



6365
Precision LCR Meter

User Manual
1.01
JULY 2016

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1. Safety Specification

This instrument is designed according to EN61010-1 Specification. The main purpose of this Specification is to ensure that the instrument will be used in the laboratory or the factory safely; it is not suitable for outdoor applications, especially the moistened or dusty locations. Abnormal use of this instrument may cause the electrocution hazard. Before using this instrument, please read the descriptions of this Specification carefully to avoid causing accident due to incorrect or unintended use.

1. Safety marks (the following safety marks may appear in this Manual)



Caution :

Please read the content of this Manual carefully.



High-voltage hazard
symbol :

The output terminal may release lethal voltage. Please read the safety instructions described in this chapter.



Grounding :

Before working with this tester, be sure to connect this terminal with the ground to prevent from touching the housing as to cause electrocution accident due to current leakage.



Warning sign :

If the product is improperly used, it may cause adverse result to the instrument or the Test Piece. If the product is improperly used, it may cause injury or even death.

2. Electrocution

To prevent electrocution accident from occurring, it is suggested that the operator wear insulating rubber globes before working with the machine and then start the test-related activities.

3. Grounding

The back panel of the instrument is fitted with a safe ground terminal. Be sure to connect this ground terminal to the ground to prevent the operator from touching the housing as to cause the electrocution.

4. Power Source

The scope of power used by this instrument is 88~264Vac. To insert the power source, please check if the power to be connected is identical with the power-shifting sign indicated on the back panel. When changing the fuse, it is required to use specific type of fuse designed in same ampere to prevent the electrical wire from burning. Before making any replacement, please remove the plug to prevent danger.

5. Warm-up

The instrument will operate normally upon starting the power. To achieve the specified accuracy, it is suggested warming up the instrument for over 15 minutes.

6. External control unit

This unit is able to execute the external control. For this purpose, please ensure that the operator is not touching the signal output end and the Test Piece to avoid causing hazard.

7. Machine failure

Stop using the instrument immediately when finding it is operating abnormally, such as significant difference is existed between the current displayed on the current meter and the design value; or the current is not supplied, but the overlapping current indicator remains illuminated continuously. In this case, please contact us or your dealer to provide technical support.

8. Ending the test

When not using the instrument, please shut off the Power Switch. To restart

the Power Switch after being disconnected, please wait for few seconds; however, do not execute consecutive on/off action of the power.

9. Installation, storage

Normal operating temperature and humidity scope of the instrument is 5°C~40°C and 80% RH respectively, and the instrument may act abnormally if exceeding such range. The storage temperature and humidity scope of the instrument is -20°C~ 70°C and 80% RH respectively. To achieve correct testing and to protect safety, do not install the instrument in the environment exposing to direct sunshine or high temperature, high humidity, frequency oscillation and rich dust.

10. Emergency treatment

Upon the occurrence of electrocution, burning of the Test Piece or the burning of Main Unit, please disconnect the Power Switch and remove the power cord plug immediately to avoid causing a hazard.

11. General instructions

- Do not place any combustible or heavy object on the instrument.
- Avoid heavy impact that may damage the machine.
- When cleaning the instrument, remove the power plug first and then wipe with the soft cloth soaked with mild cleanser and fresh water.
- If the instrument presents any Tolerance sign, do not attempt to dismantle it for making repairs; instead, send the instrument to our professional maintenance personnel for solving the problem.

2. Preface

In this chapter, we briefly introduce the characters, key features and specifications of 6365 Precision LCR Meter.

2.1 Introduction

The test frequency of the 6365 Precision LCR Meter is 20Hz~200kHz (6365) / 0.1Hz~200kHz (6365A) and the test signal is 10mV-2Vrms (min. resolution 1mV). The measurement in a continuously changing environment can be executed stage-by-stage with the test frequency and grade, and high-speed continuous tests can be performed under different test and mode conditions. The machine also supports USB and GPIB PC connection capabilities to improve the design and test efficiency significantly.

The performance, convenience and operation flexibility of the Precision LCR Meter have become indispensable tools for the professional measuring technicians. In addition to providing full-range solutions for the testing equipment over the past years. Therefore, it can be used in the testing of a variety of components such as resistor, capacitor, inductor, oscillator, sensor, time-delay wire, filter and resonator.

2.2 Key Feature

- Basic accuracy up to 0.08%
- The lowest test frequency from 0.1Hz (6365A)
- Multi step function
- Synchronous tests with four parameter settings
- Interface: GPIB, RS232, Handler
- User-friendly interface, easy to operate
- Support fully test functions

2.3 Contents

- LCR-6365 x1
- LCR- 6365 User Manual x1
- Power Cord x1
- F423501 Kevin Clips x1

2.4 Measuring Parameters

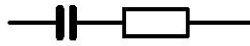
- | | |
|---------------------------|---------------------------|
| • Series Inductance (Ls) | Parallel Inductance (Lp) |
| • Series Capacitance (Cs) | Parallel Capacitance (Cp) |
| • Series Resistance (Rs) | Parallel resistance (Rp) |
| • Reactance (X) | Susceptance (B)(=1/X) |
| • Impedance (Z) | Admittance (Y)(=1/Z) |
| • Loss factor (D) | Quality factor (Q)(=1/D) |
| • Phase angle (θ) | Conductivity (G) |
| • DC Resistance (Rdc) | |

2.5 Parameters

- Series / Parallel mode :
To measure resistance, capacitance, inductance, reactance and s conductivity, user can select series or parallel mode.

◆ Capacitance (C) :

Series mode :

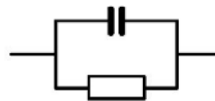


Relevant equations:

$$C_s = C_p (1 + D^2)$$

D = dissipation factor

Parallel mode :



$$C_p = \frac{C_s}{(1 + D^2)}$$

D = dissipation factor

◆ Inductance (L) :

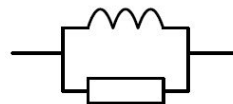
Series mode :



Relevant equations:

$$L_s = \frac{L_p}{\left(1 + \frac{1}{Q^2}\right)}$$

Parallel mode :



$$L_p = L_s \left(1 + \frac{1}{Q^2}\right)$$

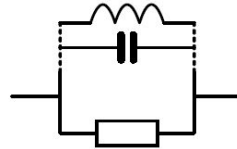
Q = Quality Factor

Q = Quality Factor

◆ Reactance (X) :

Series mode :

Parallel mode :



Relevant equations:

$$R_s = \frac{R_p}{(1 + Q^2)}$$

$$R_p = R_s(1 + Q^2)$$

Q = Quality Factor

Q = Quality Factor

◆ Resistance (R) and Conductivity (G) :

The electrical resistance of an electrical conductor is a measure of the difficulty to pass an electric current through that conductor. The SI unit of electrical resistance is the “ohm” (Ω).

The inverse quantity is electrical conductance, and this is the ease with which an electric current passes through a circuit. The SI unit of electrical conductance is measured in Siemens (S) and it the reciprocal of the resistance ($G=1/R$).

Resistance (R) :

1. Series mode $\rightarrow R_s$
2. Parallel mode $\rightarrow R_p$
3. DC Resistance $\rightarrow R_{dc}$

Relevant equations:

$$R = \frac{V}{I} = \frac{1}{G} = Z_s - j \quad \Rightarrow Z_s - j\omega L = Z_s + \frac{j}{\omega C}$$

$$|Z_s| = \sqrt{(R^2 + X^2)}$$

$$|Z_p| = \frac{R \ X}{\sqrt{(R^2 + X^2)}}$$

$$R_s = |Z| \cos \theta$$

Conductivity (G) :

Parallel mode $\rightarrow G_p$

* Conductivity measuring by parallel mode only.

$$G_p = \frac{I}{V} = \frac{1}{R} = Y_p - j \quad \text{or} \quad Y_p - j\omega C = Y_p + \frac{j}{\omega L}$$

$$|Y_s| = \frac{G \ B}{\sqrt{(G^2 + B^2)}}$$

$$|Y_p| = \sqrt{(G^2 + B^2)}$$

$$G_p = |Y| \cos \theta$$

◆ Capacitance (C):

Capacitance (denoted by the letter C) is the ability of a body to store an electrical charge at a given potential difference between its plates. The SI unit of capacitance is the farad (symbol: F).

1. Series mode $\rightarrow C_s$
2. Parallel mode $\rightarrow C_p$

Relevant equations:

$$Z_s = R + j \quad \text{or} \quad R + j\omega L = R - \frac{j}{\omega C}$$

$$Y_p = G + j \quad \text{or} \quad G + j\omega C = G - \frac{j}{\omega L}$$

$$Q = \frac{\omega L_s}{R_s} = \frac{1}{\omega C_s R_s} \quad (\text{series R L C circuit})$$

$$Q = \frac{R_p}{\omega L_p} = \omega C_p R_p \quad (\text{parallel R, L, C values})$$

$$D = \frac{R_s}{\omega L_s} = \omega C_s R_s \quad (\text{series R \& L C r v, i})$$

$$D = \frac{G_p}{\omega C_p} = \omega L_p G_p \quad (\text{p G \& L C r y, \epsilon})$$

◆ Inductance (L):

Inductance is the property of an electrical conductor by which a change in current through it induces an electromotive force (EMF) in both the conductor itself and in any nearby conductors by mutual inductance. In the SI system, the measurement unit for inductance is the henry (with the unit symbol H).

