Surround Master Involve Proper - QS Decode?

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Testing Preformed:

- Surround Master Encoder QS Validation
- Inter-Channel Cross Talk
- Inter-Channel Phase Shift
- Inter-Channel Linearity

Equipment:

- CRO: Digitech, Dual-Channel Oscilloscope QC1922
- Signal generator: Wavetek, 5 MHz Sweep Generator Model 184
- Multimeter: Protek 506 Digital Multimeter

Surround Master Encoder QS Validation Tests

Testing Method: Each of the 4 input channels of the Surround Master encoder unit was subjected to a 1 V RMS 15 kHz sinusoidal signal individually and the output from the left and right stereo output channels was observed and measured (using the CRO and multimeter).

Results:

Surround Master Rear Left Channel

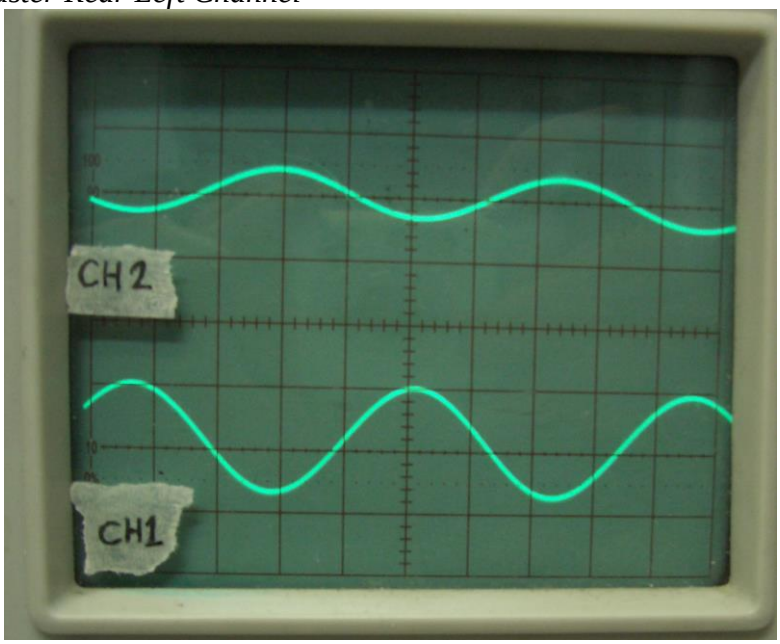

Figure 1 Rear Left, CH 1 is Left & CH 2 is Right

Table 1 Voltage measurements & CRO information.

Input signal voltage	Left output voltage	Right output voltage	CRO channels:	CRO Settings:
0.99	0.614	0.251	CH 1 = Left CH 2 = Right	CH1 = 0.5 V/Div CH2 = 0.5 V/Div T.B. = 0.1 ms

Surround Master Front Left Channel

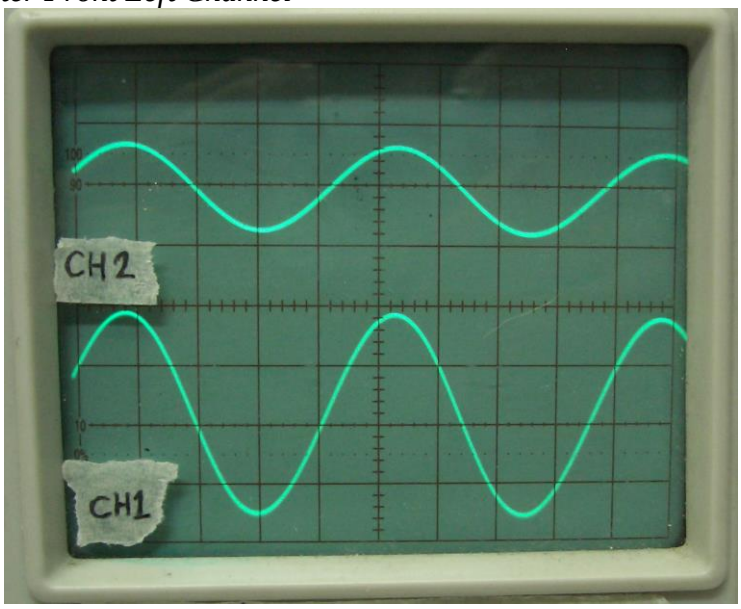

Figure 2 Front left, CH 1 is left & CH 2 is right.

Table 2 Voltage measurements & CRO information.

