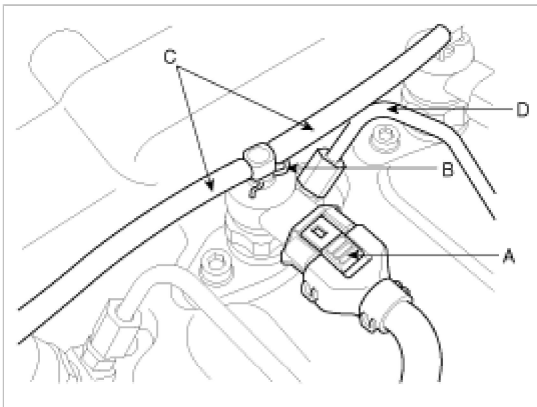


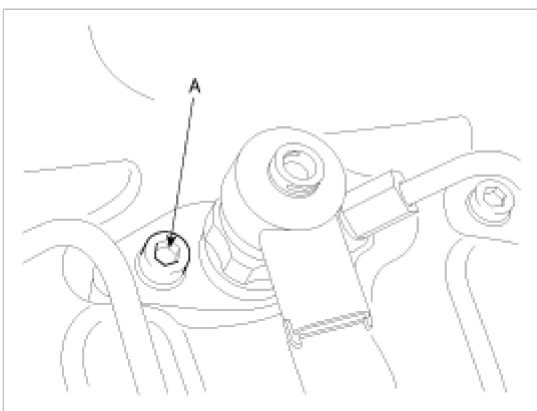
REMOVAL

- Common Rail Fuel Injection System is subject to extremely high pressure (Approximately 1,600 bar)
- Never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Always pay attention to safety precaution.
- Ensure the absolute cleanliness.
- It is not recommended to remove the injectors without any notice.
- High pressure fuel pipe should not be reused.
- Once an injector mounting bolt is removed, the bolt must be replaced with new one. When replacing an injector clamp or dowel pin, be sure to also replace the injector mounting bolt with new one.

1. Turn ignition switch OFF and disconnect the negative(-) battery cable.
2. Disconnect the injector connector (A).



3. After removing the clip (B), disconnect the retun tube (C) from the injectors.
4. Disconnect the high pressure pipe (D) connecting the injectors with the common rail.
5. Unscrew the injector clamp tightening bolt (A) and pull the injector upward.



Use SST, when it is difficult to remove the injector from the engine.

INSTALLATION

1. Install the injector according to the reverse order of REMOVAL procedure.

- When installing the injector, **MUST REPLACE** the O-ring (A) and apply a grease to that.
- **MUST PERFORM** " Injector Class Input" procedure after injector installation.

When installing the high pressure pipe, apply the specified tightening torques to the flange nuts of the high pressure pipe side and the common rail side with SST (Refer to below table).

Item	Dimension	SST No.
Flange Nut (Injector Side)	14mm (0.551 in)	09314-27110
Flange Nut (HP Pump Side)		
Flange Nut (Common RailSide)	17mm (0.669 in)	09314-27120

• **Injector clamp mounting bolts:** 28.4 ~ 32.4 N·m (2.9 ~ 3.3 kgf·m, 21.0 ~ 23.9 lbf·ft)

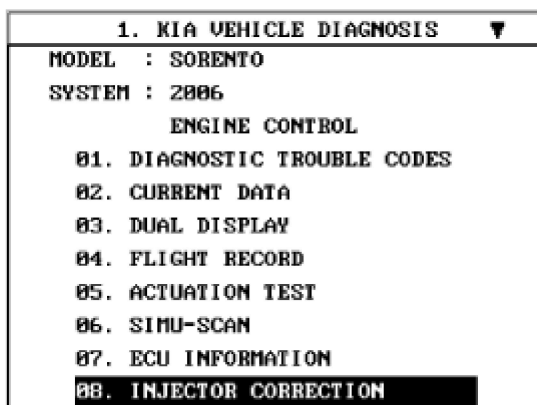
• **High pressure pipe flange nuts (Injector ↔ Common Rail):** 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)

High pressure pipe flange nuts (Common Rail ↔ HP Pump): 24.5 ~ 28.4 N·m (2.5 ~ 2.9kgf·m, 18.1 ~ 20.1 lbf·ft)

REPLACEMENT

After replacing an ECM, **MUST** input the injector data (7 digit) of each cylinder into a new ECM.

