COIN CRAFTS' MANUAL

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INTRODUCTION

1. GENERAL

1.01 The purpose of this manual is to familiarize coin personnel with the many intricate phases of coin service. This includes an overview of the total coin operation with emphasis on:

1. Station Equipment
2. Central Office testing and circuit design requirements.
3. Trouble analysis of station, loop and central office equipment.
4. Cord board and "TSPS" operation
5. Loop plant
6. Coin Improvement Items including DTF

1.02 To understand and effectively clear troubles on coin service, a basic knowledge of the above items is necessary.

1.03 Coin service today, consists of Dial-Tone-First (DTF), Coin-First (CF) and Postpay type service. All utilize the single slot coin station and all place different demands upon central office and test desk equipment.

> ***Note 1:*** This manual is not intended to replace any BSP, Booklet, or Manual, but is provided to supplement information already available to the craftsperson.
>
> ***Note 2:*** Information in this manual pertains to 1A/2A, 1C/2C, 1D/2D, and 1E-type sets only and does not include the old multislot sets.

1.04 Prior to the development of the single slot coin telephone and introduction of DTF service, coin operation was relatively simple. The coin station (multislot) placed very few demands upon the central office and test desk equipment. If the central office equipment could furnish a threshold capable of collecting or refunding a coin deposit, test for the presence of a coin, provide a minimum amount of talking battery and ring the station ringer, the station performed quite effectively.

1.05 Social changes, during the 1960s made the multislot coin station a prime target for: vandalism, strong arm robbery, fraud, and theft of service. This brought about the introduction of the more rugged single slot coin station and a new environment for coin service.

1.06 Presently there are four types of single slot coin stations all having an identical outside appearance:

> "A" Series—designed for all coin first areas for use in coin first operation
>
> "C" Series—a convertible set that can be used in either a dial-tone-first mode or a coin-first mode.
>
> "D" Series—for use in dial-tone-first mode only.
>
> "E" Series—for postpay operation only.

1.07 Components for the single slot coin stations although appearing the same and physically fitting the same mountings are not always compatible. Station component compatibility charts will be found in Chapter 1, Part 5.

1.08 The operational description of the single slot coin station is explained in Chapter 1. The operational description must be understood by the central office and test desk force maintaining coin service. The station totalizer assembly as outlined in Chapter 1 affords a natural trouble indicator and trouble analyzer for loop plant, station and central office trouble conditions. The master test frame, maintenance control center, district junctor test frame, J test boxes, and coin supervisory test sets are good test facilities but lack the trouble

detecting features that the coin station totalizer provides.

2. GENERAL SYSTEM CONSIDERATIONS FOR DTF CONVERSION

STATION COMPATIBILITY

2.01 The operational description for the "A" series coin station is similar to that of the "C" series station wired in the coin-first mode (Chapter 1, Part 1). The difference being—the "A" series coin station requires that talking battery always be negative to the ring side of the line with ground on the tip side. The "A" series station therefore, will not operate with office or loop condition when reversals are present. In central offices providing both DTF and CF type service it becomes necessary to modify the "A" series stations to "C" series.

2.02 With closing of cord boards and implementation of TSPS, personnel involved in coin service must be aware of the polarity sensitivity of the "A" series coin station.

EXAMPLES:

1. The trunks to "TSPS" provide +48-volt talking battery on the ring side of the line when serving DTF service. This is deposit recognization for less than initial rate and also utilized to prevent TT fraud.

2. Toll diversion option on No. 5 Crossbar trunks to TSPS reverses the talking battery.

3. In Step-by-Step offices polarity reversals may be experienced due to malfunction of switching operations or local calls completed to a coin station.

2.03 The above examples will render the "A" series coin station out of service.

2.04 The following items are of a general nature and pertain to all switching systems. It should be noted that they are not listed in any particular order relating to their importance or urgency but are considerations in converting an existing Central Office (CO) to Dial-Tone-First (DTF) coin operation.

2.05 ***Cutover Coordination.***

(a) Conversion of offices to DTF operation requires coordination of the central office and station changes if unimpaired coin telephone service is to be maintained during cutover. Cutover to DTF coin operation can cause customer confusion. This confusion is compounded when temporary incompatibilities are introduced between the central office and coin telephones by the cutover procedures used. The central office serving arrangements permit side-by-side operation of Coin-First and Dial-Tone-First stations without line segregation during and following cutover. However, full cutover of all coin telephones to DTF operation in a local central office will allow the customer to more rapidly learn the new method of operation without need to identify the type of station (Coin-First or Dial-Tone-First) which he is trying to use.

2.06 ***Cutover Procedures.***

(a) The following DTF cutover procedure has been used by several companies with minimal impact of the cutover (other than customer unfamiliarity with the new service) on coin telephone operations.

(1) ***Modify:*** Test desk, test cabinets, test sets.

(2) ***Modify:*** CO equipment with the exception of +48-volt options.

(3) ***Modify or change:*** Stations to "C" series.

(4) ***Modify:*** Toll equipment with the exception of +48-volt options.

(5) Prepare announcement circuits and announcements.

(6) Implement +48-volt options.

(7) Test all circuits using a "C" series coin station wired in the DTF mode.

(8) ***Convert:*** Line relays to loop start.

(9) ***Convert:*** Stations to the DTF mode.

(10) ***Change:*** Dial instruction cards.

(11) Make final test of station in DTF mode.

(12) Make final test of all associated CO, Toll, and Test Desk equipment.

(13) Make final check of announcements.

2.07 ***Deposit Required Announcement.***

(a) The standard announcement that is recommended for use when the required initial rate coin deposit has not been detected is as follows: "The call you have made requires a 10-cent (initial rate) deposit. Please hang up, wait for dial tone, deposit 10 cents (initial rate) and dial your call again." In addition, when all announcement trunks are busy during heavy traffic conditions, calls should be routed to recorder tone. Routing to another recording can only confuse the customer.

(b) The next revision of the Central Office Management Practices Division D, Section 2, Appendix 1 will contain the recommended announcement phrase.

2.08 ***Coin Present Tests.***

(a) Coin present tests prior to coin return on abandoned calls and coin disposal tests to determine successful coin collect or coin return actions must be made using positive (+48 volt) battery. Coin deposits of less than the initial rate will not be detected by a negative battery test (-48 volts), since the unoperated initial rate contact (T1) at the station will prevent coin ground detection.

2.09 ***Subscriber Line Multiplex (SLM) Operation.***

(a) The SLM has been arranged to serve Coin-First coin telephones. It ***cannot*** serve Dial-Tone-First or Coin-First coin telephones in a DTF equipped office. Alternative facilities must be provided for all SLM coin lines when the office is cutover to DTF operation.

2.10 ***Talking Battery Polarity on Operator Trunks.***

(a) As covered in the various letters, +48-volt battery is necessary at the DTF wired coin telephone when an operator is monitoring coin deposits. Unless the trunk provides this polarity the operator will be unable to monitor initial deposits which are less than the local call initial rate (5 cents in 10-cent areas, 5 cents and 10 cents in 15-cent areas and 5 cents, 10 cents, and 15 cents in 20-cent areas). This requirement covers trunks which handle terminating traffic requiring coin deposits at the coin telephone, i.e., collect calls to coin telephones as well as trunks handling originating traffic.

2.11 ***Toll Grade Battery.***

(a) The coin service improvement program which initiated Dial-Tone-First service included option changes in central office circuitry to eliminate ***toll grade battery.*** The low impedance presented by this supply can result in currents at the coin station (on short loops) in excess of 200 ma which limits the design options for new station circuitry. All circuits which supply toll grade battery toward the station should therefore be modified per the appropriate drawing issue which eliminates the toll grade battery supply.

2.12 ***Coin Station Test Line.***

(a) A Coin Station Test Line Circuit SD-1C297-01 is available to assist the coin station repairperson in testing the capabilities of the coin telephone without the need for a test deskperson. This circuit, which was introduced in 1971 was covered by EL 1388 (GL 71-07-150), can test either CF or DTF wired coin stations in all types of central offices. When changing from CF to DTF operation there is an option change which must be made in the test circuit (remove option "S" on SD-1C297-01).

2.13 ***Coin Instruction Cards.***

(a) The recommended format for coin instruction cards is covered in GL 73-11-069. This letter covers the recommended format for 20-cent initial deposit rates at Coin-First or Dial-Tone-First telephones and is adaptable to other rate situations. The more standard the instruction cards are made the more easily the customer can identify the services the coin telephone provides.

2.14 ***Coinless Call Completion.***

(a) Implementation of Dial-Tone-First coin operation provides the coin telephone customer with the ability to reach the operator, directory

assistance operator, or emergency center (911) without the need for an initial coin deposit. While this gives the customer the capability of making information or special toll calls (collect, credit card, or third number billed) even without coins, it also increases the probability of other types of calls.

2.15 ***Permanent Signals.***

(a) The introduction of DTF can result in a higher instance of permanent signals. A receiver off-hook will result in a permanent signal.

(b) With Coin-First operation a coin deposit in addition to a receiver off-hook is required to get a call into the permanent signal condition.

TABLE A

CODE SIGNIFICANCE

CODE	HOUSING	MODE OF OPERATION	DIAL
1A1	Box Type	Coin-First Only	Rotary
1A2			TOUCH-TONE
2A1	Panel Type		Rotary
2A2			TOUCH-TONE
1C1	Box Type	Coin-First or Dial-Tone-First	Rotary
1C2			TOUCH-TONE
2C1	Panel Type		Rotary
2C2			TOUCH-TONE
1D1	Box Type	Dial-Tone-First Only	Rotary
1D2			TOUCH-TONE
2D1	Panel Type		Rotary
2D2			TOUCH-TONE
1E1	Box Type	Post Pay	Rotary
1E3			None (Manual)

CHAPTER I

COIN STATIONS

1C/2C-TYPE COIN TELEPHONE SET
DETAILED DESCRIPTION

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1. GENERAL

1.01 The 1C/2C coin telephone set is capable of providing coin service in either Coin-First (CF) or Dial-Tone-First (DTF) systems. The set can be converted in the field from one mode of operation to the other.

Components in this set are designed to operate reliably in a temperature range between -20 degrees and +140 degrees Fahrenheit.

1.02 The 1C/2C set is available with rotary or TOUCH-TONE® dial.

1.03 Codes for the 1C- and 2C-type sets are described in Table A.

TABLE A

CODE SIGNIFICANCE

CODE	FIRST NO.	LETTER	SECOND NO.
1C1	Box Type	CF or DTF Mode (Convertible)	Rotary Dial
1C2			TOUCH-TONE Dial
2C1	Panel Type		Rotary Dial
2C2			TOUCH-TONE Dial

1.04 Abbreviations used in this section are as follows:

CF—Coin-First

DTF—Dial-Tone-First

TT—TOUCH-TONE Dial

DP—Dial Pulse

DON—Dial Off Normal

HT—Hopper Trigger

CR—Coin Relay

RE—Reset Electromagnet

CO—Central Office

TSPS—Traffic Service Position System

SH—Switchhook

SCR—Silicon Controlled Rectifier (voltage and current controlled electronic switching)

2. FUNCTIONS

Coin Chute (Fig. 1)

2.01 ***Nickel Operation—Valid Coin Accepted (Fig. 2).***

(1) Nickel is deposited in coin entrance and passes magnetic trap.

(2) Nickel continues and is checked for size and weight as the nickel separator rotates.

(3) Nickel is channeled into the nickel magnet area.

(4) The nickel magnet sets up an eddy current effect which slows its movement down the chute.

(5) The nickel continues on, falls toward the rear of the chute, strikes the nickel anvil, bounces over the nickel divider, and is accepted.

2.02 ***Nickel Operation—Coin Rejected (Fig. 2).***

(1) Light weight magnetic slugs or coins will be stopped by the magnetic trap.

(2) If the size or weight is incorrect, it will be stopped at various locations in the chute and must be retrieved by operation of the coin release mechanism.

(3) If the eddy current characteristics are incorrect, the bounce on the nickel anvil will cause the coin to be rejected.

2.03 ***Dime Operation—Valid Coin Accepted (Fig. 3).***

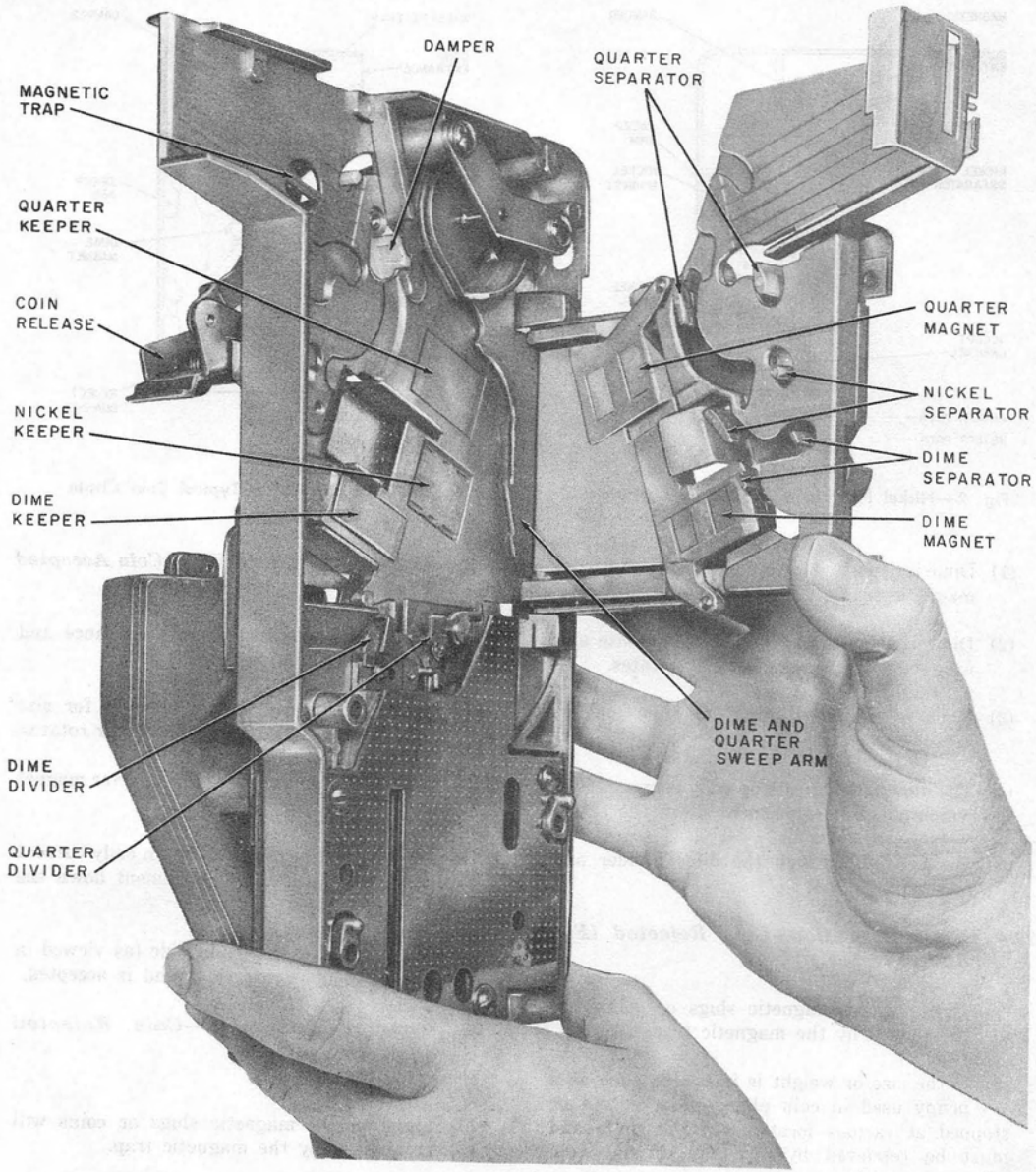


Fig. 1—Typical Coin Chute

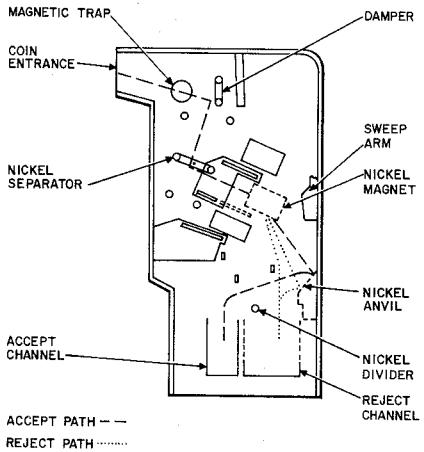


Fig. 2—Nickel Path in a Typical Coin Chute

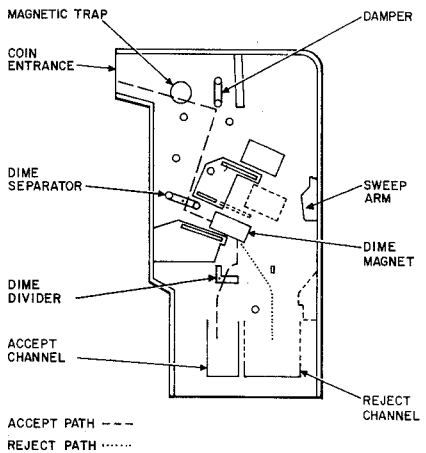


Fig. 3—Dime Path in a Typical Coin Chute

(1) Dime is deposited in coin entrance and passes magnetic trap.

(2) Dime continues and is checked for size and weight as the dime separator rotates.

(3) Dime is channeled into the dime magnet area.

(4) The dime magnet sets up eddy current effect which slows its movement down the chute.

(5) Dime drops through the dime divider and is accepted.

2.04 ***Dime Operation—Coin Rejected (Fig. 3).***

(1) Light weight magnetic slugs or coins will be stopped by the magnetic trap.

(2) If the size or weight is incorrect, such as a penny used in coin phone tests, it will be stopped at various locations in the chute and must be retrieved by operation of the coin release mechanism.

(3) If the eddy current characteristics are incorrect the dime magnet, with the aid of the divider, will reject the coin.

2.05 ***Quarter Operation—Valid Coin Accepted (Fig. 4).***

(1) Quarter is deposited in coin entrance and passes magnetic trap.

(2) Quarter continues and is checked for size and weight as the quarter separator rotates.

(3) Quarter is channeled into the quarter magnet area.

(4) The quarter magnet sets up an eddy current effect which slows its movement down the chute.

(5) Quarter strikes the right side (as viewed in Fig. 3) of quarter divider and is accepted.

2.06 ***Quarter Operation—Coin Rejected (Fig. 4).***

(1) Light weight magnetic slugs or coins will be stopped by the magnetic trap.

(2) If the size or weight is incorrect, it will be stopped at various locations in the chute and must be retrieved by operation of the coin release mechanism.

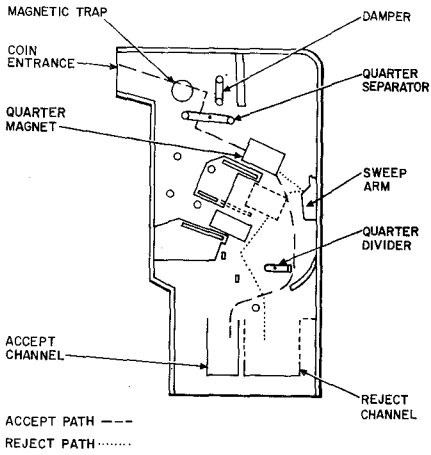


Fig. 4—Quarter Path in a Typical Coin Chute

(3) If the eddy current characteristics are incorrect, the bounce on the sweep arm will cause the coin to be rejected.

2.07 ***Coin Release Mechanism Operation.***

(1) The magnetic trap is withdrawn to release trapped magnetic material.

(2) The chute opens to release coins stopped at various locations.

(3) Sweep arms clear material from the coin magnet areas and direct stopped material to the reject channels.

Totalizer (Fig. 5)

2.08 The totalizer is an electromechanical device that has the ability to total initial rate deposits, prepare the set for calling, and signal coin denominations to the operator. Minimum loop current required to operate the totalizer reliably is 23 milliamps.

2.09 Accepted coins fall through the chute and strike totalizer arms, which project into the chute. Nickels and dimes strike the lower arm while quarters strike the upper arm. Arm deflection causes a ratchet wheel to rotate and operate a cam. Each cog on the ratchet wheel represents a 5-cent increment. The cam shaft is rotated 10 degrees by each nickel deposited, 20 degrees by each dime, and 50 degrees by each quarter.

2.10 The totalizer contains several components described as follows:

A. DTF Mode

(1) ***T1 (Initial Rate) Contacts.***

(a) Its normally open contacts, when operated, provide a path for the initial rate ground test.

(b) Its normally closed contacts allow totalizer to total deposits up to initial rate before reading out.

(2) ***T2 (Totalizer Off Normal) Contacts.***

(a) Operate (transfer) when any coin is deposited.

(b) The normally closed contacts short the totalizer during talking.

(c) The normally open contacts, when operated, provide a path through the speech network to allow totalizer to restore to normal when going on-hook.

(3) ***S (Stepping) Relay and its S1 Contacts.***

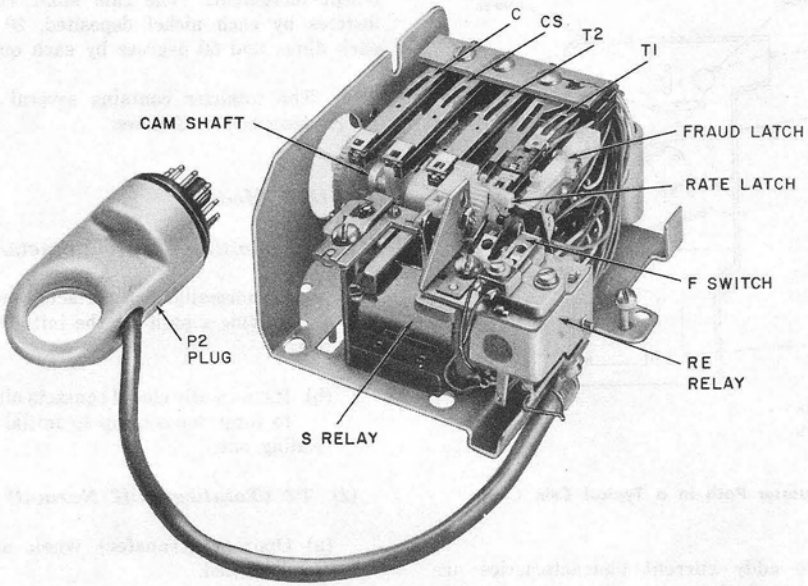
(a) The operating and releasing action of the S relay steps the totalizer back 10 degrees each time it operates.

(b) This action continues until T2 goes back to normal thus shorting the totalizer.

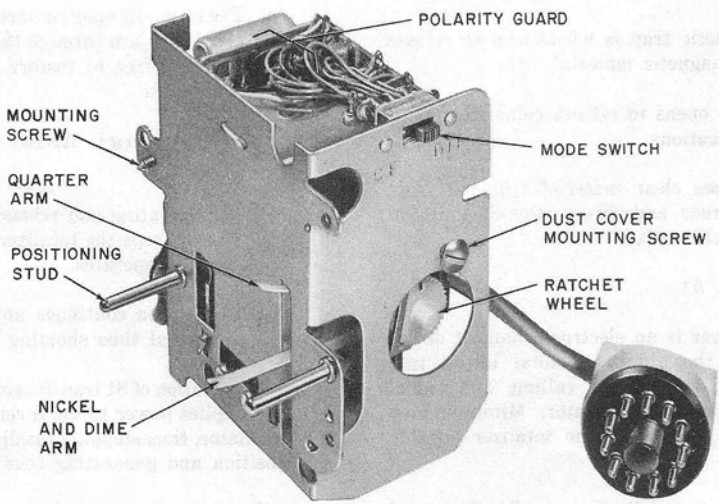
(c) Operation of S1 transfer contacts alternately applies power to the S relay and coin tone oscillator, thus stepping totalizer back to home position and generating coin signals.

(4) ***C (Coin Arm Off-Normal) Contacts.***

(a) On all coin deposits, the C contacts transfer to prevent the totalizer from stepping back while the coin arm is held down by a coin.



VIEW A



VIEW B

Fig. 5—1A Totalizer

(b) The normally closed C contacts, when opened, remove the current path from the S relay while the normally open contacts, when closed, connect a click suppression circuit.

(5) ***CS (Coin Signal Speed Changing) Contacts.***

(a) The CS contacts operate only on quarter deposits.

(b) The normally closed CS contacts open to allow more voltage across the S relay, thus providing a faster readout.

(c) The normally open CS contacts bypass the normally closed C contacts to allow the S relay coil to energize thereby allowing early totalizer response before the quarter arm returns to normal.

(6) ***RE (Reset Electromagnet).***

(a) The primary function of the RE relay is to reset the T1 contacts to normal on coin collect or refund pulses.

(b) When the initial rate is registered in the totalizer, the T1 contacts operate and the spring loaded rate latch engages holding T1 in its operated position.

(c) When the RE armature operates, it disengages the rate latch and T1 restores to normal.

(d) A second function of the RE relay is to control the F (fraud) switch.

(7) ***Antifraud Provisions (F Switch Contacts and FRAUD Latch).***

(a) Operation of the RE opens the F switch.

(b) The fraud latch drops down each time the totalizer goes off home position.

(c) If the RE operates while the fraud latch is down (totalizer off home position) the F switch will open and be held open by the fraud latch until the totalizer steps back to home position, thus preventing the possibility of fraudulently satisfying the initial rate ground check. This prevents calls from being made for less than initial rate.

(8) ***Polarity Guard:*** The polarity guard around the totalizer circuit allows it to operate on positive or negative battery.

B. CF Mode

(1) ***T1 (Initial Rate) Contacts.***

(a) The normally open contacts operate to close the ring lead and cause CO ground start when initial rate is deposited.

(b) The normally closed contacts open to remove dial short when initial rate is deposited.

(2) ***T2 (Totalizer Off-Normal) Contacts.***

(a) Operate (transfer) when any coin is deposited.

(b) The normally closed contacts short the totalizer during talking.

(c) The normally open contacts when operated, provide a path through the speech network to allow totalizer to restore to normal when going on-hook.

(3) ***S (Stepping) Relay and Its S1 Contacts.***

(a) The operating and releasing action of the S relay steps the totalizer back 10 degrees each time it operates.

(b) This action continues until T2 goes back to normal thus shorting the totalizer.

(c) Operation of S1 transfer contacts alternately applies power to the S relay and coin tone oscillator, thus stepping totalizer back to home position and generating coin signals.

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(a) On all coin deposits, the C contacts transfer to prevent the totalizer from stepping back while the coin arm is held down by a coin.

(b) The normally closed C contacts, when opened, remove the current path from the S relay; while the normally open contacts, when closed, connect a click suppression circuit.

(5) ***CS (Coin Signal Speed Changing) Contacts.***

(a) The CS contacts operate only on quarter deposits.

(b) The normally closed CS contacts open to allow more voltage across the S relay, thus providing a faster readout.

(c) The normally open CS contacts bypass the normally closed C contacts to allow the S relay coil to energize, thereby allowing early totalizer response before the quarter arm returns to normal.

(6) ***RE (Reset Electromagnet).***

(a) The primary function of the RE relay is to reset the T1 contacts to normal on coin collect or refund pulses.

(b) When the initial rate is registered in the totalizer, the T1 contacts operate and the spring loaded rate latch engages and holds T1 in its operated position.

(c) When the RE armature operates, it disengages the rate latch and T1 restores to normal.

(d) A second function of the RE relay is to control the F (fraud) switch.

(7) ***Antifraud Provision (F Switch Contacts and Fraud Latch).***

(a) The F switch provides no essential function in the CF mode.

(b) The fraud latch operates when totalizer is off normal and RE is operated, thus preventing fraudulent ground start.

(8) ***Polarity Guard:*** The polarity guard around the totalizer circuit allows it to operate on positive or negative battery.

2.11 Output characteristics of the totalizer are as follows:

(1) ***Tone Pulsing:***

(a) Fast readout (quarter only)—5 beep tones

(1) Pulsing rate—12-17 PPS

(b) Slow readout (nickel and dime only)

(1) Nickel—1 beep tone

(2) Dime—2 beep tone

(3) Pulsing rate—5-8.5 PPS

Coin Chassis (Fig. 6)

2.12 The coin chassis is a framework for mounting electrical components as follows:

(1) ***B Relay***—The B relay contacts close during totalizer readout and place a capacitor across the speech circuit to prevent the customer from hearing coin signals.

(2) ***Coin Signal Oscillator***—Generates a dual frequency signal, controlled by totalizer readout indicating to the operator what value of coin has been deposited.

(3) ***A Relay***—Provides ground lifting in DTF mode and controls totalizer readout in CF mode.

Dial and Housing Assembly (Fig. 7)

2.13 The dial and housing assembly contains the switchhook contacts and rotary or TOUCH-TONE dial. The switchhook contacts are operated as the handset is lifted. Contacts SH1, SH2, and SH4 perform the same functions in both CF and DTF modes. SH3 differs as described in (3).

(1) ***SH1***—When operated, SH1 connects the receiver in the speech circuit. The normally closed contacts (when handset is on hook) provide for insufficient deposit refund.

(2) ***SH2***—A mercury switch, connected in parallel with SH4, which prevents switchhook dialing in the CF mode.

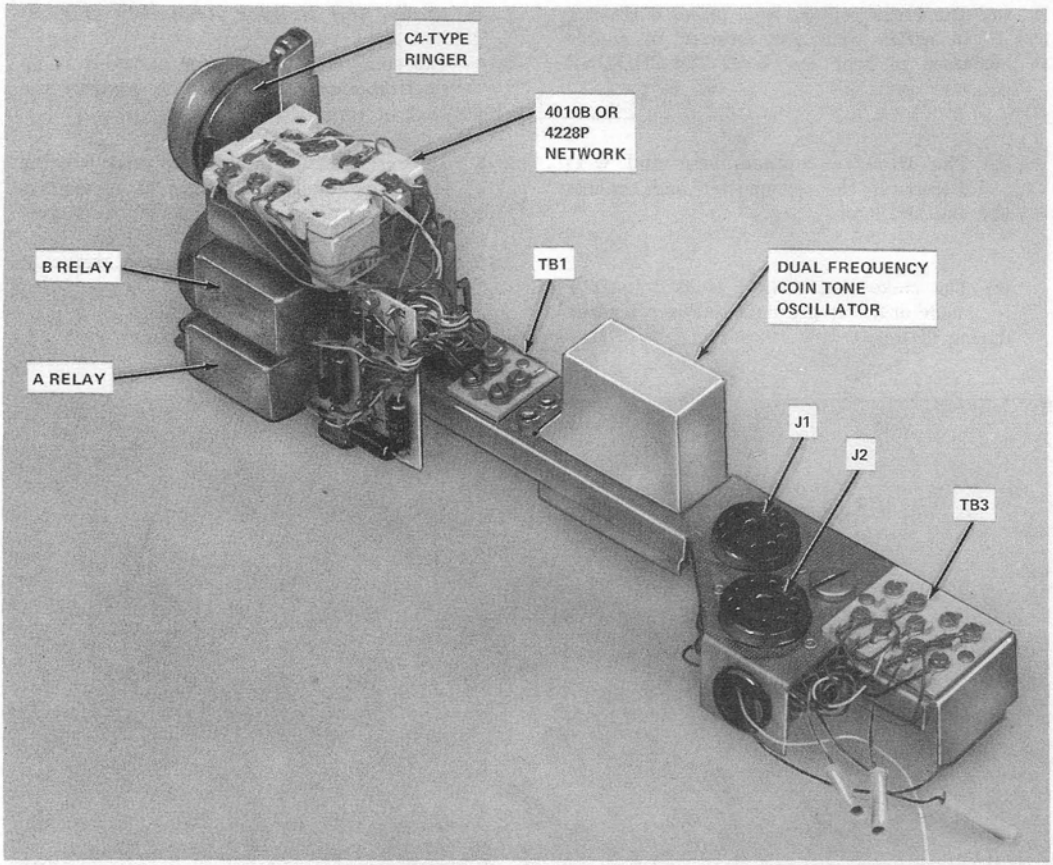


Fig. 6—31A Coin Chassis

(3) ***SH3***—In the DTF mode, its normally closed contacts, when operated, allow totalizer to total deposits up to initial rate before reading out. In CF mode (handset on hook), SH3 normally closed provides a short path to permit insufficient deposit refund.

(4) ***SH4***—Closes ring lead when operated.

(5) ***Rotary dial contacts.***

(a) DP—Dial pulsing contacts

(b) DON 1—Operates when dial is off normal. Shorts receiver to prevent acoustic shock.

(c) DON 2—Used in DTF mode only. Prevents totalizer readout during dialing.

(6) ***TOUCH-TONE dial common switch.***

Note: This procedure and Fig. 10 refer to a 35-type TOUCH-TONE dial. A 70-type dial is similar.

(a) The break contact (y-z) places a resistor in series with the receiver to enable customer to hear low level TOUCH-TONE signals.

(b) The transfer contacts (v-e and w-x) disconnect the transmitter and connect the dial oscillator.

(c) The make contact (s-t) is used in DTF mode only. It prevents totalizer readout during dialing.

Coin Relay and Hopper Assembly (Fig. 8)

2.14 The coin relay and hopper assembly is an electromechanical unit which controls the coin collect or coin refund function.

2.15 The resistance of the 1A coin relay winding is approximately 1020 ohms at 70 degrees Fahrenheit and is effected by temperature changes.

2.16 Operating Values of Coin Relays are:

- Operate current—41 milliamps

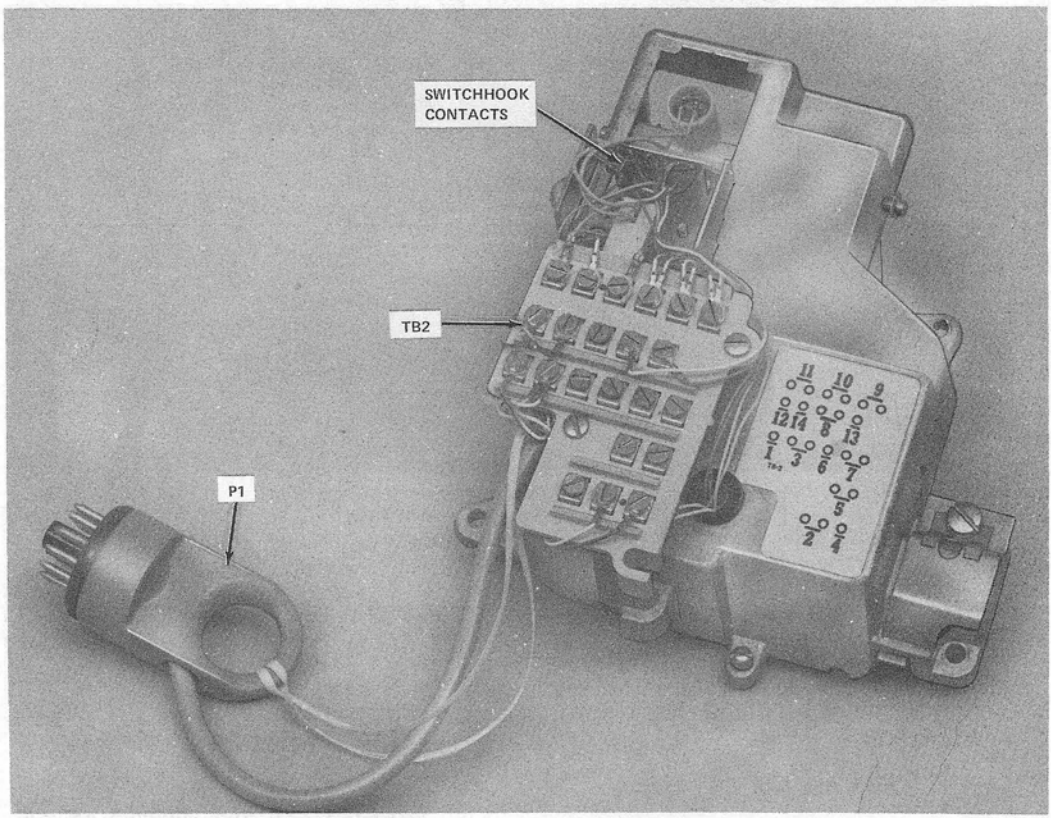


Fig. 7—Typical Coin Dial Unit

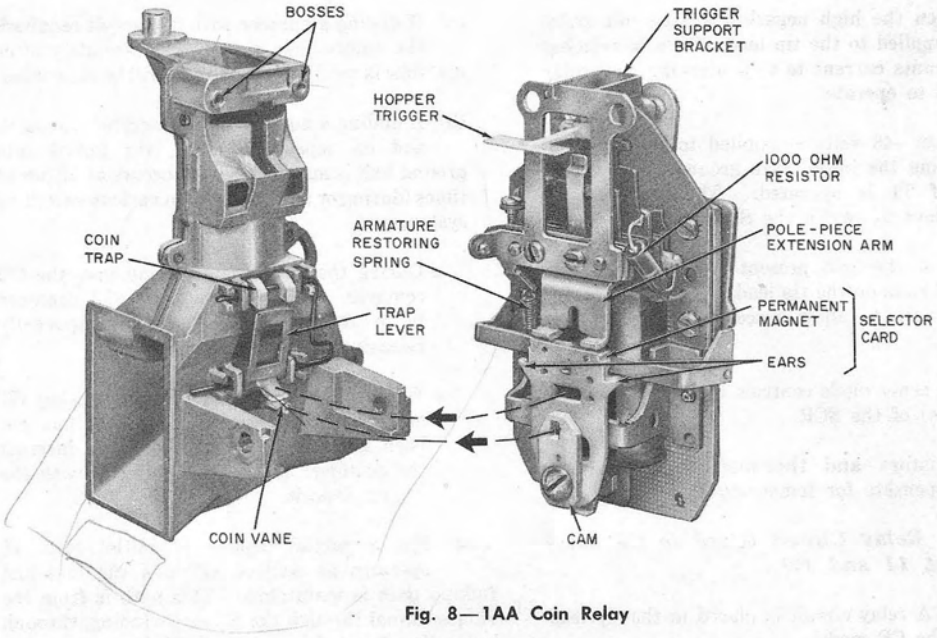


Fig. 8—1AA Coin Relay

- Nonoperate current—30 milliamps
- Operating time—450 ±50 milliseconds

2.17 Hopper trigger contacts (HT) are closed by the first coin deposited. All coins deposited are temporarily stored in the hopper, on the coin trap, until dumped when the coin relay operates.

2.18 The selector card is polarized to move to the right or left, depending on the polarity of the central office voltage applied. This mechanically operates the cam which in turn operates the coin vane in hopper to collect or refund coins.

2.19 Upon release of coin relay operating cycle, the HT and coin trap restore to normal.

Other Component Circuits (Fig. 9 through 12)

2.20 ***Speech Circuit:*** The speech circuit is a standard telephone speech network. The tip and ring connections are reversed with respect to the usual 500 set connections to guarantee a path from tip to ground that does not go through the transmitter. The ground connection is at the ac balance point of the network to reduce noise due to unbalance when the ground is connected.

2.21 ***Ground Lifting Circuit (Used in DTF only) (Fig. 9 and 10).***

(a) The ground lifting circuit is composed of the A relay, a polarity guard, and associated varistors, resistors, and capacitors. When loop current is flowing in the ring lead, the A relay operates to remove the ground connection at the station. Removal of ground at the station reduces noise unbalance.

(b) Capacitors outside the polarity guard lower the ac impedance and prevent transients induced by collect or refund pulses.

2.22 ***Coin Return Network (Used in DTF only) (Fig. 9 and 10).***

(a) The coin return network is composed of an SCR, a zener diode, and associated resistors, thermistor, and diode. The principle function of this circuit is to allow refund to occur if the T1 contact in the ground lead is open.

(b) When the high negative voltage coin pulse is applied to the tip lead, the SCR switches and permits current to flow allowing coin relay and RE to operate.

(c) When -48 volts is applied to the tip lead, during the initial rate ground test, current flows if T1 is operated. The -48 volts is insufficient to switch the SCR.

(d) When the coin present test is made with +48 volts on the tip lead, the diode bypasses the network to allow successful completion of the test.

(e) The zener diode controls the firing level (67 volts) of the SCR.

(f) Resistors and thermistor are used to compensate for temperature variation.

2.23 ***Tip Relay Circuit (Used in CF only) (Fig. 11 and 12).***

(a) The A relay circuit is placed in the tip lead in the CF mode.

(b) After initial rate deposit, and tip is grounded at the CO, the A relay operates and allows the totalizer to read out after each subsequent coin deposit.

3. THEORY OF OPERATION

DIAL-TONE-FIRST SERVICE (Fig. 9 and 10)

Originating a Call

3.01 In DTF service, the central office line relay is wired for loop start (ring -48 volts; tip grounded).

3.02 When the handset is lifted, switchhook contacts SH3, SH2 and SH4, and SH1 operate in that order and loop current flows from the ring lead to tip. This path is through the A relay winding, the normally closed T2 contact, the operated SH1 and SH4 contacts, through the speech network to tip. Current through this path operates the CO line relay and the A relay to remove station ground. Dial tone is received.

