

SubSurface Leak Digital Quatro Correlator

Software

LC5000

Instruction Manual



Preface

Thank you for purchasing this software.

In addition to this instruction manual, the software has a help function that explains how to use it. Please use it in conjunction with this instruction manual if anything is unclear.

Introduction

This software was created for the purpose of displaying, processing, and printing data measured by the LC-5000 and LC-2500 Leak Noise Correlator on a PC.

It cannot be used to display data measured by any other devices.

For details on how to use the LC-5000 main unit and pre-amplifiers (hardware), see the instruction manual supplied with the main unit. This manual covers the setup, menus, and usage of the LC50-W software.

System Requirements

- Supported OS: Windows 7, 8, 10 or higher, 32-bit or 64-bit compatible
- Memory: 1 GB or more on 32-bit OS
2 GB or more on 64-bit OS
- Hard disk capacity: At least 16 GB available on 32-bit OS
At least 20 GB available on 64-bit OS
- Other: SD card slot (for using SDHC-Class 10 card to read and set data)
CD-ROM drive (for installation)
OS-compatible printer

*.NetFramework 4.5 or higher must be installed.

The latest version of .NetFramework can be installed from the official Microsoft website.

The contents of this document are subject to change without notice.

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1. Installation on a PC

In order to run this software, it is necessary to copy the necessary files to your computer's hard disk and install the software in Windows.

Note

- When installing the software, log in with administrator privileges.

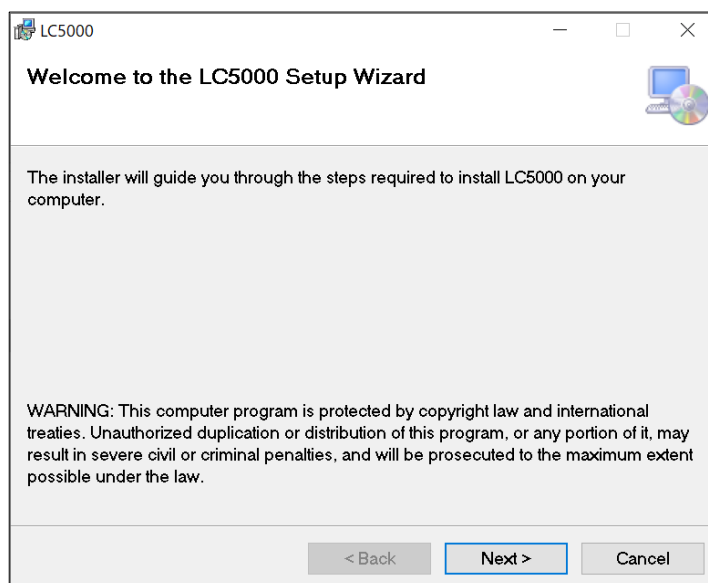
1-1 How to Install

- ① Insert the LC50-W CD into the CD-ROM drive.

The installation welcome screen appears.

If the installation welcome screen does not appear double-click “setup.exe” on the CD-ROM to display it.

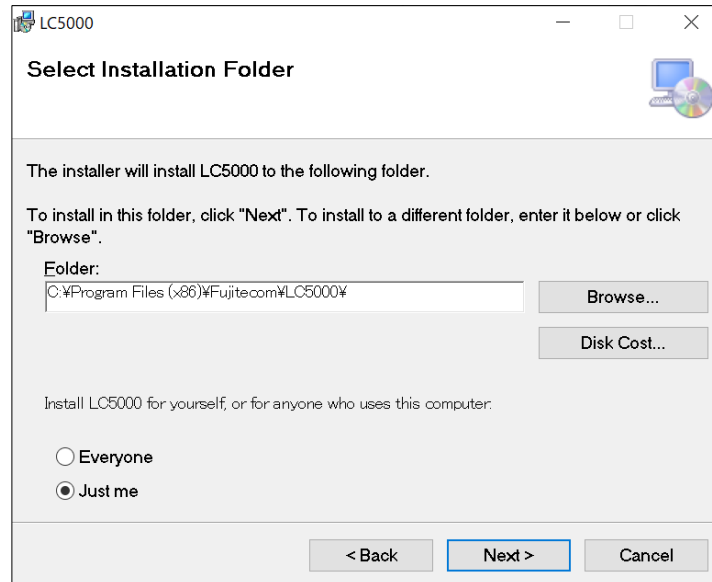
- ② When the “Welcome to the LC5000 Setup Wizard” screen appears, click "Next".



- ③ The “Select Installation Folder” screen appears.

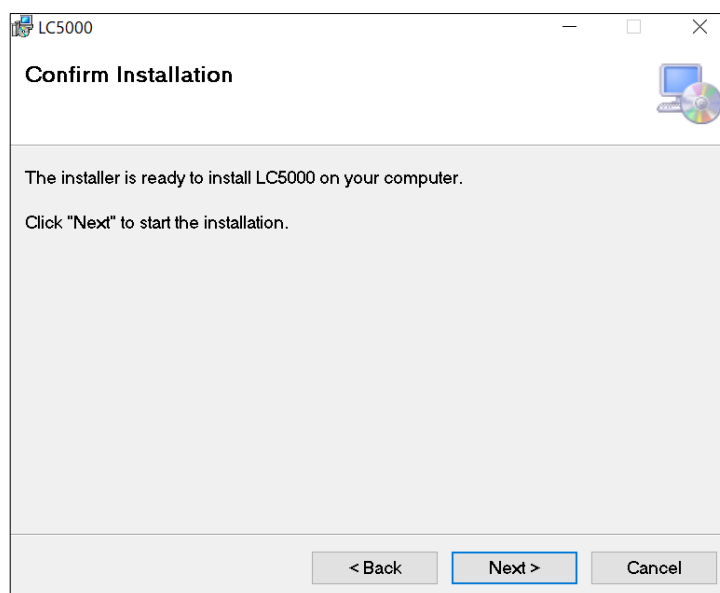
Confirm the installation folder and click "Next".

If you want to change the installation location, select a destination from the "Browse" button and click "Next".



- ④ The “Confirm Installation” screen appears.

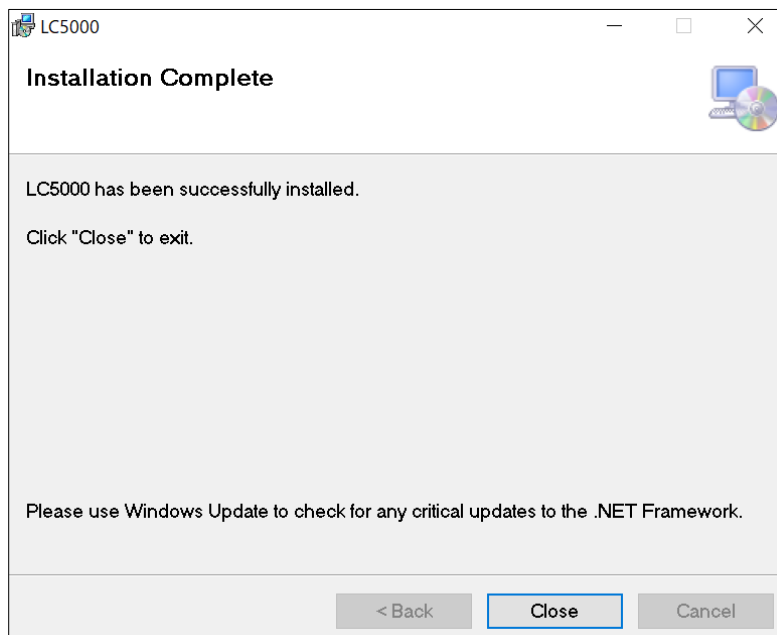
Click "Next" to begin the installation.



