

## Determine Li-ion battery reliability in just 10 seconds

### BATTERY IMPEDANCE METER BT4560



USB 2.0

RS-232C



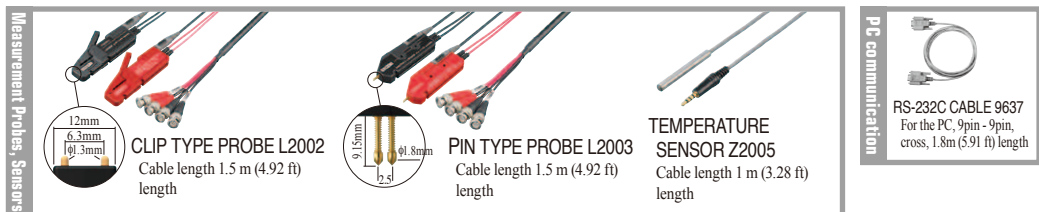
- Low-frequency AC-IR measurement\* enables faster measurement  
\*The BT4560 eliminates the need for charging or discharging by measuring internal impedance at a low frequency of 1 Hz or below
- Extremely reliable measurements for low-impedance batteries  
\*The BT4560 uses a testing current of 1.5 A at the 3mΩ range, which improves the S/N ratio
- Circuit configuration highly tolerant of contact and wire resistance to provide stable measurements
- Simultaneous measurement of impedance and voltage

Order Code: BT4560

Note: This product is not supplied with measurement probes. Please select and purchase the measurement probe options appropriate for your application separately.

#### Basic specifications (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

Allowable input voltage	Up to 5 V
Measured information	Impedance, voltage, temperature
Impedance measurement	Parameters: R, X, Z, θ, Frequency: 0.1 Hz to 1050 Hz, Measurement ranges: 3.0000 mΩ, 10.0000 mΩ, 100.000 mΩ Testing current: 3 mΩ range: 1.5 Arms, 10 mΩ range: 500 mArms, 100 mΩ range: 50 mArms
Voltage measurement	Measurement range: 5.00000 V (single range), Measurement time: 0.1 s (Fast to 1.0 s (Slow))
Temperature measurement	Range: -10.0 °C to 60.0 °C, Measurement time: 2.3 s
Basic accuracy	Z: ±0.4% rdg. θ: ±0.1 °, V: ±0.0035% rdg. ±5 dgt., Temperature: ±0.5 °C (at 10.0 to 40.0 °C)
Functions	Comparator, self-calibration, sample delay, average, contact check, measurement current error, and other
Interfaces	RS-232C/USB (virtual COM port) * Cannot be used simultaneously EXT. I/O (NPN/PNP can be switched)
Power supply	100 to 240 V AC, 50/60 Hz, 80 VA max
Dimensions and mass	330 mm (12.99 in) W × 80 mm (3.15 in) H × 293 mm (11.54 in) D, 3.7 kg (130.5 oz)
Accessories	Power cord ×1, Instruction manual ×1, Zero-adjustment board ×1, USB cable (A-B type) ×1, CD-R (communication instruction manual, PC application software, USB driver) ×1



### Technical Analysis

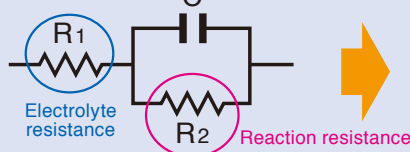
#### An alternative measurement method for inspecting charging/discharging output characteristics (DC-IR) [Low-frequency AC-IR measurement]

\*Please see the individual product catalog for more information

#### Information obtained by low-frequency measurement

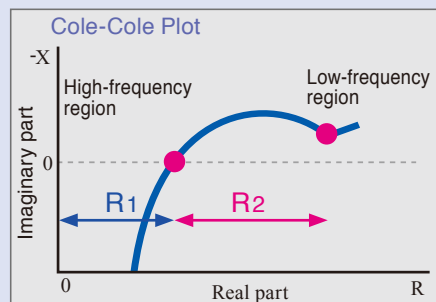
Electrochemical characteristics of a battery and Cole-Cole plot

