

CIRCUIT DESCRIPTION

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ELECTRONIC SWITCHING SYSTEMS
COMMON
TEST
CIRCUIT
FOR RINGING AND COIN CONTROL CIRCUITS

B. Changes in Apparatus

B.1 Added R19 - KS-14603LLCA 750 - Fig.1 Option ZY

D. Description of Changes

D.1 Options EZ and ZY are added to permit testing of the newer ringing circuits in offices equipped with the zone 16 signaling option.

D.2 The option index, Circuit Note 102 and 104, FS-1 and APPFIG1 have been corrected to reflect the above change.

D.3 Added Information Note 313.

D.4 Correct drawing errors in the way some options were shown.

AT&T Bell Telephone Laboratories

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ELECTRONIC SWITCHING SYSTEMS

COMMON
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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The purpose of this circuit is to provide a means by which the central control, under direction of the stored program and acting through the scanner and signal distributor circuits, can carry out the functions required to test the following circuits:

- (a) Ringing circuit for individual 2-party, coin, and PBX lines.
- (b) Ringing circuit for coded, superimposed, reverting and rural ringing, off- and on-hook ringback.
- (c) Coin control circuit.

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2. GENERAL DESCRIPTION OF OPERATION

2.01 When testing the ringing circuits, the test circuit will provide the proper terminations to operate the ringing circuits. The following tests are available:

- (a) Power cross,
- (b) Leakage,
- (c) Ring nontrip,
- (d) Ring trip,
- (e) Ringing on tip or ring, and
- (f) Various continuity checks.

2.02 When testing the coin control circuit, the test circuit will provide the proper terminations to operate the coin control circuit. The following tests are available:

- (a) Coin test relay operate,
- (b) Coin test relay nonoperate,
- (c) Network continuity test,
- (d) Test for collect potential,
- (e) Test for return potential, and
- (f) Simulate presence of a coin in the coin box.

2.03 The test circuit is connected to either the ringing circuit or to the coin control circuit via the trunk switching circuit.

SECTION II - DETAILED DESCRIPTION

1. STATES OF THE CIRCUIT

1.01 This circuit has seven magnetic latch relays designated A, B, C, D, E, F, and G. These relays, when operated and released by the signal distributor circuit, can put this circuit in various states. Each state can be defined by the particular magnetic latch relays operated and identified by the sum of the weighting numbers associated with each operated relay. In general, weighting numbers are assigned as follows: A = 1, B = 2, C = 4, D = 10, E = 20, F = 40, and G = 100. Because of the nature of this plan, the digits 8 and 9 never appear in a state number.

1.02 Only one relay at a time can be operated or released by the signal

distributor circuit. Thus only one digit of any state number can change at any one time, and it can change by only 1, 2, 4, 10, 20, 40, or 100.

1.03 Information Note 302 pictorially displays the circuit states. Crossing a vertical or horizontal line in the diagram is equivalent to operating or releasing one relay by the signal distributor circuit.

1.04 In general, the circuit is placed in a given state by the signal distributor circuit under control of the program. The scanner circuit, under program control, reports circuit conditions to the system control so that the proper decision can be made for selecting the next circuit state.

2. PURPOSE OF CIRCUIT COMPONENTS

2.01 Capacitor C1 and resistor R28 provide an ac path to detect the application of ringing.

2.02 Resistors R3 and R4 provide a path to ground for checking the operation of relays P and R.

2.03 Relay R, with resistor R1, provides a test for the presence of 36,160 ohms in the ringing circuits.

2.04 Relay P, with its shunting resistor R2, provides a test for the presence of 18,080 ohms in the ringing circuits.

2.05 Diodes CR1, CR2, CR3, and CR4 provide the proper polarity of termination to detect the presence of +130 volts or -130 volts in the coin-control circuit.

2.06 Resistors R9, R8, and R7 with relay R provide a continuity test for leakage in the ringing circuits.

2.07 Resistors R12 and R13 provide for the operate test of the coin test relay in the coin-control circuit, SD-1A211-01.

2.08 Resistors R10 and R11 provide for the nonoperate test of the coin-test relay in the coin control circuit, SD-1A211-01.

