

COIN STATION TEST LINE SD-1C297-01
TESTS AND TROUBLE LOCATING PROCEDURES

1. GENERAL

PAGE

1.01 This section describes a method of testing and adjusting the coin station test line circuit SD-1C297-01. The test line will operate with any coin station that does not require dial long line circuits. This section also provides trouble locating information should the test verifications not be obtained.

1.02 This section is reissued to add Test K and to make minor changes and revisions to Tests C, G, H and J. This reissue affects the Equipment Test List.

1.03 The following tests are covered:

PAGE

A. Coin Present and Ground Removal: This test checks the ability of the test line to detect the presence of the proper coin or coins at the coin station and to determine if the ground removal relay operates in DTF phones.

7

B. Digit Reception: This test checks the ability of the test line to reject an invalid digit and request a valid digit.

9

C. Ground Check, Loop Resistance and Leakage: This test checks the ability of the test line to make a loop resistance and line leakage test of the coin station loop, returning signals to indicate results of the tests.

10

D. Coin Return and Collect: This test checks the ability of the test line to test the coin station, coin return, and collect functions.

16

E. 4-Volt Power Supply Test and Adjustment: This test checks the 4-volt power supply and outlines procedures to be followed if the voltage is out of limits.

18

F. Coin Relay Time Test: This test checks the ability of the test line to determine the operating time of the coin relay in the coin station.

19

G. Ground Check Loop and Resistance Test Adjustments: This test checks circuit pack A962 and outlines procedures to check the results of the loop resistance and ground check tests of Test C.

20

H. Leakage Adjustment: This test checks circuit pack A963. Procedures are outlined to check the results of the leakage test of Test C.

24

I. Message Register Test (Option ZE): This test checks the ability of the traffic register circuit (SD-30896-01) to score the appropriate register for each dialed test digit.

26

J. TOUCH-TONE® Dialing Test (Option X): This test checks the operation of the optional TOUCH-TONE receiver and that pulse relays P1 through P5 operate as required per dialed digit.

27

K. Foreign EMF Check (Option ZK): This test checks the ability of the test line to detect a foreign EMF in excess of a predetermined value on the line.

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NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

1.04 In order to test all features of the coin station test line, an ungrounded 1C1/1C2 coin station, which is either dial tone first (DTF) or coin first (CF), and is equipped with a 3W4B cord is used in the step-by-step, panel, crossbar, or ESS offices where the test line is located. The 3W4B cord is connected by means of 364 type tools to the T, R, and G terminals of the coin chassis as follows: tip (white) to T, ring (black) to R, sleeve (red) to G. The coin station should have the coin bank removed. The 1C2 telephone (with DTF) will allow testing of the TOUCH-TONE option in Test J.

1.05 Various signaling tones and test answers are generated by the test line and are described as follows:

- **C Tone:** C (coin) tone is supplied whenever a coin is desired in the coin hopper. Coin tone consists of alternate application of high tone and dial tone at a rate of 120 ipm.
- **Interrupted Dial Tone:** This tone is supplied when the test line awaits a digit requesting a new test. This tone consists of dial tone interrupted at 120 ipm. This tone is used so that if the test line gets disconnected and central office dial tone is applied to the coin station, a difference will be noted.
- **HU Tone:** HU (hang up) tone consists of steady high tone and is applied whenever it is desired to have the coin station receiver placed on-hook.
- **Beep Tone:** Beep tones are supplied as test answers to various tests. The number of beep tones constitute a code which indicates the test result of the test being performed. Each code is heard three times. Beep tone is produced by interrupting high tone at 120 ipm.
- **Coded Ringing:** Coded ringing is supplied as test answers to indicate results of certain tests. With the coin station receiver on-hook, the number of rings constitute a code which indicates the test result of the test being performed. The ringing current is interrupted at a rate of 60 ipm. The receiver may be lifted during ringing and coded tones will

replace coded ringing at the same 60-ipm rate.

1.06 The test line circuits are designed to accept rotary dialed digits. When required, TOUCH-TONE digits may be received by a test line having the TOUCH-TONE receiver and interface circuits (option X). An illegal digit will be rejected and the circuit reset to await a legal digit. The legal digits (those which initiate a valid test) are as follows:

- Digit 0 for the FEMF check (option ZK)
- Digit 2 for the resistance tests
- Digit 3 for the collect tests
- Digit 4 for the return tests
- Digit 5 for the coin relay time test

1.07 For troubles which are encountered on the test line while performing the tests of this section, a CORRECTIVE ACTION column is provided. This column lists the "checks" that should be made should the associated verification not be obtained. The "checks" provided in this column are listed in the order in which they should be performed.

1.08 The tests should preferably be made out of hours since the test line will be out of service during the test procedures.

1.09 This section provides actions and verifications testing and calibrating the coin station test line with either a DTF or CF phone.

1.10 Lettered Steps: A letter, a, b, c, etc, added to a step number in Part 3 or 4 of this section, indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

2. APPARATUS

Note 1: The following listing of apparatus is intended only for use in testing and not trouble locating.

Note 2: It is recommended, but not necessary, that a coin phone (1C1 rotary dial or 1C2 TOUCH-TONE when option X is provided) modified for DTF be used for calibration of coin station test line. A phone having CF operation may be used during calibration; however, the complete capability of the coin station test line will not be checked.