3.03 ***Dialing With No Deposit Made.***

(a) If dialing a number with no deposit required, the number can be dialed immediately after dial tone is received and the call will be forwarded.

(b) If dialing a number which requires a deposit, and no deposit is made, the initial rate ground test is made. This test occurs at different times (during or after dialing) in various switching systems.

- During the initial rate ground test, the CO removes -48 volts from ring and connects it to tip, (ring open) thus temporarily releasing the A relay.
- When no ground is detected (indicating HT or T1 open), the initial rate test has not been satisfied and a recording will instruct the customer to reinitiate his call with the proper deposit.

3.04 For a partial deposit of initial rate, T2 operates as well as HT and the dial and talking path is maintained. This path is from the ring terminal through the A relay winding, through normally closed T1, operated SH3 contacts, DP contacts (rotary dial only), operated SH2 and SH4 contacts, through the speech network, transmitter, normally closed v-e contacts (TOUCH-TONE dial only), back through the speech network to tip.

3.05 Upon deposit of initial rate, T1 operates, removing the short from totalizer and B relay winding. This allows B relay to operate and current flow to the totalizer and coin signal oscillator. A path now exists from the ring terminal through the A relay winding, B relay winding, S (stepping) relay winding, C and S1 totalizer contacts, through DP contacts (rotary dial only), operated SH2 and SH4 contacts, through the speech network and transmitter, normally closed v-e contacts (TOUCH-TONE dial only), back through the speech network to tip. As S1 transfers and the totalizer reads out, the coin tone oscillator is energized intermittently. The operated B relay bypasses the speech circuit.

3.06 When the totalizer steps back to home, T2 restores, shorting the totalizer and B relay winding. The B relay releases, removing the AC short across the speech network. Even though the totalizer is returned to home position, T1 contact remains operated because it is mechanically latched in its transfered position.

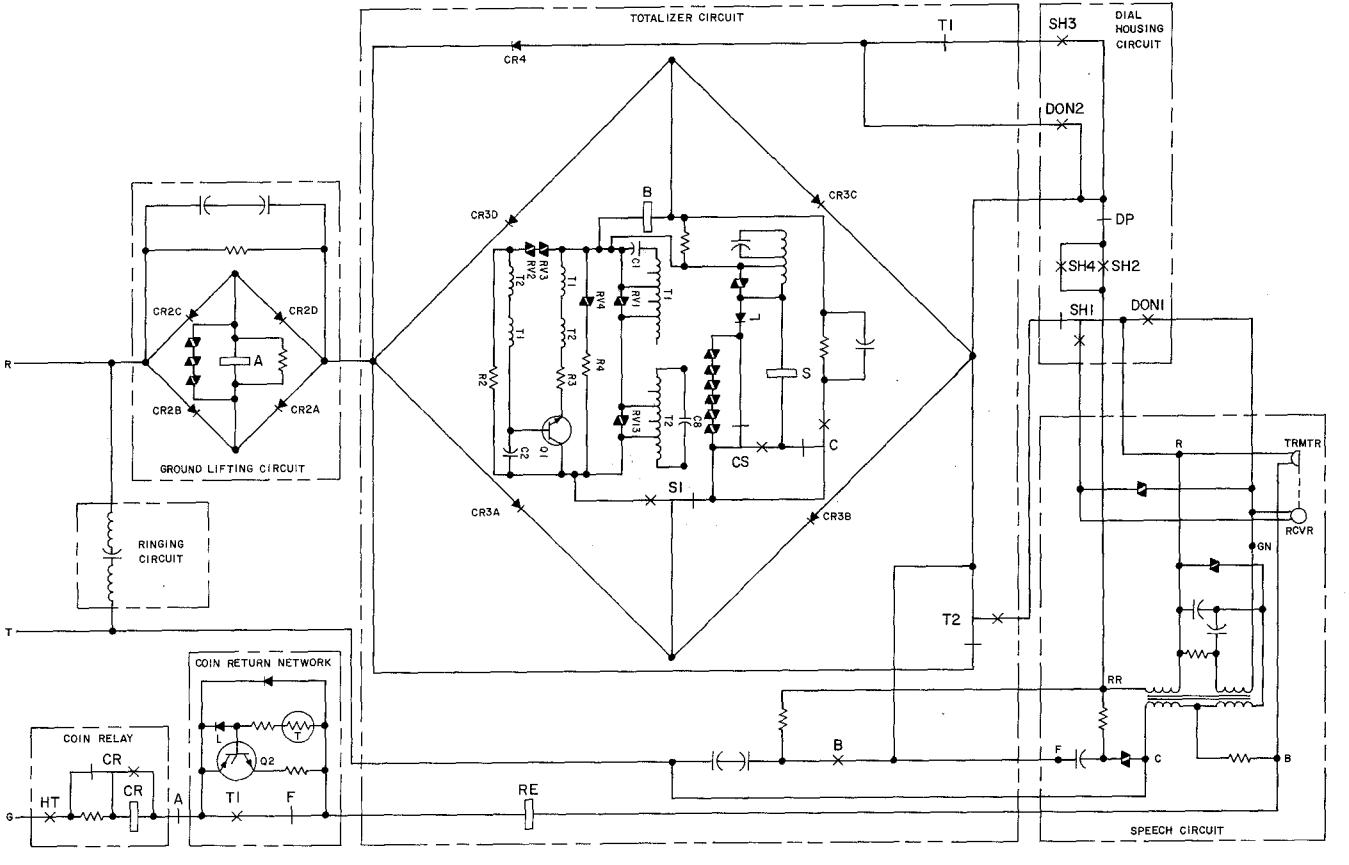


Fig. 9—1C1/2C1 Coin Telephone Set—Schematic (DTF Mode)

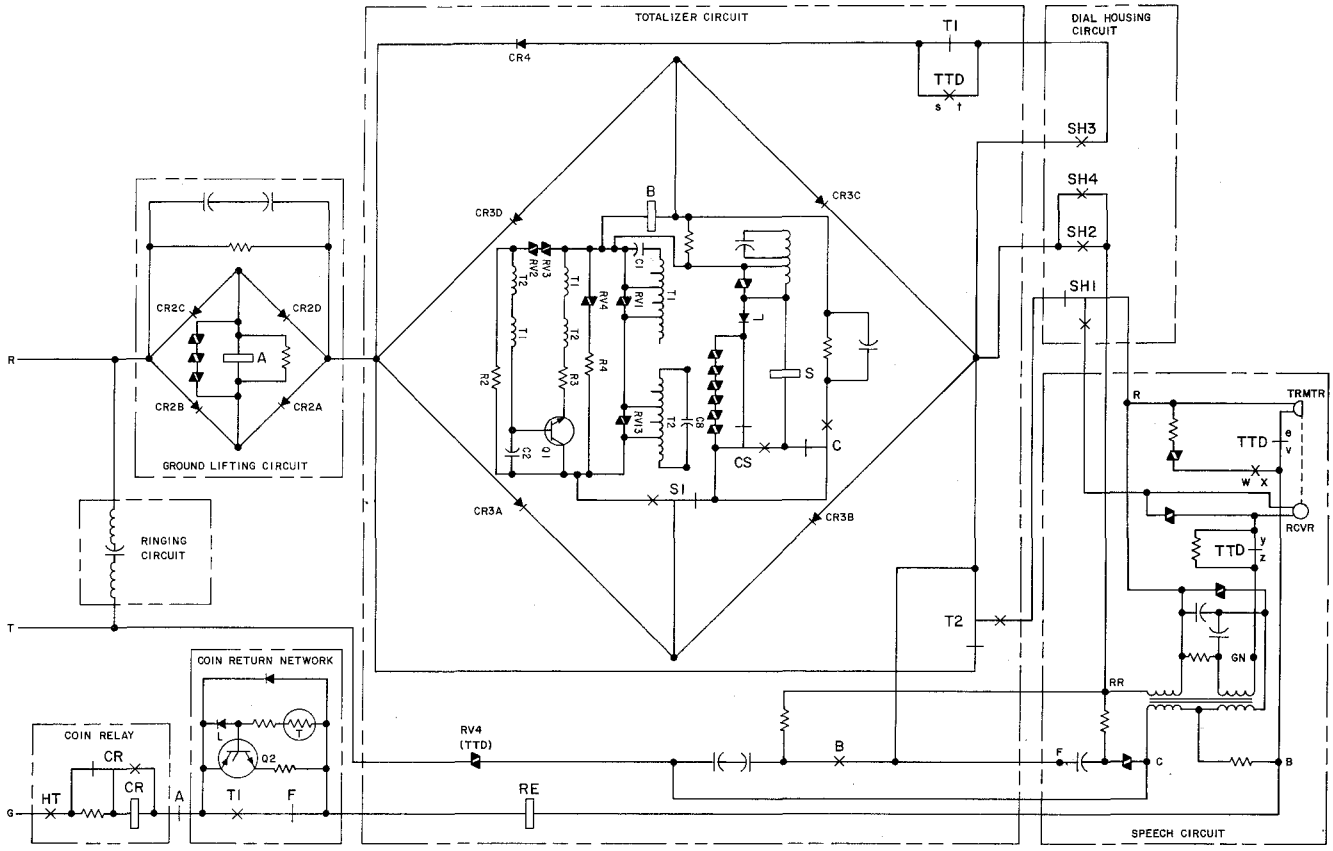


Fig. 10—1C2/2C2 Coin Telephone Set—Schematic (DTF Mode)

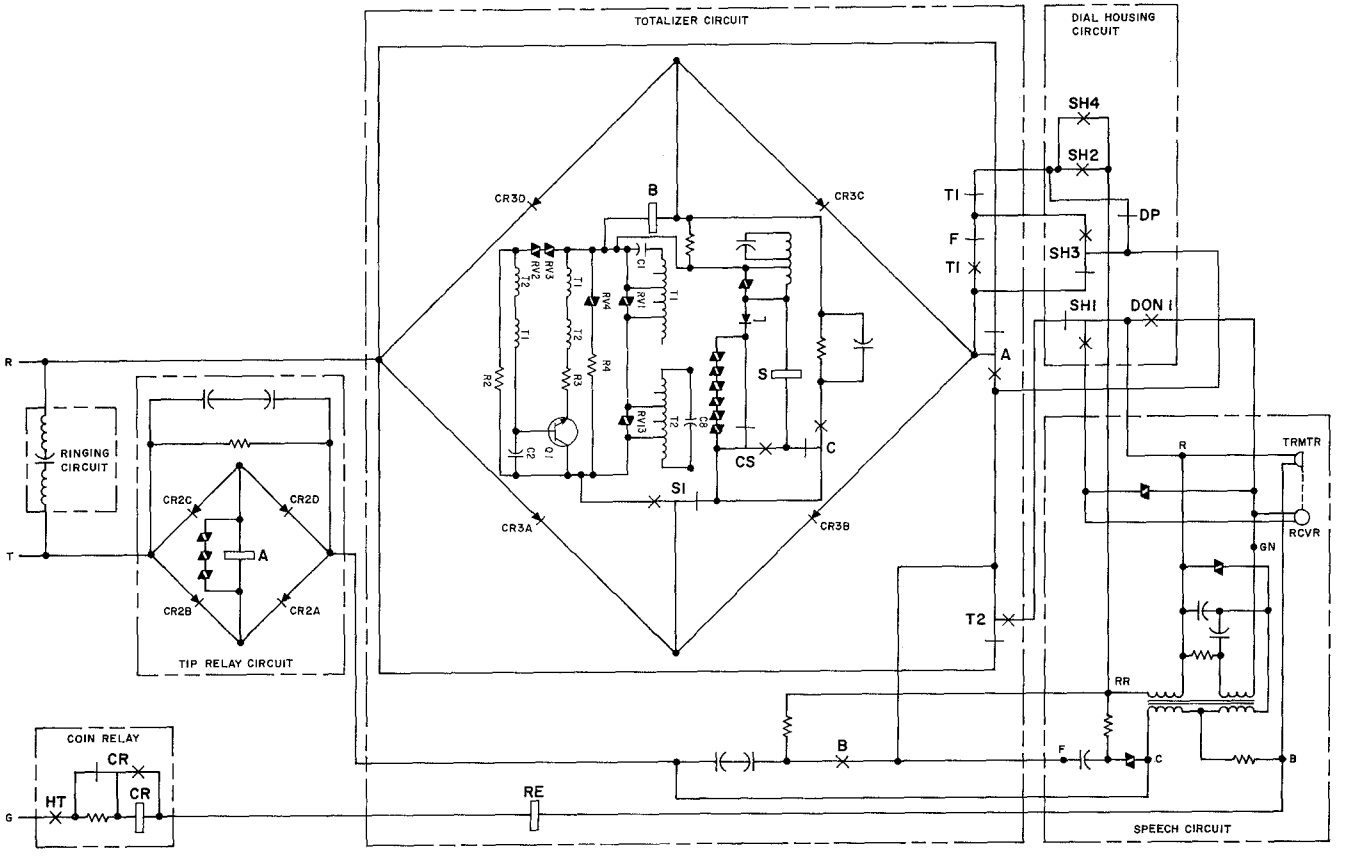


Fig. 11—1C1/2C1 Coin Telephone Set—Schematic (CF Mode)

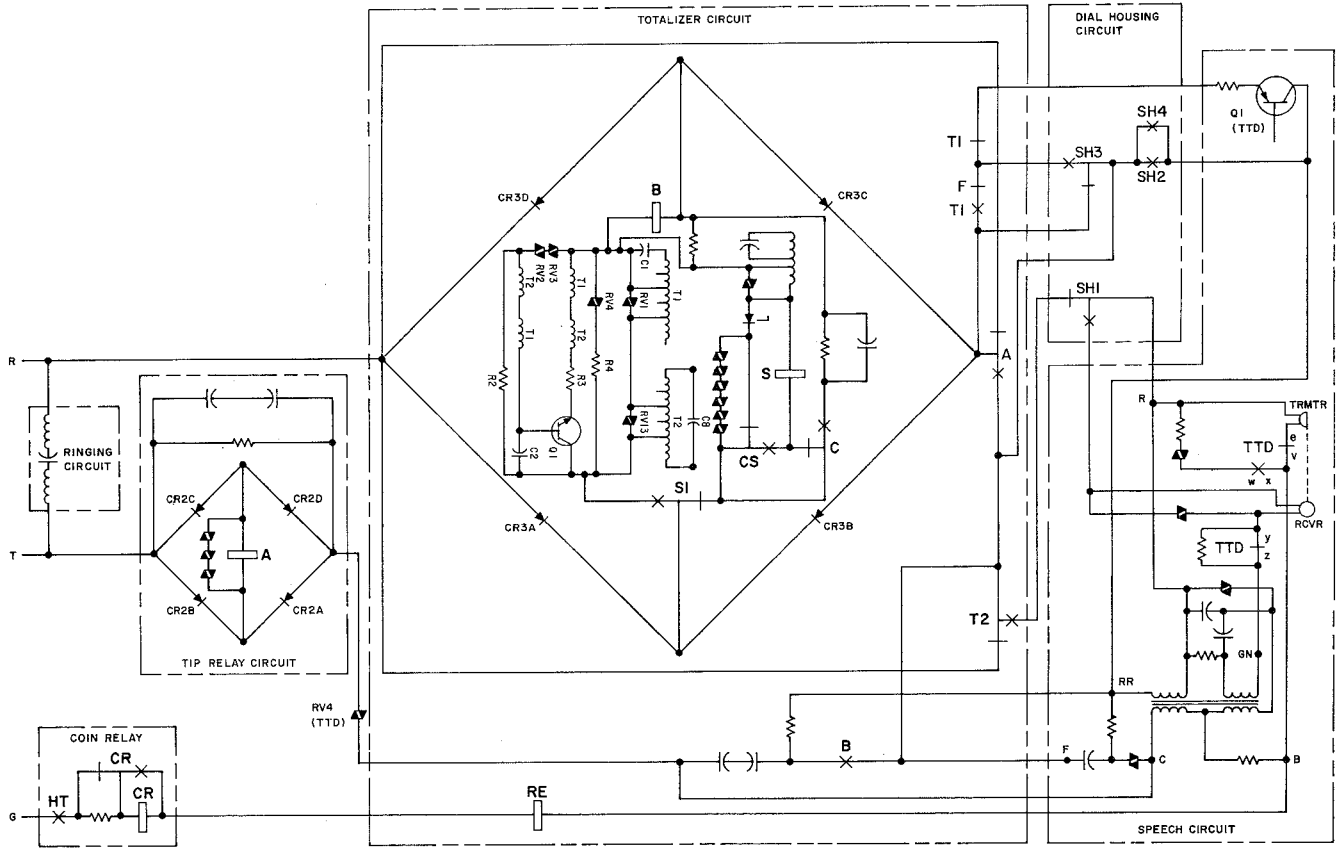


Fig. 12—1C2/2C2 Coin Telephone Set—Schematic (CF Mode)

3.07 A dialing and talking path now exists from the ring lead to tip. This path is through the A relay winding, normally closed T2 contacts, normally closed DP contacts (rotary dial only) operated SH2 and SH4, the speech network, transmitter, normally closed v-e contacts (TOUCH-TONE dial only) back through the speech network to tip.

3.08 With a rotary dial, the dial-off-normal contacts short out the receiver during dialing.

3.09 With a TOUCH-TONE dial, v-e contacts open while w-x contacts close during dialing, thus removing the transmitter from the speech network. Also the y-z contacts open, removing the shunt across the level limiting resistor to reduce oscillator sidetone in the receiver.

Restoring Set to Standby

3.10 Upon completion of call, customer hangs up handset, SH contacts restore, and the A relay releases. CO removes -48 volts from ring, ground from tip, and a collect (+130 volts) or refund (-130 volts) pulse is applied to tip, operating the coin relay and reset electromagnet (RE).

3.11 Operation of coin relay collects or refunds coin(s), and operation of RE unlatches totalizer contact T1.

3.12 The operated coin relay closes its make contact causing the current to bypass the relay and flow through the resistor which was previously shorted. The short across the relay winding causes the relay to be slow release. The resistor, having approximately the same resistance as the coin relay winding, is placed in the circuit to protect relay contacts in the CO and HT contacts in the set.

3.13 As the coin relay releases, the HT contacts open, placing the coin phone in its idle or standby condition.

Call Abandoned

3.14 ***Partial Initial Rate Deposited (3.04).***

(a) Upon hanging up handset, SH contacts restore. When SH3 restores, the short around the totalizer is removed and current flows through the A relay winding, polarity guard, B relay winding, S relay winding, C and S1 contacts, operated T2, normally closed SH1, and the speech network to tip.

(b) Operation and release action of the S relay causes the totalizer to step back to its home position.

(c) When the totalizer has been stepped to home, T2 contact restores, shorting the totalizer and opening the telephone circuit. Shorting the totalizer releases the B relay. Opening the circuit releases the A relay. Both relays restore to normal.

(d) The CO, detecting the open circuit, applies -130 volts return battery to tip side of line to return the deposit. This causes the coin relay and RE to operate.

(e) As the coin relay releases, HT opens, placing set in its idle or standby condition.

3.15 ***Initial Rate Deposited (3.05).***

(a) Upon hanging up handset, SH contacts restore and A relay releases. CO removes -48 volts from ring, ground from tip, and a refund (-130 volts) pulse is applied to tip, operating the coin relay and RE, thus releasing T1.

(b) As the coin relay releases, HT opens, placing set in its idle or standby condition.

Nickel Local Overtime

3.16 After the called party answers, the CO initiates timing.

3.17 When the initial talk period has ended, collect voltage is applied and the initial deposit is collected.

3.18 After approximately a 30 second interval, a coin supervisory control circuit is connected to the line.

3.19 If a nickel is deposited, T2 and HT in the coin station operate, the CO reverses battery on the line (applies +48 volts with tip grounded) for approximately 600 milliseconds and the totalizer reads out. When totalizer reads out, T2 reverts to normal.

3.20 With T2 in its normal position, CO applies +48 volts to tip, with ring open, to check for coin presence. If test is satisfied, conversation may continue.

3.21 If a nickel is not deposited, a recording is connected to the line and requests overtime deposit.

- After 30 seconds, an additional coin presence test is made. If a coin is not deposited, the call is terminated.

Coin Disposal Test

3.22 Immediately after collect or return voltage is applied following customer disconnect, the CO makes a coin disposal test by applying +48 volts to the tip side of the line with ring open.

3.23 If no coin ground is detected, the HT contacts are open and the test is satisfied. If ground is detected, the HT contacts are still closed, indicating a failure to dispose of coin.

3.24 If ground was detected in 3.23, the CO again applies collect or return voltage and repeats test. If this second test fails, an alarm condition is indicated at the CO for corrective action.

Toll Call

3.25 Originate a call as in 3.01, 3.02, and 3.03.

3.26 After the number is dialed, the CO automatically applies return voltage and any previous coin deposit is returned.

3.27 The call is then connected to either a TSPS trunk or to a cord switchboard operator trunk.

3.28 ***If the call is connected to a TSPS.***

(1) A TSPS operator is automatically connected to the calling party.

(2) The local office TSPS trunk applies +48 volt battery on the ring side of the line toward the station. This replaces the normal -48-volt talk battery on the line which removes the short across the totalizer (positive battery blocked by CR4).

Note: If multiwink signaling (or equivalent) is provided, +48-volt battery is provided only when an operator is attached.

(3) The TSPS operator requests the deposit required for initial talk period as displayed on the position, then monitors the coin tones for correct deposit and releases the position from that call.

(4) After the called party answers, the TSPS trunk times the call and at the end of the initial charge period causes the CO to collect the initial deposit and routes the call to an idle TSPS position. (This may not be the same position as before.)

(5) The operator is connected to the call and instructs the customer to signal when through. The position is released and the TSPS trunk continues to time the call automatically.

(6) When the customer flashes the switchhook at the end of the call, an idle TSPS position is connected. The operator requests coin deposit in amount displayed at the position, monitors the coin tone signals for correct deposit, collects the deposit, and releases the position.

(7) The customer hangs up handset. If the operator fails to collect the deposit it is automatically collected and a coin disposal test is made. The station is now idle and ready for another call.

3.29 ***If the call is connected to a cord switchboard operator.***

(1) A +48-volt battery is applied to the ring side of the line toward the station.

(2) The operator requests the deposit required for initial period, monitors the coin tone signals for correct deposit and forwards the call.

(3) The operator times the call, and at the end of the initial period, collects the deposit, and instructs the customer to signal when through.

(4) When the customer flashes the switchhook at the end of the call, the operator determines the overtime charge, and requests a coin deposit in the amount of the overtime charge. The

operator monitors the coin tone signals for correct deposit, collects the deposit, then disconnects.

(5) The customer hangs up handset and the station is now idle and ready for another call.

Incoming Call

3.30 The CO applies ringing over tip and ring to the station.

Note: Incoming ***collect*** calls cannot be received when the ring to tip talk battery is negative since the totalizer is shorted by SH3, T1, and CR4 or when an operator is not available to handle the call.

3.31 When the handset is lifted, ringing is shorted which trips a relay in the CO thus removing ring battery from the line. The shorting path is from ring, through the A relay winding, normally closed T2, DP contacts (rotary dial only), operated SH2 and SH4 contacts, through the speech network to tip.

3.32 The CO now applies talk battery to ring and ground to tip.

COIN FIRST SERVICE (Fig. 11 and 12)

Originating A Call

3.33 In CF service, the central office is monitoring the ring to ground path (ring -48 volts, tip open).

3.34 When the handset is lifted, switchhook contacts SH3, SH2 and SH4, and SH1 operate in that order and a path exists from ring to the HT contacts. This path is through the normally closed T2 contacts, the DP contacts (rotary dial only), operated SH2 and SH4, through the speech network, transmitter, v-e contacts (TOUCH-TONE dial only), RE, coin relay winding to the normally open HT.

3.35 For a partial deposit of initial rate, T2 operates as well as HT.

3.36 Upon deposit of initial rate, T1 operates, thereby closing the normally open T1 contact, completing the ring to ground path. This path is from ring through the normally closed A relay contact, through operated T1 contacts, F contacts, operated SH3, DP contacts (rotary dial only), operated SH2 and SH4, through the speech network, transmitter, normally closed v-e contacts (TOUCH-TONE dial only), RE, coin relay, HT contacts, to ground.

3.37 The CO applies dial tone and grounds the tip side of the line.

3.38 Grounding the tip operates the A relay causing the A contacts to transfer. Opening the normally closed A contact removes the shorting path from the totalizer. A path now exists through the B relay winding, S (stepping) relay winding, C and S1 totalizer contacts, through operated T1, normally closed F contacts, operated SH3, DP contacts (rotary dial only), operated SH2 and SH4, through the speech network, transmitter, normally closed v-e contacts (TOUCH-TONE dial only), back through the speech network, through the A relay winding to tip. As S1 transfers and the totalizer reads out, the coin tone oscillator is energized intermittently. The operated B relay shorts the speech circuit so the customer cannot hear the generated beep tones.

3.39 When the totalizer steps back to home position, T2 restores, shorting the totalizer and B relay winding. The B relay releases, removing the AC short across the speech network. Even though the totalizer is returned to home position, T1 contact remains operated because it is mechanically latched in its transferred position.

3.40 A dialing and talking path now exists from the ring lead to tip. This path is through the normally closed T2 contacts, normally closed DP contacts (rotary dial only) operated SH2 and SH4, the speech network, transmitter, normally closed v-e contacts (TOUCH-TONE dial only) back through the speech network, through the A relay to tip.

3.41 When dialing with a rotary dial, the dial-off-normal contacts short out the receiver.

3.42 When dialing with a TOUCH-TONE dial, v-e contacts open while w-x contacts close, thus removing the transmitter from the speech network. Also, the y-z contacts open, removing the shunt across the level limiting resistor to reduce oscillator sidetone in the receiver.

Note: If the call is a local noncharge call, the deposit will be returned upon completion of call as described in 3.43.

Restoring Set to Standby

3.43 Upon completion of call, customer hangs up handset, SH contacts restore, and the A relay releases. CO removes -48 volts from ring, ground from tip, and a collect (+130 volts) or refund (-130 volts) pulse is applied to tip, operating the coin relay and reset electromagnet (RE).

3.44 Operation of coin relay collects or refunds coin(s), and operation of RE unlatches totalizer contact T1.

3.45 The operated coin relay closes its make contact causing the current to bypass the relay and flow through the resistor which was previously shorted. The short across the relay winding causes the relay to be slow release. The resistor, having approximately the same resistance as the coin relay winding, is placed in the circuit to protect relay contacts in the CO and HT contacts in the set.

3.46 As the coin relay releases, the HT contacts open, placing the coin phone in its idle or standby condition.

Call Abandoned

3.47 ***Partial Initial Rate Deposited (3.35).***

(a) Upon hanging up handset, SH contacts restore and current flows from ring to station ground through the normally closed A contact, normally closed SH3, operated T2, normally closed SH1, the transmitter v-e contacts (TOUCH-TONE dial only) RE, coin relay and HT.

(b) The CO recognizing the ground, applies ground to tip which operates the A relay and removes the short ground around the totalizer.

(c) Current now flows through the polarity guard, B relay winding, S relay winding, C and S1 contacts operated T2, normally closed SH1, the speech network, and the A relay winding to tip.

(d) Operation and release action of the S relay causes the totalizer to operate and step back to home.

(e) When the totalizer has been stepped back to home, T2 contact restores, shorting the totalizer and opening the telephone circuit. Shorting the totalizer releases the B relay. Opening the circuit releases the A relay. Both relays restore to normal.

(f) The CO, detecting the open circuit, applies -130 volts return battery to tip side of line to return the deposit. This causes the coin relay and RE to operate.

(g) As the coin relay releases, HT opens, placing set in idle or standby condition.

3.48 ***Initial Rate Deposited (3.36).***

(a) Upon hanging up handset, SH contacts restore and A relay releases. CO removes -48 volts from ring, ground from tip, and a refund (-130 volts) pulse is applied to tip, operating the coin relay and reset electromagnet (RE).

(b) As the coin relay releases, HT opens, placing set in idle or standby condition.

Nickel Local Overtime

3.49 After the called party answers, the CO initiates timing.

3.50 When the initial talk period has ended, collect voltage is applied and the initial deposit is collected.

3.51 After an approximate 30 second interval, a coin supervisory control circuit is connected to the line.

3.52 If a nickel is deposited, T2 and HT in the coin station operate, the CO reverses battery on the line (applies +48 volts with tip grounded) for approximately 600 milliseconds and the totalizer reads out. When totalizer reads out, T2 reverts to normal.

3.53 With T2 in its normal position, CO applies -48 volts to tip, with ring open, to check for coin presence. If test is satisfied, conversation may continue.

3.54 If a nickel is not deposited, a recording is connected to the line to request an overtime deposit.

- After 30 seconds, an additional coin presence test is made. If a coin is not deposited, the call is terminated.

Coin Disposal-Test

3.55 Immediately after collect or return voltage is applied following customer disconnect, the CO makes a coin disposal test by applying +48 volts to the tip side of the line with ring open.

3.56 If no coin ground is detected, the HT contacts are open and the test is satisfied. If ground is detected, the HT contacts are still closed, indicating a failure to dispose of coin.

3.57 If ground was detected in 3.56, the CO again applies collect or return voltage and repeats test. If this second test fails, an alarm condition is indicated at the CO for corrective action.

Toll Call

3.58 ***Coin-First Station—Coin-First Office.***

(1) Originate a call as in 3.33 through 3.40.

(2) After the number is dialed, the CO automatically applies return voltage and the deposit is returned.

(3) The call is then connected to either a TSPS trunk or to a cord switchboard operator trunk.

(4) ***If the call is connected to a TSPS.***

(a) A TSPS operator is automatically connected to the calling party.

(b) The TSPS operator requests the deposit required for initial talk period as displayed at the position, then monitors the coin tone signals for correct deposit and releases the position from that call.

(c) After the called party answers, the TSPS trunk times the call and at the end of the initial charge period causes the CO to collect the initial deposit and routes the call to an idle TSPS position. (This may not be the same position as before.)

(d) The operator is connected to the call and instructs the customer to signal when through. The position is released and the TSPS trunk continues to time the call automatically.

(e) When the customer flashes the switchhook at the end of the call, an idle TSPS position is connected. The operator requests a deposit in the amount displayed at the position, monitors the coin tone signals for correct deposit, collects the deposit, and releases the position.

(f) The customer hangs up handset. If the operator fails to collect the deposit, it is automatically collected and a coin disposal test is made. The station is now idle and ready for another call.

(5) ***If the call is connected to a cord switchboard operator:***

(a) The operator requests the deposit required for initial period, monitors the coin tone, signals for correct deposit and forwards the call.

(b) The operator times the call, and at the end of the initial period collects the deposit, and instructs the customer to signal when through.

(c) When the customer flashes the switchhook at the end of the call, the operator determines the overtime charge required, and requests a coin deposit in the amount of the overtime charge. The operator monitors the coin tone signals for correct deposit, collects the deposit, then disconnects.

(d) The customer hangs up handset and the station is restored to the idle state and ready for another call.

3.59 ***Coin-First Station (C Series Station Only)—Coin-First/Dial-Tone-First Office***

(1) Originate a call as in 3.33 through 3.40.

(2) After the number is dialed, the CO automatically applies return voltage and any previous deposit is returned.

(3) The call is then connected to either a TSPS trunk or to a cord switchboard operator trunk.

(4) ***If the call is connected to a TSPS.***

(a) A TSPS operator is automatically connected to the calling party.

(b) The local office TSPS trunk applies +48-volt battery on the ring side of the line toward the station. This replaces the normal -48-volt talk battery on the line.

Note: The +48 volts has no effect in the operation of a coin first station, but in a combination office (CF/DTF), this feature is necessary to operate a DTF station which has a diode (CR4) around the totalizer.

(c) The TSPS operator requests the deposit required for initial talk period as displayed at the position, then monitors the coin tone signals for correct deposit and releases the position from that call.

(d) After the called party answers, the TSPS trunk times the call and at the end of the initial charge period causes the CO to collect the initial deposit and routes the call to an idle TSPS position. (This may not be the same position as before.)

(e) The operator is connected to the call and instructs the customer to signal when through. The position is released and the TSPS trunk continues to time the call automatically.

(f) When the customer flashes the switchhook at the end of the call, an idle TSPS position is connected. The operator requests coin deposit in amount displayed at the position, monitors the coin tone signals for correct deposit, collects the deposit, and releases the position. The deposit is automatically collected upon position release.

(g) The customer hangs up handset. If the operator fails to collect the deposit it is automatically collected and a coin disposal test is made. The station is now idle and ready for another call.

(5) ***If the call is connected to a cord switchboard operator.***

(a) The +48-volt battery is applied to the ring side of the line toward the station.

Note: Refer to note following (4)(b).

(b) The operator requests the deposit required for initial period, monitors the coin tone signals for correct deposit, and forwards the call.

(c) The operator times the call, and at the end of the initial period, collects the deposit, and instructs the customer to signal when through.

(d) When the customer flashes the switchhook at the end of the call, the operator determines the overtime charge, and requests a coin deposit in the amount of overtime charge. The operator monitors the coin tone signals for correct deposit, collects the deposit, then disconnects.

(e) The customer hangs up handset and the station is restored to the idle state and ready for another call.

Incoming Call

3.60 The CO applies ringing over tip and ring to the station.

3.61 When the handset is lifted, ringing is shorted which trips a relay in the CO thus removing ring battery from the line. The shorting path is from ring, through the normally closed T2 contacts, DP contacts (rotary dial only), operated SH2 and SH4 contacts, through the speech network, through the A relay winding, to tip.

3.62 The CO now applies talk battery to ring and ground to tip.

4. SEQUENCE CHARTS

4.01 The following is an alphabetical listing of Sequence Charts:

A—Local Call (DTF), Deposit Required

B—Local Call (DTF), No Deposit Required

C—Call Abandoned, Insufficient Deposit Refund (DTF)

D—Call Abandoned, Initial Rate Deposited (DTF)

E—Nickel Local Overtime (CF and DTF)

F—Coin Disposal Test (CF and DTF)

G—Toll Call (DTF)

H—Incoming Call (CF or DTF)

I—Local Charge Call (CF)

J—Local Non-Charge Call (CF)

K—Call Abandoned, Insufficient Deposit Refund (CF)

L—Call Abandoned, Initial Rate Deposited, No Dial Tone (CF)

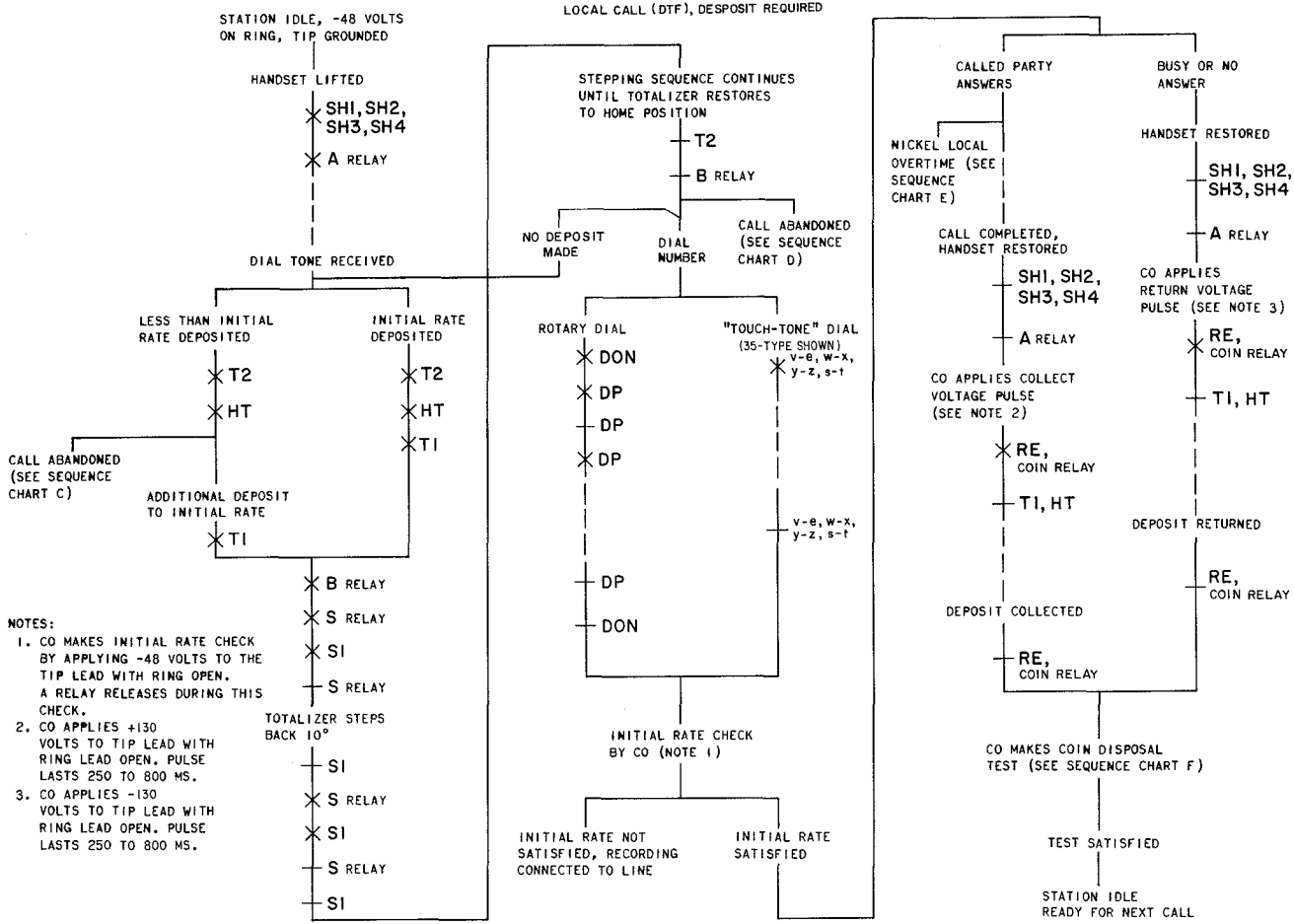
M—Call Abandoned, Initial Rate Deposited, Dial Tone Received (CF)

N—Toll Call—CF Station, CF Office

O—Toll Call—CF Station, CF/DTF Office

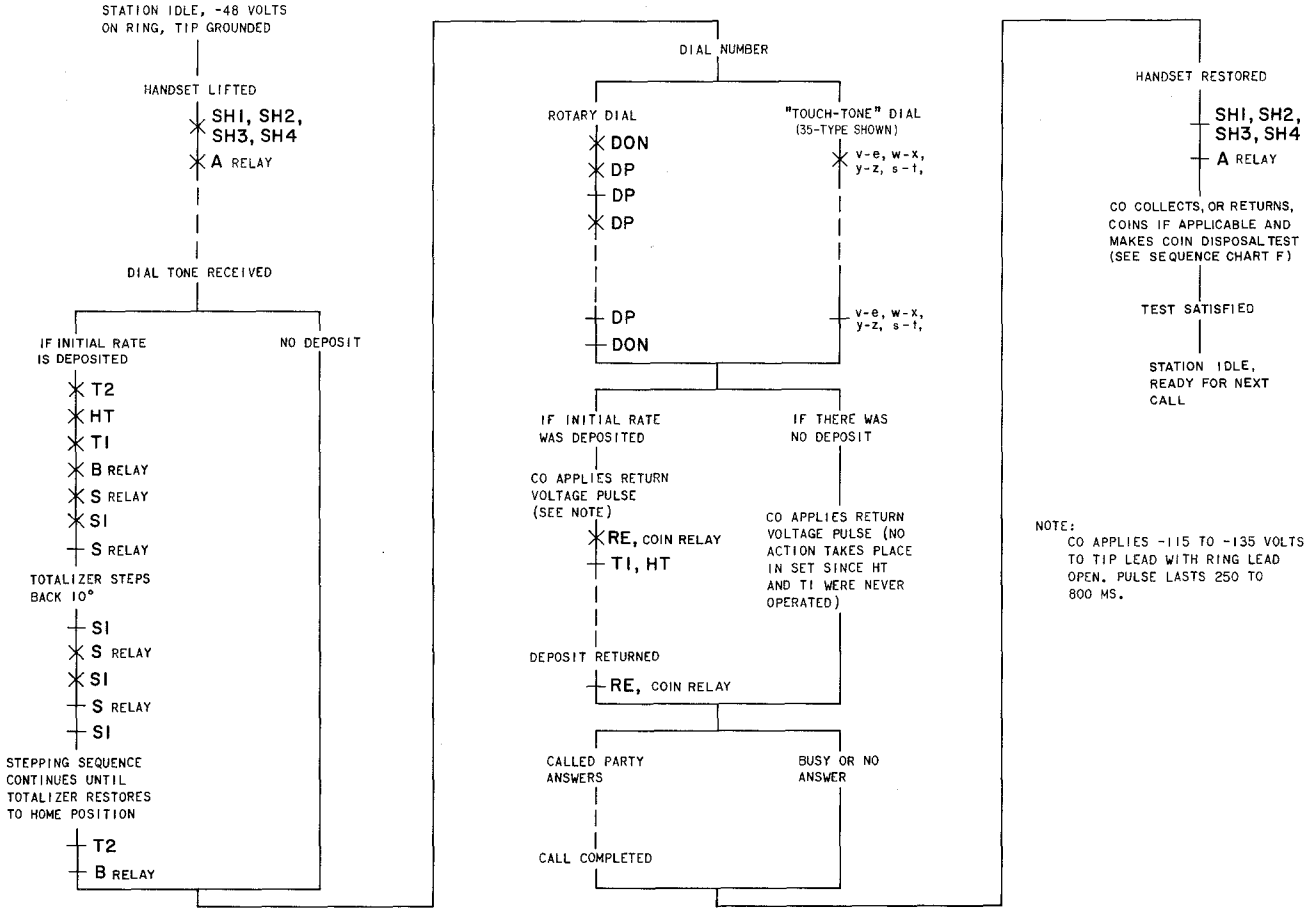
SEQUENCE CHART A

LOCAL CALL (DTF), DESPOSIT REQUIRED



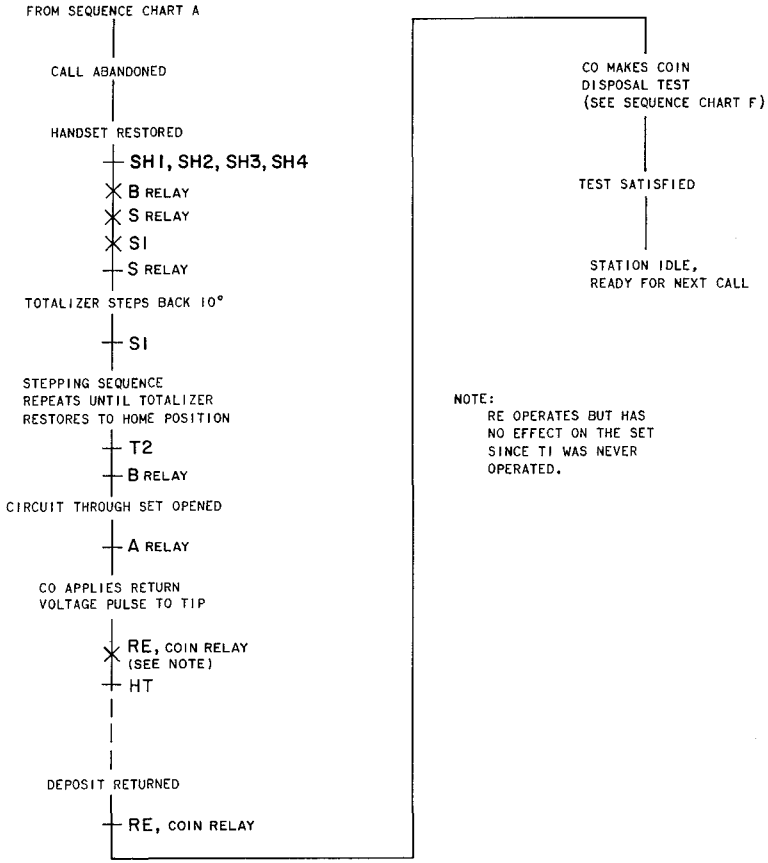
SEQUENCE CHART B

LOCAL CALL (DTF), NO DEPOSIT REQUIRED



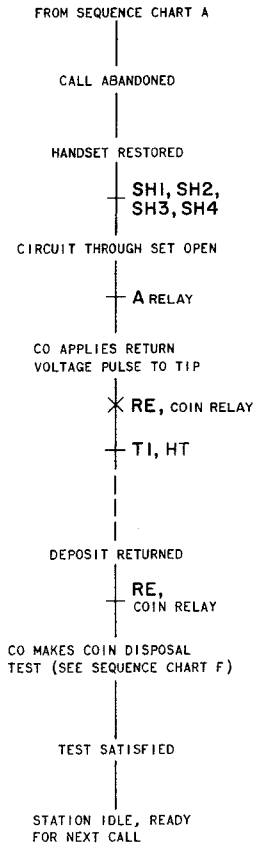
NOTE:
CO APPLIES -115 TO -135 VOLTS TO TIP LEAD WITH RING LEAD OPEN. PULSE LASTS 250 TO 800 MS.

