LINE CONCENTRATOR NO. 1A

SD-96536-01, SD-96537-01, AND SD-95957-01

SYSTEM TESTS

1. GENERAL

1.01 This section is one of a series of sections on the line concentrator No. 1A. This section contains tests for in-service concentrator systems after cutover.

1.02 This section is reissued for the following reasons:

(a) To revise title

(b) To redesignate Operational Tests as follows:

- A.1 to N
- A.2 to O
- B to P
- C.1 to Q
- C.2 to R
- D to S
- E to T
- F to U

(c) To delete battery replacement information (old Test C)

(d) To delete Part 7 for relocation to Section 067-105-301

(e) To delete installation information (old Table C)

(f) To revise titles of Tests A, B, O, P, and S

(g) To revise all tests

(h) To add Tables B, C, D, and F and Fig. 5

(i) To combine Part 6 into Part 5

(j) To include a previous addendum

(k) To make other minor changes as required.

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

1.03 The following tests are covered.

Maintenance Tests

1.04 All maintenance tests except A, B, C, L, and M should be made during light traffic conditions because test conditions may prevent service calls from completing.

1.05 Tests A, B, and E are not applicable to line concentrator systems where the remote circuit is located in a central office, community dial office, or toll office and where the power is furnished by the office associated with the remote unit.

1.06 Test D is not applicable to concentrator systems where ground resistance between the control and remote unit(s) is too high and metallic conductors are used.

1.07 Tests A, B, D through H are not applicable to line concentrator systems arranged with repeatered, carrier, or long lines circuits for trunks between the remote and control circuits because these tests are performed on a dc basis.

1.08 ***Test Line Assignment:*** Reference should be made to local records to establish the arc terminal number of each test line associated with the concentrator control unit under test and information on the associated location for the D- and T- registers.

1.09 The dial tone speed register and dial tone speed indicating circuits, if provided, will not be available for use by the traffic department while Test L is in progress.

1.10 During Test L, the dial tone speed registers (D- and T-) will score. The reporting of these operations should be in accordance with local instructions.

1.11 Some tests in this section are for use with the control unit and both remote units. Actions upon and/or verifications by key, switches, relays, lamps, etc, are associated with the remote unit (0 or 1) under test and that part of the control unit (0 or 1) associated with the specific remote unit under test.

1.12 Tests in this section require testing or testing and verifications at either the control unit and remote unit or the dial tone speed register (DTSR) and traffic register rack (TRR), simultaneously.

1.13 A maintenance visit in the spring and once in the fall to remote units equipped with the ac power and heater circuit should include an inspection of the thermostat and heating element. The thermostat cuts the associated heating element off at 50 $\pm$5 degrees F and turns the element on at 35 $\pm$5 degrees F.

1.14 ***Lettered Steps:*** A letter, a, b, c, etc, added to a step number in Part 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 letter within a test. Where a condition does not apply, all steps designated by the letter should be omitted.

2. REFERENCES AND APPARATUS

References

2.01 The following associated references should be used with this section:

- CD- and SD-96536-01, Common Systems, Line Concentator No. 1A, Control Circuit, 100-Line Capacity
- CD- and SD-96537-01, Common Systems, Line Concentrator No. 1A, Remote Circuit, 100-Line Capacity
- CD- and SD-95957-01, Common Systems, Line Concentrator No. 1A, Remote Circuit, 50-Line Capacity
- CD- and SD-96556-01, Common Systems, Line Concentrator No. 1A, Modifications, Provide Long Line Service, −24 Volt Battery

Supply to Signal Circuit and Metallic Charging Circuit

- CD- and SD-96557-01, Common Systems, Line Concentrator No. 1A, Modification Circuit for Additional Applications In MTWX Service
- Section 067-105-301, Line Concentrator, No. 1A Trouble Analysis
- Section 167-285-301, Line Concentrator, No. 1A, KS-15917, List 3 Battery Supply, Operating Methods
- Section 032-173-301, Testing, Replacing, Handling and Storing of Circuit Packs and Semiconductor Devices
- Section 040-263-501, Relays 275-, 276-, 291-, 292-, 301-, 303-, 316-, 320-, and 321-Type, Tests Using Test Sets SD-95439-01 (J94725A)
- Section 040-275-301, Dry-Reed-Type Relays, Precautions To Be Observed When Testing
- Section 081-310-116, D Cabinet Tent.

Apparatus

2.02 The apparatus required for each test is shown in Table A. The details of each item are covered in the paragraph indicated by the number in parenthesis.

2.03 Test E requires measurement of 140 milliamperes, but the KS-14510 volt-ohm-milliammeter is limited to 120 milliamperes. When required to measure 140 milliamperes, a suitable equivalent, such as the KS-8039 milliammeter, with capability to measure 140 milliamperes is needed.

2.04 Blocking and insulating tools as required. Use tools and apply as covered in Section 069-020-801.

2.05 Dummy Fuse—Construct the dummy fuse as follows.

(1) Unsolder fuse element of 70A fuse A.

(2) Remove element, spring, cap, plastic tip, etc.

(3) Replace fuse element with wire connections shown in Fig. 1.

(4) Solder 70A fuse B into circuit with wire B.

(5) Thread wire through fuse cap.

(6) Tape bare parts of fuse B.

TABLE A

APPARATUS	TESTS																			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
KS-14510 VOM* (2.03)	1	1	1	1		1	1	1							1						
Blocking and Insulating Tools (2.04)	√	√		√	√	√	√	√	√	√	√	√		√	√					√	√
Dummy Fuse (2.05)				1	1																
Cord (2.06)									1	1					1			1	1	1	
1011G Handset (2.07)											1					1				1	
Cord (2.08)											1										
Operated Fuses (2.09)				√	√							√									
KS-3008 Stopwatch*													1								
No. 14-Type Test Desk														1							
67C Test Set or Equivalent																1	1	1	1		1

√ as required

* or equivalent

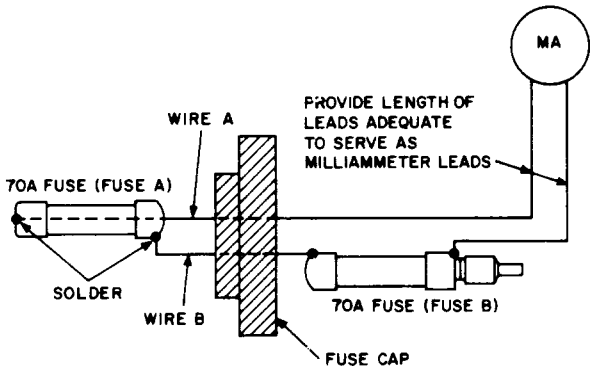


Fig. 1—Construction of Dummy Fuse

2.06 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord) and two KS-6278 connecting clips (for connecting relay terminals to terminal strip terminals).

