

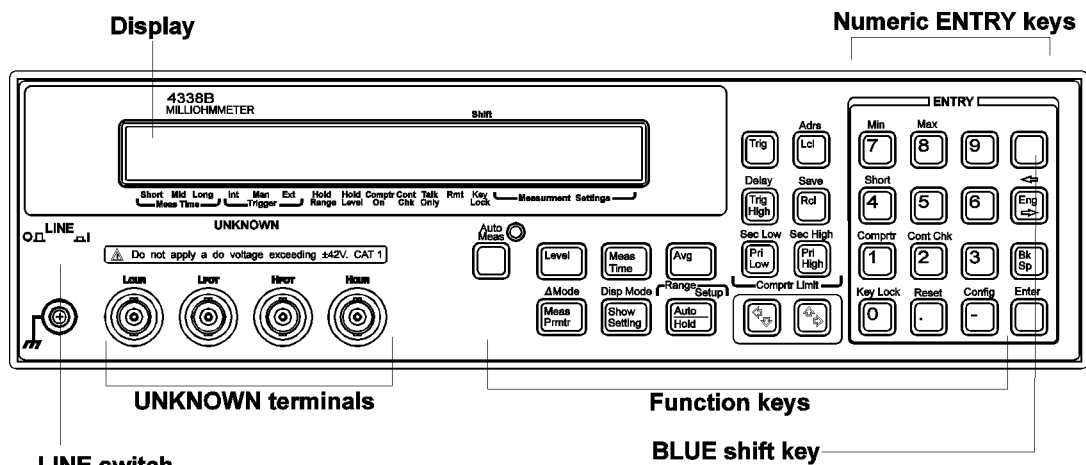
**Agilent 4338B Milliohmmeter**  
**User's Guide**



**Agilent Part No. 04338-90021**  
**Printed in JAPAN January 2001**

**Fourth Edition**

# 4338B Milliohmmeter




**LINE switch**

**Function keys**

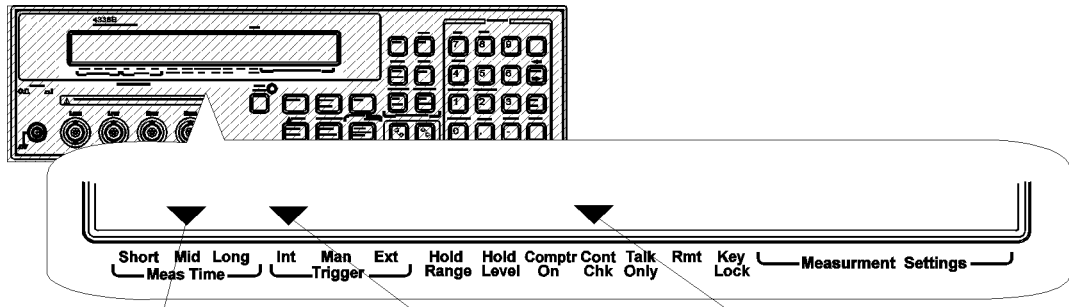
**BLUE shift key**

Activates the secondary function printed in blue above the keys. For example,

Pressing   executes a Key Lock.

(In this book, the BLUE shift key is expressed as , the top of key is not labelled "blue".)

LD100001



Indicates the medium measurement time mode is selected.

Indicates the internal trigger mode is selected.

Indicates the contact check function is active.

LD100002

## Contents of this Manual

- Chapter 1, Preparation for Use

  - For initial turn ON of the 4338B

- Chapter 2, Operating the 4338B

  - Basic measurement operation

    - Getting acquainted with the 4338B—for beginners

    - Handy reference for common measurement tasks—for all users

- Chapter 3, Measurement Example

  - Measurement Examples for typical 4338B applications

    - Measuring Electrolytic Capacitor

    - Measuring Inductor

    - Measuring Transformer

In the 4338B User's Guide, information on the following subjects is not discussed:

- Initial Inspection
- GPIB remote control
- Using with Handler
- Maintenance
- Specifications
- Error Messages

For detailed information on these subjects, see the *4338B Operation Manual*.



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## Preparation for Use

### In This Chapter

Before turning the 4338B ON, you must first set the 4338B to match the available power LINE voltage.

If the 4338B's power LINE voltage and frequency are properly set and ready to use, you can skip this chapter.

### Power Requirements

The 4338B's power source requirements are as follows:

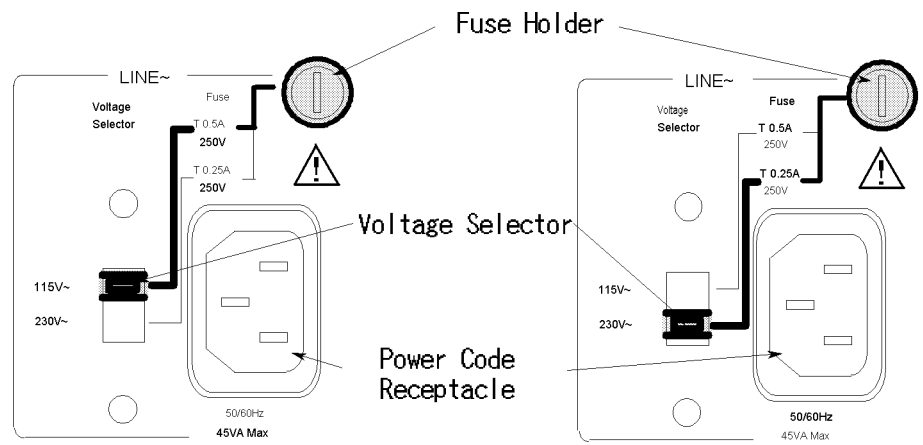
- LINE Voltage :** 100 / 120 / 220 / 240 V ac ( $\pm 10\%$ )
- LINE Frequency :** 47 to 66 Hz
- Power Consumption :** 45 VA maximum

### To Set Power LINE Voltage

1. Confirm that the power cable is disconnected.
2. Slide the LINE Voltage selector on the rear panel to match the power LINE voltage which will be used (see Table 1-1).

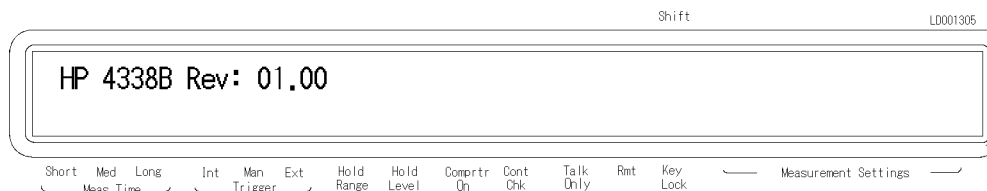
**Table 1-1. Line Voltage Selection**

Voltage Selector	Line Voltage	Required Fuse
115V	100/120Vac( $\pm 10\%$ )	UL/CSA type, Time delay 0.5A 250V (Agilent part number 2110-0202)
230V	220/240Vac( $\pm 10\%$ )	UL/CSA type, Time delay 0.25A 250V (Agilent part number 2110-0201)

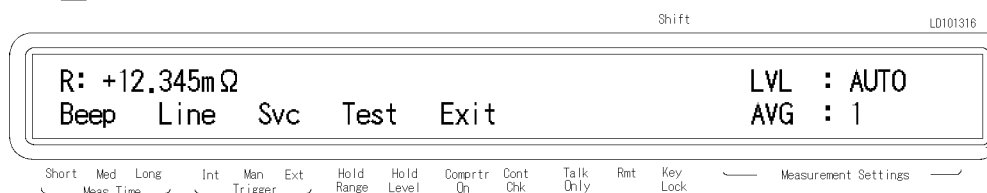




## To Set Power LINE Frequency

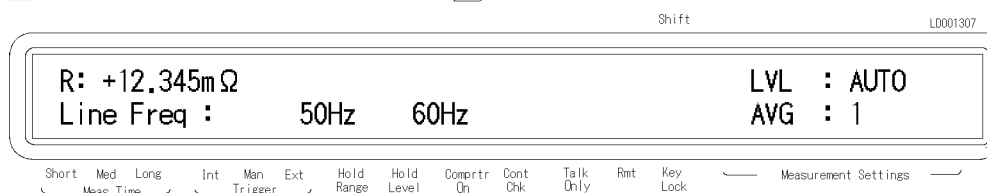
1. Connect the power cable to the power cord receptacle on the rear panel.
2. Push the LINE switch in. The 4338B will emit a beep when it turns ON, and perform the self test. (If any message is displayed, see “Error Messages” back of *4338B Operation Manual*.) The 4338B will be ready for operation after a message like the following is displayed.







