

# Surround Master Involve Proper - QS Decode?

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## Testing Performed:

- Surround Master Involve QS Encoder 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 Involve QS ENCODER Validation Tests

**Testing Method:** Each of the 4 input channels of the Surround Master encoder unit was subjected to a 1 V RMS 1.1 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 ENCODER Rear Left Channel*

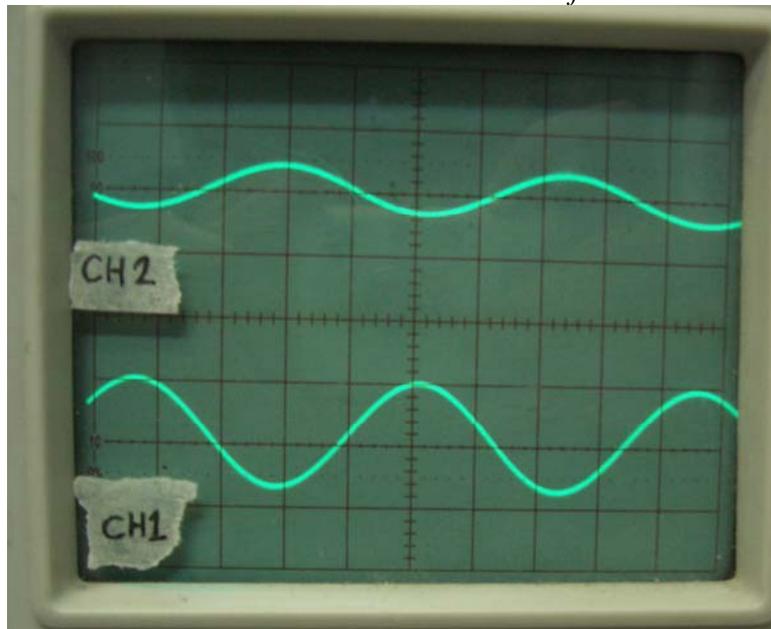


Figure 1 Rear Left, CH 1 is Left & CH 2 is Right

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	CH1 = 0.5 V/Div
			CH 2 = Right	CH2 = 0.5 V/Div
				TB 0.2 ms/ div

*Surround Master ENCODER Front Left Channel*

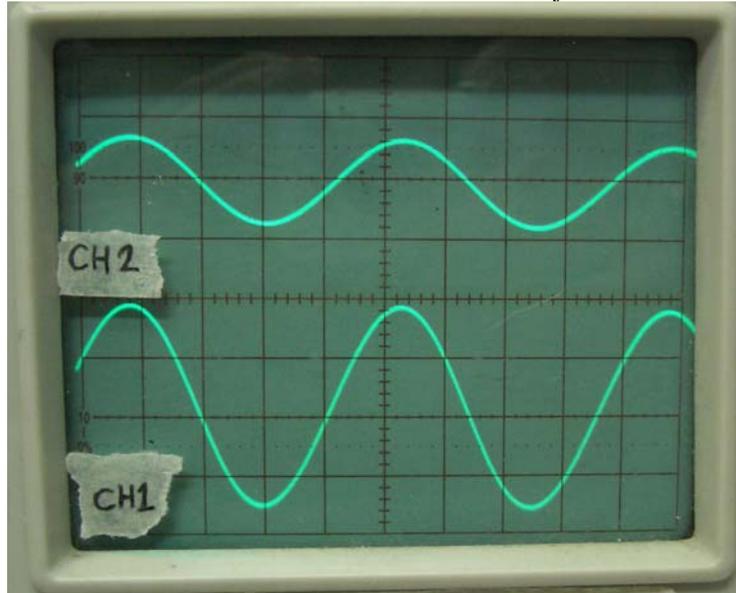


Figure 2 Front left, CH 1 is left & CH 2 is right.

