

## Western Electric 550-C Switchboard Documents

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P.B.X. SYSTEMS  
NO. 550C, 551A OR 551B  
AUXILIARY SIGNAL AND  
BATTERY CUT-OFF KEY CIRCUIT

CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded	Superseded By
B10 relay	B1011 relay
"R" option	"N" option

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 Option "R" is designated and rated, "Mfr. Disc.", replaced by option "N", which is added.
- D.2 Note 102 is changed to add reference to options "R" and "N".
- D.3 "R" and "N" are added to options used table.
- D.4 Winding designations are added for (N) relay, fig. 1.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

- 1.1 The auxiliary signal relay shown in Fig. 1 is used to control the audible signal to the attendant when the buzzer key is turned on, whenever a call is originated from any station line, central office trunk or tie trunk circuit, or upon disconnection by a station line or tie trunk circuit connected to a rear cord.
- 1.2 The battery key shown in Fig. 2 with fuses in Fig. 8 are provided to control the battery supply to the station cord telephone and dial, central office trunk and tie trunk circuit in a single position switchboard where central office and building battery is inaccessible for replacement of fuses.
- 1.3 The battery key shown in Fig. 5 is provided for one position where local battery is used and fuses are accessible for replacement.
- 1.4 The fuses and the battery key shown in Fig. 6 are provided for two positions with central office battery or building battery where the building battery is inaccessible for replacement of fuses.

1.5 The battery key shown in Fig. 7 is provided for two positions with local or building battery and battery is accessible for replacement of fuses.

1.6 The buzzers in Fig. 1A are provided for operation on ringing current. The 8A buzzer differs from the 4B buzzer in that the volume can be regulated by the P.B.X. attendant.

1.7 The buzzer and associated apparatus in Fig. 1B are provided when a buzzer operated on the P.B.X. battery is required.

1.8 The foot switch is provided in Fig. 4 for use when the buzzer is to be silenced by a foot operated switch.

2. WORKING LIMITS

	Station Lines Without Line Relay	
	With 2W Lamps	With B2 Lamps
Maximum External Circuit Loop Resistance	70 ohms	150 ohms
Minimum Insulation Resistance		>15000 ohms
*Combined Insulation Resistance of all station lines without line relays.		

3. FUNCTIONS

- 3.1 To provide an audible signal on calls originated by stations, incoming calls on central office trunk circuits and incoming calls on tie trunk circuits.
- 3.2 To provide an audible signal on disconnection by stations or tie trunk on rear cords.
- 3.3 To provide means of cutting off the battery to the station line, cord, telephone and dial, central office, trunk, and tie trunk circuits.
- 3.4 To provide means of equalizing the battery potential between two positions when battery is supplied over cable pairs from the central office or a battery which is inaccessible,

- 3.5 To provide an audible signal operated on ringing current.
- 3.6 To provide an audible signal operated on the P.B.X. battery.
- 3.7 To provide for the use of a local battery at the P.B.X.

#### 4. CONNECTING CIRCUITS

When this circuit is listed on a key sheet the connecting information thereon is to be followed.

- 4.1 550C, 551A or B P.B.X. station line circuit - SD-66181-01 or SD-66110-01.
- 4.2 550C, 551A or B Central office trunk circuit - SD-66163-01 or SD-66109-01.
- 4.3 550C, 551A or B P.B.X. Tie trunk circuits - SD-66401-01 or SD-66039-01.
- 4.4 550C, 551A or B P.B.X. ringing circuit - SD-66182-01 or SD-65118-01.
- 4.5 550C, 551A or B P.B.X. cord circuits - SD-66179-01 or SD-66022-01.
- 4.6 24V central office battery supply leads - SD-90232-01.

- 4.7 550C, 551A or B P.B.X. telephone and dial circuit - SD-66180-01 or SD-66023-01.

- 4.8 Long line or long trunk circuits.

#### DESCRIPTION OF OPERATION

5. When the BUZZER key is turned to ON position the buzzer Fig. 1A or 1B is connected to the make contact of relay (N). When the line lamp on a station line, central office trunk, or tie trunk or a rear cord lamp is lighted relay (N) operates causing the buzzer to operate. When the lamp is extinguished relay (N) releases and the buzzer is silenced.

6. Battery is supplied to the central office trunk, cord, tie trunk, telephone and dial, and station line circuits through the BATTERY key when it is in the "ON" position. Battery is disconnected from this apparatus when the BATTERY key is in the "OFF" position to prevent the lamps from lighting and to prevent the relays in the cord circuits from operating in case the associated NIGHT keys are released. The BATTERY for long line or long trunk equipment is not connected through the battery cut-off key in order to provide for night service.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-CJS-RLL-DU

# SHEET INDEX

SHEET INDEX			ISSUE NO.																											OLD SHEET NO.	
FIG.	CONTENTS	SHEET NO.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27											
	SHEET INDEX SUPPORTING INFORMATION	A1	10																												
1 1A 1B 2 3 4 5 6 7 8	AUX SIG CKT AC BUZZER DC BUZZER BATTERY KEY FUSING WHEN 2 POS ARE LINED UP TOGETHER BUZZER FOOT SW BATTERY KEY BATTERY KEY BATTERY KEY	B1	10																											-011	
	CIRCUIT NOTES EQUIPMENT NOTES FIG. AND OPTIONS USED TABLE WORKING LIMITS KEYTOP DIAGRAMS	D1	10																											-011 -012	
	CIRCUIT REQ TABLE	F1	10																											-012	
51 52 53 54 55 56	FOR FIG. 1 FOR FIG. 1 FOR FIG. 2 FOR FIG. 2 & 8 FOR FIG. 5 FOR FIG. 6	G1	10																											-012	
57 58 59 60 61	FOR FIG. 7 FOR FIG. 2 FOR FIG. 2 & 8 FOR FIG. 5 FOR FIG. 6	G2	10																											-012	
62	FOR FIG. 7	G3	10																											-012	

## SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING, ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE SHEET INDEX.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.
6. "OLD SHEET NO." REFERS TO SHEET NO. PRIOR TO ISSUE: 100

## SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT INFO	ED-65634-01

SD- 66123-01

PBX SYSTEMS  
NO. 550C, 551A, OR 551B  
AUXILIARY SIGNAL AND  
BATTERY CUT-OFF KEY CIRCUIT

(2)

(AUX)

BELL TELEPHONE LABORATORIES  
INCORPORATED

35

M&M ONLY

MFR DISC. FOR 550C PBX

SD-66123-01-A1  
7 SHEETS



FIG. 1A  
A-C BUZZER

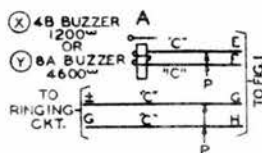


FIG. 1  
AUX. SIG. CKT.

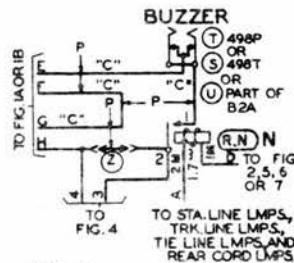


FIG. 2  
BATTERY KEY

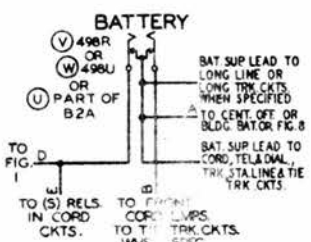


FIG. 4  
BUZZER FOOT SW.

