TRUNK RELAY, LINK, AND SEQUENCE CIRCUITS USING TEST CIRCUIT SD-70295-01 TELETYPEWRITER LINE CONCENTRATING UNIT NO. 101A

1. GENERAL

1.01 This section describes a method of testing the full duplex trunk relay, link, and sequence circuits associated with the line concentrating unit No. 101A, using test circuit SD-70295-01.

1.02 This section is reissued for the following reasons:

(a) To revise the title of the section to include link and sequence circuits.

(b) To combine Sections A280.568, A280.571, and A280.573. This section replaces Sections A280.571 and A280.573.

(c) To include the use of the modified test circuit SD-70295-01.

(d) To add steps in Test A to check release of connection if operator disconnects before subscriber.

(e) To add a new Test D to provide a test of the manual operation feature.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The tests covered are:

A. Trunk Relay Circuits: This test checks the following features, teledirection, pulsing station number, unattended station start, station answer, transmission, recall, disconnect, rering, station calling, and trunk release with either the operator or subscriber disconnecting first.

B. Link Circuit: This test checks the connection between a particular subscriber line and a particular trunk.

C. Sequence Circuit: This test checks that the subscriber gains access to the proper idle trunk in a predetermined or overflow trunk group.

D. Emergency Manual Service: This test checks the manual operation features of the concentrator.

1.04 Tests A, B, and C can be made on the same cycle of tests. Duplication of some operations can then be avoided.

1.05 The method for testing link and sequence circuits is based on checking proper link operation between a particular trunk and a particular subscriber line, principally to locate suspected or reported trouble. If all paths to trunks available to a subscriber line are to be checked, the test should be repeated, using the same subscriber line, but connecting to a different trunk for each test, until all trunks have been used. To check paths from a particular trunk to all subscriber lines, the test should be repeated for each subscriber line using only one trunk. To check every possible path, it is necessary to test each trunk with each subscriber line.

1.06 Tests A, B, C, and D, once performed initially, would normally be on a non-scheduled basis. The tests should be made so that each cycle of tests will check a particular group of paths, and additional cycles will check additional groups, until all possible paths are used. For instance one cycle might involve tests with one trunk to all lines, with a different trunk used on the next cycle, etc, until all trunks are used.

1.07 Precautions should be taken to avoid service interruptions and delays. To avoid impairment of service to the customer the tests should be made during periods of practically no traffic. The tests should be made rapidly, consistent with accuracy and completeness. To avoid "hits" and other objectionable circuit conditions, patch cords should be placed in the following sequence, and taken down in reverse order.

(a) Test circuit.

(b) Practice circuit.

(c) Trunk circuit.

(d) Subscriber line circuit.

1.08 The traffic department should be given the number of registrations on the NCA, NCB (if provided), and SUB OFL registers, due to testing procedures. The register readings should be recorded at the start and completion of the tests.

1.09 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 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.

1.10 In general, only those lamps, tones, signals, etc, necessary for verification, are mentioned in the verification column.

2. APPARATUS

All Tests

2.01 Test circuit SD-70295-01.

2.02 Two patching cords, two P3E cords, 6 feet long, equipped with two No. 338A plugs (No. 6P1A cords).

3. PREPARATION

Tests A, B, and C

STEP	ACTION	VERIFICATION
1	Obtain release of trunk and operate trunk BSY key. ***Note 1:*** Should a call originate at the operator office over another trunk for test attendant line, station bell of that line will ring. ***Note 2:*** Should red TRK lamp be flashing after patches are completed, depress TRK key momentarily. TRK lamp should be extinguished. ***Note 3:*** Should a call be originated on the subscriber line used for test, SUB ANS lamp of test circuit will light. If a call is received for subscriber line used for test, SUB SIDE OF TRK CALL lamp will light.	Trunk BSY lamp lighted.
2a	If armature of S relay is connected to negative 130v for marking condition when trunk repeater is arranged for closed loop operation — Operate test circuit REV key.	
3b	If test circuit has been modified to include the REL LP REP key — Operate this key when testing trunk relay associated with ***relay*** type loop. (Normal position of key is used when testing trunk relay associated with ***electronic*** type loop.)	

