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701PK PRIVATE BRANCH EXCHANGE GENERAL DESCRIPTIVE INFORMATION

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1. INTRODUCTION

A. General

1.01 This section describes the 701PK step-by-step dial private branch exchange which provides for 200-line service in two 100-line frames (modules). (See Figure 1.)

1.02 This section is reissued to delete reference to the 711PK PBX and to add information on the heavy-traffic module, the incoming selector and dial repeating tie trunk module, and the relay rack framework assembly. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

B. Basic Module

1.03 The basic module (Fig. 1 and 2) operates independently for installations up to 100 lines or provides facilities for the first 100 lines in a 200-line installation. All apparatus required for the first 100 lines is self-contained. This module is also equipped with common alarm, line finder control, and shelf alarm equipment required for a 200-line installation.

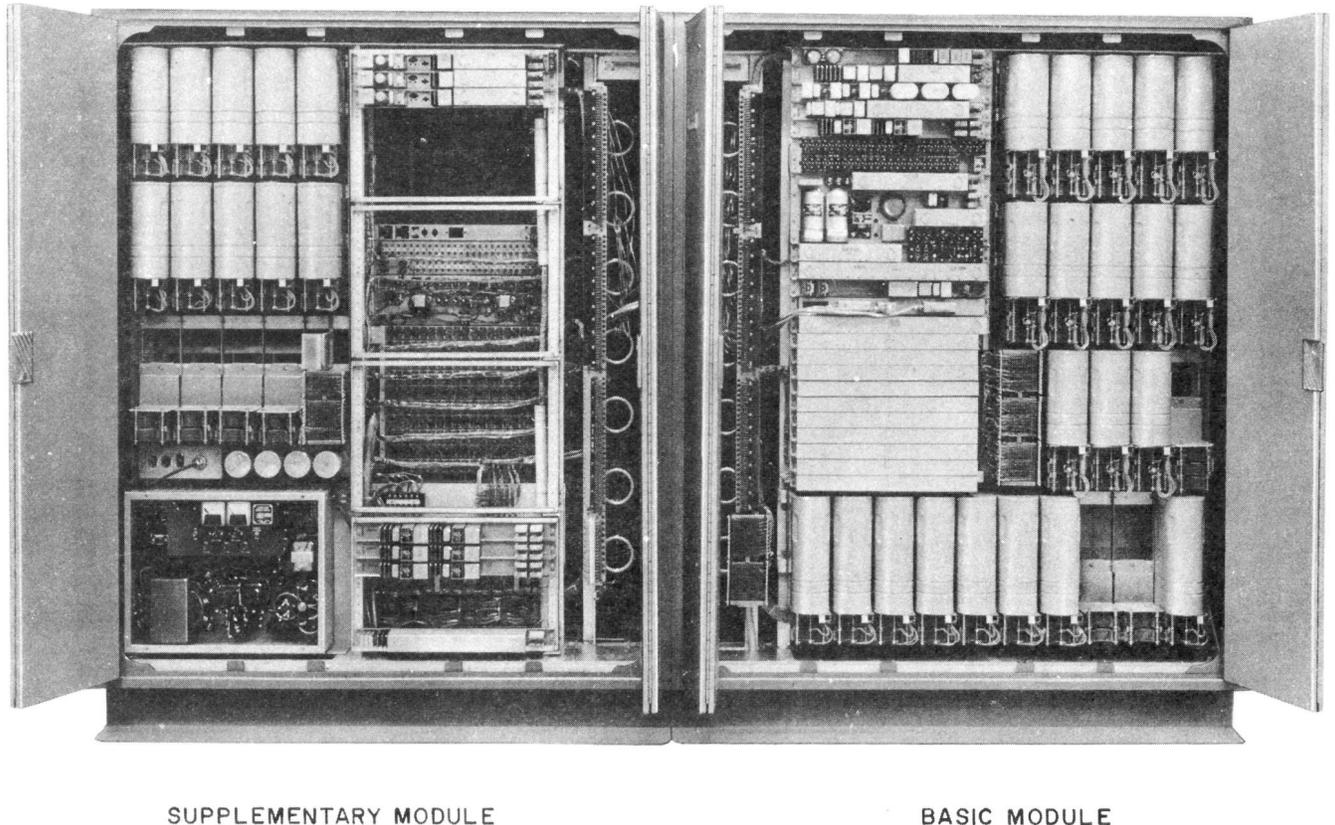


Fig. 1 — Front View of an In-Line Arrangement of the Two Modules With Cabinet Doors Open

C. Supplementary Module

1.04 The supplementary module (Fig. 1) is added to build out the 100-line facility provided by the basic module into a 200-line PBX for medium-heavy traffic. Positions for additional switches are provided for traffic growth.

D. Heavy Traffic Module

1.05 A heavy traffic module (Fig. 3) may be added to build out the line finder and selector switch capacity when traffic requirements exceed either the 14-line finder and associated selector capacity provided for 100 station lines or the 28-switch capacity provided for a 200-line system.

E. Incoming Selector and Dial Repeating Tie Trunk Module

1.06 An incoming selector and dial repeating tie trunk module (Fig. 4) may be added for use with the 552D or 608A switchboards to provide for incoming selectors and dial repeating tie trunks.

F. Calling

1.07 The 701PK is a 3-digit system with station numbers 200 through 299 assigned to the basic module and station numbers 300 through 399 assigned to the supplementary module. Dial equipment, controlled by dials at the station telephones, consists of step-by-step switches which

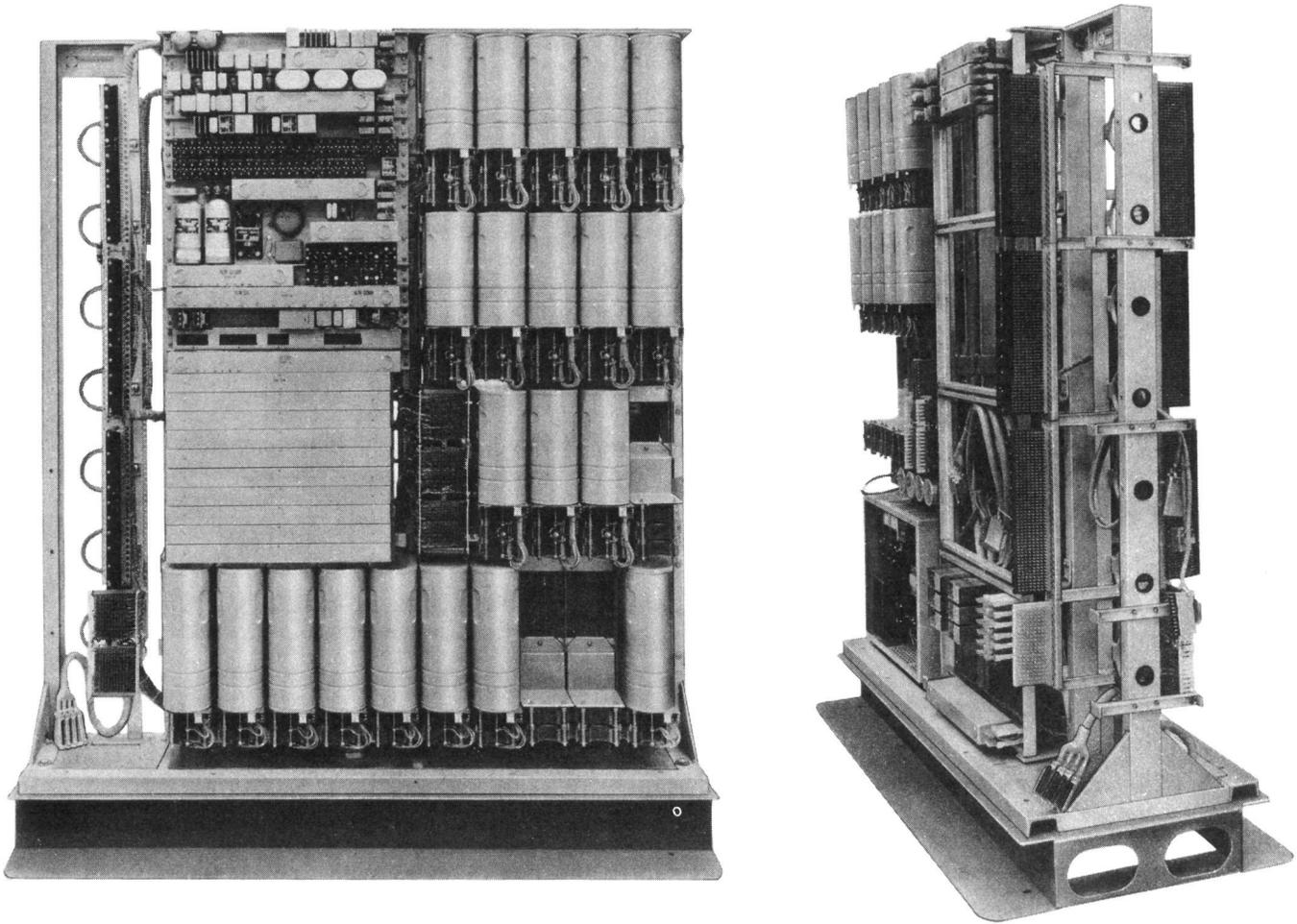


Fig. 2 — Front and Side Views of Basic Module Without Cabinet

connect one station to another or to central office trunks or tie trunks.

1.08 Intercommunicating calls are completed by dialing. Calls outgoing to the central office or tie trunk calls are established either directly by dialing or via an attendant at the associated switchboard. Incoming calls from the central office are routed by the switchboard attendant to the station by means of jack connections. Jacks for each station line within the local PBX appear on the face of the switchboard.

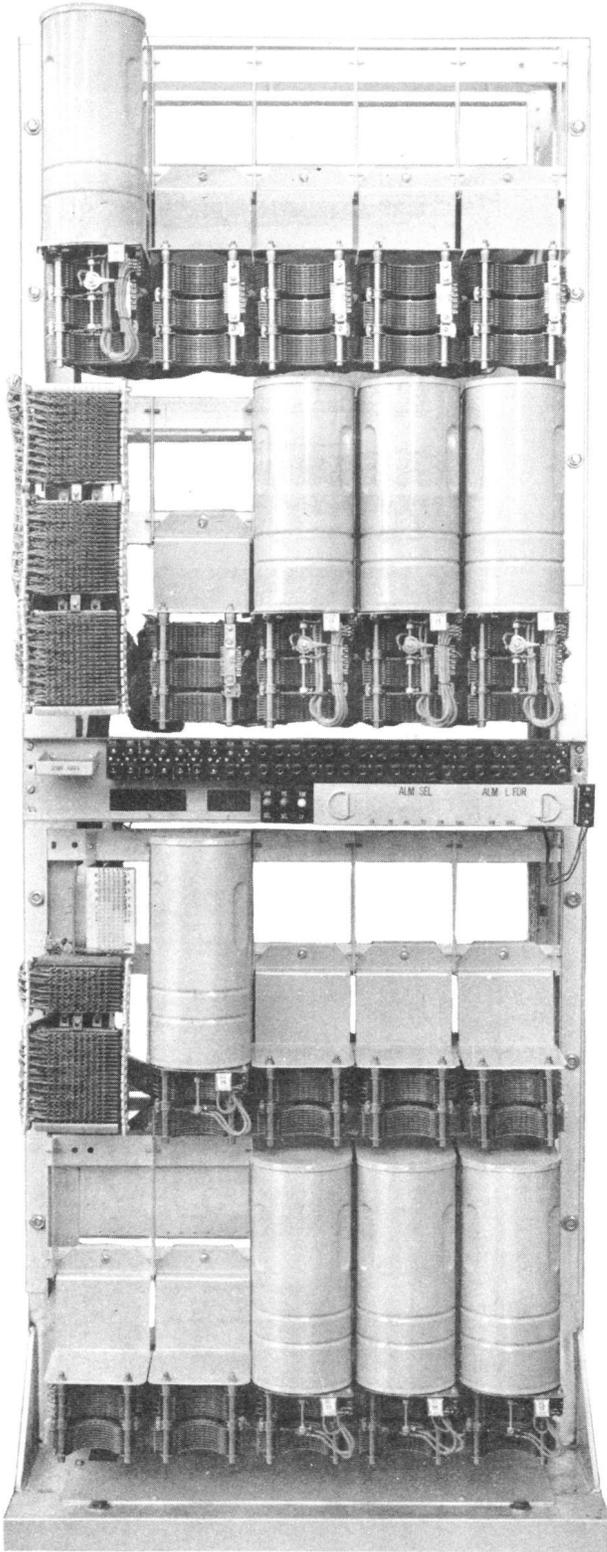
G. Capacity

1.09 The basic and supplementary modules are equipped with 98 dial station lines per module. Two lines per module are used for testing

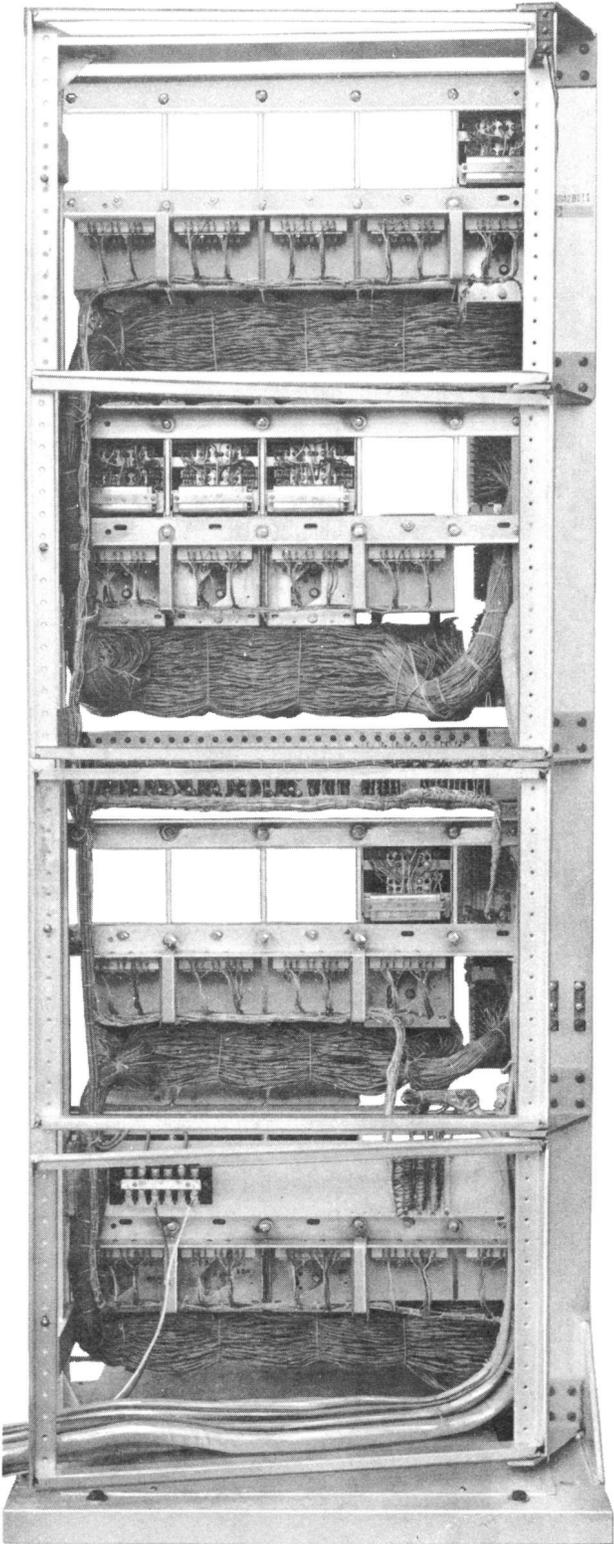
connectors. Each module is wired to accommodate a maximum of 14 line finders, 14 local first selectors, and 10 connectors. The two modules, however, are supplied with switches for medium-heavy traffic for a 200-line installation as follows:

SWITCHES	BASIC	SUPPLEMENTARY
Line Finders	13	10
Selectors	13	10
Connectors	8	8

1.10 Trunks and miscellaneous units are mounted on the frames and gates of each module as required. The basic unit is equipped with a common alarm circuit, manual conference circuit, test line circuit, selector level intercept trunk, connector intercept trunks, and a 9-ampere

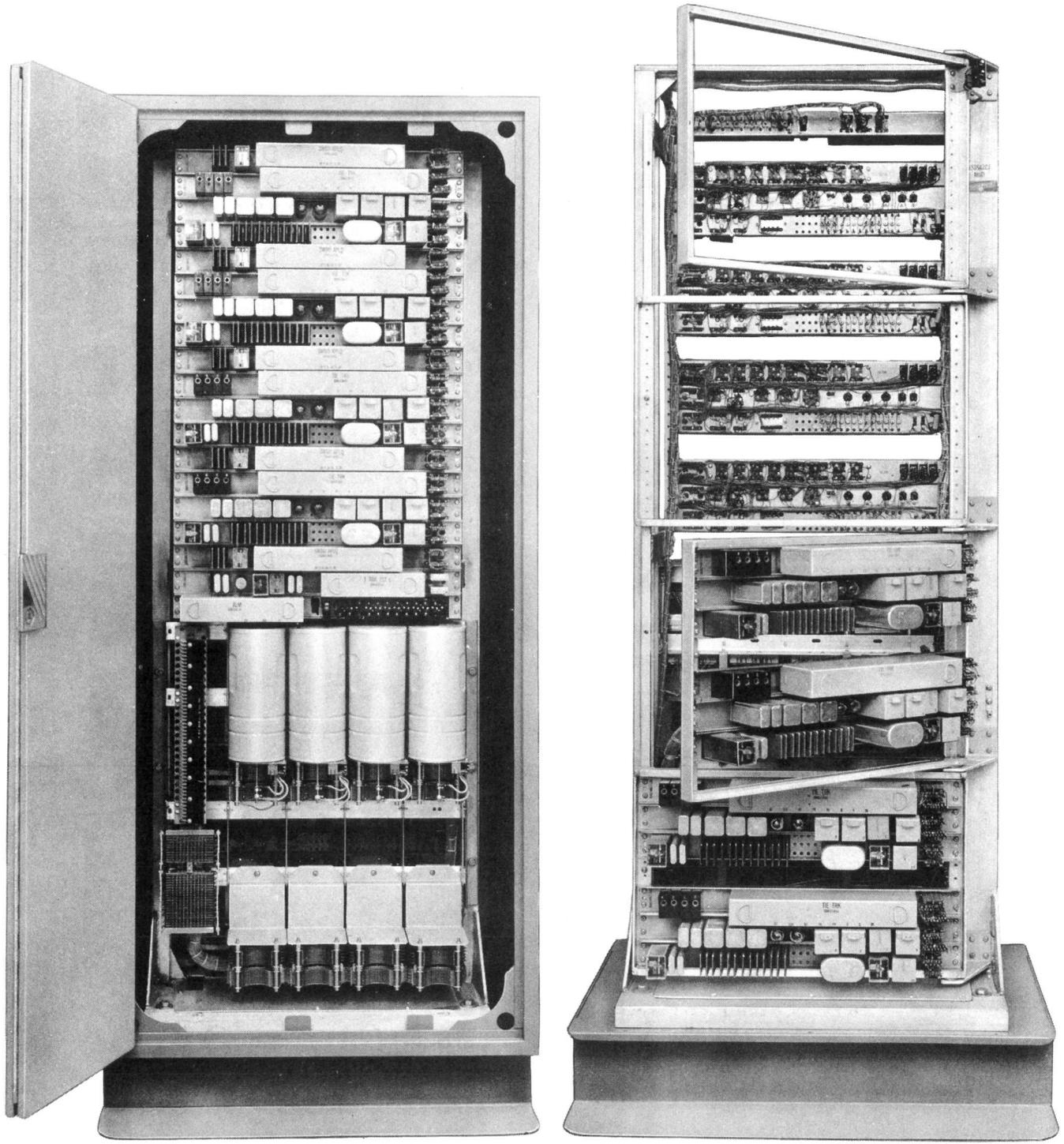


A — Front



B — Rear

Fig. 3 — Front and Rear View of Heavy Traffic Module



A — Front View

B — Rear View

Fig. 4 — Front and Rear View of Incoming Selector and Dial Repeating Tie Line Frame

batteryless power plant. The supplementary module is equipped with a control and transfer unit and a 9-ampere batteryless power plant. All modules are equipped with four gates having mounting plate capacity of thirty-one 2- by 23-inch mounting plates for central office trunks, attendant trunks, etc, as required. A relay rack framework assembly (Fig. 5) may be added to provide space for sixty-two 2- by 23-inch mounting plates if required.

1.11 The heavy traffic module is wired for a maximum of nine line finder switches and nine first selectors. It is initially equipped with four line finder and four selector switches.

1.12 The incoming selector and dial repeating tie trunk module is wired for 8 incoming selectors and 12 trunks when used with the 552D switchboard, or 8 incoming selectors and 13 trunks when used with the 608A switchboard. It is initially equipped with four incoming selectors and six dial repeating trunks.

H. Operating Features

1.13 The 701PK PBX provides the following operating features for a 100- or 200-line installation.

- (a) Station hunting
- (b) Power failure transfer
- (c) Vacant selector level intercept
- (d) Vacant connector terminal intercept
- (e) Station restriction of outgoing central office calls
- (f) Batteryless power plant for each module
- (g) Attendant controlled transfer (flashing)
- (h) Attendant controlled conference (manual)
- (i) Common alarm system
- (j) Attendant "0" level trunk
- (k) Connector test line

I. Optional Features

1.14 The following optional PBX features may be provided.

- (a) Battery reserve supply

- (b) Code calling and dictation equipment
- (c) Message waiting
- (d) Long distance terminal

J. Power

1.15 A batteryless power plant, housed in each 100-line module, operates from nominal 115-volt 60-cycle alternating current to supply the required battery and signaling currents. The two power plants are connected to divide the dc load equally, and automatic load transfer circuits are provided for emergency operation. An emergency battery reserve power plant is available on an optional basis when required.

K. Attendant Equipment

1.16 The 701PK operates with either a 608A or a 552D cord-type switchboard. The switchboard used may be of either the multiple or non-multiple type, depending upon installation requirements.

L. Shipping and Installation

1.17 The size and weight of the eight shipping boxes (excluding switchboard) required for a 200-line installation permit transportation to customer premises through standard 6-foot 6-inch doors and on modern elevators.

1.18 The modules may be equipped with acoustically treated cabinets. Thus, they may be installed in a general office area as well as in an equipment room.

1.19 Preformed plug and receptacle terminated cables between the modules simplify installation and also reduce installation time. Machine-wired banks and terminal strips greatly reduce the number of installer connections.

2. SWITCHING EQUIPMENT

2.01 The basic element of this system is the step-by-step switch, which consists of a switch unit together with one or more wiper spring assemblies and terminal banks (Fig. 6). Each bank consists of ten levels of terminals in a partial circle. This switch steps upward for level selection and rotates for terminal selection.

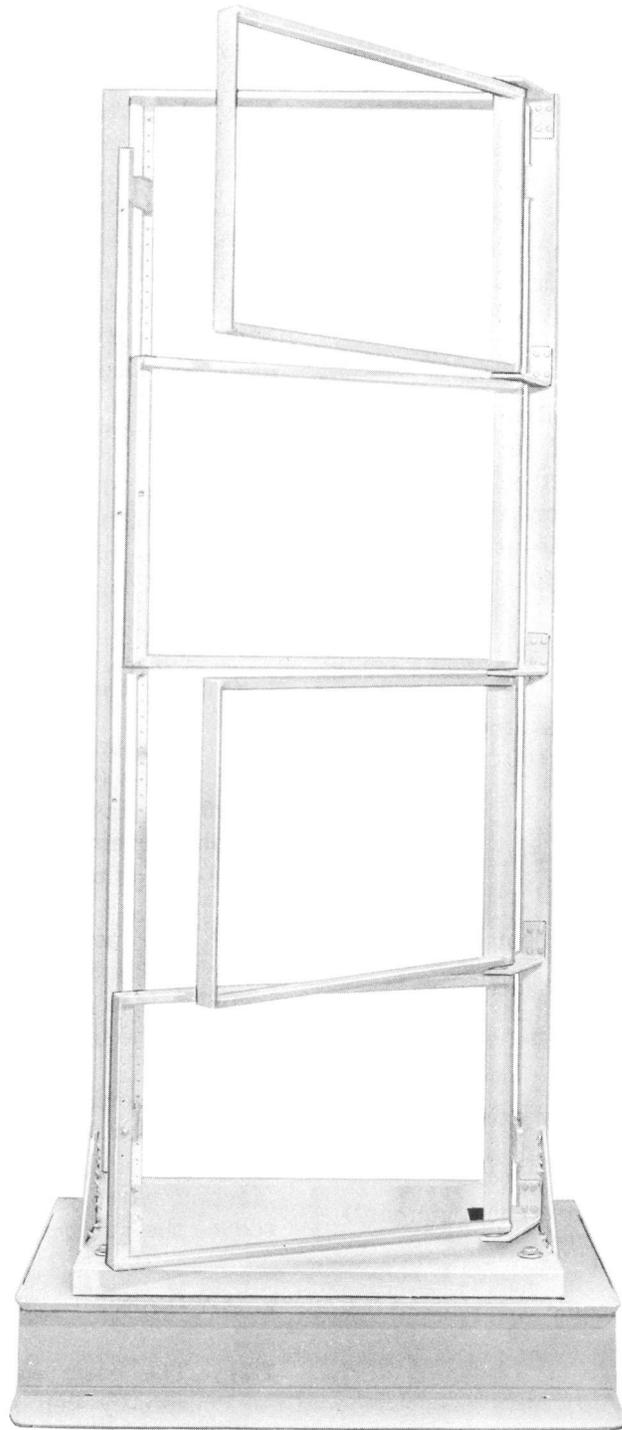


Fig. 5 — Relay Rack Framework Assembly

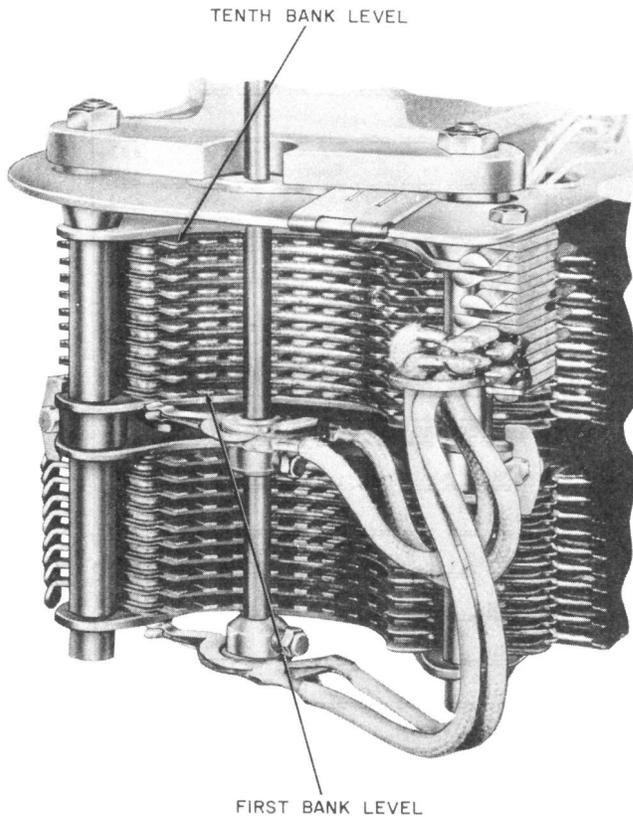


Fig. 6 — Step-by-Step Switch Bank Assembly and Mounting

A. Line Finders

2.02 The line finder switch (Fig. 7) operates automatically and consists of three 200-point switch banks, each with an associated wiper assembly, to care for the tip, ring, and sleeve terminals of 200 station lines. A vertical commutator and commutator wiper assembly are added to provide the level hunting feature.

2.03 The tip and ring terminals (T and R) of the 200 through 299 station numbers appear in the lower switch bank; the tip and ring terminals (T1 and R1) of the 300 through 399 station numbers appear in the middle bank. In the top bank, the sleeve leads of the 200 through 299 station numbers are wired to the S terminals and those of the 300 through 399 station numbers are wired to the S1 terminals. (See Figure 8.)

