MULTIFREQUENCY OUTGOING SENDERS
TESTS USING OFFICE TEST FRAME TEST CIRCUIT SD-27633-01 (J23260)
NO. 5 CROSSBAR OFFICES

1. GENERAL

1.01 This section describes a method of testing multifrequency outgoing senders SD-26051-01 using the office test frame, SD-27633-01 (J23260) for small No. 5 crossbar offices.

1.02 This section is reissued for the following reasons. Revision arrows are used to emphasize the more significant changes. This issue does not affect Equipment Test Lists.

(a) To revise Part 3, Preparation, Step 9c to indicate operation of STP switch for ANI and non-ANI calls.

(b) To revise all Tests except M, O, P, and Q to include test procedures when the selected class of service has access to TOUCH-TONE® originating registers.

(c) To revise Test H to include positive test control feature.

(d) To revise Test M to provide optional checks for the elimination of stuck sender plant registration on test calls when the sender is made busy at the MTF and a TUR maintenance busy indication when the sender is held out of service in offices equipped with alarm surveillance and control feature.

(e) To revise Test U to include testing procedures when small crossbar switches are provided.

(f) To revise Test Chart, Test H to change operation of OF1 key to OF key.

(g) To add paragraph 1.11 to include application of the lamp display control feature (option YR).

(h) To make minor changes as required.

1.03 The tests covered are:

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1.04 Test O will normally be used to make a comparative frequency test of an oscillator output. When the results of this test are not within the limits specified, or when a precise measurement of a frequency is required, Test Q should be performed.

1.05 If the oscillator output voltage or frequency is not within the limits specified in the test, the requisite corrective measures will be found in the circuit notes of SD-26051-01.

1.06 In performing the following tests, action and/or verification are required in the locations indicated.

Tests B, K, L—Marker Frame

Tests C, D, F, G, I, J, L, M, N, O, P, Q—Sender Frame

Tests E, T—Translator-Frame

Test L—Sender Group-Busy Circuit

Test N—MF Current Supply Circuit

1.07 Tests M and N require that all senders in a sender subgroup be made busy.

1.08 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Parts 3 and 4 of this section, indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

1.09 Local instructions should be followed for recording and reporting plant register operations for registers associated with sender SS leads.

1.10 If the trouble indicator and connector circuit is not associated with the master alarm release key of the alarm sending circuit, the TIC MB key at TIC should be operated in unattended offices to prevent lamps from being lighted and generating heat sufficient to discolor and warp designating strips. A large number of lamps lighted could also result in lamp fuses operating and causing a major alarm.

1.11 When lamp display control feature (option YR) is provided at the trouble indicator and connector circuit (TIC), a stored trouble condition is indicated by a lighted red DR lamp. Momentary operation of the LD key will cause the trouble indicating lamps to light. These lamps will be extinguished with the momentary operation of the RLS key. Application of this feature will prevent trouble lamp displays from occurring in unattended offices.

2. APPARATUS

2.01 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.

2.02 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord) and two KS-6278 connecting clips (to connect ground).

2.03 67C test set or equivalent, equipped with one 518B tool (test pick), and one KS-6278 connecting clip (to check for the presence or absence of ground).

2.04 67C test set or equivalent, equipped with two 624B (test connector) tools (to make test connections to terminals arranged for solderless wrapped connections).

2.05 Electron tube voltmeter (Voltohmyst, RCA WV-98A Senior, or equivalent) (for measuring oscillator output voltages).

2.06 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one 624B (test connector) tool, and one KS-6278 connecting clip.

2.07 Load resistor 19LM or equivalent, 275 ohms ±1 percent.

2.08 Load resistor, 19SE or equivalent, 1100 ohms ±1 percent.

2.09 Frequency meter, Berkley EPUT or Hewlett-Packard 521C counter with 10-second gates.

2.10 Patching cord, P3U cord, 7 feet long, equipped with one 310 plug and one 351A plug (3P27B cord) ⧫for regular size crossbar switches or patching cord P3BE cord, 7 feet long, equipped with one 310 plug and one 459A plug for small size crossbar switches.⧫

2.11 Patching cord, P3E cord, 6 feet long, equipped with two 310 plugs (3P7A cord).

2.12 Testing cord, Pomona Electronics MG-C-BNC-36 cable assembly, 3 feet long, equipped with one UG-88C coaxial connector and two alligator clips (red clip connected to cable center conductor, black clip connected to shield) (for use with Berkley EPUT meter).

2.13 Testing cord, Hewlett-Packard 11001A cable assembly, 45 inches long, equipped with one UG-88C coaxial connector and one dual banana plug (plug nearest knurled section connected to cable center conductor) (for use with Hewlett-Packard 521C cord).

2.14 No. 60 Mueller clip for use with Hewlett-Packard 11001A cable assembly.

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

3. PREPARATION

STEP	ACTION	VERIFICATION
Tests A Through L, N, R, S, T, U, V		
1	At TIC— Momentarily operate RLS key.	All lamps extinguished.
2	At OTF— Restore all keys and switches.	All lamps extinguished.
3	Set RSG switch to OSB_ position to select sender group.	
4	Set RSS switch to select sender under test.	
5	Operate MKR_key to select completing marker.	
6a	If particular trunk is required— ⧫Operate FS_ key to select trunk link frame.	

