

# 1 LCR Meter Sample Application

## -1 Overview

The LCR Meter Sample Application is a sample application software for LCR meters.

### (1) Functionality

This software provides the following functionality:

- LCR mode measurement
- Configuration of LCR mode measurement conditions
- Display of LCR mode measured values
- Saving of LCR mode measurement data
- TRANSFORMER mode measurement \*1
- Configuration of TRANSFORMER mode measurement conditions \*1
- Display of TRANSFORMER mode measured values \*1
- ANALYZER mode measurement \*2
- Configuration of ANALYZER mode measurement conditions \*2
- Display of ANALYZER mode measured values as a graph \*2
- Display of ANALYZER mode measured values as a list \*2
- Saving of ANALYZER mode measured value lists \*2
- Calculation of measurement accuracy
- Calculation of the measurement range
- Acquisition of measurement screens
- Measurement of communications times
- Saving and loading of LCR meter settings \*3

### (2) Measurement methods

The sample application provides the following six measurement methods:

- Frequency characteristics (measurement while varying the frequency)
- Power characteristics (measurement while varying the power) \*4
- Voltage characteristics (measurement while varying the voltage)
- Current characteristics (measurement while varying the current)
- Time interval measurement (measurement over a user-specified time interval) \*5
- "Acquire by pressing ENTER" measurement (one-time measurement) \*5

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\*1 IM3533 and IM3533-01 only

\*2 IM3533-01, IM3570, IM3590, and IM7580 only

\*3 IM3523 only

\*4 IM7580 only

\*5 LCR mode only

### (3) Operating environment

Supported operating systems	Windows Vista SP1 or later (32-bit/64-bit) Windows 7 (32-bit/64-bit) Windows 8 (32-bit/64-bit) Windows 10 (32-bit/64-bit)
Software environment	Microsoft .NET Framework 4.0
CPU	1 GHz or greater
RAM	512 MB or greater
Display resolution	1024 X 768 pixels or greater
Hard disk	At least 5 MB available (If .NET Framework 4.0 has not yet been installed, an additional 900 MB of space is required. Additional space is required in order to store recorded data.)
Communications interfaces	RS-232C, GPIB, USB, LAN

Table 1-1 Operating environment

The following cables are required in order to connect the LCR meter to a computer:

- RS-232C connection: RS-232C cross cable (9-pin female to 9-pin female)
- GPIB connection: National Instruments GPIB-USB-HS
- USB connection: USB cable (AB type)
- LAN connection: LAN cross cable

### (4) Supported products

This software can be used with the following products:

- IM3523
- IM3533
- IM3533-01
- IM3536
- IM3570
- IM3590
- IM7580

## -2 Start screen

The start screen is displayed when the LCR Meter Sample Application is launched.

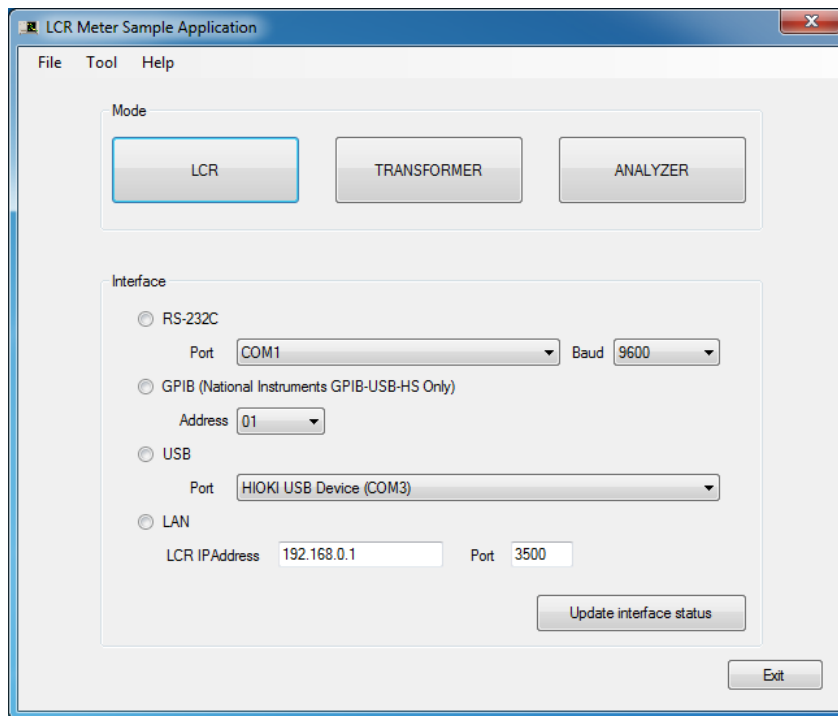


Figure 2-1 Start screen

Select the interface you're using to connect the LCR meter and switch to a function screen.

### -3 LCR mode

You can perform LCR mode measurement.

