2

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

CHANGES

B. CHANGES IN APPARATUS

Removed	Replaced By
699 Cord Fig. F	D5U Cord Fig. F
Superseded	**Superseded By**
4A Varistor (A) Fig. 2	33A Varistor (A) Fig. 2

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The cord fasteners shown in Fig. E, were shown in Fig. 2.

D.2 Cord fasteners shown in Fig. F were added on Issue 8-D for record purposes only.

D.3 Prior to Issue 8-D, D5U cord shown in Fig. F was 699 cord.

D.4 Prior to Issue 8-D, 33A Varistor (A) was not shown in Fig. 2.

D.5 Prior to Issue 8-D, Note 106 read as follows: "Provide one Fig. 3 for each Fig. 1 that is to be arranged for coin operation."

D.6 In Fig. E "or equivalent" is added at hand set mounting.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340-REP-FJS

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CHANGES

B. CHANGES IN APPARATUS

	Superseded	Superseded By
B.1	2 - 110 Plugs Figs. 4 & 5	310 Plugs

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The circuit has been redrawn on account of poor condition of tracing.

D.2 The plugs in Figs. 4 & 5 are shown as 110 or 310. The change is recorded in Note 114.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3340

EBS)
FJS) QY

COMMON SYSTEMS
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CHANGES

B. CHANGES IN APPARATUS

B.1	Superseded	Superseded By
	5S Mess. Reg. Fig. 1-D	5AH Mess. Reg.
	5EB Dial Figs. E and F	5LB Dial
	W2K Cord Fig. 5	W2BC Cord
	(2W10A)	(2W27A)

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

C.1 The 5S message register is shown as "U" apparatus.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The message register in Fig. 1-D is shown as "U"-5 ohms or "V"-9.5 ohms. Note 116 is added and a record added to Note 114.

D.2 The dials in Figs. E and F are shown as 5FB or 5LB, in note 102, "5EB" is replaced by "5LB".

D.3 The code and assembly number of the cord in Fig. 5 is changed.

D.4 The cross-connections have been changed.

All other headings, No change.

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DEPT. 3340

EBS)
FJS)VA

COMMON SYSTEMS
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THRU TEN DIAL SUBSCRIBER LINE CIRCUITS

CHANGES

B. CHANGES IN APPARATUS

Added

699 cord (Fig. F)

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Prior to this issue Fig. E was part of Fig. 2 and Fig. F was not shown. A record of this change is included in Note 114, and note 115 is added to cover the use of Figs. E and F.

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 inter-office 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 when used 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 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.

4. CONNECTING CIRCUITS

4.1 Jack panel circuit for connecting to subscriber line circuits.

4.2 Panel final multiple or step-by-step connector multiple.

4.3 Number group connector circuit in crossbar office.

4.4 Panel or step-by-step intercepting trunk circuit.

4.5 Noise measuring test circuit.

4.6 Position clock circuit.

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 office all (TR) keys should be operated. In order to originate a call the (TLK-HLD) key is operated 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 (C1) 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 (C1) 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 (C1). 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 (C1) and extinguish lamp (C) in case coin current is not received.

In case message rate lines are used for originating calls then the appropriate register, Fig. 1A, Fig. 1B, Fig. 1C or Fig. 1D, 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 offices Fig. 1B for step-by-step offices having 100 or 200 point line finders, Fig. 1C for panel offices and Fig. 1D for step-by-step offices having 50 point line finders for dial message rate lines. 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. 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 hold 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, the (TR) key associated with that line is operated. 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 diconnected. 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. 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.

5.6 Noise Measuring Facility

In order to make noise measurements on connections established to this test set, a jack is provided in connection with the intercepting trunk for connecting the noise measuring equipment. This noise measuring equipment is contained in another test set and is connected to this test set by plugging into jack (NM). With the noise measuring equipment attached through jack (MN), noise measurements may be made by operating all the (TR) keys on the test lines, originating a call on one of the test lines to any one of the terminating test lines, 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 may be operated to the (HLD) position while noise measurements are being made and another call originated to a different terminating test line. This call may be answered but its (TR) key should not be restored until the (TR) key of the preceding connection has been operated, to free the noise measuring equipment. The (TR) key of the second call can 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.

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