



Technical Service Bulletin

GROUP

ENGINE
ELECTRICAL

NUMBER

19-EE-002H

DATE

APRIL, 2019

MODEL

Kona Electric (OS EV)
Ioniq Electric (AE EV)

SUBJECT: ELECTRIC VEHICLE (EV) BATTERY REPLACEMENT PROCEDURES

IMPORTANT

- Carefully follow all steps of this TSB. The required special tools and TSB procedures are very important for safe handling of a large heavy EV battery.
- Do not disconnect or remove the 12V or EV battery before the Battery Management System (BMS) DTC Analysis and Data Analysis screens are collected by the GDS.
- The removed EV battery must be carefully handled to avoid physical damage per the procedures of this TSB.

Description: The following summarizes the service procedure for EV battery replacement:

Section	Content	Pages
A.	Dealer uses GDS to collect BMS DTC Analysis and BMS Data Analysis.	3-4
B.	Dealer calls Techline to establish a Techline Case. Dealer sends the BMS Data Analysis screen capture file(s) to Techline repository or by email to request an EV battery replacement approval.	5
C.	Techline approves Dealer EV battery replacement and an EV battery will be shipped to Dealer. Techline will call back to confirm estimated time of arrival.	5
D.	Required Tools will be shipped as "essential" to Dealer from Bosch and billed one time to Dealer.	2, 5
E.	Dealer Technician performs the required online EV Battery Replacement Training Module. Technician will receive training credit.	5
F.	Once the required tools and the replacement EV battery are on hand, Dealer removes and replaces the EV battery.	6-11
G.	Confirm the vehicle can go into Ready mode without warning lights on. Clear DTC by GDS and make sure no battery related DTC were restored. Perform SOC Calibration by GDS.	11
H.	Kona Only: Fill the P/E coolant reservoir and bleed by GDS for 30 minutes.	12
I.	Dealer test drives the vehicle. Check that it takes a level-1 or level-2 charge.	13
J.	Secure the removed battery to the shipping box from the replacement battery. For Kona only make sure the battery coolant nipples are plugged. Install the battery box cover securely.	13
K.	Dealer Parts Dept. requests battery return by KBI of the used battery core per TSB 19-EE-001.	13

Applicable Vehicles:


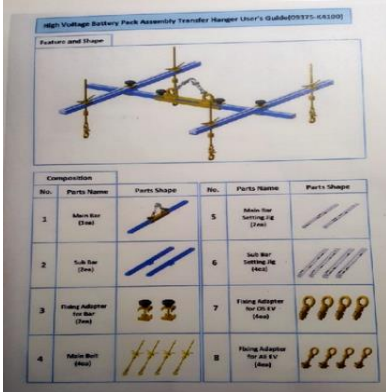
- 2017-2019MY Ioniq Electric (AE EV)
- 2019MY~ Kona Electric (OS EV)

Warranty Information:

Model	Op Code	Operation	Op Time	Causal Part	Nature Code	Cause Code
Kona Electric (OS EV)	37510R00	HIGH VOLTAGE BATTERY PACK ASSY	Refer to WebLTS	37501-K4000	I3A	ZZ3
	37510RQ0	DIAGNOSTIC TOOL OPERATION				
Ioniq Electric (AE EV)	37503R00	HIGH VOLTAGE BATTERY SYSTEM ASSY	Refer to WebLTS	37501-G7200	I3A	ZZ3
	37510RQ0	DIAGNOSTIC TOOL OPERATION				

EV Battery Required Special Tools Information:

- The following special tools are required for the safe, secure, efficient lifting of large heavy EV battery (~1000lbs). Proper tools are required to avoid damage to the EV battery.
- Both tools will be shipped from Bosch to any Dealer at their first EV battery replacement service as a required special tool.

PART NAME / (Part Number)	DIAGRAM	REMARK
Propulsion System Lift Table (P/N: HMA52200-A)		Shipped from Bosch Allows for safe and efficient EV battery replacement. Engine hoist can fit under it to raise an EV battery from the table. Multi-Use air/hydraulic operated lift rated at 1760 lbs capacity can lift 21.5 to 70 inches high. Multiple uses include EV Battery, Engine/Transaxle, Fuel Tank, Cradles, Suspensions, and Chassis systems.
High Voltage Battery Lifting Fixture (P/N: 09375-K4100)		Shipped from Bosch

Service Procedure:

A-1. Perform the GDS **All Fault Search** function to review all stored DTC(s).

