THE MICRO 570 ANALYZER

The Micro 570 Analyzer provides the ability to test the charging and starting systems, including the battery, starter and alternator.

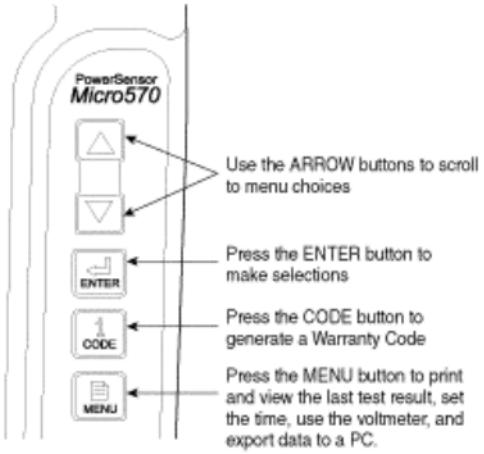
⚠ CAUTION

※ Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.
※ When charging battery by test result, Battery must be fully charged.
To get accurate test result, battery surface voltage must have subsided ahead before test when you test battery after charged. (See following Battery Test Results)



Keypad

The Micro 570 button on the key pad provide the following functions :



Battery Test Procedure

1. Connect the tester to the battery.
   - Red clamp to battery positive (+) terminal.
   - Black clamp to battery negative (-) terminal.

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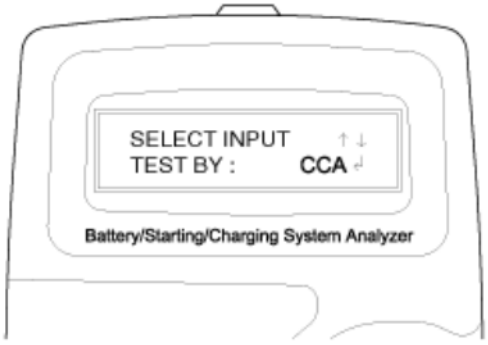
⚠ CAUTION

Connect clamps securely. If "CHECK CONNECTION" message is displayed on the screen, reconnect clamps securely.

2. The tester will ask if the battery is connected "IN-VEHICLE" or "OUT-OF-VEHICLE". Make your selection by pressing the arrow buttons; then press ENTER.



3. Select CCA and press the ENTER button.



NOTICE

CCA : Cold cranking amps, is an SAE specification for cranking batteried at -0.4°F (-18°C).

4. Set the CCA value displayed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.

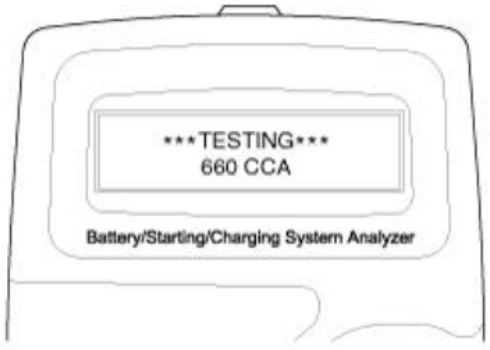
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NOTICE

The battery ratings(CCA) displayed on the tester must be identical to the ratings marked on battery label.

5. The tester will conduct battery test.



6. The tester displays battery test results including voltage and battery ratings.
   Refer to the following table and take the appropriate action as recommended by the Micro 570.



Battery Test Results

Result On Printer	Remedy
GOOD BATTERY	No action is required.
GOOD RECHARGE	Battery is in a good state. Recharge the battery and use. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and Retest method after battery charge' below.)
CHARGE & RETEST	Battery is not charged properly. – Charge and test the battery again. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and Retest method after battery charge' below.)

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REPLACE BATTERY	Replace battery and recheck the charging system. – Improper connection between battery and vehicle cables may cause "REPLACE BATTERY". Retest the battery after removing cables and connecting the tester to the battery terminal directly prior to replacing the battery.
BAD CELL-REPLACE	Charge and retest the battery. – If the Micro 570 recommends "REPLACE BATTERY", replace the battery and recheck the charging system.

[Charge and Retest method after battery charge]

Battery charge

Set battery charger to 'Auto Mode' (The Mode that charging current drops as the battery charges.) and charge battery until charging current down close to zero or the charger alerts you with an alarm when charge is complete.
(Minimum charging time recommended: More than 3 hours with Auto Mode that explained above)

- If battery is not fully charged, battery surface voltage will be high while the amount of current charged (CCA) in battery is low. If you measure the battery under this condition, tester may misjudge that battery sulfation occurred because the amount of current in battery is too low in comparison with battery voltage.
  * Surface voltage: When battery is charged electrolyte temperature increases and chemical reaction become active resulting in an excessive increase of battery voltage.
  It is known that it takes approximate one day to subside this increased surface voltage completely.

Battery Test after charge

Do not test battery right after the charge. Test battery after battery surface voltage has subsided as instructed in the following procedure.

(1) When battery charge is complete, install the battery in the vehicle.

(2) Put IG key to ON position and turn on head lamp with low beam, and wait 5 minutes. (Discharge for 5 minutes)

(3) Turn off the head lamp and IG key, and wait 5 minutes. (Waiting for 5 minutes)

(4) Remove +, - cable from the battery and test battery.

⚠ WARNING

Whenever filing a claim for battery, the print out of the battery test results must be attached.

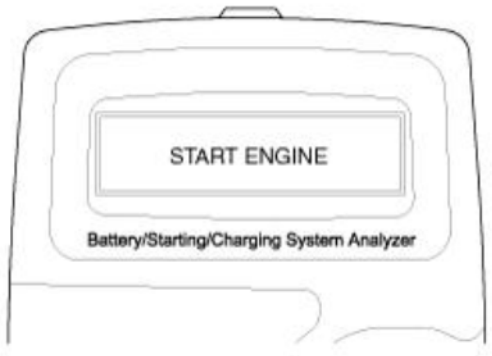
Starter Test Procedure

7. After the battery test, press ENTER immediately for the starter test.



8. Start the engine.

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9. Cranking voltage and starter test results will be displayed on the screen.
   Refer to the following table and take the appropriate action as recommended by the Micro 570.



Starter Test Results

Result On Printer	Remedy
CRANKING VOLTAGE NORMAL	System shows a normal starter draw.
CRANKING VOLTAGE LOW	Cranking voltage is lower than normal level. – Check starter.
CHARGE BATTERY	The state of battery charge is too low to test. – Charge the battery and retest.
REPLACE BATTERY	Replace battery. – If the vehicle is not started though the battery condition of "GOOD BATTERY" is displayed, check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. – If the engine does crank, check fuel system.

NOTICE

When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

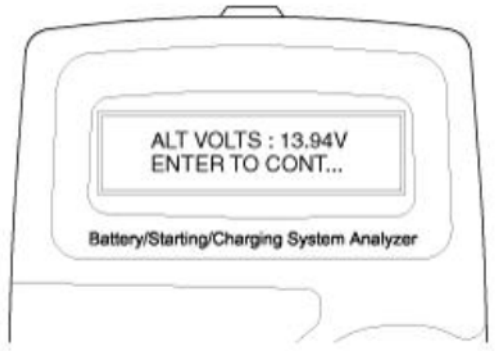
Charging System Test Procedure

10. Press ENTER to begin charging system test.

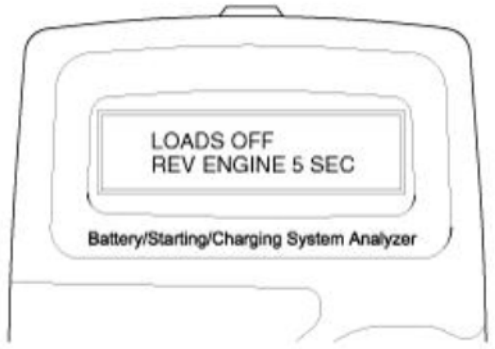
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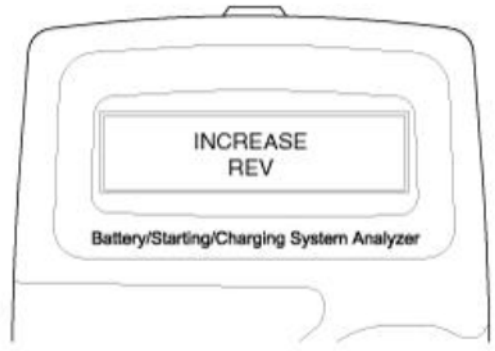


11. The tester displays the actual voltage of alternator.
    Press ENTER to continue.

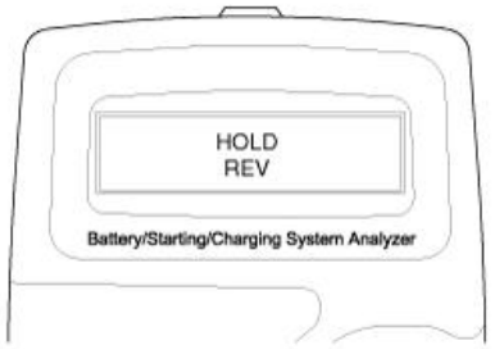


12. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)

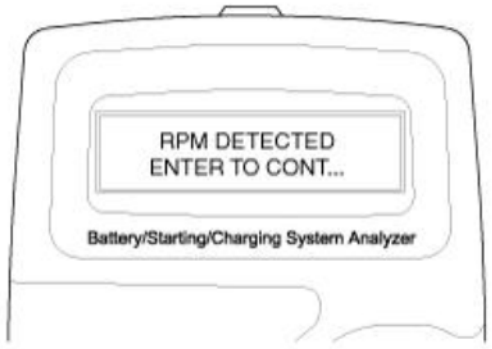




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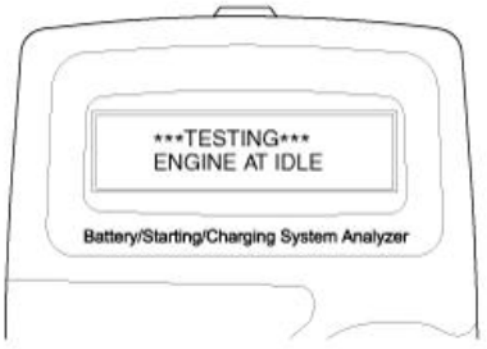
13. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.



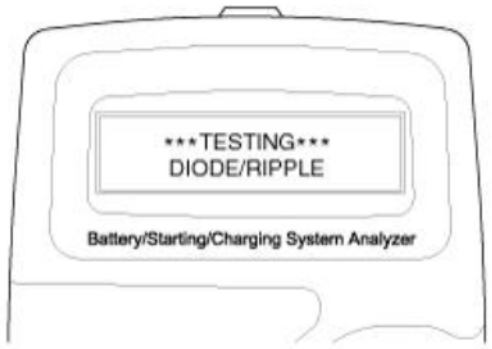
14. If the engine RPM is not detected, press ENTER after revving engine.



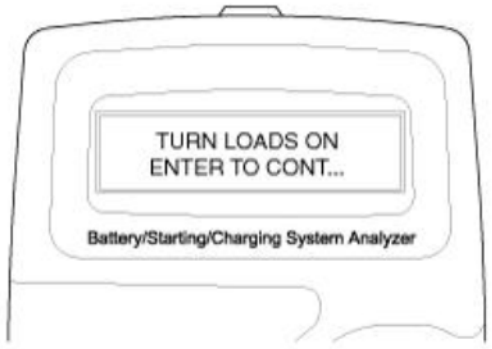
15. The tester will conduct charging system test during loads off.



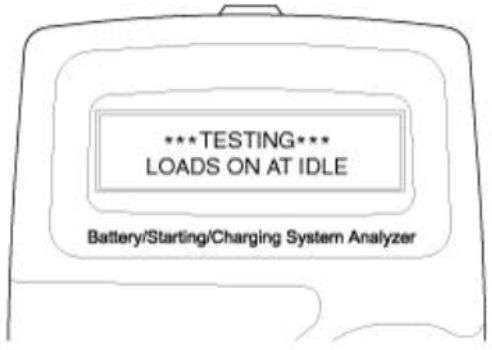
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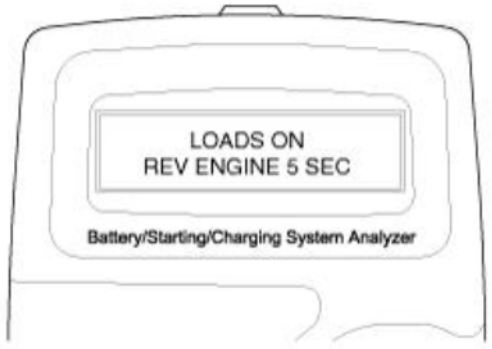
16. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.



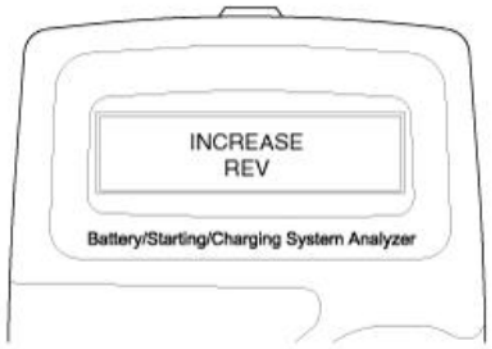
17. The tester will conduct charging system test during loads on.

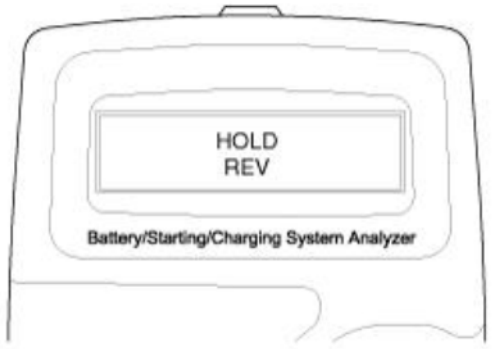


18. Rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)

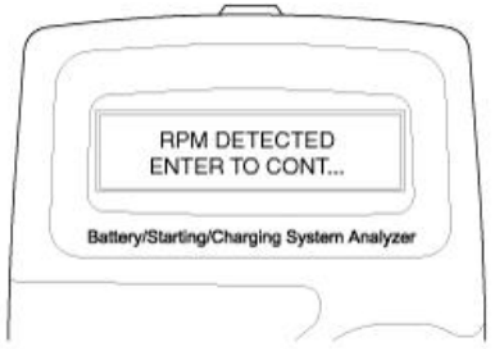


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19. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.

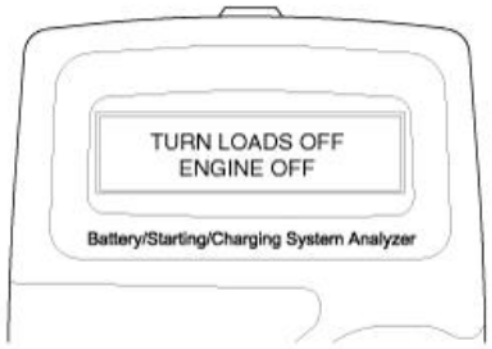


20. If the engine RPM is not detected, press ENTER after revving engine.

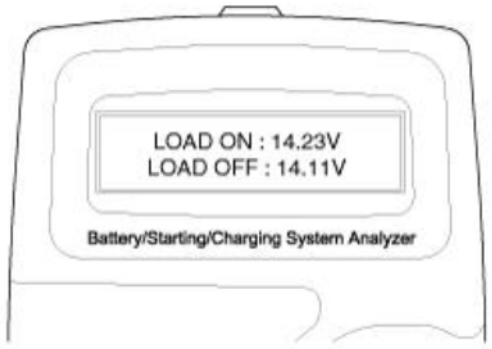


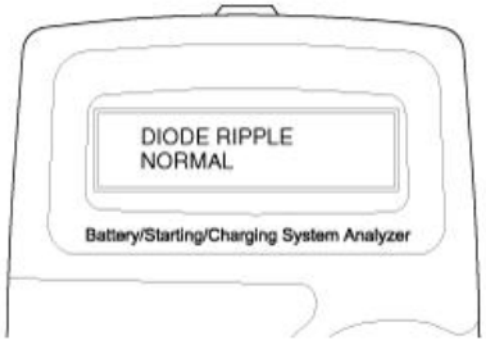
21. Turn off electrical loads (air conditioner, lamps, audio and etc). Turn the engine off.

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22. Charging voltage and charging system test results will be displayed on the screen.
Shut off engine end disconnect the tester clamps from the battery. Refer to the following table and take the appropriate action as recommended by the Micro 570.







Charging System Test Results

Result On Printer	Remedy
CHARGING SYSTEM NORMAL / DIODE RIPPLE NORMAL	Charging system is normal.
NO CHARGING VOLTAGE	Alternator does not supply charging current to battery. – Check belts, connection between alternator and battery and replace belts or

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	cable or alternator as necessary.
LOW CHARGING VOLTAGE	Alternator does not supply charging current to battery and electrical load to system fully. – Check belts and alternator and replace as necessary.
HIGH CHARGING VOLTAGE	The voltage from alternator to battery is higher than normal limit during voltage regulating. – Check connection and ground and replace regulator as necessary. – Check electrolyte level in the battery.
EXCESS RIPPLE DETECTED	One or more diodes in the alternator is not functioning properly. – Check alternator mounting and belts and replace as necessary.

The MDX-670P Analyzer

The MDX-670P battery conductance and electrical system analyzer tests batteries as well as starting and charging systems for vehicle.
It displays the test results in seconds and features a built-in printer to provide a copy of the results.

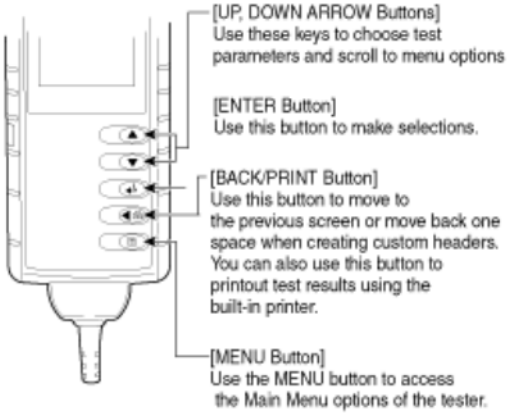


⚠ CAUTION

1) Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.
2) When charging battery by test result, Battery must be fully charged. To get accurate test result, battery surface voltage must have subsided ahead before test when you test battery after charged. (See following Battery Test Results)

NOTICE

When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.



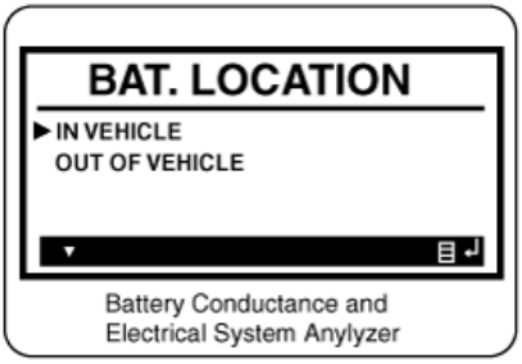
1. Connect the red clamp to the positive (+) terminal and the black clamp to the negative (–) terminal.

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NOTICE

For a proper connection, rock the clamps back and forth. The tester re¬quires that both sides of each clamp be firmly connected before testing. A poor connection will produce a CHECK CONNECTION or WIGGLE CLAMPS message. If the message appears, clean the terminals and reconnect the clamps.

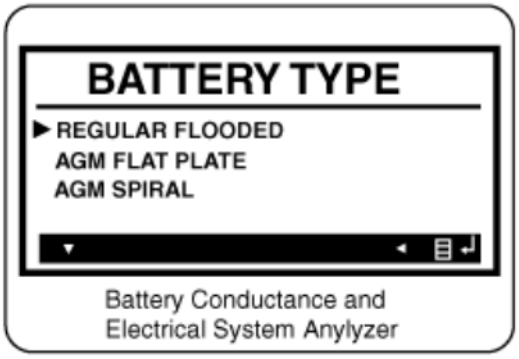
2. Scroll to and select IN VEHICLE or OUT OF VEHICLE for a battery not connected to a vehicle.



