HIOKI

2000

3540 mΩ HiTESTER

Components measuring instruments

CE

With BCD output (-01 suffix) , printer interface (-02 suffix) or RS-232C interface (-03 suffix)

Fast-response milliohmmeter offers selectable manual measurement or system application.

The 3540 mΩ HiTESTER includes a comparator function essential for component sorting, fast 16 times-per-second sampling, temperature compensation and auto-ranging, and a choice of versions depending on usage.
The 3540 is the low-price version without external control interfaces, for manual measurements.
The 3540-01 adds BCD output and external control, the 3540-02 includes a printer interface and the 3540-03 includes a RS-232C interface.

ISO14001
JQA-E-90091

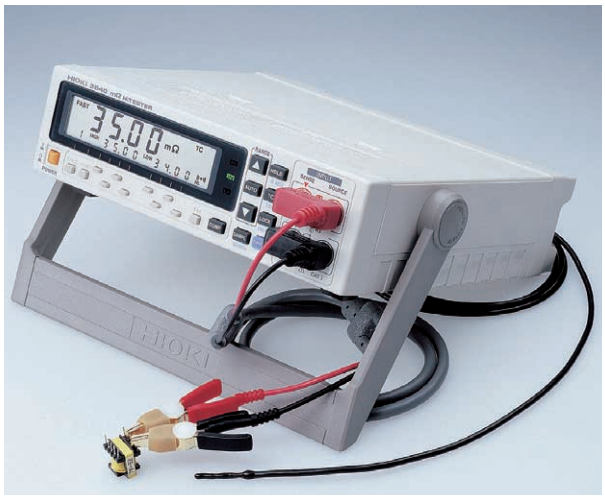
http://www.hioki.co.jp/

HIOKI company overview, new products, environmental considerations and other information are available on our website.

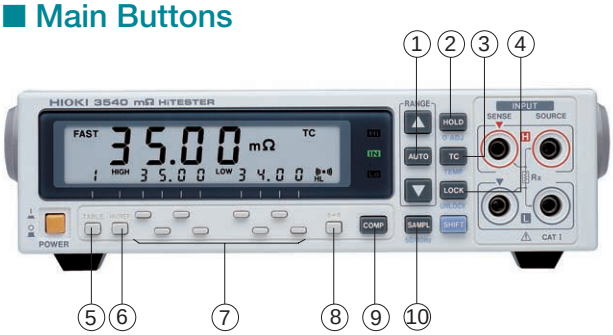
Internal Comparator with Fast 100-ms Response

Features

- Comparator function memorizes up to seven tables.
- Dual comparator modes: Hi-Lo compares upper and lower limits, and REF-% compares a range and standard value.
- Fast response of about 100 ms (measuring pure resistance: actual response depends on material under test)
- Temperature compensation function measures temperature and calculates value relative to copper at 20˚C/68˚F.
- Utilizes 4-terminal method to eliminate effects of leads and contact resistance.
- Auto-ranging function.
- Dual power system: batteries or AC adapter.
- BCD, printer interface and RS-232C interface options in -01, -02 and -03 suffix versions, respectively.



■ Main Buttons



*All display segments shown lit for purposes of illustration.

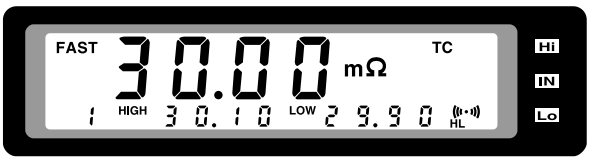
1. Range Select, Auto-Range On/Off
2. Hold (also controllable by external trigger and EOC, besides displaying hold)
3. Temperature compensation On/Off or temperature display
4. Button lock
5. Comparator Table Select (Up to 7 states can be memorized)
6. Comparator Mode Select (Hi-Lo or REF-%)
7. Comparator Value Set (Upper/Lower limits or standard value/range settings)
8. Beeper Mode Select (HL, IN, OFF)
9. Comparator On/Off
10. Sampling Speed Select (Fast: 16 times/s, or Slow: 4 times/s)

■ Comparator Function

The comparator includes a Hi-Lo mode for setting upper and lower limits, and a REF-% mode for setting a standard value and range.
Up to seven tables can be memorized, each storing a measurement range, comparator mode and comparator values.

Hi/IN/Lo measurements are indicated by LED and 3-way beeper mode, and for the -01 and -02 versions, results are available for external use at open-collector output terminals on the rear panel.