SEQUENCE CHART C
CALL ABANDONED,
INSUFFICIENT DEPOSIT REFUND (DTF)



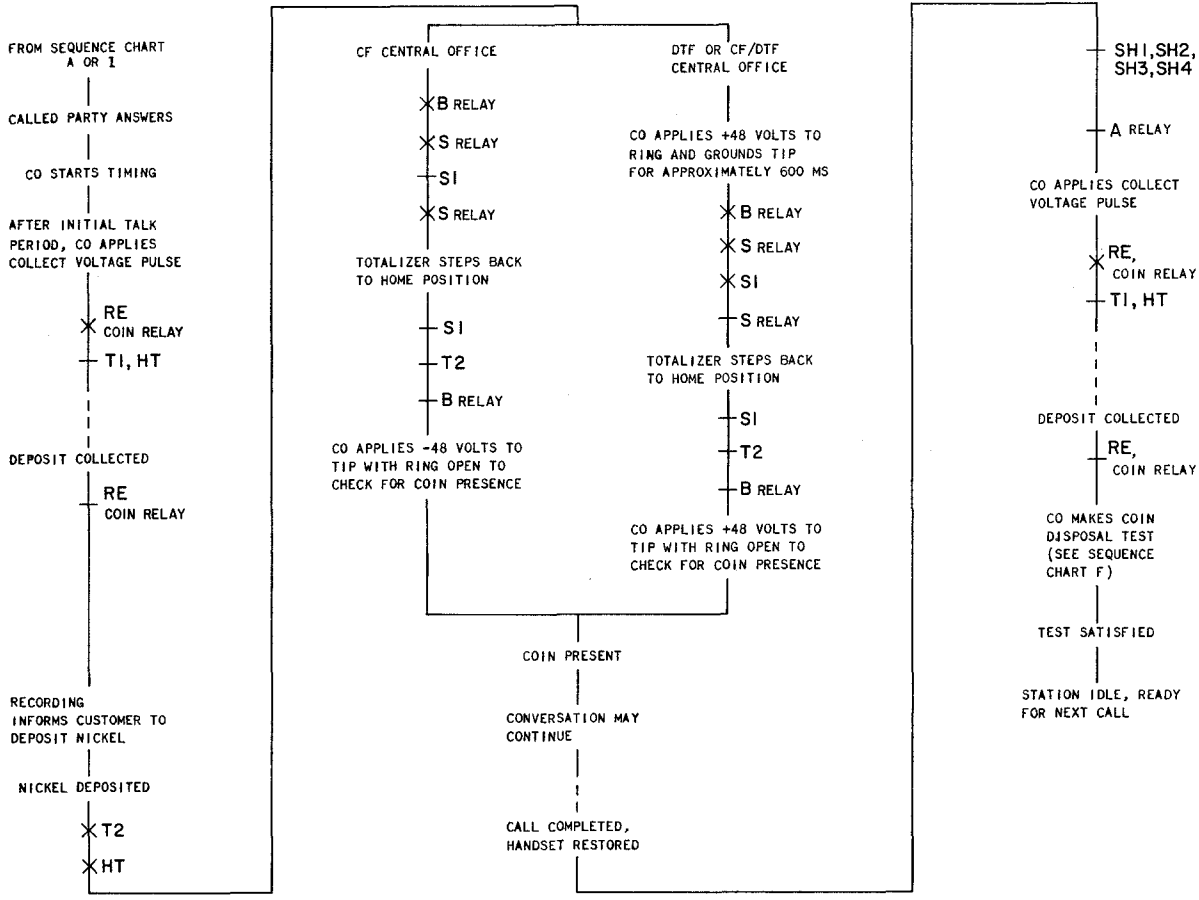
SEQUENCE CHART D

CALL ABANDONED,
INITIAL RATE DEPOSITED (DTF)



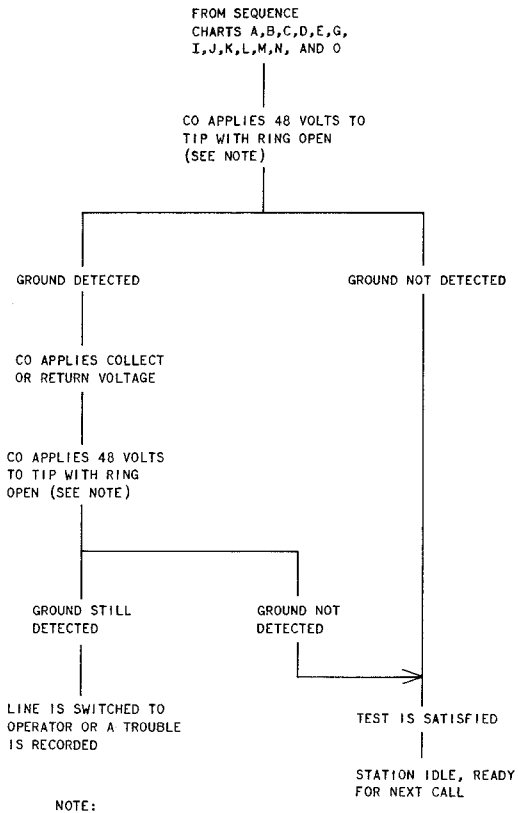
SEQUENCE CHART E

NICKEL LOCAL OVERTIME (CF AND DTF)



SEQUENCE CHART F

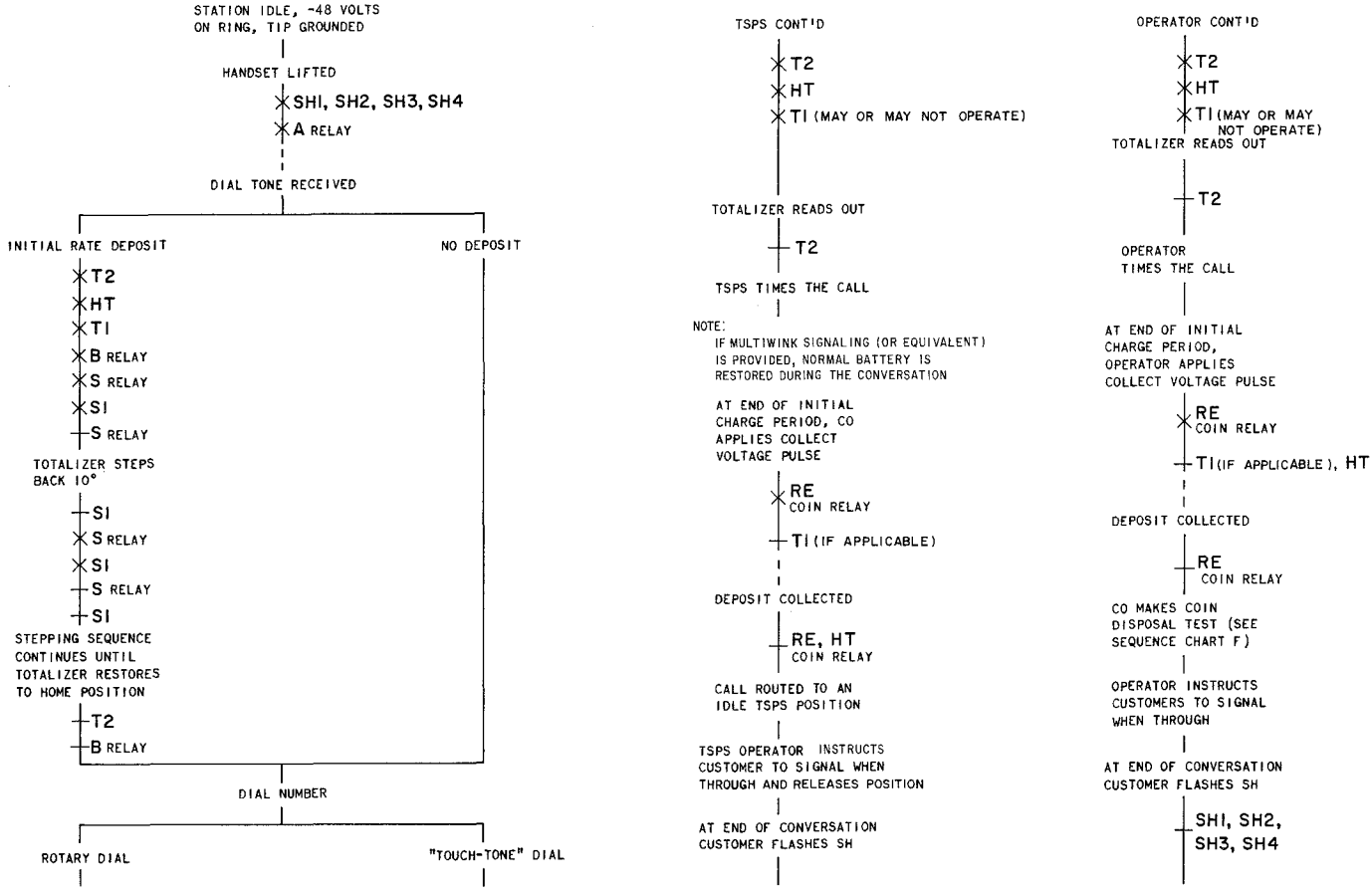
COIN DISPOSAL TEST (CF AND DTF)

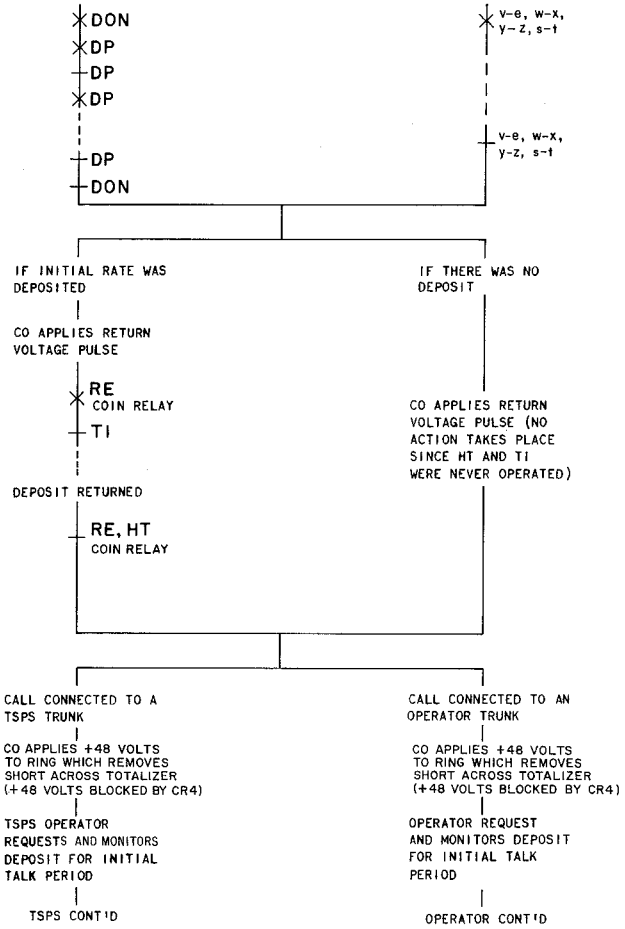


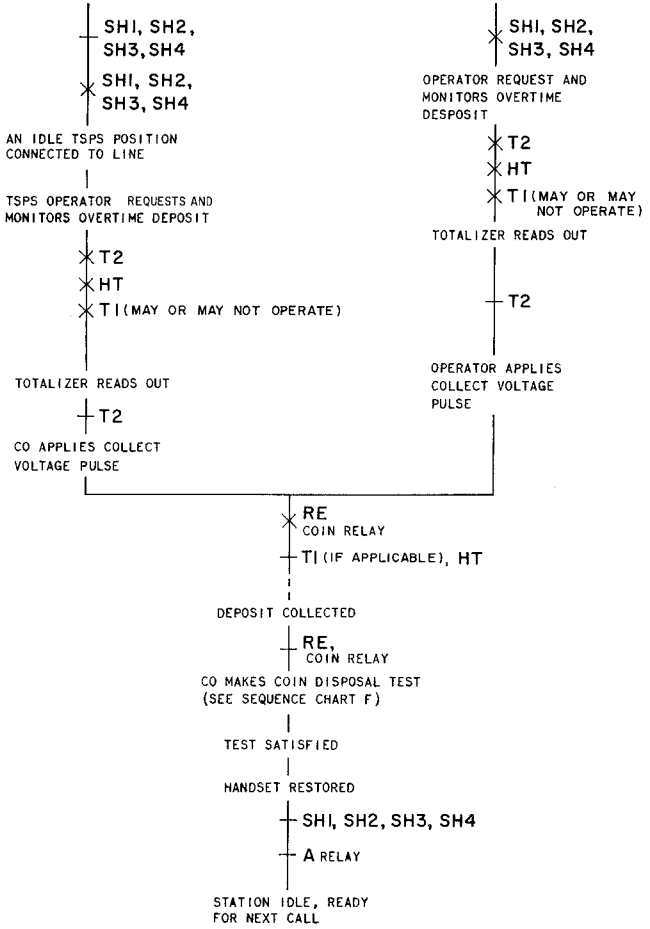
NOTE:
IN A CF OFFICE, -48 VOLTS IS APPLIED; IN A DTF OR CF/DTF OFFICE, +48 VOLTS IS APPLIED; HOWEVER IN SOME OFFICES, COIN RETURN VOLTAGE MAY BE USED FOR THIS TEST.

SEQUENCE CHART G

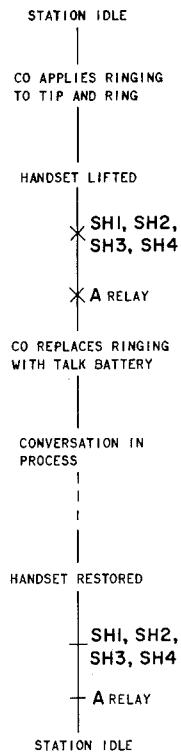
TOLL CALL-DTF STATION, DTF OFFICE



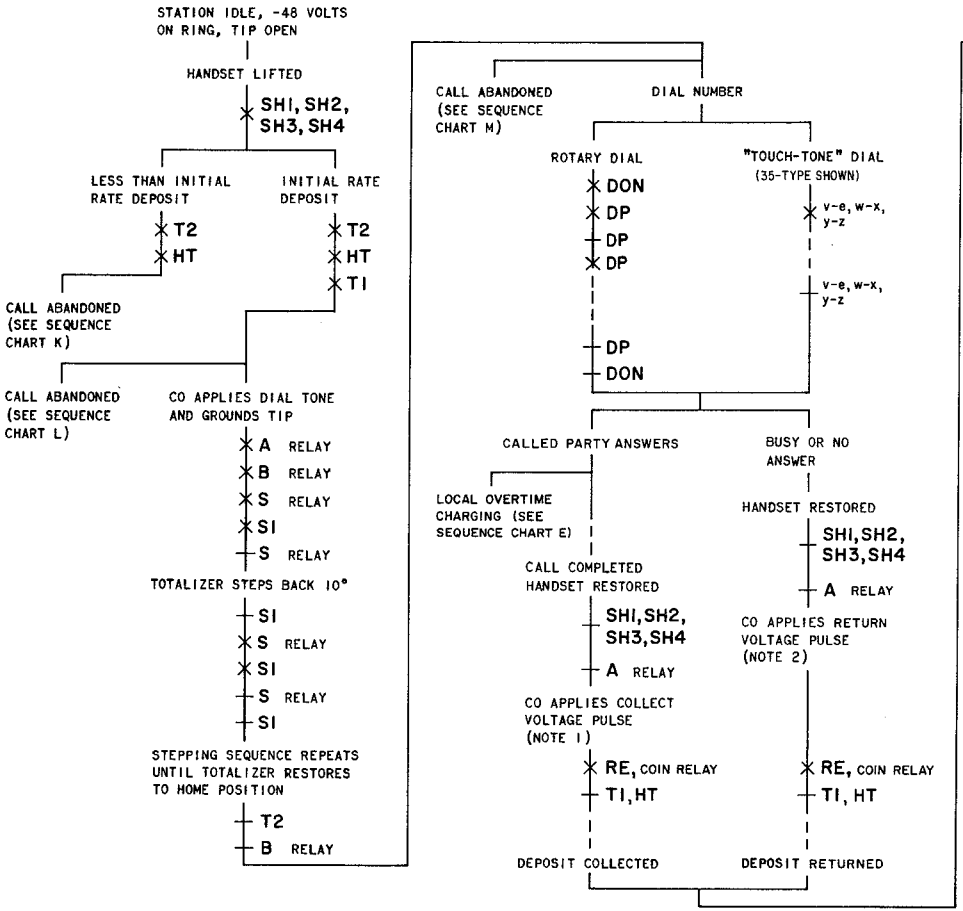

DON
DP
DP
DP
DP
DON
v-e, w-x, y-z, s-t
v-e, w-x, y-z, s-t
IF INITIAL RATE WAS DEPOSITED
CO APPLIES RETURN VOLTAGE PULSE
RE COIN RELAY
TI
DEPOSIT RETURNED
RE, HT COIN RELAY
IF THERE WAS NO DEPOSIT
CO APPLIES RETURN VOLTAGE PULSE (NO ACTION TAKES PLACE SINCE HT AND TI WERE NEVER OPERATED)
CALL CONNECTED TO A TSPS TRUNK
CO APPLIES +48 VOLTS TO RING WHICH REMOVES SHORT ACROSS TOTALIZER (+48 VOLTS BLOCKED BY CR4)
TSPS OPERATOR REQUESTS AND MONITORS DEPOSIT FOR INITIAL TALK PERIOD
TSPS CONT'D
CALL CONNECTED TO AN OPERATOR TRUNK
CO APPLIES +48 VOLTS TO RING WHICH REMOVES SHORT ACROSS TOTALIZER (+48 VOLTS BLOCKED BY CR4)
OPERATOR REQUEST AND MONITORS DEPOSIT FOR INITIAL TALK PERIOD
OPERATOR CONT'D


SHI, SH2, SH3, SH4
SHI, SH2, SH3, SH4
AN IDLE TSPS POSITION CONNECTED TO LINE
TSPS OPERATOR REQUESTS AND MONITORS OVERTIME DEPOSIT
T2
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
CO APPLIES COLLECT VOLTAGE PULSE
SHI, SH2, SH3, SH4
OPERATOR REQUEST AND MONITORS OVERTIME DESPOSIT
T2
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
OPERATOR APPLIES COLLECT VOLTAGE PULSE
RE COIN RELAY
TI (IF APPLICABLE), HT
DEPOSIT COLLECTED
RE, COIN RELAY
CO MAKES COIN DISPOSAL TEST (SEE SEQUENCE CHART F)
TEST SATISFIED
HANDSET RESTORED
SHI, SH2, SH3, SH4
A RELAY
STATION IDLE, READY FOR NEXT CALL

SEQUENCE CHART H
INCOMING CALL (CF OR DTF)

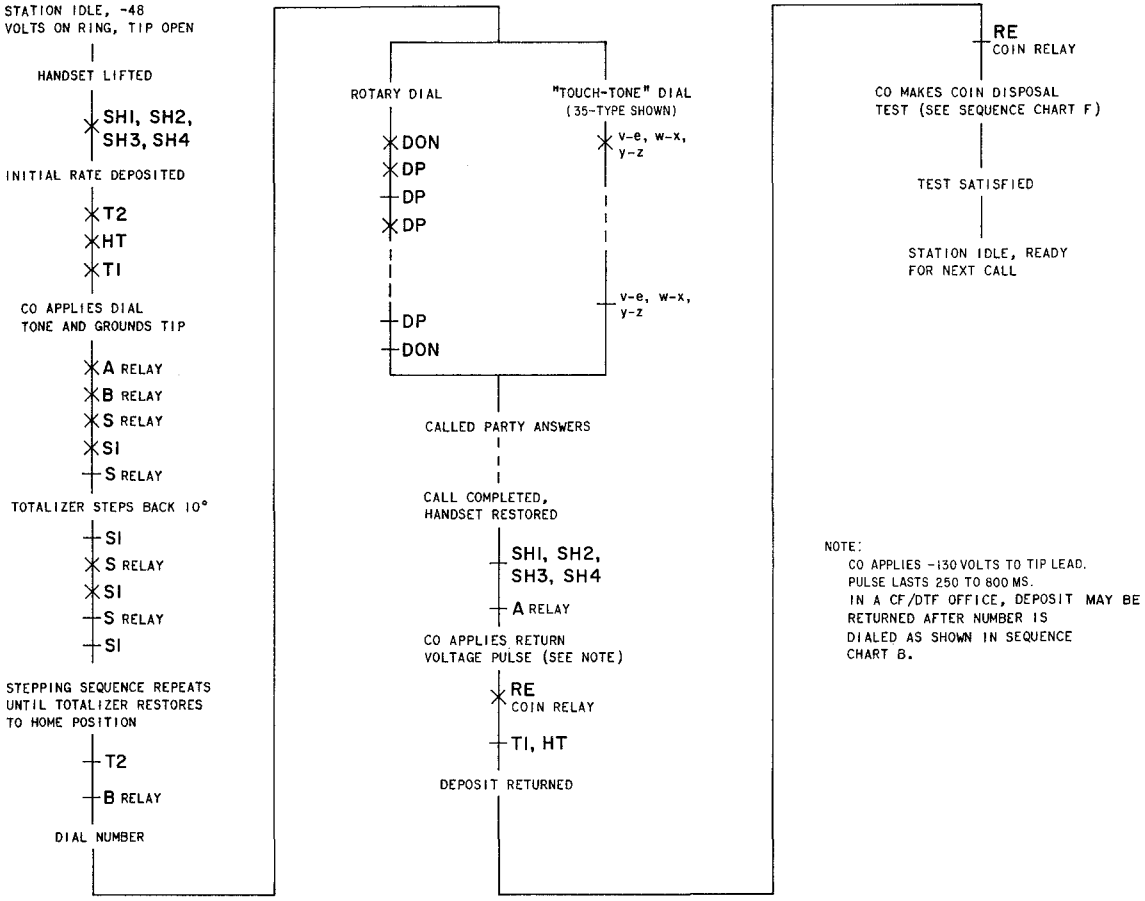


SEQUENCE CHART I
LOCAL CHARGE CALL (CF)



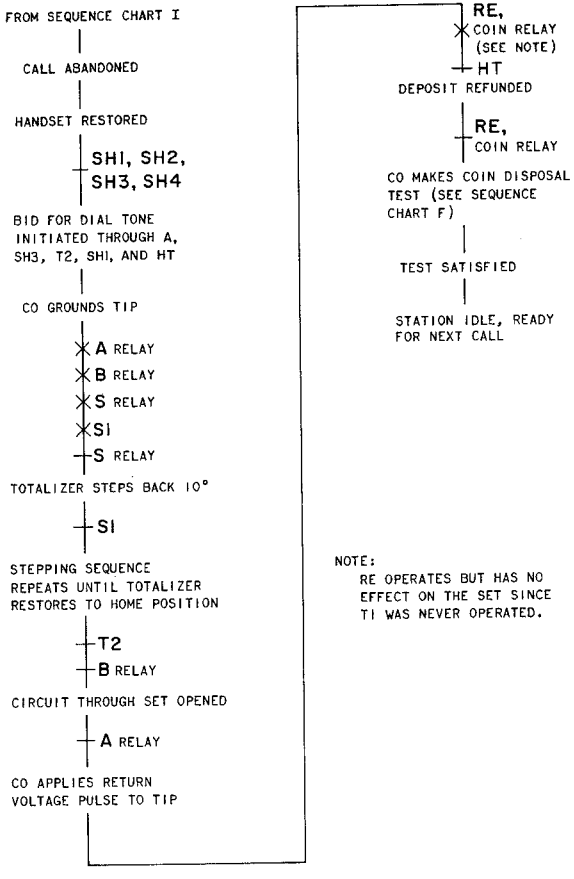
NOTES:
1. CO APPLIES +130 VOLTS TO TIP LEAD WITH RING LEAD OPEN. PULSE LASTS 250 TO 800 MS.
2. CO APPLIES -130 VOLTS TO TIP LEAD WITH RING LEAD OPEN. PULSE LASTS 250 TO 800 MS.

SEQUENCE CHART J
LOCAL NON-CHARGE CALL (CF)



NOTE:
CO APPLIES -130 VOLTS TO TIP LEAD.
PULSE LASTS 250 TO 800 MS.
IN A CF/DTF OFFICE, DEPOSIT MAY BE RETURNED AFTER NUMBER IS DIALED AS SHOWN IN SEQUENCE CHART B.

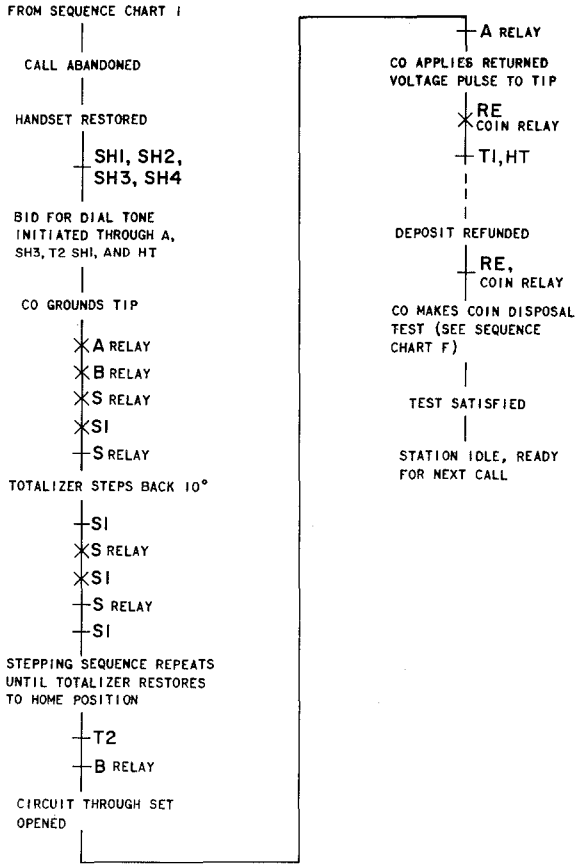
SEQUENCE CHART K
CALL ABANDONED, INSUFFICIENT
DEPOSIT REFUND (CF)



NOTE:
RE OPERATES BUT HAS NO EFFECT ON THE SET SINCE T1 WAS NEVER OPERATED.

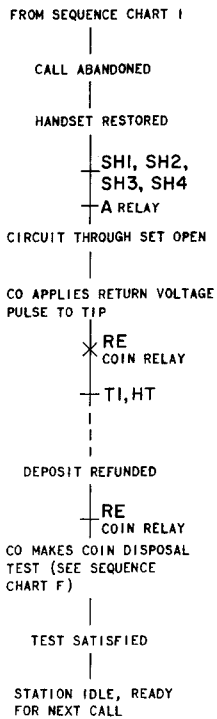
SEQUENCE CHART L

CALL ABANDONED INITIAL RATE
DEPOSITED, NO DIAL TONE (CF)



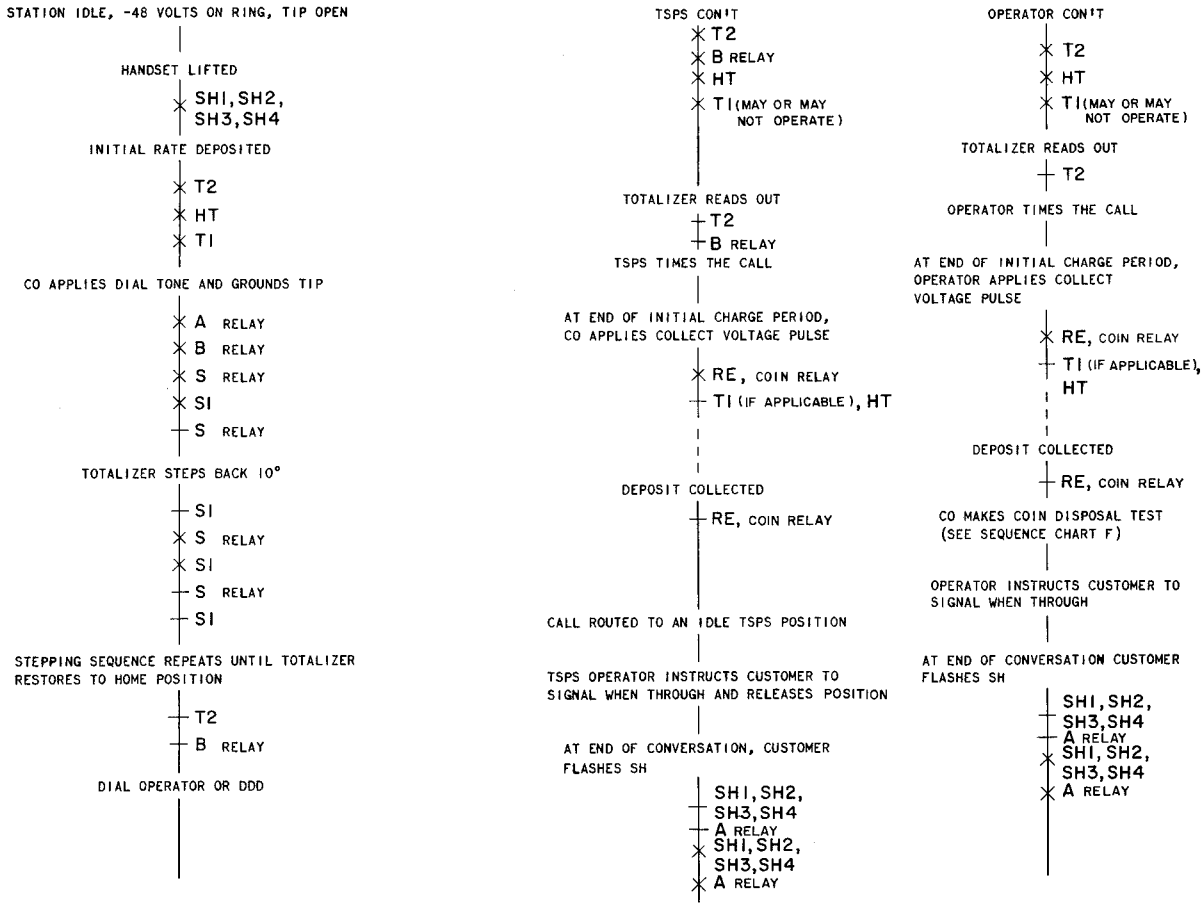
SEQUENCE CHART M

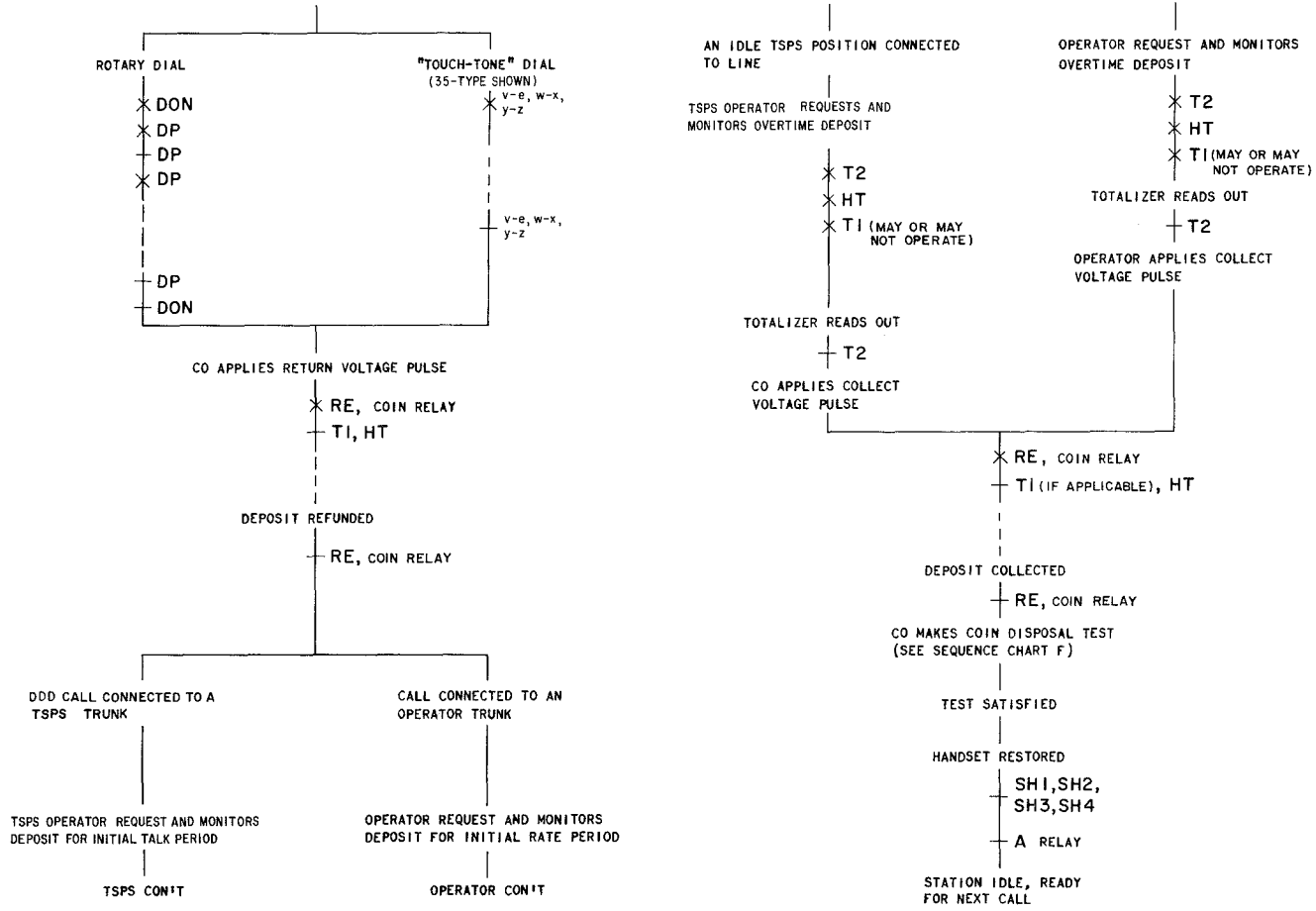
CALL ABANDONED AFTER
INITIAL RATE DEPOSITED AND
DIAL TONE RECEIVED (CF)



