Specification

LA101 Audio Oscillator

Frequency range	5Hz to 38kHz, 3 steps (coarse) and 32 steps (fine) per octave.
Frequency accuracy	Correct to 0.02% (200 ppm).
Frequency stability	±30ppm
Frequency resolution	32 spot frequencies synthesised over one octave, repeating, multiplied by 2,4,8 etc.
Level accuracy	±0.03dB +26 to -60dBu, ±0.2 -60 to -80dBu. Laser-trimmed resistors and software error corrections stored in EPROM.
Impedance accuracy	±2% or ±2 W (whichever is the greater).
Amplitude range	-100 to +26dBu in 1dB or 0.01dB steps.
Amplitude flatness	±0.05dB, 5Hz - 31.5kHz.
Waveforms	Sine, square, triangular, sawtooth (positive and negative going), DC+ and DC-. A double tone with 70Hz separation is also available at 1kHz.
Tone bursts	Programmable frequency, level and duration (27 minutes max. 100µs resolution). A series of tones or tone bursts can be easily programmed, and can be made to repeat. Start on zero crossing.
Distortion (THD+N)	<-86dB (0.005%) 1kHz; <-86dB 400Hz, <-80dB (0.01%) 100Hz; <-76dB (0.016%) 6.3kHz; (all rms, 2f - 22kHz bandwidth). Combined LA101/102 measurement.
Output selection	L/R/L+R or Mute. Muted channel is automatically terminated with selected impedance.
Output impedance	10Ω at rear XLRs. 75 W or 600 W selectable on front jack sockets. Balanced and floating, separate resistors. Other output impedances available to special order.
Minimum load	600Ω at +20dBu one channel, or +18dB both channels loaded.
Weighting curves	RIAA; CCIR 468; O41; 50µs de-emphasis; plus 5 user programmable weighting curves.
Sequences	Over 60 predefined test sequences and 10 user programmable sequences.
Segments	47 selectable test segments for user assembly.
FSK	Frequency Shift Keyed data transmitted over signal path, 110 baud.
Presets	5 frequency and 5 level presets (user programmable)
Relative levels	Any level can be set as a 0dB reference.
Z-correction	Automatic level corrections for 600Ω loading selectable.

Common to both units

Standards	All measurements meet quoted standards regarding weighting curves, accuracy, and meter ballistics.
Remote control	The RS232 compatible serial interface provides complete control of measurements and access to results using a comprehensive set of ASCII commands. 9 pin D-type sockets.
Serial interface	Inputs: Opto-isolated, +2V threshold. Outputs ±5V. Compatible with most RS232 and RS423 equipment. 8 data bits, 1 start bit, 1 stop bit, no parity.
Baud rate	75, 110, 150, 300 (default), 1200, 2400, 4800 and 9600 (19200 baud also available on LA102 output only). Split baud rates supported.
Size	216mm(W) × 88mm(H) × 258mm(D). Weight: 3kg (LA101 or LA102). Display 71mm × 27mm.
Power requirement	Mains 220-250V, 50-60Hz, 9VA, (110V option).
Battery life	Automatic mains recharge in 16 hours. 4 hours use.
Safety	IEC1010
Temperature range	10-40ºC operating, 10-30ºC for full distortion specification.
Connectors	PO 1/4" Jack (B gauge, small tip) & XLR-3 at rear.
Guarantee	1 year. Fast repair/software recalibration service available.
Technical support	Lifetime technical support from Lindos via telephone (usually 24 hours), fax, mail or e-mail
EMC compliance	Complies with the EMC directive (EN50081 & EN50082) when used with connecting leads as prescribed in the LA100 handbook.
Traceability	Calibration either traceable to British National Standards or derived by approved ratio techniques.
Calibration Interval	2 years recommended.
Support Software	Lin4WinXP running under Windows 95/98/2000/XP is supplied with each LA100. Connecting leads to a 9w D type serial port are included. 25w leads and additional licences available on request.

