10

STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
COMBINATION CONNECTOR CIRCUIT
ONE RING
WITH OR WITHOUT REVERSE
BATTERY SUPERVISION

CHANGES

B. Changes in Apparatus

B.1 Added
B Network, 186A ZF option, Fig. 1

C Network, consisting of 1-542D capacitor and 1-KS13490 L2 Resistor, .150 Ohms, ZG option, Fig. 1

T and R capacitor, 580A, ZI option, Fig. 1

A Capacitor, 542U, ZI option, Fig. 1

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 The spring layout BSP figures for the A relays (options Y and Z) are changed from 11 to 726. The BSP figures are the same except that 726 contains information on the newer silver/palladium contact material.

D. Description of Changes

D.1 Figure 1 is revised to show the addition of pigtail contact protection networks. The added networks are designated options ZF and ZG and are rated Standard. The existing networks, option W, rated Standard are to be used only when option M is required.

D.2 New T, R, and A capacitors are added to Figure 1. The previous capacitors are designated option ZH and are to be used only when M option is required. The added capacitors are designated ZI option and are rated Standard.

D.3 Information is added to arrange this circuit without reverse battery supervision on an optional basis. The circuit with reverse battery supervision is designated ZJ option and ZK option without.

D.4 Notes 105 and 108 are revised and notes 111, 112 and 113 are added to explain options ZF, ZG, ZH, ZI, ZJ and ZK.

D.5 Keysheet and maintenance BSP information is added as part of the Supporting Information.

F. Changes in CD Sections

F.1 In section 4. Connecting Circuits, correct 4.5 as follows.

4.5 Connector Bank Multiple Circuit - SD-32128-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5225-LCB
WECo DEPT 5152-RTO-WEA

STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
COMBINATION CONNECTOR CIRCUIT
ONE RING

CHANGES

B. Changes in Apparatus

B.1 ADDED

1 - 63T, 2000 ohms, D Resistor, ZB Option

B.2 REMOVED

1 - KS-8512,L2A, 750 ohms, K Resistor, ZH Option

D. Description of Changes

D.1 The D resistor is added across the RON contacts to permit the operation of K relay on disconnect to prevent the reoperation of K relay over its primary winding on disconnect of toll calls. Also the KS-8512,L2A K resistor around the secondary winding of K relay, shown as ZH option on Issue 15B, is removed.

D.2 The D resistor is shown as part of ZB option which was added on Issue 15B to prevent rotary overstep.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MKD-RJJ

STEP-BY-STEP SYSTEMS
NO. 1, 350A, OR 355A
COMBINATION CONNECTOR CIRCUIT
ONE RING

CHANGES

D. Description of Changes

D.1 The wiring shown as ZG option on issue 16D of this circuit, to provide busy tone over the same lead for both toll and local operation, is removed on a no-record basis since WECo manufacturing drawings have not been revised to reflect this change. The wiring shown as ZF option is restored as shown prior to issue 16D.

D.2 Lead designation LTB is added at jack spring 23 to provide a separate path for toll busy tone. The busy flash lead designation, 60 IPM OR 120 IPM AS SPEC at jack spring 23, is rated Mfr Disc.

D.4 Reference to options ZF and ZG is removed from Note 105 and Options Used table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MKD-RJJ

STEP BY STEP SYSTEMS
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ONE RING

CHANGES

B. Changes in Apparatus

B.1 REMOVED

63L (A) resistor ZF option

D. Description of Changes

D.1 The return of busy flash to the toll operator is shown as ZF option and rated Mfr Disc. The return of busy flash to the local operator, option Q, is also rated Mfr Disc. The return of busy tone only is shown as ZG option and is standard for both toll and local calls.

D.2 Note 110 is rated Mfr Disc.

D.3 Reference to options ZF and ZG is added to Note 105 and Options Used table.

D.4 This circuit is shown replacing SD-30228-01.

D.5 Note 109 is revised to clarify the use of options M and N.

