NTI Minilyzer

Mike Rivers

A couple of years back, NTI brought out the Minirator, a hand-held multi-function test generator. I rated it as best-of-show at the AES (or was it NAMM?) show where it was introduced, and I reviewed it in the June 99 issue of Recording. A year later, a companion unit, the Minilyzer, was on display, and I knew I needed one for my toolkit. It showed up on my doorstep one snowy day in February (just a day late for my birthday), so I took it for a spin. Here's what it's all about.

Whazzit?

The Minilyzer packs a multitude of audio measurement functions into a single hand-held unit. It's slightly larger than the Minirator, mostly because of its larger LCD. The LCD not only displays menus and numerical values, but some graphics as well. Inputs are an RCA jack for unbalanced sources and a female XLR for balanced sources. There's a mini headphone jack for monitoring the input (handy for hearing the frequency announcements on a calibration tape when aligning a tape deck). An AGC on the monitor output assures that you're able to hear something even with input levels down around -60 dBu without frying your ears with a full level input. Although this feels like a stereo jack, it's really mono with only the tip active, so with a stereo headset, you hear in one ear only, a minor quibble. There's also a built-in microphone which is active only when used in the acoustic polarity test mode.

What's on the menu?

Level/Frequency, THD+N, VU+PPM, Acoustic polarity, Balance, Sweep, 1/3 octave spectrum display, and Oscilloscope. Some are obvious, others require a bit of explanation. Operation is fairly intuitive. The ESC button brings the highlight cursor from whatever it's doing back to the function menu. The Enter button in the center of the cursor buttons brings up the menu, the cursor buttons scroll through the menu list, and the Enter button makes the selection. In any measurement mode, the cursor keys highlight any unit or parameter of the display that can be modified. For example, when measuring level, if it's reading

in dBu and you want to read volts, simply move the cursor over “dBu”, press Enter, then use the cursor keys to scroll through the measurement units.

Level and Frequency

These are the functions I use most often, so I’ll explain them first. The level and frequency of the input signal are displayed together on the LCD screen. Level measurements can be either absolute (relative to one of the standard reference levels - dBu, dBV, or in volts), or relative to the input level present when the Relative mode is selected. For example, you want to measure the frequency response of a particular device. Put in a 1 kHz test signal and, with the Minilyzer in the absolute mode, you read the device’s output level as +3.97 dBu. Switch to Relative mode and the reading normalizes to 0.00 dB. Now, as you change the input frequency, you can read the output relative (in dB) to the level at 1 kHz. The meter reads the true RMS voltage, so it will read accurately on a distorted waveform (or noise) as well as a pure sine wave.

The level/frequency display also has a bar graph which provides a pseudo-analog meter display, handy for tweaking when you’re looking for a peak or null. Another indicator on this display shows whether the input is coming from a balanced or unbalanced source, and, if the XLR input is unbalanced, it will show you which pin is positive relative to the other. Maximum input level is +12.5 dBV at the unbalanced input, +20.5 dBu at the balanced input.

Distortion

As a big fan of hamfest-acquired lab test equipment, the Hewlett-Packard 334A distortion analyzer on my bench is an old-fashioned one, requiring you to set it in the ballpark of the test frequency and either null it out manually or wait for the autonull circuit to do its thing. The Minilyzer automatically tracks any frequency within its working range and displays total harmonic distortion plus residual noise (THD+N) directly, quick and simple. I didn’t have a clean enough source to verify the Minilyzer’s specified residual THD+N of 0.005%, but it agreed closely with my H-P on my best oscillator (about 0.05% THD) up through about 10%. A quick frequency sweep through a cheap transformer-type direct box while watching the THD+N display reminded me of why I don’t use it for bass.

