



The 558A PBX console accommodates 10 central office trunk lines and 40 telephones. It is easier to operate and more compact than the 555 cord-and-jack switchboard it replaces in the background. The inexpensive PBX fills a gap left by larger systems and should be attractive to small business customers.

PBX switchboards are giving way to small desk-top consoles and remote switching cabinets. One member of the new family, the 558A PBX, replaces the 25 year old 555 cordboard. Recent technology helps make it economical, practical, and attractive.

A Small PBX For the Small Business

J. J. Marek

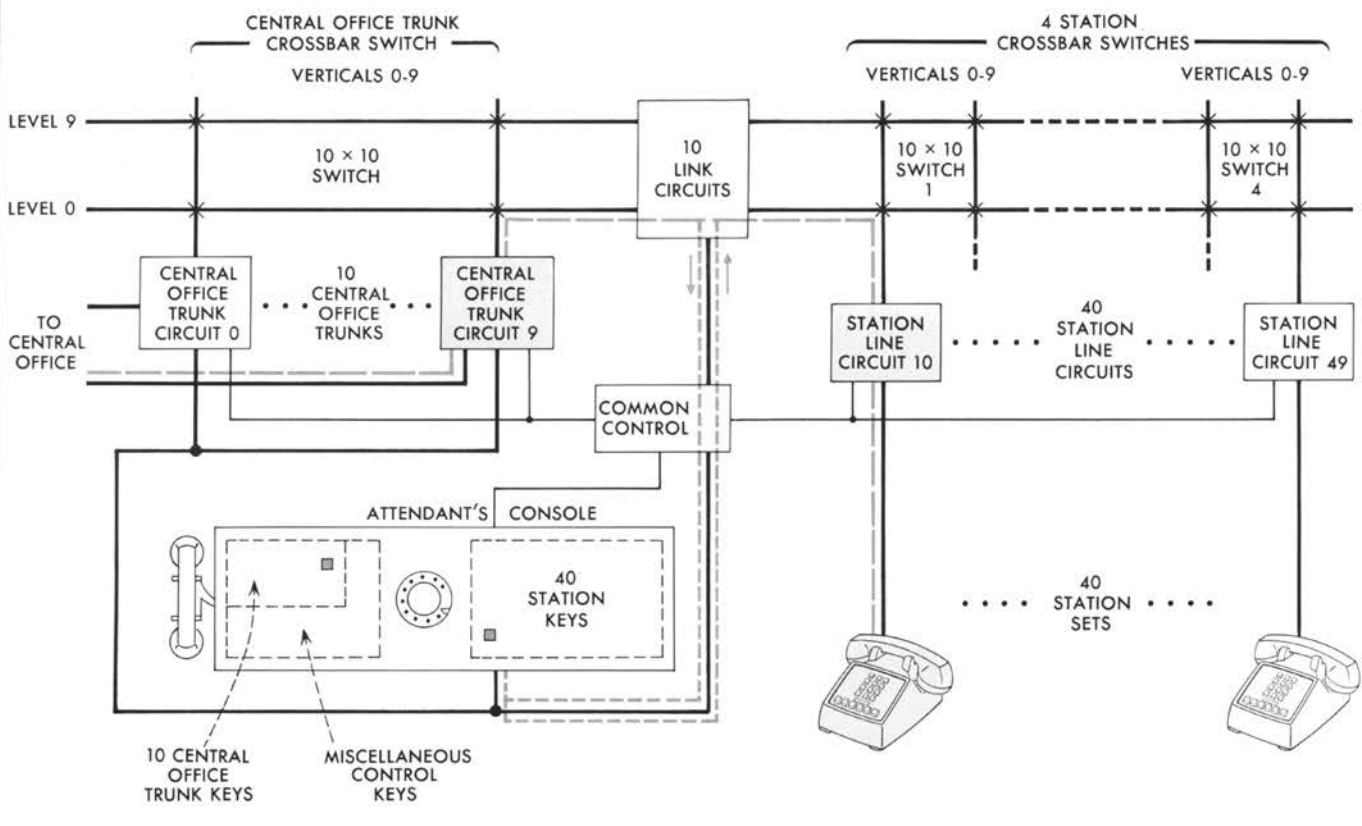
IN RECENT YEARS a new style of smaller desk-top console has replaced the cord-jack and toggle-switch units of the nineteen thirties and forties. The new style, with the associated cabinets of switching circuits, includes a variety of private branch exchange (PBX) consoles designed to make use of some of the more recent developments in telephone technology. One of these, the 558A PBX, is an inexpensive manual switching system which serves a maximum of 40 telephone extensions (stations) and 10 central office trunks.

In the past, the market for a small manual PBX was served by the 555 cord-and-jack switchboard. This system was developed for commercial use just after World War II. However, the 555 PBX was discontinued in 1966 when the more modern 608 PBX, a pushbutton switchboard, was designated to replace several PBX switchboards. But the 608 PBX is a switchboard with capacity for many more extension lines than most small

customers use. Equipping this switchboard with only a few lines was inefficient and expensive for both the operating companies and their customers.