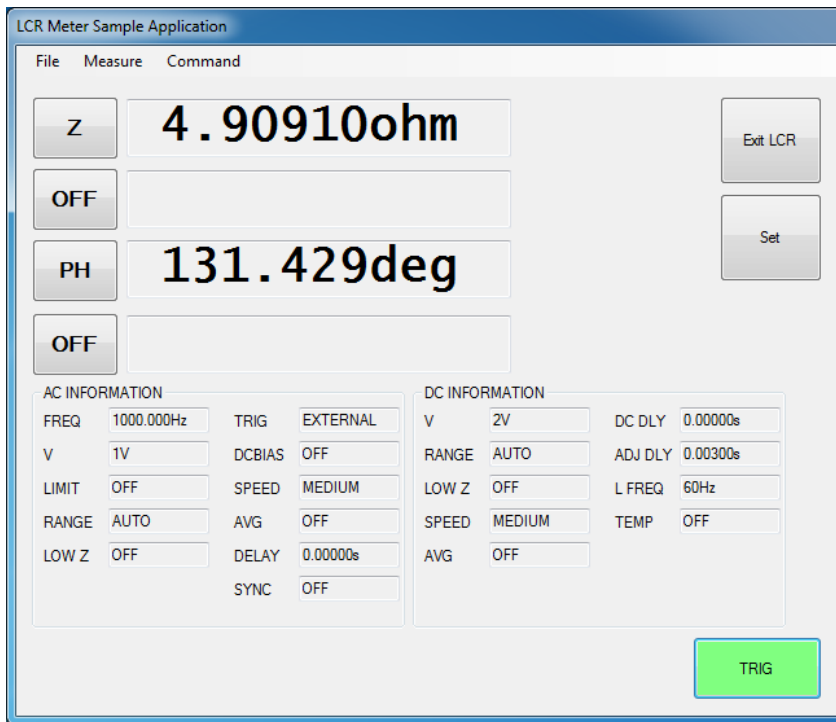


Figure 3-1 LCR mode screen

#### (1) LCR settings

You can set the measurement conditions used in LCR mode.

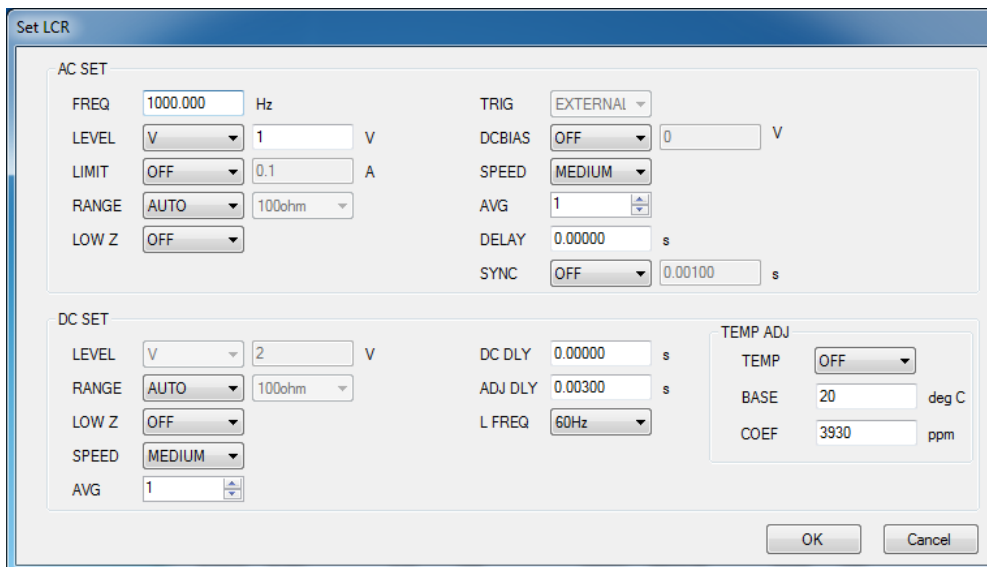
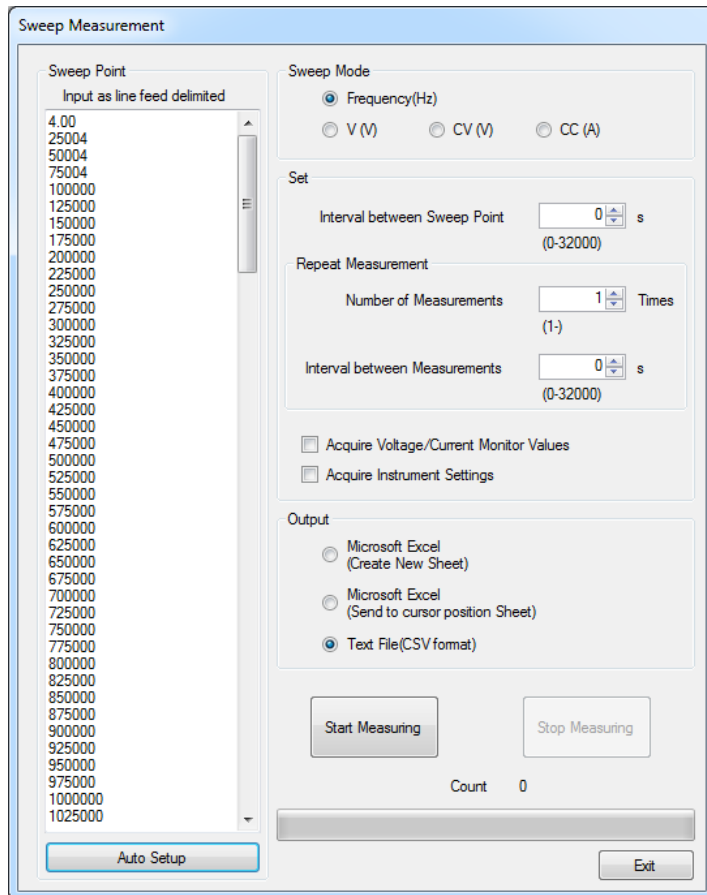


Figure 3-2 LCR settings screen

(2) Frequency, voltage, and current characteristics measurement

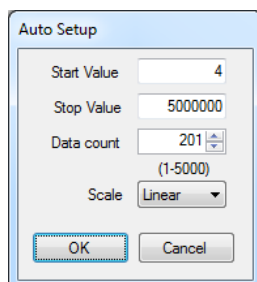
You can make measurements while varying the frequency, power, voltage, or current. Measurement data can be saved as a Microsoft Excel or CSV file.



