HYUNDAI Technical Service Bulletin	GROUP **HYBRID CONTROL**	NUMBER **17-HC-004**
	DATE **DECEMBER, 2017**	MODEL **SONATA PLUG IN HYBRID (LF PHEV)**
SUBJECT: DTC P1BA7 PHEV BATTERY BMS AND WIRING REPLACEMENT		

NOTICE

- ***Carefully follow all Service Procedure steps and NOTICES to ensure high voltage safety and correct repair.***
- ***Print this TSB in color for adequate contrast to accurately identify all pertinent components, harness, connectors, and bolt/nut locations of the service procedure.***

Description:

Some 2016-2017MY SONATA PLUG IN HYBRID (LF PHEV) vehicles may develop a Check Hybrid System Light On with the following DTC found stored in the Battery Management System (BMS):

- **DTC P1BA7** - **Overcharge Detection Active**

In addition, one or both of the following DTCs may also be stored along with the DTC P1BA7:

- DTC P1B77 - High Voltage Battery Precharging Fault
- DTC P1B25 - Hybrid Battery Safety Plug Or Fuse Circuit

NOTE: This bulletin does not apply for just a DTC P1B77 or P1B25, it must also have P1BA7.

This bulletin's Service Procedure will convert the PHEV battery overcharge detection system from a Voltage Protection Device (VPD) mechanical type switch to an Overvoltage Protection Device (OPD) electronic type device internal to both the new SUB BMS and MAIN BMS.

The following will be performed to achieve the conversion to an OPD type system:

- Replace the Sub and Main BMS.
- Replace Sub and Main BMS Wiring.
- Perform OBC ECU Software Update.

Applicable Vehicles:	Certain 2016-2017MY Sonata Plug-In Hybrid (LF PHEV) vehicles produced between Jun 24, 2015 to Aug 31, 2017.

Warranty Information:

Model	Op Code	Operation	Op Time	Causal Part	Nature Code	Cause Code
Sonata Plug-In Hybrid (LF PHEV)	37513F01	BMS & WIRING REPLACEMENT AND OBC UPGRADE	2.3 M/H	37503-E6AS1	I3A	ZZ3

Parts Information:

PART NAME	FIGURE / PART NUMBER	REMARK
MAIN BMS	 37513-E6520	1 per vehicle
SUB BMS	 37513-E6620	1 per vehicle
MAIN BMS WIRING	 37517-E6520	1 per vehicle
SUB BMS WIRING	 37517-E6620	1 per vehicle

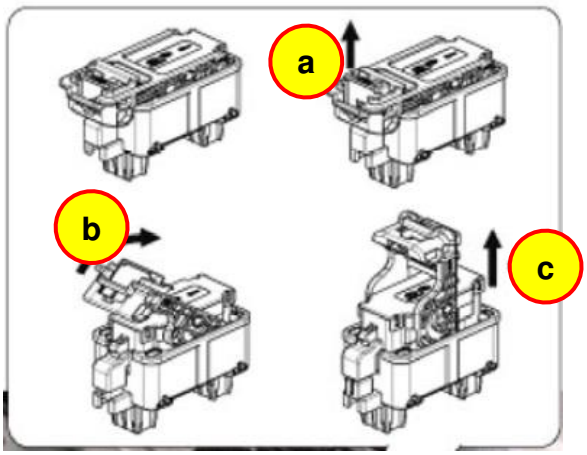
Required Tools List:

- Safety Gloves
- Cordless impact gun 3/8”
- Cordless screw gun
- Ratchet 3/8”
- Torque wrench
- 10mm 3/8” socket
- 12mm 3/8” socket
- 17mm 3/8” socket
- Small and Medium 3/8” Extensions
- Trim tool remover
- Electrical tape
- Pocket flat head

Service Procedure:

1. **Per HEV "General Safety Information and Caution", wear insulated safety gloves for this entire service procedure.**

   Unfasten the hook (**a**) and remove the safety plug (**b**) by pulling the lever (**c**) in the direction of the arrow.