Battery equivalence circuit

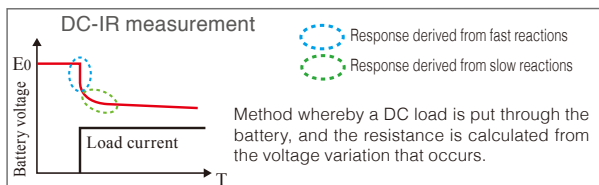


Two-point measurement at high and low frequencies

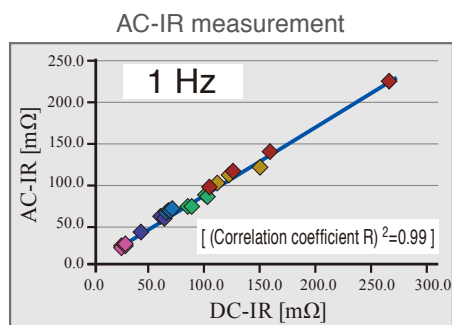
Traditional battery testers only record the electrolyte resistance of the battery by measuring it at a frequency of 1 kHz. Measurement at a low frequency of around 1 Hz, however, enables the tester to also observe the reaction resistance on the surface of the electrodes. The BT4560 assures the quality of battery cells by investigating both electrolyte resistance and reaction resistance with a two-point measurement at high and low frequencies. In this way, it helps to improve quality and extend the service life of lithium ion battery modules.



#### Correlation between DC-IR measurement and low-frequency AC-IR measurement



A strong correlation is found between the measured values of DC-IR and low-frequency AC-IR. Useful as an alternative to DC-IR testing



## High-speed Measurement from Large-cell to High-voltage Battery Testing

### BATTERY HiTESTER BT3563, BT3562



GP-IB/  
BT3563-01, BT3562-01  
RS-232C



- Measure high-voltage battery packs up to 300V (BT3563)
- Production line testing of high-voltage battery packs and battery modules
- Large (low-resistance) cell testing
- Choice of PC interfaces for full remote operation

Note: The comparison threshold values depend on the battery manufacturer, type, and capacity, and these must be established by the user.

**Order Code:** **BT3563** (basic model)  
**BT3563-01** (with GP-IB and analog output)  
**BT3562** (basic model)  
**BT3562-01** (with GP-IB and analog output)

Note: Measurement leads are not included. Purchase the appropriate lead option for your application separately. The male (system side) of the EXT I/O connector is also available. Please inquire with your Hioki distributor.

#### Basic specifications (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

	BT3563/BT3563-01	BT3562/BT3562-01
Max. applied measurement voltage	± 300 VDC rated input voltage ± 300 VDC Max. rated voltage to earth	± 60 VDC rated input voltage ± 70 VDC Max. rated voltage to earth
Resistance measurement ranges	3 mΩ (Max. display 3.1000 mΩ, resolution 0.1 mΩ) to 3000 Ω (Max. display 3100.0 Ω, resolution 100 mΩ), 7 ranges Accuracy: 30 mΩ to 3000 Ω ranges, ± 0.5% rdg. ± 5 dgt. (Add ± 3 dgt. for EX.FAST, or ± 2 dgt. for FAST and MEDIUM) 3 mΩ range, ± 0.5% rdg. ± 10 dgt. (Add ± 30 dgt. for EX.FAST, or ± 10 dgt. for FAST, or ± 5 dgt. for MEDIUM) Testing source frequency: 1 kHz ± 0.2 Hz, testing current: 100 mA (3 mΩ range) to 10 mA (3000 Ω range) Open-circuit Voltage: 25 V peak (3/30 mΩ ranges), 7 V peak (300 mΩ range), 4 V peak (3 Ω to 3000 Ω ranges)	
Voltage measurement ranges	6 VDC (resolution 10 mV) to 300 VDC (resolution 1 mV), 3 ranges Accuracy: ± 0.01% rdg. ± 3 dgt. (Add ± 3 dgt. for EX.FAST, or ± 2 dgt. for FAST and MEDIUM)	6 VDC (resolution 10 mV) to 60 VDC (resolution 100 mV), 2 ranges
Display	31000 full digits (resistance), 600000 full digits (voltage), LED	
Sampling rate	Four steps, 4 ms (Extra-FAST), 12 ms (FAST), 35 ms (Medium), 150 ms (Slow) (Typ., sampling time depends on supply frequency settings and function.)	
Measurement time	Response time + sampling rate, approx. 10 ms for measurements (Response time depends on reference values and the measurement object.)	
Comparator functions	Judgment result: Hi/IN/Lo (resistance and voltage judged independently) Setting: Upper and lower limit, Deviation (%) from reference value Logical ANDed result: PASS/FAIL, calculates the logical AND of resistance and voltage judgment results. Result display, beeper, or external I/O output, Open-collector (35 V, 50 mA DC max.)	
Analog output	Measured resistance (displayed value, from 0 to 3.1 V DC, -01 suffix models only)	
Interfaces	External I/O, RS-232C, Printer (RS-232C), GP-IB (-01 suffix models only)	
Power supply	100 to 240 VAC, 50/60 Hz, 30 VA max.	
Dimensions and mass	215 mm (8.46 in) W × 80 mm (3.15 in) H × 295 mm (11.61 in) D, 2.4 kg (84.7 oz)	
Accessories	Instruction manual ×1, Power cord ×1	