Analyser

Inputs	10Ω and 600Ω selectable. Differential inputs, with L/R selection.
Overload protection	100V rms, diode limited.
Level measurement	-95 to +28dBu in 10dB ranges (autoranging/manual).
Default	RMS 2Hz-100kHz -3dB, 20Hz-40kHz -0.2dB.
Options	2-5 RMS 22Hz-22kHz, VU 22Hz-22kHz, RMS A Wtd, PPM, VU A Wtd.
High pass filter	400Hz with12dB/octave selectable.
Audio band filter	Selectable with 22Hz 12dB/octave, 22kHz 36dB/octave.
Level resolution	Numeric: 0.01dB steps. Bar graph: 0.2dB/pixel (default) 0.04dB/pixel (zoomed).
Level accuracy	±0.05dB +28 to -60dBu, ±0.2dB -60 to -80dBu
Frequency	Reciprocal counting 20Hz-20kHz, 4-5 digit readout
Phase	±180º, 20Hz to 20kHz with ±2º accuracy (up to 40kHz with reduced resolution).
Noise measurement	-105 to +8dBu in 10dB ranges.
Default	CCIR468-4 weighted quasi-peak.
Options 2,3,6,7	CCIR468-4 unweighted, RMS 22-22k, CCIR/ARM, CCIR RMS.
Residual Noise	-97dBu CCIR468 wtd, -107dBu RMS 22kHz.
Rumble measurement	Weighted slow (IEC98) (on noise option 5). Unweighted slow (IEC98) (on noise option 4).
Crosstalk	-117 to +8dBu, narrow band measurement, automatic freq. selection. Measured with a two stage 12dB/oct bandpass filter. -1dB at 20% frequency error, -10dB at one octave.
Options1-6	100Hz, 315Hz, 1kHz, 6.3kHz, 10kHz, 40Hz. 400Hz instead of 315Hz available to order.
Options 7-9	80Hz-400Hz, 1.8kHz-21kHz and 12-21kHz bandpass.
Residual Noise	-117dBu at 1kHz, -111dBu at 6.3kHz typical.
Distortion	THD+Noise, relative, with automatic fundamental measurement and filter frequency selection. Measured with a combined multi-stage notch and high-pass filter. Frequency tolerance is ±1% for 70dB rejection. No nulling required and the broad notch rejects flutter sidebands effectively. (-60dB @ +2%)
Options 1-6	100Hz, 315Hz (3rd harmonic), 1kHz, 6.3kHz, 10kHz, 40Hz.
Input Level Range	-60dBu to +28dBu, noise limits readings below 0dBu.
Residual reading	Combined specification as for LA101 above.
Response	-0.5dB at 2nd harmonic, 22kHz 36dB/octave band-limited.
Wow & flutter	-80dB to -20dB (0.01% to 10%).
Default	Weighted quasi-peak to IEC386, DIN45507.
Options 2,6,7	Unweighted quasi-peak, weighted RMS, Unweighted RMS.
Quantising distortion	40Hz notch, 400Hz HP, Wtd CCIR & Unwtd rms.
Difference frequency dist.	70Hz bandpass filter for 2nd order difference frequency distortion measurement on double tone with 70Hz separation (1kHz-20kHz).
FIM (Frequency Intermod.)	To DIN45411 (3KHz/300Hz) to -60dB, 0.1%
Sequences	Responds automatically to all LA101 sequences.
FSK speed tolerance	±4% speed error allowed.
Monitor loudspeaker	With volume setting and listen switch.
Scope/headphones output	BNC 1V RMS output mid-scale and 0/+5V BNC sync. pulse.
22Hz-22kHz filter	Elliptic design with 60dB rejection at 44kHz. This permits valid distortion measurement on digital equipment despite sampling residue.
Sequence results	Sweeps produce a graph on the display with cursor readout, automatic scrolling and scaling facilities. Sequences produce a graph plus several pages of data with quick access.
Printout	Sequence results can be printed directly on an Epson ESC/P, IBM or HP Deskjet compatible printer fitted with parallel or serial interface. Printout includes high resolution frequency response graphs.
Sequence memories	5 sequence memories allow later printout or analysis.
Tolerance testing	5 user programmable tolerances in addition to 10 pre-programmed tolerances (Selftest, IBA, EPS81, EPS84, EPS98, Studer A812 etc)
Test tape mode	LA102 can automatically measure frequency response, W&F and speed from a test tape, ignoring voice announcements and plotting an interpolated graph between the spot frequencies it finds. External frequency sweeps can also be used.

