Twintex

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LCR Meter

Operation Manual V1.0

Twintex Electronics Co., Ltd

Add.: 702, #16-21, Block B, Sanhehuaqiao Village, Dalang Sub-district,

Longhua District, Shenzhen, China 518109

Tel: +86-755-28129890

Fax: +86-755-28149802

Web: www.twintex.com.tw

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CONTENTS

Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

Calibration Notification

We notify that the LCR meters included in this manual are in compliance with the features and specifications as stated in this manual. Before shipment, the LCR meter has been calibrated in factory. The calibration procedures and standards are compliant to the national regulations and standards for electronic calibration.

Warranty

We guarantee that the LCR meter has been passed strict quality check. We warrant our LCR meter's mainframe and accessories in materials within the warranty period of one year. We guarantee the free spare parts for products which are approved defective in this period. To get repair service, please contact with your nearest sales and service office. We do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hinted guarantee items related to tradable characteristics and any particular purpose. We will not take any responsibility in cases regarding to indirect, particular and ensuing damage, such as modifications to the circuit and functions by the users, repairing or component replacement by the users, or damage during transportation.

For product improvement, the specifications are subject to change without prior notice.

SAFETY INSTRUCTION

This chapter contains important safety instructions that you must follow when operating the LCR meter and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for the LCR meter.

Safety Symbols

The following safety symbols may appear in this manual or on the LCR meter:

Symbol	Name	Description
⚠ WARNING	WARNING	Identifies conditions or practices that could result in injury or loss of life.
⚠ CAUTION	CAUTION	Identifies conditions or practices that could result in damage to the LCR meter or to other properties.
⚡	DANGER	High voltage
⚠	ATTENTION	Refer to the manual
⏚		Protective conductor terminal
⏚		Earth (ground) terminal
⏚		Chassis ground terminal

Safety Guidelines

General Instruction ⚠ CAUTION	• Do not place heavy objects on the casing. • Avoid serious impact or improper handling to prevent damage to the LCR meter. • Preventive measures for releasing static electricity should be taken when connecting the LCR meter. • Do not block the air ventilation holes on the two sides and on the back of the chassis. • Do not disassemble the LCR meter unless you are professionals.
Power supply ⚠ WARNING	AC Input voltage: 110V/220V±10%, 50/60Hz Connect the protective grounding conductor of the AC power cord to an earth ground to avoid electrical shock.
Fuse ⚠ WARNING	• Make sure the correct type of fuse is installed before power up. • Replace the AC fuse with the same type and rating as the original fuse. • Disconnect the power cord before fuse replacement. Make sure the cause of fuse blowout is fixed before fuse replacement.
Cleaning	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. • Do not use chemicals or cleaner containing harsh material such as benzene, toluene, xylene, and acetone.
Operation environment	• Location: indoor, no direct sunlight, dust free, almost non-conductive pollution. • Relative humidity: <80% • Altitude: <2000m • Temperature: 0°C ~ 40°C
Storage environment	• Location: indoor • Relative humidity: <70% • Temperature: 10°C ~ 70°C

1. PRODUCT INTRODUCTION

1-1. Description

The LCR7000 series are high precision LCR meter with basic accuracy 0.1% and maximum measurement frequency 10kHz, 30kHz and 200kHz. The 5-digit 4.3-inch TFT LCD display gives easy reading. The RS-232 interface facilitates in remote control and analysis of measurement results. With its fast measurement speed, wide frequency range and low cost, the LCR7000 series are widely used in R&D, IQC, online quality control and automatic test system.

1-2. Features

- 32-bit core processor
- 5-digit 4.3-inch TFT LCD display
- 2 signal source output impedance: 30Ω, 100Ω
- 100 sets memories for internal storage/save
- 500 memories for U disk storage/save, supports FAT16 and FAT32 files
- Save the last parameter settings before power off
- Standard interface: RS-232, HANDLER, USB HOST
- Optional interface: USB DEVICE, GPIB

1-3. Front Panel Introduction
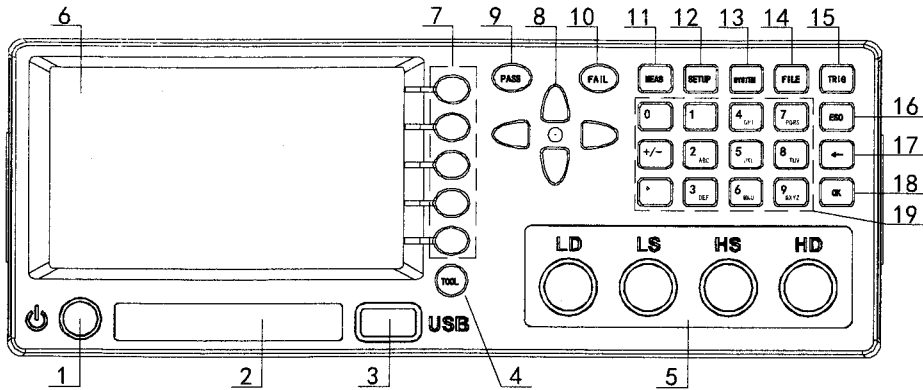
1) Power switch

Press to power ON or OFF the LCR meter.

2) Name label

It shows brand and model number.

3) USB HOST interface

Connect U flash disk to save or load the file.

4) [TOOL]

Make a short press to this key, the menu soft key area shows corresponding menus. Make a short press again, the menus disappear.

Make a long press (>1 second) to this key, the LCR meter panel is locked. Other keys (except TOOL key) are locked, no response to press.

Make a long press again to this key, the LCR meter panel is unlocked. All keys response to press. When the LCR meter is controlled by RS232, the LCR meter front panel is locked by default. Make a long press to this key again to unlock the front panel.

5) Measurement terminals: LD, LS, HS, HD

4-teminal test lead is used to connect 4-terminal test fixture or cable to measure DUT.

It is recommended to use the test lead attached to the LCR meter. Using self-made test lead or test lead from other suppliers may cause error in measurement results.

Illustration to the 4-terminal Test Lead
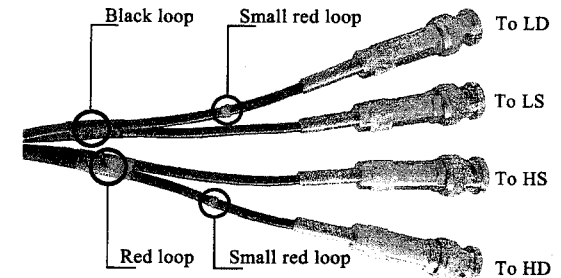
6) LCD display

4.3-inch TFT LCD displays measurement results and conditions.