1. Replace the injector with a new one according to the "REMOVAL" and "INSTALLATION" procedures.
2. Connect a scan tool to Data Link Connector (DLC) and turn ignition switch on.
3. Select "ENGINE CONTROL".
4. Select "A-ENGINE (VGT)"
5. Select "INJECTOR CORRECTION".



6. Press "ENTER" key.

*** CONDITION: IG. KEY ON(ENGINE STOP)**

1. IF THE INJ. IS CHANGED, THE INJ. CORRECTION FUNC SHOULD BE PERFORM TO CONTROL THE NOR.FUEL INJ.
2. TO INPUT THE INJECTOR NUMBER, PRESS SHIFT KEY AND SELECT THE CYL. BY ARROW KEY AT THE SAME TIME. AND INPUT THE INJ. DATA BY [F1]~[F6], DIGIT KEY. PRESS [ENTER].
3. AFTER COMPLETE, TURN THE IG. KEY OFF AND CHECK THE SYSTEM AFTER 10 SEC.

7. Input the injector data (7 digit) written on the top of each injector with function keys ([F1] ~ [F6]) and number keys.

INJECTOR 1	AAAAAAA	
INJECTOR 2	AAAAAAA	
INJECTOR 3	AAAAAAA	
INJECTOR 4	AAAAAAA	

- SELECT THE CYLINDER BY SHIFT+ARROW KEY AND INPUT THE DATA BY F1~F6 KEY AND PRESS [ENTER] KEY.

ABCD	EFGH	IJKL	MNOP	QR-U	VW-Z
------	------	------	------	------	------

INJECTOR 1	AAAAAAA	
INJECTOR 2	AAAAAAA	
INJECTOR 3	AAAAAAA	
INJECTOR 4	AAAAAAA	

WRITING COMPLETE

ABCD	EFGH	IJKL	MNOP	QR-U	VW-Z
------	------	------	------	------	------

When "WRITING FAIL" is displayed on the scan tool, input injector data (7 digits) of each cylinder into a new ECM again as prior procedure.

INJECTOR 1	AAAAAAA	
INJECTOR 2	AAAAAAA	
INJECTOR 3	AAAAAAA	
INJECTOR 4	AAAAAAA	

WRITING FAIL

INSPECTION

- COMPRESSION TEST
- IDLE SPEED COMPARISON
- INJECT QUANTITY COMPARISON

TEST PROCEDURE

1. Connect Hi-Scan(Pro) and select "Vehicle" and "Engine Test Function".
2. Information for ECM version is displayed as below.

1.7. COMPRESSION TEST

SYSTEM INFORMATION
P/N : *****
S/W : *****

This function is available

If you ready, press [ENTER].

<Available system>

1.7. COMPRESSION TEST

SYSTEM INFORMATION
P/N : *****
S/W : *****

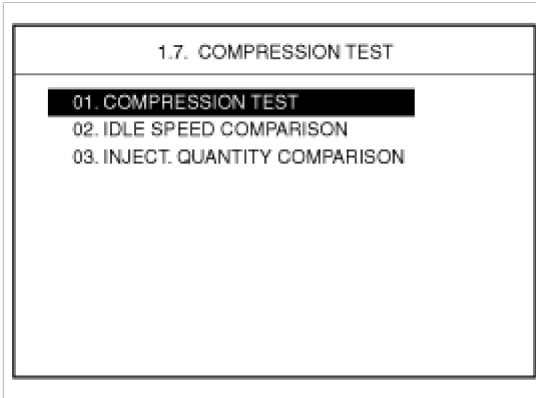
This function is not available.

