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STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, 360A OR 35-E-97
COIN TRUNK CIRCUIT
FOR USE PRECEDING A FIRST SELECTOR SERVING COIN LINES ARRANGED FOR FOR PREPAY OR COINLESS ACCESS TO SPECIFIED NUMBERS

CHANGES

B. Changes in Apparatus

	Replaced	Replaced By
B.1	MB Key 552J, FS1, App. Fig. 1	MB Key 552A, FS1 App. Fig. 1
B.2	Superseded	Superseded By
	CNP Relay AJ133, FS3 App. Fig. 1	CNP Relay AJ152, FS3 App. Fig. 1
	R18 Resistor, KS-16645,L1, 100K, CPS1	R18 Resistor, KS-16645,L1, 22K, CPS1

B.3 Added

C5 Capacitor 542B, .2 micro farad, CPS1

D. Description of Changes

D.1 The code of the MB key is changed.

D.2 The code of the CNP relay is changed due to the MFR. DISC. status imposed on the AJ133.

D.3 Capacitor C5 is added to improve the RF noise immunity of the monostable multivibrator CP1.

D.4 The value of R18 is changed to insure adequate base saturation current when transistor Q2 is triggered.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB
WECO DEPT 5152-CAW-WEA

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STEP-BY-STEP SYSTEMS NO. 1, 350A, 355A, 360A OR 35-E-97 FOR USE PRECEDING A FIRST SELECTOR SERVING COIN LINES ARRANGED FOR FOR PREPAY OR COINLESS ACCESS TO SPECIFIED NUMBERS

CHANGES

B. Changes in Apparatus

B.1 Added

PAH, 1 microfarad, 542D, App. Fig. 2

PAH, 20,000 ohm, KS-13490L1, App. Fig. 2

SI, 2400 ohm, KS-13491L1, App. Fig. 1

D. Description of Changes

D.1 Resistor PAH and capacitor PAH are added to provide an additional 50 ms of "hold time" to CP1, pulse amplifier. This additional hold time appears only during the coin test period.

D.2 Resistor SI is added to provide sufficient operate current to the B relay in the Timed Release Circuit.

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COIN TRUNK CIRCUIT
FOR USE PRECEDING A FIRST SELECTOR
SERVING COIN LINES ARRANGED FOR
PREPAY OR COINLESS ACCESS TO
SPECIFIED NUMBERS

CHANGES

B. Changes in Apparatus

B.1 Removed

R18, KS-16645,L1
100K ohm
(Part of CPS1)

Replaced By

R18, KS-16645,L1
22K ohm
(Part CPS1)

B.2 Added

C5, 542B
.2 microfarad
(Part of CPS1)

D. Description of Changes

D.1 Capacitor C5 is added to improve the RF noise immunity of the monostable multivibrator.

D.2 Resistor R18 is changed to insure adequate base saturation current when transistor Q2 is triggered.

D.3 Several minor drafting and documentation errors are corrected in this reissue.

F. Changes in CD Section II and Section III

F.1 In paragraph 6.06 - Change:

"Operated relay CP provides a hold path for slow-release relay CNPA, which started to release when relay I operated." To read: "Operated relay CP operates relay CNP."

F.2 In Section III, paragraph 5.03, change paragraphs (b), (c), and (d) to read

(b) Power supply required
1-0 to 100Vdc, 0.25 ampere
1- -5Vdc, 0.25 ampere

(c) Preliminary Preparation

(1) Connect the positive terminal of each power supply to CP terminal 13.

(2) Connect the positive terminal of the milliammeter to terminal 16 and the negative terminal to the -50Vdc supply.

(3) Connect the negative terminal of the variable supply ti CP terminal 12.

(d) CP Test - Perform tests in the order indicated.

(1) Increase the variable supply voltage to 50 volt. Milliammeter shall read less than 10 microamperes.

(2) Increase the variable supply voltage to 90 volt.

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STEP BY STEP SYSTEMS NO. 1, 350A, 355A, 360A OR 35E97 COIN TRUNK CIRCUIT FOR USE PRECEDING A FIRST SELECTOR SERVING COIN LINES ARRANGED FOR PREPAY OR COINLESS ACCESS TO SPECIFIED NUMBERS

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides service to coin stations. It is arranged to automatically collect or return, as required, any coin(s) deposited.

1.02 The circuit may be arranged to operate in either a prepay (coin-first) or coinless access (dial-tone-first) mode. This circuit may be arranged to function with common control TOUCH-TONE® and non-compatible TOUCH-TONE circuits.

2. GENERAL DESCRIPTION OF OPERATION

DIAL PULSE

2.01 When a coin station goes off-hook, a seizure (loop start or ground start for dial-tone-first or coin-first, respectively) is placed on the line circuit. A line finder operates and extends the seizure to its coin trunk, which operates the PLS relay over the loop. The operated PLS relay extends the loop seizure to the first selector, register, or converter circuit. Dial tone is then returned to the coin station.

2.02 The coin trunk receives the dial pulses from the coin station and repeats them, via the PLS relay, toward the first selector.

2.03 If the coin trunk is arranged to operate in the dial-tone-first mode, each of the first digits (maximum of three) is temporarily stored in the trunk digit register for interdigital translation.

2.04 When the called customer answers, the terminating circuit produces a reversal of the tip-to-ring potential. This is detected by the coin trunk, causing it to enter its charge state and to cut the connection through metallic.

2.05 When either customer goes on-hook, the switch train causes ground to be removed from the sleeve lead. This causes the coin trunk to activate its coin-disposal function. When the coin disposal is completed, the coin trunk releases the line finder and enters its idle state.

SECTION II - DETAILED DESCRIPTION

1. SEIZURE

GENERAL

1.01 When a coin station requests service, it activates its associated line relay (loop start or ground start for dial-tone-first or prepay, respectively) which seizes an idle line finder. The line finder extends a ground on the sleeve lead to its coin trunk operating relay S. Operated relay S places an enable ground to the pulse amplifier (p/o CP1) and the PLS relay. Operated relay S operates relay SA and, if the trunk is arranged for dial-tone-first, relay HLD. The trunk is now ready to supply and supervise loop current to the coin station.

1.02 Operated relay SA opens the operate path to the make-busy (MB) relay, and sets up an operate path for the seizure-complete (SC) relay.

1.03 When the line finder locates the coin-station loop, it cuts the station through to the coin trunk. The coin trunk then supplies loop current from ground through resistor R8, inductor L2, and normal contacts of relays CC and CNT to the tip lead, over the station loop to the ring lead, through normal contacts of relays CNT, CC, and CND to the CO battery through the low-pass filter (inductors L1 and L3, capacitor FC, diode PLS, and resistor PLS).

1.04 Loop current produces a voltage drop across resistor PLS. This signal is amplified by the pulse amplifier, operating relay PLS. Operated relay PLS closes the loop through to a first selector via resistor R7, diode CT2, and normal contacts of relays ANN (dial-tone-first), CC, IDT, and MB. The PLS relay operates relay PLSA, by extending battery through a normal contact and coil of the PLSA relay to ground. PLSA operates and holds through resistor PLSA to the operated PLS contact. PLS also starts the interdigital timer TM1, by removing battery from terminal 1 and placing it on terminal 2.

1.05 The initial operation of relay PLSA places a holding ground on the pulse amplifier through normal contacts SC and ANN, and operated contact S. This guarantees that the coin trunk will reach its SC state, before it will repeat pulses or disconnects into the switch train.

