

COMMON SYSTEMS
CALL THRU TEST SET CIRCUIT
FOR USE IN SENDING AND RECEIVING CALLS
THRU TEN DIAL SUBSCRIBER LINE CIRCUITS

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 This circuit may be used for AMA operation using the same figures and options as required for non-message rate and non-coin operation.

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 For the (MR) message register, Fig. 1B, "LT1 (MR)" is moved from "Conn. Grd." column to "Conn. Bat." column and under "Test Set Prep." column "GRD" is changed to "BAT".

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 In Fig. 1 reference to Notes 110 and 111 is changed to Note 102.

D.2 In Fig. 2 references to Notes 108 and 114 are changed to Notes 103 and 104 respectively.

D.3 Reference to Note 102 is added in Fig. 1A.

D.4 In Note 102 the information for Message Register operation in step-by-step offices formerly read:

	<u>Provide</u>		
	<u>Figs.</u>	<u>App.</u>	<u>or Wir.</u>
100 & 200 point L.F. Not 2 MR	1B	W & Z	
100 & 200 point L.F. 2 MR	1B	W	
50 point L.F. for Dial MR	1D	W	

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

This circuit is for use in originating and receiving calls over subscriber line circuits in crossbar, panel and step-by-step offices. This circuit provides means for establishing connections through circuits forming the various channels for regular subscriber calls in each type of office.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

3.01 Provides means for originating calls through regular subscriber equipment in any line group of an office.

3.02 Provides means for receiving calls from any terminating line group in an office.

3.03 Provides for channel check of a connection established from any originating line group to any terminating line group in an office.

3.04 Provides means in conjunction with a test line circuit to establish a connection to any distant office over interoffice trunks.

3.05 Provides means in conjunction with a jack panel for readily associating any of the ten test lines with a particular line circuit for originating calls.

3.06 A pen register is provided to monitor dial pulses.

3.07 Provision is made for calling on coin lines in which case means are provided for checking the polarity of the coin current.

3.08 Provides means for testing and holding a step-by-step switch train when an open holding ground on the sleeve is encountered.

3.09 Provides for short circuiting the dial contacts to prevent further dialing while holding a switch train after detecting an open sleeve.

3.10 Provides an optional arrangement of message registers for use with message rate lines.

3.11 Provides a ring-up lock-up lamp and buzzer signal on incoming calls.

3.12 In panel and step-by-step offices provides for incoming calls normally to be routed to an intercept operator unless transferred to the test

set by the operation of a (TR) key on each incoming test line.

3.13 Provides means for connecting an incoming call to noise measuring equipment through jack (NM).

3.14 Provides a holding key (HLD) for holding either an originating or incoming call.

3.15 Provides means for instantaneous listening and talking on any connection by the operation of the talk key (TLK).

3.16 Provides a jack (IC) and make busy plug for transferring intercept calls in a No. 1 crossbar office. In a step-by-step office the (IC) jack is used to prevent the test for open sleeve being made if a plug is inserted in the jack.

3.17 A buzzer key (BZ) is provided and its operation will silence the buzzer.

3.18 An electric clock is provided for timing in connection with noise measurement tests.

3.19 Provision is made for checking that a test call is being made on coin lines.

3.20 By means of the (IC) jack and a make busy plug, test lines in a No. 5 crossbar office are transferred from no-such number tone trunks to the test set.

3.21 Provide same figures and options for AMA operation as required for non-message rate and non-coin operation.

4. CONNECTING CIRCUITS

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

4.1 Patching jack circuit for connecting to subscriber line circuits - SD-96068-01.

4.2 Panel final multiple or step-by-step connector multiple - SD-21200-01, ES-239664, SD-31326-01.

4.3 Number group connector circuit in crossbar No. 1 office - SD-25276-01.

4.4 Panel or step-by-step intercepting trunk circuit - SD-21633-01, ES-240090, SD-31337-01.

4.5 Noise measuring test circuit - (2B noise measuring set or any other similar test set).

4.6 Position clock circuit - SD-96201-01.

4.7 Trunk circuit - no-such-number signal tone - SD-25824-01.

4.8 10 ipm impulse circuit - SD-96343-01.