2.07 1011G handset equipped with a 2W37A cord.

2.08 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 411C tool (for connecting test battery to fuse alarm bars).

2.09 Operated (blown) fuses used in Test K, as required, are furnished by plant personnel.

3. PREPARATION AND PRECAUTIONS

3.01 A talking circuit for test coordination is required between units. This test coordination circuit should use facilities such as order wire or DDD network where the remote unit is located in a central office or community dial office.

3.02 When working at the remote unit in temperatures below freezing, use a handkerchief or other form of face mask to prevent breath from condensing on any portion of the equipment. Condensation on the equipment may cause malfunctions. Section 081-310-116 covers the use of the D cabinet tent which should be used during inclement weather.

3.03 Do not make any adjustments to relays or crossbar switches without consulting the appropriate requirement and adjusting procedure for the particular relay or switch.

Dry-Reed Relays

3.04 The CO- (cutoff) relays in the control unit and the L- (line) and CO- relays in the remote unit are the 302-type dry-reed relays. Before testing 302-type relays or the circuits containing them, reference should be made to Section 040-275-301 for testing and precaution information.

3.05 Contacts of reed relays may be damaged if test connections causing contacts to make or break 1/2 ampere or more are made. A high-impedance telephone test set or headset should be used when testing reed relay contacts and circuits containing the contacts. An optional resistance battery (RB) test terminal with a 500-ohm resistor connected in series may be provided at remote units. A low-impedance test set, such as the 1011-B telephone hand test set, may be used for testing reed relay contacts at the remote unit when the RB test terminal is used.

Mercury Relays

3.06 The relays used in service with the signaling leads (ST- and SR-) at both remote and control units are the 303 mercury contact type. Before testing 303-type relays or the circuits containing these relays, reference should be made to Section 040-263-501 for testing methods information.

3.07 The 303-type signaling relays may be permanently damaged if more than 60 milliamperes are caused to flow through the relay winding. A high-impedance telephone hand test set should be used at the control unit when testing the signaling leads (ST- and SR-). At the remote unit, a low-impedance telephone set, such as the 1011B telephone hand test set, may be used to test signaling leads when the RB test terminal is used.

Magnetic Latching Crossbar Switches and Reed Relays

3.08 The hold magnets and cutoff relays in both control and remote units are magnetic latching. These switches or relays should not be operated or released electrically or manually during testing except by normal circuit operation or in strict accordance with approved procedures.

Indiscriminate operation or release of the switches and relays will cause system malfunctions.

Diodes

3.09 Before testing diodes or the circuits containing these diodes, reference should be made to Section 032-173-301 for testing, replacing, handling, and storing of circuit packs and semiconductor devices information.

4. MAINTENANCE TESTS

STEP	ACTION	VERIFICATION
A.	**Measure Remote Unit Battery Voltage (Group 0)**	
	Note: Refer to 1.05 and 1.07.	
1	At control unit— When TB07 relay is released— Momentarily operate DP0 relay.	07 hold magnets released. *Note:* Trunks waiting for disconnection with higher preference than trunk 07 will release before trunk 07.
2	Block operated A07 and C07 hold magnets.	
3	Measure voltage across terminals T07 and R07 associated with trunk on unit terminal strip.	Meter indicates 26 to 34 volts.
4	Remove blocking tools from A07 and C07 hold magnets.	
B.	**Measure Remote Unit Battery Voltage (Group 1)**	
	Note: Refer to 1.05 and 1.07.	
1	At control unit— When TB17 relay is released— Momentarily operate DP1 relay.	17 hold magnets released. *Note:* Trunks waiting for disconnection with higher preference than trunk 17 will release before trunk 17.
2	Block operated A17 and C17 hold magnets.	
3	Measure voltage across terminals T17 and R17 associated with trunk on unit terminal strip.	Meter indicates 26 to 34 volts.
4	Remove blocking tools from A17 and C17 hold magnets.	
C.	**Measure ▶Voltage of Spare◀ Battery for Remote Unit**	
1	At ▶battery charging◀ remote unit— Remove CHG fuse.	

STEP	ACTION	VERIFICATION
2	Connect voltmeter to TP1 (GND) and TP2.	Meter indicates approximately 26.5 volts.
3	Set TST switch to TST for 2 or 3 seconds.	Meter indicates more than 23 volts (when 72 degrees F).
4	Restore TST switch.	
5	Disconnect voltmeter.	
6	Replace CHG fuse.	

D. Ground Return Resistance

Note: Refer to 1.04, 1.06, and 1.07.

1a	If 100-line remote unit is used with both groups or group 0 only or if 50-line remote unit is associated with group 0 of control unit— At control unit— When TB07 relay is released— Momentarily operate DP0 relay.	07 hold magnets released.
2a	Block operated A07 hold magnet.	
3b	If 100-line remote unit is used with group 1 only or if 50-line remote unit is associated with group 1 of control unit— At control unit— When TB17 relay is released— Momentarily operate DP1 relay.	17 hold magnets released.
4b	Block operated A17 hold magnet.	
5	At remote unit— Remove CHG fuse.	At control unit— Major alarm sounds.
6	At control unit— Measure voltage in accordance with Fig. 2 at T- terminal associated with trunk on unit terminal strips and record voltage. ***Note:*** Determine polarity of voltage relative to ground. Plus (+) is for positive and minus (—) for negative. This voltage is E_1.	
7	At remote unit— Measure charging current in accordance with Test E and Fig. 1 and record voltage.	

STEP	ACTION	VERIFICATION

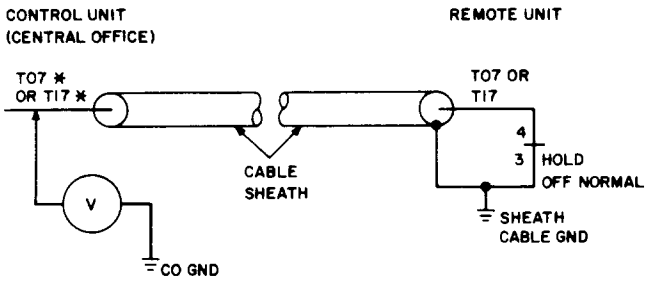


Fig. 2—Measurement of Ground Return Resistance

Note: This current is I.

8 Remove dummy fuse and insert CHG fuse.

9 At control unit—
Momentarily operate AR key. — Major alarm silenced.

10 Measure voltage again in accordance with Fig. 2 at T- terminal associated with trunks on unit terminal strip and record voltage.

