TELEPHONE ANSWERING SYSTEMS
LINE CONCENTRATOR-IDENTIFIER (J93021)
USED WITH ELECTROMECHANICAL CENTRAL OFFICES
TESTS AND INSPECTIONS AT TIME OF INSTALLATION
USING TEST SET KS-21056

CONTENTS PAGE

1. GENERAL

1.01 This section covers tests and inspection required during installation of SD-95964-01 and SD-95962-01 Line Concentrator-Identifier (CI) System using test set KS-21056.

1.02 Section 473-500-101 contains the description, calibration, and operation of test set KS-21056.

1.03 Line Concentrator-Identifier Systems can be equipped with either tone signaling or metallic (dc) signaling. On systems equipped with tone signaling, test and adjust the tone signaling circuit (TSC) (Section 473-500-501) before testing the Concentrator-Identifier System.

1.04 This issue of the section is based on the following drawings:

SD-95964-01, Issue 16B

SD-95962-01, Issue 9B

SD-99608-01, Issue 1.

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

1.05 Special service protection should be applied when the line concentrator-identifier is equipped with metallic (dc) signaling. The pulsing channel and trunks 1 and 2 may contain voltages which are hazardous.

1.06 Tests C through J of the installation tests are to be performed on the concentrator before it is interconnected to the identifier via metallic (dc) signaling or tone signaling. If the concentrator is to be equipped with tone signaling, the AB plug should be inserted into connector A at the concentrator frame local cable while performing Tests C through J.

2. INSPECTION OF CROSS-CONNECTION APPARATUS

CONCENTRATOR-CENTRAL OFFICE

2.01 The cross-connections should be neatly dressed and all connections properly terminated.

2.02 The terminal lugs and terminal strips should be free from wire clippings and loose bits of solder, and the conductors should be carried through the proper fanning holes.

2.03 The MDF should be checked for cross-connection of lines 00 through 99 and for proper turnover of cross-connections where applicable.

2.04 Coin control battery CC+ and CC− or telegraph battery (+) and (−) should be connected.

2.05 Central office battery (−48V) should be connected.

2.06 The central office alarm leads should be properly cross-connected.

2.07 The traffic register circuit should be properly cross-connected to the traffic register circuit in the central office.

2.08 The trunk circuits should be properly connected to the traffic usage recorder in the central office.

2.09 TEL A and TEL B jacks and SWMN jack should be cross-connected to the central office frame line circuit and switchman line circuit, respectively, as required.

2.10 TLK jack should be cross-connected to a spare subscriber line, as required.

For Metallic Signaling

2.11 Cross connections should be run for the trunks.

2.12 Cross connections should be run for the pulsing pair, digit complete pair and the auxiliary pulsing and digit complete pairs (if provided).

For Tone Signaling

2.13 Cross connections should be run from the central office fuse panel to the tone signaling circuit.

2.14 Data trunks and talk trunks should be properly cross connected.

IDENTIFIER-ANSWERING BUREAU LOCATION

2.15 The terminal box, connecting blocks, fanning strip, binding post chamber, or terminal strips should be firmly mounted and properly marked.

2.16 The interior of the terminal box should be clean and free from spare wire and wire clippings. The nuts on spare terminal lugs should be turned down fingertight. The spare terminal lugs on the terminal strip should be clean.

2.17 The cross-connections should be neatly dressed and all connections properly terminated.

2.18 The terminal lugs and terminal strips should be free from wire clippings and loose bits of solder, and conductors should be carried through the proper fanning holes.

2.19 Lines 00 through 99 are cabled to the frame for cross-connection to the answering jack and lamp circuits at the switchboard.

2.20 The two 1A test posts should be cross connected to a line circuit, as required.

2.21 The fuse alarms and other optional alarms should be properly connected.

2.22 Building battery or local power supply should be properly connected.

For Metallic Signaling

2.23 Cross connections should be run for the trunks.

2.24 Cross connections should be run for the pulsing pair, digit complete pairs and the auxiliary pulsing and digit complete pairs (if provided).

For Tone Signaling

2.25 Cross connections should be run from the identifier fuse panel to the tone signaling circuit.

2.26 Data trunks and talk trunks should be properly cross connected.

3. INSPECTION OF CABLES

CONCENTRATOR-CENTRAL OFFICE

For Metallic Signaling

3.01 On the frame local cable located adjacent to the controller and controller connector unit, plug AB should be inserted into connector A.

3.02 Connector B of the frame local cable should be equipped with a dust cover and tied down to the local cable for storage.

For Tone Signaling

3.03 On the frame local cable located adjacent to the controller and controller connector unit, plug AB should be inserted into connector B.

3.04 Connector A of the frame local cable should be connected to connector TSC of the tone signaling equipment via an A25C double-ended cable (TS cable).

IDENTIFIER-ANSWERING BUREAU LOCATION

3.05 The cables should be run and fastened in accordance with standard PBX installation practices.

3.06 The entering cable should be properly fastened to the form supports.

3.07 Plug-type connectors for optional equipment should be properly terminated and secured.

For Metallic Signaling

3.08 On the cabinet local cable located adjacent to the controller and controller connector unit, plug AB should be inserted into connector A.

For Tone Signaling

3.09 Plug AB, located on the cabinet local cable near the controller and controller connector unit, should be inserted into connector TSI on the tone signaling equipment.

3.10 Connector A of the cabinet local cable should be equipped with a dust cover and tied down to the local cable for storage.

4. INSPECTION OF FUSES

CONCENTRATOR-CENTRAL OFFICE

4.01 The proper fuses should be in place in each of the working circuits.

4.02 The spare fuse holders should be equipped with the proper fuses.

IDENTIFIER-ANSWERING BUREAU LOCATION

4.03 The proper fuses should be in place in each of the working circuits.

4.04 The spare fuse holder, located on the inside front cabinet door, should contain the proper spare fuses.

5. INSPECTION OF EQUIPMENT

ANSWERING BUREAU LOCATION

5.01 The equipment cabinet should be level and secured to the floor, as required by local installation instructions.

5.02 The interior of the cabinet should be clean and free of wire clippings, solder splashes, foreign material, etc.

5.03 The exterior of the cabinet should present a neat appearance without unsightly scratches or other defects. Both front and rear doors should hang freely and lock with normal effort.

5.04 All relay covers should be in place.

5.05 Verify that all required apparatus and wiring options have been installed and connected.

5.06 Verify that index records, located on the inside cover of the CD and SD binder, are filled with issue number and figures and options installed.

5.07 Verify that the current SD drawings, CD book, and cross-connection records are filed.

6. INSTALLATION TESTS—DESCRIPTION

6.01 The tests covered are:

A. Power Supply Check: This test checks the voltage and polarity of the central office (−48V) and coin control (±135V) battery at the concentrator. At the identifier, the building battery or power supply is checked for proper voltage and polarity.

B. Relay Test: This test checks the FA (B-type) relay at the concentrator for both electrical and mechanical requirements. At the identifier, the following B-type relays are checked

for electrical and mechanical requirements: DC, TC, CIA, and TCA.

C. Pulse Generator: This test checks the pulsing speed and percent break of the pulse generator.

D. Units Timing: This test checks the timing interval of the units digit timing circuit.

E. Tens Timing: This test checks the timing interval of the tens digit timing circuit.

F. Trunk Timing: This test checks the timing interval of the TMA and TMB trunk timers. The trunk timer returns a trunk to normal after a timed interval if a call is not answered.

G. Control Timing: This test checks the timing interval of the CT timing circuit. The CT timer permits select and hold magnets to release before another call is processed.

H. Lockout Timing: This test checks the timing interval of the lockout timing circuit. The lockout timing circuit prevents a call from being processed twice during one ringing interval.

I. Ringup Circuit: This test checks the operation of the ringup circuit and associated units and tens identifier.

J. Concentrator Operation: The following features are checked:

(1) Operating sequence of the concentrator

(2) Pulses produced by controllers A and B representing the units and tens digit of an associated ringup circuit

(3) Digit complete signal initiated by the concentrator.