⚠ WARNING

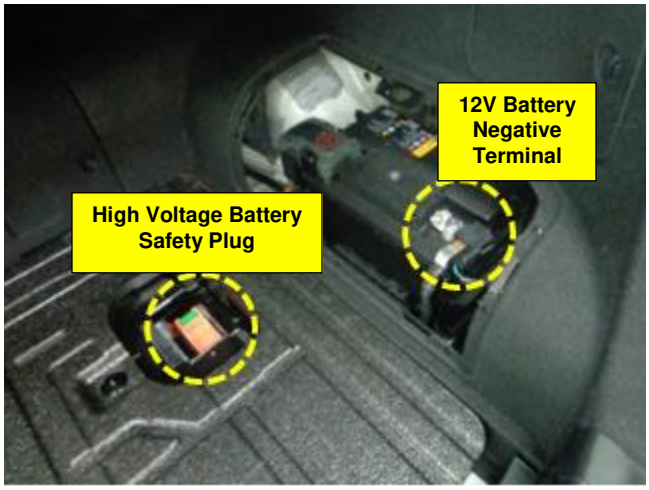
Be sure to read and follow the "General Safety Information and Caution" before doing any work related with the high voltage system.
Wait 5 minutes after disconnection to allow for high voltage system capacitor discharge.
Failure to follow the safety guidelines may result in serious electrical injuries.



Vehicle Safety Related Disconnects:

- The negative terminal to the 12V auxiliary battery should be removed.
  (NOTE: Record customer radio presets to be able to restore them after service.)

- High voltage battery safety plug according to the above procedure.



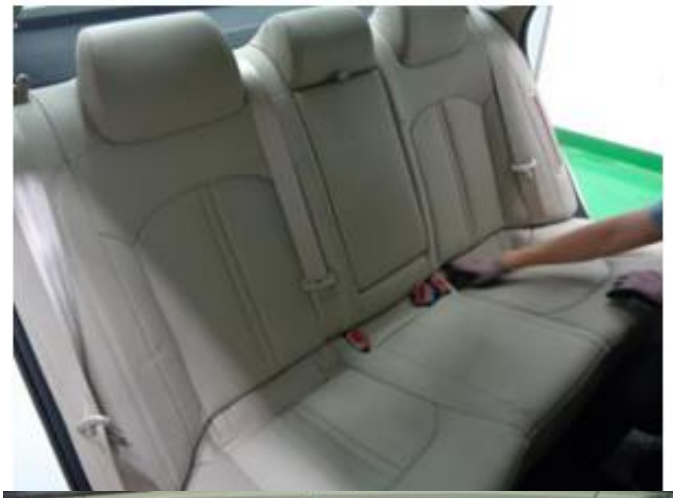
NOTICE

There is only one safety plug disconnection to safely disconnect both the PHEV Main and Sub High Voltage Battery.

2. Remove the following to be able to access both PHEV Main and Sub High Voltage Battery:

   - Rear Seat Lower Assembly.
   - Rear Seat Back Assembly.
   - Trunk Partition Board.
   - Trunk Cover Board and Felt.
   - Trunk Felt Side Trims on both sides.

   Refer to the Service Manual for detailed removal instructions.



This diagram identifies both the Main and Sub High Voltage Battery Packs in the PHEV →



3. Disconnect the BMS and high voltage connectors (**A**) from the Sub High Voltage Battery.



4. Remove the mounting nuts and cooling duct (**B**) from the Sub High Voltage Battery.

   Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
   Tightening torque:
   7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



5. Remove the mounting bolts and Sub High Voltage Battery Pack from the vehicle.

   Tool: *17mm 3/8" socket + cordless 3/8" impact gun.*
   Tightening torque*:*
   78.4 ~ 117.7N.m (8.0 ~ 12.0 kgf.m,57.9 ~ 86.8lb-ft)



6. Remove the mounting bolts and aluminum cover from the Sub High Voltage Battery Pack.

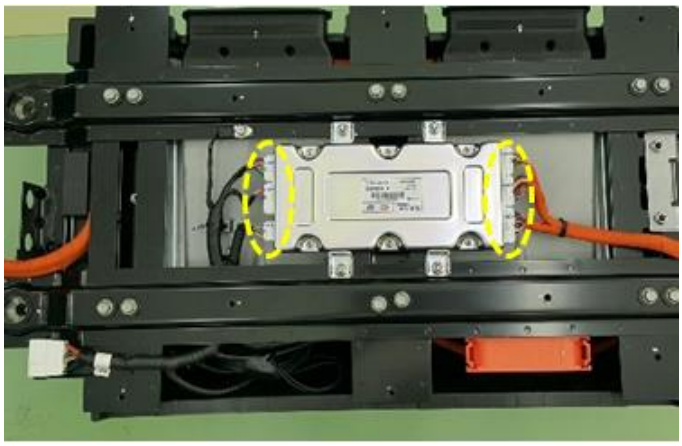
   Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
   Tightening torque*:*
   7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



Remove the dark water tight cover from the Sub High Voltage Battery Pack.



