November 1, 2021 – Postscript to the Retrochallenge

After reviewing my own activities and accomplishments for the last 31 days, I think it's only appropriate to submit the following self-evaluation of my Retrochallenge project. Self-criticisms are rarely objective, so the following may be considered 100% subjective.

1. While emphasis was given to *function* over form, it would have been subjectively better to retain more of the historical fabric of the switchboard. In particular, the indicator lamps for each "line" and the associated jack field should have been retained rather than replaced with modern audio patch panels. The degree of corrosion and physical damage to the contacts in the original jacks made the use of those panels problematic.

2. The addition of an ethernet switch and cat-5e patch panel, while not historically relevant from a retro-tech perspective, allowed for the consolidation of wiring in the workshop, and is therefore a practical "win."

3. The heart of the switchboard, as originally designed by Bell Laboratories in the late 1920's, was the cord circuits. Unfortunately, the manner in which they were implemented made the presence of a human attendant (or "operator") almost mandatory. The provision of switches to enable "night service" simply patched a particular extension to a particular CO trunk (or another extension) and effectively bypassed the switchboard. I should have spent more time working on the cord circuits and getting them all functional before working on the automation of switching. As it stands, I only have 7 (of the original 15) cord circuits to make connections through the matrix switch.

4. The "normalized" audio patch panels made it easy to configure the switchboard for automatic switching but also execute a "manual override" for real-time changes to the configuration. By simply plugging a telephone instrument into the top jack for a particular line, telephone service was maintained while working on the automated switching apparatus. Likewise, simple patch cords could be use in place of the rather complicated cord circuits for testing purposes.

5. The use of original-equipment relays (from the 1920's) added a level of complexity to troubleshooting. Modern relays are smaller, consume less current, and have more consistent switching characteristics.

6. The TI 99/4A was a surprisingly effective machine for generating MF and DTMF tone signals, but the choice of using the parallel (PIO) ports for control of the matrix switch was a mistake. For ongoing use, a small microcontroller

(perhaps a BASIC Stamp) will be used to interpret commands and control the matrix switch, accepting those commands over a serial RS-232 interface.

7. Although presently limited to accepting control commands from a single "line" (the operator's telephone circuit), the matrix switch is surprisingly functional, despite the use of "flakey" wiring and ancient line relays.
8. Despite their simplicity, the basic "DC Loops" and ringdown circuits have surprising utility and can, by themselves, provide many of the functions that I bought the switchboard to accomplish.
9. Although the TI 99/4A is remarkably well equipped for generating control tones, and even call-progress tones, the BASIC programs run very slowly and the lack of a "wait" function often causes overlap and similar timing issues.
10. The lack of disk storage or "reliable" tape storage makes the choice of the TI 99/4A a "loss" when it comes to software development for the matrix switch. While the use of the Classic99 emulator made it easy to write some of the software, the difficulties associated with cassette storage (and getting the programs back onto the PC-based emulator) meant that the "working" versions didn't make it back onto the PC or get posted to the blog. I have yet to get the Classic-99 emulator to "read" an audio file taken from the real tape drive.

So that's it for another year. I'm going to continue work on this particular project for the foreseeable future, if only to keep basic telephone communication a possibility in my own workshop. Dropping conventional telephone service from my local carrier in favor of a fiber-optic internet connection will no doubt save money, and the use of the VOIP service through the switchboard will allow me some flexibility in the use of traditional data communications.

I'd like to personally thank Urbancamo, EPooch, and the rest of the folks at Retrochallenge.org for providing this venue and all the various participants in this years Retrochallenge. It's been an education!

-- Paleoferrosaurus