NOTICE

Following an IN VEHICLE test you will be prompted to test the starting and charging systems.

3. Scroll to and select REGULAR FLOODED, AGM FLAT PLATE, or AGM SPIRAL where applicable.



NOTICE

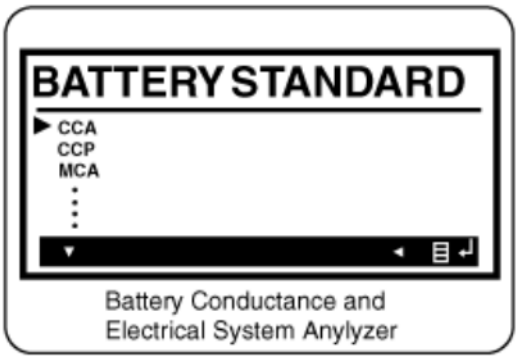
If the vehicle equipped with ISG function, select the AGM FLAT PLATE.

4. Scroll to and select the battery's rating system.

NOTICE

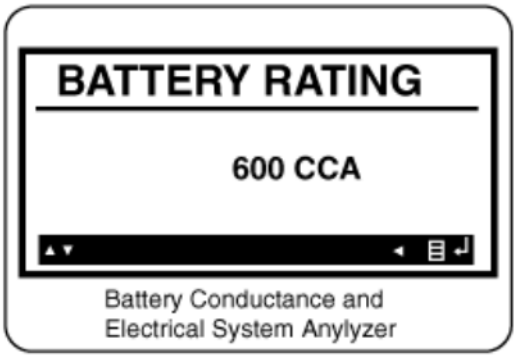
Mostly, the CCA value is marked on the battery label, but sometimes marked EN or SEA value. Select one of them.

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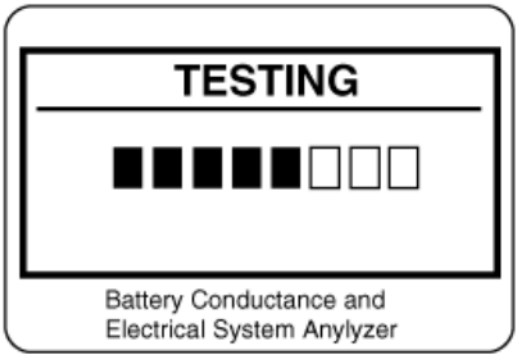


- CCA: Cold Cranking Amps, as specified by SAE. The most common rating for cranking batteries at 0 °F (–17.8 °C).
- EN: Europe-Norm
- SAE: Society of Automotive Engineers, the European labeling of CCA

5. Set the selected rating value displayed on the screen to the value marked on the battery label by pressing up and down arrow buttons.

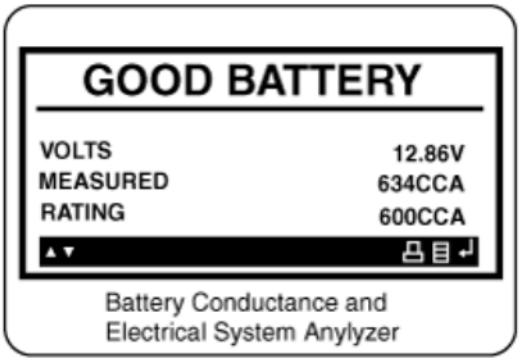


6. Press ENTER to start test.



7. After several seconds the tester displays the decision on the battery's condition and the measured voltage. The tester also displays your selected battery rating and the rating units.

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Battery Test Results

Result On Printer	Remedy
GOOD BATTERY	No action is required.
GOOD RECHARGE	Battery is in a good state. Recharge the battery and use. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and Retest method after battery charge' below.)
CHARGE & RETEST	Battery is not charged properly. – Charge and test the battery again. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and retest method after battery charge' below.)
REPLACE BATTERY	Replace battery and recheck the charging system. – Improper connection between battery and vehicle cables may cause "REPLACE BATTERY", retest the battery after removing cables and connecting the tester to the battery terminal directly prior to replacing the battery.
BAD CELLREPLACE	Charge and retest the battery. – If recommends "REPLACE BATTERY", replace the battery and recheck the charging system.

[Charge and Retest method after battery charge]

Battery charge

Set battery charger to 'Auto Mode' (The Mode that charging current drops as the battery charges.) and charge battery until charging current down close to zero or the charger alerts you with an alarm when charge is complete.(Minimum charging time recommended: More than 3 hours with Auto Mode that explained above)

- If battery is not fully charged, battery surface voltage will be high while the amount of current charged (CCA) in battery is low. If you measure the battery under this condition, tester may misjudge that battery sulfation occurred because the amount of current in battery is too low in comparison with battery voltage.
  * Surface voltage: When battery is charged electrolyte temperature increases and chemical reaction become active resulting in an excessive increase of battery voltage.
  It is known that it takes approximate one day to subside this increased surface voltage completely.

Battery Test after charge

Do not test battery right after the charge. Test battery after battery surface voltage has subsided as instructed in the following procedure.

(1) When battery charge is complete, install the battery in the vehicle.

(2) Put IG key to ON position and turn on head lamp with low beam, and wait 5 minutes. (Discharge for 5 minutes)

(3) Turn off the head lamp and IG key, and wait 5 minutes. (Waiting for 5 minutes)

(4) Remove +, - cable from the battery and test battery.

NOTICE

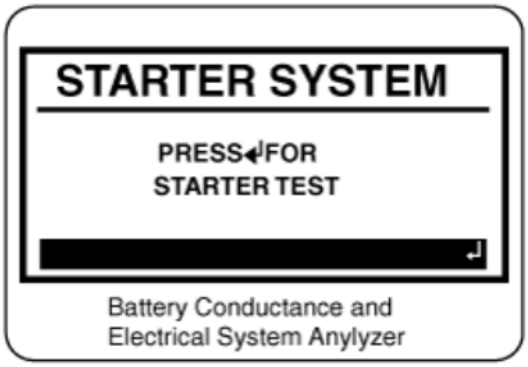
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For an in-vehicle test, the display alternates between the test results and the message “PRESS FOR STARTER TEST.

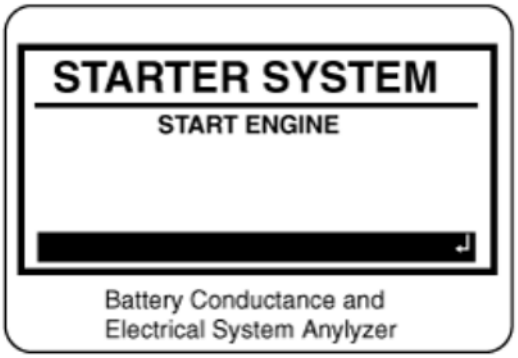
NOTICE

Before starting the test, inspect the alternator drive belt. A belt that is glazed or worn, or lacks the proper tension, will prevent the en¬gine from achieving the rpm levels needed for the test.

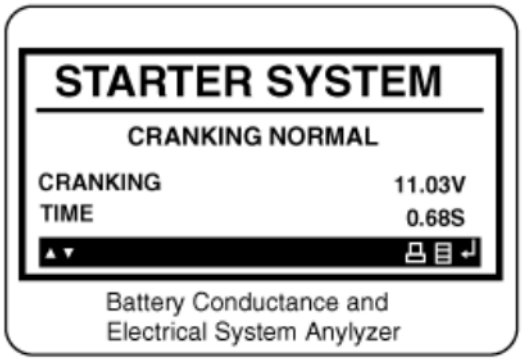
8. Press the ENTER button to proceed with the starter test.



9. Start the engine when prompted.



10. The tester displays the decision on the starter system, cranking voltage, and cranking time in milliseconds.



Starter Test Results

Result On Printer	Remedy
CRANKING VOLTAGE NORMAL	System shows a normal starter draw.
CRANKING VOLTAGE LOW	Cranking voltage is lower than normal level. – Check starter.
CHARGE BATTERY	The state of battery charge is too low to test.

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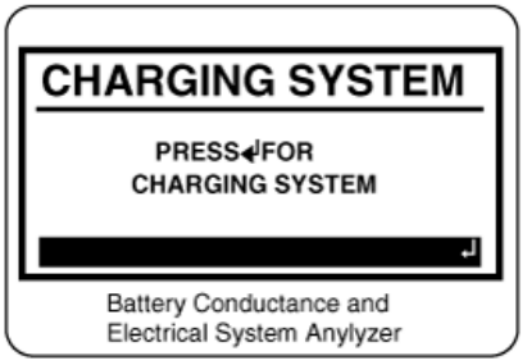
	– Charge the battery and retest.
REPLACE BATTERY	Replace battery. – If the vehicle is not started though the battery condition of "GOOD BATTERY" is displayed, check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. – If the engine does crank, check fuel system.

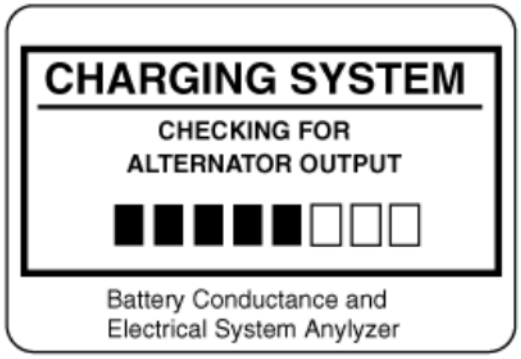
NOTICE

For an in-vehicle test, the display alternates between the test results and the message “PRESS FOR CHARGING TEST.

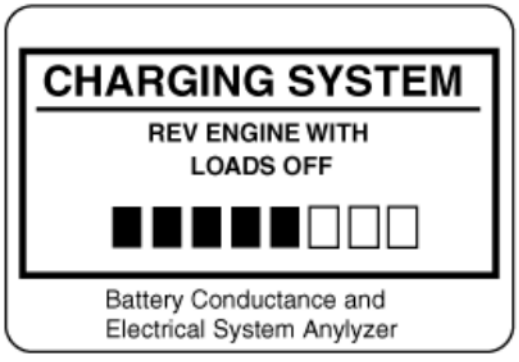
Step 3: Charging System Test

11. Press the ENTER button to proceed with the charging test.



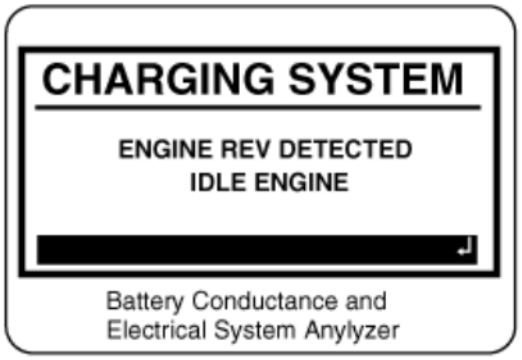


12. Rev the engine with loads off. (Following the on-screen prompts)

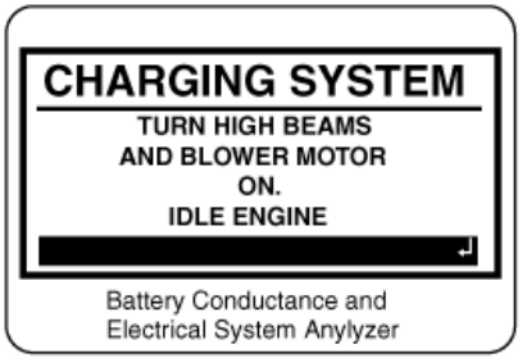


13. The message that engine RPM is detected will be displayed on the screen, idle the engine.

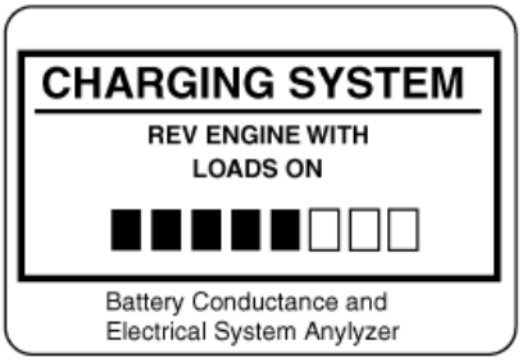
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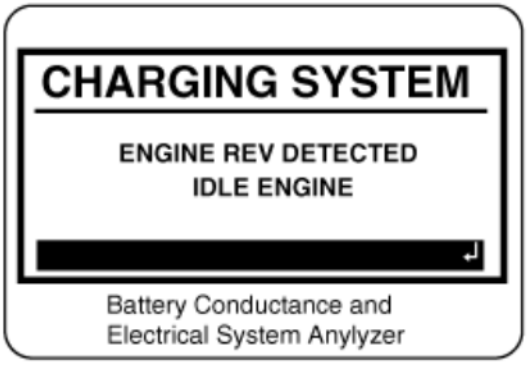
14. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.



15. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.

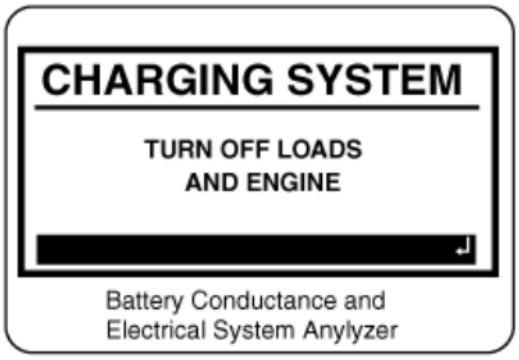


16. The message that engine RPM is detected will be displayed on the screen, idle the engine.

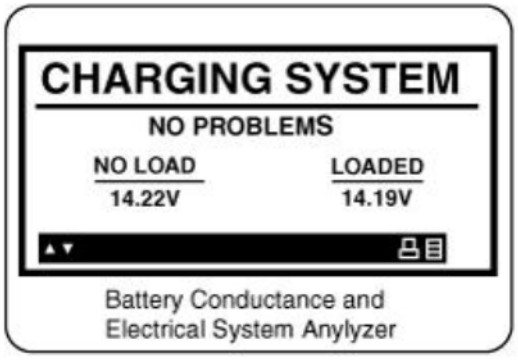


17. Turn off loads and engine.

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18. The Charging System decision is displayed at the end of the procedure.



Result On Printer	Remedy
NO PROBLEMS	System is showing normal output from the alternator.
NO OUTPUT	No alternator output detected. – Check all connections to and from the alternator, especially the connection to the battery. If the connection is loose or heavily corroded, clean or replace the cable and retest. – If the belts and connections are in good working condition, replace the alternator. (Older vehicles use external voltage regulators, which may require only replacement of the voltage regulator.)
LOW OUTPUT	Alternator does not supply charging current to battery and electrical load to system fully. – Check belts and alternator and replace as necessary.
HIGH OUTPUT	The voltage from alternator to battery is higher than normal limit during voltage regulating. – Check connection and ground and replace regulator as necessary. – Check electrolyte level in the battery.
EXCESSIVE RIPPLE	The voltage from alternator to battery is higher than normal limit during voltage regulating. – Check alternator mounting and belts and replace as necessary.
CHARGE BATTERY	The starter voltage is low and the battery is discharged. Fully charge the battery and repeat the starter system test.
REPLACE BATTERY	Battery must be replaced before the starting system can be tested.

19. Press the BACK/PRINT button to print the test results or MENU to return to the Options Menu.

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SPECIFICATIONS

Ignition System

Items			Specification		
			1.0	1.25	
			Petrol	ISG	Non-ISG
Ignition coil	Primary resistance		0.75 ± 15 % (Ω)		0.82 ± 10 % (Ω)
	Secondary resistance		5.9 (kΩ)		15.5 ± 15 % (kΩ)
Spark plugs	Unleaded	Type	LKR6D-10E, ELR9SC10	LKR6D-10E, ELR9SC10	
		Gap	0.9 ~ 1.0 mm (0.0354 ~ 0.0394 in.)	0.9 ~ 1.0 mm (0.0354 ~ 0.0394 in.)	
	Leaded	Type	LKR6D-E, ELR9SC8	-	LKR6D-E, ELR9SC8
		Gap	0.7 ~ 0.8 mm (0.0276 ~ 0.0315 in.)	-	0.7 ~ 0.8 mm (0.0276 ~ 0.0315 in.)

Starting System

Items			Specification			
			1.0		1.25	
			Non-ISG	ISG	Non-ISG	ISG
Starter	Rated voltage		12V, 0.9kW	12V, 1.2Kw	12V, 0.9kW	12V, 1.2Kw
	No. of pinion teeth		8	11	8	11
	No-load characteristics	Voltage	11.5V	11V	11.5V	11V
		Ampere	70A, MAX	70A, MAX	70A, MAX	70A, MAX
		Speed	3,000rpm, MIN	2,500rpm, MIN	3,000rpm, MIN	2,500rpm, MIN

Charging System

Items			Specification			
			1.0		1.25	
			Non-ISG	ISG	Non-ISG	ISG
Alternator	Rate voltage		13.5V, 70A	13.5V, 90A	13.5V, 70A	13.5V, 90A
	Speed in use		1,000 ~ 18,000 rpm			
	Voltage regulator		IC Regulator built-in type			
	Regulator setting voltage	External mode	ECU control			
		Internal mode	14.55 ± 0.3V			
	Temperature compensation	External mode	ECU control			
		Internal mode	-3.5 ± 2mV/°C			

Battery

▷CMF40L-BCI

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Items	Specification
Capaticy [20HR/5HR] (AH)	40/32
Cold Cranking Amperage (A)	354 (SAE) / 283 (EN)
Reserve Capacity (Min)	55

▷CMF45L-DIN

Items	Specification
Capaticy [20HR/5HR] (AH)	45/36
Cold Cranking Amperage (A)	410 (SAE) / 328 (EN)
Reserve Capacity (Min)	80

▷AGM60L-DIN: ISG

Items	Specification
Capaticy [20HR/5HR] (AH)	60/48
Cold Cranking Amperage (A)	640 (SAE) / 512 (EN)
Reserve Capacity (Min)	100

Information

- Model type description
  - Battery type notation : □□□ □□ □ - □□□ (① ② ③ ④)

① : Battery specification
- CMF : Closed Maintenance Free
- MF : Maintenance Free - Openable Type
- AGM : Absorbent Glass Mat

② : Battery capacity (20HR)
- 68 : 68AH

③ : Terminal location
- L : Positive terminal is left
- R : Positive terminal is right

④ : Battery type
- DIN: Deutsche Industric Normen
- BCI: Battery Council International

- Cold Cranking Ampere (CCA): Cold Cranking Amps is a rating used in the battery industry to define a battery's ability to start an engine in cold temperatures.

– The rating is the number of amps a new, fully charged battery can deliver at -18 °C(-0.4 °F) for 30 seconds, while maintaining a voltage of at least 7.2 volts for a 12 volt battery.

– The higher the CCA rating, the greater the starting power of the battery.

- RESERVE CAPACITY (RC) : Reserve Capacity is a battery industry rating, defining a battery's ability to power a vehicle with an inoperative alternator or fan belt.

– The rating is the number of minutes a battery at 26.7 °C(80 °F) can be discharged at 25 amps and maintain a voltage of 10.5 volts for a 12 volt battery.

– The higher the reserve rating, the longer your vehicle can operate should your alternator or fan belt fail.

