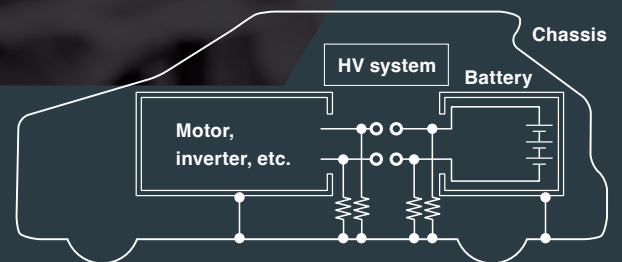


### Stay safe during EV maintenance



High voltages make safety for EV maintenance essential. This guide outlines correct procedures and reliable electrical tests to ensure safe operations.



Zero-voltage



Temperature



Equipotential bonding



Insulation resistance

# Shutting down the HV system of the vehicle

Visual inspection

DTC scan

Disconnect the HV bus

Temperature measurement of the HV batteries

Zero-voltage measurement

Disconnect the HV battery cable

Discharge

Zero-voltage measurement

Complete shutting down the HV system

For safety, be sure to carry out a visual inspection and look out for motor faults by performing a DTC (Digital Trouble Codes) scan.

Before proceeding to electrical testing and measurement, make sure to shut down<sup>\*1</sup> the vehicle's HV (High-voltage) system by disconnecting the service plug or using the switch.

<sup>\*1</sup> The removal of high-voltage components is hazardous work. Ensure that the work is performed by qualified personnel with professional training, following applicable laws and regulations. For details, please follow the operation manual of each vehicle manufacturer.

Measure the surface temperature of the HV battery with a non-contact thermometer. In this inspection, check for variations in temperature as well as areas of high temperature. These may indicate issues that need further investigation.

## INFRARED THERMOMETER FT3700s

The FT3700s is an infrared thermometer with a two-point laser marker that measures the average surface temperature inside a circle formed by the two points.



This measurement is conducted to prevent electric shock and to make sure that the vehicle is shut down. Safety from electrocution is ensured by measuring the voltage on surfaces that are likely to be touched when unplugging the HV connector.

In this test, voltage should be measured between specific points and the chassis ground of the vehicle. It should show up as zero volts (0 V).

## DIGITAL MULTIMETER DT4261

- The DT4261's terminal shutters make it physically impossible to insert the wrong test lead. They prevent overvoltage and electrical shock accidents.
- The LoZ (low input impedance) mode gets rid of the effects of ghost voltages caused by the measurement target's stray capacitance and the multimeter's high input impedance. This lets you get accurate readings.



After performing a zero-voltage measurement (see below), disconnect the high-voltage (HV) cable and wait at least 10 minutes for the HV system to discharge. To avoid a serious accident, it is necessary to wait for a certain period of time. Take note that the discharge time may vary, so make sure to check with the vehicle manufacturer.

After unplugging the HV battery's connector, make sure that the HV system is shut down.



# Shutting down the HV system of the vehicle

Visual inspection

DTC scan

Disconnect the HV bus

Temperature measurement of the HV batteries

Zero-voltage measurement

Disconnect the HV battery cable

Discharge

Zero-voltage measurement

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## RESISTANCE METER RM3548

|                         |                                                           |
|-------------------------|-----------------------------------------------------------|
| Resistance range        | 3 mΩ (0.1 μΩ resolution) to 3 MΩ range (100 Ω resolution) |
| Testing current         | 500 nA DC to 1 A DC                                       |
| Open-terminal voltage   | 5.5 V DC max.                                             |
| Temperature measurement | -10.0°C to 99.9°C                                         |



More information about RM3548



### PIN TYPE LEAD 9465-11



### PROTECTOR Z5041

Protects main unit from shocks



### MAGNETIC STRAP Z5020

Fixed to the chassis with magnets



※ 2 pieces required

## DIGITAL MULTIMETER DT4261

|                             |                                                                                                                                     |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| DC voltage range            | 600.0 mV to 1000 V                                                                                                                  |
| AC voltage range            | 6.000 V to 1000 V (true RMS, crest factor 3 or less)                                                                                |
| LoZ V                       | 600.0 V (true RMS, crest factor 3 or less)                                                                                          |
| Other measurement functions | DC + AC voltage, DC current, AC current, AC current with clamp-on probe, frequency, resistance, continuity, capacitance, diode test |



