TRUNK TRANSMISSION TESTS

PANEL AND PANEL TANDEM OFFICES

PROVIDED WITH OUTGOING TRUNK TEST FRAME OR TESTBOARD

1. GENERAL

1.01 This section describes the methods of making transmission measurements on outgoing trunks and trunks to switchboards, or plant or traffic operating desks in panel or panel tandem offices using an outgoing trunk test frame or testboard. This section also describes the method of assisting with transmission measurements on incoming trunks. The transmission measurements covered in this section include loss, message circuit noise, impulse noise, frequency response, and peak-to-average ratio (P/AR). These transmission measurements include transmission measurements formerly contained in Section 215-174-501, Issue 4 and Section 215-721-501, Issue 4.

1.02 This section is reissued to:

(a) Add 23D transmission measuring set to apparatus list and tests A, D, E, AA, AB, BA and BB

(b) Add 6H IC to apparatus list and describe its use in tests C, AD and BD

(c) Add J94742A portable auxiliary test set to apparatus list and describe its use in tests A, B, D, E, AA, AB, and AC when testing trunks to No. 5 CSBR ACD.

This reissue does not affect the Equipment Test List.

1.03 The tests covered are:

1.04 The tests and procedures in this section are identified by a special designation plan. Single test letters A through Z are reserved for tests which require no assistance at the terminating end. Double test letters AA through AZ are reserved for near end originated tests that require assistance at the far end. Double lettered procedures BA through BZ are reserved for the assistance required on incoming tests to this office. The second letter of double lettered tests and procedures identifies companion procedures and tests. For example:

NEAR END TEST	CORRESPONDING FAR END PROCEDURE
AA	BA
AB	BB
. . . . .	
AZ	BZ

The tests and procedures for the far end offices are contained in the trunk transmission sections covering the particular type of far end office involved.

1.05 Transmission requirements for trunks are shown on circuit layout cards, local trunk records, or appropriate sections of the practices.

1.06 In each test, the transmission loss indicated by the transmission measuring set (TMS) meter includes the connecting circuits used to complete the connection.

1.07 The transmission loss indicated by the TMS meter is the actual measured loss (AML) in dB of the circuit under test and is made under the same conditions as expected measured loss (EML) was computed.

1.08 The results of these tests should be entered on the proper form.

1.09 For Tests AB and BB, when using the KS-19353, L1 oscillator, the output must be set using a 23-type TMS prior to testing. When using the KS-19353 L1 or L4 oscillator to test single frequency signaling trunks, the output of the oscillator must be disconnected before sweeping through a signaling frequency such as 2400 Hz or 2600 Hz.

1.10 After the trunk under test has been connected to a 101-type test line, Tests AA through AE can be performed on the same trunk without releasing the trunk from the test line.

1.11 If so directed by the distant originating end, Tests BA through BE can be performed on the trunk under test before releasing it.

1.12 Test C is only applicable to trunks not containing N, O, or ON carrier.

1.13 For Tests AA through AE, a talking path can be established with the terminating end using either the handset associated with the outgoing trunk test circuit or a 52S (replaces 52A) head telephone set connected to the telephone circuit associated with the OGT test circuit.

1.14 A busy test should be made after connecting to the trunk T jack at the OGT test circuit (see Section 215-721-501). The MB jack associated with the trunk can be used when the trunk is busy to hold the trunk when it becomes idle and can be used when the trunk is idle to hold it out of service. Two sets of T and MB jacks are provided at the OGT test circuit for each ANI outgoing trunk (SD-21972-01 and SD-21974-01). One set of T and MB jacks is associated with the district or office multiple end of the trunk circuit and the other set is associated with the line side of the trunk circuit. ***When testing an ANI outgoing trunk, the T jack associated with the district***

or office multiple and the MB jack associated with the line side of the trunk circuit should be used. With an ANI key provided, test calls may be directed to a special NNX code (a free code) without AMA tape registration. Any other test line termination will be routed to an operator for verification of calling number. When an ANI key is not provided, no tests can be performed without operator assistance on ANI trunks to a 4-type toll office and only tests which have a special NNX code (a free code) assigned to them can be directed to crossbar tandem or No. 5 crossbar offices. The ANI key does not serve PCI test facilities; therefore, only tests to those lines which have been assigned a special NNX code can be performed without operator assistance on ANI trunks requiring PCI pulsing.

1.15 ***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.

2. APPARATUS

2.01 The apparatus required for each test is shown in Table A. A more descriptive name and additional information on each item are covered in the paragraph indicated by the number in parentheses. Calibration and operating procedures for each set may be found in the section listed with each test set. ***It is important that the transmission test equipment is known to be accurately calibrated.***

2.02 Outgoing trunk test board test circuit (OGT test circuit) SD-21154-01.

2.03 Outgoing trunk test board test circuit (OGT test circuit) SD-21610-01.

2.04 Trouble desk trunk test cord circuit (OGT test circuit) SD-21941-01.

2.05 Trouble desk outgoing trunk test positions (OGT test circuit) ES-20015-01.

2.06 Trunk test cord trouble desk (OGT test circuit) ES-226467.

2.07 Test termination circuit (TTC) SD-96540-01.

2.08 Transmission and noise measuring circuit (TNM) SD-95900-01.

2.09 Transmission test line or test trunk circuit (101-type test line) SD-98100-01; Item 145 for ground cutoff offices, Item 160 for battery cutoff offices.

2.10 23A, B, C, or D transmission measuring set (TMS) J94023A, B, C, or D (Sections 103-223-100 or 103-223-101).

2.11 3A or 3C noise measuring set (NMS) J94003A or J94003C (Section 103-611-100 or Section 103-611-101 respectively).

2.12 6A or 6H impulse counter (IC) J94006A or J94006H (Section 103-620-100 or 103-620-101).

Note 1: The 6H IC should be equipped with C-notched weighting filter 497G.

Note 2: When 6A IC is used for measurements without 554A filter, it should be calibrated from a 900-ohm source, i.e. 1000-0-900 jack.

2.13 KS-19260 or KS-19353, L1 or L4 oscillator (OSC) (Section 103-302-100, 103-302-105, or 103-302-106 respectively).

Note: The oscillator should be adjusted to desired output level as measured with the 23-type TMS. With the KS-19353 L1 OSC the output should be checked after each change in frequency.

2.14 P/AR meter generator (P/AR GEN) J94027A (Section 103-110-110).

2.15 P/AR meter receiver (P/AR RCVR) J94027B (Section 103-110-110).

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

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

TABLE A

APPARATUS	TESTS														
	A	B	C	D	E	AA	AB	AC	AD	AE	BA	BB	BC	BD	BE
OGT Test Circuit (2.02), (2.03), (2.04), (2.05), or (2.06)	1	1	1	1	1	1	1	1	1	1					
TTC (2.07)	1	1	1	1	1	1	1	1	1	1	1	1	1		
TNM (2.08)	1	1		1	1	1	1	1			1	1	1		
101-Type Test Line (2.09)											1	1	1	1	1
23-Type TMS (2.10)	1			1	1	1	1				1	1			
3A or 3C NMS (2.11)		1						1					1		
6A or 6H IC (2.12)			1						1					1	
Oscillator (2.13)							1		1*			1		1*	
P/AR GEN (2.14)										1					1
P/AR RCVR (2.15)										1					1
Patching Cord (2.16)	1	1‡		2	2	2	2	1‡		3	3	3	2‡		2
Patching Cord (2.17)	1	1		2	2	2	2	1			2	2			
Patching Cord (2.18)	2	2	2	2	3	2	2	2	2						
Testing Cord (2.19)		1						1					1		
Patching Cord (2.20)			1						1†					1†	
Patching Cord (2.21)‡		1						1					1		
Testing Cord (2.22)									2§	1				2§	1
Test Receiver (2.23)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
52S Head Telephone Set (2.24)													1	1	
554A Filter§									1					1	
J94742A Aux. Test (2.25)	1	1		1	1	1	1	1							
Patching Cord (2.26)¶	1	1		1	1	1	1	1							

* Required if testing trunks containing N, O, or ON carrier.