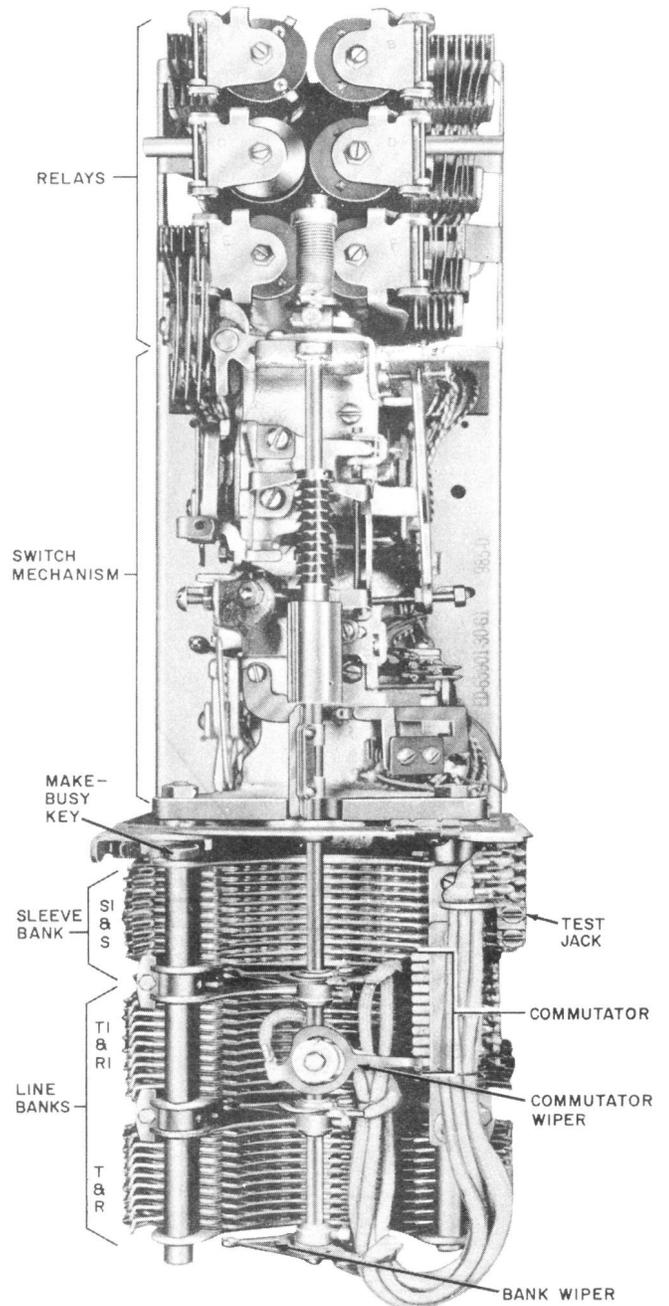


Fig. 7 — 200-Point Line Finder Switch

2.04 The line finder banks on any combination of basic, supplementary, and heavy traffic modules are multiplied together to serve one line finder group by means of plug-in connectors and formed cable through the module bases. Local cables from the line finder jacks and like numbered selector jacks are terminated on a 252A terminal strip to facilitate wiring to future TOUCH-TONE calling equipment. Straps on the terminal strip

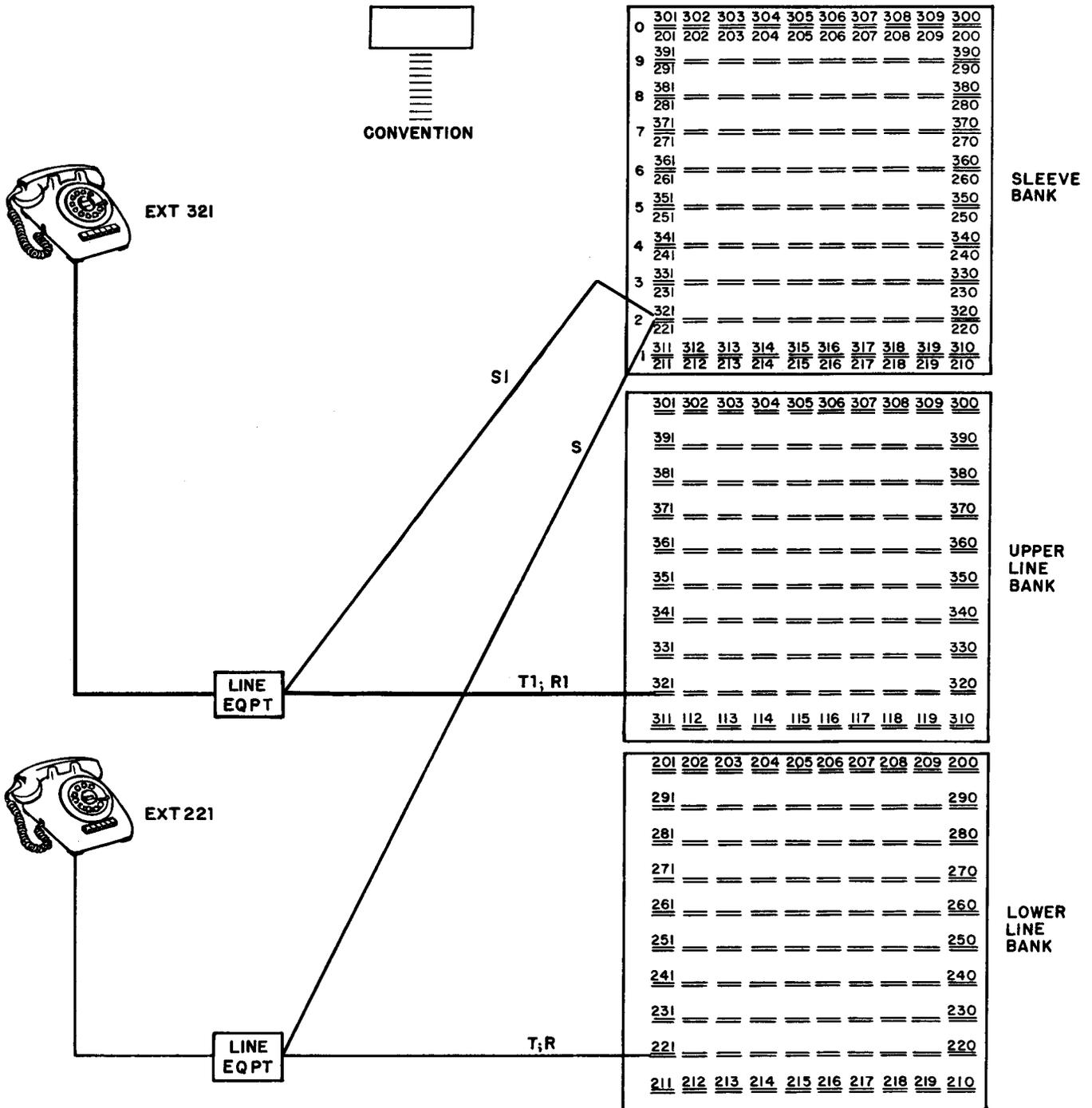


Fig. 8 — 200-Point Line Finder Switch Showing Bank Numbering At the Switch

connect each line finder to the associated selector. Local cables connect the station relays to the subscriber line terminal strip on the distributing frame vertical.

2.05 Line finder switch positions are numbered as follows:

MODULES EQUIPPED	SWITCH POSITIONS
(a) Basic module	1 through 14
(b) Basic and supplementary modules	1 through 10, 21 through 24 (basic) and 11 through 20, 25 through 28 (supplementary)
(c) Basic and heavy traffic modules	1 through 10, 21 through 24 (basic) and 11 through 17, 19, 20 (heavy traffic)
(d) Basic, supplementary, and heavy traffic modules	1 through 10, 31 through 34 (basic), 11 through 14, 18, 25 through 30, 35 through 37 (supplementary), and 15 through 17, 19 through 24 (heavy traffic)

2.06 All of the line finders, line finder banks, and associated line relays constitute a line finder group. The line finder group is divided into ten subgroups. In a fully equipped 200-line PBX system with heavy traffic module, subgroup 1 is comprised of line finder switches 1, 21, 27, and 31;

subgroup 2 is comprised of switches 2, 18, 22, and 32 etc (Fig. 10). In smaller systems the higher numbered switches would not be provided. However, the subgroup pattern for the number of switches actually provided follows a similar numbering pattern as indicated above (Fig. 11). Switches may be added, removed, or relocated to meet changing traffic requirements without affecting the chaining sequence of the equipped subgroups. Each of the ten line finder subgroups serves ten station lines from the basic module and ten station lines from the supplementary module.

2.07 To reduce line finder hunting time and to distribute the traffic load among the line finders, a retrograde slip (from right to left) wiring method on the line finder bank is used (Fig. 9). Therefore, the 20 lines of subgroup 1 appear on the first level of the line bank of subgroup 1 switches; the 20 lines of subgroup 2 appear on the second level of the line bank of subgroup 1 switches and appear on the first level of line bank of subgroup 2 switches; the 20 lines of subgroup 3 appear on the third level of the line bank of subgroup 1 switches and appear on the first level of the line bank of subgroup 3 switches, etc. Also, the 20 lines of subgroup 1 that appear on the lowest bank level of subgroup 1 switches appear on the corresponding top bank level (level 10) of subgroup 2 switches and on bank level 9 of subgroup 3 switches. If the first choice switch in a subgroup is busy, the call is advanced through the subgroup to the first idle switch. If all the line finders in the subgroup are busy, the call is directed to an idle switch in the next lower numbered subgroup.

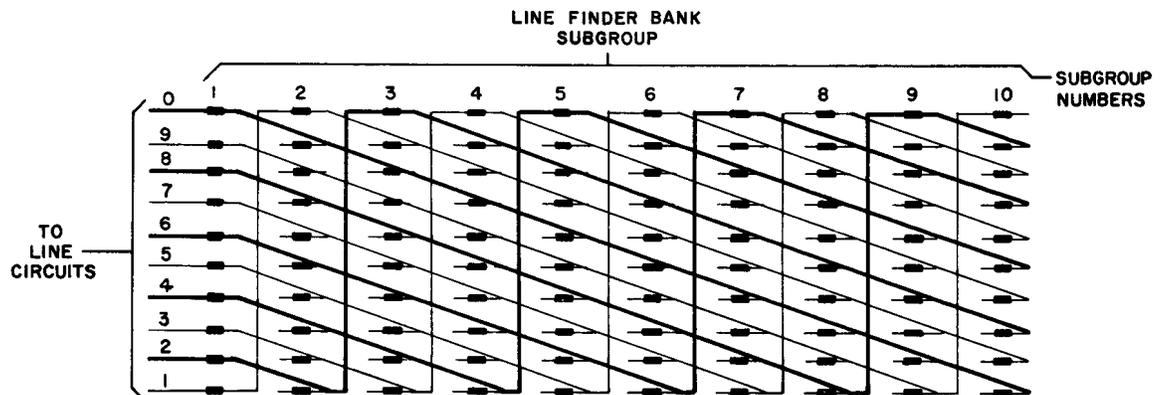
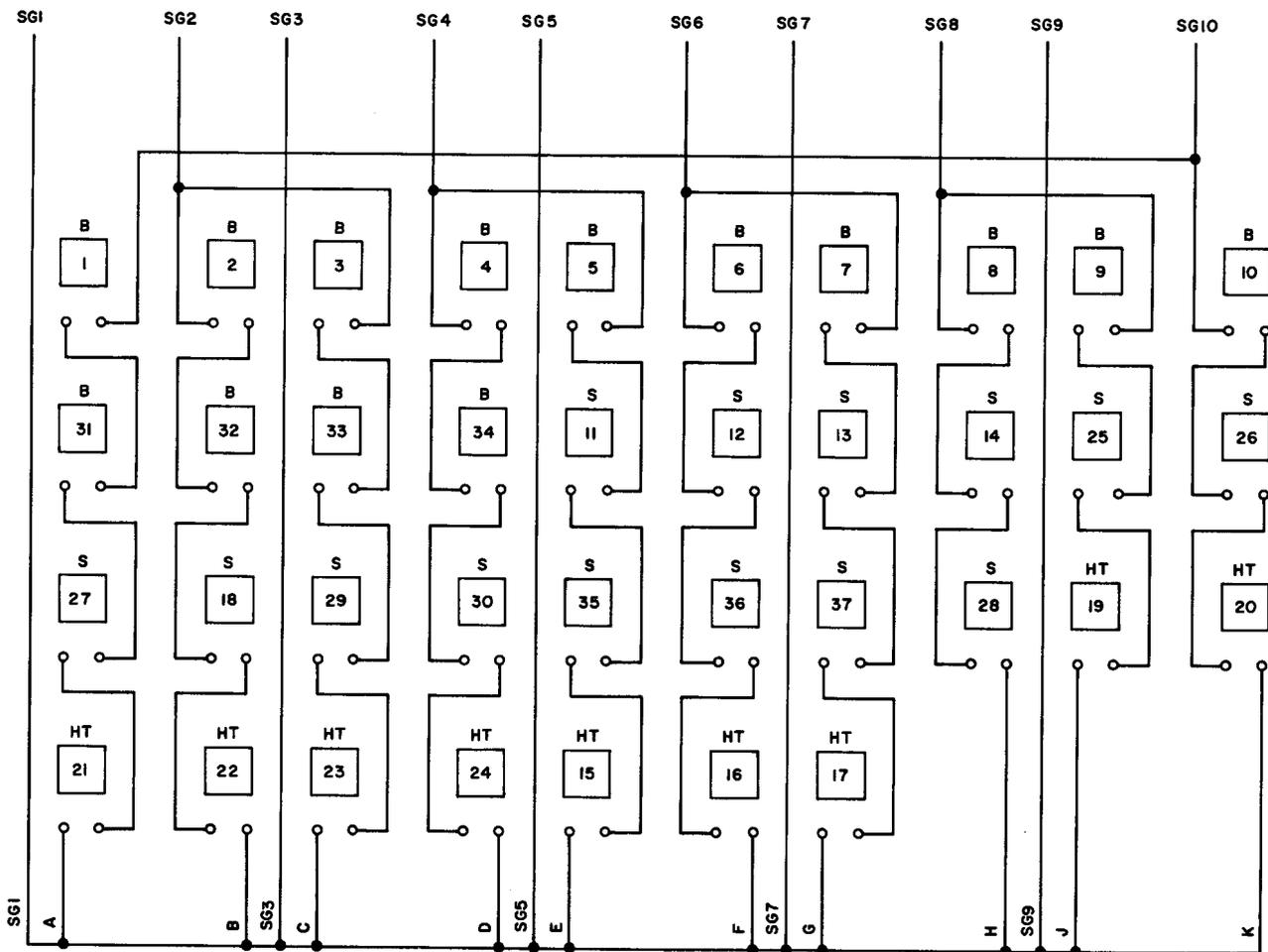


Fig. 9 — Line Finder Bank Slip

2.08 When a call is originated, the associated line and subgroup relays apply (1) ground to the start lead for starting the line finder, (2) ground to the commutator lead to mark the vertical commutator level, and (3) battery to the sleeve terminal so that the calling station line may be extended to an idle selector associated with the line finder.

