

21A TESTBOARD

MEASUREMENT AND ADJUSTMENT OF TRANSMISSION TEST TRUNKS

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1. GENERAL

1.01 This section describes the procedures for measuring and adjusting losses in test access circuits and 101 test trunks terminating in a 21A testboard, associated with a 4-wire No. 1, electronic switching system (ESS) provided for switched services networks (SSN).

1.02 The switching network is included in the circuit when making measurements and adjustments of losses in access lines. The ESS must be operational and it must be possible to establish a connection from the 21A testboard position to a trunk on the outgoing side of the switching network in order to make these measurements and adjustments.

2. TESTS AND ADJUSTMENTS REQUIRED

2.01 Measurements on access lines are made from the SD-95900-01 transmission measuring circuit at the 21A testboard position, through the switching network to trunk terminals on the outgoing side of the trunk switch frame. See Fig. 1. When the loss between these points is adjusted to 2 db, the proper transmission level of -2 db is obtained at the outgoing switch terminals

when transmitting from the 21A testboard position.

2.02 Measurements on 101 test trunks are made from the SD-95900-01 transmission measuring circuit at the 21A testboard position, to the 101 trunk terminals on the incoming side of the trunk switch frame. The loss is adjusted to 2 db. The switching network is not included in the measurements.

2.03 Losses are adjusted by strapping terminals on level adjusting pad units located in the testboard access circuits and 101 test trunks. The pads should be strapped initially for a loss of 1.5 db. The pads are constructed using 221A resistors and are adjustable in 0.1-db steps. Equivalent pads, which are sometimes located in the measuring circuits of the SD-95900-01 transmission and noise measuring system, are not provided in this application.

A. Apparatus Required

2.04 The following apparatus is required in order to perform the tests described in this section.

1 — 22A Milliwatt Reference Meter

1 — 36A Attenuator

1 — 2P15A Cord, 338A to 310

1 — 2W17A Cord, equipped with KS-6278 Connector Clips

B. Preparation

2.05 The office milliwatt supply, connected through the SD-95900-01 transmission measuring circuit, is used as a source of 1000-cycle test power for measurements described in this section. The 1-milliwatt supply should be checked and adjusted using a 22A milliwatt reference meter which has been properly calibrated. Refer to

SECTION 310-282-300

Section 103-222-100 for information on the 22A meter.

2.06 Before beginning the procedure for measuring and adjusting access lines, select a trunk to which a connection can be established through the switching network from the testboard position. In order not to send false signals to the distant end, the E and M leads of the circuit are split and the trunk should be removed from service during tests. The circuit under test should be opened at the trunk distribution frame while making the required measurements on access lines to avoid the bridging effect of the trunk on the measurement. The measurement, however, must be made at the trunk switch frame.

2.07 Connections through the switching network are not required when measuring and ad-

justing 101 test trunks, since measurements are made at the incoming side of the switch. The cut-through relay (CT), in the universal frame coupler circuit connecting the 101 test trunk to the switching network, normally operated by the ESS, must be blocked operated to provide circuit continuity. The E and M leads of the trunk need not be split.

2.08 The use of a communication channel, between the testboard and the location at which measurements are made, will facilitate the accomplishment of these test procedures.

2.09 Refer to Section 310-282-501 for description of testboard operational procedures required in conducting these tests.

3. MEASUREMENTS AND ADJUSTMENTS

A. Measurement and Adjustment of Losses in Access Circuits

STEP	PROCEDURE
1	At testboard position, split the E and M leads of the trunk or line to which a connection will be established, by inserting the testboard SIG T cord into the SIG L/D jacks of the circuit. Operate keyshelf keys, associated with the SIG T cord, to condition the circuit to the on-hook state in both directions.
2	Connect a testboard TST cord to the access circuit (ACC jack), on which measurements are to be made, and establish a connection through the ESS to the selected trunk.
3	Remove the selected trunk from service by assigning a maintenance-busy status. The trunk should also be removed from service at the distant end. <i>Note:</i> If adjustment is being made to a pad which has not previously been strapped, the pad should be initially strapped to provide a loss of 1.5 db. Refer to Table A for strapping and terminal strip information.
4	At the trunk distribution frame connecting to the outgoing side of the switching network, lift the cross-connections in both the transmit and the receive paths of the selected trunk.
5	At the outgoing side of the trunk switch frame, connect the 36A attenuator and the 22A meter to the transmit leads (T1-R1) of the selected trunk. This connection is designated A1 in Fig. 1. The manner of associating the 36A attenuator with the 22A meter is shown in Fig 2. Set the attenuator DB switch to .0-600. Set the 22A FUNCTION switch to 600; set the REFERENCE LEVEL DBM switch to -3 (prior to initial adjustment) or to -2 (checking a previously made adjustment).