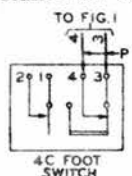


FIG. 1B  
D-C BUZZER

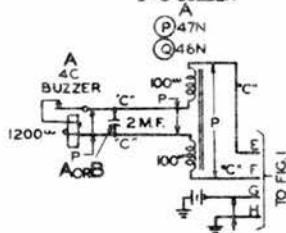


FIG. 3 (MFR. DISC)

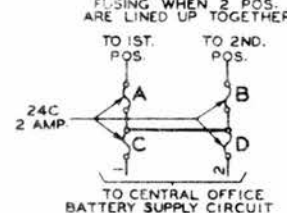


FIG. 5  
BATTERY KEY

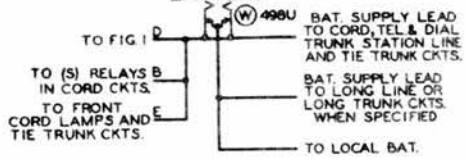


FIG. 6  
BATTERY KEY

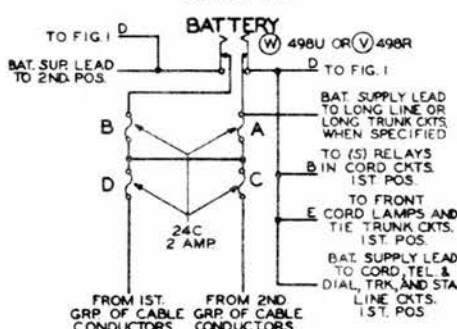


FIG. 7  
BATTERY KEY

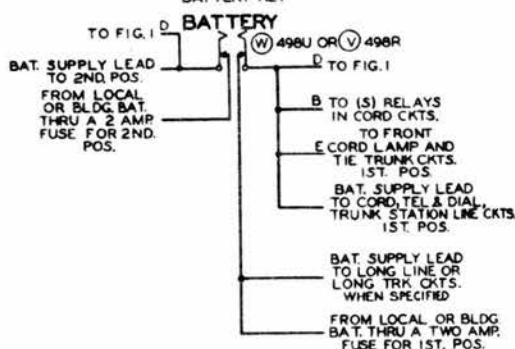
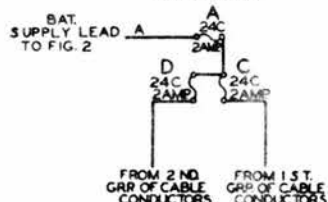


FIG. 8  
BATTERY KEY



## CIRCUIT NOTES:

101.

FEATURE OR OPTION		PROVIDE	
		FIG. OR WIR.	QUANTITY
A-C BUZZER		1A YOR	1 PER PBX
D-C BUZZER	550C PBX	1B Q	1 PER PBX
	551A OR 551B PBX	1B P	1 PER PBX
AUX SIG. CKT.	550C PBX	1 U	1 PER PBX
	551A OR 551B PBX	1 S OR T	1 PER PBX
BUZZER FOOT SW.	PROVIDED	4	1 PER PBX
	NOT PROVIDED	Z IN FIG. 1	
BAT. KEY	FOR ONE POS. WHERE LOCAL BAT IS USED AND FUSES ARE ACCESSIBLE FOR REPLACEMENT	550C PBX 5 W	1 PER PBX
		551A OR 551B PBX 5 W	1 PER PBX
BAT. KEY	FOR ONE POS. WHERE CENT. OFF. OR BLDG. BAT. IS ACCESSIBLE FOR REPLACEMENT OF FUSES.	550C PBX 2 U	1 PER PBX
		551A OR 551B PBX 2 W OR V	1 PER PBX
BAT. KEY	FOR ONE POS. WHERE CENT. OFF. OR BLDG. BAT. IS INACCESSIBLE FOR REPLACEMENT OF FUSES.	550C PBX 2 & 8 U	1 PER PBX
		551A OR 551B PBX 2 & 8 W OR V	1 PER PBX
BAT. KEY	FOR TWO POS. WITH CENT. OFF. BAT. OR BLDG. BAT. WHERE BLDG. BAT. IS INACCESSIBLE FOR REPLACEMENT OF FUSES.	550C PBX 6 W	1 PER 2 POS.
		551A OR 551B PBX 6 W OR V	1 PER 2 POS.
BAT. KEY	FOR TWO POS. WITH LOCAL OR BLDG. BAT. AND BAT. IS ACCESSIBLE FOR REPLACEMENT OF FUSES.	550C PBX 7 W	1 PER 2 POS.
		551A OR 551B PBX 7 W OR V	1 PER 2 POS.

102.

RECORD OF FIGURES, WIRING, AND APPARATUS CHANGES						
IF JOB CHANGED ON ISS.	RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN.	SEE NOTE	USE IN CIRCUIT		
				STD.	A & M	M.D.
3-D	S OR T	(BUZ) FOR PBX NO. 551A, 551B		S		T
3-D	W OR V	(BAT) FOR PBX NO. 551A, 551B		W		V
4-D		FOR PBX 550C		U		
7-D	X OR Y	X		Y		X
7-D	Z OR FIG. 4	Z		Z FIG. 4		
8-D				FIG. 5		
8-D				FIGS. 6 OR 7		FIG. 3
8-D				FIG. 8		
9-D	N OR R	R		N		R

## EQUIPMENT NOTES:

201. NEW LEAD TO BE RUN TO THE BATTERY CUT-OFF KEY IN THE CROWN MOLDING.

202. ON THE CIRCUIT LABEL IN THE 550C PBX THE "BUZ" PUNCHING IS DESIGNATED "BAT".

203. PUNCHINGS B4 &amp; B5 ARE PROVIDED ON THE 550C, 80 &amp; 320 LINE, PBX ONLY.

204. THE BATTERY CUT-OFF KEY IN THE 2ND, 551 PBX POSITION SHOULD BE REMOVED AND ALL LEADS CONNECTED TO IT SPliced AND TAPED TOGETHER.

205. ALL LEADS CONNECTED TO THE 550C PBX BATTERY CUT-OFF KEY SHOULD BE REMOVED AND SPliced AND TAPED TOGETHER.

## FIGURES AND OPTIONS ON THIS DWG.

CKT FIG.	APP OR WIRING
1	Z
1A	X
1B	Y
2	W
3	V
4	U
5	T
6	S
7	R
8	Q
9	P

BUZZER  
ON OFFBATTERY  
ON OFF

14-26V.

U B2A



## WORKING LIMITS

STATION LINES  
WITHOUT LINE RELAYS  
WITH  
2W LAMPS 82 LAMPS  
70<sup>W</sup> 150<sup>W</sup>  
\*15,000<sup>W</sup>

