

Description

Exhaust emissions (CO, HC, NO_x) are controlled by a combination of engine modifications and the addition of special control components.

Modifications to the combustion chamber, intake manifold, camshaft and ignition system consist the basic control system.

These items have been integrated into a highly effective system which controls exhaust emissions while maintaining good drivability and fuel economy.

mcx30.com

Description

The catalytic converter of the gasoline engine is a three way catalyst. It oxidizes carbon monoxide and hydrocarbons (HC), and separates oxygen from the oxides of nitrogen (NO_x).

[WCC]



Removal and Installation

[Catalytic Converter (WCC)]

1. Remove the exhaust manifold.

(Refer to Engine Mechanical System - "Exhaust Manifold")

Installation

1. Install in the reverse order of removal.

mcx30.com

Description

The Gasoline Particulate Filter (GPF) system prevents Particulate Matter (PM) from being discharged to the atmosphere and consists of a filter assembly, two Exhaust Gas Temperature Sensors (EGTS). The filter is integrated in the catalytic converter assembly and has honeycomb cell structure which can filter the PM in the exhaust gas. While the exhaust gas passes the GPF, This gathered PM in GPF is called "soot".



GPF

Regeneration

This procedure is to forcibly regenerate the GPF with scan tool when the GPF doesn't have been regenerated during driving. For example, if the vehicle has repeated "Low speed driving" or "Short distance driving", the GPF regeneration procedure cannot be proceeded because "Regeneration Mode" doesn't made.



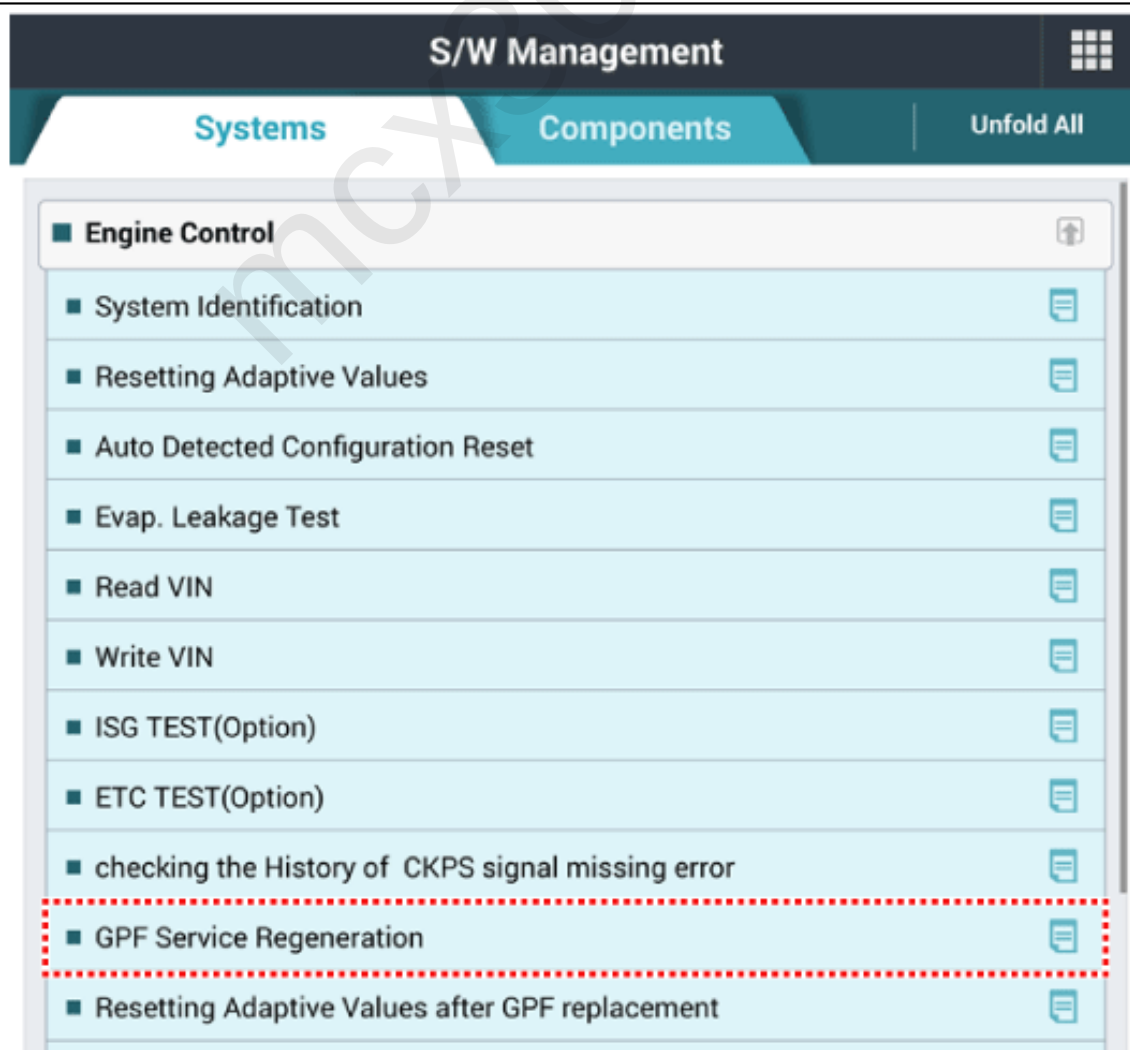
- If performing the GPF service regeneration mode indoors, fire or burn injuries may occur by high temperature exhaust gas.

