PBX SYSTEMS NO. 700C, 701A, 701B, OR 702A INCOMING TRUNK CIRCUIT FOR INWARD DIALING FROM STEP-BY-STEP OR CROSSBAR TANDEM OFFICE OR DISTANT PBX ARRANGED TO TRANSFER CALLS TO PBX ATTENDANT

CHANGES

D. Description of Changes

D.1 To correct a pumping condition of relays A, T2, and RV encountered on a disconnect over a long central office loop, a lock path is added to relay RV to provide a delayed release. The lock path is controlled by relay TA and slow-release relay B. This arrangement insures that relay RV cannot reoperate after release and prevents the pumping action of the relays.

D.2 The above change is made on a no-record basis to bring this drawing into agreement with WECo manufacturing drawings. The added wiring is to be included as part of option F which was added on Issue 10B of this drawing.

D.3 This change is nonfield-effecting in that Issue 10B of this drawing has not been manufactured at the time of this change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3223-JLF-FLS

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CHANGES

D. Description of Changes

D.1 Option ZD is added to provide leads TMS- and WFA- to Traffic Measuring Systems No. 1A (TMS-1A) when required.

D.2 Option ZE is added to provide lead MS (motor start lead) to the Power Ringing Circuit. This lead is to be provided when continuous ringing is not provided and no other circuits associated with this circuit provide a motor start lead.

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TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides for the completion of direct inward dialed calls from a step-by-step or crossbar tandem office or distant PBX. In addition, this circuit permits transfer of calls to another extension through a switchboard position.

2. GENERAL DESCRIPTION

2.01 This circuit is connected between a central office trunk or tie trunk and an incoming selector. It also has an appearance at a switchboard either on a jack per trunk basis, or through a trunk finder circuit if it is desired to concentrate the transfer traffic to a smaller number of jack circuits than there are trunk circuit.

2.02 Dial pulses are transmitted directly to the incoming selector without loss. Pulsing limitations are therefore determined by those of the incoming switchtrain.

2.03 When the called station answers, reverse battery supervisions from the connector circuit causes this circuit to insert a bridged impedance transmission circuit across the tip and ring to the called station and places battery feed on the tip and ring to the central office.

2.04 If the central office disconnects first, this circuit restores to normal immediately and is ready to accept the next call.

2.05 If the called station disconnects first, there is a 1.4 second delay before disconnect supervision is transmitted to the central office to distinguish between a disconnect or a transfer request.

2.06 Direct inward dialed calls are transferred to the attendant if the called station flashes the switchhook. The supervisory flash, which is not transmitted to the central office, causes the switchboard lamp to light.

2.07 When the attendant answers the called extension may remain on the connection for conversation with the attendant or with parties connected by the attendant.

2.08 When the originally called extension disconnects, the indial switchtrain releases.

2.09 If the attendant disconnects first, the original indial connection is maintained and succeeding transfer requests are possible.

2.10 The attendant may flash the toll operator on indial toll calls by momentarily removing and re-inserting the cord in the trunk jack.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE AND DIALING

1.01 With this circuit idle, battery and ground is supplied toward the central office from relay A of the incoming selector Seizure takes place when a bridge is connected across the incoming T and R leads at the central office.

1.02 Ground on lead T from the selector relay A is extended through the central office bridge to lead R through diode CR1 and back to -48 volts from selector relay A, operating relay A of the incoming selector. The selector is now ready to receive dial pulses.

1.03 Dial pulses are transmitted directly to the selector and no relays in this circuit operate until the called station answers.

2. CALLED STATION ANSWERS, TRANSMISSION AND PREPARATION FOR TRANSFER

2.01 When the called station answers, the connector functions to return answer supervision (battery on tip, ground on ring). Relay P operates in series with diode CR2 which operates relay PA.

2.02 Relay PA operated:

(a) Operates relay A through a normal contact of relay SP.

(b) Prepares a capacitive coupled transmission path.

(c) Closes a path to cause the RD timing circuit to function to condition this circuit for possible transfer.

(d) Prepares a path to prevent the release of relay P upon the operation of relay J or TA.

(e) Prepares an operate path for timing relay T1.

(f) Opens the operate path of relay T2.

2.03 Relay A operated:

(a) Operates relay B.