1. Series mode → L_s
2. Parallel mode → L_p

Relevant equations:

$$Z_s = R + j \cancel{X} R + j\omega L = R - \frac{j}{\omega C}$$

$$Y_p = G + j \cancel{B} G + j\omega C = G - \frac{j}{\omega L}$$

$$Q = \frac{\omega L_s}{R_s} = \frac{1}{\omega C_s R_s} \quad (\text{series R \& L C r v, i})$$

$$Q = \frac{R_p}{\omega L_p} = \omega C_p R_p \quad (\text{parallel R, L, C values})$$

$$D = \frac{R_s}{\omega L_s} = \omega C_s R_s \quad (\text{series R \& L C r v, i})$$

$$D = \frac{G_p}{\omega C_p} = \omega L_p G_p \quad (\text{p G \& L C r y, \epsilon})$$

◆ Reactance (X) and Susceptance (B):

In AC circuit analysis, reactance is represented by the capital letter “X”

which is the imaginary part of a complex impedance. Reactance is the opposition of a circuit element to a change in the current or voltage, due to that element's inductance or capacitance which is similar to the opposition of resistance to current in a DC circuit. In an AC circuit (e.g. a series RLC circuit) inductance and capacitance may oppose current and are named reactance measured in units of Ohm (Ω).

In electrical engineering, susceptance (B) is the imaginary part of admittance. The inverse of admittance is impedance, and the real part of admittance is conductance. The latter is the reciprocal of impedance ($B=1/X$) and is measured in units of siemens (S).

◆ Reactance (X) :

Series mode $\rightarrow X_s$

* Reactance measuring by series mode only.

Relevant equations:

$$X = \frac{1}{B} = |Z| \sin \theta$$

$$|Z_s| = \sqrt{(R^2 + X^2)}$$

$$|Z_p| = \frac{R \ X}{\sqrt{(R^2 + X^2)}}$$

$$X_s = |Z| \sin \theta$$

◆ Susceptance (B) :

Parallel mode → B_p

* Susceptance measuring by parallel mode only.

Relevant equations:

$$B = \frac{1}{X} = |Y| \sin \theta$$

$$|Y_s| = \frac{G}{\sqrt{G^2 + B^2}}$$

$$|Y_p| = \sqrt{G^2 + B^2}$$

$$B_p = |Y| \sin \theta$$

◆ Impedance (Z) and Admittance (Y) :

The impedance covers oppositions in AC circuits including resistance, inductance, and capacitance and is measured in units of Ohm (Ω). In electrical engineering, admittance covers both conductance and susceptance and is the reciprocal of impedance. It is measured in units of siemens (S).

Impedance (Z) :

Relevant equations:

$$Z = \frac{E}{I} = \frac{1}{Y}$$

$$Z_s = R + j \omega L = R - \frac{j}{\omega C}$$

$$|Z_s| = \sqrt{R^2 + X^2}$$

$$|Z_p| = \frac{R}{\sqrt{R^2 + X^2}}$$

$$R_s = |Z| \cos \theta$$

$$X_s = |Z| \sin \theta$$

Admittance (Y) :

Relevant equations:

$$Y = \frac{I}{E} = \frac{1}{Z}$$

$$Y_p = G + j B \quad G + j\omega C = G - \frac{j}{\omega L}$$

$$|Y_s| = \frac{G \quad B}{\sqrt{(G^2 + B^2)}}$$

$$|Y_p| = \sqrt{(G^2 + B^2)}$$

$$G_p = |Y| \cos \theta$$

$$B_p = |Y| \sin \theta$$

◆ Quality factor (Q) and Loss factor (D) :

The quality factor measures energies consumed by relative frequency. In general, the better a circuit's quality factor the better its selectivity.

The dissipation factor is the reciprocal of quality factor. It is the signal angle loss by a capacitor (or inductor) and acting frequency at a fixed temperature. Phase shifts caused by time lag between an externally applied voltage and current generated may result in loss of current and energy dissipation. Here the total current (I) is the sum of the charging current (I_c) by a 90° voltage phase shift and loss current (I_R) of the same voltage. The loss angle is the angle δ between the total current and charging current and tanδ the dissipation factor (symbol: D) as shown in the figure below:

$$D = \tan \delta = \frac{I_R}{I_c}$$

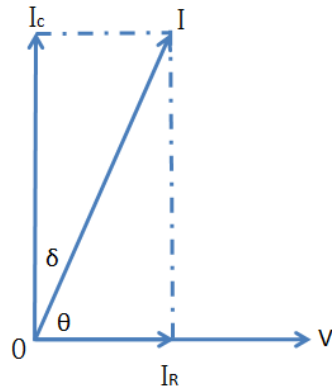


Figure 2-5-1 Phase diagram of the actual capacitance

Quality factor (Q) :

Relevant equations:

$$Q = \frac{R_p}{\omega L_p} = \omega C_p R_p \quad (\text{parallel } R, L, C \text{ values})$$

$$Q = \frac{\omega L_s}{R_s} = \frac{1}{\omega C_s R_s} \quad (\text{series } R \text{ \& } C \text{ r.v, i})$$

$$Q = \frac{1}{\tan(90 - \theta)^\circ} = \frac{1}{D}$$

Loss factor (Q) :

Relevant equations:

$$D = \frac{R_s}{\omega L_s} = \omega C_s R_s \quad (\text{series } R \text{ \& } C \text{ r.v, i})$$

$$D = \frac{G_p}{\omega C_p} = \omega L_p G_p \quad (\text{parallel } G \text{ \& } C \text{ r.v, i})$$

$$D = \tan(90 - \theta)^\circ = \frac{1}{Q}$$

◆ Phase angle (θ) :

This is the shift angle when measuring impedance (Z), admittance (Y), quality factor (Q) and dissipation factor (D).

Relevant equations:

$$Z_s = R + j \cancel{X} \quad R + j\omega L = R - \frac{j}{\omega C}$$

$$Y_p = G + j \cancel{B} \quad G + j\omega C = G - \frac{j}{\omega L}$$

$$Y_p = G + j \cancel{B} \quad G + j\omega C = G - \frac{j}{\omega L}$$

$$Q = \frac{1}{\tan(90 - \theta)^\circ} = \frac{1}{D} \quad D = \tan(90 - \theta)^\circ = \frac{1}{Q}$$

$$R_s = |Z| \cos \theta \quad X_s = |Z| \sin \theta$$

$$G_p = |Y| \cos \theta \quad B_p = |Y| \sin \theta$$

2.6 Set up of hardware structure

Main structure of the test machine LCR-6365

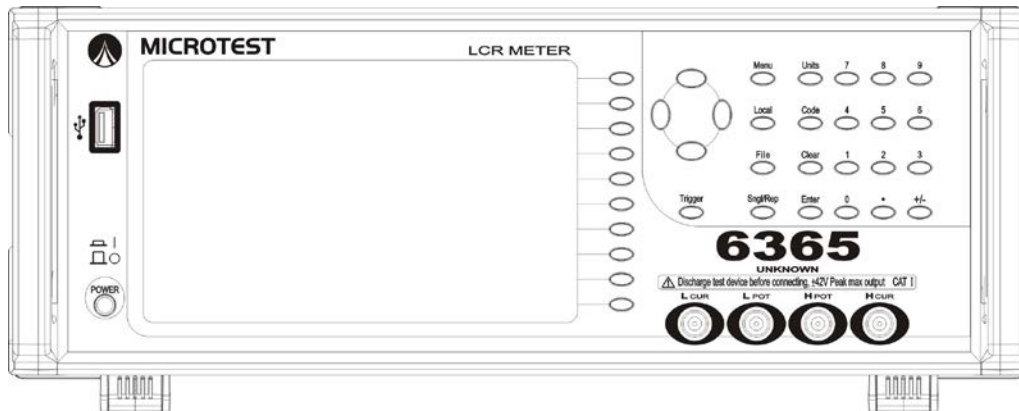


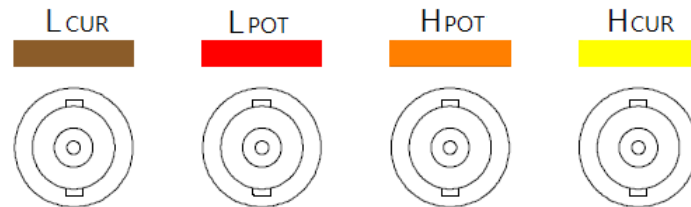
Figure 2-6-1: Front view of the test machine LCR-6365

Front panel overview

- Display: LED backlight display with a resolution at 800x480
- Function key: Press to select functions to the right of the screen
- Menu: Press to display the main menu page
- Local: Press to unlock the keyboard when your machine is in remote control mode
- File: Press to display the file management page
- Sngl/Rep: Press to switch between single trigger or repeat trigger measurement in meter mode
- Trigger: This is used in meter mode. For single trigger mode it triggers measurement; for repeat trigger mode it pauses/resumes measurement. The message "TRIG HOLD" prompts when measurement stops.
- Units: Press to capture a screen shot and save the file in a connected USB drive.
Please connect your USB drive in advance. Picture files are saved in the folder "\6365_LCR\Screen\" in the format BMP.
The USB drive here supports FAT32 format with a capacity up to 64GB
- Code: Reserved and has no function now
- Clear: Press to delete invalid numbers in edit mode
- Enter: Press to validate edited values or selections
- Arrow key: Press to select menu items or parameters
- Numeric key: Press to input numeric values in edit mode

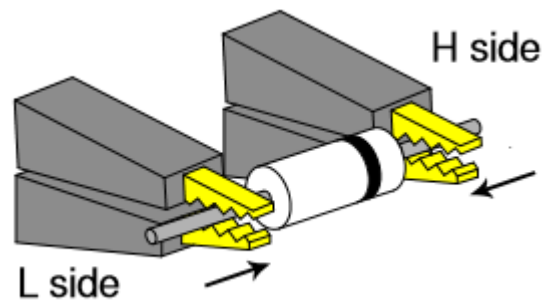
- Measurement terminal:

- LCUR Receive test current, connect to the DUT's cathode (-)
- LPOT Voltage measurement cathode, connect to the DUT's cathode (-)
- HPOT Voltage measurement anode, connect to the DUT's anode (+)
- HCUR Provide test current, connect to the DUT's anode (+)

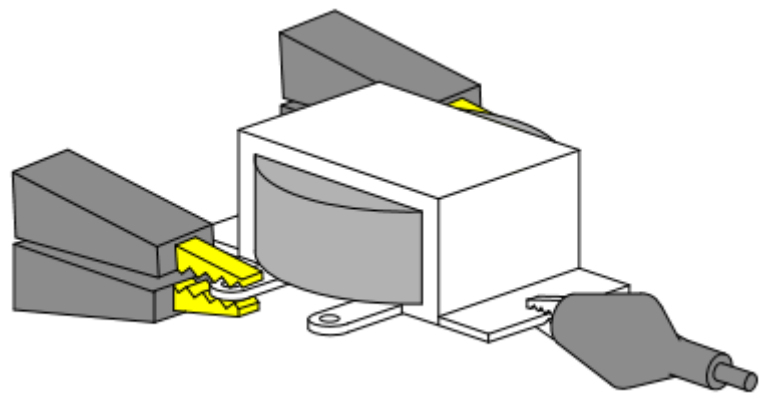


The figure above indicates the 6365 4-wire measurement connector of your machine, please connect the 4-wire command jig connector of the jig's test line to them respectively.

