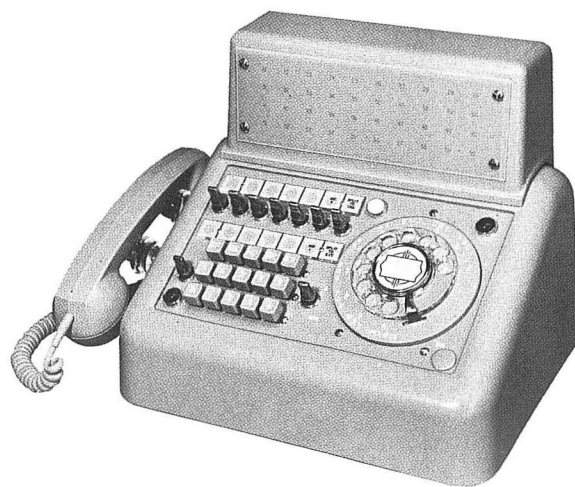


# LEICH TYPE 40 AND TYPE 80 P-A-B-X



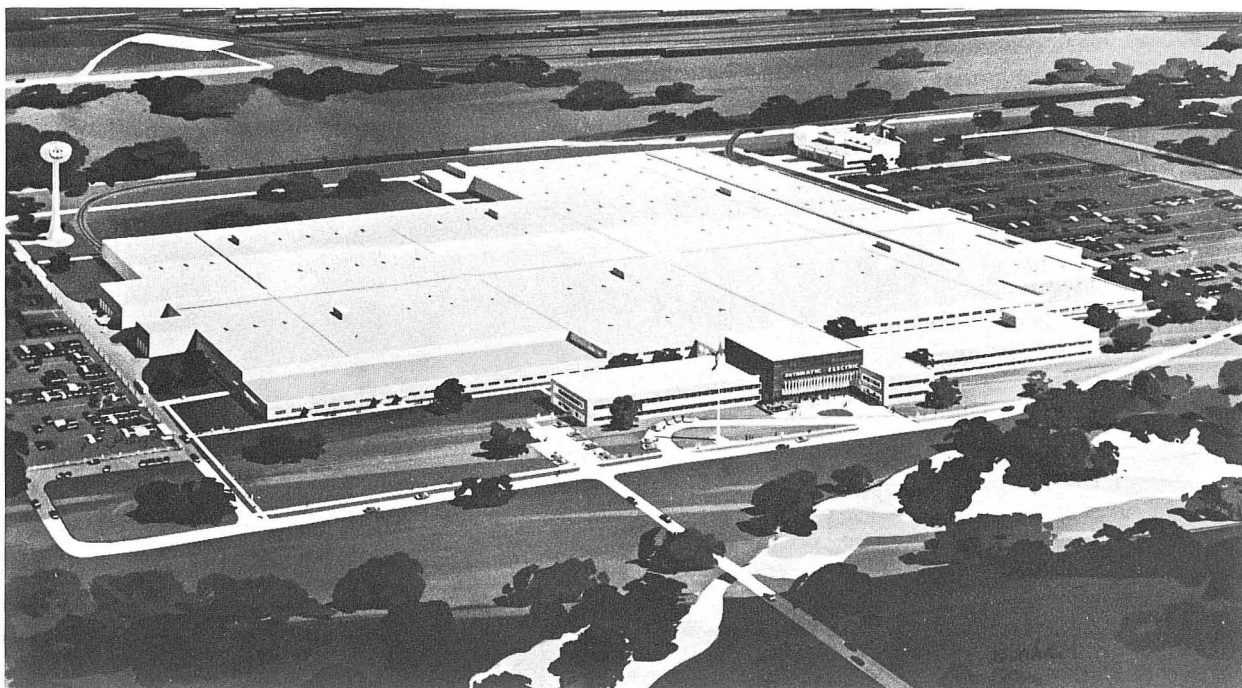
Technical Bulletin 500-407

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# LEICH TYPE 40 AND TYPE 80 P-A-B-X

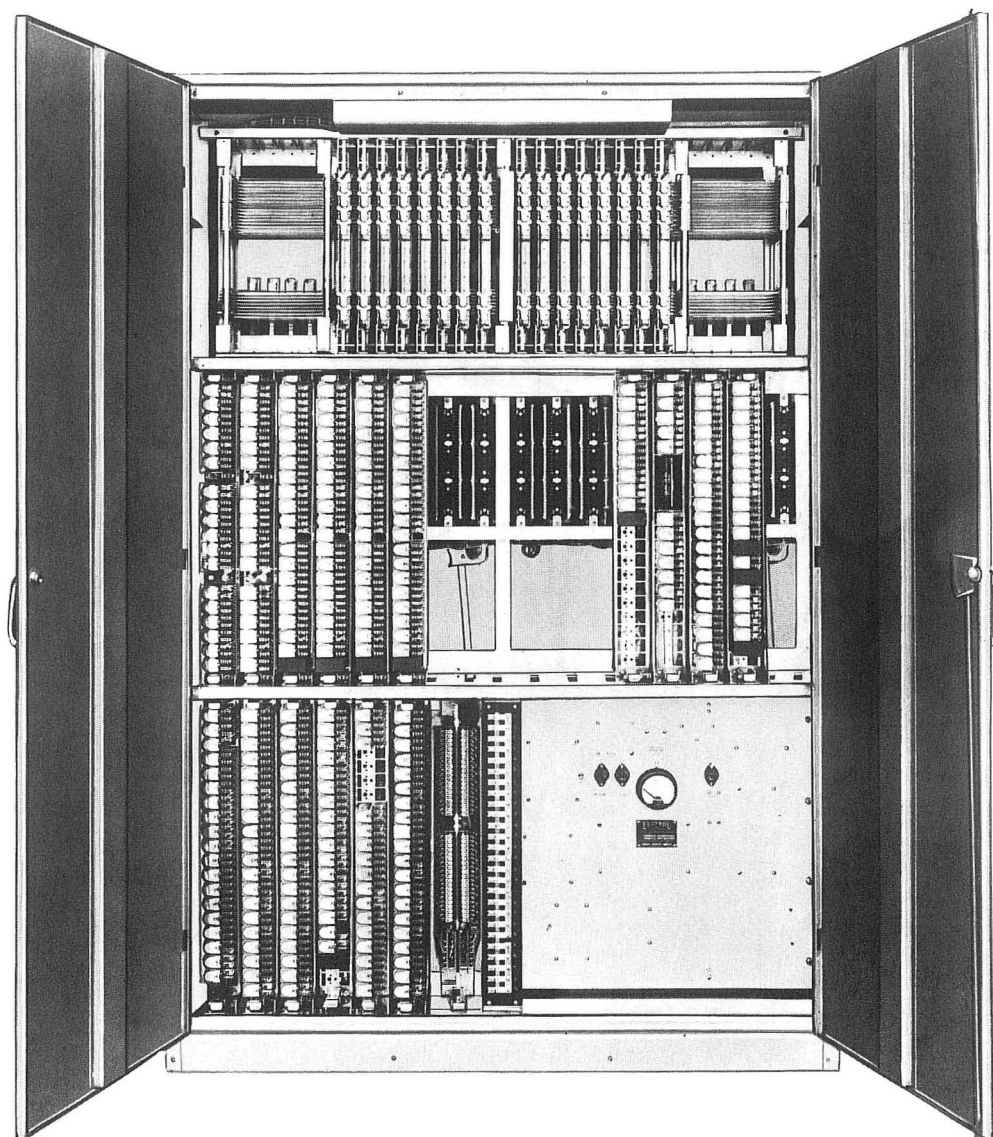


Figure 1. The Type 40 P-A-B-X.

## 1. INTRODUCTION

This Technical Bulletin covers both the Leich Type 40 and Type 80 private automatic branch exchanges, (P-A-B-X). The features and services provided by these two P-A-B-X's and the method of operation are very similar. The principal difference is the capacity of each P-A-B-X and the amount of equipment required to meet the capacity.

The Type 40 P-A-B-X (figure 1) is an all relay switching, common control, and common-battery type P-A-B-X capable of serving 40 local lines (a maximum of 39 local lines when

equipped with the attendant's turret). The Type 40 P-A-B-X operates at a voltage range of 44 to 56 volts with a common-battery central office, and can also be adapted to work into a magneto office. The Type 40 P-A-B-X can be equipped with a total of 6 local links, 10 central office trunks (city trunks), 2 attendant's information trunks, and an attendant's P-A-X line.

The Type 40 P-A-B-X uses a standard Type 80 or 90 telephone as station apparatus, except in the case of stations arranged for power failure transfer service where a Type 80 or 90 telephone equipped with a grounding push-button may be required. The Type 40 P-A-B-X



uses two-digit local dialing, with single-digit access to certain features such as city trunks or attendant's information trunks. The Type 40 P-A-B-X can be operated with or without the attendant's turret.

The Type 80 P-A-B-X (figure 2) is an all relay switching, common control, and common-battery type P-A-B-X capable of serving a maximum of 80 local lines, (a maximum of 79 local lines when equipped with the attendant's turret). The Type 80 P-A-B-X operates at a voltage range of 44 to 56 volts with a common-battery central office and can also be adapted to work into a magneto office. The Type 80 P-A-B-X can be equipped with 9 local links, 18 city trunks (with optional equipment for 3 additional links or 2 additional city trunks), 4 attendant's information trunks, and an attendant's P-A-X line.

The Type 80 P-A-B-X uses standard Type 80 or 90 telephones as station apparatus with the exception of stations arranged for power failure transfer service where a Type 80 or 90 telephone equipped with grounding push-button may be required. The Type 80 P-A-B-X uses three digits for local dialing with single-digit access to certain features. The Type 80 P-A-B-X can be operated with or without the attendant's turret.

The Type 40 and the Type 80 P-A-B-X have the same specified operating limits. The city trunk loop limit is either the central-office loop limit or 1500 ohms, whichever is less. The specified line loop limit is 1000 ohms, excluding the station instrument. At stations assigned to power failure transfer service, or night answer service, the sum of the central-office trunk loop and the loop of the P-A-B-X station assigned to the trunk must not exceed the central-office loop limit.

## 2. STANDARD FEATURES AND OPERATING SERVICES

The following paragraphs outline the standard features and operating services of the Type 40 and 80 P-A-B-X's.

### 2.1 Arranging Trunk Groups

- a. The trunks of the Type 40 P-A-B-X can be split into two groups. The local stations can then be arranged to fall into one of the two following classifications:

Restricted - local station is restricted from accessing trunk groups.

Non Restricted - local station can access all trunk groups.

- b. The trunks of the Type 80 P-A-B-X can be split into three groups. Local stations can then be arranged to fall into one of the three following classifications:

Restricted - local station is restricted from accessing all three trunk groups.

Non Restricted - local station can access all three trunk groups.

Partially Restricted - local station can access 1 or 2 of the three trunk groups.

### 2.2 Trunk Transfer

A local station can transfer a trunk call to a second local station by dialing the digit "1", to place the trunk call on "hold", and then dialing the digits of the desired local station. When the original local station disconnects, the trunk call is automatically transferred to the second local station.

### 2.3 Consultation Service

If a local station is engaged on a trunk call, dialing the digit "1", places the trunk call on "hold". The original local station can then dial a second local station and converse without the party on the city trunk being able to hear the conversation. To return to the trunk call, after the called station hangs up, the original station again dials "1".

