PBX SYSTEMS
NO. 605A OR 701A
ATTENDANT'S TELEPHONE
AND DIAL CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Repeating coil coupling is provided in figure 2 to reduce noise due to unbalanced longitudinal currents.

A.2 The resistance of the holding bridge is reduced after the dial restores to normal to hold the central office equipment over maximum subscriber loop range.

B. CHANGES IN APPARATUS

B.1

Superseded	Superseded By
54B Retardation Coil (D)	54AC Retardation Coil (D)
18BH Resistance (D)	18AJ Resistance (D)

Added

KS-8058 Resistance (A)
111A Resistance (B)

Removed	Replaced By
L4F Cord	L4R Cord
528 Receiver	716D Receiver
L2A Cord	L2K Cord
329 Transmitter	635A Transmitter

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Fig. 2 is added and figures 1, E, F and G are rated "Mfr.Disc." in order to provide repeating coil coupling between the station and the trunk after the attendant dials to reduce noise caused by unbalanced longitudinal currents and to provide a low resistance bridge after dialing.

D.2 The L2F and L4R Cords, 5E and 5F Dials, 716 Receiver, 635A Transmitter and 289A Plug are shown instead of the L2A and L4F Cord, 2E and 2F Dials, 528 Receiver and 329 Transmitter and 137 Plug which are Mfr.Disc.

D.3 Note 116 was added.

D.4 The drawing title was changed from

PBX SYSTEMS
NO. 605A OR 701A
TELEPHONE AND DIALING CIRCUIT
FOR ATTENDANT'S USE IN MULTIPLE
OR NONMULTIPLE SWITCHBOARDS
WITH OR WITHOUT VACUUM
CLICK REDUCTION CIRCUIT

To

PBX SYSTEMS
NO. 605A OR 701A
ATTENTAND'S TELEPHONE AND DIAL CIRCUIT

D.5 Figure 1 formerly was designated main figure.

D.6 Note 109 which read, "The manufacture of the L4E Cord and 234 and 329 transmitters for use in this circuit has been discontinued. The L4E Cord, 234 Transmitter and 329 Transmitter are superseded by the L4F Cord, 396-A Transmitter and 323 Transmitter respectively on Issue 6-D of this circuit. Prior to Issue 6-D, the L4F Cord and the transmitter and receiver codes were not shown." was removed.

D.7 The working limits which were

	Toward Station
Max. Ext. Ckt. Loop	600ω

were removed and "see range chart" was substituted.

D.8 Reference to Transmission Test figure numbers removed from Transmission Test Requirements on sheet 1.

All other headings under "Changes", no change.

1. PURPOSE OF CIRCUIT

1.1 This circuit is used by the PBX attendant in establishing local, central office and tie trunk connections.

2. WORKING LIMITS

2.1 See range chart.

3. FUNCTIONS

3.1 To enable the attendant to talk over a PBX cord circuit.

3.2 To enable the attendant to dial over a PBX cord circuit.

3.3 To reduce the intensity of clicks to the attendant when a cord is plugged into a station line circuit or central office trunk.

3.4 To delay the opening of the short circuit on the input coil or receiver when the dial returns to normal.

3.5 To provide a low resistance bridge after dialing.

4. CONNECTING CIRCUITS

4.1 Cord Circuit SD-66011-01.

DESCRIPTION OF OPERATION

5. TALKING ON CORD CIRCUITS - FIG. 1

When the (TALK AND DIAL) key of an associated cord circuit is operated, the "T1", "R1", "T2", "R2" and "ZT" leads of the telephone and dialing circuits are connected to the cord circuit, closing the tip, ring and receiver leads, thereby affording a talking path for the attendant.

6. CIRCUIT OPERATION OF VACUUM TUBE AND ASSOCIATED APPARATUS OF FIG. D

When the (EM) key is normal, the vacuum tube circuit is connected between the induction coil and the attendant's telephone jacks and when the telephone set plug is inserted into the attendant's jack and a (TALK AND DIAL) key is operated, relay (TR) operates, closing the filament circuit for the vacuum tube. Lamp (C) or Resistance (C) in the filament circuit is used to provide a satisfactory filament current regulation. Due to the high ratio of transformation of the input transformer (A), resistance (P) is connected across the output terminals of the input transformer to reduce the speech voltage input to the vacuum tube sufficiently to prevent overloading the tube to the extent of producing noticeable distortion in speech transmission. After amplification by the tube, the voltage of the speech signal is stepped down through the output transformer (B). Any transient voltage impressed across the receiver, such as is obtained when plugging a cord into a station or trunk jack, has a high peak characteristic which would produce objectionable clicks in the attendant's receiver. A high peaked positive transient voltage overloads the tube and causes it to distort the click; a high peaked negative transient reduces the plate current and thereby decreases the input to the receiver.

When the telephone set plug is removed from the attendant's telephone set jacks, relay (TR) releases and the filament circuit of the vacuum tube is opened. In case of trouble in the vacuum tube circuit, the (EM) key is operated. This opens the filament circuit and connects the receiver to the induction coil in the usual fashion.

