

Diagnostic testing of 2018 Toyota Camry Hybrid Li-Ion Cells with LVc-40

BACKGROUND:

→ Hybrid and electric vehicles are increasingly using lithium-ion (Li-ion) batteries for energy storage.

→ Older hybrid vehicles used Nickel-Metal Hydride (NiMH) batteries, which could be:

- Reconditioned and balanced using the EVc-30 from NuVant Systems.
- This tool revolutionized the hybrid aftermarket by enabling shops to remanufacture NiMH batteries.



→ In response to the rise of Li-ion batteries, NuVant Systems developed the LVc-40, designed specifically for:

Testing Li-ion cells

Remanufacturing Li-ion packs



CASE STUDY:

2018 TOYOTA CAMRY HYBRID

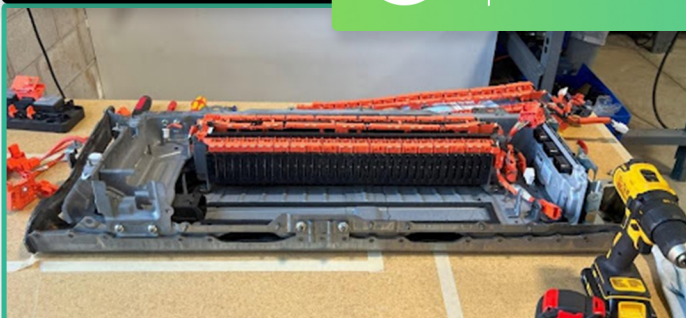
The 2018 Toyota Camry Hybrid was chosen due to its **wide adoption** and **incorporation of li-ion cells**.

The battery pack includes:

- 70 Panasonic EV Energy Li-ion cells
- Connected in series, configured as two sets of 35 cells placed side by side.



Total test time: **2.25** hrs



TESTING PROCEDURE:

1. Preparation → Both sets of 35 cells were:

- Removed from the pack enclosure

2. Connecting Set 1 to the LVc-40 → Each of the 35 cells was connected individually using LVc-40's battery cables:

- One cable end: push-fit into the LVc-40 front panel
- Other cable end: two ring terminals (positive & negative)

→ Connection process:

- Positive terminal: ring terminal placed on positive cell terminal stud and fastened to 50 in-lbs
- Negative terminal: same process for the negative side

- Left clamped in their original restraints

3. Running the Test Plan → Once all 35 cells were connected:

- LVc-40 powered on
- LVcharge software launched
- Ran a discharge/charge cycle to evaluate state of health (SoH)

4. Repeating for Set 2

- Set 1 was removed from the LVc-40.
- Set 2 was connected using the same procedure.
- Ran the same discharge/charge test plan.

Ah capacity test measurements for Toyota Camry Hybrid cells (Set 1)

3.543	3.518	3.515	3.527	3.552
3.537	3.565	3.511	3.559	1.555
3.565	3.515	3.523	3.516	3.595
3.552	3.586	3.509	3.509	3.554
3.586	3.596	3.518	1.641	3.586
3.543	3.518	3.571	1.516	3.596
3.507	3.565	3.547	3.565	3.579

Ah capacity for Toyota Camry Hybrid cells (Set 1) after replacing cells 27, 28, 30

3.543	3.518	3.515	3.527	3.552
3.537	3.565	3.511	3.559	3.499
3.565	3.515	3.523	3.516	3.595
3.552	3.586	3.509	3.509	3.554
3.586	3.596	3.518	3.565	3.586
3.543	3.518	3.571	3.559	3.596
3.507	3.565	3.547	3.565	3.579

Test – Set 2 Results:

- ✓ No cell failures detected
- ✓ All cells balanced at 80% state of charge (SOC)

Both sets (Set 1 and Set 2) were then:

- Reinstalled into the battery pack enclosure
- Ready for vehicle testingcharge (SOC)