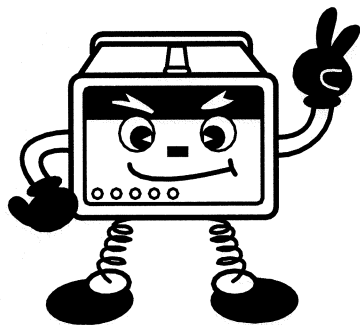
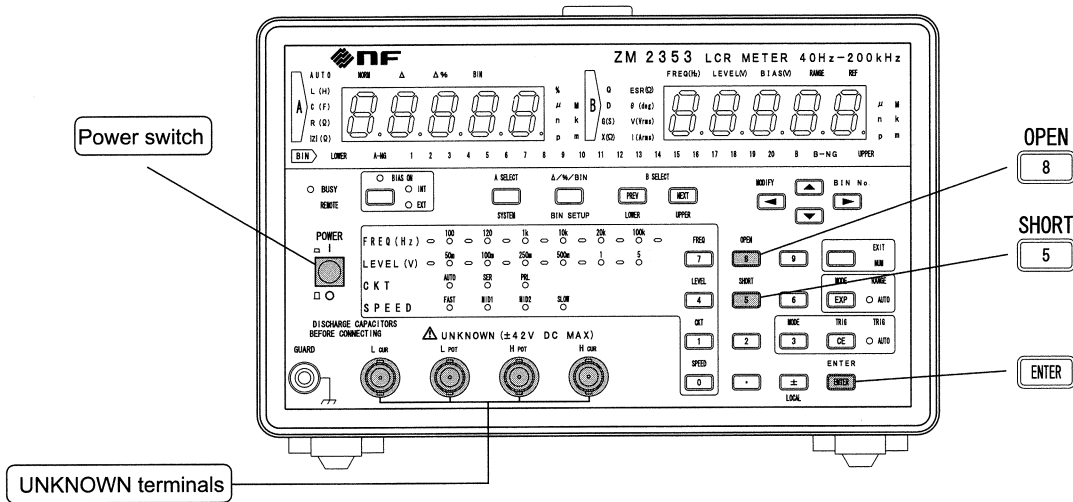


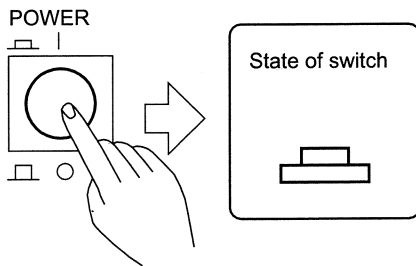
How to Measure **4**



Measurement in AUTO Mode



- 1 Turn on the power switch to energize the ZM2353/ZM2354.



Note

The system selects the following conditions (the initial setting) automatically.
 Mode: AUTO
 FREQ: 1 kHz
 LEVEL: 1 V

- 2 All indicators on Displays A and B and all LED lamps light up.



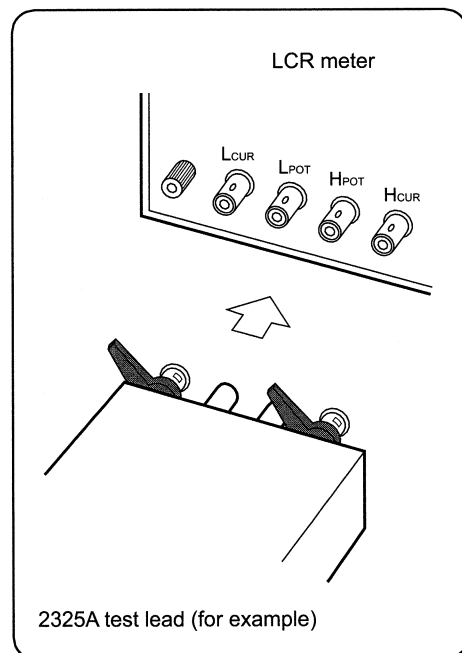
Be careful!

Be alert to any unlit indicator on Displays A or B or unlit lamp.
 If any of them is found unlit, contact NF Corporation or NF representatives.

- 3 When the internal circuit has been checked, [01] is indicated on Display B, and then measurement starts.

- * If any anomaly is detected, error message will be shown.
- * Perform a warm-up run for at least 30 minutes.

- 4 Connect the 2325A Test Lead (test fixture).



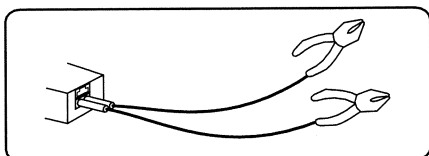
Note

For description of LCR Meter Test Lead and Test Fixture (optional), see the "Guide to Test Fixtures and Test Leads".

5

Execute zero correction.

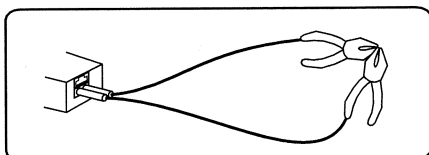
- Execute open correction.



+

Press **OPEN** **8**.

- Execute short correction.



+

Press **SHORT** **5**.



Be careful!

If **SHORT** **5** is pressed with two clips kept open, or if **OPEN** **8** is pressed with two clips kept closed, then an error will be caused.

6

Press **ENTER**.

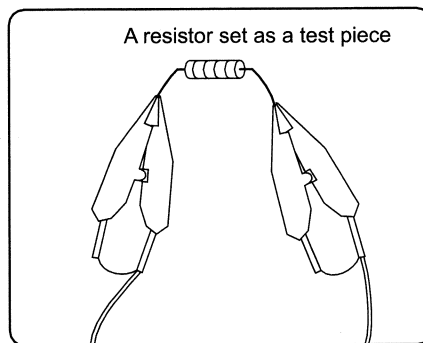


Be careful!

