

CIRCUIT DESCRIPTION

CD-31777-01
Issue 5-D
Appendix 1-B
Dwg. Issue 29-B

STEP BY STEP SYSTEMS
NO. 355A, 356A OR 35-E-97
SUBSCRIBER LINE CIRCUIT

CHANGES

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THAN THOSE APPLYING TO ADDED, SUPERSEDED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

C.1 Revised and corrected "See Test Note"
column at U680 and Y268 relays.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2315-AH-RCD-NG

STEP BY STEP SYSTEMS
NO. 355A, 356A OR 35E97
SUBSCRIBER LINE CIRCUIT

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Provision made for automatic line number identification in 355A offices with "Automatic Number Identification" equipment.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Lead S Option "N" added in Figs. 1 and 2 to provide means for line identification in ANI offices.

D.2 Notes 102 and 103 changed to show added "N" option.

D.3 Note 106 added.

D.4 Replacement note added in title box to indicate this circuit is replaced by SD-32133-01 and SD-32216-01 except in 356A offices and for filling out partially equipped line finder frames.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 Provides means, on an originated call, to cause a line finder to find the terminals associated with the calling line and to prevent starting a line finder on terminating calls.

1.2 Provides means of operating a message register over a fourth lead associated with the line, or furnish a succeeding trunk a direct or message register ground or a resistance ground as a type of line indication.

1.3 Provides means to lockout a permanent signal condition to free the line finder and first selector and to function an alarm circuit when a predetermined number of permanent signals occur.

1.4 Provides means for identifying the line automatically in offices equipped with automatic number identification equipment, on calls outgoing to CAMA offices.

2. WORKING LIMITS

2.1 Fig. 1 & "X" Wiring

	45V Min.	48V Min.
Max. Ext. Ckt. Loop	1,000 ohms	1,200 ohms
Min. Ins. Res.	15,000 ohms	15,000 ohms
Max. Earth Potential	±20V	±20V

2.2 Fig. 2 & "X" Wiring

	45V Min.	48V Min.
Max. Ext. Ckt. Loop	1,400 ohms	1,500 ohms
Min. Ins. Res.	15,000 ohms	15,000 ohms
Max. Earth Potential	±20V	±20V

2.3 Fig. 2 "X" Wiring Omitted

Max. Ext. Res. (Ring side to Grd.)	Earth Potential
900Ω	0, + 22V
800Ω	-1.2, + 19.8V
700Ω	-2.4, + 17.6V
600Ω	-3.6, + 15.4V
500Ω	-4.9, + 13.2V
400Ω	-6.1, + 11.0V
300Ω	-7.3, + 8.8V
200Ω	-8.5, + 6.6V
100Ω	-9.8, + 4.4V
0Ω	-11.0, + 2.2V

Min. Ins. Res. 15000Ω

2.4 Fig. 1 "X" Wiring Omitted

Max. Ext. Res. (Ring Side to Grd.)	Earth Potential
700Ω	0, + 17.6V
600Ω	-1.5, + 15.4V
500Ω	-2.8, + 13.2V
400Ω	-4.2, + 11.0V
300Ω	-5.5, + 8.8V
200Ω	-6.9, + 6.6V
100Ω	-8.2, + 4.4V
0Ω	-9.6, + 2.2V

Min. Ins. Res. 15000Ω

3. FUNCTIONS

- 3.01 To start a line finder when a call is originated at a line circuit.
- 3.02 To mark the terminals of a calling line on the line finder banks.
- 3.03 To clear the tip and ring when the line is found by the finder or seized by a connector.
- 3.04 To open the finder start lead when the line is found.
- 3.05 To allow the line finder and first selector to release after an interval on a permanent signal condition. (Figure 2 only), "X" wiring.
- 3.06 To lock out a subscriber's line under control of the bridge across the line, under a permanent signal condition. This is called "permanent signal lock-out." (Figure 2 only), "X" wiring.
- 3.07 To close a circuit for lighting a lamp when there is a permanent signal lock-out. (Figure 2 only), "X" wiring.
- 3.08 To charge on completed calls on message rate lines.
- 3.09 To provide an indication on the "A" lead of the type of calling line in offices arranged for "Extended Trunking".
- 3.10 To provide an indication to the permanent signal alarm circuit when a line is in a permanent signal lock-out condition.
- 3.11 To provide means of line identification in offices equipped with Automatic number identification.

4. CONNECTING CIRCUITS

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

- 4.01 Line Finder Circuit
 - 3 Wire - SD-32000-01 (Typical)
 - 4 Wire - SD-31909-01 (Typical)
- 4.02 Line Finder Control Circuit (Group Circuit) SD-31922-01
- 4.03 Local Connector SD-31737-01 (Typical)
- 4.04 Subscriber Line

4.05 Auxiliary Line Circuits

Postpay Coin Service SD-31732-01
 Subs. Reg. Operation SD-31854-01
 For Busying Line SD-31883-01
 Coin Control Connector SD-32024-01
 Delayed Charge Reg. Opr. -
 SD-32082-01
 Ten Cent Coin Service SD-95494-01
 and SD-30882-01

- 4.06 PBX Trunk Circuit SD-66051-01 (Typical)
- 4.07 Perm. Signal Alarm Circuit - SD-31912-01
- 4.08 Dial Long Line Circuit SD-31376-01 and SD-32053-01 (Typical)
- 4.09 Busy Line Cut-in Circuit - SD-32155-01 (Typical)
- 4.10 Number Network and Primary Bus Circuit - SD-95813-01

DESCRIPTION OF OPERATION

5. SUBSCRIBER CALLS (Figures 1 and 2)

When using "X" wiring a subscriber calls by placing a bridge across the tip and ring of the line. When omitting "X" wiring a call is originated from a PBX selector level and ground is connected to the ring of the trunk. Under these conditions the (L) relay with its P and T windings or P, S and T windings energized, operates make first contacts (5T and 3B in Figure 1, 5T and 5B in Figure 2) without opening or closing any other contacts.