SEQUENCE CHART N

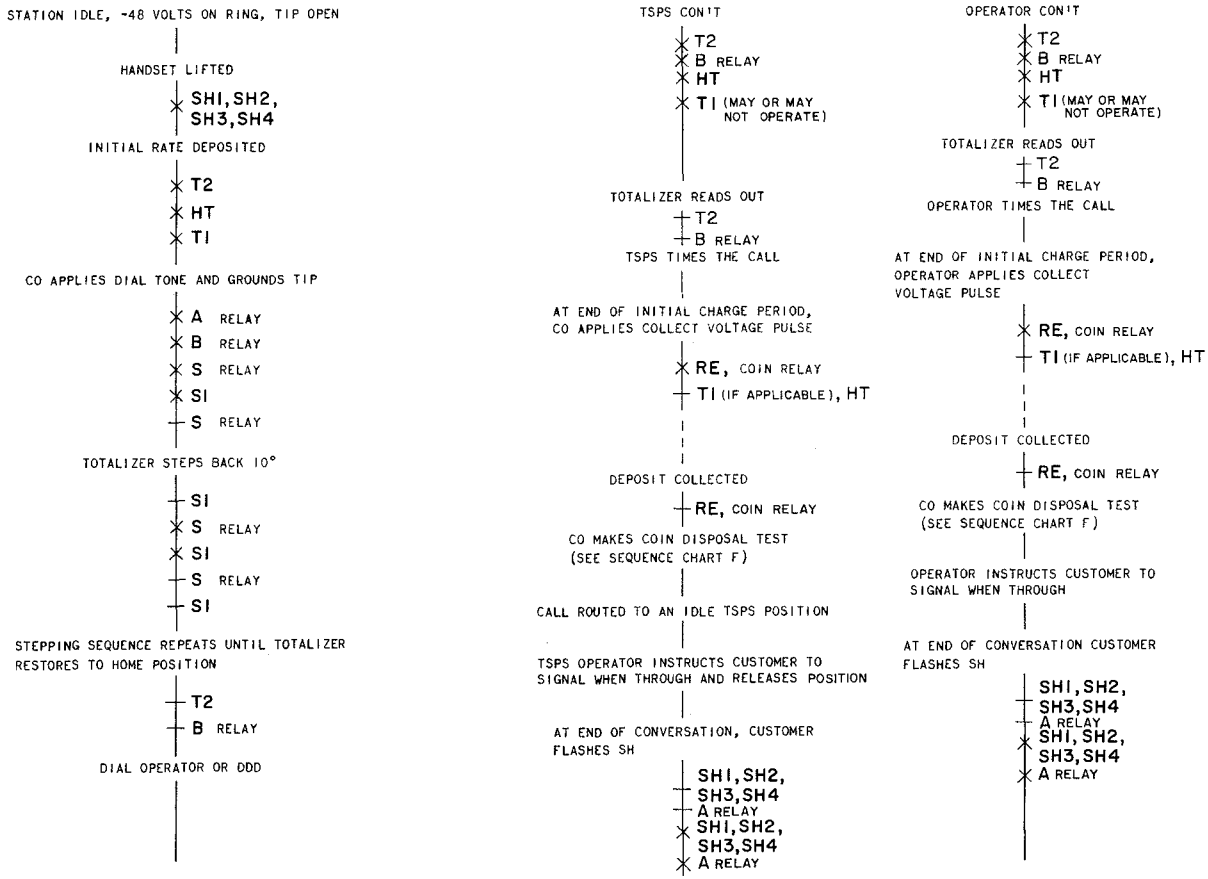
TOLL CALL-CF STATION, CF OFFICE

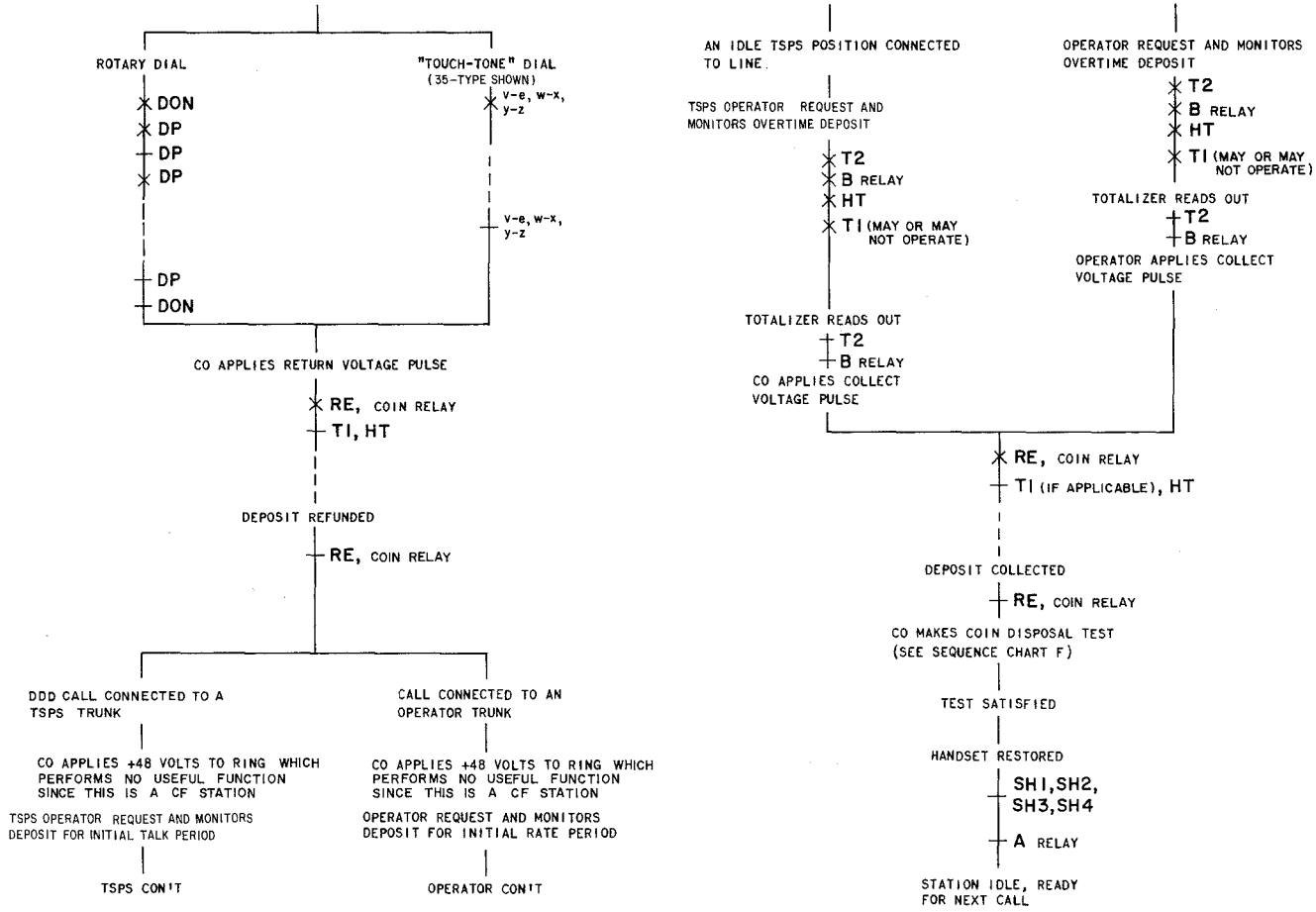



ROTARY DIAL
DON
DP
DP
DP
DP
DON
"TOUCH-TONE" DIAL
(35-TYPE SHOWN)
v-e, w-x, y-z
v-e, w-x, y-z
CO APPLIES RETURN VOLTAGE PULSE
RE, COIN RELAY
TI, HT
DEPOSIT REFUNDED
RE, COIN RELAY
DDD CALL CONNECTED TO A TSPS TRUNK
CALL CONNECTED TO AN OPERATOR TRUNK
TSPS OPERATOR REQUEST AND MONITORS DEPOSIT FOR INITIAL TALK PERIOD
OPERATOR REQUEST AND MONITORS DEPOSIT FOR INITIAL RATE PERIOD
TSPS CON'T
OPERATOR CON'T
AN IDLE TSPS POSITION CONNECTED TO LINE
TSPS OPERATOR REQUESTS AND MONITORS OVERTIME DEPOSIT
T2
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
CO APPLIES COLLECT VOLTAGE PULSE
OPERATOR REQUEST AND MONITORS OVERTIME DEPOSIT
T2
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
OPERATOR APPLIES COLLECT VOLTAGE PULSE
RE, COIN RELAY
TI (IF APPLICABLE), HT
DEPOSIT COLLECTED
RE, COIN RELAY
CO MAKES COIN DISPOSAL TEST (SEE SEQUENCE CHART F)
TEST SATISFIED
HANDSET RESTORED
SH1, SH2, SH3, SH4
A RELAY
STATION IDLE, READY FOR NEXT CALL

SEQUENCE CHART O

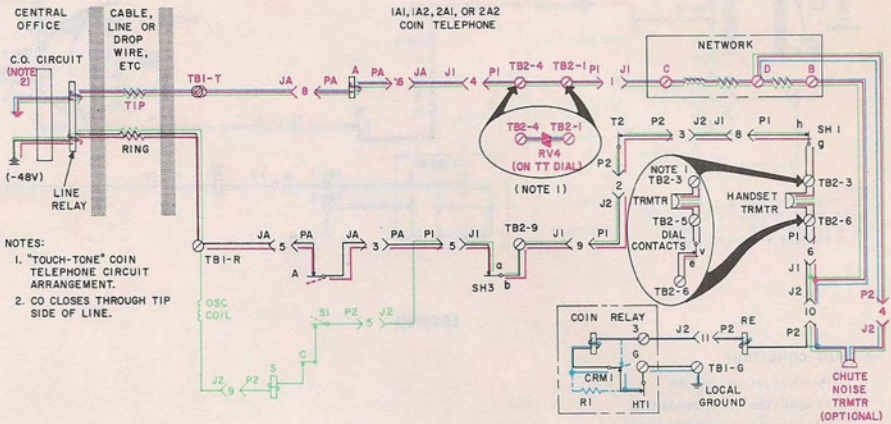
TOLL CALL-CF STATION, CF/DTF OFFICE




ROTARY DIAL
"TOUCH-TONE" DIAL
(35-TYPE SHOWN)
DON
DP
DP
DP
DP
DON
v-e, w-x, y-z
v-e, w-x, y-z
CO APPLIES RETURN VOLTAGE PULSE
RE, COIN RELAY
TI, HT
DEPOSIT REFUNDED
RE, COIN RELAY
DDD CALL CONNECTED TO A TSPS TRUNK
CALL CONNECTED TO AN OPERATOR TRUNK
CO APPLIES +48 VOLTS TO RING WHICH PERFORMS NO USEFUL FUNCTION SINCE THIS IS A CF STATION
CO APPLIES +48 VOLTS TO RING WHICH PERFORMS NO USEFUL FUNCTION SINCE THIS IS A CF STATION
TSPS OPERATOR REQUEST AND MONITORS DEPOSIT FOR INITIAL TALK PERIOD
OPERATOR REQUEST AND MONITORS DEPOSIT FOR INITIAL RATE PERIOD
TSPS CONIT
OPERATOR CONIT
AN IDLE TSPS POSITION CONNECTED TO LINE.
TSPS OPERATOR REQUEST AND MONITORS OVERTIME DEPOSIT
T2
B RELAY
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
B RELAY
CO APPLIES COLLECT VOLTAGE PULSE
OPERATOR REQUEST AND MONITORS OVERTIME DEPOSIT
T2
B RELAY
HT
TI (MAY OR MAY NOT OPERATE)
TOTALIZER READS OUT
T2
B RELAY
OPERATOR APPLIES COLLECT VOLTAGE PULSE
RE, COIN RELAY
TI (IF APPLICABLE), HT
DEPOSIT COLLECTED
RE, COIN RELAY
CO MAKES COIN DISPOSAL TEST (SEE SEQUENCE CHART F)
TEST SATISFIED
HANDSET RESTORED
SH1, SH2, SH3, SH4
A RELAY
STATION IDLE, READY FOR NEXT CALL

COLOR FUNCTIONAL SCHEMATICS

1A/2A/1C/2C-TYPE COIN TELEPHONE SETS



LEGEND

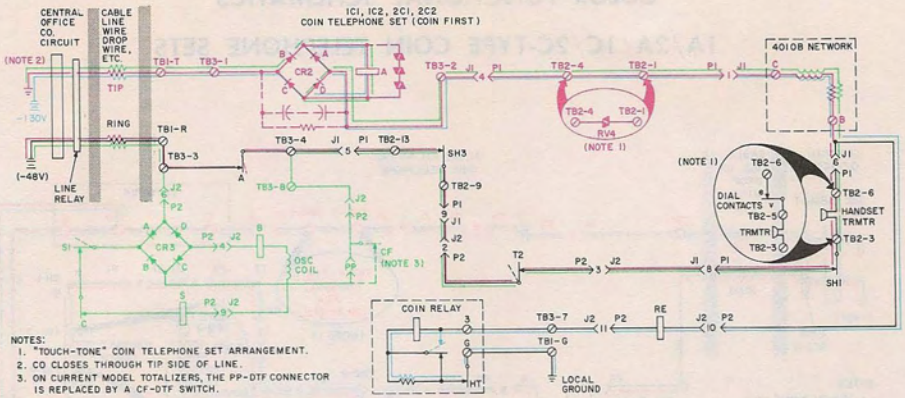
CIRCUIT CONDITION:

- Handset on switchhook
- T2 operated (coin deposited)
- HT1 (hopper trigger) operated

CIRCUIT ACTION:

1. **Black** — This circuit causes the tip side of line to be closed through to ground in the CO. Dial tone is placed on line but is ineffective. Current in this circuit (48V) is not sufficient to operate RE or coin relay.
2. **Red** — A relay operates, causing its normal contacts to open removing the short across the **S** (stepper) relay.
3. **Green** — (a) Operation of **S** relay causes its normally closed **S1** contact to open. The **S1** contact in opening causes the **S** relay to release, thus closing the **S1** contact. This operating and releasing action of the **S** relay steps the totalizer 10 degrees back to normal each time it operates. (Each $.05 amount deposited causes the totalizer to rotate 10 degrees.)
   (b) When the totalizer has been stepped back to normal, **T2** contact restores (opens its make contact, which in turn, opens the telephone circuit.)
4. **Blue** — (a) The CO, detecting the open telephone circuit, sends out negative 100 to 130 volts return battery to return the deposit.
   (b) The **RE** relay in operating would normally restore the **T1** contact. Since the initial rate was not deposited, the **T1** was normal and the operated **RE** relay has no effect.
   (c) The operated coin relay, closes its make contact causing the current to bypass the relay and flow through the resistor which was previously shorted. The short across the relay winding causes the relay to be slow release. The resistor, having approximately the same resistance as the coin relay winding, is placed in the circuit to protect contact **HT** when it restores, and to protect the resistance lamp in the central office circuit.
   (d) As the coin relay releases, the **HT** contact opens placing the coin telephone set in its idle state.

Fig. 1—Call Abandoned With Less Than Initial Rate Deposited (Deposit Refunded)—1A/2A-Type



LEGEND

CIRCUIT CONDITION:

- Handset on switchhook
- T2 operated (coin deposited)
- HT1 (hopper trigger) operated

CIRCUIT ACTION:

1. **Black** — This circuit causes the tip side of line to be closed through to ground in the CO. Dial tone is placed on line but is ineffective. Current in this circuit (48V) is not sufficient to operate **RE** or coin relay.
2. **Red** — **A** relay operates, causing its normal contacts to open removing the short across the **S** (stepper) relay
3. **Green** — (a) Operation of **S** relay causes its normally closed **S1** contact to open. The **S1** contact in opening causes the **S** relay to release, thus closing **S1** contact. This operating and releasing action of the **S** relay steps the totalizer 10 degrees back to normal each time it operates. (Each $.05 amount deposited causes the totalizer to rotate 10 degrees.)

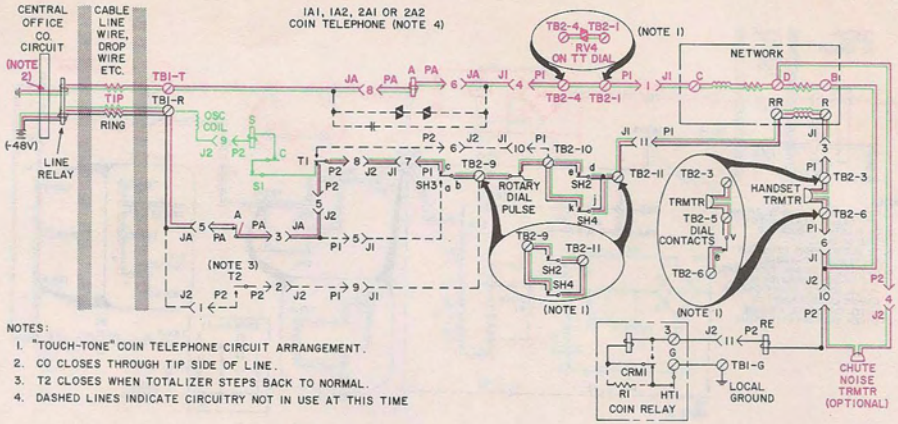
   (b) When the totalizer has been stepped back to normal, **T2** contact restores, (opens its make contact, which in turn, opens the telephone circuit.)
4. **Blue** — (a) The CO, detecting the open telephone circuit, sends out negative 100 to 130 volts return battery to return the deposit.

   (b) The **RE** relay in operating would normally restore the **T1** contact. Since the initial rate was not deposited, the **T1** was normal and the operated **RE** relay has no effect.

   (c) The operated coin relay, closes its make contact causing the current to bypass the relay and flow through the resistor which was previously shorted. The short across the relay winding causes the relay to be slow release. The resistor, having approximately the same resistance as the coin relay winding, is placed in the circuit to protect contact **HT** when it restores, and to protect the resistance lamp in the central office circuit.

   (d) As the coin relay releases, the **HT** contact opens, placing the coin telephone set in its idle state.

Fig. 2—Call Abandoned With Less Than Initial Rate Deposited (Deposit Refunded)—1C/2C-Type (CF)



NOTES:

1. "TOUCH-TONE" COIN TELEPHONE CIRCUIT ARRANGEMENT.
2. CO CLOSES THROUGH TIP SIDE OF LINE.
3. T2 CLOSES WHEN TOTALIZER STEPS BACK TO NORMAL.
4. DASHED LINES INDICATE CIRCUITRY NOT IN USE AT THIS TIME

LEGEND

CIRCUIT CONDITION:

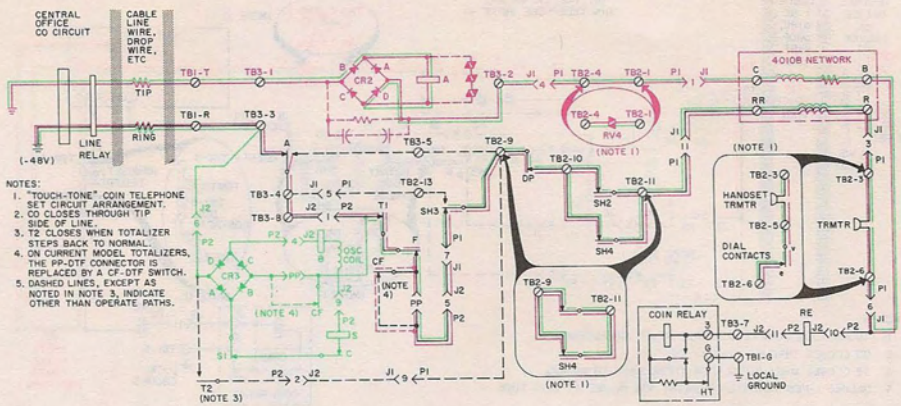
- Outgoing call
- Handset off-hook (SH1, SH2, SH3, SH4 operated)
- T2 operated (coin deposited)
- T1 operated (initial rate deposited)
- **HT** (hopper trigger) operated

CIRCUIT ACTION:

1. **Black** — This circuit causes the tip side of line to be closed through to ground in the CO. Dial tone is placed on line. Current in this circuit (48V) is not sufficient to operate **RE** or coin relay.
2. **Red** — A relay operates causing its normal contact to open which removes the short across the **S** (stepper) relay.
3. **Green** — (a) Operation of **S** relay causes its normally closed **S1** contact to open. The **S1** contact in opening causes the **S** relay to release thus closing the **S1** contact. This operating and releasing action of the **S** relay steps the totalizer 10 degrees back each time it operates.

   (b) When the totalizer has stepped back to normal the **T2** contact restores and places the telephone circuit in its dialing and talking state.

Fig. 3—Initial Rate Deposited—Origination State—1A/2A-Type



LEGEND

CIRCUIT CONDITION:

- Outgoing call
- Handset off-hook (SH1, SH2, SH3, SH4 operated)
- T2 operated (coin deposited)
- T1 operated (initial rate deposited)
- HT (hopper trigger) operated

CIRCUIT ACTION:

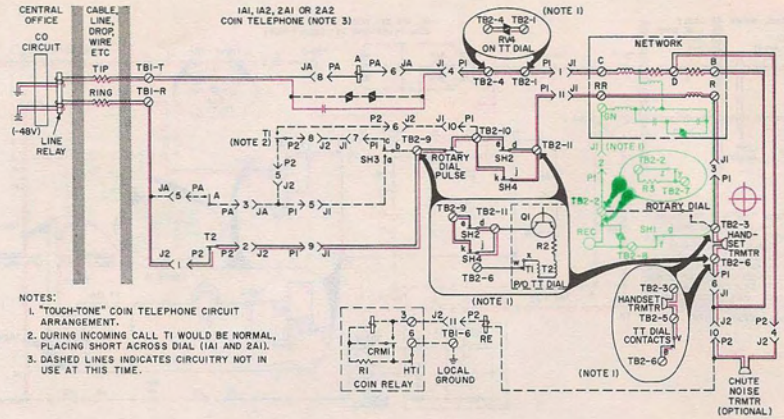
1. **Black** — This circuit causes the tip side of line to be closed through to ground in the **CO**. Dial tone is placed on line. Current in this circuit (48V) is not sufficient to operate **RE** or coin relay.

2. **Red** — **A** relay operates causing its normal contact to open which removes the short across the **S** (stepper) relay.

3. **Green** — (a) Operation of **S** relay causes its normally closed **S1** contact to open. The **S1** contact in opening causes the **S** relay to release thus closing the **S1** contact. This operating and releasing action of the **S** relay steps the totalizer 10 degrees back each time it operates.

   (b) When the totalizer has stepped back to normal the **T2** contact restores and places the telephone circuit in its dialing and talking state.

Fig. 4—Initial Rate Deposited—Origination State—1C/2C-Type (CF)



LEGEND

CIRCUIT CONDITION:

- Outgoing call
- Handset off-hook
- Dial tone present
- T1 operated
- T2 returned to normal

CIRCUIT ACTION:

1. **Black — Dialing —**

   Dialing path of rotary dial coin telephone set differs from TOUCH-TONE set (see Note 1 and insets). TOUCH-TONE dial contacts **V, E** open and disconnect transmitter from network during dialing; contacts **W, X** close and connect the dial oscillator to the network in place of the transmitter.

2. **Red — Talking —**

   TOUCH-TONE dial contacts **V, E** close, and **W, X** open during the talking state (see insets). The coin signal transmitter detects the sound of coins dropping through the chute.

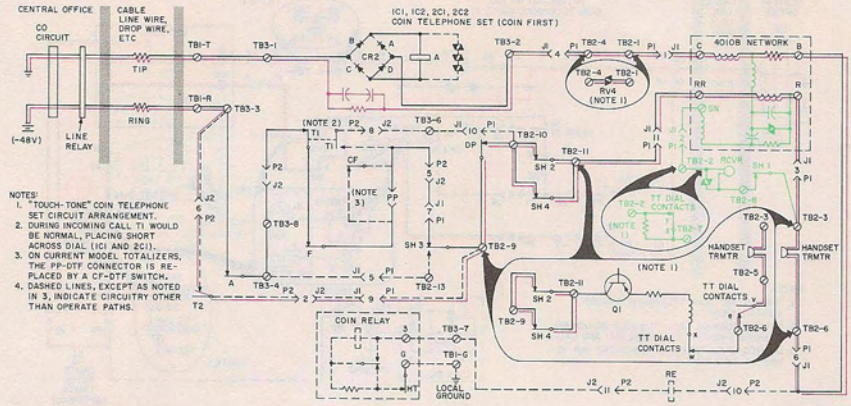
3. **Green — Listening —**

   (a) The listening (secondary) circuit receives its energy through inductive coupling from the primary induction coil windings.

   (b) Rotary dial off-normal contacts short out the receiver during dialing.

   (c) TOUCH-TONE dial contacts **Y, Z** remove the shunt across level limiting resistor **R3** to reduce oscillator sidetone during dialing.

Fig. 5—Dialing, Talking, and Listening Circuits—1A/2A-Type



LEGEND

CIRCUIT CONDITION:

- Outgoing call
- Handset off-hook
- Dial tone present
- T1 operated
- T2 returned to normal

CIRCUIT ACTION:

1. **Black — Dialing —**

   Dialing path of rotary dial coin telephone set differs from TOUCH-TONE set (see Note 1 and insets). TOUCH-TONE dial contacts **V, E** open and disconnect transmitter from network during dialing; contacts **W, X** close and connect the dial oscillator to the network in place of the transmitter.

2. **Red — Talking —**

   TOUCH-TONE dial contacts **V, E,** close, and **W, X** open during the talking state (see insets).

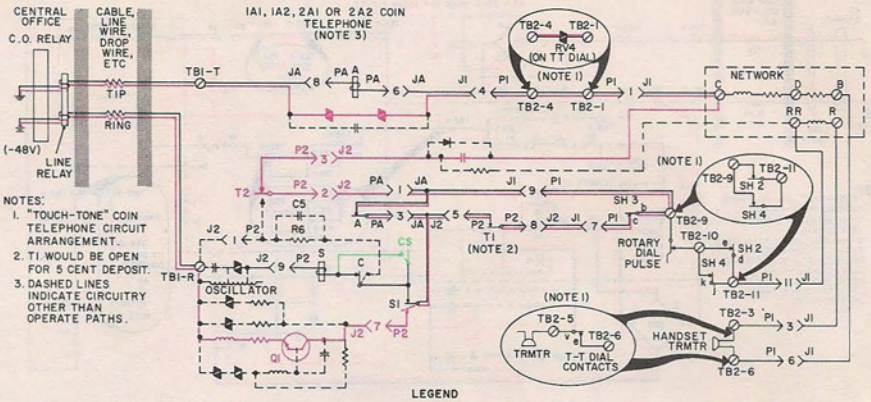
3. **Green — Listening —**

   (a) The listening (secondary) circuit receives its energy through inductive coupling from the primary induction coin windings.

   (b) Rotary dial off-normal contacts short out the receiver during dialing.

   (c) TOUCH-TONE dial contacts **Y, Z** remove the shunt across level limiting resistor **R3** to reduce oscillator sidetone during dialing.

Fig. 6—Dialing, Talking, and Listening Circuits—1C/2C-Type (CF)



LEGEND

CIRCUIT CONDITION:

- **Nickel, Dime,** or **Quarter** deposit requested by operator
- **T2** operated as result of deposited coin
- **C** and **CS** contacts normal for nickel or dime deposit
- **C** and **CS** contacts operated for quarter deposit

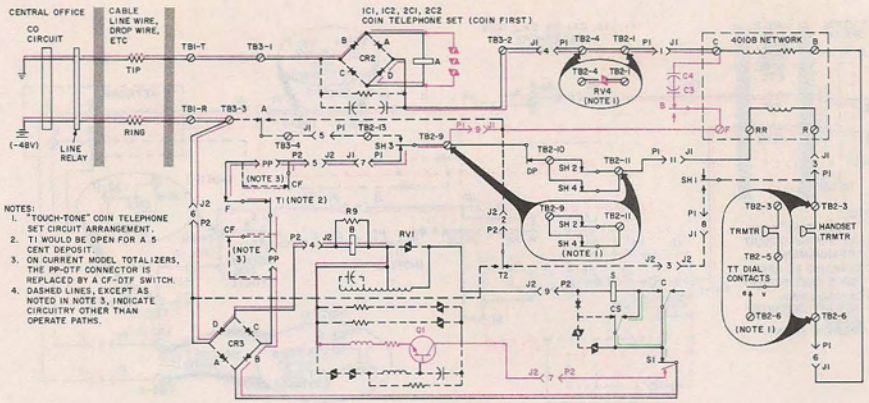
CIRCUIT ACTION:

1. **Black** — Oscillator charging circuit and **S** relay operating path for nickel or dime deposit. The circuit is shown for dime deposit. Nickel deposit circuit would be the same, except **T1** contact would be normal (open) instead of closed as shown.

2. **Black and Green** — Oscillator charging circuit and **S** relay operating path for quarter deposit. **CS** contact operates when totalizer rotates 45°, enabling charging of the **S** relay before **C** contact restores. This enables a faster readout of the oscillator circuit.

3. **Red** — Oscillator readout (tone signal) path. Contact **S1** transfers the current flow from the totalizer to the transistor. Current flow is increased and decreased due to the changing polarity on the emitter and base of the transistor caused by the transformer action of the tank circuit. This produces tone signal heard by operator during operate and release stepping of **S** relay. The signal bypasses the network through the **T2** contacts and the **AC** shorting capacitor.

Fig. 7—Coin Signal Tone Circuit—1A/2A-Type



LEGEND

CIRCUIT CONDITION:

- **Nickel, Dime,** or **Quarter** deposit requested by operator
- **T2** oprated as result of deposited coin
- **C** and **CS** contacts normal for **nickel** or **dime** deposit
- **C** and **CS** contacts operated for **quarter** deposit

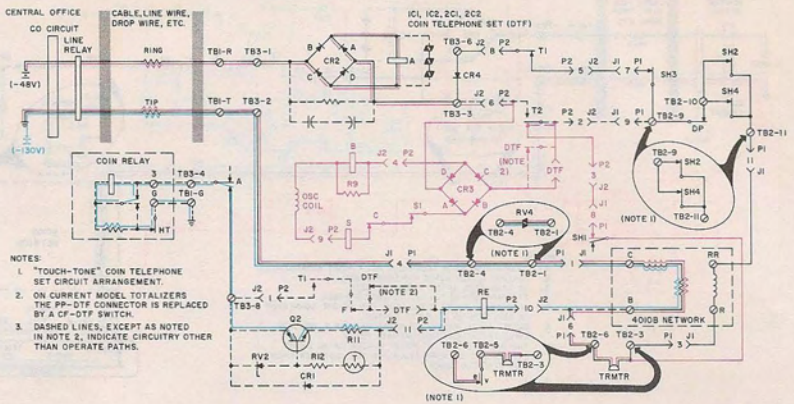
CIRCUIT ACTION:

1. **Black** — Oscillator charging circuit and **S** relay operating path for nickel or dime deposit. The circuit is shown for dime deposit. Nickel deposit circuit would be the same, except **T1** contact would be normal (open) instead of closed as shown.

2. **Black** and **Green** — Oscillator charging circuit and **S** relay operating path for quarter deposit. **CS** contact operates when totalizer rotates 45°, enabling charging of the **S** relay before **C** contact restores. This enables a faster readout of the oscillator circuit.

3. **Red** — Oscillator readout (tone signal) path. Contact **S1** transfers the current flow from the totalizer to the transistor. Current flow is increased and decreased due to the changing polarity on the emitter and base of the transistor caused by the transformer action of the tank circuit. This produces tone signal heard by operator during operate and release stepping of **S** relay. The signal bypasses the network through the **B** relay contacts and the **AC** shorting capacitors.

Fig. 8—Coin Signal Tone Circuit—1C/2C-Type (CF)



LEGEND

CIRCUIT CONDITION:

- Handset off-hook
- Less than initial rate deposited — handset on-hook
- **T2** opened (coin deposited)
- **HT** (hopper trigger) closed

CIRCUIT ACTION:

1. **Black** — For a deposit less than initial rate, a path exists from Ring to Tip through **A** relay, normally closed **T1** contacts, operated **SH3, SH2** and **SH4**, network, and transmitter, which causes CO to send dial tone.

2. **Red** — Handset is restored; all switchhook contacts restored to normal. When **SH3** opens, the short is removed around totalizer and current flows through **A** relay, polarity guard, **S** (stepper) relay normally opened (but now closed) **T2**, normally closed **SH1** and network to Tip. Operation of the **S** relay causes the totalizer to operate and step back to home position.

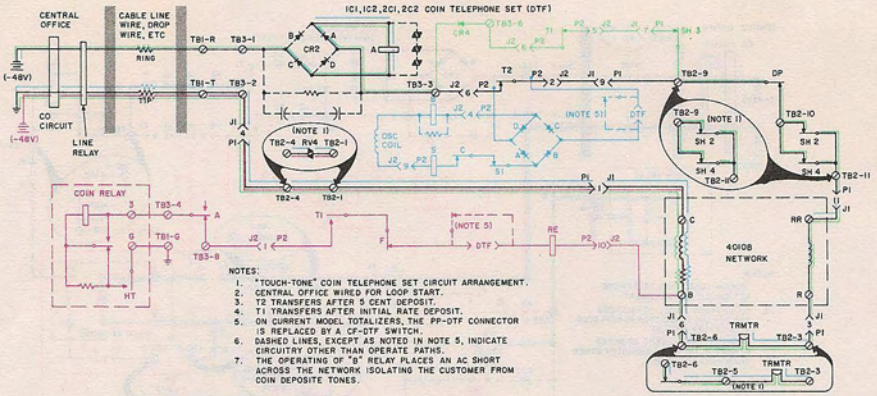
3. **Blue** — (a) When the totalizer has been stepped back to normal, **T2** contact restores (opens its make path) which in turn, opens the telephone circuit.

   (b) The CO, detecting the open telephone circuit, sends out negative 100 to 130 volts return battery over tip side of line to return the deposit.

   (c) The operated coin relay closes its make contact causing the current to bypass the relay and flow through the resistor which was previously shorted. The short across the relay winding causes the relay to be slow release. The resistor, having approximately the same resistance as the coin relay winding, is placed in the circuit to protect contact **HT** when it restores, and to protect the resistance lamp in the CO circuit.

   (d) As the coin relay releases, the **HT** contact opens, placing the coin telephone set in its idle state.

Fig. 9—Call Abandoned With Less Than Initial Rate Deposited (Deposit Refunded)—1C/2C-Type (DTF)



LEGEND

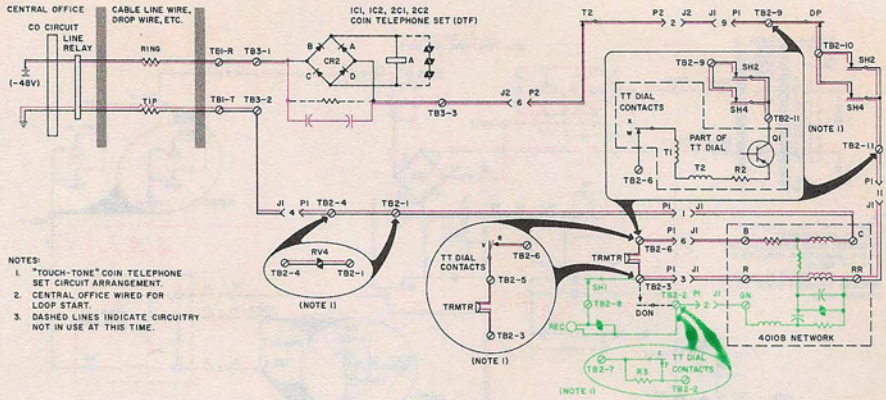
CIRCUIT CONDITION:

- Handset off-hook
- **HT** and **T2** operated with 5-cent deposit
- **T1** operated with initial rate deposit

CIRCUIT ACTION:

1. **Black — Standby**
   Central office wired for loop start — Ring is negative while tip is grounded. When handset is lifted, **SH1**, **SH2** and **SH4**, and **SH3** transfer. Loop current flows through **A** relay and dial tone is placed on the line.
2. **Red — Ground Test For Initial Rate Deposit**
   After a sufficient number of digits have been dialed, the CO removes battery from the ring and connects it to the tip; opens the ring releasing the **A** relay. This action permits the CO to look for coin station ground. If ground is not found (**HT** and **T1** open) and this should be a charge call, customer will hear a recording requesting an initial rate deposit.
3. **Green — 5-Cent Deposit**
   With a deposit less than initial rate, coin relay **HT** contacts close and totalizer contacts **T2** open. A path exists from Ring to Tip through normally closed **T1**, operated **SH3**, **SH2** and **SH4**, and network.
4. **Blue — Initial Rate Deposit**
   Normally closed **T1** contacts open applying current to oscillator and totalizer. Totalizer "reads out" and steps back to home position.

Fig. 10—Standby, Ground Test for Initial Rate Deposit, 5-Cent Deposit, and Initial Rate Deposit—1C/2C-Type (DTF)



NOTES:
1. "TOUCH-TONE" COIN TELEPHONE SET CIRCUIT ARRANGEMENT.
2. CENTRAL OFFICE WIRED FOR LOOP START.
3. DASHED LINES INDICATE CIRCUITRY NOT IN USE AT THIS TIME.

LEGEND

CIRCUIT CONDITION:

- Outgoing call
- Handset off-hook
- Dial tone present
- **T1** operated
- **T2** returned to normal

CIRCUIT ACTION:

1. **Black — Dialing —**

   Dialing path of rotary dial coin telephone set differs from TOUCH-TONE set (see Note 1 and insets). TOUCH-TONE dial contacts **V, E** open and disconnect transmitter from network during dialing; contacts **W, X** close and connect the dial oscillator to the network in place of the transmitter.

2. **Red — Talking —**

   TOUCH-TONE dial contacts **V, E** close, and **W, X** open during the talking state (see insets).

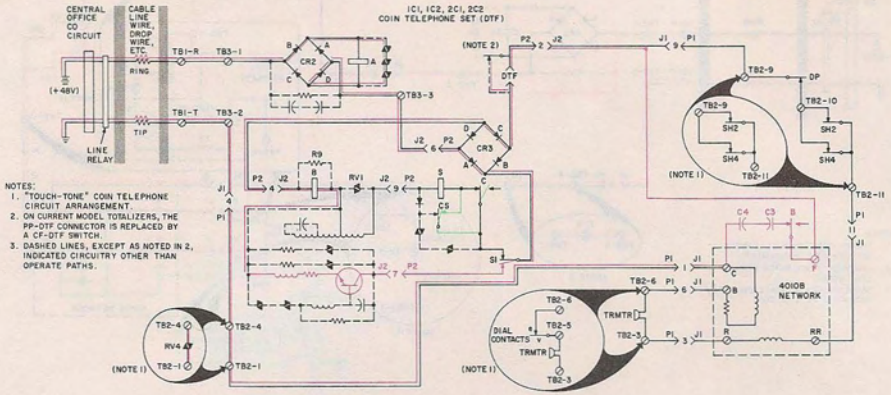
3. **Green — Listening —**

   (a) The listening (secondary) circuit receives its energy through inductive coupling from the primary induction coil windings.

   (b) Rotary dial off-normal contacts short out the receiver during dialing.

   (c) TOUCH-TONE dial contacts **Y, Z** remove the shunt across level limiting resistor **R3** to reduce oscillator sidetone during dialing.

Fig. 11—Dialing, Talking, and Listening Circuits—1C/2C-Type (DTF)



LEGEND

CIRCUIT CONDITION:

- **Nickel, Dime,** or **Quarter** deposit requested by operator
- **C** and **CS** contacts normal for nickel or dime deposit
- **C** and **CS** contacts operated for quarter deposit

CIRCUIT ACTION:

1. **Black** — Oscillator charging circuit and **S** relay operating path for nickel or dime deposit.
2. **Black** and **Green** — Oscillator charging circuit and **S** relay operating path for **quarter** deposit. **CS** contact operates when totalizer rotates 45°, enabling charging of the **S** relay before **C** contact restores. This enables a faster readout of the oscillator circuit.
3. **Red** — Oscillator readout (tone signal) path. Contact **S1** transfers the current flow from the totalizer to the transistor. Current flow is increased and decreased due to the changing polarity on the emitter and base of the transistor caused by the transformer action of the tank circuit. This produces tone signal heard by operator during operate and release stepping of **S** relay. The signal bypasses the network through the **B** relay contacts and the **AC** shorting capacitors.

Fig. 12—Coin Signal Tone Circuit—1C/2C-Type (DTF)

1D/2D-TYPE COIN TELEPHONE SET

DETAILED DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 The 1D/2D coin telephone set is used in conjunction with system standard Dial-Tone-First (DTF) central office arrangements to provide coin telephone service.

1.02 The 1D/2D set consist of a ringer, polarity guard and surge protector, active speech network, handset, switchhook, and dial for residential like functions. Functions unique to coin service are handled by integrated circuits, A and B relays, 47A signal, coin return network, and coin relay.

1.03 These sets are available with rotary or TOUCH-TONE® dial.

1.04 Codes for the 1D- and 2D- type sets are described in Table A.

TABLE A

CODE SIGNIFICANCE

CODE	FIRST NO.	LETTER	SECOND NO.
1D1	Box Type	DTF Mode	Rotary Dial
1D2			TOUCH-TONE Dial
2D1	Panel Type		Rotary Dial
2D2			TOUCH-TONE Dial

1.05 Abbreviations used in this section are as follows:

DTF—Dial-Tone-First

CO—Central Office

CDR—Customer Dial Receiver

HT—Hopper Trigger

SCGT—Stuck Coin Ground Test

IRGT—Initial Rate Ground Test

1.06 ***Initial Rate Setting.***

(1) Initial rate may be adjusted from 5¢ to $3.15 in 5¢ increments. Since there is no totalizer, this set is less likely to be put out of service by improper CO sequences.

(2) Initial rate setting is accomplished by inserting one or more leads into the ***negative*** field (-VCC) with remaining leads inserted in positive field (+VCC). Six leads, terminated on back side of chassis are color coded and individually plug ended. Each lead represents a specified amount (see Table B). These plug-ended leads are pressed on the pin connectors to establish an initial rate setting.

TABLE B

INITIAL RATE LEADS

LEAD COLOR	LEAD MONETARY VALUE
BR	5 Cents
R	10 Cents
Y	20 Cents
S	40 Cents
W-BL	80 Cents
W-BR	1 Dollar — 60 Cents

2. FUNCTIONS

2.01 Fig. 1 and 2 show block diagrams of rotary and TOUCH-TONE coin telephone sets, respectively. The 32A coin chassis includes an active network for speech equalization, the ringer, and an integrated circuit coin tone oscillator. The front cover consists of a dial, switchhook, handset, and terminal board (TB2), which connects to the chassis via an 11-pin connector (J1). The 47A signal is attached to the side of the coin chute where coins are sensed as they leave the lower chute area. The 47A signal connects to the chassis via a 15-pin connector (J2).

IDENTIFICATION AND DESCRIPTION OF COMPONENTS

2.02 Polarity Guard and Surge Protector—maintains proper set polarity and limits surge voltage behind station protector to prevent circuit damage.

2.03 A-Relay (Ground Lifter)—operates on loop current to open or "lift" the tip to ground path. This feature prevents the line unbalance that would be caused by a tip to ground path.

2.04 B-Relay (Initial Rate)—is a latching relay which has two windings. One winding causes the relay to latch on initial rate deposit and the other unlatches the relay when the coin relay is actuated for coin collection or return.

2.05 IC1 Integrated Circuit (Coin Logic)—is a hybrid integrated circuit (HIC) in a 40-pin dual in-line package. It acts as a controller of set functions during coin deposits, switchhook flashes, and dial operation.

2.06 IC2 Integrated Circuit (Coin Tone Oscillator)—is a 14-pin HIC similar in construction to ICs used as TOUCH-TONE dial oscillators. It provides dual frequency coin deposit signals. It is switched on by the IC1 to provide a slow readout for 5¢ and 10¢ deposits and a fast readout for a 25¢ deposit.