Input signal voltage	Left output voltage	Right output voltage	CRO channels:	CRO Settings:
0.99	0.612	0.252	CH 1 = Left CH 2 = Right	CH1 = 0.5 V/Div CH2 = 0.5 V/Div T.B. = 0.1 ms

Surround Master Front Right Channel

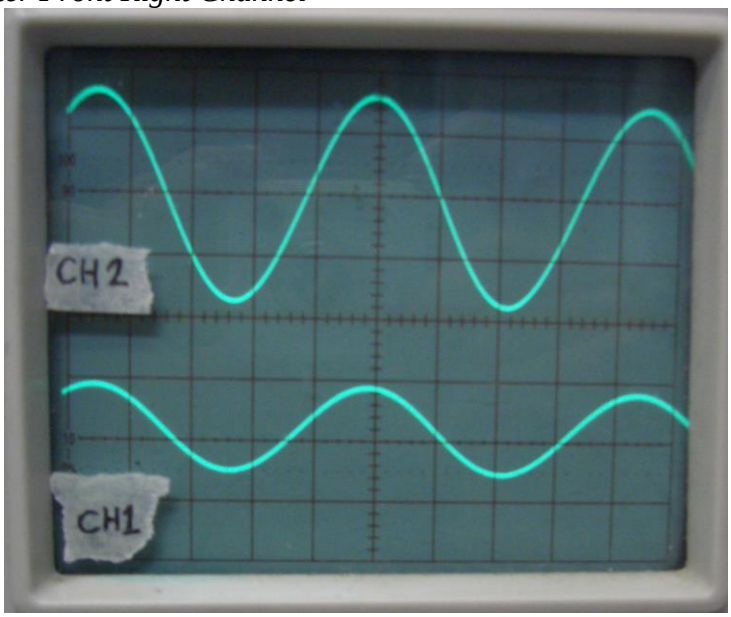

Figure 3 Front Right, CH 1 is left & CH 2 is right.

Table 3 Voltage measurements & CRO information.

Input signal voltage	Left output voltage	Right output voltage	CRO channels:	CRO Settings:
0.99	0.254	0.602	CH 1 = Left CH 2 = Right	CH1 = 0.5 V/Div CH2 = 0.5 V/Div T.B. = 0.1 ms

Surround Master Rear Right Channel

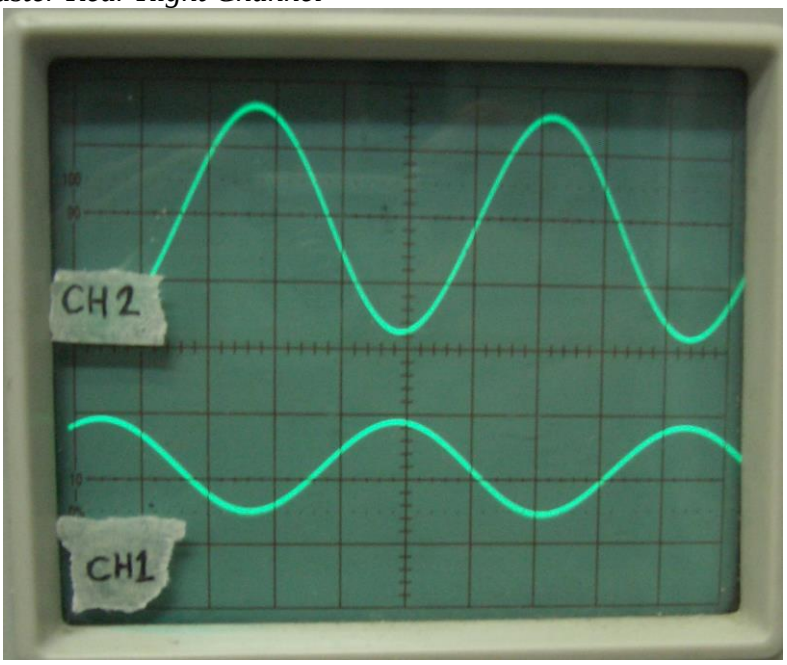

Figure 4 Rear Right, CH 1 is left & CH 2 is right.

Table 4 Voltage measurements & CRO information.

Input signal voltage	Left output voltage	Right output voltage	CRO channels:	CRO Settings:
0.99	0.254	0.6	CH 1 = Left CH 2 = Right	CH1 = 0.5 V/Div CH2 = 0.5 V/Div T.B. = 0.1 ms

Inter-Channel Cross Talk Tests

Testing Method: The stereo outputs of the Surround Master encoder were connected to the stereo inputs of the Surround Master decoder unit. As in the previous encoder test a 1 V RMS 15 kHz sinusoidal signal was inputted into each of the 4 inputs individually then the output from all four of the decoder's output channels was observed, measured and compared.

Following this the stereo outputs of the Surround Master encoder were connected to the stereo inputs of the Sansui QSD-1 decoder unit and the test procedure was repeated in the same manner (so the performance of the two decoder units could be compared).

Results:

Surround Master

Input Channel	Input Voltage	Output Channels Voltage:			
		Front Left	Front Right	Rear Left	Rear Right
Front Left	0.978	1.004	0.015	0.015	0.013
Front Right	0.978	0.017	0.966	0.017	0.015
Rear left	0.974	0.019	0.012	0.967	0.009
Rear Right	0.975	0.017	0.017	0.018	0.96

