

**COMBINATION CONNECTORS**  
**TOLL OPERATION TESTS**  
**USING TEST SET SD-31858-01 (J34701A)**  
**AND TEST LINE SD-31857-01 (J33017F)**  
**STEP-BY-STEP SYSTEMS**

**1. GENERAL**

**1.01** This section describes a method of testing the toll operating features of 100- and 200-point combination connectors by means of test set SD-31858-01 and test line SD-31857-01.

**1.02** This section is reissued to include testing of 200-point combination connectors, to expand Test B and C to include a machine intercept test, to make the section available to No. 35-E-97 offices, and to bring the section generally up to date. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

**1.03** The tests covered are:

**A. Busy Line Test — Leak:** This test checks the stepping features of a connector under a leak condition. It also checks its ability to return busy tone, busy flash where provided, and to release.

**B. Idle Line Test — Loop — Other Than 8-party Semiselective Connectors:** This test checks the stepping features of a connector under a loop condition and its ability to ring, trip, and provide a proper transmission path. On 200-point connectors cut-through to machine intercept is checked.

**C. Idle Line Test — Loop — 8-party Semiselective Connectors:** This test checks the stepping features of a connector under a loop condition and its ability to ring, trip, and provide a proper transmission path, and with 200-point connectors, machine intercept is checked. It also makes a complete check of 100-point connector K and N relays and 200-point connector G and N relays. Connector ringing polarity is checked either by test line bells or by lamps on the test set.

**1.04 100-point Connectors:** The test line employed in making these tests is connected to terminal 99, except in the case of rotary hunting connectors and, in some cases, 20-code ringing connectors as described in 1.06. In rotary hunting groups, terminal 99 is made busy and the test line is connected to terminal 90. The hunting feature is checked by directing the switch to terminal 99 and noting that it steps to terminal 90.

**1.05 200-point Connectors:** The test line for nonrotary hunting connectors is connected to terminal 99 of the upper and lower banks. The test line for rotary hunting connectors is connected to terminal 99 of the upper banks and to terminal 90 of the lower banks, terminal 99 of the lower banks being made busy. The rotary hunting feature of the switch is tested with the test set LO-UP key in its normal position by directing the switch to terminal 99 and having it step to 90.

**Caution:** *If the connector stops on any other terminal, immediately release the connector so as to avoid ringing on a subscriber line.*

**1.06** When testing 20-code ringing connectors, codes 11 to 20 must be used to make a complete check of the ringing. If the ninth level is arranged to close the normal post springs, codes 11 to 20 will be tested by dialing 99. If the ninth level is not so arranged, cross-connect the test line circuit to a nonworking terminal on a level which is arranged to close the normal post springs and use this nonworking terminal as the test terminal.

**1.07** In Tests B and C, space in parentheses is provided for writing in the interval during which the pretrip and trip tests are to be made as indicated in Table A or B.

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**1.08** When testing connectors arranged for 1000-ohm or 1115-ohm maximum external subscriber loop, which have 60- to 75-volt silent interval tripping battery and for which ac requirements are specified, any ring-trip relays which fail on the pretrip or trip test (test set or test line test resistance values) shall be re-adjusted to meet the requirements specified in Sections 040-803-701 and 040-236-701 and the re-adjust ringing current values provided by the test line. These values are obtained as indicated for READJUST in Tables A and B, by connecting the TL jack of the test set to the AC jack of the test line.

**1.09** There is magnetic interference between the ring-trip relay and the H relay, if operated, of some combination connectors. Due to this interference, when testing these connectors arranged for 1400-ohm or 1500-ohm maximum external subscriber loop, the following shall apply.

(a) **Pretrip:** Any ring-trip relay which fails on the pretrip test shall be readjusted mechanically and electrically to meet the requirements specified in Sections 040-803-701 and 040-236-701, and in the circuit requirements table. If the connector is of the type where the H relay is not operated on local calls, the connector should then be tested from the local side and the ring-trip relay further readjusted, if necessary, to meet the pretrip and trip tests as covered in Section 226-405-500. Make the trip test from the toll side.

(b) **Trip:** Any connectors which fail on the trip test shall be tested from the local side, and the ring-trip relay readjusted, if necessary, to meet the pretrip and trip tests as covered in Section 226-405-500. When the trip test is met from the local side, failure to trip during the silent period from the toll side is due to magnetic interference. In this case, tripping during the ringing period shall be considered sufficient.

**Note:** If the ring-trip relay was readjusted and the connector tested from the local side following pretrip failure, it is not necessary to test the connector from the local side following trip failure.

**1.10** 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.

**1.11 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.

**1.12** Local instructions should be followed for recording and reporting any register operations caused by performing these tests.

