

## 21A TESTBOARD

### MEASUREMENT OF OFFICE LOSSES

CONTENTS	PAGE
1. GENERAL . . . . .	1
2. TESTS REQUIRED . . . . .	1
A. Apparatus Required . . . . .	1
B. Preparation . . . . .	1
3. MEASUREMENTS AND ADJUSTMENTS . . . . .	2
A. Measurements and Adjustments of Office Losses in Network Trunk and Subscriber Lines . . . . .	2
B. Test Checks . . . . .	4

#### 1. GENERAL

1.01 This section describes the procedures for measuring office losses in network trunks and subscriber lines connecting to a 4-wire electronic switching system (ESS) serving switched services networks (SSN). Measurements are made from a 21A testboard.

1.02 *Lettered Steps:* A letter a, b, c, etc, added to a step number in Part 3 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 procedure; 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. TESTS REQUIRED

2.01 Measurements of office losses in network trunks and subscriber lines are made between the 21A testboard and input/output points of carrier channels at the voice-frequency patching bay. When office losses are adjusted according to procedures described in this section, proper input levels are established to the carrier channel in the

transmitting direction, and to the switch terminals of the switching network, in the receiving direction. Adjustments are made by means of adjustable 1C pads in the transmit and receive paths of network trunks and subscriber lines.

2.02 Checks are made on test trunks connecting the 21A testboard to a 5D switchboard, data test bays, telegraph testboard, or other testing locations, as provided. These trunks, which are usually multipled, are not used for transmission measurements, but they are checked for use in operational tests to their various terminations.

#### A. Apparatus Required

2.03 The following apparatus is required.

- 1 — 22A Milliwatt Reference Meter
- 1 — 36A Attenuator
- 1 — 21A Transmission Measuring Set (TMS)
- 1 — KS-14160 Connector or 1 KS-16370, L3 Connector
- 1 — 600-Ohm Termination
- 1 — W2BS Cord 2W33A
- 1 — P3N Cord 3P17A

#### B. Preparation

2.04 Adjustments of the measuring pads in the access circuit used in making measurements of office losses must be made according to procedures described in Section 310-282-300 before using the circuit for making measurements described in this section.

2.05 All trunk or line equipment must be in place when measurements and adjustments are made, unless otherwise stated in the procedure.

2.06 If 3A echo suppressors are used in a trunk, the losses of the suppressors should be carefully adjusted to zero before making measure-

**SECTION 310-282-500**

ments and adjustments of office losses. If 1A echo suppressors are used, the losses of the suppressors are measured as part of the office losses.

**2.07** If single-frequency signaling units of the fixed-mounting type are used, the units should be carefully adjusted for zero loss at 1000 cycles, in the receiving direction before making measurements and adjustments of office losses.

**2.08** When plug-in, single-frequency signaling units are used, zero loss connectors are substituted for the units when making measurements in the receiving direction only. Electron tube units are replaced by KS-14160 connectors; transistorized units are replaced by KS-16370, L3, connectors. Terminals of the connectors must be strapped as follows:

KS-14160: 0 to 6; 1 to 7.

KS-16370, L3: M to U; 5 to V.

**2.09** Equalizers, when provided, are bypassed for these measurements and adjustments. The loss of the equalizer circuit will be adjusted to zero when equalization adjustments are made.

**2.10** Procedures for setting up a test to a network trunk or to a subscriber line from the 21A testboard are covered in Section 310-282-501.

**2.11** Calibrate all test equipment before using it. Information on test equipment is found in the following sections:

22A MW Reference Meter — 103-222-100

71B MW Reference Generator — 103-326-100

21A Transmission Measuring Set — 103-221-100, 103-221-101

**2.12** The use of a communication trunk between the testboard and second testing location will facilitate the measurements and adjustments described in Part 3 of this section.

**3. MEASUREMENTS AND ADJUSTMENTS**

**A. Measurements and Adjustments of Office Losses in Network Trunks and Subscriber Lines**

**3.01** Measure and adjust office losses in network trunks and subscriber lines by the following procedure. A typical testing arrangement is shown in Fig. 1.

