

Lindos Lin4WinXP

**Support Software for the
LA100, MS1 and MS10
Audio Analysers**

User Manual

First Edition

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Getting Started

1.1 Introduction

The Lin4WinXP software enables a PC with Windows to control the Lindos LA100, MS10 or MS1 Audio Analysers via a serial link. It provides a simple way of accessing the standard features using a graphical user interface rather than operating the units from their front panels. Automatic test sequences and frequency sweeps can be run under computer control and the results displayed, printed, uploaded to the Lindos Test Sheet Database for public viewing or saved to disc. Tolerance testing allows all results to be checked against pass/fail tolerances. This all works in a similar way to operation from the front panels so existing users should find it easy to use. The Windows software provides many more options with a simpler user interface.

Graphs can be printed as large as the printer will allow and a rich set of options allows the colours, styles and overlays to be controlled. Tolerance masks can be shown on the graphs and the grid density and labelling can be easily adjusted.

This manual refers to Lin4WinXP v5.30. Please refer to accompanying update sheets or to the ReadMe file on disc if you have a later version. If you are upgrading from an earlier version refer to appendix B for a list of new features. If you are new to Windows refer to appendix C for an explanation of the common dialog boxes.

Please send any comments, suggestions or bug reports to Lindos Electronics.

1.2 Installing the Software

Put the supplied CD into a Compact Disc Drive and double click on the drive icon in 'My Computer' or an equivalent short cut. Double click on the Setup file to install Lin4WinXP on your hard disc. If you encounter any problems installing the software restart the computer, ensure that no other applications are running and try again.

The software will work with Windows 95, 98, NT3, NT4, 2000, ME or XP.

To run Lin4WinXP click on the Windows Start button, follow the programs menu arrow and click on the Lin4WinXP icon.

1.3 Connecting the LA100

The full software pack normally comes without connecting leads. Users upgrading from the Lindos DSK2, DSK4, Lin4Win v2.1 or Lin4Win2000 software should already have suitable leads which for older units are:

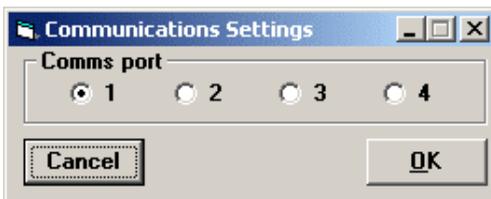
9 pin D plug to 5 pin domino DIN (3m long)

5 pin domino DIN to 5 pin domino DIN (1m long)

The LA100 MK3 interfaces using two standard D-type to D-type RS232 leads which are supplied with all new and upgraded units.

Plug the 9 way D plug into the PC serial port labelled SERIAL (or COM1), and plug the other end into the LA101 or the LA102. If the computer has a 25 way serial port you will need an adapter plug or a different lead.

The other lead should then be used to connect the LA101 and the LA102 together. The two serial interface sockets on each unit are connected in parallel, so it doesn't matter which one is used, but note that when using domino DIN leads the notch should be towards the left when looking in to the socket (most LA100 units have a keyed socket, but a few were shipped with non-keyed sockets). You can connect the LA100 to COM2, COM3 or COM4 if COM1 is already used but you will need to change the serial port option by clicking on **Comms Setting** from the **Options** menu, which can be found at the top of the main results window.



When the LA101 and LA102 are daisy-chained like this the LA102 provides the handshake signal back to the computer. This means that the LA101 can be disconnected and the LA102 used by itself with the computer. However, if the LA101 is to be used on its own a dummy handshake plug must be plugged into the unused socket on the LA101 to return the computer's own handshake (a domino DIN plug with pins 2 and 5 connected together is available from Lindos on request).

No special settings are needed in the LA100, Lin4WinXP will automatically detect which baud rate the LA100 is set to and reconfigure it for 9600 baud.

When the LA100 is connected to the computer its own keyboard can still

control it. The computer will take over and disable the LA100 keyboard when it needs to, but it will return the LA100 to manual mode as soon as it has finished. If the LA100 is ever left in REMOTE mode tap the [ON/OFF] key briefly to put it into manual mode, but this shouldn't be necessary.

1.4 Connecting the MS1/MS10

All MiniSonic devices are supplied with Lin4WinXP and a D-type to D-type RS232 lead.

Connect the female D-type to the PC's serial port and the male D-type to the MiniSonic's RS232 port. Take care to not plug into the audio input or outputs as this will cause the UniSon PowerBus to become shorted resulting in a loss of power from the unit. The MiniSonic's power circuits are internally protected so no damaged will be caused should this accidentally occur.

The MiniSonic can be connected to COM2, COM3 or COM4 if COM1 is already used but you will need to change the serial port option from **Options/Comms Setting** on the menus listed at the top of the main results window.

1.5 Basics

Double-click on the Lin4WinXP icon to start the program and after a few seconds the main window and the Control Panel will open.

If the computer has a firewall installed it will probably prompt whether to allow Lin4WinXP to access the Internet. Lin4WinXP needs Internet access to publish test results to the Lindos web site and to download updates, but it will function without Internet access if you wish to keep blocking it. Refer to your firewall documentation for further details.

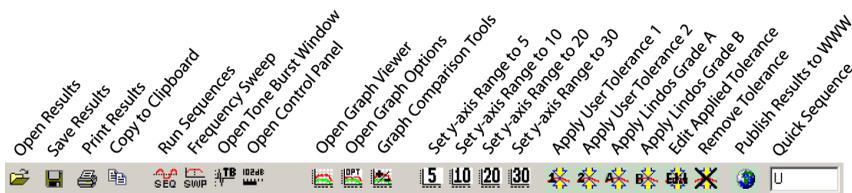
If no device is present the status bar at the bottom left of the control panel will turn red and flash the message "No unit Connected (no handshake) on COM1". Return to the previous section if this occurs or see appendix A if you suspect baud rate problems.

Once a connection is established the panel message will change, to show the device connected along with its serial number and firmware version.

For example "LA100 5077 V6.7" or "MiniSonic 0001 M3.0".

The software requires a licence keyfile to function fully with an LA100 unit, (MiniSonic units work in full with all versions straight away). If the LA100 is not licensed a message will appear offering to connect to the internet and download the latest Userkey file or continue in demonstration mode. The Userkey file contains a list of all the currently licensed LA100s. If the PC being used doesn't have an Internet connection the Userkey.dat file can be download manually from www.lindos.co.uk/lin4win.html and copied over the existing 'Userkey.dat' in the 'Lin4WinXP' installation directory (normally in C:/Program Files).

The tool bar at the top of the main window provides the following functions:



These buttons apply to the graph last selected. A single click on a graph will select a graph. A double click will display the graph in the Graph Viewer.

Audio test results are displayed in the main window, which uses a multi-document interface (MDI) to enable multiple results to be displayed in sub-windows within this main window. The test results may be from automatic test sequences, frequency sweeps, data logging or test procedures. It doesn't matter how they were generated as they are all treated in the same way.

All of the program's features can be accessed from the menus. The button bar and control keys also give quick access to the common features (for example Ctrl-P to print, Ctrl-S to save, Ctrl-O to open a file etc). Some common operations can also be accessed by double-clicking over the graph or text results.

Sequences can be run by entering a list of segment letters into the 'Quick Sequence' box on the toolbar, through the menus or via the control panel. Note that all MiniSonic segments are lower case letters and the majority of LA100 uppercase. If connection to the device proceeded smoothly, as described above, try entering 'U' or 'u' and pressing return. Assuming that a signal path is available between the output and input the device will immediately run and receive a stereo sweep. It is also worth noting that the MiniSonic can communicate with an LA100 (i.e. entering 'U' with a MiniSonic

connected will produce an LA100 sweep) and will generate and receive some LA100 segments (see section 4.6 of the MiniSonic manual for further details).

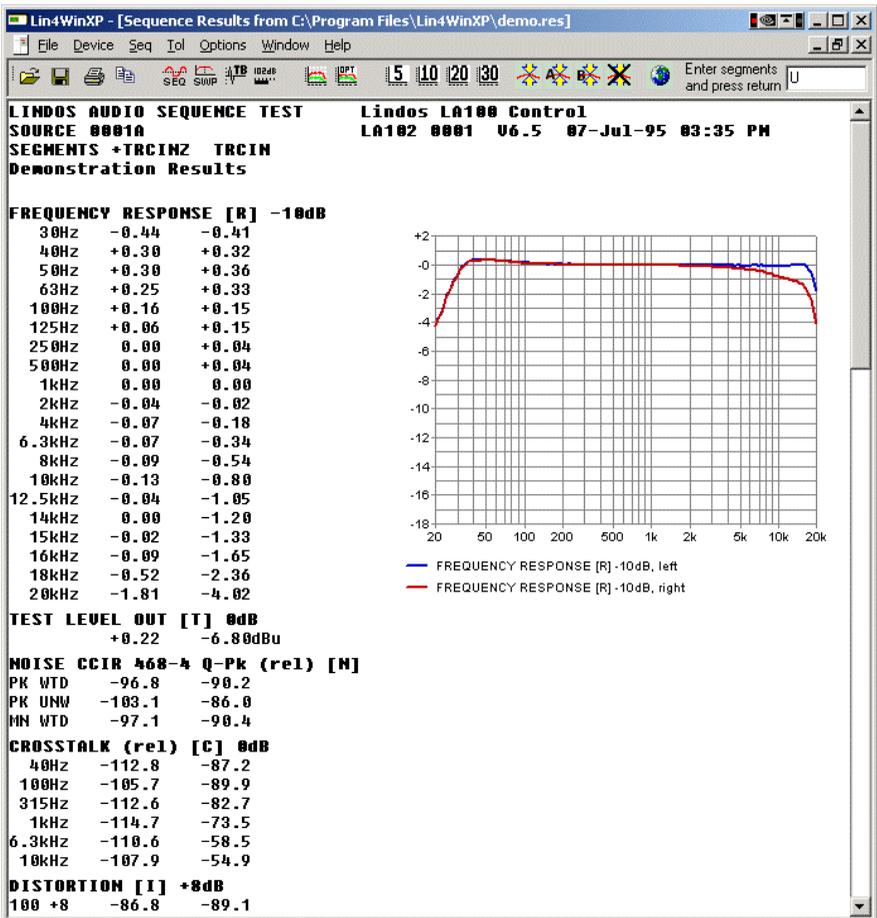
Sequence Handling

1.6 File Handling

Use the **File** menu to load or save results. Results files have a RES file extension and are typically just 2K bytes in size. Sample Results and Tolerance files are provided with the software in directories named Results and Tolerances, which can be found in the directory that the software was installed to (normally C:/Program Files/Lin4WinXP).

