

## CONTACT NOISE MEASUREMENTS

### SUMMARY AND ANALYSIS

#### PANEL OFFICES

#### 1. GENERAL

1.01 This section discusses the interpretation of data collected with the 30A Level Distribution Register (30A LDR) in surveys of contact noise in panel dial offices.

1.02 Three methods of rating contact noise performance have been chosen as a result of studies of a number of surveys; these are:

- (A) Per cent. Seconds Noisier than 35 dba.
- (B) Distribution of Calls with Respect to Noise Transmission Impairment (NTI).
- (C) Four-point Average.

Method (A) is intended for use ultimately to express the results of routine noise measurements. Method (B) is of particular value in offices where the multiple bank terminals are treated with contact protectant. Analysis, by this method, of surveys made before and after the initial treatment gives a good picture of the improvement obtained in terms of reduced transmission impairment. Method (C) provides a means for obtaining, with the 30A LDR, the "4-point average" type of value which has generally been used up to the present time for expressing the results of contact noise measurements. This method provides a tie-in between Methods (A) and (B) above and the older "4-point average," which has been computed in the past from readings with a noise measuring set, and will presumably be used only during the period of introduction of the new methods.

1.03 The front of Form E-3739 has been designed to provide space for recording the data taken during a survey consisting of two hundred 50-second calls as described in Section 215-175-501. Data collected on a typical survey are illustrated by Fig. 1. The back of the form provides space for developing and summarizing the results of the survey. The detailed procedures for using this part of the form are given under 2. METHOD. A facsimile of the results of a survey is shown by Fig. 2.

#### 2. METHOD

##### (A) Per Cent. Seconds Noisier than 35 dba

2.01 The "per cent. seconds noisier than 35 dba" method is the simplest means of interpreting the data obtained with the 30A LDR,

the value for a given survey being obtained directly from Form E-3739. Present experience indicates that the percentage of testing time that the noise exceeds 35 dba may vary over the range from less than one per cent. in the quieter, treated offices to as high as 45 per cent. in the noisier, untreated offices. This method will ultimately be used for interpreting the results of all routine contact noise measurements and a value greater than five per cent. in a treated office will generally indicate a need for retreatment. However, until experience has been obtained with treated offices in a particular area the analysis described in 2.03 to 2.06 should be made as part of the interpretation of all contact noise surveys.

2.02 In the lower right-hand corner of the front of Form E-3739 there are two spaces, designated A and B, in which are shown the total number of one-second intervals noisier than 25 and 35 dba, respectively, during the 10,000 seconds that elapse while two hundred 50-second test calls are being made. In order to translate these figures to percentages of the 10,000 seconds of testing time, therefore, all that need be done is to point off two decimal places in each figure. These percentages are then entered in lines (A) and (B) of the SUMMARY on the back of the form.

##### (B) Distribution of Calls with Respect to Noise Transmission Impairment (NTI)

2.03 The results of a number of surveys of untreated and petrolatum-treated panel offices have shown that the distribution of calls with respect to noise transmission impairment (NTI) are quite different in the two cases. Ordinarily, offices that are to receive treatment are surveyed both before and after treatment, and the results analyzed in the manner described in 2.04 to 2.06, inclusive, to obtain the distributions of calls with respect to NTI. In order to show graphically the improvement obtained by means of the treatment it will be desirable to show the "before" and "after" distributions on a single curve sheet.

Note: Noise transmission impairment is the impairment to telephone transmission caused by noise, and is expressed in terms of the db reduction in speech volume that would cause an equal impairment.

**SECTION 215-175-301**

2.04 A table is provided in the lower left-hand corner of the back of Form E-3739 for recording the data required to obtain the distribution curve for a given survey. The number of calls having seconds per call noisier than 35 dba (>35) for each of the class intervals (0, 1-5, etc. to over 45) shown in Column (1) should be recorded in Column (2). The manner in which the number of calls in each class interval is obtained is illustrated by the following example which covers the first twenty calls shown on Fig. 1.

		> 35			
		Register	Seconds per		
BE 0010	Readings	Call	>35	Class	Tally Sheet
Start 2272					
Orig. 1	-	0	0		
" 2	73	1	1-5	0	
" 3	74	1	1-5	1-5	
" 4	76	2	1-5	6-10	
" 5	-	0	0	11-15	
" 6	77	1	1-5	16-20	
" 7	-	0		etc.	
" 8	92	15	11-15		
" 9	-	0	0		
" 10	2295	3	1-5		

BE 1349

Start 2295					
Orig. 1	-	0	0		
" 2	96	1	1-5		
" 3	-	0	0		
" 4	-	0	0		
" 5	-	0	0		
" 6	97	1	1-5		
" 7	-	0	0		
" 8	09	12	11-15		
" 9	13	4	1-5		
" 10	2313	0	0		

2.05 The "seconds per call >35" column above is shown merely for illustrative purposes. In actual practice the differences would be obtained from the ">35" columns on the front of the form and scored directly on a scratch tally sheet. The results of the tally sheet should be entered in Column (2) of the table on the back of the form, accumulated "upwards" in Column (3) and the corresponding cumulative percentage entered in Column (4). The latter values should be plotted on the adjoining graph against the values of NTI in Column (5), shown at the top of the graph as PLOTTING POINTS, and a smooth curve drawn through these points. The cumulative percentages of calls impaired more than 2 db and 7 db, respectively, are obtained from the curve and entered in

lines (C) and (D) of the SUMMARY. These characteristics of the NTI distribution are useful as a performance index, after sufficient surveys have been made to furnish a basis for a performance scale. Until such a scale can be made available, the figures may be used simply for comparison purposes, for example, to compare performance of an office before and after the application of petrolatum treatments.

