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Caution:

- 1. EVc units cannot be used safely without a battery pack cooling box and fan.
- 2. EVc units should not be used without training from NuVant staff.
- 3. EVc users must wear safety glasses.
- 4. EVc users should use safety barriers (e.g. Plexiglas, poly-carbonate, shatter proofglass, etc.) for protection during pack reconditioning.
- 5. EVd users should use an insulating electrical mat, safety glasses and high voltage gloves.
- 6. Always wear personal protective equipment when assembling battery packs, connecting the battery to EVd harness, operating the power tester, and installing the battery into enclosures. NuVant Systems is not responsible for any property damage and/or injury that occurs during use of equipment.

Failure to take the above precautions will result in injury or death.

Abbreviations/Symbols

(Glossary of Terms can be found at end of document)

Α	amp
Ah	amp-hour
DOD	depth of discharge
HV	high-voltage
1	current
Li-ion	lithium ion
NiCad	nickel cadmium
NiMH	nickel metal hydride
Ω	ohm
οςν	open circuit voltage
QR code	Quick Response code (found on Toyota modules)
Res	resistance
SOC	state of charge
V	voltage
Wh	watt-hour

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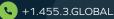
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Software:

- EVcharge used for EVc operation and data analysis.
- TeamViewer used for remote training by NuVant staff and diagnostics.
- WPS Office used for module data analysis and pack building.
- Battery Pack Builder used for module data analysis and pack building.



Files (EVc Materials folder):

Resources:

- Battery Webinar.pdf Printable copy of Battery Repair Webinar
- Full EVc and EVd Manual.pdf user manual for EVc operation
- Pack Builder Manual.pdf user manual for Pack Builder operation
- Honda Reconditioning Instructions.pdf Instructions on how to connect Honda
 modules and build cooling box
- Pack Builder (Empty).xlsx Empty copy of Pack Builder sheet, with inventory and templates Plan

EVc Software and Files

Files:

- Ford Escape Plan.xml
- Honda Cylindrical Plan.xml
- Toyota 10 Cell Plan.xml
- Toyota Prius and Camry (Steps 3-8).xml
- *Toyota Prius and Camry Plan.xml
- Ford Fusion Plan.xml
- Toyota 8 Cell (Highlander) Plan.xml
- Toyota 12 Cell Plan.xml
- Toyota Prius and Camry (Steps 5-8).xml

*this is the primary plan







BIOPHARM

Phenolphthalein indicator

Core Inspection

Tools Needed:

- Socket wrenches (to remove enclosure)
- HV plug (to remove enclosure, see images below)
- Voltmeter (to read module voltages)
- QR code scanner (to read/store QR codes)
- Spray bottle with phenolphthalein solution (1%)



Camry ('07-'11)



HV Plug 2: Prius ('11-'15), Camry ('12-'17)

QR code scanner

*Phenolphthalein Leak Test:

- 1. Fill a spray bottle with 1% phenolphthalein solution
- 2. Spray the sides of battery modules, including terminals
- 3. Wait a few minutes
- 4. The clear solution will turn pink indicating the presence of leaking electrolyte
- 5. Remove/reject leaking modules
- 6. Wipe solution off of modules with wet towel

Pre-Reconditioning

Procedure

- 1. Visually inspect the outer enclosure
- 2. REJECT any cores that have:
 - A. Painting on part or entire enclosure
 - B. Third-party reconditioner/rebuild labels or logos
 - C. Damage/markings
- 3. Remove outer enclosure and inspect modules
- 4. REJECT any cores that have:
 - A. Leaking modules (white powder at terminals, or stains on bottom plate) Phenolphthalein solution can also be used to detect leaks*
 - B. Modules with visible markings (for example, numbers, marker pens, tape, stickers)
 - C. Modules with voltages below 6 V
 - D. Non-sequential modules (QR codes should read in a sequential fashion)

Pre-Screening Process

After cores arrive, their enclosures must be opened to pre-screen the modules.

- 1. Inventory and document cores
 - A. Vehicle type
 - B. Number of modules
 - C. Markings
- 2. Remove outer enclosure from cores
- 3. Remove modules from tie rods and note any markings on modules
- 4. Manually measure module voltage with voltmeter (reject if below 6V)
- 5. Scan module QR codes and record module mass in "Inventory A" spreadsheet
- 6. Place modules in "Inventory A -Pre-reconditioned Modules" shelf











Preparation

8

- 1. From the Module Inventory A shelf select 30 modules
- 2. Number modules (User Label) on one side. This is your own numbering system.
- 3. Install modules into tie rods. For the Toyota Prius tie rods, assemble 28 modules, and for Toyota Camry, connect 34 modules. These are the four metal rods (two below & two above) and end plates. Alternate the positive and negative terminals on each side.