2.09 The following resistors provide for ring trip test on the given ring trip relays:

R20, R21, R22, R23	AJ118
R20, R21, R22, R23, R24	AJ119
R16, R17	AJ25
R16, R17	AJ47

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2.10 The following resistors provide for ring nontrip test on the given ring trip relays:

R18, R20, R21, R22, R23	AJ118
R18, R19, R20, R21, R22,	
R23, R24	AJ119
R14, R16, R17	AJ25
R14, R15, R16, R17	AJ47

2.11 Resistor R29 provides for the proper current level to the scanner.

2.12 Resistors R25, R26, and R27 limit the current from the ± 130 volt battery.

2.13 Resistors R6 and R5 limit the current when a continuity test is made internal to the test circuit.

2.14 Resistor R30 (5200 ohms) provides for the nonoperate test of the coin test

relay in the coin-control circuit, SD-1A295-01.

2.15 Resistor R31 with R30 (1705 ohms) provides for the operate test of the coin test relay in the coin-control circuit, SD-1A295-01.

2.16 Diodes CR5 and CR6 provide for positive and negative polarity testing of the coin-test relay in the coin-control circuit, SD-1A295-01.

2.17 Resistors R33 and R34 and relay CV are part of Option A, which provides an improved coin voltage test.

3. DESCRIPTION OF CIRCUIT STATES

3.01 Material describing circuit states is summarized in Table A. Additional information will be found in the reference paragraphs.

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TABLE A

No.	State Name	Operated Relays	Connected Components in Tip and Ring Circuit		Meaningful Connected Ferrrod Sensors	Tip and Ring Connected to Trunk Switching	See
			Function	Designations Circuit			
0	Idle	None	None		None	No	3.02
1	Power Cross Tip	A	Check for 36 kohm on Tip in ringing Circuit	Relay R R1	2	Tip Only	3.03
5	Power Cross Tip	A,C	Check for 18 kohm on Tip in ringing Circuit	Relay P R2	2	Tip Only	3.04
7	Power Cross Ring	A,B,C	Check for 18 kohm on Ring in Ringing Circuit	Relay P	2	Ring Only	3.05
11	Power Cross Check Tip	A,D	Check that Relay R Operates on 10 kohm Internal on Tip	Relay R R1	2	Tip Only	3.06
12	Trip Test Superimposed Circuit	B,D	Trip Resistance Applied	R16, R17	3	Yes	3.07
15	Power Cross Check Tip	A,C,D	Check that Relay P Operates on 10 kohm Internal on Tip	Relay P R2	2	Tip Only	3.08
16	Nontrip Test Superimposed Circuit	B,C,D	Nontrip resistance Applied	R14,R15, R16,R17	3	Yes	3.09
17	Power Cross Check Ring	A,B,C,D	Check that Relay P Operates on 10 kohm Internal on Ring	Relay P R2	2	Ring Only	3.10
20	Coin Line Collect Volt Test	E	The Collect Potential is Detected with Diodes	R25,R26,R27 Relay CV R33,R34	0 (OPT B) 0,2 (OPT A)	Yes	3.11
21	Coin Relay Nonoperate	A,E	Nonoperate Current for Coin Relay	R10,R11	0	Yes	3.12
23	Minimum Leakage Resistance Not Detected	A,B,E	Check for Minimum Leakage	R9,R8,R7	2	Yes	3.13
24	Coin Line Return Volt Test	C,E	The Return Potential is Detected with Diodes	R25,R26,R27 Relay CV R33,R34	0 (OPT B) 0,2 (OPT A)	Yes	3.14
27	Maximum Leakage Resistance Detected	A,B,C,E	Check for Maximum Leakage Detected	R9	3	Yes	3.15

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TABLE A (Cont)

