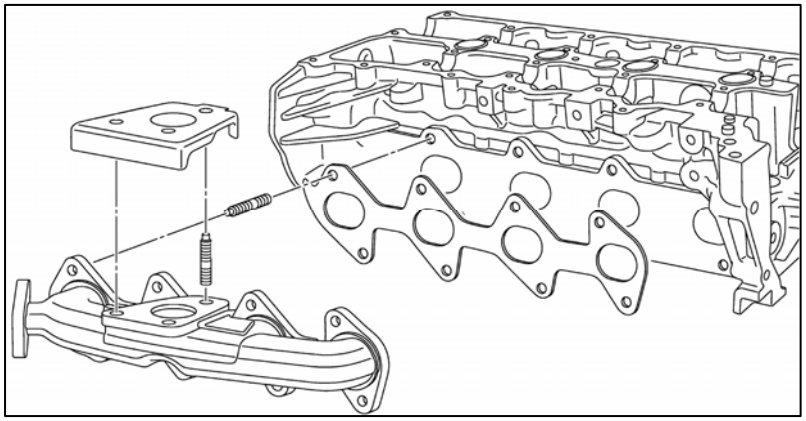
Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



M9R Exhaust Manifold

The exhaust manifold is of a typical cast iron design attached to the cylinder head.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



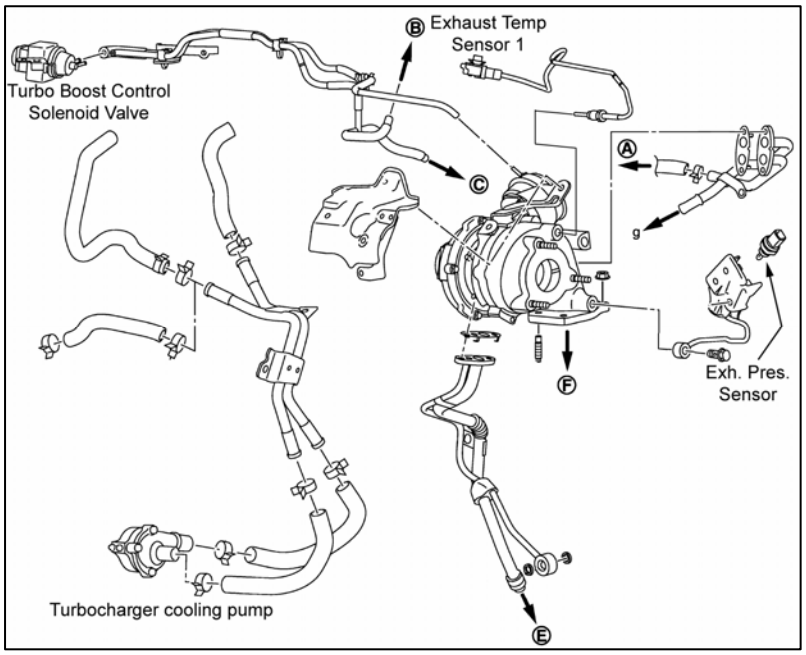
ENGINE MECHANICAL

M9R Variable Geometry Turbo

A Variable Geometry Turbo (Variable Nozzle or VNT) is utilised. The operation of the turbo is the same as fitted to the YD25 engine (D40/R51) or ZD30 engine (Y61).

There is the addition of a coolant pump which circulates coolant around the turbo once the engine has been switched off. This is to ensure that an ideal temperature is maintained after engine shut off. It will only be activated at a pre determined engine coolant temperature. Refer to page 53 for more details.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.

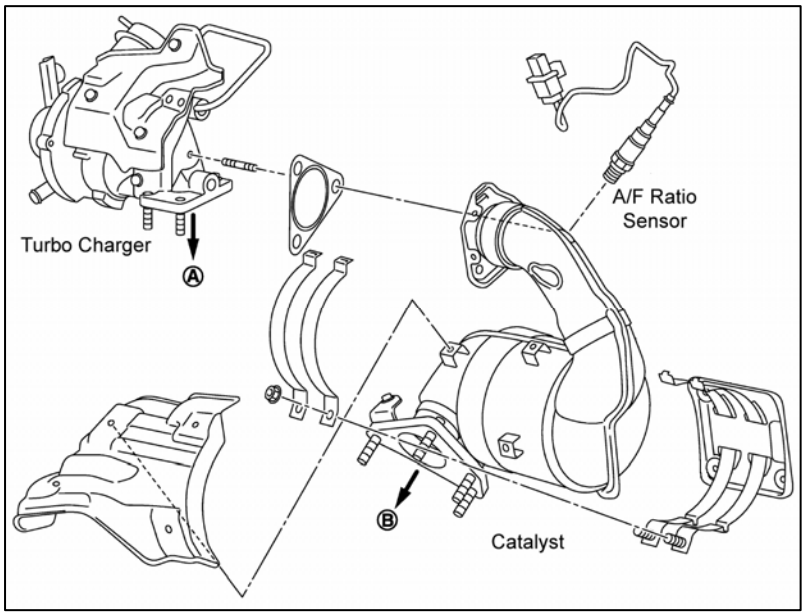


M9R Catalyst

As is the case with any modern CRD engine, an Oxidisation Catalyst is fitted in the exhaust stream directly after the turbo charger unit.

An Air Fuel Ratio sensor is installed in the catalyst & it is required for precise EGR control.

Carefully follow the directions outlined in section ENGINE – ENGINE MECHANICAL of the Service Manual whenever working on any of the components shown right.



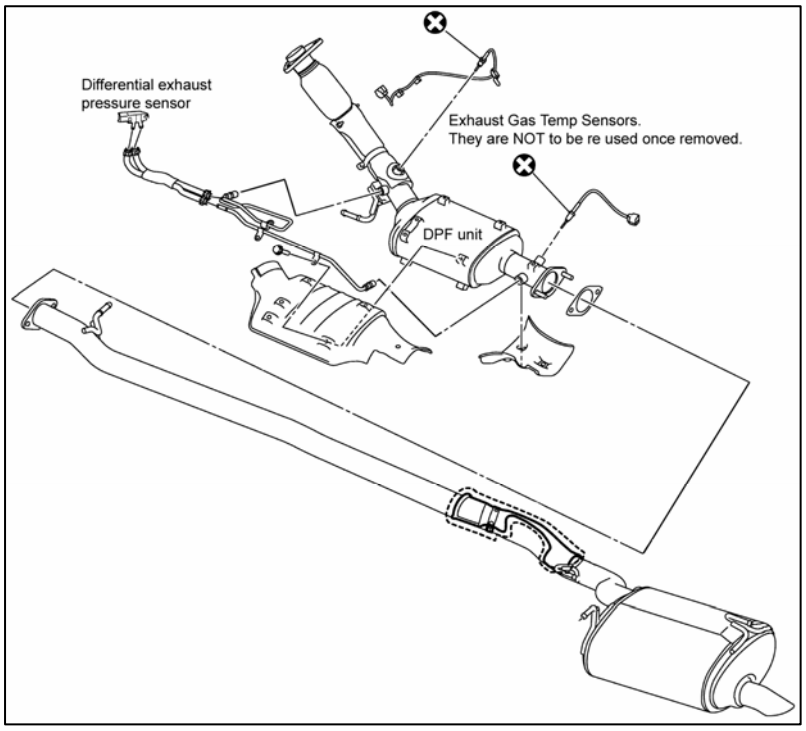
ENGINE MECHANICAL

M9R Exhaust

The exhaust system is of a typical design however it incorporates the DPF unit.

Take special care when working on the exhaust system as it easily reaches EXTREMELY HIGH temperatures.

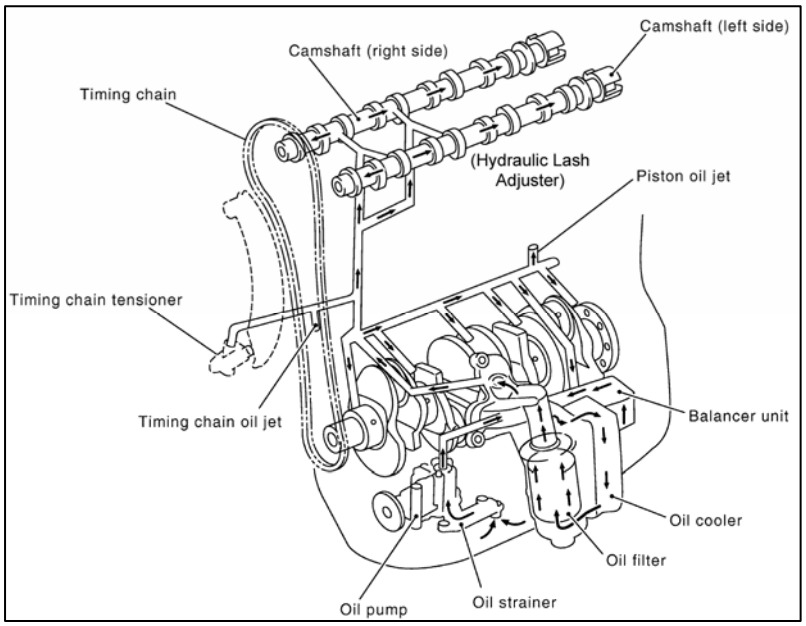
If for any reason the exhaust system is to be removed – try to avoid the removal of the DPF temperature sensors. Once they have been unscrewed from their position THEY ARE NOT TO BE RE-USED!



ENGINE LUBRICATION

M9R Lubrication System

The lubrication system is of a similar design to most other Nissan engines. However there is now the addition of hydraulic lifters in the cylinder head.
The Engine Oil pump is a separately mounted chain driven unit.



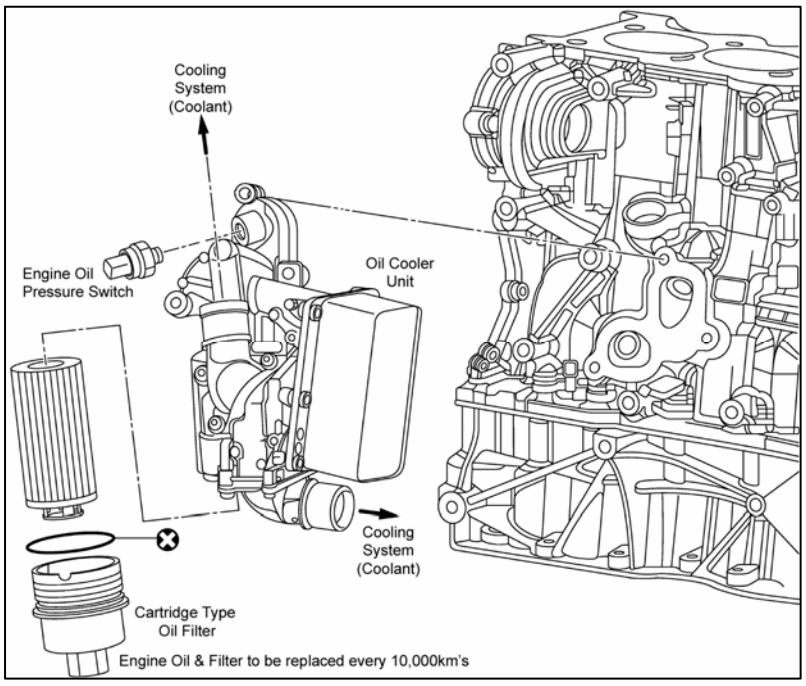
M9R Engine Oil Cooler & Filter

A large engine oil cooler unit is utilised. Coolant from the engine circulates inside the unit in order to maintain the engine oil at an appropriate temperature.

A cartridge type engine oil filter is utilised. The design is similar to that used on the ZD30 engine.

The Engine Oil & Filter is to be replaced every 10,000km's.
Only use **5W 30 ACEA C3 "Low Ash"** type engine oil in this engine.

Please follow the instructions in section ENGINE – ENGINE LUBRICATION of the Service Manual whenever working with any of the components shown right.

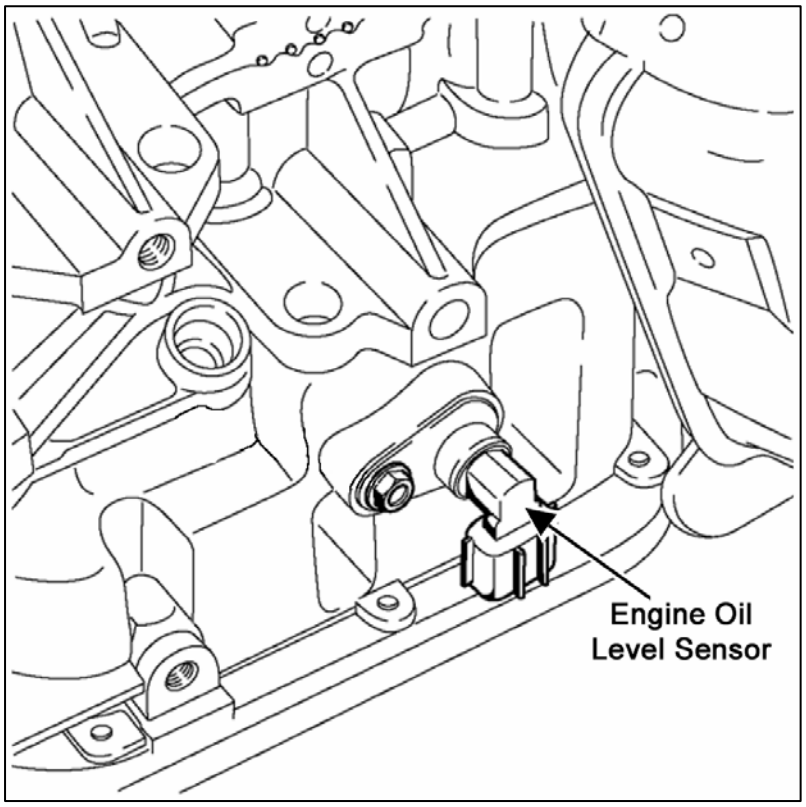


ENGINE LUBRICATION

Engine Oil level Sensor

The sensor is inserted through the side of the engine block & into the sump containing engine oil.
The operation of the sensor is the same as the sensor fitted to YD25 engines.
If the Ignition is in the OFF position for MORE than 5 minutes & then the drivers door is opened, the resistance of the oil level sensor is measured by the instrument cluster. If the resistance indicates that the sensor is inserted into a sufficient amount of engine oil, the display on the instrument cluster will display the message “Oil Good” once the ignition is then switched from OFF to ON.
If the engine oil level is excessively LOW, the instrument cluster will display the message “Oil Lo”

Please refer to section MWI of the Service Manual for further information regarding the operation of the sensor & the display on the instrument cluster. Otherwise refer to page 85 of this manual for more detail.



M9R Engine Oil Cap / Oil Level Gauge

The Oil Cap has the Engine Oil Level Gauge attached to it. Remove the cap & carefully lift up to slide the “Dip Stick” out of the tube, carefully wipe it & re-insert it, once again remove it to read the engine oil level.

TAKE NOTE OF THE WARNING ON THE CAP!

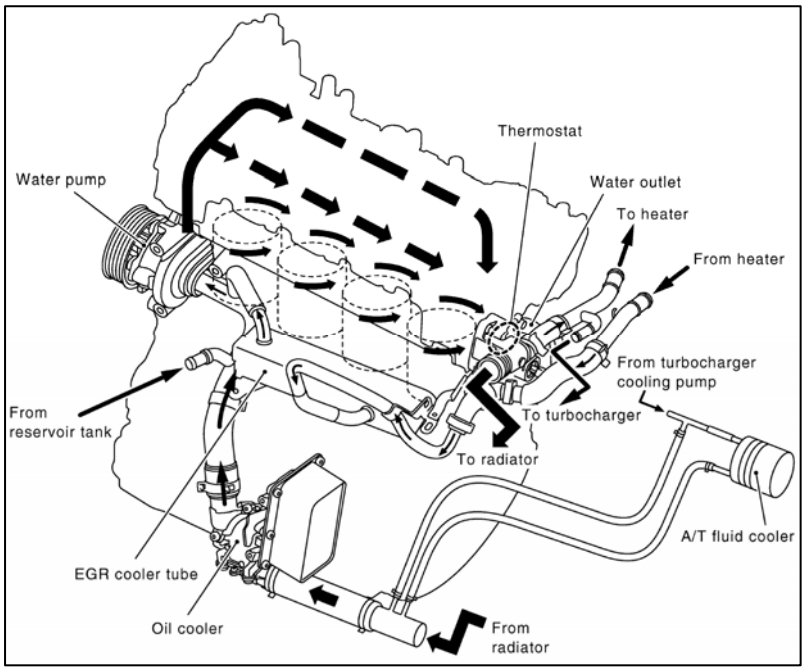
Eng Oil Filler Cap & “Dipstick”

ENGINE COOLING

M9R Cooling System

The cooling system is of a similar design to most other engines.

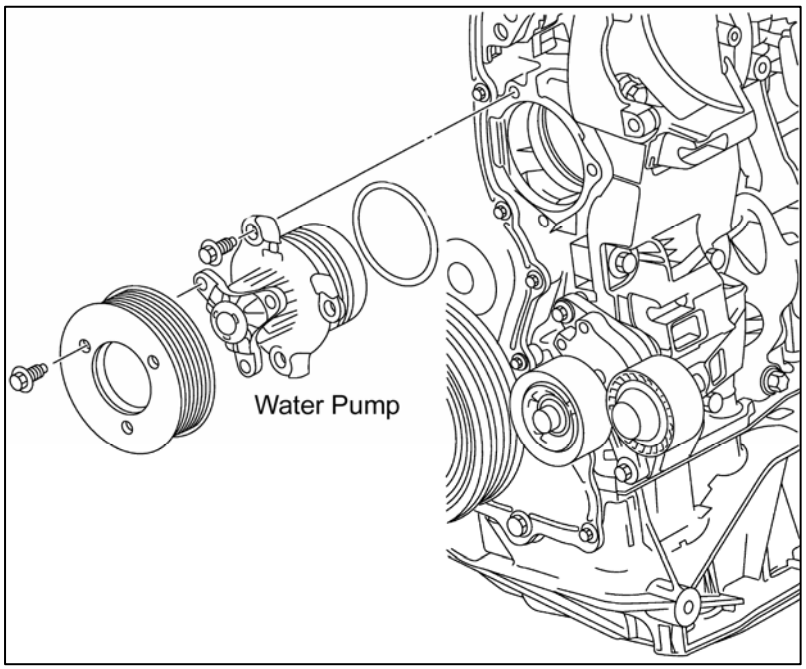
NOTE:
Only 1 x Thermostat is used in the engine.



M9R Water Pump

The Water Pump is a conventionally designed unit. It is driven by the auxiliary drive belt.

Please follow the instructions in section ENGINE – ENGINE COOLING of the Service Manual whenever working with any of the components shown right.



DO NOT REPLACE THE ENGINE COOLANT UNTIL THE 80,000KM SERVICE OR 4 YEARS!

THIS APPLIES TO ALL CURRENT NISSAN VEHICLES!

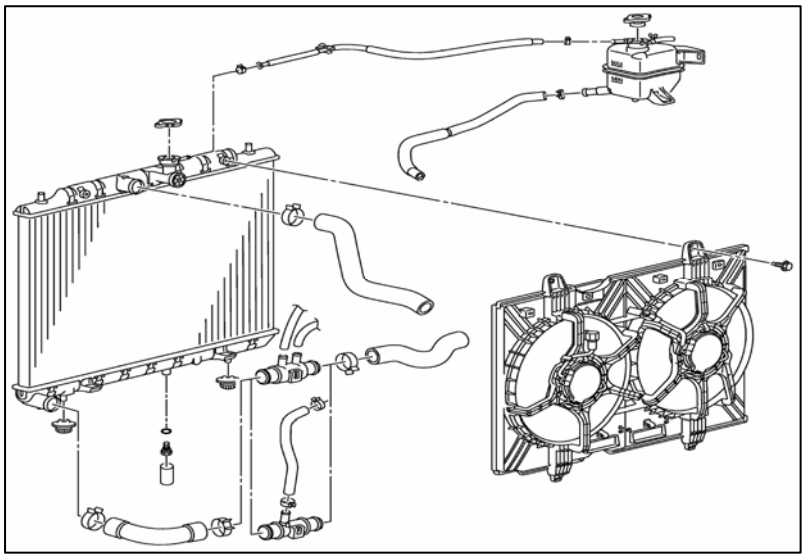
Coolant is to be replaced every 40,000km's or 2 years there-after.

ENGINE COOLING

M9R Radiator & Electric Cooling fans

A downflow type radiator continues to be utilised with the M9R engine. It is of plastic / aluminium construction.

The Electric cooling fans are controlled by the ECM following signals from the ECTS. The ECM signals the IPDM E/R to activate the appropriate relays for Low or High speed control. They also will operate with the A/C as well.
Refer to section ENGINE – ENGINE CONTROL for information on the operation of the fans. Otherwise refer to section ENGINE – ENGINE COOLING for detail relating to the fans & radiator.

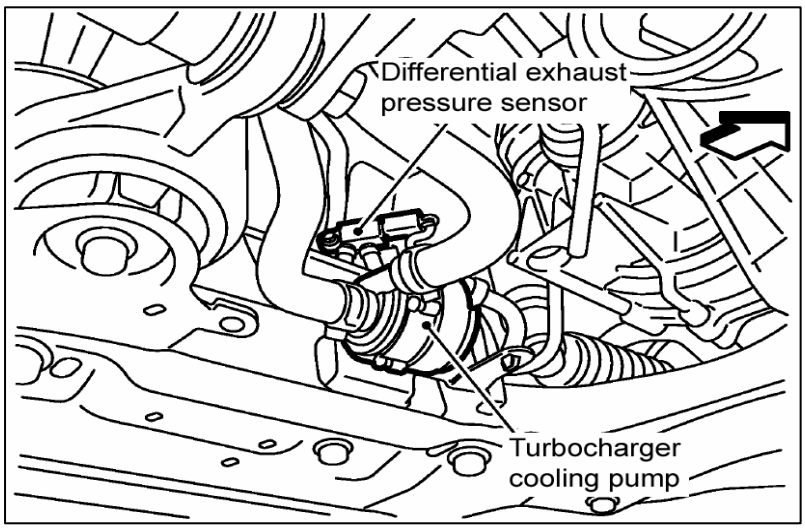


M9R Pressure Relief Cap

Like D40 & R51 models, the pressure relief cap is located on the expansion bottle. If there is any overflow it is relieved to the atmosphere – THEREFORE DO NOT ALLOW THE COOLANT BOTTLE TO BE OVERFILLED.
Take note of the relief pressure on the cap; **137kPa.**
The Cap located on the radiator is a blanking cap only.
Take care NOT accidentally swap the caps over & ensure the correct part is ordered if the cap is to be replaced.

M9R Turbo Coolant Pump

An electrically operated coolant pump is used to enhance the flow of coolant around the turbo charger unit after the engine has been switched off if the coolant temperature exceeds a certain level.
The pump is powered by a relay which is in turn operated by DIRECTLY by the ECM.
Refer to page 56 for more detail.

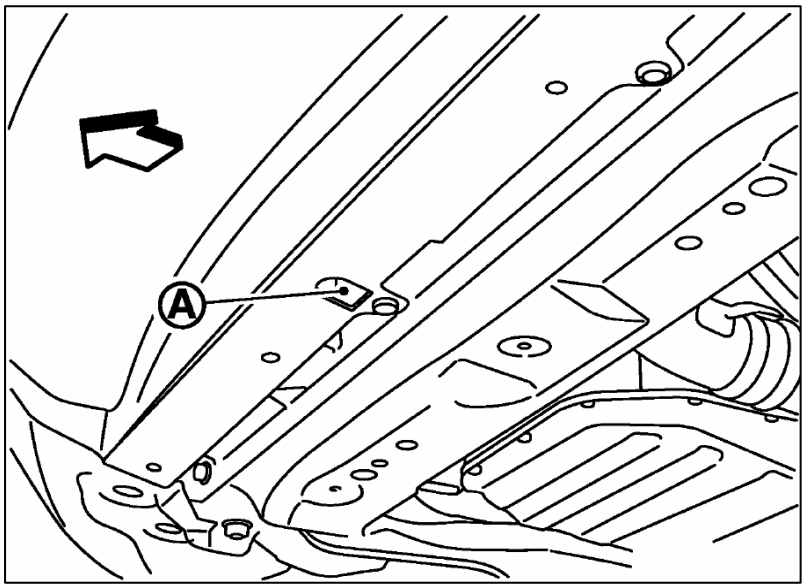


ENGINE COOLING

Draining Engine Coolant

Coolant is to be drained via the drain point in the bottom of the radiator.
A; Radiator Drain

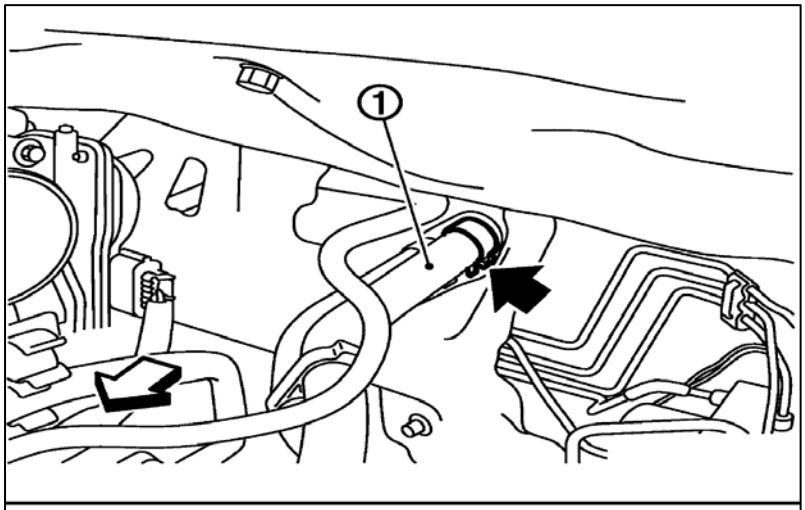
Ideally the engine should be flushed thoroughly before refilling the engine with new coolant.

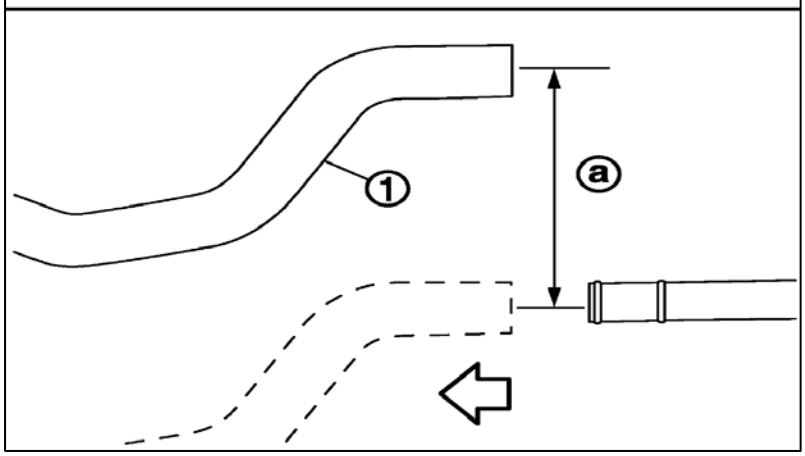


Bleeding Air from Engine Cooling System

Bleeding trapped air from the cooling system is via the top heater hose on the firewall. Disconnect the hose & raise it to a higher level as the diagram suggests. (Approximately 10cm)

Please follow the instructions in sections ENGINE – ENGINE COOLING & MAINTENANCE of the Service Manual whenever working with any of the components shown right.





Cooling System Capacity; 8.9L
(3.0L of Nissan LLC will be required to ensure the correct 30% LLC ~ 70% Water ratio.)

DO NOT REPLACE THE ENGINE COOLANT UNTIL THE 80,000KM SERVICE OR 4 YEARS!
THIS APPLIES TO ALL CURRENT NISSAN VEHICLES!

Coolant is to be replaced every 40,000km's or 2 years there-after.

BOSCH COMMON RAIL DIESEL INJECTION

Written with the kind permission & support of
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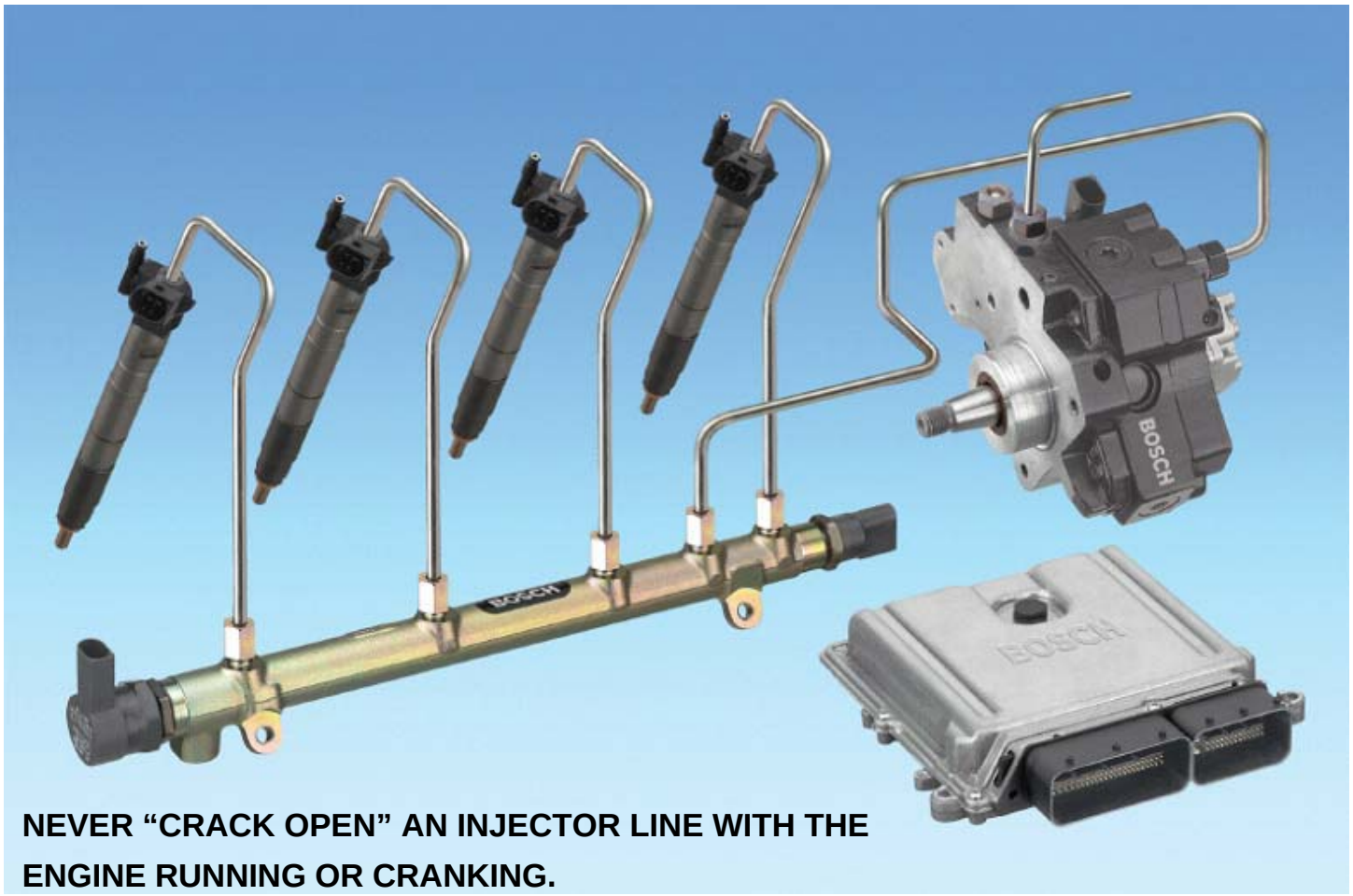
Basic Design Features of CRD

There is a chamber which is similar in appearance to a Petrol Engine EFI Fuel Rail mounted along the top of the Engine (i.e: the Fuel Rail or otherwise known as the “Common Rail”)
The Rail is filled with fuel via a High Pressure Pump being driven directly by the engine. The design principle & operation is near identical to that of a Petrol Engine with EFI.