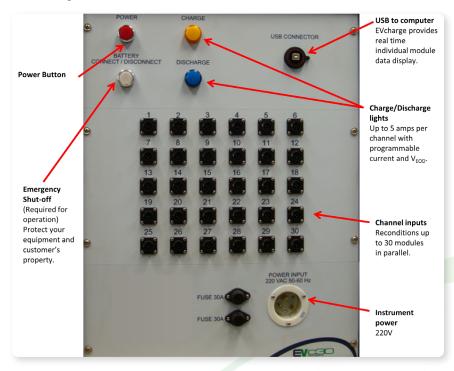


28 modules clamped with tie rods and end plates

- 4. Make sure that your modules are clamped securely and place onto the cooling box.
- 5. Connect the EVc cables to the modules using the ring terminals. Do not exceed torque of 50 in-lbs (use a medium setting on drill).
 - A. EVc-30: For Prius, connect the first 28 cables and disconnect cables 29 and 30 from the front panel. For Camry, connect 30 cables and save the remaining 4 modules for later reconditioning.
 - B. EVc-12: For Prius & Camry, connect 12 cables to first 12 modules. You can only recondition 12 modules at a time.
- 6. THE COOLING BOX AND FAN MUST BE ON DURING RECONDITIONING.

Module Reconditioning - EVc

Connecting the EVc and software



 Push red button to turn on EVc and turn on laptop. Make sure USB cord from the EVc is connected to the laptop. Open the EVcharge software located on the desktop.



2. The laptop should automatically recognize the device. Close the National Instruments prompt (select "do nothing").

1)





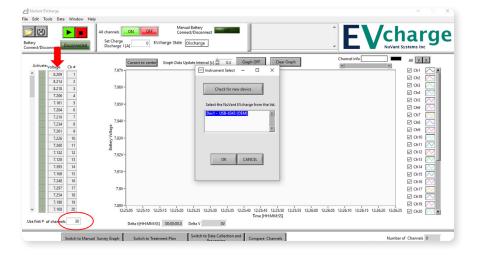




Module Reconditioning – EVc

y ect/Disc	connect	Disconnected	All channels ON OF Set Charge Discharge I [A]	EVcharge State Discharge	OFF			charge NuVant Systems Inc
			Cursors to cer		43 (OEM) "Dev1" - NI Device	Monitor X	Channel info	All V X
Activate	Voltage	Ch#	7.97V-		Device Detected		*	
X	0.000	0			Device Detected			Ch2
X	0.000	0	7.96V-	•	NI USB-6343 (OEM	A)		☑ Ch3
X	0.000	0	7.96V -		Dev1			
100	0.000	0			Devi			Ch5
×.	0.000	0	7.95V-					2 Ch6
X	0.000	0		Test this device		Go +		Ch7 1
1	0.000	0	7.94V -	using Test Panels	5			☑ Ch8
	0.000	0	a	Configure and t	last this davice			Ch9
1	0.000	0	5 7.93V -		ement & Automation Explore	Go *		Ch10
1		0	-2-3-17.93V -	-				
1		0		View online dev	vice documentation	Go -		
		0	7.92V -	-				Ch12 V
1		0		-O View device pin	outs	Go v		Ch14
X		0	7.91V-	-O Herrice pin				
X		0		0				
X		0	7.9V -	O Do nothing		Dismiss *		
X		0	1.44					Ch18
X	0.000	0						Chia Chia
X		0	7.89V-	12:25:15 12:25:20 12:25:25 12:25:	20 12/25/25 12/25/40 12/25		12:26:05 12:26:10 12:26:15 12:26:3	

3. The "Instrument Select" window should automatically open. Select your device from the list and click "OK." If you have previously used this instrument on this laptop, it may automatically connect (the module voltages appear on the left hand side).



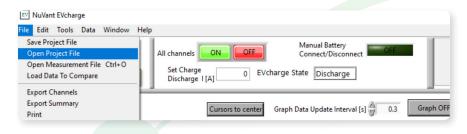
Module Reconditioning – EVc

- 4. If the window does not appear, under "Tools," click "Configure" to re-open the "Instrument Select" window. Once EVcharge software recognizes the EVc instrument, you should see the correct voltage readings for the channels on the left side of the window (under Voltage).
- 5. Type in the correct number of channels to use in the "Use first # of channels" box. This is usually 28 or 30, depending on how many modules you connect. For example, when reconditioning just a Toyota Prius pack, channels 29 and 30 are inactive.

Opening and running plan (or project) file

The project plan file contains the appropriate charge/discharge steps for each type of battery. For each step, the individual modules either charge or discharge to the appropriate cut-off voltage or time limit. Once all modules reach the cut-off, the next step begins. This plan/recipe is all contained in the project file. No other input needed from the EVc user aside from the steps below.

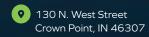
 Go to "File" > "Open Project File". Select the proper plan file (.xml) to open. For Toyota Prius and Camry modules, select the "Toyota Prius and Camry Plan.xml".





