Smartville Periscope

User Manual

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1 Introduction

This document is intended to provide instructions for operating and understanding Smartville's Periscope EV Battery Pack Tester.

1.1 Applicability

Applicable to Periscope V1.0.

1.2 Revision History

Rev	Date	Edited by	Change
1.0	02/15/2024	MS	Release
1.1	06/04/2024	QS	Software portions added
1.2	06/14/2024	BE	Terms and conditions updated
1.3	09/23/2024	QS	Error codes added
1.4	10/01/2024	MS	Changed wire harnesses, changed pictures, changed wire process, changed user interface, and cleaned wording and formatting
1.5	**11/25/2024**	**RK**	**Updated periscope supported battery list, New periscope registration steps outlined, Battery Report Explained section added**

2 Safety

This device is intended to be used with electric vehicles and electric vehicle batteries. Depending on the application, high voltage with the potential to cause harm may or may not be present. Use of this tool should be restricted to trained personnel and only on vehicles and batteries deemed safe and stable. If working directly with the battery pack, high voltage PPE and protocols should be used.

3 Specifications

Mechanical	
Dimensions	15.8 in x 12.1 in x 6.8 in 391 mm x 307 mm x 173 mm
Weight	12.2 lbs
Material (Case)	Lightweight NK-7 Resin
Environmental Rating (Case)	IP67 Ingress Protection MIL-STD-810F Immersion ASTM D-4169 DC-18 Rainfall
Physical Protection (Case)	ASTM D-4169 DC-18 Vibration and Drop Test ATA Specification 300 - Category 1 Impact
Electrical	
Battery Capacity	10 Ah
Battery Voltage	12.8 V nominal 9.2 - 14.6 V
Nominal battery duration	20 hours
Charging Voltage	14.4 V
Maximum Charge Current	5 A
Life Cycles	2500 with 100% DOD 3600 with 80% DOD 7000 with 50% DOD
Certification (Battery)	UL, CE, DOT, & ISO
Communication Interfaces	Wi-Fi
Storage Conditions	

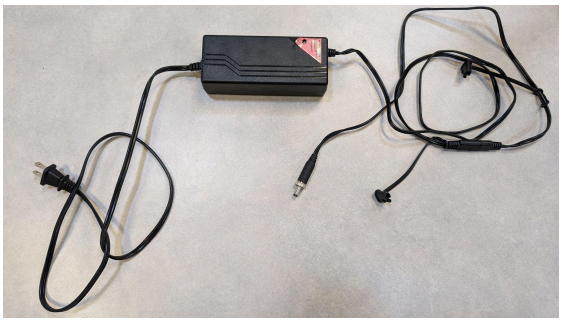
Storage Temperature	32 - 86 °F
Storage Duration	12 Months at 77 °F
Storage Environment	IP67 when closed
Operating Conditions	
Operating Temperature	-4 - 140 °F 32 - 140 °F for charging
Operating Environment	Dry conditions

3.1 Vehicle Compatibility

Vehicles	Battery Packs
• Tesla Model S/X • Nissan Leaf (Gen 1/ 2) • Chevy (Bolt/ EUV) • Kia (EV6, EV9, NIRO) • Hyundai (KONA, IONIQ Electric/ 5 / 6) • Genesis (GV60, GV70, G80)	• Tesla Model 3/Y • Nissan Leaf (Gen 1/ 2)

3.2 Materials Included

Item	Quantities	
Periscope Device	x1	

Barcode Scanner	x1	
Tesla 3/Y Battery Harness	x1	
Nissan Battery Harness	x1	
ODB2 Harness (Applies to Nissan or Chevy)	x1	
Battery Charger	x1	

