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STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 360A
OUTGOING TRUNK CIRCUIT
FROM SELECTOR MULTIPLE
MULTIPLE AT SWITCHBOARD
COMPOSITE SUPERVISION TYPE B

CHANGES

B. Changes in Apparatus

B.1	SUPERSEDED	SUPERSEDED BY
	19KY Resistor, F	18DA Resistor, F1

D. Description of Changes

D.1 Options ZK, ZL, ZM, and ZN in Fig. 2 are removed on a no record basis.

D.2 The 18DA resistor, ZJ option, is added in Fig. 2, replacing the 19KY.

D.3 Note 301 is revised.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5641-MKD-RMW

STEP BY STEP SYSTEMS
NO. 1, 350A, 355A OR 360A
OUTGOING TRUNK CIRCUIT
FROM SELECTOR MULTIPLE
MULTIPLE AT SWITCHBOARD
COMPOSITE SUPERVISION TYPE B

CHANGES

B. Changes in Apparatus

B.1 ADDED

1-19KY Resistor F, ZJ Option, Fig. 2

1-446F Diode H, ZM Option Fig. 2

2-185A Networks S, ZG Option, Fig. 1 and Fig. 3

B.2 REMOVED

1-18DB Resistor F, ZH Option, Fig. 2

1-18BM Resistor H, ZL Option, Fig. 2

D. Description of Changes

D.1 Option ZG is added to Fig. 1 and 3.

D.2 Options ZH and ZL in Fig. 2 are rated Mfr Disc.

D.4 Options ZJ and ZM are added in Fig. 2 and rated Std.

D.5 Options ZK and ZN are added in Fig. 2, rated Std, and clarified in Note 301.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5641-PHS-RMW

HL

CIRCUIT DESCRIPTION

CD-31795-01
ISSUE 3B
APPENDIX 6B
DWG ISSUE 13B

STEP BY STEP SYSTEMS NO. 1, 350A, 355A or 360A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

B. Changes in Apparatus

B.1 REMOVED

2 - 18G Resistors, (T and R), ZE option, Fig. 1.

D. Description of Changes

D.1 Fig. A was formerly shown as part of Fig. 1. Fig. B is added replacing Fig. A.

D.2 Option 2F is added in Fig. 1 replacing the former wiring shown as option ZE.

D.3 Reference to options ZE and ZF and Fig. A and B is added in Note 104 and Options Used Table.

D.4 Note 108 is added.

D.5 Application of W and X options is clarified in Note 102 to agree with working limit information shown on the drawing.

F. Changes in Description of Operation

F.1 Change last sentence of 5 to read: The disconnect signal is transmitted to the distant end by the A relay as it connects ground to the M lead to the composite signaling circuit.

F.2 Change the heading of paragraph 5 to read: Fig. 1 and Fig. A or B.

BELL TELEPHONE LABORATORIES , INCORPORATED

DEPT 2363-MKD-RJJ,Jr.

STEP BY STEP SYSTEMS NO. 1, 350A, 355A OR 360A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

120CS
Repeating Coil
"ZD" Option

Superseded	Superseded By
Y273 Relay, "U" Option, Fig. 1	Y226 Relay, "ZC" Option, Figs. 1 & 3
Y273 Relay, "ZB" Option, Fig. 3	

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The Mfr. Disc. Y273 Relay is superseded by the Y226 Relay.

D.2 The 120CS (silicon steel core) repeating coil is added to be used when the 120C (permalloy core) repeating coil is not available.

D.3 Notes 106 and 107 are added.

D.4 Options "ZB", "ZC" and "ZD" are added to the Options Used table.

D.5 Option "ZD" is added to Note 102.

D.6 Options "ZB", "ZC", "ZD", "G" and "H" are added to Note 104.

E. CHANGES IN TRANSMISSION REQUIREMENTS

E.1 The 120CS repeating coil is added and the individual loss for the 4MF capacitor is revised.

All other headings no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2325-LKC-EWO-A8

STEP BY STEP SYSTEMS NO. 1,350A,355A OR 360A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

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

C.1 The test clip data for the 221FAE relay (A) is changed to be the same as that specified for the 221FAF relay (A) to permit obtaining the soak value under all conditions. This relay was formerly tested from springs 1 and 2 of the test jack and springs 4T and 4B of relay (S) were not insulated.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Connecting information to the AMA trunk circuit is added to Figs. 1, 53, 55 and 56.