MAX EXT. CKT. LOOP  
MIN. INSULATION RES

\*COMBINED INSULATION RESISTANCE OF ALL  
STATION LINES WITHOUT LINE RELAYS

## PBX SYSTEMS

NO. 550C, 551A, OR 551B  
AUXILIARY SIGNAL AND  
BATTERY CUT-OFF KEY CIRCUIT

2

SD-66123-01-D1

BELL TELEPHONE LABORATORIES

INCORPORATED

3S

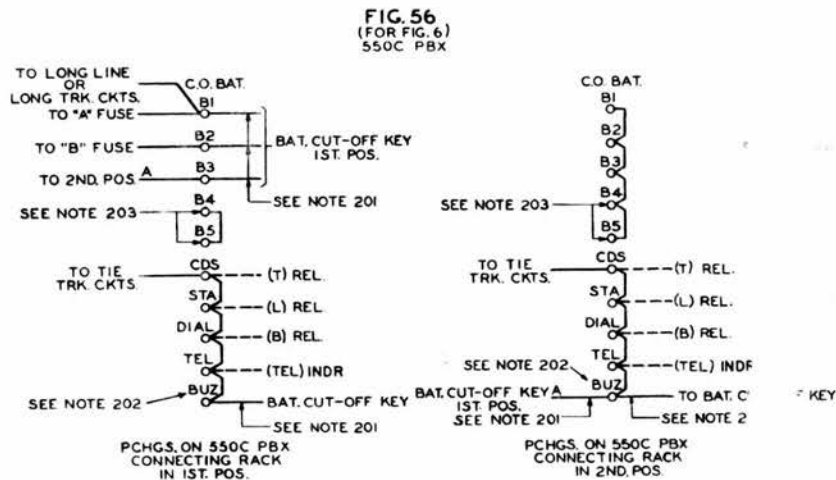
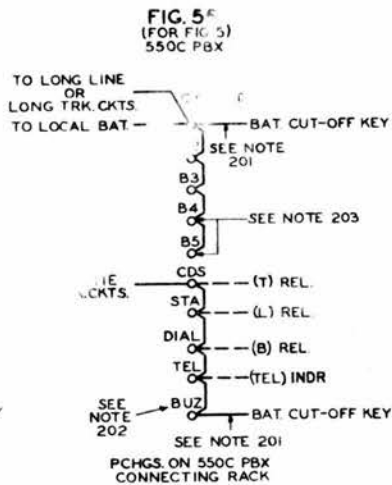
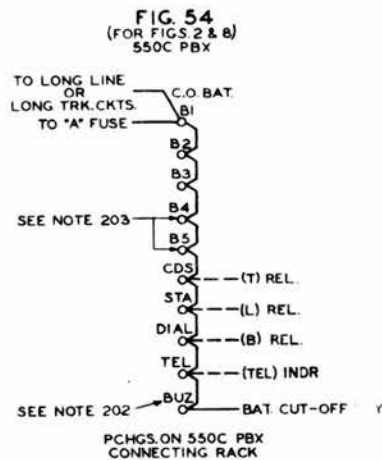
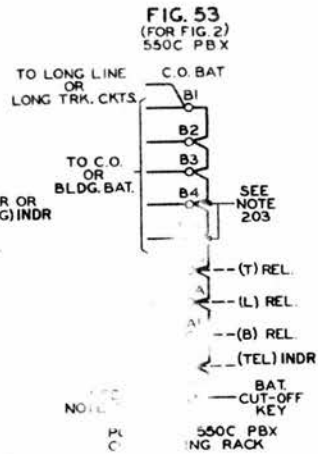
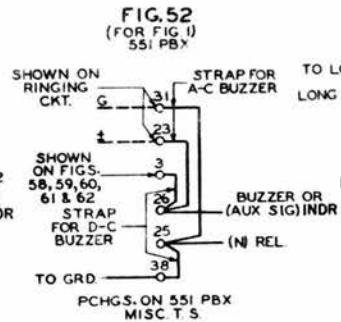
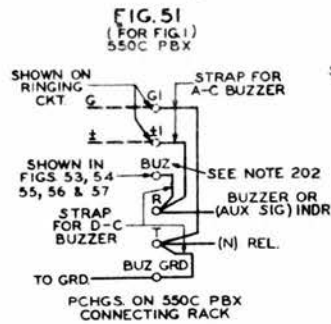


FIG. 57  
(FOR FIG. 7)  
550C PBX

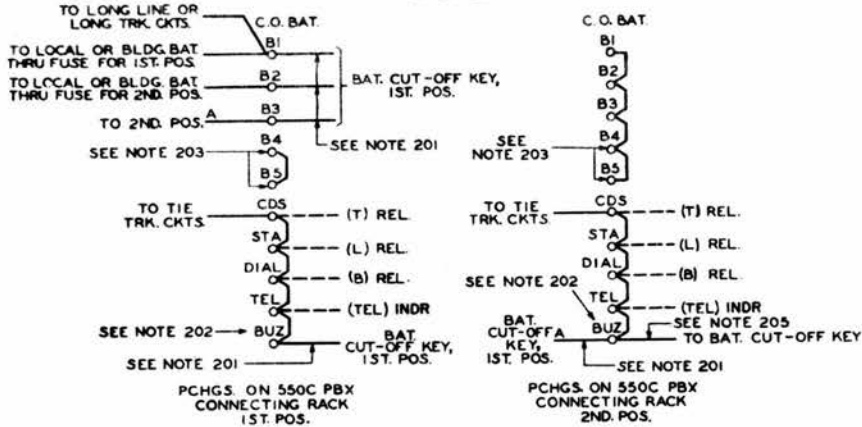


FIG. 58  
(FOR FIG. 2)  
551 PBX

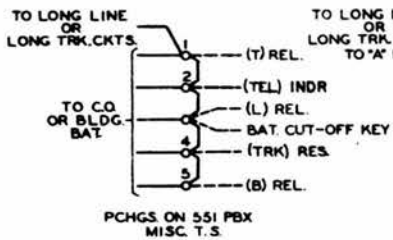


FIG. 59  
(FOR FIGS. 2 & 8)  
551 PBX

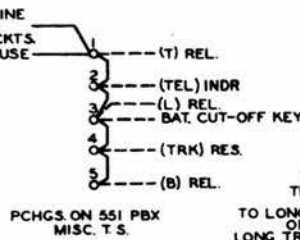


FIG. 60  
(FOR FIG. 5)  
551 PBX

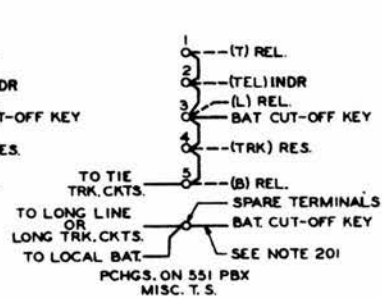


FIG. 61  
(FOR FIG. 6)  
551 PBX

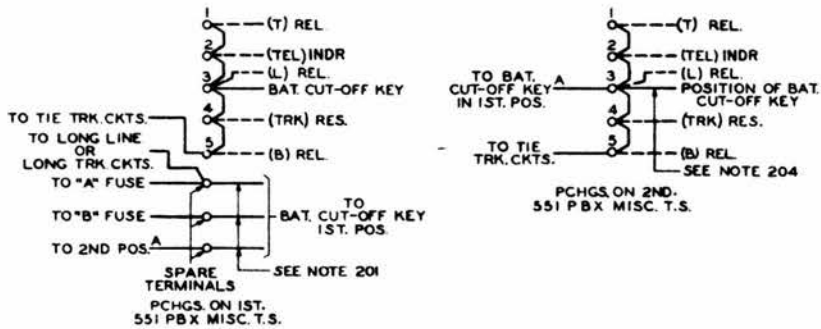
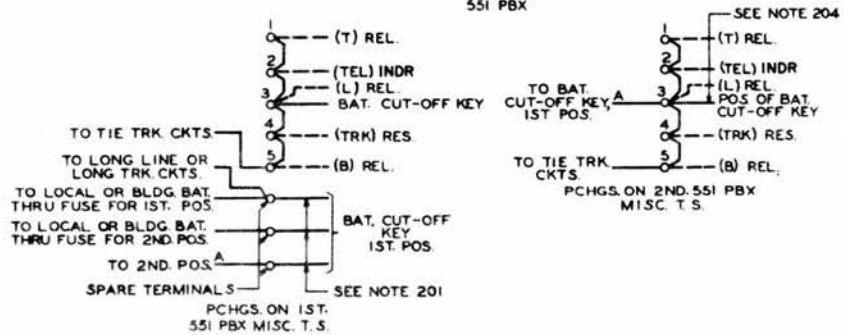




FIG. 62  
(FOR FIG. 7)  
551 PBX





PBX SYSTEM  
#550C, 551A OR 551B  
CENTRAL OFFICE TRUNK CIRCUIT

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 Working limits for Fig. C changed. The working limits formerly were as follows:

Fig.	72V Min.	75V Min.	80V Min.	84V Min.	90V Min.
A	550 $\omega$	600 $\omega$	700 $\omega$	800 $\omega$	1200 $\omega$
B			*550 $\omega$	*650 $\omega$	1200 $\omega$
C	1200 $\omega$	1200 $\omega$	1200 $\omega$	1200 $\omega$	1200 $\omega$

\*Min. 1.1 mf. measured capacity of 1 mf. condenser.

