

GENERAL DESCRIPTION
552B AND 552E PBX

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1. GENERAL

1.01 This section describes the Nos. 552B and 552E private branch exchanges.

1.02 The 552B and 552E PBX's are modifications of the 552A nonmultiple PBX switchboard heretofore associated with dial equipment in small 701A PBX's. The 552B is a manual, nonmultiple switchboard and the 552E is a manual, multiple switchboard. Except for the multiple feature of the 552E, these switchboards are identical both in equipment and operating features.

1.03 The 552B and E PBX's are intended to provide inter-connection service between two extension stations or between one extension and an outside subscriber by means of plug and jack connections, established manually by an attendant.

1.04 The principal features of the 552B and E PBX's are:

- (a) Cord circuit arranged for double supervision, that is, it provides supervision from each extension independently on an extension-to-extension connection.
- (b) Nonthrough supervision from extension to central office trunk is provided on both incoming and outgoing calls except when the night and through dial key in the cord circuit is operated.
- (c) The switchboards may be used with either manual or dial central offices. When used with manual offices, the dial is generally omitted from the keyshelf.
- (d) A fuse and power alarm circuit is furnished which sounds a buzzer and lights a lamp, both located in the switchboard, when any fuse is operated.
- (e) An auxiliary signal circuit sounds a buzzer when any cord circuit, trunk, or line lamp is lighted. A buzzer cutoff key is provided to silence the buzzer when desired.
- (f) Each position is equipped with a hand generator for supplying ringing current to the cord circuits under emergency conditions. A generator key is provided to cut in the hand generator when required.
- (g) A battery cutoff switch is furnished in the top rail above the jack field, the operation of which disconnects

battery from all of the PBX equipment except the long line and long trunk circuits.

(h) Existing types of manual, automatic, repeating tie trunks, and conference circuits for maximum of five conferees are used in the 552B and E PBX's.

(i) Extension and trunk jacks are multiplied on a 3-panel basis for the 552E PBX.

(j) An inclosed distributing frame designed for use at the head of line-up is provided for multiple 552E PBX installations. The end, top, and sides may be removed as a unit to provide ready access to the terminal strips.

(k) Platforms are necessary under each position of the 552E PBX and 2-position 552B PBX's to accommodate the long cords required.

(l) The range of the 552B and E PBX's is the same as that of the 605 PBX.

2. EQUIPMENT DESCRIPTION

2.01 The switchboards are of wood construction, the key-shelf, lock rail, and piling being covered with black phenol fiber, and the plug shelf with black semi-hard rubber. All other parts are finished in either oak or mahogany-walnut. The battery cabinet is also of wood construction with grey finish and is intended to mount separately from the PBX. When tie trunks are furnished, they are also mounted apart from the PBX, in metal apparatus cabinets.

A. Capacity

2.02 The 552B PBX switchboard will usually be furnished as a single unit. The capacity of the 552B PBX is as follows:

Station Lines	320
Central Office and Tie Trunks	15
Cord Circuits	15

However, where a greater capacity than can be obtained with one switchboard section is required, two switchboards may be lined up and bolted together. In such cases the sections will be mounted on a platform in order to provide space for the longer cords that are required to reach to the jacks in the adjacent sections.

2.03 Based upon multiplying the jack and lamp equipment on a 3-panel basis, the capacity of the 552E PBX is as follows:

Station Lines (with designation strips)	420
Central Office and Tie Trunk	30
Cord Circuits (per position)	15

The station line capacity may be increased by omitting the designation strips from the station line multiple. The trunk capacity may be increased by decreasing the number of station lines. If the number of trunks is increased to 60, the station line capacity will be reduced to 360.

B. Face Equipment

2.04 In the 552B PBX, provision is made for mounting 320 station line jacks with associated line lamps, and 15 trunks with trunk lamps, in two panels on the face of the board. In each panel, the upper 8 rows each consist of a strip of 20 station line jacks with a strip of 20 line lamps directly underneath. Below these in each panel are a strip of 10 trunk jacks with a strip of 10 trunk lamps directly beneath. In the right panel, just above the station jacks, are the keys and lamps associated with the fuse alarm circuit. The battery cutoff key, auxiliary signal key, hand generator key, fuse alarm key, power alarm lamp, and switchboard fuse alarm lamp are located near the top of the board.