D.6 This circuit is rated A&M Only for use in 350A offices.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MKD-RJJ, JR.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, OR 355A
COMBINATION CONNECTOR CIRCUIT
ONE RING

CHANGES

B. Changes in Apparatus

B.1

SUPERSEDED	SUPERSEDED BY
197GP Switch, G Option	197HR Switch, ZE Option
248 Relay	248D Relay

B.2 ADDED

1-KS-8512, L2A(K) Resistor, ZH Option

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 A nonoperate current flow requirement of 115 ma for test and readjust is specified for the double dog of the switch.

C.2 On page 1, Test Note 6 is deleted. It formerly read: Double dog shall not operate.

C.3 On page 1, Test Note 7 formerly read: (RLS) springs 1-2 shall break.

C.4 On page 3, under column headed Conn BAT, the test clip data for the J relay was formerly shown as 6(G).

C.5 Current flow requirements are added for secondary winding of K relay in parallel with K resistor.

D. Description of Changes

D.1 Option ZB is added to open the original operating path for the rotary magnet and E relay to prevent rotary overstepping after the units digit has been dialed. The former wiring is shown as ZA option which is rated Mfr Disc.

D.2 Option ZD is added to provide battery to the secondary winding of relay K directly, rather than through the rotary magnet.

D.3 The 197GP switch, G option is replaced by the 197HR switch, ZE option, to provide RON springs.

D.4 Option ZH is added to insure the release of the K relay on disconnect.

D.5 Note 111 is added to cover the use of ZD and ZH options when ZB option is provided.

D.6 Former Note 201 is shown as Note 202 and a new Note 201 is added. Note 203 is added.

D.7 Reference to options ZA, ZB, ZC, ZD, and ZE is added to Note 105 and Options Used Table.

F. Changes in Description of Operation

F.1 In the first sentence of second paragraph under 13.2, after "of relay K" add: with ZC option.

F.2 Add a third paragraph under 13.2: With ZB option, the original operating path for the rotary magnet and E relay is opened to prevent rotary overstepping after the units digit has been dialed.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MKD-RJJ, Jr.

STEP BY STEP SYSTEMS
NO. 1, 350A OR 355A
COMBINATION CONNECTOR CIRCUIT
ONE RING

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Provision is made to automatically release the connector and switch train on local calls within a predetermined time when the called party disconnects but the calling party fails to disconnect.

B. CHANGES IN APPARATUS

B.1 Added.

1 - KS-5812, LAC(R) resistor, J option

B.2

Superseded	Superseded by
197E Switch (H option)	197OP Switch (G option)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The title is changed to include the use of this circuit in No. 1 and 350A offices in addition to 355A offices.

D.2 The busy flash feature to operators over the local train, option Q, is changed from Special to A&M Only.

D.3 Option J is added for use where automatic disconnect on local calling holds is required. Option K shows the former wiring.

D.4 The leads formerly connecting to the "Misc. Alm. Ckt." are also shown connecting to the "Switch Trouble Alarm Ckt." Lead designated Code 1 or MR-R1, Code 1+ or Code 1- or MR SUP+ or MR SUP- formerly read Code 1, Code 1+ or Code 1-.

D.5 Equipment note 201 is added.

D.6 Circuit note 110, Feature or Option table for A&M options is added.

D.7 The use of Options K and J is added in note 108.

D.8 Reference to Options G, H, J and K is added in note 105 and the Options Used Table.

1. PURPOSE OF CIRCUIT

1.1 This circuit is used for extending a call from a toll or local selector to a subscriber's line.

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2. WORKING LIMITS

LIMITS ARE FOR SINGLE OFFICE AREAS. FOR MULTI-OFFICE AREAS, AND FOR OPERATOR PULSING, SEE KEY SHEETS.