NOTE: *Fuel Pressure is NOT created via Engine Oil Pressure as it is in some other types of CRD engines. This system is known as Hydraulic Electric Unit Injection –* ***HEUI.***

The Fuel is maintained under this extremely high pressure in the rail as so desired by the ECM. Steel tubes connected to each injector supply this pressurised fuel from the rail.
The injectors therefore can be operated by the ECM at any time to produce the very fine spray pattern (thanks to the readily available - at all times - high fuel pressure) in order to promote clean combustion.

The M9R utilises the **Bosch EDC16CP33** Common Rail System.



NEVER “CRACK OPEN” AN INJECTOR LINE WITH THE ENGINE RUNNING OR CRANKING.

Fuel pressure can reach a MAXIMUM PRESSURE of 1600 BAR (23,200PSI).

BOSCH

BOSCH COMMON RAIL DIESEL INJECTION

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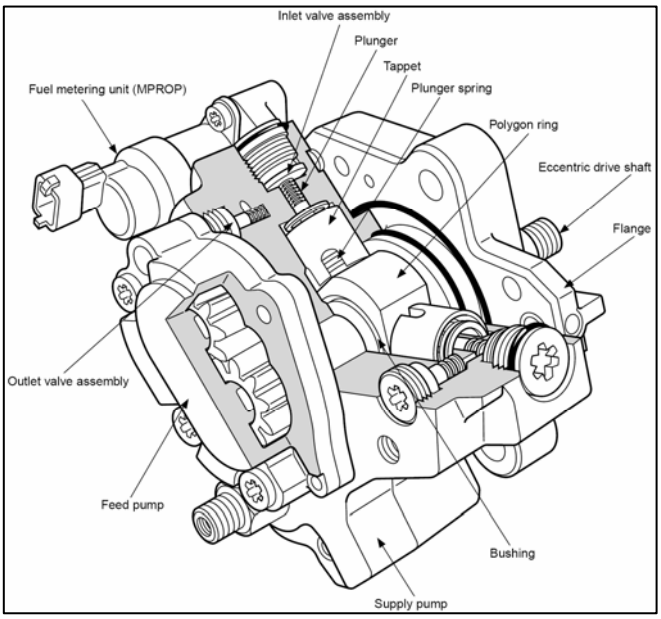
1. Fuel Pump (BOSCH CP3)

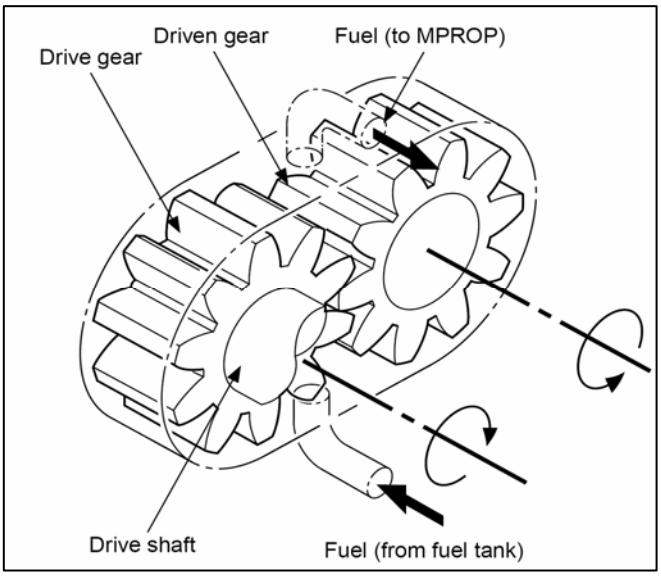
The Fuel Pump consists primarily of the following;
• Feed pump
• Fuel Metering Unit (MPROP - Metering Proportional Valve)
• High Pressure Pump

NOTE:
Do <u>NOT</u> in anyway dismantle the Fuel Pump or even loosen / remove the front pulley. Once it's removed from the engine, seal all openings with the designated plugs <u>IMMEDIATELY</u>.



(i) Feed Pump

The feed pump is a circumscribed gear type pump and consists of a drive gear and a driven gear.
The drive gear is connected to the high-pressure pump drive shaft by a plate coupling.
The rotational speed of the drive gear is the same as that of the drive shaft.



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BOSCH COMMON RAIL DIESEL INJECTION

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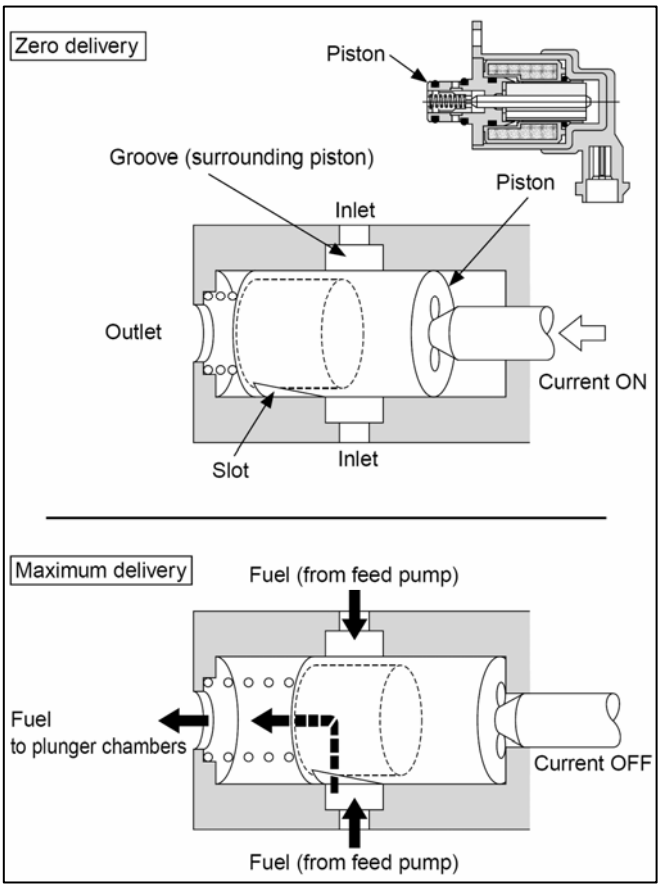
1. Fuel Pump (BOSCH CP3) …/Cont'd

(ii) Fuel Metering Unit (MPROP)

The fuel metering unit consists of a housing, an armature assembly, a magnetic core, a solenoid core, a piston and a spring.

The piston is located inside the magnetic core. Fuel flows through the inlets and into a groove running around the inside of the magnetic core.



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BOSCH COMMON RAIL DIESEL INJECTION

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1. Fuel Pump (BOSCH CP3) …/Cont'd

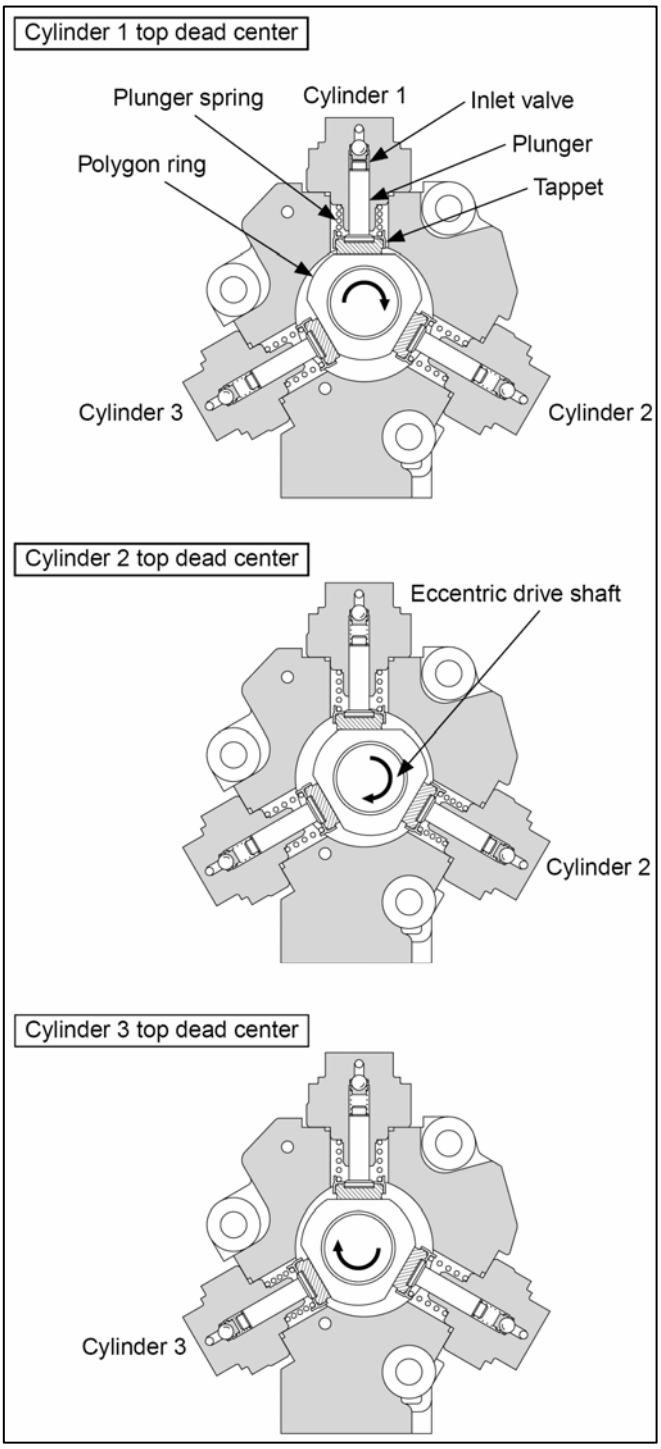
(iii) High Pressure Pump

The high-pressure pump is a radial piston high pressure pump in which three plungers are arranged radially around the eccentric drive shaft.

The plungers are reciprocated by the eccentric rotation of the polygon ring assembled on the drive shaft. (The polygon ring itself does not rotate, it is only moved in a circular motion.)

The drive shaft is driven directly by the engine via a coupling.

The high-pressure pump consists of inlet valves, outlet valves, plungers, plunger springs, tappets, a polygon ring, a drive shaft and a pump housing.



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BOSCH COMMON RAIL DIESEL INJECTION

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2. Rail

The Rail stores pressurised fuel (0 to 1600 BAR, 23,200psi) delivered from the supply pump and distributes the fuel to each cylinder's injector.

NEVER "CRACK OPEN" A FUEL LINE (steel fuel line linked to the rail) WITH THE ENGINE RUNNING OR CRANKING.
SEVERE INJURY WILL BE A RESULT OF THIS ACTION!!!

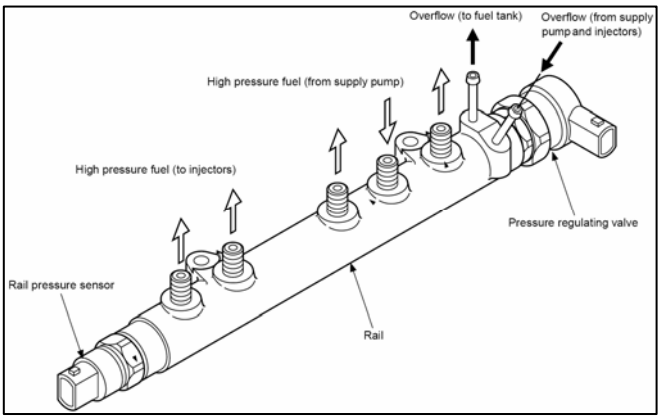
(i) Fuel Rail Pressure Sensor

The rail pressure sensor is mounted in one end of the rail and detects the fuel pressure in the rail. This signal is sent to the engine's ECU.
This sensor is a semi-conductor type pressure sensor which uses the Peizo resistive effect to detect changes in electrical resistance when pressure is applied to a silicon wafer.

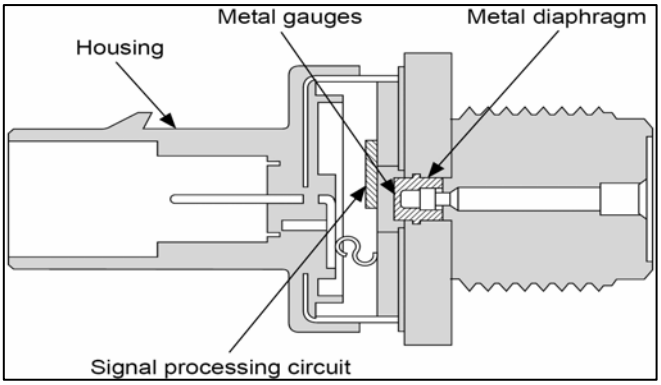
NOTE:
Do NOT probe the sensor with a mutimeter. An attempt to check the internal resistance of this sensor will destroy it.

(ii) Pressure Regulating Valve

The pressure regulating valve is an electromagnetic ball-type seat valve that maintains a constant pressure in the rail.
When the pressure of the fuel in the rail is less than the specified pressure, the ECU increases the current to the solenoid to seat the armature plate's ball against the valve body seat. Because of this the fuel supplied by the supply pump is able to increase the pressure in the rail.
When the pressure of the fuel in the rail exceeds the specified pressure, the ECU decreases the current to the solenoid.
As a result of this, the pressure of the fuel in the rail pushes against the armature plate's ball and fuel is returned to the fuel tank until the fuel pressure reaches the specified pressure.
Through this series of controls, a constant fuel pressure can be maintained in the rail.
Also, overflow from the supply pump and the injectors is returned to the fuel tank through the pressure regulating valve to assist with the cooling of this valve.

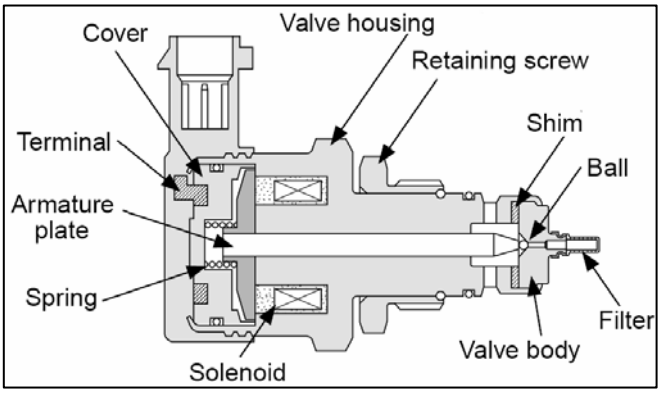


PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING HIGH FUEL PRESSURE SYSTEMS. REFER TO STB GI 05-007 FOR MORE DETAIL.



RAIL PRESSURE SENSOR

Neither of these 2 sensors can be unscrewed from the fuel rail. If either of them have to be replaced, the WHOLE RAIL needs to be replaced.



PRESSURE REGULATING VALVE
If this valve is disconnected it will result in no rail pressure & the engine will not start.

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BOSCH COMMON RAIL DIESEL INJECTION

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3. Fuel Injector

The injectors are Piezo-Electric. The injector is opened by the expansion of a piezo-electric element (1) when it is supplied electrically. The control voltage is 120 volt with a current up to 25 amps.

WARNING

A voltage signal is used to open the injector & another voltage signal is used to close the injector. Therefore if an injector is disconnected at the point of opening, the injector will remain open.

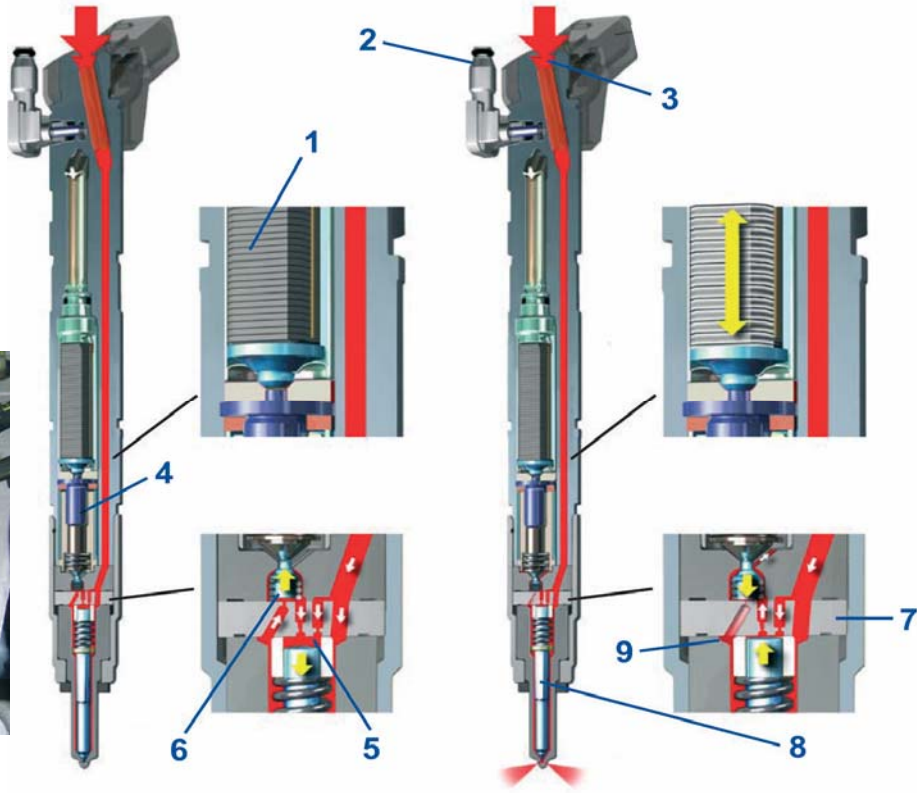
When the injector is closed, the pressure in the control chamber (5) forces the needle back to its seat. The opening of valve (6) triggers the opening of injector by the mechanical action of the piezo-electric actuator. The valve blocks a transfer tube (9) from the jet plate and the pressure in the control chamber escapes towards the return pipe.
The fuel pressure causes the needle to rise up and the injection starts.

To raise valve (4) and allow the injector to open, a considerable force is needed to overcome the fuel pressure keeping the valve closed.
To do this, the force generated by the expansion of the piezo-electric element is amplified.
This acts on servo piston (1) with a diameter greater than the opening piston (3).
Fuel from the return circuit connects the 2 pistons hydraulically.

Each Injector has a UNIQUE calibration code etched on the electrical connector.

1 Piezo-electric actuator.
2 Tank return line.
3 High pressure inlet.
4 Hydraulic servo
5 Control chamber.
6 Valve.
7 Jet plate.
8 Needle.
9 Transfer pipe.

To ensure the servo body is correctly filled, a pressure of 10 bar in the return circuit is required. A pressure valve located on the circuit fulfils this function.



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BOSCH COMMON RAIL DIESEL INJECTION

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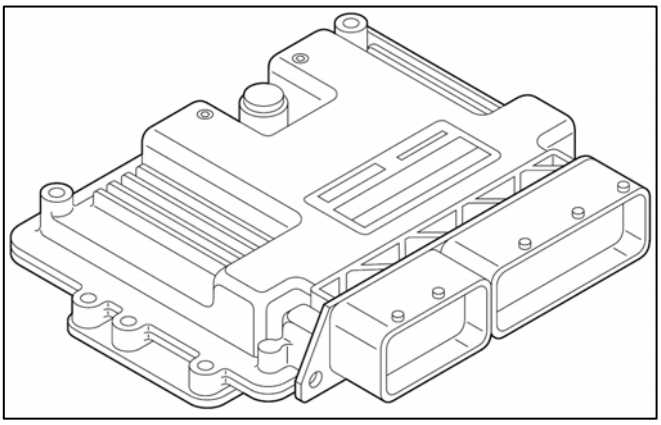
4. Electronic Control Module (ECM)



Information signals detected by the various sensors and switches are input to a microcomputer inside the ECM. In accordance with these information signals, characteristic data and compensation data recorded on the ROM (Read Only Memory device) are read into the CPU (the central processing unit).
Computations are performed using this control data and the information signals from the input section, and the results are output as control signals.
The control signals output from the microcomputer are converted to drive signals in accordance with their content. These drive signals are output to the injectors and the solenoid valves to control injection quantity and injection timing.

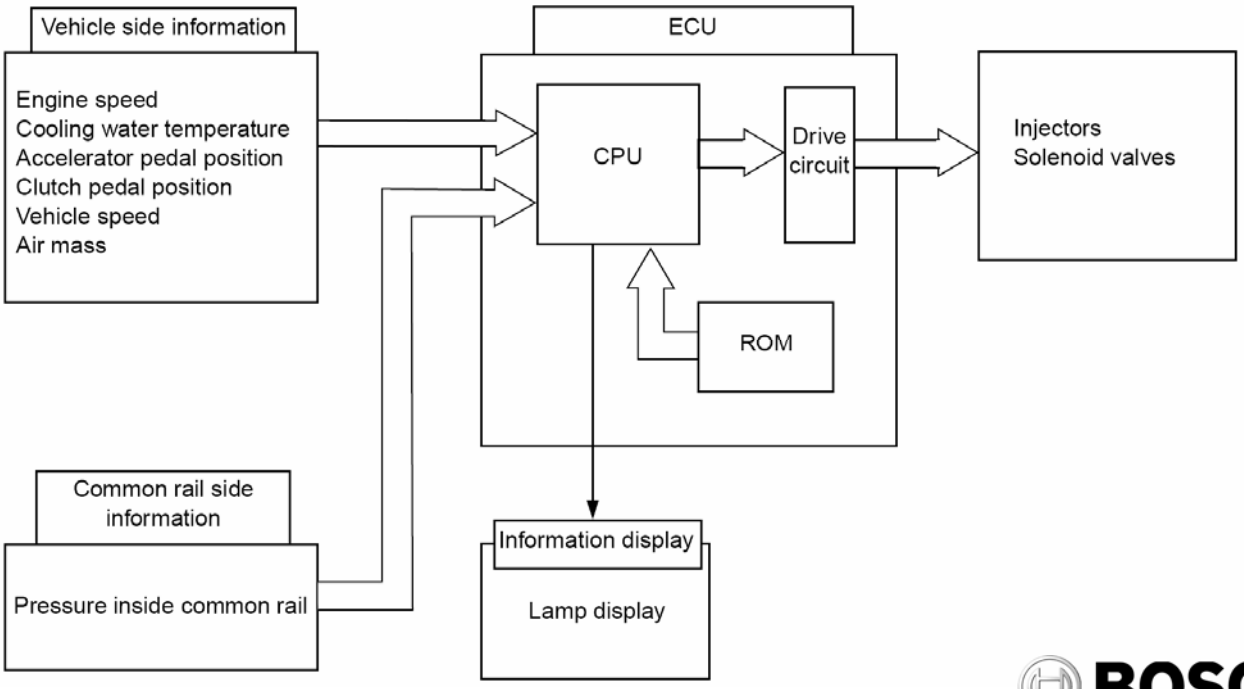
NEVER "swap" a known GOOD ECM to a problem vehicle. Fit the suspect ECM to a known good vehicle instead. If it is proven to be a failed ECM, then there is a fault in the vehicle which caused the failure of the ECM. LOCATE & REPAIR THE FAULT prior to installing a new ECM to a problem vehicle.

As a rule of thumb, ECM failures are EXTREMELY RARE. <u>Fuel, Air, Power & Ground</u> issues are most typically the cause of engine running faults.

NOTE:

If the ECM is to be replaced, numerous operations such as injector code entry & service regeneration (along with an oil & filter change) needs to be carried out.

THE INSTALLATION OF A NEW / ANOTHER ECM IS A COMPLEX PROCESS & SHOULD BE AVOIDED.



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BOSCH COMMON RAIL DIESEL INJECTION

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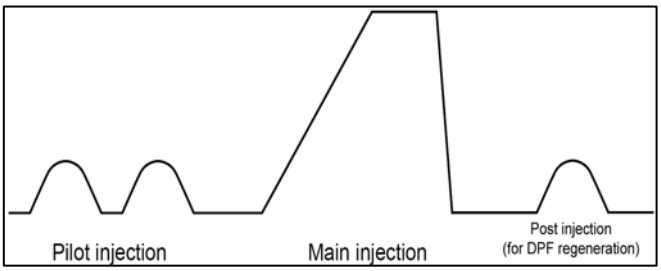
Fuel Delivery to the Engine

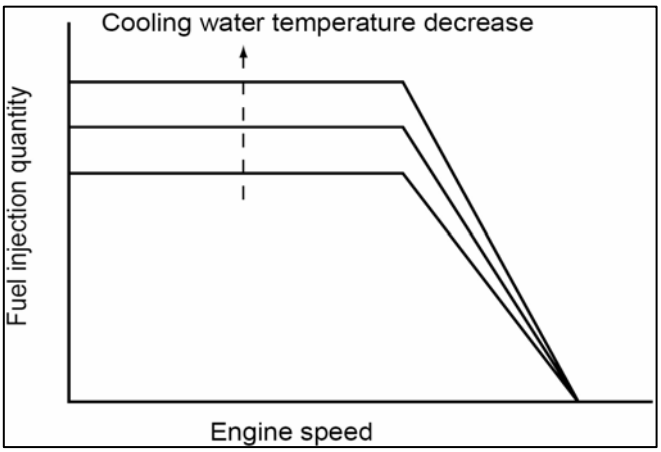
1. Pilot Injection

Pilot injection precedes the usual injection (ie, main injection) and is the injection of a very small quantity of fuel.
Pilot injection suppresses the initial generation of heat to decrease NOx and noise generated at the beginning of combustion.
A post injection is typically utilised during DPF Regeneration.

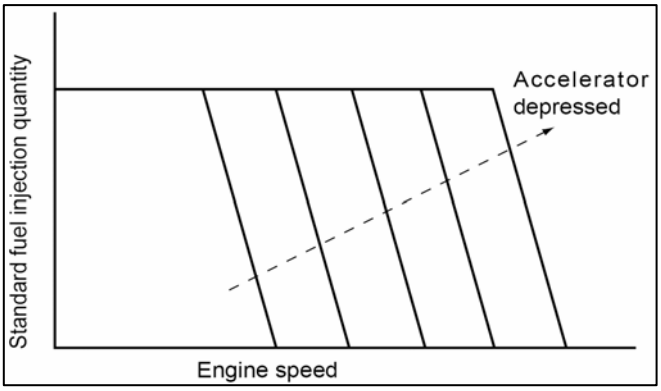


2. Fuel Injection Quantity Control

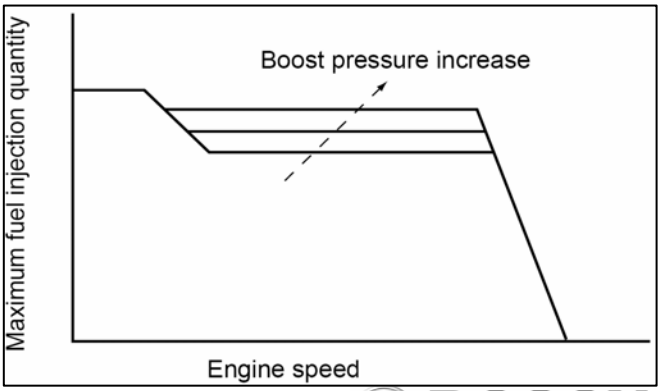
(i) Fuel injection quantity at engine starting
At engine starting, the fuel injection quantity is determined by the engine speed at starting and coolant temperature.



(ii) Standard fuel injection quantity
The standard fuel injection quantity is determined by the engine speed and accelerator position.



(iii) Maximum fuel injection quantity
The maximum fuel injection quantity is calculated from engine speed and boost pressure.



BOSCH COMMON RAIL DIESEL INJECTION

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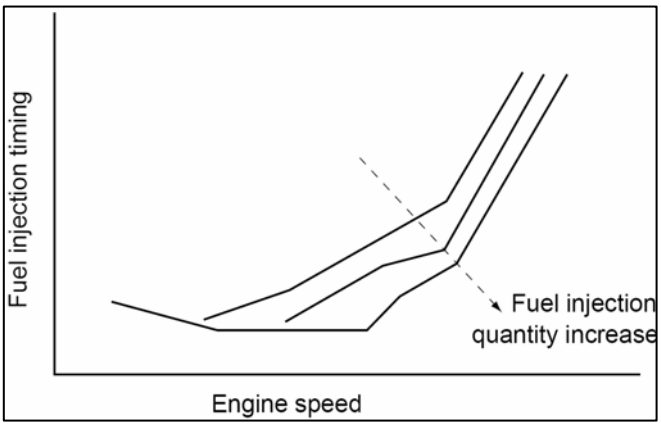
Fuel Delivery to the Engine …/Cont'd

3. Fuel Injection Timing Control

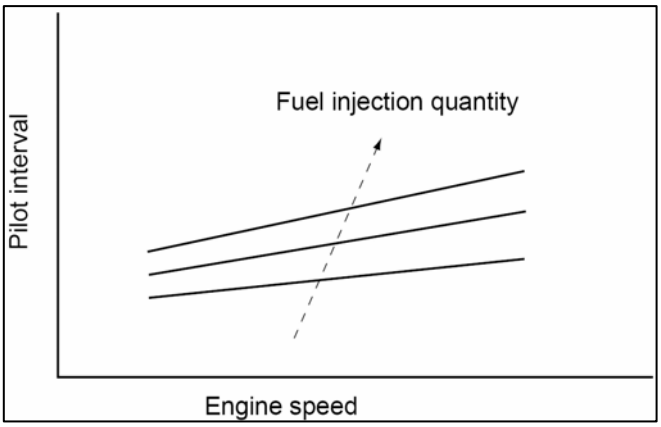
(i) Main Injection Timing

Main injection timing is calculated from the fuel injection quantity and engine speed.