## 2. APPARATUS

### All Tests

- 2.01** Test set, J34701A (SD-31858-01).
- 2.02** Connector test line circuit, J33017F (SD-31857-01).
- 2.03** No. 52A head telephone set (associated with test set).
- 2.04** Patching cord, P4K cord, 12 feet long, equipped with No. 289B plug and No. 240C plug (No. 4P5A cord) (for use with 100-point connectors).
- 2.05** Patching cord, consisting of a P4K cord, 12 feet long, equipped with a No. 289B plug, and a P3H cord, 10 feet long, equipped with a No. 310 plug, both cords attached to a No. 240C plug (No. 5P5A cord) (for use with 200-point connectors).
- 2.06** Patching cord, P3E cord, 6 feet long, equipped with two No. 310 red shell plugs (No. 3P7A cord).

**2.07** Patching cord, P3E cord, 6 feet long, equipped with two No. 310 black shell plugs (No. 3P6D cord).

#### Tests B and C

**2.08** Patching cord, P3E cord, 1 foot long, equipped with two No. 310 plugs (No. 3P6A cord) (for use when test set is provided with PTR key).

**2.09** Patching cord, P3E cord, 6 feet long, equipped with two No. 310 plugs (No. 3P7A cord) (for use when test set is equipped with NTR key and for readjusting relays having ac readjust requirements).

#### Test C

**2.10** Patching cord, P3E cord, 6 feet long, equipped with two No. 310 plugs (No. 3P7A cord) (for use when test set is arranged for visual ringing).

### 3. PREPARATION

#### All Tests

STEP	ACTION	VERIFICATION
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1	Connect test set B, R jacks to connector test line B, R jacks, respectively, using 6-foot black shell and red shell plug P3E cords.	
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*Note:* To avoid possible grounding of battery supply lead, connect cord to test set first and, when disconnecting, remove cord from test set last.

2	Connect head telephone set to test set TEL jack.	
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#### For 100-point Connectors

3	Using No. 4P5A cord, insert No. 289B plug into test set TT jack with stay cord down.	
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4	Operate SL key.	
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5	Insert No. 240B plug of cord into test jack of connector to be tested.	
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BSY lamp not lighted.

*Note:* If BSY lamp lights, transfer No. 240B plug to next connector to be tested.

#### For 200-point Connectors

6	Using No. 5P5A cord, insert No. 289B plug of P4K cord into test set TT jack with stay cord down.	
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7	Operate SL key.	
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8	Insert No. 310 plug of P3H cord into test set FR jack.	
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9	Insert No. 240C plug into test jack of connector to be tested.	
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BSY lamp not lighted.

*Note:* If BSY lamp lights, transfer No. 240C plug to next connector to be tested.

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STEP	ACTION	VERIFICATION
<b>Test B</b>		
10a	If test set is provided with PTR key — Using one-foot P3E cord, connect test set TL jack to proper test set jack, as shown in Table A.	
11a	Operate S key.	
12b	If test set is provided with NTR key — Using 6-foot P3E cord, connect test set TL jack to test line jack and/or operate keys in test set as shown in Table B.	
<b>Test C</b>		
13c	If test set is arranged for visual ringing — Connect test set 8R jack to test line T jack using 6-foot P3E cord.	
14d	If testing terminal-per-station connectors — Operate OP, NOR, NO keys to one of three positions using different position on each test cycle.	
	<i>Note:</i> By using position NO, an operate test of the connector K or G relay is applied; by using position OP, an operate test of the connector N relay is applied; and by using position NOR, a nonoperate test of the N relay is applied. It may be desired to impose the three conditions on each connector tested. In any case, this complete test should be made when clearing specific cases of trouble.	

Table A — Test Set Provided With PTR Key

KIND OF RING	MAX. EXT. SUB. LOOP (OHMS)	TRIP BAT. VOLTS	CONNECT TL JACK TO		PRETRIP (INTERVAL)	TRIP (INTERVAL)
			TST SET JK.	TST LINE JK.		
			TEST	READJUST		
SUPER-IMPOSED	750 - 900	60 - 75	TR1	AC	RINGING	RINGING
	1000 - 1115		TR2			
AC-DC		45 - 52	TR3	-		SILENT
	TR4		-			

Table B — Test Set Provided With NTR Key

KIND OF RING	MAX. EXT. SUB. LOOP (OHMS)	TRIP BAT. VOLTS	CONNECT TL JACK TO TEST LINE JACK FOR		KEYS OPERATED		PRETRIP (INTERVAL)	TRIP (INTERVAL)
			TEST	READJUST	TEST	READJUST		
SUPER-IMPOSED	750-900	60-75	SUP	AC	S	S	RINGING	RINGING
	1000-1115		-	-	S TR2-L TR3-L	-		
AC-DC		48.5 TO 50.0	-	-	L TR2-L TR3-R	L TR2-R TR3-R	SILENT	SILENT
SUPER-IMPOSED	1400-1500		-	-	L TR2-L TR4-L	L TR2-R TR4-L		
		66-75	-	-				