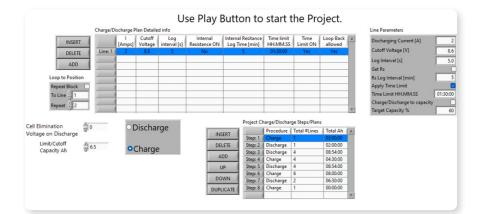


1)



$\rightarrow \cdot \uparrow = \circ$	Webinar > EVc Material > Plan Files >	~	C 🔎 Search	n Plan Files
janize 👻 New folder				≣ - □
🞍 Downloads 🖈	Name	Date modified	Туре	Size
📔 Documents 🖈 🔒	🥫 Extra Plan Files	4/12/2022 2:12 PM	File folder	
🔁 Pictures 🛛 🖈	Ford Escape Plan.xml	8/6/2020 2:40 PM	XML Document	27 KB
🕳 nuvantsyster 🖈	Ford Fusion Plan.xml	6/8/2020 11:29 AM	XML Document	27 KB
🕳 jonathanhier 🖈	🚽 Honda Cylindrical Plan.xml	6/3/2020 10:42 AM	XML Document	36 KB
SPEC SHEETS *	Toyota 10 Cell Plan.xml	3/18/2020 2:43 PM	XML Document	27 KB
Channel 1.0	Toyota 12 Cell Plan.xml	3/18/2020 2:56 PM	XML Document	27 KB
	🔊 Toyota Highlander Plan.xml	3/18/2020 2:47 PM	XML Document	27 KB
myself	Toyota Prius and Camry (Steps 3-8).xml	3/16/2020 4:17 PM	XML Document	27 KB
NUVANT PRODU	Toyota Prius and Camry (Steps 5-8).xml	3/16/2020 4:18 PM	XML Document	21 KB
Spec Sheets	Toyota Prius and Camry Plan.xml	6/3/2020 11:11 AM	XML Document	27 KB
Dropbox				
Nuvant Systems I				
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File nam	ne: Toyota Prius and Camry Plan.xml		Custom Pat	ttern (*.xml;*XML)

2. When the file opens, your treatment plan oyota Prius and Camry Plan.xml" will be displayed. **Detailed plan steps are shown in Appendix.**



Module Reconditioning - EVc

- 3. Click the green "PLAY" button on the upper left to start the reconditioning.
 - A. Make sure that the "Battery Connect/Disconnect" button is pushed in on the EVC front panel.
 - B. If your EVc software is not activated for your instrument, please contact us.
 - C. If you have the activation code for your instrument, go to "Help" > "Advanced Activate" and enter the code.

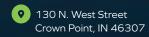


- 4. A window will pop up asking where to save your data files.
 - A. Click on desktop under "Quick Access" on the left.
 - B. Click "New Folder" and name it something such as "Pack 1"
 - C. Click into the newly created folder and select "OK".

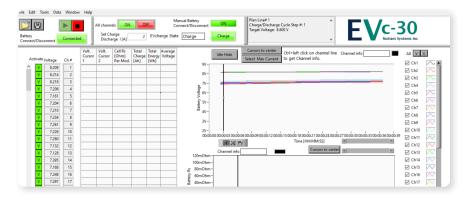
EV Choose or Enter Pat	h of File			×
\leftrightarrow \rightarrow \checkmark \uparrow	> This PC > Desktop > Pack 1	~	C 🔎 Searc	h Pack 1
Organize 👻 New fo				≣ • 💷 🚯
🛨 Quick access 👔	Name	Status	Date modified	Туре
E Desktop 📌	N	lo items match your s	earch.	
🚽 Downloads 🖈		-		
📔 Documents 🖈				
🔀 Pictures 🛛 🖈				
🕳 jonathanhie 🖈				
File	name: 5_24_2022_at_19_6		Custom Pa	ttern (*.csv;*.CSV) V
			ОК	Cancel
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 When the reconditioning process starts, you will hear a click and the "Activate" channel lights will turn green in the software. The process will take 20-24 hours.

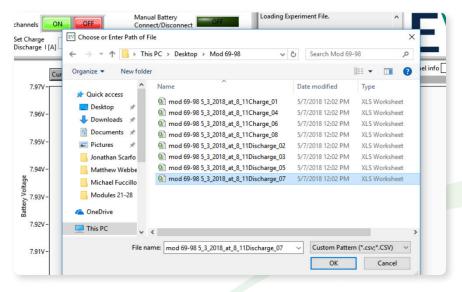


6. When reconditioning ends, the software will display "Plan Completed" and all the green lights on the left will turn off. You are now ready to view the data results.

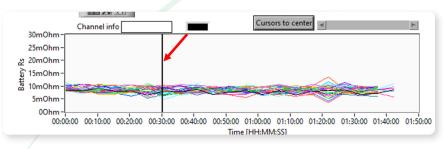
Building Inventory

Exporting summary files from data

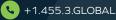
- 1. Open EVcharge software and select "Open Measurement File" under "File" in the Toolbar.
- 2. Select the discharge file used for diagnostic (in this case, "Discharge_07"). The data will load.