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TROUBLE SHOOTING

Ignition System

Symptom	Suspect area	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch	Inspect ignition lock switch, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
	Spark plugs	Inspect spark plugs, or replace as required
	Ignition wiring disconnected or broken	Repair wiring, or replace as required
	Spark plugs cable	Inspect cable, or replace as required
Rough idle or stalls	Ignition wiring	Repair wiring, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
	Spark plugs cable	Inspect cable, or replace as required
Engine hesitates/poor acceleration	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required
	Ignition wiring	Repair wiring, or replace as required
Poor mileage	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required

Charging System

Symptom	Suspect area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown	Check fuses
	Light burned out	Replace light
	Wiring connection loose	Tighten loose connection
	Electronic voltage regulator	Replace voltage regulator
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging)	Drive belt loose or worn	Adjust belt tension or replace belt
	Battery cable loose, corroded or worn	Inspect cable connection, repair or replace cable
	Electronic voltage regulator or alternator	Replace voltage regulator or alternator
	Wiring	Repair or replace wiring
Overcharge	Electronic voltage regulator	Replace voltage regulator
	Voltage sensing wire	Repair or replace wiring
Discharge	Drive belt loose or worn	Adjust belt tension or replace belt
	Wiring connection loose or short circuit	Inspect wiring connection, repair or replace wiring
	Electronic voltage regulator or alternator	Replace voltage regulator or alternator
	Poor grounding	Inspect ground or repair
	Worn battery	Replace battery

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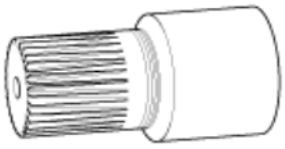
Starting System

English ▼

Symptom	Suspect area	Remedy
Engine will not crank	Battery charge low	Charge or replace battery
	Battery cables loose, corroded or worn out	Repair or replace cables
	Transaxle range switch (Vehicle with automatic transaxle only)	Refer to A/T Group
	Fuse blown	Replace fuse
	Starter faulty	Replace
	Ignition switch faulty	Replace
Engine cranks slowly	Battery charge low	Charge or replace battery
	Battery cables loose, corroded or worn out	Repair or replace cables
	Starter faulty	Replace
Starter keeps running	Starter	Replace
	Ignition switch	Replace
Starter spins but engine will not crank	Short in wiring	Repair wiring
	Pinion gear teeth broken or starter motor	Replace
	Ring gear teeth broken	Replace fly wheel or torque converter

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SPECIAL SERVICE TOOLS

Tool Name / Number	Illustration	Description
Alternator pulley remover wrench 09373-27000		Removal and installation of alternator pulley.

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DESCRITION

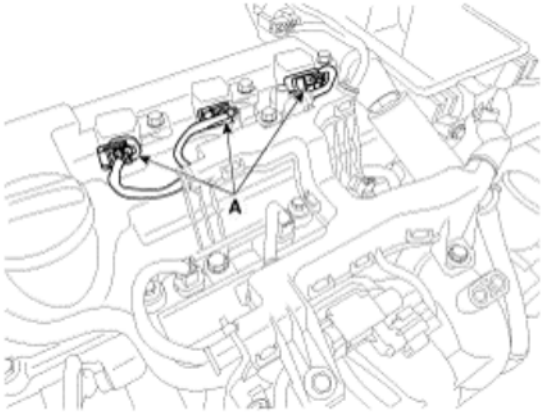
Ignition timing is controlled by the electronic control ignition timing system. The standard reference ignition timing data for the engine operating conditions are pre-programmed in the memory of the ECM (Engine Control Module).
The engine operating conditions (speed, load, warm-up condition, etc.) are detected by the various sensors. Based on these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the ECM. The ignition coil is activated, and timing is controlled.

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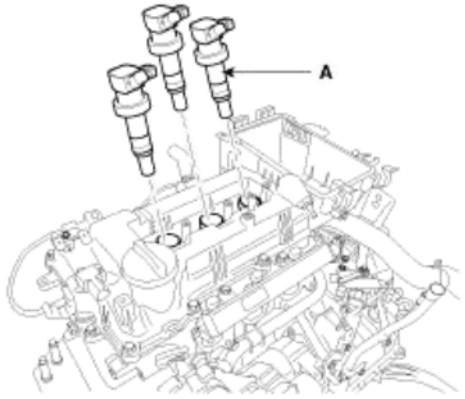
ON-VEHICLE INSPECTION

[1.0L]

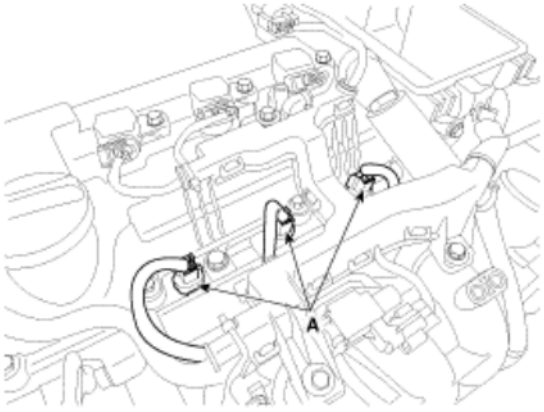
1. Remove the engine cover.
2. Disconnect the ignition coil connectors (A).



3. Remove the ignition coils (A).

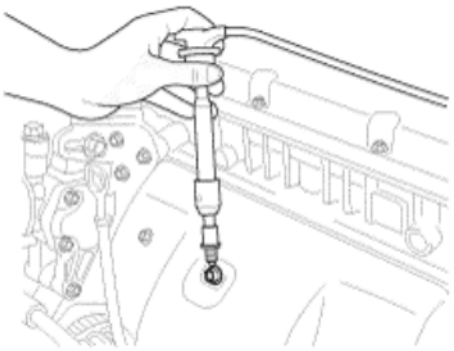


4. Disconnect the injector connectors (A).



5. Using a spark plug socket, remove the spark plug.
6. Install the spark plug to the ignition coil.
7. Ground the spark plug to the engine.

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8. Check if spark occurs while engine is being cranked.

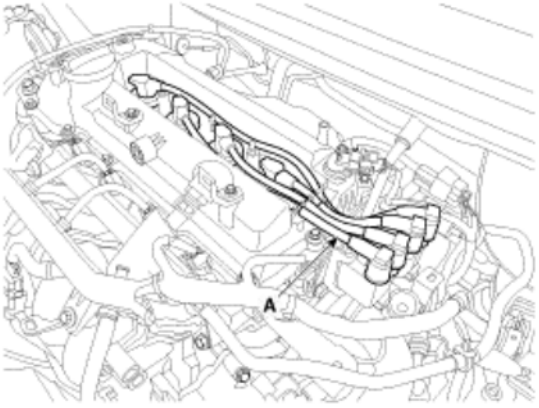
> **NOTICE**
>
> To prevent fuel being injected from injectors while the engine is being cranked, disconnect the injector connector. Crank the engine for no more than 5 ~ 10 seconds.

9. Inspect all the spark plugs.
10. Using a spark plug socket, install the spark plug.
    Tightening torque :
    14.7 ~ 24.5N.m(1.5 ~ 2.5kgf.m, 10.8 ~ 18.1lb-ft)
11. Install the ignition coil.
    Tightening torque :
    9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)
12. Reconnect the injector connectors.
13. Reconnect the ignition coil connectors.

[1.25L]

1. Remove the resonator.
2. Disconnect the spark plug cable (A) from the spark plug.

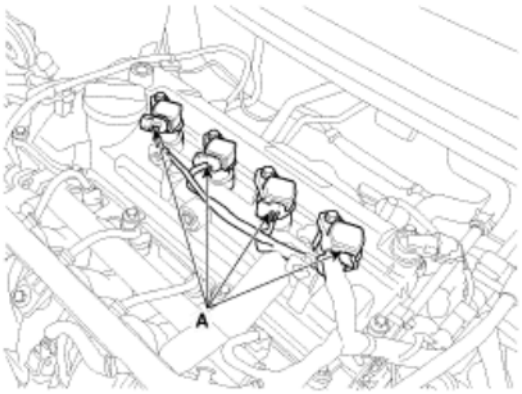
[Non-ISG]



Disconnect the ignition coil connectors (A).

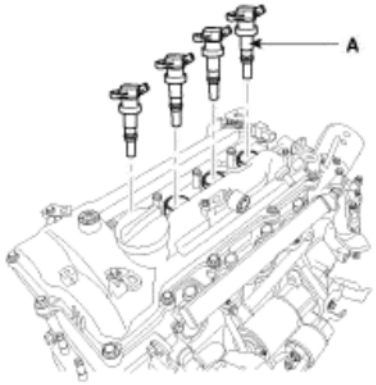
[ISG]

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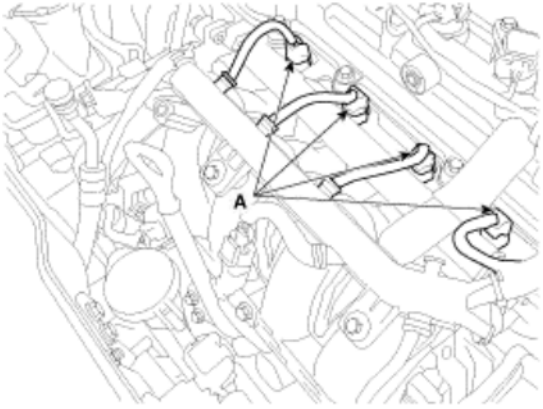


3. Remove the ignition coils (A).

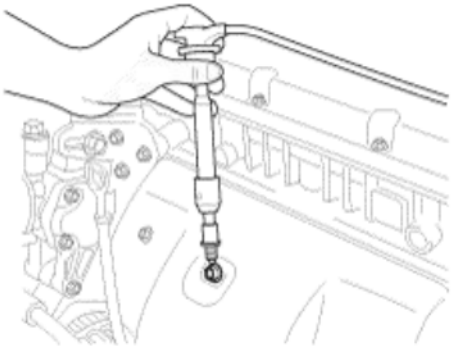
[ISG]



4. Disconnect the injector connectors (A).



5. Using a spark plug socket, remove the spark plug.
6. Install the spark plug to the spark plug cable (or ignition coil).
7. Ground the spark plug to the engine.



8. Check if spark occurs while engine is being cranked.

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NOTICE

To prevent fuel being injected from injectors while the engine is being cranked, disconnect the injector connector. Crank the engine for no more than 5 ~ 10 seconds.

9. Inspect all the spark plugs.

10. Using a spark plug socket, install the spark plug.
    Tightening torque :
    14.7 ~ 24.5N.m(1.5 ~ 2.5kgf.m, 10.8 ~ 18.1lb-ft)

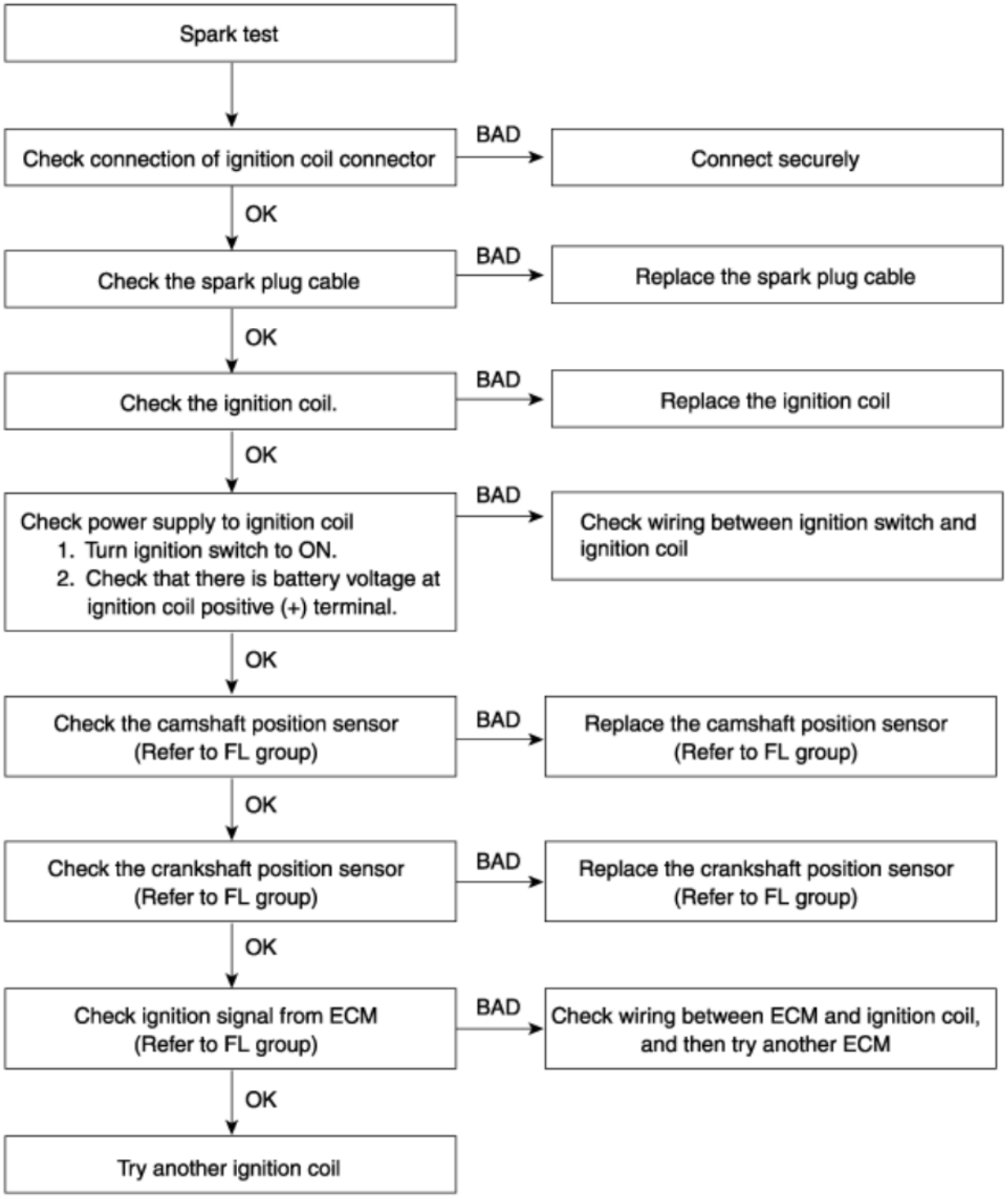
11. Reconnect the spark plug cables.(Non-ISG type)

12. Install the ignition coil. (ISG type)
    Tightening torque :
    9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

13. Reconnect the injector connectors.

14. Reconnect the ignition coil connectors.

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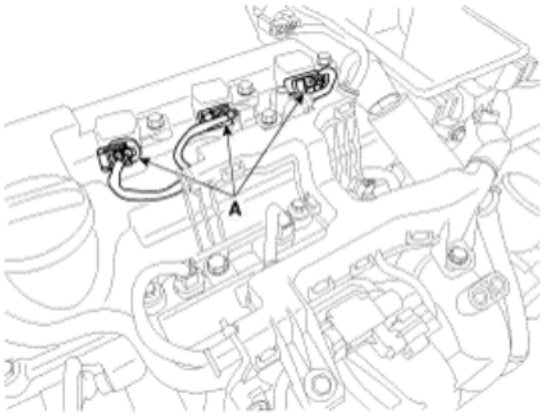


Inspect Spark Plug

[1.0L]

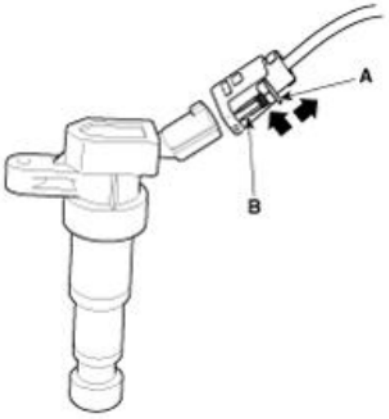
1. Disconnect the ignition coil connectors (A).

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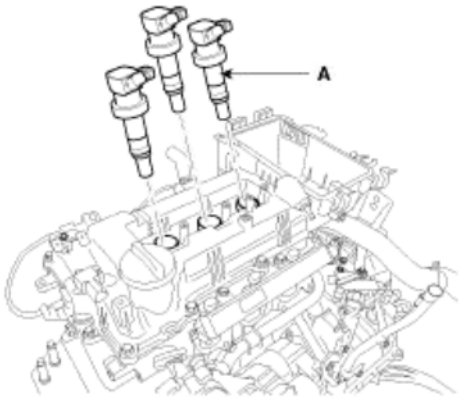
NOTICE

When disconnecting the ignition coil connector, pull out the locking pin (A) and then pull out the connector while pressing the clip (B).



2. Remove the ignition coils (A).

   Tightening torque :
   9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)



3. Using a spark plug socket, remove the spark plug.

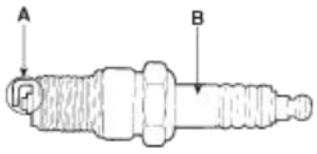
   Tightening torque :
   14.7 ~ 24.5N.m(1.5 ~ 2.5kgf.m, 10.8 ~ 18.1lb-ft)

⚠ CAUTION

Be careful that no contaminates enter through the spark plug holes.

4. Inspect the electrodes (A) and ceramic insulator (B).

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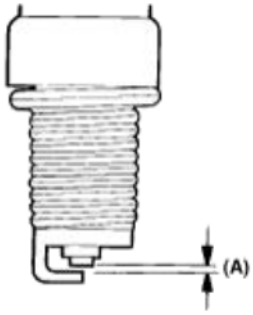
Inspection Of Electrodes

Condition	Dark deposits	White deposits
Description	– Fuel mixture too rich – Low air intake	– Fuel mixture too lean – Advanced ignition timing – Insufficient plug tightening torque

5. Check the electrode gap (A).

Standard

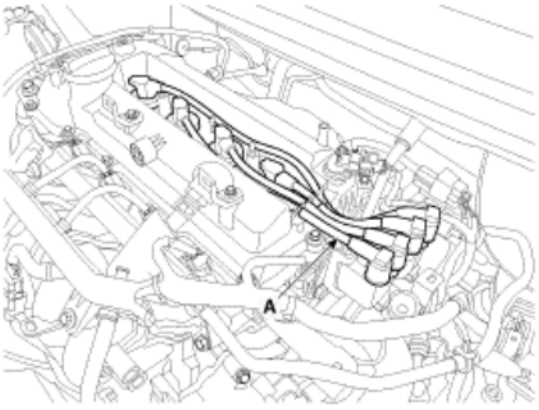
Unleaded : 0.9 ~ 1.0 mm (0.0354 ~ 0.0394 in.)
Leaded : 0.7 ~ 0.8 mm (0.0276 ~ 0.0315 in.)



[1.25L]

1. Disconnect the spark plug cable (A) from the spark plug.

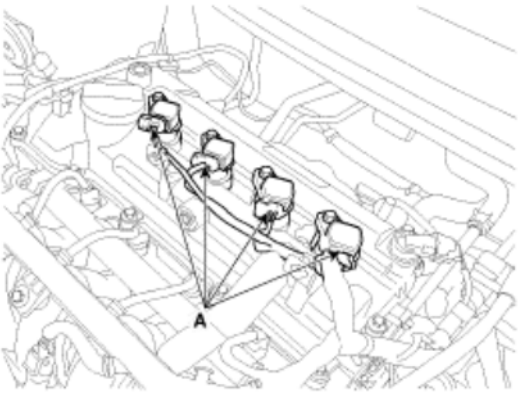
[NON-ISG]



Disconnect the ignition coil connectors (A).