## 4. METHOD

STEP	ACTION	VERIFICATION
<b>A. Busy Line Test — Leak</b>		
10	Restore SL key.	C lamp lighted.
11	Operate LK key.	
12	Operate BY key.	
13	With 200-point connectors — Operate LO-UP key to UP position.  <i>Note:</i> On alternate testing cycles, the LO-UP key should be left in the normal position.	
14	Operate DL ST key.	
15	Dial 99.  <i>Note:</i> Dial an extra digit if testing terminal-per-line code ringing connectors (100-point connectors only).	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal. Busy tone may or may not be heard in receiver, depending upon office arrangement. C lamp extinguished.
16	Operate CT key.	C lamp flashes at 60 ipm. Busy tone continues to be heard, if heard in Step 15.
17	Restore DL ST, CT keys.	
18	Operate, restore SL key.	Connector releases. C lamp remains lighted when SL key is restored.
19	Restore LK, BY keys, LO-UP key, if operated.	
20	Unless other tests are to be made on this switch — Remove all test connections.	C lamp extinguished.
<b>B. Idle Line Test — Loop — Other Than 8-party Semiselective Connectors</b>		
13	Restore SL key.	C lamp lighted.
14	Operate 300 key.	
15	Operate SW key.	C lamp extinguished.
16	Operate DL ST key.	
17c	If testing other than code ringing terminal-per-line connectors — Dial 99.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
18c	Restore SW key.	Audible ringing heard in receiver. Buzzer relay sounds, follows ringing code. 2-ring or code ringing connectors — First audible ring should be full code ring.

STEP	ACTION	VERIFICATION
19d	If testing code ringing terminal-per-line connectors — Operate REV L key.	
20d	Dial 99, then dial a code digit for ringing over the tip.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
21d	Restore SW key.	Audible ringing heard in receiver. Buzzer relay sounds, follows ringing code.
22d	Restore DL ST key. Operate, restore SL key.	Connector releases. C lamp lighted.
23d	Operate SW key.	C lamp extinguished.
24d	Operate DL ST key.	
25d	Restore REV L key.	
26d	Dial 99, then dial a code digit for ringing over the ring.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
27d	Restore SW key. <i>Note:</i> Different code digits should be dialed on each test cycle so that eventually all codes will have been tested on each switch.	Audible ringing heard in receiver. Buzzer relay sounds, follows ringing code. First audible ring should be full code ring.
28	Operate CT key.	
29e	If testing connectors in offices in which generator is connected to ground — Operate REV L key. <i>Note:</i> Steps 29e through 31e should be made during one ( ) interval.	
30e	Operate PTR or NTR key momentarily.	
31e	Restore REV L key.	Buzzer relay responds to next ringing period.
32e	If testing connectors in offices in which generator is connected to superimposing battery — Operate PTR or NTR key momentarily at start of ( ) interval.	Buzzer relay responds to next ringing period.
33	Operate TR key momentarily at start of ( ) interval.	C lamp lighted while TR key operated. Test applied in silent interval — Audible ringing signal is not heard again in receiver, buzzer relay does not again sound. Test applied in ringing interval — Audible ringing and buzzer relay immediately silenced.
34	Operate TOLL key.	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
35	Operate ANS key. <i>Note:</i> It may be necessary to restore the ANS key momentarily to start the tone.	Tone heard in receiver. C lamp lighted.
36	Restore DL ST, TOLL, ANS keys.	C lamp extinguished. Tone removed.
37	Restore CT key.	Audible ringing again heard in receiver. Buzzer relay again sounds.
38	Operate, restore SL key.	Connector releases. C lamp lighted.
<b>Machine Intercept (200-point Connector Only)</b>		
39	Operate SW key.	C lamp extinguished.
40	Operate DL ST, MI keys.	
41	Dial 99.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal. Recorded message heard in receiver.
42	Restore DL ST, SW, MI keys.	
43	Operate, restore SL key.	Connector releases. C lamp lighted.
44	Unless other tests are to be made on this switch — Remove all test connections, restore all keys to normal.	C lamp extinguished.
<b>C. Idle Line Test — Loop — 8-party Semiselective Connectors</b>		
15	Restore SL key.	C lamp lighted.
16	Operate 300 key.	
17	Operate SW key.	C lamp extinguished.
18	Operate DL ST key.	
<b>Line Seizure and Ringing Test 8-party Semiselective Terminal-Per-Line Connectors</b>		
19e	If test set is arranged for audible ringing — Operate REV L key.	
20e	Operate BELL T key.	
21e	Dial 99, then dial code digit for ringing over tip.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
22e	Restore SW key.	Audible ringing heard in receiver. R- or R+ bell rings, buzzer relay sounds, follows ringing code.
23e	Operate, restore SL key.	Connector releases. C lamp lighted.