STEP	PROCEDURE
	<p><i>Note:</i> Do not proceed unless the 22A set is properly calibrated. Refer to 2.11.</p>
1	<p>Check the output of the office milliwatt supply using a 22A milliwatt reference meter. Connect the 22A set to the testboard MEAS jack and operate the SEND key. For pad adjustment purposes, the output at MW should be exactly 0 dbm. Refer to applicable sections for adjusting procedures, if required.</p>
2	<p>At the testboard, connect a TST cord to an access circuit jack (ACC) and originate a test call to the network trunk or line on which measurements and adjustments are to be made. Assign a maintenance-busy status to the circuit, thereby removing it from service. Two-way trunks should be removed from service at each end.</p> <p><i>Note:</i> If adjustments to equipment mentioned in 2.06 and 2.07 apply, make these adjustments before continuing this procedure.</p>
3	<p>If initial adjustment is being made, equip the trunk or line P<sub>T</sub> and P<sub>R</sub> pads with 89A resistors to provide circuit continuity for making measurements. If the pads have been previously equipped with 89-type resistors, do not change the pads at this time.</p>

STEP	PROCEDURE
4	Using a patch cord, bypass the equalizer circuit, if provided, as shown in Fig. 1. The equalizer 1C pad should be equipped with an 89A resistor to provide circuit continuity.
5	At the VF patch bay, insert a 600-ohm termination into the MOD IN jack of the trunk or line under test.
6	Patch the EQ OUT jacks, of the trunk or line under test, to the 3A attenuator and the 22A meter. The manner of connecting the attenuator to the input of the meter is shown in Fig. 2.
7	Set the attenuator DB switch to .0-600. Set the 22A meter FUNCTION switch to 600; set the REFERENCE LEVEL DBM switch to -16.
8	At the testboard, operate the SEND key.
9	Observing the 22A meter indication, reset the attenuator DB switch and the 22A REFERENCE LEVEL DBM switch, if required, to bring the indicated level as close to 0 at the -16 dbm reference level as the 0.1-db steps of the attenuator permit. If this adjustment is possible using the attenuator DB switch only, the loss to be provided by the P <sub>T</sub> pad is the setting of the DB switch. If it is necessary to reset the 22A REFERENCE LEVEL DBM switch to -15 in order to obtain a 0 indication on the 22A meter, the loss to be provided in the P <sub>T</sub> pad is 1 db plus the setting of the attenuator DB switch.
10	Replace the 89A resistor in the P <sub>T</sub> pad with an 89-type resistor, as required, to provide the loss determined in Step 9 and repeat the previously described measurement with the attenuator DB switch set to .0. The meter indication must be 0 ±.13 dbm at the -16 reference level.
11	At the testboard, restore the SEND key to normal.
12	At the VF patch bay, disconnect the 36A attenuator and 22A meter from the EQ OUT jack.
13	Remove the 600-ohm termination from the MOD IN jack and insert into the DEMOD OUT jack of the same trunk or line.
14	At the testboard, patch the 36A attenuator and 22A set to the R (upper) jack of the ACC (twin) jack. Set the attenuator DB switch to .0-600, the 22A meter FUNCTION switch to 600, and the REFERENCE LEVEL DBM switch to 0.
15a	If plug-in, single-frequency signaling units are used, remove the unit associated with the trunk or line under test and replace it with a zero loss connector. Use a KS-14160 connector to replace an electron tube unit and a KS-16370, L3, connector to replace a transistorized unit. Check that strapping described in 2.08 has been provided.
16	At the VF patch bay, patch the 1000/+7/600 jack to the EQ IN jack of the trunk or line under test. If no 1000/+7/600 jack is provided, use the 21A TMS to transmit 1000-cycle tone at a level of +7 dbm (600 ohms), as measured with a 22A meter.

