3802

DIGITAL HiTESTER

INSTRUCTION MANUAL

Contents

Introduction

Thank you for purchasing the HIOKI "3802 DIGITAL HiTESTER." To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Accessories

3851-10 TEST LEAD (a pair)	1
Protective holster	1
Instruction Manual	1
6F22 manganese battery(built into the instrument)	1

Safety

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using the instrument, be sure to carefully read the following safety notes.

⚠WARNING

This instrument is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

Safety symbols

	• The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function. • In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.
	Indicates that dangerous voltage may be present at this terminal.
	Indicates a grounding terminal.
	Indicates a fuse.
	Indicates DC (Direct Current)
	Indicates AC (Alternating Current).
	Indicates DC (Direct Current) or AC (Alternating Current).

The following symbols in this manual indicate the relative importance of cautions and warnings.

	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
	Advisory items related to performance or correct operation of the instrument.

■ Measurement categories (Overvoltage categories)

This instrument conforms to the safety requirements for CAT II (1000 V), CAT III (600V) measurement instruments.
To ensure safe operation of measurement instrument, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

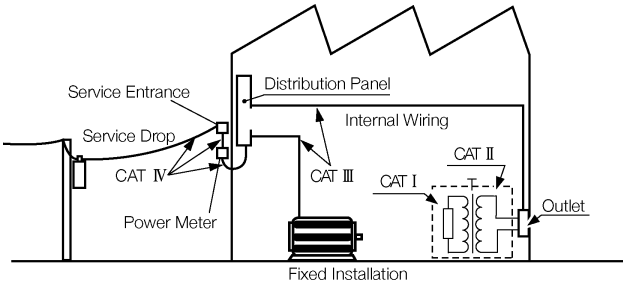
CAT I : Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.

CAT II : Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)

CAT III : Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.

CAT IV : The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



Notes on Use

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

⚠ DANGER

- **Always verify the appropriate setting of the function selector before connecting the test leads. Disconnect the test leads from the measurement object before switching the function selector.**
- **Never apply voltage to the test leads when the Resistance, Continuity or Diode Check, or Capacitance functions are selected. Doing so may damage the instrument and result in personal injury.**
  To avoid electrical accidents, remove power from the circuit before measuring.

⚠WARNING

- **To avoid electric shock, do not allow the instrument to get wet, and do not use it when your hands are wet.**
- **Do not attempt to adjust or repair the instrument with the case open and with voltage being generated and input. Such adjustments or repairs should only be made by a technician who fully understands the dangers involved.**
- **If the instrument is connected to a line that is to be measured, dangerous voltage levels may be applied to the terminals, and removing the case may expose live components. When opening the case to replace the battery, etc., the test leads must be detached.**

⚠CAUTION

- **If the protective functions of the instrument are damaged, either remove it from service or mark it clearly so that others do not use it inadvertently.**
- **Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.**
- **This instrument is not designed to be entirely water- or dust-proof. To avoid damage, do not use it in a wet or dusty environment.**
- **For safety reasons, when taking measurements, only use the 3851-10 TEST LEAD provided with the instrument.**
- **Do not use the instrument near a source of strong electromagnetic radiation, or near a highly electrically charged object. These may cause a malfunction.**

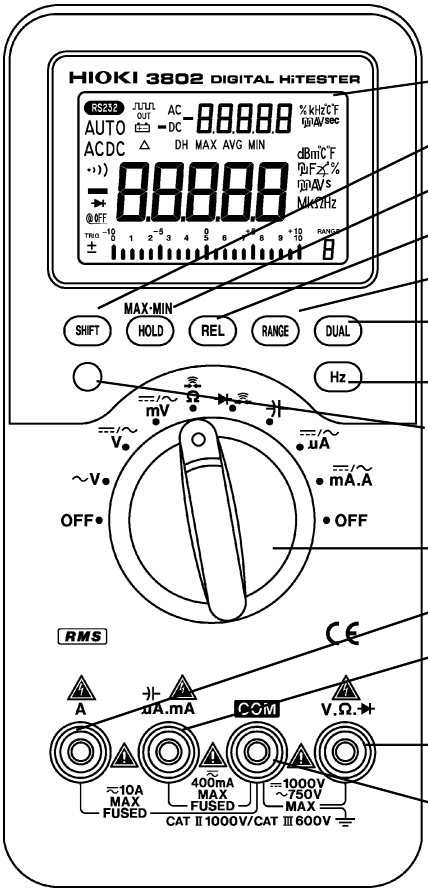
Preliminary Check

Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

⚠WARNING

Before using the instrument, make sure that the insulation on the test leads is undamaged and that no bare conductors are improperly exposed. Using the product under such conditions could result in electrocution. Replace the test leads with the specified Hioki Model 3851-10.

Chapter 1 Names and Functions of parts



13. LCD Display
2. **SHIFT** Key
3. **HOLD/MAX • MIN** Key
4. **REL** Key
5. **RANGE** Key
6. **DUAL** Key
7. **Hz** Key
8. Display range select Key
1. Function Switch
12. **A Terminal**
11. **µA.mA.⊣⊢** Terminal
9. **V • Ω • ⊣◀** Terminal
10. **COM** Terminal

1. Function Switch

Selects functions, and turns the instrument on and off.

~V	AC coupling voltage measurement.
⎓/~V	DC, AC Voltage measurements.
⎓/~mV	DC, AC millivolt measurements.
Ω/	Resistance, Continuity measurements: 400Ω to 40MΩ
****	Diode measurement.
⊣⊢	Capacitance measurement: 4nF to 9999mF
⎓/~μA	DC, AC Microampere measurements: 400 to 4000mA
⎓/~mA.A	DC,AC milliampere and ampere measurements: 40 to 400mA or 4 to 10A.

2. **SHIFT**:

⎓/~V	Select DC, AC
⎓/~mV	Select DC, AC
Ω/	Select Resistance measurement, Continuity check
⎓/~μA	Select DC, AC
⎓/~mA.A	Select DC, AC

- This key is used for selecting the measurement of alternating source or direct source.
- Push this key momentarily to step through DC and AC test.
- For Ohm test, push this key momentarily to toggle•))) ON/OFF.
  The beeper will sound continuity when test value below 100 counts (40,000 counts resolution : 1000 counts).

3. **HOLD/MAX • MIN**:
   DATA HOLD or Refresh Data Hold
   - The data hold function allows operator to hold the displayed digital value while the analog bar graph continues showing the present readings.
   - To select **Refresh Hold** by power-on options. The reading can be updated to the indicator automatically when the reading is changed. And simultaneously the beeper sounds a tone to remind user.
   - Press this key momentarily to toggle DH on or off.

4. **REL(ZERO)**
   Relative
   - The relative function shows the difference between the measured value and the stored value.
   - Press to toggle RELative(△) ON or OFF.

5. **RANGE**:
   - In auto-range, press this key to select manual range and turn off the **AUTO** annunciator.
   - In manual range, press this key momentarily to step up 1 range at one time, press this key for more than 1 second to select auto-range.
   - In auto-range, the **AUTO** annunciator is lit and the meter will select an appropriate range for resolution if a reading is greater than maximum available range, **OL** (overload) will be displayed on the display. The meter will select a lower range when reading is less than about 9% of full scale.

6. **DUAL**:
   Dual Display Combination
   - Press this key momentarily to select different combinations of dual display. The combinations of dual display are shown following table.

