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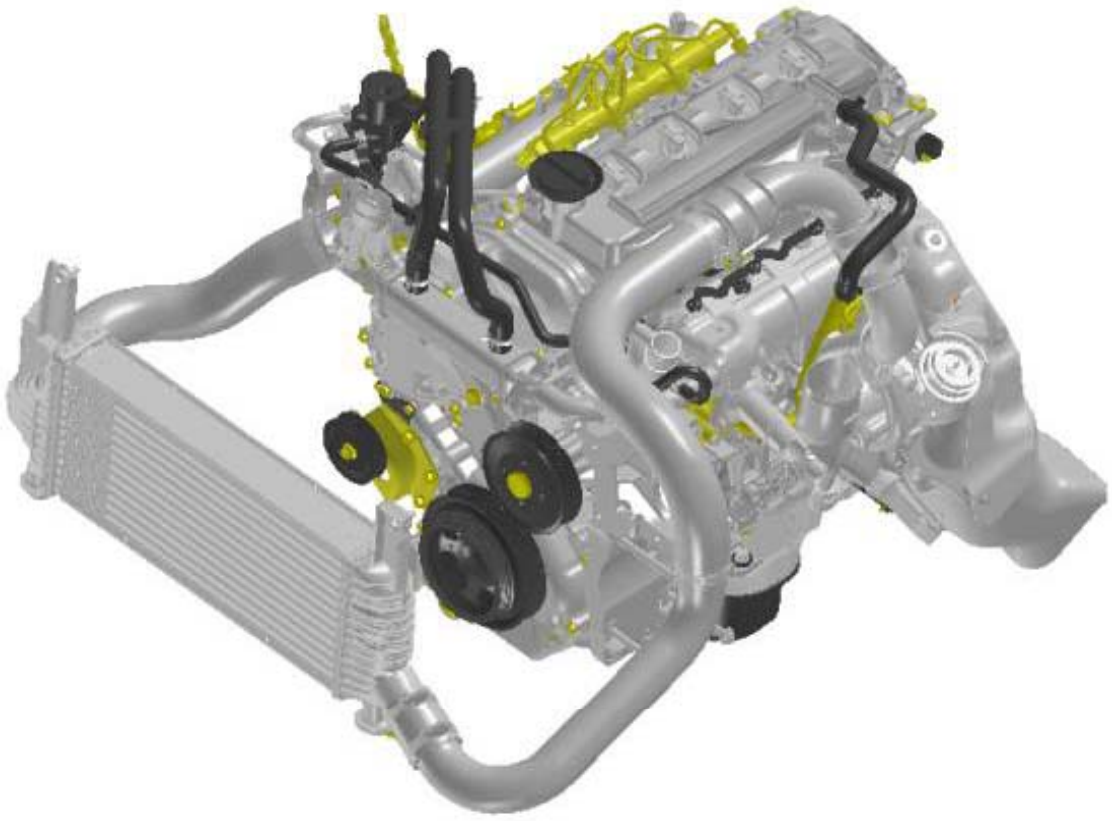
Nissan Australia. May 2010



YD25DDTi Common Rail Diesel Engine

R51 Pathfinder
D40 Navara
D22 Navara

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 contained 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.

Log onto www.nissanlearningacademy.com.au for more detail or e-mail training@nissan.com.au

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

OTHER INFORMATION TO SUPPORT THIS TRAINING MANUAL

This Training Manual should be used in conjunction with the "2010 Diesel Particulate Filter" Training Manual.

R51, D40 & D22 SERVICE MANUAL (ESM) (Correct as of May 2010)

R51 Pathfinder; **SM0E-1R51GE**

D40 produced in Spain; **SM0E-1D40GE**

D40 produced in Thailand; **SM8E-1D40G2**

D22 Navara; **SM8E-5D22G1**

These ESM's have been automatically issued to **all** Nissan dealers. (via the parts distribution system) If your dealership does not have any of them, they can be ordered via normal parts channels using the above quoted publication numbers.

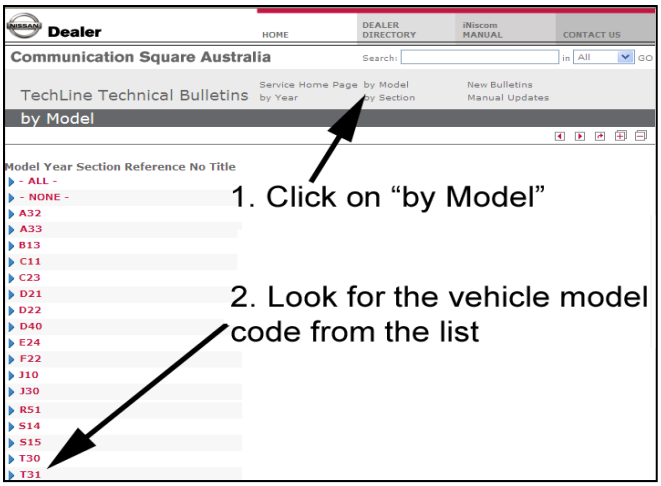
This Training Manual is designed for the purpose of relaying information about the vehicle & the systems within it. This Training Manual is **not** to be used as the Service Manual. Throughout this Training Manual, references are made to the Service Manual for additional information regarding fault diagnosis,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

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

SERVICE TECHNICAL BULLETINS (STB's)

Please ensure you familiarise yourselves with all STB's relating to R51, D40 & D22

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

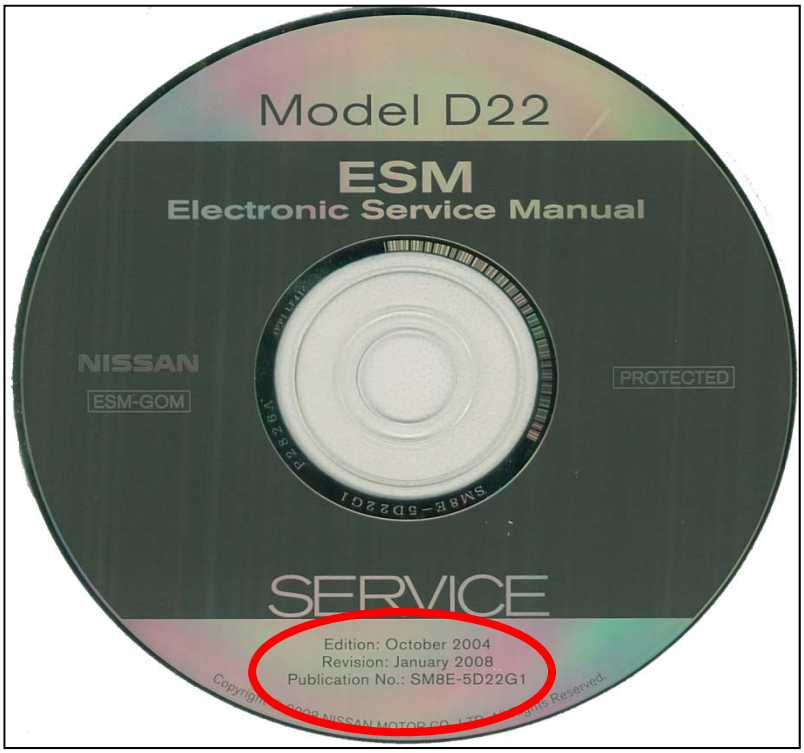


GENERAL INFORMATION

D22 Navara ESM

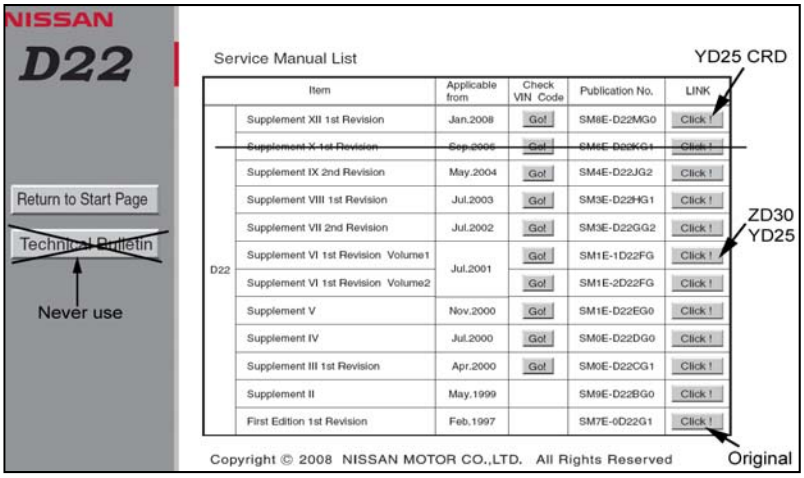
This 1 x disc contains information for ALL D22 Navara's produced since 1997. Care must be taken when using this disc as it contains information relevant to other countries as well as Australia.

Refer to the "SM list" on the iNISCOM Service Homepage. (Over on the LH side of the screen under "TechLine")
Ensure that this is the latest esm for D22!



Publication Number (Part #)
SM8E-5D22G1
(Correct as at **May 2010**)

Supplement Selection
This can be complex, therefore take note of the vehicles build date & select the most recent publication that was printed prior to the car being built. If the information cannot be found, go back down the list to earlier publications.
YD25 CRD variants commenced production in January 2008. Therefore select the very top publication (Supp XII) for information that relates to the YD25 Engine Control system & Engine Mechanical.
Other information for YD25 EM can be found in Supp VI (July 2001)
ZD30 EM & EC information is mostly located in Supp VI as well.

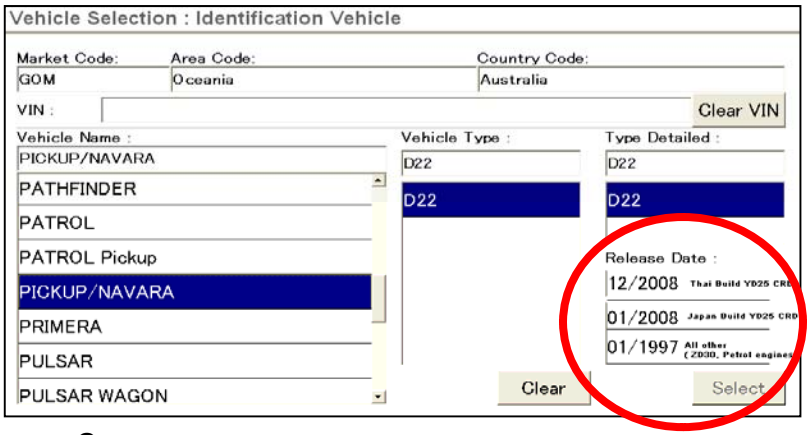


Using CONSULT III on D22

CONSULT II is **not** compatible on 2007MY vehicles & onwards.
CONSULT III is recommended for use on all D22, especially the YD25 variants.

Date Selection

Locate the "Build Date" of the vehicle. It's stamped on the Factory ID plate which is attached to the inside firewall on RHS of the engine bay. Select the date on CONSULT III which is the most recent date behind the vehicles build date.



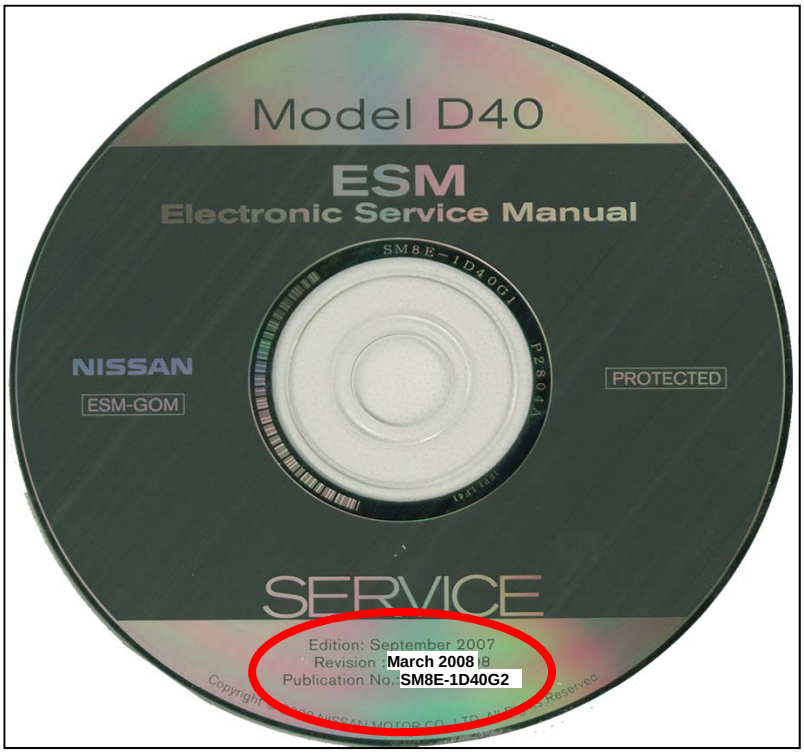
GENERAL INFORMATION

Thailand D40 Navara ESM

This 1 x disc contains information for ALL Thai produced D40 Navara's.

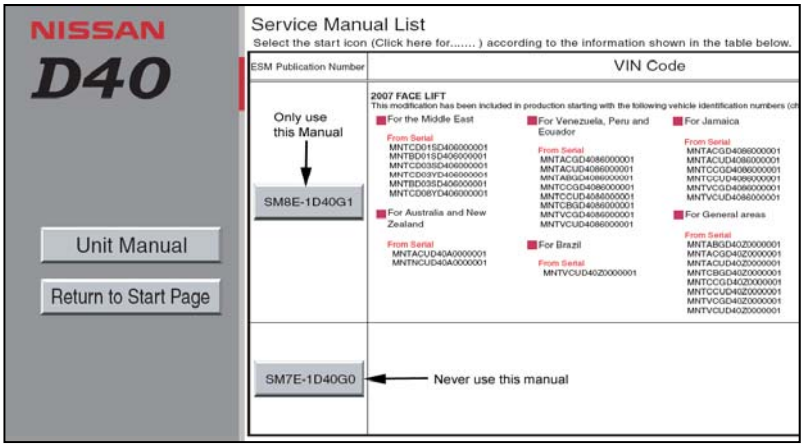
Do **NOT** use this ESM for models produced in Spain.

Refer to the "ESM LIST" on the iNISCOM Service Homepage. (Over on the LH side of the screen under "TechLine") Ensure that this is the latest ESM for Thailand produced D40!



Publication Number (Part #)
SM8E-1D40G2
(Correct as at **May 2010**)

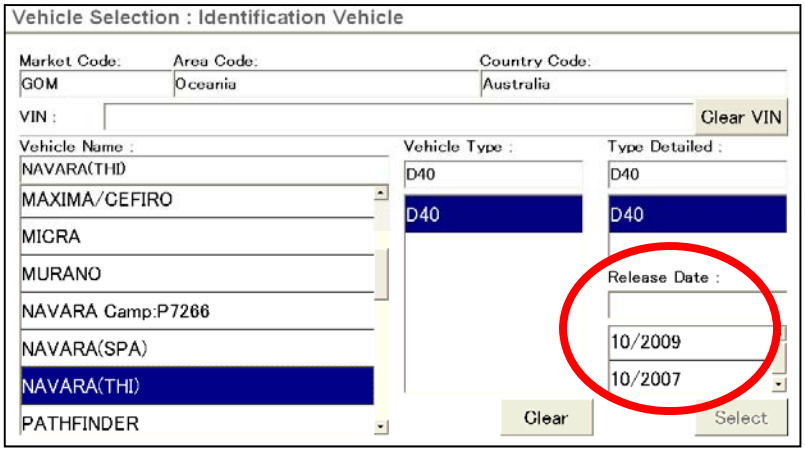
Supplement Selection
Refer to the picture. Only select the upper Supplement.



How to Identify Thailand Produced D40
Refer to the VIN. Thailand produced vehicles have "MNT" as the 1st 3 characters. Thai produced D40 VINs are as follows;
• **MNT*CUD40A0000001** (Original prod'n)

Using CONSULT III on Thai build D40
CONSULT II is **not** compatible on 2007MY vehicles & onwards.
CONSULT III is recommended for use on all Thai build D40. Do **not** use CONSULT II.

Date Selection
Locate the "Build Date" of the vehicle. It's stamped on the Factory ID plate which is attached to the inside firewall on the back LHS of the engine bay. Select the date on CONSULT III which is the most recent date behind the vehicles build date.



GENERAL INFORMATION

Spain D40 Navara ESM

This 1 x disc contains information for ALL Spain produced D40 Navara's.
Do **not** use this ESM for models produced in Thailand.

Refer to the "ESM LIST" on iNISCOM Service Homepage. (Over on the LH side of the screen under "TechLine") Ensure that this is the latest ESM for Spain produced D40!

Publication Number (Part #)
SM0E-1D40GE
(Correct as at **May 2010**)

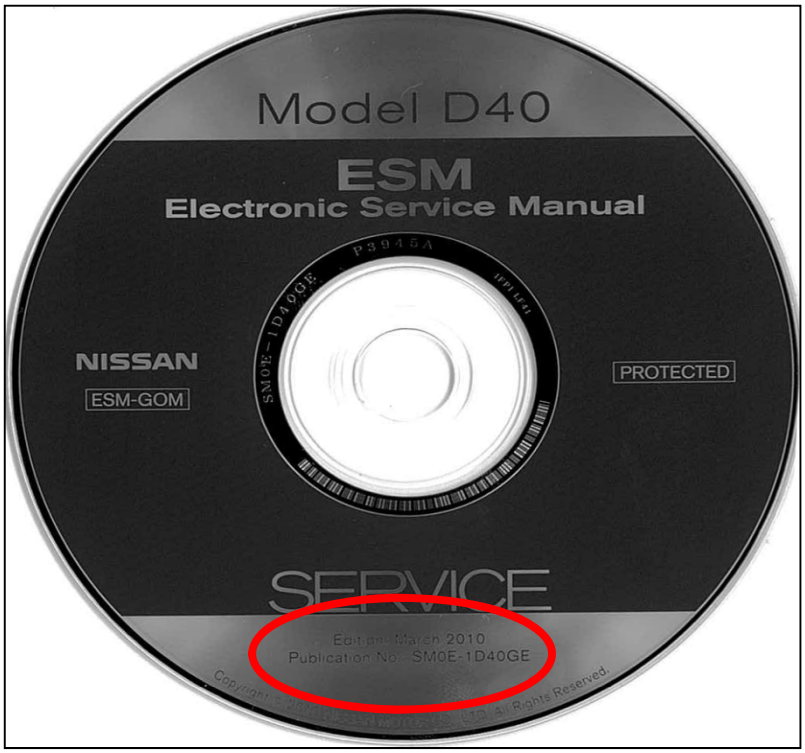
Publication Selection
Refer to the picture. Select the publication dependant on the Model Year.

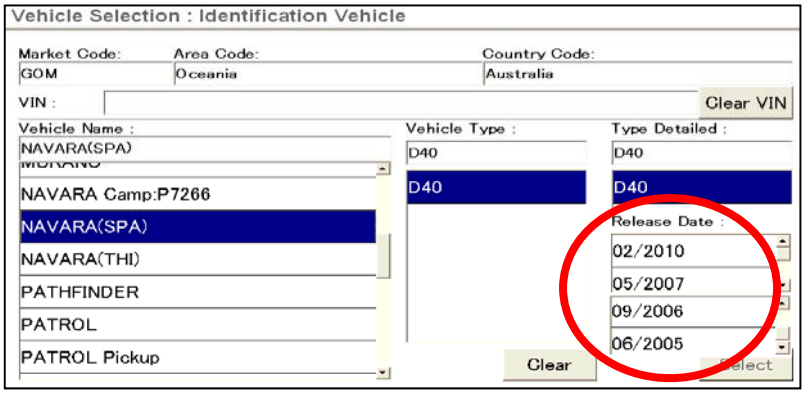
How to Identify Spain Produced D40
Refer to the VIN. Spain produced vehicles have "VSK" as the 1st 3 characters. Spain produced D40 VINs are as follows;
Select "From August 2005" for;
• **VSKC**D40A0000001**
(2005~2006MY Original Prod'n)
• **VSKC**D40A0135001**
(2007MY Introduction of DPF on YD A/T variants)
• **VSKC**D40A0218001**
(2008MY minor facelift)

Select "From February 2010" for;
• **VSKC*ND40A0375001**
(2010MY major face lift. ST-X 140Kw YD25 & VQ40 4WD only variants)

Using CONSULT III on Spain build D40
CONSULT II is **not** compatible on 2007MY vehicles & onwards.
CONSULT III is recommended for use on all Spain build D40.

Date Selection
Locate the "Build Date" of the vehicle. It's stamped on the Factory ID plate which is attached to the inside firewall on the back LHS of the engine bay, or on an A Pillar mounted sticker, drivers side. Select the date on CONSULT III which is the most recent date behind the vehicles build date.





GENERAL INFORMATION

R51 Pathfinder ESM

This 1 x disc contains information for ALL R51 Pathfinders.

Refer to the "ESM LIST" ON iNISCOM Service Homepage. (over on the LH side of the screen under "Techline")
Ensure that this is the latest ESM for R51!

Publication Number (Part #)
SM0E-1R51GE
(Correct as at **May 2010**)

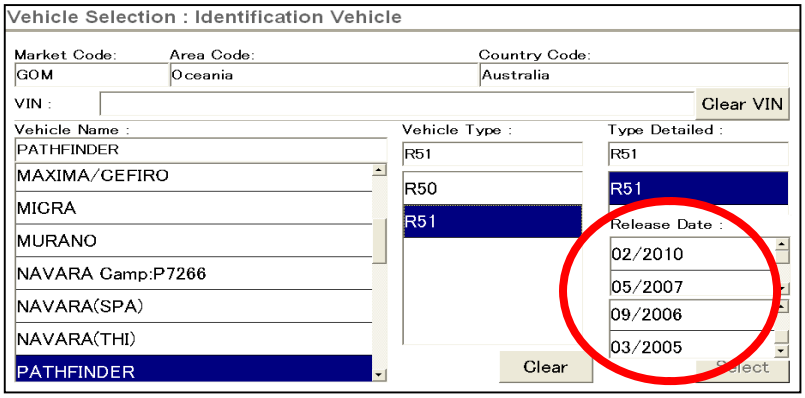
Publication Selection
Refer to the picture. Select the publication dependant on the Model Year.

How to Identify Spain Produced R51
Refer to the VIN. Spain produced vehicles have "VSK" as the 1st 3 characters. Spain produced R51 VINs are as follows;
Select "From March 2005" for;
- **VSKJ*WR51A0000001**
(2005~2006MY Original Prod'n)
- **VSKJ*WR51A0135001**
(2007MY Introduction of DPF on YD A/T variants)
- **VSKJ*WR51A0218001**
(2008MY minor facelift)

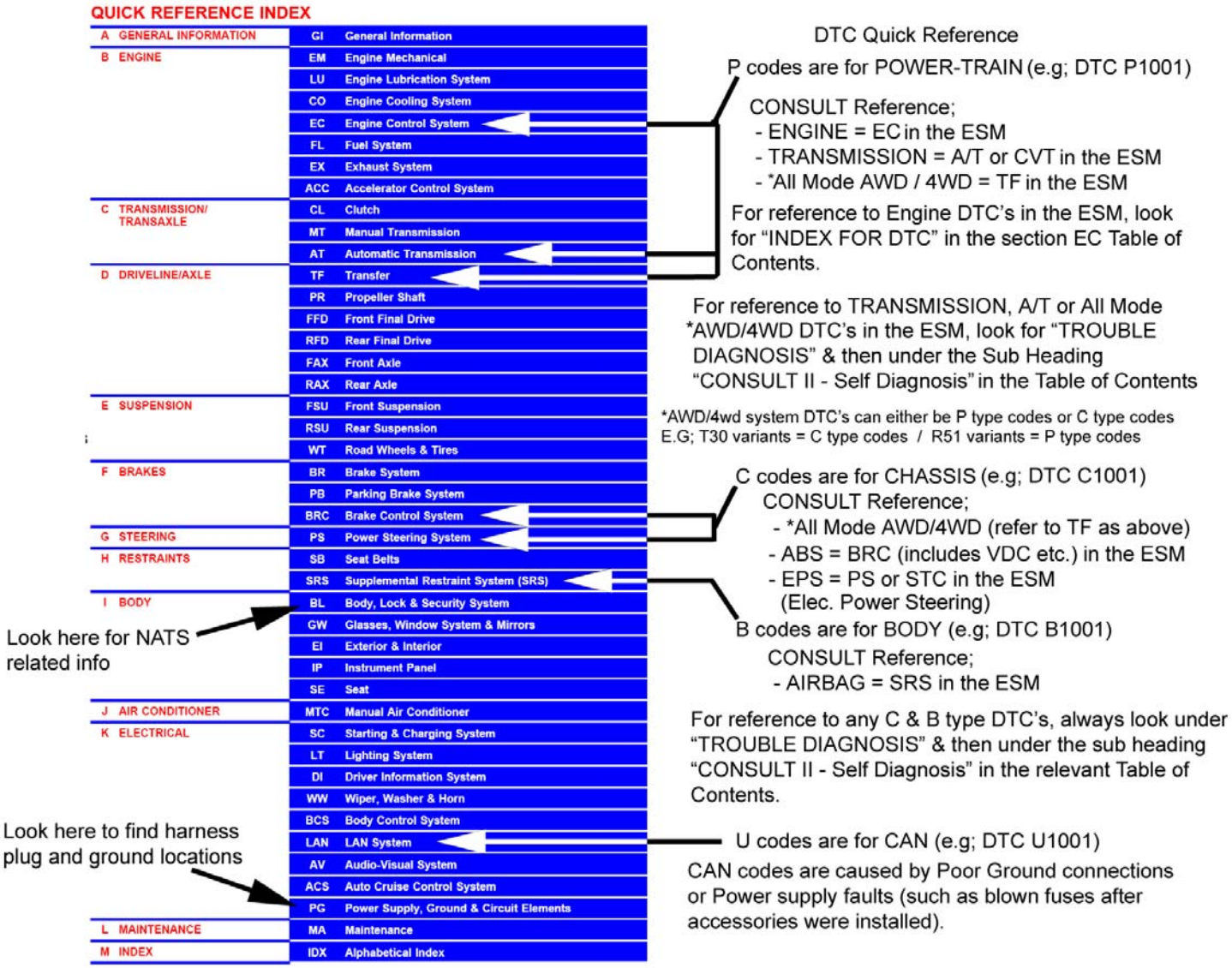
Select "From February 2010" for;
- **VSKJVWR51A0375001**
(2010MY major face lift. ST-X 140Kw YD25 only variants)

Using CONSULT III on R51
CONSULT II is **not** compatible on 2007MY vehicles & onwards.
CONSULT III is recommended for use on all R51.

Date Selection
Locate the "Build Date" of the vehicle. It's stamped on the Factory ID plate which is attached to the inside firewall on the back LHS of the engine bay, or on an A Pillar mounted sticker, drivers side. Select the date on CONSULT III which is the most recent date behind the vehicles build date.



FINDING DTC's IN THE ESM



Diagnostic Trouble Code numbers (DTC's).

P = Power-train. Engine, Transmission or Transfer related faults (P1001 for example)

C = Chassis. Braking, Steering & All-mode 4x4 system related faults (C1001 for example)

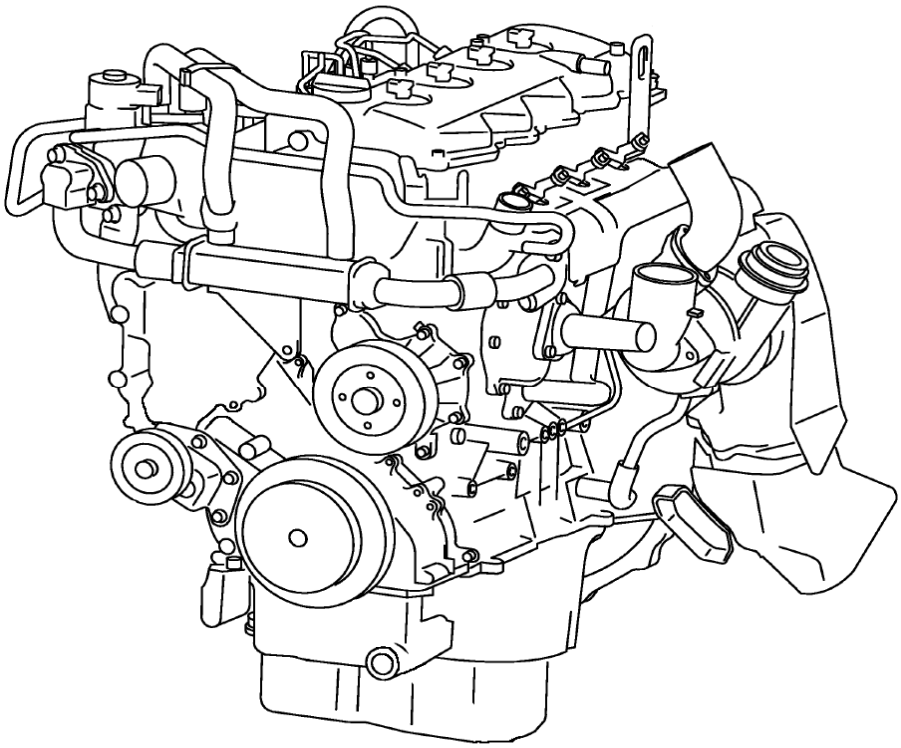
B = Body. Primarily Airbag related faults (B1001 for example)

U = CAN related faults. (U1001 for example)

The most common cause of CAN DTC's are POOR GROUND connections or NO POWER (blown fuse) related.

GENERAL INFORMATION

YD25DDTi



With the introduction of R51 Pathfinder & D40 Navara in 2005, a completely new Diesel Engine for the Australian Nissan product range was introduced. The YD25DDTi engine with a Denso Common Rail Diesel injection system. (1800BAR max. pressure)
The 2005 ~ 2006MY YD25 engine complied to Euro III level emissions.

The 2007MY R51 / D40 saw some minor changes to the engine for emission reduction (Euro-IV). As part of the change, Diesel Particulate Filter (DPF) was added to A/T variants.

For the 2010MY R51 / D40, Power & Torque outputs of the engine were increased from 126Kw / 403Nm to 140Kw / 450Nm. This was achieved via changes to the cylinder head & air intake system plus an increase in maximum fuel pressure in the common rail (1800BAR > 2000BAR) . The engine complies to Euro IV emissions, however it is a Euro V compatible engine.

Although new to Australia in 2005, the YD series engine has been used in Nissan vehicles destined for the European market since 1999 & typically is found in vehicles such as T30 & N16. In both cases the engine is a smaller 2.2L capacity. (YD22DDTi.)

Since 2001, D22 models in both New Zealand & Europe utilised the YD25 engine, however it was not a CRD engine, the Fuel system utilised the Bosch VP44 Pump.
The 2008MY D22 saw the introduction of the YD25DDTi CRD for Australia as well as in New Zealand & Europe.

Transmission options for the YD engine in R51 & D40 is either 6 M/T or 5 E-A/T. All R51 & D40 ST / ST-X variants fitted with the YD Engine have ASCD (Cruise Control) as standard fitment.
The transmission for all D22 continues to be the 5 M/T only.

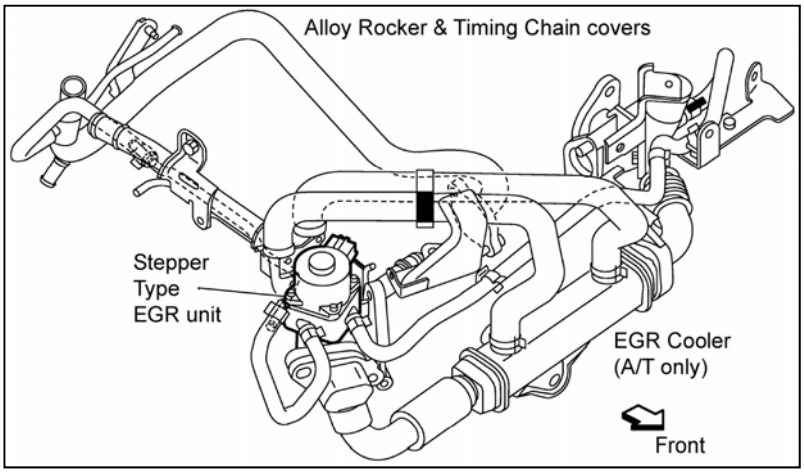
GENERAL INFORMATION

YD25 Type Identification

For R51 & D40 models, there are 2 types of YD25 engines. Type 1 & Type 2. This does **not** apply to D22.

1. YD25 Type 1 (128 Kw. Euro III)
For R51 & Spain D40, Type 1 was applied from start of production until 8/2006.
VSKJVWR51A0000001 ~ 0135000
VSKCVND40A0000001 ~ 0135000

NOTE:
DPF was never fitted to any YD25 Type 1 engine.

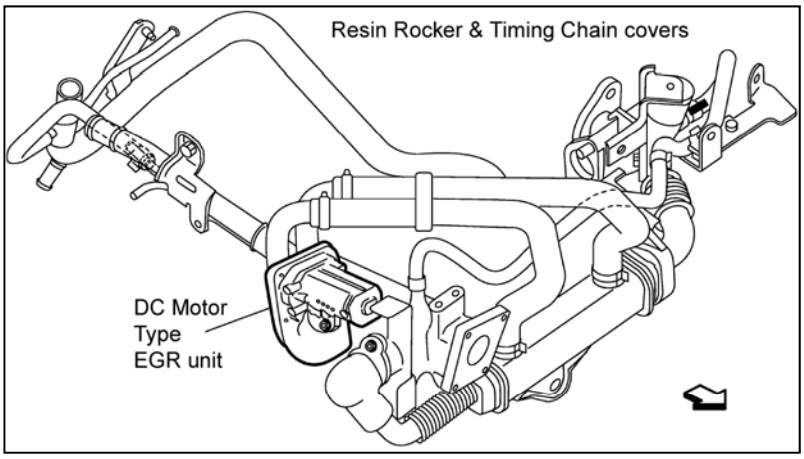


2005 ~ 2006MY YD25 Type 1 (R51 & D40)

2. YD25 Type 2 (106Kw / 126Kw. Euro IV)
For R51 & Spain D40, Type 2 was applied from 9/2006.
VSKJVWR51A0135001 ~ 0374999
VSKCVND40A0135001 ~ 0374999

For Thailand D40, YD25 Type 2 was applied from start of production.
MNT*CUD40A0000001

NOTE:
YD25 Type 2 engines have DPF fitted if the transmission is A/T.



2007 ~ 2009MY YD25 Type 2 (R51 & D40)

3. D22 YD25-CRD (98Kw. Euro IV)
YD25 Type 1 / Type 2 does NOT apply to D22 models. The differences between D22 vs R51 / D40 are as follows;
• There are no Balance shafts fitted.
• Waste Gate (conventional) type Turbo is utilised instead of the Variable Nozzle Turbo
• There is no air intake control valve (throttle) fitted
• Intercooler is mounted on top of the Engine

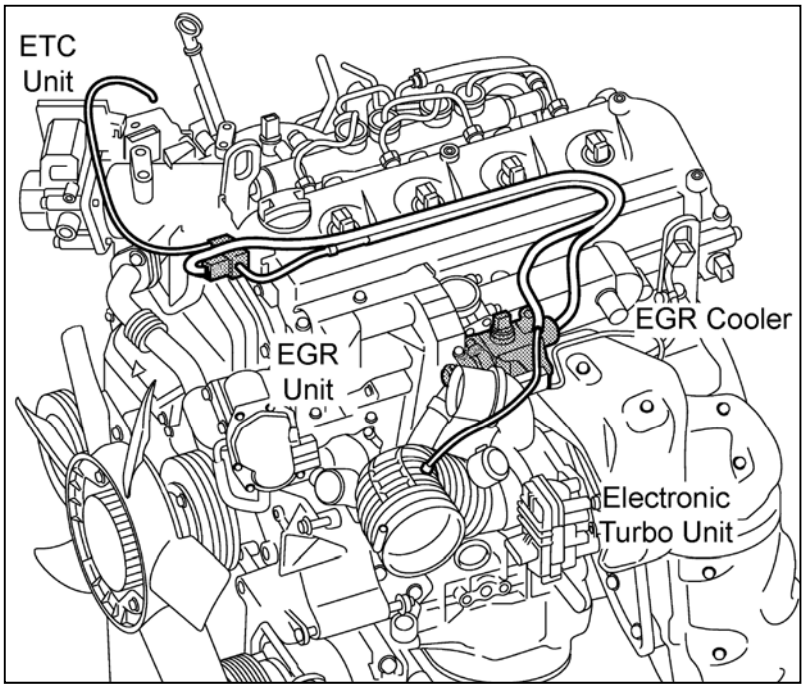
2008 ~ 2010MY YD25 (D22)

GENERAL INFORMATION

YD25 Type Identification

4. YD25 2010MY
(140Kw. Euro IV / Euro V compatible)
For R51 & Spain D40, the new 140Kw engine was applied from 02/2010.
VSKJVWR51A0375000 >
VSKCVND40A0375000 >

NOTE:
DPF is not fitted to the new 2010MY YD25.



2010MY YD25 (R51 & D40)

GENERAL INFORMATION

YD Engine Comparison Chart (Correct as at May 2010)

	D22 – YD25 Euro IV 2008MY >	R51 / D40 YD25 Type 1 / Euro III 2005 ~ 2006MY	R51 / D40 YD25 Type 2 / Euro IV 2007MY ~ 2009MY	R51 / D40 YD25 2010MY Euro IV / V 2010 MY >
Cylinder Arrangement	Inline 4 Cylinder			
Displacement (cc)	2488			
Bore & Stroke (mm)	89.0 x 100			
Compression Ratio	16.5 : 1			15:1
Cyl block / Cyl head Rocker Cover / Timing Chain Cover	Cast Iron / Alloy / Resin / Alloy	Cast Iron / Alloy / Alloy / Alloy	Cast Iron / Alloy / Resin / Resin	
Valve gear / Cam drive	16 Valve & shim adjustable / Chain driven DOHC			
Injection	DI – Denso CRD1800 BAR			DI – Denso CRD 2000 BAR
Power (KW @ rpm) & Torque (Nm @ rpm)	(*1) 98@3600 & 304@2000	128@4000 & 403@2000	(*2) 106 or 126@4000 & 356 or 403@2000	140@4000 & 450@2000
Balancer Unit	Not Fitted	Separate unit located in sump, gear driven by crank		
Air Intake Throttle type & EGR type	No Throttle fitted & DC motor type EGR	Vacuum operated Throttle valve & Stepper motor type EGR	DC motor type Throttle valve & DC motor type EGR valve	
Turbo / Intercooler	Conventional Waste Gate / Top of engine mounted	Vacuum operated VNT / Front of radiator mounted		Elec. operated VNT / Front of radiator mounted
Electronic Oil Level sensor	Yes			
Engine Oil Maint. Intervals	10,000 km's			
Engine Oil Specification	(*3) 10W 40 ACEA B3		(*3) 10W 40 ACEA B3 (*4) A/T variants with DPF; 5W 30 ACEA C3	10W 40 ACEA B3
DPF fitted	NO		Only on A/T variants	NO

***1 Power & Torque is reduced via type of turbo fitted & ECM programming.**

***2 Lower power & torque Type 2 engine fitted to Thailand build D40 RX Single Cab & 2WD Dual Cab. Revised ECM programming is the main difference.**

***3 REFER TO STB MA 05-001**

***4 REFER TO STB MA 07-002**

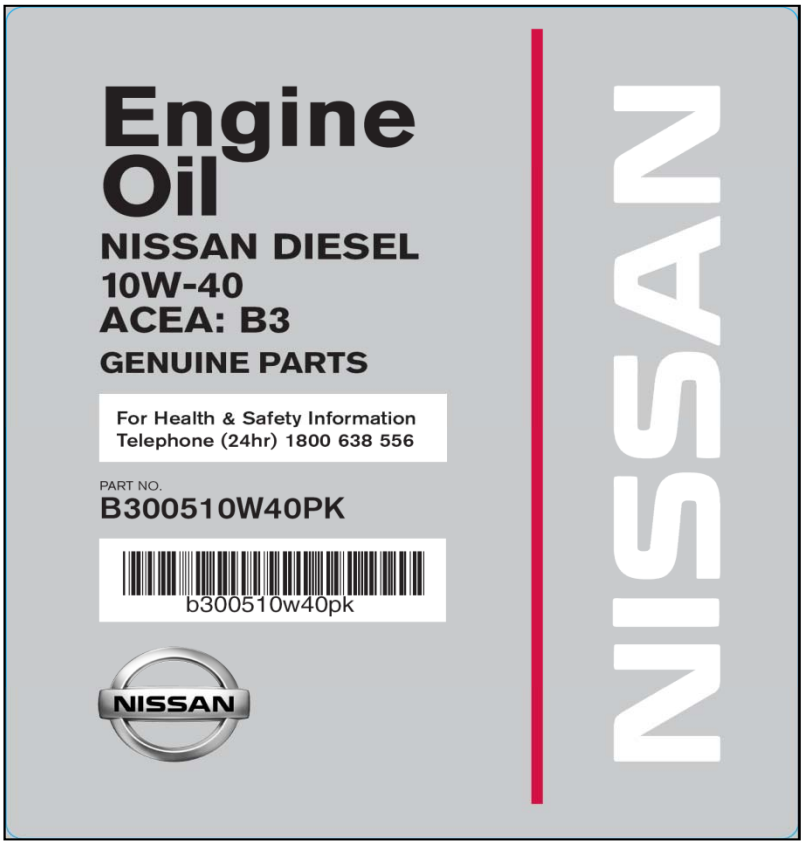
GENERAL INFORMATION

YD25DDTi non DPF Engine Oil

Only use a 10W 40 ACEA B3 engine oil in non DPF YD25 engines.
The Engine Oil & Filter is to be replaced after a **maximum** of 10,000km's or 6 months.
More frequently is the vehicle is operated under harsh conditions.

NOTE 1:
This is the Engine Oil recommended for ALL ZD30 engines since the year 2000 (All VP44 pump & ZD30-CRD engines)

NOTE 2:
This Engine Oil is suitable for the new YD25 2010MY engine.



YD25DDTi with DPF Engine Oil

Only use a 5W 30 ACEA C3 engine oil in all DPF equipped YD25 engines!
The Engine Oil & Filter is to be replaced after a **maximum** of 10,000km's or 6 months.
More frequently is the vehicle is operated under harsh conditions.

NOTE 1:
DPF is fitted to R51 Pathfinder & Spain/Thai D40 Navara's with Auto Transmission (YD25 Type 2 with A/T. See page 8 for more detail)

NOTE 2:
This is the Engine Oil recommended for **all** M9R engines fitted to T31 X-TRAIL.

"Low Ash" Full Synthetic Engine Oil for all DPF equipped engines.

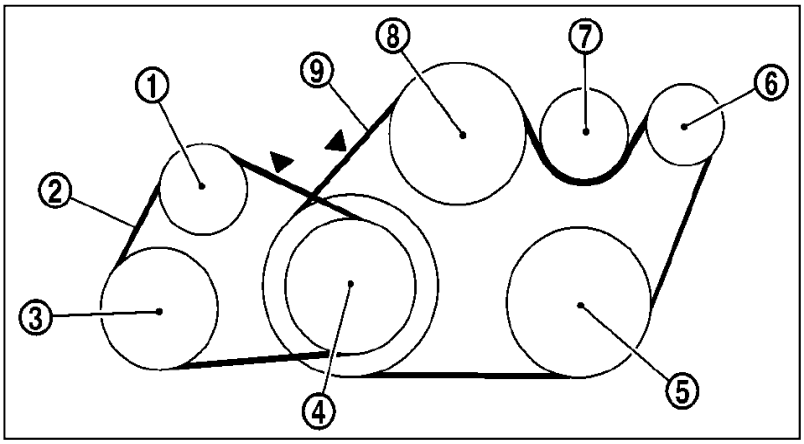
ENGINE MECHANICAL

YD25DDTi Drive Belts

There are 2 x separate drive belts.
The Alternator, Fan & A/C Compressor Belt and the Power Steering Pump Belt. Both are mechanically adjustable.
Reference should be made to section EM of the Service Manual for details on removal, installation & adjustment of the drive belts.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)
L MAINTENANCE > MA (Maintenance)

NOTE:
For D22, refer to section EM & MA of the Service Manual.



YD25 Type 1 / Type 2 (R51 & D40)

1. Idler pulley
2. Power steering oil pump belt
3. Power steering oil pump
4. Crankshaft pulley
5. A/C compressor
6. Alternator
7. Idler pulley
8. Water pump pulley
9. A/C compressor, alternator and water pump belt

YD25 2010MY Drive Belts

The Drive belt arrangement has changed for 2010MY.

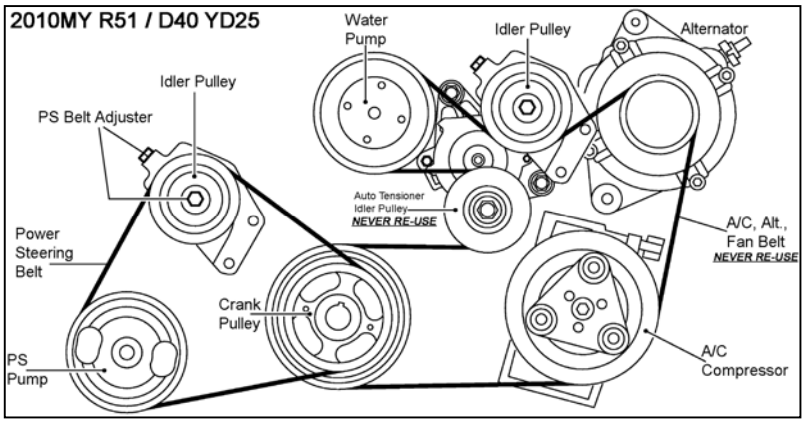
Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)
L MAINTENANCE > MA (Maintenance)

WARNING

Once the main drive belt (fan / AC / alt. belt) has been removed, it can never be re-used. The belt, & idler pulley / tensioner assembly must be replaced with new parts regardless of the km's travelled.
The Power Steering belt & tensioner is OK to be re-used after removal.

Never run the engine without the drive belt. Otherwise the Crankshaft Pulley will be damaged.

This also applies to the drive belt of the T31 X-TRAIL M9R Diesel.



YD25 2010MY

ONCE REMOVED, NEVER RE-USE THE MAIN DRIVE BELT, IDLER PULLEY & TENSIONER ASSEMBLY.

Power Steer Belt & Idler Pulley / Tensioner is OK for re-use.

