

LOOP DIALING TOLL AND A-B TOLL TRANSMISSION SELECTORS AND  
OTHER SELECTORS WITH LOOP COMPENSATING RESISTANCES  
PULSE REPEATING AND PULSING TESTS  
USING PULSE REPEATING SD-31667-01 (J34720A) AND  
PULSING SD-31481-01 (J34717A) TEST SETS  
STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section describes a method of applying pulsing and pulse repeating tests to loop dialing toll transmission selectors, A-B toll transmission selectors, and other selectors with loop compensating resistances, such as loop dialing toll preceding selectors and selectors for completing intercepted calls. Pulsing tests of coin control selectors are not included in this section. Where the selectors are equipped with pulsing relays having a 3-letter code suffix, as for example, No. 221 FAE, the pulse repeating test set SD-31667-01 is required to furnish additional loop and leak conditions.

1.02 This section is reissued to expand the section to include 355A and 35-E-97 community dial offices. Step numbers in Parts 3 and 4 have been changed, however, arrows have not been used to indicate these changes.

1.03 The tests covered are:

**A. Over-all Pulsing Test — Selectors Not Equipped with 3-Letter Code Suffix Pulsing Relays:**

This test checks the over-all pulsing features of selectors not equipped with 3-letter code suffix pulsing relays.

**B. Over-all Pulsing Test — Selectors Equipped with 3-Letter Code Suffix Pulsing Relays:**

This test checks the over-all pulsing features of selectors equipped with 3-letter code suffix pulsing relays.

**C. Over-all Pulsing and C Relay Release**

**Test:** This test checks the over-all pulsing and C relay release features of the loop dialing toll, A-B toll transmission and other selectors with compensating resistances.

**D. Magnet Pulsing Tests:** This test checks the stepping features of the stepping magnets in loop dialing toll, A-B toll transmission selectors and other selectors with compensating resistances.

**E. Pulse Repeating Tests of A Relay:** This test checks the pulse repeating feature of the A relay in loop dialing toll, A-B toll transmission and other selectors with loop compensating resistances.

1.04 Tests A and C or B and C are alternative methods. Test C is intended for use when it is desired to include an approximate check of the releasing time of the C relay in offices where the relay timing test set is not available. Ordinarily Test C, if applied on a routine basis, would be made at less frequent intervals than Test A or B, either one or the other, but not both, being made on any one testing cycle. Test C should be applied as a final check after clearing any trouble involving adjustment of the C relay.

1.05 Test D is not required on a routine basis, but should be performed on any switch on which a failure is encountered under the leak test condition in Tests A, B or C in order to determine if the trouble indicated by these tests is due to the switch mechanism.

1.06 Test E may be applied in accordance with Section 040-012-711 and the circuit requirement tables, when required.

**1.07** The general procedure for the analysis and correction of pulsing failures encountered in making pulsing tests of selectors is covered in Section 226-170-700. The correction of pulse repeating failures of selectors is covered in Section 040-012-711.

**1.08** When testing selectors arranged to absorb the initial digit on the level involved in this section, an extra digit must be pulsed before proceeding with each pulsing operation.

**1.09** While these tests are being conducted, the preceding trunk should be made busy in the approved manner.

**1.10** For convenience, incoming toll selectors are tested with the incoming trunks connected. However, a failure under this condition may be due to some trouble on the trunk, or perhaps to the capacitance of the trunk. Therefore, if a failure is encountered with the trunk connected, the trunk should be opened at the main frame in the terminating office and the selector retested. If a failure is encountered, adjustments should be made as required to meet the test before reconnecting the trunk.

**1.11** *Lettered Steps:* A letter a, b, c, etc, added to a step number in Parts 3 and 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.

**1.12** The test equipment specified in this section is designed to apply proper marginal tests (simulated critical circuit conditions) when the circuit under test and the test equipment have an applied voltage of 48.5 to 50. In those offices where power plants are normally operated at more than 50 volts, the battery voltage should be reduced and maintained within the required limits while the tests are being made.

## 2. APPARATUS

**2.01** The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraphs indicated by the number in parentheses.

TABLE A

APPARATUS	TESTS			
	A	B	C	D
Test Set (2.02)	1	1	1	1
Test Set (2.03)	1	1	1	1
Test Set (2.04)	-	1	1	1
Patching Cord (2.05)	*	*	*	*
Patching Cord (2.06)	1	1	1	1
Patching Cord (2.07)	-	1	1	1
Testing Cord (2.08)	*	*	*	*
Testing Cord (2.09)	-	-	-	1
Make-Busy Tool (2.10)	*	*	*	*

\* As required.

**2.02** Pulsing test set J34717A (SD-31481-01).

**2.03** 36B (remote control) test set.

**2.04** Pulse repeating test set J34720A (SD-31667-01).

**2.05** Patching cord, P2J cord, 6 feet long, equipped with two red shell 310 plugs (2P9B), for use when battery and ground jack is used to provide battery and ground for test set.