Function	Primary display	Secondary display	Remark
AC Voltage	AC Volt	Frequency	
DC Voltage	DC Volt	Frequency	
AC Current	AC Amps	Frequency	
DC Current	DC Amps	Frequency	

7. **Hz**:
   Select Frequency Test
   - For Volt or Amp test, press this key momentarily to enter Frequency test and Voltage or Current is indicated in secondary display.
     Press this key more than 1 second to return to Voltage or Current measurement.
   - The combinations of dual display are shown in the following by pushing **Hz** key.

Function	Primary display	Secondary display
AC Voltage	Frequency(Hz)	AC Volt
DC Voltage	Frequency(Hz)	DC Volt
AC Current	Frequency(Hz)	AC Amps
DC Current	Frequency(Hz)	DC Amps

8. Display range select:
   - Press this key for more than 1 second to toggle 4,000 or 40,000 counts resolution.

9. **V** • Ω • ⊣◀ Terminal
   - Use this terminal for voltage, resistance and diode functions.

10. **COM** Terminal
    - Common terminal for each function. (Please connect the black test lead)

11. **µA.mA.**⊣⊢ Terminal
    - Use this terminal for µA, mA.⊣⊢ functions.

12. **A** Terminal
    - Use this terminal for A functions.

13. LCD Display illustration:

Bar graph	: Analog bar graph annunciator (21 segments) with scale indicators
AUTO OFF	: Auto power off is enabled
	: Battery power is weakening (below approx. 7.2 V)
DC	: Direct Current or Voltage
AC	: Alternating Current or Voltage
AUTO	: AUTO range Mode
△	: Zero(Delta) mode annunciator
DH	: Data hold annunciator
MAX AVG MIN	: Dynamic recording mode, indicates the present reading
MAX	: Maximum reading
AVG	: Average reading
MIN	: Minimum reading
•))	: Continuity function annunciator
	: Diode/Audible continuity function annunciator
mμA	: Current unit of primary or secondary display
mV	: Voltage unit of primary or secondary display
MkΩ	: Resistance (ohm) units
kHz	: Frequency units for primary or secondary display
RANGE 8	: The measuring range of each function.
sec	: Relative time unit (second)
RS232	: Communication ON annunciator
nμF	: Capacitor units

Chapter 2 Measurement Procedures

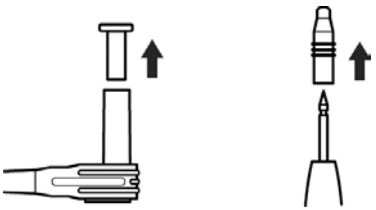
⚠WARNING

Observe the following precautions to avoid electric shock.

- **There insulating clearance around the terminals is not safe. Be careful when connecting test leads.**
- **The changing of the function switch when replacing the test terminals requires disconnection of the test leads from the item being measured and then the disconnection of the test leads from the terminals.**

■ Preparation for Measurement

The safety caps are attached to the test leads. Remove these caps before connecting to the instrument.



2.1 Voltage Measurement

⚠ DANGER

- **The maximum input voltage is 1200 VDC, 850 Vrms, or, 10^6V • Hz. (600 VDC/rms or 10^6 V • Hz when setting the function switch to ⎓/∿mV.) Attempting to measure voltage in excess of the maximum input could destroy the instrument and result in personal injury or death.**
- **To avoid electrical shock, be careful to avoid shorting live lines with the test leads.**

NOTE Correct measurement may be impossible in the presence of strong magnetic fields, such as near transformers and high-current conductors, or in the presence of strong electromagnetic fields such as near radio transmitters.

2.1.1 AC Voltage Measurement (using ∿V function)

(1) Set the function switch to **∿V** .

(2) Connect the black test lead to **COM** terminal and red test lead to **V • Ω •** ⏚ terminal.

(3) Touch the test leads to the test points and read the display.

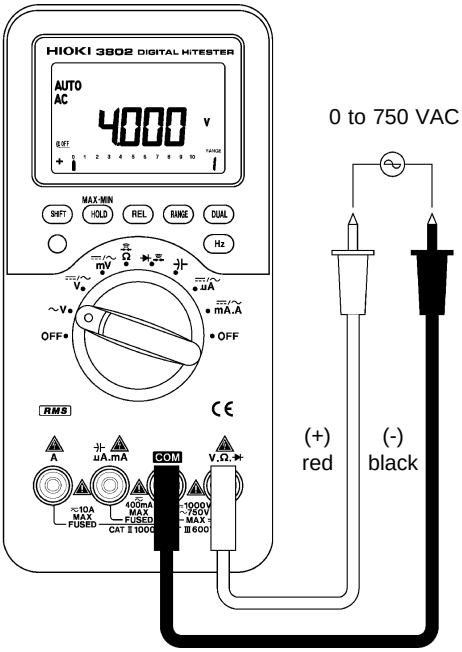
(4) For manual range selection, press the **RANGE** key (the **AUTO** mark disappears). To return to auto-ranging operation, press and hold the **RANGE** key for more than 1 second.

(5) Push **DUAL** key momentarily to enter multi-display mode. Below, that is **DUAL** key operation for AC voltage.

Key operation	Primary display	Secondary display
Push Dual	AC Voltage	Hz
Push Dual	AC Voltage	

(6) Push **Hz** key momentarily to enter frequency measurement.

Key operation	Primary display	Secondary display
Push Hz	Hz	AC Voltage
Push Hz and hold more than 1 second	AC Voltage	



2.1.2 DC/AC Voltage Measurement (using ⎓/∼V or ⎓/∼mV function)

(1) Set the function switch to **⎓/∼V or ⎓/∼mV** .

(2) Connect the black test lead to **COM** terminal and red test lead to **V • Ω •** ⊣◀ terminal.

(3) Touch the test leads to the test points and read the display.

(4) For manual range selection, press the **RANGE** key (the **AUTO** mark disappears). To return to auto-ranging operation, press and hold the **RANGE** key for more than 1 second.

(5) Push **SHIFT** key momentarily to step through DC and AC test.

Key operation	Primary display	Secondary display
Push SHIFT	AC Voltage (mV)	
Push SHIFT	DC Voltage (mV)	

(6) Push **DUAL** key momentarily to enter multi-display mode. Below, the table is **DUAL** key operation for DC voltage or mV.

Key operation	Primary display	Secondary display
Push Dual	DC Voltage (mV)	Hz
Push Dual	DC Voltage (mV)	

Below, that is **DUAL** key operation for AC voltage or mV.

