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 Major System: ELECTRIC VEHICLE Created: 3/21/2025
 Current Language: English Last Modified: 1/20/2026
 Other Languages: NONE Author: Ryan Hendrickson
 Viewed: 281

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Coding Information

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Title: Electric Vehicle State of Charge Calibration

Applies To: All Electric Vehicles

CHANGE LOG

Please refer to the change log text box below for recent changes to this article:

1/20/2025 - Added Note in Diagnostic Step Section.
 04/23/2025 - Initial Article Release.

DESCRIPTION

This document will walk the user through correcting the battery State of Charge (SOC) calibration.

It has been found on some electric vehicles that the SOC calibration can become incorrect over time. Often times this is from the vehicle sitting a long period without use or charging the batteries. This will result in the SOC value on the cluster becoming inaccurate compared to the SOC value in the battery packs. This may also result in a low value for the vehicle range estimate on the EGC.

SYMPTOMS

- Estimated range remaining displayed on the cluster is low for the given remaining SOC.
- SOC decreases significantly faster than expected while operating the vehicle.

DTC/Light	Description
N/A	N/A

SPECIAL TOOLS / SOFTWARE

Tool Description	Tool Number
Service Diagnostic Solutions (SDS)	
Electric Vehicle "Y" Adaptor Cable	08-801-01
Nexiq USB 2 or Nexiq USB 3	

Electric Vehicle "Y" Adaptor Cable 08-801-01 **must** be used when diagnosing and recording signals with SDS. The EV Y adapter cable can only be used with the NEXIQ USB2 or NEXIQ USB3 adapter.

SERVICE PARTS INFORMATION

Kit Description	Part number	Qty. Required	Notes

N/A	N/A	N/A	N/A
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DIAGNOSTIC STEPS

WARNING: To prevent personal injury and / or death, or damage to property, NEVER service a high-voltage vehicle without completing High-Voltage Safety training. Before working on vehicle, read and obey High-Voltage Safety, and Lock-Out Tag-Out safety procedures and information.

NOTE: It is a good practice to confirm the BMS calibration is up to date. Please review [IK4300030](#) for instructions on updating the BMS.

Pre-Entry conditions

- No DTCs related to batteries, cell voltage, or State of Charge (5919-x, 5923-x, 8100-x). If there are DTCs for these items please follow the appropriate FCAP/GUIDE for the DTC.
- Battery health report can be taken at any SOC if the vehicle cannot be charged or driven. It is preferred that the SOC be either 30-50% or 90-100% for the most accurate results. It is preferred that we do not evaluate the SOC in the 60-65% range.
- **After driving/charging the vehicle will need to be parked with the key off for 60 minutes or more.** When the key is turned on to connect with SDS be sure to turn off all additional loads such as fans, heat, A/C, lights, etc. The purpose of waiting 60 minutes after any charging or load being placed on the batteries is to allow the pack voltages to stabilize.

Step	Action	Decision
1	DIAGNOSTIC: <ul style="list-style-type: none"> • Using IK4300027, capture a battery health report. • Open battery health report and review values for battery pack temperatures, see figure 1 below. <p>Are all values at 50°F (10°C) or above?</p>	Yes. Continue to step 2.
		No. Charge/drive the vehicle to warm batteries. See section Warming the High Voltage Batteries below (Link). Then repeat key off 60 minutes and retest this step.