**2.06** Patching cord, P3H cord, 10 feet long, equipped with one 310 plug and one 240A plug (2P2A).

**2.07** Patching cord, P3K cord, 6 feet long, equipped with two 310 plugs (3P15A).

**2.08** Testing cord, W2M cord, 9 feet long, equipped with one red shell 310 plug and two 59 cord tips (2W12A cord), for use when battery and ground block or 35-type fuse (not to exceed 5 amperes) and frame ground is used to provide battery and ground to test set.

**2.09** Testing cord, W1H cord, 10 feet long, equipped with one 347B plug, one 360A tool (1W8A cord) and one 419A tool.

**2.10** 477A (or 375A) (make-busy) tools, as required.

**3. PREPARATION**

STEP	ACTION	VERIFICATION
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**Tests A, B, C and D**

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|---|---|--|
| 1 | Connect battery and ground to BAT-G jack of test set.<br><br><i>Note 1:</i> If using W2M cord, connect red (sleeve) conductor to ground and white (tip) conductor to battery.<br><br><i>Note 2:</i> To avoid possible grounding of battery supply lead, connect cord to test set first, and, when disconnecting, remove cord from battery supply first. |  |
| 2 | Connect 36B test set to jacks A and B of pulsing test set with stay cord of 289A plug to bottom, or ridged side of 152 plug to left.  |  |

**Tests A, C and D — Selectors Not Equipped With 3-Letter Code Suffix Pulsing Relays**

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|----|--|--|
| 3a | If testing selectors designed to extend ground back on sleeve lead, such as local or incoming selectors —<br>Insert 310 plug of P3H cord into SW jack of pulsing test set.   |  |
| 4b | If testing selectors designed to receive ground forward over sleeve, such as toll intermediate —<br>Insert 310 plug of P3H cord into TL jack of pulsing test set.  |  |
| 5  | Establish loop values required by operating resistance keys provided in pulsing test set to approximate loop conditions encountered in service. Tests can be made on loops from 0 to 1400 ohms in 200-ohm steps. The following resistance values are inserted in the pulsing test set by operating the keys indicated below: |  |

PULSING TEST SET RESISTANCE	KEYS OPERATED
200 ohms	200
400 ohms	400
600 ohms	200 and 400
800 ohms	800
1000 ohms	200 and 800
1200 ohms	400 and 800
1400 ohms	200, 400 and 800

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
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*Note 1:* In those cases where the compensating resistance in the selector is in the circuit when connection is made to the test jack, the proper test set resistance value to be used is the one which most nearly represents the external pulsing loop over which the switch operates in service, as shown on the trunk or cable record cards.

*Note 2:* In those cases where the compensating resistance in the selector is not in the circuit when connection is made to the test jack, the proper test set resistance value to be used is the one which most nearly equals the maximum external pulsing loop for which the selector is arranged, as shown on the circuit drawing.

**Tests B, C and D — Selectors Equipped With 3-Letter Code Suffix Pulsing Relays**

- 6 Connect TL jack of pulsing test set to INT jack of pulse repeating test set, using P3K cord.
- 7 Insert 310 plug of P3H cord into R jack of pulse repeating test set.
- 8 Establish loop values required by operating resistance keys in pulsing test set and pulse repeating test set indicated below. Values shown for each test set are arranged to facilitate testing under both loop and leak conditions and include selectors that may or may not be equipped with compensating resistances in pulsing relay circuit.

SELECTOR PULSING LOOP RANGE	PULSING TEST SET	PULSE REPEATING TEST SET
0 to 600 ohms Not compensated	200 and 400	None
600 to 1200 ohms Not compensated	200 and 400	200 and 400
0 to 1200 ohms Compensated	See Note	None
1200 to 2000 ohms Not compensated	800	400 and 800
1200 to 2000 ohms Compensated	800	See Note

STEP	ACTION	VERIFICATION
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*Note:* When the selector is equipped with compensating resistances in the pulsing circuit, insert sufficient resistance in the pulsing loop of the test set, to which this note is being applied, so that the sum of the loop resistance values in this test set plus the value of the compensating resistances in the selector pulsing circuit equals approximately 1200 ohms. In the case of the pulse repeating test set, use the resistance keys with the numerical designation only. In either test set, the sum of the numerical designation of the resistance keys operated equals the loop resistance added in the test set.

#### 4. METHOD

STEP	ACTION	VERIFICATION
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**A. Over-all Pulsing Test — Selectors Not Equipped with  
3-Letter Code Suffix Pulsing Relays**

6	Operate LKC key.	
7	Insert 240A plug of P3H cord into test jack of idle selector to be tested.	BY lamp does not light.
8	Depress remote control LP key momentarily.	Selector steps smoothly to ninth level and cuts in.
9	Depress remote control RLS key momentarily.	Selector releases. <i>Note:</i> Disregard flashes of BY lamp as selector releases.
10	Depress remote control LK key momentarily.	Selector steps smoothly to ninth level and cuts in.
11	Depress remote control RLS key momentarily.	Selector releases.
12	Remove 240A plug from selector test jack.	
13	Unless further tests are to be made — Remove all cords and restore all keys.	