1. Fully discharge the DUT before connecting it to the jig
2. Connect the jig terminal to the BNC terminal in the front panel by its aligned color
3. Connect the DUT to the jig. For a DUT with polarity connect the jig's H side to the DUT's anode and L side cathode. Keep the jig clip close to the DUT body.



4. For a DUT with casing which is not connected to any jig clip, ground it to reduce the impact of noise.



Back of the test machine LCR-6365

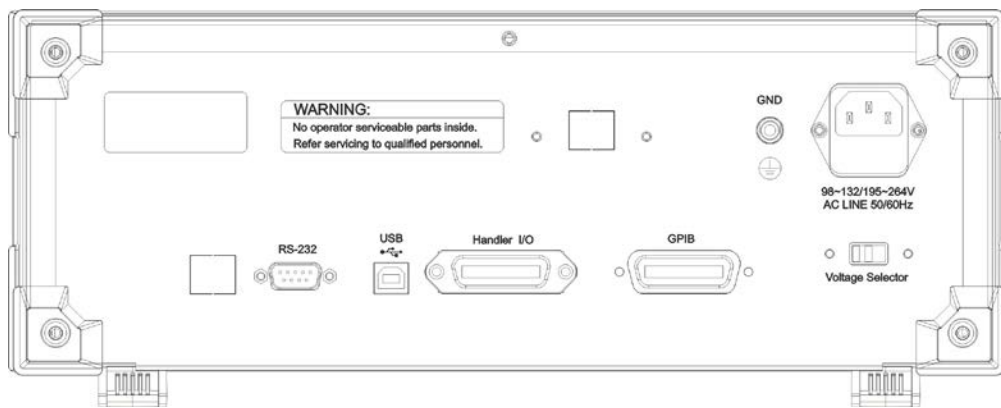


Figure 2-6-2: Back of the test machine LCR-6365

Connection port at the back of the test machine LCR-6365

1. **AC INPUT:** This is the AC power input socket. Press the power switch to the 110V or 220V position according to the voltage of the input power.
2. **RS-232:** RS-232 series communication port interface
3. **GPIB:** GPIB communication information
4. **USB:** Reserved without function now

2.7 Precautions before power on

Make sure there is an adequate and stable AC voltage for each device in your test machine LCR-6365 before powering it on for operation.

3. Operation

3.1 6365 main menu

Press the Menu key to display the main menu page.

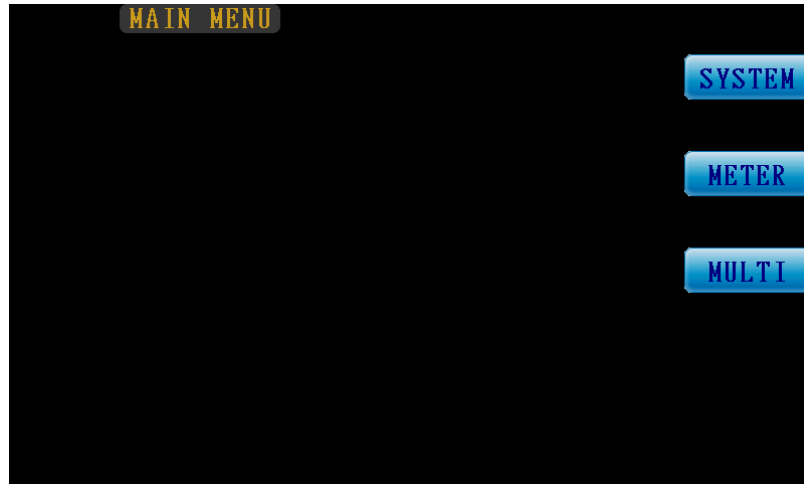


Figure 3-1-1: Main menu page

- SYSTEM: Press to display the System Setup page
- METER: Press to display the Meter Mode page for multimeter measurement
- MULTI: Press to display the Multi-Step Mode page for multi-step test function

3.2 5236 system setup

Press the Menu key to display the main menu page, select the SYSTEM option to display the system setup page.



Figure 3-2-1: System setup page

1. Trigger delay (mS): Set up the trigger delay time in the range of 0ms~5000ms
2. Compare Beep: Set up the buzzer alert timing when the compare function is enabled in Meter Mode. Press the Select function key to make your choice.
 - a. OFF: Turn alerts off
 - b. NG: Alert in case any one item is over the given range (FAIL)
 - c. OK: Alert only when every item open for comparison falls in the given range (PASS)
3. Multi Step Beep: Set up a test results alert sound in multi-step test mode. Press the Select function key to make your choice.
 - a. ON: Turn alerts on
 - b. OFF: Turn alerts off
4. Handler Interface: Enable/disable the Handler Interface function. Press the Select function key to make your choice.

- a. ON: Enable the Handler Interface function
 - b. OFF: Disable the Handler Interface function
5. GPIB Address: Set up a GPIB communication address in the range of 1~30
 6. RS-232 Baud Rate: Set up the baud rate of the series communication port. Press the Select function key to make your choice with options of 115200/56000/384000/19200/9600 bps.
 7. Communication Interface: Select the desired communication interface of GPIB or RS-232
 8. Language: Press the Select function key to make your choice of options: English, Traditional Chinese, Simplified Chinese.
 9. About: Display the edition information of your machine

3.3 6365 Meter Mode

Press the Menu key to display the main menu page, select the METER option to display the Meter Mode page.

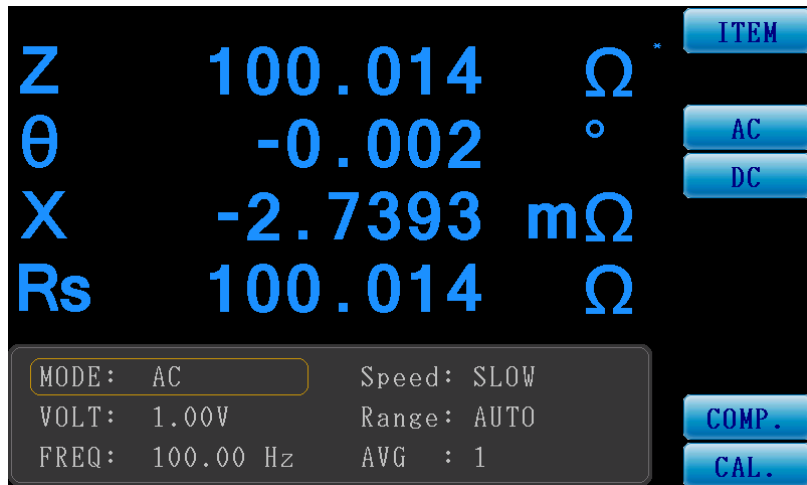


Figure 3-3-1: Meter Mode page

- Measurement settings
 - ◆ MODE: Measurement mode with the options of AC and DC
 - ※ The DC mode has Rdc (DC resistance) measurement only

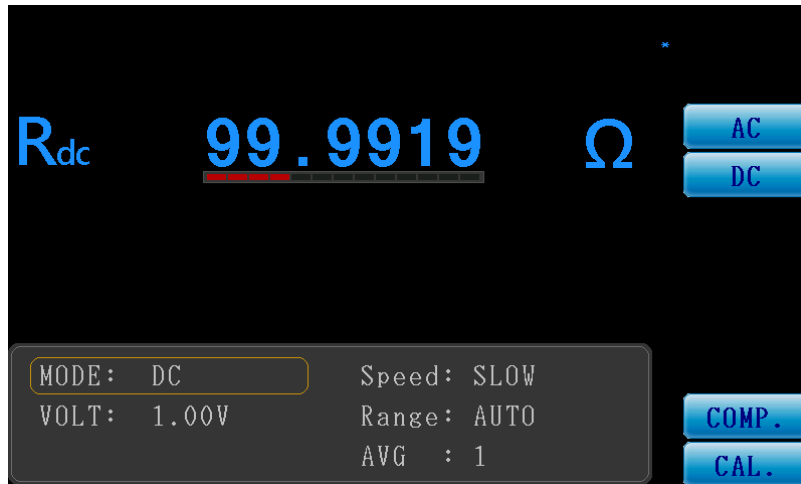


Figure 3-3-2: DC mode page (for Rdc measurement only)

- ◆ VOLT: Set up the voltage measurement in the range of 10mV~2.0V
- ◆ FREQ: Set up the frequency measurement in the range of 20Hz~200kHz (6365)/0.1Hz~200kHz (6365A). This option is valid for AC mode only.
- ◆ Speed: Set up the measurement speed with the options of: MAX (very fast), FAST (fast), MED (normal), SLOW (slow)

Measurement time (display refresh time exclusive):

MAX: 5mS
 FAST: 25mS
 MED: 100mS
 SLOW: 250mS

Including display refresh time: (varies with number of refreshing items)

