COMMON SYSTEMS TEST TRUNK RINGING CIRCUIT

B. Changes in Apparatus

B.1 Superseded	Superseded by
PR1 Resistor, 18G - App Fig 1	PR1 Resistor, 18JM - App Fig 1
PR2 Resistor, 18G - App Fig 1	PR2 Resistor, 18JM - App Fig 1

D. Description of Changes

D.1 Added connecting circuits for the "Loop Testing System Circuit" in accordance with SD-2P076-01 and for "Pair Gain Test Controller" in accordance with SD-97760-01. The following changes were made to accommodate these circuits.

D.1.1 Changed the Lead & Option Indexes, added options ZI, ZP, and ZQ.

D.1.2 Changed FS1 and FS2.

D.1.3 Changed circuit note 102 (Features and Option Table).

D.1.4 Changed CADs 2, 6, 7, 8, and 9.

D.1.5 Added CAD 10 to provide for LTS connection to MDF Trunks per SD-90070-01.

D.1.6 Changed BD2.

D.2 Improved the circuit balance in ESS offices for use with the "Loop Testing System Circuit" (MLT-2) by substituting precision resistors for those used in the signal path. These resistors also affect MLT-2 measurements of resistance fault location. The following changes were made to accommodate this improvement.

D.2.1 Changed the apparatus code for resistors PR and PR1 from 18G to 18JM.

D.2.2 Added circuit notes 114 and 115 to provide for the 18JM codes when used with the LTS.

D.3 Corrected the Feature and Options Table of Circuit Note 102 to provide for MDF Test Trunks, Touch Tone testing apparatus requirements in ESS COs, and ESS CO options. This change is made so that the series resistors in the signal path are not used when the circuit is connected to the MDF Trunk (per SD-90070-01). These series resistors are used to protect ferods and fereed contacts in ESS no-test trunks and should not be used for MDF Trunks.

D.3.1 Circuit Note 116 was added to accommodate changes in Circuit Note 112.

D.4 Deleted the PR2 resistor requirement for all ESS offices (except 2ESS) providing unigauge. This increases the ringing range in ESS offices for long loops by decreasing the resistance by 200 ohms. The following changes were made to accommodate this change.

D.4.1 Added option ZR to provide for circuit continuity in 2ESS offices when unigauge option ZO is not used.

D.4.2 Added Circuit Note 117.

D.4.3 Changed FS3 and FS4.

D.4.4 Changed Circuit Note 112.

D.4.5 Changed Lead & Option Indexes.

AT&T BELL LABORATORIES

DEPT 59424-JDQ-GGAB

CIRCUIT DESCRIPTION

CD-96474-01
ISSUE 6AC
APPENDIX 1B
DWG ISSUE 19B
DISTN CODE 1N99

COMMON SYSTEMS
TEST TRUNK RINGING
CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 App Fig. 1

Superseded	Superseded By
LL, Diode 446F	LL, Diode 533F
RTLL, Diode 446F	RTLL, Diode 533F

D. Description of Changes

D.1 LL Diode 533F replaces, on a line out basis, diode 446F which is Mfr Disc.

D.2 RTLL diode 533F replaces, on a line out basis, diode 446F which is Mfr Disc.

D.3 At FS 1, added OR TO LOOP TESTING CKT.

D.4 At FS 3, drawing changed showing a continuous connection for contact 8 of relays R+ and T+, to provide for continuity to the SUP+ relay when option ZO is employed without option W.

D.5 At CAD 2, CAD 7, CAD 8, CAD 9, added OR TO LOOP TESTING CKT.

D.6 At BD 2, added block: LOOP TESTING CIRCUIT SD-2P033-01.

F. Changes to CD

F.1 In Section III under 4. CONNECTING CIRCUITS, add:
(r) Loop Testing Circuit - SD-2P033-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 9324-JDQ-OBD

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CD-95474-01
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6

COMMON SYSTEMS TEST TRUNK RINGING CIRCUIT

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is designed to connect central office (CO) ringing to a subscriber line upon receiving a control signal from the test position.

2. GENERAL DESCRIPTION OF OPERATION

2.01 This circuit, in its normal condition, serves as a connection between the originating test equipment and the terminating equipment at the CO. Connection to a subscriber line is established from the test position over leads T, R, and S or, with V option, over leads TT, TR, LT, and LR.

