

## KS-21250, L2 COIN CRAFTS' TEST SET

### 1. GENERAL

1.01 This section provides identification, operation, and maintenance for the KS-21250, L2 Coin Crafts' Test Set (Fig. 1).

1.02 Whenever this section is reissued, the reason(s) for reissue will be listed in this paragraph.

1.03 The KS-21250, L2 test set is a portable, self-contained test set for use in testing coin telephone components and the interaction between the coin telephone set and the central office (CO).

### 2. IDENTIFICATION

2.01 The KS-21250, L2 test set is housed in a metal case approximately 8-1/4 inches wide, 6-1/2 inches high, 7 inches deep, and weighs about 5 pounds. It has a hinged cover and a carrying strap. The test set is powered by twelve 1-1/2 volt AA batteries (not furnished with set).

2.02 The features of the test set are as follows:

- (a) Hinged cover with spot-welded brackets for coiling test cord, fastening test clips, storing instruction booklet, and restoring power switch to OFF position when cover is closed. The hinged cover may also be removed for easy positioning of test set while working.
- (b) W4CN four-conductor test cord to connect test set to coin telephone set with color coded insulators on test clips.
- (c) Three square headed terminals marked RING, TIP, and GND for bridging of craft hand test set.
- (d) Power off/on switch.

- (e) Battery check switch and associated light emitting diode (LED) for visual test of batteries.
- (f) Coin relay operate switch and associated neon indicator lamp for field testing of coin relay.
- (g) Coin relay battery off/on switch to provide battery for the coin relay operate and timing circuit.
- (h) Coin return-coin relay timing/coin collect (CR-TIME/CC) switch for testing the operation and timing of the coin relay.
- (i) Fast and slow LEDs as visual indicators of coin relay timing test.
- (j) Loop battery off/on switch for providing local battery to test coin telephone set independent of CO.
- (k) -48/+48 switch for reversing local loop battery to simulate normal CO or positive CO battery condition.
- (l) Normal/sample hold switch provides opportunity to display sequence signals from CO in normal sequence timing (approximately 1/2 second) or sample and hold display of signals for approximately 4-1/2 seconds.
- (m) Seven LEDs for visual indication of (CO generated) sequence tests, loop battery, polarity tests, and loop current and foreign EMF tests.
- (n) 23MA detector switch for making loop current test.
- (o) Loop margin off/on switch for introducing 10-percent loop loss when testing marginal loop battery conditions.