Results files can be loaded by clicking on **Open** in the **File** menu or by dragging and dropping them into the main window. Please see appendix C if you are new to Windows. The results will be displayed in a new window.

Use the **Open** menu entry to load the demo.res results file.



Results may be saved using the **File Save** menu or by clicking on the Save button (the floppy disc icon). Ctrl-O and Ctrl-S can also be used to access the open and save dialogs quickly.

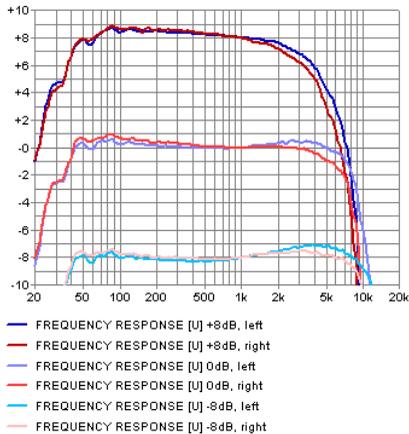
1.7 Results Display

Sequence results are shown in a window with the graphs beside the text, as on an LA102 printout. This window can be scrolled up and down using the standard Windows scroll bar, scroll buttons or wheel mouse. It can also be scrolled with the Page Up and Page Down and cursor up/down keys.

Graph options can be used to change the size, scale, colour, normalisation or style of the graph as described in section 1.42. To change the graph options click on the Graph Options button or choose **Graph Options** from the **Options** menu. The new options will be applied to all graphs in the current results window as well as to new results windows that are opened, but other results windows will not be affected.

1.8 Results Manipulation

Each segment displayed on a results sheet can be copied to another results sheet by dragging and dropping the segment text. The drag can be initiated anywhere on the segment's text and a dashed bounding box will appear around the text. Drop the box onto another segment's text and the segment will be inserted below the segment it was dropped on (unless the segment being copied is already on the results sheet). This is useful for overlaying multiple frequency response graphs that were generated with different sequence runs, adding power to MiniSonic in particular as it can only normally plot one response.



Select **Overlay All** from the frequency response tab on the Graph Options window to overlay multiple graphs.

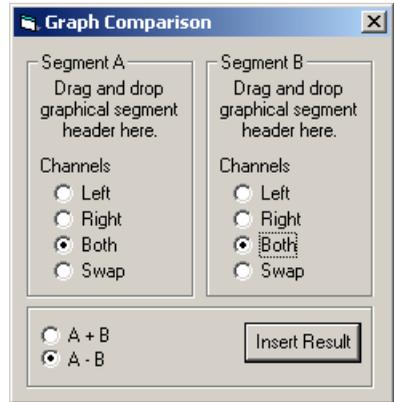
To delete a segment, single-click the segment text and press delete. A message box will appear asking you to confirm the deletion.

1.9 Comparing Frequency Response Graphs

When testing microphones or equipment in a system with a known response error it can be useful to add graphs or subtract one graph from another.

Click on the graph comparison icon on the toolbar to open the **Graph Comparison** window:

Drag and drop the segment headers of the graphs onto the boxes labelled segment A and segment B. Note that the same segment can be dropped onto both boxes and that this facilitates the comparison of one channel with another from the same graph, see DPA4060 microphone results below.

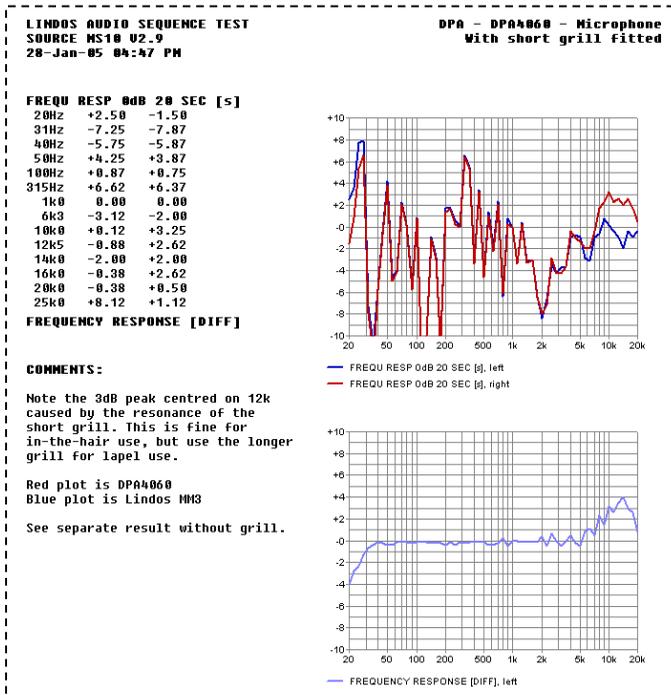


Left selects the left channel for comparison.

Right selects the right channel.

Both selects both channels.

Swap will swap the channels over.



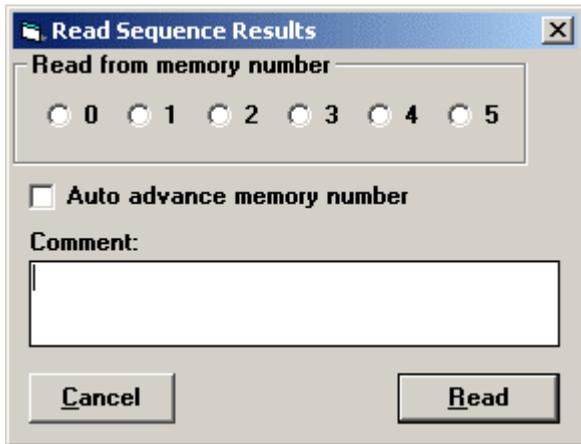
Select the form of comparison required (**A+B** or **A-B**), then bring the results sheet that you want the results to appear on to the fore by clicking on its title bar. Click **Insert** to insert the result.

Depending on the settings either one or two new graphs will appear at the bottom of the results sheet.

1.10 Reading Results from the LA102

Use the **Device** menu to read results from the LA102. This will read the results from the last sequence test, whether it was run directly on the LA100 or under computer control.

The LA102 has 6 results memories, numbered 0 to 5, and memory 0 is always used to hold new results. (The LA102 can be used to store up to 6 sets of results by pressing * 2 and then a memory number to store the current results, from memory 0, in one of the other memories. Test results are stored in non-volatile memory so they are preserved if the LA102 is turned off).



A comment to be held with the results can be entered into the space provided, and the date and time will automatically be added to the results header. Comments can also be added/edited after the results have been received/loaded by double clicking on the text (see section 1.43 for further details).

Click on the **Read** button to read the results (this should take about 4s, but will take longer on slow computers, or for large results files containing many frequency response sweeps). If this fails, refer to the troubleshooting section in appendix A.

Technical note: Since the LA102 memory is shared and used for different purposes the number of results memories is sometimes reduced. In particular, results memories 4 and 5 cannot be used when user defined tolerances are held in the LA102, and the number of memories is also reduced if the 'number of compartments per memory' (LA102 configuration C) has been increased. See the LA102 manual and V6.3/V6.5 update sheet for details. Attempting to read from a results memory that isn't available will give a warning message.

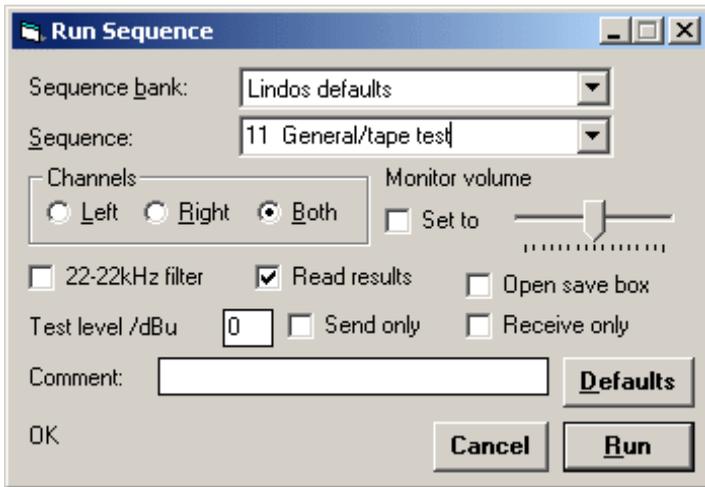
1.11 Reading Results from the MiniSonic

Click the **Get** button on the Control Panel to read results from a MiniSonic. The read process will take no more than one second and will read the test results from the last sequence test, whether it was run directly on the MiniSonic or under computer control.

The MiniSonic (V3.0) can at present store one set of results in its memory and the results are preserved if the unit is turned off.

1.12 Running LA100 Sequences

The simplest way to run a sequence is to enter a list of segments (e.g. TRINCZ) into the text box provided on the far right of the toolbar or to the right of the status box on the Control Panel and press return. The Run Sequence window will then open and messages confirming the progress of the sequence will be displayed. Once the sequence has completed the results will be retrieved and displayed automatically.



The Run Sequence window can be opened by clicking the **Seq** or **Setup** buttons on the Control panel, by choosing **Seq/Run seq** from the Menu bar or by clicking the **SEQ** button on the toolbar on the main. The sequence can be specified using any of the following methods:

1. Choose a **Sequence bank** from the drop down bank menu and then choose a sequence from the drop down sequence menu.
2. Click in the Sequence field and enter a sequence number. Note that

sequence numbers 1-10 are used defined; sequences 11-20 are the Lindos defaults etc.

3. Click in the **Sequence** field and enter the segment. For example, TRCINZ could be entered directly in to this field. (Note that the 10 user defined sequences in the LA101 will be preserved and not overwritten).

