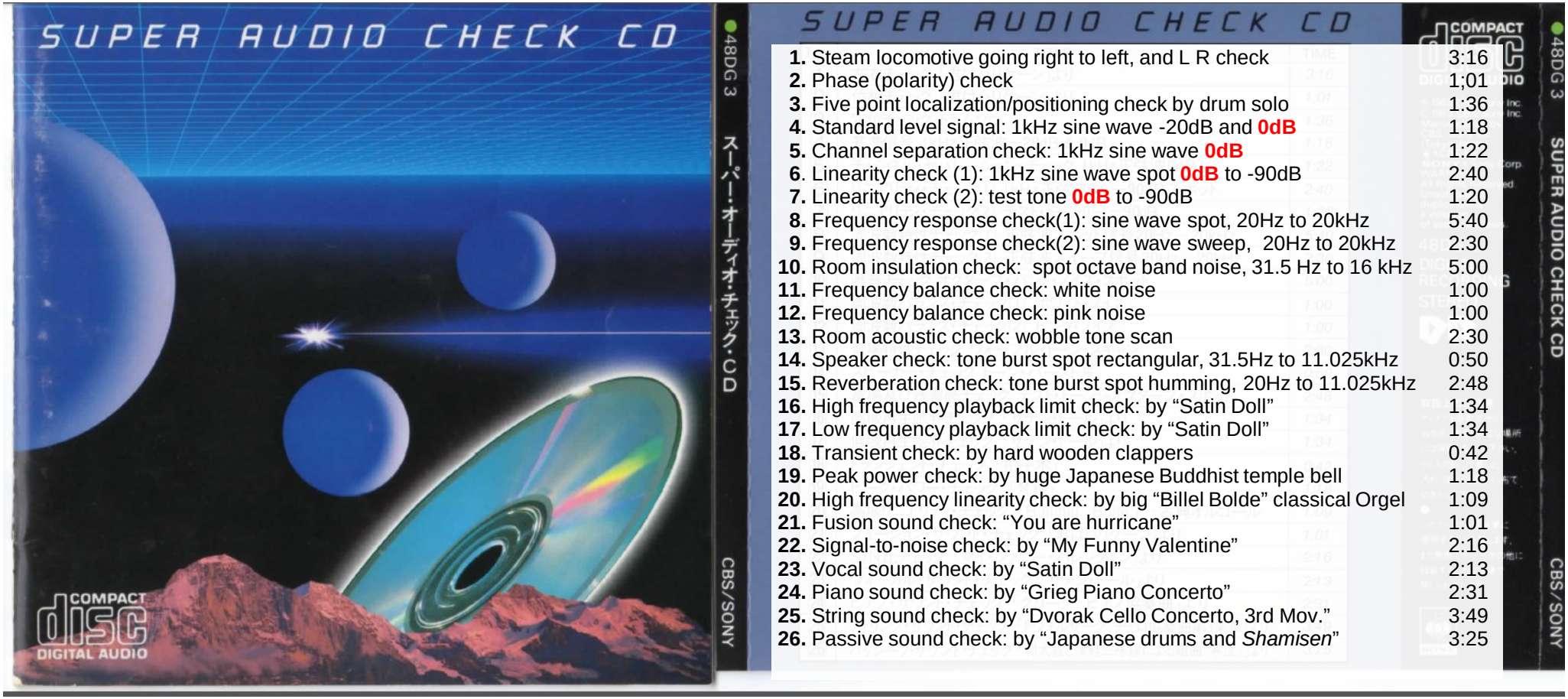

SUPER AUDIO CHECK CD
48DG 3
スーパー・オーディオ・チェック・CD
CBS/SONY
COMPACT disc DIGITAL AUDIO
SUPER AUDIO CHECK CD
T.No. TITLE TIME
1 左右チェック「君はハリケーン」より 3:16
2 位相チェック「君はハリケーン」より 1:01
3 定位チェック ドラム・ソロ 1:36
4 基準信号 1kHz正弦波−20dB & 0dB 1:18
5 チャンネル・セパレーション・チェック 1kHz正弦波0dB 1:22
6 リニアリティ・チェック(1) 1kHz正弦波0～−90dBスポット 2:40
7 リニアリティ・チェック(2) テスト・トーン0～−90dB 1:20
8 周波数特性チェック(1) 正弦波スポット信号20Hz−20kHz 5:40
9 周波数特性チェック(2) 正弦波スイープ信号20Hz−20kHz 2:30
10 遮音チェック オクターブ・バンド・ノイズ・スポット 5:00
11 周波数バランス・チェック(1) ホワイト・ノイズ 1:00
12 周波数バランス・チェック(2) ピンク・ノイズ 1:00
13 音場特性チェック ウォーブル・トーン・スキャン 2:30
14 スピーカー・チェック トーン・バースト波 0:50
15 音場及び残響感チェック テスト・トーン1/3オクターブ・スポット 2:48
16 高域再生限界チェック「サテン・ドール」より 1:34
17 低域再生限界チェック「サテン・ドール」より 1:34
18 トランジェント・チェック「拍子木」 0:42
19 ピーク・パワー・チェック「梵鐘」 1:18
20 高域リニアリティ・チェック「Bimmel Bolle」…古典オルゴール 1:09
21 フュージョン・サウンド・チェック「君はハリケーン」より 1:01
22 S/N比チェック「マイ・ファニー・バレンタイン」より 2:16
23 ヴォーカル・サウンド・チェック「サテン・ドール」より 2:13
24 ピアノ・サウンド・チェック「グリーグ：ピアノ協奏曲」より 2:31
25 ストリング・サウンド・チェック「ドヴォルザーク：チェロ協奏曲第3楽章」より 3:49
26 パッシーブ・サウンド・チェック「和太鼓と津軽三味線による組曲'家流'」より 3:25
COMPACT disc DIGITAL AUDIO
48DG 3
DIGITAL RECORDING
STEREO
DR
SUPER AUDIO CHECK CD
CBS/SONY


SUPER AUDIO CHECK CD
48DG 3
スーパー・オーディオ・チェック・CD
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COMPACT disc DIGITAL AUDIO
SUPER AUDIO CHECK CD
1. Steam locomotive going right to left, and L R check 3:16
2. Phase (polarity) check 1;01
3. Five point localization/positioning check by drum solo 1:36
4. Standard level signal: 1kHz sine wave -20dB and 0dB 1:18
5. Channel separation check: 1kHz sine wave 0dB 1:22
6. Linearity check (1): 1kHz sine wave spot 0dB to -90dB 2:40
7. Linearity check (2): test tone 0dB to -90dB 1:20
8. Frequency response check(1): sine wave spot, 20Hz to 20kHz 5:40
9. Frequency response check(2): sine wave sweep, 20Hz to 20kHz 2:30
10. Room insulation check: spot octave band noise, 31.5 Hz to 16 kHz 5:00
11. Frequency balance check: white noise 1:00
12. Frequency balance check: pink noise 1:00
13. Room acoustic check: wobble tone scan 2:30
14. Speaker check: tone burst spot rectangular, 31.5Hz to 11.025kHz 0:50
15. Reverberation check: tone burst spot humming, 20Hz to 11.025kHz 2:48
16. High frequency playback limit check: by “Satin Doll” 1:34
17. Low frequency playback limit check: by “Satin Doll” 1:34
18. Transient check: by hard wooden clappers 0:42
19. Peak power check: by huge Japanese Buddhist temple bell 1:18
20. High frequency linearity check: by big “Billel Bolde” classical Orgel 1:09
21. Fusion sound check: “You are hurricane” 1:01
22. Signal-to-noise check: by “My Funny Valentine” 2:16
23. Vocal sound check: by “Satin Doll” 2:13
24. Piano sound check: by “Grieg Piano Concerto” 2:31
25. String sound check: by “Dvorak Cello Concerto, 3rd Mov.” 3:49
26. Passive sound check: by “Japanese drums and *Shamisen*” 3:25

SUPER AUDIO CHECK CD

This CD is designed to make it easy to check all of your audio systems, including CD players, amplifiers, speakers, tape decks, and listening rooms, with ultra-precision signal sources.