K. Measurement of Line Current: This test checks the value of line current that flows during pulsing.

L. Trunk Seizure and Supervision: This test checks the seizure and supervision of trunk units.

M. Concentrator-Identifier Operation: The following features are checked:

(1) Operating sequence of the concentrator-identifier

(2) Line identification at the concentrator and switchboard

(3) Digit complete signal initiated by the concentrator and verification of the digit complete test returned by the identifier.

N. Load Test: This test checks the operation of the concentrator-identifier with all ringup circuits being energized.

O. Trunk Connector Operation: The following features are checked:

(1) Trunk connector switch (1-3) operation at the concentrator.

(2) Subscriber connector relay (C0 or C1) operation at the concentrator.

(3) Trunk connector switch (1-3) operation at the identifier.

(4) Trunk E or F relay operation at the identifier.

(5) A talking path can be verified over each trunk.

(6) The trunk is held under control of the switchboard attendant.

P. Trunk Busy and Trunk Allotter Sequence: This test checks the operating sequence of the trunk allotter and use of make-busy keys.

Q. Alternate Allotter: The following features are checked:

(1) The alternate trunk allotter is used when a trouble occurs in the regular trunk allotter.

(2) The alternate trunk allotter is used when the AA key is operated.

(3) The alternate trunk allotter is released when the AR key is operated or when

the remote alarm release telephone number is dialed (optional).

R. Alternate Use of Controllers: The following features are checked:

(1) Alternate use of controllers in originating and terminating equipment

(2) Make-busy of controllers when either CA or CB key is operated

(3) Lamp indication of controller in use at concentrator.

S. Lockout Timing Transfer: This test checks the transfer capabilities of the lockout timing circuit.

T. Indicator Make-Busy: This test checks the use of the indicator make-busy keys.

U. Time-Out and Alarm Cutoff: The following features are checked:

(1) The controller at the identifier will time out in 4 to 6 seconds if PC1 or PC2 relay is held operated due to a controller relay failure.

(2) On the next attempt to process a call, the concentrator will time out and initiate a system time-out.

(3) During the system time-out, all common equipment in the concentrator and identifier will be locked out of service.

(4) During the system time-out, the pulsing pair is transferred to an alternate pair (optional).

(5) The audible office alarm is silenced when the ACO key is operated.

(6) The concentrator is restored to normal when the AR key is operated or the remote alarm release telephone number is dialed (optional).

V. Fuse Alarms: This test checks the ability of the fuse alarm circuits in the originating and terminating equipment to function when a fuse has operated.

W. All-Trunks-Busy (Calls Waiting), Calls Display, and Traffic Registers: The following features are checked.

(1) Traffic register circuit in central office.

(2) AB traffic register at identifier.

(3) ATB light (if provided) and AB register (if provided) at switchboard.

(4) Calls are served and displayed when all trunks are busy.

(5) TRF timer (if provided) adjustment at concentrator.

6.02 Performance of Tests K-R, T, U, and W requires simultaneous actions and verifications at the concentrator, identifier, and switchboard. A talking connection can be established to the answering bureau via a line circuit or by use of the test set as follows:

(1) Calibrate test set (Section 473-500-101).

(2) Connect a 52-type headset to the headset jack on the test set.

(3) Connect the pulse test cord to the pulse jack on the test set.

(4) On the test set, place the function switch to the SP pulse mode position. Place the pulse polarity switch according to the polarity of ringing voltage (negative or positive superimposed) applied to subscriber lines.

(5) Connect the pulse test cord to the tip and ring of a vacant ringup circuit at the concentrator Sub (L) terminal strip.

Note: Tip lead is located at grooved side of connector.

(6) On the test set, momentarily depress pulse switch. At the switchboard, insert a cord into the jack associated with the lighted switchboard lamp. To transmit at the test set, depress the talk switch; to receive, release the talk switch.

6.03 The instruction "activate ringup circuit" in the ***Action*** column of Installation Tests shall

be performed by use of the test set. The procedure using the test set is as follows:

(1) Calibrate test set (Section 473-500-101).

(2) At test set, connect pulse test cord to pulse jack.

(3) At test set, place pulse polarity switch according to ringing voltage (negative or positive superimposed) applied to subscriber lines.

(4) At test set, place function switch to SP (single pulse) pulse mode position.

(5) Connect pulse test cord to ringup circuit at concentrator Sub (L) terminal strip.

Note: Tip lead is located at grooved side of connector.

(6) At test set, momentarily depress pulse switch. Pulse indicator lamp flashes and ringup circuit should operate.

6.04 ***Test set KS-21056 must be connected by the black lead of five-conductor test cord to concentrator ground while performing tests using the test set in the SP or DP pulse mode position. The five-conductor test cord can be inserted in either the digit display or the timer jack of the test set.***

6.05 Tests K, L, and R of Installation Tests are not required on concentrator-identifier equipped with tone signaling.

6.06 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 9 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. Where a condition does not apply, all steps designated by that letter should be omitted.

6.07 If a trouble condition can not be isolated while performing tests in this section, refer to Section 473-501-502, Trouble Analysis, to assist in isolating the trouble.

7. APPARATUS

CONCENTRATOR-CENTRAL OFFICE

7.01 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 parentheses.

7.02 KS-14510, L1 volt-ohm-milliammeter, or equivalent, L2 test leads, or equivalent (used to check power supply).

7.03 KS-21056, L1 test set equipped with KS-21056, L2 pulse test cord, KS-21056, L3 five-conductor test cord, and KS-21056, L4 patch cord (used to test concentrator).

7.04 35-Type test set (used to test relays).

7.05 52-Type headset (used to establish a talking connection with the terminating end via use of test set KS-21056).

7.06 KS-13490, L2 resistor, 0.5 watt, 5600 ohms, or equivalent (used as a dummy load in testing the concentrator).

7.07 Testing cord, W2W cord, 10 feet long, equipped with a 310 plug, one 360B tool, one 360C tool (2W17C cord), and two 365 (alligator clips) tools (used to connect 35-type test set to relays under test).

7.08 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 411A (test pick) tool (for use in testing fuse alarm circuit).

7.09 Patching cord, one conductor, 12.5 inches long, equipped with two No. 30 Mueller Mini-Gator clips and two No. 32 Mueller insulators (W1AP cord).

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

IDENTIFIER-ANSWERING BUREAU LOCATION

7.11 KS-14510, L1 volt-ohm-milliammeter, or equivalent, L2 test leads, or equivalent (used to check power supply).

TABLE A

LIST OF APPARATUS FOR TEST

APPARATUS	TESTS																					
	A	B	C	D	E	F	G	H	I	J	*K	*L	M	N	O	P	Q	*R	S	T	U	V	W
Concentrator Central Office																							
KS-14510 Meter (7.02)	1																						
KS-21056 Test Set (7.03)			1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1
35-Type Test Set (7.04)		1																					
52-Type Headset (7.05)											1	1	1	1	1	1	1	1		1	1		1
5600Ω Resistor (7.06)			1	1	1	1	1	1	1	1													
2W17C Cord (7.07)		1																					
1W13B Cord (7.08)																						1	
W1AP Cord (7.09)			4	3	3	4	4	3	3	3	1												
Tool (7.10)			†		†					†	†	†	†	†			†						
Identifier Answering Bureau																							
KS-14510 Meter (7.11)	1																						
35-Type Test Set (7.12)		1																					
2W17C Cord (7.13)		2																					
1W13B Cord (7.14)																						1	
Tool (7.15)											†	†	†								†		

* Not required on concentrator - identifier equipped with tone signaling.

† Blocking and insulating tools, as required.

7.12 35-Type test set (used to test relays).

7.13 Testing cord, W2W, 10 feet long, equipped with a 310 plug, one 360B tool, one 360C tool (2W17C cord), and two 365 (alligator clips) tools (used to connect 35-type test set to relays under test).

7.14 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 411A (test pick) tool (for use in testing fuse alarm circuit).