No.	State Name	Operated Relays	Connected Components in Tip and Ring Circuit		Meaningful Connected Ferrrod Sensors	Tip and Ring Connected to Trunk Switching	See
			Function	Designations Circuit			
31	Coin Relay Operate	A,D,E	Operate Current for Coin Relay	R12,R13	0	Yes	3.16
32	Trip Test	B,D,E	Trip Resistor Applied	R21,R22,R23 R24	3	Yes	3.17
33	Ringling on Tip	A,B,D,E	Ringling Path Set from Tip to Ground	R28,C1	1	Yes	3.18
36	Nontrip Test	B,C,D,E	Nontrip Resistor Applied	R18,R19, R20,R21, R22,R23, R24	3	Yes	3.19
37	Ringling on Ring	A,B,C,D,E	Ringling Path Set from Ring to Ground	R28,C1	1	Yes	3.20
64	Internal Simplex Test	C,E,F	Internal Check	R5,R6,R25 R26,R27; CR1,CR2, CR3,CR4	0,1	No	3.21
66	Internal Loop Test	B,C,E,F	Internal Check	R9	3	No	3.22

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STATE 0, IDLE

3.02 Tip and ring toward the trunk switching circuit is open.

STATE 1, POWER CROSS TIP

3.03 The test circuit supplies battery and a series relay R and resistor R1 to check for the presence of approximately 36 kohm on tip in the ringing circuits.

STATE 5, POWER CROSS TIP

3.04 The test circuit supplies battery and a series relay P and shunting resistor R2 to check for the presence of 18 kohm on tip in the ringing circuits. Relay P should not operate on 36 kohm.

STATE 7, POWER CROSS RING

3.05 Same as state 5 except that the test is made on the ring lead.

STATE 11, POWER CROSS CHECK TIP

3.06 This state is used as an internal check state for the operation of relay R on tip.

STATE 12, TRIP TEST SUPERIMPOSED CIRCUIT

3.07 The proper resistance is applied from tip to ring to cause the ring trip relay in the ringing circuit to operate during the silent interval.

STATE 15, POWER CROSS CHECK TIP

3.08 This state is used as an internal check state for the operation of relay P on tip.

STATE 16, NONTRIP TEST SUPERIMPOSED CIRCUIT

3.09 The proper resistance is applied from tip to ring to cause nonoperation of the ring trip relay in the ringing circuit during the silent interval.

STATE 17, POWER CROSS CHECK RING

3.10 Same as state 15 except that the test is made on the ring lead.

STATE 20, COIN LINE COLLECT VOLT TEST

3.11 Diodes are connected through resistors to tip and ring to check for the presence of 130 volts of the proper polarity in the coin-control circuit. With option A, Relay CV tests for adequate coin line collect current flow.

STATE 21, COIN RELAY NONOPERATE

3.12 The test circuit provides a resistor termination to ground to supply the nonoperate current to the coin test relay in the coin-control circuit. This termination is supplied on the tip lead.

STATE 23, MINIMUM LEAKAGE RESISTANCE NOT DETECTED

3.13 Leakage resistors are applied in series with relay R to tip and ring leads. Because this large leakage resistance is not detected in the ringing circuit, relay R should operate as an indication of dc continuity.

STATE 24, COIN LINE RETURN VOLT TEST

3.14 Diodes are connected through resistors to tip and ring to check for the presence of 130 volts of the proper polarity in the coin control circuit. With option A, relay CV tests for adequate coin line return current flow.

STATE 27, MAXIMUM LEAKAGE RESISTANCE DETECTED

3.15 Leakage resistance is applied from tip to ring and should be detected by the ringing circuit.

STATE 31, COIN RELAY OPERATE

3.16 Same as state 21 except that the resistor applied will supply the operate current.

STATE 32, TRIP TEST

3.17 The proper resistance is applied from tip to ring to cause the ring trip relay in the ring 1- and 2-party circuit to operate during the silent interval.

STATE 33, RINGING ON TIP

3.18 A ringing path is applied from tip to ground to check the application of party ringing.

STATE 36, NONTRIP TEST

3.19 The proper resistance is applied from tip to ring to cause nonoperation of the ring trip relay in the ring 1- and 2-party circuit during the silent interval.

STATE 37, RINGING ON RING

3.20 A ringing path is applied from ring to ground.

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STATE 64, INTERNAL SIMPLEX TEST

3.21 This state provides an internal check of diodes CR1, CR2, CR3, and CR4 in the forward direction. This check also verifies continuity of ferroids 0 and 1.

