

STEP-BY-STEP SYSTEMS
NO. 1 OR 350A
COIN BOX TRUNK CIRCUIT
FOR USE PRECEDING A FIRST SELECTOR
SERVING PREPAYMENT COIN LINES
WITH OR WITHOUT DELAYED CHARGE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

Figure 4
U 114 (LL) Relay

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Figure 4 is added to facilitate the use of this circuit with a Subscriber Rotary Line Ckt. equipped with a Dial Long Line Ckt.

D.2 Connection to Subscriber Rotary Line Ckt. SD-31259-01 is now shown.

1. PURPOSE OF CIRCUIT

1.1 This circuit is used to provide dial service to prepayment coin stations from a step by step central office. It is arranged to automatically collect or return the coin deposited as required, after each call. When Fig. B is used it is arranged to delay setting up the charge condition until 2 to 5 seconds after the called party answers.

2. WORKING LIMITS

2.1 Maximum external circuit loop resistance for subscriber's pulsing and supervision. See Range Chart.

2.2 Earth potential limits:

Neg. Limit	206N Relay (P)		280U or 239GU Relay (P)	
	Minimum Conduc. Lp.	Maximum Pos. E. P.	Minimum Conduc. Lp.	Maximum Pos. E. P.
Positive Limits	0 Ohms.	7.5V	0 Ohms	9.5V
	105 "	8 "	105 "	10 "
	240 "	8.5 "	220 "	10.5 "
	370 "	9 "	320 "	11 "
	500 "	9.5 "	425 "	11.5 "
			530 "	12 "

2.3 Minimum insulation resistance - 20,000 ohms.

3. FUNCTIONS

3.01 To provide for connecting a prepayment coin station to a first selector.

3.02 To provide for transmitting dial tone from the selector circuit to the calling subscriber.

3.03 To test for the presence of a coin in the coin box.

3.04 To repeat dial pulses after the coin is deposited.

3.05 To automatically return the coin on all uncompleted calls and on completed calls on which there is no charge.

3.06 To automatically collect the coin on completed calls to stations on which a charge is to be made.

3.07 To automatically collect the coin on completed calls to an operator unless the operator otherwise disposes of the coin before disconnecting.

3.08 To automatically busy the associated line finder when a ground is connected to the sleeve of the associated first selector.

- 3.09 To cut out the coin test and pulse repeating features when the calling station line is equipped with a long line circuit.
- 3.10 To provide means for making trunk operation and pulse repeating tests.
- 3.11 To provide means for indicating a trunk that has failed to dispose of a coin.
- 3.12 With Fig. 2 to defer setting up the charge condition until 2 to 5 seconds after the called party answers.
- 3.13 To provide direct ground to the "A" lead in Fig. 3 in offices equipped with CAMA trunks.

4. CONNECTING CIRCUITS

When this circuit is listed on a key sheet, the connecting information thereon is to be followed.

- 4.01 Line Finder Circuit - SD-31530-01*.
- 4.02 Selector Circuit - SD-30200-01*.
- 4.03 Interrupter and Alarm Circuit for Prepay Box Trunks - SD-30852-01*.
- 4.04 Coin Box Trunk Release Circuit - SD-31861-01.
- 4.05 Pulse Repeating Test Set - SD-31667-01.
- 4.06 Interrupter and Alarm Circuit Arranged to Provide a Delay Interval - SD-31494-01*.
- 4.07 Sub. Line Ckt. Equipped With Rotary Line Switch - SD-31259-01.
- 4.08 Misc. Alm. Ckt. for Prepayment Coin Box Trks. - SD-31978-01.
- 4.09 Timing Ckt. for Coin Trks. - SD-31893-01.
- 4.10 Pulsing Test Set - SD-90469-02*.

*Typical Circuits.

