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PBX ACCESS LINE CIRCUIT SD-5E000-01

OPERATIONAL TESTS

STEP-BY-STEP TYPE PBX

1. GENERAL

1.01 This section provides in-service test procedures for one of the access line circuits which are used at 701-, 711-, and 740-type PBX systems when the PBX must operate with a 4-wire switching center such as AUTOVON. These tests enable a confidence check to be made of the line circuit by establishing voice connections with appropriate test equipment at the switching center. Proper operation of the line circuit is verified by observing audible and visual signals at the PBX switchboard and *principal* relay operation at the line circuit. Additional verification is obtained by satisfactory transmission between the line circuit under test and the 4-wire switching center.

Note: The relays which are observed in these tests are not the only relays which operate or release for a given functional operation. They are termed *principal* relays in these tests because their operation or release indicates receipt or transmission of principal signals by the equipment under test.

1.02 The tests provided in this section are as follows:

A. ROUTINE Outgoing Calls: This test checks the operation of the line circuit during ROUTINE outgoing calls from a station telephone set and from a PBX switchboard.

B. Precedence Outgoing Call: This test checks the operation of the line circuit when a Precedence call is initiated from a PBX switchboard.

C. ROUTINE Incoming Call to Manual PBX: This test checks the operation of the line circuit when ROUTINE calls are placed to a manual PBX.

D. ROUTINE Incoming Calls to Dial-Type

PBX: This test checks the ability of the line circuit to operate properly when calls are placed to a station telephone set and when ROUTINE incoming calls are transferred to the switchboard by the station.

E. ROUTINE Listed Number Call: This test checks the ability of the line circuit to interpret a ROUTINE Listed Number Call (call automatically transferred to switchboard attendant).

F. Precedence Call to Dial-Type PBX Not Arranged for Precedence Network-In-Dialing (PNID): This test checks the ability of the line circuit to respond to the special signaling used in Precedence calls and to alert the switchboard.

G. Precedence Calls to a Dial-Type PBX Arranged for PNID: This test checks the ability of the line circuit to respond to PNID signals and to alert a station telephone set. The test also checks that Precedence calls to busy stations or unanswered Precedence calls are transferred to the switchboard attendant.

H. Attendant Preempt: This test checks line circuit operation when the attendant preempts incoming and outgoing calls.

I. Switching Center Preempt for Reuse: This test checks line circuit operation when incoming or outgoing, ROUTINE or Precedence, calls are preempted by the switching center so that a higher priority call can be completed to the line circuit.

J. Switching Center Preempt Not for Reuse: This test checks line circuit operations when a call is preempted by the switching center and a higher priority call is *not* awaiting completion to the line under test.

K. Miscellaneous Functions: This test checks the ability of the line circuit to complete a call when an E lead off-hook wink of less than 1.1 seconds occurs before the distant end answers. It also tests line circuit operation when an unanswered ROUTINE call is preempted by the switching center after a 100- to 560-msec E lead wink has occurred.

1.03 It is assumed in these tests that the PBX and associated circuits, the access line circuit, and the switching center are all operating properly. Obvious station defects such as broken wires, loose connections, etc., should be corrected prior to performing these tests.

1.04 Lettered Steps: The letters a, b, c, etc., added to a step number in Part 2 of this section indicate an action which may or may not be required, depending upon 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.

1.05 Terminology: Certain terminology has been used in these tests which may require clarification. The switching center testboard which is referenced in most of these tests is a modified 19A testboard which is installed as a test device in all switching centers (e.g. AUTO-VON). References to a station telephone set refer

to any PBX extension telephone set. It is assumed that in conducting these tests a station set that is in close proximity to the switchboard will be used. Certain tests will apply to stations arranged for PNID. This means that the access line is optioned to receive Precedence calls on a network-in-dial basis.

1.06 The dial-repeating PBX access line circuit may be used in large manual PBXs, in dial-type PBXs arranged for Precedence Network-In-Dialing, and in dial-type PBXs which are not arranged for Precedence Network-In-Dialing. Table A lists the various installations and the applicable tests.

TABLE A	
INSTALLATION	APPLICABLE TESTS
Manual PBX	A, B ¹ , C, H ² , I, J, K
Dial-Type PBX Arranged for PNID	A, B ¹ , D, E, G, H ² , I, J, K
Dial-Type PBX Not Arranged for PNID	A, B ¹ , D, E, F, H ² , I, J, K

Note 1: This test should be performed only if the PBX access line is capable of initiating Precedence calls.