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

8. PREPARATION

8.01 Tests C through J are to be performed on the concentrator before it is interconnected to the identifier via metallic (dc) signaling or tone signaling. If the concentrator-identifier has been interconnected with metallic signaling, disconnect the trunks, pulsing pair, and digit complete pair at the horizontal distributing frame. If the concentrator is to be equipped with tone signaling, the AB plug should be inserted into connector A at the concentrator frame local cable while performing Tests C through J.

8.02 Tests K through W are to be performed on the CI interconnected as a system.

STEP	ACTION	VERIFICATION
	Tests C Through K, M Through U, and W	
1	Calibrate test set KS-21056 (Section 473-500-101).	
	Tests C Through J	
2	At concentrator— Set K and KA resistors of both controllers to maximum resistance.	
3	At concentrator— At miscellaneous terminal strip— Using W1AP cord— Strap across terminals 00 and 20 (PT and PR leads). Using two W1AP cords and 5.6K resistor— Strap resistor across terminals 10 and 31 (DCR and DCT leads).	
	Tests K Through R, T, and U	
4	Establish a talking connection between the originating equipment in the central office and the terminating equipment in the answering bureau.	
	Tests P, Q, R, T, U, and W	
5	Select for test a vacant ringup circuit, if available, and inform answering bureau which line was selected for test.	

STEP	ACTION	VERIFICATION
9. METHOD		
A. Power Supply Check		
1	At concentrator— At voltmeter— Place meter switch to 60 Vdc position.	
2	At concentrator— At control panel— Connect (−) lead of voltmeter to 48V terminal and (+) lead to GRD terminal.	At voltmeter— Meter reads in the range of 43-53 volts.
3	At concentrator— At voltmeter— Place meter switch to 300 Vdc position.	
4	At concentrator— At terminal strip A— Connect the (+) lead of the voltmeter to terminal 15 and the (−) lead to ground.	At voltmeter— Meter reads in the range of 105-135 volts.
5	At concentrator— At terminal strip A— Connect the (−) lead of the voltmeter to terminal 13 and the (+) lead to ground.	At voltmeter— Meter reads in the range of 105-135 volts.
6	At identifier— At voltmeter— Place meter switch to 60 Vdc position.	
7	At identifier— Connect the (−) lead of the voltmeter to the 24V terminal and the (+) lead to G terminal.	At voltmeter— Meter reads in the range of 20 to 26 volts.
B. Relay Test		
Concentrator-Central Office		
	***Electrical and mechanical tests should be applied in accordance with Circuit Requirement Table SD-95964-01.***	
1	The FA relay (B-type) should be checked for both electrical and mechanical requirements.	
Identifier-Answering Bureau Location		
	***Electrical and mechanical tests should be applied in accordance with Circuit Requirement Table SD-95962-01.***	

STEP	ACTION	VERIFICATION
2	The following B-type relays should be checked for both electrical and mechanical requirements: DC, TC, CIA, and TCA.	
C. Pulse Generator		
4	At concentrator— Operate CA key.	
5	At test set KS-21056— Connect KS-21056, L4 patch cord to pulse speed, percent break jack. Place function switch to pulse speed position.	
6	At concentrator— At controller A— Block W relay nonoperated. Blocks ST2 relay operated. Using W1AP cord— Connect −48V (central office battery) to 5B of ST relay.	Audible sound at approximately 20 Hz produced by pulse generator.
7	At concentrator— Connect patch cord to P jack of controller A. ***Note:*** If reading is incorrect, adjust pulsing speed to 19 pulses per second by performing the following: (a) To increase pulsing speed, decrease BA and CA resistors of controller A. (b) To decrease pulsing speed, increase BA and CA resistors of controller A.	At test set— Panel meter shall read in the range of 18 to 20 pulses per second on red scale. Pulse indicator lamp flashes.
8	At test set— Place function switch to percent break position. ***Note:*** If reading is incorrect, adjust percent break to 35 percent break by performing the following: (a) To increase percent break, decrease BA resistor and increase CA resistor of controller A. (b) To decrease percent break, increase BA resistor and decrease CA resistor of controller A.	At test set— Panel meter shall read in the range of 33 to 37 percent break on the black scale. Pulse indicator lamp flashes.
9a	Adjustment of either pulse speed or percent break will affect the other reading. If adjustment was made, retest the pulse speed	

STEP	ACTION	VERIFICATION
	and percent break to verify the requirement was obtained.	
10	At test set— Place function switch to pulse speed position.	
11	At concentrator— At controller A— Remove patch cord from P jack. Remove W1AP cord. Remove blocking tools from W and ST2 relays. Manually release the ST2 relay.	
12	At concentrator— Restore CA key. Operate CB key.	
13	At concentrator— At controller B— Block W relay nonoperated. Block ST2 relay operated. Using W1AP cord, connect −48V (central office battery) to 6B of STB relay.	Audible sound at approximately 20 Hz produced by pulse generator.
14	At concentrator— Connect patch cord to P jack of controller B. Perform the requirements of Steps 7 to 10 on controller B circuitry.	
15	At concentrator— At controller B— Remove patch cord from P jack. Remove W1AP cord. Remove blocking tools from W and ST2 relays. Manually release the ST2 relay.	
16	At concentrator— Restore CB key.	
17	At test set— Remove patch cord from pulse speed, percent break jack.	

D. Units Timing

4	At test set— Connect five-conductor test cord to timer jack. Place function switch to 5.0 sec timer position.	
5	At test set— Operate reset switch.	

STEP	ACTION	VERIFICATION
6	At concentrator— Connect five-conductor test cord— GREEN to 6T of C relay. WHITE to 3B of TAA relay. BROWN to ground. BLACK to ground. RED to −48V.	
7	At test set— Operate reset switch.	
8	At test set— Operate start timer switch. ***Note:*** If requirement is not obtained, test and adjust TAA relay according to Circuit Requirement Table, SD-95964-01. Replace UT gas tube. Repeat Steps 7 and 8.	At test set— On black scale of panel meter— Meter reads in the range of 1.6 to 4.0 seconds.
9	At test set— Operate reset switch.	At test set— Panel meter returns to zero.
10	At concentrator— Remove five-conductor test cord from concentrator and test set.	
11	At concentrator— Operate AR key.	At concentrator— Audible alarm silenced Visual alarm extinguished.

E. Tens Timing

4	At test set— Connect five-conductor test cord to timer jack. Place function switch to 5.0 sec timer position.	
5	At test set— Operate reset switch.	
6	At concentrator— Connect five-conductor test cord— GREEN to 6T of C relay. WHITE to 3B of TAA relay. BROWN to ground. BLACK to ground. RED to −48V.	
7	At concentrator— Operate CB key.	

STEP	ACTION	VERIFICATION
8	At concentrator— At controller B— Block DC1 relay operated.	
9	At test set— Operate reset switch.	
10	At test set— Operate start timer switch. ***Note:*** If requirement is not obtained, test and adjust TAA relay according to Circuit Requirement Table, SD-95964-01. Replace TT gas tube. Repeat Steps 9 and 10.	At test set— On black scale of panel meter— Meter reads in the range of 1.6 to 4.0 seconds.
11	At test set— Operate reset switch.	At test set— Panel meter returns to zero.
12	At concentrator— Operate AR key.	At concentrator— Audible alarm silenced. Visual alarm extinguished.
13	At concentrator— Remove blocking tool from DC1(B) relay. Restore CB key.	
14	At concentrator— Remove five-conductor test cord from concentrator and test set.	

F. Trunk Timing

4	At test set— Connect five-conductor test cord to timer jack. Place function switch to 5.0 sec timer position.	
5	At test set— Operate reset switch.	
6	At concentrator— Operate TB-key of trunk under test. See Table B.	
7	At concentrator— At trunk unit under test (Table B)— Connect five-conductor test cord— GREEN to 4T of DR relay. WHITE to 2B of DR relay. BROWN to 3T of DR relay. BLACK to ground. RED to −48V.	