Even though measurement can be performed without executing zero correction, the measurement will not produce correct result.

7

Attach a test piece to the test lead (test fixture).



8

Execute measurement. AUTO and R (Ω) light up.
* Display A will show the measurement.



Note

If it is a capacitor: AUTO and C (F)
If it is a coil: AUTO and L (H)

Q lights up.

* Display B will show the value of Q.

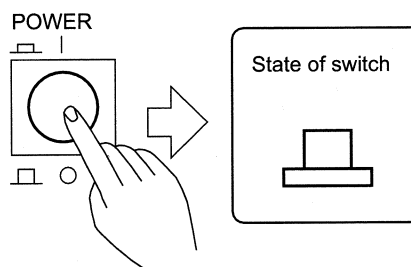


Note

If it is a capacitor: D
If it is a coil: Q

9

Press the power switch to turn off the power.



Note

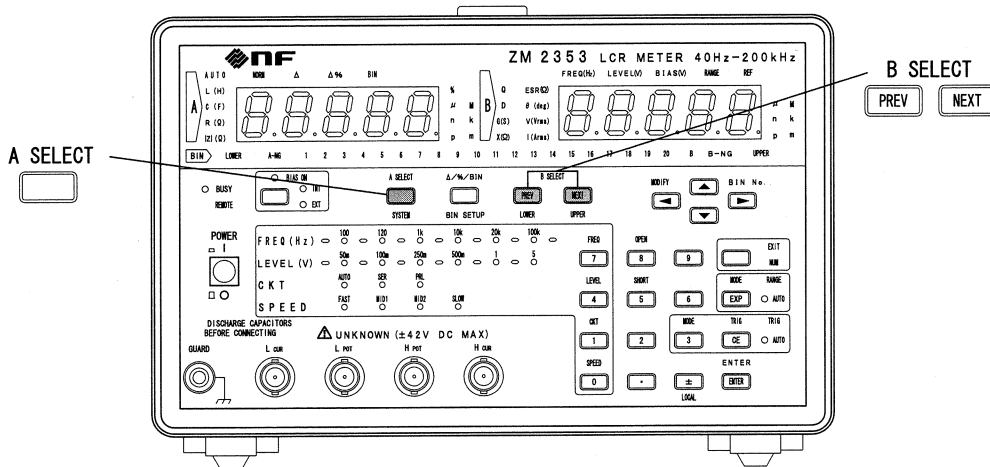
The operation procedures for measurement items written on the next page and on should be performed between Steps ③ and ⑧.

③ After display B has shown [01].

⑧ After the measuring result has been shown



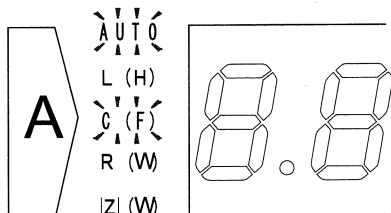
Selecting measurement parameter



Automatic selection of parameter

- Once the test piece is attached, L, C, R, and |Z| will be selected automatically according to the phase angle of the impedance.

Example: If it is C:



Note

Automatic selection by the phase angle of impedance

If $\theta = +90 \pm 30^\circ$: L, Q

If $\theta = 0 \pm 30^\circ$: R, Q

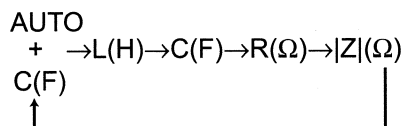
If $\theta = -90 \pm 30^\circ$: C, D

If $\theta = \text{otherwise}$: |Z|, θ

Arbitrary selection of parameter

- Every press on , the button for selection of the main parameter (on Display A) will change the indication on Display A in turn.

Example: If it is C:

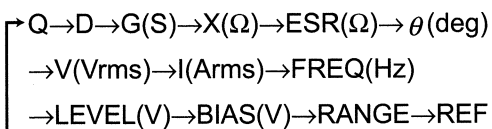


Select the desired indication when it is lighting.

- Press one of them of (the button for selection of the sub parameter on Display B).

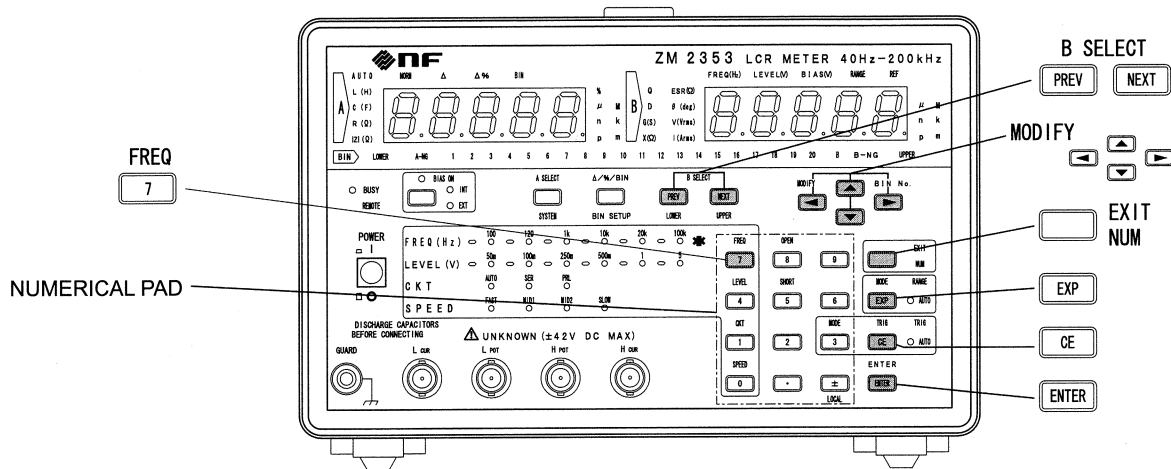
Every press on (regular direction) or (opposite direction) will change the indication on Display B in turn.

