

9

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, 360A OR 35-E-97
200 POINT LINE OR TRUNK FINDER
3 WIRECHANGESB. Changes in Apparatus

B.1	<u>Superseded</u> A Network, 178A Figures 2 and 16 Option J	<u>Superseded By</u> A Network Consisting of 2-542D Capacitors, and 1-KS13490 L2 Resistor, 150 Ohms, Figures 2 and 16 Option G
-----	--	---

D. Description of Changes

D.1 Figures 2 and 16 are revised to show the replacement of the 178A contact protection network with a new pigtail network. The new coded apparatus is designated option G and is rated Standard. The old contact protection network is designated option J and is rated Mfr. Disc.

D.2 Note 109, Record of Figures, Wiring and Apparatus Changes, is revised to show the changes noted in D.1.

D.3 Note 106 is revised to show the addition of option G.

~~D.4~~ Reference to 360A is added to the title, notes 104 and 108, the rating box, and CADs 1 and 2.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5225-LCB
WECC DEPT 5152-RTO-WEA

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35E97
200 POINT LINE OR TRUNK FINDER
3 WIRE

CHANGES

D. Description of Changes

- D.1 Fig. 16 and Fig. 2 are modified to provide connection to the Jack Access Circuit for Automatic Call Thru Test Set.
- D.2 Note 103 is modified to show the use of this circuit, with prepay coin lines and long line equipment, in a 35E97 office.
- D.3 Prior to Issue 9D, use of this circuit in 350A offices was standard.
- D.4 Prior to Issue 9D, the rating of Fig. 15 and Note 108 was A&M Only.

F. Changes in CD Sections

F.1 Under 4. CONNECTING CIRCUITS add:

- 4.23 Jack Access Circuit for Automatic Call Thru Test Set - SD-32523-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MFC-RJJ, Jr.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
200 POINT LINE OR TRUNK FINDER
3 WIRE

CHANGES

D. DESCRIPTION OF CHANGES

D.1 In Fig. 2 at the cross-connecting information for lead "S", connecting to Selector Circuit or Post Pay Coin Trunk Circuit or Register Trunk and Link Circuit or Converter Trunk Circuit, is added.

D.2 In CAD 1, connecting information is changed.

F. CHANGES IN CD SECTION

F.1 Under 4. CONNECTING CIRCUIT add:

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

4.22 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 35E97
 200 POINT LINE OR TRUNK FINDER
 3 WIRE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added:

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

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE CAUSED BY CHANGES IN APPARATUS

C.1 The residual requirement for the 221CP (C) relay Fig. 16 was S-4 prior to issue 7D.

D. DESCRIPTION OF CHANGES

D.1 Provision is added to have single party message rate service for 355A and 35E97 offices.

D.2 Option "K" is added and existing wiring is designated option "M". Option "K" is used when the busy sleeve voltage exceeds -2.4 volts but does not exceed -4.3 volts. Notes 103, 104, and 109 are revised to show these changes.

D.3 Prior to issue 7D, Note 202 was standard.

D.4 Prior to issue 7D, the title, the rating of the circuit, and Notes 104 and 108 made reference to 360A offices.

D.5 Prior to issue 7D, the "S" and "LO" leads in Fig. 2 were designated: To Selector Circuit.

D.6 In Fig. 16 the "V" option must always be furnished and therefore should not be identified as an option. Reference to "V" in Fig. 16 has been removed and terminal 9 is connected to the sleeve lead without option. This is done on a no record basis.

D.7 Prior to issue 7D, Note 301 read: If convenient, use voltage limit as measured on busy finder sleeve lead with any

standard voltmeter of at least 1000 ohms per volt; otherwise compute sleeve conductor resistance.

D.8 Prior to issue 7D, the title of Fig. 16 did not refer to high sleeve potential operation.

D.9 Prior to issue 7D, reference was made to Fig. 16 in Note 104.

