

STATION SYSTEMS
KEY TELEPHONE SYSTEM NO. 1A
PRIVATE LINE CIRCUIT
FOR AN OFF-PREMISE EXTENSION STATION
ARRANGED TO PROVIDE FOR
CENTRAL OFFICE SERVICE

Drawings for SD-69105-01 have been converted
from 4- by 7-inch handbook size to 8-1/2 by 11-inch
handbook size. CD will no longer be printed in 4- by
7-inch handbook size.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5113-WFBW-LHA

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CHANGE

B. CHANGES IN APPARATUS

B. 1 Superseded	Superseded By
(B) -54L Ret. Coil "X" App.	(B) -274L Ret. Coil "W" App.
Figure 2:	Figure 3:
634YD Subset with 113D In- duction coil and 6017Y Key	634YD Subset with 104A Induction coil and 6017Y Key

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

- C. 1 The soak value for the (L1) relay was 43.
- C. 2 The numbering of test notes 2 & 3, page 1 is interchanged.

D. DESCRIPTION OF CIRCUIT CHANGES

- D. 1 Figure 2 is rated "Mfr. Disc." and replaced by Figure 3 showing 634YD Subsets of current manufacture.
- D. 2 Circuit note 101 is modified to cover connections at the Key Station.
- D. 3 In Figure 51, the lead to 1M (H) Rel. and 2M (L) Rel. were shown on terminals 7 and 8 respectively, the "C" lead to Ring Supply was designated "RG" and the lead to 11TF (BF) Rel. was shown as 11TR.
- D. 4 Reference to Figs. 2 & 3 is added in ckt. note 104.

All other headings under "Changes", no change.

1. PURPOSE OF CIRCUIT

- 1. 1 This circuit provides facilities for connecting the main station later referred to as the "M" station and the controlled station later referred to as the "C" station to a central office line. It also provides for connecting the "M" and "C" stations together by private line which is the extension of the central office line from the "M" station to the "C" station.

2. WORKING LIMITS

- 2. 1 Refer to working limit table on drawing.

3. FUNCTIONS

- 3. 01 To signal the "M" station on calls incoming from central office.
- 3. 02 To signal the "C" station on calls incoming from central office.
- 3. 03 To place control of the central office line to the "C" station under control of the "M" station.
- 3. 04 To signal the "M" station when the "C" station is employing the central office line and the "M" station attempts to call the "C" station.
- 3. 05 To signal the "M" station from the "C" station.
- 3. 06 To signal the "C" station from the "M" station.
- 3. 07 To provide for the "M" station holding a call on the central office line.
- 3. 08 To provide for releasing the hold condition from either the "M" or "C" stations.
- 3. 09 To prevent the "M" station from signaling the "C" station when the "C" station is employing the central office line.
- 3. 10 To supply talking battery to the "M" station when talking to the "C" station.
- 3. 11 To supply talking battery to the "M" station when both "M" and "C" stations are connected to the central office line.
- 3. 12 To hold the relays in the cut-through position when the "C" station is talking on the central office line and the battery at the central office is opened.

4. CONNECTING CIRCUITS

- 4. 1 All systems central office line circuits.
- 4. 2 Key telephones of 1A key telephone system.

DESCRIPTION OF OPERATION

5. FUNCTIONS OF RELAYS

(R) Relay

Operates on ringing current to ring the "C" station on incoming calls.

(R1) Relay

Applies ringing to private line on calls incoming on the central office line and when push button signaling is employed from the "M" to the "C" station.

(L) Relay

Used for releasing the hold relay when the "M" station connects to the central office line.

(H) Relay

Used to hold connection on the central office line.

(L1) Relay

Used as a supervisory relay to control the cut-through equipment on calls from the "C" station to the central office line.

(SR) Relay

Used to hold up during dialing or switchhook flashing to maintain the cut-through position on calls from the "C" station to the central office line.

(CT) Relay

Used to cut through the private line from the "C" station to the central office.

(HO) Relay

Used to hold over the cut-through condition in case of calls in the panel system when line relay battery is removed and before the sender is connected.