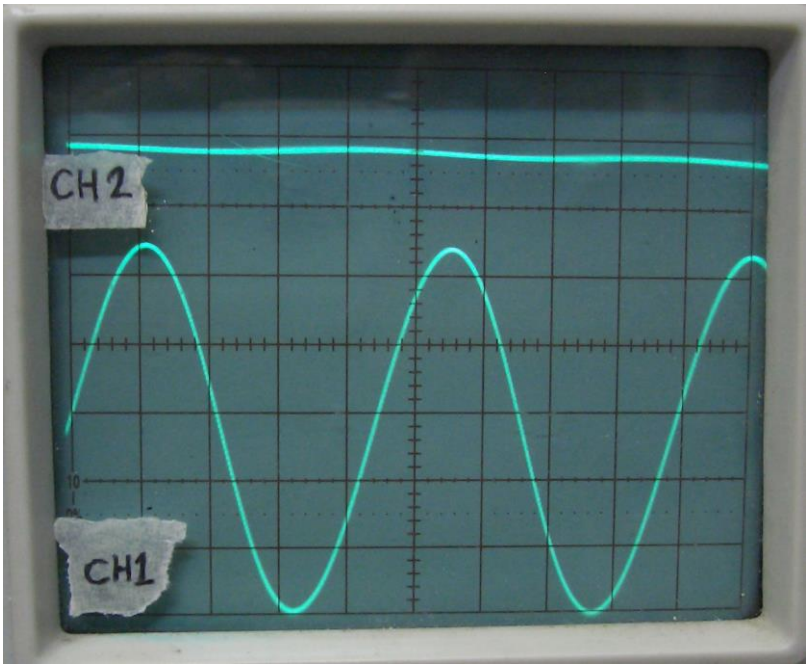

Figure 5 Front Left, CH 1 is front left & CH 2 is rear left.

Table 5 CRO information.

CRO Channels:	CH1 = F.L.	CH2 = F.R.
CRO Settings:	0.5 V/Div	0.5 V/Div

Note: All CRO traces looked practically identical to the one shown in Figure # (and there was no value in showing them all in this report).

Sansui QSD-1

Input Channel	Input Voltage	Output Channels Voltage:			
		Front Left	Front Right	Rear Left	Rear Right
Front Left	0.974	0.997	0.107	0.069	0.028
Front Right	FAULTY				
Rear left	0.977	0.068	0.038	0.967	0.118
Rear Right	FAULTY				

During the testing it was discovered that both the right output channels of the Sansui QSD-1 decoder unit were faulty so only the left channels could be used in the testing and comparison of the two decoder units. It is highly unlikely that the fault in the right channels would affect the performance of the left channels in any way which would not be immediately noticeable in the tests.

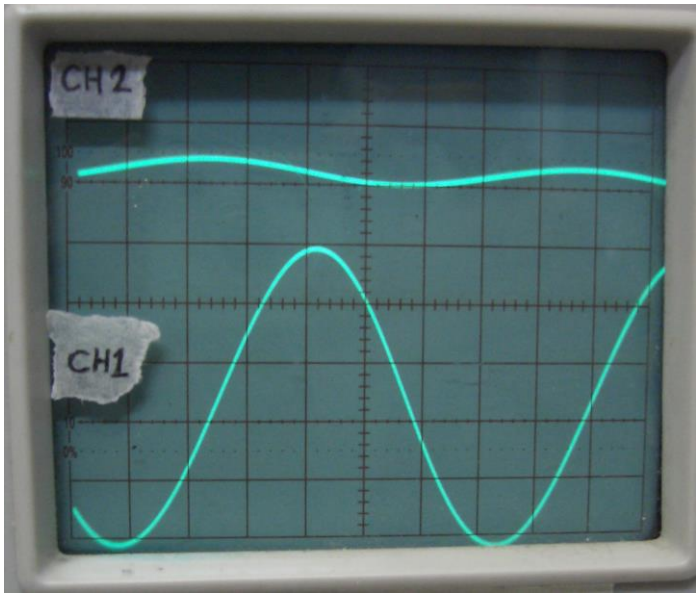

Figure 6 Front Left input, CH 1 is front left & CH 2 is rear left.

Table 6 CRO information.

CRO Channels:	CH1 = F.L.	CH2 = F.R.
CRO Settings:	0.5 V/Div	0.5 V/Div

Inter-Channel Phase Shift Tests

Testing Method: As in the previous test the stereo outputs of the Surround Master encoder were connected to the stereo inputs of the Surround Master and Sansui QSD-1 decoder units. A 1 V RMS 15 kHz sinusoidal signal was inputted into two of the four inputs at a time in a number of combinations and the signals from the corresponding outputs on both decoders were observed and measured to determine any phase shifts.

Results:

Surround Master Front Left vs. Rear Left

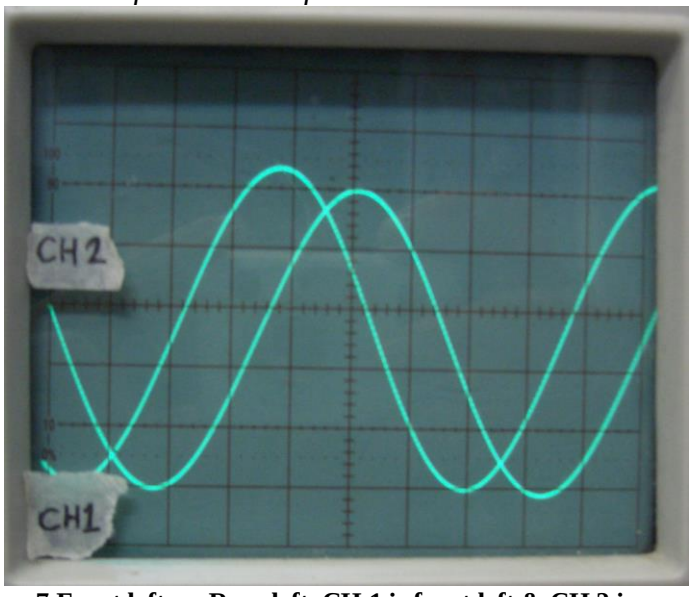

Figure 7 Front left vs. Rear left, CH 1 is front left & CH 2 is rear left.