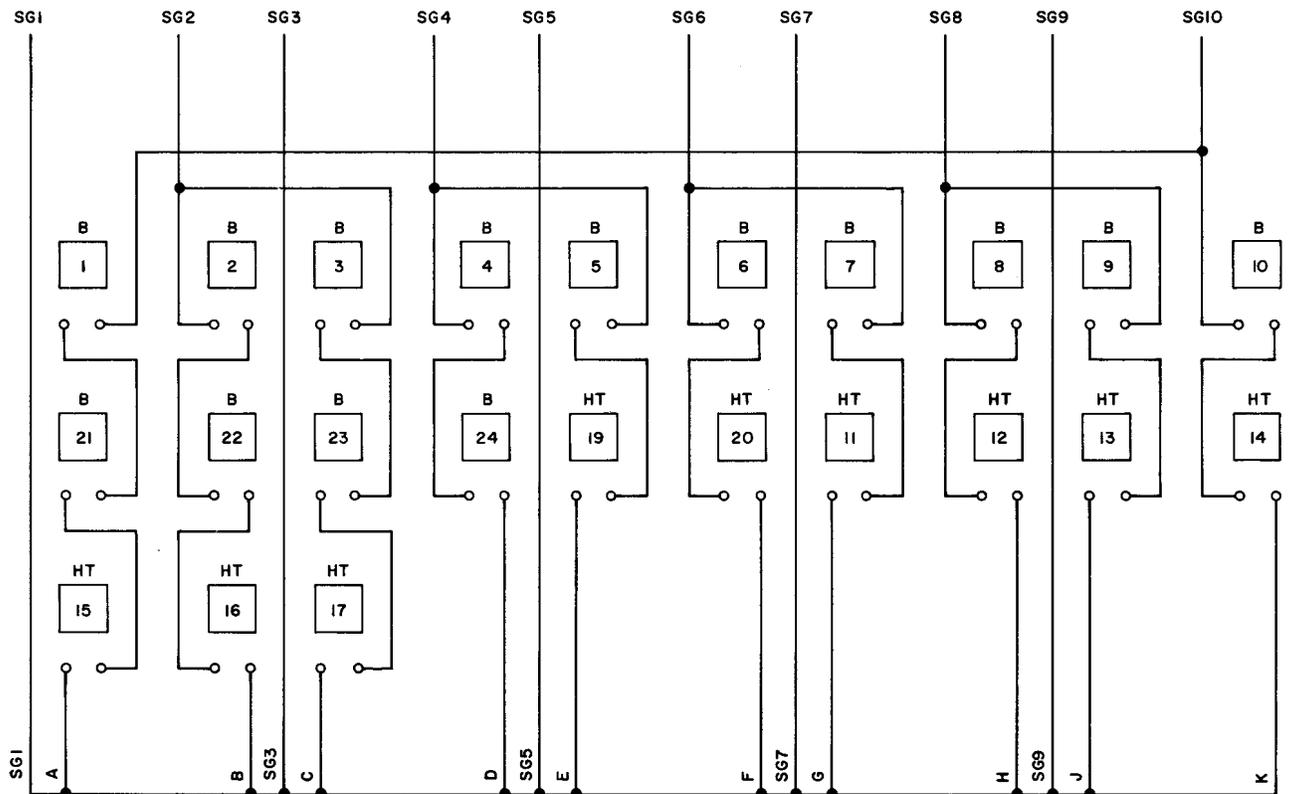
B. Selectors

2.09 Selector switches (Fig. 12) are designated both by type and by their position in the switching train, and are used to select trunks to other switches, central office trunks, or attendant and tie trunks.



NOTE:
 LETTER ABOVE SWITCH NUMBER IN BLOCK DENOTES LOCATION OF SWITCHES - "B" SWITCHES IN INITIAL OR BASIC MODULE, "S" SWITCHES IN SUPPLEMENTARY MODULE, "HT" SWITCHES IN HEAVY TRAFFIC MODULE.

Fig. 10 — Start Circuit Arrangement — 200-Line With Heavy Traffic Module



NOTE:
 LETTER ABOVE SWITCH NUMBER IN BLOCK DENOTES
 LOCATION OF SWITCHES - "B" SWITCHES IN INITIAL OR
 BASIC MODULE, "HT" SWITCHES IN HEAVY TRAFFIC
 MODULE.

Fig. 11 — Start Circuit Arrangement — 100-Line with Heavy Traffic Module

2.10 The selector equipment on each of the basic, supplementary, and heavy traffic modules is patterned after associated line finder arrangements on the respective modules and is located on the opposite side of the frame from the line finders.

2.11 A selector level consists of ten terminals and only ten trunks may be assigned to any given level when the level is cabled common to all the shelves serving a group of selectors. When more than ten trunks are to be provided in a trunk group, a trunking arrangement known as a graded multiple is used. Where this is done, the terminals of a given selector level, instead of being wired to bank multiple strips mounted on each shelf unit, can be connected together by direct cable or cabled

to the distributing frame and cross-connected together. This permits certain trunks, called common trunks, to appear before all selectors in the group; others, known as individual trunks, are wired to separate selectors within the group.

2.12 The individual trunks, first choice to the selectors, are always the lower numbered trunks. A reversal, used to reduce the selector hunting time, is usually placed at the middle of the subgroup. The tenth trunk, used for last trunk-busy registration, is always a straight multiple.

2.13 The terminals of the top or zero level of the first selector multiple are connected to attendant trunks, and those of the ninth level are

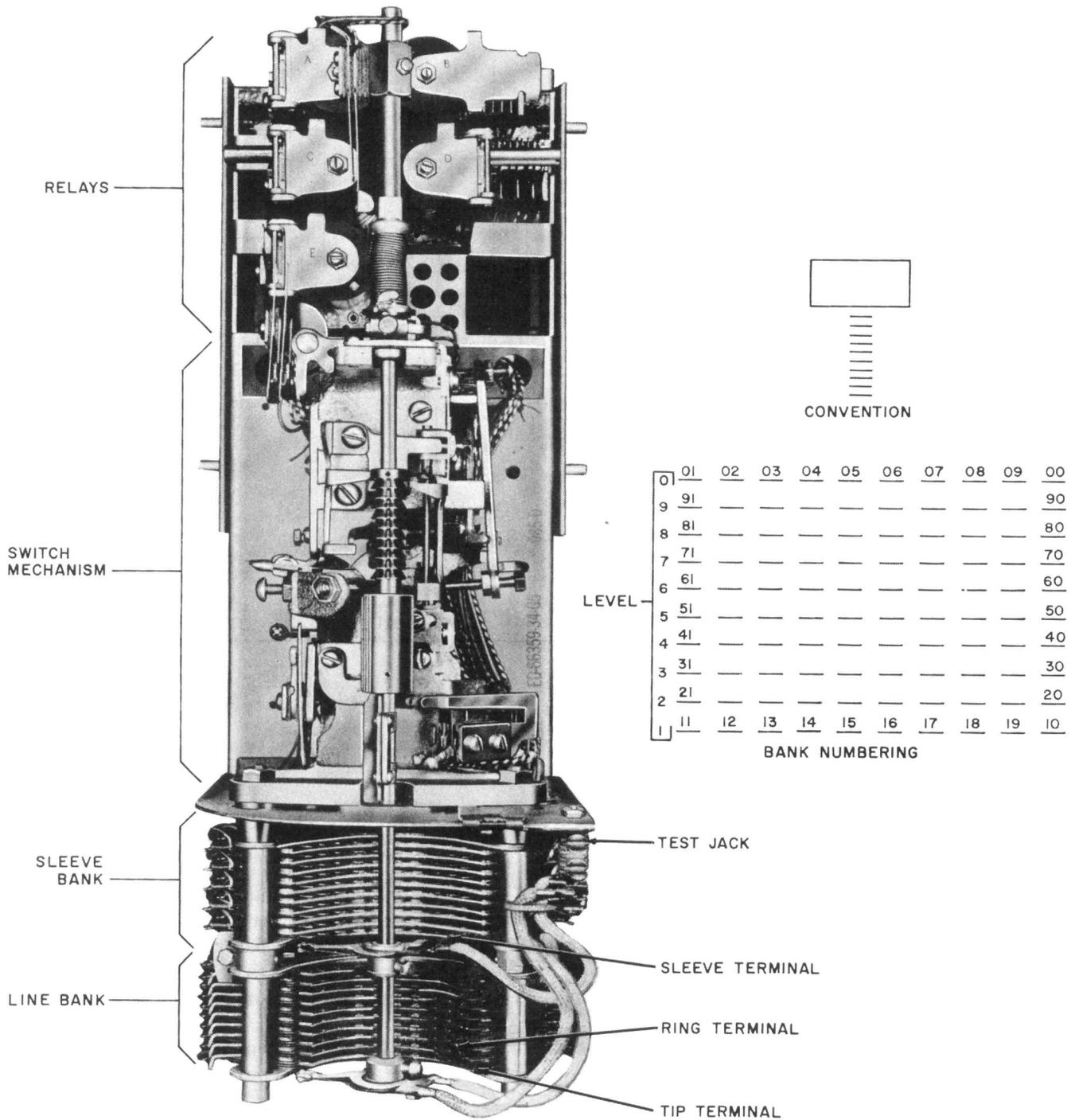


Fig. 12 — Selector Switch

connected to central office trunks. The terminals of the lower levels may be extended to connectors. The first level is preferably unassigned to minimize the possibility of a preliminary pulse because of switch hook operation or similar action by the station user. However, where the numbering system requires its use, the first level may be used for access to service code groups. Any remaining levels on the selector multiple may be used for tie trunks, foreign exchange trunks, etc.

2.14 Fifteen trunks (Fig. 13) on each of selector bank levels 7, 8, and 9 of each module are provided with a graded multiple trunking arrangement. A typical arrangement in the basic module is as follows:

(a) Terminals 1 through 5 on selector switches 1 through 5, 9, and 10 of subgroup A are connected in multiple to provide five individual trunks.

(b) Terminals 6 through 10 on selector switches 1 through 14 are connected in multiple to provide five common trunks. Trunks from terminals 6 through 9 are reversed between modules to reduce selector hunting time. Terminal 10, used for last trunk-busy registration, is a straight multiple.

(c) Terminals 1 through 5 on selector switches 6 through 8 and 11 through 14 of subgroup B are connected in multiple to provide five individual trunks.

A similar arrangement is provided in the supplementary module.

2.15 For station-to-station dialing, a first selector switch operates in response to the dialing of a hundreds digit. The switch wiper steps vertically to select a terminal level corresponding to the pulses generated by dialing. Automatic ro-

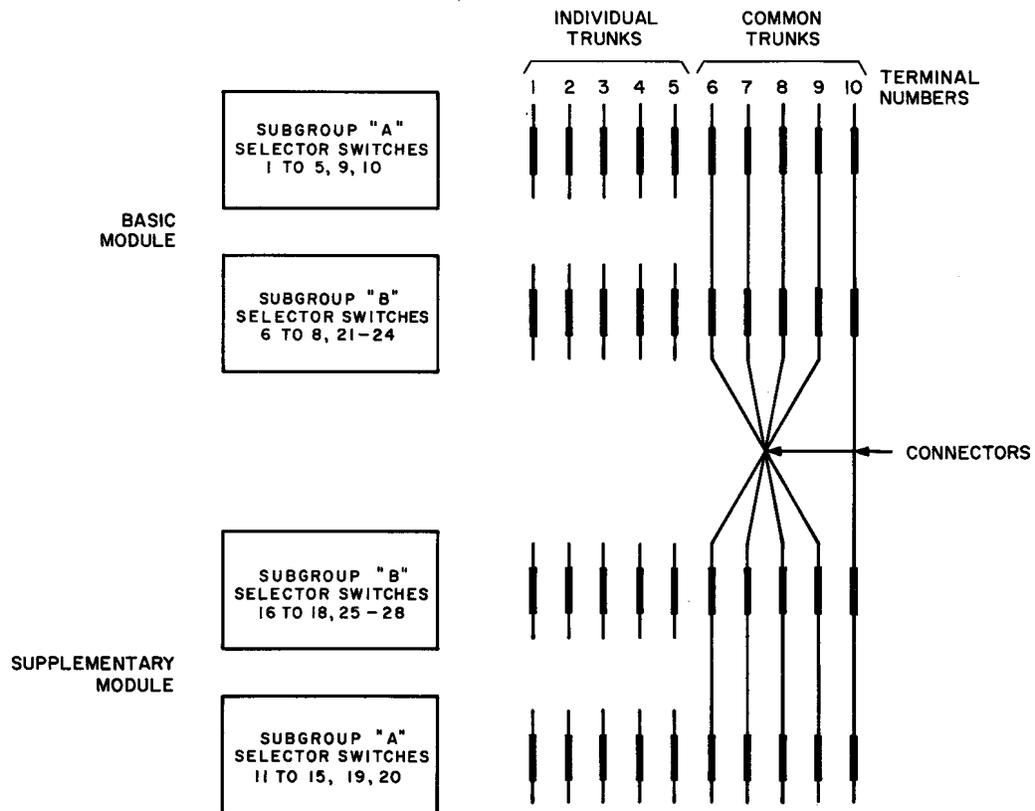


Fig. 13 — Typical Graded Multiple Arrangement of Selector Trunks (For Use On Levels 7 Through 9 Only)

tary motion then selects an idle trunk in the selector multiple. The first selector switch is permanently connected to a line finder switch. As soon as the line finder seizes the calling station line, the first selector switch returns dial tone to the calling station.

2.16 Outgoing calls routed through the first selector may encounter an all-paths-busy condition, that is, all outgoing trunks on a particular level are busy. The first selector will then step to the eleventh rotary position and return an audible busy tone to the calling station.

2.17 Incoming selectors provided in the incoming selector and dial repeating tie trunk module allow a distant PBX to have access to the selector bank multiple of the local PBX. This permits the attendant or stations from a distant PBX to complete calls over a dial repeating tie trunk and incoming selector into the local selector bank multiple on the same basis as a local station. Operation of the incoming selector is essentially the same as the first selector except that dial tone is not normally provided.

C. Connectors

2.18 The connector switch (Fig. 14) is the last step in the train of selection and operates in response to dial pulses for both the vertical and rotary motion. The tens and units digits of the 3-digit number control the connector. Dialing the tens digit determines the level selected; dialing the units digit determines the particular terminal to which connection is made.

2.19 Rotary hunting connectors are used to serve groups of consecutive lines. Each connector is capable of hunting over a predetermined group of terminals on the same level and of seizing the first idle terminal assigned to the group. The rotary hunting connector responds to dial pulses of the last two digits. If all lines in the group are busy, a busy tone is returned to the calling party after the last terminal in the group has been tested.

2.20 The functions of the connector are summarized as follows.

- (a) Testing the called line for busy and returning busy tone if the line is in use

- (b) Extending the connection to the called line if it is idle
- (c) Ringing the called line and returning audible ringing to the calling party
- (d) Removing ringing current from the called line when the called party answers
- (e) Holding all preceding switches operated until the connection is released
- (f) Reversing polarity on the calling side of the line for supervisory purposes
- (g) Releasing when the calling party disconnects and causing the release of all other switches used in the connection

3. ARRANGEMENT, DIMENSIONS, AND WEIGHTS

A. Arrangement

3.01 The structural design characteristics of the two 100-line modules, optional battery reserve supply cabinet, and optional feature modules effectively conform to an in-line arrangement with growth from right to left. The battery reserve supply cabinet may be located to the right of the basic module if required by local conditions. The heavy traffic module, the incoming selector and dial repeating tie trunk module, and the relay rack module illustrated in Figure 15 as feature bays may be added to either the 100-line basic module or the 200-line basic and supplementary modules as required.

B. Dimensions and Weights

3.02 Equipment dimensions and weight data are given in Table A.

4. SWITCH FRAMES

A. General

4.01 Step-by-step switch shelves and trunk gates are mounted on double sided frames of welded aluminum construction. A back-to-back frame arrangement provides adequate mounting facilities with easy access to apparatus and cabling. A distributing frame is mounted on the left end of the basic frame to match a similar distributing frame on the right end of the supplementary frame. Terminal strips are mounted adjacent to their respective switches.