(b) Connects inductor L across the tip and ring toward the PBX switchtrain as a local holding bridge.

2.04 Relay B operated:

(a) Operates relay SP.

(b) Prevents the operation of relay S1 when the attendant answers a transfer request.

(c) Prepares a path for disconnect timing.

(d) Operates relay F which serves no useful function at this time.

(e) Opens the lock path of relay SP.

(f) Grounds lead S to the incoming sleeve lead.

(g) Prepares an operate path for relay J

2.05 Relay SP operated:

(a) Transfers the holding bridge for relay A from a make contact of relay PA to the tip and ring at the central office. Relay A now remains operated under control of the central office.

(b) Splits the tip and ring toward the central office from the tip and ring toward the incoming selector and capacitively couples the two for conversation through capacitors T and R.

(c) Splits the sleeve lead so the original switchtrain can be released after a transfer is complete.

(d) Prepares an operate path for relay AA to signal the attendant for a transfer request.

(e) Removes ground from lead K to the Traffic Register Circuit and grounds lead TU to the Traffic Usage Recorder Circuit.

(f) Prepares a lock path for relays T1 and T2.

2.06 The operation of relay PA extended ground on lead O, from the incoming selector or from option V, to relay time delay circuit RD.

2.07 After a delay of 1.4 seconds relay time delay circuit RD functions to operate relay TA.

2.08 The 1.4 second delay prior to conditioning this circuit for transfer prevents a premature switchhook flash, due to a switchhook fumble, from signalling the attendant.

2.09 Relay TA operated:

(a) Operates relay T1.

(b) Prepares an operate path for relay RV.

(c) Partially opens the holding bridge for the indial switchtrain. This function is of no importance at this time due to the make contact of relay PA which prevents opening the loop.

2.10 Relay T1 operated:

(a) Locks operated to relays A, SP and PA operated and relays T2 and J released.

(b) Releases relay F.

(c) Opens the operate path of relay AA.

(d) Removes ground from the input of time delay circuit RD causing relay TA to release.

(e) Partially opens the operate path of relay J.

(f) Prepares an operate path for relay RV.

(g) Prepares an operate path for relay T2.

2.11 Relay TA released:

(a) Removes the original operate path of relay T.

(b) Restores the portion of the holding bridge to the PBX switchtrain which allows a switchhook flash.

(c) Opens the operate path of relay RV.

2.12 With relay T1 operated and relays T2 and TA normal, this circuit is conditioned for a transfer request.

3. FLASH TO TRANSFER A DID CALL

A. Station Flashes for Transfer

3.01 When the called station flashes the switchhook, the connector functions to restore on-hook polarity causing relays P and PA to release.

3.02 Relay PA released:

(a) Applies ground to the input of relay time delay circuit RD to start the 1.4 second disconnect timing.

(b) Operates relay T2.

(c) Provides a lock path for relay T1 under control of relay T2 operated.

3.03 Relay T2 operated:

(a) Locks operated to relays SP, A and PA operated and relay J normal.

(b) Prepares an operate path for relays AA and RV.

(c) Opens the operate path of relay F to prevent its operation if relay T1 releases.

(d) Opens the operate path of relay J.

(e) Provides a lock path for relay T1 under control of relay PA released.

(f) Prevents disconnect timing from proceeding if relay PA reoperates and relay T1 releases.

3.04 If the called party releases the switchhook within 1.4 seconds, the connector functions and causes relays P and PA to reoperate.

3.05 Relay PA operated:

(a) Cancels disconnect timing.

(b) Releases relay T1.

(c) Removes the original operate path of relay T2.

(d) Restores the portion of the holding bridge of the indial switchtrain that prevents the operation of relay J from releasing the switchtrain.

3.06 Relay T1 released:

(a) Operates relay AA.

(b) Restores the operate path of relay J.

3.07 Relay AA operated:

(a) Locks operated to relays SP and T2 operated and relay J and T1 released.

(b) Grounds lead NA to the Night Alarm Circuit (606B, 607 Switchboard) or Lead G to the Auxiliary Signal Fuse Alarm, Battery Cutoff and Miscellaneous Circuit (608 Switchboard).

(c) Capacitive couples audible ringing to the ring lead to inform the conversing parties that the attendant is being signalled.

