

Minstruments

for Analog Audio Signals

Acoustilyzer

Minilyzer

Minirator

MiniSPL



MR2 MINIRATOR

Analog Audio Signal Generator



Sine Wave, Sweeps, Noise & more

Frequency Resolution to 0.01 Hz

External Power & USB Connector

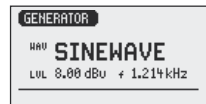
Backlight for LCD & Mute Key

+8 dBu Max. Output Level

THD+N < -90 dB (0.003%)



Minirator MR2 is a powerful audio generator, offering a full range of useful analog test signals for calibration, maintenance and repair of professional audio equipment. The rotary settings wheel combined with surrounding fast access function keys enables instant and intuitive operation without compromising fine adjustment capabilities. Instrument operation is further enhanced with a backlight LCD, illuminated mute button, safety hand strap, jack for external DC power supply and an USB interface for firmware updates.



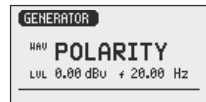
Sine Output

MR2 generates extremely pure sine waveforms at freely selectable frequencies. In addition, sweep signals may be defined within any frequency interval and with a step resolution as fine as 1/12th of an octave.



Pink Noise, White Noise

Pink or White Noise is synthesized with high spectral density, normal amplitude distribution and with infinite cycle duration. An automated on-off cycle mode for convenient RT60 measurements with the Acoustilyzer AL1 is included.



Polarity, Delay

Additional test signals for measuring speaker- or cable polarity and propagation delays ideally complement the companion ML1 / AL1 analyzers.

Intuitive Operation

The most frequently used parameter changes such as waveform, level and frequency are accessible via function keys. The sensitivity of the rotary wheel is adjustable with the "sens" key.



Mute Key

The "mute" key is illuminated and mutes the signal generator output. A flashing backlight indicates the mute status to the operator.



External DC & USB Connector

The typical battery life time is 20 hours. For continuous operation an optional mains power supply is available. The USB interface enables firmware updates via the NTI website.



Technical Data MR2 / MR-PRO

Outputs	Balanced XLR, unbalanced RCA Phantom power resistant																				
Inputs	XLR for cable test (MR-PRO) DC power supply, USB port																				
Wave Forms	Sine, Pink Noise, White Noise, Polarity test signal Delay test signal Wave File playback (MR-PRO)																				
Wave File Format (MR-PRO)	Sampling freq.: 48 kHz Resolution: 16 Bit, Mono Output Level: 0 dBFS = 18 dBu (sine) according to EBU R68																				
Frequency Setting	Range: 10 Hz - 20 kHz Increment: in 1 digit steps Accuracy: 0.01%																				
Stepped Sweep Function	Freq. range: freely selectable Increment: 1/1, 1/3, 1/6, 1/12 octave Sweep speed: selectable, 0.5 - 5 seconds																				
Continuous Sweep (Chirp) Function	Freq. range: freely selectable Increment: Linear / Logarithmic Chirp speed: 1 - 99 seconds per cycle																				
Level Units	MR-PRO: dBu, dBV, V, dBFS, % MR2: dBu, dBV, V																				
Output Level Ranges	<table border="1"> <thead> <tr> <th>Wave form</th> <th>Min</th> <th>Max MR-PRO</th> <th>Max MR2</th> </tr> </thead> <tbody> <tr> <td>Sine, Sweep, Chirp</td> <td>-80 dBu</td> <td>+18 dBu</td> <td>+8 dBu</td> </tr> <tr> <td>White Noise</td> <td>-80 dBu</td> <td>+10 dBu</td> <td>0 dBu</td> </tr> <tr> <td>Pink Noise</td> <td>-80 dBu</td> <td>+8 dBu</td> <td>-2 dBu</td> </tr> <tr> <td>Polarity, Delay Test</td> <td>-80 dBu</td> <td>+16 dBu</td> <td>+6 dBu</td> </tr> </tbody> </table>	Wave form	Min	Max MR-PRO	Max MR2	Sine, Sweep, Chirp	-80 dBu	+18 dBu	+8 dBu	White Noise	-80 dBu	+10 dBu	0 dBu	Pink Noise	-80 dBu	+8 dBu	-2 dBu	Polarity, Delay Test	-80 dBu	+16 dBu	+6 dBu
Wave form	Min	Max MR-PRO	Max MR2																		
Sine, Sweep, Chirp	-80 dBu	+18 dBu	+8 dBu																		
White Noise	-80 dBu	+10 dBu	0 dBu																		
Pink Noise	-80 dBu	+8 dBu	-2 dBu																		
Polarity, Delay Test	-80 dBu	+16 dBu	+6 dBu																		
Flatness	MR-PRO: ± 0.2 dB MR2: ± 0.5 dB @ RL ≥ 600 Ohm																				
Accuracy	MR-PRO: ± 0.2 dB MR2: ± 0.5 dB @ 1 kHz																				
THD+N	22 Hz - 22 kHz, average, @ 1 kHz, typical MR-PRO: -96 dB (0.0016%) @ 18 dBu, noise floor typ. 15 µV MR2: -90 dB (0.0032%) @ 8 dBu, noise floor typ. 25 µV																				
Output Impedance	MR-PRO: 12.5 Ohm balanced, I _{max} = 10 mA MR2: 200 Ohm balanced																				
Impedance Measurement (MR-PRO)	Method: Absolute value Z Meas. Range: 4 Ohm - 50 kOhm balanced 2 Ohm - 25 kOhm unbalanced @ f = 30 Hz - 10 kHz (Sine) and @ Level from -20 dBu to +18 dBu Accuracy: ± 10 % or ± 2 Ohm																				
Phantom Power Reading (MR-PRO)	Meas. Range: 0 - 54V Accuracy: ± 3 % or ± 0.5 V																				
USB Functionality	Firmware update Mass Storage Device (MR-PRO)																				
Flash Memory (MR-PRO)	32 MByte for storing wave files and configurations																				
Display	Graphical, with back light																				
Auto-Power-Off	10, 30, 60 minutes or OFF																				
Batteries	3 x AA Alkaline dry cells or rechargeable equivalents Battery Life: MR-PRO: 10 h / MR2: 20 h typical																				
Temperature Range	0° to 45° C (32° to 113° F)																				
Humidity	< 90% rel. humidity, non-condensing																				
Dimensions (LxWxH)	MR-PRO: 152 x 81 x 43 mm (incl. protective shock jacket) MR2: 147 x 74 x 41 mm																				
Weight	MR-PRO: 310 g (11 oz.) MR2: 250 g (9 oz.) incl. batteries																				