4 Device Operation

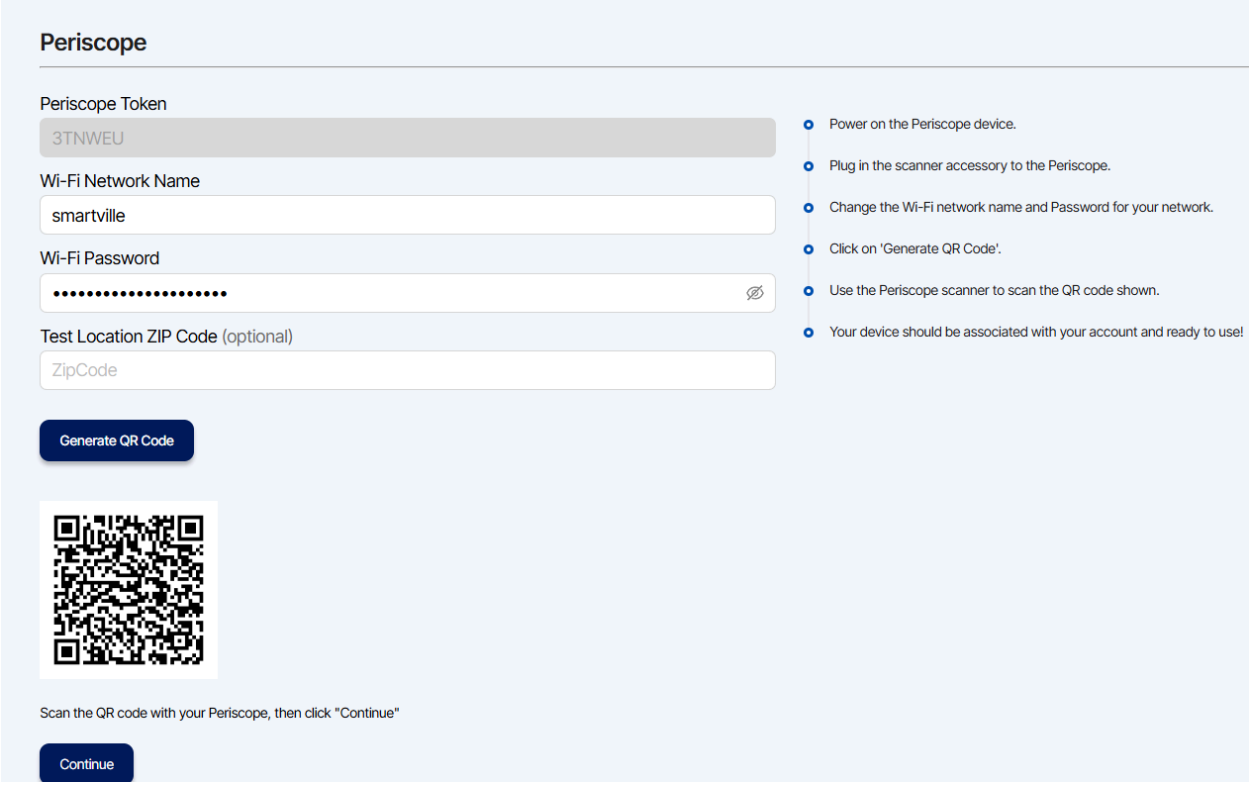
4.1 Charging

1. Use the provided battery charger for charging the device. Only the Periscope charger will charge the device.
2. Press and undo latches to open the case and expose the device's physical interface in the bottom portion of the case.
3. Plug the charger into a 120 V outlet and watch for the indicator light on the charger. Green light indicates that the charger is ready for charging.
4. Plug the charger into the charging jack. Secure by threaded ring on connector. Leave the case open during charging, and watch the indicator light. Red light and an audible fan noise indicates charging is in progress.
5. When charging is complete, the indicator light will turn green. Unplug charger. Do not leave the charger plugged in when complete.