The recorded original signals were prepared mainly by computer simulation in ultra-high precision of (99.999999999) or higher, and high-precision analog oscillator and a high-quality music source are used.

Be careful not to turn up the volume too much during playback to avoid damage to the speakers, as some very high level signals are included.

48DG
Supervised signal production: Sony Technology Laboratory
Tadashi TAKISE, Kiyofumi INANAGA, Kazuhiko AIDA

Planning and production: Taichi KAMETANI
Engineer: Tetsuo BABA, Takashi WATANABE
Designer: Katsu KWAHARA

T.No	(time)	チェック項目・信号内容	レベル	時間	
1	1(0'00") 2(2'08") 3(2'32")	■Channel check Steam locomotive Left channel: music Right channel; music		3'16"	Oh-igawa River Rail way Steam locomotive: tandem C11+C12 The Square: "You are Hurricane" Masahiro AIDO
2	1(0'00") 2(0'31")	■Phase (Polarity) check In phase (proper polarity) Out of phase (reverse polarity)		1'01"	he Square: "You are Hurricane" Masahiro AIDO
3	1(0'00") 2(0'09") 3(0'27") 4(0'44") 5(1'01") 6(1'18")	■Five Positioning/Localization check Left Mid-left Center Mid-right Right		1'36"	Drums solo
4	1(0'00") 2(0'44")	■Standard level signal 1kHz sine wave standard 1kHz sine wave **maximum**	−20dB 0dB	1'18" (30") (20")	
5	1(0'00") 2(0'45")	■Channel separation check 1kHz sine wave left channel 1kHz sine wave right channel	0dB 0dB	1'22" (30") (30")	
6	1(0'00") 2(0'10") 3(0'20") 4(0'30") 5(0'40") 6(0'50") 7(1'00") 8(1'10") 9(1'20") 10(1'30") 11(1'40") 12(1'50") 13(2'00") 14(2'10") 15(2'20") 16(2'30")	■Linearity check(1) 1kHz sine wave L+R	0dB −8dB −14dB −17dB −20dB −21dB −23dB −26dB −32dB −40dB −50dB −60dB −70dB −80dB −90dB	2'40" (10 sec interval)	

Be careful for the high gain!

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T.No	(time)	チェック項目・信号内容	レベル	時間	
7	1(0'00")	■Linearity check(2)		1'20"	
	2(0'05")	Tone burst (humming)	0dB		
	3(0'10")	L+R	− 8dB	(5 sec interval)	
	4(0'15")		−14dB		
	5(0'20")		−17dB		
	6(0'25")		−20dB		
	7(0'30")		−21dB		
	8(0'35")		−23dB		
	9(0'40")		−26dB		
	10(0'45")		−32dB		
	11(0'50")		−40dB		
	12(0'55")		−50dB		
	13(1'00")		−60dB		
	14(1'05")		−70dB		
	15(1'10")		−80dB		
	16(1'15")		−90dB		
8		■Frequency response check(1)		5'40"	
	1(0'00")	Spot sine wave 20Hz	−20dB		
	2(0'20")	L+R 31.5Hz	〃	(20 sec interval)	
	3(0'40")	63Hz	〃		
	4(1'00")	125Hz	〃		
	5(1'20")	250Hz	〃		
	6(1'40")	400Hz	〃		
	7(2'00")	500Hz	〃		
	8(2'20")	1kHz	〃		
	9(2'40")	2kHz	〃		
	10(3'00")	3kHz	〃		
	11(3'20")	4kHz	〃		
	12(3'40")	8kHz	〃		
	13(4'00")	10kHz	〃		
	14(4'20")	12.5kHz	〃		
	15(4'40")	16kHz	〃		
	16(5'00")	18kHz	〃		
	17(5'20")	20kHz	〃		

Be careful for the high gain!

DG 3

T.No	(time)	チェック項目・信号内容	レベル	時間	
9	1(0'00")	■Frequency response check(2) Sine wave sweep L+R 20hz – 20kHz	−20dB	2'30"	
10		■Transfer/Insulation check		5'00"	
	1(0'00")	Octave band noise 31.5Hz	−20dB		
	2(0'30")	L+R 63Hz	〃	(30 sec interval)	
	3(1'00")	125Hz	〃		
	4(1'30")	250Hz	〃		
	5(2'00")	500Hz	〃		
	6(2'30")	1kHz	〃		
	7(3'00")	2kHz	〃		
	8(3'30")	4kHz	〃		
	9(4'00")	8kHz	〃		
	10(4'30")	16kHz	〃		Over 20 kHz was cut-off
11	1(0'00")	■Frequency balance check(1) White noise L+R	−20dB	60"	
12	1(0'00")	■Frequency balance check(2) Pink noise L+R	−20dB	60"	
13	1(0'00")	■Sound perspective check) Wobble tone scan L+R	−20dB	2'30"	
14		■Speaker transient check		50"	
	1(0'00")	Rectangular 31.5Hz	−10dB	(各5" 間隔)	
	2(0'05")	tone burst L+R 63Hz	〃		
	3(0'10")	125Hz	〃		
	4(0'15")	250Hz	〃		
	5(0'20")	500Hz	〃		
	6(0'25")	1kHz	〃		
	7(0'30")	2kHz	〃		
	8(0'35")	2.756kHz	〃		
	9(0'40")	5.513kHz	〃		
	10(0'45")	11.025kHz	〃		
15		■Reverberation check			
	1(0'00")	Humming tone burst 20Hz	−10dB	2'48"	
	2(0'07")	L+R 25Hz	〃		
	3(0'14")	31.5Hz	〃	(7 sec interval)	

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15		■Reverberation check			
	1(0'00")	Humming tone burst 20Hz	−10dB	2'48"	
	2(0'07")	L+R 25Hz	〃		
	3(0'14")	31.5Hz	〃	(7 sec interval)	
	4(0'21")	40Hz	−20dB		
	5(0'28")	50Hz	〃		
	6(0'35")	63Hz	〃		
	7(0'42")	80Hz	〃		
	8(0'49")	100Hz	〃		
	9(0'56")	125Hz	〃		
	10(1'03")	160Hz	〃		
	11(1'10")	200Hz	〃		
	12(1'17")	250Hz	〃		
	13(1'24")	315Hz	〃		
	14(1'31")	400Hz	〃		
	15(1'38")	500Hz	〃		
	16(1'45")	630Hz	〃		
	17(1'52")	800Hz	〃		
	18(1'59")	1kHz	〃		
	19(2'06")	1.25kHz	〃		
	20(2'13")	1.6kHz	〃		
	21(2'20")	2kHz	〃		
	22(2'27")	2.756kHz	〃		
	23(2'34")	5.513kHz	〃		
	24(2'41")	11.025kHz	〃		
18		■High Fq playback limitation check		1'34"	from "Satin Doll" voice: Marlene
	1(0'00")	High-cut digital filer flat			—D.Ellington—B.Strayhorn—J.Wercen
	2(0'19")	High-cut over 18 kHz			
	3(0'38")	High-cut over 13 kHz			
	4(0'57")	High-cut over 9.2 kHz			
	5(1'16")	High-cut over 6.5 kHz			
17		■Low Fq playback limitation check		1'34	from "Satin Doll" voice: Marlene
	1(0'00")	Low-cut digital filer flat			—D.Ellington—B.Stayhorn—J.Wercen
	2(0'19")	Low-cut under 42Hz			
	3(0'38")	Low-cut under 59Hz			
	4(0'57")	Low-cut under 83Hz			
	5(1'16")	Low-cut under 120Hz			
16		■Transient sound check		0'42"	From *"Kanade-hon Chusin-gura"*
	1(0'00")	Hard wodden clappers			By Kanisuke TAKESHIBA