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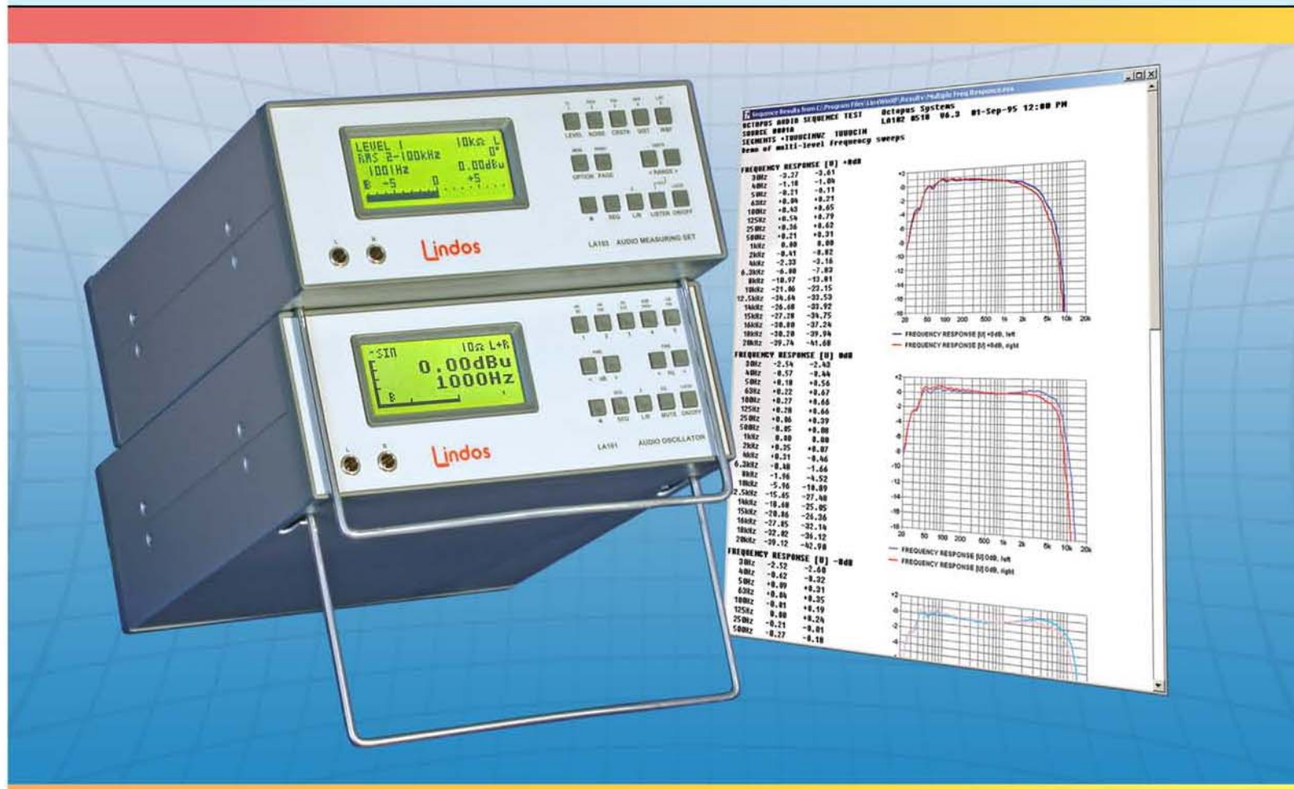
Lindos Electronics



Lindos LA100 Audio Analyser

from the experts in audio

Features:

- Measures Level, Frequency, Phase, Noise, Crosstalk, Distortion, Rumble, W&F
- Used by broadcasters world-wide
- Low distortion synthesised oscillator
- Fully floating 10,75 & 600Ω outputs
- Lindos standard test sequences for fast automatic testing
- Frequency response display
- Pass/fail tolerance limits
- Built in mains/rechargeable lithium-ion battery operation
- Prints directly to Epson and HP compatible printers
- Serial computer interface for remote control
- Lin4WinXP Windows support software included
- Back-lit LCD with high contrast and wide viewing angle
- Fast auto-ranging with manual override

Introduction

The LA100 Audio Analyser is a complete audio test system in daily use worldwide by broadcasters, manufacturers, researchers, telecommunications and studio engineers.

The LA100 comprises the LA101 Audio Oscillator and the LA102 Audio Measuring Set. These can be supplied as two separate units, or mounted together in a single 19" rack mount case (referred to as the LA100R). The units have rechargeable lithium-ion batteries which trickle charge when mains power is connected, making them as portable as a multi-meter - ideal for both field and bench applications.

The LA100 can be used for manual or automatic testing, with the results displayed in numerical and graphical form on the back-lit LCD, or printed via the RS232 compatible interface. Lindos can supply a compact serial to parallel interface for parallel-only printers. The software support package supplied (Lin4WinXP) provides the ultimate in computer controlled audio analysis, and there is a rich built-in instruction set for writing customised control software.

LA101 Digital Waveform Generation

Digital waveform synthesis guarantees quartz-accurate frequencies and stable levels - corrected to a few hundredths of a dB by calibration correction factors embedded in the mains EPROM. This design offers fast level changing, frequency sweeps and glitch-free tone bursts.

The up-down buttons control the frequency from 5Hz to 38kHz in third-octave steps and the level from -100dBu to +26dBu in precise 1dB steps. The ✱ keys gives fine control, with 32 steps per octave and 100 steps per dB. User programmable presets give instant access to five commonly-used frequencies and levels.

Flexible Measurement Options

The LA102 is a precision millivoltmeter with an array of filters and rectifiers which, under microprocessor control, provide most world standards in audio measurement. For ease of use there are five basic measurement functions (level, noise, crosstalk, distortion, W&F), and each offers a range of options. For example, tapping the **NOISE** key quickly give a reading using the ITU-R 468 weighting filter and rectifier, but pressing the **OPTION** key produces a menu listing various other noise measurement options (ITU-R 468 unweighted, A-weighting, ARM-2K, rumble etc). The displayed bar-graph exhibits the correct dynamic characteristics for each standard, so the level options include a true RMS, VU and PPM rectifier characteristics with a choice of bandwidths (2Hz-100kHz, 22Hz-22kHz or 400Hz-22kHz). Range changing is automatic with manual override and the bar graph can be zoomed (5:1) when dealing with small signal variations. There are also facilities for setting relative levels and peak hold, and for changing the displayed units (dBu, dBV, W or V). When the **LEVEL** function is selected, the frequency and phase difference (between channels) is also displayed. Left and right input levels can be displayed on a dual bar graph together with a mean phase jitter display.

Distortion is measured at six spot frequencies using a novel band-stop plus high pass filter. No nulling or tuning is required. Simply apply the signal - press **DIST** - read the results - in under a second. The design guarantees immunity from errors caused by frequency drift or wow and flutter.

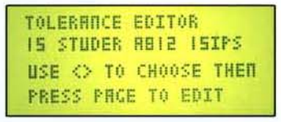
Crosstalk is measured at the same six frequencies (other options available), with selective filtering to reduce the contribution from out-of-band noise. Various other measurements include, quantising distortion, difference frequency intermodulation distortion, wow & flutter and rumble.

Other features include balanced inputs via PO jacks (front) or XLRs (rear) with switchable 600Ω loading, channel selection and a speaker and scope output that lets you monitor the measurement after the filtering and gain stages.

