Automatic Electric Director System – Steering Calls Through a Step-by-Step Exchange

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In small step-by-step telephone exchanges in the early days, there was no standard number of digits for phone calls and no elaborate requirements for trunking to other offices. They had only as many digits needed to reach all numbers on the exchange, and any trunking to other places had to go through the operator. In some cases, subscribers could dial calls to other exchanges, but that required special instructions in the telephone directory that the subscriber had to consult.

In larger exchanges, though, the trunking needs were much more complicated, and special instructions and digits a subscriber would need to dial would be more complicated and impractical. It would depend on where they were calling from, because in a plain SxS exchange, what you dial is what you get, and available paths through the exchange to get to a trunk group would vary, depending on what was available on the selector levels. No two exchanges were alike. Any special instructions would, in effect, be a road map through the exchange (I have an example of this in a rural directory that lists the digits a caller would dial to reach another exchange, and it depended on what exchange they were calling from).

What was needed was a system which enabled a caller to dial a directory number from any exchange without needing to consult any special instructions, one which would interpret the dialed prefix and the machine would figure out how to steer the call through the office.

Enter the Automatic Electric director system, which could outpulse one to six digits, based on a three-digit prefix. The outpulsed digits did not need to have any numerical correlation to the dialed prefix. The director was a common control device that would stay on the call from the start and then drop off when the out pulsing was done and the connection from start to end was set up. This provided the flexibility in office design and prefix interpretation that one would think was available only in much more complicated equipment such as panel or crossbar.

The director mechanism and wiring was mounted in a box 24 inches by 18 inches (photo, top of page 7). There were other switches mounted in a rack elsewhere that supported the director when it was on a call, but were not a direct part of it.

The circuits needed to cut the director into the calling switch train were between the line switch/line finder and the first selector, much like a Teltone converter. In the director's case, the path between the line finder and the first selector needed to be split for the director to do its job, then closed when it was done. The director was capable of receiving subscriber dialed digits and out pulsing at the same time, thus requiring the tip and ring path between the line finder and first selector to be split. When a caller went off hook and was found by a line finder, a rotary switch wired in at this point looked for an idle path to a special Strowger selector switch called an "A" switch. When one was found, this "A" switch would apply dial tone to the line. The first digit of seven the caller dialed stepped this switch up. This switch would then cut into the contact bank on that level, looking for an idle director. There were a set of directors on each level of the "A" switch that were assigned as first numbers in the three digit prefixes in the local calling area. When a director was found, it would receive the remaining six dialed digits.

Based on the two next digits, the director would convert the second and third numbers of the dialed prefix into whatever digits were needed to be out pulsed to steer the call through the switch train to the far end office. These pulses would step selectors into position that could be in either the near-end office, the far-end office or a tandem office in between. The director could out pulse one to six digits to do this. While this was going on, the caller could dial the remaining four digits of the directory number and the director would record and store these, until the outpulsing was done. All of this was done in real time while the caller dialed the number, and did not require the caller to pause in the middle of dialing.

In the director, there was a Strowger switch called the "BC" switch that would record the second dialed digit by stepping up the wipers, and the third digit by rotating the wipers in. The "BC" switch had six wipers that would stop on whatever position was dialed, and these six wipers represented the one to six call steering digits. The six contacts in the contact bank the wipers could stop on, were jumpered on a large terminal block called the "translation jumper field" to set the steering digits. Each contact was jumpered to one terminal out of ten, and that was how many pulses were sent out for that number. Since the director could outpulse one to six digits, it didn't have to put out all six, and any unused ones had those contacts on the "BC" switch strapped to an eleventh position labeled "digit cut-off." This position would cause the director to skip to the next digit. When all six digits were done, the out pulsing of the last four digits would begin. The last four digits of the dialed number would be sent unchanged. These would operate the last two selectors and the connector switch in the switch train, in the far-end office.