- 2.01** The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.
- 2.02** Coin station equipped with 3W4B cord. See paragraph 1.04.
- 2.03** 5-, 10-, and 25-cent coins, as required.
- 2.04** 3P6H patching cord.
- 2.05** Coin station test line calibration set J93025B (SD-1C395-01).
- 2.06** Wire strap (for use with DTF phone).
- 2.07** KS-14510-L1 voltmeter or equivalent.
- 2.08** Blocking and insulating tools, as required. Use tools and apply as covered in Section 069-020-801.
- 2.09** Various resistors for local maximum loop resistance requirement and local requirement plus 50 ohms if other than provided on calibration test set LOOP RES switch. Refer to PREPARATION Steps 8 through 16e.
- 2.10** 1C2 telephone equipped with 3W4B cord, wired for DTF. See paragraph 1.04.
- 2.11** One W3AN cord, 4 feet long, equipped with one 310 plug and three miniature alligator clips equipped with insulators (3W14A cord).
- 2.12** 300 ohm $\pm 1\%$, 1/2 watt resistor.
- 2.13** 364 type tools for use in conjunction with 3W4B cord.
- 2.14** Nongrounded (dry cells) power sources of 3 Vdc.
- 2.15** 50K ohm $\pm 1\%$ 1/2 watt resistor.
- 2.16** 55K ohm $\pm 1\%$, 1/2 watt resistor.
- 2.17** 100K ohm $\pm 1\%$, 1/2 watt resistor.

TABLE A
REQUIRED APPARATUS

APPARATUS	TESTS										
	A	B	C	D	E	F	G	H	I	J	K
Coin Station (2.02)	1	1	1	1	1	1	1	1	1		1
5-, 10-, and 25-cent Coins (2.03)	√	√	√	√		√	√	√	√		√
Cord (2.04)			1				1	1			1
Coin Station Test Line Calibration Set (2.05)			1				1	1			1
Wire Strap (2.06)	1										
KS-6320 Orange Stick				1							
Size 1B Screwdriver						1					
Voltmeter (2.07)					1			1			
723A Extractor					1		1	1			
158A Adapter — (Card Extender)					1		1	1			
3-inch C Screwdriver					1		1	1			
Blocking and Insulating Tools (2.08)	√	√	√	√	√	√	√	√	√	√	√
Various Resistors (2.09)			√				√				
1C2 Telephone wired for DTF (2.10)										1	
Cord (2.11)			1*					1*			1*
300 ohm ±1% 1/2 watt resistor (2.12)			1*					1*			1*
364 Tool (2.13)	3	3	3	3	3	3	3	3	3		3
Dry Cell Batteries 3V Sources (2.14)											1@
50K Resistor (2.15)			1					1			
55K Resistor (2.16)			1					1			
100K Resistor (2.17)											1

√ As required.

* If calibration set is not provided with LOOP ADJUST switch.

3. PREPARATION

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
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Tests A Through H and K

- | | | | |
|----|--|----------------------------|--|
| 1 | Check that test line circuit is not busy. | OH and DISC relays normal. | |
| 2a | If test line circuit is in a No. 5 crossbar office —
Operate MB switch to MB position. | | |
| 3b | If test line is in a step-by-step office not equipped with dial tone first —
Insulate 10M of RET relay. | | |
| 4b | Insulate 2M of COL relay. | | |

Tests C, G, H, and K

- | | | | |
|---|--|--|--|
| 5 | Insert plug of → 3W4B ← cord of coin station into COIN PHONE jack of calibration set. | | |
| 6 | Patch TJA jack of calibration set to TJ jack of test line under test. | | |
| 7 | Set calibration set switches as follows:

LEAKAGE — NONE
GRD RES — SHORT
LOOP RES — NONE
LOOP ADJ — NORMAL
(When provided) | | |

Tests C, G, and K

- | | | | |
|----|--|--|--|
| 8 | Determine maximum loop resistance design requirement for office associated with test line to be checked. Use this value for maximum local loop requirement value of LOOP RES switch settings. (Typical values are shown in Table D). | | |
| 9c | If local loop requirement value and/or local loop requirement plus 50 ohm value is not provided on calibration set LOOP RES switch —
Obtain two ($\pm 1\%$, 1/2 watt or greater) resistors, each with | | |

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	half maximum local loop requirement resistance value.		
10c	Obtain two ($\pm 1\%$, 1/2 watt or greater) resistors each half maximum local loop requirement plus 50 ohms (ie, each resistor is 25 ohms greater than those of Step 9c).		
11c	Connect one resistor of Step 9c across the EXT TIP (1) terminals and other resistor across the EXT RING (1) terminals.		
12c	Set LOOP RES switch to EXT 1 when local loop requirement is specified.		
13d	If EXT TIP (2) and EXT RING (2) terminals are not provided — When local loop requirement plus 50 ohms value is specified for LOOP RES setting, remove resistors of Step 9c and connect one resistor of Step 10c across the EXT TIP (1) terminals and the other resistor across the EXT RING (1) terminals.		
14d	Set LOOP RES switch to EXT 1.		
15e	If EXT TIP (2) and EXT RING (2) terminals are provided — Connect one resistor of Step 10c across the EXT TIP (2) terminals and the other resistor across the EXT RING (2) terminals.		
16e	Set LOOP RES switch to EXT 2 when local loop requirement plus 50 ohms is specified.		
17f	If calibration set is not provided with LOOP ADJUST switch — When ACTION calls for setting LOOP ADJ switch to 300 ohms — Using 3W14A cord — Connect 300 ohms $\pm 1\%$		