MAX: 8mS ~ 12mS
 FAST: 28mS ~ 32mS
 MED: 102mS ~ 107mS
 SLOW: 252mS ~ 257mS

- ◆ Range: Set up the measurement shift with the options of AUTO, HOLD (remain in current shift), 1 (shift 1), 2 (shift 2), 3 (shift 3)
- ◆ AVG: Set up the count for average in the range of 1~64
- ITEM: (measurement parameter settings)

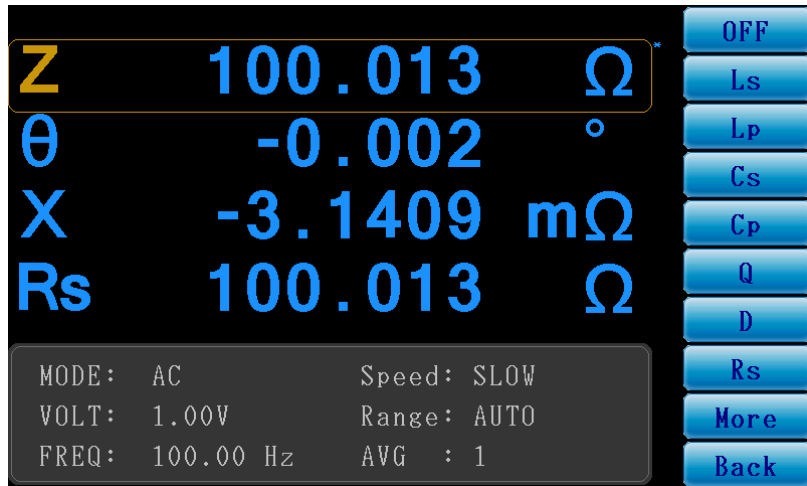


Figure 3-3-3: Parameter selection page 1

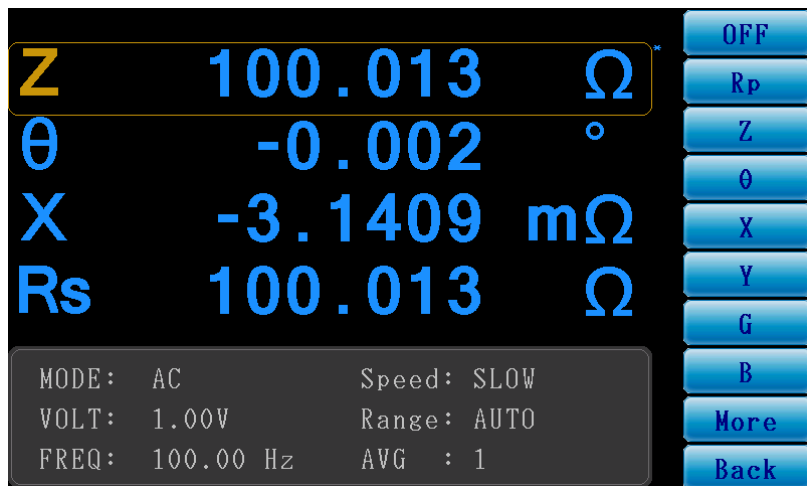


Figure 3-3-4: Parameter selection page 2

- ◆ Up/down arrow key: Press to move the yellow frame to the desired test parameter item
- ◆ Left/right arrow key: Change the measurement parameter value of the items selected by the yellow frame. Valid options are:
OFF/Ls/Lp/Cs/Cp/Q/D/Rs/Rp/Z/θ/X/Y/G/B
- ◆ Function menu
 - OFF: Disable the measurement function of the given item (DO NOT disable all four of them)
 - Ls: Set the item to Ls measurement (series induction)
 - Lp: Set the item to Lp measurement (parallel induction)
 - Cs: Set the item to Cs measurement (series capacitance)
 - Cp: Set the item to Cp measurement (parallel capacitance)
 - Q: Set the item to Q measurement (quality factor)

- D: Set the item to D measurement (loss factor)
- Rs: Set the item to Rs measurement (series resistance)
- Rp: Set the item to Rp measurement (parallel resistance)
- Z: Set the item to Z measurement (impedance)
- θ : Set the item to θ measurement (phase angle)
- X: Set the item to X measurement (reactance)
- Y: Set the item to Y measurement (admittance)
- G: Set the item to G measurement (conductance)
- B: Set the item to B measurement (susceptance)
- More: Go to next menu page
- Back: Return to measurement page

- COMP.: (compare function)

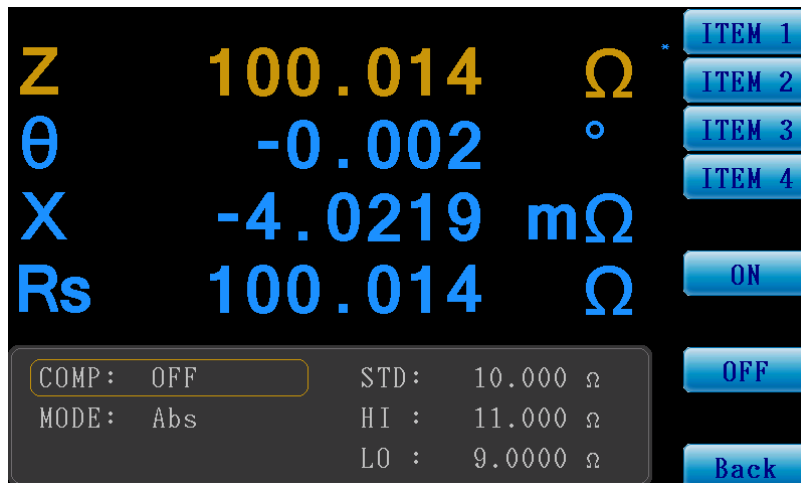


Figure 3-3-5: Compare function setup page

◆ Compare conditions setup

- COMP: Switch the compare function ON or OFF
- MODE: Set up the compare mode:
 - ✓ Abs: Upper/lower limit determined by values in HI/LO fields
 - ✓ Δ Abs: Set the upper limit to $STD+HI$ and lower limit $STD+LO$
 - ✓ $\Delta\%$: Set the upper limit to $STD+(STD \times HI\%)$ and lower limit $STD+(STD \times LO\%)$
- STD: Set up the standard value
- HI: Set up the upper limit
- LO: Set up the lower limit

◆ Function menu

- ITEM 1: Select to edit measurement item 1
- ITEM 2: Select to edit measurement item 2
- ITEM 3: Select to edit measurement item 3
- ITEM 4: Select to edit measurement item 4
- Back: Return to measurement page

The figure below is the page of the enabled compare functions. The message box below each measurement group varies with the actual value.

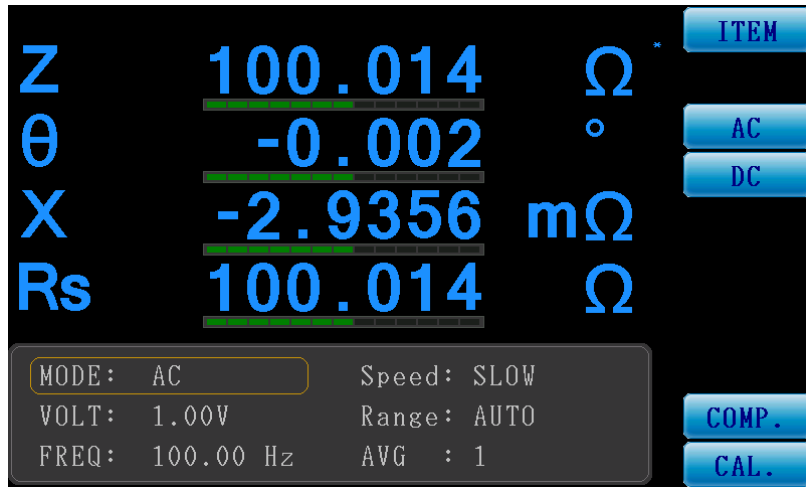
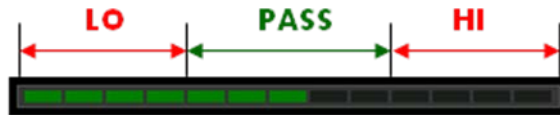


Figure 3-3-6: Measurement page with the compare function enabled

The bar chart of the compare function may appear like the figure below:



LO: this bar shows a red block in the range of “LO” when the measurements fall below the lower limit

PASS: this bar shows a green block in the range of “PASS” when the measurements fall within the range between the lower and upper limit

HI: this bar shows a red block in the range of “HI” when the measurements fall below the upper limit

- CAL.:
Press to calibrate the OPEN/SHORT circuit

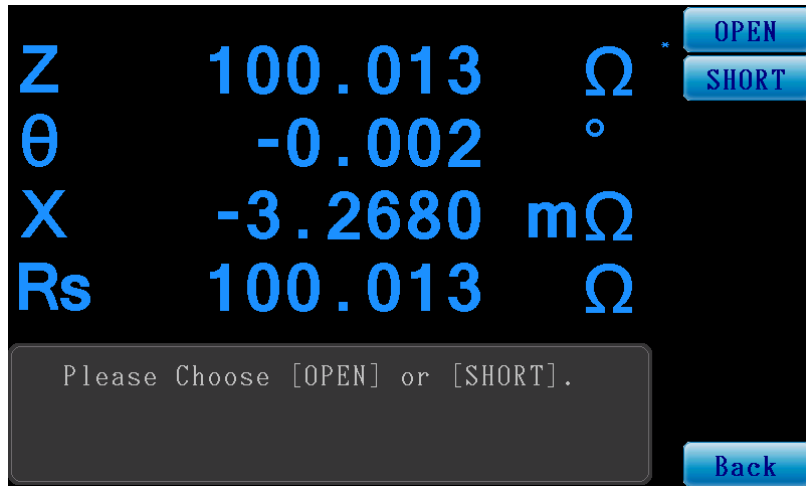


Figure 3-3-7: Calibration function page of meter mode

- OPEN: press to display the open circuit calibration menu
 - DC: start the DC open circuit calibration
 - Spot: start the open circuit calibration of the current “AC” configuration setting
 - All Freq: start the full frequency open circuit calibration

- SHORT: press to display the short circuit calibration menu
 - DC: start the DC short circuit calibration
 - Spot: start the short circuit calibration of current “AC” configuration setting
 - All Freq: start the full frequency short circuit calibration

3.4 6365 Multi Step Mode

Press the Menu key to display the main menu page, select the MULTI option to display the Multi Step Mode page.