Hi-Lo Comparator



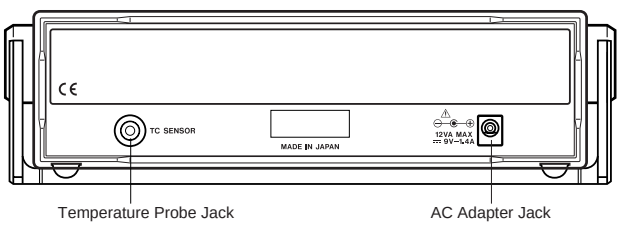
Example display with FAST sampling, measurement value 30.00 mΩ, temperature compensation on, table no. 1, upper limit 30.10 and lower limit 29.90, and beeper mode HL.

REF-% Comparator

Example display with FAST sampling, 100.0% deviation of display from standard value (displayed deviation = measured value / standard value × 100%), temperature compensation function on, table no. 7, standard value is 30.00, range is ±10.0%, and beeper mode IN.

■ 3540

The basic version includes the essential functions: eliminating external interfaces to keep the price low. Comparator results are displayed by LED and beeper. Jacks are provided on the rear panel for the temperature probe (for temperature compensation), and for the AC adapter.



Temperature Measurement Display

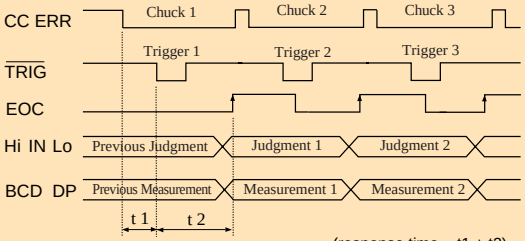
Ideal Interface for System Applications

■ 3540-01

This version is equipped with a digital interface providing BCD output of comparator results and external control capability, as well as the essential functions of the 3540. Along with BCD output, the range, comparator tables, EOC and power can be externally controlled, ideal for system applications.

Timing Chart Example

The following chart shows the timing relationships between comparator results using the hold function and BCD output at the external connector.



FAST t1: 40 ms, t2: 60 ms
SLOW t1: 70 ms, t2: 230 ms

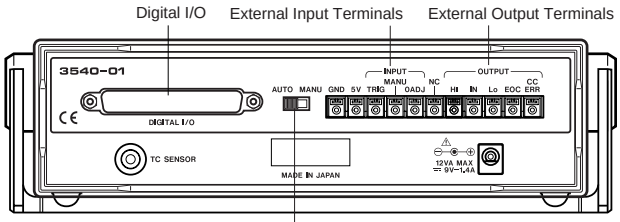
(response time = t1 + t2)

At Hold time, the EOC is retained until the next trigger to facilitate sequencing. Display and output are retained until the next EOC is taken.

CC ERR input enhances test reliability with various materials under test

t1: (Settling time) after checking, the delay until measured power is stable before triggering. Settling time depends on material under test (value is relative to pure resistance).

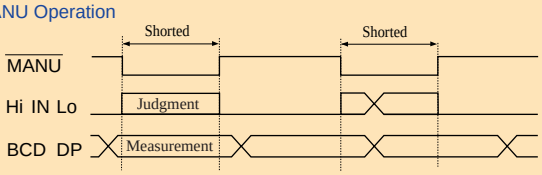
t2: (Measuring) raising EOC accepts BCD and comparator results, so the desired data is captured.



AUTO/MANU Select

With AUTO selected, BCD and comparator results are output continuously. With MANU selected, comparator results are output only when the MANU and GND external input terminals are shorted together.

MANU Operation



Digital I/O Details

Outputs (TTL: 5V, 20 mA max.)
- BCD DP (range) signal
- End-Of-Check (EOC) signal
- Supply Current Error (CC ERR) signal

Inputs (TTL: 5V, 20 mA max.)
- Range Select
- Comparator Table Select
- DC Power (+5V, 200 mA max.)
- GND

Note: Signal Logic
TTL Outputs: assert = 5V, negate = 0V
TTL Inputs: assert = 0V, negate = 5V
Open Collector Outputs: assert = ON, negate = OFF

External I/O

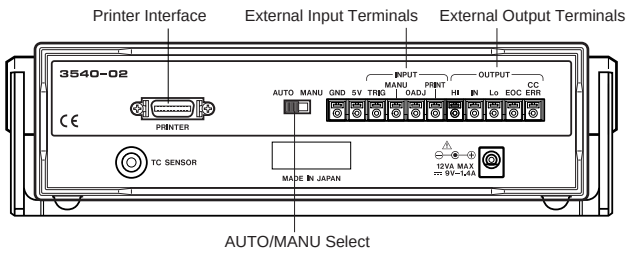
Outputs
(Open Collector: 35V, 50 mA max.)
- Comparator Result signal (Hi, IN, Lo)
- End-Of-Check (EOC) signal
- Supply Current Error (CC ERR) signal