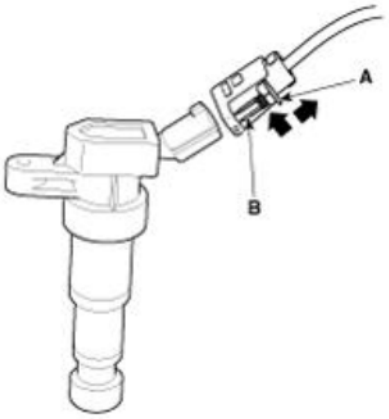
[ISG]

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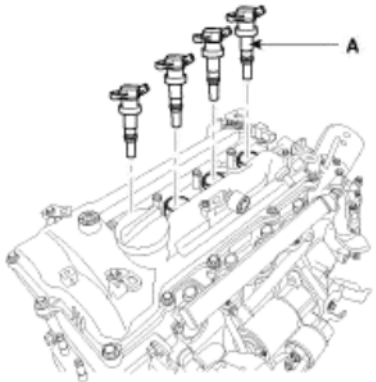
NOTICE

When disconnecting the ignition coil connector, pull out the locking pin (A) and then pull out the connector while pressing the clip (B).



2. Remove the ignition coils (A).
   Tightening torque :
   9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

[ISG]



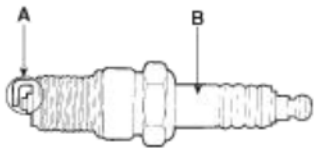
3. Using a spark plug socket, remove the spark plug.
   Tightening torque :
   14.7 ~ 24.5N.m(1.5 ~ 2.5kgf.m, 10.8 ~ 18.1lb-ft)

⚠ CAUTION

Be careful that no contaminates enter through the spark plug holes.

4. Inspect the electrodes (A) and ceramic insulator (B).

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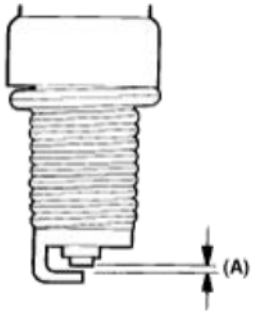


Inspection Of Electrodes

Condition	Dark deposits	White deposits
Description	– Fuel mixture too rich – Low air intake	– Fuel mixture too lean – Advanced ignition timing – Insufficient plug tightening torque

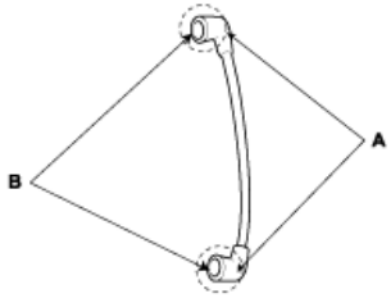
5. Check the electrode gap (A).

   Standard
   Unleaded : 0.9 ~ 1.0 mm (0.0354 ~ 0.0394 in.)
   Leaded : 0.8 ~ 0.9 mm (0.0315 ~ 0.0354 in.)



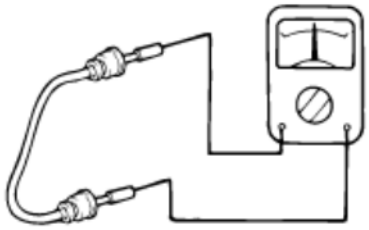
Inspect Spark Plug Cable

1. Carefully remove the spark plug cable by pulling on the rubber boots (A).
   Check the condition of the spark plug cable terminals (B), if any terminal has surface corrosion, clean it off, and if it broken or distorted, replace the spark plug cable.



2. Connect the ohmmeter probes and measure resistance.
   Resistance: 5.6kΩ/m ± 20 %

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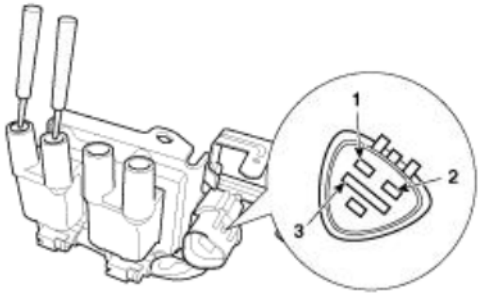


3. Resistance should not be higher than 10kΩ/m.
   If resistance is higher, replace the cable.

Inspect Ignition Coil

[1.25L Non-ISG]

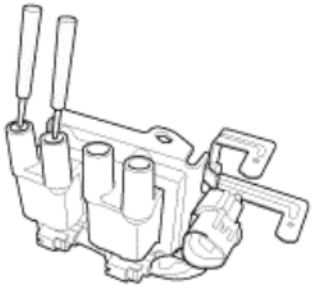
1. Measure the primary coil resistance between terminals 1, 2 and 1, 3.



Standard value: 0.82Ω±10%

2. Measure the secondary coil resistance between the high-voltage terminals for the No.1 and No. 4 cylinders, and between the high voltage terminals for the No. 2 and No. 3 cylinders.
   Standard value: 15.5kΩ/m ±15%

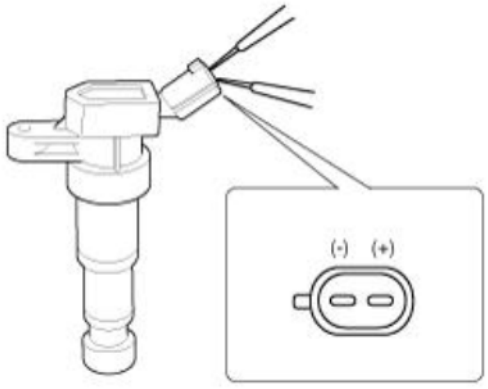
> **⚠ CAUTION**
>
> Be sure, when measuring the resistance of the secondary coil, to disconnect the connector of the ignition coil.



[1.0L Petrol/1.25L ISG]

1. Measure the primary coil reistance between terminals (+) and (-).

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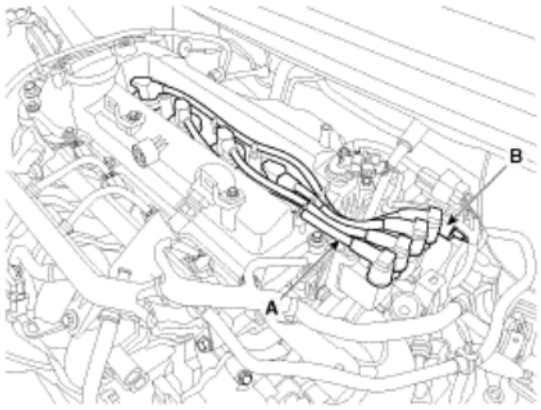
Standard value : 0.75Ω ± 15%

REPLACEMENT

[1.25L Non-ISG]

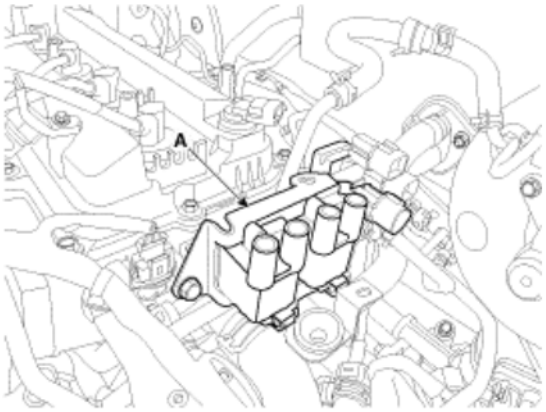
Ignition Coil

1. Disconnect the spark plug cables (A) and ignition coil connector.



2. Remove the ignition coil (A).

   Tightening torque:
   18.6 ~ 23.5 N.m (1.9 ~ 2.4 kgf.m, 13.7 ~ 17.4 lbf.ft)

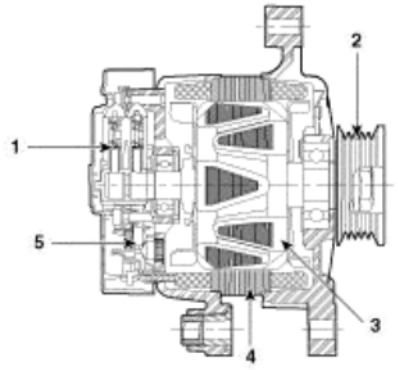


3. Installation is the reverse of removal.

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DESCRIPTION

The charging system consists a battery, an alternator with a built-in regulator, and the charging indicator light and wire.
The Alternator has built-in diodes, each rectifying AC current to DC current.
Therefore, DC current is present at the alternator "B" terminal.
Additionally, the alternator and charging voltage is regulated by the battery voltage detection system.
The alternators is regulated by the battery voltage detection system. The main components of the alternator are the rotor, stator, rectifier, capacitor, brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



1. Brush
2. Drive belt pulley
3. Rotor
4. Stator
5. Rectifier

Alternator Management System (AMS)

Alternator management system controls the charging voltage set point in order to improve fuel economy, manage alternator load under various operating conditions, keep the battery charged, and protect the battery from over-charging. ECM controls generating voltage by duty cycle (charging control, discharging control, normal control) based on the battery conditions and vehicle operating conditions.
The system lowers the charging rate when accelerating. Lowering the charging rate will allow more engine power for accelerating.
The system increases the charging rate when decelerating. The system uses the unused power of the decelerating engine and increases the charging rate.

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ON-VEHICLE INSPECTION

⚠ CAUTION

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Never disconnect the battery while the engine is running.

Check Battery Voltage

1. If 20 minutes have not passed since the engine was stopped, turn the ignition switch ON and turn on the electrical system (headlamp, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
2. Turn the ignition switch OFF and turn off the electrical systems.
3. Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.
   Standard voltage: 12.5 ~ 12.9V at 20°C(68°F)
   If the voltage is less than specification, charge the battery.

Check The Battery Terminals And Fuses

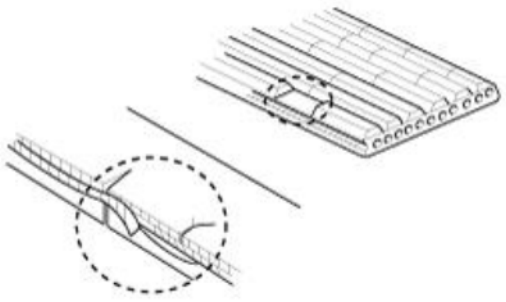
1. Check that the battery terminals are not loose or corroded.
2. Check the fuses for continuity.

Inspect Drive Belt

1. Visually check the belt for excessive wear, frayed cords etc.
   If any defect has been found, replace the drive belt.

NOTICE

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



2. Measure the drive belt tension and adjust it.

Drive belt tension measurement and adjustment

Belt tension measurement

Measure the belt tension using a sonic tension meter.

Belt tension
[1.0L]

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New belt:
980.7 ~ 1078.7 N (100 ~ 110 kg, 220.5 ~ 242.5 lb)
Used belt:
676.7 ~ 774.7 N (69 ~ 79 kg, 152.1 ~ 174.2 lb)
[1.25L]
[Without OAD]
New belt:
883.6 ~ 931.6N (85 ~ 95kg, 187.4 ~ 209.4lb)
Used belt:
637.4 ~ 735.5N (65 ~ 75kg, 143.3 ~ 165.3lb)
[With OAD]
New belt:
637.4 ~ 735.5N (65 ~ 75kg, 143.3 ~ 165.3lb)
Used belt:
490.3 ~ 588.4N (50 ~ 60kg, 110.2 ~ 132.3lb)

⚠ CAUTION

- If the engine has run for 5 minutes or more, the belt tension must be adjusted as a used belt.
- When installing the V-ribbed belt, all grooves on the pulley should be covered with belt ribs.
- A loose belt causes slip noise.
- Too tight belt cause bearing of alternator and water pump to damage.

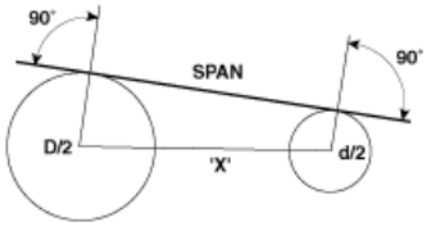
Using a sonic tension meter (U-505/507 type)

1. Input the belt specifications into the tension meter (A).

Location of measurement	Input data		
	M (Mass, g/m.rib)	W (Width, rib)	S (Span, mm)
Crankshaft pulley to idler [1.0L]	13.4	5	180
Crankshaft pulley to alternator pulley [1.25L]	13.4	5	275

NOTICE

Measurement of S (Span): Calculate average value after measuring the distance 3~4 times.



$$SPAN = \sqrt{X^2 - \frac{(D-d)^2}{4}}$$

X : Distance of center (mm)
D : Pulley diameter (mm)
d : Pulley diameter (mm)

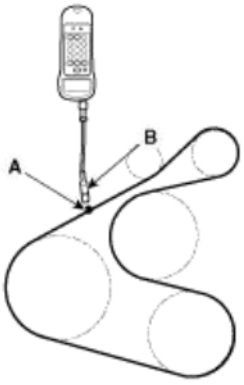
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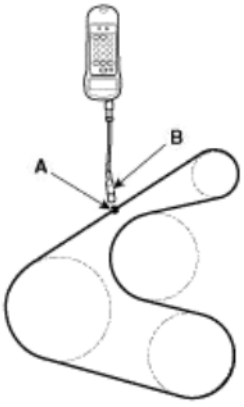
2. Locate the micro phone (B) close to the center of belt span (A) and bounce the belt by finger 2~3 times. Read a value on the display.

[With A/C]

[1.0L]

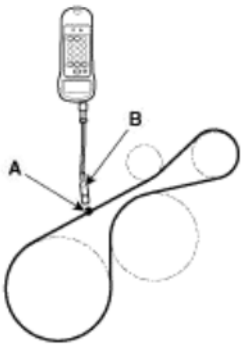


[1.25L]



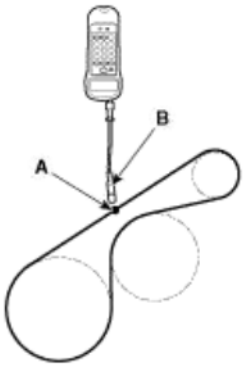
[Without A/C]

[1.0L]



[1.25L]

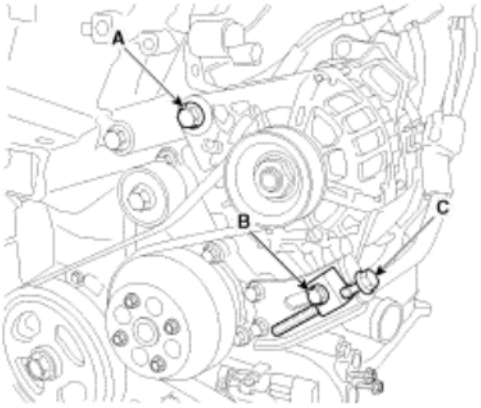
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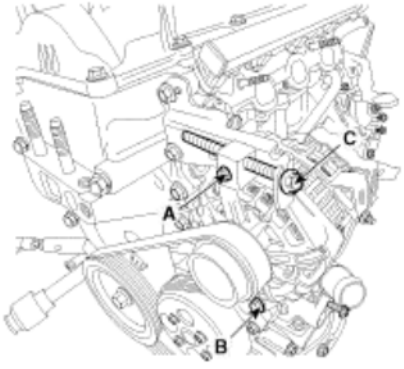
If adjustment is necessary:

1. Loosen the mounting bolts (A, B).
2. Tighten the adjusting bolt (C) counterclockwise in loose tension; loosen the bolt clockwise in high tension.

[1.0L]



[1.25L]



3. Recheck tension of the belt.
4. After adjusting tension, tighten the mounting bolts.
   Tightening torque
   14 mm bolt:
   29.4 ~ 41.2 N.m (3.0 ~ 4.2 kgf.m, 21.7 ~ 30.4 lb-ft)
   12 mm bolt:
   21.6 ~ 32.4 N.m (2.2 ~ 3.3 kgf.m, 15.9 ~ 23.9 lb-ft)

Visually Check Alternator Wiring And Listen For Abnormal Noises

1. Check that the wiring is in good condition.
2. Check that there is no abnormal noise from the alternator while the engine is running.

Check Discharge Warning Light Circuit

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1. Warm up the engine, and then turn it off.
2. Turn off all accessories.
3. Turn the ignition switch "ON". Check that the discharge warning light is lit.
4. Start the engine. Check that the light is lit.
   If the light does not go off as specified, troubleshoot the discharge light circuit.

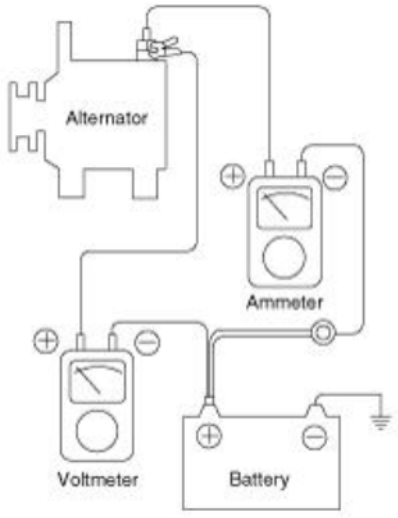
Inspect Charging System

Voltage Drop Test Of Alternator Output Wire

This test determines whether or not the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

Preparation

1. Turn the ignition switch to "OFF".
2. Disconnect the output wire from the alternator "B" terminal. Connect the (+) lead wire of ammeter to the "B" terminal of alternator and the (-) lead wire of ammeter to the output wire. Connect the (+) lead wire of voltmeter to the "B" terminal of alternator and the (-) lead wire of voltmeter to the (+) terminal of battery.



Test

1. Start the engine.
2. Turn on the headlamps and blower motor, and set the engine speed until the ammeter indicates 20A. And then, read the voltmeter at this time.

Result

1. The voltmeter may indicate the standard value.
   Standard value: 0.2V max
2. If the value of the voltmeter is higher than expected (above 0.2V max.), poor wiring is suspected. In this case check the wiring from the alternator "B" terminal to the battery (+) terminal. Check for loose connections, color change due to an over-heated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle. Turn off the headlamps, blower motor and the ignition switch.

Output Current Test

This test determines whether or not the alternator gives an output current that is equivalent to the normal output.

Preparation

1. Prior to the test, check the following items and correct as necessary.
   Check the battery installed in the vehicle to ensure that it is good condition. The battery checking method is described in the section "Battery".

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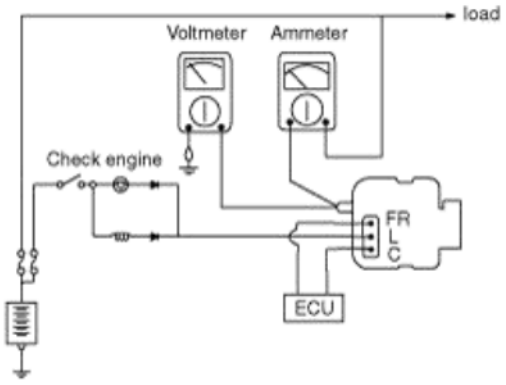
The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.
Check the tension of the alternator drive belt. The belt tension check method is described in the section "Inspect drive belt".

2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

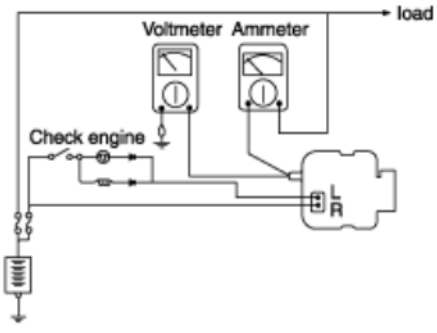
> **NOTICE**
>
> Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wire to a good ground.
7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.

[AMS]



[Non-AMS]



Test

1. Check to see that the voltmeter reads as the same value as the battery voltage. If the voltmeter reads 0V, and the open circuit in the wire between alternator "B" terminal and battery (+) terminal or poor grounding is suspected.
2. Start the engine and turn on the headlamps.
3. Set the headlamps to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

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NOTICE

After the engine start up, the charging current quickly drops. Therefore, the above operation must be done quickly to read the maximum current value correctly.

Result

1. The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is in good condition, remove the alternator from the vehicle and test it.
   Limit value : 60% of the voltage rate

NOTICE

- The nominal output current value is shown on the nameplate affixed to the alternator body.
- The output current value changes with the electrical load and the temperature of the alternator itself. Therefore, the nominal output current may not be obtained. If such is the case, keep the headlamps on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load.
  The nominal output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high.
  In such a case, reduce the temperature before testing again.