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	resistor across tip and ring (red and black leads) and connect 310 plug calibration box COIN PHONE jack.		
Tests A, B, D, E, and F			
18	Connect 1C2 or 1B1 phone equipped with → 3W4B ← cord into TJ jack of test line under test.		
Tests C through H and K			
19	Remove DISC timer circuit card.		
A. Coin Present and Ground Removal			
	<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.		
19	With DISC timer inserted — Lift receiver off-hook.	C tone heard.	Check test cord connections, Check relay CT (should be operated). Check wiring on terminal block TS (C) pin 35. Check office tone supply. Check relay INTR (should operate and release at rate of 120 times per minute). Check office 120-ipm interrupter. Check operation and wiring with sequence chart SC 1 and functional schematic FS 2 of SD-1C297-01.
20	Hang up receiver.	In approximately 60 seconds — OH relay released.	Check DISC timer. Check wiring and sequence of relays DISC and CT. Check operation and wiring with sequence chart SC 6 and functional schematics FS 1 of SD-1C297-01.
21	Lift receiver off-hook.	C tone heard.	
22c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* (120-ipm dial tone heard.)	Check the ground removal feature of the coin station. Check continuity of coin station sleeve lead. Check relay CGA (should operate when initial rate is deposited and remain

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
23d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	<p>operated until relay ON operates). Check TM-3 timer and TMR-3 relay. Check transistor Q1 on component assembly CA-7. Check relay BP (should be operated). Check operation and wiring with sequence chart SC 5 and functional schematics FS 7 of SD-1C297-01. Check interlock circuit of CP's if BPR relay is not sequencing.</p> <p>Check continuity of coin station sleeve lead. Check relay CGA (should operate when initial rate is deposited and remain operated until relay ON operates). Check TM-3 timer and TMR-3 relay. Check transistor Q1 on component assembly CA-7. Check relay BP (should be operated). Check office tone supply. Check relay INTR (should operate and release at rate of 120 times per minute). Check office 120-ipm interrupter. Check operations and wiring with sequence chart SC 5 and functional schematics FS 7 of SD-1C297-01. Check interlock circuit of CP's if BPR relay is not sequencing.</p>
24	Hang up receiver.	Coin returned.	<p>Check operation of coin station hopper trigger and coin control relay. Check relay DISC (should operate and release). Check relay RET (should operate and coin should be returned). Check operation and wiring with sequence chart SC 6</p>

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
			and functional schematics FS 1 of SD-1C297-01.
25c	If provided with DTF phone — Strap terminals 4 and 8 at terminal board 3 of chassis assembly which jumpers ground removal relay (A) contacts.		
26c	Lift receiver and deposit initial rate.	2 beeps heard* (no ground removal). 120-ipm dial tone heard.	Check strap installed at Step 25c. Check ground lead from coin station to test line.
27c	Hang up receiver.	Coin returned.	
28c	Remove strap from ter- minals 4 and 8 at terminal board 3 of chassis assembly. (Strap installed in Step 25c.)		
29e	If no further tests are to be made — Disconnect plug from TJ jack.		
30e	Restore all switches.		
31e	Remove all blocking and insu- lating tools.		
B. Digit Reception			
	<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.		
19	Lift receiver off-hook.	C tone heard.	Perform Test A.
20c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
21d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
22	Dial an illegal digit. See 1.06.	In 60 seconds — 120-ipm dial tone silenced. Coin returned. Silence followed by C tone.	Perform Test A. Check operation and wiring with sequence chart SC 2 and functional schematic FS 3 of SD-1C297-01.
23	Hang up receiver.	In approximately 60 seconds — Test line disconnects.	
24	Perform Test D to check reception of legal digit.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	<i>Note:</i> Test C or F could be performed in place of procedure D if so desired.		
	C. Ground Check, Loop Resistance and Leakage		
	<i>Note 1:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.		
	→ <i>Note 2:</i> It maybe more convenient to watch the BPR relay operation rather than listen to the beep answers. Each time the BPR relay operates momentarily, one beep is generated. ←		
20	→ Set switches on calibration set in accordance with Step 7 of PREPARATION. ←		
21	Lift receiver off-hook.	C tone heard.	Perform Test A.
22g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
23h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
24	Dial digit 2.	Coin returned. 3 beeps heard.* (Loop and ground OK). HU tone heard.	Check LOOP RES and GRD RES switch settings; should be on NONE and SHORT. Check Test G if only 1 or 2 beeps heard. Check operation and wiring with sequence chart SC 2 and functional schematic FS 3 of SD-1C297-01. Check operation of relays GRT, LRT, RT, RC, ANS-1, ANS-2. Use sequence chart SC 4 and functional schematic FS 6 of SD-1C297-01. If BPR relay is not sequencing, check CP interlock circuit. Check circuit packs A962, A963, and A965. Check relays RHU and CT (should operate simultaneously). Check operation and wiring