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	CH1 = 0.5 V/Div
			CH 2 = Right	CH2 = 0.5 V/Div
				TB 0.2 ms/ div

*Surround Master ENCODER Front Right Channel*

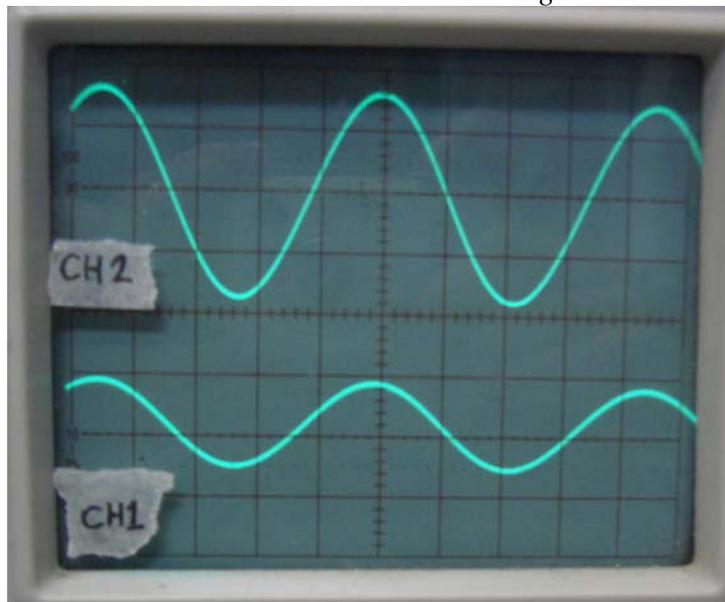


Figure 3 Front Right, CH 1 is left & CH 2 is right.

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	CH1 = 0.5 V/Div
			CH 2 = Right	CH2 = 0.5 V/Div
				TB 0.2 ms/ div

*Surround Master ENCODER Rear Right Channel*

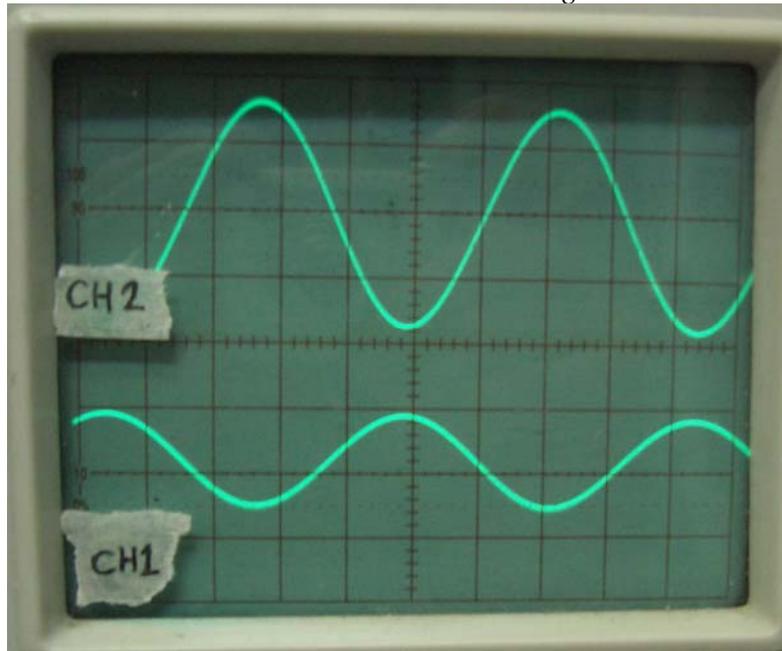


Figure 4 Rear Right, CH 1 is left & CH 2 is right.

