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STEP-BY-STEP SYSTEMS NO. 1, 350A 355A, 35-E-97 OR NO. 1 WITH AMA GROUP AND ALARM RELAY CKT FOR LINE AND TRUNK FINDERS

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The purpose of this circuit is to provide a means of assigning a finder to hunt for a line requiring service and to indicate to the finder the level on which that line is located. It also provides a means to operate alarms to indicate trouble in the finders. On permanent line seizures of lines arranged for lock-out it operates an alarm and releases the finder and selector circuits.

2. GENERAL DESCRIPTION OF OPERATION

2.01 When a call is originated on a line or trunk circuit, this circuit starts the associated line or trunk finder. When all finders are busy, this circuit removes the ground from all subgroup relays and operates the all finders busy register. Removing the ground allows any finder which has become idle to release its D relay.

SECTION II - DETAILED DESCRIPTION

1. CIRCUIT OPERATION

FIG. 2 PROVIDED

1.01 There are ten (G) relays. Each (G) relay is connected to 20 subscriber's lines or trunks located on the same level in the finder bank multiple.

1.02 When a call is originated on a line or trunk circuit, the associated line relay operating connects battery through another relay to the sleeve lead in the finder multiple and also connects ground to the "G" lead of Figure 2 causing relay (G) to operate. (G) operating, connects ground to the "A" lead which is connected to the segment of the finder commutator corresponding to the level on which the line or trunk is located and also grounds the start lead "ST" to start a finder hunting for the line or trunk. When the finder seizes the calling line or trunk, the second relay in the line or trunk circuit operates, releasing the line relay and in turn releasing releasing relay (G) which removes ground from the commutator segment and the start lead. Relay (G) operating also connects ground to the "CB" lead through normal contacts on the (OB) relay to operate a relay in the switch trouble alarm circuit and operate an alarm if the CB lead remains grounded for a predetermined time.

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FIGS. 2 AND 8 PROVIDED

1.03 Relay (G) operates as described in paragraph 1.02 except that the "ST" lead is connected to contacts on the (Z) relay. Assuming both (W) and (Z) relays are normal, ground on the "ST" lead from relay (G) is connected to the "ST" lead associated with the first choice finder in the subgroup associated with the particular (G) relay. Ground from the (G) relay over the "CB" lead operates a slow-to-release relay in the switch trouble alarm circuit which operates an alarm as described in paragraph 5.1 and also connects ground to the "WZ" lead operating relay (W). (W) operating, connects ground to the upper terminals of the windings on the (W) and (Z) relays, locking (W) operated. (Z) does not operate because ground on the "WZ" lead shunts (Z). When the finder seizes the line or trunk and relay (G) releases, releasing the relay in the switch trouble alarm circuit and removing ground from lead "WZ", relay (Z) operates and transfers the start lead connected to Figure 2 from the first choice finders to the second choice finders. The next call originating in a line or trunk circuit operates relay (G), which connects ground to the start lead "ST" to Figure 8; since (Z) is operated this ground is extended to a second choice finder directing that finder to find the line or trunk. Ground is again connected to the "Z" lead which shunts down the (W) relay and holds the (Z) operated. When the second choice finder finds the line or trunk, relay (G) releases and ground is removed from lead "WZ" to relay (Z). (Z) releases, transferring the "ST" lead to Figure 2 back to the "ST" lead of the first choice finder.

2. ALL FINDERS BUSY

2.01 When all finders are busy, the multiple chain circuit is opened, allowing (CH) and (S) of Figure 1 to release, which operates (OB), closing a circuit to operate the "all finders busy" register, (except when the (TST) key, Figure 7, is operated), removing the ground from the top armature springs of all the (G) relays in the group. This removes the ground from the start lead to allow all (D) relays of any finder which may become idle to release. Relay (OB) operating, transfers the "CB" lead of relay (G) from lead "CB" to "AFB". Ground connected to lead "AFB" for a predetermined time operates a minor alarm indicating a call blocked due to heavy traffic with no idle finders available. Ground connected to lead "CB" for a predetermined time operates a major alarm indicating a call blocked with at least one idle finder in the group. This is a trouble condition. When any of the finders become idle, the multiple chain circuit is closed, operating (CH) and (S) and allowing (OB) to release. The shunt on relay (OB) causes the (OB) relay to be a little slow in releasing to provide time for all idle finder (D) relays to release because the first finder (D) relay to release closes the multiple chain.