Date Measured	Fri Aug 11 14:00:00 (UTC-07:00)		CAN Trace Name	C:\Users\SDS\Desktop\Diagnosis\SDS_Scan_Data\Recording\BMS\BMS_Health_2023_08_11_140000.csv			
Case #	230499	Details	1.00				
Odometer	6207.89 miles	Hours	3.00 hr	Remaining Distance	29.77 miles		
Discharge Energy	14553.60 kWh	Charge Energy	15524.50 kWh	kWh/Mile	2.344 kWh/miles		
Act SOC %	35.60 %	Cust SOC %	39.20 %	Display SOC %	34.80 %		
				SOH %	95.20 %		
BMS SOC Parameters		Maximum SOC %	49.40 %	Minimum SOC %	28.14 %		
				Display PP SOC%	39.18 %		
String V	618.136 V			618.121 V			
Pack	1		2		3		
Avg Temp	72.80 F		73.10 F		73.10 F		
Pack Volt	206.024	25 %	206.043	30 %	206.069	30 %	
Low Cell	3.266	25 %	3.266	25 %	3.268	25 %	
Avg Cell	3.270	25 %	3.271	30 %	3.271	30 %	
Max Cell	3.273	30 %	3.274	30 %	3.273	30 %	
Cell	Frm	1	SOC	Frm	2	SOC	
	1	1	3.271	30 %	22	3.271	30 %
	2		3.273	30 %		3.270	25 %
	3		3.268	25 %		3.269	25 %
	4	2	3.270	25 %	23	3.268	25 %
					44	3.272	30 %
					65	3.291	55 %
					86	3.259	25 %
					107	3.258	25 %

Figure 1: Battery Health Report (example)

- Item 1: High Voltage Battery Current Draw
- Item 2: Cluster Display SOC Value
- Item 3: Average High Voltage Battery Pack Temp
- Item 4: High Voltage Battery Pack Voltage
- Item 5: Average Cell Voltage

Step	Action	Decision
2	DIAGNOSTIC: <p>Using the battery health report, review the high voltage amperage draw.</p>	Yes. Continue to step 3.

	Is the value at 1.5A or below?	No. Open a technical service case file and share the battery health report on the case.
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Step	Action	Decision
3	DIAGNOSTIC: Using the battery health report, review the battery pack voltage and SOC values from the 6 or 9 high voltage batteries. Are the SOC values with 5% of each other highest to lowest?	Yes. Continue to step 4. No. Open a technical service case file and share the battery health report on the case.

Step	Action	Decision
4	DIAGNOSTIC: <ul style="list-style-type: none"> • Review the battery pack SOC values. • Average the battery pack SOC values (sum of all values, then divide by the count of numbers that were added). • Round to the nearest whole number and record the value. • Next review the "Display SOC%" value. Is the average battery pack SOC value within 10% of the "Display SOC%" value?	Yes. No change is needed. No. Continue to step 5.

Step	Action	Decision
5	DIAGNOSTIC: Review the average battery pack SOC value. Please select from the following:	0-19% SOC. Open a case file and share the battery health report on the case. 20-55% SOC. Continue to step 6. 56-70% SOC. Drive or Charge the vehicle to achieve a SOC value of 20-55% or 71-100%. 71-100% SOC. Continue to step 6.

Step	Action	Decision
6	DIAGNOSTIC: Change the State of Charge values in the BMS. See instructions below. (Link to Repair Steps) It is recommended to confirm the battery pack average SOC value compared to the "Display SOC%" when at both the lower range, 20-55%, and again at the upper range, 90-100%. Please select from the following:	SOC was at or below 55%. Charge to 100%, restart at step 1 to confirm the readings. SOC was at or above 56%. Drive/discharge to achieve approximately 40%, restart at step 1 to confirm the readings.

WARMING THE HIGH VOLTAGE BATTERIES

If the high voltage batteries are below 50°F then it will be difficult to have confidence in evaluating the readings or having confidence after a change is made. There are three ways to warm up the batteries.

- If the batteries are at a high state of charge it is recommended to drive the vehicle for the purpose of warming the batteries.
- If the batteries are at a lower state of charge it is recommended to charge the vehicle for the purpose of warming the batteries. Note that charging with a level 2 (AC) charger is preferred in this case as the slower charge rate will give the batteries more time to warm up.
- Parking indoors overnight is another option as the batteries will warm naturally.

