Equipment arrangements for No. 5 crossbar markers

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Switching Equipment

In the No. 5 crossbar system, a single marker performs the functions of both the originating and terminating markers in the No. 1 crossbar system. In addition, it establishes a connection between the subscriber lines and the registers that give dial tone and record the digits dialed. The equivalent connection was performed by the line link and sender link controllers in the No. 1 system. The No. 5 marker is therefore considerably larger than either of the No. 1 markers.

As with all other No. 5 crossbar equipment, the marker has been arranged on standardized frames of a size that can be conveniently handled in the shop and by the installer. Each frame is completely equipped, wired, and tested in the factory so that the installation effort is reduced to erecting and interconnecting frames and making the necessary tests to assure satisfactory operation. To aid manufacture and job engineering, the marker was designed so that associated circuit functions can be assembled in small standardized units apart from the frames with their common equipment and wiring. These standard units, with whatever optional features are needed, are then arranged on standard frames as required for a particular installation.

In grouping together associated operating features, care was taken first to segregate into small equipment units those functions whose equipment was of a repetitive or multiple nature. A relatively high demand is thus developed for these units, and the number required for each particular marker can be readily furnished initially or added as an office expands. Each of the marker frames is equipped to its capacity with those functional units having the closest association, not only for better operation and maintenance but also for economical wiring and testing in the shop.

One of the markers for the Media office is shown in Figure 1 where the bays are numbered from right to left for convenience of reference. Two frames, each having two bays, are required for each marker. One frame, bays 3 and 4, has the common control functions and line, trunk, and junctor identification and selection functions; the

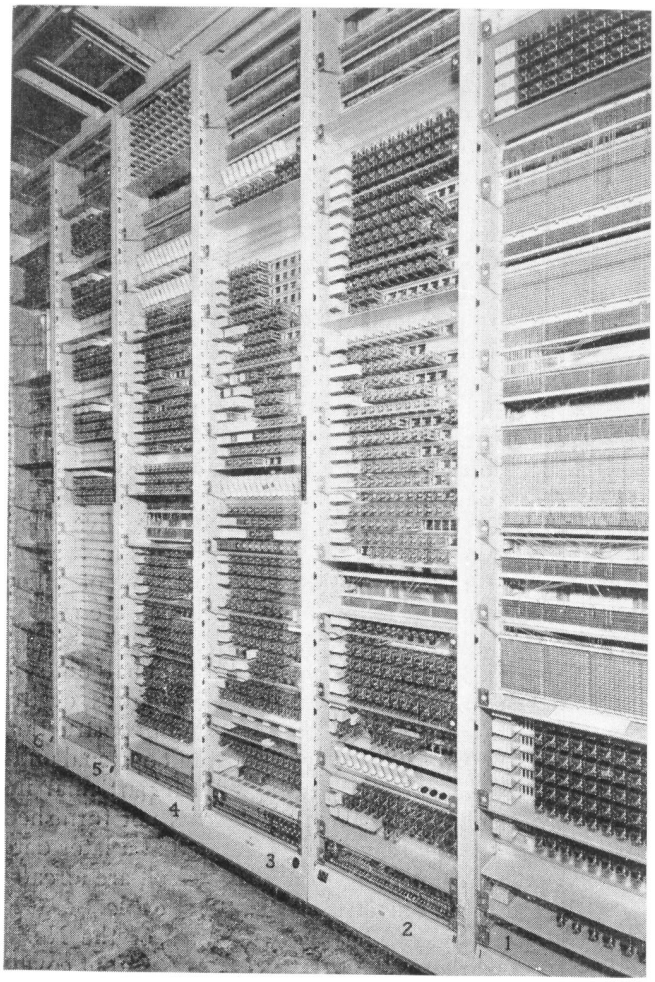

Fig. 1—One of the markers in the Media office.

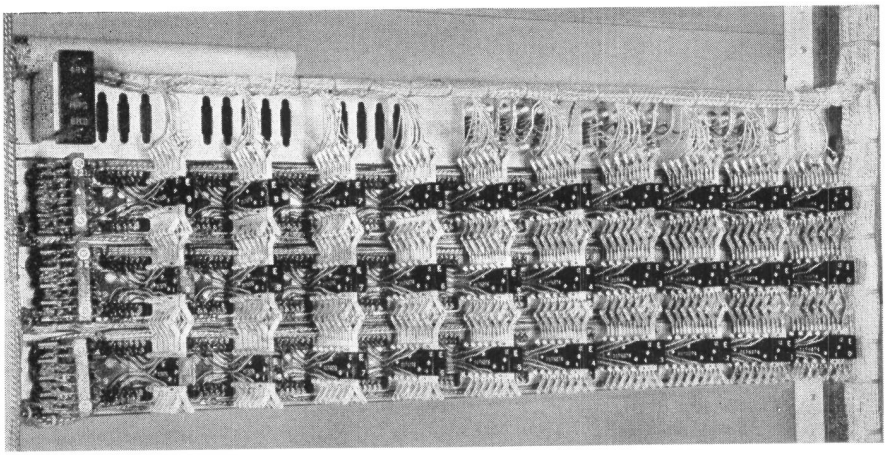

Fig. 2—Trunk test lead connector frame in the Media office.

other frame, bays 1 and 2, has the translator, route relay, and other call completing functions. An additional single bay frame, bay 5, is common to a number of markers and accommodates the relay units which connect the trunk test leads from the trunk link frame to the marker. Space is provided on this bay for 480 relays which may connect 80 or 40 routes from ten trunk link frames to six or twelve markers or 40 routes from twenty trunk link frames to six markers. When an office has more than 80 routes and six markers as an example, more than one bay of this kind is required. In the photograph, relays are provided for only fifty routes and three markers. Another single bay frame, bay 6, provides space for the class of service relay units and cross-connection fields for four markers. A third single bay frame may sometimes be required to provide route relays in addition to the 100 mounted on one of the two bay frames. Each of these five shop wired frames has terminal strips at the top of the frame for the connection of interframe switchboard cables which are run by the installer.

