COMBINATION CONNECTORS
TOLL OPERATION TESTS
USING TEST SET SD-31859-01 (J34722B)
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-31859-01 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 Test C to include a machine intercept test, to revise Test C for proper lamp indication, 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 and its ability to return busy tone, busy flash, if 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. With 200-point connectors, cut-through to machine intercept is checked. It also makes a complete check of 100-point connector K and N relays and the ringing control relays in 200-point connectors. Connector ringing polarity is checked either by test line bells or by lamps in the test set.

1.04 ***100-point Connectors:*** The test line 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 having it step 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 bank being made busy. The rotary hunting feature of the switch is tested, with the test set LO-UP key in the normal position, by directing the switch to terminal 99 and having it step to terminal 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 non-working 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.

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 readjusted to meet the requirements specified in Sections 040-803-701 and 040-236-701 and the readjust 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 requirement 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 226-405-501. Make the trip test from the toll side.

(b) ***Trip:*** Any connector which fails 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 226-405-501. When the trip test is met from the local side, failure to trip during the silent interval 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 conditions 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 with reference to recording and reporting any register operations caused by performing these tests.

2. APPARATUS

2.01 Test set, J34722B (SD-31859-01).

2.02 Connector test line circuit, J33017F (SD-31857-01).

2.03 No. 1011G dial hand test set (handset) (or equivalent), connected to a W2CL cord, 4 feet long, equipped with a No. 471A jack and a No. 240A plug (No. 2W39A cord).

2.04 Patching cord, P4K cord, 12 feet long, equipped with a No. 289B plug and a No. 240C plug (No. 4P5A cord) (for use in testing 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).

Test Set Equipped With B and R Jacks

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

2.07 Patching cord, P3E cord, 6 feet long, equipped with two No. 310 red shell plugs (No. 3P7A 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 provided with NTR key and when 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 indication).

3. PREPARATION

All Tests

STEP	ACTION	VERIFICATION
1a	If test set is equipped with B, R jacks — Connect test set B jack to connector test line B jack using black shell P3E cords.	
2a	Connect test set R jack to connector test line R jack using red shell P3E cord. *Note:* To avoid possible grounding of the battery supply lead, connect cords to test set first and, when disconnecting, remove cords from test set last.	
3b	If test set is not equipped with B, R jacks — Insert B, R plugs of cord associated with test set into connector test line B, R jacks, respectively.	
4	Insert No. 240A plug of handset into test set TJ jack.	
For 100-point Connectors Only		
5	Using No. 4P5A cord, insert No. 289B plug of P4K cord into test set TT jack, with stay cord down.	
6	Insert No. 240C plug of P4K cord into test jack of connector to be tested.	C lamp does not light. *Note:* If C lamp lights, remove plug from test jack and proceed to another switch.

STEP	ACTION	VERIFICATION
For 200-point Connectors		
7	Using No. 5P5A cord, insert No. 289B plug into test set TT jack with stay cord down.	
8	Insert No. 310 plug of No. 5P5A cord into test set FR jack.	
9	Insert No. 240C plug of No. 5P5A cord into test jack of connector to be tested.	C lamp does not light. *Note:* If C lamp lights, remove plug from test jack and proceed to another switch.
Tests B and C		
10c	If test set is provided with PTR key — Connect test set TL jack to proper test jack, using 1-foot P3E cord, as shown in Table A.	
11c	Operate S key.	
12d	If test set is provided with NTR key — Connect test set TL jack to jack of test line, using 6-foot P3E cord and/or operate keys in test set as shown in Table B.	
Test C		
13e	If test set is arranged for visual ringing — Connect test set 8R jack to test line T jack, using 6-foot P3E cord.	
14f	If testing terminal per station connectors — Operate OP, NOR, NO key to one of three positions, using different position on each test cycle. *Note:* 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 TST SET JK TEST	CONNECT TL JACK TO TST LINE JK READJUST	PRETRIP (INTERVAL)	TRIP (INTERVAL)
SUPER-IMPOSED	750 - 900	60 - 75	TR1	AC	RINGING	RINGING
			TR2			
	1000 - 1115	45 - 52	TR3	—		SILENT
AC-DC			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 TEST	CONNECT TL JACK TO TEST LINE JACK FOR READJUST	KEYS OPERATED TEST	KEYS OPERATED READJUST	PRETRIP (INTERVAL)	TRIP (INTERVAL)
SUPER-IMPOSED	750 - 900	60-75	SUP	AC	S	S	RINGING	RINGING
AC-DC	1000 - 1115	48.5 TO 50.0	—	—	S TR2-L TR3-L	—	SILENT	SILENT
	1400 - 1500		—	—	L TR2-L TR3-R	L TR2-R TR3-R		
SUPER-IMPOSED		66-75	—	—	L TR2-L TR4-L	L TR2-R TR4-L		