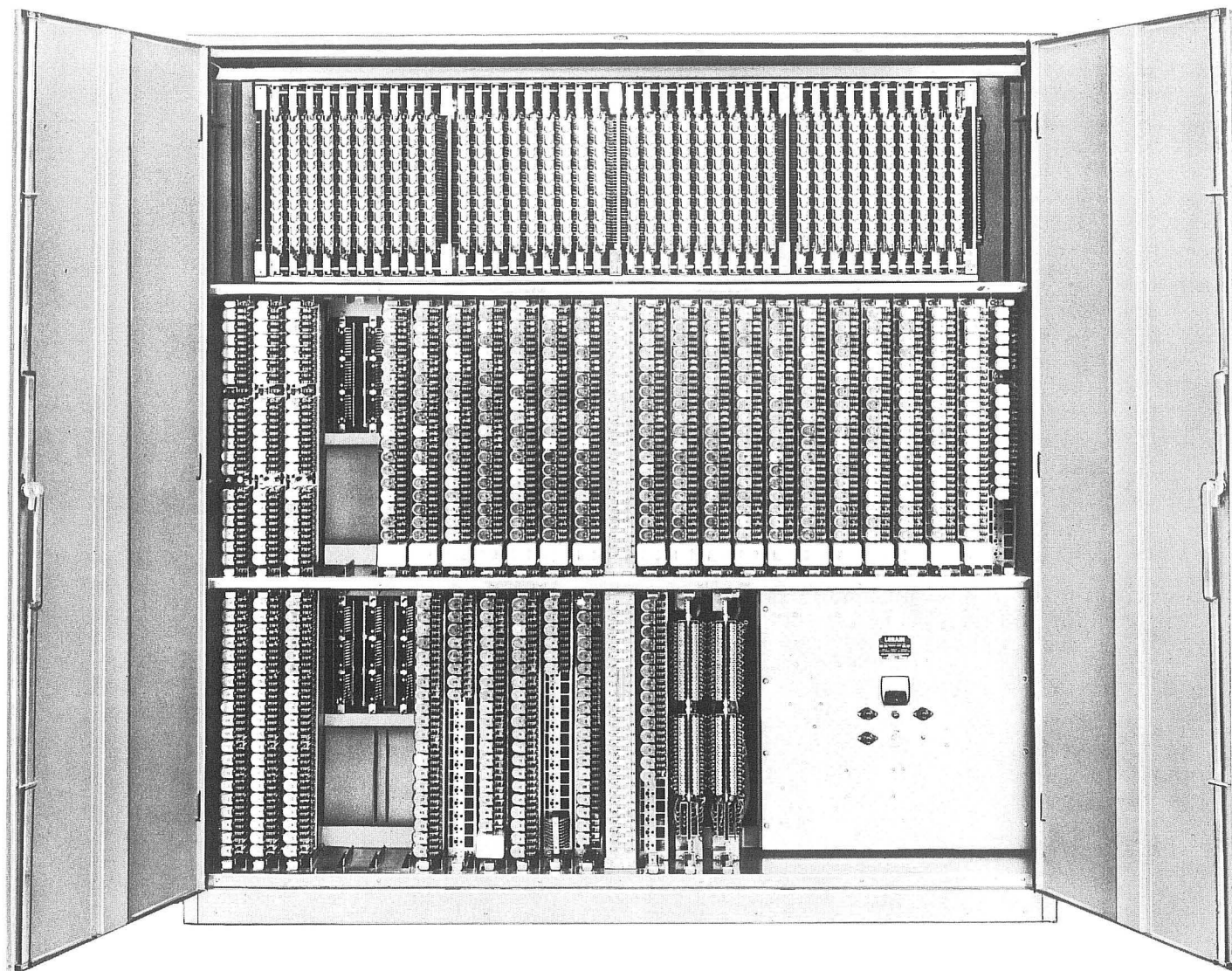
### 2.4 Two-Station, One-Trunk Conference Service

A two-local station, one-trunk conference service can be had by connecting a special "C" wire at the city trunk. When a local station desires to bring a second local station into a conference with a city trunk, he dials the digit 1, then the digits of the desired local station. The second station is then informed not to hang up, the first station again dials "1" to set up the conference.

### 2.5 Power Failure Transfer

A number of local stations corresponding to the number of city trunks can be arranged to transfer automatically to preassigned city trunks should a commercial power failure occur. Stations assigned to power failure service must be equipped with a grounding push-button when the city trunks are arranged for outgoing loop dialing with ground seizure at the distant end. To initiate a call during a power failure, the grounding push-button at the local station must be depressed before the desired party's number can be dialed. Incoming calls during a power failure are routed directly and automatically from the city trunk to its corresponding preassigned local station.





*Figure 2. The Type 80 P-A-B-X.*

## 2.6 Universal Night Answer

When the night key (N) on the attendant's turret is operated, incoming trunk calls will cause a separate night signal or buzzer on the turret to sound. The call may be answered from any local station by dialing the digit assigned to night answer, usually the digit 8. If necessary the call can then be transferred to another local station.

## 2.7 Predetermined Night Answering

Certain city trunks can be connected directly to preassigned local stations when the night key on the attendant's turret is operated. In this case the call cannot be transferred to another local station. Outgoing calls are originated from these stations as covered in paragraph 2.5.

## 2.8 Attendant's Busy Override

An attendant, attempting to reach a local station upon receiving a busy indication, can,

by operating the break-in key (BK), cut in on the busy line and inform the desired party of an important incoming call.

## 3. OPTIONAL SERVICES

The following paragraphs discuss the optional equipment that can be incorporated into the Type 40 or 80 P-A-B-X. Consideration must be given to the equipment mounting facilities of either P-A-B-X before adding any optional equipment. Section 4 covers the various combinations of equipment possible with the Type 40 or Type 80 P-A-B-X.

### 3.1 Code Call Circuit

The code call circuit provides 36 signal codes which can control audible signals. These signals are used for notifying parties on the premises, but out of hearing of their regular station instrument, that a call is waiting for them.



To sound a particular party's code signal, any local station or the attendant may dial the digit assigned to the code call circuit (usually "6"), then the digits of the desired code signal are dialed. The longest signal code to be sounded is 6, as the 36 codes comprise all combinations of the digits 1 to 6. To answer, the signaled party dials 31 (Type 40 P-A-B-X) or 231 (Type 80 P-A-B-X) from any station; lines 31 and 231 are reserved for code call answer.

A code call supervisory lamp which will flash at 60 ipm when the signaled party answers, is mounted on the attendant's turret control panel. This lamp flashes when the attendant initiates the code call signal using the attendant out dial trunk and is required to answer a city trunk call before the code call is answered. When a local station uses this circuit, the lamp will not flash.

### 3.2 "Meet-Me" Conference Circuit

This circuit provides a "Meet-me" type conference for a city trunk and three local stations, or four local stations. The attendant or a local station can setup a "meet-me" type conference involving a city trunk. If a local station is setting up the conference which includes a city trunk, he dials the digit assigned to meet-me conference service and then replaces the handset. The city trunk is automatically transferred to the conference circuit. The local station must then notify the other parties who are to take part in the conference to dial the number assigned to the conference circuit. Setting up a "meet-me" type conference by the attendant will be discussed in section 8.

### 3.3 City Trunk Storage

This circuit allows local stations to store up to a maximum of three incoming calls when the attendant's turret is set up for universal night answering service or when an attendant's turret is not provided. When an incoming trunk call is answered by a local station, and an attempt is made to transfer the call to another local station the digit 1 is dialed to place the trunk call on "hold", while the desired party's number is dialed. If the called station is busy, the calling station depresses the hookswitch and notifies the city trunk party that his party is busy. If the calling party desires to wait, the local station dials the digit 1 and then the digit assigned to city trunk storage. This procedure can be repeated to store a maximum of three calls. To remove calls from storage, the digit or digits assigned to city trunk storage release must be dialed. Calls must be taken out of storage in the same order they are placed in storage.

This feature can prove extremely useful; for example a night watchman who cannot remain

at one assigned station, but must be free to move about to perform various duties. With this feature he can answer, transfer, hold, and place calls in storage from any local station.

### 3.4 Executive Override Circuit

This circuit allows an assigned local station to override a busy condition either automatically or by dialing a suffix digit. An option can be provided to supply a tick tone to the busy line so the parties will be aware of the override condition.

### 3.5 Dictation Control Link

This circuit permits the connection of local stations to centrally located dictation equipment. A dictation control link must be supplied for each dictation machine provided.

### 3.6 Public Address Cut-In

Announcements can be made over a public address system from any local station by dialing the access number and making the announcement.

### 3.7 Paging Telephone

A paging telephone is connected through a speaker in a central location, a microphone is also located in the same area. This equipment allows a worker to carry on his normal work, and maintain a telephone conversation by listening to the speaker and talking towards the microphone.

### 3.8 Toll Diversion Adapter

This circuit adapts an associated city trunk for toll diversion and toll restriction service. A local (nonrestricted) station attempting to place a toll call will be diverted back to the attendant. The toll diversion adapter is inserted between the trunk circuit and the termination of the trunk leads to the central office.

### 3.9 Tie or FX Trunks

Tie trunks to a distant P-A-B-X or P-B-X can be provided. Consultation and conference features can be provided on tie trunks.

FX (foreign exchange) trunks can be furnished to a central office, other than the central office serving the P-A-B-X.

### 3.10 Rotary Trunk Selection

This circuit provides a maximum of 2 groups of 3 local lines each, 1 group of 5 local lines and 1 group of 6 local lines or combinations of



these as required and is used to automatically hunt for an idle line within the group. The three stations do not have to be numbered consecutively, however, the second digit of the first pilot number of both groups must be the same. For example, group one may be assigned to hunt over lines 41, 56, and 67; and group two may hunt over lines 51, 64, and 72. Notice that the second digit of the pilot number of the two groups is the same.

### 3.11 Central-Office Trunk Adapter for 2-Way Ringdown Signaling

This circuit is capable of converting a maximum of three city trunks for 2-way ringdown signaling.

### 3.12 Message Waiting Service

Message waiting service can be provided with the Type 40 and 80 P-A-B-X's. To equip a P-A-B-X for message waiting service, a message waiting turret must be provided and the telephones served by this message waiting turret must be equipped with a message waiting lamp. The message waiting turret is similar in design and size to the attendant's turret. The message waiting lamp is a neon lamp mounted below and to the right of the dial.

## 4. MOUNTING ARRANGEMENTS

The following paragraphs and tables outline the various equipment mounting arrangements

possible with the Type 40 and 80 P-A-B-X's. Tables A and C list the standard equipment provided and also the bank outlets, relay bar positions and switch positions required by the standard equipment. Tables B and D list the optional equipment that can be provided and also the bank outlets, relay bar positions and switch positions required by the optional equipment.

The relay bar shown in figure 3 (link relay bar) is ready to be jacked-in to its mounting position. The jacks are located at the rear of the metal case. When the relay bar is jacked-in to its mounting position, these jacks will make contact with the jack strip located at the mounting position. All relay bars are equipped with the same type of metal case and jacks. The metal case encloses the wiring and various components mounted at the rear of the relay bar.

The cross point switch shown in figure 4 can function as a finder, connector or trunk switch. The switch must be mounted in the switch shell before metal contact rods can be inserted.

### 4.1 Mounting Arrangements for the Type 40 P-A-B-X

The equipment comprising the Type 40 P-A-B-X is assembled in a three-shelf arrangement and completely enclosed in a metal cabinet 48" wide, 72" high and 15" deep. The cabinet is finished in gray lacquer. The cabinet has two lift-off type hinged doors both front and rear, which when opened allow easy access to the equipment mounted within (figure 1).

TABLE A

Equipment	Bank Outlets	Switch Positions	Relay Bar Positions
39 Local lines: 2 link relay bars 2 selection control relay bars common equipment 1 line equipment relay strip * power failure transfer circuit *	39	12	2 2 2 -
Attendant's turret: 2 attendant's information trunks turret position turret register **	2		1 1 -
10 city trunks	10	10	10
TOTAL (used)	52	22	18
Balance	8	4	3
*These are relay strips, not jack-in type relay bars. Their mounting positions are not considered relay bar positions.			
**Turret register circuit is mounted on the power failure transfer relay bar.			



TABLE B

Optional Equipment	Bank Outlets	Switch Positions	Relay Bar Positions
"Meet-me" Conference *	1	3	1
Executive Link	1	1	1
Dictation Control (on line)	1	-	1
Dictation Control (on switch)	-	1	1
City Trunk Storage	6	-	1
Public Address Cut-In **	1	-	-
Toll Diversion Adapter	-	-	1
Code Call	2	-	1
* "Meet-Me" conference is mounted on the attendant's trunk relay bar.			
** Public Address Cut-in adapter must be mounted externally.			

- a. The three equipment shelves are designated B, D, and E. Shelf B contains the Leich crosspoint switch shell shown in figure 5, which houses 6 finder switches, 6 connector switches, and ten trunk switches. In all,

the switch shell has available 26 mounting positions designated B1 through B26.