† Required if testing trunks not containing N, O, or ON carrier or if using 6H IC.

§ Required if testing trunks containing N, O, or ON carrier using 6H IC.

‡ 2P16A cord required for connection to 3A NMS.
3P7A cord required for connection to 3C NMS.

¶ Required if testing trunks to No. 5 CSBR ACD.

2.18 Patching cord, P3F cord, 8 feet long, equipped with a 309 plug and a 310 plug (3P12H cord).

2.19 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord) and two KS-6278 connecting clips (for connecting ground to 3A NMS).

2.20 Patching cord, P2B cord, equipped with two 310 plugs (2P4C cord). ***Do not substitute; 6A IC must not be grounded.***

2.21 Patching cord, P2AE cord, 4 feet long, equipped with a 310 plug and a 289B plug (2P16A cord).

2.22 Patching cord, W2DL cord, 5 feet 6 inches long, equipped with a 310 plug and two 35 cord tips (2W33A cord).

2.23 Test receiver, 716C receiver equipped with a 310 plug.

2.24 52S (replaces 52A) head telephone set.

2.25 ◗J94742A portable auxiliary test set for originating calls to No. 5 CSBR ACD.

2.26 Patching cord, P2J cord, 6 feet long, equipped with two 310 plugs (2P9B cord).◖

3. PREPARATION

3.01 ***Each test set employed in the tests should be calibrated in accordance with the appropriate section of the practices (see Part 2) before it is used.*** Also refer to these sections for details of operations of the test set.

3. PREPARATION (Cont)

STEP	ACTION	VERIFICATION
Tests A, D, E, AA, AB, BA, BB		
1	At TTC— Restore all keys.	
2a	If using portable 23-type TMS— At portable 23-type TMS— Using 3P7A cord, connect MEAS jack to REC1 jack of TTC.	
3a	Operate INPUT key to 900.	
4a	Operate function key to MEAS.	
5b	If using frame-mounted 23B or 23C TMS— Using 3P7B cord, connect MEAS/900 jack to REC1 jack of TTC.	
6c	If using TNM circuit— Using 3P7B cord, connect RCV or RCV B jack to REC1 jack of TTC.	
7d	◗If testing trunks to a No. 5 CSBR ACD— At J94742A portable auxiliary test set— Restore all keys to normal.	
8d	Place TRK TR switch in Position 1.	
9d	Using P2J cord, connect BAT jack to −48V battery and ground supply.	
10e	If testing trunks to a No. 5 CSBR ACD using SF signaling— Operate DEL key.◖	

STEP	ACTION	VERIFICATION
Tests A, D, E, AA, AB		
11	At TTC— Using P3F cord, connect TST1 jack to T1 jack of OGT test circuit. *Note:* ▶Omit this step if testing trunks to No. 5 CSBR ACD.◀	
12	Using P3F cord, connect TRK1 jack to T jack of trunk under test (see 1.14).	If testing switchboard- or desk-ended trunk— At switchboard or desk— Call is answered and, if required, will be transferred to supervisory telephone circuit.
13d	▶If testing trunks to a No. 5 CSBR ACD— At J94742A portable auxiliary test set— Using P3F cord, patch TRK 1 TST FAC jack to TRK1 jack of TTC.	
14d	Using P3F cord, patch TRK1 TRK jack to T jack of trunk to be tested (see 1.14).◀	
15	Insert plug of test receiver into RCVR jack.	
Tests B, AC, BC		
16	At TTC— Restore all keys.	
17f	If using 3A NMS— On 3A NMS— Set FUNCTION switch to NM-900.	
18f	Connect GRD post to ground.	
19f	Using P2AE cord, connect 289B plug to IN jack of 3A NMS and 310 plug to REC1 jack of TTC.	
20g	If using 3C NMS— At 3C NMS— Set FUNCTION switch to NM-600/900.	
21g	Connect GRD post to ground.	
22g	Using P3E cord, connect IN jack of 3C NMS to REC1 jack of TTC.	
23c	If using TMN circuit— At TNM— Operate NM key.	NMB lamp lighted.

STEP	ACTION	VERIFICATION
24c	Using 3P7B cord, connect RCV or RCV B jack to REC1 jack on TTC.	
25	At TTC— Using P3F cord, connect TST1 jack to T1 jack of OGT test circuit. ***Note:*** ▶Omit this step if testing trunks to No. 5 CSBR ACD.◀	
26	Using P3F cord, connect TRK1 jack to T jack of trunk under test (see 1.14).	If testing switchboard- or desk-ended trunks— At switchboard or desk— Call is answered and, if required, will be transferred to supervisory telephone circuit.
27d	▶If testing trunks to a No. 5 CSBR ACD— At J94742A portable auxiliary test set— Restore all keys to normal.	
28d	Place TRK TR switch in Position 1.	
29d	Using P2J cord, connect BAT jack to −48V battery and ground supply.	
30d	Using P3F cord, patch TRK1 TST FAC jack to TRK1 jack of TTC.	
31d	Using P3F cord, patch TRK1 TRK jack to T jack of trunk to be tested (see 1.14).	
32e	If testing trunks to a No. 5 CSBR ACD using SF signaling— Operate DEL key.◀	
33	Insert plug of test receiver into RCVR jack.	
Tests C, AD		
34	At TTC— Restore all keys.	
35	Using P3F cord, connect TST1 jack to T1 jack of OGT test circuit.	
36	Using P3F cord, connect TRK1 jack to T jack of trunk under test (see 1.14).	If testing switchboard- or desk-ended trunk— At switchboard or desk— Call is answered and, if required, will be transferred to supervisory telephone circuit.
37	Insert plug of test receiver into RCVR jack.	

STEP	ACTION	VERIFICATION
Tests AB, BB		
38h	If using portable KS-19353 OSC— At KS-19353 OSC— Using 3P7A cord, connect OUTPUT jack to SD jack of TTC.	
39h	Operate FUNCTION switch to 900.	
40i	If using frame-mounted KS-19260 OSC— At TTC— Using 3P7B cord, patch REC1 jack to OSC/900 jack.	
Tests AE, BE		
41	At TTC— Restore all keys.	
42	At P/AR RCVR— Operate IMPEDANCE key 900.	
43	At TTC— Using W2DL cord, connect 310 plug to REC1 jack and 35 cord tips to INPUT binding posts of P/AR receiver.	
44	Using 3P7A cord, connect SD jack to 900 jack of P/AR generator.	

4. METHOD

STEP	ACTION	VERIFICATION
A. One-Way 1000-Hz Loss Measurement to 102-Type Test Line (Fig. 1)		
16	At TTC— Operate SD REC1 key to its receive position (horizontal).	
17	At OGT test circuit— Originate call to 102-type test line in office in which trunk terminates, as described in Section 215-721-501.	1000-Hz tone heard in test receiver.
18j	If testing switchboard-ended trunks— Request connection to 1MW TEST jack.	
19d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.