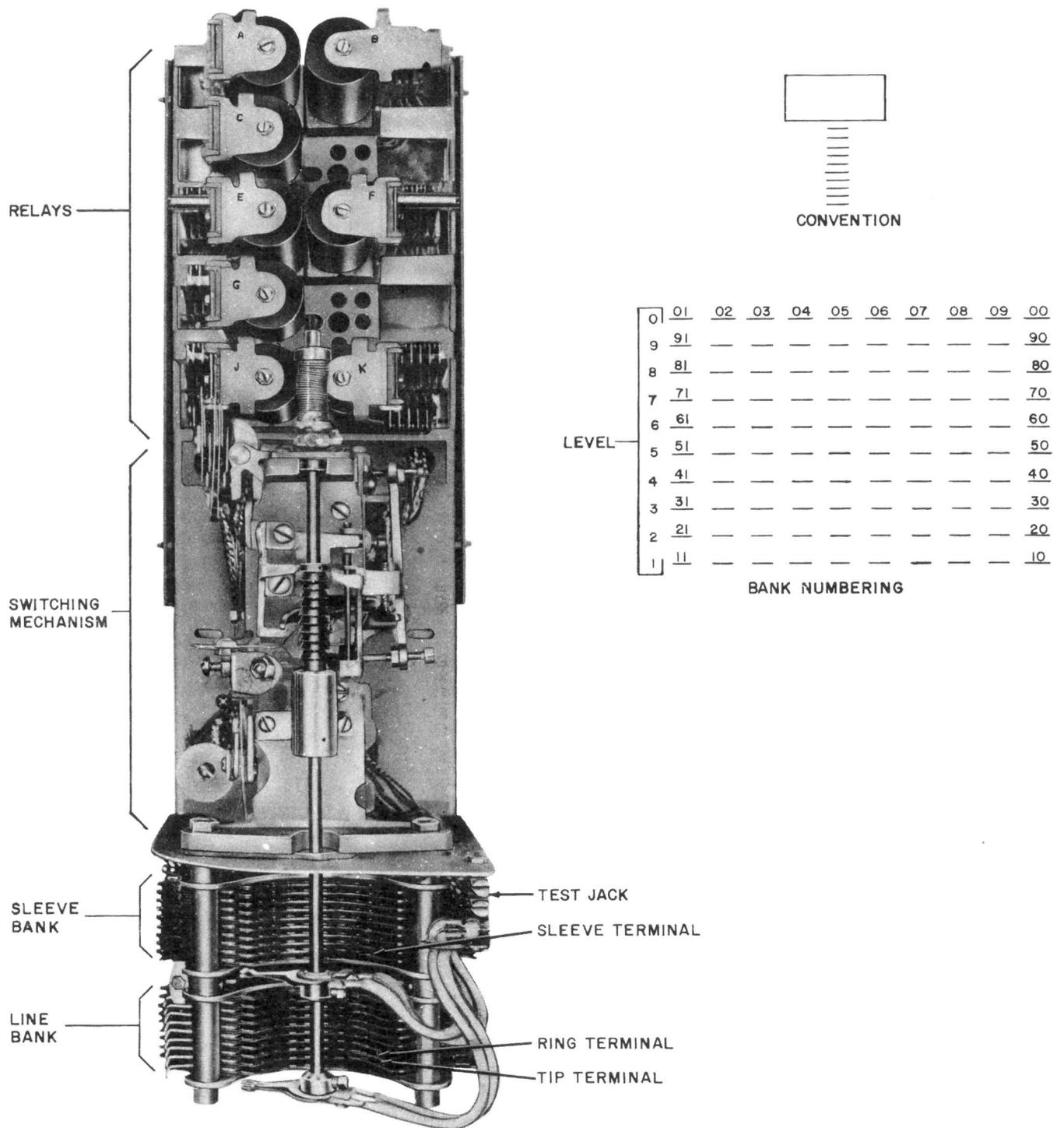


Fig. 14 — Connector Switch

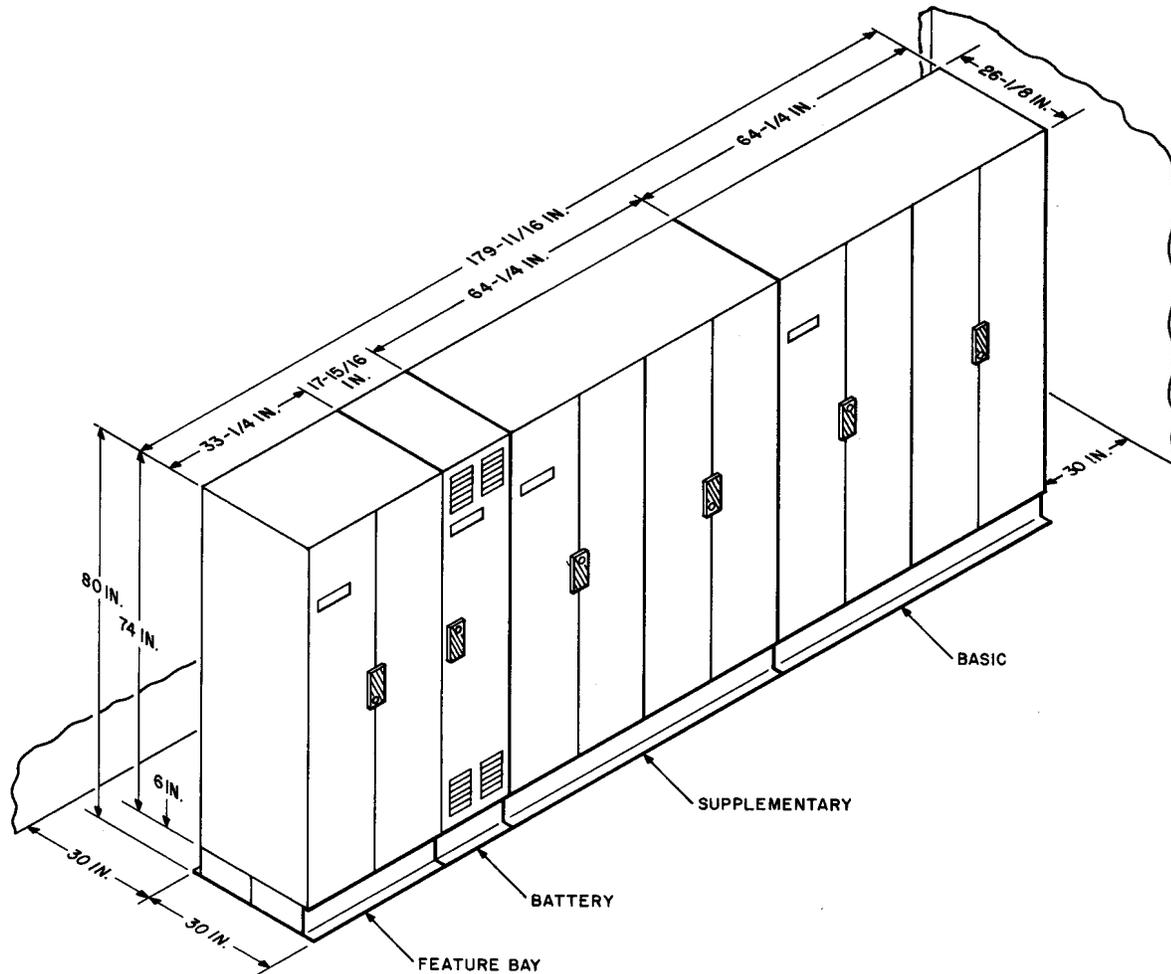


Fig. 15 — In-Line Arrangement of Two 100-Line Modules, Feature Bay, and Optional Battery Reserve Supply With Dimensions

4.02 The basic and supplementary frames are equipped as follows.

- (a) One 14-position line finder shelf
- (b) One 14-position selector shelf
- (c) One 10-position connector shelf
- (d) One distributing frame that mounts six 16-inch strips and one 8-inch terminal strip with space to mount the connector bank mechanized terminal strip
- (e) One fixed relay rack for mounting sixteen 2-inch by 23-inch plates
- (f) One fixed relay rack for mounting ten 1-3/4 inch by 21-inch plates

(g) Three relay rack gates for mounting eight 2-inch by 23-inch plates each

(h) One relay rack gate for mounting seven 2-inch by 23-inch plates

B. Basic Frame

4.03 The front of the frame (Fig. 16) mounts the line finder and connector switches. One hundred line relays, alarm equipment, a fuse panel, and several trunk circuits are rack mounted.

4.04 The rear of the frame (Fig. 17) mounts selector switches, machine-wired selector terminal strips, a power panel, a power plant, and variable quantities of central office trunks and optional equipment that are gate-mounted. The

TABLE A
EQUIPMENT DIMENSIONS AND WEIGHT DATA

DESCRIPTION	DIMENSIONS (INCHES)			APPROXIMATE WEIGHT (POUNDS)	
	LENGTH	DEPTH	HEIGHT	UNCRATED	CRATED
Basic 100-Line Switching Module Without Cabinet (less base)	62-1/2	22	70-1/2	1100	1250
Supplementary 100-Line Switching Module Without Cabinet (less base)	62-1/2	22	70-1/2	900	1050
Cabinets For 100-Line Switching Modules Without Base (each)	64-1/4	26-1/8	74	300	430
Mounting Base For Switching Modules (each)	64-1/4	30	6	115	150
Batteryless Power Supply Unit (each)	26-1/2	7-1/2	19	155	170
Heavy Traffic Module Without Cabinet (less base)	25-1/2	22	70-1/2	335	435
Incoming Selector and Dial Repeating Tie Line Module Without Cabinet (less base)	25-1/2	22	70-1/2	355	455
Cabinet For Heavy Traffic or Incoming Selector Modules Without Base (each)	33-1/4	26-1/8	74	150	225
Mounting Base For Heavy Traffic or Incoming Selector Modules (each)	33-1/4	30	6	65	85
Battery Charging Power Supply Unit (each)	26-1/2	7-1/2	19	160	175
Battery Cabinet With Base	17-15/16	26-1/8 *30	74 *6	245 †515	380

* Base dimensions

† With batteries

power panel is equipped with plugs for intermodular connection.

C. Supplementary Frame

4.05 The front of the frame (Fig. 16) mounts selector switches, machine-wired selector terminal strips, a power plant, a power panel, and mounting gates. The power panel is equipped with plugs for intermodular connection. Additional trunk circuits and optional equipment are gate-mounted.

4.06 The rear of the frame (Fig. 17) mounts line finder and connector switches, machine-

wired line finder and connector terminal strips, 100 line relays, alarm equipment, and a fuse panel.

D. Heavy Traffic Frame

4.07 The front of the frame mounts a maximum of nine line finders, nine selectors, and alarm circuits individual to the frame. On the rear of the frame, a set of four swinging gates hinged on the "I" beam upright will accommodate a total of thirty-one 2-inch mounting plates which may be equipped per job requirements. It is intended that the heavy traffic frame be located in a line-up with other installed modules to facilitate passing of the intermodule cables through the base openings.

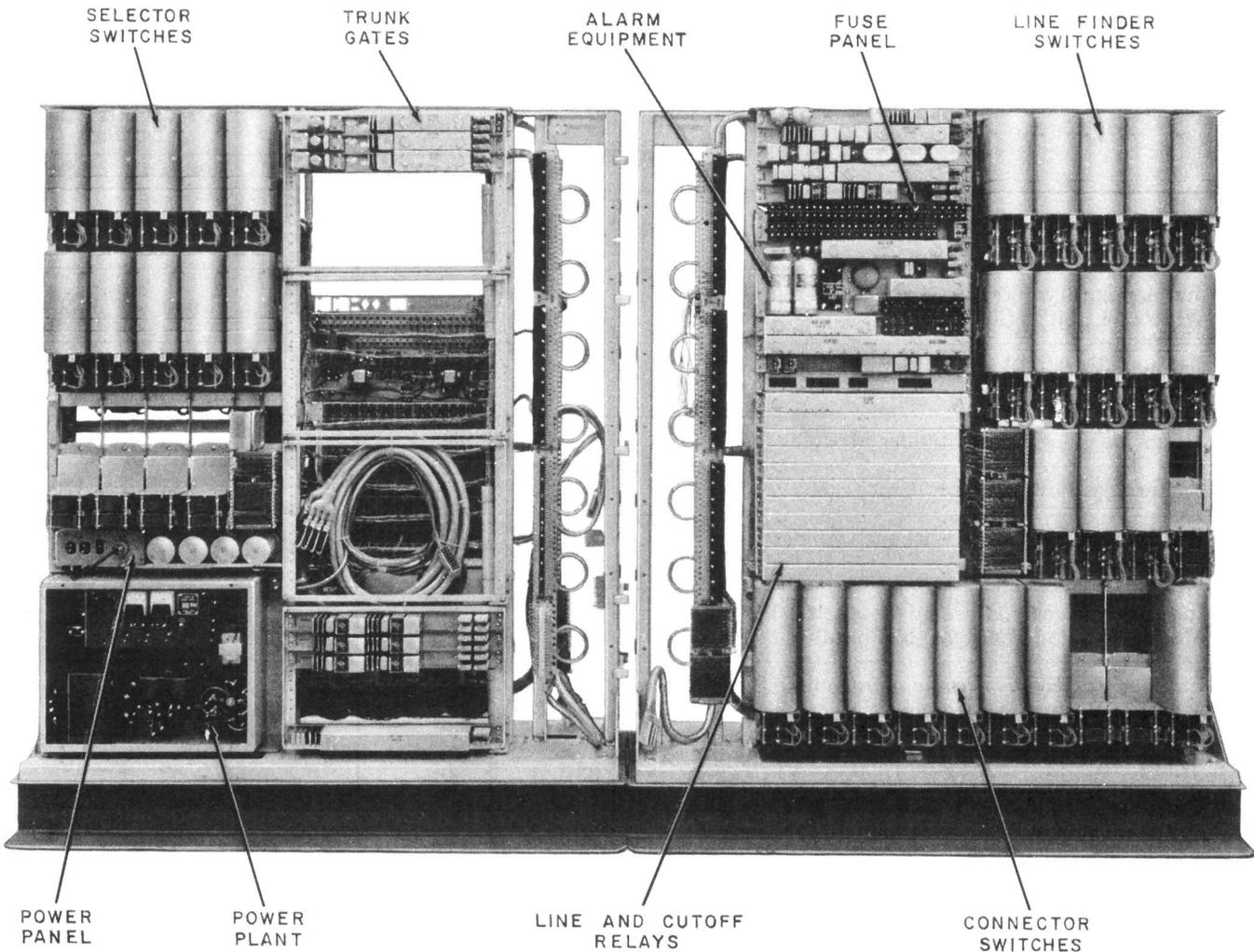


Fig. 16 — Front View of an In-Line Arrangement of the Two 100-Line Frames Without Cabinets

E. Incoming Selector and Dial Repeating Tie Line Frame

4.08 The front of the frame mounts a maximum of eight incoming selectors, alarm circuits individual to the frame, one tie trunk test line unit, and four dial repeating tie trunk units. On the rear of the frame, a set of four swinging gates hinged on the "I" beam upright provides thirty-one 2-inch mounting-plate spaces which are arranged to mount either eight additional tie-trunk units when used with a 552D switchboard or seven additional tie-trunk units when used with a 608A switchboard. An in-line location, with respect to other installed modules, will permit passing the intermodule cables through the base openings.

