A Homemade LD-DTMF Converter

I've been after a thing like this for a while as I use an ATA which doesn't understand pulse dialling. A few things are commercially available:—

First is the RotaTone. These are fitted inside the telephone so you need one for every 'phone you wish to convert. Great if you only want to do one but it'd soon get expansive if you want to do several.

A better-sounding bet is the DialGizmo which is a box that connects between the socket and 'phone, or 'phones. They cost about the same but come from Australia and are expensive enough to be liable for Import VAT, plus the other charges associated therewith.

A similar thing called a Dialor2 is available from China via AliExpress or e-Bay but these aren't much cheaper, not as good, and are still enough to get HMRC interested.

I finally came across this design for which I claim no credit. It was first developed by Boris Cherkasskiy and then modified by Arnie Weber.

Both these people have made their code available (the link in Boris Cherkasskiy's page is dead but it's available from here), though sadly they both seem to assume that any reader already knows about programming micro-controllers. Arnie Weber provides a confusing wealth of data, including a double-sided PCB which is beyond the skills of we primitive creatures from the heath, but no instructions at all.

I did find a guide to getting the code onto a micro controller this but as it was a few years old the software recommended had changed meaning the instructions no longer applied. This is the tale of how I managed it. I'm not claiming that it's the Correct or Best way, just one that works.

I've designed a single-sided circuit board and tweaked the circuit diagram to show how to connect it to a GPO 746 telephone, which is what this guide uses as an example. This information is applicable to most 700-sereis telephones, though the Compact/Jubilee models have different terminal numbering. These instruments actually involve more work than the older ones. The dial connexions are the same no matter the model of telephone and diagrams showing connexions for the 232 and 332 are included.

I also added made a few changes to the circuit. Firstly I incorporated a bridge in case the line polarity is reversed. Boris Cherkasskiy used 2kΩ for R1 which Arnie Weber reduced to 220Ω "To prevent voltage droop when dial/pulse switches are closed." I found that this caused a massive reduction of volume on the telephone so split the difference and used 1kΩ. That still caused a very slight reduction but a side-by-side test was required to observe it.

I then heard on a forum that somebody had built this and was complaining about a volume reduction even at 1kΩ. I don't know enough about this person's telephone set-up to comment further but other people (sadly those overly well-versed in the Sin of Onan) appeared to be saying that the zener diode and C1 form a low impedance path for the AC sound signal so part of it isn't getting to the line. The proportion was being determined by the value of R1. A better solution was to use a 78L05 voltage regulator IC as these have a high impedance to AC. Fitting that made it possible to reduce R1 to 100Ω.

It was also pointed out that if the telephone is answered while it is ringing, as opposed to during a gap between rings, for a fraction of a second the ringing current would be getting to the converter which could have unfortunate consequences for the micro controller; it may be damaged, crash or have its software scrambled. A simple solution to this was to fit a transitory voltage suppression diode (D1).

The PCB artwork in PNG format, code (Arnie Weber's version), diagrams and how I programmed the micro-controller is in a ZIP file here:
http://joefreeman.weebly.com/uploads/1/3/7/7/13770951/a_homemade_ld_to_dmtf_converter.zip.