HYUNDAI Technical Service Bulletin	GROUP **ENGINE**	NUMBER **21-EM-008H**
	DATE **June, 2021**	MODEL(S) **Tucson (TL)** **Santa Fe Sport (AN)** **Santa Fe (TM)** **Sonata (LF)** **Veloster N (JSN)**

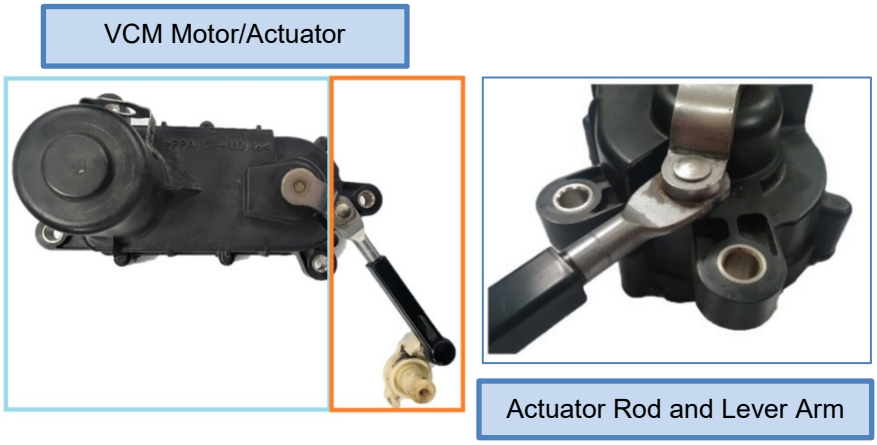
SUBJECT: INTAKE MANIFOLD VCM DIAGNOSIS AND REPAIR GUIDELINES

Description: This bulletin provides additional service diagnostic information and repair procedures related to Variable Charge Motion Controllers (VCM) equipped in the applicable vehicles listed below. This bulletin also provides information on the use of the Service Kit for 2.4L equipped engines, which enables replacing the VCM Lever Arm without replacing the complete Intake Manifold Assembly.

Refer to the applicable Engine Control / Fuel System sections in the Shop Manual, and then follow the procedures outlined in this bulletin whenever a vehicle with the following symptom(s) are being diagnosed:

- Check Engine Light illumination with VCM related DTC.
- Unstable engine RPM and reduced engine power.
- Abnormal noise from the intake manifold whenever engine RPM is raised from idle speed.

Component Overview:
The Variable Charge Motion Controller has 2 major segments that assist each other during operation.

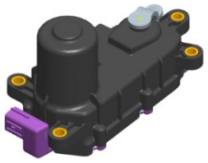
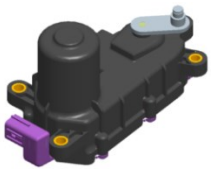
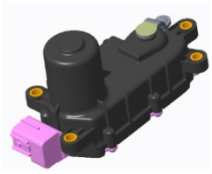


- The VCM Motor/Actuator is connected to a Rod and Lever Arm.
- This Lever Arm is also connected to the linkage that controls the air flaps to manage the Intake Manifold air flow.
- During low and mid RPM range, the tumbling of air that flows into the cylinder is reinforced.
- This improves the engine combustion performance and also enhances the engine torque.

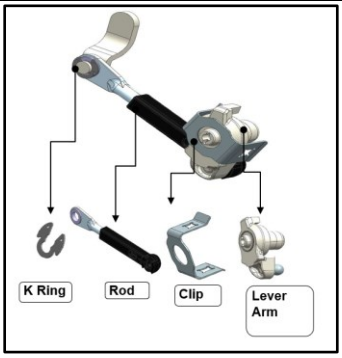
Applicable Vehicles:

- Certain 2015-2019MY Sonata (LF) vehicles with 2.0L Turbo and 2.4L engines.
- Certain 2017-2018MY Santa Fe Sport (AN) vehicles with 2.0L Turbo and 2.4L engines.
- Certain 2019-2020MY Santa Fe (TM) vehicles with 2.0L Turbo and 2.4L engines.
- Certain 2018-2021MY Tucson (TL) vehicles with 2.4L engines.
- Certain 2019-2022MY Veloster N (JSN) vehicles with 2.0L Turbo engines.