F. Battery Reserve Cabinet

4.09 A separate cabinet houses the batteries and associated equipment required for battery reserve.

5. POWER

A. Batteryless Power Plant

5.01 The 9-ampere batteryless power plant (Fig. 13) in each module converts the commercial 115-volt 60-cycle single phase alternating current to 48 volts dc by rectification and filtering. Each power plant also contains a ringing and tone generator circuit. The filter capacitors are of such

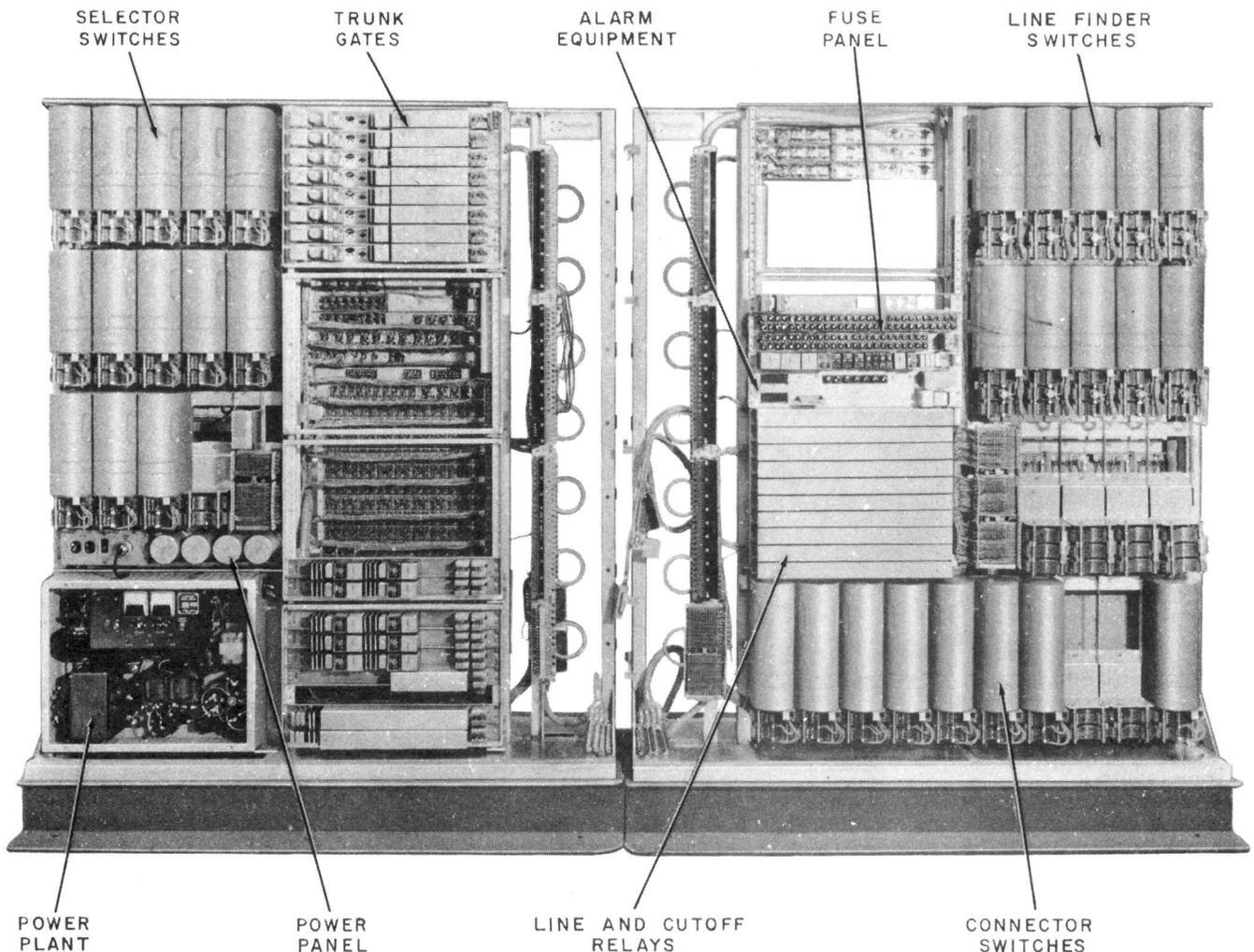


Fig. 17 — Rear View of an In-Line Arrangement of the Two 100-Line Frames Without Cabinets

value to prevent disruption of established connections for approximately 1/2-second duration in case of momentary commercial power failure. Ringing voltage is standard 20 cycles, interrupted to furnish 1-second ringing intervals separated by 3-second quiet periods. Both the dial and busy tones are supplied by the tone generator circuit which produces 600-cycle current modulated at 120 cycles.

5.02 Power transfer circuits are available for emergency operations. For a 200-line installation, a transfer unit in the supplementary module transfers the ringing and tone load from the power plant of the basic module to the power plant of the supplementary module if the ringing and tone load fails in the basic module.

5.03 If commercial power fails, an emergency arrangement is provided whereby ten station lines per module are connected to selected central office trunks.

B. Battery Reserve Plant

5.04 For locations where PBX service must be maintained during commercial power failures, a 48-volt battery power plant with a separate cabinet with batteries is available on an optional basis (Fig. 19). When the battery reserve cabinet is provided, the battery supply units on the basic and supplementary modules are replaced with a battery charging power supply unit on each module. System operation is possible for approximately 6 hours during commercial power failure.

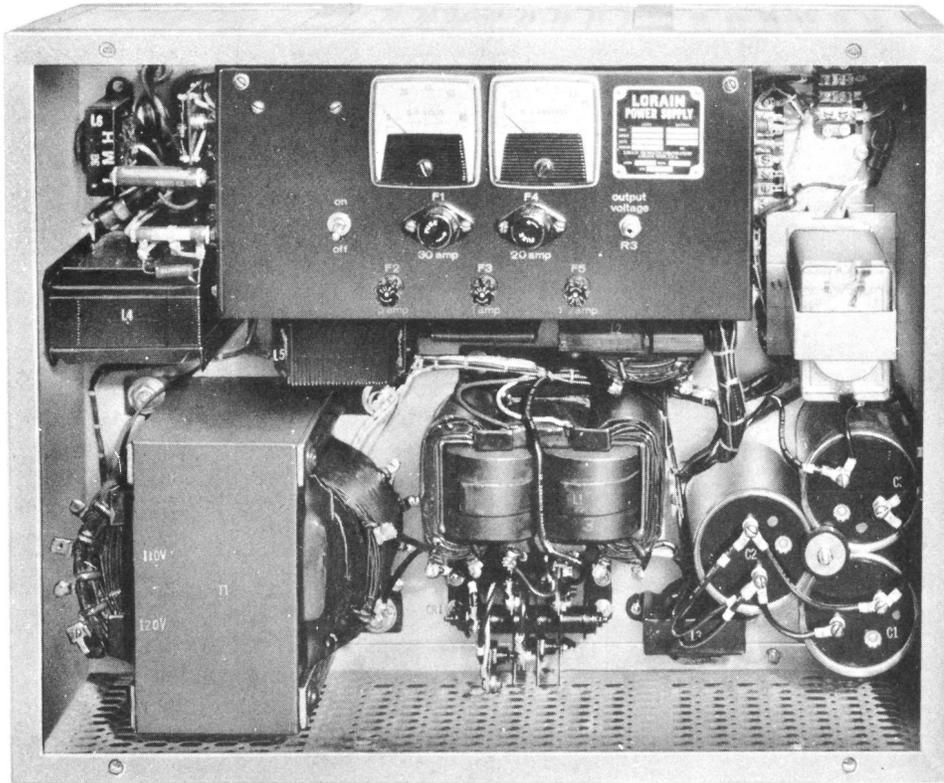


Fig. 18 — Batteryless Power Plant

6. ALARM CIRCUITS

6.01 The alarm circuits provide (1) visual and audible alarm signals at the switching equipment and at the local PBX switchboard, and (2) for an extension of the local PBX switchboard alarms to the central office, if necessary. The circuits may function on either a marginal or reversed battery alarm system at the central office. The alarm equipment of the basic module (Fig. 20) consists of a fuse panel, common alarm panel, shelf alarm (line finder, selector, and connector) panels, and a power failure transfer panel. The alarm equipment of the supplementary module (Fig. 21) consists of a fuse panel and a ringing control and transfer panel.

6.02 Alarm signals are given for the following conditions.

- (a) Permanent short circuit of a station line
- (b) Ground on the ring side of a station line
- (c) Receiver left off the hook

- (d) All line finders busy
- (e) Failure of a line finder to find a station line (call blocked)
- (f) Grounded line finder start lead
- (g) Failure of a switch to restore to normal after its release magnet has operated
- (h) Blown fuse in the switching equipment or at the switchboard
- (i) Trouble in the power ringing circuit of either the basic module or the supplementary module
- (j) Transfer of the ringing equipment load of the basic module to the supplementary module

The audible alarm signal at the common alarm equipment may be silenced by operating the alarm cutoff key. When this key is operated, a guard lamp at the equipment is lighted.