Therefore the GPF service regeneration mode must be performed in a outdoor safe zone.

Forcibly Regeneration Condition

- Engine coolant temperature : about 70°C
- Engine at idle
- P-range (A/T) or Neutral (M/T)
- Normal battery voltage
- Electrical fully load ON (A/C ON if equipped, Blower ON with maximum speed, Head Lamp ON, Wiper ON, Other Lamps ON, etc.).

1. Turn ignition switch OFF.
2. Connect a diagnostic tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "Vehicle, Model year, Engine, System".
5. Start engine at idle and P-range (A/T) or neutral (M/T).
6. Apply electrical fully load to the vehicle (A/C ON, Blower ON with maximum speed, Head Lamp ON, Wiper ON, and Other Lamps ON, etc.).
7. Select "Vehicle S/W Management".
8. Select "GPF Service Regeneration".



■ GPF Service Regeneration

■ Resetting Adaptive Values after GPF replacement

■ ECU Mapping Verification

■ Dual Clutch Transmission

■ ABS/ESP

■ Forward Collision-Avoidance Assist

■ Airbag(Event #1)

■ Airbag(Event #2)

S/W Management

• GPF Service Regeneration (GPF Selection)

Purpose	Function used to remove deposits in GPF (Gasoline Particulate Filter) forcibly with no restriction (certification).
Enable Condition	1. Engine Idling or HEV Ready 2. Vehicle Stopped 3. Engine Coolant Temperature: Over 60°C 4. Shift Lever: AT/DCT at P, MT at N 5. Brake Pedal Off, Accelerator Pedal Off 6. Electrical Load On (Air Conditioner, Blower, Etc.)
Concerned Component	PCM/ECM, Gasoline Particulate Filter(GPF)
Concerned DTC	-
Fail Safe	Warning Lamp On, deteriorated driving performance and DTC occurred due to excessive SOOT accumulation in GPF.
Etc	Check the engine coolant and fuel lines since the function is carried out while the engine is running. Remove Soot according to the vehicle conditions for GPF Service Regeneration (engine coolant temperature, shift lever, engine condition, and electrical load).

OK

S/W Management

■ GPF Service Regeneration

● [GPF regeneration function]

This function is used for forcibly removing the soot deposited in the GPF by means of the diagnostic device.

⚠ [Caution]

In replacing the ECU, carry out ODO input before carrying out GPF regeneration.

[C1] Button : GPF regeneration

[C2] Button : ODO input

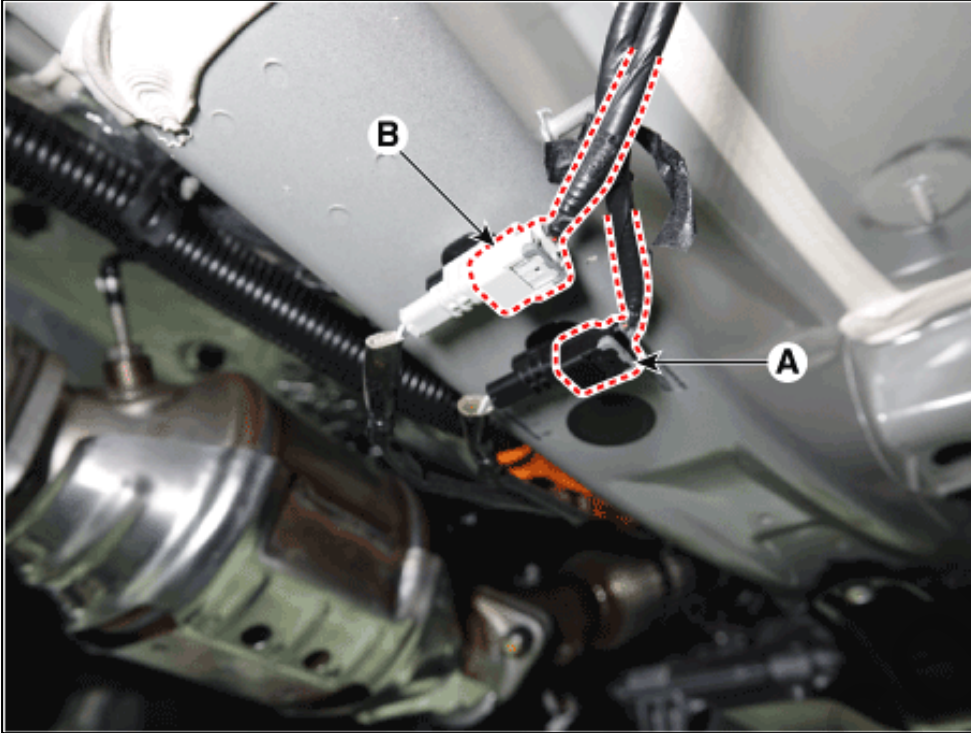
[Cancel] button : End the optional function