Table 7 front left & rear left voltage measurements and calculated phase shift.

Channels Compared:	Input Voltage:	FL voltage:	RL voltage:	Phase Shift (in deg):	Leading Channel:
FL & RL	0.974	1.021	0.97	70.9	FL

Surround Master Front Right Vs Rear Right

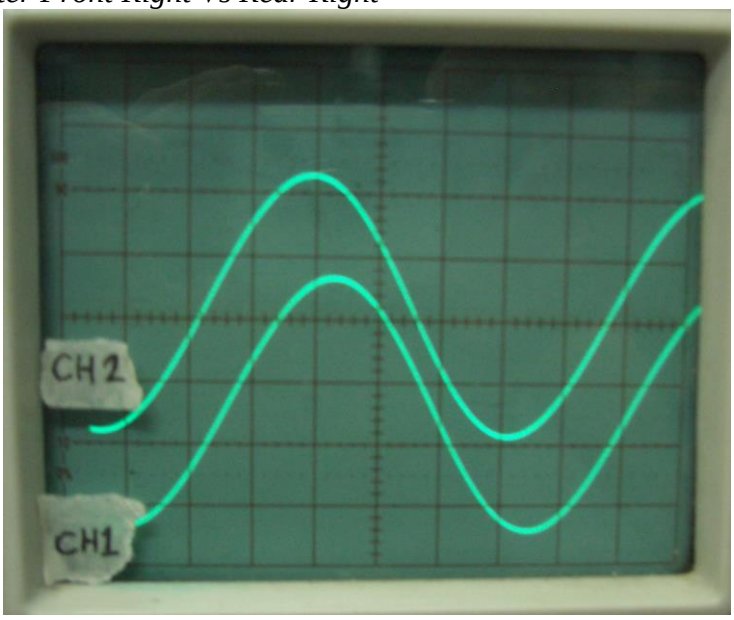

Figure 8 Front right vs. Rear right, CH1 is front right & CH 2 is Rear Right.

Table 8 front right & rear right voltage measurements and calculated phase shift.

Channels Compared:	Input Voltage:	FR voltage:	RR voltage:	Phase Shift (in deg):	Leading Channel:
FR & RR	0.975	0.789	0.785	21.8	RR

Surround Master Front Left vs. Front Right

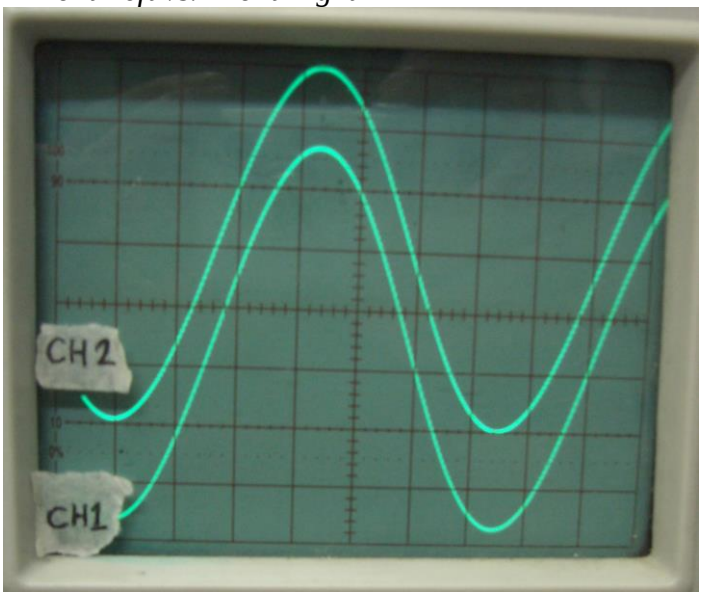

Figure 9 Front left vs. Front right, CH 1 is front left & CH 2 is front right.

Table 9 front left & front right voltage measurements and calculated phase shift.