(d) Applies battery to lead L or G under control of relay S normal to light the trunk lamp at the switchboard. (Fig. A, B, C and E).

(e) Applies ground to lead L or G under control of relay S normal to start the trunk finder circuit hunting for this circuit. (Fig. D).

(f) Connects battery through the 1958 ohms of resistor D in parallel with the windings of relay S to lead S or S1 to the trunk finder bank multiple to provide a stopping battery for the trunk finder circuit. (Fig. D).

(g) Connects ground to the ring conductor through the coil of relay mal contact of relay T1 and an operated contact of relay B. (Fig. D)

(h) Connects battery through resistor B to the tip conductor. (Fig. D).

B. Attendant Answers

3.08 This circuit presents a trunk class appearance to all switchboard cord circuits. This circuit will cause the cord circuit to function and place a dry bridge toward this circuit to operate and hold relay J which places battery feed to the cord circuit.

3.09 The attendant answers such calls with the front cord of a cord pair for the 552, 605 and 607B type switchboard and uses the rear cord of a cord pair for the 606A, 606B, 607A, 608A and 608D type switchboard.

At a 552 or 605 type switchboard (Fig. A)

3.10 Battery, through the windings of relay S placed in parallel, is connected to lead SL or I to the cord circuit sleeve lead through an off-normal contact of the jack.

3.11 Relay S and cord circuit relay T operate in series from ground in the cord circuit. Relay T causes the cord circuit to function to place a bridge across the tip and ring to this circuit which causes the operation of relay J.

3.12 Relay S operated:

(a) Removes battery from lead L (or G) to extinguish the trunk lamp at the switchboard.

(b) Prepares an operate path for relay S1.

At a 606B, 607A or 607B type switchboard (Fig. B)

3.13 Battery through the windings of relay S, connected in series aiding, in series with 1958 ohms of resistor D, is connected to the sleeve of the cord circuit.

3.14 Relay S operates in series with a sensing and a marginal relay in the cord circuit. The high resistance sleeve does not allow the marginal relay to operate and the cord circuit functions to place a dry bridge across the tip and ring to this circuit which causes relay J to operate.

3.15 Relay S operated:

(a) Removes battery from lead L (or G) to extinguish the trunk lamp at the switchboard.

(b) Prepares an operate path for relay S1.

At a 608A or 608D type switchboard (Fig. C)

3.16 When the cord is inserted in the trunk jack, ground is connected to lead SL of this circuit through off-normal contacts of the jack. Ground on lead SL operates relay S.

3.17 Relay S operated:

(a) Connects ground to lead S to the cord circuit through 3796 ohms of resistors C and D.

(b) Removes battery from lead L (or G) to extinguish the trunk lamp at the switchboard.

(c) Prepares an operate path for relay S1.

3.18 With 3796 ohms on the cord circuit sleeve, the cord circuit functions to place a dry bridge across the tip and ring of this circuit which causes relay J to operate.

At a 606A type switchboard (Fig. E).

3.19 Ground through the primary winding of relay S in series with 620 ohms of resistor E is connected to the sleeve of the cord circuit

3.20 Battery on the cord circuit sleeve operates relay S. The high resistance to the cord circuit causes the cord circuit to function to place a dry bridge across the tip and ring toward this circuit to operate relay J.

3.21 Relay S operated:

(a) Removes battery from lead L (or G) to extinguish the trunk lamp at the switchboard.

(b) Prepares an operate path for relay S1.

When used with a trunk finder circuit (Fig. D)

3.22 When this circuit is used with trunk finder circuits to concentrate the transfer traffic to a fewer number of jack appearances than trunk circuits, this circuit appears on the trunk finder bank multiple. The jack of each trunk finder circuit is connected to an attendant trunk circuit which has a unique jack and lamp at a switchboard.

3.23 When relay AA operated as described in paragraph 3.07 (e), (f), (g) and (h), the trunk finder was started, stopping battery was provided on the sleeve, and battery feed was placed on the tip and ring through the coil of relay J.

3.24 When the trunk finder stops on the terminal marked by battery on the sleeve, the finder grounds the sleeve to operate relay S.

3.25 Relay S operated:

(a) Locks operated to the sleeve of the trunk finder circuit.