STEP	ACTION	VERIFICATION
20d	Restore START 1 key.	
21d	Press TOUCH-TONE® button 2 to select 102-type test line.	
22d	Operate CUT THRU 1 key.◀	
23	At TTC— Operate TMS1 key.	At 23-type TMS or TNM— Meter reading is far-to-near transmission loss.
24	At 23-type TMS or TNM— Record meter reading (Scale B on TNM meter).	
25	Remove connection from T jack of trunk just tested.	
26	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 16 through 25.	
27k	If no further tests are to be made— Remove all patching cords; restore all keys.	

B. Message Circuit Noise Measurement To 100-Type Test Line (Fig. 1)

34	At TTC— Operate SD REC1 key to its receive position (horizontal).	
35	On OGT test circuit— Originate call to 100-type test line in office in which trunk terminates as described in Section 215-721-501.	
36j	If testing switchboard-ended trunks— Request connection to balance test termination.	
37d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
38d	Restore START 1 key.	
39d	Press TOUCH-TONE button 0 to select 100-type test line.	
40d	Operate CUT THRU 1 key.◀	
41	Operate TMS1 key.	At 3A or 3C NMS or on scale A of TNM— Meter indicates noise measured at near end. Character of noise heard in 716C receiver.

STEP	ACTION	VERIFICATION
42	At 3A or 3C NMS or on TNM— Record meter reading (Scale A on TNM) and character of noise.	
43	Remove connection from T jack of trunk just tested.	
44	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 34 through 43.	
45k	If no further tests are to be made— Remove all patching cords; restore all keys.	

C. Impulse Noise Measured To 100-Type Test Line (Fig. 1)

Note: Test C is applicable only to trunks not containing N, O, or ON carrier.

38j If using 6A IC—
At TTC—
Using P2B cord, connect REC1 jack to IN jack of 6A IC.

Note: 6A IC must ***not*** be grounded.

39j At 6A IC—
Set REF LEV DBRN key and switch to step nearest required noise reference level.

40k ▶If using 6H IC—
At TTC—
Using P2B cord, connect REC1 jack to MEAS jack of 6H IC.

41k At 6H IC—
Operate DIAL MEAS switch to MEAS.

42k Set DBRN control to required noise reference level.◀

43 At OGT test circuit—
Originate call to 100-type test line in office in which trunk terminates as described in Section 215-721-501.

44l If testing switchboard-ended trunks—
Request connection to balance test termination.

STEP	ACTION	VERIFICATION
45	At TTC— Operate SD REC1 key to its receive position (horizontal).	
46	Operate TMS1 key.	
47j	If using 6A IC— At 6A IC— Operate timer switch to HOLD or to 5 minutes beyond required interval, then set to required timing interval.	
48k	▶If using 6H IC— Operate TIMER switch to required interval. ***Note:*** To insure accurate timing on intervals of 3 minutes or less, adjust TIMER to 5 minutes and return to desired interval.◀	
49	Momentarily operate RESET key.	
50	After timing interval— Record counter reading. ***Note:*** If distant end returns repetitive on-hook supervision, monitor connection with 716C receiver and observe impulse counter to determine number of impulses per minute caused by changes in supervision. Multiply by timing interval in minutes and subtract result from counter reading in Step 50.	Counter indicates impulse counts measured at near end minus corrections, if required.
51	Remove connections from T jack of trunk just tested.	
52	For other trunks to be tested— Repeat appropriate steps in PREPARATION and Steps 38j through 51.	
53m	If no further tests are to be made— Remove all patching cords; restore all keys.	

D. Two-Way 1000-Hz Loss Measurement and Noise Check to 104-Type Test Line (Fig. 1)

16	At TTC— Using 3P7B cord, connect SD jack to 1000-0-900 jack.	
17	Operate SD REC1 key to its receive position (horizontal).	

STEP	ACTION	VERIFICATION
18	At OGT test circuit— Originate call to 104-type test line, as described in Section 215-721-501. ***Note:*** ▸Supervisory lamp may be designated in any of several ways (S, TSUP, SUP1, SUP2) depending upon which OGT test circuit is used.◂	S (supervisory) lamp lighted or test progress tone heard.
19	If testing switchboard-ended trunks— Request connection to 104-type test termination.	
20d	▸If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
21d	Restore START 1 key.	
22d	Press TOUCH-TONE button 4 to select 104-type test line.	
23d	Operate CUT THRU 1 key.◂	
24	Operate TMS1 key.	
25	Immediately after supervisory lamp is extinguished or test progress tone is removed— At TTC— Operate and hold SD REC1 to SD position for approximately 3 seconds. ***Note:*** Near-to-far transmission loss measured and data stored at distant transmission measuring circuit.	
26	After 3-second period— Operate SD REC1 key to its receive position (horizontal).	1000-Hz tone received for 10 seconds. ***Note:*** If S lamp lights momentarily or a short burst of test progress tone is heard ***instead of*** the 10-second tone, repeat Steps 24 through 26. If S lamp lights momentarily or a short burst of test progress tone is heard ***after*** the 10-second tone, add 10 dB to TMS or TNM meter reading for the second 10-second tone.
27	Record far-to-near transmission loss during first 10-second tone.	
28	Record sum of far-to-near and near-to-far losses during second 10-second tone.	

STEP	ACTION	VERIFICATION
29j	If far-end noise check required— After second 10-second tone removed— Monitor test call for 5 seconds.	If S lamp lights steadily or steady test progress tone heard— Far-end noise does not exceed 41 DBRNC. If S lamp flashes or interrupted test progress tone heard— Far-end noise exceeds 41 DBRNC.
30	Subtract TMS or TNM reading in Step 27 from reading in Step 28.	Result is near-to-far transmission loss.
31	Remove test connection from T jack of trunk just tested.	
32	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 18 though 31.	
33k	If no further tests are to be made— Remove all patching cords; restore all keys.	

E. Two-Way 1000-Hz Loss Measurement Using Loop-Around Test Line (Fig. 1 and 2)

16	At TTC— Operate SD REC1 key to its receive position (horizontal).	
17	At OGT test frame— Originate call to 102-type test line in office in which trunk terminates, as described in Section 215-721-501.	
18j	If testing switchboard-ended trunks— Request connection to 1MW jack.	
19d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
20d	Restore START 1 key.	
21d	Press TOUCH-TONE button 2 to select 102-type test line.	
22d	Operate CUT THRU 1 key.◀	
23	At TTC— Operate TMS1 key.	At 23-type TMS or TNM— Meter reading indicates far-to-near transmission loss.
24	At 23-type TMS or TNM— Record meter reading (Scale B on TNM).	

STEP	ACTION	VERIFICATION
25	Remove connection for T jack of trunk just tested.	
26	For remaining trunks in group— Repeat appropriate Steps in PREPARATION and Steps 16 through 25.	
27	When all trunks in group have been tested— Select one trunk from the group to be used as a "reference trunk," (see Section 660-501-500).	
28	At TTC— Restore all keys.	
29	Disconnect 310 plug from REC1 jack (Fig. 1) and connect it to REC2 jack (Fig. 2).	
30	Using 3P7B cord, connect SD jack to 1000-0-900 jack.	
31	Operate SD REC1 key to its receive position (horizontal).	
32	Using P3F cord, connect TST2 jack to T1 jack of manual outgoing trunk test frame. ***Note:*** ▶Omit this step if testing trunks to No. 5 CSBR ACD.◀	
33	Using P3F cord, connect TRK1 jack to T jack of first trunk to be tested.	
34	Using P3F cord, connect TRK2 jack to T jack of "reference trunk."	
35	At OGT test circuit— Originate call as described in Section 215-721-501 to first appearance of loop-around test termination circuit.	
36	If testing switchboard-ended trunks— Request connection to first appearance of loop-around test termination.	
37d	▶If testing trunks to No. 5 CSBR ACD— At J94742A portable auxiliary test set— Using P3F cord, connect TRK 1 TST FAC jack to TRK1 jack of TTC.	
38d	Using P3F cord, connect TRK 1 TRK jack to T jack of reference trunk.	