The finder and connector switches are always mounted in pairs. The number of

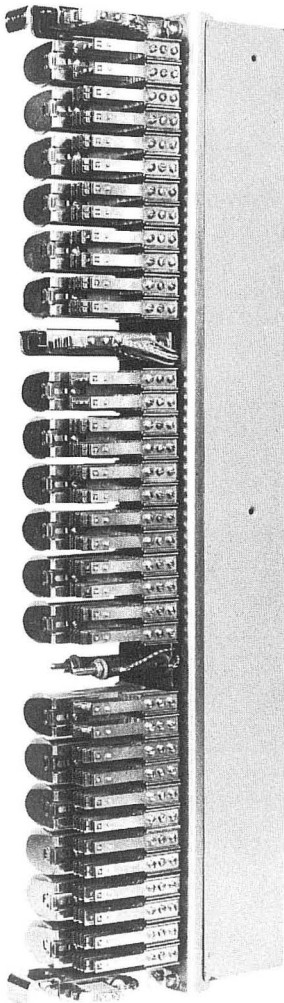


Figure 3. Relay bar.

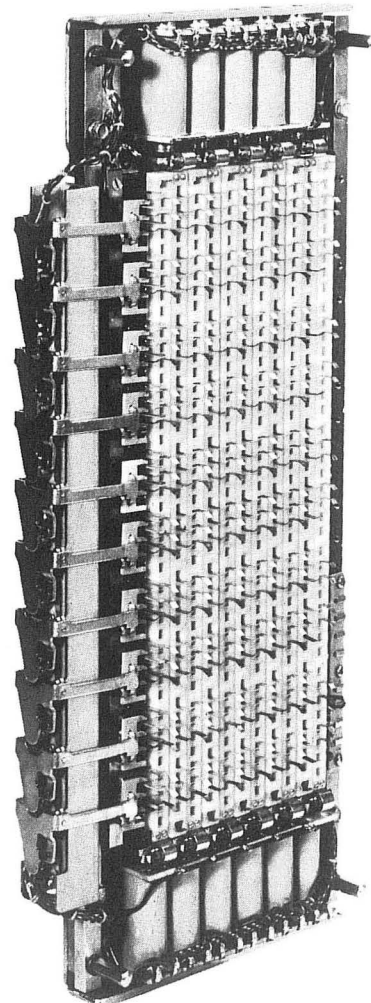


Figure 4. Crosspoint switch.



these switches required is determined by the number of links supplied. Each link requires one finder and one connector switch.

The trunk switches are mounted to the left and right of the finder and connector switches. The amount of trunk switches required depends upon the number of city trunks supplied. Each city trunk requires one trunk switch. The four optional switch positions can be used to house the switches required by the optional equipment listed in Table B.

- b. Shelf D has available 16 jack-in relay bar positions designated D1 through D16 (figure 5). Positions D1 and D2 are occupied by the two link circuit relay bars, each link relay bar contains relay equipment for three link circuits. Positions D3 through D12 contain the ten city trunk relay bars. If less than ten city trunks are provided, the remaining positions can be used to house optional equipment. Position D13 is occupied by the interrupter and the trunk and code call control circuit. Positions D14, D15 and D16 are optional positions.
- c. Shelf E has 5 jack-in relay bar positions designated E1 through E5. Positions E6 and E7 house the line equipment and power failure transfer circuit; these are not jack-in relay bar positions (figure 5). Shelf E also contains the fuse panel and the power supply. Position E1 is occupied by the finder guard circuit. Position E2 and E3 are occupied by the selection con-

trol circuits; each selection control relay bar serves three link circuits. Position E4 is occupied by the attendant's trunks and meet-me conference trunk. Position E5 is occupied by the turret position circuit. If the attendant's turret is not supplied this can be used as an optional position. Position E6 is occupied by the power failure transfer and turret register circuit. Position E7 is occupied by the line equipment relay strip. The line equipment relay strip contains 80 relays, (40 line relays and 40 cut-off relays) and serves 40 local lines. Each local line is served by an individual line and cut-off relay.

## 4.2 Capacity of the Type 40 P-A-B-X

The three factors in determining the over-all equipment capacity of the Type 40 P-A-B-X are total bank outlets, switch positions, and relay bar positions provided. The Type 40 P-A-B-X provides 60 bank outlets, 26 switch positions and 21 relay bar positions. The Type 40 P-A-B-X shown in figure 5 contains all the standard equipment including the equipment associated with attendant's turret and provides 39 local lines, 1 attendant's P-A-X line, 10 city trunks and 2 attendant's information trunks. Table A lists the capacity of the Type 40 P-A-B-X that has been utilized.

Table B lists the optional equipment available for the Type 40 P-A-B-X. When planning the use of optional equipment keep in mind the P-A-B-X capacity listed in Table A. Table A lists the capacity of the P-A-B-X that has been utilized and also the bank outlets, switch

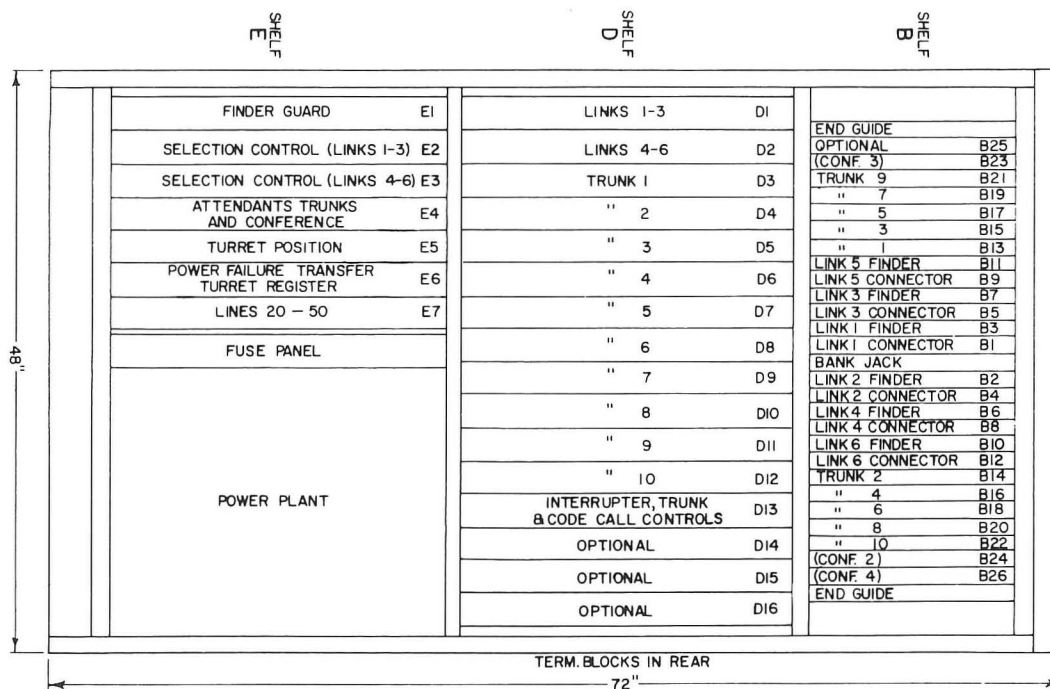


Figure 5. Mounting arrangements for Type 40 P-A-B-X.



TABLE C

Equipment	Bank Outlets	Switch Positions	Relay Bar Positions
74 local lines *	74		
3 link relay bars		18	3
3 selection control relay bars			3
common equipment			4
2 line equipment relay strips **			-
power failure transfer circuit **			-
Attendant's turret:	4		
attendant's trunk circuit			1
turret position circuit			1
turret register circuit ***			-
16 city trunks	18	18	18
TOTAL (used)	96	36	30
Balance	3	4	6
*Lines 286-289, 280 strapped for consultation-transfer service on city trunks 16-20, may be used for local lines if these trunks are not used.			
**These are relay strips, not jack-in type relay bars. Their mounting positions are not considered relay bar positions.			
***Turret register circuit is mounted on the miscellaneous common equipment relay bar.			

positions, and relay bar positions available for mounting optional equipment. These available positions will determine the type and amount of optional equipment that can be used with this P-A-B-X.

If more optional features are required than there are optional bank multiple outlets or switches available, use one of the following solutions:

- Decrease one local line per each bank multiple outlet required.
- Decrease one trunk for each switch and bank multiple outlet required.

#### 4.3 Mounting Arrangements for the Type 80 P-A-B-X

The equipment comprising the Type 80 P-A-B-X is assembled in a three-shelf arrangement and completely enclosed in a metal cabinet 72" wide, 72" high and 15" deep (figure 2). The cabinet has two lift-off hinged doors and a snap-in central panel both front and rear. The cabinet is finished in gray lacquer.

- The three shelves shown in figure 6 are designated B, D, and E. Shelf B contains the crosspoint switch shell which is capable of housing 40 switches and provides 100 bank outlets. The 40 switch positions within

the crosspoint switch are designated B1 through B40. The crosspoint switch shell in figure 6 contains 9 finder and 9 connector switches, 18 trunk switches, and 4 optional switch positions. The amount of finder and connector switches required depends upon the amount of links supplied. Each link requires one finder and one connector switch, these are always mounted side by side. The amount of trunk switches required depends upon the number of city trunks supplied; each city trunk requires 1 trunk switch. The 4 optional positions can be used to house the switches required by the optional equipment listed in Table D.

- Shelf D contains 24 jack-in relay bar positions, designated D1 through D24 (figure 6). Positions D1, D2, and D3 are occupied by the three link circuit relay bars, each link relay bar containing relay equipment for three link circuits. Position D4 can be occupied either by the link circuit relay bar containing links 10 through 12 or by city trunk No. 20. If neither of these two relay bars are provided, this position can be used as an optional position. Position D5 is occupied by city trunk No. 19 if provided. If trunk No. 19 is not provided, this can be used as an optional position. Positions D6 through D23 are occupied by city trunks No. 1 through No. 18. If less than 18 city trunks are provided, unused



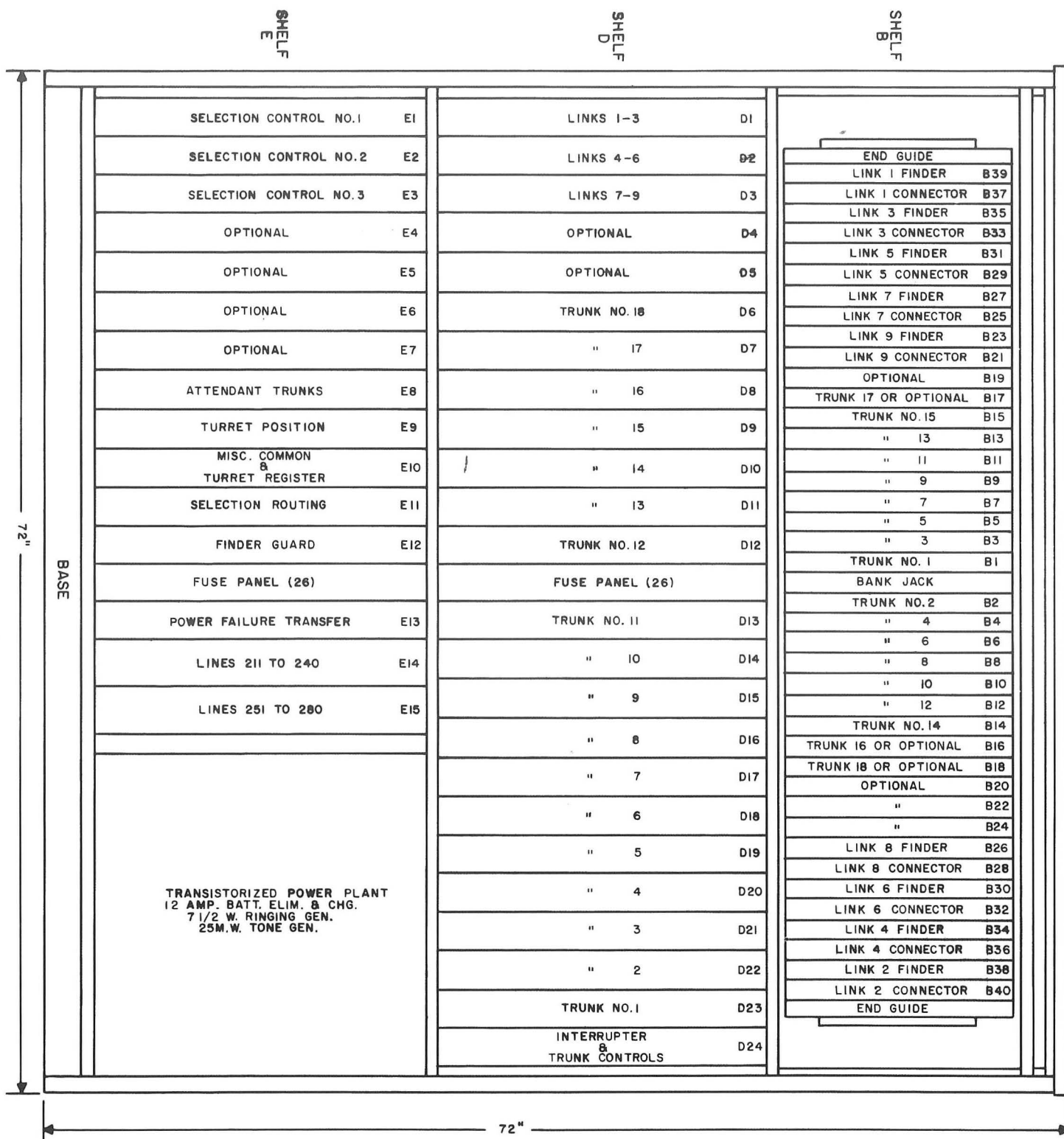


Figure 6. Mounting arrangements for Type 80 P-A-B-X.