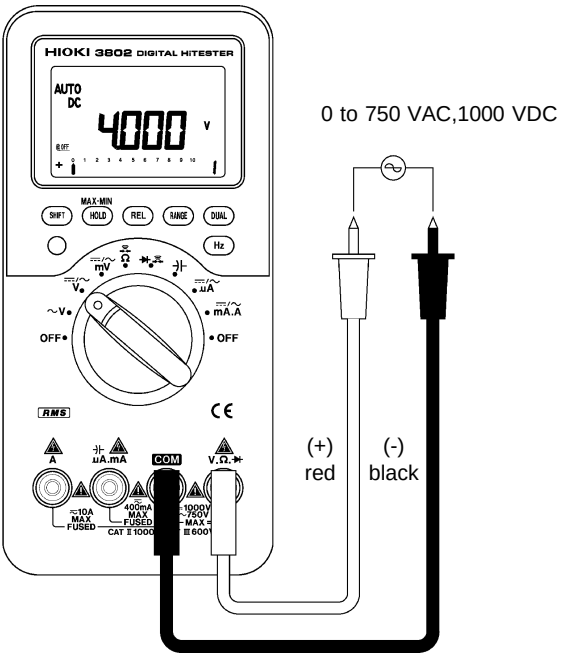
Key operation	Primary display	Secondary display
Push Dual	AC Voltage (mV)	Hz
Push Dual	AC Voltage (mV)	

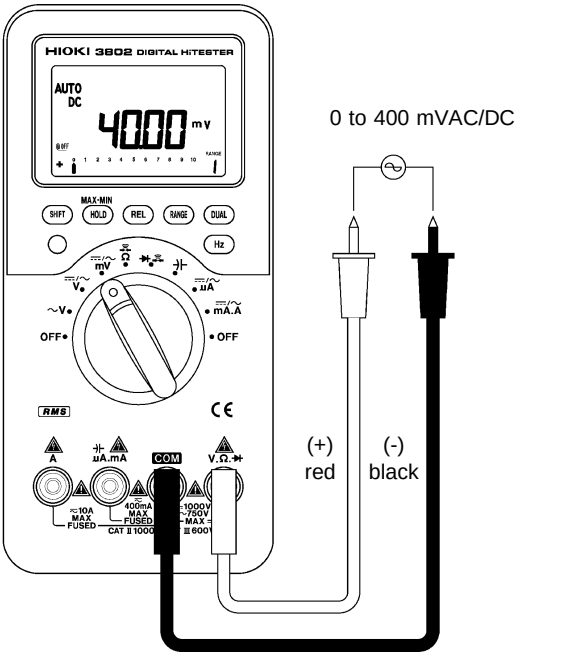
(7) Push **Hz** key momentarily to enter frequency measurement.

Key operation	Primary display	Secondary display
Push Hz	Hz	DC(AC)Voltage (mV)
Push Hz and hold more than 1 second	DC(AC) Voltage (mV)	

NOTE

- When measuring the voltage of Braun tube, select 1000 VDC range.


HIOKI 3802 DIGITAL HITESTER
AUTO
DC
4000
V
SHIFT
MAX-MIN
HOLD
REL
RANGE
DUAL
Hz
OFF
OFF
RMS
COM
0 to 750 VAC,1000 VDC
(+)
red
(-)
black


HIOKI 3802 DIGITAL HITESTER
AUTO
DC
4000
mV
SHIFT
MAX-MIN
HOLD
REL
RANGE
DUAL
Hz
OFF
OFF
RMS
COM
0 to 400 mVAC/DC
(+)
red
(-)
black

2.2 Resistance Measurement

⚠ DANGER

- **Never apply voltage to the test leads when the Resistance functions is selected. Doing so may damage the instrument and result in personal injury.**
  To avoid electrical accidents, remove power from the circuit before measuring.

(1) Set the function switch to Ω .

(2) Connect the black test lead to **COM** terminal and red test lead to **V** • Ω • ⊣◀ terminal.

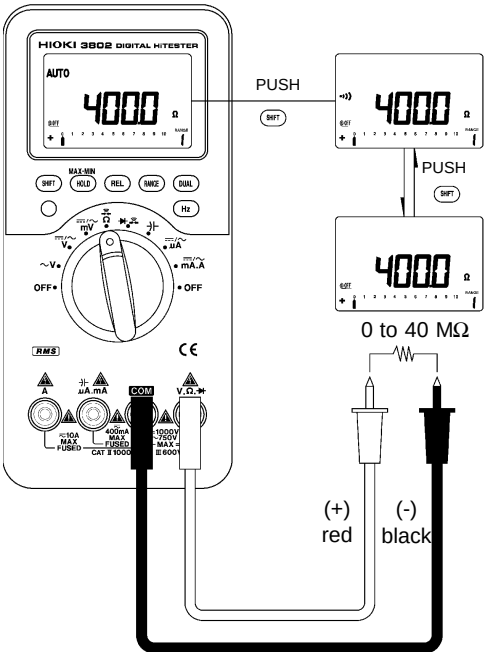
(3) Touch the test leads to resistor and read the display.

(4) For manual range selection, press the **RANGE** key (the **AUTO** mark disappears). To return to auto-ranging operation, press and hold the **RANGE** key for more than 1 second.

(5) In Ohm test, press **SHIFT** key momentarily to toggle CONTINUITY function ON/OFF. The continuity range is 0-400.0 Ω Momentarily pushing this key will only turn the beeper off. While testing continuity, the beeper will sound if the resistance falls below 10 Ω.

NOTE

- When the continuity check function is enabled, a beep sounds if the resistance corresponds to a display value of 100 or less in the current range (or a value of 1000 or less in a 40000 counts resolution).
- In the continuity check function, holding down the **RANGE** key for at least 1 second switches to auto ranging, and the •)) indication appears, but no continuity check is carried out.


HIOKI 3802 DIGITAL HITESTER
AUTO
4000
Ω
PUSH
SHIFT
MAX-MIN
HOLD
REL
RANGE
DUAL
Hz
OFF
RMS
COM
0 to 40 MΩ
(+)
red
(-)
black

2.3 Diode Check

⚠ DANGER

- **Never apply voltage to the test leads when the Diode Check functions is selected. Doing so may damage the instrument and result in personal injury.**
  To avoid electrical accidents, remove power from the circuit before measuring.

A good diode allows current to flow in one direction only. To test a diode, turn the power off, remove the diode from the circuit, and proceed as follows:

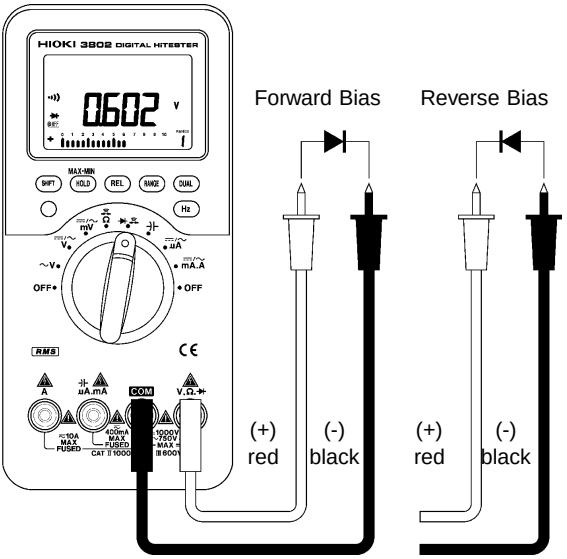
(1) Set the function switch to position.

(2) Connect the black test lead to **COM** terminal and red test lead to **V • Ω •** terminal.

(3) Touch the red lead to the positive side of the diode and the black lead to the negative side. The meter can display diode voltage drops to approximately 2.5 V. A typical voltage drop is 0.4 to 0.7 V, and the meter will sound a beep to remind user.

(4) Reverse the test leads and measure the voltage across the diode again. If the diode is:
- Good : **OL** is displayed.
- Shorted : Near 0 V drop is displayed in both directions, and the beeper sounds continuously.
- Open : **OL** is displayed in both directions.

(5) Repeat step (3) and (4) for other diodes.