Note: Determine polarity of voltage relative to ground. Plus (+) is for positive and minus (—) for negative. This voltage is E_2.

11 Remove blocking tools from A- hold magnet.

12 Calculate ground return resistance using

$$\frac{(\pm E_2) - (\pm E_1)}{I} = \text{ohms}$$

(Record for use in Test G as required). — Not more than 23 ohms.

E. Charging Current at Remote Unit

Note 1: The test should be performed during periods of light traffic. This facilitates keeping

STEP	ACTION	VERIFICATION
	four trunks in each group busy when measuring current at a 100-line remote unit using both groups or keeping four trunks busy in the appropriate group when measuring current at a 100-line remote unit using one group only or a 50-line remote unit.	
	Note 2: Refer to 1.05.	
1a	If 100-line remote unit is used with both groups or group 0 only or if 50-line remote unit is associated with group 0 of control unit— At control unit— When TB- relay is released— Momentarily operate DP0 relay.	Hold magnets associated with selected trunk released.
2a	Block operated A- hold magnet.	
3a	Repeat Steps 1a and 2a until six A- hold magnets are blocked operated.	
4b	If 100-line remote unit is used with group 1 only or if 50-line remote unit is associated with group 1 of control unit— At control unit— When TB- relay is released— Momentarily operate DP0 relay.	Hold magnets associated with selected trunk released.
5b	Block operated A- hold magnet.	
6b	Repeat Steps 4b and 5b until 12 hold magnets are blocked operated.	
7	At remote unit— Remove CHG fuse and insert dummy fuse (Fig. 1).	At control unit— Major alarm sounds.
8	Measure charging current and record for use in Test G as required.	If 100-line remote unit receives charging current using the trunks of two groups— Near but not exceeding 140 milliamperes. If 100-line or 50-line remote unit receives charging current using the trunks of one group— Near to 80 milliamperes but not exceeding 140 milliamperes.
9	Remove dummy fuse and insert CHG fuse.	
10	At control unit— Momentarily operate AR key.	

STEP	ACTION	VERIFICATION
11	Remove blocking tools from all A- hold magnets.	

F. Insulation Resistance of Signaling Leads

Note 1: This test should be performed during periods of light traffic because test conditions render the concentrator inoperative. Also, at completion of Steps 4, 7, and 10, a check for operated preference relays should be made to determine if a service call(s) is waiting. If any preference relay(s) is found operated, the blocking tool should be removed from RL2 relay to allow the service call(s) to complete. After the service call(s) is finished, the blocking tool may be replaced on RL2 relay to continue the test.

Note 2: Refer to 1.07.

1	At control unit— When all TB- relays in group 0 or 1 associated with signaling leads under test are released— Block operated RL2 relay.	
2	Insulate contacts of Z1 relay in accordance with Table B.	

TABLE B

ASSOCIATED REMOTE UNIT TRANSLATION TO INSULATE Z1 RELAY CONTACTS

ASSOCIATED REMOTE UNIT	INSULATE Z1 CONTACTS
100 line	10, 1, and 8
50 line	10 and 1

3	Measure leakage (resistance) of TS0 in accordance with Table C and Fig. 3.	Meter indicates not less than 30,000 ohms.
4	Remove insulators from Z1 relay.	
5	Insulate contacts of Z1 and/or Z1A relays in accordance with Table D.	
6	Measure leakage (resistance) of RS0 in accordance with Table C and Fig. 3.	Meter indicates not less than 30,000 ohms.

STEP ACTION VERIFICATION

TABLE C

SIGNALING LEADS TRANSLATION TO TERMINALS

SIGNALING LEADS	IF 100-LINE REMOTE UNIT IS USED WITH BOTH GROUPS OR GROUP 0 ONLY OR 50-LINE REMOTE UNIT IS ASSOCIATED WITH GROUP 0 OF CONTROL UNIT		IF 100-LINE REMOTE UNIT IS USED WITH GROUP 1 ONLY OR 50-LINE REMOTE UNIT IS ASSOCIATED WITH GROUP 1 OF CONTROL UNIT	
		TERMINAL NUMBER		TERMINAL NUMBER
TS0	TERMINAL	70	TERMINAL	72
RS0	STRIP	60	STRIP	62
TS1	ON	71	ON	73
RS1	UNIT	61	UNIT	63

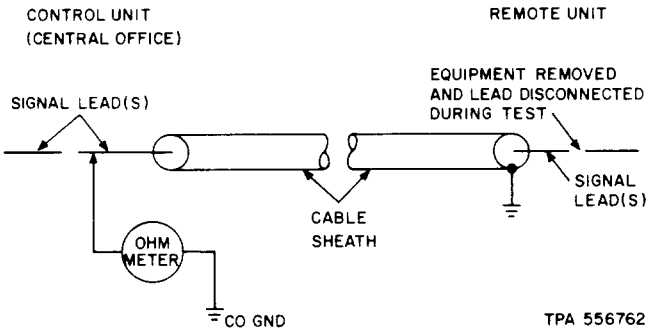


Fig. 3—Measurement of Signal Lead Insulation Resistance

TABLE D

ASSOCIATED REMOTE UNIT TRANSLATION TO INSULATE Z1 OR Z1A CONTACTS

ASSOCIATED REMOTE UNIT	INSULATE CONTACTS	
	Z1	Z1A
100 line	9 and 3	11
50 line	9 and 3	—

7 Remove insulators from Z1 and Z1A relays as required.

8 At remote unit—
Remove M relay from socket.

STEP	ACTION	VERIFICATION
9	At control unit— Measure leakage (resistance) of TS1 in accordance with Table C and Fig. 3.	Meter indicates not less than 30,000 ohms.
10	At remote unit— Replace M relay.	
11	Disconnect RS1 lead.	
12	At control unit— Measure leakage (resistance) of RS1 in accordance with Table C and Fig. 3.	Meter indicates not less than 30,000 ohms.
13	At remote unit— Reconnect RS1 lead.	
14	At control unit— Remove blocking tools from RL2 relay.	

G. Interference on Signaling Leads

Note 1: Perform Tests D and E before proceeding with Test G because resulting numerical values are used to calculate the final determination in this test.

Note 2: Refer to 1.04 and 1.07.