C1

C2

Cancel

1. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
2. Lift up the vehicle.
3. Remove the floor under cover front [RH].
4. Disconnect the Exhaust Gas Temperature Sensor (EGTS) [Front] (A) and [Rear] (B).



5. Remove the Gasoline Particulate Filter (GPF) (A).

Tightening torque :

39.2 - 58.8 N.m (4.0 - 6.0 kgf.m, 28.9 - 43.4 lb-ft)



•When installing, replace with new gaskets.



Installation

1. Install in the reverse order of removal.

Replacement



•After replacing the GPF assembly, MUST perform the "Component Change Routine" procedure.

1. Turn ignition switch OFF.
2. Connect a diagnostic tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "Vehicle, Model year, Engine, System".
5. Start engine at idle and P-range (A/T) or neutral (M/T).
6. Apply electrical fully load to the vehicle (A/C ON, Blower ON with maximum speed, Head Lamp ON, Wiper ON, and Other Lamps ON, etc.).
7. Select "Vehicle S/W Management".
8. Select "Resetting Adaptive Values after GPF replacement".

S/W Management

Systems

Components

Unfold All

■ Engine Control

■ System Identification

■ Resetting Adaptive Values

■ Auto Detected Configuration Reset

■ Evap. Leakage Test

■ Read VIN

■ Write VIN

■ ISG TEST(Optional)

■ ETC TEST(Optional)

■ checking the History of CKPS signal missing error

■ GPF Service Regeneration

■ Resetting Adaptive Values after GPF replacement

■ ECU Mapping Verification

■ Dual Clutch Transmission

■ ABS/ESP

■ Forward Collision-Avoidance Assist

■ Airbag(Event #1)

■ Forward Collision-Avoidance Assist



■ Airbag(Event #1)



■ Airbag(Event #2)



S/W Management



- Replace GPF and reset the learning values.

Purpose	Function to reset the previous learning values after replacing all GPF-related parts.
Enable Condition	1. Ignition Key ON 2. Engine Off 3. Vehicle Stopped
Concerned Component	GPF-related parts
Concerned DTC	-
Fail Safe	-
Etc	-

OK

S/W Management

■ Resetting Adaptive Values after GPF replacement

● [GPF learning value deleted]

This function is used for deleting the GPF learning value in GPF or ECU replacement

●[Condition]