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
			with sequence chart SC 5 and functional schematic FS 7 of SD-1C297-01.
25	Hang up receiver.	Coin station bell rings once, indicating nonleaky line.*	Check Test H of this section.
26	At calibration set, set switches as follows: LEAKAGE — 100K (T-R) → <i>Note:</i> When testing with SXS DTF office using coin trunk SD-32359-01, connect a 50K ohm resistor across EXT LEAK terminals and set LEAKAGE switch to EXT (T-R). ← GRD RES — SHORT LOOP ADJ — NORMAL (When provided) LOOP RES — NONE		
27	Lift receiver off-hook.	C tone heard.	
28g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Check test cord connections to calibration circuit. Perform Test A.
29h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Check test cord connections to calibration circuit. Perform Test A.
30	Block AUX-1 relay operated.		
31	Dial digit 2.	120-ipm dial tone silenced.	Perform Test B.
32	After CPT relay releases — Block TMR-1 relay non-operated.		
33	Set GRD RES switch to 100.		
34	Remove blocking tool from AUX-1 relay.	ANS-1 relay not operated.	Perform Test G.
35	→ Rotate GRD RES switch to SHORT.	ANS-1 relay operated.	
36	Disconnect CP A965.	ANS-1 relay released.	
37	Reconnect CP A965.	ANS-1 relay remains released.	Replace CP A965. Check short circuit on GRD RES switch. ←

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
38	Remove blocking tool from TMR-1 relay.	Coin returned. 3 beeps heard.* (Loop and ground OK). HU tone heard.	Perform Test G.
39	Hang up receiver.	2 rings heard.* (Leakage resistance fails).	Perform Test H of this section.
40	At calibration set, set switches as follows: LEAKAGE — 110K (T-R)		
	→ <i>Note:</i> When testing with SXS DTF office using coin trunk SD-32359-01 connect a 55K ohm resistor across EXT LEAK terminals and set LEAKAGE switch to EXT (T-R). ←		
	GRD RES — SHORT		
41	Lift receiver off-hook.	C tone heard.	
42g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	
43h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	
44	Block AUX-1 relay operated.		
45	Dial digit 2.	120-ipm dial tone silenced.	Perform Test B.
46	After CPT relay releases — Block TMR-1 relay non-operated.		
47	Set GRD RES switch to 150.	ANS-1 relay → not operated. ←	
48	Remove blocking tool from AUX-1 relay.	ANS-1 relay operated.	Perform Test G.
49	Rotate GRD RES switch to SHORT.	ANS-1 relay remains operated.	
50	Remove blocking tool from TMR-1 relay.	Coin returned. 1 beep heard.* (Ground resistance fails). HU tone heard.	Perform Test G.
51	Hang up receiver.	1 ring heard.* (Leakage resistance OK).	Perform Test H.
52	At calibration set, set switches as follows: GRD RES — SHORT		

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	LEAKAGE — 100K (R-G) <i>Note:</i> When testing with SXS DTF office using coin trunk SD-32359-01, connect a 50K ohm resistor across EXT LEAK terminal and operate LEAKAGE switch to EXT (R-G) ←		
	LOOP ADJ — NORMAL (When provided)		
	LOOP RES — Set to local loop requirement value. (See Steps 8 through 16e).		
53	Lift receiver off-hook.	C tone heard.	
54g	If provided with DTF phone — Deposit initial rate.	→ 1 beep heard.* ← 120-ipm dial tone heard.	
55h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	→ 2 beeps heard.* ← 120-ipm dial tone heard.	
56	Block AUX-1 relay operated.		
57	Dial digit 2.	120-ipm dial tone silenced.	
58	After CPT relay operates — Block TMR-2 relay non-operated.		
59	Remove blocking tool from AUX-1 relay.	Coin returns.	
60	Block TMR-3 relay non-operated.		
61i	If calibration set is provided with LOOP ADJUST switch — Set LOOP ADJUST switch to 300.		
62f	If calibration set is not provided with LOOP ADJUST switch — Remove plug from COIN PHONE jack of calibration set.		
	<i>Danger: In the following step, high voltage (130 volts) can appear on tip lead during coin disposal.</i>		
63f	Connect 3W14A cord equipped with 300 ohm resistor across tip and ring leads to COIN PHONE jack of calibration set.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
64	Remove blocking tool from TMR-2 relay.	LRT relay operated. ANS-2 relay does not operate.	Perform Test G.
65i	If calibration set is provided with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately set LOOP ADJUST switch to NORMAL.	3 beeps heard.* (Loop resistance OK). HU tone heard. <i>Note:</i> Coded answer begins when TMR-3 is operated.	Perform Test G.
66f	If calibration set is not provided with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately disconnect 3W14A cord and connect coin station to COIN PHONE jack of calibration set.	3 beeps heard.* (Loop resistance OK). HU tone heard. <i>Note:</i> Coded answer begins immediately after TMR-3 operates therefore part of answer that is generated before the coin station is connected to the calibration set may not be heard.	Perform Test G.
67	Hang up receiver.	2 rings heard.* (Leakage resistance fails).	Perform Test H.
68	At calibration set, set switches as follows: LEAKAGE — 110K (R-G) → <i>Note:</i> When testing with SXS DTF office, using coin trunk SD-32359-01, connect a 55K ohm resistor across EXT LEAK terminal and operate LEAKAGE switch to EXT (R-G). ← GRD RES — SHORT LOOP ADJUST — NORMAL LOOP RES — Set to local loop requirement value plus 50 ohms. (See Steps 8 through 16e).		
69	Lift receiver off-hook.	C tone heard.	
70g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	
71h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	
72	Block AUX-1 relay operated.		

