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# GBPPR 'Zine – Issue #5 – August 2004



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Welcome to **Green Bay Professional Packet Radio's** ([www.gbppr.org](http://www.gbppr.org)) crappy magazine!

Lots of pay phone information in this issue, never mind that it's from 1978...

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## Table of Contents

- ◆ **Page 2 : Coin Telephone Introduction**
  - ◆ Brief introduction to Bell System pay phone service.
- ◆ **Page 6 : 1C / 2C-type Coin Telephone Set**
  - ◆ Bell System Practice on pay phone specifications.
- ◆ **Page 29 : 1A / 2A / 1C / 2C-type Coin Telephone Set – Functional Diagrams**
  - ◆ Block diagrams and schematics on pay phone operations.
- ◆ **Page 41 : Bell System 177A Test Set**
  - ◆ Leaflet included with this old coin station test set.
- ◆ **Page 45 : Homebrew "Digital" Cable TV Filter**
  - ◆ OMG! FREE PPV TV!
- ◆ **Page 47 : The Ramsey DA25 for SIGINT Applications**
  - ◆ A simple, broadband microwave antenna.
- ◆ **Page 53 / Bonus**
  - ◆ 5ESS Switch Returned Circuit Pack Tag.
- ◆ **Page 54 / The End**
  - ◆ Editorial and Rants.

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# Coin Telephone Introduction

## Introduction

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 (CO) testing and circuit design requirements
3. Trouble analysis of station, loop, and central office equipment
4. Cord board and Traffic Services Position System (TSPS) operation
5. Loop plant
6. Coin improvement items including Dial Tone First

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

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

Prior to the development of the single-slot coin telephone and introduction of DTF service, coin operation was relatively simple. The coin station (multi-slot) 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.

Social changes during the 1960s (whiny rich kids) made the multi-slot 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.

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

- "A" Series – Designed for all CF areas for use in CF operation.
- "C" Series – A convertible set that can be used in either DTF mode or CF mode.
- "D" Series – For use in DTF mode only.
- "E" Series – For post pay operation only.

Components for the single-slot coin stations, although appearing the same and physically fitting the same mountings, are not always compatible.

The operational description of the single-slot coin station is explained in the following pages. The operational description must be understood by the central office and test desk force maintaining coin service. The station totalizer assembly as outlined next, affords a natural trouble indicator and trouble analyzer for loop plant, station, and central office trouble conditions. The Master Test Frame (MTF), 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.

## General System Considerations for DTF Conversion

### **Station Compatibility**

The operational description for the "A" series coin station is similar to that of the "C" series station wired in the CF mode. 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.

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.

#### *Polarity Reversal Examples:*

1. The trunks to TSPS provide +48 VDC talking battery on the ring side of the line when serving DTF service. This is deposit recognition for less than initial rate and also utilized to prevent Touch-Tone® fraud (fraudulent simulation of coin signals by manipulating Touch-Tone® dial buttons).
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.

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

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 to DTF coin operation.

### **Cutover Coordination**

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 CF and DTF 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.

### **Cutover Procedures**

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 VDC options.
3. **Modify or Change** Stations to "C" series.

4. **Modify** Toll equipment with the exception of +48 VDC options.
5. Prepare announcement circuits and announcements.
6. Implement +48 VDC 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, test desk equipment.
13. Make final check of announcements.

### ***Deposit Required Announcement***

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.

### ***Coin Present Tests***

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 VDC) battery. Coin deposits of less than the initial rate will not be detected by a negative battery test (-48 VDC), since the unoperated initial rate contact (T1) at the station will prevent coin ground detection.

### ***Subscriber Line Multiplex (SLM) Operation***

The SLM has been arranged to serve CF coin telephones. It *cannot* serve DTF or CF 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.

### ***Talking Battery Polarity on Operator Trunks***

As covered in the various letters, +48 VDC 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.

### ***Toll Grade Battery***

The coin service improvement program which initiated DTF 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.

## **Coin Station Test Line**

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).

## **Coin Instruction Cards**

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 CF or DTF 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.

## **Coinless Call Completion**

Implementation of DTF 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 type of calls.

## **Permanent Signals**

The introduction of DTF can result in a higher instance of permanent signals. A receiver off-hook will result in a permanent signal. With CF operation a coin deposit in addition to a receiver off-hook is required to get a call into the permanent signal conditions.

## **Coin Station Code Significance**

<b>Code</b>	<b>Housing Type</b>	<b>Mode of Operation</b>	<b>Dial Type</b>
1A1	Box	Coin First Only	Rotary
1A2	Box	Coin First Only	Touch-Tone®
2A1	Panel	Coin First Only	Rotary
2A2	Panel	Coin First Only	Touch-Tone®
1C1	Box	Coin First or Dial Tone First	Rotary
1C2	Box	Coin First or Dial Tone First	Touch-Tone®
2C1	Panel	Coin First or Dial Tone First	Rotary
2C2	Panel	Coin First or Dial Tone First	Touch-Tone®
1D1	Box	Dial Tone First Only	Rotary
1D2	Box	Dial Tone First Only	Touch-Tone®
2D1	Panel	Dial Tone First Only	Rotary
2D2	Panel	Dial Tone First Only	Touch-Tone®
1E1	Box	Post Pay	Rotary
1E3	Box	Post Pay	None (manual)

*More pay phone information in the upcoming GBPPR 'Zine issues.*

# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1  
Issue 2

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

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL . . . . .	6	Originating A Call . . . . .	16
2. FUNCTIONS . . . . .	6	Restoring Set to Standby . . . . .	21
Coin Chute . . . . .	6	Call Abandoned . . . . .	21
Nickel Operation—Valid Coin Accepted . . . . .	6	Partial Initial Rate Deposited . . . . .	21
Nickel Operation—Coin Rejected . . . . .	7	Initial Rate Deposited . . . . .	21
Dime Operation—Valid Coin Accepted . . . . .	7	Nickel Local Overtime . . . . .	22
Dime Operation—Coin Rejected . . . . .	7	Coin Disposal Test . . . . .	22
Quarter Operation—Valid Coin Accepted . . . . .	7	Toll Call . . . . .	22
Quarter Operation—Coin Rejected . . . . .	7	Incoming Call . . . . .	23
Coin Release Mechanism Operation . . . . .	7	COIN FIRST SERVICE . . . . .	23
Totalizer . . . . .	9	Originating A Call . . . . .	23
A. DTF Mode . . . . .	9	Restoring Set to Standby . . . . .	24
B. CF Mode . . . . .	11	Call Abandoned . . . . .	24
Coin Chassis . . . . .	13	Partial Initial Rate Deposited . . . . .	24
Dial and Housing Assembly . . . . .	13	Initial Rate Deposited . . . . .	24
Coin Relay and Happer Assembly . . . . .	13	Nickel Local Overtime . . . . .	25
Other Component Circuits . . . . .	14	Coin Disposal Test . . . . .	25
3. THEORY OF OPERATION . . . . .	16	Toll Call . . . . .	25
DIAL-TONE-FIRST SERVICE . . . . .	16	Coin-First Station—Coin First Office . . . . .	25
		Coin-First Station (C Series Station Only)—Coin-First/Dial-Tone-First Office . . . . .	26

# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1

CONTENTS	PAGE
Incoming Call . . . . .	27
<b>4. SEQUENCE CHARTS . . . . .</b>	<b>27</b>

**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).**

# 1C / 2C-type Coin Telephone Set

ISS 2, COIN CRAFTS MANUAL 1-1

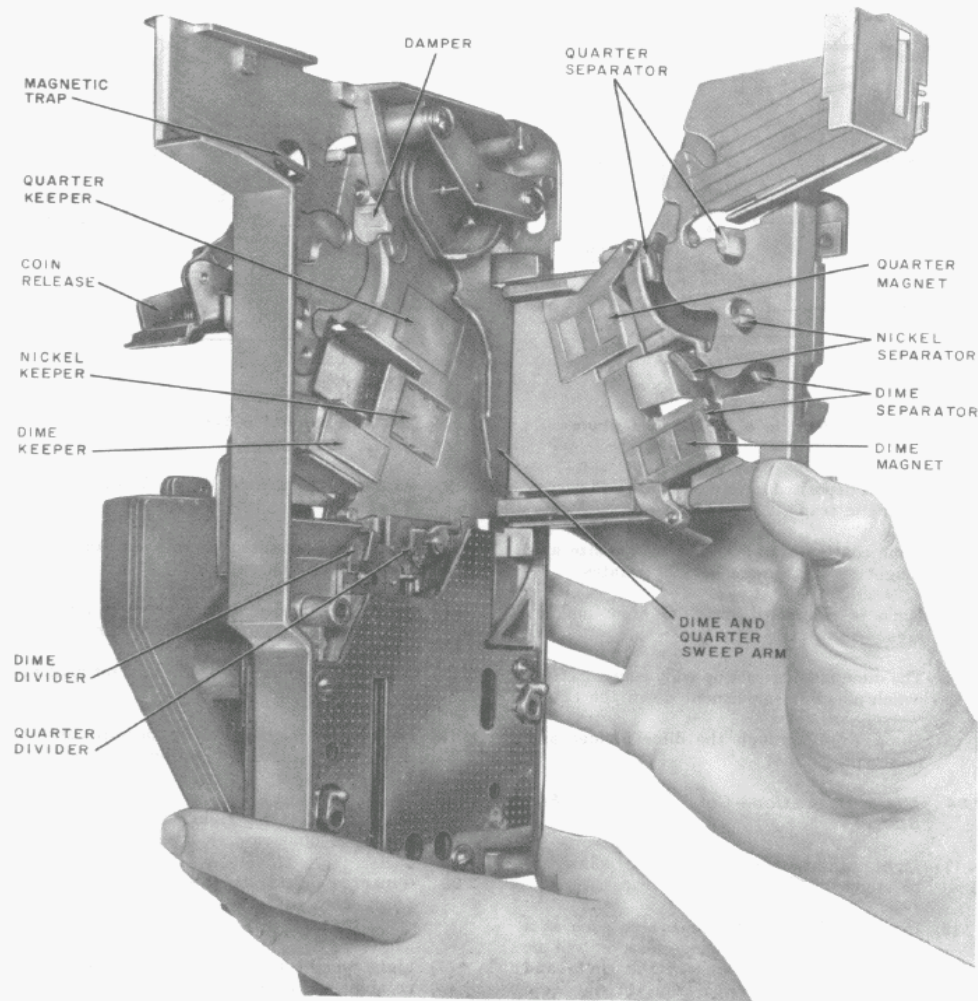


Fig. 1—Typical Coin Chute



# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1

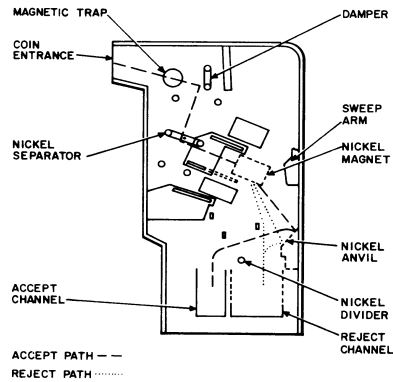


Fig. 2—Nickel Path in a Typical Coin Chute

- (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.

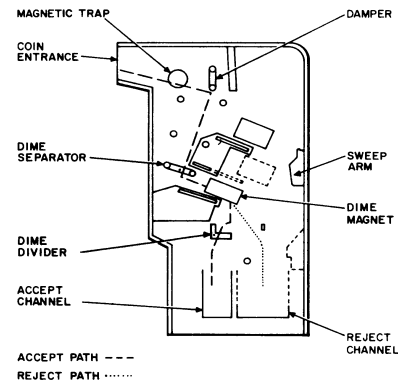


Fig. 3—Dime Path in a Typical Coin Chute

**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.

# 1C / 2C-type Coin Telephone Set

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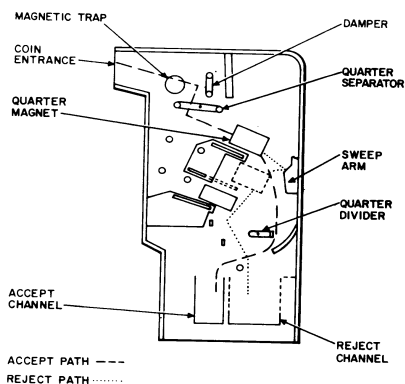


Fig. 4—Quarter Path in a Typical Coin Chute

(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.