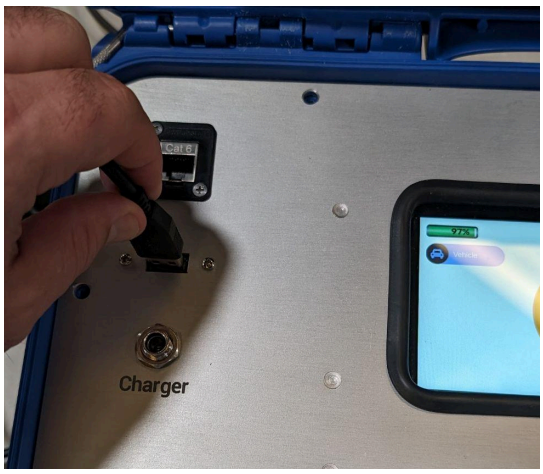
4.2 Periscope Registration and Setup

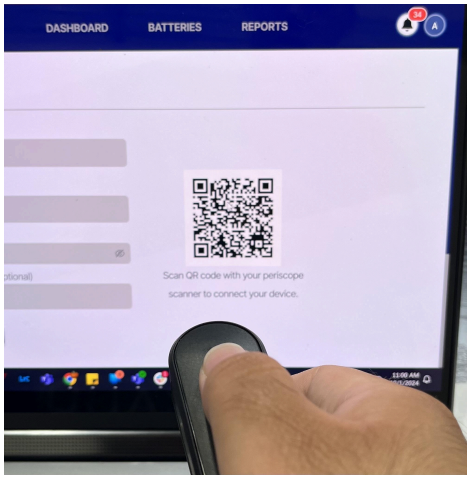
The following steps MUST be completed prior to scanning for the first time.
Each Periscope device must initially be set up to a) register the periscope to the user, and b) to set up wifi credentials.

1. To register a periscope, navigate to www.wholebatterycatalog.com and either login or register a new account.
2. Once logged in, navigate to the Menu > Periscope page
3. Click on Add Periscope to register a new periscope to your account.
4. Enter wifi name and password, as well as a test location zip code if desired. The zip code is not required, but can be later used to sort tests by location.



5. Once all data is entered, click Generate QR Code.
6. Lastly, connect the provided scanner to the periscope and tap the scanner setup button indicated by the gear symbol. See *4.5 User Interface* for more details. Scan the generated QR code.
7. Once scanned please click continue and verify the device serial number is listed on your account.





8. The periscope is now registered and set up. Repeat these steps if the wifi credentials ever need to be changed or updated.

4.3 Test Setup

1. To open the case, press down the gray latches to unlock the black clasps. Wire harnesses are located in the lid's storage compartments.

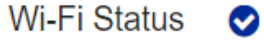
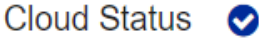
2. Locate the harness required for the battery under test. Refer to Section *3.2 Materials Included* for harness images.
3. Connect the cable to the Periscope's battery jack. Holding the top of the cable plug, twist and push the plug until it latches onto the device socket. Lastly, twist the cable plug *base* until it clicks into place.

4. Connect the harness to the battery under testing. Refer to the Section *5 Cable Connections* for instructions on connecting each type of harness.
5. The device is ready to be powered on, see the next section.

4.4 User Interface

The Periscope UI is shown below, and subsequently described in this section.

The following table describes each of the UI attributes.

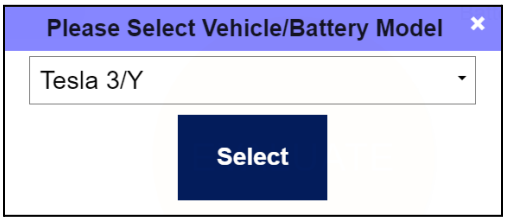
Icon	Description
	**Periscope SOC Gauge**: Indicates when Periscope is running low on battery.
	**Internet Connection Status**: Indicates if the periscope has internet connection or not. If disconnected this will be a red X.
	**Cloud Connection Status**: Indicates if the periscope is actively connected to the Whole Battery Catalog cloud system. If disconnected this will be a red X.
	**Evaluation Button**: Button to start a periscope test.

	**Scanner Setup**: Button to initiate a QR scan for setting up wifi and user credentials of the Periscope.
	**Device Information**: Button to view Periscope device settings and credentials.
	**Cached Reports:** This icon will appear ONLY IF there are cached reports on the device. Cached reports occur when the tests are collected outside of wifi range. As soon as a wifi connection is reestablished, cached reports will automatically be sent to the cloud and the cached reports indicator will count down.