7) Soft keys

Five soft keys are used to select parameters. The corresponding function of each soft key has been displayed on its left (the right part of LCD). The function definition varies with different pages.

8) CURSOR keys

This key is used to move the cursor on the LCD displayed page. When the cursor moves to a zone, the corresponding zone will be lightened.

9) PASS indicator

The indicator lights on to show that the test result has passed.

10) FAIL indicator

The indicator lights on to show that the test result has failed.

11) [MENU]

Five soft keys are used to select parameters. The corresponding function of each soft key has been displayed on its left (the right part of LCD). The function definition varies with different pages.

When the LCD display the <MEAS DISPLAY> page and the cursor key moves to <MEAS DISPLAY>, press [MEAS] key to display the measurement results in full screen.

12) [SETUP]

Press this key to enter measurement parameter setup page.

13) [SYSTEM]

Press this key to Enter system setup page.

14) [FILE]

Press this key to enter file management page.

15) [TRIG]

When the trigger mode is set to MAN mode, press this key to trigger the LCR meter.

16) [ESC]

ESCAPE key.

17) [←]

BACKSPACE key is used delete the last numeric of the input value.

18) [OK]

This key is used to end the input of data, and confirm and save the data displayed on the inputting line.

19) Number keys

These keys are used to input data to the LCR meter. The key consists of numerical keys [0] to [9], decimal point [.] and [+/-] key.

1-4. Rear Panel Introduction
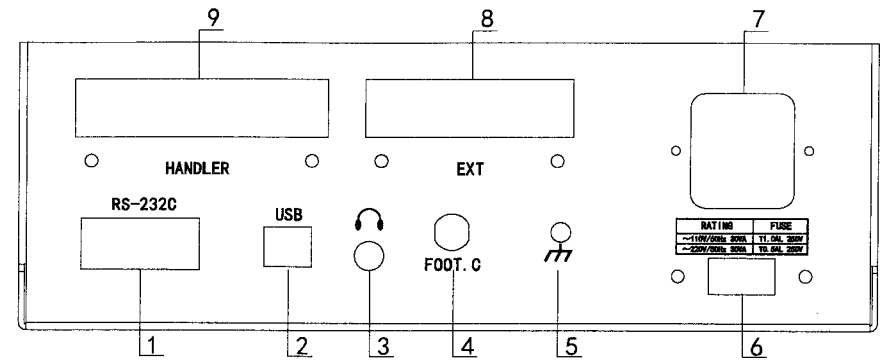
1	RS-232C interface	6	Voltage selector
2	USB device interface	7	Power socket
3	Headset interface	8	EXT extension interface
4	FOOT.C foot switch interface	9	HANDLER interface
5	GND screw		

2. PANEL OPERATION

2-1. <MEAS DISPLAY>

Press [MEAS] key, the <MEAS DISPLAY> page will be displayed on screen as shown below:

```
┌─────────────────────────────────┬──────────┐
│                          MEAS    │  MEAS    │
│                                  │  DISP    │
│ FUNC : Cp-D      RANGE : AUTO    │          │
│ FREQ : 1 kHz     SPEED : SLOW    ├──────────┤
│ LEVEL : 1.00V    COMP   : OFF    │  BIN     │
│                                  │  DISP    │
│   /  Cp : -0.0015p    F          ├──────────┤
│                                  │          │
│      D  : 0.3697                 │          │
│                                  ├──────────┤
│                                  │          │
│ Vm:OFF           Im:OFF          │          │
│                                  │  QUICK   │
│                                  │  CLEAR   │
├─────────────────────────────────┤          │
│ ▯Use softkeys to select      ▯  │          │
└─────────────────────────────────┴──────────┘
```

2-1-1. MEAS DISP

In <MEAS DISP> page, use the four direction keys (▲▼◄►) to move cursor to choose of FUNC, FREQ, LEVEL, RANGE, SPEED, COMP. Pressing [QUICK CLEAR] softkey can make quick clear to all parameters.

Test parameter

When parameter "Cp-D" of FUNC is selected, other test parameters are display in the right side of the screen. Each parameter can be selected by its softkey. There are test parameters of Cs-D, Cp-D, Ls-Q, Lp-Q, Rs-Q, Rs-D, Rp-Q, Rp-D, R-X, Zs-θ, Zs-r.

```
┌─────────────────────────────────┬──────────┐
│        <  MEAS  DISP  >          │          │
│ FUNC : ▮          RANGE : AUTO   │  Cs-D    │
│ FREQ : 1 kHz      SPEED : SLOW   ├──────────┤
│ LEVEL : 1.00V     COMP   : OFF   │          │
│                                  │  Cp-D    │
│   /  Cp : -0.0015p    F          ├──────────┤
│                                  │          │
│      D  : 0.3697                 │  Ls-Q    │
│                                  ├──────────┤
│                                  │          │
│                                  │  Lp-Q    │
│ Vm:OFF            Im:OFF         ├──────────┤
│                                  │  MORE    │
│                                  │  1/4     │
├─────────────────────────────────┤          │
│ ▯Use softkeys to select      ▯  │          │
└─────────────────────────────────┴──────────┘
```

Range mode (not available for LCR-7010)

There are four range modes to choose from: Auto, Hold, Increase +, Decrease -

```
┌─────────────────────────────────┬──────────┐
│        <  MEAS  DISP  >          │          │
│ FUNC : Cp-D       RANGE : ▮      │  AUTO    │
│ FREQ : 1 kHz      SPEED : SLOW   ├──────────┤
│ LEVEL : 1.00V     COMP   : OFF   │          │
│                                  │  HOLD    │
│   /  Cp : -0.0015p    F          ├──────────┤
│                                  │          │
│      D  : 0.3697                 │  INCR +  │
│                                  ├──────────┤
│                                  │          │
│                                  │  DECR _  │
│ Vm:OFF            Im:OFF         ├──────────┤
│                                  │          │
├─────────────────────────────────┤          │
│ ▯Use softkeys to select      ▯  │          │
└─────────────────────────────────┴──────────┘
```

Test frequency

Different models have different test frequency points. Press increase or decrease key to choose the last or the next frequency points.