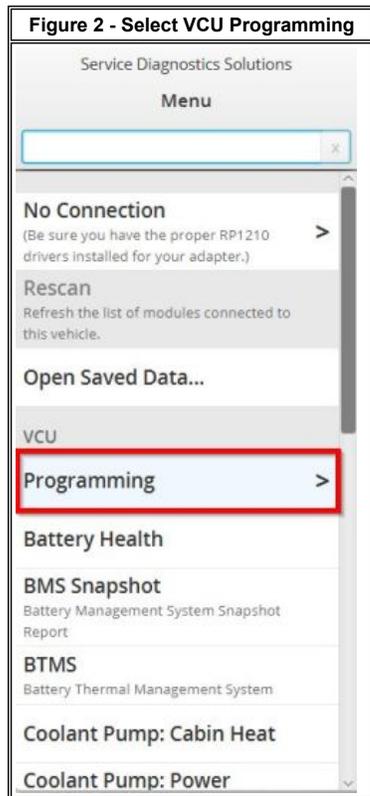
When driving or charging is completed it is recommended to park indoors if possible to avoid losing the increased temperature of the high voltage batteries.

[\(Return to Diagnostics step 1\)](#)

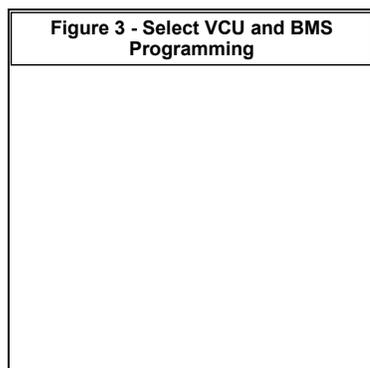
REPAIR STEPS

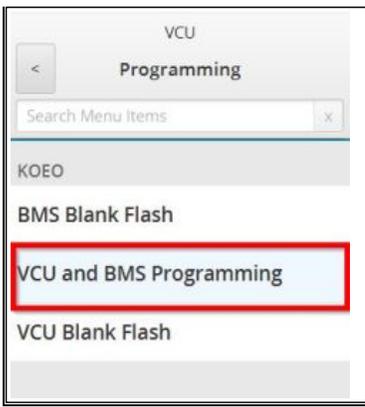
SDS BMS state of charge parameter change instructions

- 1) Open SDS and connect to the vehicle. No need for a health report at this time.
- 2) On the left side menu select VCU Programming.