2.06 The graph used for the illustration shows that the distribution of calls with respect to NTI for the treated office (solid line) has a relatively sharp bend at about 2 db of NTI and only 5 per cent. of the calls have a noise impairment in excess of 2 db. On the other hand the distribution for an untreated office (dashed line, obtained from a survey made before application of contact protectant), bends gradually and has comparatively numerous calls with high values of NTI. If the former type of distribution is not obtained as a result of petrolatum treatment, an early investigation should be made to determine the cause of the high noise condition that is responsible. Inspection of the data as originally recorded on Form E-3739 will indicate the combinations of calling and called lines involved in the noisiest calls. Repeated connections should be established between these lines until a high noise condition is again obtained. The connection should be held and traced to locate the source of the noise: i.e., bank terminal, brush tension, sequence switch, commutator, or other source. This procedure should indicate the cause of the high noise conditions and should accordingly furnish a guide as to the further action required.

(C) Four-point Average

2.07 In view of the general use of the "four-point average" in the past as a performance index it is desirable to include this figure in the summary of contact noise performance, at least during the introduction of the new measuring method employing the 30A LDR.

2.08 The "four-point average" is defined as the numerical average of the amounts of noise, expressed in dba, that are exceeded respectively in three, six, ten and twenty per cent. of the seconds observed. It is necessary, therefore, to know the noise distribution reasonably well in order to compute the "four-point average."

2.09 Studies of contact noise distributions made with wide-range level-distribution apparatus have shown that cumulative distributions

of noise in panel offices can be represented by straight lines on arithmetic probability paper, with little or no error in the noise range that is of interest. It is, therefore, practicable to determine the cumulative distribution with sufficient accuracy for computation of the "four-point average" by plotting the two values obtained in 2.02, Lines (A) and (B) of the SUMMARY, on the upper left-hand grid of the back of the form and drawing a straight line through these points.

2.10 With a cumulative distribution of this type the "four-point average" noise value corresponds theoretically to the noise value that is exceeded eight per cent. of the time. Accordingly the "four-point average" is obtained from the intersection of the straight line distribution and the eight per cent. line, which is emphasized on the grid to facilitate locating the point of intersection. The reading at this point, shown as E on Fig. 2, should be entered as line (E) of the SUMMARY.

CONTACT NOISE SURVEY  
PANEL OFFICES

CITY Alpha  
OFFICE Beta  
MULTIPLE BANK TERMINALS  
 TREATED WITH KP-1373 CONTACT PROTECTANT  
 UNTREATED

DATE 10-8-48  
2B SET NO. 38175  
POT. 20 DB WTG. 71A OBSERVERS DJS

SECTION 215-175-301

TERM. →	BE 0010		BE 1349		BE 2097		BE 3645		BE 4399		BE 5471		BE 6799		BE 7597		BE 8525		BE 9597		TOTAL	
LEVEL →	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35	>25	>35
TIME →	8:59		9:17		9:31		9:46		10:01		10:15		10:33		10:52		11:08		11:24			
ORIG 1	42	-	-	-	25	15	-	-	15	60	81	-	91	-	39	41	69	-	19	-		
" 2	55	73	72	96	97	21	92	35	30	-	82	-	-	-	74	60	71	72	48	84		
" 3	65	74	73	-	99	-	96	-	34	-	84	-	94	29	77	-	77	-	80	89		
" 4	85	76	77	-	04	-	03	36	-	-	33	18	96	-	18	63	85	73	86	-		
" 5	89	-	79	-	16	22	16	37	41	-	54	22	00	-	47	65	86	-	88	-		
" 6	96	77	93	97	40	25	50	50	-	-	57	23	09	31	48	-	91	-	93	-		
" 7	09	-	-	-	56	30	75	53	46	61	66	-	10	-	50	66	99	74	96	-		
" 8	58	92	36	09	61	33	79	54	56	63	69	-	11	-	51	-	12	75	06	-		
" 9	60	-	66	13	62	-	02	58	57	-	85	28	14	-	55	67	18	76	21	91		
" 10	8471	2295	8566	2313	8685	2334	8813	2359	8857	2363	8986	2428	9017	2431	9168	2470	9218	2476	9321	2491		
START	8338	2272	8471	2295	8566	2313	8615	2334	8813	2359	8877*	2373*	8986	2428	9017	2431	9168	2470	9218	2476		
NET	133	23	95	18	119	21	128	25	44	4	109	55	31	3	151	39	50	6	103	15	963	209
TIME →	1:38		1:52		2:06		2:34		2:48		3:02		3:30		3:48		4:03		4:17			
ORIG 1	01	-	67	-	19	67	84	-	14	-	62	05	29	-	75	-	39	28	07	-		
" 2	-	-	82	64	22	-	98	-	19	93	68	08	34	-	77	-	42	29	08	-		
" 3	-	-	83	-	30	71	08	-	21	-	69	-	36	-	79	-	49	33	28	48		
" 4	1:	62	94	65	39	78	11	86	22	-	70	-	-	-	81	-	78	41	30	-		
" 5	32	-	98	-	58	82	35	87	24	-	74	10	37	-	-	-	80	42	34	49		
" 6	37	63	02	66	66	84	47	-	25	-	78	11	44	16	94	17	85	-	35	-		
" 7	39	-	03	-	71	-	48	-	-	-	08	13	62	-	05	-	96	44	36	-		
" 8	40	-	10	-	73	-	97	91	30	-	-	-	67	-	34	27	98	-	43	50		
" 9	59	-	14	-	82	-	03	-	-	-	15	-	-	-	56	-	99	-	0033 **77	3660 **64		
" 10	9460	2563	9515	2566	9582	2584	9713	2592	9735	2594	9828	2615	9869	2616	9936	2627	0001	2645	0082	64		
START	9394*	2558*	9460	2563	9515	2566	9582	2584	9713	2592	9755*	2604*	9828	2615	9869	2616	9936	2627	0001	2645		
NET	66	5	55	3	67	18	131	8	22	2	73	11	41	1	67	11	65	18	71	9	658	86
TOTAL	199	28	150	21	186	39	259	33	66	6	182	66	72	4	218	50	115	24	174	24	1621	295
																					(A)	(B)

