

Design patterns for No. 5 crossbar

No. 5 crossbar has already a broader potential field of application than any previous dial system, and it is better adapted than any to accept new services and features as they are developed in the future. The novel method of handling calls that has been devised and many of the new circuit features have already been briefly described previously.* Not less novel are some of the general equipment patterns which have been introduced to enhance the versatility of the system in providing services and at the same time insuring economy in production and maintenance.

Because No. 5 provides so many services, the deviations from office to office will be more pronounced than ever before. It is unlikely that two central offices will be identical in numbers of switch frames of the various types, or in the equipment provided

on them. Some of the things which will combine to make each office different are: the numbers of subscribers, the kinds of service they require, the number of times they call, the durations and destinations of their calls, the number of central offices in the same building and in the community, and the nature, variety, and number of interconnecting circuits required to provide for the flow of traffic between the office and all other connecting offices.

All of this implies custom building, and custom building is expensive. It was unusually urgent to keep it within bounds in No. 5 by devising standardized equipment patterns which would not only provide innumerable necessary combinations of services initially, but also enable facilities to be added and traffic distribution to be rearranged to care for growth, change, and the introduction of new features. The primary objective in equipment design for the No. 5

† See page 5.

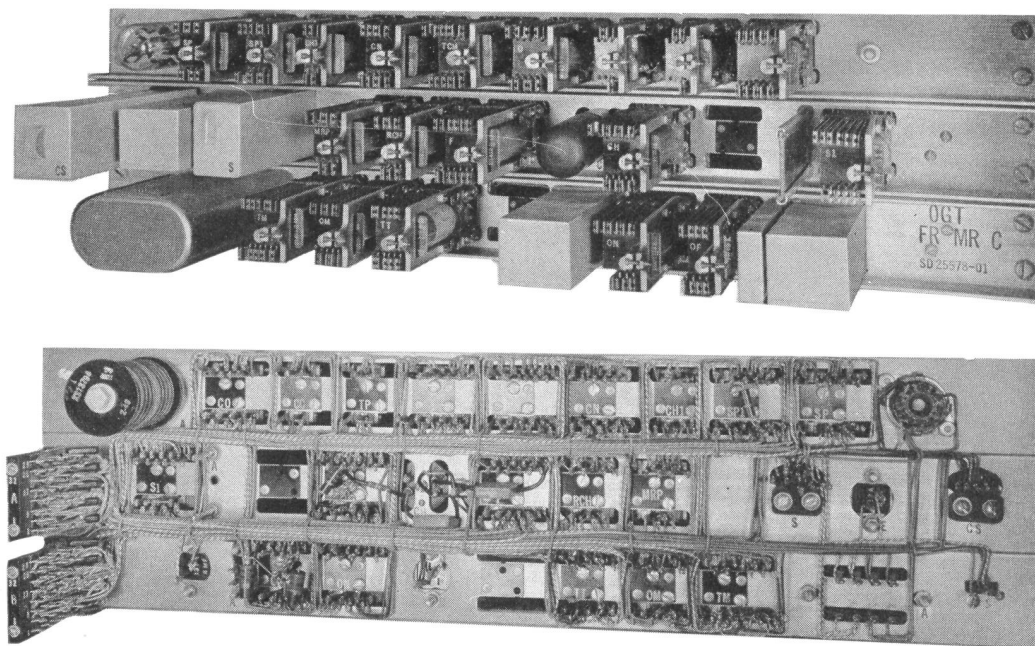


Fig. 1—Front and rear views of a typical functioned unit.

system was to exploit to the fullest extent the great flexibility inherent in the switching plan and, at the same time, to standardize all arrangements in the fewest patterns, with the fewest parts and assemblies for most economical manufacture, engineering, installation, and maintenance. In spite of the fact that flexibility and standardization are frequently incompatible, they have been combined to an unusual degree in No. 5.

Although no two offices are expected to be exactly alike, there are features within each that will be the same. Some are required in varying numbers in all offices, others are optional and specified more or less frequently. To meet this situation, a standard package was designed for each basic combination of features and these packages are used as the building blocks for all frame equipments. These standard basic units, which are generally not larger than one or two square feet in area, are re-used wherever practicable to concentrate demands on the smallest number of items.

These small subassemblies are called functional units. Frequently, an auxiliary service not required in every office employs one or two relays which cannot be economically packaged apart from a related functional unit. Each such option is coded separately for engineering and administration reasons. It may be furnished always or only as required, depending on which arrangement is more economical. All functional units can be bench assembled, wired, and tested, and straight line assembly methods can be employed where justified. Interconnecting wires, pre-cut to length and preskinned, are run along the surface of the mounting plates which support the components and they are connected as run. A new wire with plastic insulation was developed for this purpose which reduces wiring congestion, fire hazard, and contact troubles from lint. The elimination of the wire cutting operation at the bench avoids wire clippings in the units. A typical functional unit of the type discussed is shown in Figure 1.