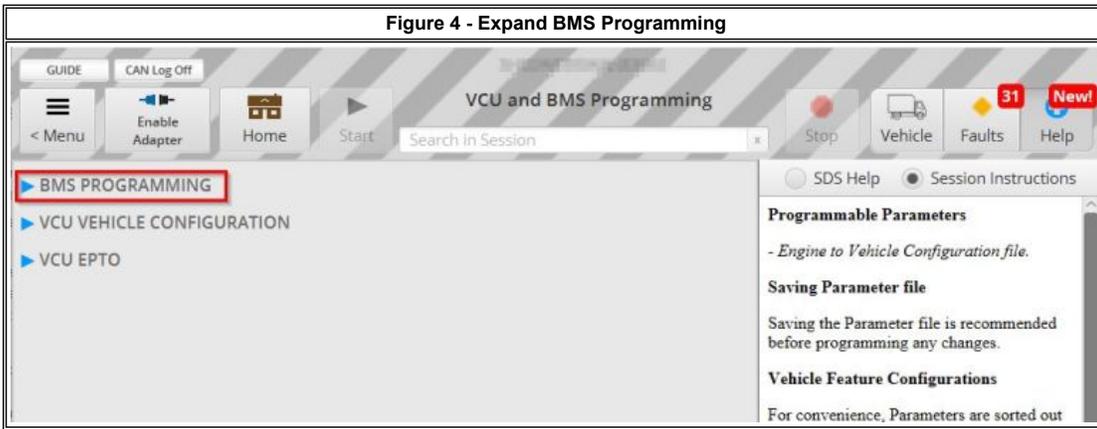


- 3) Select VCU and BMS Programming

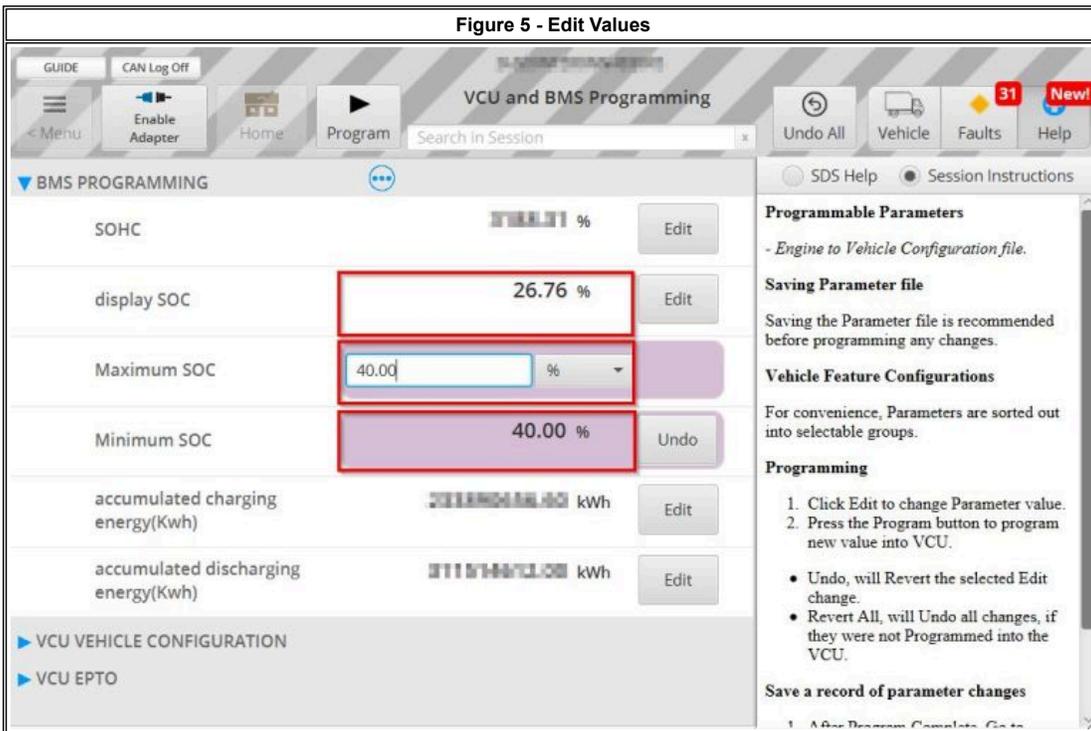




4) Expand BMS Programming



5) Edit Display SOC, Maximum SOC, and Minimum SOC to the average battery pack SOC value identified in step 4. In the example below a parameter that has not been edited yet will be white in color and once edited will be shaded light purple in color. Set all three values to the same number as you identified in step 4.



6) Then select the Program button at the top of the screen to program in the new values. Follow the onscreen prompts to complete the programming.

Figure 6 - Program Values

The screenshot shows the 'VCU and BMS Programming' interface. At the top, there is a navigation bar with 'GUIDE', 'CAN Log Off', 'Home', and a 'Program' button highlighted with a red box. Below this is a search bar and buttons for 'Undo All', 'Vehicle', 'Faults', and 'Help'. The main content area is titled 'BMS PROGRAMMING' and contains a table of parameters:

Parameter	Value	Action
SOHC	100.00 %	Edit
display SOC	40.00 %	Undo
Maximum SOC	40.00 %	Undo
Minimum SOC	40.00 %	Undo
accumulated charging energy(Kwh)	134872045.00 kWh	Edit
accumulated discharging energy(Kwh)	184783944.00 kWh	Edit

Below the table are sections for 'VCU VEHICLE CONFIGURATION' and 'VCU EPTO'. On the right side, there is a 'Programmable Parameters' panel with instructions for saving parameter files and programming.

7) Return to Diagnostics step 6. ([Link to Diagnostics step 6](#))

OTHER RESOURCES

SDS user guide. [4328790](#)
EV resource center. [RC0900002](#)
SRT homepage [Link](#)
Master Service Information [Link](#)

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