ENGINE MECHANICAL

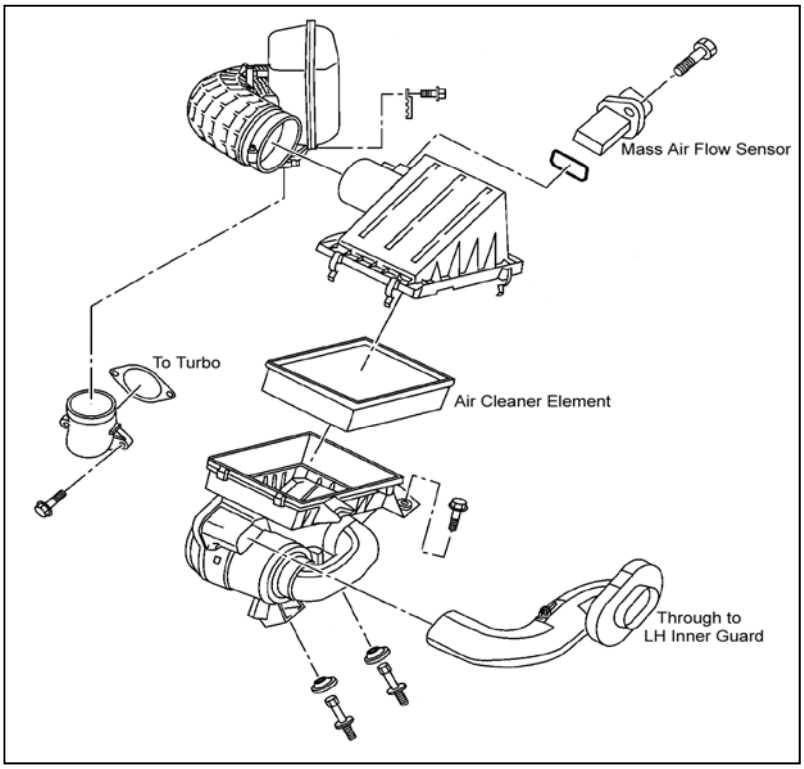
YD25DDTi Air Cleaner

The Air Filter Element is a **dry paper** type.
It must be cleaned regularly.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)
L MAINTENANCE > MA (Maintenance)

NOTE 1:
Thailand produced variants utilise a revised air filter element & housing assembly.

NOTE 2:
For D22, refer to section EM & MA of the Service Manual.



R51 & D40

YD25DDTi Charge Air Cooler

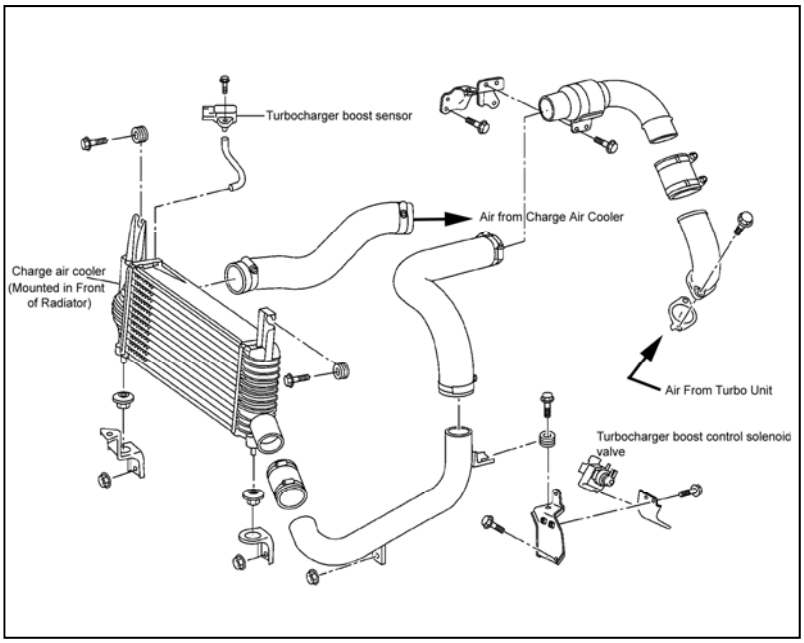
The Charge Air Cooler (Intercooler) is mounted vertically in front of the radiator instead of the horizontally mounted units such as the Intercooler on the Y61 ZD engines.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

PLEASE ENSURE THAT ALL FITTINGS ARE SECURE & FREE FROM AIR LEAKAGE.

NOTE 1:
For D22, refer to section EM of the Service Manual.

NOTE 2:
For the 2010MY YD25, refer to section EM of the Service Manual.



YD25 Type 1 / Type 2 (R51 & D40)

ENGINE MECHANICAL

YD25DDTi Intake Manifold & EGR

(YD25 Type 1)

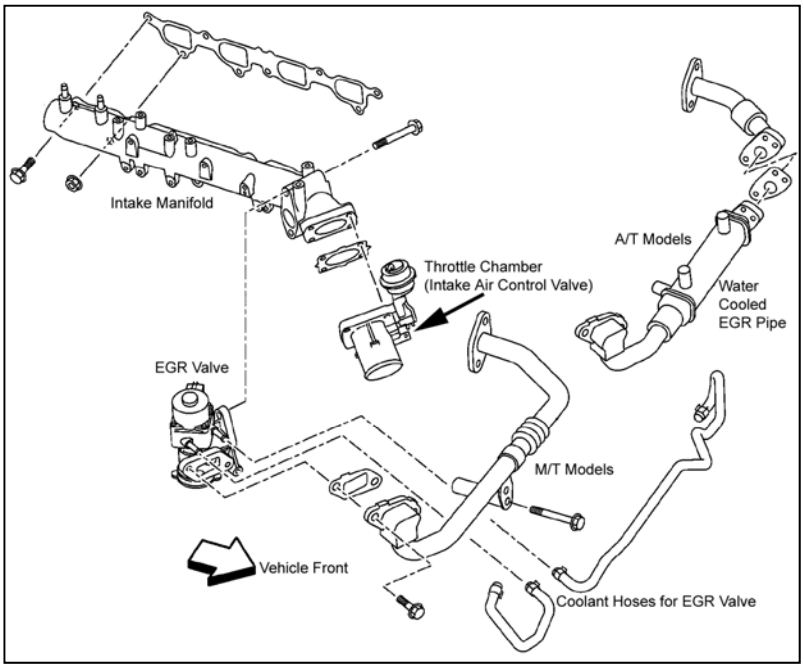
The Intake Manifold as shown right is mounted on the RH side of the Cylinder Head.

An Intake Air Control Valve (throttle valve) is utilised.

Please note the differences with M/T & A/T models in regards to the EGR pipe. The A/T models have a water cooled EGR pipe.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > EM (Engine Mechanical)



YD25 Type 1

NOTE 1:

Type 1 YD25 has a mechanically (vacuum) controlled Intake Air Control Valve & a Stepper type EGR unit.

NOTE 2:

For D22, please refer to section EM of the Service Manual. Intake Air Control Valve not fitted to D22.

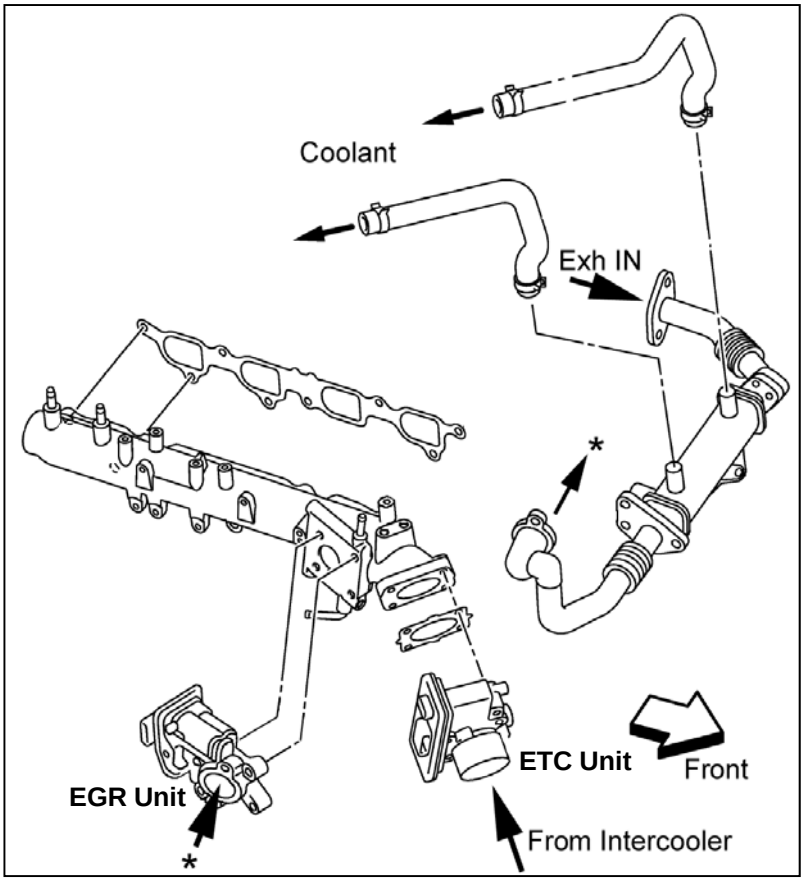
YD25DDTi Intake Manifold & EGR

(YD25 Type 2)

Late 2006 production saw various changes to the YD25 engine. These mostly relate to the Air Intake, EGR & Exhaust systems.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > EM (Engine Mechanical)



YD25 Type 2

NOTE 1:

Type 2 YD25 has an electrically controlled Intake Air Control Valve & a DC motor type EGR unit

NOTE 2:

For D22, please refer to section EM of the Service Manual. The EGR system is similar to that shown right.

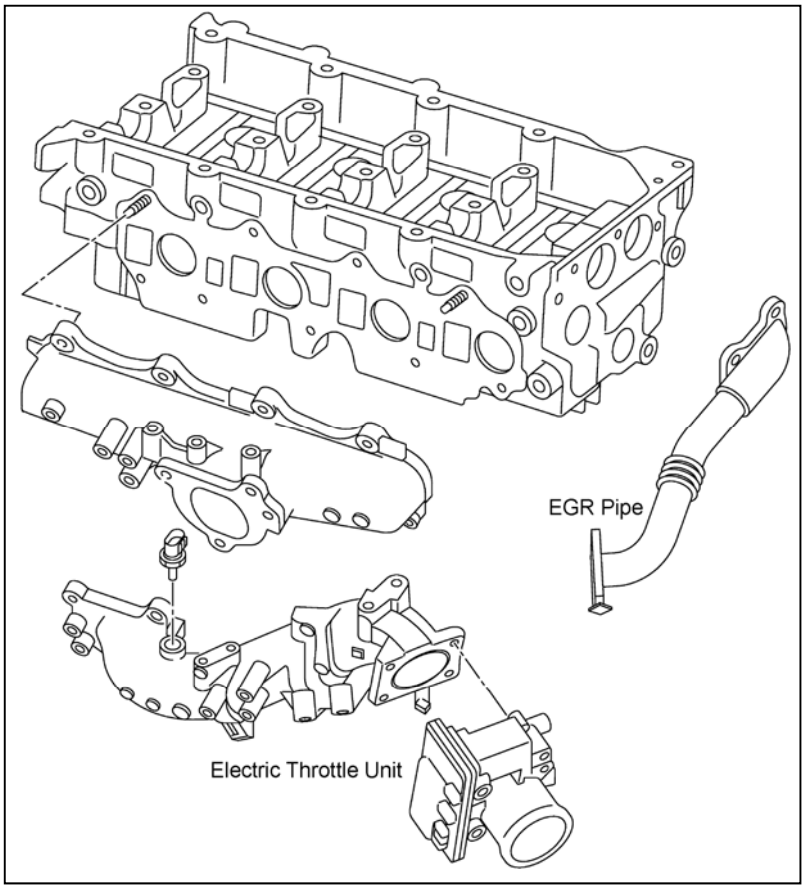
ENGINE MECHANICAL

YD25 2010MY Intake Manifold

For the YD25 2010MY engine, another change to the Air Intake system has been applied.
The Throttle Valve continues to be electrically operated.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE:
The Intake Manifold does **not** require removal to remove the Fuel Rail.



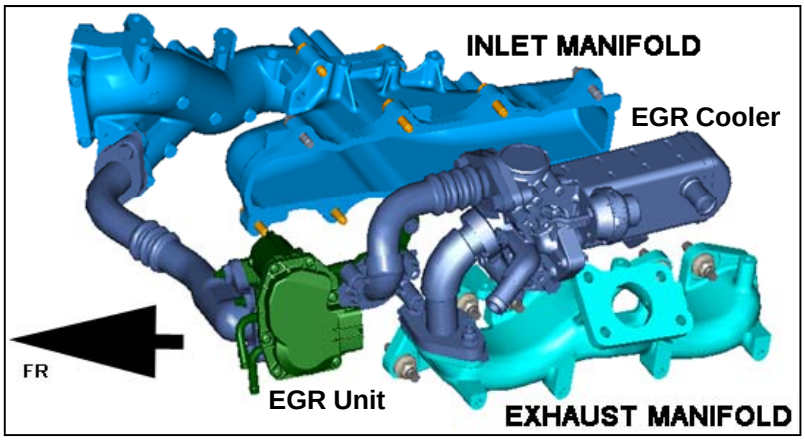
YD25 2010MY

YD25 2010MY EGR System

For the YD25 2010MY engine, another change to the EGR system has been applied.
The EGR valve continues to be electrically operated, however there is now a bypass valve fitted to the EGR cooler.
Exhaust gases are **not** fed through the EGR cooler when the engine temperature is cold.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE:
Like the M9R engine in the T31 X-TRAIL, there is an EGR Cooler Bypass Valve fitted to the 2010MY YD25.



YD25 2010MY

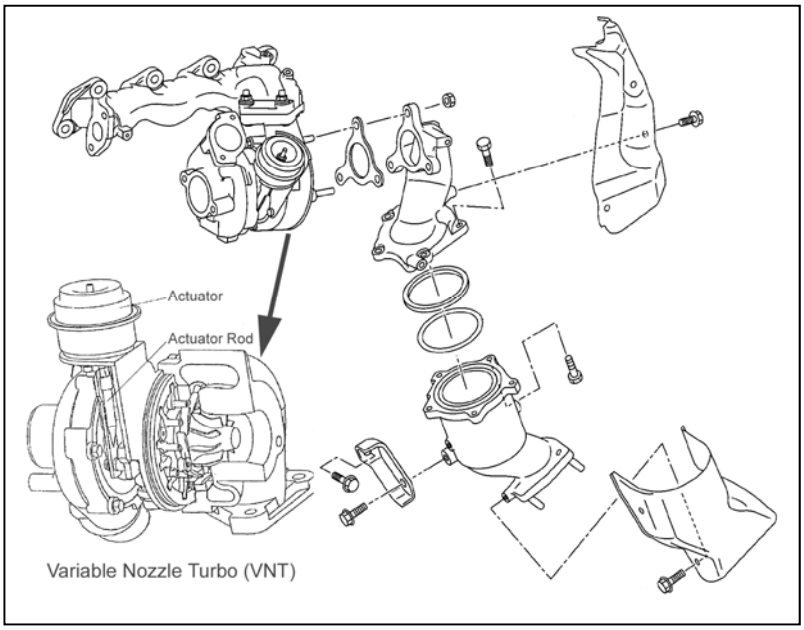
ENGINE MECHANICAL

YD25DDTi Exhaust Manifold, Turbo & Catalyst (YD25 Type 1)

The Exhaust Manifold system is similar to that fitted to the ZD engine on Y61.
Like the (Y61) ZD Engine, a VNT type Turbo charger unit is utilised.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE 1:
Please ensure that the Engine Oil level is **not overfull** when diagnosing a complaint of Oil Leakage from the Turbo Unit.



YD25 Type 1

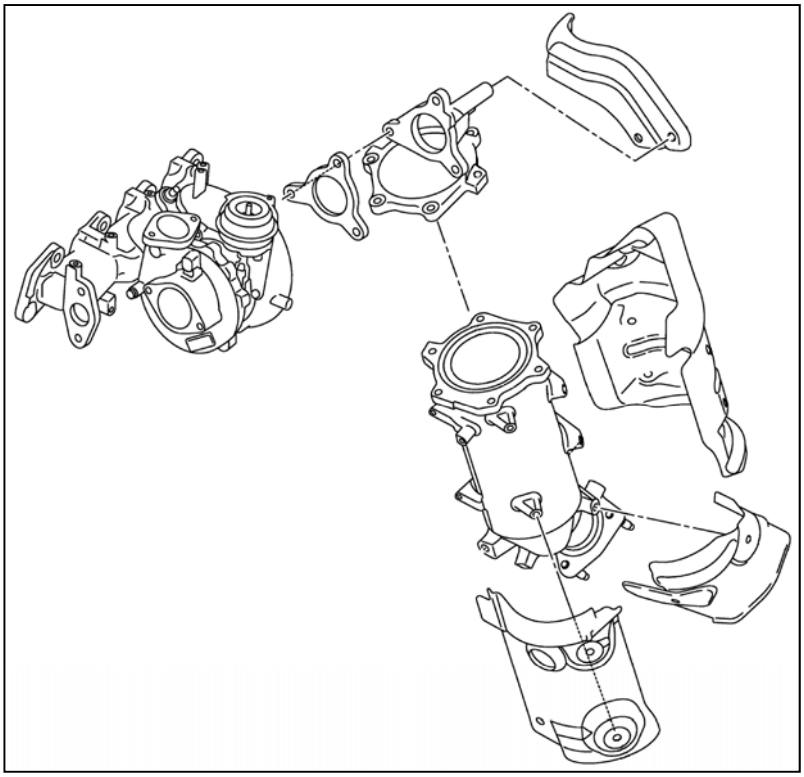
YD25DDTi Exhaust Manifold, Turbo & Catalyst (YD25 Type 2)

Late 2006 production saw various changes to the YD25 engine. These mostly relate to the Air Intake, EGR & Exhaust systems.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE 1:
Type 2 R51 & D40 has a larger catalyst & the Turbo has been repositioned.

NOTE 2:
For D22, please refer to section EM of the Service Manual. A conventional Waste Gate type turbo is utilised for D22.



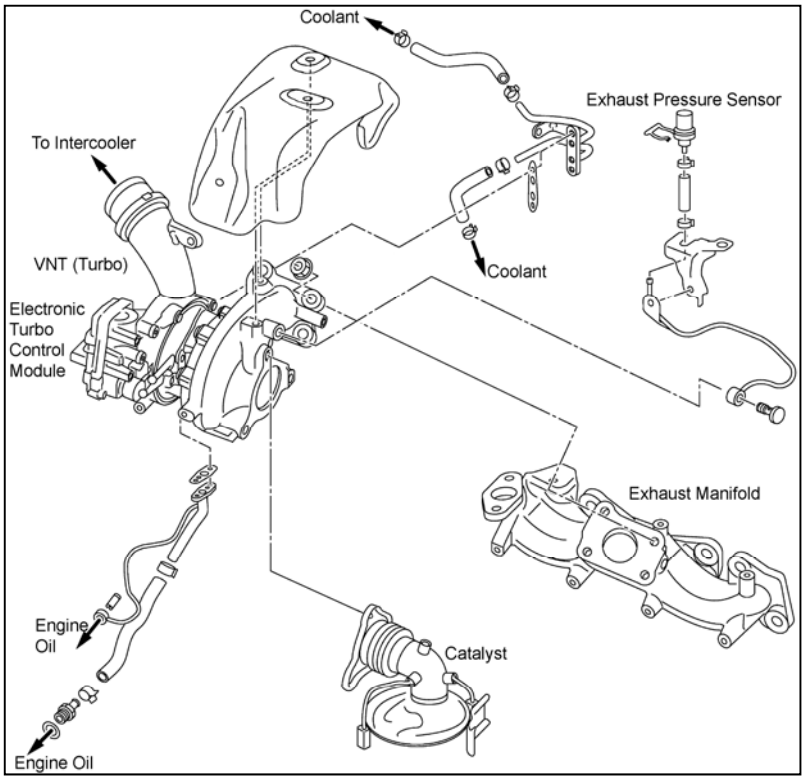
YD25 Type 2

ENGINE MECHANICAL

YD25 2010MY Exhaust Manifold, Turbo & Catalyst

A revised Exhaust Manifold has been utilised. Exhaust Pressure & Temperature sensors have also been added.
An electronically operated Variable Nozzle Turbo (VNT) or Variable Geometry Turbo (VGT) has been utilised in place of the previous vacuum operated type.
The Electronic VGT unit continues to be Water Cooled.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)



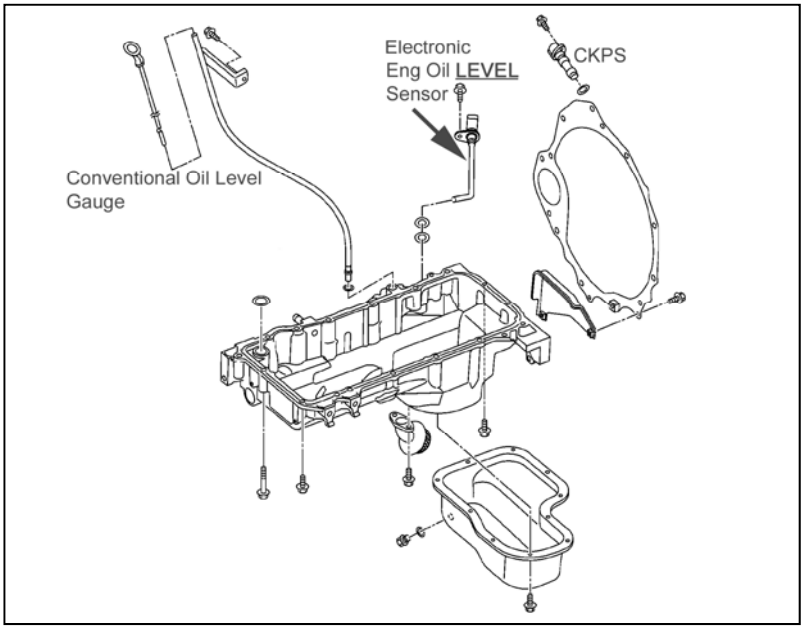
YD25 2010MY

YD25DDTi Oil Pan

The Oil Pan design is very much the same as that installed on the ZD Engine.
Take note of the Electronic Oil Level Sensor. This is discussed in more detail further on in this Training Manual.
Take care of the Crank Shaft Position Sensor at the rear of the engine also.
Further information regarding the components shown right can be found in sections EM of the Service Manual**.**

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE 1:
For D22, please refer to section EM of the Service Manual.

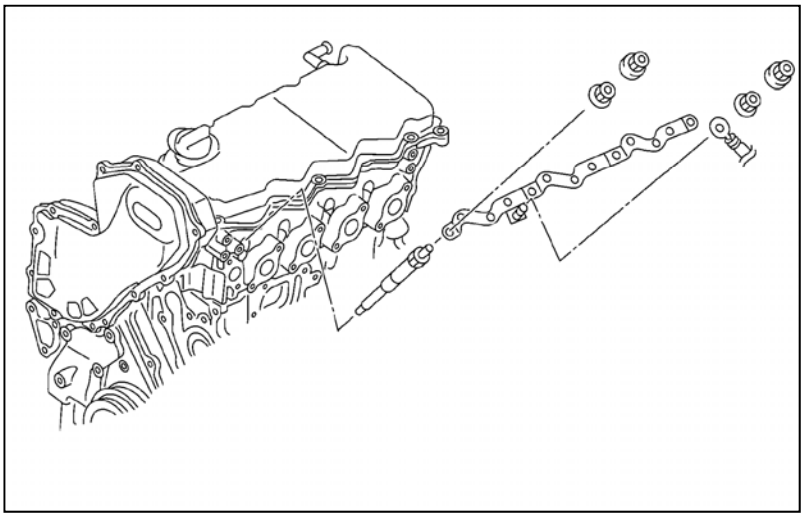


YD25 Type 1, Type 2 & 2010MY

ENGINE MECHANICAL

YD25DDTi Glow Plugs

Once again the Glow system construction & operation is near identical to the ZD Engine. It is necessary to remove the Glow Plugs in order to measure the Engine Compression.



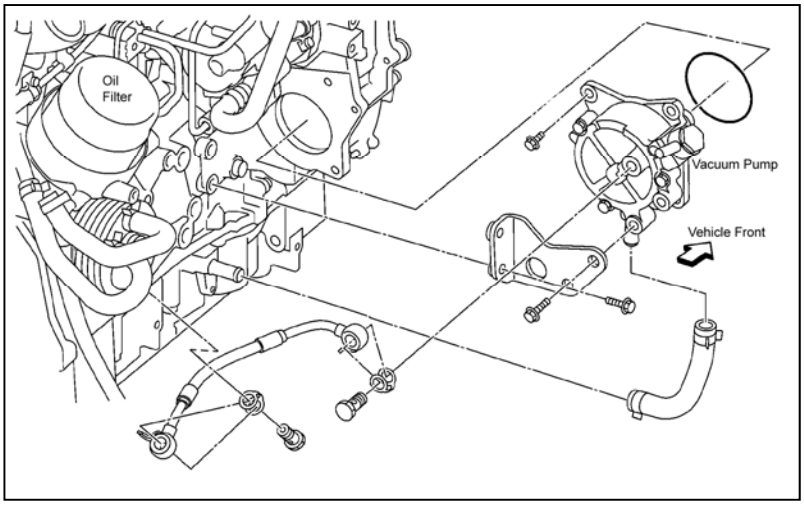
Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE:
Even though the YD compression adapter SST appears to be similar to that used on ZD engine, the SST's are different. The use of a ZD compression gauge adapter on a YD engine will result in **serious engine damage.** The SST number for all YD25 Compression Testing; **ED19600610**

Further detail & precautions regarding the checking of the Engine Compression can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical) > CYLINDER HEAD

YD25DDTi Vacuum Pump

The Vacuum Pump is Engine driven & is located on the RH side of the Engine.



Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE 1:
No SST's are required for the removal of the Vacuum Pump.

NOTE 2:
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.

Vacuum Pump supplies vacuum to the;
- **Brake Booster (All YD25)**
- **Turbo Boost Actuator via ECM controlled solenoid (YD25 Type 1 & 2 only)**
- **Intake Air Throttle Valve via ECM controlled solenoid (YD25 Type 1 only)**
- **EGR Bypass Cooler via ECM controlled solenoid (YD25 2010MY only)**

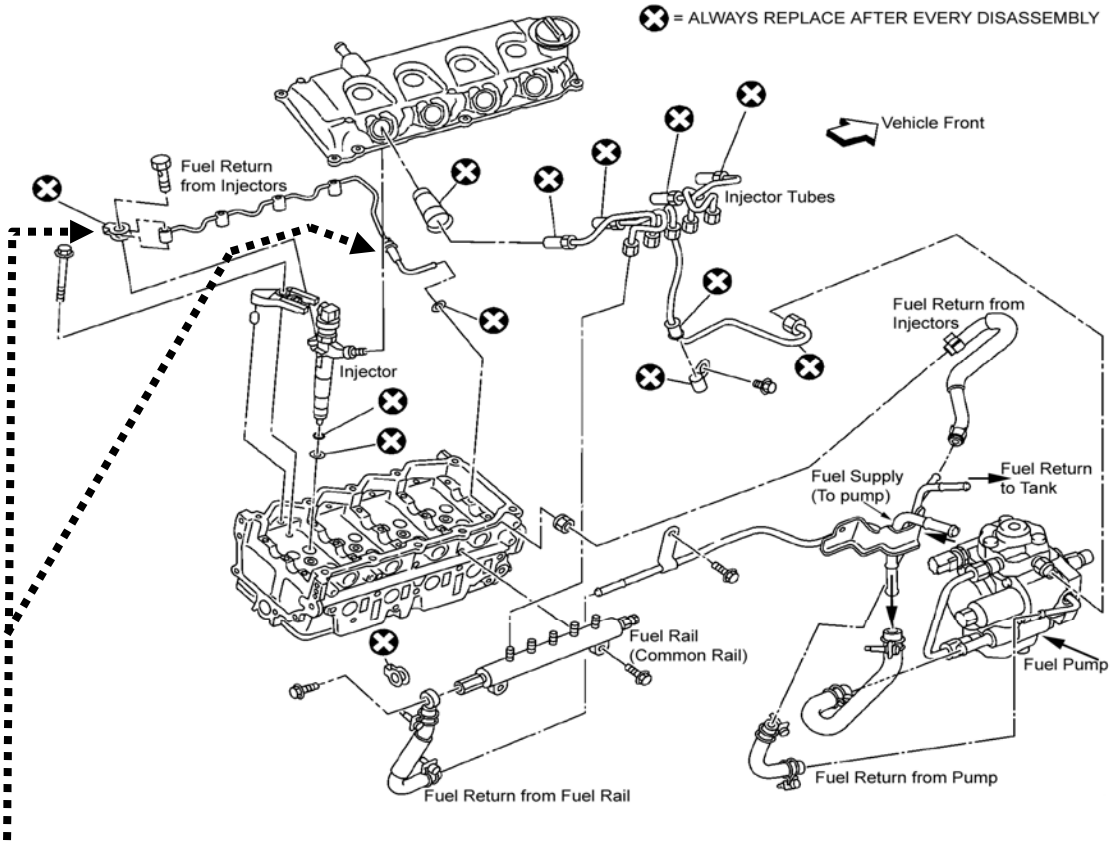
ENGINE MECHANICAL

YD25DDTi Fuel Rail, Pump & Injectors

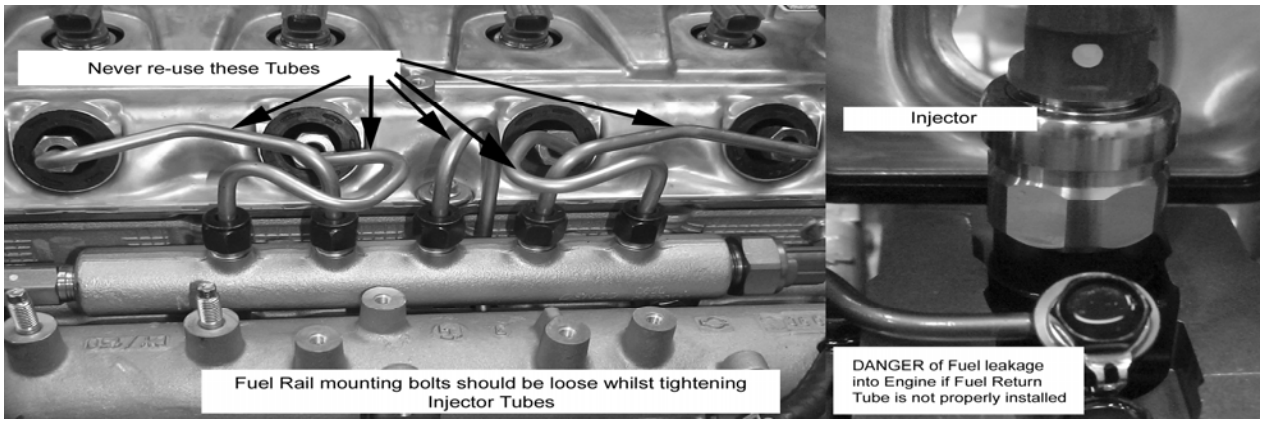
The Common Rail along with the Injectors & Pump are mounted as shown in the diagram. **Take note** of the components that **cannot** be re-used once they have been removed or loosened.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE:
For the YD25 2010MY engine, the Inlet Manifold **does not require removal** as part of the Fuel Rail removal process.



IF INSTALLED INCORRECTLY, THESE WASHERS WILL LEAK FUEL INTO THE ENGINE. CAREFULLY FOLLOW DIRECTIONS IN SECTION B – EM OF THE SERVICE MANUAL WHEN RE-INSTALLING OR SERIOUS ENGINE DAMAGE WILL RESULT.

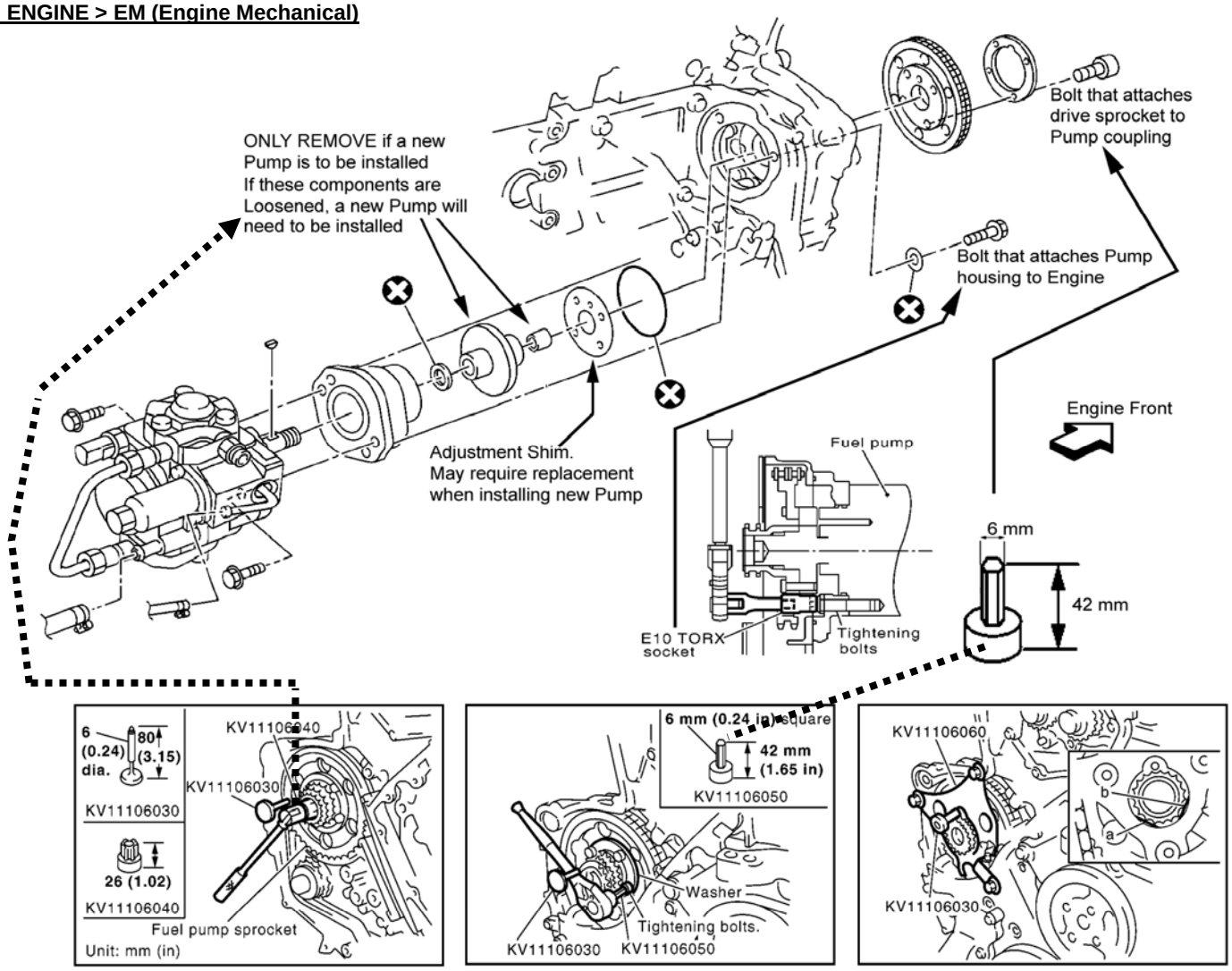


ENGINE MECHANICAL

YD25DDTi Fuel Pump Removal

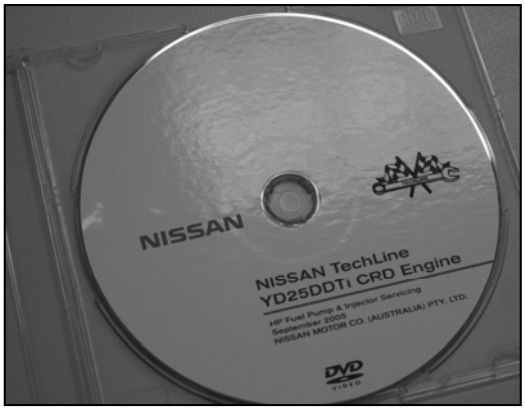
Carefully follow the procedure outlined in section EM of the Service Manual when removing & re-installing the Fuel Pump as well as fitting a complete new pump.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)



DO NOT LOOSEN BOLT. It is only being turned in order to rotate Pump shaft.

Substitute tools are OK.



This TRAINING DVD demonstrates step by step how to remove the YD25 Fuel Pump.

Contact TechLine via a non vehicle related enquiry if you do not have a copy of this DVD.

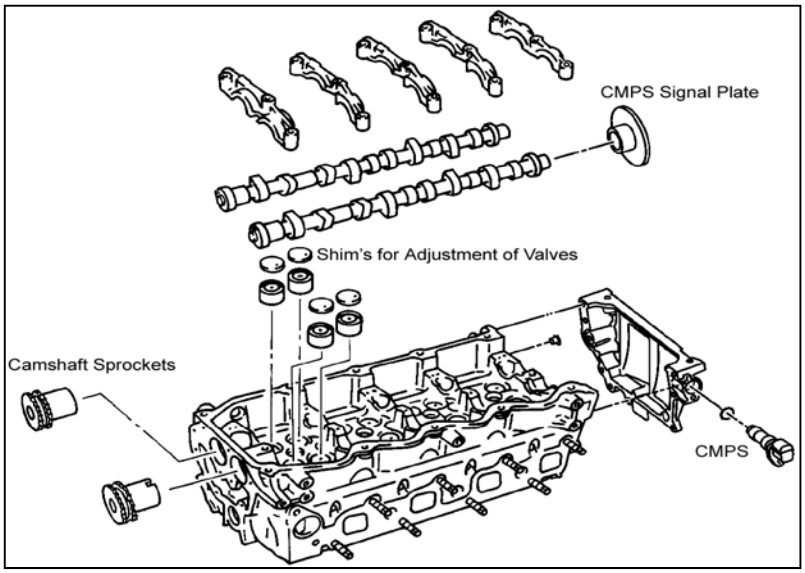
Otherwise send an e-mail to; training@nissan.com.au

ENGINE MECHANICAL

YD25DDTi Camshafts & Cyl Head

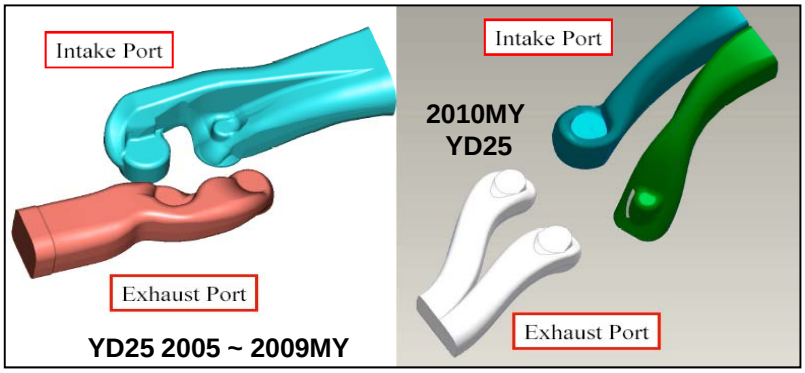
The construction of the Cylinder Head is similar to that on the ZD Engine. However the Camshaft Signal Plate & sensor (CMPS) is located at the rear of the head.
The valves (like the ZD) are shim adjustable. However valve clearance adjustment is **not** required unless there is a problem.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)



YD25 2010MY Cylinder Head

The Intake & Exhaust ports have been relocated in the Cylinder Head of the new 2010MY engine.
For the earlier version of the engine, the Intake Valves & Exhaust Valves were located on the left & right side of the cylinder head. Therefore both the camshafts operated Inlet & Exhaust Valves. This is the same as the ZD30 & M9R diesel engines.
For the 2010MY YD25, the design of the head is similar to that of a petrol engine, where the Exhaust Valves are located on the left side of the cylinder head & the inlet valves are located on the right side of the cylinder head.

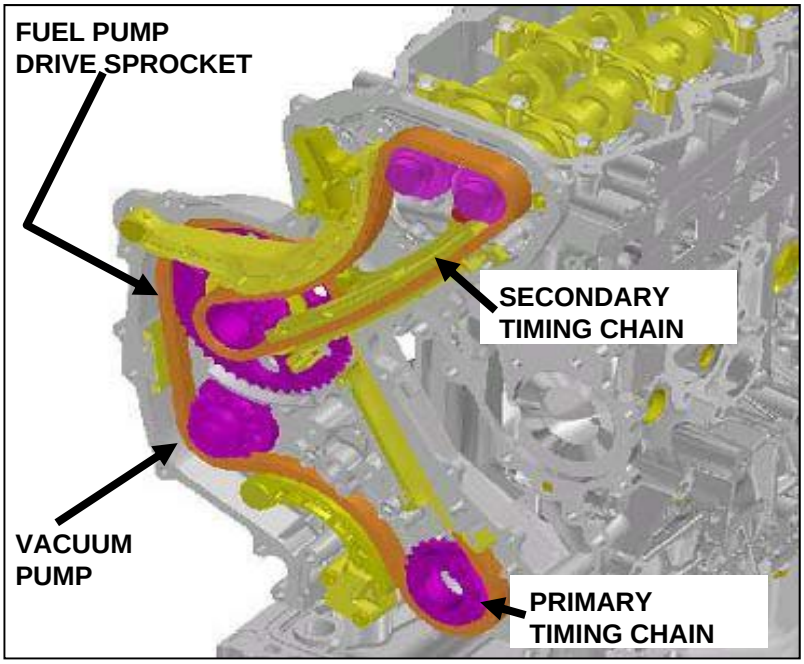


YD25DDTi Primary & Secondary Timing Chain

The Engine Timing system is configured as displayed in the diagram shown right.
There are 2 x separate chains, a single row Primary chain (lower chain) & a double row Secondary chain (upper chain).
The Vacuum Pump & Fuel Pump is driven by the Primary chain. The Camshafts are driven by the Secondary chain.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

Also refer to **STB EM 09-002**

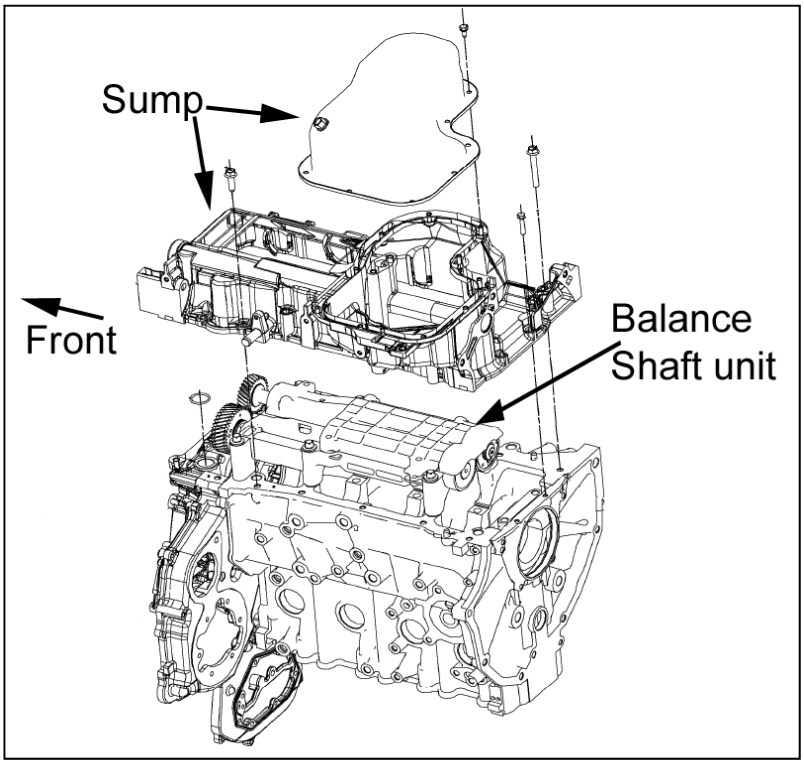


ENGINE MECHANICAL

YD25DDTi Balance Shafts

The YD Engine like the ZD engine utilises Balance Shafts in order to reduce engine NVH.
However the Balance shafts are a self contained unit located in the sump & are driven by a gear on the front of the crankshaft.
The unit is similar in design & operation to that installed on the QR25 & M9R engine in T31 X-TRAIL.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)



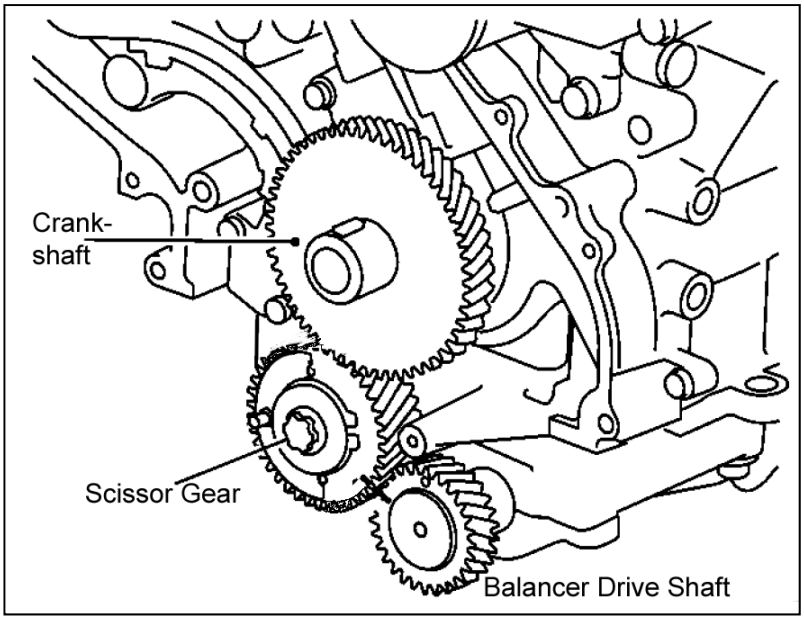
YD25 Type 1, Type 2 & 2010MY

When re-installing the Balancer Unit &/or drive gears & associated components, the **timing** of the Balancer Unit **must be set correctly.**

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > EM (Engine Mechanical)

NOTE 1:
For D22, Balance Shafts are not utilised.