All other headings under "Changes", no change.

1. PURPOSE OF CIRCUIT

- 1.1 This circuit is used to provide a means for connecting the 550C, 551A or 551B switchboard to a dial central office, or to a manual central office.

2. WORKING LIMITS

2.1	Fig.	72V Min.	80V Min.	84V Min.	90V Min.
Max. Conductor Loop	A	550 $\omega$	700 $\omega$	800 $\omega$	1200 $\omega$
	B		*550 $\omega$	*650 $\omega$	1200 $\omega$
	C	1200 $\omega$	1800 $\omega$	2400 $\omega$	4000 $\omega$

\*Min. 1.1 mf. measured capacity of 1 mf. condenser.

Minimum Insulation Res. Manual Panel and Crossbar 20,000 $\omega$   
Step-by-Step 30,000 $\omega$

3. FUNCTIONS

- 3.1 To give a visual signal when ringing current is applied to the trunk at the central office on incoming calls.
- 3.2 To prevent the trunk lamp from lighting on outgoing calls.



- 3.3 To prevent a false pulse when plug is inserted in the jack.
- 3.4 To disconnect the line winding of relay (L) from across the line to improve transmission.
- 3.5 To prevent a false line lamp upon disconnection.

#### 4. CONNECTING CIRCUITS

- 4.1 No. 550C, 551A or 551B PBX auxiliary signal and battery cut-off key circuit.
- 4.2 Subscriber's line circuit in manual, panel, crossbar or step-by-step central office.
- 4.3 No. 550C, 551A or 551B P.B.X. cord circuit.

#### DESCRIPTION OF OPERATION

##### 5. INCOMING CALLS

When ringing current is applied to this circuit at the associated central office, relay (L) operates on its secondary winding and locks on its primary winding under control of the jack. Relay (L) operated causes the trunk lamp to light and the buzzer in the associated auxiliary signal circuit to function as an indication of an incoming call.

##### ANSWERING

When the plug of the cord circuit is inserted in the trunk jack associated with the lighted lamp, the holding path of relay (L) is opened and the relay releases extinguishing the trunk lamp. The jack is so arranged that the ring side of the line is not connected through until the tip springs are operated. This prevents a false pulse should the plug of the cord be inserted only part way in the jack. The operation of the jack springs also disconnects the line winding of relay (L) from the tip of the trunk to improve transmission and with Fig. A to connect it to the ring conductor to remove any charge remaining on the condenser after ringing so as to prevent the relay operating on the removal of the plug from the jack.

##### 7. OUTGOING CALLS

When the plug of the attendant's cord circuit is inserted in the trunk jack to make an outgoing call the springs of the jack operate and function as described above.

##### 8. THERMISTORS

The thermistor is a thermal device which ordinarily has a very high resistance in the order of 100,000 ohms. On a



short surge of current such as occurs on disconnection the thermistor does not have time to heat and presents a high resistance to the circuit preventing the operation of the (L) relay. On ringing current which continues for approximately two seconds the thermistor will heat up in about one second and lower its resistance to about 1000 ohms. This will allow sufficient ringing current to flow through the condenser and the relay to cause it to operate in the usual manner. This resistance has the effect of decreasing the range of the P.B.X. trunk circuit. It is not directly detectable from the trunk loop because of the resonance between the relay winding and the series condenser. However, the decrease is appreciable as is indicated in the working limits. When it is necessary to obtain a longer loop than can be obtained with the existing condenser in the circuit it should be replaced with a condenser of 1.3 mf. as indicated in the drawing.

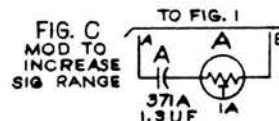
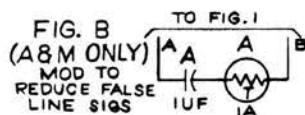
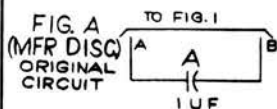
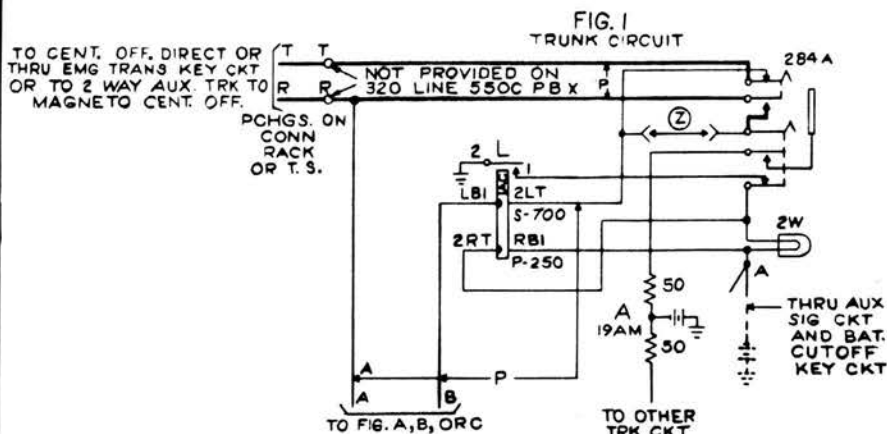
#### 9. MODIFICATION OF EXISTING P.B.X.'s

It has been the practice with Fig. A, in step-by-step exchanges to provide a reversal at the IDF in order to reduce the effect of the surges which cause a false line lamp on disconnection. When the thermistor is added to the circuit it is no longer necessary to make this reversal.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3330

LJB)  
WLF) IF



CIRCUIT NOTES:

101. PROVIDE ONE 19AM RESISTOR PER TWO TRUNKS.
102. CONNECT GROUND SIDE OF TRUNK TO TIP SIDE AND BAT. SIDE OF TRUNK TO RING SIDE OF THIS CIRCUIT WHEN THE TIP AND RING OF THE TRUNK ARE REVERSED AT THE I.D.F. IN STEP BY STEP CENTRAL OFFICES FOR MAINTENANCE PURPOSES. FOR USE WITH FIG. A.

103. RECORD OF FIGURES, WIRING AND APPARATUS CHANGES

CHANGED ON ISS	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT		
				STD	A&M	MD
6D	FIG. A, B OR C	FIG. A		FIG. C	FIG. B	FIG. A
6D	Z	Z				Z

14-26V

WORKING LIMITS

20V SIGNALING

72V MIN. 80V MIN. 84V MIN. 95V MIN.

FIG. A 550Ω 700Ω 800Ω 1200Ω

FIG. B 5500\* 5500\* 6500\* 1200Ω

FIG. C 1200Ω 1800Ω 2400Ω 4000Ω

\*MIN. 1.1UF MEASURED CAPACITY OF 1UF CAPACITOR (A)

REPLACING 190-B-11 AND REPLACING ES-203306 FOR TRUNK CIRCUIT

SD-66109-01

PBX SYSTEMS

NO. 550C, 551A, OR 551B  
CENTRAL OFFICE TRUNK CIRCUIT

A&M ONLY

"MFR DISC." FOR 550C PBX

2

SD-66109-01-1  
2 SHEETS

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## P.B.X. SYSTEMS

### NO. 550C, 551A OR 551B

### CORD CIRCUIT

**CHANGES****B. CHANGES IN APPARATUS**

B.1 Superseded                      Superseded By  
Relay 178AF                      Relay 178CM

**D. DESCRIPTION OF CIRCUIT CHANGES**

D.1 The use of the 178AF relay is rated Mfr. Disc. to show realistic ratings for obsolescent apparatus.

D.2 The rating of the circuit is changed from A&M Only, Mfr. Disc. for 550C P.B.X., to Mfr. Disc. to agree with the rating of the 551A and 551B P.B.X.

D.3 Note 106 is added.

All other headings under changes, no change.

**1. PURPOSE OF CIRCUIT**

1.1 This circuit is used at a No. 550C, 551A or 551B P.B.X. switchboard to establish connections between two local stations or a local station and a central office trunk.

