



**ZM2371/ZM2372/ZM2376
Application Software**

Instruction Manual

DA00026022-005

**ZM2371/ZM2372/ZM2376
Application Software**

Instruction Manual

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--- Preface ---

Thank you very much for purchasing our “**ZM2371/ZM2372/ZM2376 LCR METER**”. To ensure safe use of this product, please read first “**Safety Precautions**” on the following pages.

■ Before Reading This Manual

This manual is intended for users with knowledge for basic operation of the operating system (OS) (Microsoft Windows) to be used. For basic operation of the Windows OS or definitions of terms such as “click” and “drag”, see the user’s guide of the Windows OS.

■ Caution Symbols Used in This Manual

The following caution symbols are used in this manual. Be sure to observe these caution symbols and their contents.

CAUTION

This mark indicates cautions on handling of this program.

● This manual has the following chapter organization.

If you use the product for the first time, read this manual, starting from “1. OVERVIEW” (page.1-0).

1. OVERVIEW

Describes the general of product functions.

2. INSTALLATION

Describes the environment necessary for the operations and how to install/uninstall the application software.

3. DISPLAY AND SETTING

Describes the screen display and how to make various settings.

4. OPERATION

Describes how to perform various measurement operations.

5. LIST OF SETTING TABLES

Gives various information tables.

6. USER MESSAGES

Describes error specifications.

7. MAINTENANCE

Describes how to cheack version

———— Safety Precautions ————

To ensure safe use, be sure to observe the following warnings and cautions.

NF Corporation shall not be held liable for damages that arise from a failure to observe these warnings and cautions.

- **Be sure to observe the contents of instruction manual.**

This instruction manual contains information for the safe operation and use of this product.

Be sure to read this information first before using this product.

All the warnings in the instruction manual must be heeded to prevent hazards that may cause major accidents.

- **In case of suspected anomaly**

If the product controlled by this editor emits smoke, an abnormal smell, or abnormal noise, immediately power it off and stop using it.

If such an abnormal occurs, prevent anyone from using this product until it has been repaired, and immediately report the problem to NF Corporation or one of our representatives.

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The “**ZM2371/ZM2372/ZM2376 Application Software**” (hereinafter, “ZM237x Application Software or this software”) was shipped after having undergone full testing and inspection by the NF Corporation.

Should this product fail due to a manufacturing flaw or due to a mishap during shipping, contact NF Corporation or one of our representatives.

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If a problem occurs or if you have questions, contact NF Corporation or one of our representatives where you purchased this product.

When contacting NF Corporation or one of our representatives, provide the model name (or product name), version number, and information as detailed as possible about the nature of the problem, conditions of use, etc.

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1. OVERVIEW

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1.1 General

The “**ZM237x Application Software**” supports the remote control of the LCR Meter ZM2371 / ZM2372 / ZM2376.

It runs on the Windows OS of personal computer (PC), and it sets and acquires various parameters and controls measurement with respect to the LCR Meter ZM2371 / ZM2372 / ZM2376 via USB.

Its main functions are as listed below:

- Sets and acquires measurement parameters
- Controls measurement and acquires measurement result
- Sends macro
- Outputs the acquired measurement result to a file

CAUTION

The Operation mode 1 is not supported in the ZM2376. Please, select the operation mode 0.

1.2 Software Configuration

The “**ZM237x Application Software**” runs as a single application software, and it can start from the start program menu or desktop icon created after installation.

The environmental setting information set by the application is managed with the system setting information file in the application data folder.

1.3 Measurement Status

For the “**ZM237x Application Software**”, the measurement status varies when various operations are executed.

- | | |
|------------------|--|
| ● Stand-by | Communication with device is not executed. |
| ● SpotMeasuring | Spot measurement is being executed. |
| ● SweepMeasuring | Sweep measurement is being executed. |
| ● MacroProc | User-described macro command is being sent. |
| ● Uploading | Various settings are being made to the device. |
| ● Downloading | Various settings are being received from the device. |
| ● Pausing | Measurement is paused. |

Fundamentally, when the operation that communicates with ZM237x device is under way, other operations are limited.

For operational limitations in the measurement status, see “**3.8 Functional Limitations According to Measurement Status**” (p3-14).

1.4 Log Output to Microsoft Excel File

The “**ZM237x Application Software**” cannot create a new file to which log data are output. To use this function, prepare the file in advance, or use the “Sample Template.xls” supplied along with this software.

To use the log output function in the “xls” format, the Microsoft Excel 2007 or later versions must be installed in your PC.

1.5 Conventions

This manual uses the following conventions:

- Menu names displayed on the screen, user input strings, and other elements: block letters enclosed by square brackets ([,]).
Examples: **[File (F)]**, **[12.3456]**
- Button names displayed on the screen user's key operations, and other elements: block letters enclosed by a box ().
Examples: , ,
- Strings and other elements expressing each function or item of this software : block letters enclosed by double quotation mark (" ").
Example: **"Display"**, **"Send Macro"**, **"Setting File"**
- Press one key while holding down another key → Two keys are connected by a plus (+) symbol.
Example: +
- Press one key, release it and after press another key → Two keys are divided a comma (,).
Example: ,

2. INSTALLATION

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2.1 System Requirements

Before installing this software, check that the system satisfies all the requirements below.

2.1.1 Personal computer

- Free hard disk space 64 MB or more
- Display: 800 × 600 pixels or higher and High Color(16bit) or more
- OS: Windows 7(32bit/64bit)/ Windows 8.1 (32bit/64bit)/
Windows 10 (32bit/64bit)
- Disk drive: CD-ROM drive
- Communication interface: USB

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CAUTION

The CD-ROM drive is required only when the software is installed.

2.1.2 Software component

- Microsoft .NET Framework 4.0

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2.2 Installation Procedure

For installing or uninstalling the software, log on to the Windows as a user having administrative privilege.

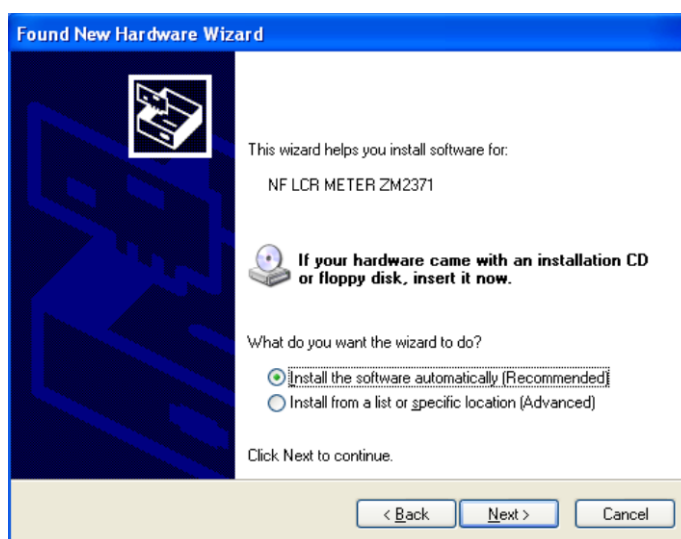
2.2.1 Installing the USB driver software

For users who do not have VISA environment (Windows 7 only)

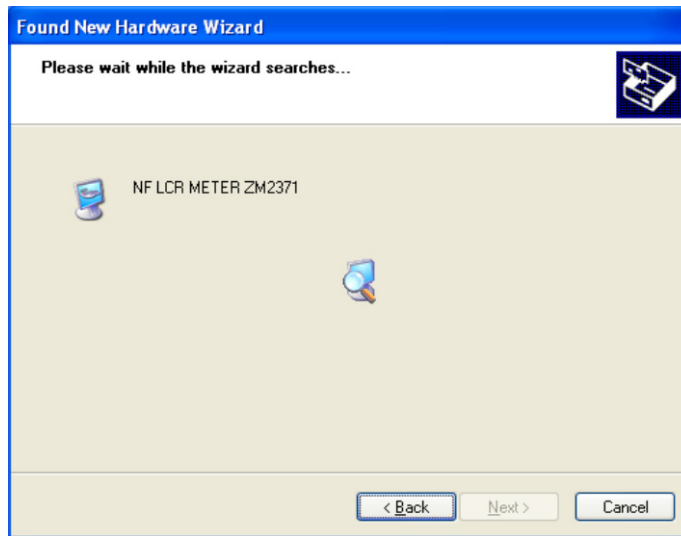
For communication with the ZM2371/ZM2372/ZM2376, the USB driver must be installed. The USB driver can be used in Windows 7 only. The USB driver is not tested in Windows 8.1 and Windows 10. Thanks in advance.