The 'Sweep Measurement' dialog box is divided into several sections. On the left, a 'Sweep Point' list shows values from 4.00 to 1025000 in increments of 25000. The 'Input as line feed delimited' checkbox is checked. The 'Sweep Mode' section has three radio buttons: 'Frequency(Hz)' (selected), 'V (V)', and 'CV (V)'. The 'Set' section includes 'Interval between Sweep Point' (0 s, range 0-32000), 'Repeat Measurement' (Number of Measurements: 1 Times, range 1-), and 'Interval between Measurements' (0 s, range 0-32000). There are checkboxes for 'Acquire Voltage/Current Monitor Values' and 'Acquire Instrument Settings'. The 'Output' section has three radio buttons: 'Microsoft Excel (Create New Sheet)', 'Microsoft Excel (Send to cursor position Sheet)', and 'Text File(CSV format)' (selected). At the bottom, there are 'Start Measuring' and 'Stop Measuring' buttons, a 'Count' display showing 0, and 'Auto Setup' and 'Exit' buttons.

Figure 3-3 Frequency/voltage/current characteristics measurement screen

You can set automatically set sweep points by specifying the start value, end value, and number of data points.



The 'Auto Setup' dialog box contains four input fields: 'Start Value' (4), 'Stop Value' (500000), 'Data count' (201, range 1-5000), and 'Scale' (Linear). At the bottom are 'OK' and 'Cancel' buttons.

Figure 3-4 Sweep point automatic setup screen

# Example CSV file saved during frequency/voltage/current characteristics measurement

```
MODEL, IM3570
Ver, V3.11

DATE, 2017-05-30
TIME, 18:31:12

AC SETTINGS
FREQ, 5000000.00, Hz
V, 1, V
LIMIT, OFF
RANGE, HOLD, 1Mohm
LOW Z, OFF
SPEED, SLOW2
AVG, OFF
DELAY, 0.00000, s
DC BIAS, OFF

Frequency(MHz), AC Status, Z, PH, AC Vmoni, AC Imoni, DC Vmoni, DC Imoni
4.00, 3, 25.29198E+09, -146.204, 1.000838E+00, 3.881721E-11, 0.000000E+00, 0.000000E+00
25004, 2, 1.033173E+09, -104.054, 1.030344E-01, 2.236199E-10, 0.000000E+00, 0.000000E+00
50004, 2, 181.9796E+06, -39.037, 5.201070E-02, 3.421480E-10, 0.000000E+00, 0.000000E+00
75004, 2, 167.5964E+06, 3.175, 3.482143E-02, 1.536798E-10, 0.000000E+00, 0.000000E+00
100000, 2, 167.1980E+06, -5.768, 2.618488E-02, 1.546787E-10, 0.000000E+00, 0.000000E+00
:
```

### (3) Time interval measurement

You can make measurements at a user-specified time interval. Measurement data can be saved as a Microsoft Excel or CSV file.

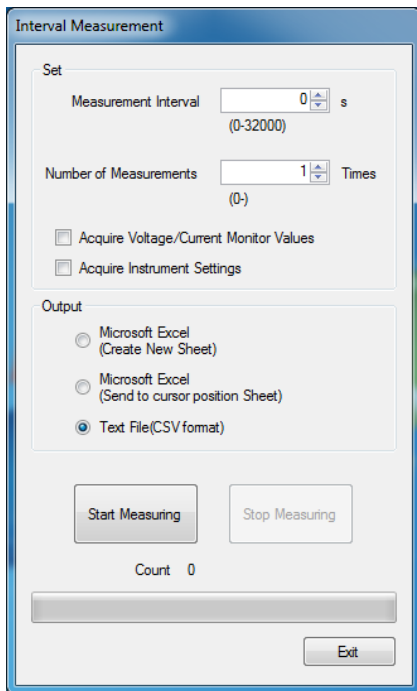


Figure 3-5 Time interval measurement screen

Example CSV file saved during time interval measurement

```
MODEL, IM3570
Ver, V3. 11

DATE, 2017-05-30
TIME, 18:32:10

AC SETTINGS
FREQ, 5000000. 00, Hz
V, 1, V
LIMIT, OFF
RANGE, HOLD, 1Mohm
LOW Z, OFF
SPEED, SLOW2
AVG, OFF
DELAY, 0. 00000, s
DC BIAS, OFF

DATE, TIME, AC Status, Z, PH, AC Vmoni, AC Imoni, DC Vmoni, DC Imoni
2017-05-30, 18:32:11, 0, 523. 3394E+03, 67. 336, 1. 404615E-03, 2. 865997E-10, 0. 000000E+00, 0. 000000E+00
2017-05-30, 18:32:12, 0, 513. 1694E+03, 67. 007, 1. 404616E-03, 3. 339377E-10, 0. 000000E+00, 0. 000000E+00
2017-05-30, 18:32:13, 0, 517. 9510E+03, 69. 294, 1. 404422E-03, 3. 282056E-10, 0. 000000E+00, 0. 000000E+00
2017-05-30, 18:32:14, 0, 530. 5060E+03, 66. 928, 1. 404592E-03, 2. 526029E-10, 0. 000000E+00, 0. 000000E+00
2017-05-30, 18:32:15, 0, 514. 8023E+03, 68. 124, 1. 404715E-03, 3. 310959E-10, 0. 000000E+00, 0. 000000E+00
:
```

(4) "Acquire by pressing ENTER" measurement

You can make measurements whenever the ENTER key is pressed. Measurement data can be saved as a Microsoft Excel or CSV file.