**2. WORKING LIMITS****STATION TO STATION**

			Supv.			
		14V	15V	17V	19V	21V
Max. Ext.	185 $\omega$	200 $\omega$	235 $\omega$	270 $\omega$	305 $\omega$	
Ckt. Loop						
Min. Ins.	20,000 $\omega$					
Res.						

Trunk Supv.  
See Range Charts.

**3. FUNCTIONS**

- 3.1 Completing talking connections between local stations.
- 3.2 Completing talking connections between local stations and central office trunks.

3.3 Attendant dialing on front cord.

3.4 Thru dialing and supervision on station to central office connections.

3.5 Thru supervision with cord splitting on central office connections.

3.6 Nonthru supervision.

3.7 Ringing supervision on front cord on central office connections.

3.8 Ringing on front and rear cords.

3.9 Double supervision on local connections.

**4. CONNECTING CIRCUITS**

When this circuit is listed on a keysheet, the connecting information thereon is to be followed.

4.1 No. 550C, 551A or 551B P.B.X. station line circuit SD-66110-01.

4.2 No. 550C, 551A or 551B P.B.X. trunk circuit SD-66109-01.

4.3 No. 550C, 551A or 551B P.B.X. ringing circuit SD-65118-01.

4.4 No. 550C, 551A or 551B auxiliary signal and battery cut-off key circuit SD-66123-01.

4.5 No. 550C, 551A or 551B P.B.X. attendant's telephone circuit and dial circuit SD-66023-01.

**DESCRIPTION OF OPERATION****5. COMPLETING LOCAL CONNECTIONS**

When the rear cord plug is inserted in the jack associated with the lighted line lamp, the



lamp is extinguished, the supervisory lamp associated with the front cord is lighted and relay (A) operates preventing the supervisory lamp associated with the rear cord from lighting. The talk and dial key is then operated connecting the attendant's telephone set across the cord for talking. On learning that a local connection is wanted, the plug of the corresponding front cord is inserted in the station jack of the called line. The front cord ringing key is then operated connecting ringing current to the line to signal the called station.

When the receiver is removed from the switchhook at the called station, relay (C) operates. Relay (C) operated causes the front cord supervisory lamp to be extinguished as an indication that the called party has answered.

**5.1** The operation of the switchhook at either station will cause the corresponding relay (A) or (C) to release and reoperate in turn flashing the associated supervisory lamp as a recall signal.

## **5.2 Disconnection on Local Call**

When the receivers are replaced on the switchhooks at the calling and called stations, relays (A) and (C) release in turn allowing the associated cord supervisory lamps to light as disconnect signals. The plugs of the front and rear cords are then withdrawn from the associated jacks and the circuit restores to normal.

## **6. COMPLETING CALLS DIAL CENTRAL OFFICE**

### **6.1 Calls Dialed by Attendant**

The call is answered as described in paragraph 5. With the talk and dial key operated, the plug of the front cord is inserted in an idle trunk jack operating relay (T). Relay (T) operated prevents the front cord supervisory lamp from lighting, disconnects P.B.X. battery and ground from the cord, short-circuits relay (C) and causes (E) to operate. Relay (E) operated, removes the retardation coil from across the tip and ring of the cord and short-circuits the secondary (36 ohm) winding of relay (A). The circuit is now in condition for the attendant to dial the central office. After dialing is completed, the talk and dial key is restored causing relay (E) to lock thru its own contacts under control of the talk and dial key.

### **6.2 Disconnection on Attendant Dial Calls (Thru Supervision)**

When the receiver is replaced on the switchhook at the local station at the end of the call, relay (A) releases relighting the rear cord supervisory lamp as a disconnect signal and operating relay (S), and the apparatus at the central office releases. Relay (S) operated, splits the cord to prevent ringing the station falsely should the trunk be re seized at the central office before the cords at this P.B.X. are withdrawn from the jacks. When the plugs of the cords are withdrawn from the associated jacks, all operated apparatus releases restoring the circuit to normal.

Should the trunk be seized by the central office apparatus before disconnection by the attendant, relay (R) operates on central office ringing current and holds over the ringing interval. This causes the front cord supervisory lamp to light as a recall signal. When the talk and dial key is operated the retardation coil of the dial circuit is bridged across the line and relay (E) is released. Relay (E) released connects the retardation coil across the tip and ring of the cord to trip machine ringing and also releases relay (S). Relay (S) released connects the tip and ring of the rear cord to the tip and ring of the front cord. The call is then completed by inserting the plug in the called station line jack and operating the rear ringing key.

### **6.3 Disconnection on Attendant Dial Calls (Non-thru Supervision)**

When the receiver is replaced on the switchhook at the local station at the end of a call, relay (A) releases relighting the rear cord supervisory lamp as a disconnect signal and releasing the (E) relay. Relay (E) prevents the (S) relay operating and connects the retardation coil across the tip and ring of the cord for holding the central office connection. The plugs of the cords are then withdrawn from the associated jacks releasing all operated relays and restoring the circuit to normal.

### **6.4 Calls Dialed from Station (Thru Dial Calls)**

With the night and thru dial key operated the plug of the front cord is inserted in the jack of an idle trunk. Operation of this key disconnects



all apparatus in the cord except the rear supervisory relay and relay (R) in series with the 2 mf condenser bridged across the cord. Either or both supervisory lamps may or may not flicker during dialing.

#### 6.5 Disconnection on Thru Dialed Calls

When the receiver is replaced on the switchhook, the central office apparatus is released and relay (A) releases lighting the rear supervisory lamp as a disconnect signal. If the trunk is seized by the central office apparatus before disconnection by the attendant, the station bell will ring and relay (R) will operate lighting the front supervisory lamp during ringing intervals. The attendant answers the call by restoring the night and thru dialing key and operating the talk and dial key. From this point on the circuit functions as previously described.

#### 7. OUTGOING CALLS TO MANUAL CENTRAL OFFICE

The call is answered as described in paragraph 5. The plug of the front cord is then inserted in an idle trunk jack causing relay (T) to operate. Relay (T) operated, disconnects the P.B.X. battery and ground from the retard coil in the cord circuit, bridging it across the cord, lighting the line lamp at the central office. Relay (A) may or may not remain operated during the interval between the disconnection of P.B.X. battery by relay (T) and the connection of central office battery from the central office cord circuit. When the call is answered by the central office operator, relay (A) operates if released and extinguishes the rear cord supervisory lamp if lighted. The call is then passed with the talk and dial key operated. The talk and dial key is then released and the circuit functions as described in paragraph 6.1.

#### 8. INCOMING CALLS FROM DIAL OR MANUAL CENTRAL OFFICE

When the plug of the front cord is inserted in the trunk jack associated with the lighted trunk lamp and the talk and dial key is operated, the trunk lamp is extinguished and relay (T) operates. Relay (T) operated disconnects P.B.X. battery and ground from the retardation coil in the cord circuit, bridging the retardation coil across the tip and ring of the cord to trip machine ringing, and short-circuits relay (C).

The call is completed by inserting the plug of the rear cord in the called station jack and ringing current is applied to the line. When the receiver is removed from the switchhook at the called station, relay (A) operates extinguishing the rear supervisory lamp and operating relay (E) which locks under control of the talk and dial key. Relay (E) operated opens the circuit of the retardation coil bridged across the tip and ring of the cord and short-circuits the secondary (36 ohm) non-inductive winding of relay (A) if lead "A" is connected.

#### 9. DISCONNECTION

When the receiver is replaced on the switchhook at the called station, relay (A) releases relighting the rear supervisory lamp as a disconnect signal and operates relay (S) if the cord is arranged for thru supervision or releases relay (E) if the cord is arranged for nonthru supervision. From this point on, the circuit functions as described in paragraph 6.2 or 6.3.