[Setup procedure]

- (a) Insert the CD-ROM into the CD-ROM drive of the PC.
- (b) Execute **[English\Application\Driver\x86\Setup.EXE]** on the CD-ROM.
If using Windows 7(64bit), execute **[English\Application\Driver\x64\Setup.EXE]**.
- (c) Click the **[Next]** button, following the screen guidance to start installation.
A warning message by Windows security will be displayed, but select **[Install this driver software]** to continue installation.
- (d) Upon completion of setup program, connect the device to the personal computer, and power on the device.
The Windows will recognize device automatically and the driver will be set up.



2.2 Installation Procedure



[Note]

The installed USB driver runs with the ZM2371/ZM2372/ZM2376 only.

It is not compatible with the VISA environment. If you communicate with other devices in the VISA environment, use the software in the VISA environment.

VISA (Virtual Instrument Software Architecture) is the standard recommended by VXI plug & play System Alliance that promotes the standardization of instrument software architecture.

For users who have already been using VISA environment

This software can be used in the VISA environment if the VISA environment has been established in the user's personal computer.

Select **[VISA]** for the setting in "4.9 Configuration, 4.9.1 Communication setting, b) Driver type".

The operation of this software in VISA environment has been checked with the NI-VISA of National Instruments Corporation.

Operation check version: NI-VISA version 16.0

Please note that operation troubles in other vendors' VISA environment may be attributable to user's own problem.

To use this software in the NI-VISA environment, the user has to acquire the license from National Instruments Corporation.

For the NI-VISA, make an inquiry to National Instruments Corporation.

The information on National Instruments Corporation and NI-VISA can be got at the Web site of <http://www.ni.com/>.

2.2.2 ZM237x application software

- (a) Insert the CD-ROM into the CD-ROM drive of the PC.
- (b) Execute **[English\Application\Setup.EXE]** on the CD-ROM or **[D:\English\Application\Setup.EXE]** from **[Run]** on the start menu.
[D:] indicates the CD-ROM drive. If another drive letter is assigned to the CD-ROM driver, assign it appropriately, according to your system.
- (c) Click the **Next** button, following the screen guidance to start installation.
- (d) When installation has been completed this software can be executed.
Click **[ZM237x Application]** from **Start** – **[All Programs]** – **[NF]** – **[ZM]** – **[ZM237x]** to execute the software.

2.2.3 Uninstalling ZM237x application software

Start **[Add or Remove Programs]** on the control panel, and select “**NF ZM237x Application Software**” and then click **Change/Remove** button to delete this software.

Not that the folder in which the this software was installed may not be removed in some case. All the files created in the folder remains as they are. If the holder is unnecessary, delete it after uninstllation.

3. DISPLAY AND SETTING



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3.1 Start and Exit of Program

3.1.1 Start

To start this software, double-click the shortcut icon for ZM237x application software created automatically on the desktop, or select **Start** → **All Programs** → **NF** → **ZM** → **ZM237x** → **ZM237x Application**.

3.1.2 Exit

To exit this software, click the **X** button at the upper right of this software screen, or press the **Alt** + **F4** keys. Or, execute the menu **[File (F)] – [Exit (X)]** (**Ctrl** + **X** or **Alt**, **F**, **X**). If executed, the following screen (Figure 3-1 Exit confirmation screen) will appear, and then select **Yes** to exit, or **No** to cancel.

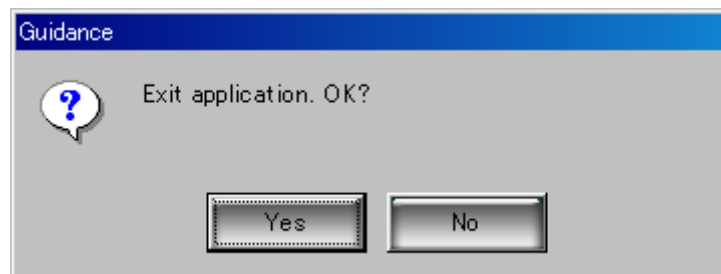


Figure 3-1 Exit confirmation screen

3.2 Main Screen Structure

This section describes the outline of main screen structure of this software.

The software name and the file name in or from which this software was saved or read are displayed on the title bar. “Untitled” is displayed in the file name display field when file operation is not performed immediately after start.

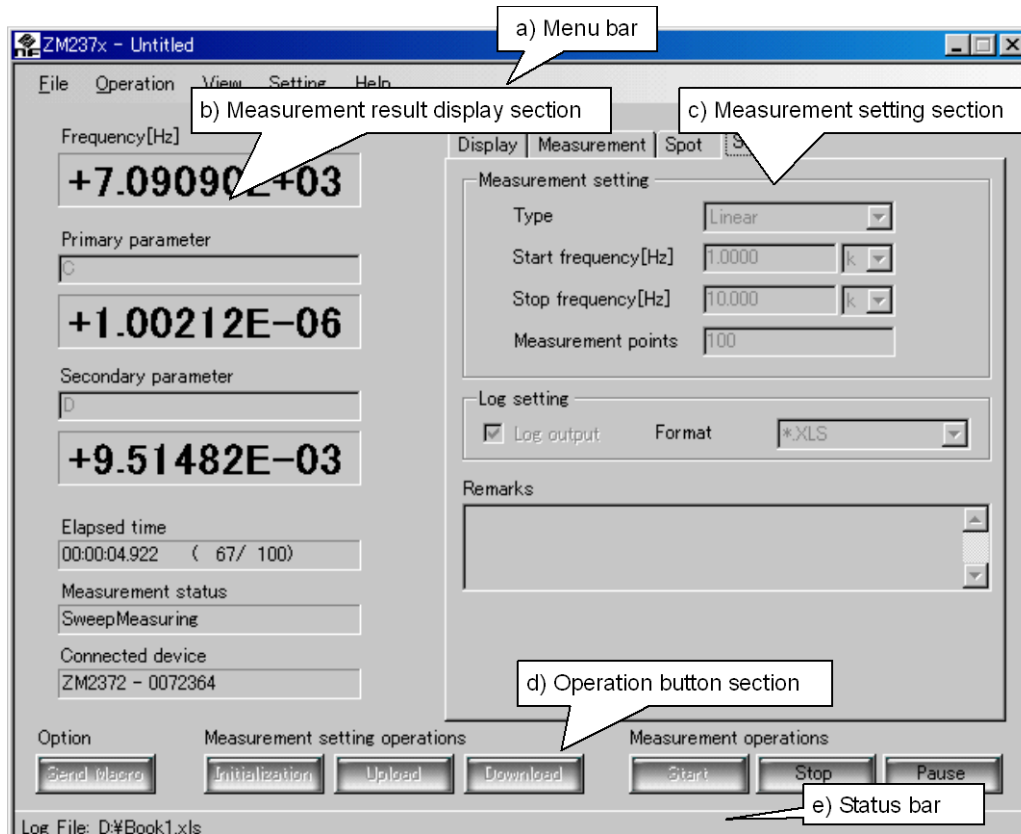


Figure 3-2 Screen structure

a) Menu bar

☞ See “3.3 Menu Bar” (p.3-3)

b) Measurement result display section

☞ See “3.4 Measurement Result Display Section” (p.3-4)

c) Measurement setting section

☞ See “3.5 Measurement Setting Section” (p.3-6)

d) Operation button section

☞ See “3.6 Operation Button Section” (p.3-12)

e) Status bar

☞ See “3.7 Status Bar” (p.3-13)