	M	N	O	P	Q	R	S	T	U	V
	—	1	—	—	—	1	1	1	1	1
	√	√	√	√	√	—	—	—	√	—
	—	1	—	—	—	—	—	—	—	—
	1		—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	√	—
	—	—	1	—	—	—	—	—	—	—
	—	—	—	1	—	—	—	—	—	—
	—	—	—	√	√	—	—	—	—	—
	—	—	—	1	—	—	—	—	—	—
	—	—	—	—	1	—	—	—	—	—
	—	—	—	—	1	—	—	—	—	—
	—	—	—	—	—	—	—	—	1	—
	—	—	—	—	—	—	—	—	1	—
	—	—	—	—	√	—	—	—	—	—
	—	—	—	—	√	—	—	—	—	—
	—	—	—	—	√	—	—	—	—	—
	√	—	√	√	√	—	—	—	√	—
	—	—	—	—	—	—	—	—	—	—

STEP	ACTION	VERIFICATION
7a	Set TS switch and operate ODD/EVEN key to select trunk.◀	
8b	If trunk requires wink start— Operate WK key.	
9c	If control of start pulse frequency combinations on ▶ANI or non-ANI◀ calls to TSPS No. 1 is provided— Set STP switch for start pulse transmitted. (Refer to Table B)	

TABLE B

STP SWITCH SETTING	START PULSE TRANS-MITTED	TYPE OF CALL
0-10	10-0	Noncoin 0+ (PPCS)
1-10	10-1	Coin 0+
2-10	10-2	Spare
4-10	10-4	Noncoin 1+
7-10	10-7	Coin 1+

10d	▶If class of service selected has access to TOUCH-TONE originating registers— Operate TT key.◀	

Tests B, E, H, I, K, L, N, U, V

11	At jack, lamp, and key circuit— Restore (push-in) CTR_ key associated with sender under test, if operated.	

4. METHOD

STEP	ACTION	VERIFICATION

A. Regular Call

	▶*Note:* Refer to paragraph 1.11.◀	
11	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 1.◀	

STEP	ACTION	VERIFICATION
12e	If route selected is flat rate— Operate NCH key.	
13	Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. At end of sender pulsing— EP, CS lamps lighted. High tone heard. TOK lamp lighted.
14	Restore ST key.	All lamps extinguished. High tone silenced.
15	Repeat Steps 6a through 14, as required ⧫for Tests 2 through 21.⧫	
16	Restore all keys and switches not required in next test.	
B. Trunk Test—Open Trunk		
12	At OTF— Operate keys and set switches in accordance with Test chart ⧫Test 22.⧫	
13	At marker selected for test— Block nonoperated HTR relay.	
14	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED, TGT lamps lighted. Overflow tone heard. At TIC— TGT_, FS_, TS_, TB_, OSG_, SSA/SSB, OS_ lamps lighted identifying sender under test and trunk selected.
15	Momentarily operate RLS key.	All lamps extinguished.
16	At OTF— Restore ST key.	All lamps extinguished. Overflow tone silenced.
17	At marker selected for test— Block operated HTR relay.	
18	At jack, lamp, and key circuit— Operate (pull-out) CTR_ key associated with sender under test, if restored.	
19	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing—

STEP	ACTION	VERIFICATION
		ED, TGT lamps lighted. Overflow tone heard. At jack, lamp, and key circuit— TO_ lamp associated with sender under test lighted.
20	Restore (push in) then operate (pull out) CTR_ key associated with sender under test, if required.	TO_ lamp extinguished.
21	At OTF— Restore ST key.	All lamps extinguished. Overflow tone silenced.
22	Repeat Steps 6a through 21 as required ▶for Test 23.◀	
23	At marker selected for test— Remove blocking tool from HTR relay placed in Step 17.	
24	At OTF— Restore all keys and switches not required in next test.	

C. Abandoned Call—AMA

11	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 24.◀	
12	At sender under test— Insert plug of 32A test set into RC jack.	
13	Insulate 1M, 10M of STT relay.	
14	Momentarily operate white (start) button on 32A test set.	ON1 relay operated.
15	***Immediately*** after ON1 relay operates— Momentarily operate red (release) button on 32A test set.	In 6 to 12 seconds— ON1 relay released.
16	Remove insulators from 1M, 10M of STT relay placed in Step 13.	
17	Remove plug of 32A test set from RC jack.	
18	At OTF— Restore all keys and switches not required in next test.	

STEP	ACTION	VERIFICATION
D. Abandoned Call—Non-AMA		
11	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 25.⧫	
12	At sender under test— Insert plug of 32A test set into RC jack.	
13	Momentarily operate white (start) button on 32A test set.	ON1, SP relays operated.
14	***Immediately*** after SP relay operates— Momentarily operate red (release) button on 32A test set.	ON1, SP relays released. EP relay not operated.
15	Remove plug of 32A test set from RC jack.	
16	At OTF— Restore all keys and switches not required in next test.	
E. AMA Transverter Trouble Release		
12	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 26.⧫	
13	At AMA translator— Remove cross-connections from originating test line.	
14	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. Overflow tone heard. At TIC— TV_ lamp lighted. DNK lamp ***not*** lighted.
15	Momentarily operate RLS key.	All lamps extinguished.
16	At OTF— Restore ST key.	All lamps extinguished. Overflow tone silenced.
17	Restore all keys and switches not required in next test.	
18	At AMA translator— Replace cross-connections at originating test line removed in Step 13.	