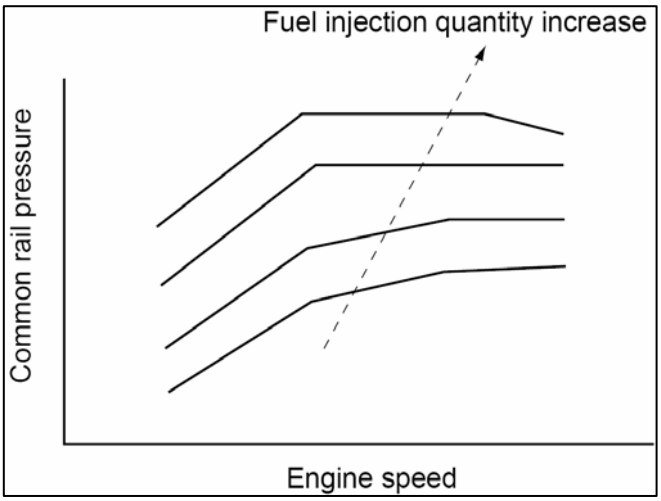
(ii) Pilot Injection Timing (pilot interval)

The pilot interval is calculated from the fuel injection quantity and engine speed.



4. Fuel Injection Pressure Control

The fuel injection pressure is calculated from the fuel injection quantity and engine speed.
Pressure in the Rail is regulated by the Fuel Metering unit on the Fuel Pump & the Pressure Regulating Valve on the Fuel Rail.



BOSCH COMMON RAIL DIESEL INJECTION

Written with the kind permission & support of
BOSCH AUSTRALIA PTY. LTD.

Service & Repair of Bosch Fuel System Components

1. High Pressure Fuel Pump;
If the diagnosis process has been correctly followed & it has been determined that the Fuel Pump is at fault, please refer to **GI07-006a** for repair or instructions. Only a specific Bosch agent is authorised to inspect, dismantle & repair these Fuel Pumps.
DO NOT ORDER A NEW PUMP FROM PARTS TO REPAIR A PUMP OR SUSPECT PUMP PROBLEM. If this occurs without any authorisation from Nissan, any warranty claim made will be DENIED.

2. Injectors;
If the diagnosis process has been correctly followed & it has been determined that the Injectors are at fault, please refer to **GI07-006a** for repair or instructions.

3. Fuel Rail;
If the diagnosis process has been correctly followed & it has been determined that either the Fuel Rail, Fuel Rail Pressure Sensor &/or the Fuel Pressure Regulating Valve is at fault, please order a COMPLETE NEW FUEL RAIL ASSEMBLY via normal parts channels as the rail & attached components are not serviceable & are not supplied separately.

4. Steel Fuel Tubes;
Once removed, these components must NEVER be reused. Order replacement ones via normal parts channels. Refer to page 14 of this manual for more detail.

5. ECM;
It is HIGHLY UNLIKELY that the ECM has failed, however if it suspected that the ECM has done so, install it into a known good vehicle. NEVER “swap” a known GOOD ECM to a problem vehicle. If it is proven to be a failed ECM, then there is a fault in the vehicle which caused the failure of the ECM. LOCATE & REPAIR THE FAULT prior to installing a new ECM to a problem vehicle.
As a rule of thumb, ECM failures are EXTREMELY RARE. Fuel, Air, Power & Ground issues are most typically the cause of engine running faults.
Replacement ECM’s are available via normal parts channels.

NOTE:
If the ECM is to be replaced, numerous operations such as injector code entry & service regeneration (along with an oil & filter change) needs to be carried out.
THE INSTALLATION OF A NEW / ANOTHER ECM IS A COMPLEX PROCESS & SHOULD BE AVOIDED.

COMMON RAIL DIESEL CLEANLINESS & PRECAUTIONS

WARNING:

Do NOT clean the engine using a high pressure water pump because of the risk of damaging connections. Moisture may collect in the connectors and create electrical connection malfunctions

INSTRUCTIONS TO BE FOLLOWED BEFORE ANY WORK IS CARRIED OUT ON THE INJECTION SYSTEM

- **Check that you have the plugs for the unions to be opened (bag of plugs sold at the Parts Stores – Nissan part No. 16609 00Q0A). Plugs are to be used once only. After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable). Unused plugs must be thrown away.**
- **Check that you have hermetically resealable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.**
- **Lint-free towelettes to be used for fuel pump related service purpose. The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.**

INSTRUCTIONS TO BE FOLLOWED BEFORE OPENING THE FUEL CIRCUIT

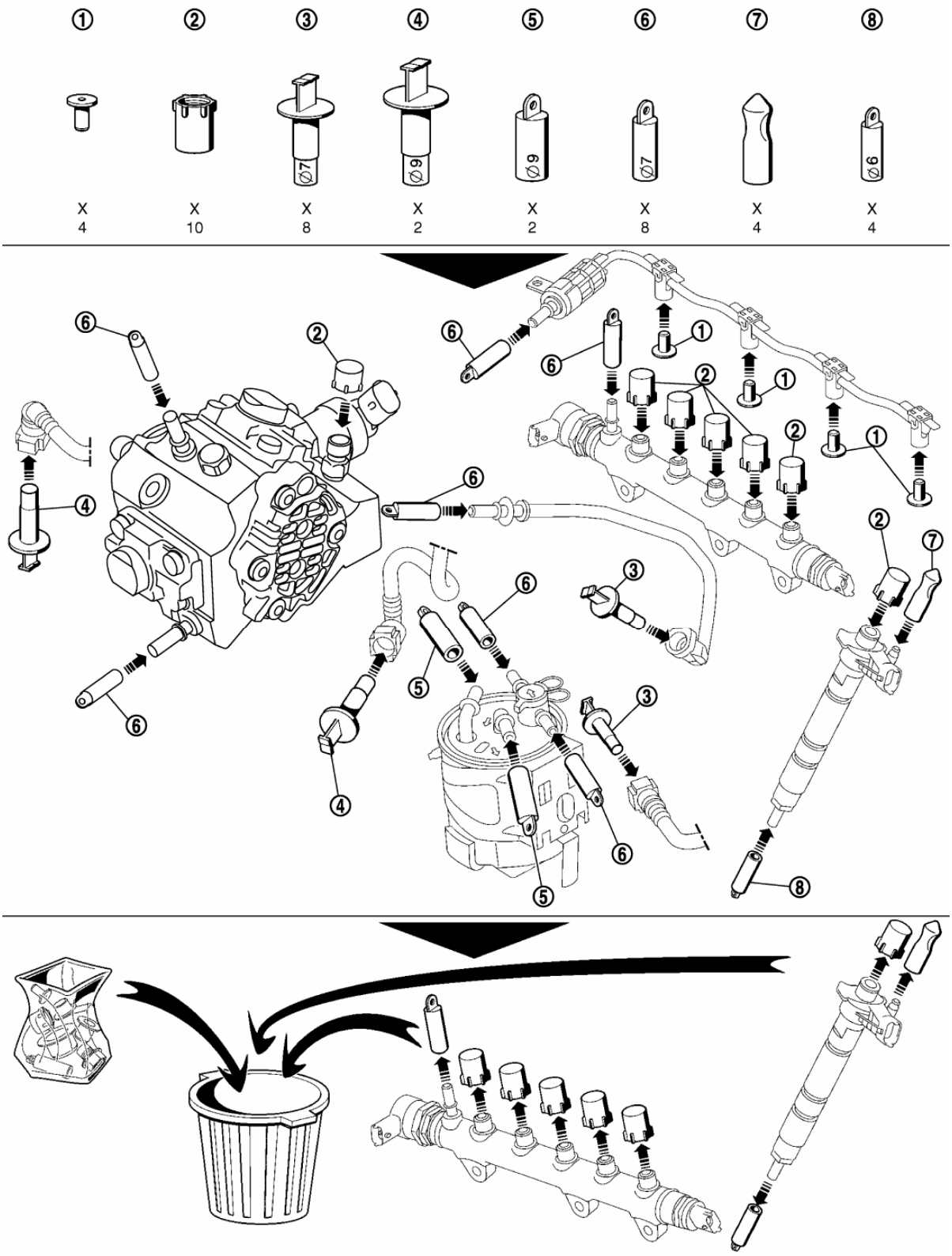
- **For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.**
- **For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).**
- **Use a brush and thinners to clean the connections to be opened.**
- **Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone). Check that no bristles remain adhered.**
- **Wash your hands before and during the operation if necessary.**
- **When wearing leather protective gloves, cover these with latex gloves.**

INSTRUCTIONS TO BE FOLLOWED DURING THE OPERATION

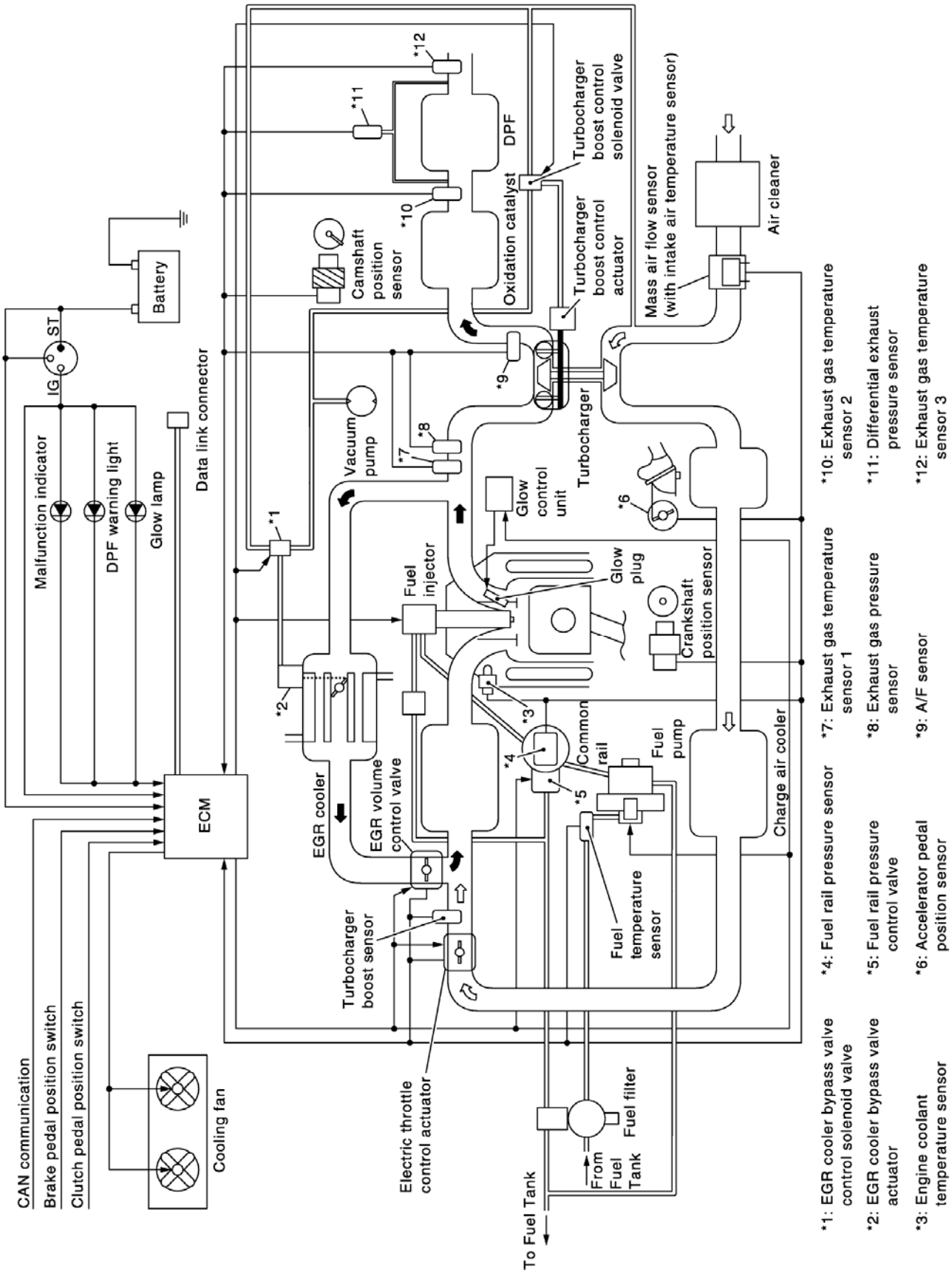
- **As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system. The plugs to be used are available from the Parts Stores - Nissan part No. 16609 00Q0A, They must not, under any circumstances, be reused.**
- **Close the hermetically sealed bag, even if it has to be reopened shortly afterwards. Ambient air carries contamination.**
- **All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.**
- **The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened. These items are likely to allow impurities to enter the system.**
- **A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.**
- **Even the simple Fuel Filter replacement process during the 40,000km service can DAMAGE the fuel system if the above noted cleanliness precautions are not adhered to.**

COMMON RAIL DIESEL CLEANLINESS

Sealing Plugs; Nissan part No. 16609 00Q0A



ENGINE CONTROL



ENGINE CONTROL

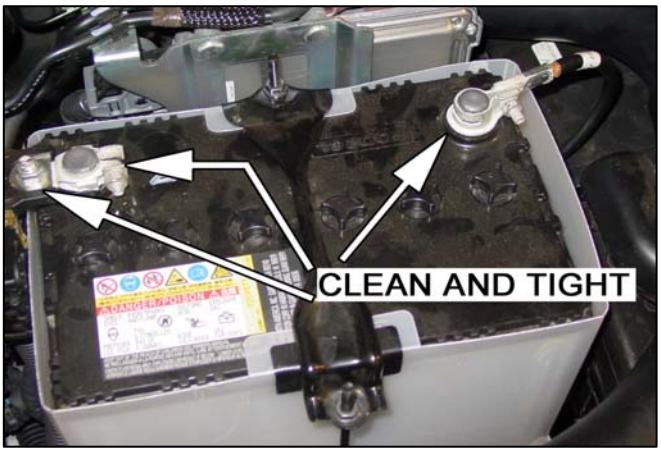
INPUT	ECM FUNCTION	OUTPUT (ACTUATOR)
BATTERY VOLTAGE (& GROUND) IGNITION SWITCH ACTIVITY	FUEL INJECTION QUANTITY	FUEL INJECTOR, PUMP & RAIL
ACCELERATOR PEDAL ACTIVITY CRANK POSITION & SPEED	FUEL INJECTION TIMING	
CAMSHAFT POSITION FUEL RAIL PRESSURE	VEHICLE SPEED CONTROL (ASCD)	GLOW CONTROL UNIT
FUEL TEMPERATURE ENGINE COOLANT TEMPERATURE	GLOW PLUG OPERATION	EGR VOLUME CONTROL VALVE
MASS AIR FLOW INTAKE AIR TEMPERATURE	EGR VOLUME CONTROL	
TURBO BOOST (Air Pressure in Intake) ASCD REQUEST FROM DRIVER	COOLING FAN CONTROL	COOLING FAN RELAY (Via CAN)
ASCD CANCEL REQUEST (Brake & Clutch Pedal) BAROMETRIC PRESSURE (Altitude) EGR VOLUME CONTROL VALVE POSITION SENSOR	TURBO BOOST CONTROL	TURBO BOOST CONTROL SOLENOID VALVE
EXHAUST PRESSURE DIFFERENTIAL EXHAUST PRESSURE SENSOR EXHAUST TEMP SENSOR	ELECTRIC THROTTLE CONTROL	ELECTRIC THROTTLE ACTUATOR A/F SENSOR HEATER
FRONT EXHAUST GAS TEMP SENSOR (DPF) REAR EXHAUST GAS TEMP SENSOR (DPF) A/F RATIO SENSOR	DPF REGENERATION CONTROL	AIR CONDITIONER COMPRESSOR RELAY (Via CAN) TURBO COOLANT PUMP
THROTTLE VALVE POSITION A/C REFRIGERANT PRESSURE (High Side)	A/F SENSOR HEATER CONTROL	
* BRAKE PEDAL ACTIVITY (Stop Lamp operation) * AUTO TRANSMISSION ACTIVITY & GEAR LEVER POSITION	TURBO COOLING CONTROL	EGR COOLER BYPASS CONTROL
* ELECTRIC POWER STEERING ACTIVITY * VEHICLE SPEED	AIR CONDITIONER CONTROL	DRIVER INFORMATION (Fuel usage, ASCD, Glow, DPF)
* VEHICLE BRAKING / STABILITY (ESP) SYSTEM ACTIVITY * AIR CONDITIONER REQUEST	EGR COOLER BYPASS CONTROL	
* ELECTRICAL LOAD (* CAN COMMUNICATION)	ON BOARD DIAGNOSIS	MALFUNCTION INDICATOR LAMP & ECM (SELF DIAGNOSIS – CONSULT III)

ENGINE CONTROL

M9R Inputs to ECM

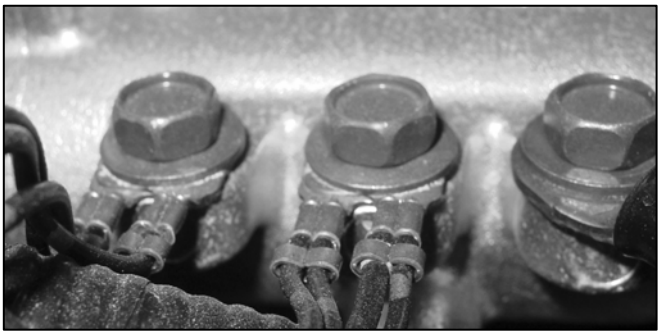
1a. Battery Voltage

This is an extremely important input to the ECM for engine operation.
Ensure that the voltage level remains stable, especially during cranking. A situation maybe possible where there is enough battery voltage for cranking, however there maybe an insufficient level for the ECM to operate properly.



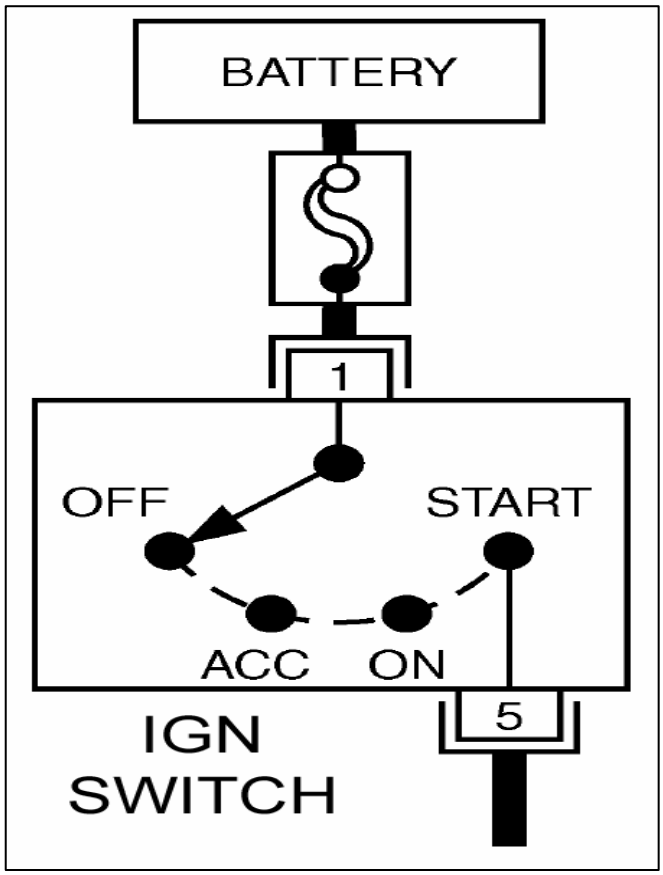
1b. ECM Ground

Even though a decent Voltage supply is available to the Engine Control System, if the ECU or major fuel system components do NOT have a decent Ground connection, then correct operation of the Engine System will NOT be possible.
Please ensure any Ground connections as shown here are in good condition (Clean & Tight.)



2. Ignition Switch

The ECM needs to know if the engine is being cranked, if it is simply ON & of course when it is being turned OFF.

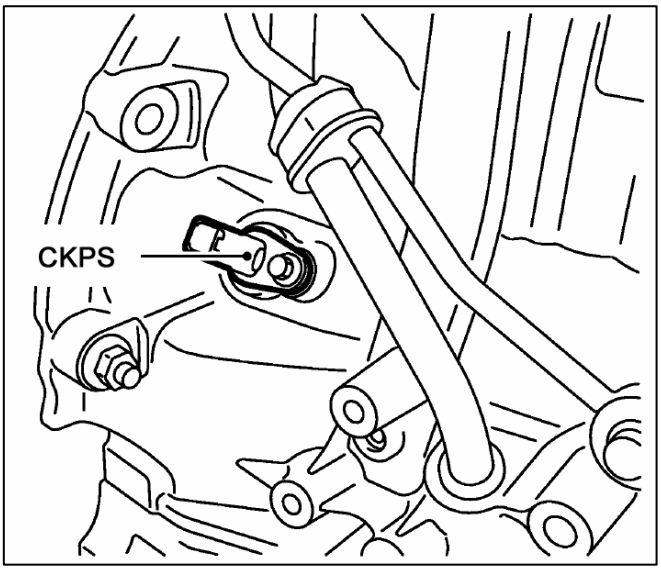


ENGINE CONTROL

M9R Inputs to ECM

3. Crankshaft Position Sensor (CKPS)

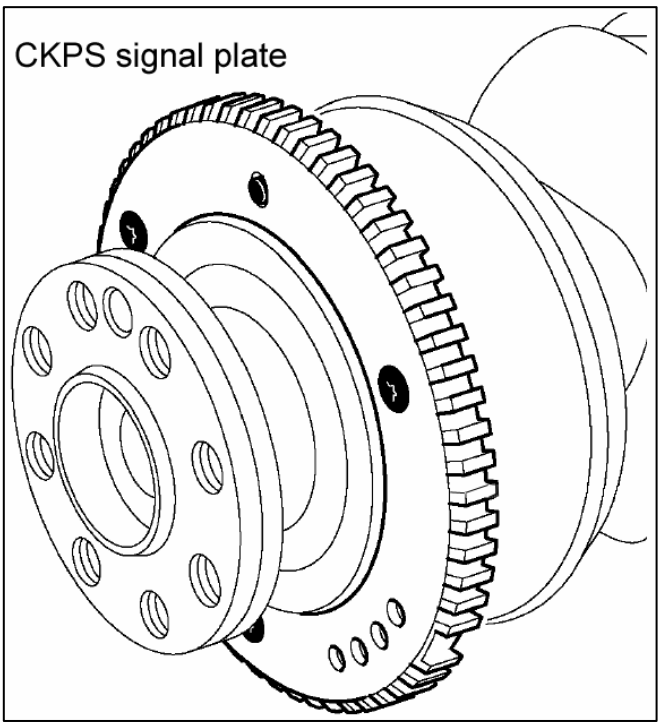
The CKPS is located at the RH rear side of the Engine below the exhaust manifold. (Therefore on the firewall side of the car). It protrudes through a hole in the engine block facing the gear teeth (cogs) of the signal plate on the a signal plate attached to the cyl no. 4 crankshaft counterweight.



The CKPS informs the ECM of the following information;

- The position of the crankshaft (is the engine at TDC or elsewhere?)
- If the crank is actually moving & if so, how fast.

1 section of the signal plate does not have “teeth” cut into it. This is to determine the 360-degree TDC point.



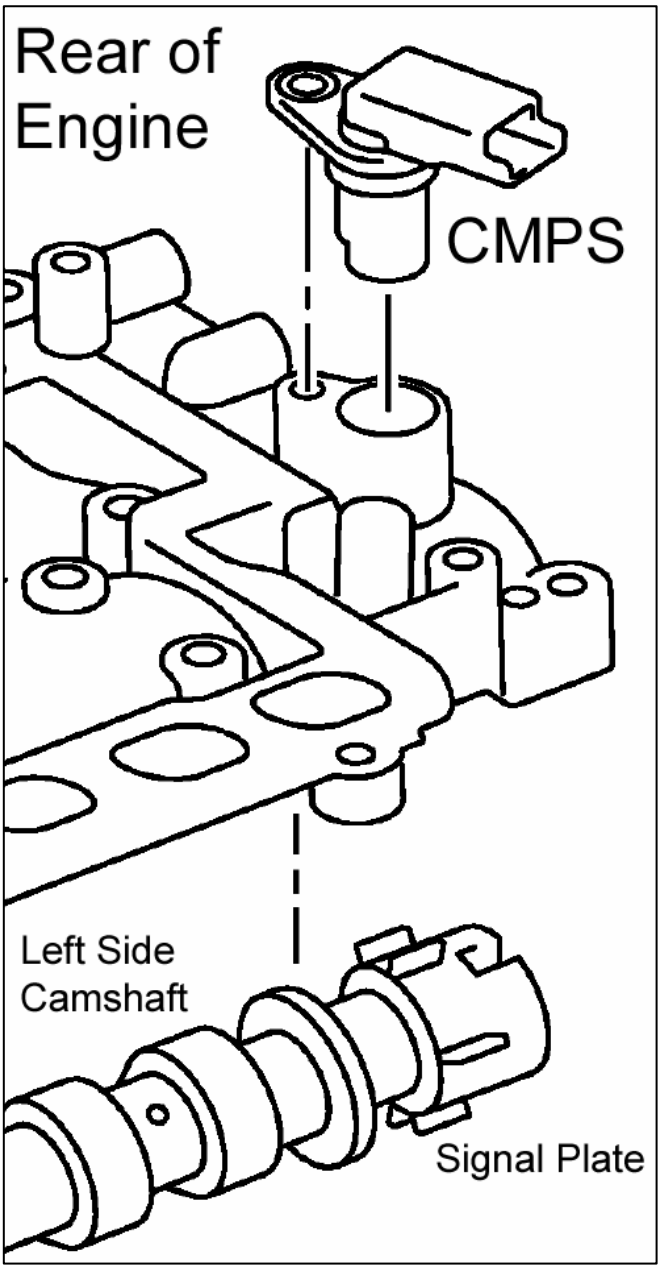
ENGINE CONTROL

M9R Inputs to ECM

4. Camshaft Position Sensor (CMPS)

The CMPS is located at the rear of the cylinder head. It senses the camshaft rotation.
The ECM uses this information to identify a particular cylinder's piston position and firing order.

When the CKPS circuit becomes inoperative, the CMPS is able to be used as a back-up signal.
This provides some control of the engine management system by utilising the timing of cylinder identification signals.



ENGINE CONTROL

M9R Inputs to ECM

5. Engine Coolant Temperature Sensor (ECTS)

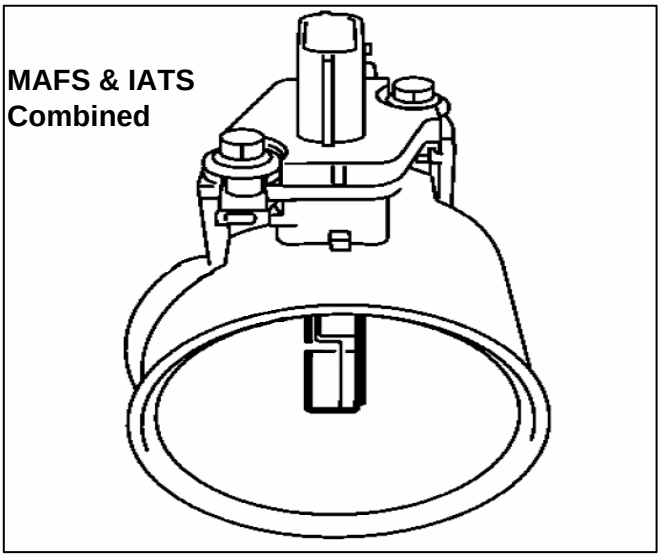
The ECTS is used to detect the engine coolant temperature.
It's design & operation is the same as other ECT sensors utilised by the Nissan engine range.

6. Mass Air Flow Sensor (MAFS)

The MAFS is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow.
The MAFS controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases.
The ECM detects the air flow by means of this current change.

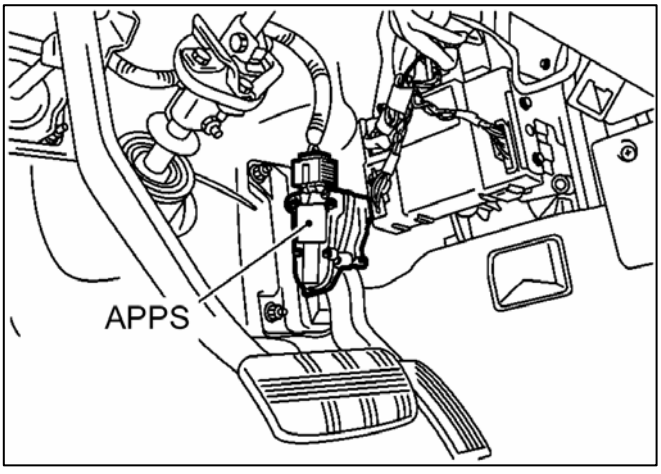
7. Intake Air Temperature Sensor (IATS)

The IATS is built into the MAFS.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



8. Accelerator Pedal Position Sensor (APPS)

The APPS is installed on the upper end of the accelerator pedal assembly. The sensor detects the following items of information;
• Actual Accelerator Pedal Position
• If the pedal is actually moving (being pushed by the driver or not) and if it is moving, the rate of movement (rapid movement or gentle / slow movement).
The ECM controls the injection based on these signals. Idle position of the accelerator pedal is determined by the ECM receiving the pre-learned signal from the APPS. The ECM uses this signal for idle control & fuel cut.



ENGINE CONTROL

M9R Inputs to ECM

9. Fuel Rail Pressure Sensor (BOSCH)

The FRP sensor is an extremely important input into the ECM. From this signal, the ECM can determine how to operate the Fuel Metering Solenoid Valve on the Fuel Pump as well as the Fuel Rail Pressure Control Solenoid Valve on the Fuel Rail in order to vary the Fuel Rail pressure (the amount of fuel) that is in the Fuel Rail.

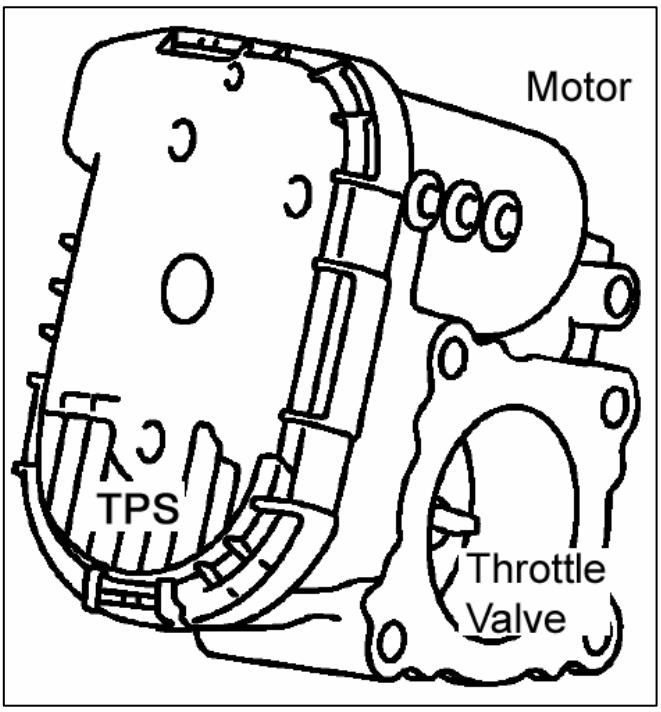
NOTE:
DO NOT EVER DISMANTLE THE FUEL RAIL. REPLACING THE FRP SENSOR MEANS REPLACING THE WHOLE FUEL RAIL ASSEMBLY!