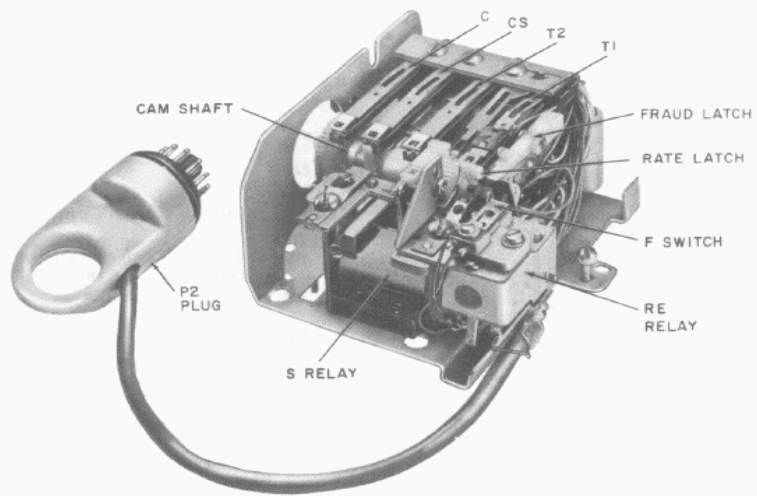
#### (4) C (Coin Arm Off-Normal) Contacts.

- (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.

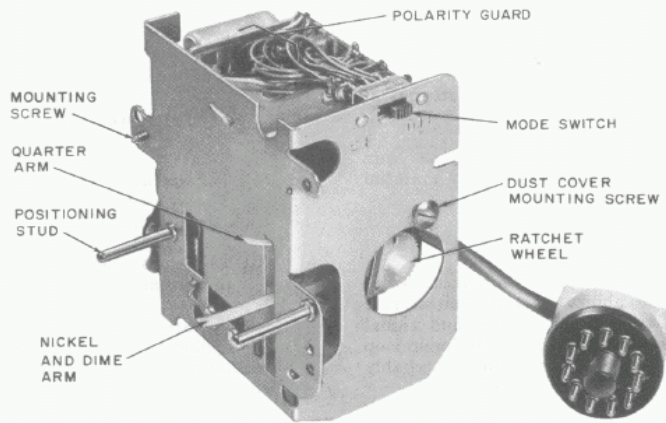
Page 9

# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1



VIEW A



VIEW B

Fig. 5—1A Totalizer

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# 1C / 2C-type Coin Telephone Set

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ISS 2, COIN CRAFTS MANUAL 1-1

- (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.
- (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.

Page 11

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# 1C / 2C-type Coin Telephone Set

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## COIN CRAFTS MANUAL 1-1

- (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.

# 1C / 2C-type Coin Telephone Set

ISS 2, COIN CRAFTS MANUAL 1-1

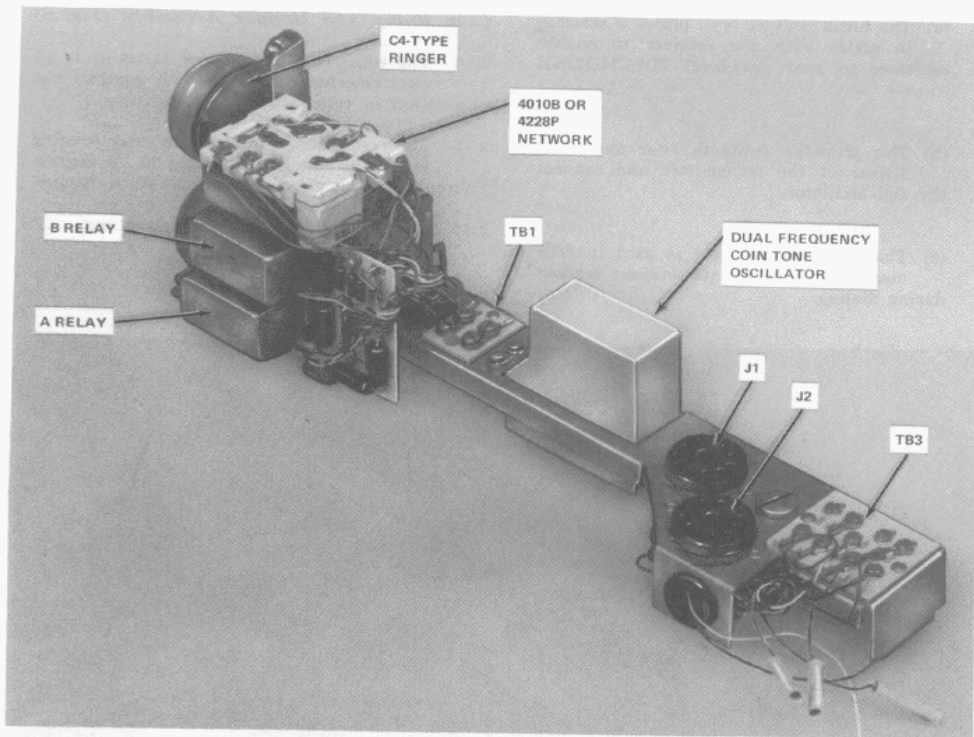


Fig. 6—31A Coin Chassis

(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.

Page 13



# 1C / 2C-type Coin Telephone Set

## COIN CRAFTS MANUAL 1-1

(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

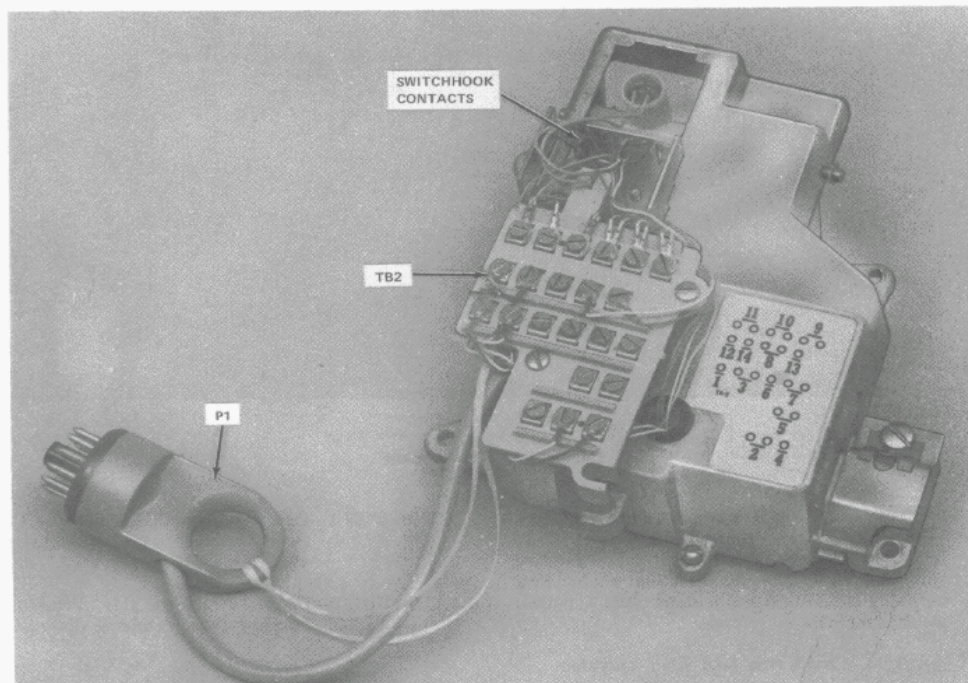


Fig. 7—Typical Coin Dial Unit

# 1C / 2C-type Coin Telephone Set

ISS 2, COIN CRAFTS MANUAL 1-1

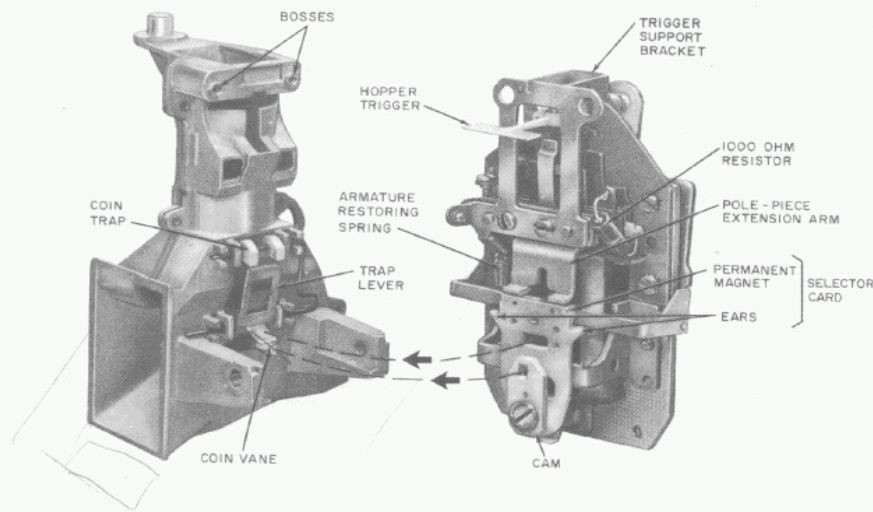


Fig. 8—1AA Coin Relay

- 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.



# 1C / 2C-type Coin Telephone Set

## COIN CRAFTS MANUAL 1-1

- (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 transferred position.

# 1C / 2C-type Coin Telephone Set

ISS 2, COIN CRAFTS MANUAL 1-1

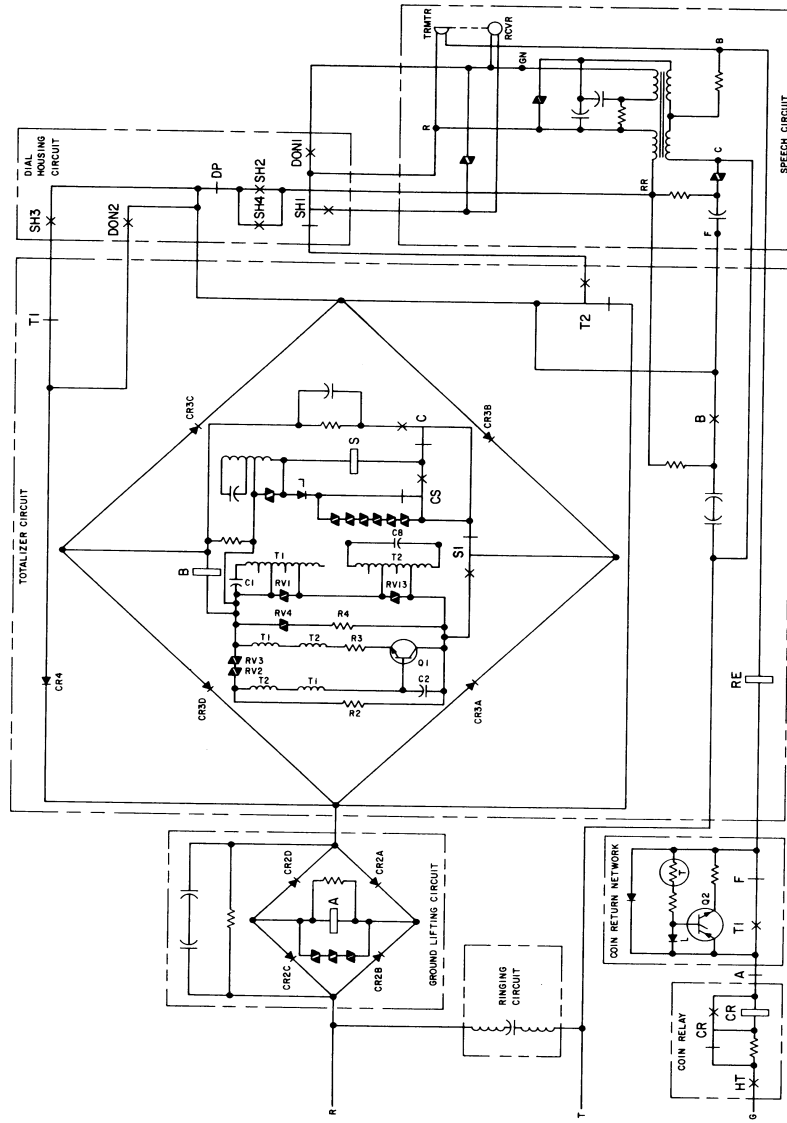


Fig. 9—1C1/2C1 Coin Telephone Set—Schematic (DTF Mode)

# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1

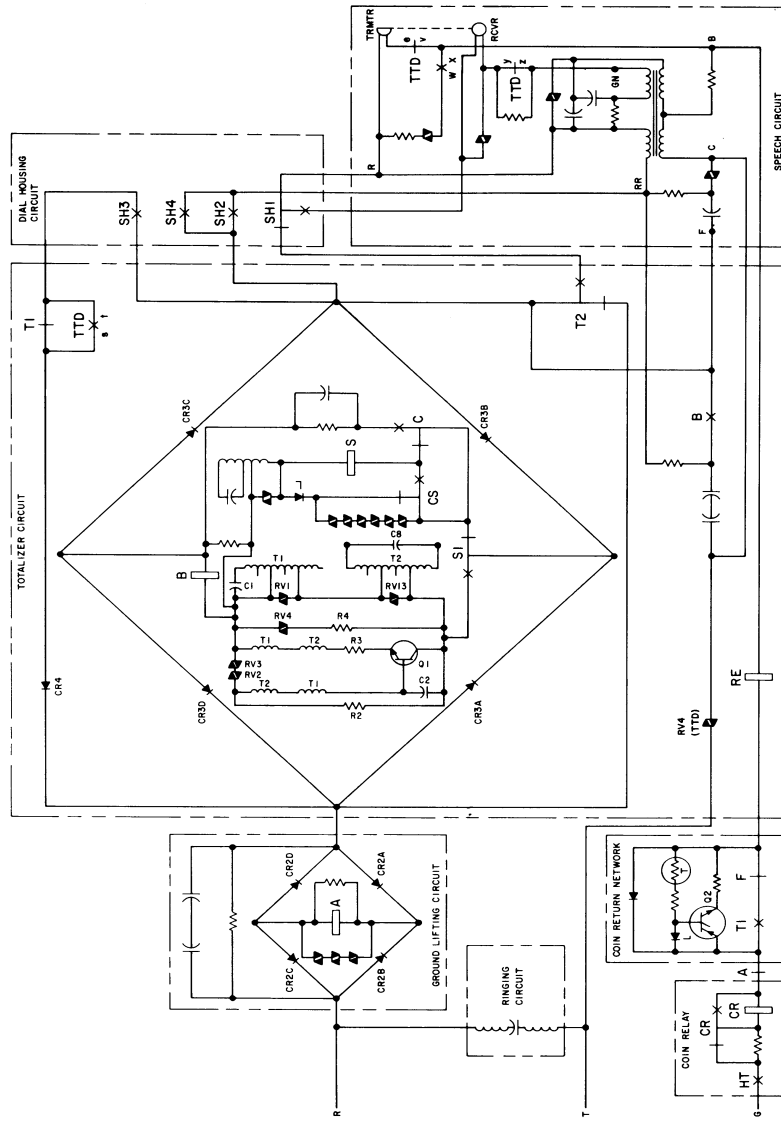


Fig. 10—1C/2C Coin Telephone Set—Schematic (DTF Made)

# 1C / 2C-type Coin Telephone Set

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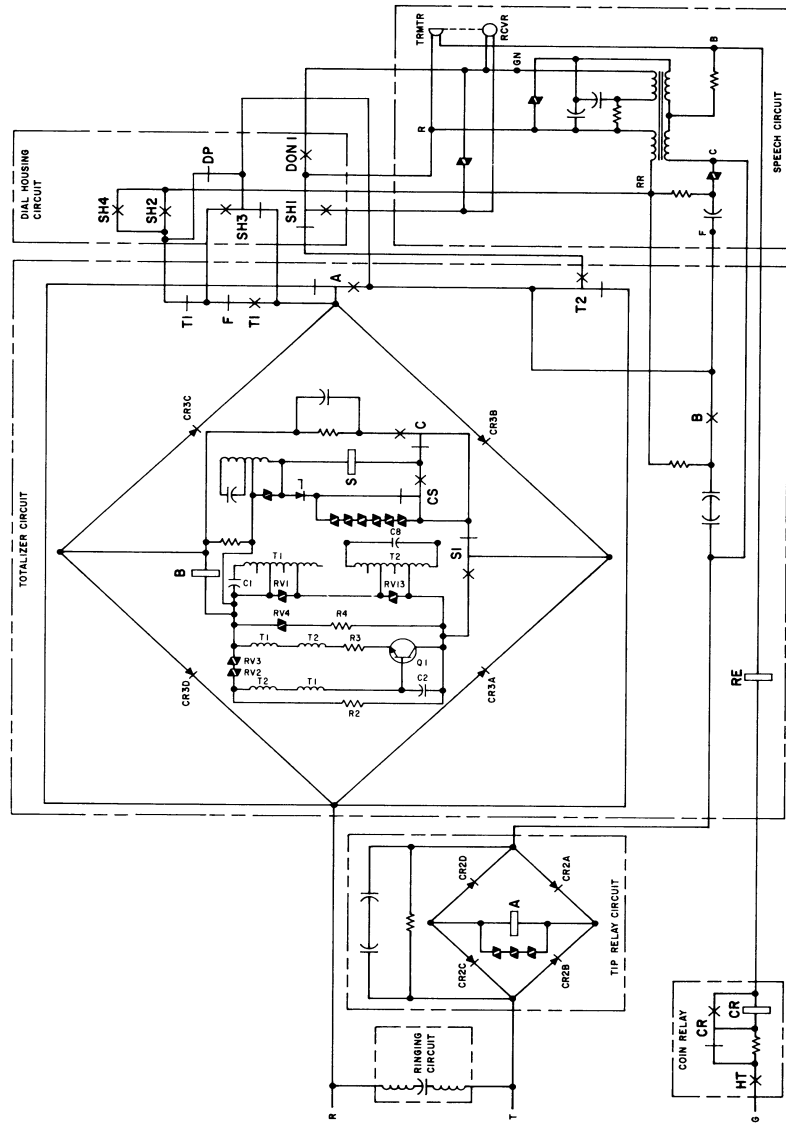


Fig. 11—1C1/2C1 Coin Telephone Set—Schematic (CF Mode)

# 1C / 2C-type Coin Telephone Set

COIN CRAFTS MANUAL 1-1

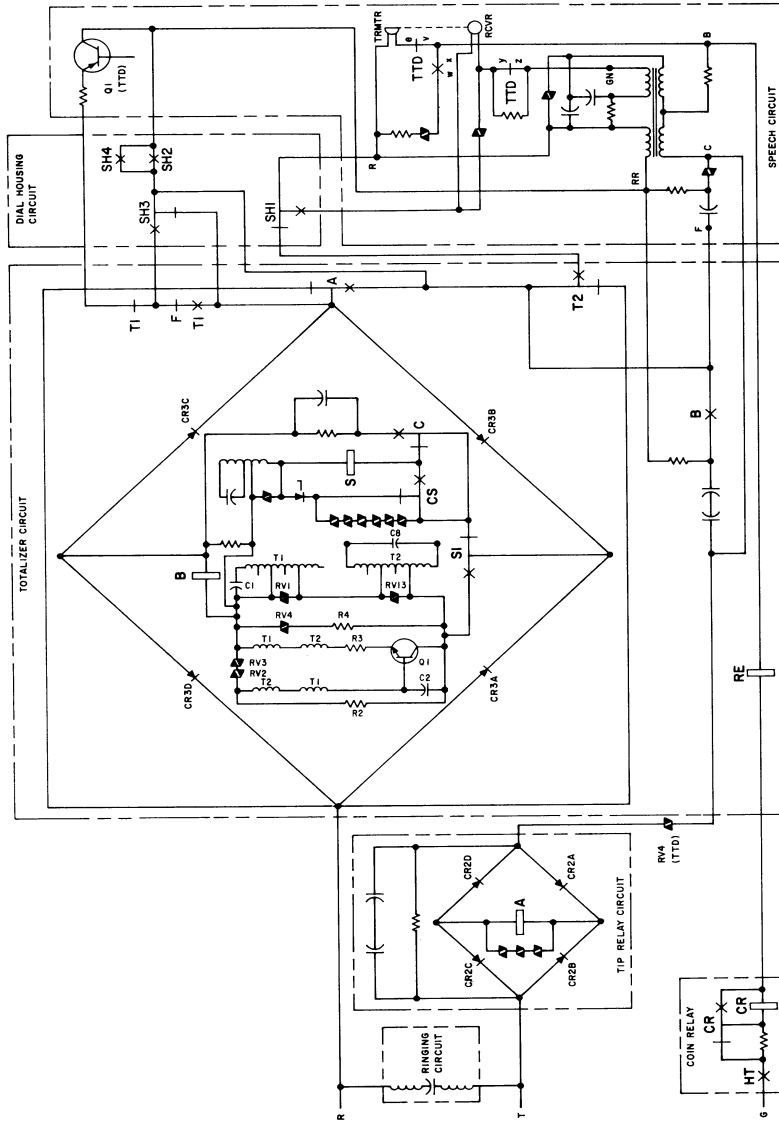


Fig. 12—1C2/2C3 Coin Telephone Set—Schematic (CF Mode)

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# 1C / 2C-type Coin Telephone Set

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**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.

Page 21

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# 1C / 2C-type Coin Telephone Set

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## COIN CRAFTS MANUAL 1-1

**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

# 1C / 2C-type Coin Telephone Set

ISS 2, COIN CRAFTS MANUAL 1-1

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.

Page 23



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# 1C / 2C-type Coin Telephone Set

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## COIN CRAFTS MANUAL 1-1

**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.

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# 1C / 2C-type Coin Telephone Set

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ISS 2, COIN CRAFTS MANUAL 1-1

**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.

Page 25

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# 1C / 2C-type Coin Telephone Set

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## COIN CRAFTS MANUAL 1-1

(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.

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# 1C / 2C-type Coin Telephone Set

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ISS 2, COIN CRAFTS MANUAL 1-1

