SINGLE-FREQUENCY SIGNALING CIRCUITS TYPES E1A, E1B, E2B, E3B, E4B, E1C, E2C, E3C, E4C, E5C, E1D, E2D, E3D, E4D, E5D, E1J, E1L, E2L, E1P, E1R, E1S, AND E2S IN SERVICE TESTS

1. GENERAL

1.01 This section describes a method of making in-service tests of the following 2400- or 2600-Hz (transistor type) single-frequency signaling units.

E1A, per SD-96499-01

E1B, per SD-98085-01

E2B, per SD-98090-01

E3B, per SD-98124-01, and SD-98124-02, E4B per SD-98124-03

E1C, E2C, per SD-98086-01 and SD-98086-02

E3C, E4C, E5C per SD-99767-01

E1D, E2D, E3D, per SD-98087-01 and SD-98087-02

E4D, E5D per SD-99764-01

E1J, per SD-99762-01

E1L, E2L, per SD-98137-01 and SD-98137-02

E1P, per SD-99779-01

E1R, per SD-99780-01

E1S, E2S per SD-98138-01 and SD-98138-02

The in-service tests are made using a bay-mounted, or portable monitoring circuit per SD-95877-01, or SD-96519-01 or SD-96519-02. The SD-95877-01 monitoring circuit is part of the J98613N panel, while the SD-96519-01 is either the J98613Y or part of the J98613AY equipment.

1.02 This section has been reissued to revise Tables B and C in Tests A and B to make minor corrections. This reissue does not affect the Equipment Test List.

1.03 The tests covered are:

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1.04 In addition to the tests in this section, over the line pulsing and supervision tests per Section 179-302-501 can be made.

1.05 Failure to meet any of these tests indicates the need of a more complete check or readjustment of the signaling unit. In such cases, the unit should be removed from its operating position using a disengaging tool and plugged into the testing position for out-of-service tests and readjustment, except for the E1P and E1R, which should be returned for repair.

Caution: If this section is used as a preliminary check test prior to initial service, observe the following precautions. The signaling unit should be in normal operating position for several minutes to allow mercury in any 291- or 303-type relays to assume operating conditions.

1.06 The transmission measuring set will be referred to in this section as TMS.

1.07 The 2B signaling test set will be referred to in this section as 2B test set.

1.08 Because there are variations in monitor circuits, two methods of calibrating the MON AMP are provided in Part 3. This adjustment compensates for the associated high-impedance input circuit when bridged across a 600-ohm circuit. If this amplifier is known to be in adjustment, the calibration can be omitted.

1.09 In certain cases the source impedance and/or the load impedance at the monitoring point is not 600 ohms. Correction factors have therefore been included in the verification values.

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

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.

TABLE A

APPARATUS	TEST					
	A	B	C	D	E	F
Monitoring circuit (2.02)	1	1	1	1	1	1
2B Test set (2.03)				1		1
13A or 21A TMS	1	1	1	1		
Head telephone set					1	1
Cord (2.04)	1	1	1	1		
Cord (2.05)	1	1	1		1	1
Cord (2.06)	1	1	1	1	1	1
Cord (2.07)				1		1

2.02 Monitoring circuit, J98613N (SD-95887-01), or test and monitoring circuit, J98613AY (SD-96519-01 or SD-96519-02), or monitoring circuit only, J98613Y (SD-96519-01 or SD-96519-02).

2.03 The 2B test set, J64730B (SD-56134-02).

2.04 Testing cord: for 13A TMS, W2DL cord, 6 feet long, equipped with 310 plug and two 35 cord tips (2W42A cord); for 21A TMS, P3N cord, 6 feet long, equipped with a 241A plug and a 310 plug (3P17B cord).