STEP	ACTION	VERIFICATION
39d	Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
40d	Restore START 1 key.	
41d	Press TOUCH-TONE button 6 to select first appearance of loop-around test termination.	
42d	Operate CUT THRU 1 key.◀	
43	At TTC— Operate TMS2 and REC2 keys. ***Note:*** If first appearance of loop-around test termination circuit is also a 102-type test line, TMS or TNM indicates far-to-near transmission loss of reference trunk.	
44	Remove plug from TST2 jack and insert into TST1 jack.	
45	At OGT test circuit— Originate call to second appearance of loop-around test line as described in Section 215-721-501.	
46j	If testing switchboard-ended trunks— Request connection to second appearance of loop-around test termination.	
47d	▶If testing trunks to No. 5 CSBR ACD— At J94742A portable auxiliary test set— Using P3F cord, connect TRK 2 TST FAC jack to TRK2 jack of TTC.	
48d	Using P3F cord, connect TRK 2 TRK jack to T jack of first trunk to be tested.	
49d	Operate TRK TR switch to position 2.	
50d	Operate START 2 key.	Interrupted dial tone heard in monitoring receiver.
51d	Restore START 2 key.	
52d	Press TOUCH-TONE button 7 to select second appearance of loop-around test termination.	
53d	Operate CUT THRU 2 key.◀	
54	At TTC— Operate TMS1 key and operate SD REC1 key to its send position (vertical).	Test tone received at TMS or TNM.

STEP	ACTION	VERIFICATION
55	Record loop-around test transmission loss.	Difference between loop-around loss and far-near loss of "reference trunk" is near-far loss of trunk under test.
56	At TTC— Restore TMS1 key and operate SD REC1 key to its receive position (horizontal).	
57	At OGT— Remove P3F cord from T jack of trunk just tested.	
58	Insert P3F cord into T jack of next trunk to be tested.	
59	Repeat Steps 45 through 58 for each remaining trunk in group to be tested.	
60	Remove plug of cord connected to T jack of "reference trunk".	
61	Insert plug of cord removed from T jack of last trunk tested (Step 57) into T jack of "reference trunk".	
62	Select "second reference trunk" from trunks previously tested (see Section 660-501-500).	
63	Restore TMS2 and REC2 keys.	
64	Insert plug of cord connected to TRK2 jack into T jack of "second reference trunk."	
65d	◗If testing trunks to No. 5 CSBR ACD— Insert plug of cord connected to TRK 2 TRK jack into T jack of second reference trunk.◖	
66	Remove plug of cord connected to T1 jack from TST1 jack and insert into TST2 jack.	
67	Repeat Steps 35 through 55 considering "reference trunk" to be trunk under test and the "second reference trunk" to be the "reference trunk."	
68k	If no further tests are to be made— Remove all patching cords; restore all keys.	

STEP	ACTION	VERIFICATION
AA.	**Two-Way 1000-Hz Loss Measurement to 101-Type Test Line, Switchboards, or Plant or Traffic Operating Desks—Originating End Procedures (Fig. 1)**	
16j	If testing nonswitchboard-ended or non desk-ended trunks— At OGT test circuit— Originate call to 101-type test line, as described in Section 215-721-501.	
17d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
18d	Restore START 1 key.	
19d	Press TOUCH-TONE button 1 to select 101-type test line.	
20d	Operate CUT THRU 1 key.◀	
21	Request terminating end to connect 0 dBm 1000-Hz tone to trunk under test for agreed upon interval.	
22	At TTC— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	At 23-type TMS or TNM— Meter indicates far-to-near loss.
23	At 23-type TMS or TNM— Record meter reading (Scale B on TNM). ***Note:*** If only one-way test is required, omit Steps 24 through 30k.	
24	After agreed upon interval— At TTC— Restore TMS1 key.	
25	Request terminating end to measure.	
26	At TTC— Using 3P7B cord, connect SD jack to 1000-0-900 jack.	
27	At TTC— Operate TMS1 key and operate SD REC1 key to its send position (vertical).	
28	After agreed upon interval— Restore TMS1 key and operate SD REC1 key to its receive position (horizontal).	

STEP	ACTION	VERIFICATION
29	Obtain and record TMS reading from terminating end.	
30k	If no further tests are to be made on this trunk— Request terminating end to disconnect.	
31	At TTC— Remove test connection from T jack of trunk just tested.	
32	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 16j through 31.	
33l	If no further tests are to be made— Remove all patching cords; restore all keys.	

AB. Two-Way Frequency Response Measurement To 101-Type Test Line, Switchboard, or Plant or Traffic Operating Desks—Originating End Procedures (Fig. 1)

41j	If testing nonswitchboard-ended or nondesk-ended trunks— At OGT test circuit— Originate call to 101-test line, as described in Section 215-721-501.	
42d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
43d	Restore START 1 key.	
44d	Press TOUCH-TONE button 1 to select 101-type test line.	
45d	Operate CUT THRU 1 key.◀	
46	Request terminating end to send first required frequency at 0 dBm for agreed upon length of time.	
47	At TTC— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	Tone heard in receiver. TMS indicates far-to-near loss at first frequency.
48	Record TMS reading.	
49	Restore TMS1 key and request next required frequency to be sent.	

STEP	ACTION	VERIFICATION
50	Operate TMS1 key.	Tone heard in receiver. TMS indicates far-to-near loss at second frequency.
51	Record TMS reading.	
52	Repeat Steps 49 through 51 for other required frequencies. ***Note:*** If only one-way test required, omit Steps 53 through 60.	
53	Restore TMS1 key and request terminating end to measure loss at required frequencies over trunk under test.	
54	Adjust oscillator to send first required frequency at 0 dBm.	
55	Operate TMS1 key.	
56	Operate SD REC1 key to its send position (vertical) for agreed upon length of time.	
57	Restore SD REC1 key to its receive position (horizontal); then restore TMS1 key.	
58	Obtain and record TMS reading from terminating end.	
59	Adjust oscillator to send next required frequency at 0 dBm. ***Note:*** TMS1 key must be normal while changing frequencies. This is particularly important when passing through 2400 to 2600 Hz.	
60	Repeat Steps 55 through 59 for other required frequencies.	
61k	If no further tests are to be made on this trunk— Request terminating end to disconnect.	
62	Remove test connection from T jack of trunk just tested.	
63	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 41j through 62.	

STEP	ACTION	VERIFICATION
64l	If no further tests are to be made— Remove all patching cords; restore all keys.	