LCR-7010: 100Hz,120Hz,1kHz,10kHz

LCR-7030: 100Hz,120Hz,1kHz,10kHz,20kHz,30kHz

LCR-7200: 40Hz, 50Hz, 60Hz, 75Hz, 100Hz, 120Hz, 150Hz, 200Hz, 250Hz, 300Hz, 400Hz, 500Hz, 600Hz, 750Hz, 800Hz, 1kHz, 1.5kHz, 2kHz, 2.5kHz, 3kHz, 4kHz, 5kHz, 6kHz, 7.5kHz, 10kHz, 12kHz, 15kHz, 15.7kHz, 16.2kHz, 20kHz, 25kHz, 30kHz, 40kHz, 50kHz, 60kHz, 66.6kHz, 75kHz, 100kHz, 120kHz, 150kHz, 200kHz (38 points)

```
┌─────────────────────────────────┬──────────┐
│        <  MEAS  DISP  >          │          │
│ FUNC : Cp-D       RANGE : AUTO   │  INCR + +│
│ FREQ : ▮          SPEED : SLOW   ├──────────┤
│ LEVEL : 1.00V     COMP   : OFF   │          │
│                                  │  INCR +  │
│   /  Cp : -0.0015p    F          ├──────────┤
│                                  │          │
│      D  : 0.3697                 │  INCR +  │
│                                  ├──────────┤
│                                  │          │
│                                  │  DECR -  │
│ Vm:OFF            Im:OFF         ├──────────┤
│                                  │  DECR - -│
├─────────────────────────────────┤          │
│ ▯Use softkeys to select      ▯  │          │
└─────────────────────────────────┴──────────┘
```

Speed

Speed can be set at fast, medium or slow.

When test frequency ≥1kHz:

Fast: max.30 times/second

Medium: 10 times/second

Slow: 3 times/second

```
        <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO          FAST
FREQ : 1 kHz         SPEED : █████
LEVEL : 1.00V        COMP   : OFF          MED

   /   Cp : -0.0015p    F
                                           SLOW
       D  : 0.3697


Vm:OFF                    Im:OFF

█Use softkeys to select          ▣
```

Test level

Test level of LCR-7010 and LCR-7030 can be choose from 0.1V, 0.3V, 1V.

Test level of LCR-7200 can be set from 0.05V to 1V.

```
        <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO          1V
FREQ : 1 kHz         SPEED : SLOW
LEVEL : ████         COMP   : OFF
                                           0.3V
   /   Cp : -0.0015p    F
                                           0.1V
       D  : 0.3697
                                           INCR +

Vm:OFF                    Im:OFF           DECR -

█Use softkeys to select          ▣
```

Comparator

Comparator can be set ON or OFF. Press <BIN DISP> softkey to enter bin display for more details.

```
        <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO          ON
FREQ : 1 kHz         SPEED : SLOW
LEVEL : 1.00V        COMP   : ███
                                           OFF
   /   Cp : -0.0015p    F
                                           BIN
       D  : 0.3697                         DISP


Vm:OFF                    Im:OFF

█Use softkeys to select          ▣
```

Parameter area

In parameter area, the test parameter and its value are displayed.

Font size of the parameters can be set as small size of large size by pressing [FONT] softkey.

Parameter value display can be turn on or off by pressing [DISP] softkey.

Deviation can be set as OFF, ABS or % by pressing [DEV] softkey.

```
        <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO          FONT
FREQ : 1 kHz         SPEED : SLOW          ███
LEVEL : 1.00V        COMP   : OFF
                                           DISP
   /   ██ : -0.0015p    F                  ██

       D  : 0.3697                         DEV

                                           OFF
Vm:OFF                    Im:OFF

█Use softkeys to select          ▣
```

Parameter area

In parameter area, the test parameter and its value are displayed.

Font size of the parameters can be set as small size of large size by pressing [FONT] softkey.

Parameter value display can be turn on or off by pressing [DISP] softkey.

Deviation can be set as OFF, ABS or % by pressing [DEV] softkey.

```
        <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO          FONT
FREQ : 1 kHz         SPEED : SLOW          ███
LEVEL : 1.00V        COMP   : OFF
                                           DISP
   /   ██ : -0.0015p    F                  ██

       D  : 0.3697                         DEV

                                           OFF
Vm:OFF                    Im:OFF

█Use softkeys to select          ▣
```

Monitored Voltage and Current

Vm and Im are monitored voltage and current of the DUT respectively. When Vm or Im is selected, it can be set ON or OFF.

```
          <  MEAS  DISP  >
FUNC : Cp-D          RANGE : AUTO        ON
FREQ : 1 kHz         SPEED : SLOW
LEVEL : 1.00V        COMP  : OFF         OFF

   /   Cp : -0.0015p    F

       D  : 0.3697


   ■:OFF                Im:OFF

  ⓘUse softkeys to select        ⓥ
```

2-2. <BIN DISPLAY> (not available for LCR-7010)

Press [BIN DISP] key in the pay of <MEAS DISP>, the <BIN DISPLAY> page will be displayed on screen as shown below:

```
                                        MEAS
COMP : OFF    AUX : OFF    COUNT : OFF   SETUP
NOMINAL: 0.0000pF          MODE  : ABS
 ┌─────┬──────────┬─────────┬────────┐   BIN
 │ BIN │ LOW [  ] │ HIGH [ ]│ COUNT  │   DISP
 │  1  │          │         │        │
 │  2  │          │         │        │
 │  3  │          │         │        │
 │ 2nd │          │         │        │
 │ AUX:│   OFF    │  OUT  : │        │
 └─────┴──────────┴─────────┴────────┘
   \   Cp: -0.0009p F        BIN:        QUICK
       D :  0.0033                       CLEAR

  ⓘUse softkeys to select        ⓥ
```

COMP: Set comparator ON or OFF

AUX: Set auxiliary ON or OFF

COUNT: Set counting ON or OFF

NOMINAL: Input nominal value via numeric keys or softkeys. It is reference value of main parameter range.

Deviation is for main parameters only. There are 3 operations to Deviation: OFF, ABS or %.
- → ABS (Absolute Deviation): The absolute deviation is the currently measured value minus preset nominal value. Its calculation formula is: $\Delta ABS = X - Y$.
  X is the currently measured value. Y is preset nominal value.
- → % (percentage deviation): The percentage deviation is the percentage of the difference between the currently measured value and the preset nominal value. Its calculation formula is: $\Delta\% = (X - Y)/Y \times 100[\%]$

X is the currently measured value. Y is preset nominal value.