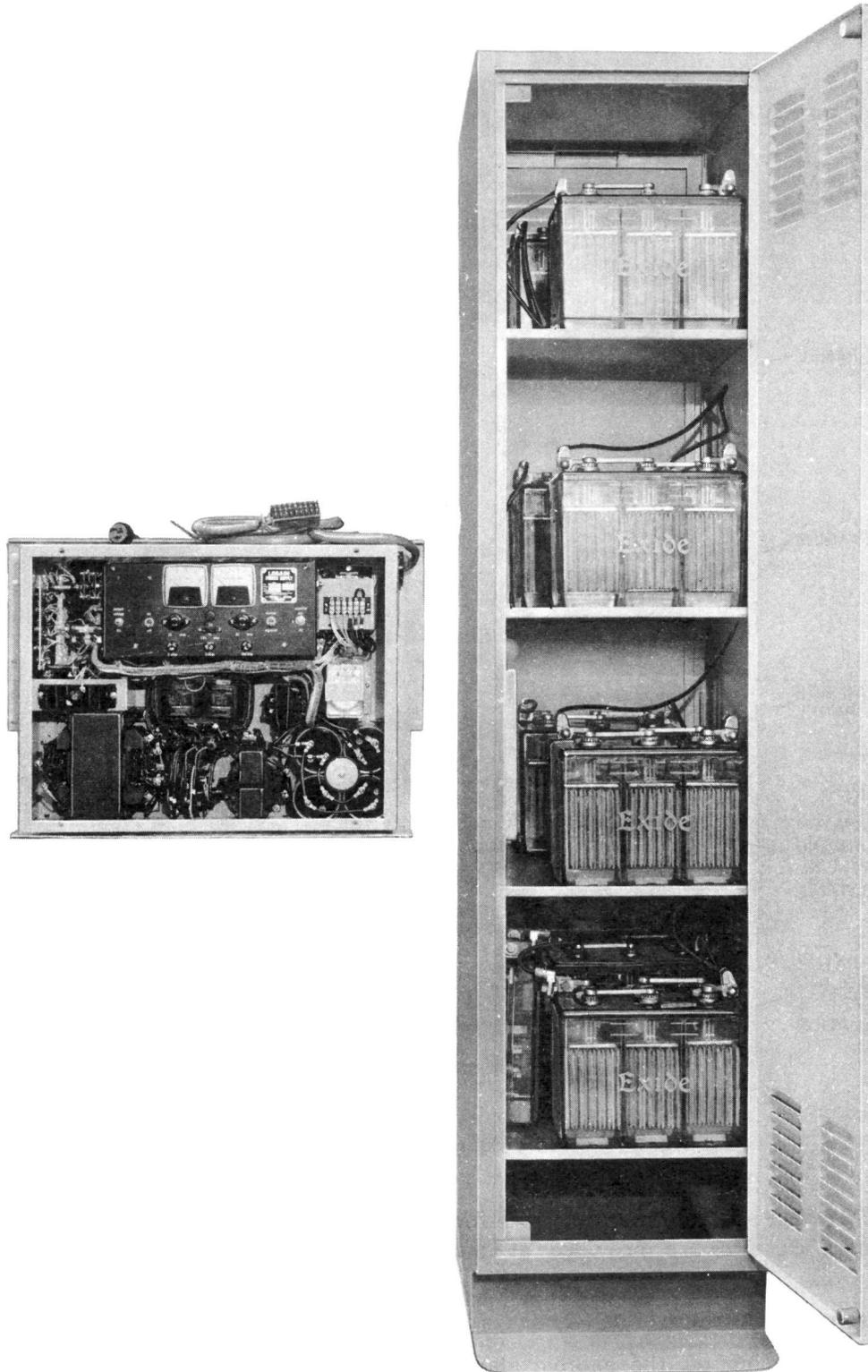


Fig. 19 — Battery Reserve Cabinet and Battery Charging Supply Unit

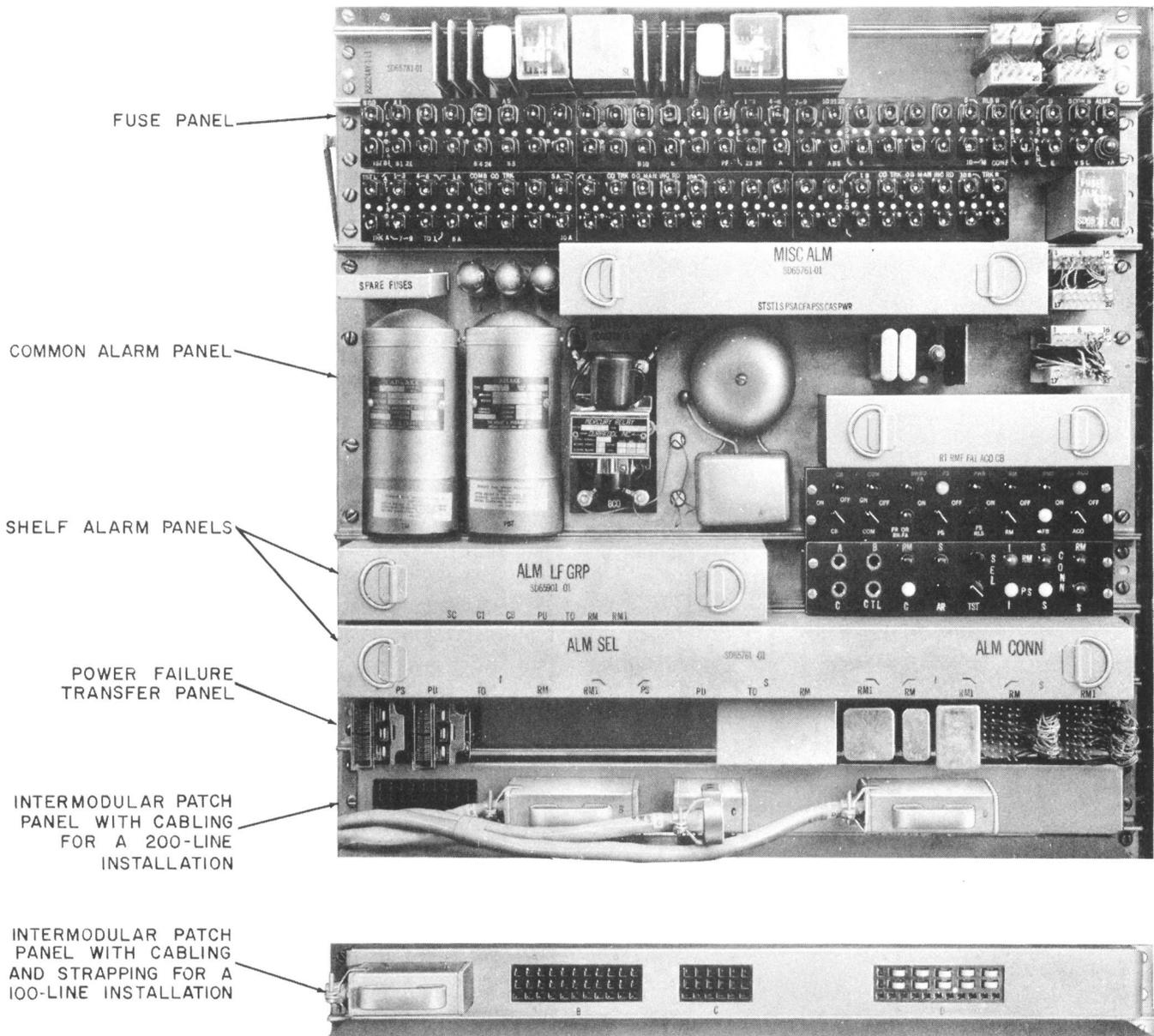


Fig. 20 — Alarm Equipment for the Basic Module

6.03 In the 701PK PBX, the following keys for the alarm circuits are provided at the switchboard.

- (a) A key to silence the buzzer (SIG)
- (b) A key for cutting off the audible alarm signal (ACO)

7. TRAFFIC REGISTERS

7.01 Traffic data from central office trunks, tie trunks, and the various step-by-step

switches are obtained from all-trunks-busy registers, all-finders-busy registers, last-trunks-busy registers, and peg count registers.

7.02 The traffic register units can be mounted in the face of a PBX, on a backboard in the room with the attendant switchboard, or on mounting plates on the relay racks in the switchroom. All registers are cabled to the distributing frame for cross-connection to the desired switching circuit.

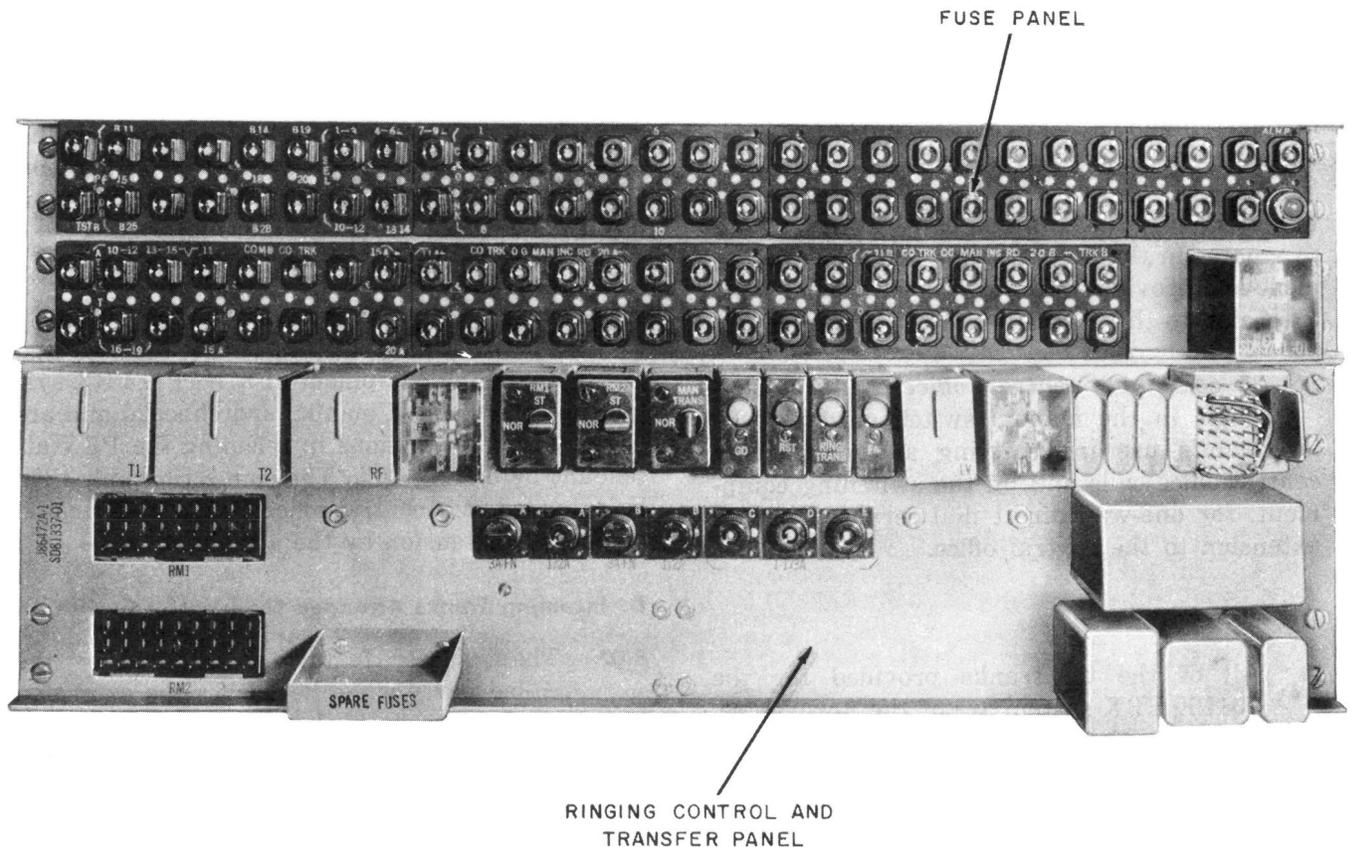


Fig. 21 — Alarm Equipment for the Supplementary Module

7.03 When registrations of the call load are not desired, a cutoff key associated with each register group is used to make the registers inoperative.

7.04 *All-trunks-busy (ATB) registers* for attendant trunks, dial central office trunks, or tie trunks are connected to all trunks in a group and operate each time all the trunks in the group become busy.

7.05 *All-finders-busy (AFB) registers* are connected to all line finder switches in a group and operate each time all of the finders in the group become busy.

7.06 *Last-trunk-busy (LTB) registers* for connectors are connected to the sleeve of the last-choice terminal and operate each time the last-choice connector is seized.

7.07 *Peg count (PC) registers* used to measure originating, incoming, and outgoing traffic are connected to first selectors and incoming selectors, as required, and operate each time any of the switches in a group is restored to normal from an off-normal condition.

8. TRUNKS

8.01 Initial trunking arrangements for a 200-line 3-digit 701PK installation are shown in Figure 22.

A. Central Office Trunks

8.02 These trunks originate in the central office and terminate on customer premises in a manual switchboard or in the dial operated switching equipment of the PBX.

8.03 Central office trunks available for the 701PK PBX are classified as follows.

(a) *An attendant central office trunk* terminates only in the manual switchboard associated with the PBX and provides 2-way manual ringdown service between the attendant and the central office.

(b) *A direct dial central office trunk* terminates in the dial operated switching equipment and provides one-way service from a PBX extension to the central office by direct dialing.

(c) *A combined central office trunk* terminates in the manual switchboard for the attendant's use in receiving and originating central office calls and, in the switching equipment, for one-way direct dial service from an extension to the central office.

B. Tie Trunks

8.04 All of the tie trunks provided for the 701PK PBX system are of the 2-way type. However, by making one or more of its features inoperative, a tie trunk may be used on a one-way basis, where desirable. The 2-way tie trunks terminate on trunk jacks at the PBX switchboards, in the switching equipment, or both at the switchboard and in the dial equipment.

8.05 These trunks include one or more of the following types of service.

(a) *Manual Tie Trunk Service* (between a 701PK PBX and a distant attended PBX): Terminations are at the PBX switchboards for manual selection and answering by the attendants. If the tie trunk provides manual service only, either automatic or ringdown signaling may be used.

(1) *Automatic Signaling*: The line signal is automatic and operates when the attendant inserts a cord plug into the trunk jack.

(2) *Ringdown Signaling*: Signaling over a ringdown tie trunk is accomplished by operating the cord circuit ringing key after the tie trunk has been selected by the attendant.

(b) *Manual and Dial-Selected Tie Trunk Service* (between a 701PK PBX and a distant attended PBX): In addition to an appearance

at the PBX switchboard, tie trunks providing dial-selected service are associated with terminals on selector levels for outgoing traffic. The tie trunk may be selected by the station dialing a designated code, after which the call is completed manually by the attendant at the distant PBX switchboard. (See Figure 23.)

C. Trunks to Attendant

8.06 These trunks connect the dial-operated switching equipment of a 701PK PBX system to its associated manual switchboard and are used by the dial stations in reaching the PBX attendant by dialing "0". The connection may then be extended to a central office trunk, a tie trunk, or another extension by the attendant.

D. Incoming Trunks Arranged for Transfer Service

8.07 The transfer feature is actuated by the called party when he flashes the extension switch hook. The flashing action causes the cord circuit lamp at the switchboard to flash to summon the attendant in on the connection, and the transfer is completed by the attendant.

E. Manual Conference Circuit

8.08 This unit provides circuitry whereby the local PBX switchboard attendant may originate and control a conference involving a maximum of five stations as follows.

- (a) Four stations and one central office trunk or tie trunk
- (b) Three stations and two central office trunks or tie trunks
- (c) Three stations, one central office trunk, and one tie trunk

9. ROUTING OF CALLS ORIGINATING AT PBX DIAL STATIONS

9.01 Station users may make outgoing local calls by either dialing directly or by dialing "0" for local PBX attendant assistance.

A. Station-to-Station Calls

9.02 When a station receiver is removed from the switch hook, an idle line finder (Fig. 22) in the associated subgroup hunts the line and ex-