1. Key ON
2. Engine stopped
3. Vehicle in the stopped state

[OK] button : GPF learning value deleted

[Cancel] button : End the optional function

OK

Cancel

Description

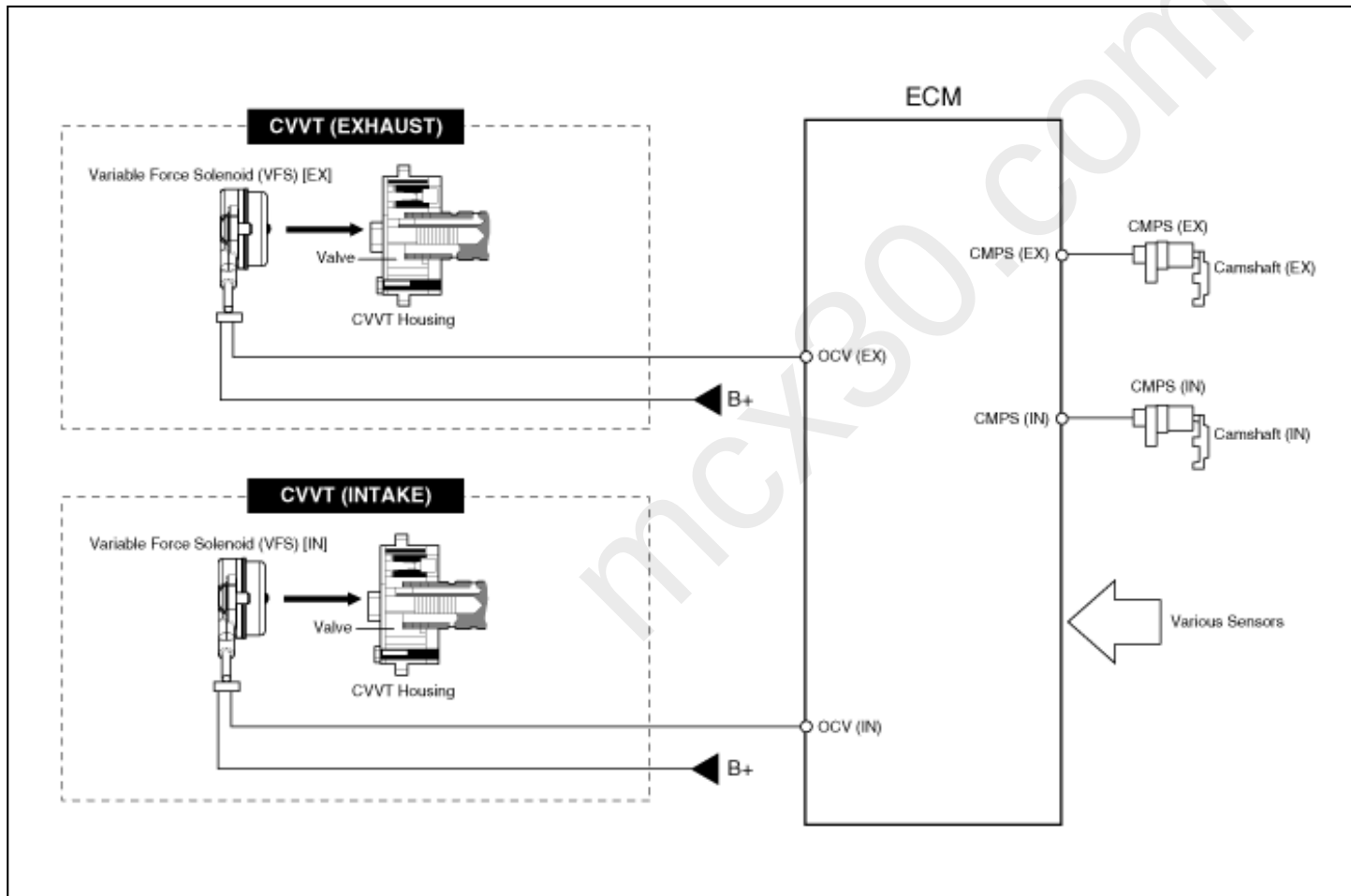
Continuous Variable Valve Timing (CVVT) system advances or retards the valve timing of the intake and exhaust valve in accordance with the ECM control signal which is calculated by the engine speed and load.

By controlling CVVT, the valve over-lap or under-lap occurs, which makes better fuel economy and reduces exhaust gases (NO_x, HC) and improves engine performance through reduction of pumping loss, internal EGR effect, improvement of combustion stability, improvement of volumetric efficiency, and increase of expansion work.

This system consist of

- the CVVT Oil Control Valve (OCV) which supplies the engine oil to the cam phaser or runs out the engine oil from the cam phaser in accordance with the ECM PWM (Pulse With Modulation) control signal,
- the CVVT Oil Temperature Sensor (OTS) which measures the engine oil temperature,
- and the Cam Phaser which varies the cam phase by using the hydraulic force of the engine oil.

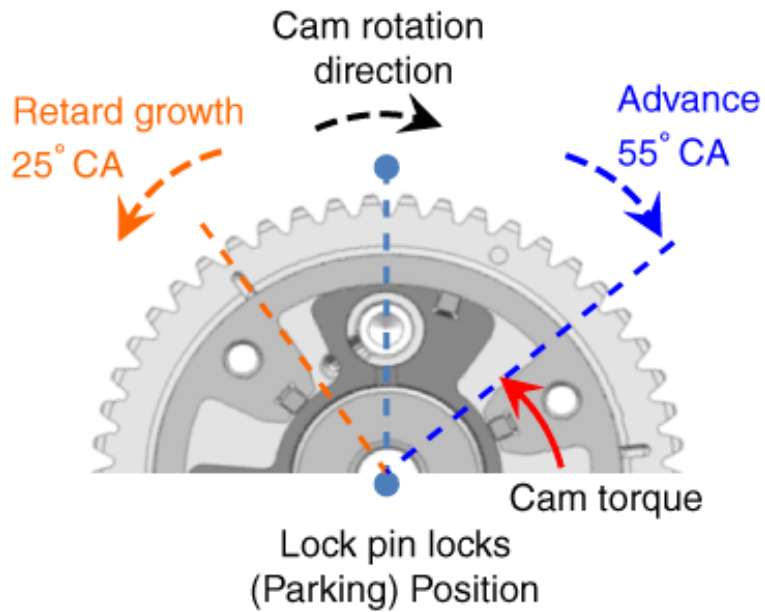
The engine oil getting out of the CVVT oil control valve varies the cam phase in the direction (Intake Advance/Exhaust Retard) or opposite direction (Intake Retard/Exhaust Advance) of the engine rotation by rotating the rotor connected with the camshaft inside the cam phaser.



[Intermediate Lock CVVT]

It increases the retarded amount compared to the default state to expand the operating range of the variable valve timing system.

The cam phase is fixed mechanically so that it is locked at the middle position.