Parts Information:

MODELS	PART NAME	FIGURE	PART NUMBER	NOTES
2.4L Sonata (LF) Tucson (TL) Santa Fe Sport (AN) Santa Fe (TM)	VCM Motor		28323-2GGA1	Replace According to Inspection Results
2.0T Santa Fe Sport (AN) Sonata (LF) Santa Fe (TM)			28323-2GTA1	
2.0T Veloster N (JSN)			28323-2GPD0	

VCM Service Kit Information:

PART NUMBER	FIGURE	NOTES
2.4L 28399-2GGA0		VCM Service Kit includes: • Rod • Lever Arm • Clip • K-Ring **NOTE:** K-Ring is available separately as 28231-2GGA0 if only that part is required.

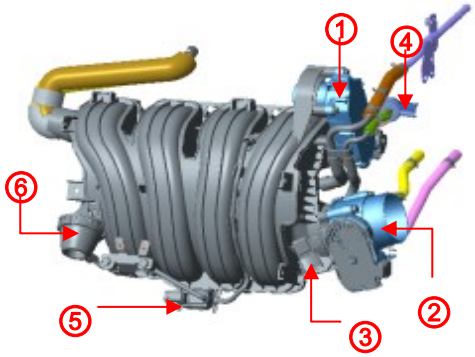
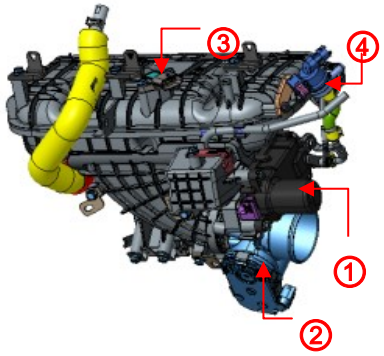
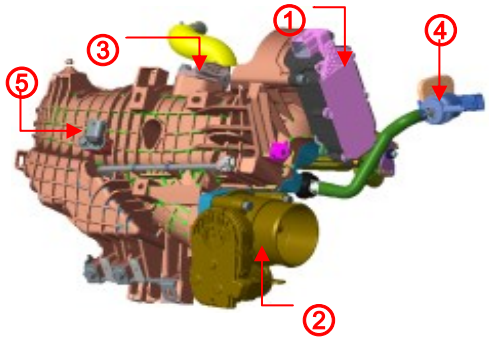
Note: VCM Service Kit only applies to vehicles equipped with 2.4L engines.

Warranty Information:

MODEL	OP CODE	OPERATION	OP TIME	CAUSAL PART	NATURE CODE	CAUSE CODE
Sonata (LF) Tucson (TL) Santa Fe (TM) Santa Fe Sport (AN) Veloster N (JSN)	28325R00	MOTOR ASSY - VARIABLE CHARGE MOTION (VCM)	Refer to WEBLTS for current LTS time	Refer to Parts Information	I3T	ZZ3