Not all ECM version support
this function

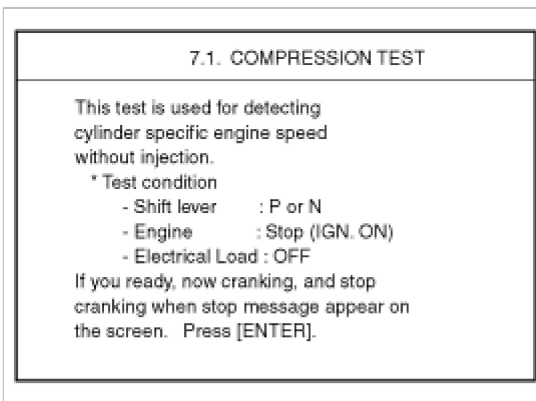
If you ready, press [ENTER].

<Not available system>

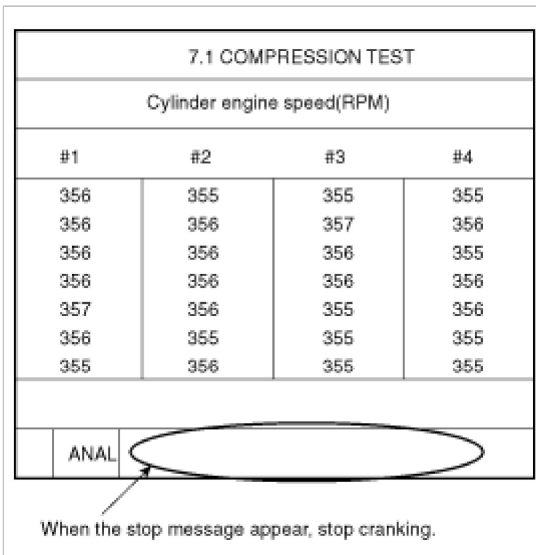
3. After pressing "[ENTER]", select "COMPRESSION TEST" mode and press "[ENTER]".



4. Set the test condition described as below screen and then, crank engine. When engine stop message being appeared, stop cranking.



5. Press "ANAL" and the test result is appeared.



During cranking engine does not start.

7.1 COMPRESSION TEST			
Cylinder engine speed(RPM)			
#1	#2	#3	#4
356	355	355	355
356	356	357	356
356	356	356	355
356	356	356	356
357	356	355	356
356	355	355	355
355	356	355	355

◀	▶	AVG	HELP
---	---	-----	------

Data scanning button

6. Press "AVG" and the data average of each cylinder is appeared. Press "HELP" and description of the data is appeared.

Cylinder engine speed(RPM)					
Speed(RPM)	200	250	300	350	AvG
#1 CYL.	████████	████████	████████	████████	355
#2 CYL.	████████	████████	████████	████████	355
#3 CYL.	████████	████████	████████	████████	355
#4 CYL.	████████	████████	████████	████████	355

PREV	HELP
------	------

↓

7.1 COMPRESSION TEST	
*The higher cylinder engine speed: - >The low compression pressure. *It can help to identify the mechanical defects.	

PREV

7. After pressing "ESC", select "IDLE SPEED COMPARISON" and press "[ENTER]".

8. Set the test condition described as below screen and press "[ENTER]".

7.2. IDLE SPEED COMPARISON

This test is used for detecting cylinder specific engine speed with injector energizing.
(Cylinder balancing function is deactivated.)

* Test condition

- Compression test : Normal
- Shift lever : P or N
- Engine : Idle
- Electrical Load : OFF

If you ready, Press [ENTER].