3. Press  . The following message is displayed.



4. Press  until “Line” blinks, and press .



A blinking item means that it is currently selected.

5. If the setting does not match the power LINE frequency, press  to toggle the setting between “50 Hz” and “60 Hz”, then press .
6. Press  until Exit blinks, and press .

### Note



The power line frequency setting is stored and is not changed after reset or power-off. Once you set it, you do not need to set the line frequency again as long as the same power line frequency is being used.

## **Operating the 4338B**

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### **In This Chapter**

Basic measurement operations of the 4338B and references are explained.

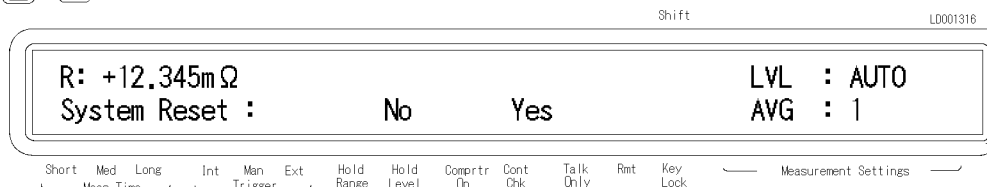
For measurement, we use the 16338A Test Lead Set with the 4338B.

## Let's Try—Fully Automatic Measurement

The 4338B's auto measurement function automatically selects the appropriate test signal level and measurement range. You can measure the DUT with very simple procedure, only connecting test leads, performing a SHORT correction, and connecting the DUT.

### Resetting 4338B to its Default Settings

1. Press to select the reset menu.



2. Press until Yes blinks, and press .

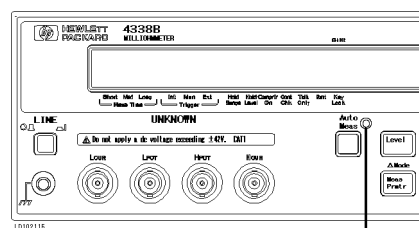
The 4338B will be reset to its default settings. For more information about the default settings, see “Default Settings” later in this chapter.

### Note



When the **Auto Measurement indicator** turns ON, the auto measurement function is active.

Resetting the 4338B, or pressing activates the auto measurement function.



Auto Measurement Indicator

### Connecting the Test Leads

Connect the test leads to the UNKNOWN terminals as follows:

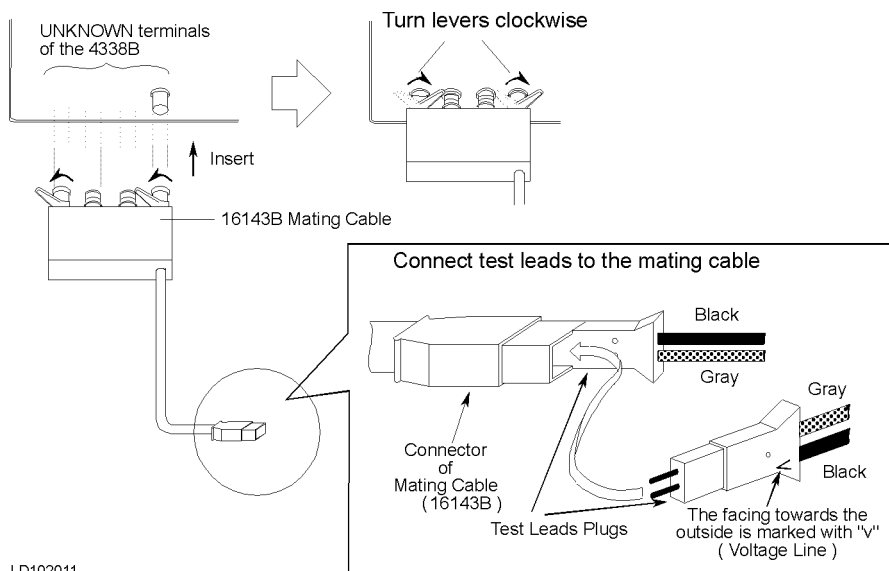


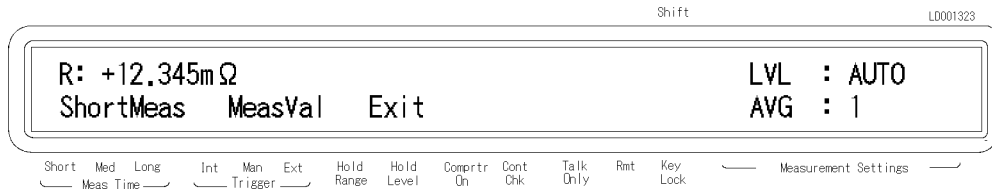





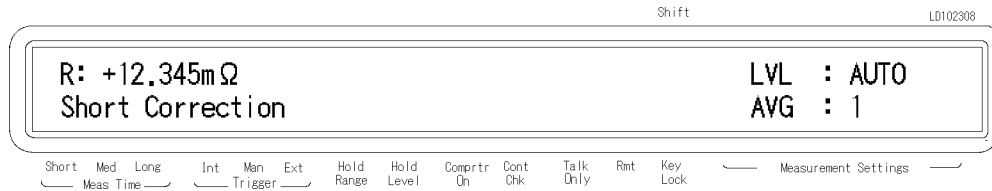
Figure 2-1. Connecting 16338A Test Lead Set

**Performing a SHORT Correction**  
**—Canceling the residual impedance in series with the DUT**

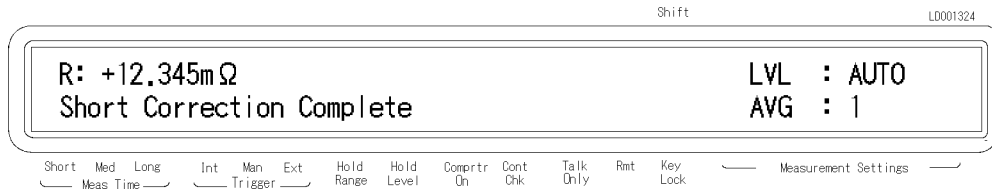
1. Configure the test electrodes in a SHORT configuration by connecting the High and Low electrodes to each other. (For information on the SHORT configuration, see “SHORT Configuration” on page 2-13.)
2. Press  . The SHORT correction menu is displayed.



3. Select ShortMeas using  or , and press . The SHORT correction is performed with the following message.



After a while, the 4338B will display the SHORT correction finished message,



and return to the measurement mode.

**If “WARNING: Out Of Limit” is displayed**

The SHORT impedance is so high that it would be unsuitable for SHORT correction data.

**If “WARNING: Improper Correction” is displayed**

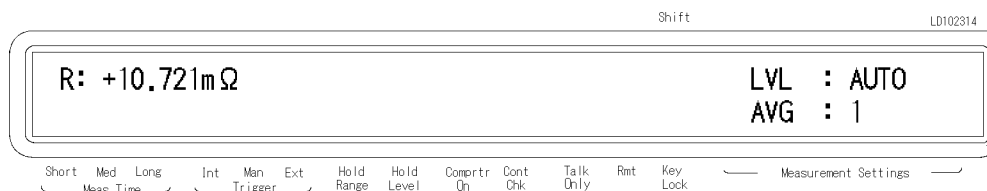
When the “OVL D”, “OVVOL” or “N.C.” is displayed during the SHORT correction.

- Check that the test leads are properly connected to the UNKNOWN terminals.
- Check that the test clips are properly shorted.

And then perform the SHORT correction again.

