

CIRCUIT DESCRIPTION

CD-31777-01  
ISSUE 6D  
APPENDIX 2A  
DWG ISSUE 37A

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

CHANGES

B. Changes in Apparatus

B.1 Replaced

LO Diode, 458A, Option ZF,  
Fig. 2

Replaced By

LO Diode, 446F, Option ZF,  
Fig. 2

D. Description of Changes

D.1 The 458A Diode in Figure 2 is replaced by a 446F Diode.

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DEPT 5245-LCB  
WECO DEPT 5152-RTO-WEA

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

CHANGES

B. Changes In Apparatus

B.1 Added

458A Diode Option ZF Fig. 2

D. Description of Changes

D.1 Option ZF is added and rated Standard and Option ZG is designated and rated Standard. Options ZF and ZG provide means for preventing the operation of the (LO) relay when the message register associated with this circuit is scored on a +65 volt or -48 volt application respectively.

D.2 Circuit Notes 102 and 103 are changed to reflect the above modification. Information Note 303 is added to describe the function of the above modification.

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DEPT 5225-LCB  
WEC DEPT 5152-REA-WEA

STEP-BY-STEP SYSTEMS  
NO. 355A, 356A, OR 35E97  
SUBSCRIBER LINE CIRCUITSECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 This circuit causes the line finder to seize the tip, ring and sleeve when a call is originated, and to cause the connector bank to be busy to incoming calls.

SECTION II - DETAILED DESCRIPTION1. SUBSCRIBER CALLS (Figures 1 and 2)

1.01 When using "X" wiring, a subscriber originates a call by placing a bridge across the tip and ring of the line. With "X" wiring omitted, the call is originated by placing ground on the ring side of the line. 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.

1.02 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.

1.03 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.

2. LINE CALLED (Figures 1 and 2)

2.01 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.

3. DISCONNECTION (Figure 1)

3.01 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.

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

4.01 When a line has a permanent signal condition on it, the (L) relay is held operated by 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.

4.02 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.

4.03 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.

4.04 The circuit remains in the above condition until calling subscriber disconnects, whereupon the (L) relay releases, releasing the (LO) relay.

4.05 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 ring-side of the line to reoperate (L) is slower in releasing than the (LO) and therefore (L) will not reoperate in time to hold (LO).

4.06 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 reseizure, 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.

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

5.01 When the calling subscriber disconnects, the ground is removed from the sleeve by the switchtrain releasing. Relay (L) will release and relay (LO) will release after operating momentarily to restore the circuit to normal.

5.02 If a line is called and the subscriber disconnects first, the ground is removed from the sleeve by the connector and the circuit performs just as described in Section 5.01 after ground was removed from the sleeve by the selector.

6. MESSAGE RATE

6.01 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.

6.02 When Option ZE is provided, operation of the register connects battery, via the register contacts, to the M lead. The connecting circuit at the PBX causes the station message register to score at the same time.

7. PERMANENT SIGNAL ALARM (Figure 2 with "Y" Option)

7.01 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 through which "PSL" battery is obtained is arranged to provide an alarm on a predetermined number of permanent signals.

8. SUBSCRIBERS LINE INDICATION (Figure 6)

8.01 In offices arranged for "Extended Trunking" 4 wire line finders are provided which connect the "A" lead, in-

dividual to the subscriber's line circuit, through to the line finder-selector trunk to provide an indication of the type of calling line.

9. AUTOMATIC NUMBER IDENTIFICATION

9.01 In 355A Offices with automatic number identification equipment option N is used to provide a tone path from the line sleeve to the networks associated with the ANI identifier. 5800 Hz tone (ANI-Type B) or a 340 volt dc pulse (ANI-Type C) on this lead provides means of identifying the line directory number.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Fig. 1 and "X" Wiring

	<u>45V Min</u>	<u>48V Min</u>
Max. Ext. Ckt. Loop	1,000 ohms	1,200 ohms
Min. Ins. Res.	15,000 ohms	15,000 ohms
Max. Earth Potential	+20V	+20V

1.02 Fig. 2 and "X" Wiring

	<u>45V Min</u>	<u>45V Min</u>
Max. Ext. Ckt. Loop	1,400 ohms	1,500 ohms
Min Ins. Res.	15,000 ohms	15,000 ohms
Max. Earth Potential	+20V	+20V

1.03 Fig. 1 "X" Wiring Omitted

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

Min. Ins. Res. 15000 ohms

1.04 Fig. 2 "X" Wiring Omitted

Max. Ext. Res. . . . Earth Potential  
(Ring Side  
to Ground)

900 ohm	0, + 22V
800 ohm	-1.2, + 19.8V
700 ohm	-2.4, + 17.6V
600 ohm	-3.6, + 15.4V
500 ohm	-4.9, + 13.2V
400 ohm	-6.1, + 11.0V
300 ohm	-7.3, + 8.8V
200 ohm	-8.5, + 6.6V
100 ohm	-9.8, + 4.4V
0 ohm	-11.0, + 2.2V

Min. Ins. Res. 15000 ohms

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
L	Line
LO	Line Out
MR	Message Register

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.

3.12 To permit message unit repetition to a PBX via a third wire.

4. CONNECTING CIRCUITS

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

- (a) Line Finder Circuit -  
3 Wire - SD-32000-01(Typical)  
4 Wire - SD-31909-01(Typical)
- (b) Line Finder Control Circuit (Group Circuit) - SD-31922-01
- (c) Local Connector - SD-31737-01 (Typical)
- (d) Subscriber Line
- (e) 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
- (f) PBX Trunk Circuit - SD-66051-01 (Typical)
- (g) Perm. Signal Alarm Circuit - SD-31912-01
- (h) Dial Long Line Circuit - SD-31376-01 and SD-32053-01(Typical)
- (i) Busy Line Cut-in Circuit - SD-32155-01(Typical)
- (j) Number Network and Primary Bus Circuit - SD-95813-01
- (k) Line Concentrator Control Circuit SD-96536-01
- (l) Number Network and Identifier Circuit - SD-32374-01
- (m) PBX Station Message Register Pulse Circuit - SD-66915-01(Typical)
- (n) Two-Way Connecting Trunk Circuit - SD-66870-01(Typical)

- (o) Message Register Resistor Circuit - SD-99417-01
- (p) Large MJ Mobile Radio Telephone System - Line Circuit - SD-2R002-01
- (q) Small MJ Mobile Radio Telephone System - Line Circuit - SD-2R049-01
- (r) Large MJ Mobile Radio Telephone System - Link Circuit - SD-2R008-01
- (s) Small MJ Mobile Radio Telephone System - Link Circuit - SD-2R055-01
- (t) Small MJ Mobile Radio Telephone System - Test Panel Circuit - SD-2R055-01

5. MANUFACTURING TESTING REQUIREMENTS

5.01 All requirements are covered in the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.1 Connecting information for Dial Tone First Coin Box Trunks is added to Note 102.

D.2 BSP information is added to the Supporting Information column.

Note: This reissue also covers information authorized by subsequent appendixes to Issue 5D of the CD.

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