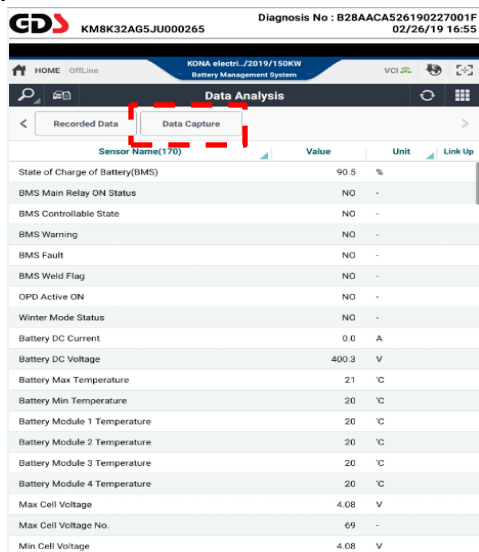
BMS DTC Search Result:

- Review for any BMS system DTC stored. Verify in the shop manual if any have a possible cause of EV battery.
- If BMS DTC does not apply to a potential EV battery problem, this TSB does not apply.

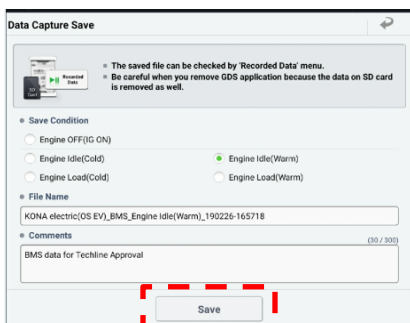
A-2. Capture all data from the GDS **BMS Data Analysis** function as follows:

(Preferred) GDS has an SD card:

Use the GDS **Data Capture** function that can be found by scrolling to the right at the top of the GDS screen:



Sensor Name(170)	Value	Unit	Link Up
State of Charge of Battery(BMS)	90.5	%	
BMS Main Relay ON Status	NO	-	
BMS Controllable State	NO	-	
BMS Warning	NO	-	
BMS Fault	NO	-	
BMS Weld Flag	NO	-	
OPD Active ON	NO	-	
Winter Mode Status	NO	-	
Battery DC Current	0.0	A	
Battery DC Voltage	400.3	V	
Battery Max Temperature	21	°C	
Battery Min Temperature	20	°C	
Battery Module 1 Temperature	20	°C	
Battery Module 2 Temperature	20	°C	
Battery Module 3 Temperature	20	°C	
Battery Module 4 Temperature	20	°C	
Max Cell Voltage	4.08	V	
Max Cell Voltage No.	69	-	
Min Cell Voltage	4.08	V	



Data Capture Save

The saved file can be checked by 'Recorded Data' menu.
Be careful when you remove GDS application because the data on SD card is removed as well.

Save Condition

☐ Engine OFF(IG ON)
☐ Engine Idle(Cold)
☒ Engine Idle(Warm)
☐ Engine Load(Cold)
☐ Engine Load(Warm)

File Name
 KONA electric(OS EV)_BMS_Engine Idle(Warm)_190226-165718

Comments (0/300)
 BMS data for Techline Approval

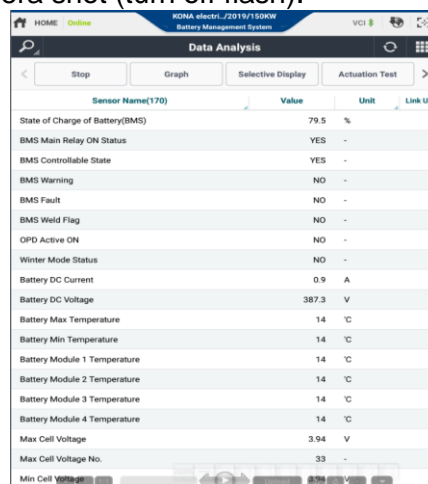
Save

Selecting the **Save** button creates a PDF file of the multiple pages of all the data of the BMS Data Analysis.

GDS does not have an SD card:

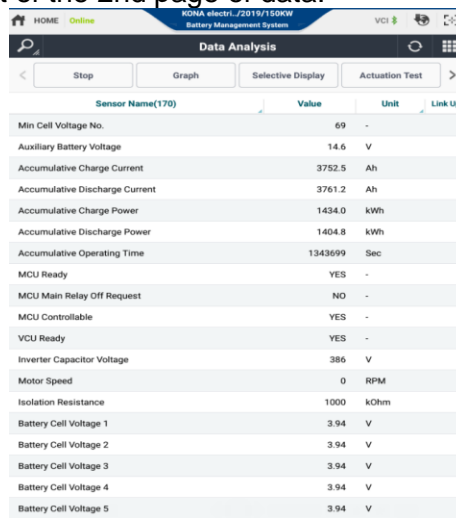
Capture the first page of Data Analysis, either by:

- Manual tablet screenshot (press LOCK and HOME buttons together).
- Camera shot (turn off flash).