HIOKI 3802 DIGITAL HITESTER
0602
SHIFT
MAX-MIN
HOLD
REL
RANGE
DUAL
Hz
OFF
OFF
RMS
COM
Forward Bias
Reverse Bias
(+)
red
(-)
black
(+)
red
(-)
black

2.4 Capacitance Measurement

⚠ DANGER

- **Never apply voltage to the μA.mA.⊣⊢ terminal. Doing so may damage the instrument and result in personal injury.**

⚠WARNING

- **Be sure to short the capacitor to discharge it before measuring it if it may charged. Doing so may damage the instrument and result in personal injury.**

(1) Set the function switch to ⊣⊢ position.

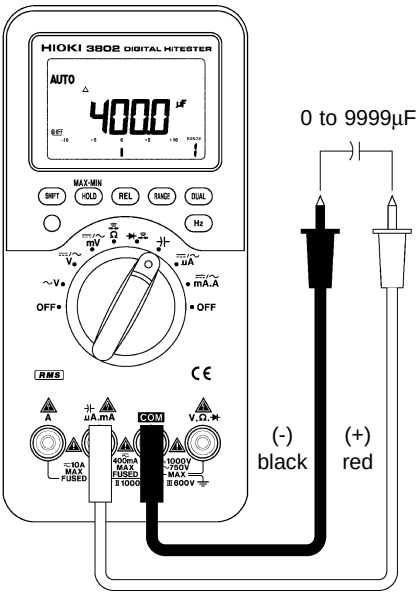
(2) Connect the red lead to **μA.mA.⊣⊢** terminal, and black lead in **COM** terminal.

(3) Open the test leads, then push **REL** key momentarily to zero the residual.

(4) Connect the test leads across the capacitor and read the display.

NOTE

- Observe polarity when measuring the polarized capacitors.
- When testing low-capitance devices, noise introduced into the test leads from the human body may prevent the measured value from stabilizing. If this occurs, use the optional 9617 CLIP ON BASE or the optional 9618 CLIP-TYPE LEAD and keep hands away from the leads during measurement.


HIOKI 3802 DIGITAL HITESTER
AUTO
4000
μF
MAX-MIN
SHIFT
HOLD
REL
RANGE
DUAL
Hz
OFF
OFF
RMS
COM
0 to 9999μF
(-)
black
(+)
red

2.5 Current Measurement

⚠WARNING

- **Do not use the tester to measure current when the electric potential is 600 V or greater. The current function overload protection trips at 600 VAC.**
- **To avoid electrical accidents, remove power from the circuit before measuring.**
- **Do not apply voltage while a current range is selected. Applying voltage may result in damage to the instrument, or a serious accident.**

2.5.1 μA Measurement (400 μA,4000 μA)

(1) Set the function switch to ⎓/∼**μA** .

(2) Connect the black test lead to **COM** terminal and red test lead to **μA.mA.⊣⊢** terminal.

(3) Touch the test leads to the test points and read the display.

(4) For manual range selection, press the **RANGE** key (the **AUTO** mark disappears). To return to auto-ranging operation, press and hold the **RANGE** key for more than 1 second.

(5) Push **SHIFT** key momentarily to step through DC and AC test.

Key operation	Primary display	Secondary display
Push SHIFT	ACμA	
Push SHIFT	DCμA	

(6) Push **DUAL** key momentarily to enter multi-display mode. Below, the table is **DUAL** key operation for DC mA.

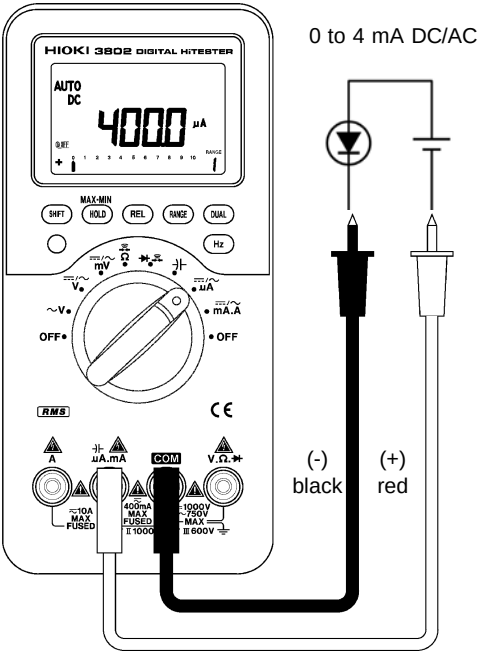
Key operation	Primary display	Secondary display
Push Dual	DCμA	Hz
Push Dual	DCμA	

Below, the table is **DUAL** key operation for ACμA.

Key operation	Primary display	Secondary display
Push Dual	ACμA	Hz
Push Dual	ACμA	

(7) Push **Hz** key momentarily to enter frequency measurement.

Key operation	Primary display	Secondary display
Push Hz	Hz	DC (AC)μA
Push Hz and hold more than 1 second	DC (AC)μA	



2.5.2 mA Measurement (40 mA,400 mA)

(1) Set the function switch to ⎓/∿**mA.A** .

(2) Connect the black test lead to **COM** terminal and red test lead to **µA.mA.**⊣⊢ terminal.

(3) Touch the test leads to the test points and read the display.

(4) For manual range selection, press the **RANGE** key (the **AUTO** mark disappears). To return to auto-ranging operation, press and hold the **RANGE** key for more than 1 second.

(5) Push **SHIFT** key momentarily to step through DC and AC test.

Key operation	Primary display	Secondary display
Push SHIFT	AC mA	
Push SHIFT	DC mA	

(6) Push **DUAL** key momentarily to enter multi-display mode. Below, the table is **DUAL** key operation for DC mA.

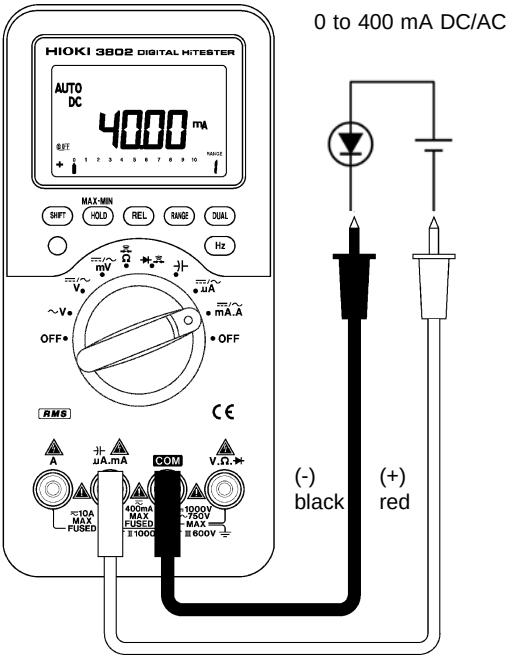
Key operation	Primary display	Secondary display
Push Dual	DC mA	Hz
Push Dual	DC mA	

Below, the table is **DUAL** key operation for AC mA.

Key operation	Primary display	Secondary display
Push Dual	AC mA	Hz
Push Dual	AC mA	

(7) Push **Hz** key momentarily to enter frequency measurement.

Key operation	Primary display	Secondary display
Push Hz	Hz	DC (AC) mA
Push Hz and hold more than 1 second	DC (AC) mA	


0 to 400 mA DC/AC
HIOKI 3802 DIGITAL HiTESTER
AUTO
DC
4000
mA
SHIFT
HOLD
REL
RANGE
DUAL
MAX-MIN
Hz
OFF
OFF
RMS
COM
(-)
black
(+)
red

2.5.3 A Measurement (10 A)

⚠WARNING

- **The maximum input current in the 10 A range is DC 10 A or AC 10 A rms. Never exceed this limit, as doing so could result in destruction of the instrument and personal injury or death.**

(1) Set the function switch to ⎓/∼**mA.A** .