▷Effect

Improves fuel efficiency by approx. 1.7%.

Expands the intake CVVT operating range.

(Increases the retarded amount by up to 30° compared to the default state.)

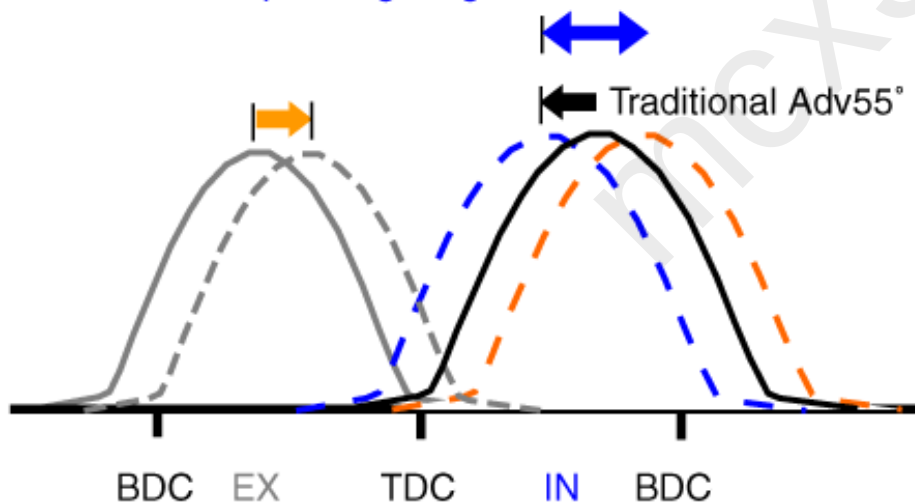
▽

LIVC (Late Intake Valve Close)

▽

1. Improves fuel efficiency by reducing pumping loss.
2. Improves knocking characteristics by reducing compression ratio.