STEP	ACTION	VERIFICATION
19	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if required.	

F. Delay Pulsing of Last Digit on AMA Call

11	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 27.⧫	
12	At sender under test— Insert plug of 32A test set into RC jack.	
13	Insulate 1M, 10M of STT relay.	
14	Momentarily operate white (start) button on 32A test set.	ON1, AMA, STT relays operated. Sender outpulsed all but last digit.
15	Remove insulator from 1M of STT relay placed in Step 13.	Sender outpulsed last digit and released.
16	Momentarily operate red (release) button on 32A test set.	
17	Remove insulator from 10M of STT relay placed in Step 13.	
18	Remove plug of 32A test set from RC jack.	
19	At OTF— Restore all keys and switches not required in next test.	All lamps extinguished.

G. No-Pulsing LAMA Call

11	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 28.⧫	
12	At sender under test— Insert plug of 32A test set into RC jack.	
13	Momentarily operate white (start) button on 32A test set.	ON1, STS1, STT relays operated. RLT relay operated and sender released without pulsing.
14	Momentarily operate red (release) button on 32A test set.	
15	Insulate 1M, 10M of STT relay.	

STEP	ACTION	VERIFICATION
16	Momentarily operate white (start) button on 32A test set.	ON1, STS1, STT relays operated. In 6 to 12 seconds— RO relay operated.
17	Momentarily operate red (release) button on 32A test set.	Sender released.
18	⧫Repeat Steps 6a through 17, as required for Test 29.⧫	
19	Remove insulators from 1M, 10M of STT relay placed in Step 15.	
20	Remove plug of 32A test set from RC jack.	
21	At OTF— Restore all keys and switches not required in next test.	All lamps extinguished.

H. Reversed Trunk

12	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 30.⧫	
13e	If positive test control is provided— At jack, lamp, stand key circuit— Insert 322A make-busy plug into M_C_MB jack of marker selected in Step 5.	
14e	At marker under test— Block nonoperated TVA, XTV relays.	
15e	Block operated SCC relay.⧫	
16	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. Overflow tone heard.
17	Restore ST key.	All lamps extinguished. Overflow tone silenced.
18e	⧫If positive test control is provided— At marker under test— Remove blocking tools placed in Steps 14e and 15e.	
19	At jack, lamp, and key circuit— Remove 322A make-busy plug from M_C_MB jack placed in Step 13e.⧫	

STEP	ACTION	VERIFICATION
20	At OTF— Restore all keys and switches not required in next test.	
21	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if required.	

I. Timing Features

12	At OTF— Operate keys and set switches in accordance with Test Chart ⏵Test 32.⏴	
13	At sender under test— Insert plug of 32A test set into RC jack.	
14	Block nonoperated EP relay.	
15	Momentarily operate white (start) button on 32A test set.	ON1 relay operated. In 13 to 24 seconds— TM relay momentarily operated. Sender released.
16	Momentarily operate red (release) button on 32A test set.	
17e	If AMA is provided— Insulate 1M, 10M of STT relay.	
18e	At OTF— Operate keys and set switches in accordance with Test Chart ⏵Test 32.⏴	
19e	At sender under test— Momentarily operate white (start) button on 32A test set.	ON1 relay operated. In 6 to 12 seconds— TM relay momentarily operated. Sender released.
20e	Momentarily operate red (release) button on 32A test set.	
21e	Remove insulators from 1M, 10M of STT relay placed in Step 17e.	
22	Remove blocking tool from EP relay placed in Step 14.	
23	Remove plug of 32A test set from RC jack.	

STEP	ACTION	VERIFICATION
24	At OTF— Restore all keys and switches not required in next test.	All lamps extinguished.
25	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if restored.	
J. Cancel Timed Release Alarm		
11	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if restored.	
12	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 33.⧫	
13	At sender under test— Block nonoperated EP relay.	
14	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. TGT lamp lighted. In 13 to 24 seconds— Overflow tone heard. At jack, lamp, and key circuit— TO_ lamp lighted.
15	At OTF— Restore ST key.	All lamps extinguished. Overflow tone silenced.
16	Set RSS switch to OFF.	In 10 to 15 seconds— At jack, lamp, and key circuit— R-S-TOA lamp lighted. Major alarm sounds.
17	Insert 322A make-busy plug into MB_ jack associated with sender under test.	R-S-TOA lamp extinguished. Major alarm silenced.
18	Remove 322A make-busy plug from MB_ jack.	
19	At OTF— Set RSS switch to select sender under test.	
20	At jack, lamp, and key circuit— Restore (push in) CTR_ key associated with sender under test.	TO_ lamp extinguished.
21	Operate (pull out) CTR_ key associated with sender under test, if required.	