D.10 Under CONNECTING CIRCUITS the following was added.

4.21 Trunk Circuit - SD-31493-01*

F. CHANGES IN DESCRIPTION OF OPERATION

F.1 Prior to issue 7D, the working limits were:

	Finder Bank Terminal to Holding Ground
Fig. 2	Fig. 16

Max Busy Sleeve Potential	2.4v	7.0v
Max Ext Sleeve Conduc Res	13.0Ω	35.0Ω

The working limits now are:

	Finder Bank Terminal to Holding Ground
Fig. 2	Fig. 16

Max Busy Sleeve Potential	-2.4v"M"	-7.0v
	-4.3v"M"	

The voltage drop of the sleeve conductor from bank terminal to holding ground shall not exceed the above limits as measured on the finder bank terminal with any standard voltmeter with a minimum resistance of 1000 ohms per volt.

* Typical Circuit

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2363-MPC-FCK

28

CIRCUIT DESCRIPTION

CD-33013-01
Issue 4-D
Appendix 1-D
Dwg. Issue 6-D

STEP BY STEP SYSTEMS
NO. 1, 350A, 355A, 360A OR 35E97
200 POINT LINE OR TRUNK FINDER
3-WIRE

CHANGES

removed and shown connecting to
selectors only.

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

C.1 The Readj. hold requirement
23.5 for D relay, was added
to CR table.

D.2 Note 104 is revised to remove
reference to single party
message rate service in 355A offices,
since this presently used only with
4-wire finders, also to clarify the
information covering the use of
FIG. 9 with X OPTION and FIG. 13
with Y and W OPTIONS.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The IO lead in FIG. 2 pre-
viously shown connecting to
selector repeaters is

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2335-WCS-FEB-MJ

STEP BY STEP SYSTEMS
NO. 1, 350A, 355A, 360A OR 35E97
200 POINT LINE OR TRUNK FINDER
3 WIRE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

In Fig. 16

49A Varistor

63A, 15 Ω Resistor82A, 150 Ω Resistor

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

C.1 Note 5, Page 1 Added.

C.2 Changes in "Direct Current Flow Regt." and "Circuit Preparation" data for relays (b) and (f) are shown for Fig. 16.

C.3 Circuit preparation data for the "C" relay is shown separately for Fig. 16.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Figure 16 and Test Note 5, Page 1 were added to provide high sleeve conductor resistance operation.

D.2 Note 101 is changed to show fusing information for high sleeve operation.

D.3 Note 104 is changed to show the modification for the high sleeve feature.

D.4 Note 109 is changed to record the addition of "Special Fig." 16.

D.5 Figure 16 is entered in Options Used table.

D.6 The "Working Limits" were changed to include the limits for Fig. 16.

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, to a trunk circuit or to a selector-repeater and when used as a trunk finder its purpose is to establish a connection from the trunk to other trunks

or repeater circuits. When serving two classes of lines or trunks any level or levels in the multiple banks can be arranged to extend a class indication to the succeeding circuit.

2. WORKING LIMITS

2.1 The maximum external resistance of the sleeve conductor or the maximum voltage drop in the sleeve conductor from the finder bank terminal to the holding ground shall be as indicated below. The measurements may be taken with any standard voltmeter with a minimum resistance of 1000 per volt.

Fig. 2 Fig. 16

Max. Busy Sleeve Potential 2.4v 7.0v
Max. Ext. Sleeve Conduc. Res. 13.0 Ω 35.0 Ω

3. FUNCTIONS

3.01 To find a subscriber's line or trunk in a group of 200 lines or trunks when a call is originated.

3.02 To extend the tip, ring and sleeve leads of the originating circuit to the succeeding circuit.

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

3.04 To advance the start lead to a succeeding finder when the finder is in use or is made busy from the associated selector circuit or (MB) key.