3.3 Menu Bar

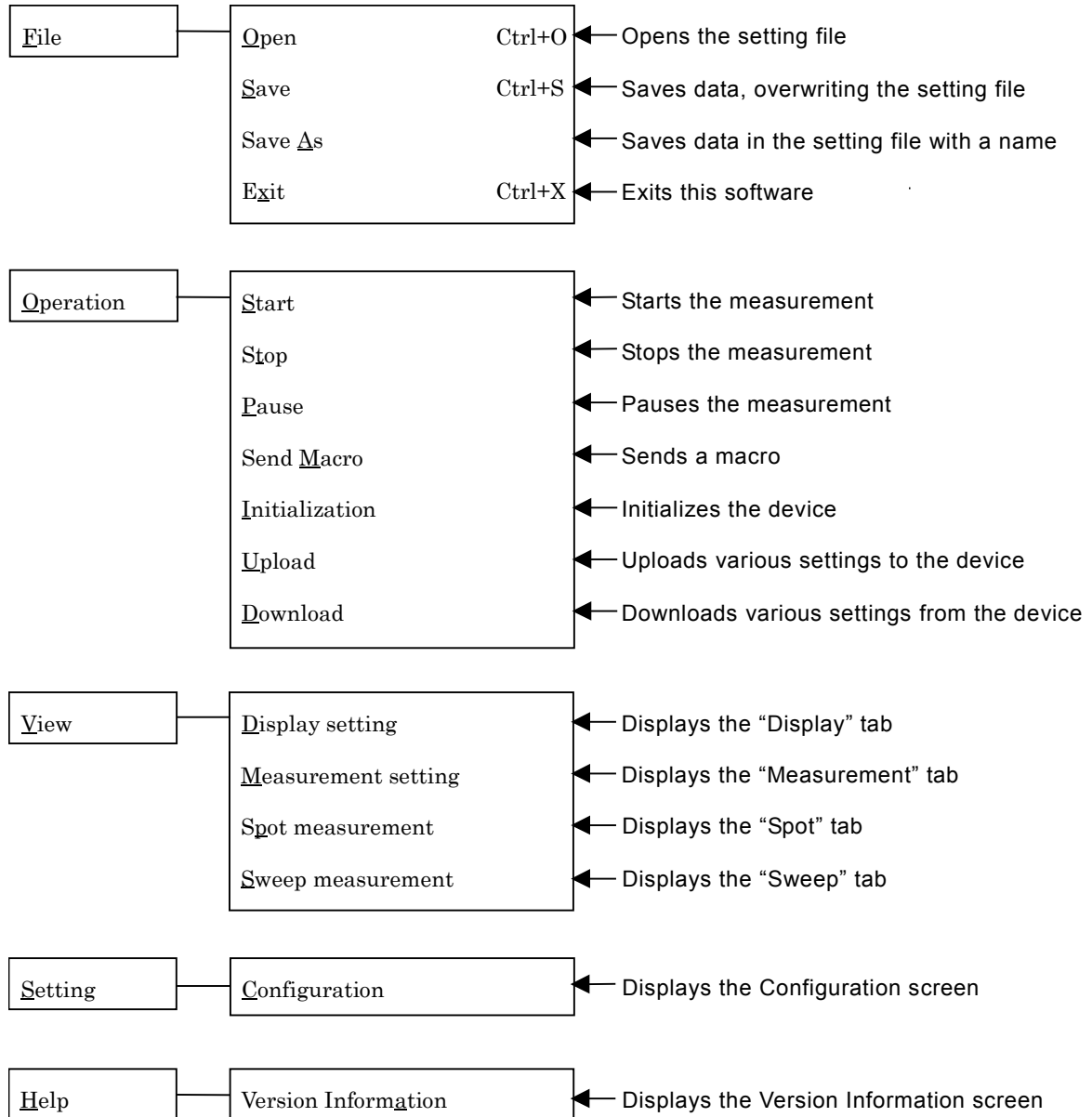


Figure 3-3 Menu bar

Each item of menu bar is switched between enable and disable according to the **[Measurement status]** of this software.

For details, see “**3.8 Functional Limitations According to Measurement Status**” (p.3-14).

3.4 Measurement Result Display Section

3.4.1 Measurement result display

In the measurement result display field, the latest measurement result information during the measurement is displayed.

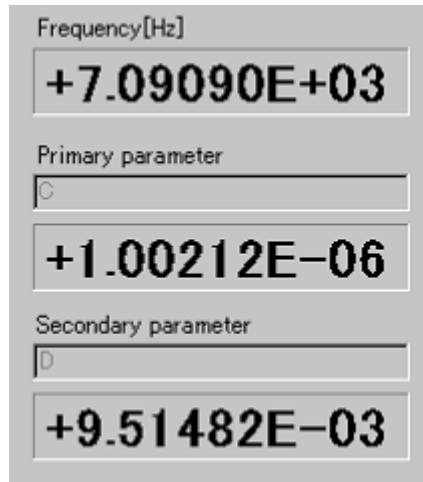


Figure 3-4 Measurement result display

a) Frequency

The frequency used for the latest measurement is displayed.

In the sweep measurement, the measurement is executed while the frequency is varied, and therefore the frequency value varies every measurement.

b) Primary parameter

The primary parameter being measured is displayed.

In the upper area, the item name of primary parameter being measured is displayed.

In this text area, the user can enter arbitrary character string. Also, if the type of primary parameter is changed in “3.5.1 Display” (p.3-6), appropriate parameter item name is entered automatically.

In the lower area, the latest measurement result of primary parameter is displayed.

c) Secondary parameter

The secondary parameter being measured is displayed.

In the upper area, the item name of secondary parameter being measured is displayed.

In this text area, the user can enter arbitrary character string. Also, if the type of secondary parameter is changed in “3.5.1 Display” (p.3-6), appropriate parameter item name is entered automatically.

In the lower area, the latest measurement result of secondary parameter is displayed.

These parameters are updated only during measurement, and after the measurement finished, the latest measurement result is kept displayed. For various measurements, see “4. Operation” (p.4-0).

3.4.2 Measurement status display

In the measurement status display field, various statuses during measurement or in stand-by state are displayed.

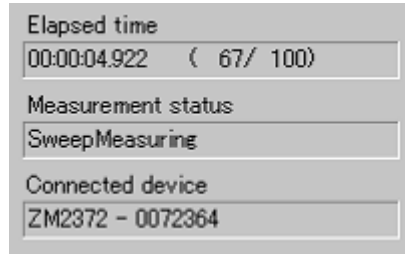


Figure 3-5 Measurement status display

a) Elapsed time

The elapsed time since the measurement started and the measurement count are displayed.

The elapsed time is displayed in the format of hour:minute:second (hh:mm:ss.sss), and the measurement count is displayed in the format of measurement count/total measurement count.

b) Measurement status

Current measurement status is displayed. The measurement status varies as listed below.

Table 3-1 Description of measurement status

Measurement status	Description
Stand-by	Device stands by for various operations.
Pausing	Various operations are paused.
SpotMeasuring	Spot measurement is under way.
SweepMeasuring	Sweep measurement is under way.
Uploading	Setting to the device is under way.
Downloading	Acquisition of settings from device is under way.
MacroProc	Macro send is under way.

During communication with various devices, the operation that includes a change in measurement setting is disabled.

For the operational limitations, see “**3.8 Functional Limitations According to Measurement Status**” (p.3-14).

c) Connected device

The model name and its serial number connected for measurement or setting are displayed.

After checking that the device used for measurement is displayed, perform various operations.

3.5 Measurement Setting Section

3.5.1 Display

With the display, set the primary and secondary parameters displayed in “**3.4 Measurement Result Display Section**” (p.3-4).

For details of parameters, see the instruction manual of the device.

Figure 3-6 Display

a) Type

Select the type of primary/secondary parameter. If the type is changed, the parameter item name in “**3.4.1 Measurement result display**” (p.3-4) is changed to the selected parameter item name.

b) Deviation display

Select the deviation display format when measurement is executed with the primary/secondary parameter.

ABS	Measured value is displayed as it is. (Default)
DEV	Deviation from reference value is displayed. Deviation = Measured value – Referenced value
PCNT	Deviation is displayed in percent to the reference value. Deviation % = ((Measured value – Referenced value) / Referenced value) × 100

c) Deviation reference value

Set reference value when the deviation is displayed in primary/secondary parameter. The unit of reference value is interpreted according to the parameter (ex. Z → Ω).

d) Remarks

Up to 100 characters can be described as a user’s own memo in remarks field. Note that a comma “,” and line feed (CRLF) can be used in a character string, but they are output as they are in the log output file in the CSV format.

3.5.2 Measurement

With the measurement, set various parameters used for actual measurement.
For details of parameters, see the instruction manual of the device.

Figure 3-7 Measurement

a) Frequency

Set the frequency used for measurement.

Enter a numeric value in the text area and from the combo box on the right side, select the desired SI prefix, so that you can set a multiplier for the entered numeric value.