In so doing the (L) relay starts a line finder by placing direct ground on the "ST" lead and marks a set of terminals on the line finder banks by connecting its 700 ohm battery winding to the bank sleeve terminal.

When the line finder reaches the line, ground on the sleeve wiper of the finder fully operates the (L) relay. The (L) relay fully operated, disconnects ground from the "ST" lead, disconnects its windings from the line and in Fig. 2 connects the (LO) relay grounded P winding to the sleeve. The (LO) relay does not operate, however, because of the ground on the sleeve.

6. LINE CALLED (Figures 1 and 2)

When a line is called ground on the sleeve from the connector sleeve wiper fully operates the (L) relay on its P winding. The (L) relay disconnects its own windings from the line; connects the

connector sleeve lead to the line finder sleeve lead and in Figure 2 connects the P winding of the (LO) relay to the sleeve lead. The (LO) relay does not operate, however, as it is shunted by the ground on the sleeve.

7. DISCONNECTION (Figure 1)

When either the connector or line finder disconnects from this line the ground is removed from the P winding of the (L) relay which releases, restoring the circuit to normal.

8. PERMANENT SIGNAL LOCK-OUT (Figure 2, "X" wiring)

When a line equipped with a line circuit per Figure 2, "X" wiring has a permanent signal condition on it, the (L) relay is held operated to the line finder sleeve in the same manner as on a regular call. The holding ground on the sleeve is furnished from the first selector circuit.

After an interval determined by a common timing circuit the selector momentarily removes ground from the sleeve. Under this condition a relay in the line finder releases opening the tip and ring between the line and the selector. Also the (LO) relay of this circuit will operate to its make first contact 5B in series with the P winding of the (L) relay when the ground is removed from the sleeve. The (LO) relay then operates fully to ground on 6T of the (L) relay and opens the circuit through which it originally operated. The (L) relay then releases but the (LO) relay is slow in releasing and consequently holds until the (L) relay reoperates its make first contacts because of the bridge on the line. The (LO) relay then holds to ground on 6T of the (L) relay.

The (LO) relay in operating also opens the "S" lead to the line finder, connects ground to the "PS" lead for lighting a signal lamp, grounds the connector sleeve lead to make the line busy and opens the "ST" lead so the operated (L) relay will not start a line finder.

The circuit remains in the above condition until the bridge is removed from the line whereupon the (L) relay releases, releasing the (LO) relay.

Permanent signal lockout will not function with dial selected PBX trunks since the relay that releases in the trunk to reconnect the seizure to the ringside of the line to reoperate (L) is slower in releasing than the (LO) and therefore (L) will not reoperate in time to hold (LO).

Prepay coin lines will not function satisfactorily with permanent signal lockout since the coin box trunk connects ground to the sleeve towards the selector on

re seizure, until a coin is deposited, which would ground the PB lead to the Permanent Signal Timing Circuit thru the selector and thereby prevent timing permanent signals.

9. DISCONNECTION (Figure 2, "X" wiring)

If a calling subscriber having a line circuit per Figure 2 ("X" wiring) disconnects, the ground is removed from the sleeve and the operation described in Section 8 takes place with the exception that the (L) relay does not reoperate. The (LO) relay will therefore release after operating momentarily and restore the circuit to normal.

If a line having a line circuit per Figure 2, "X" wiring is called and the calling subscriber disconnects first, the ground is removed from the sleeve by the connector and the circuit performs just as described in Section 8 after ground was removed from the sleeve by the selector.

10. MESSAGE RATE (Figures 1 or 2 and Figure 3)

Figure 3 is provided for use with message rate lines. When a call originated by the line is completed the message rate trunk functions and connects a low resistance battery to lead "A" through the line finder. This operates the MR register.

11. PERMANENT SIGNAL ALARM - Fig. 2 with "Y" option

When the LO relays are connected to "PSL" battery, each relay energized on a lockout increases the current obtained from that source and the Permanent Signal Alarm Circuit thru which PSL battery is obtained is arranged to provide an alarm on a predetermined number of permanent signals.

12. SUBSCRIBERS LINE INDICATION (Figure 6)

In offices arranged for "Extended Trunking" 4 wire line finders are provided which connect the "A" lead, individual to the subscriber's line circuit, thru to the line finder-selector trunk to provide an indication of the type of calling line.

13. AUTOMATIC NUMBER IDENTIFICATION

In 355A Offices with automatic number identification equipment options "N" is used to provide a tone path from

the line sleeve to the networks associated with the ANI identifier. 5800~ tone on this lead provides means of identifying the line directory number.

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