1.06 At the end of the 70-ms interdigital timing period, started by operated PLS, timer TM1 and relay IDT operate. Operated relay IDT connects transformer T1 to the tip (establishes voice channel through the coin trunk), and removes its short circuit across resistor R6 and isolation inductor L4. At this time, supervisory current from the switch train is passed through normal contact GD and resistor R6. This provides a path for the current during the transient current buildup through inductor L4. Operated relay IDT also starts timer TM2, and supplements the holding ground to the pulse amplifier through normal contacts of GD and EID.

1.07 Timer TM2 fast-operates through a normal contact of SC and resistor SC, operating the guard (GD) relay. Operated relay GD removes resistor R6 from the supervisory loop toward the switch train, placing isolation inductor L4 in series with the tip-to-ring shunt path, and provides an operate path to relay SC through operated SA and normal ECD contacts.

1.08 Operated relay SC removes the holding ground toward the pulse amplifier, splits the sleeve lead (this puts relay S under control of the switch-train sleeve and grounds the sleeve toward the line finder), removes resistor SC from the timing network of TM2, and operates the delayed-charge (DYC) relay through normal contacts CT and ANN.

1.09 The coin trunk is now in its SC state. It is ready to pass dial tone to the coin station and to repeat dial pulses (see 1.09 for addition requirements in common control and noncompatible TOUCH-TONE offices), or pass TOUCH-TONE into the switch train. The S relay, now under control of the switch train, will recognize disconnects and initiate the coin-disposal function.

REGISTER OR CONVERTER DIAL-TONE-FIRST (APP FIG. 2, 4, AND 8)

1.10 When dial-tone-first operation is provided in a common control or noncompatible TOUCH-TONE office, a register/converter attached signal must be received before the trunk will allow dial pulses or switch-hook flashes to be repeated into the switch train. The register or converter attached signal is passed over the CS or IC lead, respectively, and consists of a battery (-48 volts) pulse which operates relay SSD1. Operated relay SSD1 operates relay SSD2 from ground through an operated S contact. When the battery pulse is removed, relay SSD1 releases and operates relay SSD3 from ground through operated contacts of relays S and SSD2. Relay SSD2 remains operated through one of its make contacts to a ground provided by operated relay S. The release of relay SSD1 also transfers the CS/IC lead into the trunk battery-and-ground signal detector circuit. The SSD1 relay winding, used to detect the battery pulse on the IC lead, also indicates a coin class of service to the converter circuit (noncompatible only).

1.11 Operated relay SSD3 provides a path to the sleeve lead through a normal CCK contact for relay S. This path supplements two other paths (one through contacts of relays DC1, DC2, and F, and another

through relay contacts EID and F) between the sleeve lead and relay S. When the trunk reaches this state, it is ready to repeat pulses or switch-hook flashes into the switch train. However, if any loop signals are detected by the coin trunk before relay SSD3 operates, the coin trunk disconnects from the switch train and activates its coin-return function toward the coin station (see 7).

2. PULSING

GENERAL

2.01 During dial pulsing, the open-loop condition of each pulse turns off the pulse amplifier, releasing relay PLS. When the pulse amplifier turns off, its single-shot (monostable multivibrator) is fired, locking the amplifiers output off for a 43-ms (±5 percent) time period. This, by holding relay PLS normal, insures all pulses repeated into the switch train have a break period greater than 40 ms.

2.02 Released PLS, releases relay PLSA, timer TM1, and timer output relay IDT. Released IDT, releases timer TM2; timer output relay GD opens the secondary of transformer T1, and connects the tip lead from the switch train to resistor R7. Relay IDT, under control of timer TM1, is held normal over the pulsing of each digit. Thus, transformer T1 and inductor L4 are removed from the pulse-repeating loop during pulsing.

2.03 Loop pulsing, under control of the coin-station dial, causes relays PLS and PLSA to operate and release. Contacts of relay PLS repeat pulses into the switch train and into the input of timer TM1. At the end of a digit, timer TM1 operates relay IDT (timer TM1 operates when relay PLS remains operated for a period greater than 70 ms). Operated relay IDT connects ground through a normal contact of relay GD to the hold input of the pulse amplifier, starts guard timer TM2, reconnects transformer T1 across the switch-train loop, and removes the short across inductor L4 and resistor R6. Thus, the pulse amplifier is held operated during the guard internal, and is independent of the customer loop. During this period, current from the switch train is passed through resistor R6 and inductor L4. Resistor R6 provides for continuous current flow from the switch train, while current is building in inductor L4.

2.04 After a 200-ms delay, timer TM2 operates from operated IDT. This operates relay GD, which removes the hold on the pulse amplifier and opens the path to resistor R6. With resistor R6 removed from the switch-train loop, all supervisory current passes through inductor L4. In this state, the coin trunk is ready to accept the next digit dialed, and provides pre-answer supervision toward the coin station. In this state, the trunk can pass audible signals between the coin station and the switch train via transformer T1. If another digit is dialed, the operation described in 2.03 and 2.04 is repeated.

DIAL-TONE-FIRST (APP FIG. 2)

2.05 The optional arrangement for dial-tone-first operation provides the means to count digits (DC-relays), count the pulses in a digit (P-relays), record digit translations (F, SD1, 410X, and X11 relays), connect the coin station to a recorded announcement (ANN relay), and to make an interdigital coin test (HLD, EID relays).

2.06 Operation of the digit register is controlled by relay IDT, which operates when the coin station goes off-hook and at the end of each digit dialed. The initial operation of relay IDT sets the digit register in its off-hook state by operating relay DC3. The register then counts each operation of relay IDT, with a maximum count of three, and provides control for the translator during translation of the A, B, and C digit, as required (see Table A).

TABLE A

Digit	IDT	DC1	DC2	DC3	Relays Remaining Operated at End of Digit
Off-Hook	Operate	-	-	X	DC3
1	Release	-	X	X	
	Operate	-	X	-	DC2
2	Release	X	X	-	
	Operate	X	X	X	DC1, DC2, DC3
3	Release	X	-	X	
	Operate	X	-	-	DC1

2.07 Operation of the pulse register is controlled by relay PLSA via a make contact of relay S, and normal contacts of relays GD, ANN, and EID. This register counts the operations of relay PLSA, and is cleared each time relay GD operates. Operation of relays ANN or EID, or the release of relay S, also clears (releases) the pulse register.

2.08 When the coin trunk is initially seized, the operation of relay PLSA operates relay P4. However, the translator (relays F, SD1, 410X, X11) does not sample the pulse-register output at this time, and the subsequent operation of relay GD (the hold

on the pulse amplifier guarantees that relay GD will operate (see 2.04)) releases relay P4. At the beginning of each digit (a maximum of three digits are counted), relay GD releases, enabling the pulse register.

2.09 When the first digit is dialed, the initial release of relay PLS releases timer TM1 and its output relay IDT. Released relay IDT advances the digit counter from its off-hook state (DC1 DC2 DC3 = 001) to a state which indicates the first digit is being received (DC1 DC2 DC3 = 011). The release of relay IDT also releases timer TM2 and its output relay GD. With relay GD released, the pulse counter (P-relays) counts the operations of relay PLSA as it responds to dial pulses (see Table B).