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	CH1 = 0.5 V/Div
			CH 2 = Right	CH2 = 0.5 V/Div
				TB 0.2 ms/ div

## 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 1.1 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:

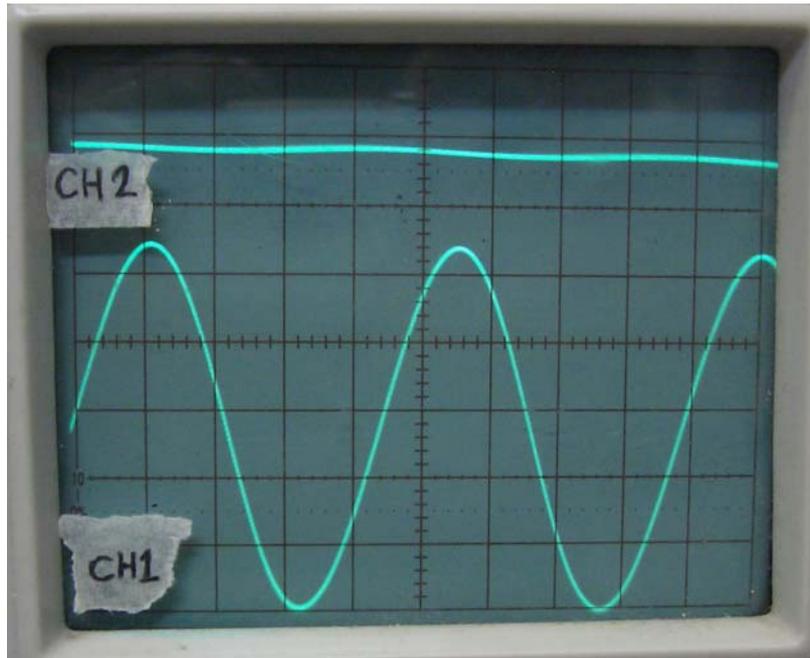
#### *Surround Master*

**Table 5 Surround Master inter-channel cross talk input and output voltage measurements.**

Input Channel	Input Voltage	Output Channels Voltages:			
		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

**Table 6 Surround Master inter-channel cross talk input and output amplitudes in dB.**

Input Channel	Input Amplitude (dB)	Output Channels amplitudes (dB):			
		Front Left	Front Right	Rear Left	Rear Right
Front Left	0	0.2	-36.3	-36.3	-37.5
Front Right	0	-35.2	-0.1	-35.2	-36.3
Rear left	0	-34.2	-38.2	-0.1	-40.7
Rear Right	0	-35.2	-35.2	-34.7	-0.1



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

**Table 7 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 5 (and there was no value in showing them all in this report).

*Sansui QSD-1*

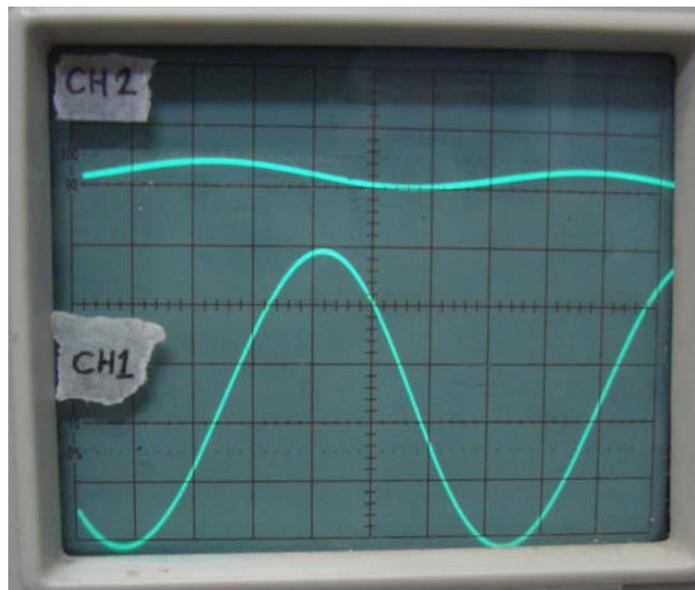
**Table 8 Sansui QSD-1 inter-channel cross talk input and output voltage measurements.**

Input Channel	Input Voltage	Output Channels Voltages:			
		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				