 Click on the "Battery Rs" window to fill the "Cell Rs" (Resistance) column of the data. Move the cursor to the 30 minute mark.









6		Building Inventor
4. Click "File"	> "Export Summary"	VuVant EVcharge
		File Edit Tools Data Window Help Save Project File Open Project File All of Open Measurement File Ctrl+O Load Data To Compare All of Open Measurement File Ctrl+O All of Open Measurement File
		Export Channels Export Summary Print

5. Enter the QR codes and User Custom Number. Use the QR code reader included with the instrument.

End

Ctrl+F4

8 713

1	OR CODES	User Custom		harg
	QR CODES	Number	Load Last	0318 2 AM
CH 1	243HNG06414E	69	Clear Table	
CH 2	26ZH7G12591E	70		-
CH 3	283H8A16514E	71	Cancel	Ctrl+
CH 4	03XHOG07254D	72	Accept	to ge
CH 5	03XHOG07248D	73	Ассерг	-
CH 6	243HKG05438E	74	Factory	
CH 7	26ZH7G12594E	75	Date	
CH 8	243HIG03777E	76		
CH 9	243HMG06195E	77	Auto Fill in	
CH 10	265G3A13389B	78	Custom Numbers	
CH 11	265G3A13381B	79	custom numbers	
CH 12	265G3A13313B	80		
CH 13	012LOM07242G	81	Initial N for	1
CH 14	244HOA05042E	82	Autopopulate	1

6. Click accept and save the summary file as "Summary" in the same folder as your data.

Adding Modules to Your Inventory

1. Open Battery Pack Builder

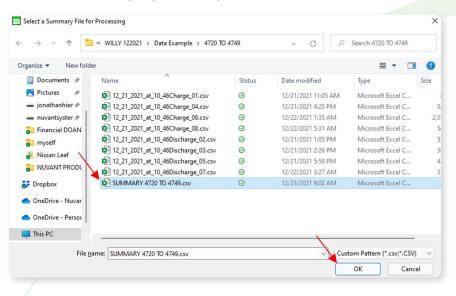


Building Inventory

2. To add modules to your inventory, go to File, Add Summary

e Help								
New	Ct	rl+N	erate Report Hi	gh Resistance	Low Capac	ity		
Add Sum	mary File Ct	rl+Shift+A		grittesistance	con copue			
End	Ct	rl+Q						
Pa	ick Size		SortBy	∕ Capacity	ty By Energy		Extract Best	Pla
		Module EVc Con. #	Run ID	Process Date	Capacity [Ah]	Energy [Wh]	Rs [Ohm]	
	Line: 1	and the second	Run ID 4F5DE878					со
	Line: 1 Line: 2	EVc Con. #		Date	[Ah]	[Wh]	[Ohm]	co 01ZSNN0977
		EVc Con. # P: 12 C: 1	4F5DE878	Date 12/22/2021	[Ah] 4.907	[Wh] 36.96	[Ohm] 0.0115	co 01ZSNN0977 01ZSNN0977
	Line: 2	EVc Con. # P: 12 C: 1 P: 12 C: 2	4F5DE878 4F5DE878	Date 12/22/2021 12/22/2021	[Ah] 4.907 4.268	[Wh] 36.96 31.93	[Ohm] 0.0115 0.0168	co 01ZSNN0977 01ZSNN0977 01ZSFN0348
	Line: 2 Line: 3	EVc Con. # P: 12 C: 1 P: 12 C: 2 P: 12 C: 4	4F5DE878 4F5DE878 4F5DE878	Date 12/22/2021 12/22/2021 12/22/2021	[Ah] 4.907 4.268 5.002	[Wh] 36.96 31.93 37.49	[Ohm] 0.0115 0.0168 0.0110	01ZSNN0977 01ZSNN0977 01ZSFN0348 01ZSNN0976
	Line: 2 Line: 3 Line: 4	EVc Con. # P: 12 C: 1 P: 12 C: 2 P: 12 C: 4 P: 12 C: 22	4F5DE878 4F5DE878 4F5DE878 4F5DE878 4F5DE878	Date 12/22/2021 12/22/2021 12/22/2021 12/22/2021	[Ah] 4.907 4.268 5.002 4.054	[Wh] 36.96 31.93 37.49 30.56	[Ohm] 0.0115 0.0168 0.0110 0.00957	co 01ZSNN0977 01ZSNN0977 01ZSFN0348 01ZSNN0976 01ZSNN0975
	Line: 2 Line: 3 Line: 4 Line: 5	EVc Con. # P: 12 C: 1 P: 12 C: 2 P: 12 C: 4 P: 12 C: 22 P: 12 C: 25	4F5DE878 4F5DE878 4F5DE878 4F5DE878 4F5DE878 4F5DE878	Date 12/22/2021 12/22/2021 12/22/2021 12/22/2021 12/22/2021	[Ah] 4.907 4.268 5.002 4.054 4.177	[Wh] 36.96 31.93 37.49 30.56 31.36	[Ohm] 0.0115 0.0168 0.0110 0.00957 0.0198	01ZSNN0977 01ZSNN0977 01ZSNN0977 01ZSFN0348 01ZSNN0975 01ZSNN0975 01ZSNN0975

3. Choose the summary file you wish to import and click OK









Building Inventory

 The software will automatically separate "High Resistance" and "Low Capacity" modules into their own tabs. All satisfactory modules will be added to your "Inventory."

