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, E2S AND E3S 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, ▶E3S◀ 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 is reissued for the following reasons:

(a) To include the use of the 4A signaling test set, when available, in Tests D and F.

(b) To delete references to the 13A TMS.

(c) To add the E3S to the title.

(d) To make minor changes as necessary to conform with the above.

This reissue does not affect the Equipment Test List.

1.03 The tests covered are:

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D. Overall Receiver Operation: This test checks that the received tone level measured in Test B has been amplified and converted to dc power of sufficient strength to operate the receiver relay. 6

E. Circuit Monitoring: This test checks the condition of the circuit; whether idle (tone on), or seized (tone off), or other conditions. 7

F. Signal Monitoring: This test checks that the supervisory signals and dial pulses are passed to and received from the drop, thereby indicating that the signaling circuit is operating properly. 8

1.04 In addition to the tests in this section, over the line pulsing and supervision tests per Section 179-302-501 or 179-302-502 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.

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 The 4A signaling test set will be referred to in this section as the 4A test set.

1.09 Because there are variations in monitor circuits, two methods of calibrating the MON amplifier 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.

1.10 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.

1.11 ***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 or 4A Test set (2.03)				1		1
21A TMS (2.04)	1	1	1			
Head Telephone set					1	1
Cord (2.05)	1	1	1	1		
Cord (2.06)	1	1	1		1	1
Cord (2.07)	1	1	1	1	1	1
Cord (2.08)				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) or the 4A test set, J94743A (SD-1C244-01), including the E&M interface unit, J94743AD.

2.04 The J94021A (21A) transmission measuring set (TMS).

2.05 Patching cord, P3N cord, 6 feet long, equipped with a 241A plug and a 310 plug (3P17B cord).

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

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

2.08 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.	
1	Attach 3P17B cord to TMS.	
2	Calibrate TMS if necessary.	
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 amplifier in monitoring circuit to obtain indication same as recorded in Step 3a.	
8a	Remove patch cord from CAL OUT, MON IN jacks.	
9b	If monitoring circuit is part of J89613AY (test and monitoring circuit)— Connect TMS to AMP OUT jack.	
10b	Set RECEIVER switch to position 2.	TMS indicates 0 dB. See Step 11c.
11c	If requirement of Step 10b is not met— Adjust gain control of MON amplifier to obtain 0 dB.	

STEP	ACTION	VERIFICATION
12	Set RECEIVER switch to position 1.	
13	Using P8E cord, patch 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.	With circuit in idle condition (tone on)— 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 ▶E3S◀	−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

STEP	ACTION	VERIFICATION
15	Remove patch cord from LINE TRANS or LINE XMT and MON IN jacks.	
16d	If no other tests are to be performed—Disconnect all cords.	

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.	With circuit in idle condition—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, ◗E3S◖ or E1R at distant end.	
E1S E2S, ◗E3S◖ 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.

STEP	ACTION	VERIFICATION
		Record indication. ***Caution: Verification depends on transmitted SF tone level at distant office and on transmission characteristics of 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.	
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, E2S and E3S 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 network is functioning properly, refer to 1.05.
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.	
D.	**Overall Receiver Operation**	
14d	If using 2B test set— Restore all keys of 2B test set to normal.	
15d	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.	

STEP	ACTION	VERIFICATION
16d	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 lighted indicating R or RG relay of signaling unit has operated.
17e	▶If using 4A test set— Connect 4A test set to 110-volt ac, operate POWER switch to ON.	
18e	Equip 4A test set with E&M interface unit.	
19e	Using 3P7A cord, connect E & M jack of test circuit to DROP/S jack of 4A test set.	
20e	At 4A test set— Operate TWD LINE, TWD DROP keys to MON.	
21e	Set E&M/CX-S/R switch to E&M/CX.	With circuit in idle condition— LINE lamp lighted.◀
22f	If Test F is not to be made or if no other unit is to be monitored— Disconnect all cords.	
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.	For all units except E1L, E2L, or E1P in loop-start applications— When circuit is idle— Tone heard. When circuit is seized— Tone not heard. 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, E2S, ▶or E3S◀

STEP	ACTION	VERIFICATION
		loop-start applications— When circuit is idle— Tone heard. When circuit is seized— Tone not heard. 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, E2S, ▶or E3S◀ 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.	
19d	If no other tests are to be performed— Disconnect all cords.	

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	Plug head telephone set in MON OUT TEL SET or OUT T-R jacks of monitoring circuit.	
16d	If using 2B test set— At 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.	
17d	Using 3P7A cord, patch between E & M jack of monitoring circuit and TST 2-D jack of 2B test set.	
18e	▶If using 4A test set— Connect 4A test set to 110-volt ac power.	
19e	Equip 4A test with E&M interface unit.	
20e	Using 3P7A cord, connect E&M jack of monitoring circuit to DROP/S jack of 4A test set.	

STEP	ACTION	VERIFICATION
21e	Operate TWD LINE, TWD DROP keys to MON.	
22e	Set E&M/CX-S/R switch to E&M/CX.	
	Originating Office—Outgoing Call	
23	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 or 4A 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	
24	Remove patch cord 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 or 4A 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.
25	Disconnect all cords.	

TABLE D

2B SIGNALING TEST SET INDICATIONS

SF UNIT CONDITION	OUTGOING CALL									
	E1A, E-B, E1C, E2C, E1J		E1S, E2S, ▶E3S◀ LOOP-START		E1S, E2S, ▶E3S◀ GROUND START		E1R LOOP-START		E1R GROUND START	
	LAMP ***		LAMP ***		LAMP ***		LAMP ***		LAMP ***	
	LINE	DROP	LINE	DROP	LINE	DROP	LINE	DROP	LINE	DROP
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, E2S, and ▶E3S◀ 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 ***	
	LINE	DROP	LINE	DROP	LINE	DROP	LINE	DROP	LINE	DROP
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.

***The line and drop lamps of the 2B test set are designated L and D, respectively.