4.9 Subscriber message register supply - SD-25770-01.

5. DESCRIPTION OF OPERATION

5.1 Originating Calls

After the test circuit is connected to subscriber line circuits by patching at the jack panel and cross connecting at the I.D.F. the test set is ready for operation. In a crossbar No. 1 office all (TR) keys should be operated. In a crossbar No. 5 office all (TR) keys should be operated and the make busy plug must be in the (IC) jack in order to transfer the test lines to the test set. A call is originated by operating the (TLK-HLD) key to the (TLK) position. Dial tone should be heard in the receiver as an indication that dialing may proceed. Moving the dial off normal will operate the off normal relay (ON) which short circuits the transmitter and opens the receiver circuit to provide a dialing bridge including polarized relay (P) provided for dial monitoring if Fig. 8 is furnished. When the dial returns to normal, the pulsing contacts are opened intermittently to send the proper pulses on the loop through the talking key to the regular subscriber dial pulse recording equipment in the central office. When dialing is completed the (ON) relay releases and immediately connects the talking circuit so that the test man may hear any clicks or disturbances due to dialing, that a subscriber would receive under similar conditions.

5.2 Dial Monitoring (Fig. 8)

When it is desired to monitor the dial pulses, the cord associated with the pen register (Fig. 5) is plugged into jack (SO) prior to dialing. Local contacts on the jack will apply a biasing current to the secondary winding of the (P) relay which will operate the armature to close its number 5 contact. When the talking key is operated to close the loop relay (P) will operate on its primary windings P1 and P2 series aiding to close contact 4. When the dial is moved off normal, the operation of relay (ON) will operate relay (G), which is slow releasing and will remain operated between pulses. When the pulsing contacts of the dial open, the circuit through the primary windings of relay (P) is opened and it releases

with the aid of the biasing current in its secondary winding. The closure of contact 5 with relay (G) energized closes ground through jack (SO) to actuate the pen register during the open interval of the dial contacts. When the dial contacts close at the end of a pulse, relay (P) is again operated on its primary windings to close contact 4. This cycle is repeated for each pulse and each train of pulses of the dial, so that a record is obtained on the tape of the pen register showing the exact number and order of the pulses dialed.

5.3 Originating Calls on Coin and Message Rate Lines

When a coin line is to be used as a calling line the coin circuit (Fig. 3) should be used in order to check the coin current. Before dialing on a coin line the non-locking (CN) key should be operated momentarily. This operation causes relay (Cl) to operate and lock in a local circuit to ground on a normally closed contact of relay (C) through release key (RLS). Lamp (C) is lighted. Relay (Cl) operated also connects ground to the tip of the line through relays (C) and (PC). When coin current is returned over the tip of the line relay (C), which non-operates on the 48 volt battery, will operate regardless of the polarity of the coin battery. Relay (C) operating locks itself to the tip through relay (PC) and releases relay (Cl). Lamp (C) is, therefore, extinguished. Relay (PC) is used to determine the polarity of the coin current. If coin return polarity is used relay (PC) is operated to its number 5 contact and no circuit action results except the retirement of lamp (C). If coin collect polarity is applied relay (PC) will operate to close its number 4 contact and lamp (IC) will be lighted in addition to the retirement of lamp (C). Lamp (IC) will be lighted during the application of the coin collect current and the buzzer will sound if key (BZ) is normal. When either polarity of coin current is removed relay (C) releases, unlocking itself and relay (PC) from the tip of the line. Lamp (IC) will then be extinguished if it has been lighted. Key (RLS) is operated to release relay (Cl) and extinguish lamp (C) in case coin current is not received. By the operation of key (TN) Fig. 9 when talking connection is completed with the coin operator a tone signal is given to the operator that a test call is being made.

In case message rate lines are used for originating calls then the appropriate register, Fig. 1A, Fig. 1B, Fig. 1C, Fig. 1D or Fig. 1E is connected at the test set and is associated with the line in the same manner as a subscriber's

register. Fig. 1A is used for crossbar No. 1 offices, Fig. 1B for step-by-step offices with positive booster battery supply, Fig. 1C for panel offices, Fig. 1D for step-by-step offices having negative 48 volt battery supply and Fig. 1E for crossbar No. 5 offices. By this means the operation of the message register may be checked under the same conditions as on a subscriber's call. When originating a call on a message rate line simulating a tip party, the (CN) key should be operated momentarily before dialing in order to provide a ground on the tip of the line for discrimination purposes and in a crossbar No. 5 office to connect the message register tube to the proper supply lead. The (RLS) key should be operated to remove this ground at some time after the connection has been established and before disconnection of the call.