## For High-speed Production Line Testing of Small Battery Packs

### BATTERY HiTESTER 3561



GP-IB/  
3561-01  
RS-232C



- High-speed testing for production lines of small battery packs for mobile and portable communications devices
- Measure internal resistance and battery voltage
- For process control such as in high-speed automated assembly lines

Note: The comparison threshold values depend on the battery manufacturer, type, and capacity, and these must be established by the user.

**Order Code:** **3561** (basic model)  
**3561-01** (with GP-IB interface)

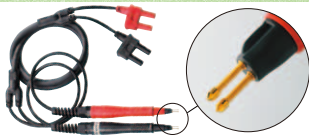
Note: Measurement leads are not included. Purchase the appropriate lead option for your application separately. The male (system side) of the EXT I/O connector is also available. Please inquire with your Hioki distributor.

#### Basic specifications (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

Max. applied measurement voltage	±22 V DC ±70 V DC maximum rated voltage above ground
Resistance measurement ranges	300 mΩ (Max. display 310.00 mΩ, resolution 10 μΩ) to 3 Ω (Max. display 3.1000 Ω, resolution 100 μΩ), 2 ranges Accuracy: ±0.5 % rdg. ±5 dgt. (Add ±3 dgt. for EX.FAST, or ±2 dgt. for FAST and MEDIUM) Testing source frequency: 1 kHz ±0.2 Hz, testing current: 10 mA (300 mΩ range), 1 mA (3 Ω range) Open-circuit Voltage: 7 V peak
Voltage measurement ranges	DC 20 V, resolution 0.1 mV, Accuracy: ±0.01 % rdg. ±3 dgt. (Add ±3 dgt. for EX.FAST, or ±2 dgt. for FAST and MEDIUM)
Display	31000 full digits (resistance), 199999 full digits (voltage), LED
Sampling rate	Four steps, 4 ms (Extra-FAST), 12 ms (FAST), 35 ms (Medium), 150 ms (Slow) (Typ., sampling time depends on supply frequency settings and function.)
Measurement time	Response time + sampling rate, approx. 3 ms for measurements (Response time depends on reference values and the measurement object.)
Comparator functions	Judgment result: Hi/IN/Lo (resistance and voltage judged independently) Setting: Upper and lower limit, Deviation (%) from reference value Logical ANDed result: PASS/FAIL, calculates the logical AND of resistance and voltage judgment results. Result display, beeper, or external I/O output, Open-collector (35 V, 50 mA DC max.)
Interfaces	External I/O, RS-232C, Printer (RS-232C), GP-IB (-01 suffix models only)
Power supply	100 to 240 V AC, 50/60 Hz, 30 VA max.
Dimensions and mass	215 mm (8.46 in) W × 80 mm (3.15 in) H × 295 mm (11.61 in) D, 2.4 kg (84.7 oz)
Accessories	Instruction manual ×1, Power cord ×1