2.07 Speech Network—is a network which interconnects the loop, transmitter, and receiver. It provides ac and dc voltage equalization over the loop range and also TOUCH-TONE dial and coin tone equalization. During coin signaling, the speech portion is disabled so that the customer hears low level coin tones.

2.08 Ringer—the C4B ringer is used. It is mounted on the 32A chassis frame and connected across the line.

2.09 Dial—the TOUCH-TONE version uses a 70A dial which operates on either normal or reverse CO battery to provide end-to-end signaling capabilities. The rotary version has the dial pulse contacts in the ring lead.

2.10 47A Signal—attaches to the side of the 20A chute the same as the 1A totalizer of the

1C coin telephone set. Sensor elements in the coin paths convert mechanical energy of the coin to a voltage signal which in turn signals the coin logic.

2.11 1A-Type Coin Relay—is located in the tip to ground path. It collects or refunds the contents of the hopper when the tip to ground current flow is 41 milliamps.

3. THEORY OF OPERATION

Note: The CO battery requirements for system standard DTF service are defined as follows.

(a) ***Negative Battery:*** -48 volt dc on ring with ground on tip.

(b) ***Positive Battery:*** +48 volt dc on ring with ground on tip.

(c) ***Initial Rate Ground Test (IRGT):*** -48 volt dc on tip (20 ma dc maximum) with ring open.

(d) ***Stuck Coin Ground Test (SCGT):*** +48 volt dc on tip (20 ma dc maximum) with ring open.

(e) ***Coin Collect:*** +130 volt dc on tip (41 ma dc minimum) with ring open.

(f) ***Coin Refund:*** -130 volt dc on tip (41 ma dc minimum) with ring open. Collect and refund may be followed by a SCGT to assure the coins cleared the hopper. SCGT passes if no current flows, which indicates that the HT contacts have been restored.

ORIGINATING A LOCAL CALL

3.01 In DTF service, the customer is instructed to:

- listen for tone
- deposit coins
- dial

With the contention that upon hearing dial tone a customer will know he has accessed a working system. This is in contrast to coin first operation, where the customer must invest initial rate to get dial tone.

IDLE STATE

3.02 In the on-hook condition the CO has -48 volt dc on R and ground on T. No loop current flows because switchhook contacts are open.

LOCAL CHARGE CALL, ANSWERED

3.03 When the customer picks up the handset, the switchhook closes and loop current flows. The A-relay operates and the network and TOUCH-TONE dial are enabled. A reset pulse initializes the logic and the set is ready for coin deposits. The CO recognizes a bid for service and supplies dial tone. The customer hears dial tone and deposits the first coin. The coin strikes the respective sensor element in the 47A signal, the value is registered, and the coin continues on to operate the hopper trigger (HT) contacts. As soon as the coin is registered in the logic, the coin oscillator generates coin tones. Immediately after the coin tone which makes initial rate, the B-relay is operated. After each deposit is signaled, the network and dial are reenabled. Loop battery is removed when the initial rate ground check (IRGC) is made, causing the A relay to release momentarily. This provides a path from tip-to-ground. The CO reapplies negative battery causing A relay to reoperate and removes ground from tip of line. When the customer hangs up, the switchhook opens, the A relay releases, coins are collected by collect battery from the CO and the B relay is released. As the coin relay armature releases, the hopper trigger (HT) restores and a stuck coin ground test (SCGT) is applied. If the coin has cleared the hopper, HT is open and the test passes. The set is now ready for the next call.

LOCAL CHARGE CALL, NOT ANSWERED

3.04 This call proceeds, as in 3.03, until busy signal is heard or there is no answer to ringing. Upon hanging up, the CO recognizes the disconnect and coin return battery is applied. The coin relay refunds the initial deposit, and the set is ready for the next call.

CALL TO A NONCHARGE NUMBER

3.05 When the customer picks up the handset, the switchhook closes, loop current flows,

and the set initializes as in 3.03. On receipt of dial tone, the customer dials a noncharge number. Call is completed in normal manner. When the call is terminated, the CO provides a refund cycle to return any coins that may have been deposited by mistake.

ABANDONED CALL

3.06 This is a situation whereby the customer terminates prior to dialing, during dialing, or before receiving a busy or audible ringing signal. When the switchhook opens at termination the CO recognizes the disconnect and applies a refund. If coins have been deposited, they are returned as in 3.04. If no money has been deposited, no current will flow through coin relay because HT is open.

CHARGEABLE CALL WITH INSUFFICIENT OR NO DEPOSIT

3.07 This call proceeds, as in 3.03, until the IRGT is made. The call is routed to an announcement trunk and the customer is advised how to properly make the call. If partial funds were deposited, a refund is made, and the set is ready for the next call.

AUTOMATIC LOCAL OVERTIME

3.08 Areas which have initial and overtime charging on local calls serve the customer as follows. One-half minute before the end of the initial period, the initial deposit is collected. A brief tone to alert the customer to deposit 5¢ for the first overtime period is sent. A SCGT is made at the end of the initial period. It will indicate the presence of a coin, if the customer had deposited 5¢ (HT closed), and the call is allowed to continue until 30 seconds from the end of the first overtime when the routine is repeated. If the customer did not deposit 5¢ (or another coin to close HT), the SCGT will not indicate the presence of a coin and the call is connected to an operator, who prompts the customer and listens for the coin deposit signal.

LOCAL CALL—SIMULTANEOUSLY DEPOSITING COINS AND DIALING

3.09 If a customer deposits a coin which is registered in the logic during dial operation, coin signaling is deferred until the dial is released. If the dial is operated during a coin tone, that tone is completed and the remainder is delayed until the dial is released. If the dial is operated during a silent interval, the sequence halts immediately, and resumes on dial release. Thus the dial has priority over the coin logic for local calls. This prevents simultaneous coin and dial signaling which would cause misregistered digits.

3.10 Initial charge is announced, and coin signals are heard by the position attendant. Overtime charges may be handled by another position in the group. The set functions as before by signaling each coin as deposited.

ORIGINATING A TOLL CALL

3.11 ***Toll Call Through a Cord Switchboard.***

(a) The customer picks up the handset, receives dial tone and dials "O" (no deposit needed). When the operator connects, the trunk supplies refund in the event money had been deposited. Normal battery is replaced by reversed battery for the remainder of the call. The customer announces the called number and the operator specifies the initial charge. The customer deposits coins which are read out as they are deposited. The operator starts timing the call and at the end of the initial period, collects the initial deposit and announces ***"your initial period is up, please signal when finished."*** The customer either flashes the switchhook or hangs up when through. If he flashes, he is advised of overtime charges. If he hangs up, the operator must call back. The operator listens to the coin signals, collects the money, and terminates. The customer hangs up and the set is ready for the next call initiation. The TOUCH-TONE dial is active during normal and reversed battery to provide end-to-end signaling.

3.12 ***Toll Call Through a TSPS.***

(a) Operator assisted (0 + NPA + 7 digits) or operator dialed ("O"-) calls progress as in 3.11 except the operator is located at a TSPS console. The customer may also begin by dialing the toll number or 1 + the toll number depending upon local practice. A position is seized and refund is applied. Reversed battery is supplied.

3.13 ***Toll Call—No Coins Used.***

(a) The set operates as residential for collect and third party billed calls.

INCOMING LOCAL CALL

3.14 The set operates as residential.

INCOMING TOLL CALL

3.15 ***Sent-Paid.***

(a) The set operates as residential.

3.16 ***Collect.***

- Upon answer, the local operator asks whether the charges are accepted and whether the set is a coin station.
- If coin station is verified and charges are accepted, coins are deposited in the coin station and are totaled by the operator. The set reads out each deposit as it is made. Coins are collected at the end of initial and overtime periods.

4. FEATURES

4.01 The following is a list of features applicable to the 1D/2D coin telephone set.

(1) Stable and reliable operation from -30° to +140°F

(2) Assures consistent coin signaling in all environments

(3) Coin misregistration greatly reduced over previous coded sets which was caused by totalizer malfunction.

(4) Circuit presents a constant DC resistance to the CO for all signaling and switching functions.

(5) The network uses low transmitter current and ac amplification.

(6) Set resistance is almost constant at approximately 300 ohms.

(7) Automatic circuit reset, when going on-hook, eliminates set lockup when CO trouble conditions are encountered.

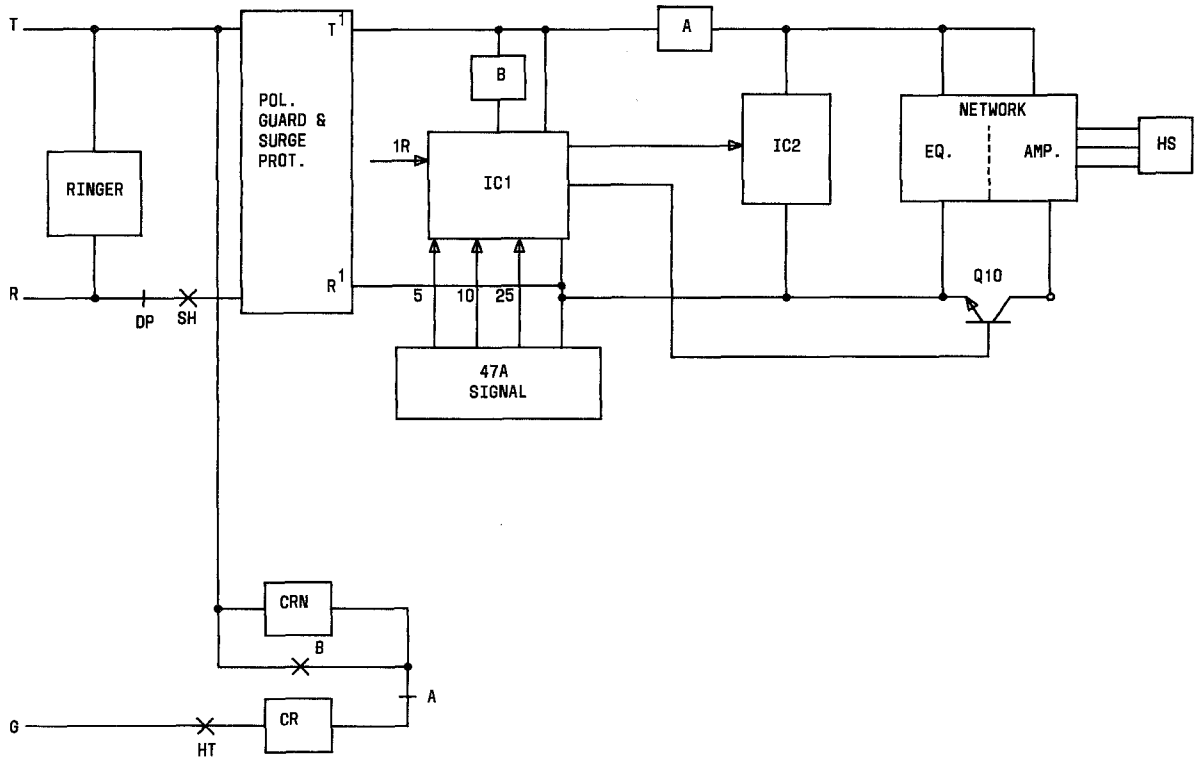


Fig. 1—1D1/2D1 Coin Telephone Set, Schematic

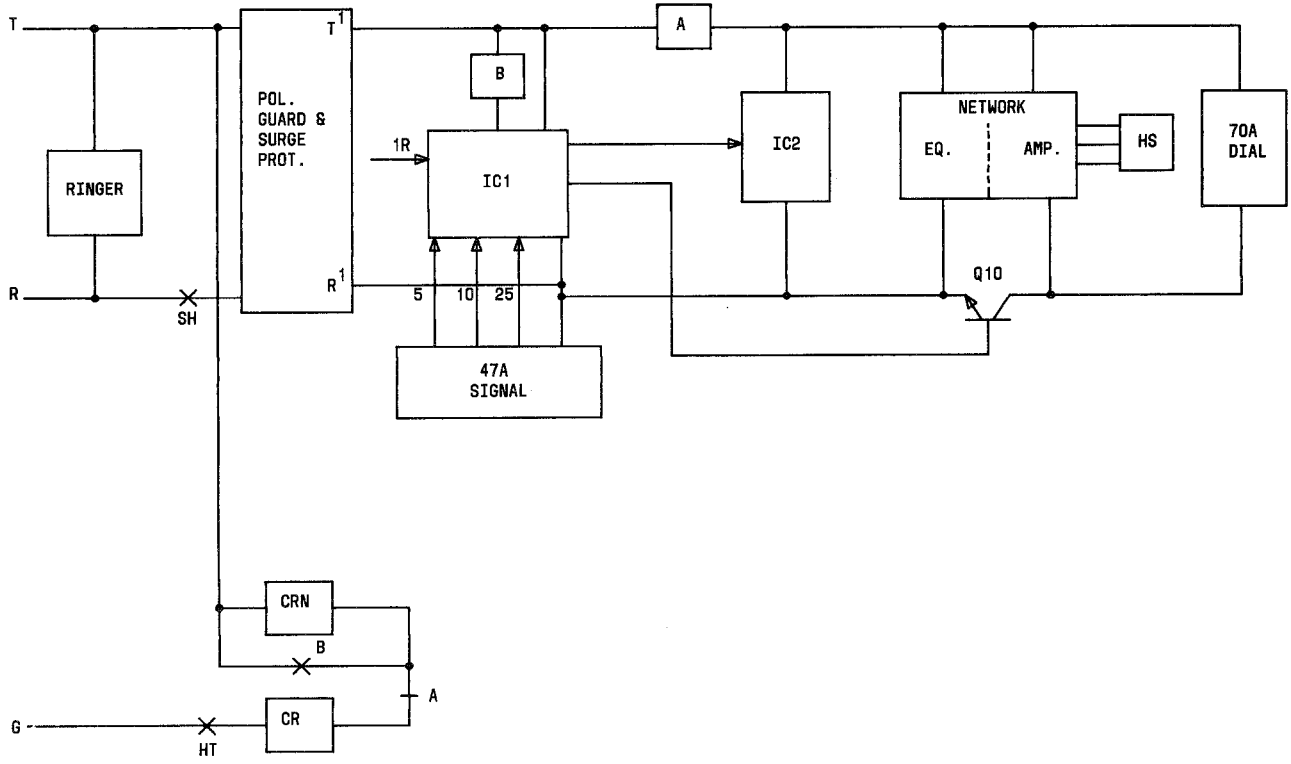


Fig. 2—1D2/2D2 Coin Telephone Set, Schematic

1E-TYPE COIN TELEPHONE SET

DETAILED DESCRIPTION

POSTPAY SERVICE—THEORY OF OPERATION

DIAL POSTPAY (FIG. 1)

Note: This detailed description is based on the operation of a 50A hopper (MD). The new 51A hopper has the same effect on the set circuit, the difference being that the hopper trigger (HT) and 4480 ohm resistor in the 50A hopper has been replaced by an electronic delay circuit in the 51A hopper.

1.01 In Postpay service, the central office (CO) supplies -48 volt to ring with tip grounded.

1.02 When the handset is lifted, switchhook contacts operate and current flows from the ring lead to tip. The path is through the normally closed T2 contact, DP, operated SH2 and SH4, through the speech network, through normally closed T1 [parallel with hopper trigger (HT)] to tip.

1.03 The called number is then dialed and the called party must answer before a coin deposit is made. When the called party answers, the CO automatically opens (splits) the transmission path and sends a ***deposit-coin*** tone to the calling party.

Note: The "deposit-coin" tone is a low frequency tone to inform the calling party that the called party has answered and the initial rate deposit should be made immediately.

1.04 During the time the connection is split, the CO ***S*** relay operates and reverses the loop to the set (negative on tip, ground on ring). This reversed loop prepares the set to receive the initial rate by causing the ring lead to be more positive than tip. With the loop reversed, the totalizer will not restore because diode CR4 is forwarded biased and SH3 (NO) is closed, thus shorting the totalizer and allowing an accumulation of deposits up to, or more than, the initial rate.

1.05 If the totalizer is set for more than 5-cent initial rate, and the calling party deposits a nickel, the HT will operate but is shorted by the normally closed totalizer contact T1. Any time the initial rate requirement is satisfied, totalizer contact T1 will open.

1.06 With HT and T1 both open, the 4480 ohm resistor, located on the 50A hopper, is momentarily placed in series with the loop which creates essentially a low current pulse.

Note: This momentary pulse must have a minimum width of 100 milliseconds and a maximum of 300 milliseconds. The CO recognizes the pulse by use of two relays with different release currents.

1.07 When the CO recognizes this pulse, the CO margin relay will release, thus removing the split connection and establishing the talking circuit. This marginal relay is critical to loop length. Over range will cause improper operation.

1.08 When the switchhook is restored, SH3 (NO) contact opens, and the short around the totalizer is removed. Current now flows through the totalizer, operating the S relay, and the totalizer steps back to ***home*** position.

Note: Unlike a Coin-First or Dial-Tone-First set, the totalizer in a postpay set remains off ***home*** through the total call period for local calls.

1.09 In cases of toll calling, when the customer dials the operator, the CO recognizes the toll call, will not reverse tip and ring, thus the ring lead remains negative throughout the call.

Note: When operator call back is required, negative battery must be supplied on the ring lead.

1.10 With negative on ring, diode CR4 is reversed biased, thus allowing the totalizer to ***read out*** all coin deposits requested by the operator. In addition, the 446F diode across HT contact is forward biased, shorting the HT contact, thus reducing the noise (caused by opening and closing of HT) transmitted to the operator.

MANUAL POSTPAY (FIG. 2)

1.11 The manual coin telephone set consists of the talking and signaling circuitry of a standard 500-type telephone set but also provides coin signaling upon deposit of coins.

1.12 The manual set is usually connected directly to an operator circuit, and the operator will hear all coin deposit tones.

1.13 As in dial postpay service, it is necessary that the CO provide negative battery at all times when the set is connected to an operator circuit.

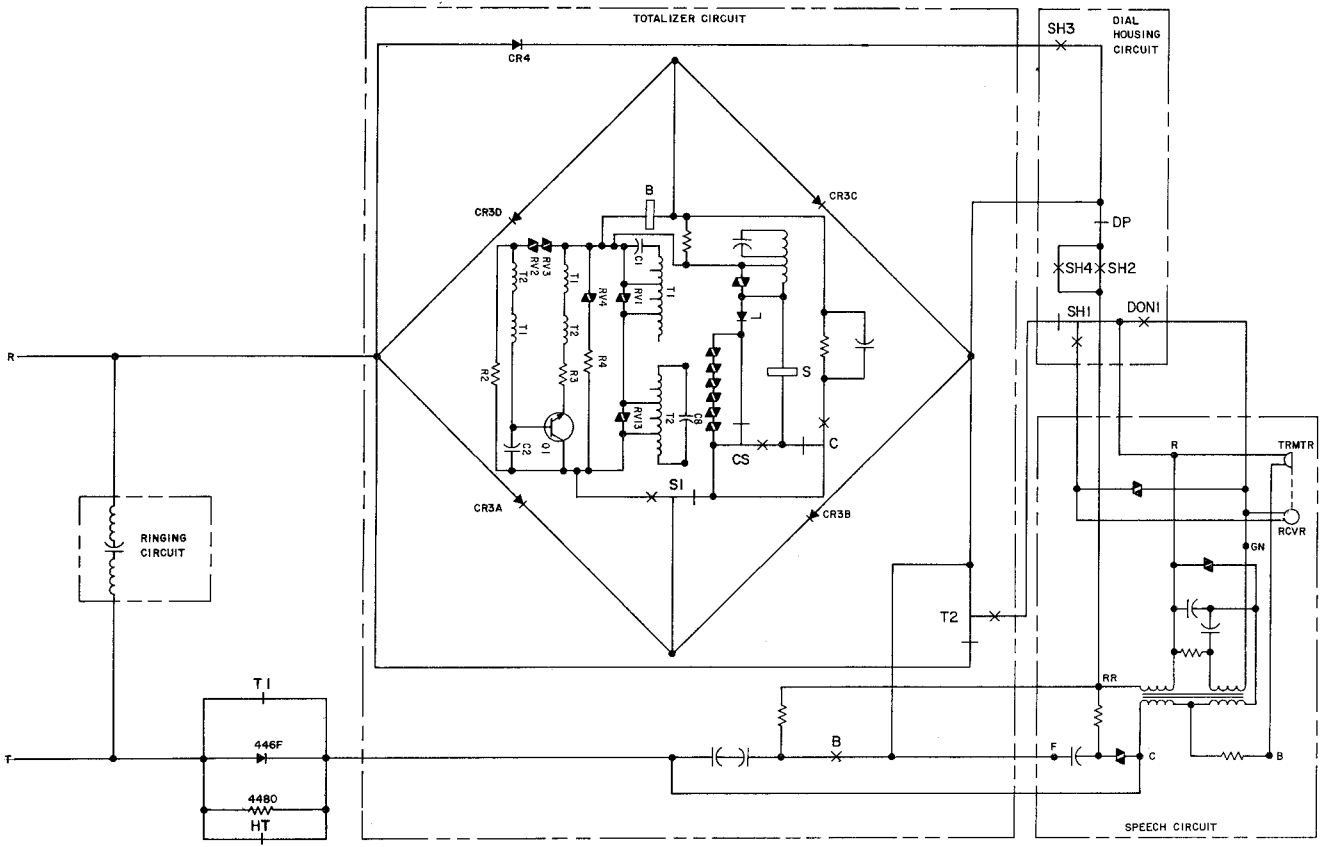


Fig. 1—1E1 Coin Telephone Set, Schematic

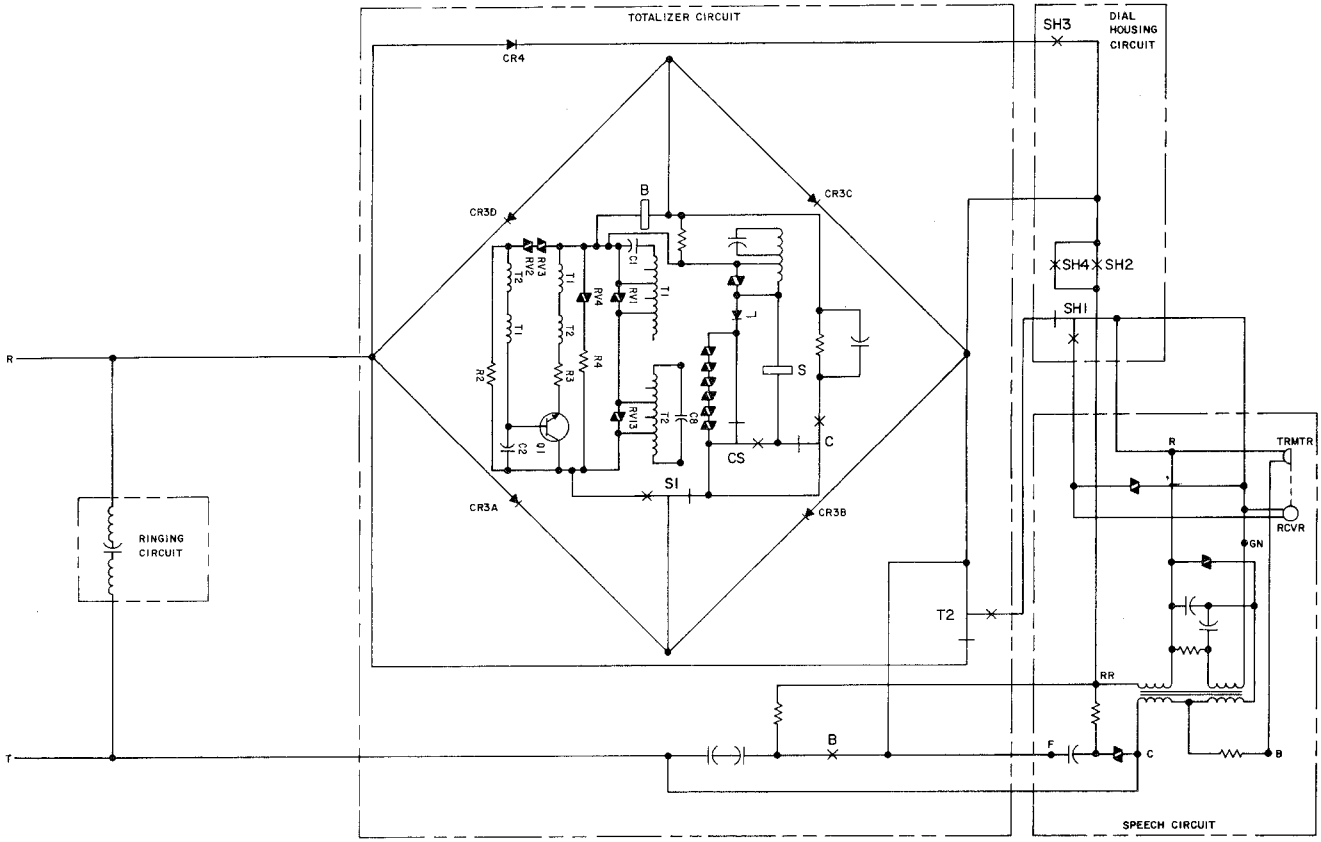


Fig. 2—1E3 Coin Telephone Set, Schematic

COMPONENTS AND COLOR SELECTION

TABLE A
COMPONENT AND COLOR SECTION
(1A/2A-TYPE SETS)

COIN TEL SET	FRONT COVER		DIAL AND HOUSING		DIAL	NUMBER PLATE ASSY	INFORMATION PLATE	HANDSET
	COVER UNIT ASSY (MD)	COIN COVER UNIT *	DIAL AND HOUSING ASSY (MD)	COIN DIAL UNIT *				
1A1-3 (Black)	819054032 (P-90E403)	70A1-3	841317241 or 819042748 (P-90D274) (MD)	60A1-44	8WA or 8W (MD)	818418527	840156319	G3AH-52, G3AK-52, G3AHF-52†, G3AKF-52†, G13-Type‡
				60A2-44				
1A1-44 (Chrome)	819054446 (P-90E444)	70A1-44		60A1-44				
				60A2-44				
1A1-51 (Moss Green)	819054511 (P-90E451)	70A1-51		60A1-44				
				60A2-44				
1A2-3 (Black)	819055039 (P-90E503)	71A1-3	840346977	61A1-44	70A			
			819042755 (P-90D275)		35T3A			
1A2-44 (Chrome)	819055443 (P-90E544)	71A1-44	840346977	611-44	70A			
			819042755 (P-90D275)		35T3A			
1A2-51 (Moss Green)	819055518 (P-90E551)	71A1-51	840346977	61A1-44	70A			
			819042755 (P-90D275)		35T3A			
2A1-67 (Brushed Stainless)				61A1-44	8WA or 8W (MD)	818720526		
2A2-67 (Brushed Stainless)				61A1-44	70A			
					35T3A			

* These coin cover unit and coin dial unit codes are for ordering information to obtain the unit, wired, tested, and equipped for the correct mode of operation. Since the units may be field converted from one type to another, maintenance, and installation should be based on the first three (3) characters of the code only. It is important therefore to ensure that the unit being used is wired properly and that the coin cover unit has the proper information plate and instruction cards for the type of service with which it is being used. All rotary coin cover units are equipped with 8WA dials and all TOUCH-TONE coin covers units are equipped with 70A dials.

† G3AHF-52 and G3AKF-52 are optional flame retardant handsets that can replace the G3AH-52 and G3AK-52 respectively. The G3AK and G3AKF are equipped with a moisture resistant transmitter barrier and special transmitter cap.

‡ A G13-Type amplified handset can be used. Refer to Section 501-211-102 for complete information.

TABLE A (Contd)
COMPONENT AND COLOR SECTION
(1A/2A-TYPE SETS)

HOUSING AND MTG PLATE ASSY	CHUTE-TOTALIZER	COIN CHASSIS	COIN RELAY AND HOPPER ASSY	RETURN CHUTE ASSY	COIN RETURN ASSY	COIN RECP RAIL	CASH COMPT. DOOR
818512036 (P-85A203)	811554286 (P-15E428) Consist of 20A Chute 811555796 (P-15E579) Totalizer	840693634 with DF Oscillator	1AA Coin Relay Consist of 1A Coin Relay and 811557172 Coin Hopper Assembly	811557305 (Current return chute assemblies are made of plastic instead of diecasting)	812165462	1B	2A-3 or 2B-3 (Optional)
818512444 (P-85A244)							2A-44 or 2B-44 (Optional)
818512519 (P-85A251)							2A-51 or 2B-51 (Optional)
818512036 (P-85A203)							2A-3 or 2B-3 (Optional)
818512444 (P-85A244)							2A-44 or 2B-44 (Optional)
818512519 (P-85A251)							2A-51 or 2B-51 (Optional)
						1D	5A-67

TABLE B
COMPONENT AND COLOR SECTION
(1C/2C/1E-TYPE SETS)

COIN TEL SET	MODE OF OPERATION	FRONT COVER		DIAL AND HOUSING		DIAL	NUMBER PLATE ASSY	INFORMATION PLATE	HANDSET
		COVER UNIT ASSY (MD)	COIN COVER UNIT *	DIAL AND HOUSING ASSY (MD)	COIN DIAL UNIT				
1C1-3 (Black)	CF	819054032	70A1-3	841317241 or 819042748 (P-90D274)	60A1-44	8WA or 8W (MD)	818418527	840156319 for Coin First 840156327 for Dial Tone First (Used on 1C-and 2C-Type sets only)	G3AH-52, G3AK-52, G3AHF-52† G3AKF-52 † G13-Type‡
	DTF	(P-90E403	70A2-3		60A2-44				
1C1-44 (Chrome)	CF	819054446	70A1-44		60A1-44				
	DTF	(P-90E444	70A2-44		60A2-44				
1C1-51 (Moss Green)	CF	819054511	70A1-51		60A1-44				
	DTF	(P-90E451	70A2-51		60A2-44				
1C2-3 (Black)	CF	819055039	71A1-3	840346977 (70A Dial) or 819042755 (P-90D275) (35T3A Dial)	61A1-44	70A or 35T3A (MD)			
	DTF	(P-90E503	71A2-3		61A2-44				
1C2-44 (Chrome)	CF	819055443	71A1-44		61A1-44				
	DTF	(P-90E544	71A2-44		61A2-44				
1C2-51 (Moss Green)	CF	819055518	71A1-51		61A1-44				
	DTF	(P-90E551	71A2-51		61A2-44				
2C1-67 (Brushed Stainless)	CF			841317241 or 819042748 (P-90D274)	60A1-44	8WA or 8W (MD)	818720526		G3AH-52, G3AK-52, G3AHF-52† G3AKF-52 † G13-Type‡
	DTF				60A2-44				
2C1-84 (Bronze)	CF			841317258 or 840152227	60A1-84		818720039		G3AH-3, G3AK-3, G13-Type‡
	DTF				60A2-84				
2C2-67 (Brushed Stainless)	CF			840346977	61A1-44	70A			G3AH-52, G3AK-52, G3AHF-52† G3AKF-52 † G13-Type‡
	DTF				61A2-44				
	CF			819042755	61A1-44	35T3A (MD)			
	DTF				61A2-44				
2C2-84 (Bronze)	CF			840347173	61A1-84	70A			G3AH-3, G3AK-3, G13-Type‡
	DTF				61A2-84				
	CF			840157580	61A1-84	35T3A (MD)			
	DTF				61A2-84				
1E1-3 (Black)	Dial Post Pay	840658033	70A5-3	841317241 or 819042748 (P-90D274)	60A2-44	8WA or 8W (MD)	818418527	840156087	G3AH-52, G3AK-52, G3AHF-52† G3AKF-52 † G13-Type‡
1E1-44 (Chrome)		840658447	70A5-44						
1E1-51 (Moss Green)		840658512	70A5-51						
1E3-3 (Black)	Manual Post Pay	840659031	70A4-3	841317266 or 812366516 (P-23F651) Housing Assembly	60A4-44	840994727 Apparatus Blank Assembly			
1E3-44 (Chrome)		840659445	70A4-44						
1E3-51 (Moss Green)		840659510	70A4-51						

* These coin cover unit and coin dial unit codes are for ordering information to obtain the unit, wired, tested, and equipped for the correct mode of operation. Since the units may be field converted from one type to another, maintenance, and installation should be based on the first three (3) characters of the code only. It is important therefore to ensure that the unit being used is wired properly and that the coin cover unit has the proper information plate and instruction cards for the type of service with which it is being used. All rotary coin cover units are equipped with 8WA dials and all TOUCH-TONE coin cover units are equipped with 70A dials.

† G3AHF-52 and G3AKF-52 are optional flame retardant handsets that can replace the G3AH-52 and G3AK-52 respectively. The G3AK and G3AKF are equipped with a moisture resistant transmitter barrier and special transmitter cap.

TABLE B (Contd)
COMPONENT AND COLOR SECTION
(1C/2C/1E-TYPE SETS)

HOUSING AND MTG PLATE ASSY	CHUTE-TOTALIZER	COIN CHASSIS	COIN RELAY AND HOPPER ASSY	RETURN CHUTE ASSY	COIN RETURN ASSY	COIN RECP RAIL	CASH COMPT. DOOR
818512036 (P-85A203)	20A1A Consist of 20A Chute and 1A Totalizer	31A with DF Oscillator (31A2 Coin Chassis is available wired and tested for DTF service)	1AA Coin Relay Consist of 1A or P-15E687 (MD) Coin Relay and 811557172 (P-15E717 Coin Hopper Assembly	811557305 (Current return chute assemblies are made of plastic instead of diecasting)	812165462	1B	2A-3 or 2B-3 (Optional)
818512444 (P-85A244)							2A-44 or 2B-44 (Optional)
818512519 (P-85A251)							2A-51 or 2B-51 (Optional)
818512036 (P-85A203)							2A-3 or 2B-3 (Optional)
818512444 (P-85A244)							2A-44 or 2B-44 (Optional)
818512519 (P-85A251)							2A-51 or 2B-51 (Optional)
						1D	5A-67
					840152219		5A-84
					812165462		5A-67
					840152219		5A-84
840656037	20A10A Consist of 20A Chute and 10A Totalizer	30B with DF Oscillator	51A or 50A (MD) Hopper Assembly		812165462	1B	2A-3 or 2B-3 (Optional)
840656441							2A-44 or 2B-44 (Optional)
840656516							2A-51 or 2B-51 (Optional)
840657035			50B Hopper Assembly				2A-3 or 2B-3 (Optional)
840657449							2A-44 or 2B-44 (Optional)
840657514							2A-51 or 2B-51 (Optional)

‡ A G13-type amplified handset can be used. Refer to Section 501-211-102 for complete information.

TABLE C
COMPONENT AND COLOR SECTION
(1D/2D TYPE SETS)

COIN TEL SET	COIN COVER UNIT	COIN DIAL UNIT	DIAL	NUMBER PLATE ASSY	INFORMATION PLATE	HANDSET
1D1-03 (Black)	70A-Type	60A-Type	8WA	818418527	840156327	G3AH, G3AK, G3AHF,* G3AKF* G13-Type†
1D1-44 (Chrome)						
1D1-51 (Moss Green)						
1D2-03 (Black)	71A-Type	61A-Type	70A			
1D2-44 (Chrome)						
1D2-51 (Moss Green)						
2D1-67 (Brushed Stainless)		60A-Type	8WA	818418526		
2D1-84 (Bronze)				818720039		
2D2-67 (Brushed Stainless)		61A-Type	70A			
2D2-84 (Bronze)						

* G3AHF-52 and G3AKF-52 are optional flame retardant handsets that can replace the G3AH-52 AND G3AK-52 respectively. The G3AK and G3AKF are equipped with a moisture resistant transmitter barrier and special transmitter cap.

† A G13B amplified handset can be used. Refer to Section 501-211-102 for complete information.

TABLE C (Cont)
COMPONENT AND COLOR SECTION
(1D/2D-TYPE SETS)

HOUSING AND MTG PLATE ASSY	CHUTE SIGNAL	COIN CHASSIS	COIN RELAY AND HOPPER ASSY	RETURN CHUTE ASSY	COIN RETURN ASSY	COIN RECEP-TACLE	CASH COMPT DOOR
818512036	20A47A Consists of a 20A Chute and a 47A Signal	32A	1AA Consists of a 1A Coin Relay and 811557172 Coin Hopper Assy	811557305	812165462	1B	2A-3 or 2B-3 (Optional)
818512444							2A-44 or 2B-44 (Optional)
818512519							2A-51 or 2B-51 (Optional)
818512036							2A-3 or 2B-3 (Optional)
818512444							2A-44 or 2B-44 (Optional)
818512519							2A-51 or 2B-51 (Optional)
						1D	5A-67
					840152219		5A-84
					812165462		5A-67
					840152219		5A-84

KS-21250 PORTABLE COIN TELEPHONE TEST SET

1.01 The KS-21250 portable test set may be used to check certain features of the coin telephone set when a central office line is not available or when dial long line equipment is used in the CO.

Warning: Hazardous voltages on leads when test buttons operated.

Note: The timing circuit in this test set is designed to time a 450 ms relay.

1.02 Perform following pretest set-up.

(a) On 1-type sets, remove cover unit assembly and hang it on a KS-20950 parking tool or connect a P11C patch cord between P1 and J1.

(b) On 2-type sets, open door and faceplate assembly and connect a P11C patch cord between P1 and J1.

Warning: Disconnect CO tip and ring from set.

(c) Connect the test set to TB1 terminals in telephone set, Red to R, Green to T, and Yellow to G.

1.03 Perform the following tests.

(a) ***Telephone Tests:***

Note 1: The table and step numbers referenced in the test are found in Section 506-900-503 or the Coin Maintenance Check Booklet.

Note 2: In these tests, only the ***possible cause*** and ***remedial action*** entries apply in the referenced tables and steps.

Note 3: When test set is ***on,*** it supplies battery to the telephone set and sidetone is available except when either button is depressed.

DTF MODE (C/D-TYPE SETS ONLY)

	Test	Table	Step
(1)	Handset on hook. Test set ON. Deposit quarter.	B	6
	• Totalizer steps back (C-type sets only) • Beep tones heard in test set (C-type sets only)		
(2)	Refund money using REFUND/TIME button	B	6
(3)	Handset off-hook. Deposit nickel less than initial rate.	B	7
	• Totalizer does not step back (C-type sets only) • No beep tone(s) heard, except in 1D/2D sets beep tones will be heard		
(4)	Operate dial	B	7
	• Clicks/TT signals heard in test set		
(5)	Go on-hook	B	8
	• Totalizer steps back (C-type sets only) • Beep tone(s) heard except in 1D/2D sets beep tone(s) will not be heard.		
(6)	Refund coin(s)		
(7)	Go off-hook. Reverse Red and Green test set leads. Deposit nickel.	B	12 and 14
	• Totalizer steps back (C-type sets only) • Beep tone heard		
(8)	Refund nickel		

CF MODE (A/C-TYPE SETS ONLY)

(1)	Handset on-hook. Test set ON. Deposit quarter.	A	5
	• Totalizer steps back • Beep tones heard in test set		
(2)	Refund coin using REFUND/TIME button	A	5

CF MODE (Cont)

	Test	Table	Step
(3)	Handset off-hook; test set OFF. Deposit nickel less than initial rate. Turn test set ON. • Totalizer does *not* step back • No beep tone(s) heard	A	7
(4)	Go on-hook • Totalizer steps back • Beep tone(s) heard in test set.	A	6
(5)	Go off-hook; operate dial • Clicks/TT signals are *not* heard • Sidetone present in handset.	A	6
(6)	Refund coin(s) using REFUND/TIME button		
(7)	Test set OFF. Deposit initial rate. Turn test set on. • Totalizer steps back • Beep tones heard in test set	A	8
(8)	Operate dial • Clicks/TT signals heard • Sidetone present	A	9
(9)	Refund coin(s) using REFUND/TIME button		

POSTPAY MODE (E-TYPE SETS ONLY)

(1)	Handset off-hook. Test set ON. • Sidetone present in handset	E	4
(2)	Rotate dial and release • Clicks heard		
(3)	Insert KS-14995, L3 tool between coin chute and hopper to prevent loss of deposited coins		
(4)	Deposit nickel less than initial rate • Totalizer does not step back • No beep tones heard	E	14

POSTPAY MODE (Contd)

Test	Table	Step
(5) Hang-up • Totalizer steps back • Beep tone(s) heard	E	17
(6) Handset off-hook — Deposit initial rate • Totalizer does not step back • In a 1E1 set, a click is heard in test set speaker	E	15
(7) Reverse Red and Green leads of test set. • Totalizer steps back • Beep tones heard in speaker	E	17
(8) Deposit quarter • Five beeps heard	E	6
(9) Disengage chute locking spring; slowly pull top of chute forward while holding KS-14995, L3 tool. Lift chute and tool out of set and retrieve coins.		

(b) ***Timing Test***—Coin relay (CF and DTF sets only). Remove coin chute assembly. Connect test set Red to No. 3 on coin relay. Yellow to G relay terminal. Black to top lead of relay resistor.

(1) Deposit coin (or trip hopper trigger).

(2) Press and hold REFUND/TIME button. Relay operates. Timing light(s) can be read.

(3) Release and lift return chute assembly out. Operate COLLECT button. Observe in hopper that coin vane moves to collect position.

(4) Reassemble disconnected components.