5.4 Check for Continuity of Sleeve Holding Ground

In step-by-step offices a feature is provided by the use of Fig. 4 to indicate an open in the sleeve holding ground of a step-by-step switch train and to connect a ground back on the sleeve to hold the train up to the point of the open. The timing of the relays is such that momentary opens which might cause false release of switches will also be indicated and held from the test circuit. When the dial is turned off normal relay (ON) operates and in turn operates relay (OS3) which locks to a ground through a contact of key (TLK). Key (TLK) also closes the sleeve of the line through the contact of relay (OS3) operated through the windings of relay (OS) and resistance to ground. Relay (OS) will not operate as long as ground is connected to the sleeve of the line.

If the sleeve holding ground should open at any time relay (OS) will operate to battery on the sleeve and close ground to operate relay (OS1). Relay (OS1) is low resistance so that a low resistance holding circuit is immediately applied to the sleeve to delay the release of the relays connected to the sleeve until relays (OS1) and (OS2) operate which closes holding ground directly to the sleeve. Relay (OS) will be shunted by this holding ground and will release, releasing relay (OS1), but relay (OS2) locks itself through a contact of relay (OS3). Relay (OS2) operated also lights lamp (OS), as an indication that an open sleeve has been encountered, and short circuits the dial contacts to prevent further dialing. When the switch train has been held by this circuit it is an easy matter to determine where the open occurred.

5.5 Incoming Call

In order to receive a call on a line, in a panel or step-by-step office, the (TR) key associated with that line is operated. In crossbar offices the incoming calls are switched for all lines from the intercepting trunk by inserting the make busy plug in the (IC) jack, Fig. 6. When this plug is inserted it is necessary to operate all the (TR) keys on the 10 individual test lines in order to receive incoming calls on the test set. In crossbar No. 5 offices the lines are transferred from the tone trunks to the test set by inserting the make busy plug in the (IC) jack. All (TR) keys must be operated in order to receive calls and to prevent interference between calls on different test lines. The incoming call may have originated on another line of the test set or may have come from a test set in another office. The incoming call will connect ringing current across the tip and ring to operate relay (R). Relay (R) will lock to ground on the (TLK) key and will light lamp (IC) as a signal of an incoming call on this line. If the buzzer key (BZ) is normal the buzzer will sound as an audible signal of an incoming call. In order to answer the incoming call the (TLK-HLD) key is operated to the talking position. When the (TLK) position is reached, the locking ground for the (R) relay is opened and the relay releases, extinguishing the (IC) lamp. The telephone circuit is closed to the line by the (TLK) key and the test man may talk. In step-by-step offices if both the talking key on the originating line and the talking key on the answering line are operated at the same time the sleeves of these two lines are connected together. Under this condition, improper operation of the circuit may result. The incoming call may be held by operating the (TLK-HLD) key to (HLD) position. This closes the non-inductive holding bridge across the line, relieves the telephone circuit, and opens the sleeve of the line. When the (TLK-HLD) key is restored to normal the call is disconnected. Restoring the (TR) key of the line will connect the line to the intercepting trunk so that incoming calls will be routed to the intercepting operator in panel or step-by-step offices.

When the ten test lines are divided into groups for association with different type offices, operation is the same as above except that the (TR) keys in one group will have not effect on lines in other groups, as they are not in multiple.

5.6 Noise Measuring Facility

In order to make noise measurements on connections established to this test set, a jack (NM) for each type office connected to the set is provided for connecting the noise measuring equipment. With noise measuring equipment attached through jack (NM), noise measurements can be made by operating all the (TR) keys on the associated test lines, originating a call on one of the test lines to any one of the terminating test lines having operated (TR) keys, answering this incoming call, then restoring the (TR) key in that particular test line on which the incoming call is received. This connects the tip and ring of the answering end of the connection directly to the noise measuring equipment. The (TLK-HLD) key on the originating end of this connection should be operated to the (HLD) position while noise measurements are being made. Another call may be originated to a different terminating test line in the associated group, but its (TR) key should not be released until the (TR) key of the preceding connection has been operated to free the noise measuring equipment. The (TR) key of the second call may then be restored and noise measurements on this can proceed while another connection is being established. The electric clock is used for timing the noise measuring tests.

5.7 Calls to Test Line

In order to facilitate testing over channels involving interoffice trunks and in order not to require an assistant at the distant office on such calls, provision is made for calling a test line number in the distant office. When this connection is established to the test line the ringing is tripped and tone is sent back.

5.8 Electric Clock

A position electric clock, Fig. 7, is provided to operate from the regular clock supply or from the 10 ipm impulse circuit.

5.9 AMA Operation

Since neither message registers nor coin lines are used in the AMA system, the operation of the test set in an AMA office is the same as for non-coin and flat rate lines.