

The successor of the Minirator family just arrived on the shelf\*...The tested MR-PRO has a little (and cheaper brother) named MR2. A high value generator for all audio tests in the field. It's not an improved MR1 but a totally new design making it a perfect companion for the ML1 and AL1. The DR2 as digital version is also available! Check it out!



*\* Since the writing of the article, lot of things happened in the life of the Minirator MR-PRO. Due to its digital management, it has been updated. The report was carried out with the first release of the firmware...*

### Functions

On the first MR version, (it was a Neutrik) the 2 lines LCD were associated with only 3 keys. This ergonomics was not really convenient. We have now a big screen with white back light, 8 keys and a bi-directional wheel replace the keys. More this wheel is speed sensitive. The back light switches off

automatically, and lights on the very readable screen every time we hit a key. The access to all the parameter is made on the wheel by scrolling in the menus. We found here the ML1 and AL1 way. Once the parameter highlighted, one hit on the center key and the parameter value can be adjusted with the wheel. When you

### For Who? For What?

MR-PRO is the tool you must have when you install or verify audio systems, diagnosis to write if you work in audio electronic or acoustic. It's also a small laboratory generator usable to expertise defective items with two associates: the oscilloscope

and of course the ML1 and AL1. Its performances have followed the evolution of the products of the market and its esthetic is younger. Put in your toolbox but take care of small signals!

### Innovation

MR1 was innovating, the MR-PRO brings more with its .WAV file reader and a high resolution tuning of level and frequency.



1



2

1: NTI puts shortcuts keys to access to waveform, level and frequency screens. The rotating ring chooses parameters and values. NTI adds a mute key. Very convenient and nice ergonomics!

2: Unusual connectors for a generator. We can go in on a XLR-F connector to test cables, the USB port is used to update the generator, manage .wav files, which you can play instead of sine or other shaped waves.

have to process to repetitive tasks, 10 memories allow you to preset settings. The cherry on the cake is the presence of three keys for an instant access to wave, level and frequency screens. In this step, we have the choice of setting steps, 1 or 0.1 dB for the level (far better than the 2 dB of the MR1) and four steps in fraction of octave for frequency. NTI sets the output level from -80 to +18 dBu for sine waves, a compatible level with ML1. Generally, an audio input circuit accepts a +20 dBu (7,75V) level, +18 dBu is an improvement on the MR1's +6 dBu. If the MR-PRO is mainly a field generator, it's THD as low as -96 dB (0,0016 %) at +18 dBu makes of it a perfect lab instrument. Among the waves, we found the sawtooth wave for polarity test (suitable for the ML1 & AL1) and

the white and pink noises. Their output level is limited to +8 dBu but you must remind that the peak level drives the signal close to clipping. As the generation of signals is digital, the maximum level is fixed by occupation of all bits...

NTI adds a sweep generator synchronized with ML1 plotter or other rapid test systems. USB MiniLINK option can then extract the data for export in Excel. If on the MR1 the smallest step was 1/3 octave, we have here a Hz resolution from 10 to 9999 Hz then 10 Hz up to 20 kHz. This limit is fixed by the Shannon theorem, with the internal sampling frequency of 48 kHz, it's difficult to generate clean signals over 20 kHz.

NTI has the great idea to suppress the square wave! A perfect square wave has a lot of harmonics. We need

around 10 to have a good shape on the scope. If we need a 5 kHz square wave, with a 48 kHz sampling frequency, we will reproduce only 3<sup>rd</sup> harmonic. It may only be useful to have low frequency square wave. A bad square generated can drive to false interpretation. If you need a real square wave, the analog domain is the best and it's not difficult to build your generator. One way to generate a better square wave would have been the use of the DSD 1 bit part of the DA converter.