(2) Connect the black test lead to **COM** terminal and red test lead to **A** terminal.

(3) Touch the test leads to the test points and read the display.

(4) Push **SHIFT** key momentarily to step through DC and AC test.

Key operation	Primary display	Secondary display
Push SHIFT	AC A	
Push SHIFT	DC A	

(5) Push **DUAL** key momentarily to enter multi-display mode. Below, the table is **DUAL** key operation for DC A.

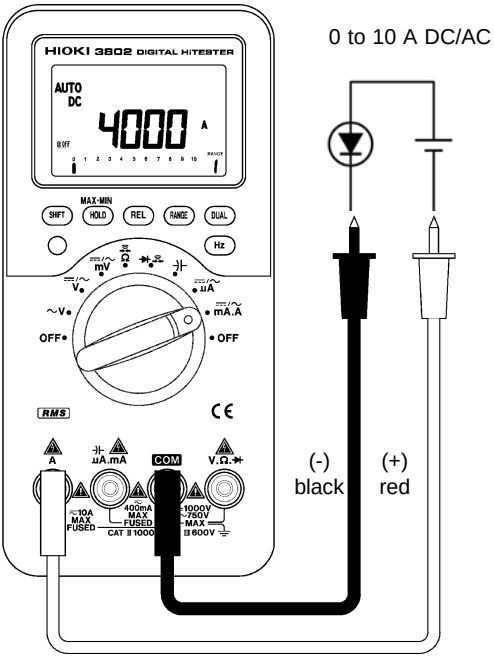
Key operation	Primary display	Secondary display
Push Dual	DC A	Hz
Push Dual	DC A	

Below, the table is **DUAL** key operation for AC mA.

Key operation	Primary display	Secondary display
Push Dual	AC A	Hz
Push Dual	AC A	

(6) Push **Hz** key momentarily to enter frequency measurement.

Key operation	Primary display	Secondary display
Push Hz	Hz	DC (AC) A
Push Hz and hold more than 1 second	DC (AC) A	


HIOKI 3802 DIGITAL HiTESTER
AUTO
DC
4000
A
MAX-MIN
SHIFT
HOLD
REL
RANGE
DUAL
Hz
mV
Ω
μA
V
mA.A
OFF
OFF
RMS
CE
A
μA.mA
COM
V.Ω.
10A MAX FUSED
400mA MAX FUSED
CAT II 1000
1000V
750V
MAX
600V
0 to 10 A DC/AC
(-)
black
(+)
red

Chapter 3 Special Functions Instruction

This multi-meter provides operators with various functions including:

- Dynamic Recording
- Data Hold / Refresh Hold
- Relative
- Analog Bar graph
- Auto Power Off and Sleep Mode
- Display Value Selection Function
- Demonstrate Annunciator of Display (LCD Display Check Function)
- Continuity Function For Ohms Measurement
- Combination Display
- Communication Function (RS-232C)
- Warning Function for Incorrect Current Input Terminal Connection
- Power-on Option

3.1 Dynamic Recording

The dynamic recording mode can be used to catch intermittent turn on or turn off surges, verify performance, measure while you are away, or take readings while you are operating the equipment under test and can not watch the meter.

The average reading is useful for smoothing out unstable or changing inputs, estimating the percentage of time a circuit is operated, or verifying circuit performance.

The operational procedures are described below:

(1) Press **HOLD/MAX • MIN** for more than 1 second to enter the dynamic recording. The present value is stored to memories of maximum, minimum and average. **MAX AVG MIN** annunciator will be on.

(2) Press this key for more than 1 second to exit recording mode.

(3) Press this key momentarily to cycle through maximum, minimum, average and present readings. The **MAX, MIN, AVG** or **MAX AVG MIN** annunciator turns on respectively to indicate which value is being displayed.

(4) The beeper sounds when a new maximum or minimum value is recorded.

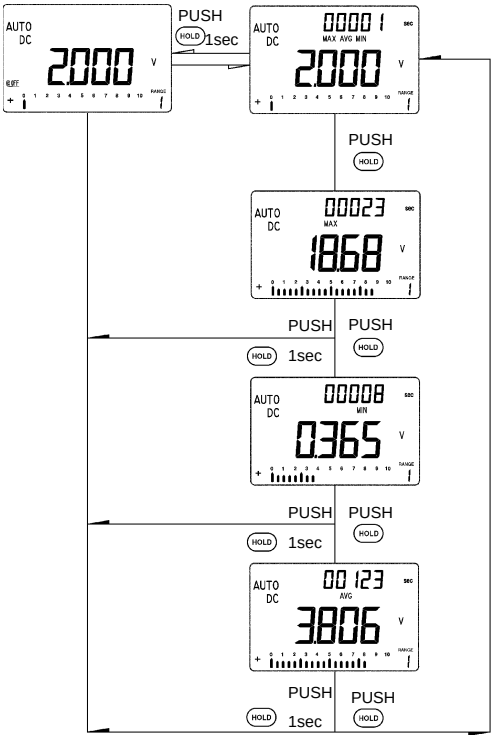
(5) If an overload is recorded the averaging function will stop. An average value becomes **OL** (overload).

(6) The secondary digits show the relative stamping time for **MAX, MIN, AVG** reading.

NOTE

- In dynamic recording, the auto power off feature is disabled. and the AUTO OFF will be turned off.
- Selecting dynamic recording in auto range, it will record the value of MAX, MIN or AVG for different ranges.
- The recording speed of dynamic recording is about 100 milli-seconds (0.1 second).
- The average value is the true average of all measured values taken since the recording mode was entered.

• The unit of relative time is second, and the maximum display is 99,999 sec.



3.2 Data Hold/Refresh Hold

3.2.1 Data Hold

The data hold function allows operators to hold the displayed digital value, while the analog bar graph continues showing the present readings. Press **HOLD/MAX • MIN** key to enter the data hold mode, and the **DH** will be displayed. Press the key again to exit. The present reading is now shown.

NOTE

- The analog bar graph continues showing the present readings.

3.2.2 Refresh Hold

You can use the power-on option to set the Refresh Hold when you are working on a difficult measuring field. This function will freeze measuring value automatically, and sound a tone to remind user. The operation of push key is same as the operation of Data hold.

NOTE

- If the reading is unstable, the display may not be updated.
- In the voltage, current, and capacitance functions, when the measured value corresponds to 80 counts (800 counts in the case of 40000 counts resolution), the display value is not updated.
- In the resistance and diode functions, the display value is not updated in the overload **OL** state, and when the test leads are open-circuit.

3.3 Relative (ZERO)

The relative function subtracts a stored value from the present measurement and displays the result.

(1) Press **REL** key momentarily to set the relative mode. This sets the display to zero and stores the displayed reading as a reference value, also △ will be displayed.

(2) Both auto or manual range can set relative mode. The relative mode can't be set when an overload has occurred.

(3) Press this key again to exit the relative mode.

(4) In the relative mode, the zero point of bar graph is set to middle position.

(5) When the Ohm measurement mode is entered, the display will reads a non zero value due to the presence of test leads. You can use the relative function to Zero-Adjust the display.