	Module EVc Con.#	Run ID	Process Date	Capacity [Ah]	Energy [Wh]	Rs [Ohm]	QR code	DAQ SN	Nominal Voltage [V]	User Label
Line: 1	P: 12 C: 3	4F5DE878	12/22/2021	3.999	30.00	0.0236	01ZSNN09780L	1E5FC08	7.502	4722
Line: 2	P: 12 C: 5	4F5DE878	12/22/2021	3.143	23.00	0.0935	01ZSNN09786L	1E5FC0B	7.318	4724
Line: 3	P: 12 C: 7	4F5DE878	12/22/2021	3.421	25.60	0.0221	01ZSNN09788L	1E5FC0B	7.484	4726
Line: 4	P: 12 C: 9	4F5DE878	12/22/2021	2,489	18.70	0.0340	01ZSNN09790L	1E5FC0B	7.511	4728
Line: 5	P: 12 C: 23	4F5DE878	12/22/2021	2.905	21.54	0.0599	01ZSNN09759L	1E5FC0B	7.413	4742
Line: 6	P: 12 C: 27	4F5DE878	12/22/2021	3.088	23.15	0.0453	01ZSNN09755L	1E5FC0B	7.496	4746
Line: 7	P: 12 C: 29	4F5DE878	12/22/2021	4.975	36.19	0.0514	01ZSNN09753L	1E5FC0B	7.275	4748



	Module EVc Con. #	Run ID	Process Date	Capacity [Ah]	Energy [Wh]	Rs [Ohm]	QR code	DAQ SN	Nominal Voltage [V]	User Label	-
Line: 1	P: 12 C: 6	4F5DE878	12/22/2021	0.001509	0.01107	0.00	01ZSNN09787L	1E5FC08	7.334	4725	1
Line: 2	P: 12 C: 8	4F5DE878	12/22/2021	0.001509	0.01038	0.00	01Z5NN09789L	1ESFC08	6.874	4727	1
Line: 3	P: 12 C: 10	4F5DE878	12/22/2021	0.001509	0.01060	0.00	01ZSNN09791L	1E5FC0B	7.023	4729	1
Line: 4	P: 12 C: 11	4F5DE878	12/22/2021	0.001509	0.01038	0.00	01ZSNN09792L	1E5FC0B	6.874	4730	1
Line: 5	P: 12 C: 12	4F5DE878	12/22/2021	0.001509	0.01048	0.00	01ZSNN09793L	1ESFC0B	6.944	4731	1
Line: 6	P: 12 C: 13	4F5DE878	12/22/2021	0.001509	0.01067	0.00	01ZSNN09794L	1E5FC0B	7.068	4732	1
Line: 7	P: 12 C: 14	4F5DE878	12/22/2021	0.001509	0.01041	0.00	01ZSNN09795L	1E5FC08	6.896	4733	1
Line: 8	P: 12 C: 15	4F5DE878	12/22/2021	0.001509	0.01048	0.00	01ZSNN09796L	1ESFC0B	6.946	4734	1
Line: 9	P: 12 C: 16	4F5DE878	12/22/2021	2.489	18.84	0.0116	01ZSNN09797L	1E5FC0B	7.569	4735	1
Line: 10	P: 12 C: 17	4F5DE878	12/22/2021	2.621	19.93	0.0164	01ZSNN09798L	1E5FC08	7.606	4736	1

Pack Size		SortBy	Capacity Sor	ty By Energy		xtract Best		ile Used fo	r last Summary	_
	Module EVc Con. #	Run ID	Process Date	Capacity [Ah]	Energy [Wh]	Rs [Ohm]	QR code	DAQ SN	Nominal Voltage [V]	User Label
Line: 1	P: 12 C: 1	4F5DE878	12/22/2021	4.907	36.96	0.0115	01ZSNN09778L	1E5FC0B	7.532	4720
Line 2	P: 12 C: 2	4F5DE878	12/22/2021	4.268	31.93	0.0168	01ZSNN09779L	1E5FC0B	7.479	4721
Line: 3	P: 12 C: 4	4F5DE878	12/22/2021	5.002	37.49	0.0110	01ZSFN03485L	1E5FC0B	7.495	4723
Line: 4	P: 12 C: 22	4F5DE878	12/22/2021	4.054	30.56	0.00957	01ZSNN09760L	1E5FC08	7.537	4741
Line: 5	P: 12 C: 25	4F5DE878	12/22/2021	4.177	31.36	0.0198	01ZSNN09757L	1E5FC0B	7.507	4744
Line: 6	P: 12 C: 26	4F5DE878	12/22/2021	4.040	30.35	0.0106	01ZSNN09756L	1E5FC0B	7.512	4745
Line: 7	P: 12 C: 28	4F5DE878	12/22/2021	4.213	31.65	0.0170	01ZSNN09754L	1E5FC0B	7.512	4747
Line: 8	P: 12 C: 30	4F5DE878	12/22/2021	5.124	38.35	0.00891	01ZSNN09752L	1E5FC0B	7,484	4749