Sensor Name(170)	Value	Unit	Link Up
State of Charge of Battery(BMS)	79.5	%	
BMS Main Relay ON Status	YES	-	
BMS Controllable State	YES	-	
BMS Warning	NO	-	
BMS Fault	NO	-	
BMS Weld Flag	NO	-	
OPD Active ON	NO	-	
Winter Mode Status	NO	-	
Battery DC Current	0.9	A	
Battery DC Voltage	387.3	V	
Battery Max Temperature	14	°C	
Battery Min Temperature	14	°C	
Battery Module 1 Temperature	14	°C	
Battery Module 2 Temperature	14	°C	
Battery Module 3 Temperature	14	°C	
Battery Module 4 Temperature	14	°C	
Max Cell Voltage	3.94	V	
Max Cell Voltage No.	33	-	
Min Cell Voltage			

- Note the parameter at the bottom of the screen and manually scroll down until that parameter shows at the top of the screen.
- Capture a manual tablet screenshot or camera shot of the 2nd page of data.



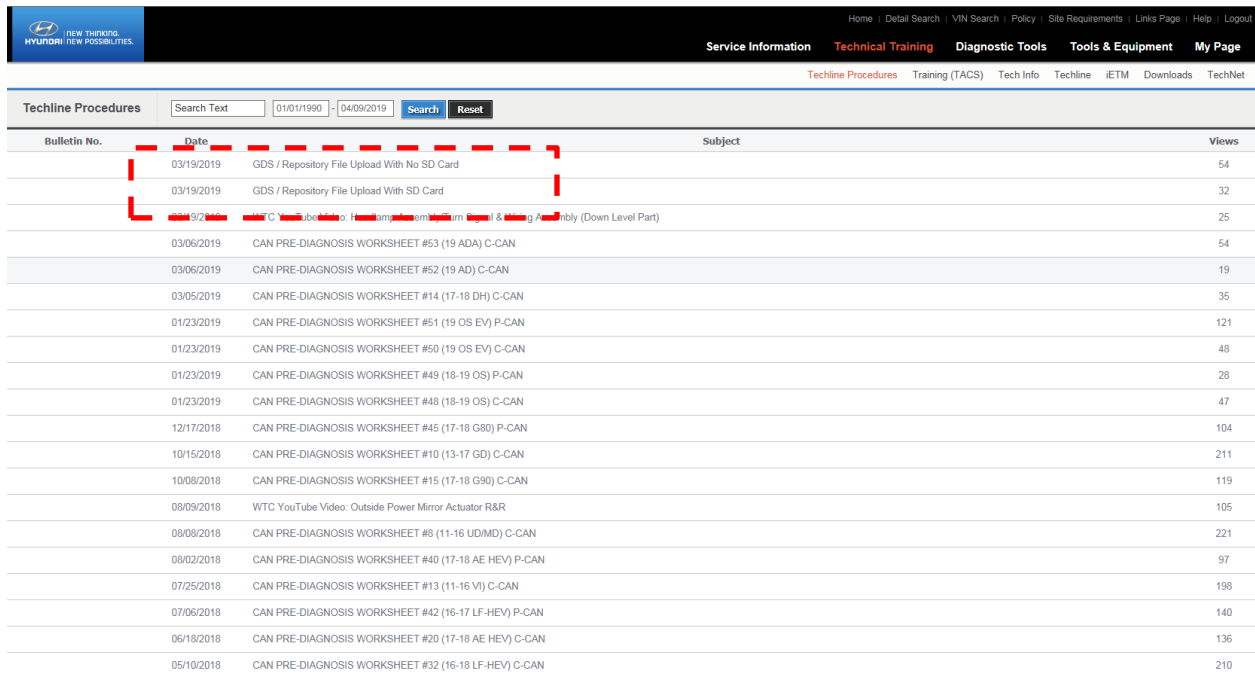
Sensor Name(170)	Value	Unit	Link Up
Min Cell Voltage No.	69	-	
Auxiliary Battery Voltage	14.6	V	
Accumulative Charge Current	3752.5	Ah	
Accumulative Discharge Current	3761.2	Ah	
Accumulative Charge Power	1434.0	kWh	
Accumulative Discharge Power	1404.8	kWh	
Accumulative Operating Time	1343699	Sec	
MCU Ready	YES	-	
MCU Main Relay Off Request	NO	-	
MCU Controllable	YES	-	
VCU Ready	YES	-	
Inverter Capacitor Voltage	386	V	
Motor Speed	0	RPM	
Isolation Resistance	1000	kOhm	
Battery Cell Voltage 1	3.94	V	
Battery Cell Voltage 2	3.94	V	
Battery Cell Voltage 3	3.94	V	
Battery Cell Voltage 4	3.94	V	
Battery Cell Voltage 5	3.94	V	

- Continue the above steps page by page until all Data Analysis pages are captured & saved.