## Measuring a DUT

Connect the DUT to the test leads, and the measurement result will be displayed.

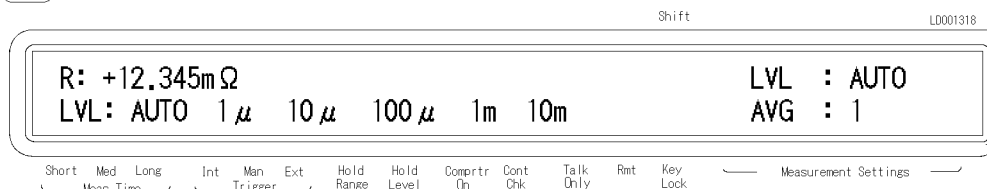


## Test Voltage Limit





The peak voltage across the DUT does not exceed 20 mV. (When the test voltage exceeding 20 mV, the 4338B disables the test voltage output and displays “OVVOL”(Over Voltage).) It prevents the test voltage from destroying the oxidation film, formed between the contacts. So, even when an unknown DUT is measured without special preparation, the contact resistance is still accurately measured without disturbing the state of the oxidation film.

## To Set Test Signal Level

1. Press . The test signal level menu is displayed.



The blinking level is currently selected.

2. Select the test level using , or  or .
3. Press .

If the test signal setting is other than AUTO, the **Hold Level** annunciator(▼) appears in the LCD display.

## To Select Measurement Range


### Auto Range mode

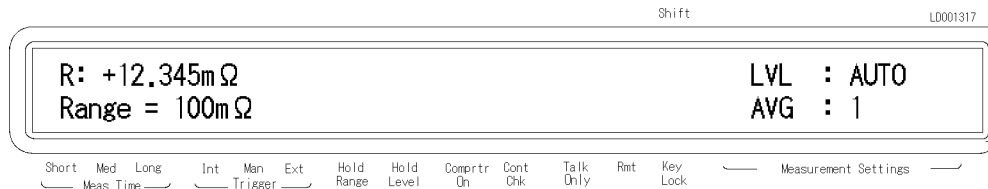
#### —Automatically selecting the optimum measurement range




Press . The **Hold Range** annunciator(▼) turns OFF.

### Hold Range mode—Holding the measurement range of your choice

To select the measurement range,

1. Press . The measurement range setup menu is displayed.

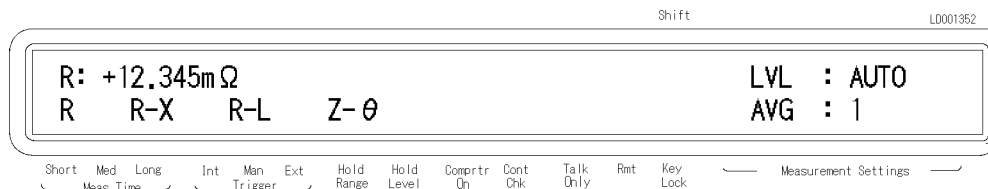





2. Press  or  until the desired range is displayed. Or input the impedance value to be measured using the numeric ENTRY keys, and the 4338B will select the optimum measurement range setting.
3. Press . The **Hold Range** annunciator(▼) turns ON.

To determine which measurement range you should select, see “Measurement Range Setting” later in this chapter.


## To Select Measurement Parameter

1. Press . The measurement parameter menu is displayed.




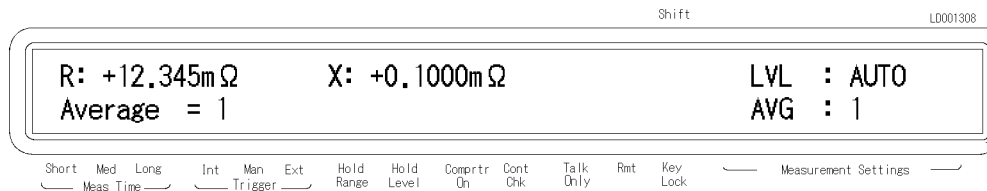
2. Press  or  to select the measurement parameter, and press . The following parameters are available.
  - R (Resistance)
  - R—X (Resistance—Reactance)
  - R—L (Resistance—Equivalent series inductance)
  - Z— $\theta$  (Absolute value of impedance—phase angle)






## To Select Measurement Time Mode

Press  until the **Meas Time** annunciator(▼) points to the desired measurement time mode (Short, Med or Long).

## To Set Averaging Rate—Stabilizing the measurement result


1. Press .




2. Enter the averaging rate using the numeric ENTRY keys. (For example, to enter 4, press  .) You can enter integer values from 1 to 256. Also, you can increase or decrease the value using  or .
3. Press  to set the value and to exit.

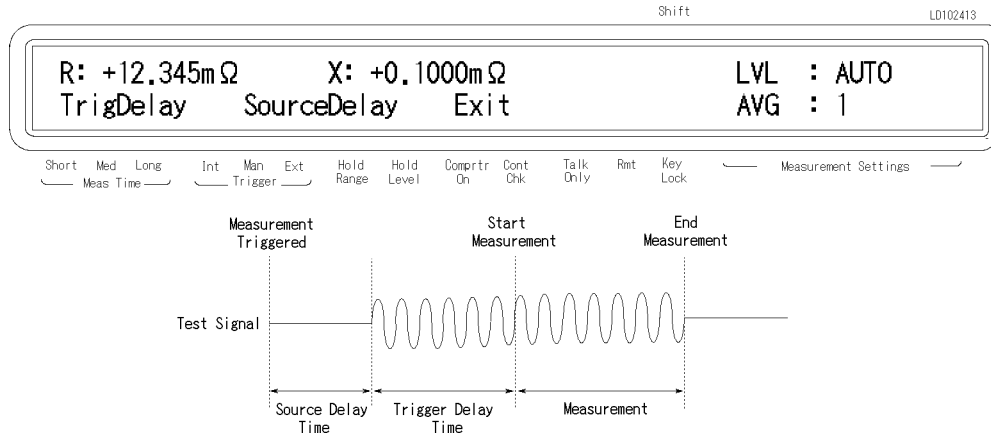






## To Select Trigger Mode

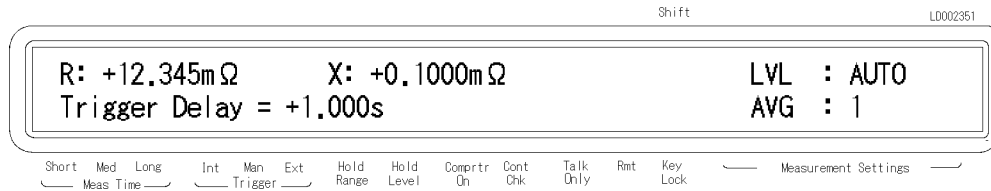
Press  until the **Trigger** annunciator(▼) points to the desired trigger mode (Int, Man or Ext). To trigger a measurement in each mode, see “To Trigger a Measurement” later in this chapter.






## To Set Trigger Delay Time and Source Delay Time

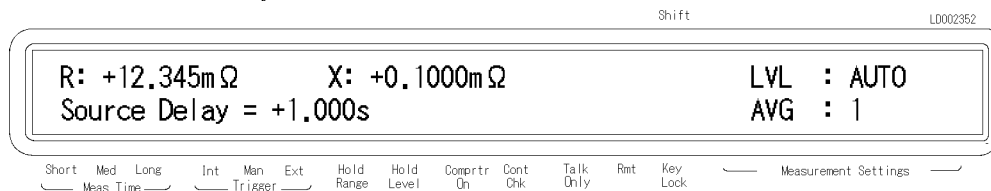
1. Press . The delay time setting menu is displayed.



2. If you select **TrigDelay**, the trigger delay setup menu appears. Enter the desired trigger delay time using the numeric ENTRY keys. (For example, to set 0.5 sec, press    .) You can set the trigger delay time from 0 sec to 9.999 sec.





3. Press  to set the value.
4. If you select **SourceDelay**, the source delay setup menu appears. Enter the desired source delay time using the numeric ENTRY keys. (For example, to set 0.5 sec, press    .) You can set the source delay time from 0 sec to 9.999 sec.