STEP	PROCEDURE
6	At the testboard position, connect a CON cord, associated with the previously connected TST cord, to the MEAS jack. The TALK-MON key, associated with the cord pair, should be in the normal position.
7	Operate the SEND key.
8	<p>At the trunk switch frame, observe the indication on the 22A meter. Reset the attenuator DB switch (using 600 setting) to obtain a 0 indication on the 22A meter, or as close to 0 as the 0.1-db attenuation steps permit. If an initial adjustment is being made, determine the required loss in the T pad by the following formula, where 1.5 is the initially adjusted loss of the pads, A is the setting of the attenuator DB switch, and L is the required loss of the pad in db.</p> $1.5 - (1-A) = L$ <p>Example:</p> <p>Attenuator setting is 0.7</p> $1.5 - (1-0.7) = L$ $1.5 - 0.3 = L$ $1.2 = L$ <p>If the pad was previously adjusted, the deviation in the 22A meter indication from -2 dbm is the adjustment of loss in db which must be made to the pad.</p>
9	Referring to Table A, strap terminals of the level adjusting pad unit (T pad) to obtain the required loss, as determined in Step 8, as closely as possible.
10	Set the 22A REFERENCE LEVEL DBM switch to -2. Set the attenuator DB switch to .0-600. Repeat the previously described measurement. The 22A meter indication should be 0, ± 0.05 db.
11	At the trunk switch frame, disconnect the 36A attenuator and 22A meter from the transmit leads of the selected trunk and connect to the receive leads (T-R) of the same trunk. This connection is designated A2 in Fig. 1. Set the attenuator DB switch to .0-600. Set the 22A meter REFERENCE LEVEL DBM switch to -3 (prior to initial adjustment) or to -2 (checking a previously made adjustment).
12	At the testboard, disconnect the CON cord from the MEAS jack, then, reconnect the cord, this time in the inverted attitude (knurled edge down). Test power is applied to the receive path of the trunk.
13	Determine the loss required in the receive path R pad and make the necessary adjustment in the same manner as described in Steps 8 through 10, for the T pad.
14	At the testboard, disconnect the CON cord from the MEAS jack. Restore the SEND key to normal.

STEP	PROCEDURE
15	At the trunk switch frame, disconnect the 36A attenuator and 22A meter.
16	At the trunk distribution frame, replace the cross-connections lifted in Step 4. If additional access circuits are to be tested, this will be a temporary restoration of cross-connections while a new connection to the network trunk is established through the switching network. <i>Note:</i> If no other access circuits are to be tested and adjusted, proceed to Step 21.
17a	If another access circuit is to be measured and adjusted, disconnect the testboard TST cord from the ACC jack of the circuit previously tested and connect the cord to the ACC jack of the circuit which will now be tested.
18a	Establish a new connection through the switching network to the previously selected network trunk. Connection can be made to a trunk which has been made maintenance busy.
19a	When connection to the network trunk has been reestablished, the cross-connections, restored in Step 16, should be reopened. <i>Note:</i> If adjustment is being made to a pad which has not previously been strapped, the pad should be initially strapped to provide a loss of 1.5 db. Refer to Table A for strapping and terminal strip information.
20a	Repeat Steps 5 through 16.
21	At the testboard, remove the maintenance-busy status from the network trunk. The trunk should also be restored to service at the distant end.
22	Disconnect the testboard TST cord. Disconnect the SIG T cord and return the associated keys to normal.

B. Measurement and Adjustment of 101 Test Trunks

STEP	PROCEDURE
1	At the testboard position, from which the longest electrical path between the switching network and the multiplied testboard jacks is presented, connect a CON cord to the 101 trunk jack. <i>Note:</i> If adjustment is being made to a pad which has not previously been strapped, the pad should be initially strapped to provide a loss of 1.5 db. Refer to Table B for strapping and terminal strip information.

