TOLL AND COMBINATION CONNECTORS
TOLL OPERATION TESTS
USING TRUNK TEST SET SD-90469-01 OR SD-90469-02 (J94710A)
AND TEST LINE SD-32198-01
STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section describes a method of testing the operating features of 100-point toll connectors, and the toll operating features of 100- and 200-point combination connectors, by means of trunk test set SD-90469-01 or SD-90469-02 and test line SD-32198-01.

1.02 This section is reissued to include testing of the 200-point combination connector features, to expand Test B to include a machine intercept test, and to bring the section generally 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. Busy Line Test — Leak: This test checks the stepping features of a connector under a leak condition. It also checks the ability of the connector to return busy tone and to release.

B. Nonlevel Hunting Connectors — Idle Line Test — Loop: This test checks the stepping features of a connector under a loop condition. It also checks the ringing, pretrip, trip, transmission, and release features. Connector ringing is indicated either by test line bells or visual signals on the test set.

C. Level Hunting Connectors — 100-Point Only — Idle Line Test — Loop: This test checks the trunk hunting features of a connector under a loop condition. It also checks the ringing, pretrip, trip, transmission, and release features. Connector ringing is indicated either by test line bells or visual signals on the test set.

D. Ringing Polarity Test — 8-party Semiselective Ringing Connectors: This test makes a complete check of toll connector H and J relays, or combination connector K and N relays, and is intended for use only when testing a connector in connection with clearing a specific case of trouble. On a test cycle basis, the 8-party connectors should be tested as outlined in Tests A and B.

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 and level hunting connectors. (See 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 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 In the case of level hunting connectors, terminal 91 is ordinarily used as the test line number. In order to reach this terminal, it is necessary to dial the digit which will direct the switch to the ninth level, plus an additional digit if the connector is wired to start hunting after dialing the units digit.When the connectors are wired so as to hunt over a group of 100 trunks regardless of the digit (or digits) dialed, terminal 11 is used as the test number. In order

to reach this terminal, it is necessary to ground the commutator of the lowest level, then dial any digit.

1.07 ***Toll Connectors:*** When testing connectors arranged for 1400- or 1500-ohm maximum external subscriber loop, any ring-tip relays which fail on the pretrip or trip test (test line test resistance values) 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 tables. Repeat the test, and, if the relay continues to fail, operate the test set keys as described in Part 4 to apply the test line readjust resistance values and change the tension in the No. 1 spring, as required.

1.08 ***Combination Connectors:*** 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- or 1500-ohm maximum external subscribers 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 shall 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 226-415-506. 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 adjusted, if necessary, to meet the pretrip and trip tests as covered in Section 226-415-506. 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.

1.09 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.

1.10 ***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.

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

2. APPARATUS

All Tests

2.01 Trunk test set, J94710A (SD-90469-01 or SD-90469-02).

2.02 Head telephone set (associated with test set).

2.03 Connector test line circuit, SD-32198-01.

2.04 Patching cord, P4K cord, 12 feet long, equipped with a No. 240B plug and No. 289B plug (No. 4P4A cord) (for use with 100-point toll connectors).

2.05 Patching cord, P4K cord, 12 feet long, equipped with No. 240C plug and No. 289B plug (No. 4P5A cord) (for use with 100-point combination connectors).

2.06 Patching cord, consisting of a P4K cord, 12 feet long, equipped with a No. 289B plug, and a P3H cord equipped with a No. 310 plug, both cords connected to a No. 240C plug (No. 5P5A cord) (for use with 200-point combination connectors).

2.07 Patching cord, P3K cord, 12 feet long, equipped with two No. 310 plugs (No. 3P15B cord) (for connecting battery and ground to test set when 48-volt jack is provided).

2.08 Testing cord, W2M cord, 9 feet long, equipped with one No. 310 plug and two No. 59 cord tips (No. 2W12A cord) (for connecting battery and ground to test set when no 48-volt jack is provided).