10. Turbo Charger Boost Sensor

The Turbo Boost Sensor detects pressure in the inlet just after to the throttle unit. (Measure intake air pressure after it exits the ETC) The sensor output voltage to the ECM increases as the air pressure in the inlet manifold increases.

11. Throttle (valve) Position Sensor (TPS)

The TPS responds to the throttle valve movement. It has two sensors. These sensors are potentiometers which transform the throttle valve position into an output voltage and send the voltage signal to the ECM. The TPS detects the valve **position** and sends the voltage signals to the ECM.
The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle control motor to set the throttle valve opening angle in response to the requested condition by the ECM for EGR control & DPF regeneration control.

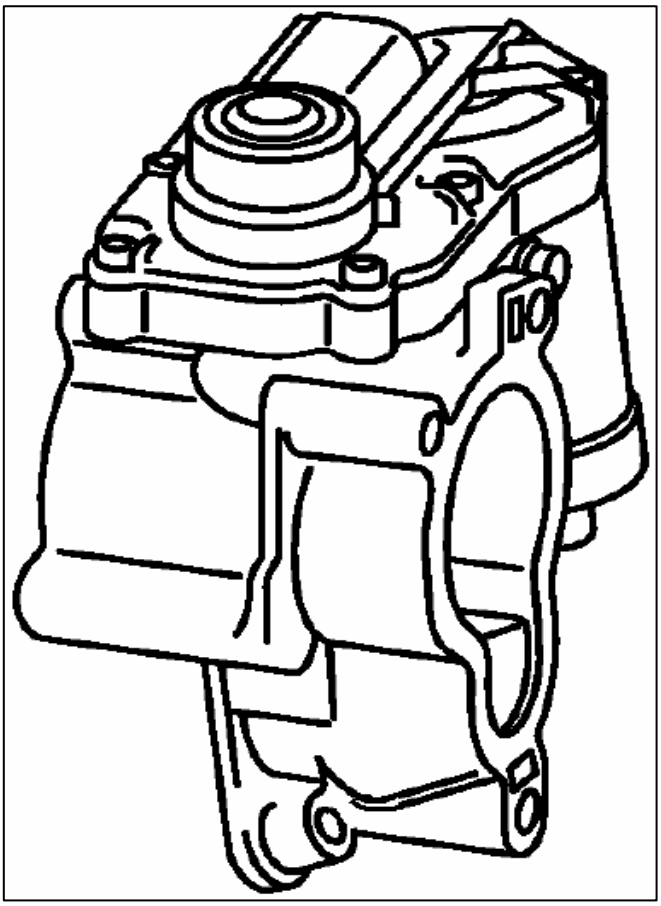


ENGINE CONTROL

M9R Inputs to ECM

12. EGR Volume Control Valve Position Sensor

The EGR Position Sensor monitors the actual position of the EGR Valve & sends a feedback signal to the ECM. The ECM judges the current opening angle of the valve from this signal and controls the DC motor to position the valve opening angle in response to driving conditions.



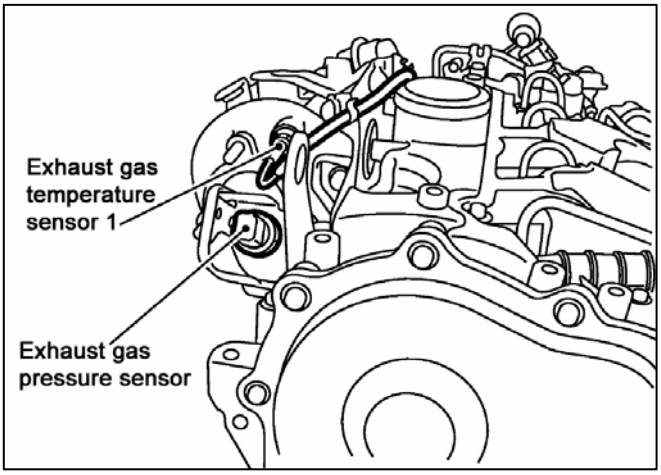
13. Exhaust Gas Pressure Sensor

An exhaust pressure sensor is mounted on the exhaust manifold at the turbo inlet. It measures the pressure in the exhaust system before the gases enter the turbo. The sensor is utilised to regulate the exhaust pressure for turbocharger and catalyst protection. It is used in combination with the Boost Sensor for better turbo boosting control.

14. Exhaust Gas Temperature Sensor

An Exhaust gas Temperature Sensor is located adjacent to the above mentioned temperature sensor.
It is used for the following to reasons;

- Turbo, engine & engine component protection.
- Optimum temperature control for DPF regeneration.



Avoid removing these sensors from their position unless they are to be replaced.

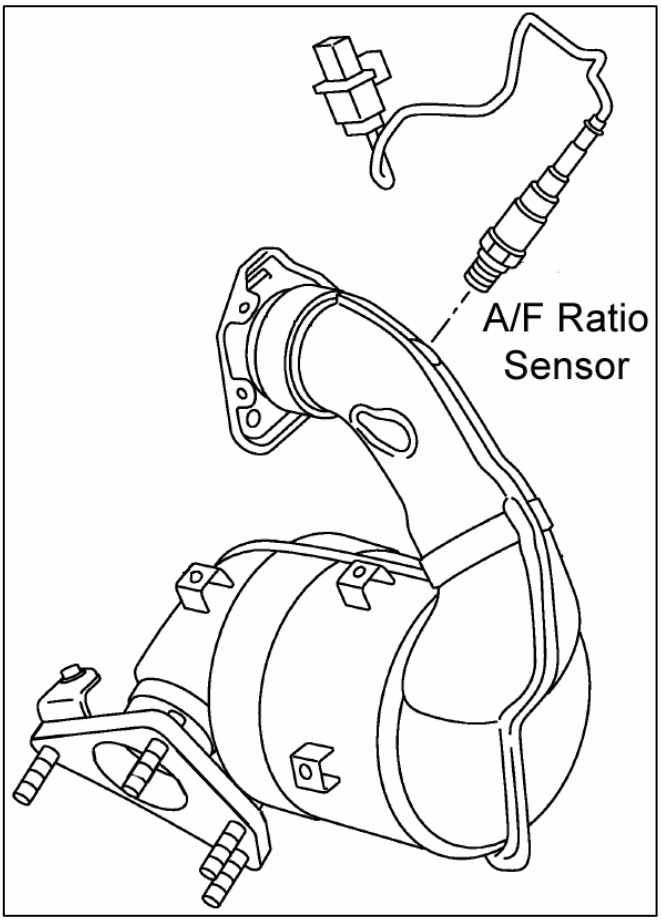
Removing (unscrewing) these sensors will most likely damage them.

ENGINE CONTROL

M9R Inputs to ECM

15. Air Fuel Ratio Sensor (EGR)

The Air Fuel Ratio Sensor measures the content of Oxygen left over after combustion. This signal allows for the more precise control of EGR by the ECM for the most ideal NOx emission.



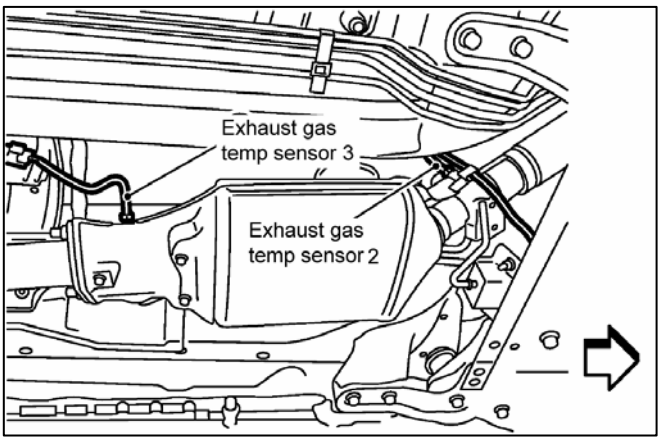
16. Front Exhaust Gas Temp Sensor (DPF)

The Front Exhaust Gas Temperature Sensor (EGTS) is installed before DPF and senses the exhaust gas temperature. The signal is sent to the ECM & it is used to compare the signal from the EGTS fitted to the outlet (rear) of the DPF.

17. Rear Exhaust Gas Temp Sensor (DPF)

The Rear Exhaust Gas Temperature Sensor is located after DPF and senses exhaust gas temperature.
As mentioned above, the signal from this sensor is compared to the signal from the front sensor.

NOTE:
Additional information regarding DPF can be sourced from the Diesel Particulate Filter (DPF) Training Manual.



Do not remove these sensors from their position unless they are to be replaced.

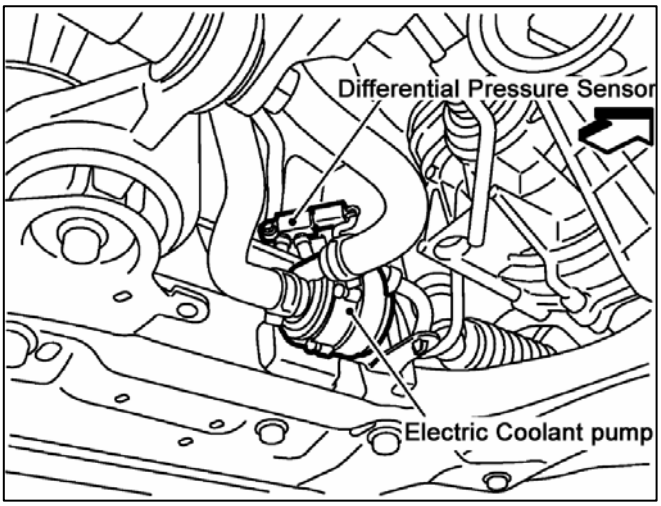
Removing (unscrewing) these sensors will most likely damage them.

ENGINE CONTROL

M9R Inputs to ECM

18. Differential Exhaust Pressure Sensor (DPF)

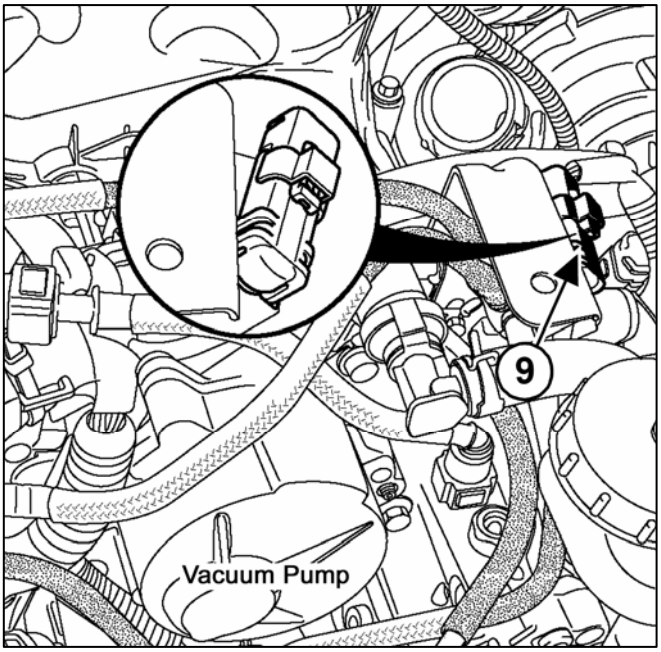
The Differential Exhaust Pressure Sensor is connected to the inlet & outlet sides of the DPF unit in the exhaust system via 2 separate pressure sensor tubes (upstream and downstream).
The Sensor measures the difference between the exhaust pressure before and after the DPF. The Differential Exhaust Pressure Sensor converts the difference into a voltage signal. ECM receives the signal and estimates the amount of Particulate Matter in DPF.



NOTE:
Additional information regarding DPF can be sourced from the Diesel Particulate Filter (DPF) Training Manual.

19. Fuel Temperature Sensor

The Fuel Temperature Sensor is of a conventional Thermistor design. The sensor is located in the fuel line just prior to the fuel reaching the pump and detects the temperature of the fuel. This information is sent to the ECM which is able to make corrections in the fuel injection signal which take into account the effect that temperature has on fuel viscosity.



20. Barometric Sensor (BOSCH)

The barometric pressure sensor is built into ECM. The sensor detects barometric pressure (altitude) and sends the voltage signal to the microcomputer.

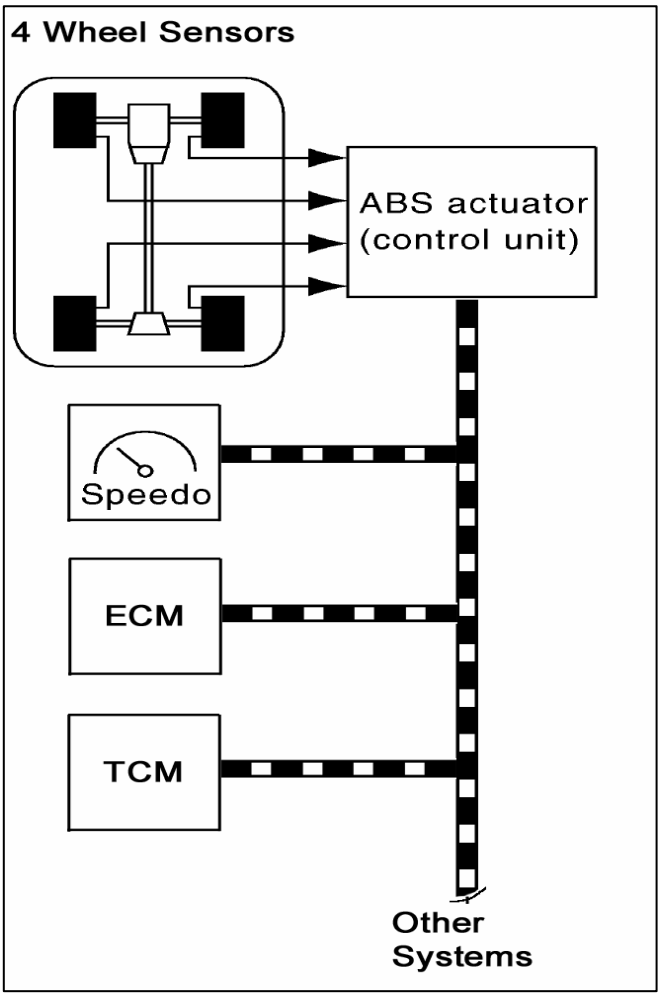
ENGINE CONTROL

M9R Inputs to ECM

21. Vehicle Speed Signal

The ECM receives vehicle speed sensor signal via CAN communication line. The source of the signal originates from the ABS / ESP system wheel speed sensors.
The ECM primarily uses this signal for ASCD control (Cruise Control).

NOTE:
It is NOT possible to add additional accessories that require a VSS to the vehicle such as Satellite Navigation systems.



22. Transmission Activity.

Communication via the CAN network between the ECM & the TCM is constantly taking place.
The Transmission speeds, gear position etc. is shared with the ECM.
The Engine's activity such as Engine speeds & temperature as well as the drivers commands (Accelerator Pedal activity) is shared with the Transmission.

NOTE:
PNP switch activity is included in the transmission activity signals that are sent to the ECM via the CAN.

ENGINE CONTROL

M9R Inputs to ECM

23. Stop Lamp Switch (Normally open)

The stop lamp switch is installed on the brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the ECM. (The signal actually comes from the BCM via CAN)
This signal is mainly used by the ECM to decrease the engine speed when the vehicle is driving (moving).
The switch reverts to a closed position when the pedal is pressed. It supplies power to the Stop Lamps as well as a signal to the ECM.
For AT models, the switch has a second set of contacts which operate in the same manner. This secondary switch is for the transmission lever Shift Lock function.
The Stop Lamp Switch is found on the Brake Pedal bracket, adjacent to the ASCD Brake Switch.

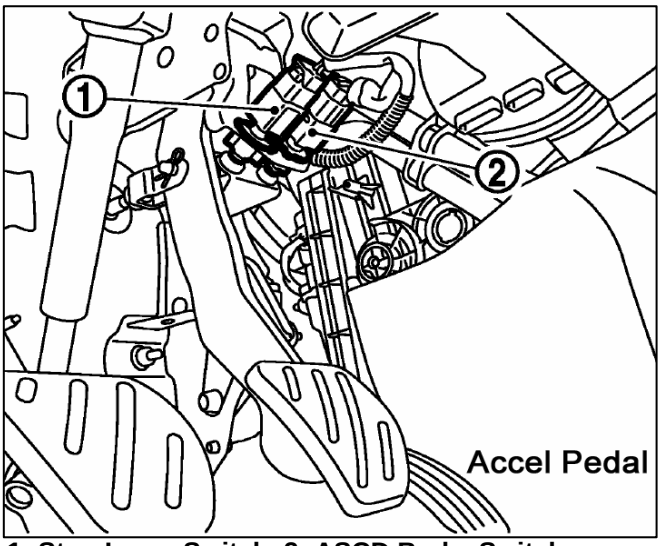
24. ASCD Brake (pedal) Switch (Normally closed)

When the brake pedal is depressed, ASCD brake switch and stop lamp switch are turned ON. ECM detects the state of the brake pedal by these 2 SEPARATE inputs.

NOTE:
The ASCD Brake switch reverts from a closed position to an Open position when the brake pedal is depressed. As a result the ECM receives a 0V signal when the pedal is pressed.
The Stop Lamp switch works in the **opposite** manner.

25. ASCD Clutch (pedal) Switch (Normally closed)

When the clutch pedal is depressed, it signals the ECM to cancel the ASCD. It is on the SAME circuit as the above discussed ASCD Brake pedal switch. It also is normally closed. If the pedal is pressed it opens & the output voltage from the ECM is NOT sent to ground.
1: ASCD Clutch Switch

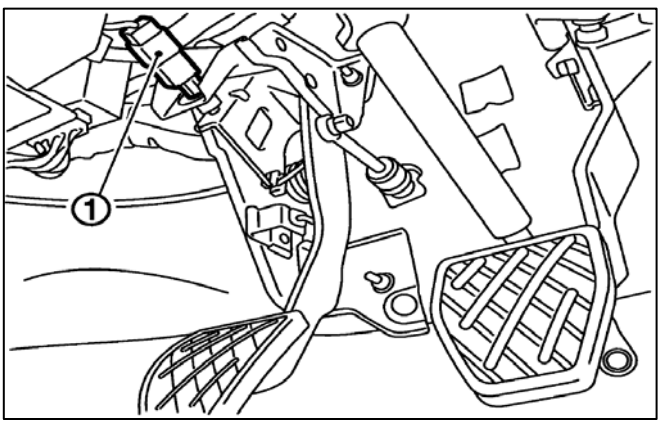


1: Stop Lamp Switch 2: ASCD Brake Switch

Accelerator and Brake mutual comparison diagnosis (Failsafe Control)

This diagnosis is designed to return the engine to normal idle when the driver depresses the brake pedal whilst the accelerator pedal is being held to drive the car (ASCD OFF) The diagnosis feature judges that driver wants to stop driving the vehicle. (ECU judges that the accelerator pedal is hanging).
However if the brake pedal is depressed prior to the accelerator pedal being depressed, it will not drop engine RPM.
Activation conditions;
Engine RPM; >1000rpm
Vehicle speed; >5km/h
DTC P2299 will be logged in the ECM as a result of this condition.

NOTE:
This feature also applies to T31 models fitted with the QR25 petrol engine & Y61 models fitted with the ZD30-CRD engine. However a DTC will NOT be logged.

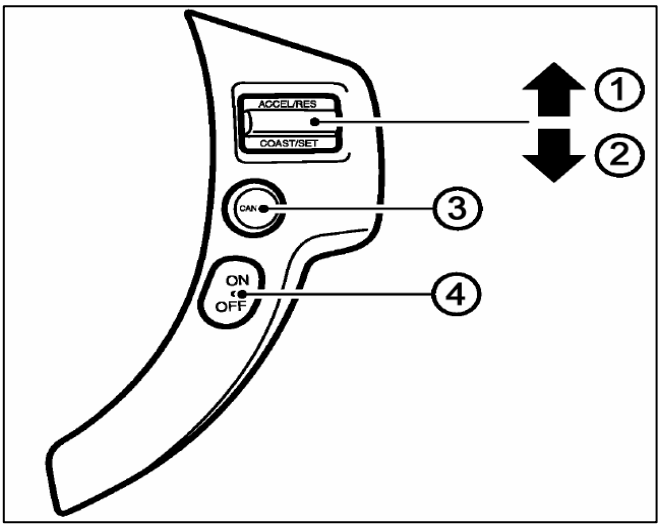


ENGINE CONTROL

M9R Inputs to ECM

26. ASCD Steering (wheel) Switches

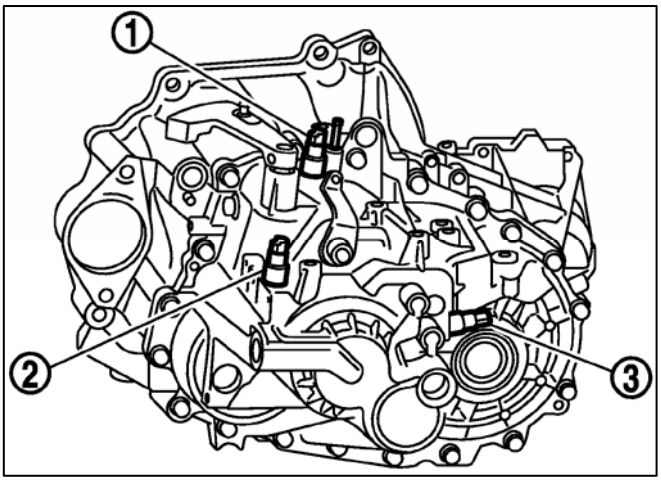
ASCD steering switch has varying values of electrical resistance for each button.
The ECM reads the voltage variation of the switch that is pressed and determines which button is operated.
The switches are mounted on the steering wheel.
1: ACCEL / RESUME
2: SET / COAST
3: CANCEL
4: ON OFF (Main Switch)



NOTE:
ASCD = Automatic Speed Control Device. (Cruise Control)

27. Park Neutral Position Switch (PNP) (MT Models)

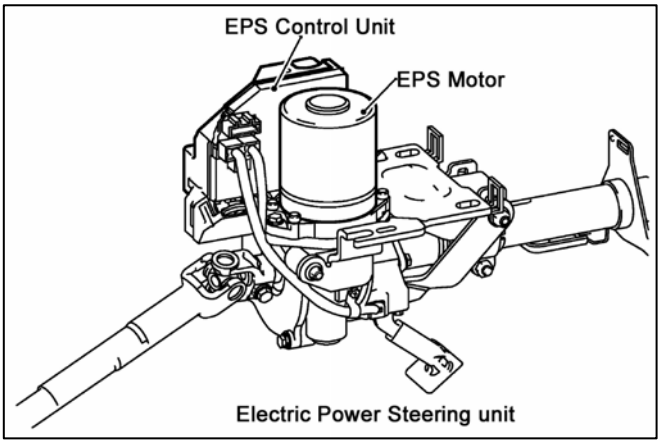
When the gear lever is in Neutral, the Neutral Position is ON. ECM detects the position because the continuity of the line (the ON signal) exists.
The signal is sent directly to the ABS control unit & in turn the PNP signal is then supplied by the ABS Control Unit to the ECM via the CAN
1: PNP Switch
2: Back-up Lamp Switch
3: 1st Gear Switch



NOTE:
The 1st Gear position switch is required for Hill Descent Control & Hill Start Assist.

28. Power Steering Operation

When the EPS is being operated, a signal is sent to the ECM via CAN. The ECM then utilises the signal to adjust the idle RPM so to a suitable idle speed. This will ensure that the engine will not stall / stumble when the steering is being operated.
The operation of EPS can draw a high electrical current at times.

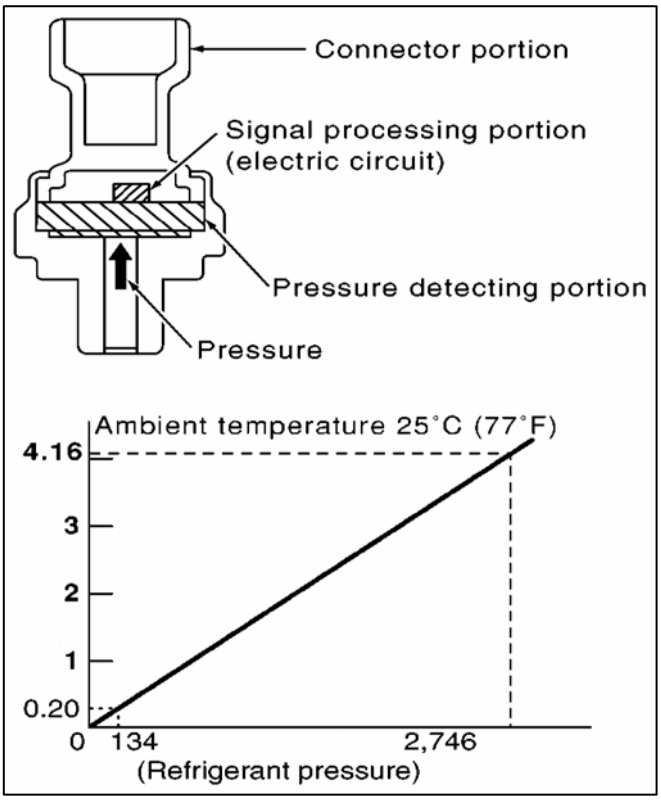


ENGINE CONTROL

M9R Inputs to ECM

29. A/C Refrigerant Pressure Sensor (RPS)

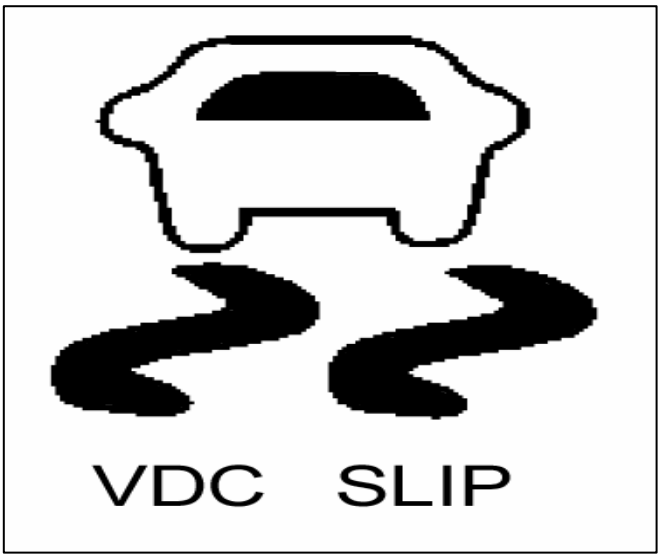
The RPS is installed on the high pressure pipe between the condenser & the evaporator on the A/C system.
The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. (The pressure of the liquid **after** it has exited the condenser is measured.)
The voltage signal is sent to ECM and it controls the cooling fan system, or disengage the compressor in the event of excessively LOW or HIGH system pressure.
Due to the input of this sensor it can be possible to have Electric cooling fan operation due to high A/C system pressure, yet the engine temperature is cool.
Input from this sensor can also assist the ECM to set the most ideal idle speed control for the given conditions. Typically on a hot day, the system pressure is high, therefore the compressor load on the engine is high. The ECM will need to set a higher engine idle speed to cope with the higher load.



30. ESP (VDC) & TCS Activity.

Communication from the ABS / TCS / VDC Control Unit is sent to the ECM via CAN communication.
When the vehicle is un-stabilised due to excessive wheel slip being detected or the vehicle is sliding sideways etc., the ECM assists with re-stabilising the vehicle by controlling the engine power (reducing fuel injection) so that engine power is reduced.

NOTE:
ESP = Electronic Stability Program
VDC = Vehicle Dynamic Control
Both mean the same thing.

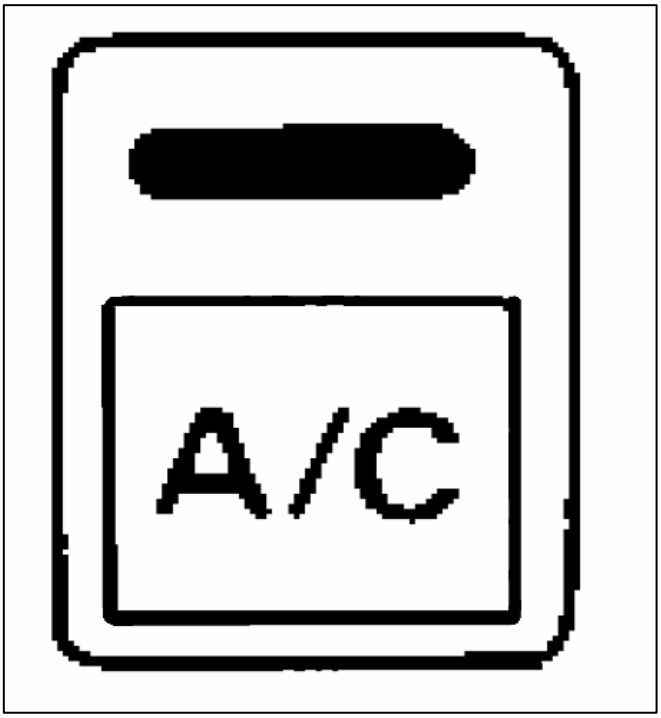


ENGINE CONTROL

M9R Inputs to ECM

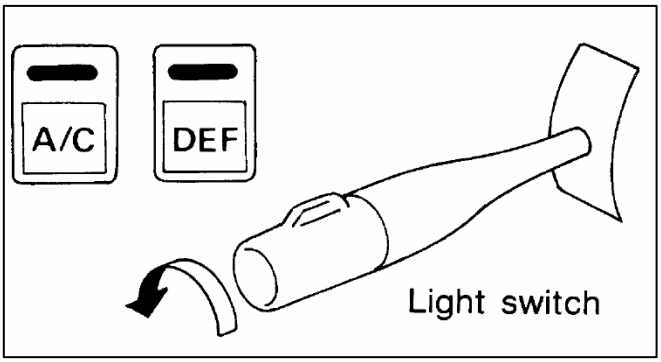
31. Air Conditioner Request.

A request for Air Conditioner operation is sent from the A/C Control Unit / BCM to the ECM via CAN. The ECM looks at various inputs of it's own to determine if it is OK to operate the compressor. (E.G; Eng speed, eng temp, eng loads etc as well as A/C system pressure etc.).
If the ECM allows compressor operation, a signal is sent via CAN to the IPDM E/R to operate the A/C compressor relay (located within the IPDM E/R).



32. Electrical Loads.

Whenever any electrical loads are switched on, a signal is sent to the ECM (typically via CAN).
The ECM will then set a suitable idle speed via control if the ETC to cope with the additional load placed on the engine.