2.05 Patching cord, P3E cord, 3 feet long, equipped with two 310 plugs (3P7B cord).

2.06 Monitoring cord, P8E, 12 feet long, equipped with one KS-8585, List 10 plug and one KS-8586, List 7 socket.

2.07 Patching cord, P3E, 6 feet long, with 310 plug at each end (3P7A cord).

3. PREPARATION

STEP	ACTION	VERIFICATION
All Tests		
	Note: When using 21A TMS, before calibrating, allow connected ac power to warm up the measuring set. The ac power should not be disconnected if the TMS is to be used in these tests.	
1	Attach testing cord to TMS.	
2	TMS should be known to be correctly calibrated.	
3a	If monitoring circuit is on J98613N or J98613Y (monitoring circuit only) panel— Connect TMS to CAL MEAS jack.	Record TMS indication.
4a	Disconnect TMS from CAL MEAS jack.	
5a	Using 3P7B cord, patch CAL OUT jack of monitoring circuit to MON IN jack.	
6a	Connect TMS to AMP OUT jack of monitoring circuit.	
7a	Adjust GAIN control of MON AMP in monitoring circuit to obtain reading on TMS equal to that recorded in Step 3a.	
8a	Remove patch cord from CAL OUT, MON IN jacks.	
9b	If monitoring circuit is part of J98613AY (test and monitoring circuit)— Connect TMS to AMP OUT jack.	
10b	Turn S2 RECEIVER switch to position 2 M OPR.	TMS indication should be exactly 0 dB. See Step 11c.
11c	If requirement of Step 10b is not met— Readjust MON AMP to get 0 dB reading.	
12	Turn S2 RECEIVER switch to position 1 MEAS INPUT.	

STEP	ACTION	VERIFICATION
13	Patch monitoring cord between S socket of signaling unit to be monitored and S1 socket of monitoring circuit.	

4. METHOD

STEP	ACTION	VERIFICATION
A. Transmitted Tone Level		
14	Using 3P7B cord, patch LINE TRANS or LINE XMT jack of monitoring circuit to MON IN jack of monitoring circuit.	Steady SF tone indicates on-hook. TMS measurement is in accordance with Table B.

TABLE B

TRANSMITTED TONE LEVEL

SF UNIT UNDER TEST	TMS INDICATION	REMARKS	
E1A	−32.5 to −35.5		
	−42.8 to −45.8	If associated with P1T CXR.	
E1B E2B E3B E4B E1J	−35.0 to −37.0	If EQUIP side of SF unit is terminated with 600 ohms	
	−29.0 to −32.0	If EQUIP side of SF unit is left open	
E1C, E2C, E3C E4C, E5C, E1D E2D, E3D, E4D E5D, E1R, E1S E2S	−35.0 to −37.0		
E1L E2L E1P	Less than −45.0	Idle	Loop Start
	−23.0 to −27.0*	Ringing	
	−35.0 to −37.0	Idle	Ground Start
	−23.0 to −27.0 at 20-Hz rate	Ringing	

* For E1P — High level duration is 380 milliseconds

15	Remove patch cord from LINE TRANS or LINE XMT and MON IN jacks.	

STEP	ACTION	VERIFICATION
16d	If no other tests are to be performed— Disconnect all cords but leave testing cord attached to TMS.	

B. Received Tone Level

14	Using 3P7B cord, patch LINE REC or LINE RCV jack of monitoring circuit to MON IN jack of monitoring circuit.	Steady SF tone indicates on-hook. TMS measurement is in accordance with Table C.

TABLE C

RECEIVED TONE LEVEL

SF UNIT UNDER TEST	TMS INDICATION	REMARKS	
E1A	—12.0 to —24.0	If E1A at other end otherwise reading is 2dB lower	
E1B E2B E3B E4B E1J	—14.0 to —26.0	If E1A unit is at distant end, received level tone should be 2dB higher.	
E1C, E2C, E3C E4C, E5C	—14.0 to —26.0		
E1D, E2D, E3D E4D, E5D	—6.0 to —20.0		
E1L, E2L, E1P	—6.0 to —20.0	Assuming that E1S, E2S, or E1R at distant end.	
E1S E2S E1R	Less than —45.0	Idle	Loop Start
	+6.0 to —9.0*	Ringing	
	—6.0 to —20.0	Idle	Ground Start
	+6.0 to —9.0 at 20-Hz rates	Ringing	

* If E1P at other end — High level duration is 380 milliseconds.