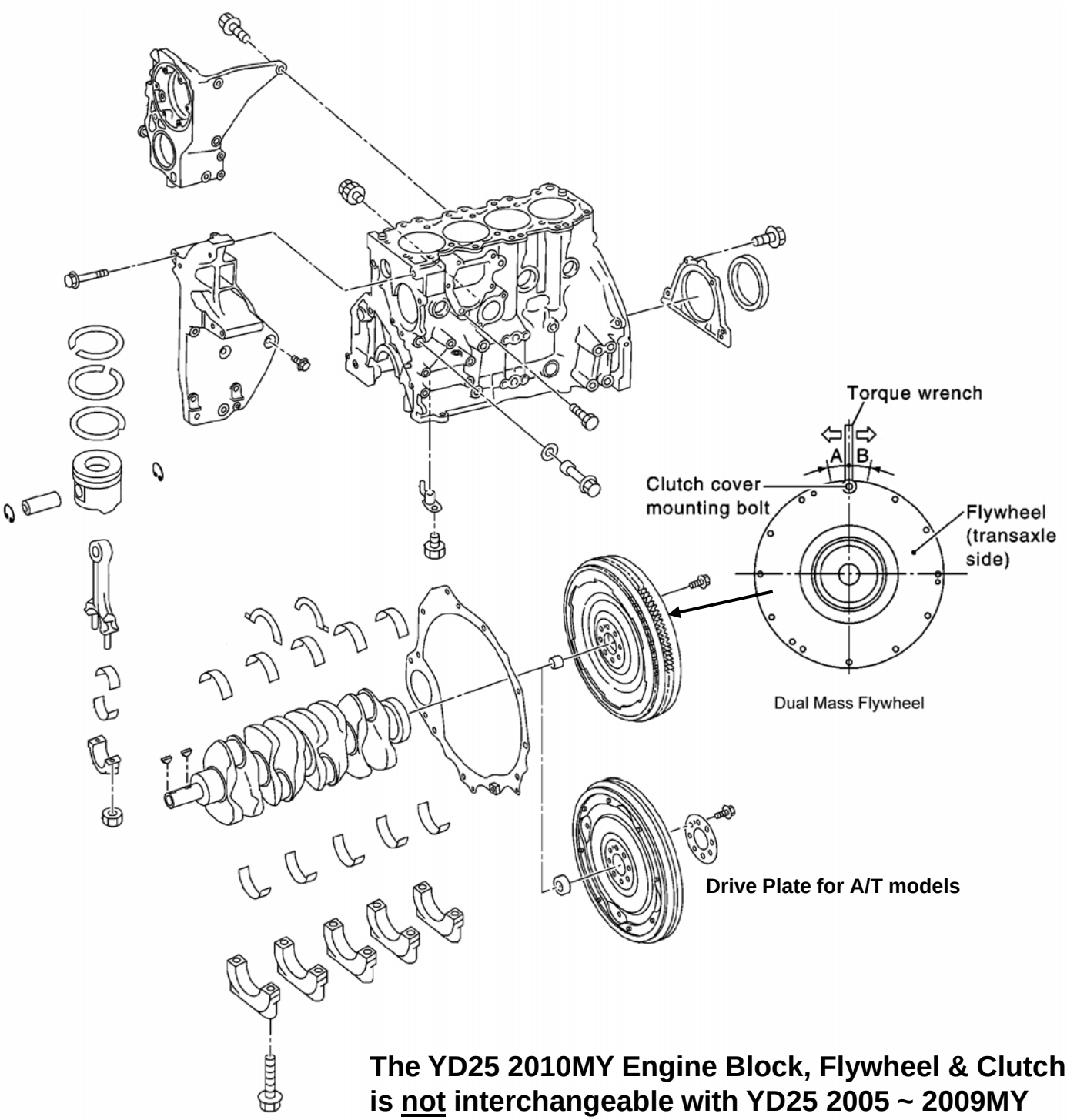
NOTE 2:
No Specials Tools are required for the removal for the Balancer Unit or Gears.



YD25 Type 1, Type 2 & 2010MY

ENGINE MECHANICAL

YD25DDTi Cylinder Block & Dual Mass Flywheel (M/T)



The YD25 2010MY Engine Block, Flywheel & Clutch is <u>not</u> interchangeable with YD25 2005 ~ 2009MY

ENGINE LUBRICATION SYSTEM

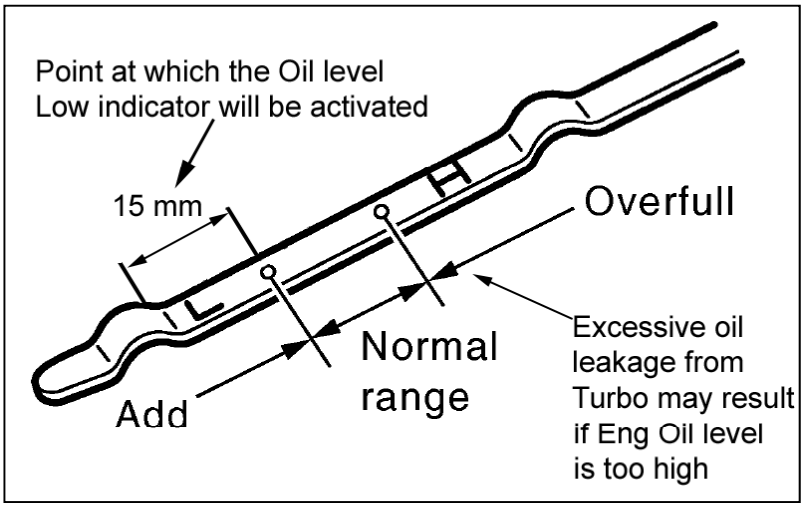
YD25DDTi Oil level Gauge

Like the ZD engine, it is imperative that the Engine Oil Level is correctly maintained. Ideally the Oil Level should be maintained close to the Maximum level at all times.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > LU (Engine Lubrication System)
L MAINTENANCE > MA (Maintenance)

NOTE:
The picture shown right is **not** drawn to scale. It is an example only.



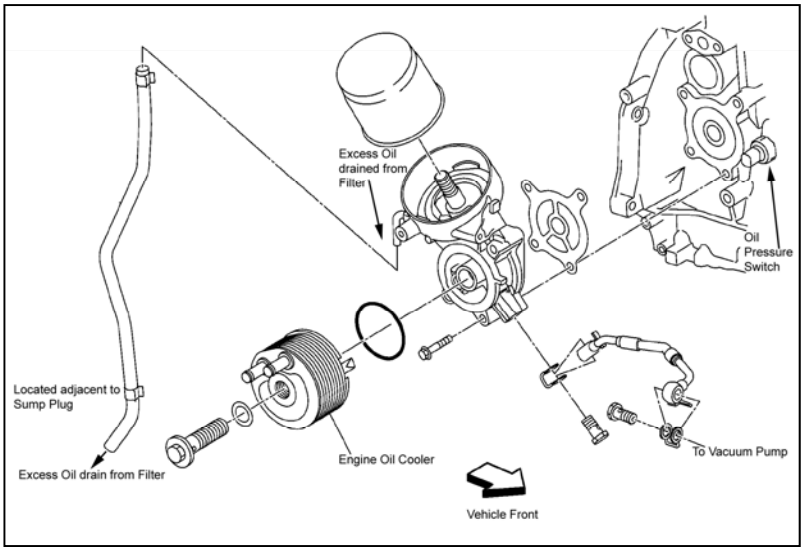
YD25DDTi Engine Oil Filter & Cooler

The Oil Filter is located on the RH side of the engine.
When loosening the filter, excess oil will drain out via a conveniently located tube. Its drain point is located near the sump plug.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > EM (Engine Mechanical)
B ENGINE > LU (Engine Lubrication System)
L MAINTENANCE > MA (Maintenance)

NOTE:
The oil drain tube has been deleted in later production.



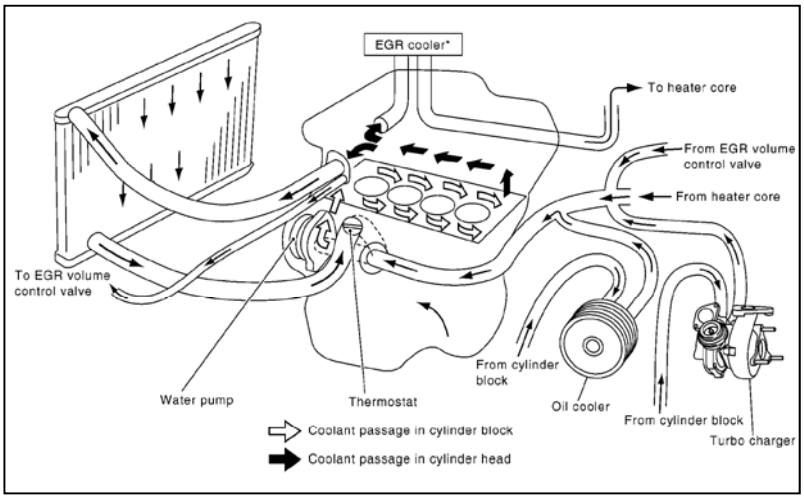
ENGINE COOLING SYSTEM

YD25DDTi Cooling System

Apart from the Heater core, Engine Coolant will also flow through the Engine Oil Cooler at the Engine Oil Filter, the EGR system & Turbo unit as well.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > CO (Engine Cooling System)
L MAINTENANCE > MA (Maintenance)



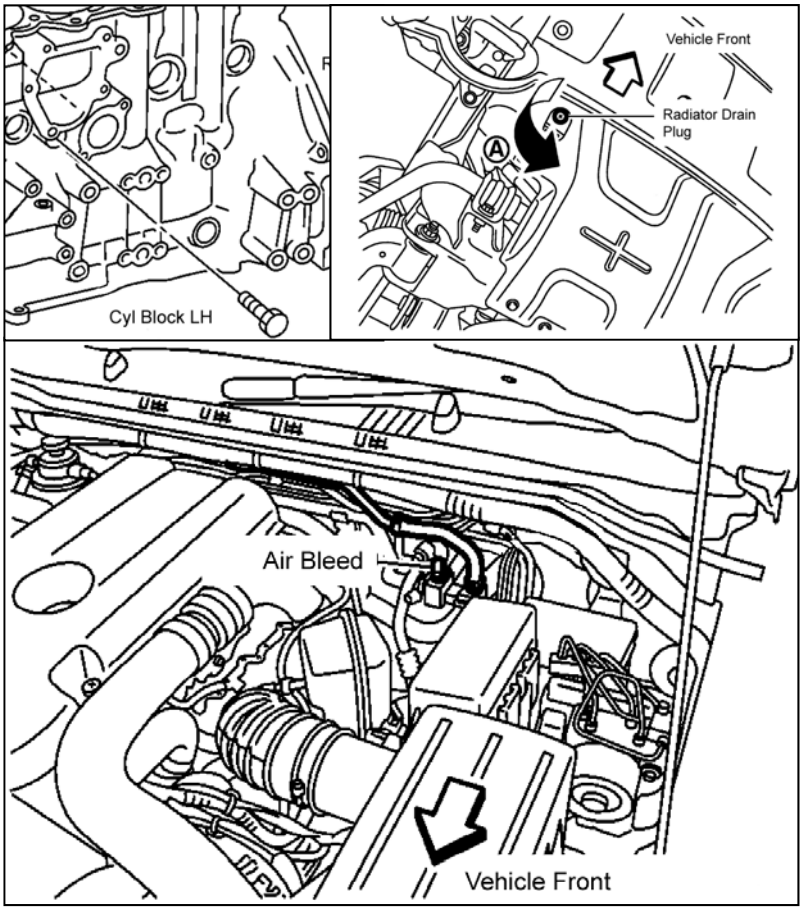
YD25DDTi Cooling System Maintenance

When the Coolant is to be changed (refer to section MA of the Service Manual for the coolant change schedule), please ensure the coolant is completely drained from the 2 x positions shown right.

When re-filling, take note of the point where to bleed any air which is trapped in the system.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;

B ENGINE > CO (Engine Cooling System)
L MAINTENANCE > MA (Maintenance)



R51 & D40

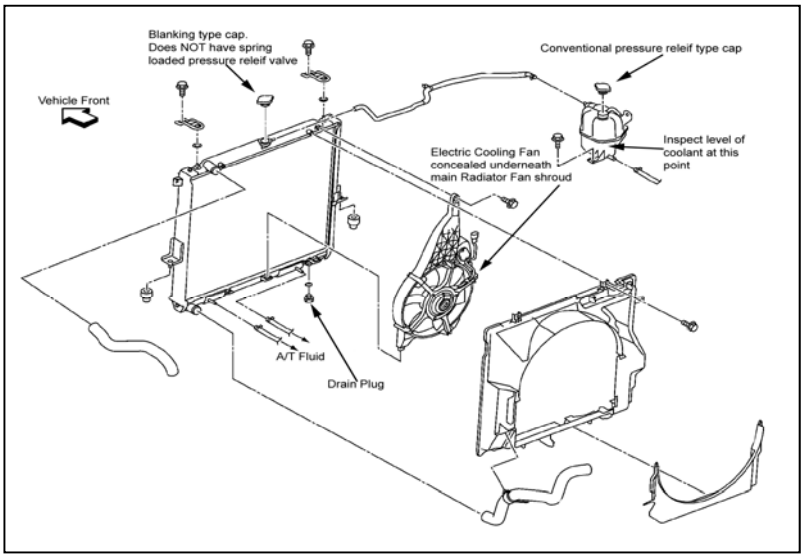
ENGINE COOLING SYSTEM

YD25DDTi Radiator & Electric Cooling Fan

The Radiator is a down flow type made from an aluminium core which is crimped onto plastic upper & lower tanks. Plastic fan shrouds are attached to the inner side of the radiator in order to assist the main Viscous Fan (engine driven) draw air through the radiator.

A single electrically operated Cooling Fan is located on the inside of the radiator, underneath the main Fan Shroud. The fan is operated by the IPDM E/R after it has received a request signal from the ECM. The fan cannot be seen from inside the engine bay unless the shrouds are removed.

Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > CO (Engine Cooling System)

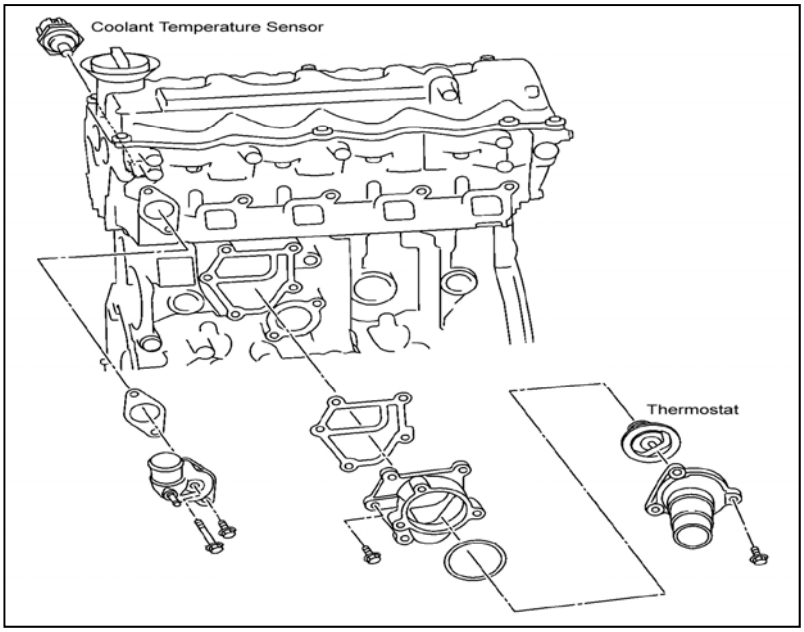


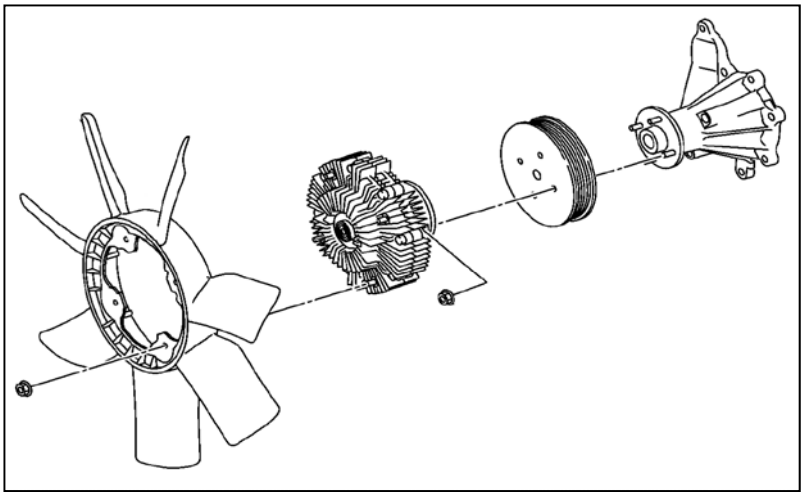
YD25DDTi Thermostat & Viscous Cooling Fan

The Thermostat is located on the LH side of the engine block as shown in the picture right.

The engine driven cooling fan has a temperature sensitive viscous coupling & is mounted on the Water Pump drive shaft.

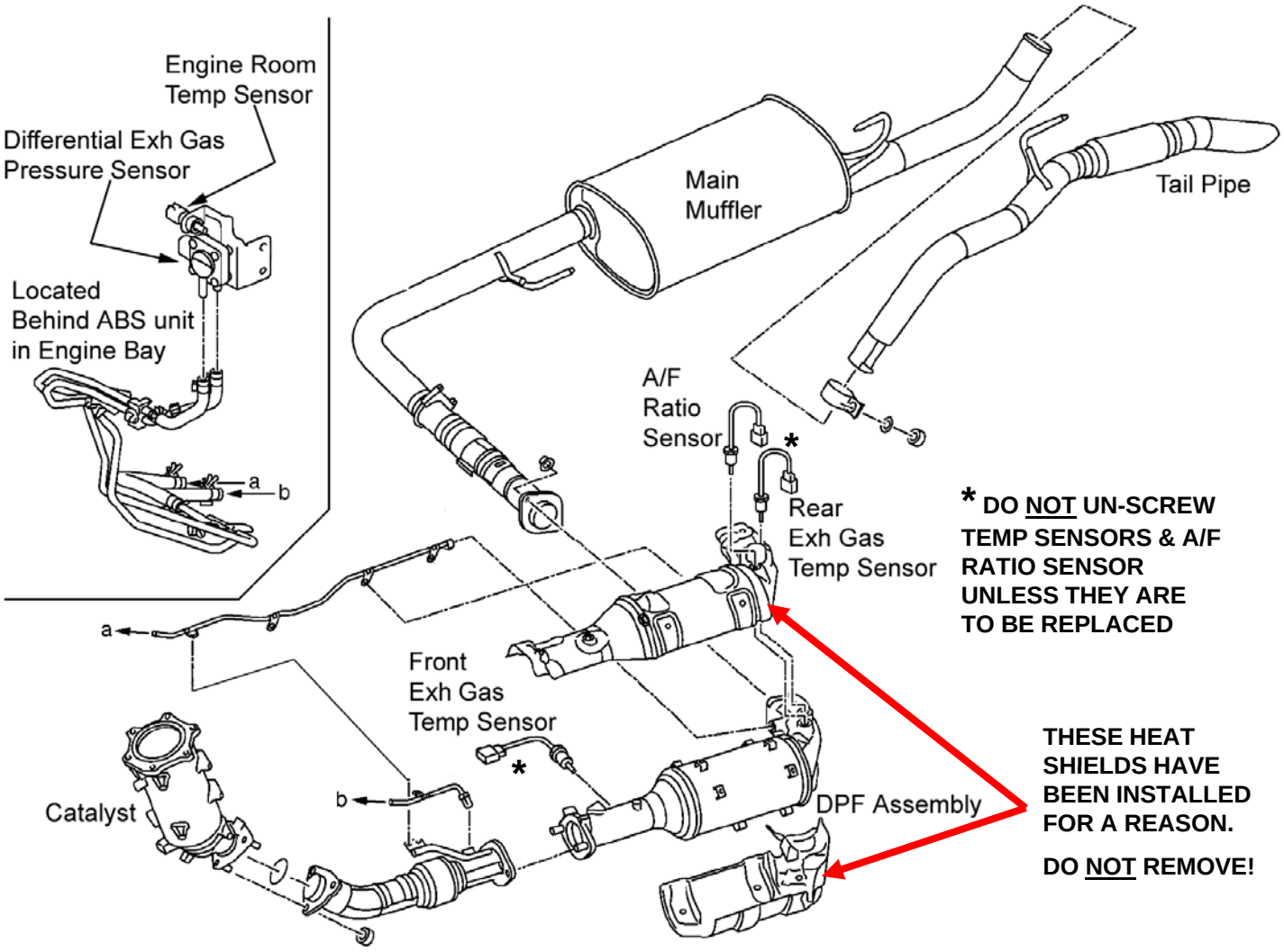
Further detail & precautions regarding the components shown right can be found in the ESM as follows;
B ENGINE > CO (Engine Cooling System)





EXHAUST SYSTEM

YD25 TYPE 2 DPF ENGINE EXHAUST SYSTEM



- Ensure that there is **no** Exhaust Gas **leakage** in **any** part of the Exhaust System.
- Do **not** modify the exhaust system in anyway.
- Do **not** remove or encourage the removal of **any** Heat Shields.
- 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 (dry grass, leaves etc.) whenever the vehicle is presented for service.

DENSO HP3 COMMON RAIL DIESEL INJECTION

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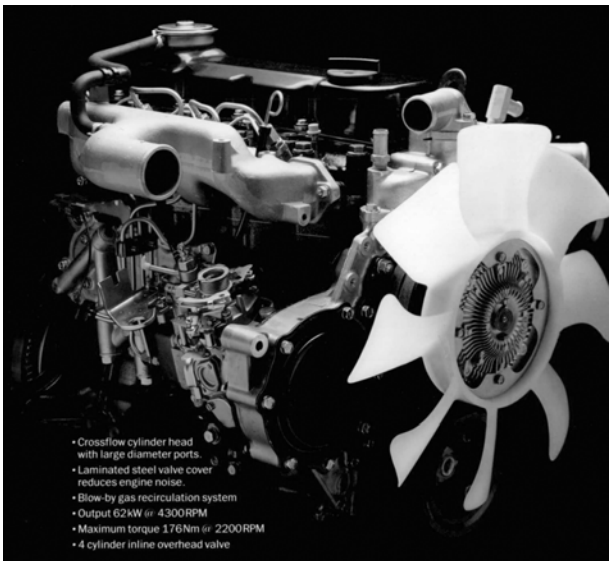
Background – Why Common Rail Diesel?

1986 ED35 4 cyl Direct Injected Diesel



1987 TD27 4 cyl In-Direct Injected Diesel

The Environment & Emission Regulations

Worldwide there is a strong demand for improved vehicle fuel economy and reduced exhaust gas emissions. In addition to this the consumer has an expectation for good driveability. The vehicle must be able to be driven at high speeds with ease, accelerate quickly & do so with minimal noise & pollution.

Diesel engine vehicles are highly acclaimed for good fuel economy. European regulations were therefore designed to encourage European vehicle consumers to move towards Diesel powered vehicles in order to address future fuel & environmental preservation issues.
However diesel engines typically performed poorly in the areas of “Nitrogen Oxides (NOx)" and “Particulate Matter" (PM) being contained in the output exhaust gas. These items had to be greatly reduced in order to meet more stringent exhaust gas regulations.
In addition to this, poor engine performance, excessive noise & visible pollution issues tended to make diesel vehicles unpopular to consumers.

Marketability, high demand for good fuel consumption & clean emissions required the advancement of engine & fuel system technology to alleviate the diesel engine negatives.
Common Rail Fuel systems along with modern engine design has been able to successfully address all of these issues.

DENSO HP3 COMMON RAIL DIESEL INJECTION

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Demands on Diesel Powered Vehicles

With consumer demand for good performance and vehicle operating convenience plus the demands from authorities to meet strict emissions, the Diesel engine is placed under a lot of pressure to satisfy many areas;

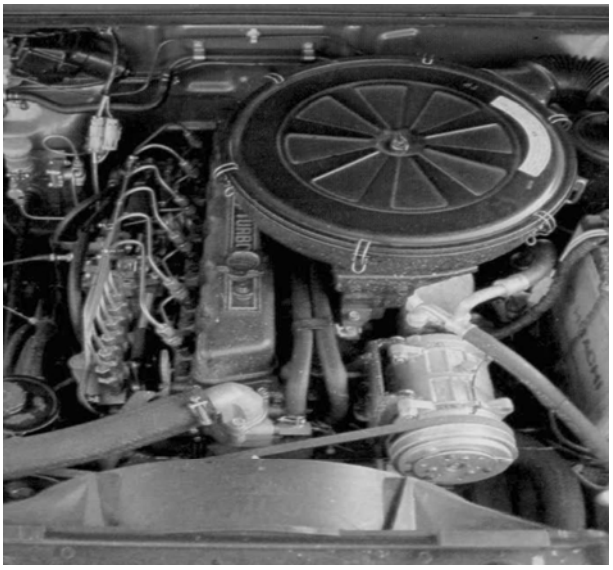
- Less emission of Nitrogen Oxides (NOx), Particulate Matter – smoke etc. (PM), Carbon Monoxide (CO), Hydrocarbon (HC) from the exhaust gases.
- Improved fuel economy.
- Reduction of noise.
- Improved power output and driving performance.

With these demands in mind, Diesel Engine & Fuel System designers & manufacturers had to develop highly advanced Engines & Fuel Systems in order to meet these requirements.

Systems such as the Electronically controlled Pump used on RD28ETi Engine in Y61 & TD27ETi Engine in R20 (Bosch COVEC) as well as the system on the 2000 ~ 2006MY ZD30 Engine (Bosch VP44) were partially able to meet the above described demands. However this still was not enough. The demands only increased in all areas so further developments needed to be made.

The introduction of a fully electronically controlled Common Rail Diesel engine combined with advanced engine design has now addressed this issue in full.
Engines of smaller capacity can now produce much more power & torque over a wider RPM range than larger capacity engines. At the same time they use less fuel and produce far less noise & exhaust emissions.

1983 SD33T 6 cyl In-Direct Injected Diesel



1985 SD25 4 cyl In-Direct Injected Diesel

DENSO HP3 COMMON RAIL DIESEL INJECTION

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High Pressure Common Rail vs Electronically Controlled High Pressure Pump

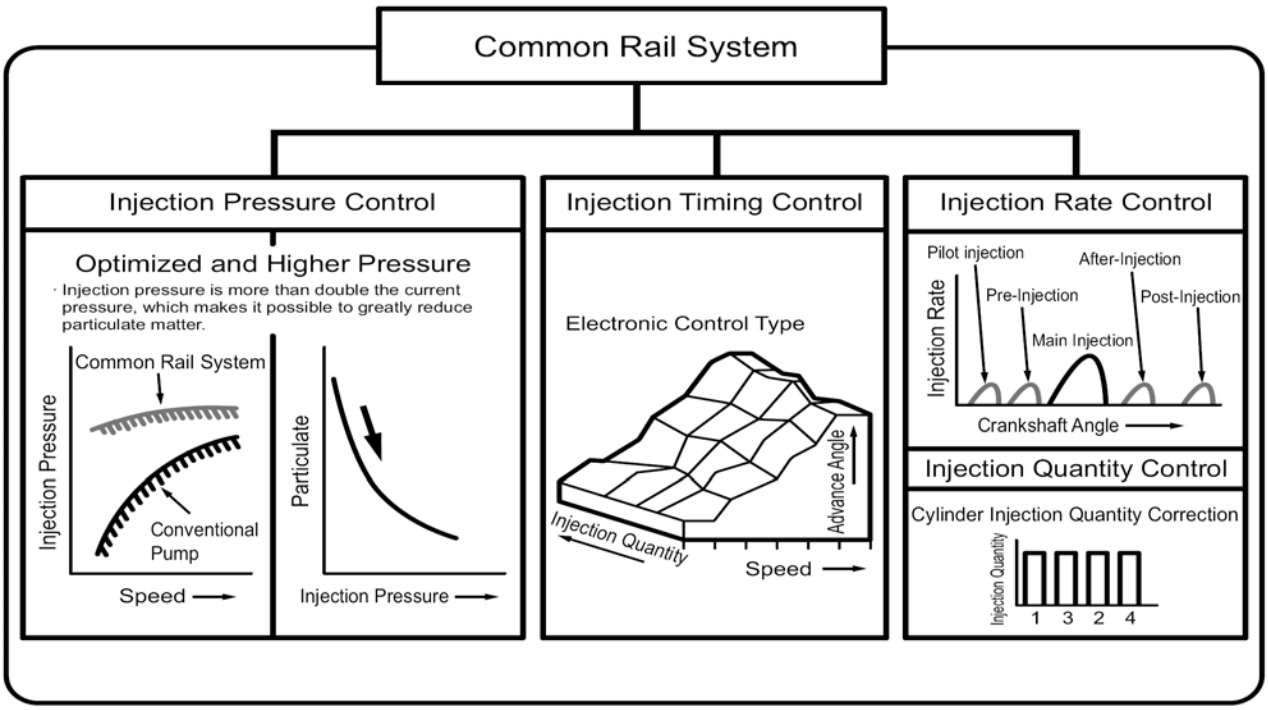
A Common Rail Diesel (CRD) Injection System is able to provide & continuously maintain an extremely high pressure at the injector in order to create a finer spray of fuel for cleaner combustion.
A result of a finer spray of fuel will also result in more power output from the engine & improved fuel economy.

Modern electronically controlled injector pumps also have the ability to produce high pressure at the injector, however this system has its limitations. The advantages that CRD has over the Pump controlled system is found are 3 main areas;
• How much Fuel is delivered (Quantity) over a given period of Time. CRD has a much wider time period available in order to gradually deliver fuel. This achieves a quieter engine operation as well as cleaner emissions.

• When the delivery of the Fuel occurs (Timing) over a given period of time. A CRD system can choose a more optimal time to deliver the Fuel. Therefore more power & cleaner emissions result. This provides for quieter Engine operation as well.

• Even higher pressures over a wider period of time can be produced in order to provide even better fuel delivery into the combustion chamber.

• Lightweight & more compact design of the Fuel System components.



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Cont'd…/

Rotary Pumps – even though Electronically controlled – are limited in the following areas;
• The period of time that the desirable level of Fuel Pressure produced is available for. The High Pressure will only occur when the pump is in a certain position.

• The Injector will only open when the Fuel Pressure is at a certain level & therefore Injection will only occur during the above mentioned Pump Position.

• More complicated & heavier components. Higher cost of production

These are the main limitation's that Injection Systems dependant on Rotary Pumps have if they were to achieve such high levels of performance & low levels of fuel consumption & emissions.
The CRD Engine has a lot more flexibility to do what is needed in order to achieve all of these desirable conditions.

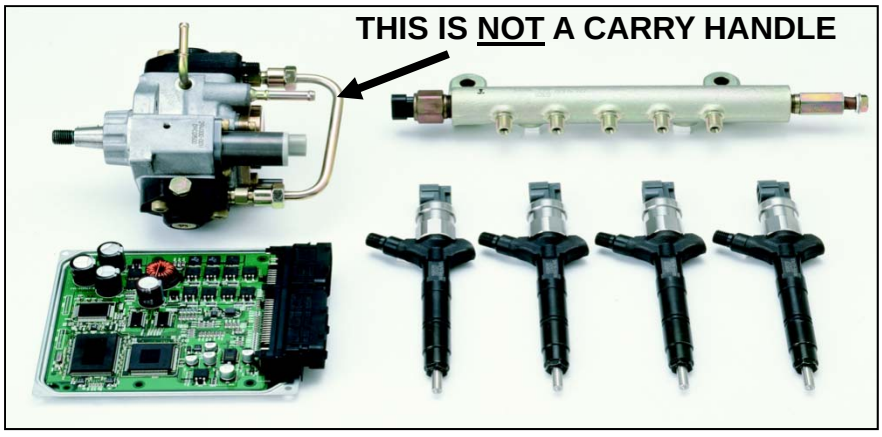
Basic Design Features of CRD

A chamber which is similar in appearance to a Petrol Engine EFI Fuel Rail is mounted along the top of the Engine (i.e: the Fuel Rail or otherwise known as Common Rail)
It 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.

The Fuel is maintained under this extremely high pressure in the rail (ECM controlled pressure) which is directly fed to each injector via small steel tubes.
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.

DENSO was the first in the world to introduce a commercial application of the CRD system.

Maximum Fuel Pressure (Maximum Fuel Pressure in the Common Rail):
- Denso 1800 BAR for 2005 ~ 2009MY YD25 in R51, D40, D22
- Denso 2000 BAR for 2010MY YD25 in R51, D40
- Bosch 1600 BAR for the T31 M9R & Y61 ZD30-CRD engines.



DENSO HP3 COMMON RAIL DIESEL INJECTION

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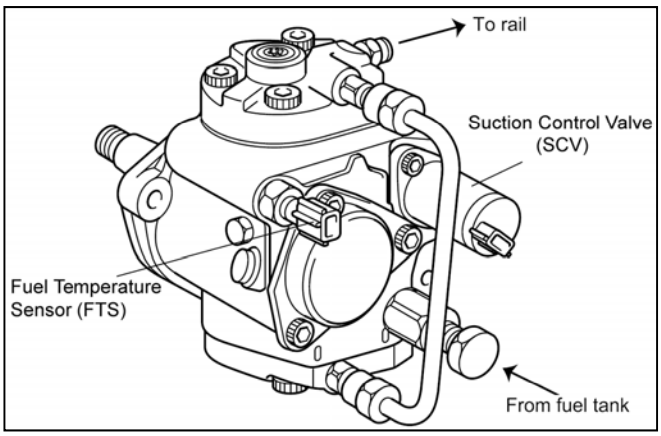
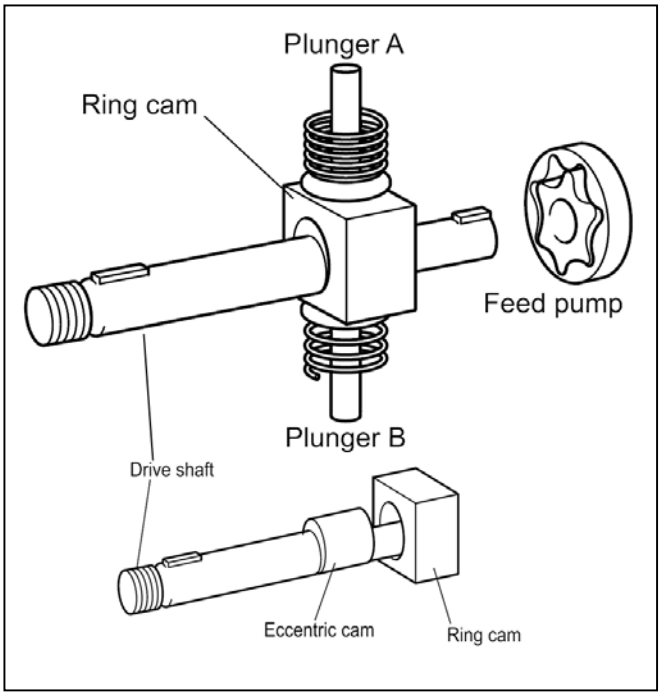
1. Fuel Pump (DENSO HP3)

The supply pump consists primarily of the following;
• Fuel Temperature Sensor.
• Pump body (eccentric cam, ring cam and plungers).
• Feed pump.
• SCV (Suction Control Valve).
WARNING: The "U" shaped tube on the back of the pump is **not** a carry handle for the pump.



(i) Fuel Temperature Sensor

This provide the ECM with the temperature of the fuel to allow for changes of fuel viscosity. Varying fuel viscosity will vary the amount of fuel delivery, therefore the ECM compensates injection rate to allow for this.



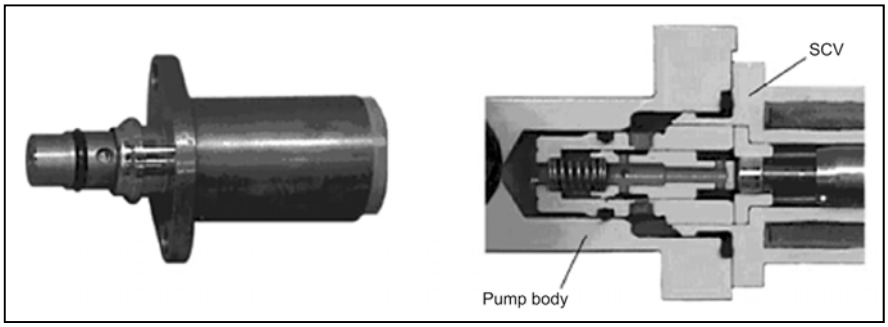
(ii) Supply Pump & Feed Pump

The engine drives the Supply Pump at a ratio of 1:2. It consists of two plungers which are positioned vertically on the outer ring cam for compactness.
The internal camshaft drives the two plungers which pressurise the fuel in the plunger chamber and send it to the rail.
The built-in trochoid type Feed Pump draws fuel from the fuel tank and sends it to the plunger chamber. The feed pumps construction & operation is similar to an oil pump of an engine.

(iii) Suction Control Valve (SCV)

The quantity of fuel supplied to the rail is controlled by the SCV, using signals from the ECU.

(Cont'd over page…/)



DENSO HP3 COMMON RAIL DIESEL INJECTION

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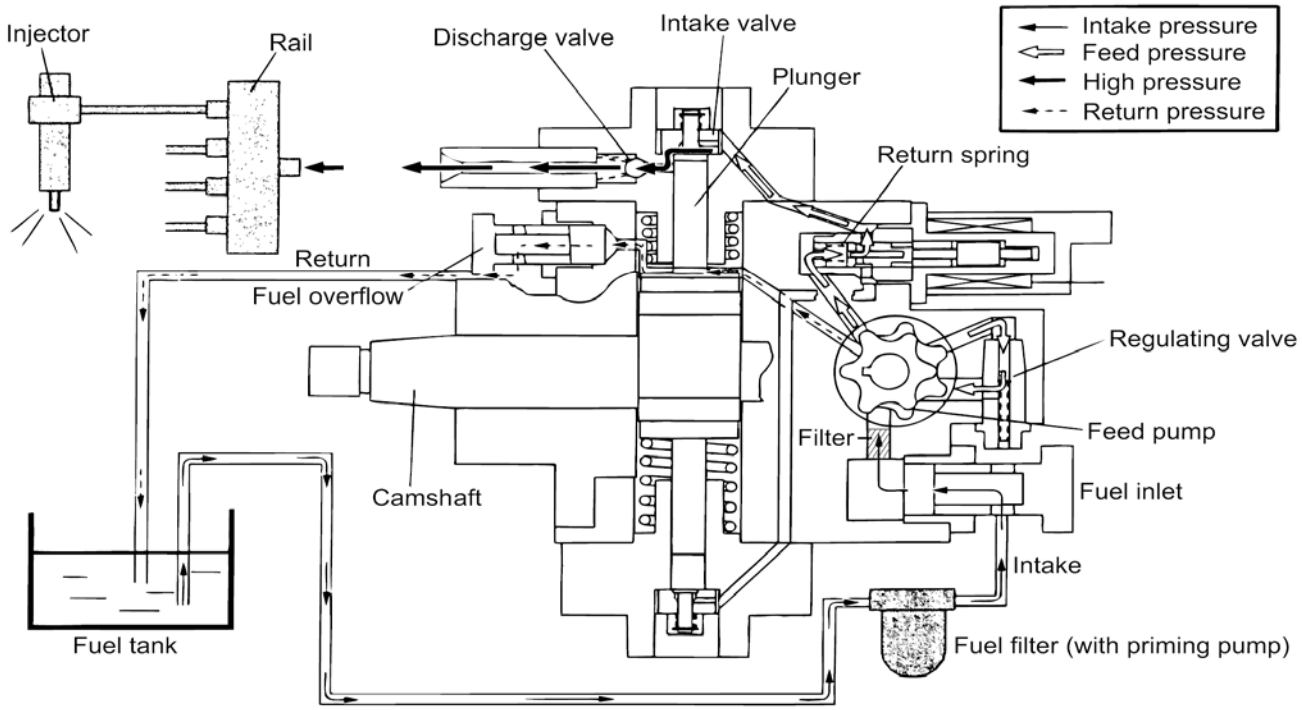
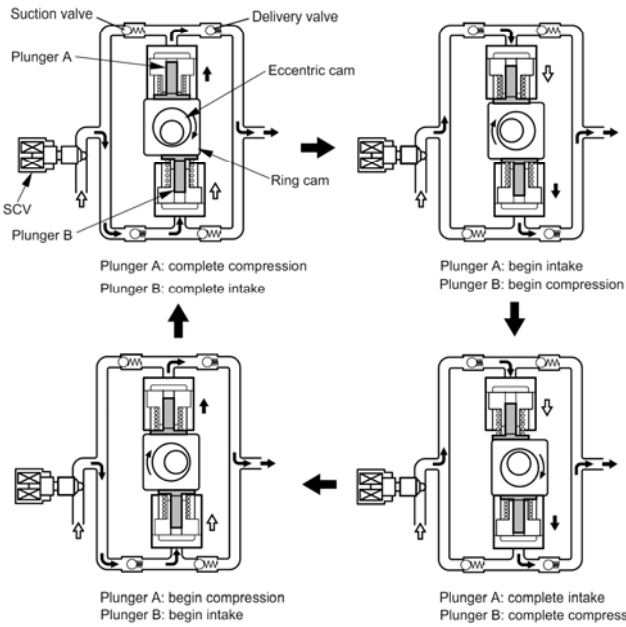
1. Supply Pump (HP3) …/Cont'd



(iii) Suction Control Valve (SCV) - …/Cont'd

The construction & operation of the SCV is typical of an Electrical Solenoid which is operated by a Voltage Signal supplied by the ECU (ON & OFF Duty cycle)

The SCV is a "Normally Open" type (the intake valve is **open** if **not** energised.)
If more Fuel is needed to be pumped (forced under high pressure) into the Rail in order to create a higher pressure for Injection, the ECU operates the Solenoid with less voltage in order for it to open & allow more Fuel to be drawn into the Pumping chamber.
If there is a need for Less Fuel, the ECU increases the voltage at the SCV which in turn forces it to close & restricts that amount of fuel that is allowed to be drawn into the pumping chamber.



EVEN THE TINIEST AMOUNT OF CONTAMINANTS THAT GET INTO THE FUEL SYSTEM CAN CAUSE SERIOUS FUEL SYSTEM ISSUES.
FUEL SYSTEM CLEANLINESS IS VERY IMPORTANT

DENSO HP3 COMMON RAIL DIESEL INJECTION

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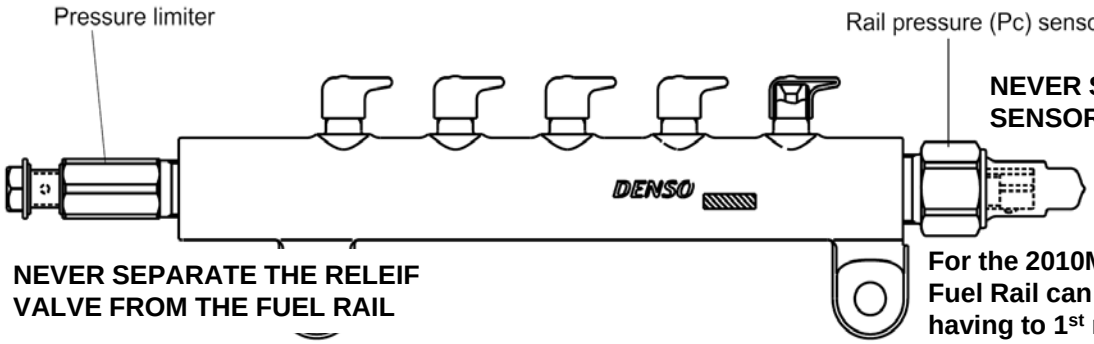
2. Rail (DENSO)

The Rail stores pressurised fuel (Max of 1800 BAR, 26,000psi or Max of 2000 BAR, 29,000psi) delivered from the supply pump and distributes the fuel to each cylinder's injector.

DO NOT <u>EVER</u> LOOSEN INJECTOR PIPES WHILST THE ENGINE IS RUNNING. <u>SEVERE INJURY</u> WILL BE A RESULT OF THIS ACTION!!!



NEVER SEPARATE THIS SENSOR FROM THE FUEL RAIL

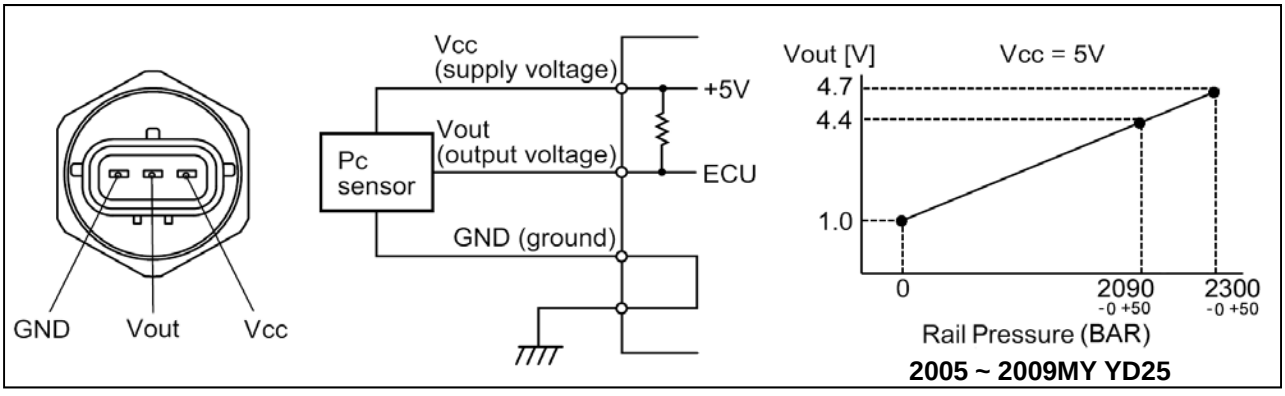
NEVER SEPARATE THE RELEIF VALVE FROM THE FUEL RAIL

For the 2010MY YD25 engine, the Fuel Rail can be removed without having to 1st remove the Inlet Manifold

(i) Rail Pressure Sensor (RPS - DENSO)

The RPS (Pc sensor) is mounted in the front end of the rail and detects the fuel pressure in the rail. This signal is sent to the ECM.

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.

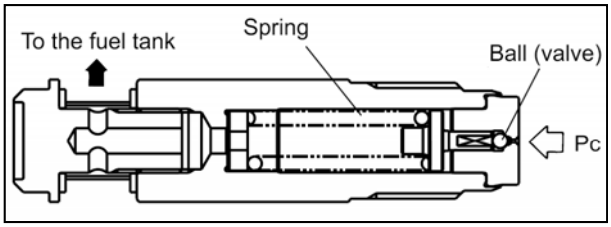


2005 ~ 2009MY YD25

(ii) Rail Pressure Limiter (DENSO)

The pressure limiter relieves excess pressure if an abnormally high pressure is generated.

The valve opens when pressure in the rail reaches approximately 2210 BAR (or 2410 BAR) and closes when pressure falls to approximately 500 BAR. Fuel released by the pressure limiter returns back to the fuel tank.



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

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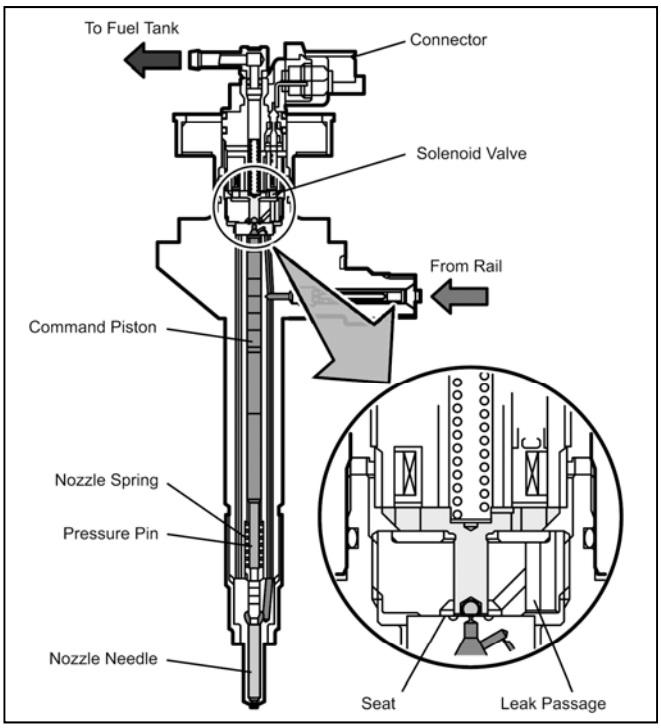
3. Injector (DENSO QR Code Type)

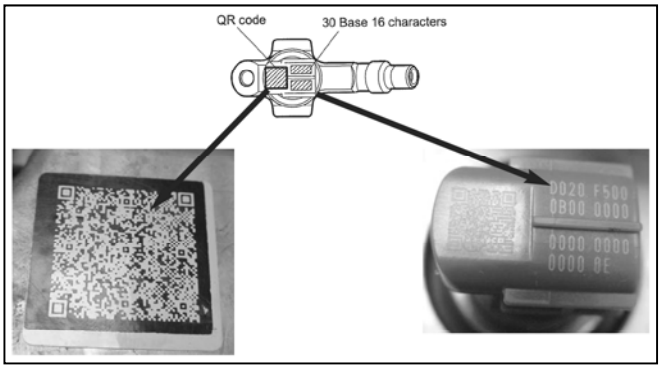
The Injectors inject the high-pressure fuel from the rail into the combustion chambers at the optimum injection timing, rate and spray condition, in accordance with commands received from the ECM.