2.02 High-resistance positive battery on the sleeve conductor and ringing voltage on the test pair cause the ringing circuit to connect CO ringing to the subscriber line. Where machine ringing or divided code ringing is supplied from the test position, this circuit follows the ringing interval. Where continous 4-party selective ringing is supplied from the test position, 4-party selective ringing is connected to the line.

2.03 The tube and relay combinations, T-, R- and T+, R+ (W option), respond to the ringing signal received from the test position and control the connection of CO ringing.

2.04 In some cases, the test position ringing circuit supplies 60- to 75-volt silent period battery which could cause the tube to operate during the silent period. In this case, X option is provided which connects the tube and relay combinations only during the ringing period.

2.05 When this circuit is used in ESS offices on trunks over which TOUCH-TONE station testing is done, and the TOUCH-TONE frequency test applique circuit is not provided, it is necessary to inhibit the functioning of this circuit during the duration of the testing. The TOUCH-TONE test activating signal is low-resistance positive battery connected to the sleeve conductor. This signal operates marginal relay TT (option K) as well as relay RC. Relay TT operated inhibits this circuit.

2.06 When used in a Unigauge office with an incoming CO trunk, a tone of 0.5-second duration is placed on the T and R leads after

ringing has been tripped as a signal to the tester that the call is to a long-loop subscriber line. Relay LL, previously operated by the CO circuitry, shifts the ringing voltage from normal to that required for Unigauge ringing.

2.07 When associated with an MDF test trunk or test trunk and selector circuit in a Uniguage office, relay LL is operated by a detector upon receipt of a 1950-Hz tone, transmitted by the secondary ringing circuit prior to the start of ringing.

SECTION II - DETAILED DESCRIPTION

1. RINGING - SC1

1.01 Operation of a ringing key at the test position connects ringing voltage to the test pair and high-resistance positive battery to the sleeve lead.

RINGING CONTROL

1.02 High-resistance positive battery connected to the sleeve lead operates relay RC which in turn operates relay RT1. Relay TT, when provided, does not operate. Relay RT1 closes its holding path, in part, and operates relay RC1. Relay RC1 operated:

(a) Completes the holding path for RT1 under control of RT.

(b) Opens the operating path for relay RT1.

(c) Closes its own holding path to relay RC.

(d) Transfers the incoming test pair to the incoming ringing voltage gas tube detector.

INCOMING RINGING DETECTION

1.03 Negative ringing voltage connected to the tip or ring of the test pair causes the T- to R- cold cathode gas tubes to conduct. Similarly, a positive ringing voltage will fire tubes T+ or R+. The associated relay T-, R-, T+, or R+ operates.

1.04 R- or R+ operated operates relay R. With ZO option provided, R+ operated will also operate SUP+ which will provide the proper tripping polarity for the input of the ring trip circuit pack (CP1).

1.05 T- or T+ operated operates relay T. With ZO option provided, T+ operated will also operate SUP+ which will provide the proper tripping polarity for the input of the ring trip circuit pack (CP1).

1.06 Relay R or T operated will:

(a) Connect ground to the tip or ring of the line.

(b) Lock under control of relay RT1.

(c) Partially close a path to apply CO ringing to the ring or tip of the line.

(d) Apply -48V to pin 6 of the RTLL circuit pack which in turn will operate relay RTLL (option ZO).

1.07 Relay R-, R+, T-, or T+ follows the ringing signal from the test position and connects ringing to the line. Where continuous ringing is supplied by the test position R-, R+, T-, or T+ remains operated and machine ringing is connected to the line.

1.08 Relay RT is in series with either the ringing generator lead (S, ZO options) or ringing ground lead (T option). Under the ringing condition, current flow through the subscriber set is insufficient to operate relay RT.

60-75 VOLT SILENT PERIOD BATTERY (OPTION X)

1.09 With option X provided, the operating path for the tube and relay combination is closed through only when relay RU is operated. Relay RU operates during the ringing interval from the test position.

1.10 Diodes R1, R2, R3, and R4 serve as a full wave rectifier to convert the incoming ac to pulsating dc. Capacitor R blocks dc and prevents operation of RU during the silent period.

2. CALL ANSWERED AT THE SUBSCRIBER SET - SC2, OPTION ZC

2.01 When the call is answered, a low-impedance bridge on the line permits enough current to flow to operate RT which releases RT1. RT1 releases R or T and connects a bridge across the test pair (Z or Y option) to trip the ringing at the test position. R or T released disconnects CO ringing from the line.

3. RESTORE TO NORMAL - SC3

3.01 Release of the ringing key at the test position switches the third wire from positive to negative battery. RC releases and in turn releases RC1. RC1 transfers the test pair from the ringing detector to the subscriber line and the circuit is restored to normal.