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T.No	(time)	チェック項目・信号内容	レベル	時間	
19	1(0'00")	■Peak power check Huge Buddhist temple bell		1'18"	Hoh-koh-ji Temple in Kyoto
20	1(0'00")	■High Fq linearity check Big Bommel Bolle classical Orgel		1'09"	Big Bommel Bolle classical Orgel
21	1(0'00")	■Fusion sound check check Fusion pops		1'01"	"You are Hurricane"/The Square —Masahiro Andoh—
22	1(0'00")	■S/N ratio check Jazz vocal		2'16"	""My Funny Valentine" Hideo ICHIKAWA Trio / R.Rogers
23	1(0'00")	■Vocal sound check Jazz vocal		2'13"	from "Satin Doll" /voice: Marlene —D.Ellington—B.Strayhorn—J.Wercer
24	1(0'00")	■Piano sound check Piano concerto Tokyo Phiharmonic Orchestra		2'31"	from Grieg Piano Concerto Hiriko NAKAMURA (pf), Yohichiro OHMACHI (cond)
26	1(0'00")	■String sound check Cello concerto Czech Phiharmonic Orchestra		3'49"	Dvorak Cello Concerto 3rd Mov. Tsuyoshi SUTSUMI (vc) Zdenek KOSLER (cond)
25	1(0'00")	■Passive sound check Japanese drums and *"Shamisen"*		3'25"	From Suites *"Kanryu"* for *Wadaiko* (Japanese drums) and *"Shamisen"* Nobu AMANO and katsuaki-SAWADA Group

DG 3

If you like music and audio, you may have your own proud audio system. However, not many people may be able to fully utilize the power of the audio system and make full use of its performance.

Conversely, if you further tweak your audio system and listening environment, tune it up, and make full use of it, you should be able to produce even better sound.

This Super Audio Check CD allows anyone to easily check the audio system and listening environment without the need for a dedicated measuring instrument, and by tune-up, it will be even more than ever.

This CD is made so that you can enjoy it with improved sound. In particular, the high playback capability of compact discs (CDs), which is unthinkable with conventional analog LP records, is exactly the same as getting a large computer and a signal oscillator that costs millions of yen, you can now play the signal. For the first time, it has become possible to perform an audio check that is almost perfect, which can only be done with CD format.

Take advantage of this Super Audio Check CD to enrich your audio life.

●The original signals recorded on this CD consist of ultra-high-precision test signals digitally synthesized with of eleven nine (99.999999999) or higher precision by computer simulation, test noises which satisfy over 3σ (sigma, standard deviation) Gaussian distribution, and also human voices and other music sources which provide basics for ear listening audio check; a collection of carefully selected tracks.

● In this CD, the maximum level represented by 16 bits is set 0dB. The dB value of each signal indicates that the peak of the waveform is at that dB level. (However, noise signals are out of this rule). Moreover, the recorded signal at the position which is 20dB lower than 0dB as a tentative reference value of this CD. The effective dB value and average dB value of the signals in different waveforms may have different dB values. The average output level of noise signals such as white and pink noises are recorded at almost the same level as the effective value (RMS) of -20 dB for a sine wave.

●Since many of these signals contain high frequency components and very high gain levels that are extremely high compared to normal music sources, be careful not to damage the speaker due to excessive input during playback.

1. Channel check

The first track is to check the left and right channels. First of all, the passing sound of steam locomotive (SL), departing from *Oigawa* Railway *Senzu* Station, tandem two SLs C11+C12, passes from right to left. If it passes from left to right, the left and right connections may be reversed.

Narration and music are then played from the left channel and then from the right channel. Check each position and check if the tones (sound coloration) are the same. If the left and right tones are different, not only the center sound will not be properly localized, but also the balance of the playback sound field will also be lost. Use the multi-speaker attenuators and/or the tone control of the amplifier to make adjustments so that the left and right sounds are the same. Also, if the left and right are played in reverse, you need to check that each of your connection cables is connected correctly.

2. Phase (Polarity) check

If the left and right tones match and are connected in the correct phase (polarity), the first narration and music will be played correctly from the center of the left and right shakers. If it is off to the left or right from the center, adjust each part and adjust it so that it comes to the center with the balance knob. If the sound is scattered all over, it may be connected in the opposite phase.

If the reverse phase sound to be played next is localized in the center, it is a reverse phase connection; you need to reverse the phase by reversing the + and - of speaker cable of one channel.

3. Localization check

Let's check the localization using the 5-point localization, which is easy to see in normal recording. The drums solo is played in the order of left, middle of left to center, center, middle of center to right, and right. Each of the five sounds should be clearly best localized at the position where the left to right shaker's distance is divided into five equal parts. If the localization between the center and the left and right is not so clear, it will become clear if you widen the speaker spacing or bring the listening point closer. Also, in the case of a multi-speaker setup, bring the speakers in each frequency range closer to have clearer localization.

4. Standard level signal

In this CD, the maximum peak level is set as 0dB for all of the 16 bit digital bits are 1, and set the -20dB down level as tentative standard level of this CD. With general/usual CD players, this level gives output voltage of about 200 mV RMS.

This signal can be used for adjustment of standard level when doing sound recording with tape deck, *etc*. Noon time tone in FM radio in Japan can be used for the same purpose, but it is not always on air; if you would once determine the relative gain for it with this -20dB test tone, you can always have proper air-check recording level. This is just identical to you would have a dedicated professional standard-level generator.

Next, the maximum level tone of CD format will be played which makes your CD player to output 2V RMS +/-3dB. This maximum level tone is 20dB higher than the standard tone (of -20dB), and therefore your speaker drivers would be destroyed when played in ordinary volume/ gain dial position. You need to carefully reduce the volume/gain for this maximum level tone.

5. Channel separation (cross talk) check

These are the signals for check of L-R channel separation (cross talk). The foris signal is 1kHz sine wave in Lch=0dB, Rch=－∞dB, and the second is Lch=－∞dB, Rch=0dB. Using these, I can check the cross talk between L and R. Of course the lower the better the cross talk between L and R channels.

6. Linearity check(1)

These are L+R 1kHz sine wave in various level/gain for check of audio instrument itself and the VU meters, and also for check of dynamic range of your listening environment including your audio system. The signals consist of L+R sine wave in maximum 0dB to minimum -90dB. For check of VU meters usually used in listening, -20dB, -21dB and -23dB signals included near the standard level of -20dB. You may set the volume/gain of -20dB signal to the zero position of amplifier's VU meter, and then check the accuracy of your meter with -21dB and -23dB tones. If you would set the -20dB tone to your ordinary listening maximum volume and then check the lower level tones down to -90dB, you can find S/N ratio and/or dynamic range of your listening environment.

7. Linearity check(2)

These are the signals can be used for the same purposes like above track-6. Signals are 6 wave of sine wave pulse applied with so called humming window (a kind of time window with amplitude manipulation) restricting the broadening of the band width. The same tone was repeated three times with 1 sec interval, in 0 dB to -90dB, having 3 sec silent period between the

When you would use these signals for check of your listening environment, you can check with the better feeling of "music listening" compared to the previous pure sine wave tones in track-7. (Please also refer to the notes on treack-15.)