The Injector is a compact, energy-saving solenoid-control type incorporating a TWV (Two-Way Valve).

The injector used on the YD25DDTi Engine for R51 is a QR (Quick Response) Code type.
The QR has a calibration code stamped into the upper plastic connector socket. This allows the Technician to update the engine's ECM when one (or more) injectors **or** the ECM is replaced.
This is achieved through CONSULT-III Work Support by entering the alpha numeric code via the key board of the CONSULT III and registering the individual injector ID codes to the ECM.
If this process is **not** completed, poor engine low speed drivability & performance will result. DTC's will also be logged.

The advantage of this design is injection quantity accuracy has improved dramatically and as a result each cylinder now can function more efficiently for improved exhaust emissions and reduction in engine noise.



PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING THE HIGH VOLTAGE WHICH OPERATES THE FUEL INJECTORS.

REFER TO STB GI 05-007 FOR MORE DETAIL.

DENSO HP3 COMMON RAIL DIESEL INJECTION

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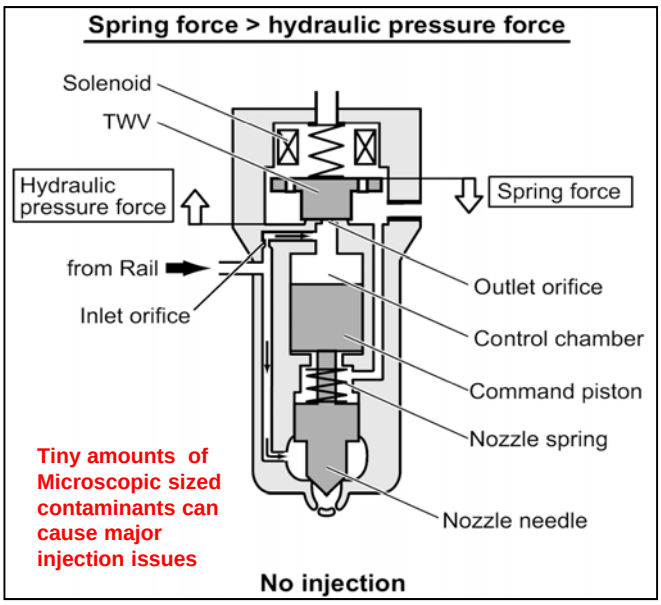
Injector Operation

The Two Way Valve (TWV) solenoid valve opens and closes the outlet orifice to control the pressure in the control chamber, and the start and end of injection.

(i) No injection

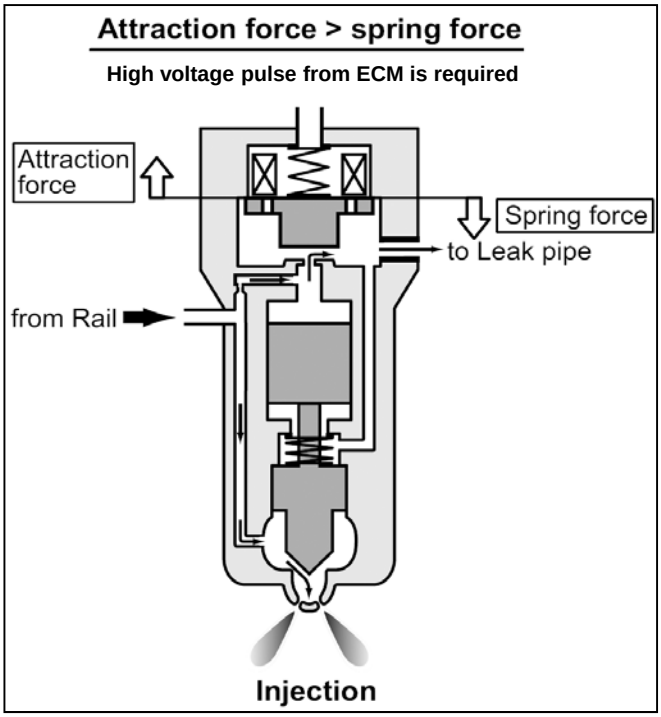
When current is not supplied to the solenoid, the solenoid spring force is stronger than the hydraulic pressure in the control chamber. As a result the solenoid valve is pushed downward, effectively closing the outlet orifice. The hydraulic pressure from the rail is then applied to the top of the command piston. This force, plus the force of the nozzle spring, holds the nozzle needle against its seat and fuel is not injected.



EVEN THE TINIEST AMOUNT OF CONTAMINANTS THAT GET INTO THE FUEL SYSTEM CAN CAUSE SERIOUS INJECTION RELATED ISSUES. FUEL SYSTEM CLEANLINESS IS VERY IMPORTANT

(ii) Injection

When current is initially applied to the solenoid, the attraction of the solenoid pulls the TWV up, opening the outlet orifice and allowing the fuel to flow out of the control chamber to the leak pipe.
After the fuel flows out, the pressure in the control chamber decreases allowing the command piston to move upwards.
Fuel pressure can now work against the lower shoulder of the needle nozzle forcing the needle to rise and injection to begin.
Fuel which escapes past the outlet orifice, flows to the leak pipe and downwards below the command piston assisting it to move upward, helping to improve the nozzle's opening and closing response.
As current continues to be applied to the solenoid, the nozzle can reach its maximum lift, where the injection rate is also at the maximum level.
When current to the solenoid is switched OFF, the TWV falls, causing the nozzle needle to close immediately and the injection to stop.



THE ECM PULSES (OUTPUTS) THE INJECTOR WITH EXTREMELY HIGH VOLTAGE (80 ~ 120V)
ALWAYS ENSURE THE GROUND CONNECTIONS IN THE ENGINE BAY ARE MAINTAINED

PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING THE HIGH VOLTAGE WHICH OPERATES THE FUEL INJECTORS.

REFER TO STB GI 05-007 FOR MORE DETAIL.

DENSO HP3 COMMON RAIL DIESEL INJECTION

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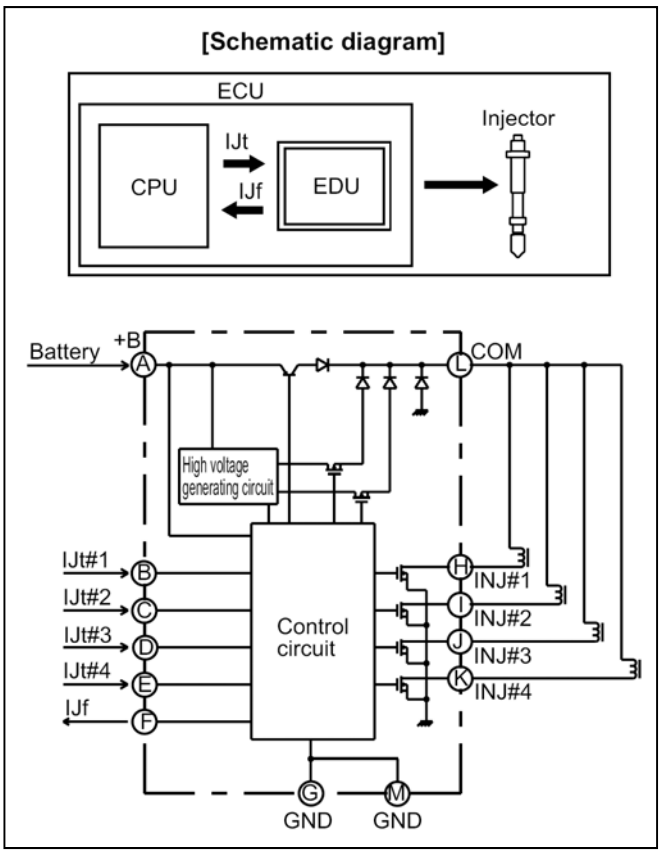
4. ECM (ECU - DENSO)
This is the command centre that controls the fuel injection system and engine operation in general.

The Electronic Drive Unit (EDU) which is a high voltage DC to DC generating device is contained inside the ECM.
This is due to a need to activate the injector solenoids rapidly, hence the need for high electrical current. This current is too much for a conventional ECM to handle.

The EDU is able to transform the battery voltage into a high voltage in a similar manner to that of a gasoline engine's ignition coil.
The ECM signals the EDU, which in turn signals both sides (+ve and -ve) of the injector. The EDU is not independently serviceable.

PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING THE HIGH VOLTAGE WHICH OPERATES THE FUEL INJECTORS.

REFER TO STB GI 05-007 FOR MORE DETAIL.



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DENSO HP3 COMMON RAIL DIESEL INJECTION

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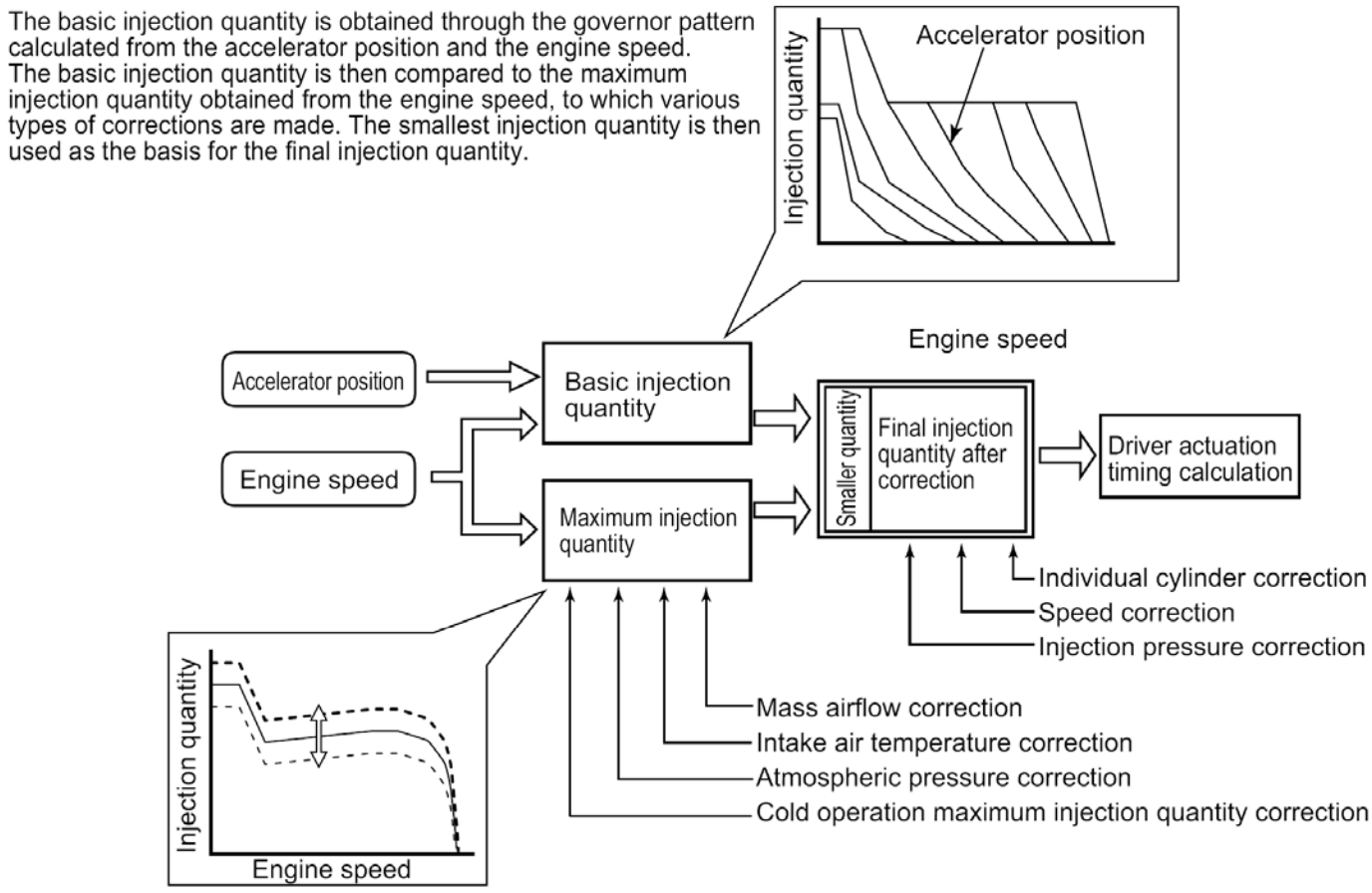
Engine Control

The CRD system effects fuel injection quantity and injection timing control far more accurately than the mechanical governor and timer used in the conventional injection pump system.
The engine ECU performs the necessary calculations in accordance with the sensors installed on the engine and the vehicle. It then controls the timing and duration of time in which current is applied to the injectors, in order to realize both optimal injection and injection timing.

1. Fuel Injection Quantity Control

The fuel injection quantity control function replaces the conventional governor function. With the benefit of electronic control however, additional types of Injection quantity controls are now possible;



DENSO HP3 COMMON RAIL DIESEL INJECTION

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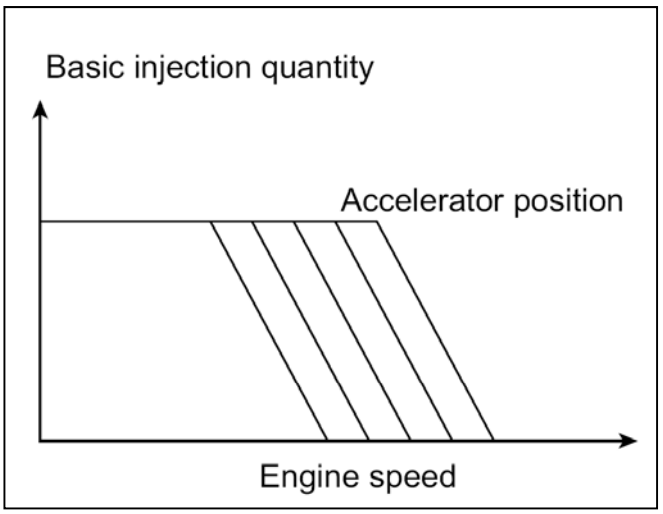
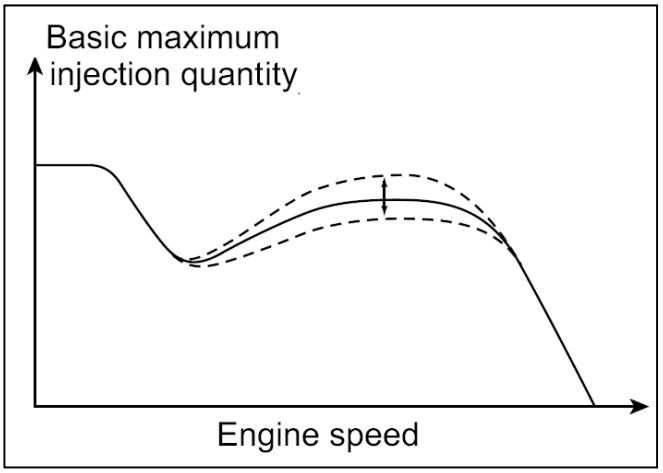
(i) Basic Injection Quantity
The basic injection quantity is determined by the Engine Speed (CKPS) and the Accelerator Position (APP Sensor). The injection quantity is increased when the accelerator position signal is increased while the engine speed remains constant.



(ii) Maximum Injection Quantity
The maximum injection quantity is calculated by adding the below correction factors to the basic maximum injection quantity that is determined by the engine speed;
- Mass Airflow correction
- Intake Air Temperature correction
- Atmospheric Pressure correction
- Cold operation maximum injection quantity correction.



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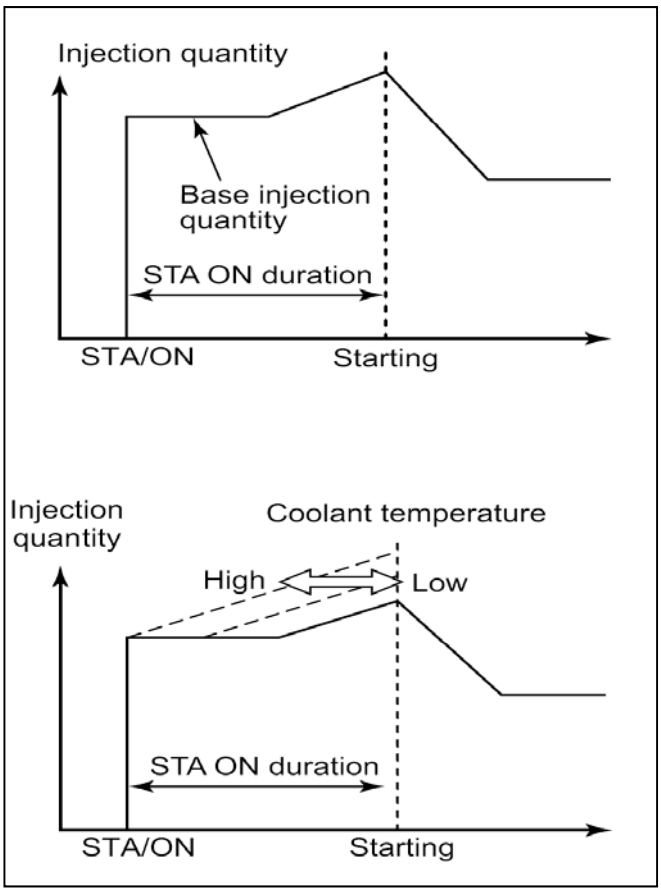
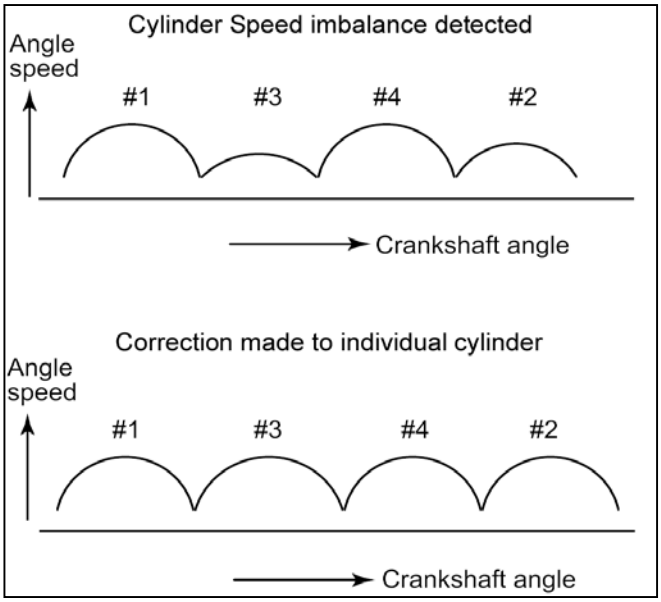
(iii) Starting Injection Quantity
When the Ignition switch is turned ON, the injection quantity is calculated in accordance with the starting base injection quantity and the starter ON time (STA ON duration or ignition switch in CRANK position duration). The base injection quantity and the inclination of the quantity increase / decrease change in accordance with the coolant temperature and the engine speed.



(iv) Idle Speed Control System
This system controls the idle speed by regulating the injection quantity in order to match the actual speed to the target speed that is calculated by the engine ECU. The target speed varies according to the type of transmission (manual or automatic), whether the air conditioner is ON or OFF, the gear position and the coolant temperature.

(v) Idle Vibration Reduction Control
To reduce engine vibrations during idle, this function compares the angle speeds (times) of the cylinders and regulates the injection quantity for the individual cylinders if there is a large difference, in order to achieve a smooth engine operation.



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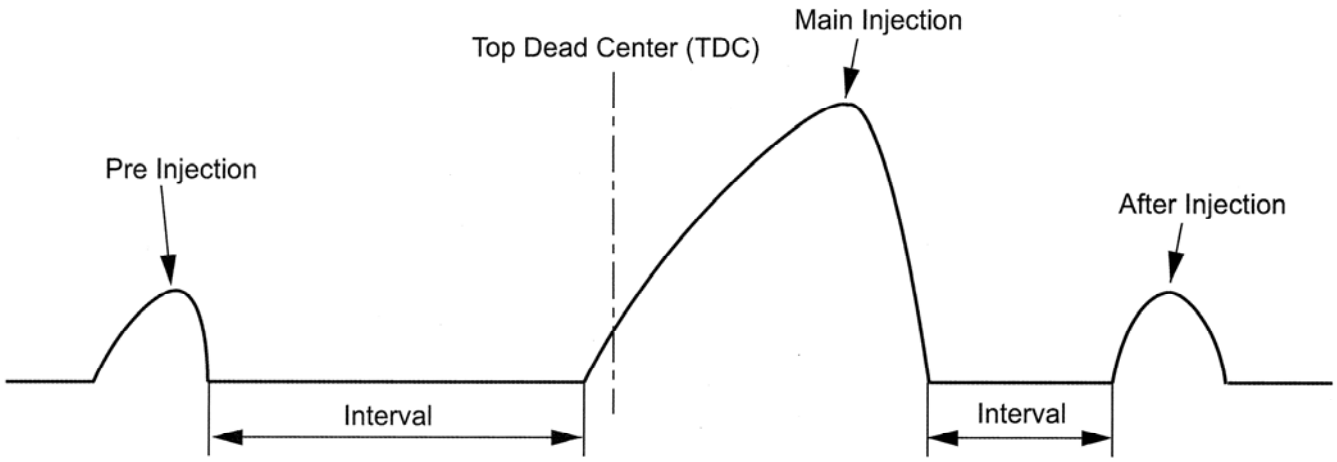
2. Fuel Injection Timing Control

Fuel injection timing is controlled by varying the timing in which current is applied to the injectors.
Once again, precise & more flexible injection timing is made possible with electronic controls.



(i) Main Injection Timing

The ECM calculates the basic injection timing based on the engine speed the final injection quantity, and adds various types of corrections in order to determine the optimal main injection timing.

(ii) Pre Injection Timing

Pre injection timing is controlled by adding a pre injection interval to the main injection timing. The pre injection interval is calculated based on the final injection quantity, engine speed, coolant temperature (map correction).
The pre injection interval at the time the engine is started is calculated from the coolant temperature and speed.

(iii) After Injection

After Injection is added in order to extend the period of combustion over a wider range. A reduction of Particulate Matter (PM) is the main result.

DENSO HP3 COMMON RAIL DIESEL INJECTION

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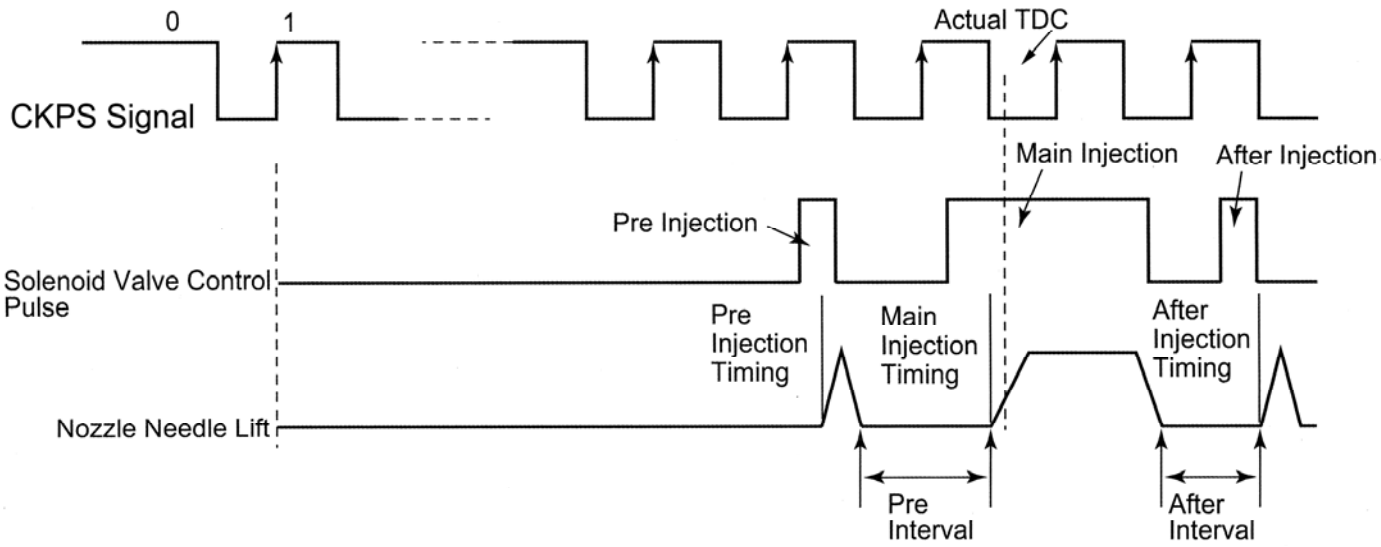
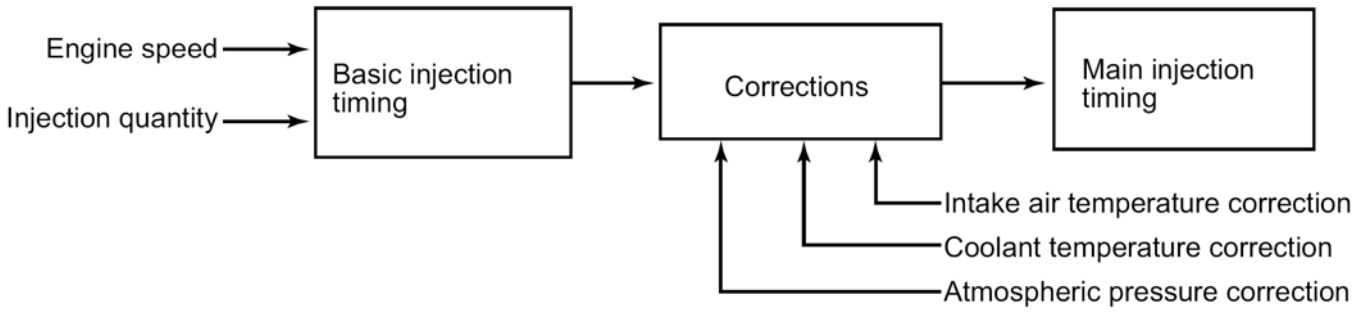
2. Fuel Injection Timing Control (…/Cont'd)

Outline of Timing Control



Injection Timing Calculation Method



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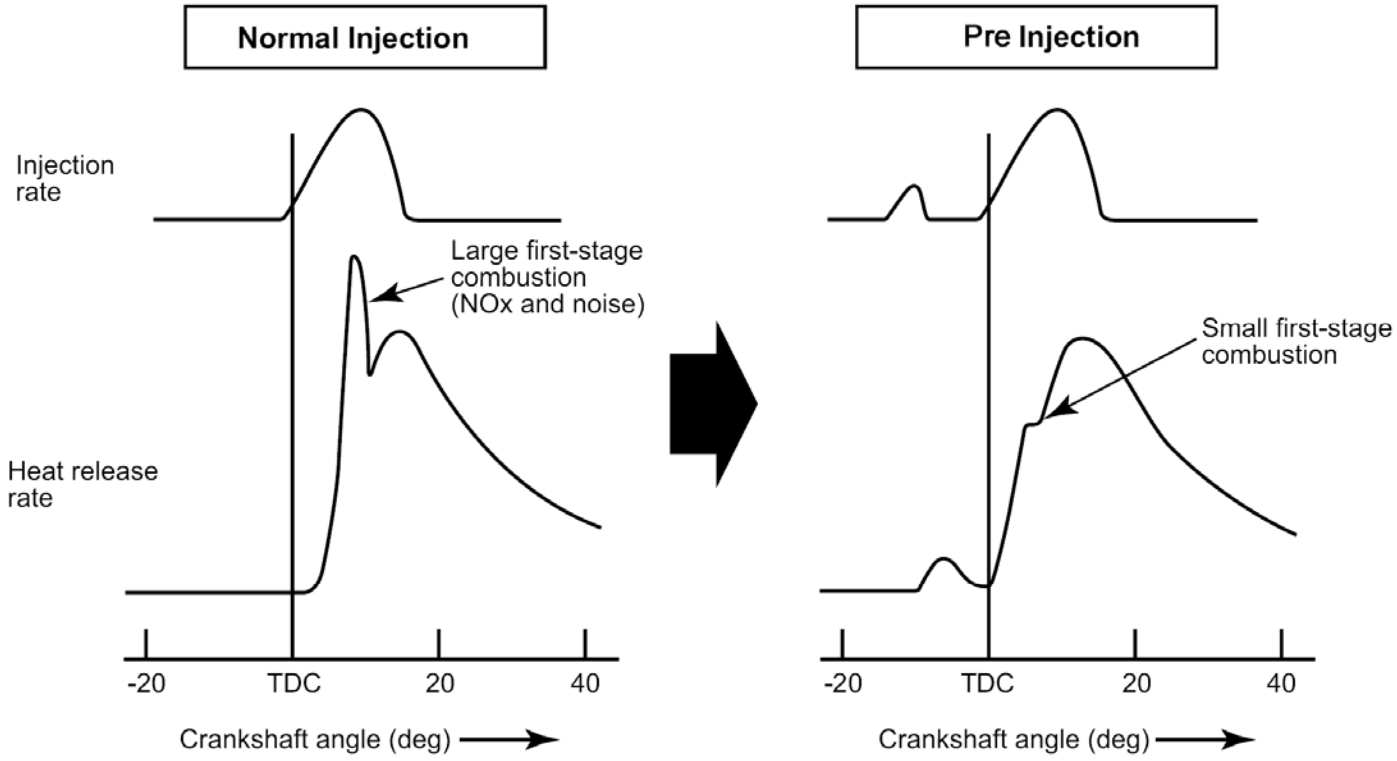
3. Fuel Injection Rate Control

In a conventional high pressure pump system the injection rate increases with the adoption of high-pressure fuel injection. The ignition lag, which is the delay from the start of injection to the beginning of combustion, cannot be shortened to less than a certain value. As a result, the quantity of fuel that is injected until main ignition occurs increases, resulting in an explosive combustion at the time of main ignition. This increases both NOx and noise.

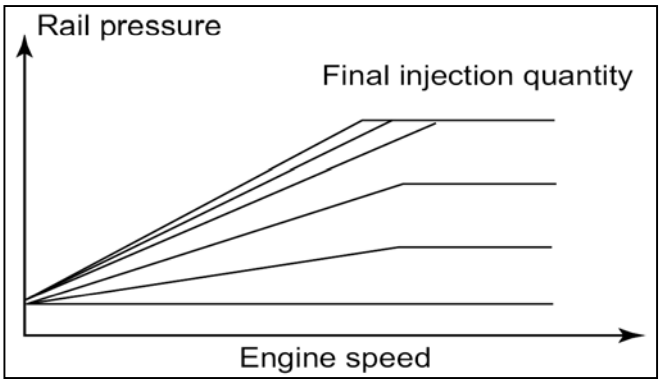
For this reason, pre injection is provided to minimize the initial injection rate & prevent the explosive first-stage combustion. A reduction in noise and NOx is the result.



4. Fuel Injection Pressure Control

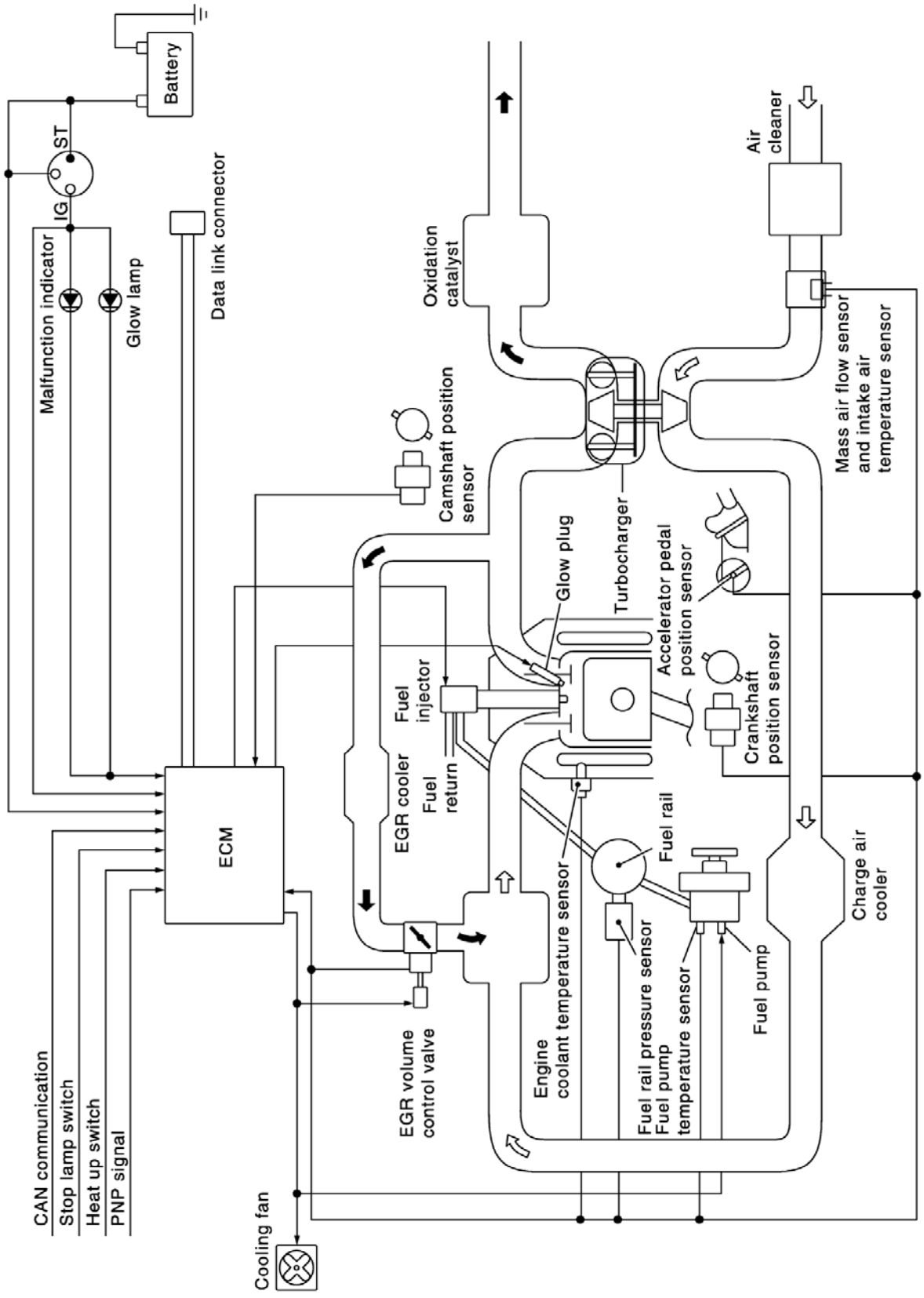
A value that is determined by the final injection quantity, the water temperature and the engine speed is calculated.

During the starting of the engine, the calculation is based on the water temperature and the atmospheric pressure.



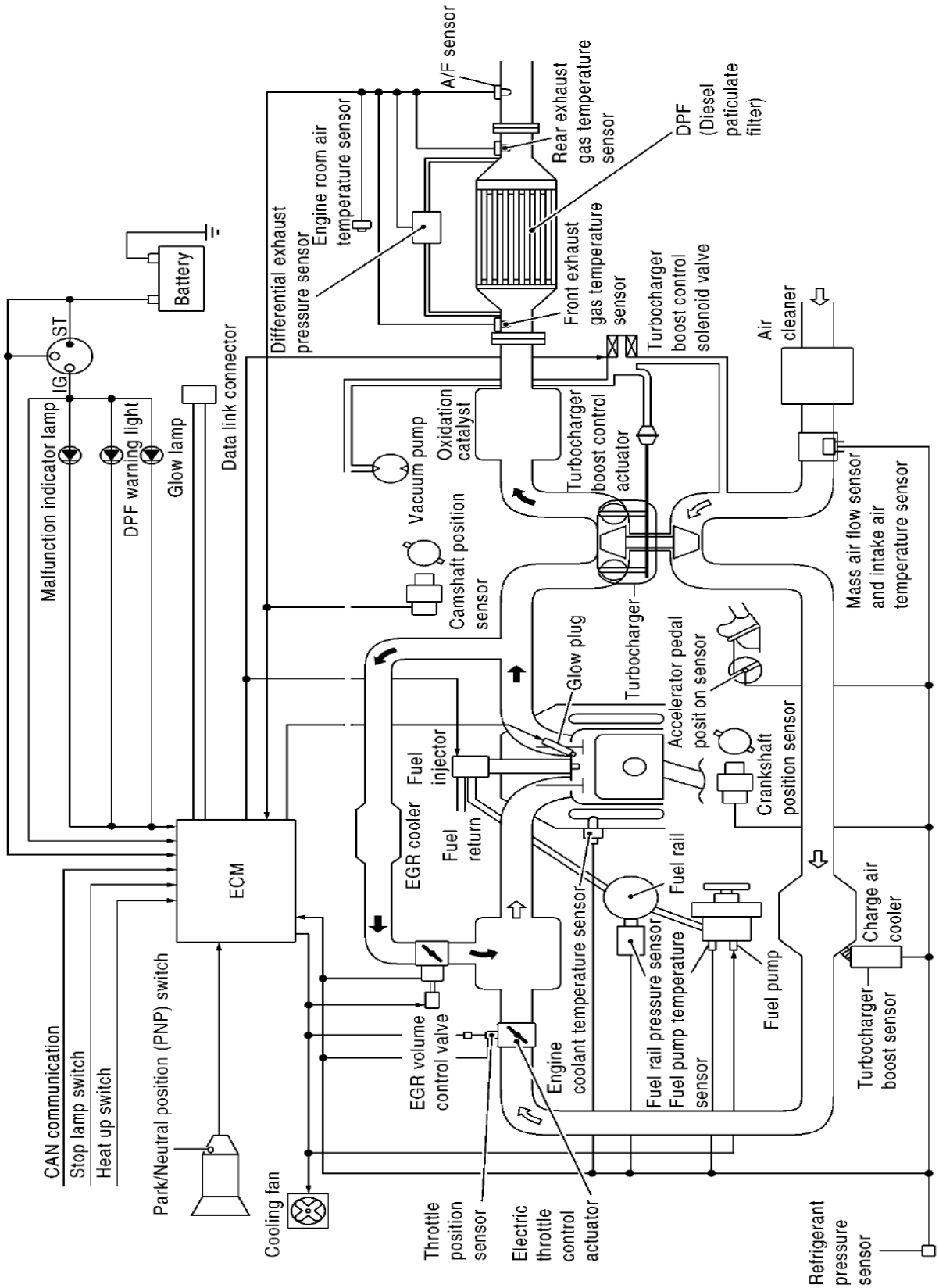
ENGINE CONTROL SYSTEM

YD25 D22



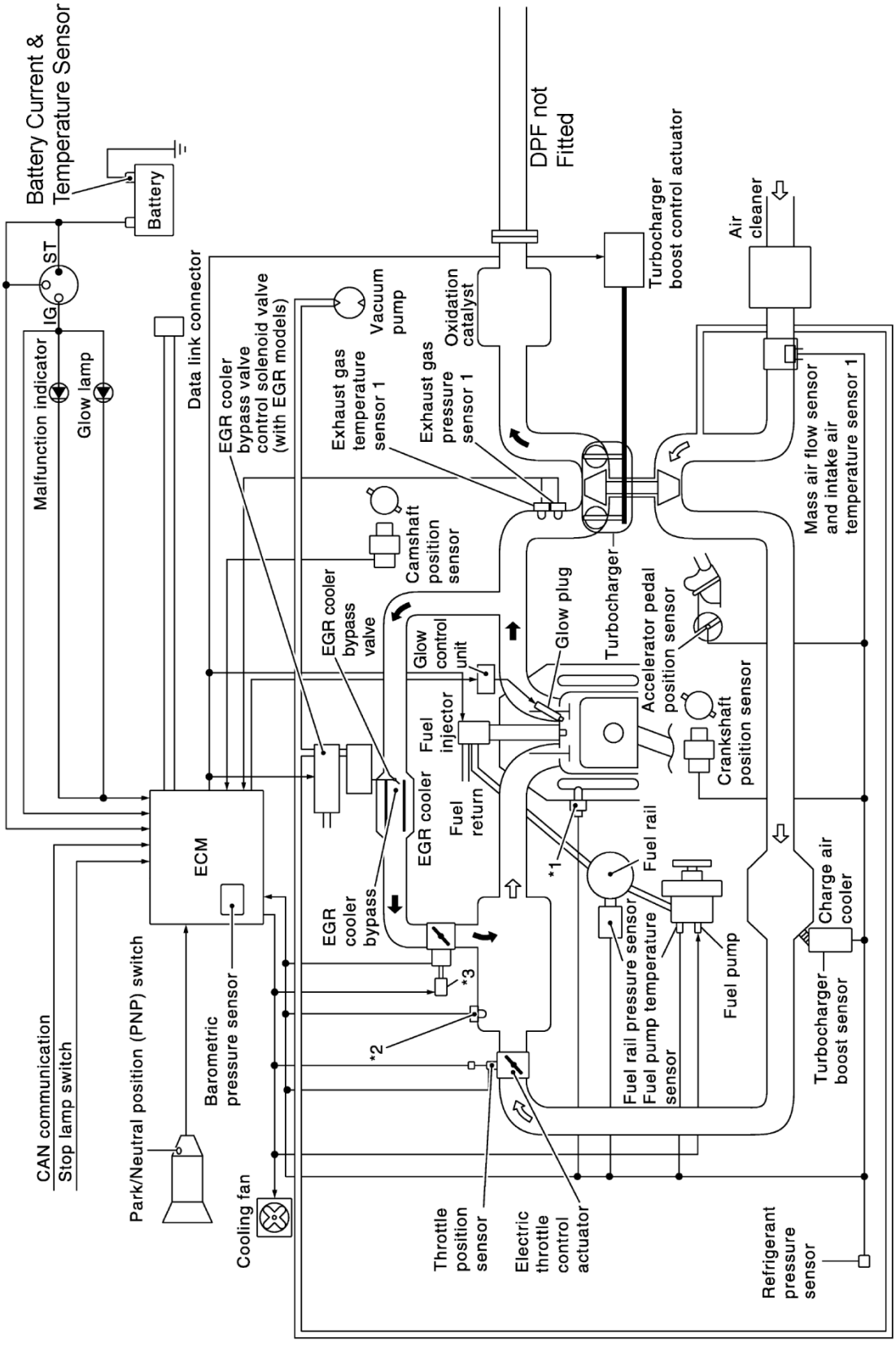
ENGINE CONTROL SYSTEM

YD25 Type 2 with DPF



ENGINE CONTROL SYSTEM

YD25 2010MY



ENGINE CONTROL SYSTEM

YD25 Type 2 with DPF

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

ENGINE CONTROL SYSTEM

YD25 2010MY

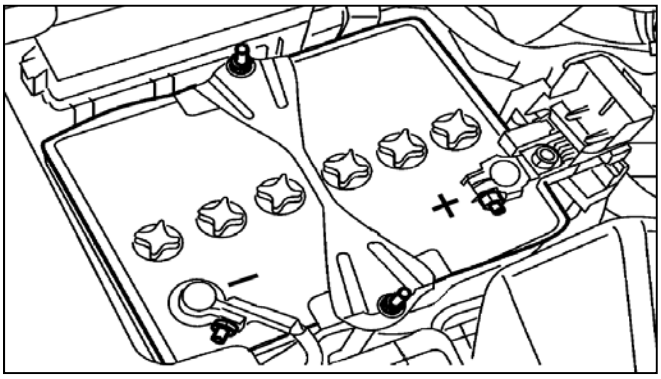
INPUT	ECM FUNCTION	OUTPUT (ACTUATOR)
BATTERY VOLTAGE (& GROUND) IGNITION SWITCH ACTIVITY ACCELERATOR PEDAL ACTIVITY CRANK POSITION & SPEED	FUEL INJECTION QUANTITY FUEL INJECTION TIMING	FUEL INJECTOR & PUMP
CAMSHAFT POSITION FUEL RAIL PRESSURE FUEL TEMPERATURE ENGINE COOLANT TEMPERATURE	VEHICLE SPEED CONTROL (ASCD) GLOW PLUG OPERATION	GLOW C/U & INDICATOR LAMP
MASS AIR FLOW INTAKE AIR TEMPERATURE x 2	EGR VOLUME CONTROL	EGR VOLUME CONTROL VALVE
TURBO BOOST (Air Pressure in Intake) ASCD REQUEST FROM DRIVER ASCD CANCEL REQUEST (Brake & Clutch Pedal) BRAKE PEDAL ACTIVITY (Stop Lamp operation) GEAR LEVER POSITION (P/N)	COOLING FAN CONTROL TURBO BOOST CONTROL	COOLING FAN RELAY (Via CAN) TURBO BOOST CONTROL SOLENOID VALVE
BAROMETRIC PRESSURE (Altitude) EGR VOLUME CONTROL VALVE POSITION SENSOR EXHAUST PRESSURE SENSOR EXHAUST GAS TEMP SENSOR BATTERY CURRENT BATTERY TEMPERATURE THROTTLE VALVE POSITION A/C REFRIGERANT PRESSURE (High Side) * AUTO TRANS ACTIVITY * VEHICLE SPEED * VEHICLE STABILITY SYSTEM (VDC) ACTIVITY * AIR CONDITIONER REQUEST (* CAN COMMUNICATION)	ELECTRIC THROTTLE CONTROL EGR COOLER BYPASS ALTERNATOR CURRENT CONTROL AIR CONDITIONER CONTROL ON BOARD DIAGNOSIS	IPDM / ALTERNATOR REGULATOR ELECTRIC THROTTLE ACTUATOR EGR BYPASS ACTUATOR AIR CONDITIONER COMPRESSOR RELAY (Via CAN) MALFUNCTION INDICATOR LAMP & ECM (SELF DIAGNOSIS – CONSULT II)

ENGINE CONTROL SYSTEM

YD25DDTi 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 (3 in total)

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 the Ground connections as shown here are in good condition (Clean & Tight.)