For the input of frequency, “**3.5.5 Parameter input limitation**” (p.3-11) is applied.

b) Voltage level

Set the measurement voltage level. The measurement voltage level can be set with the resolution 10mV (voltage level $\geq 1V$) or 1mV (voltage level $< 1V$).

For the out-of-range input, warning is displayed as described in “**3.5.5 Parameter input limitation**” (p.3-11).

c) ALC

Set the automatic level control and a drive system.

When the DUT is driven with constant voltage or current, set the ALC function to ON (constant voltage (CV) or constant current (CC)). When specifying the constant voltage (CV) or constant current (CC), set or check the voltage or current value in advance.

d) Constant current level

Set the measurement current level when the DUT is driven with constant current.

For the out-of-range input, warning is displayed as described in “**3.5.5 Parameter input limitation**” (p.3-11).

e) Auto ranging

By checking or unchecking the “Auto ranging” checkbox, set auto ranging (check) or hold (uncheck) of the measurement range.

f) Measurement range

When “Range Auto ranging” is held (uncheck), the measurement range can be set manually. When the measurement range is held, select a range so as to measure the DUT within the recommended range as closely as possible, considering the variations of DUT.

g) Trigger source

Set the trigger source by selecting one of sources given in the combo box. Select either of the following trigger sources used for the measurement:

Internal	Internal trigger. Trigger is applied automatically at the completion of measurement to execute measurement continuously. Other trigger signals are ignored.
Manual	Manual trigger. Trigger can be applied by pressing the TRIG key on the front panel.
External	External trigger. Trigger is applied by TRIG signal of handler interface.
Bus	Trigger is applied by remote control. See description of *TRG and GET.

h) Trigger delay time

The trigger delay time is the time from trigger up to signal acquisition start. The signal settling time varies depending on the nature of DUT or required accuracy. Set long trigger delay time to the extent that the measured value does not change even if the trigger delay time is varied a little.

For the out-of-range input, warning is displayed as described in “**3.5.5 Parameter input limitation**” (p.3-11).

i) Measurement speed

Set the measurement speed by selecting one of speeds given in the combo box.

j) DC bias

Set the DC bias output ON (DC-biased voltage is effective) or output OFF (0V).

To disable the DC bias setting, uncheck the checkbox.

When the DC bias setting is enabled, set the DC bias voltage with the resolution 0.01V.

For the out-of-range input, warning is displayed as described in “**3.5.5 Parameter input limitation**” (p.3-11).

k) Averaging count

To enable the averaging, check the checkbox, or to disable the averaging, uncheck the checkbox. When the measured value varies due to noise, the averaging function can reduce the variations.

Setting a large value to the averaging count causes a long time to be taken for one measurement. For the out-of-range input, warning is displayed as described in “**3.5.5 Parameter input limitation**” (p.3-11).

3.5.3 Spot

With the spot, set the parameters necessary for the spot measurement.

 See “4.1 Spot Measurement” (p.4-1)

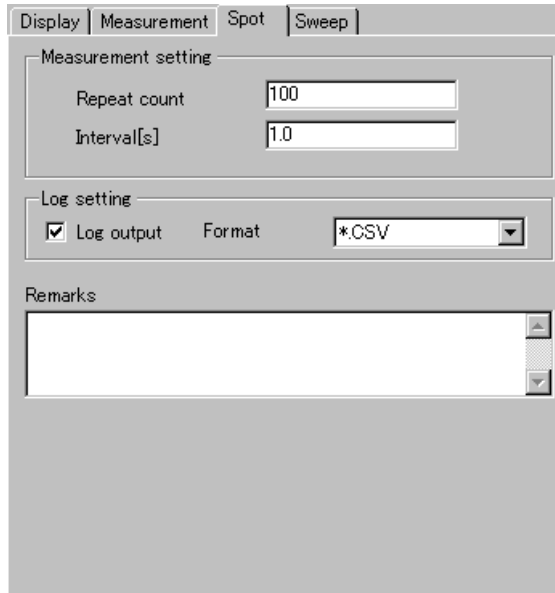


Figure 3-8 Spot

a) Repeat count

Set how many times the measurement is repeated.

For the out-of-range input, warning is displayed as described in “3.5.5 Parameter input limitation” (p.3-11).

b) Interval

Set the interval (wait interval) between measurements when the measurement is executed by the amount of specified repeat count.

For the out-of-range input, warning is displayed as described in “3.5.5 Parameter input limitation” (p.3-11).

c) Log setting

To output the measurement result to a log file, check the “Log output” checkbox and set the log output format.

If the “Log output” checkbox is unchecked (disabled), the log output function of measurement result is disabled.


For the log output function of measurement result, see “4.1.3 Log output” (p.4-2).

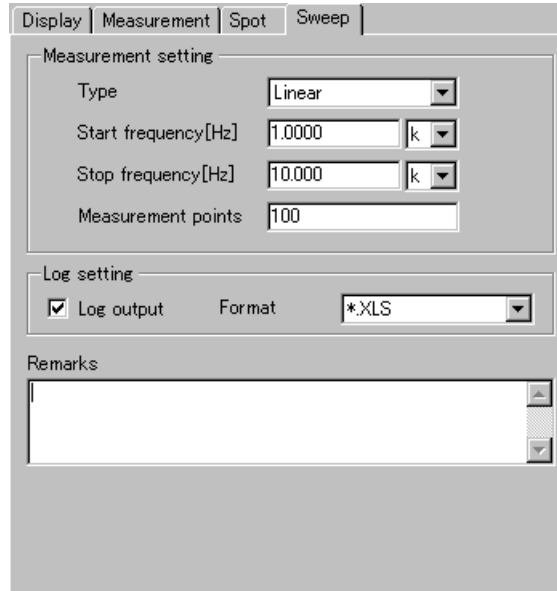
d) Remarks

Up to 100 characters can be described as a user’s own memo in remarks field. Note that a comma “,” and line feed (CRLF) can be used in a character string, but they are output as they are in the log output file in the CSV format.

3.5.4 Sweep

With the sweep, set the parameters necessary for the sweep measurement.

 See “4.2 Sweep measurement” (p.4-4)



The screenshot shows a software interface for setting a sweep measurement. At the top are four tabs: 'Display', 'Measurement', 'Spot', and 'Sweep'. The 'Sweep' tab is selected. Below the tabs is a 'Measurement setting' section with four fields: 'Type' (a dropdown menu set to 'Linear'), 'Start frequency[Hz]' (a text box with '1.0000' and a unit dropdown set to 'k'), 'Stop frequency[Hz]' (a text box with '10.000' and a unit dropdown set to 'k'), and 'Measurement points' (a text box with '100'). Below this is a 'Log setting' section with a checked 'Log output' checkbox and a 'Format' dropdown menu set to '*.XLS'. At the bottom is a 'Remarks' section with a large text area for notes.

Figure 3-9 Sweep

a) Type

Select “Linear” or “Log” as the type of sweep measurement.

b) Start/Stop frequency

Set the start/stop frequency of the sweep measurement with the resolution 5 digits (however, resolution mHz (three explicit decimal point) if less than 1Hz).

For the out-of-range input, warning is displayed as described in “3.5.5 Parameter input limitation” (p.3-11).

c) Measurement points

Set the measurement points in the sweep measurement.

For the out-of-range input, warning is displayed as described in “3.5.5 Parameter input limitation” (p.3-11).

d) Log setting

To output the measurement result to a log file, check the “Log output” checkbox and set the log output format.

If the “Log output” checkbox is unchecked (disabled), the log output function of measurement result is disabled.

For the log output function of measurement result, see “4.1.3 Log output” (p.4-2).

e) Remarks

Up to 100 characters can be described as a user’s own memo in remarks field. Note that a comma “,” and line feed (CRLF) can be used in a character string, but they are output as they are in the log output file in the CSV format.

3.5.5 Parameter input limitation

For the input of numeric value in the measurement parameters, a settable range is limited.

If other than numeric value is entered, or if the out-of-range value is entered, the warning screen as shown below is displayed and the setting is returned to the value set previously.

