

A&O—The PBX

Bob #1 February 14, 2016, 10:35pm

A few days ago I had a chance to finish the new telephone system. David and I installed it in the dispatcher's office, directly above the CTC machine.

Getting the system up and running was a priority task, as it would be needed for initial operating sessions held prior to the CTC machine becoming fully operational.

On the old A&O we used a sound-powered party-line telephone system. It worked well enough, but the volume dropped precipitously when two or more operators picked up. There is an excellent party-line phone circuit board by Chuck Catania and Seth Neumann for model railroad use, but I wanted to avoid the instantaneous "pay attention to me now!" interruptions that operators impose on the dispatcher. Hence, we have a bit of an overkill solution, a custom PBX for the A&O.



A modern electret microphone capsule and amplifier are hidden in this vintage Frisco dispatcher's

telephone graciously donated by Vince's brother Louis Griesemer. This classic Western Electric unit easily adapted to our application. The sensitive microphone eliminates the need to extend the scissor mechanism and speak directly into the unit, working well at distances up to 2 feet away. I left the original vintage patina on this unit as it added a lot of character to the installation. There will be plenty of room to reach the leftmost CTC column switches.

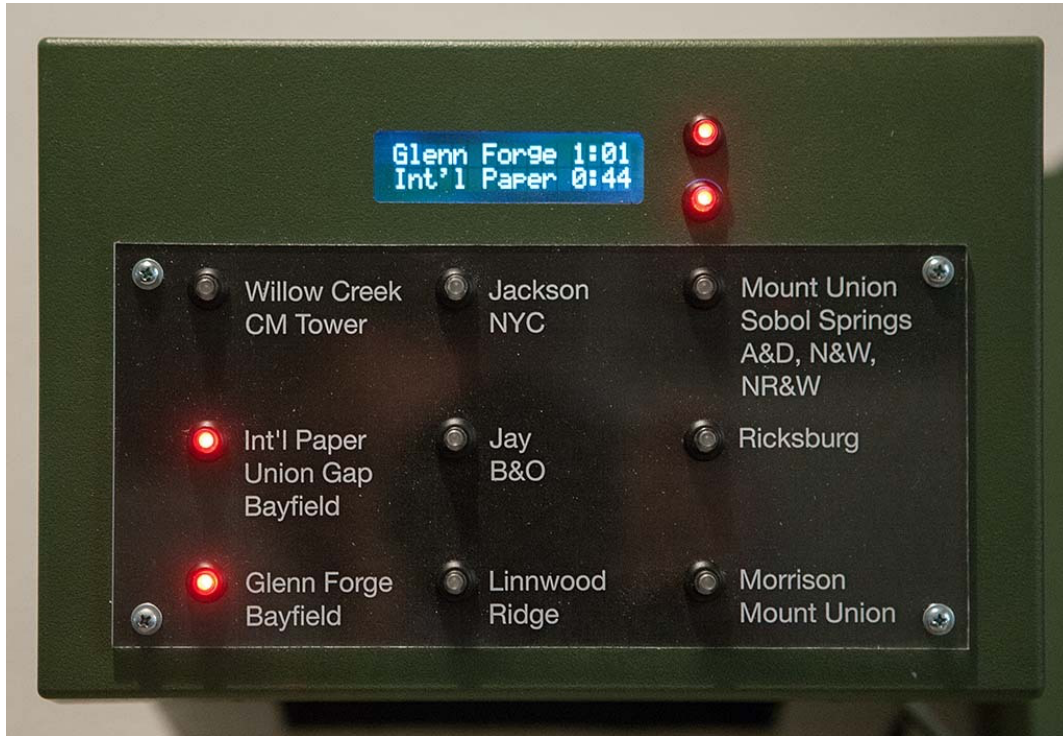


So what is custom about this PBX, and how does it manage dispatcher interruptions? When the first operator picks up a field telephone, the dispatcher hears a single, brief and soft ring that repeats every 30 seconds or so. The caller automatically goes on hold until the dispatcher chooses to pick up. He or she can answer immediately or finish other work before dealing with the operator's "perceived crisis." Callers can be answered in any order. The two callers who have been waiting the longest appear on a blue-white LCD display along with the actual time they have been on hold.

Here we see the control head, with as simple a user interface as I could imagine. When the dispatcher wants to do something with a phone line other than what's currently happening, just press the corresponding illuminated line button. Press a button to answer a line, or hang up on one line and

answer another. When a button is not illuminated, press it to activate a buzzer at that telephone station.

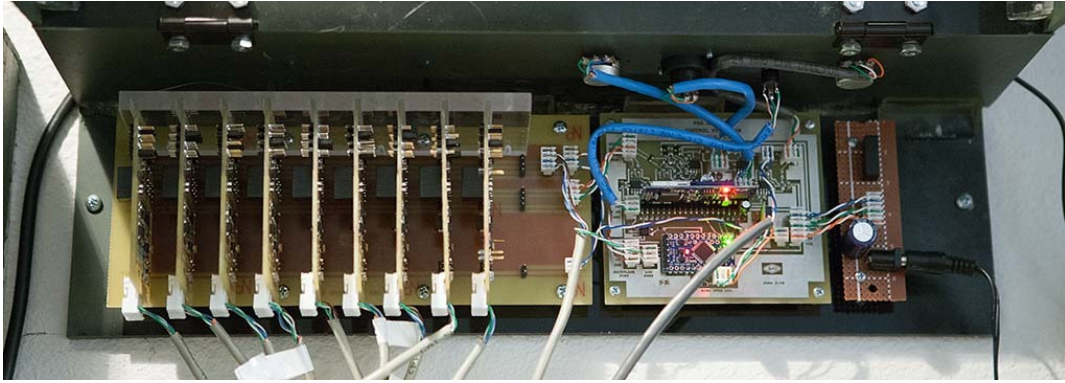
Telephones are shared “regional” resources, so there are multiple station names listed for each phone.



Bob #2 February 14, 2016, 10:35pm

Here is a peek into the guts of the PBX. A Sparkfun Arduino Pro Mini coordinates everything. That's a small blue PC board on the rightmost control board, one I home fabricated. Also on that board is a commercial MP3 player module, attached at a right angle to the A&O board, that serves up on-hold messages including some that might surprise, but all guaranteed to be “squeaky clean.” A 3.5mm audio jack attached to the lid accepts stereo input from a cheap CD player for entertainment between periodic A&O announcements.

On the left are 9 telephone line cards, one for each field phone. On each is a high-impedance current loop feed with a design inspired by an ancient Western Electric circuit, and a modern I2C digital section which can switch the line between on-hold audio and the dispatcher, or “ring” a field buzzer.



Operator's telephones all have topside LED illumination so that they can be easily found and handled during night operations.



Edited to add picture of phone.

jaybarnaby #3 February 14, 2016, 10:35pm

Impressive, as always!

Jay

luizgad #4 October 23, 2017, 12:34am

good work!!!

congratulations.

i living in Brazil and i buid one project like this.

is possible share the schematics and code?

thanks.

Luiz

Bob #5 October 24, 2017, 1:44pm

Luiz -

Welcome to the A&O! Thank you for your interest in and kind words about the telephone system.

The documentation is *not* complete. You will need to reverse-engineer the control processor board from the PC board artwork to draw your own schematic. Depending on your skill this could be an extremely difficult project. Construction requires skill in analog and digital electronics, C++ programming on the Arduino, PC board fabrication and surface mount soldering. Unfortunately I will *not* be able to provide support.

I will send you what I have by private email. Thank you for your request, and again, welcome to the A&O.