Note 2: This test should be performed only if the PBX access line is capable of preempting existing calls.

2. METHOD

STEP	ACTION	VERIFICATION
A. ROUTINE Outgoing Calls		
1	At a station handset — Dial switching center testboard.	At line circuit — If rotary dial is used, relays A and L follow dial pulses. Relays E and RV operate when testboard answers. At switchboard — ROUTINE busy lamp lights.
2	When testboard answers, conduct talking test.	Conversation satisfactory.

STEP	ACTION	VERIFICATION
3	Go on-hook.	At line circuit — Relay RV releases; relays A and L release. At switchboard — ROUTINE busy lamp extinguishes when testboard disconnects.
4	At station handset — Dial an address that will <i>not</i> answer.	ROUTINE busy lamp on.
5	When address does not answer, go on-hook.	ROUTINE busy lamp extinguishes. At line circuit — Relays A and L release.
6	At switchboard — Insert cord plug into ROUTINE jack.	At switchboard — ROUTINE busy lamp lights. At line circuit — Relay D1 operates.
7	Insert trunk cord of idle pair into PRECEDENCE jack.	Relays A and L operate; relay D1 releases. At switchboard — PRECEDENCE busy lamp lights.
8	Using attendant dial, dial (on the cord in PRECEDENCE jack) switching center testboard.	At line circuit — Relays A and L follow dial pulses.
9	When dialing is completed, remove cord plug from PRECEDENCE jack.	Relay D1 operates. When testboard answers, relays CC and JP1 operate. At switchboard — PRECEDENCE busy lamp extinguishes.
10	Conduct talking test.	Conversation satisfactory.
11	Terminate call, remove cord plug from ROUTINE jack; restore PBX to normal.	When testboard disconnects, all lamps extinguish; trunk is released.

B. Precedence Outgoing Call

1	At switchboard — Insert calling cord plug into PRECEDENCE jack.	At switchboard — Both busy lamps light. At line circuit — Relay D1 operates.
2	Using attendant 16-button station set, TOUCH-TONE dial switching center testboard.	Relay D1 operates. When testboard answers, relay E operates followed by operation of relay CC after a 1.1-second time delay.
3	Conduct talking test.	At switchboard — Conversation satisfactory.
4	Terminate call, remove cord plug from PRECEDENCE jack; restore PBX to normal.	When testboard disconnects, all lamps extinguish; trunk is released.

STEP	ACTION	VERIFICATION
C. ROUTINE Incoming Call to Manual PBX		
1	At PBX — Contact switching center testboard and request steady ground on E lead.	At PBX — Busy lamps light. In approximately 3 seconds ROUTINE line lamp lights; busy lamps extinguish. At line circuit — Relay E operates.
2	Insert cord plug into jack associated with lighted line lamp.	Relay D1 operates. Relays CC and JP1 operate 1.1 seconds after relay D1 operates. At PBX — ROUTINE line lamp extinguishes; busy lamp lights.
3	Conduct talking test with testboard attendant.	Conversation satisfactory.
4	Remove cord plug from line jack and restore PBX to normal.	Busy lamp extinguishes. At line circuit — Relay D1 releases.

D. ROUTINE Incoming Calls to Dial-Type PBX

1	At switchboard — Contact switching center testboard and request that a nonprecedence call be placed to a station telephone set.	At station telephone set — When call is placed, station ringing occurs. At line circuit — Relay E operates, then follows incoming dial pulses. At switchboard — Busy lamps light.
1a	If incoming call is to PBX arranged for PNID — At testboard — First digit dialed must be a 4.	At line circuit — Relay P4 operates. At switchboard — Both busy lamps light.
2	At station telephone set — Answer call and conduct talking test.	At switchboard — PRECEDENCE busy lamp extinguishes. At station telephone set — Conversation satisfactory.
3	Terminate call; go on-hook.	At switchboard — PRECEDENCE busy lamp lights, then both busy lamps extinguish when testboard disconnects.
4	Repeat Steps 1 and 2 of this test.	Same as Steps 1 and 2.

