## I Impedance Analyzer Sample Application

### -1 Overview

The Impedance Analyzer Sample Application is a sample application for use with impedance analyzers.

#### (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
- ANALYZER mode measurement
- Configuration of ANALYZER mode measurement conditions
- Display of ANALYZER mode measured values as a graph
- Display of ANALYZER mode measured values as a list
- Saving of ANALYZER mode measured value lists
- Calculation of measurement accuracy
- Calculation of the measurement range
- Acquisition of measurement screens
- Measurement of communications times

#### (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)
- Voltage characteristics (measurement while varying the voltage)
- Current characteristics (measurement while varying the current)
- Time interval measurement (measurement over a user-specified time interval) \*1
- "Acquire by pressing ENTER" measurement (one-time measurement) \*1

<sup>\*1</sup> 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 impedance analyzer 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:

- IM7580A
- IM7581
- IM7583
- IM7585
- IM7587

# -2 Start screen

The start screen is displayed when the Impedance Analyzer Sample Application is launched.

Impedance Analyzer Sample Applica	ation		×
File Tool Help			
Mode	2	ANALYZER	
Interface RS-232C Port COM1 GPIB (National Instru Address 01 USB	ments GPIB-USB-HS Only)	▼ Baud 9600	•
Port HIOKI U CLAN IP address 192.168	SB Device (COM3) 0.1 Port 3	1500	•
		Update interface sta	stus Exit

Figure 2-1 Start screen

Select the interface you're using to connect the impedance analyzer and switch to a function screen.

# -3 LCR mode

You can perform LCR mode measurement.

Impedance A	Analyzer Sample A	Application	1			
File Me	easure Comma	ind				
Z	4.	909	962o	hm	]	Exit LCR
OFF						Sat
PH	13	1.4	427d	eg		Set
OFF						
- AC INFOR	RMATION					
FREQ	300.0MHz	TRIG	EXTERNAL			
P	0.0dBm	SPEED	MEDIUM			
		AVG	OFF			
		DELAY	0.00000s			
		SYNC	OFF			
						TRIG

Figure 3-1 LCR mode screen

# (1) LCR settings

You can set the measurement conditions used in LCR mode.

Set LCR						
AC SET						
FREQ	300.0	MHz		TRIG	EXTERNAL 🔻	
LEVEL	P •	0.0	dBm	SPEED	MEDIUM -	
				AVG	1	
				DELAY	0.00000	s
				SYNC	OFF 🔻	0.00100 s
					ОК	Cancel

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.

Sweep Point	Sweep Mode
Input as line feed delimited	Frequency(MHz)
1.0000	
2.4950	© P(dBm) © V(mV) © I(mA)
3.9900	
5.4850	Set
6.9800	
8.4750	Interval between Sween Point
9.9700	
11.465	(0-32000)
12.960	Repeat Measurement
14.455	
17.445	Number of Measurements 1 🜩 Time
10.040	(1)
10.340	(1-)
20.430	
21.000	Interval between Measurements 0 🚔 s
24 920	(0.22000)
26.415	(0-52000)
27 910	
29 405	Acquire Voltage/Current Monitor Values
30.900	
32.395	Acquire Instrument Settings
33.890	
35.385	Output
36.880	Output
38.375	Microsoft Excel
39.870	<ul> <li>(Create New Sheet)</li> </ul>
41.365	
42.860	Microsoft Excel
44.355	(Send to cursor position Sneet)
45.850	Text File(CSV format)
40.040	
40.040 50.225	
51.000	
53 325	
54 820	Start Measuring Stop Measuring
56.315	
57.810	
59.305	Count 0
60.800	Count
62.295 +	

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.

Auto Setup	
Start Value	1
Stop Value	300
Data count	201 🚔
Scale	(1-5000) Linear 🔻
ОК	Cancel

Figure 3-4 Sweep point automatic setup screen

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

MODEL, IM7581 Serial NO.,000000100 Ver, V1.02 DATE, 2017-05-30 TIME, 17:37:48 AC SETTINGS FREQ, 300. 00000, MHz P, 0. 0, dBm SPEED, MEDIUM AVG, OFF DELAY, 0. 00000, s TRIG SYNC, OFF Frequency(MHz), AC Status, Z, PH, AC Vmoni, AC Imoni 1.0000, 3, 217.689E+03, 113.542, 447.111E-03, 2.05390E-06 2. 4950, 3, 100. 361E+03, 97. 396, 446. 991E-03, 4. 45384E-06 3.9900, 3, 64.9821E+03, 95.080, 446.870E-03, 6.87681E-06 5. 4850, 3, 47. 6127E+03, 95. 528, 446. 744E-03, 9. 38288E-06 6.9800, 3, 37.2920E+03, 94.200, 446.615E-03, 11.9762E-06 :