STEP	ACTION	VERIFICATION
22e	If alarm sending circuit is provided— Repeat Steps 14 and 15.	
23e	Operate alarm transfer key to DB or SB position as required to transfer alarms.	TO_ lamp extinguished. TR lamp lighted.
24e	Operate alarm transfer key to NTR position.	
25e	Momentarily operate RS key.	LO lamp momentarily lighted. TR lamp extinguished.
26	At sender under test— Remove blocking tool from EP relay placed in Step 13.	
27f	If stop sender progress feature (YC option) is provided— At sender under test— Block nonoperated second steering relay that would normally operate depending on code used for test.	
28f	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. TGT lamp lighted. In 13 to 24 seconds— Overflow tone heard. At jack, lamp, and key circuit— TO_ lamp lighted. At sender under test— TRL, PG1 relays operated.
29f	At sender under test— Remove blocking tool from steering relay placed in Step 27f.	
30f	At OTF— Restore ST key.	All lamps extinguished.
31f	At jack, lamp, and key circuit— Restore (push in) CTR_ key associated with sender under test.	TO_ lamp extinguished.
32f	Operate (pull out) CTR_ key associated with sender under test.	
33	At OTF— Restore all keys and switches not required in next test.	

STEP	ACTION	VERIFICATION
K. Marker Reorder		
12	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 34.⧫	
13	At marker selected for test— Block nonoperated HTR relay.	
14	At TIC— Insert 322A make-busy plug into TIC MB MKR_ jack associated with marker selected for test.	
15	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED, TGT lamps lighted. Overflow tone heard.
16	Restore ST key.	All lamps extinguished. Overflow tone silenced.
17	At marker selected for test— Remove blocking tool from HTR relay placed in Step 13.	
18	At TIC— Remove 322A make-busy plug from TIC MB MKR_ jack.	
19	At OTF— Restore all keys and switches not required in next test.	
20	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if required.	
L. Intersender Timing		
12	At OTF— Operate keys and set switches in accordance with Test Chart ⧫Test 35.⧫	
13	At outgoing sender group release circuit associated with sender under test— Block operated R relay.	
14	At sender under test— Block nonoperated SP relay.	

STEP	ACTION	VERIFICATION
15	At marker selected for test— Block operated HTR relay.	
16	At OTF— Operate ST key.	S, OS lamps lighted At end of dialing— ED, TGT lamps lighted. In 4.5 to 8.5 seconds— Overflow tone heard.
17	Restore ST key.	All lamps extinguished. Overflow tone silenced.
18	At marker selected for test— Remove blocking tool from HTR relay placed in Step 15.	
19	At outgoing sender group release circuit— Remove blocking tool from R relay placed in Step 13.	
20	At sender under test— Remove blocking tool from SP relay placed in Step 14.	
21	At OTF— Restore all keys and switches not required in next test.	
22	At jack, lamp, and key circuit— Operate (pull out) CTR_ key associated with sender under test, if required.	
M. Sender Busy		
	Note: Refer to paragraph 1.07	
1	At jack, lamp, and key circuit— Insert 322A make-busy plugs into MB_ jack of all other senders in subgroup associated with sender under test.	
2	At sender under test— Block operated SB relay.	Check for absence of ground on terminals 16 and 26 of terminal strip A and terminal 17 of terminal strip B on sender control unit.
3	At jack, lamp, and key circuit— Insert 322A make-busy plug into MB_ jack associated with sender under test.	
4	At sender under test— Remove blocking tool from SB relay placed in Step 2.	Check for absence of ground on terminals 16 and 26 of terminal strip A and terminal 17 of terminal strip B on sender control unit.

STEP	ACTION	VERIFICATION
5	At jack, lamp, and key circuit— Remove 322A make-busy plug from MB_ jack associated with sender under test.	At sender under test— Check for presence of ground on terminals 16 and 26 of terminal strip A and terminal 17 of terminal strip B on sender control unit.
6a	▶If option is provided for elimination of stuck sender plant registration on test calls when sender is made busy at OTF— At jack, lamp, and key circuit— Insert 322A make-busy plug into MB_ jack associated with sender under test.	
7a	At sender under test— Block operated CT, TRL relays	Check for absence of ground on terminal 36 of terminal strip A on sender control unit.
8a	At jack, lamp, and key circuit— Remove 322A make-busy plug from MB_ jack associated with sender under test.	At sender under test— Check for presence of ground on terminal 36 of terminal strip A on sender control unit.
9a	Remove blocking tools placed in Step 7a.	
10b	If option is provided for TUR maintenance busy indication in offices arranged for alarm surveillance and control feature— At jack, lamp, and key circuit— Insert 322A make-busy plug into MB_ jack associated with sender under test.	At sender under test— Check for presence of ground on terminal 24 on terminal strip B on sender control unit.
11b	At jack, lamp, and key circuit— Remove 322A make-busy plug from MB_ jack associated with sender under test.	At sender under test— Check for absence of ground on terminal 24 of terminal strip B on sender control unit.
12b	Block operated TRL relay.	At jack, lamp, and key circuit— TO_ lamp lighted. R-S-TOA lamp lighted. Major alarm sounded. At sender under test— Check for presence of ground on terminal 24 on terminal strip B on sender control unit.
13b	Remove blocking tool placed in Step 12b.	At jack, lamp, and key circuit— TO_ lamp extinguished. R-S-TOA lamp extinguished. Major Alarm silenced.
14	Remove all 322A make-busy plugs placed in Step 1.◀	

