WEST VANCOUVER CENTRAL OFFICE
NOISE INVESTIGATION REPORT
WRITTEN FOR:
THE B.C. TELEPHONE CO.

BY: Derek W. Spratt

JANUARY 1982

SUMMARY

This is a report of an investigation into noise levels in step-by-step switching Central Offices. This investigation is centered around noise produced by selector and rotary switches. Other sources of noise such as battery noise are not dealt with here (and preventative maintenance concerning such can only involve tightening of battery and power connection-a sometimes awkward if not difficult task).

Noise Metallic, Noise to Ground and Impulse Noise levels were measured in the West Vancouver Central Office before and after cleaning of all switches. A noticable improvement resulted and it is the recommendation of this report the C.O. switches should be cleaned and lubricated regularly to keep up the quality of subscriber service.

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INTRODUCTION

From June 16, 1981 to August 27, 1981, a noise investigation was conducted at the West Vancouver Central Office. Two sets of tests were conducted: one within the West Vancouver C.O. and the other between the West Vancouver C.O. and the North Vancouver C.O.. Measurements included Noise Metallic, Noise to Ground and Impulse Noise. The first set of noise measurements were taken from the line finders and passed through the selector switches to a termination at the racks. The second set of measurements used the same line finders, passed through the C.O. rotary switches and then terminated at the racks in the North Vancouver C.O.. No significant increases in noise levels were found when passing through the rotary switches. The majority of calls use direct trunks (they do not pass through the rotary switches) so no emphasis has been placed on rotary switches as noise sources in this report.

After eighty sets of measurements were taken within the West Vancouver C.O. (one set each from each line finder times eight line finder's times ten bays), all selector switches were cleaned and lubricated (previous cleaning done approximately one year ago). All eighty measurements were repeated after cleaning.

The noise level improvements due to the cleaning of the switches is investigated in this report.

EQUIPMENT DESCRIPTION

The instrument used for Noise Metallic and Noise to Ground measurements was the Wilcom Spectrum Analyzer and Noise Measuring Set.

Wilcom Products Inc.
Laconia, N.H.,U.S.A.
Model T132B
Serial No. 636

Impulse Noise measurements were made using the Bell System 6F Voiceband Noise Measuring Set.

Model J94006F
Serial No. 595
C-Notch 1010 Hz filter
BSP 103 626 100
SD 99737-01

The termination for the impulse noise measurements was supplied by the NEC 37B test set.

Northeast Electronics Corp.
Concord, N.H., U.S.A.
Model TTS-37B-1
Serial No. 2786

DESCRIPTION OF MEASUREMENT TECHNIQUES

1. When using the Wilsom Spectrum Analyzer and Noise Measuring Set for measurement of Noise Metallic and Noise to Ground the following procedure was observed:

   The West Vancouver C.O. silent line termination was dialed up (at the particular L.F. being used) using a butt-end and then the Wilcom test set was connected (c. message filter on) and noise measurements were made (butt-end removed). Impulses were ignored and the average levels were recorded.

2. When measuring Impulse Noise, the NEC 37B test set was set up at the racks in imitation of a subscriber telephone. A butt-end was used to dial up this termination (at the particular L.F. being used) and once ringing, the termination test set (37B) was switched from bridged mode to the 900 ohm termination (phone answered). The Bell System 6F impulse measuring set was then connected (with c-notch filter at 1010 Hz) and the impulse noise measurement was conducted for fifteen (levels set at 46,52,58 and 64 dbrnc) minutes.

Detailed information on the measurement techniques is not really required because the tests conducted were relative tests. The sought after information was on noise level improvements after cleaning so only the relative accuracy of the

testing procedure and equipment is important. Hence, the reliability of these tests is deemed to be quite good.

DATA MEASUREMENTS BEFORE CLEANING

The following data was measured using the previously mentioned measurement techniques:

C.O. : West Vancouver

DATE: June 16, 1981

TIME: 11:00 AM.

922-3011
922-2091

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 15 min. 64 hi	58	52	46 lo	
1	4D	A (6)	5	75	10	33	57	111	(2)
1	4D	B (17)	7	73	28	62	86	111	(16)
1	3C	A (8)	6	73	11	19	63	120	(3)
1	3C	B (14)	7	75	1	14	44	83	(20)
1	2B	A (8)	8	76	5	9	14	26	(9)
1	2B	B (21)	8	74	26	65	145	235	(17)
1	1A	A (6)	12	75	PAY PHONE				(11)
1	1A	B (20)	9	74	PAY PHONE				
2	8	A (6)	6	64	4	22	39	55	(3)
2	8	B (1)							

C.O. : West Vancouver

DATE: June 18, 198

TIME: 10:45 AM.