TABLE B

TRUNK TIMER TESTS

TO TEST TRUNK TIMER OF TRUNK	OPERATE TB- KEY	MAKE CONNECTIONS TO DR- RELAY (STEP 7)	OBSERVE TRUNK TIMER RELAY OPERATES
1	TB1	DR1	TMA of Trunk 1
2	TB2	DR2	TMB of Trunk 2
3	TB3	DR3	TMA of Trunk 3
4	TB4	DR4	TMB of Trunk 4
5	TB5	DR5	TMA of Trunk 5
6	TB6	DR6	TMB of Trunk 6

	Using W1AP cord— Ground 1B of DR relay.	
8	At test set— Operate reset switch.	
9	At test set— Operate start timer switch. ***Note:*** If requirement is not obtained, test and adjust TMA, TMB relays according to Circuit Requirement Table of SD-95964-01. Repeat Steps 8 and 9.	At test set— On black scale of panel meter— For code 1 ringing— Meter reads in the range of 2.4 to 3.6 seconds. For code 2 ringing— Meter reads in the range of 1.2 to 2.0 seconds. At trunk unit— Observe TMA or TMB relay operates (Table B).
10	At test set— Operate reset switch.	At test set— Panel meter returns to zero.

STEP	ACTION	VERIFICATION
11	At concentrator— At trunk unit— Remove five-conductor test cord and W1AP cord.	
12	At concentrator— Restore operated TB-key.	
13	Repeat Steps 6 through 12 until all trunk timers are tested.	
14	At test set— Remove five-conductor test cord.	
G. Control Timing		
4	At test set— Connect five-conductor test cord to timer jack. Place function switch to 0.25 sec timer position.	
5	At test set— Operate reset switch.	
6	At concentrator— Connect five-conductor test cord— GREEN to 13T of HA relay. WHITE to 3T of CT relay. BROWN to ground. BLACK to ground. RED to −48V. Connect W1AP cord— Ground to 4T of CT relay.	
7	At test set— Operate reset switch.	
8	At test set— Operate start timer switch. ***Note:*** If requirement is not obtained, test and adjust CT relay according to Circuit Requirement Table SD-95964-01. Replace CT gas tube. Repeat Steps 7 and 8.	At test set— On red scale of panel meter— If central office voltage is in the range of 43 to 45 volts or 50 to 53 volts— Panel meter reads in the range of 0.052 to 0.180 seconds. If central office voltage is in the range of 45 to 50 volts— Panel meter reads in the range of 0.064 to 0.170 seconds.
9	At concentrator— Remove five-conductor test cord. Remove W1AP cord.	

STEP	ACTION	VERIFICATION
10	At test set— Remove five-conductor test cord. Operate reset switch.	

H. Lockout Timing

4	At test set— Connect pulse test cord to pulse jack. Place function switch to DP (double pulse) pulse mode position. Place pulse polarity switch according to type of ringing (negative or positive superimposed) applied to subscriber lines.	
5	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to the tip and ring of a vacant ringup circuit having a units digit associated with first lockout timer under test. See Table C.	

TABLE C

LOCKOUT TIMER TEST

TO TEST TIMER NO.	CONNECT TEST SET TO VACANT RINGUP CIRCUIT HAVING UNITS DIGIT OF
1	0, 5
2	1, 6
3	2, 7
4	3, 8
5	4, 9

STEP	ACTION	VERIFICATION
6	At test set— Place DP (double pulse) interval switch to 1.9 seconds position.	
7	At test set— Momentarily operate pulse switch.	At test set— Pulse indicator lamp flashes twice. At concentrator— One TK-lamp lighted and extinguished. ***Note:*** If two TK-lamps lighted during this interval, double processing of a call has occurred. Proceed to Steps 13a or 17b for lockout timer readjustment.
8	At test set— Place DP interval switch to 2.3 seconds position.	
9	At test set— Momentarily operate pulse switch.	At test set— Pulse indicator lamp flashes twice. At concentrator— Two TK-lamps are lighted and extinguished. ***Note:*** If two TK-lamps are not lighted, proceed to Steps 13a or 17b for lockout timer readjustment.
10	At concentrator— Remove pulse test cord from ringup circuit associated with lockout timer under test.	
11	At concentrator— Connect pulse test cord to ringup circuit associated with next higher numbered lockout circuit and repeat Steps 5 through 10 until all lockout timers are tested.	
12	At concentrator— After all lockout timers are tested, remove pulse test cord from Sub (L) terminal strip and from test set.	

Readjustment Procedures For Lockout Timers Without Option YU (Potentiometer) Prior to SD-95964-01, Issue 15B

13a	Test and adjust MA, MB, and MC relays of lockout timer under test in accordance with Circuit Requirement Table SD-95964-01.	
14a	Repeat Steps 6 through 9.	

STEP	ACTION	VERIFICATION
15a	If lockout timer does not meet requirements of Step 7, install option ZR (capacitor MB1).	
16a	Repeat Steps 6 through 9.	
	For Lockout Timers With Option YU (Potentiometer) SD-95964-01, Issue 15B and Later	
17b	Test and adjust MA, MB, and MC relays of lockout timer under test in accordance with Circuit Requirement Table SD-95964-01.	
18b	At test set— Place DP interval switch to 2.0 seconds position. Repeat Step 7.	
19b	Place DP interval switch to 2.2 seconds position. Repeat Step 9.	
20b	If lockout timer does not meet the requirements of Steps 7 and 9— Adjust PMB potentiometer of lockout timer under test. Repeat Steps 18b and 19b.	
I.	**Ringup Circuit**	
4	At test set— Connect pulse test cord to pulse jack. Place function switch to SP (single pulse) pulse mode position. Place pulse polarity switch according to type of ringing voltage (negative or positive superimposed) applied to subscriber line.	
5	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to ringup circuit 00. ***Note:*** Tip lead is located at grooved side of connector.	
6	At test set— Momentarily depress pulse switch.	At concentrator— RU relay associated with ringup circuit under test operates and releases in approximately 1 second. UI- and TI-lamps of ringup circuit under test illuminate and extinguish.
7	At concentrator— At Sub (L) terminal strip—	

STEP	ACTION	VERIFICATION
	Remove pulse test cord from ringup circuit under test.	
8	At concentrator— A Sub (L) terminal strip— Connect pulse test cord to next higher numbered ringup circuit and repeat Steps 6 and 7 until all ringup circuits are tested.	
J. Concentrator Operation		
4	The following procedures will test the concentrator by manually walking the concentrator through a complete outpulsing sequence. Sequence Chart 1, SD-95964-01, will assist in following the concentrator through the outpulsing sequence.	
5	At concentrator— Operate CB key.	
6	At test set— Connect pulse test cord to pulse jack. Connect five-conductor test cord to digit display jack. Place function switch to digit display position. Place pulse polarity switch according to type of ringing voltage (positive or negative superimposed) supplied to subscriber lines.	
7	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to tip and ring of RU73.	
8	At concentrator— Connect five-conductor test cord— GREEN to 2B of SS relay. WHITE to 7 of PG(A) relay. RED to 7T of PU(A) relay. BROWN to 5 of P(A) relay. BLACK to ground.	
9	At concentrator— Block TAA relay nonoperated.	
10	At concentrator— Block DS(A) relay nonoperated.	
11	At test set— Momentarily depress reset switch.	At test set— Digit display lamps extinguished, if lighted.

STEP	ACTION	VERIFICATION
12	At test set— Momentarily depress pulse switch.	At concentrator— RU73 relay operates. UI3 and TI7 lamps light. LO3 relay operates. CA lamp lights. ST1(A) relay operates.
13	At concentrator— Block DC3(A) relay nonoperated.	
14	At concentrator— Remove blocking tool from DS(A) relay.	At concentrator— ST2(A) relay operates and releases. PU1(A) relay operates. TK-lamp lights. At test set— Digit display lamps illuminate for units digit 3. Digit complete lamp illuminates to indicate concentrator has initiated digit complete test.
15	At concentrator— Block DS(A) relay nonoperated.	
16	At concentrator— Remove blocking tool from DC3(A) relay.	At concentrator— DC1(A) relay operates. DC3(A) relay operates. ST1(A) relay operates.
17	At concentrator— Block CT relay nonoperated.	
18	At concentrator— Remove blocking tool from DS(A) relay.	At concentrator— ST2(A) relay operates and releases. PU1(A) relay releases. At test set— Digit display lamps illuminate for tens digit 7.
19	At concentrator— Remove blocking tool from CT relay.	At concentrator— CT relay operates and releases. Other operated relays release. UI3, TI7, and TK-lamps extinguish.
20	At concentrator— Remove five-conductor test cord.	
21	At concentrator— Connect five conductor test cord— GREEN to 2B of SS relay. WHITE to 7 of PG(B) relay. RED to 7T of PU(B) relay.	