2.05 In the 552E PBX, provision is made for mounting 280 station line jacks and line lamps, with 20 trunks and

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trunk lamps in two panels in front of each attendant. In each panel, the upper 7 rows each consist of a strip of 20 station line jacks with a strip of 20 line lamps directly beneath. Below these, in each panel are a strip of 10 trunk busy lamps with a strip of 10 trunk jacks directly underneath, and a strip of 10 trunk line lamps below them. In the right panel, on position No. 1, just above the station jacks, are the power fuse alarm and position fuse alarm lamps. Near the top of the board, in position No. 1 only, are located a battery cutoff key, a fuse alarm cutoff key, a buzzer cutoff key, and a hand generator key. The hand generator key is also provided in all positions of the board.

2.06 When the board is equipped with an 8A buzzer, a buzzer volume adjustment knob is located at the left of the piling rail below the lamp and jack panels.

2.07 The front and rear cords, night and through dial key, the talk and dial key, and the attendant's dial (when provided) are on the switchboard shelf. The attendant's set jacks and the emergency ringing generator handle are located in the lock rail.

C. Rear Equipment

2.08 The relays and other equipment associated with the station line circuits, cord circuits, central office trunk circuits, and attendant's telephone circuits are mounted on 21-5/8-inch mounting plates in the rear of the switchboard.

2.09 Tie trunk units, conference circuit, and other units on 23-inch plates must be mounted in relay cabinets. The relay gate in the rear of the switchboard section will accommodate only 19-inch and 21-5/8-inch plate equipment units.

D. Cord Circuit

2.10 The cord circuit is arranged to provide a series condenser bridged impedance type connection for extension-to-extension and extension-to-tie trunk calls. A straight through connection is provided on extension to central office calls, and battery for the extension station transmitter is obtained from the central office. Nonthrough supervision is obtained on both incoming and outgoing calls.

2.11 A 2-lever key is associated with each cord circuit and provides the following features:

1. Night and through dialing.
2. Attendant's talking and dialing.
3. Ringing on rear cord.
4. Ringing on front cord.

Ringing current is applied to the rear cord by operating the rear lever forward and is applied to the front cord by operating the front lever in a forward direction. When the front lever is operated in a backward direction, it connects the attendant's telephone and dial into the cord circuit. When operated in a backward direction, the rear lever allows an extension station to dial and complete an outside call. When the attendant is not on duty, the rear lever is operated in the same way to provide night connections.

E. Central Office Trunk Circuit

2.12 The central office trunk circuit of the 552B and 552E PBX's provides 2-way communication service between a PBX and a manual or dial central office. It provides a locked-in trunk lamp and auxiliary signal for central office trunk calls incoming to the PBX. The lamp and auxiliary signal are retired when an attendant inserts a front cord in the jack to answer the call.

2.13 The central office trunk circuit is equipped with two jacks, a regular jack and a night jack. The regular jack is used on connections established by the attendant and the night jack is used on night connections to by-pass the relay equipment.

2.14 On multiple installations, busy lamps are provided in addition to the regular trunk lamps to indicate when the trunk is being used.

F. Tie Trunk Circuits

2.15 It is intended that the manual ringdown, manual automatic, and repeating tie trunks which are now used for the 552A and 605A PBX's should also be used for the 552B and E PBX's. The tie trunk circuits are mounted in separate apparatus cabinets.

2.16 One manual ringdown tie trunk is arranged for use on noncomposited lines and one is arranged for use on either composited or noncomposited lines. On both of these tie lines, signaling is by means of 20-cycle ringing current both on incoming and outgoing calls. Recall to and from the distant PBX is also accomplished by 20-cycle ringing current.

2.17 A 2-way manual automatic tie trunk is for use in establishing a connection to a distant PBX, using direct current for signaling in both directions. This tie trunk may be selected at the distant PBX either manually or if the distant PBX is dial by dialing from an extension station. Incoming calls from the distant PBX may be established without the aid of the distant PBX attendant but outgoing calls to that PBX will require the services of the attendant. The 552B or E PBX attendant's services will be required in establishing both connections.

2.18 The repeating tie trunk is for use with tie lines to distant dial-type PBX's. It has one additional feature over the automatic tie trunk in that if a cord circuit is connected with the tie trunk dial jack at the 552B or E PBX and the talk and dial key operated, then the attendant's dial may be used to select an extension station of the distant PBX without the aid of the distant PBX attendant. When this tie trunk is used either incoming calls or outgoing calls may be made to a distant PBX without the aid of the distant PBX attendant. The 552B and E PBX attendant's services will be required on both calls.