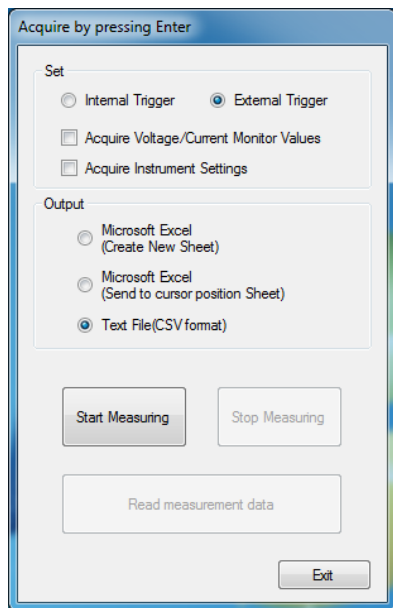


Figure 3-6 "Acquire by pressing ENTER" screen

Example CSV file saved during "acquire by pressing ENTER" measurement

```
MODEL, IM3570
Ver, V3.11

DATE, 2017-05-30
TIME, 18:34:20

AC SETTINGS
FREQ, 5000000.00, Hz
V, 1, V
LIMIT, OFF
RANGE, HOLD, 1Mohm
LOW Z, OFF
SPEED, SLOW2
AVG, OFF
DELAY, 0.00000, s
DC BIAS, OFF

DATE, TIME, AC Status, Z, PH, AC Vmoni, AC Imoni, DC Vmoni, DC Imoni
2017-05-30, 18:34:21, 0, 508.4468E+03, 68.327, 1.404104E-03, 3.629821E-10, 0.000000E+00, 0.000000E+00
2017-05-30, 18:34:22, 0, 547.1544E+03, 68.523, 1.403642E-03, 1.933452E-10, 0.000000E+00, 0.000000E+00
2017-05-30, 18:34:22, 0, 522.5415E+03, 68.767, 1.403694E-03, 3.009092E-10, 0.000000E+00, 0.000000E+00
2017-05-30, 18:34:22, 0, 523.5633E+03, 67.072, 1.403521E-03, 2.845311E-10, 0.000000E+00, 0.000000E+00
2017-05-30, 18:34:22, 0, 514.7413E+03, 68.428, 1.403768E-03, 3.335621E-10, 0.000000E+00, 0.000000E+00
:
```



(5) Test measurement

You can perform a series of measurements under the set measurement conditions and display the results.

To start test measurement, choose [Start Test Measurement] on the [Measure] menu.

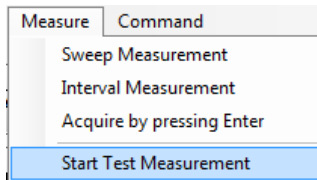


Figure 3-7 "Start Test Measurement" menu command

To stop test measurement, choose [Stop Test Measurement] on the [Measure] menu.

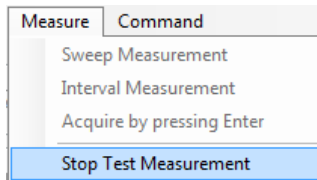


Figure 3-8 "Stop Test Measurement" menu command

#### -4 TRANSFORMER mode

You can perform measurements in TRANSFORMER mode.

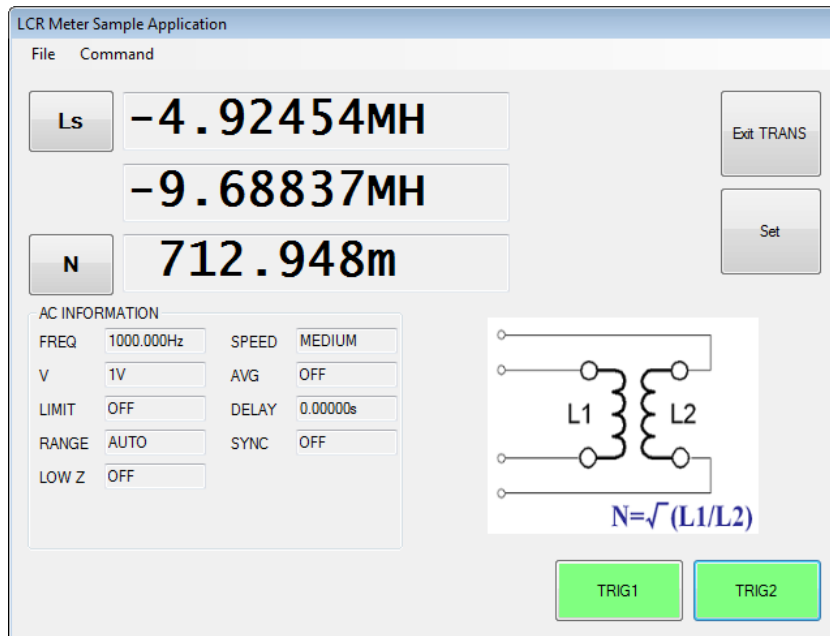


Figure 4-1 TRANSFORMER mode screen

##### (1) TRANSFORMER settings

You can set the measurement conditions used in TRANSFORMER mode.