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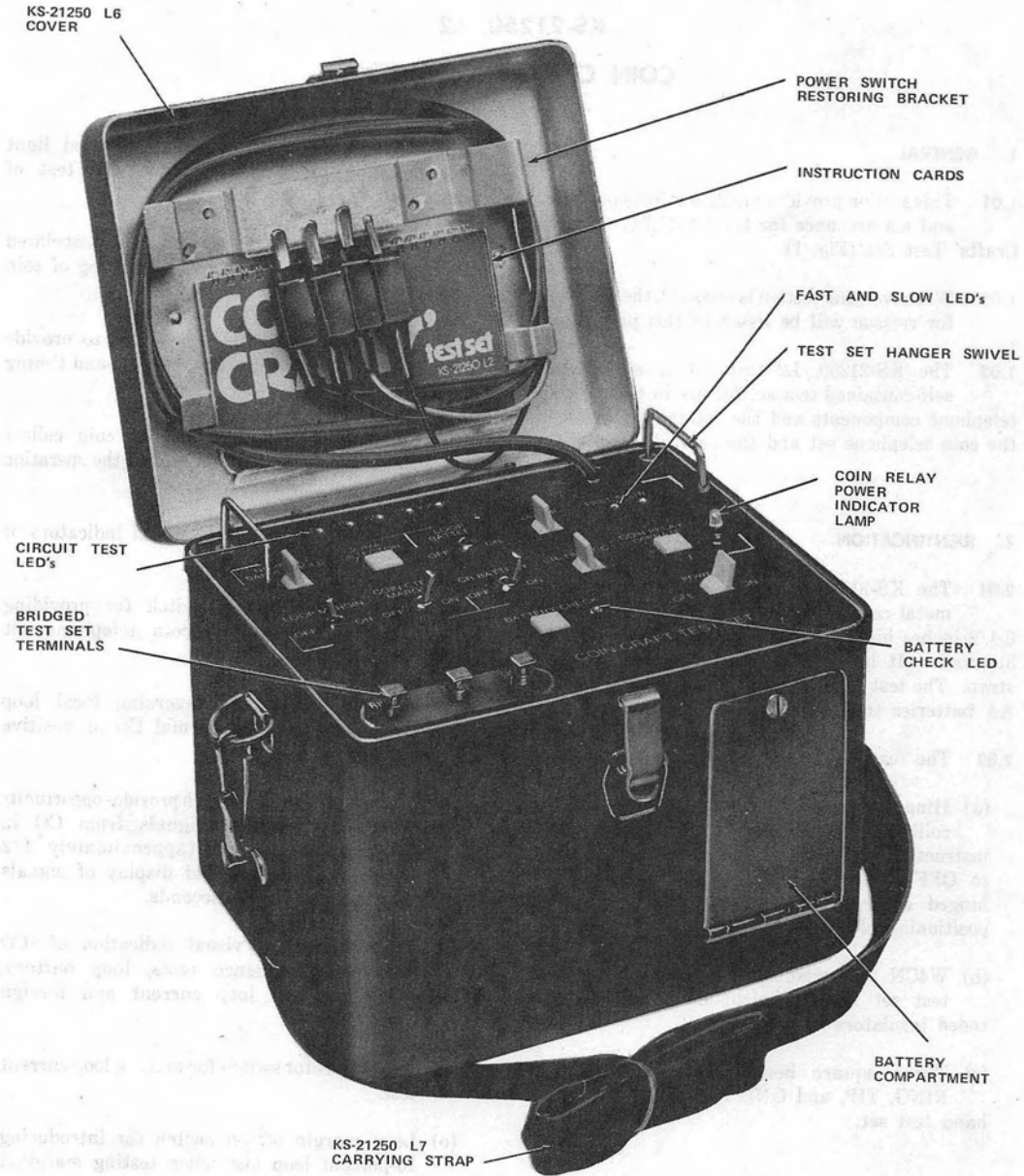


Fig. 1—KS-21250, L2 Coin Crafts' Test Set

(p) Coin control margin off/on switch for introducing 10-percent loss in coin control loop when testing marginal coin loop conditions.

(q) HT1 receiver unit controlled by loop battery key, used for monitoring coin tones, TOUCH-TONE® dial signals, and transmission from coin telephone handset.

(r) An easy access battery compartment with captive single-turn screw lock and latching battery holder that slides in and out of battery compartment on a track for ease of battery replacement.

(s) Single battery pack power source.

(t) Automatic shut-off when batteries are too low.

(u) Convenient easy to use controls.

(v) Adjustable carrying strap of webbed material with snap-on clasps for carrying test set.

(w) Two test set hangar swivels to suspend test set on the front of 1- and 2-type telephone sets.

**2.03** The KS-21250, L2 coin test set does not come equipped with batteries. The batteries must be provided by the craft. The test set uses twelve 1-1/2 volt AA batteries.

**2.04** The set of instruction cards supplied with the test set are intended as a guide only. If more detailed instructions are needed, refer to this section or Section 506-900-503.

### 3. OPERATION

**3.01** The KS-21250, L2 test set has three general classes of test procedures:

- (a) CO source, loop and external wiring of coin telephone set.
- (b) Interaction between coin telephone and CO line.
- (c) Coin telephone testing and timing independent of CO line.



*If the fast or slow LEDs come on when test set power is turned on, they will reset when the Coin Return Battery switch is turned ON and OFF.*

**3.02** To perform CO source, loop and external wiring tests, remove cover of coin telephone set, install P11C patch cord, or hang cover on KS-20950, L2 cover parking tool, swivel hangars around to suspend test set from telephone set and proceed as follows:

- (1) **23MA Test**—The 23MA current detector circuit simulates a 350-ohm load to the CO and will light a LED indicating when a current of 23MA or greater is flowing in the loop. This represents a worst case telephone set resistance which could be encountered in the field.