MR2 or MR-PRO?

The Minirator is available as MR2 and MR-PRO. While the MR2 has been optimized for "Value at a most attractive price", the MR-PRO has been developed with additional innovative functionality for even more demanding applications.



	MR2	MR-PRO
Generator		
Output Level max.	8 dBu	18 dBu
Flatness	+/- 0.5 dB	+/- 0.2 dB
Output Impedance	200 Ω	12.5 Ω
THD+N typical	< -90 dB	< -96 dB
Measurement Functions		
Phantom Power Measurement		✓
Impedance and Balance		✓
XLR Cable Tester		✓
Wave Forms		
Sine, Stepped & Cont. Sweep	✓	✓
Pink Noise, White Noise	✓	✓
Polarity- and Delay Test Signal	✓	✓
Proprietary Wave Files (*.WAV)		✓
Configurations Storage		
Protective Shock Jacket		✓
Hand Strap, USB Cable	✓	✓
NTI article codes		
	600 000 300	600 000 310

Accessories



Pouch MR2/MR-PRO
Belt pouch
NTI Art.No 600 000 302



System Case
for Minstruments + Mic
NTI Art.No 600 000 020



Mains Power Adapter
for MR2 / MR-PRO
NTI Art.No 600 000 301



Cable Test Plug
for MR-PRO
NTI Art.No 600 000 311



Calibration Certificate
for MR2 / MR-PRO
NTI Art.No 600 000 303



MINIRATOR MR-PRO

Enhanced Analog Audio Signal Generator

Sine Wave, Sweeps, Noise & more

Proprietary Wave Forms (*.WAV)

Impedance Meter

Cable Tester

+18 dBu Max. Output Level

THD+N < -96 dB (0.002%)

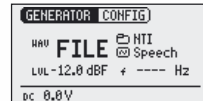


The MR-PRO is an extremely powerful analog audio generator to satisfy every need for the professional engineer. Proprietary user wave forms may be loaded via USB into the internal flash memory. Innovative and unique technology includes continuous monitoring of the impedance of the connected load, the signal balance and the phantom power. Plus the integrated cable testing promotes MR-PRO to the level of a cable analyzer, simplifying trouble shooting tasks. MR-PRO includes all functions of the Minirator MR2.



Basic Signals

MR-PRO offers the same range of audio signals as the MR2. The optimized output stage features even lower residual distortion than the MR2, combined with an extended level range up to +18 dBu.