8. Frequency response check (spot sine wave)

This track consists of sine wave spot signals covering 20Hz – 20kHz in octave steps and also in frequently used frequencies usually used to check audio instruments. All the signals are in constant -20dB gain. These tones are prepared in extremely low distortions, and therefore can be also used for distortion measurements. If you use these signals and those in track-6 for determinations of linearity and deviation of your VU level meters, then you may use these signals as high-sensitivity level meters. Even though the frequency range of 20Hz – 20kHz covers all the human listening capability, we have considerable individual-to-individual and age-dependent difference (or deviations) in hearing abilities. In general, the music sound "energy" in extra-low and extra-high frequency is not so large. This means you would have little problem if you cannot hear 20Hz and/or 20kHz.

As for your audio system, however, the wider the frequency response, the better for the reproduction of recorded sound.
Apart from the octave series tones, You can use 400Hz for bias adjustment of your tape recorder, and 3kHz for wow and flutter measurement, 12.5kHz for tuning of equalizer.

9. Frequency response check (sine wave sweep)

This track is logarithmic 20Hz – 20kHz sine wave sweep in 50s/dec; the entire track length is 150 sec, and you can find the relation of time and frequency in Figure-1 in next page. Together with the signals in track-8, this sweep tone can be used for various check, and you would please use this also for check of listening room acoustics. Depending on the room environment, we sometimes have non-natural booming coloration of the sound with specific frequency, possible howling to audio instrument and/or furniture giving uncomfortable resonance noises. This sweep tone would help you in finding the specific frequency with which you would hear non-natural hill and/or valley in gain/volume of the room sound. If you find such a specific frequency tone, you may

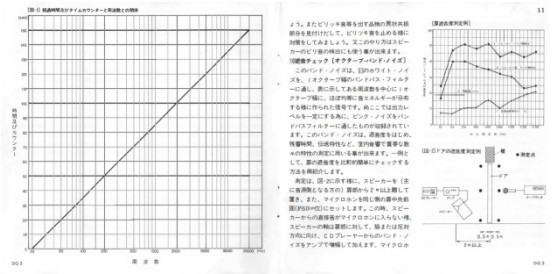
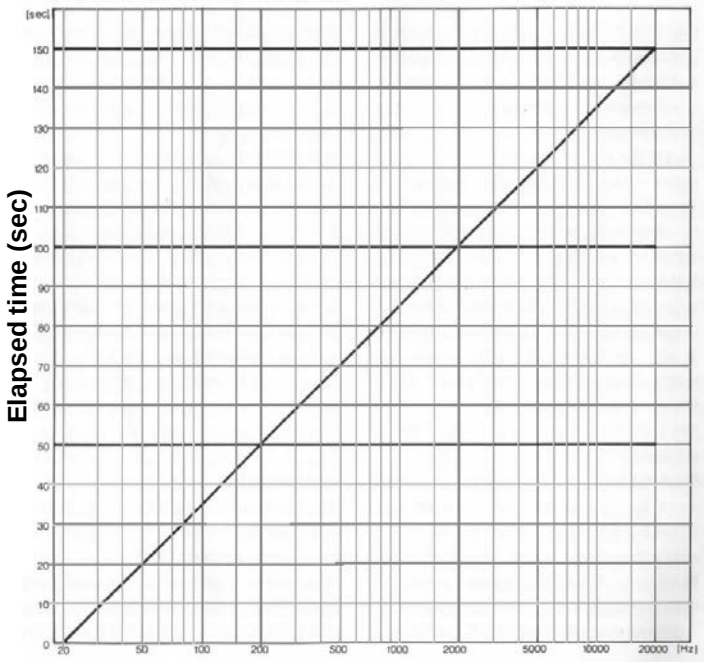


Figure-1 Elapsed time and frequency in track-9



play the specific portion repeatedly for your adjustments of furniture and/or curtain, *etc*., to minimize the resonance and stationary wave in your listening environment. This check cab be also applied for finding unusual “vibration” of your speakers depending on frequency.

10. Sound transfer/insulation check (octave band noise)

Each of the 10 tones of these band noise was prepared by putting the white noise in track-11 into one-octave-width band-pass filter to produce almost constant distribution of sound energy having the center at the specific frequency. In order to have constant output level, this track was made by putting pink noises into the band-pass filter.

These octave band noises can be used for various measurements of such as degree of sound insulation, reverberation time, sound transfer characteristics, etc., which are important in designing the room and acoustics. One example of such application is relatively easy check of sound insulation by a door as shown in Figure-2. Your speaker should be placed at least 2m away from the door, and the measurement microphone should be placed at about 50cm from the door surface.

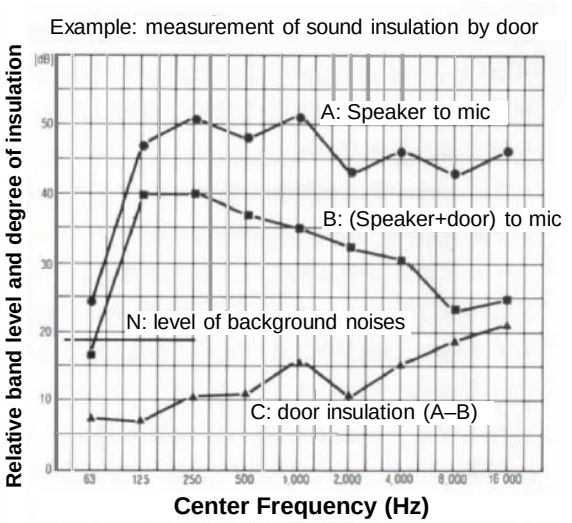
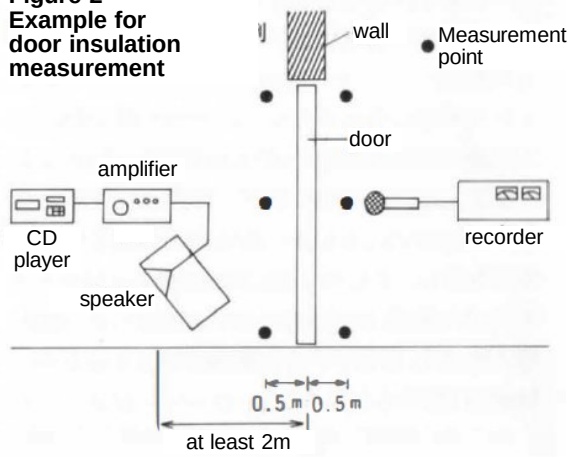
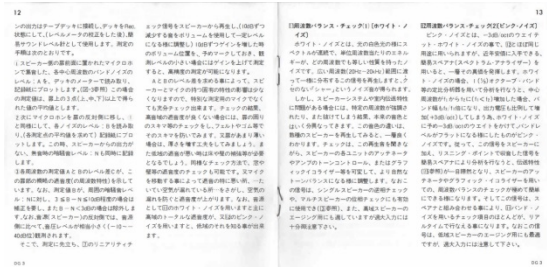


Figure-2
Example for door insulation measurement





The speaker's direct sound should not go into microphone, so align the speaker driver not facing to the microphone as shown in Figire-2. You may connect microphone to a recorder (such as tape deck) and use the recording VU meter (after proper calibration) as tentative sound level meter. The measurement procedures are as follows;

1. Read the each level of the band noises at the speaker side (without door), and plot the levels (level-A) on the graph paper. The plot value should be average of levels at more than 3 points (up, middle, down) near the door.

2. Move the microphone to the other side of the closed door and perform the similar measurement to be plotted as level-B. At this time you should also plot the blank noise level (without speaker sound) as level-N.

3. The difference between level-A and level-B at various frequency can be plotted as level-C which represents the approximate sound insulation degree and characteristic by the door.

Here, in case if 3dB≦(B-N) ≦10dB, you would need some correction, and if (b-N)<3dB, you may exclude/ ignore it. Please note that on the opposite side of the sound source (speaker) the sound pressure level is considerably lower (-10dB to -40dB) than that of the facing side of the sound source.