*Bullet (•) at beginning of line indicates normal response or test OK to preceding step.*

- (a) All **off/on** switches in **off** position.
- (b) Connect test set leads to TB-1 of coin telephone set per Fig. 2:
  - -48V LED lights.
  - (c) With coin telephone handset on-hook, depress and hold 23MA DETECTOR switch:
    - 23MA LED lights.
- (2) **Loop Margin Test**—The loop margin test checks the ring and tip loop from the CO by shunting 10 percent of the available current away from the coin telephone set. This in effect extends the loop by 10 percent. If the circuit fails the loop margin test, it indicates a borderline loop resistance condition and the telephone set may experience erratic troubles or failures.

- (a) All OFF/ON switches in OFF position except POWER switch.
- (b) Connect test set leads per Fig. 2 and take coin telephone handset off-hook:
  - -48V LED lights.

- (c) Connect 1013-type hand test set (with switch in monitor position) to ring and tip test terminals (square headed terminals in lower left corner of test set).
- (d) Set LOOP MARGIN switch to ON.
- (e) Deposit 35 cents in coin chute and observe tones on 1013 hand test set.
- (f) If no tones are heard, turn LOOP MARGIN switch OFF, deposit 35 cents, and observe tones.
- (g) If tones still are not heard, consult test desk for loop and ground measurements.
- (h) If tones are heard and coin control problems are known to exist, the test desk should be consulted for loop and ground measurements.
- (i) Hang up coin telephone handset:
- Coins should return.
- (j) Set LOOP MARGIN switch to OFF.
- (3) **Coin Control Margin Test**—The coin control margin test checks for marginal conditions on the tip to ground coin control path. A failure on this test indicates a borderline circuit resistance and the telephone set may experience erratic trouble or failures.
- (a) All OFF/ON switches in OFF position except POWER switch.
- (b) Connect test set leads per Fig. 2 and take telephone handset off-hook:
- -48V LED lights.
- (c) Set NORMAL/SAMPLE HOLD switch to SAMPLE HOLD.
- (d) Set COIN CONTROL MARGIN switch to ON.
- (e) Trip hopper trigger by hand.
- (f) Place telephone handset on-hook:
- Coin relay should operate and CR LED should be ON.
- (g) Set COIN CONTROL MARGIN switch to OFF.
- (h) If test (f) fails, repeat test with switch in OFF position.
- (i) If test still fails, consult test desk for loop and ground measurements.
- (4) **Foreign EMF Test**—This is a special use test where the test desk may not be available but you do have access to service on the CO main distributing frame. It will show if there is induced or crossed battery and ground on the pair but will not indicate trouble on individual conductors.
- (a) All OFF/ON switches in OFF position except POWER switch.
- (b) Connect test set leads per Fig. 2:
- -48V LED should light.
- (c) Have tip and ring opened at CO main frame:
- LED should go off.
- (d) If any LED lights, call test desk for circuit test.

### 3.03 LED SIGNAL DETECTION EXPLANATIONS:

The sequence charts in Section 506-100-120 specifies when the following signals may be applied to the coin telephone for both Coin First Operation and Dial Tone First Operation. These signal indicators are not designed to work with range extenders (DLL, SRE, etc):

- -48: This LED indicates -48 volts ring to tip at the coin set. (This is the normal polarity applied to the set during call initiation.)
- +48: This LED indicates +48 volts ring to tip at the coin set. (This is the normal polarity applied to the set when an operator is on line during DTF calls.)
- -CP: The "minus coin presence" test is used to determine if initial rate requirements have been met in the DTF coin telephone