- B-1. Contact Techline at **1-800-325-6604** to open a Techline Case for approval of an EV battery replacement. Note the Techline case number assigned.
- B-2. Upload the following to the Techline Repository or email to: hmatechlinefax@hmausa.com:
- BMS Data Analysis Data Capture file(s).

NOTE: Be sure to include Dealer Number, VIN and Techline Case# in the subject line of each Techline Repository or email submission, so Techline can match to your case.

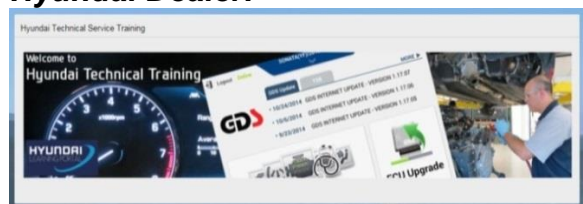
General Instructions on how to Upload to Techline Repository are found at Technical Training – Techline Procedures:



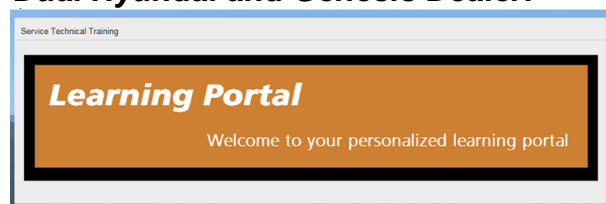
Bulletin No.	Date	Subject	Views
	03/19/2019	GDS / Repository File Upload With No SD Card	54
	03/19/2019	GDS / Repository File Upload With SD Card	32
	03/19/2019	WTC YouTube Video: H-mat Pump Assembly & H-mat Pump Assembly (Down Level Part)	25
	03/06/2019	CAN PRE-DIAGNOSIS WORKSHEET #53 (19 ADA) C-CAN	54
	03/06/2019	CAN PRE-DIAGNOSIS WORKSHEET #52 (19 AD) C-CAN	19
	03/05/2019	CAN PRE-DIAGNOSIS WORKSHEET #14 (17-18 DH) C-CAN	35
	01/23/2019	CAN PRE-DIAGNOSIS WORKSHEET #51 (19 OS EV) P-CAN	121
	01/23/2019	CAN PRE-DIAGNOSIS WORKSHEET #50 (19 OS EV) C-CAN	48
	01/23/2019	CAN PRE-DIAGNOSIS WORKSHEET #49 (18-19 OS) P-CAN	28
	01/23/2019	CAN PRE-DIAGNOSIS WORKSHEET #48 (18-19 OS) C-CAN	47
	12/17/2018	CAN PRE-DIAGNOSIS WORKSHEET #45 (17-18 G80) P-CAN	104
	10/15/2018	CAN PRE-DIAGNOSIS WORKSHEET #10 (13-17 GD) C-CAN	211
	10/08/2018	CAN PRE-DIAGNOSIS WORKSHEET #15 (17-18 G90) C-CAN	119
	08/09/2018	WTC YouTube Video: Outside Power Mirror Actuator R&R	105
	08/08/2018	CAN PRE-DIAGNOSIS WORKSHEET #8 (11-16 UDMD) C-CAN	221
	08/02/2018	CAN PRE-DIAGNOSIS WORKSHEET #40 (17-18 AE HEV) P-CAN	97
	07/25/2018	CAN PRE-DIAGNOSIS WORKSHEET #13 (11-16 VI) C-CAN	198
	07/06/2018	CAN PRE-DIAGNOSIS WORKSHEET #42 (16-17 LF-HEV) P-CAN	140
	06/18/2018	CAN PRE-DIAGNOSIS WORKSHEET #20 (17-18 AE HEV) C-CAN	136
	05/10/2018	CAN PRE-DIAGNOSIS WORKSHEET #32 (16-18 LF-HEV) C-CAN	210

- C. Once Techline approval is received, the EV Battery will be shipped out by Mobis to the Dealer. Shipping can take 2-5 days depending on location since EV battery can only be shipped by Hazmat ground transportation. Techline will confirm the estimated time of arrival (ETA).
- D. Required Tools on page-2 will ship out from Bosch (if not already been sent out).
- E. Perform the EV Battery Replacement Online Training Module on the “Hyundai Technical Training” Learning Portal (if a Hyundai only Dealer) or, on the “Learning Portal” (if a dual Hyundai and Genesis Dealer). The course will provide Technician training credit.

Hyundai Dealer:



Dual Hyundai and Genesis Dealer:



- F-1. After the EV battery and special tools are on hand, remove the EV battery from the vehicle per the specific shop manual instructions for each model and place the battery on the lift table. Begin by removing the service plug from the battery and wait 5+ minutes for inverter discharge.

Refer to the **Battery Removal Tips** on the next page.