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

3.06 To return the finder to normal when the finder fails to find the originating line or trunk.

3.07 To operate an alarm in the alarm circuit when the switch fails to restore in a predetermined time interval after the release magnet is energized.

3.08 To advance the start lead and open the multiple chain circuit when the finder switch is removed from the frame.

- 3.09 To return the finder to normal at any stage of the operation when the originating subscriber or operator disconnects except when the connection is held by an operator's trunk circuit.
- 3.10 To provide access to the line finder by means of the test jack.
- 3.11 To extend a class indication to the succeeding circuit from any level in the line finder multiple bank.
- 3.12 To remove the pulse repeating and coin test function of the coin trunk when the calling line is equipped with a dial prepayment long line circuit.

4. CONNECTING CIRCUITS

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

- 4.01 Subscribers Line Circuit - SD-32133-01*
- 4.02 No. 702 PBX Line Circuit - SD-66402-02*
- 4.03 Tandem Trunk Circuit - SD-31534-01*
- 4.04 Selector Circuit - SD-30200-01*
- 4.05 Prepay Coin Trunk Circuit - SD-31592-02*
- 4.06 Message Register Trunk Circuit - SD-31493-01*
- 4.07 Outgoing Trunk Circuit - SD-31315-01*
- 4.08 Outgoing Repeater Circuit - SD-31779-01*
- 4.09 Selector Repeater Circuit - SD-31914-01*
- 4.10 Switch Trouble Alarm Circuit - SD-32239-01
- 4.11 Test Circuit for 200 Point Finders - SD-31524-01*
- 4.12 Intercepting Trunk Circuit from Local Selector Multiple - SD-31767-01*
- 4.13 Intercepting Trunk Circuit from Connector or Toll Selector Multiple - SD-31337-01
- 4.14 Intercepting Trunk Circuit from Plugging-up Line Circuit - SD-31339-01*
- 4.15 Outgoing Trunk Circuit for Intercepting Service - SD-31965-01*
- 4.16 Dial Long Line Circuit for use with prepayment Coin Line - SD-32053-01*

- 4.17 Group and Alarm Relay Circuit - SD-32194-01
- 4.18 Outgoing Pulse Correcting Repeater - SD-31892-01
- 4.19 Incoming or outgoing Pulse Correcting Trunk Ckt. - SD-31929-01
- 4.20 Two Way Sleeve Repeating Ckt. - SD-32063-01

*Typical Circuit

DESCRIPTION OF OPERATION

5. FINDING LINE OR TRUNK

5.1 Vertical Stepping

When the receiver is removed from the switchhook at the calling station or a trunk is seized, the line relay in the associated line or trunk circuit operates. The operation of this relay connects battery through the winding of a relay of this circuit to the sleeve terminal of the line finder bank and also operates a group start relay in the group and alarm relay circuit. This group start relay connects ground to a segment of the commutator corresponding to the level in which the line or trunk is located and also grounds the start lead to operate relay (A) of the finder circuit. (A) grounds the 's' lead, opens the release circuit and operates the stepping relay (C) which 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) transfers the locking circuit for (B) 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.

5.2 Rotary Stepping

The rotary magnet steps the shaft around until one of the sleeve wipers reaches the terminal which is connected to battery thru the winding of a relay in the

line or trunk 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 winding of (B) or (F) and (C) relays to ground. This tends to operate spring #1 on relays (B) and (F) on the opening of the circuit in the secondary winding of relay (C). If the S wiper finds this battery, (F) 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.