Figure 3-4-1: Multi Step Mode page

Figure 3-4-1 is the list of the Multi Step test which outlines the test configuration of each group.

- Multi-Step Mode list:
 - ◆ 1~8: 8 groups of multi-step settings which can be selected by pointing the cursor to the desired one with the up/down arrow key
 - ◆ Select: click to edit the test items in the yellow color frame
 - ◆ TEST: press to enter the multi-step test mode
 - ◆ CAL.: press to start the open/short circuit calibration of the multi-step function
 - ◆ QUIT: press to exit the multi-step mode and go back to the main menu

The figure below is a page with the test items set:

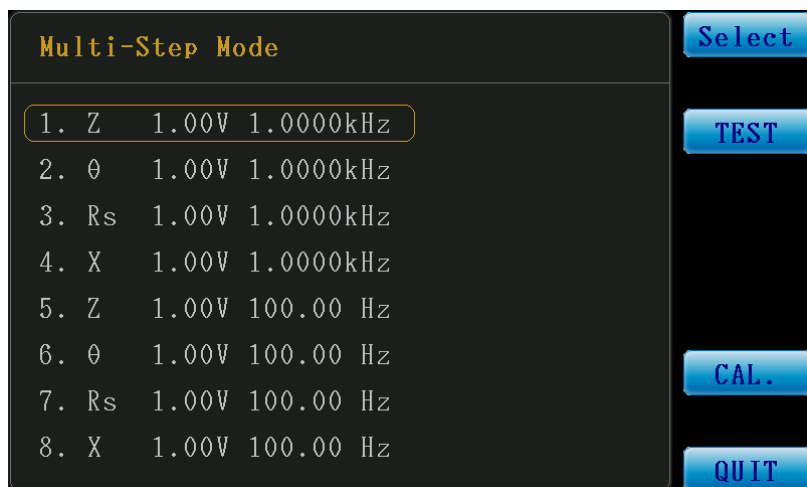


Figure 3-4-2: Page with test items set

- Multi-Step Mode edit:

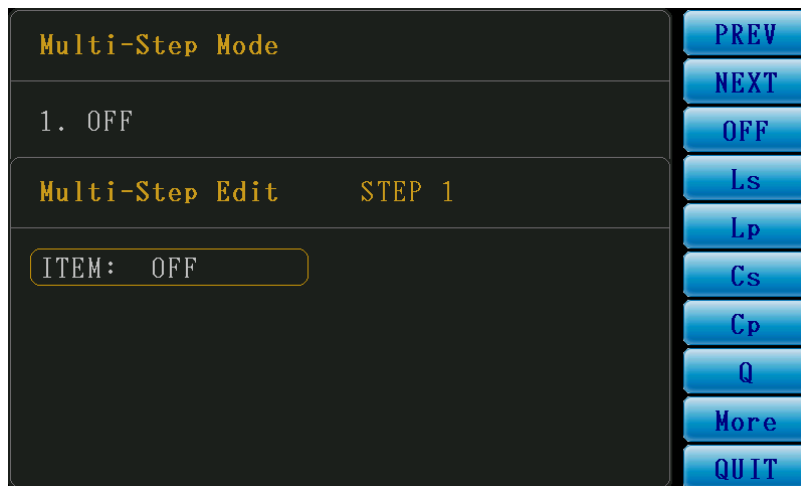


Figure 3-4-3: Multi Step Mode edit page

You can edit the test items in the Multi-Step Edit window at the bottom of the page. String “STEP 1” suggests the first test item is now being edited. Press the function key to the right of the page to edit the desired test item and conditions.

In this page option “ITEM” is OFF now. You may select one test parameter to the right to open this test item as shown in the figure below.

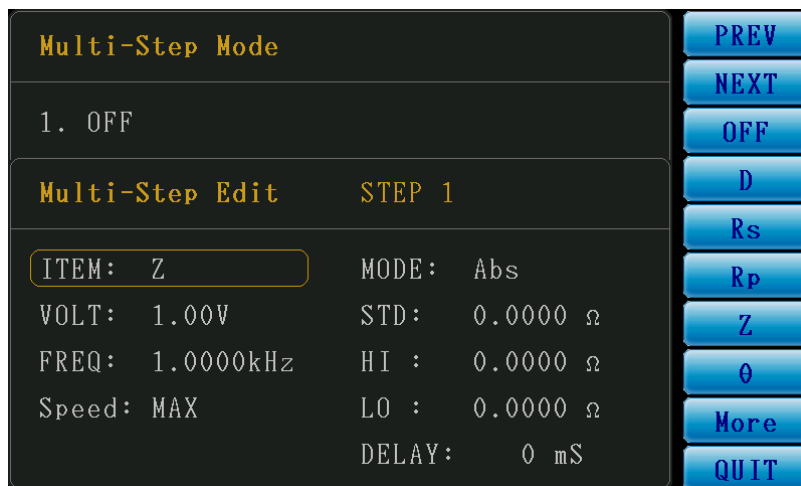


Figure 3-4-4: Multi Step Mode edit page

◆ Quick menu

- PREV: press to go to the last test step
- NEXT: press to go to the next test step
- QUIT: exit the edit page and go back to the Multi-Step Mode list

◆ Edit items

- ITEM: Set up the test item with the parameters to the right (as shown below):
 - OFF: Disable the measurement function of the given item
 - Ls: Set the item to Ls measurement (series induction)
 - Lp: Set the item to Lp measurement (parallel induction)
 - Cs: Set the item to Cs measurement (series capacitance)
 - Cp: Set the item to Cp measurement (parallel capacitance)
 - Q: Set the item to Q measurement (quality factor)
 - D: Set the item to D measurement (loss factor)
 - Rs: Set the item to Rs measurement (series resistance)
 - Rp: Set the item to Rp measurement (parallel resistance)
 - Z: Set the item to Z measurement (impedance)
 - θ : Set the item to θ measurement (phase angle)
 - X: Set the item to X measurement (reactance)
 - Y: Set the item to Y measurement (admittance)
 - G: Set the item to G measurement (conductance)
 - B: Set the item to B measurement (susceptance)
 - Rdc: Set the item to Rdc measurement (DC resistance)

- VOLT: Set up the measurement voltage in the range of 10mV~2.0V

- FREQ: Set up the measurement frequency in the range of 20Hz~200kHz(6365)/0.1Hz~200kHz(6365A). This option is valid in AC mode only.

- SPEED: Set up the measurement speed with the options of: MAX (very fast), FAST (fast), MED (normal), SLOW (slow)

- MODE: Set up the compare mode:
 - ✓ Abs: Upper/lower limit determined by values in HI/LO fields
 - ✓ Δ Abs: Set the upper limit to STD+HI and the lower limit STD+LO
 - ✓ Δ %: Set the upper limit to STD+(STD x HI%) and the lower limit STD+(STD x LO%)

- STD: Set up the standard value
- HI: Set up the upper limit
- LO: Set up the lower limit

- DELAY: Set up the delay time in the range of 0~5000 (mS)

- ◆ Multi-Step Mode calibration function
Once all test items have been edited, select the option “CAL.” to do OPEN/SHORT calibration before running the tests.

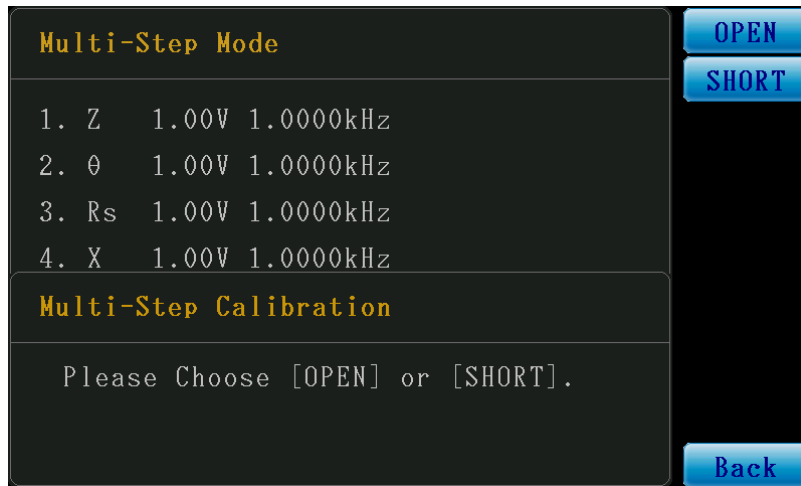


Figure 3-4-5 Multi Step Mode calibration page

- OPEN: press to start the open the circuit calibration

- SHORT: press to start the short circuit calibration

- Multi-Step Test Mode:

A multi-step test page is shown below. Test results (“PASS” or “FAIL”) will show in the yellow framed message box (with text READY shown now). Test data is shown to the right of the individual test items in green (PASS) or red (FAIL).