- * When the installation starts, you may see a screen similar to the one below.
Click "Yes".

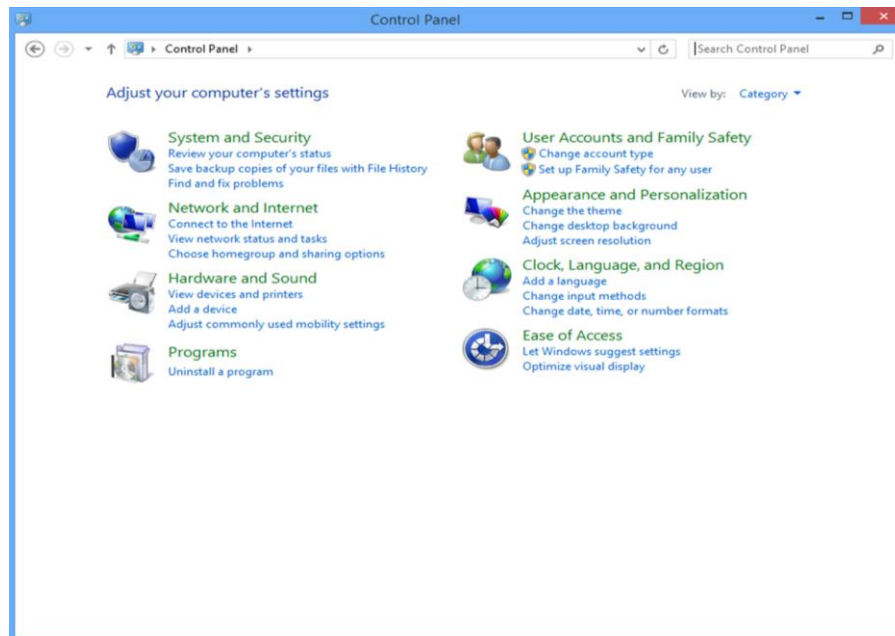


- ⑤ When the following screen is displayed, installation is complete.
Click "Close" to finish.

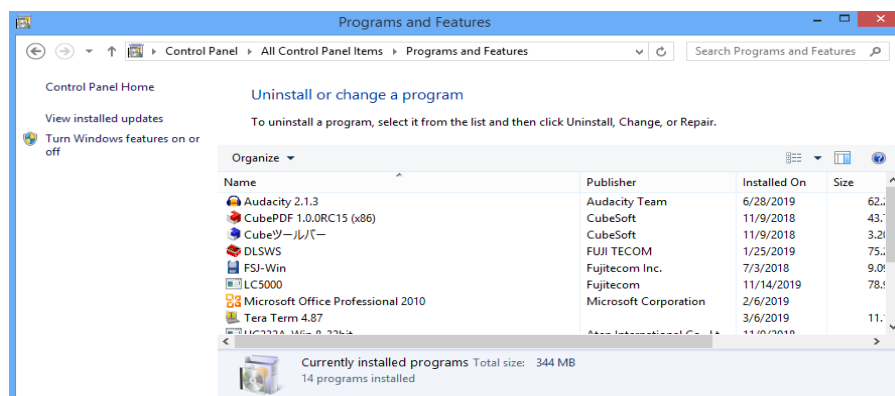


1-2 How to Uninstall

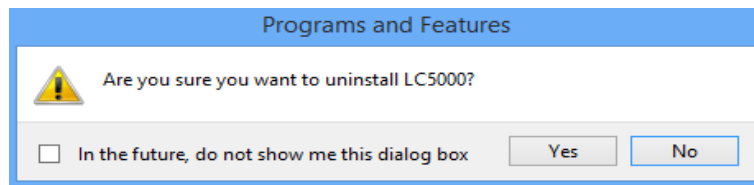
- ① Open "Uninstall a program" in the Control Panel.



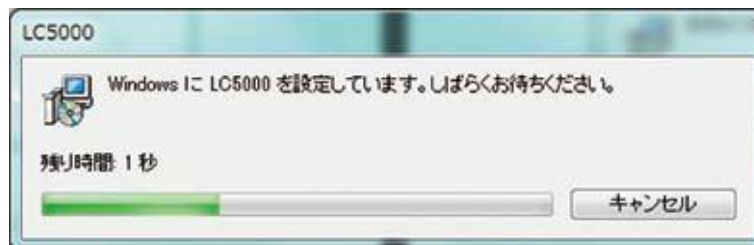
- ② Select "LC5000" from the displayed list and click "Uninstall".



- ③ When the “Programs and Features” message appears, click "Yes".



- ④ During the uninstallation, you will see a screen similar to the one below.
When the screen disappears, the uninstall is complete.



1-3 Shortcut Creation

A shortcut is created when the software is installed.

2. List of Menu Items

2-1 Main Menu

File	Read data (LC-2500):	Read data from the LC-2500.
	Display data:	Display data saved of the LC-5000 or LC-2500.
	Save as:	Save the specified data with a new name.
	Overwrite save:	Overwrite data whose index contents have been modified.
	Close data:	Close the data that was selected for display.
	Print:	Print the specified file.
	Config:	Configure the language, display unit, COM port, and other settings.
	Help index:	Open the Help screen, where the screen display and operation instructions are summarized in a simplified manner.
	Version Index:	Display the software version.
	Exit:	Exit this software.
Edit	Copy index information:	Copy the contents of the index to the clipboard.
	Copy display graph:	Copy the graph image to the clipboard.
	Edit index information:	View and edit the index contents of the displayed and selected graph.
	Export text:	Export the specified data as text.
	Export CSV:	Export the specified data as a CSV file.
Graph	Value display:	Show the values at the point on the graph indicated by the cursor.
	H Axis (Zoom In):	Zoom in along the horizontal axis.
	H Axis (Zoom Out):	Zoom out along the horizontal axis.
	V Axis (Zoom In):	Zoom in along the vertical axis.
	V Axis (Zoom Out):	Zoom out along the vertical axis.
	Redo:	Restore the graph to its original size.
Window	Display side by side:	Display multiple files side-by-side.

2-2 Tool Buttons

These buttons have the same functionality as the main menu selections.



- ① Display data
- ② Overwrite save
- ③ Print
- ④ Value display
- ⑤ Horizontal axis zoom out
- ⑥ Horizontal axis zoom in
- ⑦ Vertical axis zoom out
- ⑧ Vertical axis zoom in
- ⑨ Undo
- ⑩ Log/Linear
- ⑪ Help index

Log/Linear Button

The horizontal axis of the graph of FFT data can be toggled from logarithmic to linear, or from linear to logarithmic.

Toggling between the log display and linear display is done from this tool button, not from the main menu.