2.09 Patching cord, P3E cord, 10 feet long, equipped with two No. 310 plugs (No. 3P6F cord) (for connecting test set to jack on connector frame).

Test A

2.10 No. 240A plug (for testing level hunting connectors).

Test C

When Connector Test Line Is 11

2.11 Testing cord, No. 893 cord, 6 feet long, equipped with two No. 360A tools (No. 1W13B cord) and two KS-6278 clips.

Tests B, C, and D

When Visual Ringing Signal Is Provided

2.12 Patching cord, P3E cord, 10 feet long, equipped with two No. 310 plugs (No. 3P6F cord).

3. PREPARATION

STEP	ACTION	VERIFICATION
All Tests		
1a	If battery supply jack is available — Connect BAT-G jack of test set to 48-volt battery supply jack on connector frame, using P3K cord. ***Note:*** To avoid possible grounding of battery supply lead, connect cord to test set first, and, when disconnecting, remove cord from test set last.	
2b	If battery supply jack is not available — Insert No. 310 plug of W2M cord into BAT-G jack of test set.	
3b	Connect red (sleeve) conductor of cord to frame ground, white (tip) conductor to equipment side of convenient 48-volt battery fuse (not to exceed 5 amperes in any case).	
4	Connect head telephone set to test set jack TEL.	
5	Using P3E cord, connect TL jack of test set to a jack on connector frame as follows. TL2 — For connectors using superimposed ringing with 66-75V silent period battery (except level hunting). TL1 — For level hunting connectors. TL — For all other connectors.	

STEP	ACTION	VERIFICATION
6	Operate SL key.	
7c	If testing toll connectors — Using No. 4P4A cord, connect test set TT jacks to test jack of connector under test.	BSY, C lamps do not light. *Note:* If BSY lamp lights, disconnect and proceed to another switch.
8d	If testing 100-point combination connectors — Using No. 4P5A cord, connect test set TT jacks to test jack of connector under test.	BSY, C lamps do not light. (See note Step 7c.)
9e	If testing 200-point combination connectors — Using No. 5P5A cord, insert No. 289B plug into test set TT jacks, No. 310 plug into FR jack, then connect No. 240C jack to test jack of connector under test.	BSY, C lamps do not light. (See note Step 7c.)
Tests B, C, and D		
10f	If visual ringing signal is provided — Operate BF NO key.	
11	Using P3E cord, connect test set C jack to a jack on connector frame as follows. C1 — For 8-party connectors and 1-ring connectors using superimposed ringing. C — For all other connectors.	
12g	If testing 8-party connectors and visual ringing signal is provided — Test set J-NO, J-O, H-O key should be operated to one of three positions when applying Test B. Use a different position on each routine test cycle. In performing Test D, use the test line and test set as outlined therein. *Note:* By using position H-O, an operate test of the toll connector H relay or the combination connector K relay is applied; by using position J-O, an operate test of the toll connector J relay or the combination connector N relay is applied; and by using position J-NO, a nonoperate test of the J or N relay is applied.	