STEP	ACTION	VERIFICATION
	BROWN to 5 of P(B) relay. BLACK to ground.	
22	At concentrator— Restore CB key. Operate CA key.	
23	Perform Steps 10 through 19 on controller B circuitry.	
24	At concentrator— Remove pulse test cord and five-conductor test cord from concentrator and test set.	
25	At concentrator— Restore CA key.	
26	At concentrator— Remove blocking tool from TAA relay.	

K. Measurement of Line Current

This test is not required on concentrator-identifier equipped with tone signaling.

5	At identifier— Block nonoperated PC1 relays in both controllers.	
6	At test set— Place function switch to line current position. Insert patch cord into line current jack.	
7	At concentrator— Operate CB key.	
8	At concentrator— Using a W1AP cord— Ground 5B of SS relay.	
9	At concentrator— Block operated STA1 relay. Block operated DC1(A) relay. ***Caution: The sleeve of the LC jack has +130V potential.***	At concentrator— CA lamp lights.
10	At concentrator— Insert patch cord into LC jack associated with controller A.	At test set— On black scale of panel meter— Meter reads in the range as indicated in Table D.

TABLE D

LINE CURRENT MEASUREMENT

SD-95964-01, ISSUE 15B AND LATER HAVING AC FILTERS – OPTION YS		ISSUES PRIOR TO SD-95964-01, ISSUE 15B NOT HAVING AC FILTERS
RESISTANCE OF PULSING LOOP – OHMS	LOOP CURRENT – MA.	LOOP CURRENT – MA.
Less Than 1500	30 ±3	30 ±3
1500-3000	32 ±3	
3000-4000	35 ±3	

STEP	ACTION	VERIFICATION
	Note: If meter reading is incorrect, adjust the K and KA resistors of controller A until the requirement is obtained.	
11	At concentrator— Remove patch cord from LC jack associated with controller A.	
12	At concentrator— Restore CB key. Operate CA key.	
13	At concentrator— Remove blocking tools from STA1 and DC1(A) relays.	At concentrator— CA lamp extinguishes.
14	At concentrator— Block operated STB1 relay. Block operated DC1(B) relay.	At concentrator— CB lamp lights.
15	At concentrator— Insert patch cord into LC jack associated with controller B. ***Note:*** If meter reading is incorrect, adjust the K and KA resistors of controller B until the requirement is obtained.	At test set— On black scale of panel meter— Meter reads in the range as indicated in Table D.
16	At concentrator— Remove patch cord from LC jack and from line current jack of test set.	
17	At concentrator— Remove blocking tools from STB1 and DC1(B) relays.	At concentrator— CB lamp extinguishes.
18	At concentrator— Remove W1AP cord from 5B of SS relay.	
19	At concentrator— Restore CA key.	
20	At identifier— Remove blocking tools from PC1 relays.	

L. Trunk Seizure and Supervision

This test is not required on concentrator-identifier equipped with tone signaling.

5	At concentrator— Operate TB-key of trunk under test.	

STEP	ACTION	VERIFICATION
6	At concentrator— Block operated TS-relay of trunk under test.	At concentrator— TK-lamp of trunk under test illuminates.
7	At concentrator— Block operated S1-relay of trunk under test.	At concentrator— DR-relay of trunk under test operates. At identifier— TC and TC2 relays of trunk under test operate. T-lamp of trunk under test lights.
8	At identifier— Block operated TCA relay of trunk under test.	At concentrator— S-relay of trunk under test operates. At identifier— IL relay of trunk under test operates.
9	At concentrator— Remove blocking tool from TS-relay of trunk under test.	At concentrator— At trunk under test— TS-relay releases. TK-lamp extinguishes.
10	At concentrator— Remove blocking tool from S1-relay of trunk under test.	At concentrator— S1 relay of trunk under test remains operated.
11	At identifier— Remove blocking tool from TCA-relay of trunk under test.	At identifier— At trunk under test— TC-relay releases. IL and TC2 relays release. T-lamp extinguishes. At concentrator— At trunk under test— S-relay releases. S1-relay releases. DR-relay releases.
12	At concentrator— Restore TB-key of trunk under test.	
13	At concentrator— Operate next higher numbered TB-key and repeat Steps 6 through 12 until all trunks are tested.	

M. Concentrator-Identifier Operation

5	The following procedure will test the concentrator-identifier by manually walking the CI through a complete operating sequence.	
6	For systems equipped with metallic (dc) signaling, SC1 (Sequence Chart 1) of SD-95964-01 and SD-95962-01 will assist in following the operating sequence of the CI. For systems	

STEP	ACTION	VERIFICATION
	equipped with tone signaling, SC1 of SD-99556-01 should be used in addition to the sequence charts for the CI.	
7	Steps followed by the letter (a) are to be performed on CI equipped with metallic signaling. Steps followed by the letter (b) are to be performed on CI equipped with tone signaling.	
	For CI Equipped With Metallic (dc) Signaling	
8a	At test set— Connect five-conductor test cord to digit display jack. Connect pulse test cord to pulse jack. Connect 52-type headset to headset jack. Place pulse polarity switch according to type of ringing voltage (positive or negative superimposed) applied to subscriber line. Place function switch to digit display position.	
9a	At concentrator— Block TAA relay nonoperated.	
10a	At identifier— Block DL2 relays of both controllers nonoperated.	
11a	At identifier— Operate CB key. Operate I2 key.	
12a	At concentrator— Operate CB key.	
13a	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to tip and ring of RU73.	
14a	At concentrator— Connect five-conductor test cord— GREEN to 2B of SS relay. WHITE to 7 of PG(A) relay. RED to 7T of PU(A) relay. BROWN to 5 of P(A) relay. BLACK to ground.	At test set— Panel meter reads within rectangle on red scale which indicates CO battery is within limits. ***Note reading on black scale.***
15a	At concentrator— Block DS(A) relay nonoperated.	

STEP	ACTION	VERIFICATION
16a	At test set— Momentarily depress reset switch.	At test set— Digit display lamps extinguished, if lighted.
17a	At test set— Momentarily depress pulse switch.	At concentrator— RU73 operates. UI3 and TI7 lamps light. SM3 (select magnet) switches 1, 2, 3 operate. CA lamp lights. ST1(A) relay operates.
18a	At identifier— Block SM relay nonoperated.	
19a	At concentrator— Remove blocking tool from DS(A) relay.	At concentrator— ST2(A) relay operates and releases. PU(A) and PU1(A) relays operate. Trunk connector hold magnet operates (Table E). TK- lamp lights. At test set— Digit display lamps light for units digit 3. Digit complete lamp lights. At identifier— Digit register relays are operated for units digit 3 (Table F) S3 (select magnet) switches 1, 2, 3 operate.
20a	At concentrator— Block DS(A) relay nonoperated.	
21a	At identifier— Remove blocking tool from SM relay.	At identifier— SM relay operates. Digit register relays release. T-lamp lighted. At concentrator— DC3(A) relay operates. ST1(A) relay operates. At test set— On black scale of panel meter— Meter reads at least five small divisions more than in Step 14a.
22a	At identifier— Block the operated DC1(A) relay operated.	
23a	At concentrator— Block the operated PU1(A) relay operated.	
24a	At concentrator— Remove blocking tool from DS(A) relay.	At concentrator— ST2(A) relay operates and releases. DC1(A) relay releases. At test set—