STEP	PROCEDURE
2	At the universal frame coupler circuit, connecting the 101 trunk to the switching network, block operated the CT relay.
3	At the trunk switch frame, connect the 36A attenuator and 22A meter to the transmit leads (T1-R1) of the trunk under test, on the incoming side of the frame. This connection is designated B1 in Fig. 1. The manner of associating the 36A attenuator and the 22A meter is shown in Fig. 2.
4	Set the attenuator DB switch to .0-600. Set the 22A meter FUNCTION switch to 600; set the REFERENCE LEVEL DBM switch to -3 (prior to initial adjustment) or to -2 (checking a previously made adjustment).
5	At the testboard position, connect the TST cord, associated with the previously connected CON cord, to the MEAS jack. The TALK-MON key, associated with the cord pair, should be in the normal position.
6	Operate the SEND key.
7	At the trunk switch frame, observe the indication on the 22A meter. Reset the attenuator DB switch (using 600 settings) to obtain a 0 indication on the 22A meter, or as close to 0 as the 0.1-db attenuation steps permit. If an initial adjustment is being made, determine the required loss in the T pad, using the formula and example given in Step 8 of the preceding procedure for making measurements and adjustments of access circuits. Record the value for use later in the procedure. If a previous adjustment was made, record the difference between -2 dbm and the level indicated on the 22A meter.
8	At the trunk switch frame, disconnect the 36A attenuator and the 22A meter from the transmit leads of the trunk and connect to the receive leads (T-R) of the same trunk. This connection is designated B2 in Fig. 1. Set the attenuator DB switch to .0-600. Set the 22A REFERENCE LEVEL DBM switch to -3 (prior to initial adjustment) or to -2 (checking a previously made adjustment).
9	At the testboard, disconnect the TST cord from the MEAS jack, then, reconnect the cord, this time in the inverted attitude (knurled edge down). Test power is applied to the receive path of the trunk.
10	Determine the loss required in the receive path R pad in the same manner as in Step 7 for the T pad. Record this value for use later in the procedure.
11	At the testboard position, from which the shortest electrical path between the switching network and the multiplied testboard jacks is presented, connect a CON cord to the trunk under test.
12	At the first testboard position, disconnect cords and restore the SEND key to normal.
13	At the second testboard position, connect the TST cord, associated with the previously connected CON cord, to the MEAS jack in the inverted attitude (knurled edge down).

STEP	PROCEDURE
14	<p>Repeat the determination of the required loss in the receive path R pad as done in Step 10. Record the determined value.</p> <p><i>Note:</i> If the difference in readings obtained in Steps 10 and 14 is more than 0.2 db, the reason should be determined and corrected.</p>
15	<p>If there is a measurable difference between the values recorded in Step 10 and Step 14, average the two values (two values for initial adjustment, or two values for readjustment, as applicable).</p>
16	<p>Referring to Table B, strap terminals of the level adjusting pad unit (R pad) to obtain the average loss determined in Step 15, as closely as possible.</p>
17	<p>Repeat the previously described measurement at the trunk switch frame. The indication on the 22A meter should be 0 ± 0.05 db when adjusted as follows: (1) find the difference between the value recorded in Step 14 and the average level computed in Step 15; (2) subtract the difference from the level indicated on the 22A meter.</p>
18	<p>At the trunk switch frame, disconnect the 36A attenuator and 22A meter from the receive leads and connect to the transmit leads (T1-R1) of the same trunk.</p>
19	<p>Set the 36A attenuator DB switch to .0-600. Set the 22A meter REFERENCE LEVEL DBM switch to -3 (prior to initial adjustment) or to -2 (checking a previously made adjustment).</p>
20	<p>At the testboard, disconnect the TST cord from the MEAS jack, then, reconnect the cord, this time in the normal attitude (knurled edge up).</p>
21	<p>Observe the indication on the 22A meter and determine the loss required in the T pad as previously done in Step 7. Record the value.</p>
22	<p>If there is a measurable difference in the values recorded in Step 7 and Step 21, average the two values (two values for initial adjustment, or two values for readjustment, as applicable).</p>
23	<p>Referring to Table B, strap terminals of the level adjusting pad unit (T pad) to obtain the average loss determined in Step 22, as closely as possible.</p>
24	<p>Repeat the previously described measurement at the trunk switch frame. The indication on the 22A meter should be 0 ± 0.05 db when adjusted as follows: (1) find the difference between the value recorded in Step 21 and the average computed in 22; (2) subtract the difference from the level indicated in the 22A meter.</p>
25	<p>At the trunk switch frame, disconnect the test equipment.</p>
26	<p>At the trunk distribution frame, restore the previously opened cross-connections.</p>
27	<p>At the testboard, restore the network trunk to service. Disconnect testboard cords and restore keys to their normal positions.</p>