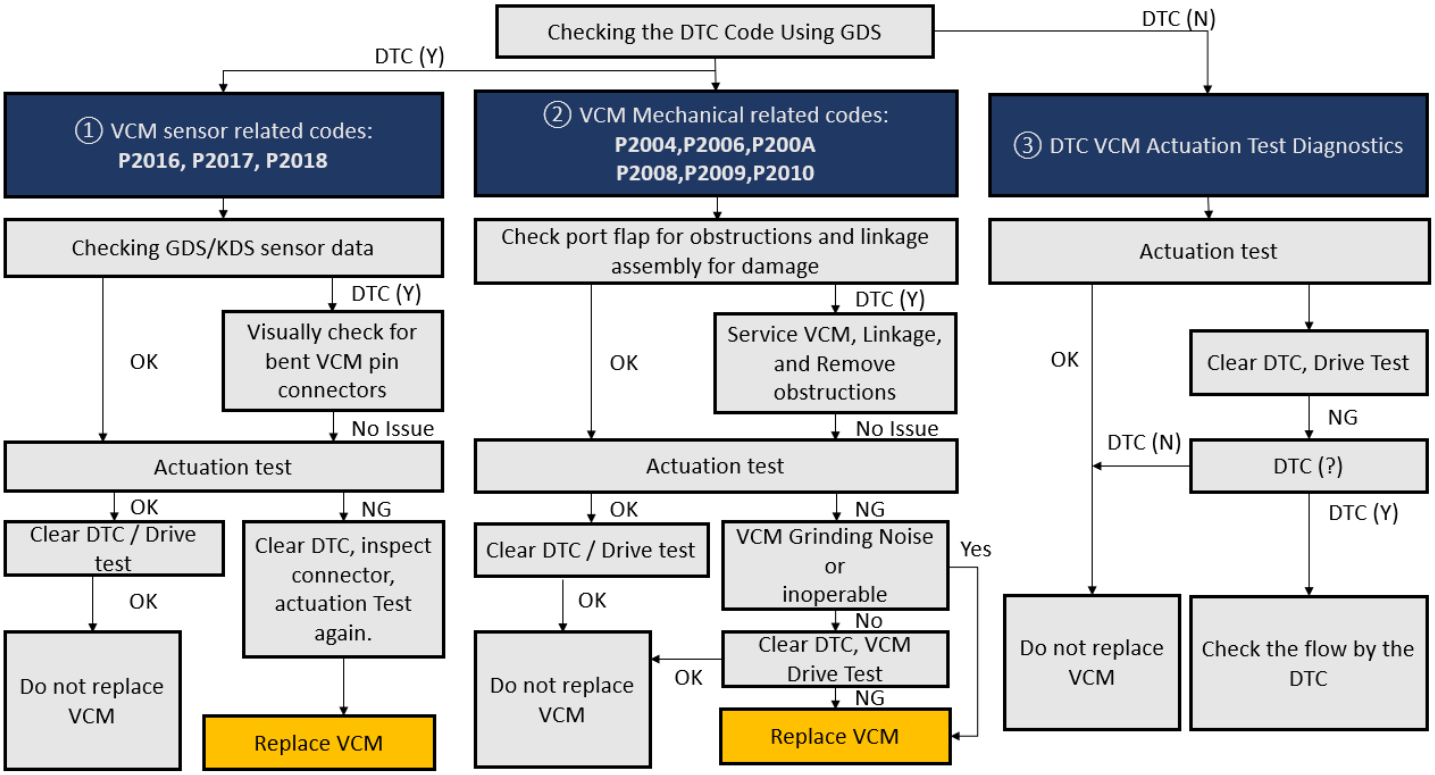
Note: Normal Warranty Applies.

VCM and Intake Manifold Component Information:

MODEL	FIGURE
2.4L Sonata (LF) Tucson (TL) Santa Fe Sport (AN) Santa Fe (TM)	① VCM ② ETC ③ BPS ④ PCSV ⑤ VIS Sol. ⑥ VIS Act. 
2.0T Sonata (LF) Santa Fe (TM) Santa Fe Sport (AN)	① VCM ② ETC ③ BPS ④ PCSV 
2.0T Veloster N (JSN)	① VCM ② ETC ③ BPS ④ PCSV ⑤ ATS 

Index:
ATS – Ambient Temperature Sensor
BPS – Boost Control Sensor
ETC – Electronic Throttle Control
PCSV – Pressure Control Solenoid Valve
VCM – Variable Charge Motion Actuator
VIS – Variable Intake System

Troubleshooting Flow Diagram:

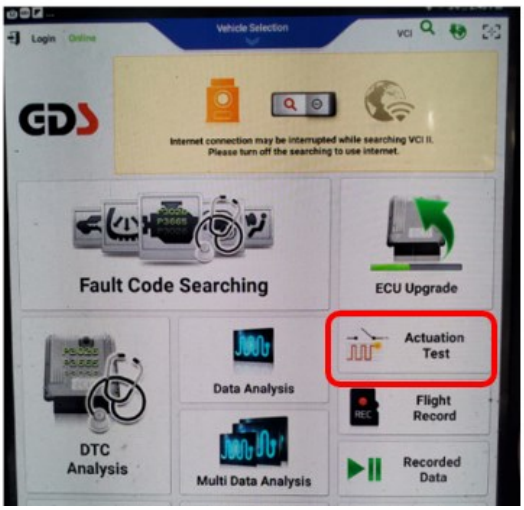


Fault Code Inspection:

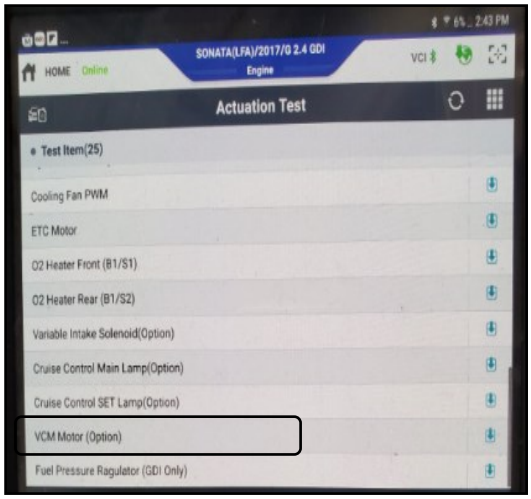
DTC	DESCRIPTION	CONTROL	MIL	NOTES
P2016 P2017	Sensor signal SCG SCP/OC	RPM and Torque are limited	1 Drive Cycle	HOLD locked in VCM closed position
P2018	Noise Detected from sensor signal	Normal Engine control	2 Drive Cycles	Fault detected, normal VCM control
P2004	Sensor signal: Open Fixed	- Control Flap in closed position - RPM and Torque are limited	1 Drive Cycle	HOLD locked in VCM closed position
P2006	Sensor signal: Closed Fixed		1 Drive Cycle	
P200A	Sensor signal: Abnormal Range		1 Drive Cycle	
	- Initial learning failure - Driven learning failure - Endurance error	Normal Engine Control	2 Drive Cycles	Fault detected, normal VCM control
	Max Duty Time Over	- Control Flap in closed position - RPM and Torque are limited	2 Drive Cycles	HOLD fixed in VCM closed position
	Contamination error		1 Drive Cycle	3 counters. HOLD Fixed in VCM closed position
P2008 P2009 P2010	Driver IC error (ECU or VCM)		1 Drive Cycle	HOLD Fixed in VCM closed position

VCM Actuation Test using GDS:

1. Select Actuation Test from the GDS tool.

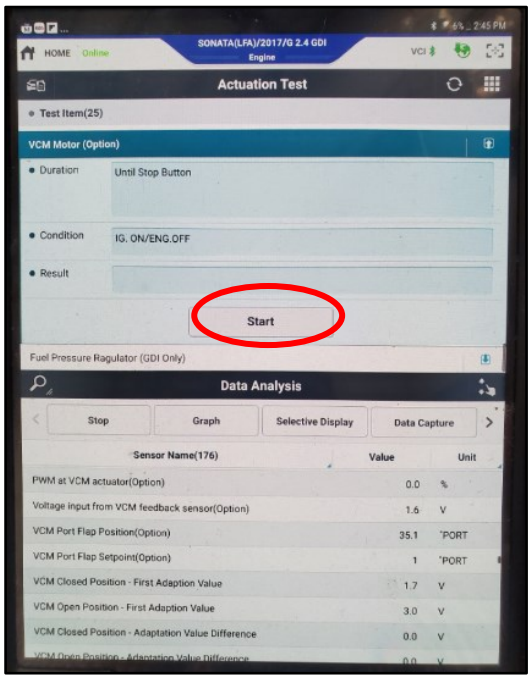


2. Select VCM Motor (Option).



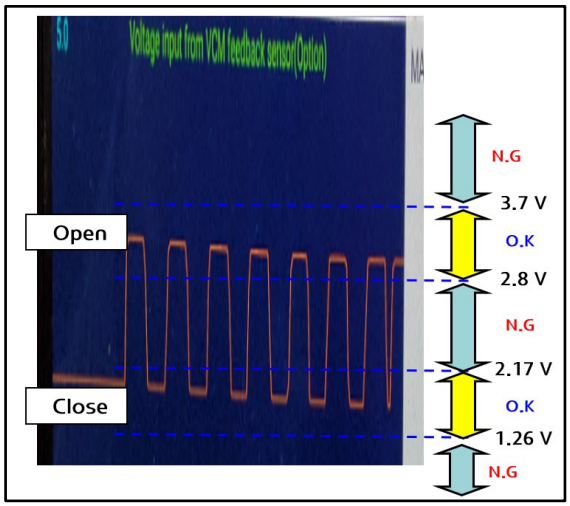
3. Under Data Analytics select:
   - PWM at VCM actuator (Option)
   - Voltage input from VCM feedback sensor

   ➢ Run the test by selecting Start.

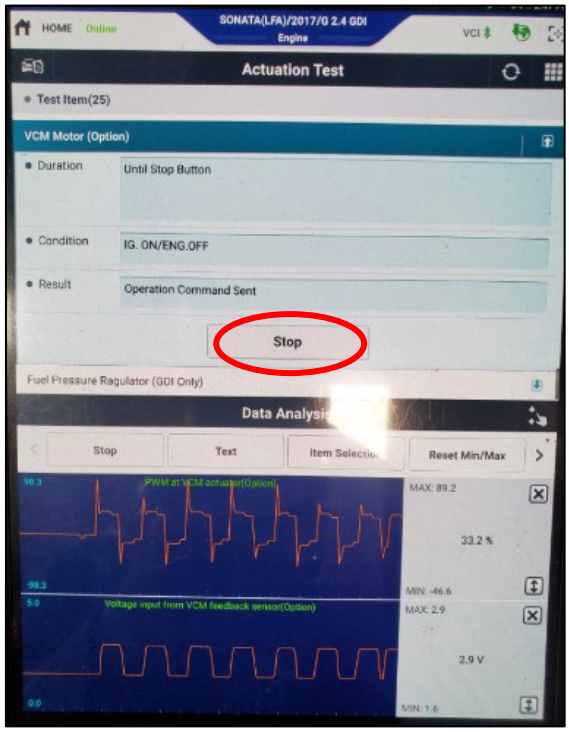


4. Check the Voltage input from VCM feedback sensor. If the Voltage is not within the ideal sensor range, replace the VCM Motor. **Do not replace the entire Intake Manifold Assembly.**

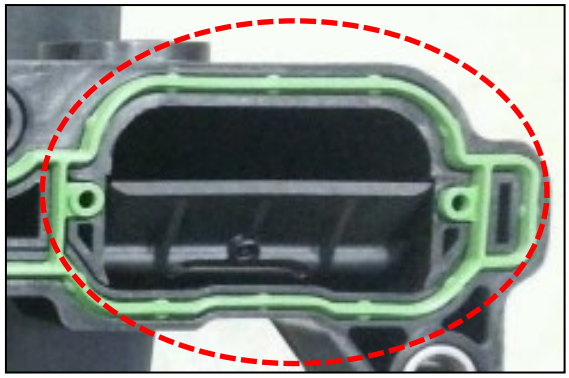
Position	Ideal Sensor Output Range (V)	
	2.4GDI	2.0T-GDI
VCM Close	1.26~2.17	1.306~2.246
VCM Open	2.8~3.7	2.534~3.474



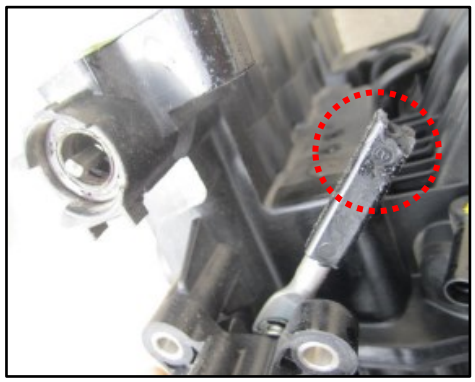
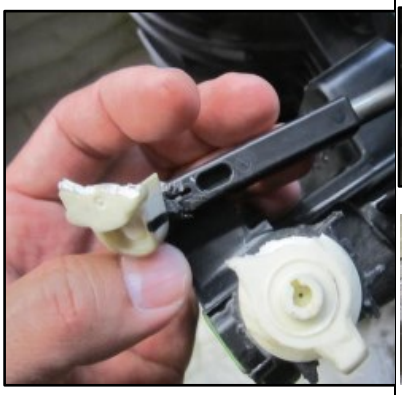
5. End the test by selecting Stop.