3. Displaying Data on the LC-5000 or Reading Data from the LC-2500

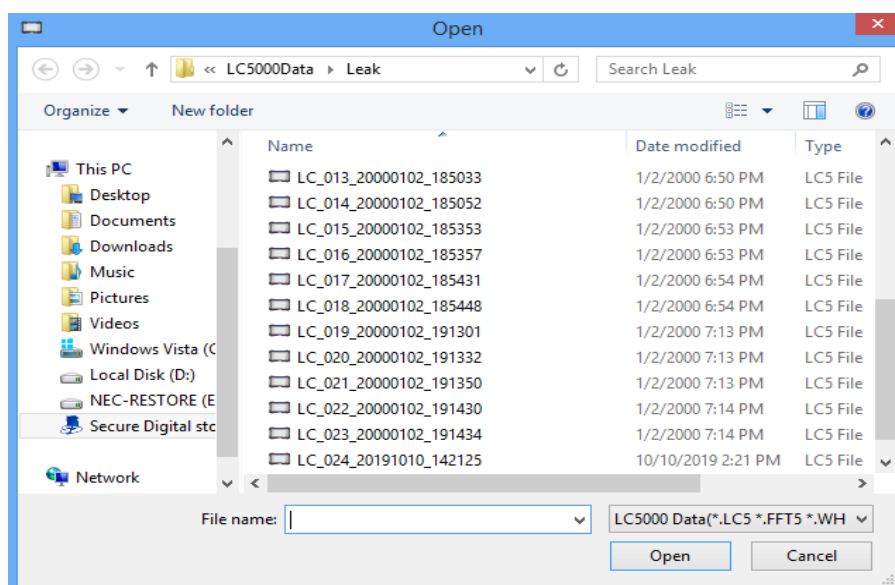
The LC-5000 and LC-2500 use different data storage methods.

In the case of the LC-5000, this software is used to view the data saved on the SD card. In the case of the LC-2500, this software is used to read the data after connecting the unit to the PC with an RS-232C cable. For details on how to save data and how to connect to a PC, refer to the instruction manuals of the respective devices.

3-1 Reading Data from the LC-5000

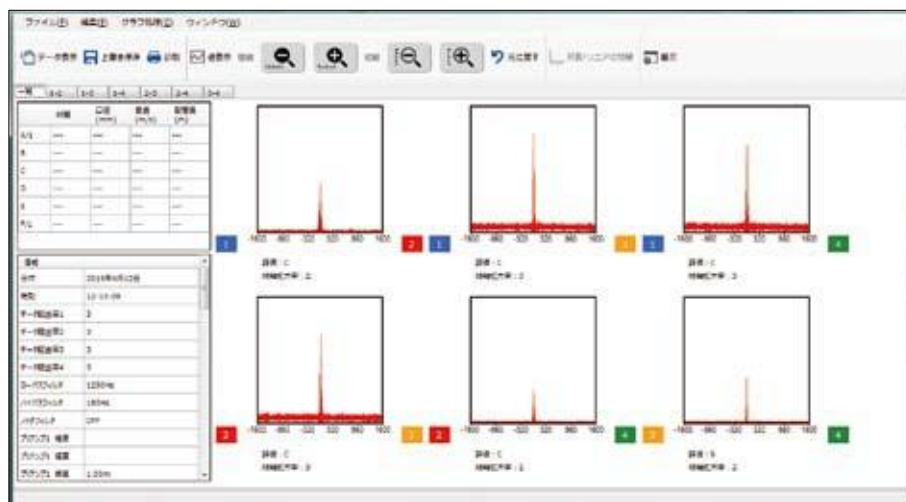
Procedure

Select "Display data" from the "File" menu. Or select "Display data" from the tool buttons.
Select the file you want to display and click "Open".



3. Displaying Data on the LC-5000 or Reading Data from the LC-2500

A list of correlation graphs for the selected data is displayed.

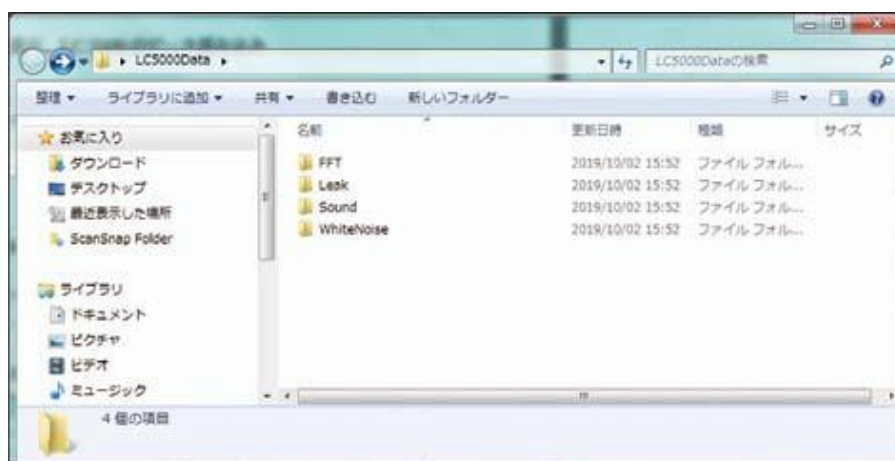


About the Folders where LC-5000 Data is Stored

The data acquired by the LC-5000 is stored in the “LC5000Data” folder.

The “LC5000Data” folder contains the folders “FFT” (FFT data), “Leak” (leakage location data), “Sound” (leakage sound data), and “WhiteNoise” (white noise data).

Copy or move the data files to your computer as required. The file names are explained in the next section.



About File Names

When the types of data listed below are saved to the SD card, the data file is named as indicated below.

- Leakage location
- FFT
- White-noise data

LC_ 000_ 20191016_173516 . LC5

① ② ③ ④ ⑤

No.	Item	Content
①	Header	LC: Fixed header string indicating leakage location data LCFFT5: Fixed header string indicating FFT data LCWHN5: Fixed header string indicating white-noise data
②	File number	Consecutive number used for naming LC-5000 data files
③	Date saved	LC-5000 date and time when data was saved on the LC-5000
④	Separator character	A symbol that separates the file name from the extension
⑤	Extension	LC5: Leakage location data FFT5: FFT data WHN5: White-noise data

- Recording data

LCWAV_ 000_ 1_ 20191016_173516 . WAV

① ② ③ ④ ⑤ ⑥

No.	Item	Content
①	Header	LCWAV: Fixed header string indicating recorded data
②	File number	Consecutive number used for naming LC-5000 data files
③	Pre-amplifier number	Number of the pre-amplifier that recorded the sound
④	Date saved	LC-5000 date and time when data was saved on the LC-5000
⑤	Separator character	A symbol that separates the file name from the extension
⑥	Extension	WAV: Recording data