TABLE D

Optional Equipment	Bank Outlets	Switch Position	Relay Bar Position
'Meet-me ' Conference	1	3	1
Link Relay Bar (links 10-12)	-	6	1
Link Selection control relay bar	-	-	1
Code Call	2	-	1
City Trunk #19	1	1	1
City Trunk #20	1	1	1
Executive Link	-	1	1
Dictation Control-trunk on Line	1	-	1
Dictation Control-trunk on Switch	-	1	1
City Trunk Storage	6	-	1
Public Address System *	1	-	-
Toll Restriction Adapter	-	-	1
*Public Address adapter is mounted externally.			

positions can be used as optional positions. Position D24 is occupied by the interrupter and trunk control circuit.

- c. Shelf E contains 12 jack-in positions designated E1 through E12 (figure 6). Positions E13, E14, and E15 house the line equipment and power failure transfer circuits, these circuits are mounted on relay strips, not relay bars. Positions E13, E14, and E15 are not considered relay bar positions. Positions E1, E2, and E3 are occupied by the three selection control circuits. A selection control circuit must be provided for each link relay bar supplied. Position E4 is occupied by selection control circuit No. 4, when links 10 through 12 are provided. When links 10 through 12 are not provided, E4 can be used as an optional position. Positions E5, E6, and E7 are optional positions. Positions E8 (4 attendant's trunks), and E9 (attendant's turret), are associated with the attendant's turret and can be used as optional positions if the attendant's turret is not supplied. Position E10 is occupied by the miscellaneous common and turret register circuit. The miscellaneous common equipment need be provided only if the attendant's turret is not supplied. Position E11 is occupied by the selection routing circuit. Position E12 is occupied by the finder guard circuit. Position E13 is occupied by the power failure transfer circuit. Positions E14 and E15 are occupied by the line equipment relay strips. Each local line is served by an individual line, and cut-off relay which is mounted on the line equipment

relay strips. Each line equipment relay strip contains 80 relays, (40 line relays and 40 cut-off relays) and serves 40 local lines. Therefore two line equipment relay strips are required to serve 80 local lines.

#### 4.4 Capacity of the Type 80 P-A-B-X

As in the case of the Type 40 P-A-B-X, the three factors determining the over-all equipment capacity of the Type 80 P-A-B-X are the total bank outlets provided, switch positions, and relay bar positions available. The Type 80 P-A-B-X provides 100 bank outlets, 40 switch positions, and 36 relay bar positions. The Type 80 P-A-B-X shown in figure 6 contains the standard equipment, including the equipment associated with the attendant's turret and provides up to 79 local lines, 1 attendant's P-A-X line, 18 city trunks, and 3 attendant's information trunks. Table C lists the bank outlets, switch positions, and relay bar positions utilized by this standard equipment.

Table D lists the optional equipment available for the Type 80 P-A-B-X. When planning the use of optional equipment keep in mind the P-A-B-X capacity listed in Table C. Table C illustrates the capacity of the P-A-B-X that has been utilized and also the bank outlets, switch positions, and relay bar positions available for mounting optional equipment. These available positions will determine the type and amount of optional equipment that can be used with this P-A-B-X. Also see paragraph 4.5.

When more optional features are required than there are optional bank multiple outlets or



switches available, apply the following solutions:

- a. Decrease one local line per each bank multiple outlet required.
- b. Decrease one trunk for each switch and bank multiple outlet required.

#### 4.5 Type 40 and 80 P-A-B-X Auxiliary Trunk Bay

The Type 40 and 80 P-A-B-X auxiliary trunk bay shown in figure 7 is designated to be used as an equipment overflow bay for the Type 40 or Type 80 P-A-B-X. The auxiliary trunk bay provides 12 jack-in relay bar positions for mounting optional equipment. With the addition of the auxiliary trunk bay, the total relay bar positions provided by either P-A-B-X is increased by 12, however, the switch and bank outlets provided by either P-A-B-X is not increased.

### 5. THEORY OF OPERATION

Connection between the calling line and the called line is established through the link circuit. The link circuit consists of a finder switch which makes connection to the calling line under control of the line relay serving the calling line by way of the finder guard circuit and link selection control circuit. A link relay circuit consisting of six relays receives the dial pulses and transmits them to the associated selection control circuit. A connector switch then selects the called line under control of the link relays and the attached selection control circuit.

#### 5.1 Line Equipment

Each local P-A-B-X line is served by a line relay and a cut-off relay. The line relay, designated LR, operates when the handset is lifted off-hook and controls seizure of a link. The cut-off relay, designated CO, operates on incoming calls to disconnect the line relay whenever the line is connected to a link or trunk.

#### 5.2 Finder Guard

The finder guard prevents interference between lines which attempt to simultaneously land (seize) by allowing the lowest-numbered line to land first. The finder guard also provides a preference circuit to maintain service under various faulty conditions. If a line has trouble in landing, a relay will release and shift the preference circuit so that a high-numbered line can land ahead of a lower-numbered line that is in trouble.

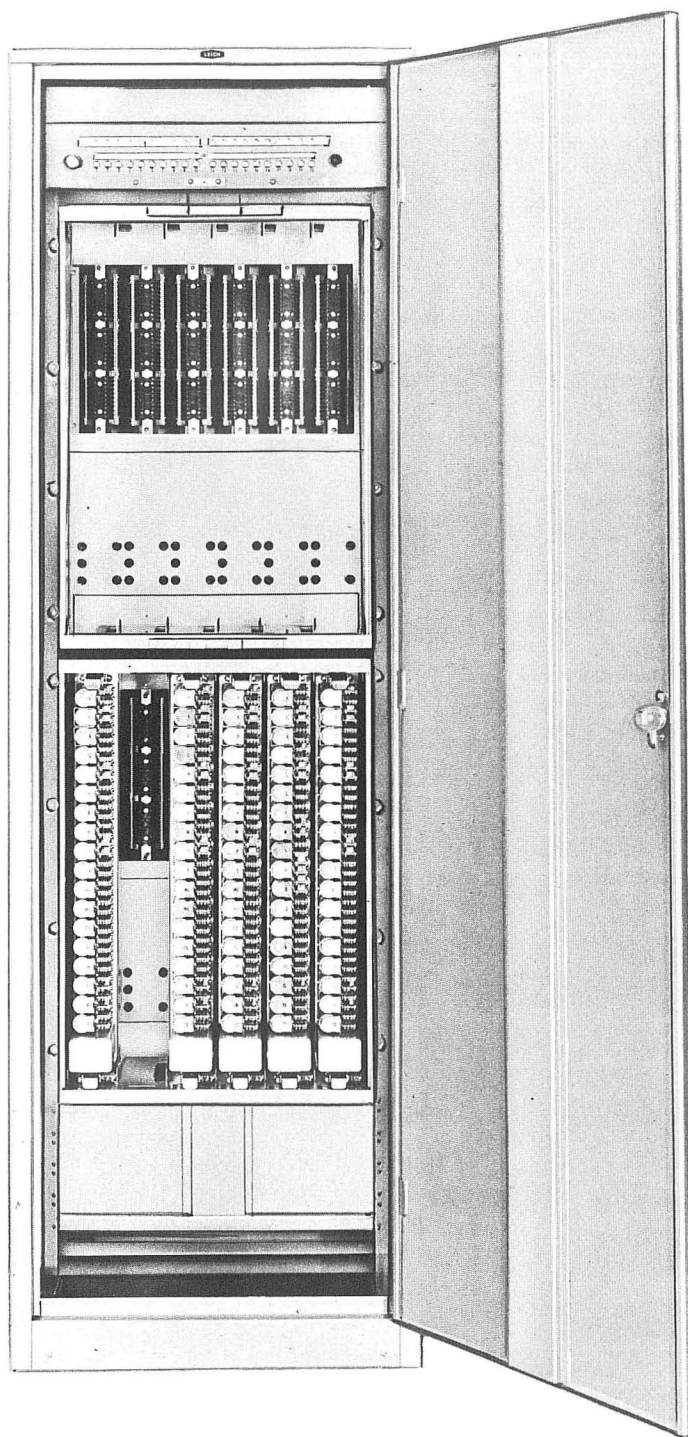


Figure 7. Auxiliary trunk bay.

#### 5.3 Link Selection Control

After a line has landed in the finder guard, information is passed to the selection control circuit causing the calling line to select an idle link. Three links are connected to each selection control and no other links use it; for example, links 1, 2, and 3 are associated with selection control circuit No. 1. The link holds the selection control from the time the calling party seizes the link and selection control, until the connection to the called line, trunk group, or to a special service feature is complete. The selection control is then dis-



engaged from the link, and prepares to accept another call.

Approximately 8 seconds are allowed for the calling party to dial the first digit. If no dial pulses are received within this time, the selection control causes the link to return busy tone to the calling party and also disengages itself from that link and prepares to accept another call. This also holds true in the case of two-digit numbers for the maximum time allowed between dialing of the first and second digits, and also on three-digit numbers for the maximum time that is allowed between dialing the second and third digits.

Incoming calls engage the selection controls and links in rotation. Assuming that all links and selection controls are idle, the first call will seize selection control No. 1 and link 1; the second call will seize selection control No. 2 and link 4; in the Type 80 only, the third call will seize selection control 3 and link 7. With this condition all three selection control circuits of the Type 80 and the two selection control circuits of the Type 40 have been utilized and a reset condition occurs so that the next call that attempts to land will seize selection control 1 and link 2.

#### 5.4 Selection Routing Circuit (Type 80 P-A-B-X Only)

The selection routing circuit is arranged to absorb the prefix digit of local station codes. Although the Type 80 P-A-B-X uses three-digit local codes, only two digits are required to complete a connection through the connector switch. After absorbing the prefix digit, this circuit then routes the tens and units digits to complete the selection. The selection routing circuit also provides full, partial or non-restricted service to trunks, and also routing for special single-digit features.

#### 5.5 Selection Methods

Both the Type 40 P-A-B-X and the Type 80 P-A-B-X engage a finder switch to find the calling line and an associated connector switch to connect it to the called line. Each finder and connector switch must have access to each of the 40 or 80 lines served by the P-A-B-X. A sufficient number of finder and connector switches should be provided to handle the demands for service during the heavy traffic hours of the day.

For purposes of example, figure 8 schematically illustrates two finder switches and two connector switches of a 80-line P-A-B-X. Only nine of the 80 lines are shown, in order to present a picture of the switch more clearly. Each local station is represented by a single

conductor, although four conductors are required in the P-A-B-X for each line.

Because the finders and connectors must be able to access any one line out of the 80 lines, the total lines are divided into tens selections and units selections, corresponding to the tens and units digits of the assigned line number or code. The tens selection selects that line group which includes the desired line, and the units selection selects one of these ten lines.

Each switch has 10 tens-lifts, actuated by armatures associated with the vertical coils at the top and bottom of the switch. Eight of these tens-lifts (10-80) are associated with line circuits and two (90- and 00) are available for special features. To make a selection, one of these tens-lifts is operated by its armature to actuate the bank spring finger into contact with the multiple bars of ten lines, only three of which are illustrated. This establishes connections from ten lines out of the 80, one to each of the ten bank springs in that switch.

To pick one line out of these ten, each switch has ten units-lifts, actuated by armatures associated with the horizontal coils at the front of the switch. Operating one of these units-lifts causes the eleventh, or front finger of the bank spring on that units level to make contact with the switch bus conductor.