	45V. MIN.					48V. MIN.				
	PULSING FROM SUB.			CALLED STA. SUPV.		PULSING FROM SUB.			CALLED STA. SUPV.	
TYPE OF DIAL OR ADJ.	2, 4 OR 5	6	7	ADJ "A"	ADJ "B"	2,4 OR 5	6	7	ADJ "A"	ADJ "B"
MAX. EXT. CKT. LOOP*	750Ω	1200Ω	1100Ω	1000Ω	1400Ω	850Ω	1500Ω	1400Ω	1115Ω	1500Ω
MAX. EXT. CKT. LOOP**	850Ω	1400Ω	1300Ω	1000Ω	1400Ω	1000Ω	1500Ω	1500Ω	1115Ω	1500Ω
MAX. EXT. CKT. LOOP***	1000Ω	1400Ω	1400Ω	1000Ω	1400Ω	1115Ω	1500Ω	1500Ω	1115Ω	1500Ω
MIN. INS. RES.	15,000Ω			15,000Ω		15,000Ω			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

2.1 Tripping Ranges

TYPE OF RINGING AND DISTRICT	RINGING INTERVAL VOLTAGE: AC VOLTAGE	DC VOLTAGE	SILENT INTERVAL VOLTAGE	CODE OF (F) RELAY	OPTION	RATING	MAX. EXT. CKT. LOOP FOR TRIPPING ADJ "A"	ADJ "B"	ADJ "D"	ADJ "E"
AC-DC	80-90(1)	45-52	45-52	222T	D,M	STD.(2)	1030Ω	-	1400Ω	-
	75-110(2)		48-52	222T	D,M	STD.(2)	1115Ω	-	1500Ω	-
SUP. TUBE ±5 V.E.F.	80-90(2)	45-52	45-52	222T	D,M OR N	STD.	-	-	1400Ω	1400Ω
			48-52	222T	D,M OR N	STD.	-	-	1500Ω	1500Ω
	65-90	37-40	45-52	222T	D,M	STD.	1030Ω	-	1400Ω	-
			48-52	222T	D,M	STD.	1115Ω	-	1500Ω	-
			60-75	222T	D,M	M.D.	-	1500Ω	-	-
				222DP	E,M	A&M	-	1500Ω	-	-
SUP. INVERTED 42A AND TUBE	65-90	37-40	60-75	222DP	E,M	A&M	1040Ω	-	-	-
SUP. 42A, INVERTED 42A AND TUBE	65-90	37-40	60-75	222DP	E,M	A&M	900Ω	-	-	-

(1) 75-90 DURING POWER FAILURE
(2) 75-110 IS A&M

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3. FUNCTIONS

3.1 To differentiate between local and toll calls.

3.2 To select a line as determined by the pulses received by it.

3.3 To remain operated until the calling subscriber has disconnected.

3.4 To test busy while so held.

3.5 To return audible ringing tone to the calling end.

3.6 To trip machine ringing when the called party answers.

3.7 To start and stop the source of ringing supply.

3.8 The following functions apply when used as a local connector:

3.81 To return busy tone to the calling subscriber when the line selected is busy.

3.82 To return busy flash on operator originated calls if the line tested is busy.

3.83 To start machine ringing as soon as the switch is seized and (B) operates.

3.84 To reverse battery to the calling line when the called subscriber answers.

3.85 To provide a supervisory signal if the called subscriber disconnects before the calling subscriber.

3.86 To supply the calling and called ends with transmission battery.

3.87 To automatically disconnect the calling line after a predetermined interval on calling party holds, permitting release of connector and freeing called line.

3.9 The following functions apply when used as a toll connector:

3.91 To cause the operator to receive the line busy flash if the line dialed is busy.

3.92 To extend the trunk free of transmission obstructions to the line seized.

3.93 To cause the operator to be signaled when the line has been seized.

3.94 To start machine ringing under control of the toll operator.

4. CONNECTING CIRCUITS

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

4.1 Subscriber line ckt. - SD-32133-01*.

*Typical.