AC. Message Circuit Noise Measurement to 101-Type Test Line, Switchboards, or Plant or Traffic Operating Desks—Originating End Procedures (Fig. 1)

34	At TTC— Operate SD REC1 key to its receive position (horizontal).	
35j	If testing nonswitchboard-ended or nondesk-ended trunks— On OGT test circuit— Originate call to 101-type test line in office in which trunk terminates, as described in Section 215-721-501.	
36d	▶If testing trunks to a No. 5 CSBR ACD— Operate START 1 key.	Interrupted dial tone heard in monitoring receiver.
37d	Restore START 1 key.	
38d	Press TOUCH-TONE button 1 to select 101-type test line.	
39d	Operate CUT THRU 1 key.◀	
40	Request terminating end to provide a balance termination or, if a far-end noise measurement is also desired, to connect noise measuring equipment at far end. ***Note:*** If only one-way test required, omit Steps 41 and 44.	
41	Request terminating end to measure noise for agreed upon interval.	
42	At TTC— Operate TMS1 key.	Noise meter indicates noise measured at near end. Character of noise heard in 716C receiver.
43	Record meter reading and character of noise.	
44	After agreed upon interval— Restore TMS1 key and obtain measurement and character of noise from terminating end.	

STEP	ACTION	VERIFICATION
45k	If no further tests are to be made on this trunk— Request terminating end to disconnect.	
46	At TTC— Remove test connections from T jack of trunk just tested.	
47	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 34 through 46.	
48	If no further tests are to be made— Remove all patching cords; restore all keys.	

AD. Impulse Noise Measurement To 101-Type Test Line, Switchboards, or Plant or Traffic Operating Desks—Originating End Procedures (Fig. 1)

For Trunks Not Containing N, O, or ON Carrier

38j	If using 6A IC— At TTC— Using P2B cord, connect REC1 jack to IN jack of 6A IC. ***Note:*** 6A IC must ***not*** be grounded.	
39j	At 6A IC— Set REF LEV DBRN key and switch to step nearest required noise reference level.	
40k	▶If using 6H IC— At TTC— Using P2B cord, connect REC1 jack to MEAS jack of 6H IC.	
41k	At 6H IC— Operate DIAL MEAS switch to MEAS.	
42k	Set DBRN control to required noise reference level.◀	
43l	If testing nonswitchboard-ended or nondesk-ended trunks— At OGT test circuit— Originate call to 101-type test line in office in which trunk terminates as described in Section 215-721-501.	

STEP	ACTION	VERIFICATION
44	At TTC— Operate SD REC1 key to its receive position (horizontal).	
45	Operate TMS1 key.	
46	Request terminating end to provide a balanced termination or, if a far-end impulse noise measurement is also desired, to connect an impulse counter. ***Note:*** If only one-way test is required, omit Steps 47 and 52.	
47	Request terminating end to measure impulse noise for agreed upon interval.	
48j	If using 6A IC— At 6A IC— Operate timer switch to HOLD or to 5 minutes beyond required interval; then set to required timing interval.	
49k	▶If using 6H IC— Operate TIMER switch to required interval. ***Note:*** To insure accurate timing on intervals of 3 minutes or less, adjust TIMER to 5 minutes and return to desired interval.◀	
50	Momentarily operate RESET key.	
51	After timing interval— Record counter reading.	Counter indicates impulse counts measured at originating end.
52	After agreed upon interval— Obtain counter reading from terminating end.	
53m	If no further tests are to be made on this trunk— Request terminating end to disconnect.	
54	At TTC— Remove test connections from T jack of trunk just tested.	
55	For other trunks to be tested— Repeat appropriate Steps in PREPARATION and Steps 39j through 54.	
56n	If no further tests are to be made— Remove all patching cords; restore all keys.	

STEP	ACTION	VERIFICATION
	For Trunks Containing N, O, or ON Carrier	
57h	If using portable KS-19353 OSC— At TTC— Using 3P7A cord, connect SD jack to OUTPUT jack of oscillator.	
58h	At KS-19353 OSC— Operate FUNCTION switch to 900.	
59i	If using frame-mounted KS-19260 OSC— At TTC— Using 3P7B cord, patch REC1 jack to OSC/900.	
60j	If using 6A IC— At TTC— Using W2DL cord, connect 310 plug to REC1 jack and 35 cord tips to terminals 1 and 2 of 554A filter.	
61j	Using W2DL cord, connect 310 plug to IN jack of 6A IC and 35 cord tips to terminals 7 and 8 of 554A filter. ***Note:*** The 6A IC must not be grounded.	
62j	At 6A IC— Set REF LEV DBRN key and switch to 57 DBRN.	
63k	▶If using 6H IC— At TTC— Using P2B cord, connect REC1 jack to MEAS jack of 6H IC.	
64k	At 6H IC— Operate DIAL MEAS switch to MEAS.	
65k	Set DBRN control to 57 DBRN.◀	
66	At TTC— Originate call to 101-type test line in office in which trunk terminates as described in Section 215-721-501.	
67j	If using 6A IC— Request terminating end to connect oscillator adjusted for 600 Hz at −10 dBm.	
68k	▶If using 6H IC— Request terminating end to connect oscillator adjusted for 2800 Hz at −10 dBm.◀	

STEP	ACTION	VERIFICATION
69	Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	
70	At impulse counter— Operate timer switch to at least 5 minutes beyond required interval.	
71	Momentarily operate RESET key.	
72o	If impulse counter does not count continuously— Proceed immediately to Step 75.	
73p	If impulse counter counts continuously— Call terminating end over order wire or DDD connection.	
74p	Request terminating end to adjust oscillator above or below frequency setting until impulse counter stops counting continuously. Output of distant oscillator should remain at −10 dBm. ***Note:*** If no oscillator setting can be found which will stop the impulse counter from counting continuously, repeat Step 74p with the impulse counter adjusted to the next higher DBRN setting. Use successively higher settings until an oscillator frequency can be found which causes the impulse counter to stop counting continuously.	
75	Restore TMS1 key.	
76j	If using 6A IC— At 6A IC— Set REF LEV DBRN key and switch to step nearest required noise reference level.	
77k	▸If using 6H IC— At 6H IC— Set DBRN control to required noise reference level.◂	
78	At TTC— Operate TMS1 key.	
79	At impulse counter— Operate timer switch to 5 minutes beyond required interval, then set to required timing interval.	
80	Momentarily operate RESET key.	

STEP	ACTION	VERIFICATION
81	After timing interval— Record counter reading.	Counter indicates impulse counts measured at originating end.
82	At TTC— Restore TMS1 key.	
83	Request terminating end to disconnect oscillator. ***Note:*** If only near-end test desired, omit Steps 84 through 92.	
84	Request terminating end to connect impulse counter as described in Test BD Steps 22j through 26k. Also request terminating end to notify near end over a separate communication circuit if impulse counter counts continuously.	
85j	If using 6A IC— Adjust oscillator output for 600 Hz at −10 dBm.	
86k	▶If using 6H IC— Adjust oscillator output for 2800 Hz at −10 dBm.◀	
87	Operate TMS key; then operate SD REC1 key to its send position (vertical).	
88q	If required by terminating end— Adjust frequency of oscillator slowly above or below original setting until terminating end indicates that impulse counter has stopped counting. Oscillator output should remain at −10 dBm.	
89r	If terminating end has not indicated need for change in frequency, or after the oscillator has been adjusted to the proper frequency as per Step 88q, restore TMS1 key and request terminating end to adjust impulse counter to required reference level and to measure impulse noise.	
90	Operate TMS1 key.	Counter at terminating end indicates impulse counts measured at terminating end.
91	After required timing interval— Restore TMS1 key.	
92	Obtain and record impulse noise measurements from terminating end.	

STEP	ACTION	VERIFICATION
93s	If no further tests on this trunk— Request terminating end to disconnect. Remove connections from T jack of trunk just tested.	
94	For other trunks to be tested, repeat appropriate Steps in PREPARATION and Steps 62j through 92s. ***Note:*** Do not change oscillator frequency setting from that used in Steps 85j through 88q on first trunk tested.	
95t	If no further tests are to be made— Remove all patching cords; restore all keys.	