STATE 66, INTERNAL LOOP TEST

3.22 An internal loop current is established through ferrod sensor 3 for purposes of testing.

4. TYPICAL SEQUENCE OF STATES

4.01 Under control of the program, this circuit can be put through a variety of sequences. The following are some examples:

- (a) Test the ringing circuit - (SD-1A168-01) - 0-1-5-7-27-23-33-37-36-32-12-10-0.
- (b) Test the ringing circuit - (SD-1A188-01) - 0-1-5-7-27-23-33-37-36-32-36-16-12-10-0.
- (c) Test the coin control circuit - SD-1A211-01, (Option N) 0-20-21-31-21-20-24-20-0.
- (d) Test the coin control circuit, SD-1A211-01, (Option 2) 000-010-110-130-132-130-120-124-120-121-131-130-110-010-0.
- (e) Test the coin control circuit, SD-1A295-01, (Option 2) - 0-10-30-34-35-25-24-20-24-20-21-31-30-10-0.

These sequences assume no trouble conditions.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The results of tests performed with this test circuit are valid only when the office battery is between 48 and 52.5 volts.

2. FUNCTIONAL DESIGNATIONS

2.01 Circuit States

Designation	Meaning
NU	Not used
X	Transition

2.02 Relays

Designation	Meaning
E ₁	Slave relay of relay E.
P	Low ringing circuit resistance check.
R	High ringing circuit resistance check.
A through G	The magnetic latching relays A through G are operated by the signal distributor under program control. Their alphabetical designations assist in programming.

2.03 Associated Scanner Ferrod Sensors

Designation	Meaning
0, 1, 2, 3	Ferrod sensors associated with this circuit are numbered for identification only. Their numerical designations also assist in programming.

3. FUNCTIONS

3.01 Under control of the system program, this circuit can be switched into the states and carry out the operations described in Section II, 3.

4. CONNECTING CIRCUITS

- (a) Trunk switching circuit - SD-1A107-01, and via it to ringing circuit for individual, 2-party, coin, and PBX lines - SD-1A168-01; or ringing circuit for coded, superimposed, reverting, and rural ringing, off- and on-hook ringback - SD-1A188-01; or coin control circuits - SD-1A211-01 or SD-1A295-01.
- (b) Miscellaneous trunk frame scanner circuit - SD-1A117-01; master scanner circuit - SD-1A118-01; master scanner circuit - SD-1A209-10; as required.
- (c) Miscellaneous trunk frame signal distributor circuit - SD-1A128-01, or signal distributor circuit - SD-1A216-01.
- (d) Miscellaneous circuit for all frames - SD-1A129-01.

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5. MANUFACTURING TESTING REQUIREMENTS

Intermediate Requirements

5.01 None.

End Requirements

5.02 This circuit should be tested to verify that it is wired in accordance with the schematic and wiring drawings, that requirements of the circuit requirement table are met, that transmission test requirements are met, and that the circuit is capable of performing all functions stated in this circuit description.

6. ALARM INFORMATION

6.01 This circuit has a single fuse to the -48 volt supply on the bay fuse panel. If this fuse blows, it will cause the PA relay to operate an alarm.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 This circuit is taken out of service by following the direction given in BSP 231-130-301.

7.02 Before the circuit is worked on, the associated power removal switch on this circuit must be operated to remove dangerous voltages.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added

Resistor R33 KS-20289 L6C, 909 ohm, Opt.A, Fig. 1
Resistor R34 KS-20289 L6C, 1210 ohm, Opt.A, Fig. 1
Relay CV AF168, Opt.A, Fig. 1
Network CV 185A, Opt.A, Fig. 1

C. Description of Changes

D.1 Added options A and B with option B depicting the former circuit configuration and option A providing an improved $\pm 130V$ collect/return voltage test termination.

D.2 Modified Note 104 and added Note 312 to include information for added options A and B.

D.3 Modified App. Fig. 1 to show the addition of resistors R33 and R34 and relay CV per option A.

D.4 Added information to circuit requirements table.

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