

**FINAL SELECTOR CIRCUIT TEST**  
**USING TEST SET ES-20150-01 OR ES-239844**  
**GROUND CUTOFF RELAY PANEL OFFICES**

**1. GENERAL**

**1.01** This section describes a method of testing final selector circuits at the final frames in ground cutoff relay offices using the manually operated incoming and final selector test set ES-20150-01 or ES-239844.

**1.02** This section is reissued to eliminate the flash indication during the busyback test and to bring the section up to date. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The tests covered are:

**A. Idle Direct Line Test:** This test checks that the final circuit connects ground to the ring conductor until final selections have been completed.

**B. Busy Direct Line Test:** This test applies a busy line condition to the last test line terminal 99 and checks the ability of the final circuit to advance to the busyback position.

**C. Terminal Hunting and Idle Line Test:**  
This test checks the terminal hunting arrangement of the final circuit and its operation on encountering a line condition which simulates an idle line not arranged for terminal hunting.

**D. Terminal Hunting and Line Busy Test:**  
This test finds a busy line condition on test line terminal 97.

**E. Idle Terminal Hunting Line Test:** This test checks the terminal hunting arrangement of the final circuit and its operation on reaching a line on which the condition simulates an idle line arrangement for terminal hunting.

**F. Check of No-Test Feature:** This test checks the ability of the final selector to stop on a busy line and advance to the talking position on calls placed over no-test incoming circuits.

**G. Time Measure Release Test:** This test checks the time measure disconnect feature of the final circuit.

**H. Telltale Test:** This test checks the ability of the final circuit to advance under control of the X commutator in those cases where the final selector goes to telltale on final selection.

**I. Brush Continuity Test:** This test checks for continuity of the tip, ring, and sleeve springs of the brush under test.

**J. Particular Line Test — Idle Line Condition:** This test checks final circuits to particular terminals in connection with do not answer and wrong number reports. This test also checks the ability of the final circuit to stop on the final terminal to which it is directed.

**K. Particular Line Test — Busy Line Condition:** This test checks the ability of the final selector circuit to restore the brush rod to normal and give a busy indication after being directed to the final terminal made busy.

**1.04** These tests are intended for use in testing individual final selector circuits which are not tested by a final selector test frame. They may also be used to supplement the test frame tests and to check the operation of final circuits on a manual basis.

**1.05** The tests are made at the final selector frame and the test set is connected to the proper jacks by means of patching cords.

**1.06** For Tests A through G, the final selector is directed to test lines which are connected to three final terminals, 97, 98, and 99, in the bottom bank of each final choice. Terminals 97 and 98 are arranged as permanently busy terminal-hunting test lines. Terminal 99 is connected to the test set during test by means of a patching cord. When terminal 99 is not in use for testing purposes, it is associated with an intercepting trunk.

**1.07** The test set is arranged to check one of the multiple brushes for continuity and crosses and to make tests of final circuits under conditions corresponding to those encountered in service on idle and busy terminal-hunting and nonterminal-hunting lines as well as test of the no-test and time measure release features.

**1.08** Brush continuity is checked on one brush by test A, C, E, F, or G. Test I is used to test brushes not checked by these tests. For Test I, the final selector is directed to a working final terminal.

**1.09** During Tests A through J, observe the advance of the final selector for irregular operation such as sluggish up drive, slipping sequence switch drive disc, etc.

**1.10** During Test H, observe the tripped brush to detect brush chatter conditions.

**1.11** Features are provided for advancing the test set while observing the final selector circuit. The plug of the 32A test set (2.04) is inserted into the EX-K jack of the test set (2.01).

To start the test, operate the WH key of the 32A test set. This simulates the operation of the ST key on the selector test set ES-20150-01 or ES-239844. To restore the test set to nonoperate, operate the RED key on the 32A test set.

**1.12** Any final circuit on which a failure is encountered when making a test should be made busy until the trouble is cleared.

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

**2. APPARATUS**

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

**2.02** Incoming and final selector test set ES-20150-01 or ES-239844.

**2.03** Four P3E patching cords, 4 feet long, equipped with two 310 plugs (3P7E cord).

**TABLE A**

APPARATUS	TESTS										
	A	B	C	D	E	F	G	H	I	J	K
Test Set (2.02)	1	1	1	1	1	1	1	1	1	1	1
Patching Cords (2.03)	4	4	4	4	4	4	4	2	3	3	3
Telephone Headset	—	1	—	—	—	—	—	—	—	—	1
32A Test Set	—	1	1	1	1	1	—	1	1	—	—
184 Make-busy Plug	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓As required.

## 3. PREPARATION

STEP	ACTION	VERIFICATION
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## All Tests

**Caution:** All relay covers on the final selector circuit should be in place during the period that the test of the final selector is in progress.

- 1 Restore keys.
- 2 Insert 184 make-busy plug into MB jack of selector to be tested.