The director had a minor switch to steer the pulses to the "BC" switch and the four additional minor switches that counted and stored the last four dialed digits. This switch would advance during the inter-digit pause. There were two unidirectional rotary switches that controlled the sending of pulses out of the director, The "sending control switch" which selected the outpulsing of the digits one by one, and the "sending switch" which would send out the desired number of pulses for each digit. The first ten positions on the contact bank of the "sending control switch" were wired to the six wipers on the "BC" switch and then the four wipers of the minor switches that registered the last four dialed digits. Each position chose in order the digits to outpulse. When the director had outpulsed a digit, the "sending control switch" would step to the next position. The other switch, the "sending switch" selectors, stepped one position to the next at ten steps per second, sending out a pulse down stream per step as it went, and would stop on the position that was jumpered on the block for that number for the prefix, and for what position the minor switches had been stepped to, thus causing it to outpulse the intended number of pulses for that digit, but no more. It repeated this operation for each digit to outpulse.

When all this was done, the director and the "A" switch would release, and the split in the path between the line finder and the first selector was closed, so the talking path was put through.

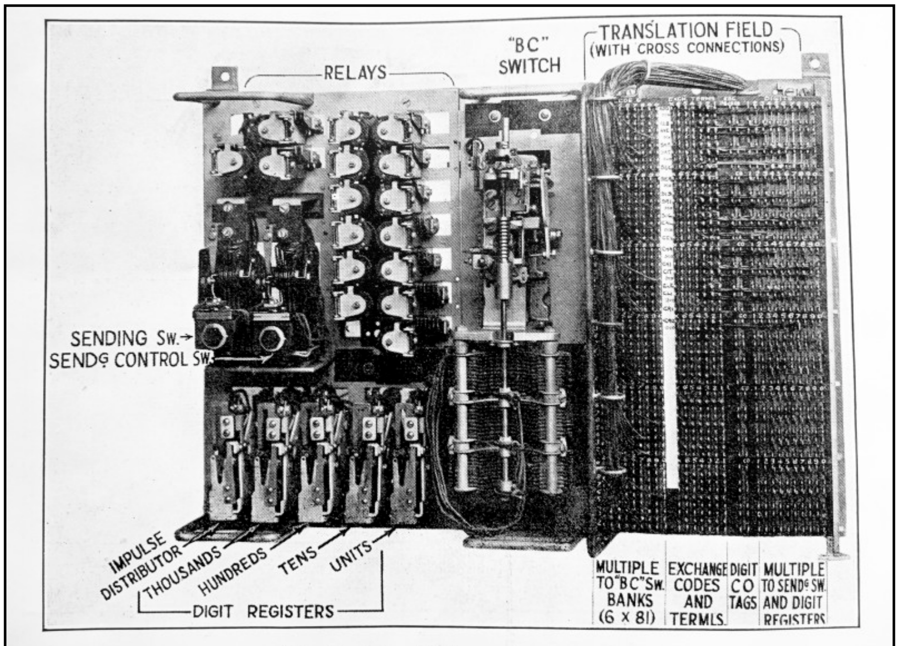

Fig. 19. View of Director Assembly

Since the director could receive dialed digits and out pulse at the same time, the operation went faster. The time delay between when the caller finished dialing the last number and when the called line was seized was only a few seconds longer than if the caller had dialed all the needed digits.

The director system saw extensive use in major cities, including London and other places in England, and Havana, Cuba. It greatly simplified the subscriber dialing of telephone numbers and made the transition from manual service to dial service much easier on the subscriber.

The General Post Office, operator of England's telephone network, standardized on the SxS system in 1922 when they decided to convert their exchanges to dial operation. Mostly this was done for political purposes, as SxS could be manufactured domestically (Western Electric actually installed a panel exchange in London, hoping to get the GPO to purchase panel equipment, but lost out, as they were unwilling to establish a factory to make it in England), but also the availability and capabilities of the director made this the obvious choice for them. The consensus at the time was that a network of semiautomatic exchanges in London would actually cost more than full automatic, so semiautomatic was not used as a transition system to full automatic.

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