2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

Regulated Voltage Test

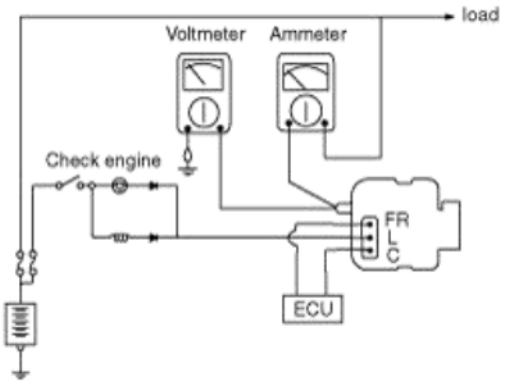
The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.

Preparation

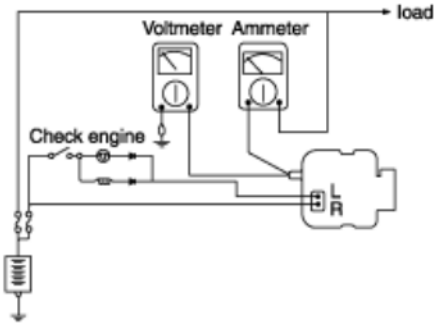
1. Prior to the test, check the following items and correct if necessary.
   Check that the battery installed on the vehicle is fully charged. The battery checking method is described in the section "Battery".
   Check the alternator drive belt tension. The belt tension check method is described in the section "Inspect drive belt".
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "B" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "B" terminal of the alternator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.

[AMS]

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[Non-AMS]



Test

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.
   Voltage: Battery voltage
   If it reads 0V, there is an open circuit in the wire between the alternator "B" terminal and the battery and the battery (-) terminal.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less.

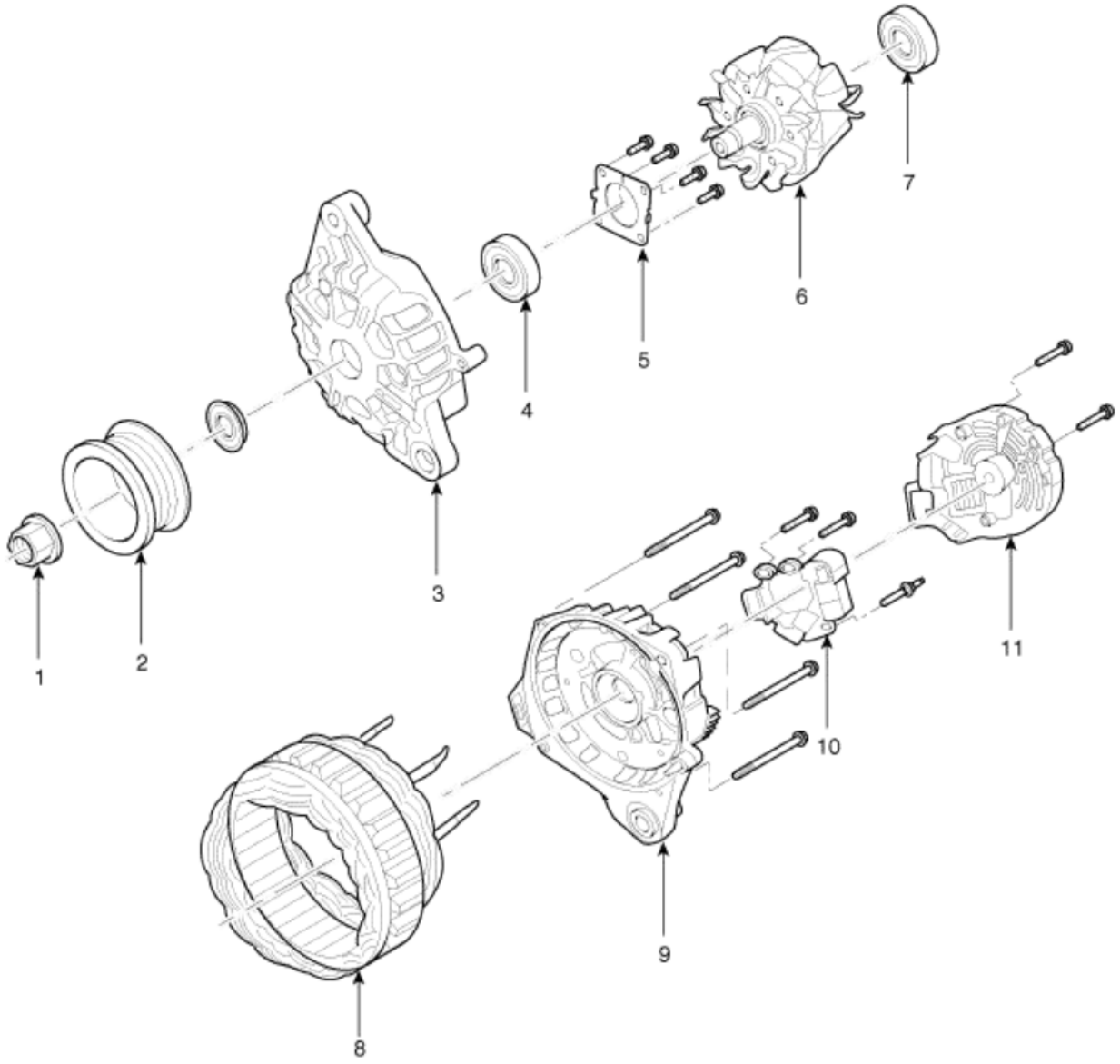
Result

1. If the voltmeter reading dosen't agree with the standard value, the voltage requlator or the alternator is faulty.
2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter and ammeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

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COMPONENT

[1.0L]

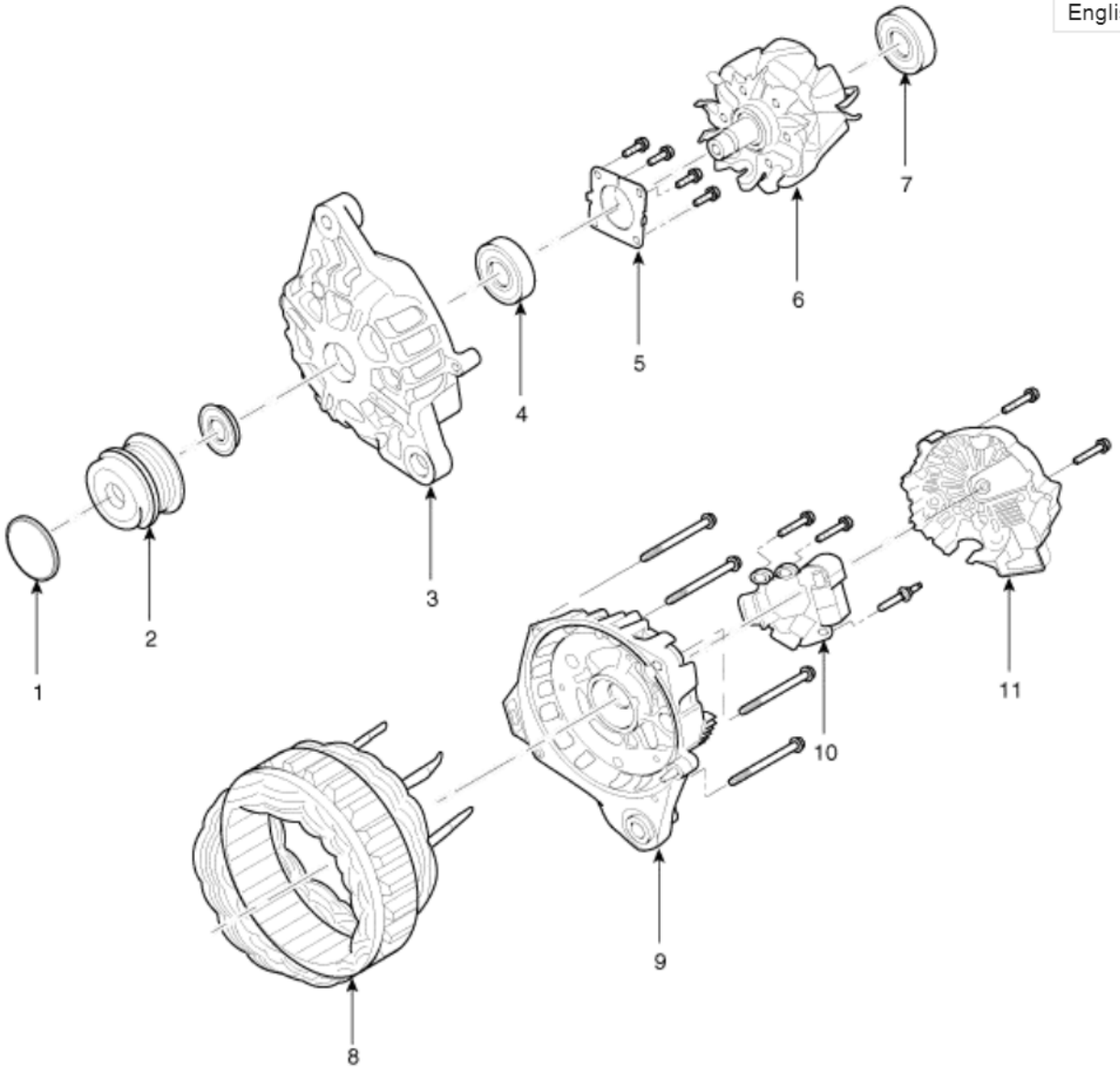


1. Nut 2. Pulley 3. Front housing 4. Front bearing 5. Retainer 6. Rotor	7. Rear bearing 8. Stator 9. Rear housing 10. Regulator 11. Rear cover

[1.25L]

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English ▼



1. OAD cap	7. Rear bearing
2. OAD pulley	8. Stator
3. Front housing	9. Rear housing
4. Front bearing	10. Regulator
5. Retainer	11. Rear cover
6. Rotor	

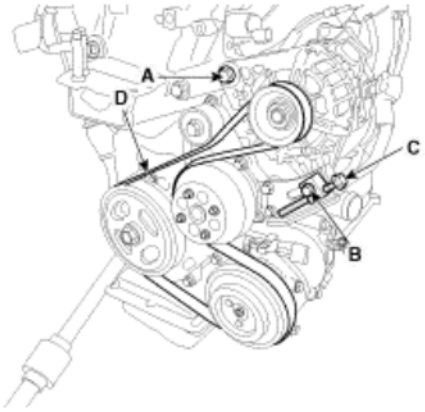
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REMOVAL AND INSTALLATION

[1.0L]

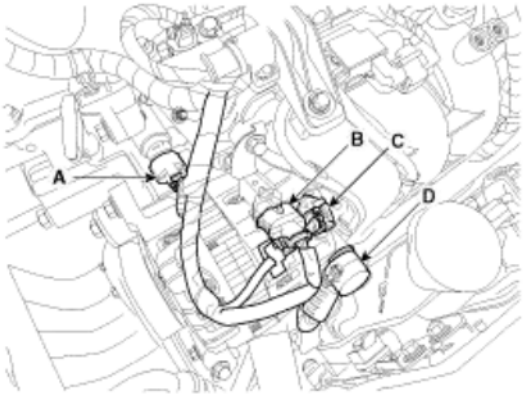
1. Disconnect the battery negative terminal.
   Tightening torque
   Without battery sensor :
   7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
   With battery sensor :
   4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)

2. Remove the drive belt.
   (1) Loosen the alternator mounting bolts (A, B).
   (2) Loosen the tension by turning the tension adjusting bolt (C) counterclockwise.
   (3) Remove the drive belt (D).



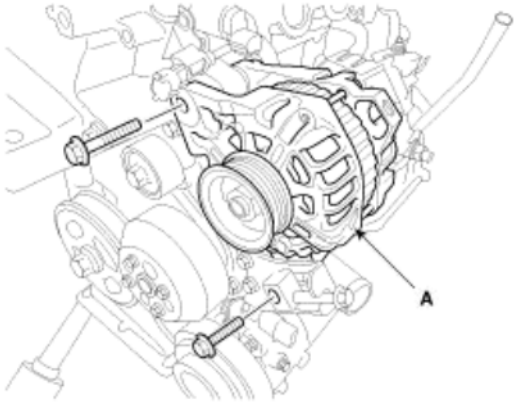
3. Disconnect the intake OCV(Oil Control Valve) connector (A) and the knock sensor connector (B).

4. Disconnect the alternator connector (C) and the cable (D) from alternator "B" terminal.
   Tightening torque:
   9.8 ~ 14.7 N.m (1.0 ~ 1.5 kgf.m, 7.2 ~ 10.8 lb-ft)



5. Remove the alternator (A).
   Tightening torque
   14mm bolt:
   29.4 ~ 41.2 N.m (3.0 ~ 4.2 kgf.m, 21.7 ~ 30.4 lb-ft)
   12mm bolt:
   21.6 ~ 32.4 N.m (2.2 ~ 3.3 kgf.m, 15.9 ~ 23.9 lb-ft)

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6. Installation is the reverse order of removal.
7. Adjust the alternator belt tension after installation.

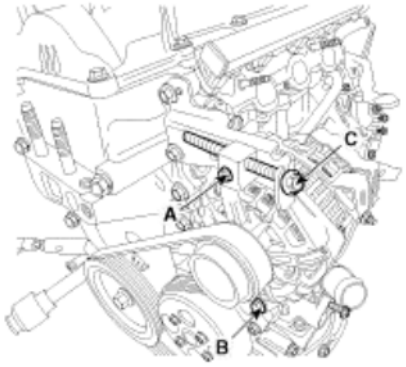
[1.25L]

1. Disconnect the battery negative terminal first, then the positive terminal.

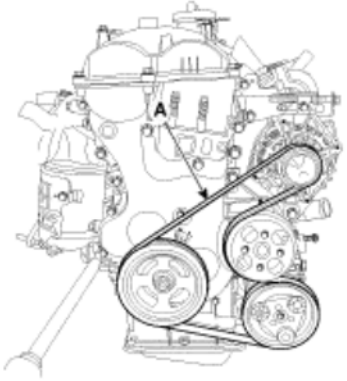
   Tightening torque
   (+) terminal:
   7.8 ~ 9.8 N.m (0.8 ~ 1.0 kgf.m, 5.8 ~ 7.2 lb-ft)
   (-) terminal:
   4.0 ~ 6.0 N.m (0.4 ~ 0.6 kgf.m, 3.0 ~ 4.4 lb-ft)

2. Remove the drive belt.
   (1) Loosen the alternator mounting bolts (A, B).

   (2) Loosen the tension by turning the tension adjusting bolt (C) counterclockwise.



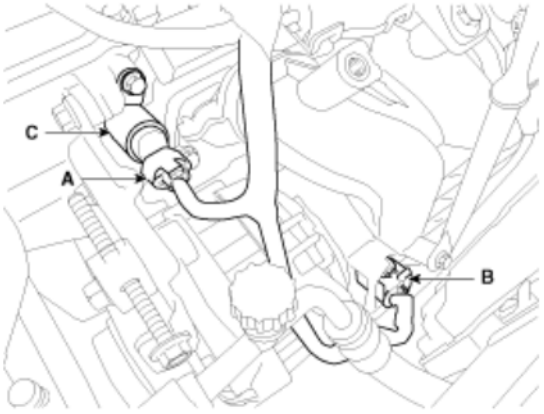
   (3) Remove the drive belt (A).



3. Disconnect the intake OCV(Oil Control Valve) connector (A) and the alternator connector (B).
4. Remove the intake OCV(Oil Control Valve) (C).

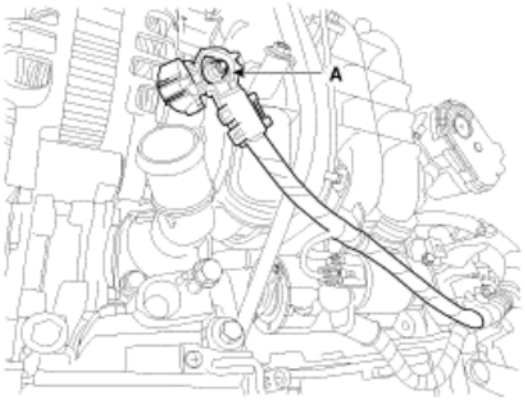
   Tightening torque:
   9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

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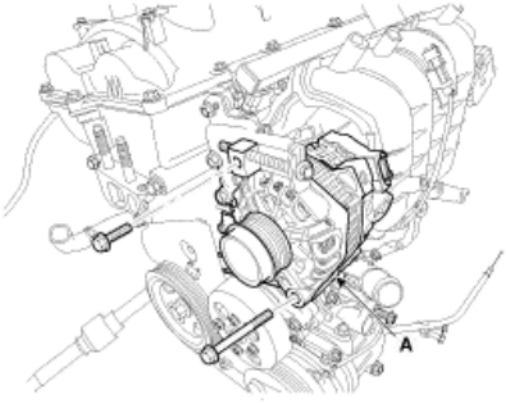
5. Disconnect the cable (A) from alternator "B" terminal.

   Tightening torque:
   9.8 ~ 14.7 N.m (1.0 ~ 1.5 kgf.m, 7.2 ~ 10.8 lb-ft)



6. Remove the alternator (A).

   Tightening torque
   14mm bolt:
   29.4 ~ 41.2 N.m (3.0 ~ 4.2 kgf.m, 21.7 ~ 30.4 lb-ft)
   12mm bolt:
   21.6 ~ 32.4 N.m (2.2 ~ 3.3 kgf.m, 15.9 ~ 23.9 lb-ft)



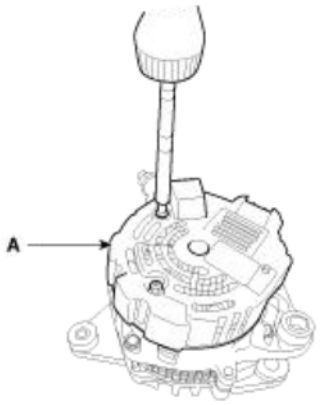
7. Installation is the reverse order of removal.

8. Adjust the alternator belt tension after installation.

DISASSEMBLY

1. Remove the rear cover (A).

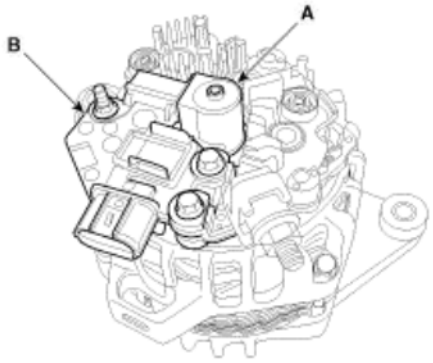
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2. Remove the slip ring guide (A) and regulator assembly (B).

NOTICE

When removing, be careful that other parts are not damaged.

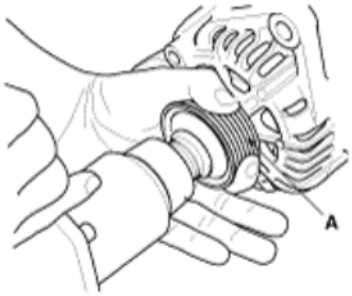


3. Remove the OAD cap. (with OAD)

NOTICE

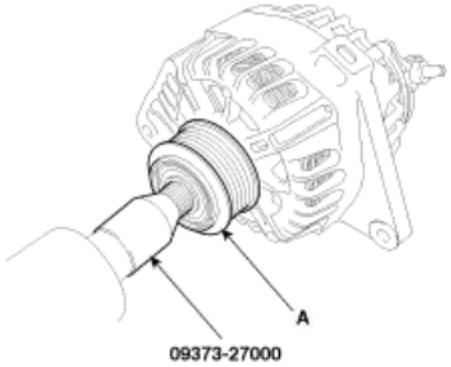
When installing, replace with new OAD cap.