4. METHOD

STEP	ACTION	VERIFICATION
	A. Busy Line Test — Leak	
10	Operate LEAK key.	
11	Operate PTR or NTR key.	
12	Operate SL key.	
13	With 200-point connectors, operate LO-UP key to UP position. *Note:* On alternate testing cycles, the LO-UP key should be left in the normal position.	
14	Operate handset cord switch to ON position.	
15	Operate handset switch to TALK position.	
16	Dial 99. *Note:* 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, depending upon office arrangement.
17	Operate CT key.	REV BAT lamp flashes. Busy tone continues to be heard, if heard in previous step.
18	Operate handset switch to MON position.	
19	Restore SL key.	Connector releases.
20	Restore CT, LEAK, PTR or NTR keys, and LO-UP key, if operated.	
21	Unless other tests are to be made on this switch — Remove all test connections, restore all keys to normal.	
	B. Idle Line Test—Loop—Other Than 8-Party Semiselective Connectors	
13	Operate SL key.	
14	Operate handset cord switch to OFF position.	
15	Operate handset switch to TALK position.	

STEP	ACTION	VERIFICATION
	Machine Intercept (200-point Connectors Only)	
16	Operate MI key, LO-UP key to UP position.	
17	Dial 99. Listen in headset receiver.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal. Recorded message heard in receiver.
18	Release SL key.	Connector releases.
19	Restore MI and LO-UP key.	
	Line Seizure and Ringing Tests (All Connectors)	
20	Operate PTR or NTR key.	
21e	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.
22e	Operate CT key.	
23e	Restore PTR or NTR key.	
24e	Restore CT key.	Audible ringing heard in receiver. Buzzer relay sounds, follows ringing code. **Two-ring or code ringing connectors** First audible ring is a full code ring.
25e	Operate CT key.	
26f	If testing code ringing terminal per line connectors (100-point connectors only) — Operate REV L key.	
27f	Dial 99, then dial a code for ringing over the tip.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
28f	Operate CT key.	
29f	Restore PTR or NTR key.	
30f	Restore CT key.	Audible ringing heard in receiver. Buzzer relay sounds, follows ringing code.
31f	Operate CT key.	
32f	Operate handset switch to MON position.	
33f	Restore CT, then SL, REV L keys.	Connector releases.
34f	Operate PTR or NTR key.	

STEP	ACTION	VERIFICATION
35f	Operate SL key.	
36f	Operate handset switch to TALK position.	
37f	Dial 99, then dial a code for ringing over the ring.	Connector steps to ninth level, then rotates smoothly to test line terminal.
38f	Operate CT key.	
39f	Restore PTR or NTR key.	
40f	Restore CT key. *Note:* 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. Buzzer relay sounds, follows ringing code. **Code ringing connectors** First audible ring is a full code ring.
41f	Operate CT key.	
42f	Operate handset switch to MON position.	
43g	If testing connectors in offices in which the generator is connected to ground — Operate REV L key. *Note:* Steps 43g through 45g should be made during one ( ) interval.	
44g	Operate PTR or NTR key momentarily.	
45g	Restore REV L key.	Buzzer relay responds to next ringing period.
46h	If testing connectors in offices in which the generator is connected to superimposed battery — Operate PTR or NTR key momentarily at start of ( ) interval.	Audible ringing continues to be heard in receiver. Buzzer relay responds to next ringing period.
47	Operate TR key momentarily at start of ( ) interval.	REV BAT lamp lights while TR key is operated. **Test applied in silent interval** Audible ringing signal not heard again. Buzzer relay does not sound again. **Test applied in the ringing interval** Audible ringing and buzzer relay immediately silenced.
48	Restore CT key.	Audible ringing again heard in receiver. Buzzer relay again sounds.
49	Operate CT key.	
50	Restore SL key.	Connector releases.

STEP	ACTION	VERIFICATION
51	Unless other tests are to be made on this switch — Remove all test connections and restore all keys to normal.	

C. Idle Line Test—Loop—8-party Semiselective Connectors

15	Operate PTR or NTR key.	
16	Operate SL key.	
17	Operate handset cord switch to OFF position.	
18	Operate handset switch to TALK position.	