So, prior to the insulation measurement, you may play the linearity check signal of track-7 and adjust the volume dial to give constant sound level using the consecutively (-10dB step) lowering tones to memorize/mark the dial positions; then, in the actual insulation measurement you can gain-up/dial-up for the low-level sound so that giving results in higher precision.

To see/measure the (A-B) would effectively minimize/compensate the effects of individual "characteristic" of speaker and microphone, and hence you can measure the sound insulation without using (expensive) measurement microphone.

If you find insufficient insulation in high frequencies, you should check the open space around the door, and try to use felt and/or rubber to fill the open space. If the door is not thick enough you may consider some way to increase the thickness. Thickness.

If you find insufficient insulation in low frequency, you may need some reinforcements in the floor and/or wall.

You may apply this method to check your windows, walls, *etc*. By moving the microphone, you can find the specific place of insufficient sound insulation and/or "air leakage" to be fixed for better sound insulation.

Just for your further reference, you can observe the total high frequency insulation by using white noise of track-11, and total low frequency sound insulation by using pink noise of track-12.

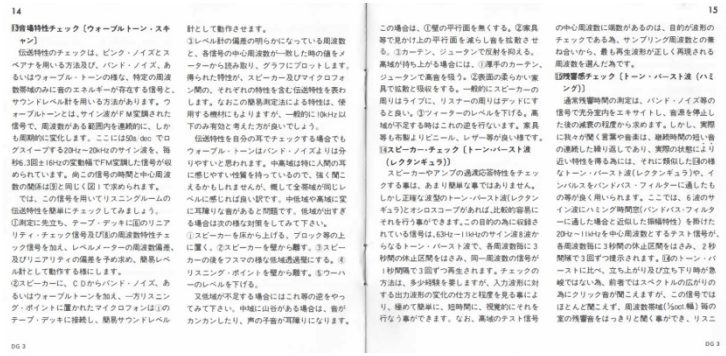
11. Frequency balance check(1) white noise

White sound noise, like white light, has continuous frequency spectrum with exactly equal sound energy per frequency. The white noise of wide frequency (20Hz to 20kHz) gives uncolored sheering sound to your ears. In case if you have some problem(s) in your speaker system and/or room acoustics, it would give improper emphasis and/or defects at specific frequency resulting in non-uniform sound in frequency in comparison with the ideal uniform noise sound. These sound "coloring differences" can be well heard by using several different speaker systems/units. Using white noise, you may adjust attenuators for speaker units, tone controller of amplifier, and/or graphic equalizer, to give more natural uniform tone balance. White noise can be also used for phase/polarity check of single speaker as well as multi-driver speaker system (also refer to track-3).

White noise is also suitable for "burn-in" ("aging") of tweeters and super-tweeters, but you should be careful enough to avoid possible over-load to the speaker units.

12. Frequency balance check(2) pink noise

Pink noise is "-3dB/Oct weighted white noise" and can be used for similar purposes like as with white noise in track-11. If you use a simple spectrum analyzer), which has been available at a low price in recent years, its true value will be further demonstrated. In case of white noise, if analyzed using a constant ratio analyzer such as 1 (1/3) octave band, when the center frequency increases from f1 to f2 (f1 <f2), the bandwidth also becomes f1/f2 times, and the output voltage also increases proportionally (+3dB /Oct), so pink noise is prepared by adding -3dB weight to white noise so that the band level becomes flat. Therefore, when this signal is put into the speaker and analyzed by simple spectrum analyzer at listening position, the transmission characteristics (see also track-15) become clear at a glance, and the frequency balance check/ adjustment using attenuators and/or graphic equalizer would become very easy. And this pink noise, together with spectrum analyzer, would enable real-time analysis of almost all of the check items using the band noise of track-11.



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③音場特性チェック〔ウォーブルトーン・スキャン〕

伝送特性のチェックは、ピンク・ノイズとスペアナを用いる方法及び、バンド・ノイズ、あるいはウォーブル・トーンの様な、特定の周波数帯域のみに音のエネルギーが存在する信号と、サウンドレベル計を用いる方法があります。ウォーブルトーンとは、サイン波がFM変調された信号で、周波数がある範囲内を連続的に、しかも周期的に変化します。ここには50s/decでログスイープする20Hz～20kHzのサイン波を、毎秒6.3回±16Hzの変動幅でFM変調した信号が収められています。尚この信号の時間と中心周波数の関係は型と同じく従って定められます。

では、この信号を用いてリスニングルームの伝送特性を簡単にチェックしてみましょう。

①測定に先立ち、テープ・デッキに図のリニアリティ・チェック信号及び1/3の周波数特性チェック信号を加え、レベルメーターの周波数偏差、及びリニアリティの偏差を予め求め、簡易レベル計として動作する様にします。

②スピーカーに、C Dからバンド・ノイズ、あるいはウォーブルトーンを加え、一方リスニング・ポイントに置かれたマイクロフォンは1/3のテープ・デッキに接続し、簡易サウンドレベル計として動作させます。

③レベル計の偏差の明らかになっている周波数と、各信号の中心周波数が一致した時の値をメーターから読み取り、グラフにプロットします。得られた特性が、スピーカー及びマイクロフォン間の、それぞれの特性を含む伝送特性を表わします。なおこの簡易測定法による特性は、使用する機材にもよりますが、一般的に10kHz以下のみ有効と考えた方が良いでしょう。

伝送特性を自分の耳でチェックする場合でもウォーブル・トーンはバンド・ノイズよりは分りやすいと思われます。中高域は特に人間の耳に感じやすい性質を持っているので、強く聞こえるかもしれませんが、慣して全帯域が同じレベルに感じれば良い訳です。中低域や高域に変に耳障りな音があると問題です。低域が出ずぎる場合は次の様な対策をしてみて下さい。

①スピーカーを床から上げる。ブロック等の上に置く。②スピーカーを壁から離す。③スピーカーの後をフスマの様な低域透過壁にする。④リスニング・ポイントを壁から離す。⑤ウーハーのレベルを下げる。

又低域が不足する場合にはこれ等の逆をやってみて下さい。中域に山谷がある場合は、音がカンカンしたり、声の子音が耳障りになります。

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この場合は、①壁の平行面を無くする。②家具等で見かけ上の平行面を減らし音を拡散させる。③カーテン、ジュータンで反射を抑える。

高域が持ち上がる場合には、①厚手のカーテン、ジュータンで高音を吸う。②表面の柔らかい家具で拡散と吸収をする。一般的にスピーカーの周りはライブに、リスナーの周りはデッドにすると良い。③ツイーターのレベルを下げる。高域が不足する時はこれの逆を行ないます。家具等も布製よりビニール、レザー等が良い様です。

④スピーカー・チェック〔トーン・バースト波（レクタンギュラ）〕

スピーカーやアンプの過渡応答特性をチェックする事は、あまり簡単な事ではありません。しかし正確な波形のトーン・バースト波（レクタンギュラ）とオシロスコープがあれば、比較的容易にそれを行う事ができます。この目的の為に収録されている信号は、63Hz～1kHzのサイン波を途からならなトーン・バースト波で、各周波数毎に3秒間の休止区間をはさみ、同一周波数の信号が1秒間隔で3回ずつ再生されます。チェックの方法は、多少時間を要しますが、入力波形に対する出力波形の変化の仕方と程度を見る事により、極めて簡単に、短時間に、視覚的にそれを行なう事ができます。なお、高域のテスト信号の中心周波数に端数があるのは、目的が波形のチェックである為、サンプリング周波数との兼ね合いから、最も再生波形が正しく再現される周波数を選んだ為です。

