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STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35-E-97
LINE FINDER CIRCUIT
200 POINT - 4 WIRE

CHANGES

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

C.1 A new adjustment, designated B, is added to the Circuit Requirements table for the B relay, Fig. 2. The existing adjustment is retained and designated A.

C.2 Test Note 8 is added to reflect the above changes.

D. Description of Changes

D.1 Reference to Test Note 8, Circuit Requirements table is added to Fig. 2.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2563-WCB-RJJ,Jr.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
LINE FINDER CIRCUIT
200 POINT - 4 WIRE

CHANGES

D. Description of Changes

D.1 Fig. 2 and 11 are modified to show connection to the Jack Access Circuit for Automatic Call Through Test Set.

D.2 Note 103 is modified to include 355A offices for high-sleeve voltage feature.

D.3 Prior to this issue, 350A offices were AT&TCo Std.

F. Changes in CD Sections

F.1 Under 4. CONNECTING CIRCUITS add:

4.13 Jack Access Circuit for Automatic Call Through Test Set - SD-32523-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MPC-RJJ

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
LINE FINDER CIRCUIT
200 POINT 4 WIRE

CHANGES

D. DESCRIPTION OF CHANGES

D.1 CAD 1 is modified to show connections for Noncommon Control TOUCH-TONE and Common Control Circuits.

D.2 In Circuit Note 103, deleted Fig. 2 from feature "Without class of service tone, postpay coin trunk operation or restriction service", and added it as a separate feature under Line Finders only.

F. CHANGES IN CD SECTIONS

F.1 Under 4. Connecting Circuits, add:

4.11 Converter Trunk - TOUCH-TONE Calling - SD-32326-01.

4.12 Register Trunk and Link - SD-32353-01 - (Trunk Portion).

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-GO-RJJ,JR.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
LINE FINDER CIRCUIT
200 POINT - 4 WIRE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

1 KS-14603 L1A, C Resistor, "J" Option

D. DESCRIPTION OF CHANGES

D.1 Option "J" is added and option "Q" is designated to modify this circuit when the busy sleeve voltage does not exceed -4.3.

D.2 Circuit Notes 103 and 107 are modified to show this change.

D.3 In Information Note 301 "If convenient" and "otherwise compute sleeve conductor resistance" have been deleted.

D.4 The maximum external sleeve conductor resistance from finder bank terminal to holding ground has been changed.

D.5 Information Note 306 has been added.

F. CHANGES IN CD SECTION

F.1 The working limits under paragraph 2 are:

	Finder Bank Terminal to Holding Ground	
	Fig. 2	Fig. 11
Max Busy Sleeve Potential	-2.4V "Q" -4.3V "J"	-7V

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DEPT 2363-MPC-RJJ

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
LINE FINDER CIRCUIT
200 POINT - 4 WIRE

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Added footnote 6 to Fig. 9 in Circuit Note 104.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2335-AH-FBB-LL

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
LINE FINDER CIRCUIT
200 POINT - 4 WIRE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

(A) 63A Resistor 15ω (Fig. 11)
(B) 82A Resistor 150ω (Fig. 11)
(A) 49A Varistor (Fig. 11)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Fig. 11 modifies Fig. 2 for high sleeve resistance operation.

D.2 Changed title to include 35-E-97 office A&M Only.

D.3 Added to Note 103 "modification for high sleeve operation".

D.4 Added Note 108 for 35-E-97 office.

D.5 Revised Note 104 to include Figs. 12 and 13 for 35-E-97 office.

D.6 Revised Note 107 to reflect above changes.

D.7 Added Figs. 11, 12 and 13 to Options Used table.

D.8 Revised working limits to show 35 ohms for max. ext. sleeve conductor resistance for Fig. 11.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 The purpose of this circuit when used as a line finder is to establish a connection from a calling subscriber's line to a first selector, a selector repeater or a trunk circuit. It has a 4th conductor which can be used for operating a message register or to provide a class of service indication to a succeeding trunk. When provided, the normal post springs can be used to provide additional indications, to the succeeding circuits.

2. WORKING LIMITS

2.1 Figure 2

The maximum external resistance of the "S" conductor from bank terminal to holding ground shall be 13 ohms or the maximum busy potential on the sleeve lead at the bank terminal shall be 2.4 volts as measured by any standard voltmeter at least 1,000 ohms per volt.

2.2 Figure 11 (Special)

The voltage drop of the sleeve conductor from bank terminal to holding ground shall not exceed seven volts measured on the finder bank terminal with any standard voltmeter with a minimum resistance of 1,000 ohms per volt, or the maximum resistance between the sleeve terminal in the finder bank to the holding ground shall be 35 ohms.