D.2 Connecting information to the auxiliary trunk circuit arranged to restrict service is added to Figs. 1, 3, 53, 55, 56, 58 and 59.

D.3 Reference to AMA is added to Note 102.

4. CONNECTING CIRCUITS

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

4.01 Line and Balancing CX Set and Repeating Coil Circuit SD-95004-01.*

4.02 CX Signaling Circuit Type "B" SD-95028-02.*

4.03 AB Toll Preceding Selector SD-31241-01.*

4.04 Local Selector SD-30200-01.*

4.05 Outgoing Trunk Circuit from Switchboard SD-64499-01.*

4.06 Automatic Ticketing Trunk Circuit SD-31949-01.

4.07 Rotary Out Trunk Switch Circuit SD-30868-01.*

4.08 Trunk Finder Circuit SD-31530-01*.

4.09 Traffic Register Circuit SD-31109-01.*

4.10 Pulse Repeating Test Set SD-31667-01.

4.11 Selector Bank Multiple Circuit SD-32123-01.

4.12 Aux. Trk. Ckt. SD-96384-011.

4.13 Misc. Alm. Ckt. Traffic Reg. SD-31976-01.

4.14 AMA Outgoing trunk circuit SD-32204-01.

4.15 Auxiliary Trunk Circuit arranged to Restrict Service SD-32187-01.

*Typical Circuit

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2353-MBB-EWO-PC

STEP BY STEP SYSTEMS NO. 1, 350A, 355A OR 360A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Optional wiring "Q" & "N" are added to cross-connection figures 58 & 59 respectively.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3030-VJA-RLL-N5

STEP BY STEP SYSTEMS
NO. 1, 350A, 355A OR 360A
OUTGOING TRUNK CIRCUIT
FROM SELECTOR MULTIPLE
MULTIPLE AT SWITCHBOARD
COMPOSITE SUPERVISION TYPE B

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

4-184A Networks (D), (E), (J) and (P) - "ZA" option in Fig. 2

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

C.1 On Page 2 of Circuit Requirements tables, Test Note 7 is added.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 "ZA" option added in Fig. 2 for contact protection networks.

D.2 Circuit Note 105 added.

D.3 Note 102 is changed to show reference to "E" type repeaters where office impedance is covered.

D.4 Working limits changed to show increased loop ranges for subscriber pulsing.

2. WORKING LIMITS

2.1 "W" Apparatus Subs. Loop

	45 V. Min.			48 V. Min.		
Type of Dial	2, 4 or 5	6	7	2, 4 or 5	6	7
* Max. Ext. Ckt. Loop	750Ω	1200Ω	1100Ω	850Ω	1500Ω	1400Ω
** " " " "	850Ω	1400Ω	1300Ω	1000Ω	1500Ω	1500Ω
*** " " " "	1000Ω	1400Ω	1400Ω	1115Ω	1500Ω	1500Ω
Min. Insulation Resistance - 15,000Ω						

* When using 1000Ω loop - Leak B in pulsing test set.
** When using 1200Ω loop - Leak A in pulsing test set.
*** When using 1400Ω loop - Leak A in pulsing test set.

2.2 "W" Apparatus - Trunk Loop

Maximum conductor loop pulsing 1200 ohms.
Maximum external circuit loop supervision 2200 ohms.
Minimum insulation resistance 30,000 ohms.

2.3 X Apparatus - Trunk Loop

Conductor loop pulsing 1200 to 2000 ohms.
Maximum external circuit loop supervision 2690 ohms.
Minimum insulation resistance 30,000 ohms.

4. CONNECTING CIRCUITS

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

4.01 Line and Balancing CX Set and Repeating Coil Circuit SD-95004-01.*

4.02 CX Signaling Circuit Type "B" SD-95028-02.*

4.03 AB Toll Preceding Selector SD-31241-01.*

4.04 Local Selector SD-30200-01.*

4.05 Outgoing Trunk Circuit from Switchboard SD-64499-01.*

4.06 Automatic Ticketing Trunk Circuit SD-31949-01.

4.07 Rotary Out Trunk Switch Circuit SD-30868-01.*

4.08 Trunk Finder Circuit SD-31530-01.*

4.09 Traffic Register Circuit SD-31109-01.

4.10 Pulse Repeating Test Set SD-31667-01.

4.11 Selector Bank Multiple Circuit SD-32123-01.

4.12 Aux. Trk. Ckt. SD-96384-011.

4.13 Misc. Alm. Ckt. Traffic Reg. SD-31976-01.

*Typical Circuit.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-GR-RLL-N1

HL

STEP BY STEP SYSTEMS NO. 1, 350A, 355A, OR 360A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 The added functions consists of adding a 500Ω battery to the sleeve lead in 35-E-97 offices as an idle trunk indication.

