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STEP BY STEP SYSTEMS
NO. 1 OR 350A
CONNECTOR CIRCUIT
COMBINATION TOLL AND LOCAL
LOOP DIALING TOLL TRAIN
SELECTIVE OR
1 RING SEMI-SELECTIVE RINGING

CHANGES

B. Changes in Apparatus

B.1 ADDED

1 - 63T, 2000 ohm, C resistor, ZN option

B.2 REMOVED

1 - KS-8512, L2A, 750-ohms, K resistor, ZR option

D. Description of Changes

D.1 The C resistor is added across the RON contacts to permit the operation of E 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 ZR option on Issue 86B is removed.

D.2 The C resistor is shown as part of ZN option which was added on Issue 34B to prevent rotary overstep.

BELL TELEPHONE LABORATORIES, INCORPORATED

EPT 2363-MKD-RJJ, Jr.

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CHANGES

D. Description of Changes

D.1 The wiring shown as ZQ option on Issue 35D 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 ZP option is restored as shown prior to Issue 35D.

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.3 Reference to options ZP and ZQ is removed from Note 109 and Options Used Table.

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CHANGES

B. Changes in Apparatus

B.1 ADDED

1 KS-8512, L2A, K resistor, option ZR.

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

C.1 Current flow requirements are added for secondary winding of K relay in parallel with K resistor.

D. Description of Changes

D.1 The K resistor, option ZR, is added around the secondary winding of the K relay to insure its release when option ZN is provided.

D.2 Note 118 is added to cover the use of options V and ZR when option ZN is provided.

D.3 Reference to option ZR is added to Note 109 and Options Used table.

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CHANGES

B. Changes in Apparatus

B.1 REMOVED

1 - 63L, A Resistor - ZP Option

D. Description of Changes

D.1 The return of busy flash to the toll operator is shown as option ZP and rated Mfr Disc. replaced by return of busy tone ZQ option which is AT&TCo Std.

D.2 Reference to options ZP and ZQ is added in Note 109 and Options Used table.

D.3 Replaced by SD-31739-01 is added in the title box.

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CHANGES

B. Changes in Apparatus

B.1

SUPERSEDED	SUPERSEDED BY
197GP switch (ZL option)	197HR switch (ZO 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 9 is deleted. It formerly read: Double dog shall not operate.

D.3 On Page 1, Test Note 10 formerly read: RLS springs 1-2 shall break.

D. Description of Changes

D.1 Option ZN 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 ZM option which is rated Mfr Disc.

D.2 Option W is rated Mfr Disc. and the rating of option V is changed from Mfr Disc. to AT&TCo Std.

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

D.4 Reference to options ZM, ZN, ZO and ZL is added to Note 109 and Options Used table.

D.5 Former Equipment Note 201 is renumbered Note 202 and a new Note 201 is added. Note 203 is added.

D.6 Note 116 is added.

F. Changes in Description of Operation

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

F.2 Add as third paragraph under 13.2 the following:

With ZN 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.

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DEPT 2363-MKD-RJJ,JR.

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CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded	Superseded by
197E Switch, (E option) and F53184 switch formerly shown as part of ZK option	197GP Switch (ZL option)
KS-8512-D4C resistor (R1)	KS-8512-L2C resistor (R1)

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

C.1 The 221CK (C) relay and the 221DT (E) relay were shown as E option.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Circuit Note 109 is changed to show the rating of option ZK as standard and reference to ZL is added. Option E is rated Manufacture Discontinued.

D.2 The rating of this circuit is changed to A&M Only. Prior to this issue it was rated AT&TCo Standard.

D.3 Equipment Note 201 is added.

D.4 Option X, joint control feature on release on connectors is rated Manufacture Discontinued.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2335-MKD-FBB-RJ

STEP-BY-STEP SYSTEM
NO. 1 OR 350A
CONNECTOR CIRCUIT
COMBINATION TOLL AND LOCAL
LOOP DIALING TOLL TRAIN
SELECTIVE OR
1 RING SEMI-SELECTIVE RINGING

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 A circuit arrangement providing automatic disconnect of the called party and release of the connector and the switch train when the calling party fails to hang up on local calls is added.

B. CHANGES IN APPARATUS

B.1 Added

1 - F-53184 Switch (ZK option)
1 - RS-8512, L+C Resistor (R1) (ZK option).

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Option ZK is added for use on local calls in offices where release of connector is under control of calling party and automatic disconnect on calling party holds is required. Option ZJ shows former wiring.

D.2 Option ZK is rated "Provisional."

D.3 A lead designated "AUT. DISC." connecting to Switch Trouble Alarm Ckt. is added.

D.4 Reference to options ZJ and ZK is added to Notes 109, 115 and the options used table.

D.5 Note 106 is rated "Mfr. Disc." The information is added to Note 115.

All other headings under Changes, no change.

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.

2. WORKING LIMITS

Limits are for single office areas. For multi-office areas, and for operator pulsing, see key sheets.

	45 V. Min.					48 V. 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.		15000Ω		15000Ω			15000Ω		15000Ω	

* 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.