Kona EV: High Voltage Battery System – Repair Procedures:

HYUNDAI NEW POSSIBILITIES

Service Information

New Items Shop ETM DTC TSB Campaign Fix It Right

SHOP KONA electric(OS EV) [2019-2] 2019 150KW VIN # Search Reset

150KW

- General Information
- Driveshaft and axle
- Suspension System
- Steering System
- Restraint
- Brake System
- Body (Interior and Exterior)
- Body Electrical System
- Heating,Ventilation And Air Conditioning
- Battery Control System
 - General Safety Information and Caution
 - High Voltage Shut-off Procedures
 - High Voltage Battery Handling Guide
 - Specifications
 - Components and Components Location
 - Description and Operation
 - System Diagram
 - Special Service Tools
 - Troubleshooting
 - High Voltage Battery System
 - Components and Components Location
 - Description and Operation
 - Schematic Diagrams
 - Inspection
 - Repair procedures
 - Battery Pack Assembly
 - Power Relay Assembly (PRA)
 - Quick-Charger Relay Assembly (QRA)
 - Case
 - High Voltage Battery Control System
 - High Voltage Charging System
 - High Voltage Distributing System
- Cooling System
- Motor System
- Reduction Gear System
- Vehicle Control System


KONA electric(OS EV) > 2019 > 150KW > Battery Control System

Removal

WARNING


- When working on the high voltage system, make sure that you are familiar and comply with the "Safety Precautions, Cautions and Warnings." If you may occur.
- When working on the high voltage system, make sure to cut off the high voltage first according to the "High Voltage Cut-off Procedure." If you do not occur.

- Turn OFF the ignition switch and separate the (-) cable on the auxiliary battery (12V).
- Remove the luggage board assembly. (Refer to Body - "Trunk Trim")
- Remove the rear seat. (Refer to Body - "Rear Seat")
- Remove the service plug cover (A).



Information

- Remove the service plug in the following order.



Ioniq EV: High Voltage Battery System – Repair Procedures:

HYUNDAI NEW POSSIBILITIES

Service Information

New Items Shop ETM DTC TSB Campaign Fix It Right

SHOP IONIQ Electric(AE EV) [2017-2] 2019 88KW VIN # Search Reset

88KW

- General Information
- Driveshaft and axle
- Suspension System
- Steering System
- Restraint
- Brake System
- Body (Interior and Exterior)
- Body Electrical System
- Heating,Ventilation And Air Conditioning
- Battery Control System
 - General Safety Information and Caution
 - High Voltage Shut-off Procedures
 - High Voltage Battery Handling Guide
 - Specifications
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 - High Voltage Battery Control System
 - High Voltage Battery Cooling System
 - High Voltage Charging System
 - High Voltage Distributing System
- Motor System
- Reduction Gear System
- Vehicle Control System

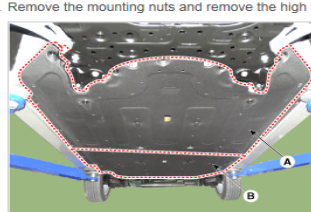

IONIQ Electric(AE EV) > 2019 > 88KW > Battery Control System

Removal

WARNING

- When working on the high voltage system, make sure that you are familiar and comply with the "Safety Precautions, Cautions and Warnings." If you may occur.
- When working on the high voltage system, make sure to cut off the high voltage first according to the "High Voltage Cut-off Procedure." If you do not occur.

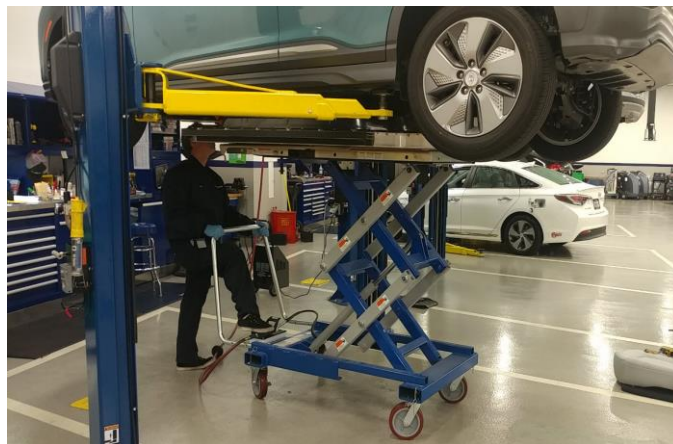
- Turn OFF the ignition switch and separate the (-) cable on the auxiliary battery (12V).
- Disconnect the high voltage circuit (Refer to "High Voltage Cut-off Procedure")
- Lift the vehicle.
- Remove the mounting nuts and remove the high voltage battery front under cover (A) and rear under cover (B).
- Remove the mounting clip and remove the rear bumper under cover (A).

F-2. Battery Removal Tips:

- You must use the SST P/N: HMA52200-A Propulsion System Lift Table as shown in the Required Tools section.