4. Remove the pulley (A). (without OAD)

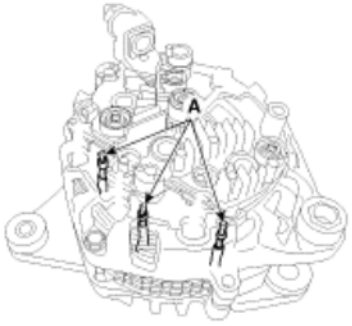


Using the SST (09373-27000), remove the OAD pulley (A). (with OAD)

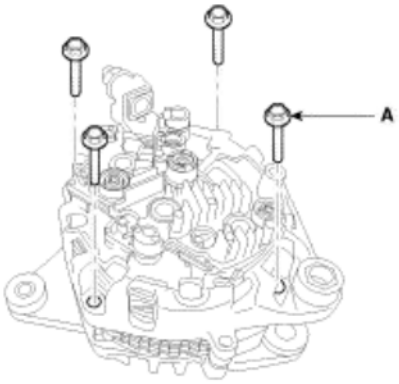
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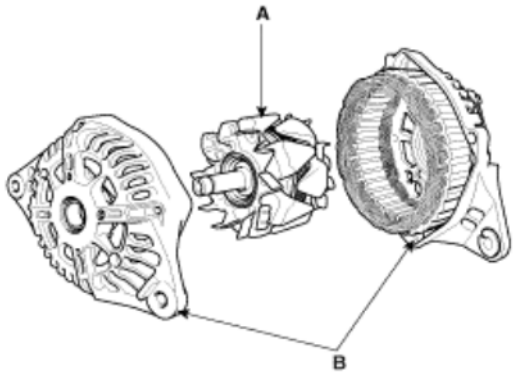
5. Disconnect the 3 stator leads (A).



6. Loosen the through bolts (A).



7. Disconnect the rotor (A) and housing (B).

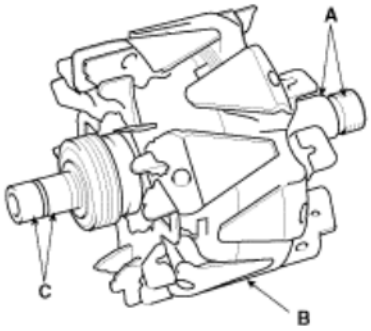


INSPECTION

Inspect Rotor

1. Check that there is continuity between the slip rings (C).

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2. Check that there is no continuity between the slip rings and the rotor (B) or rotor shaft (A).
3. If the rotor fails either continuity check, replace the alternator.

Inspect Stator

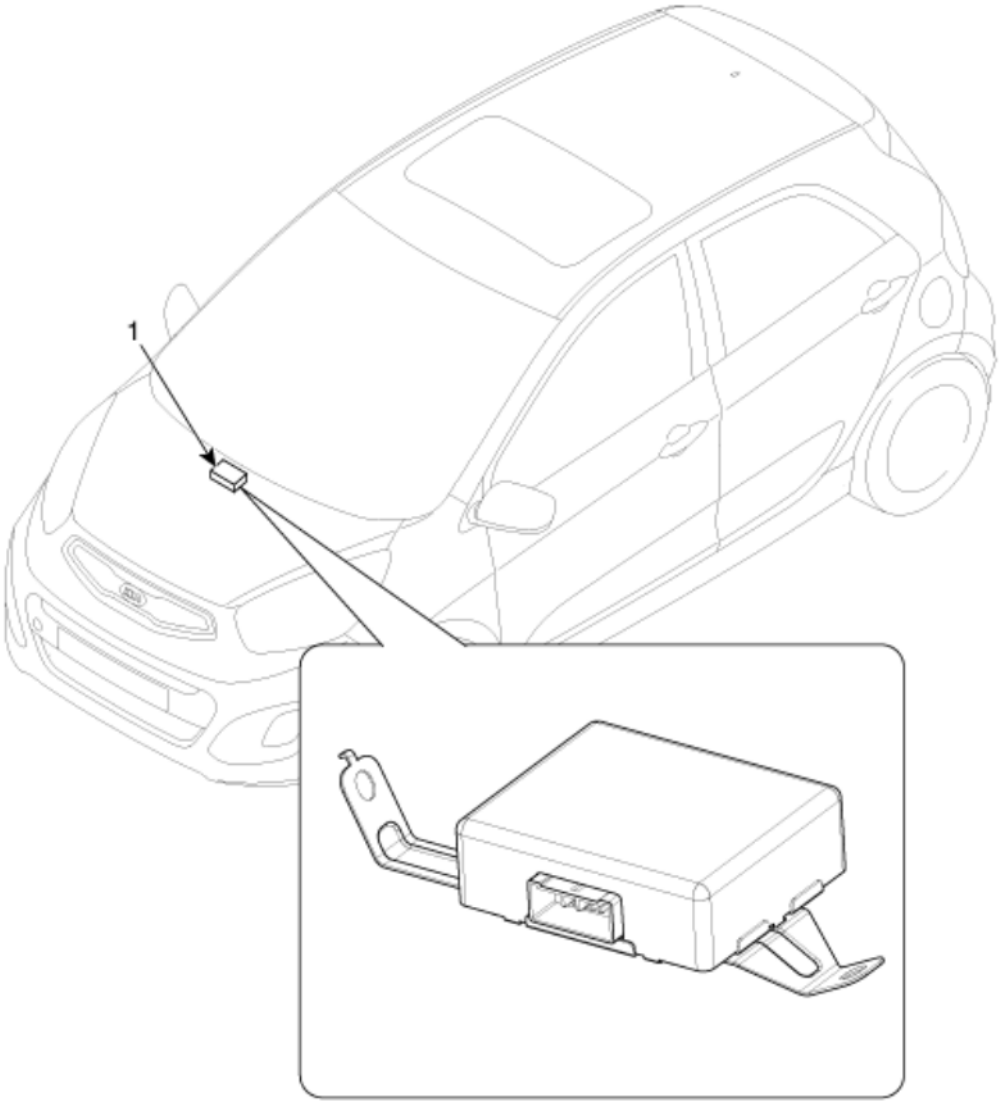
1. Check that there is continuity between each pair of leads (A).



2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the alternator.

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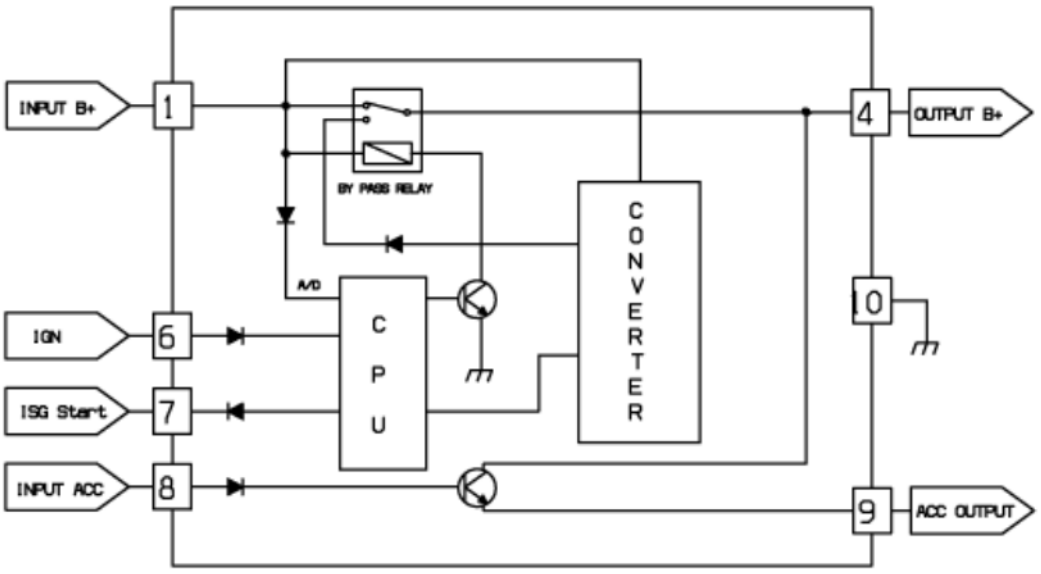
COMPONENT LOCATION

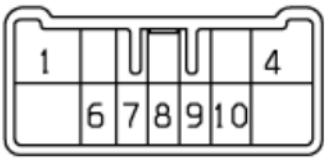


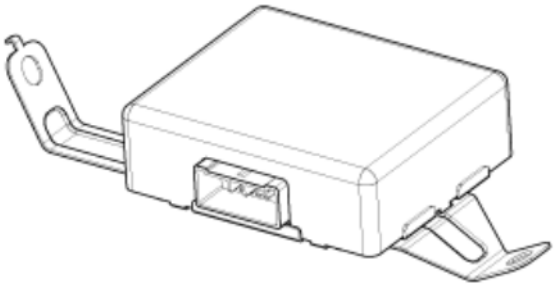
1. DC/DC Converter

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CIRCUIT DIAGRAM







[DC/DC Converter]

PIN NO.	DESCRIPTION	REMARKS
1	INPUT B+	
2	-	
3	-	
4	OUTPUT B+	Audio,Amplifier
5	-	
6	IGN	
7	ISG START	
8	INPUT ACC	
9	OUTPUT ACC	Audio signal Input
10	GND	
11	-	

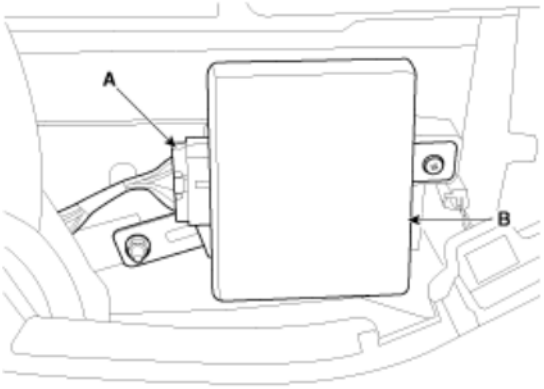
NOTICE

In case of IGN 2 with connecting battery, input the signal 'ISG Start' then BY PASS RELAY will be ON, after boosting voltage (12±0.6V) of low battery, if the battery voltage is over 12±0.5V then BY PASS RELAY will be OFF.
In the ISG mode, if the power of an audio system turns OFF by drawdown while "Auto Starting" or "Idle Starting" function operates, replace the DC/DC converter.

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REMOVAL AND INSTALLATION

1. Disconnect the battery negative terminal.
   Tightening torque
   Without battery sensor :
   7.8 ~ 9.8 N.m (0.8 ~ 1.0 kgf.m, 5.8 ~ 7.2 lb-ft)
   With battery sensor :
   4.0 ~ 6.0 N.m (0.4 ~ 0.6 kgf.m, 3.0 ~ 4.4 lb-ft)
2. Remove the audio assembly. (Refer to BE group)
3. Remove the glove box. (Refer to BD group)
4. Disconnect the connector (A) and then remove the DC/DC converter (B).



5. Installation is reverse order of removal.

> **NOTICE**
>
> After disconnecting then reconnecting the battery negative cable, the ISG function dose not operates until the system is stabilized, about 4 hours.

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DESCRIPTION

1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.



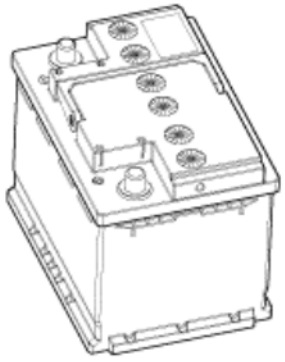
NOTICE

After disconnecting then reconnecting the battery negative cable, reset some parts that require the reset procedures. (Refer to BE group – General Information)

[With ISG System]

AGM battery is used for especially heavy load on the vehicle network depending on equipment and requirements. AGM stands for Absorbent Glass Material Battery; that is absorbent glass fibre fleece. AGM batteries are fitted in models with electrical loads/consumers which have a high energy demand.
The constantly increasing energy demand of modern vehicle electrical systems calls for ever more powerful battery solutions.
The power consumption is considerable even when the vehicle is parked.
The somewhat higher price compared with a battery of similar size is fully balanced by the following benefits:

- Significantly longer service life
- Increased starting reliability at low temperatures
- 100 % freedom from maintenance
- Low risk in event of an accident (reduced risk to the environment)



Recharging [With ISG System]

Check the battery condition

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English ▼

The battery condition cannot be determined solely on the basis of the battery charge state. If there is a suspicion of a d battery, check the battery condition whit battery tester and investigate the cause by means of the test module. With a low battery charge state, recharge the battery.

Recharging the AGM battery

The battery may be charged using the battery chargers at a constant charge voltage of 14.8V.
If possible, the battery temperature during charging should be between 20°C (68°F) and 30°C (86°F).
Only chargers with voltage clamping (IU or WU curve) may be used or chargers with IUoU curve which have a trickle.

IU or WU charging technique
Optimized charging voltage for IU or WU: 14.7V (at 20°C ~ 30°C (68°F ~ 86°F)) about 24 hours
Min. charging voltage at 20°C (68°F): 14.4V
Max. charging voltage at 20°C (68°F): 14.8V
10% of capacity is recommended as charging current (e.g. 60Ah : 10 = 6,0A charging current).

⚠ WARNING

Do not charge the AGM battery with>15.2V. No quick-charging routines.

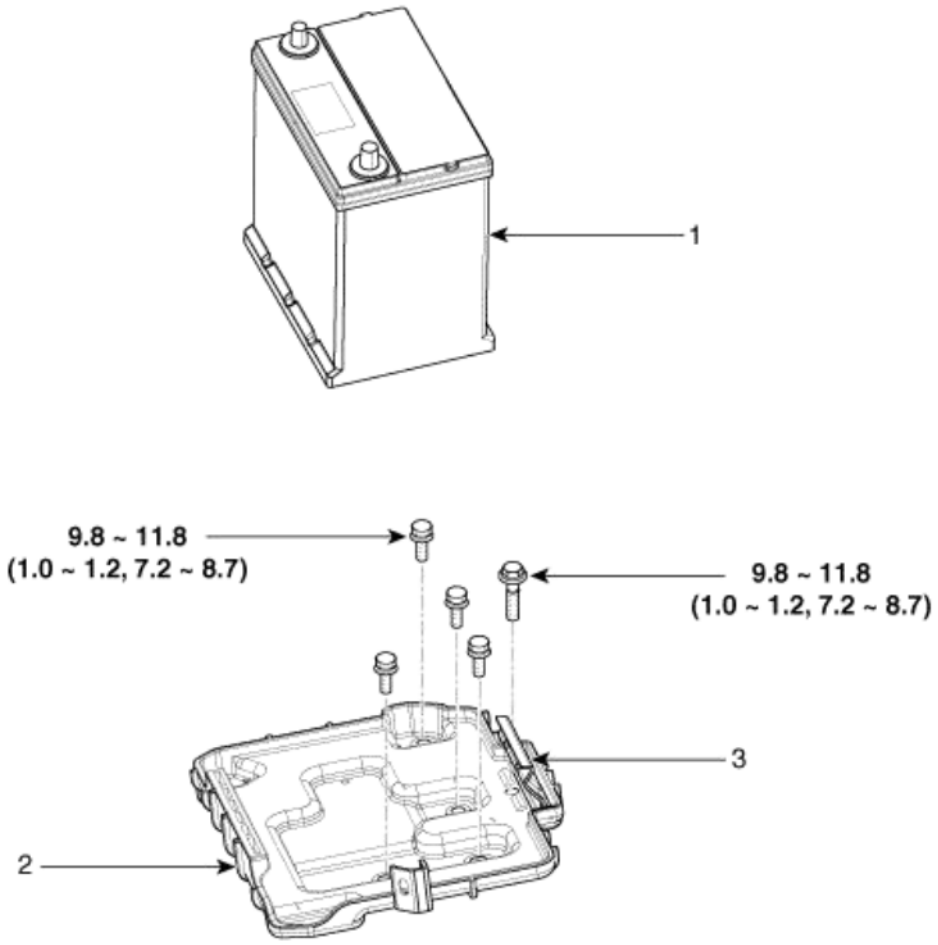
⚠ CAUTION

If the battery is charged directly at the battery terminals on vehicles with battery sensor, misinterpretations of battery condition and under certain circumstances also unwanted Check Control messages or fault memory entire can occur. After recharging finished, let the battery stand for over 10 hours with normal temperature for battery stabilization.

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COMPONENTS

[NON-ISG Type]

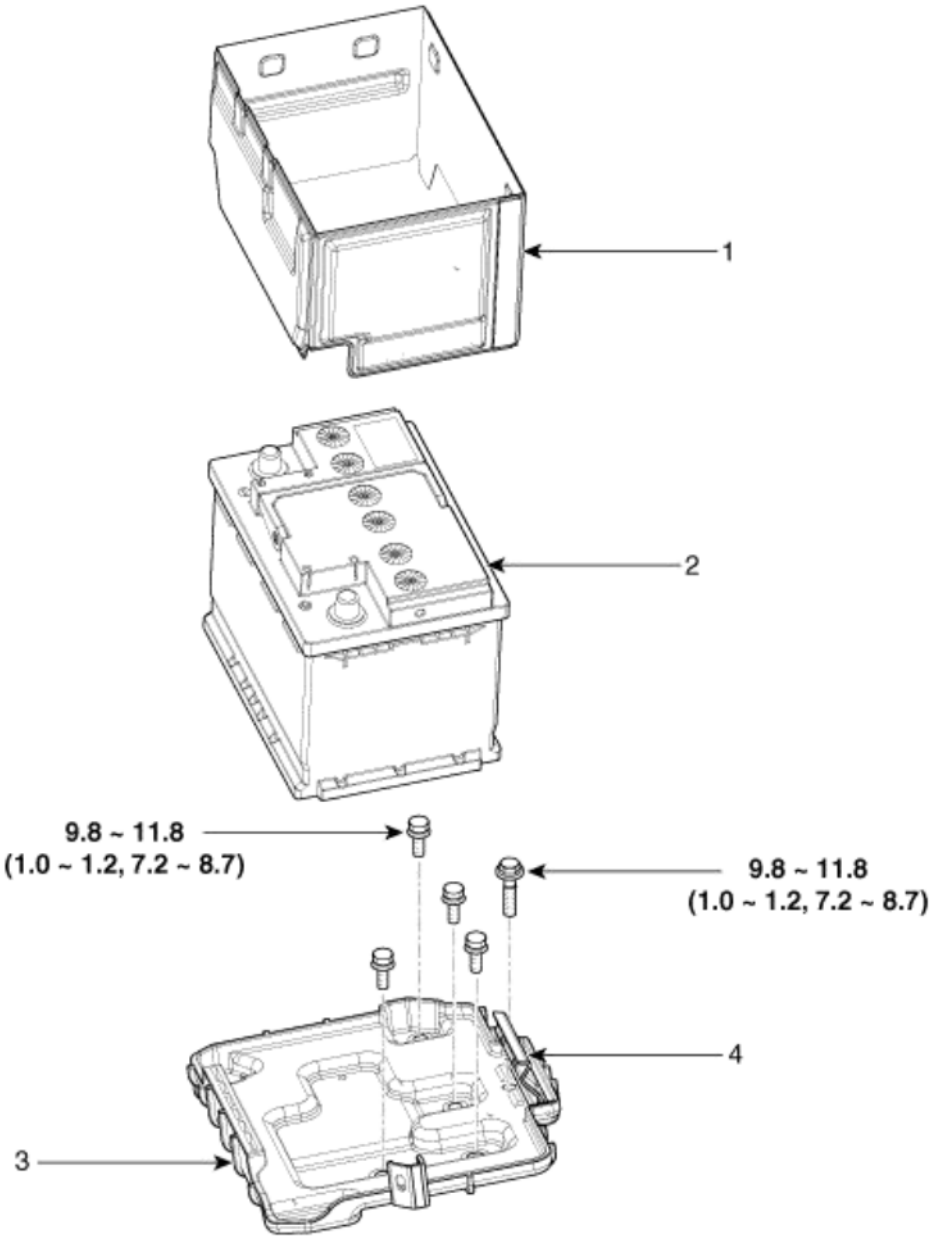


Torque : N.m (kgf.m, lb-ft)

1. Battery 2. Battery tray	3. Battery mounting clamp

[ISG Type]

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Torque : N.m (kgf.m, lb-ft)

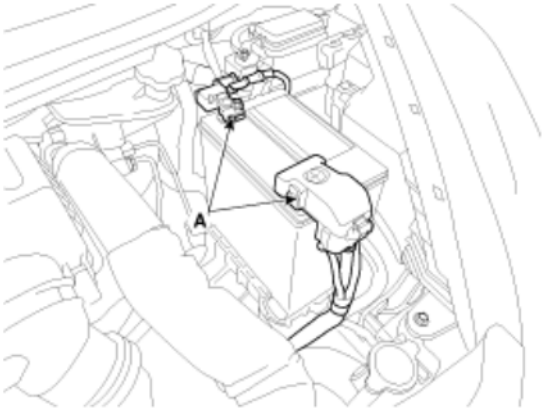
1. Battery insulation pad 2. Battery	3. Battery tray 4. Battery mounting clamp

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REMOVAL AND INSTALLATION

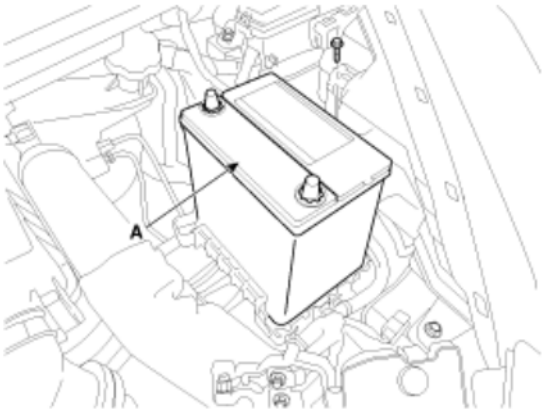
1. Disconnect the terminals (A) from the battery. The negative terminal first.