**Table 9 Sansui QSD-1 inter-channel cross talk input and output amplitudes in dB.**

Input Channel	Input Amplitude (dB)	Output Channels amplitudes (dB):			
		Front Left	Front Right	Rear Left	Rear Right
Front Left	0	0.2	-19.2	-23	-30.8
Front Right	FAULTY				
Rear left	0	-23.1	-28.2	-0.1	-18.4
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 10 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 1.1 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*

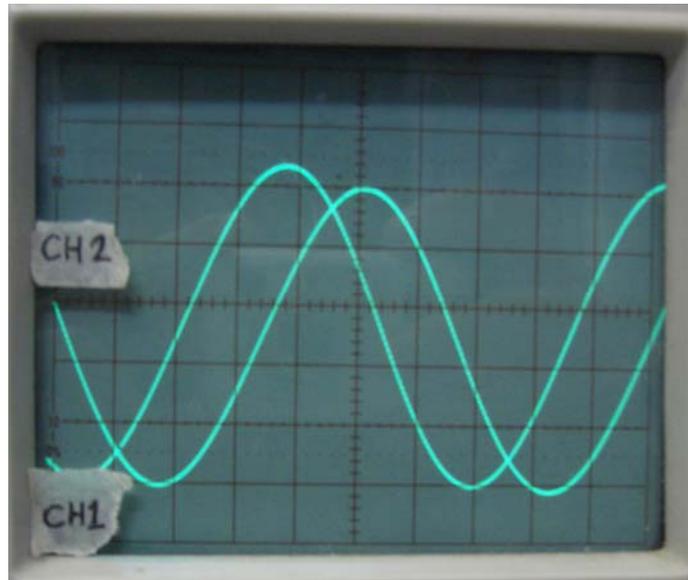
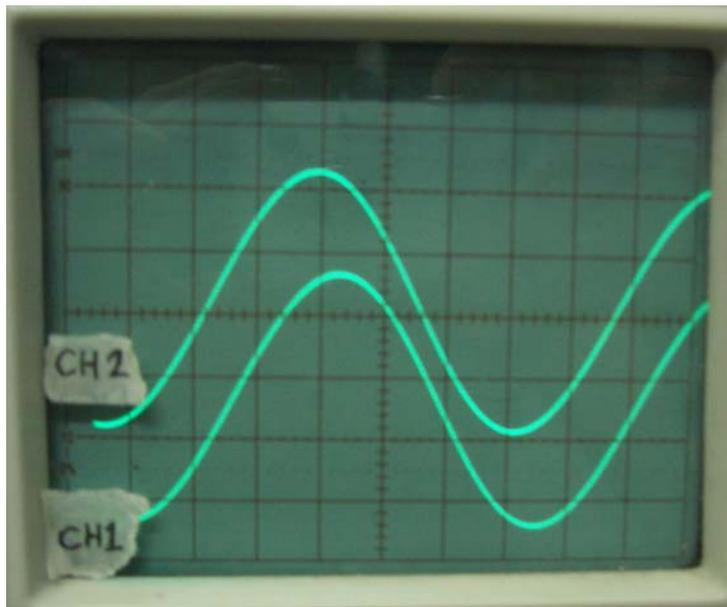


Figure 7 Front left vs. Rear left, CH 1 is front left & CH 2 is rear left.