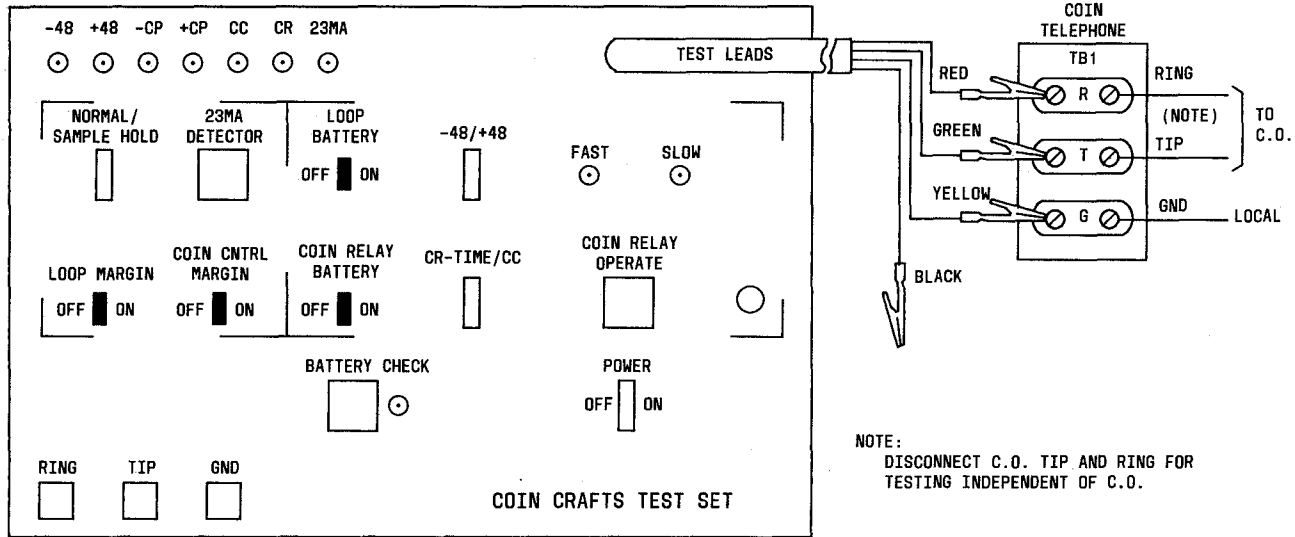


Fig. 2—Test Lead Set-up for All Tests Except Coin Relay Timing

set. This test is made with -48 volts tip to ground.

- +CP: The "positive coin presence" test is used to determine if the hopper has been cleared of coins. It is also used for the five cent local overtime charge. This test is made with +48 volts tip to ground (Note).
- CC: The "coin collect" LED is on whenever a coin collect signal is applied to the coin set (+130 volts tip to ground).
- CR: The "coin return" LED is on whenever a coin return signal is applied to the coin set (-130 volts tip to ground).
- 23MA: This LED is used with the test set 23MA test.

**Note:** In a CF office, -48 volts is applied; in a DTF or CF/DTF office, +48 volts is applied; however, in some offices, coin return voltage may be used for this test.

**3.04 The CO Sequence Test:** Tests the interaction between the coin telephone set and the CO equipment. During these tests, LEDs other than those shown may light. These others may be ignored. Prepare coin telephone set as follows and proceed as in (1) or (2).

- Install P11C patch cord or hang cover of coin telephone set on KS-20950, L2 cover parking tool.
- Connect test set leads to TB-1 of coin telephone set per Fig. 2.
- Set test set POWER switch to ON.
- Depress **Battery Check** switch—**Battery Check LED** should light.
- For extended **LED** viewing time set **Normal/Sample Hold**, switch to **Sample Hold**.



**The -48, +48 LEDs are not controlled by Sample Hold switch.** These LEDs will only light when the respective voltages are present in circuit.

**(1) Coin First Mode Operational Test:**

Bullet (●) indicates Test OK action or normal response. If failure refer to table and step in Section 506-900-503 or follow instruction.

ACTION	FAILURE TABLE STEP
(a) Remove coin relay dust cover—lift handset off-hook—operate hopper trigger by hand:	
Dial tone is heard.	A 14
● -48 LED lights.	
(If both fail—CO or outside plant trouble is indicated—consult test desk)	
(b) Dial any digit except <b>0</b> or <b>1</b> :	
• Dial tone remains after dialing.	A 15
(c) Set <b>Loop Margin</b> switch to <b>On</b> —deposit nickel:	
• Dial tone remains [if this test is <b>OK</b> , skip Step (d)].	
(d) Repeat test (c) with <b>Loop Margin</b> switch in <b>Off</b> position:	
• Dial tone remains—[If telephone set passes this test and failed test (c), refer to test desk for loop and ground resistance measurements].	A 16
<b>The CO may time out to permanent signal if dial tone is requested past time out period.</b>	
(e) Set <b>Loop Margin</b> switch to <b>Off</b> —set <b>Coin Control Margin</b> switch to <b>ON</b> —hang up handset:	
• <b>CR LED</b> lights while coin relay operates and nickel returns [if this test is <b>OK</b> , skip test (f)].	