AE. Two-Way P/AR Measurement To 101-Type Test Line, Switchboards, or Plant or Traffic Operating Desks—Originating End Procedures (Fig. 1)

45	At TTC— Using P3F cord, connect TST1 jack to T1 jack of OGT test circuit.	
46	Using P3F cord, connect TRK1 jack to T jack of trunk under test (see 1.14).	
47	Operate SD REC1 key to its receive position (horizontal).	
48j	If testing nonswitchboard-ended or nondesk-ended trunk— At OGT test circuit— Originate call to 101-type test line in office in which trunk terminates, as described in Section 215-721-501.	
49	Request terminating end to connect a P/AR generator for agreed upon interval.	
50	At TTC— Operate TMS1 key.	
51	On P/AR RCVR— Adjust COARSE and FINE RECEIVED LEVEL ADJ controls to obtain RECEIVED LEVEL meter reading at REF LEVEL.	Meter reading is P/AR measurement at originating end.
52	Record P/AR meter reading. ***Note:*** If only one-way test required, omit Steps 54 through 56.	

STEP	ACTION	VERIFICATION
53	After agreed upon inteval— At TTC— Restore TMS1 key.	
54	Request terminating end to prepare to make P/AR measurement.	
55	Operate TMS1 key and operate SD REC1 key to its send position (vertical).	Meter reading at terminating end is P/AR measurement.
56	After agreed upon interval— Restore TMS1 key and obtain P/AR measurement from terminating end.	
57k	If no further tests are to be made on this trunk— Request terminating end to disconnect.	
58	At TTC— Remove test connections from T jack of trunk just tested.	
59	For other trunks to be tested— Repeat Steps 45 through 56.	
60l	If no further tests are to be made— Remove all patching cords; restore all keys.	

BA. Two-Way 1000-Hz Transmission Loss Measurement to 101-Type Test Line—Terminating End Procedures (Fig. 3)

7	At 101-type test line termination— Connect 52S head telephone set to TEL jack.	
8	At TTC— Insert plug of test receiver into RCVR jack.	
9	Using 3P7B cord, connect SD jack to 1000/0/900 jack.	
10	Using 3P7A cord, connect TRK jack to TM jack of 101-type test line.	
11	When requested by originating end to connect 0 dBm, 1000-Hz tone— Operate TMS1 key and operate SD REC1 key to its send position (vertical).	
12	After agreed upon interval— Restore TMS1 key.	

STEP	ACTION	VERIFICATION
13	When requested by the originating end to measure— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	
14	Read TMS meter.	
15	Restore TMS1 key and report meter reading to originating end.	
16h	If no further tests are to be made— Remove all patching cords; restore all keys.	

BB. Two-Way Frequency Response Measurement to 101-Type Test Line—Terminating End Procedures (Fig. 3)

41	At 101-type test line termination— Connect 52S head telephone set to TEL jack.	
42	At TTC— Insert plug of test receiver into RCVR jack.	
43	Using 3P7A cord, connect TRK1 jack to TM jack of 101-type test line.	
44	When directed by originating end to send— Adjust oscillator to 0 dBm at requested frequency. *Note:* TMS1 key must be normal while changing frequency.	
45	Operate TMS1 key and operate SD REC1 key to its send position (vertical).	
46	After agreed upon interval— Restore TMS1 key.	
47	Repeat Steps 44 through 46 at other frequencies as directed by originating end.	
48	When directed by originating end to measure— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	
49	Read TMS meter.	
50	Restore TMS1 key and report meter reading to originating end.	

STEP	ACTION	VERIFICATION
51	Repeat Steps 48 through 50 as directed by originating end.	
52j	If no further tests are to be made— Remove all patching cords; restore all keys.	
BC.	**Message Circuit Noise Measurement to 101-Type Test Line—Terminating End Procedures (Fig. 3)**	
34	At 101-type test line termination— Connect 52S head telephone set to TEL jack.	
35	When requested by originating end to make a noise measurement— At TTC— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	NMS or TNM (scale A) meter indicates noise measured at terminating end. Character of noise heard in 52S head telephone set.
36	Restore TMS1 key and report meter reading and character of noise to originating end.	
37	When requested by originating end to provide a balance termination— At TTC— Operate TR key.	
38	Monitor with 716C receiver.	
39	When distant end requests removal of termination— Restore TR key.	
40j	If no further tests are to be made— Remove head telephone set and all patching cords; restore all keys.	
BD.	**Impulse Noise Measurement to 101-Type Test Line—Terminating End Procedures (Fig. 3)**	
1	At 101-type test line termination— Connect 52S head telephone set to TEL jack.	
2	At TTC— Insert plug of test receiver into RCVR jack.	
3	Using 3P7A cord, connect TRK1 jack to TM jack of 101-type test line.	
4	When requested by originating end to provide a balance termination— At TTC— Operate TR key.	

STEP	ACTION	VERIFICATION
5	Monitor with 716C receiver.	
6	When requested to remove termination— Restore TR key.	
For Trunks Not Containing N, O, or ON Carrier		
7j	If using 6A IC— At 6A IC— Set WTG switch to VOICE BAND.	
8j	Set REF LEV DBRN key and switch to step nearest required noise reference level.	
9j	When requested by originating end to make an impulse noise measurement— Using P2B cord, connect IN jack to REC1 jack of TTC. ***Note:*** 6A IC must ***not*** be grounded.	
10k	If using 6H IC— At 6H IC— Operate DIAL MEAS switch to MEAS.	
11k	Set DBRN control to required noise reference level.	
12k	When requested by originating end to make an impulse noise measurement— Using P2B cord, connect MEAS jack to REC1 jack of TTC.	
13	At TTC— Operate TMS1 key and operate SD REC1 key to its receive position (horizontal).	
14	Operate timer switch to 5 minutes beyond required interval, then set to required timing interval.	
15	Momentarily operate RESET key.	
16	After timing interval— Record counter reading.	
17	Restore TMS1 key and report results to originating end.	Counter indicates impulse counts measured at terminating end.
18l	If no further tests are to be made— Remove head telephone set and all patching cords; restore all keys.	

STEP	ACTION	VERIFICATION
	For Trunks Containing N, O, or ON Carrier	
19h	If using portable KS-19353 OSC— At OSC— Using 3P7A cord, connect OUTPUT jack to SD jack on TTC.	
20h	Operate FUNCTION switch to 900.	
21i	If using frame-mounted KS-19260 OSC— At TTC— Using 3P7B cord, patch REC1 jack to OSC/900.	
22j	If using 6A IC— At TTC— Using W2DL cord, connect 310 plug to REC1 jack and 35 cord tips to terminals 1 and 2 of 554A filter.	
23j	At 6A IC— Using W2DL cord, connect 310 plug to IN jack and 35 cord tips to terminals 7 and 8 of 554A filter. ***Note:*** The 6A IC must ***not*** be grounded.	
24j	When requested by originating end to provide test termination— Adjust oscillator output for 600 Hz at −10 dBm.	
25k	▶If using 6H IC— At TTC— Using P2B cord, connect REC1 jack to MEAS jack of 6H IC.	
26k	When requested by originating end to provide test termination— Adjust oscillator output for 2800 Hz at −10 dBm.◀	
27	Operate TMS1 key and operate SD REC1 key to its send position (vertical).	
28m	If required by originating end— Adjust oscillator frequency above or below original setting at −10 dBm until originating end indicates that impulse counter stopped counting continuously.	
29	After timing interval— Restore TMS1 key.	

