

Ringling selection in No. 5 crossbar

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In supplying telephone service under the wide range of conditions encountered, it is often necessary to connect more than one subscriber to a single line. From the point of view of the number of subscribers per line, five types of lines are available at present for No. 5 crossbar: single party, two party, four party, eight party, and ten party. Four party lines may be either of two types: one having full and the other semi-selective ringing. With full selective ringing, each subscriber hears ringing only when his station is being called, while with semi-selective ringing, each subscriber hears the ringing for his own and one other station. On individual, two party, and four party full selective lines, therefore, each subscriber hears only his own ringing, while on four party and eight party semi-selective lines he hears also the ringing for one other party, and on ten party lines he hears the ringing for four others. Coded ringing is used to identify the party called, and the five codes indicated in Figure 1 are employed in the No. 5 crossbar system.

This group of codes has been arranged so that it may be used for all these types of lines. Individual, two party, and four party full selective lines use only code one. Eight

party and four party semi-selective lines use codes one and two; only ten party lines use all five codes.

On party lines, half of the subscriber stations are arranged to be rung over the "ring" conductor, and half over the "tip" conductor. On eight party lines and four party full selective lines, a further limitation in the ringing a subscriber hears is made possible by superimposing the interrupted 20-cycle ringing on either negative or positive d-c. All ringing is superimposed on a d-c component to permit the tripping relay to operate when the subscriber answers, and the normal d-c component is negative; only for eight party and four party full selective is the positive superimposed ringing employed. To specify a ringing code completely, therefore, it is necessary to state the side of the line to which the ringing is applied, whether it is negative or positive superimposed, and the particular one of five codes of Figure 1 that is employed. There are thus in all fourteen types of ringing used at present in No. 5 crossbar, and they are indicated in Table I.

Although very few central offices serve lines of all these types, they frequently have more than one type of line, and the proper type of ringing must be selected for each call. Means must be provided at a central office for selecting and applying ringing to any line, but since this equipment is used only for a brief period in each call, it would in general be uneconomical to associate these circuits with each line. In the step-by-step system they are associated with the connectors, while in the panel and No. 1 crossbar systems, they are associated with the incoming trunk circuits. These latter systems rarely have eight or ten party lines, and thus the equipment for selecting ringing consists of only a few relays. In the rare cases when eight or ten party lines are required, the additional ringing selecting equipment is associated with only the few lines that require it.

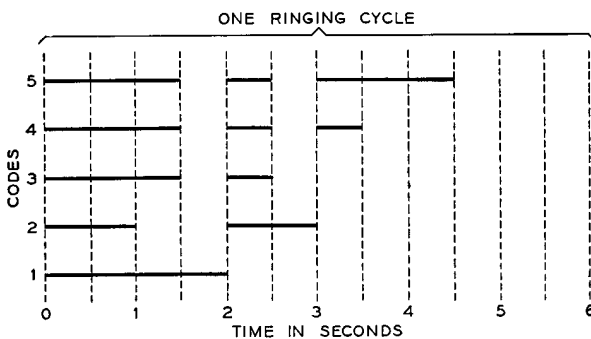


Fig. 1—The five basic ringing codes used by the No. 5 crossbar system.