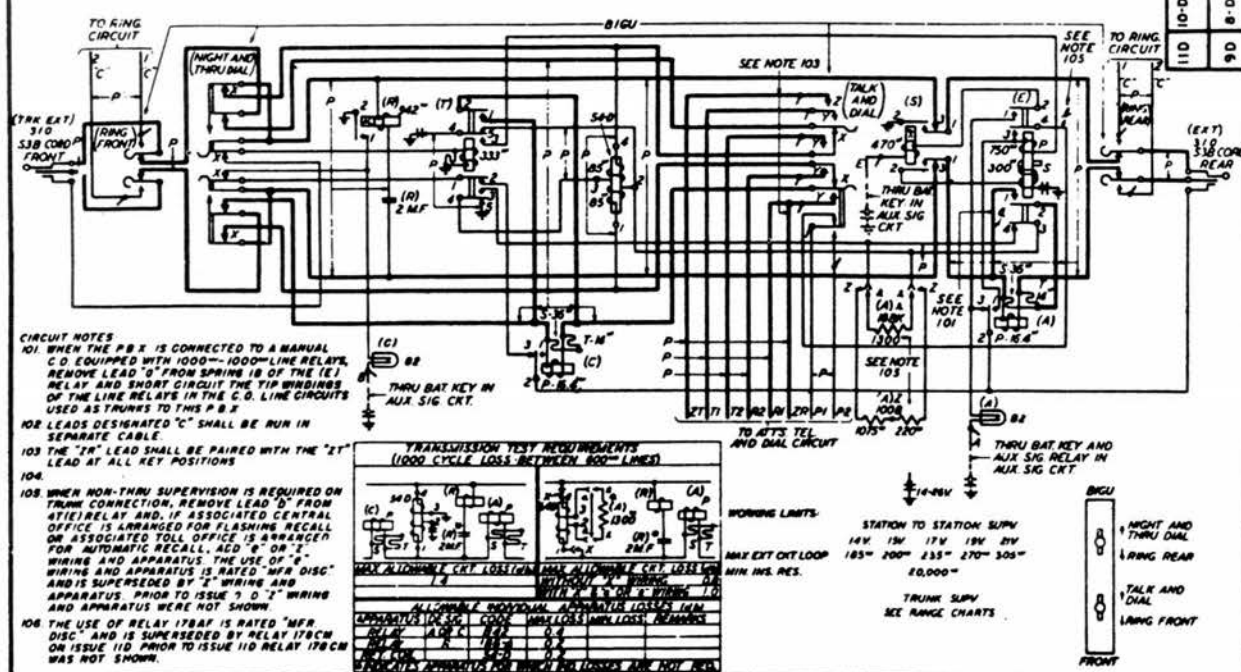
#### 10. MISCELLANEOUS APPARATUS

##### 10.1 (A) Resistance

The (A) resistance provides a permanent bridge across the cord for nonthru supervision on trunk calls to prevent falsely recalling the central office or toll operator.



P.B.X. NO. 550C, 551A, OR 551B  
CORD CIRCUIT



CIRCUIT REQUIREMENTS

NO 550C, 551A, OR 551B P.B.X.-CORD CIRCUIT (CD)

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	DIRECT CURRENT FLOW REQ.	REMARKS
DESIG. CODE	B.S.P. CON. FIG. POS.	BLOCK	TEST CLIP DATA	TEST SET	TEST DATA
RELAYS					
A 842	J	030	EXT-CD-R GRD.	PSA O	.150 .012
			EXT-CD-R GRD.	PSA R	.150 .004
			EXT-CD-R GRD.	PSA I	.150 .028
			EXT-CD-R GRD.	PSA H	.150 .0038
C 842	J	030	TRK-CD-R GRD.	PSA J	.150 .012
			TRK-CD-R GRD.	PSA R	.150 .004
			TRK-CD-R GRD.	PSA I	.150 .028
			TRK-CD-R GRD.	PSA H	.150 .0038
E 843	H/O	L 025	2070	EXT-CD-S GRD.	P O .016 .014
R 178-A			UNWDCM	BAT.	O .0083 .0075
			UNWDCM	BAT.	NO .0038 .004
S 178-A	D/D		ZY (E) GRD.	Z	O .028 .024
178CM			ZY (E) GRD.	Z	NO .013 .017
Y 844	B/Y	L 030	TRK-CD-S	BAT	PS O .032 .028
MISC.					
BIGU				3/4	
KEY					

TEST NOTES:

1. REQUIREMENTS FOR TESTING FROM FRONT OF BOARD: GROUND SLEEVE OF REAR (EXTENSION) CORD ONLY TO LIGHT SUPERVISORY LAMP. ACTION OF 842 RELAY OBSERVED FROM FLASHING OF SUPERVISORY LAMP.

2. PRIOR TO ISSUE 3-0 THE REQUIREMENT FOR RELAY (S) WAS OPR. TEST .0255, READJ. 024, NON-OPR. TEST .017, READJ. 018, AND THE CONTACT PRESSURE WAS NOT SHOWN.

3. (TALK AND DIAL) KEY: ALL "Y" CONTACTS SHALL MAKE BEFORE ANY "X" CONTACT BREAKS. "Z" CONTACT SHALL MAKE LAST.

4. NON-CLICK REQUIREMENT.

(A.) (NIGHT AND THRU DIAL) KEY: WHEN LEVER IS RESTORED FROM (RING REAR) POSITION "X" CONTACTS SHALL NOT BREAK.

(B.) (RING REAR) KEY: WHEN LEVER IS RESTORED FROM (NIGHT AND THRU DIAL) POSITION NORMALLY OPEN CONTACTS SHALL NOT CLOSE.

(C.) (RING FRONT) KEY: WHEN LEVER IS RESTORED FROM (TALK AND DIAL) POSITION NORMALLY CLOSED CONTACTS SHALL NOT OPEN.

(D.) (TALK AND DIAL) KEY: NON-CLICK REQUIREMENT WAIVED WHEN LEVER IS RESTORED TO NORMAL FROM (RING FRONT) POSITION.

CIRCUIT DESCRIPTION

CD-66110-01  
Issue 5D  
Appendix 1D  
Dwg Issue 7D

PBX SYSTEMS  
NO. 550C, 551A, OR 551B  
STATION LINE CIRCUIT  
WITH OR WITHOUT LINE RELAY

Drawings for SD-66110-01 have been converted to 8-1/2 by  
11 inch handbook size.

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DEPT 5336-LEVD-EVDL

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Page 1  
1 Page



P.B.X. SYSTEMS  
No. 550C, 551A OR 551B  
STATION LINE CIRCUIT  
WITH OR WITHOUT LINE RELAY

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO  
ADDED OR REMOVED APPARATUS

- C.1 Test value for relay (L) operate, changed from 11 ma. to 8.4  
ma. to provide for increased range of station line circuit.  
Test Note 1 added.

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 Working limit, with line relay, changed from 150 ohms max.  
external ckt. loop to 500 ohms. Note 107 added.

All other headings under Changes, No change.

1. PURPOSE OF CIRCUIT

- 1.1 This circuit is used at a No. 550C, 551A or 551B P.B.X.  
switchboard to provide a means of establishing a connection  
to a station on incoming and outgoing calls.

2. WORKING LIMITS

2.1	Line Signaling		
	With Line Relay	Without Line Relay Using 2W Lamp	Without Line Relay Using B2 Lamp
Max.Ext.Ckt.Loop Res.	500 ohms	70 ohms	150 ohms
Min. Ins. Res.	20,000	*	*

\*The combined minimum insulation resistance of all lines com-  
mon to one aux. signal relay shall not be less than the min.  
insulation resistance specified for the aux. signal relay.

3. FUNCTIONS

- 3.1 To give a visual signal on incoming calls from associated  
station.
- 3.2 Extinguishing line lamp when call is answered.