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
73	Dial digit 2.	120-ipm dial tone silenced.	
74	After CPT relay operates — Block TMR-2 relay non-operated.		
75	Remove blocking tool from AUX-1 relay.	Coin returns.	
76	Block TMR-3 relay non-operated.		
77i	If calibration set is provided with LOOP ADJUST switch — Set LOOP ADJUST switch to 300.		
78f	If calibration set is not provided with LOOP ADJUST switch — Remove plug from COIN PHONE jack of calibration set. <i>Danger: In the following step, high voltage (130 volts) can appear on tip and ring leads during coin disposal.</i>		
79f	Connect 3W14A cord equipped with 300-ohm resistor across cords tip and ring (red and black leads) to COIN PHONE jack of calibration set.		
80	Remove blocking tool from TMR-2 relay.	LRT relay operated ANS-2 relay → slow operated. ←	Perform Test G.
81i	If calibration set is provided with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately set LOOP ADJUST switch to NORMAL.	2 beeps heard.* (Loop resistance fails). HU tone heard. <i>Note: Coded answer begins immediately after TMR-3 relay operates.</i>	Perform Test G.
82f	If calibration set is not pro- vided with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately disconnect 3W14A cord and connect coin station to COIN PHONE jack of calibration set.	2 beeps heard.* (Loop resistance fails). HU tone heard. <i>Note: Coded answer begins immediately after TMR-3 operates.</i>	Perform Test G.
83	Hang up receiver.	1 ring heard.* (Leakage resistance OK).	Perform Test H.

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
84	At calibration set — Set switches counterclockwise as far as possible.		
85j	If no further tests are to be made — Disconnect plugs from TJ, TJA, and COIN PHONE jacks.		
86j	Restore all switches.		
87j	Replace DISC timer.		
88j	Remove all blocking and insulating tools.		
D. Coin Return and Collect			
<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.			
20	Lift receiver off-hook.	C tone heard.	Perform Test A.
21c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
22d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
23	Dial digit 4.	HU tone heard.	Check relays RHU and CT (should operate simultaneously). Check operation and wiring with sequence chart SC 5 and functional schematic FS 7 of SD-2C297-01.
<i>Note:</i> Read combined operations of Steps 24 and 25 before proceeding.			
24	Hang up receiver.	Coin returned on first attempt. Coin station bell rings once for first answer.	Check attempt counter, relays ATC-1, ATC-2, and ATC-3. Check coin station coin control relay. Check relay RHU (should be operated). Check operation and wiring with sequence chart SC 3 and functional schematic FS 5; also functional schematic FS 7.

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
25	Lift receiver off-hook after first answer.	Answer completed as coded tone (1 beep repeated two times). 120-ipm dial tone heard.	Check relay RHU (should be released). Check relay INTR (should operate at a rate of 120 times per minute). Check office 120-ipm interrupter. Check operation and wiring with sequence chart SC 3 and functional schematic FS 5; also SC 5 and functional schematic FS 7.
26	Deposit an initial rate or greater using a single coin.		
27	Dial digit 4. <i>Note:</i> Read combined operations of Step 28 and 29 before proceeding.	HU tone heard.	
28	With index finger holding coin relay armature in non-operated position, hang up receiver. When first attempt is completed (indicated by pressure on index finger), remove finger from armature.	Coin returned on second attempt. Coin station bell double rings.	
29	Lift receiver off-hook after first double ring.	2nd and 3rd answers completed as coded double beeps. 120-ipm dial tone heard.	
30	Deposit an initial rate or greater using a single coin.		
31	Dial digit 4.	HU tone heard.	
32	With index finger holding coin relay armature in non-operated position, hang up receiver. When second attempt is completed (indicated by pressure on index finger), remove finger from armature.	Coin returned on third attempt. Coin station bell triple rings.	
33	Lift receiver off-hook after the first triple ring.	2nd and 3rd answers completed as coded triple beeps. 120-ipm dial tone heard.	
34	Block coin relay armature nonoperated with orange stick.		
35	Deposit an initial rate or greater using single coin.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
36	Dial digit 4.	HU tone heard.	
37	Hang up receiver.	Coin not returned. Coin station bell rings three times.*	
38	Remove orange stick from coin station.		
39	Lightly depress coin relay armature.	Coin returned or collected.	
40	Repeat Steps 20 through 39 except dial 3 in Steps 23, 27, 31, and 36.	Coin is collected in Steps 24, 28, 32, and 39 rather than returned.	
41e	If no further tests are to be performed — Disconnect plug from TJ jack.		
42e	Replace DISC timer.		
43e	Restore all switches.		
44e	Remove all blocking and insulation tools.		
E. 4-Volt Power Supply Test and Adjustment			
20	Place CP A966 on card extender.		
21	Remove CP A973.		
22	Measure voltage of CP A966 between pin 13 (negative) and pin 26 (positive).	Meter indicates 4.2 to 4.3 VDC.	Check CP A966 and connector card seating. Check meter scale setting. Check connection of meter and proper pin connection. Check CP A964. Check Step 24c.
	<i>Note:</i> Leave meter connected to pin 13 and 26.		
23	Insert CP A973.	Meter indicates 4.0 to 4.1 VDC.	Refer to next step for corrective action.
24c	If voltage is beyond limits — Carefully adjust R2 potentiometer (on CP A966) until required voltage is obtained.	Voltage is adjustable between 4.0 and 4.1 VDC.	Replace CP A966. Check diode CR4 on CP A964.
25	Disconnect meter connections.		
26	Remove card extender and place CP A966 back in position.		
27	Perform Test F of this section.		