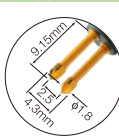
#### BT3563/3562, 3561 Series Shared Options

##### Measurement lead (for measuring high voltage batteries with Models BT3563 and BT3562)



##### PIN TYPE LEAD L2100

A:300 mm (11.81 in), B:172 mm (6.77 in), L:1400 mm (4.59 ft), for high voltage battery measurements, 600 V DC max., BT3563, BT3562 only

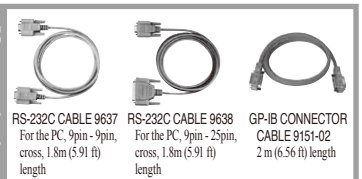


**TIP PIN 9772-90**  
To replace the tip on the 9772, L2100, (one piece)



**ZERO ADJUSTMENT BOARD 9454**  
For the L2100, 9465-10, 9465, 9461

##### PC communication

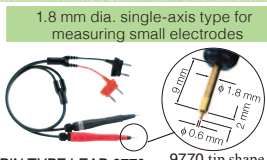


**RS-232C CABLE 9637**  
For the PC, 9pin - 9pin, cross, 1.8m (5.91 ft) length

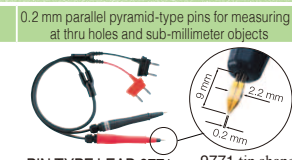
**RS-232C CABLE 9638**  
For the PC, 9pin - 25pin, cross, 1.8m (5.91 ft) length

**GP-IB CONNECTOR CABLE 9151-02**  
2 m (6.56 ft) length

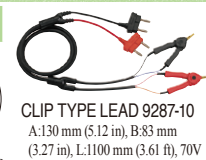
##### Measurement leads (for measuring batteries up to 60 V with BT3563, BT3562, or 3561)



**PIN TYPE LEAD 9770**  
A:260 mm (10.24 in), B:140 mm (5.51 in), L:850 mm (2.79 ft), 70V DC



**PIN TYPE LEAD 9771**  
A:260 mm (10.24 in), B:138 mm (5.43 in), L:850 mm (2.79 ft), 70V DC



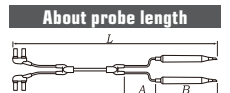
**CLIP TYPE LEAD 9287-10**  
A:130 mm (5.12 in), B:83 mm (3.27 in), L:1100 mm (3.61 ft), 70V DC



**FOUR TERMINAL LEAD 9453**  
A:280 mm (11.02 in), B:118 mm (4.65 in), L:1360 mm (4.46 ft), 60V DC



**LARGE CLIP TYPE LEAD 9467**  
A:300 mm (11.81 in), B:116 mm (4.57 in), L:1360 mm (4.46 ft), 50V DC



**About probe length**  
A: From junction to probe  
B: Probe part  
L: Whole length

## Instantaneously Diagnose Battery Degradation

### BATTERY HiTESTER 3555



- For use with compact batteries such as NiCad and nickel-metal hydride
- Instantaneously diagnose degradation (PASS, CAUTION, FAIL) by measuring internal resistance and voltage

\*Operator must input the criteria for PASS/FAIL judgments according to the type of battery being measured.

**Order Code: 3555**

Note: The 3555 is unable to make PASS/FAIL judgments for lithium-ion batteries due to the extremely small magnitude of the changes in their internal resistance. For applications involving measurement of batteries with low internal resistance, for example lead acid batteries, use the Battery HiTester 3554.