Place a piece of cardboard on the table top of 1/8 inch thickness minimum.

**Kona EV Only:**

- When disconnecting the coolant hoses from the Kona EV battery, clamp the hoses carefully from the vehicle side to avoid losing coolant from the reservoir.
- Catch the coolant that drains and discard it.



- Attach a short spare coolant hose (from your shop supply) to one side of the pair of coolant nipples from the battery.

Blow out all the coolant from the battery from the other coolant nipple using shop air as shown.



- Loop and attach the spare coolant hose to both coolant nipples from the battery.

NOTE: Clamp the hose at both nipples to prevent coolant from draining during handling and shipping of the battery.



F-3. Exchanging Battery from the Vehicle with the Service Battery:

- a) When the EV battery is received in the shipping box use a fork lift (with extenders if available) or pallet jack to carefully lift and transport the battery to the work site.

NOTE: *There are 2 different styles of boxes, each is opened in different ways:*

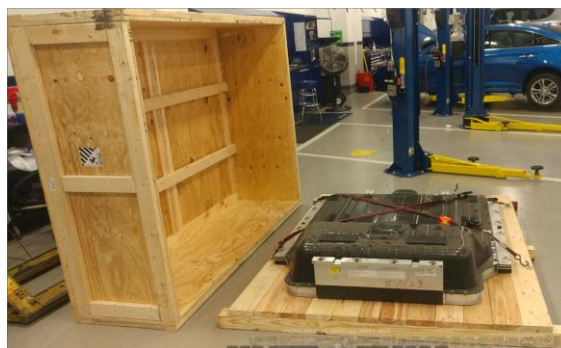
OEM Box:

- OEM EV battery box will have a top cover that is secured by nails or screws.
- Nails will need to be pried up or screws removed to be able to remove the cover.



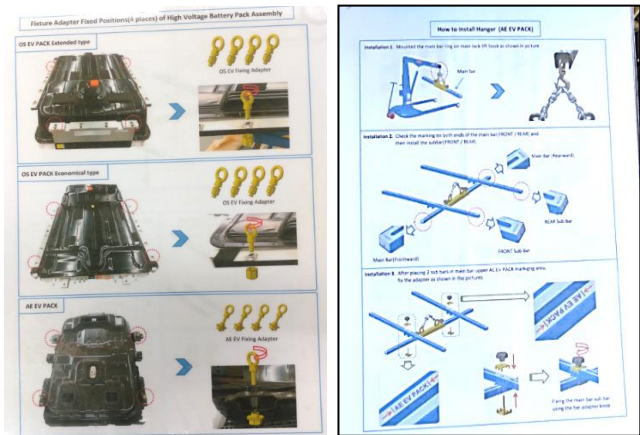
Refurbished EV Battery Box:

- Refurbished EV battery box has a full cover integrated with side panels.
- It may include clips at the bottom that secure the cover to the bottom crate that holds the battery. These clips will need to be removed and saved for attaching back.
- Flip up the full cover assembly as shown.
- Remove the straps securing the battery in place.



- b) Assemble the High Voltage Battery Lifting Fixture SST P/N: 09375-K4100 to the EV battery as per the instructions provided with the kit depending on model and type of battery.

NOTE: For Kona EV battery, use the (OS EV PACK Extended Type) instructions. Do not follow instructions for the Economical Pack.



The following instructions depend on whether a **Fork Lift** (preferred) or an **Engine Hoist** is used:

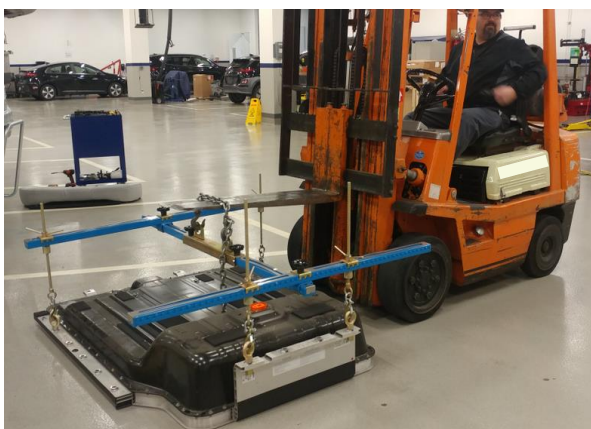
Fork Lift Instructions:



- c) Use a fork lift with chains and the Lifting Fixture Kit to raise up the replacement battery:



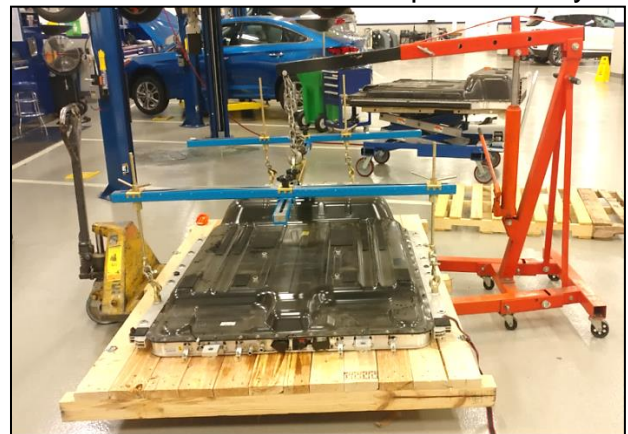
- d) Move the replacement EV battery and carefully place it on the shop floor as a temporary resting point. Remove the Lifting Fixture Kit from the battery.