Assuming that line 31 is calling and that finder 1 is seized for the call, tens-lift 30 in this finder is operated to connect lines 31-30 to the bank springs of the switch, and units-lift 1 is actuated to connect its bank spring fingers to the switch bus conductor. The other nine bank spring sets do not complete a circuit, as all potential connections remain open at the unoperated units-lift contacts.

Line 31 is now connected to the link associated with that particular finder. When the desired number is dialed, the link functions to cause operation of a tens-lift and a units-lift in the connector. Assuming that 23 is dialed, tens-lift 20 functions to connect lines 21-20 to the bank springs of the connector, thus completing the connection from the finder by way of the link and connector to line 23.

#### 5.6 City Trunk

The city trunk circuit along with a trunk switch connects the P-A-B-X to a common battery or automatic central office. Local stations on restricted lines cannot dial the city trunk directly to make an outgoing call. These stations must dial the attendant over an attendant's information trunk, and have the attendant make the call for them. These calls can then



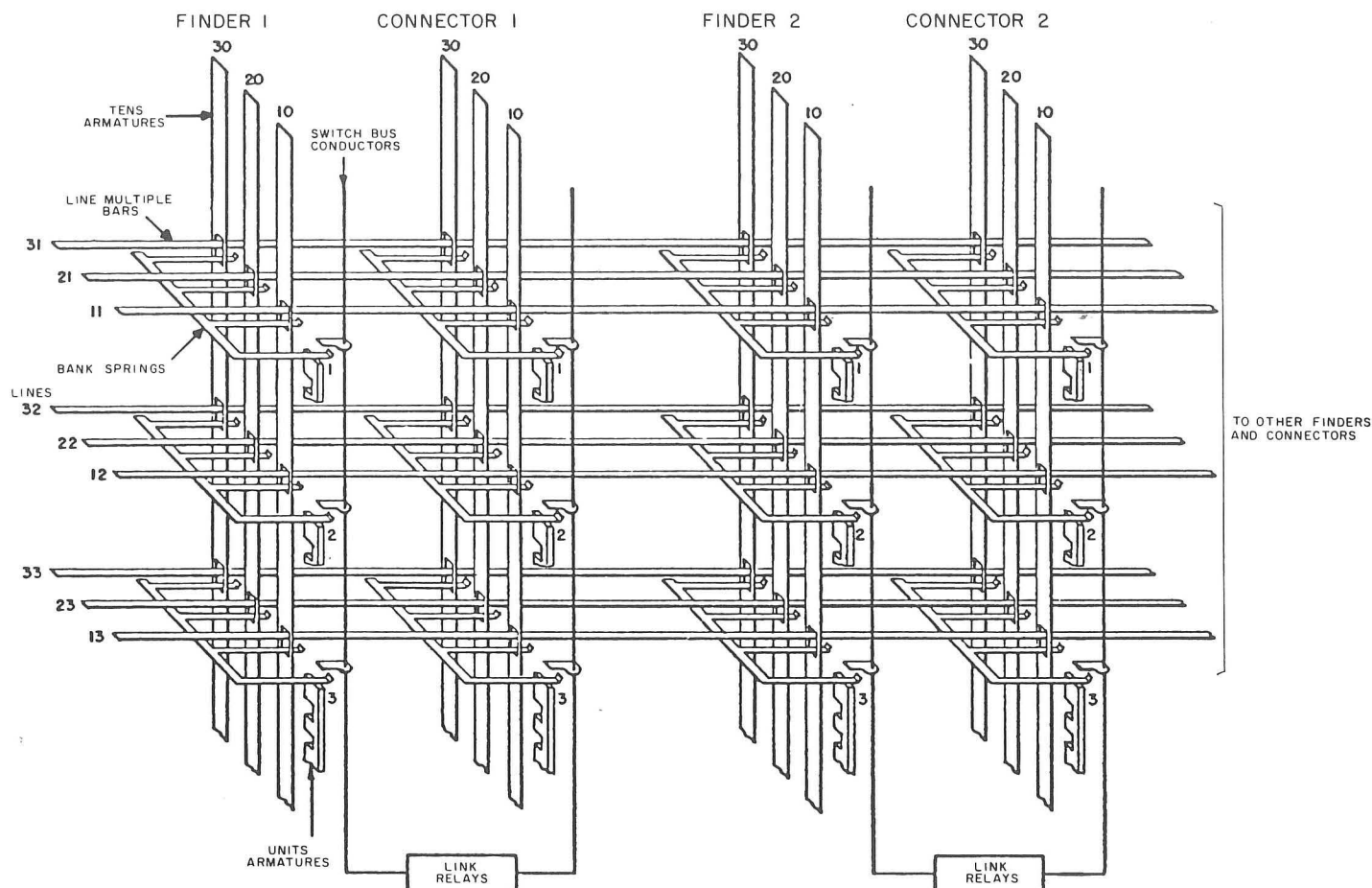


Figure 8. Crosspoint switch diagram.

be extended to the local station. Stations on nonrestricted lines may dial the trunk directly to make outgoing calls.

## 6. SELECTION SCHEME BLOCK DIAGRAM

Using the block diagram in figure 9, we will trace three different types of calls through a Type 80 P-A-B-X: a call between two local stations, an outgoing trunk call from a local station, and an incoming trunk call through the attendant's turret to a local station.

### 6.1 Local Call - Station to Station

For this example, we will assume that station 1 is calling station 2. Station 1 lifts the handset off-hook which places a d-c loop across the T and R leads and operates the line circuit (relay LR). The line circuit actuates the finder guard circuit and identifies the calling line. The finder guard checks that no other lines are requesting service and signals the first available link selection control circuit to cause one of its 3 associated links to connect its finder switch to station line 1. The link circuit then signals the line circuit that it has "found" the calling line. The line circuit releases the finder guard and station 1 hears dial tone.

Station 1 dials, sending pulses through the link circuit to the link selection control which counts them and passes the information to the selection routing circuit. The routing circuit then controls the selection of station line 2 in the link connector switch. The selection control circuit tests the line to determine if it is busy or idle, then signals the link circuit to return busy tone or switch through and signal the called station. In either case, the selection control circuit disengages from the link circuit and becomes available to serve either of its two remaining associated lines.

### 6.2 Outgoing Trunk Call

For this example, we can assume any station is initiating an outgoing call via a city trunk. The system functions as above (paragraph 6.1) to the point of tracing the call through the selection routing circuit. In this example, the selection routing circuit recognizes that the calling station desires to be connected to a trunk circuit, and passes the information to the access and rotation control circuit (part of the interrupter and trunk control circuit) associated with the desired trunk group which signals the first available trunk circuit to connect itself to the calling line and to re-

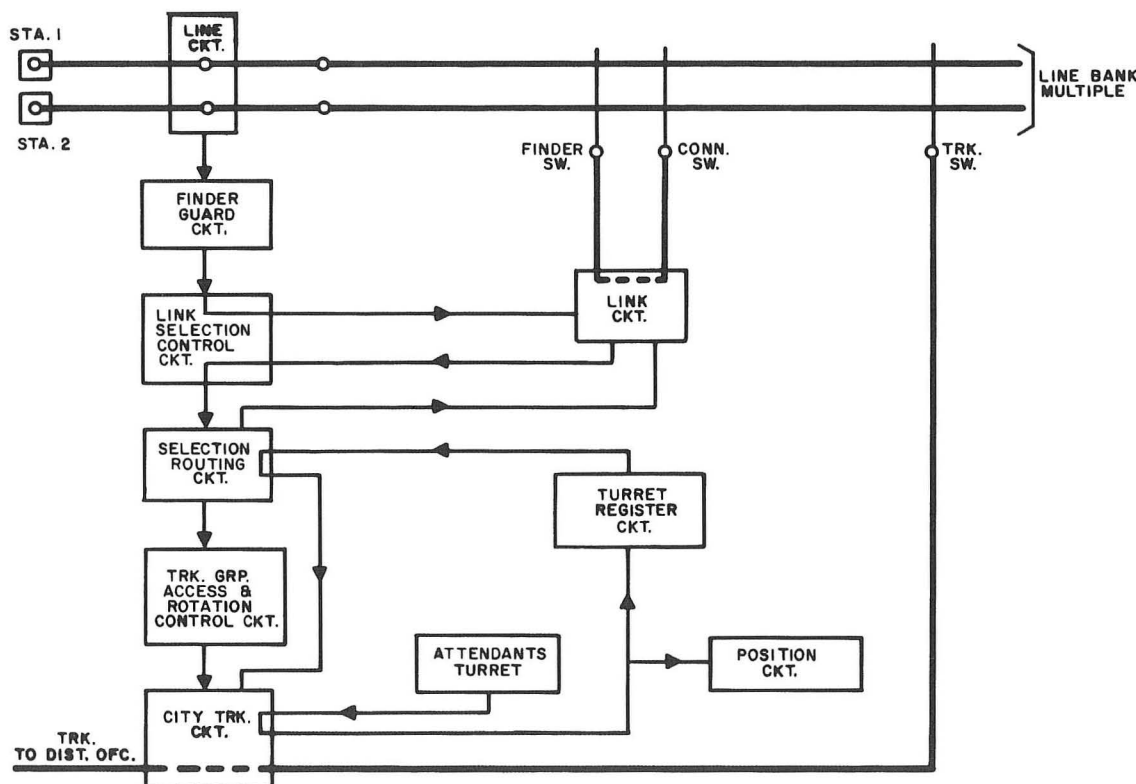


Figure 9. Block diagram, tracking a call.

lease the link. If no trunk is available, the access and rotation control circuit informs the calling link (via the selection control circuit) and causes busy tone to be returned to the calling station. If a trunk is available, dial tone will be returned to the calling party; the calling party can now dial the desired city number.

### 6.3 Incoming Trunk Call

On an incoming trunk call, the corresponding trunk lamp flashes on the attendant's turret. The attendant answers by operating the trunk switch towards the flashing lamp. The attendant extends the call, (through the use of the keyset buttons) via the position circuit, the turret register circuit, and the selection routing circuit which act to cause the trunk switch to perform as a connector switch and connect to the called station's line. The busy test is made by the position circuit which signals the turret whether the line is busy or idle. If the line is idle, the trunk is caused to switch through and ring while the register circuit is released.

## 7. TRUNK GROUPS AND RESTRICTIONS

### 7.1 Type 40 P-A-B-X

- a. Restricted and nonrestricted stations. The Type 40 P-A-B-X is wired for one trunk group, however, three trunk groups can be derived from this one original group. The

Type 40 P-A-B-X is wired with all stations restricted from making city trunk calls. Local stations, of the Type 40 P-A-B-X, fall in one of two classifications: restricted, or nonrestricted. Restricted stations cannot complete any city trunk calls. In order to place an outside call, a restricted station must dial the attendant and have the attendant place the call. Nonrestricted stations can access any city trunk group. Local stations are restricted through jumpers connected between two terminals on the line equipment terminal blocks mounted in position E7.

- b. Digit assignment. The Type 40 P-A-B-X has 10 access digits that are assigned (when dialed from local stations) as in Table E.

### 7.2 Type 80 P-A-B-X

- a. Restricted, nonrestricted and partially restricted stations. The Type 80 P-A-B-X is wired for one trunk group, with all stations restricted from accessing this group. However, three trunk groups can be derived from this one trunk group. The method of restricting lines is through the strapping of specified terminals on the terminal blocks mounted in the line equipment positions, E14 and E15. Each local line has a set of terminals on these terminal blocks. Local stations fall into one of three groups; restricted, nonrestricted or partially re-



stricted. Local stations that are classified as restricted cannot seize any city trunk groups, they must have the attendant place all outside calls. Stations classified as nonrestricted can seize any trunk group. Stations classified as partially restricted can seize two of the trunk groups usually by dialing the access digits 4 or 5, but cannot access the primary trunk group. Another optional arrangement can be derived by strapping changes at the selection routing circuit where a partially restricted station can seize trunk group No. 4 only or trunk group No. 5 only.

- b. Digit assignment. The Type 80 P-A-B-X has 12 access digits that are assigned when dialed from local stations as in Table F.