User wave forms (*.WAV)

A number of user test signals may be stored as uncompressed WAV-files in the MR-PRO memory. The selected file is seamlessly looped. Data exchange is simplified via the USB port.

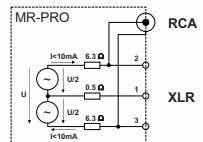
Measurement Functions

Sophisticated and unique technology continuously measures load impedance, balance and any phantom power voltage, providing a detailed view of the connected load for rapid fault finding.



Cable Test

The built-in cable tester verifies the proper 1:1 pin connection through any cable connected between the XLR output and the built-in XLR input. Alternatively an optional Cable Test Plug may be used for single ended installations.



True Level Output Stage

The compensated output stage of MR-PRO precisely stabilizes to the specified output level over a wide range of varying loads. Possible deviations at reaching the output current limit are clearly indicated.

Store Preset Configurations

Up to 10 complete instrument configurations can be stored in the internal flash memory and reloaded for repetitive tasks. The saved settings may also be transferred to other Minirator MR-PRO instruments.



AL1 ACOUSTILYZER

Compact Acoustical Analyzer



Real Time Analyzer

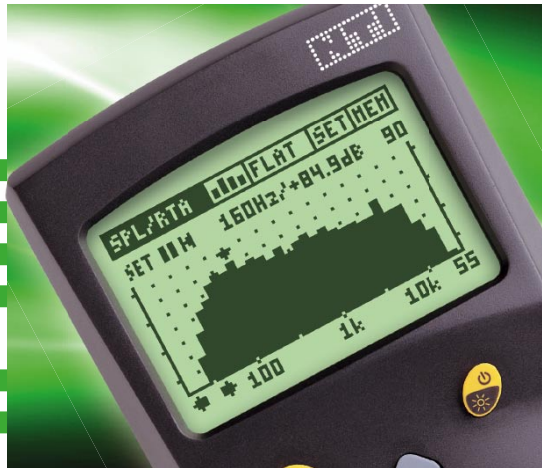
Reverberation Time RT60

Speech Intelligibility STIPA

Zoom FFT, Delay, THD+N, ...

Class 0 design

Long Battery Life (>16h)

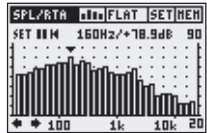


The Acoustilyzer AL1 shares a common hardware platform with the Minilyzer ML1. It greatly expands the Minstruments family with a comprehensive set of acoustical measurement functions. The practical blend of electrical and acoustical functions, combined with computer connectivity through the standard USB interface positions AL1 to be an indispensable tool for every sound/system contractor, installer and multi-media specialist. For existing Minilyzer users a Crossgrade package is offered.



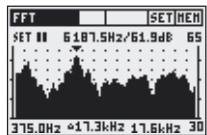
Sound Level Meter

Featuring SPL (act, max, min), LEQ, repeatable short time LEQ and logging functionality. RTA display is selectable without interrupting broad band measurements, fulfilling any event monitoring requirement.



Real Time Analyzer, RTA

Fast RTA with 1/3 and full octave resolution also calculates SPL, LEQ and Max/Min for each band. Numerical cursor readout with peak hold. Fast logging of RTA results together with broad band values via PC interface.



Zoom FFT

Extremely fast, real-time Zoom FFT with resolutions up to 0.7Hz over the entire frequency range. The ideal tool for visualization of comb filters and narrow band effects. Features detailed cursor readout and data storage.

Reverberation Time RT60

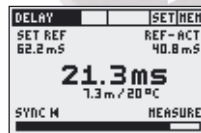
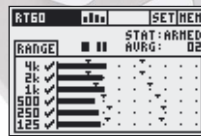
Octave band RT60 measurements (8 octave bands from 63 Hz to 8 kHz) according to ISO3382 with auto trigger, ranging and averaging. Suitable gated pink noise sequences are included on the supplied Test-CD.

Delay Time

Calculates the delay time between electrical reference signal and signal from built-in microphone. A designated chirp is provided on the Test-CD. The automatic difference display simplifies the verification of delay line arrangements.

Speech Intelligibility STIPA

The STIPA analyzer option allows reliable measurement of the intelligibility within 15 sec. according to the latest IEC standards. Measurements may be referenced to previously acquired noise level spectra. TNO verified algorithm.