Also refer to **STB EL10-002**

THE ECM PULSES (OUTPUTS) THE INJECTOR WITH EXTREMELY HIGH VOLTAGE (80 ~ 120V)
ALWAYS ENSURE THE GROUND CONNECTIONS IN THE ENGINE BAY ARE MAINTAINED

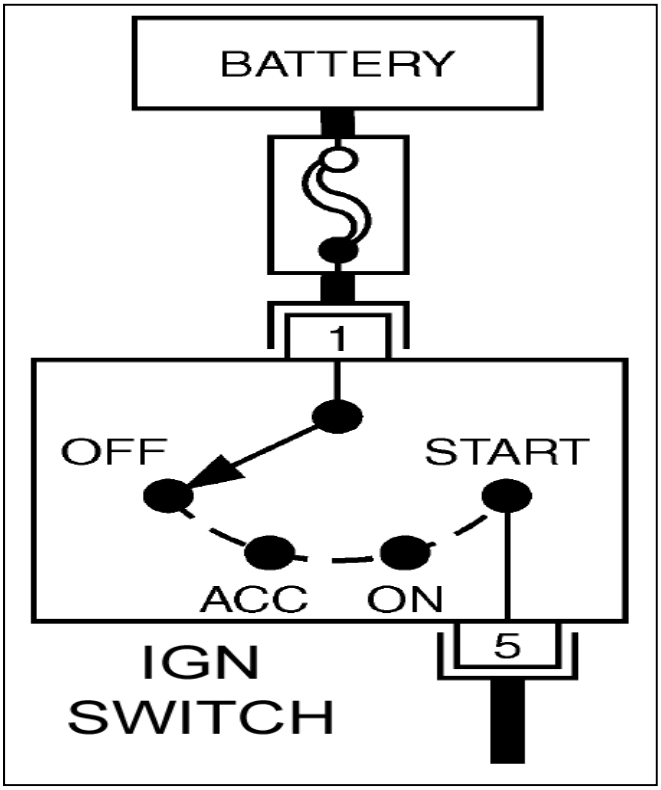
2. Ignition Switch

The ECM needs to know if the engine is being cranked, if the Ignition Switch is simply ON, held in the cranking position & of course when it is OFF.

IMPORTANT NOTE

WHEN CRANKING THE ENGINE, ALWAYS ENSURE THE IGNITION KEY IS HELD IN THE CRANK POSITION FOR APPROXIMATELY 3 SECONDS .

NEVER “FLICK” THE KEY WHEN CRANKING. THE ECM NEEDS TO SEE A MINIMUM OF 2 FULL CRANKSHAFT / CAMSHAFT ROTATIONS DURING CRANKING .

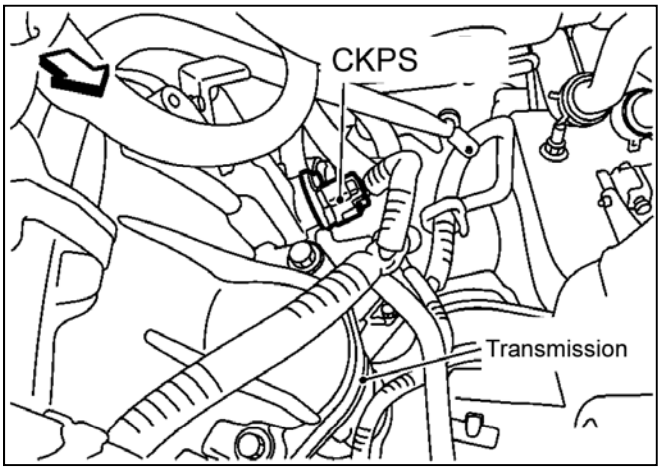


ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

3. Crankshaft Position Sensor (CKPS - DENSO)

The CKPS is located at the RH rear of the cylinder block. It is attached onto the transmission bell-housing & protrudes through a hole facing the gear teeth (cogs) of the signal plate on the Flywheel.

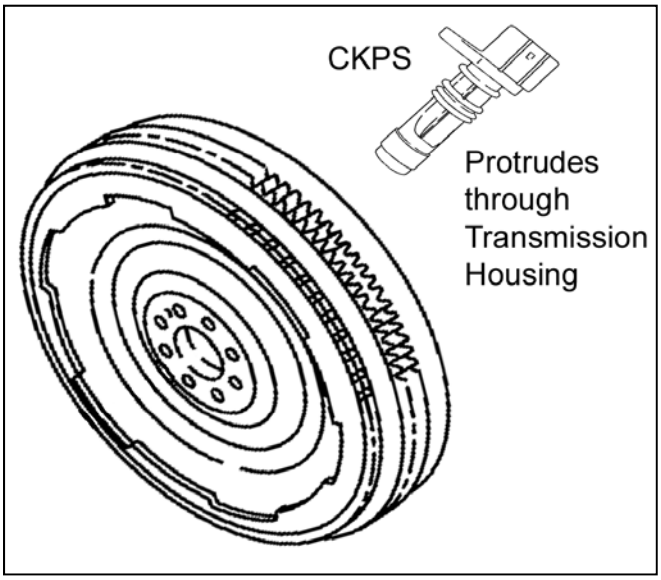


The CKPS informs the ECM of the following information;
- The position of the crankshaft (is the engine at TDC or not)
- If the crank is actually moving & if so how fast.

A section of the signal plate has teeth missing, which are used to determine the 360-degree TDC point.

NOTE 1:
If the Dual Mass Flywheel has failed & there is **excessive backlash** as a result, there is a likelihood that CKPS related DTC's maybe logged.

NOTE 2:
Always ensure that the CKPS is removed prior to the transmission being removed.



IMPORTANT NOTE

WHEN CRANKING THE ENGINE, ALWAYS ENSURE THE IGNITION KEY IS HELD IN THE CRANK POSITION FOR APPROXIMATELY 3 SECONDS .

NEVER "FLICK" THE KEY WHEN CRANKING. THE ECM NEEDS TO SEE A MINIMUM OF 2 FULL CRANKSHAFT / CAMSHAFT ROTATIONS DURING CRANKING .

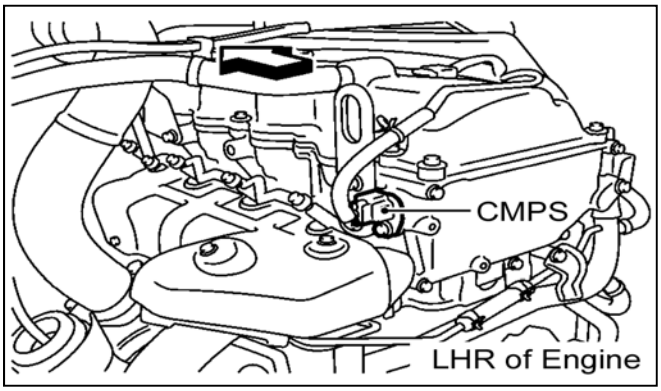
ENGINE CONTROL SYSTEM

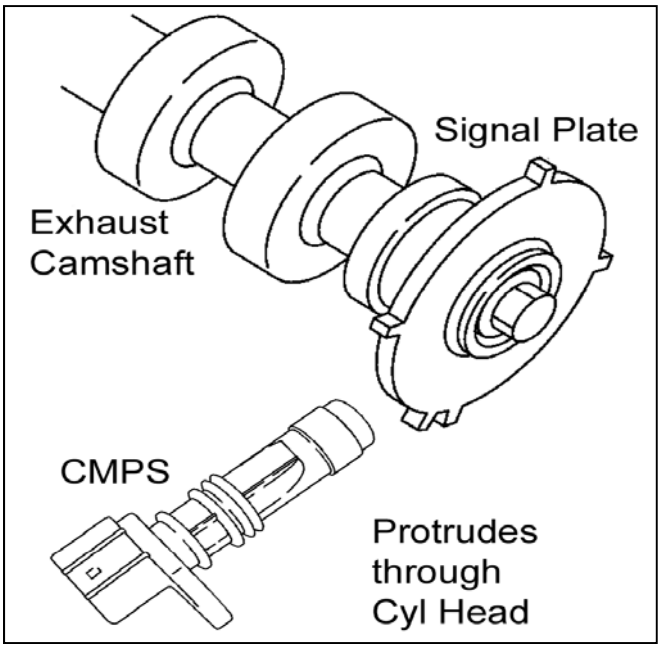
YD25DDTi Inputs to ECM

4. Camshaft Position Sensor (CMPS – DENSO)

The CMPS is located at the left rear of the cylinder head. It senses the camshaft rotation. (Crankshaft 180 degree Rotation is also determined)
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.
The CMPS & CKPS are identical parts.
They are of a permanent magnet and Hall IC construction.





IMPORTANT NOTE

WHEN CRANKING THE ENGINE, ALWAYS ENSURE THE IGNITION KEY IS HELD IN THE CRANK POSITION FOR APPROXIMATELY 3 SECONDS .

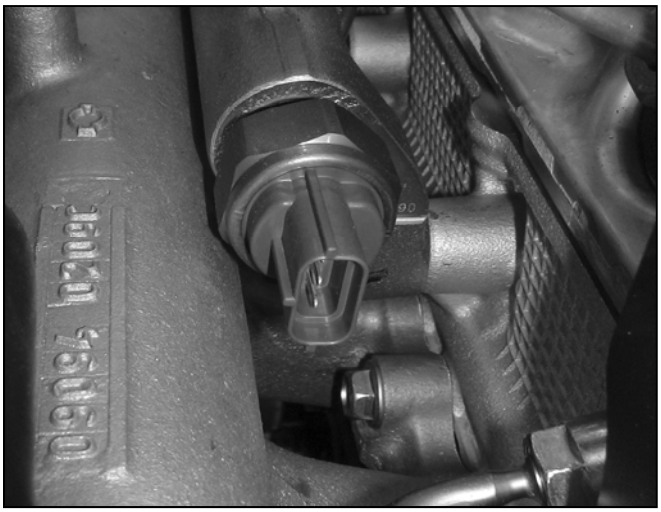
NEVER "FLICK" THE KEY WHEN CRANKING. THE ECM NEEDS TO SEE A MINIMUM OF 2 FULL CRANKSHAFT / CAMSHAFT ROTATIONS DURING CRANKING .

5. Fuel Rail Pressure Sensor (FRPS - DENSO)

The FRPS is an extremely important input into the ECM. From this signal, the ECM can determine how to operate the SCV on the Fuel Pump in order to vary the amount of Fuel Pressure. (Fuel that is forced into the Fuel Rail)

WARNING

If for ANY reason the Fuel Rail Pressure Sensor is to be replaced, the **WHOLE FUEL RAIL IS TO BE REPLACED.**
Any operation that involves removing & refitting sensors to rails will most likely result in a **DAMAGED SENSOR** & fuel leaks.



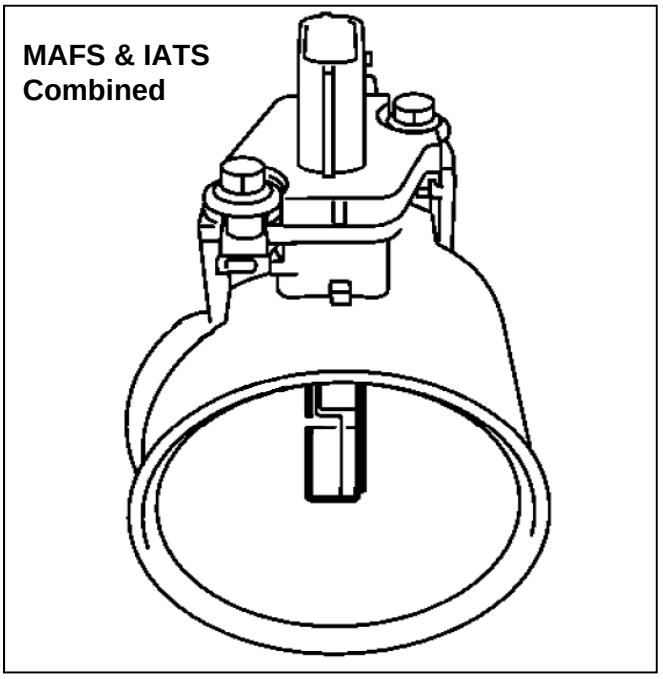
For YD25 2010MY, the Inlet Manifold does NOT need to be removed for the Fuel Rail removal process.

ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

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 the 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.

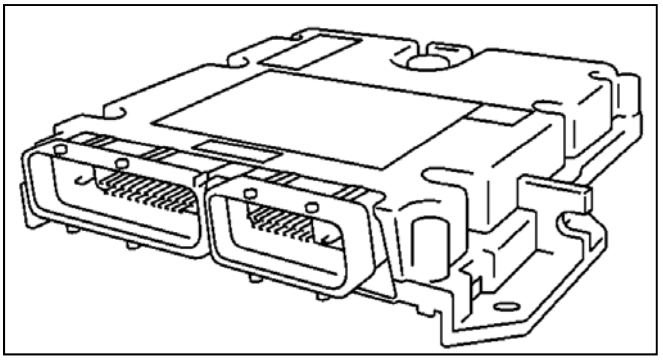


7. Intake Air Temperature Sensor (IATS)

The intake air temperature sensor 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.

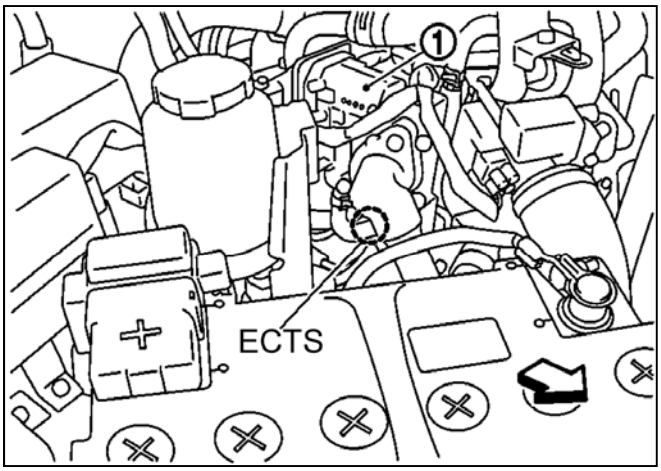
8. Barometric Sensor (DENSO)

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



9. Engine Coolant Temperature Sensor (ECTS)

The ECTS is used to detect the engine coolant temp. It's design & operation is the same as other ECTS's utilised by the Nissan engine range.
It is located at the front of the engine underneath the Inlet Manifold.



ENGINE CONTROL SYSTEM

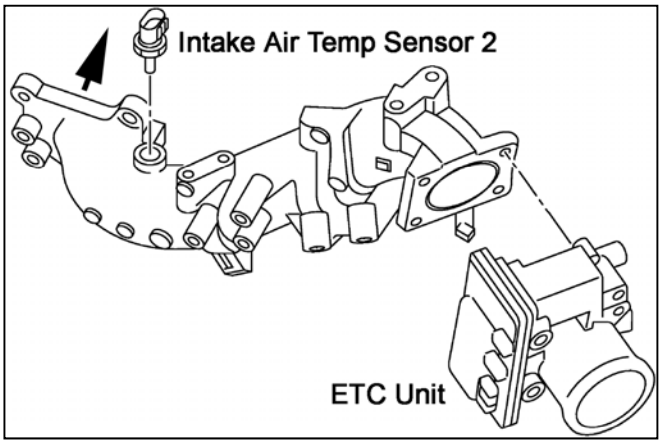
YD25DDTi Inputs to ECM

10. Intake Air Temperature Sensor 2 (IATS)

(YD25 2010MY only)

The intake air temperature sensor is located in the Inlet Manifold. It measures the temperature of the air just prior to the air entering the engine.

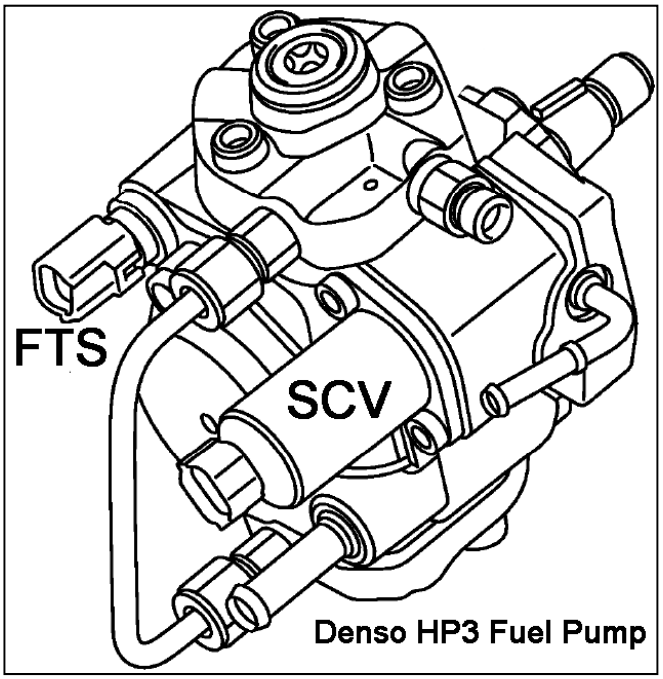
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



YD25 2010MY only

11. Fuel Temperature Sensor (FTS - DENSO)

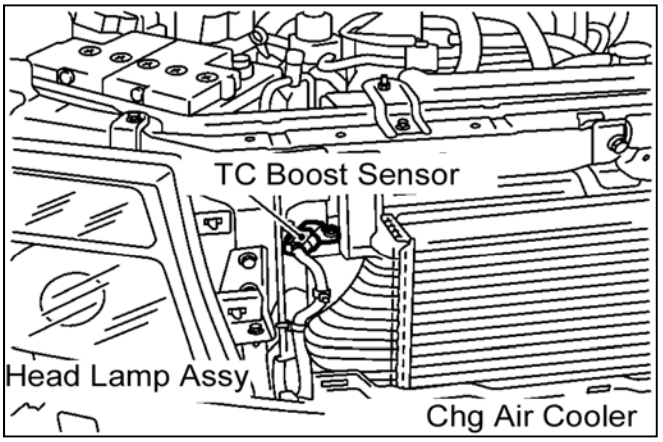
The FTS is of a conventional Thermistor design. The sensor is mounted on the fuel pump body and detects the temperature of the fuel inside the pump. This information is sent to the ECM which is able to make corrections in the fuel injection signal which take into account the effect that temperature has on fuel viscosity.



12. Turbo Charger Boost Sensor (TBS)

The TBS detects pressure in the exit side of the Charge Air Cooler (Intercooler). The sensor output voltage to the ECM increases as pressure increases.

The Boost Pressure can be read via CONSULT III Data Monitor.



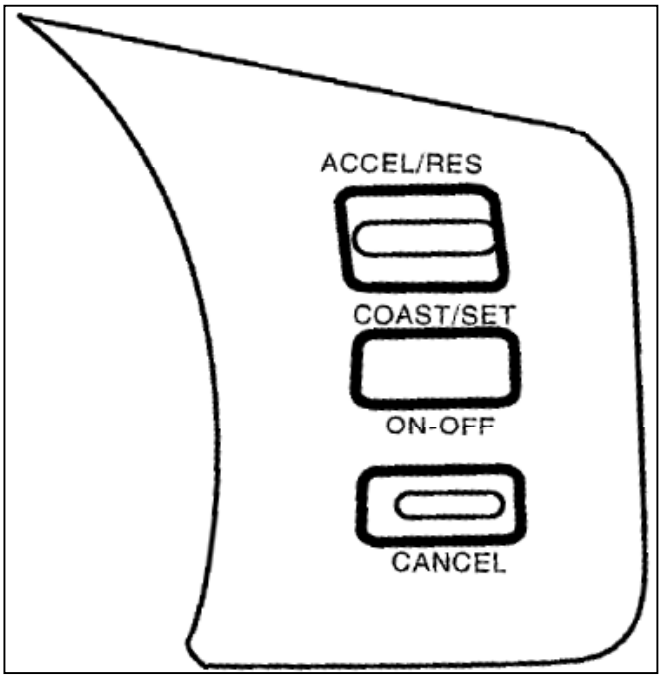
YD25 Type 1, Type 2 & 2010MY

ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

13. 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.



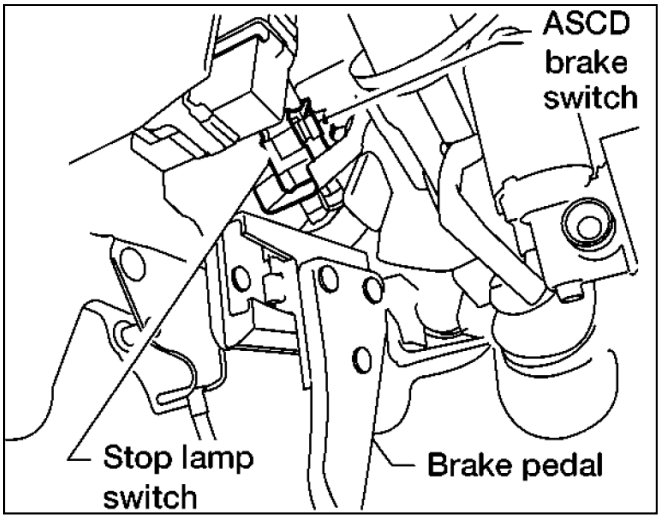
R51 & D40

14. ASCD Brake (pedal) Switch

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.
On M/T models, there is also a Clutch Pedal switch, if the Clutch Pedal is depressed, the Clutch Pedal Switch open circuits the ASCD Brake Switch circuit.

15. Stop Lamp Switch

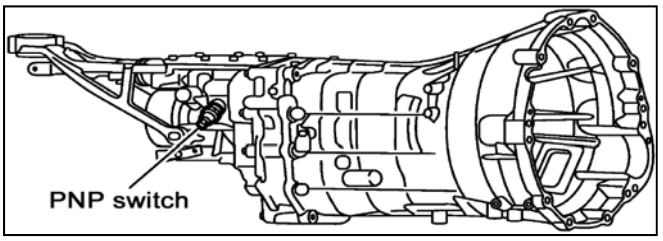
The stop lamp switch is installed to the brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the
ECM. The ECM uses the signal to control the fuel injection control system.
It is found on the Brake Pedal bracket, adjacent to the ASCD Brake Switch.



R51 & D40

16. PNP Switch

When the gear position is in neutral (M/T), the Park/Neutral position (P/N Posi) is ON.
The ECM detects the position because the continuity of the line (the ON signal) exists.



R51 & D40

ENGINE CONTROL

YD25DDTi Inputs to ECM

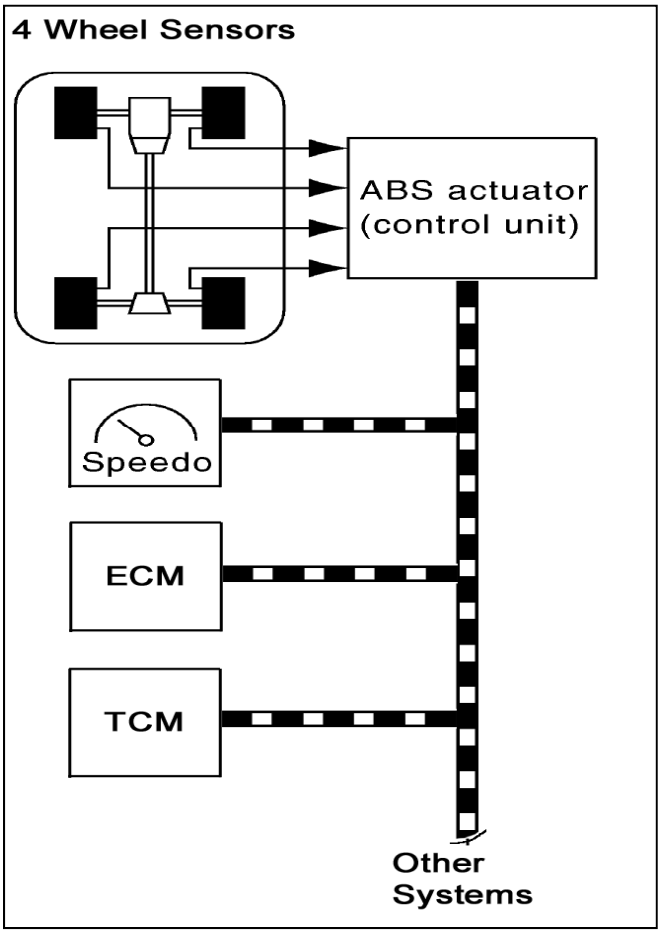
17. Vehicle Speed Signal (VSS)

The ECM receives the VSS signal via CAN communication line. Even though it is sent from the combination meter, the source of the signal originates from the ABS / VDC system wheel speed sensors. The ECM primarily uses this signal for ASCD control.

NOTE:
The Vehicle Speed Signal exists on the CAN. It is **not** possible to source a stand alone vehicle speed signal on R51 & ABS equipped D40 models.

NOTE for D40 without ABS:
A conventional VSS is attached to the rear output of the transfer unit. The signal is sent directly to the instrument cluster & from there the VSS signal is output onto the CAN. An additional VSS is fitted to the front output of the transfer. This is only for the 4x4 system.

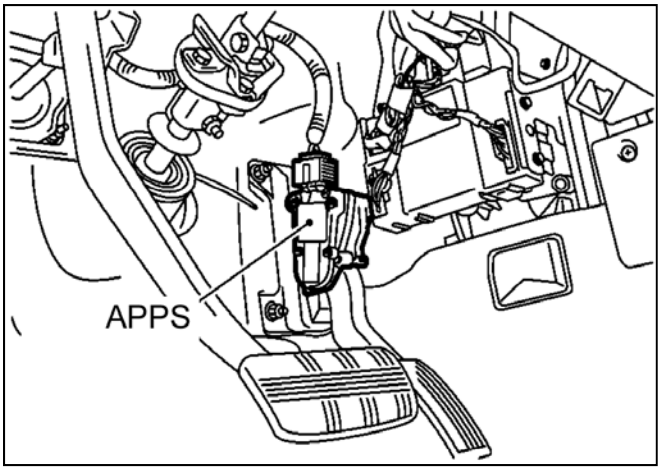
NOTE for D22:
A conventional VSS is attached to the output of the transmission. The signal is sent directly to the instrument cluster.



R51 & D40

18. 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 signal is sent to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.
The signal is also utilised by the VDC system, the All Mode 4x4 System, the TCM & the ECM for A/C compressor cut.



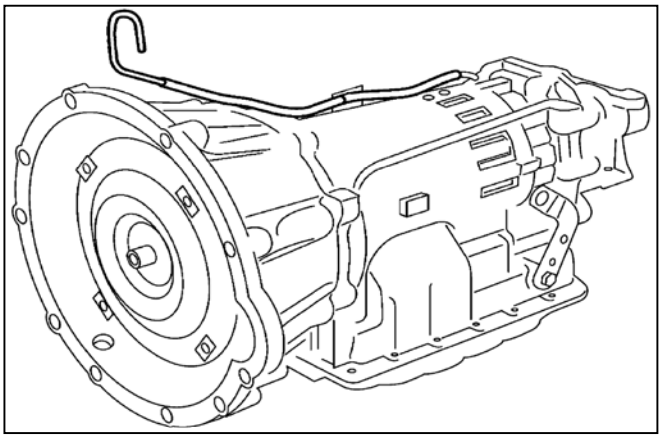
ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

19. 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.

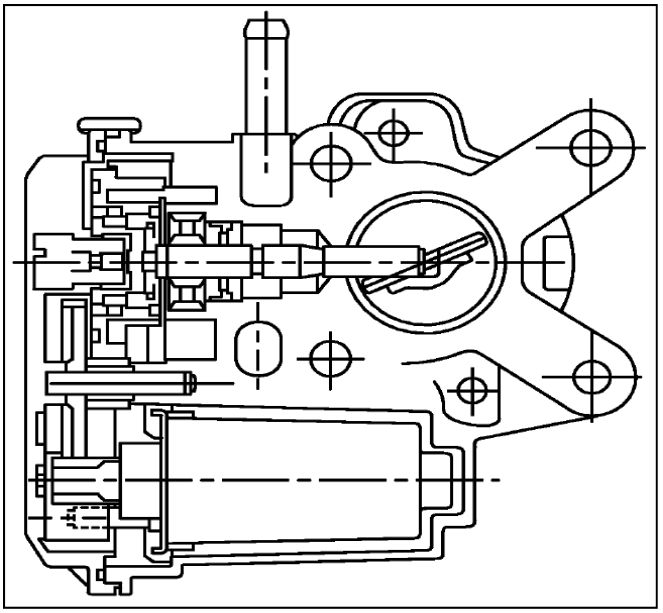
NOTE:
PNP switch activity is included in the transmission activity signals that are sent to the ECM via the CAN.



20. 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.

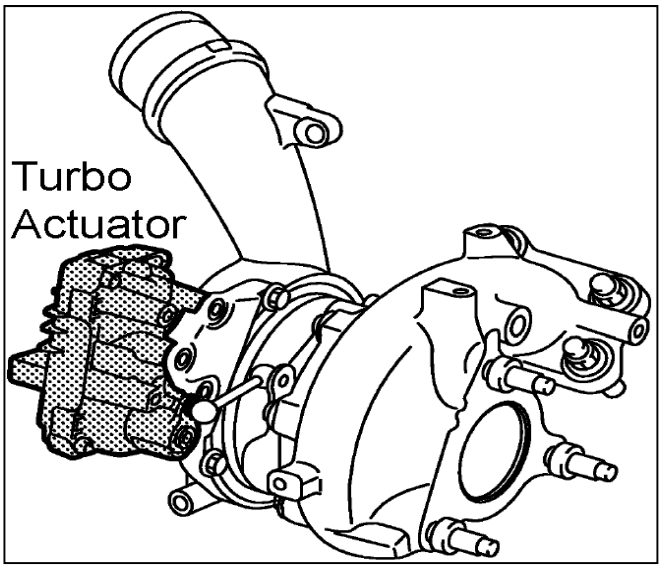
NOTE for YD25 Type 1 :
A stepper type EGR is utilised but a position feedback signal is **not** output to the ECM in this case.



YD25 D22, Type 2 & 2010MY

21. Turbocharger Boost Control Actuator

The Turbocharger Boost Control Actuator is integral with the turbocharger and consists of a Control Unit (C/U), Electric Motor and Vane Position Sensor which detects gear & rod position.
The Turbo Actuator C/U communicates with the ECM via a special communication link. The Turbo Actuator C/U receives the target nozzle vane angle signal from the ECM. The Turbo Actuator C/U transmits a turbo vane position sensor signal and self-diagnosis information back to the ECM.



YD25 2010MY

ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

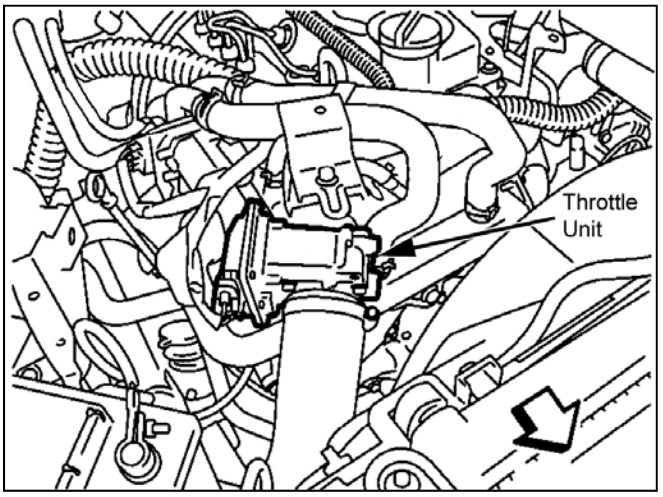
22. Throttle Position Sensor

The Throttle Position Sensor detects the actual position of the electrically controlled Throttle Valve. Throttle position sensor detects the opening angle of throttle valve and converts the angle into a voltage signal. Based on the signal, ECM judges whether throttle control actuator operates the throttle valve properly or not.
The throttle valve is always in the max. open position.

For DPF equipped engines only:
The throttle valve will only close (partially) to perform DPF regeneration. Otherwise the valve remains fully open when not performing DPF regeneration.

NOTE:
The Throttle valve does a complete close & open self test cycle **after** the engine completely shuts down. It does **not** close to stop engine shake like the throttle valve on the Type 1 YD25 engine.

NOTE for YD25 Type 1:
Although a throttle valve is utilised, it is mechanically controlled & it does **not** output a feedback signal to the ECM.

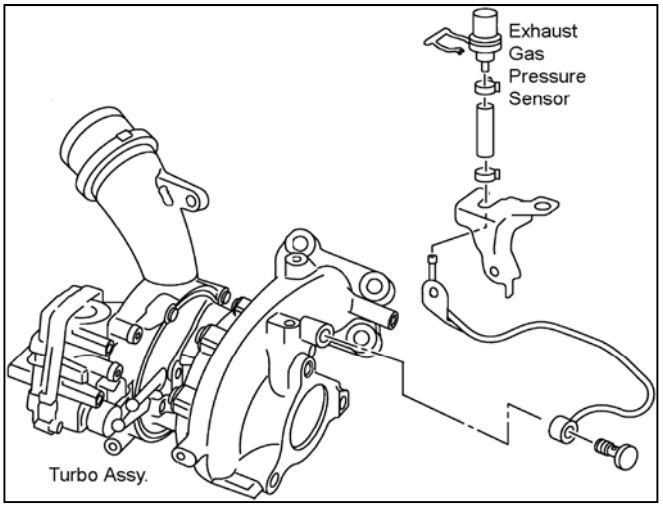


YD25 Type 2, 2010MY

23. Exhaust Gas Pressure Sensor (EGPS)

(YD25 2010MY only)

An EGPS 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.

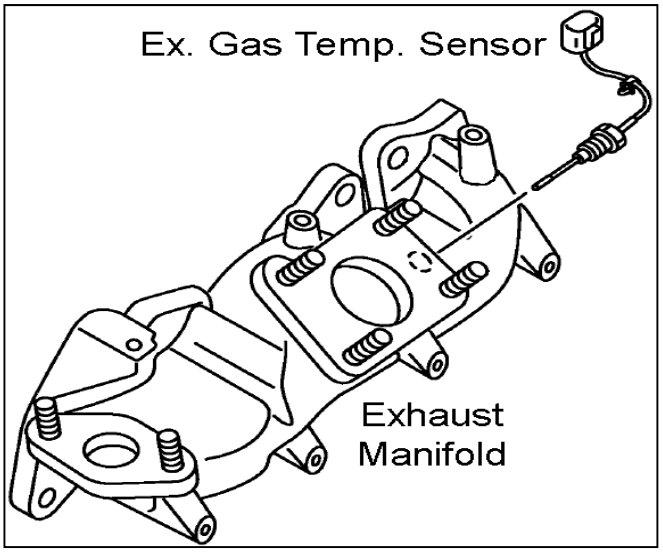


YD25 2010MY

24. Exhaust Gas Temperature Sensor (EGTS) (YD25 2010MY only)

An EGTS is located in the exhaust manifold. It is used for the following to reasons;
• Turbo, engine & engine component protection.

NOTE:
Do **not** un-screw the temp sensor unless it is to be replaced.



YD25 2010MY

ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

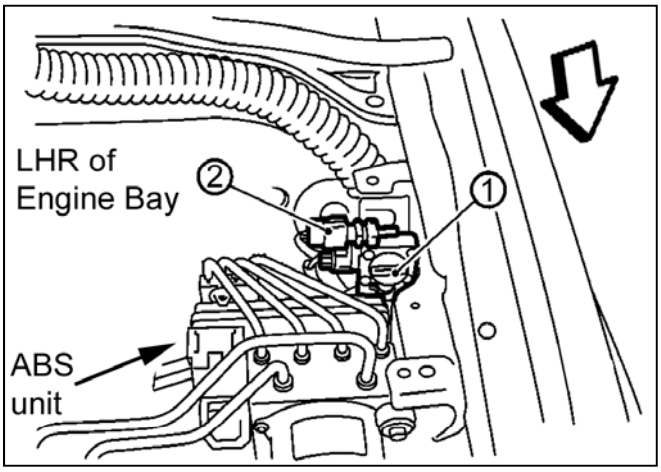
25. Differential Exhaust Pressure Sensor

(YD25 Type 2 DPF equipped only)

The Differential Exhaust Pressure Sensor (1) 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.

(2) = Engine Room Temp Sensor.



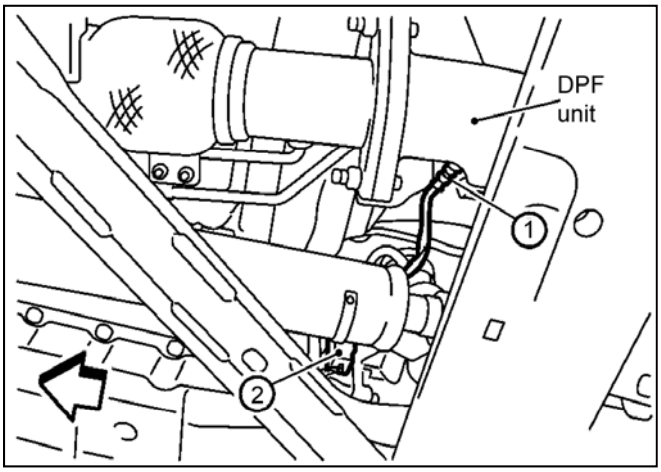
YD25 Type 2 DPF equipped

26. Front Exhaust Gas Temp Sensor

(YD25 Type 2 DPF equipped only)

The Front Exhaust Gas Temperature Sensor (1) is installed before DPF and senses the exhaust gas temperature. The Front Exhaust Gas Temperature Sensor uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

The signal is sent to the ECM & it is used to compare the signal from the Exhaust Gas temp Sensor fitted to the outlet of the DPF.



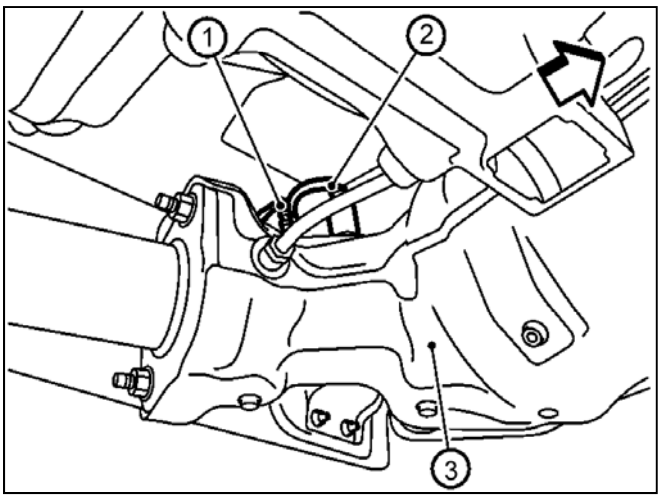
YD25 Type 2 DPF equipped

DO NOT UN-SCREW TEMP SENSORS UNLESS THEY ARE TO BE REPLACED

27. Rear Exhaust Gas Temp Sensor

(YD25 Type 2 DPF equipped only)

The Rear Exhaust Gas Temperature Sensor (2) 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.



YD25 Type 2 DPF equipped

ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

28. Air Fuel Ratio Sensor

(YD25 Type 2 DPF equipped only)

Air Fuel Ratio Sensor is installed on the downstream side of the DPF. The A/F sensor measures the oxygen level in the exhaust gas and converts it into a voltage signal. The signal is sent to the ECM.

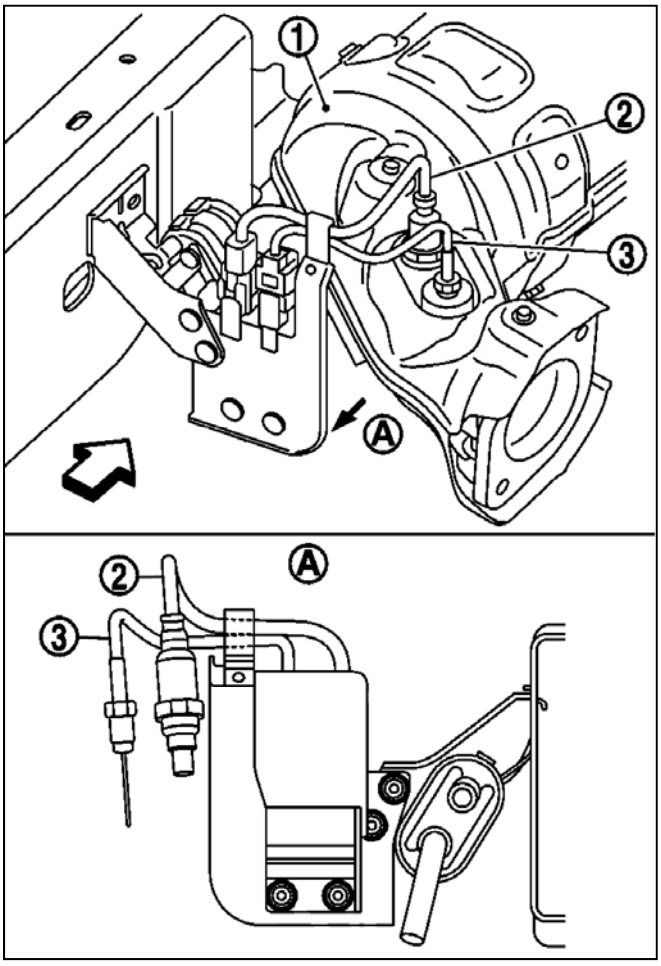
Based on the signal from the A/F sensor the ECM calculates the air fuel mixture ratio. The ECM uses the calculated ratio for the DPF regeneration control.

A heater is integrated in A/F sensor to ensure the required operating temperature for the sensor is maintained.

(1) = DPF assembly

(2) = A/F Ratio Sensor

(3) = Rear Exhaust Gas Temperature Sensor



YD25 Type 2 DPF equipped

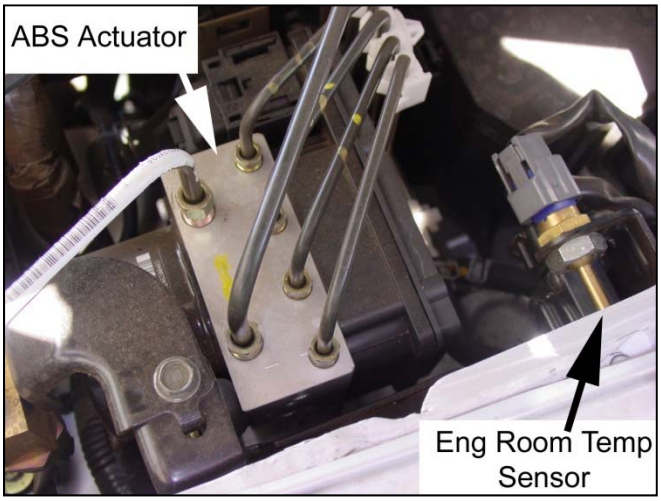
DO NOT UN-SCREW SENSORS UNLESS THEY ARE TO BE REPLACED

29. Engine Room Air Temperature Sensor

(YD25 Type 2 DPF equipped only)

The Engine Room Air Temperature Sensor detects the ambient temperature around differential exhaust pressure sensor which is located in the engine bay. The temp sensor is located adjacent to the Differential Exhaust Pressure Sensor.

The Engine Room Air Temperature Sensor sends the signal to ECM. Based on the signal the ECM will compensate for the characteristics of differential exhaust pressure sensor which changes with the temperature. The temperature sensor uses a thermistor which is sensitive to the change in temperature.



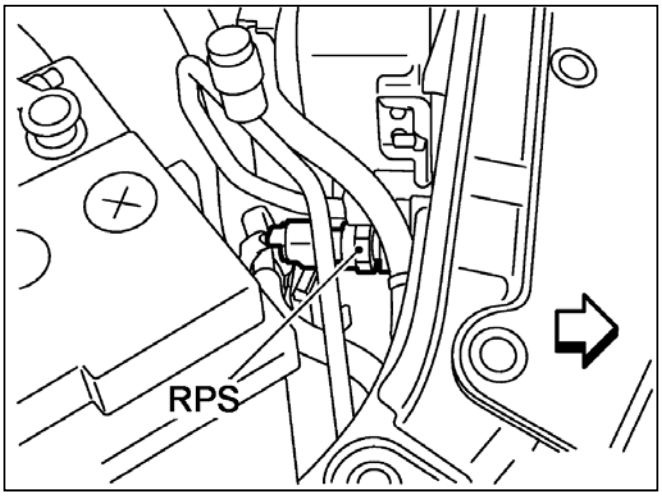
YD25 Type 2 DPF equipped

ENGINE CONTROL

YD25DDTi Inputs to ECM

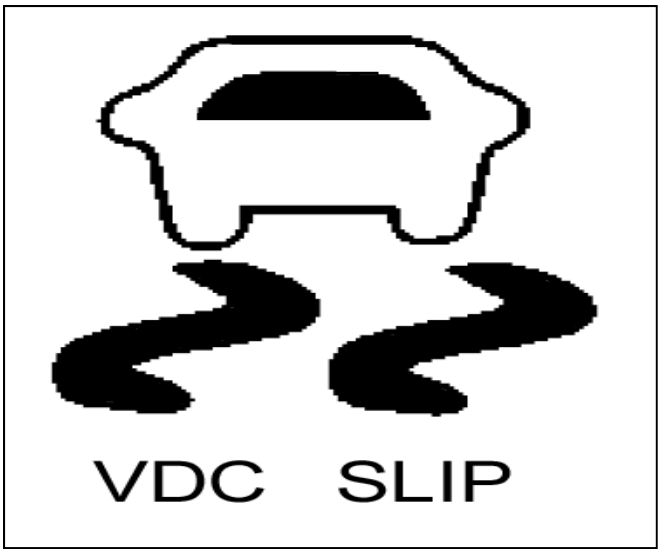
30. A/C Refrigerant Pressure Sensor (RPS)

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)
The voltage signal is sent to ECM and it controls the cooling fan system.
Due to the input of this sensor it can be possible to have Electric cooling fan operation due to excessive 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.



31. VDC & TCS Activity.

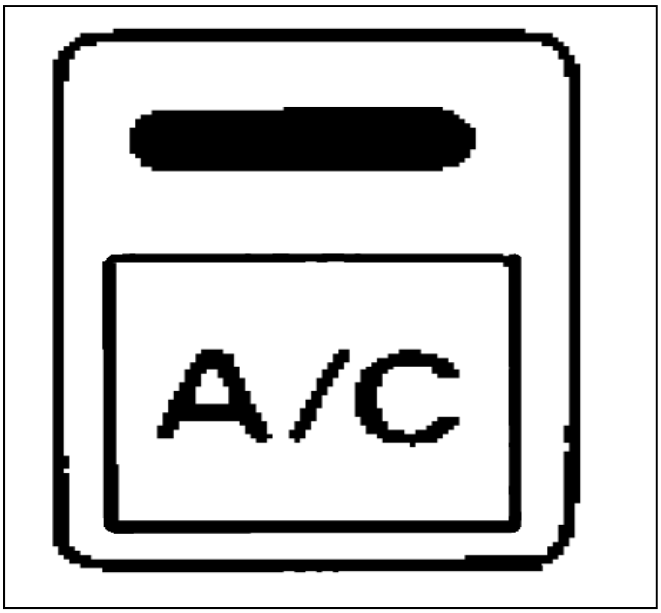
Communication from the ABS / TCS / VDC Control Unit is sent to the ECM via CAN communication.
When the vehicle is un-stabilised due to excessive wheel slip being detected or the vehicle is sliding sideways etc., the ECM assists with re-stabilising the vehicle by control of the throttle valve (ETC) in order to reduce engine power output.



NOTE:
VDC = Vehicle Dynamic Control

32. Air Conditioner Request.

A request for Air Conditioner operation is sent from the A/C Control Unit 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).



