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CD-1E054-01
 ISSUE 3B
 APPENDIX 2B
 DWG ISSUE 8B
 DISTN CODE 1W99

PEX SYSTEMS
 INTERFACE CIRCUIT
 "TOUCH-TONE" CALLING
 TO DIAL PULSE CONVERSION

7

CHANGES

E. Changes in ApparatusE.1 Added

Capacitor E, Code 542F, App Fig. 1,
 Option E

D. Description of Changes

D.1 Option E is added and rated Special.
 Also, option E is added and rated
 AT&TCo Standard to designate wiring formerly
 not designated. Option E is always fur-
 nished with the circuit. However, when
 the circuit is to be provided for use with
 No. 4 ESS MCC Call Director circuits,
 option E will be removed and option F will
 be added by means of installer wiring.

F. Changes in Description of Operation

F.1 In SECTION III, add the following:

7. OPERATION WITH NO. 4 ESS MCC CALL
 DIRECTOR CIRCUITS

7.01 This circuit is used with a
 TOUCH-TONE receiver and 2/7 to
 dial pulse conversion circuit. To-
 gether, they provide TOUCH-TONE to
 dial pulse conversion for No. 4 ESS
 MCC Call Director circuits that are
 equipped with TOUCH-TONE calling.
 Application of option E and removal
 of option F arranges the circuit for
 this function.

7.02 With option E applied, operation is
 identical to that already described
 for TOUCH-TONE calling except for the
 following modifications.

(a) Relay LO is held operated during
 idle periods to open the loop
 between leads PT and PR.

(b) Lead CAFE is connected to lead
 END to always maintain the 2/7
 to dial pulse converter in the short
 time-out period of 4 seconds when
 this circuit is seized.

(c) When time-out occurs, the con-
 verter operates relay ETO via
 lead 13. Relay ETO holds operated
 through relay ON2 contact 4B. Con-
 tact 10B of relay ETO opens lead 24
 to the converter to inhibit further
 TOUCH-TONE to dial pulse conversion
 for the duration of the call. How-
 ever, with option E removed, relay
 RL does not operate and no release
 sequence occurs. Release will only
 occur when leads T and R are opened
 at the end of the call.

(d) Capacitor E is added to provide
 a higher level of transmission
 through this circuit. This is nec-
 essary because the circuit remains
 in the connection for the duration
 of all calls.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3223-RAM-FKE

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NOTICE

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CIRCUIT DESCRIPTION

CD-1E054-01
ISSUE 3B
APPENDIX 1B
DWG ISSUE 7B

PBX SYSTEMS
INTERFACE CIRCUIT
"TOUCH-TONE"® CALLING
TO DIAL PULSE CONVERSION

CHANGES

D. Description of Changes

D.1 Option F is added and rated Standard to prevent generation of a false dial pulse during the release of this circuit.

F. Changes in Description of Operation

F.1 In SECTION II, after the third sentence of 3.04, add the following: "Relays A3 and SW1 operated short winding 1-2 of inductor L1, maintaining the path through winding 3-4."

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 3222-RRM-FLS

PBX SYSTEMS
INTERFACE CIRCUIT
"TOUCH-TONE" CALLING
TO DIAL PULSE CONVERSION

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<u>SECTION I - GENERAL DESCRIPTION</u>	

1. PURPOSE OF CIRCUIT

1.01 This circuit is for use with foreign exchange lines terminated on switchboards with TOUCH-TONE dials, in cases where the central office equipments serving these lines do not have TOUCH-TONE capability, and for use with dial repeating tie trunks which are terminated on switchboards equipped with TOUCH-TONE dials, in cases where the distant PBXs do not have TOUCH-TONE capability. It is also for use with common group and station access TOUCH-TONE calling.

2. GENERAL DESCRIPTION OF OPERATION

2.01 When a call is originated on a foreign exchange line or dial repeating tie trunk by an attendant using a TOUCH-TONE dial, an access circuit functions to call in TOUCH-TONE to dial pulse conversion equipment. The function of the conversion equipment is to convert the TOUCH-TONE dial signals into rotary dial pulses.

2.02 This circuit is interposed between the trunk finder and the solid state converter. When the trunk finder finds the access circuit or converter trunk circuit on which the call is being made, this circuit connects the calling party to the TOUCH-TONE calling receiving circuit and the solid state converter.

2.03 At this point, dial tone is furnished to the calling party to indicate that the equipment is ready to receive the call. When the TOUCH-TONE signals are received, they are identified and translated by the TOUCH-TONE receiver and its associated translation circuit. The digits are stored in the solid state converter. The solid state converter pulses out the digits in the same sequence that they were stored, inserting after each digit a 600-ms interdigital time to give sufficient time for the switching equipment to hunt for an idle circuit. The storage of the digits is necessary since TOUCH-TONE dialing can be done much faster than outpulsing.