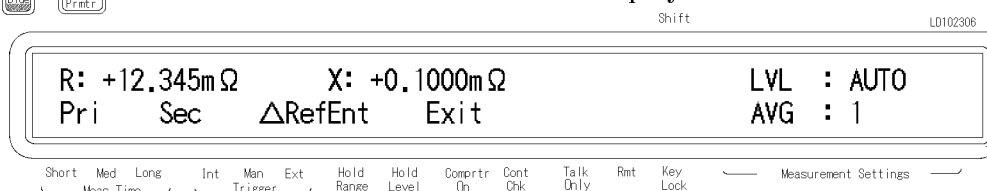


5. Press .
6. Select **Exit** to exit the menu.

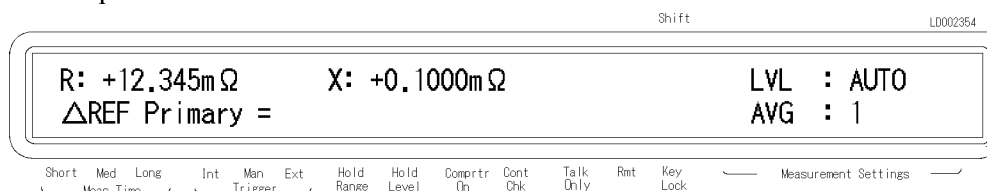
## To Use Deviation Measurement Function


### Setting the Deviation Reference Values

1. Press  . The deviation measurement menu is displayed.




2. Select RefEnt using  or , and press . The 4338B displays the primary parameter reference setup menu.



Enter the reference value using the numeric ENTRY keys, and press .

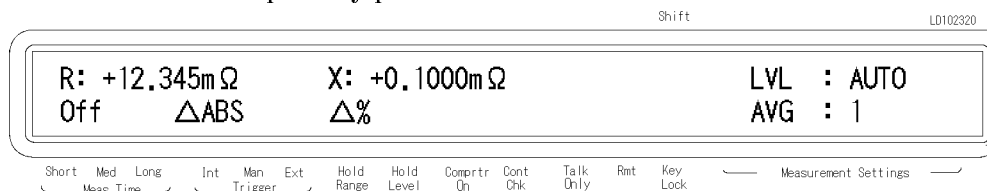
3. In the case of R—X, R—L or Z— $\theta$  measurement mode, the 4338B displays the secondary parameter reference setup menu.



Enter the reference value using the numeric ENTRY keys, and press .

### Selecting the Deviation Mode




1. If you select Pri from the deviation measurement menu, you can select the deviation measurement mode for the primary parameter.



$\Delta$ ABS measured value—reference

$\Delta$ % (measured value—reference)/reference $\times$ 100 %

Off turns OFF the deviation measurement






Select the desired mode using  or , and press .

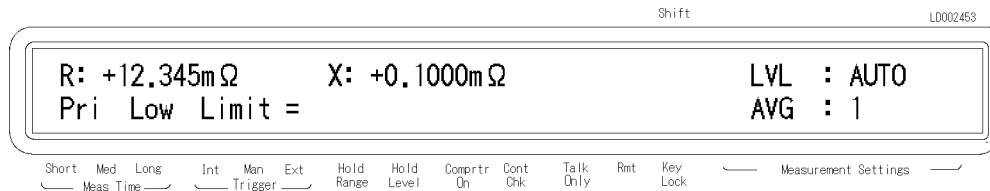
2. If you select Sec, the 4338B displays the same menu as above figure. You can select the deviation measurement mode for the secondary parameter in the same manner as the primary parameter.


3. Select Exit using  or  and press .

## To Use Comparator Function

### Setting the Limit Values



- For setting the lower/higher limit of the primary parameter, press  / . And for setting the lower/higher limit of the secondary parameter, press  / . For example, if you press , the primary parameter lower limit setup menu is displayed as follows:





- Enter the limit value using the numeric ENTRY keys, and press  to enter the value. You can set the value from  $-9.999 \times 10^{13}$  to  $9.999 \times 10^{13}$ .

### Sorting

To start sorting,

Press  . The **Comprtr On** annunciator(▼) turns ON.

To abort sorting,

Press  . The **Comprtr On** annunciator(▼) turns OFF.

The sorting results are HIGH, IN, and LOW.



Where,



HIGH            greater than higher limit  
 IN                between higher limit and lower limit  
 LOW              less than lower limit

The 4338B shows the comparison results using the display, beeper, printer, and 16064B LED Display/Trigger Box. (To use the 16064B, see “Accessories Available” later in this chapter.)

- For result output to the display, see “To Select Display Mode” in the next page.
- For result output to the beeper, see “To Select Beeper Mode” later in the next page.
- For result output to the printer, see “To Print Measurement Data” later in this chapter.

## To Use Contact Check Function —Monitoring the connection of test electrodes and DUT

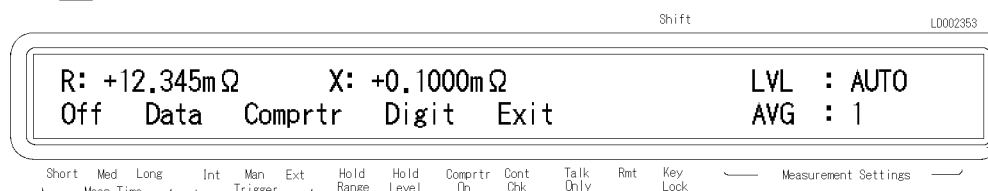
Press  . The **Cont Chk** annunciator(▼) appears, and contact check function is ON.



Press   again to turn OFF the contact check function. The **Cont Chk** annunciator(▼) disappears.

When the contact check result is FAIL, the 4338B will display N.C. (No-Contact).

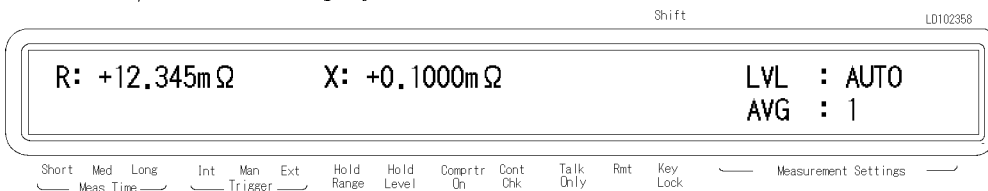
## To Select Display Mode

1. Press  .



2. Use  or  to select a mode from Data, Comprtr, Digit or Off.

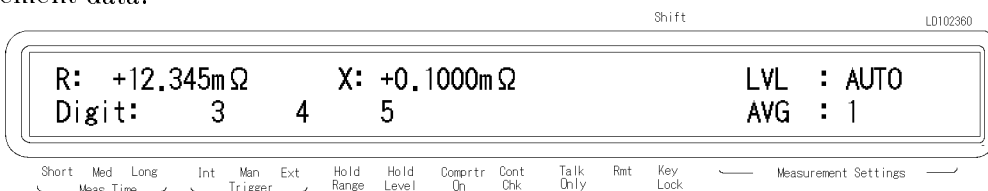
■ If you select Data, the 4338B displays the measurement result.



■ If you select Comprtr, the 4338B displays the comparator result.



■ If you select Digit, the following menu appears, and you can select the display digits for the measurement data.

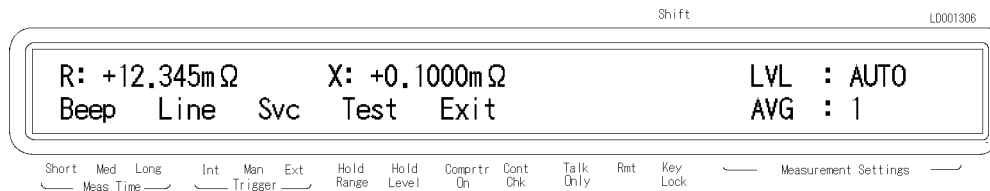





■ If you select Off, the 4338B will not display any measurement result (Display OFF mode).