922-2091
926-5278

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46 lo	
2	8	A (6)	6	69	4	22	39	55	(3)
2	8	B (14)	6	73	12	23	43	80	(20)
2	7	A (8)	5	71	11	23	41	112	(8)
2	7	B (19)	10	71	7	25	60	126	(14)
2	6	A (5)	6	70	13	27	67	159	(6)
2	6	B (19)	5	69	11	26	79	191	(20)
2	5	A (6)	4	72	4	28	111	272	(6)
2	5	B (22)	5	72	14	59	151	291	(22)
3	12D	A (20)	8	72	2	20	41	62	(2)
3	12D	B (7)	5	71	1	12	35	78	(16)
3	11C	A (21)	4	73	24	41	75	137	(1)
3	11C	B (5)	5	68	2	8	14	55	(17)
3	10B	A (18)	5	73	17	50	107	202	(9)
3	10B.	B (7)	6	73	9	23	59	172	(22)
3	9A	A (21)	6	72	13	62	114	198	(9)
3	9A	B (5)	5	73	2	26	87	200	(17)
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C.O. : West Vancouver

DATE: June 22, 19

TIME: 9:40 AM.

922 2091

926 5901

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46 lo	
4	16 D	A (7)	3	62	0	5	28	76	(5)
4	16D	B (15)	4	64	1	1	8	74	(18)
4	15C	A (6)	3	74	0	1	3	21	(4)
4	15C	B (20)	3	73	0	4	22	75	(22)
4	14B	A (2)	3	72	1	2	12	35	(2)
4	14B	B (21)	2	74	10	11	46	108	(21)
4	13A	A (9)	3	74	6	26	47	90	(19)
4	13A	B (22)	5	72	3	7	20	53	(8)
5	20D	A (1)	3	70	6	10	35	94	(2)
5	20D	B (18)	5	71	14	15	39	95	(21)
5	19C	A (4)	4	72	7	12	23	71	(1)
5	19C	B (17)	3	72	4	5	24	71	(17)
5	18B	A (1)	2	76	12	19	90	148	(6)
5	18B	B (15)	4	78	8	10	29	83	(19)
5	17A	A (4)	5	72	3	3	13	64	(3)
5	17A	B (16)	5	73	2	2	17	68	(14)
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C.O. : West Vancouver

DATE: June 23, 198

TIME: 9:35 AM.

922-2091
926 5901

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46 lo	
6	24	A (8)	4	71	1	12	25	70	(3)
6	24	B (15)	3	72	1	2	17	62	(20)
6	23	A (5)	5	75	2	3	16	46	(5)
6	23	B (16)	3	73	–	–	3	32	(17)
6	22	A (4)	4	73	4	15	40	110	← (9)
6	22	B (16)	4	73	16	39	49	82	(22)
6	21	A (3)	5	72	~~60~~	~~149~~	~~246~~	~~357~~	~~(3)~~
6	21	B (18)	6	73	0	7	29	61	(20)
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C.O.: West Vancouver

DATE: June 24, 1981

TIME: 10:05 AM

922-2091
925-1714

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46 lo	
7	28D	A (8)	4	75	9	35	45	74	(8)
7	28D	B (15)	3	72	2	17	45	147	(17)
7	27C	A (3)	3	72	1	1	8	39	(7)
7	27C	B (20)	4	72	2	9	35	80	(20)
7	26B	A (2)	4	75	1	10	21	53	(7)
7	26B	B (22)	4	74	1	10	24	52	(14)
7	25A	A (5)	6	72	3	10	18	47	(3)
7	25A	B (22)	4	72	5	47	131	222	(16)
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C.O. : West Vancouver

DATE: June 25, 1981

TIME: 9:35 AM.

922-2091
925-1713

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46	
8	32 D	A (5)	5	69	-	3	10	39	(1)
8	32D	B (17)	3	69	14	38	88	122	(18)
8	31C	A (3)	3	70	31	75	85	120	(9)
8	31C	B (19)	3	71	2	2	4	21	(20)
8	30B	A (5)	2	71	4	11	37	83	(8)
8	30B.	B (20)	4	71	-	1	11	46	(22)
8	29A	A (4)	3	71	2	8	16	63	(19)
8	29A	B (14)	3	73	-	31	50	80	(15)
10	40	A (8)	6	64	-	2	11	35	(6)
10	40	B (13)	5	74	-	3	23	89	(16)
10	39	A (7)	4	65	3	25	41	65	(8)
10	39	B (14)	5	66	19	72	114	168	(16)
10	38	A (2)	5	68	2	18	103	171	(6)
10	38	B (18)	4	68	25	31	53	112	(18)
10	37	A (4)	4	66	1	26	54	131	(9)
10	37	B (19)	5	63	9	22	48	92	(17)
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C.O. : West Vancouver

DATE: June 26, 1981

TIME: 9 : 25 A.M.