Example: If is pressed (will produce the opposite result):



Select the desired indication when it is lighting.

Setting the measurement frequency



Use of direct buttons

1

Every press on **FREQ** will change the six indications of FREQ (Hz) in turn:

1k→10k→20k→100k→100→120

Select the desired indication when it is lighting.



Note

To select your desired frequency, use the numerical pad or the Modify button.

2

Press **NUM.**



Note

This button activates the numerical pad, when the indication lamps on the numerical pad go out.

Using the numerical pad

1

Press one of buttons of **B SELECT**. Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

Q→D→G(S)→X(Ω)→ESR(Ω)→θ(deg)
 →V(Vrms)→I(Arms)→FREQ(Hz)
 →LEVEL(V)→BIAS(V)→RANGE→REF

Select FREQ (Hz) when it is lighting.

3

Press buttons on the pad to make a desired two- or three-digit number for resolution setting.

Example: To specify 125 kHz:

Press **1**, **2**, **5** and then press **EXP** to light up (k) for the units.

B 125 *

Example: To specify 250 Hz:

Press **2**, **5** and **0**.

B 250



Note

- A value in the range from 40 to 200 kHz can be entered. The number in the one place will be rounded off into the nearest ten. Example: If 115 Hz is entered:



- The measure for the units will be shown automatically. Example: If 10000 Hz is entered:



- If you entered a wrong number, then press **CE** and retry the entry.
- If **EXIT** is pressed, the system will return to Step 1.
- Every press on **EXP** will change the measure (characteristic) in turn.

4 Press **ENTER** to complete the setting. Select **FREQ (Hz)** when it is lighting.



Note

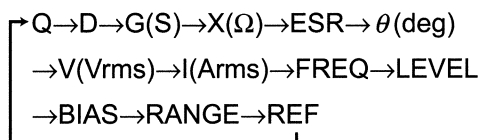
Frequency is set in the resolution as follows:
 40 Hz to 99 Hz: resolution of 1 Hz
 100 Hz to 990 Hz: resolution of 10 Hz
 1.0 kHz to 9.9 kHz: resolution of 100 Hz
 10 kHz to 200 kHz: resolution of 1 kHz

Use of Modify button

B SELECT

1 Press one of buttons of **PREV** **NEXT**. Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

Example: If **NEXT** is pressed (**PREV** will produce the opposite result):



Select **FREQ (Hz)** when it is lighting.

2 Press any of the four buttons of:



Note

The press will activate the Modify button.

3 Press one of buttons of **MODIFY** **←** **→** to specify the digit. The selected value will blink.

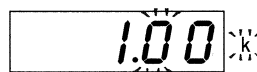
4 Press the buttons of **↑** **↓** to make a desired two- or three-digit number for resolution setting and complete the setting.

A press on **↑** will increase the value.

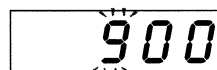
A press on **↓** will decrease the value.

Example: to decrease from 1.00 kHz to 900 Hz:

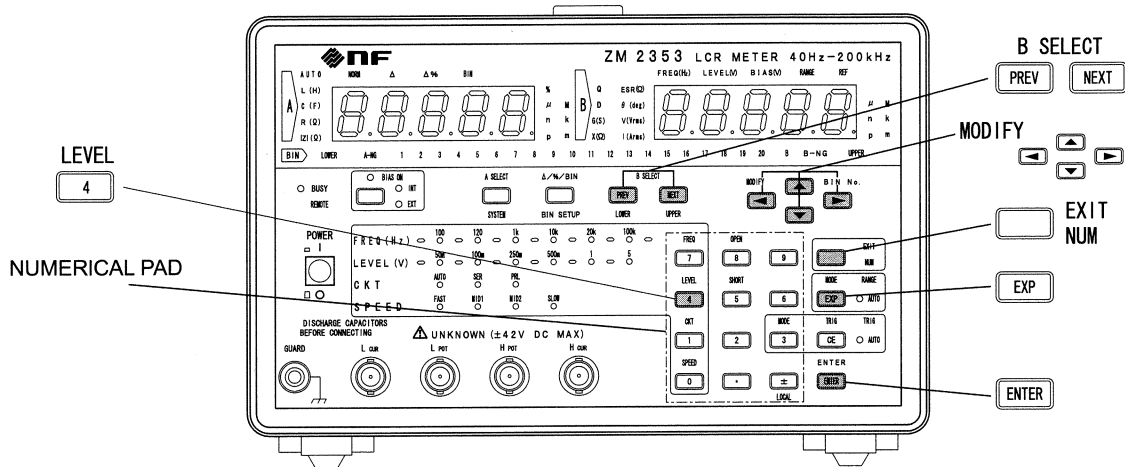
In the state of



Press **↓** and
 You will get:



Setting the measurement voltage



Use of direct buttons

1 Every press on **4** will change the indication of LEVEL (V) in turn:

1 → 5 → 50m → 100m → 250m → 500m

Select the desired indication when it is lighting.



Note

To select your desired voltage, use the numerical pad or the Modify button.