⑤残響時間チェック〔トーン・バースト波（ハミング）〕

通常残響時間の測定は、バンド・ノイズ等の信号で充分室内をエキサイトし、音源を停止した後の減衰の程度から求めます。しかし、実際に我々が聞く言葉や音楽は、継続時間の短い音の連続した繰り返しであり、実際の状態により近い特性を得る為には、それに類した1/3の様なトーン・バースト波（レクタンギュラ）や、インパルスをバンドパス・フィルターに通したもの等が良く用いられます。ここでは、6波のサイン波にハミング時間窓（バンドパス・フィルターに通した場合と近似した振幅特性）を掛けた20Hz～1kHzを中心周波数とするテスト信号が、各周波数毎に3秒間の休止区間をはさみ、2秒間隔で3回ずつ発音されます。1/3のトーン・バーストに比べ、立ち上がり及び立ち下り時が急峻ではない為、前者ではスペクトルの広がりの為にクリック音が聞こえますが、この信号ではほとんど聞こえず、周波数帯域（3oct.幅）等の室の残響音をはっきりと聞く事ができ、リスニ

DG 3

Pink noise is also suitable for “burn-in” (“aging”) of squawkers and woofers, but you should be careful enough to avoid possible over-load to the speaker units.

13. Room acoustic check: wobble tone scan

Acoustic transmission characteristics can be checked/measured by using 1. pink noise and spectrum analyzer, 2. signal with sound energy at specific frequency area, such as band noise or wobble tone, and sound-level meter. Wobble tone is the FM modulated sine wave which has periodically oscillating frequency spectrum in specific frequency region. This track consists of 20Hz - 20kHz sine wave of 50s/dec log-sweep with 6.3 times/sec ±16Hz FM modulation. The elapsed time and center frequency are in the same correlation as shown in Figure-1 for track-9.

Now let’s check transmission characteristics of your listening room using this wobble tone signal.

1. Prior to the measurement, you need to apply the linearity check signal (track-6) and frequency check signal (track-8) into your recorder to know the frequency and linearity deviations, so that the level meter can be used as convenient level meter.

2. Now you may play the band noise or wobble tone to be recorded by microphone and recorder as simple level meter.

3. Read the level value from the meter when the frequency at which the deviation of the level meter is known and the center frequency of each signal match, and plot it on the graph. The obtained characteristics represent the transmission characteristics, including the respective characteristics, between speaker and microphone.

The transmission characteristics obtained by this simple method depend on the equipment used, but in general it is better to consider that the result is effective only below 10 kHz.

Even if you check the transmission characteristics with your own ears, the wobble tone seems to be easier to understand than the band noise. The mid-high range is particularly easy for the human ear to hear, so it may sound strong, but generally all bands should feel at the same level. It is a problem if there is a strangely jarring sound in the mid-low range or high range. If the low range is too high, try the following measures.
1. Raise the speaker from the floor, place it on a block, etc., 2. Move the speaker away from the wall. 3. Put a low-frequency transparent wall like a bran behind the speaker,

4. Move your listening position away from the wall. 5. Lower the level of the woofer.

If the low range is insufficient, do the opposite.

If there are mountains and valleys in the midrange, the sound may be jarring, or it may be a consonant or jarring voice. In this case, you may try; 1. Eliminate parallel surfaces on the wall, 2. Reduce the apparent parallel planes between the furniture so that sound is dispersed, 3. Curtains and carpet also suppress reflections.

If the high range is raised, 1. Absorb high notes with thick curtains and carpet, 2. The soft furniture on the surface diffuses and absorbs; generally it's better to be “live” around the speaker, and “dead” around the listener, 3. Lower the level of the tweeter.
Do the opposite when you run out of high frequencies.

As for furniture, usually vinyl, laser, etc. are better than cloth.

14. Speaker check: rectangular tone burst wave

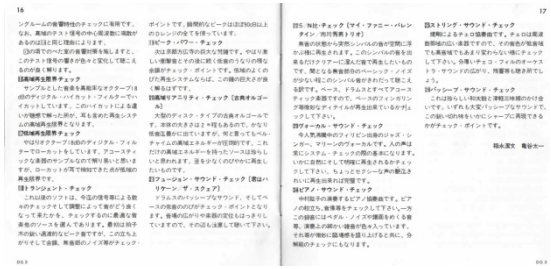
Generally speaking, it is not so easy to measure the transient characteristics of speakers and/or amplifiers.

You can measure the transient characteristics rather easily, however, using accurate shape (rectangular) tone bust signals and spectrum analyzer, like oscilloscope. For this purpose, track-14 consists of tone burst signals of consecutive 8 sine waves in each of the frequencies, 3 times with 1 sec interval, and 3 sec between the frequency groups. You somewhat need to be get used to the measurement, but you can get the transient patterns simply, quickly and visually by looking at the output signal shape against the input tone burst. The reason why the center frequency of the high-wave test signal has a fraction is that the purpose is to check the waveform, so the frequency that gives the most reproducible waveform is selected in consideration of the sampling frequency.

15. Reverberation check: Tone burst wave (humming)

Generally, the reverberation time is measured from the degree of decay after the sound source is stopped by sufficiently exciting the room with signals such as band noise. However, the words and music we hear are actually continuous repetitions of short-duration sounds, and in order to obtain characteristics closer to the actual sound, tone burst wave like in track-14 and band-pass filtered impulse are often used.

Here, 6 sine waves treated with humming time-window (resembling amplitude characteristics of band-pass filter) are prepared having center frequency in 20Hz - 20kHz,



three times (2sec interval), 3 sec between the frequency groups.

Compared to the tone-burst of track-14, the rising and falling times are not steep, so in the former, a click sound can be heard due to the wide-spread spectrum, in this track it can hardly be heard, and the reverberation of the room can be clearly heard with each of the frequency band (1/3 Oct. width), nice for check of acoustic characteristics of the listening room.

The reason why the center frequency of the high frequency test signal has a fraction is the same as track-14. If you apply the acoustic countermeasure practices of the room described for track-13, you can clearly hear that the sound of this test signal changes in various ways.

16. High frequency playback limit check

The sample music is high-cut with a highly efficient octave 18dB digital high-cut filter. The frequency at which the difference due to this high cut is audibly understood is the high-frequency reproduction limit of the reproduction system including the ears.

17. Low frequency playback limit check

Again, the sample music is low-cut with a highly efficient octave 18dB digital low-cut filter. You may rather easily hear the difference since the music is acoustic instruments, but the frequency that the low cut can be detected with your ears is the low frequency reproduction limit.

three times (2sec interval), 3 sec between the frequency groups.

18. Transient check

For the sound sources after this, we have selected the best sources such as music to check how the sound has been improved by various checks and adjustments so far described.

At first, it is a sharp transient peak sound of the wooden clappers; the sound “kick-up”, tailing note, S/N ratio in silent portions, *etc*., are the key checkpoints. The transient peaks are in full dynamic range over 90dB.

19. Peak power check

Next is the huge Japanese bell of *Hokoji* Temple in Kyoto. After all, the checkpoint is the violent shock sound and the subsequent low-pitched growl finish. If you have a playback system with well-extended low frequencies, you should be able to “see” the hugeness of this bell.

20. High frequency linearity check

A large disc type classic music box. The size of the main body is about 2 m, so the bass is rich, but the high frequency energy of the bell chime is overwhelming. It seems that a source with such high frequency energy is very rare. We want to play it freely with little distortion.

21. Fusion sound check: “You are hurricane”

The passive sound of the drums and the extension of the bass sound are the checkpoints. The spread of the sound stage and the localization of the instrument are also clear, so please listen carefully.