7. DIALING - FIG. E

In order to dial on a cord circuit, the associated (TALK AND DIAL) key is operated. When the dial is moved off normal, relay (H) operates, opening the attendant's telephone circuit, opening a future talking path between the front and rear cords of the cord pair via the "T1", "R1", "T2", "R2" leads, operating relay (D) and shunting resistance (D) around retardation coil (D). The operation of relay (D) short-circuits the parallel combination consisting of resistance (D) and retardation coil (D), provides a locking path for relay (H), and operates relays (S) and (R). The operation of relay (S) splits the cord circuit, leaving the impulse springs of the dial connected to the front cord, and ground and battery through relay (B) to the rear cord. Relay (R) operated, short-circuits the input coil or the attendant's receiver for a sufficient length of time to prevent an undesirable click when the dial restores after dialing each digit, and to prevent the attendant from hearing the transmission of dial pulses. Relay (B) operates over the station loop or through the retardation coil bridge in the cord, in case the station has hung up, and closes a locking path for relay (S) under control of the (TALK AND DIAL) key. Dial impulses are transmitted over the trunk in the usual manner. When the dial is completely restored, relay (D) releases, removing the short-circuit from the parallel combination consisting of retardation coil (D) and resistance (D) and releasing relays (H) and (R). The release of relay (H) removes resistance (D) shunt from around retardation coil (D) and closes the attendant's talking circuit. The release of relay (R) opens the shunt on the input coil or the attendant's receiver. Retardation coil (D) now holds the connection and the front and rear cords are connected through condensers (T1) and (R1) to enable the station to talk on the connection in case the attendant fails to restore the (TALK AND DIAL) key after dialing. When the (TALK AND DIAL) key is restored, relays (B) and (S) release, restoring the circuit to normal.

8. TALKING AND DIALING - FIG. 2

8.1 New Features Provided by Fig. 2

Fig. 2 differs from Figs. 1 and E in that the talking condition between the station and the central office after the dial restores to normal through a retardation coil instead of through condensers. Another difference is that the bridge after each digit is one 48 ohm winding of the 54AC retardation coil instead of the 440 ohm windings of the 54B retardation coil shunted by the 1000 ohm resistance. The low impedance

of the 54AC retardation winding (which is further lowered by the 50 ohm shunt on the 3-4 winding at this time) prevents a false pulse which might occur after each digit and also provides for operation with central offices that have been arranged for increased range. The d-c bridge consisting of one winding of the 54AC retardation coil and the 18AJ resistance is normally 448 ohms to provide for making busy tests on local calls or incoming trunk calls and to avoid taking too much talking battery from the station on the front cord on a local connection.

8.2 Dialing

When the dial is removed off-normal (assuming a TALK AND DIAL key operated and the associated cord in a trunk or tie trunk jack) relay (H) operates from the off-normal contact of the dial.

Relay (H) operated, (1) disconnects the "T1", "R1" and "ZT" leads from the telephone circuit, (2) short-circuits the 3-4 winding of retardation coil (D), and (3) closes the circuit to relay (D). (The secondary winding of relay (H) is not used in this circuit).

Relay (D) operated closes the circuit to operate relays (R) and (S) and connects condenser (R) in series with resistance (B) across the station end of the dial circuit. Resistance (A) is in series with condenser (R) to prevent a large flow of current through the contacts of relay (D) in case the capacity of the station loop is large.

Relay (R) operated short-circuits the attendant's receiver for purposes described later.

Relay (S) operated disconnects the station from the trunk battery supply through the cord circuit and connects the station to the by-pass battery and ground supply circuit supplied by relay (B). Condenser (R) in series with resistance (B) being bridged across the station circuit at this time reduces clicks to the station which may be caused by the breaking and reconnecting of talking battery.

Relay (B) operates in series with the station loop, or if the receiver is not off at the station, in series with the cord bridge, (1) short-circuits resistance (D) to provide the low resistance bridge for holding the trunk when the dial returns to normal, (2) provides a locking path for relay (S), and (3) connects winding 3-4 of retardation coil (A) across the station loop in series with condenser (R). The 3-4 winding of retardation coil (A) is shunted at this time by resistance (B) and the 1-2 winding is shunted by relay (H) contacts to prevent the station hearing the dial pulses.

When the dial returns to normal, relay (H) releases, (1) removes the short circuit on the 1-2 winding of retardation coil (A), (2) reconnects the attendant's telephone circuit to the trunk, and (3) opens the circuit to relay (D).

Relay (D) releases slowly, (1) opening the circuit to relay (R), (2) removing the 50 ohm shunt from across the 3-4 winding of retardation coil (A), restoring the transmission circuit to the station through the retardation coil which is now used as a repeating coil.

Relay (R) releases slowly removing the short-circuit from the attendant's receiver. This prevents the attendant hearing any clicks due to charging or discharging condenser (S) when the circuit is restored to normal. Resistance (A) is bridged across condenser (R) to dissipate any charge remaining between digits.

Upon subsequent operation of the dial the circuit functions in a similar manner except that relay (S) is operated from relay (B) which in turn remains operated from the bridge at the station or in the cord circuit.

When the (TALK AND DIAL) key is restored, all relays restore to normal.

BELL TELEPHONE LABORATORIES, INC.

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