Using the numerical pad

1 Press one of buttons of **B SELECT** (PREV, NEXT). Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

Q → D → G(S) → X(Ω) → ESR(Ω) → θ(deg)
 → V(Vrms) → I(Arms) → FREQ(Hz)
 → LEVEL(V) → BIAS(V) → RANGE → REF

Select LEVEL (V) when it is lighting.

7 Press **NUM**.

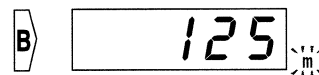


Note

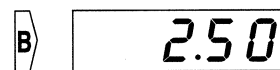
This button activates the numerical pad, when the indication lamps on the numerical pad go out.

3 Press buttons on the pad to make a desired two- or three-digit number for resolution setting.

Example: To specify 125 mV:
 Press **1**, **2**, **5** and then press **EXP** to light up (m) for the units.



Example: To specify 2.5 V:
 Press **2**, **.**, **5** and 2.50 will be indicated.



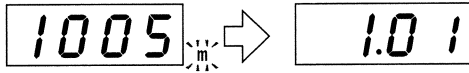


Note

- A value in the range from 10 m to 5 V can be entered.

The number in the one place will be rounded off into the nearest ten, and the measure for the units will appear automatically.

Example: If 1005 m is entered:



- If you entered a wrong number, then press **CE** and retry the entry.
- If **EXIT** is pressed, the system will return to Step 1.
- Every press on **EXP** will change the measure (characteristic) in turn.

4

Press **ENTER** to complete the setting.



Note

10 mV to 999 mV: Resolution of 1 mV
 1.00 V to 5.00 V: Resolution of 10 mV

Use of Modify button

1

Press one of buttons of **B SELECT** **PREV** **NEXT**.
 Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

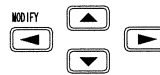
Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

Q→D→G(S)→X(Ω)→ESR(Ω)→θ(deg)
 →V(Vrms)→I(Arms)→FREQ(Hz)
 →LEVEL(V)→BIAS(V)→RANGE→REF

Select LEVEL (V) when it is lighting.

2

Press any of the four buttons of:



Note

The press will activate the Modify button.

3

Press one of buttons of **MODIFY** **←** **→** to specify the digit.
 The selected value will blink.

4

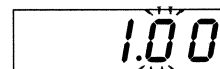
Press the buttons of **↑** **↓** to make a desired three-digit number for resolution setting and complete the setting.

A press on **↑** will increase the value.

A press on **↓** will decrease the value.

Example: to decrease from 1.00 V to 900 mV:

In the state of

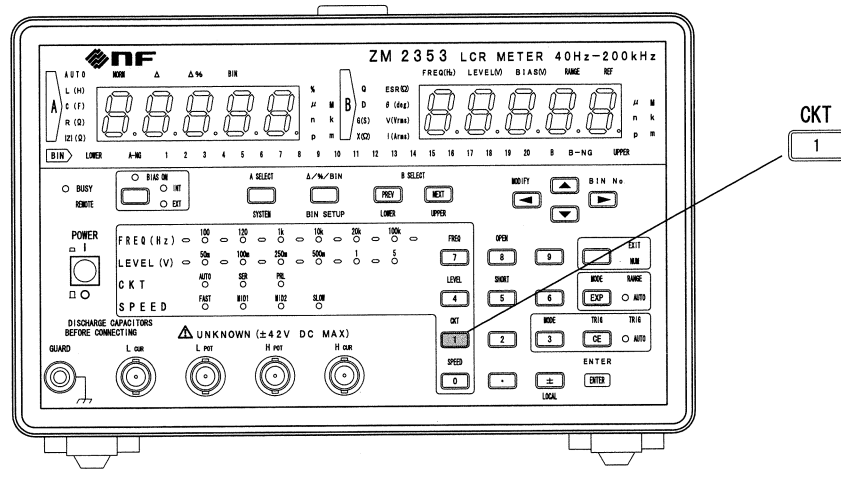


Press **↓** and

You will get:



Selecting an equivalent circuit



Automatic selection of an equivalent circuit

1 When the test piece has been attached, SER or PRL will be selected automatically according to the magnitude of impedance, and parameters selected on Displays A and B.

If SER is selected:



If PRL is selected:



Note

If AUTO has been selected on Display A, also AUTO is selected for the equivalent circuit.

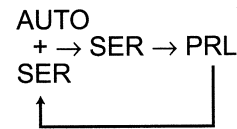


Note

- SER: This selects a series equivalent circuit.
- PRL: This selects a parallel equivalent circuit.

Arbitrary selection of equivalent circuit

1 Every press on **CKT** changes the indication of equivalent circuits in turn. If SER has been selected automatically:



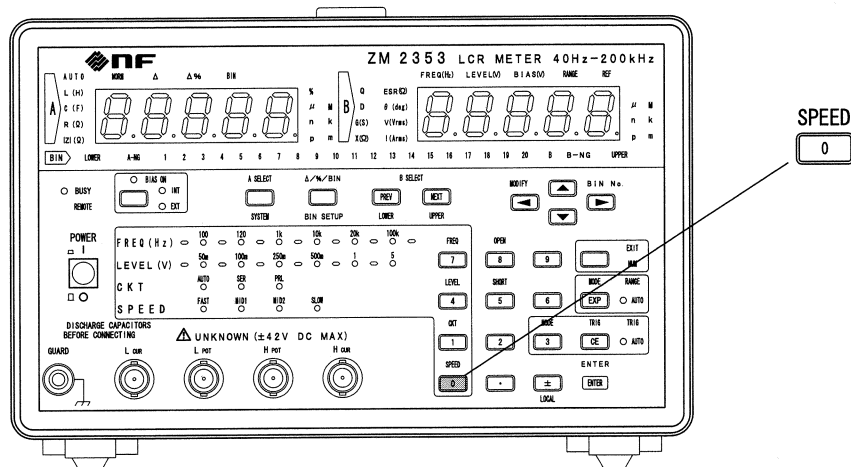
Select the desired indication when it is lighting.