- 3.3 Preventing lamp from lighting when calling associated station.

#### 4. CONNECTING CIRCUITS

- 4.1 No. 550C, 551A or 551B P.B.X. Auxiliary Signal and Battery Cut Off Key Circuit.
- 4.2 No. 550C, 551A or 551B P.B.X. cord circuit.

#### DESCRIPTION OF OPERATION

##### 5. ANSWERING INCOMING CALLS

###### 5.1 With Line Relay

When the receiver is removed from the switchhook at the associated station relay (L) operates. Relay (L) operated causes the line lamp to light and the audible signal to function, if the buzzer key in the associated auxiliary signal and battery cut off key circuit is operated, as an indication that a call is being made. When the plug of the P.B.X. cord circuit is inserted in the jack associated with the lighted line lamp relay (L) releases extinguishing the lighted line lamp.

###### 5.2 Without Line Relay

When the receiver is removed from the switchhook at the associated station the line lamp lights and the audible signal functions if the associated buzzer key is operated. When the plug of the cord is inserted in the jack the line lamp is extinguished.

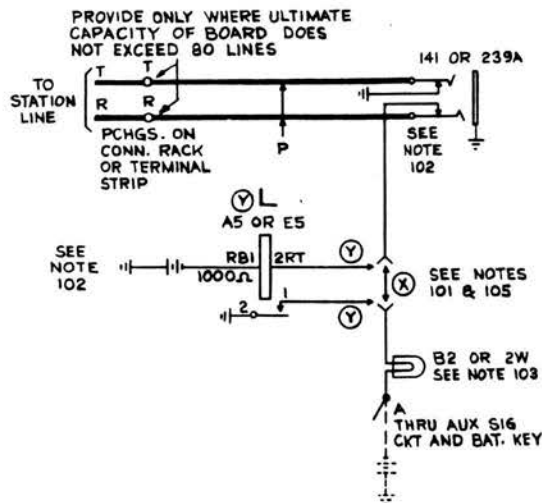
##### 6. OUTGOING CALLS

When the station associated with this line circuit is to be called, the plug of a cord circuit is inserted in the jack but no operation takes place other than the opening of the jack contacts.

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DEPT. 332

AB)  
WEM) GK



- CIRCUIT NOTES:
- (MFR DISC.)
101. (A) PROVIDE Y WIRING AND APPARATUS WHERE THE EXTERNAL CIRCUIT LOOP RESISTANCE IS GREATER THAN  $70\Omega$  AND NOT GREATER THAN  $500\Omega$ .  
(B) PROVIDE X WIRING WHERE THE EXTERNAL CIRCUIT LOOP IS LESS THAN  $70\Omega$ .
102. THE USE OF THE A5 RELAY IS RATED "A&W ONLY" AND IS SUPERSEDED BY THE USE OF THE E5 RELAY ON ISSUE 20.
103. THE USE OF THE 2W LAMP IN THIS CIRCUIT IS RATED "MFR DISC" AND IS SUPERSEDED BY THE USE OF THE B2 LAMP ON ISSUE 30. PRIOR TO ISSUE 30 THE B2 LAMP WAS NOT SHOWN.
- 104.
105. PROVIDE Y WIRING AND APPARATUS OR X WIRING IN ACCORDANCE WITH THE MIN INS RES NOTE UNDER WORKING LIMITS.
106. PRIOR TO ISSUE 40 THE MAX EXT CKT LOOP RES WITHOUT LINE RELAY USING B2 OR 2W LAMP WAS  $70\Omega$ , NOTE 101 WAS NOT RATED "MFR DISC", AND NOTE 105 WAS NOT SHOWN.
107. PRIOR TO ISSUE 60 MAX EXT CKT LOOP WITH LINE RELAY WAS  $150\Omega$ .

14 - 26V

WORKING LIMITS:

	WITH LINE REL	LINE SIGNALING WITHOUT LINE REL USING 2W LAMP	WITHOUT LINE REL USING B2 LAMP
MAX EXT CKT LOOP RES	$500\Omega$	$70\Omega$	$150\Omega$ SEE NOTE 106
MIN INS RES	$20,000\Omega$	*	*

\* THE COMBINED MINIMUM INSULATION RESISTANCE OF ALL LINES COMMON TO ONE AUX SIGNAL RELAY SHALL NOT BE LESS THAN THE MINIMUM INSULATION RESISTANCE SPECIFIED FOR THE AUX SIG RELAY.

REPLACING 190-B-10 & ES-203306 FOR STATION LINE CIRCUIT

SD-66110-01

PBX SYSTEMS

NO. 550C, 551A, OR 551B  
STATION LINE CIRCUIT

WITH OR WITHOUT LINE RELAY

2

A&W ONLY  
"MFR DISC." FOR 550C PBX

SD-66110-01-1

2 SHEETS

BELL TELEPHONE LABORATORIES  
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**P.B.X. SYSTEMS**  
**NO. 550C, 551A OR 551B**  
**TELEPHONE AND DIAL CIRCUIT**

**CHANGES****B. CHANGES IN APPARATUS**

- B.1 Added  
2-223A Jacks — Fig. 3

**D. DESCRIPTION OF CIRCUIT CHANGES**

- D.1 Note 112 is added.
- D.2 Fig. 3 is added when a second pair of attendants telephone set jacks is required in connection with Fig. A or C.

All other headings under Changes, no change.

**1. PURPOSE OF CIRCUIT**

- 1.1 This circuit is used at a 550C, 551A or 551B PBX by the attendant to listen and talk on connections established by the associated cord circuits and for dialing to Panel or Step-by-Step Dial Central Offices.

**2. WORKING LIMITS**

- 2.1 None.

**3. FUNCTIONS**

- 3.1 Attendant talking and listening.
- 3.2 Dialing called number to dial central offices.
- 3.3 Arranged to prevent false pulses to panel central offices.
- 3.4 Arranged to prevent clicks to the attendant on operation and release of "Talk and Dial" keys.

**4. CONNECTING CIRCUITS**

- 4.1 No. 550C, 551A or 551B PBX Cord Circuit.

- 4.2 No. 550C, 551A or 551B PBX Auxiliary Signal and Battery cut-off key circuit.

**DESCRIPTION OF OPERATION****5. TALKING AND LISTENING ON CONNECTIONS**

When the plug of the attendant's telephone set is inserted in the jacks associated with this circuit and the "talk and dial key" is operated in the cord circuit, the attendant's telephone set is bridged across the tip and ring of the cord. This enables the attendant to talk or listen on connections established by the cord circuit.

It will be noted that the receiver circuit is closed last on the operation of a "talk and dial key", this prevents a click to the attendant on the operation and release of the "Talk and Dial Key".

**6. DIALING CALLED NUMBER TO STEP-BY-STEP OR PANEL DIAL OFFICES**

When the "talk and dial key" of the cord circuit is operated and the dial tone received, the dial is moved off-normal. Relay (H) operates on the off-normal contact of the dial through its primary winding. Relay (H) operated, disconnects the ring of the attendant's telephone circuit from the cord, operates relay (D) and connects resistance (R) in parallel with the 54B retardation coil. Relay (D) operated, disconnects the ring of the attendant's telephone circuit from the repeating coil, short-circuits the 54B retardation coil, connects ground to the secondary winding of relay (H), and operates relay (F). Relay (F) operated, disconnects the tip and ring of the rear cord circuit from the tip and ring of the front cord circuit and connects the tip and ring of the rear cord to the repeating coil and relay (B). Should the receiver be off the switchhook at the calling station, relay (B) operates through the cord circuit and the station loop, otherwise it will operate through the holding bridge in the

cord circuit. Relay (F) is then locked operated under the control of relay (B).