G. Manual Conference Circuit

2.19 The manual conference circuit provides means for connecting up to a maximum of five stations, four stations and one trunk, or three stations and two trunks simultaneously. The circuit has three "station" jacks and two "station or trunk" jacks. The "station" jacks are used for connecting three local stations together and the "station or trunk" jacks are used when four or five extension stations are required in the conference or for either trunk or tie trunk connections.

H. Attendant's Telephone Circuit

2.20 The attendant's telephone circuit consists of the equipment associated with the attendant's telephone and dial. It may be connected with any cord circuit by the operation of a talk and dial key. The functions of the circuit are to enable the attendant to talk and dial over a PBX cord circuit and to provide a low resistance bridge after dialing in order to hold up the central office equipment.

I. Auxiliary Signal and Fuse Alarm Circuits

2.21 The auxiliary signal circuit provides a means for obtaining an audible signal upon operation of a cord, trunk, or line lamp. A cutoff key is provided to silence the buzzer when desired.

2.22 The fuse alarm circuit sounds the same buzzer used in the auxiliary signal circuit upon operation of a fuse. The cutoff key silences the buzzer as in 2.21.

J. Power Supply

2.23 Battery for the PBX is supplied from a small storage battery plant on the customer's premises which is furnished in a cabinet arranged to mount apart from the PBX. The battery may be charged via cable pairs or from a rectifier.

2.24 The battery cutoff switch disconnects battery from all units except the long line circuits.

2.25 The ringing current is usually supplied over cable pairs from a central office. An emergency hand generator is provided at all positions for supplying ringing current in the case of failure of the central office supply. A ringing key

mounted on the top rail of the switchboard is provided to cut in the hand generator when required.

3. CIRCUIT OPERATION

A. General

3.01 In general, the circuits of the 552B and 552E PBX's are similar in operation. The trunk circuits of the 552E have an additional feature due to the multiplying arrangements in that each trunk has two lamps associated with its jack, a line lamp and a busy lamp, whereas the 552B trunk has only a line lamp. When a cord is connected with a trunk jack at one position, the busy lamps at all appearances of the trunk are lighted and a busy test potential is applied to all the jack sleeves. Operation of the circuit is thereby made possible in the event of failure of the busy lamps because of a burned-out lamp.

B. Station-to-station Connection

3.02 On station-to-station calls, the rear cord is used with the calling station and the front cord with the called extension. For this connection, the cord circuit is the series condenser, bridged impedance type, having condensers in series with the tip and ring leads, a retardation coil for supplying battery to the calling station and windings on an H-type relay for supplying battery, and ground to the called station, as shown in Fig. 1.

3.03 When a connection is desired from an extension station to another extension station, the attendant is signaled by the extension line lamp which lights when the station receiver is removed from the hook. The attendant extinguishes the line lamp by inserting a plug into the line jack and then operates the talk and dial key to ascertain the station desired, and completes the call by connecting the front plug into the called station jack and operating the front ringing key. On 552E PBX, the attendant should make a busy test before plugging into the called extension jack. The front cord supervisory lamp lights when the attendant restores the talk and dial key and remains lighted until the call is answered.

3.04 Supervision is obtained independently from each extension, disconnect signals from the calling extension being received by lighting the rear cord lamp and from the called extension on the front cord lamp. Either extension may recall the attendant by moving the station switch up and down, which flashes the associated cord lamp.

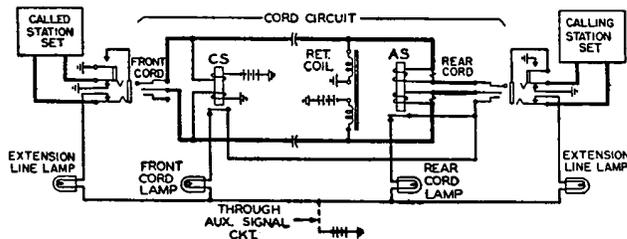


Fig. 1—Extension-to-extension Connection

C. Extension to Central Office Trunk Connection

3.05 On extension to central office trunk connections or on central office trunk to extension connections, the rear cord is used with the extension and the front cord with the trunk. For this connection, the series condensers and impedances of the cord circuit are removed and the extension line is connected directly with the trunk as shown in Fig. 2. The extension receives its talking battery from the central office.