ACTION	FAILURE TABLE STEP			
(f) Repeat test (e) with <i>Coin Control Margin</i> switch in <i>Off</i> position:				
<ul style="list-style-type: none"> <li>• <i>CR LED</i> lights while coin relay operates and nickel returns [if telephone set passes this test and failed test (e), refer to test desk for loop and ground resistance measurements].</li> </ul>	A	17		
(g) Set <i>Coin Control Margin</i> switch to <i>off</i> . Lift handset off-hook and deposit initial rate. Dial a busy number. When busy signal is heard, hang up handset:				
<ul style="list-style-type: none"> <li>• +<i>CP LED</i> lights. (If the +<i>CP LED</i> does not light and the coin relay operates or if the -<i>CP LED</i> lights and the coin relay operates, a CO trouble is indicated. Refer to test desk.)</li> </ul> <p><i>Other LEDs will light during this test but may be ignored.</i></p> <p>(h) With handset on-hook—trip hopper trigger by hand and depress and hold the <i>23MA Detector</i> switch:</p> <ul style="list-style-type: none"> <li>• <i>23MA LED</i> should light. (If <i>23MA LED</i> does not light, refer to test desk for loop and ground resistance measurements.)</li> </ul> <p>(i) To ensure a completely operational coin telephone set, proceed with Steps 4, 5, 6, 7, and 8 of the <i>Eight Step Coin Station Routine</i>. Use the coin crafts' test set for coin relay timing as discussed in paragraph 3.06.</p>				
		(2) <i>Dial Tone First Operational Test:</i> Bullet (•) indicates <i>Test OK</i> action or normal response. If failure, refer to table and step in Section 506-900-503 or follow instruction. After initial set up -48 <i>LED</i> should be lighted, then proceed as follows:		
		FAILURE TABLE STEP		
		ACTION		
		(a) Connect craft hand test set to ring and tip terminals of coin crafts' test set with hand test set in monitor position.		
		(b) With the handset on-hook, depress <i>23MA Detector Switch</i> :		
		<ul style="list-style-type: none"> <li>• <i>23MA LED</i> lights (if test fails, refer to test desk for loop and ground resistance test). Release <i>23MA Detector Switch</i>.</li> </ul>		
		(c) Lift handset off-hook:		
		<ul style="list-style-type: none"> <li>• Dial tone should be heard.</li> </ul>	B	4
		(d) Dial any digit <i>except</i> 0 or 1:		
		<ul style="list-style-type: none"> <li>• Dial tone should be broken.</li> </ul>	B	9
		(e) Set <i>Loop Margin</i> switch to <i>On</i> —deposit 35 cents:		
		<ul style="list-style-type: none"> <li>• Totalizer should restore. Coin tones should be heard in craft hand test set (if initial rate is less than or equal to 35 cents). If Step (e) test is OK—skip test (f).</li> </ul>		
		(f) Set <i>Loop Margin</i> switch to <i>Off</i> —Deposit 35 cents:		
		<ul style="list-style-type: none"> <li>• Totalizer should restore—coin tones should be heard in craft hand test set. [If this test passes and test (d) failed, refer to test desk for loop and ground resistance measurements.]</li> </ul>	B	5