MR-PRO has another sweep generator. It generates chirps, which are continuous sweeps of the spectrum. The screen allows you to program its duration and frequency limits. You can also have a linear or logarithmic frequency progression according to the chosen analyzer. We regret the absence

### USE

**Congratulation for the ergonomics, which is far more nice than the previous one. Testers are integrated and shortcuts very convenient and useful.**

### PERFORMANCES

**The MR-PRO is tuned on the ML1 and has even performances going further than ML1's possibilities.**

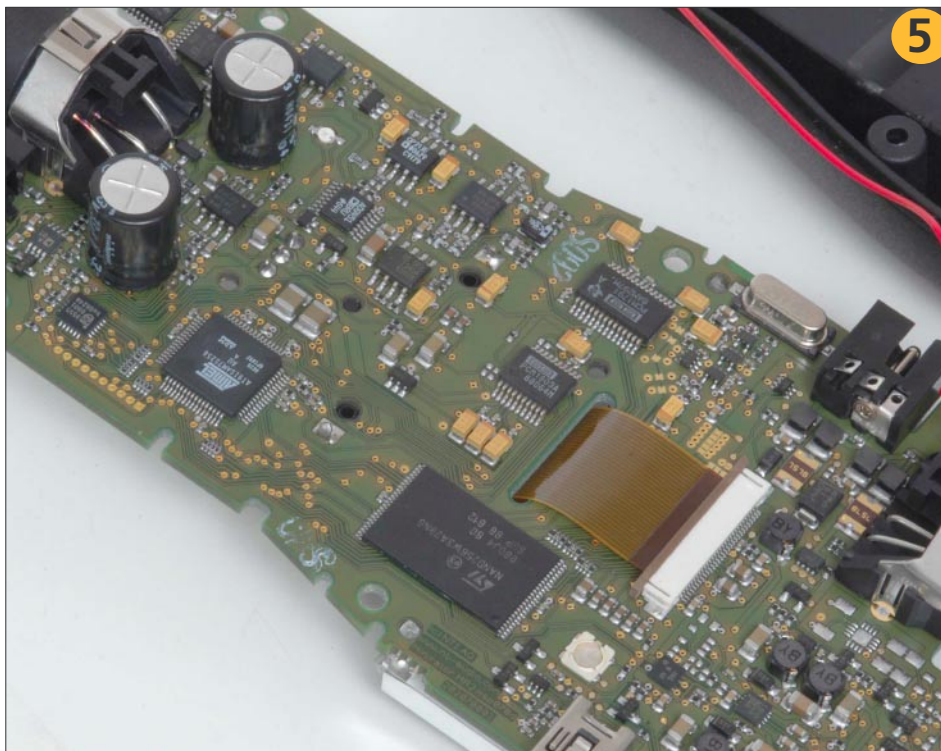
### QUALITY/PRICE RATIO

**Swiss quality and precision. There is a price for performances. It's more expensive than the MR1 but is also more complete, performing and nice. A positive assessment!**

3: NTI has a Cable Test Adapter used to test cables. On this screen we can see the value of its two resistors. Thus you can test a very long cable. Impedance and balance are shown on this screen.

4: With sweep and chirp mode, you can select a lot of parameter. Here: 1/3 oct sweep, 0.5 s per step, and 1 second start signal.

5: A flash memory, a microcontroller, converters, op amps are surface mounted on a very thick and strong PC board.



of a starting tone useful for some plotters. If you need square waves, you can download the file from the NTI website in the internal 32 MB flash memory. The files have a 16 bits/48 kHz format. The capacity of the memory allows 5 minute of recording. Fortunately, we can loop the samples. To download an audio file, you'll

have to connect the MR to a PC via USB port. The MR-PRO becomes then an external memory. The memory is also used to store configurations. Furthermore, the MR-PRO can measure some parameters of the input where it's connected. Within some seconds, it measures the input impedance and tests the balancing of the input reporting the value on

each pin. With this data, we can discover a wrong connection or find a pin where the impedance is higher to avoid the overload of a weak source.

Really the MR-PRO measures also the phantom power voltage. You may have some surprises! Here, the generator gives the voltage for the two pins, in case of a broken or wrong circuit.