Building Inventory

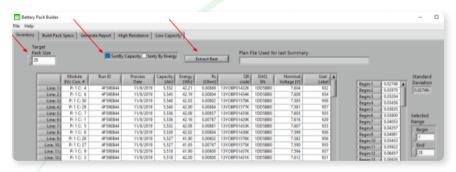
5. Note that your Battery Pack Builder data is stored on your computer under "Documents" in the "EVc-BatteryInventory" folder. This includes the "High Resistance," "Low Capacity," "Inventory" and "Used for Packs" modules. Battery Pack Builder clears the High Resistance and Low Capacity tabs automatically (each time you close the software), but the module data is stored in these CSV files.

	ry .			
+ New ~		Sort 🗸 🗮 Vi	iew ~ •••	
- → · ↑	> This PC > Documents > EVc-BatteryInvent	ory		~ C)
🔶 Quick access	Name	Status	Date modified	Туре
E Desktop	* EVc_HighRes_Inventory.csv	0	4/19/2022 6:50 PM	Microsoft Excel Com
↓ Downloads	EVc_Inventory.csv	\odot	4/19/2022 6:50 PM	Microsoft Excel Com
Documents	EVc_LowCap_Inventory.csv	\odot	4/19/2022 6:50 PM	Microsoft Excel Com
	EVc_UsedForNewPack_Inventory.csv	0	4/28/2022 11:24 AM	Microsoft Excel Com

6. Continue adding modules to your "Inventory" via summary files until you have enough to build a pack.

Build Toyota Prius Pack (28 modules) from Inventory

- 1. Go to "Inventory"
- 2. On Target Pack Size, choose 28
- 3. Click "Sort By Capacity"
- 4. Click "Extract Best"









Building Inventory

5. Click "Build Pack Specs" tab. This shows you the modules chosen and how to arrange them as blocks. This also shows what the block voltages are on the right.

Help											
entory Bu	ild Pack Specs	Generate Report	rt High Resistar	ce Low Capaci	ty						
										Build Pack Summ	
+	1st Module User Label	2nd Module User Label	1nd Module QR code	2nd Module QR code	1st Module EVc Con.#	2nd Module EVc Con.#	1st Module Voltage [V]	2nd Module Voltage [V]	Total Voltage [V]	Min Voltage	15.082
lock 1	942	3959	13YOBP01562K	19457M11240L	P11C:14	Pt 4 Ct 20	7.623	7.459	15.08	Min voltage	137/16
lock 2	946	3956	13YOBP01566K	043T9N00531L	Pt 1 C: 18	P: 4 C: 17	7.620	7.469	15.09		
lock 3	945	957	13YOBP01565K	13YOBP01577K	Pi 1 Ci 17	Pi 1 Ci 29	7.619	7.581	15.20	Max Voltage	15.205
lock 4	930	956	13YOBP01430K	13YOBP01576K	P11C:02	Pi 1 Ci 28	7.618	7.582	15.20		
lock 5	929	958	13YOBP01429K	13YOBP01578K	Pi 1 Ci 01	Pi 1 Ci 30	7.616	7.585	15.20	Difference	0.123
lock 6	947	938	13YOBP01567K	13YOBP01438K	Pt 1 C: 19	P: 1 C: 10	7.612	7.587	15.20	Difference	0.121
lock 7	931	939	13YOBP01431K	13YOBP01439K	Pt 1 C: 03	P: 1 C: 11	7.612	7.588	15.20		
lock B	948	955	13YOBP01568K	13YOBP01575K	P: 1 C: 20	P: 1 C: 27	7.610	7.590	15.20		
lock 9	949	954	13YOBP01569K	13YOBP01574K	Pi 1 Ci 21	Pi 1 Ci 26	7.609	7.593	15.20		
lock 10	934	937	13YOBP01434K	13YOBP01437K	P: 1 C: 06	P: 1 C: 09	7.608	7.594	15.20		
lock 11	933	953	13YOBP01433K	13YOBP01573K	P: 1 C: 05	P: 1 C: 25	7.607	7.598	15.21		
llock 12	952	936	13YOBP01572K	13YOBP01436K	Pi 1 Ci 24	Pi 1 Ci 08	7.604	7.599	15.20		
Block 13	932	950	13VOBP01432K	13YOBP01570K	P:1C:04	P: 1 C: 22	7.604	7.600	15,20		