Line Seizure and Ringing Tests — 8-party Semiselective Terminal-per-line Connectors

19g	If test set is arranged for audible ringing — Operate REV L key.	
20g	Operate BELL T key.	
21g	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.
22g	Operate CT key.	
23g	Restore PTR or NTR key.	
24g	Restore CT key.	Audible ringing heard in receiver. R— or R+ bell rings, buzzer relay sounds, follows ringing code.
25g	Operate CT key.	
26g	Operate handset switch to MON position.	
27g	Restore CT, then SL keys.	Connector releases.
28g	Operate PTR or NTR key.	
29g	Operate SL key.	
30g	Restore REV L key.	
31g	Operate BELL R key.	
32g	Operate handset switch to TALK position.	

STEP	ACTION	VERIFICATION
33g	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.
34g	Operate CT key.	
35g	Restore PTR or NTR key.	
36g	Restore CT key. ***Note:*** 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. R— or R+ bell rings, buzzer relay sounds, follows ringing code. First audible ring should be a full code ring.
37	Operate CT key.	
38e	If test set is arranged for visual ringing — Operate REV L, T keys.	
39e	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.
40e	Operate CT key.	
41e	Restore PTR or NTR key.	
42e	Restore CT key.	Audible ringing heard in receiver. (+) or (—) lamp lights, buzzer relay sounds, follows ringing code.
43e	Operate CT key.	
44e	Operate switch on hand test set to MON position.	
45e	Restore CT, then SL keys.	Connector releases.
46e	Operate PTR or NTR key.	
47e	Operate SL key.	
48e	Restore REV L, T keys.	
49e	Operate R key.	
50e	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.
51e	Operate CT key.	
52e	Restore PTR or NTR key.	

STEP	ACTION	VERIFICATION
53e	Restore CT key. *Note:* 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. (+) or (—) lamp lights, buzzer relay sounds, follows ringing code. First audible ring should be a full code ring.
54	Operate CT key.	

Line Seizure and Ringing Test — 8-Party Semiselective Terminal-per-station Connectors

55g	If test set is arranged for audible ringing — Operate BELL R key.	
56h	If testing 200-point connectors — Operate LO-UP key. *Note:* On alternate testing cycles, leave LO-UP key in normal position.	
57g	If test set is arranged for audible ringing — Dial 99.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
58g	Operate CT key.	
59g	Restore PTR or NTR key.	
60g	Restore CT key.	Audible ringing heard in receiver.
61g	Operate CT key.	R— bell rings, follows code, when test line OP, NOR, NO key is in either NO or NOR position. R+ bell rings, follows code, when test line OP, NOR, NO key is in OP position. Buzzer relay sounds during ringing interval. **Two-ring connectors** First audible ring should be a full code ring.
62e	If test set is arranged for visual ringing — Operate R key.	
63e	Dial 99.	Connector steps smoothly to ninth level, then rotates smoothly to test line terminal.
64e	Operate CT key.	
65e	Restore PTR or NTR key.	
66	Restore CT key.	Audible ringing heard in receiver.

STEP	ACTION	VERIFICATION
67i	If testing for negative superimposed ringing — With OP, NOR, NO key in either NO or NOR position — Operate CT key.	(−) lamp lights, follows code. Buzzer relay sounds during ringing interval. **Two-ring connectors —** First audible ring should be a full code ring.
68j	If testing for positive superimposed ringing — With OP, NOR, NO key in OP position — Operate TR1-R, CT keys.	(+) lamp lights, follows ringing code. **Two-ring connectors —** First audible ring should be a full code ring. Buzzer relay sounds.
69j	Restore TR1-R key.	
70	Operate switch on hand test set to MON position.	
71	Operate PTR or NTR key momentarily at start of ( ) interval.	Audible ringing continues to be heard in receiver. Buzzer relay stops while key is operated.
72	Operate TR key momentarily at start of ( ) interval.	REV BAT lamp lights while TR key is operated. **Test applied in silent interval** Audible ringing not heard again in the receiver, buzzer relay does not sound again. **Test applied in ringing interval** Audible ringing, buzzer relay immediately silenced.
73	Restore CT key.	Audible ringing again heard in receiver. Buzzer relay again sounds.
74	Operate CT key.	
75	Restore SL key.	Connector releases.
Machine Intercept (200-point Connectors Only)		
76	Operate SL key.	
77	Operate MI key, LO-UP key to UP position.	
78	Dial 99. Listen in test receiver.	Connector steps to ninth level, rotates smoothly to test line terminals. Recorded message heard in receiver.
79	Release SL key.	Connector releases.
All Connectors		
80	Unless other tests are to be made on this switch — Remove all test connections, restore all keys to normal.	