STEP	ACTION	VERIFICATION
24e	Operate SW key.	C lamp extinguished.
25e	Restore, operate DL ST key.	
26e	Restore REV L key.	
27e	Operate BELL R key.	
28e	Dial 99, then dial code digit for ringing over ring.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
29e	Restore SW key. <i>Note:</i> Different code digits should be dialed on each routine test cycle so that eventually all codes will have been tested on each switch.	Audible ringing heard in receiver. R- or R+ bell rings, buzzer relay sounds, follows ringing code. First audible ring should be full code ring.
30c	If test set is arranged for visual ringing — Operate REV L key.	
31c	Dial 99, then operate BY key before dialing code digit for ringing over tip.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
32c	Restore SW key.	Audible ringing heard in receiver. CR or CC lamp lights, buzzer relay sounds, follows ringing code.
33c	Operate, restore SL key.	Connector releases. C lamp lighted.
34c	Operate SW key.	
35c	Restore BY, REV L keys.	
36c	Restore, operate DL ST key.	
37c	Dial 99, then operate BY key, PTR or NTR key before dialing code digit for ringing over ring.	
38c	Restore SW key. <i>Note:</i> Different code digits should be dialed on each routine test cycle so that eventually all codes will have been tested on each switch.	Audible ringing heard in receiver. CR or CC lamp lights, follows ringing code. First audible ring should be full code ring.

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39e	If test set is arranged for audible ringing — Operate BELL R key.	
40e	Dial 99.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
41e	Restore SW key.	Audible ringing heard in receiver. R- bell rings during ringing interval when test line OP, NOR, NO key is in either NO or NOR position. R+ bell rings during ringing interval when test line OP, NOR, NO key is in OP position. Buzzer relay sounds during ringing interval. 2-ring connectors — First audible ring is full code ring.
42c	If test set is arranged for visual ringing — Dial 99, then operate BY key, PTR or NTR key.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
43c	Restore SW key.	Audible ringing heard in receiver. CR lamp lights during ringing interval when test line OP, NOR, NO key is in either NO or NOR position. CC lamp lights during ringing interval when test line OP, NOR, NO key is in OP position. 2-ring connectors — First audible ring is full code ring.
44e	If test set is arranged for audible ringing — Restore BELL R key.	R+ or R- bell stops ringing. Buzzer relay continues to sound during ringing interval.
45c	If test set is arranged for visual ringing — Restore BY, PTR, or NTR key.	CR or CC lamp extinguished. Buzzer relay sounds during ringing interval.
46f	If test set is provided with PTR key — Connect test set TL jack to proper test jack, using one-foot P3E cord, as shown in Table A.	
47f	Operate S key.	
48g	If test set is provided with NTR key — Connect test set TL jack to test line jack, using 6-foot P3E cord, and/or operate keys in test set, as shown in Table B.	
49	Operate CT key.	
50	Operate PTR or NTR key momentarily at start of ( ) interval.	Audible ringing continues to be heard in receiver. Buzzer relay silenced while key is operated.

STEP	ACTION	VERIFICATION
51	Operate TR key momentarily at start of ( ) interval.	C lamp lights while TR key is operated. Test applied in silent interval — Audible ringing signal is not heard again in the receiver, buzzer relay does not again sound. Test applied in ringing interval — Audible ringing and buzzer relay are immediately silenced.
52	Operate TOLL key.	
53	Operate ANS key. <i>Note:</i> It may be necessary to restore the ANS key momentarily to start the tone.	Tone heard in receiver. C lamp lighted.
54	Restore DL ST, TOLL, ANS key.	C lamp extinguished. Tone removed.
55	Restore CT key.	Audible ringing again heard in receiver. Buzzer relay again sounds.
56	Operate, restore SL key.	Connector releases. C lamp lighted.
<b>Machine Intercept (200-point Connectors Only)</b>		
57	Operate SW key.	C lamp extinguished.
58	Operate DL ST, MI keys.	
59	Dial 99. Listen in headset receiver.	Connector steps to ninth level, rotates smoothly to test line terminal. Recorded message heard in receiver.
60	Restore DL ST, SW, MI keys.	
61	Operate, restore SL key.	Connector releases. C lamp lighted.
<b>All Connectors</b>		
62	Unless other tests are to be made on this switch — Remove all test connections, restore all keys to normal.	C lamp extinguished.