TABLE E

TRUNK CONNECTOR OPERATION AT THE CONCENTRATOR

RINGUP CIRCUIT OPERATED FOR TEST O	UNITS DIGIT	SELECT MAGNET OPERATED FOR UNITS DIGIT	TENS DIGIT	HOLD MAGNET OPERATED FOR TENS DIGIT						SUBSCRIBER CONNECTOR RELAY OPERATED FOR TENS DIGIT
				TRK 1 SW 1	TRK 2 SW 1	TRK 3 SW 2	TRK 4 SW 2	TRK 5 SW 3	TRK 6 SW 3	
00	0	0	0	A1	A2	A3	A4	A5	A6	None
11	1	1	1	A1	A2	A3	A4	A5	A6	C1
22	2	2	2	A1	A2	A3	A4	A5	A6	C0
33	3	3	3	B1	B2	B3	B4	B5	B6	None
44	4	4	4	B1	B2	B3	B4	B5	B6	C1
55	5	5	5	C1	C2	C3	C4	C5	C6	None
66	6	6	6	C1	C2	C3	C4	C5	C6	C1
77	7	7	7	C1	C2	C3	C4	C5	C6	C0
88	8	8	8	D1	D2	D3	D4	D5	D6	None
99	9	9	9	D1	D2	D3	D4	D5	D6	C1

TABLE F

DIGIT REGISTER AND INDICATOR OPERATION AT THE IDENTIFIER

DIGIT	DIGIT REGISTER RELAYS OPERATED	CALL INDICATOR AUXILIARY RELAYS OPERATED FOR TENS DIGIT	INDICATOR CONNECTOR HOLD MAGNET OPERATED FOR TENS DIGIT*
0	XN, —, —	None	E1, 2
1	XN, YN, ZP	B, C	E1, 2
2	XN, YN, ZN	C	E1, 2
3	XN, YP, ZN	A, B, C	E1, 2
4	XN, YP, ZP	A, C	E1, 2
5	XP, —, —	None	F1, 2
6	XP, YN, ZP	B, C	F1, 2
7	XP, YN, ZN	C	F1, 2
8	XP, YP, ZN	A, B, C	F1, 2
9	XP, YP, ZP	A, C	F1, 2

* E1, F1 are used with indicator 1; E2, F2 are used with indicator 2.

Digit display lamps light for tens digit 7.
At identifier—
Digit register relays operate for tens digit 7 (Table F).

25a At identifier—
Block the operated SM relay operated.

26a At identifier—
Remove blocking tool from DC1(A) relay.

At identifier—
DC1(A) relay releases.
C(1) relay and F(1) hold magnet of indicator 1 operate (Table F).
Trunk F relay operates (Table G).
Trunk connector hold magnet operates (Table G).
IT1 lamp lights.
At switchboard—
Switchboard lamp 74 (ringup circuit 73) lights.

27a At switchboard—
Insert switchboard cord into jack associated with lighted line lamp.

At switchboard—
Switchboard lamp extinguishes.

TABLE G

TRUNK CONNECTOR OPERATION
AT THE IDENTIFIER

UNITS DIGIT	SELECT MAGNET OPERATED FOR UNITS DIGIT	TENS DIGIT	HOLD MAGNET OPERATED FOR TENS DIGIT						TRUNK E OR F RELAY OPERATED FOR TENS DIGIT
0	0	0	TRK 1 A1	TRK 2 A2	TRK 3 A3	TRK 4 A4	TRK 5 A5	TRK 6 A6	None
1	1	1	A1	A2	A3	A4	A5	A6	E
2	2	2	A1	A2	A3	A4	A5	A6	F
3	3	3	B1	B2	B3	B4	B5	B6	None
4	4	4	B1	B2	B3	B4	B5	B6	E
5	5	5	C1	C2	C3	C4	C5	C6	None
6	6	6	C1	C2	C3	C4	C5	C6	E
7	7	7	C1	C2	C3	C4	C5	C6	F
8	8	8	D1	D2	D3	D4	D5	D6	None
9	9	9	D1	D2	D3	D4	D5	D6	E

STEP	ACTION	VERIFICATION
28a	At identifier— Remove blocking tool from SM relay.	At identifier— SM relay releases.
29a	At concentrator— Remove blocking tool from PU1(A) relay.	Concentrator completes processing call.
30a	At switchboard— Operate TALK key of cord circuit.	At switchboard— Talking path can be established with originating equipment.
31a	At switchboard— Remove cord from jack. Restore TALK key.	At identifier— T-lamp extinguishes.
32a	At identifier— Restore CB key. Restore I2 key.	
33a	At identifier— Operate CA key. Operate I1 key.	
34a	At concentrator— Restore CB key. Operate CA key.	
35a	At concentrator— Remove five-conductor cord.	
36a	At concentrator— Connect five-conductor test cord— GREEN to 2B of SS relay. WHITE to 7 of PG(B) relay. RED to 7T of PU(B) relay. BROWN to 5 of P(B) relay. BLACK to ground.	
37a	Repeat Steps 15a through 31a on Controller B circuitry at concentrator and on Controller B and Indicator 2 circuitry at identifier.	
38a	At identifier— Restore CA key. Restore I1 key. Remove blocking tool from DL2 relays.	
39a	At concentrator— Restore CA key. Remove blocking tool from TAA relay. Remove five-conductor test cord. Remove pulse test cord.	

STEP	ACTION	VERIFICATION
40a	At test set— Remove 52-type headset. Remove five-conductor test cord. Remove pulse test cord.	
	For CI Equipped With Tone Signaling	
41b	At test set— Connect pulse test cord to pulse jack. Connect 52-type headset to headset jack. Place pulse polarity switch according to type of ringing voltage (positive or negative superimposed) applied to subscriber line. Place function switch to SP pulse mode position.	
42b	At concentrator— Block TAA relay nonoperated.	
43b	At identifier— Block DL2 relays of both controllers nonoperated.	
44b	At identifier— Operate I2 key.	
45b	At concentrator— Operate CB key.	
46b	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to tip and ring of RU73.	
47b	At TSC originating end— Block DS(A) relay nonoperated.	
48b	At test set— Depress pulse switch.	At concentrator— RU73 operates. UI3 and TI7 lamps light. SM3 (select magnet) switches 1, 2, 3 operate. CA lamp lights. At TSC originating end— ADS(A) relay operates. TCD(A) relay operates. EDO(A) relay operates. At identifier— At TSC— TCI(A) relay operates.
49b	At identifier— Block PC1 (A) relay nonoperated.	

STEP	ACTION	VERIFICATION
50b	At TSC originating end— Remove blocking tool from DS(A) relay.	At concentrator— ST2(A) relay operates and releases. PU(A) and PU1(A) relays operate. TK-lamp lights. Trunk connector hold magnets operate (Table E). CO relay operates (Table E). At TSC originating end— WK(A) relay operates. At identifier— Digit register relays are operated for units digit 3 (Table F).
51b	At concentrator— Block DC(A) relay nonoperated.	
52b	At identifier— Remove blocking tool from PC1(A) relay.	At identifier— Digit register relays release. PC1(A) and PC(A) relays operate. S3 (select magnet) switches 1, 2, 3 operate. DC1(A) and SM(A) relays operate. At TSC— KW(A) and KZ(A) relays operate. At TSC originating end— EDO(A) and DS(A) relays operate.
53b	At identifier— Block the operated DC1(A) relay operated.	
54b	At concentrator— Block the operated PU(A) relay operated.	
55b	At concentrator— Remove blocking tool from DC(A) relay.	At concentrator— DC(A) and DC1(A) relays operate. ST2 relay operates and releases. At identifier— Digit register relays operate for tens digit 7 (Table F). T-lamp lights. At TSC— KW(A) relay releases.
56b	At identifier— Block operated SM relay operated.	
57b	At identifier— Remove blocking tool from DC1(A) relay.	At identifier— DC1(A) relay releases. C(1) relay and F(1) hold magnet of Indicator 1 operate. Trunk connector hold magnet operates (Table F). IT1 lamp lights.