7. Disconnect the BMS connectors and remove the Sub-BMS.

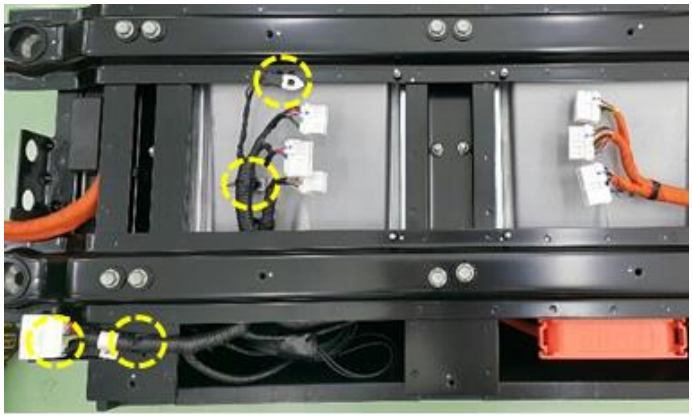


> ***NOTICE***
>
> The old Sub-BMS ECU will be discarded and replaced later at step-14 by the new SUB BMS P/N 37513-E6620.

8. Loosen the ground bolt socket and mounting clips.

   Pull out the wiring as shown in the picture to the right.

   Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
   Trim tool remover and pocket flat head.
   Tightening torque*:*
   7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

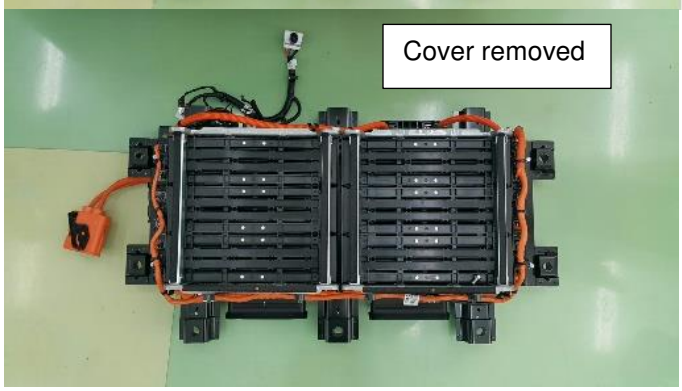


9. Place the Sub High Voltage Battery Pack upside down.

   Remove the mounting bolts and the watertight case (**C**).

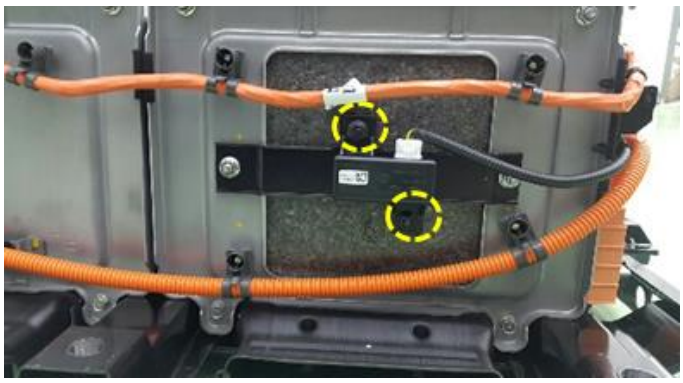
   Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
   Tightening torque:
   7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)





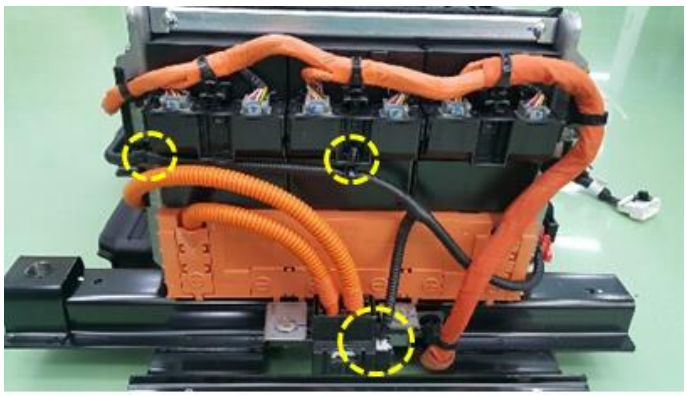
10. Remove the VPD mounting bolts and discard (NOTE: VPD will be discarded with the wiring).

    Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*



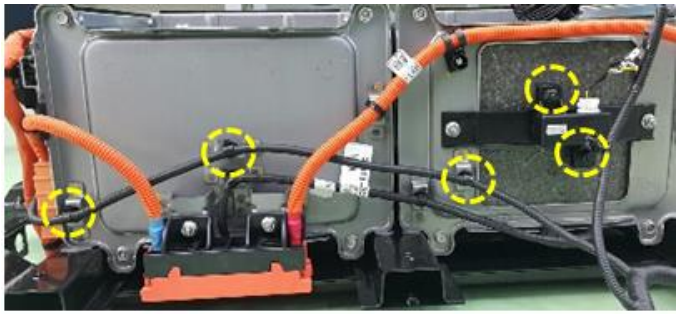
11. Remove the wiring mounting clips and disconnect the connector.

    Tool: *Trim tool remover and pocket flat head.*



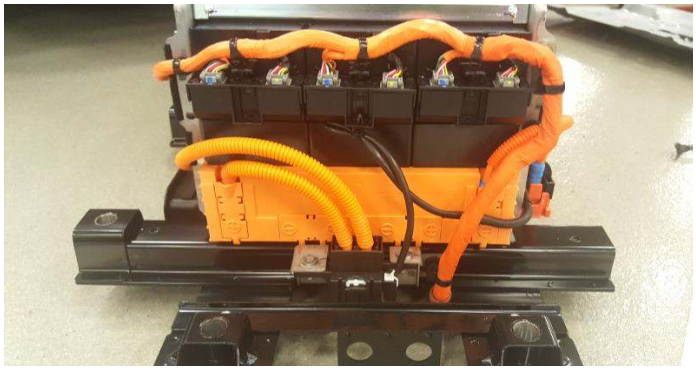
12. Remove the mounting clips and remove the VPD mounting bolts.

13. Remove and discard the existing Sub-BMS Wiring including VPD and its 2 mounting bolts.



14. Install the new **SUB BMS WIRING P/N 37517-E6620.**

> ***NOTICE***
>
> The new SUB BMS WIRING does not have a VPD, it is no longer needed.

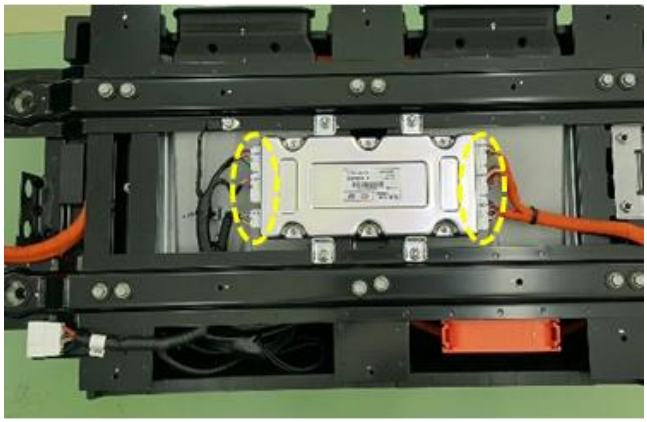




15. Reinstall the watertight cover to the Sub High Voltage Battery Pack.

    Turn the battery pack back over on the cover side.

15. Install the new **SUB BMS P/N 37513-E6620**.



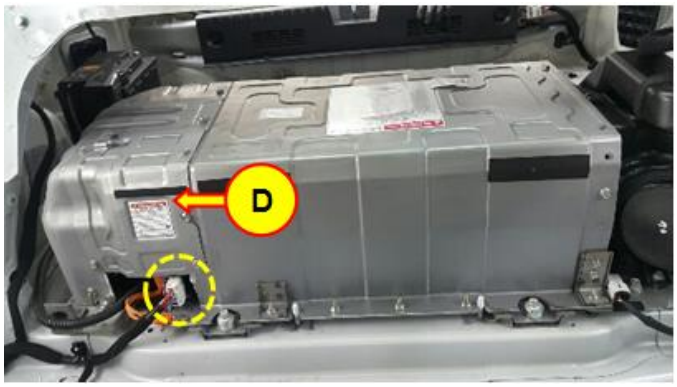
> **NOTICE**
>
> **Make sure to connect all BMS connectors are fully secured into place until a clicking sound is heard.**

16. Reinstall the removed parts on the Sub High Voltage Battery Pack in reverse order of removal.



NOTE: The Main High Voltage Battery Pack will not be removed from the vehicle.