2-3. <MEAS SETUP>

Press [SETUP] key, <MEAS SETUP> page will be displayed on screen as shown below:

```
                              MEAS
                              SETUP
   ResSource    :   30Ω
   AVERAGE      :   1
   RangeDwe l l :   0    ms
   TrigSource   :   INT
   TrigDelay    :   0    ms
   TrigEdge     :   RISING
   Handler      :   CLEAR
   PulseWidth   :   1    ms

  ⓘUse softkeys to select        ⓥ
```

ResSource	Set internal resistance source at 30Ω or 100Ω
AVERAGE	Set average number of times between numbers 1 to 255. Input numbers by numeric keys or soft key "+" and "-".
RangeDwe l l	Set range delay time between 0ms to 6000ms. Input numbers by numeric keys or soft key "+" and "-".
TrigSource	Set trigger source as INT or EXT.
TrigDelay	Set trigger display time between 0ms to 6000ms. Input numbers by numeric keys or soft key "+" and "-".
TrigEdge	Set trigger edge as RISING or FALLING.
Handler	Set comparator to CLEAR, HOLD, PULSE.
PulseWidth	Set pulse width between 1ms to 9999ms.

2-4. <SYSTEMS SETUP>

Press [SYSTEM] key, <SYSTEMS SETUP> page will be displayed on screen as shown below:

```
                              SYSTEM
   Theme        TRAD-BLUE     SETUP
   Language   :  英语         COMM
   Key Tone   :  ON           SETUP
   ToneSour   :  MASTER       ABOUT
   PassTone   :  OFF          SYSTEM
   FailTone   :  TWO SHORT    SYSTEM
   ParaSave   :  AUTO SAVE    DEBUG
   PassWord   :  OFF

  ⓘUse softkeys to select        ⓥ
```

Theme	Set display theme to BLUE, BLACK or GREEN.
Language	Set language as English or Chinese
Key Tone	Turn on or off key tone.

ToneSour	Set tone source as MASTER, EAR PHONE or ALL.
PassTone	Set pass tone OFF, or set pass tone as LONG tune, SHORT tune, TWO SHORT tunes.
FailTone	Set fail tone OFF, or set fail tone as LONG tune, SHORT tune, TWO SHORT tunes.
ParaSave	Set parameter save mode as AUTO SAVE, AUTO LOAD, or NO SAVE.
PassWord	In this page, press corresponding softkeys to choose different functions: 1) Set password OFF 2) Lock system: when setting password to lock system, all files are protected and password is required during power on 3) Lock file: it means protecting files. 4) Modify password: the default password is 0010 for LCR-7010, 0030 for LCR-7030 and 0200 for LCR-7200. 5) Save to USB flash disk: The password can be save to USB flash disk. The password file name is "0010.STA" for LCR-7010, "0030.STA" for LCR-7030, "0200.STA" for LCR-7200. Plug USB flash disk into USB HOST, when a password is required during power on, the LCR meter automatically detects the password file and read it to get password.

2-5. <COMM SETUP>

Press [COMM SETUP] softkey, <COMM SETUP> page will be displayed on screen as shown below:

```
                              SYSTEM
        Bus Mode    :  RS232C    SETUP
        BaudRate    :  9600      COMM
        Data Bit    :  8         SETUP
        Stop Bit    :  1         ABOUT
        Parity      :  None      SYSTEM
        Tx Term     :  LF
        GpibAddr    :  08
        CMD Type    :  SCPI

     Use softkeys to select
```

Bus Mode	Set bus mode as RS232C, GPIB, USBTMC or USBCDC.
BaudRate	Use "+" or "-" to choose baud rate from 4800, 9600, 19200, 38400, 115200. Baud rate is only for bus mode RS232C.
Data Bit	Set data bit as 6, 7 or 8.
Stop Bit	Set stop bit as 1 or 2.
Parity	Set parity as NONE, ODD, or EVEN.
Tx Term	Set end of text term as LF, CR or LFCR. In response to ASCII code, LF is 0x0A and CR is 0x0D. This is only end of text term when the LCR meter is returning data to PC.
GpibAddr	Set GPIB address between 0 to 31. Input numbers via numeric keys or softkeys. This is only for bus mode GPIB.
CMD Type	Please refer details to Programming Manual.

2-6. <ABOUT SYSTEM>

Press [ABOUT SYSTEM] softkey, the <ABOUT> page will be displayed on screen as shown below:

```
                                        Reset

        Model number:      :
        Serial number      :  GL-817-02333    Factory
        Firmware version   :  1.8.1
        Hardware version   :  1.0.1
        License            :  Registered      Update

                                        EXIT

     Use softkeys to select
```

Reset	Press the softkey to restart the LCR meter.
Factory	Press the softkey to return to factory setup. Password is required.
Update	Press the softkey to update firmware through USB flash disk.
EXIT	Press the softkey to exit and return to <SYSTEM SETUP> page.

2-8. Data Storage

The measurement data can be stored to USB flash stick. In <MEAS> page, press [TOOL] key to enter into data storage menu.

```
              <  MEAS  DISP  >
     FUNC : Cp-D          RANGE : AUTO      PrtSc
     FREQ : 1 kHz         SPEED : SLOW
     LEVEL : 1.00V        COMP  : OFF
                                            SAVE
                                            DATA
      /   Cp : -0.0015p     F

          D  : 0.3697                       SINGLE
                                            SHORT
                                            SINGLE
       :OFF              Im:OFF             OPEN

     Use softkeys to select
```

There are three formats for data storage: <A> , <B> [, <COMP>]
A and B are measurement results for main parameter and secondary parameter respectively. The measurement results are stored in the way of scientific notation.
<COMP> is comparator results. LCR-7010 dose not have handler function.

COMP	Description	COMP	Description
0	Fail	3	BIN 3pass
1	BIN 1 pass	4	AUX fail
2	BIN 2 pass	5	No comparator

2-8. <INTER Files List> and <EXT Files List>

The parameter settings can be saved into the internal non-volatile memory. When same parameter settings are needed in the next measurement, user can easily upload parameter settings from the internal non-volatile memory. No need to make settings again.

Press [File] key, the <Files List> page will be displayed. Press [File] key again to switch between internal and external files lists.

I:\		Page: 1	LOAD
NO	File		STORE
1			
2			DEL
3			
4			FIND ⇨
5			
6			COPY TO
7			E:
Use softkeys to select			

I:\	Page: 1	LOAD
File/Folder		STORE
		DEL
		PARENT DIR
Press ⇦ /⇨ to page, FILE to change I/E !		COPY TO I:
Use softkeys to select		

Operation steps:

1. Read existing files
   1) Use ▲ and ▼ keys to choose files. Or Input numbers to choose corresponding file, and then press [OK] key to confirm.
   2) Use ◄ and ► keys o choose pages.

2. Save parameter to files
   1) Move cursor to file number. Press [STORE] softkey to save parameter to the selected file.
   2) Press [YES] softkey to continue, or press [NO] softkey to cancel operation.
   3) If press [YES] softkey in step 2, input file name via numeric keys and then press [OK] to confirm. If the file name already exists, press [Continue] softkey to cover the existing file of press [ESC] to cancel operation.