3-2 Reading Data from the LC-2500

Procedure

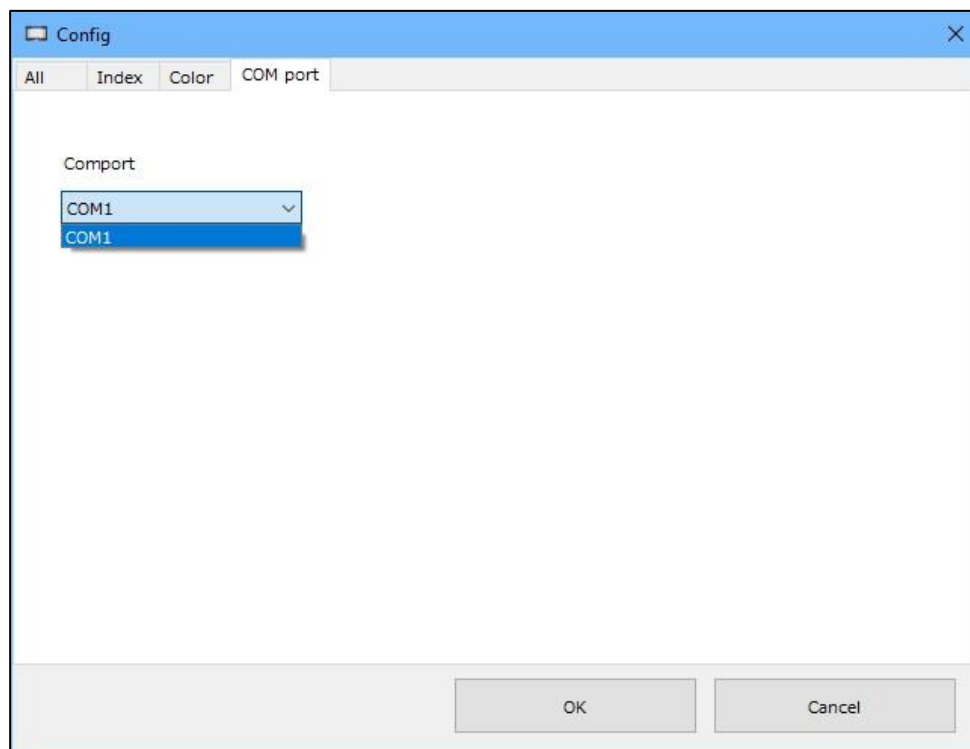
Connect the LC-2500 to the PC with the cable.

Select "Config" from the "File" menu.

From the Settings screen, set the COM port to which the LC-2500 is connected.

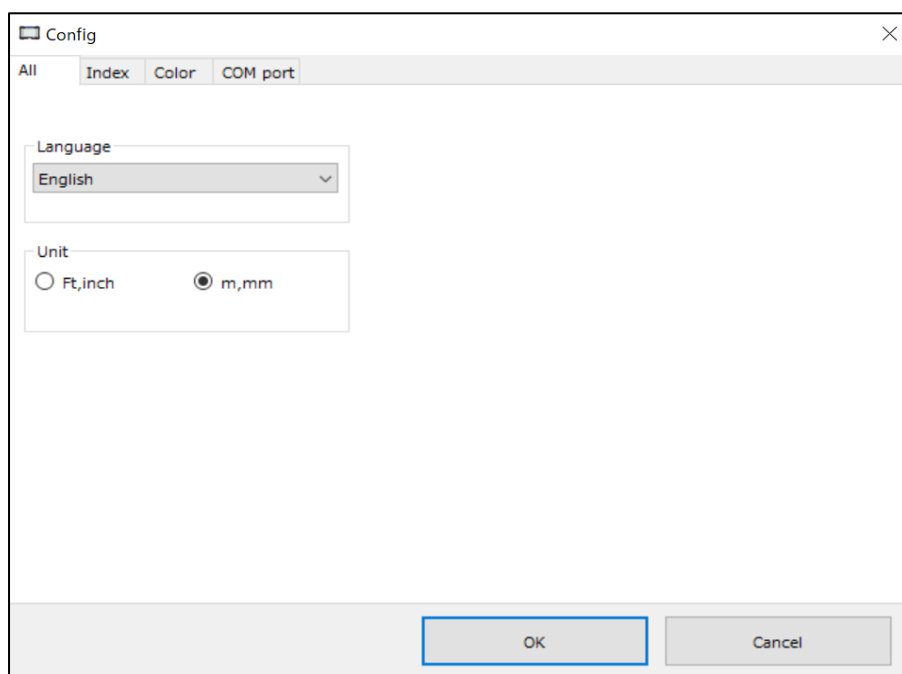
Verify the number of the COM port to which the unit is connected and select that number on the "Com Port" tab.

Also, select whether the LC-2500 should display distances in meters or feet.

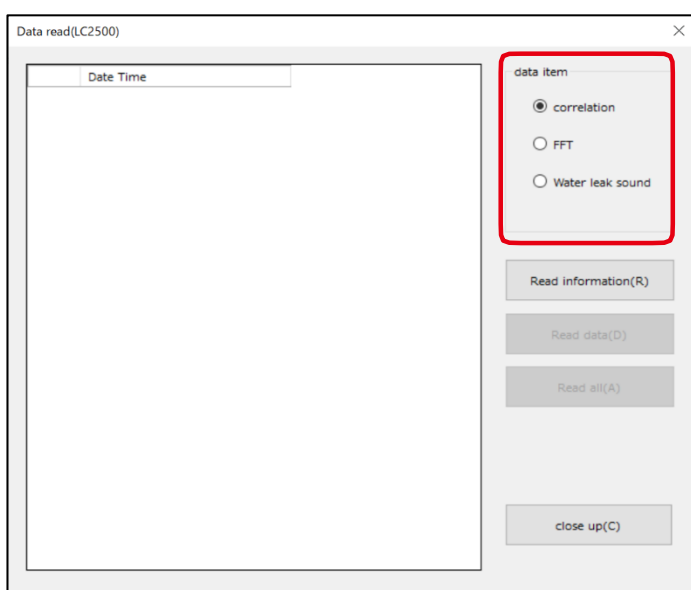


3. Displaying Data on the LC-5000 or Reading Data from the LC-2500

Select the desired display unit of the LC-2500 on the "All" tab.
After changing the settings, click "OK".



Select "Read Data (LC2500)" from the "File" menu to bring up the Read Data window.
Select the type of data to be read and then select the "Read Information (R)" button.



The types of data that can be selected are as follows.