Click the **Run** button to make the LA100 run the specified sequence. If the sequence fails or an error occurs, refer to the troubleshooting section in appendix A.

Various sequence options may be specified before running the sequence:

The **Channels** buttons can be used to make the test sequence run on the left, right or both channels. Note that the left input of the LA102 is always used to decode FSK so the left LA102 input must always be connected, even if the test is only being performed on the right channel of a system. See section 3.11 on page 48 of the Lindos LA100 manual for more details.

Monitor volume can be used to set the volume of the LA102 loudspeaker, but it cannot be adjusted once the sequence is running.

22-22kHz filter switches in a band-pass filter to reject low and high frequency noise, outside of the audio bandwidth, It will affect the LA102 frequency response slightly near these frequencies, but the effect is minimal.

Read results is normally enabled to make the computer read the results as soon as the sequence has finished. The results are displayed in a new results window.

Open save box causes a dialogue box to be opened allowing the results to be saved to disc as soon as they have been read. This is convenient when performing a large number of tests as it saves time in opening the save menu for each test.

Test level determines the level at which the sequence will be run. All of the test segments will be relative to test level and the FSK will also be at test level. See section 3.7 on page 45 of the LA100 Manual.

The **Send only** and **Receive only** buttons should be used if a sequence is being generated but not received, or vice versa (for example, when testing a

communications link, or when making a test tape).

The **Comment** field can be used to enter a comment which is then stored with the test results and displayed in the results header. Note that comments can be entered/edited after the results have been read. Double click on the results text to bring up the Results Format window.

The **Defaults** button restores all of the other settings to their defaults.

1.13 Running MiniSonic Sequences

Enter a list of segments (e.g. nurqlz) into the text box provided on the far right of the toolbar and press return. The MiniSonic will immediately run and receive the sequence returning the results when completed. No progress confirmation is provided in Lin4WinXP when used this way, but it provides a very quick way of performing tests. In many test situations you may never need to open the Control Panel at all. Note that an option in **Options/MiniSonic** is provided to control whether or not the Control Panel is opened on start up.

Open the Control Panel and click **Seq**. The drop down menu below the function buttons will show "SEQ1 'Sweep' u" and the sequence text box will display 'u'. Use the drop down menu to select a pre-defined sequence and click **Run** or press return.

Multiple sequences and repeating sequences can be run using the following commands:

/n	Repeat section between '/' characters n times
<n	Repeat all sections n times – note that a stop button appears on the control panel.

For example:

u<	will produce sweeps indefinitely and the frequency response results will be updated on the computer immediately after every sweep.
n/u/2h	will produce nuuh as will n/u/u/h
h/u/2<2	will produce huuhuu

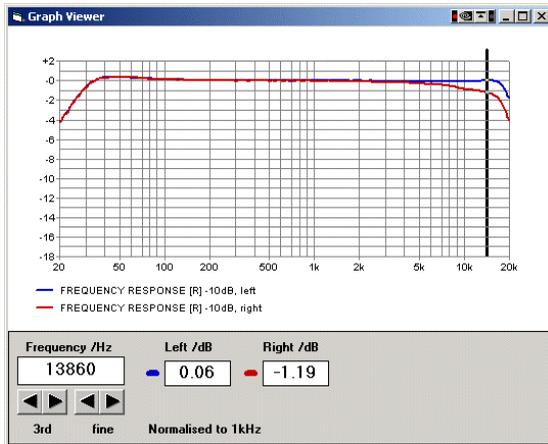
Note – It is not currently possible to include tone burst sequences using these commands. This will be corrected in a future MiniSonic firmware update.

1.14 Creating User Sequences

Editing a pre-defined sequence in the sequence text box creates a user-defined sequence. 'User Sequence' will appear selected on the drop down menu. To store the sequence for future use, rename the sequence by typing over the 'User sequence' text and clicking **Seq.** The new user-defined sequence will appear selected in the list. To edit a user-defined sequence, select the sequence from the drop down menu and type the new list of segments into the sequence text box. The list of segments displayed on the menu will automatically update. To rename a user-defined sequence, type the new name over all of the text in the menu box and click **Seq.** To delete a stored sequence remove all of the characters from either of the boxes and click **Seq.** To save user-defined sequences for future use, name and **Save** the panel setup at the bottom of the Control Panel. Note that this also saves the frequency and level presets (see section 1.25 for further details).

1.15 Large Graph Display

Click on the Graph (full size graph) button after single clicking on a graph or double-click on the graph itself to display a large (full-screen) graph together with a frequency/level display, which allows the precise level to be read for any frequency. The frequency may be changed by typing a new frequency into the frequency box; by using the up/down buttons to change it in third octave or fine steps, as on the LA101 or MiniSonic; or by clicking over the graph with the mouse.



All of the frequency response graphs in the results can be overlaid and plotted on the large graph by selecting **Overlay All** from the Graph Options window (see section 1.42). If any are not visible then they probably fall outside of the graph range and may be displayed by changing the graph scale in the Graph Options window.

The MiniSonic can produce graphs of noise against time (segment l) and of level against level (segment h). The up/down buttons in the Graph Viewer

provide one-second and one-dB steps respectively for these graphs and the fine buttons step up and down point by point. The MiniSonic can also plot phase against frequency (segment z).

A large number of graph options are available to change the size, grid density, scale, colour and overlaying of graphs. These options are accessed by clicking on the Graph Options button or via the **Options** menu see chapter 4 for details.

1.16 Tolerance Testing

The tolerance testing system is based on the Lindos format described in chapter 5 of the LA100 manual and section 8.8 of the MiniSonic manual, but it has been extended to allow distortion limits optionally in % rather than dB.

The Tolerance Definition

For every result value recorded by a test segment there can be a corresponding tolerance string. Each tolerance string can specify an upper value or a range and a maximum allowed difference between the two channels, in one of the following formats:

n	Value must be less than or equal to n
$\pm n$	Value must be $0 \pm n$
n m	Value must lie between n and m (space or sign separate n & m)
$n \pm m$	Value must be $n \pm m$.

Any of these forms can be followed by a difference specifier:

<d	Channels (or registers) must match within difference d
----	--

Note that the first form would normally be used for distortion, noise or crosstalk results, which must normally be below a certain limit (but there is usually no lower limit - they cannot be too good). The second form ($\pm n$) would normally be used for frequency response, speed error or phase results, which should ideally be 0, although the third and fourth forms are often used for frequency response results where different upper and lower limits can be useful (eg '+2-3').

n, m and d may be positive or negative, although the + sign is optional. Most tolerance limits tend to be whole numbers, although decimal places are allowed. In fact each value may be specified to a resolution of 0.0001 in the range -9999.9999 to +9999.99 (the fractional part can be omitted for whole

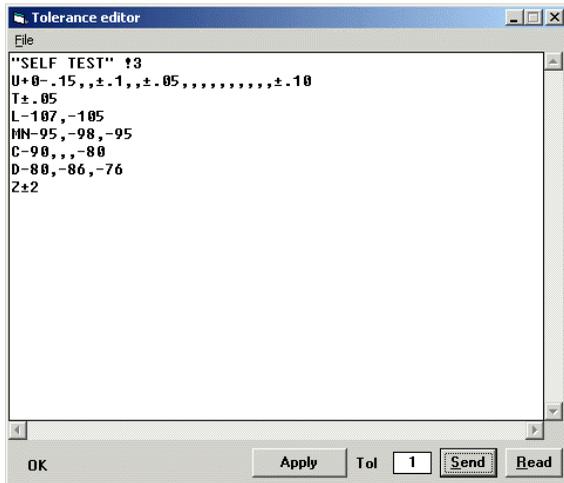
numbers).

The units that are used depends on the test segment. For example, frequency response results will be in dB, while phase results will be in degrees.

Choose **Apply tolerance** from the **Tolerance** menu item to apply a tolerance to the displayed results. Choose **Edit/Transfer tolerance** or click the edit tolerance button on the toolbar to start the tolerance editor. The **Apply** button provides a way of testing tolerances as you edit them. When clicked the tolerance will be applied to the results sheet that was last selected.

Try loading a tolerance file supplied with the software (in C:/Program Files/Lin4WinXP/Tolerances). It is advisable to make a copy of the tolerances directory elsewhere for your own use before making any changes.

The **File** menu allows tolerances to be saved or opened in the tolerance editor. Tolerances can also be applied by dragging and dropping them onto a results sheet which will also open the tolerance editor for ease of editing. It is also permissible to edit tolerances in a text editor, as they are just text files.



Tolerances can be sent to or read from the LA102 by clicking Send or Read in the tolerance editor. Progress and confirmation messages for the read and send operations are displayed in the bottom left corner of the window.

The quick tolerance icons on the toolbar offer two user tolerances and two Lindos grading tolerances for instant application. The action of the user tolerance buttons can be set up using the Tolerance Options window (click **Options/Tolerance options** - see section 1.45 for further details).

The Grade A and Grade B Tolerance buttons on the toolbar apply the Lindos-defined quality grading system:

‘**Lindos Grade A**’ suggests a level of quality that produces no perceptible degradation whatsoever for most listeners in ‘blind’ A-B testing under the very best listening conditions. It is close to what would be expected from optimal ‘CD quality’.

‘**Lindos Grade B**’ represents a level of quality that most people most of the time would find ‘near perfect’. The best compact cassette decks will meet this grade, using Dolby C or possibly Dolby B.

Tolerances can be removed by clicking the **Remove Tolerance** button on the toolbar.

The **Options/Save options** menu provides an option to save the tolerance information with the results file and by default this is turned on. When the results sheet is next loaded the tolerance will be automatically applied. Use the edit tolerance button to extract a tolerance from a saved file or to edit an applied tolerance.

When a tolerance is applied to segments with graphical results the limits are marked on the graph with blue arrows. These can be changed to lines or removed using the graph options settings (see section 1.42.1).

1.17 Printing Results

Use the **Print** option on the **File** menu to print the test results.