Each of the various functional units is equipped for one or more figures of the marker circuit. The use of unit construction makes it relatively easy to omit optional units which are not required for a particular installation. Any unit which is not furnished initially may easily be added at a later date by connecting to it leads which are already in the universal, frame local cable.

One of the novel features of the No. 5 marker is the use of transparent front covers on all the bays. These are evident in the photograph only by the rectangular lift plates at the bottom corners of each cover. How clearly these covers allow the operation of the relays to be observed is evident in the photograph. When adjustments or addition of equipment are required, the covers of all the bays are readily removed by lifting and tilting out.

Another novelty in the No. 5 marker is the use of 275 and 276 (mercury) relays*—evident near the bottom of bay 2, at the middle and near the top of bay 3, and three-quarters way up on bay 4. These relays must be mounted with their axes not more than thirty degrees from the vertical. To avoid the use of hinged mounting plates, which have been employed previously for apparatus that had to be mounted vertically, a sloping mounting plate was designed that will hold the relays within the required angle of the vertical, and yet permit their ready removal from the vacuum tube sockets into which they plug. These mounting plates accommodate either fifteen or thirty mercury relays—a single row being provided for the former unit and a double row for the latter. A single row shelf is evident near the bottom of bay 2, while a double row shelf is evident at the top of bay 3.

It was desired to have faster operate time than could be obtained with multicontact relays used in the No. 1 crossbar marker, and so lighter and smaller U-type relays are used in the No. 5 marker. In some cases, this means that a greater number of relays will be required, but this is offset by the faster

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action and more uniform mounting arrangements. To obtain particularly fast action time for some operations, the marker employs a large number of relays with 14-ohm windings; each relay requires a high wattage 90-ohm resistor in series with its winding. Instead of being mounted on their associated functional units, these resistors are provided on separate units, having twelve resistors on a plate. A number of these units are mounted together at the top of the frame. Resistors can be assigned at random from this pool to relays located anywhere on the frame, and relays may be changed or added without changing the equipment layout of the unit. In Figure 1, these resistors may be seen at the top of bay 4.

When the number of markers in an office is increased, an additional relay for connecting the trunk test leads for each route must be added to the multiple of the relays for the working markers. Since exceptional precautions must be taken to avoid interrupting the operation of important common control equipment such as markers, a special method of adding these relays was designed. The arrangement is shown in Figure 2. A vertical lead running down the rear of bay 5 connects the relays for the same route in all the markers. If there were only three markers in the office originally, there would be only three rows of these relays, each column of three relays representing the same route in the three markers. The vertical multipling lead is furnished by a newly designed, "Y" shaped terminal strip for each relay of each row. The two ends of this terminal strip slightly overlap the two-inch mounting plate, and in doing so come in contact with the terminals in the row above. A brief application of the soldering iron to these terminals connects them together, and thus completes the multiple connection. To add a unit of relays, it is necessary only to mount the unit with the relays and terminal strips in place, and solder the terminal strips to the ones immediately above, with which they will be in contact.

In the No. 1 crossbar system, decoding generally was based on two- and three-digit office codes. The No. 5 crossbar system, however, provides for one-, two-, or three-digit codes or a combination of these. To simplify the assignment and use of these codes, a cross-connecting field is provided in the No. 5 marker, and changes in the type of code require merely a change in the jumpers.

The local circuits for each marker are fused on three panels at the bottom of the two double-bay frames. However, a common alarm is provided, and the one fuse alarm lamp is at the base of one bay so as to be centrally located with respect to the four bays. A fuse guard lamp, to indicate that a fuse has been removed and the marker made busy, is placed next to the alarm lamp. These lamps may be seen in the small black rectangular plate near the left at the bottom of bay 2. An alarm release key is grouped with the miscellaneous circuit jacks and lamps in the vertical jack panel about half way up the column between bays 2 and 3. Test and telephone jacks are multipled to appear in every other upright for maintenance convenience.

Each marker frame—either one bay or two bay—is completely equipped, wired, and tested in the factory so that the installation effort is reduced to erecting and interconnecting frames and making the necessary tests to assure satisfactory operation. The two double-bay frames of each marker are placed adjacent to one another with the single bays common to a group of markers generally located central to the frames they serve. To assure greater security and continuity of service in cases of wiring or power failure, marker frames are generally associated with battery feeders and multiple cables in two groups, one group containing the even numbered markers and the other the odd numbered markers. To permit the cables of these two groups to be run in separate cable racks, and to obtain more direct cable runs, the markers in an office are located in two lines facing each other, with even markers in one line and odd markers in the other.