3. FUNCTIONS

3.1 To find a subscriber's line in a group of 200 lines when a call is originated.

3.2 To determine whether the calling line is in the upper or lower bank.

3.3 To extend the tip, ring, sleeve and "A" or "TR" leads of the originating circuit to the succeeding circuit.

3.4 To prevent two calling lines from being connected to the same selector.

3.5 To place a momentary ground on the line finder bank sleeve terminal when the line is found for the purpose of making it busy and to hold the connection until a ground is supplied from the succeeding circuit.

3.6 To advance the start lead to a succeeding finder, when the finder is in use or is made busy from the associated selector, trunk circuit or test jack.

3.7 To open the multiple chain circuit when the finder is busy.

4. CONNECTING CIRCUITS

When this circuit is shown on a keysheet, the connecting information thereon shall be followed.

4.01 Subscriber's Line Circuit - SD-32133-01*.

4.02 Group and Alarm Relay Circuit for line and Trunk Finders - SD-32194-01.

4.03 Selector Circuit - SD-30200-01*.

4.04 Coin Box Trunk Circuit - SD-31592-02*.

4.05 Message Register Trunk Circuit - SD-32082-01*.

4.06 Two-Party Message Rate Trunk - SD-31506-01.

4.07 Common Number and Class Circuit - SD-31961-01.

4.08 Switch Trouble Alarm Circuit - SD-32239-01.

4.09 Test Circuit for 200 Point Finders - SD-31456-01*.

4.10 Selector Repeater Circuit - SD-31914-01*.

*Typical Circuits

DESCRIPTION OF OPERATION

5. FINDING LINE

5.1 Low Sleeve Resistance (Fig. 2)

When a call is originated in a line circuit, a line relay is operated which applies battery through a second relay in the line circuit to the sleeve lead in the finder multiple. The line relay also operates a group start relay in the group and alarm relay circuit which applies ground to an "A" lead connected to the commutator segment corresponding to the level which includes the calling line. This group start relay also applies ground to the "ST" lead which operates relay "A". A grounds the "S" lead, opens the release circuit and operates the stepping relay C. C operates the vertical magnet and steps the shaft up until the commutator brush reaches the segment which is grounded. When this segment is reached, E operates in series with the secondary winding of C. This holds C in the operated position to prevent further stepping. E operated, locks and transfers the locking circuit for F from the off-normal ground to a circuit which is grounded for each operation of the rotary magnet. E is made slow in operating to give a short time between the last vertical step and the first rotary step to prevent snagging of wipers due to vibration. The release circuit is opened by the operation of E to preclude the release or partial release of the shaft and reoperation of A before the release of E in which case the rotary magnet would energize without the shaft being centered on any bank level and probably cause jamming of the stationary dog or snagging of the wipers on the bank terminals. The operation of E also transfers the stepping circuit from the vertical to the rotary magnet. The rotary magnet then steps the shaft around until one of the sleeve wipers reaches the terminal which is connected to battery through the winding of a relay in the line circuit. During the rotary stepping of the switch, the locking circuit to B and F is opened on the release of the rotary magnet for the purpose of preventing a false operation of these relays when the wipers are stepped over a busy or grounded "S" or "S1" terminal, in which case a circuit is closed from ground at the bank terminals, through the primary windings of the B or F and C relays to ground. This tends to operate spring No. 1 on B or F on the opening of the circuit in the secondary winding of relay C. If the "S" wiper finds this battery, B is operated in series with the primary winding of C sufficiently to close contacts 1 and 2 and C is held operated to prevent further stepping. On the closure of contacts 1 and 2 on B its secondary winding is energized. The relay then fully operates and locks to the sleeve lead. The operation of this relay closes the tip, ring and "A" or "TR" leads through to the selector, or trunk circuit, opens the operating circuit of F, opens the release circuit and operates D. The operation of D closes the sleeve lead through from the selector, or trunk circuit to the preceding circuit; closes the locking circuit for B in multiple with contacts on the rotary magnet; opens the test circuit to the "S" brush, opens the multiple chain circuit, transfers the "in or "ST" lead from A to the "out" or "TS" lead and secondary winding of D, removes battery from the C and E and the vertical magnet and releases C by short-circuiting its P winding. This allows E to release. The battery is removed from the secondary winding of C for the purpose of preventing its operation on the release of the finder switch. Battery is removed from the vertical magnet to prevent a false operation if E releases before C due to the difference in the releasing time of these two relays. A is made slow to release for the purpose of holding a ground on the sleeve lead during the time required by the connecting selector, trunk or repeater circuit to connect ground to the sleeve lead. If the "S1" wiper finds the battery on the bank terminal, F will operate in series with the primary winding of C sufficiently to close contacts 1 and 2. The closing of these contacts energizes the secondary winding and fully operates the relay. The operation of this relay transfers the "T", "R", "S" and "A" leads from the "T", "R", "S" and "A" wipers to the "T1", "R1", "S1" and "A1" wipers and also closes the circuit for operating B. Upon the operation of B the circuit functions as described when battery was found by the "S" wiper.