2.10 At the end of the first digit, recognized by a closed-loop condition greater than 70 ms, timer TM1 operates relay IDT (interdigital time). Operation of relay IDT advances the digit counter to its end-of-first-digit state (DC1 DC2 DC3 = 010), and starts the 200-ms guard timer TM2. During the guard-time interval, the digit counter connects the memory (relays F, SD1, 410X, and X11 provide the memory, while contacts of relays P- and DC- and cross-connections provide the translation function) to the pulse-register outputs. This connection is made over preselected cross-connections (see Note 401 of SD drawing for typical cross-connections), and as this is the first digit, the F relay will normally look for a ground on the 0 and 1 outputs of the pulse register (assumes 0 or 1 in the first digit position indicates a free call-no initial deposit required). If a ground is present, the F relay will operate and lock itself to ground through a contact of

TABLE B

Pulse	PLSA	P1	P2	P3	P4	P5	Relays Remaining Operated at End of Pulse
1	Release	-	-	-	-	-	
	Operate	-	-	-	X	-	P4
2	Release	-	-	X	X	-	
	Operate	-	-	X	-	-	P3
3	Release	-	X	X	-	-	
	Operate	-	X	X	X	-	P2, P3, P4
4	Release	-	X	-	X	-	
	Operate	-	X	-	-	-	P2
5	Release	X	X	-	-	-	
	Operate	X	X	-	X	-	P1, P2, P4
6	Release	X	X	X	X	-	
	Operate	X	X	X	-	-	P1, P2, P3
7	Release	X	-	X	-	-	
	Operate	X	-	X	X	-	P1, P3, P4
8	Release	X	-	-	X	X	
	Operate	X	-	-	-	X	P1, P5
9	Release	-	-	-	-	X	
	Operate	-	-	-	X	X	P4, P5
10	Release	-	-	X	X	X	
	Operate	-	-	X	-	X	P3, P5

the S relay. Operated relay F then operates the coin-present relay (CNP) via resistor F and a contact of the S relay. Operated relay CNP will cause relay EID (end interdigital) to operate when the guard interval is over (relay GD operated). If ground is not found on the 0 or 1 pulse-register outputs, the F relay will not operate. At the same time, however, the memory is examining selected pulse-register outputs (2 through 9) for a possible first digit of a free code. Provision is made for arranging the following codes for free calls.

(a) Digit 1, initially

(b) Digit 0, initially

(c) X11 service codes

(d) 410X service codes

A special arrangement is provided when both 411 and 410X service codes are provided. Detailed cross-connection information is explained in Note 401 of the SD drawing. If a free or potentially free code is not indicated in the first digit translation, all translation cross-connections to the memory are disabled when relay GD operates.

2.11 At the end of the 200-ms guard interval, relay GD operates and releases any operated P- relays (clears the pulse register), and opens the hold path to the pulse amplifier. The coin trunk is now ready to receive and repeat into the switch train, the next digit dialed.

2.12 The second and third digits are pulsed into the pulse register as described above, and read under control of the digit counter into the memory if an allowed first digit was recorded (relay 410X and/or X11 operated). If the second digit is a 1, memory relay SD1 is operated, enabling a path via DC- contacts to relay F (terminal X11A). If the third digit is a 1 (or a 0 for 410X codes), relay F is operated at the end of the third digit.

3. COIN TEST DIAL-TONE-FIRST

DIAL PULSE

3.01 The end-of-interdigital (EID) relay, operating when relays GD and CNP are operated, retires the digit-counter relays (DC-), the pulse-counter relays (P-) and, if operated, releases relay CNT. Thus, on 0-plus or 1-plus calls, operation of the F relay at the end of the first digit operates relay CNP, which causes relay EID to operate at the end of the guard interval. Hence, for this case the interdigital coin test will not be made and the second and third digits will not be recorded or translated.

3.02 If a nonfree code (initial deposit required) is indicated, the F relay does not operate and an interdigital coin test is made as follows. Operation of relay IDT at the end of the third digit advances the digit counter to a state that operates the coin-test relay (CNT) via normal ANN, EID, and make S contacts. This starts the interdigital coin test, releasing relay HLD and connecting relay CNP to the tip side of the station loop via diode CR5, inductor L1, and relay contacts I, CND, and CNT. Contacts of relay CNT open the ring lead toward the station during the test, causing the release of the station coin-ground removal relay (if provided). Relay CNP may operate during line charging; however, it is not "read" until 200 ms has elapsed. Thus, if a coin ground is present at the station, relay CNP will operate from the ground over the tip lead. At the end of the guard interval (200 ms) relay GD operates from timer TM2. Operated GD operates relay EID if a coin ground is present (CNP=1), or relay ANN if no coin ground is found (CNP=0). For the coin-present case, operated relay EID establishes a hold path for operate relay CNP via resistor F, releases the pulse and digit registers, and releases relay CNT. Released relay CNT reconnects the tip and ring to the ground and battery feed, and reoperates relay HLD. Slow-to-operate relay HLD holds the pulse amplifier operated, until the transient currents on the station loop decay. When relay HLD operates, the pulse amplifier hold is removed and the amplifier is enabled. Thus, the coin trunk is ready to repeate any further loop signals into the switch train. For the coin-not-present case, operated relay ANN opens the loop toward the switch train, places a loop seizure toward the Announcement Circuit, bridges the announcement output across the tip and ring toward the station, opens the tip and ring toward transformer T1, transfers the control of slow-release relay DYC to a contact of relay PLSA, and transfers the control of relay S to a contact of relay DYC. Thus, the coin trunk releases the switch train, applies an announcement toward the station, and supervises the station connection via the pulse amplifier.

3.03 If the coin test is made for a common control office, operation of relay EID connects battery toward lead CS to indicate a coin is present. This condition is detected by the common control when it requests a coin test over lead CS. The other functions of the interdigital coin test in a common control office are as described in 3.02.

"TOUCH-TONE" (APP FIG. 4)

3.04 With the coin trunk in its off-hook state (DC1 DC2 DC3 = 001), the trunk is ready to receive coin-test or free-call signals on the CS or IC lead from the register trunk or converter circuit, respectively. This signal lead is connected to the coin trunk battery-and ground-signal detector

through operated contact SSD3 and normal contact CCK, as described in 1.10 and 1.11.

3.05 When a coin test is required, the register or converter places a ground on the signal lead. This operates reed relay CCKD (coin-check detector) in the battery-and ground-detector circuit. Operated CCKD operates relay CCK, which locks itself through an early make contact to ground provided by a make S contact. In operating, relay CCK also opens the IC or CS signal lead. This releases reed relay CCKD, and connects the signal lead to battery through the PS resistance lamp, break contact FC, and make (not yet operated) contact EID. Operated CCK, with CNT normal, fast-recycles timer TM2 by connecting 1500-ohm resistor CCK to terminal 2 and removing battery from terminal 2 of timer TM2. This starts the release of relay GD (output relay of TM2) which, when released, operates relay CNT through operated contact CCK. Operated relay CNT starts the coin test as described in 3.02 and, in this case, starts the guard time TM2 by removing battery from terminal 1 and applying it to terminal 2. Operated CNT also removes the fast-recycle resistor CCK from terminal 2 of TM2. After 200 ms, TM2 operates relay GD, and relay EID or ANN operates as described in 3.02. If a coin is present, operated EID applies battery to the IC or CS signal lead through the path set up by operated relay CCK. This battery signal is a coin-present indication to the register or converter circuit.

3.06 When the register or converter translation indicates that the call is free (no initial deposit required), a battery signal is applied to the CS or IC lead toward the coin trunk. This operates reed relay FCD (free-call detector) in the battery and ground detector circuit. Operated FCD operates relay FC, which locks itself operated through an operated contact of the S relay. Operated relay FC operates relay F, and opens the PS lamp connection toward the CS or IC lead. Operated relay F operates relay EID, locks itself operated through an operated contact of relay S, and disables the reversal detector circuit. The trunk remains in this state until it receives answer or disconnect signals.

4. ANSWER AND CUT-THROUGH

GENERAL

4.01 The coin trunk detects answer supervision from the switch train with relay CT. This relay, which is polarized by shunt diode CT2, will operate when the switch train applies a reversal toward the coin trunk. The reversal makes the tip potential negative, relative to the ring lead. With this polarity applied, shunt diode CT2 is reverse-biased; thus, loop current from the switch train is passed through the 700-ohm winding of relay CT. Diode CT1 is forwarded-biased under this condition, bypassing inductor L4 and resistor R7. The path provided by diode CT1 aids the operation of relay CT, and clamps transient voltage surges by establishing a discharge path for the inductive energy in inductor L4.