1a	If 100-line remote unit is used with both groups or group 0 only or if 50-line remote unit is associated with group 0 of control unit— At control unit— When TB07 relay is released— Momentarily operate DP0 relay.	07 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 07 will release before trunk 07.
2a	Block operated A07 and C07 hold magnets.	
3b	If 100-line remote unit is used with group 1 only or if 50-line remote unit is associated with group 1 of control unit— At control unit— When TB17 relay is released— Momentarily operate DP1 relay.	17 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 17 will release before trunk 17.
4b	Block operated A17 and C17 hold magnets.	
5	Measure ac interference in accordance with Fig. 4 across T- terminal associated with trunk on the unit terminal strip and central office ground and record.	

STEP	ACTION	VERIFICATION

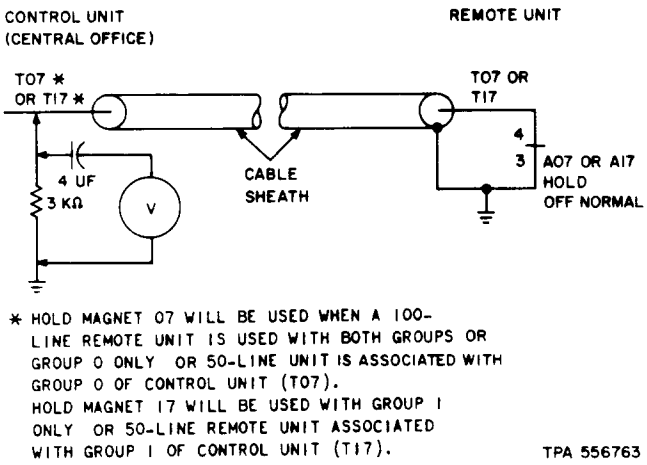


Fig. 4—Measurement of AC Interference on Signaling Leads

6	Remove blocking tools from A- and C- hold magnets.	
7	Calculate total dc interference on signaling leads as following example. From Test E, assume dc charging current is 0.140 ampere. For signaling current, assume 0.100 ampere (for all cases). From Test D, assume ground return resistance is 20 ohms. For DC voltage = (0.140 + 0.100) x 20 = 4.8 volts.	Limits in accordance with Table E not exceeded.

H. Line Insulation Test

Note 1: Where the control unit central office is arranged with regular line insulation test facilities for the concentrator trunks, refer the line insulation test requirements to the appropriate facility. If a portable electronic type test set H-297-421 (ST-627579) is available, the line insulation test may be performed in accordance with Section 102-172-501 for subscriber line rapid insulation test.

Note 2: Refer to 1.04 and 1.07.

1a	If 100-line remote unit is used with both groups or group 0 or if 50-line remote unit is associated with group 0 of control unit—	Hold magnets associated with selected trunk under test released.

STEP	ACTION	VERIFICATION

TABLE E

SIGNALING LEAD INTERFERENCE LIMITS

FOR SYSTEMS WITHOUT 60-HZ FILTERS ON SIGNAL LEADS IN CONTROL AND REMOTE UNITS		FOR SYSTEMS EQUIPPED WITH 60-HZ FILTERS ON SIGNAL LEADS IN CONTROL AND REMOTE UNITS	
When DC Interference (Step 7) Is: VOLTS	AC Interference (Step 5) May Not Exceed: VOLTS (rms)	When DC Interference (Step 7) Is: VOLTS	AC Interference (Step 5) May Not Exceed: VOLTS (rms)
10	0	10	0
9.5	0.4	9.5	1.4
9.0	0.7	9.0	2.9
8.5	1.1	8.5	4.3
8.0	1.4	8.0	5.7
7.5	1.8	7.5	7.1
7.0	2.1	7.0	8.6
6.5	2.5	6.5	10.0
6.0	2.8	6.0	11.4
5.5	3.2	5.5	12.8
5.0	3.6	5.0	14.3
4.5	3.9	4.5	15.7
4.0	4.3	4.0	17.2
3.5	4.6	3.5	18.6
3.0 or less	5.0	3.0 or less	20.0

	At control unit— When TB- relay associated with selected trunk under test is released— Momentarily operate DP1 relay.	***Note:*** Trunks waiting for disconnection with higher preference than the trunk under test will release before the selected trunk under test.
2a	Block operated A- and C- hold magnets associated with selected trunk under test.	
3b	If 100-line remote unit is used with group 1 only or if 50-line remote unit is associated with group 1 of control unit— At control unit— When TB- relay associated with selected trunk under test is released— Momentarily operate DP1 relay.	Hold magnets associated with selected trunk under test released. ***Note:*** Trunks waiting for disconnection with higher preference than the trunk under test will release before the selected trunk under test.
4b	Block operated A- and C- hold magnets associated with selected trunk under test.	

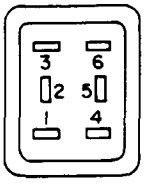
STEP	ACTION	VERIFICATION
5	At remote unit— Block operated A- and B- hold magnet associated with selected trunk under test.	
6	At control unit— Measure resistance across T- terminal associated with trunk under test on unit terminal strip and central office ground.	Meter indicates not less than 15,000 ohms.
7	Measure resistance across R- terminal associated with trunk under test on unit terminal strip and central office ground.	Meter indicates not less than 15,000 ohms.
8	Measure resistance across T- and R- terminals associated with trunks under test on unit terminal strip.	Meter indicates not less than 15,000 ohms.
9	At remote unit— Remove blocking tools from A- and B- hold magnets.	
10	At control unit— Remove blocking tools from A- and C- hold magnets.	
11	Repeat Steps 1a through 10, as required, for remaining trunk(s) to be tested.	

I. Service Denial Call

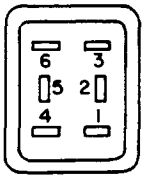
Note: Refer to 1.04.

1	At control unit— Connect terminal 69 of unit terminal strip to terminal 3 of CO- relay associated with line to be denied service in accordance with Fig. 5.	
2	Block nonoperated SRP- and DP- relays associated with group(s) which contains line to be denied service.	
3	When SL- relay associated with line under test is released— Operate and hold T- key associated with line under test.	SL- relay momentarily operated. COK lamp lighted. ***Note:*** The SL- relay must release before the COK lamp lights.
4	When COK lamp lights— Restore T- key.	COK lamp extinguished.

STEP	ACTION	VERIFICATION



NUMBERING OF TERMINALS FOR MAKING TEST CONNECTIONS FROM THE FRONT OF THE FRAME



NUMBERING OF TERMINALS AS VIEWED FROM THE REAR OF THE FRAME

TPA 556764

Fig. 5—Terminal Numbering of Relay Units—302-Type Relay

Note: Perform Step 5 without delay.

5 Block nonoperated SL- relay associated with line under test.

6 Remove blocking tools from SRP- and DP- relays.

7a If local office is No. 1 or No. 5 crossbar—Insulate contact of DIS- relay associated with line to be denied service in accordance with Table F.