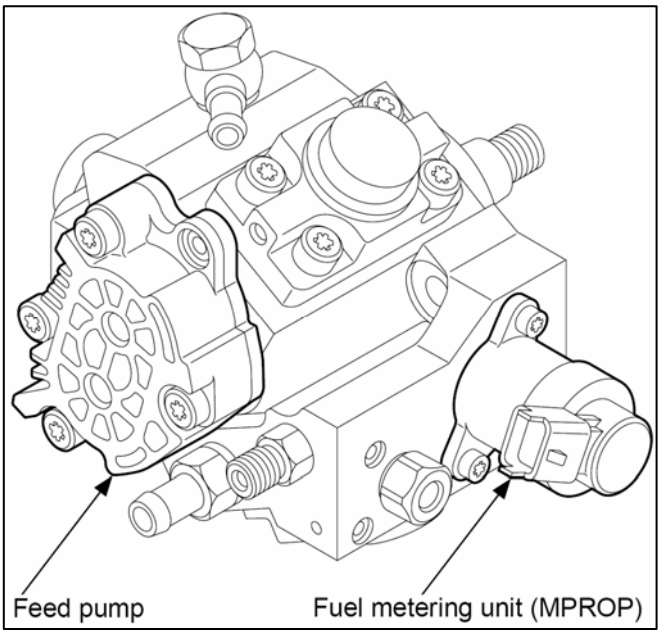


ENGINE CONTROL

M9R Outputs from ECM

1. Fuel Metering Unit (MPROP, BOSCH)

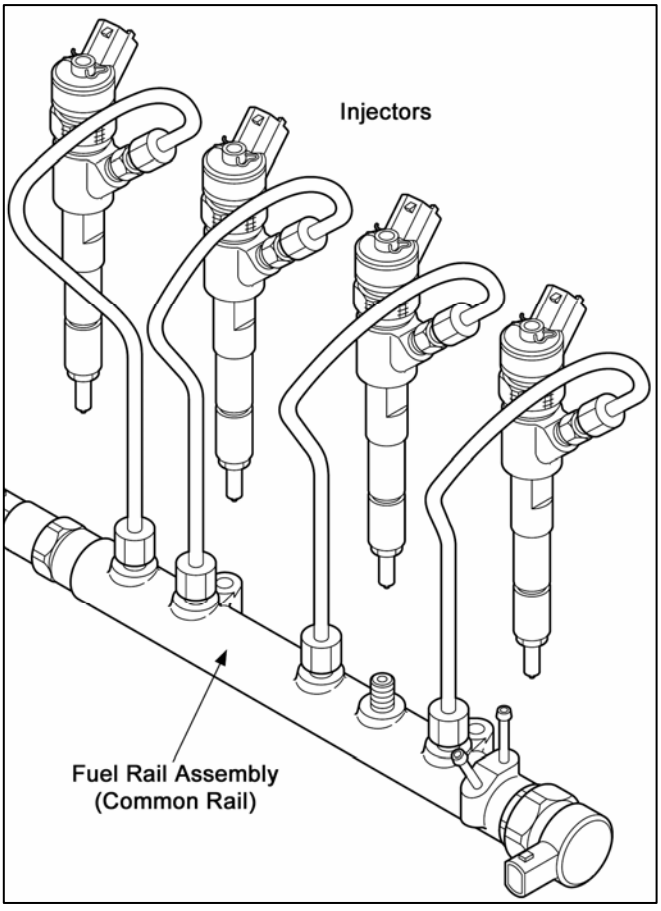
As discussed earlier in this manual, the ECM controls this device in order to regulate the amount of fuel that is allowed to be delivered (forced into) the Fuel Rail.
The Fuel Metering unit in principal works in a similar manner to the Suction Control Valve (SCV) on the Denso High Pressure Fuel pump fitted to R51 / D40 / D22 models with the YD25-CRD engine.



2. Fuel Injector (Piezo type, BOSCH)

Once again the Fuel Injector is discussed earlier in this manual. The operation of the Injector is in principle the same as the operation of the Injector in a gasoline engine. The ECU has complete control of when the Injector is open, how long it is opened for & in turn the amount of times the Injector is open & shut in 1 piston cycle.

NOTES:
• PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING THE HIGH VOLTAGE WHICH OPERATES THE FUEL INJECTORS.
REFER TO STB GI 05-007 FOR MORE DETAIL.
• Do NOT re-use the steel fuel tubes that link the rail to the injectors or the Fuel pump.



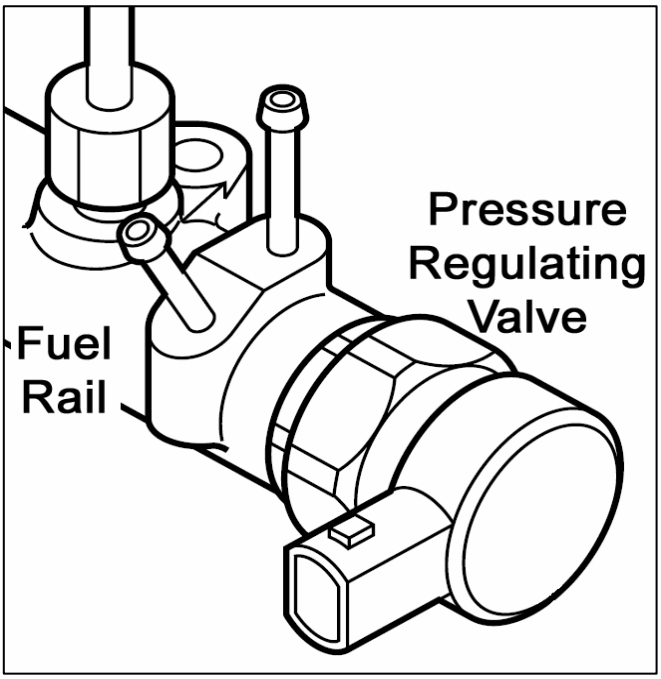
ENGINE CONTROL

M9R Outputs from ECM

3. Fuel (rail) Pressure Regulating Valve (Bosch)

This solenoid is attached to the end of the fuel rail & it works in conjunction with the Fuel Metering unit on the Fuel Pump. It maintains an ideal fuel rail pressure at all times.

SPECIAL NOTE:
DO NOT EVER DISMANTLE THE FUEL RAIL. REPLACING THE PRESSURE REGULATING SOLENOID MEANS REPLACING THE WHOLE FUEL RAIL ASSEMBLY!

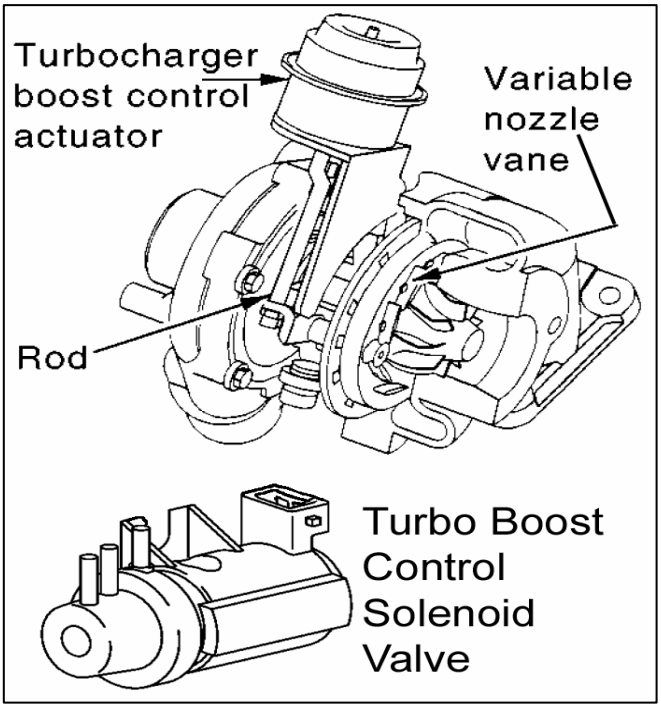


PRESSURE REGULATING VALVE
If this valve is disconnected it will result in no rail pressure & the engine will not start.

4. Turbo Boost Control Solenoid Valve

Like the ZD30 engine in Y61 & YD25 engines in R51 / D40, the Turbo Charger is a Variable Nozzle (Geometry) Turbo. Vacuum is supplied to the actuator on the turbo. If a high level of vacuum is applied, the actuator rod is forced to lift which in turn allows for maximum boost. If the vacuum supply is cut, the rod will then be forced to drop with the assistance of spring pressure. The end result is no turbo boost.
The Turbo Boost Control Solenoid valve is designed to allow vacuum to be applied or stop vacuum being applied to the actuator. The ECM has the ability to provide a partial vacuum situation for partial turbo boosting as well. This is via an ON / OFF pulse being applied to the solenoid by the ECM.

NOTE:
As part of a “Lack of Power” trouble diagnosis, ALWAYS ensure that the vacuum pump is functioning OK.
If the vacuum pump is worn & it is not providing sufficient vacuum, the turbo will not operate properly. As a result the engine will lack power due to lack of Turbo Boost.

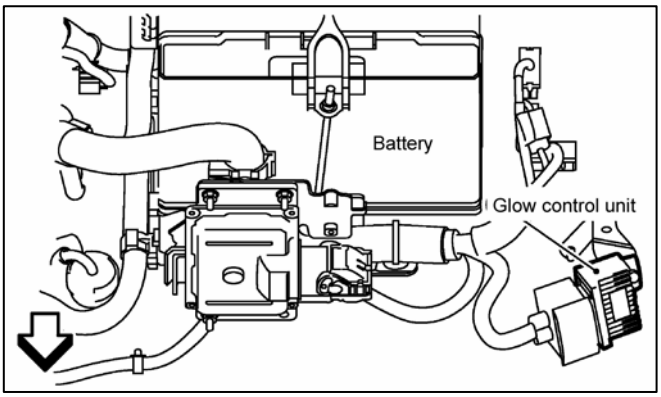


ENGINE CONTROL

M9R Outputs from ECM

5. Glow Control Unit

The ECM operates the Glow Control Unit. Once the unit is activated by the ECM, it feeds battery voltage through to the Glow Plugs.

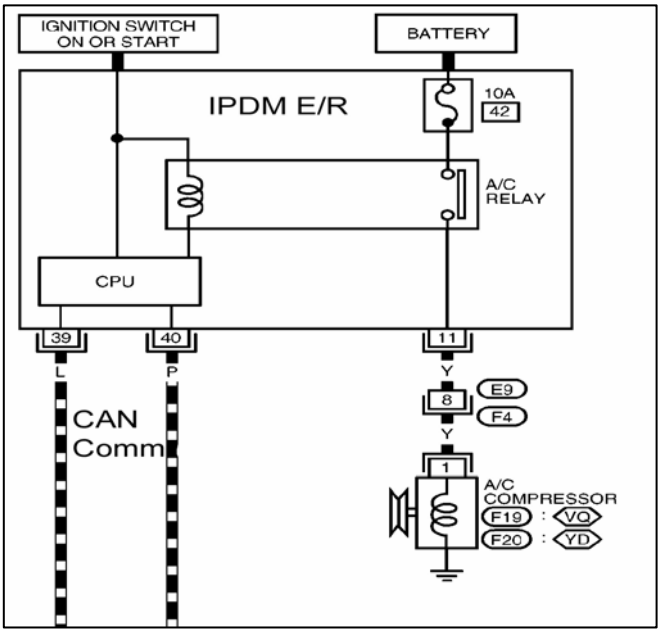


6. Air Conditioner Relay

The Air Conditioner Relay is located within the IPDM E/R. (Intelligent Power Distribution Module – Engine Room)

The ECM has the final control over the A/C compressor operation. Air Conditioning is typically required due to a driver request coming from the A/C Amplifier or the Control Panel on the dash via CAN.

If conditions such as acceleration demand, excessive engine temperature, excessive A/C system pressure or lack of A/C system pressure (no gas) are NOT evident, the ECM will send a signal via the CAN to the IPDM E/R to switch off the A/C relay which forms part of the IPDM E/R.

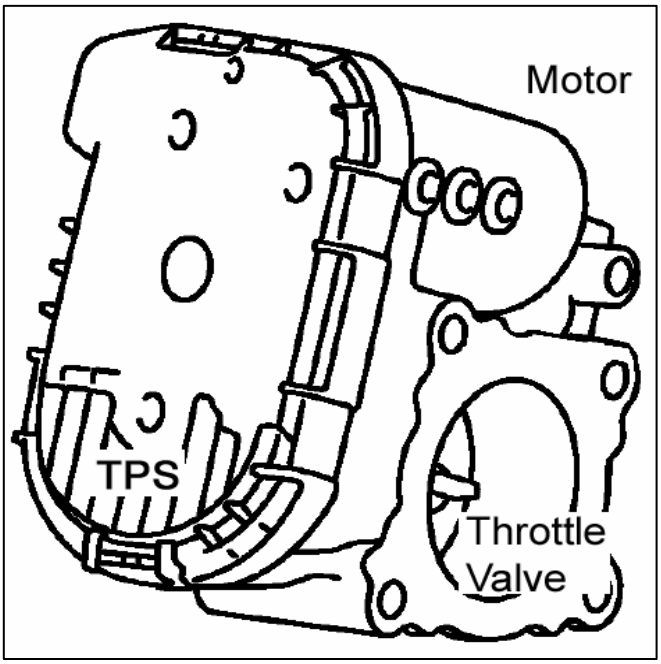


7. Electric Throttle Control Actuator

Electric throttle control actuator consists of a throttle control motor which operates throttle valve & throttle position sensor which detects the opening angle of throttle valve.

The throttle valve is fully opened when regeneration is not performed. The valve may partially close when performing a DPF regeneration or to create a partial vacuum so that EGR operation is improved.

NOTE:
The Throttle valve will also close to stop engine shake when the ignition is switched off.



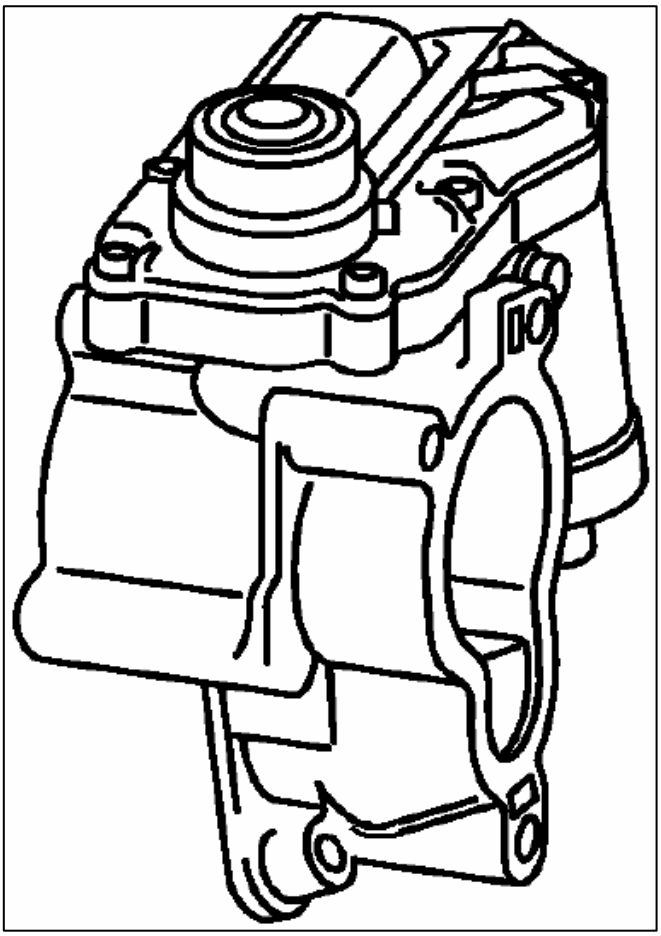
ENGINE CONTROL

M9R Outputs from ECM

8. EGR Volume Control Valve

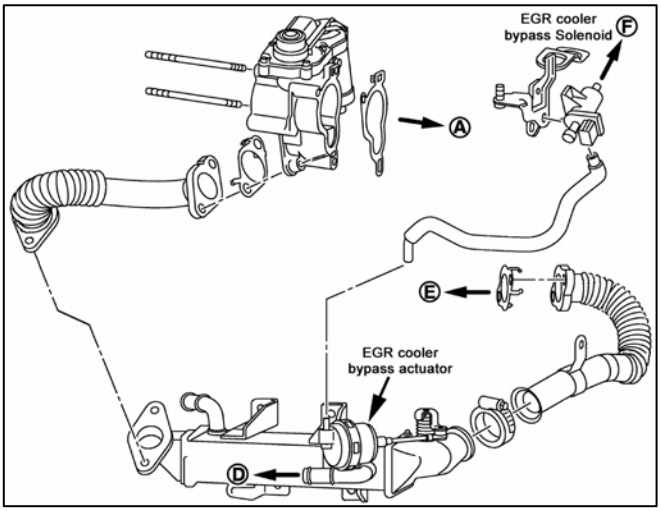
The EGR volume control valve consists of valve, actuator and position sensor. The valve is installed in EGR passage and operated by the actuator according to the output signal from the ECM. The actuator uses a DC motor and it opens or closes the valve to change the EGR flow rate.

NOTE:
The EGR valve does a complete close & open self test cycle AFTER the engine completely shuts down.
The EGR valve assembly on the Y61 Patrol fitted with the ZD30-CRD engine & current YD25 engines is similar to this EGR valve assembly.



9. EGR Cooler Bypass Control

The ECM operates a vacuum switching solenoid which in turn operates the EGR cooler bypass actuator. (Actuator is operated by vacuum)
The purpose of the actuator is to bypass the warm exhaust gases around the EGR cooler when the engine is cold in order to reduce soot emissions.
Once the engine is at operating temperature, the exhaust gases are directed through the EGR cooler prior to entering the intake.

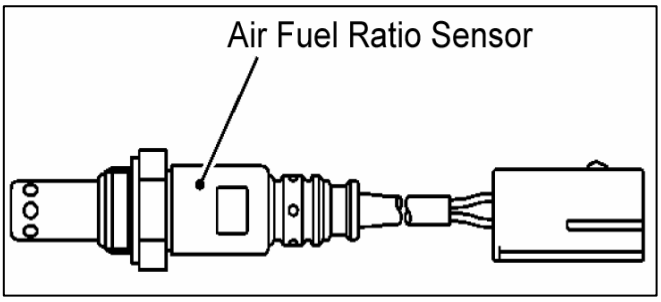


ENGINE CONTROL

M9R Outputs from ECM

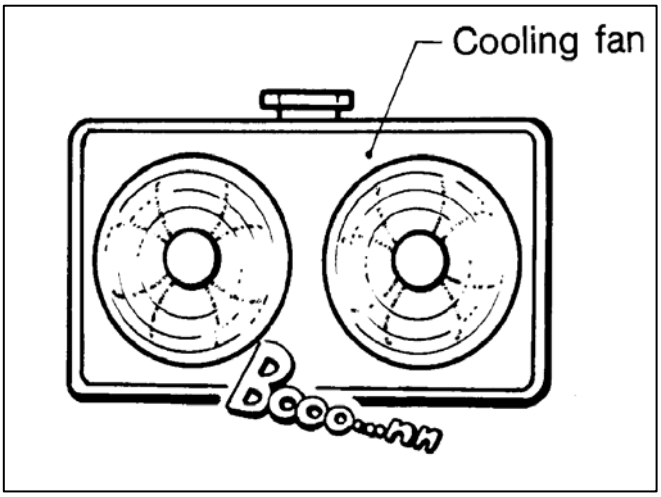
10. Air Fuel Ratio Sensor Heater

Based on intake air temperature, engine coolant temperature and rear exhaust gas temperature, ECM Operates the A/F sensor heater.
When the A/F sensor heater is ON, ECM controls A/F sensor heater with ON/OFF pulse duty signals according to driving conditions.
The sensor is heated to ensure accurate operation.



11. Cooling Fan Control

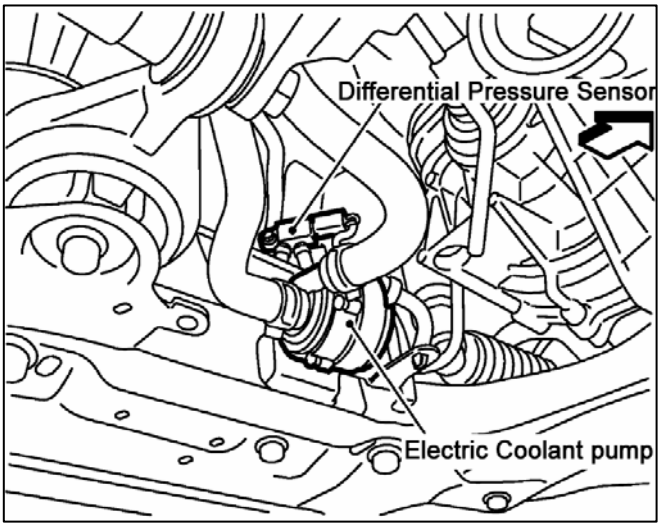
The ECM controls the cooling fan **relays** corresponding to the vehicle speed, engine coolant temperature, A/C refrigerant pressure and air conditioner ON signal.
The control system has 5-step control VERY HIGH / HIGH / MEDIUM / LOW / OFF.
The ECM does not directly drive the cooling fans. It switches the fan relays ON or OFF, which in turn controls the cooling fans.
3 cooling fan relays are located within the **IPDM E/R** unit & 2 additional relays are located adjacent to the IPDM E/R.



12. Electric Coolant Pump Relay

The ECM controls the cooling pump **relay** (located behind RH headlight) which in turn operates the coolant pump.
The coolant pump is activated for 5 minutes after the engine has been switched off if an 80 deg C coolant temperature has been exceeded.
Coolant is circulated around the turbo so that the engine oil does not boil & seize the turbo.

NOTE:
The Turbo Coolant pump is ONLY operated when the engine is NOT running.

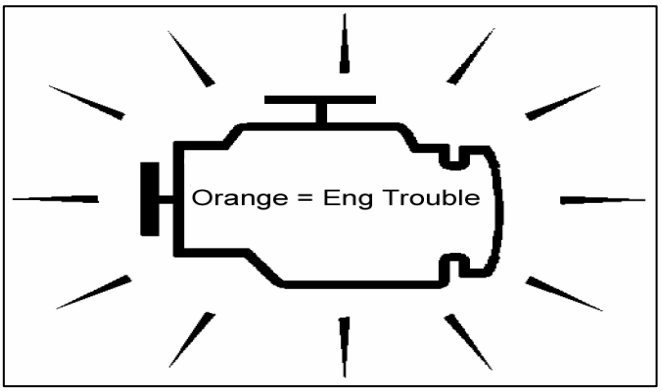


ENGINE CONTROL

M9R Outputs from ECM

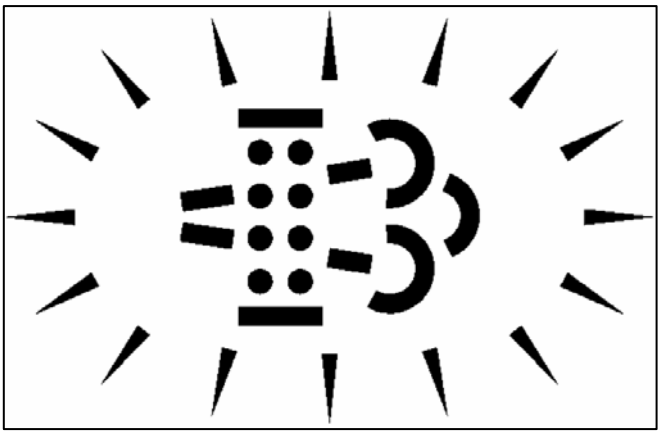
13. Malfunction Indicator Lamp (ORANGE) (On Board Diagnosis)

The MIL is located in the Instrument cluster between the Speedometer & Tachometer. It is illuminated by the ECM in the typical ORANGE colour & it indicates an engine system fault. Use of CONSULT III is required to extract DTC(s).



14. DPF Over Accumulation Warning Lamp (ORANGE)

This light is illuminated by the ECM to warn the driver that the DPF has over accumulated with soot & a "Regeneration" needs to be carried.
The customer should simply drive the car for a MINIMUM of 20 minutes at a steady 60 ~ 80km/h until the light goes out.
There will be NO DTC"s logged as a result of this light. If DTC P2002 is logged there is a specific DPF system related fault.

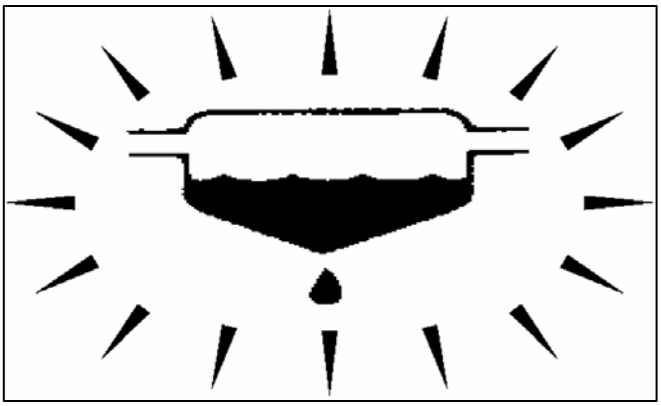


15. Glow Plugs Activated Indicator Light (ORANGE)

This light will illuminate when the ignition is switched on. It indicates to the driver that the glow plugs are active (warming up the engines combustion chamber). It is desirable to wait until this light goes out prior to starting the engine. Once the engine is running the light will remain off although in many cases the glow plugs remain active for a period of time dependant on engine temperature.

SPECIAL NOTE:
Water in Fuel Filter Warning (ORANGE)

This light is NOT operated by the ECM. It is permanently powered by the instrument cluster & it is illuminated when it is grounded by the water sensor in the base of the Fuel Filter.
There will be NO DTC's logged when the water sensor in the base of the Fuel Filter is grounded. However if the water in fuel situation is not amended, engine related DTC's will eventually be logged due to water damaging the FUEL SYSTEM components.



ENGINE CONTROL

M9R Engine Related Warning Lights (Instrument Cluster)

MIL: Malfunction Indicator Lamp (*1)
A Diagnostic Trouble Code (DTC) has been logged in the ECM. CONSULT III is required to view the code. Although the engine may appear to be running OK, it is advisable to have the vehicle inspected immediately.

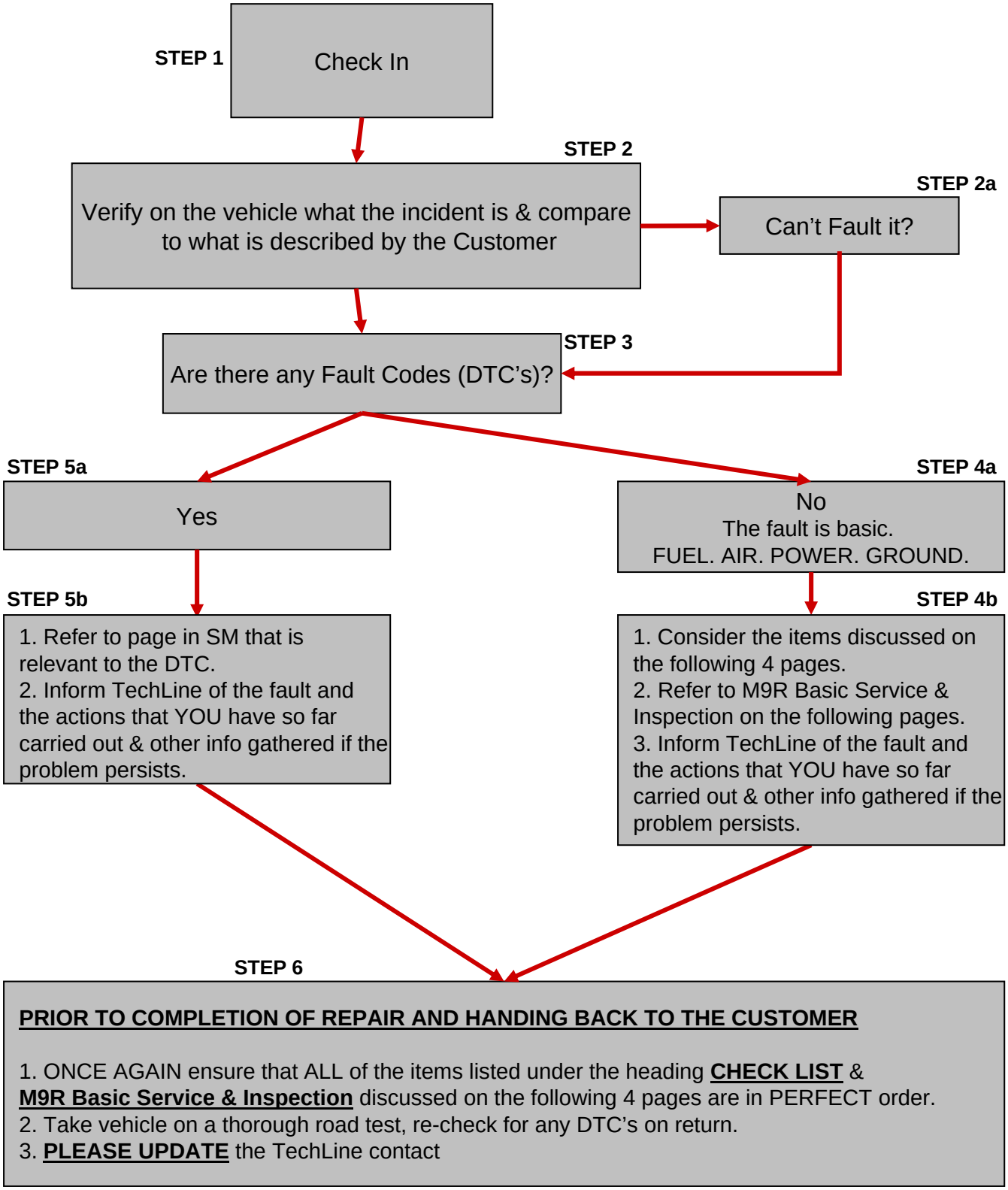
DPF: Diesel Particulate Filter has over accumulated with soot (*1)
Drive the car at a steady speed of 60 ~ 80km/h until the light goes out.

GLOW: Glow Plugs activated indicator light (*1)
No need to wait until it extinguishes itself in most cases.

WATER IN FUEL: Water in the base of the Fuel Filter
STOP THE ENGINE IMMEDIATELY & DRAIN THE WATER OUT OF THE BASE OF THE FUEL FILTER!

(*1): These lights are operated by the ECM. The Water in the Fuel Filter light is switched to ground via the water collecting in the base of the fuel filter. Refer to pages 82 – 83 for more detail.

M9R ENGINE TROUBLE DIAGNOSIS



M9R ENGINE TROUBLE DIAGNOSIS

Checklist

1. FUEL
(a) Is there sufficient QUANTITY of Fuel being delivered to the pump? Blocked Filter or Lines?
(b) Is there an acceptable QUALITY of Fuel being delivered to the Pump? Drain base of Filter & check for contaminated Fuel + Dirt &/or Water. Check for PETROL as well.
(c) Question the customer about their fuel purchasing habits etc.
(d) Is there air leaking into fuel prior to it reaching the pump?