#### (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.

nterval Measurement	
Set	
Measurement Interval	0 s (0-32000)
Number of Measurements	1 Times (0-)
Acquire Voltage/Currer	nt Monitor Values
Acquire Instrument Set	tings
Output Output Microsoft Excel (Create New Sheet) Microsoft Excel (Send to cursor pos Text File(CSV format	) ition Sheet) tt)
Start Measuring Count 0	Stop Measuring
	Exit

Figure 3-5 Time interval measurement screen

Example	CSV	file	saved	during	time	interval	measurement
---------	-----	------	-------	--------	------	----------	-------------

```
MODEL, IM7581
Serial NO.,000000100
Ver, V1.02
DATE, 2017-05-30
TIME, 17:38:34
AC SETTINGS
FREQ, 300. 00000, MHz
P, 0. 0, dBm
SPEED, MEDIUM
AVG, OFF
DELAY, 0. 00000, s
TRIG SYNC, OFF
DATE, TIME, AC Status, Z, PH, AC Vmoni, AC Imoni
2017-05-30, 17:38:35, 3, 967. 101E+00, 90. 153, 425. 229E-03, 439. 694E-06
2017-05-30, 17:38:36, 3, 967. 394E+00, 90. 159, 425. 235E-03, 439. 568E-06
2017-05-30, 17:38:37, 3, 967. 762E+00, 90. 152, 425. 243E-03, 439. 409E-06
2017-05-30, 17:38:38, 3, 967. 387E+00,
                                       90.132, 425.235E-03, 439.571E-06
2017-05-30, 17:38:39, 3, 967. 428E+00,
                                        90.169, 425.236E-03, 439.553E-06
                                    :
```

#### (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.

Se	
	💿 Internal Trigger 🛛 💿 External Trigger
	Acquire Voltage/Current Monitor Values
	Acquire Instrument Settings
Ou	tput
	Microsoft Excel
	(Create New Sheet)
	<ul> <li>Microsoft Excel (Send to cursor position Sheet)</li> </ul>
	<ul> <li>Text File(CSV format)</li> </ul>
	Start Measuring Stop Measuring
	Start Measuring Stop Measuring
	Start Measuring Stop Measuring
	Start Measuring Stop Measuring Read measurement data

Figure 3-6 "Acquire by pressing ENTER" screen

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

```
MODEL, IM7581
Serial NO.,000000100
Ver, V1.02
DATE, 2017-05-30
TIME, 17:41:40
AC SETTINGS
FREQ, 300. 00000, MHz
P, 0. 0, dBm
SPEED, MEDIUM
AVG, OFF
DELAY, 0. 00000, s
TRIG SYNC, OFF
DATE, TIME, AC Status, Z, PH, AC Vmoni, AC Imoni
2017-05-30, 17:41:42, 3, 967. 677E+00, 90. 149, 425. 241E-03, 439. 446E-06
2017-05-30, 17:41:42, 3, 967. 451E+00, 90. 131, 425. 236E-03, 439. 543E-06
2017-05-30, 17:41:43, 3, 967. 311E+00, 90. 161, 425. 233E-03, 439. 604E-06
2017-05-30, 17:41:43, 3, 967. 495E+00,
                                       90.157, 425.237E-03, 439.524E-06
2017-05-30, 17:41:43, 3, 967.093E+00,
                                        90.133, 425.229E-03, 439.698E-06
                                    :
```

#### (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.

Measure	Command		
Sweep Measurement			
Interv	Interval Measurement		
Acqu	Acquire by pressing Enter		
Start Test Measurement			

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 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.





No	FREQUENCY(MHz)	Z(ohm)	PH(deg)	Rs(ohm)	X(ohm)	*	
1	1.0000	132454.0000	98.6170	-19844.9000	130959.0000	Ξ	Exit Analyze
2	1.0289	140226.0000	95.0320	-12299.1000	139686.0000		
3	1.0587	140632.0000	93.9750	-9749.5900	140294.0000		
4	1.0893	141268.0000	96.8580	-16868.4000	140257.0000		
5	1.1208	139397.0000	94.4900	-10913.2000	138969.0000		Set
6	1.1533	145978.0000	95.9350	-15094.7000	145196.0000		
7	1.1866	137827.0000	94.9660	-11929.8000	137310.0000		
8	1.2210	134291.0000	95.8110	-13595.8000	133601.0000		
9	1.2563	142683.0000	95.0110	-12463.6000	142138.0000		
10	1.2926	137882.0000	94.5580	-10958.2000	137446.0000		
11	1.3300	137427.0000	94.7800	-11452.0000	136949.0000		
12	1.3685	135018.0000	94.9290	-11600.1000	134519.0000		
13	1.4081	137007.0000	95.2690	-12581.2000	136428.0000		
14	1.4488	140968.0000	96.2200	-15272.9000	140138.0000		
15	1.4907	139884.0000	96.4570	-15729.9000	138996.0000		
16	1.5339	131752.0000	95.4470	-12506.3000	131158.0000		
17	1.5782	129757.0000	95.9510	-13452.4000	129058.0000	-	

Figure 4-2 ANALYZER mode list screen

## (1) ANALYZER settings

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

Set Analyzer
Parameter PARA1 Z V PARA2 PH V PARA3 Rs V PARA4 X V
Sweep Set SOURCE FREQUENCY TRIG DELAY 0.00000 s
Sweep Point Set
Basic Set FREQ 1.00000 MHz SPEED MEDIUM LEVEL P 0.0 dBm AVG 1 POINT DELAY 0.00000 s
OK Cancel

Figure 4-3 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.