STEP	ACTION	VERIFICATION
5	At station telephone set — Flash switch hook for less than 1.2 seconds.	At switchboard — ROUTINE busy lamp extinguishes; line lamp flashes. At switching center testboard — Audible ringing in head/handset.
6	At switchboard — Insert cord plug into jack associated with lighted line lamp.	At switchboard — ROUTINE line lamp extinguishes; ROUTINE busy lamp lights.
7	At station telephone set — Go on-hook.	
8	At switchboard — Conduct talking test with testboard.	Conversation satisfactory.
9	Terminate call, remove cord plug from line jack; restore PBX to normal.	When testboard disconnects, all lamps extinguish; trunk is released.

E. ROUTINE Listed Number Call

1	At switchboard — Contact switching center testboard and request that a call be placed to a listed number which will automatically transfer the call to the switchboard.	At switchboard — When testboard seizes line, both busy lamps light for approximately 3 seconds, then ROUTINE line lamp lights. At line circuit — Relay E operates, then follows incoming dial pulses.
2	Insert cord plug into jack associated with lighted line lamp.	Relay AT releases. After 1.1 seconds, relay JP1 operates. At switchboard — ROUTINE line lamp extinguishes; busy lamp lights.
3	Conduct talking test.	Conversation satisfactory.
4	Remove cord plug from line jack; restore PBX to normal.	PRECEDENCE busy lamp lights. When testboard disconnects, all lamps extinguish; trunk is released.

F. Precedence Call to Dial-Type PBX Not Arranged for Precedence Network-In-Dialing (PNID)

1	Contact switching center testboard and request that Precedence call be placed to line under test.	At line circuit — When Precedence call is placed, relay E operates for 1.65 seconds and releases for 345 msec. This continues until switchboard attendant answers. At switchboard — Busy lamps light (PRECEDENCE busy lamp lights only momentarily). PRECEDENCE line lamp lights.
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STEP	ACTION	VERIFICATION
2	At switchboard — Insert cord plug into PRECEDENCE jack associated with lighted line lamp.	PRECEDENCE line lamp extinguishes; PRECEDENCE busy lamp lights.
3	Conduct talking test.	Conversation satisfactory.
4	Request testboard to disconnect.	At line circuit — Relays E and CC release.
5	Remove cord plug from PRECEDENCE jack; restore PBX to normal.	At switchboard — All lamps extinguish; trunk is released.

G. Precedence Calls to a Dial-Type PBX Arranged for PNID

1	At switchboard — Contact switching center testboard and request that a Precedence call be placed to a station telephone set.	At line circuit — Relay E operates and follows incoming dial pulses. Relay PR operates; relays P1 through P3 operate and/or release to determine the Precedence of the incoming call. At switchboard — Both busy lamps light. At station telephone set — Ringing occurs.
2	At station telephone set — Answer call.	At line circuit — Relay AR releases.
3	Conduct talking test.	At station telephone set — Conversation satisfactory.
4	Go on-hook.	At switchboard — When testboard disconnects, busy lamps extinguish; trunk is released.
5	At station telephone set — Go off-hook.	
6	At switchboard — Repeat Step 1 of this test.	At line circuit — Same as Step 1 except after 12 seconds relay AT operates. At switchboard — PRECEDENCE busy lamp extinguishes; PRECEDENCE line lamp flashes.
7	Insert cord plug into jack associated with lighted line lamp.	Line lamp extinguishes; PRECEDENCE busy lamp lights.
8	Conduct talking test.	Conversation satisfactory.
9	Terminate call by removing cord plug from line jack.	When testboard disconnects, all lamps extinguish; trunk is released.

STEP	ACTION	VERIFICATION
10	At station telephone set — Go on-hook.	
11	At switchboard — Repeat Step 1.	Same as Step 1.
12	At station telephone set — Do not answer call.	At line circuit — Approximately 12 seconds after station telephone set begins ringing, relay AT operates. At switchboard — PRECEDENCE busy lamp extinguishes; PRECEDENCE line lamp flashes.
13	At switchboard — Repeats Steps 7, 8, and 9 of this test.	Same as Steps 7, 8, and 9.
14	Restore PBX to normal.	