Printing uses a Windows printer driver that must have been set up as explained in the Windows manual. Any Windows compatible printer can be used, including Postscript and colour printers. Colour graphs will be printed on colour printers, but monochrome graphs can be printed instead by changing the Printer driver colour setting or by changing the graph options.

Many other options are available to control the margins, headings, and text size of the printed results. See sections 1.42 and 1.43 for details.

1.18 Displaying Multiple Results

Every time a new results file is loaded a new window is created, but this is not immediately apparent, as it will fill the main window, obscuring the previous

results. Use Ctrl-Tab to cycle through results - this brings an earlier results window to the fore. Ctrl-Shift-Tab cycles in the opposite direction.

Windows can be re-arranged using the **Windows** menu:

The **Cascade** option will stack the windows so that the title bar of each window is visible. The **Tile** option will show fit all of the results windows in to the main window, reducing them as necessary.

The usual Windows controls can be used to maximise, minimise or iconise windows, and if results windows are iconised the icons can be neatly positioned using the **Arrange icons** menu item.

At the bottom of the menu a list of the available results windows enables a particular set of results to be selected.

To close and remove a set of results simply click on the close box, but note that this version will not warn if the results haven't been saved.

1.19 Exporting Results via the Clipboard

Results can be copied to the Windows clipboard and pasted into other documents. The clipboard is used to hold items being moved between applications and its contents may be viewed using the Windows Clipboard Viewer application. Items put on to the clipboard will remain there until overwritten by another item, or until Windows is shut down.

To copy a set of results to the clipboard, click on the **Copy to clipboard** button. This will copy the current results text as plain ASCII text, and the graphs as a single Windows metafile (NB: text works but graphs currently have a problem). These can now be pasted into another application by using its **Paste** from clipboard button. If multiple sets of results are loaded ensure that the correct results are selected before using the Copy to clipboard button.

Some applications will only be able to handle one type of data. For example, Microsoft Write cannot handle pictures so it will only paste the results text.

Most word processors can handle text and graphics metafiles although separate paste commands are needed to paste each item. For example, in Microsoft Word the **Paste** button will paste the results text, but the Paste Special command on the **Edit** menu can be used to paste the metafile graphs into a Word document. The graph can now be resized or cropped in

Word by dragging or shift-dragging the corners of the bounding box.

Since the graph is exported as a Windows metafile it can be scaled and printed without losing any quality and without requiring excessive amounts of memory.

When results text is pasted into a word processor it should be set to use a non-proportional font, such as Courier or FixedSys to ensure that the columns line up correctly.

1.20 Saving Graphs

Graphs can also be saved as metafiles. Choose the **Save Graph** option on the **File** menu and save the file in the normal way. This will save a Windows metafile with a WMF extension, and this graphic file can then be loaded into another program, such as Microsoft Word. The graph is saved exactly as it appears, so you should ensure that the correct graph options have been set before saving the graph (see chapter 4).

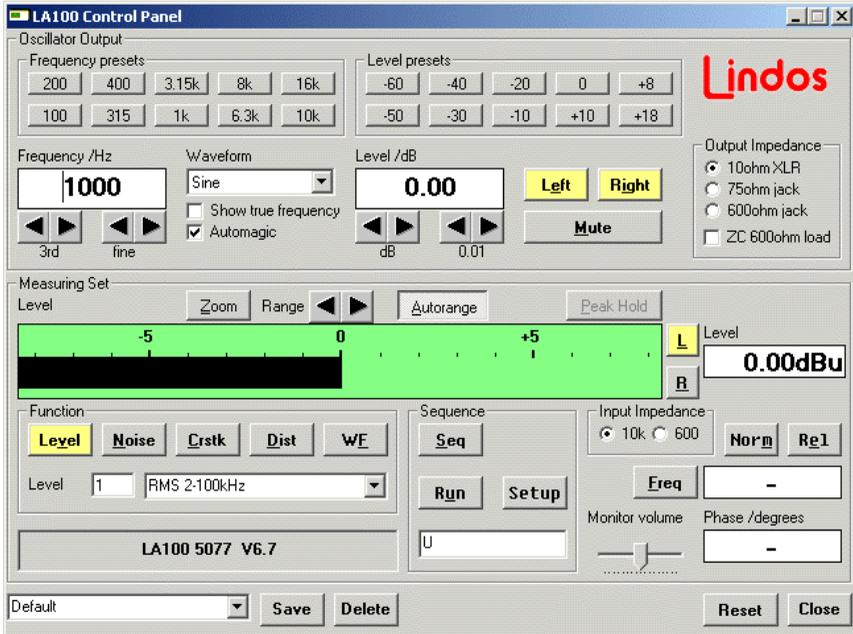
1.21 Saving Results as HTML

Choose the **Save as HTML** option from the **File** menu and save the file in the normal way. An HTML file and a GIF file with the same name will appear in the chosen directory. The GIF, which contains all the graphs, is outputted with 256 colours and at a resolution of 72 dots per inch.

Control Panel

1.22 Overview

Click on the Panel button (or choose Panel from the **Device** menu) to open the measurement Control Panel:



This panel shows the oscillator settings in the top half of the window and the measurement options and measured values in the bottom half. Many of the buttons and icons provide help if you move the mouse pointer over them and the help often gives details of keyboard shortcuts as well as explaining what they are for.

1.23 Measurement Options

The five **Function** buttons select the current function, and most provide several options which can be selected from the drop down menu or by entering the option number into the box provided. For example, when using the LA102, **Noise** option 1 provides a CCIR Weighted quasi-peak measurement, whilst **Noise** option 8 provides an A-weighted measurement.

The measurement function may be selected by clicking on one of the 5 function buttons. These are **Level**, **Noise**, **Crosstalk**, **Distortion** and **W&F** for the LA102. When used with a MiniSonic a **PPM** (Peak Programme Meter)

button is provided instead of W&F.

The options for each function are listed in chapter 2 of the LA100 manual and chapter 3 of the MiniSonic manual:

1.24 Setting Frequency and Level

The output frequency and level are set using the up/down buttons.

The **3rd** buttons change the frequency in third-octave steps (1000Hz, 1250Hz, 1600Hz, 2000Hz etc), while the **fine** buttons change the frequency in fine steps (32 steps per octave on the LA102 or 12 steps per octave on the MiniSonic). Similarly the **dB** buttons change the level in 1dB steps while the **fine** buttons change the level in 0.01dB steps on the LA102 or 0.5dB steps on the MiniSonic. Typing new values into the fields and pressing return also changes the frequency and level.

Note that the Lindos oscillators can only generate certain specific frequencies and the closest frequency available will be used. If **True frequency** is selected the actual frequency being generated will be displayed, otherwise the frequency will be rounded to the nearest third-octave when it is changed with the third-octave buttons

1.25 Frequency and Level Presets

The ten frequency and ten level presets can be used to set a particular level or frequency with a single mouse click. The preset buttons can be assigned other frequencies or levels by manually setting the frequency or level and then holding the **Ctrl** key while clicking on the preset button (or by clicking and holding the preset button for two seconds). The button will turn yellow to confirm the change. To swap two presets drag and drop one onto the other.

1.26 Setting the Output Channel

The **Left**, **Right** and **Mute** buttons are used to select the output channels and the yellow highlight indicates the current state. Clicking on **Left** or **Right** turns that channel on or off, while clicking **Mute** turns both channels off or restores the previous state if they are already muted. When a channel is off, the output is muted and terminated through a resistor so the output impedance is not affected.

1.27 Keyboard Shortcuts

The following keyboard shortcuts work when the panel is selected as the current window:

F1	Frequency down (3 rd octave steps or fine if shift is held)
F2	Frequency up (3 rd octave steps or fine if shift is held)
F3	Level down (1dB or fine if shift is held)
F4	Level up (1dB or fine if shift is held)
F5	Range down
F6	Range up
Alt-L	Measure left channel
Alt-R	Measure right channel

1.28 Frequency, Phase and Level Measurements

The Level, Frequency and Phase measurements are updated in real-time to show the values that the device is measuring. Note that when using an LA100 the Frequency and Phase measurement can be enabled or disabled by using the **Freq** button (see section 1.33 for further details).

When measuring level using a MiniSonic the Left and Right channels are measured simultaneously and displayed as two separate bar graphs and two numeric values. The LA100 however only measures level on one channel unless **Level option 4** is selected in which case both channels will be displayed. Since this requires rapid switching of the channel relays the update rate is rather slow. When using an LA100 or when measuring Noise, Crosstalk or Distortion with either unit only a single channel is measured and the **L** and **R** buttons may be used to select which channel is measured.

1.29 Distortion Measurement

When measuring distortion the level is displayed in dB, relative to the measured level of the fundamental. It is also displayed as a percentage.

Both the MiniSonic and the LA102 measure the level of the fundamental briefly when the **Dist** button is clicked (for use in deriving a relative reading), so it is important that the **Dist** button is clicked again to re-measure the fundamental if its level changes. It is a good idea to click on the **Dist** button if in any doubt.

1.30 Zoom Button

The **Zoom** button expands the bar graph scale, and the **Range** buttons change the bar graph range as well as locking the current range. The

Autorange button toggles autoranging. Autoranging is automatically disabled if one of the **Range** buttons is used.

1.31 Reset and Close Buttons

The **Reset** button resets the unit and restores the default output frequency and level.

The **Close** button closes the control panel. If using an LA100 it also puts the LA100 back into manual mode, thus allowing the LA100's own front-panel buttons to be used.

1.32 Saving the Panel Settings

The current settings in the Control Panel can be saved as a named panel setting. This can be particularly useful when production testing, where set levels or frequencies are repeatedly needed. Several settings can be saved and recalled, and the settings last used will be restored when the program is next loaded.

To save the current state of the panel enter a name for the settings into the dropdown menu in the bottom left corner of the window and click the **Save** button. The frequency and level presets are saved as well as the sequence definitions and input and output impedance settings. The current frequency, level and channel settings are not saved.

The **Delete** button allows the current panel setting (selected in the drop down menu) to be deleted.