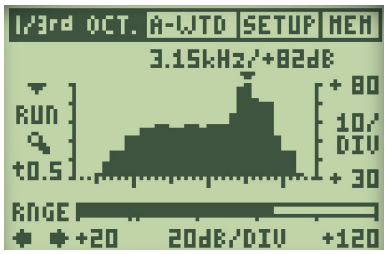
Balance

This function measures the “differentialness” of the input source, measuring the difference between the signal level on pins 2 and 3 with respect to pin 1. As a quick check, balance is indicated on the Level/THD screen by showing graphically the difference between pins 1-2 and 1-3.

When switched to the Balance mode, a numerical display indicates 0.00% for a perfectly symmetrical source, and if one side is different, displays the percentage of offset as well as indicating which pin, 2 or 3, is most positive with respect to pin 1. An unbalanced or impedance balanced source will read very close to 100% (no signal on Pin 3). This is handy for determining whether an output is balanced or unbalanced without measuring each signal pin individually. What it doesn't tell you is the source impedance between pin 1 and each of the signal pins, which is what really defines the "balance" of a source, but it's still a useful function.

Spectrum Analyzer

In the 3rd Octave mode, the Minilyzer becomes a third octave (31-band) spectrum analyzer. It doesn't have sufficient sensitivity to be able to plug in a mic and use it as an acoustic analyzer, but you can get close to that function if you use an outboard mic preamp. The time constant (for averaging) can be set from 0.2 to 5 seconds. A particularly cool feature is a tracking arrow on the display which automatically points to the highest amplitude and reads out its frequency. Though I didn't have occasion to test it, I'll bet this feature is handy when you aren't sure which slider on the graphic EQ to grab when the PA system starts howling. And speaking of PA applications, being a 1/3 octave analyzer, pink noise looks flat, white noise has a rising slope, as they should.



NTI offers the AL-1 Acoustilyzer variation of the ML-1 which has firmware for acoustic measurements and includes a measurement mic with built-in preamp which can also be used with the ML-1.

Sweep

In the Sweep mode, the Minilyzer emulates a strip chart recorder. There are two sweep modes, Frequency and Time. In the Frequency mode, it expects a stepped frequency sweep such as that generated by the NTI Minirator. It waits for a steady tone of either 315 Hz or 1 kHz, then starts recording when the frequency drops below the reference frequency, and continues recording each frequency that's higher than the previous one, stopping when it reaches its limit of 20 kHz or it sees a frequency lower than the previous one. It's automatic when used with the Minirator, though you could use an oscillator and sweep it manually, or generate a stepped-frequency test signal with a DAW. At the conclusion of the frequency sweep cycle, a graph of frequency response is displayed. Scrolling the cursor along the trace reads out amplitude and frequency at any point.

Time Sweep mode is a continuous recorder which records for a preset time (60 seconds to 100 hours, well past the battery life) or until you stop it manually.

Amplitude, THD+N, and frequency are recorded simultaneously, though only one can be displayed at a time. This mode is useful for tracking intermittents.

VU and PPM Meter

In this mode, a pair of bar graph meters are displayed, one responding as a true VU meter, the other as a PPM (peak programme meter) with your choice of three different dynamic response characteristics and reference levels. For more on meter characteristics, see my article entitled Meter Madness. There's too much to go into here, but suffice it to say that if you've been watching pseudo-VU meters all your life, you can learn a lot by watching how this one responds with your normal program material.

Oscilloscope

Just what does that waveform look like? While not a full blown lab scope, this one requires no setup, it's auto-ranging and auto-triggering, and displays approximately one cycle of the waveform on the LCD.

Polarity Test

This is the one function that's closely married with the Minirator, but it's cool enough to save for last. One of the specialized signals that the Minirator generates is a special waveform used for polarity testing. It's a sawtooth wave with a frequency of around 20 Hz. When the Minilyzer, in the Polarity mode, detects that signal, the LCD reads "In Phase" or "Out of Phase", simple as that. Put the test waveform into your monitoring chain or PA system, select the Minilyzer's internal mic as the source, and hold it up near a speaker. It'll tell you if there's been a polarity inversion somewhere in the system. The polarity test also works on the RCA and XLR inputs, so you can use it to locate a polarity inversion somewhere in the electronics. It also makes a handy mic cable tester. It will inform you if pins 2 and 3 are swapped, and if it indicates that the input is unbalanced, that means that pin 2 or 3 is either open or shorted to pin 1. Cudos for naming the function "Polarity", but a raspberry for not carrying it through to the display and calling the results "Normal" and "Reversed".