X-axis Setting Scale	Linear 💌		
Y-axis Setting			
Parameter1		Parameter2	
Show	Show -	Show	Show -
Color	Select	Color	Select
Scale	Linear 🔻	Scale	Linear 💌
Grid	Show -	Grid	Show
Parameter3		Parameter4	
Show	Show -	Show	Show -
Color	Select	Color	Select
Scale	Linear 🔹	Scale	Linear 💌
Grid	Show -	Grid	Show -
Reset			ОК

Figure 4-4 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(MHz), Z, PH, Rs, X
1, 1. 0000, 219439. 0000, 110. 7870, -77879. 0000, 205154. 0000
2, 1. 0289, 217835. 0000, 109. 2170, -71700. 5000, 205697. 0000
3, 1. 0587, 227657. 0000, 114. 8600, -95709. 1000, 206562. 0000
4, 1. 0893, 215763. 0000, 111. 5610, -79290. 7000, 200666. 0000
5, 1. 1208, 214638. 0000, 111. 5450, -78821. 0000, 199642. 0000
6, 1. 1533, 203519. 0000, 110. 6760, -71859. 4000, 190411. 0000
7, 1. 1866, 213071. 0000, 111. 6570, -78634. 8000, 198030. 0000
8, 1. 2210, 197225. 0000, 109. 2250, -64943. 4000, 186225. 0000
9, 1. 2563, 203278. 0000, 108. 9010, -65850. 4000, 192317. 0000
10, 1. 2926, 194624. 0000, 108. 2740, -61027. 3000, 184809. 0000
:

## -5 Accuracy calculation

You can set measurement conditions and calculate the measurement accuracy.

[SET]					
MODEL	IM7581	•			
PARA	Z - PH	•	SPEED	MEDIUM	•
FREQ (MHz)	1.00000		LEVEL (dBm)	0.0	
[ MEAS VALUE Z =	1000.0000	ohm	PH =	0.000	deg
[ MEAS VALUE Z = [ MEAS Accurac	] 1000.0000 #/ ]	ohm	PH = Calculate	0.000	deg
[ MEAS VALUE Z = [ MEAS Accurac MIN	) 1000.0000 xy ] -4.14795	ohm %	PH = Calculate MIN	0.000	deg
[ MEAS VALUE Z = [ MEAS Accurac Z = MIN MAX	) 1000.0000 xy ] [-4.14795 [+4.14795	ohm % %	PH = Calculate PH = MIN MAX	0.000 -2.40581 2.40581	deg de de
[MEAS VALUE Z = [MEAS Accurac Z = MIN MAX [Z : 4.14795 % =	) 1000.0000 x ] -4.14795 +4.14795 0.56000 + 3.58795	ohm % %	PH = Calculate PH = MIN MAX	0.000 -2.40581 2.40581	deg de de

Figure 5-1 Accuracy calculation screen

-6 Measurement range calculation

You can set measurement conditions and calculate the measurement range.

Calc Measure	ement Range
[SET]	[W7764
MODEL	
FREQ (MH	łz) 1.00000
[ Measurer	nent Range ] Calculate
Z [ohm]	1.00000E-01 - 5.00000E+03
L [H]	1.59155E-08 - 7.95775E-04
C IF1	3 18310E-11 - 1 59155E-06
	Exit

Figure 6-1 Measurement range calculation screen

## -7 Screenshots

You can save the measurement screen as a BMP file.

Hard Copy	
Image	
FileName Image .bmp Date and Time	
Save	
Exit	

Figure 7-1 Screenshot screen



Figure 7-2 Example BMP file created by saving the measurement screen

## -8 Measurement of communication times

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

I/F USB				
Receive Data				
HIOKI,IM7581,0	D0000100,V1.02			*
4			[	Clear
Communic	ation Time	3 37	-	
Send Command	ation Time	3.37	ms	
Communic Send Command [*IDN?	ation Time	• <b>3.37</b> • TRG;: MEASure?	ms	
Communic Send Command "IDN? Command	ation Time	• <b>3.37</b> •TRG::MEASure?	ms opc?	Send
Communic Send Command "IDN? Command	ation Time	• <b>3.37</b> •TRG::MEASure?	ms opc?	Send
Communic Send Command "IDN? Command Query "IDN?	ation Time	• <b>3.37</b> •TRG::MEASure? • :	<b>ms</b> ropc? [	Send
Communic Send Command "IDN? Command Query "IDN? Average Count	:MEASure?	• <b>3.37</b> •TRG::MEASure? • :	ms 00PC? [ •	Send Send Cancel

Figure 8-1 Communication time measurement screen