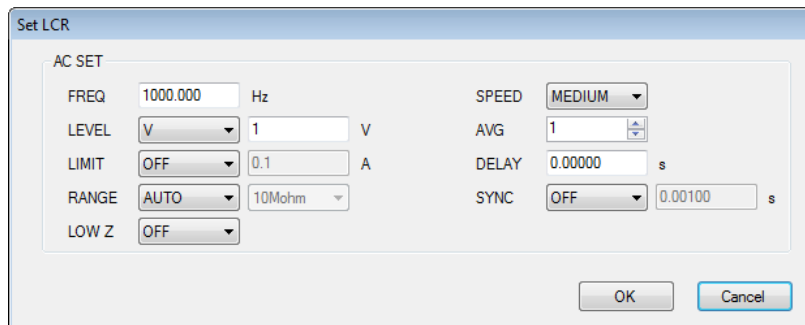


Figure 4-2 TRANSFORMER settings screen

## -5 ANALYZER mode

You can perform measurements in ANALYZER mode. You can save a graph of measured values as a BMP file, or a list of measured values as a CSV file.

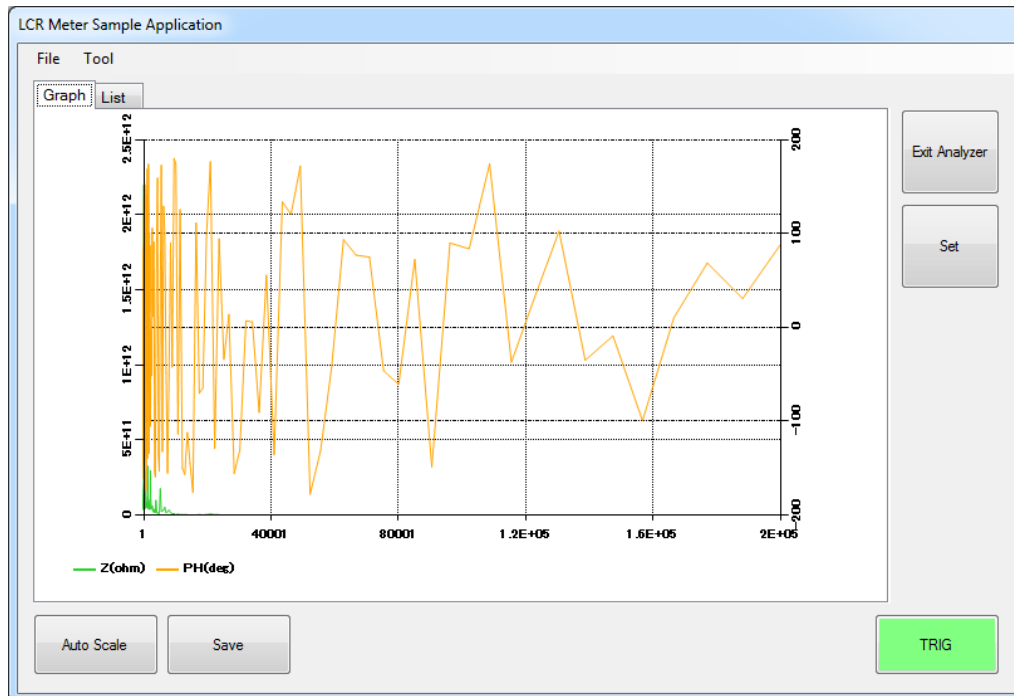


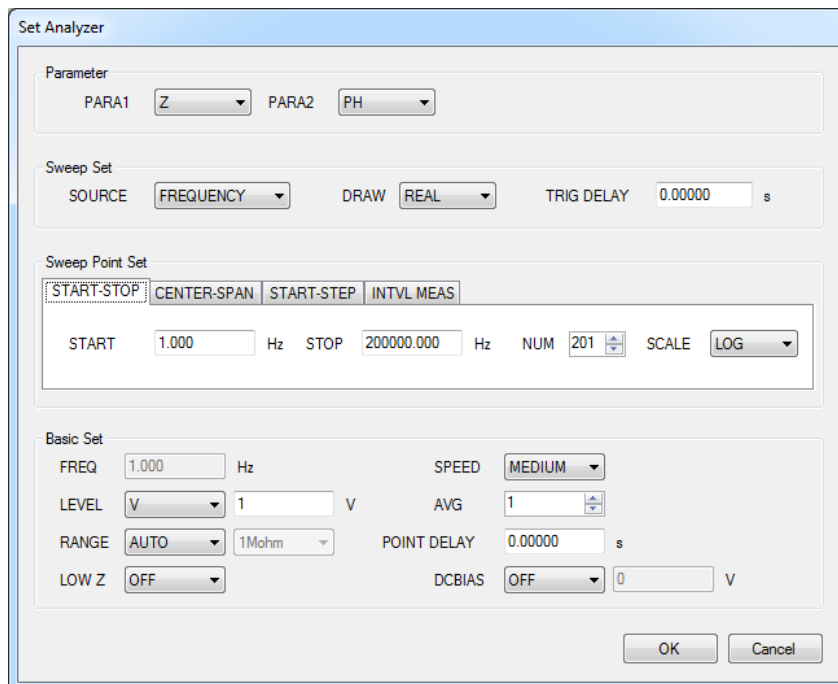
Figure 5-1 ANALYZER mode graph screen

No	FREQUENCY(Hz)	Z(ohm)	PH(deg)
1	1.00	58362300000.00...	21.9730
2	1.063	101831000000.0...	-46.8340
3	1.13	78340600000.00...	54.2440
4	1.201	52705400000.00...	70.1180
5	1.276	50473600000.00...	46.0910
6	1.357	64710100000.00...	25.9120
7	1.442	51498100000.00...	64.9700
8	1.533	64876500000.00...	29.7780
9	1.629	53982800000.00...	53.5300
10	1.732	97249600000.00...	-18.8920
11	1.841	64353000000.00...	38.2200
12	1.957	70506800000.00...	-30.0110
13	2.08	30497800000.00...	82.1190
14	2.211	71597200000.00...	16.5260
15	2.35	42835800000.00...	66.7540
16	2.498	61449800000.00...	26.0280
17	2.655	38472900000.00...	70.6230

Figure 5-2 ANALYZER mode list screen

### (1) ANALYZER settings

You can set the measurement conditions to use in ANALYZER mode.

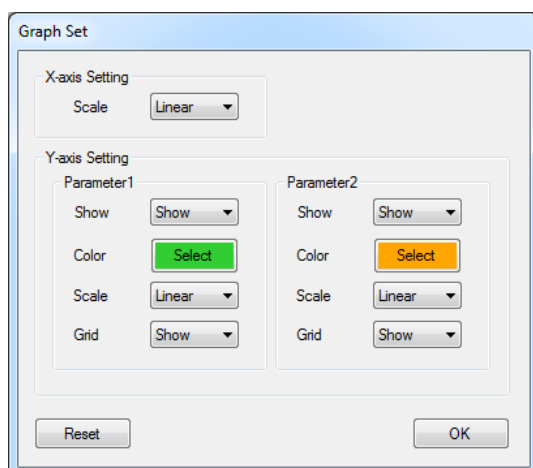


The 'Set Analyzer' dialog box is used to configure measurement parameters. It includes sections for Parameter selection (PARA1: Z, PARA2: PH), Sweep Set (SOURCE: FREQUENCY, DRAW: REAL, TRIG DELAY: 0.00000 s), Sweep Point Set (START-STOP, CENTER-SPAN, START-STEP, INTVL MEAS tabs; START: 1.000 Hz, STOP: 200000.000 Hz, NUM: 201, SCALE: LOG), and Basic Set (FREQ: 1.000 Hz, SPEED: MEDIUM, LEVEL: V, 1 V, AVG: 1, RANGE: AUTO, 1Mohm, POINT DELAY: 0.00000 s, LOW Z: OFF, DCBIAS: OFF, 0 V). OK and Cancel buttons are at the bottom right.