8 Disconnect SL- lead associated with line under test from SL- terminal on unit terminal strip.

9a If local office is No. 1 or No. 5 crossbar—Remove insulator from DIS- relay.

10 Disconnect terminal 69 from terminal 3 of CO- relay.

Note: Steps 11 and 12 restore the line under test to service.

11 Reconnect SL- lead to SL- terminal associated with line under test on unit terminal strip.

STEP ACTION VERIFICATION

TABLE F

DOUBLE CONNECTION TRANSLATION TO ASSOCIATED GROUP AND LINE NUMBER

GROUP 0					GROUP 1				
CLOSED CROSSPOINTS		CONNECTED LINE NUMBER WHEN ON SWITCH			CLOSED CROSSPOINTS		CONNECTED LINE NUMBER WHEN ON SWITCH		
SWITCH HORIZONTAL OF SWITCH A, B, OR C	SWITCH C HORIZONTAL FOR STEERING LEVEL	A	B	C	SWITCH HORIZONTAL OF SWITCH A, B, OR C	SWITCH C HORIZONTAL FOR STEERING LEVEL	A	B	C
0	8	0	20	40	0	8	50	70	90
	9	1	21	41		9	51	71	91
1	8	2	22	42	1	8	52	72	92
	9	3	23	43		9	53	73	93
2	8	4	24	44	2	8	54	74	94
	9	5	25	45		9	55	75	95
3	8	6	26	46	3	8	56	76	96
	9	7	27	47		9	57	77	97
4	8	8	28	48	4	8	58	78	98
	9	9	29	49		9	59	79	99
5	8	10	30		5	8	60	80	
	9	11	31			9	61	81	
6	8	12	32		6	8	62	82	
	9	13	33			9	63	83	
7	8	14	34		7	8	64	84	
	9	15	35			9	65	85	
8	8	16	36		8	8	66	86	
	9	17	37			9	67	87	
9	8	18	38		9	8	68	88	
	9	19	39			9	69	89	

12 Perform terminating call (Test N, Q, or R, as appropriate) on line to be restored to service.

J. Service Denial Under Permanent Signal Conditions

Note: Refer to 1.04.

1 At control unit—
Connect terminal 69 of unit terminal strip to terminal 3 of CO- relay associated wih line to be denied service in accordance with Fig. 5.

2a If local office is No. 1 or No. 5 crossbar—
Insulate contact of DIS- relay associated with

STEP	ACTION	VERIFICATION
	line to be denied service in accordance with Table F.	
3	Block nonoperated SRP- and DP- relays.	
4	Manually release TB- relay associated with trunk connected to line to be denied service.	TB- relay released.
5	Remove blocking tool from DP- relay associated with line to be denied service.	
6	Momentarily operate DP- relay associated with line to be denied service if TB- relay associated with connected trunk is not released.	TB- relay released.
7	Block nonoperated DP- relay associated with line to be denied service.	
8	When SL- relay associated with line to be denied service is released— Operate and hold T- key associated with line to be denied service.	SL- relay momentarily operated. COK lamp lighted. ***Note:*** SL- relay must release before COK lamp lights.
9	When COK lamp lights— Restore T- key.	COK lamp extinguished.
10	Block nonoperated SL- relay associated with line to be denied service.	
11	Remove blocking tools from SRP- and DP- relays.	
12	Disconnect SL- lead associated with line to be denied service from SL- terminal on unit terminal strip.	
13	Remove insulator from DIS- relay.	
14	Disconnect terminal 69 from CO- relay.	
	Note: Steps 15 and 16 restore the line denied service to service.	
15	Remove blocking tool from SL- relay.	
16	Reconnect SL- lead to SL- terminal on unit terminal.	

STEP	ACTION	VERIFICATION
K. Alarm Circuits		
	Note 1: The alarm sending circuit (SD-95417-01) in No. 5 crossbar offices or the alarm transfer circuit (SD-25885-01) in No. 1 crossbar offices where provided must be activated for this test.	
	Note 2: Refer to 1.04.	
1	At control unit— Block nonoperated CCK relay.	
2	At remote unit— Set 1011G handset MON-TALK switch to MON.	
3	Connect 1011G handset to operating spare (or idle) customer line terminals (T and R) on unit terminal strip.	
4	Set handset switch to TALK.	At control unit— CAL relay operated. AL lamp lighted. Major alarm sounds.
5	At remote unit— Set handset switch to MON.	
6	At control unit— Remove blocking tool from CCK relay.	
7	Momentarily operate AR key.	CAL relay released. AL lamp extinguished. Major alarm silenced.
8	Block nonoperated RK2 relay.	
9	At remote unit— Set handset switch to TALK.	Dial tone heard. At control unit— RAL relay operated. AL lamp lighted. Major alarm sounds.
10	At remote unit— Set handset switch to MON.	
11	At control unit— Remove blocking tool from RK2 relay.	

STEP	ACTION	VERIFICATION
12	Momentarily operate AR key.	RAL relay released. AL lamp extinguished. Major alarm silenced.
13	Block operated CCK and RK2 relays.	
14	At remote unit— Set handset switch to TALK.	Dial tone heard. At control unit— SAL relay operated. AL lamp lighted. Major alarm sounds.
15	At remote unit— Set handset switch to MON.	Dial tone silenced.
16	At control unit— Remove blocking tools from CCK and RK2 relays.	
17	Momentarily operate AR key.	SAL relay released. AL lamp extinguished. Major alarm silenced.
18	Block operated S2A relay.	
19	At remote unit— Set handset switch to TALK.	Dial tone heard. At control unit— SAL relay operated. AL lamp lighted. Major alarm sounds.
20	At remote unit— Set handset switch to MON.	
21	At control unit— Remove blocking tool from S2A relay.	
22	Momentarily operate AR key.	SAL relay released. AL lamp extinguished. Major alarm silenced.
23	Block nonoperated S4A relay.	
24	At remote unit— Set handset switch to TALK.	At control unit— SAL relay operated. AL lamp lighted. Major alarm sounds.
25	At remote unit— Set handset switch to MON.	