4.5 Test Initiation

1. Power on the Device. Press and hold the power button for 1-2 seconds. The button will light up indicating the device is booting up. The device will boot up within 30 sec - 2 min and the device screen will power on.

2. To initiate a test, press the yellow *EVALUATE* button.
3. Select associated EV Make/Model from the dropdown menu.

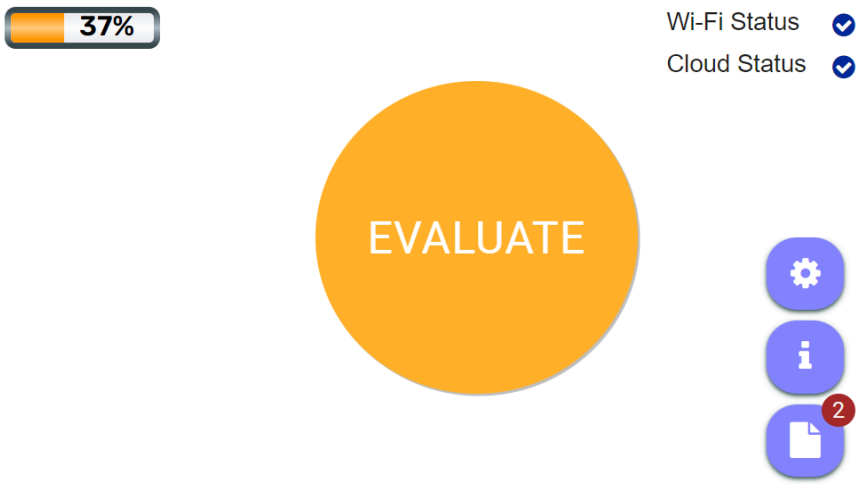


4. **NSVRP Scan Selection**: If there is an NSVRP label to scan for this test, complete the following steps. Otherwise, select SKIP.

   To scan an NSVRP label, press SCAN followed by START SCANNING and use the barcode scanner to scan the label. A “Scanned Successfully” notification will appear if the device has correctly received the NSVRP data.

5. The device will now automatically begin collecting and processing data.

6. After 1-2 minutes, either a confirmation message or an error code will appear on the screen. Watch the countdown timer on screen for the remaining time.
7. If a report is successfully generated, it will be accessible on the www.wholebatterycatalog.com account that was used to register the device.
8. If the device does not have a wifi connection when performing the test, the test data will be cached on the device until wifi connection is detected. If any reports are cached, an icon will appear in the bottom right corner of the device screen with a red indicator that counts the number of cached reports (see below):



9. If there is an error message, make note of the error code and reference the table in the **Troubleshooting** section of this manual.

5 Cable Connections

5.1 Tesla

1. Model 3/Y Battery Harness
    a. Firmly push the Tesla connector onto the battery socket, pull up the latch, and push down until it clicks into place as shown in the image below.

5.2 Nissan

1. Nissan Leaf Battery Harness
    a. Place the connector plug on the socket as shown in the image on the left. Twist the gray connector until it's fully seated on the socket.

2. OBD2 Vehicle Harness
    a. Access the Nissan Leaf OBD2 port on the left hand side of the driver side.

5.3 Chevy

1. OBD2 Vehicle Harness
    a. Access the Chevy OBD2 port on the left hand side of the driver side.

6 Troubleshooting

The following table summarizes the errors that may appear on the Periscope.

Problem / Error Code	Troubleshoot
No data	Check connection, try redoing connection and restarting device.
Device not turning on	Try charging for a few minutes.
Error Code 300	Check that the device is properly connected to the battery. Ensure the correct model is selected from the dropdown. If both are correct, contact tech support.
Error Code 301	Dataset collected from battery/vehicle is invalid or incomplete. Contact tech support.
Error Code 302	API authentication error. Contact tech support.
Error Code 303	Periscope is not registered. Contact tech support.
Error Code 304	User subscription not active. Go to wholebatterycatalog.com to check subscription status.
Error Code 305	API subscription error. Contact tech support.
Error Code 330	Payload formatting error. Contact tech support.
Error Code 392	User subscription validation failed. Contact tech support.
Error Code 393	An unknown error has occurred. Contact tech support.