STEP	ACTION	VERIFICATION
13h	If testing 8-party connectors and audible ringing signal is provided — Test line NO-J, OP-H, OP-J key should be operated to one of the three positions when applying Test B. Use a different position on each routine test cycle. In performing Test D, use test line and test set as outlined thereunder. *Note:* By using position OP-H, an operate test of the toll connector H relay or the combination connector K relay is applied; by using position OP-J, an operate test of the local connector J relay or the combination connector N relay is applied; and by using position NO-J, a nonoperate test of the J or N relay is applied.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Busy Line Test — Leak	
10	Restore SL key.	C lamp lighted.
11	Operate LK, DL ST keys.	
12f	If testing connectors other than level hunting type — Dial 99. *Note:* If testing 10-party terminal-per-line connectors arranged for busy test of the called line following completion of code selector pulsing, dial an extra digit following the test number.	Connector steps to ninth level, rotates smoothly to test line terminal. C lamp extinguished. Busy tone heard in receiver.
13g	If testing level hunting connector — Insert No. 240A plug into sleeve cutoff jack.	
14g	Dial one or two digits, as required by particular circuit wiring, which will cause connector to hunt over at least two levels. *Note:* It will be necessary to dial an extra digit if the connector is wired to start hunting after the units digit is dialed.	Connector hunts smoothly, stops on tenth terminal of last level in group of trunks selected. C lamp extinguished. Busy tone heard in receiver.
15	Operate CT key.	C lamp flashes at busyback rate, if flashing is provided.
16	Restore DL ST, CT keys.	C lamp extinguished.
17	Operate SL key momentarily.	Connector releases. C lamp lights steadily.

STEP	ACTION	VERIFICATION
18	Restore LK key.	
19g	If testing level hunting connector — Remove plug from sleeve cutoff jack.	
20	Unless other tests are to be made on this switch — Remove plug from connector test jack.	C lamp extinguished.

B. Nonlevel Hunting Connectors — Idle Line Test — Loop

14	Restore SL key.	C lamp lighted.
15	Operate SW key.	C lamp extinguished.
16i	If testing other than combination connectors — Operate LP, ID keys.	
17j	If testing combination connectors — Operate ID key.	
18	Operate DL ST key.	
Line Seizure and Machine Intercept (200-point Connectors)		
19	Operate MI key, LO-UP key to UP position. *Note:* Leave LO-UP key in normal position on alternate testing cycles.	
20	Dial 99. Listen in headset receiver.	Connector steps to ninth level, rotates smoothly to test line terminal. Recorded message heard in receiver.
21	Restore MI, DL ST keys, LO-UP key, if operated.	
22	Operate SL key momentarily.	Connector releases.
Line Seizure and Ringing Test		
23e	If testing 200-point combination connectors — Operate LO-UP key to UP position.	
24k	If testing other than 10-party terminal-per-line connectors — Dial 99.	Connector steps to ninth level, rotates smoothly to test line terminal.
25k	Restore SW key.	RR or C lamp lights, or test line bell rings, follows ringing code. Audible ring heard in receiver. With 2-ring or code ringing connectors, first audible ring should be a full-code ring.

STEP	ACTION	VERIFICATION
26m	If testing 10-party terminal-per-line connectors — Dial 99, then dial a code digit for ringing over the tip.	Connector steps to ninth level, rotates smoothly to test line terminal.
27m	Restore SW key.	C lamp lights, or bell on tip side of line rings, follows ringing code. Audible ring heard in receiver.
28m	Restore DL ST key.	
29m	Operate SL key momentarily.	C lamp lights steadily. Connector releases.
30m	Operate SW key.	C lamp extinguished.
31m	Operate DL ST key.	
32m	Dial 99, then dial a code digit for ringing over the ring. *Note:* Different code digits should be dialed on each test cycle so that eventually all codes will have been tested on each switch.	Connector steps to ninth level, rotates smoothly to terminal 99.
33m	Restore SW key.	RR lamp lights, or bell on ring side of line rings, follows ringing code. Audible ring heard in receiver.
34g	If testing 8-party connectors and visual ringing signal is provided —	RR lamp lights when J-NO, J-O, H-O test set key is in either H-O or J-NO position. C lamp lights when J-NO, J-O, H-O test set key is in J-O position.
35h	If testing 8-party connectors and audible ringing signal is provided —	R− bell rings when NO-J, OP-H, OP-J key in test line is in either OP-H or NO-J position. R+ bell rings when NO-J, OP-H, OP-J key in test line is in OP-J position.
Readjust Values for Ring-trip Relays		
36	Restore ID key.	
37	Operate T key momentarily.	
38	Operate ID key.	RR or C lamp again lights, or test line bell again rings. Audible ring again heard in receiver.
Pretrip Test		
39	Operate CT key.	
40	Restore, reoperate ID key during silent interval.	RR or C lamp again lights, or test line bell again rings. Audible ring again heard in receiver.