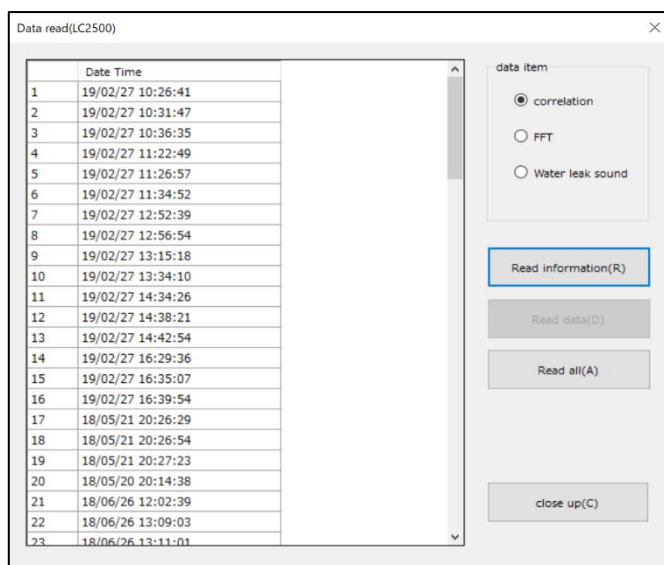
Correlation: Leakage location data

FFT: FFT data

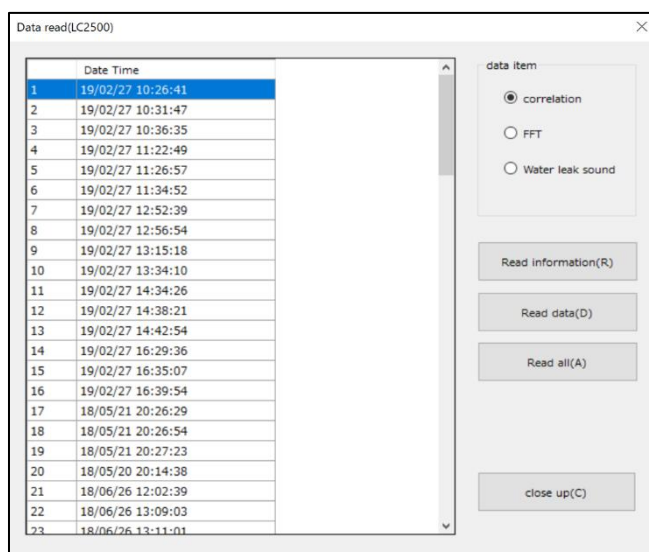
Water Leak Sound: Leakage sound data

3. Displaying Data on the LC-5000 or Reading Data from the LC-2500

A list of data currently stored on the LC-2500 is displayed.



Select the data to be read and then select the "Read Data" button.



The data is read and displayed on the screen.

Select "Save As" from the "File" menu to save the data.

* If there are multiple data selections, you can use the "Read All" button to download all of them at once.

Note

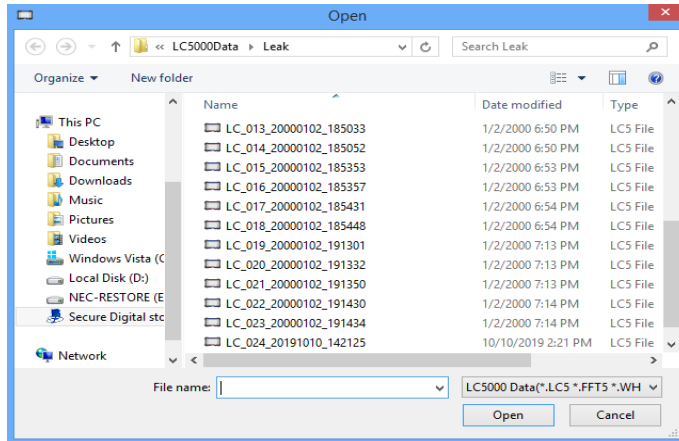
This software is only for downloading the leakage sound data, not playback.

To play the leakage sound data, use Windows Media Player or a similar audio player. (The file format is WAV.)

4. Display Graph

Displays the data that was read.

Select "Display data" from the "File" menu.



The following five types of files can be displayed:

LC-5000

- ① Leakage location data : *.lc5
- ② FFT data : *.fft5
- ③ White-noise data : *.whn5

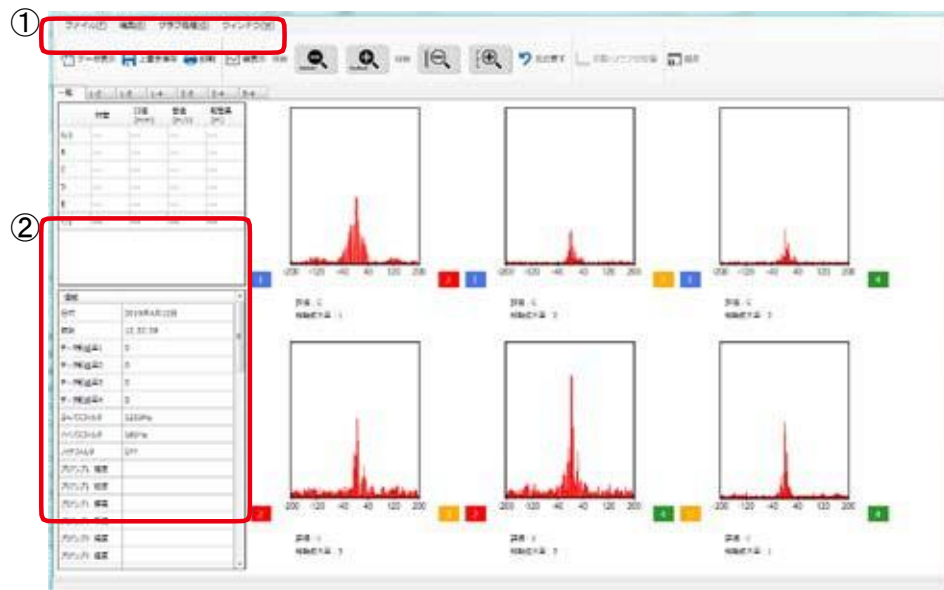
LC-2500

- ④ Leakage location data : *.lcd
- ⑤ FFT data : *.fft

Select the type of file to be displayed.

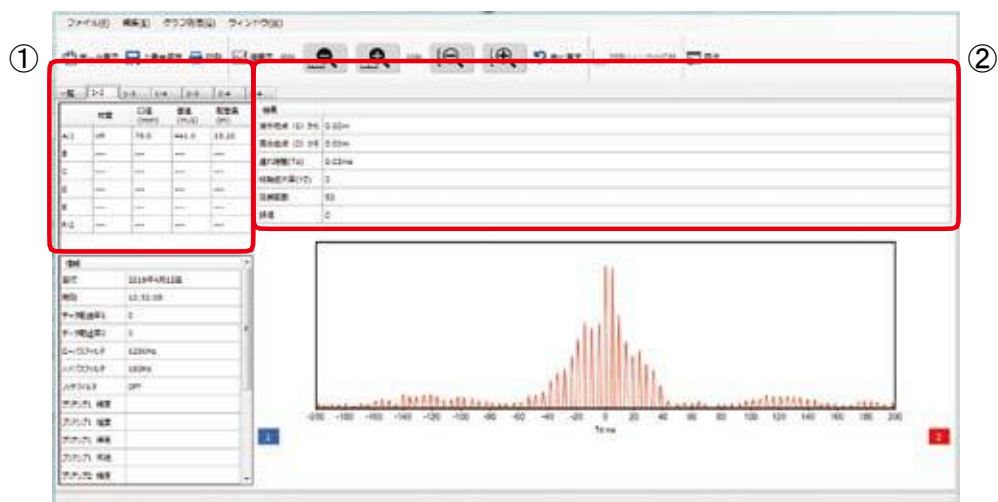
Select the folder where the data is saved, select the file you want to display, and click "Open" to display a graph similar to the one shown below.

Here, leakage location data from the LC-5000 is shown.



- ① Select a combination of pre-amplifiers.
- ② The locations of the files, date and time of measurement, condition settings, and other information is displayed.

Select a combination of pre-amplifiers or double-click the graph to see the graph between the two pre-amplifiers.



① Shows the pipe condition setting screen.

② Shows the leakage location results (distance from each pre-amplifier, delay time, etc.).

$$T1 : c \rightarrow c' \rightarrow 1 \rightarrow 1$$

The contents of the index include the pre-amplifier's latitude, longitude, altitude, etc. in addition to the type, diameter, and length of the pipe.