6. For VCM Motor, linkage or flap related code:
   - Check for obstructions in the port flap.
   - In addition, check for any protrusions of the installed metal dividers of the cylinder head intake ports which may interfere with VCM port flap movement. Reinsert any protruding port dividers fully into the cylinder head intake port if necessary.



7. Check for damage, deformation, rust, and obstructions on the VCM Rod and Lever Arm Assembly. Ensure that the assembly is not stuck in place.

DAMAGED ROD	DAMAGED LEVER ARM	DEFORMED ROD
		
Prevent damage to the Rod by not twisting it during removal.	Prevent Lever Arm damage by ensuring it is disassembled before removing the VCM	Prevent Rod-Side pivot ball post damage by removing the Lever Arm from the vehicle side first.

NOTICE

(For 2.4L only)

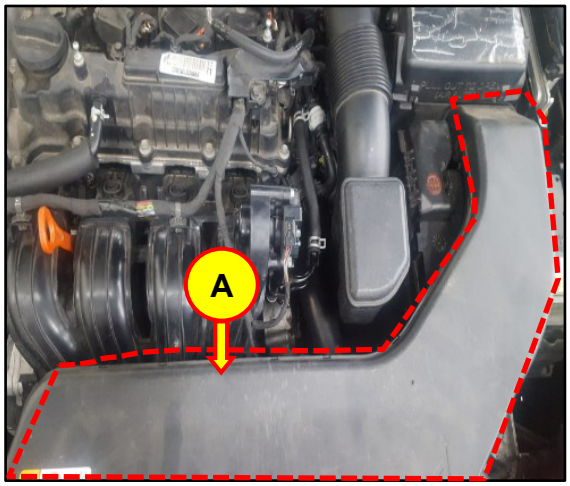
If the Rod or Lever Arm Assembly is damaged, replace it by using the VCM Service Kit. Do not replace the entire Intake Manifold Assembly.

Service Procedure:

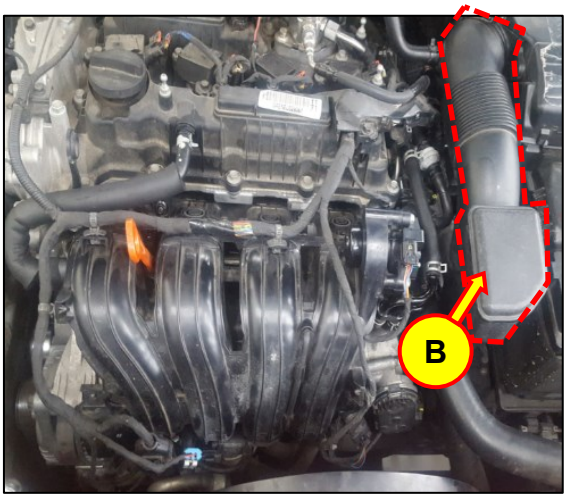
1. Turn off the engine and remove the negative terminal from the battery.

> ***NOTICE***
>
> Be sure to record the radio presets prior to battery disconnection.