ENGINE CONTROL SYSTEM

YD25DDTi Inputs to ECM

Variable Charging System

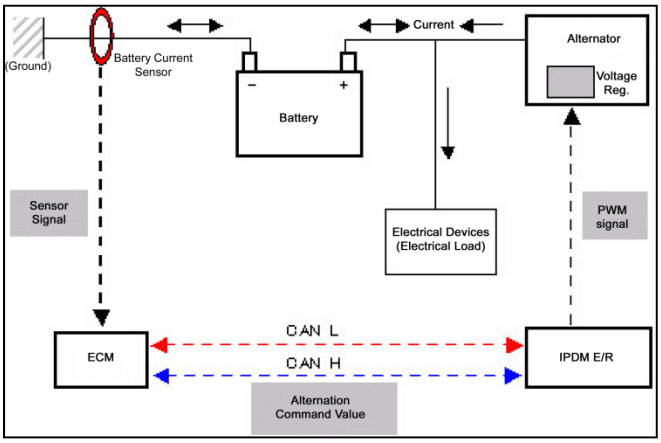
(YD25 2010MY only)

This system improves fuel economy by reducing unnecessary battery charging.

The induction type current sensor is installed between the battery negative terminal and the body ground.

With the current sensor, the ECM can detect whether the current flow direction is charging or discharging. The alternator generation voltage is controlled according to this information.

When the charging is sufficient, the generation voltage is decreased to 12~13V from the normal regulated voltage, which is approximately 14V.



33. Battery Current Sensor

The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery.

34. Battery Temperature Sensor

The battery temperature sensor is integrated in battery current sensor. The sensor measures ambient temperature around the battery.

The electrical resistance of the thermistor decreases as temperature increases.

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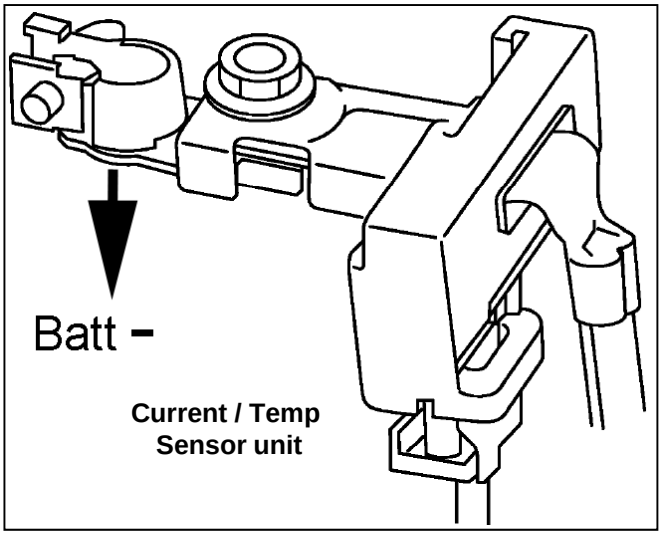


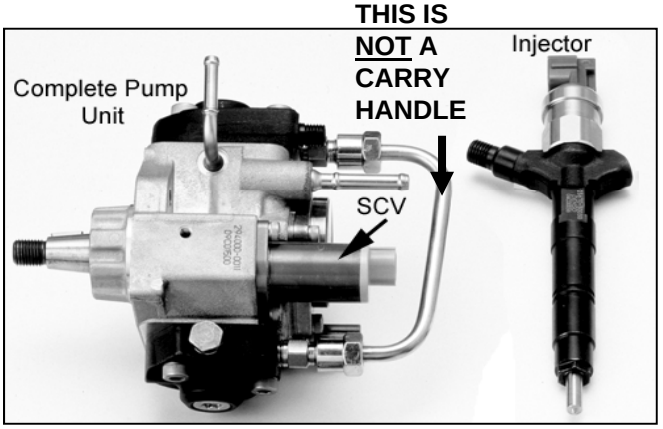
YD25 2010MY

ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

1. Suction Control Valve

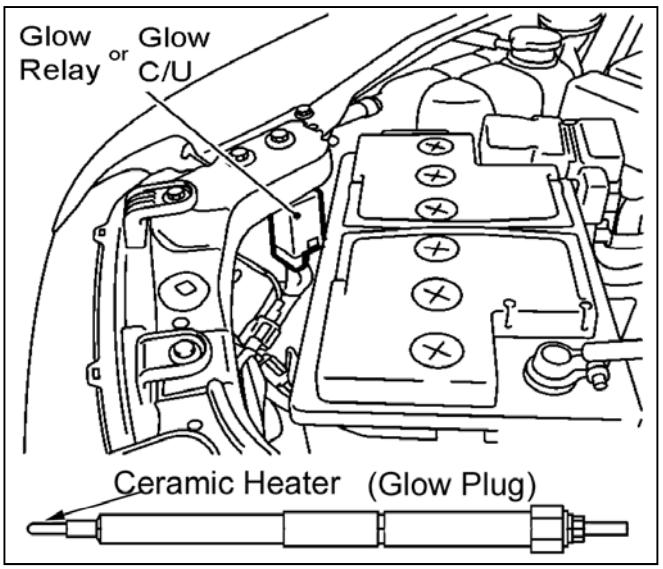
The ECM controls this valve in order to regulate the amount of fuel that is allowed to be delivered (forced into) the Fuel Rail.



2. Fuel Injector

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.
For details regarding Fuel Injector fault diagnosis, refer to **STB EF09-004.**

PLEASE OBSERVE THE SAFETY PRECAUTIONS REGARDING THE HIGH VOLTAGE WHICH OPERATES THE FUEL INJECTORS.
REFER TO STB GI 05-007 FOR MORE DETAIL.



3a. Glow Relay

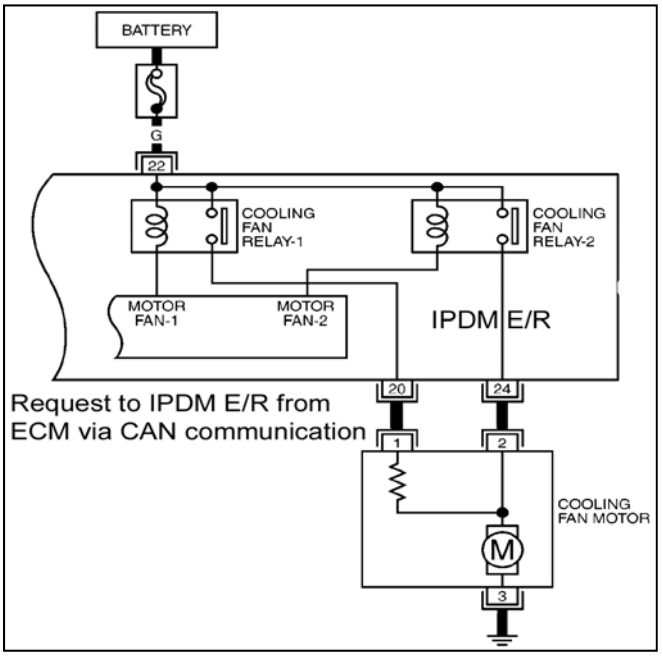
(YD25 2005 ~ 2009MY)

The ECM operates the Glow relay in the same manner as other Electronically controlled Diesel Engine vehicles. Once the relay is switched ON, it feeds battery voltage through to the Glow Plugs.

3b. Glow Control Unit

(YD25 2010MY)

The ECM operates the Glow Control Unit. Once the unit is activated by the ECM, it feeds a maximum of 11V through to the Glow Plugs. The output then drops to 7V during after glow operation.
Never apply battery voltage directly to the glow plugs



R51 & D40

4. Cooling Fan Relays

Following inputs such as A/C operation, A/C refrigerant pressure & engine temperature, the ECM will operate the Cooling Fan relay(s) which in turn sends power to the single fan motor attached to the rear of the radiator.
There are 2 x relays which form part of the IPDM E/R.
With only 1 x relay activated, current is output from the relay & fed through a resistor located on the electric fan shroud / housing.
For high speed fan operation, a second relay is switched on which in turn sends current directly to the same set of fan motor windings.

ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

5a. Turbo Boost Control Solenoid Valve

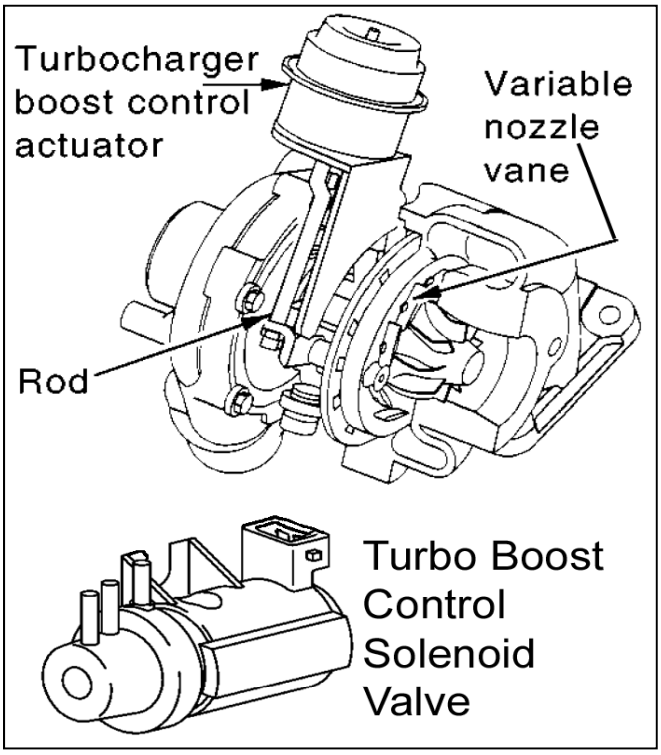
(YD25 2005 ~ 2009MY)

Like the ZD30 engine on Y61 & T31 X-TRAIL M9R, the Turbo Charger is a Variable Nozzle 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.



YD25 Type 1 & Type 2

NOTE:

As part of a “Lack of Power” trouble diagnosis, **always** ensure that the vacuum pump is functioning OK.

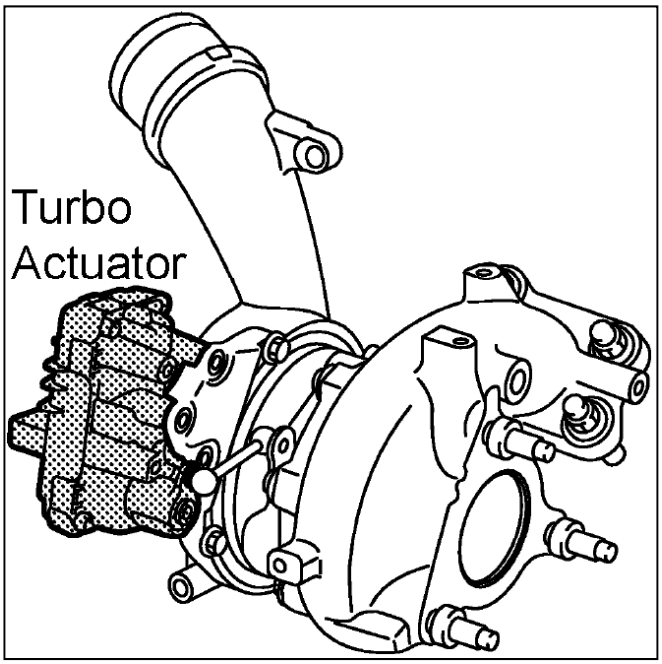
If the vacuum pump is worn & it is not providing sufficient vacuum, the turbo will not operate properly. As a result the engine will lack power due to lack of Turbo Boost.

5b. Turbocharger Boost Control Actuator

(YD25 2010MY)

The Turbocharger Boost Control Actuator is integral with the turbocharger and consists of a Control Unit (C/U), Electric Motor and Vane Position Sensor which detects gear & rod position.

The Turbo Actuator C/U communicates with the ECM via a special communication link. The Turbo Actuator C/U receives the target nozzle vane angle signal from the ECM. The Turbo Actuator C/U transmits a turbo vane position sensor signal and self-diagnosis information back to the ECM.



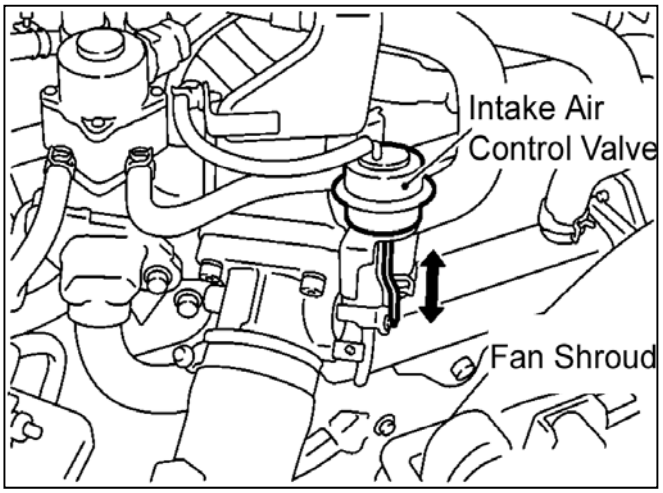
YD25 2010MY

ENGINE CONTROL SYSTEM

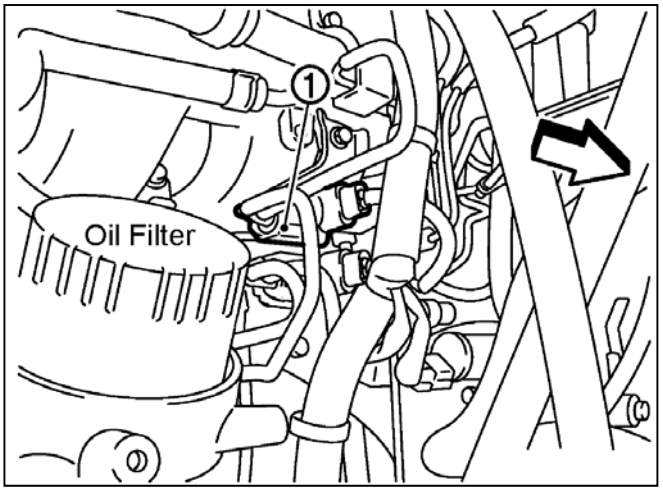
YD25DDTi Outputs from ECM

6a. Intake Air Control Valve Solenoid

The Intake Air Control Valve is mechanically controlled via a vacuum solenoid that is switched by the ECM. It is utilised for a smooth engine shut down.



NOTE:
The solenoid which applies vacuum to the throttle actuator (1: shown in the picture) is located just in front of the oil filter. Take care not to break the solenoid when removing the Oil Filter during service.



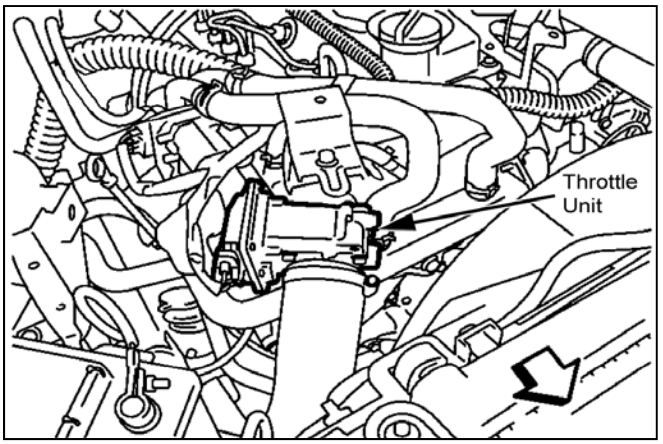
YD25 Type 1

6b. Electric Throttle Control Actuator

Electric throttle control actuator consists of a throttle control motor which operates the throttle valve.
In turn the throttle position sensor detects the opening angle of throttle valve.
The throttle valve typically remains in the open position.

For DPF equipped engines only:
The throttle valve will only close (partially) to perform DPF regeneration. Otherwise the valve remains fully open when not performing DPF regeneration.

NOTE:
The Throttle valve does a complete close & open self test cycle **after** the engine completely shuts down. It does **not** close to stop engine shake like the throttle valve on the YD25 Type 1 engine.



YD25 Type 2 & 2010MY

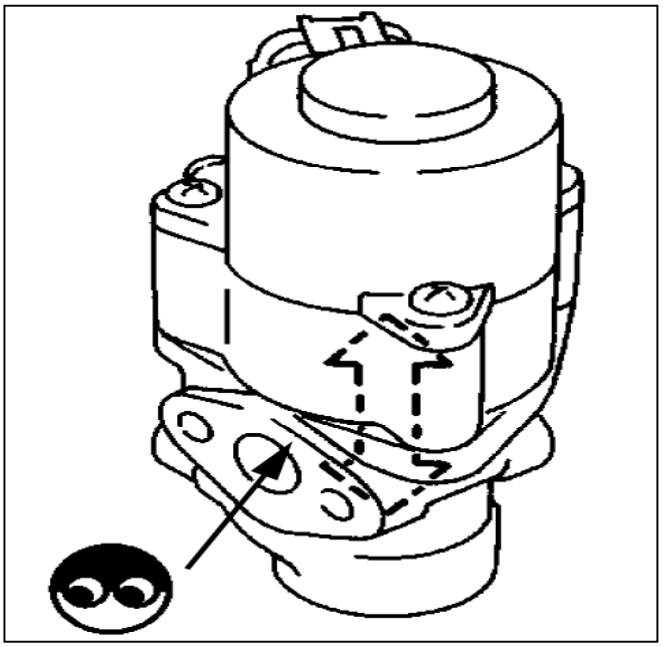
ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

7a. EGR Valve (Plunger Type)

The EGR valve is a stepper motor with 2 sets of windings linked directly to the ECM. It either lifts or lowers a plunger on & off it's seat, dependant on how much Exhaust Gas Recirculation is required.

NOTE:
There is no feedback to the ECM in case of valve failure or sticking etc.

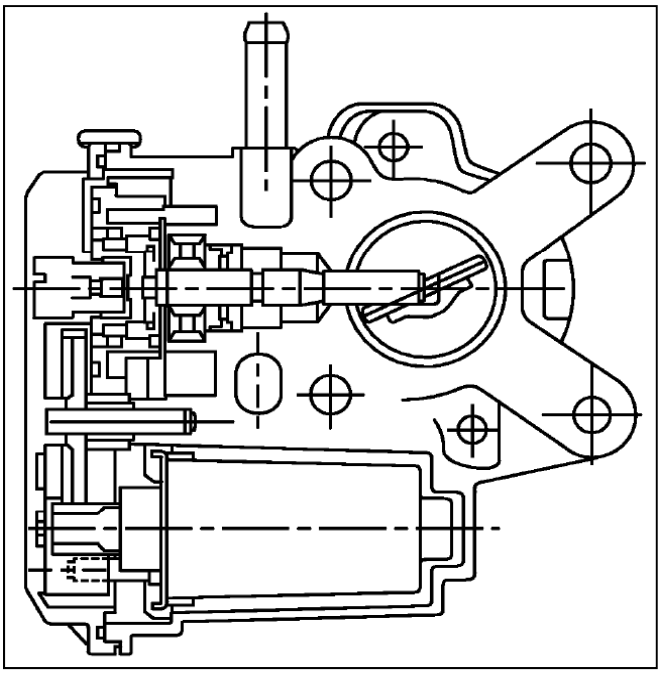


YD25 Type 1

7b. EGR Volume Control Valve (Throttle Valve Type)

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.
The movement of the EGR valve is monitored by the ECM via a valve position sensor. Therefore of the valve sticks or stops operating, the ECM can see this & logs the appropriate DTC.

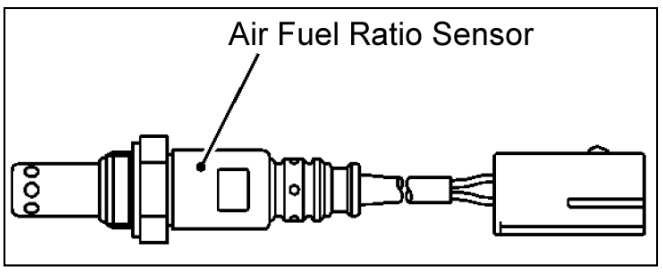
NOTE:
The EGR valve does a complete close & open self test cycle AFTER the engine completely shuts down.
The ECM can detect if there is a valve operation fault.



YD25 D22, Type 2 & 2010MY

8. Air Fuel Ratio Sensor Heater

Based on intake air temperature, engine coolant temperature and rear exhaust gas temperature, ECM switches the mode of A/F sensor heater from OFF to ON (or from ON to OFF).
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.



YD25 Type 2 DPF

ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

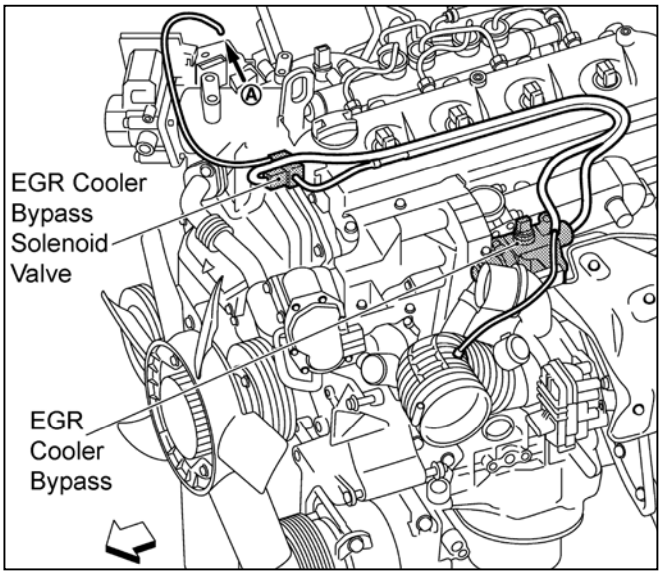
9. EGR Cooler Bypass Solenoid Valve

(2010MY YD25 only)

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.



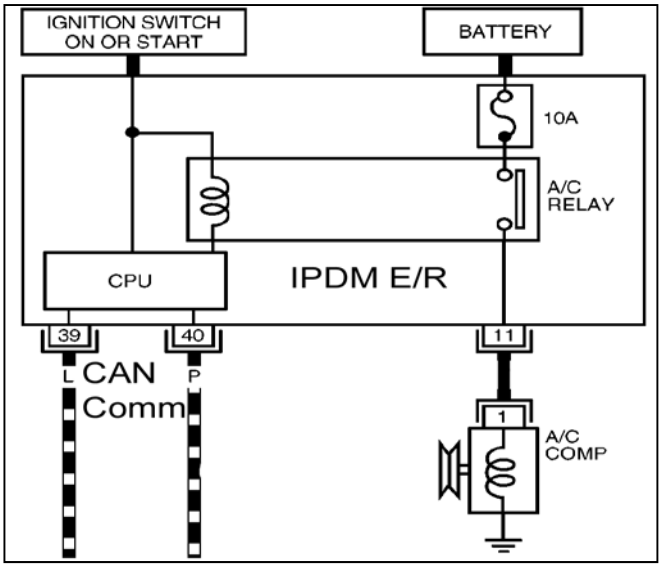
2010MY YD25

10. 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.



11. Variable Charging System

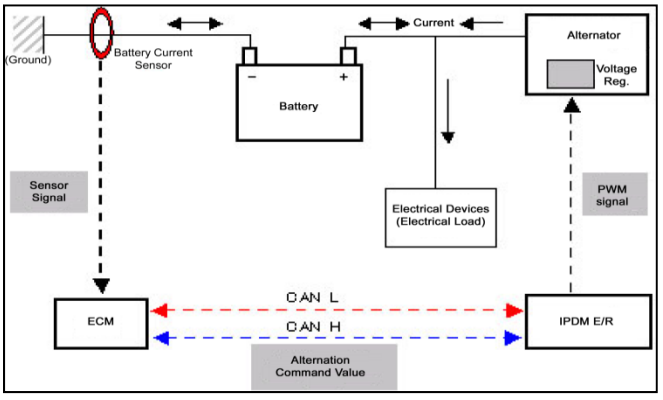
(2010MY YD25 Only)

This system improves fuel economy by reducing unnecessary battery charging.

The induction type current sensor is installed between the battery negative terminal and the body ground.

With the current sensor, the ECM can detect whether the current flow direction is charging or discharging. The alternator generation voltage is controlled according to this information.

When the charging is sufficient, the generation voltage is decreased to 12~13V from the normal regulated voltage, which is approximately 14V.



2010MY YD25

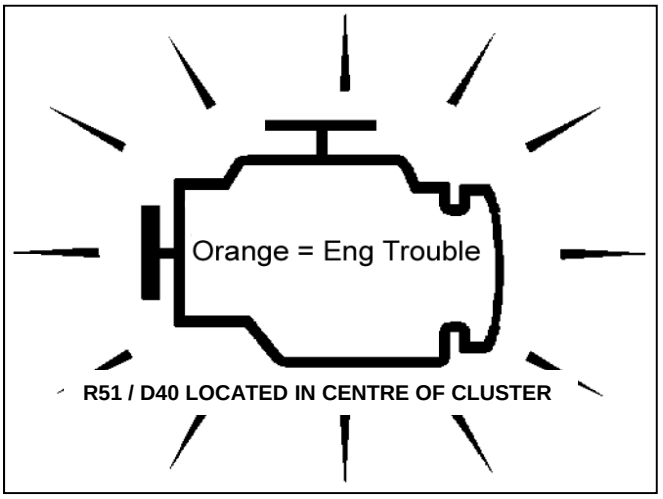
ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

12. Malfunction Indicator Lamp (MIL)

(Orange in colour)

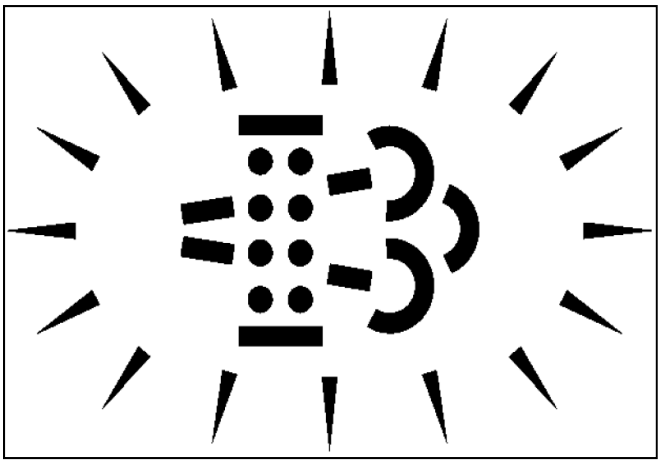
The MIL is located within the Instrument cluster between the Speedometer & Tachometer (R51 & D40). It will illuminate in the typical ORANGE colour, this indicates an engine system fault. Use of CONSULT is required to extract DTC(s).



13. DPF Over Accumulation Warning Lamp

(Orange in colour)

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 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.

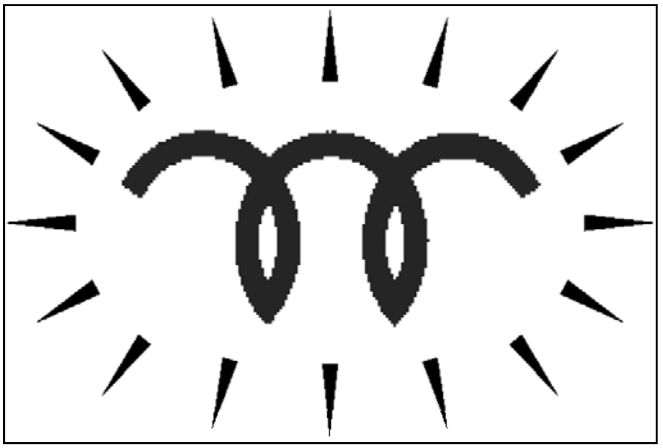


YD25 Type 2 DPF

14. Glow Plugs Activated Indicator Light

(Orange in colour)

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.



ENGINE CONTROL SYSTEM

YD25DDTi Outputs from ECM

15. CRUISE & SET Lamps (Green in Colour)

The CRUISE lamp will illuminate when the Cruise Control Main Switch on the steering wheel is pressed. (If the ignition is ON) Once the necessary conditions are met, the green coloured SET lamp will illuminate when the ASCD is actually functioning.

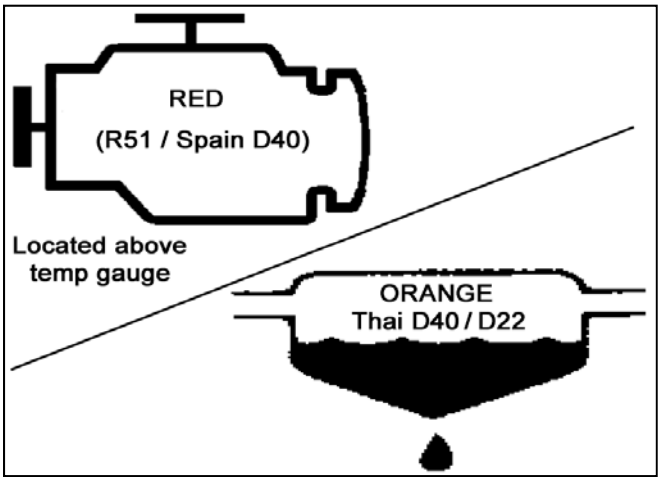
NOTE:
2007 ~ 2009MY R51 & Spain D40 do not have a “SET” lamp installed.

SPECIAL NOTE REGARDING A BLINKING GREEN COLOURED CRUISE or SET LAMP CONDITION:
When the ECM detects any of the following conditions, cruise control operation is cancelled and the green coloured CRUISE or SET lamp will blink;
- If the Engine coolant temperature is slightly higher than the normal operating temperature, the GREEN CRUISE lamp may blink slowly. (But DTC’s may not be logged unless the temperature becomes excessive)
- If a malfunction with one of the inputs for ASCD control occurs, the CRUISE or SET lamp will blink quickly. DTC’s will be logged.

SPECIAL NOTE:

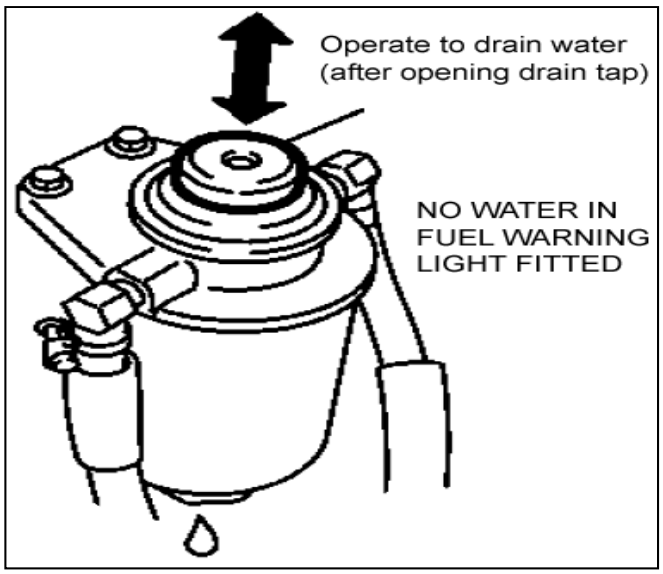
Water in Fuel Filter Warning

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. See over page for more details.



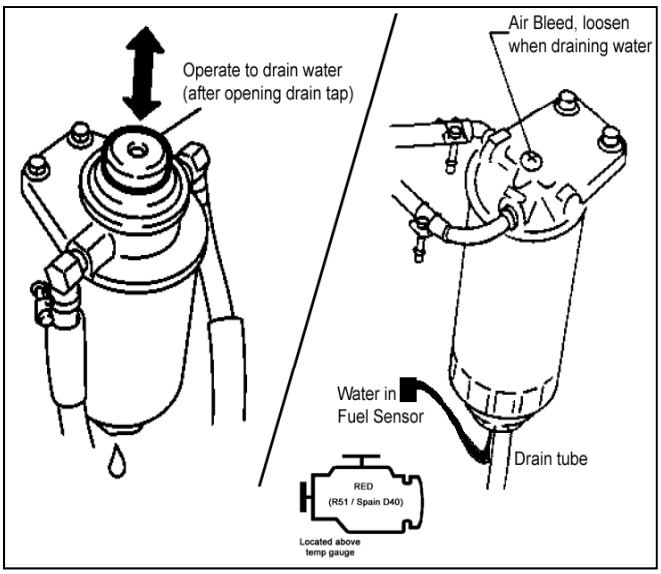
GENERAL INFORMATION

YD25 Fuel Filtration & Water in Fuel Warning Arrangement



April ~ June 2005 R51 only

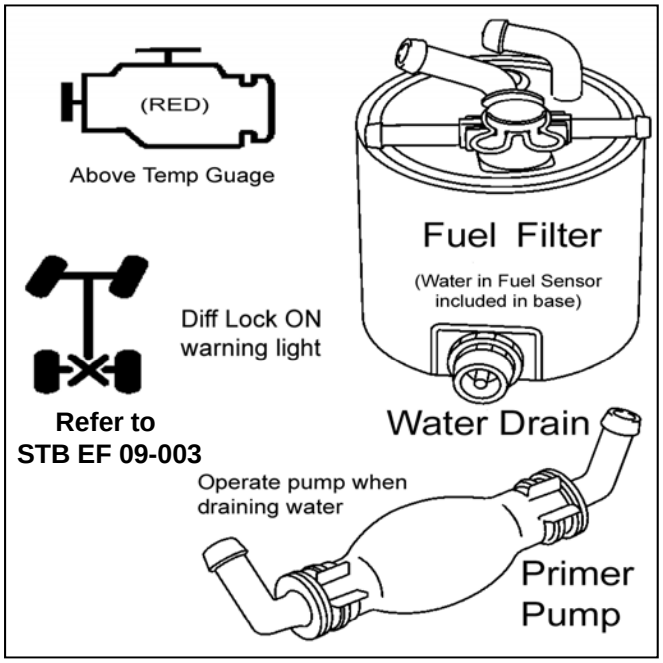
Ensure to drain water regularly as there is no Water Switch fitted.



June 05 ~ May 06 R51 & Spain D40

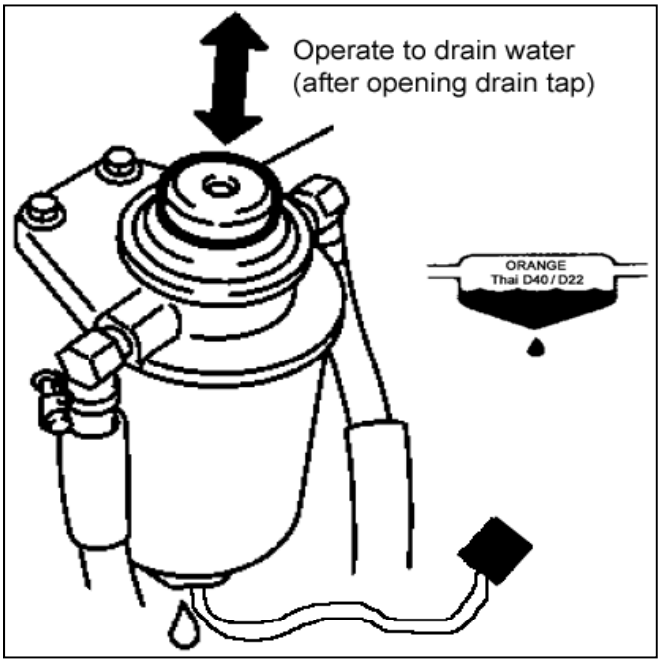
Ensure to drain water from both the Sedimentor & Fuel Filter.

Water Switch fitted to base of Sedimentor



June 2006 onwards R51 & Spain D40

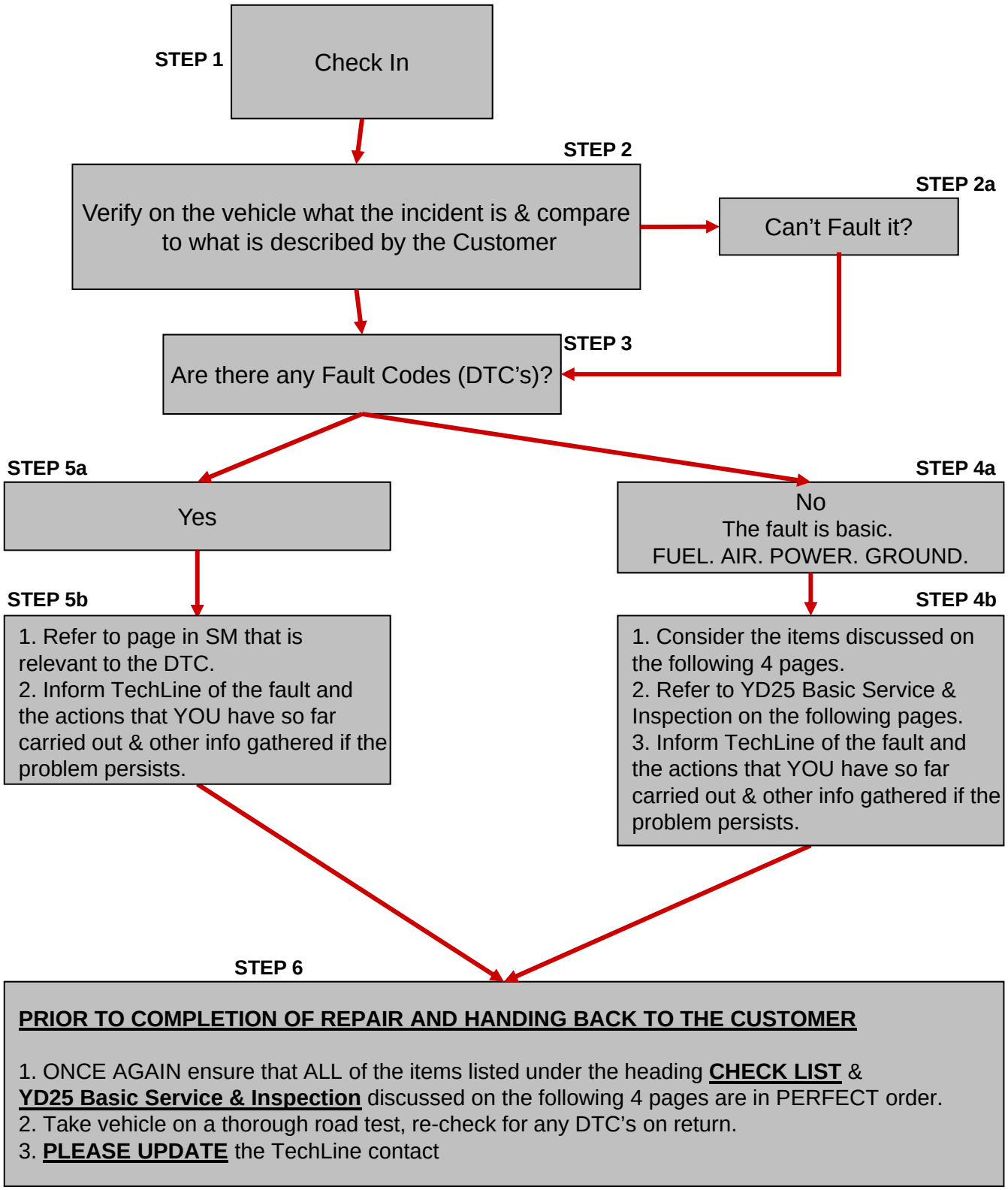
Water Sensor included as part of filter assembly. If an ORANGE coloured "Diff Lock ON" light appears on some vehicles, (late '06 production) this indicates Water in Fuel. Drain the water & refer to STB EF 09-003



All Thailand D40 & D22
Water Switch fitted to base of Filter

SPECIAL NOTE:
Y61 1998 ~ 2006MY + D22 ZD30 Orange MIL (check engine light) is also the WIF warning.

YD25 ENGINE TROUBLE DIAGNOSIS



YD25 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 84 ~ 88)

(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 / SERVICE 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? (This includes the poor / incorrect fitment of genuine accessories)

YD25 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 Sw” & ASCD Brake 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)

10. CUSTOMER INDUCED ISSUES.

- Exceeding the vehicles carrying / towing capacity.
- Using poor quality / contaminated fuels.
- The customer tends to “flick” the ignition key when starting the engine (key is not held in the crank position long enough).
- Incorrect / Insufficient servicing, wrong oils, non genuine parts
- Vehicle is driven in conditions that are not ideal for the vehicle (DPF equipped vehicle driven in stop / start conditions)

YD25 ENGINE TROUBLE DIAGNOSIS

YD25 Basic Service & Inspection

1. Fuel Filter, Bleeding & Water Drain

For **all diesel engine vehicles**, ensure that the fuel filter is drained EVERY 10,000KM'S!

If water collects in the base of the filter, the Water in Fuel warning light will illuminate to warn the driver of the water in fuel condition. There will be no DTC's recorded in the ECM however.

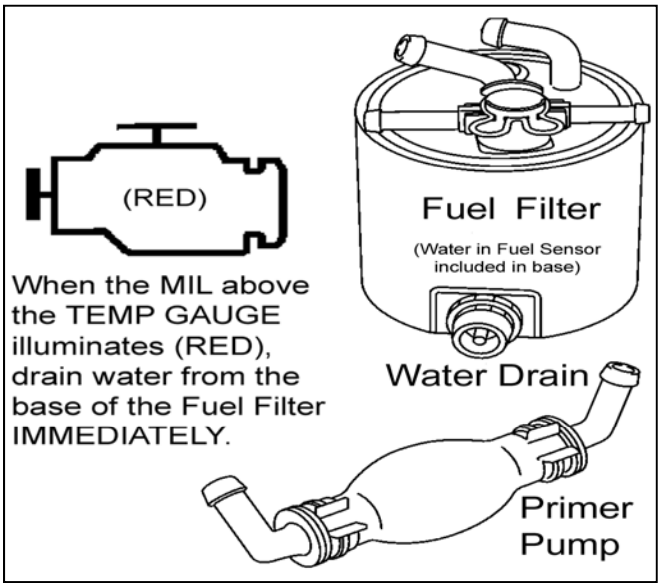
DTC's will eventually be logged if the water in fuel condition is not quickly rectified.

Refer to page 69 for more detail. Also refer to the ESM as follows;

L MAINTENANCE > MA (Maintenance) > ENGINE MAINTENANCE

&/or

B ENGINE > EC (Engine Control) > BASIC SERVICE PROCEDURE



R51 & Spain D40

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.

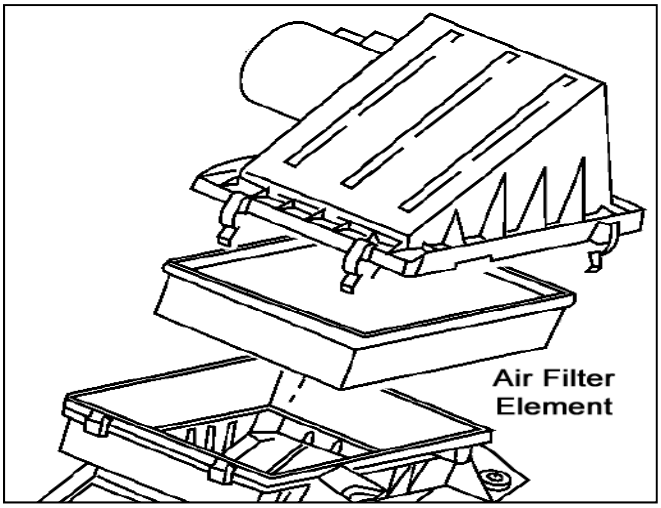
Ensure the remainder of the air intake system (such as the intercooler behind the bumper) is free from;

- Blockage
- Leakage
- Damage

Especially considering the Intercooler & ducting that is mounted behind the front grille / bumper.

Refer to the ESM as follows;

L MAINTENANCE > MA (Maintenance) > ENGINE MAINTENANCE



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 prior to taking any further action.

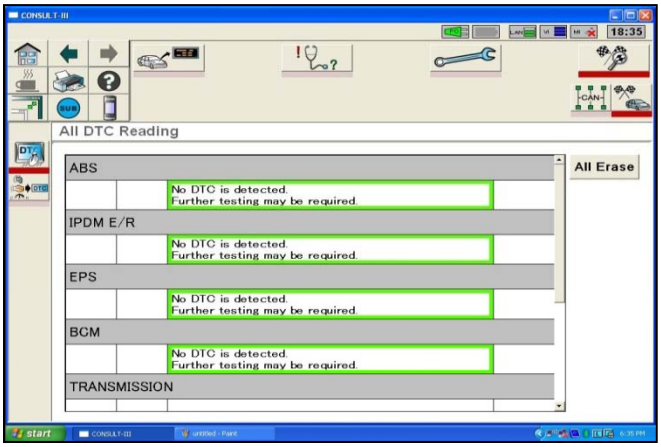
Refer to the ESM for information about the codes. Refer to the list of **"Possible Causes"** to determine the **most likely** cause of the fault.

Remember the code could be related to the basics!

Do not immediately blame expensive components.

Refer to the ESM as follows;

B ENGINE > EC (Engine Control) > INDEX FOR DTC or DTC/CIRCUIT DIAGNOSIS



NOTE: For 2005 ~ 2009MY R51 & Spain D40 YD25 with M/T, DTC U1000 is a permanent code. This is normal.

YD25 ENGINE TROUBLE DIAGNOSIS

YD25 Basic Service & Inspection

4. DPF Pressure Difference Inspection

Ensure that the DPF is not restricted excessively. Use CONSULT 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.

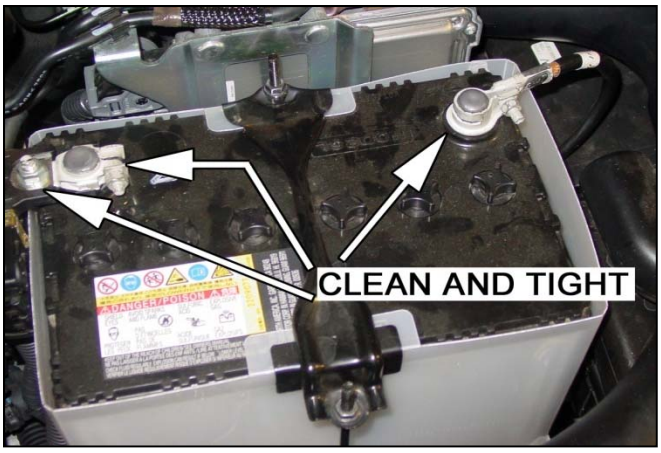
Condition	DF EX PRES SE [kPa]
• CKPS·RPM: 2000rpm • FR EX TMP SEN: 150 - 200°C (302 - 392°F) • RR EX TMP SEN: 150 - 200°C (302 - 392°F)	Less than 6.7

DPF engines only

5. Battery / Alternator / GROUNDS

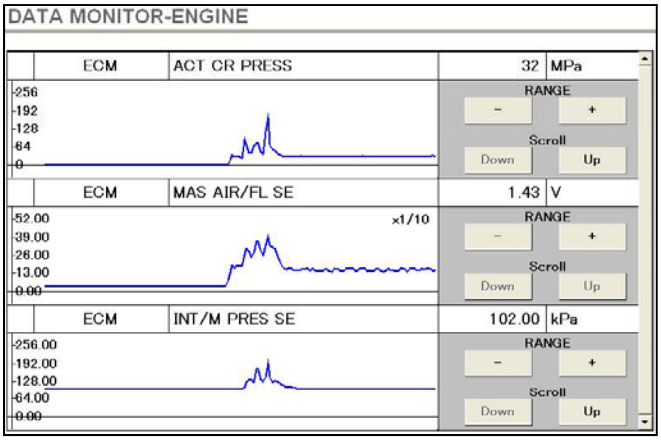
Given the engines high reliance on **electrical power**, ensure that the source of this is in perfect order.
- Clean / tight battery terminals
- Battery can pass a load test
- Alternator is charging properly - **when it is under load**
- Engine Ground connections E21, E41, E61 & F7.