**B. Over-all Pulsing Test — Selectors Equipped with  
3-Letter Code Suffix Pulsing Relays**

9	Insert 240A plug of P3H cord into test jack of idle selector to be tested.	BY lamp does not light.
10	Operate SL key of pulse repeating test set.	

STEP	ACTION	VERIFICATION
11	Depress remote control LP key momentarily.	Selector steps smoothly to ninth level and cuts in.
12	Depress remote control RLS key momentarily.	Selector releases.
13	Operate LKA key of pulsing test set.	
14	Operate D key of pulse repeating test set.	
15	Depress remote control LK key momentarily.	Selector steps smoothly to ninth level and cuts in.
16	Depress remote control RLS key momentarily.	Selector releases.
17	Remove 240A plug from selector test jack.	
18	Unless further tests are to be made — Remove all cords and restore all keys.	

#### C. Over-all Pulsing and C Relay Release Test

9c	If testing selectors not equipped with 3-letter code suffix pulsing relays — Operate LKC key of pulsing test set.	
10	Insert 240A plug of P3H cord into test jack of idle selector to be tested.	BY lamp does not light.
11d	If testing selectors equipped with 3-letter code suffix pulsing relays — Operate SL key of pulse repeating test set.	
12	Depress and hold remote control LP key long enough to start a second series of pulses.	Selector steps smoothly to ninth level and cuts in with no vertical kick of shaft.  <i>Note:</i> A vertical kick of the shaft, or vertical stepping, on the second series of pulses may be due to the C relay being too slow in its release. If the switch under test rotates more than four or five steps, a vertical kick on the second series of pulses would not necessarily be an indication of trouble.
13	After selector in test set has taken five or six steps on second cycle, as determined by sound of selector operating — Release LP key.	
14	Depress remote control RLS key momentarily.	Selector releases.

STEP	ACTION	VERIFICATION
15d	If testing selectors equipped with 3-letter code suffix pulsing relays — Operate LKA key of pulsing test set.	
16d	Operate D key of pulse repeating test set.	
17	Depress remote control LK key momentarily.	Selector steps smoothly to ninth level and cuts in.
18	Depress remote control RLS key momentarily.	Selector releases.
19	Remove 240A plug from selector test jack.	
20	Unless further tests are to be made — Remove all cords, restore all keys.	

#### D. Magnet Pulsing Tests

**Note:** This test should be performed only when a selector has failed the leak test condition in Tests A, B, or C, in order to determine if the trouble indicated by these tests is due to the switch mechanism.

- 9 With test set connections established and test set resistances and leak keys operated as in Tests A, B, or C when a selector fails the leak condition —  
Operate MAG key of pulsing test set.

**Note:** The loop resistance keys, LKA, LKC and LKD keys are ineffective when making the magnet pulsing test. The LKB key, however, is effective and should be in the normal position. By having the keys operated as in the over-all pulsing test, while conducting the magnet pulsing test, it is convenient to switch from one test to the other in the process of clearing trouble. This switching is accomplished by the release or operation of the MAG key as required.

- 10 Remove cover from switch under test.
- 11 Insert 347B plug of W1H cord into MAG jack of pulsing test set.
- 12 Connect 419A tool of W1H cord to back contact spring of pulsing springs of A relay.
- 13c If switch is off normal —  
Operate remote control RLS key momentarily.
- Selector releases.

STEP	ACTION	VERIFICATION
14	Depress remote control LK key momentarily.	Selector steps smoothly to ninth level and cuts in.
	<p><i>Note 1:</i> It is not a requirement that the C relay hold during the magnet test. If the C relay releases during this test, hold it operated manually to check the vertical magnet pulsing. If the over-all pulsing test indicated a C relay failure, correction of the failure should be in accordance with 1.07.</p> <p><i>Note 2:</i> In the case of digit-absorbing selectors, failure of the C relay to hold during pulsing may have the effect of splitting the preliminary digit, the first pulses being absorbed and the remainder of the pulses causing the switch to step and cut in on one of the lower levels before the second digit is received.</p>	
15	Depress remote control RLS key momentarily.	Selector releases.
16	Remove 419A tool from spring of A relay.	
17	Replace switch cover.	
18	Remove 240A plug from selector test jack.	
19	Unless further tests are to be made — Remove all cords and restore all keys.	

#### E. Pulse Repeating Tests of A Relay

1	Using test sets SD-31481-01 and SD-31667-01, in accordance with Section 040-012-711, check pulse repeating requirements of A relay in selector in accordance with circuit requirement tables.	Pulse repeating requirements of A relay are met.
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