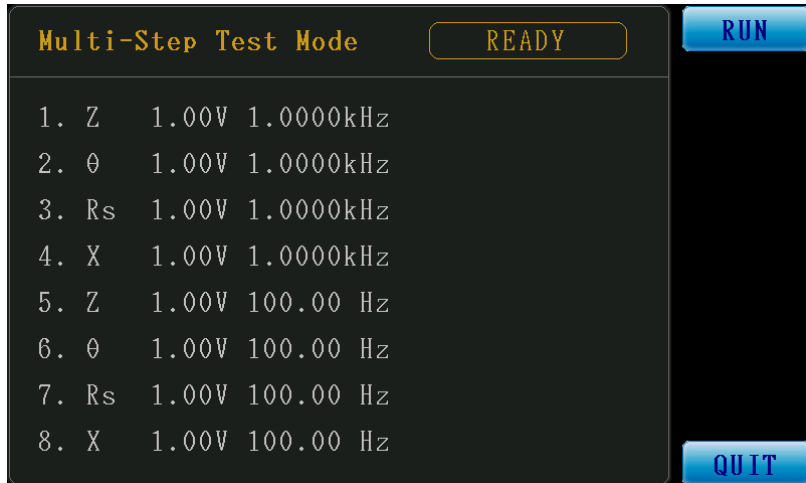


Figure 3-4-6: Multi Step test page

- ◆ RUN: begin the multi-step test
- ◆ QUIT: back to the Multi-Step Mode test item list page

See the figure below for the post multi-step test display:

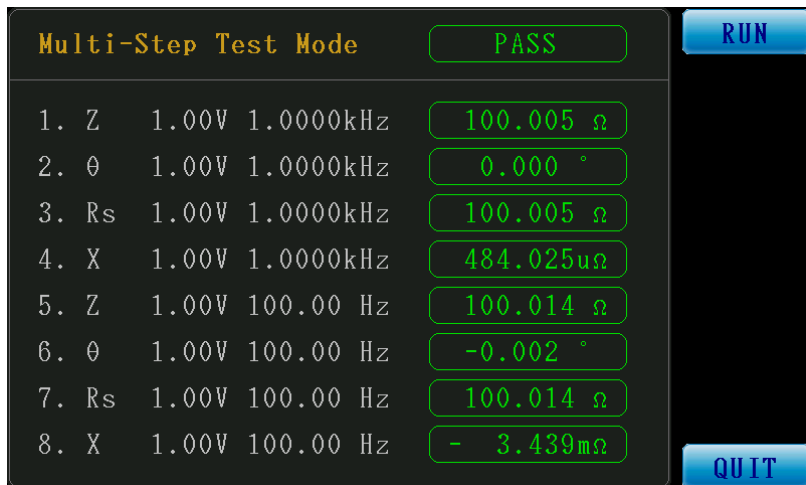


Figure 3-4-7: Post multi-step test display

3.5 6365 file management

Press the File key to display the file management main menu.

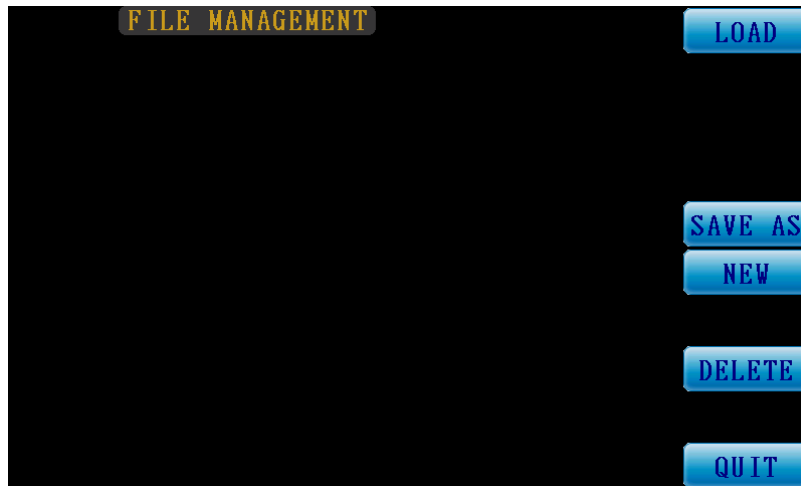


Figure 3-5-1: File management page

- ◆ File management:
 - LOAD: retrieve file
 - SAVE AS: save as a new file
 - NEW: create a new file
 - DELETE: delete a file
 - QUIT: back to the main menu

◆ LOAD FILE:

See the figure below for the LOAD FILE operation interface. Press the arrow key to select the desired file. The file being selected will have its name turn green as file "001" shown in the figure below. Press the function key LOAD to the right to load the selected file. The file preceded with symbol "@" is the one active now.

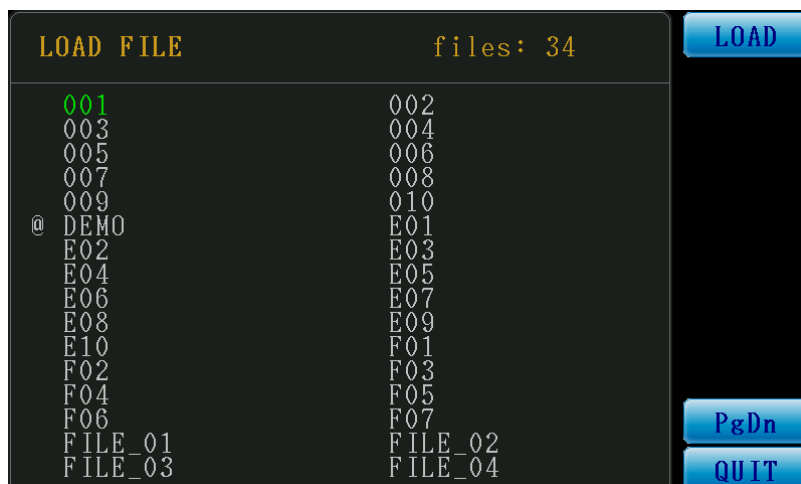


Figure 3-5-2: LOAD FILE page

- LOAD: press to load the file selected
- PgDn: press to go to the next page
- PgUp: press to go to the last page
- QUIT: press to go back to the file management page

◆ SAVE AS:

See the figure below for the SAVE AS (save the current file as a new one) operation interface. You may press the arrow key to select onscreen letters and numbers to create a file name. Point the cursor to the letter "A", click the function key Select to the right to input it after it turns green. Click OK to save the file after its name is input successfully.

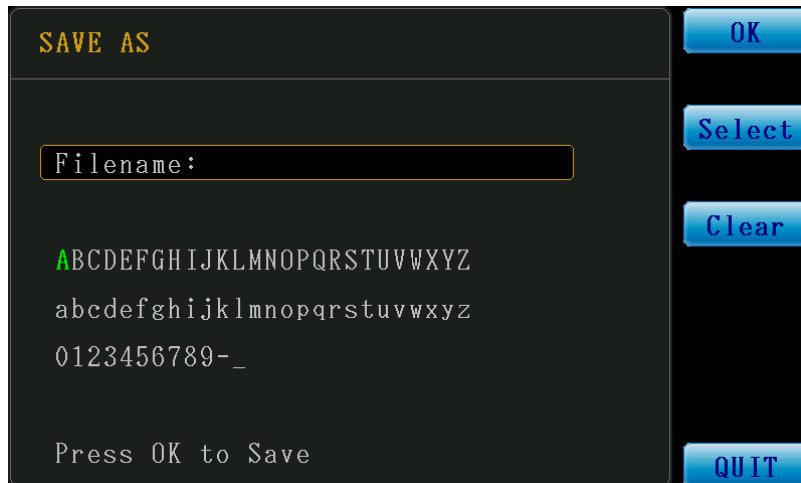


Figure 3-5-3: SAVE AS page

- Filename: file name input field
- OK: press to save the file
- Select: press to input the character of the file name
- Clear: press to delete the last character of the file name
- QUIT: press to go back to the file management page

◆ NEW:

See the figure below for the NEW FILE (create new file) operation information. You may press the arrow key to select onscreen letters and numbers to create a file name. Point the cursor to the letter "A", click the function key Select to the right to input it after it turns green. Click OK to create the file after its name is input successfully.

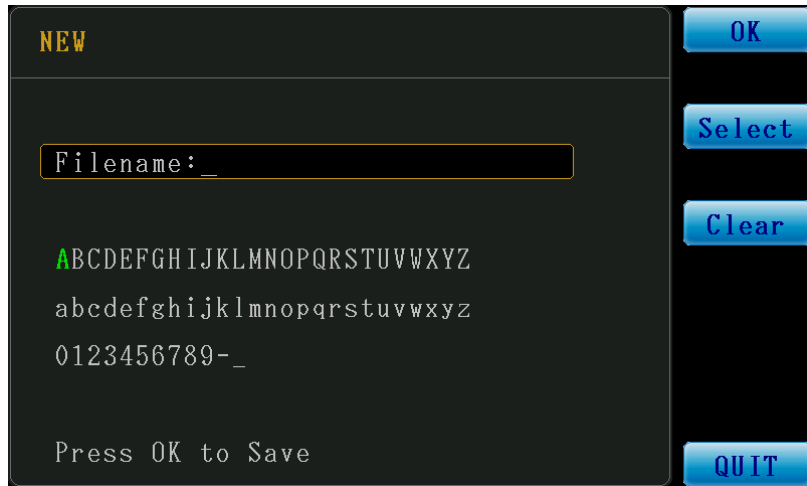


Figure 3-5-4: NEW FILE page

- Filename: file name input field
- OK: press to proceed saving the file
- Select: press to input the character of the file name
- Clear: press to delete the last character of the file name
- QUIT: press to go back to file management page

◆ DELETE:

See the figure below for the DELETE FILE operation interface. Press the arrow key to select the desired file. The file being selected will have its name turn green as file "001" shown in figure below. Press the function key DELETE to the right to delete the selected file. The file preceded with the symbol "@" is the one now in use and cannot be deleted unless another one has been loaded.