DESCRIPTION OF OPERATION

5. ORIGINATING A CALL ("S" WIRING)

When a prepayment coin station is connected to this circuit by a preceding Ckt. (L) operates over the subscriber's loop in turn operating (N) and (DD). (N) operated operates (NN). (NN) operated closes the circuit to the associated first selector, provides a holding circuit for (DD), removes the short circuit from the 6,000 ohms in series with the primary winding of (L) and changes from battery to the ring through the

non-inductive winding of the (RT) to battery through the operating winding of the (RT), and (with "L" wiring) the primary winding of (BT). (DD) operated, connects ground to the sleeve lead to hold the line finder and (with "Z" wiring and apparatus) closes in part the circuit for dial tone to the calling subscriber. When "X" wiring is provided the ground is connected to the sleeve through the (CL) retard coil to permit a number checking tone which may be connected to the sleeve of the subscriber's line to be transmitted over the sleeve lead through condenser (C) to a selector level trunk to indicate to the operator the class of service. The (B) and (C) resistances are used to prevent a transient current flow through the (B) condenser from operating (RT) falsely when the (C) retard coil is connected across the tip and ring by the operation of (NN), and dial tone is received from the selector. When "Z" wiring and apparatus are omitted, the dial tone path is not closed to the calling subscriber until the coin is deposited, as described in Paragraph 6 below.

6. COIN DEPOSITED

6.1 ("K" and "S" Wiring)

When the coin is deposited by the calling subscriber (RT) operates which operates (S). (S) operated, short-circuits (L), releasing it, locks to battery through its front contact, operates (H) and (HH), short-circuits the (B) resistance ("Z" wiring only), supplies dial tone to the calling subscriber ("Z" wiring omitted) connects (R) to the ring of the line and removes battery from (RT) which releases. (R) operates, in turn closing a path for holding the first selector when (NN) releases and also operating (D). (D) operated, holds (DD) operated. (H) operated, takes over the control of (HH) from (S). The (HH) operated releases (NN), separates the sleeves of the line finder and first selector and supplements the ground on the sleeve from (DD) to the line finder. (L) released, releases (N). (NN) released short-circuits the (D) resistance ("Z" wiring only). (N) and (NN) are slow in releasing in order to insure that (R) is fully operated before (NN) releases and opens the bridge to the first selector in case (L) releases when the coin is deposited.

6.2 ("L" and "S" Wiring and Apparatus)

When the coin is deposited by the calling subscriber, (RT) operates which operates (S). (S) operated, locks to battery through its front contacts, operates (H) and (HH), short-circuits the (B) resistance ("Z" wiring only), supplies dial tone to the calling subscriber ("Z" wiring omitted), connects (R) to the ring of the line and removes battery from (RT) which releases. (R) operated closes a path for holding the first selector when (NN) releases

and operates (D). (D) operated holds (DD) operated. (H) operated, takes over the control of the (HH) from (S). (HH) operated, releases (N) and (NN), separates the sleeves of the line finder and first selector and supplements the ground on the sleeve from (DD) to the line finder. (NN) released ("Z" wiring only), short-circuits the (C) resistance. (N) released short-circuits (L) releasing it. (N) and (NN) are slow in releasing in order to insure that (R) is fully operated before (NN) releases and opens the bridge to the first selector in case (L) releases when the coin is deposited.

The purpose of (BT) is to block the operation of the coin trunk in case of an irregular condition on the line. (BT) operated locks to the sleeve, opens the circuit to (S) preventing its operation and removes battery from the line by connecting direct ground on the ring, releasing (L). (L) released releases (N) and it turn (NN). (NN) released releases (DD) and opens the bridge towards the selector, which removes ground from the sleeve, releasing (BT) and (RT) and restores the circuit to normal.

7. DIALING ("S" WIRING)

(R) repeats pulses from the subscriber's dial to the first selector. (D) is slow in operating and releases on the first dial pulse, and remains released during the pulsing of each digit. This releases (DD) which connects the (F) and (D) resistances to the tip and ring and shorts the (C) retard coil to aid pulsing.

8. CALL CHARGED

8.1 No Delay Interval

If the call is one on which a charge should be made, the line current is reversed, operating (P) and releasing (P1) which was previously operated. With (P1) released and (P) operated, (J) and (C) operate and lock. (J) operates (K), short-circuits (P) which releases, and reverses the tip and ring leads from the first selector which causes (P1) to operate. (K) operates (K1) through the back contact of (P). (K1) operated locks and removes the short circuit from (P). (C) operated locks and operates (A) and also sets the circuit so as to collect the coin when the calling subscriber disconnects, or transfers this function to relay (T1) Fig. 2. (A) operated disconnects the tip and ring of the calling line from the (T) retard coil and the (R) relay, releasing (R), and connects the tip and ring through (P) and (P1) to the first selector. (R) released releases (D) and (DD). (DD) released performs no useful function at this time. The reversal of the line by the operation of (J) is necessary to keep (P) always connected to the ground side of the connection.