Tripping Ranges

Type of Ringing and District	Ringing Interval Voltage No. 1	Ringing Interval Voltage No. 350A	Silent Interval Voltage	Code of (F) Relay	Option	Rating	Max. Ext.Ckt. Loop For Tripping Adj. "A"	Adj. "B"	Adj. "C"
AC-DC	84-88(1) AC & 45-52 DC	72-88 OR 84-88 AC & 45-52 DC	45-52	222J	ZE	Std.(1)	1030Ω	-	1400Ω
			48-52	222J	ZE	Std.(1)	1110Ω	-	1500Ω
Sup. Tube ±5V.E.P.	84-88(1) AC & 37-40 DC(3)	72-88 OR 84-88 AC & 37-40 DC(3)	45-52	222J	ZE	Std.(1)	1030Ω	-	1400Ω
			48-52	222J	ZE	Std.(1)	1110Ω	-	1500Ω
			60-75	222J	ZE	M.D.	-	1500Ω	-
				222K OR 222L	ZC OR ZD	A & M	-	1500Ω	-
Sup. Inverted 42A and Tube	84-88(1) & 37-40 DC(3)	72-88 OR 84-88 AC & 37-40 DC(3)	60-75	222K OR 222L	ZC OR ZD	A & M	1040Ω		
Sup. 42A, Inv. 42A, and Tube	76-80(2) AC & 42-46 DC	72-88 OR 84-88 AC & 37-40 DC	60-75	222K OR 222L	ZC OR ZD	A & M	900Ω		

(1) 72-88 AC & 80-88 AC are A & M in No. 1.
(2) 64-80 AC & 72-80 AC are also A & M in No. 1.
(3) 64-80, 72-80, or 76-80 AC & 42-46 DC are also A & M in No. 1 and 350A.

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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 both the calling and called subscribers have disconnected except when used as a local connector and with prepayment coin subscriber's lines operated on the basis of coin deposit before receiving dial tone.

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 The following functions apply when used as a local connector:

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

3.72 To start machine ringing as soon as the line selected is seized.

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

3.74 To provide a supervisory signal if one subscriber disconnects before the other.

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

3.76 To automatically disconnect the calling line after an interval of 12 to 30 seconds on calling party holds, permitting release of connector and freeing called line.

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

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

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

3.83 To cause the operator to be signalled when the line has been seized.

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

4. CONNECTING CIRCUITS

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

4.1 Local Selector SD-30200-01.

4.2 Toll Selector SD-31179-01.

4.3 Sel. Bank Multiple Circuit SD-32123-01.

4.4 Connector Bank Multiple Circuit SD-32128-01.

4.5 Subscriber Line Circuit SD-32133-01.

4.6 Intercepting Trunk Circuit SD-31337-01.

4.7 Switch Trouble Alarm Circuit SD-32045-01.

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 and also prepares the vertical stepping circuit.

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 (E) also opens the supervisory No. 1 circuits. Relay (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) restores, 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) restores.

9. BUSY TEST

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

10. CONNECTION HELD

10.1 Local. Joint Control of Release. "X" Wiring.

If the call is from a local subscriber, the calling subscriber, as long as the receiver is off the hook holds relay (A) operated. The called subscriber holds relay (D) in the same manner and relay (K) is therefore held and the switch does not release. If, however, the calling subscriber hangs up first relay (A) releases causing relay (E) to be momentarily operated thereby removing ground which is supplied through the front contact and the primary winding of relay (K) to the incoming sleeve lead. This permits the preceding switches to restore. Ground is replaced on the sleeve lead by the operated (D) relay as soon as relay (E) restores in order to make the switch test busy to other selectors seeking a trunk in this group. When the called party hangs up relay (D) releases allowing the release of relays (F) and (K) and the switch.

10.2 Local. Calling Party Control of Release. "Y" and ZJ Wiring.

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.

10.3 Local. Automatic Disconnect of Calling Line on Calling Party Hold. Y and ZK Options

If the calling party fails to replace his receiver on hook after called party disconnects releasing the (D) relay, with ZK option provided the connector is automatically released after an interval of 12 to 30 seconds. Ground over lead "Aut. Disc." through a break on (H) a make on (F) a break on (D), resistor (R1), VON springs, (RLS) magnet to battery, causes (RLS) on its first step to open a pair of springs 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.

10.4 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 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 (F) is energized through its primary winding sufficiently to make its No. 2 contact. Its operation is completed through the secondary winding. Relay (F) operated transfers the subscriber's line from the ringing to the talking position.

13. OPERATION AS A LOCAL CONNECTOR

13.1 Busy

When the called line is busy, relay (G) is operated as previously described, and closes the busy tone to the trunk which is transmitted back to the calling subscriber.

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 (F), and closes ringing current to the called line.

13.4 Reverse Battery Supervision

When the called subscriber removes his receiver, relay F operates as described in par. 12, in turn operating relay (D) operates, reversing the battery to the calling line. This reversal serves to give PBX 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 (B) relay. Relay (J) will operate when relay (E) restores from ground on the sleeve lead of Toll Selector 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 (F) 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 magnet 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 the relay (J). Relay (J) operates, removing relay (A) from the tip and ring of the toll trunk, provides 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 be rung upon.

14.3 Ringing

On the first vertical pulse, relay (F) was operated, by ground on the sleeve lead through contacts on (H) and (C) operated. Relay (F) then locks to ground on the toll control lead. When the toll operator rings the called subscriber ground is removed from the toll control lead, thereby allowing relay (F) to release and start machine ringing. Relay (F) will operate when the called subscriber removes his receiver and trip 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

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. SUPERVISORY NO. 2

If the called station remains on the line after the calling station has disconnected with "X" wiring, relay (D) will remain operated and upon the release of relays (A) and (B) a circuit will be closed through the front contact of relay (D) for operating a supervisory signal.

17. 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.

18. 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.

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DEPT. 2336-AS-ROD-RR