Note

- Conditions to select series:
 - L, C, R, and $|Z|$ - ESR, X
 - L, C ($|Z| \leq 1 \text{ k}\Omega$)
 - Q, D, θ , V, I, settings
 - R ($\theta \leq 0$) - Q, D, θ , V, I, settings
 - $|Z|$ - Q, D, θ , V, I, settings
- Conditions to select parallel:
 - L, C, R, and $|Z|$ - G
 - L, C ($|Z| > 1 \text{ k}\Omega$)
 - Q, D, θ , V, I, settings
 - R ($\theta < 0$) - Q, D, θ , V, I, settings

Selecting the measuring speed



Use of direct buttons

- Every press on **MODE** **3** changes the indication of SPEED in turn.

MID2 → SLOW → FAST → MID1

Select the desired indication when it is lighting.



Note

▪ Measuring speed
This selection specifies the time necessary for the measurement as follows:

- FAST: 25 ms (typ.)
- MID1: 64 ms (typ.)
- MID2: 150 ms (typ.)
- SLOW: 480 ms (typ.)

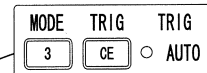
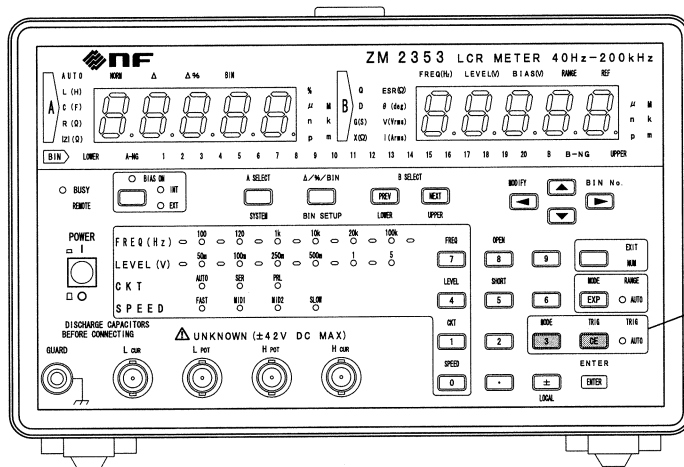


Note

The higher measuring speed you select, the shorter will be the time for the measurement, however, the fluctuation will be larger in the measurements.

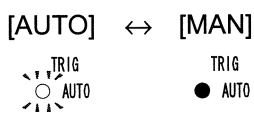


Trigger mode



Selection of Mode

1 Every press on **MODE** will toggle the trigger mode as follows:



Manual mode (MANUAL TRIG)

1 When **TRIG** **AUTO** is not lighting, a press on **TRIG** will execute one measurement, and the result will appear.

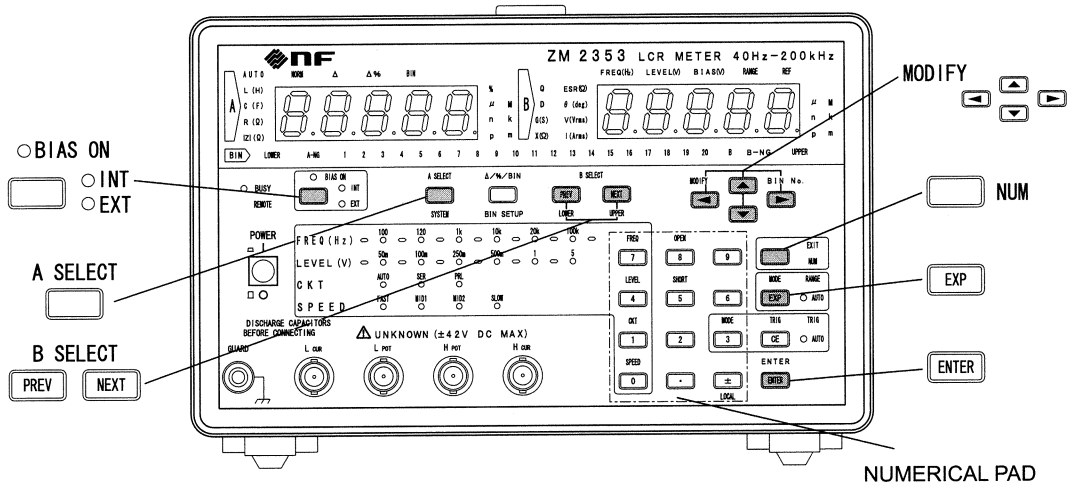
Note
In manual trigger mode, the result will be held and the system will not move.

Automatic mode (AUTO TRIG)

1 When **TRIG** **AUTO** is lighting, next measurement will be started when the current measurement is finished.

Note
In automatic trigger mode, measurement is performed in succession, and the result will appear one after another.

Application of internal DC bias



During measurement of C (capacity), the user can apply a DC bias voltage. The DC voltage bias is applicable at 0 to +2.5 V internally or using a DC power supply from outside. For the settings for use of external DC power supply and change of internal and external methods, see Chapter 7 "System Menu".