## 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)

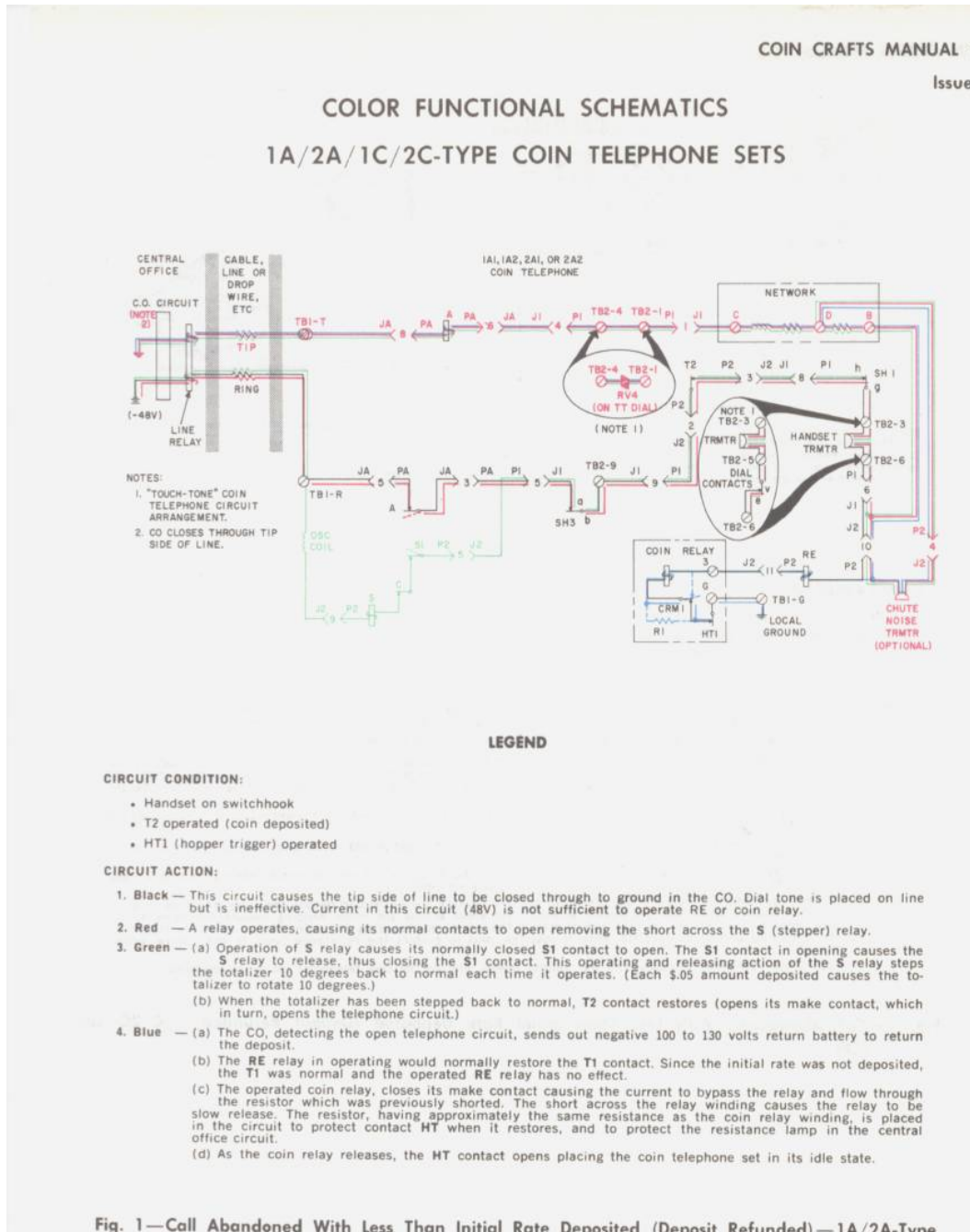
N—Toll Call—CF Station, CF Office

O—Toll Call—CF Station, CF/DTF Office

Page 27

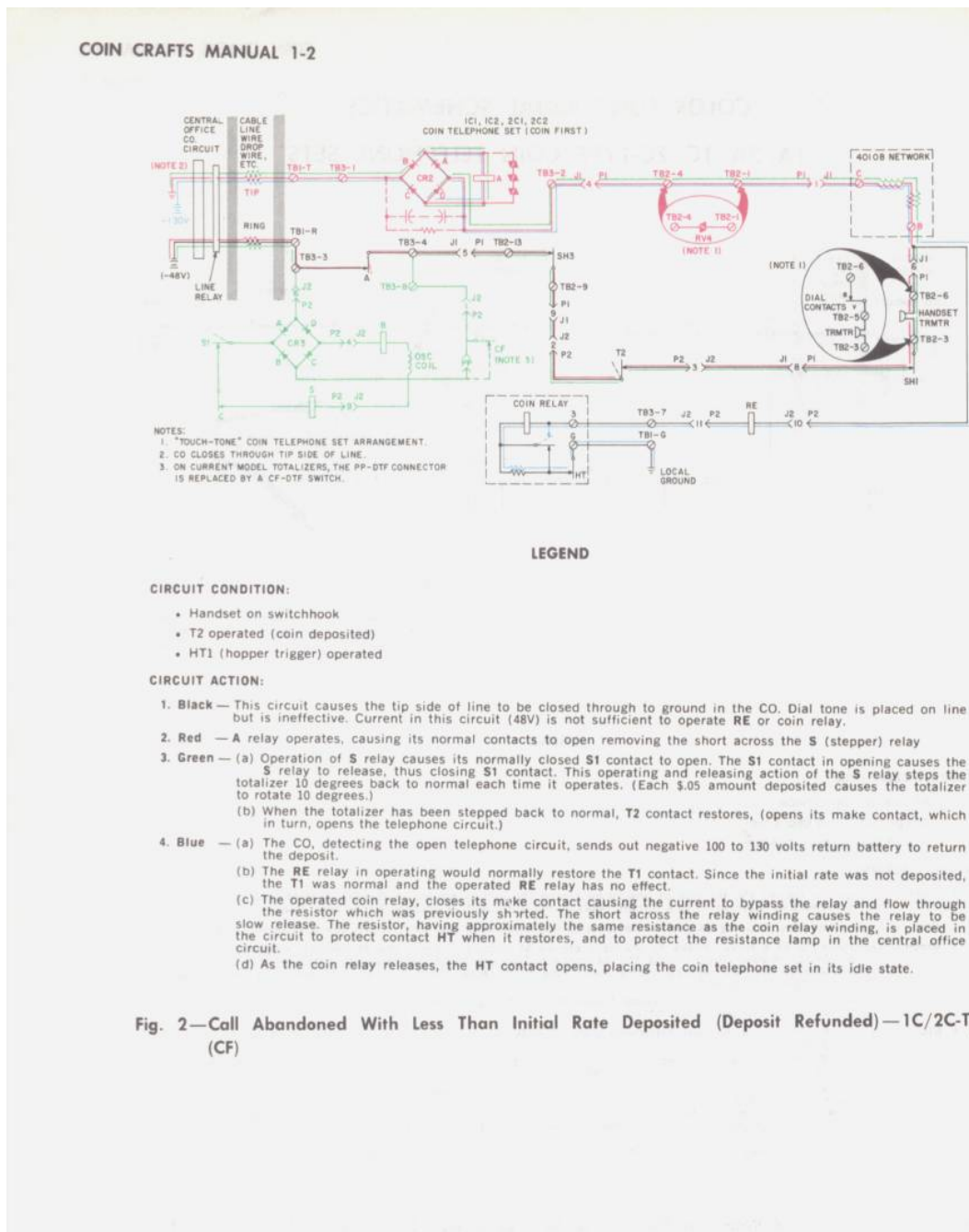
# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams



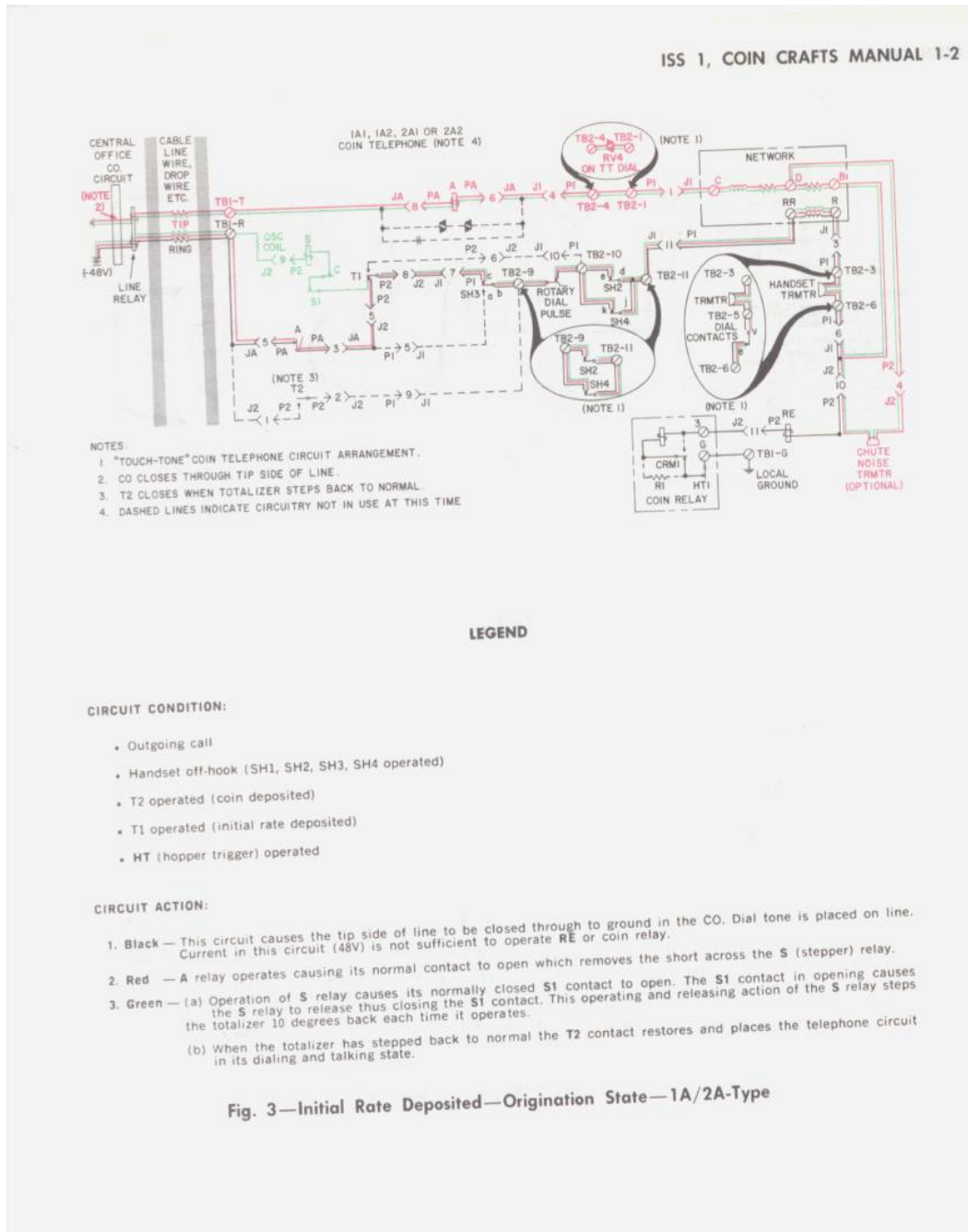
# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams



# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams

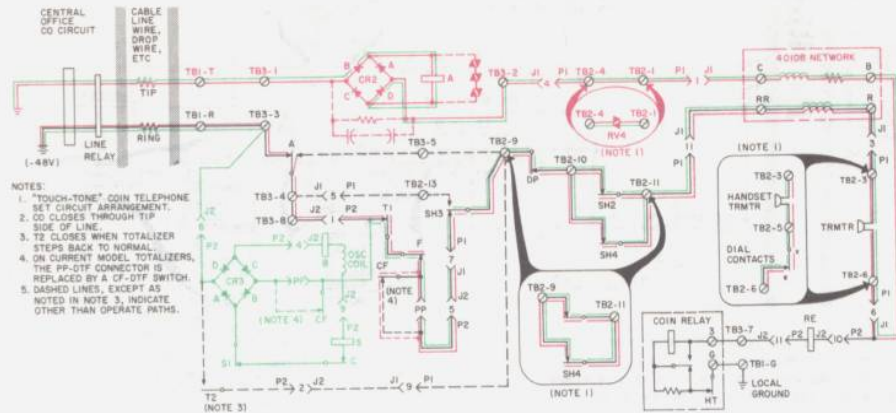




# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams

COIN CRAFTS MANUAL 1-2



### 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:

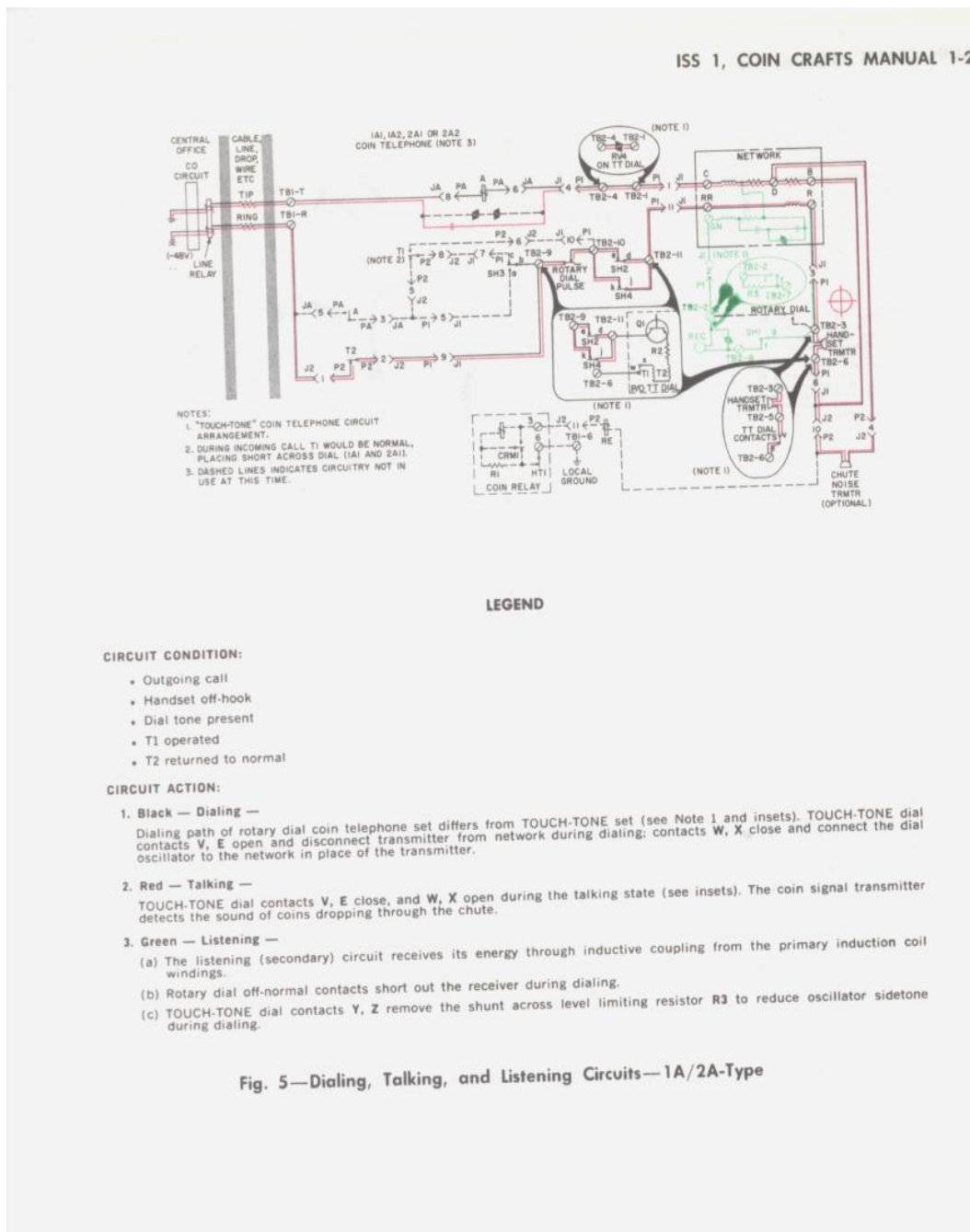
1. **Black** — This circuit causes the tip side of line to be closed through to ground in the CO. Dial tone is placed on line. Current in this circuit (48V) is not sufficient to operate RE or coin relay.
2. **Red** — A relay operates causing its normal contact to open which removes the short across the 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)



# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams



# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams

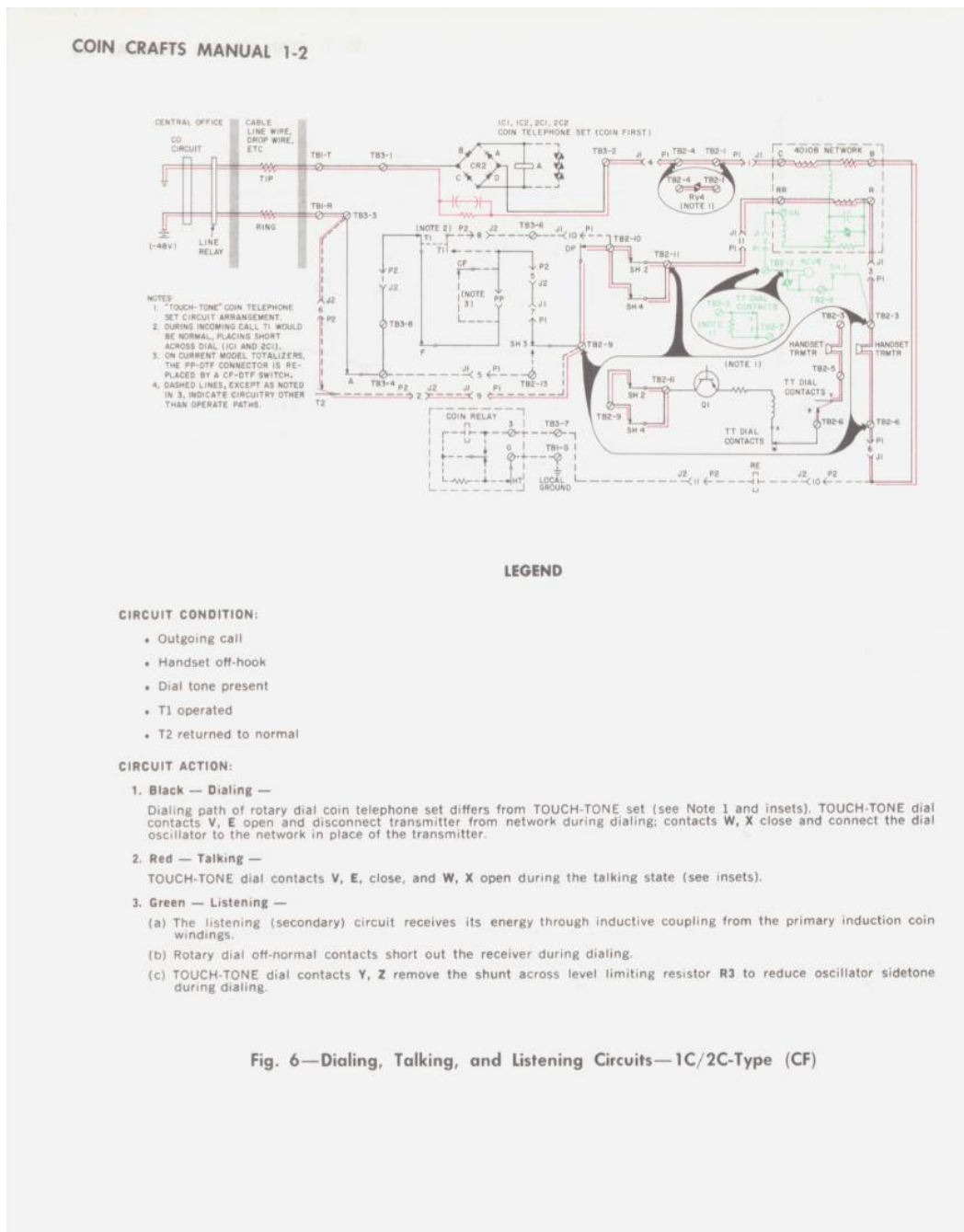
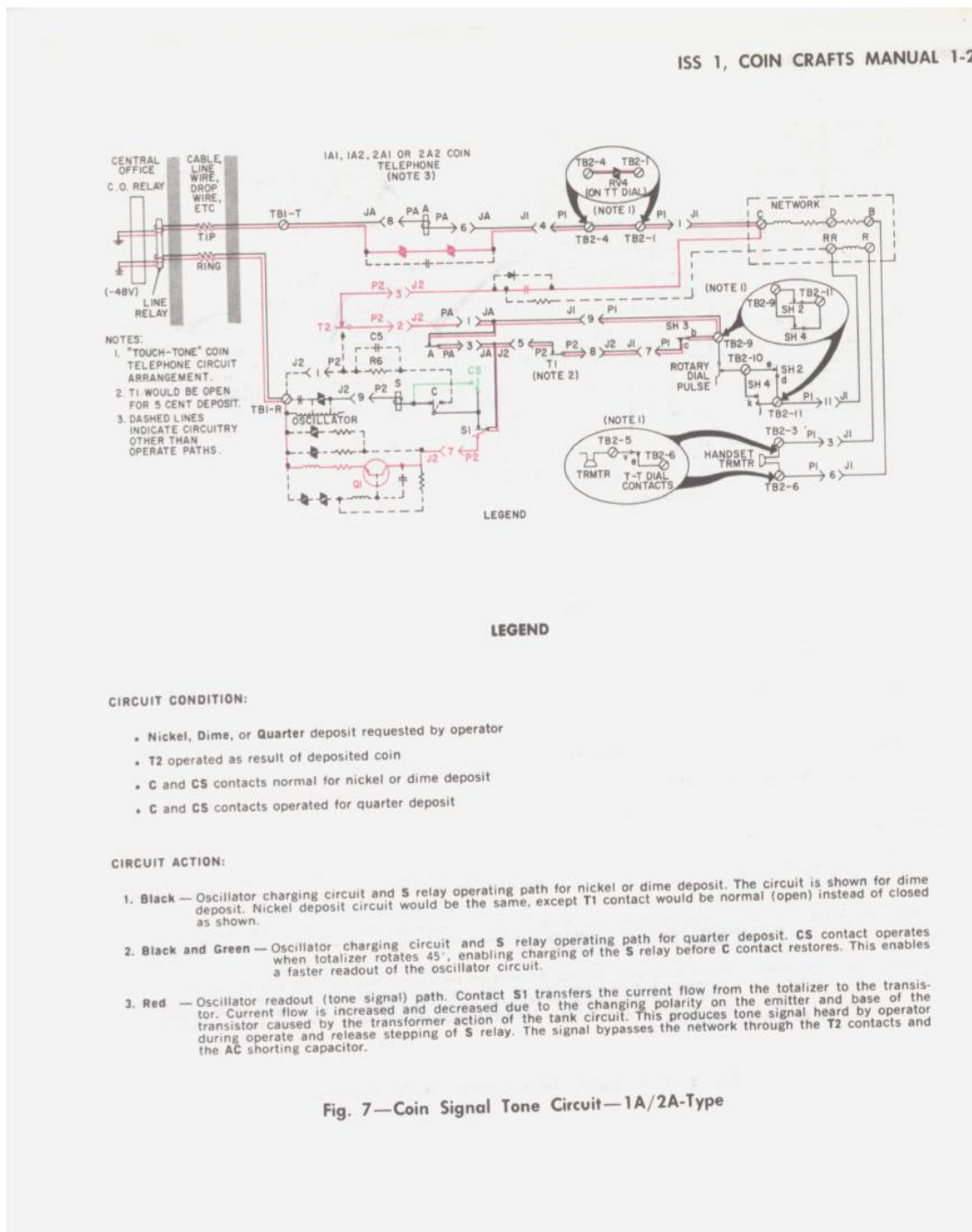


Fig. 6—Dialing, Talking, and Listening Circuits—1C/2C-Type (CF)