**Note:** Do not insert a make-busy plug into an MB jack of a circuit which is off normal.

- 3 Using patching cord, connect test set B-GRD jack to jack A on final frame jack panel.

**Caution:** To avoid possible grounding of the battery supply lead, connect the cord to the test set first and disconnect the cord from the final frame jack panel first.

- 4 Operate FIN or FF key.
- 5 Using patching cord, connect test set TST jack to TMB or T jack on final frame jack panel.
- 6a If tests are to be repeated —  
Momentarily operate A-ST key prior to the circuit becoming normal.
- 7 Operate compensating resistance key as required in accordance with Table B.

TABLE B		
TEST SET	COMPENSATING RESISTANCE KEY (Note 1)	
	WITH CAPACITANCE	WITHOUT CAPACITANCE
ES-20150-01 or ES-239844 with 1.38 MF key	1300 Ohms 1.38 MF	1900 Ohms
ES-20150-01 with FCR key	FCR	1800 Ohms
ES-239844 with FCR key	FCR	1900 Ohms
ES-239844 without FCR key	1300 Ohms (Note 2)	1900 Ohms
<p><b>Note 1:</b> The final selector circuit should be checked under both conditions for all tests except C, D, E, and H. The resistance key without capacitance shall be operated for these tests.</p> <p><b>Note 2:</b> The compensating resistance key should be operated in the MF capacity direction.</p>		

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
<b>Tests A through G</b>		
8	Using patching cord, connect test set FT jack to B jack on final frame jack panel.	
9b	If the test line is not equipped with cutoff jacks — At final selector test frame, operate TRA or TRB key.	
10	Using patching cord, connect test set INT jack to jack E on final frame jack panel.	

**Tests B through F, H and I**

- 11c If remote control features are provided —  
Insert plug of a 32A test set into test set EX-K jack.
- 12c Operate WH key on 32A test set instead of ST key.
- 13c Operate RED key on 32A test set instead of DISC key.

**Test I, J, K**

- 14 Using patching cord, connect test set D jack to D or T2 jack on final frame jack panel.
- 15d If test set is not equipped with a D jack —  
Connect one end of a patching cord to D or T2 jack on final frame jack panel. Place other end where it will not be grounded prior to use during test.
- 16e If final frames are split —  
Longer patching cords will be required.

**4. METHOD**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
<b>A. Idle Direct Line Test</b>		
11	Operate H, T, U keys to direct final selector to terminal 99.	
12	Momentarily operate ST key.	TST lamp lighted on completion of test. FF-OK lamp flashes.
13	Operate and hold DISC key.	TST, FF-OK lamps extinguished. BY lamp lighted.

STEP	ACTION	VERIFICATION
14	Release DISC key.	BY lamp extinguished.
15c	If no further tests are to be performed — Restore keys.	
16c	Remove make-busy plugs.	
17c	Disconnect patching cords.	
<b>B. Busy Direct Line Test</b>		
14	Connect telephone headset to TEL A jack.	
15	Operate LF-FB or FB key.	
16	Operate H, T, U keys to direct final selector to terminal 99.	
17	Momentarily operate ST key.	TST lamp lighted. At completion of test — FB-OK, IO-OK lamps lighted. Busy tone heard.
18	Momentarily operate DISC key.	TST, FB-OK, and IO-OK lamps extin- guished. Busy tone silenced. BY lamp lighted momentarily.
19d	If no further tests are to be performed — Restore keys.	
20d	Remove make-busy plug.	
21d	Disconnect patching cords.	
<b>C. Terminal Hunting and Idle Line Test</b>		
14	Operate H, T, U keys to direct final selector to terminal 97.	
15	Momentarily operate ST key.	TST lamp lighted. At completion of test — FF-OK lamp lighted.
16	Momentarily operate DISC key.	TST, FF-OK lamps extinguished. BY lamp lighted momentarily.
17d	If no further tests are to be performed — Restore keys.	
18d	Remove make-busy plugs.	

STEP	ACTION	VERIFICATION
19d	Remove patching cords.	
<b>D. Terminal Hunting and Line Busy Test</b>		
14	Operate LF-FB or FB key.	
15	Operate H, T, U keys to direct final selector to terminal 97.	
16	Momentarily operate ST key.	TST lamp lighted. At completion of test — FB, IO-OK lamps lighted.
17	Momentarily operate DISC key.	TST, FB-OK, and IO-OK lamps extinguished. BY lamp lighted momentarily.
18d	If no further tests are to be performed — Restore keys.	
19d	Remove make-busy plugs.	
20d	Disconnect patching cords.	

**E. Idle Terminal Hunting Line Test**

*Note:* This test applies only when using test set ES-239844.

14	Operate 1XFF key.	
15	Operate H, T, U keys to direct final selector to terminal 97.	
16	Momentarily operate ST key.	TST lamp lighted. At completion of test — FF-OK lamp lighted.
17	Momentarily operate DISC key.	TST, FF-OK lamps extinguished. BY lamp lighted momentarily.
18d	If no further tests are to be performed — Restore keys.	
19d	Remove make-busy plug.	
20d	Remove patching cords.	