1.33 Bar Graph Speed

The bar graph shows the current level, just like the bar graph on the LA102 or MiniSonic. However, when using an LA102 the bar graph on the computer display will not be as responsive as the bar graph on the LA102 itself due to communication delays over the serial link. When using a MiniSonic, the computer display will be much more responsive thanks to the MiniSonic's synchronised continuous data streaming system named SyncLink which updates the level information 110 times a second. This is fast enough to avoid obvious beating with the screen refresh rate (typically 60/75Hz).

When using either unit the **Freq** button toggles frequency and phase measurement. If turned on the frequency and phase are measured and displayed but this will make the bar graph less responsive. Turn **Freq** off to make the bar graph more responsive.

1.34 Changing the output waveform

The waveform type can be selected using the **Waveform** drop-down menu. The LA100 can generate sine, square, triangular and saw tooth waves as well as DC. The MiniSonic can generate sine waves and 1kHz, 5kHz or 10kHz square waves.

1.35 Panel Features Specific to the LA100

The LA101 output impedance can be set using the 10ohm, 75ohm or 600ohm buttons. Note that the output impedance of the rear XLRs is always 10ohms and that the front jacks are always 75ohm unless 600ohm is selected (this limitation applies when using the LA101 without a computer - see section 2.21 on page 30 of the LA100 manual).

The **ZC 600ohm** option boosts the output level by an amount dependant on the selected output impedance, to generate the selected level into a 600ohm load. For example, when using 600ohm output impedance, selecting **ZC 600ohm** will increase the output by 6.02dB.

The **Input Impedance buttons** allow the input impedance to be switched between 600ohm or 10kohm.

The panel bar graph shows the measured level and always shows the same value as the numeric display, unlike the LA102 bar graph which always shows the absolute level being measured. For example, if, when measuring distortion on a +8dB tone the normalised distortion is -40dB then the bar graph and the numeric display will both show -40dB, whereas the LA102 bar graph would show the absolute level (-32dB).

The **L** and **R** buttons are used to select the input channel.

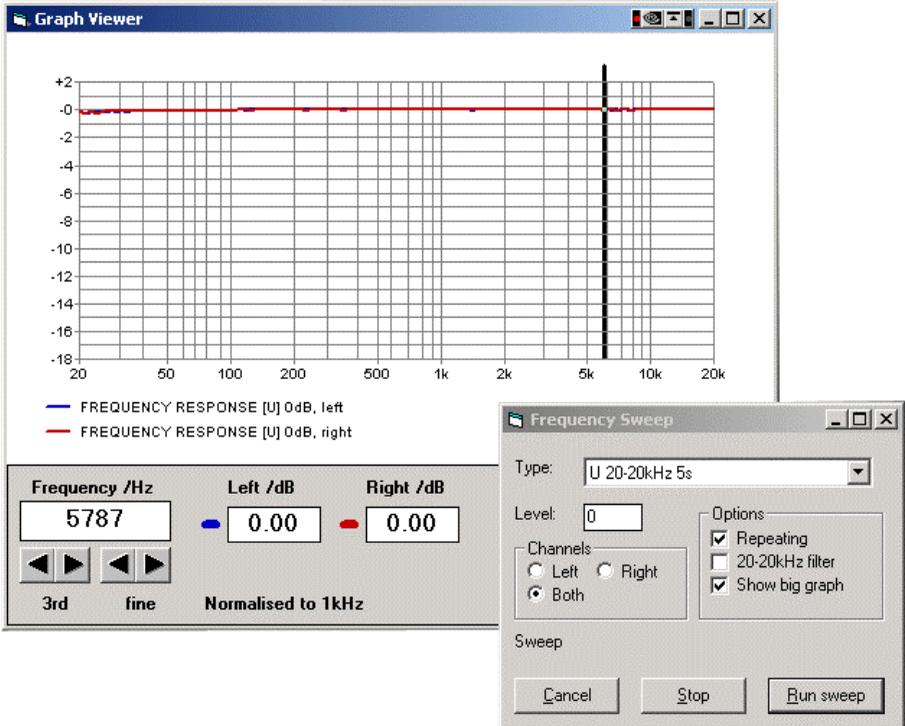
The **Monitor volume** slider controls the level of the LA102's built-in loudspeaker. The volume may be changed by dragging the slider or by clicking to the left or right of it to decrease or increase the volume.

The **Automagic** option can be enabled to make the software automatically set some obvious options. For example, when measuring crosstalk, it will automatically change the output channel if the input channel is changed, and when measuring distortion it will automatically choose the relevant distortion option if the LA101 frequency is changed.

Special LA100 Frequency Sweeps

1.36 Running a Frequency Sweep

Choose **Frequency sweep** from the **Device** menu or click on the **SWP** button to display the frequency sweep controls:



Frequency sweeps can be run as part of an automatic test sequence and most of the supplied test sequences include a frequency sweep test, but it is often more convenient to use the **Frequency sweep** menu, especially as it allows repeating sweeps.

The frequency sweep mode uses standard frequency sweep segments, and the type may be chosen from the drop down menu. Note that the initial letter refers to the LA100 segment letter (see LA100 Manual, pages 39 and 70) and the different segments cover different frequency ranges and durations.

The level in dBU and the output channels can also be set before running the sequence, and correspond to the LA100 test level and sequence channel (see LA100 manual sections 3.7, page 45 and section 3.11, page 48 respectively). Note that two-channel sweeps will take twice as long as single-channel ones, so it helps to set single-channel operation wherever possible. The sweep is always generated on both channels - the channel setting determines which channels should be measured.

The **Repeating** button determines whether the sweep will repeat continuously or just run once.

To run the sweep, click on the **Run** sweep button. The computer will initialise the LA100 and run the sweep preceded by a test level segment to determine the headroom required. The results will be displayed when the sweep finishes, and another sweep will start at the same time if repeating sweeps are being generated. If the **Big graph** option was selected the frequency sweep will be plotted on a full-screen graph, otherwise it will appear in a normal results window, with the usual sequence heading and frequency response table.

If the sweep fails or an error message appears refer to the troubleshooting section in appendix A.

1.37 Stopping a Repeating Sweep

To stop repeating sweeps click on the **Stop** button. The sweep will not stop immediately, but when the next sweep or pair of sweeps has finished (because the computer cannot interrupt the LA100 when it is running a sweep).

1.38 Frequency Response Results

If the Big Graph option was selected the results will now be available in a standard results window, as well as a large graph. If the **Big graph** option was turned off the results can be viewed full-screen by double-clicking over the results graph in the usual way.

Frequency response results behave just like any other sequence results and may be saved, printed, or tolerance-checked in the usual way (see chapter 0).

Lin4WinXP can still be used while repeating sweeps are running although the system will freeze occasionally when the results are read from the LA102.

The frequency in the Large Graph window may be changed by entering a new value, or by using the up/down buttons, or by clicking over the point of interest.

1.39 Notes and Precautions

As with normal sequences, the left channel must be connected, even if the right channel is being measured, as the left channel carries the FSK which the LA102 uses for synchronisation. When testing sharp filters or other systems which block the FSK, connect the L channel directly between the LA101 and the LA102 and connect the right channel through the device under test see LA100 manual, page 49. Enabling direct triggering on the MiniSonic allows the sequence information to be passed to the measuring set internally (see page 9 of the MiniSonic manual).

Options

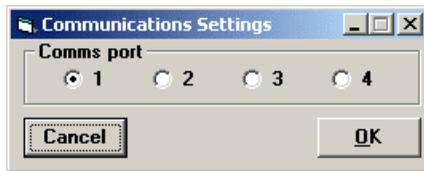
1.40 Options Menu

The **Options** menu can be used to set various choices, which determine the style of the results and also the default behaviour of various operations. When an option is changed and okayed the effect is immediate and the current option settings are saved to disc as the default settings so they can be used every time the program is run.

1.41 Comms Setting

Most PCs have at least one serial port, labelled COM1. If this is already being used, the LA100 may be connected to another serial port by setting the COM port number here (extra serial ports can usually be added by plugging in low-cost expansion cards). A USB to serial converter can also be used, in which case the COM port to which it has been assigned will need to be established from the Windows Device Manager (Start/Control Panel/System/Hardware).

The baud rate and other communication settings are handled automatically

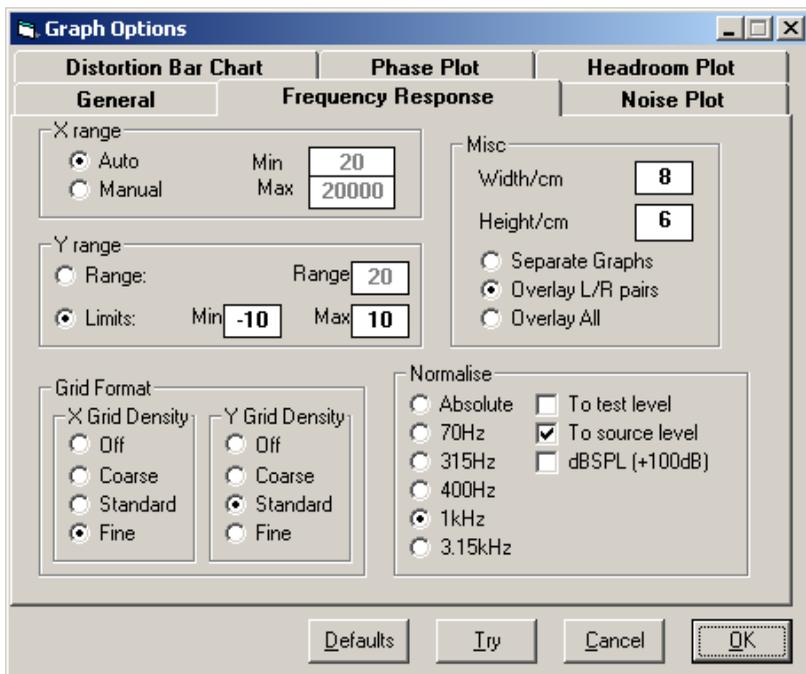


by the program and need not be set (see appendix A if you suspect baud rate problems).

When Lin4WinXP detects the presence of either a MiniSonic or LA100 the device type is automatically detected and the software customises itself accordingly. For example the MiniSonic's monitor volume cannot be controlled remotely so the control is removed from the panel.