Channels Compared:	Input Voltage:	FL voltage:	FR voltage:	Phase Shift (in deg):	Leading Channel:
FL & FR	0.975	0.86	1.144	0	-

Surround Master Rear Left vs. Rear Right

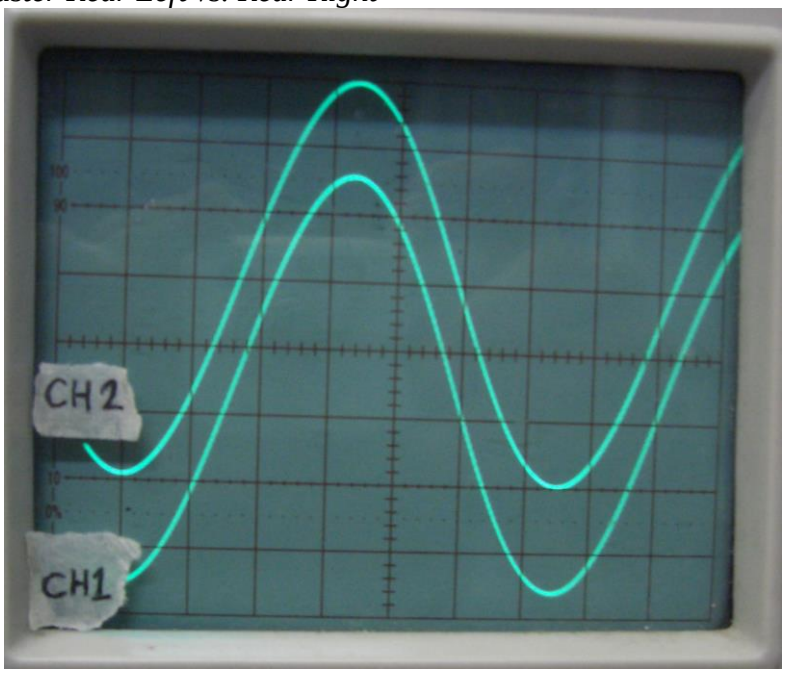

Figure 10 Rear left vs. Rear right, CH 1 is rear left & CH 2 is rear right.

Table 10 Rear left & rear right voltage measurements and calculated phase shift.

Channels Compared:	Input Voltage:	RL voltage:	RR voltage:	Phase Shift (in deg):	Leading Channel:
RL & RR	0.975	1.203	1.139	0	-

Sansui QSD-1 Front Left vs. Rear Left

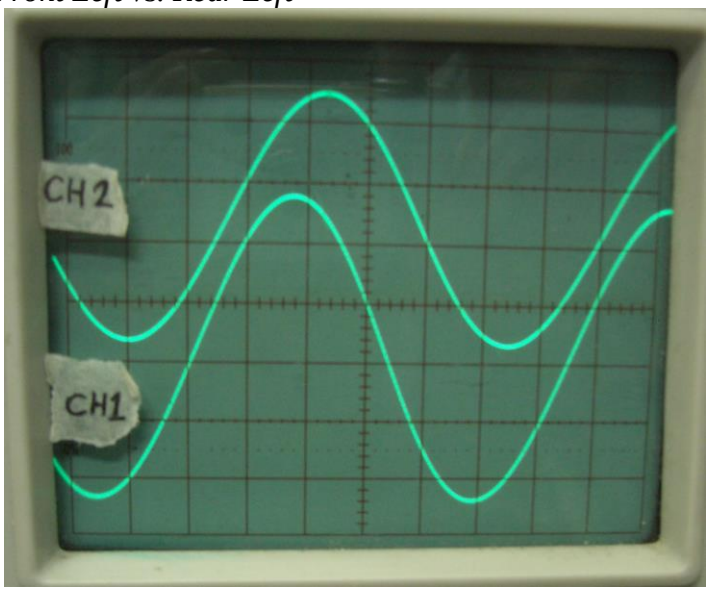

Figure 11 Sansui Front Left vs. Rear Left Input, CH 1 front left & CH 2 rear left.

Table 11 Sansui QSD-1 front left & rear left voltage measurements and calculated phase shift.

Channels Compared:	Input Voltage:	FL voltage:	RL voltage:	Phase Shift (in deg):	Leading Channel:
FL & RL	0.975	1.018	0.799	33.8	FL

Inter-Channel Linearity Tests

Testing Method: As in the previous two tests the stereo outputs of the Surround Master encoder were connected to the stereo inputs of the Surround Master and Sansui QSD-1 decoder units. A 1 V RMS 15 kHz sinusoidal signal of varied RMS voltage was applied to two channels simultaneously. Two linear potentiometers were used to regulate the RMS voltages and shift between the channels.

Results:

Surround Master Front Left and Front Right Channels

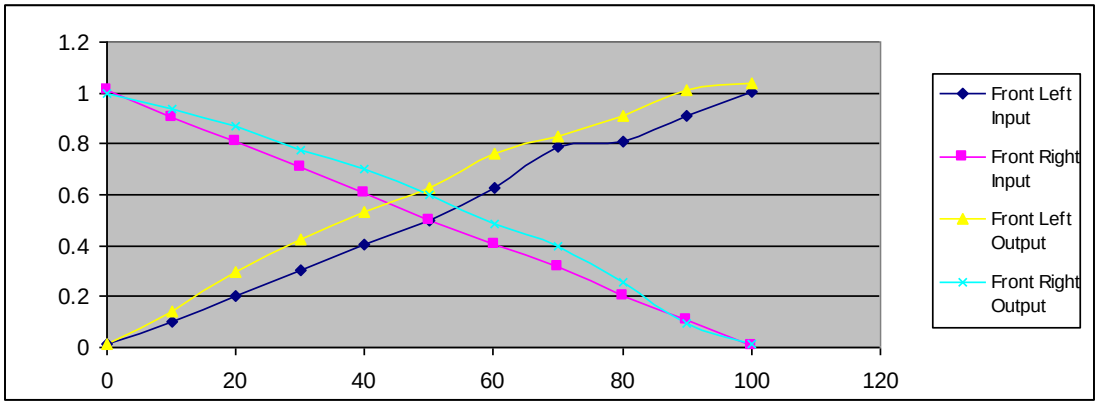

Figure 12 Front left & Front right channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in volts).