4. CIRCUIT INHIBITION

BUSY INHIBITION

4.01 When this circuit is connected to a test distributor, option C is provided which furnishes relay B. If, when dialing a subscriber line, a busy connector is encountered, a ground will be returned on lead B. This operates relay B.

4.02 Relay B operated opens the winding leads of relay RC, leaving the LT lead closed through resistor RC (V option). Relay B operated also removes ground from contacts of RC. Both of these actions effectively keep this circuit from functioning if ringing were to be applied for some reason at the test position.

"TOUCH-TONE" TESTING INHIBITION - SC4

4.03 When this circuit is used in an ESS office in which the TOUCH-TONE frequency test applique circuit is not provided, it is necessary that this circuit be inihibited during the TOUCH-TONE test duration. The TOUCH-TONE test is activated by applying low-resistance positive battery to the sleeve lead at the test position. Option K is provided to inhibit this circuit during the time the high positive current is in the sleeve circuit.

4.04 Relays TT and RC both operate under the high-current condition. Relay RC operates relay RT1. Relay RT1 then attempts to operate relay RC1, but contacts on relay TT by this time have grounded the battery side of the winding of RC1 which keeps the relay from operating. The circuit maintains this status for the duration of the TOUCH-TONE testing.

4.05 When TOUCH-TONE testing has ended, the sleeve current returns to its normal low negative value. Relays RC, TT, and RT1 then release, restoring the circuit to normal.

5. LONG LOOP CONTROL - UNIGAUGE (ZB AND ZD, ZO OR ZG OPTIONS)

5.01 In offices equipped with extended range Unigauge subscriber lines, this circuit may be used with one of the following:

(a) With a trunk to the CO from a local test desk (LTD).

(b) With a trunk from the CO to the LTD.

(c) With an MDF test trunk or test trunk and selector circuit.

5.02 Relay LL is operated by the CO circuitry when option ZF is provided, or from the output of the tone detector (CP-P18) when option ZE is provided.

5.03 Relay LL operated performs the following:

(a) Switches from normal ringing supply to long-loop ringing (lead RAC or AC-DC) when option ZH is used.

(b) Switches from normal tripping battery -48 volts to long-loop -72 volts when option ZI is used.

(c) Partially closes the operating path of relay LL1 (option ZG).

(d) Switches ringing trip relay RT out, while connecting a more sensitive relay, RTLL, if ZD option is provided, or connecting ringing trip circuit path RTLL (CP1) when option ZG or ZO is provided.

(e) Places a ground on lead LL to the TOUCH-TONE frequency test applique circuit to condition that circuit for TOUCH-TONE testing, if required.

(f) Connects tone lead HT1 to the TN transformer if option A is provided.

(g) Partially closes the operate path for relay RCT (option A).

(h) Disconnects itself from the detector (CP-P17), ZE option, while locking operated under control of relay RC1.

(i) Supplies ground to CP1 (RTLL) when option ZG is used.

5.04 The ground on RTLL circuit pack enables it, and the input status of terminals 2 and 8 at this time (ringing supply on 8 and 2 open) causes the transistors to turn on, operating relay RTLL (option ZG). Relay LL1 (option ZG) now operates and locks up to relay LL operated.

TRUNK TO CENTRAL OFFICE FROM LOCAL TEST DESK (OPTIONS A AND ZF)

5.05 When this circuit is wired to an incoming CO trunk and a tester at the LTD establishes connection to a Unigauge line, relay LL is operated by the CO circuitry, and the circuit functions as above.

5.06 Ringing applied at the LTD operates relays RC, RT1, and RC1 to cause the circuit to function as in 1.01 to 1.09. In addition to its previous functions, relay RT1 operates relay RC1. In response to this incoming ringing signal, the circuit then applies long-loop ringing to the line.

5.07 When the subscriber answers, the direct line current will operate relay RT (ZC or ZO option or relay RTLL (option ZD). When option ZG or ZO is used, the bridge across the line upsets a bridge circuit in CP1 (RTLL) causing the bias on the input transistor to reverse. This turns off that transistor which results in all transistors turning off. This releases relay RTLL (ZG or ZO option). Operation of relay RT (ZC or ZO option) or RTLL (ZD option) or release of relay RTLL (ZG or ZO option) opens the holding path of relay RT1, causing it to release.