4.2 Intercept trunk ckt. - SD-31337-01.

4.3 Miscellaneous alarm ckt. or Switch Trouble Alarm Ckt. - SD-32045-01.

4.4 Selector bank multiple ckt. - SD-32123-01.

4.5 Connector bank multiple ckt. - SD-32138-01.

4.6 Local selector - SD-31735-01*.

4.7 Toll intermediate selector - SD-31744-01*.

4.8 Toll transmission selector - SD-31745-01*.

4.9 AB toll transmission selector - SD-31746-01.

*Typical

DESCRIPTION OF OPERATION

5. SEIZURE

5.1 Local

When this connector is seized by a local selector a loop is extended across the incoming local tip and ring leads which causes relay (A) to operate. Relay (A) when operated operates relay (B) which places ground upon both the local and toll sleeves for a busy condition and to hold operated the preceding switches, prepares the vertical stepping circuit, and also grounds the MS lead to start the source of ringing supply.

5.2 Toll

When this connector is seized by a toll selector a loop is extended across the toll tip and ring and ground is connected to the toll sleeve lead. The loop across the tip and ring causes relays (H) and (A) to operate in series. The ground upon the toll sleeve is transmitted through the back contact of relay (J) to the toll control lead. Relay (H) operates and when the shaft is stepped off normal locks to ground on the sleeve. Relay (H) also opens the supervisory No. 1 or automatic disconnect circuit. Relays (A) and (B) operate as on a local selector.

6. VERTICAL STEPPING

As the dial returns to normal on the first digit, relay (A) responds to the pulses, closing the circuit through relays (C) and the vertical magnet in series. Relay (C) and the vertical magnet both operate. Relays (B) and (C) are slow to release and do not restore on dial pulses.

7. PREPARING TO RECEIVE SECOND DIGIT

When the dial comes to rest at the end of the first digit, relay (C) releases transferring the stepping circuit from relay (C) and the vertical magnet to relay (E) and the rotary magnet.

8. ROTARY STEPPING

When the dial rotates back on the second digit, relay (E) and the rotary magnet operate in parallel. The rotary magnet steps the shaft and wipers around until the wipers come in contact with the line dialed. When the pulses of the digit cease, relay (E) releases.

9. BUSY TEST

If the line dialed is busy there will be ground upon the sleeve lead "S", which before relay (E) releases, will cause relay (G) to operate. When relay (E) releases, the operating circuit for relay (G) is transferred to a locking circuit through the front contact of relay (G) to ground on the sleeve lead.

10. CONNECTION HELD

10.1 Local Calling Party Control of Release

When the calling party hangs up relays (A) and (B) release. The release of relay (B) allows the release of relays (F) and (K) and the switch. With option K, the connector and switch train are held operated as long as the calling party is off hook.

10.2 Automatic Disconnect on Local Calling Party Holds - Option J

If the calling party fails to replace his receiver on hook after the called party has disconnected releasing the (D) relay, the connector is automatically disconnected after a predetermined interval. With (D) released and (F) operated, ground over lead AUT. DISC. through R resistor, make on VON, through RLS magnet to battery, operates RLS on first step to release (B). (B) released permits the preceding switches to restore and open the loop to release (A). The release of (A) fully operates the RLS magnet, returning the connector to normal.

10.3 Toll

If the call is from a toll board, ground is maintained on the sleeve lead by the transmission selector. While the called subscriber's receiver is off the hook, the transmission selector functions to hold ground upon the sleeve lead, making this connector test busy, and also preventing it from releasing.

11. RINGING TONE

When the ringing current is being applied to the called line, a small portion passes through the .04 mf condenser, which serves to provide an audible ringing signal to the calling party.

12. RING TRIP

When the called subscriber answers, relay (P) is energized through its P winding sufficiently to make its No. 2 contact. Its operation is completed through the 3 winding. Relay (P) operated transfers the subscriber's line from the ringing to the talking position, and removes ground from the M3 lead.

13. OPERATION AS A LOCAL CONNECTOR

13.1 Busy Indication

When the called line is busy, relay (G) is operated as previously described, and returns a busy signal as determined by option R or Q.

With option R, busy tone is connected through the contacts of the (G) relay to the ring of the line connected to the calling party.

With option Q busy flash is connected through the contacts of the (G) relay to the "F" lead to preceding selectors toward the calling operator. (G) operated also connects busy tone to calling line.