STEP	ACTION	VERIFICATION
	FOR SENDERS USING MULTIFREQUENCY CURRENT SUPPLY—TEST N	
	N. Multifrequency Current Supply Trouble Release	
12	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 36.◀	
	Caution: Perform the remainder of this test as quickly as possible to reduce the possibility of a service interruption.	
13	At jack, lamp, and key circuit— Insert 322A make-busy plugs into MB_ jacks associated with all other senders in same subgroup as sender.	
14	At multifrequency current supply— Operate 1-4, 2-5, or 3-6 key associated with sender under test.	
15	At sender under test— Connect ground to terminal 15 of terminal strip C1 on pulse control unit.	
16	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. Overflow tone heard.
17	Restore ST key.	All lamps extinguished. Overflow tone silenced.
18	At sender under test— Remove ground from terminal 15 of terminal strip C1 on pulse control unit.	
19	At multifrequency current supply— Restore 1-4, 2-5, or 3-6 key.	
20	At jack, lamp, and key circuit— Remove 322A make-busy plugs from MB_ jacks associated with senders in same subgroup as sender under test.	
21	Operate (pull out) CTR_ key associated with sender under test, if required.	

STEP	ACTION	VERIFICATION
22	At OTF— Restore all keys and switches not required in next test.	

FOR SENDERS EQUIPPED WITH MULTIFREQUENCY GENERATOR—TESTS O, P, Q

O. Comparative Frequency Test

1	At jack, lamp, and key circuit— Insert make-busy plug into MB_jack associated with sender under test.	
2	Insert make-busy plug into MB_jack associated with sender (having oscillators known to be at proper frequencies) to be compared with sender under test.	
3	At each sender made busy— Block operated ON relay.	
4	Connect one 624B tool of 67C test set or equivalent to terminal 15 of terminal strip M on MF supply unit of each sender made busy. ***Note:*** If senders are not within reach of the cords, locally available cords may be used to extend the reach of cord provided with 67c test set or equivalent.	
5	Listen for beat frequency.	Oscillator frequency is satisfactory if beats counted are five or less per second. (Refer to paragraph 1.04.)
6	Remove test connections from terminals 15 of terminal strip M on MF supply units placed in Step 4.	
7	Repeat Steps 4 through 6 to test each frequency, substituting in turn terminals 15, 21, 22, 25, and 35 of terminal strip M on MF supply unit.	
8	Remove blocking tools from ON relays placed in Step 3.	
9	At jack, lamp, and key circuit— Remove 322A make-busy plugs from MB_ jacks associated with sender under test and sender used to match frequencies.	

STEP	ACTION	VERIFICATION
P.	**Oscillator Output Voltage**	
1	At jack, lamp, and key circuit— Insert 322A make-busy plugs from MB_ jacks with sender under test.	
2	At sender under test— Block operated ON relay.	
3	Connect 275-ohm register between terminals 11 and 12 of terminal strip M on MF supply unit using 893 cords. ***Note:*** 624B tools provided for connecting to terminals; KS-6278 connecting clips provided for connecting to resistor.	
4	Set voltmeter to read AC volts in accordance with approved procedure for particular meter being used.	
5	Connect voltmeter GND terminal to side of resistor connected to terminal 11 of terminal strip M on MF supply unit.	
6	Connect voltmeter probe to side of resistor connected to terminal 12 of terminal strip M on MF supply unit.	Output voltage between 1.25 and 1.75 volts. ***Note:*** If output voltage is not within limits specified, proceed as outlined in notes of corresponding schematic drawing. (Refer to paragraph 1.05.)
7	Remove connection from terminal 12 of terminal strip M on MF supply unit.	
8	Repeat Steps 6 and 7 substituting in turn terminals 15, 21, 22, 25, and 35 of terminal strip M on MF supply unit.	
9	Remove all test connections from terminal strip M on MF supply unit.	
10	Remove blocking tool from ON relay placed in Step 2.	
11	At jack, lamp, and key circuit— Remove 322A make-busy plug from MB_ jack associated with sender under test.	

STEP	ACTION	VERIFICATION
Q. Frequency Test Using Frequency Meter		
1	At jack, lamp, and key circuit— Insert 322A make-busy plug into MB_ jack associated with sender under test.	
2	At sender under test— Block operated ON relay.	
3	Connect 1100-ohm resistor between terminal 11 and the first terminal of terminal strip M on MF supply unit using 893 cords as listed in Table C. ***Note:*** 624B tools provided for connecting to terminals; KS-6278 connecting clips provided for connecting to resistor.	
4	Connect testing cord to frequency meter. (Refer to paragraphs 2.12, 2.13)	
5	Connect clip associated with shield of testing cord to side of resistor connected to terminal 11 of terminal strip M on MF supply unit.	
6	Connect clip associated with center conductor of testing cord to side of resistor connected to terminal 12 of terminal strip M on MF supply unit.	
7	Measure frequency.	Frequency within limits indicated in Table C. (Refer to paragraph 1.05.)
8	Remove connection from terminal 12 of terminal strip M on MF supply unit.	
9	Repeat Steps 7 and 8 substituting in turn terminals 15, 21, 22, 25, and 35 of terminal strip M on MF supply unit.	
10	Remove all test connections from terminal strip M on MF supply unit.	
11	Remove blocking tool from ON relay placed in Step 2.	
12	At jack, lamp, and key circuit— Remove 322A make-busy plug from MB_ jack associated with sender under test.	