Because there is a relatively large and varied market for PBX service in the New York City area, the New York Telephone Company designed a new system to fill the void left by the discontinued 555 switchboard. Market evaluation of the system concept was favorable and in January, 1969, Bell Laboratories began standardizing the design to permit its use throughout the Bell System. The first 558A PBX was produced at the new Western Electric plant in Denver, in October of the same year.

The 558A manual PBX is a break from the traditional switchboard type design in both the way it is packaged and how the attendant operates it. Both these deviations from the norm have definite advantages for the customer. The 555 switchboard contains the cord-and-jack panel and the



This simplified schematic shows the talking paths (bold lines) and the control paths (thin lines) of the 558A PBX system. The broken line in color traces a central office-to-station call. When a call comes into the system on trunk 9, for example, a light under the corresponding trunk key (on the attendant's console) flashes, and an audible tone is generated. The attendant depresses that trunk key and answers the call. To switch

the call to a telephone station in the PBX, e.g., station 10, the attendant has only to depress that station key. The telephone rings automatically. The attendant then monitors the incoming call until someone answers the telephone. (Monitoring is necessary only on incoming central office trunk calls.) After that, the attendant has no further responsibility because the call is automatically disconnected when the called party hangs up.

associated switching equipment all in one large unit. The entire system, therefore, must be installed right at the operator's work area. The switchboard takes up about the same area as a desk, without offering the clear working surface or drawer space of a desk. This is, of course, something of a waste for some customers, inasmuch as usable office space is valuable.

The 558A PBX offers a more versatile packaging arrangement in two units. The small, attractive desk-top console controls the switching equipment which is in a separate cabinet. The system is designed so that the cabinet need not be right next to the console. Instead, it may be installed in any convenient out-of-the-way place.

The console is much simpler to operate and is more efficient than a switchboard. For example, instead of answering and extending a call with a pair of switchboard cords, the console attendant handles the call by depressing pushbutton keys.

This allows for faster, almost "second nature," response. It also gives the attendant more time and desk space to serve as receptionist or information clerk.

The 558A PBX is an electromechanical unit with wire spring relay logic and a crossbar switching network. The switching network consists of five 10 by 10 (10 "horizontal" and 10 "vertical") crossbar switches. Four of the crossbar switches are assigned to the 40 telephone stations, and one is assigned to the 10 central office trunks. The horizontal levels of the four crossbar switches assigned to the telephone stations are wired together to act as a single crossbar switch with 10 horizontal levels and 40 vertical positions. Each of the 10 horizontal levels connects to one of the "link" circuits that serve as connecting points (in the same way a cord circuit does on a switchboard). The other side of a link circuit connects to a horizontal level of the trunk

switch. All the calls in the system are connected through these link circuits.

The switching equipment for the 558A PBX is housed in a single cabinet similar to those used in other crossbar PBX designs. The cabinet contains three small racks mounted vertically on ball-bearing telescoping slides. These pull forward out of the cabinet, separately, to simplify maintenance from the front. The side and front covers of the cabinet are arranged for quick removal to make the three sliding equipment racks completely accessible. Optional sound-absorbing material is available for lining the cabinet to minimize any objectionable operating noises.

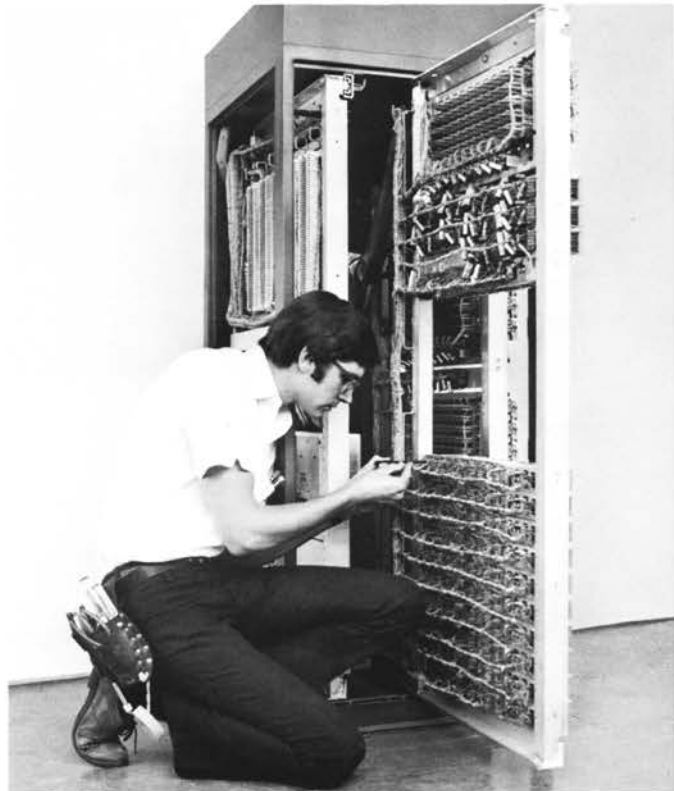
The 558A PBX serves three basic types of PBX calls: station-to-station, station-to-central office, and central office-to-station. Of course, as in other manual-service systems, all calls are handled by the console attendant. Lamp and audible signals at the console help in processing the calls.