STEP	ACTION	VERIFICATION
30j	If using 6A IC— When requested by originating end to measure— At 6A IC— Set WTG switch to VOICE BAND.	
31j	Set REF LEV DBRN key and switch to 57 dBrn.	
32j	Originating end will connect oscillator adjusted for 600 Hz at −10 dBm.	
33k	◗If using 6H IC— When requested by originating end to measure— At 6H IC— Operate DIAL MEAS switch to MEAS.	
34k	Set DBRN control to 57 DBRN.	
35k	Originating end will connect oscillator adjusted for 2800 Hz at −10 dBm.◖	
36	Operate TMS1 key, then SD REC1 key to its receive position (horizontal).	
37	At impulse counter— Operate timer switch to at least 5 minutes beyond required interval.	
38	Momentarily operate RESET key.	
39n	If impulse counter does not count continuously— Proceed immediately to Step 42.	
40o	If impulse counter counts continuously— Call originating end over order wire or DDD.	
41o	Request originating end to adjust oscillator above or below original frequency at −10 dBm until impulse counter stops counting continuously. ***Note:*** If no oscillator setting can be found which will stop the impulse counter from counting continuously, repeat Step 41o with impulse counter adjusted to the next higher setting. Use successively higher settings until an oscillator frequency can be found which causes the impulse counter to stop counting continuously.	
42	Restore TMS1 key.	

STEP	ACTION	VERIFICATION
43j	If using 6A IC— At 6A IC— Set REF LEV DBRN key and switch to step nearest required noise reference level.	
44k	▶If using 6H IC— Set DBRN control to required noise reference level.◀	
45	At TTC— Operate TMS1 key.	
46	At impulse counter— Operate timer switch to 5 minutes beyond required interval, then set to required timing interval.	
47	Momentarily operate RESET key.	
48	After timing interval— Record counter reading.	
49	Restore TMS1 key and report counter reading to originating end.	
50p	If no further tests are to be made— Remove head telephone set and all patching cords; restore all keys.	

BE. Two-Way P/AR Measurement To 101-Type Test Line—Terminating End Procedures (Fig. 3)

45	At 101-type test line termination— Connect 52S head telephone set to TEL jack.	
46	At TTC— Using 3P7A cord, connect TRK1 jack to TM jack of 101-type test line.	
47	When requested by originating end to connect P/AR GEN— Operate TMS1 key and operate SD REC1 key to its send position (vertical).	
48	After agreed upon interval— Restore TMS1 key.	
49	When requested by originating end to make P/AR measurement— Operate TMS key and operate SD REC1 key to its receive position (horizontal).	

STEP	ACTION	VERIFICATION
50	On P/AR RCVR— Adjust COURSE and FINE RECEIVED LEVEL ADJ controls to obtain RECEIVED LEVEL meter reading at REF LEVEL.	
51	Record P/AR meter reading.	
52	Restore TMS1 key and report meter reading to originating end.	
53j	If no further tests are to be made— Remove head telephone set and all patching cords; restore all keys.	

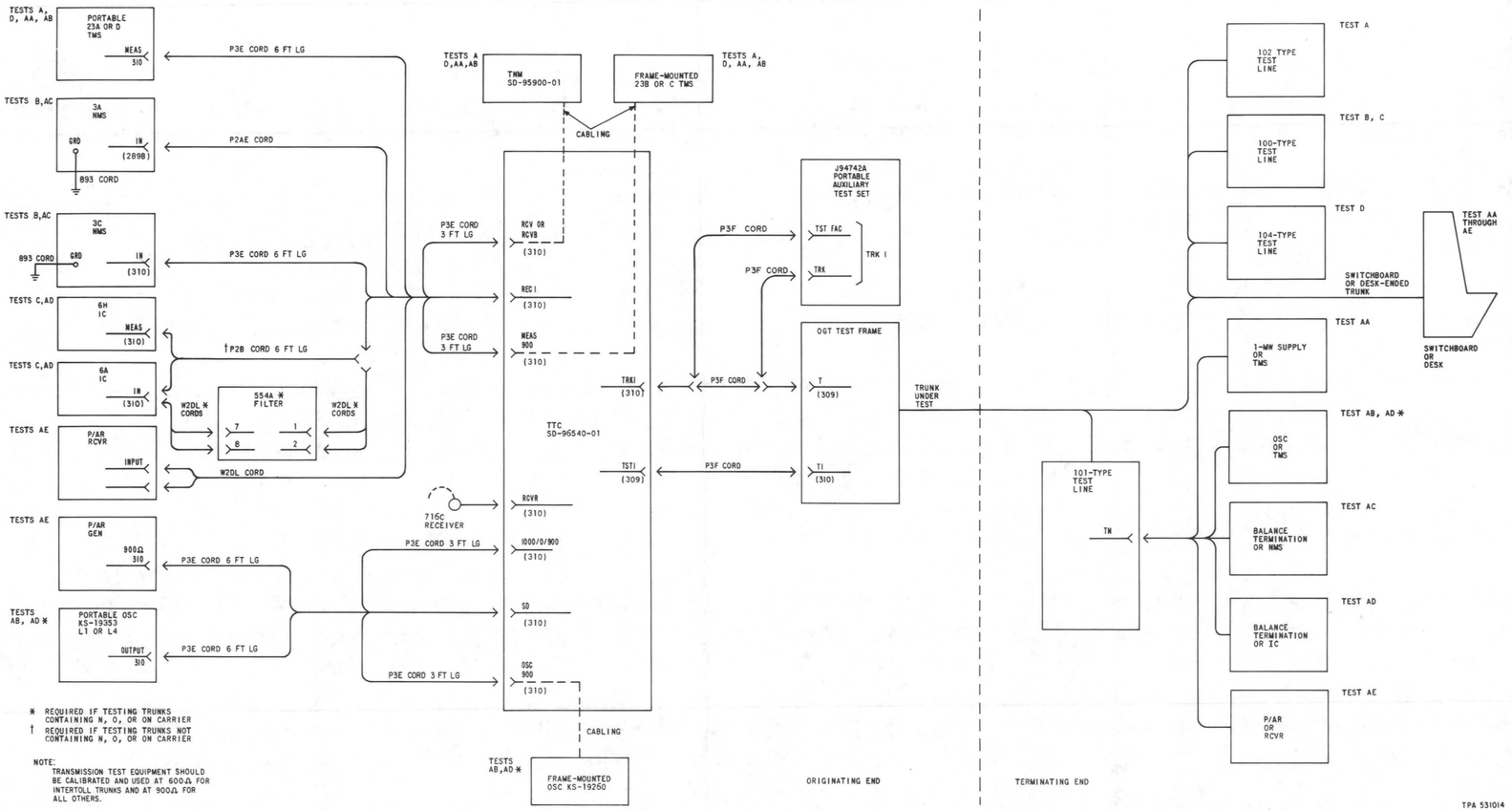
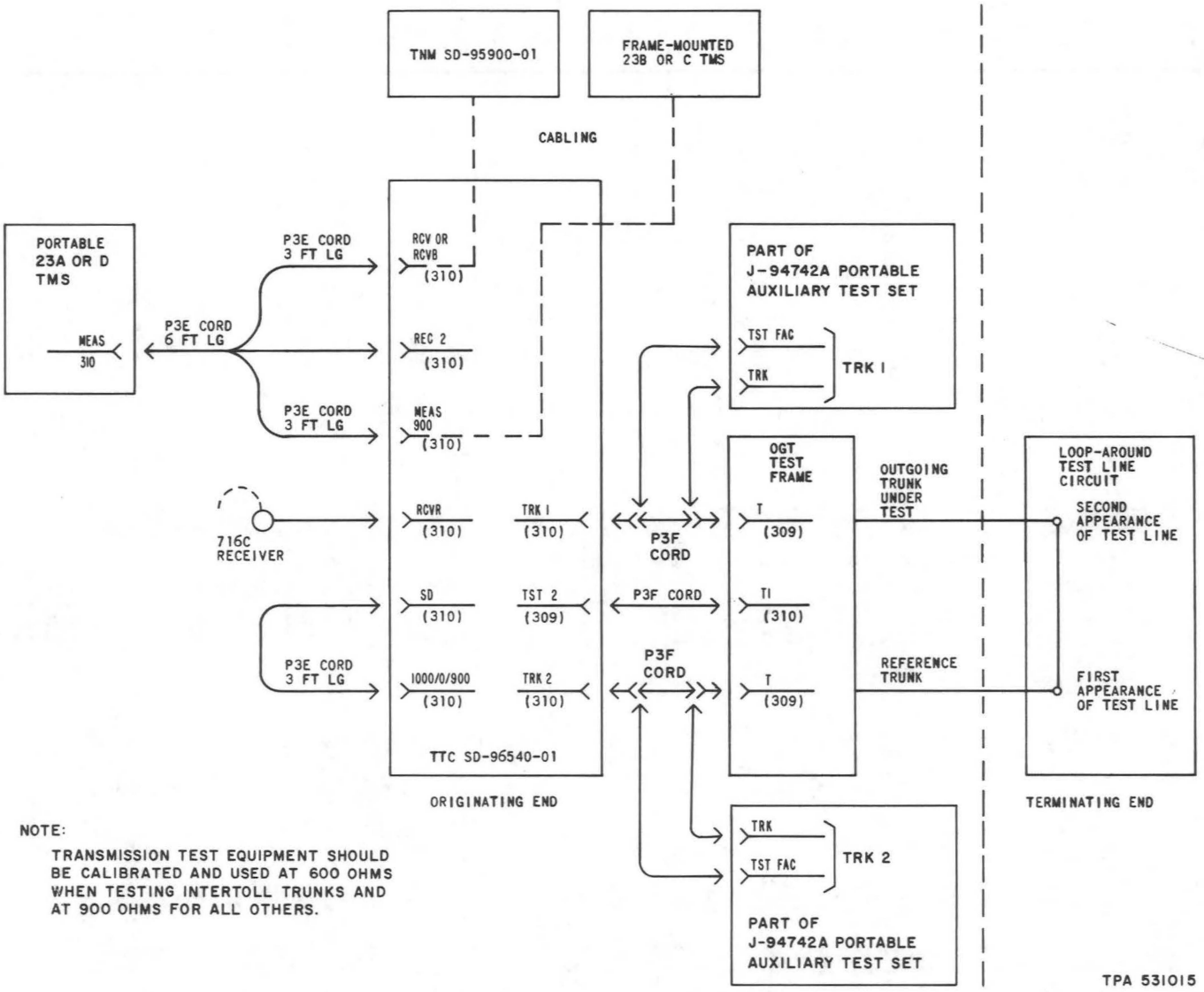