STEP	ACTION	VERIFICATION
4	Connect SEND and REC jacks of test circuit to SEND and REC jacks of trunk using 6P1A cord.	
5	Connect A and B jacks of unassigned subscriber line to A and B jacks of test circuit. See Fig. 1.	
6	Connect TTY to TTY BIAS, TTY SEND, and TTY REC jacks of test circuits, using TTY connecting cords. See Fig. 1.	

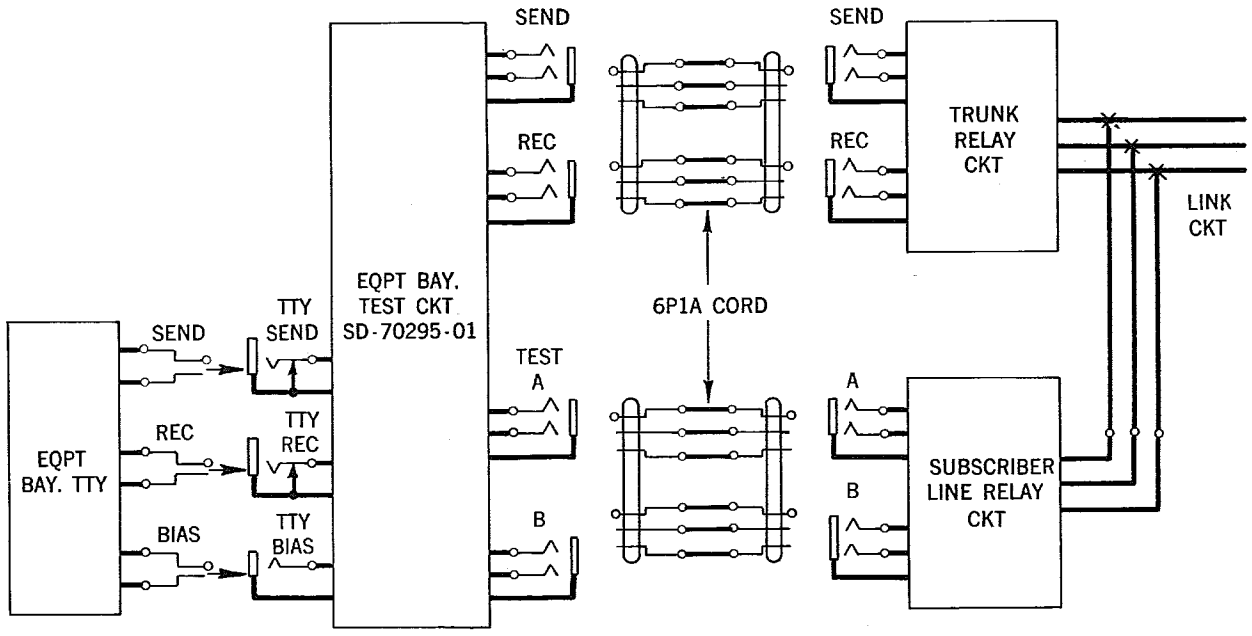

FIG. 1 – TESTING ARRANGEMENT

4. METHOD

STEP	ACTION	VERIFICATION
	A. Trunk Relay Circuits	
	Inward call — Called subscriber disconnects before operator	
7	Operate LINE SIDE OF TRK TTY and LINE SIDE OF TRK CALL keys of test circuit.	TRK CALL, NA, SEQ BSY, and CONN lamps lighted. Director will be connected to trunk and will send "director ready" signal indicated by lighting of LINE SIDE OF TRK SIG lamp.
8	Send FIGS signal on TTY followed by typing 2 or 3 digits corresponding to number of line to which test circuit is patched.	All lamps extinguished except trunk BSY. LINE SIDE OF TRK SL lamp lighted. SUB SIDE OF TRK CALL lamp lighted during ***"ON"*** period of machine ringing.
9	Hold operated LINE SIDE OF TRK RING key for at least 9 seconds to simulate unattended station start test.	SUB SIDE OF TRK CALL lamp lighted while key is operated.