STEP	ACTION	VERIFICATION
		Trunk F relay operates. Switchboard lamp 74 (ringup circuit 73) lights.
58b	At switchboard— Insert cord into jack of subscriber line 74.	At switchboard— Lamp 74 extinguishes.
59b	At identifier— Remove blocking tool from SM relay.	At identifier— SM relay releases. IT1 lamp extinguishes.
60b	At concentrator— Remove blocking tool from PU(A) relay.	Concentrator completes processing call.
61b	At switchboard— Operate TALK key of cord circuit.	At switchboard— Talking path can be established with originating end.
62b	At switchboard— Remove cord from jack. Restore TALK key.	At identifier— T-lamp extinguishes.
63b	At identifier— Restore I2 key.	
64b	At identifier— Operate I1 key.	
65b	At concentrator— Restore CB key. Operate CA key.	
66b	Repeat Steps 47b through 62b on Controller B circuitry at originating end and on Controller B and Indicator 2 circuitry at terminating end.	
67b	At identifier— Restore I1 key. Remove blocking tool from DL2 relays.	
68b	At concentrator— Restore CA key. Remove blocking tool from TAA relay. Remove pulse test cord.	
69b	At test set— Remove 52-type headset. Remove pulse test cord.	

STEP	ACTION	VERIFICATION
N. Load Test		
5	At test set— Place function switch to SP position. Place pulse polarity switch according to polarity of ringing voltage (positive or negative superimposed) applied to subscriber lines. Insert pulse test cord into pulse jack.	
6	At concentrator— Block operated TAC relay.	
7	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to tip and ring of ringup circuit 00. ***Note:*** On pulse test cord, tip lead is located at grooved side of connector.	
8	At test set— Momentarily depress pulse switch.	At test set— Pulse indicator lamp flashes. At concentrator— RU relay operates associated with ringup circuit under test.
9	Repeat Steps 7 and 8 until all ringup circuits (00-99) are operated.	
10	At concentrator— Remove blocking tool from TAC relay.	At concentrator— As each ringup group is served, the associated UI- and TI-lamps will light and extinguish as follows: (a) TI-0 through TI-9 lamps are extinguished in sequence. (b) UI-0 lamp extinguished. (c) All TI-0 through TI-9 lamps are lighted. (d) TI-0 through TI-9 lamps are extinguished in sequence. (e) UI-1 lamp extinguished. (f) Above steps continue until all ringup circuits are served. TK-lamps of the equipped trunks are lighted consecutively. CA and CB controller lamps are alternately lighted. The alarm lamp (AL) should not light. At switchboard— The switchboard lamps are lighted in the following sequence: 01, 11, 21, etc, through 91; 02, 22, 32, etc, through 92;

STEP	ACTION	VERIFICATION
		and 03, 13, 23, etc, through 93; until lamp 100 is lighted.
11	At concentrator— Remove pulse test cord from ringup circuit and test set.	

O. Trunk Connector Operation

5	At test set— Connect pulse test cord to pulse jack. Connect 52-type headset to headset jack. Place function switch to SP pulse mode position. Place pulse polarity switch according to ringing current (negative or positive superimposed) applied to subscriber line.	
6	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to ringup circuit under test. See Table E. ***Note: Perform Step 8 immediately after performing the action in Step 7.***	
7	At test set— Momentarily depress pulse switch.	At concentrator— TK-lamp lighted of trunk under test. At identifier— T-lamp lighted of trunk under test.
8	At switchboard— During interval switchboard lamp is illuminated— Insert cord into jack associated with ringup circuit under use— Operate TALK key of cord circuit.	At concentrator— Observe the select and hold magnets associated with ringup circuit and trunk under test have operated. Observe subscriber connector relay associated with ringup circuit under test is operated. See Table E. At identifier— Observe the select and hold magnets associated with ringup circuit under test have operated. Observe trunk E or F relay associated with ringup circuit under test is operated. See Table G. At switchboard— Verify a talking path is established with test set.
9	At switchboard— Restore TALK key of cord circuit. Remove cord from switchboard jack.	At concentrator— Trunk returns to normal. At identifier— Trunk returns to normal.

STEP	ACTION	VERIFICATION
10	Repeat Steps 7 through 9 until all trunks are tested.	
11	At concentrator— At Sub (L) terminal strip— Remove pulse test cord from ringup circuit under test.	
12	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to next higher number ringup circuit (see Table E) and repeat Steps 7 through 11 until all ringup circuits in Table E are tested.	
13	At test set— Remove pulse test cord. Remove 52-type headset.	
P.	**Trunk Make-Busy and Trunk Allotter Sequence**	
6	At concentrator— Activate ringup circuit (6.03) to momentarily make all trunks busy in sequence.	At concentrator— TK-lamps lighted and extinguished in sequence. At identifier— T-lamps lighted and extinguished in sequence.
7	At concentrator— Operate TB1 key.	
8	At concentrator— Activate ringup circuit (6.03) to momentarily make all trunks busy in sequence.	At concentrator— TK1 lamp does not light. Remaining TK- lamps lighted and extinguished in sequence. At identifier— T1 lamp does not light. Remaining T-lamps lighted and extinguished in sequence.
9	At concentrator— Restore TB1 key.	
10	At concentrator— Operate TB2 key.	
11	At concentrator— Activate ringup circuit (6.03) to momentarily make all trunks busy in sequence.	At concentrator— TK2 lamp does not light. Remaining TK- lamps lighted and extinguished in sequence. At identifier— T2 lamp does not light. Remaining T-lamps lighted and extinguished in sequence.

STEP	ACTION	VERIFICATION
12	At concentrator— Restore operated TB- key.	
13	At concentrator— Operate each next higher numbered TB- key and repeat Steps 11 and 12 until all TB- keys have been operated and restored.	At concentrator— TK- lamp associated with operated TB- key does not light. Remaining TK- lamps lighted and extinguished in sequence. At identifier— T- lamp associated with operated TB- key does not light. Remaining T- lamps lighted and extinguished in sequence.

Q. Alternate Allotter

6	At concentrator— Operate AA key.	At concentrator— AA lamp lights.
7	At concentrator— Activate ringup circuit (6.03).	At concentrator— TK1 lamp lighted for each ringup circuit operation. At identifier— T1 lamp lighted for each ringup circuit operation.
8	At concentrator— Restore AA key.	At concentrator— AA lamp extinguished.
9	At concentrator— At trunk allotter circuit— Manually release TA1 through TA6 relays, if operated.	At concentrator— TA0 relay operates.
10	At concentrator— Block nonoperated TA0 relay.	
11	At concentrator— Activate ringup circuit (6.03).	At concentrator— AA, AL lamps lighted. Audible alarm sounds. TK1 lamp lighted for each ringup circuit operation. At identifier— T1 lamp lighted for each ringup circuit operation.
12	At concentrator— Momentarily operate AR key.	At concentrator— AA, AL lamps extinguished. Audible alarm silenced.

STEP	ACTION	VERIFICATION
13	At concentrator— At trunk allotter circuit— Remove blocking tool from TA0 relay.	At concentrator— TA0 relay operates.
14	Activate ringup circuit (6.03).	At concentrator— TK- lamps lighted in sequence. At identifier— T- lamps lighted in sequence.

R. Alternate Use of Controllers

This test is not required on concentrator-identifier equipped with tone signaling.

6	At concentrator— Operate CB key.	
7	At concentrator— Activate ringup circuit (6.03) six times.	At concentrator— CB lamp does not light. CA lamp lighted and extinguished for each ringup circuit operation. At identifier— Controllers A and B operated alternately for each ringup circuit operation. ***Note: At identifier—When CA relay is operated, Controller A is in service. When CB relay is operated. Controller B is in service.***
8	At concentrator— Restore CB key. Operate CA key.	
9	At concentrator— Activate ringup circuit (6.03) three times.	At concentrator— CA lamp does not light. CB lamp lighted and extinguished for each ringup circuit operation. At identifier— Controllers A and B operated alternately for each ringup circuit operation.
10	At concentrator— Restore CA key.	
11	At identifier— Operate CB key.	
12	At concentrator— Activate ringup circuit (6.03) three times.	At concentrator— CA, CB lamps lighted and extinguished alternately for each ringup circuit operation. At identifier—

STEP	ACTION	VERIFICATION
		Controller B does not operate. Controller A operated for each ringup circuit operation.
13	At identifier— Restore CB key. Operate CA key.	
14	At concentrator— Activate ringup circuit (6.03) three times.	At concentrator— CA, CB lamps lighted and extinguished alternately for each ringup circuit operation. At identifier— Controller A does not operate. Controller B operated for each ringup circuit operation.
15	At identifier— Restore CA key.	