Figure 5-3 ANALYZER settings screen

### (2) Graph settings

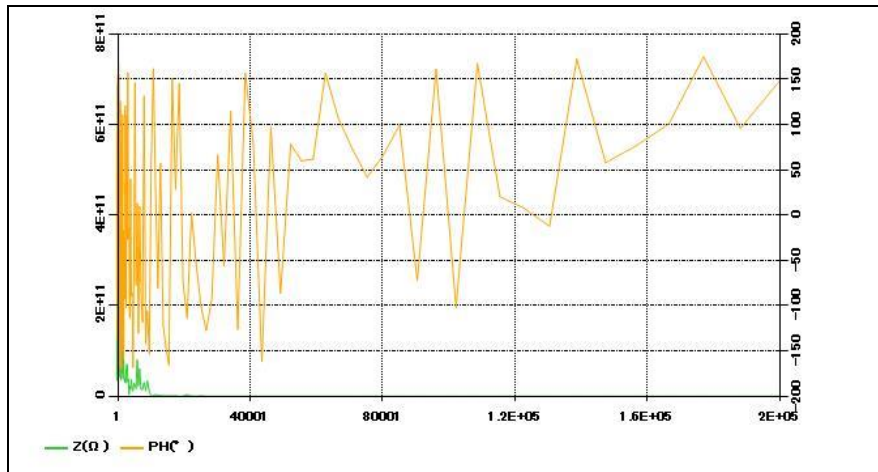
You can set whether to show each parameter on the graph screen in ANALYZER mode as well as each parameter's color and scale, and you can set whether to show the grid.



The 'Graph Set' dialog box allows configuration of graph display settings. It includes X-axis Setting (Scale: Linear) and Y-axis Setting for Parameter1 and Parameter2. For each parameter, users can set Show (Show), Color (Select), Scale (Linear), and Grid (Show). A Reset button is at the bottom left, and an OK button is at the bottom right.

Figure 5-4 Graph settings screen

(3) Example BMP file created by saving a measured value graph in ANALYZER mode



(4) Example CSV file created by saving a measured value list in ANALYZER mode

```
No. , FREQUENCY (Hz) , Z, PH
1, 1. 00, 48787500000. 0000, 17. 6920
2, 1. 063, 57611300000. 0000, 46. 0820
3, 1. 13, 36199600000. 0000, 81. 7180
4, 1. 201, 42558200000. 0000, 61. 6280
5, 1. 276, 95780500000. 0000, -44. 2260
6, 1. 357, 118187000000. 0000, -71. 5620
7, 1. 442, 67025000000. 0000, 29. 4440
8, 1. 533, 141748000000. 0000, -83. 1220
9, 1. 629, 111160000000. 0000, -50. 5320
10, 1. 732, 57342600000. 0000, 21. 6520
:
```

## -6 Accuracy calculation

You can set measurement conditions and calculate the measurement accuracy.

