Recent articles in MR and NMRA's LCC FAQ about phones

In October and November **Model Railroader** published a pair of articles about telephones. These solutions may work in some circumstances but we don't recommend them. Here are some things to consider:

Wireless Handsets as Layout Phone Systems

In October a Workshop Tip discussed using inexpensive wireless handsets as a layout intercom. These systems have been used on several layouts that I'm familiar with (Mark Dance described the use of these in the OPSIG's *Dispatcher's Office* [http://www.opsig.org/doff/] a few years ago) and these systems (made by Panasonic, VTEC, etc., and carried by the Big Box stores) work well subject to a couple of limitations:

- They're not suitable for timetable and train order dispatching with dedicated train order operators as multiple operators may be copying orders at the same time and these systems require dialing extension numbers and do not handle conference calls well, if at all. Mark Dance has a dispatcher who writes out the orders, sets a train order board remotely, and the crews come around to a set of pigeon holes to retrieve their orders, so the dial intercom works for him as it's only used by the Dispatcher and Yardmaster to talk among themselves. The prototype would have had a party line and everyone on the line is immediately connected upon going off hook. This comes down to how you feel about the TT&TO Operator position: some feel that without the cadence of the copy and repeat between the DS and OP it doesn't seem real, others are fine with the DS just writing the orders himself. It's your choice!
- Each of these systems has a slightly different set of button pushes to access the intercom, typically two or three presses to get to any station and this causes a delay of several seconds before the called party starts ringing. This may be okay at a "phone booth" on a CTC railroad or for intercom use between yards but it's generally too fussy and frustrating for dispatching.
- On the other hand these systems are inexpensive, typically sub- $100 for a 6 handset system at big-box stores, and don't require any installation other than mounting the charging cradles and finding a place to plug each power supply in.
- The phones do not look like anything you'd have seen in a dispatching or train order office in the day, but you may not care about modern artifacts in your layout room: your prototype didn't have wireless DCC cabs, either.

Vintage Equipment with Simple Choked Power Supply

In November, **MR** published an article by Don Ball describing a phone system using vintage telephone equipment, such as you might find on the **Model Railroad Control Systems Website**

[http://www.modelrailroadcontrolsystems.com/telephone/]. While I do not want to imply that a phone system that someone has installed and working satisfactorily doesn't work, I will point out that about a third of the 50+ phone systems I've supplied to model railroaders have been to upgrade systems that use a similar approach to Don's.

There are two general difficulties with systems such as the one Don describes:

- While Don's power supply uses a choke to prevent the filtered DC supply from shorting out the audio, it is not balanced and is subject to picking up interference from nearby sources of electrical noise such as DCC track power and florescent lighting ballasts. We use a balanced battery feed source such as a Telco style battery feed coil or our EBF31A [http://www.modelrailroadcontrolsystems.com/ebf31a-telephone-battery-feed/] which will reject most electrical noise. This really contributes to clarity and makes things much more pleasant for an operator who may be wearing a headset or listening to a speaker bridging the train order phone line. Our EBF31A acts as a current source which helps with mixed types of phones drawing differing amounts of talk current. As to the lack of a packaged system for model railroads, see our application note: The 5 Minute Phone System [http://www.modelrailroadcontrolsystems.com/content/5%20minute%20phone%20system.pdf].
- Don wired his telephones as with the receiver in series with the transmitter. While this was common practice in the early part of the 20th century, we strongly recommend the use of modern ("425" type networks [http://www.modelrailroadcontrolsystems.com/425-speech-network/] from the 1950s and later) anti-side tone networks at each station. These "networks" provide several useful functions that increase clarity and reliability (and none of us are getting any younger nor is any of our hearing improving).
  - Anti-side tone networks direct most of the speech energy from the microphone out onto the line and only provide enough energy to the receiver to reassure the user that the phone is working. The consequence of not doing this is that each user will tend to speak less loudly to get a comfortable speech level in his ear. As a result speech levels on the line tend to fall and intelligibility is lost, especially when several stations are off hook at once.
  - Speech networks also limit the amount of current drawn by each telephone. Older phones tend to draw a lot of current as they are not particularly efficient and when multiple phones go off-hook, more phones are contending for a fixed amount of current and the result is lower audio levels. The least efficient phones will tend to suck up the most current. This is especially a problem when different types of phone are used and, when using older equipment such as Don describes, there will be quite a bit of natural variation as the equipment has aged. So using a network at each phone helps to ensure that all phones have enough power.
  - Another feature of the modern speech network is that the amount of current sent to each transmitter is controlled, which prevents the carbon transmitters (microphones) from "packing up." Old carbon transmitters that have had excessive current through them tend to lose volume and make an annoying "frying eggs" sound. (Transmitters that are not too far

gone can be momentarily fixed by rapping the transmitter against a hard object: do you remember whacking the handset against a desk to quiet it down?)

- I recommend wiring vintage phones following the diagram for a model [500 type telephone](http://www.modelrailroadcontrolsystems.com/1950s-era-type-554-wall-set/) [http://www.modelrailroadcontrolsystems.com/1950s-era-type-554-wall-set/] even if you're using older transmitters and receivers. In extreme cases you can replace the older transmitters and receivers with more modern components from 500 type telephones. In some cases we have replaced the transmitters in older candlestick phones with modern dynamic or electric microphones. See my "[Communications for Model Railroad Operations](http://www.modelrailroadcontrolsystems.com/content/Communications%20for%20Model%20Railroads%202015.pdf)" [http://www.modelrailroadcontrolsystems.com/content/Communications%20for%20Model%20Railroads%202015.pdf] clinic, last presented at the Portland NMRA convention.

I recommend designing your phone system to support at least four stations off –hook at once: the dispatcher, two train order operators and allow for at least one train crew at a station waiting to "OS" if you have the crews OS themselves.

Layout Control Buses for Lights and Buzzers

The last phone related comment was in the LCC FAQ published in the September NMRA magazine which suggests that LCC would be useful for telephone systems. We have used the CMRInet, LocoNet and CTI layout control buses for buzzing yards and towers and lighting employee call lamps, so this is certainly not a new capability unique to LCC. In any case you still want to use an audio system based on a balanced battery feed as described above for a talk path. Any attempt to digitize voice and send it over the command bus would be difficult, expensive and use a disproportionate amount of bandwidth. If you really want to do Voice over Internet Protocol (VoIP), home and small office systems exist but they would run over an Ethernet using Internet Protocol (IP) which would be separate from the LCC bus.