Increased operating range : Adv55°~ Rtd25°



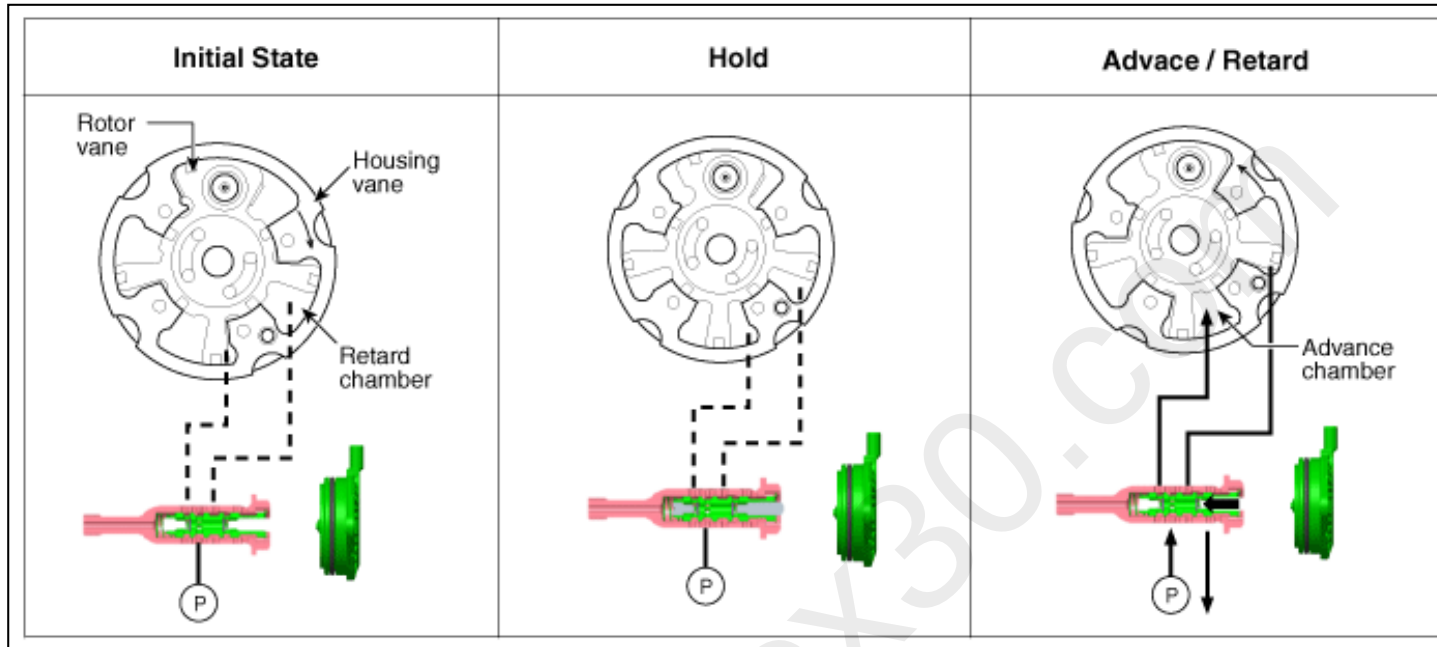
Operation

Principle

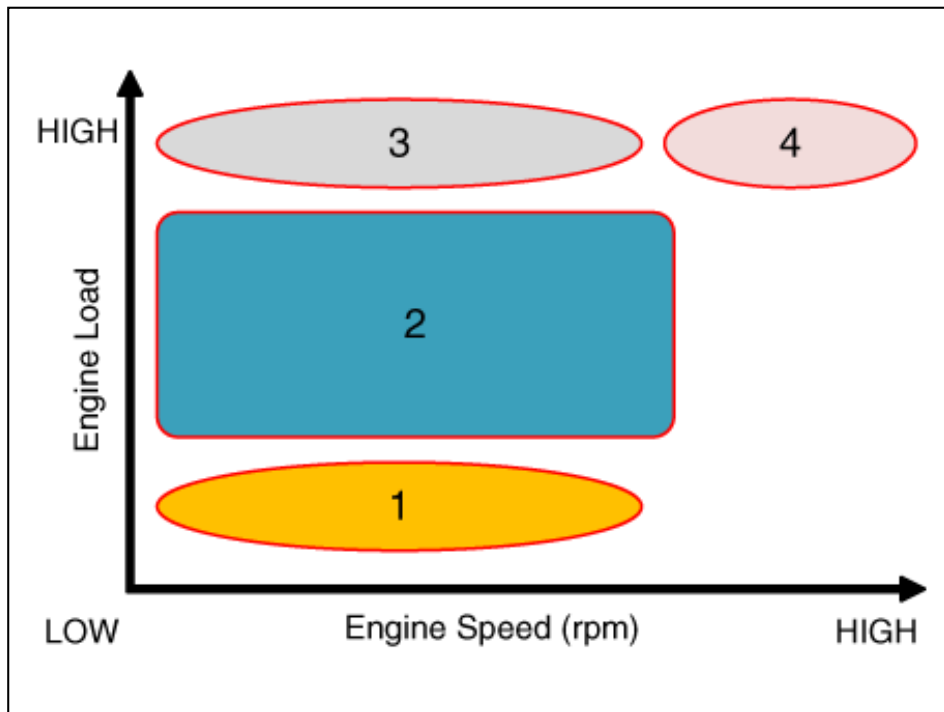
The CVVT has the mechanism rotating the rotor vane with hydraulic force generated by the engine oil supplied to the advance or retard chamber in accordance with the CVVT oil control valve control.



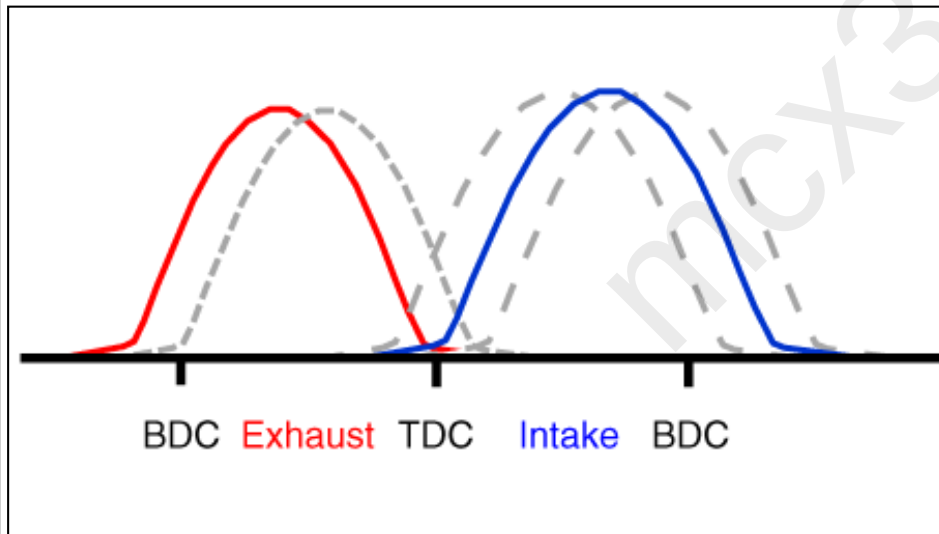
- The variable force solenoid (VFS) changes its force depending on the PWM duty to control the stroke of the OCV.
- It also controls the lock, unlock, advanced, retarded, and holding functions.