(b) Removes ground from lead (Lor) G to remove the start signal to the trunk finder circuit.

(c) Prepares an operate path for relay S1.

3.26 When the trunk finder circuit cuts-through to the attendant trunk circuit, battery on the tip through resistor B in this circuit operates relay A in the attendant trunk circuit which causes the attendant to be signalled

3.27 When the attendant inserts the cord in the attendant trunk jack, the attendant trunk functions to connect the tip and ring of the cord circuit to the tip and ring of this circuit. The attendant trunk circuit conditions the cord circuit to apply a dry bridge across the tip and ring to operate relay J in this circuit.

3.28 Relay J operated:

(a) Releases relay AA.

(b) Prevents the operation of relay F.

(c) Couples the attendant tip and ring leads through capacitors TA and RA to the tip and ring of the conversing parties.

(d) Prepares a path to reverse polarity toward the central office to signal the toll operator, if the attendant is required to do so.

(e) Prevents the start of disconnect timing by removing the ground input to time delay circuit RD.

(f) Releases relays T1 and T2 which will allow this circuit to recondition itself for transfer if the attendant releases and the originally called station does not.

(g) Partially opens the holding bridge toward the indial switchtrain to release the switchtrain when the originally called party releases.

3.29 Relay AA released:

(a) Removes audible ring tone from the tip and ring.

(b) Removes ground from lead NA or G to remove the audible signal to the attendant.

(c) Opens lead L or G to prevent lighting the switchboard lamp or starting a trunk finder circuit when relay S releases if the attendant disconnects.

(d) Connects relay S to the sleeve lead to prevent its release if the attendant flashes the toll operator. (Fig. D).

(e) Places ground on the tip to the cord circuit through the primary winding of relay J. (Fig. D).

(f) Places battery on the ring to the cord circuit through the secondary winding of relay J (Fig. D).

3.30 The attendant is now connected to the conversing parties and may add a third party to the connection or release. If the attendant releases without extending the call to a third party, she may be recalled again as described above by the originally called party. Before the recall can be established the circuit must recondition itself for transfer as previously described in section 2. CALLED STATION ANSWERS, TRANSMISSION AND PREPARATION FOR TRANSFER.

NOTE: With trunk finder operation (Fig. D) provided, the trunk finder remains on the terminal it has stopped on, even if the attendant releases. If a new transfer request is initiated at this time, the operation of relay AA places battery on the tip to operate relay A in the attendant trunk circuit to signal the attendant. The trunk finder will not release until both the attendant and calling parties disconnect.

3.31 If the originally called party releases, relay P releases which releases relay PA which causes the release of the indial switchtrain.

3.32 Any further transfer request which may be initiated by the second called party is now under control of the switchboard cord circuit for supervision.

NOTE: If the attendant adds a third party to the connection and then releases, relays S and J remain operated. If the originally called party then flashes the switchhook for a transfer, it will result in disconnect of the originally called party as described in paragraph 3.31.

4. DISCONNECT ON A DID CALL

A. Called Party Disconnects First

4.01 When the called party disconnects, this circuit functions as described in paragraphs 3.01 thru 3.03 with the following differences.

4.02 After 1.4 seconds relay time delay circuit RD functions to operate relay TA.

4.03 Relay TA operated:

(a) Opens the holding bridge to the indial switchtrain which releases the switchtrain.

(b) Operates relay RV with relays T1 and T2 previously operated.

4.04 Relay RV operated transmits disconnect supervision to the central office (ground on tip, battery on ring). The supervision is transmitted through relay SP operated. Relay SP remains operated under control of relay B which is under control of the central office monitoring relay A.

4.05 When the central office disconnects by removing the bridge across the tip and ring, relay A releases.

4.06 Relay A released:

(a) Releases slow to release relay B.

(b) Releases relays T1 and T2 which releases relay RV.

4.07 Relay B released:

(a) Removes the input to relay time delay circuit RD which releases relay TA.

(b) Releases relay SP.

(c) Operates relay S1 if relay S has remained operated. This function will be described in section 6, paragraph C. Flash to Transfer A DID Call.

4.08 Relay SP released:

(a) Transfers the incoming tip and ring from relay A to the incoming selector.