STEP	PROCEDURE
17	In the manner described in Steps 9 and 10, determine the loss required in the P <sub>R</sub> pad to obtain a 0 ±.13 db indication on the 22A meter at the 0 reference level. Replace the 89A resistor in the P <sub>R</sub> pad with an 89-type resistor, as required to obtain the required loss. Repeat the measurement to assure that the correct loss is provided.
18a	Remove the zero loss connector and replace the single-frequency signaling unit removed in Step 15. Repeat the measurement previously made. The requirements stated in Step 17 should be met with a properly adjusted signaling unit.
19	At the testboard, disconnect the 36A attenuator and 22A meter from the ACC jack and reconnect the TST cord.
20	At the VF patch bay, disconnect the patch between the EQ IN jack and the 1000/+7/600 jack (or 21A TMS).
21	Remove the 600-ohm termination from the DEMOD OUT jack.
22	Remove the cord used to bypass the equalizer circuit, if applicable.
23	Restore the trunk or line to service by removing the maintenance-busy status. When a 2-way trunk is removed from service, the trunk must be restored to service at each end.
24	Repeat the measurement and adjustment procedure on each network trunk and subscriber line.

### B. Test Trunk Checks

**3.02** Transmission requirements are not specified for test trunks to the 5D switchboard (SWBD TST), data test bays (904 TST TRK), or telegraph testboard (10C TST TRK), as provided. These trunks, normally multiplexed, are not used for

transmission measurements. Checks are made to assure that the trunks are in suitable condition for making operational tests to the various terminations of the trunks. These trunks do not connect to the switching network. A typical testing arrangement is shown in Fig. 3.

STEP	PROCEDURE
1	Check the output of the local milliwatt supply using a 22A milliwatt reference meter. With the SEND key operated, and the 22A meter connected to the MEAS jack, the indicated level should be 0 ±0.03 dbm. If required, adjust according to applicable sections. An information reference on the 22A meter is given in 2.11.
2	Calibrate the measuring circuit according to the procedure given in Section 310-282-501.
3	At the testboard, connect a CON cord to the test jack (SWBD, 904, 10C, etc) of the test trunk to be checked. Connect the associated TST cord to the MEAS jack.

STEP	PROCEDURE
4	At the second testing location, patch the test trunk jack to the DET IN jack of the 21A TMS. Set the DET INPUT switch to 0.
5	At the testboard, operate the SEND key.
6	Observe the level indicated by the TMS. The level should be 0, or a nominal amount below 0.
7	At the testboard, restore the SEND key to normal and operate the RCV key.
8	At the TMS, set OSC OUTPUT control to 0.
9	Disconnect cord from TMS DET IN jack and connect to the OSC OUT jack.
10	At the testboard, observe the level indicated by the SD-95900-01 system meter. The indicated level should be 0, or a nominal amount below 0.
11	Disconnect all cords; restore the testboard RCV key to normal.