DELAYED CHARGE AND CUT-THROUGH

4.02 When the switch train reverses the tip-to-ring potential, relay CT operates. Operated relay CT starts the release of slow-release relay DYC, and sets up an operated path to the charge-call relay (CC) through a break contact of relay DYC. Thus, if the reversal remains for a period greater than the release time of relay DYC, relay DYC releases and operates relay CC. Operated relay CC locks itself operated under control of operated relay SC, and cuts the tip and ring through metallic to the station. However, if the reversal is transient in nature, relay CT releases before slow-release relay DYC. This returns the coin trunk to its pulse-repeating state, and a charge condition is not set.

4.03 With relay CC operated, the coin trunk is cut through, removing transformer T1 and the pulsing circuitry from the tip and ring. Thus, relays PLS, PLSA, and CT release; released relay PLS releases timer TM1 and its output relay IDT, which releases timer TM2 and its output relay GD. When relay CC cuts the tip and ring through, the automatic coin-disposal detector is removed from the tip lead and the reversal detector CP 1 is connected. However, if the call is "free" (no initial deposit required) relay F is operated, opening the circuit to the reversal detector.

AUTOMATIC COIN DISPOSAL (ACD)

4.04 If the call terminates to a trunk arranged to provide automatic return of initial deposits, and if the coin trunk has not cut through before the application of the return potential, return potentials (single lead-tip only - or simplex) are detected by relay ACD. This relay, connected from ground to the tip lead through zener diodes ACD1 and ACD2, will operate if a potential greater in magnitude (either plus or minus) than 100 volts is present on the tip lead prior to cut-through. Thus, if relay ACD operates, it directly operates relay CC, setting the charge condition in the coin trunk and cutting the trunk through metallic. In cutting through metallic, the coin trunk passes the coin-disposal potential toward the coin station.

FREE CALL

4.05 When the coin trunk is equipped for dial-tone-first, a free-code call causes the F relay to operate (F is operated from internal dial-pulse translation or from signals received from TOUCH-TONE equipment). Operated relay F removes the reversal detector. On this type of call, the

terminating circuit is arranged such that ground is always applied to the tip lead; thus, the coin trunk is not required to detect reversals. Removal of the reversal detector also prevents the reversal detector from falsely operating, if the terminating circuit applies negative coin potential to the tip lead (see 10.03).

4.06 Free calls that terminate to circuits that return answer supervision-reversals (+48 volts on ring with tip grounded), cut the coin trunk through, and therefore, operated relay CC. Operated relay CC sets the coin trunk in its charge state and it will, upon disconnect, apply coin-collect potential toward the station.

CHARGE CALL

4.07 When a call terminates to a nonfree code (all calls if the coin trunk is arranged for prepay), the answer supervision signal (-48 volts on tip with ring grounded) causes the coin trunk to cut through by operating the charge-call relay CC. On this type call, relay CC connects the reversal detector to the tip lead. The negative potential on the tip lead is detected and relay REV operates. Operated relay REV reverses the tip and ring lead toward the coin station, preventing the supervisory battery at the terminating end from locking to the coin ground at the station. Operation of relay REV also operates the timed-disconnect (TD) relay from ground through operated contact CC and released contact IDT. The function of relay TD is described in 5.02.

5. DISCONNECT

CALLING PARTY FIRST

5.01 When the coin station goes on-hook, the loop is opened by the switch-hook contacts. This releases the supervisory relay in the associated selector, trunk, or connector.

> Note: If the coin trunk was not in its cut-through state at the time of disconnect, the disconnect is repeated into the switch train by the PLS relay.

This causes ground to be removed from the sleeve, releasing relay S; however, relay SC remains operated at this time and its contacts in the sleeve lead apply a holding ground toward the Line Finder Circuit. Coin-disposal potential is then applied by the coin trunk toward the station (see 6), and when the coin ground is cleared, the coin trunk restores to normal, releasing the Line Finder Circuit.

CALLED PARTY FIRST

5.02 When the called party goes on-hook first, the connector or trunk restores to normal polarity (negative on ring, ground on tip).

> Note: Recording-completing type trunks do not operate in this manner. For this type trunk, called-party disconnect simply passes supervision control to the coin station; therefore, the release of the switch train is always as described in 5.01.

Ground on the tip causes the reversal detector to release relay REV. Released relay REV removes the reversal toward the coin station, thereby maintaining ground on the tip lead toward the station. Released relay REV also starts a 12-second timing interval, by switching battery (through an operated contact of relay TD) from terminal 1 to terminal 2 of timer TM1. If the coin station goes on-hook before the 12-second timing has elapsed, the trunk releases as described in 5.01. However, if the coin station does not go on-hook, timer TM1 operates relay IDT. Operation of relay IDT releases relay S (the hold path to the sleeve lead for relay S was switched through a normal contact of relay IDT when relay TD operated). The release of relay S returns the coin trunk to normal as described in 5.01.

DISCONNECT FROM ANNOUNCEMENT SET (DIAL-TONE-FIRST)

5.03 When the coin station is connected to the announcement set, switch-hook supervision is provided by the pulsing circuit. Thus, when the station goes on-hook, relay PLS and PLSA release. The release of relay PLSA starts the release of slow-release relay DYC, which was placed under control of relay PLSA when relay ANN operated. When relay DYC releases, it releases relay S via an operated contact of relay ANN. Released relay S starts a coin-return cycle to provide a return of any coin(s) which may have been deposited after the interdigital coin test. The coin trunk then restores to normal, releasing the Line Finder Circuit.

6. COIN DISPOSAL

GENERAL

6.01 The coin-disposal function is initiated when the S relay releases, with relay SC operated. Operated relay SC holds a ground on the sleeve lead toward the Line Finder Circuit during the coin-disposal operation. Relay SC is released by relay ECD (end coin disposal) when the coin ground is cleared. This returns the coin trunk to its normal state (all relays released), and releases the Line Finder Circuit.

6.02 The coin-control circuitry (FS 3) may be arranged to provide a limited (option Ⓦ) or unlimited (option Ⓥ) number

of attempts to clear a "stuck coin". With option (W), the number of attempts is limited by the Coin Trunk Timed Release Circuit. With option (V), coin-disposal attempts will continue until the coin ground is cleared.

6.03 The polarity of the coin disposal applied toward the coin station is controlled by relay CC. This relay, which operates if answer supervision is returned to the coin trunk, will cause collect or return potential to be applied for its operated or normal states, respectively.

6.04 The coin trunk provides single-lead coin control toward the station. This method of coin control (coin potential on the tip with the ring open) allows this trunk to work into coin stations equipped with a ground-lifting relay.

DISPOSAL SEQUENCE (SC6)

6.05 Release of relay S with relay SC operated, connects battery through lamp CND and parallel resistor CND to the A lead of the interrupter circuit. At the same time, relay CND is connected to the P lead of the interrupter circuit. After a delay of 0 to 500 ms, the interrupter circuit returns ground on the P lead, operating relay CND. Operated relay CND locks itself operated through a contact of relay SA, connects relay I to interrupter lead I, connects relay CNP to the make contact of relay CP, and transfers control of timer TM2 to a make contact of relay I.