Setting of DC bias voltage

Using the numerical pad

1 Press one of buttons of **B SELECT** (PREV/NEXT). Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

- Q → D → G(S) → X(Ω) → ESR(Ω) → θ (deg)
- V(Vrms) → I(Arms) → FREQ(Hz)
- LEVEL(V) → BIAS(V) → RANGE → REF

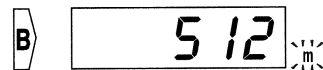
Select BIAS (V) when it is lighting.

2 Press **NUM**.

Note
This button activates the numerical pad, when the indication lamps on the numerical pad go out.

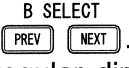


3 Press buttons on the pad to make a desired three-digit number for resolution setting.



Example: To specify 512 mV:
Press **5**, **1**, **2** and then press **EXP** to light up (m) for the units.



4 Press **ENTER** to complete the setting.

Use of Modify button

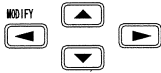
- 1 Press one of buttons of . Every press on  (regular direction) or  (opposite direction) will change the indication on Display B in turn.

Example: If  is pressed ( will produce the opposite result):

Q→D→G(S)→X(Ω)→ESR(Ω)→θ(deg)
 →V(Vrms)→I(Arms)→FREQ(Hz)
 →LEVEL(V)→BIAS(V)→RANGE→REF


Select BIAS (V) when it is lighting.


- 2 Press any of the four buttons of:




Note


The press will activate the Modify button.

- 3 Press one of buttons of  to specify the digit. The selected value will blink.

- 4 Press the buttons of  to make a desired number for setting.

A press on  will increase the value.

A press on  will decrease the value.


- 5 Press  to complete the setting.



Note

0 mV to 999 mV: Resolution of 1 mV
 1.00 V to 2.50 V: Resolution of 10 mV

Application of internal DC bias

- 1 Every press on  will change the indication on Display A in turn. Example: If it is C:


AUTO
 + →L(H)→C(F)→R(Ω)→|Z|(Ω)
 C(F)

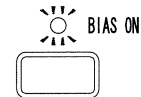
Select C (F) or |Z| (Ω).




Be careful!

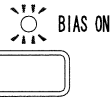
Be sure to select C or |Z| before turning BIAS ON. If AUTO + C, AUTO + |Z|, L or R is selected, you cannot turn BIAS on, and an error message will appear.

- 2 If  is pressed, DC BIAS will be applied and the lamp will light up.



Note

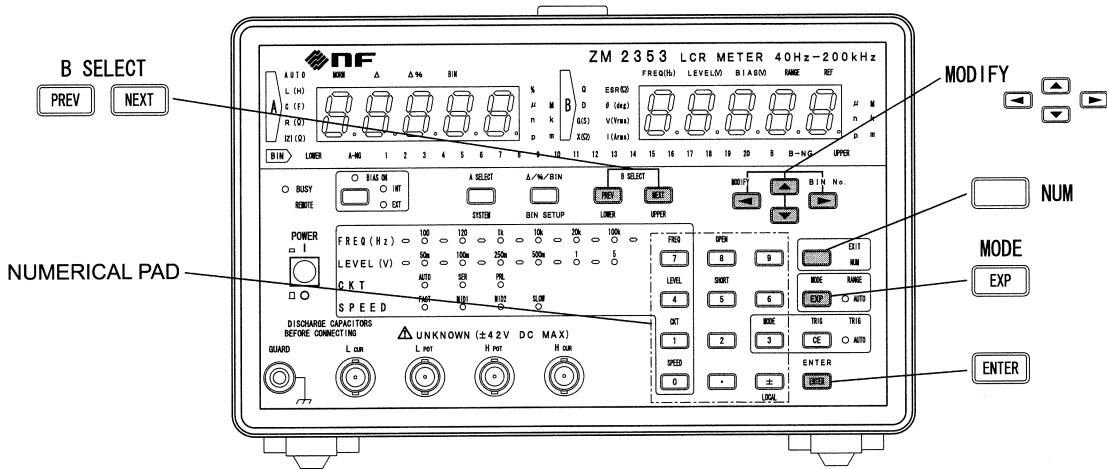
Every press on  will toggle the DC bias between ON and OFF.

ON state 

OFF state 



Setting the measurement range



The measurement range has two modes: one is automatic (Auto) and the other is fixed (Fixed).

In automatic (Auto) mode, the range is changed automatically and measurement will be indicated in the optimal range.

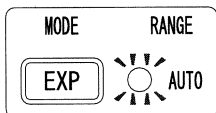
In fixed (Fixed) mode, measurement will be executed in the range, which is fixed to the setting.

Selection of mode

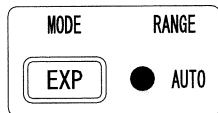
1 Every press on **EXP** toggles the mode between automatic and fixed modes.

Automatic mode (Auto)

Fixed mode (Fixed)



AUTO lamp lighting

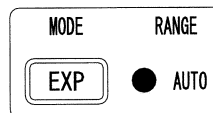


AUTO lamp not lighting

Selection of measurement range (fixed)

Using the numerical pad

1 Press **EXP** to enter the Fixed mode.



AUTO lamp not lighting



Note

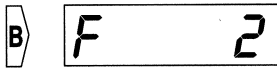
The range is fixed the range that was selected for AUTO measurement.

2 Press one of buttons of **B SELECT** (**PREV** **NEXT**). Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.

Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

Q→D→G(S)→X(Ω)→ESR(Ω)→ θ (deg)
 →V(Vrms)→I(Arms)→FREQ(Hz)
 →LEVEL(V)→BIAS(V)→RANGE→REF

Select RANGE when it is lighting.