2.04 The solid state converter associated with this circuit has pretranslation built into it, but not for all dial codes. Dial codes for which there is no pretranslation are put on time-out. For normal traffic conditions the time-out is set for 10 seconds, but when all the converters are busy, the time-out is automatically changed to 3.5 seconds.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

1.01 Upon seizure, relays A, A1, B, ON1, ON2, and PLS1 operate. At this time, the 200-ohm R9 resistor is across leads FT and FR as a holding bridge. This resistor replaces the 200-ohm holding bridge that was supplied by the access circuit. The A1 operates the A2, which in turn operates the A3. Operation of

relays A2 and A3 places resistor R10 and the resistor R9 in parallel with inductor A. Relay PLS1 operates from relay PLS in the solid state converter.

1.02 The L0 operates after the A3 is operated and locks to the ON1. The operation of the L0 releases the slow-release A2, which in turn releases the slow-release A3. Operation of the L0 and release of the A2 disconnects the 200-ohm R9 resistor from leads FT and FR, and release of A3 disconnects the 1000-ohm R10 resistor from leads FT and FR. Relays A2 and A3 are slow in releasing to give the current in the L1 inductor sufficient time to build up and thus prevent a preliminary pulse from being sent out over leads FT and FR. Operation of relays A2 and A3 also opens the coupling between the T and R and the FT and FR leads, and thus cuts down the switching transients toward the calling party.

1.03 At this point dial tone is furnished to the calling party to indicate that the conversion equipment is ready to handle the call.

2. ROTARY DIAL CALL

2.01 If the calling party uses a rotary dial, relay A follows the pulsing and repeats it to relay A1. The A1 in turn sends the pulses out on leads FT and FR. As the A1 releases on the first pulse, it places resistor R9 across inductor L1. Release of the A1 also operates the A2, and the A2, in turn, operates the A3. The operation of relays A2 and A3 places resistors R10 and R9 across inductor L1, and opens the coupling between the T and R and the FT and FR leads.

2.02 Relays B, A2, and A3 are slow-release and remain operated over the pulses. Relay B holds the connection while pulsing is going on, and operated relays A2 and A3 prevent transients from being fed back to the calling party while the pulses are repeated. With relay A1 released and relay B operated, relay C is operated on the first pulse. Relay C, being slow-release, holds operated over the pulses. The DP operates from the C and locks to the ON1. At the end of the digit, the C releases, and with relays DP and A1 operated, the RL operates and signals the access circuit to cut through. The interface and trunk finder circuits now release.

3. "TOUCH-TONE" DIAL CALL

3.01 The seizure is the same as for a rotary dial call. However, on this type of call, the pulsing is done by the pulsing relay in the solid state converter.

3.02 When TOUCH-TONE signals are received, relay EC operates within 15 ms. Its operation changes the termination for the TOUCH-TONE receiver and decouples the T and R from leads FT and FR.

3.03 After a digit is stored in the solid state converter, a signal is sent from the converter to operate relay DR 100 ms before outpulsing of the digit is started. The DR, in operating, opens the coupling between the T and R and the FT and FR leads, operates relay SW, and connects resistor R9 across the inductor L1. The SW, in operating, opens the operating path of relays C and DP, resets the timing circuit in the solid state converter, operates the SW1, which locks to the ON2, and opens an operating path of the ETO. Operation of the SW1 opens the circuit of relay DT, which releases.

3.04 When the pulsing relay of the solid state converter sends out the first pulse, relay A2 operates. The A2 places resistor R9 across inductor L1 and also operates relay A3. The A3 places resistor R10 across inductor L1. Both the A2 and A3 relays open the coupling between the T and R and the FT and FR leads. Relay A2 and A3 are slow-release and hold over the pulsing from the solid state converter. After the digit is outpulsed, relays A2, A3, and DR release, then repeat this operation and release for each digit that is outpulsed by the converter.

4. DISCONNECT

ROTARY DIAL CALL

4.01 On a rotary dial call, this circuit is connected to the call only during the time that the first digit is being dialed. At the end of the first digit, relay C releases. With the C released and the DP operated, relay RL operates and locks to the ON1. The RL grounds lead S1, thus releasing relay CV, in the access circuit, and relay DP in this circuit. Release of relay CV cuts the calling party through the access circuit and the subsequent digits are taken by the various switches through which the call is proceeding. With the release of relay CV the A releases, and in turn relays A1, A2, A3, B, ON1, ON2, and RL release. Release of relay B removes ground from lead S, thus releasing the trunk finder. With the ON1 released, power is cut off to the solid state converter and its PLS relay releases, thus releasing relay PLS1 of this circuit.

"TOUCH-TONE" DIAL CALL

4.02 On a TOUCH-TONE call, there are two ways of disconnecting the converter

from the access circuit. For those dial codes for which the converter has pre-translation built into it, after the last digit of the code is outpulsed, the converter is disconnected immediately. For dial codes for which there is no pretranslation available, the converter is disconnected after the time-out circuit functions. Transformer T1 provides coupling between the calling and called parties so that if the call is answered during time-out, the two parties can talk to each other.