B. CHANGES IN APPARATUS

B.1 Added

18AC Res. (A)

B.2

Superseded	Superseded By
448A Jk. (T)	395 Type Jk. (T)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Note 102 changed to show option required when this trunk is used in a 35-E-97 office.

D.2 Figs. 1 and 3 changed to show "M" "K" and "J" options.

D.3 "Options used" table changed to show added options.

D.4 Note 104 changed to show added options.

D.5 Fig. 53 is rated "A & M Only" for No. 1 and 350A offices.

D.6 Figs. 51 and 54 are changed.

D.7 Figs. 55 and 56 are added.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-ASD-RLL-F1

HL

STEP-BY-STEP SYSTEMS NO. 1, 350-A, 355-A OR 360-A OUTGOING TRUNK CIRCUIT FROM SELECTOR MULTIPLE MULTIPLE AT SWITCHBOARD COMPOSITE SUPERVISION TYPE B

CHANGES

B. CHANGES IN APPARATUS

B.1 Added, optional

18BH resistance (B) in Fig. 1

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 "Q", "R" and "N" options added and "Y" option is rated Mfr. Disc.

D.2 Notes 102, 106 and options used table changed to show reference to "Q", "R" and "N" options.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 This circuit is used for outgoing composite signaling trunk circuits connected to the selector multiple. It is arranged for appearance at the switchboard where it is desired to give access to these trunks directly at the switchboard.

2. WORKING LIMITS

2.1 W Apparatus - Subscriber Loop

Maximum subscriber loop 1000 ohms.
Minimum insulation resistance 15,000 ohms.

2.2 W Apparatus - Trunk Loop

Maximum conductor loop pulsing 1200 ohms.
Maximum external circuit loop supervision 2200 ohms.
Minimum insulation resistance 30,000 ohms.

2.3 X Apparatus - Trunk Loop

Conductor loop pulsing 1200 to 2000 ohms.
Maximum external circuit loop supervision 2690 ohms.
Minimum insulation resistance 30,000 ohms.

3. FUNCTIONS

3.1 To repeat loop signaling supervision and dialing as composite signaling to the composite signaling trunk circuit.

3.2 Where Fig. 2 is used, to correct the pulses as they are repeated.

3.3 To repeat composite signaling supervision received from the composite signaling trunk as reverse battery supervision.

3.4 To hold the preceding switches operated and to hold this trunk busy when seized either from a selector or from the switchboard.

3.5 To operate a traffic register when all the trunks of a group are busy.

3.6 When associated with directly connected telephone repeating to provide a termination for the repeater when the circuit is normal.

3.7 When circuit is seized by outgoing trunk selector, ground is forwarded over the "S" lead to the connecting auxiliary trunk G- circuit.

3.8 When connecting auxiliary trunk circuit is busy, ground is put on the "S" lead.

4. CONNECTING CIRCUITS

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

4.01 Line and Balancing CX Set and Repeating Coil Circuit SD-95004-01.*

4.02 CX Signaling Circuit Type "B" SD-95028-02.*

4.03 AB Toll Preceding Selector SD-31241-01.*

4.04 Local Selector SD-30200-01.*

Printed in U. S. A.

4.05 Outgoing Trunk Circuit from Switchboard SD-64499-01.*

4.06 Automatic Ticketing Trunk Circuit SD-31949-01.

4.07 Rotary Out Trunk Switch Circuit SD-30868-01.*

4.08 Trunk Finder Circuit SD-31530-01.*

4.09 Traffic Register Circuit SD-31109-01.

4.10 Pulse Repeating Test Set SD-31667-01.

4.11 Selector Bank Multiple Circuit SD-32123-01.

4.12 Aux. Trk. Ckt. SD-96384-011.

*Typical Circuit.