STEP	ACTION	VERIFICATION

TABLE C

M-TERMINAL	OSCILLATOR OUTPUT FREQUENCY	MAXIMUM PERMISSIBLE VARIATION (HZ ±1 PERCENT)
12	700	698 to 705
15	900	897 to 906
21	1100	1097 to 1108
22	1300	1296 to 1309
25	1500	1497 to 1510
35	1700	1695 to 1712

R. Automatically Identified Call

11	At OTF— Operate keys and set switches in accordance with Test Chart ⏵Test 37.⏴	
12	Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. At end of sender pulsing— EP, CS lamps lighted. High tone heard. TOK lamp lighted. At TIC— FU 2/5, VG 2/6, HG 2/5, VF 1/5, TPT or RPT, DNK, TV_, A_ through H_ lamps ighted. A_ lamp indicates automatically identified call. B_ through H_ lamps indicate calling line number.
13	Momentarily operate RLS key.	All lamps extinguished.
14	At OTF— Restore ST key.	All lamps extinguished. High tone silenced.
15	Repeat Steps 6a through 14, as required ⏵for Test 38.⏴	
16	Restore all keys and switches not required in next test.	

STEP	ACTION	VERIFICATION
S. Operator Identified Call		
11	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 39.◀	
12	Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. At end of sender pulsing— EP, CS lamps lighted. High tone heard. TOK lamp lighted.
13	Restore ST key.	All lamps extinguished. High tone silenced.
14	Repeat Steps 6a through 13, as required ▶for Test 40.◀	
15	Restore all keys and switches not required in next test.	
T. Automatically Identified Call Failure		
11	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 41.◀	
12	At AMA translator— Remove cross-connections from originating test line.	
13	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. At end of sender pulsing— EP, CS lamps lighted. High tone heard. TOK lamp lighted. At TIC— TV_ lamp lighted. DNK lamp ***not*** lighted.
14	Momentarily operate RLS key.	All lamps extinguished.
15	At OTF— Restore ST key.	All lamps extinguished. High tone silenced.
16	Repeat Steps 6a through 15, as required ▶for Test 42.◀	

STEP	ACTION	VERIFICATION
17	At AMA translator— Replace cross-connections at originating test line removed in Step 12.	
18	At OTF— Restore all keys and switches not required in next test.	

U. LAMA Call

12	At OTF— Operate keys and set switches in accordance with Test Chart test ⧫Test 43.⧫	
13	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. At end of sender pulsing— EP, CS lamps lighted. High tone heard. RN_, IE, AE, DE lamps lighted in sequence. RN-, IE, AE, DE lamps lighted in sequence. AT TIC— FU 2/5, VG 2/6, HG 2/5, VF 1/5, OFF- TH-, HN_, T_, U_, TP or RP, MB 2/5, RN 2/5, T 2/5, U 2/5, A_ through K_ lamps lighted identifying originating test line, message billing index, recorder number, and called number. ***Note:*** Disregard XP1 lamp if lighted.
14	Momentarily operate RLS key.	All lamps extinguished.
15	At OTF— Restore ST key.	All lamps extinguished. High tone silenced.
16	⧫At jack, lamp, and key circuit— Patch P3E cord from OTL jack to SP jack.⧫	
17	Operate keys and set switches in accordance with Test Chart Test 44.	
18	At jack, lamp, and key circuit— Insert 322A make-busy plug into TVMB_ jack associated with transverter selected in Test Chart.	
19	At transverter— Insulate 5, 6T of DNK1 relay.	

STEP	ACTION	VERIFICATION
20	At line link frames— Patch SP ▶P3U or P3BE cord, as required from◀ SP jack to first line location listed in Table D.	
21	At OTF— Operate ST key.	S, OS lamps lighted. At end of dialing— ED lamp lighted. In 6 to 12 seconds— Overflow tone heard. At TIC— TV_ lamp lighted. FU_, VG_, HG_, VF_, RP or TP, MB_, RN_, T_, U_, A_ through K_ lamps lighted identifying line location in Table D, message billing index, recorder number, trunk number, and called number. DNK lamp ***not*** lighted.
22	Momentarily operate RLS key.	All lamps extinguished.
23	At OTF— Restore ST key.	All lamps extinguished. Overflow tone silenced.
24	At line link frames— Remove ▶P3U or P3BE◀ cord from line location and SP jack.	
25	Repeat Steps 20 through 24 for remaining line locations provided in Table D.	
26	At transverter— Remove insulator from 5, 6T of DNK1 relay.	
27	At jack, lamp, and key circuit— Remove 322A make-busy plug from TVMB_ jack placed in Step 18.	
28	Operate (pull-out) CTR_ key associated with sender under test, if required.	
29	At OTF— Remove ▶P3E◀ cord from OTL and SP jacks.	
30	Restore all keys and switches not required in next test.	
V. Directory Assistance Charging		
12	At OTF— Operate keys and set switches in accordance with Test Chart ▶Test 45.◀	

STEP	ACTION	VERIFICATION

TABLE D

LINE LOCATION					
FRAME NO.		VERT GR		HOR GR	VERT FILE
TENS	UNITS	TENS	UNITS		
0	0	0	0	0	0
0	1	0	1	1	1
0	2*	0	2	2	2
0	3*	0	3	3	3
0	4*	0	4*	4	4
0	5*	0	5*	5	0
0	6*	0	6*	6	1
0	7*	0	7*	7	2
0	8*	0	8*	8	3
0	9*	0	9*	9	4
0	0	1*	0	0	0
0	0	1*	1	0	1

* If not equipped, use 0.