NOTE

- In the case of an overload (**OL** indication), the relative function does not operate.
- The relative function is ended by changing the function, pressing the **SHIFT** key, **RANGE** key, **DUAL** key, or **Hz** key, or by powering off the instrument.

3.4 Analog Bar Graph

The analog bar graph display provides a 21 segments analog reading representation. The unit of the bar graph is 50 counts/bar (40,000 counts resolution: 500 counts/bar) except when in the RELative mode. The unit of the bar graph is 100 counts/bar in the RELative mode. For increased sensitivity, the display of bar graph moves across the scale four times for each range. The bar returns to 0 (wraps around) for 1000, 2000, 3000, 4000 counts (40,000 counts resolution: 10,000, 20,000, 30,000, 40,000 counts).

3.5 Auto Power Off and Sleep Mode

Two steps for power saving:

(1) The instrument may enter **sleep** mode within 15 minutes, if none of the following happens.
- Push keys are used.
- Measurement function is changed.
- Dynamic recording is set.
- 1 ms peak hold is set.
- Disable auto power off with power-on option.

(2) In sleep mode, the LCD will display a blinking AOFF signal.
- To wake-up sleep mode, press any push key for more than 0.5 sec or rotate function switch.
- Without waking up, after 15 minutes, the meter will automatically shut off completely.

(3) You must turn the function switch to the OFF position, then turn on again to activate the meter after auto power off.

- DISABLE AUTO POWER OFF

When the meter is to be used for long periods of time, the operator may want to disable the auto power off. Once the auto power off function is disabled, the meter will stay on continuously. To shut off the meter by turning the function switch to the off position.

To activate this function, press and hold the **SHIFT** key before switching the meter power on. When all annunciators are displayed, press any key momentarily to exit demonstration mode, and the AOFF annunciator will be off.

NOTE

- All settings are reset after returning from sleep mode or auto power off.
- The functions in this section are disabled when recording function is active.

3.6 Display Value Selection Function

It is possible to select either 4000 or 40000 as the maximum

display value, using either of the following methods.

(1) After powering on the instrument, hold down the display range select key for more than 1 second. Holding down the display range select key once more for more than 1 second returns to the previous display value.

(2) Power on the instrument while holding down the **RANGE** key (power on options). This selects the 40000 display value setting.

NOTE

- When the dual display function is active, this changes the display value for both the first and second displays.
- When the instrument is powered on in the usual way (without using the power on options), a maximum display value of 4000 is selected.
- The display value for the capacitance measurement function does not change (fixed at 4000).

3.7 Demonstrate Annunciator

To demonstrate the annunciators, press **SHIFT** key and turn on the meter simultaneously. All annunciators will be displayed. Press any key to exit demonstration mode.

NOTE

- This operation cancels the power save function. To renewable the power save function, power the instrument off and on again.

3.8 Continuity Function for OHMS Measurement

In Ohm test, press **SHIFT** key momentarily to toggle CONTINUITY function
ON/OFF. The continuity range is 0-400.0 Ω Momentarily pushing this key will only turn the beeper on/off.
While testing continuity, the beeper will sound if the resistance falls below 10 Ω. For other range, the beeper will sound if the resistance falls below 100 counts (40,000 counts resolution: 1,000 counts).

NOTE

- After starting the conductivity check function based on resistance measurement, even pressing the **SHIFT** key to exit the function does not return to auto ranging. To set auto ranging, hold down the **RANGE** key for at least 1 second.
- In the continuity check function, holding down the **RANGE** key for at least 1 second switches to auto ranging, and the ••)) indication appears, but no continuity check is carried out. (The beeper does not sound.)

3.9 Combination Display

The frequency measuring mode helps detect the presence of harmonic currents in neutral conductors and determines whether these neutral currents are the result of unbalanced phases or non-linear loads.
For Voltage or Current test, press **Hz** key momentarily to enter Frequency test. Voltage or Current will display on the secondary display, the frequency will display on the primary display. This allows simultaneously monitor the current levels and frequency.
Press **Hz** key more than 1 second to return to Voltage or Current measurement.
Please refer to the Chapter 2 of Measurement Procedures, that will detail for other combination display.

3.10 Communication (RS-232C)

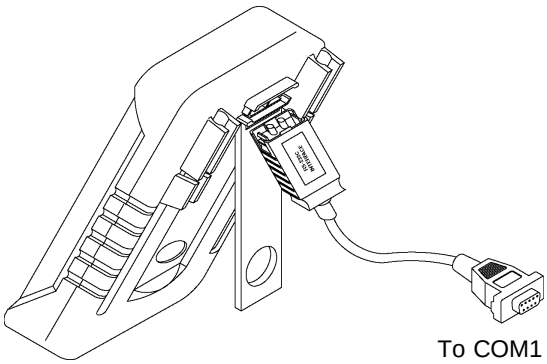
This meter has a communication capability. This function will assist user to recording and keeping data easy. We have offer 3852 to optional accessories. The 3852 include a cable with phonic receiver and a software disc. Please refer following procedures If you want to communicate with personal computer.

(1) Push and hold the **DUAL** key then turn the function switch from off position to any function, wait 1 second, then release the push key. You will find that the annunciator of RS232 is light on the display.

(2) Fixes one side of cable to the holster of meter and connect the 9 pin`s terminal of cable to communication port 1 or 2 of personal computer. See the Figure below.

(3) Execute the software to take the data for your necessary data.

NOTE • See the 3852 instruction manual



To COM1 or COM2 of computer

3.11 Warning Function for Incorrect Current Input Terminal Connection

This instrument has a safety function to prevent accidents when measuring voltages. Under the following conditions, **Error** flashes in the first display and the beeper sounds.

- The function switch is set to a position other than ⎓/∼ **mA.A**, and a test lead is connected to the A terminal.

NOTE

- This function does not operate if the fuse connected to the A terminal has blown.

3.12 Power-on Options

SELECTING POWER-ON OPTIONS

Some options can be selected only when you turn the meter on.
To select power-on options, press and hold push key while turning the function switch to any on position. Power-on options remain selected until the meter is turned off.

- **SHIFT**
  - Demonstrate Annunciators
    To demonstrate the annunciators, The entire annunciators will be displayed. Press the key again to exit demonstration mode.
  - Disable auto-power off
    In general, the auto power off function will turn the meter off if neither function switch nor push key is activated for 15 minutes. When auto power off is disabled, the meter will stay on continuously.
    Auto-power off will be auto disabled in Dynamic Recording.

- **HOLD/MAX • MIN**
  - Enable **Refresh Hold** .

- **REL**
  - Disable beeper function.
    Turns off all beeper functions.

- **RANGE**
  - Select 4,000/40,000 counts resolution.
    In general, The meter is 4,000 counts (3 3/4 digits) resolution and the response time is 3.3 times per second. By this option, the meter can be changed to 40,000 counts (4 3/4 digits) resolution and the response time can be updated to one time per second.

- **DUAL**
  - Set Computer Interface.
    Turn on Data output function by RS-232C interface. The RS232 annunciator will turn lit.