Record indication.

Caution: Verification depends on transmitted SF tone level at distant office and on transmission characteristics of

STEP	ACTION	VERIFICATION
		trunk. If requirements are not met, refer trunk to office involved for investigation.
15	Remove patch cord from LINE REC or LINE RCV and MON IN jacks.	
16d	If no other tests are to be performed—Disconnect all cords but leave testing cord attached to TMS.	
C.	**Insertion of Band-Elimination Network or Blocking of Voice Amplifier**	
14	When requirement of Test B has been met—Using 3P7B cord, patch 2W or EQ REC (RCV) jack to MON IN jack.	With circuit in idle condition— ***E1B, E2B, E3B, E4B, E1J, E1P and E1R units.*** Power indicated on TMS should be at least 28 dB less power than recorded in Test B, Step 14. Power indication of less than −45 dBm is satisfactory if Test B recorded power indication is −18 dBm or less. ***E1A, E1C, E2C, E3C, E4C, E5C, E1D, E2D, E3D, E4D, E5D, E1L, E2L, E1S, and E2S units.*** TMS indicates less power than −45 dBm. ***Note:*** ▶Failure to meet these requirements can result from a high noise level on the trunk. If there is any doubt that the band-elimination filter is not functioning properly, refer to 1.04.◀
15	Remove patch cord from 2W or EQ REC (RCV) and MON IN jacks.	
16d	If no other tests are to be performed—Disconnect all cords but leave testing cord attached to TMS.	
D.	**Overall Receiver Operation**	
14	Restore all keys of 2B test set to normal.	
15	Plug power cords of 2B test set in TEST BAT A, TEST BAT B jacks of monitoring circuit. Where monitoring circuit is combined with testing circuit as in J98613N or J98613AY, these jacks are designated merely as A, B.	
16	Using 3P7A cord, patch between E & M jack of monitoring circuit, TST 2-D jack of 2B test set.	L lamp of 2B test set lights indicating R or RG relay of signaling unit has operated.

STEP	ACTION	VERIFICATION
17d	If Test F is not to be made or if no other unit is to be monitored— Disconnect all patches and power cords associated with 2B test set.	
E. Monitoring		
14	Plug head telephone set in MON OUT TEL SET or OUT T-R jacks of monitoring circuit.	
15	Using 3P7B cord, patch LINE TRANS or LINE XMT jack to MON IN jack.	
16	Disconnect TMS from AMP OUT jack, if it is connected to this jack.	For all units except E1L, E2L, or E1P in loop-start applications— Tone heard. When circuit is idle— Tone not heard. When circuit is seized— On-hook signal causes spurt of louder tone (higher level) preceding normal lower steady tone. During dialing, pulses of louder tone heard. For E1L, E2L, or E1P in loop-start applications— Louder tone heard only when 20-Hz ringing occurs. No tone during idle or seized condition.
17	Remove end of patch cord from LINE TRANS or LINE XMT jack, connect to LINE REC or LINE RCV jack.	***Note:*** This tone is, on the average, 23 dB greater than in Step 16 and is therefore much louder at the head telephone set. For all units except E1R, E1S, or E2S loop-start applications— Tone heard. When circuit is idle— Tone not heard. When circuit is seized— On-hook signal causes spurt of louder tone (higher level) preceding normal lower steady tone. During dialing, pulses of louder tone heard. For E1R, E1S, or E2S units only— Louder tone heard only when 20 Hz ringing occurs. No tone during idle or seized condition.
18	Remove patch cord from LINE REC or LINE RCV and MON IN jacks.	