Take a sample of Fuel & store it in a clean – air tight – container for future reference

2. AIR
(a) Is there sufficient QUANTITY of Air being delivered to the Engine? Blocked Air Filter or Air Intake system? Faulty ETC? Air Leaks between MAFS & Engine?
(b) Is there an acceptable QUALITY of Air being delivered to the Engine? EGR valve stuck open? Refer to "EGR VOLUME CONTROL SYSTEM" check in section EC of the Service Manual.
(c) Check that Exhaust System is not blocked
(d) Check the Turbo Unit. Refer to "TC BOOST CONTROL SOLENOID VALVE" check in section EC of the Service Manual. Ensure there is a sufficient **vacuum supply** coming from the engine driven vacuum pump. Also refer to "TURBO CHARGER" checks in section EM of the Service Manual.
(e) Check the Engine COMPRESSION with a KNOWN GOOD compression gauge. WRITE down the figures you measured. Follow the directions in section EM of the Service Manual.

3. POWER SUPPLY & GROUND CONNECTIONS (Refer to pages 66 - 69)
(a) Check the Battery. Is it serviceable? Does the condition improve with a jumper battery connected?
(b) Confirm the cranking speed (if no start). The engine should crank at a speed of at LEAST 160rpm. Use "DATA MONITOR & view the CKPS in CONSULT to verify the engine cranking speed.
(c) Check ALL of the ground connections, battery terminals, fuses & fusible links that relate to the ENGINE SYSTEM. Carry out the "POWER SUPPLY AND GROUND CIRCUIT" checks in section EC of the Service Manual.

4. ENGINE OIL, COOLANT & PREVIOUS WORK HISTORY
HAS THE VEHICLE GOT A DECENT SERVICE HISTORY?
(a) Oil level is correct? Is it over/under full? Due for changing?
(b) Is it the correct grade / viscosity for the engine?
(c) Coolant level & condition is OK? Genuine coolant used? Cooling system is functioning OK?
(d) Have you got records of other PREVIOUS WORK HISTORY (Nissan dealer or Non Nissan Dealer), FITMENT OF NON GENUINE PARTS & AFTER MARKET ACCESSORIES?

M9R ENGINE TROUBLE DIAGNOSIS

Checklist Continued

5. BASIC SERVICE ITEMS.
Review the “Basic Service & Inspection” on the following pages. Carry out the inspection as part of any trouble diagnosis activity. (Some of the items may not be necessary given the type of problem in question)

6. ILLOGICAL INPUTS INTO THE ECM.
(a) Whilst being driven as well as stationary, ensure that inputs such as “Brake Pedal Position (BPP) Sw” are input correctly. For a complete reference list, refer to section EC (“TROUBLE DIAGNOSIS – CONSULT III Reference Value in Data Monitor Mode”) of the Service Manual.
(b) If possible, drive the vehicle fitted with a “KNOWN GOOD” Mass Air Flow Sensor.

7. ENGINE MECHANICAL TIMING INDICATION SYSTEM.
Is the Engine’s Static Timing OK? (Valve timing etc.) Timing Chains & associated drive components & CKPS / CMPS indication devices OK? Excessive or Insufficient Valve Clearances? Also refer to Check Item **“2. Air”** on the previous page.

8. NATS.
Are all of the Keys working? Is there a foreign Electronic device on the Key Ring Set? Are the keys genuine parts? The RED Key / Car symbol in the Combination Meter will illuminate if there is a NATS related issue, however this is NOT always the case.

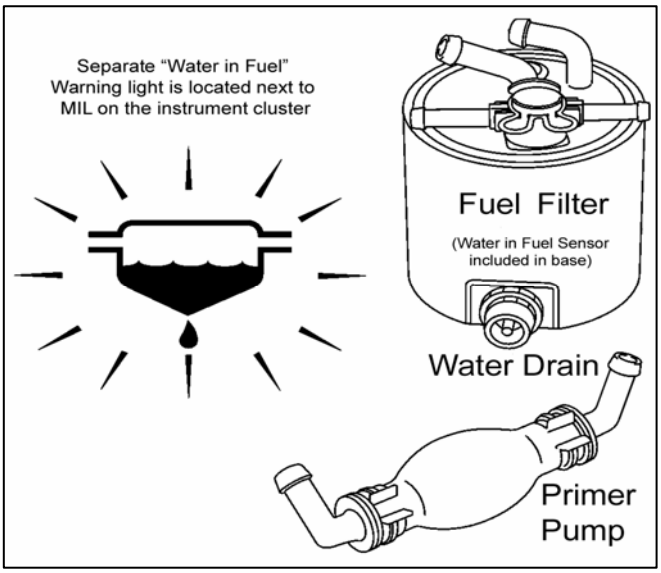
9. PRE-PROGRAMMED ECM FAILSAFE OPERATIONS.
(a) Ensure the customer does NOT drive with the brake pedal applied.
(b) Ensure that the brake pedal & brake pedal switches (Stop Lamp & ASCD cut) are correctly adjusted. Ensure the clutch pedal ASCD cut switch is correctly adjusted (where fitted)

M9R ENGINE TROUBLE DIAGNOSIS

M9R Basic Service & Inspection

1. Fuel Filter, Bleeding & Water Drain

The Fuel Filter design is similar to that fitted to ZD30 CRD engine vehicles. R51 & D40 YD25 also utilise the same design since mid 2006 production.
There is an in-line type primer pump which is operated by hand & is located adjacent to the Filter assembly
There is a facility to drain water on the base of the unit.
If there is an excessive amount of water that collects in the base of the Filter, a sensor activates a SEPARATE ORANGE WARNING LIGHT (located in the tacho) to warn the driver of the water in fuel condition.
The filter & sensor is only available as 1 complete assembly. The Filter must be replaced every 40,000km's or 2 years. It is ideal to replace it more frequently under severe driving conditions.
Refer to section MA of the Service Manual for more detail regarding the servicing of the Fuel Filter.



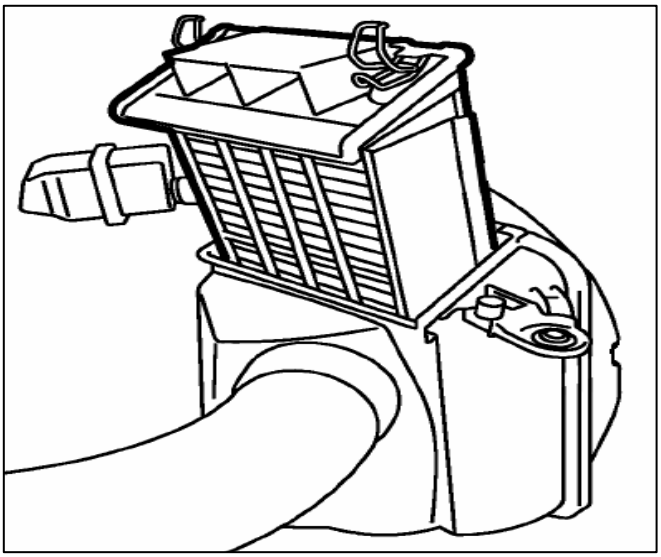
Refer to pages 82 – 83 of this Training Manual for more discussion on the "Water in Fuel" warning light

2. Air Filter & Inspection of Air Intake

Ensure the Air Filter is serviceable. If it is lightly dusted it can be cleaned with compressed air as the element is a dry paper type. Other wise it should be replaced.
Ensure the remainder of the air intake system (such as the intercooler behind the bumper) is free from;

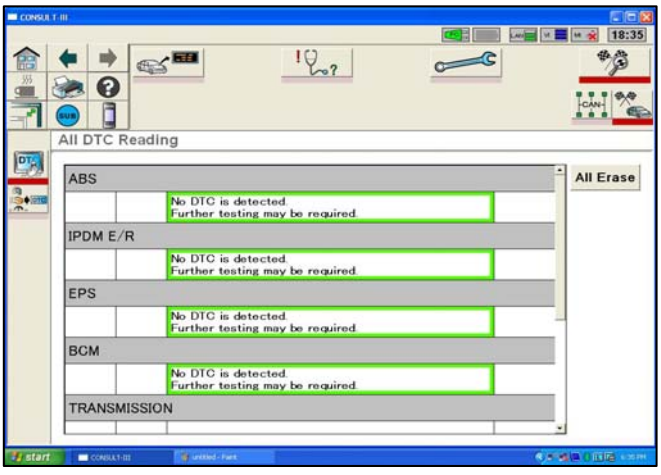
- Blockage
- Leakage
- Damage

Especially considering the Intercooler that is mounted behind the front bumper.



3. DTC Inspection

Using CONSULT III, check for any DTC's in ENGINE as well as any other system. PRINT OFF ANY DTC"s RECORDED IMMEDIATELY prior to taking any further action.
Refer to the ESM for information about the codes. Refer to the list of "Possible Causes" to determine the MOST LIKELY cause of the fault.
REMEMBER THE CODE COULD BE RELATED TO THE BASICS! Do NOT immediately blame expensive components.



M9R ENGINE TROUBLE DIAGNOSIS

M9R Basic Service & Inspection

4. DPF Pressure Difference Inspection

Ensure that the DPF is not restricted excessively. Use CONSULT III in ENGINE - DATA MONITOR to view the DIFF EXH PRES with the engine running as per the conditions outlined in the chart shown right. Refer to the DPF Training Manual for more detail.

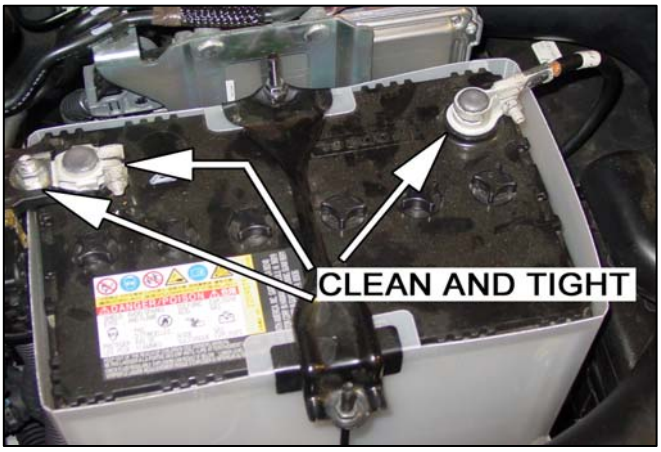
Condition	DIFF EXH PRES [mbar]
• ENGINE SPEED·: 2000 r/min • EXH GAS TEMP2: 150 - 200°C • EXH GAS TEMP3: 150 - 200°C	Less than 3.0

5. Battery / Alternator / GROUNDS

Given the engines high reliance on ELECTRICAL POWER, ensure that the source of this is in perfect order.

- Clean / tight battery terminals
- Battery can pass a load test
- Alternator is charging properly - WHEN IT IS UNDER LOAD
- Engine ground connections E17 / E21

REFER TO PAGES 66 – 69 OF THIS MANUAL FOR MORE DETAIL.

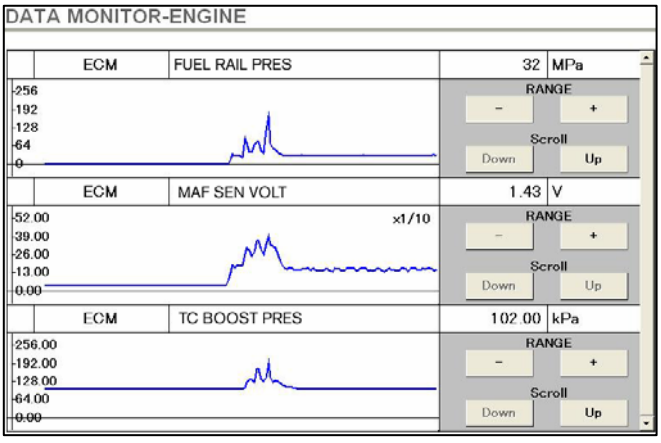


6. Fuel Pressure

Use CONSULT III in ENGINE – DATA MONITOR – FUEL RAIL PRESS (or ACT CR PRESS) to determine the amount of fuel pressure in the rail.

<u>Do NOT loosen a fuel line at the injector or rail!</u>

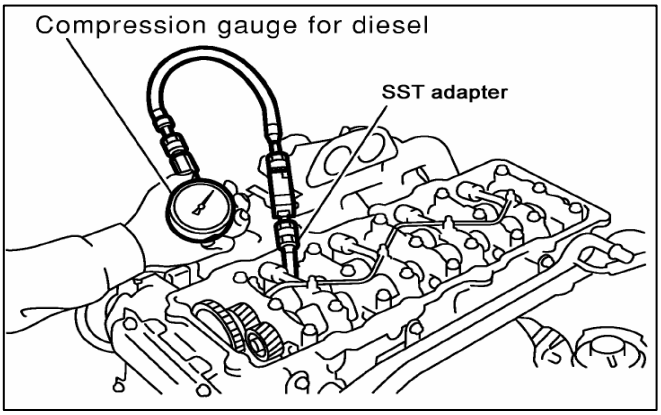
REFER TO PAGE 14 OF THIS MANUAL FOR MORE DETAIL.



7. Turbo Boost Pressure / Mass Air Flow

Use CONSULT III in ENGINE – DATA MONITOR – TC BOOST PRES & MAF SEN VOLT to determine the amount of air pressure (turbo boost) & airflow in the intake when the engine is starting, raced, under load.

REFER TO PAGE 53 OF THIS MANUAL FOR MORE DETAIL.



8. Engine Compression

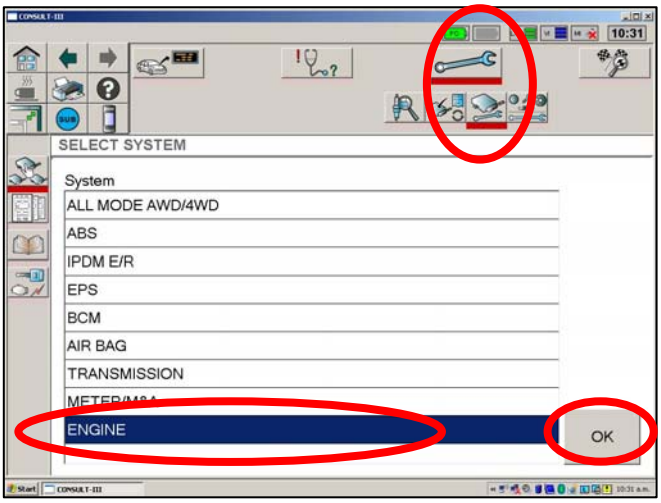
Ensure that there is suitable compression. Follow the directions outlined in section EM of the ESM.

M9R ENGINE TROUBLE DIAGNOSIS

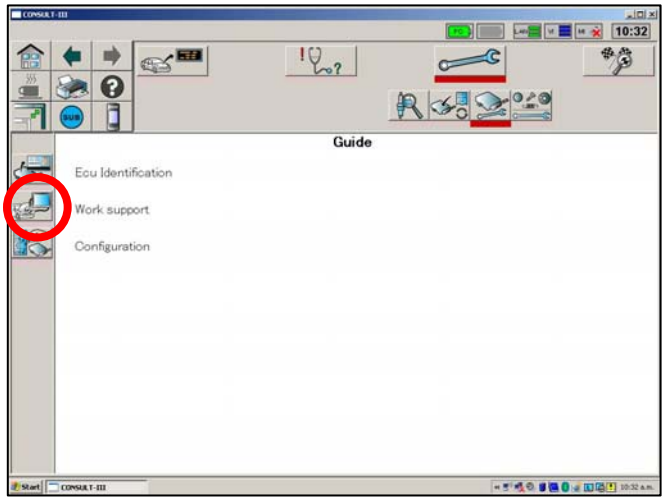
M9R CONSULT III Work Support

1. Access to WORK SUPPORT

• Touch the spanner icon & then select the smaller spanner / ECU icon at the top of the screen on CONSULT III.
• Highlight ENGINE
• Touch OK



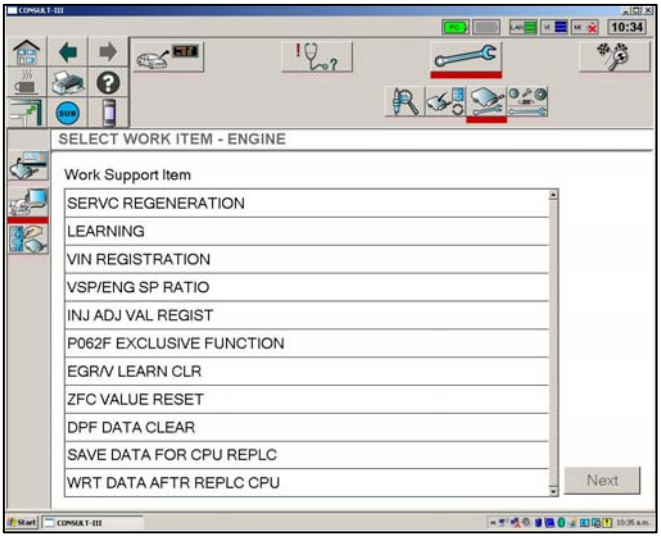
• Touch the icon adjacent to the word “Work Support”



2. Selection of Required Work Support Operation

Select (highlight) the desired Work Support operation & then touch **“Next”**
Refer to the chart on the following page as well as section EC (for M9R) – BASIC INSPECTION for further instruction regarding these operations.
In most cases the on screen instructions will guide you further.

SPECIAL NOTE:
Do NOT perform the DPF DATA CLEAR unless you have actually fitted a new DPF to the vehicle.



BASIC SERVICE OPERATION APPLICATION CHART

Required Repair \ Basic Service Operation	20 ~ 30 min Road Test at a consistent speed of 80 ~ 100km/h	*1 DPF Service Regeneration (CONSULT III) + change oil & filter	DPF Data Clear (CONSULT III)	EGR Valve Position Learn Clear (CONSULT III)	EGR Valve Closed Position Learning	ZFC Value Reset (CONSULT III)	Injector Adjustment Value Registration (CONSULT III)
*2 Repair of Engine Sluggish / Lack of Power issue (No warning lights)	**YES**	NO	NO	NO	NO	NO	NO
Repair of Engine Sluggish / Lack of Power issue - with DPF light ON	YES until DPF light goes out	YES if Road Test NG	NO	NO	NO	NO	NO
*3 DTC P2002 logged in ECM	This DTC indicates illogical inputs to the ECM from either of the exhaust temperature sensors or the Diffential exhaust pressure sensor. Check for poor harness connections & then carry out the DPF pressure difference inspection on page 63. Contact TechLine for further advice.						
Replace ECM with Brand New / Other Unit	THIS IS TO BE AVOIDED. CONTACT TECHLINE TO DISCUSS THE COMPLEX PROCESS INVOLVED WITH SWAPPING / REPLACING ECM's						
Replace DPF with Brand New Unit	Recommended Final Step	NO	**YES**	NO	NO	NO	NO
Replace DPF with Previously used DPF (Swapped DPF)	Recommended Final Step	YES (Prior to Road Test)	NO	NO	NO	NO	NO
Replace / Swap / Remove & Refit EGR Valve unit	NO	NO	NO	**YES**	**YES**	NO	NO
Fit new / Other Injectors	NO	NO	NO	NO	NO	**YES**	**YES**

Summary of Basic Service Operations

This chart quickly summarises all typical repair tasks that could possibly be required on a T31 X-TRAIL M9R. Locate the repair or repairs that were carried out on the vehicle in the left side column. Once located, refer to what Basic Service Operations are required to be carried out to support the original repair. Failure to properly complete the repair & replacement procedure could easily result in an unsuccessful repair or a repeat failure.

EXAMPLE: If a new DPF unit was fitted to the vehicle & then immediately handed back to the customer, yet the “DPF Data Clear” operation was NOT carried out with CONSULT III, the new DPF will more than likely be damaged due to the Automatic Regeneration operation being carried out at an inappropriate time.

NOTE:
With exclusion to the Road Test & the NATS Key Programming, details on how to complete all of Basic Service Operations are found in Section EC – “BASIC INSPECTION” of the Service Manual.

***1** It is MANDATORY that the Engine Oil & Filter is changed once the Service Regeneration has completed.

***2** The “Lack of Power” complaint maybe caused by a non DPF related issue. Refer to page 63 of this manual (DPF Pressure Difference inspection) to determine if the problem is DPF related or not.

***3** Refer to the ESM & carry out the inspection procedure of P2002. (Monitor the 2 x exhaust temp sensors & “DIFF EXH PRES” (differential pressure) in DATA MONITOR.

M9R ENGINE TROUBLE DIAGNOSIS

Engine Control POWER SUPPLY

1. IPDM E/R

Power supply for Engine Control is housed within the IPDM E/R (Intelligent Power Distribution Module Engine Room).
Major components powered from here are;

- ECM Relay (ECM, sensors & actuators)
- Cooling Fans

Other items operated via the IPDM are as follows;

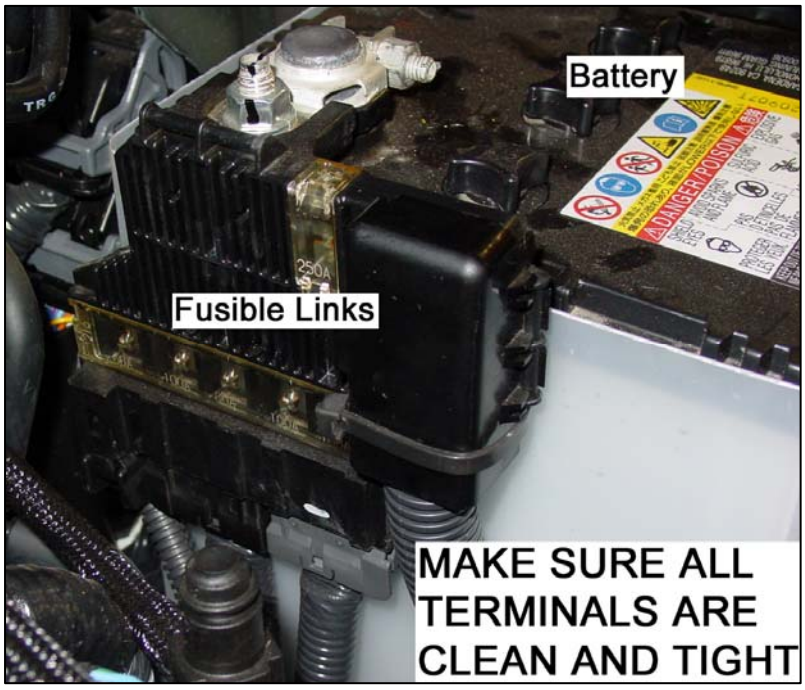
- Head lamps & fog lamps
- Taillights
- Front wipers
- Rear defog

NOTE:
Fuses for ALL of the above mentioned components / systems are located within the IPDM E/R as well.

2. Battery / Fusible links

Power to the ECM is sourced from the battery via the + terminal & fusible links.

As part of ANY trouble diagnosis activity – **YOU MUST ENSURE THAT ALL OF THESE CONNECTIONS ARE CLEAN & TIGHT OR ENGINE RUNNING ISSUES WILL RESULT!**



M9R ENGINE TROUBLE DIAGNOSIS

Engine Control POWER SUPPLY

3. Alternator

The battery is charged by the alternator. Ensure the connections on the alternator & clean & tight.

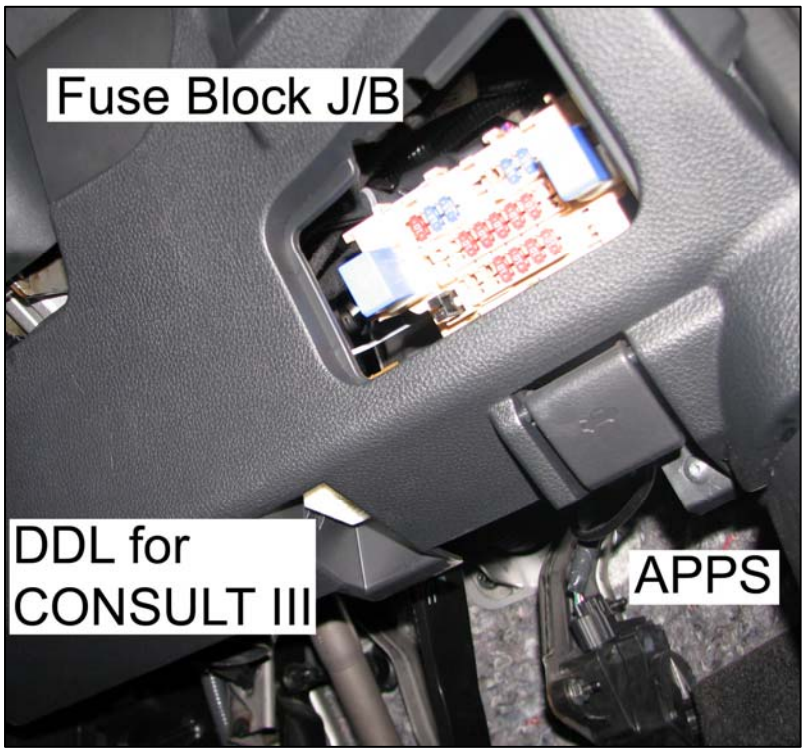
MOST IMPORTANTLY YOU MUST ENSURE THE ALTERNATOR IS CHARGING THE BATTERY PROPERLY!

With a Digital Multimeter connected to the battery, run the engine at 2000rpm with ALL ACCESSORIES SWITCHED ON! (headlights on high beam, rear defog, A/C on max). The voltage should remain above 13volts.

Fuse Block J/B

Various accessory related fuses are located here. There are no fuses in this location that relate to engine operation.

It is located to the lower right of the steering column.



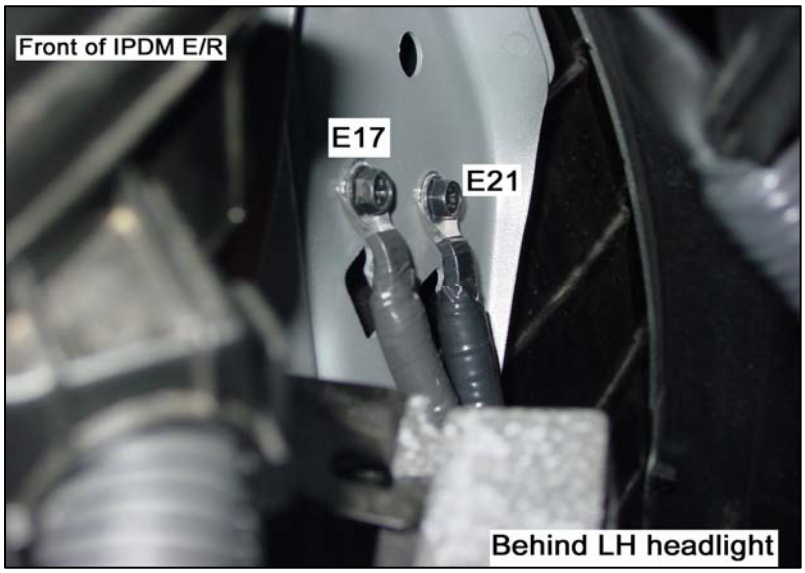
M9R ENGINE TROUBLE DIAGNOSIS

Engine Control GROUNDS

1. The main GROUND for Engine Control is in the LHS of the Engine Bay. It located down below the IPDM E/R behind the LHF headlight.

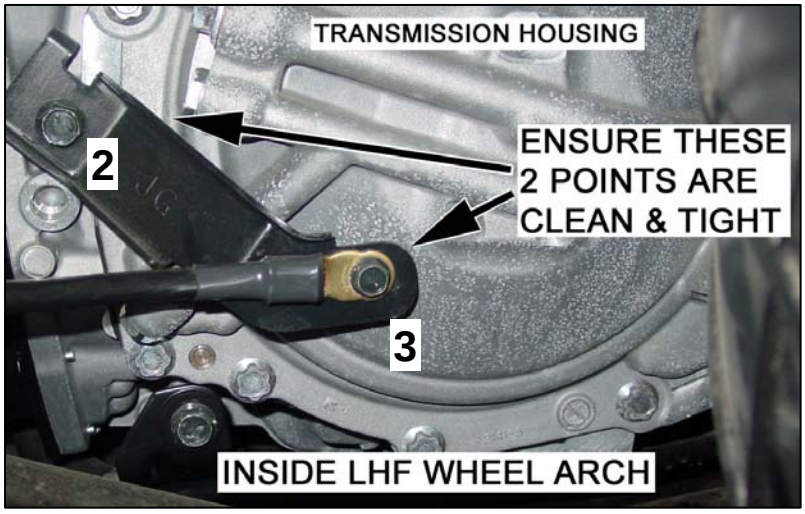
NOTE:
as well as the Engine Control system Ground, E17 is also the A/T system ground. Refer to page 77.

ALWAYS ENSURE THAT THESE GROUNDS ARE CHECKED. THEY MUST BE CLEAN & TIGHT.



2. Ensure that these 3 grounds linking the battery negative to the body & transmission are clean & tight.
Otherwise any grounds connected to the body such as the 2 x engine grounds discussed above cannot properly function.

NOTE:
The LHF wheel inner wheel arch plastic lining will need to be removed for access to these ground connections

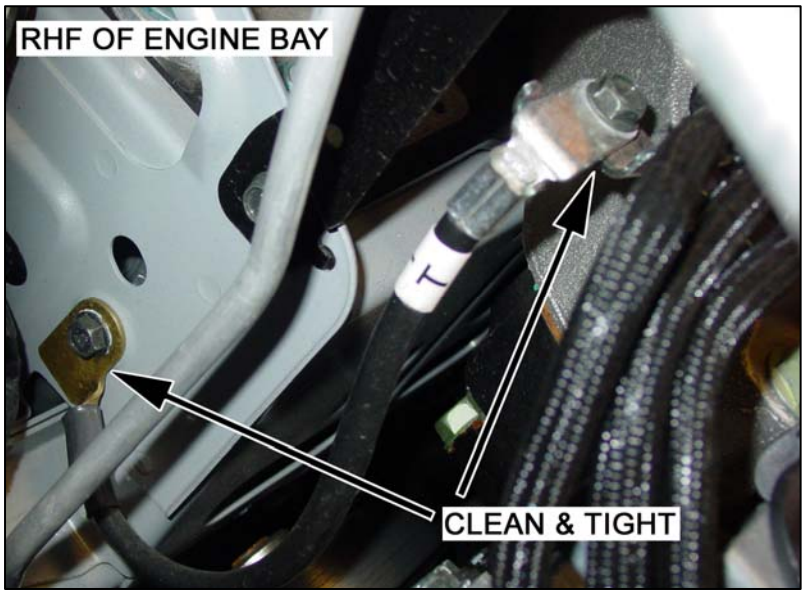


M9R ENGINE TROUBLE DIAGNOSIS

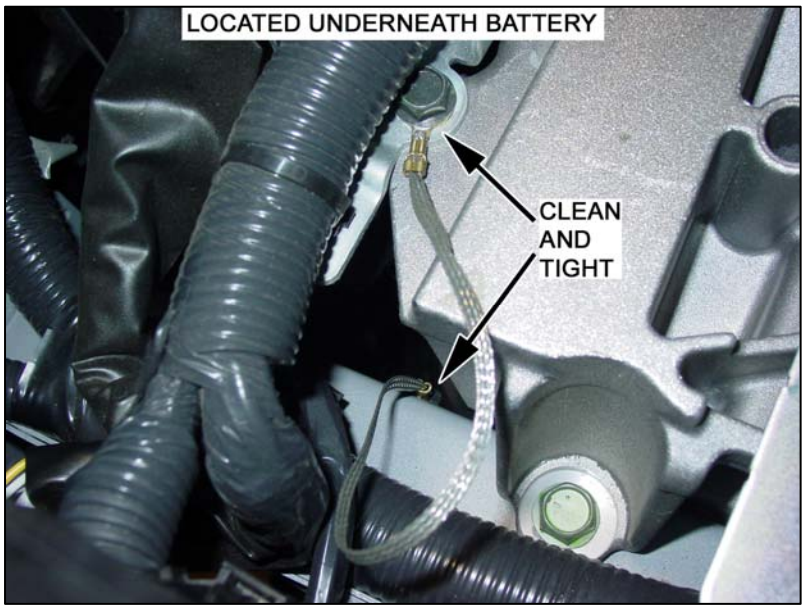
Engine Control GROUNDS

3. There is another Ground strap that links the engine to the body in the RHS of the engine bay.

ALWAYS ENSURE THAT THESE GROUNDS ARE CHECKED. THEY MUST BE CLEAN & TIGHT.



