

TRUNK TRANSMISSION TESTING USING THE LOOP-AROUND METHOD

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1. GENERAL

1.01 This section describes the loop-around method of making manual 2-way 1000-Hz transmission tests on 4-wire repeatered voice-frequency trunks, trunks on carrier channels, or 2-wire voice-frequency trunks equipped with hybrid-type repeaters. Only general concepts are discussed in this section. Other sections cover the detailed methods of setting up the test connections and making the measurements in the various switching systems.

1.02 Two-way loss measurements are required on all trunks of the above types, since the two directions of transmission are essentially independent of each other. Where the 104-type test line (Section 103-235-100) is not provided, the loop-around method provides a means whereby these measurements can be made manually at the originating end of the trunk to be tested. It should be noted, however, that this method provides only for loss measurements. Noise measurements at the far end cannot be made by this method.

1.03 This section is reissued to include recently developed types of loop-around test lines and to bring the section up to date. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

2. TEST EQUIPMENT

2.01 Recommended test equipment is given in the sections covering detailed methods of

making the tests. However, a few general comments on this subject should be made.

2.02 All transmission measuring sets (TMS) and milliwatt (MW) supplies must be properly calibrated before they are used in the tests.

2.03 The impedance of the TMS and of the MW supply must be of the same nominal value as the impedance of the office at which the test is made. The test procedures covered in other sections take into account the nominal impedances and specify the proper test sets to be used.

3. TESTING ARRANGEMENT

3.01 The loop-around technique requires that two trunks be looped (connected together) at the distant or terminating office. The transmission test line circuit (SD-98100-01) provides the equipment necessary for this interconnection. Two locally assigned test codes are required for connection to the loop-around equipment. The loop-around equipment may be optionally equipped with a 60A control unit covered by SD-99331-01. Section 103-240-500 describes a method for testing the 60A control unit when installed with SD-98100-01 loop-around test lines. The 60A control circuit provides a means for detecting a 1000-Hz tone and closing the loop-around path when the test tone on either line exceeds -15 dBm. In addition it opens the loop-around path and terminates both lines upon detection of speech at a level greater than -45 VU.

3.02 There are several types of so-called loop-around test lines. The first is a simple arrangement wherein the two trunks are looped together when the two appearances are seized, one after the other. The second provides a milliwatt test line on the first appearance. When the second appearance is seized, the milliwatt tone is disconnected from the first appearance and the trunks are looped together. The third arrangement provides a milliwatt test line on the first appearance and a balance (quiet) test line on the second, provided the

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appearances are seized separately. If one appearance is seized following the other, the milliwatt tone and balance termination are both disconnected and the two trunks are looped together. The fourth arrangement is similar to the third, except that the balance termination on the second appearance is replaced by a combined milliwatt and balance test line which, if seized separately, provides milliwatt tone for about 5 seconds followed by a balance (quiet) termination.

3.03 Loop-around testing necessarily requires that means be available at the test location in the originating office for originating and holding two connections simultaneously. The sections covering detailed loop-around testing show procedures for doing this in each of the various types of switching systems where the means have been provided.

3.04 It should be pointed out that a possibility for confusion exists if two or more test locations have the ability to originate test calls to an office containing the third or fourth arrangement discussed in 3.02. For example, if one test location has already seized the balance test line, and the milliwatt test line is then seized from another location, the trunks from both locations will be looped together. Also, if the milliwatt test line is being held, a second location could attempt to seize the balance test line with the result that the trunks would be looped together. If this occurs, it will be desirable to suspend testing to the particular office until a later time.

4. LOOP-AROUND TESTING METHOD

4.01 In loop-around testing, the actual measured loss at 1000 Hz is first measured in the direction from the terminating office to the originating office (far-to-near loss). This is done on all the trunks to be tested by dialing the milliwatt test line on each trunk. A measurement of this type is shown in Fig. 1.

4.02 After all the trunk far-to-near losses have been measured and recorded, one trunk should be selected as a reference trunk. The reference trunk will be used in measuring the loss of all the other trunks in the direction from the originating office to the terminating office (near-to-far loss). The reference trunk should be stable and its measured far-to-near loss within ± 1.0 dB of the expected measured loss (EML). Trunks which

deviate more than ± 3.7 dB from the EML should be removed from service immediately. When the combination loop-around and milliwatt test line (SD-98100-01) is used, the far-to-near loss of the reference trunk may be rechecked after each loop-around measurement, because the milliwatt supply is reconnected to the reference trunk each time the trunk connected to the second appearance of the loop-around test line is released. Where separate milliwatt and loop-around test lines are used, more care is required in choosing the reference trunk. Records of past trunk performance should be used where available. The reference trunk far-to-near loss should be remeasured before a cycle of tests is completed. If the reference trunk loss has changed, the preceding tests should, of course, be remade.