3. Upload parameters from existing files
   1) Press [File] key to switch to internal or external files list.
   2) Move cursor to the file name to be uploaded from, or input file name directly.
   3) Press [LOAD] softkey.
   4) Press [YES] softkey to upload file.

4. Copy file to USB flash disk
   1) Plug USB flash disk into USB host.
   2) Move cursor to the file name to be copied, or input file name directly.
   3) Press [YES] softkey to copy.
   4) If the file name already exists, press [Continue] softkey to cover the existing file of press [ESC] to cancel operation.

3. SPECIFICATIONS

3-1. Measurement Range

With 100Ω source resistance, there are five ranges: 31.6Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ.

With 30Ω source resistance, there are six ranges: 10Ω, 30Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ.

The effective measurement range is listed as below.

Table 3-1 Effective measurement range with 100Ω source resistance

No.	Resistance	Effective mea.range
0	100kΩ	100kΩ-100MΩ
1	10kΩ	10kΩ-100kΩ
2	1kΩ	1kΩ-10kΩ
3	100Ω	50Ω-1kΩ
4	30Ω	0Ω-50Ω

Table 3-2 Effective measurement range with 30Ω source resistance

No.	Resistance	Effective mea.range
0	100 kΩ	100kΩ-100MΩ
1	10 kΩ	10kΩ-100kΩ
2	1 kΩ	1kΩ-10kΩ
3	100Ω	100Ω-1kΩ
4	30Ω	15Ω-100Ω
5	10Ω	0Ω-15Ω

3-2. Accuracy

3-2-1. Accuracy of Z , L, C , R, X

The accuracy (A_e) of $|Z|$, L, C, R, X is shown as below:

$A_e = \pm[A+(K_a+K_b+K_f)\times 100+K_L]\times K_c$ [%]

A: Basic measurement accuracy (Refer to Fig.3-1)

K_a: Impedance scaling factor (Refer to table 3-4), impedance <500Ω

K_b: Impedance scaling factor (Refer to table 3-4), impedance >500Ω

K_c: Temperature factor (Refer to table 3-5)

K_f: Calibration interpolation factor (Refer to table 4-6)

K_L: Cable length factor (Refer to table 4-7)

Note: Choose only Ka or Kb, depending on resistance value. For others, input zero.

Condition for L, C, X accuracy: D_x (D measured value)≤0.1

Condition fo R accuracy: Q_x (Q measured value)≤0.1

When $D_x \geq 0.1$, for L, C and X, its accuracy factor A_e shall be multiplied by $\sqrt{1+D_x^2}$

When $Q_x \geq 0.1$, for R, its accuracy factor A_e shall be multiplied by $\sqrt{1+Q_x^2}$

3-2-2. Accuracy of D

The accuracy D_e of D is calculated according to: $D_e = \pm\dfrac{A_e}{100}$

The above formula is valid only when $D_x \leq 0.1$.

When $D_x > 0.1$, D_e shall be multiplied by $(1+D_x)$.

3-2-3. Accuracy of Q

The accuracy Q_e of Q is calculated according to: $Q_e = \pm\dfrac{Q_x \times D_e}{1 \mp Q_x \times D_e}$

Here Q_x is the measured value of Q. D_e is the accuracy of D.

The above formula is valid only when $Q_x \times D_e < 1$.

3-2-3. Accuracy of θ

The accuracy $θ_e$ of θ is calculated according to: $θ_e = \dfrac{180}{\pi}\times\dfrac{A_e}{100}$ [deg]

3-2-4. Accuracy of R_p

When D_x (the measured value of D) ≤0.1 The accuracy of R_p is calculated according to:

$$R_p = \pm\frac{R_{px} \times D_e}{D_x \mp D_e}$$ [Ω]

Here, R_{px} is the measured value [Ω] of R_p. D_x is the measured value of D. D_e is the accuracy of D.
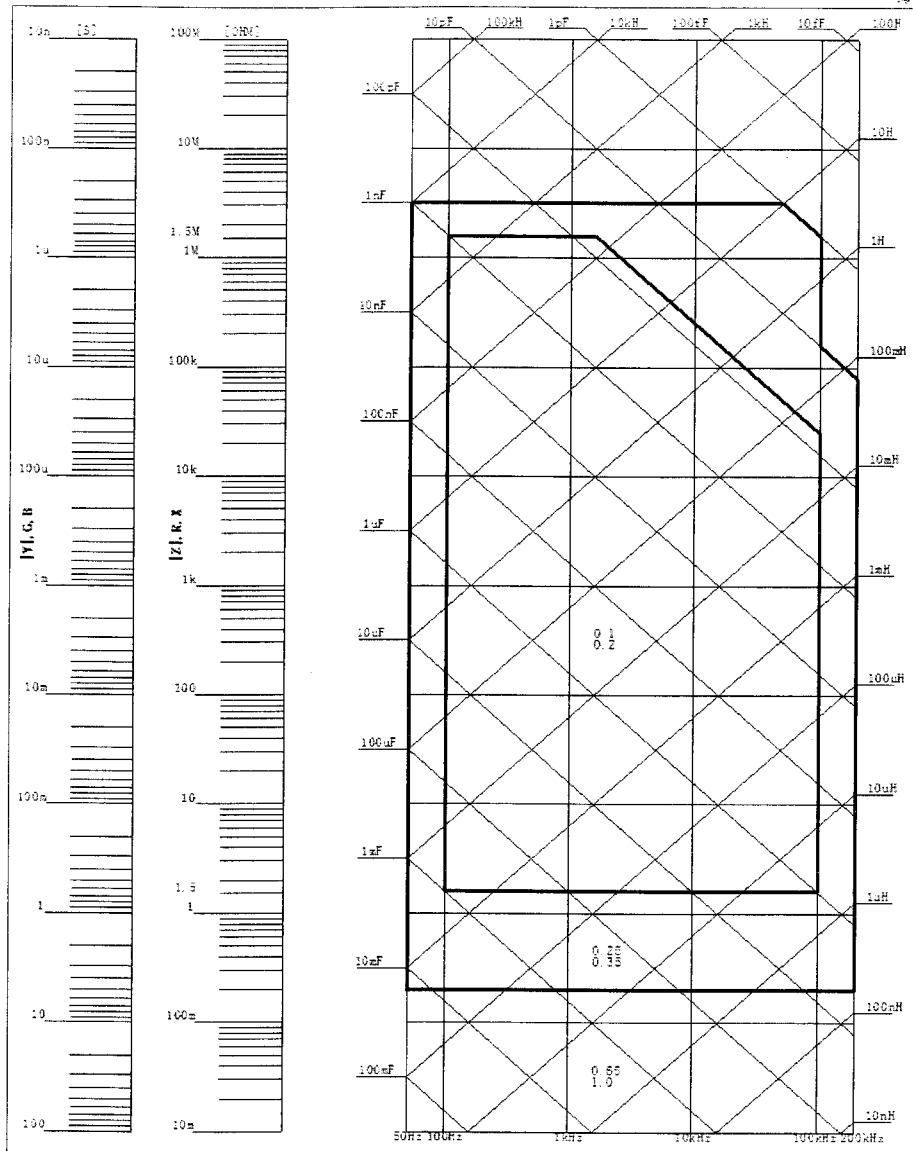
3-2-5. Accuracy of R_s

