

5

COMMON SYSTEMS
PRIVATE LINE CIRCUIT
48 VOLT OPERATION

CHANGES

D. Description of Changes

- D.1 Fig. 4 and Fig. 5 are changed to add connecting information for the No. 2 ESS Ringing and Tone Circuit.
- D.2 Circuit Note 101 is changed to show a maximum of 4 Fig. 4, W option, with one 1/2-HV fuse. It formerly showed 8 Fig. 4. This change is made to be in agreement with WE manufacturing drawings.
- D.3 Circuit Note 102 is changed to add reference to No. 2 ESS offices.
- D.4 The Table of Tripping Ranges is changed to add No. 2 ESS and also reference to J option (Mfr Disc.), which was removed inadvertently on a previous issue.
- D.5 CAD5 is changed to add connecting information for No. 2 ESS.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-RJP-RMW

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 PRIVATE LINE CIRCUIT
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TABLE OF CONTENTS	PAGE
<u>SECTION I - GENERAL DESCRIPTION</u>	1
1. <u>PURPOSE OF CIRCUIT</u>	1
<u>SECTION II - DETAILED DESCRIPTION</u>	1
1. <u>FIG. 1 PROVIDED</u>	1
CALL ORGINATED	1
CALL ANSWERED	1
DISCONNECT	2
2. <u>FIG. 4 PROVIDED</u>	2
CALL ORIGINATED	2
CALL ANSWERED	2
DISCONNECT	3
<u>SECTION III - REFERENCE DATA</u>	3
1. <u>WORKING LIMITS</u>	3
2. <u>FUNCTIONAL DESIGNATIONS</u>	3
3. <u>FUNCTIONS</u>	3
4. <u>CONNECTING CIRCUITS</u>	3
5. <u>MANUFACTURING TESTING REQUIREMENTS</u>	4
<u>SECTION IV - REASONS FOR REISSUE</u>	4

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is used to provide transmission battery to stations on a private line, to automatically signal either one of the stations when the receiver is removed from the switchhook at the other station, and to give an audible ringing tone to the calling station as an indication that the called station is being signaled.

SECTION II - DETAILED DESCRIPTION

1. FIG. 1 PROVIDED

CALL ORIGINATED

1.01 When the circuit is seized from the station No. 1 end, a bridge is connected

across the T and R leads, causing relay S1 to operate, in turn, operating relay R2 in series with break-contacts of relays RS and TP and resistor A. With option ZO, the S1 relay also connects ground to the traffic usage recorder circuit.

1.02 Relay R2 operated:

- (a) Operates relay R3.
- (b) Transfers the T and R leads (station No. 2) from the transformer to the ringing supply through the winding of relay TP when N option is furnished.
- (c) Connects tripping battery to the T lead through resistor C and the R lead through relay TP to the ringing supply when option M is furnished.
- (d) Connects ground to the traffic usage recorder circuit through the TU diode when option ZN is furnished.

1.03 Relay R3 operated:

- (a) Starts the ringing circuit when required.
- (b) Connects audible ringing to the calling end by means of ringing current through capacitor R.
- (c) Connects resistors E and F in parallel with the 2-1 and 6-5 windings of the transformer to prevent clicks to the calling end due to line discharge when the called end answers.

CALL ANSWERED

1.04 When the called station removes the receiver from the switchhook, relay TP operates, removing the short circuit from relay RS which operates in series with relay R2.

1.05, Relay RS operated:

- (a) Opens another link in its shunt-down circuit to prevent its release when relay TP releases.
- (b) Releases relay R2 by placing a short circuit around its winding.
- (c) Places a short circuit around relay R1 to prevent its operation when relay S2 subsequently operates.

- (d) Connects another ground to the traffic usage recorder circuit through the TU1 diode when option ZN is furnished.

1.06 Relay R2 released:

- (a) Releases relay R3.
- (b) Transfers the T and R leads (station No. 2) from the ringing supply to the transformer, causing relay TP to release and relay S2 to operate.

1.07 Relay R3 released:

- (a) Opens the start lead to the ringing circuit if used.
- (b) Removes the audible ringing signal from the calling end.
- (c) Removes resistors E and F from the windings of the transformer.

1.08 Relay R3 is slow releasing to ensure discharge of the line capacity before removing the resistors from the transformer windings.

1.09 Relay TP released performs no useful function at this time.

1.10 Relay S2 operated closes a supplementary path to hold relay RS operated and a supplementary ground to the traffic usage recorder circuit when option Z0 is furnished.

1.11 When a call is originated in the opposite direction, the operation is the same as described above except that, initially, relays S2 and R1 operate in place of relays S1 and R2.

DISCONNECT

1.12 When the receiver at either station is replaced on the switchhook, the corresponding supervisory relay releases. No other action takes place, however, until the other end disconnects. At this time, the second supervisory relay to release releases relay RS and removes ground from the traffic usage recorder circuit when option Z0 or ZN is furnished.

1.13 Relay RS released:

- (a) Connects a short circuit, under control of relay TP, across its winding.
- (b) Removes the short circuit around relay R1.
- (c) Removes the short circuit around relay R2, thereby restoring the circuit to normal.

2. FIG. 4 PROVIDED

CALL ORIGINATED

2.01 When the circuit is seized from the station No. 1 end, a bridge is connected across the T and R leads, causing relay S1 to operate, in turn operating relay R2 in series with a break-contact of relay RS. With option Z0, the S1 relay also connects ground to the traffic usage recorder circuit.