Table 11 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*

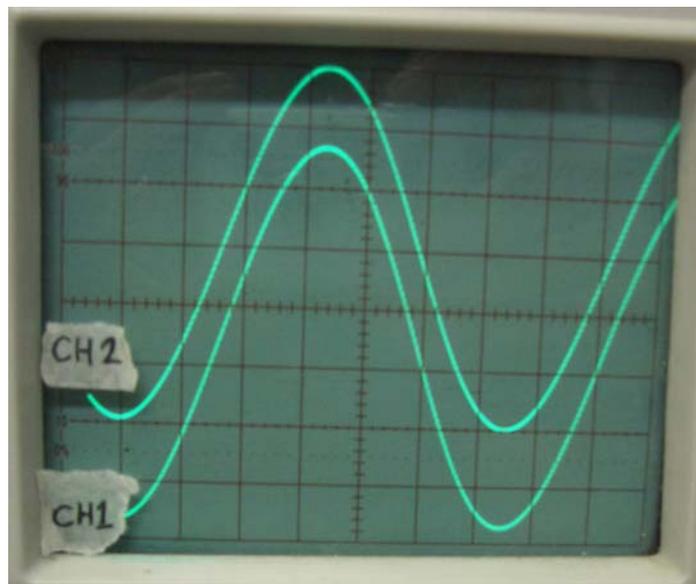


**Figure 8 Front right vs. Rear right, CH1 is front right & CH 2 is Rear Right.**

**Table 12 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 13 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*

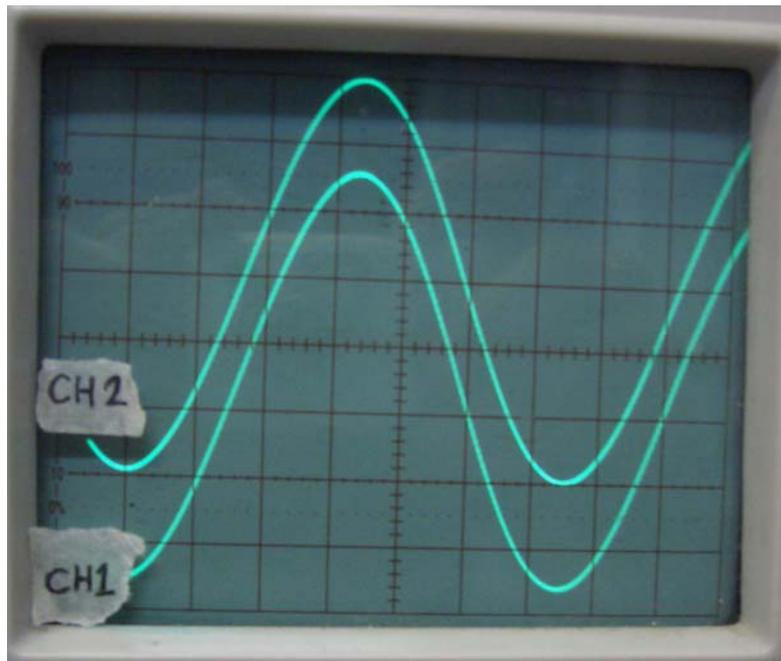


Figure 10 Rear left vs. Rear right, CH 1 is rear left & CH 2 is rear right.

**Table 14 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*

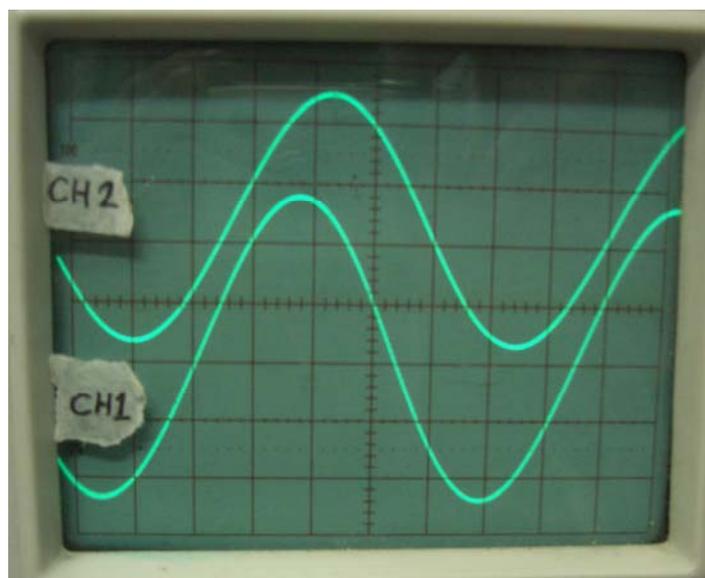


Figure 11 Sansui Front Left vs. Rear Left Input, CH 1 front left & CH 2 rear left.