1.42 Graph Options

The Graph Options window can be opened by clicking on the **Graph Options** button on the toolbar or through the **Options/Graph Options** menu:



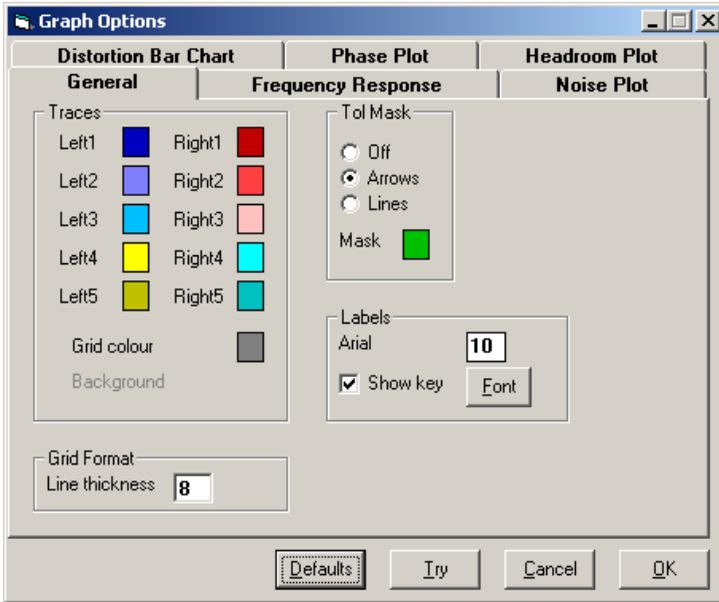
The tab buttons provide access to the options for different graph types. The General tab and the Frequency Response tab are always available, but the other options are only available when handling MiniSonic test results – they are not available with LA100 test results.

The **Defaults** button restores the default graph options.

The **Try** button redraws the relevant graph with the options as they are selected. It doesn't save the new settings though so the **Cancel** button can be used to cancel the changes and revert to the previous settings.

OK accepts the changes and uses them for the current results sheet (and also for subsequent results sheets which are drawn).

1.42.1 Graph Options: General Tab



Left1, Right1 etc. These colour boxes are used to specify the colour of each plot. Left1 is used to plot the left channel for the first graphical segment, Left2 is used to plot the left channel for the second graphical segment etc. Click on one of the boxes to change its colour using the standard Windows colour picker.

The **Grid colour** can also be changed in the same way.

The **Line thickness** setting alters the thickness of the grid. This can be useful with some laser printers for which the default line thickness is too narrow.

The **Labels** option controls the font and font size used for labelling. (See appendix C for details of the Windows font picker).

Show key causes a key to be drawn below the graph indicating which colour represents which graph. It can be turned off to save space.

Mask determines whether the tolerance limits will be plotted over the graphs

when a frequency response tolerance is in use. **Arrows** causes small arrows to be plotted showing each tolerance limit. **Lines** causes the tolerance points to be joined by straight lines, but note that tolerance checking is still only applied at the specified frequency points (i.e. the points listed in the frequency response table beside the graph).

Mask is used to change the tolerance mask colour. Click on it and choose a colour from the standard colour picker.

1.42.2 Graph Options: Frequency Response Tab

The Frequency Response tab controls the scaling and layout of Frequency Response graphs:

X range determines the scale used on the X-axis. If **Auto** is enabled the scale is chosen automatically for each graph. If **Manual** is chosen the minimum and maximum values may be entered manually. This can be used to zoom in on a particular frequency range.

Y range determines the scale used on the Y-axis. If **Range** is enabled then the range can be entered in dB in the range box. This is a sliding range automatically chosen to include the peak level in the graph, but extending over the specified range.

Selecting **Limits** allows the upper and lower limits to be specified manually. These limits will be applied to all of the graphs, so they should only be used when the graphs are all around 0dB (i.e. when normalisation is being used).

Grid density controls the number of horizontal or vertical grid lines. Setting it to **Coarse** will reduce the number of grid lines, while setting it to **Fine** will increase the number (the actual number of grid lines is determined automatically).

Width and **Height** determine the graph width and height in cm. This setting affects graphs on the screen and on the printer, but the actual screen size will also depend on your monitor size and screen resolution (it is a good indication of the size though).

Separate graphs causes each graph to be plotted on a separate graph.

Overlay L/R pairs causes L/R pairs of frequency response plots to be plotted on the same graph but a different graph is used for different frequency

response segments.

Overlay All will plot all of the frequency response plots on a single graph. If any frequency response plots seem to be missing check that the **Y range** is large enough to include them, or for frequency response graphs enable normalising. Note - this button is only visible when viewing LA100 results sheets.

Normalise determines whether absolute frequency response graphs are plotted, or whether they are normalised to make them pass through 0dB at a particular frequency (315Hz, 400Hz, or more commonly, 1kHz). These options also recalculate the figures displayed in the frequency response listing. The **dBSPL (+100dB)** option is for use with microphones calibrated to give 0dBu in for 100dB SPL and is useful for displaying loudspeaker measurements in dB SPL (sound pressure level) rather than as the microphones output level in dBu.

Normalise to source level causes each set of frequency response results to be normalised to the level at which it was generated rather than 0dB. This has no effect on 0dB sweeps, but a sweep at -10dB would be normalised so that it passed through -10dB on the graph at the specified frequency. This can be useful when overlaying all of the frequency response plots on a single graph, but note that this is only available on the LA100 and relies on the figure displayed on the results sheet after the segment letter which is only present when a segment level specification has been used (e.g. TU+10).

Normalise to test level causes each set of frequency response results to be normalised to the test level as measured by the unit (if a test level result is available).

1.42.3 Graph Options: Other Tabs

The options on the other tabs allow the appearance of additional MiniSonic graphs to be changed. The **X range**, **Y range**, **Height**, **Width** and grid density options behave exactly as described in the previous section. The **Normalise** and **Overlay All** graphs options are not available.

The distortion bar chart tab includes the option **Show Grades**. Un-ticking this option will remove the grey Lindos grading zones from the distortion bar chart.

1.43 Results Format

The Results Format window can be opened by double-clicking on the text in a results window or by using the **Options/Results options** menu:

The screenshot shows the 'Results Format' dialog box. It is divided into several sections:

- Results header:**
 - Equipment Make: DENON (DENON - DR-M24HX - Cassette Deck)
 - Equipment Model: DR-M24HX
 - Equipment Type: Cassette Deck
 - Settings: REC-REPLAY Dolby-B TDK-SAX
 - Comments: Excellent Freq Response
This is a two-head machine measured during record. Note the slight phase error due to head misalignment (both heads are
- Page borders:** 20 mm
- Test style and spacing:**
 - Screen: Fixedsys 12 point (Screen font)
 - Printer: Courier New 10 point (Printer font)
 - Vertical space between segment results: 4 point
- Distortion units:** dB %
- Level units:** dBu dBV
- Print options:** Black and white

Buttons at the bottom: Defaults, Try, Cancel, OK.

The Results Format window is used to set print options and other results options. When **OK** is clicked the options are applied to the results sheet that is in focus and saved to disk as the default options for use when the program is next loaded.

The four boxes available, labelled **Equipment Make**, **Model**, **Type**, and **Settings** can be used freely to contain any text. Users are urged to fill them in as indicated, especially when publishing results to the 'Lindos Test Sheet Database', because the database organises uploaded files automatically using these entries. The first three entry boxes are combined onto the first line of the results header, with the test conditions on the second line. A typical entry might read '*Lindos - LSC24 - AD/DA Converter*' on the first line, followed by '*44.1kHz 16bit Noise-Shaped*'.

A further box in the Results header group is labelled **Comments** and this can hold a large paragraph of text, which appears below the column of figures on the left hand side of the results sheet. It is suggested that this be used to

make comments on any faults, good features, or peculiarities that others might be interested in.

Page Borders may be specified in cm to ensure that the printout has a large enough border for punching or binding.

Font size for the results text may be set independently for the screen and printer. It is often useful for reducing the font size to ensure that the results will fit on the paper or the screen.

Font name may be set independently for the screen and printer, but only fixed pitch fonts are available (such as Courier, Terminal or FixedSys) otherwise the results columns would not line up.

Note that these options do not affect the graph labelling as the label font size is set in the Graph Options (see section 1.42.1).

Space between segment results can be used to add a small gap between each segment. A value of 4 points is recommended (note that 1 point is 1/72 inches) and this is the default.

Distortion units may be set to dB or % as required (-40dB is 1%, -60dB is 0.1% and -80dB is 0.01%). This will apply to all distortion results and also tolerance specifications. The tolerance must be defined in dB, but it will be converted to % for the results display (note that printouts made directly from the LA102 always show distortion tolerances in dB).

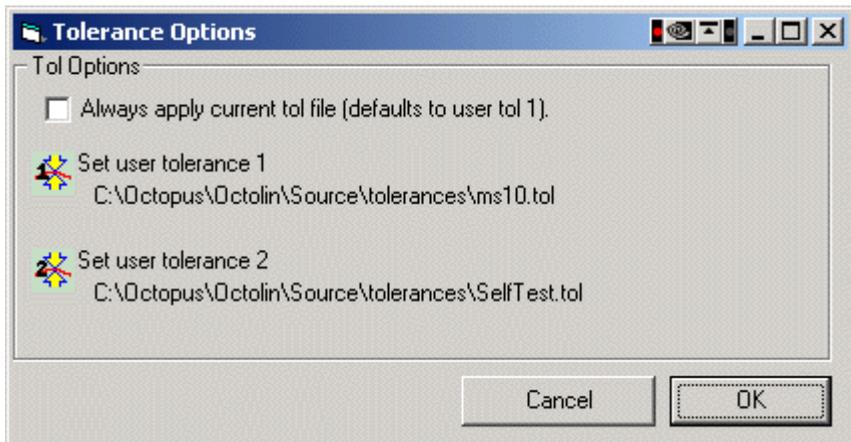
Black and White can be used to produce black and white printouts. Instead of plotting graph traces using coloured lines they will be plotted using thin lines using a different line style.