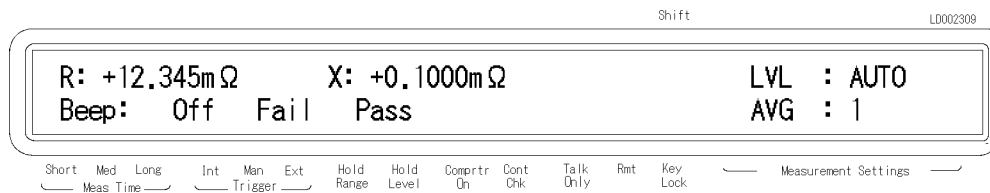
## To Select Beeper Mode

To change the beeper mode for the comparator result reporting:

1. Press  .



2. Select Beep using  or  and press  to select.



**Fail**                Emits a beep when the comparison result is HIGH/LOW, Or the contact check result is FAIL.

**Pass**                Emits a beep when the comparison result is IN.

**Off**                    No beep.

3. Select the beep mode using  or , and press  to exit to the previous display.
4. Select Exit using  or , and press  to exit.

## To Print Measurement Data

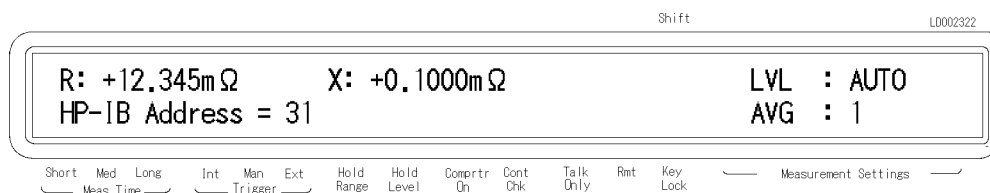
### Setting the Printer


1. Use an GPIB compatible printer, set to the listen-always mode.
2. Connect the printer to the 4338B's GPIB port on the rear panel.
3. Turn the printer ON.

### Printing

Set the 4338B to talk only mode (Set the 4338B's GPIB address to 31).

1. Press    .



- Press . The **Talk Only** annunciator(▼) turns ON, and the printer begins printing the measurement data.

When the measurement parameter R is selected, the measurement result of the secondary parameter is +0.00000E+00, and the comparison result of the secondary parameter is +0.

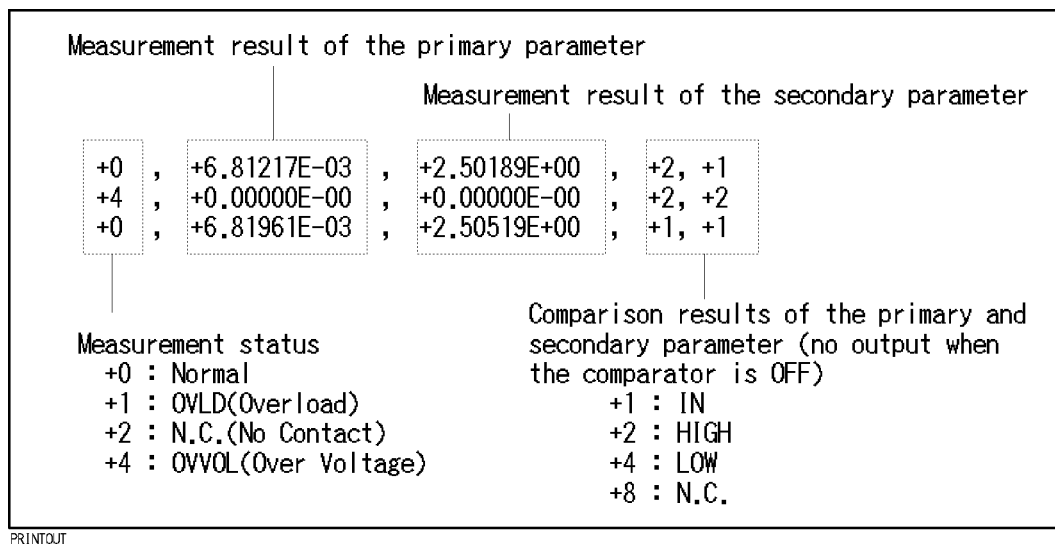


Figure 2-2. Printer Output


## Disabling Printing

Change the GPIB address to an address other than 31 (for example, 17, which is the default setting).

Press      .


## To Display the Current Settings

- Press .

The 4338B displays the current settings in the Measurement Settings area of the LCD display. Each time  is pressed, the displayed menu is changed as follows:

- Test signal level and Averaging rate
- Trigger delay time and Source delay time
- Comparator limits for the primary parameter
- Comparator limits for the secondary parameter

## To Trigger a Measurement

- In internal trigger mode—The 4338B makes continuous free-running measurements.
- In manual trigger mode—Press  when you want to trigger a measurement.
- In external trigger mode— Connect the external trigger source to the EXT TRIGGER terminal on the 4338B's rear panel, and apply a TTL level trigger signal to trigger a measurement. (For details, see the *4338B Operation Manual*.)

Note that the 4338B must be set to the external trigger mode to be triggered from an external handler or the 16064B LED Display/Trigger Box.


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## If You Have a Problem

If any of the problems listed below occur, follow the instructions described.



### If you find yourself lost when operating the 4338B

You can get back on track by:

**To return to the measurement mode** Press  several times. Select Exit if available.

**To return to the default settings** Press  . (If the reset is not accepted, confirm that the **Key Lock** annunciator is turned ON. See next.)

### If the 4338B does not accept key input:

- Check whether or not the **Key Lock** annunciator is ON. If so:
  - Press  . The **Key Lock** annunciator turns OFF and the front-panel keys are unlocked.
  - Check that the 16064B LED display/trigger box is connected to the 4338B and it is set to lock out the keys. If so, unlock the keys from the 16064B.

### If ----- or “OVL” is displayed:

The measurement result is out of the measurable range. Check the DUT and make sure the measurement range is properly set.



## Reference

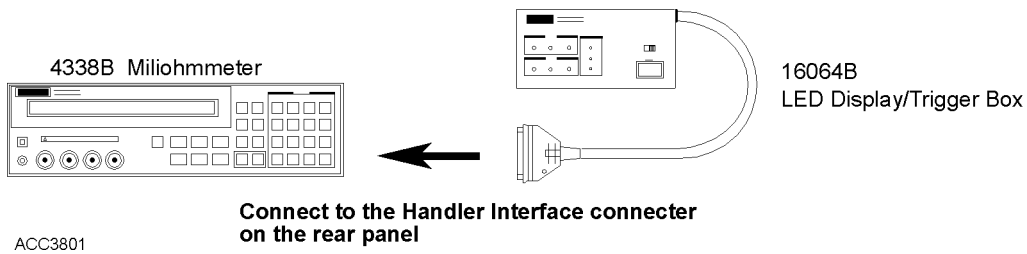
### Default Settings

- Auto measurement : ON  
(Auto level, auto range mode)
- Measurement parameter : R
- Deviation measurement : OFF
- Measurement time : MEDium
- Averaging rate : 1
- Trigger mode : Internal
- Trigger delay time : 0 ms
- Source delay time : 0 ms
- Comparator : OFF
- Display mode : Measurement data
- Display digit : 5
- Beep mode : FAIL mode
- SHORT correction data is cleared
- Contact check : OFF