2. Remove the first section of the air cleaner (A).

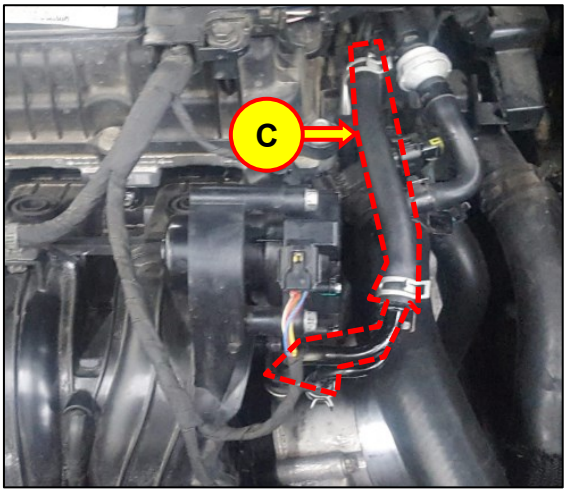


3. Remove the second section of the air cleaner (B).

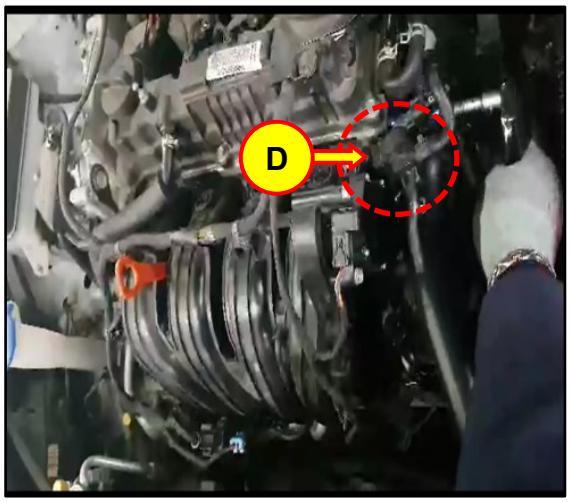


4. Loosen and remove the fixing bolt and remove the purge pipe hose to allow easy VCM service access.

> ***NOTICE***
>
> Location of purge pipe hose will vary depending on engine specifications.

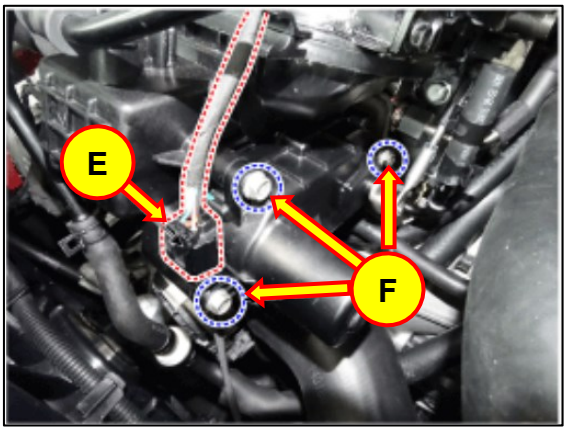


5. Remove the PCSV fixing bolt (D) to help create more clearance for removing the lever arm or VCM.



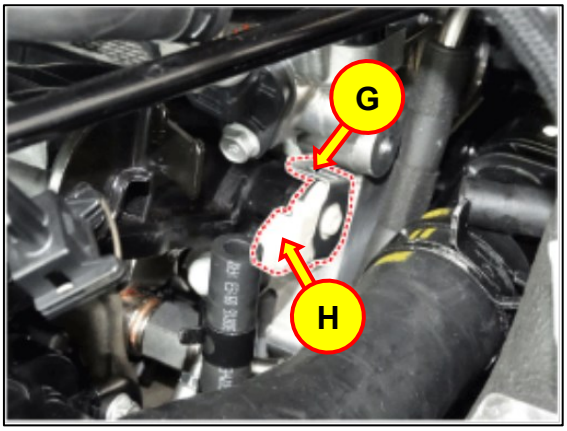
6. Disconnect VCM connector (E).

   If VCM is damaged, disconnect VCM connecting bolts (F) with a 10mm Socket Wrench.



> **NOTICE**
>
> **Tightening Torque:**
> 95 lb-in (10.8 Nm)

7. Remove and replace the VCM Motor as needed.
   - Remove K Ring and position rod away from VCM Motor to prevent Lever Arm damage.
   - Remove VCM rod clip (G) and remove the link flap connection (H) with a Flat Head Screwdriver.



   (For 2.4L only) If the Rod or Lever Arm Assembly is damaged, replace it by using the VCM Service Kit. **Do not replace the entire Intake Manifold Assembly.**

8. Reinstall parts in reverse order of disassembly.

> **NOTICE**
>
> Reprogram the radio presets recorded from Service Procedure Step #1 on page 8.

9. The Service Procedure is now complete.