4. A braided ground strap that links to body to the transmission mounts is located under the battery in the LHS of the engine bay.

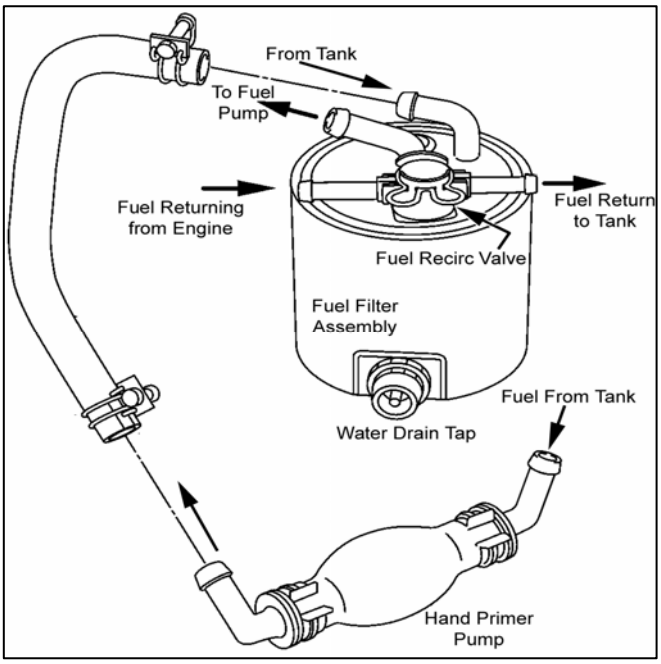


FUEL SYSTEM

M9R Fuel Filter

1. Layout

Refer to the picture shown right. This details the basic configuration of the Diesel Fuel Filter in the vehicle



2. Fuel Recirculation System

On top of the Filter assembly, there is a device (Fuel Recirculation Valve) designed to recirculate fuel back into the filter after it returns from the Engine. Dependant on the temperature, the fuel either re-enters the filter to warm the fuel in the filter to stop the fuel freezing, or it returns directly to the fuel tank.

3. Hand Primer Pump

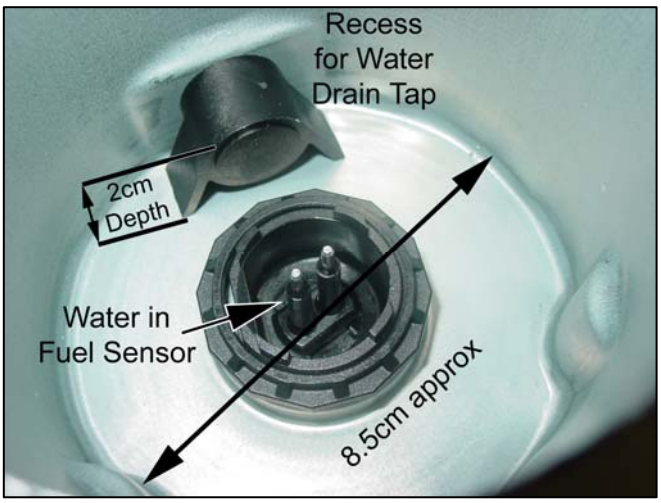
If there is a need to prime the fuel system, simply squeezing & releasing the hand pump bulb will perform this operation in EXACTLY the same manner it did with the previous hand pump design.

4. Filter Element

Refer to the picture shown right. This is the element cut out from the steel canister & removed. Fuel enters the canister & is taken from the external side of the filter paper to the inside of the filter paper & then exits the centrally located outlet of the Filter assembly to the Engine (Fuel Pump).
If any water is in the Fuel it will collect in the base of the steel canister.

5. Filter Housing

Refer to the picture shown right. This shows the inside of the steel canister with the element removed. Using the picture, it can be seen the where water is contained. With reference to the picture above as well as this one, it can be seen that there is a 2cm deep reserve for water.



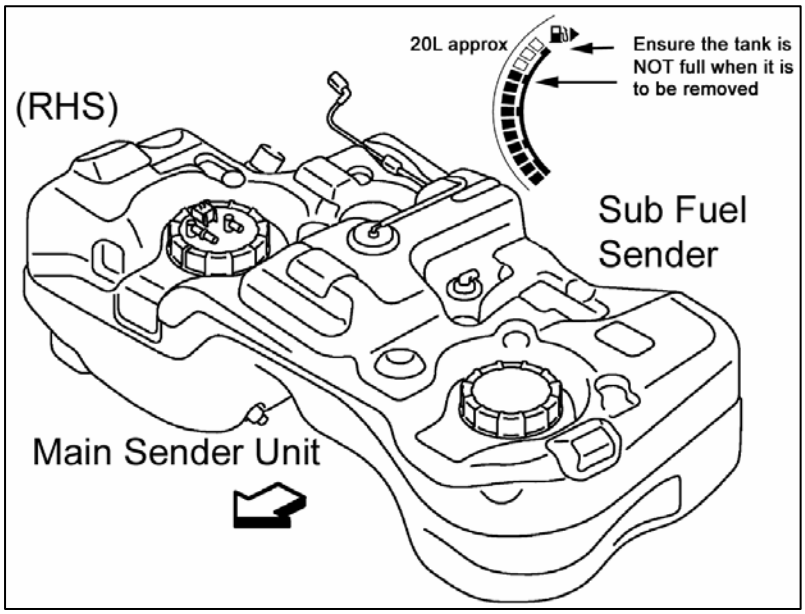
NOTES:

- The Water in Fuel Sensor, Fuel Recirculation Valve & the drain tap come complete with the fuel filter assembly. They are NOT separate parts.
- When draining water from the filter, it is **STRONGLY ADVISED** to remove the filter from the bracket & turn the filter onto its side to ensure that the **maximum** amount of water can be **drained out.**
- Refer to pages 82 – 83 for more detail

FUEL SYSTEM

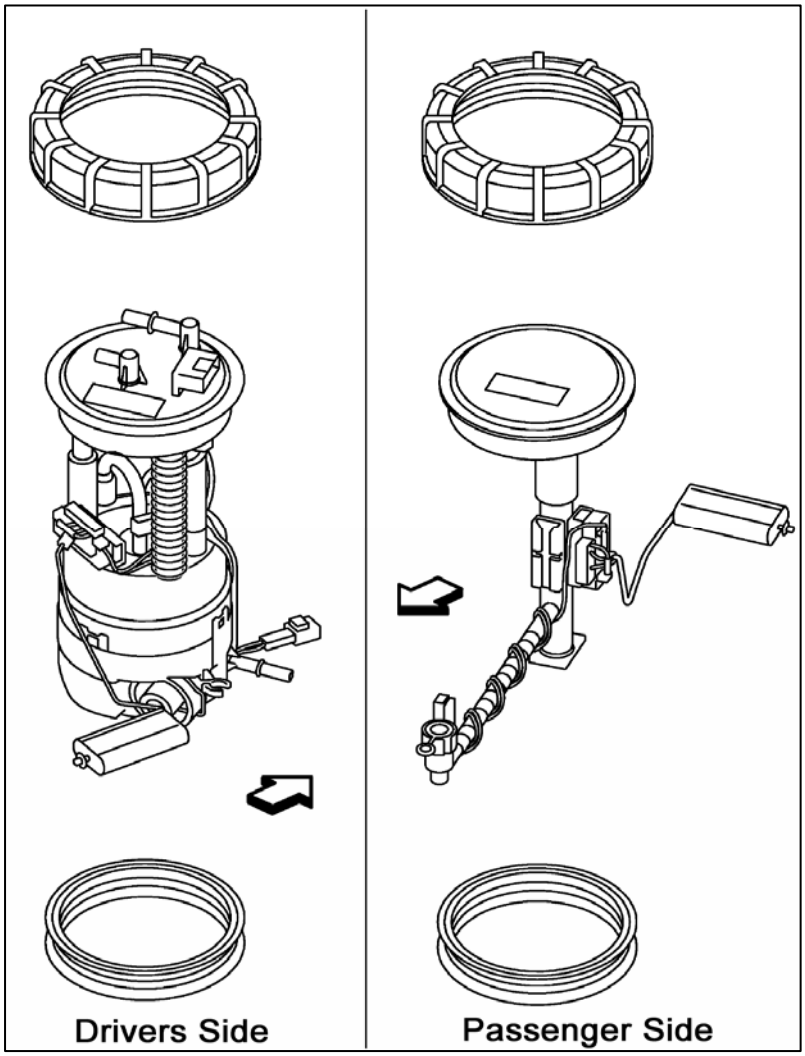
Fuel Tank

The Fuel Tank design in T31 is very similar to what is found in T30, Z50, Z33 & J10.
The Tank is made of a plastic material & has an 65L capacity.
The shape of the tank is a saddle design due to the propeller shaft running up the centre of the vehicle for the rear drive. This creates the need for a “Jet Pump” system to pump over trapped fuel to where the main pump is located.



Fuel Senders

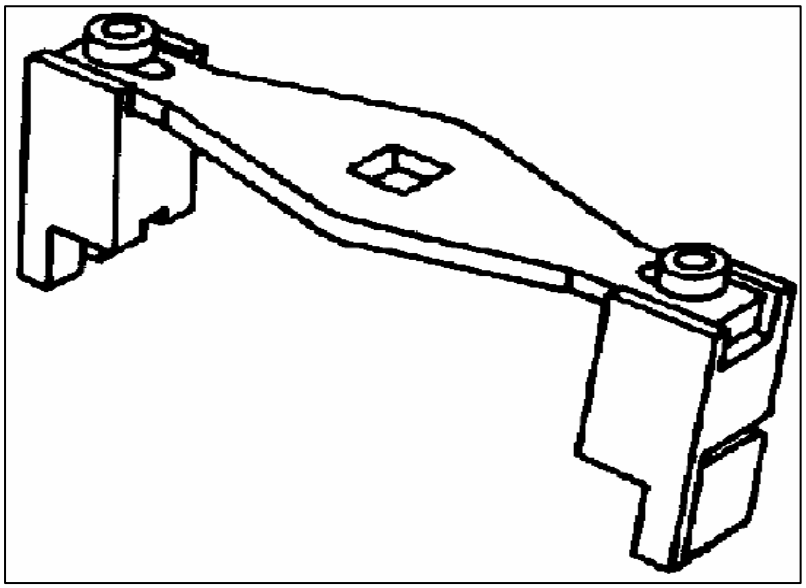
Due to above described saddle type tank design, 2 x Fuel sender units are utilised. They are wired in series in order to show an average of the amount of fuel in the tank. Fuel is taken from the drivers side of the tank. Fuel trapped in the other bowl is pumped over via the Jet Pump. The jet pump is operated via the return fuel flowing back into the tank



FUEL SYSTEM

3. Special Service Tool

For the removal of the sender units, the SST EKV9910477700 is required.



AUTOMATIC TRANSMISSION

6sp E-A/T – RE6F01A (M9R Engine)

The availability of a Automatic Transmission is made possible with the new 6 speed transmission produced for Nissan & Renault by JATCO.

General Specification

Applied model		M9R
		4WD
Automatic transmission model		RE6F01A
Transmission model code number		1XN1A
Stall torque ratio		1.75
Transmission gear ratio	1st	4.199
	2nd	2.405
	3rd	1.583
	4th	1.161
	5th	0.855
	6th	0.685
	Reverse	3.457
Recommended fluid		Genuine NISSAN Matic J ATF
Fluid capacity		7.5 L

SPECIAL PRECAUTIONS

• ONLY USE GENUINE NISSAN MATIC J TRANSMISSION FLUID IN THIS TRANSMISSION.

• Do NOT use any other fluid in this transmission such as NISSAN MATIC D or other Non Nissan brand of fluids.

• Do NOT use Matic J Fluid in any other transmission. Matic J is ONLY designed for the **RE5R05A & RE6F01A** Transmissions.

• Do NOT Blend or mix Matic J fluid with any other Automatic Transmission Fluid (Including Matic D).

• Do NOT reuse transmission fluid once it has been drained.

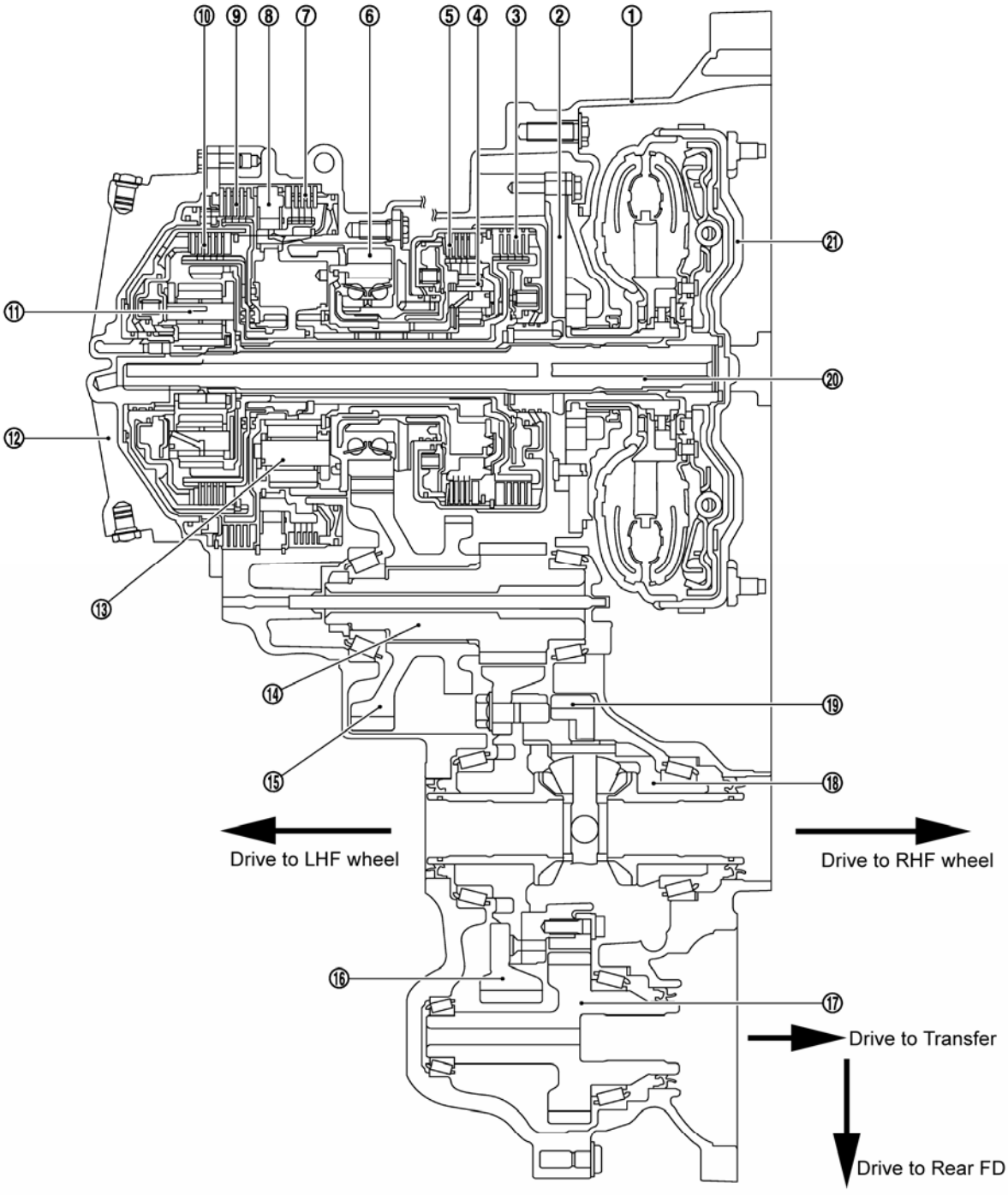
• The Fluid level inspection as well as the replacement of the fluid will require a special process to be followed. Strictly adhere to the process outlined in this Training Manual or the ESM.

SPECIAL NOTE REGARDING ANY TRANSMISSION REPAIRS:

• It is NOT possible to overhaul the transmission. Do NOT disassemble it. If the ESM directs you to replace the transmission – CONTACT TECHLINE 1ST.

• Components such as oil seals, sensors (speed & temperature) or switches (PNP) may NOT be available as separate parts. If the If the ESM directs you to replace the transmission – CONTACT TECHLINE 1ST.

AUTOMATIC TRANSMISSION



1. Converter housing
2. Oil pump
3. 3-5 reverse clutch
4. FR planetary gear
5. Low clutch
6. Output gear
7. Low and reverse brake
8. One-way clutch
9. 2-6 brake
10. High clutch
11. RDCN planetary gear
12. Side cover
13. RR planetary gear
14. Reduction pinion gear
15. Idler gear
16. Final gear
17. Transfer driven gear
18. Differential case
19. Transfer drive gear
20. Input shaft
21. Torque converter

RE6F01A

AUTOMATIC TRANSMISSION

Vehicle Speed at Which Gear Shifting Occurs

Unit: km/h

Gear position		Throttle position	
		Half throttle	Full throttle
UP	D1→D2	19 – 23	31 – 35
	D2→D3	34 – 40	54 – 60
	D3→D4	60 – 68	87 – 95
	D4→D5	80 – 88	115 – 125
	D5→D6	121 – 129	156 – 166
DOWN	D6→D5	81 – 89	145 – 155
	D5→D4	56 – 64	108 – 118
	D4→D3	39 – 45	76 – 84
	D3→D2	21 – 25	45 – 51
	D2→D1	8 – 12	8 – 12

At half throttle, the accelerator opening is 50% of the full opening.

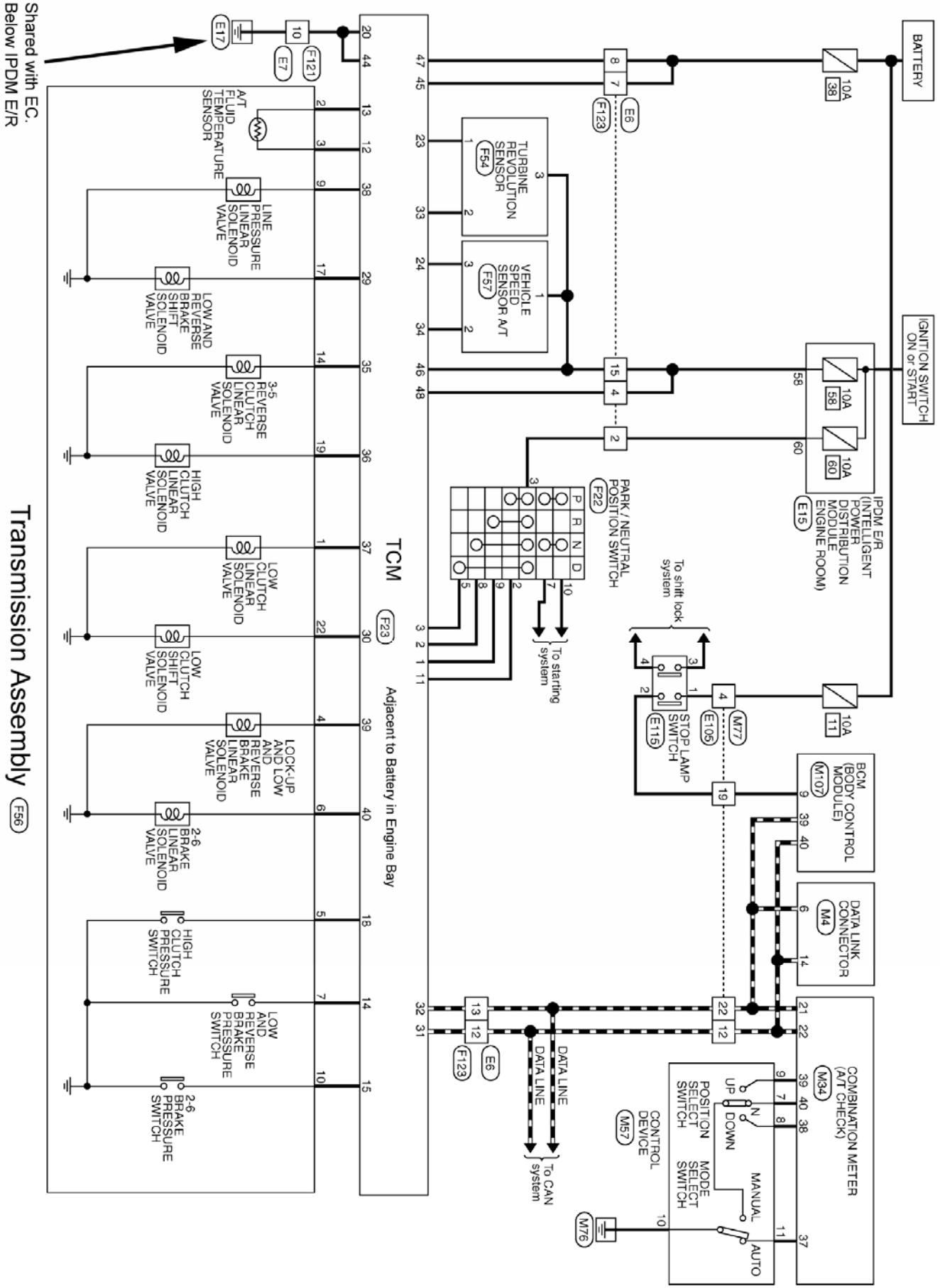
Take note of the shift point speeds in the above table. In normal driving circumstances, 6th gear will not be selected at a road speed of 100km/h.

The 5th gear ratio of 0.855:1 is suitable for 100km/h driving. 6th gear ratio is 0.685:1

AUTOMATIC TRANSMISSION

INPUT	TCM FUNCTION	OUTPUT (ACTUATOR)
BATTERY VOLTAGE (& GROUND) IGNITION SWITCH ACTIVITY * ACCELERATOR PEDAL ACTIVITY		
* ENGINE SPEED	SHIFT CONTROL	Input Clutch Solenoid Valve
* ENGINE TEMPERATURE	LINE PRESSURE CONTROL	Direct Clutch Solenoid Valve
A/T FLUID TEMPERATURE	LOCK-UP SOLENOID	Front brake solenoid valve
REVOLUTION SENSOR (2ND VSS SIGNAL)	ENGINE BRAKE CONTROL	High and low reverse clutch solenoid valve
* VEHICLE SPEED	SHIFT TIMING CONTROL	Low coast brake solenoid valve
* BRAKE PEDAL ACTIVITY	FAIL-SAFE CONTROL	Torque converter clutch solenoid valve
GEAR LEVER POSITION (P/N)	DUET EA CONTROL	Line pressure solenoid valve
* GEAR LEVER POSITION (Manual Mode)	ON BOARD DIAGNOSIS	A/T CHECK indicator lamp
TURBINE REVOLUTION		Back-up lamp relay
ATF PRESSURE SWITCHES (SW 1 ~ SW5) (* CAN COMMUNICATION)		

RE6F01A


A/T CONTROL SYSTEM
Transmission Assembly (F56)
Shared with EC.
Below IPDM E/R
BATTERY
IGNITION SWITCH ON or START
IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) (E15)
10A 38
10A 58
10A 60
10A 11
TCM (F23)
Adjacent to Battery in Engine Bay
TURBINE REVOLUTION SENSOR (F54)
VEHICLE SPEED SENSOR A/T (F57)
PARK / NEUTRAL POSITION SWITCH (F22)
P R N D
To shift lock system
To starting system
STOP LAMP SWITCH (E115)
BCM (BODY CONTROL MODULE) (M107)
DATA LINK CONNECTOR (M4)
COMBINATION METER (A/T CHECK) (M34)
POSITION SELECT SWITCH
MODE SELECT SWITCH
CONTROL DEVICE (M57)
UP
DOWN
MANUAL
AUTO
DATA LINE
To CAN system
A/T FLUID TEMPERATURE SENSOR
LINE PRESSURE LINEAR SOLENOID VALVE
LOW AND REVERSE BRAKE SHIFT SOLENOID VALVE
3-5 REVERSE CLUTCH LINEAR SOLENOID VALVE
HIGH CLUTCH LINEAR SOLENOID VALVE
LOW CLUTCH LINEAR SOLENOID VALVE
LOW CLUTCH SHIFT SOLENOID VALVE
LOCK-UP AND LOW AND REVERSE BRAKE LINEAR SOLENOID VALVE
2-6 BRAKE LINEAR SOLENOID VALVE
HIGH CLUTCH PRESSURE SWITCH
LOW AND REVERSE BRAKE PRESSURE SWITCH
2-6 BRAKE PRESSURE SWITCH

AUTOMATIC TRANSMISSION

A/T Fluid Level Check

1. Check for A/T fluid leakage. Ensure that there are no leaks & if a leak is detected – confirm what fluid it is that appears to be leaking.

2. Park vehicle on level surface and set parking brake.

3. Start engine.

4. Move selector lever through each gear position & then return the gear lever to the “P” position.

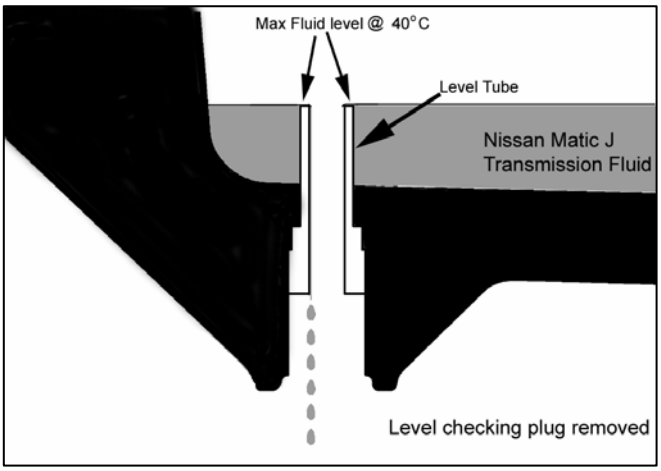
5. Ensure that the A/T fluid temperature is **exactly 40°C.**
• Connect CONSULT-III
• Select “TRANSMISSION”
• Select “DATA MONITOR”.
• Read out the value of “ATF TEMP SE 1”.
• A/T fluid temperature reaches 30°C in approximately five minutes after idling and 40°C after approximately ten minutes of idling. The level checking operation must be performed quickly.

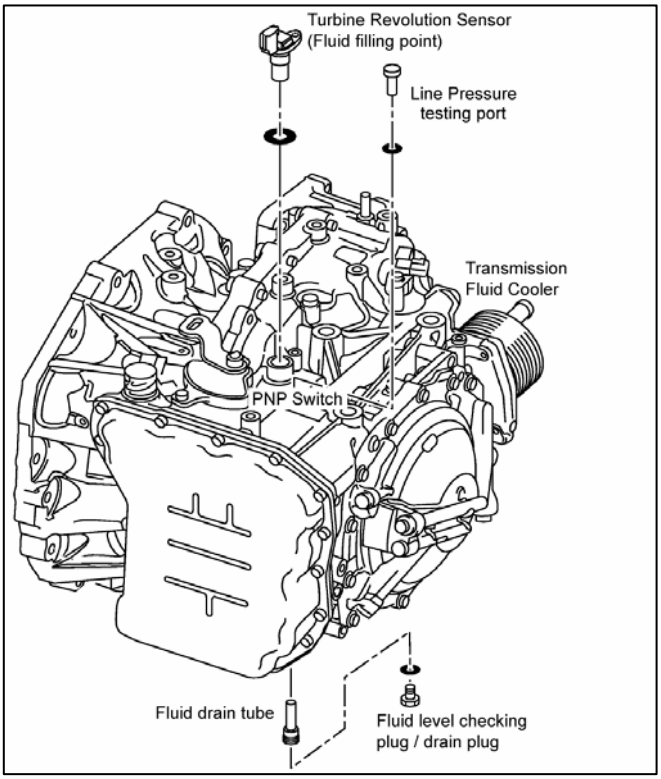
6. Remove drain plug.

7. Check A/T fluid level as follows;
• If ATF overflows from the drain hole, adjust A/T fluid level to the correct level by allowing the fluid to continue draining until the fluid is slowly dripping.
• If ATF does not overflow from the drain hole & fluid is not consistently dripping, more fluid will need to be added. Refer to the Changing Fluid instructions for information on how to add fluid.

WARNING

This operation must be carried out with the fluid temp set at **40°C**
• If the fluid is too **COLD** at the time – the level will appear to be too **LOW**.
• If the fluid is too **HOT** at the time – the fluid level will appear to be too **HIGH**.





AUTOMATIC TRANSMISSION

A/T Fluid Changing

1. Warm up ATF by running the engine & then stop the engine. Fluid to be as warm as conveniently possible.

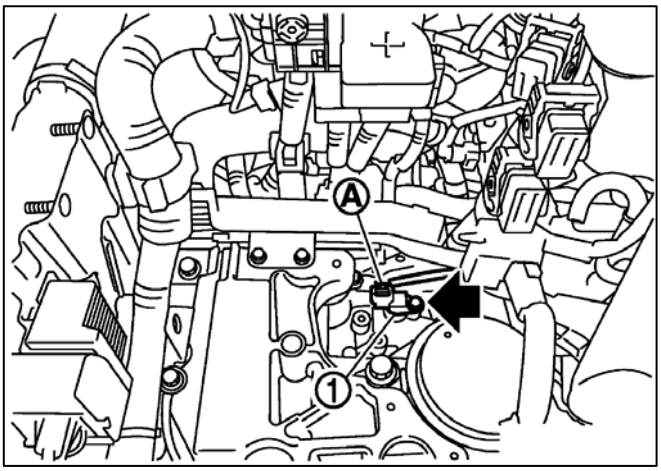
2. Remove drain plug.