STEP	ACTION	VERIFICATION
26	At control unit— Remove blocking tool from S4A relay.	
27	Momentarily operate AR key.	SAL relay released. AL lamp extinguished. Major alarm silenced.
28	Test PF fuse by momentarily applying −48 volts test battery through fuse block hole using 411C tool.	FA relay momentarily operated. FA lamp momentarily lighted. Major alarm sounds.
29	Momentarily operate AR key.	Major alarm silenced.
30	Repeat Steps 28 and 29 for A through N fuses.	
31a	If remote unit under test is 1/2 of 100-line unit or group 0 only or 50-line unit associated with group 0 of control unit— When control unit TB00 relay is released— At remote unit— Replace CHG fuse with an operated fuse. ***Note:*** To release trunk 00, manually operate DP0 relay until TB00 relay is released.	At control unit— CF or CF0 and RAL relays operated. AL lamp lighted. Major alarm sounds.
32b	If remote unit under test is a 50-line unit or 1/2 of 100-line unit associated with group 1 of control unit— When control unit TB10 relay is released— At remote unit— Replace CHG fuse with an operated fuse. ***Note:*** To release trunk 10, manually operate DP1 relay until TB10 relay is released.	At control unit— CF1 and RAL relays operated. AL lamp lighted. Major alarm sounds.
33	At remote unit— Replace operated fuse with original CHG fuse.	At control unit— CF or CF- relay released. AL lamp extinguished.
34	Momentarily operate AR key.	RAL lamp released. Major alarm silenced.

L. Dial Tone Speed Register

Note 1: Since one terminal on a dial tone speed register (DTRS) selector switch arc is assigned to each control unit group of 10 trunks and the DTSR circuit may test as many as 19 terminals per arc not associated with the concentrator group under test, one

STEP	ACTION	VERIFICATION
	test cycle for each of Steps 8, 11, 14, and 17 is required by the DTSR circuit.	
	Note 2: Refer to 1.08, 1.09, and 1.10.	
1a	If DTSR is arranged with 6-position rotary switches— At DTSR— Record switch settings of A2 through A6 and B2 through B6 rotary switches.	
2a	Set rotary switches to 6 as required to skip selector switch arcs not associated with concentrator control unit under test.	
3a	Set rotary switch(es) as required to test selector switch arc(s) associated with concentrator control unit under test.	
4b	If DTSR is arranged with 2-position toggle switches— At DTSR— Record switch settings of TA2 through TA6 and TB2 through TB6 toggle switches.	
5b	Set switches to 2 as required to skip selector switch arcs not associated with concentrator control unit under test.	
6b	Set switch(es) to 1 as required to test selector switch arc(s) associated with concentrator control unit under test.	
7	At control unit— Insulate 8B of TGB0 relay.	
8	At DTSR or TRR— Operate ST key (for one cycle of testing).	At TRR— D- register associated with group 0 of concentrator control unit under test scores once. T- register associated with group 0 of concentrator control unit under test scores once.
9	At DTSR or TTR— Restore ST key.	
10	At control unit— Remove insulator from TGB0 relay.	
11	At DTSR or TRR— Operate ST key (for one cycle of testing).	At TRR— T- register associated with group 0 of

STEP	ACTION	VERIFICATION
		concentrator control unit under test scores once.
12	At DTSR or TRR— Restore ST key.	
13	At control unit— Insulate 8B of TGB1 relay.	
14	At DTSR or TRR— Operate ST key (for one cycle of testing).	At TRR— D- register associated with group 1 of concentrator control unit under test scores once. T- register associated with group 1 of concentrator control unit under test scores once.
15	At DTSR or TRR— Restore ST key.	
16	At control unit— Remove insulator from TGB1 relay.	
17	At DTSR or TRR— Operate ST key (for one cycle of testing).	T- register associated with group 1 of concentrator control unit under test scores once.
18	At DTSR or TRR— Restore ST key.	
19	At DTSR— Reset rotary or toggle switches in accordance with record of initial switch settings.	

M. Trunk Group Usage Recorder

1	At trunk register location— Read and record all registers associated with concentrator group TB- relays (trunk-busy leads) under test.	
2a	If TUR is not operating at beginning of test and SD-95738-01 is provided— At TUR— Operate MAN key.	
3b	If TUR is not operating at beginning of test and SD-96549-01 is provided— At TUR— Restore OFF key.	

STEP	ACTION	VERIFICATION
4	At control unit— When TB- relay is released— Block operated TB- relay for one scan cycle of testing (100 seconds) by TUR.	At traffic register location— Register associated with TB- relay (trunk-busy lead) under test scores once.
5	At control unit— Remove blocking tool from TB- relay.	
6	Repeat Steps 4 and 5 for remaining TB- relays to be tested.	
7a	If TUR is not operating at beginning of test and SD-95738-01 is provided— At TUR— Restore MAN key.	
8b	If TUR is not operating at beginning of test and SD-96549-01 is provided— At TUR— Restore OFF key.	

5. OPERATIONAL TESTS

General

5.01 The tests in this part are for use to aid in the determination of the most logical testing sequence for trouble location. If trouble occurs, a visual analysis should be made to establish which operational test(s) can be performed upon what equipment and, in turn, lead to a minimized testing effort. Accordingly, a comprehensive understanding of circuit functions, result of faulty signaling, and effects of latching equipment by magnetic circuits is a basic essential.

5.02 Reference should be made to Section 067-105-301 for line concentrator No. 1A trouble analysis for method of locating trouble and causes of trouble.

5.03 Most trouble reports can be classified as originating or terminating service denials, double connections, and showering reports. Originating service denial classification would include no dial tone, cannot call out, cannot break dial tone, denied service, or other similar reports. Terminating service denial classification would be reached wrong party, cannot trip ringing, cannot reach party, and other similar reports.

Selection of Test Calls

5.04 Basically, there are three types of test calls that can be made:

- Service request calls
- Terminating calls
- Disconnect calls.

5.05 A service request call should be used to verify the ability of the concentrator to complete a call. A service request call on lines other than the test lines can only originate at the remote unit or the subscriber set. For an originating service denied condition, the subsequent terminating call often removes the trouble condition or masks the trouble.

Use of Test Lines

5.06 These tests indicate that the concentrator is capable of completing a call on one line only in each group of the control circuit. Test lines can be used to test that a connection can be made on each trunk to the test line by selecting each trunk. Other lines may fail due to circuit or apparatus irregularities when connecting to trunks. The circuit may identify the test line correctly but may fail to identify lines with trouble, such as a

dirty contact of the LA- relay in another group. The test line may complete a call to a particular trunk, and another line may fail because of bent select fingers. Accordingly, test lines may be used to determine if the concentrator system is operative. Where trouble continues or analysis indicates that the trouble is associated with a particular line(s), the associated service test call(s) should be performed upon the suspected line(s).