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
F. Coin Relay Time Test			
	<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.		
20	Lift receiver off-hook.	C tone heard.	Perform Test A.
21c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
22d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
23	Dial digit 5.	Deposit returned. Coded beep tones indicate coin relay operate time as shown in Table B. C tone heard. 120-ipm dial tone heard.	Check 60 Hz power. Check relay RET (should operate and then release). Perform Test E of this section. Check CP A973 by interchanging two CP A973 packs and repeat Steps 21c through 23 of this test. Check ground removal feature of coin station. Check coin station ground. Check relay CGA (should operate when 10 cents is deposited and remain operated until the ON relay operates). Check TM-3 timer. Check transistor Q1 on component assembly CA-7. Check relay BP (should be operated). Check office tone supply. Check relay CT (should be operated). Check wiring on terminal block TS(C) pin 35. Check operation and wiring with sequence chart SC 1 and functional schematic FS 2; also SC 2 and SC 7 and functional schematics FS 3 and FS 4.

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
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24 Adjust Phillips head screw on coin relay to change operate time.

Note: Adjust clockwise to decrease and counterclockwise to increase operate time.

TABLE B

OPERATE TIME OF COIN RELAY

OPERATE TIME	ANSWER
400 ms	1 Beep *
400-425 ms	2 Beeps*
425-475 ms (ideal)	Steady Tone
475-500 ms	3 Beeps*
500 ms	4 Beeps*

* Repeated three times

25	Deposit coin.	Coin returned. Code tone answer received.	
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26 Repeat Steps 24 and 25 until entire range of answers are obtained as shown in Table B.

27	Flash switch-hook and hang up receiver.	Test line disconnects.	
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28e If no further tests are to be performed —
Disconnect plug from TJ jack.

29e Replace DISC timer.

30e Restore all switches.

31e Remove all blocking and insulating tools.

G. Ground Check Loop and Resistance Test Adjustment

Note 1: All beep and ringing answers followed by an asterisk (*) are given a total of three times.

→ *Note 2:* Observation of the BPR relay operation may be substituted for beep listening. Each momentary operation of the BPR relay represents a single beep. ←

20	Place CP A962 on card extender.		
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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	<i>Warning: In the following step, damage to the potentiometers will occur if this stop is exceeded.</i>		
21	Carefully rotate R3 and R5 potentiometers counterclockwise until the permanent stop is reached.		
	<i>Note: R3 potentiometer is closest to card connector.</i>		
22	Set calibration set switches as follows: LEAKAGE RES — NONE GRD RES — SHORT LOOP ADJ — NORMAL (When provided) LOOP RES — Set to typical loop requirement value plus 50 ohms. Refer to Preparation Steps 8 through 16e.		
23	At coin station test line — Lift receiver off-hook.	C tone heard.	Perform Test B.
24g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
25h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
26	Block AUX-1 relay operated.		
27	Dial digit 2.		
28	When CPT relay releases — Block TMR-1 relay non-operated.		
29	Set GRD RES switch to 150.		
30	Remove blocking tool from AUX-1 relay.	RT relay operated.	
	<i>Warning: In the following step, take particular care when adjusting R3 and do not exceed the permanent stop.</i>		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
31	Adjust R3 potentiometer clockwise until ANS-1 relay just operates. <i>Note:</i> R3 potentiometer is closest to card connector.	→ ANS-1 relay operated. ←	→ Check calibration box to make sure it has been updated to last issue. ← Check card and extender board seating. Replace CP A962 or A965.
32	Set GRD RES switch to 100.		→ Check to make sure no ground is connected to coin station except through calibration box. ←
33	Remove and reinsert CP A965.	→ ANS-1 relay released and remains released. ←	→ Adjust R3 1/2 turn counter-clockwise and repeat Step 33. ← Replace CP A965.
34	Set GRD RES switch to 150.	→ ANS-1 relay operated. ←	
35	Remove and reinsert CP A965.	ANS-1 relay → released and operated. ←	Recheck setting of R3.
36	Rotate GRD RES switch to SHORT.	ANS → 1 ← relay remains operated.	
37	Block TMR-2 relay non-operated.		
38	Remove blocking tool from TMR-1 relay.	Coin returned.	Perform Test C.
39i	If calibration set is equipped with LOOP ADJUST switch — Set LOOP ADJUST switch to 300. <i>Danger: In the following step, high voltage (130 volts) can appear on tip and ring leads.</i>		
40f	If calibration set is not provided with LOOP ADJUST switch — Remove plug from COIN PHONE jack of calibration set.		
41f	Connect 3W14A cord equipped with 300 ohm resistor connected across tip and ring leads to COIN PHONE jack of calibration set.		
42	Block TMR-3 relay non-operated.		
43	Remove blocking tool from TMR-2 relay. <i>Warning: In the following step, take particular care when adjusting R5 and do not exceed the permanent stop.</i>	LRT relay operated.	