Inputs (TTL: 5V, 20 mA max.)
- Trigger (TRIG)
- Manual (MANU)
- Zero Adjust (0 ADJ)
- Print (PRINT: only in version -02)
- DC Power (+5V, 200 mA max.)
- GND

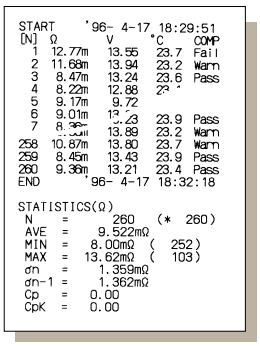
EOC and CC ERR are output from version -01 by both TTL and open collector. Pin out details are available upon request.

■ 3540-02

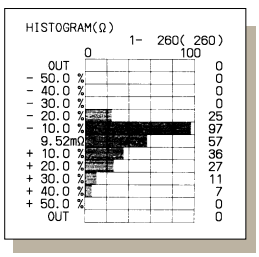
This version is equipped with a printer interface.The printer connector is provided along with the external I/O terminals of the -01 version, allowing printing by external request. The optional model 9203 DIGITAL PRINTER provides interval printing, statistical processing of maximum, minimum, average, standard deviation, histograms and graph printing. A standard printer with Centronics interface can also be connected.



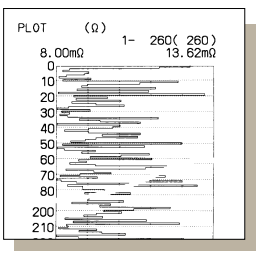
Printing Examples



Statistical Processing



Histogram



Graph Printing

9203 DIGITAL PRINTER

Printer type: Thermal Line Printer
Statistical Processing (up to 99,999 data points)
Histogram and graphics (up to 5,000 data points)
Dimensions and mass: approx. 215W × 160H × 54D mm, 1 kg.

Note: further details are provided in our brochure for Fast Sampling Low-Ohm Meter "3227 mΩ HiTESTER," available upon request.

■ 3540-03

This model is equipped with an RS-232C interface. Through this interface, all features of the instrument other than the power supply can be controlled remotely. Measurement data can also be output through the interface for processing by various applications, increasing the scope of data utility.

RS-232C Specifications

Transfer method : Synchronous transfer, full duplex.
Transfer rate : 9600
Data format : 8 data bits, no parity, 1 stop bit
Handshaking : No support for X flow or hardware flow control
Delimiter : CR or CR+LF during receive, CR+LF during send
Connection cable : D-sub 9-pin female connector, reverse connection

■3540 Specifications

Measurement method:	4-terminal direct current
Operating method:	double integration
Display:	LCD Resistance display digits up to 3500 Temperature digits up to 999
Auto-Ranging:	provided (disabled with comparator ON)
Input Overrange:	[OF] display
Current Fault:	[- - - -] display (CC ERR external output in versions -01 , -02 and -03)
Sampling Rate:	Resistance measurement: SLOW 4 times/s, FAST 16 times/s
Response Time:	Resistance measurement: SLOW 300 ms, FAST 100 ms Note: settling time depends on material under test (values are relative to pure resistance).
Temperature Compensation Function:	Standard Temperature 20˚C/68˚F, Temperature Modulus: 3930 ppm/Cu wire
Comparator:	Comparator modes: selectable Hi-Lo or REF-% Comparator results are indicated by LED and beeper (selectable from HI/IN/OFF) Up to 7 table memories (external table selection only with version -01) External output (open collector: versions -01, -02 and -03 only)
External Control: (-01, -02 and -03 Ver. only)	TTL Output: BCD Open Collector Outputs: Hi, IN, Lo, EOC, CC ERR TTL Inputs: TRIG, MANU, 0 ADJ, range, comparator table select (-01 only), PRINT (-02 only)
External Interface:	Centronics interface (-02 only), RS-232C interface (-03 only)
Overvoltage Protection:	30V DC or AC peak (fuse protected)
Environment: (non-condensating)	Operating temperature range: 0 to 40˚C (32˚F to 104˚F), less than 80% rh Storage temperature range: -10 to 50˚C (14˚F to 122˚F), less than 80% rh Operating conditions: indoors, below 2,000 m (6,562 feet) altitude
Power Supply:	AA-size Alkaline batteries: type LR6 × 6 pcs, or AA-size Manganese batteries: type R6P × 6 pcs, or Model 9445 AC ADAPTER (9 V DC, 1.4 A)
Operating Time: (with LED and Beeper on)	w/LR6 batteries: approx. 7 h (30 and 300 mΩ ranges) approx. 18 h (other ranges) w/R6P batteries: approx. 1.5 h (30 and 300 mΩ ranges) approx. 6 h (other ranges)
Maximum Rated Power:	5 VA
Dimensions:	215W × 61H × 213D mm (8.5"W × 2.4"H × 8.4"D)
Mass:	3540 – Approx 900 g (21lbs), 3540-01 – Approx 1 kg (35.3 oz.)
Accessories:	9287 CLIP TYPE LEADS (1), 9451 TEMPERATURE PROBE (1), Spare Fuse (1- F1.0 AH/250 V), Ferrite Clamp (2), External Connector Socket (*Ver.-01 only, HIROSE ELECTRIC INC. 37-pin plug / type FDCD-37P)
Conforming Standards:	EMC EN55011:1991+A2:1996 EN50082-1:1992 Safety EN61010-1:1993+A2:1995 EN61010-2-031:1994 Overvoltage category II (expected overvoltage 330V) Pollution degree 2

