SECTION 331-700-501
Issue 1, July 1970
AT&TCo Standard

CROSS-OFFICE NOISE TESTING METHODS

STEP-BY-STEP

1. GENERAL

1.01 This section describes a method for measuring noise in any SXS office. The method consists of connecting test sets to both ends of an intraoffice call and measuring noise at either end. The test sets provide a 900-ohm ac termination and a means of adjusting line current in both the originating and terminating loops.

1.02 Section 331-700-130 describes the test sets and cords used for cross-office noise testing. Information necessary to manufacture the test sets locally is included in that section.

2. TEST EQUIPMENT

2.01 Two test sets according to Fig. 1 of Section 331-700-130 are required. To simplify the instructions for their use, one of the test sets should be labeled "A" and the other "B". They are otherwise identical.

2.02 Two line-connecting cords according to Fig. 2 of Section 331-700-130 are required for connecting test set line jacks to distributing frame terminals. One meter-connecting cord according to Fig. 3 of Section 331-700-130 is required for connecting either test set to a 3A or equivalent noise measuring set.

2.03 The short clip-ended loop cord according to Fig. 4 of Section 331-700-130 is required in SXS offices only where shoes, instead of straps, are used to intercept call numbers. This cord is used to connect the intercepting trunk sleeve to the called number sleeve, thus providing battery for stopping connectors on a spare call number. In SXS offices where intercepting straps are used, do not disturb the sleeve straps to make these noise tests.

2.04 A 1011-type handset or equivalent, equipped with a 310-type switchboard plug, is required for dialing the selected test numbers.

2.05 Do not make these tests without a means of talking to a customer who is reached as a result of dialing error, record error, or malfunction.

3. PREPARATION OF DATA SHEET

3.01 Prepare data sheet, Form E-5969, for recording test results and other information. An example, with entries, is shown in Fig. 1.

4. SELECTION OF LINES FOR NOISE MEASUREMENT

4.01 Section 331-700-110 describes the procedure for selecting lines for testing. The current service-order method described in that section is the best method for use in SXS offices.

4.02 Delay while waiting for suitable PD (Permanent Disconnect) and NC (New Connect) service orders will be reduced by making arrangements before test dates with local frame supervisors. It will usually be possible to postpone work on most PD service orders until tests are made. Since NC orders can be, and often are done in advance of due date, such lines can be used for noise measurements anytime before turnover to customer.

4.03 In SXS offices where service order activity does not provide enough usable lines and numbers within a reasonable period, spare lines and numbers can be used at their IDF and CDF appearances.

4.04 Any sample can include lines and numbers from both current service orders and spares in any combination provided that all lines and numbers so used meet the requirements and are used under the conditions listed in Section 331-700-110, Part 2.

4.05 Measurements have shown that SXS machines are much more likely to be noisy during busy periods. Testing should be done during such periods.

5. TESTING PROCEDURES

A. Initial Connections and First Test Call

5.01 When using current service orders as a source of lines and numbers, proceed as follows at the main distributing frame.

(a) Select two service orders for lines that meet all of the requirements listed in Section 331-700-110, Part 2.

(b) Write the LG/T (Line Group and Terminal), cable and pair data shown on the orders on the first two lines in the CALLING LINE column (A) and CABLE PAIR column (B) on Form E-5969.

(c) Write the two call numbers on the first two lines in the CALLED NUMBER column (C) in reverse order of their line association. This reversal will prevent dialing the number associated with the calling line during testing.

5.02 The test sets should be connected at the vertical side of the main frame as follows.

(a) Test the pair shown on the first line of Form E-5969 for busy in the locally approved manner.

(b) Remove the heat coils in this pair.

(c) Connect the "A" unit LINE jack to the jumper terminals with one of the line-connecting cords.

(d) Turn the "A" unit switch to the DISC position.

(e) Connect a noise measuring set to the "A" unit METER jack with the meter-connecting cord.

(f) Connect a 1011-type handset or equivalent to the "A" unit TEL jack.

(g) Test the pair shown on the second line for busy in the locally approved manner.

(h) Remove the heat coils in this pair.

(i) Connect the "B" unit LINE jack to the jumper terminals with the order line-connecting cord.

(j) Turn the "B" unit switch to the CALL position.

(k) Turn the "A" unit switch to the CALL position and wait for dial tone.