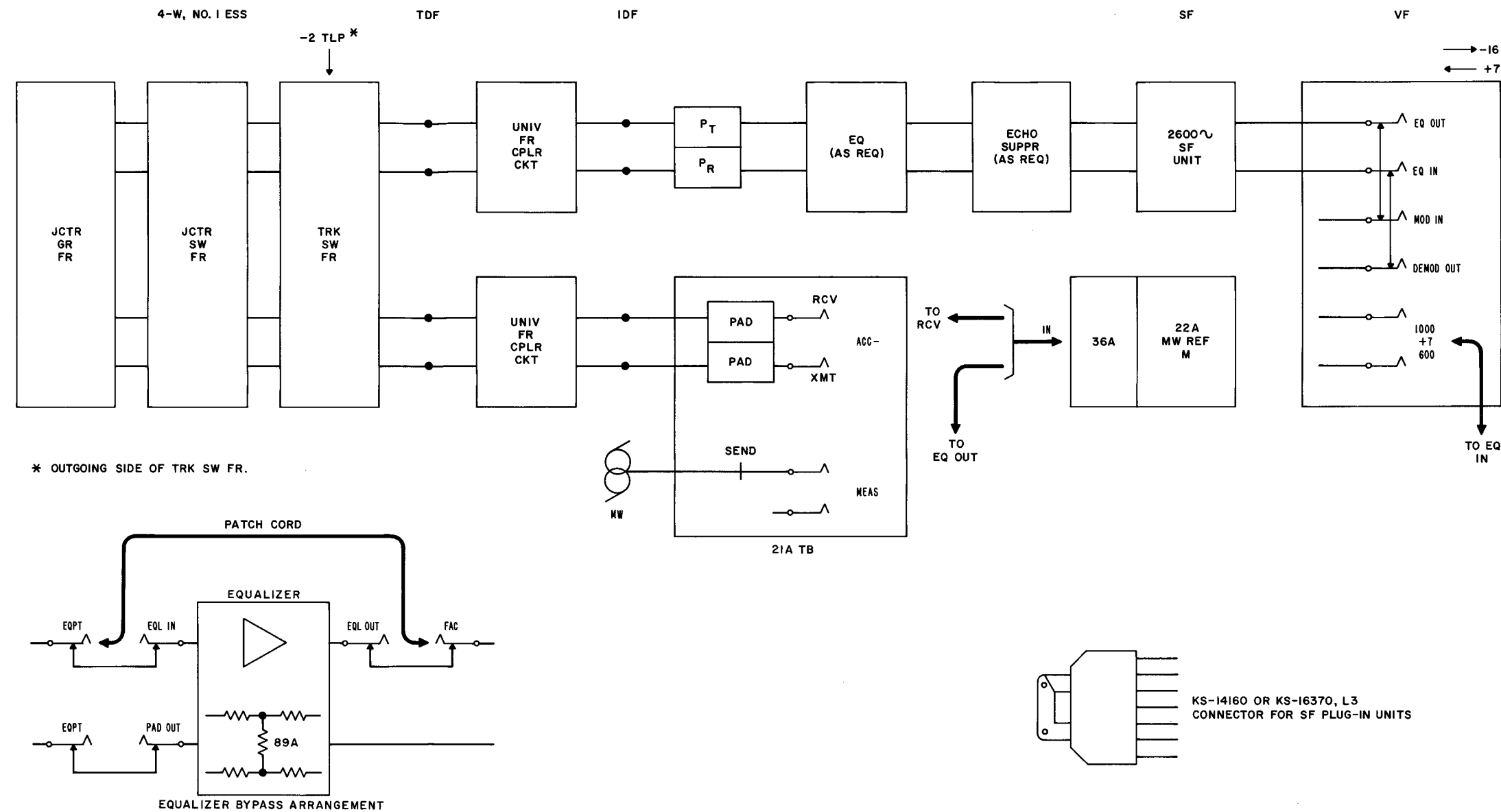


Fig. 1 — Typical Arrangement for Measuring Office Losses

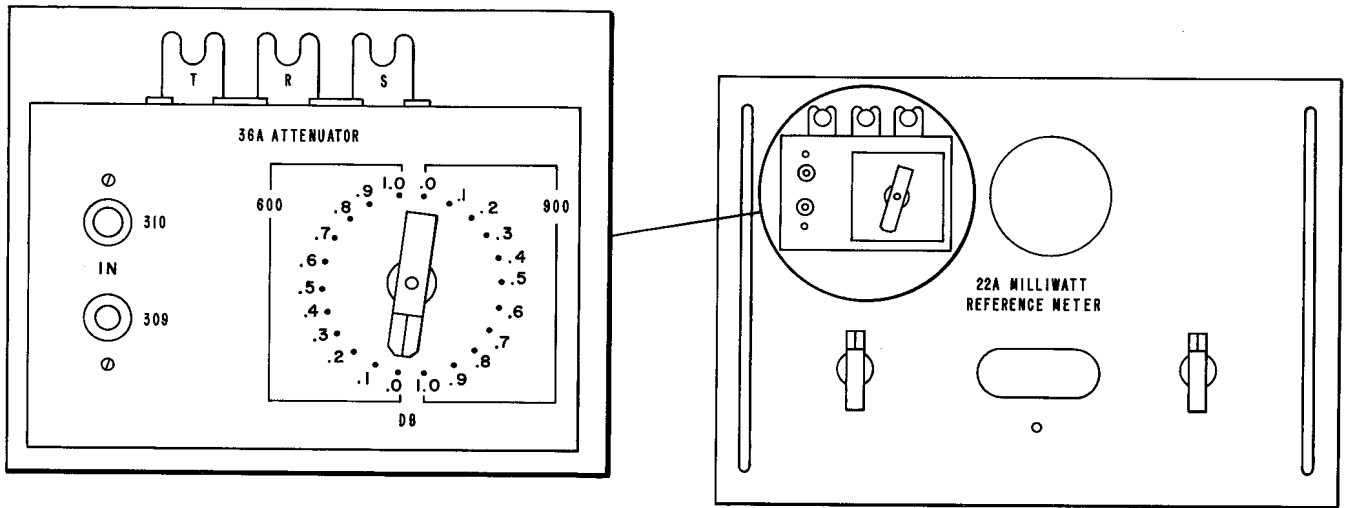


Fig. 2 — Use of 36A Attenuator