8.2 With Delayed Charging, Fig. 2

With Fig. 2 the operation is as described in par. 8.1 except that the operation of (C), instead of connecting positive coin battery to relay I connects that relay to T1, and the relays of Fig. 2 function as follows.

When the called subscriber answers (P2) operates, in turn closing the circuit of (T) to lead PKU. This lead is grounded for 1/2 second once every 3 seconds, (except that when the interrupter circuit is not in use, lead PKU is grounded,) when (T) operates, it grounds lead "ST" to start the interrupter or to keep it operating. (T) locks to (P2) thru (T1), 2 seconds after lead PKU is opened, ground is connected to lead INT, operating (T1). (T1) operated locks to off normal ground, releases (T), and connects positive coin battery to relay (I) instead of negative. If (P2) releases before (T) operates, (T1) is released and the above sequence of operations will be repeated when (P2) again operates. Fig. 2 thus insures against false charging when busy flashes or other transient conditions operate (P2).

9. CALL NOT CHARGED ("S")

If the call is one on which no charge is to be made, the line current is not reversed. (P), (K) and (K1) will, therefore, not operate and the circuit remains in a condition to return the coin when the calling party disconnects. On this type of call, (A) does not operate and the (A) and (B) condensers in the tip and ring leads provide the transmission circuit.

10. DISCONNECT

10.1 Call charged ((C) Relay Operated) ("S" or "T" Wiring)

When the calling subscriber disconnect, the preceding Ckt. is still held by ground at the contacts of the (HH). (S) releases when ground is removed from the selector sleeve and causes (Y) to operate under control of a ground interruption on lead "P" of the coin control alarm circuit, and lighting the green alarm lamp (A). The coin control alarm circuit is arranged so that ground is intermittently and alternately connected to leads "P" and "I" for an interval of 1/2 second duration. This feature is used to cause the coin control battery of this circuit, as described later, to be connected to the subscriber's line for 1/2 second duration and thereby insure sufficient time for proper operation of the coin box magnet. (Y) operated locks under control of (HH) and connects battery to the winding of (B). (B) operates when ground is received on the "I" lead. If the called subscriber should hang up before the calling subscriber, the line current is reversed when the called station disconnects,

operating (P) and (Pl) releases. (P) operated and (Pl) released short-circuits the winding of (J) causing it to release. (J) releases (K) and short-circuits (P) and (K) released release (Kl). (J) released places the (P) relay again on the ground side of the line. If the calling party disconnects first, (J), (K) and (Kl) and with Fig. 2, (Tl) release when ground is removed by the release of (HH).

10.2 Non-Charge Call ((C) Relay Normal) ("S" Wiring).

When the calling station disconnects (R) releases, releasing (D) and (DD), and opens the loop to the succeeding switches. After an interval, ground is removed from the sleeve of the selector. From this point on, the circuit functions as described in the preceding paragraph, except that (J), (K) and (Kl) will not be operated.

11. COIN CONTROL ("S" OR "T" WIRING)

The operation of (B) connects 110 volts positive or negative battery to the line to dispose of the coin. If the coin is to be collected, 110 volts positive battery is connected to the winding of (I) through the front contact of relay (C) and, with Fig. 2, the front contact of (Tl). If the coin is to be returned, the 110 volt negative battery is connected to the line through the front contact of (B) and the back contact of (C), thru the winding of (I). (I) operates in series with the coin magnet and remains operated during the time that the battery is connected to the line. The operation of (I) connects battery to hold (H) operated since the operating circuit for this relay is opened when (B) operates. When the "I" lead ground is removed (B) releases, removing the coin collect or return current, releasing (I) and holding (H) operated. At the next closure of ground to the "I" lead (B) reoperates connecting coin disposal current to the line. The coin should have been disposed of on the first application of the potential which upon the removal of the potential restores the coin magnet to normal and no current should flow through (I) on the subsequent application of the coin potential.

11.1 Release of circuit, "ZF" Option

With (B) operated and (I) normal (H) releases, releasing (HH) which (a) removes ground from the line finder sleeve, (b) releases (B), (Y), and also (C), (K), (Kl) and (Tl) if operated, and (C) connects battery to RB1 of (RT). The release of (B) connects the incoming tip and ring to relay (L) thus restoring the circuit to normal.