5.03 When using spare lines and numbers at IDF or CDF appearances, proceed as follows.

(a) Select 20 spare lines and 20 machine-intercepted call numbers. Operator-intercepted call numbers may be used where machine-intercepted call numbers are not available. The lines and numbers selected must meet the requirements listed in Section 331-700-110, 2.01, 2.02,and 2.05.

(b) Write the LG/T data in the CALLING LINE column (A) and the call numbers in the CALLED NUMBER column (B) on Form E-5969.

(c) Connect the "A" unit LINE jack to the T & R terminals of the first line shown on Form-5969 with one of the line-connecting cords.

(d) Turn the "A" unit switch to the DISC position.

(e) Connect a noise measuring set to the "A" unit METER jack with the meter-connecting cord.

(f) Connect a 1011-type handset or equivalent to the "A" unit TEL jack.

(g) Remove the intercepting shoe or straps from the call number terminals of the first call number written on Form E-5969. In offices where straps instead of shoes are used to intercept call numbers, only the T & R straps should be removed. Do not disturb the sleeve strap. Step (i) below can then be skipped since the looping cord would parallel the sleeve strap.

(h) Connect the "B" unit LINE jack to the call number T & R terminals with the other line-connecting cord.

(i) In offices where shoes are used to intercept call numbers, connect the call number sleeve terminal to the associated intercepting trunk sleeve terminal with the short clip-ended looping cord.

(j) Turn the "B" unit switch to the CALL position.

(k) Turn the "A" unit switch to the CALL position and wait for dial tone.

B. Test Procedure

5.04 The same testing procedure is used for both current service order numbers and spares. Using the dial on the 1011-type handset or equivalent that is connected to the "A" unit, dial the first number shown in the CALLED NUMBER column of Form E-5969. When audible ring tone is heard, check that the "B" unit red lamp is flashing. If it is not, you have reached a wrong number. Do not hang up. Wait ten rings for customer to answer. If customer answers, explain that you are testing and apologize for the disturbance. Find out what number you have reached by asking the customer or by tracing. Locally approved line verification methods can also be used to determine correct line data. When correct information is found, make changes in the service order data and in the entries on Form E-5969.

5.05 Repeat the test call using the correct line data.

5.06 When the "B" unit red lamp flashes, turn the switches on both the "A" and the "B" units to the MEAS-L position. Both ends of the test call are terminated in a 900-ohm impedance. At the "A" unit the telephone is shunted, preventing entrance of room noise into the circuit under test. The "B" unit has tripped ringing and there is a 900-ohm loop at each end of the test call.

5.07 Measure noise and record the data on the first test call as follows.

(a) After calibrating, set the noise meter up for bridging, C-message weighting and, if equipped, for ***meter dampening.*** Adjust the meter range switch to bring the needle to midscale.

(b) Since cross-office noise is rarely constant, an average value for steady-state noise near the lower end and an average value for the peaks must be determined. Where large needle excursions are found, it will be necessary to adjust the noise meter range switch to determine the average peak value.

(c) Write these two values in the MEAS-LONG columns (D and E) on the first line of Form E-5969.

(d) Turn both the "A" and the "B" unit switches to the MEAS-S position. This reduces loop resistance to 90 ohms. Observe the meter for one minute. Using the same averaging tecnhique, determine the steady-state and peak values.

(e) Write these values in the MEAS-SHORT columns (F and G) on the first line of Form E-5969.

(f) Turn both the "A" and "B" unit switches to the DISC position.

C. Second Test Call

5.08 When using current service orders as a source of lines and numbers, proceed as follows with the second test call.

(a) Disconnect the 1011-type handset from the "A" unit and turn the "A" unit switch to the CALL position.

(b) Connect the 1011-type handset to the TEL jack on the "B" unit.

(c) Turn the "B" unit switch to the CALL position and wait for dial tone.

(d) Dial the second number in the CALLED NUMBER column.

(e) When audible ring tone is heard and the "A" unit red lamp is flashing, turn both the "A" and the "B" unit switches to the MEAS-L position.

(f) Using the technique described in 5.05, determine the steady peak values for the long and short loop conditions. Record this data on Form E-5969 in columns D, E, F, and G.

(g) Turn both the "A" and "B" unit switches to the DISC position.

(h) Remove both line-connecting cords from the jumper terminals.

(i) Replace both pairs of heat coils.

(j) Select two more service orders and repeat the test procedure. Continue in this manner until the required number of test calls has been made.

5.09 When using spare lines and numbers, only one test call can be made with each set-up. Proceed as follows with the second test call.