Chapter 4
Specifications

4.1 General Specification

Measurement System	Dual integration
AC Measurement System	True RMS measurement
Type of Display	LCD
Maximum measurement count	40000count, 4000count
Polarity Display	Automatically lights only when '-'.
Battery Low Display	The ⊟ indicator flashes.
Range Selection	Automatic or Manual
Function Switch	Rotary switch
Sampling Rate	Approx. 3 times/s (except Ω and Hz, 4000count) Approx. 0.8 times/s (except Ω and Hz, 40000count) Approx. 0.8 times/s (Ω and Hz) Approx. 20 times/s (bar graph)
Location for use	Indoor, altitude up to 2000 m (6562 feet)
Operating Temperature and Humidity Range	0 to 50℃ (32 to 122℉), 80% RH or less (no condensation)
Storage Temperature and Humidity Range	-20 to 60℃ (-4 to 140℉), 80% RH or less (no condensation)
Temperature Characteristic	0.15 X (measurement accuracy)/℃ (℉)
Power Supply	one 6F22 manganese battery
Rated supply voltage	9 VDC X 1

Continuous operating time	Approx. 50 h (VDC, manganese battery) Approx. 90 h (VDC, alkaline battery)
Maximum input voltage	VDC, VAC, V(AC+DC): 40 mV to 400 mV range: 600 VDC/600 Vrms(sin) except 40 mV to 400 mV range: 1200 VDC/850 Vrms(sin) ADC,AAC,A(AC+DC): 400µA to 400 mA range: Fuse protection 1 A/600 VAC 4 A to 10 A range: Fuse protection 15 A/600 VAC Ω,C,Continuity check/Diode check: 600 VDC/600 Vrms(sin)
Dielectric Strength	6 kVrms sin for 50/60 Hz, 1 minute (terminal to housing)
Noise Resistance	NMRR : VDC minimum -60 dB (50 /60 Hz) CMRR : VDC minimum -120 dB (50/60 Hz) VAC minimum -60 dB (50/60 Hz)
Power Rated	40 mVA typ. (VDC, supply voltage 9.0 V) 55 mVA typ. (DCA+Hz, supply voltage 9.0 V)
Maximum rated power	60 mVA
Battery consumption display	The indicator flashes when Approx. 7.2 V or less.
Dimensions and Mass	Approx. 90W X 192H X 37D mm Approx. 3.54"W X 7.56"H X 1.46"D (not including protrusion) Approx. 440 g,15.5 oz (body,battery) Approx. 640 g,22.6 oz (body,holster,battery)
Accessories	3851-10 TEST LEAD Protective holster Instruction manual one 6F22 manganese battery (built into the instrument)

Option	3852 RS-232C PACKAGE 3853 CARRYING CASE 9617 CLIP ON BASE 9618 CLIP-TYPE LEAD
Applicable Standards	Safety: EN61010-1:2001 Pollution Degree 2, Measurement category II (1000 V),category III (600 V) (anticipated transient overvoltage 6000 V) EMC: EN61326:1997+A1:1998+A2:2001

4.2 Accuracy Chart

We define measurement tolerances in terms of rdg. (reading) and dgt. (digit) values, with the following meanings:

- rdg. (reading or displayed value)
  The value currently being measured and indicated on the measuring instrument.

- dgt. (resolution)
  The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1".

Temperature and humidity for guaranteed accuracy
23℃±5℃ (73℉±9℉), 80% RH or less, no condensation

Guaranteed accuracy period
1 year

NOTE

- In the 40000 counts mode, multiply the number of least significant digits(dgt) by 10.

■ DC VOLTAGE

Range	Resolution (40000 counts mode)	Accuracy	Overload Protection
40mV	10μV(1μV)	±0.08%rdg.±5dgt.	600V DC/ rms or 10^6V • Hz
400mV	0.1mV(10μV)	±0.06%rdg.±3dgt.	
4V	1mV(0.1mV)	±0.06%rdg.±3dgt.	1200V DC/ 850V rms or 10^6V • Hz
40V	10mV(1mV)	±0.06%rdg.±3dgt.	
400V	0.1V(10mV)	±0.06%rdg.±3dgt.	
1000V	1V(0.1V)	±0.06%rdg.±3dgt.	

• Input Impedance: 10MΩ (1000 MΩ for 40mV and 400mV)

■ AC VOLTAGE (TRUE RMS : From 5% to 100% of range.)

Range	Resolution (40000 counts mode)	Accuracy		Overload Protection
		50/60Hz	45Hz to 1kHz	
40mV	10μV(1μV)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	600V DC/ rms or 10^6V • Hz
400m	0.1mV(10μV)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	
4V	1mV(0.1mV)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	1200V DC/ 850V rms or 10^6V • Hz
40V	10mV(1mV)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	
400V	0.1V(10mV)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	
750V	1V(0.1V)	±0.7%rdg.±5dgt.	±1.5%rdg.±5dgt.	

• Input Impedance: 10MΩ (1000MΩ for 40mV and 400mV)
• Crest factor: 3

■ DC CURRENT

Range	Resolution (40000 counts mode)	Accuracy	Input impedance	Overload Protection
400μA	0.1μA(10nA)	±0.2%rdg.±3dgt.	Approx.100Ω	1A/600VAC, High Energy Fuse
4000μA	1μA(0.1μA)	±0.2%rdg.±3dgt.	Approx.100Ω	
40mA	10μA(1μA)	±0.2%rdg.±3dgt.	Approx.1Ω	
400mA	0.1mA(10μA)	±0.2%rdg.±3dgt.	Approx.1Ω	
4A	1mA(0.1mA)	±0.2%rdg.±3dgt.	Approx.0.01Ω	15A/600VAC, High Energy Fuse
10A	10mA(1mA)	±0.2%rdg.±3dgt.	Approx.0.01Ω	

• 10 A continuous.

■ AC CURRENT (TRUE RMS: From 5% to 100% of range.)

Range	Resolution (40000 counts mode)	Accuracy 45 Hz to 1 kHz	Input impedance	Overload Protection
400µA	0.1µA(10nA)	±1.0%rdg.±5dgt.	Approx.100Ω	1A/600VAC, High Energy Fuse
4000µA	1µA(0.1µA)	±1.0%rdg.±5dgt.	Approx.100Ω	
40mA	10µA(1µA)	±1.0%rdg.±5dgt.	Approx.1Ω	
400mA	0.1mA(10µA)	±1.0%rdg.±5dgt.	Approx.1Ω	
4A	1mA(0.1mA)	±1.0%rdg.±5dgt.	Approx.0.01Ω	15A/600VAC, High Energy Fuse
10A	10mA(1mA)	±1.0%rdg.±5dgt.	Approx.0.01Ω	

- 10 A continuous.
- Crest factor: 3

■ RESISTANCE

Range	Resolution (40000 counts mode)	Accuracy	Max. Test Voltage	Overload Protection
400Ω	0.1Ω(0.01Ω)	±0.2%rdg.±3dgt.	3.3V(Max.)	600V DC/rms
4kΩ	1Ω(0.1Ω)	±0.2%rdg.±3dgt.	1.28V(Max.)	
40kΩ	10Ω(1Ω)	±0.2%rdg.±3dgt.	1.28V(Max.)	
400kΩ	100Ω(10Ω)	±0.2%rdg.±3dgt.	1.28V(Max.)	
4MΩ	1kΩ(0.1kΩ)	±0.2%rdg.±3dgt.	1.28V(Max.)	
40MΩ	10kΩ(1kΩ)	±1%rdg.±5dgt.	1.28V(Max.)	

- Instant Continuity: Built-in buzzer sounds when resistance is less than 100 counts (40000 counts mode: 1000 counts).