ACTION	FAILURE TABLE STEP
(g) Set <b>Coin Control Margin</b> switch to <b>On</b> . Hang-up handset:  <b>CR LED</b> lights while coin relay operates [if test OK—skip test (h)].	Proceed to Step (h)
(h) Set <b>Coin Control Margin</b> switch to <b>off</b> and retest:  <b>CR LED</b> lights while coin relay operates. [If this test passes and test (g) failed, refer to test desk for loop and ground resistance measurements.] Set <b>Coin Control Margin</b> to <b>off</b> .	B 6
(i) Lift handset off-hook, dial a busy or charged number and hang up before answer:  • - <b>CP LED</b> lights (failure indicates CO failure—refer to test desk).  (j) Lift handset off-hook, dial a busy number. After busy signal is heard, hang up handset:  • + <b>CP LED</b> lights—failure indicates CO failure—refer to test desk.  (k) To ensure a completely operational coin telephone set, proceed with Steps 4, 5, 6, 7, and 8 of the <b>Eight Step Coin Station Routine</b> . Use the coin crafts' test set for coin relay timing as discussed in paragraph 3.06.	
<b>3.05 Coin Telephone Testing and Timing Independent of CO</b> —For this test, craftsperson will have to know coin telephone type and type operation (coin first or dial tone first) it is wired for. Telephone tests include test of dial, sidetone, totalizer, T1 rate contact, SCR and zener diode, and oscillator. Table and Step No. refer to corresponding entries in Section 506-900-503 and only coin telephone set related "Possible Cause" and "Remedial Action" entries apply. These instructions apply when there is <b>no</b> interaction	

with the central office, ie, the coin station is being driven by the test set.

**DANGER: There are high voltages on test leads when COIN RELAY OPERATE switch is depressed. KEEP HANDS CLEAR.**

- (1) Set coin telephone and coin crafts' test set up as follows:
  - (a) Remove coin telephone front cover and install P11C patch cord or hang cover on KS-20950, L2 cover parking tool.
  - (b) Disconnect tip and ring of line at TB-1 of coin telephone set.
  - (c) Connect test set leads per Fig. 2.
  - (d) All OFF/ON SWITCHES in OFF position except POWER switch.
  - (e) Depress BATTERY CHECK switch:
    - BATTERY CHECK LED should light.
  - (f) Set COIN RELAY BATTERY switch to ON:
    - NEON lamp next to COIN RELAY OPERATE switch should light after approximately 12 seconds.
  - (g) Set CR (coin return)—TIME/CC (coin collect) switch to CR-TIME.
  - (h) -48/+48 battery switch to -48.
  - (i) Set LOOP BATTERY switch to ON.
  - (j) Proceed as in (2), (3), (4), or (5).
- (2) COIN FIRST OPERATION WITH 1A, 2A, 1C OR 2C COIN TELEPHONES

**Note:** Bullet (•) indicates **Test OK** action, if failure refer to table and step in Section 506-900-503.

ACTION	TABLE STEP
(a) Handset on-hook—deposit 35 cents:  • Totalizer steps back—beep tones are heard from test set.	A 5



ACTION	TABLE	STEP	(3) DIAL TONE FIRST OPERATION WITH 1C OR 2C SETS	ACTION	TABLE	STEP
(b) Return money by depressing <b>Coin Relay Operate</b> switch:						
• Coin relay operates—money returned.	A	5		(a) Handset off-hook—deposit 35 cents:		
(c) Handset off-hook—set <b>Loop Battery</b> switch to <b>Off</b> —deposit nickel less than initial rate. Set <b>Loop Battery</b> switch to <b>On</b> :				• Totalizer steps back—beep tones are heard.	B	5
• Totalizer does <b>not</b> step back—no beep tones heard.	A	7		(b) Handset on-hook—return money by depressing <b>Coin Relay Operate</b> switch:		
(d) Hang up handset:				• Money returns.	B	6
• Totalizer steps back—beep tones are heard.	A	6		(c) Handset off-hook—deposit nickel less than initial rate:		
(e) Handset off-hook—operate dial:				• Totalizer does not step back—no beep tones are heard.	B	7
• Clicks/T-T signals are not heard—sidetone is present in handset.	A	6		(d) Operate Dial:		
(f) Return money with <b>Coin Relay Operate</b> switch. Set <b>Loop Battery</b> switch to <b>Off</b> —Deposit initial rate—set <b>Loop Battery</b> switch <b>On</b> :				• Clicks/T-T signals are heard in test set.	B	7
• Totalizer steps back—beep tones are heard.	A	8,9		(e) Handset on-hook:		
(g) Operate dial:				• Totalizer steps back—beep tones are heard.	B	8
• Clicks/T-T signals are heard in test set.	A	8,9		(f) Return money by depressing <b>Coin Relay Operate</b> switch†take headset off-hook—set -48/+48 switch to +48—deposit nickel:		
(h) Set -48/+48 switch to +48—operate T-T dial (this test does not apply to 1A coin sets):				• Totalizer steps back—beep tones are heard.	B	12
• T-T signals not generated—sidetone is present in handset.	A	8,9		(g) With -48/+48 switch still in +48 position—operate T-T dial:		
(i) Depress <b>Coin Relay Operate</b> switch to return money.				• C-type sets equipped with polarity guard—TT signals are heard.		
(j) All <b>Off/On</b> switches to <b>Off</b> . -48/+48 switch to -48.				• C-type sets not equipped with polarity guard—TT signals are not heard.		
(k) Disconnect test set and restore CO connections to coin set.				(h) All <b>off/on</b> switches to <b>off</b> —-48/+48 switch to -48.		