4.03 Having chosen a reference trunk, this trunk is now connected to the first appearance of the loop-around test line in the terminating office. (With the combination MW and loop-around equipment, this will be the MW side of the equipment.) One of the other trunks to be tested is then connected to the second appearance of the loop-around test line. Figure 2 shows this connection. With the two trunks looped in this manner, 1000-Hz (1mW) tone is sent into the trunk under test and measured on the reference trunk. The measured loss includes the near-to-far loss of the trunk under test and the far-to-near loss of the reference trunk. As the far-to-near loss of the reference trunk is known, this loss is subtracted from the measured loss to determine the near-to-far loss of the trunk under test. The loss of the loop-around equipment and the associated wiring in the terminating office is required to be less than 0.1 dB and may be neglected. The reference trunk is held connected to the first appearance of the loop-around test line and each of the other trunks is connected in turn to the second appearance of the loop-around test line and measured in a like manner.

4.04 The near-to-far loss of the reference trunk may be obtained by selecting a second reference trunk and looping it with the original reference trunk.

4.05 All loop-around test measurements and computations should be recorded for analysis. Chart A is a suggested work sheet showing typical entries. Chart B is a blank work sheet that may, if desired, be reproduced locally. The trunk deviations, columns 4 and 8, Chart A, should be

used for trouble analysis and for the computations of the trunk transmission maintenance index for the office. All losses are recorded as positive values—gains are assumed to be negative losses. A plus deviation indicates that a trunk has too much loss while a negative deviation indicates not enough trunk loss.

4.06 Summary of loop-around testing.

- Step 1: Record the identifying numbers of the trunks to be tested (column 1, Chart A).
- Step 2: Record the Expected Measured Loss of each trunk (column 2, Chart A).
- Step 3: Check the calibration of all test equipment to be used in the tests.
- Step 4: Measure the far-to-near loss of each trunk by connecting each trunk to the 1mW test line at the terminating office (see Fig. 1). Record the measurements (column 3, Chart A).
- Step 5: Compute the far-to-near deviation of each trunk (column 3 minus column 2, Chart A). Record the deviations (column 4, Chart A).
- Step 6: Select a reference trunk (see 4.02) and record the measured far-to-near loss of this trunk (column 6, Chart A for all trunks except the reference trunk itself).
- Step 7: Connect the reference trunk to the first appearance of the loop-around test line at the terminating office (see Fig. 2).
- Step 8: Connect the trunk to be tested to the second appearance of the loop-around test line at the terminating office (see Fig. 2).
- Step 9: Send 1000 Hz (1mW) on the trunk under test and measure the loss on the reference trunk (see Fig. 2). Record this loop-around loss (column 5, Chart A).
- Step 10: Repeat Steps 8 and 9 on the other trunks to be tested.
- Step 11: Recheck periodically the far-to-near loss of the reference trunk (see 4.02).
- Step 12: Compute the near-to-far loss (column 7, Chart A) and the deviation (column 8, Chart A) for each trunk.
- Step 13: Select a second reference trunk and connect it and the original reference trunk to the loop-around equipment.
- Step 14: Send 1000 Hz (1mW) on the original reference trunk and measure the loop-around loss on the second reference trunk. Record this loss.
- Step 15: Compute the near-to-far loss and the deviation of the original reference trunk.