When the dial returns to normal, relays (D) and (H) release. Relay (H) is sufficiently slow in releasing to hold resistance (R) in parallel with the 54B retardation coil until the current in that coil is partly built up. This prevents a false pulse at the end of each digit when dialing. Relay (D) released, connects the 54B retardation coil across the tip and ring of the front cord and connects the ring of the attendant's telephone circuit to the repeating coil. Relay (H) released, connects the ring to the front cord. Relays (F) and (B) remain operated under control of the talk and dial key of the cord circuit until the dialing is completed. When the talk and dial key is released relays (F) and (B) release and restore the circuit to normal.

## 7. CLICK REDUCTION

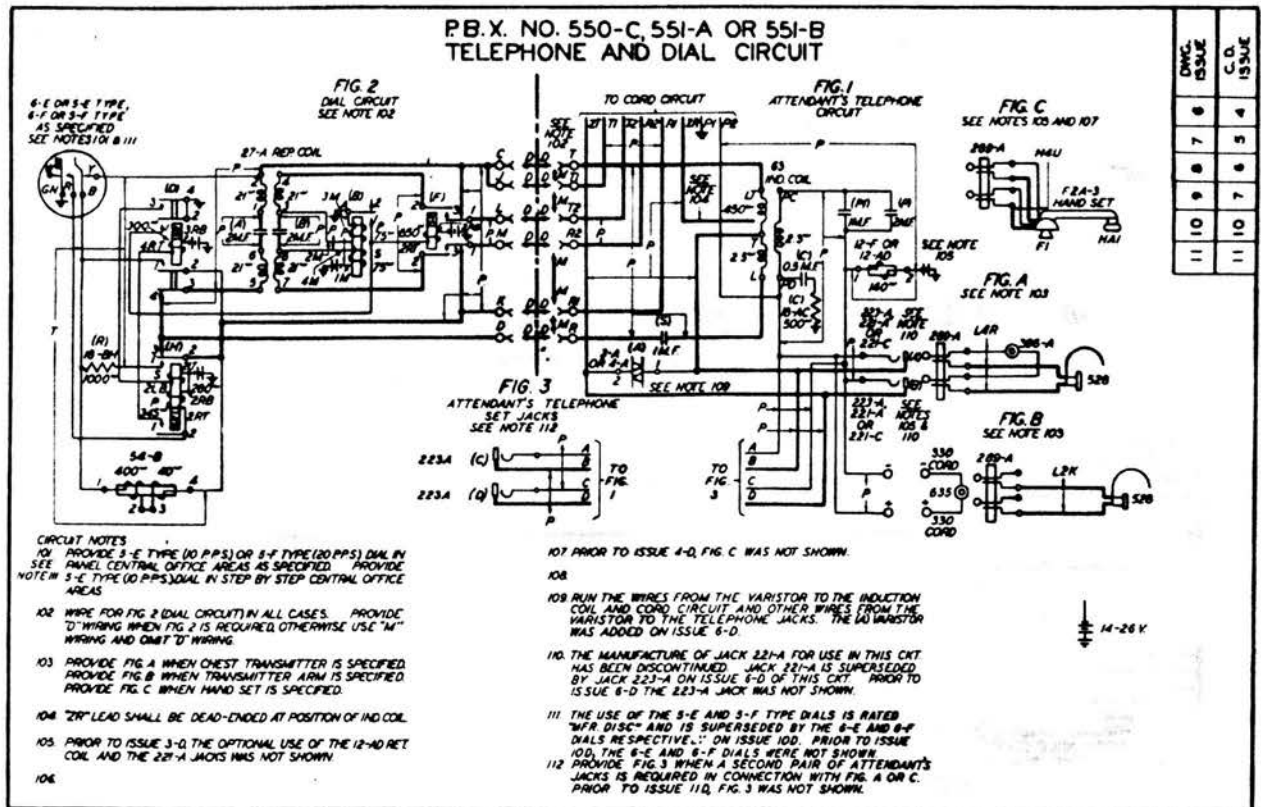
The varistor is provided to reduce the intensity of clicks in the receiver. With normal talking voltage the resistance of the varistor is very high, but on an increase of voltage the resistance is reduced to a very low value which reduces the intensity of the clicks heard in the receiver.

## 8. FIG. 3

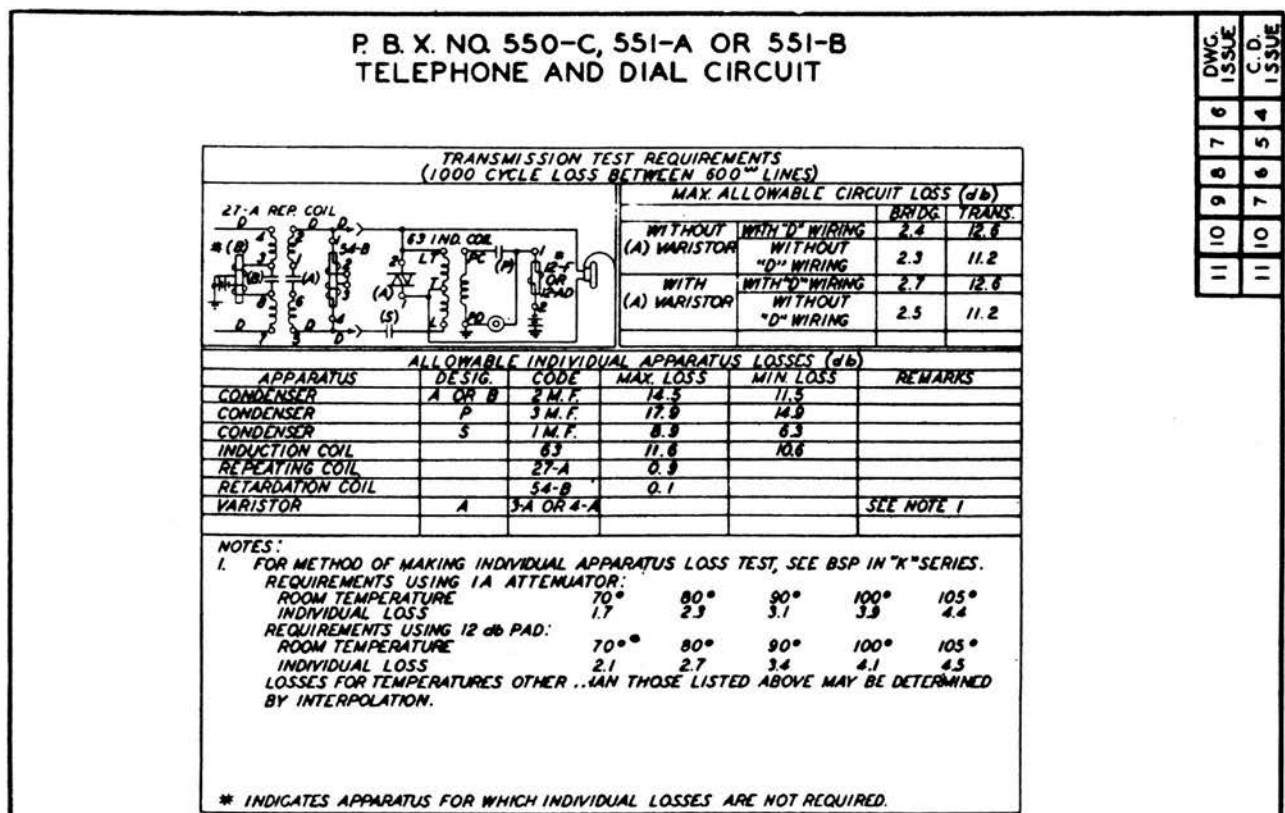
This figure provides a second pair of telephone jacks which may be used in connection with Fig. A or C. With this figure two operators may be connected at the same time.

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DWG. ISSUE	C.O. ISSUE
11 10 9 8 7 6	11 10 9 8 7 6 5 4



DWG. ISSUE	C.O. ISSUE
11 10 9 8 7 6	11 10 9 8 7 6 5 4

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