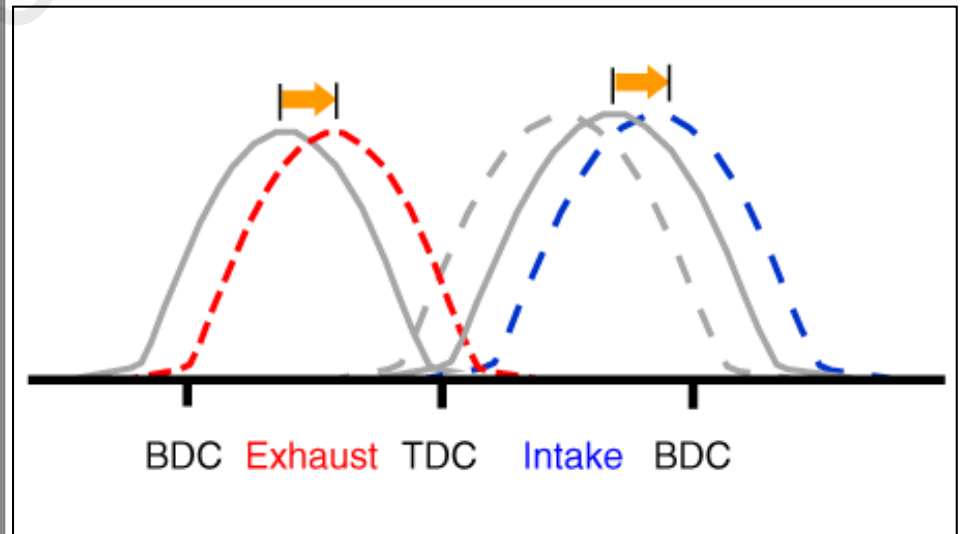
[CVVT System Mode]



(1) Low Speed / Low Load

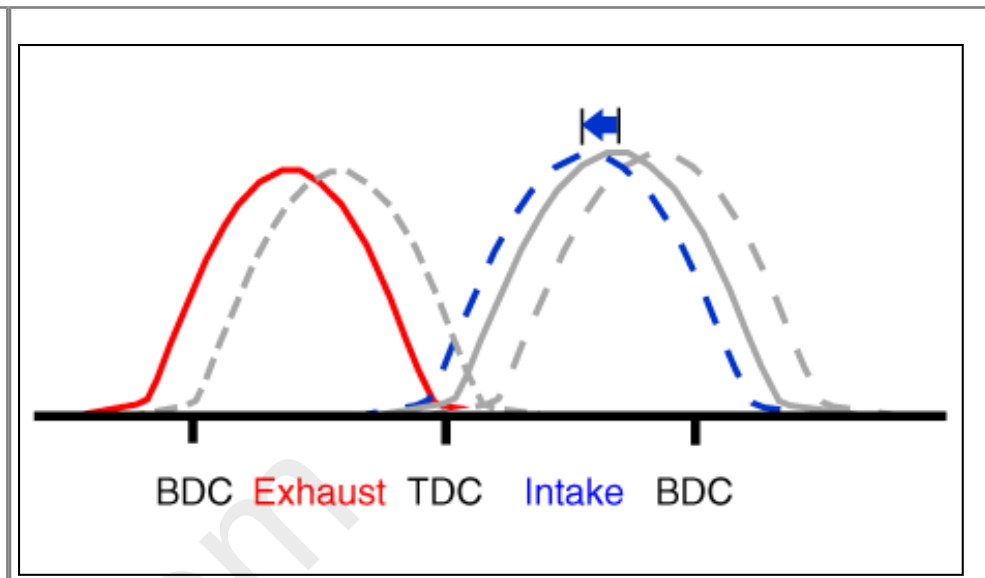
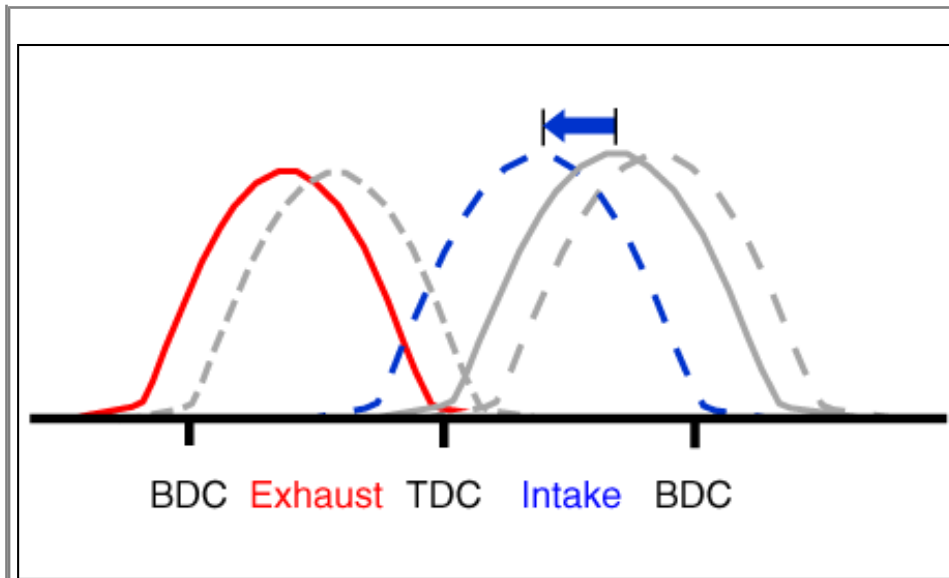