22. S/N Ratio check: by “My Funny Valentine”

From the silent space, the sound of cymbal suddenly plays as if it floats in the space. Those who want to reproduce the sound of this cymbal as clearly as possible. The less basic noise in the silence between, the clearer the sound of this cymbal should be. Bass and drums are all acoustic instruments, so please check if you can reproduce the subtle details such as fingering of the bass.

23. Vocal sound check: by “Satin Doll”

The vocalist is Marlene, a jazz singer from the Philippines who is currently gaining popularity. Human voice is always the basis for system checks. Check how it plays naturally and clearly. If you can reproduce the luster of a slightly sexy voice beautifully, it will be complete.

24. Piano Sound Check

This is a piano concerto played by Hiroko NAKAMURA. Check the graininess, lusters and sound image of the piano. On the other hand, this recording contains various small noises in the performance such as pedal noise and the sound of turning the music score. These will subtly enhance the sense of presence, and also these are checkpoint of the audio system’s sound resolution.

25. String sound check

A cello concerto by cellist Tsuyoshi TSUTSUMI. The cello is a wide-band instrument, so check that its timbre does not change in the low or high range. You can also listen to the wide-spread and reverberation of the thick and heavy Czech Philharmonic Orchestra sound.

26. Passive sound check

This is a rare combination of Japanese drums and *“Tsugaru shamisen”*. All of them have very passive transient sounds, and the check point is how sharply these transient sound can be reproduced.

Kiyofumi INANAGA
Taichi KAMETANI

How to use Super Audio Check CD?

Nobuyuki DEN

Perhaps no one believes that the CD you take out of the case and have in your hand is actually a device, not a CD. Obviously. In my hand is a silver plate that emits a rainbow color with a diameter of 12 cm. It's the usual CD. It looks the same. Then, the reason why it is a device is that most of the contents of this CD are not music but signal sounds such as "*peeh, pooh,* and *poco*".

The bass sounds strange these days, the vocals and chorus are strange, the hi-cut isn't fine enough, and so on. There should be something is wrong? When I was asked to go out to my friend's house, I took it out, lowered the cartridge needle, and listened for 30 seconds to see the drawbacks, or I should have this song to use to check my own system.

On the other hand, for the engineers who develop audio components, there is a device that can do nothing without this, although it is the same as doing claws with "music" at the end. It is a measuring instrument.

Just as when listening to music from a LP vinyl disk, the signal enters the amplifier from the LP player and sounds from the speaker, the measuring instrument also has an input device and an output device. The representative of the input is an oscillator, and the representative of the output is an oscilloscope.

Now, the CD you have now is an oscillator.

This Super Audio Check CD begins with a sharp sound of iron wheels hitting the seams of the railroad tracks, and a strong SL sound (track-1) that makes you feel as if you were hitting your forehead.

Next, the snare's slamming effect, and the intense *The Squre*'s "You are Hurricane" sounds. It's only two minutes so far, but when the sound of smash is so much, the amplifier and speaker running is perfect and I feel like "Come on, what's next!"

Well, even if it's so cute, from track-2, you'll be in the world of CDs only. Track-2 "Phase check". In the opposite phase, it makes a really unpleasant sound. It's not a simple problem that bass sounds or doesn't come out because it's out of phase. The sound coming from the left and right ears messes up the brain, and it's a way of hearing that you can't stand for a second.

If you're an audio fan who already owns a CD player now (August 1983), you'll probably have one or two LP record of frequency records, check records on your shelf. You'll notice that checking the left and right using such a LP is clearly different from that of this check CD. When there is a narration saying "This is the right channel" in track-1, when I turn the balance dial of the amplifier all the way to the left, I can hardly hear either anything. In the case of LP, the sound that is not too loud but faint sound gets leaked. The difference in crosstalk. The CD is 90 dB for this (leakage is 1/31600), and the LP is about 25 dB including the characteristics of the player. If the leaked sound is distorted in the case of LP, the adjustment of the arm and the mounting of the cartridge (horizontal/vertical) are incorrect. So, if a CD isn't as small and leaks as I say, then the CD player is also slightly responsible, but now it's the responsibility of the amplifier and the connections to it. The cable may be wrong, or the connection may have created a strange loop.

However, it is correct to perform the above-mentioned check in track-5. And the standard of how much leakage is OK can be realized in track-6.

Now, returning to the story of track-2, it is because the CD playback has good separation and frequency characteristics of L and R, and the level are exactly the same (should), so the opposite phase (polarity on one side is opposite), will stir the brain far more than LP.

In track-3, for L, R, C (C = center), and LC (left center) and RC (right center) are added to give 5 points of localization. However, it is important, of course, it is no-good if L, C, and R do not connect smoothly, and in addition, it is troublesome that the level becomes uneven in the order of L → LC → C → RC → R. It is desirable that the conditions behind the two speakers and the left and right, as well as between the speakers, are symmetric. The left and right speakers want the same conditions. However, it is quite difficult to make the left and right sides the same, such as closet, window. Don't think too hard, but if you feel that it's a lot uneven and the sound is too different, it can trigger a change in settings or a room remodeling. One-way traffic from L to R is not enough, so please use the functions of your CD player and repeat it so that you can check in all directions such as R → L, then C → L, and C → R.

When I compared the domestic and overseas CDs with the same content, I was surprised at the difference in volume as soon as the music started, not to mention the difference in sound. It is about 6 dB higher than the other. The question arises as to whether the CD has a standard level. I understood that with this check CD.

The order of the explanation is reversed, but track-4 the index-2 of the reference signal is the maximum level of the CD, which is the maximum level when 16 bits are fully used. The sudden increase in the narration volume before this signal is a reminder for the maximum volume to come out here.

In other words, the volume above this maximum level does not come out of any CD or any CD player. It was set from the experience that even the high level from the digital master can be recorded without distortion by setting the place 20dB below the maximum level as the temporary reference level.

Index-1 in track-4 is 20 dB lower. 20dB is (in most cases) comparable to the effect of the amplifier's muting switch. However, track-4 from I to 2 is the same state as when the muting of the amplifier is turned on and the volume is turned up to listen to 1, and when 2 is muting-off, the volume becomes loud. When playing the track-4 and subsequent track-5 and track-7, be sure to be near the amplifier so that you can adjust the volume immediately. As expected, there is a margin of 20 dB for CDs.

Now, one of the three big highlights of "Check CD" is track-6.

Starting from the maximum level of 0dB, which is the same as index-2 in track-4, the level gradually decreases to 14 steps every 10 seconds. At the end, it's really -90dB.

It's just a list of numbers from 0dB to 90dB, or when you look at the table, but this is a big difference, and the height (depth) from 0dB at the top of the table to -90dB at the bottom is likened to the depth of sea. I want you to feel 0dB is the sea surface. The reference level of -20dB is the depth of the rush, -40 dB is the depth of the aqualung, and -60dB is the limit for professional divers who are behind the aqualung, but -50dB is often the limit for some professionals. Below this is the depth of submarines. Furthermore, when it reaches -80dB, it is equivalent to the awarding of a medal in the record of the deep sea submarine “Bathyscaphe” (I'm sorry it is old). Even more, -90dB makes the Mariana Trench pale, unexplored by humankind, encountering the unknown.

Track-6 is a check of linearity. Call 0dB of index-2 and raise the volume to the limit of noisy. The fourth -20dB is the reference level as mentioned above. The game starts from here. You should be able to hear it up to -40dB of index-11. If the road is busy, the sound of a car that happens to pass by or the sound of an air conditioner interferes, but the index-13 of -60 dB is the limit.

The noise from inside and outside the room is even more unexpected, but if you can hear it faintly when you take a deep breath and listen to it, it's fine. You are the owner of a in-field single-family home or a studio-like room. As you can see, -60dB is a borderline. And the difference in this number is the value of the crosstalk separation of the above-mentioned CD.