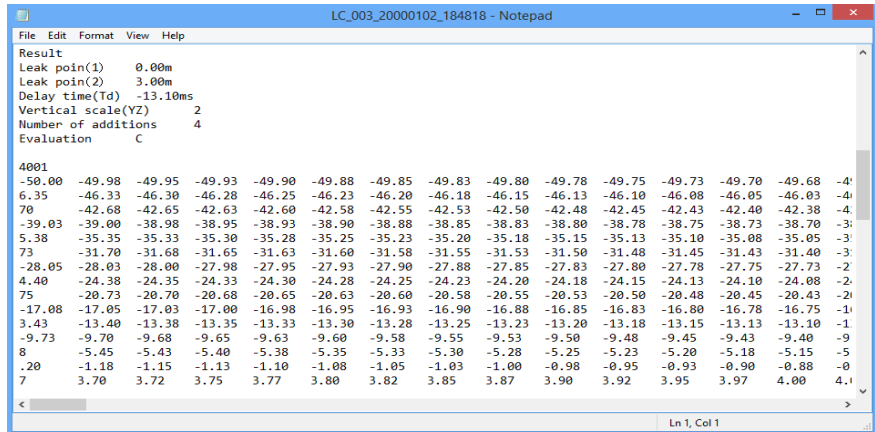
You can then paste the data into a text editor or other document preparation software.

This function copies only the graph portion of the graph selected on the screen.

You can then paste the data into your image processing or document preparation software.

This function saves the measurement data in a text format that can be handled by your spreadsheet program or other data processing software.

- In the text file that is created, the item delimiter is a tab character.
- When importing the data into your spreadsheet program or other data processing software, be sure to import the data in text format (TXT) and set the delimiter to the tab character.



- ① In the graph display screen, select “Edit” and then “Export CSV”.
- ② The Save window opens.
- ③ Select the destination folder, enter the file name, and click the “Save” button.

2013-2014

2013/10/1	2013/10/2	2013/10/3	2013/10/4	2013/10/5	2013/10/6	2013/10/7	2013/10/8	2013/10/9	2013/10/10	2013/10/11	2013/10/12	2013/10/13	2013/10/14	2013/10/15	2013/10/16	2013/10/17	2013/10/18	2013/10/19	2013/10/20	2013/10/21	2013/10/22	2013/10/23	2013/10/24	2013/10/25	2013/10/26	2013/10/27	2013/10/28	2013/10/29	2013/10/30	2013/10/31	2013/11/1	2013/11/2	2013/11/3	2013/11/4	2013/11/5	2013/11/6	2013/11/7	2013/11/8	2013/11/9	2013/11/10	2013/11/11	2013/11/12	2013/11/13	2013/11/14	2013/11/15	2013/11/16	2013/11/17	2013/11/18	2013/11/19	2013/11/20	2013/11/21	2013/11/22	2013/11/23	2013/11/24	2013/11/25	2013/11/26	2013/11/27	2013/11/28	2013/11/29	2013/11/30	2013/12/1	2013/12/2	2013/12/3	2013/12/4	2013/12/5	2013/12/6	2013/12/7	2013/12/8	2013/12/9	2013/12/10	2013/12/11	2013/12/12	2013/12/13	2013/12/14	2013/12/15	2013/12/16	2013/12/17	2013/12/18	2013/12/19	2013/12/20	2013/12/21	2013/12/22	2013/12/23	2013/12/24	2013/12/25	2013/12/26	2013/12/27	2013/12/28	2013/12/29	2013/12/30	2013/12/31	2014/1/1	2014/1/2	2014/1/3	2014/1/4	2014/1/5	2014/1/6	2014/1/7	2014/1/8	2014/1/9	2014/1/10	2014/1/11	2014/1/12	2014/1/13	2014/1/14	2014/1/15	2014/1/16	2014/1/17	2014/1/18	2014/1/19	2014/1/20	2014/1/21	2014/1/22	2014/1/23	2014/1/24	2014/1/25	2014/1/26	2014/1/27	2014/1/28	2014/1/29
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6. Graph Display Support

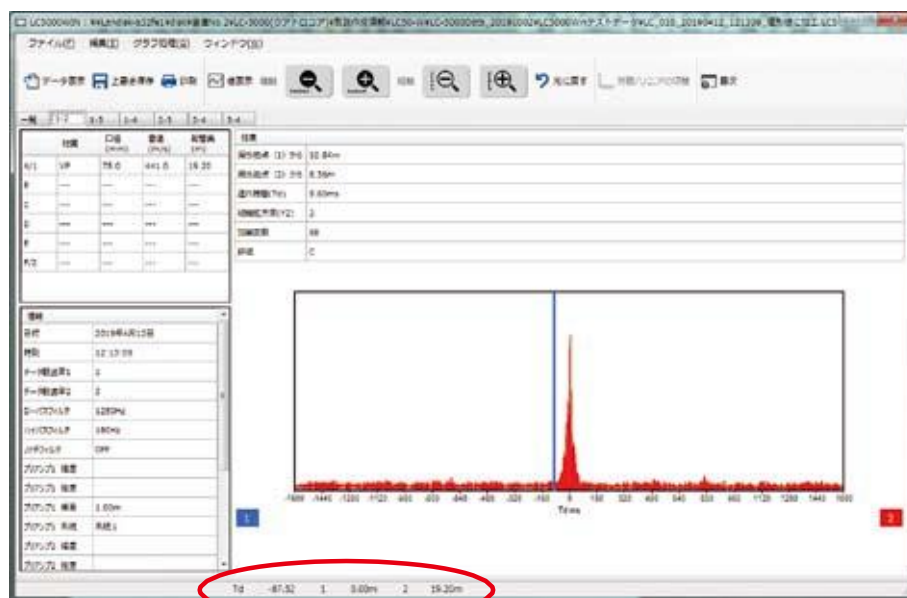
6-1 Display Cursor

This function displays the delay time and the distance from each pre-amplifier corresponding to the point indicated by the cursor at the bottom left of the graph display screen.

Select "Value display" from the "Graph" menu or the tool buttons.

A blue line appears on the graph. The numerical values corresponding to the point indicated by the line are displayed at the bottom left of the graph.

You can move the blue line left or right by dragging it with the mouse.





The values shown are, from left to right, the delay time (T_d), the distance from pre-amplifier 1, and the distance from pre-amplifier 2.

To cancel the cursor display, select " Value display" from the "Graph processing" menu again.

6-2 Zoom In/Out


Horizontal-Axis Zoom In/Out


Select " H Axis (Zoom In) " in the "Graph" menu on the graph display screen or click  button in the tool buttons to zoom in along the horizontal axis.

Select " H Axis (Zoom Out)" in the "Graph" menu or click  button in the tool buttons to zoom out along the horizontal axis.

When the cursor is displayed, it zooms in around the cursor. When the cursor is hidden, it zooms in around the peak point.

Vertical-Axis Zoom In/Out

Select "V Axis (Zoom In)" in the "Graph" menu on the graph display screen or click  in the tool buttons to zoom in along the vertical axis.

Select " V Axis (Zoom Out)" in the "Graph" menu or click  in the tool buttons to zoom out along the vertical axis.