When D_x (the measured value of D) ≤0.1 The accuracy of R_s is calculated according to:

$$R_{se} = X_x \times D_e$$ [Ω]

$$X_x = 2\pi f L_x = \frac{1}{2\pi f C_x}$$

Here, X_x is the measured value [S] of X. C_x is the measured value [F] of C. L_x is the measured value [H] of L.

D_e is the accuracy of D. f is measured frequency.

Basic measurement accuracy (Fig.3-1)

In Fig.3-1, the basic accuracy A can be selected by below method:

0.1 (a smaller value): When V_s=1V, measurement speed is accuracy of medium and slow speed.

0.2 (a larger value): When V_s=1V, measurement speed is accuracy of fast speed.

When measuring level correction level ArB (Refer to table 3-3), select measuring accuracy A according to Fig.3-1, the basic accuracy after level correction is A multiplied by Ar. Here, V_s is voltage of test signal.

Table 3-1

Test Signal Voltage V_S	Accuracy Correction Factor Ar
0.1V	2.5
0.3V	1.5
1V	1

Table 3-4 Impedance Scaling Factor K_a and K_b

Speed	Frequency	K_a (Zm<500Ω)	K_b (Zm>500Ω)
Medium Slow	fm<100Hz	$(\frac{1\times10^{-3}}{|Z_m|})(1+\frac{200}{V_s})(1+\sqrt{\frac{100}{fm}})$	$|Z_m|(1\times10^{-9})(1+\frac{70}{V_s})(1+\sqrt{\frac{100}{fm}})$
	100Hz≤fm ≤100kHz	$(\frac{1\times10^{-3}}{|Z_m|})(1+\frac{200}{V_s})$	$|Z_m|(1\times10^{-9})(1+\frac{70}{V_s})$
	fm>100kHz	$(\frac{1\times10^{-3}}{|Z_m|})(2+\frac{200}{V_s})$	$|Z_m|(3\times10^{-9})(1+\frac{70}{V_s})$
Fast	fm<100Hz	$(\frac{2.5\times10^{-3}}{|Z_m|})(1+\frac{400}{V_s})(1+\sqrt{\frac{100}{fm}})$	$|Z_m|(2\times10^{-9})(1+\frac{100}{V_s})(1+\sqrt{\frac{100}{fm}})$
	100Hz≤fm ≤100kHz	$(\frac{2.5\times10^{-3}}{|Z_m|})(1+\frac{400}{V_s})$	$|Z_m|(2\times10^{-9})(1+\frac{100}{V_s})$
	fm>100kHz	$(\frac{2.5\times10^{-3}}{|Z_m|})(2+\frac{400}{V_s})$	$|Z_m|(6\times10^{-9})(1+\frac{100}{V_s})$

Note:

fm: measured frequency, [Hz]

Zm: measured impedance of DUT, [Ω]

Vs: voltage of test signal, [mV$_{rms}$]

Table 3-5 Temperature Factor K_c

Temperature (°C)	5	8	18	28	38	
K_c	6	4	2	1	2	4

Table 3-6 Calibration Interpolation Factor Kf

Test frequency	Kf
Typical frequency (Direct calibration)	0
Non-typical frequency (Interpolation calibration)	0.0003

Note: So far frequency points of all models are typical frequencies.

Table 3-7 Cable Length Factor

Test frequency	Cable Length		
	0m	1m	2m
0.1Vrms ,0.3Vrms	0	$2.5\times10^{-4}(1+0.05fm)$	$5\times10^{-4}(1+0.05fm)$
1Vrms	0	$2.5\times10^{-3}(1+0.016fm)$	$5\times10^{-3}(1+0.05fm)$

Note: fm: measured frequency, [Hz]

4. HANDLER INTERFACE

The HANDLER interface is used to output comparator results to industrial computer (IPC), so as to realize automatic comparator test.
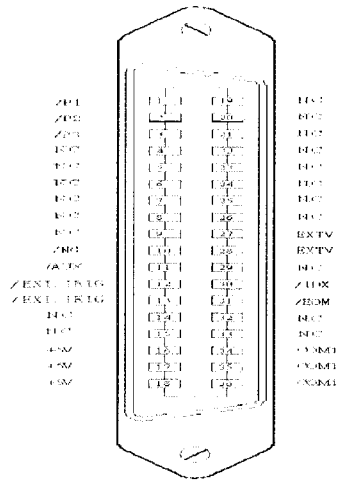
4-1. Pin Definition

Fig.4-1 Pin definition

| Pin No.	Signal	Description
1	/P1	Comparator result output.
2	/P2	All signals are collector outputs with built-in pull-up resistor. Pul-up power source
3	/P3	can be internal +5V power source or exteran power source EXTV (default at
10	/NG	EXTV).
11	/AUX	Resistance of the built-in pull-up resistor is 4.7kΩ.
12,13	/EXT.TRIG	Rising edge of this signal triggers measurement. Pulse width≥1μs. Low level drive current approx. 5-10mA.
16,17,18	+5V	Internal +5V power output: Normally it is not recommended to use internal power source. If the internal power source must be used, please make sure the signal's current is less than 0.3A and ensure the signal is well shielded from interference.
27,28	EXTV	External DC power source input for comparator signal. If using internal +5V power source, please reset the internal jumper connection.
30	/IDX	/IDX is valid after A/D conversion is finished. When the signal is valid, the automatic tester will allow the next component to move into measuring position. The currently measured result will be output when /EOM is valid.
31	/EOM	End Of Measurement: the signal is valid when the measured results and comparing results are valid.
34,35,36	COM	Reference ground for external power source EXTV. When using internal +5V power source for the HANDLER interface signal output, reference ground of the LCR meter is connected with COM.