3.06 Calls originating from an extension are established in the manner described for extension-to-extension connections except that the attendant plugs the front cord into a central office jack rather than a line jack. If the call is to a manual central office, the attendant passes the called number to the central office operator, and if the call is to a dial-type central office, the attendant dials the desired number. Under certain conditions the extension may dial out his own calls after the attendant has operated the night and through dial key. This is described in 3.15.

3.07 On calls incoming to the PBX over a central office trunk, the attendant is signaled by means of ringing current from the office over the trunk which operates an a-c relay which locks in and lights the trunk lamp. The attendant then sets up the connection by plugging the front cord into the trunk jack and operating the talk and dial key. Upon learning the number of the desired station, she connects the rear cord to the called station jack and rings the desired station. A thermistor in series with the trunk ringing relay provides a delay to prevent false operation of the ringing relay on surges from the trunk.

3.08 Nonthrough supervision is obtained on central office trunk calls, the attendant receiving disconnect signals from the extension only via the rear cord lamp. The central office connection is held by a winding of a retardation coil across the talking leads in the cord circuit when the front cord is connected with a trunk and the rear cord is either free or connected with an extension at which the receiver is on the hook. When the receiver is removed from the hook, high non-inductive resistance is connected in series with the retard coil to reduce its shunting effect upon the talking circuit. The extension station may recall the attendant by flashing the station switch as previously described. Rering from the central office on toll calls is obtained by means of ringing current sent over the trunk which operates a cord circuit a-c relay and lights the front cord lamp. The rering signal thus obtained is nonlocking; that is, it operates only while ringing current is on the line.

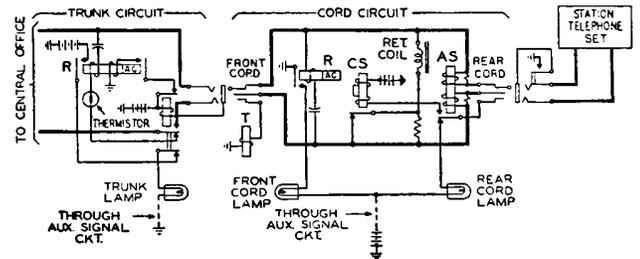


Fig. 2—Extension to Central Office Trunk Connection

D. Station-to-tie Trunk Connection

3.09 Station to tie trunk calls and tie trunk to station calls are set up in the same manner as station-to-station calls with the exception of calls from an extension to a dial-type PBX over a repeating tie trunk. On this connection after the attendant has ascertained the desired extension of the distant PBX, she plugs the front cord of the cord pair used to answer the extension into the "TALK" jack and then plugs a front cord of an idle pair into the "DIAL" jack of the trunk circuit. The attendant then operates the talk and dial key associated with the cord connected to the "DIAL" jack, dials the extension number, and then removes the cord from the "DIAL" jack. This transfers the trunk circuit back to the "TALK" jack so that the 552 PBX extension may converse with the distant extension when that extension answers.

3.10 On connections between an extension station and a manual ringdown tie trunk, disconnect signals are received from the station by lighting the rear cord supervisory lamp.

3.11 The front cord lamp lights when the distant attendant rings over the trunk. This may be used either as a disconnect signal from the distant PBX or for recalling the 552 PBX attendant. The 552 PBX attendant may also be recalled by flashing from the extension station as described for extension-to-extension connections.

3.12 On calls from an extension station to a manual automatic or dial selected tie trunk, the front cord lamp is controlled by the distant PBX attendant. When the distant attendant plugs into the trunk jack, the cord lamp goes out, and when the plug is removed, the lamp is lighted. Thus the distant PBX attendant may send disconnect signals to the 552 PBX attendant by removing the plug from trunk jack, and may flash the cord lamp to recall the 552 attendant by successively

plugging and unplugging the cord. When the call is dial selected as may be the case on incoming calls from the distant PBX, only disconnect supervision is obtained from the trunk. Disconnect and recall supervision from the 552 extension is obtained in the same manner as on manual tie trunk connections.