2.02 Relay R2 operated:

- (a) Operates relay R3.
- (b) Transfers the T and R leads (station No. 2) from the transformer to the ringing supply through the winding of relay TP when option W or Z is furnished.
- (c) Connects tripping battery to the T lead through resistor D and the R lead through relay TP to the ringing supply when option ZF is furnished.
- (d) Starts the ringing circuit when required.
- (e) Connects ground to the traffic usage recorder circuit through the TU diode when option ZN is furnished.

2.03 Relay R3 operated:

- (a) Connects audible ringing to the calling end by means of ringing current through capacitor R, option Z or ZF.
- (b) Connects audible ringing through capacitors C and D, to the T and R leads toward the calling end, option W.
- (c) Connects ground to relay RS which does not operate due to the short circuit across its winding under control of relay TP.
- (d) Partially closes a locking path to relay RS.

CALL ANSWERED

2.04 When the called station removes the receiver from the switchhook, relay TP operates, removing the short circuit from relay RS which operates.

2.05 Relay RS operated:

- (a) Opens the circuit between the T and R leads and the tone circuit, option W.
- (b) Connects resistors B and C across the 2-1 and 6-5 windings, respectively, of the transformer to prevent clicks to the calling end due to line discharges when the called end answers.

- (c) Opens another link in its shutdown path and locks to a make-contact on relay R3.
- (d) Releases relay R2.
- (e) Opens the operate path of relay R1.
- (f) Connects another ground to the traffic usage recorder circuit through the TU1 diode when ZN option is furnished.

2.06 Relay R2 released:

- (a) Releases relay R3.
- (b) Transfers the T and R leads (station No. 2) from the ringing supply to the transformer, causing relay TP to release and relay S2 to operate.
- (c) Opens the start lead to the ringing circuit, if used.

2.07 Relay R3 released:

- (a) Removes the audible ringing from the calling end, option Z or ZF.
- (b) Transfers the winding of relay RS from ground through its make-contact to ground through relays RS and S1 operated.
- (c) Transfers the locking path of relay RS from ground through its make-contact to ground through relay S2 operated.
- (d) Removes resistors B and C from the windings of the transformer.

2.08 Relay R3 is slow releasing to ensure discharge of the line capacity before removing the resistors from the transformer windings.

2.09 Relay TP released performs no useful functions.

2.10 Relay S2 operated closes a supplementary path to hold relay RS operated and a supplementary ground to the traffic usage recorder circuit when option ZO is furnished.

2.11 When a call is originated in the opposite direction, the operation is the same as described above except that initially, relays S2 and R1 operate in place of relays S1 and R2.

DISCONNECT

2.12 When the receiver at either station is replaced on the switchhook, the corresponding supervisory relay releases. No other action takes place, however, until the other end disconnects. At this time the second supervisory relay to release releases relay RS and removes ground from the traffic usage recorder circuit when option ZO or ZN is furnished.

2.13 Relay RS released:

- (a) Connects a short circuit under control of relay TP across its winding.
- (b) Partially closes the operate path to relays R1 and R2, thereby restoring the circuit to normal.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Supervisory and ringing ranges are specified in tables of the circuit drawing.

2. FUNCTIONAL DESIGNATIONS

None.

3. FUNCTIONS

3.01 Provides 48-volt transmission battery.

3.02 Provides means for automatically signaling the called station.

3.03 Provides means for automatically tripping ringing.

3.04 Provides audible ringing to the calling station.

3.05 Prevents clicks in the calling subscriber receiver due to a line discharge when the called end answers.

3.06 Provides protection for the resistance lamps against power surges.

3.07 Provides for automatically starting the associated ringing circuit when required.

3.08 Provides means for use of a tripping relay test circuit, Fig. 1.

3.09 Provides an indication to the traffic usage recorder circuit of trunk holding time (seizure to disconnect).

4. CONNECTING CIRCUITS

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

- (a) Individual Subscriber Line.
- (b) MDF Test Jack Circuit - SD-96261-01.
- (c) Alarm Signal and Talking Line Circuit - SD-96259-01.
- (d) Office Ringing Supply - SD-81605-01 (typical).

(e) Order Clerk or Chief Operator Line Circuit - SD-96262-01.

(f) Tone Distribution Circuit - SD-81652-01.

(g) No. 4A Traffic Usage Recorder Circuit - SD-95738-01.

(h) No. 3B Traffic Usage Recorder Circuit - SD-99359-01.

(i) Ringing and Tone Circuit - SD-80870-01.

B.2 Added

Fig. C

D. Description of Changes

D.1 Reference to the 20A resistance lamps A and B, option ZE, is removed from Fig. A. Option ZD is removed from the 11A or 11B resistance lamps A and B in Fig. A.

D.2 Options ZD and ZE are removed from the Option Table.

D.3 Reference to options ZD and ZE added to Circuit Note 104 on Issue 16D is removed.

D.4 Fig. C (rated Mfr Disc.) is added to provide for local grade talking battery on existing units in the field.

D.5 Circuit Note 105 is changed to delete reference to the 20A resistance lamp and add reference to Fig. C.

D.6 Circuit Note 104 is changed to add Fig. C.

D.7 Connecting information is added to Fig. 1 and Fig. 4 for connection to Fig. C.

D.8 Table of Working Limits is changed to add Fig. C.

D.9 Circuit Note 114 is changed to add Fig. C.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all the functions specified in 3. FUNCTIONS and meeting all the requirements of the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus (Components)

B.1 Removed

A and B 20A Resistance Lamps, Fig. A, Option ZE

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