5.08 With option A provided, relay RT1, in

releasing, places transformer TN, winding 1 to 4, across the T and R leads as a dc bridge to trip ringing at the LTD. In addition, a tone (HT1) is placed on the other winding of this transformer. This tone is heard for approximately 0.5 second immediately after ringing has been tripped at the LTD, and indicates a Unigauge line to the tester.

5.09 After ringing has been tripped at the test desk, polar relay RC in the sleeve lead releases, due to a change in polarity on this lead. Relay RC released shunts down relay RCT. This relay is slow in releasing and is provided to bridge the contacts of relay RC1 in the T and R leads to lengthen the time that the tone pulse is applied.

TRUNK TO LOCAL TEST DESK FROM CENTRAL OFFICE (OPTIONS B AND ZF)

5.10 When this circuit is wired to an outgoing CO trunk for incoming calls to the LTD, option A is not provided. In this case, the outgoing CO trunk furnishes a spurt of tone as soon as the tester answers an incoming call signal at the LTD. This tone indicates to the tester the presence of a Uniguage line. Relay LL is operated by the CO circuitry, and the circuit functions to permit rering tests or TOUCH-TONE testing, as previously described.

MDF TEST TRUNK OR TEST TRUNK AND SELECTOR CIRCUIT (OPTIONS ZE AND B)

5.11 When this circuit is wired to a CO MDF test trunk or test trunk and selector circuit, the line record card must be consulted by the tester to determine if the line to be tested is an extended range Uniguage line. This must be done because the CO circuitry is not used to establish the connection, thus no Uniguage tone will be heard.

5.12 In this case key REX of the primary-secondary test circuit must be operated before the ringing selection key at the LTD. This is to condition the secondary ringing circuit there to send a pulse of 1950-Hz tone on leads T and R prior to the start of ringing, and to shift the LTD to the extended range mode.

5.13 With relay RC1 previously operated when the circuit was seized, a tone detector consisting of circuit packs CP-P17 and CP-P18 is bridged across the T and R leads.

5.14 The 1950-Hz tone appearing on the T and R leads is coupled through capacitors C1 and C2 to transformer T1, winding 2-5. Varistor RV1 across this winding prevents overloading the amplifier by the ringing voltage. The signal out of transformer T1 is then fed to CP-P18 terminal 2 and then to the base of transistor Q1.

5.15 Transistor Q1 is an emitter-follower stage to provide isolation. The signal is fed from the Q1 emitter to the base of transistor Q2, which is an amplifier with a gain of 10. The signal from the Q2 collector is fed via capacitor C3 to the base of transistor Q3. Diode CR1 shunts the positive portion of the signal to ground, while the negative portion drives limiter stage Q3 into saturation. The amplitude of the signal at its collector is 17 volts and is fed via capacitor C4 to output terminal 23 and then to detector CP-P17, terminal 4.

5.16 From terminal 4 of CP17, the signal is fed to the base of transistor Q1. This transistor is normally biased off at -2.3 volts by a voltage divider formed by resistors R4 and R5. The 1950-Hz signal (17 volts) causes voltage swings above and below ground on the base of Q1 due to the resonant frequency of network Z1. Q1 conducts when the negative swing exceeds 2.3 volts. Each time Q1 conducts, the charge on capacitor C2 is increased until the bias on transistor Q2 is overcome. Q2 in conducting causes the collector voltage to fall from ground to -16 volts (terminal 11).

5.17 This signal is then passed back to CP-P18, terminal 18, and is impressed on the base of relay driver transistor Q4. This transistor goes into saturation, causing the collector voltage to drop from -48 volts to between 1.3 and 1.8 volts. Relay LL. connected to output terminal 10, operates and locks under control of relay RC1, while disconnecting itself from the detector.

5.18 Relay LL operated permits the circuit to function as previously described.

SECTION III - REFERENCE DATE

1. WORKING LIMITS

	Signaling Grd Ret-	Relay RC Met. Ret	Ringing Relays R-,T-, R+,T+	Relay TT
Max Ext Ckt Res	6880 ohms	11,000 ohms		3740 ohms
Min Ins Res	60,000 ohms	60,000 ohms	60,000 ohms	60,000 ohms
Max Earth Pot.	±15 volts		±5 volts	±15 volts
Max Trk Cond Res			750 ohms	