TABLE A — ACCESS CIRCUIT STRAPPING INFORMATION

PAD LOSS IN DB Z = 600Ω	T PAD					R PAD				
	TS(C)	TS(D)	TS(E)	TS(F)	TS(G)	TS(H)	TS(J)	TS(K)	TS(L)	TS(M)
	STRAP TERMINALS					STRAP TERMINALS				
.7	11-15	11-15		11-15	11-15	11-15	11-15		11-15	11-15
.8	15-22	15-22	11-13	15-22	15-22	15-22	15-22	11-13	15-22	15-22
.9	11-13 15-24	11-13 15-24	22-24	11-13 15-24	11-13 15-24	11-13 15-24	11-13 15-24	22-24	11-13 15-24	11-13 15-24
1.0	11-24	11-24	11-22 15-24	11-24	11-24	11-24	11-24	11-22 15-24	11-24	11-24
1.1	22-24	22-24	13-22 15-24	22-24	22-24	22-24	22-24	13-22 15-24	22-24	22-24
1.2	15-24	15-24	13-15	15-24	15-24	15-24	15-24	13-15	15-24	15-24
1.3	13-24	13-24	11-22 13-15	13-24	13-24	13-24	13-24	11-22 13-15	13-24	13-24
1.4	11-22	11-22	15-22	11-22	11-22	11-22	11-22	15-22	11-22	11-22
1.5			11-15					11-15		

TABLE B — CODE 101 TRUNK STRAPPING INFORMATION

PAD LOSS IN DB Z = 600Ω	T PAD					R PAD				
	TS(B)	TS(C)	TS(D)	TS(E)	TS(F)	TS(G)	TS(H)	TS(J)	TS(K)	TS(L)
	STRAP TERMINALS					STRAP TERMINALS				
.7	11-15	11-15		11-15	11-15	11-15	11-15		11-15	11-15
.8	15-22	15-22	11-13	15-22	15-22	15-22	15-22	11-13	15-22	15-22
.9	11-13 15-24	11-13 15-24	22-24	11-13 15-24	11-13 15-24	11-13 15-24	11-13 15-24	22-24	11-13 15-24	11-13 15-24
1.0	11-24	11-24	11-22 15-24	11-24	11-24	11-24	11-24	11-22 15-24	11-24	11-24
1.1	22-24	22-24	13-22 15-24	22-24	22-24	22-24	22-24	13-22 15-24	22-24	22-24
1.2	15-24	15-24	13-15	15-24	15-24	15-24	15-24	13-15	15-24	15-24
1.2	15-24	15-24	13-15	15-24	15-24	15-24	15-24	13-15	15-24	15-24
1.3	13-24	13-24	11-22 13-15	13-24	13-24	13-24	13-24	11-22 13-15	13-24	13-24
1.4	11-22	11-22	15-22	11-22	11-22	11-22	11-22	15-22	11-22	11-22
1.5			11-15					11-15		