STEP	ACTION	VERIFICATION
10	Operate SUB SIDE OF TRK ANS key.	LINE SIDE OF TRK SIG lamp lighted. SUB SIDE OF TRK CALL lamp extinguished.
11	Operate SUB SIDE OF TRK REC key. Send RYRY etc signals from the attendant TTY.	RYRY etc received on attendant TTY.
12	While still sending RY, operate SUB SIDE OF TRK BK key for 5 seconds.	Received RY signals cut off. LINE SIDE OF TRK SIG lamp extinguished for approximately 2/3 second, then flashes dimly.
13	Restore SUB SIDE OF TRK REC key to normal.	
14	Operate SUB SIDE OF TRK SEND key. Send RYRY etc.	RYRY etc received on attendant TTY. LINE SIDE OF TRK SIG lamp flashing follows signals.
15	Operate SUB SIDE OF TRK REC key. Send RYRY etc.	RYRY etc received on attendant TTY. LINE SIDE OF TRK SIG lamp flashing follows signals.
16	While still sending RYRY etc operate LINE SIDE OF TRK BK key for 5 seconds. *Note:* If the LINE SIDE OF TRK BK key is held down longer than 5 seconds, TTY will run open, with periodic intervals during which it will respond to local signals.	LINE SIDE OF TRK SIG lamp lighted steadily. TTY signals cut off.
17	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
18	Operate SUB SIDE OF TRK ANS key.	LINE SIDE OF TRK SIG lamp relighted.
19	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
20	Operate and release LINE SIDE OF TRK RING key.	SUB SIDE OF TRK CALL lamp lighted while key is operated.
21	Restore LINE SIDE OF TRK CALL key.	LINE SIDE OF TRK SL lamp extinguished, indicating X-bar switch has released.
Inward call — Operator disconnects before subscriber		
22	Again place call to subscriber line to which test circuit is patched by operating LINE SIDE OF TRK TTY and LINE SIDE OF TRK CALL keys of test circuit.	
23	Send FIGS signal on TTY followed by typing 2 or 3 digits corresponding to number of line to which test circuit is patched.	

STEP	ACTION	VERIFICATION
24	Operate SUB SIDE OF TRK ANS key.	
25	Restore LINE SIDE OF TRK CALL key to normal.	
26	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG and LINE SIDE OF TRK SL lamps extinguished, indicating X-bar switch has released.
Outward Call		
27	To direct outward call to trunk under test — Operate BSY keys of all lower numbered trunks. Immediately after trunk on test has been seized, restore BSY keys to normal. ***Caution: During service periods, in order to minimize the possibility of a trunk under test being seized for a regular call, it is important not to restore the BSY key if the SEQ lamp is lighted, and until SUB SIDE OF TRK ANS key in the test circuit is about to be operated.***	
28	Restore BSY key of trunk under test to normal. Operate SUB SIDE OF TRK ANS key.	LINE SIDE OF TRK SIG and trunk BSY lamps lighted.
29	Within 2 seconds, operate and hold LINE SIDE OF TRK RING key.	X-bar switch operates. Trunk connects to patched up subscriber line circuit. LINE SIDE OF TRK SL lamp lighted.
30	Release LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SL lamp remains lighted.
31	Operate LINE SIDE OF TRK CALL key to answer call.	
32	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
33	Restore SUB SIDE OF TRK CALL key to normal.	LINE SIDE OF TRK SL lamp extinguished.
34	Restore all keys of test circuit to normal.	
35	Remove cords from subscriber line A and B jacks and trunk SEND and REC jacks. (See 1.07)	
36	Restore any trunks removed from service.	