### Accessories Available

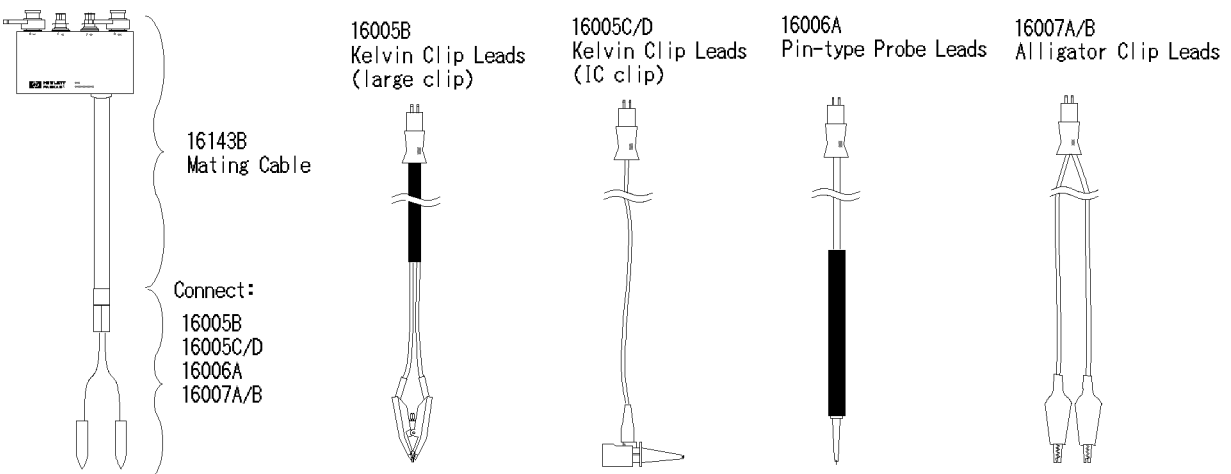
#### 16064B LED Display/Trigger Box

The 16064B LED Display/Trigger Box triggers a measurement when its trigger key is pressed, and displays the comparison results using LEDs. It allows you to manually operate the comparator function of the 4338B.



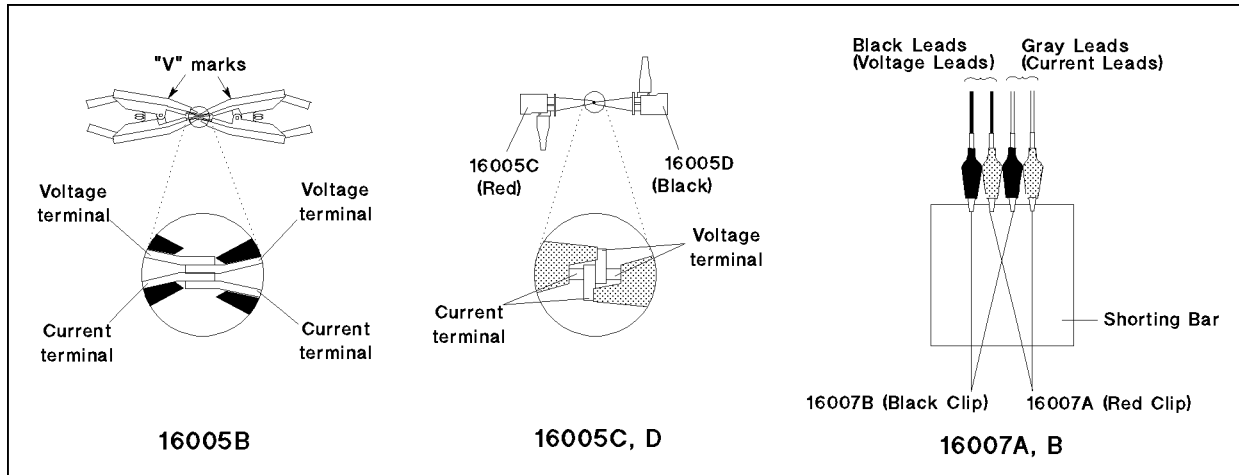
#### 16338A Test Lead Set

Four types of test leads are available for the various types of DUTs.



**Note**

In addition to using two of the same types of test leads for a measurement, you can use two different types of test leads together.

**SHORT Configuration**

**Figure 2-3. SHORT Configuration for Each Test Leads**

DO NOT perform the SHORT correction when using the 16006A Pin-type Probe, or two test clips of different types. (It is difficult to achieve effective SHORT impedance.)

## Measurement Range Setting

The available measurement range settings are 1 m $\Omega$ , 10 m $\Omega$ , 100 m $\Omega$ , 1  $\Omega$ , 10  $\Omega$ , 100  $\Omega$ , 1 k $\Omega$ , and 10 k $\Omega$ , which are limited by test level setting. See Figure 2-4.

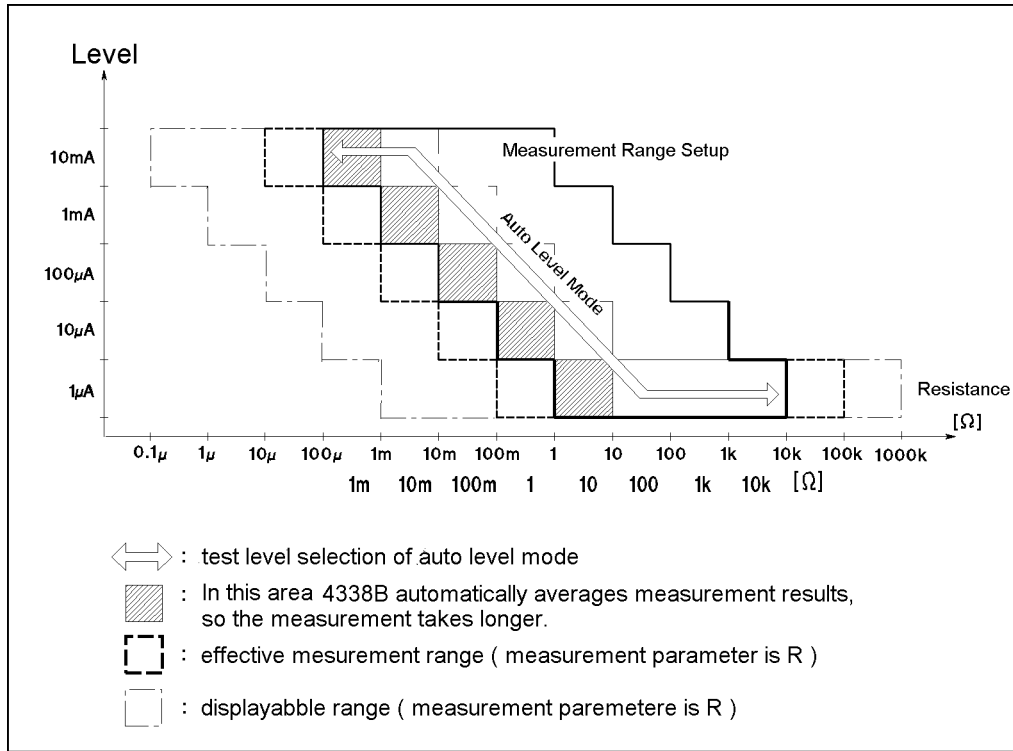


Figure 2-4. Measurement Range

## Other Topics

For details on these functions, see the *4338B Operation Manual*.

- Initial Inspection — Chapter 1 of the *Operation Manual*
- Key Lock Function — Chapter 2 and Chapter 3 of the *Operation Manual*
- GPIB — Chapter 4 and Chapter 5 of the *Operation Manual*
- Handler Interface — Chapter 3, Chapter 6, and Appendix B of the *Operation Manual*
- Save / Recall — Chapter 2 and Chapter 3 of the *Operation Manual*
- Backup Function — Chapter 3 of the *Operation Manual*
- Specification — Chapter 8 of the *Operation Manual*
- Maintenance — Chapter 9 of the *Operation Manual*
- Error Messages — “Error Messages” in back of the *Operation Manual*



## Measurement Examples

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### In This Chapter

The 4338B's features and benefits are discussed, which you can investigate by trying the typical measurement examples described in this chapter.

## Testing Contact of Electromechanical Devices

Contact failure of electromechanical devices in low current circuits is a key issue in determining these components' reliability. The 4338B offers selectable low level ac test signals (1  $\mu$ A to 10 mA), so now low current conditions can be characterized. A high resolution of 5 digits measurement result allows you to determine the slightest differences in contact resistance of devices. The ac (1 kHz) test signal eliminates potential errors introduced by thermo-electric effects across the DUT contacts.

### ■ Auto Measurement Mode

When performing gross continuity testing where the test signal level is not a significant factor in the test, the auto measurement function allows the 4338B to select the appropriate test signal level and measurement range.