3.13 On calls between an extension station and a repeating tie trunk, disconnect signals are received from the distant PBX on the front cord lamp. An extension station of the distant PBX may recall the 552 PBX attendant by flashing the station switch. Disconnect and recall supervision from the 552 extension is obtained in the previously described manner.

E. Night and Through Dial Connection

3.14 Night connections provide a means whereby certain stations may obtain incoming and outgoing telephone service via a central office during periods when the attendant is not on duty. Night connections are set up by operating the night and through dial key of a cord circuit, plugging the front cord into the "night jack" of a central office trunk, and the rear cord into the jack of the extension desiring night service. This connects the station directly to the central office trunk so that incoming calls from the central office ring the station bell, and outgoing calls may be made to the central office without the aid of an attendant. Night connections are illustrated in Fig. 3.

3.15 Through dial connections provide a means whereby the station instead of the attendant may dial outgoing calls when desired. This connection is set up in the same manner as regular station to trunk calls with the exception that the night and through dial key is operated before the trunk is plugged up. The circuit is identical with the night connection except that the regular central office jack rather than night jack is used. The circuit is shown in Fig. 3.

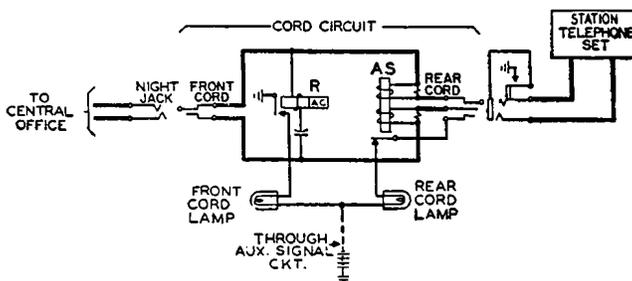


Fig. 3—Night and Through Dial Connection

F. Conference Connection

3.16 When conference connections are established, the "station jacks" are used for connecting three local stations together, and the "station and trunk" jacks when more than three extensions or when central office or tie trunks are required in the conference. When a front cord is inserted into a station jack, the sleeve relay operates to remove the shunt from the A, B, or C repeating coil, placing it in series with the other station repeating coils. Battery and ground are supplied to the connected extensions through the repeating coils of the conference circuit. When a cord is connected with a "station and trunk" jack which occurs when the jack is used with an extension, a relay operates removing the short from the jack, placing the station or trunk in multiple with the series PBX stations connected with the station jacks. When the "station or trunk" jacks are used with an extension line, battery and ground are supplied to the extension by the cord circuit. The manual conference circuit is shown in Fig. 4.

3.17 Supervision is obtained from the extension stations only, no disconnect signals being received from the trunks.

G. Talk and Dial Connection

3.18 The attendant's telephone and dial circuit may be connected to any cord circuit by the operation of the talk and dial key associated with that cord.

3.19 When the attendant desires to talk on a connection, she operates the talk and dial key which connects her transmitter and receiver to the cord so she can then converse. The operation of the talk and dial key also connects the attendant's dial to the cord circuit and the attendant may dial if she so desires.

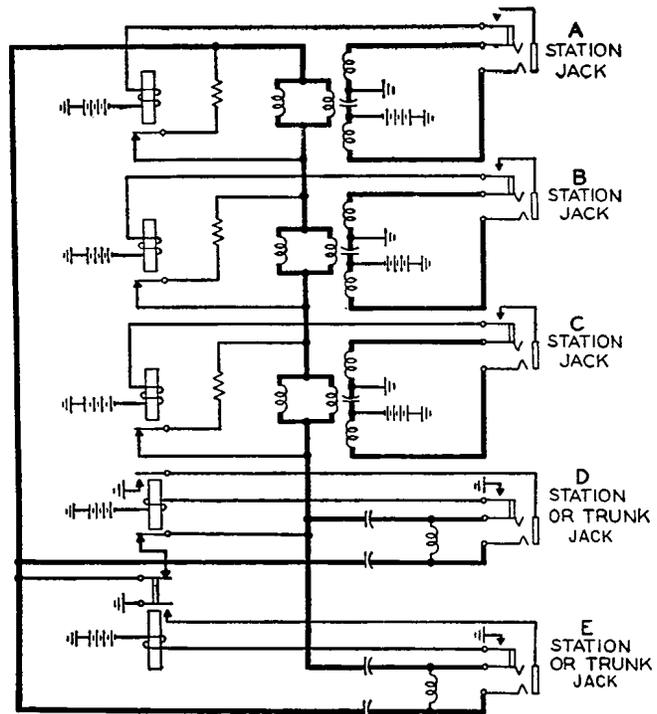


Fig. 4—Manual Conference Circuit

3.20 The attendant's talk and dial circuit before dialing is shown in Fig. 5. In this condition, the attendant's telephone set and the dial circuit holding coil are bridged across the tip and ring of the cord circuit and the attendant may converse with either extension or trunk which may be connected with either cord of the cord circuit.