6. In this example, Block 1 is Mod# 942 and 3959, Block 2 is 946 and 3956, Block 3...

	1st Module User Label	2nd Module User Label	1nd Module QR code
Block 1	942	3959	13YOBP0156
Block 2	946	3956	13YOBP0156
Block 3	945	957	13YOBP0156
Block 4	930	956	13YOBP0143

7. Click "Generate Report" tab. Fill in Company, Battery Pack Build, and Description.

felp		
ntory Build Pack Specs Generate Report High Resistance	Low Capacity	
Company John Smith Company Battery Pack Build 001	Description This is the first Toyota Prius Pack for John Smith Company. Vehicle #123450	Generate Report in HTML

Building Inventory

- 8. Click "Generate Report in HTML"
- 9. The default save location is under "Documents" and "EZware_user_files." Type a file name (e.g., John Smith 001) and click OK.

25 Choose or Enter Path of File				×
\leftarrow \rightarrow \checkmark \uparrow \uparrow This PC \rightarrow Documents \rightarrow EZware_user_F	iles	~ C		user_Files
Organize 🔻 New folder			≣ •	· 💷 😗
 jonathanhier >> Name nuvantsyster >> Financial DOAN myself NUVANT PRODI SPEC SHEETS AN Dropbox Nuvant Systems I OneDrive - Nuvar OneDrive - Persor This PC 	Status No items match y	Date modified your search.	Туре	Size
See Network File name: John Smith 001		~	Custom Pattern (*.*; OK	Cancel

10. Both an HTML and a CSV file will be saved. You can open the HTML file to view your pack.

Johr	n Smith 001.html	× +							
	C 🛈 File	C:/Users/jdoan/	/OneDrive%20-%20I	Nuvant%20System:	s%20Inc/Docum	ents/EZware_user	_Files/John%20S	mith%20001.html	
ohn S	mith Co	mnony							
01			n Company. Vehicle	#123450					
01			a Company. Vehicle Ind Module QR code		lst Module EVc Con. #	2nd Module EVc Con. #	1st Module Voltage [V]	2nd Module Voltage [V]	Total Voltage [V]

Block 1	942	3959	13YOBP01562K 194S7M11240L P: 1 C: 14	P: 4 C: 20	7.623	7.459	15.08
Block 2	946	3956	13YOBP01566K 043T9N00531L P: 1 C: 18	P: 4 C: 17	7.620	7.469	15.09
Block 3	945	957	13YOBP01565K 13YOBP01577K P: 1 C: 17	P: 1 C: 29	7.619	7.581	15.20
Block 4	930	956	13YOBP01430K 13YOBP01576K P: 1 C: 02	P: 1 C: 28	7.618	7.582	15.20
Block 5	929	958	13YOBP01429K 13YOBP01578K P: 1 C: 01	P: 1 C: 30	7.616	7.585	15.20
Block 6	947	938	13YOBP01567K 13YOBP01438K P: 1 C: 19	P: 1 C: 10	7.612	7.587	15.20
Block 7	931	939	13YOBP01431K 13YOBP01439K P: 1 C: 03	P: 1 C: 11	7.612	7.588	15.20
Block 8	948	955	13YOBP01568K 13YOBP01575K P: 1 C: 20	P: 1 C: 27	7.610	7.590	15.20
Ricely 0	0.10	054	13VOBD01560K 13VOBD01574K D-1 C-21	D-1 C-26	7 600	7 503	15 20







Appendix

Plan file: Toyota Prius and Camry (Trickle Charge) 120.xml

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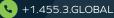
		Current	Cut-off	Time limit	SOC estimate (end of step, assume 6 Ah	
tep	Туре	(A)	(V)	(HH:MM:SS)	capacity)	Note
1	Charge	2	8.6	01:30:00	75%	Assume module at 25% or 1.5 Ah
2	Discharge	1	5	02:00:00	25%	Disconnect module below 6V
3	Discharge	3	6.5	02:00:00	0%	
		0	2.5	00:00:10	0%	
		1.5	3	02:00:00	0%	
		0	2.5	00:15:00	0%	
4	Charge	2	8.4	01:30:00	50%	
		0	10	00:00:10	50%	
		1.5	8.4	01:00:00	75%	
		0	10	00:10:00	75%	
5	Discharge	3	6.5	02:00:00	25%	
		0	2.5	00:00:10	25%	
		1.5	3	02:00:00	0%	
		0	2.5	00:15:00	0%	
6	Charge	2	8.6	02:00:00	50%	
		0	10	00:10:00	50%	
		1	8.6	02:00:00	83%	
		0	10	00:10:00	83%	
		0.5	9.6	04:00:00	100%	Trickle Charge (less than C/10)
		0	10	00:10:00	100%	
7	Discharge	3.25	6	02:00:00	0%	
		0	3	00:18:00	0%	
8	Charge	1.5	8.6	n/a	60%	Charge to 60%