13.2 Cutting Through to the Called Line

If the line dialed is idle, the (K) relay operates over its primary winding sufficiently to make its 1B and 2B contacts from battery over the sleeve from the called line circuit. Relay (K) then fully operates over its secondary winding. Relay (K) locks over its own contact, opens the rotary and release magnet circuits, extends the tip and ring to the called line and places a direct ground on the called line sleeve.

The battery to the secondary winding of relay (K) is supplied through the rotary magnet, to prevent the operation of relay if a pulse is transmitted to the rotary magnet by an irregular operation at the calling station after springs 1B and 2B have made and before springs 3T and 4T have broken. If relay (K) were permitted to operate under conditions described in the foregoing it might result in the calling party cutting in on a busy connection.

13.3 Machine Ringing

When the line is seized, relay (K) operates, extending the subscriber's line to relay (P), which closes ringing current to the called line.

13.4 Reverse Battery Supervision

When the called subscriber removes his receiver, relay (D) operates, reversing the battery to the calling line. This reversal serves to give P.B.X. or other trunk supervision when the called subscriber has answered, or to collect coins on coin box lines, or to operate the register on message rate lines.

13.5 Talking

The calling party receives his transmission battery through relay (A), the called party through relay (D).

14. OPERATION AS TOLL CONNECTOR

14.1 Busy Indication

If the line dialed is busy, there will be ground upon the sleeve lead which will cause relay (G) to operate. When relay (E) restores at the end of the second digit, relay (G) will be locked through its front contact to ground on the sleeve lead. Relay (J) will operate when relay (E) releases from ground on the sleeve lead to battery through the rotary magnet. Relay (J) in operating removes the ground from the toll control lead and transfers the busy lead from the busy tone to the busy flash. Relay (J) also transfers the toll trunk from relay (A) to the leads of the (P) relay. Relay (A) remains operated by having ground placed upon its battery winding through the 500 ohm resistance. The ground interruptions applied to the ring of the toll trunk serve to cause the toll operator's supervisory lamp to flash as an indication to the toll operator that the line dialed is busy.

14.2 Seizure

If the line dialed is idle, relay (K) will operate, opening the rotary and release magnets and busy test circuits, and extending the tip and ring to the called line. The (K) relay also places ground upon the sleeve of the line, locks to the sleeve lead, and places battery through the rotary magnet on relay (J). Relay (J) operates, removing relay (A) from the tip and ring of the toll trunk, provides a holding circuit for relay (A) and extends the tip and ring of the toll trunk through to the called subscriber's line. Relay (J), in operating, also removes ground from the toll control lead which causes the transmission selector to function to cause the cord to be transferred from the position dial to the cord circuit. Under this condition, the toll operator's cord supervisory lamp will light as a signal that the line dialed has been seized and is ready to start ringing.

14.3 Ringing

On the first vertical pulse, relay (P) was operated, by ground from relay (H)

through the make contact of relay (C). Relay (F) then locks to ground on the toll control lead. Ground is removed from the C lead by the toll transmission selector to start ringing. Relay (F) will operate when the called subscriber removes his receiver and trips ringing.

14.4 Transmission

In the talking position with relays (F), (J), and (K) operated, the subscriber's line is extended to the transmission selector free from all transmission obstructions.

15. SUPERVISORY NO. 1, OPTION K

If the called station disconnects before the calling station a path is closed through a back contact of relay (D) and front contact of relay (F) for operating a supervisory signal.

16. TEST JACK

By means of the test jack this circuit may be operated either as a local or toll connector in the manner just described. It is also used for busying the circuit when it is out of order and for otherwise facilitating maintenance conditions. Certain jack springs of this circuit are adjusted so that ground will be connected to the local and toll sleeve leads as a busy indication whenever the switch is removed from its position.

17. CONTACT PROTECTION

The contact protection unit (C) is used to protect contacts which operate the stepping magnets. Contact protection (B) is used to protect the contacts which open the circuit for ringing current at the time ringing is tripped.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2335-MKD-FBB-SW