H. Attendant Preempt

1	At switchboard — Insert cord plug into ROUTINE jack.	At switchboard — ROUTINE and PRECEDENCE busy lamps light. At line circuit — Relay D1 operates.
2	Insert trunk cord of idle pair into PRECEDENCE jack.	Relays A and L operate; relay D1 releases.
3	Using attendant dial, dial switching center testboard.	At line circuit — Relays A and L follow dial pulses (if rotary dial was used). At switchboard — PRECEDENCE busy lamp extinguishes.
4	When dialing is complete, remove cord plug from PRECEDENCE jack.	Relay D1 operates. When testboard answers, relays JP1 and CC operate.
5	Insert cord plug into PRECEDENCE jack.	At switchboard — PRECEDENCE busy lamp lights. Preempt tone audible in head/handset on ROUTINE cord circuit. In approximately 4 seconds dial tone audible in head/handset on Precedence cord circuit. At line circuit — Relay JP operates; relay AT operates in approximately 3 seconds. Relay E releases. Relay J releases.
6	Remove cord plug from ROUTINE jack.	
7	Remove cord plug from PRECEDENCE jack.	At switchboard — All lamps extinguish; trunk is released.

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STEP	ACTION	VERIFICATION
8	At station handset — Dial the switching center testboard.	
9	At switchboard — Preempt call by inserting cord plug into PRECEDENCE jack.	At switchboard — PRECEDENCE busy lamp lights. Dial tone in approximately 4 seconds. At station handset — Preempt tone audible for 3 seconds. At switching center testboard — Preempt tone audible for 3 seconds. At line circuit — After approximately 3 seconds, relays A and L release; relay E releases.
10	At station handset — Go on-hook.	Relays RL1 and RL2 release.
11	At switchboard — Remove cord plug from PRECEDENCE jack.	At switchboard — All lamps extinguish; trunk is released.
12	At switchboard — Contact switching center testboard and request that a ROUTINE call be placed to a station telephone set.	
13	At station telephone set — Answer call.	
14	At switchboard — Insert cord plug into PRECEDENCE jack.	At switchboard — PRECEDENCE busy lamp lights; dial tone audible in approximately 4 seconds. At station telephone set — Preempt tone audible. In approximately 3 seconds, disconnect occurs. At line circuit — Relay E releases.
15	At switchboard — Remove cord plug from PRECEDENCE jack.	At switchboard — All lamps extinguish; trunk is released.
16	At station handset — Dial address that will not answer.	
17	At switchboard — Insert cord plug into PRECEDENCE jack.	PRECEDENCE busy lamp lights; after approximately 4 seconds dial tone audible in attendant head/handset. At station handset — Preempt tone audible for 3 seconds. At line circuit — Relays A and L release.

STEP	ACTION	VERIFICATION
18	At station handset — Go on-hook.	Relays RL1 and RL2 release.
19	At switchboard — Remove cord plug from PRECEDENCE jack; restore PBX to normal.	At switchboard — All lamps extinguish; trunk is released completely.

I. Switching Center Preempt for Reuse

1	At station handset — Dial switching center testboard.	
2	Request testboard to apply preempt wink signal and tone to line under test.	At line circuit — Relay E releases for duration of preempt wink signal (approximately 345 msec). In approximately 3 seconds, relays A and L release; relay AR operates. At station handset — Preempt tone audible for 3 seconds. At switchboard — PRECEDENCE line lamp lights if PBX is arranged for non-PNID. PRECEDENCE busy lamp lights if PBX is arranged for PNID.
3	At station handset — Go on-hook.	At line circuit — Relays RL1 and RL2 release. At switchboard — After testboard release of E lead, all lamps extinguish; trunk is released.
4	At switchboard — Place ROUTINE call to switching center testboard.	
5	Request testboard to apply preempt wink signal and tone to line under test.	At line circuit — Relay E releases for duration of preempt wink signal. In approximately 3 seconds, relay AR operates. Relay J releases. At switchboard — PRECEDENCE line lamp lights; preempt tone audible. After 3 seconds, attendant cord lamp lights.
6	Remove cord plug from ROUTINE jack.	At line circuit — Relay S releases. At switchboard — After testboard release of E lead, all lamps extinguish; trunk is released.