3. TROUBLE IN CHAIN CIRCUIT

3.01 If any part of the chain circuit becomes crossed with battery or ground, either relay (S) or (CH), depending upon whether the lead is grounded with battery or ground, releases. This lights the (C) lamp in Figure 7.

4. TROUBLE GROUND ON START LEAD

4.01 If the start lead becomes grounded due to some trouble in the circuit, the finders start one at a time and go to the 11th rotary step and release. The (D) relays of all finders are operated, the (CH) and (S) release, and the (OB) operates. (OB) operated, operates (GD) from ground on the start lead, in turn operating (AL), which locks to ground at the (AR) key, lights the (S) lamp in series with a relay in the alarm circuit, and operates (C1). The operation of (C1) removes the battery from the secondary windings of the (D) relays in all finders, allowing all idle finders to release. Upon the release of all idle finders, the ground on the start lead again operates each finder in succession. However, if a call is originated at this time a finder will stop on this level and establish the connection through to the succeeding circuit. (AL) will remain locked and operate an alarm until the trouble is cleared. The relay is released by momentarily operating the (AR) key in Figure 7.

5. CALL BLOCKED ALARM

5.01 The operation of any (G) relay in the group grounds the "CB" lead to Figure 1. If this ground persists for a predetermined time, a relay in the switch trouble alarm circuit operates either a minor or major alarm depending on whether relay (OB) is operated as described in paragraph 6.

6. PERMANENT SIGNAL

FIGURE 4 - 355A OFFICE

6.01 When a permanent signal persists on a line circuit arranged for lockout, resistance ground is applied to lead "PS" at the line circuit operating relay "PS1" or "PS2" which in turn applies ground through resistance "PS" in parallel with lamp (PS) over lead "RLS" to a high resistance battery in the miscellaneous alarm circuit. After this ground is applied for a predetermined time to the lead intended for the permanent signal alarm, an alarm is operated and the high resistance battery is changed to a low resistance battery which lights the (PS) lamp.

6.02 When the PS 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.

6.03 On a call from a line arranged for lockout, ground will be returned over the "LO" lead from the selector circuit to operate the PS relay to its first step. If ground is present on the "PA" lead, PS will operate fully and place the "S1" lead to the finder under control of the "PB" lead. If the subscriber dials within a 2-4 minute interval, ground will be removed from the "LO" lead and the PS relay will release. If the subscriber is abnormally slow in dialing or a permanent occurs, the finder will be released at the end of the predetermined interval by the momentary removal of ground from the "PB" lead. The line finder and selector will be released then causing the PS relay to release. When connected to certain selectors the PS relay may follow pulses on a normal call.

6.04 With PS fully operated, removal of ground from the "PA" lead will not release the relay as long as ground is maintained on the "LO" lead. Also, if ground is removed from the "LO" lead with ground on the "PA", PS will remain operated for a short interval until ground is removed from the "PA" lead.

7. RESISTANCES

7.01 Resistances (C) and (S) in Figure 1 and (PS) in Figure 4 are provided to insure operating current for the associated alarm relay if the lamp is burned out. Resistances (PS1) and (PS2) in Figure 4 are provided to reduce the current through relays (PS1) and (PS2), respectively, to prevent overheating these relays when a large number of permanents are encountered.

8. TEST LINE JACKS

FIGURES 3 AND 5 PROVIDED

8.01 The test line jacks are provided for convience in making routine tests of the finders. Jacks (A) and (B) are provided for each group of 200 lines or trunks. The tip, ring, and sleeve of jack (A), Figure 3, and tip, ring, sleeve and A of Figure 5 are wired to finder bank terminals 110 located in the upper bank. The tip, ring and sleeve of jack (B), Figure 3, and tip, ring, sleeve and A of Figure 5 are wired to finder bank terminal 10 located in the lower bank.

8.02 The ring of jack (48v) is connected to the commutator segment of the finder bank associated with the level on which the test line appears.