6.06 On the next cycle of the interrupter circuit, ground is returned to the coin trunk on lead I, operating relay I. Operated relay I operates relay CNT through a make contact of relay CND, and opens the operate circuit to slow-release relay CNPA. When relay CNT operates, coin-disposal potential is applied toward the coin station through a make or break contact of relay CC, through diode bridge, resistor and relay CP, and through make contacts of relays I and CNT. A break contact of relay CNT opens the ring lead toward the coin station. The coin ground at the station causes relay CP to operate (relay CP may operate and release on line charging even if no coin ground is present). Operated relay CP provides a hold path for slow-release relay CNPA, which started to release when relay I operated. Relay CP remains operated as long as coin-ground current exists.

6.07 The state of relay CNP is masked during the first 200-ms of the 500-ms interrupt cycle by the output relay (GD) of timer TM2. This prevents false operation of the end of coin disposal (ECD) relay during any transient release of relays CP and CNP. At the end of the 200-ms guard interval relay GD operates, placing relay ECD under control of a normal contact of relay CNP. Thus, if the coin ground is cleared (coin returned or collected) before the end of the interrupt cycle, relays CP and CNP release, operating relay ECD. Operated relay ECD locks itself operated through a make contact of relay CND, and releases relay SC. When relay SC releases, it releases the Line Finder Circuit, relay SA, and the interrupter circuit. Released relay SA releases CND, which releases relays CNT, I, ECD, and GD, returning the coin trunk to its normal state.

6.08 If more than one interrupt cycle is required to dispose of the coin(s), or if there is a stuck coin, the interrupter releases relay I. Released relay I opens the operate path to relay ECD, and recycles timer TM2, releasing relay GD. On the next interrupter cycle the sequence of 6.06 and 6.07 is repeated. Thus, repeated disposal attempts are made until the coin ground is removed, or until the timed release circuit (option (W)) removes battery from relay CNP; whereupon, the coin-trunk release sequence of 6.07 takes place.

7. FALSE PULSE OR TROUBLE CONDITION (DIAL-TONE-FIRST)

GENERAL

7.01 When a coin trunk is associated with common control or noncompatible TOUCH-TONE equipment, this equipment must be seized before dial-pulse information can be handled by the central office. Thus, the coin trunk is arranged to apply coin return toward the coin station, and release itself and its Line Finder Circuit if pulses are received before the central office seizure is complete.

7.02 If the seizure of the central office equipment is not complete before loop pulses are received, relay SSD3 is normal (see 1.10 and 1.11). The pulse(s) received cause the digit counter (DC-) to advance from its off-hook state, opening the remaining circuit to relay S. Thus, relay S releases and the coin trunk enters its coin-disposal sequence (see 6).

"TOUCH-TONE"

7.03 If a TOUCH-TONE circuit encounters a trouble condition and cannot complete a call, it will return reorder tone to the coin station. Disconnect by the coin station, during the reorder interval, will restore all circuits to normal as described in 5.01. If the coin station remains off-hook, the reorder interval terminates, and a coin-check signal is sent to the coin trunk. The coin-check signal operates relays CCKD and CCK in the coin trunk. If a no-charge indication was previously sent (relay F operated), or if the trouble was caused by loop pulses (DC- relays advanced from off-hook state), operated relay CCK releases relay S. This restores all circuits to normal (see 6). If relay F is normal and the digit register (DC- relays) is in its off-hook state, operation of relay CCK will initiate a coin test (see 3.05). If a coin is present, the coin trunk will supervise

the loop toward the coin station and return all circuits to normal if any loop pulses or a disconnect signal occurs. However, if no coin is found, the station is connected to the Announcement Circuit (see 5.03).

8. PERMANENT SIGNAL (APP FIG. 5)

8.01 Relays PS and PS1, and resistance lamp PS, provide the coin trunk with a means to count timing pulses from the central office common timing circuit. Wire option (M) is used if the timing-circuit output is battery; option (N) is used if the output signal is ground.

8.02 The permanent signal circuitry is activated when relay S operates. This connects relay PS to the common timing circuit through a break contact of relay CNP and an operated contact of relay ANN, or a break contact of relay CC. When battery (option (M)) or ground (option (N)) is returned, relay PS operates and transfers its connection from the timing circuit to a holding battery or ground, respectively. In operating, relay PS connects relay PS1 through to the timing circuit. If relay PS is not released (CNP operates or relay CC operates with relay ANN normal), the next timing pulse operates relay PS1. Operated relay PS1 transfers its connection from the timing circuit to a holding ground, through an operated contact of relay PS. The operation of relay PS1 opens the loop start leads (ST and ST1) toward the Announcement Circuit, and connects ground to terminal 26 and 27 of terminal block B.

8.03 Thus, permanent-signal outputs are provided when the coin trunk is seized, without the return of answer supervision (relay CC operated), for a period greater than its timing interval, or for dial-tone-first, when a connection to the Announcement Circuit (relay ANN operated) exists for a period greater than the permanent-signal timing interval.

9. CIRCUIT PACK ONE

GENERAL

9.01 Circuit pack one contains three independent circuit functions: an automatic coin-disposal detector, a reversal detector, and a controlled-pulse amplifier. Each of these circuits is described in the following paragraphs.

AUTOMATIC COIN DISPOSAL DETECTOR (P/O CP 1)

9.02 Zener diodes CR1 and CR2, resistor R5, and reed relay K1, form a detector which operates if a voltage in excess of ±100 volts is applied to terminal 3. The application of +100 volts to terminal 3 will forward-bias diode CR1 and break down reverse-biased diode CR2. Diode CR2 will, in this case, nominally drop 68 volts; thus, the remaining voltage of 32 volts will be dropped across the series combination of resistor R5 and relay K1, operating the relay. The application of -100 volts to terminal 3 results in a similar operation, with the roles of diodes CR1 and CR2 interchanged.

9.02 When relay K1 operates, ground is applied to terminal 1. Diode CR3 provides contact protection for the dry-reed contact of relay K1, and is externally connected to the input side of the load driven by contact K1.

9.03 If voltages less than the breakdown of diodes CR1 or CR2 are applied to terminal 3, the reverse-biased diode blocks current flow and prevents relay K1 from operating (application of this circuitry is given in 4.04).

REVERSAL DETECTOR (P/O CP 1)

9.04 Transistors Q3, Q4, and Q5 form a high-gain dc amplifier. The output of this amplifier drives reed relay K2. Resistors R13 and R12 provide a threshold bias at the emitter of transistor Q4. This bias (nominally 41 per cent of the local battery potential) establishes the voltage that must be exceeded at terminal 0 before the amplifier will become active. Capacitor C3 and external resistors R7 and R8 (P/O CP 2, 3, or 4) form a low-pass filter at the input to the amplifier.

9.05 When the voltage across C3 becomes approximately 2 volts more negative than the voltage at the emitter of Q4, the amplifier turns ON and operates relay K2. Operated relay K2 applies a ground to terminal 16. The amplifier turns OFF, releasing relay K2 when the voltage across C3 becomes less negative than the threshold. Diode CR7 provides contact protection for dry-reed contact K2 (application of this circuitry is given in 4.07).

CONTROLLED PULSE AMPLIFIER (P/O CP 1)

9.06 Transistor Q1 is a dc amplifier and provides output current to an external relay (PLS) connected to terminal 11. Resistor R3, and varistors RV1 and RV2 provide a threshold bias at the emitter of transistor Q1. Resistors R4 and R21 provide current limiting for the collector circuit of Q1. Resistor R1 provides current limiting for the base of Q1 and isolation for the external circuitry connected to terminal 15. Resistor R2 provides current limiting for the hold input to the base of Q1.