3. Remove A/T fluid level tube & allow the fluid to drain out of the hole.

4. Install A/T fluid level tube & then install the drain plug.

5. Inject ATF via the Turbine Revolution Sensor hole. The battery, battery tray / ECM bracket will have to be remove to access the sensor.

6. Refer to the “Fluid Level Check” (previous page) to ensure that the level is correct. Ensure to warm the transmission up to **40°C**. Use CONSULT III to confirm.



NOTES:

• If the amount of discharge is known beforehand, add 500ml of ATF to the amount of discharge and inject the total amount in the mounting hole of turbine revolution sensor.

• If whole quantity of ATF has been discharged, add 500ml of ATF to fluid capacity and inject the total amount in the mounting hole of turbine revolution sensor.

• Since the ATF in the A/T assembly cannot be fully drained in a single operation, the steps (from 3 to 5) may need to be performed up to 3 times or so.

• Replace O-rings of the drain plug and the turbine revolution sensor with new ones. Apply ATF to O-rings.

• If the special procedure for Checking the A/T Fluid is not followed then the risk of over filling the transmission can occur. Fluid leakage will occur if the Transmission is overfilled.

• It will NOT be necessary to replace the Transmission Fluid Filter when changing the A/T fluid. The filter is NOT available as a separate part, it comes complete with the Control Valve (valve body) assembly.

• Only use **Nissan Matic J** Transmission Fluid

AUTOMATIC TRANSMISSION

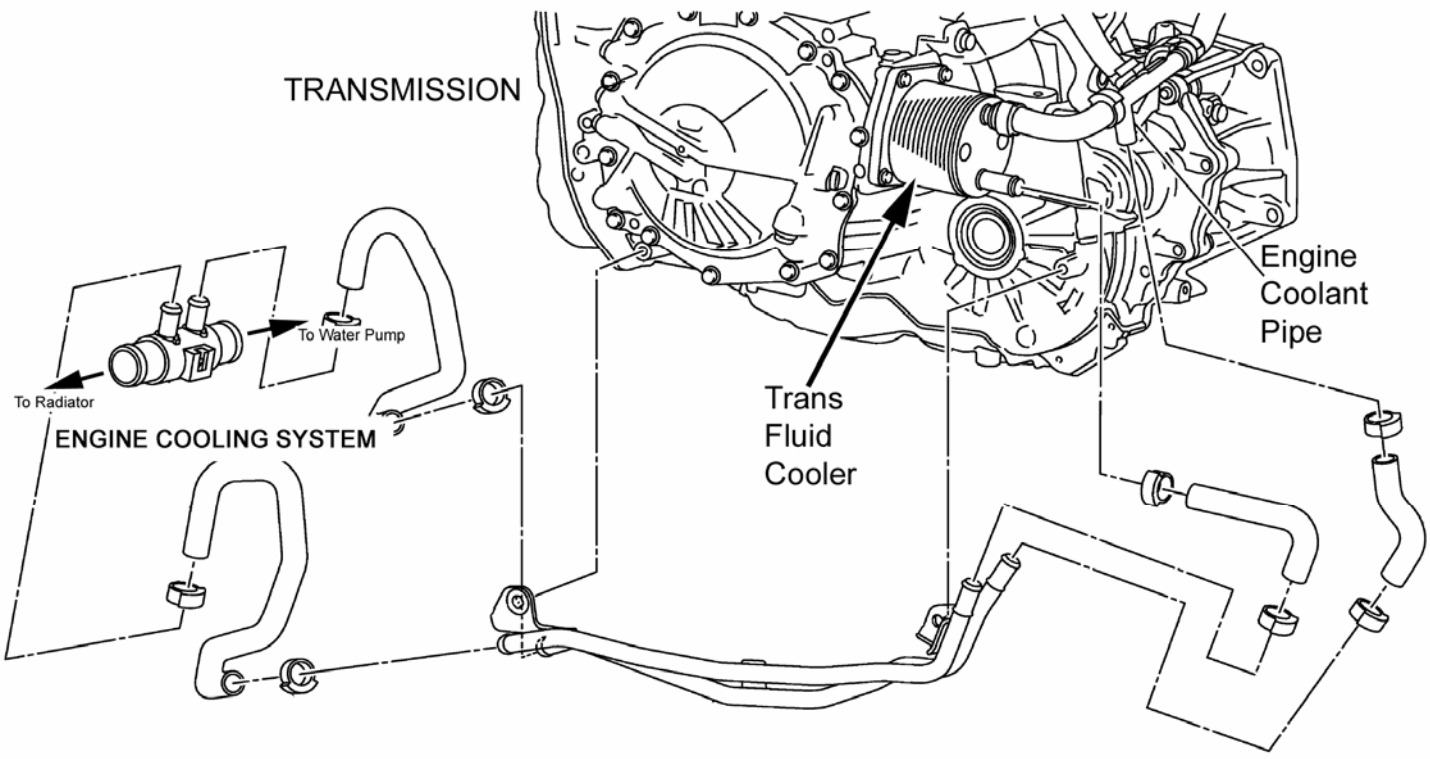
A/T Fluid Cooling

Cooling of the A/T Fluid is achieved via an engine coolant filled Transmission Fluid Cooler unit attached to the Transmission assembly.

SPECIAL NOTE:
AT NO STAGE DOES THE TRANSMISSION FLUID EXIT THE TRANSMISSION. The Fluid is contained within the transmission at all times. There is no external “Air to Fluid” cooler mounted in front of the radiator & there is no “Coolant to Fluid” cooler located in the bottom tank of the radiator.

After Market Transmission Fluid Coolers
It is NOT POSSIBLE to add an additional fluid cooler to the vehicle as there are not any external pipes / hoses that are accessible.
The MAXIMUM towing capacity for T31 X-TRAIL M9R is 1350kg. (Braked trailer)

Flushing the Transmission Fluid with Transmission Flushing Machines
This operation is not possible due to no external pipes / hoses containing transmission fluid which can be branched into. Repeatedly fill & drain the transmission (operate the transmission via the engine running etc. between each drain & fill) to flush the transmission of contaminated fluid.

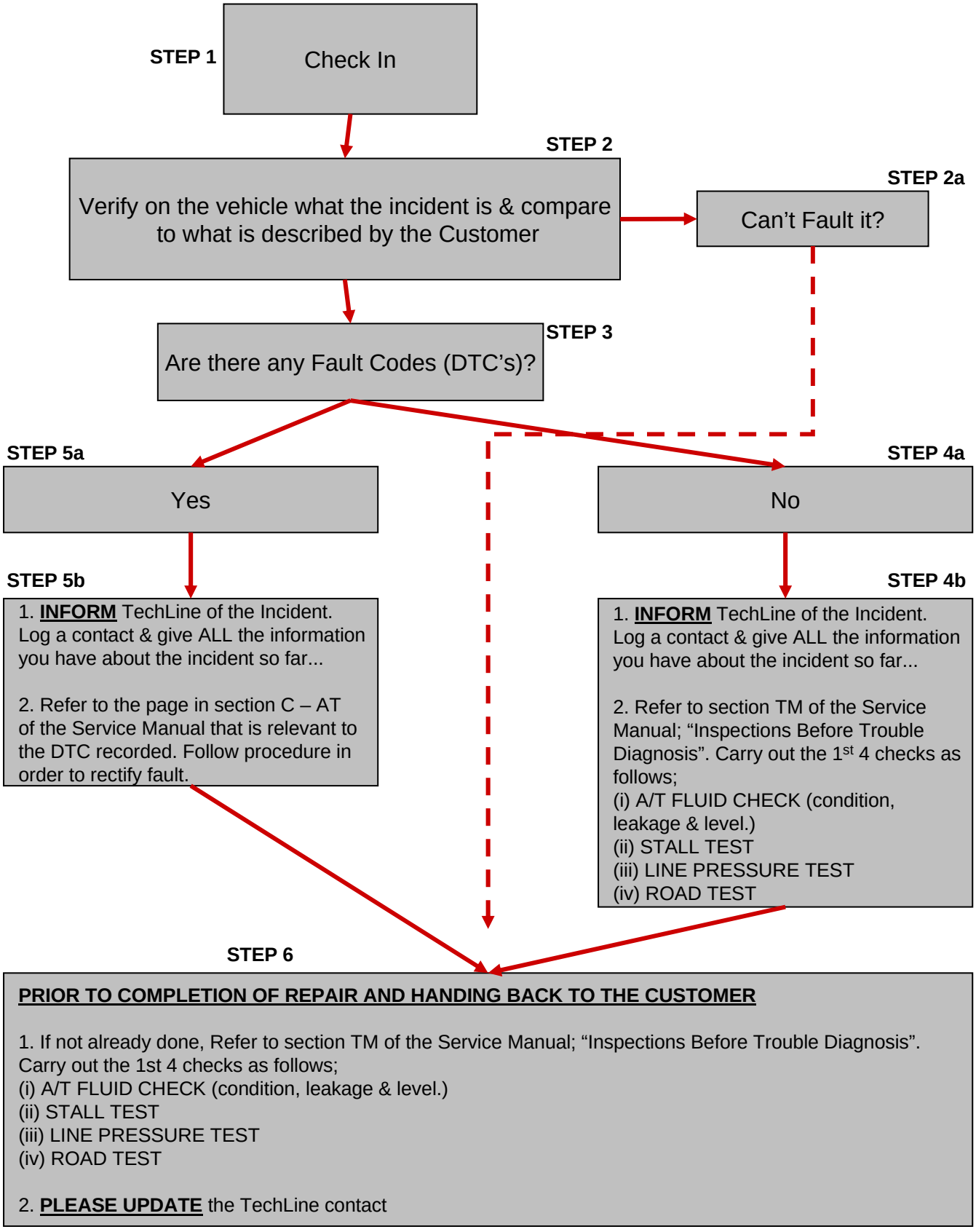


NEW 6 speed E-A/T;
Engine Coolant is piped to the transmission. The transmission fluid stays inside the transmssion. It is NOT possible to branch into a pipe containing transmission fluid & add an additional / external fluid cooler to it.

CONVENTIONAL A/T;
Transmission Fluid is piped to the base of the radiator. It is possible to branch off the fluid pipes in order to extend the fluid cooling capacity of needed.

RE6F01A Transmission Trouble Diagnosis

Basic Work Flow Chart



METER, WARNING & INSTRUMENTS

Water in Fuel Warning System

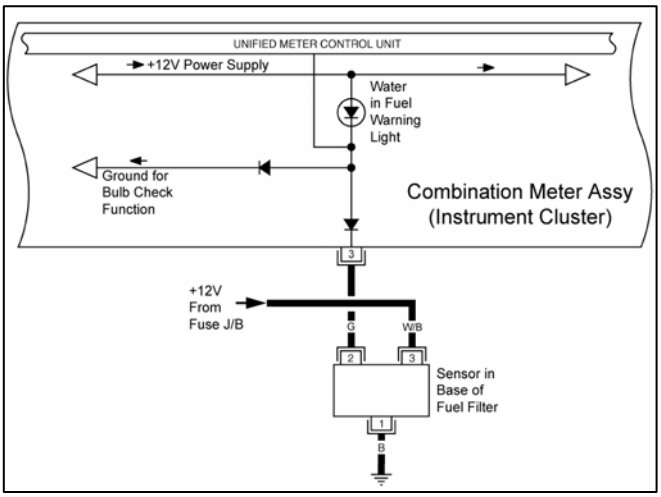
There is a sensor assembly in the base of the Fuel Filter which triggers the light once a set amount of water has collected in the base of the Filter.
The sensor measures the electrical conductivity of the liquid it is immersed in.

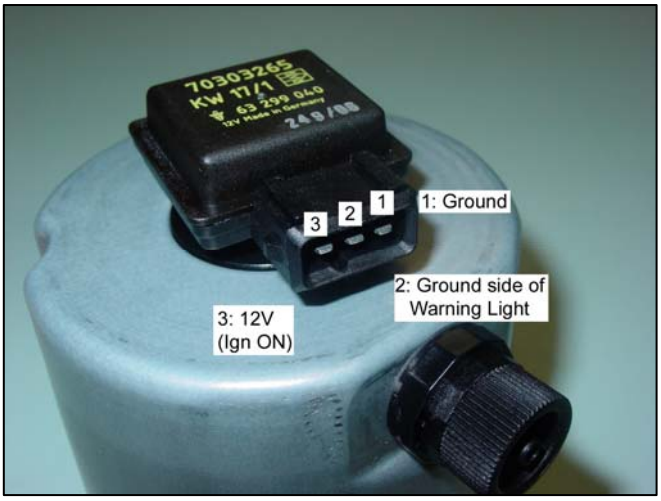
The sensing element (2 x probes) is approximately 2cm up from the bottom of the fuel filter and provided the filter is full of diesel, (as it normally should be) the resistance across the 2 sensor terminals is measured through the liquid (diesel fuel in this case). The value measured will be the default resistance value of diesel fuel. (Conductivity of diesel).

As water collects in the fuel system, its specific gravity is greater than diesel, causing the water to settle in the bottom of the filter. Once 2cm (approx) of water has settled at the bottom of the filter, the conductivity of water is different to diesel, this in turn triggers the water in fuel warning to be activated.

With the ignition ON, power is fed to the sensor unit (terminal 3) in the base of the filter. The sensor unit requires it's own power supply to operate.
Terminal 2 is connected to the Ground side of the globe in the instrument cluster. If this wire is grounded, the globe will illuminate.
Terminal 1 is permanently connected to Ground.
If there is enough water to short the sensor probes inside the filter, (see pic over page) the sensor unit detects this condition & then grounds terminal 2.

In a normal condition, the filter base should ONLY contain diesel fuel, therefore this is not able to short the terminals. Water can conduct electricity (diesel cant) therefore a Water in Fuel condition is detectable.

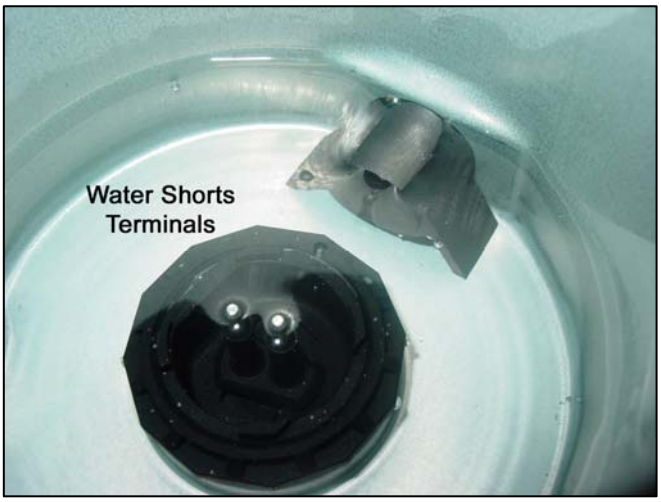




Filter & Sensor are 1 complete assembly.
They are NOT separate parts.

METER, WARNING & INSTRUMENTS

(i) Water in Fuel Warning Light ON Condition
Refer to the picture shown right. This shows the amount of water necessary (approximately 2cm deep) to create a short between the 2 probes centrally located in the base of the filter housing.



This short will trigger the illumination of the Water in Fuel warning light in the instrument cluster.

(ii) Water in Fuel Warning Light OFF Condition
This picture shown right shows the amount of water remaining AFTER the drain tap has been opened & all possible water has drained out. (Filter remained level)

NOTE:
When draining water from the filter, it is **STRONGLY ADVISED** to remove the filter from the bracket & turn the filter onto its side to ensure that the **maximum** amount of water can be **drained out.**

METER, WARNING & INSTRUMENTS

Distance to Next Service Reminder

The distance to next service reminder **MUST BE ADJUSTED TO THE CORRECT INTERVAL AT THE PRE DELIVERY INSPECTION.**
The vehicle will be delivered with the interval set to 20,000km's. (i.e; The reminder will indicate that there is no need for a service until 20,000km's)
The Service interval for T31 X-TRAIL Diesel is every 10,000km's!

To adjust oil change interval:
1. Push and hold the trip computer mode switch for more than 3 seconds while the wrench symbol and distance to next service information is displayed.
The wrench symbol and the distance will reset to 20,000km's & start flashing. Release the mode switch.

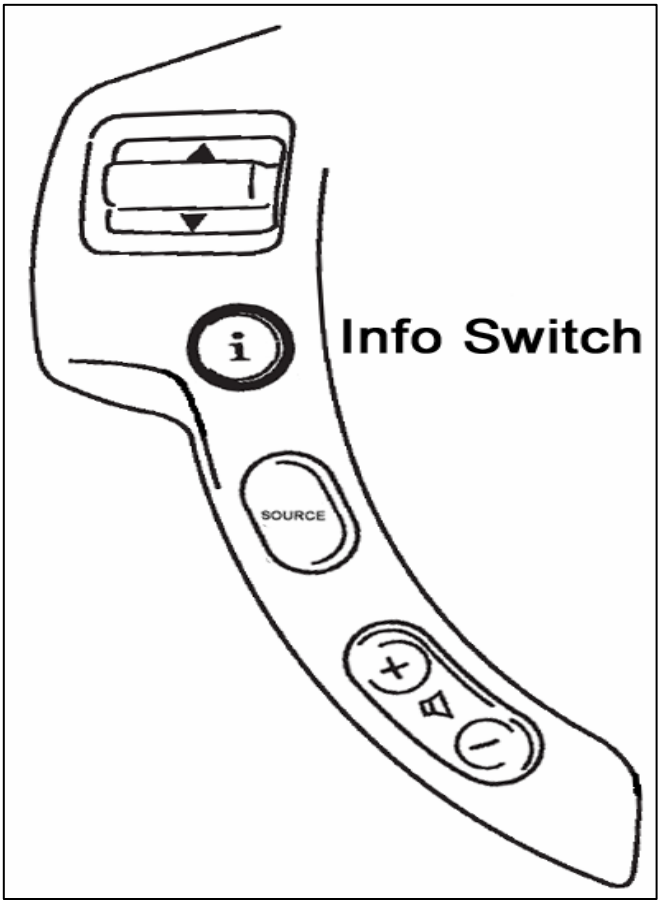
2. While the display is flashing, push the trip computer mode switch again to enter the adjusting mode.

3. Turn the trip computer mode switch clockwise or counter-clockwise to increase or decrease the interval. Each turn increases or decreases the interval by 1,000 km's. If no further action is taken, the display will switch to the oil level indication and the new interval will be set.

To Reset the Service Reminder after a Service
Push and hold the trip computer mode switch for more than 3 seconds while the wrench symbol and distance to next service information is displayed.
The wrench symbol and the distance will start flashing & the interval will revert back to 10,000km's.
The display will stop flashing after some seconds.

NOTE:
The "Info" switch on the steering wheel performs the same functions at the Trip Computer Mode switch on the inner RH side of the instrument cluster.

Trip Computer Mode Switch



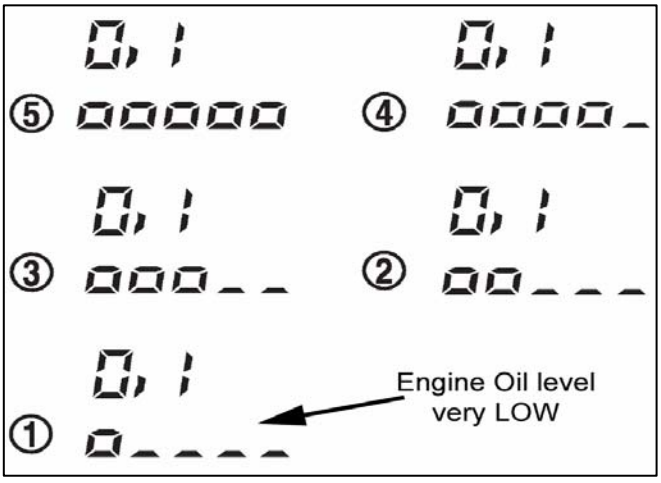
METER, WARNING & INSTRUMENTS

Electronic Engine Oil Level Indicator

When the ignition switch is in the "ON" position, engine oil information is displayed on the LCD display in the following order:

- Distance to next service (with a wrench symbol)
- Engine Oil level indication ("Oil Good" or "Oil Lo")

Push & release the trip computer mode switch or the INFO switch on the steering wheel (button with an " i ") when the "Oil Good" message is displayed. A detail of the oil level (5 - 1) appears as illustrated.



Engine Oil level Sensor Operation

The sensor is inserted through the side of the engine block & is directed into the sump containing engine oil. The operation of the sensor is the same as the sensor fitted to YD25 engines.

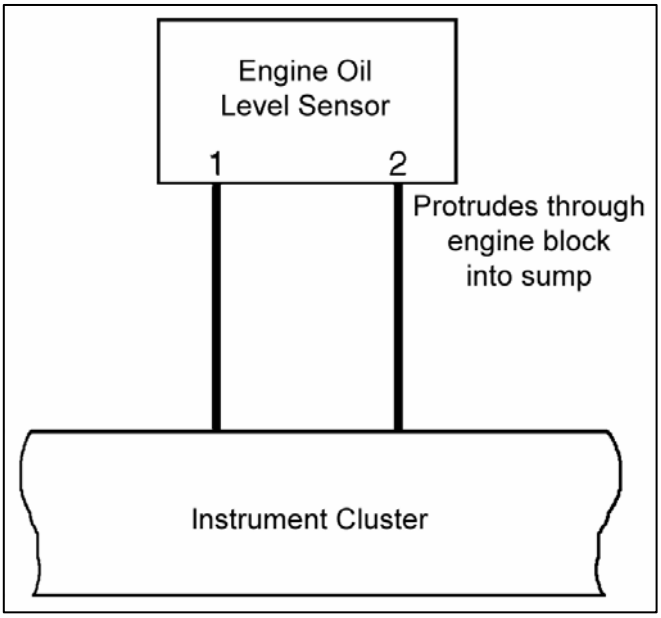
If the Ignition is in the OFF position for MORE than 5 minutes & then the drivers door is opened, the resistance of the oil level sensor is measured by the instrument cluster. If the resistance indicates that the sensor is inserted into a sufficient amount of engine oil, the display on the instrument cluster will display the message "Oil Good" once the ignition is switched from ON. (The ignition is to have been off for more than 5 mins at the time the door is opened so that the cluster will take the resistance reading of the sensor)

If the engine oil level is excessively LOW, the instrument cluster will display the message "Oil Lo"

NOTE:

If more than 5 minutes has elapsed with the ignition OFF & then the drivers door is opened after the engine oil has been drained (during a normal service for example), the low oil condition will remain in the memory of the cluster until the door has once again been closed & remained so for 5 mins or more, sufficient oil has been added to the engine & the drivers door is re-opened.

Please refer to section MWI of the Service Manual for further information regarding the operation of the sensor & the display on the instrument cluster.



MAINTENANCE

General

The Servicing for T31 M9R is mostly consistent with all other Nissan models. See below for further comments etc.
STRICT PRECAUTIONS MUST BE ADHERED TO WHEN CHANGING THE ENGINE OIL & REPLACING THE FUEL FILTER. See below for more details.

Pre Delivery Inspection

Ensure that a Pre Delivery Inspection is correctly carried out. Refer to the "Dealer PDI Pack" for more details on the PDI of T31 vehicles

Engine Oil for M9R

Ensure that a suitable quality engine oil is used. It is recommended to use **5W 30 ACEA C3 "Low Ash"** type engine oil & it is to be changed every 10,000km's or 6 months – whichever comes 1st.
PRECAUTIONS;
- Do NOT fill the engine too quickly
- Do NOT start the engine until **10 minutes after** the oil has been added to the engine
- Do not allow the engine to be overfull - **even slightly overfull is un-acceptable.** The Oil level must be exactly on the full mark after the engine has been started – oil pressure warning light has gone out & then stopped to rest for 10 minutes.

DO NOT RELY ON THE AUTOMATIC OIL DISPENSING SYSTEMS AS IT IS COMMON FOR THEM TO BE IN NEED OF RE-CALIBRATION!

Engine Oil Capacity including Filter; 7.4L.
Engine Oil Specification; 5W 30 ACEA C3 (Full Synthetic "Low Ash" type engine oil)

Engine Coolant for M9R

Ensure that the Coolant is **NOT replaced until the 80,000km service or 4 years** – whichever comes 1st. Once it has been replaced the service interval for coolant is every 40,000km's or 2 years.
NOTE:
Always ensure that all of the old coolant has been drained / flushed from the engine. Only EVER use Genuine **Nissan Long Life Coolant.**
Engine Cooling System Capacity; 8.4 ~ 8.9L (M/T ~ A/T). Reservoir Bottle capacity is an additional **0.75L**

6 speed Auto Transmission Fluid – Nissan MATIC J

There is no specific servicing requirement for the AT. However if the vehicle is used for towing a lot it is STRONGLY RECOMMENDED that the fluid is closely inspected for colour / condition / level etc. every 10,000km's. (otherwise every 20,000km's). If it is discoloured or it appears to be contaminated, drain the fluid & refill with new Nissan Matic J fluid only.
AT Fluid Capacity; 7.5L. Only use Nissan MATIC J

MAINTENANCE

6 Speed Manual Transmission Oil

Inspect the Oil carefully. Typically it will require replacement by 100,000km's. Only use a suitable quality GL-4 type Transmission Oil with a viscosity of 75W 85.
Transmission Oil Capacity 2.0L

Transfer & Final Drive Oil

Inspect the Oil carefully in each unit. Typically it will require replacement every 40,000km's. Only use a suitable GL-5 type Oil with a viscosity of 80W 90.
Transfer Capacity; 0.36 ~ 0.38L. Final Drive Capacity; 0.55L

Brake Fluid

Replace the brake fluid with a suitable DOT 4 type fluid every 40,000km's or 2 years.

Dry Paper Air Filter Element

Inspect it every 10,000km's & replace it after a maximum of 40,000km's or every 2 years. More frequently for dusty conditions.

Fuel Filter

Like any other diesel engine model – IT MUST BE DRAINED EVERY 10,000KM'S and replaced every 40,000km's or 2 years.
THE FUEL FILTER REPLACEMENT OPERATION MUST BE CARRIED OUT IN A CLEAN ENVIRONMENT. CONTAMINATION OF ANY KIND THAT ENTERS THE FUEL SYSTEM VIA AN OPENED FUEL LINE CAN EASILY CAUSE SERIOUS ENGINE RUNNING PROBLEMS!

Tyre Rotation & Wheel Balance

Ideally they should be rotated & balanced every 10,000km's. Ensure that the wheels are installed properly & that they are NOT tightened with an impact gun. Ensure that they are correctly tightened USING A TORQUE WRENCH or driveline vibration will result.

Wheel Alignment

A 4 WHEEL ALIGNMENT MUST BE CARRIED OUT AT THE PRE DELIVERY. It is strongly recommended to inspect the front wheel alignment every 20,000km's or 1 year thereafter.
Monitor the wear characteristics of the rear tyres to determine the need of a rear wheel alignment.

HVAC system (in-cabin) Micro Air Filter

Replace it every 20,000km's. More frequently in dusty conditions.

MAINTENANCE

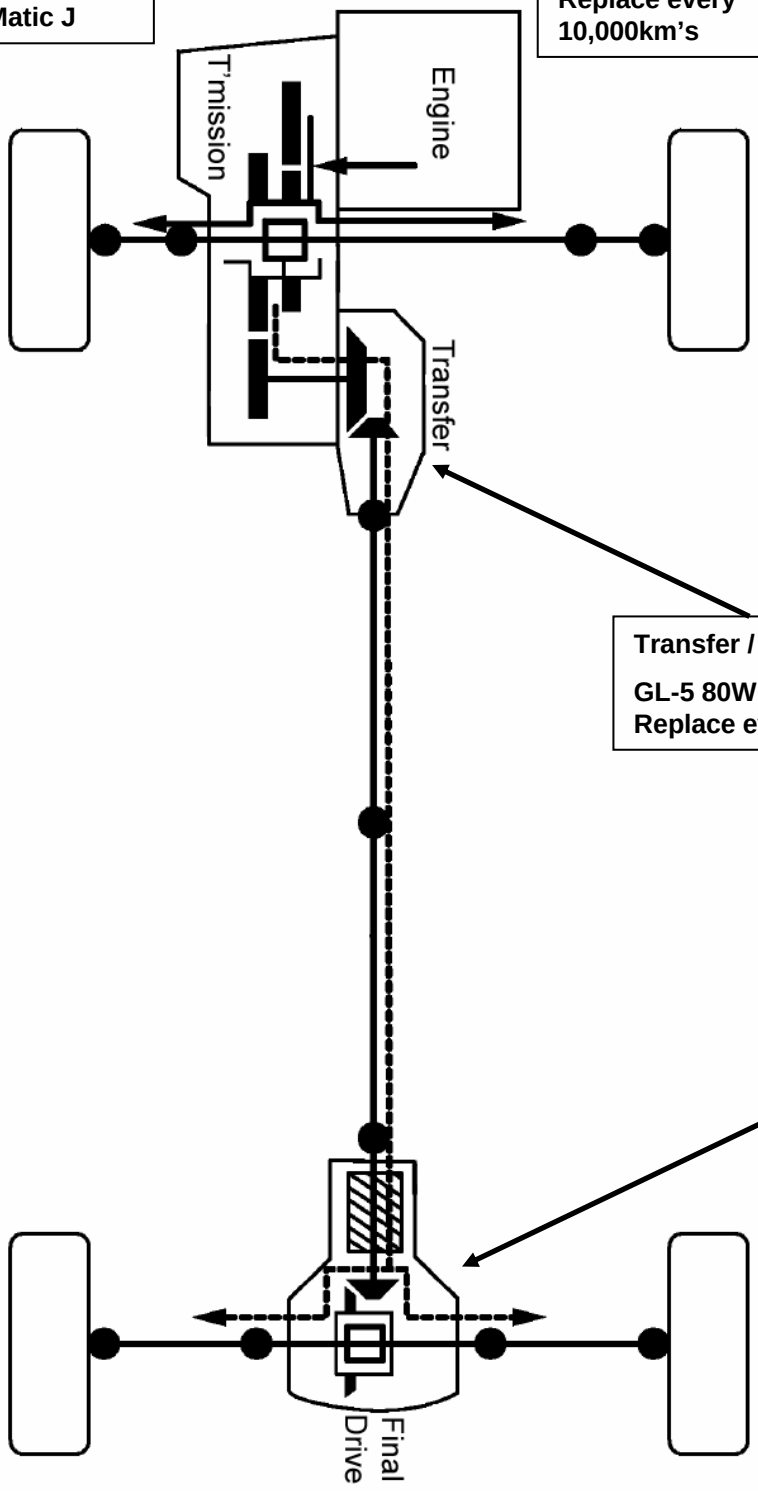
Transmission

M/T; GL-4 75W 85. Replace every 100,000km's.

A/T; Nissan Matic J

Engine

5W 30 ACEA C3 Replace every 10,000km's



Transfer / Final Drive

GL-5 80W 90 (Diff Oil) Replace every 40,000km's