Refer to pages 84 ~ 84 of this manual for more detail.



6. Fuel Pressure

Use CONSULT in ENGINE – DATA MONITOR – ACT CR PRESS to determine the amount of fuel pressure in the rail.
Do not loosen a fuel line at the injector or rail!
Refer to page 19 & 34 of this manual for more detail.

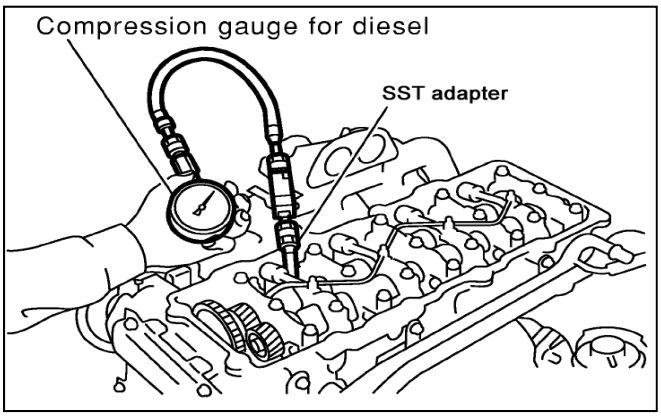


7. Turbo Boost Pressure / Mass Air Flow

Use CONSULT III in ENGINE – DATA MONITOR – INTAKE/M PRES SE & MAS AIR/FL SE to determine the amount of air pressure (turbo boost) & airflow in the intake when the engine is starting, raced, under load.
Refer to page 63 & 53 of this manual for more detail.
Also refer to the ESM as follows;
B ENGINE > EC (Engine Control) > TROUBLE DIAGNOSIS > CONSULT-III Reference Value in Data Monitor Mode or ECU DIAGNOSIS INFORMATION

8. Engine Compression

Ensure that there is suitable compression.
Follow the directions outlined in the ESM as follows;
B ENGINE > EM (Engine Mechanical) > CYLINDER HEAD

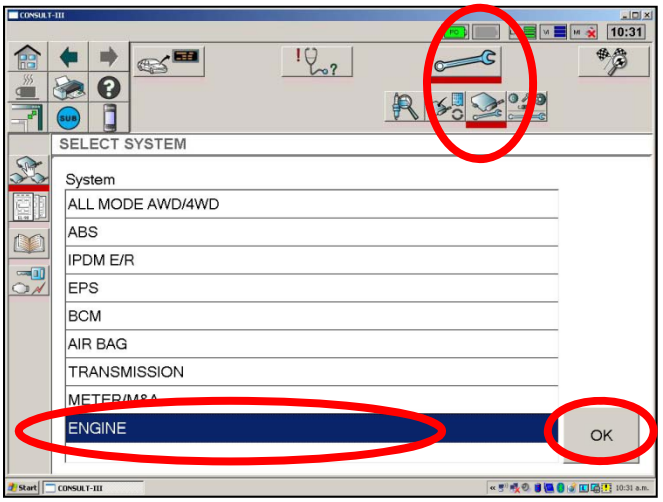


YD25 ENGINE TROUBLE DIAGNOSIS

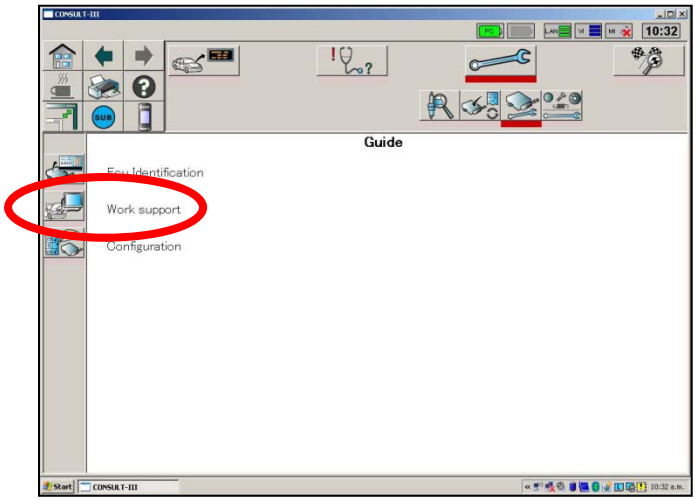
YD25 CONSULT III Work Support

1. Access to WORK SUPPORT (All YD25)

- Touch the spanner icon ('Repair" menu) & 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"



2a. Selection Work Support Functions

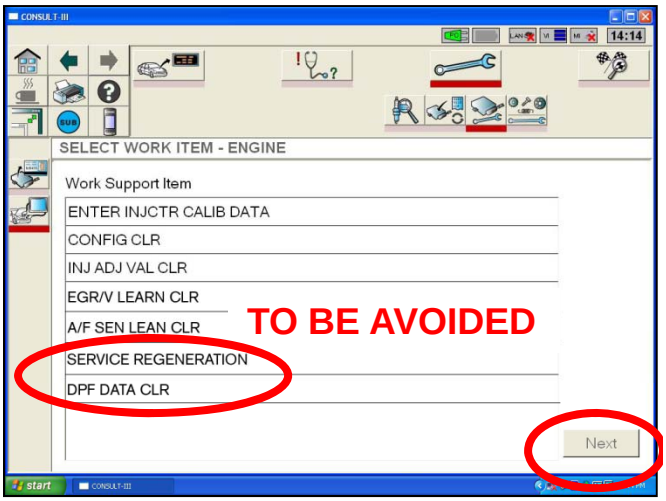
Select (highlight) the desired Work Support function & then touch **"Next"**
Refer to the chart on page 82 for further instruction regarding these operations.
In most cases the on screen instructions will guide you further.

Also refer to the ESM as follows;
B ENGINE > EC (Engine Control) > TROUBLE DIAGNOSIS > CONSULT-III Function (ENGINE)
- or
B ENGINE > EC (Engine Control) > ON BOARD DIAGNOSTIC (OBD) SYSTEM > CONSULT-III Function

WARNING

- Do **not** perform the "DPF DATA CLEAR" unless you have actually fitted a **brand new** DPF to the vehicle.

- Do **not** perform a "SERVICE REGENERATION" unless it's the last resort. A 30 min drive is preferable. If the SERVICE REGENERATION is performed – you must **change the engine oil & filter** after it's completed.



YD25 Type 2 Work Support Options

Options vary between the different YD25 engines

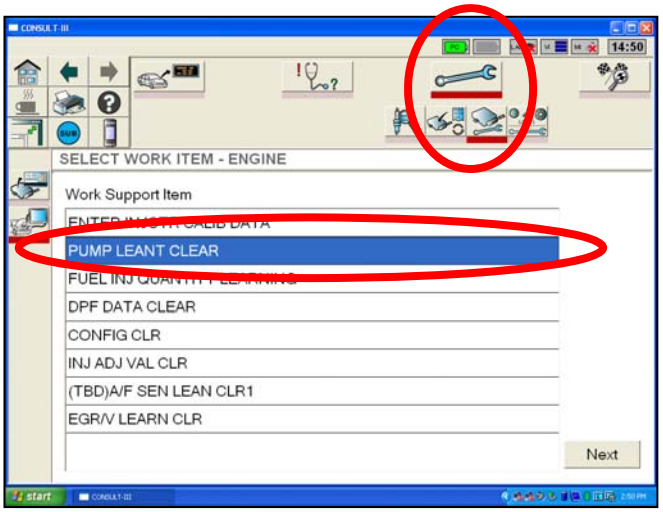
YD25 ENGINE TROUBLE DIAGNOSIS

YD25 CONSULT III Work Support

2b. Selection Work Support Functions

For 2010MY YD25, there are some differences.
Take special note that the “PUMP LEANT CLEAR” function has moved to Work Support instead of Active Test.

NOTE:
Ignore the “DPF DATA CLEAR” & “A/F SEN LEAN CLR” functions.



YD25 2010MY Work Support Options

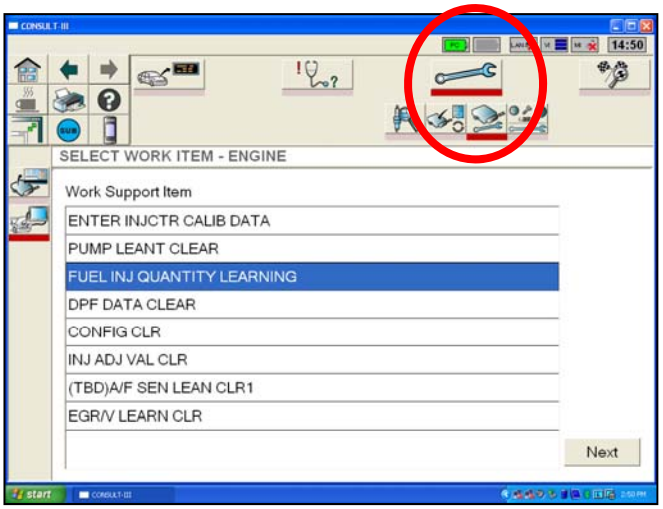
3. Work Support Function Descriptions

(i) Fuel Inj Quantity Learning (YD25 2010MY only)

Fuel Injection Quantity Learning is performed to adjust fuel injection quantity deviation during the use of injectors under various conditions to properly adjust the injection quantity.
If this learning is not performed, then malfunctions, such as knocking and poor acceleration may occur.

Injector fuel injection quantity learning must be performed after the following cases;
(i) Injector(s) are replaced.
Please note that if all the injectors are replaced, then perform Learning Value Clear **only**. The clear function is in the fuel injection quantity learning function.
(ii) ECM is replaced.
(iii) ECM detects any DTC. Rectify the fault & then carry out the learn procedure

Refer to the ESM as follows;
B ENGINE > EC (Engine Control) > BASIC INSPECTION > FUEL INJECTION QUANTITY LEARNING



YD25 2010MY

YD25 ENGINE TROUBLE DIAGNOSIS

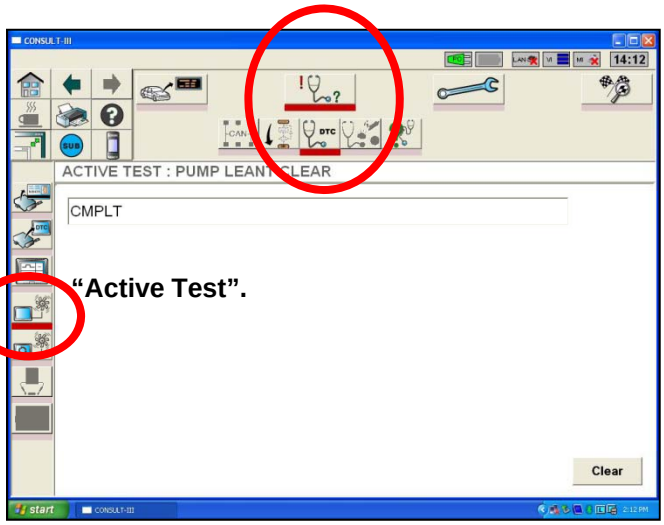
YD25 CONSULT III Basic Service

(ii) Fuel Pump Learning Value Clearing (All YD25)

The ECM has the capability to learn how to control the Fuel pressure in the Rail in order to match each Fuel Pumps unique characteristics. This is achieved via the control of the Suction Control Valve (SCV) on the Fuel Pump after monitoring the Fuel Pressure sensor in the Fuel Rail.

However it maybe necessary to clear this learnt value from the memory of the ECM after working on the Fuel system. This principle of learning the ideal Fuel Pressure & maintaining a unique setting for each engine is very much like the principle of Petrol engines learning & maintaining a unique A/F Alpha.

This "CLEAR" function in CONSULT III can be found in "ACTIVE TEST" (or "Work Support" for YD25 2010MY).



(YD25 Type 1, Type 2 & D22) From Engine, click on; "Select" > "Active Test" > "PUMP LEANT CLEAR"

Refer to the ESM as follows;

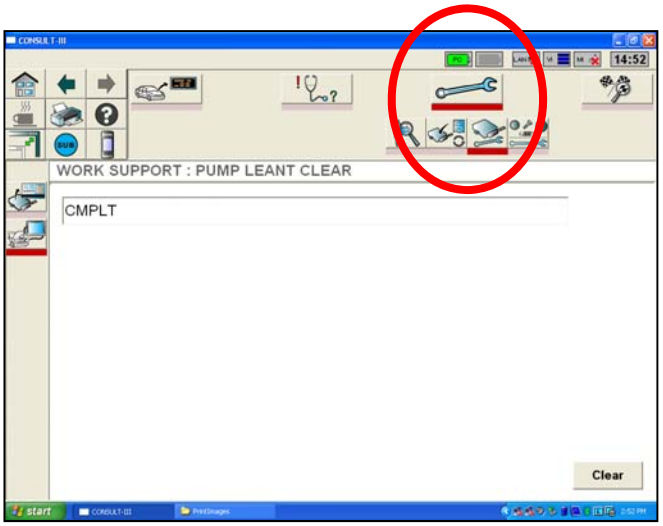
B ENGINE > EC (Engine Control) > BASIC SERVICE or BASIC INSPECTION > FUEL PUMP LEARNING VALUE CLEARING

A typical scenario that will require the "PUMP LEANT CLEAR" operation to be performed is after the following repairs have been carried out;

- A new Fuel Filter has been fitted (in any case)
- Rectification of the following DTC's;

P0088, P0089, P0093, P1272, P1273, P1274, P1275.

- After rectification of a fuel blockage issue
- After rectification of a fuel aeration issue
- After the HP Fuel Pump has been replaced
- After Injectors &/or Fuel Rail has been replaced
- Complaints of excessive fuel consumption / smoke emission / DPF issues. (Use this in conjunction with a thorough engine / driveline / vehicle inspection)



(YD25 2010MY) The "PUMP LEANT CLEAR" function is located in the Work Support Menu

WARNING!

AFTER FITMENT OF NEW FUEL PUMP TO THE ENGINE, NEVER START THE ENGINE UNTIL THE "PUMP LEANT CLEAR" OPERATION HAS BEEN CARRIED OUT. DO IT 3 TIMES. (Ign. OFF for 10 seconds between each clear)

SPECIAL "PUMP LEANT CLEAR" PROCEDURE

1. With engine idling, touch "CLEAR" on CONSULT & wait until "CMPLT" appears.
2. Touch "BACK" or back out of the screen to the Active test menu.
3. Switch off ignition (stop engine) for 15 seconds.
4. Restart engine & idle.
5. Once again access the "Pump Leant Clear" in CONSULT.
6. With engine idling, touch "CLEAR" on CONSULT & wait until "CMPLT" appears.
7. Continually repeat these steps. Ensure the ignition OFF condition (step 3) is always carried out. TechLine may advise to try this up to 10 times.
8. Re-evaluate engine operation.

YD25 ENGINE TROUBLE DIAGNOSIS

YD25 CONSULT III Basic Service

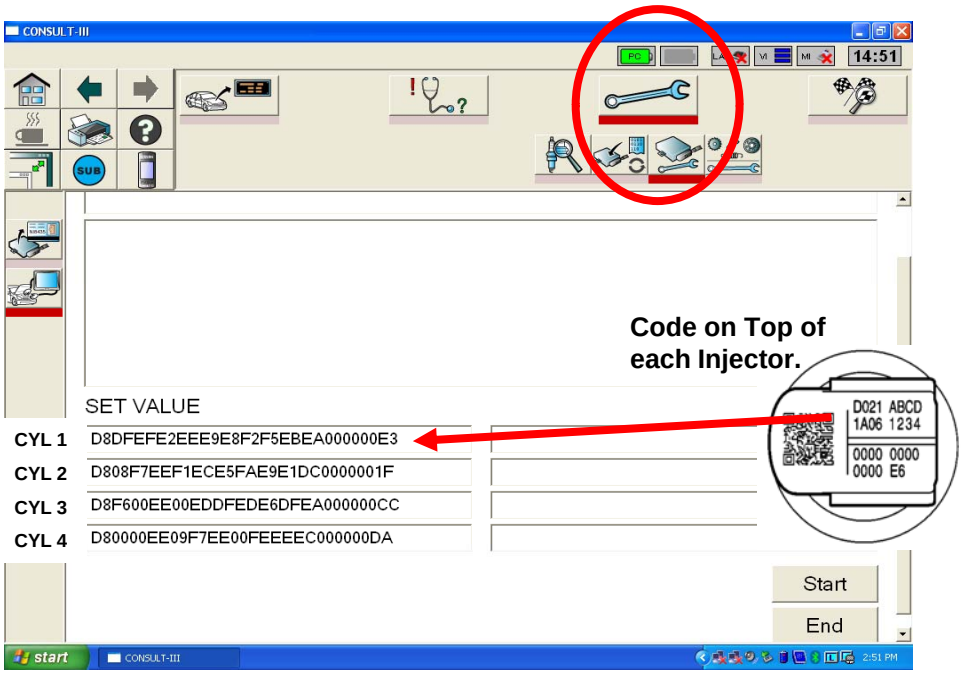
(iii) Injector Adjustment Value Registration (All YD25)

Each Injector will tend to have very slight differences between them with the amount of Fuel they deliver when an electrical current is applied to them.
If the ECM was to apply exactly the same current to all 4 x injectors on the Engine, there will tend to be slight differences in the amount of Fuel each Injector delivers.

Therefore once the Injector has been manufactured, a special resistance measurement is taken of the Injector. This measurement is converted into a special code & then printed on the top of the Injector. This code is entered into the ECM at the factory via a special scan tool.

However if during service, 1 or more than 1 of the injectors are replaced, the code of the failed injector needs to be erased from the ECM & the code of the newly installed injector will need to be entered into the ECM. This operation is carried out easily using CONSULT II.
If the ECM is replaced, the codes of the already existent Injectors need to be entered into the ECM.

Refer to the ESM as follows;
B ENGINE > EC (Engine Control) > BASIC SERVICE or BASIC INSPECTION > FUEL PUMP LEARNING VALUE CLEARING



In CONSULT III, select "Repair" > "ENGINE" > "Work Support" > "ENTER INJCTR CALIB DATA"

Connect an external Power Source to the CONSULT III & a booster battery to the vehicle.

Ensure the "Caps Lock" on the keyboard is ON.

After the entry of each code, it is advisable to click the "START" button on the screen. The codes will then be locked into memory. (May save you having to repeat the process)

Ensure the codes on CONSULT III screen match the code printed on top of each Injector.

Thailand build engines injectors are different to Spain build engine injectors.

YD25 ENGINE TROUBLE DIAGNOSIS

YD25 CONSULT III Basic Service

(iv) EGR Volume Control Valve Closed Position Learning Value Clear (YD25 Type 2, D22 & 2010MY)

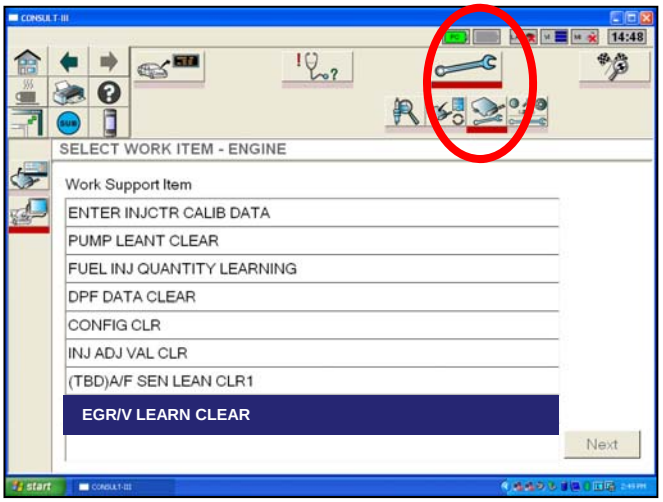
If the following actions regarding the EGR valve have been carried out;

- EGR volume control valve is removed & refitted
- EGR volume control valve is replaced

This operation using CONSULT III in Work Support must be carried out to ensure proper operation of the EGR valve.

Refer to the ESM as follows;

B ENGINE > EC (Engine Control) > BASIC SERVICE or BASIC INSPECTION > EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING VALUE CLEAR



YD25 D22, Type 2 & 2010MY

(v) EGR Volume Control Valve Closed Position Learning (YD25 Type 2, D22 & 2010MY)

If the following actions regarding the EGR valve have been carried out;

- EGR volume control valve is removed & refitted.
- EGR volume control valve is replaced
- ECM is replaced

This operation must be carried out to ensure proper operation of the EGR valve.

This is much like the Accelerator Pedal & Throttle Valve learning operation on Petrol engine models with Electric Throttle. It is a simple matter of operating the ignition key within set time periods. (10 sec. ON then 10 seconds OFF. Repeat 3 times.

Engine must never be hot

Refer to the ESM as follows;

B ENGINE > EC (Engine Control) > BASIC SERVICE or BASIC INSPECTION > EGR VOLUME CONTROL VALVE CLOSED POSITION LEARNING

YD25 ENGINE TROUBLE DIAGNOSIS

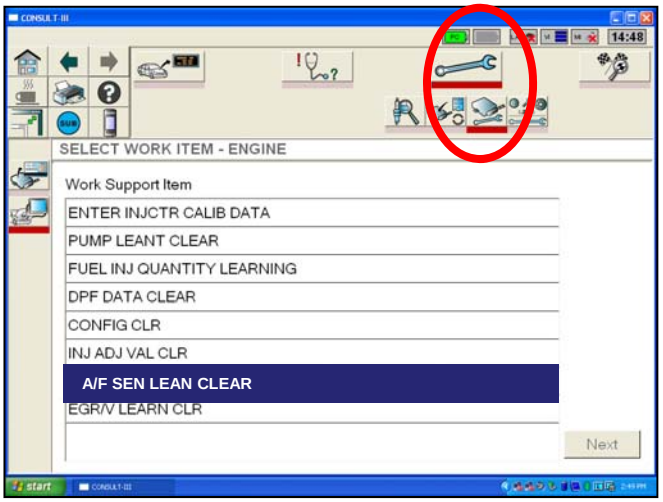
YD25 CONSULT III Basic Service

(vi) A/F Sensor Learning Value Clear
(YD25 Type 2 DPF only)

The ECM learns the output characteristic of A/F sensor to perform the control of DPF regeneration precisely. The A/F sensor learning value should be cleared under the following conditions;

- A/F sensor is replaced
- ECM is replaced with used one which stores the A/F Sensor Learning Value of another A/F sensor
- Continual logging of DTC P2002 even if the system is OK.

Refer to the ESM as follows;
B ENGINE > EC (Engine Control) > BASIC SERVICE > A/F Sensor Learning Value Clear



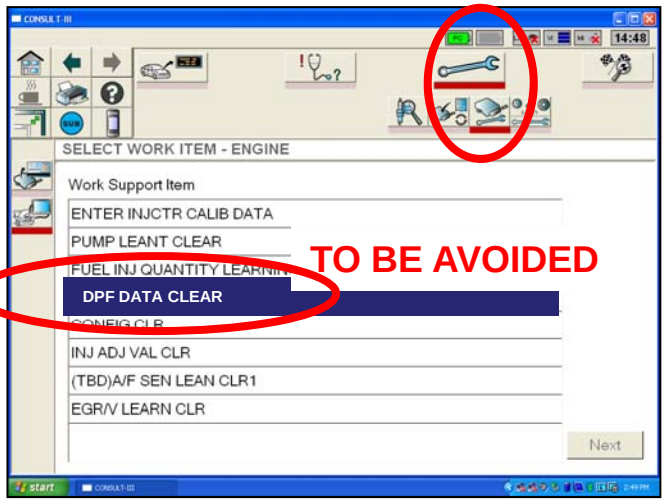
YD25 Type 2 DPF

(vii) DPF Data Clear (YD25 Type 2 DPF only)

Perform “DPF DATA CLEAR” in “WORK SUPPORT” mode with CONSULT when the DPF assembly is replaced with a new one.

Based on the signal from the various sensors, the ECM estimates the amount of PM in the DPF and stores the value in the EEPROM (Electrically Erasable Programmable Read Only Memory) as DPF data. When the DPF is replaced with a new one, there is a difference between the DPF data stored in ECM and the actual amount of PM in the DPF assembly. This is because no PM is trapped in the new DPF. Therefore the ECM cannot perform regeneration control correctly. Perform “DPF DATA CLEAR” in “WORK SUPPORT” mode with CONSULT to clear DPF data stored in ECM.

Refer to the ESM as follows;
B ENGINE > EC (Engine Control) > BASIC SERVICE > DPF Data Clear



YD25 Type 2 DPF

WARNING!

Never perform “DPF DATA CLEAR” with CONSULT when DPF is not replaced with new one.
DPF may be damaged because regeneration is not performed at appropriate timing.
Only carry out this function after the fitment of a brand new DPF.

YD25 ENGINE TROUBLE DIAGNOSIS

YD25 CONSULT III Basic Service

(viii) Service Regeneration (YD25 Type 2 DPF only)

Service Regeneration is performed with CONSULT to burn off the PM in the DPF. (Do NOT drive the vehicle in this case). Service Regeneration with CONSULT should **only** be performed due to the following cases;

1. If the ECM enters fail-safe mode because the amount of PM in the DPF reaches a specified level.

NOTE:

When ECM enters fail-safe mode because the amount of PM in the DPF reaches the specified level, check whether or not a DTC is stored in ECM. In the case of DTC stored, perform the Diagnostic Procedure for the DTC 1st.

2. If the ECM is replaced.

NOTE:

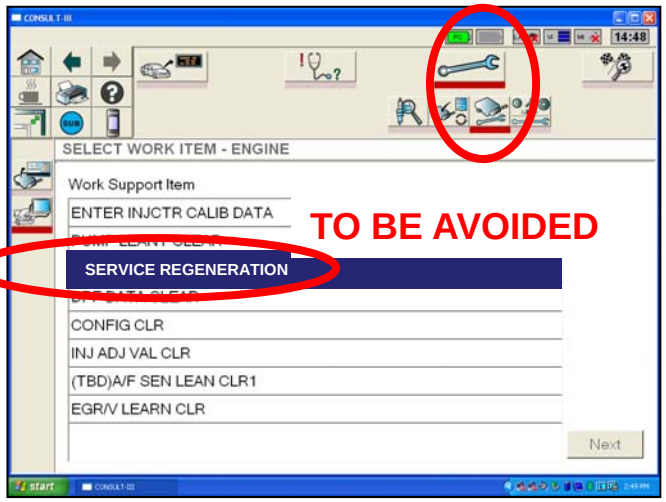
It is necessary to perform the service regeneration to make the amount of PM in the DPF 0 in order to match the value stored in the newly installed ECM which is 0. If this is not done the automatic regeneration will occur at the wrong times (too early or too late)

3. If a component Inspection for DPF is performed due to DTC P2002 being logged in the ECM. The cause of the DTC must be rectified prior to Service Regeneration. Otherwise the operation will fail.

WARNING!

- **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 with the A/C on for 75 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 service regeneration. Fuel mixes with engine oil during service regeneration.**

However, the mixture of fuel with the engine oil does not occur during the regeneration which is automatically performed under normal operation.



YD25 Type 2 DPF

Reference should be made to the ESM as follows;

B ENGINE > EC (Engine Control) > BASIC SERVICE > Service Regeneration

DO NOT CARRY OUT THIS OPERATION UNLESS IT IS ABSOLUTELY NECESSARY

NOTES:

- Whilst the Service Regeneration (SR) is being performed with CONSULT – it **must** be plugged into an **external power source.**
- Once the SR has completed, clean / tighten all of the engine bay Grounds – (along with changing the Oil & Filter).
- Once the SR has completed, Inspect the entire Air Intake system for leaks, faults. Replace the Air Filter if in doubt.
- With CONSULT in Engine - Data Monitor, check the INT/M PRES SE (Turbo Boost). Ensure the Turbo is boosting OK.
- Perform the “PUMP LEANT CLEAR” with CONSULT.

BASIC SERVICE OPERATION APPLICATION CHART

Basic Service Operation / Required Repair	20 ~ 30 min Road Test at a consistent speed of 80 ~ 100km/h	*1 DPF Service Regeneration (CONSULT) + change oil & filter	DPF Data Clear (CONSULT)	DPF A/F Sensor Learn Clear (CONSULT)	EGR Valve Position Learn Clear (CONSULT)	EGR Valve Closed Position Learning	Throttle Valve Closed Position Learning	Fuel Injection Quantity Learning (CONSULT)	Fuel Pump Learn Clear (CONSULT)	Injector Adjustment Value Registration (CONSULT)	Reprogram ALL NATS Ignition Keys to vehicle (CONSULT with NATS Software)
						Ign. ON, then off 10 sec. x 3 times					
*2 Repair of Engine Sluggish / Lack of Power issue (No warning lights)	**YES** (Other LOP diagnosis required if NG)	NO	NO	NO	NO	NO	NO	NO	**YES**	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	**YES**	NO	NO	NO	NO	**YES**	NO	NO
Inspection of excessive smoke emission / excessive fuel consumption (but no DTC)	1.Clarify if the condition is typical for the vehicle. Driving styles, loads carried / towed, non standard wheels, tyres & accessories can affect the operation of the engine. 2. Question the type of fuel used &/or where it is sourced from. 3. Make sure the Injector Codels have been entered correctly. 4. Remove, clean with emery & refit all engine bay ground connections. 5. Perform a thorough Air Intake system inspection & check Turbo Boost with C-III Data Monitor; INT/M PRES SE. 6. Check fuel filter / fuel system for contamination. Rectify as necessary. 7. Perform Fuel Pump Learn Clear 3 times (Ign OFF for 10 seconds in between each clear) 8. If YD25 2010MY, carry out Fuel Injection Quantity Learning										
Replace ECM with Brand New Unit	NO	**YES**	NO	NO	NO	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
	Be sure of the EXACT REASON why the ECM is being Replaced. Discuss with TechLine to be sure.										
Replace ECM with Previously Used ECM (Swapped ECM)	THIS IS TO BE AVOIDED. CONTACT TECHLINE TO DISCUSS THE COMPLEX PROCESS THAT IS REQUIRED WITH REPLACING / SWAPPING ECM's										
*3 DTC P2002 logged in ECM	This DTC indicates illogical inputs to the ECM from either of the Front &/or Rear DPF temp sensors or the Diffential exhaust pressure sensor. Check for poor harness connections. Contact TechLine for further advice.										
Replace A/F Sensor	NO	NO	NO	**YES**	NO	NO	NO	NO	**YES**	NO	NO
Replace DPF with Brand New Unit	Recommended Final Step	NO	**YES**	**YES**	NO	NO	NO	NO	**YES**	NO	NO
Replace DPF with Previously used DPF (Swapped DPF)	Recommended Final Step	YES (Prior to Road Test)	NO	**YES**	NO	NO	NO	NO	**YES**	NO	NO
Replace / Swap / Remove & Refit Electric Throttle Unit	NO	NO	NO	NO	NO	NO	**YES**	NO	**YES**	NO	NO
Replace / Swap / Remove & Refit EGR Valve unit	NO	NO	NO	NO	**YES**	**YES**	**YES**	NO	**YES**	NO	NO
Fit new / Other Fuel Pump	NO	NO	NO	NO	NO	NO	NO	**YES**	**YES** (prior to starting engine)	NO	NO
Fit new / Other Injectors	NO	NO	NO	NO	NO	NO	NO	**YES** (Do the Clear only)	**YES**	**YES**	NO
Replace Fuel Filter or repair Fuel supply issues	NO	NO	NO	NO	NO	NO	NO	**YES** (only if there are major issues)	**YES**	NO	NO
Fit new / Other Fuel Rail Assembly	NO	NO	NO	NO	NO	NO	NO	**YES**	**YES**	NO	NO
Engine	**YD25 Type 2 DPF only**				**YD25 D22, Type 2 & 2010MY**		**YD25 Type 2 & 2010MY**	**YD25 2010MY**	**All YD25**		

Refer to over page for more details

YD25 ENGINE TROUBLE DIAGNOSIS

Summary of Basic Service Operations

This chart quickly summarises all typical repair tasks that could possibly be required on YD25 engine vehicle. The chart can be used for any YD25 D22, YD25 Type 1, YD25 Type 2 & YD25 2010MY.
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, the new DPF will more than likely be damaged due to the Automatic Regeneration operation being carried out at an inappropriate time.

PRIOR TO FITTING A NEW FUEL PUMP / FUEL RAIL / INJECTORS;

Ensure that any contaminated fuel has been flushed out of the system. Contaminated fuel is the **most likely** cause of the component failure in the first place.

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 Service Procedure or Basic Inspection" of the Service Manual.
***1** It is **mandatory** that the Engine Oil & Filter is changed once the Service Regeneration with CONSULT has completed. Refer to **STB MA 07-002a.**
***2** The "Lack of Power" complaint maybe caused by a non DPF related issue. Other Lack of Power diagnosis maybe required.
***3** Refer to the ESM & carry out the inspection procedure of P2002. (Monitor the 2 x exhaust temp sensors & "DF EXH PRES SENS" (differential pressure) in DATA MONITOR.

DPF Difference of Pressure & Exhaust Temperature Inspection

1. Connect CONSULT to the vehicle & access "ENGINE" & then "DATA MONITOR"
2. Using the "SELECTION FROM MENU" option, display the following items in "Numerical" on the screen of CONSULT

• CKPS (RPM)
• FR EX TMP SEN
• RR EX TMP SEN
• DF EX PRES SE [kPa]

With the engine running at 2000rpm, ensure the "DF EX PRES SE" reading is below 6 ~ 7 KPa. (will tend to flicker between 3 to 5 KPa. Refer below.
If the pressure is higher, refer to the procedure on clearing the PM in the DPF (Regeneration) as outlined on page 12 of the DPF Training Manual.
If the pressure is normal (below 6 ~ 7 KPa) the lack or power / sluggish performance problem is **not** DPF related. Carry out the normal Trouble Diagnosis procedure for Lack of Power.

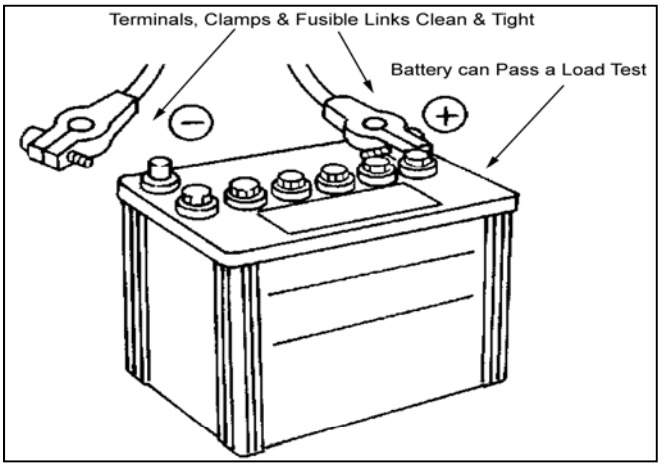
Condition	DF EX PRES SE [kPa]
● CKPS·RPM: 2000rpm ● FR EX TMP SEN: 150 - 200°C (302 - 392°F) ● RR EX TMP SEN: 150 - 200°C (302 - 392°F)	Less than 6.7

YD25 ENGINE TROUBLE DIAGNOSIS

Power Supply & Connections

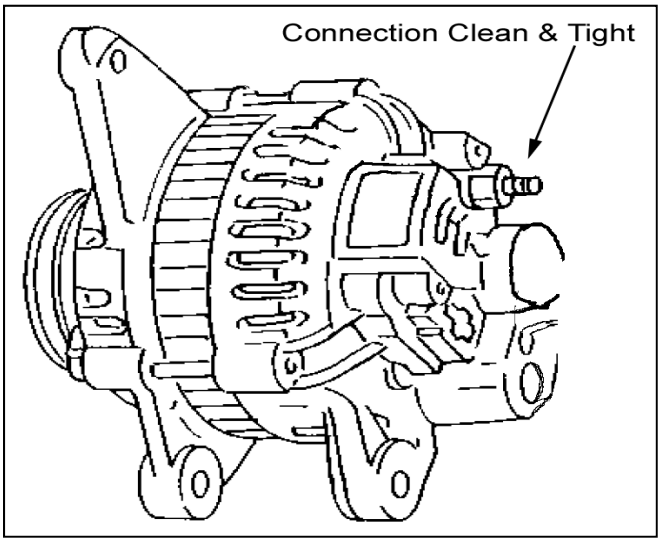
1. Battery

Ensure that the Battery is in **good condition**. Is it able to cope under load? Carry out a load test on it to be sure.
Ensure the POS & NEG terminals are **clean & tight.**
Remove & inspect them closely to be sure.
Make sure the Fusible links on the Positive terminal are not corroded.



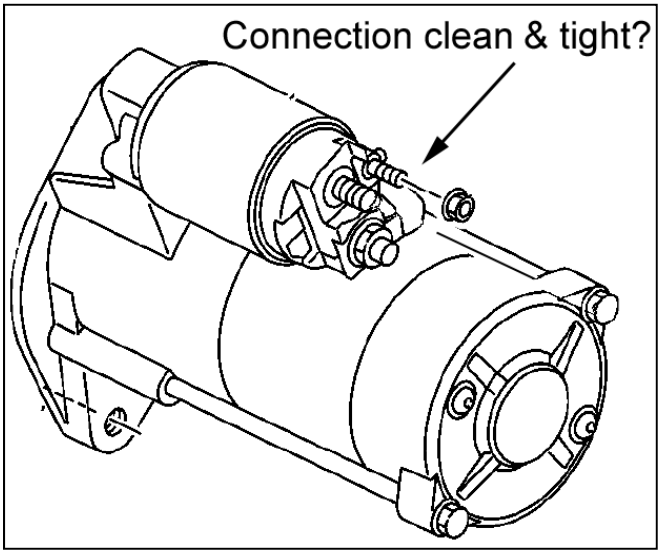
2. Alternator

Is the Alternator outputting a decent charge? Operate all electrical accessories to ensure the Alternator can cope under a loaded condition. Ensure the connections on the rear of the Alternator are **clean & tight.**



3. Starter Motor

Even though it may appear that the Starter Motor is functioning correctly, ensure that the main cables connected to it are **clean & tight.**



YD25 ENGINE TROUBLE DIAGNOSIS

Main Grounds

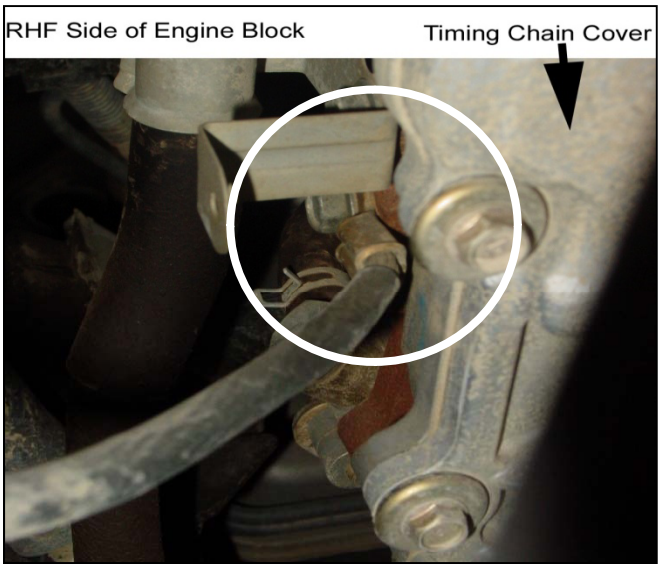
(R51 / D40 shown)

1. Battery Negative & Main Body

Ensure that the **both** of the connections circled in the diagram are **clean & tight.** Remove, inspect & refit securely once cleaned to be sure.

2. Engine Block

Ensure that the connection circled in the diagram is **clean & tight.** Remove, inspect & refit securely once cleaned to be sure.

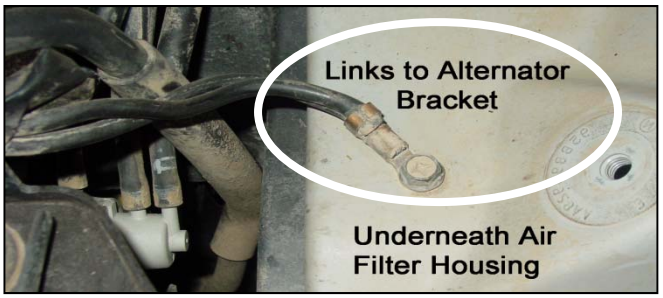


3. Alternator Bracket

Ensure that the connection circled in the diagram is **clean & tight.** Remove, inspect & refit securely once cleaned to be sure.

4. Underneath Air Filter Housing

Ensure that the connection circled in the diagram is **clean & tight.** Remove, inspect & refit securely once cleaned to be sure.



YD25 ENGINE TROUBLE DIAGNOSIS

Engine Control System Grounds

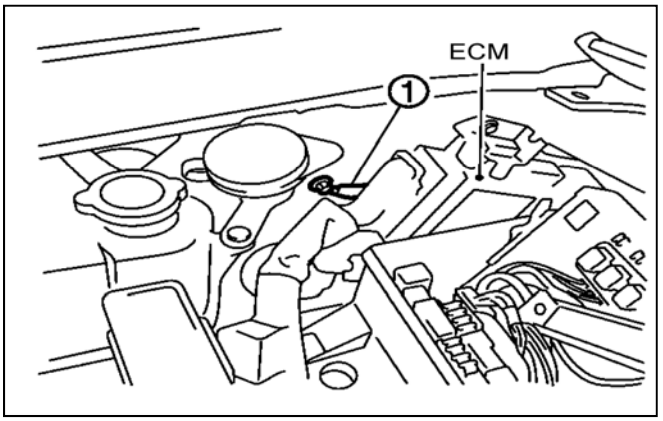
(R51 / D40 shown)

Ensure that ALL of the Ground connections shown right are in **good condition**. Ensure they are **clean & tight.**

Refer to **STB EL10-002**

1. ECM Ground E21

This Ground is located adjacent to the ECM in the engine bay.

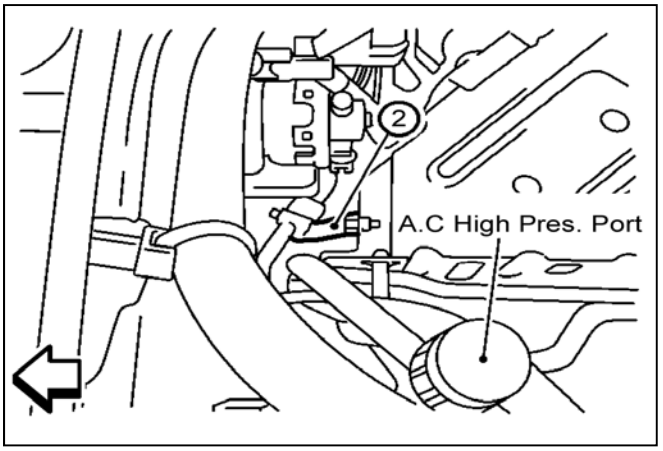


IMPORTANT NOTE:

The ECM outputs an **extremely high current** to operate the Fuel Injectors. Therefore a **good ground** connection is very important for reliable engine operation.

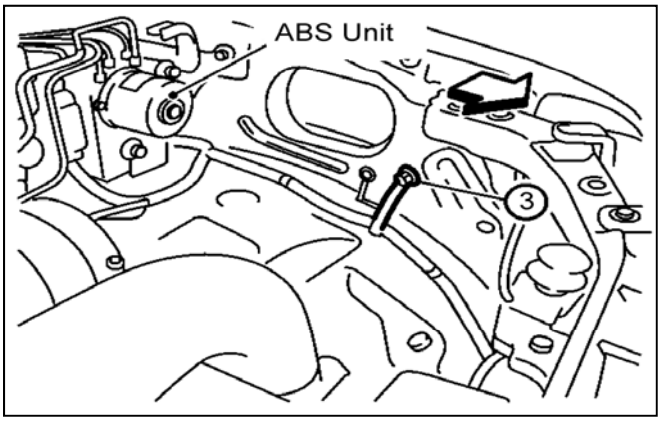
2. ECM Ground E41

This Ground is located under the battery carrier.



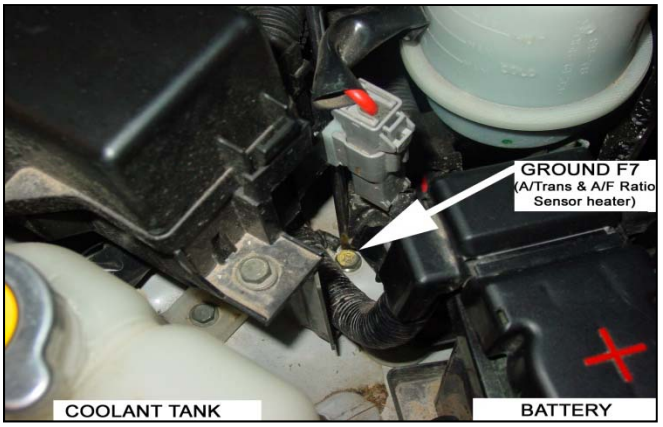
3. ECM Ground E61

This Ground is located under Air Cleaner Housing. The Ground adjacent to E61 is the ABS / VDC system Ground.



4. TCM & A/F Ratio Sensor Heater Ground F7 or F59

This single Ground connection is the **only** Ground connection for the Automatic Transmission. The A/F Ratio Sensor heater also shares the same Ground connection.