Table 12 Front left & front right input and output voltage measurements.

Front Left			Front Right		
%	In	Out	%	In	Out
0	0.01	0.01	100	1.01	1
10	0.1	0.14	90	0.9	0.94
20	0.2	0.3	80	0.81	0.87
30	0.3	0.43	70	0.71	0.78
40	0.41	0.53	60	0.61	0.7
50	0.5	0.63	50	0.5	0.6
60	0.62	0.76	40	0.4	0.49
70	0.79	0.83	30	0.32	0.4
80	0.81	0.91	20	0.2	0.26
90	0.91	1.01	10	0.11	0.09
100	1.01	1.04	0	0.01	0.01

Surround Master Rear Left and Rear Right Channels

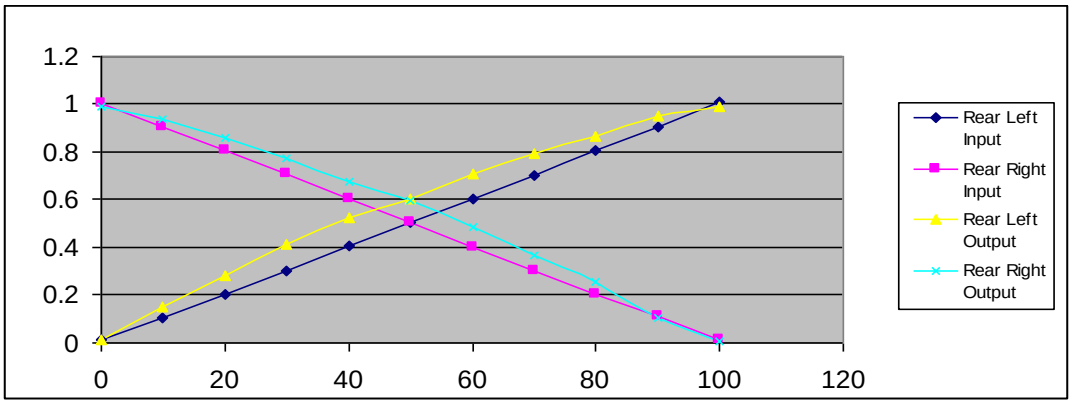

Figure 13 Rear left & Rear right channels, X axis is percentage of full signal voltage of rear left channel input (in percent), Y axis is voltage of output channels (in volts).

Table 13 Rear left & rear right input and output voltage measurements.

Rear Left			Rear Right		
%	In	Out	%	In	Out
0	0.01	0.01	100	1	0.99
10	0.1	0.15	90	0.91	0.94
20	0.2	0.28	80	0.81	0.86
30	0.3	0.41	70	0.71	0.78
40	0.4	0.52	60	0.6	0.67
50	0.5	0.61	50	0.51	0.6
60	0.6	0.71	40	0.4	0.49
70	0.7	0.8	30	0.3	0.37
80	0.8	0.87	20	0.2	0.26
90	0.9	0.95	10	0.11	0.11
100	1.01	0.99	0	0.01	0.01

Surround Master Front Left and Rear Left Channels

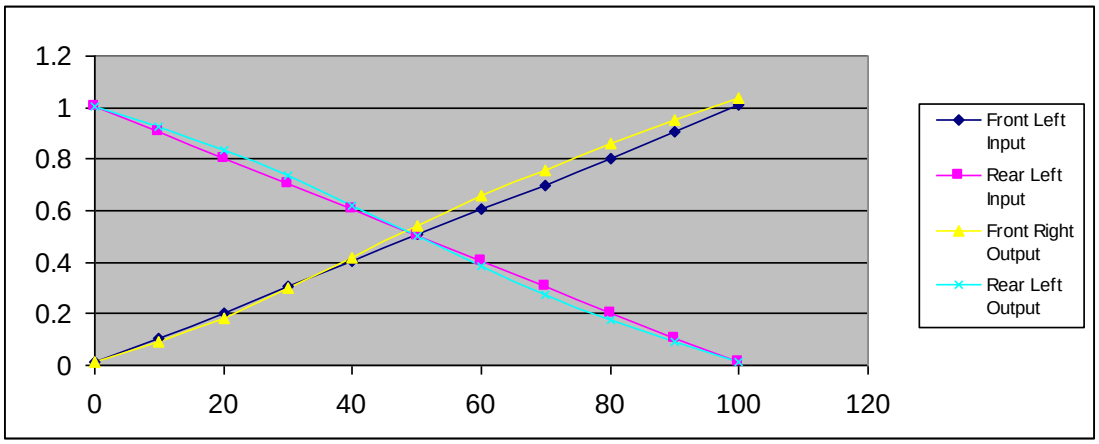

Figure 14 Front left & Rear left channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in volts).

Table 14 Front left & rear left input and output voltage measurements.