# 1A / 2A / 1C / 2C-type Coin Telephone Set

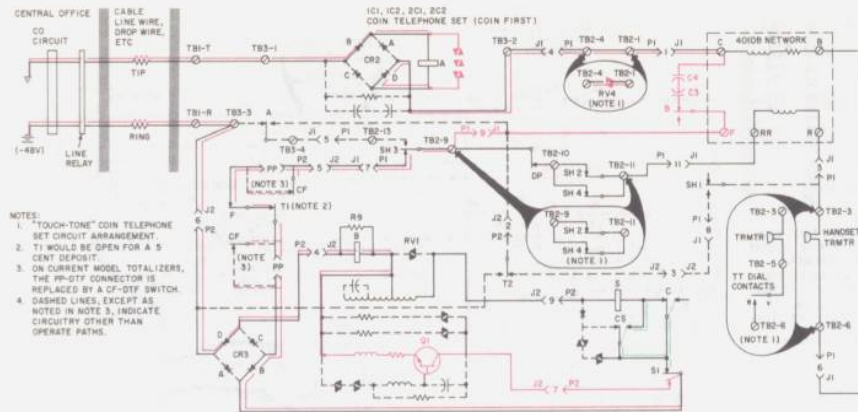
## Functional Diagrams



# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams

COIN CRAFTS MANUAL 1-2



### 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

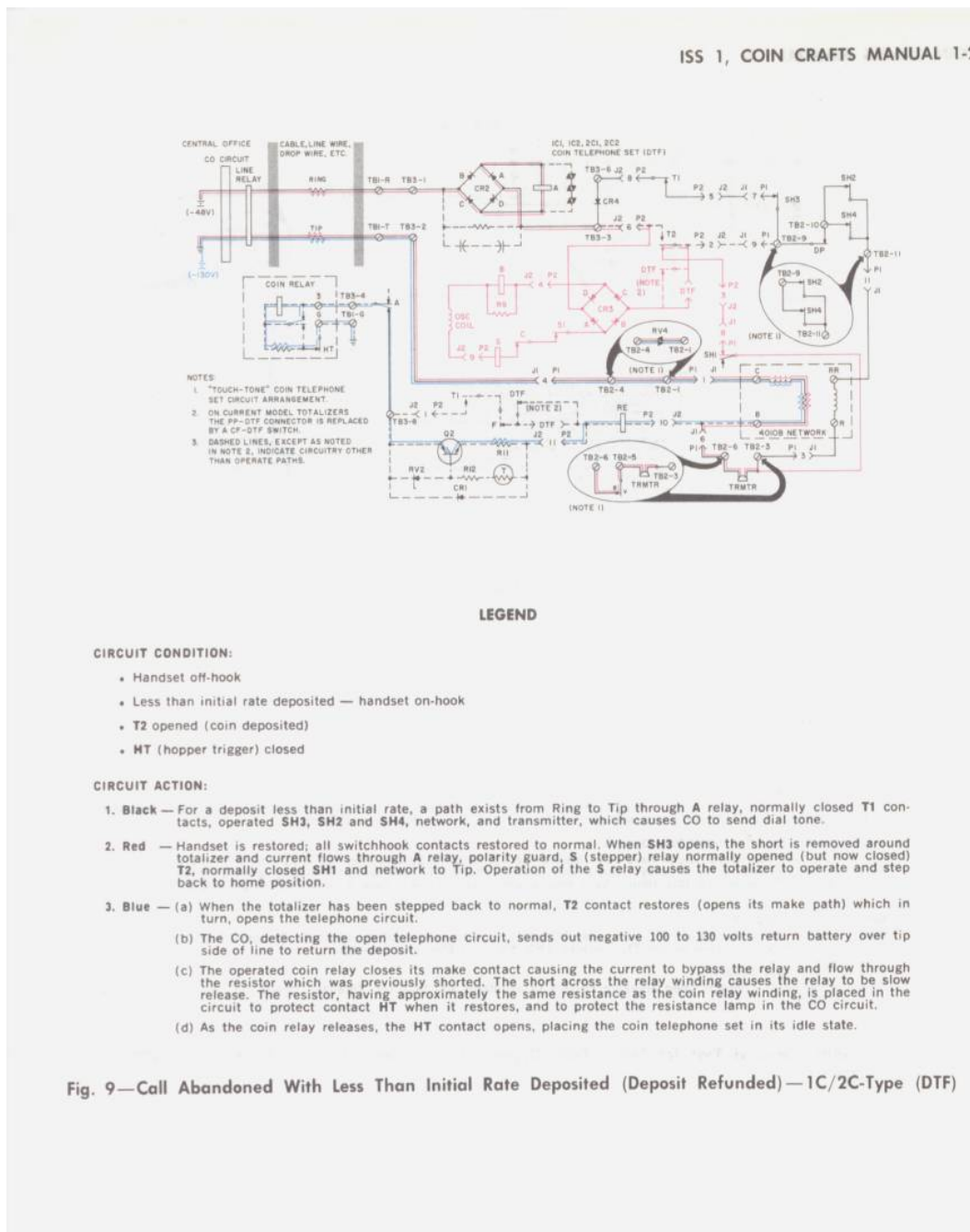
#### CIRCUIT ACTION:

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 B relay contacts and the AC shorting capacitors.

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

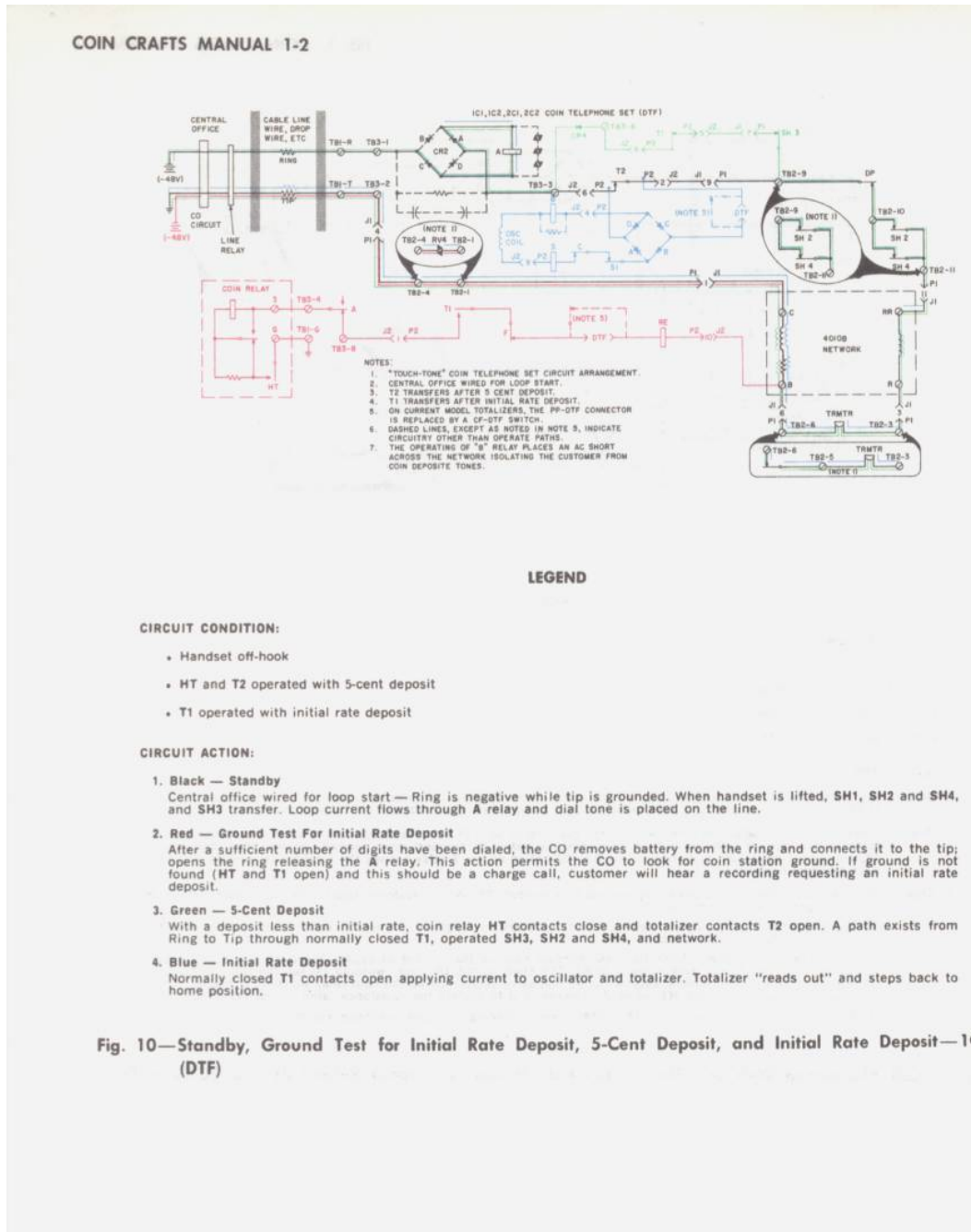
# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams



# 1A / 2A / 1C / 2C-type Coin Telephone Set

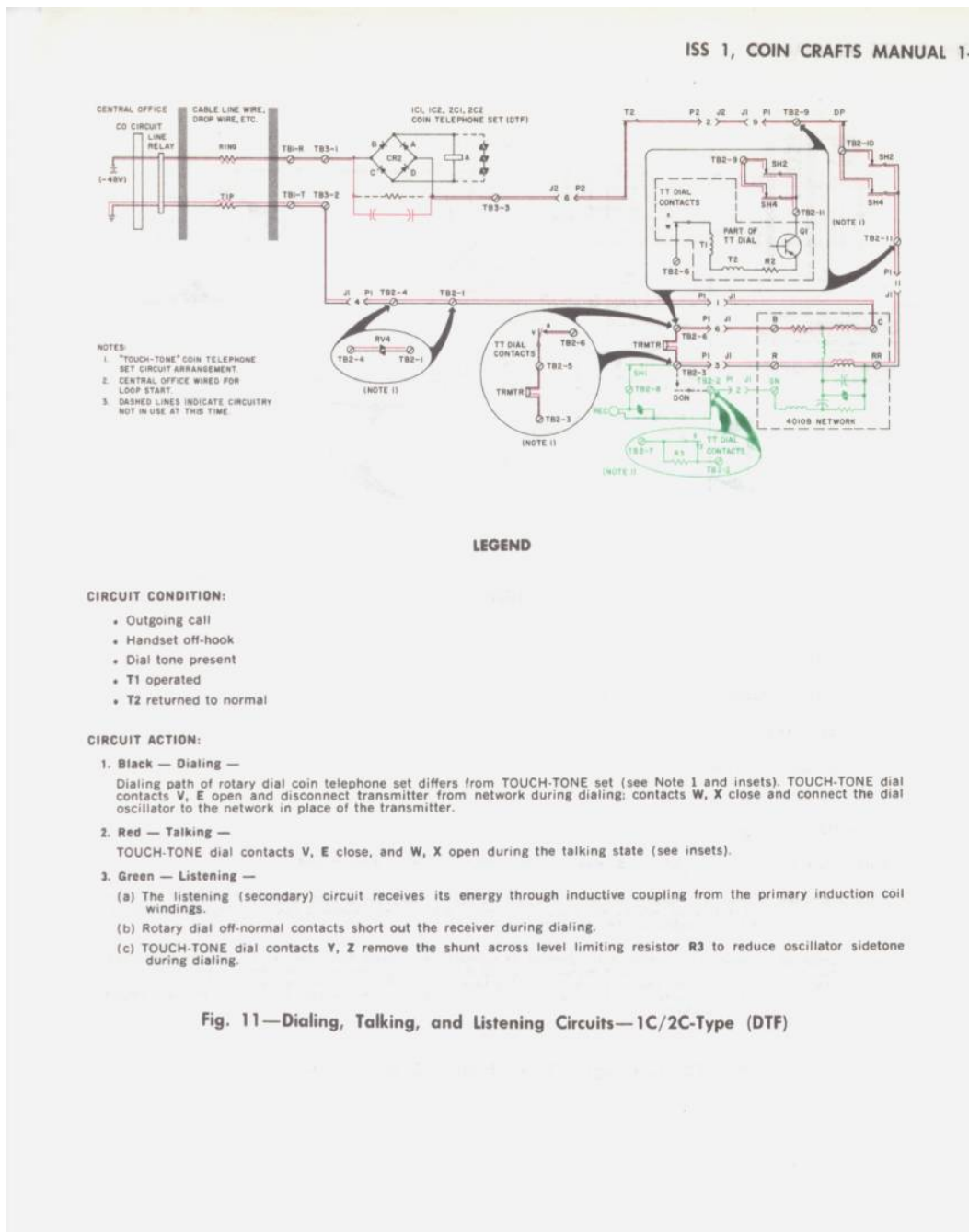
## Functional Diagrams





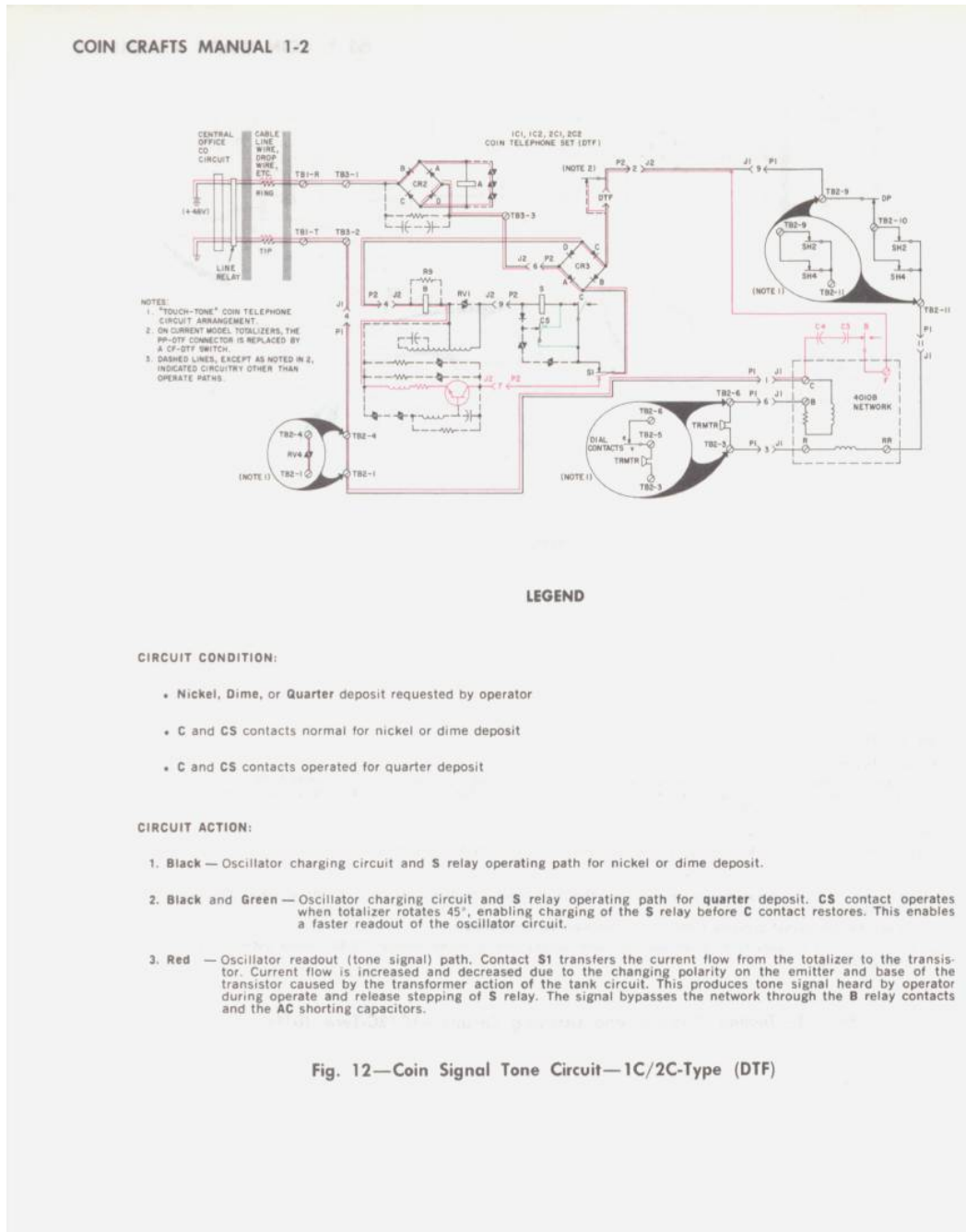
# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams



# 1A / 2A / 1C / 2C-type Coin Telephone Set

## Functional Diagrams





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# Bell System 177A Test Set

## **Introduction**

The 177A test set is designed to monitor the voltage polarity and levels provided to the coin telephone set from any type of Central Office (CO), test desk, test console, test cabinet, line status verifier, or mechanized loop testing system.

The 177A test set Light Emitting Diodes (LED) respond to negative or positive potentials across the loop, or to either side of the loop to ground. A third wire is also provided with LEDs for tip to ground tests. Alternating Current (AC) and superimposed potentials can also be determined and identified. The 177A test set may be used for monitoring on an in-service basis without interfering with the circuit operation. It can also be used to determine trouble conditions when circuits are in the idle state. Foreign Electromotive Force (FEMF) trouble conditions are readily identified without fear of burning the trouble condition clear.

Listed are sample test procedures and the signaling threshold required for Dial Tone First (DTF) 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 VDC battery on the tip side with the ring side open.
2. *Stuck Coin or 5 Cent Overtime Test:* +48 VDC battery on the tip side with the ring side open.
3. *Transmission and Coin Deposit Readout on Local Call:* -48 VDC 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 is Applied:* +48 VDC battery on the ring side of the line and ground on the tip side.
5. *Coin Return:* -130 VDC battery on the tip side of the line with the ring side open.
6. *Coin Collect:* +130 VDC battery on the tip side of the line with the ring side open.

## **Sample Test Procedures Using the 177A Test Set**

### *Test Set Lead 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 central office or at the station.

<b>Step</b>	<b>Action</b>	<b>Verification</b>
1	With handset on-hook.	No. 1 LED (-48 VDC) lights brightly, indicating battery and ground from the line equipment.
2	Go off-hook.	No. 1 LED (-48 VDC) goes dim, indicating battery and ground (dial tone) from the CO or test desk. No. 5 LED may light (dim) on loops equipped with Dial Long Line (DLL) or Signaling Range Extenders (SRE).
3	Deposit initial rate and dial local charge number.	No. 1 LED follows dial pulses. At completion of dialing, No. 6 LED (-48 VDC) lights momentarily, indicating initial rate ground test.
4	Call answered.	No. 1 LED (-48 VDC) now lit.

#### *Automatic 5 Cent Overtime*

<b>Step</b>	<b>Action</b>	<b>Verification</b>
1	At the end of 4-1/2 minutes.	No. 4 and 5 LEDs (+130 VDC) light and go dark, indicating a coin was collected.
2	Trip hopper trigger to simulate local overtime deposit.	
3	At the end of first 5 minutes.	No. 2 LED (+48 VDC) lights momentarily, indicating totalizer homing battery has been applied. No. 5 LED (+48 VDC) flashes, indicating coin present test.

#### *Dial "0" and Call (TSP, TSPS, Cord Board)*

<b>Step</b>	<b>Action</b>	<b>Verification</b>
1	With handset on-hook.	No. 1 LED (-48 VDC) lights bright.
2	Go off-hook.	
3	Dial "0" + (local charge number).	Just prior to operator answer, No. 3 and 6 LEDs flash, representing coin refund.
4	Operator answer.	No. 2 LED (+48 VDC) lights, indicating positive talking battery for totalizer homing.
5	Trip hopper trigger and request operator to collect.	No. 4 and 5 LEDs flash once, indicating +130 VDC coin collect pulse.

*continued...*

<b>Step</b>	<b>Action</b>	<b>Verification</b>
6	Request operator to ring back and hang up.	No. 1 and 2 LEDs glow following 20 cycle ringing supply, indicating ringing current applied.
7	Trip hopper trigger and request operator to refund.	No. 3 and 6 LEDs flash once, indicating –130 VDC coin refund pulse.

*Incoming Toll (Collect)*

<b>Step</b>	<b>Action</b>	<b>Verification</b>
1	Have operator initiate call to coin test station.	No. 1 or 2 LED lit prior to ringing. Both diodes are lit during ring.
2	Go off-hook.	No. 1 and 2 LEDs go dark. No. 2 LED lights, indicating +48 VDC talking battery on line.
3	Request operator to identify deposit. Deposit less than initial rate.	No. 2 LED remains lit, totalizer homes, operator can identify deposit.
4	Request operator to refund.	No. 2 LED goes dark, No. 3 and 6 LEDs flash, indicating –130 VDC coin refund pulse. No. 2 LED lights.
5	Trip hopper trigger and request operator to collect.	No. 2 LED goes dark, No. 4 and 5 LEDs flash, indicating +130 VDC coin collect pulse.
6	Request operator to disconnect circuit.	
7	Hang up.	No. 2 LED goes dark. No. 1 LED lights.

Recycle

<b>Step</b>	<b>Action</b>	<b>Verification</b>
1	At coin station, block coin relay armature (non-operational).	
2	Lift handset.	
3	Deposit initial rate and dial a local test number for audible ring (busy).	No. 1 LED lights, follows dial pulses. Audible heard.
4	Hang up.	No. 1 LED goes dark, No. 3 and 6 LEDs flash, indicating a -130 VDC coin refund pulse. No. 5 LED lights, indicating +48 VDC stuck coin test. No. 3 and 6 LEDs flash, indicating a second coin refund pulse.
5	Remove blocking tool.	No. 1 LED lights.
6	Go off-hook, then hang up.	No. 1 LED goes dark momentarily, No. 3 and 6 LEDs flash once, indicating a -130 VDC coin refund pulse.

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## Homebrew "Digital" Cable TV Filter

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**DIGITAL POWER FILTER**  
The ULTIMATE Digital Cable Descrambler/Filter

**UNLEASH THE POWER OF YOUR DIGITAL CABLE!**

**\$99 FOR THE FIRST FILTER**  
Additional units \$49.95 each  
Limit 5 at \$49.95 each

**Reduced Price**  
**While Supplies Last!**

The filter will allow you to receive all the channels that you order with your remote control! PAY-PER-VIEWS, ADULT, MOVIES, SPORT EVENTS, & SPECIAL EVENTS!

Filter set up is this easy

WALL  
TV SET  
TO TV  
DIGITAL CABLE BOX

**WORKS WITH:**  
Motorola, RCA, Jerrild, General Instruments, Pioneer, Scientific Atlanta, Explorer Series, Zenith, Tocom, and many many more!

Now While Supplies Last ONLY \$39.95! Normally, \$99.95! \$60.00 Savings!!!

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The above is from a website linked in a piece of spam email I recently received. Now, normally I don't read spam, but when I saw an ad for a "Digital Power Filter" to get free PPV channels, I just had to check it out. The website for the ad mentioned above is:

<http://arbeo.furtherest.info/amite/cable>, if you wish to check it out. Yes, they are selling 60 MHz High Pass Filters (HPF) for \$39.95. A savings of \$60.00! Man, I'm in the wrong business...

The idea on these filters is to block the two-way communication between the cable box and the cable company's billing computers. The cable TV system is Frequency Division Multiplexed (FDM). This means that each communication channel (TV channel in this case) is at a different frequency. Frequencies between 60 and 800 MHz on a typical cable TV system are reserved for the normal channels we watch daily. Below about 60 MHz, is where the two-way (data) traffic is located. This is where the cable TV company "talks" to your cable box, where "digital" TV is transmitted, and yes, where cable modem traffic is located. The idea is that on *some* cable systems, if you block the cable boxes' downstream data, you can order pay-per-view channels and not be billed. This is because the internal "descrambler" of the cable box is activated locally, but the cable box can't send the billing information back to the cable company. Of course, not all cable systems are alike, some even have the two-way communication frequencies operating up to around 120 MHz. Some cable boxes will only "descramble" the signal after a two-way handshake (with the billing system) is established, rendering these filters useless.

A legitimate use for these filters is to remove TV interference caused by TV broadcast, citizens band, or amateur radio transmitters.

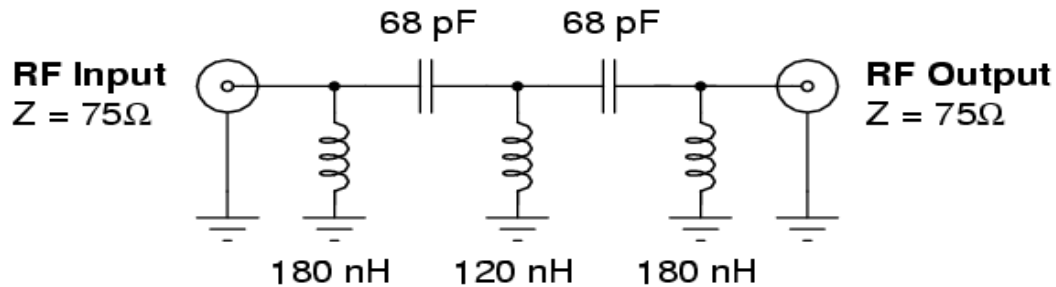
## Schematics

All capacitors in picofarads, inductors in nanohenrys. Filters are 5<sup>th</sup> order Chebyshev.

The filter connects in-between the incoming coaxial cable (wall) and the cable box. Use only one of the three filters shown.