ACTION	TABLE	STEP
(i) Disconnect test set and restore CO connections to coin set.		

## (4) DIAL TONE FIRST OPERATION WITH 1D OR 2D SETS

ACTION	TABLE	STEP
(a) Handset off-hook—deposit 35 cents:		
• Series of rapid beeps from test set.	B	12
(b) Depress and <b>hold</b> T-T dial button or hold rotary dial at off-normal position (during wind-up portion of dial cycle)—deposit dime:		
• Coin signal beep tones are <b>not</b> heard.	B	12
(c) Release dial:		
• Two beep tones are generated when dial returns to normal.	B	12
(d) -48/+48 switch to +48—deposit nickel:		
• Beep tone is heard.	B	12
(e) All <b>off/on</b> switches to <b>off</b> : -48/+48 switch to -48.		
(f) Disconnect test set and restore CO connections to coin set.		
(5) DIAL POST PAY OPERATION WITH 1E1 OR 1E3 SETS		

**Note:** Insert KS-14995, L3 tool between coin chute and hopper to prevent loss of coins.

ACTION	TABLE	STEP
(a) Handset off-hook:		
• Sidetone present in handset.	E	4
(b) Rotate and release dial:		
• Clicks heard in test set.	E	5

ACTION	TABLE	STEP
(c) Set -48/+48 switch to +48 and deposit initial rate:		
• Totalizer does not step back—in a 1E1 set equipped with a 51A hopper, a click is heard in test set speaker. If set is equipped with a 50A hopper, operate coin trap by hand and a click is heard in test set speaker.	E	14,15,17
(d) Handset on-hook:		
• Totalizer steps back—beep tones are heard.	E	14,17
(e) Set -48/+48 switch to -48 and deposit initial rate:		
• Totalizer steps back—beep tones are heard.	E	14,17
(f) Retrieve coins.	E	16
(g) All OFF/ON switches to OFF.		
(h) Disconnect test set and restore CO connections to coin set.		

**3.06 Coin Relay Timing Test:** For this test, CO may be disconnected by removing front cover plug P1:

- (a) Connect test set leads—green to No. 3 terminal of coin relay, yellow to ground terminal of coin relay, black to the top of coin relay resistor (Fig. 3).
- (b) Set test set **Power** switch to **On**.
- (c) Depress **Battery Check** switch:
  - **Battery Check** LED should light.
- (d) Set **Coin Relay Battery** switch to **On**:
  - Neon lamp should light after approximately 12 seconds.
- (e) Set **CR-Time/CC** switch to the **CR-Time** position.
- (f) Trip coin relay hopper trigger.

(g) Press and hold **Coin Relay Operate switch**—[after neon lamp Step (d) is lighted];

- Observe **Fast** and **Slow** LEDs and refer to Table A of this section for action required.

(h) Unfasten and lift out P-15E730 coin return chute assembly if not already done (single-slot chute).

(i) Set **CR-TIME/CC** switch to CC.

(j) Depress **Coin Relay Operate** switch:

- Observe if coin vane in hopper moves to the **collect** position.

(k) Reassemble disconnected components.

(l) All **OFF/ON** switches to **OFF** position **CR-TIME/CC** switch to **CR-TIME**.

(m) Disconnect test set and restore **P1** plug.

#### 4. MAINTENANCE AND ORDERING

**4.01** Under normal use, the KS-21250, L2 test set should not require repair or maintenance except battery replacement.