   Tightening torque
   (-) terminal (without battery sensor):
   7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
   (-) terminal (with battery sensor):
   4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)
   (+) terminal :
   7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



2. Remove the battery (A) after removing the clamp bolt.

   Tightening torque :
   9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



3. Remove the battery tray (A).

   Tightening torque :
   9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



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4. Installation is the reverse order of removal.

English ▼

⚠ CAUTION

- ISG (Idle stop & go) system equipped vehicle always use the AGM battery only. If flooded battery has installed, this can potentially lead to engine electrical trouble or ISG system error.
- Replace same capacity of the AGM battery.

NOTICE

Ensure an AGM battery is fitted.
In all cases, an AGM battery must be installed and registered in the vehicle for the ISG function to work perfectly.
The vehicle with the new battery must be placed in the ignition switch OFF and door closed, hood switch OFF state for at least 4 hours.
ISG system's stabilization may take 4 hours after new battery installation.
ISG function is operates about 4 hours later and 2 times cranking by user.
But first 25 times, the ISG function can operates regardless of ISG system stability for ISG function operating check.

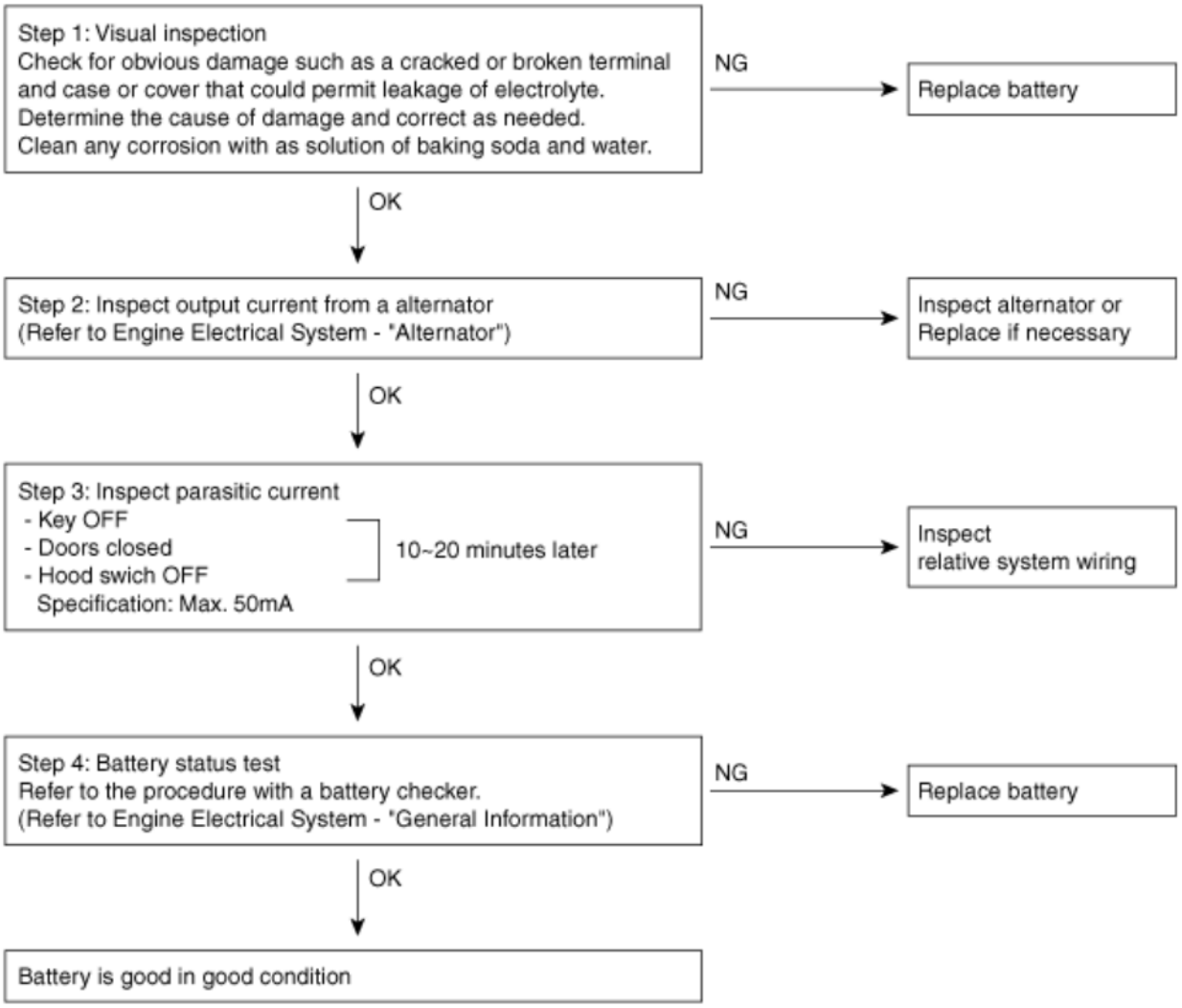
⚠ WARNING

Do not open the AGM battery.
The AGM battery must not be opened under any circumstances as the introduction of oxygen from the air will cause the battery to lose its chemical equilibrium and rendered non-operational.

INSPECTION

Battery Diagnostic Flow

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Vehicle parasitic current inspection

1. Turn the all electric devices OFF, and then turn the ignition switch OFF.
2. Close all doors except the engine hood, and then lock all doors.
   (1) Disconnect the hood switch connector.
   (2) Close the trunk lid.
   (3) Close the doors or remove the door switches.
3. Wait a few minutes until the vehicle's electrical systems go to sleep mode.

> ***NOTICE***
>
> For an accurate measurement of a vehicle parasitic current, all electriacl systems should go to sleep mode. (It takes at least one hour or at most one day.) However, an approximate vehicle parasitic current can be measured after 10~20 minutes.

4. Connect an ammeter in series between the battery (-) terminal and the ground cable, and then disconnect the clamp from the battery (-) terminal slowly.

> **⚠ CAUTION**
>
> Be careful that the lead wires of an ammeter do not come off from the battery (-) terminal and the ground cable to prevent the battery from being reset. In case the battery is reset, connect the battery cable again, and then start the engine or turn the ignition switch ON for more than 10 sec. Repeat the procedure from No. 1.

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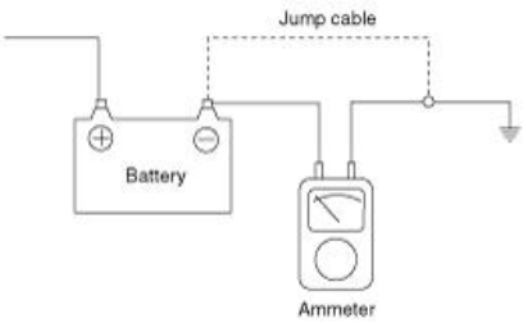
To prevent the battery from being reset during the inspection,

a. Connect a jump cable between the battery (-) terminal and the ground cable.

b. Disconnect the ground cable from the battery (-) terminal.

c. Connect an ammeter between the battery (-) terminal and the ground cable.

d. After disconnecting the jump cable, read the current value of the ammeter.



5. Read the current value of the ammeter.
   - If the parasitic current is over the limit value, search for abnormal circuit by removing a fuse one by one and checking the parasitic current.
   - Check the parasitic current again, and search for suspected unit by removing a unit connected with the abnormal circuit one by one.

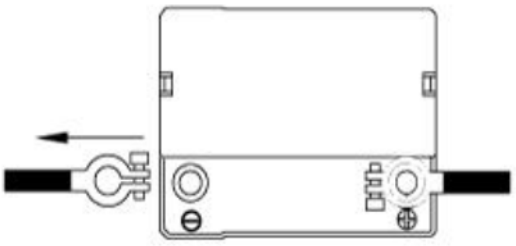
   Limit value (after 10~20 min.) : Below 50mA

CLEANING

1. Make sure the ignition switch and all accessories are in the OFF position.
2. Disconnect the battery cables (negative first).
3. Remove the battery from the vehicle.

⚠ CAUTION

Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte. Heavy rubber gloves (not the household type) should be wore when removing the battery.



4. Inspect the battery tray for damage caused by the loss of electrolyte. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described above.
6. Inspect the battery case and cover for cracks. If cracks are present, the battery must be replaced.

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7. Clean the battery posts with a suitable battery post tool.
8. Clean the inside surface of the terminal clamps with a suitable battery cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure tops of the terminals are flush with the tops of the posts.
11. Tighten the terminal nuts securely.
12. Coat all connections with light mineral grease after tightening.

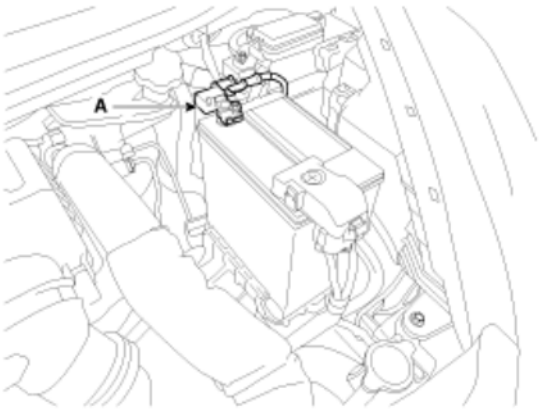
⚠ CAUTION

When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuit at the terminals of batteries being charged.
A spark will occur when the circuit is broken. Keep open flames away from battery.

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DESCRIPTION

Vehicles have many control units that use more electricity. These units control their own system based on information from diverse sensors. It is important to have a stable power supply as there diverse sensors giving a variety of information. Battery sensor (A) is mounted on battery (-) terminal. It transmits battery voltage, current, temperature information to ECM. ECM controls generating voltage by duty cycle based on these signals.



⚠ CAUTION

When battery sensor signal fault occurs, inspect the vehicle parasitic draw in advance after inspecting the sensor because the sensor will behave abnormally when the parasitic draw is more than 100mA. (Refer to vehicle parasitic current inspection)

NOTICE

It takes a few hours for a new battery sensor to detect the battery state correctly.Perform the following process after replacing the battery sensor.

1) Ignition switch ON/OFF.
2) Park the vehicle about 4 hours.
3) After 4 hours later, check that the SOC (State of charge) of battery is displayed on GDS properly.
4) After engine start ON/OFF 2 times or more, check the SOF (State of function) of battery using GDS.

⚠ CAUTION

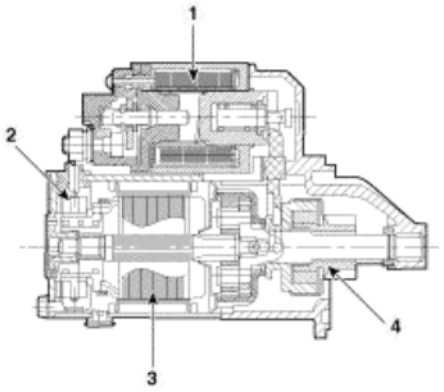
For the vehicle equipped with a battery sensor, be careful not to damage the battery sensor when the battery is replaced or recharged.

- When replacing the battery, it should be same one (type, capacity and brand) that is originally installed on your vehicle. If a battery of a different type is replaced, the battery sensor may recognize the battery to be abnormal.
- When installing the ground cable on the negative post of battery, tighten the clamp with specified torque of 4.0~6.0N.m (0.4~0.6kgf.m, 3.0~4.4lb-ft). An excessive tightening torque can damage the PCB internal circuit and the battery terminal.
- When recharging the battery, ground the negative terminal of the booster battery to the vehicle body.

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DESCRIPTION

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), ignition lock switch , connection wires and the battery cable.
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil.
The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.
The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



1. Solenoid
2. Brush
3. Armature
4, Over running clutch

[ISG Type]

In conjunction with the ISG function, the starter motor must do a great deal more work. The starter motor is therefore configured for a significantly higher number of start cycles. The components of the starter motor have been adapted to the higher requirements.

NOTICE

There are two kinds of starter, ISG type starter and the other.
When replace the starter, confirm that the part number and connector shape.

⚠ CAUTION

ISG (Idle stop & go) system equipped vehicle always use the ISG type starter only. If the other starter has installed, this can potentially lead to engine electrical trouble or ISG system error.

⚠ WARNING

Do not disassemble the ISG type starter.
If the starter troubles occur, replace the starter.

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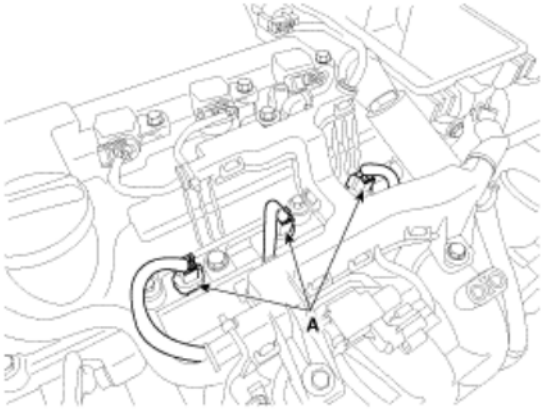
STARTER CIRCUIT TROUBLESHOOTING

NOTICE

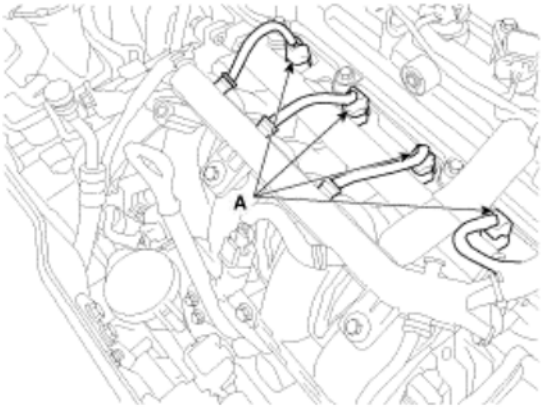
The battery must be in good condition and fully charged.

1. Disconnect the injector connectors (A).

[1.0L]



[1.25L]



2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to START.
   If the starter cranks the engine normally, starting system is OK. If the starter will not crank the engine at all, go to next step.
   If it won't disengage from the ring gear when you release key, check for the following until you find the cause.
   - Solenoid plunger and switch malfunction.
   - Dirty pinion gear or damaged overrunning clutch.

3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.
   If the starter cranks the engine normally, repairing the loose connection repaired the problem. The starting system is now OK.
   If the starter still does not crank the engine, go to next step.

4. Disconnect the connector from the S-terminal of solenoid. Connect a jump wire from the B-terminal of solenoid to the S-terminal of solenoid.
   If the starter cranks the engine, go to next step.
   If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.

5. Check the following items in the order listed until you find the open circuit.

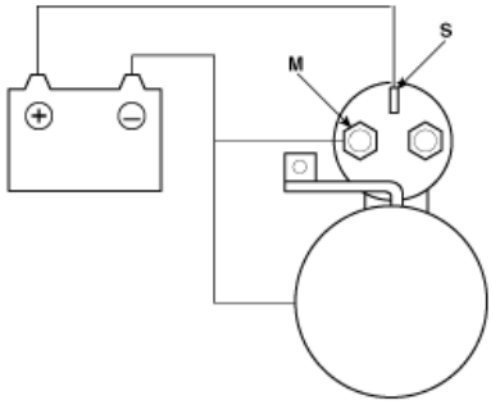
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English ▼

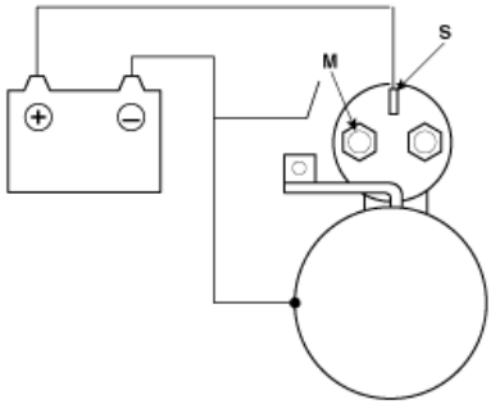
- Check the wire and connectors between the driver's under-dash fuse/relay box and the ignition switch, between the driver's under-dash fuse/relay box and the starter.
- Check the ignition switch (Refer to Ignition system in BE group)
- Check the transaxle range switch connector or ignition lock switch connector.
- Inspect the starter relay.

Starter Solenoid Test

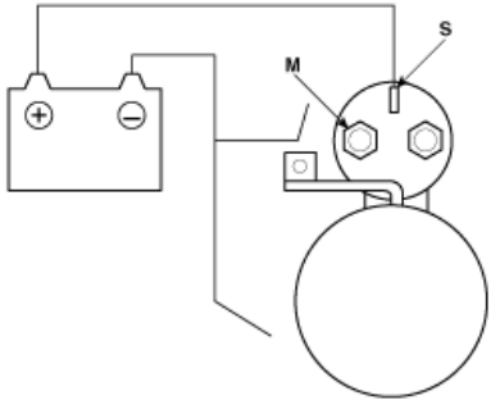
1. Disconnect the field coil wire from the M-terminal of solenoid switch.
2. Connect the battery as shown. If the starter pinion pops out (engages), it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



3. Disconnect the battery from the M terminal.If the pinion does not retract, the hold-in coil is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



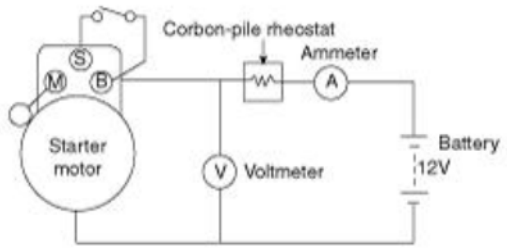
Free Running Test

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as

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follows.