Appendix

Glossary Of Terms

- Amp (I) Unit for measurement of electric current as 1 coulomb/second.
- Amp-hour capacity (Ah) Battery charge capacity. Defined as current output multiplied by time. A battery capable of outputting 2 Amp of current for 2 hours is a 4 Ah battery.
- **Anode** The negative battery terminal during discharge. In a charged NiMH battery this is designated as MH, where M is a mixed metal and H is a hydrogen.
- C-rate Discharge current is expressed as a C-rate in order to normalize against battery capacity, which varies between different batteries. A C-rate is a measure of the rate at which a battery is discharged relative to its maximum capacity. A 1C rate means that the discharge current will discharge the entire battery in 1 hour. For a 100 Ah battery, this equates to a discharge current of 100 Amps. A 5C rate for this battery is 500 Amps. C/2 is 50 Amps.
- **Cell -** The smallest form a battery can take. Comprised of a single anode/cathode pair, a separator, and an electrolyte.
- Charge current The battery is charged at ~1C-rate (to roughly 70 percent SOC) before transitioning to lower C-rates (tapering eventually to ≤ C/10)
- Current Flow of electric charge measured in amps I or coulombssecond
- **Cut-off voltage -** Also called the end of discharge voltage or VEOD.
- Cycle A single sequence of charge and discharge.
- **Cycle life** An estimate of the number of cycles a battery can be subjected to before it no longer meets performance standards. Actual cycle life is dependent on factors such as temperature, DOD, cycling rate, etc.
- **Depth of discharge (% DOD)** The percentage of battery capacity that has been discharged expressed as a percentage of maximum capacity. A discharge to at least 80 % DOD is referred to as a deep discharge.[1]
- **Electrolyte** A chemical solution which conducts electric current by means of mobile ions. The NiMH battery electrolyte is potassium hydroxide in water (30%).
- Energy density (Wh/L) Energy in the battery per unit volume. Characteristic of chemistry and packaging design. Determines battery size needed to achieve a given electric range for the vehicle.







Glossary Of Terms (Cont'd)

- **Float charge -** Constant current charging at a current low enough rate (C/10 or less) to avoid swelling due to oxygen evolution at the positive electrode.
- Internal resistance () Resistance to flow of current within only the cell or module itself.
- Maximum continuous discharge current The maximum current at which the battery
 can be discharged continuously. This limit is usually defined by the battery
 manufacturer in order to prevent excessive discharge rates that would damage the
 battery or reduce its capacity. Along with the maximum continuous power of the
 motor, this defines the top speed and acceleration of the vehicle.[1]
- Maximum 30-sec discharge pulse current The maximum current at which the battery can be discharged for pulses of up to 30 seconds. This limit is usually defined by the battery manufacturer in order to prevent excessive discharge rates that would damage the battery or reduce its capacity. Along with the peak power of the electric motor, this defines the acceleration performance (0-60 mph time) of the vehicle. [1]
- Memory effect An issue in NiMH and NiCd batteries observed after repetitive low DOD cycles in which the battery seems to "remember" this low DOD and behave as though it represents full discharge. This results in reversible loss of capacity due to increased resistance in the repeatedly uncycled material within the battery.
- Module Several battery cells connected in series. The total voltage of the module is the sum of the individual cell voltages. The nominal module voltage for Toyota prismatic NiMH batteries is 7.2 V.
- Nominal voltage The reference, or standard, voltage of the battery. The NiMH cell
 nominal voltage is 1.2 V.
- **Nominal energy (Wh) -** "energy capacity" or "Watt-hour capacity". The total Watt-hours available when the battery is fully discharged at a given C-rate.[1]
- **Open-circuit voltage –** The voltage between the battery terminals with no load applied. The open-circuit voltage depends on the battery state of charge, increasing with state of charge.
- **Resistance ()** Material property, indicative of difficulty in passing charge through said material. Measured in ohms. Resistance is the inverse of conductance.

Appendix

Glossary Of Terms (Cont'd)

- Separator A material within the battery cell, between the cathode and the anode.
 It should allow charge to flow between the two poles of the battery, but never permit them to touch.
- Specific Energy (Wh/kg) The nominal battery energy per unit mass, sometimes
 referred to as the gravimetric energy density. Specific energy is a characteristic of the
 battery chemistry and packaging. Along with the energy consumption of the vehicle, it
 determines the battery weight required to achieve a given electric range.[1]
- **Specific power (W/kg)** The maximum available power per unit mass. Specific power is a characteristic of the battery chemistry and packaging. It determines the battery weight required to achieve a given performance target.
- **State of Charge (% SOC)** An expression of the present battery capacity as a percentage of maximum capacity. SOC is generally calculated using current integration to determine the change in battery capacity over time.
- Voltage (V) Electrical potential difference between two points (ex. terminals of battery). 1 volt will cause a current of 1 amp to flow through a resistance of 1 ohm









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