STEP	ACTION	VERIFICATION
	B. Link Circuit	
7	Operate LINE SIDE OF TRK TTY and LINE SIDE OF TRK CALL keys of test circuit.	TRK CALL, SEQ BSY, CONN lamps lighted. Director will connect to trunk and send "director ready" signal indicated by lighting LINE SIDE OF TRK SIG lamp.
8	Send FIGS signal on TTY followed by typing 2 or 3 digits corresponding to number of line to which test circuit is patched.	All lamps extinguished except trunk BSY. LINE SIDE OF TRK SL lamp lighted. SUB SIDE OF TRK CALL lamp lighted during ***"ON"*** period of machine ringing.
9	Operate SUB SIDE OF TRK ANS key.	LINE SIDE OF TRK SIG lamp lighted. SUB SIDE OF TRK CALL lamp extinguished.
10	Operate SUB SIDE OF TRK REC key. Send RYRY etc signals from attendant TTY.	RYRY etc received on attendant TTY.
11	While still sending RY, operate SUB SIDE OF TRK BK key for 5 seconds.	Received RY signals cut off. LINE SIDE OF TRK SIG lamp extinguished for approximately 2/3 second, then flashes dimly.
12	Restore SUB SIDE OF TRK REC key to normal.	
13	Operate SUB SIDE OF TRK SEND key. Send RY etc.	RY etc received on attendant TTY. LINE SIDE OF TRK SIG lamp flashing follows signals.
14	Operate SUB SIDE OF TRK REC key. Send RY etc.	RY etc received on attendant TTY. LINE SIDE OF TRK SIG lamp flashing follows signals.
15	While still sending RY, operate LINE SIDE OF TRK BK key for 5 seconds. *Note:* If LINE SIDE OF TRK BK key is held operated longer than 5 seconds, TTY will run open, with periodic intervals during which it will respond to local signals.	LINE SIDE OF TRK SIG lamp lighted steadily. TTY signals cut off.
16	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
17	Restore LINE SIDE OF TRK TTY and LINE SIDE OF TRK CALL keys to normal.	LINE SIDE OF TRK SL lamp extinguished when crossbar switch has released.
18	Restore all keys of test circuit to normal.	
19	Remove cords from subscriber line A and B jacks and trunk SEND and REC jacks. (See 1.07)	
20	Restore any trunks or lines removed from service.	

STEP	ACTION	VERIFICATION
	C. Sequence Circuit	
	Note: Trunk selected for test should be the first choice trunk in the sequence circuit.	
	Units having one trunk outlet —	
7	Operate SUB ANS and SUB SIDE OF TRK ANS keys of test circuit.	LINE SIDE OF TRK SIG, CALL, SEQ BSY, trunk BSY lamps lighted.
8	Immediately after LINE SIDE OF TRK SIG lamp lights, operate LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SL lamp lighted. CALL, SEQ BSY lamps extinguished.
9	Operate LINE SIDE OF TRK CALL key and release LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SIG lamp remains lighted. LINE SIDE OF TRK SL lamp remains lighted. Trunk BSY lamp remains lighted.
10	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
11	Restore LINE SIDE OF TRK CALL key to normal.	LINE SIDE OF TRK SL and trunk BSY lamps extinguished.
12	Remove plug from trunk SEND and REC jacks.	
13	Repeat Steps 7 through 12 using each trunk to operator office. Operate trunk BSY keys of all lower numbered trunks to connect to trunk under test, then restore BSY keys to normal.	
14	Remove plug from A and B jacks of subscriber line circuit.	
15	Repeat Steps 7 through 12 using each subscriber line and first trunk.	
16	Restore all trunk BSY keys to normal and remove cords. See 1.07.	
	Units having two trunk outlets — subscriber lines not equipped for key selection of outlets — unit not arranged to permit overflow of calls from one outlet to another —	
	Note: For the purpose of these tests, one trunk outlet will be termed outlet "A" and the other outlet "B".	
17	Operate SUB ANS and SUB SIDE OF TRK ANS keys of test circuit.	LINE SIDE OF TRK SIG, CALL, SEQ BSY, trunk BSY lamps lighted.
18	Immediately after LINE SIDE OF TRK SIG lamp lights, operate LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SL lamp lighted. CALL, SEQ BSY lamps extinguished.