(c) ***Coin Relay Operate Margin*** (CF and DTF sets only). ***Check***—with a working central office line connected to coin telephone set.

(1) Connect Yellow lead of test set to 3 on coin relay and Black lead of test set to top of relay resistor, lift handset. (Test Set Off.)

(2) Deposit initial rate.

(3) Dial any digit but ***0.*** Hang up. Relay should operate despite added shunt load built into the test set. If coin relay fails to operate, have test deskperson assist in determining loop and ground resistance measurements.

1.04 Return coin telephone set to normal operation.

1.05 When finished with test set, ***turn it "OFF."***

1.06 Replacement batteries for the KS-21250 test set are:

- KS-14389 - 48-volt
- KS-14369 - 48-volt
- KS-14368 - 1.5-volt or 1.5-volt Alkaline for operation below 0°F (Eveready No. E91 or RAY-O-VAC No. 815).

Timing Light Indications		Action	
Fast	Slow	Relay	Relay Armature Screw
ON	ON	OK	OK but see*
OFF	ON	Slow	Turn clockwise — see note
ON	OFF	Fast	Turn counterclockwise

Note: Adjust armature screw ¼ turn each time. Retest, readjust, retest until OK. When collect button is used to operate relay, the timing lights remain off.

*When the RELAY is below 20°F, check and adjust until both SLOW and FAST lights are on, then turn relay screw counterclockwise and repeat until relay tests SLOW after last ¼ turn.

COIN TEST LINE CIRCUIT

1. GENERAL

1.01 The Coin Station Test Line is usable on coin lines ***not*** equipped with dial long line units. It allows the installation or repair forces to make the following operational tests without tying up local test desk facilities or requiring services for an operator:

- Coin Detection and Ground Removal
- Ground Circuit Foreign EMF (ZK Option)
- Loop Foreign EMF (ZK Option)
- Ground Circuit Check
- Loop Resistance
- Loop Leakage
- Coin Collect
- Coin Return
- Coin Relay Operating Time

1.02 While performing the preceding tests, proper functioning of the following can be determined:

- Coin Chute
- Dial
- Totalizer
- Ringer
- Transmitter and Receiver
- Automatic Coin Local Overtime (DTF).

1.03 The referenced tables are found in the Coin Maintenance Check Booklet or Section 506-900-503. Example: (B-4) indicates Step 4 in the Trouble Analysis, Table B.

1.04 Initial rate must be deposited to access the test line. After the test line has been seized CF stations require a single coin deposit equal to or greater than initial rate to dial additional tests; example: initial rate is 15 cents, a quarter must be deposited. For DTF stations nickel, dime, or quarter can be deposited for additional tests except when Automatic Coin Overtime Test is made.

1.05 Tests should be made in a sequential manner as shown in the Test Line Procedure. Tests may be repeated by dialing the assigned digit when the test line is in the "Test Selection Mode" (interrupted dial tone). Once the Relay Time test has been dialed (digit 5), the test can be recycled as often as necessary by tripping hopper trigger or redepositing a coin. The Coin Detection and Ground Removal tests require disconnect and reseizure of the test line if retest is desired.

1.06 If no action is taken for approximately 60 seconds after the reception of the "Test Selection Tone" (interrupted dial tone) during any phase of the sequence, the test line will automatically disconnect and restore the circuit to normal.

1.07 Tones are used to indicate a required action by the craftsperson as follows:

- Alternating high and low tone (Tone C)—requires deposit of coin or operation of hopper trigger.
- Steady high tone (hang-up tone)—request to restore handset to on-hook condition. In some tests high tone replaces tone C upon deposit of coin or operation of trigger.
- Interrupted dial tone (test selection tone)—proper digit should be dialed depending on test desired.

1.08 Test results are returned to the craftsperson in the form of coded beeps or rings which are repeated three times. When rings are called for the handset should be taken off-hook before

the 3rd ring or group of rings to prevent test line disconnect.

1.09 The Coin Test Line is capable of testing rotary or TOUCH-TONE® dial stations.

2. PREPARATION

2.01 The following apparatus is required:

- P11C cord—Used to connect cover unit assembly or door and faceplate assembly to coin chassis
- KS-20950, L1 parking tool (Fig. 1)—Used to hang cover unit assembly of 1-type set on side of housing, eliminating the need for a P11C cord
- 146B bias margin gauge—Collect and Return Test
- 1013A hand test set—Connect to receiver circuit when upper housing or cover unit assembly is on floor or to verify coin signals
- KS-14995, L3 tool—Placed between coin chute and hopper during Collect test to prevent collection of coins (Fig. 2)
- Two dimes, one nickel, one quarter.

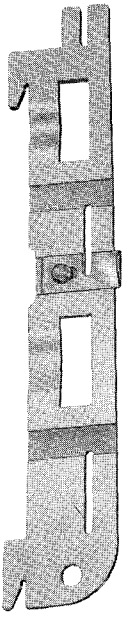


Fig. 1—KS-20950, List 1 Cover Parking Tool

2.02 Prepare coin station as follows:

(1) Remove cover unit assembly of 1-type sets or open door and faceplate assembly of 2-type sets.

(2) If P11C cord is used, invert handset on switchhook of 1-type sets to prevent armored cord pushing handset off-hook when cover unit assembly is set aside.

(3) Where possible, install cover unit assembly on a KS-20950, L1 cover parking tool (Fig. 1).

(4) When testing, ensure that totalizer CF-DTF mode switch (C-type sets only), is in the proper position.

3. COIN TEST LINE PROCEDURE

3.01 Perform test per following flow charts:

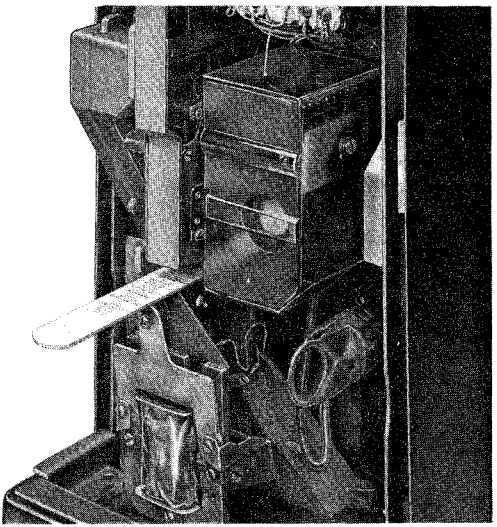


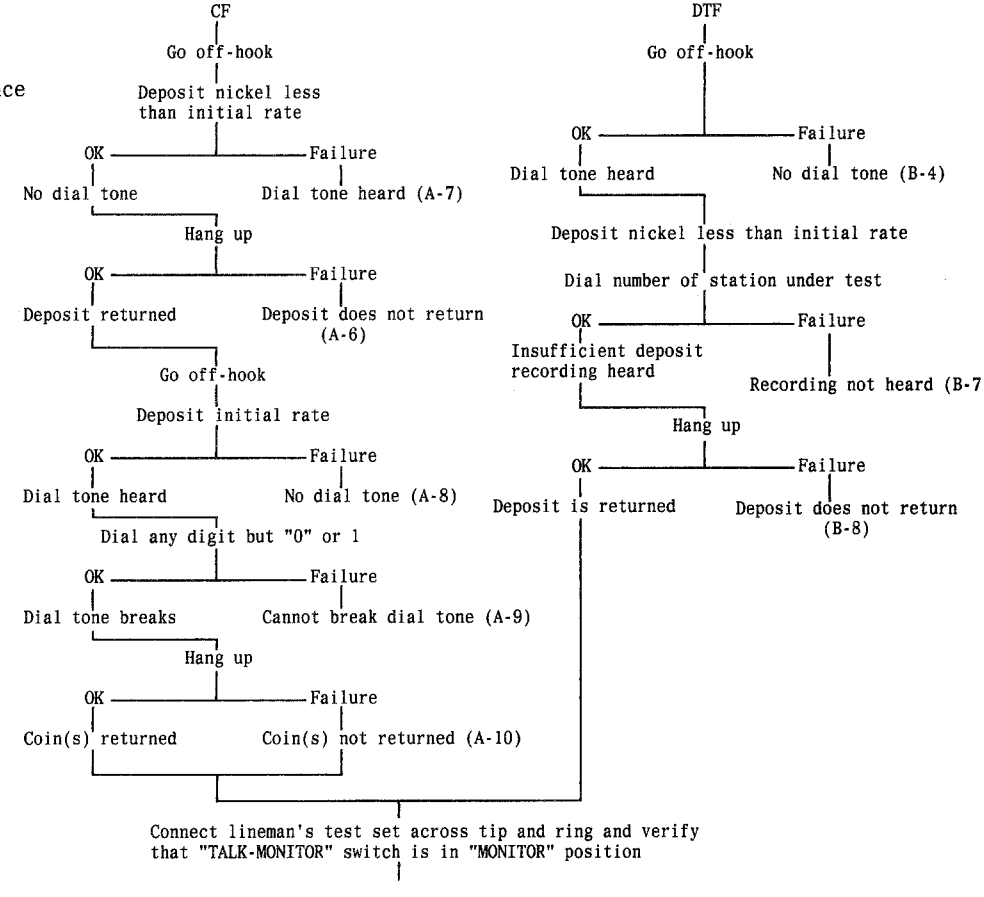
Fig. 2—KS-14993, List 3 Tool—In Position for Collect Test

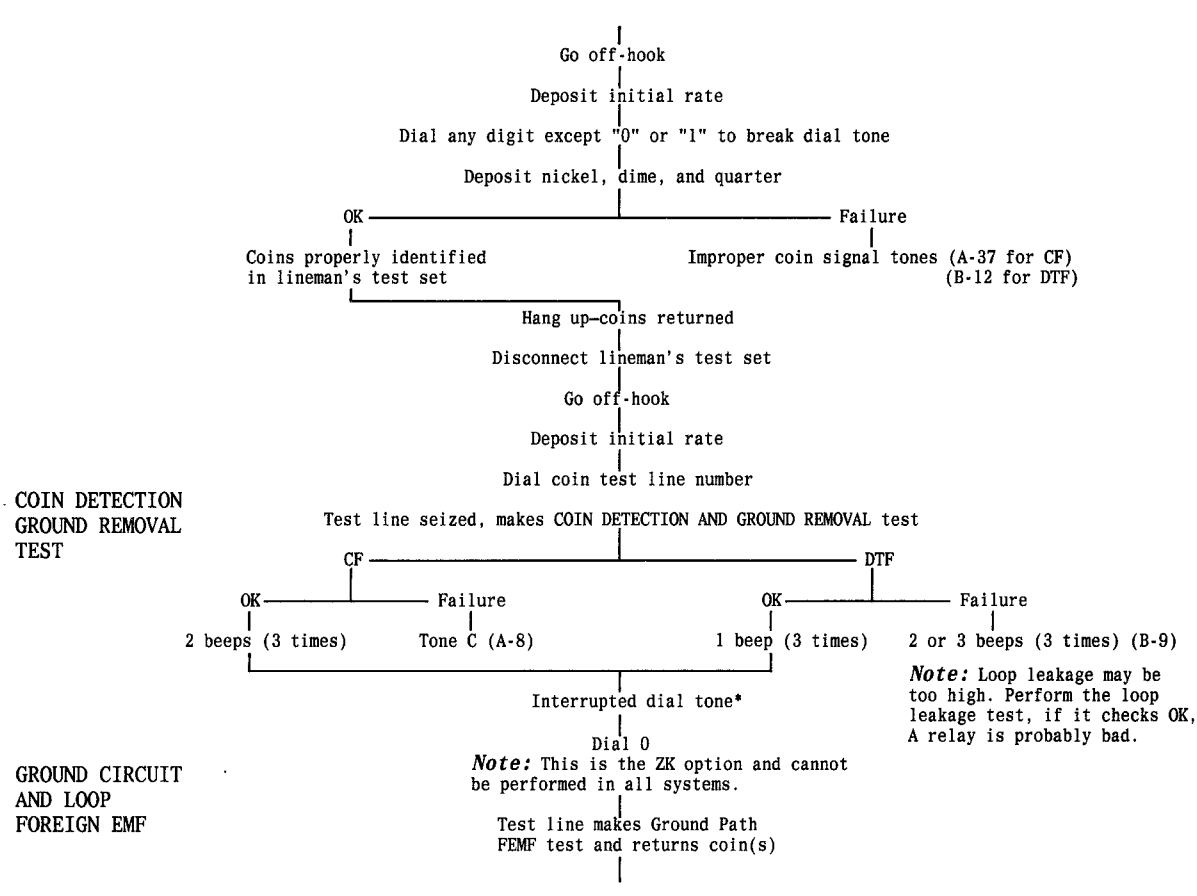
LEGEND

CF–Coin First
DTF–Dial Tone First
(A-7)–Table A
Step No. 7
In Coin Maintenance
Check Booklet,

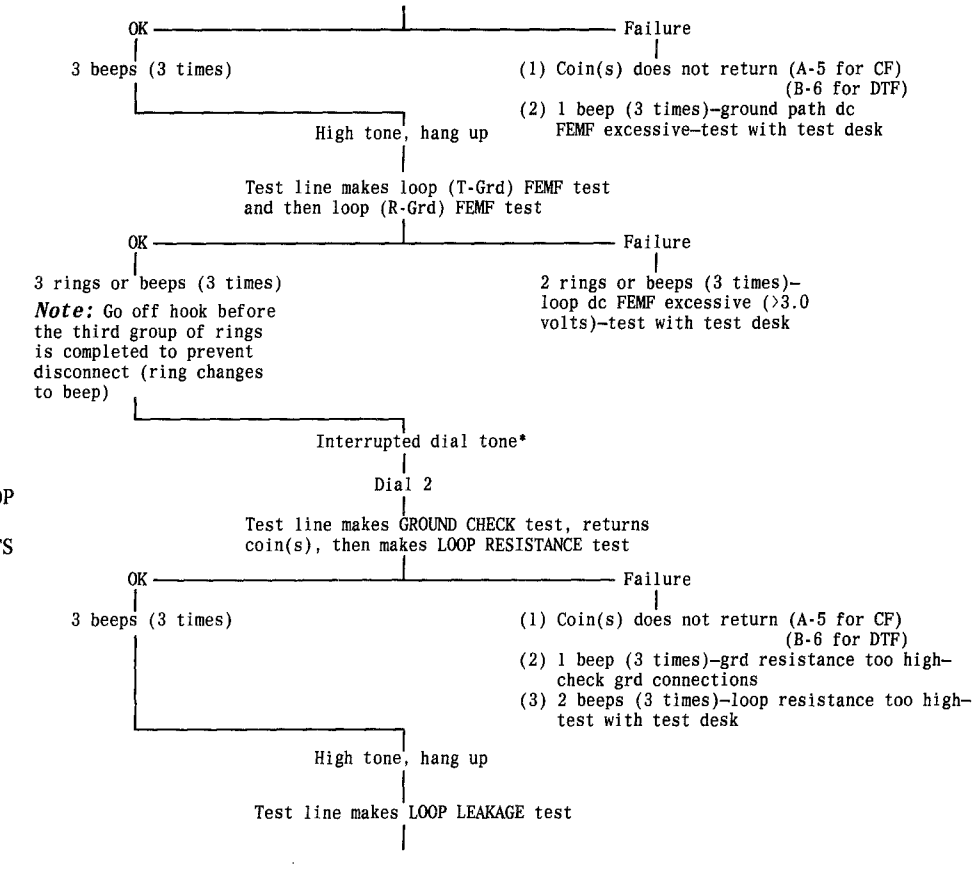
(Typical)

COIN TEST LINE TESTS



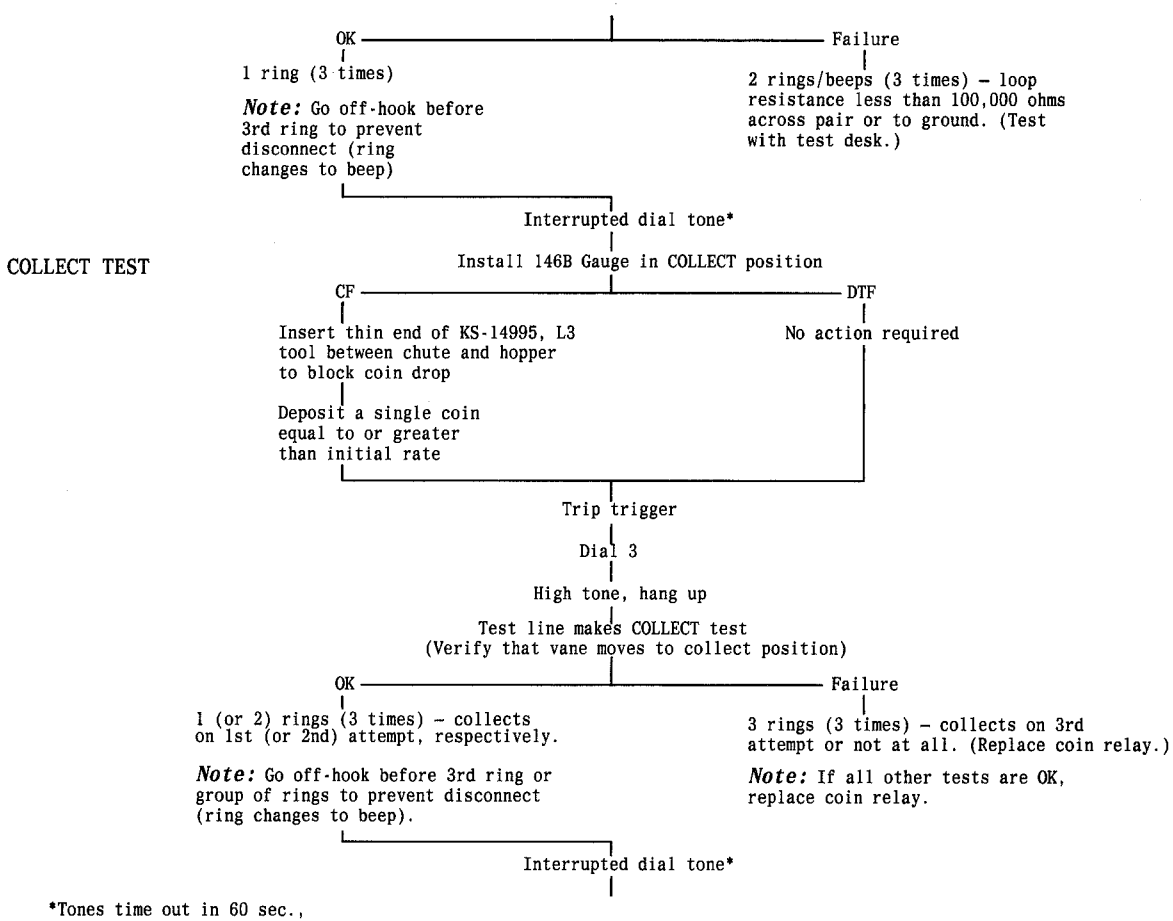


*Tones time out in 60 sec., test line disconnects

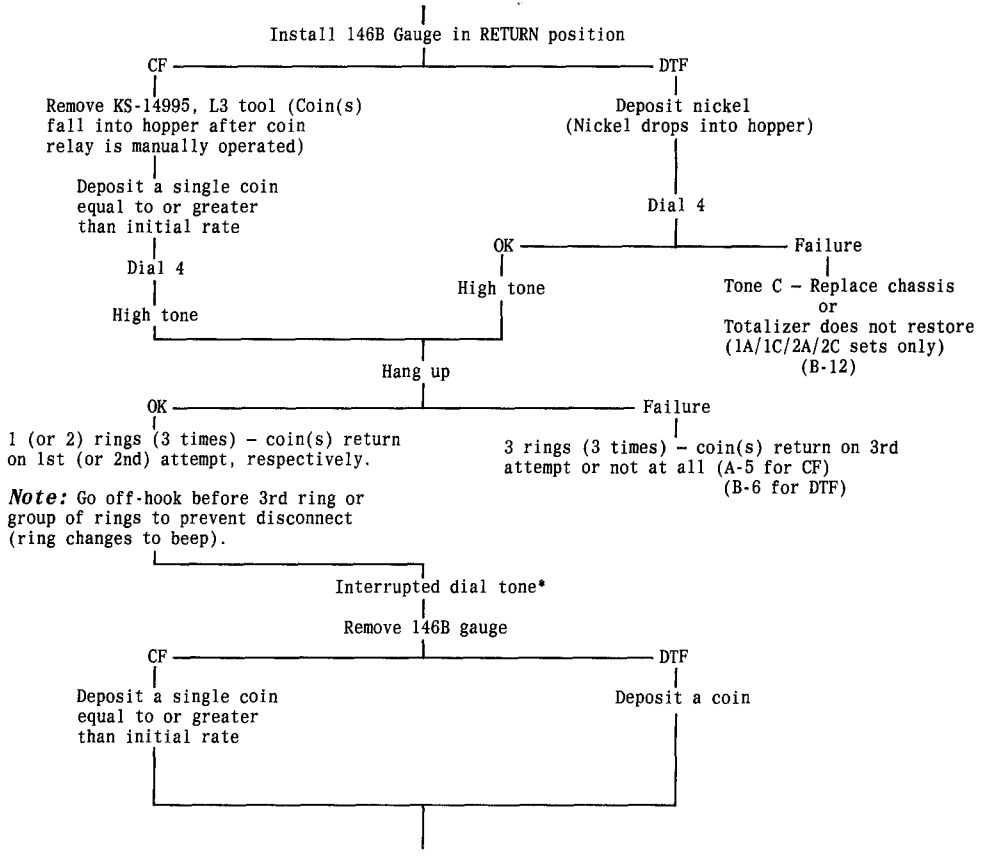


GROUND CHECK, LOOP RESISTANCE, AND LOOP LEAKAGE TESTS

*Tones time out in 60 sec., test line disconnects


OK
Failure
1 ring (3 times)
Note: Go off-hook before 3rd ring to prevent disconnect (ring changes to beep)
2 rings/beeps (3 times) – loop resistance less than 100,000 ohms across pair or to ground. (Test with test desk.)
Interrupted dial tone*
COLLECT TEST
Install 146B Gauge in COLLECT position
CF
DTF
Insert thin end of KS-14995, L3 tool between chute and hopper to block coin drop
No action required
Deposit a single coin equal to or greater than initial rate
Trip trigger
Dial 3
High tone, hang up
Test line makes COLLECT test
(Verify that vane moves to collect position)
OK
Failure
1 (or 2) rings (3 times) – collects on 1st (or 2nd) attempt, respectively.
Note: Go off-hook before 3rd ring or group of rings to prevent disconnect (ring changes to beep).
3 rings (3 times) – collects on 3rd attempt or not at all. (Replace coin relay.)
Note: If all other tests are OK, replace coin relay.
Interrupted dial tone*
*Tones time out in 60 sec., test line disconnects

RETURN TEST
(AND AUTOMATIC
NICKEL LOCAL
OVERTIME TEST
DTF only)



*Tones time out in 60 sec., test line disconnects

COIN RELAY TIMING TEST

Dial 5

Test line makes COIN RELAY TIME test

Redeposit a single coin equal to or greater than initial rate to recycle test

SIGNAL (Coin relay operate time)	TEMPERATURE of Coin Relay			
	Below 20°	20-60°	60-100°	Above 100°
4 Beeps (Above 500 milliseconds)	Refer to Adjust Chart	TOO SLOW – Refer to Adjust Chart		
3 Beeps (475-500 milliseconds)				
STEADY TONE (425-475 milliseconds)		OK		
2 Beeps (400-425 milliseconds)				
1 Beep (Below 400 milliseconds)	TOO FAST– Refer to Adjust Chart			

Adjust Chart

Temperature	Adjusting Procedure
Above 100°	Adjust to steady tone and turn armature screw clockwise until first indication of 2 beeps is acquired
60 to 100°	Adjust to 3 beeps and turn armature screw clockwise until first indiction of steady tone is acquired
20 to 60°	Adjust to 4 beeps and turn armature screw clockwise until first indication of 3 beeps is acquired
Below 20°	Adjust to 3 beeps and turn armature screw counterclockwise until first indication of 4 beeps is acquired – then turn screw counterclockwise an additional 1/4 turn

Go on hook momentarily (flash switchhook)

Interrupted dial tone heard*

Hang up. test line disconnects

*Tones time out in 60 sec., test line disconnects

177A TEST SET

1.01 The 177A test set is being designed to monitor the voltage polarity and levels provided to the coin telephone set from any type central office, test desk, test console, test cabinet, line status verifier, mechanized loop testing, etc.

1.02 The 177A test set light emitting diodes respond to negative or positive potentials across the loop or either side of the loop to ground. A third wire is also provided with diodes for tip to ground tests. AC and superimposed potentials can be determined and identified. The 177A test set can be used for monitoring on an-inservice basis without interfering with circuit operation. It can also be used to determine trouble conditions when circuits are in the idle state. FEMF trouble conditions are readily identified without fear of burning the trouble conditions clear.

1.03 Listed are sample test procedures and the signaling threshold required for Dial-Tone-First service. From this it can be determined the signaling application to be monitored. The test set can be connected at the station, central office terminal locations, or any location where tip, ring, and ground can be accessed.

Signaling Threshold for Dial-Tone-First

(1) Coin present test for initial deposit: -48 volt battery on the tip side with the ring side open.

(2) Stuck coin or 5-cent overtime test: +48 volt battery on the tip side with the ring side open.

(3) Transmission and coin deposit readout on local call; -48 volt battery on the ring side of line and ground on the tip side.

(4) Transmission and coin deposit on toll call and totalizer homing before coin control has been applied: +48 volt on the ring side of the line and ground on the tip.

(5) Coin return: -130 volt battery on the tip side of the line with the ring side open.

(6) Coin collect: +130 volt battery on the tip side of the line with the ring side open.

Sample Test Procedures Using the 177A Test Set

Connections: Green and Red from the 177A test set connecting cord to the tip and ring of the line. Yellow lead from the connecting cord to the central office or station ground.

Dial-Tone-First Mode (Local Call)

Local Overtime Call—Test set connected to a DTF line appearance in the CO or at the station. In No. 5 Crossbar to the Originating Test Line of the Master Test Frame.

STEP	ACTION	VERIFICATION
1	With handset on-hook	No. 1 diode (-48 volt) lights brightly indicating battery and ground from the line equipment
2	Go off-hook	No. 1 diode (-48 volt) goes dim indicating battery and ground (dial tone) from the (Orig. Reg., Sub Sender, Sel, etc.). No. 5 diode may light (dim) on loops equipped with Dial Long Line (DLL) or Signaling Rang Extender (SRE)
3	Deposit initial rate and dial local charge number	No. 1 diode follows dial pulses. At completion of dialing No. 6 diode (-48 volt) lights momentarily indicating initial rate ground test
4	Call answered	No. 1 diode (-48 volt) now lighted
Automatic 5-Cent Overtime		
1	At the end of first 4-1/2 minutes	No. 4 and 5 diodes (+130 volt) light and go dark, indicating a coin was collected
2	Trip HT to simulate local OT deposit.	
3	At the end of first 5 minutes	No. 2 diode (+48 volt) lights momentarily indicating totalizer homing battery has been applied
		No. 5 diode (+48 volt) flashes indicating coin present test
Dial "0" and Call (TSP, TSPS, Cord Board)		
1	With handset on-hook	No. 1 diode (-48 volt) lights bright
2	Go off-hook	
3	Dial "0" +	Just prior to operator answer, No. 3 and 6 diodes flash, representing coin refund
4	Operator Answer	No. 2 diode (+48 volt) lights indicating positive talking battery for toalizer homing
		Operator requests deposit
5	Trip HT and request operator to collect	No. 4 and 5 diodes flash once, indicating +130 volt coin collect pulse
6	Request operator to ring back and hang up	No. 1 and 2 diodes glow following 20 cycle ringing supply, indicating ringing current applied

STEP	ACTION	VERIFICATION
7	Trip HT and request operator to refund	No. 3 and 6 diodes flash once, indicating -130 volt coin refund pulse.
Incoming Toll (Collect)		
1	Have Cord Board Operator initiate call to coin test station	No. 1 or 2 diode lighted prior to ringing Both diodes are lighted during ring
2	Go off-hook	No. 1 and 2 diodes go dark. No. 2 diode lights indicating +48 volt talk battery on line
3	Request operator to identify deposit. Deposit less than initial rate	No. 2 diode remains lighted, totalizer homes, operator can identify deposit
4	Request operator to refund	No. 2 diode goes dark, No. 3 and 6 diodes flash, indicating -130 volt coin refund pulse. No. 2 diode lights
5	Trip HT and request operator to collect	No. 2 Diode goes dark, No. 4 and 5 diodes flash, indicating +130 volt coin collect pulse
6	Request operator to disconnect circuit	
7	Hang up.	No. 2 diode goes dark No. 1 diode lights.
Recycle		
1	At coin station, block coin relay armature nonoperate	
2	Lift handset	
3	Deposit initial rate and dial a local test number for audible ring	No. 1 diode lights, follows dial pulses. Audible heard
4	Hang up	No. 1 diode goes dark, No. 3 and 6 dioes flash indicating -130 volt coin refund pulse. No. 5 diode lights indicating +48 volt stuck coin test No. 3 and 6 diodes flash indicating a second coin refund pulse
5	Remove blocking tool	No. 1 diode lights
6	Go off-hook, then hang up.	No. 1 diode goes dark momentarily, No. 3 and 6 diodes flash once, indicating a refund pulse.

RANGE CHARTS AND COIN RELAY OPERATE VALUES

TABLE A

MAXIMUM ALLOWABLE CONDUCTOR LOOP RANGE WITHOUT RANGE EXTENSION—EXCLUDES NOMINAL 300-OHM ALLOWANCE FOR COIN TELEPHONE

CO TYPE	COIN-FIRST OFFICE	DIAL-TONE-FIRST OFFICE	NOTE
SXS	1050Ω	—	1
SXS	1200Ω	1200Ω	2
Panel	1200Ω	—	3
No. 1 XBAR	1200Ω	1200Ω	3
No. 5 XBAR	1300Ω	1300Ω	3
No. 1 ESS	1300Ω	1300Ω	4, 6
No. 2 ESS	1300Ω	1300Ω	5, 6
No. 3 ESS	1300Ω	1300Ω	—

Notes:

General—Transmission requirements dictate a minimum transmitter current of 23 ma.

*1. This value assumes the use of SD-31592-02 (Issue 32B or later) coin trunks which is useable in Coin-First offices only. For older trunks refer to to Step-by-Step key sheets.

*2. This value of loop assumes use of SD-32539-01 coin trunk.

3. This value is for offices arranged to operate with up to 1500-ohm external circuit resistance. For other applications refer to key sheets.

4. This value assumes a minimum CO voltage of 48 volts and office wiring of 100 ohms. For other voltage levels see the chart covered under Note 6.

5. This value assumes a minimum CO voltage of 47 volts and office wiring of 50 ohms. For other voltage levels see the chart covered under Note 6.

* Notes 1 and 2 assume that line relay equipment is of compatible range.

TABLE A (Cont'd)

6. No. 1 and No. 2 ESS ranges including office wiring resistance for CO voltage values shown. Determination of external conductor resistance will require subtraction of known office wiring resistance. If actual voltage is lower than expected minimum in a given office, or if the loop resistance is greater than the limit imposed by the expected voltage minimum, the customer could experience cutoffs during totalizer readout.

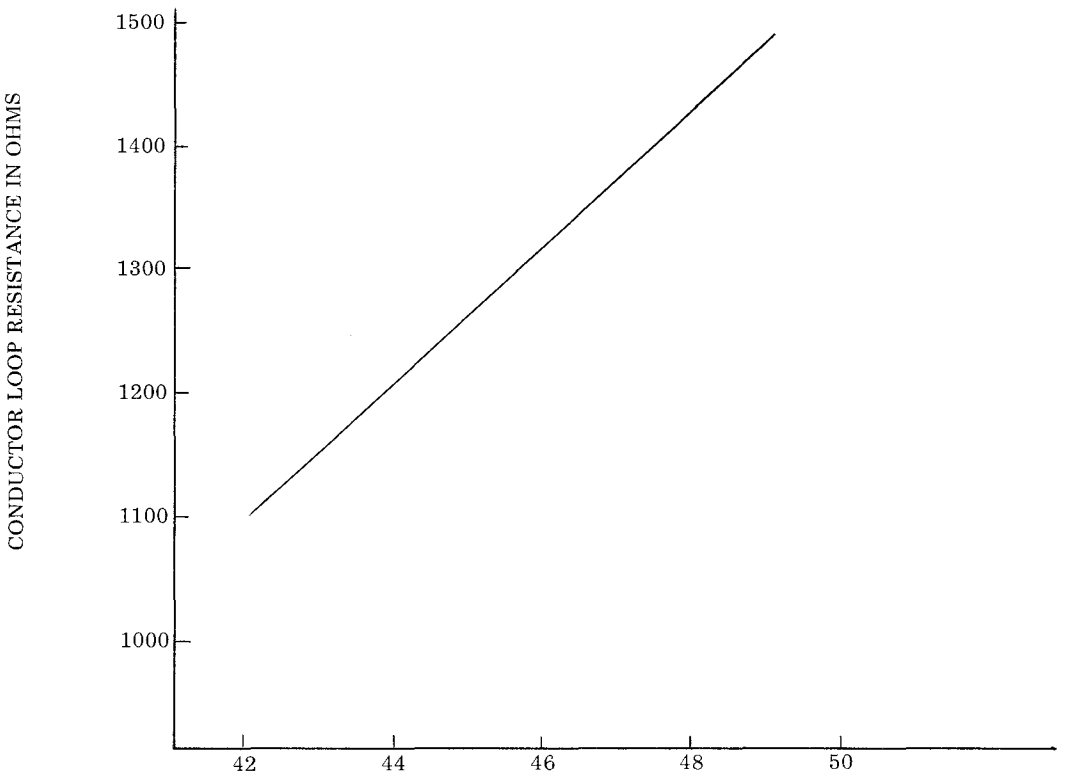


TABLE B

CONDUCTOR LOOP RESISTANCES IN OHMS

TYPE OFFICE EQUIP.	SD-32053-01 DLL		SD-26130-01 DLL		SD-96592-01 DLL		NS-02517-01 SRE[1]		NOTES
	CF	DTF	CF	DTF	CF	DTF	CF	DTF	
SXS	1800	1800[5]	—	—	2700	2700	2100	2400	2, 3
No. 5 XB	—	—	2800[6]	—	3100	3100	2400	2400	3, 4
No. 1 XB	—	—	—	—	2700	2700	2400	2400	2, 3
No. 1 ESS	—	—	—	—	3100	3100	2400	2400	3, 4
No. 2 ESS	—	—	—	—	3100	3100	2400	2400	3, 4
No. 3 ESS	—	—	—	—	3100	3100	2400	2400	3, 4

Notes:

General—The dial Long Line circuits and range extender listed are the only approved range extension equipment for coin lines. Resistance shown include dc resistance of any E-type repeaters used (73 through 180 ohms).

1. Signaling range extender.
2. Minimum coin collect and coin return voltages are assumed to be ±116 volts. No. 1A coin relays (operate current of 41 ma) are assumed at coin telephone. For other coin voltages consult the SD working limits section.
3. Maximum ground resistance of 50 ohms and maximum DC earth potentials of ±3 volts are assumed. Values in excess of these limits will reduce ranges.
4. Minimum coin collect and coin return voltages are assumed to be ±125 volts. No. 1A coin relays (operate current of 41 ma) are assumed at coin telephone. For other coin voltages consult the SD working limits section.
5. Dial-Tone-First operation is possible with circuits modified per drawing Issue 29D.
6. Coin-First operation in No. 5 Crossbar offices is possible if DLL circuit is modified per drawing Issue 7B. Not usable by TOUCH-TONE® equipment stations. All 1A stations must be modified to 1C equivalent.

TABLE C

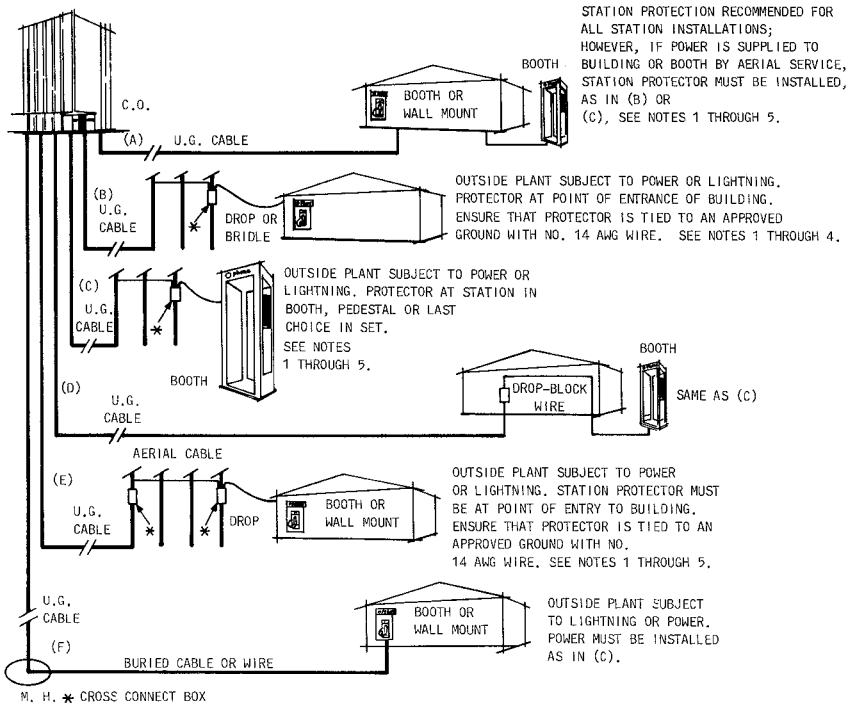
OPERATE VALUES OF COIN RELAYS

MARKING ON RELAY	OPERATING TIME	OPERATE CURRENT	NON-OPERATE CURRENT
P-15E687	625 ±75 milliseconds (Notes 2 and 3)	48 milliamps	40 milliamps
1A*	450 ±50 milliseconds	41 milliamps	30 milliamps
1A (Note 1)			

Notes:

1. Coin relays marked 1A without the asterisk symbol have bifurcated rather than solid contact springs.
2. 625 ms relay should be retimed to 450 ±50 ms. Use coin test line circuit or KS-21250 test set.
3. On repeated visits indicating coin relay troubles, and where ground requirements have been met, it is recommended that 48 ma operate relays be replaced with 41 ma operate relays.

PROTECTION



NOTES:

1. FOR ADDITIONAL INFORMATION ON STATION PROTECTOR AND SIGNALING GROUNDS, REFER TO SECTION 460-100-400.
2. HOUSINGS OF ALL OUTSIDE STATIONS MUST BE GROUNDED. IF SET IS NOT MOUNTED IN A GROUNDED ENCLOSURE, RUN A NO. 14 AWG WIRE FROM STATION TO NEAREST APPROVED GROUND.
3. CARBON BLOCKS THAT BREAK DOWN PREMATURELY CAN CAUSE FAILURES OF COIN COLLECT OR REFUND. CARBON BLOCKS SHOULD BE CHECKED ON "COINS DON'T RETURN" TROUBLE REPORTS, AND IF FAULTY CARBONS ARE FOUND, IT IS RECOMMENDED THAT THEY RE REPLACED BY GAS TUBE PROTECTORS. IN AREAS SUBJECT TO FREQUENT LIGHTENING EXPOSURES, GAS TUBE PROTECTORS ARE RECOMMENDED.
4. WHEN THE PROTECTOR IS MOUNTED IN AN ENCLOSURE SUCH AS A BOOTH OR SHELF, BOND THE ENCLOSURE AND PROTECTOR GROUND TOGETHER WITH NO LESS THAN NO. 14 AWG WIRE.
5. WHEN PROTECTOR IS MOUNTED INSIDE SET, CONNECT WIRING PER VIEW A OR B BELOW.

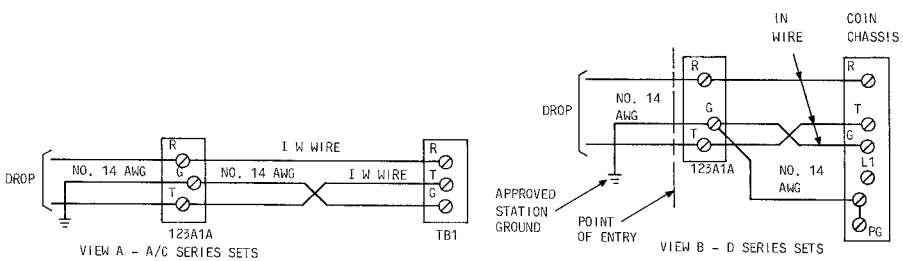


Fig. 1—Special Protection Requirements

DTF FACTORS FOR THE COIN STATION

1. DTF CONSIDERATIONS

1.01 All 1A/2A-type coin telephone sets must be converted to 1C/2C-type or 1D/2D-type before the central office switchboard trunks and coin handling units (i.e., coin supervisory circuits) are equipped for positive (+48 volt) battery.

1.02 When the first central office in a TSPS serving area is equipped for Dial-Tone-First operation, the handling arrangements for terminating coin traffic should be reviewed so that 1A/2A coin telephones in unconverted local offices will not be subjected to +48 volts which they cannot tolerate.