More information about DT4261



### WIRELESS ADAPTER Z3210

Transfers measurement data to a mobile device



### MAGNETIC STRAP Z5020

Fixed to the chassis with magnets



## INSULATION TESTER IR4059

|                      |                                                                        |
|----------------------|------------------------------------------------------------------------|
| Rated output voltage | 50 V DC, 125 V DC, 250 V DC, 500 V DC, 1000 V DC                       |
| Overload protection  | 600 V AC (10 s)                                                        |
| Response time        | Approx. 0.3 second for PASS/FAIL judgement (based on in-house testing) |



More information about IR4059



### WIRELESS ADAPTER Z3210

Transfers measurement data to a mobile device



### MAGNETIC STRAP Z5020

Fixed to the chassis with magnets



※ 2 pieces required

## INFRARED THERMOMETER FT3700/FT3701

|                                     |                                                                                                                                                               |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurement temperature range       | FT3700: -60.0°C to 550.0°C (-76°F to 1022°F)<br>FT3701: -60.0°C to 760.0°C (-76°F to 1400°F)                                                                  |
| Measurement wavelength              | 8 to 14 μm                                                                                                                                                    |
| Thermal emissivity compensation (ε) | 0.10 to 1.00                                                                                                                                                  |
| Measurement field diameter          | FT3700<br>Φ83 mm at 1000 mm (3.27 in. at 3.28 ft.) (distance : spot = 12 : 1)<br>FT3701 Φ 100 mm at 3000 mm (3.94 in. at 9.84 ft.) (distance : spot = 30 : 1) |



More information about FT3700/FT3701



## CARRYING CASE C0213



It can accommodate all measuring instruments.  
EV maintenance manual included.

# Recommended KIT

## EV RESISTANCE TEST KIT

Model No. (Order Code): RM3548 EV KIT\*  
 \* EV maintenance manual included  
 List price: \$2130

**RESISTANCE  
METER  
RM3548**



**PROTECTOR  
Z5041**



**PIN TYPE LEAD  
9465-11**



NEW

**MAGNETIC  
STRAP  
Z5020**



※ 2 pieces

## EV INSULATION TEST KIT

Model No. (Order Code): IR4059 EV KIT\*  
 \* EV maintenance manual included  
 List price: \$640

**INSULATION  
TESTER IR4059**



NEW

**MAGNETIC  
STRAP  
Z5020**



※ 2 pieces

## EV HV SYSTEM TEST KIT

Model No. (Order Code): EV HV SYSTEM TEST KIT  
 List price: \$2476

**INFRARED  
THERMOMETER  
FT3700-20**



**DIGITAL  
MULTIMETER  
DT4261**



**INSULATION  
TESTER IR4059**



NEW

**RESISTANCE  
METER  
RM3548**



**PROTECTOR  
Z5041**



**CARRYING  
CASE  
C0213**



NEW

## EV HV SYSTEM ADVANCED TEST KIT

Model No. (Order Code): EV HV SYSTEM ADVANCED  
TEST KIT  
 List price: \$3386

**PIN TYPE LEAD  
9465-11**



NEW

**MAGNETIC  
STRAP  
Z5020**



※ 5 pieces

**INFRARED  
THERMOMETER  
FT3700-20**



**DIGITAL  
MULTIMETER  
DT4261**



**INSULATION  
TESTER IR4059**



NEW

**RESISTANCE  
METER RM3548**



**PROTECTOR  
Z5041**



**CARRYING  
CASE  
C0213**



NEW

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**HEADQUARTERS**

81 Koizumi,  
Ueda, Nagano 386-1192 Japan  
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**More information on the EV  
Maintenance Tools**