TESTING PULSE-TO-TONE CONVERTERS

by Ralph Meyer

This article summarizes tests using three pulse-to-tone converters on two internet-based voice services.

Although the public switched telephone network (PSTN) was required to be backward compatible, telephone service over the internet is not governed by the same rules. Therefore, rotary-dial telephones will always work on your local telephone company's line, but they might not always work with internet service. Small pulse-to-tone converters seem to offer an attractive way to use our vintage rotary phones on "modern" phone lines, so I made several tests recently to see how this would work out.

Tests of Services and Converters

The tests were run on two different voice-over-internet services (VoIP for voice-over-internet protocol). Internet service requires an analog telephone adapter (ATA), which is a small box like a cable modem. In my home I have Vonage service with a Vonage Model VDV21-DV ATA. The other service available was in the office of the internet service provider, Easton Utilities, in our small town of Easton, MD. Easton uses an Arris Model TM602G/115 ATA.

The phone used for most of the testing was a Western Electric 302. Before going further, let me say that the WE 302 will work directly on my Vonage system, so you might be able to use a rotary-dial phone directly on your VoIP system without a converter. But not all ATAs will accept pulses, and the Easton system would not even break dial tone with pulses.

The following three pulse-to-tone converters were tested: Oldphoneworks.com LPT310 ($39.95 plus shipping), Dialgizmo.com (no model number)($39.95 plus shipping), and Alldav.com P2Tv2.1-48 ($20 including shipping). Don Woodbury at Oldphoneworks graciously provided the Oldphoneworks and Dialgizmo converters for testing whereas the Alldav converter was purchased on the internet.

During the tests, I was able to ask questions to the developers: Don Woodbury at Oldphoneworks.com in Canada, Justin Vietz at Dialgizmo.com in Australia, and Allen Wan at Alldav.com in the U.S. In spite of this help, I do not consider my tests definitive or comprehensive, but I'll describe the results anyway.

Test Results

All three converters worked well on the Easton Utilities VoIP system, and the Dialgizmo and Alldav converters worked well on the Vonage VoIP system. The Oldphoneworks converter did not work at first on the Vonage system, although it would produce tones for several digits and then stop as if it were running out of gas. Further study of the three converters produced some interesting observations that impact performance.

Use of "Ultracapacitors"

The Oldphoneworks and the Alldav converters use ultracapacitors in their circuits. These are used like little batteries with a stored charge. Consequently, these two units have to charge up for at least 10-15 minutes before first use. If you try to use them before their capacitors are charged, they will generate a few tones and then quit, just as the fully charged Oldphoneworks converter did on my Vonage system. You can also deplete the charge by dialing too many numbers in quick succession.

The Oldphoneworks and Alldav converters are also sensitive to polarity because of those ultracapacitors. Although these converters are wired to have the correct polarity with most ATAs, there could be a case where the polarity is reversed. In that case, the polarity could be corrected in one of several ways: (a) reverse the red and green leads inside the converter, (b) cut off the RJ11 plug and crimp on another one upside down, (c) use a line extension cord that reverses polarity, or (d) reverse the wires in the line if there is house wiring between the ATA and the converter.

When asked about the potential use of a polarity guard, Allen Wan of Alldav.com said, "Designing for reversed polarity in this situation is actually much more complicated than doing so for a telephone. I can't just rectify the signal because a negative voltage is part of the AC ring signal which will affect some phones upstream. At a minimum, bell ringers will sound different if you rectify the signal. There were other approaches, but they were all more complicated than I was willing to deal with since my goal was to keep the design simple and cheap."

The Dialgizmo converter, on the other hand, does not use ultracapacitors and is not polarity sensitive. Just plug it

in and it is ready to go. I noticed that the off-hook voltage with the Dialgizmo was higher (about 8 volts and relatively stable) than the other units, which exhibit an off-hook voltage of 4-5 volts and rather variable, just like the phone without any converter attached. It looks like the Dialgizmo has a current limiter (perhaps a resistor) in it rather than letting the transmitter resistance (varies a lot) determine the current – and hence voltage. This is consistent with the Dialgizmo design objective of stealing as little power from the line as possible.

Performance may differ with Dial type

Don Woodbury pointed out that some converters might behave differently with different dials because some dials have transmitter shunts (e.g., WE 302) and others do not (e.g., WE 500). I don't understand what these converters are looking for, but do I know what these telephones are presenting to the line. With its dial shut, the resistance and voltage across the 302 are zero for the entire time the dial is rotating. The resistance and voltage are not zero across the 500 because its dial does not short out the resistance of the coil primary (about 30 ohms), the transmitter (75-275 ohms), and that little 22-ohm resistor. Together these are on the order of 200 ohms.

So I tested a WE 500 with the Oldphoneworks converter and it worked fine. Then I added a 220-ohm resistor to the line between the WE 302 and the Oldphoneworks converter. It worked like a charm. Next I removed the resistor and disabled the dial shunt by removing the wire from terminal marked "R" – the dial still works well. With this change, the Oldphoneworks converter also worked with the WE 302. By the way, adding a 220-ohm resistor in this location is just like a PSTN line with 220-ohms resistance, which would be typical and not a big deal.

There are Kellogg, S-C, and AE dials that also use a transmitter shunt. I think those shunts could likewise be disabled by simply removing one wire, and I don't think the performance would be affected in any significant way (maybe early CO equipment required a stronger pulse current). But if you just add about 200 ohms resistance to the telephone end of the converter, the problem experienced by the Oldphoneworks converter should go away. Don Woodbury is considering adding such a resistance to his product.

Other Observations

By the way, the Dialgizmo has a ringing pass-through limit of 2 REN. I don't know about the other converters. If you have more than two phones on your VoIP line, you may need to put a converter behind each phone rather than at the ATA.

I noticed one other thing during the tests. You have to wait for the converter to produce its tone before dialing the next digit. Don't get ahead of it. But you then have to keep moving so you don't exceed the 5-second time limit between digits on some (all?) systems. No napping while dialing.

There are a lot of reviews on line regarding pulse-to-tone converters, and it appears to be well known that not all converters work with all phones and all ATAs. So, while I learned something, I don't think my tests provide enough information to know if these converters will work on your system or not. You might just have to try a converter to see if it works with your telephone and VoIP system – and then try one of the remedies mentioned above if it doesn't. ☎

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Editor's note: Please send your pulse-to-tone observations to eab@telephone-collectors.org and we'll include them in a future issue.