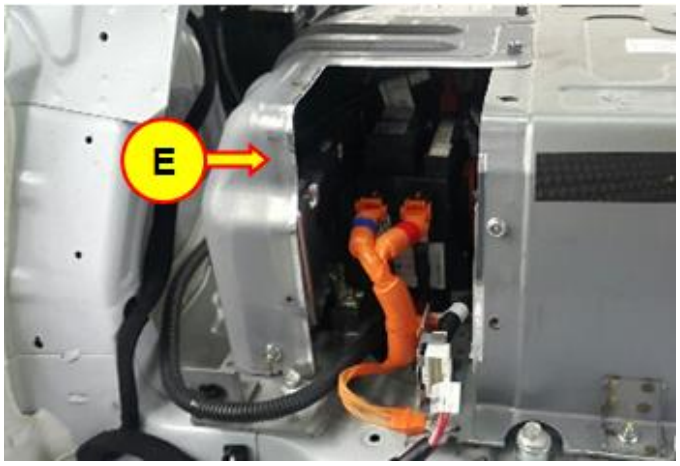
17. Loosen the mounting bolts and remove the front cover (**D**) of the Main High Voltage Battery Pack.



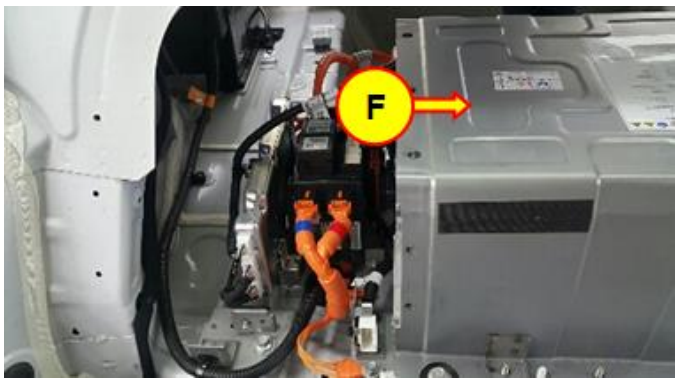
18. Disconnect the BMS connector.
Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

19. Loosen the mounting bolts and remove the rear cover (**E**) of the Main High Voltage Battery Pack.

Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



20. Loosen the mounting bolts, nuts, and remove the cover (**F**) of the Main High Voltage Battery Pack.



Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Ratchet 3/8".
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

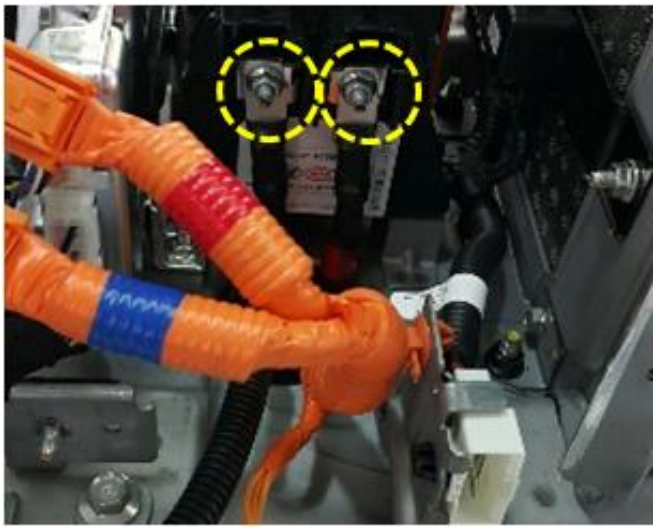
21. Disconnect the OBC and CPU connectors.



Loosen the ground bolt.

Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

22. Remove the inverter power positive and negative cable terminals.



⚠WARNING

Be careful not to have the positive and negative cable terminals make contact to each other. Tape each terminal temporarily with electrical tape to help prevent contact between the terminals.

Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Ratchet 3/8".
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

23. Disconnect the fan connector.



24. Remove the cooling duct mounting bolts and nuts.

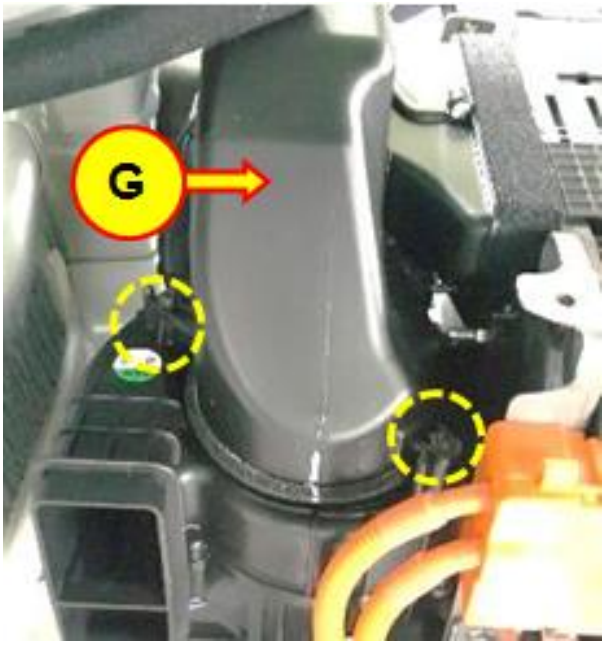
    Remove the harness retainers to the cooling fan.

    Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
    Trim tool remover and pocket flat head.
    Tightening torque:
    7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



25. Remove the mounting screws and cooling duct (**G**).

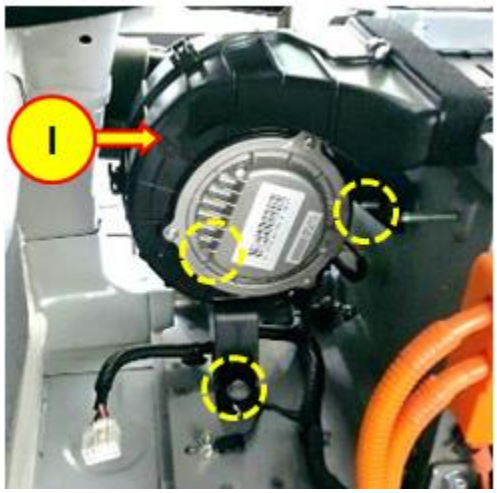
    Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
    Tightening torque:
    7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



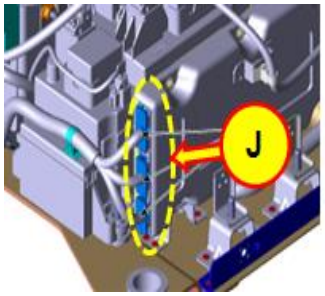
26. Disconnect the cooling fan connectors and mounting nuts to remove both cooling fans (**H** & **I**).

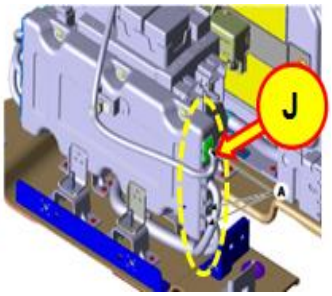
Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)





27. Disconnect the BMS connectors (**J**).



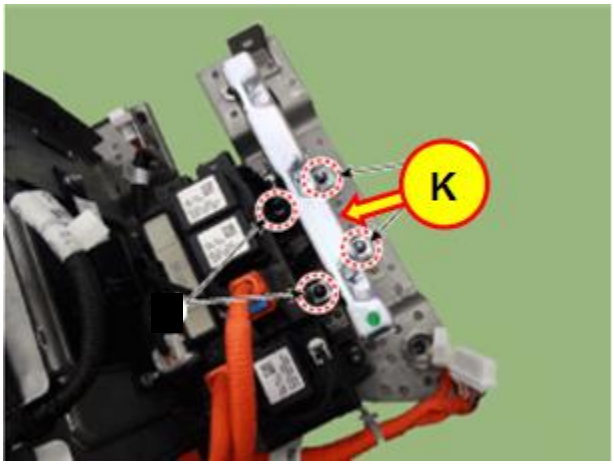


28. Remove the mounting nuts and the Main BMS (**K**).

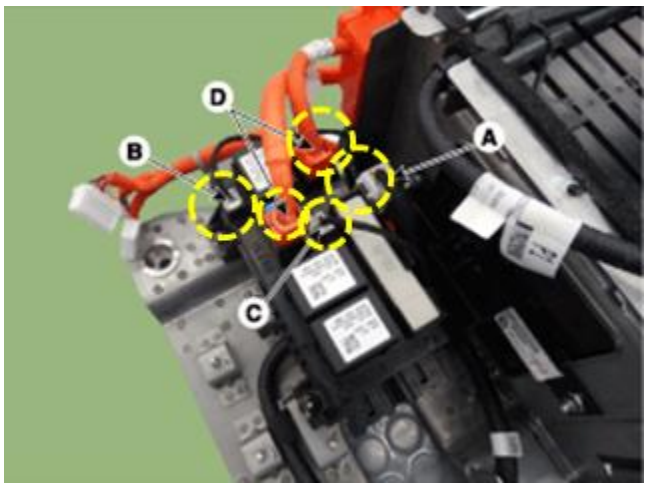
NOTICE

The old Main BMS will be discarded and replaced later at step-37 by the new MAIN BMS P/N 37513-E6520.

Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)

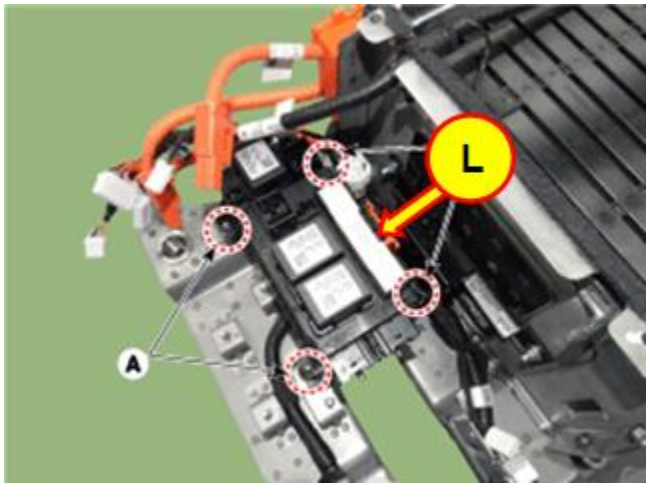


29. Disconnect the Power Relay Assy. (PRA) connectors.



30. Remove the mounting bolts and remove the PRA (**L**).

Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
Tightening torque:
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



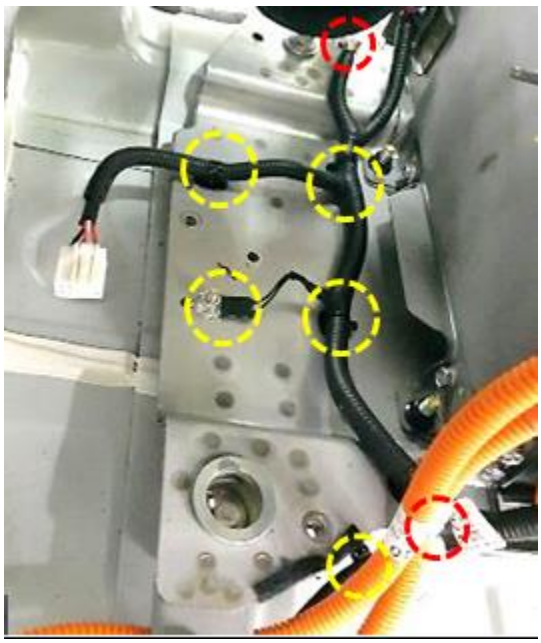
View after PRA removed.



31. Remove the wiring mounting clips and ground bolt.

    Disconnect the connector.

    Tool: *10mm 3/8" socket + cordless 3/8" impact gun.*
    Trim tool remover and pocket flat head.
    Tightening torque:
    7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)





32. Remove the main wiring harness mounting clips.

    Tool: *Trim tool remover and pocket flat head.*



33. Remove the mounting clips, VPD nuts, and ground bolt.

34. Remove and discard the existing Main BMS Wiring, the VPD and its 2 mounting nuts.



NOTICE

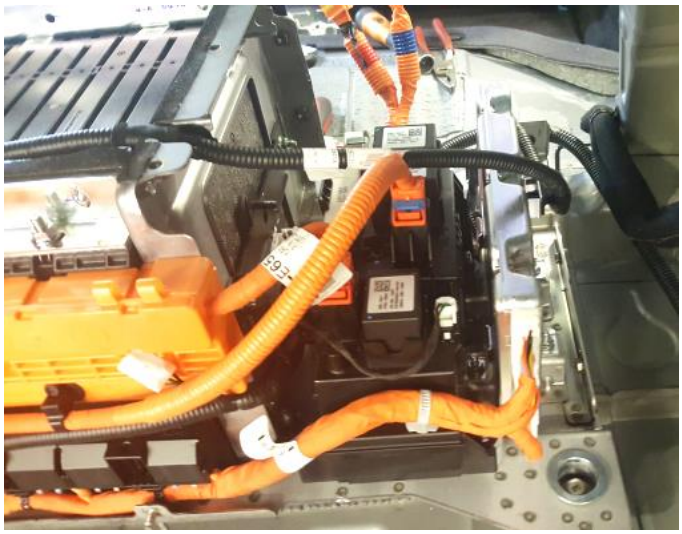
The new MAIN BMS WIRING does not have a VPD. They are no longer needed.

35. Install the new **MAIN BMS WIRING P/N 37517-E6520.**



36. Reinstall the PRA.

37. Install the new **MAIN BMS P/N 37513-E6520.**



NOTICE

Make sure to connect all BMS connectors fully into place until a clicking sound is heard.

38. Reinstall all the remaining removed parts in reverse order of removal.

39. Using GDS perform the **OBC ECU Software Update Procedure** (**see the next 2 pages)**.

40. Perform a brief few minute test drive to ensure the vehicle is operating normally. If possible confirm vehicle can take a charge indicating the green charge light on top center of the dash.