### ■ Test Voltage Limit

If the peak voltage across the DUT exceeds 20 mV, the 4338B disables the test voltage output. It prevents the test signal voltage applied across the DUT from disturbing the state of the oxidation film formed between the contacts.

## Measuring the Contact Resistance of Switch

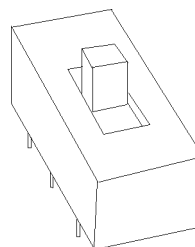
This example shows the procedure to measure contact resistance of switch. Using the auto measurement function reduces the test measurement complexity due to selecting the test level and measurement range according to the DUT.

### DUT

Switch

### Requirements

Test Fixture : 16143B Mating cable  
16005C IC Clip Leads (red clip)  
16005D IC Clip Leads (black clip)



### Measurement Setup

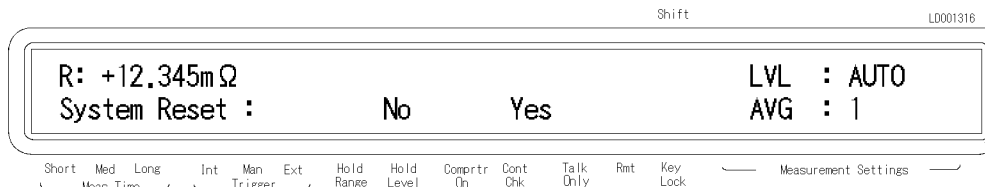
Measurement parameter : R



Use Auto Measurement Mode  
(Auto level, Auto measurement range)

### Measurement Procedure

1. Reset the 4338B.

a. Press  .

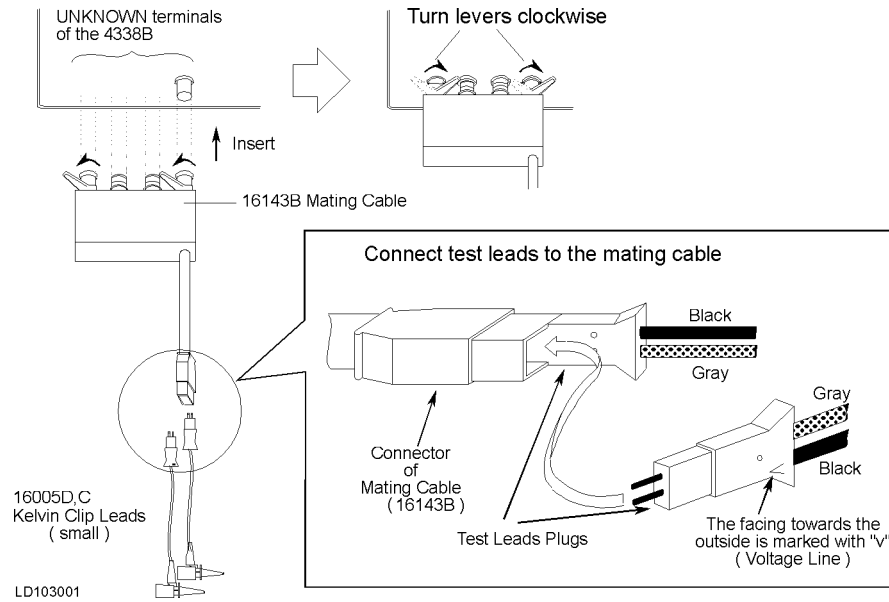


b. Press  until Yes blinks, and press .

## 3-2 Measurement Examples

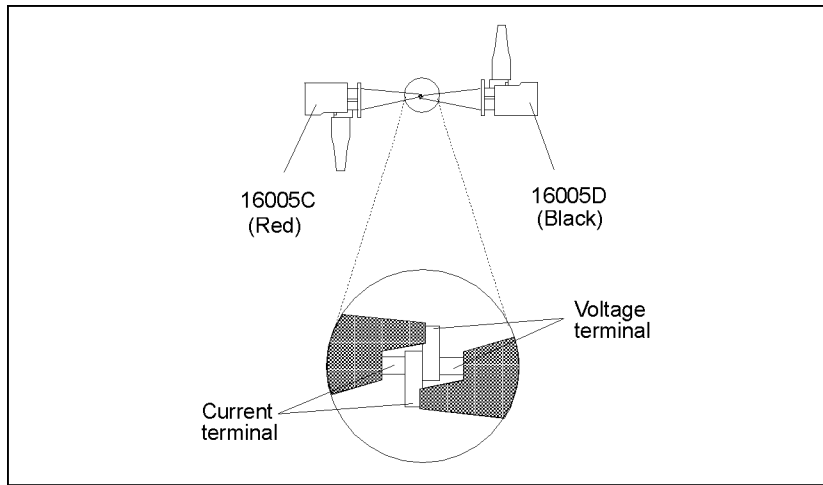
## 4338B

2. Connect test fixture to the UNKNOWN terminals as follows:

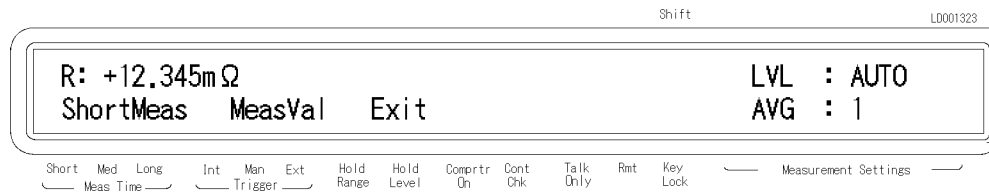


3. Perform a SHORT correction.

a. Short the test lead clips together as shown in the following figure:



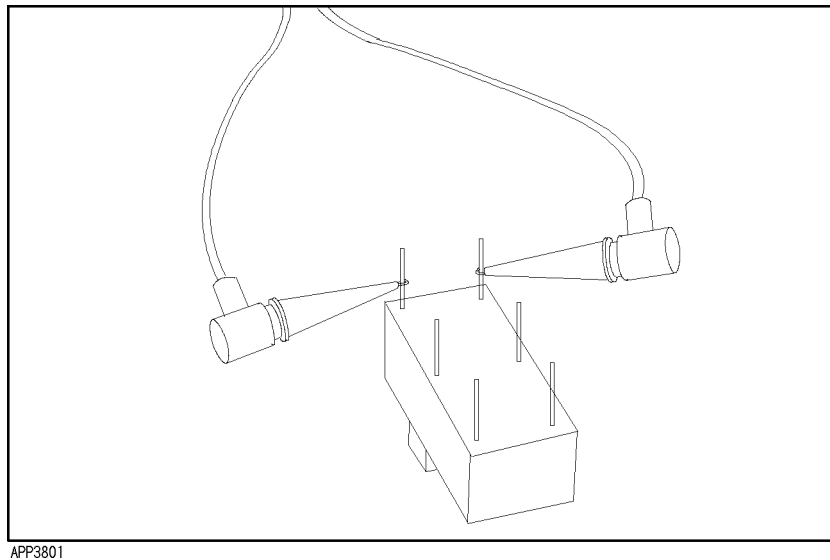
b. Press  .



c. Press  or  to select **ShortMeas**, and press .

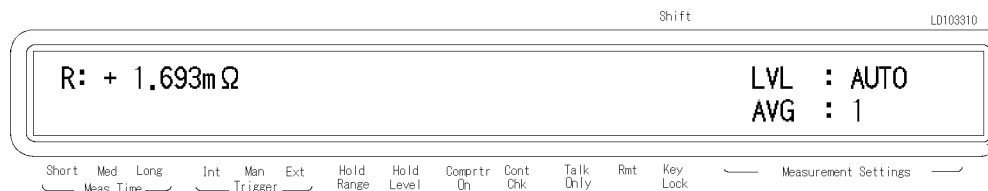
After a while, the SHORT correction will be completed with the message “Short Correction Complete”. (If “Out Of Limit” is displayed, see “Performing a SHORT Correction –Canceling the residual impedance in series with the DUT” in Chapter 2.)