STEP	ACTION	VERIFICATION
19d	If no other tests are to be performed— Disconnect all cords but leave testing cord attached to TMS.	
F. Signal Monitoring		
	Note: E3C, E4C, and E5C units ***cannot*** be tested per this test.	
14	Disconnect TMS from AMP OUT jack, if it is connected to this jack.	
15	On 2B test set— Restore all keys to normal.	
16	On 2B test set— Plug power cords in TEST BAT A, TEST BAT B jacks of monitoring circuit. Where monitoring circuit is combined with test circuit as in J98613N or J98613AY, these jacks are designated merely as A, B.	
17	Plug head telephone set in MON OUT TEL SET or OUT T-R jacks of monitoring circuit.	
18	Using 3P7A cord, patch between E & M jack of monitoring circuit and TST 2-D jack of 2B test set.	
Originating Office—Outgoing Call		
19	Using 3P7B cord, patch LINE TRANS or LINE XMT jack to MON IN jack.	On all units listed in Outgoing Call Table D observe circuit functions in accordance with following lamp indications on 2B test set during progress of outgoing service or testboard call. Not all calls have all line conditions listed; but if conditions do occur, lamps respond. 2600-Hz tone should be heard on E1A, E-B, E-C, E1J and E1R units when D lamp is on.
Terminating Office—Incoming Call		
20	Remove patch cord end from LINE TRANS or LINE XMT and plug into LINE REC or LINE RCV jack.	On all units listed in Incoming Call Table D observe circuit functions in accordance with following lamp indications of 2B test set during progress of incoming service or distant testboard call. Not all calls have all line conditions listed; but if conditions do occur, lamps respond. 2600-Hz tone should be heard on E1A, E-B, E-D, E1J, E-L, and E1P units when the L lamp is on.
21	Disconnect all cords.	

TABLE D

2B SIGNALING TEST SET INDICATIONS

SF UNIT CONDITION	OUTGOING CALL									
	E1A, E-B, E1C, E2C, E1J		E1S, E2S LOOP-START		E1S, E2S GROUND START		E1R LOOP-START		E1R GROUND START	
	LAMP		LAMP		LAMP		LAMP		LAMP	
	L	D	L	D	L	D	L	D	L	D
Idle	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
Seizure	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Stop Dial	OFF	OFF	—	—	—	—	—	—	—	—
Start Dial	ON	OFF	—	—	—	—	—	—	—	—
Dialing	ON	OFF +PLS	OFF	ON +PLS	OFF	ON +PLS	OFF	OFF +PLS	OFF	OFF +PLS
Intercept	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Busy back 60 IPM	FL	OFF	—	—	—	—	—	—	—	—
Reorder 120 IPM	FL	OFF	—	—	—	—	—	—	—	—
Ringing*	—	—	ON	—	ON	—	ON	—	ON	—
Called Pty Answer	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Called Pty Hang Up	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
Calling Pty Hang Up	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON

* On ringback or ringing of incoming call E1R, E1S, and E2S units will respond with a lamp "ON" condition.

SF UNIT CONDITION	INCOMING CALL									
	E1A, E-B E-D, E1J		E1L, E2L LOOP-START		E1L, E2L GROUND-START		E2P LOOP-START		E1P GROUND-START	
	LAMP		LAMP		LAMP		LAMP		LAMP	
	L	D	L	D	L	D	L	D	L	D
Idle	ON	ON	ON	ON	ON	ON	ON	OFF	ON	OFF
Seizure	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Stop dial	OFF	OFF	—	—	—	—	—	—	—	—
Start dial	OFF	ON	—	—	—	—	—	—	—	—
Dialing	OFF +PLS	ON	OFF +PLS	ON	OFF +PLS	ON	OFF +PLS	OFF	OFF +PLS	OFF
Intercept	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Busy back 60 IPM	OFF	FL	—	—	—	—	—	—	—	—
Reorder 120 IPM	OFF	FL	—	—	—	—	—	—	—	—
Ringing**	—	—	—	—	—	—	—	ON	—	—
Called Pty Answer	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Called Pty Hang Up	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
Calling Pty Hang Up	ON	ON	ON	ON	ON	ON	ON	OFF	ON	OFF

** On ringback or ringing of call to E1R, E1S, or E2S units the lamp will light if the E1P unit is using E and M lead signaling only.