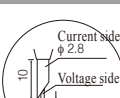
#### Basic specifications (Accuracy guaranteed for 6 months, Post-adjustment accuracy guaranteed for 6 months)

Resistance Measurement range	300 mΩ (Max. display 300.00 mΩ, resolution 100 μΩ) to 30 Ω (Max. display 30.00 Ω, resolution 10 mΩ), 3 ranges Accuracy: ±0.8 % rdg. ±6 dgt. (All ranges) Testing source frequency: 1 kHz ±5 Hz, testing current: 5 mA (300 mΩ range), 500 μA (3 Ω range), 50 μA (30 Ω range) Open-circuit Voltage: 5 V peak
Voltage Measurement range	± 3 V (Max. display ±3.000 V, resolution: 1 mV) to ± 30 V (Max. display ±30.00 V, resolution: 10 mV), 2 ranges Accuracy: ±0.1 % rdg. ±6 dgt.
Absolute Max. input voltage	50 V DC max. (No AC input)
Sampling rate	1.25 times/s (at resistance and voltage measurement combination)
Comparator functions	Setting: Upper and lower limit for resistance, and lower limit for voltage, Number of comparator setting: 10 sets Comparator output: Pass (green), Warning (amber), and Fail (red) LEDs, Audible output on warning or fail
Other	Data storage: N/A, Interface: N/A, Temperature measurement: N/A
Power supply	LR6 (AA) Alkaline dry battery ×6, Continuous operating time: 18 h
Dimensions and mass	196 mm (7.72 in)W × 130 mm (5.12 in)H × 50 mm (1.97 in)D, 680 g (24.0 oz) (including batteries)
Accessories	Pin type lead 9461 ×1, Instruction manual ×1, LR6 (AA) alkaline battery × 6

Measurement Leads



**PIN TYPE LEAD 9461**  
A:240 mm (9.45 in), B:132 mm (5.20 in), L:804 mm (2.64 ft)



**9461 tip shape**



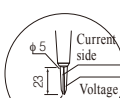
**ZERO ADJUSTMENT BOARD 9454**  
For the L2100, 9465-10, 9465, 9461



**FOUR TERMINAL LEAD 9453**  
A:280 mm (11.02 in), B:118 mm (4.65 in), L:1360 mm (4.46 ft), 60V DC



**CLIP TYPE LEAD 9452**  
A:220 mm (8.66 in), B:197 mm (7.76 in), L:1360 mm (4.46 ft)

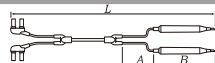


**9452 tip shape**



**CLIP TYPE LEAD 9287-10**  
A:130 mm (5.12 in), B:83 mm (3.27 in), L:1100 mm (3.61 ft), 70V DC

#### About probe length

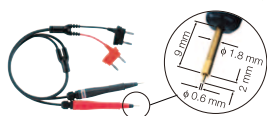


A: From junction to probe  
B: Probe part  
L: Whole length

#### Primarily for use with compact secondary batteries, etc. (for terminals with very little surface area)

1.8 mm dia. single-axis type for measuring small electrodes

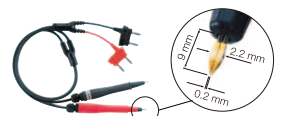
0.2 mm parallel pyramid-type pins for measuring at thru holes and sub-millimeter objects



**PIN TYPE LEAD 9770**  
A:260 mm (10.24 in), B:140 mm (5.51 in), L:850 mm (2.79 ft), 70V DC



**9770 tip shape**



**PIN TYPE LEAD 9771**  
A:260 mm (10.24 in), B:138 mm (5.43 in), L:850 mm (2.79 ft), 70V DC



**9771 tip shape**

## Medium and Large Lead Acid Battery Tester Ideal for Diagnosing UPS Batteries

### BATTERY HiTESTER 3554



- Measurement circuit that's more resistant to noise than previous models
- Instantaneously diagnose degradation (PASS, CAUTION FAIL) by measuring internal resistance and voltage
- Increased measurement efficiency thanks to new compact, lightweight probes
- Store up to 4,800 data points in built-in memory and transfer to PC via USB

**Order Code: 3554**

Note: The thresholds for determining the pass/fail condition of a battery depends on the specifications and standards of the battery manufacturer, battery type, capacity, etc. It is important and necessary to always conduct battery testing against the internal resistance and terminal voltage of a new or reference battery. In some cases, it may be difficult to determine the deterioration state of traditional open type (liquid) lead-acid or alkaline batteries which demonstrate smaller changes in internal resistance than sealed lead acid batteries.