Fig. 1—Tests A through D, AA through AE—Equipment Diagram



NOTE:

TRANSMISSION TEST EQUIPMENT SHOULD BE CALIBRATED AND USED AT 600 OHMS WHEN TESTING INTERTOLL TRUNKS AND AT 900 OHMS FOR ALL OTHERS.

Fig. 2—Test E—Equipment Diagram

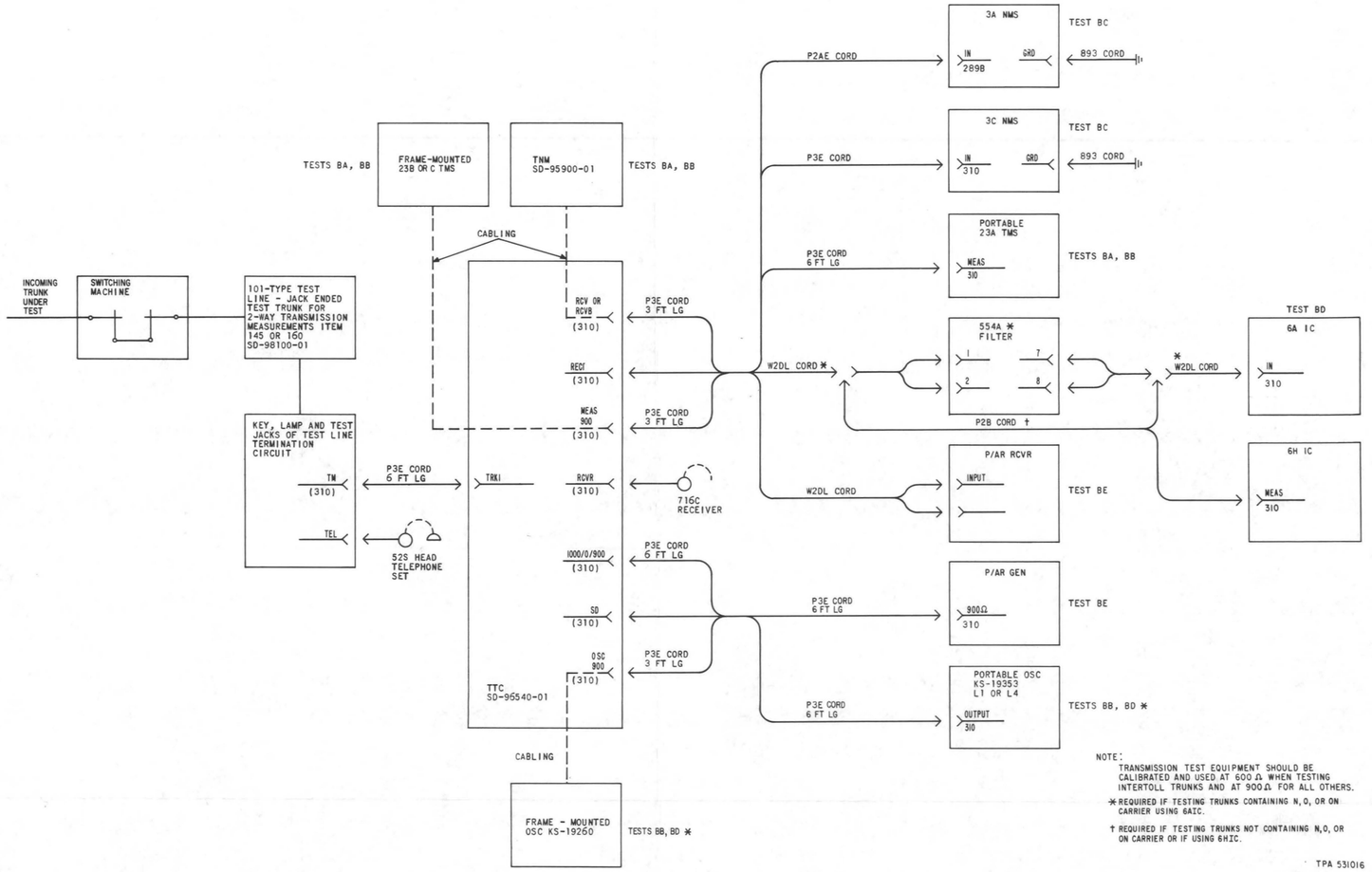


Fig. 3—Tests BA through BE—Equipment Diagram