(a) Remove the short clip-ended looping cord from the called number sleeve terminals if the cord was used.

(b) Remove the "B" unit line-connecting cord from the number T & R terminals.

(c) Replace the intercepting shoe or straps.

(d) Turn the "A" unit switch to the CALL position and wait for dial tone.

(e) Dial the number again to verify that it has been properly intercepted.

(f) Remove the "A" unit line-connecting cord from the line T & R terminals.

(g) Connect the "A" and "B" units to the ***next*** line and number shown on Form E-5969 in the sequence described in 5.03 (c) through (k).

(h) Proceed with the second test call as described in 5.04 and 5.05. Continue in this manner until the required number of test calls has been made.

5.10 This procedure is used in two stages. Twenty thru-connections are measured and the results analyzed as in Part 6B. If the results are unsatisfactory, it may be necessary to measure an additional 20 thru-connections by repeating the above procedure.

6. EVALUATION OF TEST DATA

A. During Testing

6.01 A wide range of readings will be found in SXS offices. When recording measurements watch for variations from previous readings.

6.02 When noise above 18 dBrnc ***or*** substantially higher than other readings in the same sample is found in the MEAS-L position, do not turn both test unit switches to the MEAS-S position at the same time.

6.03 Record this higher value on Form E-5969 before proceeding with trouble isolating measures. When trouble has been found, describe the findings on the back of the form.

6.04 Turn the originating unit to the MEAS-S position and observe the meter for one minute.

6.05 If the noise level changes by more than 2.0 dB, there is an unreliable contact in the originating loop. This loop includes line-finder and selector wipers and relay contacts. Any of the springs in these components that are improperly tensioned or positioned will often produce noise, particularly where the contact points or surfaces on such springs are worn, eroded, corroded, or dirty.

6.06 If little or no change occurs, turn the terminating unit to the MEAS-S position.

6.07 Observe the meter for one minute. If the noise level changes by more than 2.0 dB, there is an unreliable contact in the terminating loop. This loop includes connector wipers and relay contacts. Inspect the springs and contacts in these components for condition, position, and tension.

6.08 If little or no change occurs, inspect wiper cord and jumper connections.

6.09 When investigating high noise readings, both listen to and measure the noise. Using the headset provided with the noise meter, monitor the higher noise readings when switching from MEAS-L to MEAS-S. ***There should be no difference in noise magnitude or character at different levels of loop current.*** When a difference is detected by either measuring or listening, it is an indication of mechanical or electrical failure of one or more circuit components. The defective element can often be isolated by having one person watch the meter and listen with the headset while another person pushes the circuit contacts together, one pair at a time, with two orange sticks or tooth picks. The office frame line or belt line can be used for communicating between the two persons. In some locations, the paging system or a portable loudspeaker will be simpler to use. In very small offices, yell back and forth.

6.10 If no noise-causing trouble is found release the test call and refer the connector frame to the office supervisor for ***off-hour*** checking of talking battery connections. Frame power taps and filter capacitor fuse connections cause noise.

Caution: Do not attempt such checking during busy hours.

B. After Testing

6.11 When 20 thru connections have been measured proceed as follows.

(a) Count the number of connections that measured above 18 in either columns D or F. In this and in the following counts where both columns being examined contain readings in excess of the stated number for the same test call, count only one.

(b) Count the number of connections that measured above 22 in either columns D or F.

(c) Count the number of connections that measured above 26 in either columns E or G.

(d) Count the number of connections that measured above 30 in either columns E or G.

(e) Write these four counts in the spaces provided at the bottom of Form E 5969.

6.12 Testing is completed if:

(a) No measurements in columns D and F exceed 18 ***and*** no measurements in columns E and G exceed 26. The office is acceptable.

(b) Any measurements in columns D and F exceed 22 ***and/or*** if any measurements in columns E and G exceed 30. The office is unacceptable and in need of immediate corrective action.

(c) Four or more measurements in columns D and F exceed 18 ***and/or*** if four or more measurements in columns E and G exceed 26. The office is unacceptable and in need of immediate corrective action.

6.13 Testing is ***not*** completed if:

(a) One, two, or three measurements in columns D and F exceed 18 ***and/or*** one two, or three measurements in columns E and G exceed 26. The office condition is in doubt. Twenty more test calls should be made under the same conditions as the first 20.