4-2. Time Sequence of Interface Signal
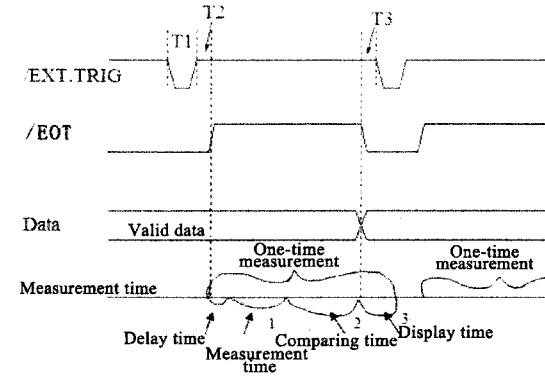
Fig.4-3 Time sequence chart

Time	MIN Value	MAX Value
T1: Trigger pulse width	1us	
T2: Delay time of starting measurement	200us	Display time + 200us
T3: Trigger waiting time after /EOT output	0us	---

4-4. Schematic Diagram of Interface Signal
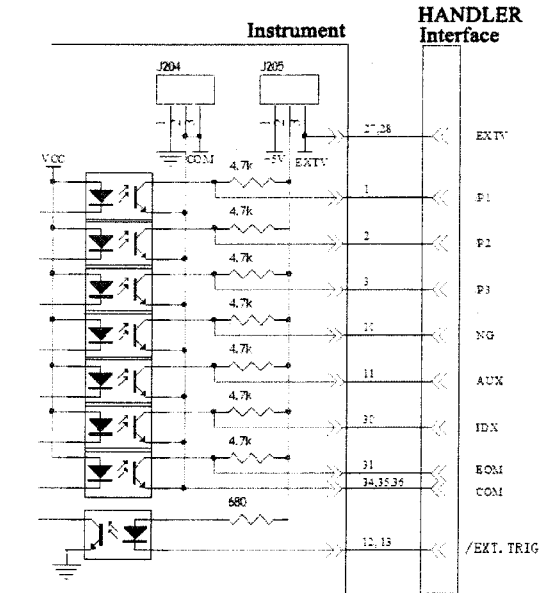
If using internal +5V power source: connect pin 1 to pin 2 of J205; and connect pin 1 to pin 2 of J204.

If using external EXTV power source: connect pin 2 to pin 3 of J205; and connect pin 2 to pin 3 of J204.

5. REMOTE CONTROL

The LCR meter is available with RS232C interface and USB HOST as standard. GPIB is an optional interface.

5-1. RS232C Interface

The RS232C interface of this LCR meter is not strictly based on international RS232 standards. Only the minmal subset as table 5-1 is available.

Table 5-1

Signal	Abbreviation	Connector's Pin number
Send data	TXD	2
Receive data	RXD	3
Ground	GND	5

Fig.5-1 Connection illustration
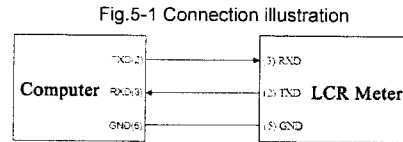
5-3. Description to GPIB Interface

The GPIB (IEEE488) interface is a universal intelligent instrument bus interface. The LCR meter can be connected with computer or other intelligent instruments through GPIB interface to construct an automatic test system with other instruments. Maximum 15 units of instruments can be connected to one bus at the same time. The LCR meter adopts IEEE488.2 standards. The command system is open. User can control the LCR meter by sending commands.

TIPS:

1. In one bus system, the connecting cable of each unit shall be less than 2 meters. Total cable length shall be less than 20 meters.
2. Maximum 15 units can be connected to one bus.
3. There is no rule on how to connect cables. However, it is recommended to impose four back connectors on one instrument.
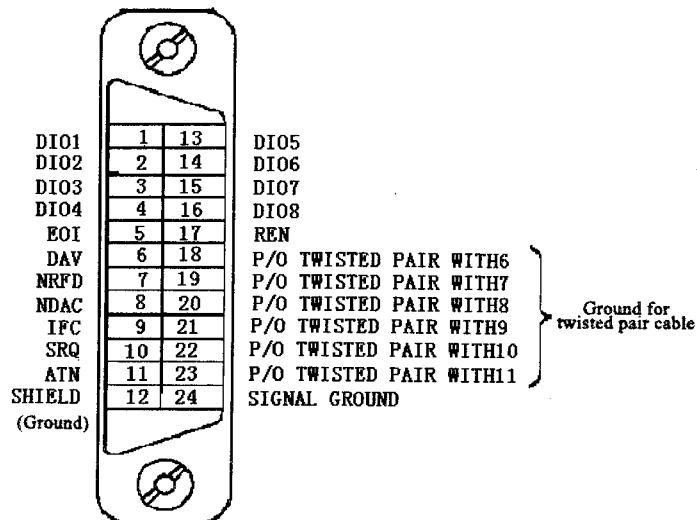
Fig.5-2 GPIB Connector and Pinout

DIO1	1	13	DIO5
DIO2	2	14	DIO6
DIO3	3	15	DIO7
DIO4	4	16	DIO8
EOI	5	17	REN
DAV	6	18	P/O TWISTED PAIR WITH6
NRFD	7	19	P/O TWISTED PAIR WITH7
NDAC	8	20	P/O TWISTED PAIR WITH8
IFC	9	21	P/O TWISTED PAIR WITH9
SRQ	10	22	P/O TWISTED PAIR WITH10
ATN	11	23	P/O TWISTED PAIR WITH11
SHIELD (Ground)	12	24	SIGNAL GROUND

Ground for twisted pair cable

Figt.5-3 Superimposition of two back connectors   Figt.5-4 Superimposition of four back connectors
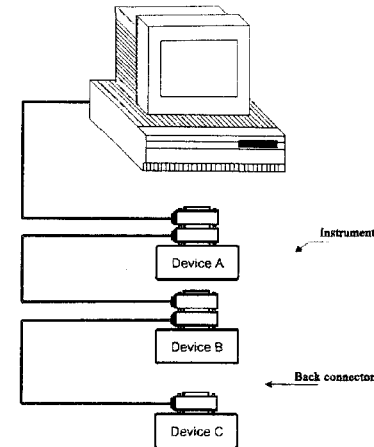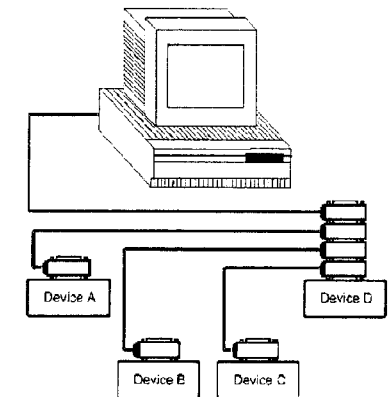
Connector's function:

Code	Function	Description
SH1	Data source contact	Three line connection
AH1	Receiver communication	Three line connection
T5	Speak function	Send instrument information
L4	Listen function	Receive instrument information
SR1	Service request	Demand service
RL1	Remote/local switch	Switch between remote control and local control
DC1	Reset instrument	Send CLEAR signal
DT1	Trigger instrument	Send trigger signal
C0	Control function	Send control signal

5-3-1. GPIB Address

GPIB address can be set between numbers from 0 to 31. Please refer to [SYSTEM] menu for details of interface setup.