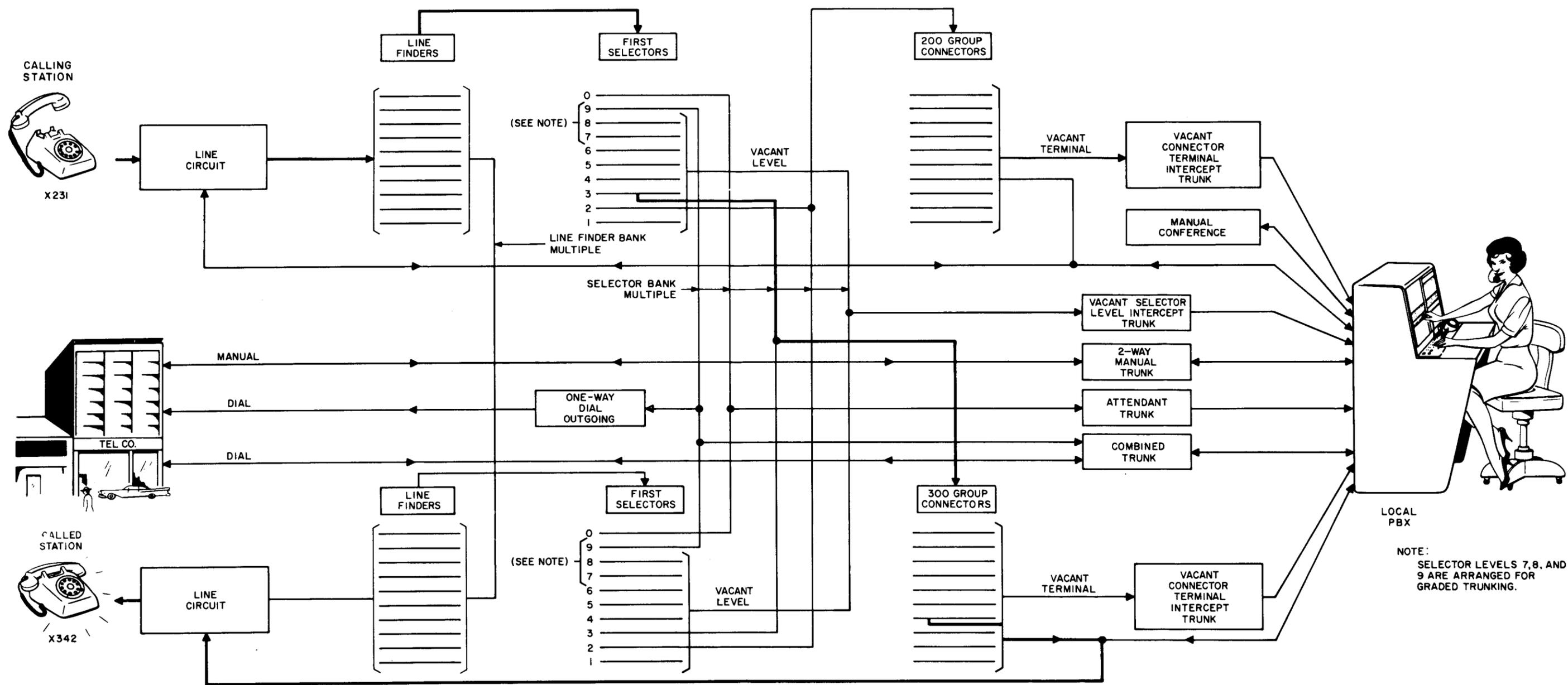


Fig. 22 — Initial Trunking Arrangements for a 200-Line 3-Digit System

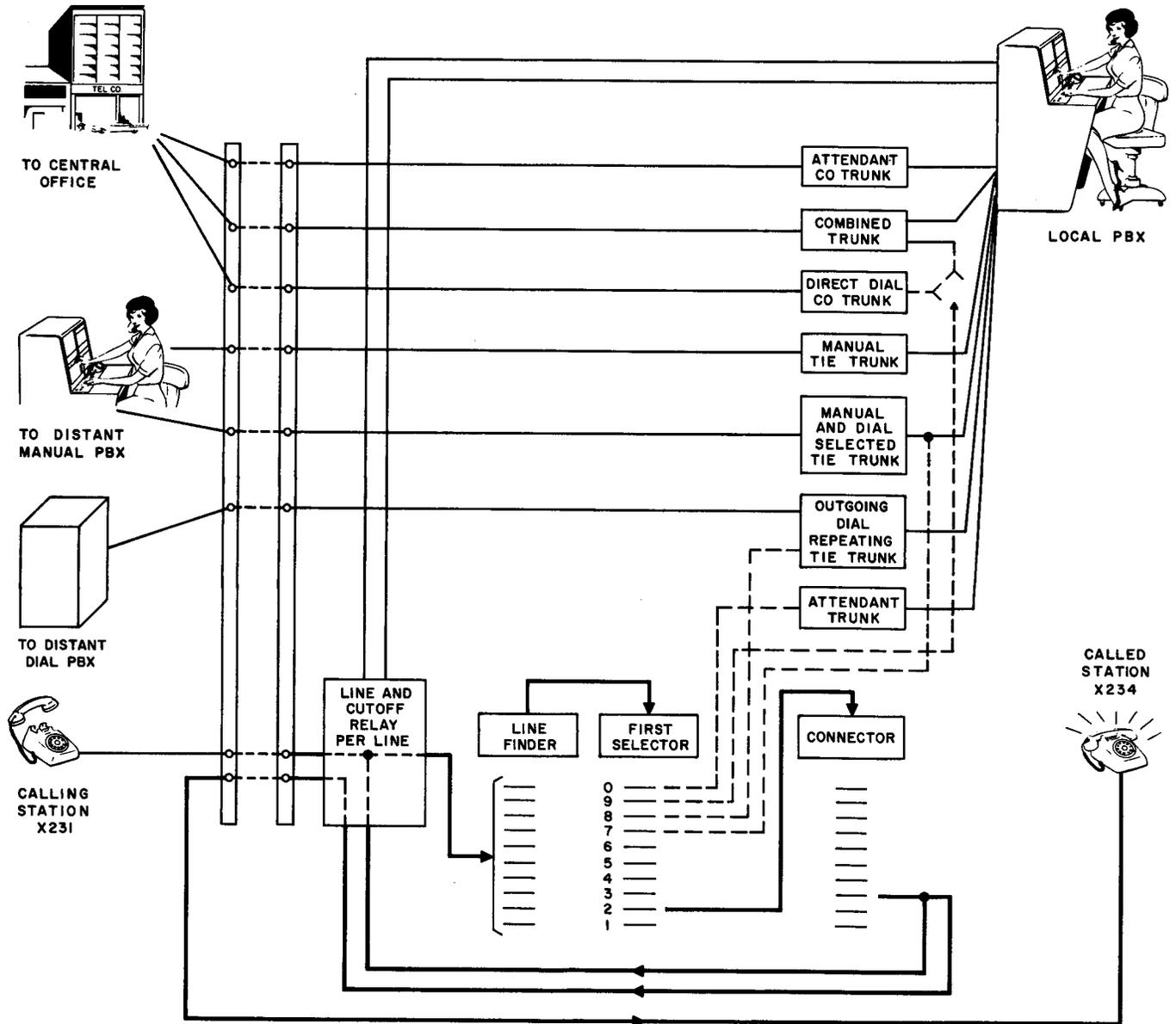


Fig. 23 — Typical Optional Trunking Arrangements for a 200-Line 3-Digit System

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tends the connection to a first selector switch for dial tone. Dialing the first (hundreds) digit of the 3-digit number causes the first selector to step vertically to the level corresponding to the digit dialed, and to rotate automatically on that level until an idle trunk to a connector is found. Dialing of the tens digit steps the connector switch vertically to the desired level; dialing the units digit causes the switch to rotate to the desired terminal for a completed connection between a calling and called station within the local PBX.

B. Station-to-Attendant Calls

9.03 Station users may reach the local PBX attendant by dialing "0". In response to pulses generated by dialing "0", the first selector wipers step to the tenth or "0" level in the selector multiple and then hunt on the level by rotary action until an idle attendant trunk is found. When the idle trunk is seized, the first selector extends the call over the trunk to the associated switchboard and causes the line lamp of the corresponding trunk jack at the cord switchboard to light.

9.04 The attendant answers the call by inserting a cord plug into the trunk jack. The desired connection is then established through the cord circuit at the manual switchboard.

9.05 When the station user replaces the receiver on the switch hook, the attendant receives a disconnect signal (supervisory on cord). Removal of the cord plug from the jack restores the circuit to normal.

C. Station to Central Office Calls

9.06 Central office calls may be completed by unrestricted stations without the assistance of the local PBX attendant.

9.07 The calling party must first dial the digit corresponding to the selector level to which central office trunks have been assigned. The local selector then extends the call through a central office trunk to the dial central office. From there a second dial tone is returned. The calling party may then proceed to dial the desired number in the usual manner.

D. Station to Dial Repeating Tie Trunk Calls

9.08 Calls over dial repeating tie trunks may be completed directly by dialing the tie trunk code and the extension, or via the distant attendant by dialing "0" after the tie trunk has been seized.

9.09 When the tie trunk code is dialed, the switches on the first selector step up to the corresponding selector level and rotate in the level until an idle trunk is found.

9.10 The call is extended to an incoming selector or selector-connector at the distant end, and the desired extension can be reached directly by dialing the appropriate code without waiting for a second dial tone.

9.11 If the distant PBX is operated as a tandem point to other PBX, the incoming selector or selector-connector at the far end will connect, on tandem calls, a dial repeating tie trunk to the PBX beyond tandem. This tie trunk terminates either at an attendant position or in an incoming selector or selector-connector for reaching extensions by dialing additional digits. The repeating tie trunk is arranged to provide suitable transmission terminations at the tandem PBX and at the PBX beyond tandem.

E. Station to Dial-Selected Tie Trunk Calls

9.12 Calls over dial-selected tie trunks are completed by the attendant at the terminating PBX. When the tie trunk code is dialed, the local selector extends the call to a terminating jack at the distant end. The tie trunk lamp associated with the jack lights, and the distant attendant completes the connection via the station jack by means of the cord circuit.

F. Station to Ringdown Tie Trunk Calls

9.13 Calls over a ringdown tie trunk to a distant attended PBX are placed through the local PBX attendant. The tie trunk is selected manually by the local attendant and it is necessary for the attendant to operate the associated cord circuit ringing key to light the tie trunk lamp at the connecting PBX. If the cord is arranged for flashing recall, the attendant must remain on the connection or return to the connection after ringing to avoid false operation of the flashing recall. The

call is completed manually by the attendant at the distant PBX.

G. THRU Connections on Tie Trunks Via Attendant Position

9.14 When the attendant answers a tie trunk call and it is determined that the call will be completed via another tie trunk, the THRU jacks of both the incoming and outgoing tie trunks are connected by a pair of cords.

9.15 The attendant then inserts another dial cord into the dial or answer jack of the outgoing jack and dials the connection. Upon completion of dialing, the attendant removes the dial cord and the first answering cord from the jacks. The cords in the THRU jacks hold the equipment and provide supervision and transmission as required for this type of call.

10. ROUTING OF CALLS TERMINATING AT PBX STATIONS

A. Over Central Office Trunks

10.01 An incoming call to a PBX, whether from a dial or manual central office, appears as a lighted trunk lamp on the face of the switchboard. The attendant answers the call with the trunk cord and establishes a connection to the called station via the station line jack.

10.02 Where machine ringing is provided, the ringing will start automatically and the calling party will hear the audible ring until the called station answers. If machine ringing is not provided, the attendant signals the called station manually by operating the ringing key associated with the station end of the cord.

B. Over Dial-Selected Tie Trunks

10.03 An incoming call over a dial-selected tie trunk terminates on a trunk jack at the auxiliary switchboard. The lamp associated with the trunk jack lights to signal the attendant. The attendant answers the call by plugging the proper cord of a pair into the jack and completes the connection via the station jack by means of the cord circuit.

11. MANUAL EXTENSIONS

11.01 Some of the extensions at a 701PK PBX may not be equipped with dials. Such lines are equipped with jack and lamp appearances at the switchboard, and outgoing calls from these stations are handled by the attendant. When the handset at the calling station is removed from the switchhook, a line lamp associated with the line jack termination at the switchboard is lighted. The attendant answers the call with the proper cord and establishes the desired connection through a cord pair.

11.02 Incoming calls to these stations are completed by the attendant via the station line jack. In addition, these extensions may be assigned to connector terminals so that incoming dial calls can be completed directly.

12. SUPERVISORY FEATURES

12.01 A station-to-station call that is dialed directly is under the control of the calling party, and the replacement of the receiver at the calling station releases the switch train.

12.02 On a station-to-station connection that is established through the manual switchboard, switch hook supervision is obtained on both ends of the cord. The connection is held until the cord circuit is released.

12.03 On a call from a station to distant attendant via a dial-selected tie trunk, the originating end is under calling party control and the terminating end is under control of the distant attendant.

12.04 On a station-to-attendant call made locally or via a repeating tie trunk, the connection is under joint control of the station and the attendant.

12.05 An outgoing station-to-station call over a dial repeating tie trunk is under joint control of the calling and called parties.

12.06 In a dial central office district, a call from a station to the central office that is dialed directly is under the control of the calling station, except in the case of a call to the central office operator or to a toll operator. In this case, the

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connection is under the joint control of the station and the central office operator, and the station can flash the central office operator.

12.07 If a call is made to a manual central office, the connection is under the joint control of the station and the central office operator.

13. SUPPLEMENTARY FACILITIES

A. Restricted Service

13.01 Any individual line may be restricted from obtaining a direct dial connection to a central office trunk simply by removing a red plastic sleeve from a contact on the line relay of the associated line circuit. If the central office level is dialed, the calling station receives busy tone. A second class of restriction may also be provided by adjusting normal springs to close on any level or levels corresponding to subgroups of station lines in which all stations are denied access to one or more levels of the first selector.

B. Intercepting Service

13.02 Vacant selector levels and unused connector terminals of a 701PK PBX are connected to intercepting trunks (Fig. 16) and terminated in jacks and lamps at the attendant position. These levels and terminals are connected to the switchboard by strapping arrangements at the selector bank terminal strip and line terminal strip mounting on the distributing frame.

13.03 When a vacant selector level or a units digit corresponding to a vacant connector terminal is dialed, the intercepting trunk is seized by the calling line and the line lamp associated with the trunk jack lights. The attendant answers the call by inserting the plug of a PBX cord into the jack and the line lamp is extinguished. When the calling station disconnects, the attendant receives a disconnect signal. When the attendant disconnects, the circuit restores to normal.

C. Toll Diversion

13.04 Ordinarily, unrestricted PBX stations or tie trunks can dial the central office code and utilize whatever services are available, such as local, toll, and direct distance dialing. However, these stations can be denied direct access to

toll in those cases where the central office trunks can be arranged for toll diversion.

13.05 When an unauthorized station or tie trunk dials a code which provides for toll service, the toll diverting feature transfers the station from the central office trunk to a toll diverting trunk and the central office connection is released.

13.06 The toll diverting trunk routes the call to an answering jack at the PBX switchboard.

D. Long Line and Long Trunk Circuits

13.07 When the conductor resistance of a PBX trunk or a PBX off-premise extension exceeds the normal operating range, supplementary signaling circuits are required for extending these ranges.

13.08 The range obtainable with these supplementary circuits varies with the type of PBX and the particular conditions encountered. In general, however, the long line, long trunk circuits, and repeater equipment provide a means for extending the ranges for transmitting switch hook, ringing, and dial pulse signals. Various combinations of these facilities are required to satisfy the unique condition of the individual line, and, through their use, the distance between the terminating points may be increased.

E. Recorded Telephone Dictation Trunks

13.09 These trunks appear on selector levels in the PBX switch train, and are extended to either dial controlled or voice controlled dictating machines. One trunk circuit is associated with each dictating machine. A dial station user may reach a dictating machine by dialing the selector level code. Automatic selection of an idle trunk is accomplished in the normal trunk hunting manner for the PBX. Tone is returned from the dictation trunk to indicate that the machine is available.

14. MAINTENANCE

14.01 In addition to the alarm circuits described in Part 6 which provide visual and audible alarm signals for trouble conditions, the following maintenance test features are provided:

- (a) Two test terminals (90 and 99) in each connector multiple for testing connector hunting.
- (b) A test key on the miscellaneous alarm unit for testing the line finder group chaining circuit.
- (c) Test jacks and make-busy facilities on each switch for testing individual switches and the switch train.
- (d) Test jacks equipped with connecting clips on each side of the distributing frame to facilitate attaching test equipment to terminals on the distributing frame.
- (e) Test battery and ground terminals are provided on each module.

14.02 A tie trunk test line is provided in the incoming selector and dial repeating tie trunk module for testing dial repeating tie trunks, attendant 2-wire connectors from the connector test jack, and for testing outgoing trunks to attendant 2-wire connectors from the distant switchboard.

15. DIAL AUXILIARY SWITCHBOARDS

A. General

15.01 A manual cord switchboard consists of one or more sections of framework containing a jack field in which are terminated station lines, central office trunks, and tie trunks. Double ended cord circuits connect the jacks together. In addition, there is a telephone and dial circuit, connecting the attendant to the cord circuits by means of keys, and miscellaneous common auxiliary and alarm circuits. The switchboards available for the 701PK PBX may be of either the nonmultiple (where the dial station line and trunk jacks have only one appearance) or multiple type (where there are two or more appearances of the same line or trunk jack).

15.02 Night connections between a station requiring night service and a central office trunk are established by the attendant through a cord circuit on the associated switchboard. The attendant plugs the back cord of an idle cord pair into the station jack, and the front cord into a central office trunk jack, then operates the night and through dial key. The station is then connected directly to the central office trunk. Incoming calls from the central office are terminated at the station and outgoing calls to the central office may be made without the assistance of the attendant.

B. 552D PBX Switchboard

15.03 The 552D switchboard is attendant operated and may be used with the 701PK PBX. Dial extension jacks and trunk jacks are arranged on a 3-panel multiple basis. This switchboard is used to establish telephone connections manually by means of cord circuits.

15.04 The 48-volt dc power for the switchboard is supplied from the power unit of the 701PK dial switching equipment. The ringing current may be supplied either from the 701PK ringing equipment or over cable pairs from a central office.

C. 608A PBX Switchboard

15.05 The 608A cord-type switchboard may be used either as a manual PBX on a multiple or nonmultiple basis or as an attendant board with the 701PK dial PBX. The switchboard is used to establish telephone connections manually by means of cord circuits. The 608A PBX features all non-locking pushbutton key operation, distinctive supervisory lamp signals to indicate the status of a call, and plug-in type circuit equipment. The cord circuit enables the attendant to answer all calls on the back cord and features automatic machine ringing on the front cord, manual ringing on both cords, and audible flashing recall on both the front and rear cords.

15.06 The 48-volt dc, ringing, and 120-ipm supplies are provided by the power unit of the 701PK dial switching system.