**Calc Accuracy**

[ SET ]

MODEL: IM3570

PARA: Z - PH

SPEED: MEDIUM

FREQ (Hz): 1000.000

CABLE: 0m

RANGE (ohm): 1kohm

AUTO

DC BIAS: OFF

LEVEL (V): 1.000

TEMP (deg C): 23

[ TEMP Adjust ]

ADJUST: OFF

BASE (deg C): 20.0

COEF (ppm): 3930

[ MEAS VALUE ]

Z = 1000.0000 ohm

PH = 0.000 deg

[ MEAS Accuracy ]

Calculate

Z = MIN: -0.58000 %

Z = MAX: +0.58000 %

PH = MIN: -0.39200 deg

PH = MAX: 0.39200 deg

Z : 0.58000 % = (0.14500 + (0.00000)) \* 1 \* 4 \* 1 \* 1 \* 1

PH : 0.39200 deg = 0.09800 \* 1 \* 4 \* 1 \* 1 \* 1

Exit

Figure 6-1 Accuracy calculation screen

## -7 Measurement range calculation

You can set measurement conditions and calculate the measurement range.

**Calc Measurement Range**

[ SET ]

MODEL: IM3570

RANGE (ohm): 1kohm

FREQ (Hz): 1000.000

DC: OFF

LEVEL [V]: 1.000

[ Measurement Range ]

Calculate

Z [ohm]: 2.40000E+02 - 1.00000E+04

L [H]: 3.81972E-02 - 1.59155E+00

C [F]: 1.59155E-08 - 6.63146E-07

Exit

Figure 7-1 Measurement range calculation screen

## -8 Screenshots

You can save the measurement screen as a BMP file.

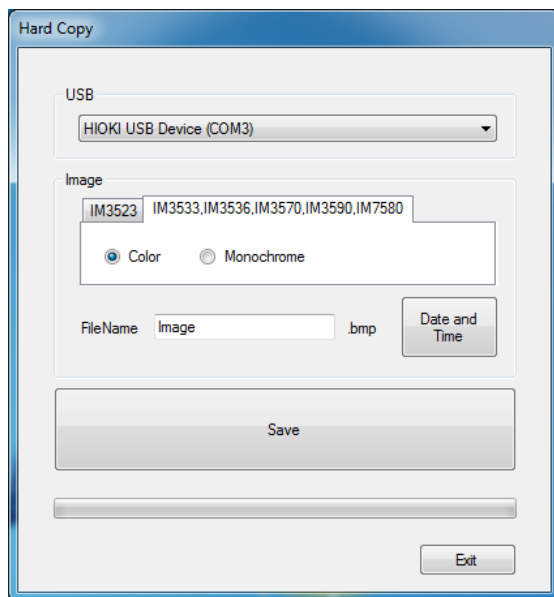


Figure 8-1 Screenshot screen

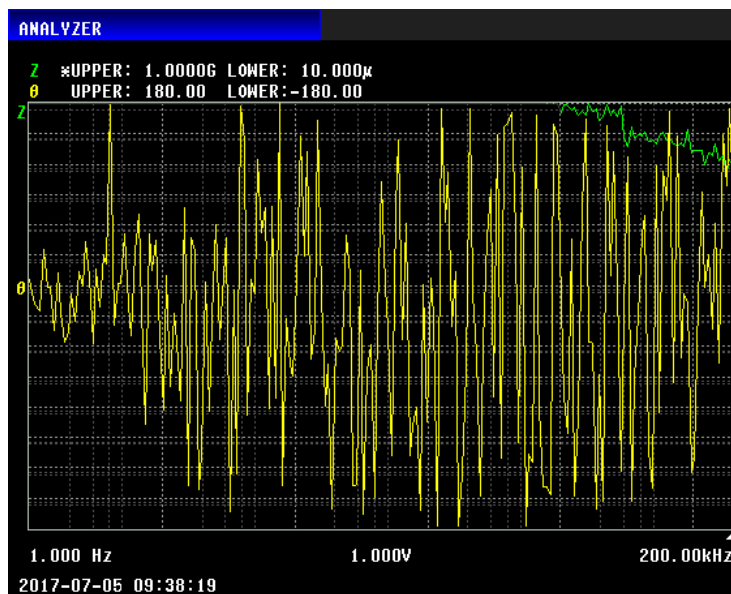
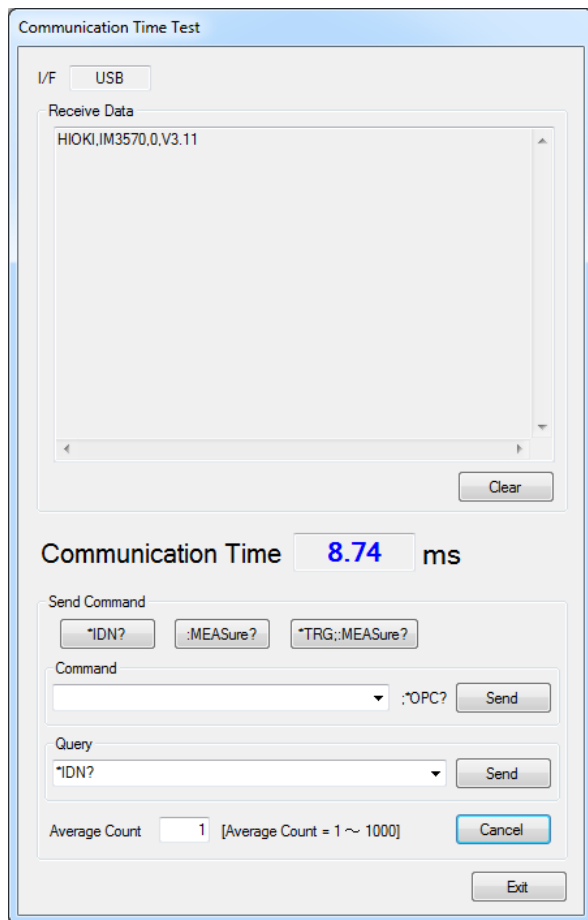


Figure 8-2 Example BMP file created by saving the measurement screen

## -9 Measurement of communication times

You can send a communications command and measure the communication time.