DESCRIPTION OF OPERATION

5. FIG. 1

When this circuit is seized the (A) relay operates operating the (B) relay. The (B) relay operated, removes the termination for telephone repeaters through the (C) condenser and (C) resistance where furnished, removes its ground from the "BR" lead to the traffic register circuit so that when all trunks are busy this lead is no longer grounded, supplies ground to the sleeve lead to hold preceding selectors operated and to keep the circuit busy, removes ground from the "M" lead to the (CX) signaling circuit substituting battery through the (B) resistance lamp and also the (B) resistance. When pulses are received the (A) relay follows pulsing and on each pulse disconnects battery thru the (B) resistance lamp substituting direct ground. With "R" option the (B) resistance battery is used to maintain a potential on the "M" lead to the composite signaling circuit during the time that the (A) relay is transferring from one contact to the other and with "Q" option ground through resistance "B" is applied to the "M" lead during the transfer time to increase the per cent pulse break. During pulsing the operating ground from the (A) relay to the (B) relay is momentarily interrupted, but the (B) relay which is slow to release remains operated during the pulsing of each digit. Supervision is received from the called end as a ground from the composite signaling circuit over the "E" lead which operates the (S) relay. The (S) relay operated reverses the line current to the preceding circuits. Upon disconnecting the (A) relay releases and after an interval the (B) relay releases restoring the circuit to the idle normal condition. The disconnect signal is transmitted to the distant end by the (A) relay as it connects ground to the "E" lead to the composite signaling circuit.

6. FIG. 2

Where pulse correction is required Fig. 2 is furnished and the (A) relay instead of transmitting composite signaling to the composite signaling circuit direct controls the pulse corrector shown in Fig. 2 which in turn controls the composite signaling. Ground on the sleeve lead operates the (F) relay. The (A) relay operated, operates the (D) relay which closes an additional ground for holding the (B) relay operated, inserts the (D) resistance in series with itself to reduce the current drain since the (D) relay is operated during conversation and prepares the circuit for operating the (E) relay when the (A) relay releases. The (E) resistance is in parallel with the (E) relay winding to insure that the (D) relay holds in series with the (E) relay and to prevent the (E) relay from operating on momentary opening of the (CX) relay contact. When the (A) relay releases on the first pulse of a digit the (D) relay holds and the (E) relay operates. The (E) relay operated, opens the original operating circuit for the (D) relay from the (A) relay, removes ground from the winding of the (F) relay, operates the (P) relay, operates the (H) relay, and prepares the circuit for preventing a ground pulse being transmitted when the (J) relay operates. The (P) relay operated removes the (E) resistance shunt from the (E) relay winding and prepares a circuit for preventing a ground pulse being transmitted when the (E) relay releases. The (H) relay operated, operates the (J) relay which prepares the circuit for transmitting a ground pulse when both the (E) and (P) relays have released. The removal of ground from the winding of the (F) relay upon the operation of the (E) relay caused it to release somewhat slowly due to the (F) resistance in parallel with its winding. The (F) relay released releases the (E) and (D) relays. The (E) relay released reestablishes the circuit for operating the (D) relay from the (A) relay when operated. If the (A) relay is reoperated before the (E) relay releases the (D) relay may not release. The (E) relay released also releases the (P) relay and removes ground from winding of the (H) relay. The (P) relay released reoperates the (F) relay, and closes ground to the composite signaling circuit beginning the break period of the pulse. If the rate at which pulses are received is relatively slow or this is the last or only pulse of a digit the somewhat slow to release (H) relay releases releasing the (J) relay. The (J) relay released, removes the ground and reconnects battery through the (B)