## 8. ATTENDANT'S TURRET

### 8.1 Description - Type 40 P-A-B-X

The attendant's turret for the Type 40 P-A-B-X (figure 10) is assembled in an attractive

TABLE E

Digit	Assignment
1	Busy tone Absorb repeatedly
2	Local stations 21-20
3	Local stations 31-30
4	Local stations 41-40
5	Local stations 51-50
6	"Meet-me" conference or busy tone
7	City trunk, trunk group No. 2 or busy tone
8	Universal night answer or busy tone
9	City trunk, trunk group No. 1
0	Attendant

TABLE F

Digit	Assignment
1	Absorb repeatedly
2	Local lines
3	Busy tone
4	Busy tone or trunk group No. 2
5	Busy tone or trunk group No. 2
6	Busy tone or "meet-me" conference
7	Busy tone or code call
8	Universal night answer
9	City trunk
0	Attendant
29	Busy tone
20	Busy tone

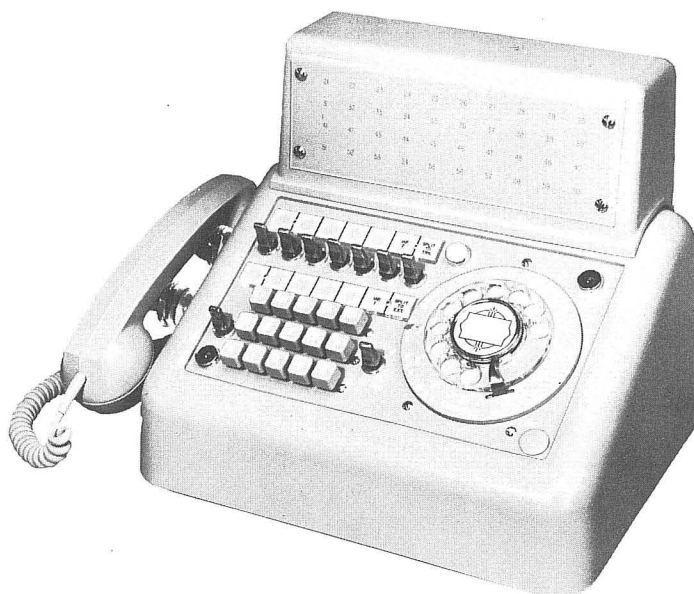


Figure 10. Attendant's turret, Type 40 P-A-B-X.

polystyrene casing, 11" wide, 9" deep, and 6" high. The turret is available in three colors, green, beige or gray and mounts easily on a desk or table. The turret control panel, slopes toward the attendant placing all the controls within easy reach. The handset mounts on the side of the turret and is equipped with a retractile cord and a self-compensating network.

Although this turret has been associated with the Type 40 P-A-B-X it can be used with a Type 80 P-A-B-X that will not be supplied with more than 10 city trunks. However, this would not be economical if additional trunks (more than a total of 10) may be added in the near future.

### 8.2 Description - Type 80 P-A-B-X

The attendant's turret for the Type 80 P-A-B-X (figure 11) is assembled in an attractive polystyrene casing, 16" wide, 17" deep, and 8" high. It is similar in design to the Type 40 P-A-B-X attendant's turret. The turret control panel, slopes toward the attendant to make all lamps clearly visible and place all controls within easy reach of the attendant. The handset, mounted on the side of the turret, is equipped with a retractile cord and a self-compensating network.

The Type 80 P-A-B-X is constructed so that two attendant's turrets can be connected to one P-A-B-X switchboard, if city trunk traffic becomes too heavy for one attendant to handle efficiently. The one restriction, in using two attendant's turrets, is that all the odd-numbered trunks must appear on one turret and all even-numbered trunks must appear on the other turret.





*Figure 11. Attendant's turret, Type 80 P-A-B-X.*

### 8.3 Busy Lamp Field

On incoming trunk calls, the busy lamp field aids the attendant in determining whether the desired local station is busy or idle. By depressing a preassigned push button on the turret control panel or operating a city trunk key the attendant can visually determine the condition of any local station, without using the turret keyset.

The busy lamp field is mounted on the attendant's turret above the control panel. The busy lamp field is available in three colors, green, beige or gray. Cabling is required to the switchboard. The line numbers are engraved in the face panel, which is finished in the same color as the housing.

#### 8.3.1 Busy lamp field, Type 40 P-A-B-X attendant's turret.

The busy lamp field for the Type 40 P-A-B-X turret is shown in figure 10. Each of the 40 local stations has an individual lamp appearing in the busy lamp field that will light steadily when the corresponding station is busy. The busy lamp field can be controlled through a spare push button, designated SP, mounted on the attendant's turret or by operating a city trunk key. When the push button is depressed or the city trunk key operated, any busy station will cause its corresponding busy lamp to light. The lamps are arranged in four rows of 10 lamps each.

#### 8.3.2 Busy lamp field, Type 80 P-A-B-X attendant's turret (figure 11).

Each of the 80 local stations has an individual lamp appearing in the busy lamp field that will

light whenever the corresponding station is busy. The busy lamp field can be controlled through a push button, designated SP, mounted on the control panel, or by operating a city trunk key. When the push button is depressed or the city trunk key operated any busy station will cause its busy lamp to light. The lamps are arranged in two groups of four rows, with ten lamps in each row. The last two digits of the line's three digit number are engraved on the face panel.

### 8.4 Operation of Attendant's Turret

The following paragraphs outline briefly the proper method of operating the attendant's turret. (A complete set of operating instructions is provided with the P-A-B-X.) The control panels for the two turrets are shown in figures 12 and 13.

- a. Incoming trunk call. To answer an incoming trunk call, operate the trunk key toward the flashing lamp. The lamp will extinguish and the keyset lamp will light steadily to indicate the keyset is available.
- b. Signaling a local station. To extend the trunk call to any local station, depress the keyset buttons in the sequence corresponding to the desired station's number. If an error is made in depressing the keyset buttons, depress the keyset release button, designated KR, and again depress the keyset buttons corresponding to the desired local station. If the local station is idle, the keyset lamp will extinguish, and the trunk lamp flashes ringing signal. The trunk key may then be restored. When the called station answers, the trunk lamp will light steadily; when the local station disconnects, the lamp will extinguish.

If the call is not answered within a reasonable time, the attendant can re-enter the call by reoperating the trunk key. To release from the city trunk, depress the keyset release button.

If the called local station is busy, the keyset lamp will flash and the attendant will receive busy tone. To release from the busy connection, depress the keyset release button. When the keyset lamp lights steadily, the city trunk call can be extended to another local station if so desired.

- c. Busy override. The attendant can override a busy condition if necessary to notify one of the parties of an incoming trunk call. By depressing the break-in button, designated BK, the attendant can converse with the parties on the busy line. If the called station agrees to accept the call, the attendant must depress the keyset release button and resignal the desired station.



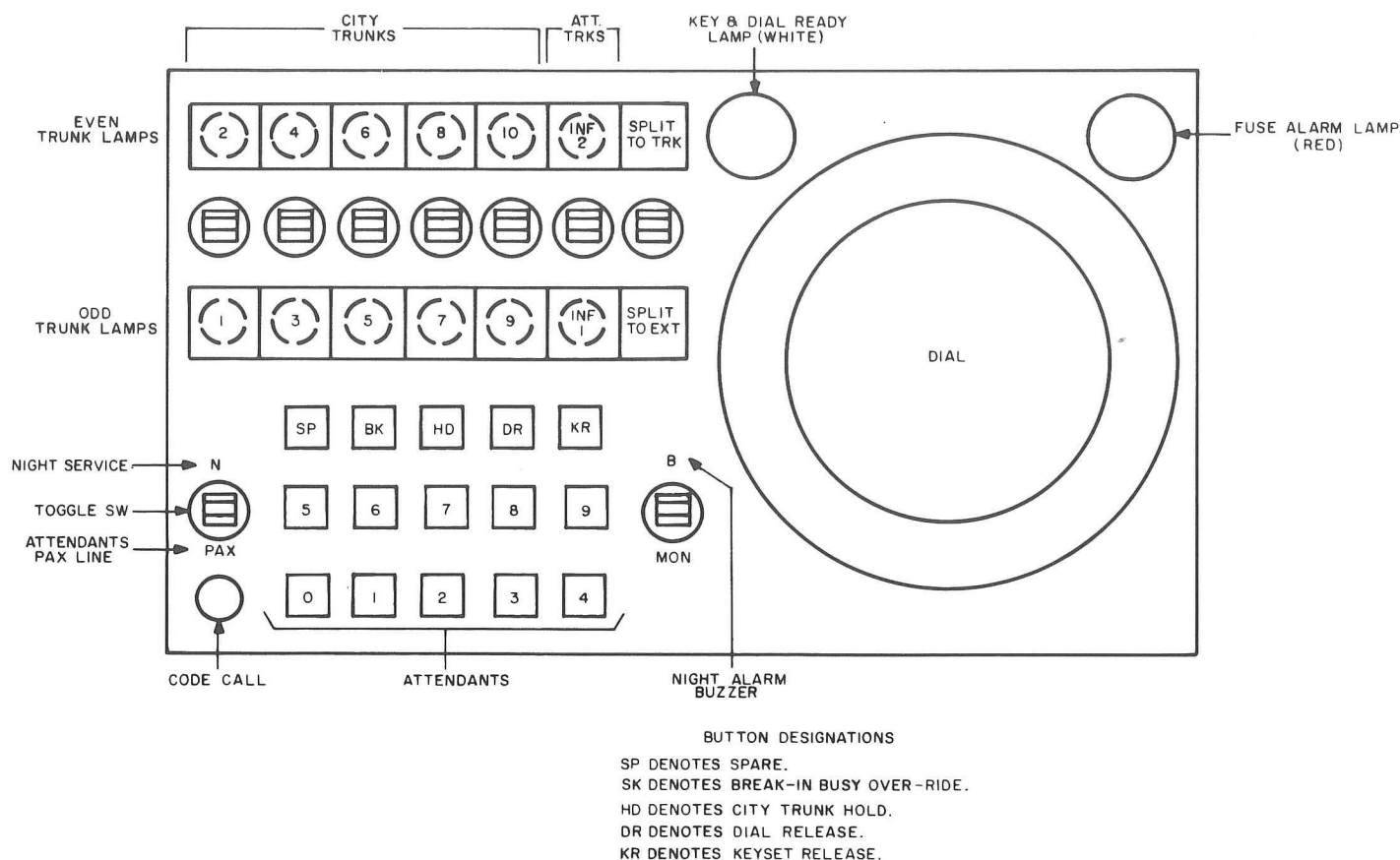


Figure 12. Type 40 attendant's turret, control panel.

- d. Splitting a call. If the attendant wishes to converse with the party on the city trunk without being heard by the local station, the attendant operates the SPLIT TO TRK key. Should the attendant desire to talk to the local station without being overheard by the city trunk party, the attendant operates the SPLIT TO EXT key. In both cases, the trunk key must also be operated.
- e. Placing a city trunk on hold. To place a city trunk call on hold, the corresponding trunk key must be operated and the hold key, designated HD, must be depressed. The keyset lamp will extinguish and the corresponding trunk lamp will flash. The city trunk key can then be restored. To release a city trunk on hold, operate the trunk key and depress the keyset release button; the keyset lamp will light and the trunk lamp will extinguish. If a party on a city trunk wishes to talk to more than one local station after depressing the keyset buttons corresponding to the desired local station, depress the hold button. The trunk lamp will flash until the local station answers, it will then light steadily. When the local station disconnects, the trunk lamp will begin to flash, the attendant then depresses the keyset release button and then signals the second local station by depressing the corresponding keyset buttons.
- f. Outgoing call via a city trunk. To originate a call via a city trunk, operate the trunk key of an idle city trunk, listen for dial tone, and then dial the desired city number. If the city trunk is connected to a manual office, the operator will complete the connection to the desired city party. To recall the city operator or release the dialed city connection, depress the dial release button, designated DR, holding it down for about 1/2 second.
- g. Code call. The attendant places the incoming trunk call on hold by depressing the hold button and restoring the trunk key. The attendant then operates the P-A-X key and using the turret dial, dials the digit assigned to code call. If the code call circuit is idle (no busy tone), again by using the turret dial, dial the code of the desired party. When the called party answers, by dialing the digits assigned to code call answer, the attendant informs the party of the waiting city call. If the party agrees to accept the call, the attendant restores the P-A-X key, operates the city trunk key, depresses the keyset release button to release the trunk from hold, and extends the call to the local station through the keyset. This prevents tying up the code call circuit.
- h. Attendant's information trunks. Two information trunks are provided on the Type 40