7 Battery Report Explained

This section is a guide to understanding the different fields in your battery report. Each field is explained in detail, helping you interpret the data and gain insights into the health, performance, and status of your vehicle's battery. Whether you're looking at the state of charge (SOC), state of health (SOH), or more specific metrics like cell voltage or battery cycles, this section provides a clear explanation of what each value means.

7.1 Vehicle Information

Field	Description
Make	Manufacturer of the Vehicle
Model	Model of the vehicle
VIN	Vehicle Identification Number
Manufacturing Year	Year the vehicle was manufactured
Odometer	Total distance traveled by vehicle (**Miles, mi**)

7.2 Battery Information

Field	Description
Manufacturer	The manufacturer of the battery
Unique ID	Unique identifier for the battery
Manufacturing Date	Date the battery was manufactured
Rated AH Capacity	Rated amp-hour capacity of the battery (**Amp-hours**)
Rated Energy Capacity	Rated energy capacity in kilowatt-hours (**kWh**)
Battery Chemistry	Chemical composition of the battery (e.g., Lithium-ion, NCM, LFP)
Battery Type	Physical design of cells (e.g., Prismatic, Pouch, Cylindrical)
Battery Configuration	Details of cell configuration (e.g., series-parallel pack)

7.3 Battery Pack Information (Test Results)

Field	Description
Battery Pack SOH	State of Health: Overall health of the battery pack (**0% - 100%**)
Battery Pack SOC	State of Charge: Current charge level of the battery pack (**0% - 100%**)
Battery Pack Voltage	Voltage of the battery pack (**Volts, V**)
Battery Pack Current	Current being drawn or supplied by the battery (**Amperes, A**)
Battery Pack Temperature	Temperature of the battery pack (**typically -50 to +50°C**)
Battery Isolation Resistance	Resistance between the battery and ground (**typically above 1000 kOhms**)
Battery Pack Fault Message	Any fault messages related to the battery pack
Battery Pack Warning Message	Warning messages about the battery pack status

7.4 Cell Voltage Metrics

Field	Description
Mean Cell Voltage	Average voltage of all cells in the battery pack (**typically 2.5V - 4.2V**)
Min Cell Voltage	Lowest voltage observed across all cells (**typically 2.5V - 4.2V**)
Max Cell Voltage	Highest voltage observed across all cells (**typically 2.5V - 4.2V**)
Cell Voltage Max-Min Range	Difference between maximum and minimum cell voltages (**typically 0V - 0.1V**)
Cell Voltage Standard Deviation	Variation in voltage across extreme cells (**typically 0V - 0.05V**)

Reported Cell Readings	Number of cells with reported voltage readings

7.4.1 Cell Grid Distribution

The Cell Voltage Distribution is represented visually with a color-coded grid where each cell's voltage is compared to the mean voltage. The grid will highlight the status of each individual cell as:

1. Green for Balanced cells (deviation within ±0.05V).
2. Orange for Deviating cells (deviation greater than ±0.1V).
3. Red for Imbalanced cells (deviation greater than ±0.05V).

7.5 Battery Deep Dive

Field	Description
Estimated AH Capacity	Estimated amp-hour capacity based on current conditions (**Amp-hours**)
Estimated Energy Capacity	Estimated energy capacity of the battery (**kWh**)
Calendar Age	Age of the battery since manufacturing
Number of Battery Cycles	Total number of charge/discharge cycles (**Cycles**)
Accumulative Battery Charging	Total energy charged into the battery (**kWh**)
Accumulative Battery Discharging	Total energy discharged from the battery (**kWh**)
Fault Status	Current status of battery faults
BMS Status	Status of the Battery Management System

7.6 Report Summary

Field	Description
Report Id	Unique identifier for the report
Time of Test Collection	Timestamp when the test data was collected
Time of Report Generation	Timestamp when the report was generated
Report Expiration Date	Date when the report data expires (YYYY-MM-DD)

8 Terms and Conditions

8.1 Introduction

These Terms and Conditions ("Terms") govern the sale of Smartville's Periscope ("Product") between the seller ("Seller") and the buyer ("Buyer"). By placing an order, Buyer agrees to be bound by these Terms.