Front Left			Rear Left		
%	In	Out	%	In	Out
0	0.01	0.01	100	1	1.01
10	0.11	0.09	90	0.9	0.92
20	0.2	0.18	80	0.81	0.84
30	0.3	0.3	70	0.71	0.74
40	0.4	0.42	60	0.61	0.62
50	0.51	0.54	50	0.5	0.5
60	0.61	0.66	40	0.4	0.39
70	0.7	0.76	30	0.3	0.28
80	0.81	0.86	20	0.2	0.17
90	0.91	0.95	10	0.1	0.09
100	1.01	1.04	0	0.01	0.01

Surround Master Front Right and Rear Right Channels

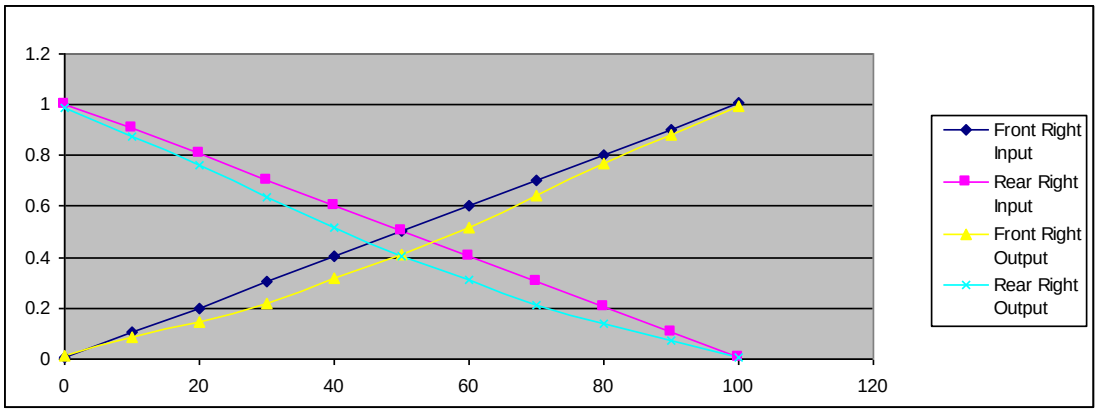

Figure 15 Front right & Rear right channels, X axis is percentage of full signal voltage of front right channel input (in percent), Y axis is voltage of output channels (in volts).

Table 15 Front right & rear right input and output voltage measurements.

Front Right			Rear Right		
%	In	Out	%	In	Out
0	0.01	0.01	100	1	0.99
10	0.11	0.09	90	0.91	0.88
20	0.2	0.15	80	0.81	0.77
30	0.31	0.22	70	0.7	0.64
40	0.4	0.32	60	0.61	0.52
50	0.51	0.41	50	0.5	0.41
60	0.6	0.52	40	0.41	0.31
70	0.71	0.65	30	0.31	0.21
80	0.81	0.77	20	0.21	0.14
90	0.9	0.88	10	0.11	0.08
100	1.01	1	0	0.01	0.01

Surround Master Front Left and Rear Right Channels

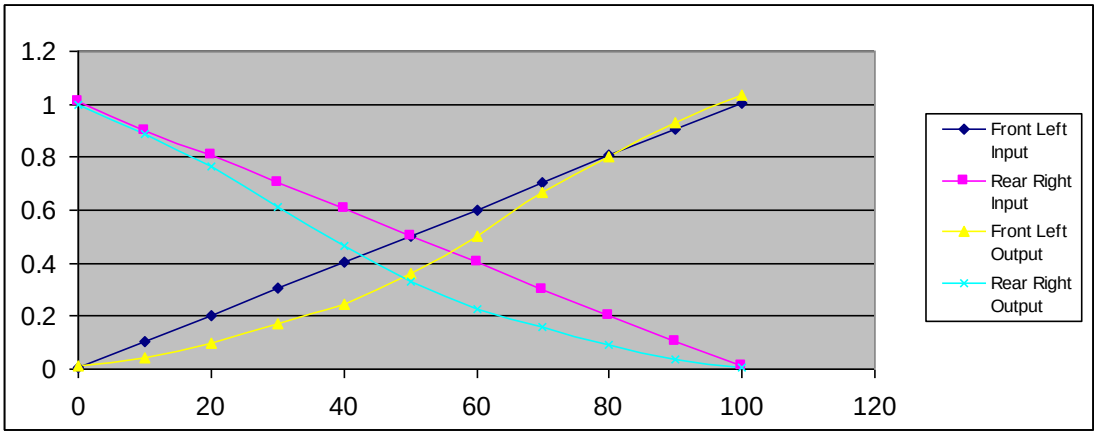

Figure 16 Front left & Rear right channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in volts).

Table 16 Front left & rear right input and output voltage measurements.