Cancel Zoom In/Out

To cancel the zoom in/out, select "Redo" in the "Graph" menu or "Redo" in the tool buttons.

- * You can also zoom in and out by right-clicking on the graph and selecting the desired operation.

6-3 Edit Index

This function lets you edit the index information of the selected graph.

Select the data for which you want to change or add index information.

Select “Edit index information” in the “Edit” menu to bring up the Index window.

The screenshot shows the 'Index' window with the following details:

- Title Bar:** Index
- Tabs:** Index, Index Preamp1, Index Preamp2, Index Preamp3, Index Preamp4, Pipe1-2, Pipe1-3, Pipe1-4, Pipe2-3, Pipe2-4, Pipe3-4
- Fields:**
 - Date:** Saturday, April 27, 2019
 - Time:** 12:02:58 PM
 - Site number:** (empty text box)
 - LPF:** 1250Hz
 - HPF:** 180Hz
 - NF:** OFF
- Buttons:** OK, Cancel

Select the item you want to change or add to and make the edits.

- * If you change the settings of the low-pass and high-pass filters using this function, the correlation data itself will not be changed.

6-4 Edit Pipe Information

Select "Edit index information" in the "Edit" menu, select "Pipe" from the displayed window, and edit the appropriate pipe information.

The screen shot below shows the pipe information between pre-amplifier 1 and pre-amplifier 2.

The screenshot shows a software window titled 'Index' with a tabbed interface. The 'Pipe1-2' tab is active. The window contains a table for editing pipe information between pre-amplifier 1 and pre-amplifier 2. The table has columns for Material, Diameter (mm), Velocity (m/sec), and PipeLength (m). There are six rows labeled A through F. Below the table, there are fields for TdMax (ms) and Total (m), an 'Installation location' text box, and a 'Comment' text box. At the bottom right are 'OK' and 'Cancel' buttons.

	Material	Diameter (mm)	Velocity (m/sec)	PipeLength (m)
1	VP	75.0	441.0	19.20
A	---	---	---	---
B	---	---	---	---
C	---	---	---	---
D	---	---	---	---
E	---	---	---	---
F	---	---	---	---

2

TdMax (ms): 43.54

Total (m): 19.20

Installation location:

Comment:

OK Cancel

After editing the pipe information, click "OK" to save and exit.

When you click "OK", the selected TdMax and Total will be recalculated and displayed according to the changes made.

In addition, the leakage location distances for the changed data are recalculated and displayed based on the Td.

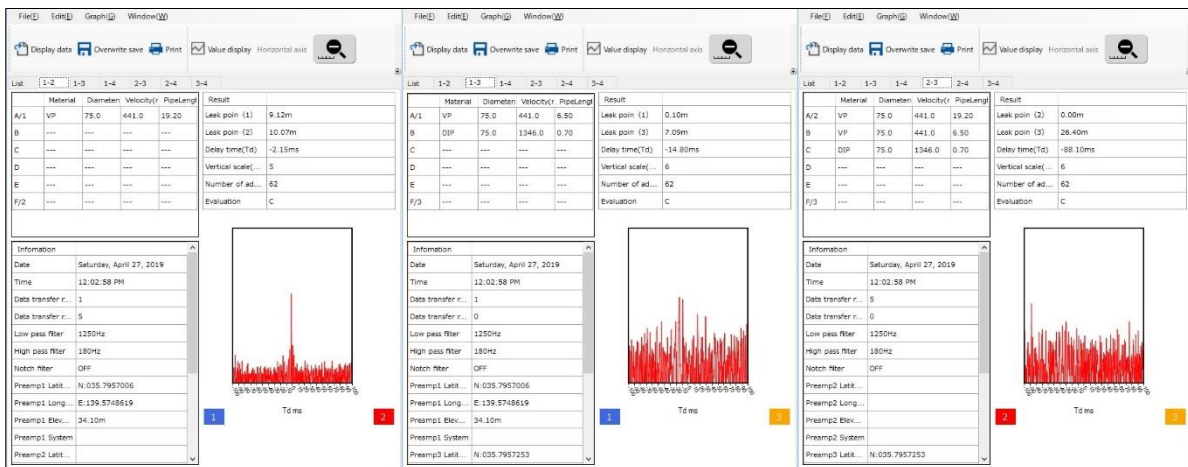
7. Window

7-1 Side-By-Side View

When displaying multiple graphs of correlation data, you can separate the windows so that they do not overlap.

To display the correlation data, select “Display data” in the “File” menu or “Display data” in the tool buttons.

After displaying multiple correlation data graphs, select “Side-by-side view” in the “Window” menu. The correlation data will be displayed side-by-side.



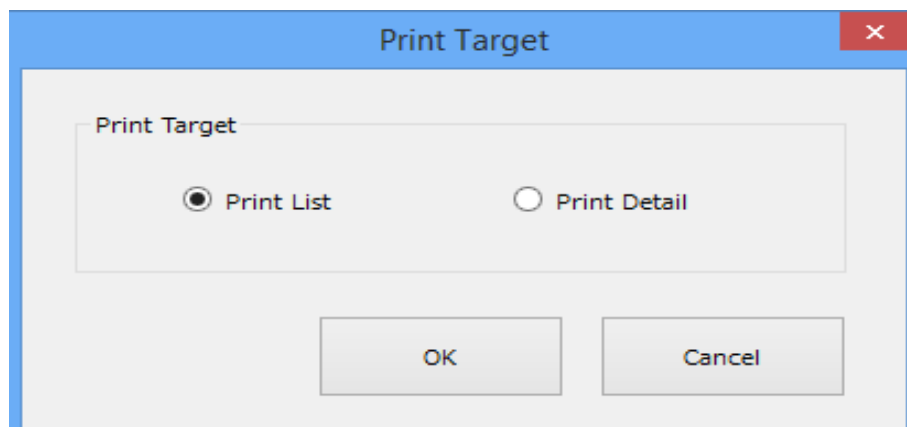
8. Print

8-1 Print

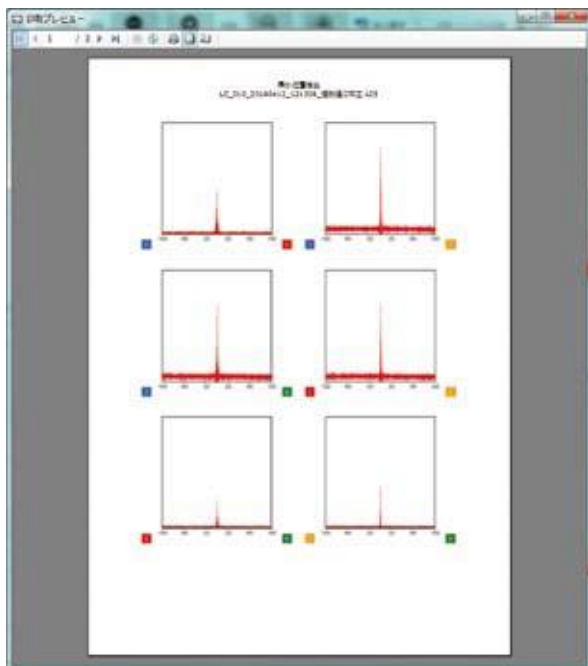
This function prints the selected graph index items.