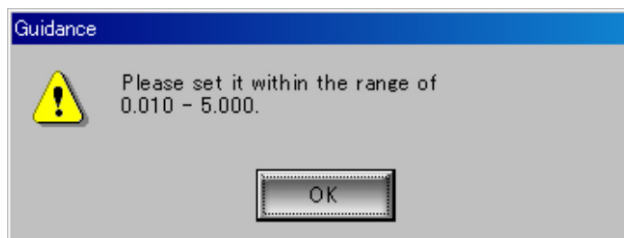


Figure 3-10 Parameter input range warning display

For the input limited values of respective parameters, see “**5.2 List of Input Limited Values**” (p.5-2).

3.6 Operation Button Section

Each operation button in the operation button block corresponds to the item having same name in the [Operation] menu.

Each button in the operation button section is switched between active and inactive according to the [measurement status] of this software.

For details, see “3.8 Functional Limitations According to Measurement Status” (p.3-14).

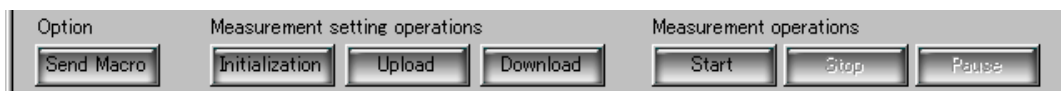


Figure 3-11 Operation button section

3.6.1 Measurement operations

Select the measurement operation buttons to start or stop the spot measurement or sweep measurement.

For details of each measurement, see the following:

🔗 See “4.1 Spot Measurement” (p.4-1)

🔗 See “4.2 Sweep measurement” (p.4-4)

a) Start

Starts the spot measurement or sweep measurement. The [measurement status] becomes “SpotMeasuring” or “SweepMeasuring”. The measurement restarts when [measurement status] is “Pausing”.

b) Stop

Stops current operation and causes [measurement status] to be “Stand-by”.

c) Pause

Pauses current sweep measurement and causes [measurement status] to be “Pausing”.

3.6.2 Measurement setting operations

a) Initialization

🔗 See “4.3 Initialization” (p.4-6)

b) Upload

🔗 See “4.4 Upload” (p.4-7)

c) Download

🔗 See “4.5 Download” (p.4-8)

3.6.3 Option

a) Send Macro

Opens the command text file that the user described arbitrarily, and sends it to the device.

🔗 See “4.6 Send Macro” (p.4-9)

3.7 Status Bar

On the status bar, the log output file name is displayed when [measurement status] is “Measuring”, or “Pausing” and also the log output of measurement result is enabled. If the log output of measurement result is disabled, nothing is displayed in the position where the file name is displayed.

Also, when the measurement processing completed and [measurement status] becomes “Stand-by”, the display of log output file name is cleared.

 See “4.1.3 Log output” (p.4-2)



Figure 3-12 Status bar

3.8 Functional Limitations According to Measurement Status

Table 3-2 Functional limitations according to measurement status

Classifi- cation	Items		Measurement statuses						
			Stand- by	Spot Measuring	Sweep Measuring	Up loading	Down loading	Macro Proc	Pausing
Menu	File	Open	○	×	×	×	×	×	×
		Save	○	○	○	○	○	○	○
		Save As	○	○	○	○	○	○	○
		Exit	○	○	○	○	○	○	○
	Operation	Start	○	×	×	×	×	×	○
		Stop	×	○	○	○	○	○	○
		Pause	×	×	○	×	×	×	×
		Send Macro	○	×	×	×	×	×	×
		Initialization	○	×	×	×	×	×	×
		Upload	○	×	×	×	×	×	×
		Download	○	×	×	×	×	×	×
	View	Display setting	○	○	○	○	○	○	○
		Measurement setting	○	○	○	○	○	○	○
		Spot measurement	○	○	○	○	○	○	○
		Sweep measurement	○	○	○	○	○	○	○
	Setting	Configuration	○	×	×	×	×	×	×
	Help	Online Help	○	○	○	○	○	○	○
		Version Information	○	○	○	○	○	○	○
Operation buttons	Send Macro		○	×	×	×	×	×	×
	Initialization		○	×	×	×	×	×	×
	Upload		○	×	×	×	×	×	×
	Download		○	×	×	×	×	×	×
	Start		○	×	×	×	×	×	○
	Stop		×	○	○	○	○	×	○
	Pause		×	×	○	×	×	×	×

4. OPERATION

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4.1 Spot Measurement

4.1.1 Start operation

When [measurement status] of this software is “Stand-by”, if the Spot is displayed, [Operation (O)] – [Start (S)] menu and the **Start** button in the operation button section become active, and you can select either way to start the spot measurement.

 See “3.8 Functional Limitations According to Measurement Status” (p.3-14)

After you selected the start, the software establishes communication with the device and acquires the parameter information set to the device. In such a case, if an event that the device does not accept the communication (warning status on the device side) or an error that, for instance, the communication with device is interrupted occurs, the warning screen is displayed and the measurement cannot be continued.

 See “4.7 Operation Stop Due to Drive Error or Communication Error” (p.4-11)

If [Log output] is checked (enabled) before the measurement starts, the measurement settings are output to the log file by specifying the log output file. After that, the measurement results acquired from the device are output to the specified file as needed. For details, see “4.1.3 Log output” (p.4-2).

4.1.2 Stop operation

To stop the ongoing spot measurement, click the **Stop** button ([Operation (O)] – [Stop (E)] or **Alt**, **O**, **T**).

4.1.3 Log output

To execute the log output, check the **[Log output]** (enabled) in “**3.5.3 Spot**” (p.3-9) and select from **[Format]** the file format to be output.

By specifying the log output target file at the start of measurement, the measurement settings and measurement results can be output to the log file. The specified log output file path is displayed on the status bar at the bottom of main screen.

If the log output of measurement settings or measurement results failed by any reason, the warning screen appears and the measurement processing stops.

Depending on the setting of [Format], the file specified at the start of measurement and the log output operation are different.

a) CSV format

The measurement settings and measurement results are saved in a file in the CSV format (file extension: *.CSV).

At the start of measurement, display the **[Save As]** dialog, and specify the log output target file and click the **OK** button, so that the log data are output to the specified file (created).

b) XLS format

Start the file in the Microsoft Excel format (file extension: *.xls), so that the measurement settings and measurement results are output according to the cell setting of the specified file.

Also, if [*.XLS] is selected as the format, before starting the measurement, specify [Sheet name], [Starting Cell row], and [Starting Cell column] by referring to “4.9 Configuration” (p.4-13).

At the start of measurement, display the **[File Open]** dialog, and select the log output file and click the **OK** button, so that the Microsoft Excel starts and the log data are output to the specified cell.

4.1 Spot Measurement

4.1.4 Log file format

The log file format of the spot measurement is as listed below.

At the output to the XLS file, the log data are output in the following format with the base point located in the cell described to **[Starting Cell row]** and **[Starting Cell column]** in **"4.9 Configuration"** (p.4-13).

Table 4-1 Spot measurement log file format

Row	Major category (column 1)	Minor category (column 2)	Item (column 3)	Set value (column 4)
1	[MeasureSetting]			
2	Display	Primary parameter	Label	Up to 16-character text
3			Type	"Z Y R Rp Rs G C Cp Cs L Lp Ls REAL MLIN"
4			Deviation display	"ABS DEV PCNT"
5			Deviation reference value	0, ±(1.00000E-16 to 9.99999E+11)
6		Secondary parameter	Label	Up to 16-character text
7			Type	"Q D Phase X B Rs Rp G Lp Rdc IMAG REAL"
8			Deviation display	"ABS DEV PCNT"
9			Deviation reference value	0, ±(1.00000E-16 to 9.99999E+11)
10	Measurement	Frequency	Frequency	*
11		Signal level	ALC	"OFF CV CC"
12			Constant voltage level	0.010 to 5.00
13			Constant current level	0.001 to 200.000
14		Range	Auto ranging	"ON OFF"
15			Measurement range	"100mOhm 1Ohm 10Ohm 100Ohm 1kOhm 10kOhm 100kOhm 1MOhm"
16		Trigger	Trigger source	"Internal Manual External BUS"
17			Trigger delay time	*
18		Measurement speed	Measurement speed	"Rapid FAST MED SLOW VerySLOW"
19		DC bias	Enable	"ON OFF"
20			Setting	*
21		Averaging	Enable	"ON OFF"
22			Averaging count	1 to 256
23	Remarks	Remarks	Remarks	Up to 100-character text
24	— (Blank row)			
Item (column 1)				Set value (column 2)
25	[SpotSetting]			
26	Repeat count			1 to 10000
27	Interval			0.5 to 100.0
28	Remarks			Up to 100-character text
29	— (Blank row)			
	Index (column 1)	Elapsed time (column 2)		Measurement result (column 3 and later)
30	[Spot Result]			
31	No.	Elapsed time		Result
32	1	YYYY/MM/DD hh:mm:ss.xxx		Measurement result (first time))
...	. . .			
n	n	YYYY/MM/DD hh:mm:ss.xxx		Measurement result (nth time)

* Depends on the model

	ZM2371/ZM2372	ZM2376
Frequency	0.001 ~ 100.000E+3	0.001 ~ 5.50000E+6
Trigger delay time	0.000 ~ 999.999	0.0000 ~ 999.9999
DC bias setting	0.00 ~ 2.50	0.000 ~ 5.000

4.2 Sweep Measurement

4.2.1 Start operation

When [measurement status] of this software is “Stand-by”, if the Sweep is displayed, [Operation (O)] – [Start (S)] menu and the **Start** button in the operation button section become active, and you can select either way to start the sweep measurement.