S. Lockout Timing Transfer

2	At concentrator— Activate ringup circuit (6.03) with a units digit 0 or 5.	At concentrator— At TMD LO unit— #1 MA, MB, MC relays operate and release.
3	At concentrator— Activate ringup circuit (6.03) with a units digit 1 or 6.	At concentrator— At TMD LO unit— #2 MA, MB, MC relays operate and release.
4	At concentrator— Activate ringup circuit (6.03) with a units digit 2 or 7.	At concentrator— At TMD LO unit— #3 MA, MB, MC relays operate and release.
5	At concentrator— Activate ringup circuit (6.03) with a units digit 3 or 8.	At concentrator— At TMD LO unit— #4 MA, MB, MC relays operate and release.
6	At concentrator— Activate ringup circuit (6.03) with a units digit 4 or 9.	At concentrator— At TMD LO unit— #5 MA, MB, MC relays operate and release.
7	At concentrator— Operate LA key and activate ringup circuit (6.03) with a units digit 0 or 5.	At concentrator— At TMD LO unit— #2 MA, MB, MC relays operate and release.
8	At concentrator— Restore LA key. Operate LB key.	
9	At concentrator— Activate ringup circuit (6.03) with a units digit 1 or 6.	At concentrator— At TMD LO unit— #3 MA, MB, MC relays operate and release.

STEP	ACTION	VERIFICATION
10	At concentrator— Restore LB key. Operate LC key.	
11	At concentrator— Activate ringup circuit (6.03) with a units digit 2 or 7.	At concentrator— At TMD LO relay unit— #4 MA, MB, MC relays operate and release.
12	At concentrator— Restore LC key. Operate LD key.	
13	At concentrator— Activate ringup circuit (6.03) with a units digit 3 or 8.	At concentrator— At TMD LO unit— #5 MA, MB, MC relays operate and release.
14	At concentrator— Restore LO key. Operate LE key.	
15	At concentrator— Activate ringup circuit (6.03) with a units digit 4 or 9.	At concentrator— At TMD LO unit— #1 MA, MB, MC relays operate and release.
16	At concentrator— Restore LE key.	

T. Indicator Make-Busy

6	At identifier— Operate I1 key.	
7	At concentrator— Activate ringup circuit (6.03) three times.	At identifier— IT1 lamp does not light. IT2 lamp lighted and extinguished for each ringup circuit operation.
8	At identifier— Restore I1 key. Operate I2 key.	
9	At concentrator— Activate ringup circuit (6.03) three times.	At identifier— IT2 lamp does not light. IT1 lamp lighted and extinguished for each ringup circuit operation.
10	At identifier— Restore I2 key.	

STEP	ACTION	VERIFICATION
U. Time-Out and Alarm Cutoff		
	Note: The action in Step 7 must be performed immediately after the action in Step 6.	
6	At concentrator— Activate ringup circuit (6.03).	Call processed in a normal manner.
7	At identifier— At controller processing call— When PC1 relay operates, block it operated.	At identifier— At controller processing call— After approximately 2 to 4 seconds— Relay DL2 operates. ***Note:*** Relay DL2 operated indicates the terminating controller has timed out. Relay DL2 operated will force the concentrator to time out on the next attempt to process a call.
8	At identifier— Remove blocking tool from PC1 relay.	At identifier— PC1 relay releases.
9	At concentrator— Activate ringup circuit (6.03).	At concentrator— After approximately 2.2 seconds— AL lamp lighted. Audible alarm sounded. UI- and TI-lamps of ringup circuit lighted. CA or CB lamp lighted. SS relay operates which indicates auxiliary pulsing pair (optional) is in use. At identifier— TO lamp lighted. At switchboard— Line lamp associated with ringup circuit lighted for approximately 2 seconds.
10	At concentrator— Operate ACO key.	At concentrator— ACO lamp lighted. AL lamp remains lighted. Audible alarm silenced.
11	At concentrator— Operate AR key.	At concentrator— AL lamp extinguished. CA or CB lamp extinguishes. UI- and TI-lamps extinguished. SS relay releases. At identifier— TO lamp extinguished.
12	Repeat Steps 6 through 11 to test the other controller in the identifier.	

STEP	ACTION	VERIFICATION
V. Fuse Alarms		
	Note: The instruction "connect battery to fuse alarm bus bar" is performed by inserting the 411B tool into the aperture in the fuse cap and momentarily touching the fuse alarm bus bar.	
1	At concentrator— At fuse panel— At fuse A1— Using 1W13B cord— Connect battery (−48V) to fuse alarm bus bar.	At concentrator— FA lamp lighted. Audible alarm sounds.
2	At concentrator— At fuse panel— Disconnect battery from fuse alarm bus bar.	At concentrator— FA lamp extinguished. Audible alarm silenced.
3	At concentrator— At fuse panel— At PF fuse— Using 1W13B cord— Connect battery (−48V) to fuse alarm bus bar.	At concentrator— 20A lamp lighted. Audible alarm sounds.
4	At concentrator— At fuse panel— Disconnect battery from fuse alarm bus bar.	At concentrator— 20A lamp extinguished. Audible alarm silenced.
5	At identifier— At fuse panel— At A1 fuse— Using 1W13B cord— Connect battery (−24V) to fuse alarm bus bar.	At identifier— FA lamp lighted. At switchboard— FA lamp lighted (if provided). FA1 lamp lighted (if provided). Audible alarm sounds (if provided).
6a	At switchboard— Operate AS key (if provided).	At switchboard— Audible alarm silenced. FA1 lamp remains lighted.
7	At identifier— At fuse panel— Disconnect battery from fuse alarm bus bar.	At identifier— FA lamp extinguished. At switchboard— FA lamp extinguished (if provided). FA1 lamp extinguished (if provided).
8a	At switchboard— Restore AS key (if provided).	

STEP	ACTION	VERIFICATION
W. All-Trunks-Busy (Calls Waiting), Calls Display, and Traffic Registers		
6a	For concentrators equipped with TRF timer, option XC— Timer TRF may be adjusted by the potentiometer for a controller activity monitoring period of 1 to 20 seconds. The timers interval, determined by local requirements, will monitor the activity of the concentrator and will activate the central office traffic register circuit if the activity at any given time exceeds the timed interval.	
7	At test set— Connect pulse test cord to pulse jack. Connect 52-type headset to headset jack. Place function switch to SP pulse mode position. Place pulse polarity switch according to ringing voltage (positive or negative superimposed) applied to subscriber line.	
8	At concentrator— Leaving TB1 key normal, operate remaining TB-keys.	
9	At concentrator— At Sub (L) terminal strip— Connect pulse test cord to ringup circuit. ***Note:*** Step 11 must be performed immediately after Step 10.	
10	At test set— Depress pulse switch.	
11	At switchboard— During interval switchboard line lamp is illuminated— Insert switchboard cord into jack associated with lighted lamp. Operate TALK key of cord circuit.	At switchboard— Talking path established with originating end.
12	At concentrator— At Sub (L) terminal strip— Remove pulse test cord. Connect pulse test cord to another ringup circuit.	
13	At test set— Depress pulse switch.	At concentrator central office— Traffic register circuit operates. At identifier— AB register operates.

STEP	ACTION	VERIFICATION
		At switchboard— ATB lamp lights (if provided). AB register operates (if provided). Line lamp associated with selected ringup circuit lighted for approximately 2 seconds.
14	At switchboard— Remove cord from switchboard jack. Restore TALK key.	
15	At concentrator— Remove pulse test cord. Restore operated TB-keys.	
16	At test set— Remove pulse test cord. Remove 52-type headset.	