9. FINDER START TEST KEY - FIGURE 7

9.01 A finder start test key (TST) is wired to the winding of the group relay in the first group. The operation of the (TST) key operates the associated (G) relay. The purpose of this is to enable the test man to make a quick test of the start lead and all finders in a 200 line or trunk unit. The operation of a group relay without the operation of any line or trunk relay to connect battery to the sleeve lead of the finder bank starts one finder at a time, each finder goes to overflow and the circuit is extended to the next finder, until all finders have gone to their overflow position. If the test is repeated without releasing the key, then the last finder operated on the first cycle of the test will not operate on the succeeding test. The operation of the (TST) key opens the operating circuit for the "all finders busy" register but if the key is released during the time that all finders are busy the register may operate.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning
AL	Alarm
C1	Idle Finder Release
CH	Chain Relay - F Lead
G	Group Relay
GD	Trouble Ground on Start Lead
OB	All Finders Busy
PS	Permanent Signal Alarm
S	Chain Relay - S Lead
W) Z)	Alternate Preference - First and Second Choice Finder

3. FUNCTIONS

3.01 To apply a ground to a start lead as a signal to a finder that a line re-

quires service to originate a call.

3.02 To mark a level on which a calling line is located.

3.03 To transfer the ground from one start lead to another so that successive calls may be served by different finders.

3.04 To remove the starting ground from all subgroup relays and also to operate the all-finders-busy register when all finders are busy, except when the (TST) key is operated.

3.05 To give an alarm when the multiple chain circuit becomes crossed with either battery or ground.

3.06 To give an alarm and cause continuous hunting of all idle finders if a start lead becomes permanently grounded.

3.07 To give a major alarm if any of the subgroup relays (G) remain operated for a predetermined time and an idle finder is available.

3.08 To give a minor alarm if any of the subgroup relays (G) remain operated for a predetermined time due to all finders busy.

3.09 To provide access to a test line in the finder multiple.

3.10 To provide a means to start all idle finders one at a time by means of a (TST) key.

3.11 To provide an alarm if a line arranged for lockout becomes locked out due to a permanent condition.

3.12 To release line finder and selector after an interval if a line arranged for lockout remains "off hook" without dialing.

3.13 To release the line finder and selector circuits under permanent signal condition.

4. CONNECTING CIRCUITS

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

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

4.02 Subscriber's Line Circuit arranged for lockout - SD-32216-01.

4.03 Traffic Register Circuit - SD-31109-01, SD-30896-01.

4.04 Switch Trouble Alarm Circuit - SD-31525-01*.

4.06 Line or Trunk Finders

200-point 4-wire high sleeve - SD-33012-01
200-point 3-wire low sleeve - SD-33013-01
200-poing 3-wire high sleeve - SD-33014-01
200-point 4-wire low sleeve - SD-33015-01

4.07 Permanent Signal Alarm Circuit - SD-31912-01.

4.08 Miscellaneous Alarm Circuit (permanent signal timing) - SD-32192-01.

4.09 Line Finder and Line Switch Group Busy Indicating Circuit - SD-32097-01.

4.10 Line Load Control Circuit - SD-32069-01.

4.11 Power Shelf Terminal Block - H-62707.

4.12 Miscellaneous Alarm Circuit (For Message Rate Trks) - SD-31978-01.

4.13 Miscellaneous Alarm Circuit (Register Circuit) - 355A - SD-31976-01.

4.14 Intercepting Trunk Circuit - SD-31995-01.

4.15 Auxiliary Intercept Trunk - SD-35015-01.

* Typical circuits

5. MANUFACTURING TESTING REQUIREMENTS

INTERMEDIATE REQUIREMENTS

5.01 All apparatus in this circuit shall be capable of meeting the requirements

specified in the Circuit Requirements Table.

END REQUIREMENTS

5.02 This circuit shall be capable of performing all the functions listed in this Circuit Description.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1	Removed	Replaced By
	A Jack - 349A - Fig. 5	A Jack - 506A - Fig. 5
	A Jack - 349A - Fig. 5	A Jack - 506A - Fig. 5

D. Description of Changes

D.1 The title of this circuit is changed. It formerly read:

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
GROUP AND ALARM RELAY CIRCUIT
FOR LINE AND TRUNK FINDERS

D.2 CAD 2 is changed to show lead OF on terminal 18 of TS(A) as surface wire. The previous issues showed this lead as switchboard cable. This change is made on a no-record basis per agreement with WECo standards.

D.3 The following connecting circuit is added.

Auxiliary Intercept Trunk Arranged for Intercept Service Between Connector Number in NO. 1 SXS Offices and an Automatic Intercept System - SD-35015-01

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB
WECO DEPT 5151-JJJ-WEA