 See “3.8 Functional Limitations According to Measurement Status” (p.3-14)

After you selected the start, the software establishes communication with the device and acquires the parameter information set to the device. In such a case, if an event that the device does not accept the communication (warning status on the device side) or an error that, for instance, the communication with device is interrupted occurs, the warning screen is displayed and the measurement cannot be continued.

 See “4.7 Operation Stop Due to Drive Error or Communication Error” (p.4-11)

If [Log output] is checked (enabled) before the measurement starts, the measurement settings are output to the log file by specifying the log output file. After that, the measurement results acquired from the device are output to the specified file as needed. For details, see “4.1.3 Log output” (p.4-2).

4.2.2 Stop operation

To stop the sweep measurement which is under way or in pause status, click the **Stop** button ([Operation (O)] – [Stop (E)] or **Alt**, **O**, **T**). ([Measurement status] becomes “Stand-by”)

After the measurement stopped, the measurement cannot restart from the stop point, To restart the measurement, execute the measurement stop processing from the **Pause** processing.

4.2.3 Pause operation

To pause the ongoing sweep measurement, click the **Pause** button ([Operation (O)] – [Pause (P)] or **Alt**, **O**, **P**). ([Measurement status] becomes “Pausing”)

To restart the measurement from the pause status, select [Start] operation. To stop the measurement, perform [Stop] operation.

4.2.4 Log output

In the sweep measurement, the log output can be executed same as spot measurement.

 See “4.1.3 Log output” (p.4-2)

4.2.5 Log file format

The “CSV format” log output file format of the sweep measurement is as listed below.
In the case of “XLS format”, the log data are output with the base point located in the cell described to **[Sheet name]**, **[Starting Cell row]** and **[Starting Cell column]** in “4.9 Configuration” (p.4-13), similarly to CSV format.

Table 4-2 Sweep measurement log file format

Row	Major category (column 1)	Minor category (column 2)	Item (column 3)	Set value (column 4)
1	[MeasureSetting]			
2	Display	Primary parameter	Label	Up to 16-character text
3			Type	"Z Y R Rp Rs G C Cp Cs L Lp Ls REAL MLIN"
4			Deviation display	"ABS DEV PCNT"
5			Deviation reference value	0, ±(1.00000E-16 to 9.99999E+11)
6		Secondary parameter	Label	Up to 16-character text
7			Type	"Q D Phase X B Rs Rp G Lp Rdc IMAG REAL"
8			Deviation display	"ABS DEV PCNT"
9			Deviation reference value	0, ±(1.00000E-16 to 9.99999E+11)
10	Measurement	Frequency	Frequency	*
11		Signal level	ALC	"OFF CV CC"
12			Constant voltage level	0.010 to 5.00
13			Constant current level	0.001 to 200.000
14		Range	Auto ranging	"ON OFF"
15			Measurement range	"100mOhm 1Ohm 10Ohm 100Ohm 1kOhm 10kOhm 100kOhm 1M Ohm"
16		Trigger	Trigger source	"Internal Manual External BUS"
17			Trigger delay time	*
18		Measurement speed	Measurement speed	"Rapid FAST MED SLOW VerySLOW"
19		DC bias	Enable	"ON OFF"
20			Setting	*
21		Averaging	Enable	"ON OFF"
22			Averaging count	1 to 256
23	Remarks	Remarks	Remarks	Up to 100-character text
24	— (Blank row)			
	Item (column 1)			Set value (column 2)
25	[SweepSetting]			
26	Type			"Linear Log"
27	Start frequency			0.001 to 100.000E+3
28	Stop frequency			0.001 to 100.000E+3
29	Measurement points			1 to 10000
30	Remarks			Up to 100-character text
31	— (Blank row)			
	Index (column 1)	Elapsed time (column 2)	Measurement frequency (column 3)	Measurement result (column 4)
32	[Sweep Result]			
33	No.	Elapsed time	Frequency	Result
34	1	YYYY/MM/DD hh:mm:ss.xxx	Measurement frequency (first time)	Measurement result (first time)
...	...			
n	n	YYYY/MM/DD hh:mm:ss.xxx	Measurement frequency (nth time)	Measurement result (nth time)

* Depends on the model

	ZM2371/ZM2372	ZM2376
Frequency	0.001 ~ 100.000E+3	0.001 ~ 5.50000E+6
Trigger delay time	0.000 ~ 999.999	0.0000 ~ 999.9999
DC bias setting	0.00 ~ 2.50	0.000 ~ 5.000

4.3 Initialization

The device is initialized (reset). Current settings and correction values are reset to initial values.

Also, the warning status of device is cleared.

For details of errors during initialization, see “**4.7 Operation Stop Due to Device Error or Communication Error**” (p.4-11).

4.4 Upload

Various parameters currently set on the software are set to the device.

For details of errors during upload, see “**4.7 Operation Stop Due to Device Error or Communication Error**” (p.4-11).

4.5 Download

Various parameters currently set to the device are acquired, and the display is updated with the acquired parameters.

For details of errors during download, see **“4.7 Operation Stop Due to Device Error or Communication Error” (p.4-11)**.

4.6 Sending Macro

By using the macro sending function, this software can send the command that the user described arbitrarily to the device.

Select **Send Macro** button (**Alt**, **O**, **M**) to display the **[File Open]** dialog. Select the text file in which the macro command is described, and select **OK**, and the Sending Macro screen as shown below will appear.

When the macro screen is displayed, the operation of main screen is disabled.

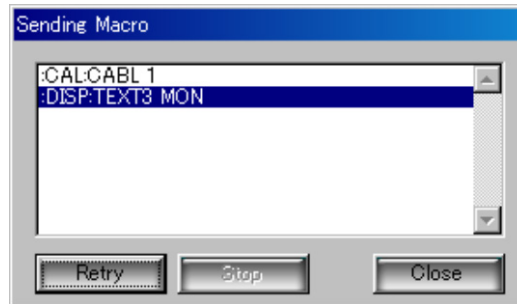


Figure 4-1 Sending Macro screen

On the Sending Macro screen, the information read from the macro sending file is displayed in the **[Macro sending commands]** list, and the macro commands are sent to the device sequentially, starting from the first line. Currently sent macro command is highlighted.

In case of a warning on the device side or a communication error during the macro sending, the warning screen is displayed and the macro sending processing is interrupted. Check the warning on the device side and also check the macro command.

4.6.1 Operation

a) Retry

Macro sending starts automatically, and it stops automatically when the command on the final line was sent. To send the macro commands again from the first line, click the **Retry** button.

During the macro sending, the **Retry** button becomes inactive and it cannot be selected.

b) Stop

To interrupt the ongoing macro sending, click the **Stop** button. If the macro sending has already been finished, the **Stop** button becomes inactive and it cannot be selected.

c) Close

To exit the Sending Macro screen, click the **Close** button. The Sending Macro screen is closed, and the main screen can be operated.