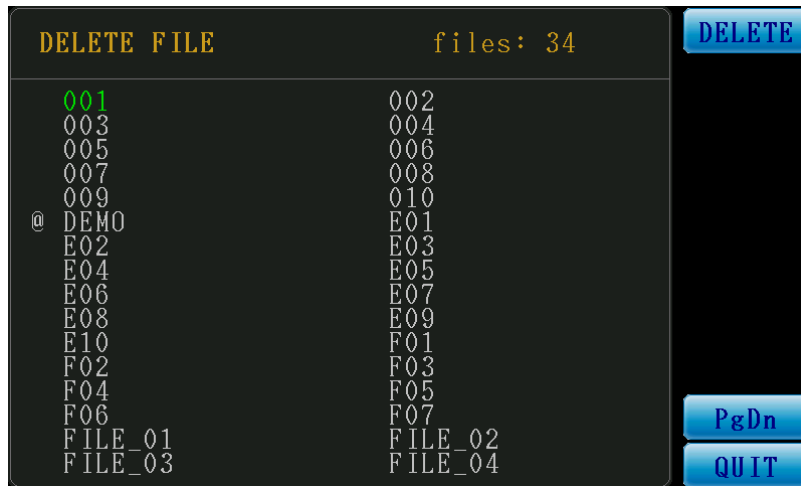


Figure 3-5-5: DELETE FILE page

- DELETE: press to delete the file selected
- PgDn: press to go to the next page
- PgUp: press to go to the last page
- QUIT: press to go back to the file management page

3.6 Command set

- Command syntax

① ② ③ ④
:MEAS:AVER [] <NR1> []

1. Command
2. Blank space
3. Parameter
4. Ending character

- Parameter type

<NR1>	Integers	e.g.: 0, 1, 2, 3
<NR2>	Decimal number	e.g.: 0.1, 1.23, 2.0
<NR3>	Floating number	e.g.: 2.5E-1, 6.25E+1
<disc>	Discrete data	e.g.: ON, OFF, MAX

- Ending character

\n (0xa) Line feed code.(LF)

- Note

Command is case insensitive.

*IDN?

Identification query

Responses: Manufacturer, model, serial number, firmware version information

Example: *IDN? returns MICROTTEST,6365,S00001,V1.607150

*TRG

Triggers a direct measurement without results returning

Example: *TRG

:CAL:OPEN:ALL?

Run open circuit calibration in the range of 20Hz~200kHz and retrieve the execution results

Responses: OK(calibration done successfully)
 NG (calibration failed)

Example: :CAL:OPEN:ALL? returns OK

:CAL:OPEN:DC?

Run DC open circuit calibration and retrieve the execution results

Responses: OK(calibration done successfully)
 NG (calibration failed)

Example: :CAL:OPEN:DC? returns OK

:CAL:OPEN:SPOT?

Run AC open circuit calibration over the current frequency and retrieve the execution results

Responses: OK(calibration done successfully)
 NG (calibration failed)

Example: :CAL:OPEN:SPOT? returns OK

:CAL:SHORT:ALL?

Run short circuit calibration in the range of 20Hz~200kHz and retrieve the execution results

Responses: OK(calibration done successfully)
 NG (calibration failed)

Example: :CAL:SHORT:ALL? returns OK

:CAL:SHORT:DC?

Run DC short circuit calibration and retrieve the execution results

Responses: OK(calibration done successfully)
 NG (calibration failed)

Example: :CAL:SHORT:DC? returns OK

:CAL:SHORT:SPOT?

Run AC short circuit calibration over the current frequency and retrieve the execution results

Responses: OK(calibration done successfully)

NG (calibration failed)

Example: :CAL:SHORT:SPOT? returns OK

:FETCH?

Return measurement values in the sequence of the current measurement items

Responses: data delimited with comma “,” e.g.:

(Measurement Value-1, Measurement Value -2, Measurement Value -3, Measurement Value -4)

Return no values for OFF items, e.g.:

(Measurement Value-1, Measurement Value -2)

Example: :FETCH?

returns 1.000060E+02,3.791240E-04,1.000060E+02,9.999395E-03

:MEAS:AVER <NR1>

Set up the average count

Parameters: in the range of 1-64

Example: :MEAS:AVER 4

:MEAS:AVER?

Query current counts of average

Responses: return the settings of the current average count

Example: :MEAS:AVER? returns 4

:MEAS:BEEP <disc>

Set up the timing of the buzzer alert in compare mode

Parameters: OFF disable the buzzer alert function
 NG enable the buzzer alert function to buzz for FAIL
 OK enable the buzzer alert function to buzz for PASS

Example: :MEAS:BEEP OFF

:MEAS:BEEP?

Query the timing of the buzzer alert in compare mode

Responses: OFF disable the buzzer alert function
 NG enable the buzzer alert function to buzz for FAIL
 OK enable the buzzer alert function to buzz for PASS

Example: :MEAS:BEEP? returns OFF

:MEAS:FREQ <NR3 | disc>

Set up the measurement frequency

Parameters: 20~200000.0 (frequency setup in the range of 20Hz~200kHz)
 MAX set frequency to 200kHz
 MIN set frequency to 20Hz

Example: :MEAS:FREQ 1000
 :MEAS:FREQ 1k
 :MEAS:FREQ 1kHz
 :MEAS:FREQ 1E3
 :MEAS:FREQ MAX
 :MEAS:FREQ MIN

:MEAS:FREQ?

Query security measurement frequency

Responses: return frequency <NR3>raised to the power e

Example: :MEAS:FREQ? returns 1.000000E+03

:MEAS:MODE <disc>

Set up the measurement mode

Parameters: AC set measurement mode to AC
 DC set measurement mode to DC

Example: :MEAS:MODE AC

:MEAS:MODE?

Query current measurement mode

Responses: AC current measurement mode: AC
 DC current measurement mode: DC

Example: :MEAS:MODE? returns AC

:MEAS:PARA <disc>

Set up the measurement parameter

Parameters: You may set up to four parameters from the following:

OFF	Disable the measurement
LS	series induction (Ls)
LP	parallel induction (Lp)
CS	series capacitance (Cs)
CP	series capacitance (Cp)
RS	series resistance (Rs)
RP	series resistance (Rp)
X	reactance (X)
B	susceptance (B)
Z	impedance (Z)
Y	admittance (Y)
D	loss factor (D)
Q	quality factor (Q)
DEG	phase angle (θ)
G	conductance (G)

Example:

:MEAS:PARA Z,DEG,X,RS

Set first item to Z, second to DEG(θ), third to X, fourth to RS

:MEAS:PARA Z,DEG,OFF,RS

Set first item to Z, second to DEG(θ), third to OFF, fourth to RS

:MEAS:PARA Z,DEG

Set first item to Z, second to DEG(θ), third and fourth without setup (the same as set to OFF)

:MEAS:PARA?

Query current measurement parameter

Responses: see below for parameters may be returned:

OFF	Disable the measurement
LS	series induction (Ls)
LP	parallel induction (Lp)
CS	series capacitance (Cs)
CP	series capacitance (Cp)
RS	series resistance (Rs)
RP	series resistance (Rp)
X	reactance (X)
B	susceptance (B)
Z	impedance (Z)
Y	admittance (Y)
D	loss factor (D)
Q	quality factor (Q)
DEG	phase angle (θ)
G	conductance (G)

Example: :MEAS:PARA? returns Z,DEG,X,RS

First item is Z, second is DEG(θ), third is X, fourth is RS

:MEAS:PARA? returns Z,DEG,OFF,OFF

First item is Z, second is DEG(θ), third and fourth is OFF

:MEAS:RANG <NR1>

Set up the measurement shift

Parameters: Set shift in the range of 1~3

Example: :MEAS:RANG 1

:MEAS:RANG?

Query current measurement shift

Responses: return shift in the range of 1~3

Example: :MEAS:RANG? returns 1

:MEAS:RANG:AUTO

Set measurement shift to Auto

Example: :MEAS:RANG:AUTO

:MEAS:RANG:HOLD

Set measurement shift to remain at current one

Example: :MEAS:RANG:HOLD

:MEAS:TIME <disc>

Set up the measurement speed

Parameters: set speed to one of the following:

MAX	very fast
FAST	fast
MED	normal
SLOW	slow

Example: :MEAS:RANG 1

:MEAS:TIME?

Query current measurement speed

Responses: return one of the following speed:

MAX	very fast
FAST	fast
MED	normal
SLOW	slow

Example: :MEAS:TIME? returns SLOW

:MEAS:TRIG:DEL <NR1>

Set up the trigger delay time

Parameters: set trigger delay time in the range of 0ms~5000ms

Example: :MEAS:TRIG:DEL 100

:MEAS:TRIG:DEL?

Query current trigger delay time

Responses: return trigger delay time in the range of 0ms~5000ms

Example: :MEAS:TRIG:DEL? returns 100

:MEAS:TRIG:MODE <disc>

Set up the trigger mode

Parameters:

REP	repeated trigger mode
SING	single trigger mode

Example: :MEAS:TRIG:MODE REP

:MEAS:TRIG:MODE?

Query current trigger mode

Responses:

REPEAT	repeated trigger mode
SINGLE	single trigger mode

Example: :MEAS:TRIG:MODE? returns REPEAT

:MEAS:VOLT <NR3 | disc>

Set up the measurement voltage

Parameters: 0.01~2.0 (set voltage in the range of 10mV~2.0V)

MAX	set voltage to 2.0V
MIN	set voltage to 10mV

Example: :MEAS:VOLT 1

:MEAS:VOLT 1V

:MEAS:VOLT 100mV

:MEAS:VOLT 1E-1

:MEAS:VOLT MAX

:MEAS:VOLT MIN

:MEAS:VOLT?

Query current measurement voltage

Responses: using scientific notation format <NR3> as return format

Example: :MEAS:VOLT? returns

1.000000E+00

:TRIG?

Trigger one measurement and return its value

※ Time value returned varies with “measurement speed” and “measurement frequency”

Responses: using scientific notation format <NR3> as return format

Return relevant measurement value based on count of test items and delimit them with comma “,”

Example:

:TRIG?

returns 1.000401E+03,-6.293376E-03,-1.098842E-01,1.000401E+03

3.7 Handler interface

You may control the test function of your machine with an external signal through the Handler Interface and Handler I/O port in its back panel.

Please set the Handler Interface ON in SYSTEM menu to enable remote control and use this function.