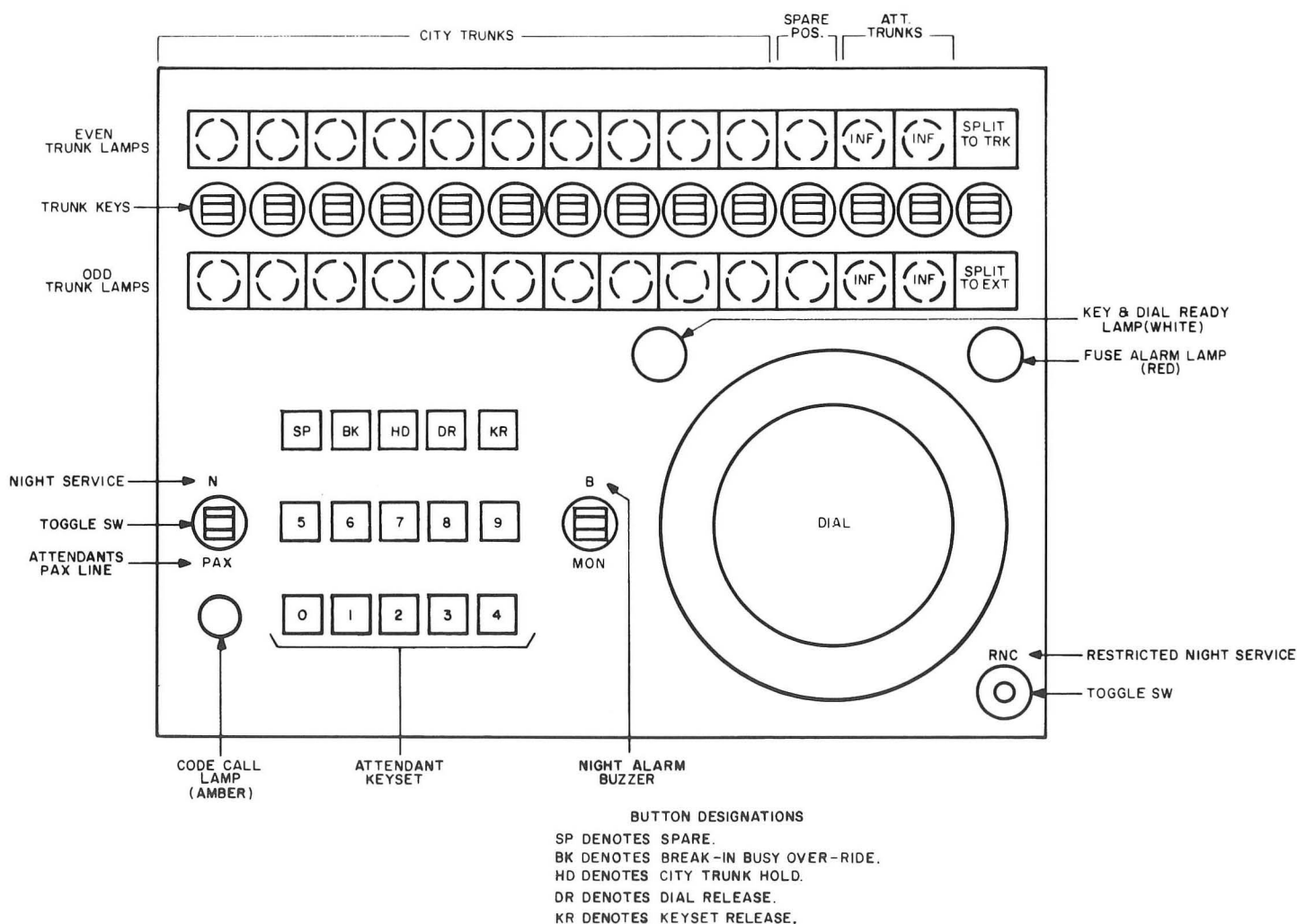


Figure 13. Type 80 attendant's turret, control panel.

P-A-B-X, three are provided on the Type 80 P-A-B-X to allow the attendant to receive calls from extension stations. When a local station dials the digit assigned to information, the information trunk lamp will flash. To answer, operate the information trunk key toward the flashing lamp. If a local station desires information while connected to a city trunk, a consultation call can be made to an information trunk. While a city trunk is on hold, the normal bright, trunk lamp supervision changes to dim to indicate the hold condition.

- i. "Meet-me" conference. To connect the city trunk to the conference circuit, depress the keyset button corresponding to the digit assigned to conference. If the conference circuit is idle, the city trunk will be automatically connected to it, restore the city trunk key. The attendant must then notify all the local stations who are to take part in the conference to dial the digit assigned to the conference. The city trunk lamp will flash until the first local station is connected to the conference circuit. If after the con-

ference is complete should the city trunk party wish to converse with another local station, place the city trunk on hold, operate the city trunk key, depress the keyset release button, depress the keyset buttons corresponding to the desired local station, and release the city trunk key.

- j. Monitoring a busy line. To monitor a call in progress on a city trunk, operate the city trunk key and also the monitor key, designated MON. The attendant can monitor the call, but cannot converse without releasing the monitor key.
- k. Night service. Operate the night key, designated N, so that incoming trunk calls will sound the night signals. The incoming call can be answered from any local station by dialing the digit assigned to night answer.
- l. Out dial trunk. By operating the P-A-X key, the attendant has access to a line over which any station or special service can be reached by using the turret dial.



- m. Buzzer. Operating the buzzer key, designated B, will cause the buzzer to sound on incoming trunk calls and on disconnect signals. The buzzer will also sound when a local station attempts to reach the attendant over an information trunk.
- n. Fuse alarm. The red lamp on the upper right-hand corner of the turret panel will light should a fuse blow in the P-A-B-X.

## 9. STATION APPARATUS METHOD OF OPERATION

A standard Type 80 or Type 90 telephone can be used as station apparatus with either the Type 40 or Type 80 P-A-B-X. Stations assigned to power failure transfer service may require a grounding push button to originate a trunk call during a power failure. A grounding push button is available with either the Type 80 or 90 telephone.

The following paragraphs outline the proper method of operating station apparatus for the Type 40 or 80 P-A-B-X local stations.

### 9.1 Local Call

Station-to-station local calls are completed automatically by lifting the handset off-hook and dialing the digits of the desired station.

### 9.2 Outgoing Trunk Calls

- a. For unrestricted stations, dial the digit assigned to city trunk access. If the trunk is tied into an automatic (dial) central office, wait for dial tone, then dial the digits of the desired city party. If the city trunk is tied into a manual office, an operator will be signaled after dialing the city trunk access digit. The operator will complete the connection to the desired city party.
- b. For restricted stations, dial the digit 0 to signal the attendant who will complete the call to the city party. Inside party hangs up and is resigaled when attendant completes call.

### 9.3 Incoming Calls - Unattended Operation

When the P-A-B-X is not equipped with an attendant's turret an incoming call will sound an audible signal. To answer, dial the assigned digit from any local station.

During periods when the attendant's turret is unattended, incoming calls will sound a common audible signal. To answer, dial the assigned digit from any local station. An example of this would be - night answer service.

### 9.4 Transfer

To transfer an incoming call to another local station, dial the digit 1, listen for dial tone, then dial the digits of the desired local station. When the called station answers, replace the handset and the call is automatically transferred.

If the party fails to answer, after waiting for a minimum of four rings, dial the digit 1 to reconnect to the city trunk call.

If the called party is busy, depress the hook-switch plunger and release it immediately, to reconnect to the city trunk.

### 9.5 Consultation Call

It is possible for a local station to call another local station for consultation, while talking to an outside party. The local station dials the digit 1, then the digits of the desired station. To return to the outside party, redial the digit 1. To return to the called station, dial the digit 1. This procedure can be repeated any number of times. If a busy condition is encountered when attempting a consultation call, depress the hookswitch and release it immediately to return to the outside party.

### 9.6 Code Call

To locate a party out of hearing distance of their ringer, but who is on the premises, dial the digit assigned to code call service. If busy tone is not heard, dial the digits of the desired party's code. The code call can be answered from any local station by dialing the digits assigned to code call answer. It is advisable to obtain the station number that the signaled party is calling from and transfer the call to that station to prevent tying up the code call circuit.

### 9.7 "Meet-Me" Conference

The local station setting up the conference must notify the desired stations to dial the digit assigned to the "meet-me" conference circuit.

If the conference will include an outside party (city trunk), dial the digit 1 and then the digit assigned to the "meet-me" conference circuit. Listen for continuous ringback tone. This is an indication that the "meet-me" conference circuit is idle, replace the handset and the city trunk is automatically transferred into the conference circuit. To call in additional local stations, follow the procedure in the above paragraph. Should the conference circuit be busy, depress the hookswitch plunger to return to the outside party.



## 10. POWER SUPPLY

The power supply for the Type 40 and 80 P-A-B-X consists of a battery eliminator (which can also be used as a battery charger), a transistorized tone generator, and a static-type ringing machine. The three units are individually fused and require only one lead-in cord that can be plugged into any separately fused 110-volt commercial power outlet. The unit produces 48-volt d-c, 20-cycle ringing supply and tone for either dial tone or busy tone.

- a. Typical power supply for the Type 40 P-A-B-X would be the Lorain Model 6B8. A typical power supply for the Type 80 P-A-B-X would be the Warren Model 48TPP12. The Type 80 P-A-B-X requires a 12-amp d-c power supply while the Type 40 requires a 6-amp power supply.

Where necessary, a 48-volt battery supply can be used, however the batteries cannot be mounted inside the equipment cabinet. A battery rack and cabinet can be furnished.

The battery eliminator on the Type 80 P-A-B-X can be converted, by a simple wiring change, to a battery charger. On the Type 40 P-A-B-X the battery eliminator can be converted to a battery charger with the addition of an adapter unit.

## 11. INSTALLATION INFORMATION

### 11.1 Dolly Assembly

The Type 40, 80 and auxiliary trunk bay can be equipped with a dolly assembly (figure 14). The dolly assembly fastens underneath the bay with screws. The base of the bay is predrilled for mounting the dolly assembly. Each dolly assembly consists of two casters and two brakes. When the bay has been moved to its permanent location the brake should be lowered to the floor. The dolly assembly increases the height of the bay by 2-3/4".

### 11.2 Cable Troughs

Cable troughs of three different lengths, one of which is formed at a right angle, can be

furnished to enclose the cable entering the P-A-B-X or auxiliary trunk bay. Figure 15 shows four different trough layouts utilizing the three trough sections. The three trough sections shown are item A - the trough end which is 6" long, item B - the trough which is 24" long, and item C, the trough ell which is formed at a right angle and is 6-21/32".

The trough sections have a removable front section. When the trough sections are used in series, they are connected by a splice plate. Figure 16 shows an exploded view of the three trough assemblies.

### 11.3 Switchboard Cable Requirements

Tables G and H list the cable requirements for the Type 40 and 80 P-A-B-X's. The tables also give ordering information for the required cables.

## 12. TEST RACK

The relay bars of the Type 40 P-A-B-X and the Type 80 P-A-B-X are designed and wired so that they can be removed from their corresponding jack-in positions, and inserted in the test rack without interfering with the normal operation of the circuit (figure 17).

The test rack is primarily a portable jack-in relay bar position that can be mounted on the front of either the Type 40 or Type 80 P-A-B-X. Attached to the rear of the test rack is an extension cable that is wired to a jack (similar to the jack at the rear of a relay bar) which is to be plugged into the jack-in position of the relay bar to be tested. The test jack is equipped with a handle to assist in plugging-in and removing the test jack. The relay bar is inserted in the jack-in position of the test rack. The relay bar can be pivoted upward away from its casing to permit access to the wiring and other components at the rear of the relay bar.

The procedure for using the test rack is as follows:

- a. Insert the test rack in its mounting position on the front of the P-A-B-X switchboard.
- b. Remove the relay bar to be tested from its jack-in position and jack it into the test rack.
- c. Insert the jack attached to the extension cable into the jack-in position of the relay bar to be tested.
- d. The circuit can now be tested and will function as if it were in its normal mounting position.