9.07 Transistors Q2 and Q6 form a single-shot (monostable) multivibrator. Diodes CR5 and CR6 provide current switching for trigger and output signals, respectively, which have a common node at the collector of transistor Q2. Resistor R21 provides current limiting for output current from the collector of Q2, and resistor R4 provides

current limiting for current between the collectors of transistors Q1 and Q2. Trigger pulses are developed across resistor R6 and are coupled to the collector of Q2 by capacitor C1. Precision components R17 and C2 establish the timing period for the quasi-stable state of the single-shot multivibrator. Diode CR9 provides reverse-bias protection for the base-emitter junction of transistor Q6. Resistor R11 and capacitor C4 provide filtering for the battery supplied to the single-shot multivibrator.

9.08 Transistor Q1 turns ON for input voltages at terminal 15 that are more than 3 volts above battery. When Q1 is ON, it draws current from ground through an external relay (PLS) into terminal 11, through resistors R21 and R4, through its collector and emitter, through varistors RV1 and RV2 to battery. At this time, the single-shot multivibrator is in its monostable state (Q6 ON and Q2 OFF). Thus, the anode of CR4 is held at a potential near the battery supply and is reverse-biased. The cathode of diode CR5 is returned to ground through R6 and is, therefore, also reverse-biased. Thus, the circuitry is in a stable state and will remain so, until the drive signal at terminal 15 is dropped below the turn-on level of transistor Q1. Note, however, that if terminal 27 (hold) is grounded, base drive for Q1 is provided through R2. If present, this drive will hold transistor Q1 ON independent of signals applied to terminal 15.

9.09 When the drive signal is removed from terminal 15 (voltage less than 2 volts above battery), transistor Q1 turns OFF. However, the inductive load connected to terminal 11 (relay PLS) has built up inductive energy during the time Q1 was ON. This energy momentarily causes current to flow into terminal 11, forward-biasing diode CR5. Thus, this diode turns ON and a positive, relative to ground, trigger pulse is developed across resistor R6. This pulse is coupled to the collector of transistor Q2 by capacitor C1 and causes the single-shot multivibrator to switch to its quasi-stable state. Thus, transistor Q2 turns ON, and transistor Q6 turns OFF. The single-shot multivibrator remains in this state for 43 ms, and during this time, ON transistor Q2 is holding the anode of diode CR4 near ground potential. Thus, if transistor Q1 is driven ON during the quasi-stable interval, collector current for Q1 is supplied from transistor Q2, through diode CR4 and resistor R4. This prevents Q1 from driving the load attached to terminal 11 (PLS relay). After the timing interval, the single-shot multivibrator returns to its monostable state (Q2 OFF, Q6 ON). With Q2 OFF, Q1 will draw current from the load (terminal 11) when it is driven ON.

9.10 The input signals to the pulse amplifier (terminal 15) are passed through a filter. This filter, which is not part of CP 1, is made up of a low-pass section (inductor L1 and resistor PLS) and a series-resonant trap (inductor L3 and capacitor FC) connected across the PLS resistor. This trap, which resonates at 60 Hz, provides rejection of longitudinal power which may be present on the station loop (see Working Limits). A description of the pulsing function is given in 2.

10. CIRCUIT PACKS TWO, THREE, FOUR, AND FIVE

10.01 Circuit packs two, three, four, and five are component circuit packs. As such, they are essentially mounting facilities for components. Therefore, with two exceptions, the description of the components is given in the body of this CD. The exceptions are the battery and ground detector which is described in 10.02 and the inhibit amplifier described in 10.03.

10.02 The battery and ground detector circuit (P/O CP 4) is comprised of components R5, R6, K1, K2, CR2, and CR3. When the circuit is activated, battery and ground is applied across voltage-divider resistors R5 and R6 (terminals 11 and 3). Thus, with no signal applied to the input (terminal 8), relays K1 and K2 are biased at one-half the battery voltage. This causes diode CR3 to be forward-biased when battery is applied to terminal 8; likewise, diode CR2 is forward-biased when ground is applied. Thus, operation of relay K2 indicates the presence of a battery signal, and operation of relay K1 indicates the presence of a ground signal.

10.03 The inhibit amplifier (P/O CP 3 and CP4) is comprised of components Q1, R11 through R14, CR7 through CR10, and C1. This amplifier becomes active if a negative potential in excess of 90 volts is applied to terminal 12. Thus, when terminal 12 is connected to the tip lead (through normal contacts of external relays REV and F) and with terminal 16 connected to the input of the reversal detector (P/O CP 1) any negative coin potentials applied to the tip lead will activate the inhibit amplifier. This causes transistor Q1 to provide sufficient current to prevent the operation of the reversal detector (P/O CP 1). Resistor R_B, capacitor C1, and diodes CR9 and CR10 form a network which provides for a fast "turn-on" and delayed "turn-off" of transistor Q1. The turn-off is delayed to mask the line discharge at the end of a coin disposal cycle. Resistors R11 and R12 in conjunction with diode CR8 provide lightning protection and diode CR7 establishes the amplifiers turn-on threshold.

11. TAKING CIRCUIT OUT OF SERVICE

11.01 When the MB key is operated, ground is extended to the MB relay through a break contact of relay SA. If the circuit is busy when the key is operated, relay SA will be operated and relay MB will not operate.

11.02 When relay MB operates, it locks to ground through operated contacts of the MB key. This shunts-down thermistor MB and provides a hold path for the MB relay around the contacts of relay SA. Other contacts of relay MB connect the tip lead of jack TJF to the tip, remove tip and ring bridge circuit across jack TJS, and split the sleeve lead, applying ground toward the associated line finder.

12. TEST JACKS

TJF

12.01 Access to the input tip, ring, and sleeve is provided by jack TJF. This jack is enabled when the MB relay is operated.

12.02 Insertion of a plug in jack TJF causes ground to be applied to the pulse amplifier through a normal contact of relay SC. This action enables the pulse amplifier, allowing the trunk to be seized over a 2-wire loop circuit (a sleeve ground is not required).

TJS

12.03 Access to the output (selector side) tip, ring, and sleeve is provided by jack TJS. With relay MB operated, insertion of plug-in jack TJS cuts off the associated selector and opens the sleeve connection to jack TJF.

12.04 Pulse-repeating tests are made by blocking relay S operated, and connecting the pulsing test set to jacks TJF and TJS.

13. CLASS OF SERVICE TONE - LINE NO. METHOD OF COIN CONTROL - FS 11

13.01 Where the line-number method of coin control is used, a class-of-service tone is required. Transmission of the tone over the sleeve lead is provided by option (X).

13.02 Connection to the A lead is provided in FS 11. Option (R) provides a 3000-ohm ground and option (Q) provides a direct ground for the A lead.

14. USE IN OFFICES EQUIPPED WITH CAMA TRUNKS

14.01 A direct ground is required on the A lead to restrict coin lines from CAMA trunks. This ground is provided by option (Q) of FS 11.

15. LINE IDENTIFICATION

15.01 The ABC capacitor allows an identifying tone or pulse to pass over the sleeve lead, from the Selector Circuit to the Line Finder Circuit. This capacitor, option (X) or (Y), is provided where the identification of coin lines is required in offices employing ANI-type B, ANI-type C, or number checking.

15.02 Inductor AB, option (X), maintains a low-resistance ground toward the line-finder sleeve, and provides a high impedance to the transmission of identifying tones over the sleeve lead, in offices with ANI-type B or number checking. Diode AC, option (Y), also maintains a low-resistance holding ground on the line-finder sleeve, and is used to provide a high impedance to identifying pulses over the sleeve, lead, in offices with ANI-type C.

16. CUTOFF KEY FOR A, I, AND P LEADS

16.01 To aid in locating troubles, the A, I, and P leads are carried through the CO key of FS 13. This provides a means of isolating the trunks into groups, located in the upper or lower half of a relay-rack bay.

16.02 When the CO key is operated, the red CO lamp is lighted.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Dialing Range:

(a) Maximum external circuit resistance, 1800 ohms.