Technical Data Acoustilyzer AL1

Sound Pressure Level	<ul style="list-style-type: none"> Leq, short-time Leq, Lmin, Lmax Timer for single and repeated measurements Dynamic range (using MiniSPL): 30 - 130 dB SPL_A Filters: Flat, A- and C-weighted, X-Curve¹, RLB Logging of SPL/LEQ results into AL1 memory Wideband- and RTA values simultaneously available
Real Time Analyzer	<ul style="list-style-type: none"> 1/3 or full octave band resolution, class 0 filters SPL, LEQ and Max-Min display per band Fast logging of results to the PC
Zoom FFT	<ul style="list-style-type: none"> Real-time Zoom FFT with 50% overlapping, 93 Bins Frequency Range: 10 Hz - 20 kHz Resolution: 187.5 Hz to 0.73 Hz
Reverberation Time	<ul style="list-style-type: none"> 8 octave bands results, based on T20, according to ISO3382. Automatic averaging with individual result readout and storage Source signal: Gated pink noise (CD included)
Delay Time	<ul style="list-style-type: none"> Propagation delay between electrical and acoustical signal input using built-in mic. Resolution < 0.1 ms, max time: 1 s Dedicated test signal: NTI chirp (CD included)
STIPA (Option)	<ul style="list-style-type: none"> Single value STI and CIS test result. Modulation indices and individual band level results accessible. Error indicator. According to IEC 60268-16, 2003 release TNO verified algorithm Post processing with recorded spectra supported
Electrical	<ul style="list-style-type: none"> Level RMS, THD+N, Frequency, Polarity Filters: Flat, A- and C-weighted, HP400, HP19k
PC Interface	<ul style="list-style-type: none"> MiniLINK USB interface with PC software and interface cable included

Further technical data continued on next page.

Accessories for Acoustilyzer and Minilyzer



MiniSPL Battery powered Measurement Microphone
NTI Art.No 600 000 022



Adapter -20dB Electrical Attenuator
NTI Art.No 600 000 014



System Case for Minstruments + Mic
NTI Art.No 600 000 020



Pouch for ML1/AL1 Soft pouch with belt-loop
NTI Art.No 600 000 012



MiniLINK USB PC Interface for ML1, Software
NTI Art.No 600 000 033

NTI article codes

Acoustilyzer AL1 (MiniLINK included)	600 000 080
ML1-AL1 Firmware Crossgrade (for all Minilyzer ML1 users, MiniLINK required)	800 000 012
STI-PA Measurement Option	800 000 013

Technical Data Minilyzer ML1 + Acoustilyzer AL1

Input Connectors	XLR balanced, RCA unbalanced
Input Impedance	40 kOhm balanced, 20 kOhm unbalanced
Input RMS (upper meas. limit)	+20 dBu balanced, +14 dBu unbalanced use Adapter -20 dB for balanced levels up to 40 dBu
Max. DC Input	±50 V _{DC}
Residual Noise	< 12 µV, XLR-input shorted
Internal Microphone	Omni directional (for polarity and delay measurements only)
Monitor Output	Jack 3.5 mm (1/8"), suitable for all common headsets
Display	Backlit graphic LCD, 64 x 100 pixels
Batteries	3x AA batteries (alkaline) Typical battery lifetime > 16 hrs
Dimensions (LxWxH)	163 x 86 x 42 mm (6.4" x 3.38" x 1.63")
Weight	300 g (10.5 oz) incl. batteries
Temperature	0° to +45° C (32° to 113° F)
Humidity	< 90 % R.H., non condensing

Technical Data Minilyzer ML1

Measurements	Level-RMS, Level-Relative, THD+N, k ₂ ...k ₅ , vu+PPM, Frequency, Polarity, Signal Balance Error, Frequency Sweep, Time Sweep, 1/3 rd Octave Spectrum, Scope, AFILS measurements supported (with MiniLINK)
Level	Units: dBu, dBV, V _{rms} Accuracy: ± 0.5 % @ 1 kHz Flatness: ± 0.1 dB Bandwidth: 20 Hz to 20 kHz Resolution: 3 digits (dB-scale) or 4 digits (V-scale)
Frequency	Range: 10 Hz to 20 kHz Resolution: 4 digits Accuracy: < ± 0.1 %
THD+N	including 2 nd to 5 th harmonics analysis Meas. Bandwidth: 10 Hz to 20 kHz Resolution: 3 digits (dB-scale) or 4 digits (%-scale) Residual THD+N: balanced < -85 dB @ -10 dBu to +20 dBu unbalanced < -74 dB @ 0 dBu to +14 dBu
vu & PPM (vu-indicator and Peak Program Meter)	according to IEC 60268 and DIN 45406. PPM Type I, IIa and Nordic. Both meters with adjustable reference and with analog & numerical peak-hold readout.
Polarity Test	Positive/Negative detection through internal microphone or XLR/RCA connector. Checks polarity of midrange-speakers, woofers and cables. MR2 or MR-PRO provides test signal.
Signal Balance Error	Indication range 0.0 % to 100 % Deviation from perfect balance in % or *1
Sweep	Level vs. Frequency or Level and THD+N and Frequency vs. Time
1/3rd Octave	Spectrum acc. IEC 1260, class II and ANSI S1.11-1976, class II from 50 Hz to 20 kHz, Bargraph for Level RMS 20 Hz to 20 kHz
Scope	Auto triggering, auto ranging, auto scaling
Filters	Flat, A-weighting, C-message, Highpass 22 Hz / 60 Hz / 400 Hz, Voice bandpass, X-Curve ⁻¹