Update: Partly as a result of this review, in a subsequent firmware update, the Polarity test results were changed to "Positive (OK)" and "Negative (Reverse)."

Other Goodies

Sometimes we want to restrict the bandwidth for measurement purposes, and the Minilyzer provides a set of preset filters for common applications - high pass at 22, 60 and 400 Hz, A-weighting for noise measurements, C-Message and voice band for telephony applications, and of course flat. I was going to complain that there wasn't a 22 kHz low pass filter to eliminate the clock and other out-of-band junk that often finds its way out the analog output of a digital device (or the record head bias), but there's no need, since the Minilyzer's bandwidth is limited to 20 kHz.

The Minilyzer remembers the last measurement mode, the filter (if any) and the units (dBu, dBV, etc.) chosen. You can have up to four different user setups if you choose (it requires one more step when starting to select the setup), one for dBu, one for dBV, one for Type I PPM, one for Type II, etc. The setup can only be selected at startup, so I found it just as convenient to change settings on the fly. The user interface - a set of four cursor buttons and an Enter button - is pretty clear once you learn what the symbols mean, and what to expect from each of its many functions. The display is backlit, with a preset turn-off time to conserve battery life. A quick press of the on/off button turns the backlight on when you need it.

Testing The Tester

As a practical exercise, I used the Minilyzer to align an analog tape deck. Starting out with level measurements in the Relative mode, I set the 500 Hz tone on the alignment tape to read 0 dB, then set the reproduce EQ for a reading of 0 VU at 10 kHz, then ran a repro frequency response check, noting deviations from 0 dB. Since the tone sequence on the alignment tape goes 1 kHz, 500 Hz, 10 kHz, then starts up from 20 Hz, it wouldn't trigger the Minilyzer in the frequency sweep recording mode. If I was going to do a lot of alignments, I probably would have spliced in another 1 kHz tone before the 20 Hz tone. It wouldn't have to be reference quality, just enough to cue the sweep recorder.

Bias adjustment came next. Using the Minirator as a source and the Minilyzer still reading relative level, I recorded 10 kHz, adjusted the bias for peak level using the analog bar graph, set the relative level so that read 0 dB, and then increased the bias until the reading dropped to -3 dB. An alternate method of setting bias is to adjust for minimum third harmonic distortion. Putting the Minilyzer in the THD+N mode, it was easy to see the null when the bias was adjusted, and it fell fairly close to the "3 dB overbias" point as expected.

Going back to relative level mode, I adjusted the record EQ, and finally, set the record level. Now I was ready to set the Minirator to sweep and record a frequency sweep on the Minilyzer just for good measure. Quick and simple.

In Conclusion

The Minilyzer is capable of making a lot of routine and some not so routine audio measurements with relative ease. Hand sized and at 10 ounces including three AA batteries, it easily fits into the toolkit for field troubleshooting. The menus are simple to navigate and the display is clear and large enough to read easily. There are a couple of limitations, however. Because of its 20 kHz limit, it may not be appropriate for tesing digital equipment when using higher sample rates, but it works fine for measurements within what's considered the conventional audio bandwidth.

With it's maximum input level of +20 dBu, it will indicate an overload (and won't display a reading) at the maximum output level of some of today's equipment. I keep a 10 dB in-line XLR pad handy when I want to check distortion at maximum output level of a "hot" mixer or D/A converter. Since it's just as useful on the bench as in the field, I'd like to have seen a fold-out stand so it could sit upright, and an external power input so it could be left on all the time without draining the batteries.

If you've been wanting to start doing your own studio maintenance, the Minlyzer, and its companion Minirator will fill the bill at a fraction of the cost and bench space as traditional test equipment.