(BF) Relay

Used to supply talking battery to the "M" station on calls between the "M" and "C" stations and on calls to the central office when both "M" and "C" stations are connected.

(S) Relay

Used to signal the "M" station on calls from the "C" station.

6. CALLS BETWEEN CENTRAL OFFICE AND "M" STATION - "C" STATION CUT-OFF

On incoming calls to the central office lines the ringer at the "M" station operates to signal an incoming call. The (R) relay also operates but performs no useful function. The subscriber in response to the incoming signal operates the proper pickup key and removes the hand set from its mounting causing the (L) relay to operate. The (L) relay performs no useful function. On calls originated at the "M" station on a central office line the central office pickup key is operated and calls may be originated in the usual manner.

7. HOLDING

The central office line may be held by the operation of the hold key in the telephone set at the "M" station. The hold key when operated opens the operating path for the (L) relay releasing it and closes a circuit for operating the (H) relay through its primary winding in series with the central office loop and station telephone set. When the (H) relay operates its holding tertiary winding will be connected across the line in series with its non-inductive quarternary winding and in parallel with the primary winding. When the hold key is released the operated pickup key will release, the operating primary winding of the (H) relay will be opened, the (H) relay will be held operated by its tertiary winding and the set will be disconnected from the line. The holding condition is released when the "M" station with the hand set off its mounting again operates its pickup key to operate the (L) relay. The (L) relay when operated short circuits the tertiary winding causing the (H) relay to release. Similarly, if the "C" station comes on the line the operation of (L1) relay operates the (SR) relay which short circuits the tertiary winding of the (H) relay causing its release.

8. TERMINATING CALLS ON THE CENTRAL OFFICE LINE WITH THE CUT-OFF KEY OPERATED TO CONNECT THE "C" STATION TO THE CENTRAL OFFICE LINE

In the case of a call terminating on the central office line the ringer operates at the "M" station and the (R) relay operates. The operation of the (R) relay operates the (R1) relay which connects the tip and ring of the central office line to the private line causing the ringer at the "C" station to operate. If the "C" station answers the ringing signal with the (T) key in the central position the (L1) relay operates, causing the operation of the (SR) relay which in turn operates the (CT) relay. The (SR) relay in operating removes the ground from the "G" lead preventing the "M" station from signaling the "C" station when push button signaling is employed. The (CT) relay when operated disconnects the "C" station from the (S) relay and connects it to the central office line. Under this condition the "C" station having a metallic bridge trips ringing and conversation may take place. In case the "M" station responds to the ringing signal after the "C" station the "M" station subscriber set is connected to the (BF) relay, which supplies talking battery to the "M" station. The operation of the (BF) relay bridges windings 1-2 and 3-4 of the (B) retardation coil across the line. Under this condition both the "M" and "C" stations may converse on the central office line. If the "M" station had responded to the ringing signal first it would have tripped ringing as it would have supplied a metallic bridge to the central office. If the "C" station then answers the (L1), (SR) and (CT) relays operate and when the (CT) relay operates it connects the "C" station across the line and furnishes battery supply through the (BF) relay to the "M" station. When both the "M" and "C" stations are connected to the central office line

it is necessary in dial systems and in manual systems with a flashing recall to immediately provide a holding bridge at the "M" station in place of the bridge at the "C" station when the latter disconnects first. This feature is provided by the two windings of the (B) retardation coil which are bridged across the line. When the "C" station disconnects the (L1) relay releases causing the (SR) to release the (CT) relay. The release of the (CT) relay bridges the "M" station across the central office line to maintain the connection in place of the (B) retardation coil.

9. CALLS ORIGINATED AT THE "C" STATION FOR THE CENTRAL OFFICE LINE

In order to be able to make a central office call from the "C" station the cut-off key at the "M" station must be in a position to connect the CR and CT leads together. When the "C" station originates a call the (T) key is operated to the (CO) position and removes the hand set from the mounting which places a metallic bridge across the line, operating the (L1) relay on battery supplied through the (S) relay. Under this condition the (S) relay is inoperative because its windings are differentially connected. The operation of the (L1) relay causes the (SR) and (CT) to operate as described in paragraph 8, causing the private line to cut the "C" station through to the central office. The "C" station may then dial in case of dial systems or originate a call manually as in manual systems. The (L1) relay may follow dial pulses but the combination of the (SR) and (CT) relays insures against the (CT) relay releasing during dialing.