Engine Hoist Instructions:



- Use a pallet jack on one side to raise the crate to make it possible to fit an Engine Hoist in place on the other side to lift up the battery.



- Move the replacement battery with the Engine Hoist to a spare shop lift or other suitable raised surface that would allow for the Engine Hoist to roll under to receive the battery. This will be a temporary resting point. Remove the Lifting Fixture Kit from the battery.

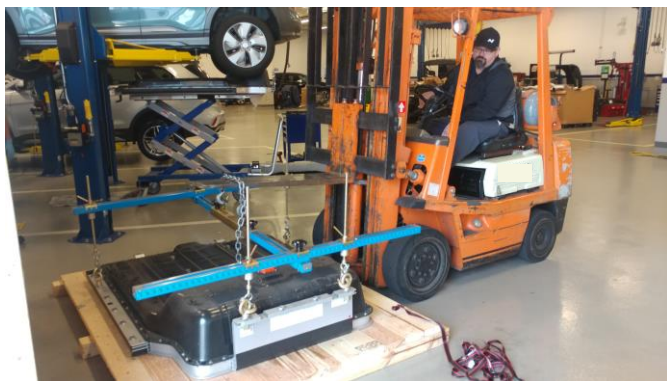


Fork Lift Instructions:

- e) After the EV battery was removed from the vehicle, install the Lifting Fixture Kit to be able to raise it from the Lift Table by Fork Lift.



- f) Move the EV battery from the vehicle to the shipping crate and carefully lower it in place so it is centered on the crate.



- g) Transfer the Lifting Fixture Kit back to install on the replacement battery. Raise the replacement battery from its temporary resting point and place it onto the Lift Table.

**Engine Hoist Instructions:**

- After the EV battery was removed from the vehicle, install the Lifting Fixture Kit to be able to raise it from the Lift Table by Engine Hoist.



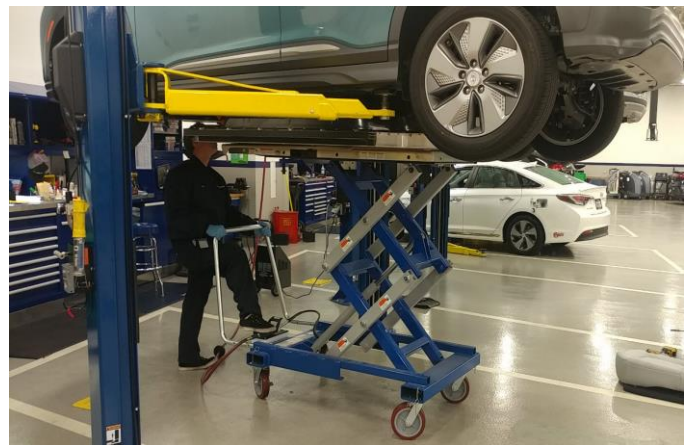
- Move the EV battery from the vehicle to the shipping crate and carefully lower it in place so it is centered on the crate.



- Transfer the Lifting Fixture Kit back to install on the replacement battery. Raise the replacement battery from its temporary resting point (of step-d) and place it onto the Lift Table.



- F-3. Install the replacement battery to the vehicle in reverse of the shop manual removal instructions.



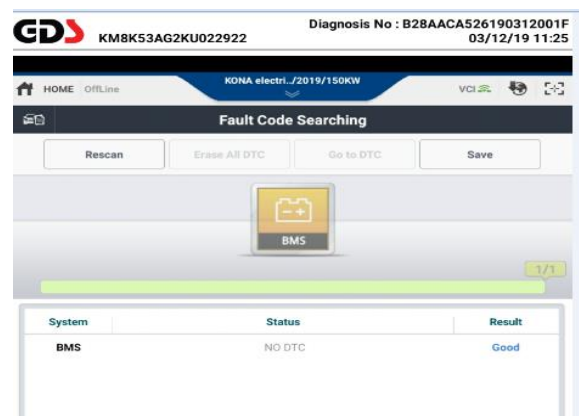
- G-1. After installation is complete, check that the vehicle will go into READY mode and there are no warning lights on.