STEP	ACTION	VERIFICATION
Tripping Test		
41	Operate TP BT (or TP) key momentarily, reoperate it to ID position during silent interval.	C lamp lights momentarily. RR or C lamp does not relight or test line bell does not rering. Audible ring not again heard in receiver. *Note:* On connectors using 66-75V silent-period battery, C lamp may not light. On connectors arranged for free service, C lamp does not light.
Transmission Test		
42	Operate T key.	***100-point Connectors*** C lamp lighted. Proper transmission tone heard in receiver. ***200-point Connectors*** C lamp lighted. High tone heard in receiver.
43	Restore T, DL ST keys.	C lamp extinguished. Tone removed.
Release		
44	Restore CT key.	
45	Operate SL key momentarily.	C lamp lighted. Connector releases.
46	Immediately restore ID key.	
47	Restore LP key, if operated, and LO-UP key.	C lamp extinguished.
Low-tone Test — 200-point Connectors Only		
48	Operate SL key, if not operated.	
49	Restore SL key.	C lamp lighted.
50	Operate SW key.	C lamp extinguished.
51	Operate LP, ID keys.	
52	Operate DL ST key.	
53	Dial 99.	Connector steps to ninth level, rotates smoothly to test line terminal.
54	Operate T key.	Low tone heard in receiver. C lamp lighted.
55	Restore T, DL ST keys.	C lamp extinguished. Tone removed. Connector releases.

STEP	ACTION	VERIFICATION
56	Restore ID key immediately.	
57	Restore LP key.	
All Connectors		
58	Unless other tests are to be made on this switch — Remove plug from test jack of connector.	

C. Level Hunting Connectors — 100-point Only — Idle Line Test — Loop

14	Restore SL key.	C lamp lighted.
15	Operate SW key.	C lamp extinguished.
16	Operate LP, ID keys.	
17	Operate DL ST key.	
Line Seizure and Ringing Test		
18i	If using test line No. 91 — Dial digit which will direct connector to ninth level (and an additional digit if required).	Connector steps smoothly to ninth level, stops on test line terminal.
19j	If using test line No. 11 — Using No. 893 cord, connect ground to commutator terminal for level No. 1.	
20j	Dial any one or two digits, as required by the particular circuit wiring.	Connector steps smoothly, stops on test line terminal.
21	Restore SW key.	RR or C lamp lights, or test line bell rings, follows ringing code. Audible ring heard in receiver.
Readjust Values for Ring-trip Relays		
22	Restore ID key.	
23	Operate T key momentarily.	
24	Operate ID key.	RR or C lamp again lights, or test line bell again rings. Audible ring again heard in receiver.
Pretrip Test		
25	Operate CT key.	
26	Restore, reoperate ID key during a silent interval.	RR or C lamp again lights, or test line bell again rings. Audible ring again heard in receiver.

STEP	ACTION	VERIFICATION
Tripping Test		
27	Operate TP BT or TP key momentarily, reoperate it to ID position during silent interval.	C lamp lights momentarily. RR or C lamp does not relight or test line bell does not rering. Audible ring not again heard in receiver. ***Note:*** On connectors using 66-75V silent-period battery, C lamp may not light.
Transmission Test		
28	Operate T key.	C lamp lighted. Proper transmission tone heard in receiver.
29j	If using test line No. 11 — Remove ground from commutator terminal for level No. 1.	
30	Restore T, DL ST keys.	C lamp extinguished. Tone removed.
Release		
31	Restore CT key.	
32	Operate SL key momentarily.	C lamp lighted. Connector releases.
33	Immediately restore ID key.	
34	Restore LP key.	
35	Unless other tests are to be made on this switch — Remove plug from test jack of connector.	C lamp extinguished.