922 2091
926 5877

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	46 lo	
9	36	A (1)	6	69	5	15	24	49	(11)
9	36	B (13)	5	67	27	55	96	196	(17)
9	35	A (2)	4	68	4	35	80	171	(5)
9	35	B (18)	4	65	9	36	80	153	(18)
9	34	A (6)	4	65	13	18	42	111	(5)
9	34	B (12)	5	67	10	33	41	75	(16)
9	33	A (3)	6	68	1	53	111	164	(4)
9	33	B (18)	6	71	10	25	72	120	(13)
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CLEANING METHOD

DATA MEASUREMENTS AFTER CLEANING

The following data was measured using the previously mentioned measurement techniques.

C.O. : West Vancouver

DATE: Aug 18, 198

TIME:

922-2091
922-2676
922-3275

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	lo 46	
1	4D	A (1)	3	71	0	13	21	33	(3
1	4D	B (19)	2	71	2	2	4	22	(14
1	3C	A (9)	3	72	16	51	76	102	(9)
1	3C	B (15)	2	70	2	19	42	68	(20
1	2B	A (3)	2	72	5	23	51	90	(7)
1	2B	B (18)	2	70	0	10	29	64	(21
1	1A	A ( )	Operator {ie. pay phone}						(
1	1A	B ( )							(
2	8	A (3)	3	64	4	18	48	66	(2
2	8	B (21)	3	63	3	12	38	87	(17
2	7	A (6)	3	62	9	45	106	161	(2
2	7	B (22)	4	61	2	2	21	110	(15
2	6	A (7)	4	61	0	4	12	42	(6
2	6	B (17)	3	61	3	16	30	65	(1
2	5	A (2)	3	63	3	16	41	61	(3
2	5	B (16)	4	61	0	4	23	56	(16
3	12D	A (3)	3	70	6	30	69	130	(9
3	12D	B (18)	4	66	13	36	58	100	(2
3	11C	A (5)	3	66	5	23	53	84	(1
3	11C	B (19)	5	65	1	8	28	53	(17
3	10B	A (3)	3	72	18	40	49	97	(8
3	10B	B (22)	2	64	4	11	60	137	(18
3	9A	A (7)	1	66	9	9	13	54	(3
3	9A	B (3)	3	65	2	3	36	87	(2
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C.O. : West Van.

DATE: Aug 20, 198

TIME:

922 2091
925-1374
925-1116
926-5927

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	lo 46	
4	16D	A (2)	3	74	5	25	38	46	(4)
4	16D	B (21)	4	75	13	39	77	166	(14
4	15C	A (5)	3	65	4	5	9	16	(3
4	15C	B (20)	2	66	20	60	91	135	(18
4	14B	A (1)	5	63	5	7	17	27	(8
4	14B	B (16)	2	64	11	30	51	71	(17
4	13A	A (4)	2	62	7	11	24	68	(1
4	13A	B (15)	2	62	2	3	6	50	(19
5	20D	A (6)	2	67	10	51	80	113	(4
5	20D	B (15)	3	66	19	85	170	303	(17
5	19C	A (8)	2	66	3	23	49	92	(3
5	19C	B (19)	11	67	6	15	33	73	(2
5	18B	A (5)	2	67	7	40	74	111	(2
5	18B	B (17)	2	66	3	25	41	83	(2
5	17A	A (4)	1	67	10	27	50	89	(3
5	17A	B (22)	1	65	0	11	34	70	(19
6	24	A (1)	2	70	2	19	44	72	(15
6	24	B (19)	1	68	9	15	29	75	(14
6	23	A (3)	2	73	1	37	87	126	(16
6	23	B (16)	2	70	6	37	78	131	(21
6	22	A (2)	3	70	7	50	81	146	(3
6	22	B (22)	4	72	0	3	32	68	(17
6	21	A (9)	2	71	7	37	58	91	(7
6	21	B (3)	2	71	21	43	130	242	(18
7	28D	A (2)	2	71	5	32	69	123	(4
7	28D	B (20)	2	70	0	0	13	63	(14
7	27C	A (6)	1	70	2	6	17	103	(6
7	27C	B (22)	2	72	3	3	10	53	(19
7	26B	A (4)	2	71	9	44	91	155	(8)
7	26B	B (22)	2	72	2	2	10	68	(20
7	25A	A (3)	2	72	7	37	51	102	(1)
7	25A	B (17)	2	72					

C.O. : West Van

DATE: Aug 27, 198

TIME:

922-7152
922-2091
926-7815

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) 64 hi	58	52	lo 46	
8	32 D	A (9)	2	68	2	17	38	64	(3)
8	32D	B (19)	1	67	1	1	1	20	(19)
8	31C	A (6)	3	65	5	8	17	38	(9)
8	31 C	B (18)	1	63	2	41	127	191	(15)
8	30 B	A (1)	1	65	3	16	67	101	(5)
8	30 B	B (22)	2	68	5	13	33	44	(14)
8	29A	A (5)	2	66	1	8	28	63	(1)
8	29A	B (19)	2	65	2	4	17	48	(21)
9	36	A (1)	2	66	7	34	72	113	(6)
9	36	B (13)	1	65	3	4	8	34	(16)
9	35	A (7)	2	66	9	30	66	109	(7)
9	35	B (19)	2	66	5	32	67	139	(12)
9	34	A (8)	2	66	25	71	133	196	(5)
9	34	B (13)	2	65	4	35	109	187	(19)
9	33	A (5)	3	68	8	49	110	171	(8)
9	33	B (13)	2	69	3	6	22	59	(13)
10	40	A (1)	1	71	8	28	60	105	(8)
10	40	B (15)	2	73	1	6	48	116	(13)
10	39	A (2)	2	71	2	39	56	87	(6)
10	39	B (15)	2	66	1	21	62	107	(12)
10	38	A (4)	2	64	5	14	23	54	(2)
10	38	B (16)	2	65	2	18	44	77	(13)
10	37	A (3)	2	65	3	19	39	66	(1)
10	37	B (13)	4	66	4	22	57	106	(15)
9	36	A ( )	Rotaries		77	135	169	243	(7)
9	36	A ( )			27	55	98	185	(7)
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ANALYSIS AND DISCUSSION OF MEASURED DATA

The following page contains the averaged results of measured data: first by bay number, and then a complete averaging of data for both pre and post cleaning data.

As can be seen, the Noise Metallic level dropped by two dB (a barely noticable improvement) and the Noise to Ground level dropped by and four dB (a little more significant).

There were fewer impulse counts above sixty four dbrnc by a factor of thirty percent. The count between fifty-two and sixty-four dbrnc didn't change significantly. Over all there was an eleven percent improvement in impulse noise above forty-six dbrnc (the range measured) which is a noticeable improvement.

Final interpretation of results can not be done as I have neither the knowledge required or the ability to effect changes and/or recommendations concerned with making such an interpretation.

C.O. : WEST VANCOUVER DATE:

TIME:

NOISE MEASUREMENTS

BAY NUMBER	LINE FINDER NUMBER	LINE FINDER GROUP	N. MET. (dbrnC)	N. GR. (dbrnC)	IMPULSE NOISE (dbrnC) (counts per interval) (64)hi	(58)	(52)	1@46	
		( )							
1	—	— (-)	5	74	10	32	49	111	
2	—	— (-)	6	70	10	29	61	142	
3	—	— (-)	6	72	9	30	67	138	
4	—	— (-)	3	71	2	7	18	67	
5	—	— (-)	5	73	7	10	33	87	PRE AVER
6	—	— (-)	4	72	3	11	25	66	
7	—	— (-)	4	73	3	17	41	89	
8	—	— (-)	3	71	7	21	38	72	
9	—	— (-)	5	68	10.	34	68	130	
10	—	— (-)	5	67	7	25	56	108	
		( )							
COMPLETE PRE AVERAGE		( )	4	71	7	22.	46.	101.	
		( )							
		( )							
1	—	— (-)	3	71	4	20	37	63	
2	—	— (-)	3	62	3	15	37	81	
3	—	— (-)	3	67	7	20	43	76	
4	—	— (-)	3	66	8	23	39	72	
5	—	— (-)	3	66	7	35	66	117	POS AVER
6	—	— (-)	2	71	7	30	67	119	
7	—	— (-)	2	71	4	16	34	89	
8	—	— (-)	2	66	3	14	41	71	
9	—	— (-)	2	66	8	33	73	126	
10	—	— (-)	2	68	3	20	49	90	
		( )							
COMPLETE POST AVERAGE		( )	2	67	5	23	49	90	
		( )							
		( )							
		( )							
		( )							

CONCLUSION AND RECOMMENDATIONS

This investigation has shown that:

1. The selector switches in Central Offices are a source of considerable noise (rotary switches on out going trunks were not given proper evaluation but surely also contribute similarly to the noise levels).

2. The cleaning method used was effective in noticeably improving noise levels in the C.O.'s.

3. The quality of noise levels degenerates noticeably in time and regular cleaning is necessary for acceptable subscriber service.

Finally, it is recommended that regular cleaning of selector and rotary switches be kept up until step-by-step switching offices are updated with Digital switches.