(b) Removes ground from leads S and TU.

(c) Grounds lead K to the Traffic Register Circuit.

4.09 This circuit is now idle and ready to receive the next incoming call.

B. Calling Party Disconnects First

4.10 When the calling party disconnects, the central office functions to remove the holding bridge from across the tip and ring which releases relay A.

4.11 Relay A released:

(a) Releases slow to release relay B.

(b) Opens the holding bridge across the tip and ring toward the incoming selector which releases the indial switchtrain which releases relay P which in turn releases relay PA.

4.12 Relay PA released releases relay T1.

4.13 Relay B released:

(a) Cancels disconnect timing.

(b) Transfers the coil of relay SP to the indial sleeve to maintain it operated until the indial switchtrain releases.

(c) Opens the operate path of relay J which releases relay J if it was operated at the time of disconnect.

(d) Operates relay S1 if relay S has remained operated. This function will be described in section 6, paragraph C. Flash to Transfer A DID Call.

4.14 When the indial switchtrain releases relay SP releases.

4.15 Relay SP released:

(a) Transfers the incoming tip and ring from relay A to the incoming selector.

(b) Removes ground from leads S and TU.

(c) Grounds lead K to the Traffic Register Circuit.

4.16 This circuit is now idle and ready to receive the next incoming call.

5. DISCONNECT ON A TRANSFERRED CALL

A. Attendant Disconnects First

5.01 When the attendant removes the cord from the trunk jack, the bridge across the tip and ring is removed which releases relay J.

5.02 With Fig. A, B, C or E provided, relay S will also release. With Fig. D provided, relay S and the trunk finder circuit are held under control of the central office and relay S1 normal.

5.03 With the indial switchtrain released, (i.e., the originally called party has previously disconnected), relay J released:

(a) Opens the tip and ring to the switchboard jack.

(b) Operates relay F which serves no useful function at this time.

(c) Applies ground to start relay time delay circuit RD through relay B operated and relay PA normal.

(d) Prepares a path to operate relay T1.

5.04 At the end of 1.4 seconds, relay time delay circuit RD functions to operate relay TA which operates relay T1 which in turn operates relay T2.

5.05 With relays TA, T1 and T2 operated, relay RV operates to transmit disconnect supervision to the central office.

5.06 At this time the circuit functions as described in section 4, A. Called Party Disconnects First with the following exception. With Fig. D provided, relay SP released releases relay S and the trunk finder circuit.

B. Calling Party Disconnects First

5.07 When the calling party disconnects, the bridge across the tip and ring is removed releasing relay A.

5.08 With this circuit connected only to the cord circuit (i.e., the originally called party has previously disconnected) relay A released will release slow to release relay B and will not perform any other useful functions.

5.09 Relay B released:

(a) Releases relay SP which functions as described in paragraph 4.08.

(b) Opens the loop to the switchboard removing battery feed to the cord circuit and releasing relay J.

5.10 Removing battery feed to the cord circuit tip and ring causes the cord circuit to function and light a cord lamp to inform the attendant of the disconnect. However, this disconnect signal to the attendant will only be transmitted if the transfer request had previously been completed, and will not be transmitted if the calling party had been placed on hold without the second cord of the cord pair being inserted in a jack.

5.11 If the attendant receives the disconnect signal, the cord will be removed from the trunk jack to release relay S.

5.12 If the call had been placed on hold and the attendant did not remove the cord from the trunk jack, relay S will remain operated.

5.13 With relay S operated and relay B released, relay S1 operates.

5.14 Relay S1 operated:

(a) Opens the operate path of relay AA.

(b) Opens lead S to the trunk finder circuit (Fig. D) to prevent holding the trunk finder.

(c) Prevents the reoperation of relay J, if relay B operates on a new incoming call, to lock-out the attendant until the cord is removed from the trunk jack.

(d) Locks operated to relay S operated.

(e) Prevents the central office from holding relay S operated with Fig. D provided if the attendant releases with a new call in progress.

5.15 This circuit is now idle with the exception of relays S and S1 operated, and is ready to receive the next incoming call.