* Steps 1 and 2 may be taken in the reverse order.

3 Press **NUM**.



Note

This button activates the numerical pad, when the indication lamps on the numerical pad go out.

4 On the numerical pad, select a number button from **1** to **6** that corresponds to the range number for fixing and press it.

5 Press **ENTER** to complete the setting.



Note

The ZM2353/ZM2354 provides six ranges.

See "Measurement range" in Chapter 8 "Measurement"



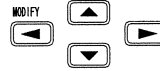
Be careful!

If any number other than 1 to 6 is pressed, an error message will appear.

Use of Modify button


1 Take Steps 1 and 2 in "Use of numerical pad".


2 Press any of the four buttons of:




Note

The press will activate the Modify button.



3 Press the buttons of   to select six ranges.

A press on  will increase the value.

A press on  will decrease the value.

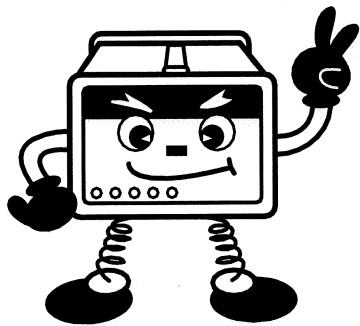


Be careful!

If "6" is shown for the range, pressing  will not change the number, and
 if "1" is shown for the range, pressing  will not change the number either.

3 Press **ENTER** to complete the setting.

Operation of Comparator Functions **5**





Comparator mode

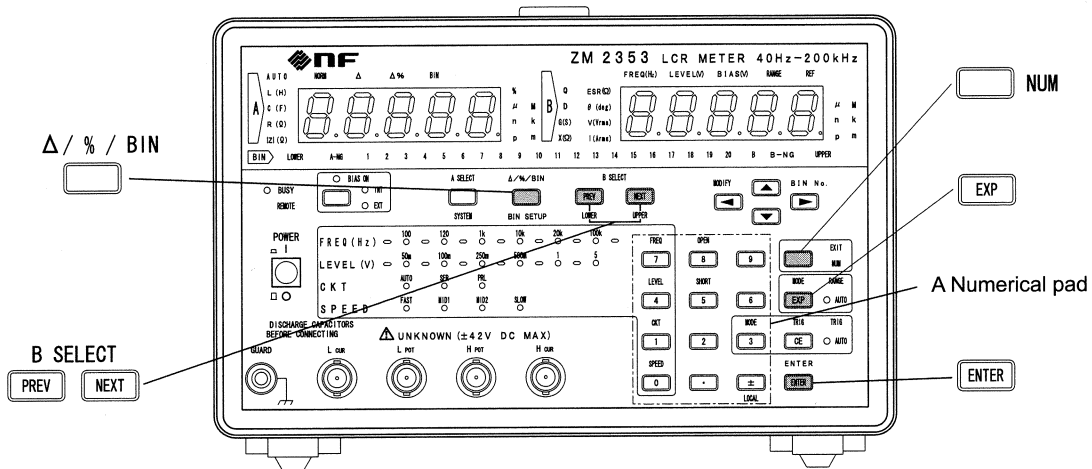
The ZM2353/ZM2354 is provided with comparator functions of maximum 21 classifications. The user can set the upper and lower limit values for the main parameters (indications on Display A) in BIN 1 to BIN 20 and also can set the upper and lower limit values for the sub parameters (indications on Display B) in BIN B.

The set values for upper and lower limit will determine the measurements and indicate the number of the BIN in which they are stored.

BIN B is enabled only when any item of Q, D, G, X, ESR, θ , V and I has been selected on Display B. If any of other items (FREQ, LEVEL, BIAS, RANGE, REF) has been selected, BIN B is disabled.

In addition, the result of determination will be supplied to the handler interface (ZM2354 only).

Viewing deviation data



The user can view the deviation data (Δ) of main parameters (indications on Display A) in relation to the reference value, and its percentage ($\Delta\%$).

Δ = Measurement – Reference value

$\Delta\%$ = $\{(Measurement - Reference\ value) / Reference\ value\} \times 100$

Setting the reference value

- Press one of buttons of **B SELECT** (PREV, NEXT).
Every press on **NEXT** (regular direction) or **PREV** (opposite direction) will change the indication on Display B in turn.
Example: If **NEXT** is pressed (**PREV** will produce the opposite result):

Q → D → G(S) → X(Ω) → ESR(Ω) → θ (deg)
→ V(Vrms) → I(Irms) → FREQ(Hz)
→ LEVEL(V) → BIAS(V) → RANGE → REF

Select REF when it is lighting.

- Press **NUM**.



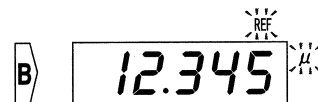
Note


This button activates the numerical pad, when the indication lamps on the numerical pad go out.

- Press buttons on the numerical pad to set a reference value in the resolution of 4-1/2 digits.


Example: To set 12.345 μ :

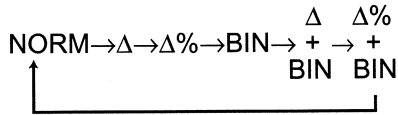
Press **1**, **2**, **.**, **3**, **4**, **5** and then press **EXP** several times, and the unit " μ " will light up.



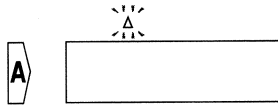
4 Press  to complete the setting.

Display of deviation data

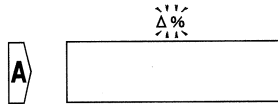
1 Every press on  changes indications on Display A in turn.