Front Left			**Rear Right**		
%	In	Out	%	In	Out
0	0.01	0.01	100	1.01	1
10	0.11	0.04	90	0.9	0.89
20	0.2	0.1	80	0.81	0.76
30	0.31	0.17	70	0.7	0.61
40	0.4	0.24	60	0.6	0.47
50	0.5	0.36	50	0.5	0.33
60	0.6	0.51	40	0.4	0.23
70	0.7	0.67	30	0.3	0.16
80	0.81	0.81	20	0.2	0.09
90	0.91	0.93	10	0.1	0.04
100	1.01	1.04	0	0.01	0.01

Surround Master Front Right and Rear Left Channels

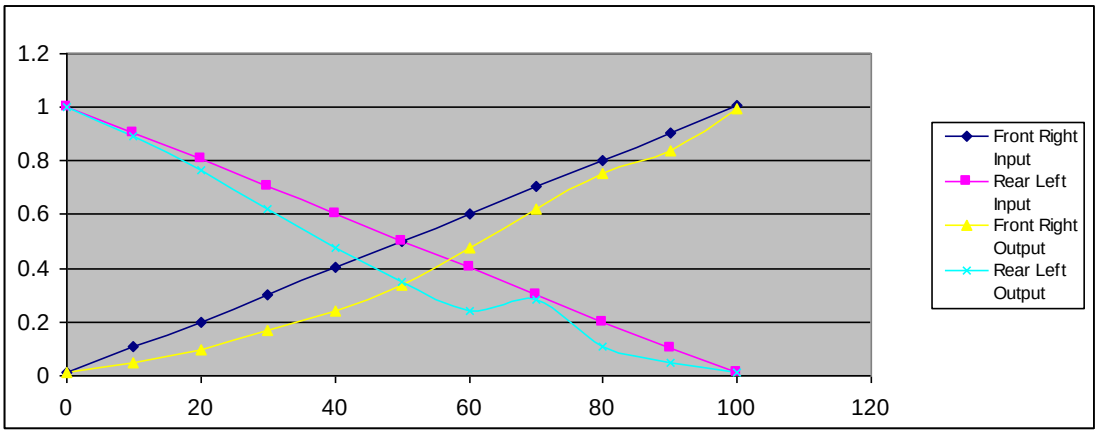

Figure 17 Front right & Rear left channels, X axis is percentage of full signal voltage of front right channel input (in percent), Y axis is voltage of output channels (in volts).

Table 17 Front right & rear left input and output voltage measurements.

Front Right			Rear Left		
%	In	Out	%	In	Out
0	0.01	0.01	100	1	1
10	0.11	0.05	90	0.91	0.9
20	0.2	0.1	80	0.81	0.77
30	0.3	0.17	70	0.7	0.62
40	0.4	0.24	60	0.61	0.48
50	0.5	0.34	50	0.5	0.35
60	0.6	0.47	40	0.4	0.24
70	0.7	0.62	30	0.3	0.28
80	0.81	0.76	20	0.2	0.11
90	0.9	0.84	10	0.11	0.05
100	1.01	1	0	0.01	0.01

Sansui QSD-1 Front Right and Rear Left Channels

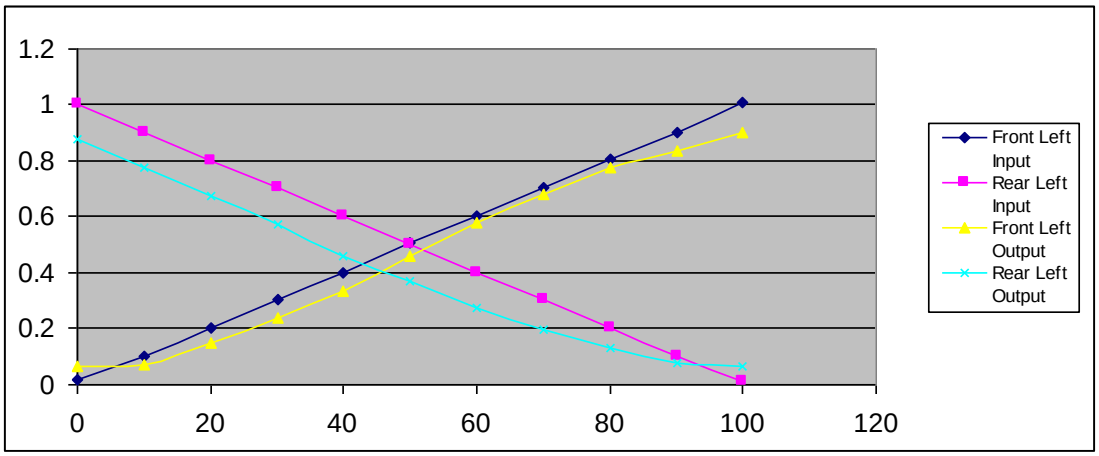

Figure 18 Front right & Rear left channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in volts).

Table 18 Sansui QSD-1 front right & rear left input and output voltage measurements.

Front Left			Rear Left		
%	In	Out	%	In	Out
0	0.02	0.07	100	1	0.88
10	0.1	0.07	90	0.9	0.78
20	0.2	0.15	80	0.8	0.67
30	0.3	0.24	70	0.71	0.57
40	0.4	0.34	60	0.6	0.46
50	0.51	0.46	50	0.5	0.37
60	0.6	0.58	40	0.4	0.28
70	0.7	0.68	30	0.3	0.2
80	0.8	0.78	20	0.2	0.13
90	0.9	0.84	10	0.1	0.08
100	1.01	0.9	0	0.01	0.06