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning
B	Busy
LL	Long loop (Uniguage)
LL1 (ZG)	Long Loop (auxiliary)
R	Ring
R-	Ring (negative)
R+	Ring (positive)
RC	Ring control
RC1	Ring control slave
RCT	Ring control tone
RT	Ring trip
RT1	Ring trip slave
RTLL (ZG,ZO)	Ring trip long loop
RU	Ring-up
SUP+(ZO)	Superimposed (positive)
T	Tip
T-	Tip (negative)
T+	Tip (positive)
TT	TOUCH-TONE

3. FUNCTIONS

3.01 Provides a test path from a test position to a subscriber line in the normal condition.

3.02 Responds to and identifies a ringing signal from the test position and connects corresponding ringing to the line.

3.03 Provides -48 volt silent period tripping battery to the line.

3.04 Disconnects ringing from the line and trips the incoming ringing signal when the call is answered.

3.05 Inhibits its normal ringing functions when receiving a busy-back ground from a test distributor.

3.06 Inhibits its normal ringing functions during a TOUCH-TONE station test, if desired.

3.07 Provides resistors to act as current limiters to protect ferrod sensors in ESS offices.

3.08 Provides a tone signal to inform the tester that the line under test is an extended range Unigauge subscriber loop.

3.09 Provides a 1950-Hz tone detector for switching ringing to the long-loop mode in a Unigauge office, when using an MDF test trunk or test trunk and selector circuit.

4. CONNECTING CIRCUITS

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

(a) Test Trunk Circuit (No. 14 LTD) - SD-95737-01.

(b) Test Trunk Circuit (No. 3 LTC) - SD-96229-01.

(c) Test Trunk Circuit (No. 3 LTC) - SD-96225-01.

(d) Test Distributor Control Circuit - SD-32007-01.

(e) Test Distributor Control Circuit - SD-31349-01, SD-31401-01.

(f) Incoming Trunk Circuit (No. 1 Crossbar) - SD-25432-01.

(g) Incoming Test Trunk Circuit (No. 5 Crossbar) - SD-26136-01, SD-25708-03. (typical).

(h) Test Trunk First Selector Circuit (Panel) - SD-21642-01, SD-21643-01 (typical).

(i) Test Trunk Selector Circuit - SD-95709-01.

(j) Incoming Test Trunk (ESS No. 1) - SD-1A86-01.

(k) Test Trunk Circuit - SD-90070-01.

(l) TOUCH-TONE Frequency Test Applique Circuit - SD-99321-01.

(m) Power, Ring, and Tone Distribution Circuit - SD-25599-01.

(n) Outgoing Test Trunk (ESS No. 1) - SD-1A187-01.

(o) Incoming Test Trunk (ESS No. 2) - SD-2H109-01.

(p) Outgoing Test Trunk (ESS No. 2) - SD-2H141-01.

(q) Test Trunk Applique Circuit - SD-97553-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The ring-trip circuit pack (RTLL - ED-2H053( ) GRP3 or ED-2H114( ) should be tested separately to function as stated in CPS ED-2H053( ) GRP3 or CPS ED-2H114( )

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

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added

R3 - KS-20289 L4(C), 1870 - ohm Resistor - Fig. 1, Option ZO

R4 - KS-20289 L4(C), 464 - ohm Resistor - Fig. 1, Option ZO

B.2

Superseded	Superseded By
CPS1-ED2H053-( ) GRP3 Circuit Pack - Fig. 1, Option ZG	CPS1-ED-2H114( ) Circuit Pack-Fig.1 Option ZO
RTLL-446F Diode - Fig. 1, Option ZG	RTLL-446F Diode - Fig. 1, Option ZO
LL1-185A Network - Fig. 1, Option ZG	SUP+-185A Network- Fig. 1, Option ZO
LL1-½AK30 Relay - Fig. 1, Option ZG	SUP+-½AK30 Relay - Fig. 1, Option ZO
RTLL-½AK30 Relay - Fig. 1, Option ZG	RTLL-½AK30 Relay - Fig. 1, Option ZO

B.3 Remove

RT - KS-14603 L1B, 200 ohm Resistor - Option ZG

D. Description of Changes

D.1 Option ZO, rated Standard, has been added to FS1, FS3, FS4, FS6, App. Fig. 1, and CAD 6 to provide the use of SUP+ and SUP- ringing in No. 2 ESS offices equipped with extended range Unigauge subscriber lines. Option ZG is rated Mfr. Disc.

D.2 FS7, Circuit Note 113 and sheet J4 have been added and circuit notes 102, 104, 105, tripping range table, SC1, SC2, and circuit requirements table have been modified to reflect the change made in D.1

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 4562-080
WECO DEPT 2313-MHK-WEA