■ CAPACITOR

Range	Resolution	Accuracy	Overload Protection
4nF	1pF	±2.5%rdg.±6dgt.	600V DC/rms
40nF	10pF	±2.5%rdg.±6dgt.	
400nF	0.1nF	±2%rdg.±4dgt.	
4µF	1nF	±5%rdg.±4dgt.	
40µF	10nF	±5%rdg.±4dgt.	
400µF	0.1µF	±5%rdg.±4dgt.	
9999µF	1µF	±6%rdg.±4dgt.>2mF, NO Spec.	

- With film capacitor or better, use Relative mode to zero residual.

■ DIODE CHECK

Range	Resolution (40000 counts mode)	Accuracy	Test Current	Test Voltage	Overload Protection
Diode	1mV(0.1mV)	±1.0%rdg. ±2dgt.	Approx. 1.65mA	<3.3V	600V DC/ rms

■ AUDIBLE CONTINUITY TEST

Range	Resolution (40000 counts mode)	Accuracy	Test Current	Test Voltage	Overload Protection
Diode	1mV(0.1mV)	built-in buzzer sounds when reading is below approx. 100 mV	Approx. 1.65mA	<3.3V	600V DC/ rms

■ FREQUENCY for Voltage measurement

Range	Resolution (40000 counts mode)	Accuracy	Min.Input Freq.	Overload Protection
100Hz	0.01Hz(0.001Hz)	±0.02%rdg.±1dgt.	10Hz	1.600VDC/ rms for mV input 2.1200V DC/ 850V rms for V input or 10^6V • Hz
1kHz	0.1Hz(0.01Hz)	±0.02%rdg.±1dgt.	10Hz	
10kHz	1Hz(0.1Hz)	±0.02%rdg.±1dgt.	10Hz	
100kHz	10Hz(1Hz)	±0.02%rdg.±1dgt.	10Hz	
200kHz	100Hz(10Hz)	±0.02%rdg.±1dgt.	10Hz	

FREQUENCY SENSITIVITY		
INPUT RANGE (Maximum input for specified accuracy = 10 x Range or 1000V)	MINIMUM SENSITIVITY(RMS SINEWAVE)	
	40Hz to 20kHz	10Hz to 200kHz
40mV	10mV	-
400mV	30mV	40mV
4V	0.3V	0.4V
40V	3V	4V
400V	30V	40V(≤100kHz)
1000V	300V	400V(≤100kHz)

Chapter 5
Maintenance and Service

5.1 Changing the Battery and Fuses

⚠WARNING

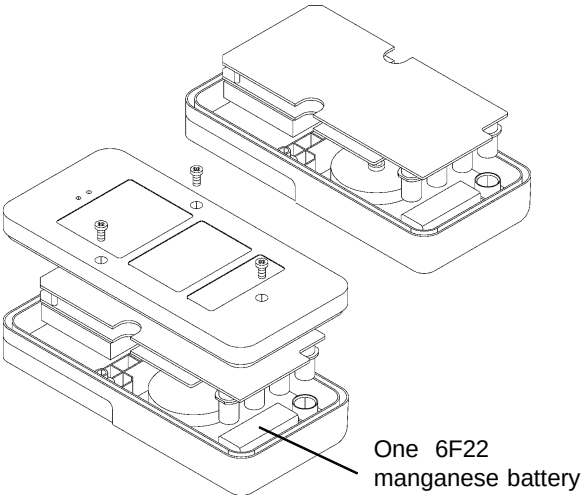
- **To avoid electric shock when replacing the battery and fuses, first disconnect the test leads from the object to be measured. Also, after replacing the battery and fuses, always replace the cover and tighten the screws before using the tester.**
- **When replacing the battery, be sure to insert them with the correct polarity. Otherwise, poor performance or damage from battery leakage could result.**
- **To avoid the possibility of explosion, do not short circuit, disassemble or incinerate battery.**
- **Handle and dispose of battery in accordance with local regulations.**
- **Replace the fuse only with one of the specified characteristics and voltage and current ratings. Using a non-specified fuse or shorting the fuse holder may cause a life-threatening hazard.**

In order to protect the circuitry, a fuse is provided for μA, mA or A terminals.

When current does not measured normally, the fuse might be blown by over current.

Referring to the diagram, change the battery or fuses as follows:

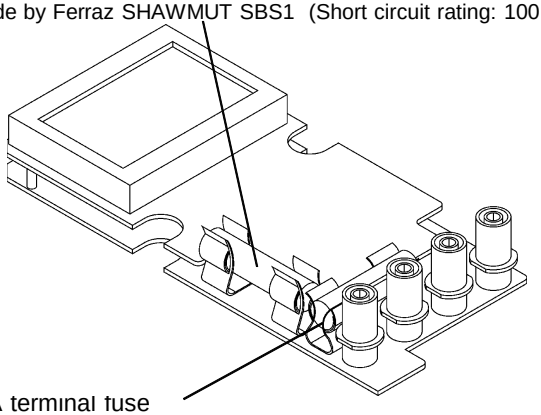
5.1.1 Battery Replacement



(1) Detach the test leads from the measuring circuit and confirm that the function switch is off.
(2) Detach the holster.
(3) Invert the lower case (bottom of the main unit) and use a Phillips screwdriver to remove the three case-retaining screws.
(4) Lift up and remove the lower case.
(5) One laminated battery (6F22) is found at the position shown in the diagram. Remove only the battery from the main unit. Detach the battery from the connector and replace with a new battery.
(6) Reattach the lower case and tighten the screws.

5.1.2 Fuse Replacement

For μA.mA terminal fuse
1 A/600 VAC ϕ10.319-34.925 mm
Made by Littelfuse BLS1 (Short circuit rating: 10 kA)
or Made by GOULD SHAWMUT SBS1 (Short circuit rating: 100 kA)
or Made by Ferraz SHAWMUT SBS1 (Short circuit rating: 100 kA)



For A terminal fuse
15 A/600 VAC ϕ10.319-38.1 mm
Made by Littelfuse KLK15 (Short circuit rating: 100 kA)
or Made by GOULD SHAWMUT ATM15 (Short circuit rating: 100 kA)
or Made by Ferraz SHAWMUT ATM15 (Short circuit rating: 100 kA)

(1) Detach the test leads from the measuring circuit and confirm that the function switch is off. Do not change the position of function switch until the fuse has been replaced; doing so during replacement may cause malfunctions.
(2) Detach the holster.
(3) Invert the lower case (bottom of main unit) and use a Phillips screwdriver to remove the three case-retaining screws.
(4) Lift up and remove the lower case.
(5) Lift up the printed circuit board.
(6) Replace the blown fuse. Make sure the fuse type is correct; fuses must match either the μA/mA or A types terminal.
(7) Reattach the printed circuit board and lower case and tighten the screws.
(8) After replacing the fuse, confirm before use that the function switch indicates the same function as on the LCD display.

5.2 Service

If the instrument seems to be malfunctioning, confirm that the battery are not discharged, and that the test leads and fuses are not open circuited before contacting your dealer or Hioki representative.

When sending the instrument for repair, remove the battery and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.

5.3 Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	DIGITAL HiTESTER
Model Number:	3801, 3802
Accessory:	3851-10 TEST LEAD
Option:	3852 RS-232C PACKAGE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001 EN61010-2-031:1994
EMC:	EN61326:1997+A1:1998+A2:2001 ClassB equipment Portable test and measurement equipment

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

30 October 2003

Yuji Hioki

President

3801A999-02

HIOKI 3802 DIGITAL HiTESTER

Instruction Manual

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