4.6.2 File format

When describing macro commands in the macro file, take care of the following points:

- The first line of the file is a header, and it must be the following definite character string.
“[ZM237x Application Software Macro Data File, Ver.1.00]”
- The macro command must begin with a colon (:). The line which does not begin with a colon (:) is all recognized as a comment and it is ignored.
- The command that contains a query character (?) is not sent as a command.
- The file extension must be “zmm”.

```
[ZM237x Application Software Macro Data File,Ver.1.00]  
:CAL:CABL 1  
:DISP:TEXT3 MON
```

Figure 4-2 Macro file description example

4.7 Operation Stop Due to Drive Error or Communication Error

When the software communicates with the device using the communicating function, an error message may be displayed.

4.7.1 Error due to unmeasurable status of device

The software checks the status of device when it established the communication with the device. In such a case, if the device is executing the command processing (standard event register: OPC bit = OFF) or it is executing the measurement (operation condition register: Measuring bit = ON), an error message is displayed and the processing is interrupted.

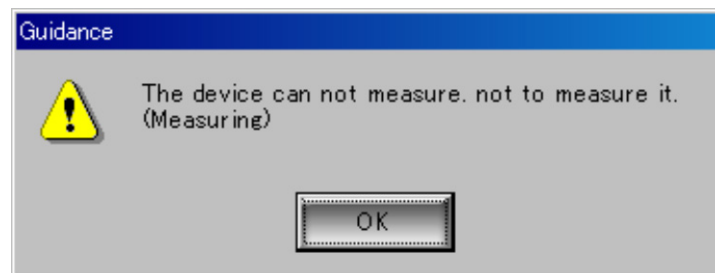


Figure 4-3 Warning display due to unmeasurable status of device

4.7.2 Error due to faulty communication with device

If an error is detected in the communication between this software and device, further operation is judged impossible, and an error message is displayed and the processing is interrupted.

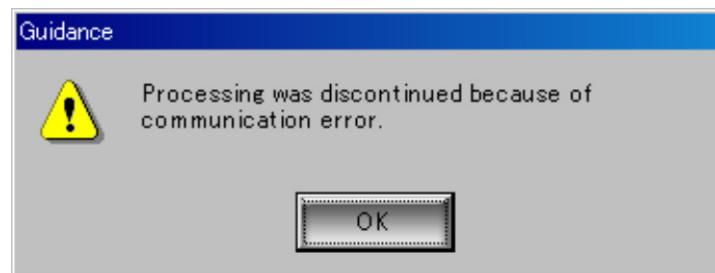


Figure 4-4 Warning display due to faulty communication with device

4.8 Parameter Setting File

The software can save/read various parameters that the user entered arbitrarily as a parameter setting file. Please note that the data set in “4.9 Configuration” (p.4-13) is not saved. The extension of parameter setting file is “.xml”.

The file name used to save/read the parameters is displayed on the title bar.

4.8.1 Reading a file

Operate **[File (F)] – [Open (O)]** (**Alt**, **F**, **O** or **Ctrl** + **O**) to display the **[File Open]** dialog. Specify the file name and click the **OK** button, and the set values will be read from the specified parameter setting file.

If the file reading failed, an error message is displayed and the reading processing is stopped.

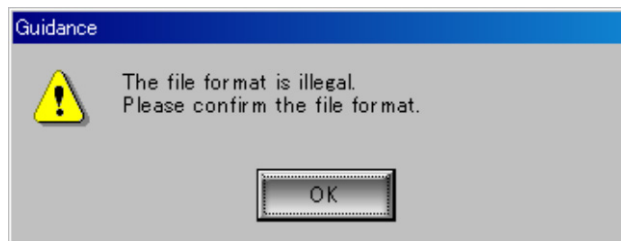


Figure 4-5 Warning display when file reading failed

4.8.2 Saving a file

Operate **[File (F)] – [Save As (A)]** (**Alt**, **F**, **A**) to display the **[Save As]** dialog. Specify the file name and click **OK** button, and the set values will be saved in the specified file name.

With the parameter setting file already saved or read, if you operate **[File (F)] – [Save (S)]** (**Alt**, **F**, **S** or **Ctrl** + **S**), the existing parameter setting file is overwritten.

Or, with the parameter setting file not saved or read yet, if you operate **[Save (S)]**, the same processing as **[Save As]** operation is executed.

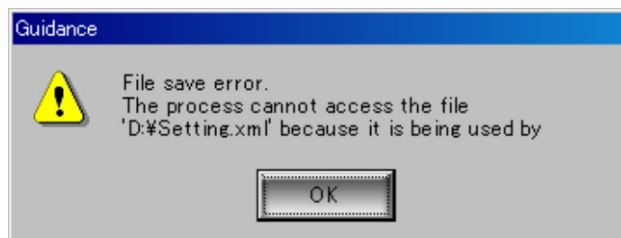


Figure 4-6 Warning display when file saving failed

4.9 Configuration

To display the **[Configuration]** screen, from the menu bar, select **[Setting (S)]** – **[Configuration (C)]** (**Alt**, **S**, **C**).

4.9.1 Communication setting

Make a setting for the communication with the device.

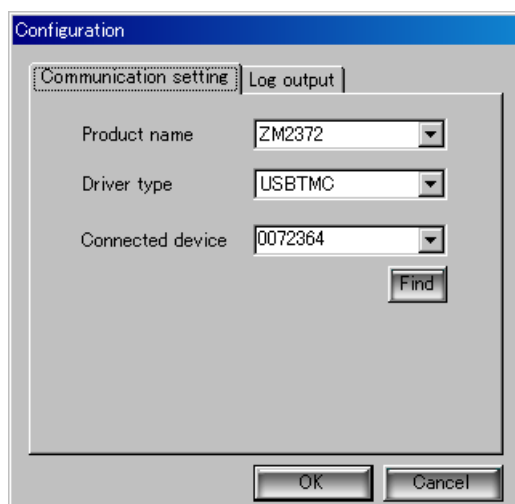


Figure 4-7 Configuration screen (Communication setting tab)

a) Product name

Select the product name to be connected to this software.

b) Driver type

Set the driver type for the communication between this software and device.

[USBTMC] uses NF USBTMC specialized driver.

[VISA] uses USB driver in the VISA environment.

c) Connected device

Select the connected device.

Here, set a serial number of the connected device. For the serial number, check it on the model seal on the rear panel of the device, or refer to Instruction Manual.

Also, by clicking the **Find** button, a list of devices connected to currently used PC is updated. From the updated pull-down list, the device can be selected and set.

4.9.2 Log output

Set the output sheet when the log output is executed in the XLS format.

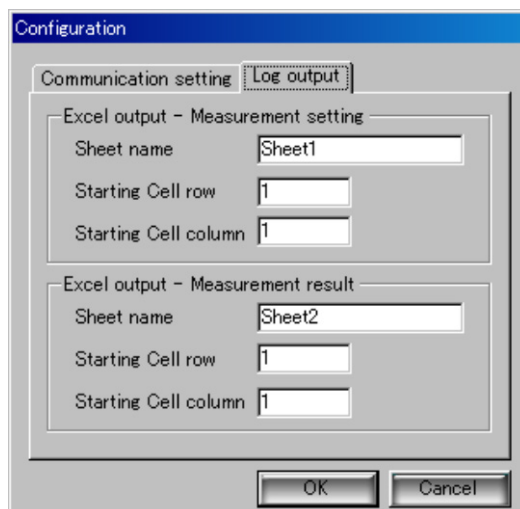


Figure 4-8 Configuration screen (Log output tab)

a) Measurement setting/Measurement result

When executing the log output in the XLS format, the measurement setting and the measurement result can be output to different sheets and cells individually. For each of the measurement setting and result, make a setting for log output individually.

b) Sheet name

Specify the sheet name in the XLS file to which the log data are output. If the sheet name is blank or the specified sheet name is not found in the selected file at the log output, the log output cannot be executed, resulting in an error. Beware of the entry.

c) Starting Cell row

Enter a numeric value to specify the row from which the log output starts on the sheet of the specified **[sheet name]**. The Microsoft Excel specifies that the maximum number of rows is 65536, and therefore 65537 or larger value cannot be entered as the starting cell row. Set the row with sufficient margin for the log output.

d) Starting Cell column

Enter a numeric value to specify the column from which the log output starts on the sheet of the specified **[sheet name]**. The Microsoft Excel specifies that the maximum number of columns is 256 (0 to 255), and therefore 255 or larger value cannot be entered as the starting cell column. Set the column with sufficient margin for the log output.