Fig. 1 - Front of Form E-3739

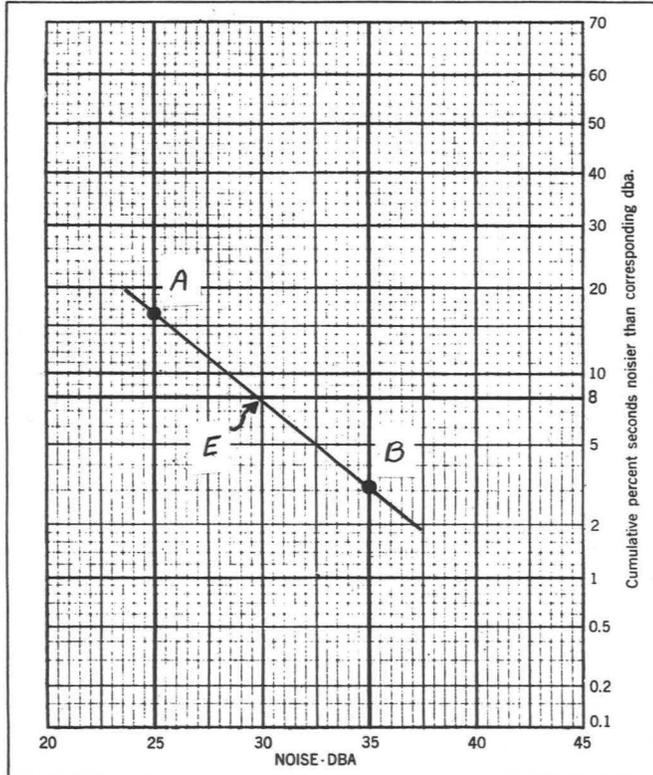
\*Note that this figure is different from the reading at the finish of the preceding set of 10 calls, as a result of check tests or adjustments on the 30A IDR between sets of calls. \*\* Note 10 false registrations between calls 8 & 9, not counted in net score. New start reading entered at top of Box 9.

SUMMARY OF CONTACT NOISE MEASUREMENTS  
PANEL OFFICES

CITY Alpha  
OFFICE Beta  
DATE 10-8-48

MULTIPLE BANK TERMINALS

TREATED WITH KS-13713 CONTACT PROTECTANT  
 UNTREATED



SUMMARY	
(A) Percent seconds noisier than 25 dba	16.2
(B) Percent seconds noisier than 35 dba	3.0
(C) Percent calls impaired more than 2 db	<del>5.0</del>
(D) Percent calls impaired more than 7 db	<del>0.5</del>
(E) Four-point average (8 % point)	30dba

*Dotted curve represents results of survey before treatment.*

① Seconds per call noisier than 35 dba	CALLS			⑤ NTI-DB	PLOTING POINTS 0.5 1.9 3.2 4.3 5.4 6.6 7.7 9.0 10.4
	② Number in Class	③ Cumulative Number	④ Cumulative Percent		
0	115	200	100	<del>NTI-DB</del>	
1-5	74	85	42.5	0.5	
6-10	6	11	5.5	1.9	
11-15	3	5	2.5	3.2	
16-20	1	2	1.0	4.3	
21-25				5.4	
26-30				6.6	
31-35				7.7	
36-40				9.0	
41-45	1	1	0.5	10.4	
Over 45					
Total	200				

Fig. 2 - Back of Form E-3739