resistance lamp to the composite signaling circuit. This terminates the break period of this pulse. If the rate at which pulses are received is relatively high, before the (H) relay has released, the (E) relay will have reoperated on a succeeding pulse reenergizing the winding of the (H) relay and removing the ground substituting battery through the (B) resistance lamp thus terminating the ground period of the pulse transmitted. From the above it will be seen that at slow rates of pulsing or the last or only pulse of a digit the ground period of pulses is the same length of time and is determined by the releasing time of the (H) relay plus the release time of the (J) relay minus the release time of the (P) relay. This time is established by adjusting the spring tension on the (H) relay to give the required percentage break meter reading when the circuit is receiving pulses from the pulsing test set at the slow speed. At high rates of pulsing the battery period of all pulses is a constant length of time and is determined by the release time of the (F) relay plus the release time of the (E) relay plus the release time of the (P) relay. This time is established by adjusting the spring tension on the (F) relay to give the required percentage break meter reading when the circuit is receiving pulses from the pulsing test set at the normal speed of 12 pulses per second. Upon disconnection at the end of a call Fig. 2 functions as described above for pulsing up to the point when the (J) relay is operated and the (E) and (P) relays released. The (D) relay being released the (J) relay remains operated through its break contact. The continued release of the (D) relay releases the (B) relay which removes ground from the sleeve lead releasing all operated relays in this circuit and removing the busy indication restoring the circuit to normal.

7. MISCELLANEOUS

The (C) resistance and (C) condenser is used when telephone repeaters are associated with this trunk in order to provide a termination when the circuit is normal. The (A) repeating coil is used when a terminal telephone repeater is not used at this end of the trunk and the long range composite signaling circuit is used in order that the line signaling currents will not flow through the repeating coil of the composite signaling circuit. This is to prevent transient currents from interfering with the composite signaling. The (T) jack is used for maintenance purposes and also to provide facilities for making this circuit busy. The (T) and (P) jacks are used for adjusting the (F) and (H) relays to the desired release time through the use of the pulsing test set and percentage break meter. As described above, the (D) resistance is used to reduce the current flow after the (D) relay is operated in order to reduce the current drain since the (D) relay is operated during conversation. The (E) resistance is used to insure that the (D) relay holds when the (E) relay operates and also prevents the (E) relay from operating on a momentary opening of the (CX) relay contact. The (F) and (H) resistances are used to make the (F) and (H) relays somewhat slow in releasing. The (T) and (R) resistances in conjunction with the preliminary make contacts of the (S) relay provide for reversing the line current inside the repeating coil without releasing the (A) relay and without short circuiting the (A) or (B) condenser.

8. FIG. 3

Ground on the sleeve lead operates a relay in the auxiliary trunk circuit which connects the tip and ring through the repeating coil circuit to the (A) relay. The (A) relay operates and forwards ground to the (B) relay. The (B) relay operates to remove the termination for telephone repeaters through the (C) condenser and (C) resistance where furnished, removes ground from "BR" lead to the traffic register circuit in order that when all trunks are busy this lead is no longer grounded, and supplies ground to the sleeve lead to hold preceding selectors operated and to keep the circuit busy. The operation of relay (B) also, removes ground from the "M" lead to the (CX) signaling circuit. When pulse correcting is required, the (B) relay connects battery to the "M" lead through the (B) resistance lamp and the (B) resistance. Resistance ground through the 1000Ω (B) resistance is connected to the "M" lead along with the (B) resistance lamp and battery when pulse correcting is not required. The (A) relay follows the pulses received and on each pulse disconnects battery through the (B) resistance lamp and connects direct ground to the "M" lead. The (B) resistance battery is used to maintain a potential on the "M" lead to the composite signaling circuit during the time that the (A) relay is transferring from one contact to the other serving as a preventitive measure against false pulsing of the polarized relay in the composite signal circuit. A resistance ground provides similar precaution but is used when pulse correction is not required. During pulsing the operating ground from the (A) relay to the (B) relay is momentarily interrupted, but

the (B) relay which is slow to release remains operated during the pulsing of each digit. Supervision is received from the called end as a ground from the composite signaling circuit over the "E" lead which operates the (S) relay. Operation of the (S) relay reverses the line current to the preceding circuits. Upon disconnecting the (A) relay releases and after an interval the (B) relay releases restoring the circuit to the idle normal condition. The disconnect signal is transmitted to the distant end by the (A) relay as it connects ground to the "M" lead to the composite signaling circuit.

A call placed on the two-way trunk through the Auxiliary Trunk Circuit to which this circuit is connected will cause the Auxiliary Trunk Circuit to place ground on the "S" lead. This indicates that the trunk is busy and an Outgoing Trunk Selector looking for an idle trunk will step off this trunk. The "E" lead has been run thru contacts 6 and 7 of (B) relay to prevent the (S) relay from operating under a busy condition on the two-way trunk before the relays of the Auxiliary Trunk have completed their operation.

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DEPT. 3310-GR-RLL-AL