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STEP	ACTION	VERIFICATION
7	At switchboard — Contact switching center testboard and request that a ROUTINE call be placed to station telephone set.	
8	At station telephone set — Answer call and request that test desk apply preempt wink signal and tone to line under test.	At line circuit — Relay E releases for duration of wink signal; relay AR operates. At switchboard — PRECEDENCE busy lamp lights momentarily; PRECEDENCE line lamp lights steadily if not arranged for PNID. PRECEDENCE busy lamp lights steadily if arranged for PNID. At station telephone set — Preempt tone audible in handset for 3 seconds.
8a	If incoming call was to PBX arranged for PNID — At line circuit — Observe count relay P4.	At line circuit — Count relay P4 releases.
9	Go on-hook.	At switchboard — After testboard release of E lead, all lamps extinguish; trunk is released.
10	At switchboard — Originate Precedence call to switching center testboard.	
11	Request testboard to apply a preempt wink signal and tone to line under test.	At line circuit — Relay E releases for duration of wink signal. At switchboard — Preempt tone audible in attendant hand/headset; attendant cord lamp lights.
12	Terminate call; remove cord plug from PRECEDENCE jack.	At line circuit — Relay AR operates. After testboard release of E lead, all lamps extinguish; trunk is released. At testboard — PRECEDENCE audible ringing returned to switching center.
13	At switchboard — Contact switching center testboard and request that Precedence call be placed to line under test. Answer call in normal manner.	

STEP	ACTION	VERIFICATION
14	Request testboard to apply preempt wink signal and tone to line under test.	At line circuit — Relay E releases for duration of wink signal. At switchboard — Preempt tone audible in attendant head/handset; attendant cord lamp lights.
15	Terminate call; remove cord plug from PRECEDENCE jack.	At line circuit — Relay AR operates. After testboard release of E lead, all lamps extinguish; trunk is released. At testboard — PRECEDENCE audible ringing returned to switching center.

J. Switching Center Preempt Not for Reuse

1	At station telephone set — Place ROUTINE call to switching center testboard.	
2	When testboard answers, request that switching center preempt call (not for reuse).	At line circuit — Relay E releases for duration of preempt wink signal (approximately 345 msec). In approximately 3 seconds relay AT operates, then releases after forced disconnect; relays A and L release. At station telephone set — Preempt tone audible in handset for 3 seconds; automatic disconnect occurs.
3	At station telephone set — Go on-hook.	At switchboard — All lamps extinguish; trunk is released. At line circuit — Relays RL1, RL2 release.
4	At switchboard — Place ROUTINE call to switching center testboard.	
5	When testboard answers, request that switching center preempt call (not for reuse).	At line circuit — Relay E releases for duration of preempt wink signal. In approximately 3 seconds, relay AT operates; relay D1 releases. At switchboard — Preempt tone audible for 3 seconds; attendant cord lamp lights, then all lamps extinguish and trunk is released.

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STEP	ACTION	VERIFICATION
6	Terminate call; restore switchboard to normal.	At line circuit — Relay AT releases; relays S and J release.
7	At switchboard — Place Precedence call to switching center testboard.	
8	When testboard answers, request that switching center preempt call (not for re-use).	At line circuit — Relay E releases for duration of preempt wink signal. In approximately 3 seconds relay AT operates. At switchboard — Preempt tone audible; attendant cord lamp lights.
9	Terminate call; restore PBX to normal.	All lamps extinguish; trunk is released. At line circuit — Relays JP, D1, and AT release.

K. Miscellaneous Functions

1	At station telephone set — Place call to switching center testboard.	
2	At testboard — Wink E lead of line circuit under test for <i>less</i> than 1.1 seconds prior to answering incoming call.	At line circuit — Relay E operates for duration of wink signal; relay PT operates, then releases.
3	Answer incoming call.	Relay E operates; relay CC operates.
4	At station telephone set — Terminate call; go on-hook.	At switchboard — When testboard disconnects, all lamps extinguish; trunk is released.
5	At station telephone set — Place call to switching center testboard.	
6	At testboard — Do <i>not</i> answer incoming call; wink E lead of line under test for 100 to 560 msec; then apply normal preempt wink signal (345 msec on-hook preceded and followed by off-hook and followed by preempt tone).	At line circuit — Relay E operates and then releases for duration of the preempt wink signals. Relays AT and PT operate, then release after forced disconnect. Relays RL1, RL2 operate; relays A and L release. At station telephone set — Preempt tone audible.
7	At station telephone set — Terminate call; go on-hook.	At switchboard — When testboard disconnects, all lamps extinguish; trunk is released.
8	Restore PBX to normal.	