Automatic Sequence Testing

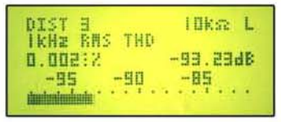
Lindos sequence testing has become the de-facto standard for telecommunications, broadcasting and production testing around the world. Its simplicity and speed allows a system to be evaluated using measurements which conform to world standards with no chance of error.
Sequence testing can be used to fully evaluate any audio circuit automatically in about a minute. Microphone circuits or P.A. systems; intercoms or intercontinental satellite links - Lindos sequence testing can cope. The test sequence is built from test segments and each test segment consists of the audio test signal preceded by an FSK (frequency shift keyed) header. The header acts as a synchronising trigger for the LA102, as well as identifying the segment code; the LA102 responds automatically and makes and stores the necessary measurements. Since the FSK is sent over the audio path, no other communication is necessary between the LA101 and the LA102. The test sequence may be received automatically at a remote site, or at a different time if the sequence is recorded and played back later.

Oscillator display (default)

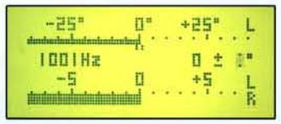


Tolerance editor

Sequence results editor



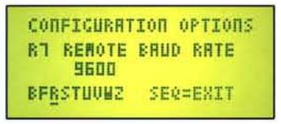
Distortion measurement display



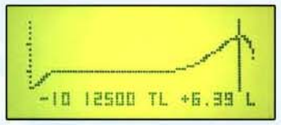
Twin level and phase mode

Oscillator display

Noise measurement display



Configuration editor



Frequency response graph

Sequence ident editor

Tolerance pass/fail title screen

Oscillator display (mute)

Control Panel

The Lin4WinXP 'Control Panel' allows control of the LA100 in manual mode from the PC keyboard. Changing the LA101's output level or frequency and setting up measurement options on the LA102 are only a mouse click away. The content of the LA100 LCDs is echoed on the PC's display.

Sequence and Tolerance Editors

Although the editors built into the LA100 are very powerful, they rely on the front panel keypad for all input. While experienced users have no problem with this, new and occasional users may prefer to use a computer keyboard and mouse.

Results Management

Lin4WinXP offers the ultimate flexibility in results management. Once downloaded from the LA102, results can be displayed, saved to disk, printed, exported to other applications and even uploaded to our online test results database (http://www.lindos.co.uk/tests). In addition, frequency response graphs can be analysed on screen in the 'Graph Viewer' by double clicking. A live cursor continually updates numeric information about each trace. Multiple graphs can be overlaid and sum and difference plots can be created using the graph comparison tool. Graphs can be exported in vector or bitmap format for inserting into in-house reports and an export CSV (comma separated values) function is also provided.

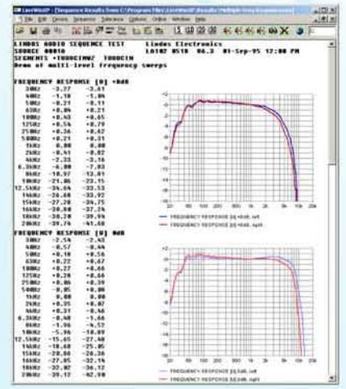
The default printout has the popular Lindos format, but graphs can be customised and user comments added as required.

Pass/Fail Tolerance Testing

For routine production line testing, quality control, or acceptance testing, the automatic test sequences allow fast and simple measurements. To make routine testing even easier, the LA102 can compare test results against tolerance limits and give an immediate 'PASS' or 'FAIL' display. Measurements which fail the tolerance test are highlighted with an asterisk (*) on both the display and the printout.

Computer Control

Lin4WinXP is a software package providing PC support software for the LA100, MiniSonic and DigiSonic audio test systems. Running under Windows™ 95/98/2000/XP it offers powerful results management tools, sequence and tolerance editors and easy software and hardware configuration.



Future Proof

Lin4WinXP was developed in house, ensuring that as the LA100 evolves, Lin4WinXP will be developed to keep pace.