Frame equipment arrangements were similarly standardized to accommodate all needed groupings of functional units completely interconnected and tested in the factory. To make each frame as self sufficient as possible, it is equipped not only with its

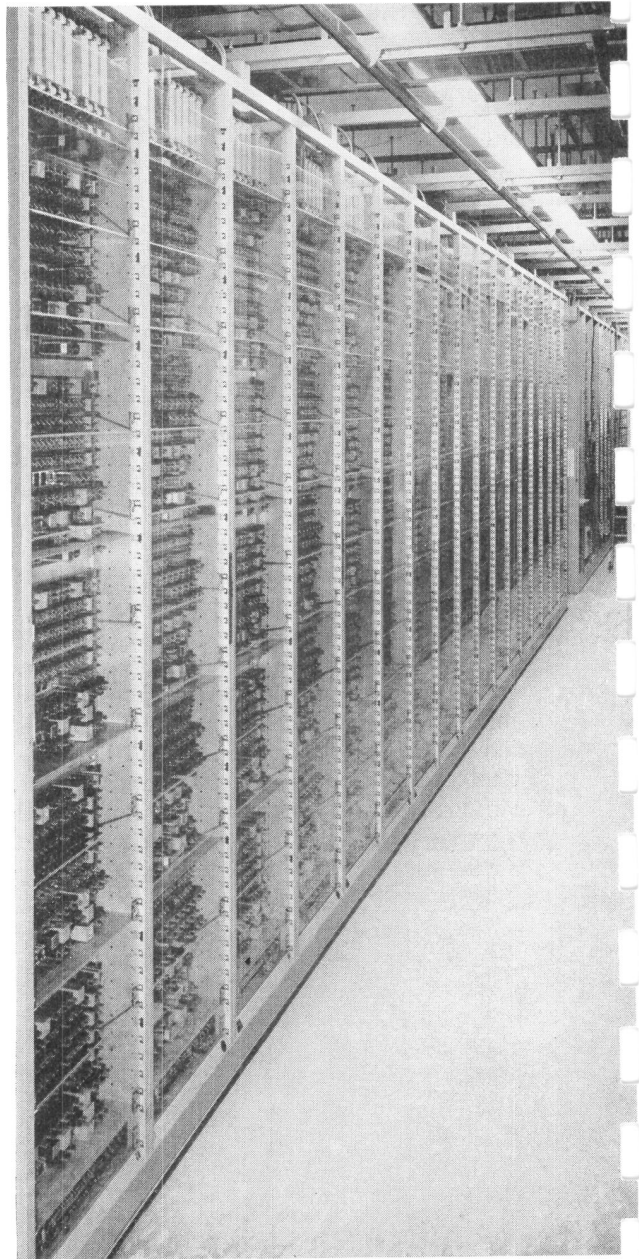


Fig. 2—Section of typical No. 5 office showing frames, covers, cabling, and lighting.

particular complement of functional units, but with fuse panels, test equipment, appliance outlets, talking battery filters, terminal strips, and all other items that serve it. Every frame arrangement permits the frame and its common equipment and wiring to be manufactured apart from its functional units. At a later stage in the assembly, units and

frames can be brought together in a flexible manner to provide all needed services. Many combinations can thus be assembled from a few standard frames and a relatively few functional units. Each office can be engineered and manufactured with just the features it needs with as little custom building as practicable.

Patterns were developed for frameworks, fuse panels, testing facilities, and all other frame equipment and wiring to enable a few parts and assemblies of each type to be brought together in different ways to constitute each standard frame, and to permit it to serve any combination of functional units to be mounted on it. Parts, assemblies, and patterns were reduced in number by organizing the frame equipments of all types into a few families with strong family resemblances.

Where at all practicable, one frame unit combination was standardized for use on all jobs. The line link, trunk link, and number group frames are in this category. For other frames, except one type which mounts assortments of trunk and miscellaneous units, ways were found to standardize the frame equipment and wiring apart from its units, and to provide full flexibility to care for its various complements of units without too great reaction on production. Even in the one exception where the frame equipment and wiring as well as the unit complements vary widely from job to job, a pattern was developed which reduced the custom building and made it relatively easy to administer. As a result, a large proportion of No. 5 frames are fully equipped, wired, and tested in the shop, and field installation is reduced to setting up the frames on the office floor, interconnecting them with interframe cables and testing the components and the system as a whole before turning it over to the Telephone Company. A section of a typical No. 5 office is shown in Figure 2.

Another novelty of the new office is the

frame construction. Heretofore, most switch frames have used angle, channel, or I-beam steel sections. In the No. 5 system, the up-rights are of sheet metal formed into a rectangular box section, which is much lighter and stiffer than former types; formed sheet metal sections are also used for the other structural members. Front and rear covers of a new design are incorporated in the frame in a way that enables frame areas to be covered to any extent desired in one consistent manner. This not only avoids a variety of strip covers and sender type casings, but it frees from cover restrictions the arrangement of apparatus on units and of units on frames.

Cable rack and cabling have been simplified. Much of the effort in planning and arranging switchboard cable on the job has been avoided by adopting a basket type cable rack in which cable is laid without being confined by clips or sewing. Instead of one for each line of frames, one rack over each wiring aisle serves two lines of frames. Each frame has power feeders terminated in solderless connectors which the installer can quickly patch to supply grids in the office for battery and 110 volt service. Appliance outlets are equipped in each frame when it is assembled, and all in one line of frames are patched together and to a ceiling receptacle by flexible cable. The installer will usually have no conduit to install for these services.

Fluorescent lamps hung from the ceiling will provide improved illumination at two levels, a high level of illumination for maintenance at an individual frame and a lower level for general office lighting. This can be installed by the building contractor before the frames are ready to be put in place, and thus the Western Electric Company installer is freed of the responsibility for mounting and connecting of lights on all frames in an office except the main distributing frames.