2. Connect a test ammeter (150-ampere scale) and carbon pile rheostats as shown in the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.

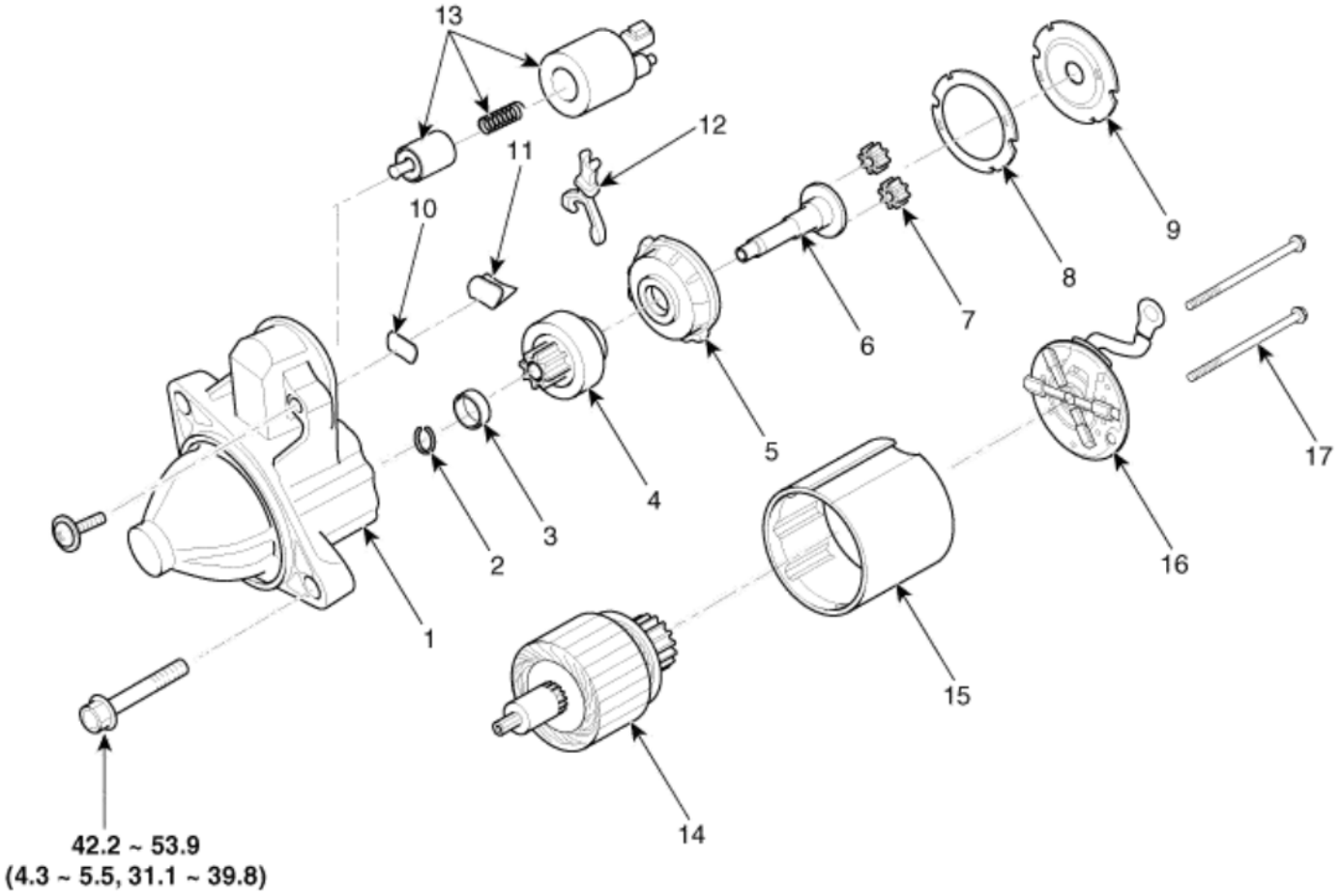


4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11.5volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Items		Current	speed
1.0L	Non-ISG	70A, MAX	3,000rpm, MIN
	ISG	70A, MAX	2,500rpm, MIN
1.25L	Non-ISG	70A, MAX	3,000rpm, MIN
	ISG	70A, MAX	2,500rpm, MIN

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COMPONENT



Torque : N.m (kgf.m, lb-ft)

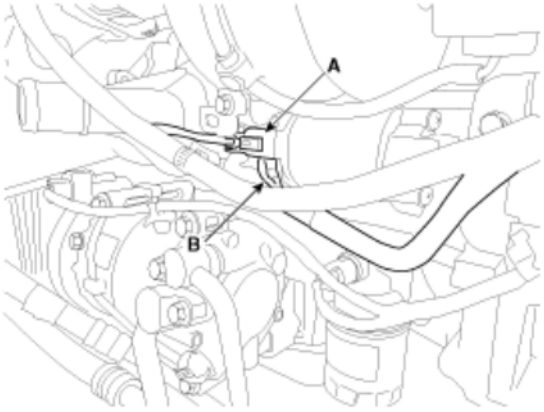
1. Front housing	10. Lever plate
2. Stop ring	11. Lever packing
3. Stopper	12. Lever
4. Overrun clutch assembly	13. Magnet switch assembly
5. Internal gear assembly	14. Armature assembly
6. Planet shaft assembly	15. Yoke assembly
7. Planetary gear assembly	16. Brush holder assembly
8. Packing	17. Through bolt
9. Shield	

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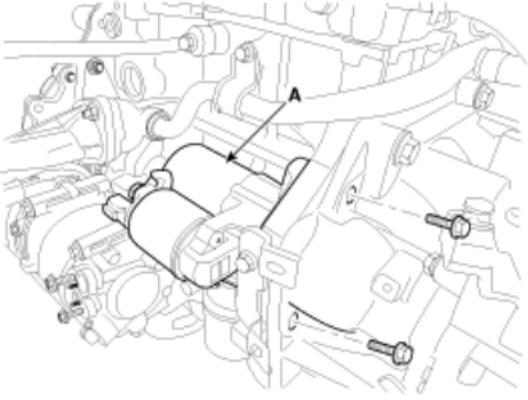
REMOVAL AND INSTALLATION

[1.0L]

1. Disconnect the battery negative terminal.
   Tightening torque
   Without battery sensor :
   7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
   With battery sensor :
   4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)
2. Remove the air duct and air cleaner. (Refer to EM group)
3. Remove the under cover. (Refer to EM group)
4. Disconnect the starter cable (A) from the B terminal on the solenoid then disconnect the connector (B) from the S terminal.
   Tighting torque :
   9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



5. Remove the 2 bolts holding the starter, then remove the starter.
   Tighting torque :
   42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lb-ft)



6. Installation is the reverse of removal.

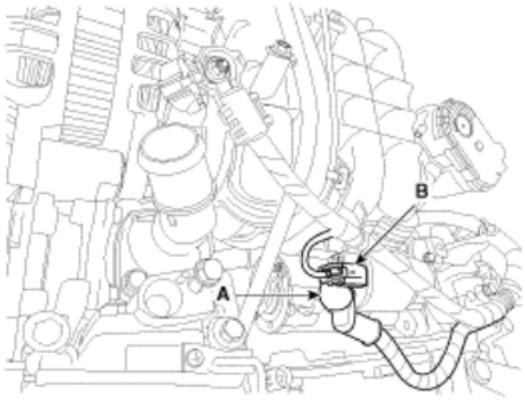
[1.25L]

1. Disconnect the battery terminals. Disconnect the negative terminal first.
   Tightening torque
   (+) terminal :

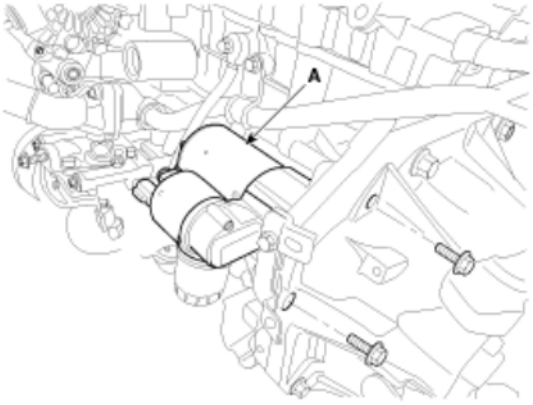
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7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
(-) terminal (without battery sensor):
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
(-) terminal (with battery sensor):
4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)

2. Remove the battery and battery tray. (Refer to Charging System in this group)
3. Remove the air duct and air cleaner assembly. (Refer to EM group)
4. Remove the under cover. (Refer to EM group)
5. Disconnect the starter cable (A) from the B terminal on the solenoid then disconnect the connector (B) from the S terminal.
   Tighting torque :
   9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



6. Remove the 2 bolts holding the starter, then remove the starter.
   Tighting torque :
   42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lb-ft)

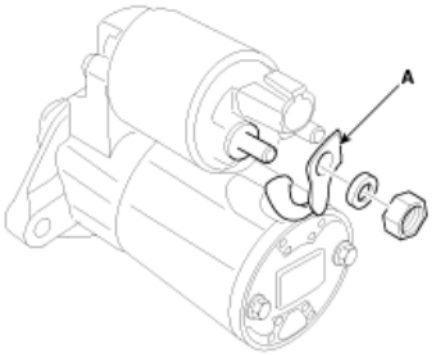


7. Installation is the reverse of removal.

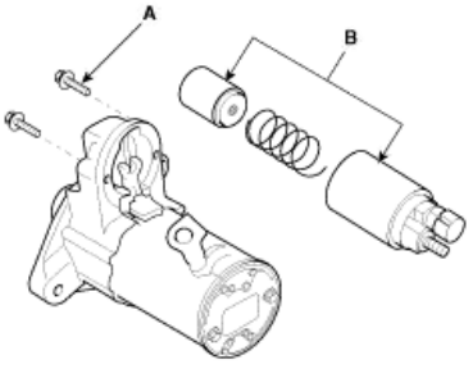
DISASSEMBLY

1. Disconnect the M-terminal (A) on the magnet switch assembly.

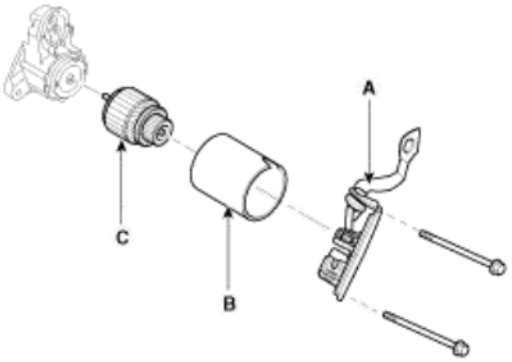
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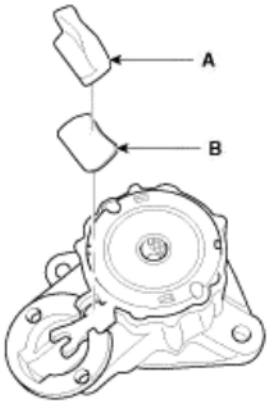
2. After loosening the screws (A), detach the magnet switch assembly (B).



3. Loosen the through bolts and then remove the brush holder assembly (A), yoke (B) and armature (C).

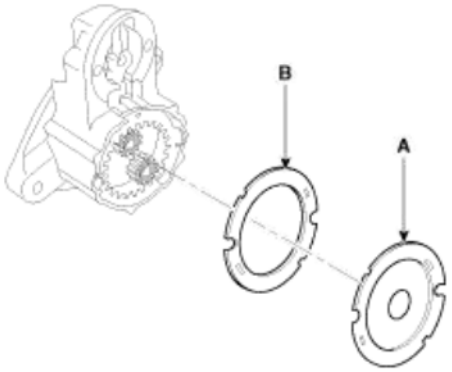


4. Remove the lever packing (A) and lever plate (B).

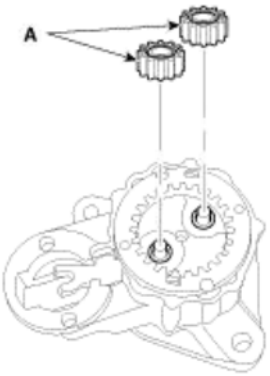


5. Remove the shield (A) and packing (B).

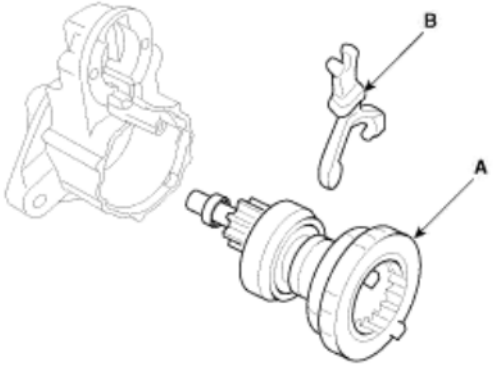
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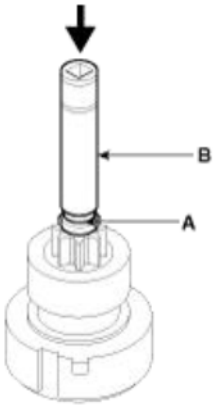
6. Disconnect the planet gear (A).



7. Disconnect the planet shaft assembly (A) and lever (B).

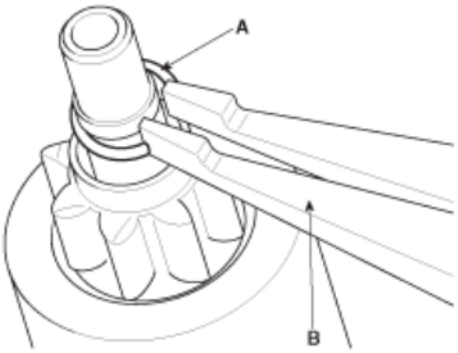


8. Press the stopper (A) using a socket (B).

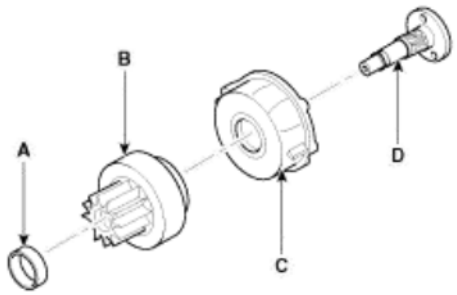


9. After removing the stop ring (A) using stop ring pliers (B).

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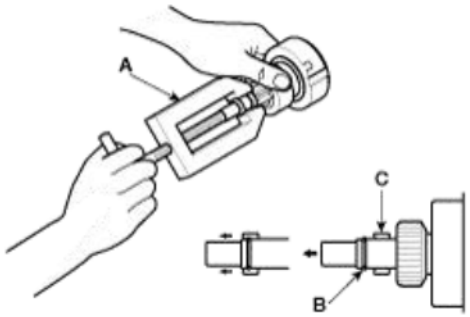


10. Disconnect the stopper (A), overrunning clutch (B), internal gear (C) and planet shaft (D).



NOTICE

Using a suitable pulling tool (A), pull the overrunning clutch stopper (C) over the stop ring (B).



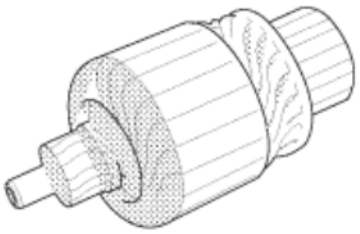
11. Reassembly is the reverse of disassembly.

INSPECTION

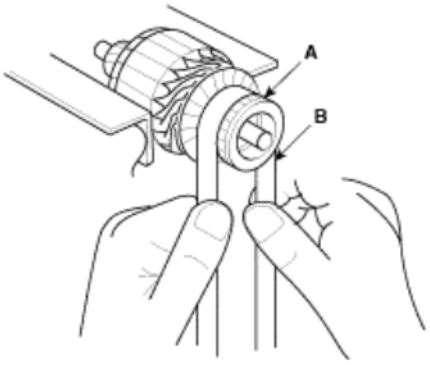
Armature Inspection And Test

1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.

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4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

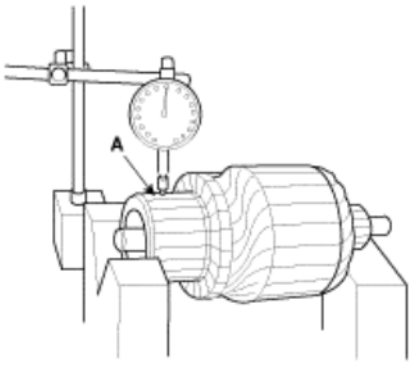
Commutator diameter
Standard (New) : 33.0mm (1.2992in.)
Service limit : 32.4mm (1.2756in.)



6. Measure the commutator (A) runout.
   - If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - If the commutator run out is not within the service limit, replace the armature.

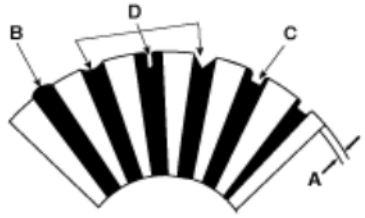
Commutator runout
Standard (New): 0.02mm (0.0008in.), max
Service limit: 0.05mm (0.002in.)

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7. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

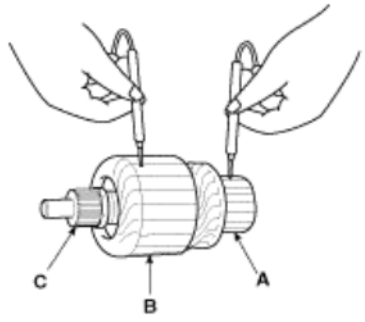
Commutator mica depth
Standard (New) : 0.5mm (0.0197in.)
Limit : 0.2mm (0.0079in.)



8. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.



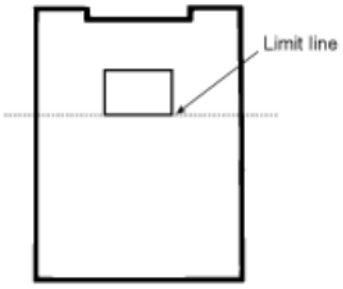
9. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



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Inspect Starter Brush

Brushes that are worn out, or oil-soaked, should be replaced.

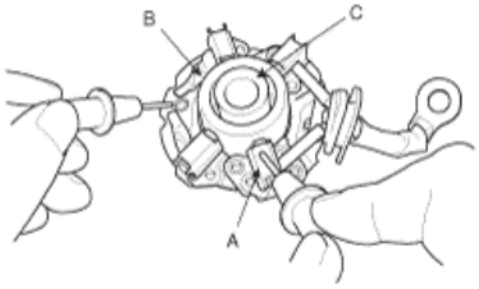


NOTICE

The seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the brushes will be sanded to the same contour as the commutator.

Starter Brush Holder Test

1. Make sure there is no continuity between the (+) brush holder (A) and (-) plate (B). If there is continuity, replace the brush holder assembly.



NOTICE

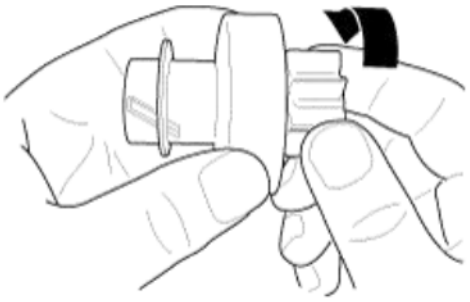
Use a pipe (C) of suitable size for the brushes not to get removed from the brush holder.

Inspect Overrunning Clutch

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.

2. Rotate the overrunning clutch both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction of it locks in both directions, replace it.

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3. If the starter drive gear is worn or damage, replace the overrunning clutch assembly. (the gear is not available separately)
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

Cleaning

1. Do not immerse parts in cleaning solvent. Immersing the yoke assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

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