Select Δ or $\Delta\%$ for deviation data when it is lighting.



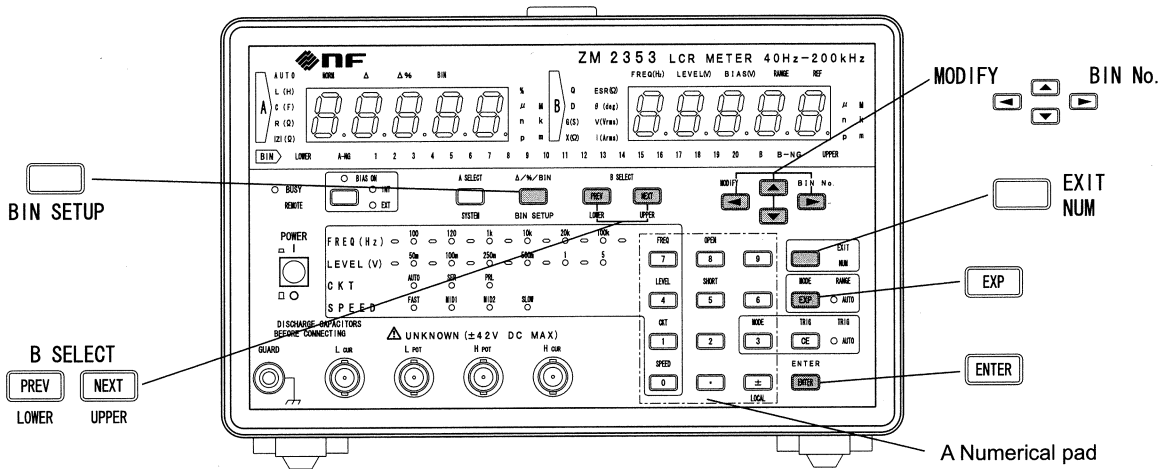
OR



Note

When deviation data (Δ) or deviation data percentage ($\Delta\%$) is displayed, "OF" or "UF" may be displayed if the valued is far away from the reference value.

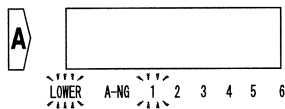
Setting the comparator mode



To set upper and lower limits for BIN determination, select BIN SETUP mode and enter upper and lower limit values for each Bin number from the numerical pad.

Entry to BIN SETUP mode

- 1 While pressing press . BIN Number "1" and "LOWER" start blinking, and a lower limit value appears on Display A and an upper limit value on Display B.




Note

The user can set upper and lower limit values in the BIN Number that is blinking.







Exit from BIN SETUP mode


- 1 Press and the system returns to the measuring state.


Upper and lower limit setting

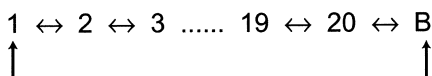
- 1 Enter the BIN SETUP mode.
 See "Entry to BIN SETUP mode".

Selection of BIN number

- 2 Every press on  or  of     changes the bin number in turn.

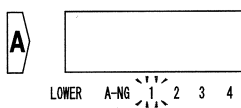
Press  and the indication moves leftward.

Press  and the indication moves rightward.

1 ↔ 2 ↔ 3 19 ↔ 20 ↔ B


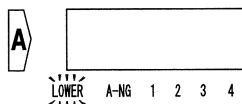
Example:

Here, select BIN 1.



To set lower limit

- 3 The system is ready for entry of a lower limit value.



Note

This button activates the numerical pad, when the indication lamps on the numerical pad go out.

4

Press  NUM.











Note

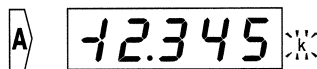
This button activates the numerical pad, when the indication lamps on the numerical pad go out.

5

Press buttons on the numerical pad to set the resolution of 4-1/2 digits.

Example: To set -12.345 k:


Press , , , , , ,  and then press , and the measure "k" will light up.

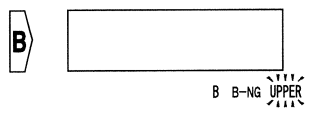



6

Press  to complete the setting.







To set upper limit

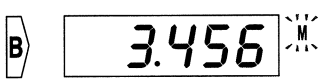
7 Press , and the system will be ready for entry of an upper limit value.









Note
When the UPPER lamp is blinking, the system is ready for entry of an upper limit value even if  has not been pressed.

8 Press buttons on the numerical pad to set the resolution of 4-1/2 digits.

Example: To set 3.456 M:
Press , , , ,  and then press , and the measure "M" will light up.



9 Press  to complete the setting.


Note
If any of , ,  or  is pressed before  is pressed, the value the user has just entered will not be established.

Next BIN setting

10 By repeating the procedure of Steps 2 to 10, select the BIN number and enter upper and lower limit values.

Note
If the entered values are valid (i.e., the lower limit < the upper limit) in a BIN number, then the BIN number will light up.

Conclusion of setting

11 Exit from the BIN SETUP mode.
 See "Exit from BIN SETUP mode".

Be careful!
In any of BINs 1 to 20, if the lower limit value and the upper limit value are in a relation of:
The lower limit value \geq The upper limit value,
then BIN judgment will be disabled for that bin number and forward.

Example:

| | Lower limit | Upper limit |
|-------|-------------|-------------|
| BIN 1 | -10 | 10 |
| BIN 2 | 0 | 0 |
| BIN 3 | -20 | 20 |

In the above case, the lower limit value is equal to the upper limit value in BIN 2. Therefore, judgment will be conducted only in BIN 1, and no judgment will be conducted in BIN 3.