41. Perform **Fault Code Search** of All Systems by GDS to make sure there are no stored DTC.

42. Restore the recorded customer radio presets and set the time.

OBC ECU Software Update Procedure:

ROM ID Table:

MODEL	SYSTEM	OBC P/No.	ROM ID	
			OLD	NEW
LF PHEV	OBC	36400-3D025	5.01 5.03	5.05

Precautions for ECU Update:

- Make sure the vehicle's battery has reasonable charge. If the vehicle has been in storage an extended time, operate the vehicle in ready mode for at least 20 minutes to assure an adequate battery charge state for reliable upgrade results.
- Make sure GDS has at least 30% battery. Charge the GDS tool if needed.
- Turn off all vehicle interior lamps (do not leave head lamp switch in auto mode.) and all vehicle accessories (including heater, A/C, blower, radio, seat warmer, defroster, etc.) so the battery will not lose charge during upgrade.
- Perform GDS ECU Upgrade with the ignition switch left in the ON position.
- Do not start the engine during the ECU Upgrade.

Automatic Mode Upgrade Procedure:

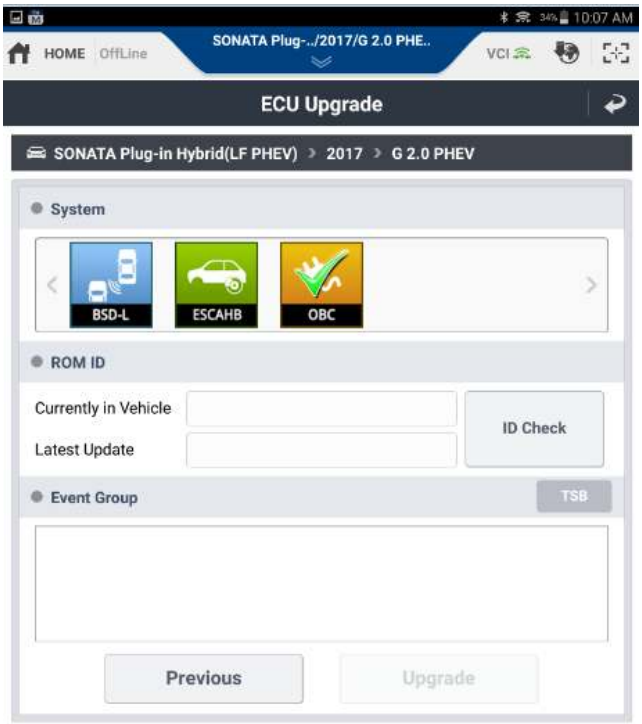
A. Select **ECU Upgrade** on the initial screen after entering the vehicle information.

B. Select **Auto Mode** and then select **OBC** for **System.**

C. Select **ID Check**.

D. GDS will read Current ROM ID and confirm that the upgrade applies to the vehicle.

E. Select the upgrade event. Touch **Upgrade**. **"461.LF PHEV OBC - CHARGING LAMP CONTROL LOGIC IMPROVEMENT"**



F. Vehicle 12V Battery Voltage is checked to make sure it is at least 12.0 volts to assure reliable upgrade results.
   - Click OK if the result is Good >12V,
   - "**Low Battery Warning**": Select Back button at top right corner:
     - Operate vehicle in Ready mode for 15 minutes and shutdown.
     - Turn Ignition On and recheck.



G. **Upgrade (1/2)** will begin and the progress will be displayed on bar graph until 100% is reached.

H. **Upgrade (2/2)** will begin and the progress will be displayed on bar graph until 100% is reached.

I. When prompted, **Turn ignition key OFF for 10 seconds.** Place it back to the ON position and select OK to continue according to the information displayed on the GDS screen.

J. Select OK on the final screen that indicates the Upgrade is complete.

K. Select **All Fault Search** to scan all systems for DTC after the Upgrade, and then select **Erase all DTC**.

Manual Mode Upgrade Procedure:

NOTICE

- **The Manual Upgrade should be performed only when the Automatic Upgrade fails after a partial bar graph was displayed.**
- If Automatic Upgrade fails, turn the ignition key OFF for about 10 seconds, place it back in the ON position to reset the control unit before performing Manual Upgrade.

a. Within the ECU Upgrade screen, select **Manual Mode**, then select the Upgrade Event **461**.

b. Select the appropriate ECU part number: **OBC 36400-3D025**.

c. Enter the **Password** as **3025**.

NOTE: The remaining ECU Upgrade steps are identical to those of steps F-K of the above Auto Mode Procedure.