**4.02 Battery Replacement:** Turn captive locking screw counterclockwise and lower hinged battery compartment door. Pull plastic latch forward and down and slide battery cartridge

completely out. Replace batteries taking care to observe polarity as marked on battery cartridge. Restore cartridge to compartment taking care to observe guide tracks on top and bottom of battery compartment. Engage plastic latch and seat firmly. Close door and lock with captive screw. Replacement batteries for the KS-21250, L2 test set are:

- KS-14368 1.5V AA-type

or

- For operation below 0°F—Eveready No. E91, or Ray-O-Vac No. 815 batteries.

**4.03** The KS-21250, L2 Coin Crafts' Test Set comes complete with carrying strap, cover, and instruction cards. Only the batteries must be ordered separately.

**4.04** If necessary, new replacement carrying strap, test set cover, and instruction cards may be ordered by KS list number.

#### (a) ORDER AS FOLLOWS

- KS-21250, L2—Coin Crafts' Test Set
- KS-21250, L5—Instruction Cards
- KS-21250, L6—Test Set Cover
- KS-21250, L7—Carrying Strap.

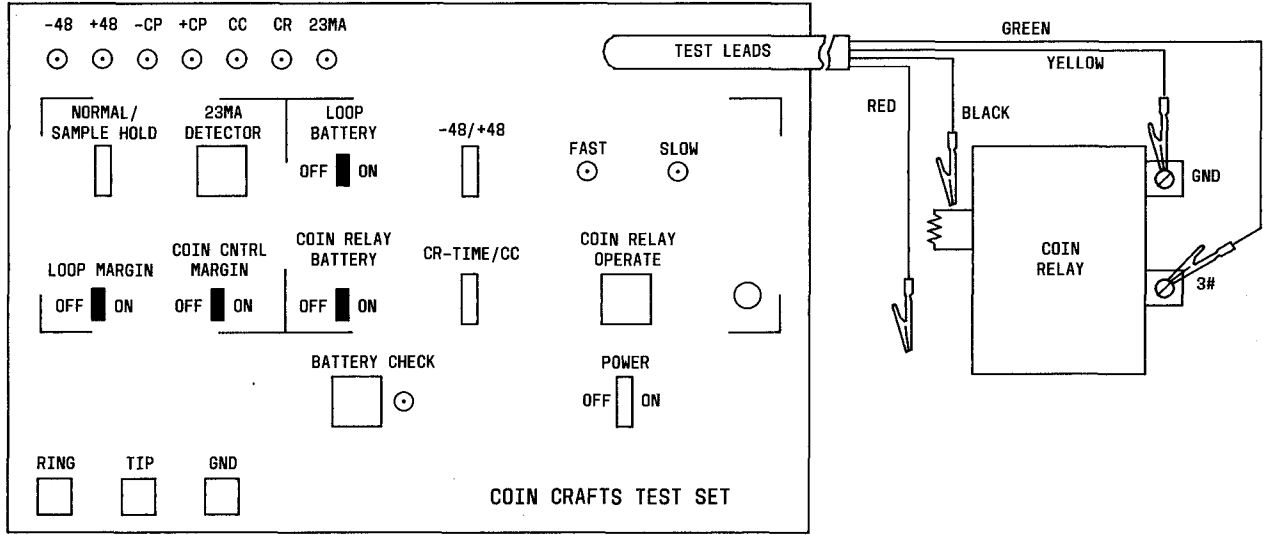


Fig. 3—Test Lead Set-up for Coin Relay Timing

TABLE A

BELOW -20°F	-20°F TO 20°F	20°F TO 60°F	60°F TO 100°F	ABOVE 100°F
Test set indicator lights will indicate SLOW after adjustment.				-FAST- then 1/4-turn CCW
		-SLOW- then 1/4-turn CW		-FAST- then 1/2-turn CCW
-SLOW- then 1/2-turn CCW	-SLOW- then 1/4-turn CCW			

*Note:* Adjust coin relay timing screw in 1/4-turn increments until the KS-21250, L2 test set indicates only FAST or SLOW as specified for the temperature range at time of adjustment. Then turn the relay timing screw clockwise (CW) or counterclockwise (CCW) the specified amount as indicated on the chart.