Telephony 101 – Bridge-type Local-battery Anti-sidetone Circuit March 3, 2013

Hello All,

As always, please send any questions about the reading assignment directly to me at oldtimetelephones@goeaston.net. I will bundle questions if necessary, repeat the questions, and give answers in an e-mail to the TCI List Server before moving on to the next reading assignment. This way everyone will benefit from these questions and answers. By sending questions directly to me, we will avoid unnecessary clutter on the List Server. Previous reading assignments, notes, questions, and answers are available in the TCI Library at http://www.telephonecollectors.info/index.php/telephony101 (this is a new URL, but the old one will eventually get you there).

Please read pages 146 through the top of page 157 in Chapter 18.

This circuit was the beginning of my telephone adventure. Ever since I was a kid playing with electrical things, I had wanted a magneto wall phone. After the college bills were paid for my kids, I splurged and bought two of these phones with the intention of hooking them together on a line. The first of the two phones was a beautiful Western Electric No. 417 (the one pictured in Fig. 9-5 in as-received condition), but it had no circuit diagram on the door and 13 internal wires had been cut! I was hopelessly lost and, as a physicist, humiliated that I couldn't make it work.

After searching public libraries and bookstores, I ended up in the Electricity Division of the Smithsonian where they told me about the telephone clubs. An ad for help in the ATCA newsletter got a response from Steve Hilsz. There was no Google; this was 1987. Right away Steve sent me a hand-drawn diagram of the bridge circuit in this phone (copy in archive of Telephony 101), and with Steve's drawing I was able to construct a complete wiring diagram. In a number of subsequent letters, we also tried to figure out the mysterious "T" terminal (now covered in the book). Over time, Steve and I exchanged more than 40 letters each way, and these letters were all written with good grammar and carefully typed on old mechanical typewriters. It was correspondence worthy of 19th Century admiration, yet to this day I have never met Steve Hilsz.

Anyway, this circuit is another application of the wonderful Wheatstone Bridge (see Appendix page 226). A description of how this bridge-type circuit works is given in the book, and measured voltages are shown when transmitting and when receiving in my tests. We noted earlier that the standard local-battery circuit (not an AST circuit) did not have an objectionable sidetone, so there would seem to be less motivation to change it. But if you look at the performance of this bridge-type circuit, you will see that it is even better than the old standard circuit.

For starters, it puts a larger signal on the line than the old standard circuit (245 mV versus 210 mV as tested). And it reduces sidetone a lot (30 mV when transmitting versus 65 mV when receiving), whereas the old standard circuit had the same receiver voltage when transmitting and receiving. Although the receiver's 65 mV is a little lower than the standard circuit's 75 mV when receiving, the standard circuit was tested with a 240-ohm receiver (No. 144) whereas the

bridge-type circuit was tested with a 120-ohm receiver (HA1). Thus the power delivered to the receiver in the bridge-type circuit is 50% greater than that of the standard circuit. Really good!

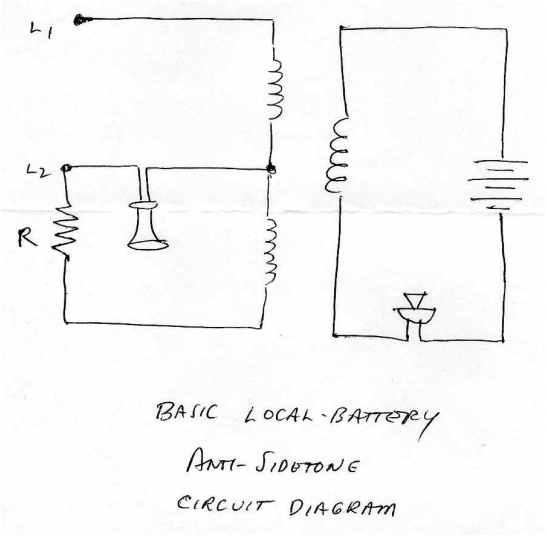
This circuit was so good that it was often used on very long common-battery lines where low transmitter current would be a problem with a regular CB phone. To avoid direct current in the receiver, you can block this current with a condenser and then bypass the condenser and receiver with a retardation coil as seen in Fig. 18-7 and 18-8. In this way such a phone was used for local-battery talking and common-battery signaling (LBTCBS).

Northern Electric used a variant of the bridge-type LB circuit in a 500-type telephone and put the circuit (less the retardation coil) in a network can. In fact, NE used the same can for a standard 500 CB phone with different wiring inside but with all the can's original markings – plus they added a few extra terminals. So in the NE wiring diagram you will not see the familiar terminal markings used by WE for this circuit, but rather you will see recycled terminal markings from a regular CB network (425 NET). By the way, there is a small error in Fig. 18-9. The terminal labeled "Q" should be shown as a solder terminal (dot) rather than a screw terminal (circle with slash).

Stromberg-Carlson, Kellogg, and Automatic Electric all used this circuit in their telephones, and wiring diagrams for all are described in the book – including that clever S-C convertible network. And Western Electric used this circuit in the "A" version of their Type 331 portable telephone, but they used an altogether different circuit in the later Type 331B (that's coming next).

If there are any questions about the current reading assignment, we will deal with the questions before moving on to the next reading assignment.

Ralph



Steve Hilsz's Drawing of January 4, 1988