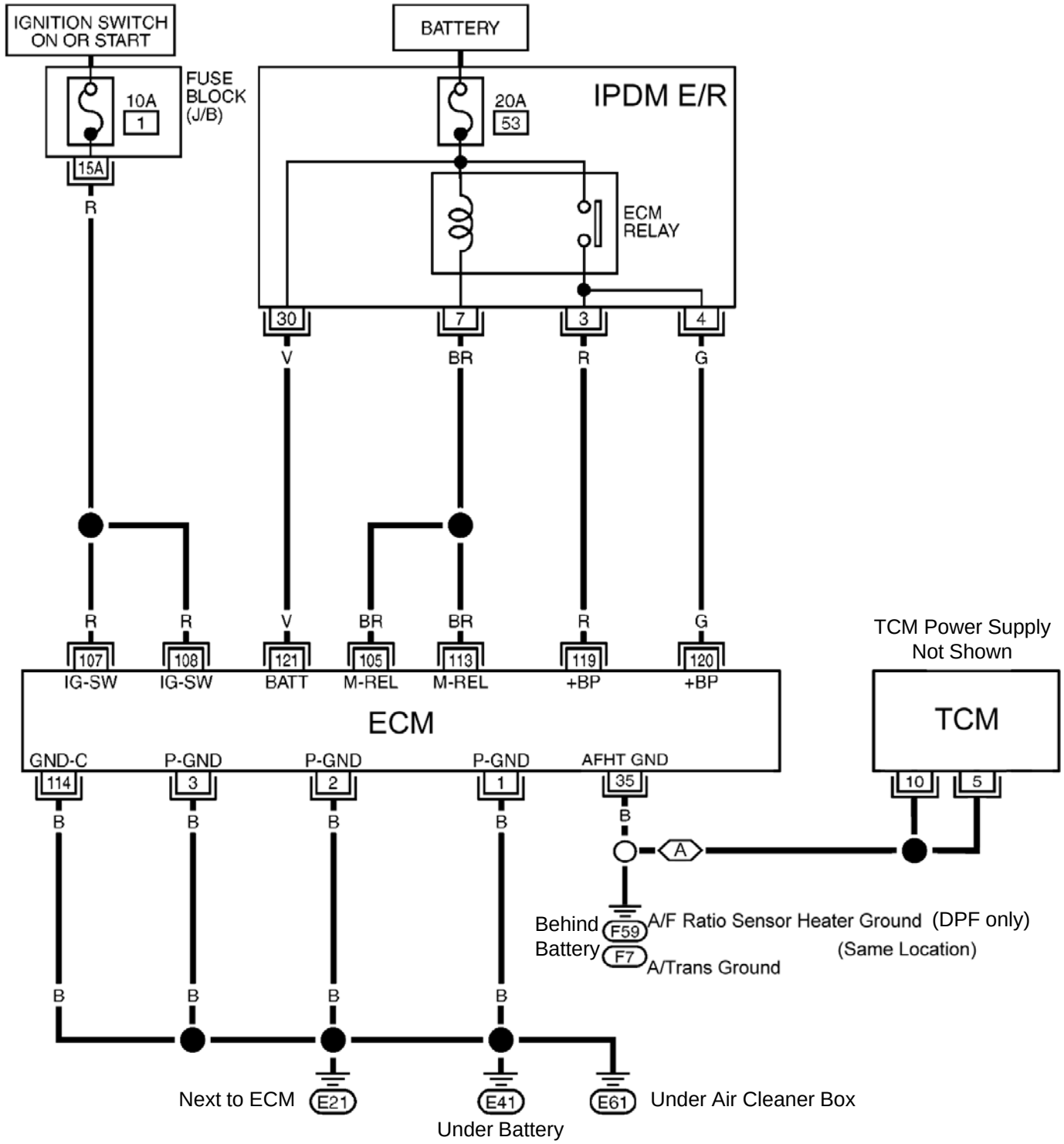


D22 YD25 EC Grounds

ECM grounds are located on the ECM bracket inside the cabin behind the centre dash. Access from LHS foot well.

YD25 ENGINE TROUBLE DIAGNOSIS

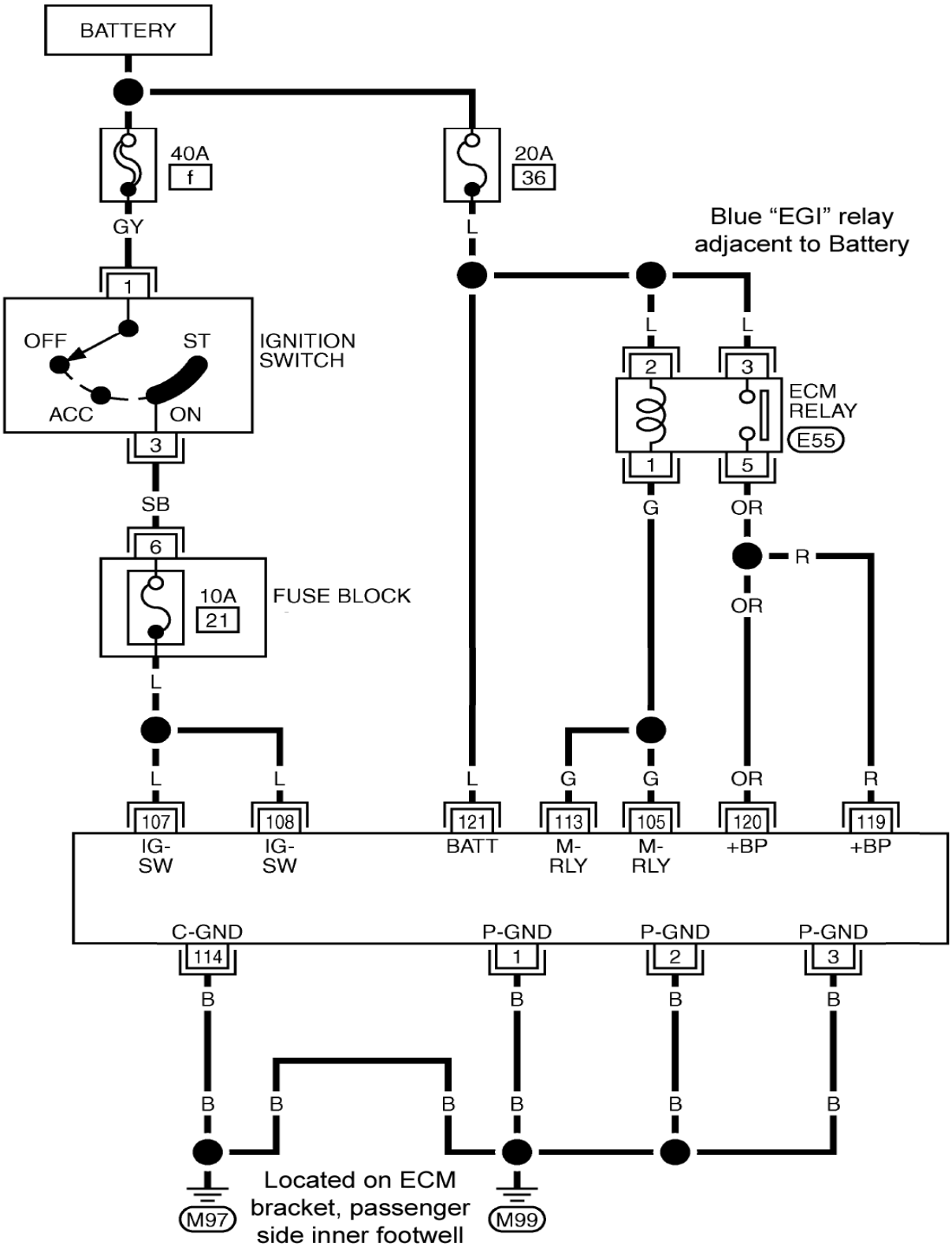
R51 & D40 Main Power & Ground Schematic



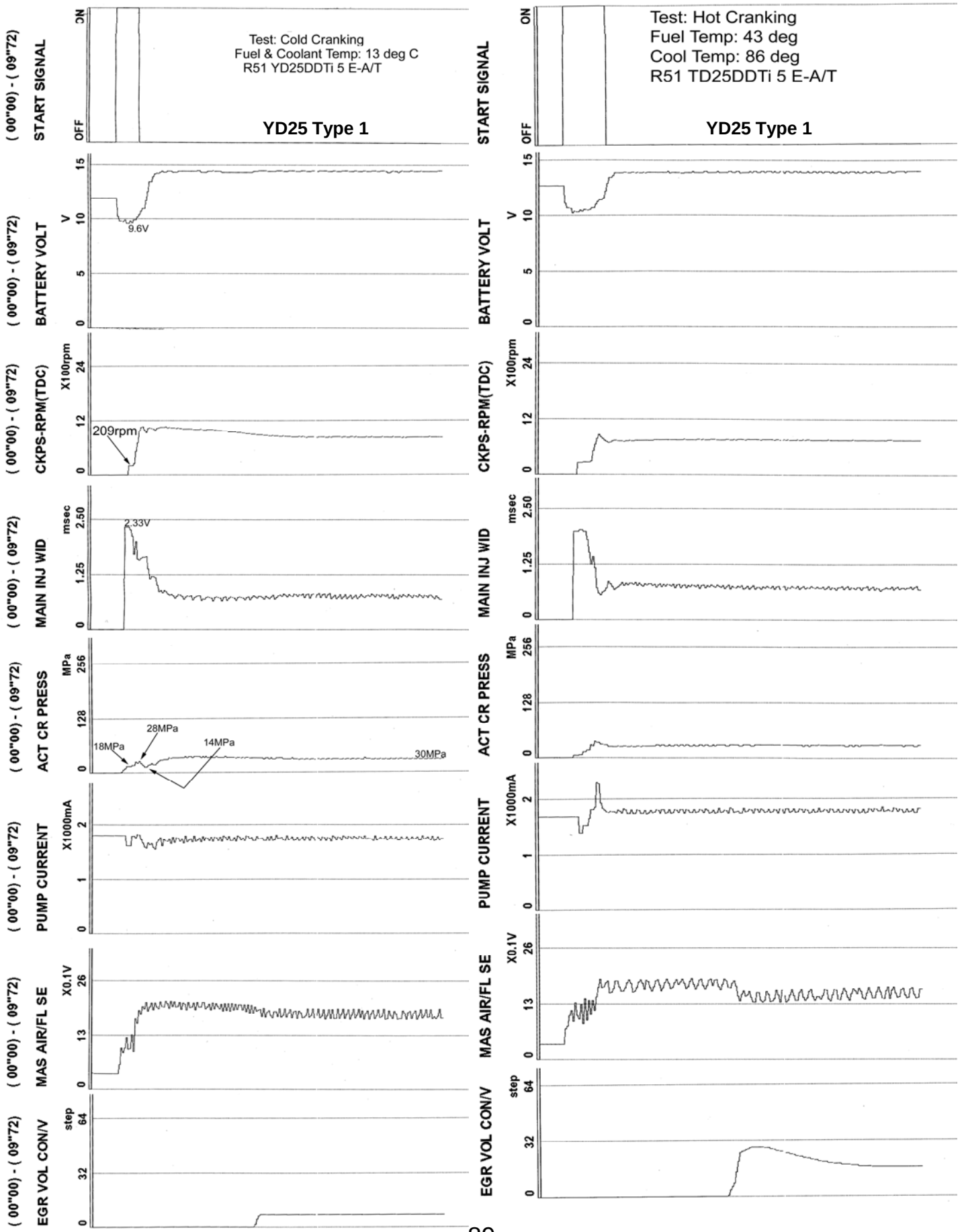
MAKE SURE ALL 4 ENGINE SYSTEM RELATED GROUNDS ARE CLEAN AND TIGHT!

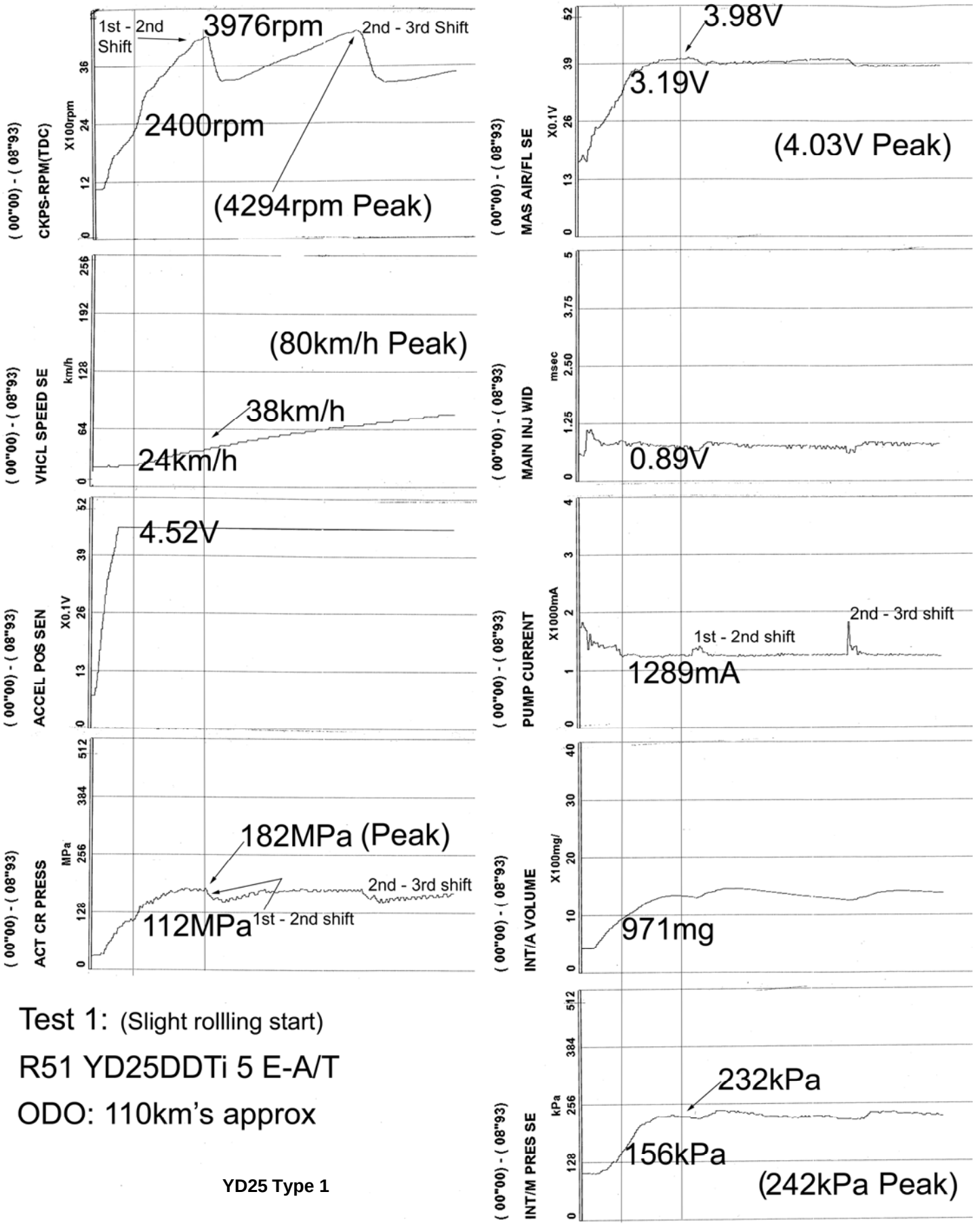
YD25 ENGINE TROUBLE DIAGNOSIS

D22 Main Power & Ground Schematic



MAKE SURE ALL 2 ENGINE SYSTEM RELATED GROUNDS ARE CLEAN AND TIGHT!


Test: Cold Cranking
Fuel & Coolant Temp: 13 deg C
R51 YD25DDTi 5 E-A/T
YD25 Type 1
Test: Hot Cranking
Fuel Temp: 43 deg
Cool Temp: 86 deg
R51 TD25DDTi 5 E-A/T
YD25 Type 1
(00"00) - (09"72)
START SIGNAL
ON
OFF
BATTERY VOLT
V
9.6V
CKPS-RPM(TDC)
X100rpm
209rpm
MAIN INJ WID
msec
2.33V
ACT CR PRESS
MPa
18MPa
28MPa
14MPa
30MPa
PUMP CURRENT
X1000mA
MAS AIR/FL SE
X0.1V
EGR VOL CON/V
step



Test 1: (Slight rollling start)

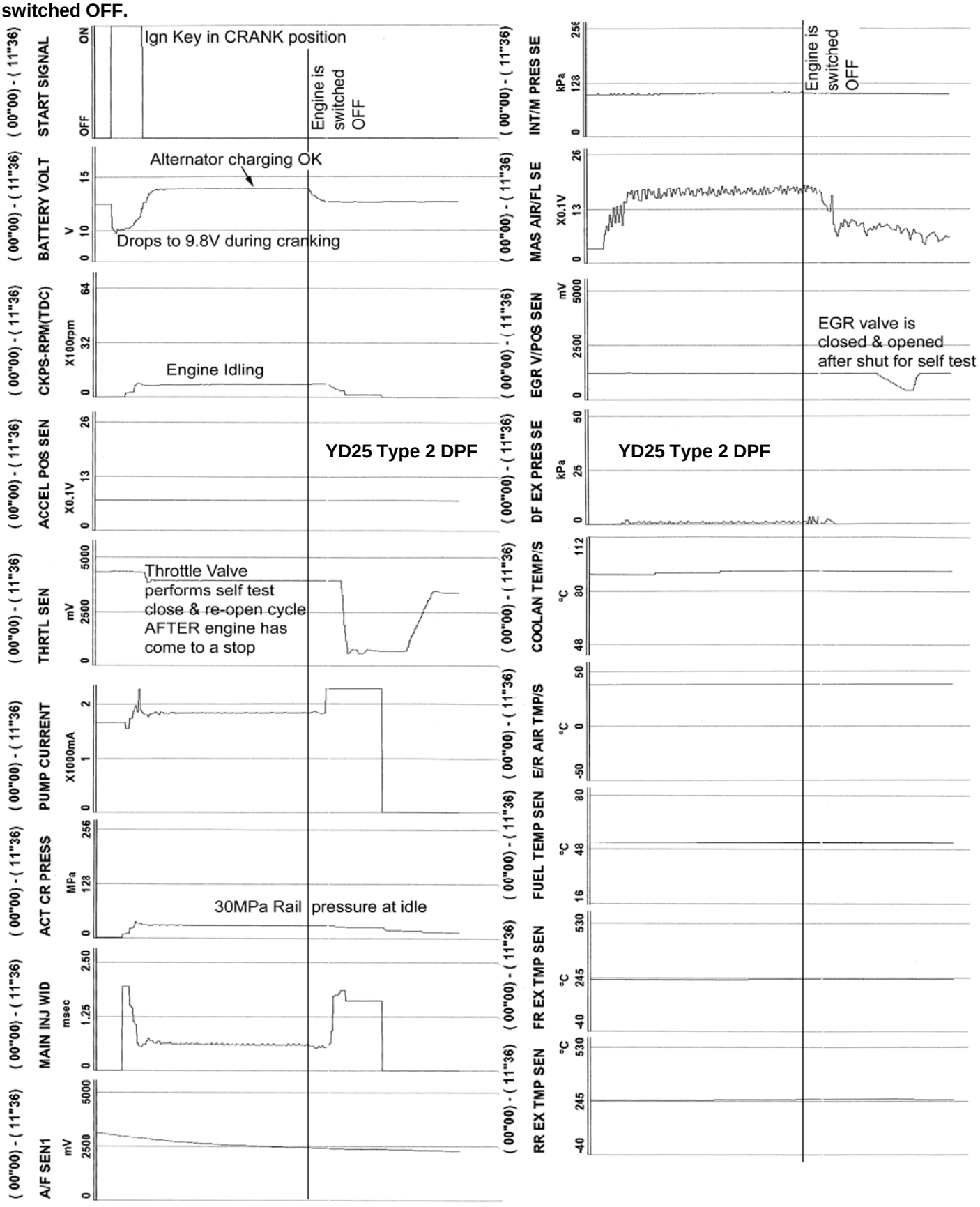
R51 YD25DDTi 5 E-A/T

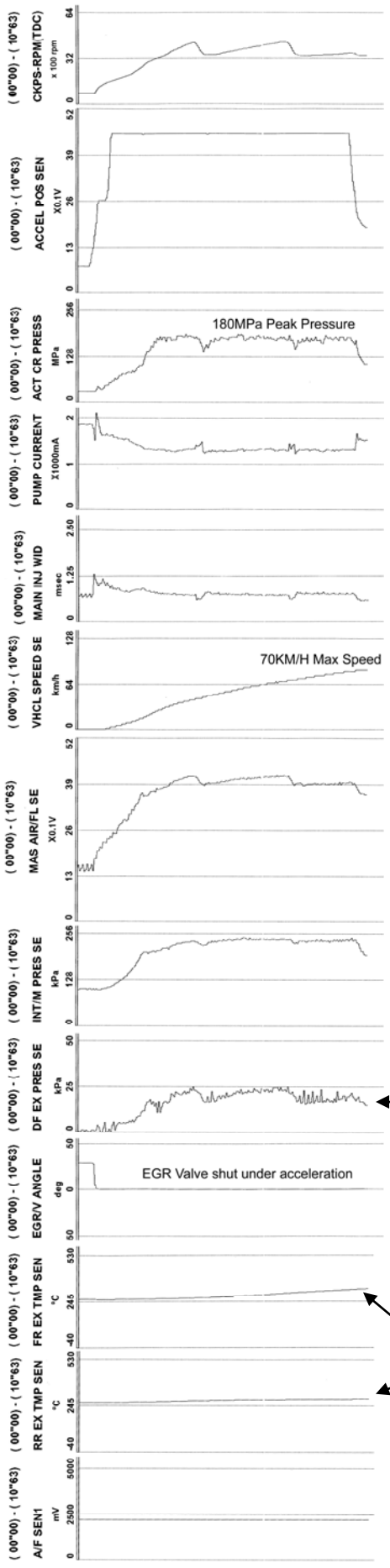
ODO: 110km's approx

YD25 Type 1

ENGINE HOT START CRANKING TEST – R51 YD25 Type 2 DPF A/T. (Engine Normal).

With Ign ON, "Record" touched on CONSULT II, then engine cranked, started & allowed to idle, then engine is switched OFF.





DRIVE TEST – R51 YD25 Type 2 DPF A/T. (Recorded over a period of 10 seconds).

Engine already idling & gear lever is already in "D", "Record" touched on CONSULT II, then driven under maximum acceleration until vehicle speed reached 70km/h.

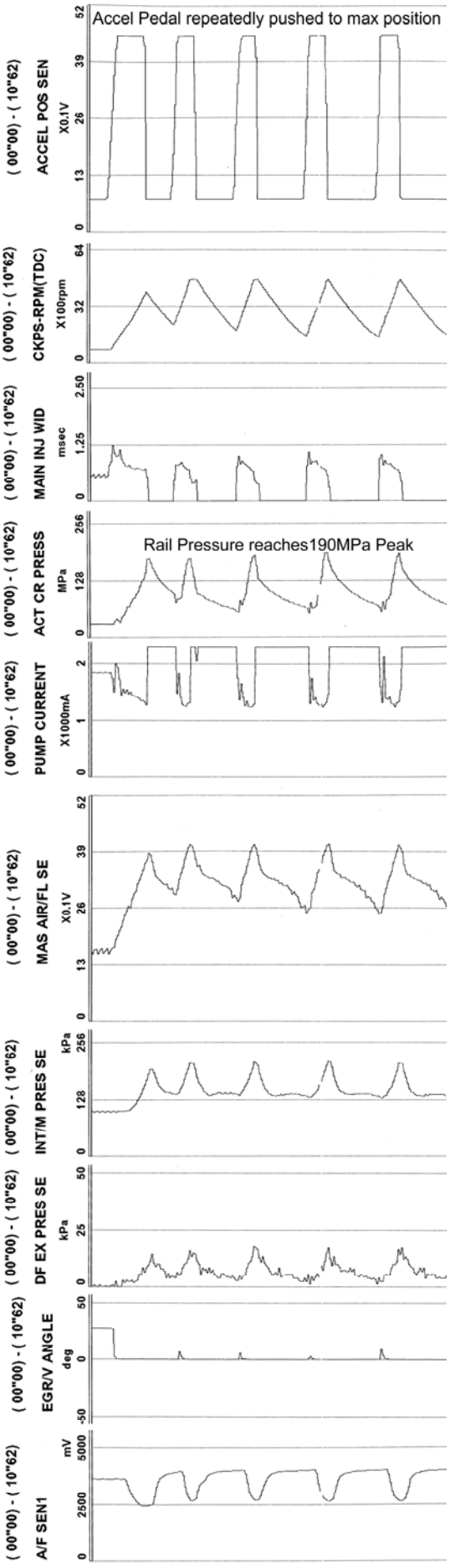
NOTE: Engine was already at operating temperature. (Approximately 88 deg C)

CONSULT II Software used; AED06G

YD25 Type 2 DPF

The Higher the Differential Exhaust Pressure reading, the higher the level of PM in the DPF causing a blockage in the DPF.

If Temperatures of 600 deg C + are shown, this would indicate that a Regeneration is being carried out automatically.



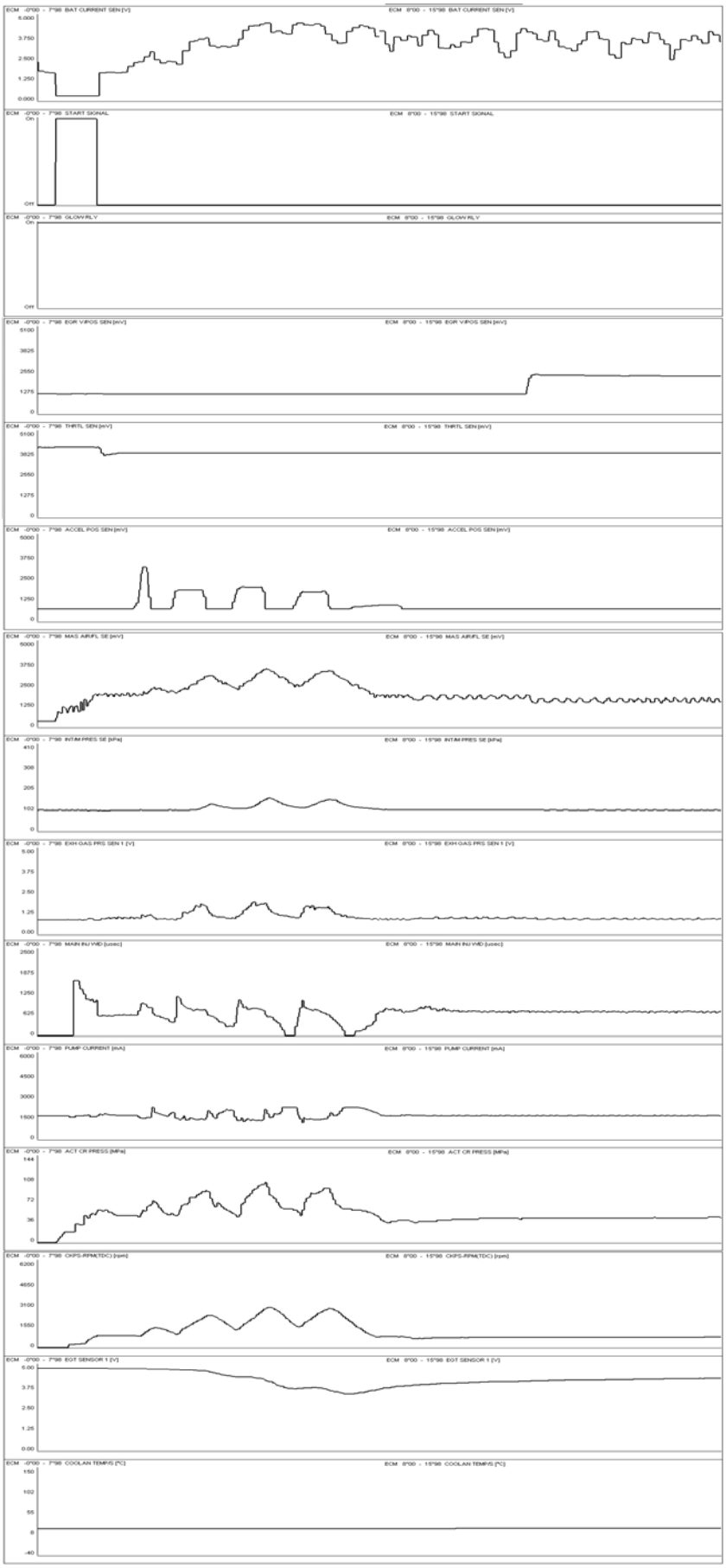
ENGINE RACE TEST – R51 YD25 Type 2 DPF A/T. (Recorded over a period of 10 seconds).

Engine already idling in neutral, "Record" touched on CONSULT II, then accelerator is repeatedly pressed to the maximum position then released.

NOTE: Engine was already at operating temperature. (Approximately 88 deg C)

CONSULT II Software used; AED06G

YD25 Type 2 DPF

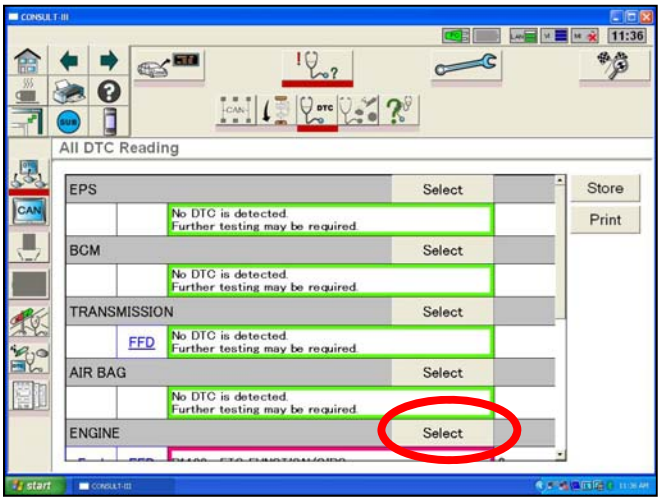


ENGINE COLD START CRANKING TEST – YD25 2010MY A/T. (Engine Normal).

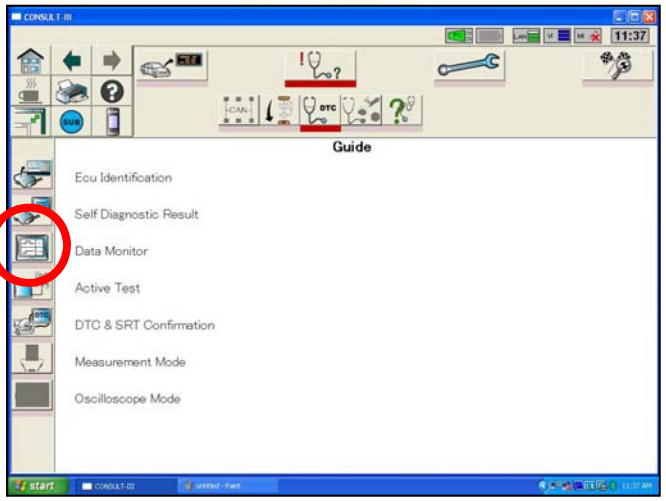
With Ign. ON, "Record" touched on CONSULT III, then engine cranked, started & allowed to idle, pressed the accel pedal a few times.

CONSULT III DATA MONITOR RECORD

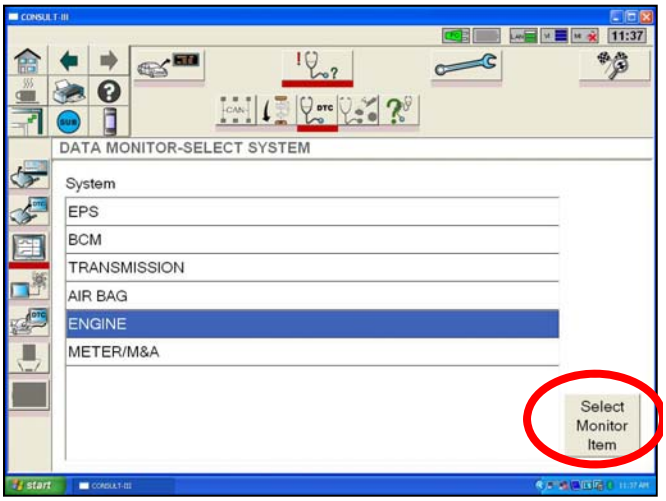
1. Touch the word "**Select**" against the desired vehicle system.



2. Touch the **"Data Monitor"** Icon on the left of the screen



3. Highlight **"ENGINE"** & then touch **"Select Monitor Item"**

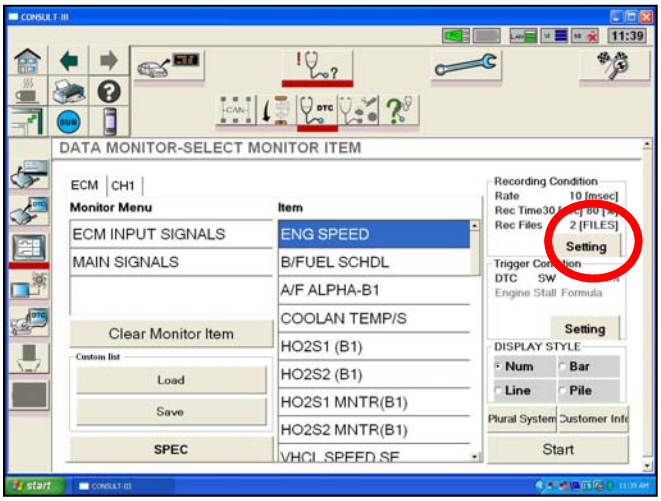


CONSULT III DATA MONITOR RECORD

4 (i) Clear the pre selected Main Signals items by touching **"Clear Monitor Item"**.

(ii) Highlight the desired items from the list on the screen. These are **examples**;

CKPS-RPM	MAS AIR/FL/SEN
ACCEL POS SEN	MAIN INJ WID
ACT CR PRESS	PUMP CURRENT
BATTERY VOLT	GLOW RELAY
START SIGNAL	EGR/V ANGLE

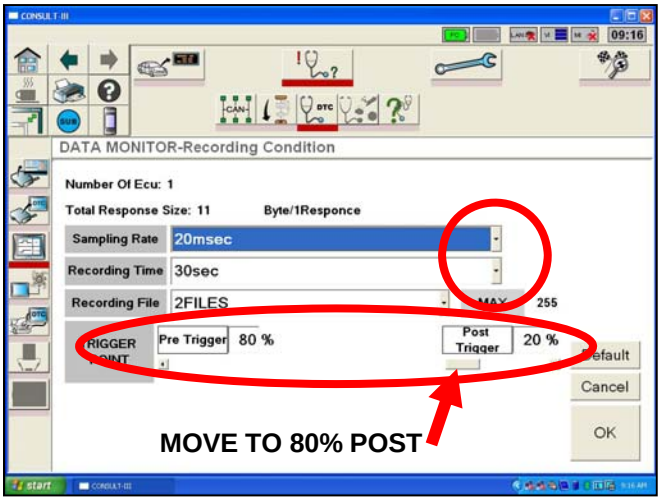


(iii) Touch the **"Setting"** tab (circled right).

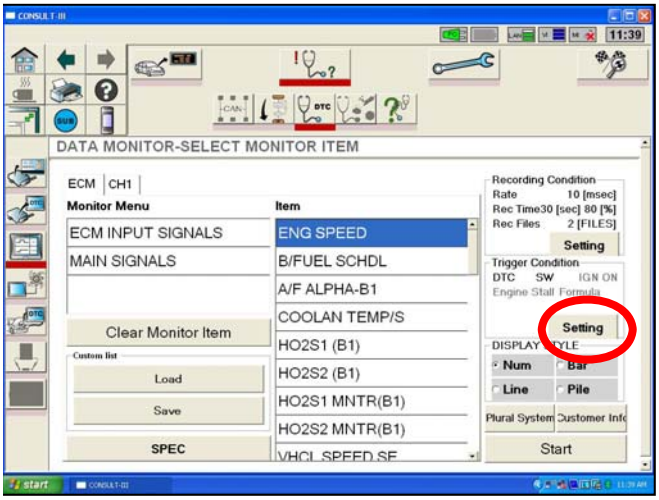
(iv) Ideally the "Sampling Rate" should be slowed down from every 10ms to every 20ms. This can be done by selecting the drop down icon. (small circle). There maybe cases where the recording time needs to be extended. Otherwise leave set to 30 seconds so as not to make the graphs too large.

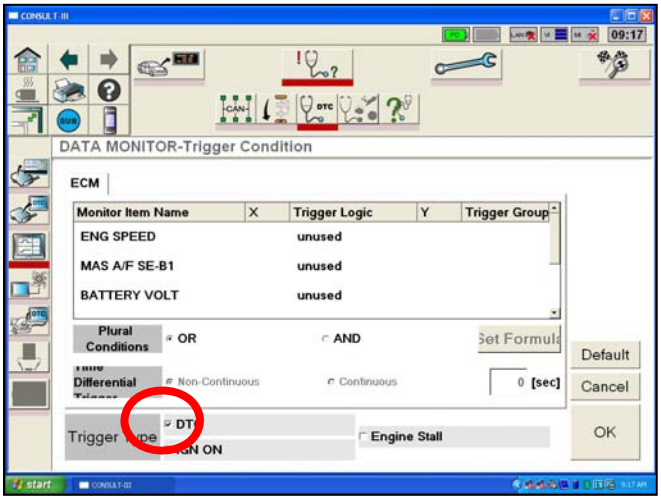
(v) In most cases it is will not be necessary to adjust the trigger point. Leave it set to 80% post & 20% pre. (large circle / arrow)

(vi) Touch **"OK"** on the bottom right of the screen & then touch **"Start"** once the screen returns to the **"SELECT MONITOR ITEM SCREEN"**



The 2nd setting tab accesses the recording trigger condition settings. Un-select the DTC box if the ECM has a permanent DTC in it. Otherwise the recording will automatically start as a DTC is detected.





CONSULT III DATA MONITOR RECORD

5. Once prepared, touch **"RECORD"** on the bottom right of the screen to capture the activity of the engine. Watch the recording time bar graph (circled right). Recording stops at 100%.

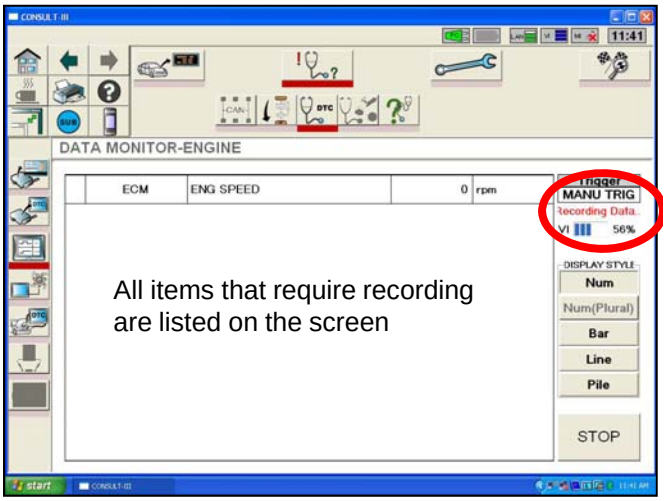
The **example recording activity** is basically as follows;

(i) Touch record

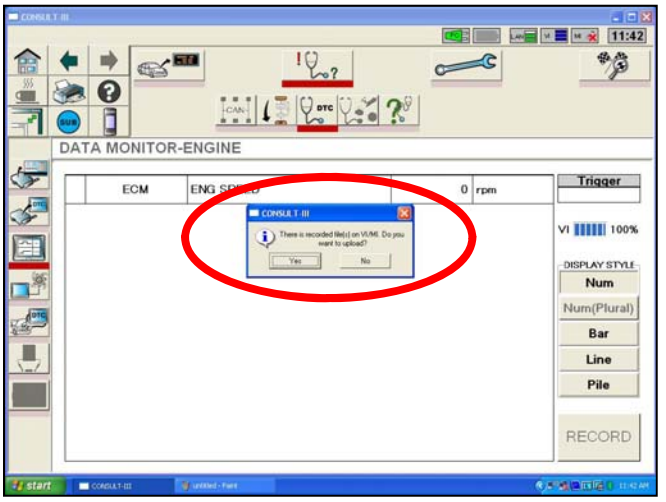
(ii) In less than a second start Engine & allow to idle for 1 second

(iii) Race engine twice & allow to idle again until the end of recording.

The above must be carried out as quickly as possible in order to maximise the recorded data on the graphs

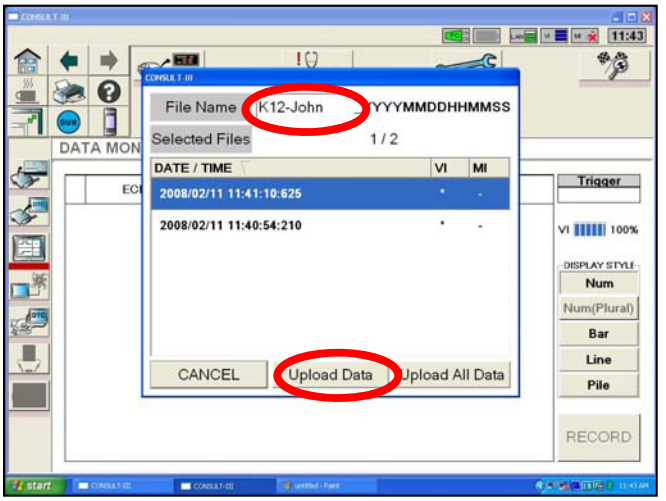


6. Once the recording has stopped, touch the back arrow (top left of screen) once. A message appears on the screen (circled right) – Touch **"Yes"**.



7. (i) Add any text after the model code to make the file name unique (circled right).

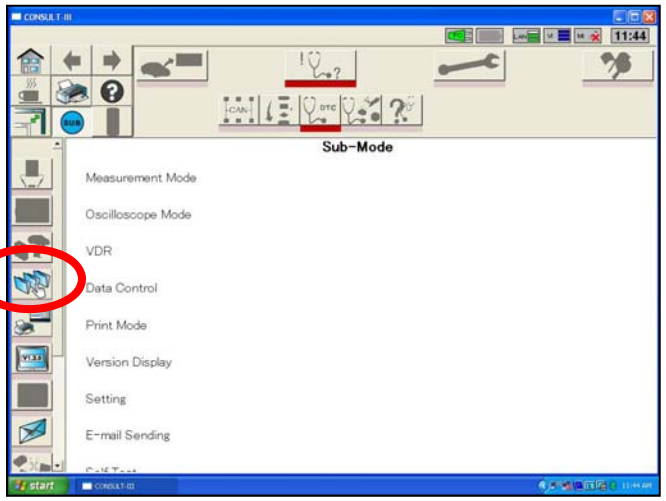
(ii) Highlight the desired data & then touch **"Upload Data"**.



CONSULT III DATA MONITOR RECORD

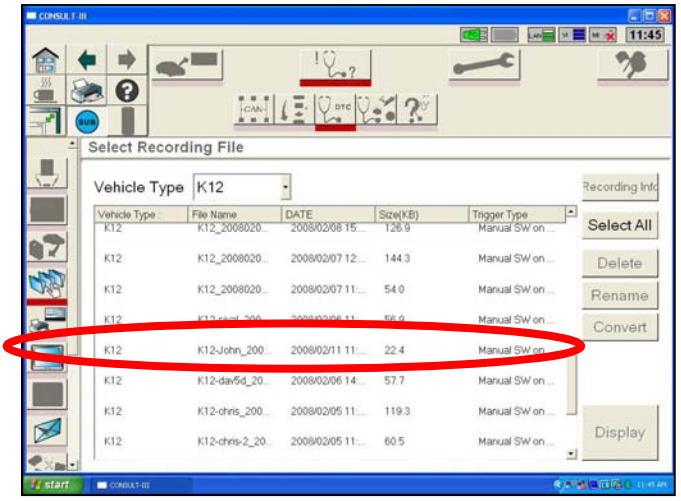
8. (i) Touch **"Sub"**. The main Sub Mode screen will appear over the Data Monitor screen.

(ii) Touch the **"Data Control"** Icon.



9. (i) Highlight the saved file (touch the text area) with the unique name previously given to the file.

(ii) Touch **"Display"** in the bottom right of the screen.

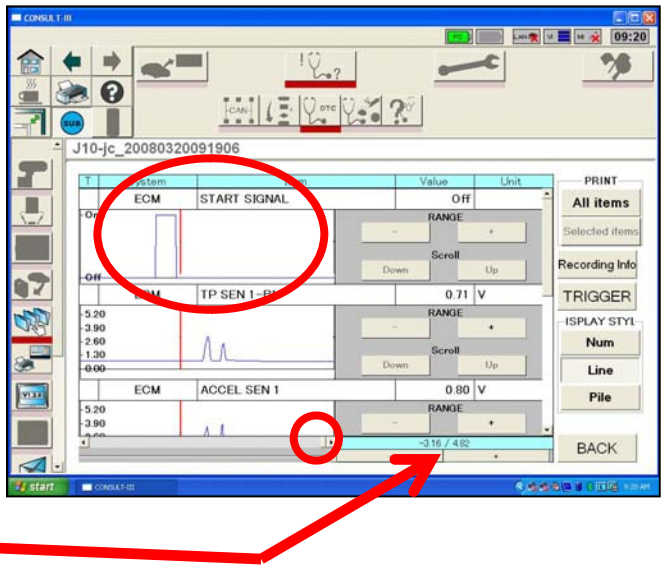


10. (i) Once the next screen appears, select **"Line"**. This will change the recorded data from Numerical to Line graph.

(ii) Ensure that the desired data is displayed. In this example the "START SIGNAL" switching from OFF to ON is clearly seen (large circle). This shows when the engine was cranked over.

(iii) It's possible to slide the data back in time to catch activity well before "RECORD" was touched. Use the small slider tab on the screen to do so. (small circle)

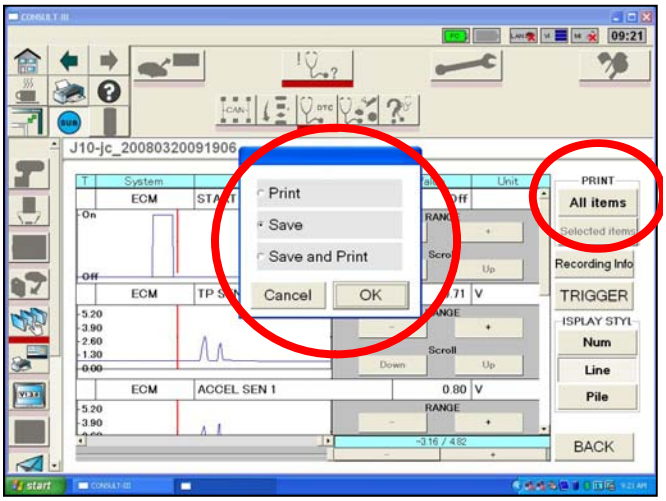
(iv) If so desired, you can compress more data into the same field. Example, instead of the window showing you 3 seconds of data – it can show 12 seconds.



CONSULT III DATA MONITOR RECORD

11. (i) Touch **"All items"** button under the "**PRINT"** title on the RHS of the screen. A small window will then appear as shown right.

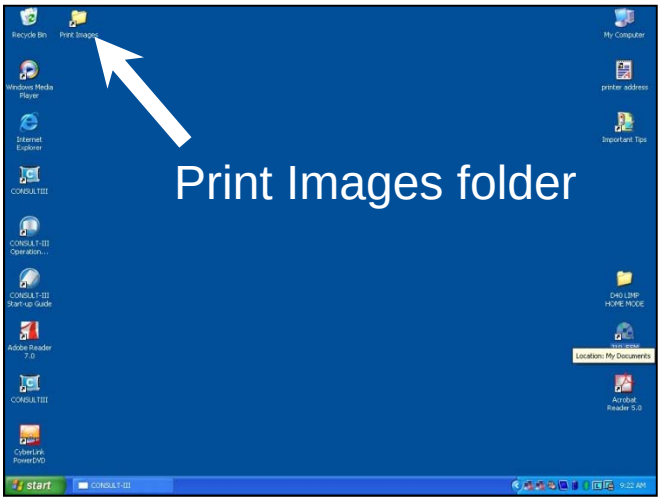
(ii) Touch the **"Save"** button on the field that next appears, followed by OK. (otherwise select print to actually print the graphs onto paper.)



12. Once "Save" has been selected, the graphs are converted into images which can be easily viewed on any PC. The image files are sent to a specific folder in the C drive of the PC as follows;

C:/Consult III/ApplicationData/Print Images

Locate this folder on the CONSULT III & create a shortcut to the folder on the desktop.



13. **<u>These files can be easily attached to the TechLine contact. There is no need to fax graphs to techline any longer.</u>**

The graphs show that once the engine was started, the accelerator pedal was press twice & then the engine returned to idle & then the recording finished.