The image shows a software window titled "Communication Time Test". At the top, there is a tab labeled "I/F" with "USB" selected. Below this is a "Receive Data" section containing a text area with the text "HIOKI,IM3570,0,V3.11" and a "Clear" button. In the center, the "Communication Time" is displayed as "8.74 ms". Below this is a "Send Command" section with three buttons: "\*IDN?", ":MEASure?", and "\*TRG::MEASure?". Underneath these are two input fields: "Command" (with a dropdown menu and a "Send" button) and "Query" (with a dropdown menu and a "Send" button). At the bottom, there is an "Average Count" field set to "1" with a note "[Average Count = 1 ~ 1000]" and a "Cancel" button. An "Exit" button is located at the very bottom right of the window.

Figure 9-1 Communication time measurement screen



### (1) Saving of settings

You can save LCR meter settings to a file.

\*This functionality is limited to the IM3523.

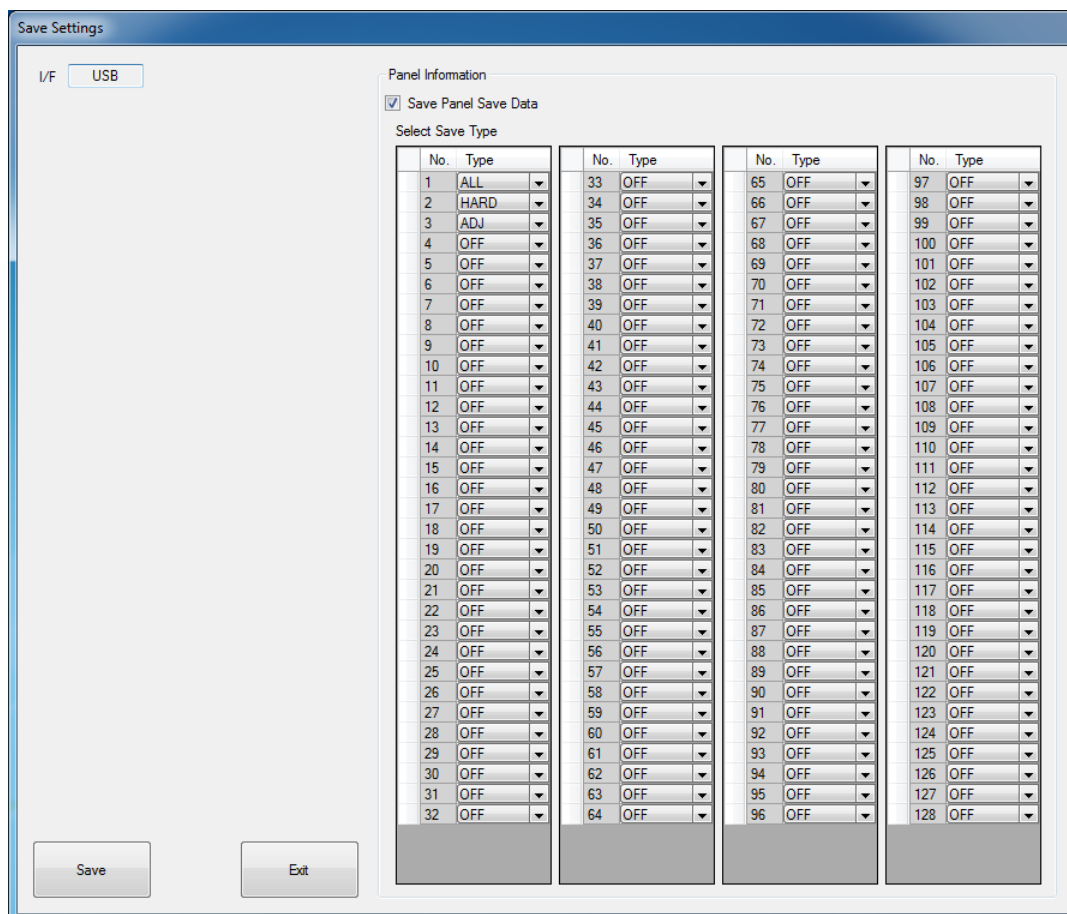


Figure 10-1 Save settings screen

### (2) Loading of settings

You can restore previously saved settings.

\*This functionality is limited to the IM3523.

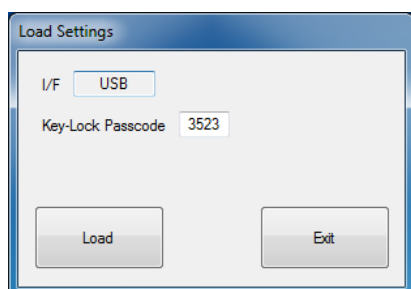


Figure 10-2 Load settings screen