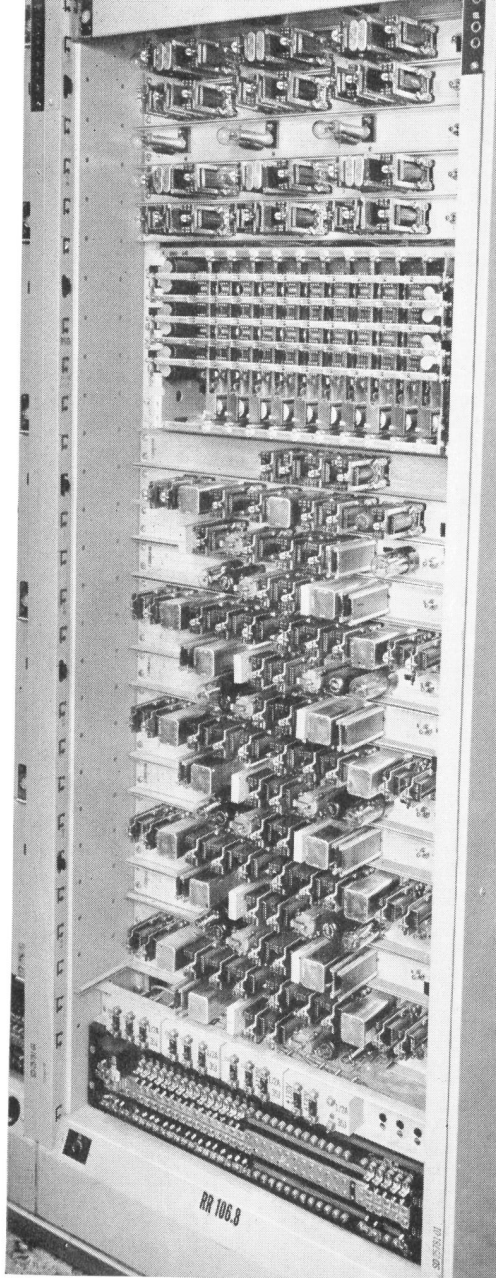


Fig. 2—Lower part of trunk bay showing one ringing switch.

The field of use for No. 5 crossbar offices, however, includes the suburbs of metropolitan centers, and these offices may commonly serve eight or ten-party lines in addition to one, two and four-party lines. The selecting equipment is associated with the trunk as in the No. 1 system, but all fourteen types of ringing are made available to each trunk. Instead of using a relay circuit, however, a crossbar switch is used to apply the ringing. The trunk circuits are installed on twenty-three inch relay racks. A ten-vertical crossbar switch is used for each ten trunks requir-

ing ringing. Each trunk circuit is associated with a switch vertical to select any one of the required types of ringing. A complete bay of this type will carry twenty or thirty trunks maximum, depending upon the amount of equipment in the trunk circuits, and will thus use either two or three crossbar switches. The lower part of such a bay is shown in Figure 2. The crossbar switch shown serves the ten trunks mounted beneath it—two trunks being mounted on each set of three mounting plates.

A simplified schematic of the circuit employed is shown in Figure 3. Levels 0 and 1 are used to apply ringing to either the tip or ring conductors of the line and ground to the other. When crosspoint 0 is closed, ground is applied to the tip conductor and ringing to the ring conductor, while when

TABLE I—THE FOURTEEN TYPES OF RINGING OF THE NO. 5 CROSSBAR SYSTEM

Code	Polarity	Side of Line	Ind. Line	Two Party	Four Party		Eight Party	Ten Party
					Semi	Full		
1	—	R	X	X	X	X	X	X
1	—	T		X	X	X	X	X
1	+	R				X	X	
1	+	T				X	X	
2	—	R			X		X	X
2	—	T			X		X	X
2	+	R					X	
2	+	T					X	
3	—	R						X
3	—	T						X
4	—	R						X
4	—	T						X
5	—	R						X
5	—	T						X

the No. 1 crosspoint is closed, ground is applied to the ring conductor and ringing to the tip. Levels 2 to 8, inclusive, select the seven types of ringing supplied by the ringing power plant: negative superimposed code 1, positive superimposed code 1, negative superimposed code 2, positive superimposed code 2, and negative superimposed codes 3, 4, and 5.

Under direction of the marker, the crosspoint for either the No. 0 or No. 1 level is operated and also the crosspoint for one of the levels from 2 to 8 depending upon the type of ringing required by the party being called. Closure of the crosspoints of any of