STEP	ACTION	VERIFICATION
19	Operate LINE SIDE OF TRK CALL key and release LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SIG lamp remains lighted. LINE SIDE OF TRK SL lamp remains lighted. Trunk BSY lamp remains lighted.
20	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
21	Restore LINE SIDE OF TRK CALL key to normal.	LINE SIDE OF TRK SL and trunk BSY lamps extinguished.
22	Remove plug from trunk SEND and REC jacks.	
23	Repeat Steps 17 through 22 for each trunk to outlet "A" using a subscriber line arranged to reach outlet "A". Operate trunk BSY keys of all lower numbered trunks to connect to trunk under test, then restore BSY keys to normal.	
24	Repeat Steps 17 through 22 for each subscriber line arranged to reach outlet "A", using first trunk to outlet "A".	
25	Repeat Steps 17 through 22 for each trunk to outlet "B" using a subscriber line arranged to reach outlet "B". Operate trunk BSY keys of all lower numbered trunks to connect to trunk under test, then restore BSY keys to normal.	
26	Repeat Steps 17 through 22 for each subscriber line arranged to reach outlet "B", using first trunk to outlet "B".	

Units having two trunk outlets — subscriber lines not equipped for key selection of outlets — unit arranged to permit overflow of calls from one outlet to another

Note: For the purpose of these tests, one trunk outlet will be termed outlet "A" and the other outlet "B".

27	Operate SUB ANS and SUB SIDE OF TRK ANS keys of test circuit.	LINE SIDE OF TRK SIG, CALL, SEQ BSY, trunk BSY lamps lighted.
28	Immediately after LINE SIDE OF TRK SIG lamp lights, operate LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SL lamp lighted. CALL, SEQ BSY lamps extinguished.
29	Operate LINE SIDE OF TRK CALL key and release LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SIG lamp remains lighted. LINE SIDE OF TRK SL lamp remains lighted. Trunk BSY lamp remains lighted.

STEP	ACTION	VERIFICATION
30	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
31	Restore LINE SIDE OF TRK CALL key to normal.	LINE SIDE OF TRK SL and trunk BSY lamps extinguished.
32	Remove plug from trunk SEND and REC jacks.	
33	Repeat Steps 27 through 32 for each trunk to outlet "A" using a subscriber line normally arranged to reach outlet "A". Operate trunk BSY keys of all lower numbered trunks to connect to trunk under test, then restore BSY keys to normal.	
34	Make busy all trunks to outlet "A" by operating trunk BSY keys.	
35	Repeat Steps 27 through 32 for each trunk to outlet "B" using a subscriber line normally arranged to reach outlet "A". Operate trunk BSY keys of all lower numbered trunks to connect to trunk under test, then restore BSY keys to normal.	
36	Repeat Steps 27 through 32 for each subscriber line normally arranged to reach outlet "A" using first trunk to outlet "A".	
37	Repeat Steps 27 through 32 for each trunk to outlet "B", using a subscriber line normally arranged to reach outlet "B".	
38	Make busy all trunks to outlet "B" by operating trunk BSY keys.	
39	Repeat Steps 27 through 32 for each trunk to outlet "A", using a subscriber line normally arranged to reach outlet "B".	
40	Repeat Steps 27 through 32 for each subscriber line normally arranged to reach outlet "B" using first trunk to outlet "B".	