6. TRUNK SEIZURE WITH A CORD CIRCUIT CONNECTED FROM A PREVIOUS CALL

A. Seizure and Dialing

6.01 This circuit functions as previously described in section 1. SEIZURE AND DIALING.

B. Called Station Answers, Transmission and Preparation for Transfer

6.02 This circuit functions as previously described in section 2. CALLED STATION ANSWERS, TRANSMISSION AND PREPARATION FOR TRANSFER.

C. Flash to Transfer a DID Call

6.03 With a cord still connected to this circuit, relay S and S1 have remained operated. Due to this condition a transfer request is processed as follows.

6.04 This circuit functions as previously described in section 3. FLASH TO TRANSFER A DID CALL, A. Station Flashes for Transfer paragraphs 3.01 thru 3.06 with the following exceptions.

6.05 Relay S1 operated prevents the combination of relay T1 normal and relay T2 operating from operating relay AA.

6.06 Relay AA released:

(a) Prevents this circuit from signalling the attendant.

(b) Prevents audible ring tone from being applied to the conversing parties.

6.07 This circuit will remain in this state until the call is terminated or until the attendant removes the cord from the trunk jack.

6.08 Termination of the call allows this circuit to return to normal with the exception of relays S and S1 which are held under control of the connected cord at the switchboard.

6.09 Removal of the cord results in the release of relays S and S1.

6.10 Relay S1 released:

(a) Prepares an operate path for relay J.

(b) Operates relay AA (relay T2 operated and relay T1 released from the switchhook flash).

6.11 With relay AA operated this circuit functions as previously described in section 3. A. Station Flashes for Transfer paragraph 3.07.

D. Disconnect

6.12 Disconnect on a DID call is the same as described in section 4. DISCONNECT ON A DID CALL.

7. FLASHING THE TOLL OPERATOR

7.01 If an incoming call was completed by a toll operator, the PBX attendant may signal the toll operater after the attendant has been recalled by the called party.

7.02 The attendant accomplishes this by removing and reinserting the cord in the trunk jack. Removal of the cord causes the release of relay J. Relay S will also release unless Fig. D is provided. In this case, relay S is held operated through the sleeve which is also preventing the release of the trunk finder circuit.

7.03 Relay J released, operates relay F. The reversal caused by relay F operated is of no consequence at this time since it is shorted out by contacts of relay J released.

7.04 When the attendant reinserts the cord in the trunk jack, relay J re-operates, which causes the release of slow to release relay F.

7.05 With relay J operated and relay F operated (due to the slow to release interval) the polarity is reversed on the tip and ring toward the central office.

7.06 The reversal causes the connected trunk circuit to function to cause the toll switchboard trunk lamp to light.

7.07 When relay F release the polarity is returned to normal which causes for the toll switchboard trunk lamp to extinguish.

7.08 If the attendant repeats this proceedure the trunk lamp at the toll switchboard will flash indicating a toll operator recall.

7.09 Since relay J released will allow this circuit to begin the timing sequence, the attendant must not have the cord removed for more than 1.4 seconds. If this interval is exceed relay T1 will operate which will prevent the operation of relay F. In order to continue flashing the toll operator, the PBX attendant must be recalled in the usual manner and repeat the above proceedure.

8. CANCELLATION OF TRANSFER

8.01 Since the same trunk circuit may serve both directory number traffic and direct inward dialed calls, this circuit is arranged to cancel transfer on specified levels under control of the incoming selector circuit.

8.02 With ground on lead O through an unoperated normal post spring of the incoming selector, the transfer feature is enabled. When the normal post spring is operated on the specified levels, ground is removed from lead O which disables the transfer feature.

8.04 The lack of ground on lead O prevents the initial operation of relays TA and T1 which does not allow this circuit to condition itself for a transfer request.

8.05 If transfer is not to be disabled on any level, option V is specified to maintain a ground on lead O independent of the incoming selector.

9. FREE SERVICE

9.01 When this circuit provides service to an official PBX, options Y and E

are specified to provide free service. With free service provided this circuit functions as previously described with the following exceptions.

9.02 To prevent answer supervision polarity from being transmitted to the central office, option Y is provided in place of option Z. Option Y maintains on-hook polarity toward the central office regardless of the condition of this circuit.

9 03 To prevent the connector from transmitting answer supervision from the time the called station answers until relay SP operates, option E is specified in place of option B. This diode bridge prevents the reversal from being passed toward the central office but does allow the normal operation of relay P.