A call is originated in the system when someone lifts a handset at one of the PBX stations. The console lamp for that station, flashing once a second, and the audible tone will alert the attendant to the request for service. The attendant responds by depressing the key which completes a talking connection between the attendant and the person who originated the call. When the calling party wants to talk with someone at another telephone within the system, the attendant depresses the key for that extension. Ringing begins automatically, and the attendant is free to serve another call. The two other types of calls (station-to-central office and central office-to-station) are handled in much the same manner. Ordinarily, the attendant dials outside calls. However, if someone at a station wants to place a trunk call himself, he has only to ask the PBX attendant for an "outside line" so he can dial the number.

To make this system economically attractive to a given market, the 558A PBX offers only the features basic to the communications needs of a small business. These include:

- TOUCH-TONE® and/or rotary dialing
- Automatic disconnect,
- Central office trunk answer when all paths are busy,
- Busy tone to a station when all paths are busy,
- Flexible night service,
- Emergency central office connections, and
- Test console facility.

Because the 558A PBX is compatible with either Touch-Tone or rotary dialing, the customer can replace his 555 switchboard with a Touch-



The switching cabinet of the 558A PBX has sliding equipment racks for easy access during installation and maintenance, as demonstrated here by installer Paul Jaeger of the New York Telephone Company. Even though the cabinet may be installed in a remote area of the customer's premises, plug-in connectors enable Jaeger to bring the console to the circuits for testing.

Tone dial console, if he wishes, and retain his rotary dial extension telephones.

The automatic disconnect feature differs from anything offered on a cord switchboard and is one of the more attractive innovations of this PBX. The operator at the 555 switchboard must supervise all the calls in the system from origin to completion. When a call is finished, a lamp on the switchboard indicates that the two cords for that connection must be removed from their jacks. This requires the operator's constant attention to the switchboard and is, therefore, rather time-consuming when there are many calls going through the system. When a call is terminated in the 558A PBX, on the other hand, the talking connection is automatically released. Supervisory circuits in the system monitor the call and release the connection when one party hangs up.

The third feature—central office trunk answer when all paths are busy—gives the attendant of the 558A PBX the ability to answer an incoming trunk call even when all the two-way paths in the system are busy. Any PBX or cord switchboard can handle only a certain number of two-way conversations at a time. When the system is occupied with this maximum number of calls, it is said to have "all paths busy." For the 555 cord-and-jack switchboard, this means that all the pairs of cords are in use and additional calls cannot be answered. The 558A PBX can handle a maximum of ten two-way calls at one time. When all these paths are busy, a lamp will light at the console to indicate that the system is full. Unlike the cord switchboard, however, the 558A system is designed so the attendant can still answer calls that come in on any remaining idle trunks from the central office. If the calling party wishes to wait until a path becomes available, the attendant can put the call on HOLD. During a period of *all paths busy*, anyone who picks up another telephone in the system will hear a "busy" tone that indicates the attendant cannot answer his signal.

Flexible night service is a standard feature offered by most PBX systems. Many business customers that use PBX service like to be able to make and receive calls through the central office trunks even during the night, or weekend hours, when an attendant is not on duty. To this end, any ten telephone stations in the 558A PBX can be temporarily connected to central office trunks for continued service during off-duty hours. Once a connection has been established, it remains in effect until the attendant releases the night service key (located on the console) and returns the system to normal service.

The emergency central office trunk connections of the 558A PBX are designed to maintain telephone contact with the central office during a failure of commercial power. Five telephone stations in the 558A system are wired to connect automatically with five trunks when the power fails. These emergency lines are powered by battery current from the telephone central office. If night conditions were in effect during this power failure, a warning light will illuminate when the commercial power returns. This indicates to the attendant that regular night service has been broken and that the emergency connections will remain in effect until they are reset by releasing the night service key. When commercial power fails during regular daytime service, any calls in progress are lost and the emergency central office trunk connections become functional. If power returns during the day, the emergency lines are disconnected automatically and the system is ready for attended service again.

The last item on the list, the test console facility, is one of the newer features incorporated in this and most other modern PBX systems. Plug-in connectors are provided in the switching cabinet which make it possible for the console to be brought to the cabinet for testing. Without this feature, placing the cabinet remote from the console might require three men for installation or testing. Because these PBX consoles can be plugged in at the cabinet, however, testing the system can be a two-man operation.

In addition to these features, two more are being developed for the 558A PBX. The first, called tie-trunk operation, provides a pair of tie trunks that will permit people on the 558A system to make direct calls to people on other PBX systems (i.e., without going through the central office). The tie-trunk feature will be a plug-in option on later models of the switching cabinet. This means the customer who orders that model of the 558A system can request that tie trunks be installed at a later date. However, with the addition of each tie trunk the PBX system will lose the use of one telephone station.

The second feature being developed is attendant paging. With this feature, a customer-provided paging network will be accessible only through the 558A console and its handset.

The modern 558A PBX should fill a need for manual systems in smaller businesses where switchboards have long been used. The ease of installation and maintenance, the adaptability of its size and packaging, and the basic features that are offered should make the 558A PBX useful to telephone companies and their customers.