The MR-PRO has a cable tester inside. You connect the XLR cable between the two XLR sockets, one M one F and the screen say the results. If the two end are not available, NTI has an end plug equipped with two resistors of different values. If the cable is crossed or if there is an intrusive serial resistor, the screen will show it.

The MR-PRO is powered with 3 AA cells. You can use the high capacity Ni-mh cells available today the autonomy will be the same as the battery one. The only problem is that the available fast chargers load cells by two or four. The autonomy will be around some hours, it may be interesting to use an external power supply but NTI doesn't give the pinout in the manual. The center pin

6: A reassuring word: it's OK. The cable is not crossed and there is no phantom voltage. More, the MR-PRO measures permanently the input impedance.

7: A small comparison to end: The new model is far sexier than the old one. Isn't it?



is +. You'll need a 5-7 V, 1000mAh power supply. Often, the DC input is protected against polarity inversion.

### Design

One PC board, between two molded ABS shells receive all the components, LCD display included, connected with it's flexible circuit. Everything is managed by an Atmel microcontroller with a 256 kB flash memory and an USB interface inside. An external flash memory is added. Signals are generated in the digital world perhaps with wave tables. A PCM 1791 is used as DA converter. Another converter, AD type, is used for impedance and phantom voltage measurements. Output amp is based on low distortion CMOS opamps. An internal switch mode power supply delivers the high voltage

necessary to output +18 dBu from 4,5 volts or less battery. Of course, we have the high standard of quality ever met on NTI products.

### Measurements

The MR-PRO takes 180 to 470 mAmps from the batteries, depending of the audio output level. At 0 dBu, we measured 220 mAmps, 250 at +10 then it goes up very fast. At this level the icon of the battery comes quite fast! We can add the 40 mAmps of the display lighting, it takes around 20 % of the total energy!

Level indication is very precise and due to the low internal impedance doesn't vary a lot with the load. On 600 ohms, we lost only 0.2 dB, less than a dB cut in four parts!

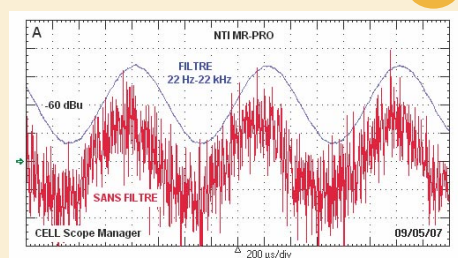
On the field, the Minirator will meet

microphone input, their value is one of the smallest in audio, generally more than 1500 ohms.

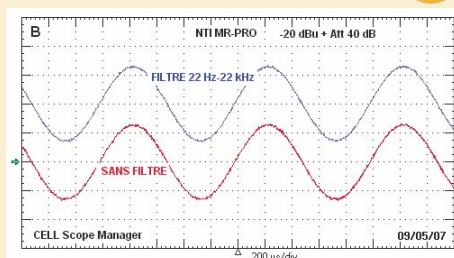
Level decreases to -80 dBu, the according dynamic is 98 dB. Take care! We are here speaking of a 20-20k bandwidth signal but the output contains a lot of high frequency components and at a low level, these component may disturb the circuits. Oscillogram A shows the shape of the signal were we perceive residual and quantification noises. As the low level is digitally generated, not by attenuator, we measure the HF noise of the converter. Our advice is to use a passive low out impedance 40 dB attenuator, the Minirator -40dB Adapter, and to use it for low level test signals. Oscillogram B shows that our -80 dBu signal is far better and usable! The drawback is that we

### Measurements:

**A**



**B**



Oscillogram A: The output level of the generator is -60 dBu. The lower trace is taken trough a 10 Hz-500 kHz BW filter.

The upper trace shows the same signal in a 20 Hz- 20 kHz band.

Oscillogram B: For this experiment, the output level of the generator is -20 dB and we inserted a 40 dB pad. The measurements are made in the A conditions. The lower trace is clean!

lose the impedance measurement. The measurement of the signal level at -80 dB gives -60 with a 500 kHz bandwidth but with a 22 kHz BW filter, we recover the -80 dB.