(b) Maximum external circuit resistance using a 2A range extender, 2000 ohms.

1.02 Supervisory Range:

(a) Maximum external circuit resistance: 2400 ohms.

1.03 AC Longitudinal Voltage:

(a) For loops less than 500 ohms, 10 Vrms.

(b) For loops greater than 500 ohms and less than 1800 ohms, 20 Vrms.

1.04 Ground potential limits, ±3 volts

1.05 Minimum insulation resistance, 15000-ohms leak.

1.06 Battery limits, 45 to 52 volts.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays (App Fig. 1)

Designation	Meaning
CC	Charge Call
CND	Coin Disposal
CNP	Coin Present
CNT	Coin Test
CP	Coin Present
CT	Cut Through
DYC	Delay Charge
ECD	End Coin Disposal
GD	Guard
I	Interrupter
IDT	Interdigital Time
MB	Make Busy
PLS	Pulse
PLSA	Pulse Auxiliary
REV	Reverse
S	Sleeve
SA	Sleeve Auxiliary
SC	Seizure Complete
TD	Timed Disconnect

2.02 Relays (App Fig. 2)

Designation	Meaning
ANN	Announcement
DC1, DC2, DC3	Digit Count
EID	End Interdigital
F	Free
HLD	Hold
P1, P2, P3, P4, P5	Pulse Count
SD1	Second Digit One
X11	Code X11
410X	Code 410X

2.03 Relays (App Fig. 4)

Designation	Meaning
CCK	Coin Check
FC	Free Call
SSD1, SSD2, SSD3	Seizure Signal Detector

2.04 Relays (App Fig. 5)

Designation	Meaning
PS, PS1	Permanent Seizure

2.05 Jacks (App Fig. 1)

Designation	Meaning
TJF	Test Jack Finder (side)
TJS	Test Jack Selector (side)

2.06 Keys

Designation	Meaning
CO (App Fig. 3)	Cutoff
MB (App Fig. 1)	Make Busy

2.07 Lamps

Designation	Meaning
CO (App Fig. 3)	Cutoff
MB (App Fig. 1)	Make Busy

3. FUNCTIONS

GENERAL

3.01 To provide for connecting a prepayment or dial-tone-first coin station to a first selector or Selector Repeater.

3.02 To recognize a sleeve ground and subsequent loop closure from a rotary line switch or line finder.

3.03 To provide for transmission of dial-tone from the Selector Circuit to the coin station.

3.04 To repeat dial pulses into the switch train with a minimum break time of 40 ms.

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

3.06 To automatically collect the coin on completed calls to stations that return answer supervision.

3.07 To defer setting the charge condition until 300 to 620 ms after answer by the called party.

3.08 To indicate a trunk which has failed to dispose of a coin.

3.09 To provide a direct or 3000-ohm ground on the A lead, option Ⓠ or Ⓡ, for restricted access to CAMA or line-number method class of service, respectively.

3.10 To recognize answer supervision, and extend the talking path through metallic with deferred charge (see 3.07).

3.11 To cut the tip and ring through metallic, without deferred charge, if coin potential is applied before answer supervision is recognized.

3.12 To recognize called-party disconnect and release the switch train, if the coin station does not go on-hook within 12 seconds.

3.13 To make the circuit test busy when removed from service.

3.14 To permit identification of the calling number where ANI-type B or ANI-type C is provided.

DIAL-TONE-FIRST

3.15 To count dial pulses.

3.16 To count the first three digits, if the first digit is not a free code.

3.17 On dial pulse calls, to translate a maximum of three digits to determine if a coin deposit is required.

3.18 To test for the presence of a coin in the coin station, after the third dial pulse digit on calls requiring a coin deposit.

3.19 To disable the coin-present test on calls not requiring a coin deposit.

3.20 To route the call to an announcement after the third digit on dial pulse calls, if the call requires a coin deposit and a coin is not present in the coin station.

3.21 To route the call to an announcement on TOUCH-TONE calls, if a coin-check request is made and a coin is not present in the coin station.

3.22 To disconnect the coin station for common control and noncompatible TOUCH-TONE if:

(a) Any pulses are received before the register or converter circuit is attached.

(b) On a TOUCH-TONE call, a no-deposit required signal (free call) is followed by a coin-check signal.

3.23 To test for the presence of a coin in the coin station, when signaled (coin-check signal) by TOUCH-TONE equipment.

3.24 To disconnect from the announcement if the coin station goes on-hook.

3.25 To recognize a permanent-signal condition exists, and to disconnect the announcement if the station remains off-hook past a 2-to 4-minute timed interval.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key sheet, the information thereon shall be followed (see Table C).

TABLE C

GENERAL

Circuit	No. 1 or 350A	360A	No. 355A	35E97
Line Finder Circuit	SD-31530-01*	SD-31530-01	SD-32000-01*	SD-32000-01
Selector Circuit	SD-30200-01*	SD-30200-02*	SD-31735-01*	SD-30910-01*
Interrupter and Alarm Circuit for Prepay Coin Trunks	SD-30852-01*	SD-31975-01	SD-31975-01	SD-31975-01
Coin Trunk Timed Release Circuit	SD-31861-01	SD-31861-01	SD-31861-01	SD-31861-01
Subline Circuit Equipped With Rotary Line Switch	SD-31259-01	SD-31259-01	SD-31259-01	
Miscellaneous Alarm Circuit for Prepayment Coin Box Trunks		SD-31978-01	SD-31978-01	SD-31978-01
Selector Repeater	SD-31914-01*		SD-31914-01*	
Pulsing Test Set	SD-90469-02	SD-90469-02	SD-31858-01	SD-31858-01
Timing Circuit for Coin Trunks	SD-31893-01 or Special SD-32115-01		SD-31893-01 or Special SD-32115-01	
Interrupter and Alarm Circuit To Provide a Delay Interval for Use With 804C Ringing Power Plant	SD-32180-01		SD-32180-01	
DIAL-TONE-FIRST				
Converter Trunk TOUCH-TONE Calling	SD-32326-01	SD-32326-01	SD-32326-01	SD-32326-01
Register Trunk and Link (Trunk Position)	SD-34535-01	SD-34535-01	SD-34535-01	SD-34535-01
Common Timing or Miscellaneous Alarm Circuit	No. 1 SD-31558-01* 350A SD-31330-01*	SD-31209-01	SD-32192-01	H61417, H61576 H61176
Amplifier Circuit	SD-92581-01	SD-92581-01	SD-92581-01	SD-92581-01
Announcement Circuit	SD-95283-01	SD-95283-01	SD-95283-01	SD-95283-01

*Typical circuit.

5. MANUFACTURING TESTING REQUIREMENTS

INTERMEDIATE REQUIREMENT FOR CIRCUIT PACKS

5.01 General

(a) All circuits packs shall be tested for proper operation after manufacture, as described in these requirements. Any circuit pack that does not pass its requirements shall be considered defective, and if repaired, shall be retested.

(b) Each circuit pack must pass a mechanical inspection before power is applied.

(c) A circuit pack must not be inserted or removed from its test setup, unless the power is turned off.

5.02 Circuit Pack One

(a) Test Equipment

1 - 905B connector or equivalent

2 - 48 Vdc lamp and socket

1 - DC milliampmeter which can be conveniently read at 20 and 1 milliamperes. Internal resistance must be less than 50 ohms for 20-mA range; accuracy ±5%.