NOTE: (For Kona only). The Powertrain Electronics (P/E) coolant has not been filled yet, so a low cooling warning light might occur, but that will be taken care of at step H.

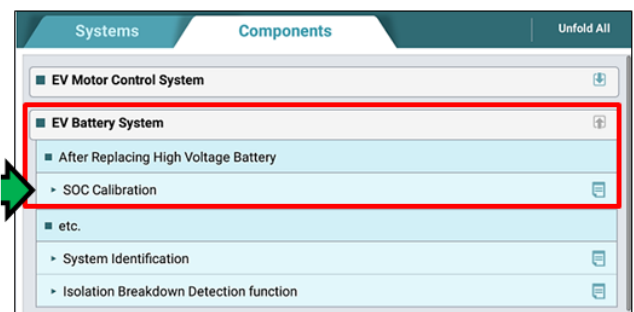


- G-2. Check All Fault Search DTC and clear DTC. Make sure no BMS battery related DTC restores.

See example of a BMS screen with no DTC, confirming that proper battery installation had occurred.

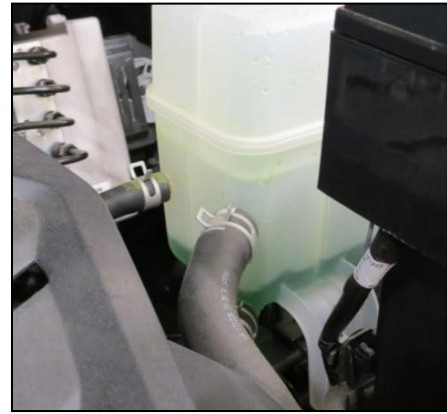


- G-3. Perform the **SOC Calibration** found in the S/W Management , EV Battery System section of GDS.



(Step H applies to Kona EV Only):

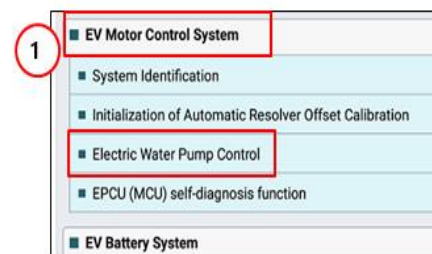
H-1. Fill the P/E cooling system reservoir to the MAX full mark with 50/50 mixture of coolant and water.



H-2. Using GDS with Ignition ON, perform the P/E cooling system air bleeding procedure.

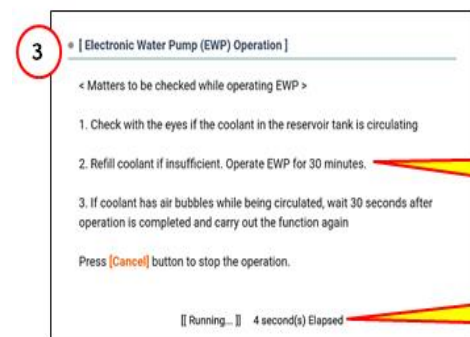
This will take about 30 minutes.

As the air is purged, recheck and add coolant as necessary.



2

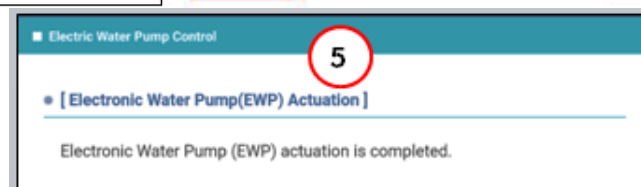
Electronic Water Pump Operation	
Purpose	To bleed air and circulate the water after repair work is done on HSG/HPCU or Electric Water Pump(EWP).
Enable Condition	1.Engine Off 2.Ignition Switch On 3.NO DTC
Concerned Component	Motor Control Unit(MCU), Electric Water Pump(EWP)
Concerned DTC	-
Fail Safe	-
Etc	-



30
Minutes

Elapsed
time/sec

Air Bubbles



- I-1. Perform a test drive for at least 2-3 miles and make sure vehicle is OK.



- I-2. Confirm the battery will take charge from a Level-2 charger (faster) or the Level-1 charger that came with the vehicle.

Recommended to keep the vehicle on a Level-2 charger until customer picks up the vehicle, so it can be delivered at the highest possible charge.



- J-1. Secure the used EV battery tightly in place with the provided straps onto the crate to minimize any movement during shipping.



- J-2. For Kona EV only, ensure there will be no coolant leaking out of the battery onto the shipping crate.

Use a spare coolant hose from your shop to loop and clamp over the 2 coolant nipples.



- J-3. Place the cover on the battery shipping box and make sure it is firmly in place to prevent the cover from dislodging during the return shipping. Secure any clips if they came with the box originally.



- K. Dealer Parts Dept. must follow TSB 19-EE-001 to schedule pickup by KBI of the used battery core as soon as possible. KBI will provide specific instructions.