■Measurement Ranges

Conditions of guaranteed accuracy: 23 ± 5˚C/73 ± 9˚F less than 80% rh (non-condensating), after 30 min. warm-up, after zero adjust.

Resistance Measurement: (sample rate: SLOW; for FAST, add 3 digits to the following digit tolerances)

Range	30 mΩ	300 mΩ	3 Ω	30 Ω	300 Ω	3 kΩ	30 kΩ
Resolution	10 μΩ	100 μΩ	1 mΩ	10 mΩ	100 mΩ	1 Ω	10 Ω
Measuring Current	100 mA		1mA			10 μA	
Maximum Applied Voltage	3.5mV	35mV	3.5 mV	35 mV	350 mV	35 mV	350 mV
Accuracy	±0.1%rdg. ±6dgt.	±0.1%rdg. ±4dgt.	±0.1%rdg. ±6dgt.	±0.1%rdg. ±4dgt.			
Temperature Modulus	(±0.02%rdg. ±0.5dgt.)/˚C (1.8˚F)						
Open-Terminal Voltage	4.0 V max.						

Temperature Measurement/Compensation

Temperature Range	Temperature Measurement Accuracy	Accuracy of Temperature Compensation (add to resistance measurement accuracy)
-10.0 to 39.9˚C (-14.0 to 103.8˚F)	±0.3%rdg. ±0.5˚C (0.9˚F)	±0.3%
40.0 to 99.9˚C (104 to 211.8˚F)	±0.3%rdg. ±1.0˚C (1.8˚F)	±0.6%

approx. 1.5 m (59.1")
platinum resistance
9451 TEMPERATURE PROBE (included)

3540 mΩHiTESTER
3540-01 mΩHiTESTER (with BCD)
3540-02 mΩHiTESTER (with Printer interface)
3540-03 mΩHiTESTER (with RS-232C interface)

Optional accessories

9445 AC ADAPTER (universal 100 to 240VAC , 9V/1.4A output/for UL type)
9445-01 AC ADAPTER (universal 100 to 240VAC , 9V/1.4A output/for EU type)
9452 CLIP TYPE LEADS
9453 FOUR-TERMINAL LEADS
9455 PIN TYPE LEADS
9460 CLIP TYPE LEADS WITH TEMPERATURE SENSOR
9461 PIN TYPE LEADS
9467 LARGE CLIP TYPE LEADS
9203 DIGITAL PRINTER (for -02)
9425 CONNECTION CORD (20-pin half-pitch—36pin/D-sub)
[for connecting the 3540-02 to the 9203/2meters]
9233 RECORDING PAPER (for the 9203/10meters,10rolls)

9287 (supplied)

Approx. 85 cm between connectors, and 8 cm between probes

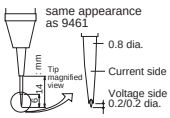
9452

Approx. 80 cm between connectors, and 20 cm between probes

9453

Approx. 80 cm between connectors, and 30 cm between probes

9455



Approx. 40 cm between connectors, and 25 cm between probes

9460

Approx. 1.7 m between connectors, and 25 cm between probes

9461

Approx. 40 cm between connectors, and 25 cm between probes

9467

Approx. 85 cm between connectors, and 25 cm between probes, 29 mm dia.

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