1.03 Conversion of 1A/2A coin telephones to 1C/2C or 1D/2D should include change of P coded coin relays to 1A equivalent as covered in EL 553 (GL 70-05-177).

1.04 Station changes required at cutover include changing the permanent information plate, the two plastic (or metal) customer instruction cards, wiring changes on the chassis and dial housing assembly, and moving the totalizer switch to the DTF mode.

1.05 A check should be made to insure that a 1A totalizer and a 31A chassis is used in a 1C/2C set.

1.06 Verification of the correct wiring and coin telephone operation should be made by using the Eight Step Routine shown in the Coin Maintenance Check Booklet or Section 506-900-503.

CHAPTER II

CENTRAL OFFICE

CENTRAL OFFICE CHECK LIST FOR COIN OPERATION AND VERIFICATION USING A 1C-TYPE COIN TELEPHONE SET

1.01 This procedure can be used as a quick check method to determine if central office equipment has been modified and installed properly. Each coin associated circuit pertaining to this listed method should be tested at least once initially and thereafter as required.

1.02 The purpose of using a coin station in performing these tests is to uncover trouble conditions that only the coin station can detect. The coin station line must be padded to reflect the maximum customer loop and ground resistance of the central office being tested.

Example: If customer loop design is 1200 ohms, prepare equipment per Fig. 1. Check key sheets for loop range.

1.03 Equipment required.

- 1C-type coin telephone set
- KS-20950, L1 parking tool or P11C test cord for box-type set
- P11C test cord for panel set.

1.04 Test Areas.

(a) ***No. 5 Crossbar***—The coin test station can be used at the Line Link Frame or can be used at the Master Test Frame for selection of Central Office equipment. Use the following hook-up:

(1) Use a spare jack in the vicinity of the MTF.

(2) Connect the T, R, and sleeve of the jack to punchings 02, 12, and GRD at the B terminal strip on the R controller bay.

(3) Connect a plug ended cord from the jack to T, R, and GRD in the coin test station.

Note: The equipment to be tested is selected using the MTF, and the coin station will be activated by the operation of the start key after coin deposit. In this manner, the coin

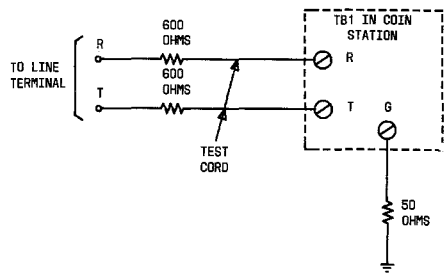


Fig. 1—Test Connections

station will detect CO trouble conditions that the MTF, when used alone, cannot detect.

(b) ***No. 1 Crossbar***—The coin station should be used at the Line Link Frame.

(c) ***Step-by-Step***—Tests should be performed at the Line Link Finder Frame and Local Coin Station Trunk Circuits.

(d) ***ESS***—Install coin line in vicinity of Line and Trunk Test Panel or Supplementary Test Panel.

A. Tests to be Performed—Coin-First

Abandon Call

STEP	ACTION	VERIFICATION
1	With handset on-hook deposit a coin that is less than initial rate	Coin should be automatically refunded

Partial Dial

2	Lift handset and deposit initial rate	Dial tone heard
3	Dial any digit but "0" or "1"	Dial tone breaks
4	Go on-hook	Coin(s) refunded

Local Charge

5	Go off-hook and deposit initial rate	Dial tone heard
6	Dial a charge number	Ringing heard
7	Calling party answers	Ringing tripped
8	Hang up	Coin collected

Stuck Coin and Recycle Feature

Note: If office is not equipped with recycle, only one application of coin control will be furnished.

STEP	ACTION	VERIFICATION
9	In the coin test station, block the coin relay armature nonoperated, but allow some travel	
10	Connect a voltmeter to TB1 in coin test station; connect negative lead to TB1-T and position lead to TB1-G	
11	Adjust voltmeter to read the 150V negative scale for return	
12	Lift handset, deposit initial rate:	
	In step-by-step office	Dial tone heard
	In No. 1 and No. 5 crossbar offices, dial a busy number.	Busy tone heard.
13	Hang up	Coin relay attempts to operate and release. Voltmeter should register from 100-volt to 130-volt

STEP	ACTION	VERIFICATION
		Note: In No. 1 and No. 5 Crossbar and ESS offices equipped with recycle, coin relay should make two attempts.
		Note: In step-by-step office, coin relay should make continued attempts and activate the coin release audible alarm.
14	In step-by-step office, remove blocking tool from coin relay	Alarm stops and coin relay refunds coin
15	In No. 1 and No. 5 crossbar and ESS offices arranged for Cord Board Stuck Coin Handling:	
	Lift handset	Cord board operator gets steady lamp. Operator answers
	Remove blocking tool from coin relay	
	Request operator to refund coin	Coin refunded
16	Go on-hook	Circuit released
17	In all offices reverse the voltmeter leads at the coin test station	
18	Adjust voltmeter to read 150V position scale for collect	
19	Block the coin relay	
20	Go off-hook and deposit initial rate	Dial tone heard
21	Dial a charge number	Ringing tone heard Called party answers
22	Go on-hook	Coin relay attempts to operate and release. Voltmeter should register from 100V to 130V
		Observe Notes 1 and 2 in Step 13
23	In step-by-step office, remove blocking tool from coin relay	Alarm stops and coin relay collects coin
24	In No. 1 and No. 5 crossbar and ESS offices arranged for Cord Board Stuck Coin Handling:	
	Go off-hook	Cord board operator gets steady lamp
	Remove blocking tool from coin relay	
	Request operator to collect coin(s)	Coin(s) collected

STEP	ACTION	VERIFICATION
25	Go on-hook	Circuit released
Local Overtime Announcement		
26	Establish a call to any local charge number	Call in progress
27	Wait 1/2 minute prior to end of overtime period	Initial deposit collected
28	Listen for recorded announcement	Recorded announcement requests 5 cent deposit for additional overtime period
29	While the announcement is in progress, deposit a nickel	Call should continue
30	Repeat Steps 26, 27, and 28. Allow recorded announcement to complete.	30 seconds after recorded announcement, the call will be disconnected.
Dial "0"		
31	Go off-hook	
32	Deposit initial rate	
33	Dial "0"	Coin automatically refunded when operator answers
34	Request operator to identify coins and deposit nickel, dime, and quarter	Operator identifies coins properly
35	Request operator to refund coins	Coins refunded
36	Deposit coin and request operator to collect	Coin collected
37	Request operator to ring back	
38	Go on-hook	Ringing heard
39	Go off-hook	Ringing stops
40	Go on-hook	Circuit is released
	Note: Test each trunk circuit.	
Incoming Toll		
41	From another phone, request cord board operator to call the coin test station using an incoming coin Toll Switching Trunk	
42	Operator establishes call	Coin test station rings

STEP	ACTION	VERIFICATION
43	Go off-hook at coin test station	Ringing trips
44	Request operator to identify coin deposit	
45	Deposit coin	Coin properly identified
46	Request operator to return coin	Coin returned
47	Deposit coin	
48	Request operator to collect coin	Coin collected
49	Go on-hook	Circuit disconnected
50	Perform Steps 44 through 49 on each incoming coin toll switch trunk	

B. Test to be Performed—Dial-Tone-First

Recycle

1	In the coin test station block the coin relay armature nonoperated but allow some travel	
2	Lift handset	Dial tone heard
3	Deposit initial rate and dial a charge number and allow call to complete	Ringing tone heard
4	Go on-hook	Coin relay should attempt to operate twice
5	After second attempt of coin relay operation, go off-hook	If Cord Board stuck coin operation is provided, operator answers Failure to remove coin ground should route a call to the cord board position or send the stuck coin indication to a TTY or TBL ticketer. This can be verified by checking trouble record
6	Request operator to identify a coin deposit	
7	Deposit a nickel	Operator identifies coin properly
8	Unblock coin relay	
9	Request operator to return coin	Coin is returned

Note 1: If coin supervisory circuits are modified properly, two attempts will be made to dispose coin in a stuck coin condition prior to routing the call to sender monitor, TTY, or TBL ticketer.

Note 2: If interface circuit to cord board position is modified properly, operator will be able to identify nickel deposit and return coin.

STEP	ACTION	VERIFICATION
	Local Overtime Announcement	
10	Establish a call to any local charge number	Call in progress
11	Wait 1/2 minute prior to end of overtime period	Initial deposit collected
12	Listen for recorded announcement	Recorded announcement requests 5 cent deposit for additional overtime period
13	While the announcement is in progress, deposit a nickel	Call should continue; if call is blocked, check circuit for +48 volt coin present test
14	Repeat Steps 10, 11, and 12. Allow recorded announcement to complete	30 seconds after recorded announcement, the call will be terminated. Operator should challenge for the O.T. deposit

Note: If operator is unable to refund, circuit is not modified to apply coin control on tip side only.

STEP	ACTION	VERIFICATION
	Abandon Call	
15	Lift handset	Dial tone heard
16	Deposit a nickel	
17	Dial any digit but "0" or "1"	Dial tone breaks
18	Go on-hook	Coin is refunded
	Announcement Circuit for Less Than Initial Rate Deposited	
19	Go off-hook	Dial tone heard
20	Deposit a nickel	
21	Dial a charge number	Announcement should indicate that an initial deposit is required
22	Go on-hook	Coin is refunded
23	Repeat Steps 19, 20, and 21 except wait for two announcement cycles	In No. 5 crossbar offices, announcement trunk disconnects after two cycles, releases channel, and returns dial tone
24	Go on-hook	

STEP	ACTION	VERIFICATION
	Dial "0" (Use TOUCH-TONE Set in DTF Mode)	
25	Go off-hook	Dial tone heard
26	Deposit nickel	
27	Dial "0"	Coin is refunded, operator answers
28	Attempt to operate TOUCH-TONE dial by depressing any button	+48 volt on trunk should disable TOUCH-TONE dial
29	Request operator to identify coin and deposit a nickel	Operator can identify the coin
30	Request operator to refund coin	Coin is refunded
31	Deposit a coin and ask operator to collect	Coin is collected
32	Request operator to ring back. Go on-hook	Phone rings

Note: These tests verify that the circuit is modified properly. The modifications for the dial "0" trunks consist of:

(1) The change in talking -48 volt battery to +48 volt.

(2) The removal of coin control from the ring side of the line.

(3) The application of automatic coin refund upon operator answer.

STEP	ACTION	VERIFICATION
	Incoming Toll Switch (Use TOUCH-TONE Set in DTF Mode)	
33	Request operator to call test station using Toll Switch Trunk	Test station rings
34	Attempt to operate TOUCH-TONE dial by depressing any button	+48 volt on trunk should disable TOUCH-TONE dial
35	Request operator to identify a nickel. Deposit nickel	Operator identifies coin properly
36	Request operator to refund coin	Coin is refunded
37	Deposit a coin and request operator to collect	Coin is collected
38	Hang up	

DTF FACTORS FOR THE CENTRAL OFFICE

Note: The implementation of Dial-Tone-First service and the Coin Service Improvement program highlighted new changes and new objectives.

1. BASIC OBJECTIVES

1.01 To enable customers to dial certain calls without an initial coin deposit, such as calls to the operator for assistance, NPA Directory Assistance calls, station-to-station toll calls, person-to-person calls, collect calls, credit card calls, and three digit service code calls including the 911 emergency code.

1.02 To give the customer greater assurance that the DTF system is working before a coin deposit is made. Coincidentally, the customer would be able to report a trouble condition without depositing a coin.

1.03 To permit DTF service operation in all types of central office—except panel—with all types of traffic switchboards and systems.

1.04 To improve transmission characteristics and reduce noise by removing the unbalancing ground at the station during conversation. An improvement of 12 to 34 db in 180 Hz balance can be expected when ground isolation is employed. Ground isolation also substantially reduces corrosion caused by ground currents.

1.05 To prevent fraudulent simulation of coin signals by manipulating TOUCH-TONE® dial buttons.

1.06 To eliminate customer irritations and lost revenues due to station put out of service by vandalism and fraud.

2. FUNCTIONAL CHANGES

2.01 DTF requires new screening of dialed digits by the central office to determine whether an initial rate is required to complete the call.

2.02 With present-day methods of coin station operation and with the need to handle both initial deposit-and subsequent deposits of less than initial rate, it is necessary for the central office to generate and send to the station a signal which conditions the station to read out deposits of less than initial rate. In CF application of loop current serves this signal function. But with Dial-Tone-First, loop current is applied before a coin is deposited. Thus a new signal must be provided. This new signal is a reversal of talking battery, specifically, ***positive 48 volts*** on the ring conductor and ground on the tip conductor.

2.03 To effect ground removal during conversation, changes are necessary in the centrol office coin control and coin testing arrangements as well as at the station.

2.04 To deter TOUCH-TONE fraud, the T-T dial is disabled electrically at appropriate times upon signal from the central office. On C-type sets this is accomplished by the same reversal of talking battery that permits subsequent 5-cent coin deposits. On operator involved calls this is permissible since the acceptance of 5-cent deposits and the disabling of the coin station TOUCH-TONE dial are required only when an operator is connected to the coin line call.

2.05 Also, positive battery is fed to the coin station on calls placed through TSPS operator. The present plan accomplishes this by a change in signaling procedure from TSPS equipment to the local office (which applies a reversal when an operator is connected). A less elaborate arrangement is used with cord switchboards, in which local office trunks to a cord switchboard are arranged to supply

positive battery to the coin station as long as the station is connected to the trunk.

3. CENTRAL OFFICE CONSIDERATIONS

3.01 *No. 1 ESS:*

(a) The following AT&T Letters describe Dial-Tone-First arrangements for No. 1 ESS:

- GL 70-02-061, EM 1735
- GL 70-06-059, Supplement 1 to EM 1735
- GL 72-02-046, EL 1674

(b) Feature Document FD 231-090-095 covering coin service in No. 1 ESS has been released. This document will include additional Dial-Tone-First information.

(c) ***Corrections to GL 70-02-061, EM 1735:*** The following changes should be made to GL 70-02-061, EM 1735:

- Paragraph 3.4.1 — Reference to stuck coin operator should be removed.
- Paragraph 3.4.2 — Reference to stuck coin operator should be removed.
- Paragraph 4.1 — Refer to Station Section for coin station set modifications. (Section 4 of this document.)
- Paragraph 4.2.6 — Refer to GL 71-06-015, EL 1279 for local test desk modifications.
- Paragraph 7.2 — Delete Step SC4.
- Paragraph 7.3 — Delete Plan (B).

(d) ***Combined Coin and Noncoin Operator Trunk Groups:*** Coin and noncoin traffic should not be combined on the same operator or TSPS trunk group. Positive battery supervision must be provided for coin lines and normal negative battery for noncoin lines. If noncoin lines are served by trunks with positive battery, end-to-end TOUCH-TONE signaling is not possible, and toll diverted lines will be disconnected.

(e) ***Conductor Loop Range:*** The only approved circuits for extending the range of Dial-Tone-First coin lines in No. 1 ESS are the signaling range extender, NS-02517-01, the coin dial long line, SD-96592-01, SLC-40, and the ITT T324S digital carrier system. Refer to the General Section for ranges obtainable with these circuits.

(f) ***Insufficient Initial Deposit Announcement:*** A special "Insufficient Initial Deposit" announcement should be provided. The recommended wording of this announcement is given in the General Section. If all of the trunks to this announcement are busy, reorder tone should be connected.

3.02 *No. 2 ESS:*

(a) ***Engineering:***

(1) Refer to TFP, Div D, Section 12-C for engineering of circuits required for Dial-Tone-First. Be sure to allow for the increased holding time of Dial-Tone-First lines on customer digit receivers, coin supervisory control circuits, permanent signal equipment and the switching network.

(2) Paragraph 4.4.1 of the TFP suggests the use of a 5-second holding time for the "Insufficient Initial Deposit" announcement if actual data is not available. This is incorrect. The suggested holding time should be 18 seconds.

(b) ***Line Assignment:*** If coin lines are being transferred from other switching machines at this time, care should be exercised in assigning these lines so that network blockage does not result.

(c) ***Polarity on TSPS Trunks:***

(1) TSPS trunks SD-2H112-01 and SD-2H144-01 must be modified to provide positive battery on calls from coin lines and negative battery on calls from noncoin lines. The fix covered by TC 82393 and TC 83410 (Broadcast Warning No. 361) for EF generics and TC 23552 and TC 25332 (Broadcast Warning No.

354) for LO generics must be provided to maintain positive battery after coin collect, coin return or ringback.

(d) ***Polarity on Operator Trunks:***

(1) All operator trunks including TSPS, recording completing, toll switch, coin overtime, and coin zone must be modified to provide positive battery on calls to or from coin lines. Trunks requiring modification include the following:

- Outgoing to TSPS — Loop SD-2H144-01
- Toll Switching — Loop SD-2H110-01
- Toll Switching — E&M SD-2H112-01
- Recording Completing — Loop SD-2H110-01
- Recording Completing — E&M SD-2H112-01
- Coin Overtime SD-2H113-01
- Coin Zone SD-2H151-01
- Outgoing to Switchboard SD-2H105-01

(2) SD-2H108-01, Incoming Trunk from 3CL Switchboard with Third Wire Coin Control, does not, at present, show an arrangement to provide positive battery. This change will be made if and when it is requested for a specific installation.

(e) ***Conductor Loop Range:*** The only approved circuits for extending the range of Dial-Tone-First coin lines in No. 2 ESS are the signaling range extender, NS-20517-01, the coin dial long line, SD-96592-01, SLC-40, and the ITT T324S digital carrier system. Refer to the General Section for ranges obtainable with these circuits.

3.03 ***No. 3 ESS:***

(a) The following AT&T Letters/Documents describe Dial-Tone-First arrangement for No. 3 ESS:

- GL 78-04-097, EL 5749
- FD 233-190-112.

3.04 ***No. 5 Crossbar:***

(a) The following AT&T Letters describe Dial-Tone-First arrangements for No. 5 crossbar:

- GL 69-08-132, EM 1425
- GL 72-05-006, EL 1829

(b) ***"Insufficient Initial Deposit" Announcement:*** The Dial-Tone-First arrangement of intercept trunk circuit SD-26121-01 (J23057CH) should be used to provide the "Insufficient Initial Deposit" announcement from either the 6A or 7A announcement system. Issue 14B of this circuit provides for the return of a partial deposit when the customer hangs up.

(c) ***Originating Registers:***

(1) In considering whether or not to modify all originating registers (OR) for Dial-Tone-First service, the following quotation from Traffic Facilities Practices, Division D, Section 8-e(1), Paragraph 4.54 should be noted:

> "From a circuit capability standpoint, the No. 5 Crossbar System can be equipped with up to six Originating Register Groups (ORGs). The effects, however, of interaction between dial tone markers and ORs are such that if an insufficient quantity of ORs is provided in one ORG, the dial tone service of customers assigned to the other ORGs in the office will be adversely affected. In general, as the number of ORGs in an office is increased, the possibility of poor dial tone service due to a forecasting error on one of these groups is increased. Coin traffic characteristics are frequently volatile and therefore more difficult to forecast than other types of traffic. Consequently, provision of a separate group of ORs for Dial-Tone-First should be avoided."

(2) In addition, essential lines and coin lines are assigned to the same vertical group. This means that if a separate Dial-Tone-First originating register group is provided, in case of a disaster, all essential lines and all coin lines will be limited to this separate group of originating registers.

(3) Refer to TFP, Division D, Section 8-e(1), for further discussion on the equipping of originating registers for Dial-Tone-First service.

(d) ***Coin Supervisory Test Circuit:*** Offices equipped with the coin supervisory test circuit should have this circuit modified for Dial-Tone-First operation.

(e) ***Recycle:*** If the automatic recycle feature for coin disposal has not previously been provided, it is recommended that it be added at the same time Dial-Tone-First is provided. The recycle feature is described in GL 71-09-013, EL 1398.

3.05 ***No. 1 Crossbar:***

(a) The following AT&T Letter describes Dial-Tone-First arrangements for No. 1 Crossbar:

- GL 70-03-176, EL 447

(b) ***Subscriber Senders:*** Page 3 of GL 70-03-176 discusses the modification of only a portion of the subscriber senders for Dial-Tone-First rather than a modification of all the senders. In so doing, care should be exercised to insure that the traffic generated by lines served by the modified senders will not be so great that service may be adversely affected. Sender holding time on Dial-Tone-First lines will be increased due to coin deposits being made after receipt of dial tone and to a larger number of permanent signals.

(c) ***Recycle:*** If the automatic recycle feature for coin disposal has not previously been provided, it is recommended that it be added in connection with the conversion to Dial-Tone-First. The recycle feature is described in EL 2451.

3.06 ***Step-by-Step:***

(a) The following AT&T Letters describe Dial-Tone-First arrangements for step-by-step:

- GL 72-05-108, EL 1484
- GL 73-03-078, EL 2299

(b) ***Local Connectors:*** Dial-Tone-First operation requires the use of either toll transmission selectors or coin connectors for incoming calls from an operator. These are the only arrangements that provide the proper battery polarity for Dial-Tone-First service.

(c) ***Auxiliary Line Circuit Coin Operation:*** Dial-Tone-First operation is not compatible with the auxiliary line circuit method of coin operation used in some 355 and 35E97 type offices.

(d) ***Conductor Loop Range:*** The only approved circuits for extending the range of Dial-Tone-First coin lines in step-by-step are the signaling range extender, NS-02517-01, coin dial long lines, SD-32053-01 and SD-96592-01, SLC-40, and the ITT T324S digital carrier system. Refer to the General Section for ranges obtainable with these circuits.

CIRCUIT MODIFICATIONS

1.01 The following circuits have been modified or provided new to reflect coin improvement items including dial tone first.

TITLE	CIRCUIT	ISSUE
NO. 5 CROSSBAR		
Incoming Trunk	SD-25911-01	12D
Incoming Trunk	SD-26083-01	8D
Incoming Trunk	SD-26123-01	4D
Incoming Trunk	SD-26149-01	3D
Outgoing Trk or Junctor	SD-26078-01	12D
Outgoing Trk to TSP(S) (Loop)	SD-27547-01	7D
Outgoing Trk to TSP(S) (E&M)	SD-27551-01	4D
Outgoing Trk to TSP(S) (E&M)	SD-28062-01	1
Outgoing Trk to TSP(S) (Loop)	SD-28063-01	1
Recording Completing Trk	SD-25923-01	10D
Recording Completing Trk	SD-25923-02	8D
Recording Completing Trk	SD-25923-03	12D
Recording Completing Trk	SD-25923-04	12D
Recording Completing Trk	SD-26091-01	11D
Recording Completing Trk	SD-26093-01	7D
Recording Completing Trk	SD-26099-01	7D
Toll Switching Trk	SD-25712-01	12D
Toll Switching Trk	SD-26081-01	8D
Toll Switching Trk	SD-26082-01	6D
Toll Switching Trk	SD-25854-01	13D
Coin Supervisory	SD-25736-01	26D
Concentrating Ckt for Perm. Sig. Holding Trks	SD-25766-01	21D
Toll Swbd. 3C or 3CL Manual Subs. Line	SD-56317-01	6D
Toll Swbd. No. 1 Manual Subs. Line	SD-56318-01	4D
Completing Marker	SD-25550-01	58D
Originating Register	SD-26040-01	38D
Originating Register	SD-25551-01	55D
MTF Auto. Monitor	SD-25680-01	79D
MTF Voltmeter Test	SD-25792-01	13D
Intercept Trk	SD-26121-01	14B
MTF Trunk Test	SD-25918-01	57D
NO. 1 CROSSBAR		
Subscriber Sender	SD-25012-01	113D
Subscriber Sender	SD-27810-01	14D
Originating Marker	SD-25016-01	98D

TITLE	CIRCUIT	ISSUE
NO. 1 CROSSBAR (Cont)		
Originating Marker Conn.	SD-25035-01	45D
Incoming Trk	SD-25026-01	16D
Incoming Trk	ES-25723-01	4D
Incoming Trk	SD-25876-01	14D
Incoming Trk	SD-25937-01	8D
Incoming Trk	SD-25263-01	17D
Incoming Trk	SD-25303-01	18D
Incoming Trk	SD-25308-01	13D
Incoming Trk	SD-25883-01	12D
Applique Unit	SD-27886-01	1
Outgoing Trk	SD-27555-01	5D
Outgoing Trk	SD-27814-01	2D
Outgoing Trk	SD-27816-01	2D
Outgoing Trk	SD-27557-01	6D
Coin Zone Trk	SD-96518-01	7D
Vacant Code Trk	SD-25125-01	11D
Vacant Code Trk	SD-25134-01	18D
Vacant Code Trk	SD-25467-01	10D
Perm. Sig. Holding Trk	SD-25418-01	23D
Perm. Sig. Holding Trk	SD-25126-01	18B
Perm. Sig. Holding Trk	SD-25425-01	11B
Coin Supv. Ckt.	SD-25061-01	25D
Coin Supv. Ckt.	SD-25061-02	27D
Coin Supv. Ckt.	SD-25444-01	14D
Coin Supv. Conc. Ckt.	SD-27153-01	5D
Coin Supv. Overtime Mon. Ckt.	SD-56000-01	8D
Talking Battery Filter	SD-27899-01	1
Orig. Sdr. Test Ckt.	SD-25221-01	90D
District Junctor Test	SD-25158-01	56D
ANI Trunk Test	SD-95889-01	14D
LAMA Trunk Test	SD-27587-01	5D
Outgoing Trunk Test Frame	SD-25117-01	57B
Station Ringer Test	SD-96218-01	20D
Coin Zone Trunk Test	SD-96372-01	11D
Perm. Sig. Holding Trk	SD-55870-01	14B
Toll Line Ckt.	SD-55779-01	5B
Special Service Trk	SD-56278-01	2B
Sender Make Busy Test	SD-21697-01	13D
Orig. Trouble Indicator	SD-25018-01	55D
STEP-BY-STEP		
Recording Completing Trk	SD-30953-01	4D
Recording Completing Trk	SD-31750-01	11D
Recording Completing Trk	SD-31888-01	13D
Recording Completing Trk	SD-32042-01	15D
Recording Completing Trk	SD-32168-01	11D
Recording Completing Trk	SD-32300-01	4D
Recording Completing Trk	SD-32301-01	2D

TITLE	CIRCUIT	ISSUE
STEP-BY-STEP (Cont)		
Outgoing Trk to Operator	SD-31146-01	11D
Outgoing Trk to Operator	SD-31315-01	19D
Outgoing Trk to Operator	SD-31752-01	11D
2-Way Trk to Toll Office	SD-30900-01	10D
2-Way Trk to Toll Office	SD-30901-01	11D
2-Way Trk to Toll Office	SD-31747-01	21D
2-Way Trk to Toll Office	SD-31775-01	23D
2-Way Trk to Toll Office	SD-31874-01	11D
2-Way Trk to Toll Office	SD-32340-01	4D
ANI Trunk	SD-32344-01	13B
Incoming Trunk	SD-31703-01	10D
Incoming Trunk	SD-31887-01	14D
Toll Transmission Sel.	SD-30949-01	7D
Toll Transmission Sel.	SD-31723-01	24D
Toll Transmission Sel.	SD-31745-01	17D
Toll Transmission Sel.	SD-31841-01	22D
Line Circuit	SD-31531-01	28D
Line Circuit	SD-31777-01	35D
Line Circuit	SD-32133-01	19D
Line Finder	ES-30427-01	41D
Primary Line Switch	SD-31644-01	28D
Coin Control Trunk	SD-32288-01	5D
Coin Control Trunk	SD-32289-01	4D
Coin Control Trunk	SD-32298-01	7D
Aux. Coin Trunk	SD-32538-01	1
Coin Trunk	SD-31592-01	30D
Coin Trunk	SD-32539-01	1
Aux. Line Ckt.	SD-32024-01	9D
Aux. Line Ckt.	SD-32166-01	7D
Aux. Line Ckt.	SD-95607-01	4D
Coin Connector	SD-33022-01	12D
Dial Long Line	SD-32053-01	29D
Misc. Alarm Ckt.	SD-31980-01	29D
Misc. Alarm Ckt.	SD-32193-01	7D
+48 Volt Battery Filter	SD-32537-01	2D
Alarm Checking Term.	SD-31835-01	19D
Rotary Line Circuit	SD-31259-01	23D
Misc. and Fuse Alarm Ckt.	SD-31209-01	43D
Misc. and Fuse Alarm Ckt.	SD-31558-01	34D
Misc. and Fuse Alarm Ckt.	SD-31613-01	24D
Misc. and Fuse Alarm Ckt.	SD-31974-01	20D
Misc. and Fuse Alarm Ckt.	SD-32192-01	22D
Misc. and Fuse Alarm Ckt.	SD-31035-01	16D
Common Timing Circuit	SD-31310-01	29D
Common Timing Circuit	SD-30303-01	40D
Trunk Test Line	SD-31636-01	14D
Coin Box Trunk Test Set	SD-31858-01	15D
Trunk Test Set	SD-90469-02	17D
ANI "B" Trunk Test Circuit	SD-32315-01	12D
ANI "C" Test Circuit	SD-32379-01	11D

TITLE	CIRCUIT	ISSUE
STEP-BY-STEP (Cont)		
Conv. Trunk Circuit	SD-32326-01	7B
TOUCH-TONE Conv. Circuit	SD-32328-01	21B
Conv. Test Circuit	SD-32329-01	8B
Conv. Test Circuit	SD-32330-01	10B
Orig. Reg. and Outpulsing Cont.	SD-32351-01	29D
Register Trunk and Line	SD-32353-01	24D
Translator Conn. Decoder Conn.	SD-32354-01	10D
Translator Circuit	SD-32355-01	13D
Decoder Circuit	SD-32356-01	13D
Manual Test Circuit	SD-32362-01	12D
Manual Test Set	SD-32363-01	8D
Trouble Ticketer	SD-32364-01	6D
Automatic Test	SD-32365-01	15D
Aux. Trunk Circuit	SD-30806-01	5
Aux. Trunk Circuit	SD-32025-01	7
Coin Box Trunk	SD-32539-01	1
NO. 1 ESS		
Coin Control Circuit	SD-1A295-01	1
Ringing & Coin Control Test Ckt	SD-1A153-01	*
Toll Switch Trunk	SD-1A184-01	*
Toll Switch Trunk	SD-1A224-01	*
Toll Switch Trunk	SD-1A192-02	*
Toll Switch Trunk	SD-1A252-01	*
Recording Completing Trunk	SD-1A169-01	*
Recording Completing Trunk	SD-1A223-01	*
Recording Completing Trunk	SD-1A192-02	*
Recording Completing Trunk	SD-1A252-01	*
TSP, TSPS Trunk	SD-1A203-01	*
TSP, TSPS Trunk	SD-1A252-01	*
Coin Zone Trunk	SD-1A254-01	*
Overtime Monitor	SD-1A255-01	*
NO. 2 ESS		
Toll Switch Trunk	SD-2H110-01	1
Toll Switch Trunk	SD-2H112-01	1
Recording Completing Trunk	SD-2H110-01	1
Recording Completing Trunk	SD-2H112-01	1
TSP, TSPS Trunk	SD-2H112-01	1
TSP, TSPS Trunk	SD-2H144-01	1
Coin Zone Trunk	SD-2H151-01	1
Overtime Monitor	SD-2H113-01	1
Recording Completing Trunk	SD-2H105-01	2A

* Issue Date 1969 or later.

TITLE	CIRCUIT	ISSUE
SWITCHBOARDS		
13C, 13D, 14C, 15C, 15D-Perm Signal Holding Trunk	SD-25126-01	18B
13C, 13D, 15C, 15D — Perm. Signal Holding Trunk	SD-25425-01	11B
3CF — Recording Comp. Trunk	SD-55120-01	6B
3CF — Toll Switch Trunk	SD-55122-01	9B
3, 3C, 3CL — Toll Switch Trk.	SD-55341-01	25A
3, 3C, 3CL — Toll Switch Trk.	SD-55352-01	11B
3C, 3CL — Subs. Line Circuit	SD-55779-01	5B
3, 3C, 3CL — Perm. Sig. Holding Trunk	SD-55870-01	14B
3, 3C, 3CL — Recording Comp. Trunk	SD-55946-01	9B
3, 3C, 3CL — Overtime Monitor Trunk	SD-56000-01	8B
3, 3C, 3CL — Recording Com. Trunk	SD-56008-01	15B
1 — Toll Switch Trunk	SD-56204-01	8A
3, 3C, 3CL — Special Service Trunk	SD-56278-01	2B
3, 3C — Recording Comp. Trunk	SD-62441-01	30B
1 — Recording Comp. Trunk	SD-62496-01	18B
3, 3C, 3CF, 3CL — Subs. Line Circuit	SD-64502-01	14B
1 — Toll Switch Trunk	SD-64875-01	11B
13C, 13D, 14C, 14D, 15C, 15D — Special Service Trunk	SD-1B067-01	3B
3C — Special Service Trunk	SD-55183-01	8AC

1.02 Following list is a reference to letters pertaining to DTF service.

REFERENCE	GL's	EL's
Toll and DSA switchboard	GL71-06-015	EL1279

CENTRAL OFFICE BATTERY POLARITY

FOR DTF SERVICE

1.01 Coin present test for initial deposit:

- -48 volt battery on the tip side with ring side open.

1.02 Coin present test for 5 cent overtime or subsequent deposit less than initial rate:

- +48 volt battery on the tip side with the ring side open.

1.03 In 1C/2C sets, totalizer homing for deposits of initial rate or more:

- ±48 volt battery on the ring side of line to ground on the tip side.

1.04 In 1C/2C sets, totalizer homing for a deposit less than initial rate or after coin control has been applied:

- +48 volt battery on the ring side of the line to ground on the tip.

1.05 The removal of coin control battery (±130 volts) on tip with ring open.

- This is to prevent false operation of the station "A" relay.

1.06 Talking battery on all operator trunks; +48 volts on ring with ground on tip:

- This is required to read out coin tones less than initial rate and to disable the TOUCH-TONE® dial.

TROUBLE ANALYSIS CHART FOR COIN STATION TEST LINE

	TROUBLE	ACTION
1	Unable to seize Coin Station Test Line (CSTL)	Check TJ jack for plug. If in No. 5 Crossbar office, check position of MB switch. Check all power sources and fuses. Check seizure relay sequence, SC1 of SD-1C29701
2	No CSTL intermittent coin and/or dial tone	Check tone sources from office. If steady tones are heard, check INTR relay, 120 IPM source, and -48 volt source. ON relay should be operated for dial tone and released for coin tone. CT relay should be operated for coin tone and released for dial tone. Check Circuit SD-1C297-01-B3 and Section 201-833-501 Step A.
3	Two beep answer for DTF ground removal test rather than one beep answer.	Check A relay operation in the coin station. Check SCR(Q1) on CA7 for short. Check relay sequence per SC1. Check CPA 962 for constant current output.
4	One beep answer for CF ground removal test rather than two beeps.	Check wiring of coin station for CF service. Check Q1 on CA7. Should turn on during test. If it does, check answer generating relay sequence per SC5. Check CPA 962.
5	Wrong test is registered or unable to dial test.	Check dial pulse registration (P) relay sequence per SC2 for various digits. Check for dirty contacts on P relays. If ON relay is operated, check illegal number gating circuit per FS3.
6	Erroneous ground, loop, and leakage test answers.	Calibrate CSTL resistance tests per Section 201-833-501. Check calibration box SD-1C395-01 resistors and changes. Check trimpots on CPA 962 and 963 for damage. Check that all circuit packs are connected.
7	No ringing answer with receiver on-hook.	Check ringing voltage source. Check 60 IPM source. Check relay sequence chart, SC5.
8	No coin disposal.	Check the return and collect coin control voltage sources. Check A relay operation in coin station if DTF. Check relay operation with relay sequence chart, SC3.
9	CSTL fails to disconnect about 60 seconds after hang up.	Check the CPD3 circuit. Check relay sequence with chart, S6.

	TROUBLE	ACTION
10	No answer forthcoming during coin relay time test. All other tests OK.	Check 4 volt power supply per Section 201-833-501. Check CPA 964, 966, and 973. Check relay sequence per chart, SC7.
11	Consistent 4 beep answer for coin relay time test regardless of coin relay time adjustment.	Check diode CR4 on CPA 964 for short. Check CPA 964, 966, and 967.
12	Rotary dial seizes CSTL OK but TT does not.	Check TOUCH-TONE dial and receiver. Check wiring between receiver and CSTL. Check battery supply to TOUCH-TONE receiver.
13	CSTL coin disposal problems in step-by-step office.	Check option S. For CF service, option S is necessary but for DTF service option S will cause the coin Station A relay to operate and interfere with coin disposal operations.

COIN SUPERVISORY

TEST SETS

1.01 Three test sets are available for performing functional tests on the coin supervisory circuit in No. 1 and No. 5 crossbar offices. These tests require the efforts of only one craftsperson.

(1) ***CMC 732 Test Set:***

- This test set can be used with the 733 test set to eliminate the need for assistance from the switchboard operator while making certain tests.

(2) ***CMC 733 Test Set:***

- This test set is used to perform tests on the coin supervisory circuits in No. 5 crossbar offices.

(3) ***CMC 734 Test Set:***

- This test set is used to perform tests on the coin supervisory circuits in No. 1 crossbar offices.

The test sets can be purchased from and installed by Western Electric Co. Detailed information on the operation and use is furnished with each test set. For further information on these test sets, refer to EL-892/PL-2433.

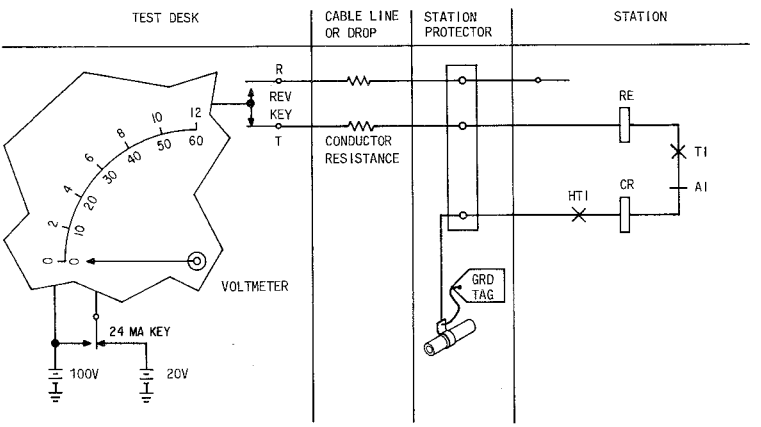
CHAPTER III

TEST DESK

FOREIGN ELECTROMOTIVE FORCE (FEMF) TEST

STEP	ACTION	VERIFICATION
1	Operate FEMF key.	
2	Connect to subscriber line with the primary test cord.	
3	Observe VMA meter.	A steady deflection on the meter indicates battery on ring. If meter needle deflects past zero volts in a reverse direction— Ring is crossed with a positive potential.
If meter reads in a reverse direction:		
4	Operate VM REV key.	Meter reads on-scale, indicating a cross with a positive potential.
5	Release VM REV key.	
6	Release FEMF key.	
7	Operate REV key.	A steady deflection on the meter indicates battery on tip.
8	Operate FEMF key.	Same indications as Step 3 except ground or potential is on tip.
If meter reads in a reverse direction:		
9	Operate VM REV key.	Same indication as Step 4.
If no further testing is required:		
10	Disconnect from primary test cord and release all operated lever keys.	LTD restored to normal.

MISCELLANEOUS TESTS



TO DETERMINE THAT A DEPOSITED COINS OPERATE A COIN GROUND CONTACT ON THE COIN RELAY, PROCEED AS FOLLOWS:

1. CONNECT TO THE LINE TO BE TESTED. LINE SHOULD TEST CLEAR OF CROSSES AND FEMF.
2. SIGNAL STATION. OPERATE T AND RCCI KEYS AND REQUEST DEPOSIT OF 10¢.
3. AFTER DEPOSIT OF COIN, RESTORE ALL KEYS AND OPERATE REV KEY.
4. VOLTMETER SHOULD DEFLECT TO NEARLY FULL SCALE, INDICATING OPERATION OF COIN HOPPER TRIGGER BY DEPOSITED COIN.
5. OPERATE 24 MA KEY. METER SHOULD DEFLECT BETWEEN 7.0 AND 9.5 VOLTS ON THE 0-24 VOLT SCALE.
6. RESTORE REV KEY AND OPERATE CR KEY TO REFUND COINS.
7. RELEASE ALL TEST CONNECTIONS AND RESTORE ALL KEYS TO NORMAL.

BSP REFERENCES:
- 662-400-500
- 662-410-500

Fig. 1—Coin Ground Closure Test (DTF)

DETERMINING EXTERNAL CIRCUIT RESISTANCE—POTENTIOMETER METHOD—16-TYPE TEST DESK (Fig. 2)

Note: This test is for accurate measurements of resistance less than 3100 ohms.