**Table 15 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 1.1 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*

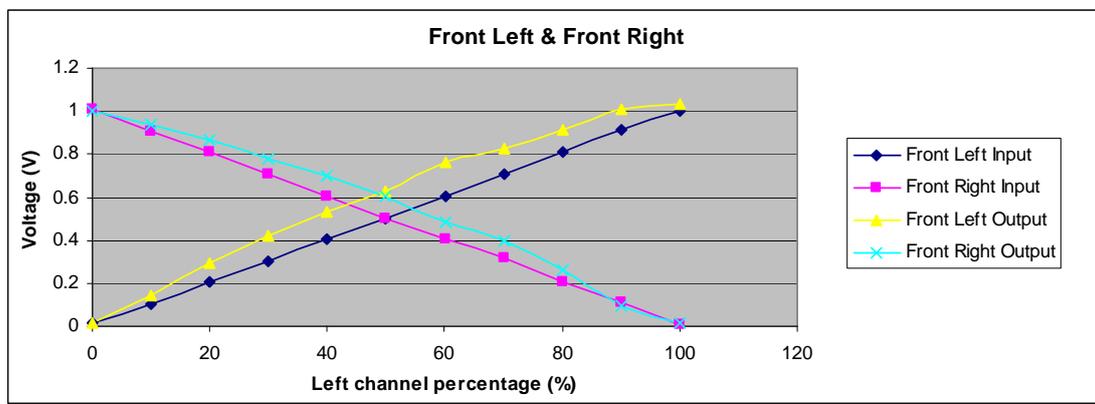
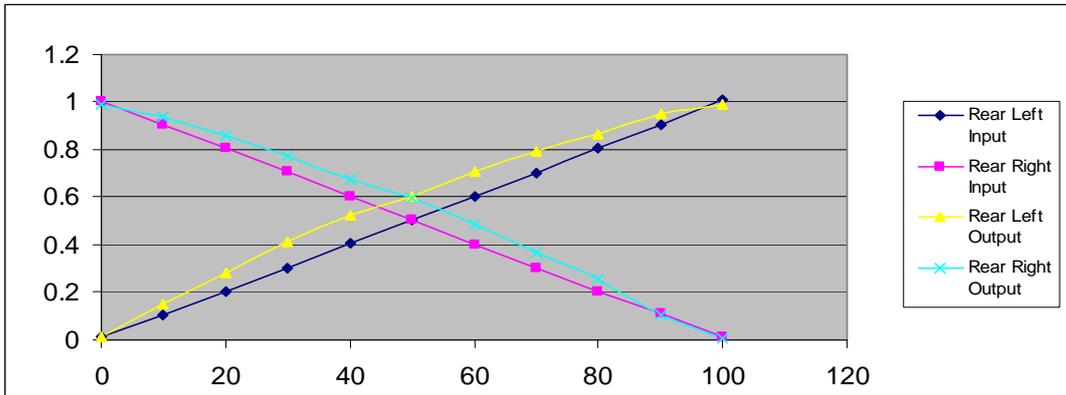


Figure 12 Front left & Front right channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in Volts).