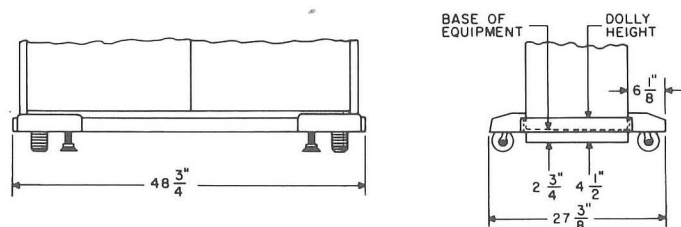
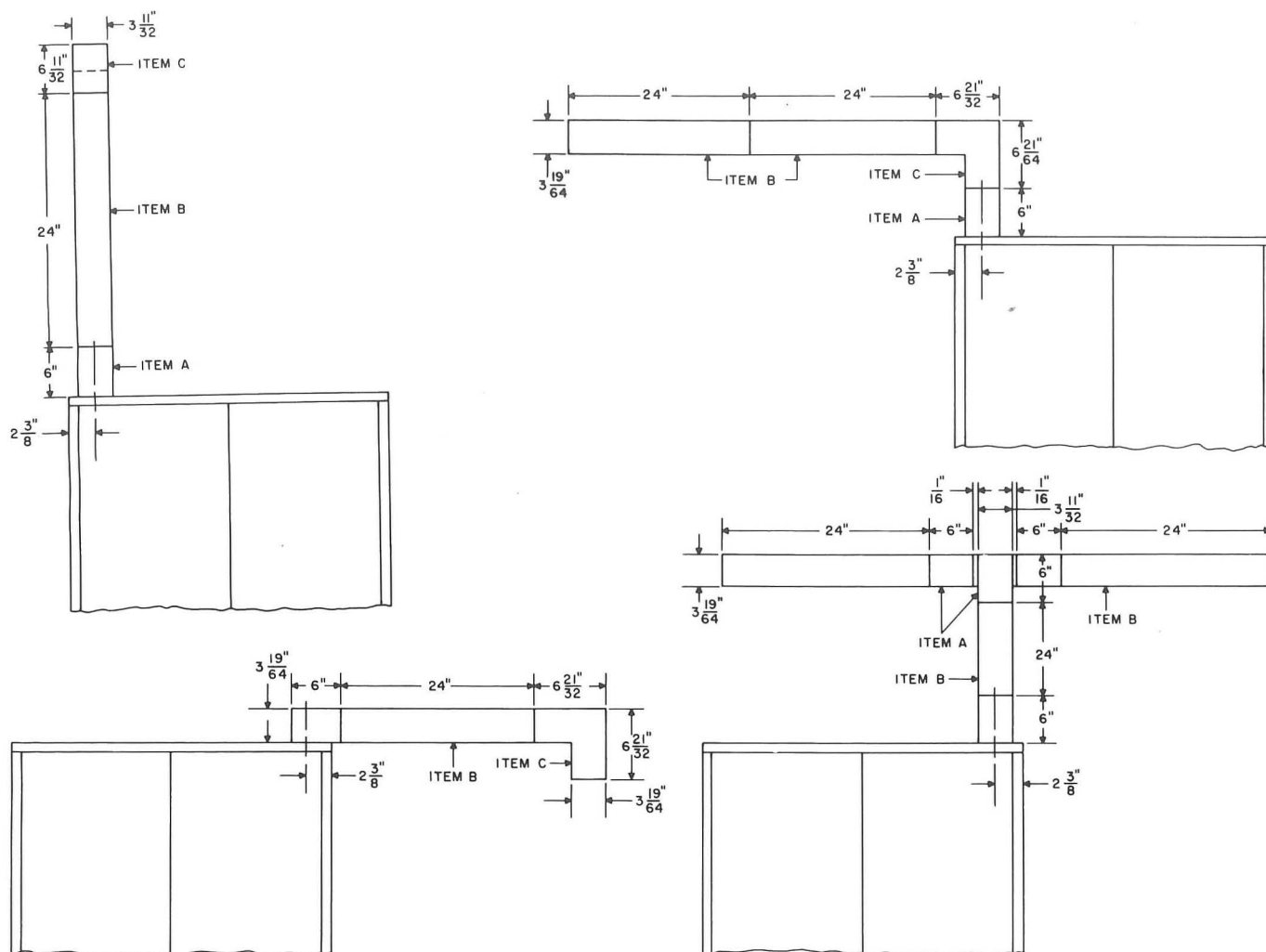


Figure 14. Dolly assembly.





ITEM	DESCRIPTION
A	NO.14650 TROUGH END
B	NO.14657 TROUGH
C	NO.014652 TROUGH ELL

Figure 15. Trough layout.

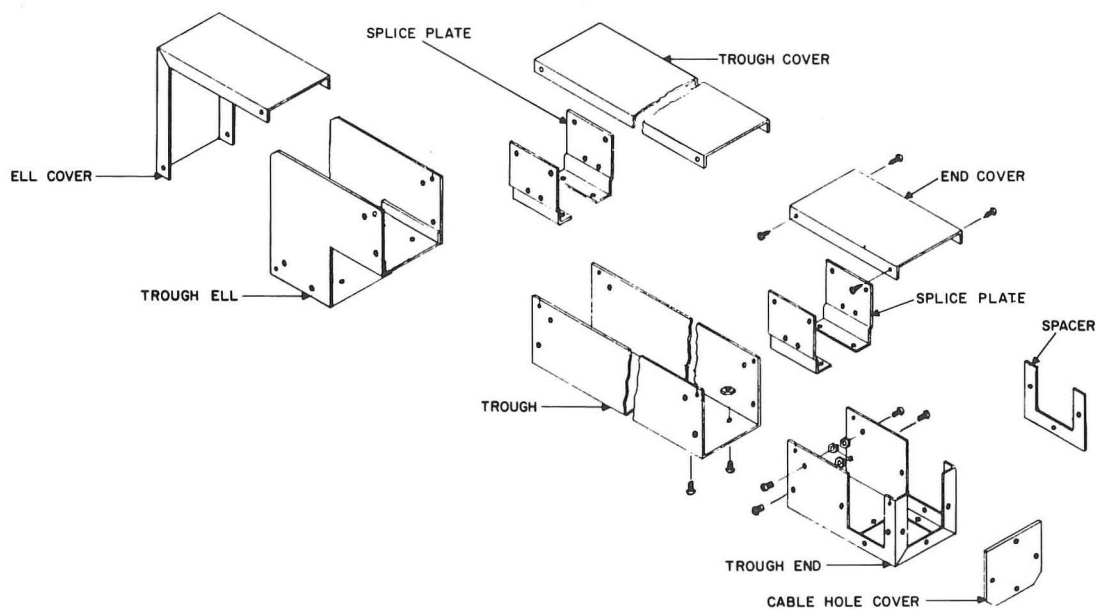


Figure 16. Trough assemblies.



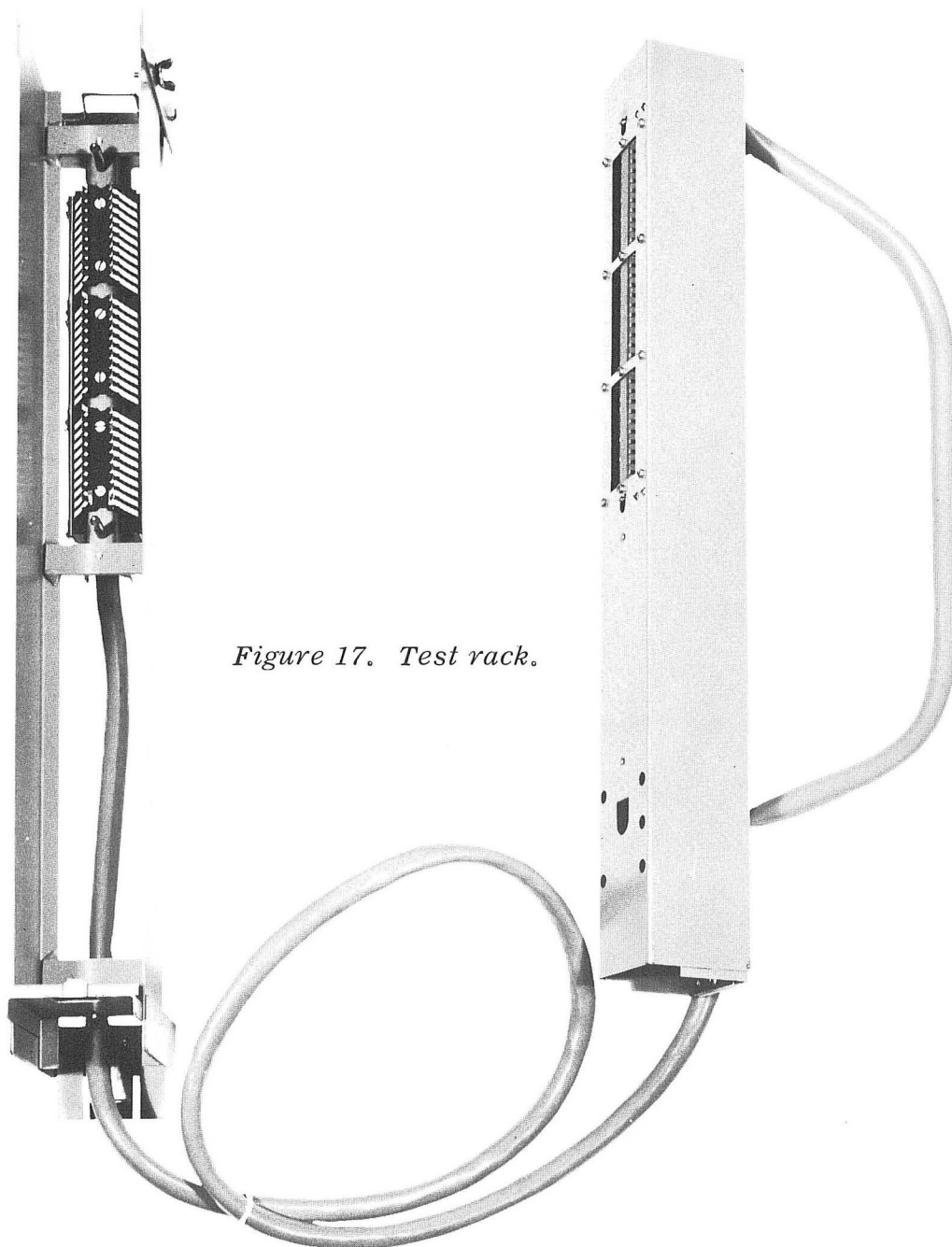


Figure 17. Test rack.

TABLE G: Switchboard Cable Requirements for the Type 40 P-A-B-X

Connection - from - to	Code	Number of singles	Number of pairs	Wire gauge
City trunk lines - Switchboard bay (T1 block) to distribution box (MDF)	D-910003-A	--	11	22
Attendant's turret leads - Switchboard bay (T1 block) to attendant's turret	D-910015-A	26	26	22
Busy lamp field - Switchboard bay (E7 block) to busy lamp field of attendant's turret	D-910010-A	--	25	22
Stations 21 - 50 Switchboard bay (E7 block) to distribution box (MDF)	D-910010-A	--	40	22

TABLE H: Switchboard Cable Requirements for the Type 80 P-A-B-X

Connection - from - to	Code	Number of singles	Number of pairs	Wire gauge
City trunk lines - Switchboard bay (T4 block) to distribution box (MDF9)	D-910008-A	--	20	22
Stations 211-240 - Switchboard bay (E14 block) to distribution box (MDF)	D-910016-A	--	40	22
Stations 251-280 - Switchboard bay (E15 block) to distribution box (MDF)	D-910016-A	--	40	22
Attendant's turret leads - Switchboard bay (T4 block) to attendant's turret	D-910019-A	40	40	22
Busy lamp field - Switchboard bay (E14 & E15 blocks) to busy lamp field of attendant's turret	D-910018-A	--	50	22

### 13. PREVENTIVE MAINTENANCE

The importance of preventive maintenance cannot be overemphasized. By performing a series of prescribed operations at regular intervals major equipment breakdown can be avoided.

Actually, the only moving parts in the Type 40 or Type 80 P-A-B-X are the relay armatures,

and unless disturbed these relays will maintain their adjustments for long periods of time. Cabinet doors should be kept closed at all times, except while performing scheduled tests or making minor repairs. The area surrounding the P-A-B-X should be kept free of dust and corrosive fumes.

Suggested routine procedure and general maintenance instructions are provided with each switchboard.





*Printed in U.S.A. by Edward Keogh Printing Company.*

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**ISSUE 2**