STEP	ACTION	VERIFICATION
N. Terminating Test Call		
1	At test desk— Dial directory number assigned to concentrator line terminal 49.	Ohmmeter indicates 33,000 ohms plus trunk loop resistance.
2	Release connection. ***Note:*** Momentary operation of the DP- relay may be required to initiate line disconnect.	At control unit— Hold magnet and crosspoints associated with line 49 released.
3	Block operated A- and C- hold magnets associated with trunk used in call.	
4	Repeat Steps 1, 2, and 3 until all trunks associated with group under test have been used with test calls. ***Note:*** Remove blocking tools if all trunks become busy to free trunks for service calls.	
5	Remove all blocking tools.	
6	Repeat Steps 1 through 5 for group 1, as required, using directory number assigned to concentrator line terminal 99.	
O. Service Request Call (From Control Unit)		
1	At control unit— When TB09 relay is released— Momentarily operate DP0 relay.	09 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 09 will release before trunk 09.
2	Block operated A09 and C09 hold magnets.	
3	Connect ground to T- terminal on unit terminal strip associated with trunk 09. ***Note:*** A service request call is initiated by line 49 using an idle trunk.	
4	Determine number of trunk connected to line 49.	

STEP	ACTION	VERIFICATION
5	Insulate contacts 7 and 9 of HS- relay associated with trunk connected to line 49.	
6	Block operated TB- relay associated with trunk connected to line 49.	
7	Disconnect ground from T- terminal associated with trunk 09.	
8	Measure resistance across terminals 7 and 9 of HS- relay associated with trunk connected to line 49.	Meter indicates 33,000 ohms plus trunk loop resistance.
9	Remove insulators from contacts 7 and 9 of HS- relay.	
10	Remove blocking tool from TB- relay. ***Note:*** Momentary operation of the DP0 relay may be required to disconnect other idle trunks with higher preference.	Hold magnets of trunk connected to line 49 released.
11	Block operated A- and C- hold magnets of trunk just released from line 49. ***Note:*** Remove blocking tools if all trunks become busy to free trunks for service calls.	
12	Repeat Steps 3 through 11 until all trunks, except 09, associated with group 0 have been used in test calls.	
13	Remove all blocking tools.	
14a	If 100-line remote unit is arranged to function as a 50-line remote unit and if 100-line remote unit is associated with group 1 of control unit (option Z)— At control unit— When TB19 relay is released— Momentarily operate DP1 relay.	19 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 19 will release before trunk 19.
15a	Block operated A19 and C19 hold magnets.	
16a	Connect ground to T- terminal on unit terminal strip associated with trunk 19.	
17b	If 50-line remote unit is used with both groups and remote units are distantly located from each other (option Y)— At control unit—	08 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 08 will release

STEP	ACTION	VERIFICATION
	When TB08 relay is released— Momentarily operate DP1 relay.	before trunk 08.
18b	Block operated A08 and C08 hold magnets.	
19b	Connect ground to T- terminal on unit terminal strip associated with trunk 08.	
	Note: A service request call is initiated by line 99 using an idle trunk.	
20	Determine number of trunk connected to line 99.	
21	Insulate contacts 7 and 9 of HS- relay associated with trunk connected to line 99.	
22	Block operated TB- relay associated with trunk connected to line 99.	
23	Disconnect ground from T- terminal associated with trunk 08 or 19.	
24	Measure resistance across terminals 7 and 9 of HS- relay associated with trunk connected to line 99.	Meter indicates 33,000 ohms plus trunk loop resistance.
25	Remove insulators from contacts 7 and 9 of HS- relay.	Hold magnets of trunk connected to line 99 released.
	Note: Momentary operation of the DP1 relay may be required to disconnect other idle trunks with higher preference.	
26	Block operated A- and C- hold magnets of trunk just released from line 99.	
	Note: Remove blocking tools if all trunks become busy to free trunks for service calls.	
27	Repeat Steps 14a through 26 until all trunks, except 08 or 19, associated with group 1 have been used in test calls.	
28	Remove all blocking tools.	

P. Service Request Call (From Remote Unit)

1	At remote unit— Set 1011G handset MON-TALK switch to MON.	

STEP	ACTION	VERIFICATION
2	Connect handset to T- and R- terminals on unit terminal strip associated with line under test.	
3	Set handset switch to TALK.	Dial tone heard.
4	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
5	Check crosspoints associated with line under test.	Crosspoints closed. Line under test connected to same trunk as at control unit.
6	At control unit— Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
7	Check crosspoints associated with line under test.	Line under test connected to same trunk as at remote unit.
8	At remote unit— Break dial tone by dialing a digit.	Dial tone silenced. Line to trunk remains connected. At control unit— Line to trunk remains connected. TB- relay associated with trunk used for line under test operated.
9	At remote unit— Set handset switch to MON. ***Note:*** Momentary operation of the associated DP- relay may be required to cause disconnect of trunk used in test.	At control unit— In 6 to 8 seconds— TB- relay associated with trunk connected to line under test released.
10	Check crosspoints associated with line under test.	Crosspoint released.
11	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
12	At remote unit— Check crosspoints associated with line under test.	Crosspoints released.
13	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.

STEP	ACTION	VERIFICATION
Q. Terminating Test Call Using TTC Key		
1	At control unit— Operate and hold TTC key.	
2	Manually operate and hold SL- relay associated with line under test.	COK lamp lighted.
3	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
4	Check crosspoints associated with line under test.	Crosspoints closed. Line under test connected to same trunk as at remote unit.
5	At remote unit— Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
6	Check crosspoints associated with line under test.	Crosspoints closed. Line under test connected to same trunk as at control unit.
7	At control unit— Release SL- relay.	
8	Restore TTC relay.	COK lamp extinguished. In 6 to 8 seconds— TB- relay associated with trunk connected to line under test released.
9	Check for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
10	Check crosspoints associated with line under test.	Crosspoints released.
11	At remote unit— Check for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
12	Check crosspoints associated with line under test.	Crosspoints released.

STEP	ACTION	VERIFICATION
R. Terminating Test Call Using Grounded Sleeve Method		
1a	If local office is No. 1 or No. 5 crossbar— At nearest service telephone set— Dial directory number of line under test (leave receiver off-hook).	
2b	If local office is other than No. 1 or No. 5 crossbar— At control unit— Connect ground to SL- terminal on unit terminal strip associated with line under test.	
3	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
4	Check crosspoints associated with line under test.	Crosspoints closed. Line under test connected to same trunk as at remote unit.
5	At remote unit— Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage present.
6	Check crosspoints associated with line under test.	Crosspoints closed. Line under test connected to same trunk as at control unit.
7a	If local office is No. 1 or No. 5 crossbar— At nearest service telephone set— Replace receiver on-hook.	At control unit— In 6 to 8 seconds— TB- relay of trunk connected to line under test released.
8b	If local office is other than No. 1 or No. 5 crossbar— At control unit— Disconnect ground from SL- terminal associated with line under test.	In 6 to 8 seconds— TB- relay of trunk connected to line under test released.
9	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
10	Check crosspoints of line under test.	Crosspoints open.
11	At remote unit— Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.