10. HOLDING "C" STATION CUT THROUGH ON LOSS OF CENTRAL OFFICE BATTERY

In the case of the panel system when line relay battery may be removed before the sender is connected, the (L1) relay will release causing the release of the (SR) relay. Under these circumstances the (CT) relay remains locked up under control of the back contact of the (HO) relay. When battery is restored to the tip and ring of the line the (L1) and (HO) receive operate current together. The (L1) usually operates first, operating the (SR) relay, thereby holding the (CT) relay. Otherwise the operation of the (HO) relay unlocks the (CT) relay but before it has had time to release ground is supplied to its winding through the front contacts of both the (L1) and (HO) relays. The (SR) relay follows the operation of the (L1) and this in turn applies ground to the (CT) relay. The (HO) relay releases upon the operation of the (SR) relay. Thus the (CT) relay is held operated and the line is maintained in the cut through condition.

11. CALLS FROM THE "M" TO THE "C" STATION

When the proper pickup key is operated at the "M" station the (BF) relay is connected to the subscriber set providing talking battery. With the

hand set removed from its mounting the operation of the (BF) relay opens the tip and ring of the central office line so that incoming calls will not cause ringing to be applied to the private line. The (BF) relay also closes alternate methods of supplying ringing to the private line. If a hand generator is employed the ringing is supplied directly to the private line through the back contacts of the (CT) relay and in series with the (L1) relay. Under this condition the (L1) relay may follow ringing but no relay action follows because the ground supplied to the armature of the (L1) relay is open at the back contact of the (BF) relay. In case ringing supply is provided at 105 volts a-c., ringing current is connected to the front contacts of the (R1) relay. The (R1) relay may be operated by operating the signal key in the telephone set, connecting the ground from the back contact of the (SR) relay to the winding of the (R1) relay.

When the "C" station responds to the ringing, which is made on a code signaling basis to enable the "C" station to identify the nature of the incoming call, the normal position of the (T) key places a 2 mf. condenser of the subscriber set in series with the line preventing the operation of the (L1) relay. The "C" station in all cases obtains its talking battery from the local supply.

12. CALLS ORIGINATED FROM THE "C" STATION TO THE "M" STATION

When the "C" station operates the (T) key to the waydown or the signaling position, ground is connected to the ring of the private line causing the operation of the (S) relay. The (S) relay operates the buzzer at the "M" station. The "M" station in responding to the buzzer signal operates the pickup key for the private line connecting the telephone set to the (BF) relay.

13. ANTI-SIDETONE NETWORK AT "C" STATION

When the "C" station employs a resistance network connection in the anti-sidetone circuit ("A" Wiring) it is so connected that there is no anti-sidetone feature for calls from the "C" station to the "M" station. In case of calls from the "C" station to the central office, however, the resistance network is inserted. When the condenser network is provided ("C" wiring) the anti-sidetone feature is then available for all calls made at the "C" station.

14. BUSY SIGNAL AT "M" STATION WHEN "C" STATION IS ON A CENTRAL OFFICE LINE

In case the "M" station attempts to originate a call to the "C" station at a time when the "C" station is engaged in a call on the central office line a steady buzzer signal is given the "M"

station when the hand set is removed from the mounting. Under the cut through condition of the private line the (CT) relay is operated as described in Paragraphs 8 and 9. When the "M" station bridges the "T" and "R" leads for connecting the "M" to the "C" station, ground is supplied from the make contacts

of the (CT) relay through the "M" station set to the battery connected through the winding of the (S) relay. This operates the (S) relay in turn operating the buzzer. The buzzer continues to operate as long as the hand set is off its mounting and the private line pickup key is operated.

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