13 Operate ST key.

OS lamp lighted.
At end of dialing—
ED lamp lighted.
At completion of sender outpulsing—
EP, CS lamps lighted.
High tone heard.
TOK lamp lighted.
▶At TIC—◀
DR_, CN_, S_, FU_, VG_, HG_, VF lamps lighted identifying transverter, transverter connector, sender and originating test line.
OFF_, RN_, CIIT_, CIIU_, lamps lighted identifying originating office group, recorder number, and call identity index trunk number.
If test is for 411 or 555-1212 2-line entry—
A_, B_, C_, or A_ through G_, MB6, CI1, CI2 lamps lighted identifying called number, message billing index, and cut-in perforator leads.
If test is for 555-1212 4-line entry—
A_ through G_, MB9, CI1, CI2, CI3, CI4 lamps lighted identifying called numbers, message billing index and cut-in perforator leads.

STEP	ACTION	VERIFICATION
		Note: Disregard XP1 lamp if lighted.
14	◗Momentarily operate RLS key.	All lamps extinguished.◖
15	At OTF— Restore ST key.	All lamps extinguished. High tone silenced.
16	◗Repeat Steps 6a through 15, as required for Test 46.◖	
17	At jack, lamp, and key circuit— Operate (pull-out) CTR_ key associated with sender under test, if required.	
18	At OTF— Restore all keys and switches not required in next test.	

5. PREPARATION OF TEST CHART

5.01 The Test Chart is used as a particular number chart and provides the OTF keys and switches to be operated for each test. Information obtained from local office records should be used to fill out the Test Chart in the following manner.

(a) Record CST_ and CSU_ switch positions to select class of service required for access to selected route.

(b) In the DIAL SWITCHES columns, record A_ through Q_ digits for prefix digit(s), area code, office code, and numericals as required for access to selected route.

(c) Record in _D column the number of digits to be pulsed into originating register. If number of digits in call is one number higher than _D keys provided, do not operate any _D key.

(d) Record in _SD column the number of digits the sender will outpulse. If number of digits to be outpulsed is one number higher than _SD keys provided, do not operate any _SD key.

(e) In the SENDER SWITCHES columns, record A_ through N_ digits as required, corresponding to digits sender will outpulse.

(f) In the SENDER SWITCHES columns, record B_ through H_ digits corresponding to digits sender will outpulse for calling line identification.

5.02 ***Test A***

(1) Test numbers 1 through 5: Select an office code whose route will cause the sender to outpulse only four digits.

(2) Test numbers 6 through 10: Select an office code whose route will cause the sender to outpulse seven digits.

(3) Test numbers 11 through 15: Select an area code and office code whose route will cause the sender to outpulse ten digits.

(4) Test numbers 16 through 20: Select country code and national number as required, whose route will cause the sender to outpulse one plus twelve digits.

(5) Test numbers 1 through 20: Apply (a), (e) of 5.01.

(6) Test number 21: Apply (a), (b), (c), (d), (e) of 5.01.

5.03 ***Test B***

(1) Test number 22: Apply (a), (b), (c) of 5.01. Do not use two-way or intertoll route.

(2) Test number 23: Apply (a), (b), (c) of 5.01. Select two-way or intertoll route.

5.04 ***Tests C, D, E, G, K, L, S, T***

(1) Apply (a), (b), (c) of 5.01.

5.05 ***Tests F, H, I, J, N***

(1) Apply (a), (b), (c), (d), (e) of 5.01.

5.06 ***Test R***

(1) Apply (a), (b), (c), (f) of 5.01.

5.07 ***Test U***

(1) Test number 43: Apply (a), (b), (c), (d), (e) of 5.01.

(2) Test number 44: Apply (a), (b), (c) of 5.01.

5.08 ***Test V***

(1) Apply (a), (c), (d), (e) of 5.01, selecting a class of service requiring AMA routing.