D. Ringing Polarity Test — 8-party Semiselective Ringing Connectors

Line Seizure, Ringing and Pretrip Test		
14f	If visual ringing signal is provided — Operate test set J-NO, J-O, H-O key to H-O position.	
15f	Restore SL key.	C lamp lighted.
16f	Operate SW key.	C lamp extinguished.
17f	Operate LP, ID keys.	
18f	Operate DL ST key.	
19e	If testing 200-point combination connectors — Operate LO-UP key to UP position.	
20f	If visual ringing signal is provided — Dial 99.	Connector steps to ninth level, rotates smoothly to test line terminal.

STEP	ACTION	VERIFICATION
21f	Restore SW key.	RR lamp flashes, follows ringing code. Audible ring heard in receiver.
22f	Operate test set J-NO, J-O, H-O key to J-NO position during silent interval.	RR lamp continues to follow ringing code.
23f	Operate test set J-NO, J-O, H-O key to J-O position.	RR lamp extinguished. C lamp flashes, follows ringing code.
24f	Operate CT key.	
25f	Restore reoperate ID key during a silent interval.	C lamp continues to follow ringing code. Audible ring again heard in receiver.
Line Seizure, Ringing and Pretrip Test		
26i	If audible ringing signal is provided — Operate test line NO-J, OP-H, OP-J key to OP-H position.	
27i	Restore SL key.	C lamp lighted.
28i	Operate SW key.	C lamp extinguished.
29i	Operate LP, ID keys.	
30i	Operate DL ST key.	
31i	Dial 99.	Connector steps to ninth level, rotates smoothly to terminal 99.
32i	Restore SW key.	R− bell rings, follows ringing code. Audible ring heard in receiver.
33i	Operate test line NO-J, OP-H, OP-J key to NO-J position.	R− bell continues to ring.
34i	Operate test line NO-J, OP-H, OP-J key to OP-J position.	R− bell silenced. R+ bell rings, follows ringing code.
35i	Operate CT key.	
36i	Restore, reoperate ID key during a silent interval.	R+ bell continues to ring. Audible ring again heard in receiver.
Tripping Test		
37	Operate TP BT (or TP) key momentarily, reoperate it to ID position during silent interval.	C lamp lights momentarily. RR or C lamp does not relight or test line bell does not rering. Audible ring not again heard in receiver. ***Note:*** On connectors using 66-75V silent-period battery, C lamp may not light. On connectors arranged for free service, C lamp does not light.

STEP	ACTION	VERIFICATION
Transmission Test		
38	Operate T key.	***100-point Connectors*** C lamp lighted. Proper transmission tone heard in receiver. ***200-point Connectors*** C lamp lighted. High tone heard in receiver.
39	Restore T, LO-UP, DL ST keys.	C lamp extinguished. Tone removed.
Release		
40	Restore CT key.	
41	Operate SL key momentarily.	C lamp lighted. Connector releases.
42	Immediately restore ID key.	
43	Restore LP key.	
44	Unless other tests are to be made on this switch — Remove plug from test jack of connector.	C lamp extinguished.
Low-tone Test — 200-point Connectors Only		
45	Operate SL key, if not operated.	
46	Restore SL key.	C lamp lighted.
47	Operate SW key.	C lamp extinguished.
48	Operate LP, ID keys.	
49	Operate DL ST key.	
50	Dial 99.	Connector steps to ninth level, rotates smoothly to terminal 99.
51	Operate T key.	Low tone heard in receiver. C lamp lighted.
52	Restore T, DL ST keys.	C lamp extinguished. Tone removed. Connector releases.
53	Restore ID key immediately.	
54	Restore LP key.	
55	Unless other tests are to be performed on this switch — Remove plug from connector test jack. Restore remaining keys, remove all cords.	