11.2 Release of Circuit, "ZG" Option

The circuit functions are described in the preceding paragraph except that when (HH) releases (B) remains locked to lead "I", and (HH) removes the coin return battery from 5B(C). Thus (B) remains operated for approximately 1/2 second until ground is removed from lead "I". This insures sufficient time for the line finder cut through relay to release before the incoming tip and ring are connected to relay (L).

12. STUCK COIN

12.1 "BB" and "S" or "T" Wiring

If the coin is not disposed of, (I) will reoperate each time coin potential is applied to the line and will hold (H) each time (B) operates thereby preventing the release of (HH). This will hold the trunk to the line. After an interval the battery thru the (A) lamp over the "A" lead will bring in an alarm.

12.2 "BA" and "S" or "T" Wiring

Battery for holding (H) operated under control of (I) is obtained from the "IB" lead in the associated "Coin Box Trunk Release Circuit." Continued attempts of the coin trunk circuit to dispose of the coin are limited by the timing of the Release Circuit. At the end of the time period, battery is removed from the "IB" lead and the circuit functions as though the coin had been disposed of, restoring to normal as described in Paragraph 11.

13. CALLS TO SPECIAL SERVICE OPERATOR ("S" WIRING)

On calls to a special operator, the selector level trunk is so arranged that the battery and ground are reversed immediately when the operator answers. This causes (P) to operate and (Pl) to release, operating (J) and (C). (J) locks, operates (K), short-circuits (P), which releases and reverses the line leads which causes (Pl) to operate. (K) operates (Kl) after (P) releases. (Kl) operated locks and removes the short circuit from (P). If coin collect current is supplied to the line from the trunk, (P) remains released and (Pl) releases. If coin return current is applied to the line from the trunk, (P) operates and (Pl) remains operated. The function of (Pl) is to make the operation of (P) ineffective at this time, thereby preventing a buzzer action between (J), (K) and (Kl) which might result in acoustic shocks due to the momentary short-circuits of the tip and ring at the (J) contacts. On a ringing by the special service operator, (P)

may operate on ringing current. If (P) remains operated due to earth potential with (P1) released, it shunts down (J). (J) releases (K) and short-circuits (P). (P) releases and shunts down (K1). (K1) in this case prevents a buzzer action between (J), (K) and (K1), (P1) being released under this condition. The earth potential which may have held (P), will not operate it after the short-circuit is removed. When Fig. 2 is provided, relays (P2), (T) and (T1) function as described in Paragraph 8.2.

14. TEST JACKS

14.1 (T) Jack

If a plug is inserted into the (T) jack of the trunk ground will be connected to the "S" lead to the line finder by the operation of the test jack spring.

14.2 (TT) Jack - "W" Wiring and "A" or "B" Wiring and Apparatus

The (TT) jack in conjunction with the (T) jack provides means for applying pulse repeating requirements to the (R) relay. By connecting a source of pulses to the (T) jack and a per cent break meter to the (TT) jack the output of the (R) can be read on the per cent break meter. When "A" apparatus is used ground must be connected to the "S" lead from the selector in order to hold relays in this circuit while testing. With "B" apparatus inserting a plug into the (TT) jack connects ground to the "S" lead. Momentary operation of the "SC" key in all but the earliest pulse repeating test sets operates the (RT) relay, in turn operating relay (S). Where the pulse repeating test set is not so arranged the (RT) relay must be momentarily operated manually.

15. FIRST SELECTOR MADE BUSY

When the first selector associated with this circuit is made busy by connecting ground to the sleeve lead, this ground is extended through the back contacts of (HH) to the sleeve of the preceding circuit. This causes a relay in the preceding circuit to busy the circuit so that it will not then be used on an incoming call.

16. CONTACT PROTECTION

Resistances (D) and (F) at the (DD) relay are connected to the (A) and (B) condensers during the application of coin battery to the line and in this connection are used to protect the contacts which control the application of this battery to the coin magnet. Condenser "D" and "F" resistance are used to protect the pulsing contacts of the (R) relay.