Units having two trunk outlets — subscriber lines equipped for key selection of outlets

Note: The following tests are based on the assumption that only part of the subscriber lines in any one concentrating unit are arranged for key selection of outlets, and that the test for proper selection of each trunk from one subscriber line has been made in connection with the tests of lines not arranged for key selection.

41	Operate SUB ANS and SUB SIDE OF TRK ANS keys of test circuit. Do not operate SUB SIDE OF TRK BK key.	LINE SIDE OF TRK SIG, CALL, SEQ BSY, trunk BSY lamps lighted.

STEP	ACTION	VERIFICATION
42	Immediately after LINE SIDE OF TRK SIG lamp lights, operate LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SL lamp lighted. CALL, SEQ BSY lamps extinguished.
43	Operate LINE SIDE OF TRK CALL key and release LINE SIDE OF TRK RING key.	LINE SIDE OF TRK SIG lamp remains lighted. LINE SIDE OF TRK SL lamp remains lighted. Trunk BSY lamp remains lighted.
44	Restore SUB SIDE OF TRK ANS key to normal.	LINE SIDE OF TRK SIG lamp extinguished.
45	Restore LINE SIDE OF TRK CALL key to normal.	LINE SIDE OF TRK SL and trunk BSY lamps extinguished.
46	Remove plug from trunk SEND and REC jacks.	
47	Repeat Steps 41 through 46 for each subscriber line normally arranged to reach outlet "A" using first trunk to outlet "A".	
48	Repeat Steps 41 through 46 for each subscriber line normally arranged to reach outlet "A" using first trunk to outlet "B" operating SUB SIDE OF TRK BK key when SUB SIDE OF TRK ANS key is operated.	
49	Repeat Steps 41 through 46 for each subscriber line normally arranged to reach outlet "B" using first trunk to outlet "B".	
50	Repeat Steps 41 through 46 for each subscriber line normally arranged to reach outlet "B" using first trunk to outlet "A" operating SUB SIDE OF TRK BK key when SUB SIDE OF TRK ANS key is operated.	
51	Restore all trunk BSY keys to normal.	
52	Remove cords. (See 1.07.)	
53	Restore all test circuit keys to normal.	

D. Emergency Manual Service

Inward Call

1	Connect TTY to test circuit using TTY connecting cords.	
2	Inform traffic department that manual operation test is to be made, then operate MAN SER key.	MAN SER lamp (red) flashes.
3	Have operator place call to subscriber line associated with test attendant line.	Trunk C-DIS and NA lamps light. Buzzer sounds.

STEP	ACTION	VERIFICATION
4	Patch A and B jacks of test circuit to A and B jacks of trunk using 6P1A cords. Operate SUB SIDE OF TRK ANS, SEND, and REC keys until called code is received, then restore keys to normal.	C-DIS and NA lamps extinguished. Buzzer silenced. Code for called subscriber line received on TTY.
5	Remove plug from A and B jacks of test circuit and insert into A and B jacks of subscriber line.	Test attendant line ringer sounds.
6	Operate ATT LINE ANS key.	TTY communication with operator.
7	Restore ATT LINE ANS key to normal.	C-DIS lamp flashes after operator disconnects.
8	Remove patch cord from A and B jacks of trunk and subscriber line.	C-DIS lamp extinguished.
Outward Call		
9	Operate ATT LINE ANS key.	Subscriber line CALL and NA lamps light. Buzzer sounds.
10	Patch A and B jacks of subscriber line to A and B jacks of trunk under test.	CALL and NA lamps extinguished. Buzzer silenced. TTY communication with operator after line signal is answered.
11	Restore ATT LINE ANS key to normal.	C-DIS lamp flashes after operator disconnects.
12	Remove patch cord from A and B jacks of trunk and subscriber line.	C-DIS lamp extinguished.
13	Restore MAN SER key to normal.	MAN SER lamp (red) extinguished.