STEP	ACTION	VERIFICATION
1	Observe that potentiometer SW1 is in the OFF position.	
2	Connect to customer line with the primary test circuit.	
If resistance to be measured is from tip to ground:		
3	Operate REV key.	VMA meter circuit connected to tip of test circuit.
If resistance to be measured is from tip to ring:		
4	Operate G key.	Ground connected to tip of test circuit.
5	Observe reading of VMA meter. ***Note:*** Operate scale change key if required so that VMA meter deflects to nearest midscale.	Meter indicates current in external circuit.
6	Operate S/C key.	S/C lamp lighted. Tip and ring of test circuit connected together, eliminating external circuit resistance from VMA meter path.
7	Operate potentiometer SW1 to the 0, 1K or 2K position. Adjust to proper position as described in Step 8.	VMA meter connected to test circuit in series with potentiometers R, SW1, and SW2.
8	Adjust potentiometers R, SW1, and SW2 to obtain the same reading on VMA meter obtained in Step 6.	Total accumulated readings of potentiometers equal the resistance of external circuit, including the test trunk.
9	Restore potentiometer SW1 to the OFF position.	Potentiometer circuit restored to normal.
10	Release S/C key.	S/C lamp extinguished.
If no further testing is required:		
11	Operate DIS key for proper control group and release all operated lever keys.	

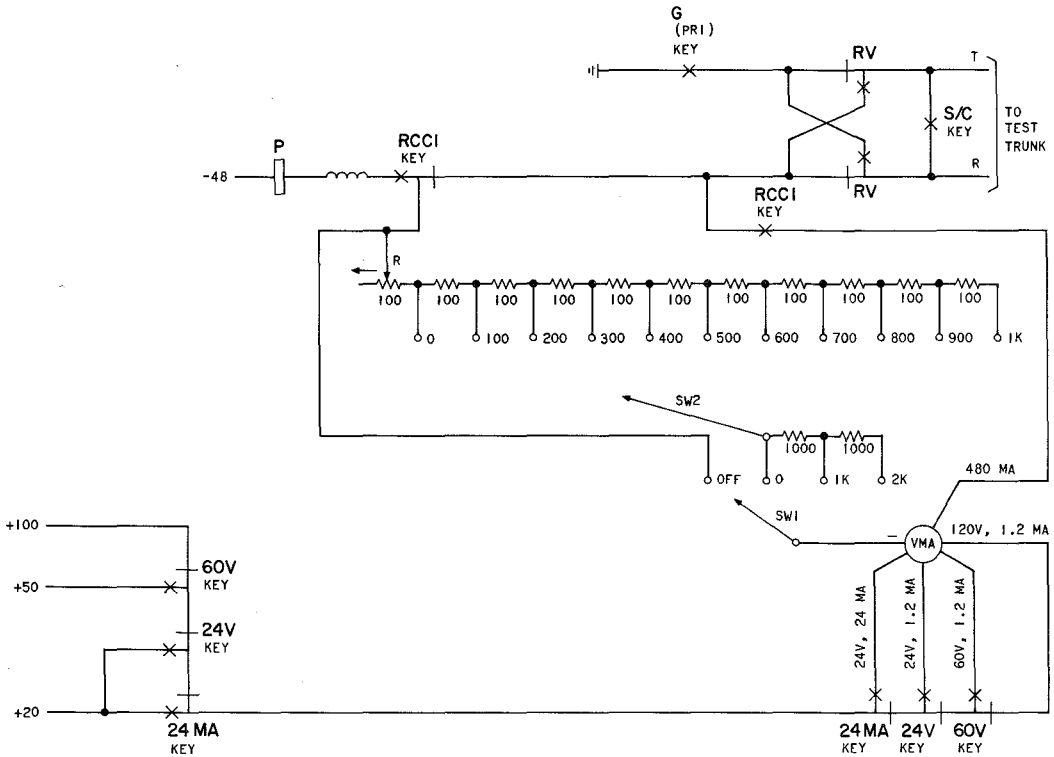


Fig. 2—Potentiometer Circuit for Determining External Circuit Resistance—16-Type Test Desk

DETERMINING EXTERNAL CIRCUIT RESISTANCE—RHEOSTAT METHOD—14-TYPE TEST DESK (Fig. 3)

STEP	ACTION	VERIFICATION
	Note: this test is for accurate measurements of resistance of less than 3100 ohms.	
1	Connect to subscriber line with the primary test cord.	
If resistance is to be measured from tip to ground.		
2	Operate REV key.	VMA meter circuit connected to tip of test circuit.
3	Observe reading of VMA meter.	VMA meter indicates current flows from ***tip to ground.***
	Note: Operate scale change key is required so that VMA meter deflects to nearest midscale.	
If resistance is to be measured from tip to ring:		
4	Operate G key.	Ground connected to tip of test circuit. Meter indicates total internal and external resistance of circuit.
5	Note reading of VMA meter.	VMA meter indicates resistance from ***tip to ring.***
6	Disconnect primary test cord from subscriber line and insert primary test cord into SC jack.	Tip and ring of test circuit connected together eliminating external circuit resistance from VMA meter path.
7	Operate RHE key.	VMA meter connected to test circuit in series with rheostats R and R1.
If total resistance measured is more than 1100 ohms:		
8	Operate 1000Ω or 2000Ω key as necessary to obtain approximate resistance readings.	
9	Adjust rheostats R and R1 to obtain the same reading on VMA meter as obtained in Step 4.	Total accumulated readings of potentiometers equal the resistance of external circuit, including the test trunk.
10	Release RHE key.	Rheostat circuit restored to normal.

STEP	ACTION	VERIFICATION
	If no further testing is required.	
11	Disconnect primary test cord and release all operated level keys.	LTD restored to normal.

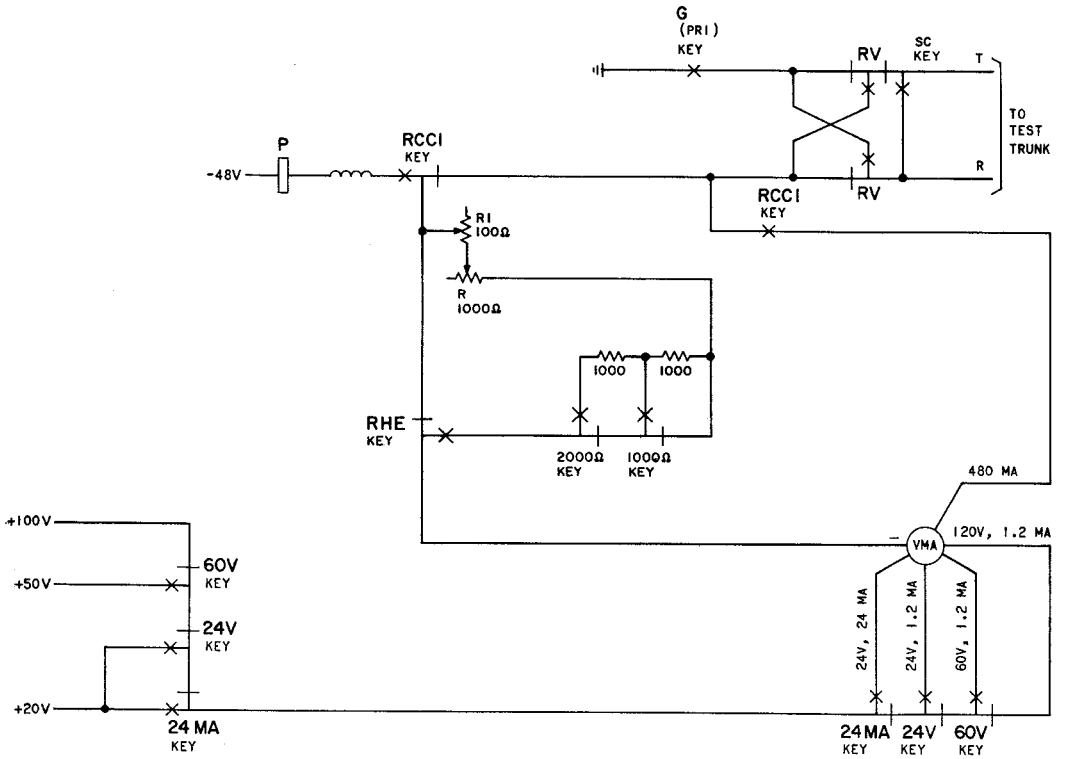
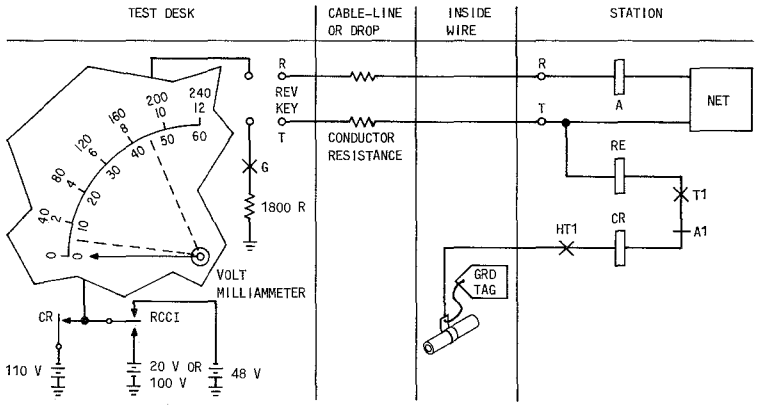


Fig. 3—Rheostat Circuit for Determining External Circuit Resistance—14-Type Test Desk



THE GROUND REMOVAL RELAY IS USED TO REMOVE THE COIN GROUND DURING A CONVERSATION TO REDUCE LINE NOISE. THIS TEST SHOULD BE MADE IN CONNECTION WITH ALL TROUBLE REPORTS INVOLVING "HUM", NOISE AND TRANSMISSION DIFFICULTIES. TO PERFORM THIS TEST, PROCEED AS FOLLOWS:

1. MAKE CONNECTION TO THE LINE TO BE TESTED.
2. SIGNAL STATION AND OPERATE T AND RCCI KEYS.
3. WHEN STATION ANSWERS RELAY A (GROUND REMOVAL) SHOULD OPERATE THROUGH ROH. CONTACT A1 BREAKS AND OPENS COIN GROUND CIRCUIT.
4. REQUEST ATTENDANT OR CRAFTSMAN TO WAIT A FEW SECONDS AND THEN DEPOSIT 10¢, KEEPING RECEIVER OFF HOOK.
5. DURING THE PAUSE, OPERATE CR AND G KEYS APPLYING REFUND CURRENT TO THE TIP AND 1800 OHM GROUND TO THE RING.
6. RELAY A SHOULD EITHER REMAIN OPERATED OR RELEASE AND REOPERATE, KEEPING THE COIN GROUND PATH OPEN.
7. MILLIAMMETER SHOULD READ 20 MA OR BETTER.
8. WHEN COIN DEPOSITED, GROUND IS CONNECTED TO THE COIN RELAY. MILLIAMMETER READING SHOULD NOT CHANGE PROVING THAT THE GROUND REMOVAL RELAY IS OPERATED AND CONTACT A1 IS OPEN.
9. RESTORE CR AND G KEYS AND OPERATED REV KEY. RELAY A SHOULD NOW RELEASE AND CLOSE CONTACT A1, COMPLETING COIN GROUND PATH.
10. MILLIAMMETER SHOULD NOW READ THE COIN GROUND ON THE TIP SIDE.
11. RESTORE REV KEY AND OPERATE CR KEY TO RETURN COIN. RESTORE ALL OTHER KEYS TO NORMAL.

IF RELAY A FAILS TO OPERATE AS DESCRIBED IN STEP 6, FOLLOWING WILL TAKE PLACE:

(A) MILLIAMMETER CURRENT WILL INCREASE MOMENTARILY TO 45 MA OR BETTER WHEN THE COIN IS DEPOSITED.

(B) WITH COIN GROUND PATH NOW CLOSED, THE COIN RELAY SHOULD OPERATE AND RETURN THE COIN, SINCE THE CR AND G KEYS ARE OPERATED.

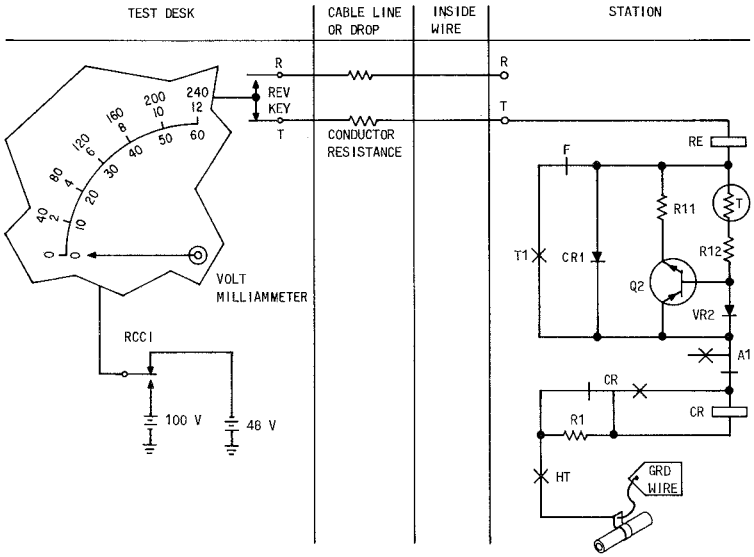
(C) WHEN THE COIN RELAY RESTORES, COIN GROUND IS REMOVED AND THE MILLIAMMETER READING SHOULD RETURN TO ABOUT 20 MA.

(D) IF IN (B) ABOVE, THE LOOP IS NEAR MAXIMUM LENGTH, THE COIN RELAY MAY NOT OPERATE, SINCE IT IS PARALLEL WITH THE STATION TRANSMITTER CIRCUIT.

(E) IF THE COIN RELAY FAILS IN (D) ABOVE, ADVISE ATTENDANT OR CRAFTSMAN TO HANG UP RECEIVER SO THAT COINS MAY BE RETURNED IN A NORMAL MANNER.

BSP REFERENCES:
- 662-400-500
- 662-410-500

Fig. 4—Coin Ground Removal Relay Test (DTF)



THE SILICON CONTROLLED RECTIFIER IS USED TO PROVIDE A PATH FOR THE COIN RETURN SIGNAL FOR A SINGLE 5¢ DEPOSIT. THIS TEST SHOULD BE MADE IN CONNECTION WITH ALL TROUBLE REPORTS OF CAN'T REFUND SINGLE NICKEL DEPOSITS. TO TEST THIS CIRCUIT OPERATION, PROCEED AS FOLLOWS:

1. CONNECT TO THE LINE TO BE TESTED.
2. WITH CONNECTION ESTABLISHED, SIGNAL ATTENDANT OR CRAFTSMAN AT STATION AND OPERATE T AND RCCI KEYS.
3. REQUEST A 5¢ DEPOSIT AND THE RECEIVER LEFT OFF HOOK.
4. RESTORE ALL KEYS AND OPERATE REV KEY - METER READS THE COIN GROUND ON THE TIP.
5. THIS INDICATES EITHER DIODE CR1 OF VR2 IS CONDUCTING WITH POSITIVE TEST BATTERY.
6. RESTORE REV KEY AND OPERATE CR KEY TO RETURN COIN.
7. FAILURE TO RETURN COIN INDICATES A DEFECTIVE SCR OR ONE OF ITS PARALLEL COMPONENTS.
8. RELEASE ALL TEST CONNECTIONS AND RESTORE ALL KEYS TO NORMAL.

BSP REFERENCES:
- 662-400-500
- 662-410-500

Fig. 5—Silicone Controlled Rectifier Test (DTF)

COIN RELAY CURRENT FLOW TEST

Notes:

1. This test must be conducted with a craftsperson at the coin station. Use Fig. 1, 2, and 3.
2. The purpose of this test is to ensure that the coin relay operates properly.
3. Perform an FEMF test (Chapter 1-9) prior to the current flow test.

STEP	ACTION	VERIFICATION
1	Connect to subscriber line with the primary test cord.	
2	Operate RCCI and T keys.	Talking battery (48 volts) and ground applied to test circuit. ***Note:*** In 1A/2A/1C/2C-type sets, the 48-volt talking battery insures the totalizer is in the ***home*** position. However, applying 48 volts talking battery from the LTD may not reset the totalizer if the test trunk and loop resistance exceeds the limits for 48-volt operation of the totalizer.
3	Signal the station.	Answering party takes station handset off-hook.
4	Request craftsperson to: (a) Remove cover unit assembly (1-type set) or open door and faceplate assembly (2-type set). (b) On 1-type set, hang cover unit assembly on a KS-20950 cover parking tool. (c) On 2-type set, use a P11C test cord. (d) Manually trip hopper trigger. (e) Identify type of coin relay and use Table C, Chapter 1-8 for requirements.	
5	Request that station be left off-hook.	

STEP	ACTION	VERIFICATION
A. Nonoperate Tests—All Type Relays		
6	Operate RHE key. (On 16-type test desk, operate SW1 to 2K position)	Rheostat circuit connected to line in series with VMA meter.
7	Adjust rheostat for maximum resistance (maximum clockwise rotation).	
8	Operate and hold operated the nonlocking CR key.	Coin return potential applied to tip of line in series with VMA meter.
9	Adjust rheostat to obtain nonoperate current value of relay under test as shown in Table C, Chapter 1-9.	VMA meter indicates nonoperate current value.
10	Release and then reoperate the CR key.	The VMA meter indicates the nonoperate current value each time the key is operated. No deflection indicates that the coin relay has operated on the previous application of nonoperate current.
11	Operate and hold operated the nonlocking CC key. (CC and CR keys are controlled by the same key lever.)	VMA meter indicates nonoperate current value.
12	Release and reoperate the CC key several times.	The VMA meter indicates the nonoperate current value each time the key is operated. No deflection indicates the coin relay has operated on the previous application of nonoperate current.
B. Operate Tests—50-Volt Relays		
13	Signal the station.	Answering station goes off-hook.
14	Request answering party to: (a) Use orange stick and block the coin relay armature in the nonoperate position. (b) Trip hopper trigger. (c) Stay off-hook during test.	
15	Operate and hold operated nonlocking CR key.	Talking battery removed.
16	Adjust rheostat for operate current value of relay under test as shown in Table C, Chapter 1-9.	VMA meter indicates operate current value.
17	Release CR key.	Talking battery restored to line.

STEP	ACTION	VERIFICATION
18	Request person at coin station to remove blocking tool from the coin relay.	
19	Operate and release CR key.	Coin relay operates at coin station.
20	Request person at coin station to trip hopper trigger.	
21	Operate and release CC key.	Coin relay operated at coin station.
22	Verify that coin relay operated properly.	

If all tests have been completed:

23 Return coin telephone set to normal.

If no further testing is required:

24 Disconnect from test trunk and release all operated lever keys.

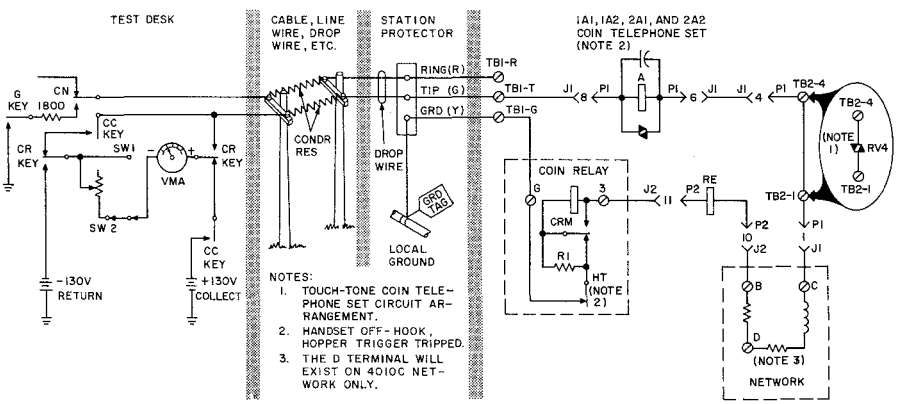


Fig. 1—Coin Relay Current Flow Test—1A/2A-Type (Coin-First)

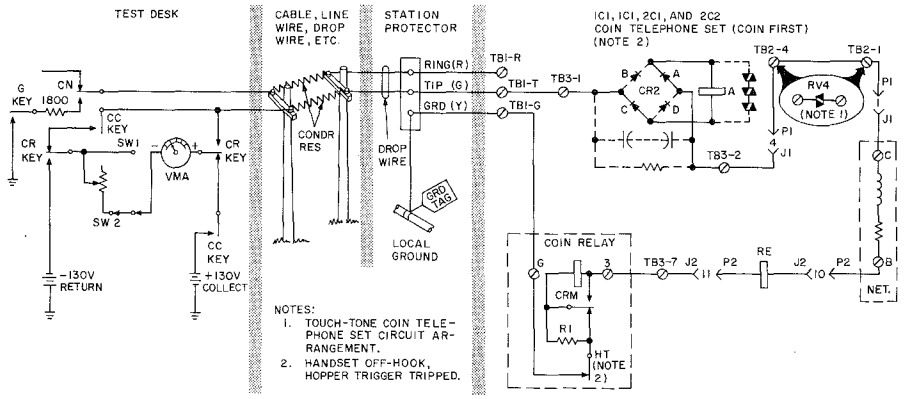


Fig. 2—Coin Relay Current Flow Test—1C/2C-Type (Coin-First)

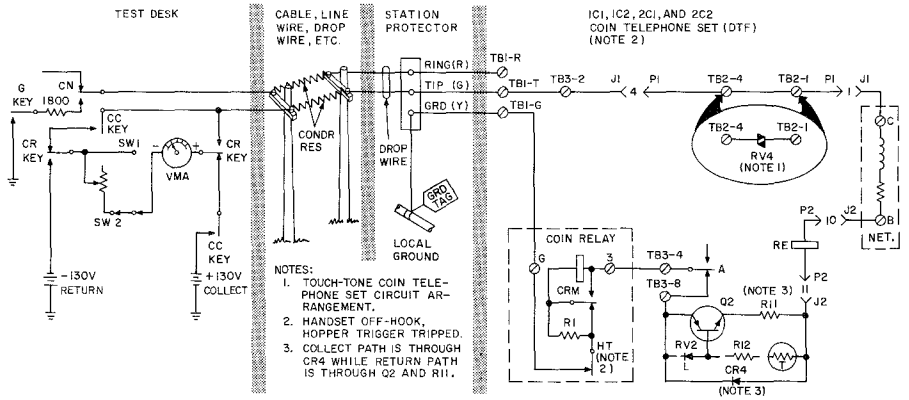


Fig. 3—Coin Relay Current Flow Test—1C/2C-Type (Dial-Tone-First)

TOTALIZER CURRENT FLOW TEST

Notes:

1. This test must be conducted with a craftsperson at the coin station. Use Fig. 1, 2, and 3.
2. The purpose of this test is to ensure the totalizer operates properly and can be reset to the home position by applying 23 ma of current at 48 volt.
3. Perform an FEMF test (Chapter 3-1) prior to the current flow test.

STEP	ACTION	VERIFICATION
1	Connect to the subscriber line with the primary test cord.	
2	Operate the RCCI and T key.	Talking battery (48 volts) and ground applied to coin line.
3	Signal the station.	Answering party takes station handset off-hook.
4	Adjust potentiometers until meter registers 23 ma.	
5	Request answering party to: (a) Remove cover unit assembly (box type coin station) or open the door and faceplate assembly (panel type coin station). Use a KS-20950 parking tool or connect a P11C cord between P1 and J1. (b) Listen for RCCI and T keys being released at the LTD. (Talking circuit to LTD is disconnected.) (c) Deposit a minimum of 35 cents to step the totalizer off normal the required steps. (d) Keep handset off-hook during current flow tests. (e) Observe that totalizer resets when 23 ma of current is applied from LTD.	
6	Restore the RCCI and T keys.	Talking battery and ground removed from coin line.

STEP	ACTION	VERIFICATION
7	Allow sufficient time for person at coin station to step totalizer off normal as instructed in Step 5(c).	
8	Operate T key. ***Note:*** Operate T key before operating RCCI key so totalizer readout tone may be heard.	
9	Operate RCCI key.	***At the LID:*** (a) 23 milliamperes of current applied to coin line with 48 volts of talking battery. (b) Listen for totalizer readout. Tone heard momentarily and stops. ***Note 1:*** A steady tone that cannot be removed indicates a jammed totalizer arm or full money box. ***Note 2:*** A continuous series of beep tone indicates an open T2 totalizer contact.
If totalizer does not reset:		
10	Operate REV key	If totalizer resets to home position while RCCI, T, and REV keys are operated, indicates the loop to an "A" series coin station is reversed.
If coins were deposited in Step 5c:		
11	Operate and release CR key.	Coins returned to person at coin station.
If no further testing is required:		
12	Request person at coin station to restore station for normal service.	
13	Restore RCCI and T keys. ***Note:*** Upon completion of testing the totalizer from the LTD, the person at the coin station should attempt to reset the totalizer from the coin station. The totalizer may be stepped off normal by depositing coins amounting to more or less than the initial rate. If coins deposited amount to initial rate or more, the totalizer should home immediately. If less	Talking battery disconnected from coin line.

STEP	ACTION	VERIFICATION

than initial rate is deposited the totalizer will not home until handset is on-hook. A totalizer which may be made to operate properly from the LTD but cannot be reset from the station indicates a defective coin trunk or associated central office circuit.

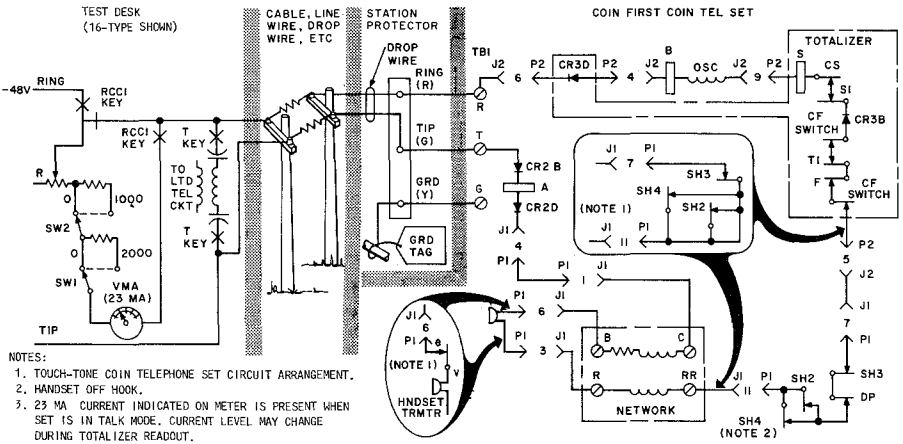


Fig. 1—Totalizer Current Flow Test (Coin-First)

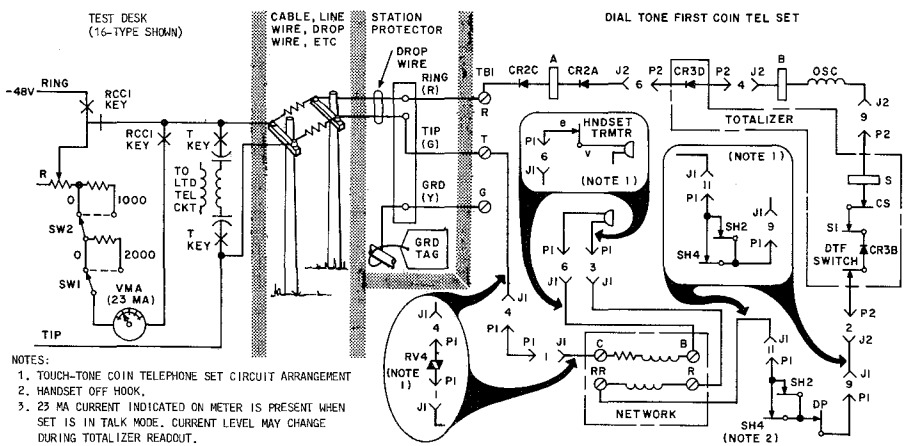


Fig. 2—Totalizer Current Flow Test (Dial-Tone-First)

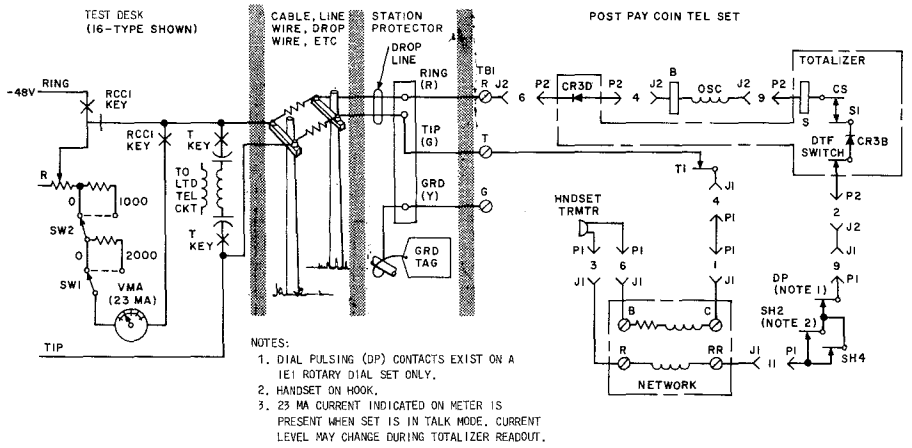


Fig. 3—Totalizer Current Flow Test (Postpay)

THE COIN STATION TOTALIZER—
A TROUBLE INDICATOR

1. GENERAL

1.01 The single slot coin station is critical to sequential testing. Tests performed out of sequence can leave the coin station in an off normal condition and the next customer will experience an out of service condition.

1.02 The totalizer, described in detail in Chapter 1-1, is a primary component in the coin telephone set for indicating troubles from the test desk.

1.03 The "A" series coin station is polar and operation of the RCCI and T keys should ***home*** the totalizer. A reversal of tip and ring on the line to the coin station will result in a failure to ***home*** the totalizer. The totalizer on "C" series coin station will restore to the ***home*** position when applying -48 volts to either tip or ring side of the line.

1.04 Refer to Table A for "homing" the totalizer.

1.05 The conditions caused by a totalizer left ***off-normal*** may result in a trouble report. (No dial tone, can't break dial tone, or can't be called.) The first attempt to originate a call after the totalizer is left off-normal may result in not receiving dial tone ("C" series station) or not being able to break dial tone ("A" series station). A customer will not be aware that even though the attempt to originate a call was unsuccessful, the action taken cleared the trouble condition. This could result in a trouble report which will test clear.

> ***Note:*** The state of the totalizer can be determined in most cases from the test desk with no one at the station by following standard test sequence.

1.06 Observing the state of the totalizer can afford valuable trouble locating information. It can generally isolate the trouble to the CO equipment, station or loop plant. It can be used to great advantage by the CO switchperson to detect the exact piece of CO equipment causing a trouble condition and also indicate to the switchperson what the cause is.

1.07 Observations can be made by the repairperson as follows:

(a) Totalizer off normal-in fraud:

(1) Observation:

- Totalizer off normal
- Rate latch down
- Fraud latch set

(2) Cause:

- This condition is generally caused by the failure of the CO equipment to apply a 48-volt battery on the loop prior to applying coin control (100- to 130-volt) battery.

(3) Verification test from RSB:

- Tester will observe a short circuit.
- Operate T and RCCI keys and monitor the oscillator tones of totalizer
- Tones stop indicating totalizer has reached ***home*** position
- Test for short circuit. Short circuit is removed
- Release test circuit
- Station now back in service.

(b) Totalizer off normal—not in fraud:

(1) Observation:

- Totalizer off normal beyond 10 degrees
- Rate latch up
- Fraud latch normal.

(2) Cause:

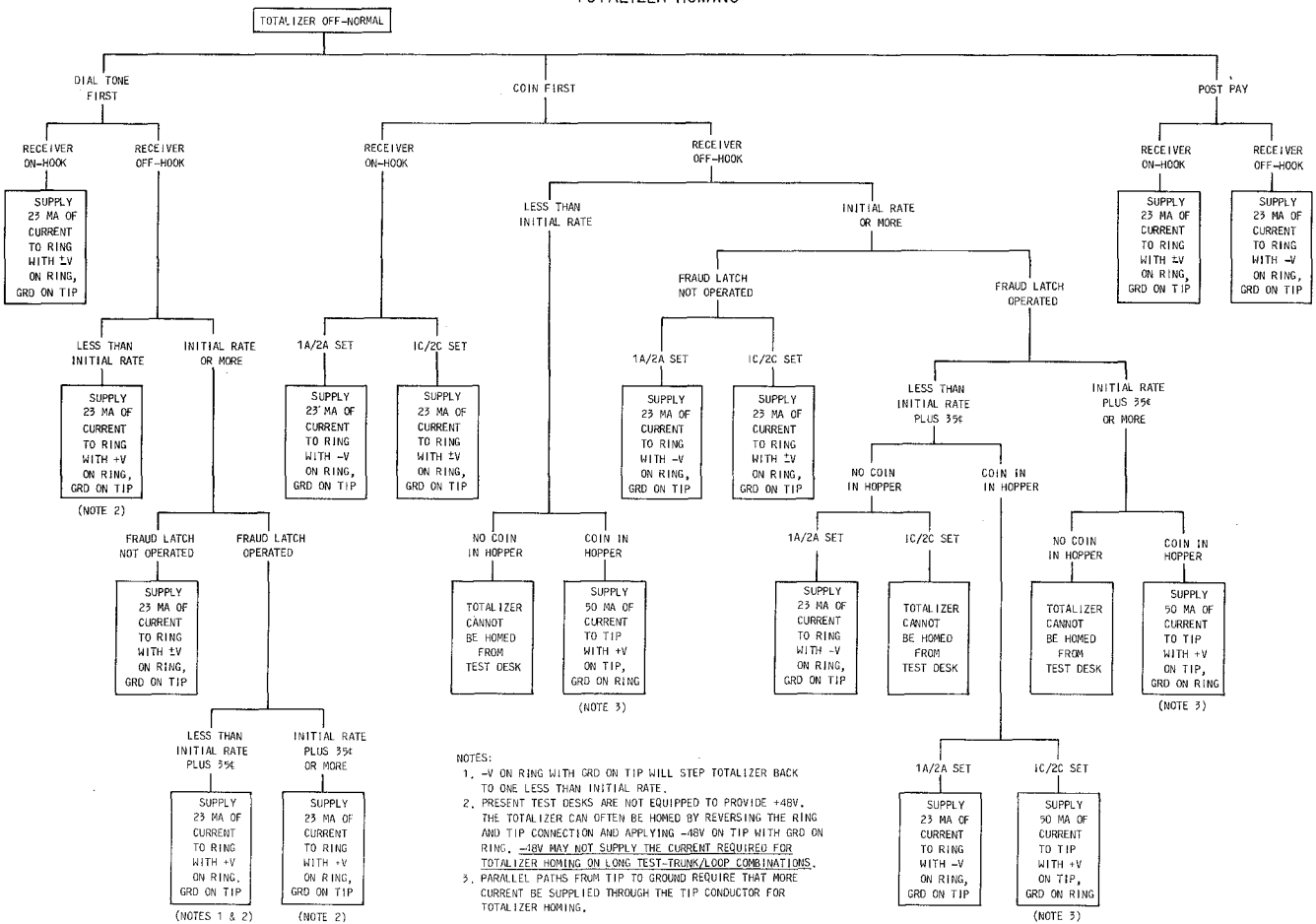
- This condition is generally caused by an open both sides or ring side open. A reversal will also cause this condition with an "A" series coin station.

(3) Verification test from RSB:

- Tester will observe ground on both sides
- Operate T and RCCI keys and monitor the oscillator tones of totalizer
- Tone stops
- Tester will now observe ground tip side
- Operate CC key and release
- Tester will now observe O.K. circuit
- Release test circuit
- Station now back in service.

Note: On an "A" series coin telephone set, if totalizer fails to home when operating RCCI and T key, operate the REV key as well. If oscillator tone is heard and stops, it is an indication that the station loop is reversed.

TOTALIZER HOMING



NOTES:

1. -V ON RING WITH GRD ON TIP WILL STEP TOTALIZER BACK TO ONE LESS THAN INITIAL RATE.
2. PRESENT TEST DESKS ARE NOT EQUIPPED TO PROVIDE +48V. THE TOTALIZER CAN OFTEN BE HOMED BY REVERSING THE RING AND TIP CONNECTION AND APPLYING -48V ON TIP WITH GRD ON RING. -48V MAY NOT SUPPLY THE CURRENT REQUIRED FOR TOTALIZER HOMING ON LONG TEST-TRUNK/LOOP COMBINATIONS.
3. PARALLEL PATHS FROM TIP TO GROUND REQUIRE THAT MORE CURRENT BE SUPPLIED THROUGH THE TIP CONDUCTOR FOR TOTALIZER HOMING.

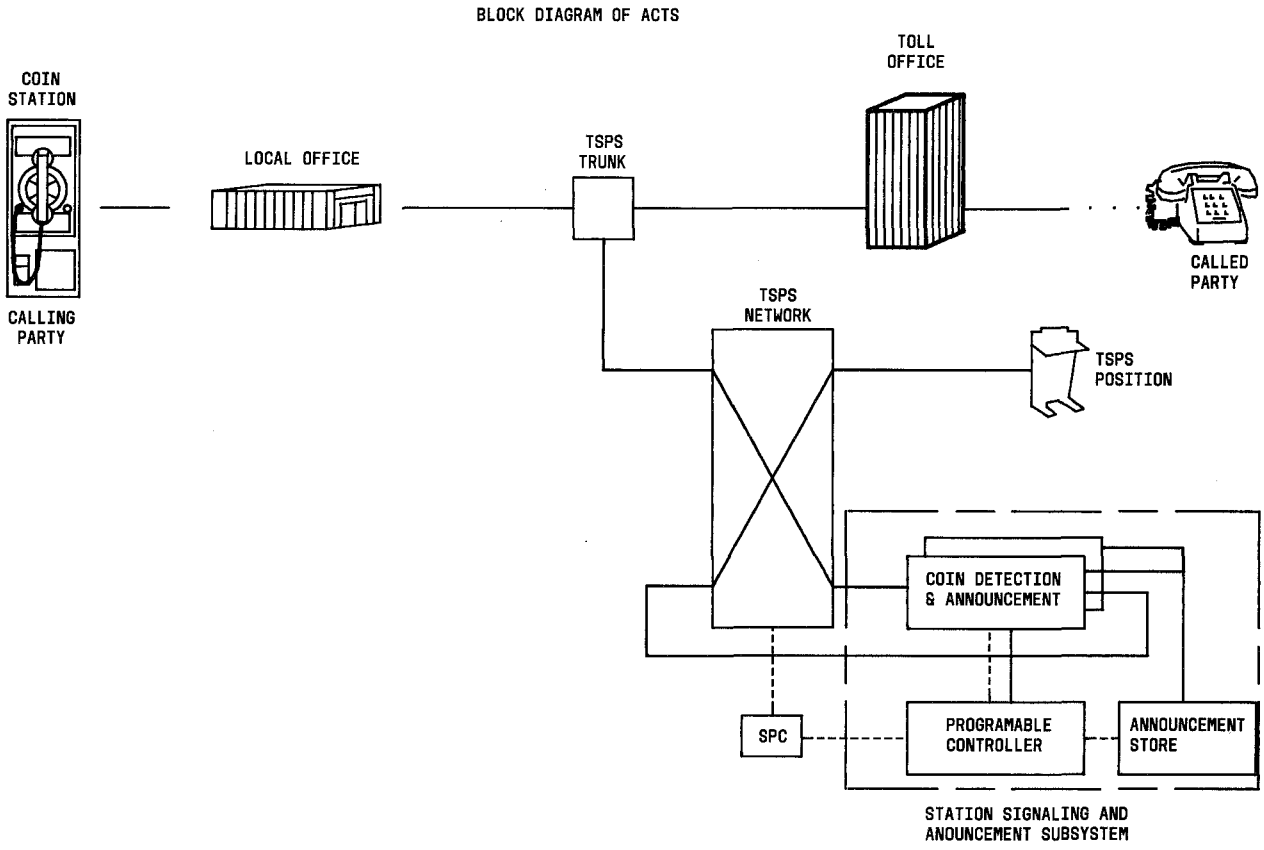


Fig. 1—Block Diagram of ACTS

CIRCUIT MODIFICATIONS

1.01 The following circuits have been modified or provided new to reflect coin improvement items including Dial-Tone-First.

TITLE	CIRCUIT	ISSUE
TEST DESKS		
12B — Test Circuit	ES-20563-01	24B
12B — Primary & Secondary Test Circuit	ES-20629-01	19B
12B — Test Circuit	ES-239388	35B
12C — Test Circuit	ES-254581	24B
12B — Suppl. Test Features	ES-359373	15B
14 — Primary and Secondary Test Circuit	SD-90053-01	33D
14 — Primary and Secondary Test Circuit	SD-90497-01	50AR
14 — Primary and Secondary Test Circuit	SD-95612-01	17AR
3 — Telephone & Test Circuit	SD-96181-01	26B
Remote Testing Ckt. — Far End	SD-99311-01	10B
12B — Test Circuit	ES-261158	24B
12C — Suppl. Testing Features	ES-254607	14B

1.02 Following list is a reference to letters pertaining to DTF service.

REFERENCE	GL's	EL's
Local Test Desk	GL71-06-015	EL1279