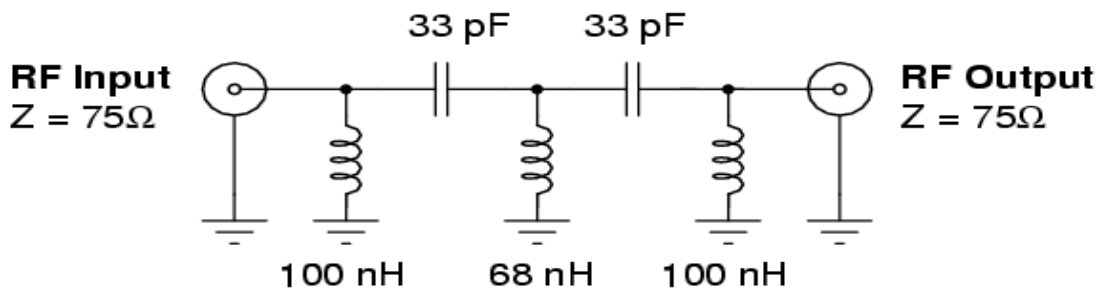
This filter only works on analog Pay-Per-View cable systems where the scrambled channel is transmitted on a standard cable TV frequency and the cable box has the ability to internally descramble the signal (i.e., most older systems).

### 30 MHz High Pass Filter



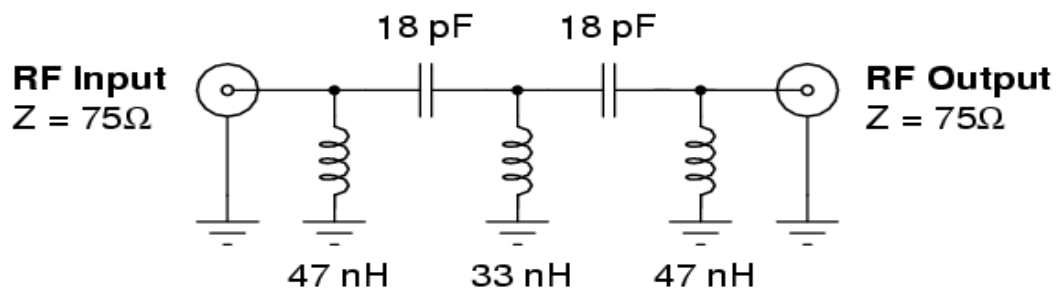
Stopband : 65 dB minimum at 10 MHz  
Cutoff : 1.0 dB at 30 MHz

### 60 MHz High Pass Filter



Stopband : 30 dB minimum at 40 MHz  
Cutoff : 1.0 dB at 60 MHz

### 120 MHz High Pass Filter



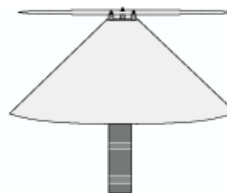
Stopband : 15 dB minimum at 100 MHz  
Cutoff : 1.0 dB at 120 MHz

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# The Ramsey DA25 for SIGINT Applications

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## BROADBAND DISCONE ANTENNA KIT



Ramsey Electronics Model No.      DA25

*Looking for a broadband antenna with a full 360 degree coverage? Discover what communication professionals have known for years using a "discone" antenna. Use this antenna to bring a multitude of signals out of the noise making it ideal for scanners and Ultra High through Microwave Frequency receivers! Search the airwaves for signals with this unique kit!*

- **Omni directional performance, no need to point in any direction!**
- **Learn about antenna theory, and what makes the discone an ideal broadband antenna!**
- **Covers all frequencies between 450 MHz and 2500 MHz, and you'll learn why!**
- **E-Z cable connection, industry standard BNC type connector.**
- **Outperforms models costing tens to hundreds of dollars more.**
- **Super small in size for easy mounting almost anywhere! An ideal "apartment" size antenna!**
- **All hardware and pre-drilled metal work included.**
- **"Forgiving" design gives you a high performance antenna each and every time.**

### Prerequisite Reading

Download the *Ramsey Electronics DA25 Discone Antenna* PDF (353k) manual at:  
<http://www.ramseyelectronics.com/downloads/manuals/DA25.pdf>

### Introduction

The *Ramsey Electronics DA25 Discone Antenna* is a beautiful (and cheap) broadband microwave antenna which can be used for omnidirectional transmitting or receiving of frequencies between 450 and 2500 MHz. This means that the antenna is ideal for Signal Intelligence (SIGINT) applications in our favorite bands – the 900 and 2400 MHz cordless phone bands!

Although the antenna works fine out-of-the-box, there are a few tweaks one may want to perform to increase the antenna's performance and usability.





Overview of the two major components of the DA25 antenna. The large "cone" is actually part of a 3 quart tin-plated funnel and the top "disk" is actually a 7-1/2 inch tin-plated pie plate. You'll notice that I cut the pie plate's sloping edge off, leaving a flat disk 7-1/2 inches in diameter. The funnel cone is 1-1/2 inches diameter on the narrow end (top), 9 inches diameter on the wide end (bottom), and 6-1/2 inches high.



Overview of the antenna's mounting hardware. The support disk (DCA2 in the manual) is a 2" diameter piece of 1/16", single-sided FR4 PC board with three holes drilled for mounting the nylon hardware, which is used to support the top disk.

The center hole is for passing the center conductor of the coaxial cable, which connects to the top disk. When soldered correctly, the coax's shield (ground) will be connected to the cone section of the antenna (via the support disk), and the coax's center conductor will connect to the top disk. The nylon hardware prevents the two sections from shorting together. The modification here is to replace the direct, soldered coax connection with a N-connector jack.

Also shown, is the new N-connector that will be mounted to the antenna. This will allow one to quickly disconnect the coaxial cable connection to the antenna. The N-connectors shown were pulled from old satellite gear. A suitable N-connector jack is available from *Surplus Sales of Nebraska*, <http://www.surplussales.com>, part number (CRF)SL203.



This is the new 2" diameter support piece. It's also made from a 2" diameter piece of 1/16", single-sided FR4 PC board material. Four 7/64" holes were drilled for mounting the N-connector, with the center hole being 11/64" in diameter. The new holes for the nylon mounted hardware were made off to the sides. They don't line up with the pre-punched holes in the top disk, so you'll have to drill them out.

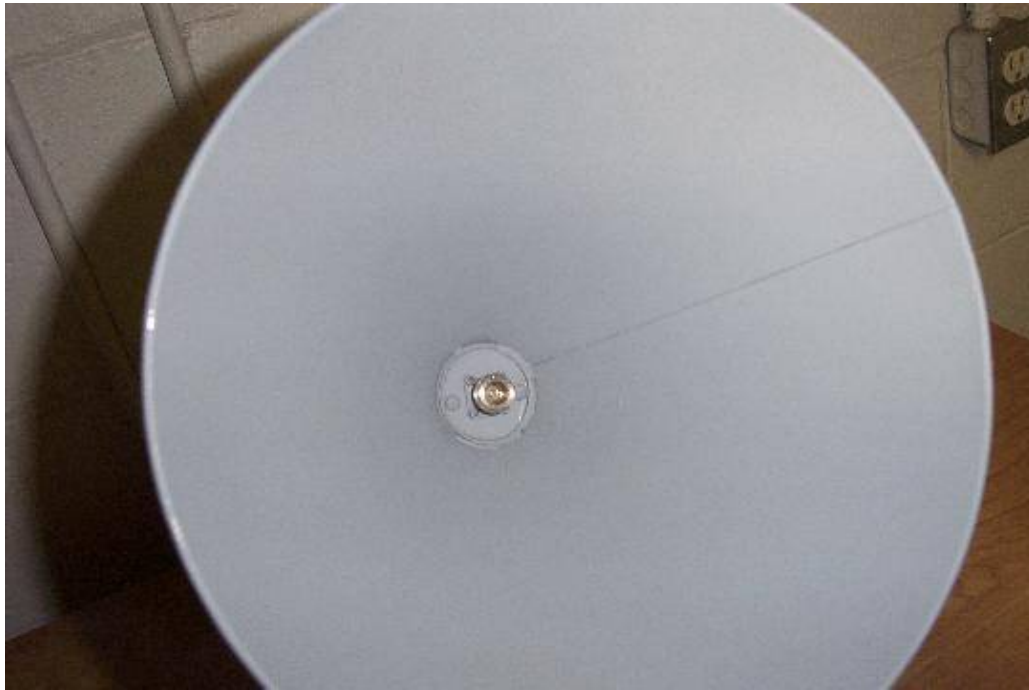




These are better pictures of the new support disk, the N-connector, and its mounting hardware (4-40). Use stainless-steel mounting hardware, if you can find it.



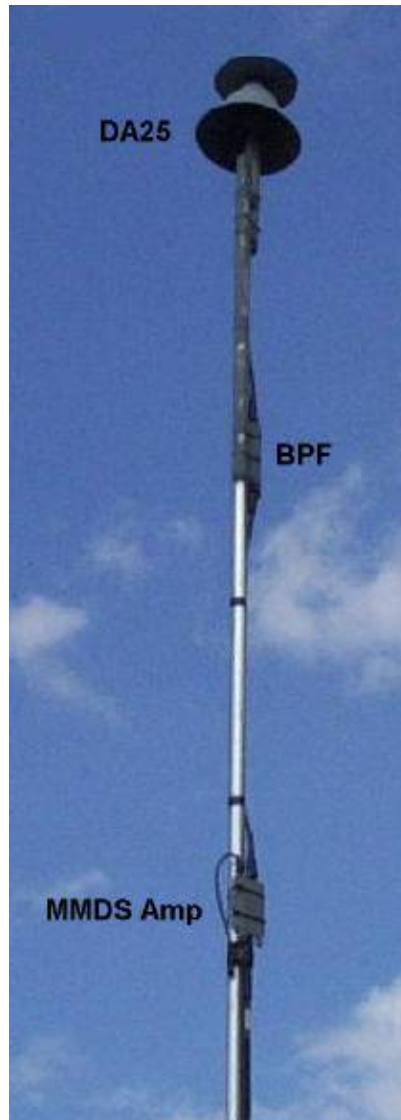
The completed antenna. Paint the antenna a light gray not only to keep it from rusting, but also to hide it when in an urban area. You don't want the camel humpers to see your SIGINT setup. Also, you may wish to epoxy a PVC coupler ring to the inside of the cone (as shown in the DA25's manual). Then you can mount the antenna on a short PVC mast to get it away from any metal objects, which can effect the antenna's performance.



View of the support disk and N-connector from the bottom of the antenna. Be sure to solder the support disk *completely* around the outside of the cone.



Closeup view of the cone, top disk, and support hardware. Note the piece of tape on the top disk to prevent the N-connector's mounting hardware from ever touching the top disk.



Examples of the DA25 in operation. The picture on the left is just a test setup with a homebrew portable PVC mast system. The picture on the right is of a working 2.4 GHz SIGINT receive setup. The DA25 (on a 10 foot pole) feeds a commercial 2.45 GHz Band Pass Filter (BPF) and a surplus MMDS (wireless cable TV) receive pre-amplifier. More details on this particular setup will be in the upcoming GBPPR 'Zine issues.



# Bonus

NW 44-18 (1-90)


# 5ESS<sup>®</sup> Switch

## RETURNED CIRCUIT PACK TAG

Office Base Number	Date Failed		
T         -   D			
Reason for Return			
Defective	Update		
Equipment Status			
Installing	Pre-Cut		
In Service			
Did Pack Fail within 24 Hours of Insertion	Office Generic Issue		
Yes	No		
Diagnostic Failure or Circuit Information (e.g. Luchan 1-0-0-3-5)			
- - - -			
Phase	Segment	Test	Mismatch (MM)
<b>TST: GRIDBD FAILURES ONLY</b>			
Fail Type (e.g. Open Xpt., Power Alarm, Scanner, Ckt. etc.)			
Len (e.g. 29-2-0-0-8-2)			
- - - - -			
Alink (e.g. 29-2-0-0-14)			
- - - - -			
Blink (e.g. 29-2-0-0-26)			
- - - - -			
Other Failure Indications			
Circuit Pack Code		Series	
Serial Number			

**SECURE TO CIRCUIT PACK**

TO ORDER TAGS CALL 1-405-491-3183



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## End of Issue #5



Any Questions?

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### Editorial and Rants



Written on the wall of a ruined fort in Verdun, France:

Austin White, Chicago, Ill., 1918

Austin White, Chicago, Ill., 1945

This is the last time I want to write my name here.





American GI's view of Europe:

This goddamn Europe. A thousand years of unending quarrels behind them, and they are still fighting. This place was a cesspool, beyond redemption. Why didn't the U.S. turn its back on them? Let them kill each other. Why should America sacrifice its young men in fruitless carnage?



**Death to Europe.**