5.3 Cut-Thru to Calling Line or Trunk

On the Closure of contacts 1 and 2 on relay (F), its secondary winding is energized. The relay then fully operates and locks to the sleeve lead. The operation of this relay closes the tip and ring through from the line or trunk to the selector, repeater or trunk circuit, opens the operating circuit of (B), opens the release circuit and operates (D) closing the sleeve lead through from the selector, repeater or trunk circuit to the line or trunk circuit; closing the locking circuit for (F) in multiple with contacts on the rotary magnet; opening the test circuit to the "S" wiper, opening the multiple chain circuit, transferring the "in" or "ST" start lead from relay (A) to the "out" or "TS" start lead and secondary winding of relay (D); removing battery from (C) and (E) and the vertical magnet, and releasing (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 of 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, (B) 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, and S leads from the T, R, and S wipers to the T-1, R-1, and S-1 wipers and also closes the circuit for operating (F). Upon the operation of (F) the circuit functions as described when battery was found by the S wiper.

5.4 When Fig. 16 is Used

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 a 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 thru the other sleeve bank to the sleeve of a busy line.

6. RELEASE

6.1 Release Before Cut-Thru to Calling Line or Trunk

When the originating subscriber or operator disconnects before the line is found, ground is removed from lead "ST" releasing the (A) relay of the finder. This closes a circuit for energizing the release magnet. In case of a false ground on the start lead, or if for any other reason the calling line is not found when the start lead is grounded the switch will go to the eleventh rotary step closing the rotary step springs. This connects ground from the V.O.N. springs through (A) to the winding of (F), operating same, and then through the front contacts of (F) and of the rotary magnet and (E), to hold the magnet operated and thus prevent future attempts at stepping. The operation of (F) operates (D) on its primary winding releasing (A) which is slow to release. (D) operated, releases (F) since no ground is received from the selector. (A) and (F) released, releases the switch but (D) remains locked to the start lead as long as the latter remains grounded, thus extending the start to the next switch.

6.2 Release After Cut-Thru to Calling Line or Trunk

When the originating subscriber or operator disconnects after the line is found, the associated selector, repeater or trunk circuit functions, removing ground from the sleeve lead allowing (F) to release, closing a circuit to energize the release magnet. (B) which may be operated and (D) which is 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 or trunk circuit.

7. NORMAL POST SPRINGS

The normal post springs operate on various levels to perform function in various combinations as described in Note 104 on the drawing. Typical applications follow:

7.1 Class of Service Indication "Y" and "W" Options

The normal post springs provide for two class indications to the succeeding circuit, for example, if both postpay coin and flat rate lines are assigned in one line finder group the normal post springs may be adjusted to make contact on levels assigned for postpay coin lines.

7.2 Class of Service Indication on Specified Levels and Restricted Service Indication on Other Levels. "Y" and "T" Options

The normal post springs are adjusted to operate on levels assigned for class of service tone indication. Operation of the normal post springs connects ground from the sleeve lead to the "A" lead to succeeding circuits. When the normal post springs do not operate, ground from the sleeve is connected to the "RS" lead which provides restricted service indication to succeeding circuits.

7.3 Dial Prepayment Coin Long Line Indication - Fig. 15 and "Y" Apparatus and Wiring

When dial prepayment coin long line circuits are included in a coin line finder group it is necessary to remove the pulse repeating and coin test feature in the associated coin trunks since the pulses are repeated, coin test is made, and talking battery is supplied by the long line circuit. Coin long line circuits must be assigned by line finder levels and the normal post springs must be adjusted to

operate on these levels. When the normal post springs operate lead "F" is transferred from lead "E" to lead "D" to operate a relay in the coin trunk from the selector sleeve ground which is connected to lead "F". When the circuit is normal the "E" lead is connected to the "F" lead to provide means for making the line finder busy if the associated selector is made busy.

8. TEST JACK

The test jack is provided for making routine tests of the finder and to monitor on the finder tip and ring.

9. (MB) KEY

The (MB) key is operated to take the finder out of service, its operation advances the start lead and opens the chain circuit. The (MB) key may be operated while the finder is cut-thru on a call, at the completion of the call the finder will restore to normal without interfering with the call.

10. 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.

11. CONTACT PROTECTION

The contact protection network (A) is provided for the purpose of protecting the contacts that make and break the circuit to the stepping magnets.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2315-AWK-RCD-GD