TEST CHART

TEST	TYPE OF TEST	TEST NO.	CLASS OF SERVICE SWITCHES		DIAL SWITCHES													NO. OF DIGITS KEYED		SENDER SWITCHES										MISC KEYS							MISC SWITCHES				TEST NO.	TEST
			CST	CSU	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	...D	...SD	A	B	C	D	E	F	G	H	J	K	L	M	N							PS PPS	PS % BK	PS L-L			
A	Regular Call	1						1	3	6	7									7D	4SD	1	3	6	7								MFS	OGT	OTL	MCB				15	65	0		1	A
		2						3	6	7	0									7D	4SD	3	6	7	0								MFS	OGT	OTL	MCB				15	65	0		2	
	7-Digits	3						6	7	0	1									7D	4SD	6	7	0	1								MFS	OGT	OTL	MCB				15	65	0		3	
		4						7	0	1	3									7D	4SD	7	0	1	3								MFS	OGT	OTL	MCB				15	65	0		4	
		5						0	1	3	6									7D	4SD	0	1	3	6								MFS	OGT	OTL	MCB				15	65	0		5	
		6			1				1	3	6	7								8D	7SD				1	3	6	7					MFS	OGT	OTL	MCB				15	65	0		6	
		7			1				3	6	7	0								8D	7SD				3	6	7	0					MFS	OGT	OTL	MCB				15	65	0		7	
	Prefix 1+7 Digits	8			1				6	7	0	1								8D	7SD				6	7	0	1					MFS	OGT	OTL	MCB				15	65	0		8	
		9			1				7	0	1	3								8D	7SD				7	0	1	3					MFS	OGT	OTL	MCB				15	65	0		9	
		10			1				0	1	3	6								8D	7SD				0	1	3	6					MFS	OGT	OTL	MCB				15	65	0		10	
		11			1							1	3	6	7					11D	10SD							1	3	6	7		MFS	OGT	OTL	MCB				15	65	0		11	
		12			1							3	6	7	0					11D	10SD							3	6	7	0		MFS	OGT	OTL	MCB				15	65	0		12	
	Prefix 1+10 Digits	13			1							6	7	0	1					11D	10SD							6	7	0	1		MFS	OGT	OTL	MCB				15	65	0		13	
		14			1							7	0	1	3					11D	10SD							7	0	1	3		MFS	OGT	OTL	MCB				15	65	0		14	
		15			1							0	1	3	6					11D	10SD							0	1	3	6		MFS	OGT	OTL	MCB				15	65	0		15	
		16			0	1	1									1	3	6	7	None	None	1									1	3	6	7	MFS	OGT	OTL	MCB				15	65	0		16	
		17			0	1	1									3	6	7	0	None	None	1									3	6	7	0	MFS	OGT	OTL	MCB				15	65	0		17	
	Prefix 011+12 Digits	18			0	1	1									6	7	0	1	None	None	1									6	7	0	1	MFS	OGT	OTL	MCB				15	65	0		18	
		19			0	1	1									7	0	1	3	None	None	1									7	0	1	3	MFS	OGT	OTL	MCB				15	65	0		19	
		20			0	1	1									0	1	3	6	None	None	1									0	1	3	6	MFS	OGT	OTL	MCB				15	65	0		20	
	Prefix 0+7 Digits	21			0					1	2	3	4																						MFS	OGT	OTL	MCB				15	65	0		21	
B	Trunk Test — Open Trunk	22																																	MFS	OGT	OTL	MCB	RLT			15	65	0		22	B
		23																																	MFS	OGT	OTL	MCB	RLT			15	65	0		23	
C	Abandoned Call — AMA	24																																	MFS	OGT	OTL	MCB	DO			15	65	0		24	C
D	Abanboned Call — Non-AMA	25																																	MFS	OGT	OTL	MCB	DO			15	65	0		25	D
E	AMA Transverter Trouble Release	26																																	MFS	OGT	OTL	MCB	TV-			15	65	0		26	E
F	Delay Pulsing of Last Digit on AMA Call	27																																	MFS	OGT	OTL	MCB	TV-			15	65	0		27	F
G	No-Pulse LAMA Call	28																																	MFS	1AO	OTL	MCB	TV-			15	65	0		28	G
		29																																	MFS	OGT	OTL	MCB	TV-			15	65	0		29	
H	Reversed Trunk	30																																	MFS	OGT	OTL	MCB	OF			15	65	0		30	H
I	Timing Features Non-AMA	31																																	MFS	OGT	OTL	MCB	NCH			15	65	0		31	I
	AMA	32																																				MCB				15	65	0		32	
J	Cancel Timed Release Alarm	33																																	MFS	OGT	OTL	MCB				15	65	0		33	J
K	Marker Reorder	34																																	MFS	OGT	OTL	MCB	RLT			15	65	0		34	K
L	Intersender Timing	35																																	MFS	OGT	OTL	MCB				15	65	0		35	L
N	Multifrequency Current Supply Trouble Release	36																																	MFS	OGT	OTL	MCB				15	65	0		36	N
R	Automatically Identified Non-observed	37																			8SD	0													MFS	OGT	OTL	MCB	ANI	TV-	TVR	15	65	0		37	R
	Call Observed	38																			8SD	3													MFS	OGT	OTL	MCB	ANI	TV-	TVR	15	65	0		38	

Test Chart

→TEST CHART (Cont)←

TEST	TYPE OF TEST		TEST NO.	CLASS OF SERVICE SWITCHES		DIAL SWITCHES															NO. OF DIGITS KEYED		SENDER SWITCHES											MISC KEYS						MISC SWITCHES					TEST NO.	TEST
																																							PS						
				CST	CSU	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	_D	_SD	A	B	C	D	E	F	G	H	J	K	L	M	N							PPS	% BK	L-L				
S	Operator Identified Call	Nonobserved	39																				1												MFS	OGT	OTL	MCB	ANI	OI	15	65	0			39	S
		Observed	40																				4												MFS	OGT	OTL	MCB	ANI	OI	15	65	0			40	
T	Automatically Identified Call Failure	Nonobserved	41																				2												MFS	OGT	OTL	MCB	ANI	OI	15	65	0			41	T
		Observed	42																				5												MFS	OGT	OTL	MCB	ANI	OI	15	65	0			42	
U	LAMA Call		43																																MFS	OGT	OTL	MCB	TV.	TVR	15	65	0			43	U
			44																																MFS	OGT	OTLP	MCB	TV.	AMA	15	65	0			44	
V	Directory Assistance Charging	AMA	45			4	1	1																											MFS	OGT	OTL	MCB	TV.	TVR	15	65	0			45	V
			46			5	5	5	1	2	1	2																								MFS	OGT	OTL	MCB	TV.	TVR	15	65	0			46	