(b) When a total of 40 test calls is completed and the measurements counted as above evaluate the office as follows:

Acceptable—No more than ***three*** measurements in columns D and F above 18 ***and*** no more than ***three*** measurements in columns E and G above 26.

Unacceptable and in need of immediate corrective action if these numbers are exceeded.

7. RECORDING AND REPORTING RESULTS

7.01 When completed, the results should be reported in accordance with local instructions.

7.02 Form E-5969 includes spaces for reporting other information important to noise and transmission study. The following data, when available, should be entered in the spaces provided.

(a) SW. RM.TEMP. and REL. HUMIDITY

Switch room temperature and relative humidity influence switching machine performance. It is not known to what extend if at all these factors relate to noise in SXS offices.

(b) WIRE CHIEF NO.

The wire chief's (office supervisor's) telephone number should be entered in the space provided to simplify follow-up procedures or questions arising with data analysis.

(c) DIAL TONE

Certain types of dial tone generating equipment are subject to failure and adjustment drift that results in reduction in dial tone level. This condition is not always readily detected by existing monitoring circuitry and routines. Dial tone level when measured at the main frame with the test set in the MEAS-L position should be at 70 ±5.0 dBrnc. Variations from this level should be investigated. Such variations provide customer opportunity for unfavorable contrast.

(d) 1 MW

One-milliwatt power generating and distributing systems are sometimes found in need of attention. This added check of tone level will promote the uniformity essential in transmission measurements. One-milliwatt power level, when measured at the main frame with the test set in the MEAS-L position, should be at 89 ±0.5 dBrnc. Variations from this level should be investigated. Such variations reduce the validity of transmission measurements. This measurement is not a substitute for the required routine check and calibration of 1-milliwatt power supply equipment. This section does not authorize or recommend any noise meter for such calibrating. When the above stated limits are exceeded, only the instrument and method described in applicable sections should be used to adjust the 1-milliwatt system.

(e) QUIET TERM.

Irregularities in quiet termination or quiet line circuit options have been found in some locations. Checking this circuit when making noise measurements will reveal such conditions. The measured noise level should not vary greatly from the sample average noise level.

8. AVAILABILITY OF FORMS

8.01 Form E-5969 is available on order from the Western Electric Co. They are furnished in pads of 50, two pads per package. Ordering information is as follows:

(Quantity) Form, E-5969.

FORM E-5969
(10 69)
SEC. 331-700-500

CROSS OFFICE
NOISE TEST DATA

CITY MYTOWN BUILDING 104 MAIN ST OFFICE 456-682-742
DATE 10-8-69 TYPE EQUIP. SXS TESTER R.A. F.A.R.
SW. RM. TEMP. 81 °F REL. HUMIDITY 23 % WIRE CHIEF NO. 456-XXXX
DIAL TONE 74 dBrnc 1 MW 88.5 dBrnc QUIET TERM. 17 20 dBrnc

	CALLING LINE	CABLE PAIR	CALLED NUMBER	MEAS. NOISE-dBrnc			
				LONG		SHORT	
				STEADY	PEAK	STEADY	PEAK
	A	B	C	D	E	F	G
1.	14-22	3-206	682 - 2037	7	11	6	12
2.	9-67	14-29	456 - 5067	9	13	8	12
3.	71-154	19-321	4321	13	15	14	17
4.	16-27	19-163	7327	9	11	12	15
5.	17-102	21-402	742 - 5102	10	12	9	12
6.	23-171	11-651	3276	13	17	11	16
7.	31-146	SPARES	5671	7	12	9	14
8.	33-109	↓	5821	12	18	14	19
9.	45-11		4157	12	16	13	16
10.	57-96		1932	11	16	11	15
11.	116-71		682- 1271	12	15	15	17
12.	77-54		7477	9	11	10	14
13.	47-121		5211	13	16	15	19
14.	53-81		4979	14	17	13	16
15.	26-114		3727	12	19	13	22
16.	19-109		465- 7231	12	21	14	26
17.	131-59		6467	9	17	12	27
18.	62-74		5892	7	11	8	12
19.	51-77		2767	13	15	13	16
20.	2-106		1014	11	16	14	19

NO. OF CONN. EXCEEDING 18 dBrnc (STEADY): 0
NO. OF CONN. EXCEEDING 22 dBrnc (STEADY): 0
NO. OF CONN. EXCEEDING 26 dBrnc (PEAK): 1
NO. OF CONN. EXCEEDING 30 dBrnc (PEAK): 0
NOTES:

Fig. 1