NTI article codes

Minilyzer ML1	600 000 011
Minilyzer ML1 incl. MiniLINK USB PC Interface	600 000 030



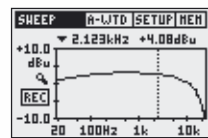
MINILYZER ML1

Analog Audio Analyzer

- Level: RMS, Rel, SPL, LEQ
- THD+N, 2nd to 5th Harmonics
- Frequency and Time Sweeps
- Scope, vu+PPM, Polarity
- Balanced & Unbalanced Input
- High Accuracy (+/- 0.1dB)

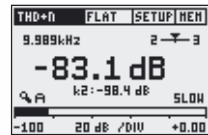


The Minilyzer ML1 is a powerful, complete audio analyzer in a palm-sized format. Its comprehensive set of easy to access measurement functions simplify the process of system verification, diagnostics and repairs of even very complex audio installations. The smart user interface aids operators of all skill levels by setting all ranges automatically and providing complete results on a single screen. The optional MiniLINK USB interface supports data storage, documentation and firmware updates.



Frequency Sweep

ML1 automatically triggers to a sweep sequence with any step width and records the frequency response. The Minirator MR2 or MR-PRO may be used as signal source. After capture all sweep data is available.



THD+N

Supports Total Harmonic Distortion plus Noise (THD+N) and 2nd to 5th selective harmonic distortion as dB value or in %. Input level and frequency measurement runs in parallel and the balance indicator finds defective cables.

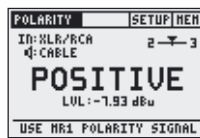


Level

Continuously measures absolute input levels either in volts, dBu or dBV and the signal frequency. Relative measurements are also supported. Connecting MiniSPL further supports basic SPL and LEQ measurements.

Polarity

Finding wrongly connected speakers is as simple as moving ML1 into the sound field of the speaker under test and its polarity will be displayed. The same measurement through the XLR input is ideal for cable tests.



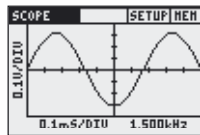
Time Sweep

Intermittent faults are often hard to find. The time sweep records the RMS level, frequency and the THD+N value simultaneously, helping to monitor the audio signal during a long period of time for later analysis.



Scope

Provides a quick and robust look at the waveform of the balanced audio signal, quickly finding clipping amplifiers etc. The auto-scale and auto-trigger functionality are normally only found in expensive stand alone scopes.



MiniSPL

Measurement Microphone



1/2" Measurement Mic

Battery Powered

Balanced Output

Omni-directional

Individually Adjusted

Auto Power-Off Control

The MiniSPL is the ideal accessory for the Acoustilyzer and Minilyzer. Its self-powered design, the individual factory adjustment and the auto power-off compel the MiniSPL to be an accurate, easy to handle yet affordable measurement microphone.

Technical Data MiniSPL (NTI article code: 600 000 022)

Microphone Type	1/2", omni-directional, pre-polarized condenser free field transducer
Sensitivity	(20 ±2) mV/Pa, (-34 ±1) dBV/Pa @ 1 kHz, balanced output
Frequency Response	100 Hz - 1250 Hz ±1 dB 20 Hz - 20 kHz ±3 dB (IEC61672, class 2)
Peak Acoustic Input	130 dB _{SPL} @ 1 kHz
Noise	30 dB _{SPL} , A-weighted
Power Supply	1 x AA battery 1.5 V, battery lifetime typical 300 hrs



Less noise • More sound

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