Select "Print" in the "File" menu or "Print" in the tool buttons.

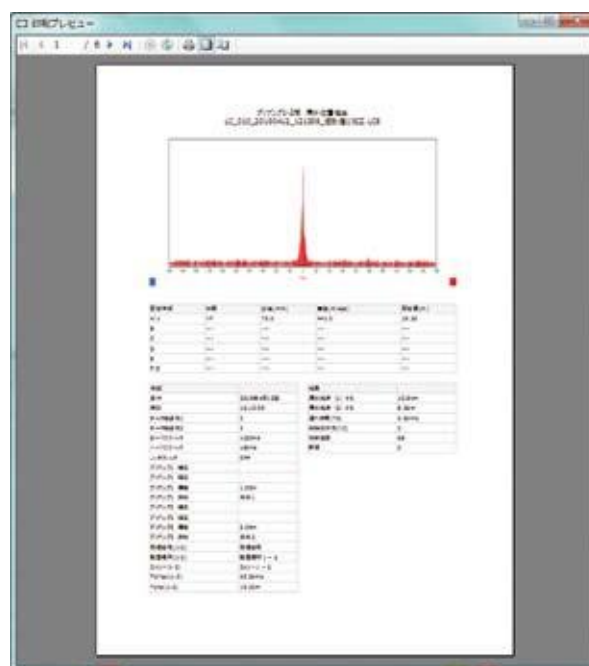
If there are multiple correlation screens, the "Print Target" window appears. Select "Print List" or "Print Detail" and then click "OK".



The Print Preview screen appears.

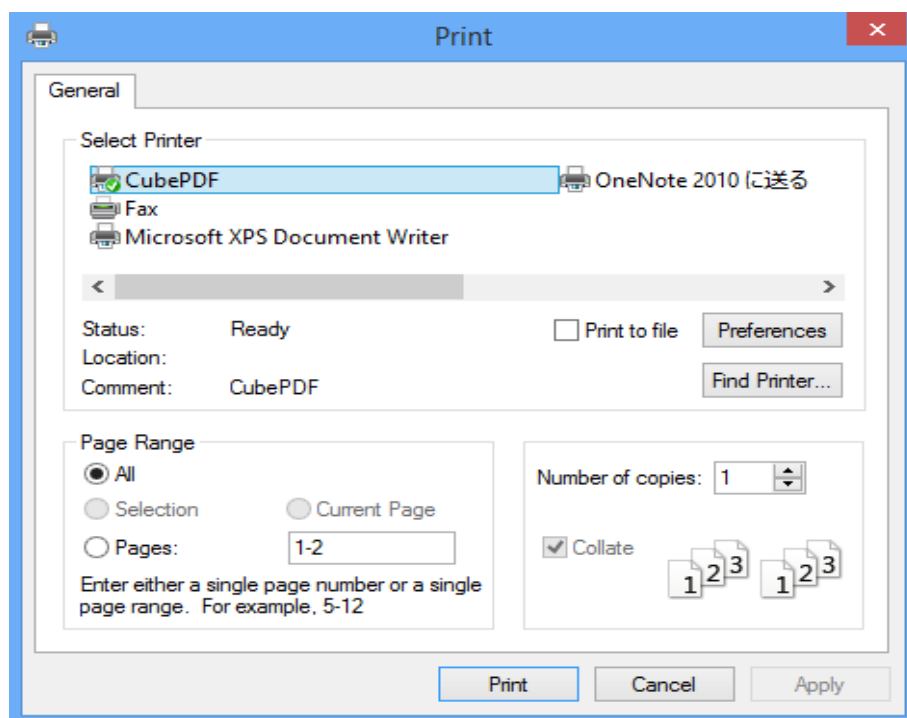


Print List Preview



Print Detail Preview

Select the printer icon  on the preview screen to open the Print window.

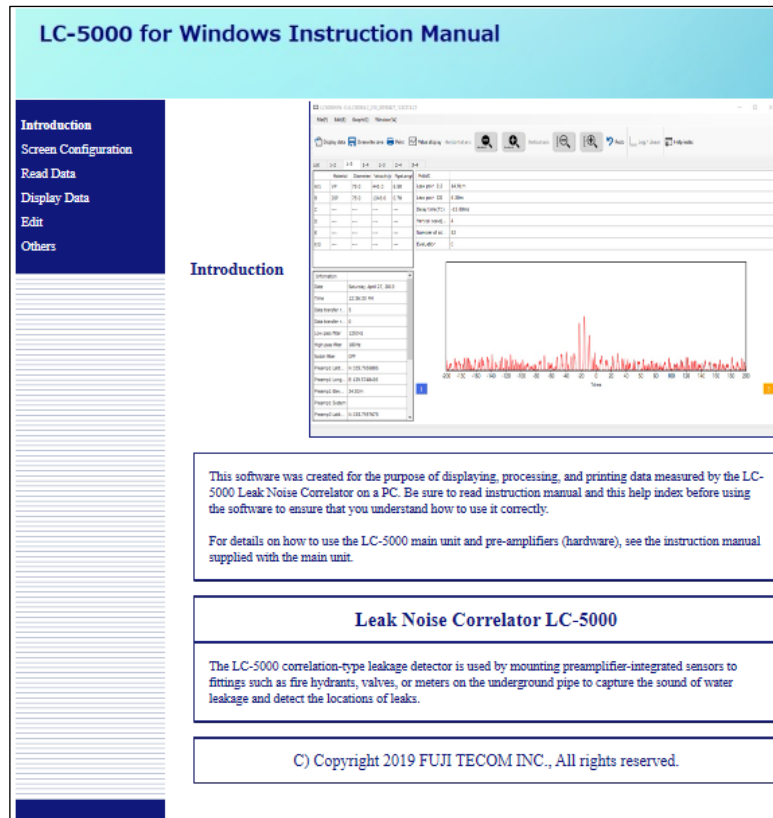


Configure the printer settings and click “Print” to print the graphs and indexes according to the settings.

9. Help Index

Use this function to get help when you are not sure how to use the software.

Select “Help index” from the “File” menu or tool buttons to open the “LC-5000 for Windows Instruction Manual” screen.



Select the desired topic from the menu on the left to see detailed information on that topic.

10. Troubleshooting

If “Reading error” is displayed when reading LC-2500 data, check the following.

① Is the LC-2500 unit powered on?	<ul style="list-style-type: none">● If not, turn on the power.
② Are you using the connection cables supplied by FUJI TECOM?	<ul style="list-style-type: none">● Be sure to use the cables supplied by FUJI TECOM.
③ Is the cable securely connected to the main unit and the PC?	<ul style="list-style-type: none">● Make sure the cables are securely connected.
④ Is the port setting correct?	<ul style="list-style-type: none">● Refer to “3. Reading Data from the LC-2500” and verify the settings.
⑤ Is the COM port IRQ set?	<ul style="list-style-type: none">● You can configure the BIOS settings when you start your computer. If an IRQ is not assigned, assign it.
⑥ Is the main unit busy detecting the leakage location, processing FFT data, or recording?	<ul style="list-style-type: none">● The main unit cannot read data while it is busy with leak detection or other tasks. Stop the leak detection or other tasks and try reading the data again.



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