#### Basic specifications (Accuracy guaranteed for 6 months, Post-adjustment accuracy guaranteed for 6 months)

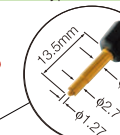
Resistance measurement range	3 mΩ (Max. display 3.100 mΩ, resolution 1 μΩ) to 3 Ω (Max. display 3.100 Ω, resolution 1 mΩ), 4 ranges Accuracy: ±0.8 % rdg. ±6 dgt. (3 mΩ range: ±1.0 % rdg. ±8 dgt.) Testing source frequency: 1 kHz ±30 Hz, testing current: 150 mA (3m/30 mΩ range), 15 mA (300 mΩ range), 1.5 mA (3 Ω range), Open-circuit Voltage: 5 V peak
Voltage measurement range	± 6 V (Max. display ±6.000 V, resolution: 1 mV) to ± 60 V (Max. display ±60.00 V, resolution: 10 mV), 2 ranges, Accuracy: ±0.08 % rdg. ±6 dgt.
Absolute max. input voltage	60 V DC max. (No AC input)
Sampling rate	1 time/s (at resistance, voltage, and temperature measurement combination)
Comparator functions	Setting: First and second resistance limits, and lower voltage limit, Number of comparator setting: 200 sets Comparator output: LCD display of PASS, WARNING, or FAIL. (Select beeper to sound on PASS/WARNING or FAIL)
Data storage	Max. storable data: 4800 sets. (Saved items: Date, time, resistance value, voltage value, temperature, comparator setting values, and comparator judgement.)
Other functions	Temperature measurement (-10.0 to 60.0 °C), USB interface (includes dedicated software for transferring data to a PC), Averaging, Zero-adjustment, Hold, Auto-hold, Auto-memory, Auto-power-save, Clock
Power supply	LR6 (AA) Alkaline dry battery ×8, Continuous operating time: 10 h
Dimensions and mass	192 mm (7.56 in)W × 121 mm (4.76 in)H × 55 mm (2.17 in)D, 790 g (27.9 oz) (including batteries)
Accessories	Pin type lead 9465-10 ×1, USB cable ×1, Application software CD ×1, Strap ×1, Instruction manual ×1, Carrying case ×1, Zero adjustment board ×1, LR6 alkaline batteries ×8, Fuse ×1

Measurement Leads

**Primarily for use with lead acid batteries, etc.**  
Easy 4-terminal measurement, 2.7 mm dia. single-axis type. Large angle of probe application, 2.5 mm pitch 2-axis pin type.



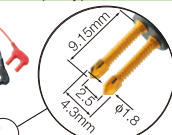
**PIN TYPE LEAD 9465-10**  
A: 45 mm (1.77 in) (red), 105 mm (4.13 in) (black, max. 515 mm (20.28 in)), B: 176 mm (6.93 in), L: 1883 mm (6.18 ft)



**TIP PIN 9465-90**  
To replace the tip on the 9465-10, (one piece)



**PIN TYPE LEAD 9772**  
A: 45 mm (1.77 in) (red), 105 mm (4.13 in) (black, max. 515 mm (20.28 in)), B: 173 mm (6.81 in), L: 1880 mm (6.17 ft)



**TIP PIN 9772-90**  
To replace the tip on the 9772, L2100, (one piece)

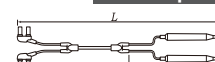


**ZERO ADJUSTMENT BOARD 9454**  
For the L2100, 9465-10, 9465, 9461



**LARGE CLIP TYPE LEAD 9467**  
A:300 mm (11.81 in), B:116 mm (4.57 in), L:1360 mm (4.46 ft), 50V DC

#### About probe length



A: From junction to probe  
B: Probe part  
L: Whole length



**REMOTE CONTROL SWITCH 9466**  
Use with the 9465 (for the 3554, 3551, 3560)



**CLIP TYPE LEAD WITH TEMPERATURE SENSOR 9460**  
For the 3540, 3554, A:300 mm (11.81 in), B:106 mm (4.17 in), L:2268 mm (7.44 ft)