The below table gives the evolution of THD+N vs level measured with an Audio Precision System One and on the NTI ML1. Measurement is made with a 22 kHz BW filter, the same applied internally to the ML1 due to its digital process. Of course, the increasing of the THD is principally due to the floor noise. If you work with a very low level, a good analog oscilloscope will be a good tool to look at the signal shape. Of course if you use an attenuator, the THD will be lower, if the attenuator is frequency linear.

When the Minirator goes into mute, the output signal is -93 dBu unweighted and -96 dBu A-weighted. The dynamic of the converter is 112 dB.

We have connected the MR-PRO to our Windows 2000 PC's USB interface. No problem! The behavior of the generator is then a memory and it's not powered by the USB link. We like Ergonomics, play of .wav files, high performances, integrated cable tester, impedance measurement, portability and total compatibility with ML1 and AL1. We regret digital noise, small flash memory and consumption.

## Minirator MR-2

The MR2 is a light and cheaper version. No preset memories, no .wav file play. The testers for cable, impedance and voltage are omitted. The output level loses 10 dB, the output impedance grows to 200 ohms and the THD loses 6 dB due to the increased noise level.

## Digirator DR-2

Knowing the digital way of building signals in this 2<sup>nd</sup> generation of signal generators, it would have been interesting to have a digital output with a perfect -98 dB signal... NTI offers a specific generator which adds to the Minirator signals DTS, Dolby Digital and Dolby E signals, synchronizes the generator on various sources, gives status channel data, tests the transparency of a non linear modulation and measures delay. Its sampling frequency goes up to 192 kHz on XLR and RCA, 96 on optical output and 48 for ADAT. The maximum resolution is 24 bits. The Digirator DR2 available since April 2008 and is totally compatible with the Digilyzer DL1.

*This article is the translated Minirator MR-PRO test report, as printed in the Sono magazine, edition January 08. The specifications have been updated.*

*Text & Photos: Etienne Lemery*

*Translation: Etienne Lemery*

Table: THD+N vs output level measured with AP System One and Minilyzer.

NIVEAU		- 40	- 20	- 10	0	+ 10	+ 18
AP SYSTEM ONE	TDH + B @ 40 Hz	0,2 %	0,019 %	0,006 %	0,0025 %	0,0017 %	0,0014 %
	TDH + B @ 1 kHz	0,2 %	0,020 %	0,006 %	0,0024 %	0,0018 %	0,0013 %
	TDH + B @ 10 kHz	0,18 %	0,018 %	0,006 %	0,0024 %	0,0019 %	0,0015 %
NTI MINILYZER	TDH + B @ 40 Hz	0,22 %	0,023 %	0,008 %	0,004 %	0,004 %	0,003 %
	TDH + B @ 1 kHz	0,22 %	0,022 %	0,007 %	0,004 %	0,004 %	0,003 %
	TDH + B @ 10 kHz	0,21 %	0,021 %	0,007 %	0,003 %	0,004 %	0,003 %

## Technical Specifications:

### Outputs

Balanced XLR, unbalanced RCA phantom power resistant, 12.5 Ohm balanced, I<sub>max</sub> = 10 mA

### Inputs

DC power supply, USB XLR for cable test

### Signal Wave Forms

Sine, Pink Noise, White Noise, Polarity test signal, Delay test signal

### Continuous Sweep

Linear / Logarithmic

### Frequency setting

10 Hz - 20 kHz

### Output Level Ranges

- 80 dBu to +18 dBu

### THD+N

-96 dB (0.0016 %) @ 18 dBu Noise Floor typ. 15 µV

### Impedance Measurement

Absolute value Z  
4 Ohm - 50 kOhm balanced

### Power Calculation

25 V, 50 V, 70.7 V, 100 V

### Phantom Power Reading

0 - 54 V

### Flash Memory

32 MByte, for storing wave files and configurations

### USB Functionality

Firmware update, Mass Storage

### Battery Life: typical : 10 h

### Weight including batteries

310 g (11 oz.)

### Dimensions (LxWxH)

152 x 81 x 43 mm incl. jacket