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
44	Adjust R5 potentiometer clockwise until ANS-2 relay just operates.	→ ANS-2 relay operated. ←	Replace CP A962 or A965.
45	At calibration set — Set LOOP RES switch to local loop requirement. (See Steps 8 through 16e).		
46	Remove and reinsert CP A965.	ANS-2 relay released.	Replace CP A965.
47	At calibration set — Set LOOP RES switch to value used in Step 22 of this test. → (Local requirement plus 50 ohms). ←	ANS-2 relay operated.	
48	Remove and reinsert CP A965. → <i>Note:</i> In the following steps, observation of BPR relay operation may be substituted for beep listening. Each time BPR operates, one beep will be emitted. ←	ANS-2 relay releases when removed and operates when reinserted.	Recheck setting of R5.
49i	If calibration set is equipped with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately set LOOP ADJUST switch to NORMAL.	2 beeps heard.* (Loop resistance failure. HU tone heard. <i>Note:</i> Coded answer begins when TMR-3 operates.	
50f	If calibration set is not provided with LOOP ADJUST switch — Remove blocking tool from TMR-3 relay and immediately disconnect 3W14A cord and connect coin station to COIN PHONE jack of calibration set.	2 beeps heard.* (Loop resistance failure). HU tone heard. <i>Note:</i> Answer begins as soon as TMR-3 operates.	
51	Hang up receiver	1 ring heard.*	Perform Test H.
52	Remove CP A962 from card extender and place A962 back in position.		
53	Perform Test C of this section. <i>Note:</i> If Test C should fail, repeat preceding steps of Test G, taking care when adjusting potentiometers.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
H. Leakage Adjustment			
<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.			
20	Place CP A963 on card extender.		
21	At calibration set — Set switches as follows: LEAKAGE — 110K (R-G)		
→ <i>Note:</i> When testing with SXS DTF office, using coin trunk SD-32359-01, connect a 55K ohm resistor across EXT LEAK terminal and operate LEAKAGE switch to EXT (R-G). ←			
GRD RES — SHORT			
LOOP RES — NONE			
LOOP ADJ — NORMAL (When provided)			
22	→ Using a KS-14510-L1 volt-ohm-meter arranged to measure resistance on low scale - Connect meter leads to terminal 1 (yellow) and 3 (red) of R5 potentiometer.		
23	Rotate R5 potentiometer counterclockwise until further rotation fails to vary minimum resistance.		
24	Disconnect meter. ←		
25	Lift coin station receiver.	C tone heard. DS1 lamp A963 lighted.	Perform Test A. Check card and extender seating.
<i>Note:</i> DS2 lamp (closest to R5 potentiometer) may also be lighted at this time.			
26c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
27d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
28	Dial digit 2.	Coin returned. 3 beeps heard.* HU tone heard.	Perform Test C.

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
29	Block TMR1 relay non-operated.		
30	Hang up receiver.		
31	Carefully adjust R5 potentiometer clockwise until neon lamp DS2 is just extinguished and then turn potentiometer one turn counterclockwise. → <i>Note:</i> DS2 lamp is the lamp closest to R5 potentiometer. ←		
32	Momentarily operate AUX-4 relay.	DS2 lamp glows dimly.	Readjust R5 potentiometer. Replace circuit pack A963.
33	At calibration set — Set switches as follows: LEAKAGE — 100K (R-G) → <i>Note:</i> When testing with SXS DTF office, using coin trunk SD-32359-01, connect a 50K ohm resistor across EXT LEAK terminal and operate LEAKAGE switch to EXT (R-G). ← GRD RES — SHORT LOOP ADJ — NORMAL (When provided) LOOP RES — NONE	DS2 lamp extinguished.	Readjust R5 potentiometer.
34	Remove blocking tool from TMR1 relay.	2 rings heard.*	→ Repeat Steps 22 through 32 if only 1 ring is heard. ←
35	Lift receiver off-hook.	C tone heard.	Perform Test A.
36c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
37d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
38	Dial digit 2.	Coin returned. 3 beeps heard.* HU tone heard.	Perform Test C.
39	Hang up receiver.	Coin station bell rings twice.* (Leakage resistance fails.)	Replace circuit pack A963. → Readjust R5, Steps 22 through 32. Check + cc supply for voltage fluctuations. ←
40	Perform Test C.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
	<i>Note:</i> If Test C should fail on Leakage Resistance Test, repeat preceding steps taking care when adjusting R5 potentiometer.		
I. Message Register Test (Option ZE)			
1	Check that test line circuit is not busy.	OH and DISC relays normal.	
2a	If test line circuit is in a No. 5 crossbar office — Operate MB → switch to MB position. ←		
3b	If test line is in a step-by-step office not equipped with dial tone first — Insulate 10M of RET relay.		
4b	Insulate 2M of COL relay.		
5	Connect 1C2 phone equipped with → 3W4B ← cord into TJ jack of test line under test.		
6	Remove DISC timer circuit card.		
7	At message register location — Record register readings of all 4 registers.		
8	At coin station test line — Lift receiver off-hook.	C tone heard.	Perform Test A.
9c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
10d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
11	Dial digit 2.	Coin returned. 3 beeps heard.* (Loop and ground OK.) HU tone heard.	Perform Test C.
12	Hang up receiver.	Coin station bell rings once.*	
13	Lift receiver off-hook.	C tone heard.	
14c	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
15d	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
16	Dial digit 3.	HU tone heard.	Perform Test C.
17	Hang up receiver.	Coin returned. Coin station bell rings once.	Perform Test D.
18	Lift receiver off-hook after bell rings once.	Answer completed as coded tone (rings and beeps).* 120-ipm dial tone heard.	
19	Deposit single coin equal to or greater than initial rate.		
20	Dial digit 4.	HU tone heard.	
21	Hang up receiver.	Coin returned. Coin station bell rings once.	Perform Test D.
22	Lift receiver off-hook after bell rings once.	Answer completed as coded tone (1 beep). 120-ipm dial tone heard.	
23	Deposit initial rate.		
24	Dial digit 5.	Coin returned. Coded beep tones heard.* C tone heard.	Perform Test F.
25	Flash switchhook once.		
26	Hang up receiver.	Test circuit disconnects.	
27	At message register location — Verify that all four registers have advanced one step each.	All registers advanced one step each.	Check operation and wiring with functional schematic FS 1 of SD-1C297-01.
28e	If no further tests are to be performed — Disconnect plug from TJ jack.		
29e	Restore all switches.		
30e	Replace DISC timer.		
31e	Remove all blocking and insulating tools.		
J. TOUCH-TONE® Dialing Test (Option X)			
1	Check that test line circuit is not busy.	OH and DISC relays normal.	
2a	If test line circuit is in a No. 5 crossbar office — Operate MB switch → to MB position. ←		
3	Connect 1C2 phone (DTF) equipped with → 3W4B ← cord into TJ jack.		