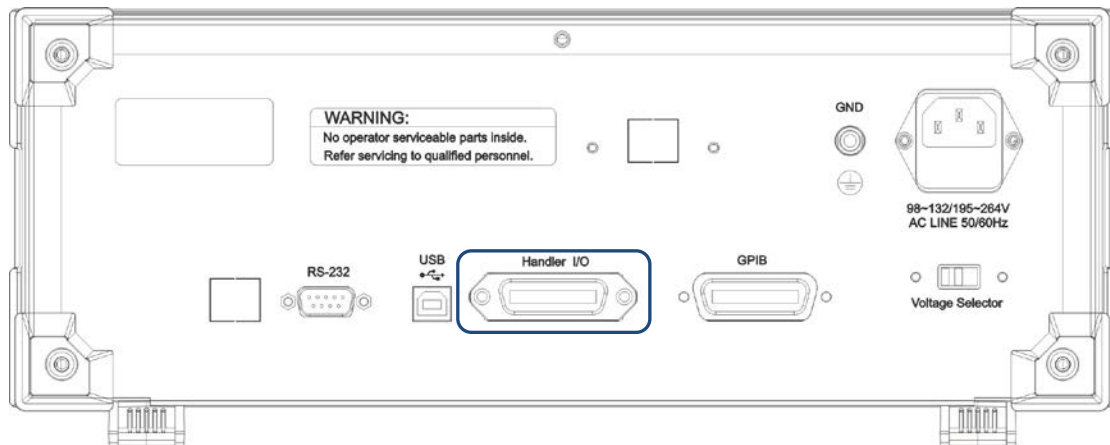


Figure 3-7-1: The Handler I/O port in back panel of your machine

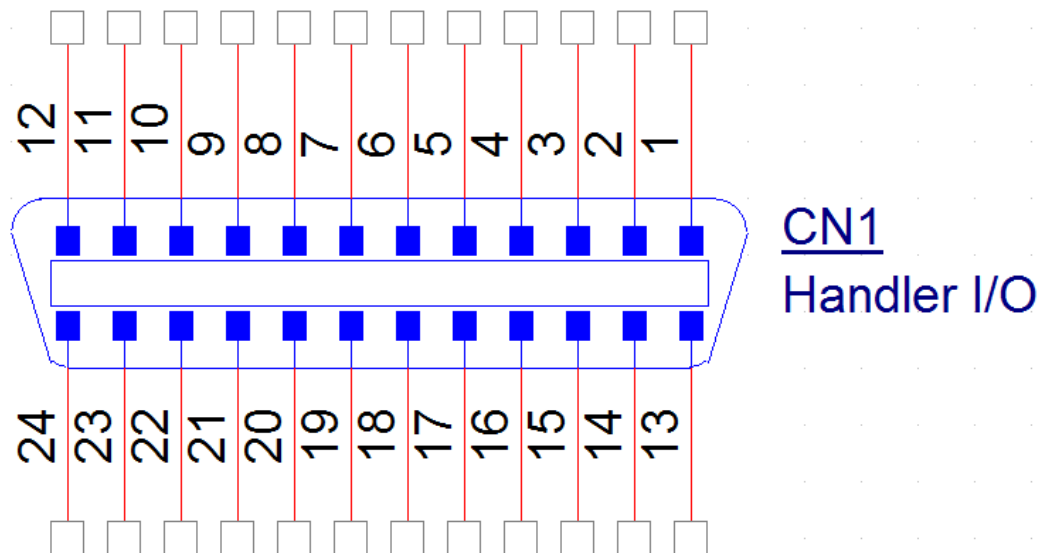


Figure 3-7-2: Pin address of Handler I/O port

- Pins in Handler I/O port

ID	Name	I/O	Function
1	/START	I	Test trigger
2	/ DAV	O	Test program ended
3	/PASS	O	Test results: PASS
4	/FAIL	O	Test results: FAIL
5	GND	-	Earthing
6	GND	-	Earthing
7	GND	-	Earthing
8	NULL	-	Null
9	NULL	-	Null
10	+5V	-	DC +5V output
11	NULL	-	Null
12	NULL	-	Null
13	/READY	O	Test function is ready, i.e. ready to receive the trigger (This signal is set to not-ready in case any test program is running or in case of Meter Mode or non-Multi Step test mode)
14	/INDEX	O	Measurement program completed (but not the whole measurement process)
15	/OK1	O	The first test item is PASS when the compare function is enabled in Meter Mode
16	/OK2	O	The second test item is PASS when the compare function is enabled in Meter Mode
17	/OK3	O	The third test item is PASS when the compare function is enabled in Meter Mode
18	/OK4	O	The fourth test item is PASS when the compare function is enabled in Meter Mode
19	/NG1	O	The first test item is FAIL when the compare function is enabled in Meter Mode
20	/NG2	O	The second test item is FAIL when the compare function is enabled in Meter Mode
21	/NG3	O	The third test item is FAIL when the compare function is enabled in Meter Mode
22	/NG4	O	The fourth test item is FAIL when the compare function is enabled in Meter Mode
23	undefined	O	Reserved

24	undefined	O	Reserved
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● Handler I/O timing diagram

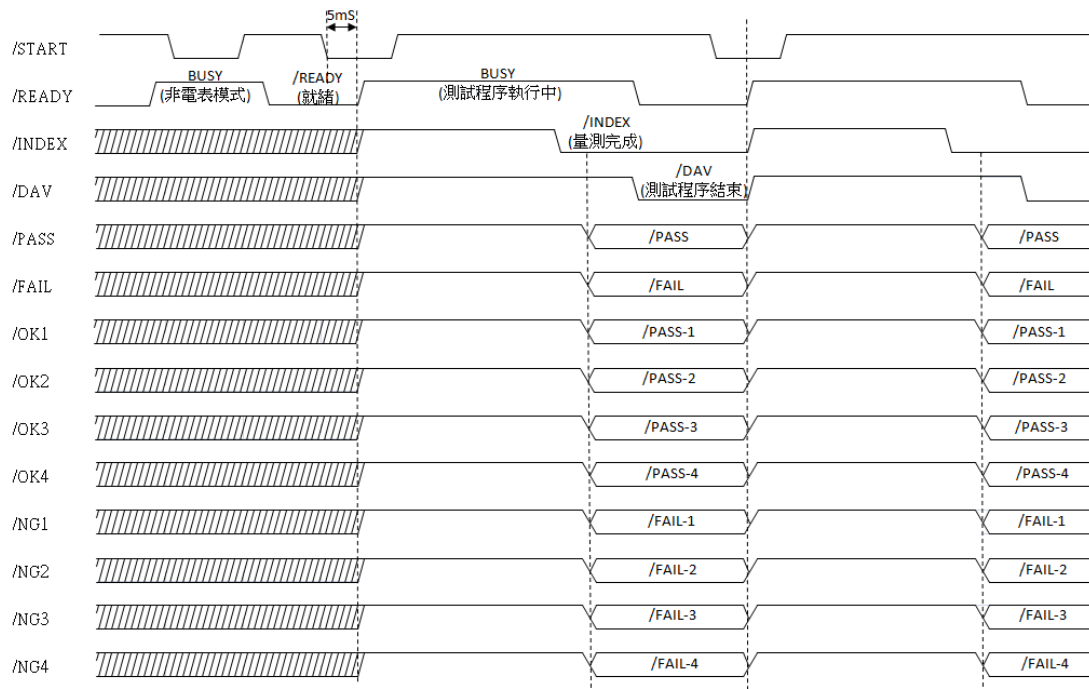


Figure 3-7-3: Handler I/O timing diagram

※Note: The Handler Interface is valid for Meter Mode and Multi Step test mode only.

For tests triggered in Meter Mode, the measurement mode will be set to Single Mode automatically.

● Use description:

All output pins are set to open collector output without any voltage or signal output. Current through each connection point will be 30mA or less and voltage DC 24V or less.

● Frequent use method:

1. Trigger signal: Control your machine for test by using normal open switch of relay. (Note: trigger signal shall last at least 5mS.)

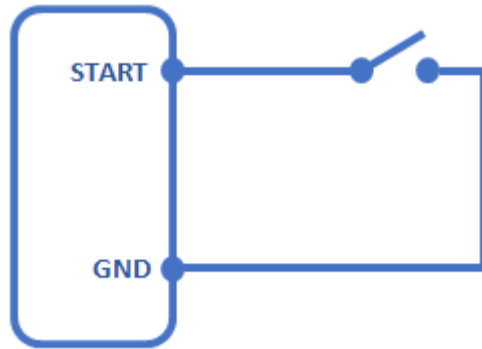


Figure 3-7-4: Diagram of recommended trigger signal connection

2. Output signal: Control relay with output signal. Please connect the relay coil to a regulator diode for safer application (with voltage less than DC24V).

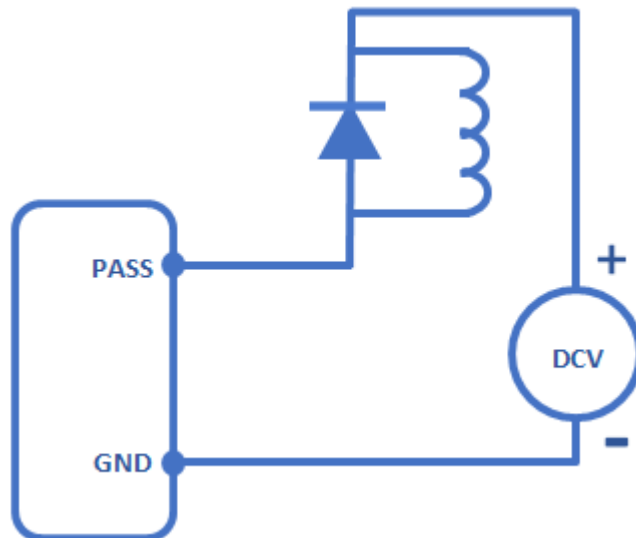


Figure 3-7-5: Diagram of recommended output signal connection