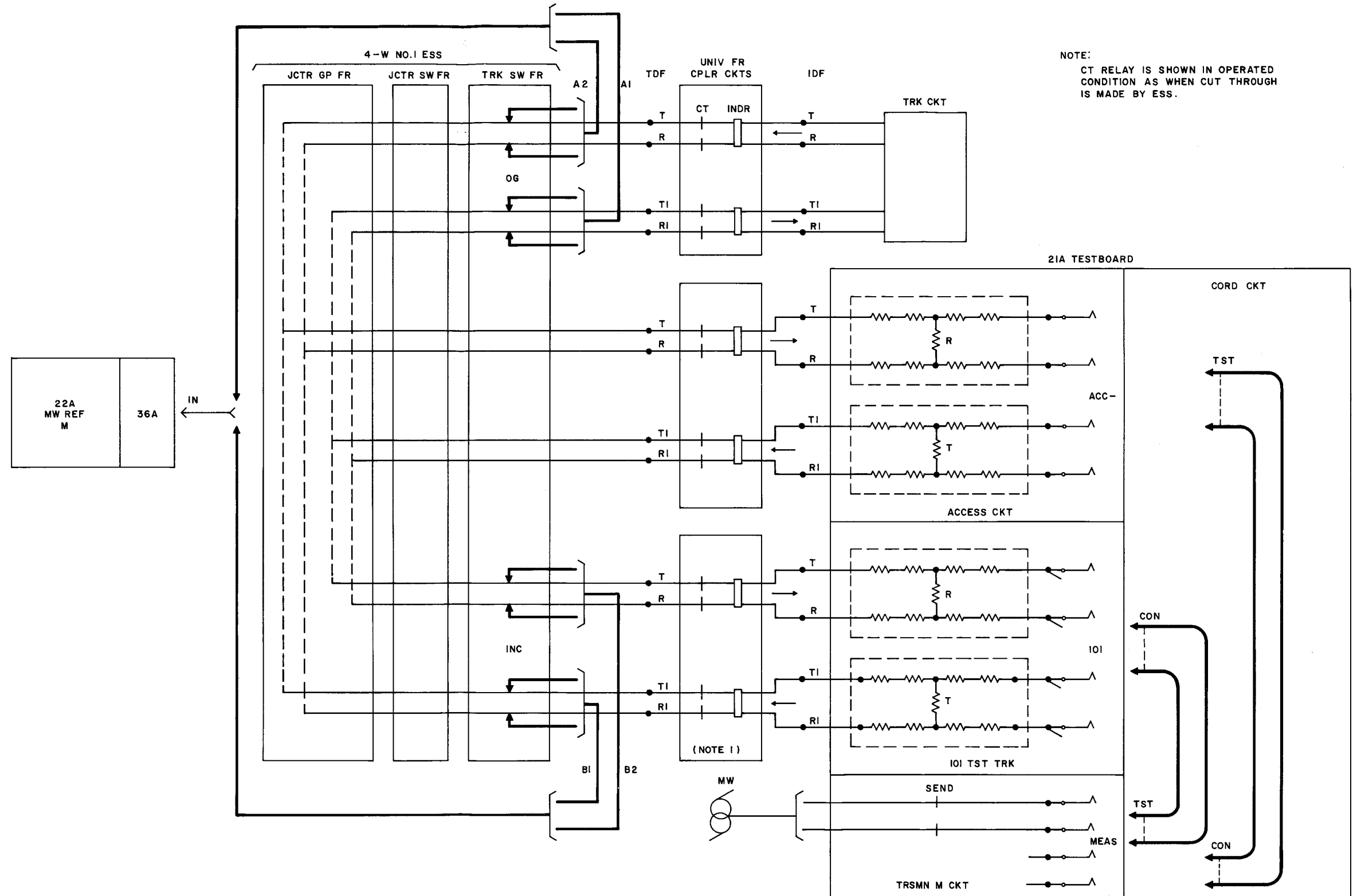


Fig. 1 — Typical Arrangements for Measuring and Adjusting Losses in Transmission Test Trunks

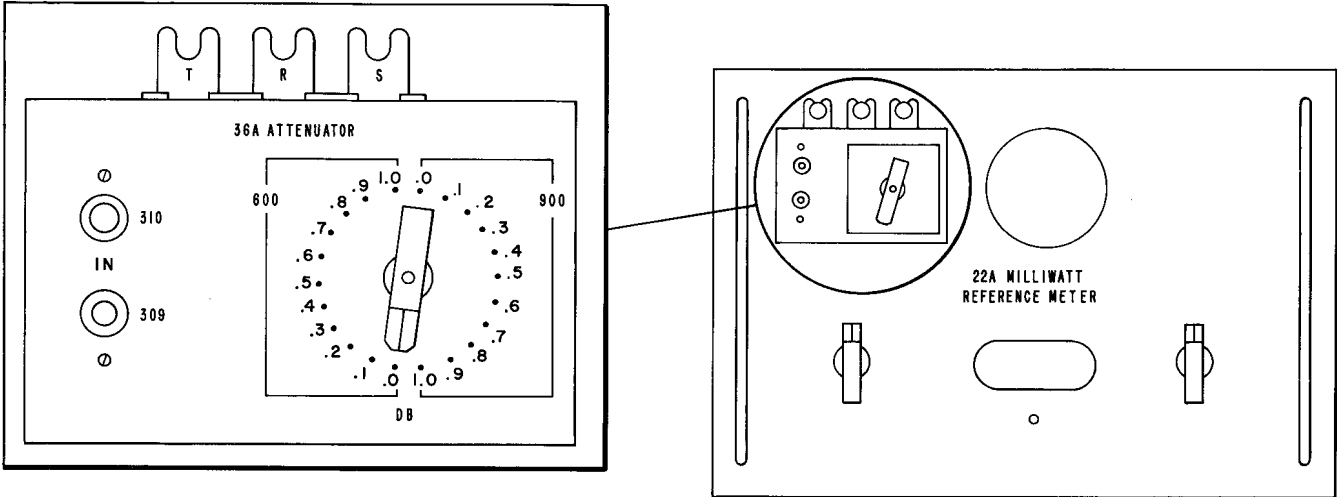


Fig. 2 — Use of 36A Attenuator with 22A Milliwatt Reference Meter for Measuring Fractional Levels