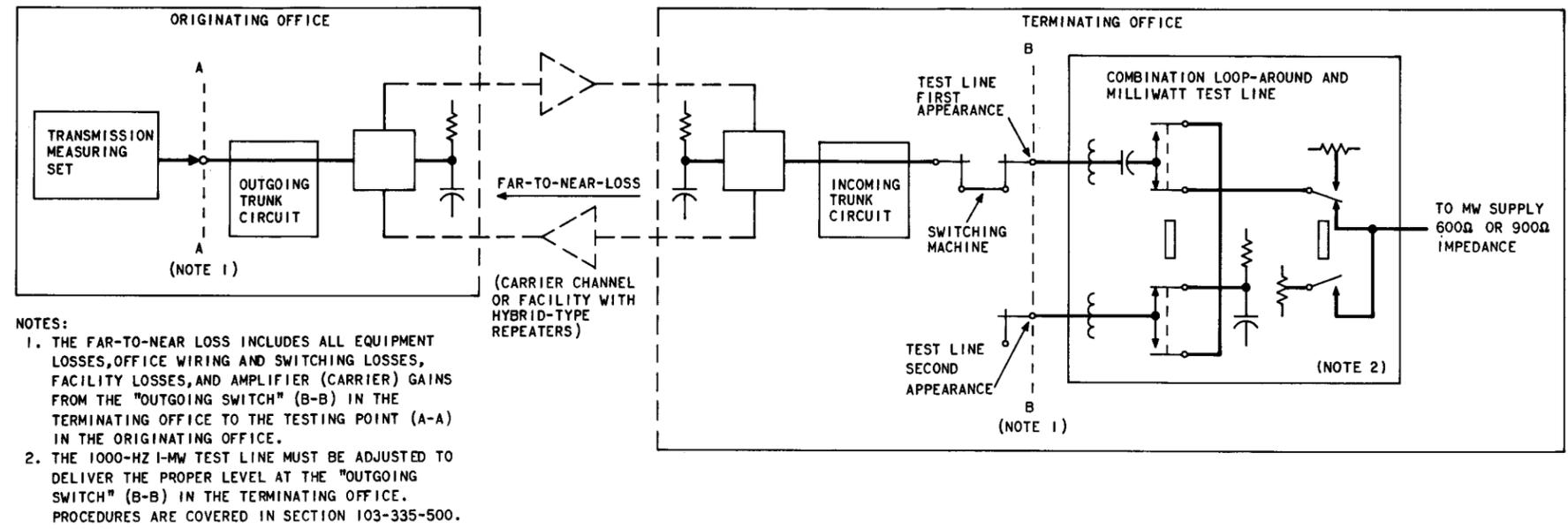
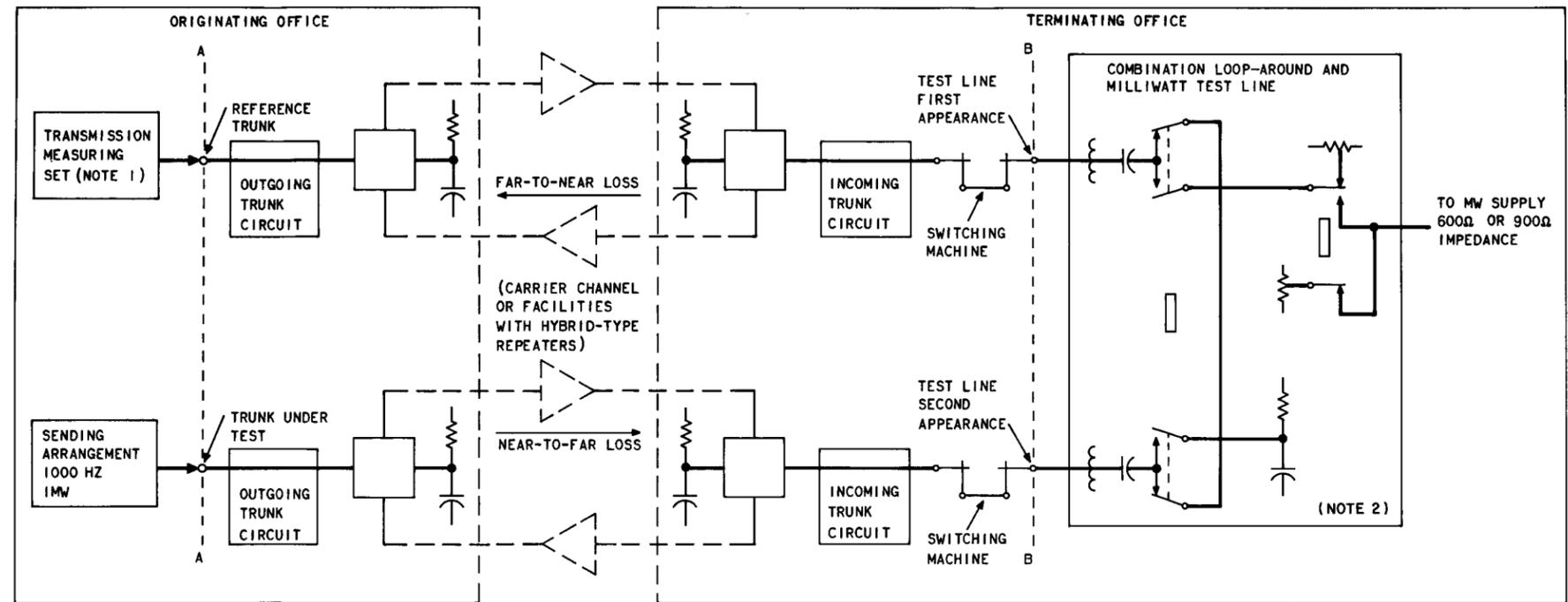


Fig. 1—Measuring Far-to-Near Losses



- NOTES:
1. THE MEASURED LOSS EQUALS THE NEAR-TO-FAR LOSS OF THE TRUNK UNDER TEST (A-A TO B-B) PLUS THE FAR-TO-NEAR LOSS OF THE REFERENCE TRUNK (B-B TO A-A).
 2. THE 1000-HZ LOSS OF THE LOOP-AROUND EQUIPMENT (SD-98100-01) AND ITS ASSOCIATED WIRING (TO B-B) IS REQUIRED TO BE LESS THAN 0.1 DB AND HENCE MAY BE NEGLICTED.

Fig. 2—Measuring Near-to-Far Losses