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
4	Momentarily operate OH relay.		
5	Block ON relay operated.		
6	Remove DISC timer circuit card.		
7	Lift receiver off-hook.		
8	Perform Steps 9 through → 18 (Table C) ← depressing and holding each key of TOUCH-TONE pad and comparing status of P1 through P5 relays with Table C.	Status of P1 through P5 relays same as those of Table C.	Check TOUCH-TONE pad and receiver. Check wiring of LG1-4 and HG1-4, and STR relays with functional schematic FS 8.
19	Remove blocking tool from ON relay.		
20b	If no further tests are to be performed — Disconnect plug from TJ jack.		
21b	Restore all switches.		
22b	Replace DISC timer.		
23b	Remove all blocking and insulating tools.		
K_c → Foreign EMF Check (Option ZK)			
	<i>Note:</i> All beep and ringing answers followed by an asterisk (*) are given a total of three times.		
20	At calibration set - Set switches as follows: LEAKAGE - NONE GRD RES - SHORT LOOP ADJ - NORMAL LOOP RES - NONE		
21	Lift receiver off-hook.	C tone heard.	Perform Test A.
22g	If provided with DTF phone — Deposit initial rate.	1 beep heard.* 120-ipm dial tone heard.	Perform Test A.
23h	If provided with CF phone — Deposit single coin equal to or greater than initial rate.	2 beeps heard.* 120-ipm dial tone heard.	Perform Test A.
24	Dial digit 0.	Coin returned. 3 beeps heard.* (Ground FEMF OK). HU tone heard.	

STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
25	Hang up receiver and remove receiver off-hook before third ringing answer has finished.	Coin station bell rings three times indicating loop FEMF OK.*	
26	At calibration set — Connect a 3.0 VDC supply across EXT GRD terminals. <i>Note:</i> Note polarity of connection.		
27	Deposit single coin equal to or greater than initial rate.	120-ipm dial tone heard.	
28	Block AUX-1 relay operated.		
29	Dial digit 0.		
30	After CPT relay releases — Block TMR1 relay nonoperated.		
31	Set GROUND RES switch to EXT.		
32	Remove blocking tool from AUX-1 relay.	ANS-1 relay operated.	Check 3.0 VDC supply and connections. Replace CPA1246.
33	Rotate GROUND RES switch to SHORT.		
34	Remove blocking tool from TMR1 relay.	Coin returned. 1 beep heard.* (Ground FEMF exists). HU tone heard.	
35	Set LEAKAGE RES switch to EXT T-R on calibration box.		
36	Connect 3.0 VDC supply in series with 1/2 watt, 100K ± 10% resistor across EXT binding posts for leakage resistance on calibration box. <i>Note:</i> Note polarity of supply.		
37	Hang up handset, and remove receiver off-hook before last ring and set LEAKAGE RES switch to EXT (T-G).	Coin station bell rings twice,* indicating T-R FEMF exists. 120-ipm dial tone heard.	Check 3.0 VDC supply and connections. Replace CPA1246.
38	Deposit single coin equal to or greater than initial rate.	120-ipm dial tone silenced.	
39	Dial digit 0.	Coin returned. 3 beeps heard.* (Ground FEMF OK). HU tone heard.	

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STEP	ACTION	VERIFICATION	CORRECTIVE ACTION
40	Hang up receiver.	Coin station bell rings twice,* indicating loop T-G FEMF.	Check test connections.
41	Disconnect 3.0 VDC supply and resistor.		
42	Repeat Steps 20 through 41 using a 3.0 VDC supply of opposite polarity in Steps 26 and 36.	Same as Steps 20 through 40.	
43	At calibration set — Set switches counterclockwise as far as possible.		
44i	If no further tests are to be performed — Disconnect plugs from TJ, TJA, and COIN PHONE jacks.		
45i	Restore all switches.		
46i	Replace DISC timer.		
47i	Remove all blocking and insulating tools.		

TABLE C

STEP	OPERATE AND HOLD DIGIT KEY	PULSE RELAYS					RELEASE DIGIT KEY
		P1	P2	P3	P4	P5	
9	1	O	O	R	R	R	1
10	2	R	R	O	R	R	2
11	3	O	O	O	O	R	3
12	4	R	R	O	O	R	4
13	5	O	O	R	O	R	5
14	6	R	R	R	O	O	6
15	7	O	O	R	O	O	7
16	8	R	R	O	O	O	8
17	9	O	O	R	R	O	9
18	0	R	R	O	R	O	0

O = OPERATE

R = RELEASE

TABLE D

TYPICAL LOCAL LOOP REQUIREMENTS ON COIN LINES

TYPE OF CENTRAL OFFICE	LOOP RESISTANCE REQUIREMENTS
Step-by-Step	1050 ohms
Panel	885 ohms
No. 1 Crossbar	1200 ohms
No. 5 Crossbar	1300 ohms
No. 1 ESS	1300 ohms
No. 2 ESS	1300 ohms

Note: Above values are based on 300-ohm station set resistance.