17. OPERATION WHEN "T" WIRING IS USED WITH LINE FINDER

The "T" wiring is used only when a part of the lines in the associated line finder group are equipped with long line circuits. The line finders are then equipped with normal post springs that operate on the multiple bank levels on which all the working lines are provided with long line circuits. When the normal post springs on the line finder operate leads "E" and "F", which are connected together when the finder is normal for the purpose of making the finder busy when the sleeve of the associated first selector is grounded, are opened and lead "F" is connected to lead "A". When a call is originated the long line circuit closes a bridge across the tip and ring which operates (L). (L) operates (N) and (DD). (N) operates (NN). (NN) closes a bridge across the tip and ring toward the first selector. The only useful function of (DD) at this time is that it grounds the sleeve so as to hold the line finder until (HH) operates. The bridge across the tip and ring causes the operation of relays in the first selector that supply a holding ground over the "S" lead. When ground is returned over the "S" lead from the first selector (A) and (S) operate, ((A) operating over the "A" and "F" leads). The operation of (A) closes the tip and ring through from the long line circuit to the first selector and allows (L), (N), (NN) and (DD) to release. The operation of (S) operates (H) and (HH). The test for the presence of the coin at the substation is made in the long line circuit and therefore (RT) and (BT) do not enter into the circuit operation on this call, similarly, the dial pulses are repeated in the long line circuit so that (R) is not used. When the call is answered (P) operates and circuit functions as described in paragraph 8 except that (A) has been operated by the NP springs instead of by (C). However the only useful function in the operation of (P) and release of (P1) is to operate (C) from a ground on (HH) and sets the circuit in a position to collect the coin when the subscriber disconnects. When the calling subscriber disconnects the circuit functions as described under paragraph 10.1. If the call is answered (C) is operated causing coin collect current to be applied to the line and if the call is not answered (C) is normal and coin return current is then applied to the line. On calls to the special service operator (P) operates and (P1) releases which operates (C) and sets the circuit in a position to collect the coin when the subscriber disconnects. The operation of (J), (K) and (K1) serves no useful function on this type of call because the repeating coil in the long line circuit prevents the coin ground from grounding the tip conductor in this circuit.

18. OPERATION WHEN FIGURES 4 AND "T" OPTION ARE USED WITH ROTARY LINE SWITCH

Figure 4 and "T" wiring are used when this circuit is associated with a subscriber rotary line switch, and preceded by a long line circuit. When this circuit is seized by a subscribers rotary line circuit ground is advanced on lead "A" to operate (LL) of Figure 4. Operated (LL) connects lead "F" to lead "A" opening lead "E". When a call is originated the long line circuit closes a bridge across the tip and ring which operates (L). (L) operates (N) and (DD). (N) operates (NN). (NN) closes a bridge across the tip and ring toward the first selector. The only useful function of (DD) at this time is that it grounds the sleeve so as to hold the subscribers rotary line switch until (HH) operates. The bridge across the tip and ring causes the operation of relays in the first selector that supply a holding ground over the "S" lead. When ground is returned over the "S" lead from the first selector (A) and (S) operate, ((A) operating over the "A" and "F" leads). The operation of (A) closes the tip and ring through from the long line circuit to the first selector and allows (L), (N), (NN) and (DD) to release. The operation of (S) operates (H) and (HH). (H) locks under control of (B). (HH) separates the "S" lead between the subscribers rotary line circuit and first selector, and grounds the "S" lead to the subscribers rotary line circuit. The test for the presence of a coin at the substation is made at the long line circuit and therefore (RT) and (BT) do not enter into the circuit operation on this call,

similarly, the dial pulses are repeated in the long line circuit so that (R) is not used. When the call is answered (P) operates, and the circuit functions as described in paragraph 8, except that (A) has been operated by (LL) in Figure 4 instead of by (C). However the only useful function in the operation of (P) and release of (Pl) is to operate (C) from a ground on (HH) and sets the circuit in a position to collect the coin when the subscriber disconnects. When the calling subscriber disconnects the circuit functions as described under paragraph 10.1, except instead of a line finder circuit a subscribers rotary line circuit is used. When the line circuit disconnects ground is removed from lead "A" releasing (LL). If the call is answered (C) is operated causing coin collect current to be applied to the line and if the call is not answered (C) is normal and coin return current is then applied to the line. On calls to the special service operator (P) operates and (Pl) releases which operates (C) and sets the circuit in a position to collect the coin when the subscriber disconnects. The operation of (J), (K) and (Kl) serves no useful function on this type of call because the repeating coil in the long line circuit prevents the coin ground from grounding the tip conductor in this circuit.

19. USED IN OFFICES EQUIPPED WITH CAMA TRUNKS - FIG. 3

Direct ground is required on lead "A" to restrict coin lines from cama trunks.

BELL TELEPHONE LABORATORIES, INCORPORATED

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