9. The rpm data of each cylinder is appeared.

7.2 IDLE SPEED COMPARISON			
Cylinder engine speed(RPM)			
#1	#2	#3	#4
790	800	752	770
796	798	756	772
794	800	752	770
794	802	754	772
794	802	754	770
794	802	756	774
792	802	752	772
Analyze the test result.			
<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 20px; display: inline-block; text-align: center; line-height: 20px;">ANAL</div>			



7.2 IDLE SPEED COMPARISON			
Cylinder engine speed(RPM)			
#1	#2	#3	#4
784	774	788	764
786	778	788	766
786	776	788	766
788	780	790	768
784	776	786	764
788	780	792	770
786	776	788	766
<div style="display: flex; justify-content: space-between; align-items: center;"> ◀ ▶ <div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 20px; display: inline-block; text-align: center; line-height: 20px;">AVG</div> HELP </div>			

10. Press "AVG" and the data average of each cylinder is appeared.
Press "HELP" and description of the data is appeared.

Cylinder engine speed(RPM)					
Speed(RPM)	650	700	750	800	AVG.
#1 CYL.	[Bar chart]				793
#2 CYL.	[Bar chart]				800
#3 CYL.	[Bar chart]				753
#4 CYL.	[Bar chart]				771

PREV **HELP**



7.2 IDLE SPEED COMPARISON

*The lower engine speed:
->The injector injects less quantity than other injectors.

*The higher engine speed:
->The injector injects more quantity than other injectors.

PREV

11. After pressing "ESC", select "INJECTOR QUANTITY COMPARISON" and press "[ENTER]".
12. Set the test condition described as below screen and press "[ENTER]".

7.3 INJECT. QUANTITY COMPARISON

This test is used for detecting cylinder specific quantity with individual energizing of injector. (Cylinder balancing function is activated.)

* Test condition

- Compression test : Normal
- Shift lever : P or N
- Engine : Idle
- Electrical Load : OFF

If you ready, Press [ENTER].

13. The data of each cylinder about RPM and compensating injection quantity is appeared.

7.3 INJECT. QUANTITY COMPARISON							
Eng. Speed(RPM)				Injection quantity(mm3)			
#1	#2	#3	#4	#1	#2	#3	#4
792	800	758	774	4.0	-2.9	-2.8	-2.4
788	798	760	774	4.0	-2.9	-2.7	-2.4
794	802	758	776	4.0	-2.9	-2.7	-2.4
792	798	758	774	4.0	-2.8	-2.7	-2.4
788	798	758	772	4.0	-2.8	-2.6	-2.4
794	802	758	772	4.0	-2.8	-2.8	-2.5
790	798	754	770	4.0	-2.9	-2.8	-2.5

Analyze the test result.

ANAL

↓

Cylinder engine speed(RPM)					
Speed(RPM)	650	700	750	800	AVG
#1 CYL.	████████████████████				791
#2 CYL.	████████████████████				799
#3 CYL.	████████████████████				757
#4 CYL.	████████████████████				773

Quant.(mm ³)	-4	-2	0	2	AVG
#1 CYL.				████████████████████	4.0
#2 CYL.		████████████████████			-2.8
#3 CYL.		████████████████████			-2.7
#4 CYL.		████████████████████			-2.3

PREV **HELP**

<Abnormal state>

14. Press "HELP" and description of the data is displayed as below.

7.3 INJECT. QUANTITY COMPARISON	
<p>*The positive correction value: ->The fuel injection of the cylinder is less than that of other cylinder.</p> <p>*The negative correction value: ->The fuel injection of the cylinder is more than that of other cylinder.</p> <p>*Extreme correction value identifies a problematic injector. After replacing injector with new one, reset & confirm the engine condition.</p>	

15. Replace the default injector, and then repeat previous test modes to check if the injector is normal.

COMPONENT INSPECTION

1. Turn ignition switch "OFF".
2. Disconnect injector connector.
3. Measure resistance between the terminals 1 and 2 of injector connector.

Resistance : 0.215 ~ 0.295Ω [20Ω (68Ω)]
