

CIRCUIT DESCRIPTION
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PANEL SYSTEM
2 WIRE RECORDING COMPLETING TRUNK
OUTGOING
TO TOLL SWITCHBOARD NO. 1 OR NO. 3
ARRANGED TO RECALL THE SUBSCRIBER

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 No change.

B. CHANGES IN APPARATUS

B.1 Added

Removed

Replaced By

(H) R1046 Relay

(H) E1011 Relay

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLY-
ING TO ADDED OR REMOVED APPARATUS

C.1 The note insulate "1" (AC) was added in the "Remark
Column" for the (C) relay.

D. DESCRIPTION OF CIRCUIT CHANGES

Prior to drawing Issue 3-AR.

D.1 The lead from the (B) condenser and the outer end of
the "L" winding relay (AC) was connected to "2B" re-
lay (H) R1046 and the lead from "2B" relay (C) was
connected to "1B" relay (H) R1046.

D.2 Battery was connected to "1B" relay (RV) and the
lead from contact "1" relay (W) was connected to
"2B" relay (RV).

D.3 Ground was connected to "1T" relay (H) R1046 and
"2T" relay (H) R1046 was connected to the inner
end of winding relay (B).

- D.4 The induction tone leads from "2T" relay (C) and the (A2) condenser were connected to "3T" and "4T" relay (H) R1046 respectively.
- D.5 "4T" relay (RV) was connected to the "RU" winding relay (H) R1046.
- D.6 Contacts "1T", "2T" and associated wiring relay (H) E1011 were not shown.
- D.7 The changes referred to in paragraphs D.1 to D.6 inclusive were made to prevent a false release of the district circuit, due to chattering of the (TK) relay when the toll operator answers or recalls the subscriber.

E. CHANGES IN CURRENT DRAIN DATA

- E.1 No change.

DEVELOPMENT

1. PURPOSE OF CIRCUIT

- 1.1 This circuit was designed for use in completing toll calls from non-coin panel system subscribers. The subscriber dialing this trunk will be connected to toll switchboard No. 1 or No. 3 over an incoming recording completing trunk at the toll office, and the subscriber will remain at the telephone while the call is completed by the toll operator. It is also arranged in case of a delay in completing the call to permit the subscriber to restore the receiver to the switchhook and the toll operator to rering the subscriber's station.

2. WORKING LIMITS

- 2.1 The minimum external circuit loop resistance over which relay (A) will non-operate on its primary winding alone is 1840 ohms.
- 2.2 The maximum external circuit loop resistance over which relay (A) will operate on its primary winding alone is 650 ohms.
- 2.3 The resistance of the "S" lead from the district multiple or office multiple banks to ground in this circuit shall not exceed 100 ohms.

OPERATION

3. FUNCTIONS

- 3.01 Provides means for preventing a false flash of the line signal during the trunk guard test by the sender circuit.
- 3.02 Provides means for signaling the toll operator when the district selector circuit has reached the "awaiting operator" position.
- 3.03 Provides the toll operator with switchhook supervision.
- 3.04 Provides the subscriber with ringing induction tone until the toll operator answers the primary signal.
- 3.05 Reverses the battery supplied to the district circuit for stepping the district into the "cut through" position to provide a direct connection to the subscriber.
- 3.06 Provides means for holding the district circuit under control of both the subscriber and the toll operator after the primary line signal has been answered.
- 3.07 Provides 48 volt transmission.
- 3.08 Holds this trunk busy to other hunting district circuits after the district has reached the "awaiting operator" position.
- 3.09 Permits the subscriber to abandon a call and release the panel apparatus before the primary line signal has been answered.
- 3.10 Provides means for reringing the subscriber's station only when the subscriber's receiver is off the hook "L" wiring or permits the toll operator to rering the subscriber's station when the receiver is either on or off the hook "K" wiring.
- 3.11 Provides means for holding the switches connected to this trunk during the ringing period.
- 3.12 Restores the circuit and connecting apparatus to normal after the completion of the call.

- 3.13 Permits the return of the ringing induction tone whenever the toll operator disconnects before the subscriber.

4. CONNECTING CIRCUITS

- 4.1 Non-coin panel district circuits.
- 4.2 Connects directly to an incoming 2 wire recording completing trunk at the #1 or #3 toll office.
- 4.3 Office selector circuits.