**F. Check of No-Test Feature**

14	Operate LF-FB or FB key.	
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STEP	ACTION	VERIFICATION
15d	If LS-FB key is provided — Operate LS-FB key.	
16	Operate H, T, U keys to direct final selector to terminal 99.	
17	Momentarily operate ST key.	TST lamp lighted. At completion of test — IO-OK lamp lighted.
18	Momentarily operate DISC key.	TST, IO-OK lamps extinguished. BY lamp lighted momentarily.
19e	If no further tests are to be performed — Restore keys.	
20e	Remove make-busy plugs.	
21e	Remove patching cords.	

#### G. Time Measure Release Test

11	Operate H, T, U keys to direct final selector to terminal 99.	
12	Momentarily operate ST key.	TST lamp lighted. At completion of test — FF-OK lamp flashes.
13	When FF-OK lamp flashes, operate and hold DISC key.	After timed interval, BY lamp lighted.
14	Using stop watch, check time BY lamp remains lighted.	BY lamp extinguished within 2 to 5 seconds.
15	Release DISC key.	FF-OK, TST lamps extinguished.
16d	If no further tests are to be performed — Restore keys.	
17d	Remove make-busy plugs.	
18d	Remove patching cords.	

#### H. Telltale Test

14	Operate H, T, U keys to select a brush associated with one of the banks on final selector frame.	
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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
15	Momentarily operate ST key.	TST lamp lighted. AT completion of test — FF-OK, IO-OK lamps lighted.
16	Momentarily operate DISC key.	TST, FF-OK, IO-OK lamps extinguished. BY lamp lighted momentarily.
17d	If no further tests are to be performed — Restore keys.	
18d	Remove make-busy plugs.	
19d	Remove patching cords.	

**I. Brush Continuity Test**

17	Operate FBC or BC key.	
18	Operate H, T, U keys to direct selector to the test line.	
19f	If lines having ground disconnected from the tip side are being tested — Operate TGO key when provided.	
20	Manually raise selector rod to test terminal of the line used for test, then trip proper brush.	
21	Momentarily operate ST key.	TST lamp lighted. At completion of up drive — IO-OK lamp lighted.
22g	If test set is equipped with GRD-SLV key — Operate and hold key.	BC-OK lamp lighted.
23g	Release GRD-SLV key.	BC-OK lamp extinguished.
24h	If test set is not equipped with GRD-SLV key — Connect ground to sleeve of free end of patching cord connected to D or T2 jack.	BC-OK lamp lighted.
25h	Remove ground from patching cord.	BC-OK lamp extinguished.
26	Momentarily operate DISC key.	TST, IO-OK lamps extinguished. BY lamp lighted momentarily.
27i	If no further tests are to be performed — Restore keys.	

STEP	ACTION	VERIFICATION
28i	Remove make-busy plugs.	
29i	Remove patching cords.	
<b>J. Particular Line Test — Idle Line Condition</b>		
17	Operate FBC or BC key.	
18	Operate H, T, U keys to direct the selector to a particular line.	
19f	If lines having battery disconnected from the tip side are being tested — Operate TGO key when provided.	
	<i>Note:</i> If TGO key is not provided, connect ground to tip terminal of terminal strip associated with the line relay unit. This connection should be made for only a short interval.	
20	Manually raise selector rod to test final terminals of line used for test, then trip proper brush.	
21	Momentarily operate ST key.	TST lamp lighted. At completion of up drive — IO-OK lamp lighted.
22g	If test set is equipped with GRD-SLV key — Operate key.	BC-OK lamp lighted.
23g	Release GRD-SLV key.	BC-OK lamp extinguished.
24h	If test set is not equipped with GRD-SLV key — Connect ground to sleeve of free end of patching cord connected to D or T2 jack.	BC-OK lamp lighted.
25h	Remove ground from patching cord.	BC-OK lamp extinguished.
26	Momentarily operate DISC key.	TST, IO-OK lamps extinguished. BY lamp lighted momentarily.
27i	If no further tests are to be performed — Restore keys.	
28i	Remove make-busy plugs.	
29i	Remove patching cords.	

STEP	ACTION	VERIFICATION
<b>K. Particular Line Test — Busy Line Condition</b>		
17	Connect telephone headset to TEL A jack.	
18	Operate PLB key.	
19	Operate H, T, U keys to direct selector to test line.	
20	Manually raise test final selector rod to terminals of line used for test, then trip proper brush.	
21	Momentarily operate ST key.	TST lamp lighted. At completion of up drive — FB-OK, IO-OK lamps lighted. Busy tone heard.
22	Momentarily operate DISC key.	TST, FB-OK, and IO-OK lamps extinguished. Busy tone silenced.
23	Restore all keys.	
24	Remove make-busy plug.	
25	Disconnect patching cords.	
26	Disconnect telephone headset.	