8.2 Orders

a. All orders are subject to acceptance by the Seller.
b. Orders must be placed via Smartville's website portal www.smartville.io

8.3 Prices and Payment

a. Pricing is reflected on Smartville's website and is exclusive of taxes and shipping costs unless otherwise stated.
b. Payment is due upon placing the order via Smartville's website.
c. Upon purchase of the Periscope, the Buyer agrees to a monthly subscription fee of $99, which will be automatically charged to the credit card used for the original purchase. This subscription fee includes complimentary software updates and two test applications per month.
d. Any additional test applications will incur a fee. Please refer to the Whole Battery Catalog website for up-to-date information on pricing. Repeat tests for the same EV battery are free of charge.

8.4 Delivery

a. Delivery dates are estimates only and not guaranteed.
b. Seller will not be liable for any delay in delivery or failure to deliver due to circumstances beyond its control.

8.5 Inspection and Acceptance

a. Buyer must inspect the Product upon delivery.
b. Any claims for shortages or defects must be made in writing within 7 days of delivery.
c. If no claim is made within this period, the Product is deemed accepted by the Buyer.

8.6 Warranty

a. Smartville, Inc. (Smartville) warrants its products ("Smartville product") to be free of defects in materials and workmanship for a period of twelve (12) months from date of delivery. The warranty covers defects in material and workmanship and is limited to replacement of parts and materials.
b. In the event that the Smartville product fails to conform, the purchaser shall not later than fourteen (14) days after the error occurs, advise Smartville of such failure in writing. Depending on the nature of the failure, Smartville will decide if a replacement part can be

shipped or if the Smartville product must be returned to the factory with seals intact for evaluation. In case of a necessary return, Smartville's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by Smartville, if the Smartville product is found to be defective it will be repaired or replaced at no charge.

c. Smartville's Warranty does not apply to damages resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This Warranty is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of mishandling; misapplication; misuse or other operating conditions outside of Smartville's control.

8.7 Limitation of Liability

a. The remedies of purchaser set forth herein are exclusive and the total liability of Smartville with respect to this product, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based.
b. Smartville, Inc. reserves the right to revise its Smartville product and publications with no obligation of Smartville, Inc. to notify any person or any organization of such revision. In no event shall Smartville, Inc. be liable for any loss of profit or any commercial damage, including but not limited to special, consequential, or other damages.

8.8 Returns and Refunds

a. The Buyer may return the Product for any reason within 14 days of delivery for a full refund.
b. To initiate a return, the Buyer must contact the Seller to obtain a Return Merchandise Authorization (RMA) number. The Product must be returned in its original condition and packaging, along with all accessories and documentation, to be eligible for a refund. Returns must be shipped at the Buyer's expense to the address provided by the Seller. Upon receipt and inspection of the returned Product, the Seller will process the refund within 14 days. The refund will be issued to the original method of payment.
The Seller reserves the right to deduct any costs associated with damage or missing items from the refund amount.
c. Returns after the 14 days return window are subject to Seller's prior written approval. Approved returns must be shipped at Buyer's expense. Refunds will be issued for the purchase price minus any applicable restocking fees.

8.9 Governing Law

a. These Terms are governed by and construed in accordance with the laws of California, USA.

8.10 Entire Agreement

a. These Terms constitute the entire agreement between Seller and Buyer and supersede all prior agreements or understandings, whether written or oral.

b. Information in this document is subject to change without notice and does not represent a commitment on the part of Smartville, Inc. Information described in this document is furnished under a nondisclosure agreement. It may be used or copied only in accordance with the terms of the agreement. It is against the law to copy information or any medium except specifically allowed in the non-disclosure agreement.