4. Connect the DUT to the test fixture.



**Figure 3-1. Connecting the DUT**

The measurement result will be displayed. The following figure shows the typical measurement result display.



### For More Information

- To print out the measurement result — See “To Print Measurement Data” in Chapter 2
- To select other measurement parameters — See “To Select Measurement Parameter” in Chapter 2
- To select measurement level — See “To Set Test Signal Level” in Chapter 2

### 3.4 Measurement Examples



## Evaluating Battery Internal Resistance

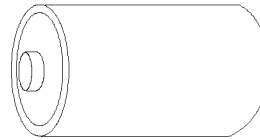
The 4338B's voltage protection on the UNKNOWN terminals allows you to evaluate internal resistance of the battery (42 V maximum).

The 1 kHz ac test signal is the best solution for evaluating the internal resistance of batteries because it avoids dc energy consumption.

### Measuring Battery Internal Resistance

#### DUT

Battery ( $\leq 42$  V)



#### Requirements

Test Fixture : 16143B Mating cable  
 16006A Pin-type Probe Leads  
 (use two leads)

#### Measurement Setup

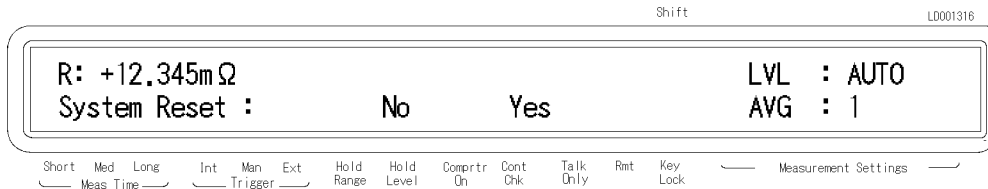
Measurement parameter : R  
 Measurement Range : Auto range mode  
 Test signal level : 1 mA<sup>1</sup>



<sup>1</sup> If the internal resistance of the battery is higher than 10  $\Omega$ , set the test level 100  $\mu$ A, not to be OVL(overload).

#### Measurement Procedure

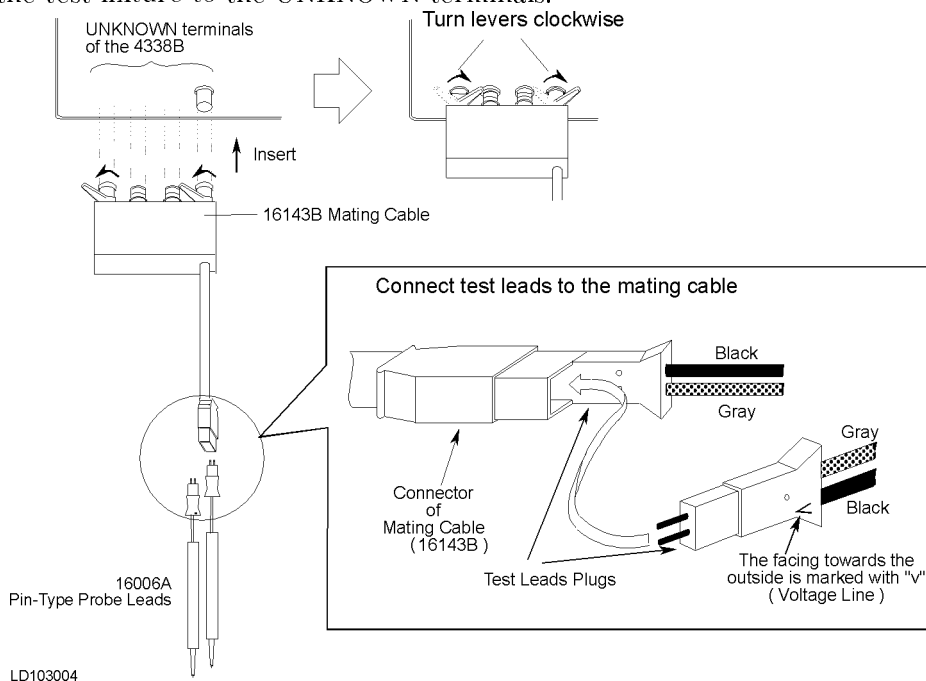
1. Reset the 4338B.

a. Press  .



b. Press  until Yes blinks, and press .

2. Connect the test fixture to the UNKNOWN terminals.

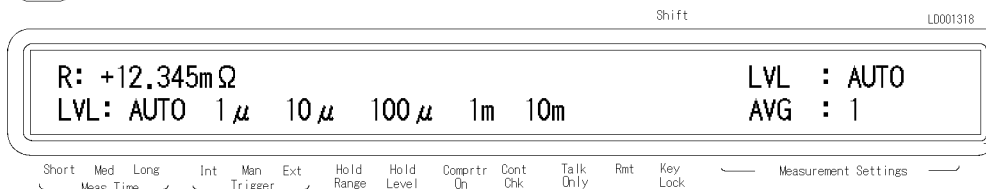


**Note** DO NOT perform SHORT correction when using the 16006A Pin-type Probe.



3. Set the test signal level to 1 mA (or 100  $\mu$ A if  $R_{DUT} > 10 \Omega$ ).

a. Press .

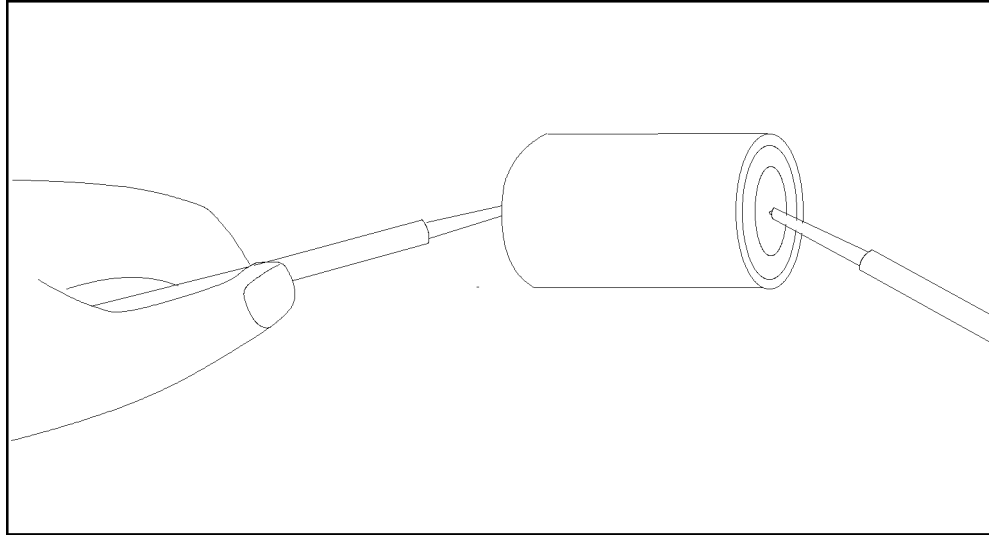


The blinking level is the level currently selected.

b. Press or to select "1m" (or "100 $\mu$ " if  $R_{DUT} > 10 \Omega$ ).

**4338B**

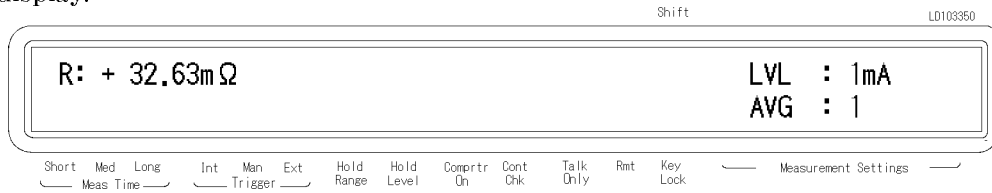
4. Connect the DUT.



APP3801

**Figure 3-2. Connecting the DUT**

The measurement result is displayed. The following figure shows the typical measurement result display.



**For More Information**

- To print out the measurement result — See “To Print Measurement Data” in Chapter 2
- To select other measurement parameters — See “To Select Measurement Parameter” in Chapter 2