(2) Part Load



(3) Low Speed / High Load

(4) High Speed / High Load



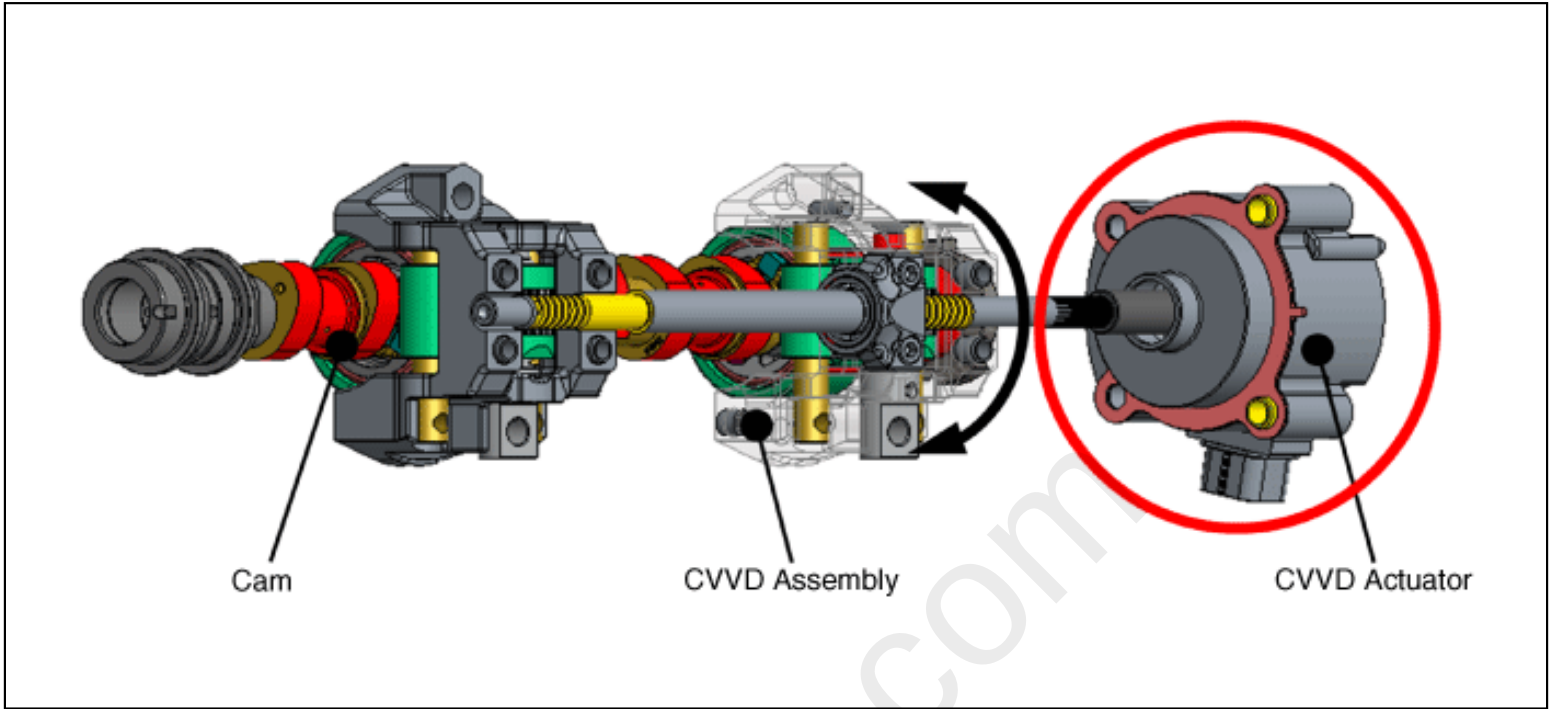
Driving Condition	Exhaust Valve		Intake Valve	
	Valve Timing	Effect	Valve Timing	Effect
(1) Low Speed / Low Load	Completely Advance	* Valve Under-lap * Improvement of combustion stability	Middle	* Valve Under-lap * Improvement of combustion stability
(2) Part Load	Retard	* Reduction of HC	Retard	* Reduction of pumping loss
(3) Low Speed / High Load	Retard	* Reduction of pumping loss	Advance	* Improvement of volumetric efficiency
(4) High Speed / High Load	Advance	* Reduction of pumping loss	Retard	* Improvement of volumetric efficiency

Description

CVVD (Continuous Variable Valve Duration) System is a device to control the optimum open and close timing according to the driving mode by changing the valve opening section.

It is composed of cam shaft, CVVD assembly, and CVVD acatuator.

The valve opening time operates in proportion to the rpm of control shaft.



Operation Principle

[CVVD System Operating Mode]

Optimum Valve Timing by Engine Load