Resistors:

1 - 56 kohms ±5%, 1/4 watt

1 - 1.8 kohms ±5%, 1/4 watt

1 - 5.6 megohms ±5%, 1/4 watt

1 - 3.3 megohms ±5%, 1/4 watt

(b) Power Supply

1 - -50 ±0.5 Vdc, 0.25 ampere

1 - 0 to 100 Vdc variable, 0.02 ampere

(c) Preliminary Preparation

(1) Connect milliampmeter positive (+) lead to ground and negative (-) lead to terminal 11 of the connector.

(2) Connect one end of the 56-kohm resistor to ground and the other end to terminal 15 of the connector.

(3) Connect one end of the 1.8-kohm resistor to the -50 Vdc supply and the other end to terminal 15 of the connector.

(4) Connect the -50 Vdc supply to terminal 17 of the connector, and ground to terminals 18 and 13.

(5) Connect one side of lamp L16 to the -50 Vdc supply and the other side to terminal 16.

(6) Connect one side of lamp L1 to the -50 Vdc supply and the other side to terminal 1.

(d) CP 1 Test. Perform tests in the order indicated.

(1) Observe reading on milliampmeter. The meter must indicate a current flow less than 1 milliampere.

(2) Disconnect the 1.8-kohm resistor from terminal 18 and observe the reading on the milliampmeter. The meter must show a reading greater than 17 milliamperes.

(3) Disconnect the 56-kohm resistor from terminal 15 and connect ground to terminal 27. The meter must show a reading greater than 17 milliamperes. The meter may now be disconnected.

(4) Observe that lamps L1 and L16 are extinguished.

(5) Connect one side of the 5.6-megohm resistor to the -50 Vdc supply and the other side to terminal 0. L16 must light while L1 remains extinguished.

(6) Connect one side of the 3.3-megohm resistor to ground and the other side to terminal 0. L16 must extinguish.

(7) Connect the positive side of the variable dc supply to terminal 3 and the negative side to ground.

(8) Increase the variable supply voltage to a reading of 60 volts. L1 must remain extinguished.

(9) Increase the variable supply voltage to a maximum reading of 100 volts. L1 must light for a voltage between 60 and 100 volts.

(10) Turn off and reconnect the variable supply, so that its negative side is connected to terminal 3 and its positive side is grounded. Repeat steps (8) and (9).

5.03 Circuit Packs Three and Four

(a) Test Equipment

1 - 905B connector or equivalent

1 - DC milliampmeter which can be conveniently read at 10 milliamperes and 10 microampheres; accuracy ±5 percent.

(b) Power Supply

1 - 0 to 100 Vdc variable, 0.02 amphere

(c) Preliminary Preparation

(1) Connect the positive terminal of the power supply to CP terminal 13 and to the positive terminal of the milliampmeter.

(2) Connect the negative terminal of the milliampmeter to terminal 16.

(3) Connect the negative supply terminal to CP terminal 12.

(d) CP Test - Perform test in order indicated.

(1) Increase the supply voltage to 50 volts. Milliampmeter shall read less than 10 microamphères.

(2) Increase the supply voltage to 90 volts. Milliampmeter shall read greater than 1 milliampere.

5.04 Circuit Pack Four

(a) Test Equipment

1 - 905B connector or equivalent.

2 - 48 Vdc lamp and socket

1 - Resistor 1.1 kohms ±5%, 2 watts

(b) Power Supply

1 - -50 ±0.5 Vdc, 0.25 amperes

(c) Preliminary Preparation

(1) Connect one end of the 1-kohm resistor to terminal 8 of the connector.

(2) Connect the negative terminal of the dc supply to terminal 11 of the connector, and ground to terminal 3.

(3) Connect one side of a lamp L4 to battery and the other side to terminal 4.

(4) Connect one side of lamp L10 to battery and the other side to terminal 10.

(d) CP 4 Test. Perform tests in the order indicated.

(1) Observe that lamps L4 and L10 are extinguished.

(2) Connect battery to the free end of the 1.1-kohm resistor L10 must light while L4 remains extinguished.

(3) Remove battery from the 1.1-kohm resistor. L10 extinguishes.

(4) Connect ground to the free end of the 1.1-kohm resistor. L4 must light while L10 remains extinguished.

END REQUIREMENTS

5.05 The following test equipment is required.

1 - 3A Pulse Generating Test Set SD-95686-01

1 - Pulse Checking Test Set SD-96362-01

1 - 1800-ohm resistor

1 - 10,000 or better ohm-per-volt dc volt meter

1 - 200-ohm resistor

5.06 Power Supply

1 - -48 +0.5 Vdc, 1 ampere

1 - -110 ±10 Vdc, 0.2 ampere

1 - +110 ±10 Vdc, 0.2 ampere

5.07 Continuity Test

(a) All components covered by individual manufacturing testing specifications shall have met their own testing requirements before overall testing is performed.

(b) Connect -48 Vdc to terminal 11 and ground to terminal 51 of terminal strip B.

(c) Connect -110 Vdc to terminal 33 and +110 Vdc to terminal 13 of terminal strip B. Ground the positive and negative sides of the -110 Vdc and +110 Vdc supplies, respectively.

(d) Manually operate each relay individually and observe that it does not remain operated.

5.08 Supervision and Pulsing Test

(a) Insulate the following contacts:

(10B)TD

(11B)TD

(11B)REV

(b) Remove circuit pack TM1.

(c) Operate the MB key, and observe that the MB lamp is lighted and that the MB relay is operated.

(d) Connect the pulse generating test set to the line-finder side test jack TJF or to terminals 58 and 48 of terminal strip B.

(e) Connect the tip lead from jack P of the pulse checking test set to 8(PLS) and the ring lead of jack P to 9(PLS).

(f) Pulsing Test-Minimum Break:

(1) Input: 1800 ohms connected in series with the pulsing contacts of the pulse generating test set with continuous pulsing at 12 PPS, and 30 percent break applied to test jack TJF or terminals 58 and 48 of terminal strip B.

(2) Output: The pulse checking test set shall read minimum 45 percent break (maximum 58 percent break).

(g) Pulsing Test-Maximum Break:

(1) Input: Connect as in (f) with continuous pulsing at 12 PPS and 64 percent break.

(2) Output: maximum 68.5 percent break.

(h) Remove insulators and pulsing test equipment; install circuit pack TM1 and release MB key.

5.09 Cut-Through Test

(a) Operate the MB key, and observe that the MB lamp is lighted and that the MB relay operates.

(b) Block relay S operated.

(c) Plug a 1011G handset into jack TJF. Operate MON SWITCH to TALK position and observe that relays PLSA, IDT, DG, DYC, and SC operate.

(d) Apply -48 volts to the ring, and ground to the tip at jack TJS and observe that relay CT does not operate.

(e) Apply -48 volts to the tip, and ground to the ring at jack TJS and observe that relay CC and REV operate (relay CT will operate momentarily and relay DYC will release), and that relays PLSA, IDT, and GD release.

End Result: -48 volts at the ring, and ground at the tip of jack TJF.

(f) Remove all blocking tools, the handset, and the battery connections at jack TJS.

(1) Re-establish trunk seizure by repeating steps (a), (b), and (c) of 5.08.

(2) Apply -100 volts to the tip at jack TJS and observe that relay CC operates.

(g) Repeat step (f) and (f)(1). Apply +100 volts to the tip at jack TJS and observe that relay CC operates.

(h) Remove all blocking tools, the handset, and the battery connections at jack TJS.

5.10 Coin Test

(a) Block relay CNT operated, and apply a ground through 2000 ohms to the tip at jack TJF.

(b) Observe that relay CNP operates.

(c) Remove blocking tools.

5.11 Coin Disposal

(a) Block relays CNT, and CND operated, and apply a ground through 2000 ohms to the tip at jack TJF.

(b) Block relay I operated and observe that relay CNP operates.

5.12 Remove all blocking tools and test connections.

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