with 22A Milliwatt Reference Meter for Measuring Fractional Levels

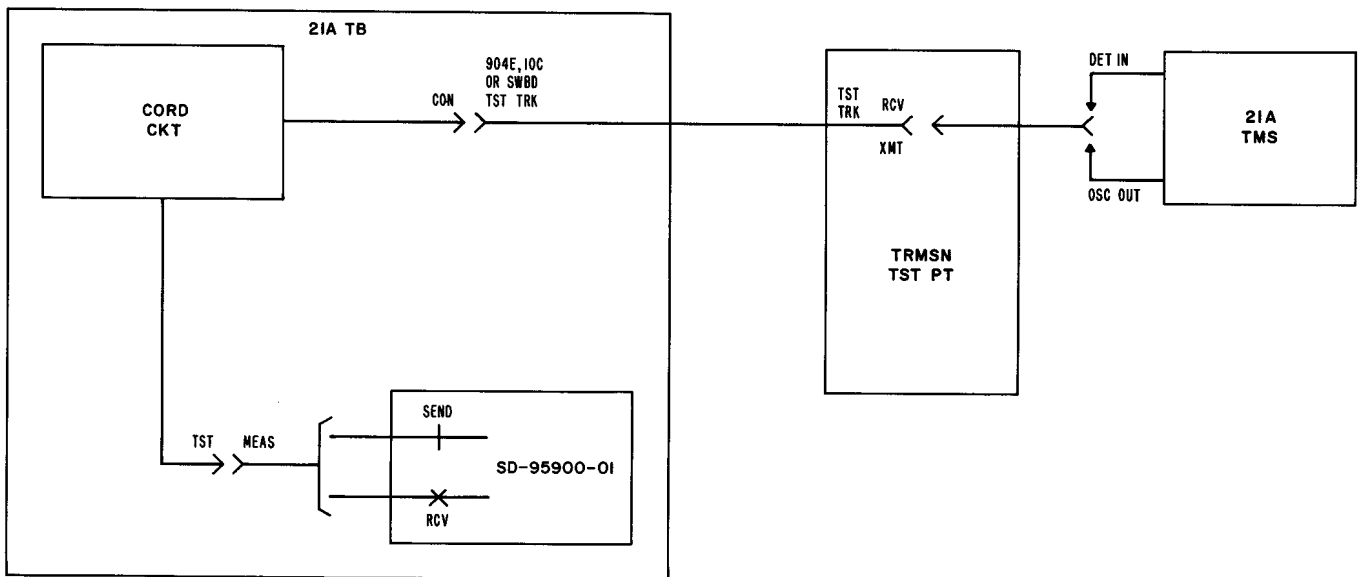


Fig. 3 — Typical Arrangement for Making Checks on Test Trunks