5-3-2. GPIB Bus Function

Commands	Description
AORT I/O (IFC)	Stop all bus actions. Stop receiving instrument's data. Reset the interface to idle state.
CLEAR LOCKOUT/ SET LOCAL	Prepare the instrument for remote control.
DEVICE CLEAR (SDC or DCL)	Clear the selected instrument, or clear all instruments.
LOCAL LOCKOUT (LLO)	Lock local commands. Carry out this command.
REMOTE	Set the instrument to remote control mode.

SPOLL	This is Serial naming command, which is used to configure the bus address status byte. 8 bytes are used to mask and read to determine the operating status of the instrument.
SERVICE REQUEST	When the series instrument requests the controller to perform a task, the instrument will send SRQ (service request) signal. SRQ signal is considered as an interrupt that tells the controller to be prepared for data transmission or there is an error condition. When the series instrument sends the SRQ service request signal, it also sets the status byte to 6 bits. The 6 bits are RQS request service bits, sometimes as a status bit when concatenated with the naming command. When the series instrument serializes, it clears the RQS (Request Service) bit and the SRQ line. Each byte of the status byte initiates an SRQ service request. The user can mask the status byte to determine which one caused the series instrument to set the SRQ line. See "Status Bytes" for details.
TRIGGER (GET)	Trigger bus commands. This command can be sent to the selected instrument or all the instruments as the listener. The series instruments must first be assigned to the listener and then set the bus trigger mode to trigger mode before sending the trigger message

5-4. USB HOST

The USB HOST can be used to control the LCR meter It is in compliance with USMTMC-USB488 and USB2.0 protocols. When using USBTMC interface, user can write commands via Labview to control the instrument.

In the first time of connecting the instrument to computer via USB cable, the computer will reminds of "Find New Device" and then pop up installation windows. Follow the installation instructions and install the USB driver successfully. A "USB Test and Measurement Device" will be found in the Device Manager.

6. MAINTENANCE

6-1. Inspection

● Inspect the LCR meter at regular intervals so that it maintains its initial performance for a long time.
● Check the input power cord for damage of the vinyl cover and overheating of the plug and cord stopper. Check the terminal screws and binding posts for loosening.

6-2. Fuse Replacement

Step   1)   Take off the power cord and remove the fuse socket using a minus driver.
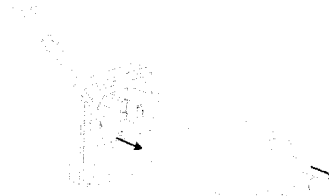
2)   Replace the fuse in the holder.

Fuse rating: T1.0/250V for 110Vac input, T0.5/250V for 220Vac input.

7. TECHNICAL SPECIFICATIONS

The specifications apply when the LCR meter is powered on for at least 30 minutes under regulated temperature.

Model	LCR-7010	LCR-7030	LCR-7200
Measurement function			
Test parameter	|Z|, |Y|, C, L, X, B, R, G, D, Q, θ		
Test signal frequency	**LCR-7010**: 100Hz,120Hz,1kHz,10kHz		
	LCR-7030: 100Hz,120Hz,1kHz,10kHz, 20kHz, 30kHz		
	LCR-7200: 40Hz, 50Hz, 60Hz, 75Hz, 100Hz, 120Hz, 150Hz, 200Hz, 250Hz, 300Hz, 400Hz, 500Hz, 600Hz, 750Hz, 800Hz, 1kHz, 1.5kHz, 2kHz, 2.5kHz, 3kHz, 4kHz, 5kHz, 6kHz, 7.5kHz, 10kHz, 12kHz, 15kHz, 15.7kHz, 16.2kHz, 20kHz, 25kHz, 30kHz, 40kHz, 50kHz, 60kHz, 66.6kHz, 75kHz, 100kHz, 120kHz, 150kHz, 200kHz (38 points)		
Basic accuracy	0.15%	0.1%	0.1%
Equivalent circuit	Series, Parallel		
Mathematical function	Absolute Deviation and Percentage Deviation		
Range mode	Auto, Hold, Manual Selection		
Trigger mode	Internal, Manual, External, BUS		
Measurement speed	Fast: max.30, Medium: 10, Slow: 3 (times/second) (≥1kHz)		
Average times	1-255		
Delay time	0-60s, step 1ms		
Calibration function	Open circuit, Short circuit, Load		
Measurement terminal	5-terminal		
Display mode	Direct, Δ, Δ%, V/I (monitoring test voltage and current)		
Display	5 digit 4.3-in LCD display		
Measurement signal			
Output impedance	30Ω, 100Ω		
Test level	0.1V, 0.3V, 1V	0.1V, 0.3V, 1V	0.1V, 0.3V, 0.5V, 1V
Test level accuracy	5%		
Measurement display range			
|Z|, R, X	0.01m Ω - 99.999 MΩ		
|Y|, G, B	0.0001μS - 99.999 S		
C	0.0001 pF - 9.9999 F		
L	0.0001 μH - 999.99 H		
D	0.0001 - 9.9999		
Q	0.0001 - 99999		
θ (DEG)	-179.99° -179.99 °		
θ (RAD)	-3.14159 - 3.14159		
Δ%	-999.99% - 999.99%		
Comparator and interface			
Comparator	N/A	4-bin comparator	5-bin comparator
Memory	100 sets memories for internal parameter settings storage/save 500 sets for U disk parameter settings storage/save		
Standard interface	RS232, USB HOST	RS232, USB HOST, HANDLER	
Optional interface	USB device, GPIB		
General			
Operating environment	0°C - 40°C, ≤80%RH		
Power source	110/220V±10%, 47~63Hz		
Power consumption	≤30VA		
Accessories	4-terminal Kelvin test clip leads, RS232 cable, power cord, operation manual		
Dimensions	265W*100H*340D mm		
Weight	Approx.3.5kg		

For the purpose of product improvement, specifications are subject to change without prior notice.