Table 16 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*

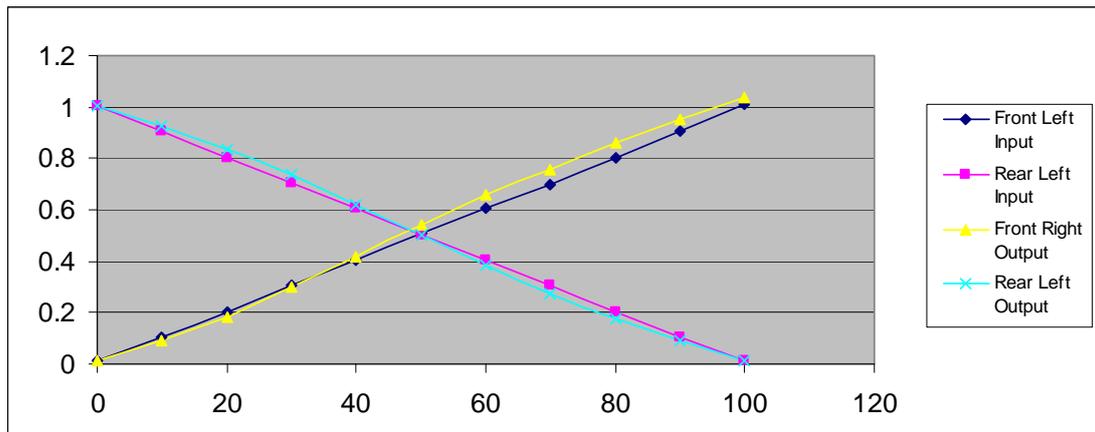


**Figure 13** Rear left & Rear right channels, X axis is percentage of full signal voltage of rear left channel input (in percent), Y axis is voltage of output channels (in Volts).

**Table 17** 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*

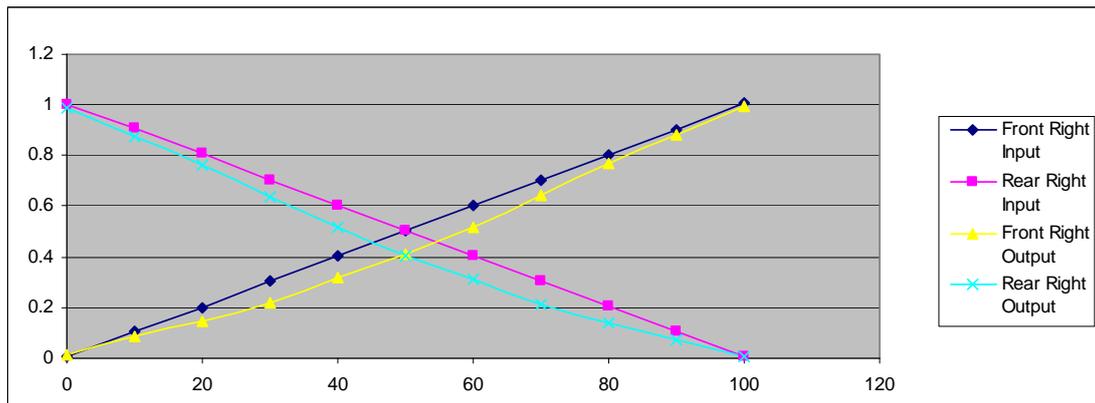


**Figure 14** Front left & Rear left channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in Volts).

**Table 18** 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*

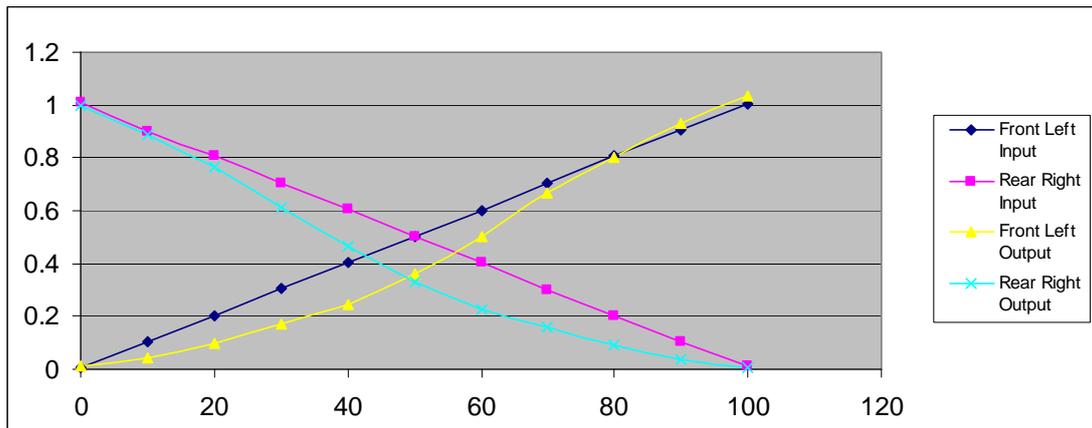


**Figure 15** Front right & Rear right channels, X axis is percentage of full signal voltage of front right channel input (in percent), Y axis is voltage of output channels (in Volts).