DETAILED DESCRIPTION

5. TRUNK IS SEIZED - When this trunk is seized by a district or office selector circuit, battery through resistance lamp (F1) is connected to the tip side of the trunk and ground through resistance lamp (F) and the (P-2) winding of relay (A) is connected to the ring side of the trunk causing a momentary closure through the (TG) and overflow relays in the sender circuit which is connected to the district circuit during the period of selection in the district selector. Relay (A) is designed not to operate at this time, thereby preventing a premature flash of the line lamp during the "selection beyond" period. When the district selector circuit reaches the position of "trunk closure" the (A) relay operates over its (P-2) winding in series with the polarized relay in the district selector circuit in turn operating relay (F). If "L" wiring is used the operation of relay (A) will also connect ground to the inner winding of relay (R) the function of which is described in paragraph 8. The operation of relay (F); (a), sets the battery and ground circuit from relay (TK) preparatory to signaling the toll operator; (b), operates relay (B), a slow releasing relay, which connects ground to the district sleeve circuit and is designed to prevent the release of the selector switches should the subscriber desire to flash the line lamp before the toll operator answers. Connecting ground to the sleeve circuit also prevents other selectors from selecting this trunk. The operation of relay (B) also operates relay (B1). The operation of relay (B1) operates relay (W) which holds up under control of relays (AC) and (B1), the function of which is described in paragraph 8. The operation of relay (B1) also operates relay (C) and prepares a holding path for relay (RV). The operation of relay (C); (a), connects ringing induction tone to the subscriber's end of the trunk; (b), connects battery through the (P-1) winding of relay (TK) to the ring conductor

and ground through the (P-2) winding of relay (TK) to the tip conductor outgoing to the toll board causing a high resistance double wound relay at the toll board to operate and light the line lamps. Relay (TK) does not operate at this time due to the high resistance loop at the toll board end.

6. TOLL OPERATOR ANSWERS - When the toll operator answers the high resistance is short-circuited at the toll board thereby permitting enough current to flow for the operation of relay (TK). The operation of relay (TK) operates relay (H). The operation of relay (H); (a), connects ground to the winding of relay (B) providing a means for holding the connection under control of the toll operator; (b), disconnects the ringing induction tone from the subscriber's end of the trunk; (c), connects battery to contact "1" relay (W) which performs no useful function at this time, its use being described in paragraph 8; (d), operates relay (RV). The operation of relay (RV); (a), reverses the battery supplied to the district circuit causing it to step into the "cut-through" position; (b), locks itself up under control of relay (B1); (c), arranges the connections to the (A) relay to include both the (P-2) and (P-1) windings. The (P-2) winding in series with resistance lamp (F) is connected to the tip side of repeating coil (L) and the (P-1) winding in series with resistance lamp (F1) is connected to the ring side of the line. This permits relay (A) to be flashed over a 1200 ohm subscriber's loop. The operation of relay (RV) also closes the talking circuit thru the (B) condenser and also the ringing circuit thru the (AC) relay and the (AC) condenser which were left open until this time to prevent a false operation of relay (TK) due to charging of the (B) and (AC) condensers upon the operation of relay (C). The circuit is now arranged for talking.

7. SIGNALING THE TOLL OPERATOR - Relay (A) in following the operation of the switchhook at the subscriber's station causes relay (F) to operate and release in unison. The operation and release of relay (F) reverses the battery and ground to the toll board end of the trunk causing the supervisory lamp in the connected toll cord circuit to flash as a recall signal or to light steadily as a disconnect signal.

8. RECALLING THE SUBSCRIBER - The operation of the ringing key in the toll cord connected to this trunk causes relay (AC) to operate in turn releasing relay (W). The release of relay (W); (a), connects battery to the outer winding of relay (R). The operation of relay (R) depends on the conditions under which this circuit is furnished. If the toll operator is to ring back on PBX connections only "L" wiring is furnished

and relay (R) will operate only when the receiver is off the hook, that is, relay (A) is operated; if the toll operator is permitted to ring under any condition, "K" wiring is used and relay (R) will operate whenever relay (W) is released. The operation of relay (R) opens the circuit through relay (A) causing it to release, if it is operated; (b), locks itself up under control of relay (B); (c), connects ringing current to the subscriber's station. When the toll operator stops ringing relay (AC) releases causing relay (W) to operate. The operation of relay (W) releases relay (R) whether "L" or "K" wiring is used, disconnects ringing current from the subscriber's station and again closes the 48-volt talking circuit through to the subscriber, restoring relay (A) to the condition it was in prior to the start of the ringing. The circuit is again arranged for talking.

9. HOLDING AND DISCONNECT - The connection is held as long as the toll operator's cord is connected to the trunk or the subscriber has the receiver off the hook. If the toll operator should disconnect first, relay (TH) will release and remove ground from the winding of relay (H) causing it to release. The release of relay (H) ~~will permit the return of the ringing induction tone to the subscriber's end of the trunk~~ indicating to the subscriber that the connection has been broken at the toll board end. At the same time the line lamps will reappear at the toll office. When the subscriber restores the receiver to the switchhook, relay (F) will release and function as described in paragraph 7. The release of relay (F) will cause the line lamps to be extinguished at the toll board unless they have been answered by the toll operator in which case the toll operator would get the disconnect signal. When both ends have disconnected relay (B) will release. The release of relay (B); (a), disconnects ground from the sleeve circuit causing the release of the connected district circuit; (b), disconnects ground from the winding of relay (Bl) which does not release immediately since it is designed to lag for a short time. When relay (Bl) releases, relays (RV), (C) and (W) release restoring the circuit to normal. The slow action of relay (Bl) permits the district circuit to disconnect before relay (RV) restores to normal.

10. TESTING - When it is desired to make this trunk busy, connect ground to the sleeve lead at the switches or local I.D.F. thereby preventing its selection by any other hunting district selector.

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