STEP	ACTION	VERIFICATION
12	Check crosspoints of line under test.	Crosspoints open.

S. Disconnect Call (From Remote or Control Unit)

1a	If test is to be performed at remote unit— At remote unit— Set 1011G handset MON-TALK switch to MON.	
2a	Connect handset to T- and R- terminals on unit terminal strip associated with line under test.	
3a	Set handset switch to TALK.	Dial tone heard.
4a	Break dial tone by dialing a digit.	Dial tone silenced.
5a	Set handset switch to MON. ***Note:*** Momentary operation of the associated DP- relay may be required to cause disconnect of trunk used in the test.	At conrol unit— In 6 to 8 seconds— TB- relay associated with line under test released.
6a	Check crosspoints associated with line under test.	Crosspoints released.
7a	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
8a	At remote unit— Check crosspoints associated with line under test.	Crosspoints released.
9a	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
10b	If test is to be performed at control unit and SD-96536-01 is equipped with TTC key (option B)— At control unit— Operate and hold TTC key.	
11b	Momentarily operate SL- relay associated with line under test.	COK lamp momentarily lighted.
12b	Restore TTC key.	In 6 to 8 seconds— TB- relay associated with trunk connected to line under test released.

STEP	ACTION	VERIFICATION
13b	Check crosspoints associated with line under test.	Crosspoints released.
14b	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
15b	At remote unit— Check crosspoints associated with line under test.	Crosspoints released.
16b	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
17c	If test is to be performed at control unit, SD-96536-01 is not equipped with TTC key, and local office is No. 1 or No. 5 crossbar— At nearest service telephone set— Dial directory number of line under test.	
18c	Replace receiver on-hook. ***Note:*** Momentary operation of the associated DP- relay may be required to cause disconnect of trunk used in test.	At control unit— In 6 to 8 seconds— TB- relay of trunk connected to line under test released.
19c	Check crosspoints of line under test.	Crosspoints released.
20c	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
21c	At remote unit— Check crosspoints of line under test.	Crosspoints released.
22c	Test for voltage across contacts 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
23d	If test is to be performed at control unit, SD-96536-01 is not equipped with TTC key, and local office is other than No. 1 or No. 5 crossbar— At control unit— Connect ground to SL- terminal on unit terminal strip associated with line under test.	

STEP	ACTION	VERIFICATION
24d	Disconnect ground from SL- terminal. ***Note:*** Momentary operation of the associated DP- relay may be required to cause disconnect of trunk used in test.	In 6 to 8 seconds— TB- relay of trunk connected to line under test released.
25d	Check crosspoints of line under test.	Crosspoints released.
26d	Test for voltage across terminals 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
27d	At remote unit— Check crosspoints of line under test.	Crosspoints released.
28d	Test for voltage across terminals 2 and 3, 4 and 5 of CO- relay associated with line under test.	Voltage ***not*** present.
T. Trunk Test		
1	At control unit— When TB09 relay is released— Momentarily operate DP0 relay.	09 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 09 will release before 09.
2	Block operated A09 and C09 hold magnets.	
3	Connect ground to T- terminal on unit terminal strip associated with trunk 09. ***Note:*** A service request call is initiated by line 49 using an idle trunk.	
4	Determine number of trunk connected to line 49.	
5	Block operated TB- relay associated with trunk connected to line 49.	
6	Disconnect ground from T- terminal associated with trunk 09.	
7	Remove blocking tool from TB- relay. ***Note:*** Momentary operation of the DP0 relay may be required to disconnect other idle trunks with higher preference.	Hold magnets of trunk connected to line 49 released.
8	Block operated A- and C- hold magnets of trunk just released from line 49.	

STEP	ACTION	VERIFICATION
	Note: Remove blocking tools if all trunks become busy to free trunks to service calls.	
9	Repeat Steps 3 through 8 until all trunks, except 09, associated with group 0 have been tested.	
10	Remove all blocking tools.	
11a	If 100-line remote unit is arranged to function as a 50-line remote unit and 100-line remote unit is associated with group 1 of control unit (option Z)— At control unit— When TB19 relay is released— Momentarily operate DP1 relay.	***Note:*** Trunks waiting for disconnection with higher preference than trunk 19 will release before trunk 19.
12a	Block operated A19 and C19 hold magnets.	
13a	Connect ground to T- terminal on unit terminal strip associated with trunk 19.	
14b	If 50-line remote unit is used with both groups and remote units are distantly located from each other (option Y)— At control unit— When TB08 relay is released— Momentarily operate DP1 relay.	08 hold magnets released. ***Note:*** Trunks waiting for disconnection with higher preference than trunk 08 will release before trunk 08.
15b	Block operated A08 and C08 hold magnets.	
16b	Connect ground to T- terminal on unit terminal strip associated with trunk 08. ***Note:*** A service request call is initiated by line 99 using an idle trunk.	
17	Determine number of trunk connected to line 99.	
18	Block operated TB- relay associated with trunk connected to line 99.	
19	Disconnect ground from T- terminal associated with trunk 08 or 19.	
19	Remove blocking tool from TB- relay. ***Note:*** Momentary operation of the DP1 relay may be required to disconnect other idle trunks with higher preference.	Hold magnets of trunk connected to line 99 released.

STEP	ACTION	VERIFICATION
20	Block operated A- and C- hold magnets of trunk just released from line 99. ***Note:*** Remove blocking tools if all trunks become busy to free trunks for service calls.	
21	Repeat Steps 11a through 20 until all trunks, except 08 or 19, associated with group 1 have been tested.	
22	Remove all blocking tools.	

U. Releasing Double or Multiple Trunk Connections

1	At control unit— Check crosspoints and determine line and group with double connection using Table F.	
2	Determine whether ground is present on sleeve lead of line with double connection. ***Note:*** If ground is present on sleeve lead of line with double connection, then block nonoperated TP- relay associated with the group containing the line (Table F).	
3	Block nonoperated SRP- relay associated with group of line.	
4	Block nonoperated TB- relays associated with double connections.	
5	Manually operate and hold DP- relay associated with double connection.	Double connection released. ***Note:*** Idle trunks with higher preference will disconnect first.
6	When double connection released— Release DP- relay. ***Note:*** Operation of DP- relay in excess of time needed to release the double connection will cause a time-out alarm or cycling.	
7	Remove all blocking tools.	