1.44 Save Options

The **Save in Lin4Win2000 format** tick box allows LA100 results sheets to be saved for use with Lin4Win2000 (an earlier version).

Save Tolerances saves the tolerance string applied to a results sheet along with the results sheet data. When the results sheet is next loaded the tolerance is automatically applied.

1.45 Tolerance Options



Selecting **Always apply current tolerance file** will cause the tolerance file last applied to a results sheet to be applied to every results sheet loaded from disk (unless the saved file has a tolerance saved with it) or read from a unit. Note that when the software first loads user tolerance 1 will be applied if this option is ticked.

The **Set user tolerance** buttons allow the action of the quick tolerance icons on the toolbar in the main results window to be set up. Click to open a file dialog box, which allows selection of the tolerance file that is to be applied by the corresponding toolbar button.

Other Features

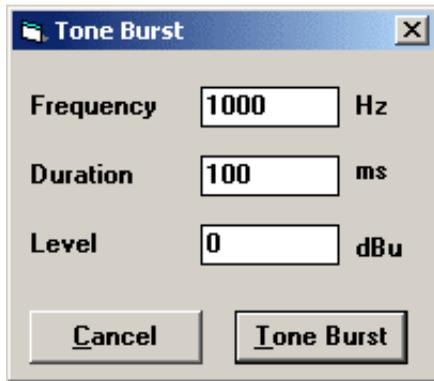
1.46 Command Window

A Command Window can be opened by choosing Command Window from the **Device** menu. It allows commands to be entered, and displays the responses of the unit. The **Error checking** facility automatically checks for LA102 errors after every command and displays an error message as appropriate.

This facility can be used to control the LA100 or MiniSonic remotely, giving full access to all of their facilities, although its use is rather limited as it is usually easier and simpler to use the sequence or panel modes. It can also be useful to try out commands when writing software to control a Lindos device.

1.47 Tone Bursts

Select **Tone Burst** from the **Device** menu or click on the TB button to open the tone burst window.



Enter the **Frequency**, **Duration** and **Level** and click on the **Tone Burst** button to generate the tone burst. These tone bursts are very accurate as the device handles the timing, rather than the computer, and the duration may be specified to a resolution of 0.1ms in the range 0.1 to 6553.5ms when controlling an LA100 or to a resolution of 1ms in the range 1-255ms on a MiniSonic.

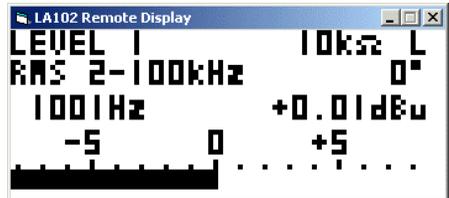
Tone bursts always use sine waves beginning at a zero crossing. They can be made to finish on a zero crossing by setting a duration which corresponds to a whole number of cycles at the specified frequency (but remember that the device may not be able to generate the precise frequency that is entered (see page 184 of the LA100 manual for a full list of LA101 frequencies).

Tone bursts are primarily intended for testing meters (PPM, CCIR etc) on other equipment. Various short bursts of specified durations are used to ensure that the meter reaches its correct target level. Note that tone-burst generation segments are also provided for this purpose.

1.48 Remote Display (LA100 only)

The remote display option on the **Device** menu shows a live-copy of the LA102 LCD on the computer screen. This will be updated in real-time, and the LA102 may be used as normal (using the front panel buttons), although it may operate a little slower than usual.

The remote display can be re-started by double-clicking over the Remote Display window or by using the **Remote Display** menu option again. When the window is closed the LA102 will return to normal operation.

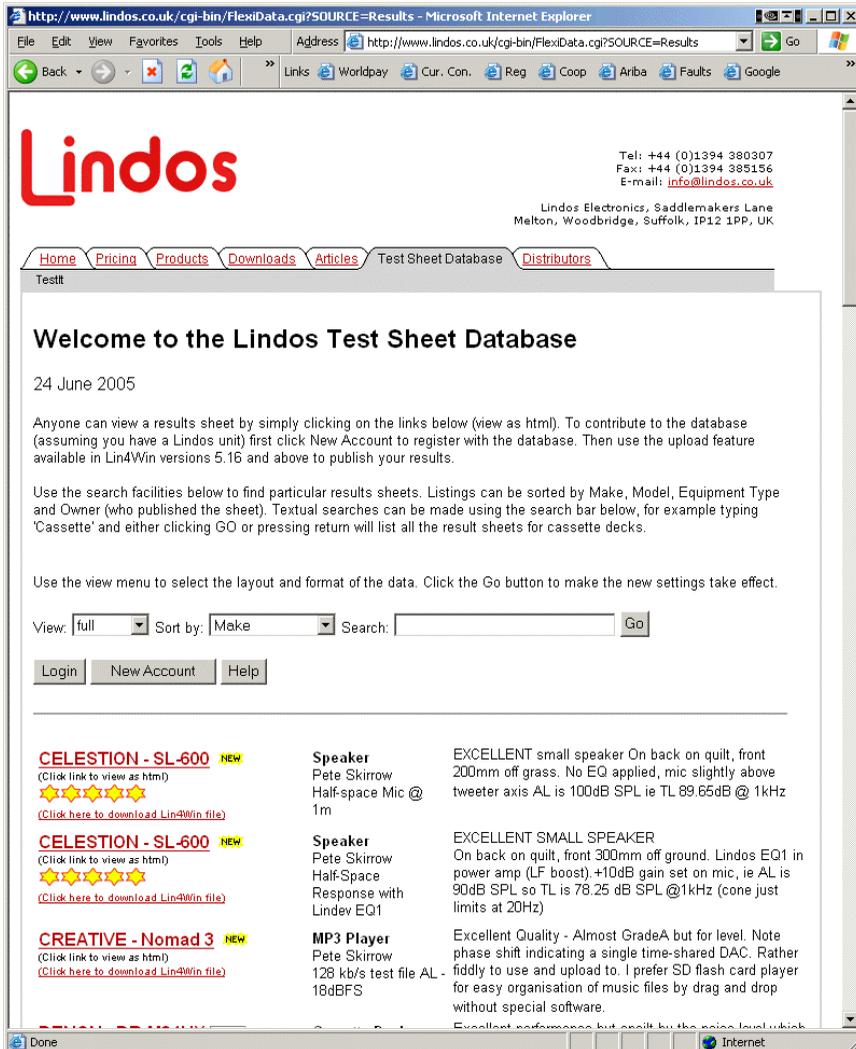


This can be useful for write-ups, demonstrations and teaching purposes.

Uploading to the Test Sheet Database

1.49 Introduction

Lindos Electronics maintains an on-line database of test results for a wide range of equipment, which can be viewed at <http://www.lindos.co.uk>: or by clicking on the 'world' icon on the toolbar and then clicking the **Open Database** button.



The site is for all audio equipment, professional or consumer, including video equipment, MP3 players, camcorders etc. Users are invited to contribute their own test results for equipment and the Lin4WinXP software provides an upload facility to send test results to the Lindos Test Sheet database.

1.50 Creating an Account

Before uploading test results it is necessary to create an account on the database. Click 'New Account' on the database web page and set up an account by following the instructions and filling in the form. Make a note of your username and password for future logins. Anyone can set up an account and immediately upload results sheets: the uploaded test results will become public once the account has been approved by Lindos.

1.51 Uploading Test Results

After testing an item of equipment using the most appropriate test sequence, the Equipment Type, details and comments should be entered by double-clicking on the results text (see section 1.43). Comments should be constructive, and aimed at helping the manufacturer as well as the user. Lindos will remove any entries it considers unsuitable. Users can edit entries they created but cannot edit other user's entries.

Select the results sheet to be uploaded by clicking on it and then click on the 'world' icon at the right of the toolbar to open the Login window:

Login - Online Test Sheet Database

Contact Name: Remember username and password

User Name: Batch publish

Password: Open published results sheet(s)

Enter your username and password then click Publish. If you don't have an account click 'Open Database' then 'New Account' on the webpage.

Enter your contact name (to be shown in the database) and the user name and password that were used to create the account and click **Publish** to upload the results. Progress messages will be displayed as the results are

uploaded. This process should take only a few seconds using broadband or 30 seconds on a modem.

If **Remember username and password** is ticked the login details will be saved for use next time the program is loaded.

Batch publish allows all of the results sheets that are currently loaded into Lin4WinXP to be published at once.

Open published results sheet opens the results sheet after it has been uploaded, as confirmation, in the default web browser set for the computer.

The **Open Database** button launches the computer's default browser and opens the Test Sheet Database from the Lindos website.

Appendix A Support & Troubleshooting

1.52 Technical Support and Other Help

For technical support please contact Lindos Electronics by phone, email or fax (contact details are given on the back cover).

Note that many of the dialogue boxes provide help if you move the mouse pointer over a button or an icon and the help often gives details of keyboard shortcuts as well as explaining what the item is for.

Please refer to the Lindos LA100 or MiniSonic manual for full details of the measurement functions, sequences and other features.

1.53 Diagnosing Problems

If LA100 communication fails, check the error message:

LA100 is busy or not connected

This means that the serial port CTS handshake line is busy. Ensure that the LA102 is turned on and connected to the correct serial port (note that an LA101 cannot be connected by itself without a dummy handshake plug). Choose **Comms setting** from the **Options** menu and ensure that the correct serial port is configured.

Unit is not responding

Ensure that the LA100 or MiniSonic is plugged into a serial port and check the **Comms settings** on the **Options** menu. If using an LA102 set the baud rate configuration B7 (9600 baud) as follows: hold **ON/OFF** and press **2**, press **PAGE** or **dB>** until the cursor is under the letter R and then press ***2** to select 9600 baud. Repeat this process on the LA101. Although the LA100 Control software will attempt to communicate at all possible baud rates, there are some slow baud rates that the PC cannot use.

LA102 responds but LA101 doesn't and sequences fail

Ensure that both units are connected and that they both display 'REMOTE 9600' when under PC control. If the LA101 displays a different number, then set its baud rate configuration as described above.

Serial Port COMx is Not Available

The program has been configured to use a serial port which is not fitted, or which is in use by another program.