4.03 On pretranslated dial codes, after the last digit is outpulsed, the converter operates relay ETO which, in turn, operates the RL. The RL grounds lead S1, thus releasing relay CV in the access circuit. The CV cuts the calling party through and relay A releases. From here on the circuit functions the same as covered in 4.01, after release of relay A on a rotary dial call disconnect.

4.04 On a call for which there is no pre-translation, after the last digit is dialed, a time-out occurs during which the converter is connected to the call. At the end of time-out relay ETO operates and in turn operates relay RL. The RL grounds lead S1, thus releasing the CV relay in the access circuit. The CV cuts the calling party through and the A relay releases. From this point on, the circuit functions in the same manner as covered in 4.01 after release of the A relay on a rotary dial call disconnect.

ABANDONED CALL

4.05 If the calling party hangs up before finishing dialing, relay A releases. In turn relays A1, B, ON1, ON2, and PLS1 release. When relay B releases, ground is removed from lead S and the trunk finder releases.

5. DIAL TONE AND PRETRANSLATION RELEASE CONTROL

5.01 The condition of lead S1 at the time of seizure, under control of the connecting access circuit, determines (1) the source of dial tone and (2) whether pretranslation release, as provided in the dial pulse converter circuit, is to be inhibited. The three states of lead S1 at this time are as follows:

- (a) Open. This condition permits relay DT to operate when relays ON2 and PLS1 operate to supply local dial tone from this circuit. Also, relay RDT released, allows any pre-translation release signal from the dial pulse converter to cause disconnect of this circuit.
- (b) Direct ground. With this condition, relays RDT and DTS operate on

seizure. Relay RDT holds operated to relay B, contact 4M. Relay DTM operates via relays DTS and RDT operated and holds via RDT contact 10M. Relay DTS releases when relay LO operates. Relays RDT and DTM operated open the operate path for relay DT. Thus, dial tone is transmitted through this circuit from the distant end. Relay RDT operated opens lead 27 from the dial pulse converter to prevent pretranslation release and opens lead DISCA from lead DISC to cause the 2/7 to dial pulse converter to continue operating.

- (c) Ground via 350 ohms resistance. With this condition, relay RDT operates but relay DTS remains released. Relay RDT operated prevents pretranslation release as described in (b) above. Relay DTS released permits relay DT to operate to connect local dial tone from this circuit.

5.02 On a TOUCH-TONE call, local dial tone is removed when relay SW1 operates before the first digit is pulsed out, and on a rotary dial call, dial tone is removed when relay DP operates at the end of the first digit.

6. POLARITY REVERSAL

6.01 When option H is provided, battery reversal (answer supervision) on leads FT and FR operates relay RV, which operates relay RL to initiate disconnect as described in 4.01.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

- 1.01 Maximum external circuit loop - 1500 ohms.
- 1.02 Minimum insulation resistance - 15,000 ohms.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
A	A position function; feeds battery, follows pulses from rotary dial.
A1	Repeats pulses from relay A and transmits them on leads FT and FR.
A2	Decouples leads T and R from leads FT and FR. Places resistor R9 across inductor L1.

thereon should be followed.

- (a) Trunk Finder Circuit - SD-1E050-01.
- (b) Trunk Finder Circuit - SD-65906-01.
- (c) Solid State Converter Circuit - SD-66892-01 (typical).
- (d) Signaling Circuit - SD-81719-01 (typical).
- (e) TOUCH-TONE Calling Receiving Circuit - SD-98148-01 (typical).
- (f) Solid State Converter and Receiver Test Set Circuit - SD-66890-01.
- (g) Traffic Register Circuit - SD-65774-01.
- (h) Traffic Usage Recorder - SD-99359-01.
- (i) Crossbar Link and Controller Circuit - SD-5E053-01.
- (j) Traffic Measurement System No. 1A Remote Scanner and Encoder Circuit - SD-3B200-01.
- (k) Link Circuit - SD-5E071-01.
- (l) 2/7 to Dial Pulse Converter - SD-1E504-01.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added

DTS and DTM relays, AK46

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3222-RPM-FLS

Resistor R14, KS-20289, L3A, 1000 ohms

DTS and DTM networks, 185A

D. Description of Changes

D.1 Connecting information is added to show operation with the 2/7 to dial pulse converter circuit, SD-1E504-01. This includes the wiring added as option R.

D.2 Option N, which includes relays DTS and DTM and resistor R14, is added to permit inhibiting of digit pre-translation release when required. Wiring formerly not designated has been designated option Q and rated Mfr Disc.

D.3 Option K is added to prevent dial pulsing from the solid state converter circuit, due to time-out, when a calling party starts to rotary dial. Wiring formerly not designated has been designated option M and rated Mfr Disc.

D.4 Option J is added to provide a hold path for relay EC to ensure proper operation of the early cut feature.

D.5 Option H is added to prevent premature release of this circuit when used with 701 PBX register senders not equipped with dial tone monitoring. Wiring formerly not designated has been designated option G and rated Mfr Disc.

D.6 Circuit Note 102 is modified.

D.7 Circuit Note 104 is modified.

D.8 CADS 1, 2, and 4 are revised to reflect the changes noted in D.1 through D.5.