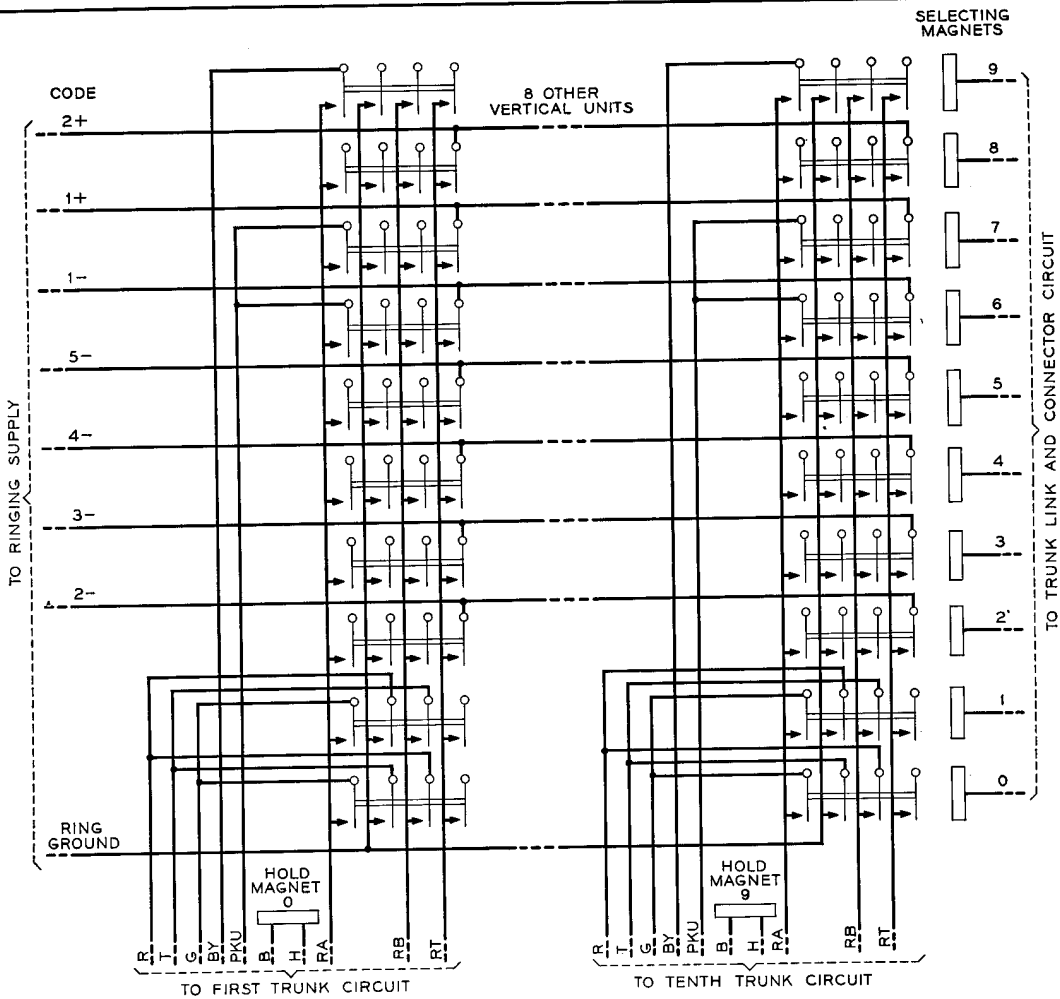


Fig. 3—Simplified schematic of ringing circuit in a No. 5 crossbar office.

the levels from 2 to 8 connects the selected code ringing supply to the RT lead to the trunk. Here it passes through the ringing trip relay and back to the crossbar switch over lead RB. Through the crosspoints of the No. 0 or No. 1 level, the RB lead is connected to either the ring or tip conductor of the subscriber's line, and ground is connected to the other lead of the line. Also through the contacts of the No. 0 or No. 1 crosspoint, ground from the trunk circuit over the G lead is connected to the RA lead, whence it returns to hold the trunk in the ringing condition until ringing is tripped or the call is abandoned.

When a line requires code 2, 3, 4 or 5, ringing is connected to a line only at the start of a complete ringing cycle so as to

avoid a partial code from being sent over the line, which might be misinterpreted by the subscriber. This means that there may be a delay of a few seconds before ringing is started. With code 1 ringing, however, there is no possibility of the code's being misinterpreted since it consists of only one ring, and if the first ring were shorter than the others, no confusion would result. For either 1— or 1+, therefore, the code ringing supply is connected at once without waiting for the end of the ringing cycle. This is brought about by using other contacts of the No. 6 and No. 7 crosspoints, which apply codes 1— and 1+, to connect the ground on the RA lead to the PKU lead. Lead RA is grounded by the closure of the crosspoints on levels 0 or 1, and this ground on the

PKU lead tells the trunk to start ringing without waiting for the end of the cycle.

Level 9 on the crossbar switch is not required for applying ringing, and is therefore employed—in conjunction with No. 0 or No. 1 crosspoints—to indicate busy and overflow conditions. If the line called is found busy, the marker, instead of operating one of the ringing code crosspoints, will operate the No. 9 crosspoint and also the No. 1 crosspoint. Closing the No. 1 crosspoint connects ground from the trunk over lead c to the RA lead, and closing the No. 9 crosspoint connects this RA lead to the BY lead. Ground on the BY lead will operate the BY (busy) relay in the trunk circuit.

If the line had not been busy, but the marker had not been able to find a path to it from the trunk link frame, it would have operated the No. 0 and the No. 9 crosspoints.

Closure of the No. 9 crosspoints operates the BY relay in the trunk as before, but closure of the No. 0 crosspoint has connected ringing ground to the tip lead of the trunk. Under these conditions the TC relay is operated in the trunk as well as the BY, giving an overflow instead of busy signal.

Since the ringing selection switch is wired for all types of lines up to and including eight and ten party, there are no ringing options to be selected in furnishing trunk circuits and associated ringing selection switches, and the engineering and installation is simplified. The only variation in an office is in the types of ringing supply. Systems with eight party lines or four party full selective lines require superimposed positive ringing codes and superimposed negative, but where there are none of these lines, superimposed positive codes are not required.