⚠ CAUTION

The Microsoft Excel 2007 or later version uses the file extension .xlsx and it can handle the rows exceeding 65537 and columns exceeding 257, but this software uses the xls file and limits the rows to 65536 and columns to 256 to maintain the downward compatibility.

5. LIST OF SETTING TABLES

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5.1 Initial Setting Value List

Table 5-1 Initial Setting Value List

	Item names	Initial value
Display	Primary parameter Type	C
	Primary parameter Deviation display	ABS
	Primary parameter Deviation reference value	0.00000
	Secondary parameter Type	D
	Secondary parameter Deviation display	ABS
	Secondary parameter Deviation reference value	0.00000
	Remarks	Blank
Measurement	Frequency [Hz]	1.0000k
	ALC	OFF
	Voltage level [Vrms]	1.00
	Constant current level [Arms]	1.00m
	Auto ranging	ON
	Measurement range	100 Ohm
	Trigger source	Internal
	Trigger delay time [s]	0.008
	Measurement speed	MED
	DC bias Enable	OFF
	DC bias Setting [V]	0.00
	Averaging Enable	OFF
	Averaging count	1
	Remarks	Blank
Spot	Repeat count	100
	Interval [s]	1.0
	Log output	OFF
	Format	CSV
	Remarks	Blank
Sweep	Type	Linear
	Start frequency [Hz]	1.0000k
	Stop frequency [Hz]	10.000k
	Measurement points	100
	Log output	OFF
	Format	CSV
	Remarks	Blank

5.2 List of Input Limited Values

Table 5-2 List of Input Limited Values

	Item names	Range
Display	Primary parameter Type	Z Y R Rp Rs G C Cp Cs L Lp Ls REAL MLIN
	Primary parameter Deviation display	ABS DEV PCNT
	Primary parameter Deviation reference value	0, $\pm 1\text{E-}16$ to $9.99999\text{E}+11$ Resolution: 6 digits Engineering unit: [f] to [T]
	Secondary parameter Type	Q D Phase X B Rs Rp G Lp Rdc IMAG REAL
	Secondary parameter Deviation display	ABS DEV PCNT
	Secondary parameter Deviation reference value	0, $\pm 1\text{E-}16$ to $9.99999\text{E}+11$ Resolution: 6 digits Engineering unit: [f] to [T]
	Remarks	Maximum 100 characters
Measurement	Frequency [Hz]	*
	ALC	OFF CV CC
	Voltage level [Vrms]	0.01 to 5.00 If exceeding 1V, resolution 10mV If less than 1V, resolution 1mV
	Constant current level [Arms]	1.0u to 200mA Resolution: 3 digits However, resolution 0.1uArms if less than 100uArms [-] 0.01 to 0.20 [m] 0.01 to 200 [u] 1.0 to 999
	Auto ranging	Enabled/Disabled
	Measurement range	100mOhm 1Ohm 10Ohm 100Ohm 1kOhm 10kOhm 100kOhm 1MOhm
	Trigger source	Internal Manual External BUS
	Trigger delay time [s]	*
	Measurement speed	RAPid FAST MED SLOW VerySLOW
	DC bias Enable	Enabled/Disabled
	DC bias Setting [V]	*
	Averaging Enable	Enabled/Disabled
	Averaging count	1 to 256
Spot	Repeat count	1 to 10000
	Interval [s]	0.5 to 100.0
	Log output	Enabled/Disabled
	Format	*.CSV / *.XLS
	Remarks	Maximum 100 characters
Sweep	Type	Linear Log
	Start frequency [Hz]	0.001 to $100\text{E}+3$
	Stop frequency [Hz]	0.001 to $100\text{E}+3$
	Measurement points	1 to 10000
	Log output	Enabled/Disabled
	Format	*.CSV / *.XLS
	Remarks	Maximum 100 characters

* Depends on the model

	ZM2371/ZM2372	ZM2376
Frequency	0.001 ~ $100.000\text{E}+3$ Resolution 5 digits	0.001 ~ $5.50000\text{E}+6$ Resolution 6 digits
Trigger delay time	0.000 ~ 999.999 Resolution 0.001	0.0000 ~ 999.9999 Resolution 0.0001
DC bias setting	0.00 ~ 2.50 Resolution 0.01	0.000 ~ 5.000 Resolution 0.001

5.3 SI Prefix List

Table 5-3 SI Prefix List

SI Prefix	How to read	Ten involution
T	tera	+12
G	giga	+9
M	mega	+6
k	kilo	+3
--	--	0
m	milli	-3
u	micro	-6
n	nano	-9
p	pico	-12
f	femto	-15

6. USER MESSAGES

6.1	Guidance Messages	6-1
6.2	Error Messages.....	6-2

6.1 Guidance Messages

Table 6-1 Guidance Messages

Message	Icon	Button	Description
Exit application. OK?	[?]	[Yes] [No]	Confirmation when the application is terminated.
If product name is changed, other settings will be within the range of the absolute value.	[!]	[OK]	If the setting range varies depending on the target model.
Other settings will be within the range of the absolute value.	[!]	[OK]	If you open the file has been selected models and model is different from the current.

6.2 Error Messages

Table 6-2 Error Messages

Message	Icon	Button	Description
Please set the numerical value.	[!]	[OK]	Other than numerical value was entered as a numerical value parameter (text box).
Please set it within the range of {0} - {1}.	[!]	[OK]	Out-of-range value (numerical value range) was entered as a numerical value parameter (text box).
Please set it within the range of the absolute value of 0 or {0} - {1}.	[!]	[OK]	Out-of-range value (\pm range) was entered as a numerical value parameter (text box).
Device connection failure. Please confirm communication setting.	[!]	[OK]	In the device communication processing*1, a connection to the device failed.
The device can not measure. not to measure it. (Preparing)	[!]	[OK]	In the device communication processing*2, the device is not enabled to measure.
The device can not measure. not to measure it. (Measuring)	[!]	[OK]	In the device communication processing*3, the device is not enabled to communicate.
Processing was discontinued because of log-output error.	[!]	[OK]	In the spot/sweep measurement processing, the log output error occurred when the log output is enabled.
Processing was discontinued because of data fetch error.	[!]	[OK]	In the spot/sweep measurement processing, the status bit check after a trigger was requested is not completed within the specified time.
Processing was discontinued because of communication error.	[!]	[OK]	In the device communication processing*1, a communication error occurred.
File read error.	[!]	[OK]	In the file*4 reading processing, an error (file open/access error) occurred.
File save error.	[!]	[OK]	In the file*4 saving processing, an error (file open/access error) occurred.
The specified file doesn't exist.	[!]	[OK]	In the file*4 reading processing, the specified file does not exist.
The file format is illegal. Please confirm the file format.	[!]	[OK]	In the file*4 reading processing, the read file information is illegal or file format is illegal.

*1 Initialization, upload, download, send macro, spot measurement, sweep measurement

*2 In the processing of *1 except initialization, the command processing is under way (OPC bit OFF)

*3 In the processing of *1 except initialization, the device is in measurement status.

*4 Measurement parameter setting file, macro sending file, configuration file maintenance

7. MAINTENANCE

7.1	Version Check.....	7-1
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7.1 Version Check

The “**ZM237xApplication Software**” version number is displayed on the CD-ROM.

The version can be displayed by selecting [**H**elp]-[**V**ersion **I**nformation].

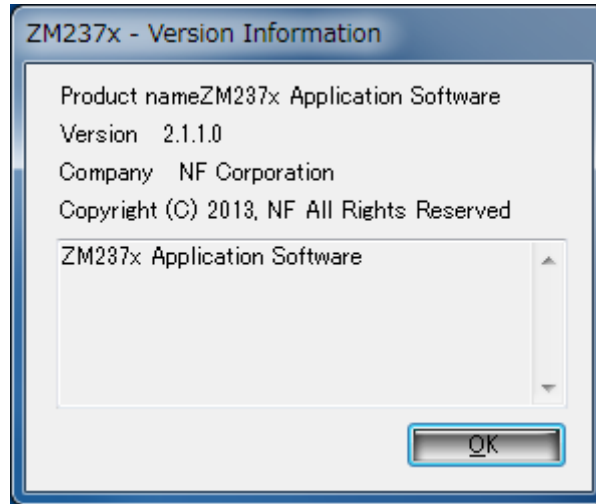


Figure 7-1 Version Dialog Box

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ZM2371/ZM2372/ZM2376

Application Software Instruction Manual

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