9.04 When disconnect timing is completed, relay RV does not operate since option B is not provided. This prevents a false off-hook polarity from reaching the central office.

10. TRAFFIC REGISTRATION

10.01 Operation of relay SP removes ground from lead K- to the Traffic Register Circuit. When all K- leads are open, a peg count is scored to indicate all trunks busy.

11. TIMING

Thermal Relay - Fig. 4 (Mfr. Disc.)

11.01 With relay PA operated and relays J, T1, T2 and TA released, ground on lead O is applied to the heating coil of thermal relay T.

11.02 In approximately 0.8 seconds relay T first opens contacts 1 and 8 then closes contacts 5 and 7 to operate relay TA. Relay TA operated allows the coil of relay T to cool.

11.03 In approximately 2 seconds the coil of relay T has cooled sufficiently to close contacts 1 and 8 and open contacts 5 and 7 which allows the operation of relay T1.

11.04 With relay B operated and relay PA normal, disconnect timing is started. Within 3 seconds relay TA operates to shunt release relay SP which transmits disconnect supervision to the central office.

Relay Time Delay Circuit - Fig. 5

11.05 With relay PA operated and relays J, T1, T2 and TA released, ground on lead O is applied to the input of relay time delay Circuit RD.

11.06 After 1.4 seconds relay time delay circuit RD functions to operate relay TA.

11.07 With relay B operated and relay PA normal, disconnect timing is started. After 1.4 seconds relay time delay circuit RD functions to operate relay TA which releases the indial switchtrain and operates relay RV to transmit disconnect supervision to the central office.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Voltage Limits 44-52 Vdc.

1.02 Minimum insulation resistance - 20,000 ohms.

Maximum external circuit supervisory loop resistance - 2,400 ohms.

Maximum external circuit pulsing loop resistance - Determined by incoming selector.

2. FUNCTIONAL DESIGNATIONS

Relay	Meaning	Primary Function
A	Answer Relay	Bridged impedance battery feed relay connected to trunk.
AA	Awaiting Answer	Operates after a switchhook flash to signal the attendant.
B	Traditional	Slow to release relay under control of relay A.
F	Flash	Slow to release relay used to flash the supervisory lamp at a toll switchboard.
J	Jack	Bridged impedance battery feed relay connected to switchboard cord circuit.
P	Polar	Operates when the connector circuit supplies answer supervision polarity
PA	Polar Auxiliary	A slave of relay P.
RV	Reversal	Reverses battery polarity to the central office to indicate disconnect supervision.
S	Sleeve	Indicates sleeve continuity to the switchboard cord circuit or trunk finder circuit.
S1	Sleeve Auxiliary	Indicates a central office disconnect with an attendant cord connected.
SP	Split	Inserts the bridged impedance talking circuit
T	Thermal	Delays disconnect supervision for 3 seconds.
T1, T2	Transfer 1 and 2	Respond to switchhook position, and initiate transfer requests.
TA	Timing Auxiliary	A slave of either relay T or solid state timing circuit RD to provide time delays.

3. FUNCTIONS

3.01 To transmit dial pulses directly to the PBX switchtrain.

3.02 To provide immediate off-hook supervision.

3.03 To delay called station disconnect supervision for 1.4 seconds.

3.04 On receipt of a switchhook flash from the called station, to light a trunk lamp at the switchboard and return audible ring tone as an indication that the attendant is being called.

3.05 On receipt of a switchhook flash from the called station, not to return audible ring tone as an indication that a transfer request cannot be completed at this time.

3.06 To provide for controlling finder circuit when concent jack appearances is required.

3.07 To extinguish the trunk lamp and remove audible ring tone when the attendant answers.

3.08 To provide a three-way connection between the attendant and the calling and called parties.

3.09 To release the switchtrain of a called party upon disconnect after a transfer request.

3.10 Transmit disconnect supervision toward the central office whenever the calling party is last to disconnect.

3.11 To release the switchtrain whenever the called party disconnects.

3.12 To enable the attendant to signal the toll operator.

3.13 To provide supervision to the attendant only if a transfer request has been completed.

3.14 To lock-out the attendant if the cord has not been removed from the trunk jack after the central office disconnects.