LA100 needs a firmware update

This program will only work with LA100 units fitted with V6.0 or later firmware. Please contact Lindos Electronics for a firmware update if you see this message. The LA100 serial number and version number are displayed on the LCD when the unit is switched on.

LA100 is in use

This error indicates that the LA100 is already being used by another part of the program. If this occurs use the **Reset Comms** entry on the **Device** menu to clear it. If this fault can be repeated please report it to Lindos Electronics.

Appendix B New Features

If you are upgrading from an earlier version of Lin4WinXP (previously Octolin), the new features are listed below:

1.54 New in V2.0

1. MiniSonic support added.

1.55 New in V5.10

1. Support for multiple graph types added
2. New options for each graph type
3. Quick Scale buttons added to toolbar
1. Quick sequence box added
2. Redraw problems fixed
3. Graph cursor added to Big Graph Viewer

1.56 New in V5.24

1. Save options
2. Tolerance options
3. Quick tolerance buttons added to toolbar
4. Upload to test sheet database facilities
5. MiniSonic phase plot support
6. MiniSonic delay measurement support
7. Heading and comments systems revamped
8. New MiniSonic sequence definition facilities
9. Save web page option
10. Automatic Userkey file downloading

1.57 New in V5.30

1. Frequency response graphs comparison tool
2. Results cut and paste capability
3. New normalising options (text + graph)
4. Grid line-width option added

Appendix C File Formats

All future software will adhere to these file formats, which have been carefully designed to be extendable and transportable between operating systems. If you write your own software to generate such files you are strongly urged to use these formats. The formats described here are also compatible with the results format described in Lindos application note 17 (Paul Skirrow, third Edition, 31 Aug 93).

Whenever plain ASCII text appears in a file the lines are terminated with CR (carriage return), LF (line feed) or CRLF pairs. In DOS and Windows the CRLF pair is used, but it is important that all software can handle text with any line terminator, as other operating systems use different terminator (BBC and Macintosh computers use CR while Unix and RISC OS systems use LF).

See the supplied master disc for some sample files

1.58 Sequence and Tolerance Files

Sequence and tolerance files have the extension SEQ or TOL respectively and they hold a single sequence or tolerance definition per file.

The definitions may extend over several lines and may include spaces. The line terminators and most spaces are removed when the sequence or tolerance is sent to the LA100.

1.59 Results Files

Results files have a .res extension and are used to store results from sequence tests, frequency sweeps, data logs and automatic test procedures.

The first part of the results file holds the complete results text as seen on the printout or in the results window. This is plain ASCII text using CRLF line terminators, but see the note above about handling CR and LF line terminators.

The second part is optional and is used to hold graph data and other information in separate packets (a mono sweep is held in a single packet). The packet header is in ASCII text but the actual data is held in a compact binary form to keep the files small.

Tolerance information, which is also optional, will appear after the graph

packets. Again, this is plain ASCII text using CRLF line terminators, but see the note above about handling CR and LF line terminators.

1.60 Results Header Lines

The first few lines of the results text, up to the first blank line, contain file header information. Subsequent lines represent the body of the results.

The first line of a results file is the title, which indicates where the results came from. For example:

```
LINDOS AUDIO SEQUENCE TEST
```

The rest of this line can contain a 42-character heading starting at character position 32 (i.e.spaces are used to pad up to this position). It will be filled in by the LA102 if the user has defined a heading in the LA102.

The second line carries details of the sending and receiving systems. The word 'SOURCE' is followed by the source ID (see section 4.3, page 67, LA100 Manual), as received from the LA101 in the FSK + segment. This is followed, at character position 32, by the text 'LA102' and the measuring set ID (the serial number and internal software version number):

```
SOURCE 0001Z                               LA102 0518 V6.5
```

The third line contains the word 'SEGMENTS', one or more spaces and a list of segments received on each channel (the lists are separated by one or more spaces):

```
SEGMENTS +TX TX
```

Subsequent header lines may be used for comments, and a blank line is used to indicate the end of the header text. It is recommended that the comments be restricted to 4 lines, but there is no limit. A blank line should always follow the header lines, and must be totally empty. A line containing a single space is not regarded as being blank (this allows multiple comments to be separated by a line containing a single space). Tab characters are not used.

1.61 Results Text

The actual results follow with a section for each test (usually each test segment). Each section has a title line giving the title of the test and the test name in square brackets. For Lindos test segments the test name is simply the segment letter. Title lines can be detected by looking for the square brackets. Subsequent lines up to the next title line contain results for that test segment.

For example:

```
TEST LEVEL OUT [T] 0dB
      +0.11      -2.65dBu
DISTORTION (2f-22k) [D] +8dB
 100Hz      -72.8      -73.0
  1kHz      -94.3      -91.4
 6.3kHz     -72.8      -77.3
PHASE (mean) [Z]
  40Hz      -0d
 100Hz      -1d
  1kHz      -4d
 6.3kHz     -7d
 10kHz     -37d
 15kHz     -28d
```

The precise format of the results lines is:

- 8 character measurement title
- 7 characters containing the L channel results
- 2 spaces
- 7 characters containing R channel results
- Any other text

The values are right justified in the 7 character field width, but the decimal points may not be aligned, as some values may use more decimal places than others (test level and frequency response results have 2 decimal places; distortion, crosstalk and noise have 1; phase results have no decimal places; W&F results have a variable number). The results value may also have a units suffix, such as d for degrees, or % for percent.

1.62 Graph Handles

Frequency sweep segments will normally generate graphs as well as text. The graph data follows in a graph packet (see below) and a graph handle is used to indicate which graphs are associated with each test.

In such cases the title line has one or more ^ characters at the end of the line, each followed by the graph handle. For example, if frequency sweep R generated two graphs with graph handles 1 and 2, then the title line would be:

```
FREQUENCY RESPONSE [R] -10dB^1^2
```

It is best to remove this suffix when displaying the results to aid clarity, but always store them in results files.

1.63 Packet Data

The packet data is optional and will normally only occur in results files that contain graphs or tolerances.

An end of text (ASCII 26) character is used to mark the end of the ASCII text section and the start of the packet data. This is followed by one or more data packets each starting with the following two lines which form a packet header:

```
type, format  
n,m
```

type is a case-insensitive string specifying the packet type, while format is a number representing the format. n indicates the number of lines of text in the packet header (not including these two lines) while m is the number of bytes of binary data that follow. Each line of text in the header is terminated with a CR (ASCII 13) character and n and m may be zero.

When reading results files unknown packets must be skipped using the values of n and m to skip over the unwanted lines and binary data bytes respectively.

1.64 The Graph Packet

The Graph packet has the following packet header:

```
Graph,format  
5,m  
xunits,yunits  
handle  
x1
```

x2

s

The keyword Graph indicates that this is a graph packet and the format indicates which graph format is used:

- 0 Linear X and Y axes
- 1 Logarithmic X, linear Y axes
- 2 Linear X, logarithmic Y axes
- 3 Logarithmic X and Y axes
- 4 Bar chart

If the format is not 0-3 then the whole packet must be ignored. Only formats 2 and 3 are used by current software.

m is the number of bytes of binary data that follow.

xunits and yunits are strings representing the units to use when labelling the graph. For a logarithmic frequency sweep these would normally be Hz,dB respectively , and for a time plot, they would be s,dB.

handle is a number representing the graph handle and is used to link the relevant part of the results text with the graph. This handle can be used to loop up the test title (see section D.5).

x1 and x2 represent the first and last values to plot on the x axis. For a 20Hz to 20kHz sweep these values would be 20,2000.

s is the number of samples in the packet. This is typically 256 for a LA100 generated frequency sweep, but other the values will occur for other results graphs.

The actual graph data follows using 2 bytes per sample (i.e. m will always be 2s) with the first sample corresponding to x1 and the last corresponding to x2.

If a linear x axis is in use (format is 0 or 2) then the points represent samples at equal intervals. If a logarithmic axis is in use (format is 1 or 3) then the samples were made using a pseudo log scale. A logarithmic scale will give reasonably accurate results, but for best results the LA100 pseudo logarithmic scale should be used (see LA100 manual for details).

Each sample is 2 bytes, integer byte first, followed by fractional byte, using two's complement fixed point binary. This is the same format that the S?

command generates - see page 146 of LA100 Manual for more details.

See the example results files provided for an example.

For example, a typical graph packet header will look like this:

```
Graph, 1  
5, 512  
Hz, dB  
1  
20  
20000  
256
```

This will be followed by 512 bytes of binary sweep data. Other graph packets may follow and note that a stereo frequency sweep will produce two graph packets.

Lin4Win2000 results files require each line of the graph header to be prefixed with a null character followed by the character that has an ASCII value equal to the number of characters on the line. Note that these are non-printable characters and they will appear in a text editor as □.

For example:

```
□□5,512  
ASCII 0,5,53,44,53,49,50
```

1.65 The Tolerance Packet

Tolerances can be saved with results sheets by specifying a tolerance packet at the end of the file.

The tolerance packet has the following packet header:

```
TOL,
```

The header should immediately follow the last graph packet (no separating characters should be used). The text following the comma contains the tolerance definition (see section 2.8 for details on how to define a tolerance).

e.g.

```
TOL, "MS10 Self-Test "  
w±.1, ±0.1, ±.25, , +0-1.0,  
uvs±.5, , ±.25, ±.15, , , , ±.15, ,  
t±.1  
n-78  
m-60  
r-55, -65, , , ,  
c-75, -70, -68  
l?, -65,  
z±20, ±20, ±20
```

Appendix D Key Shortcuts

There are several key shortcuts, and most are listed on the relevant menus and buttons.

In the results window:

Ctrl-O	Open new results
Ctrl-S	Save results
Ctrl-P	Print results
Ctrl-Q	Run sequence
Page Up/Down	Scroll results up/down by a page
Cursor up/down	Move results up/down by a line

In the Control Panel:

F1/F2	Change frequency (hold shift for fine)
F3/F4	Change level (hold shift for fine)
F5/F6	Change range
F7	Left output on/off
F8	Right output on/off
F9	Mute both output channels/restore outputs
Alt-L	Select Left input
Alt-R	Select Right input

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