**Table 19** 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*

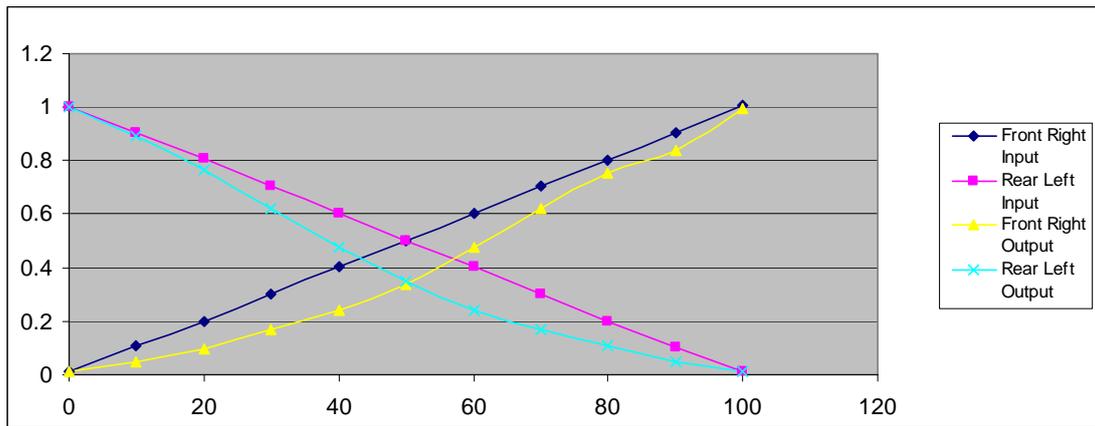


**Figure 16** Front left & Rear right channels, X axis is percentage of full signal voltage of front left channel input (in percent), Y axis is voltage of output channels (in Volts).

**Table 20** 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*

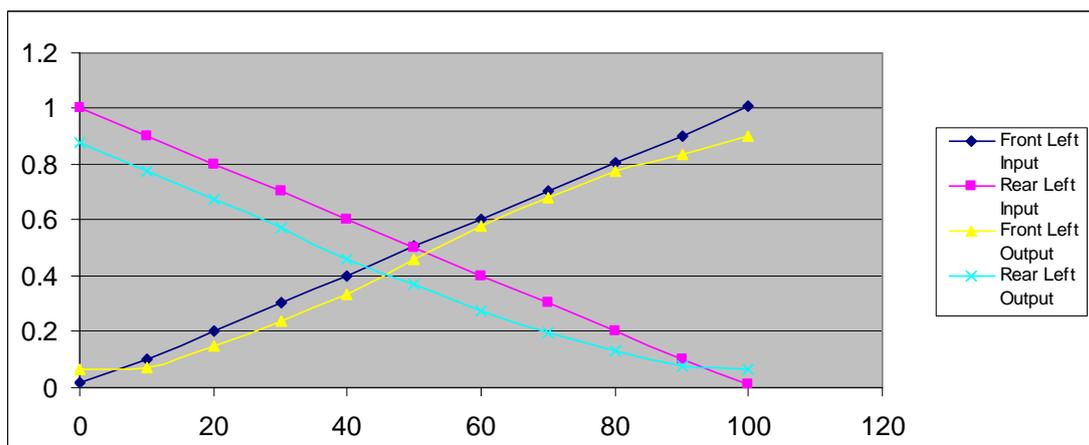


**Figure 17** Front right & Rear left channels, X axis is percentage of full signal voltage of front right channel input (in percent), Y axis is voltage of output channels (in Volts).

**Table 21** 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	0.17
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 Left and Rear Left Channels*



**Figure 18** 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 22** Sansui QSD-1 front left & 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