3.15 To provide for free service as required.

4. CONNECTING CIRCUITS

4.01 When this circuit is shown on a keysheet, the connecting information thereon is to be followed:

(a) Crossbar Tandem Office Link and Connector Circuit - SD-25033-01.

(b) Step-by-Step Selector (Bank Multiple) SD-30200-01. *

(c) Step-by-Step Selector (Bank Multiple Circuit) - SD-32123-01. *

(d) Outgoing Repeater Circuit - SD-31779-01.

(e) Incoming Selector Circuit - SD-66360-01.*

(f) Trunk Finder Circuit - SD-65794-01.*

(g) Cord Circuit - SD-66198-01.*

(h) Night Alarm Circuit - SD-66653-01.*

(i) Ringing Leads Circuit - SD-65771-01.

(j) Universal Jack Circuit - SD-65778-01.

(k) Traffic Register Circuit - SD-65774-01.

5. MANUFACTURING TEST REQUIREMENTS

5.01 This circuit shall be capable of performing all of the functions given in this description; the relays with which it is equipped shall meet the requirements given in the Circuit Requirements Table.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 This circuit may be taken out of service by being made busy at the central office.

6.02 If this circuit services an official PBX from a step-by-step central office, this circuit may be made busy by grounding the sleeve lead toward the selector bank multiple.

* Typical

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 On receipt of a switchhook flash, not to return audible ring tone as an indication that a transfer request cannot be completed at this time.

A.2 To delay disconnect supervision for 1.4 seconds.

A.3 To lock out the attendant if the cord has not been removed from the trunk jack and the central office disconnects.

B. Changes in Apparatus

B.1

SUPERSEDED	SUPERSEDED BY
T, Thermal Relay, KS-16615,L11,-Fig. 4	RD, Relay Time Delay circuit ED-99556-( ) - Fig. 5
TA, Network 185A Option K	TA Diode 446A Option J

B.2 ADDED

T, Diode, 446F, Option E
R, Diode, 446F, Option E
FS1, Diode, 446F, Option E
FS2, Diode, 446F, Option E
RV, Relay, ½AK4, Option F
S1 Relay, ½AK4, Option F
T Resistor, 144A, 1.74MEG. Fig. 5

B.3 REMOVED

A, Resistor, 18AG, Option G

D. Description of Changes

D.1 Figure 4, consisting of thermal relay T, is designated and rated Manufacture Discontinued. Prior to issue 10B, figure 4 was part of figure 1.

D.2 Figure 5, consisting of relay time delay circuit RD, connector RD and timing resistor T is added and rated Standard. This figure replaces figure 4 to provide a precise 1.4 second disconnect timing as compared to the previous timing of 2.5 seconds to 4.5 seconds.

D.3 Option K is designated and rated Manufacture Discontinued and option J is added and rated Standard to replace a portion of K wiring and apparatus. Option J also provides wiring to arrange this circuit for figure 5.

D.4 Option G is designated and rated Manufacture Discontinued and is replaced by added option F which is rated Standard. This change provides for improved called station disconnect by releasing the indial switchtrain after 1.4 seconds rather than holding the switchtrain until relay SP is shunt released. This change also required the addition of relay RV and removal of resistor A to transmit on-hook polarity to the central office.

D.5 Option E is added as a feature Standard to be provided in addition to option Y when free service is required. Option E provides wiring and diodes T, R, FS1 and FS2 to prevent a momentary answer polarity from the connector from reaching the central office.

D.6 Option B is designated as a feature Standard to be provided in addition to option Z when free service is not required. Option B provides wiring in place of the diodes provided under option E and also provides wiring to relay RV.

D.7 Option A is designated and rated Manufacture Discontinued and is replaced by added option ZA which is rated Standard. Option ZA provides wiring to relay S1, previously provided under option F, which cancels transfer and locks out the attendant if the cord remains in the trunk jack after the central office releases.

D.8 Option ZB is designated and ra[illegible] Manufacture Discontinued and op[illegible] ZC is added and rated Standard. This change prevents an open on the tip and ring to the central office from causing a recall, by placing relays T1 and T2 under control of relay A in addition to relay PA.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5152HW-JLF-WEA
DEPT 5337-RVL