Nissan Leaf Battery
Design and Maintenance

By Al Lococo

Nissan recommends owners use the following preventive actions to help maximize the lithium-ion battery's useful life and its ability to hold a charge:

Avoid exposing a vehicle to ambient temperatures above 120 °F (49 °C) for over 24 hours.
Avoid storing a vehicle in temperatures below –13 °F (–25 °C) for over 7 days.

Avoid exceeding 70 to 80% state of charge when using frequent (more than once per week) fast or quick charging.

Allow the battery charge to go below 80% before charging.

Avoid leaving the vehicle for over 14 days where the Li-ion battery available charge gauge reaches a zero or near zero (state of charge).

The Leaf battery pack has 48 modules.

Modules

High energy module (for BEV)

†General specifications

Number of cells		4
Construction		2 parallel 2 series
Dimensions	Length	303 mm
	Width	223 mm
	Thickness	35 mm
Weight		3.8 kg

•Output terminal: M6 Nut
•Voltage sensing terminal: M4 Nut
•Module fixing hole: 9.1 mm in diameter

à UN test results

Each module has 4 cells.

Lithium-ion cells

High energy cell (for Battery Electric Vehicle)

†General specifications

Cell type		Laminate type
Cathode material		$LiMn_2O_4$ with $LiNiO_2$
Anode material		Graphite
Rated capacity (0.3C)		33.1 Ah
Average voltage		3.8 V
Dimensions	Length	290 mm
	Width	216 mm
	Thickness	7.1mm
Weight		799 g

à Cell performance

à UN test results

Each module's cells are in two pairs. Each pair is in parallel .The two pairs are in series.

So, in each Leaf traction battery pack there are 48 modules in series. In other words 96 pairs in series. The pack has 192 cells in a complex series - parallel network.

Fully charged voltage is 403.2volts with a nominal voltage of 360 volts.

The pack is warranted for 8 years or 100,000 miles. The field replaceable unit is one of 48 modules. Module voltage is 7.5 volts and is monitored and managed.

The shape, size and number of cells in each module combined with the design of the enclosure contribute to maintaining safe cell temperatures and cell integrity during a crash.

The pack costs Nissan $9,000to produce or $187.50 per module.

Over time salvage companies will have battery packs and modules available for sale from vehicles with varying mileage and varying module condition. Such modules will offer owners alternative replacements at lower cost depending on the age of the vehicle needing repair.

A 12 volt sealed lead acid battery has 6 cells. Cell voltages can be neither managed, monitored nor cells replaced. A leaf module has a finer granularity than a 12 volt lead acid battery but less fine than a 6 volt lead acid. In other words the Leaf module with 4 cells compares to a 6 volt wit 3 cells or a 12 volt with 6 cells.

No one would expect a dealer to report cell condition in a 12 volt accessory battery nor would they expect cells to be replaced.

Nissan has accepted responsibility for the Leaf battery pack with some reasonable restrictions for 8 years or 100,000 miles. No one, not the owner nor the dealer, needs to know the condition of any individual cell. As an owner I am content to know that if a module needs replacement it will be detected and replaced at a reasonable cost to Nissan and no cost to me. When the warranty expires I am confident that reasonably priced salvaged modules will be available commensurate to the condition of the vehicle at that time and that there will be service available at garages, other than dealerships, capable of doing the replacement.