3.21 The attendant's talk and dial circuit and the connection to the associated cord during dialing is shown in Fig. 6. During dialing the cord circuit is split, the dial pulsing contacts being connected directly across the front cord. While battery and ground are supplied to the rear cord and also to the station, the attendant's receiver is short-circuited and the receiver circuit is disconnected from the dial circuit.

3.22 The circuit between dial pulls or after dialing is shown in Fig. 7. In this condition the attendant's telephone set is connected directly with the rear cord, battery and ground being supplied to the rear cord and to the connected station through a double-wound relay, and a transmission path is established between the front and rear cord by means of the retardation coil in the dial circuit which functions as a repeating coil at this time. The circuit remains in this condition until the talk and dial key is restored to normal.

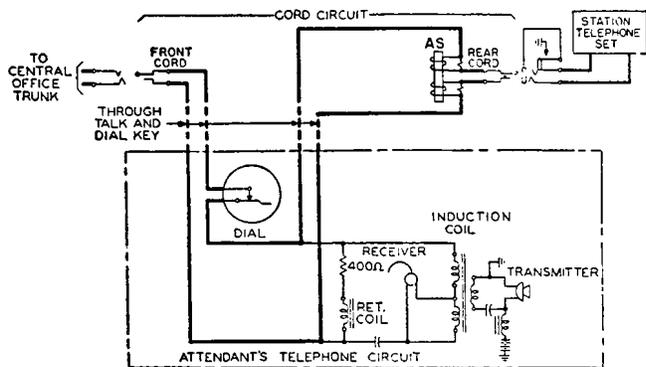


Fig. 5—Attendant's Talk and Dial Circuit Before Dialing

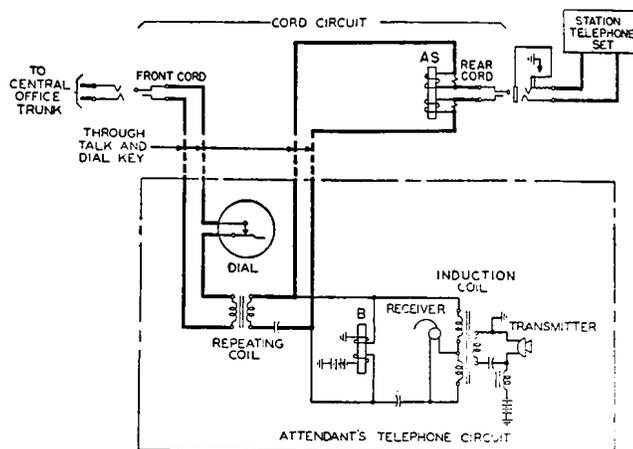


Fig. 7—Attendant's Talk and Dial Circuit After Dialing

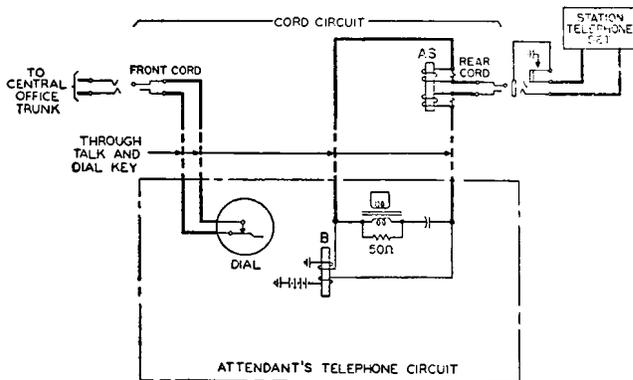


Fig. 6—Attendant's Talk and Dial Circuit During Dialing

4. SPECIFICATIONS

4.01 The following specifications pertain to the 552B and E PBX's.

Title	Number
552B PBX Switchboard	AA352.032
552E Multiple PBX Switchboard	AA352.031