5.2 High Sleeve Resistance (Fig. 11 Special)

Resistances A and B provide a potential of approximately 4.5 volts at the winding of (C) to insure release of (C) when testing a busy line on the sleeve of which a potential up to 7 volts may appear. One half of varistor (A) allows current from a

line calling for a finder to flow and hold relay (C) while the other half presents a high resistance to the shunt path through the other sleeve bank to the sleeve of a busy line. Other operations same as Paragraph 5.1

6. RELEASE

When the originating subscriber disconnects before the line is found, ground is removed from lead "ST", and relay A of the finder releases. This closes a circuit for energizing the release magnet. When the originating subscriber disconnects the after the line is found, the associated selector or trunk circuit functions to remove ground from the sleeve lead allowing B to release. The release of B closes a circuit to energize the release magnet. D and F if operated, are held until the finder returns to normal. The purpose of the secondary winding of D is to hold the relay operated if the finder is returned to normal at a time when the start lead is advanced through this finder circuit and has started a succeeding finder, until the finder thus started has found the line circuit.

7. ALL FINDERS BUSY

When all finders are busy the multiple chain circuit is opened, that is, the circuit from lead "F" to lead "S" is opened.

8. SWITCH ACTION WHEN START WIRE IS FALSELY GROUNDED OR WHEN CALLING LINE IS NOT FOUND

In case of a false ground on the start lead, or if for any reason the calling line is not found when the start lead is grounded, the switch will go to the eleventh rotary step, closing the eleventh rotary step spring. This connects ground from the VON springs through contacts of A to the winding of B, operating same, and then through the front contacts of B and of the rotary magnet and of E to hold the magnet operated and thus prevent further attempts at stepping. The operation of B operates D on its primary winding, releasing A which is slow to release. D operated releases E. A released, releases B since no ground is received from the selector. A and B released, release the switch but D remains locked to the start lead as long as the latter remains grounded, thus extending the start lead to the next switch. When all D relays are operated, the chain circuit is opened and the chain relays in the group and alarm circuit release.

9. TEST JACK

The test jack is provided for making routine tests of the finder and also serves as a means for monitoring on the talking circuit of the finder.

10. MB KEY

The MB key is provided to take the finder out of service. When the MB key is operated, the start lead is advanced to the next succeeding finder and the chain circuit is opened. If the key is operated while the finder is off-normal, that is, while it is in use on a call, nothing will interfere with that call, the finder will remain on the busy line until that call is completed when the finder will release.

11. RELEASE SIGNAL

Battery for the release magnets is supplied through a supervisory relay in the alarm circuit for the purpose of providing an alarm if a finder fails to release. This relay is also used for obtaining a peg count of the number of originating calls.

12. CONTACT PROTECTION

The A network provides protection to the contacts that make and break the circuit to the stepping magnets.

13. NORMAL POST SPRINGS

13.1 The normal post springs operate on various levels to perform functions in various combinations as described in Note 103 of the drawing. Typical uses for the normal post springs follow:

13.11 Tone to Operator

The normal post springs may connect ground either directly or through a resistance to the "A" lead to the first selector. When an operator office trunk is selected, ground through a resistance causes the trunk to send one type of tone to the operator, while direct ground causes the trunk to send another type of tone to the operator. (In any one office all operator office trunks will send the same kind of tone for a direct ground, and the other tone for a resistance ground.) Absence of ground will, of course, result in no tone being sent. When postpay coin trunks are used, and the normal post springs supply ground

to make the trunk operative, this ground may also feed forward to the "A" lead of the first selector to send tone to an operator when an operator office trunk is selected. The "A" bank terminals may be strapped to ground, or connected to resistance ground to control the class of service tone sent over office trunks.

13.12 Access Denied to Specified Selector Levels

When access is to be denied to certain selector levels from lines appearing on certain levels of the line finder, the normal post springs are adjusted to connect ground to the "RS" lead to the first selector.

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