Furthermore, please give up -70dB, -80dB, and -90dB as long as you listen to them with your ears (as long as you listen to them in the listening room) without observing them with an output measuring instrument. You can gradually turn up the volume and listen to it, but if you don't turn it down just before the narration in track-7 you will be intimidated by the ridiculous volume. I'm not responsible, but it's all an experience. To know the wide dynamic range of a CD.

If you hear up to -40dB, it's pretty OK, if you hear -60dB, it's very OK. It's not just numbers, but what you'll realize here is that the dynamic range spread from fighting noise to annoying your neighbors.

Also, when you hear that the volume when you listen to -20dB with one ear closed and the volume when you listen with both ears open at -23dB is almost the same, you can see what the difference of 3dB as the volume is. You can feel it.

Speaking of the actual feeling, I would like to point out later that the signal sound like hitting a wood block, which can be heard like "*poco, poco*" in gtrack-7, is closer to the actual situation than listening in track-6.

The sound of "*po-po-po-peep*" in the NHK radio/FM hour-time signal is 440Hz for the first three pops and 880Hz for the last tone, which is twice as high. Tells us!. On the other hand, according to some books, the (frequency) range of the sound we hear is written as 20-20,000Hz and 40-18,000Hz, but in fact this number is not easy. If the upper limit is 18kHz, then 2kHz and 3kHz are still in the bass range, but this is the magic of numbers. In track-8, xxHz is the best way to get a feel for what the sound is like.

If you look at the numbers at 315Hz, it sounds like *"Zun*" and *"Brun"*, but in reality it's a wind-like sound, and please realize that 125Hz gives a surprisingly heavy bass feeling, 3kHz and 4kHz are sharp to your ears, and 12.5kHz sounds more like a bird's chirping than a sound.

If you listened to 16kHz or higher with your audio companion, there would be a turbulence. I can hear, can't hear, I can hear, you don't lie! And so on. Well wait. At this frequency, there is a difference in age and experience with sound. Also, since the influence of wavelength is strong, if you shake your head or move your head back and forth, you may or may not hear it, so please get along well. If you can hear it, be convinced that this is no longer a sound, but a spice in cooking, and tell those who can't hear it that way.

Track-9 is a sweep from the ultra-low range of 20 to ultra-high sound waves 20,000 Hz, which is unique to CDs; running up over 150 seconds. There should be almost no sound in the first 10 seconds. If the rattling, the glass door, the umbrella of the light, the picture frame, *etc.* start to ring in another 10-30 seconds, it is recommended to stop by a spacer with it and fix it properly. It is a good idea to listen to that part repeatedly on a CD player's repeater. Such signal sounds are extremely rare in music. However, the sound component of music unknowingly vibrates somewhere and pollutes the sound.

As mentioned above, this CD is an "oscillator" if both track-8 and track-9 can be reproduced in an almost flat manner.

After suppressing the vibration in track-9, proceed to ttrack-10.

The change in noise that goes on with tones of *"doooh, guuuh, gaaah, zaaah, ziiiih"* are a kind of dirty sound. If it feels dirty, it's a sensation, but if this gradual increase of noise sounds dirty but balanced, your listening room is in place. And track-13!

The sound like effects of science fiction movie also reveal the speedy setting of the room. Naturally, it is good that the sound does not swell or lose weight. But when it's bad, it's not easy to decide what to do. For the time being, from the current state of the room, I will put out something that can be put out immediately.

I can't move-out the piano or chest of drawers, so I'll take out the sofa and the shelves which can be moved. Then return to the world of SF again. How is it different from the previous one? If it swells, put the sofa back and remove the curtain. The reverse is also true. It's easy to write, but it's actually hard.

We hope that you will be convinced and realize that the soft and voluminous ones are good for bass, the surface is smooth, and on the contrary, whether it is hard or soft affects the mid-high range to the high range.

And, the final push is track-14. A tone burst wave that sounds strange as a sound. Indexes 2, 3 and 4 are habitual and usually swell. If you adjusted it as described in track-13 above, suspect the speaker stand, and if it is a block, change the stacking method. Place a 10-yen coin between the table and speaker. Insert a piece of carpet. There are various ways to make it higher. It makes you realize that speaker settings are an eternal theme for audiophiles.

Track-15 is a signal sound, but after that, it's finally time to check with music.

Named the “limit check” tracks, the high frequency flatness of track-16 and the flatness of track-17 are included in this CD as "flat", but does it come out of your speaker in “flat” from the beginning? I can't guarantee it. I would like you to compare “relatively” the following sound sources, with your “flat” setting.

Since track-16 is for high frequency range, your ears are concentrated on the top cymbal, and track-17 is for low frequency sample so the ears are concentrated on the wood bass. In both cases, index-2 hardly tells, and index-3 finally starts to tell "changed!". In either case, the index-4 and index-5 tell “clearly changed!". At that time, you must have wrinkles between your eyebrows. Instead of trying to find the difference, sit back on the sofa and listen again. You will notice that the balance changes.

The touch of the wood bass changes even though it should be a high-frequency cut, and the edge of the sharp sound stage changes even though it should be a low-frequency cut. "Music is not just sound, it's a collection of sounds!“

When and where it was, there is a saying that "listening is to believe!" Never waste your time. No, but it's dangerous to get caught up in the numbers. I would like you to close your eyes from looking at the numbers, but experience the sound. If you feel something, open your eyes and check the numbers.

The last is the CBS Sony All Stars competition.

In particular, the music box (track-20) is a harsh sound source for cassette decks and noise reduction.

After completing the mastering for this Super Audio Check CD, the staff of CBS Sony and I all crossed their arms and groaned; "Is it okay to release such a CD?“.

I was really concerned about the “volume/gain”. And, even though we have made it, don't rely on this CD for everything. One-thirds of the content is only useful if there is an output measuring instrument. And the remaining two-thirds is, of course, for checking audio system and your ears, but more than that, it is a "trigger" to know what sound is and what frequency is.

I repeat; this CD is not just a CD, it is an oscillator and at the same time a "trigger" to knock on the door to the world of sound.

A 12-centimeter-diameter silver plate is equivalent to 10 (or more) textbooks on sound and audio system.

Nobuyuki DEN

The compact disc is a new audio system with epoch-making performance that makes the best use of modern cutting-edge digital technology in the world of vinyl records. The sound quality is very fidelity, there is almost no noise, and you can enjoy clear and powerful sound. This is because the recording and playback methods are completely different from the conventional analog methods.

In conventional SP and LP records, the vibration of the sound is directly carved into the groove. However, a CD is used to break down a music signal into small pieces, and then replace it with a code used in a computer and record it. Sound is a wave of air vibration, but it is converted into an electric signal wave with a microphone or the like. It breaks down the wave into 44,100 per second, each of which is represented in steps of about 65,000.

In this way, all music signals can be expressed numerically. Replace that number with a binary number of 0s or 1s and record it as a pulse code indicating the presence or absence of a signal (0 or 1) on the surface of the disc. This is the PCM method. When disassembled in this way, the human ear cannot detect any intervention. When you look at a beautiful color photograph under a microscope, it is the same as standing up with small points/dots. For reproduction, a thin laser beam is applied without using a needle, the code is read, and the original waveform is reassembled.

Therefore, since it is completely non-contact with the surface of the disc during playback, its life can be said to be semi-permanent. In this way, in the digital method, only the sign of 0 or 1 is actually recorded, so even if the recording code is distorted, if only the presence or absence can be determined, the original sound is completely unaffected and reassembled.

In other words, the effect on the sound during recording and playback is very small, and the sound as it is on the master tape is faithfully reproduced.

This CD has a great standard/specification that is almost the same as a professional digital recording system. The recorded signal has 16 bits, and the dynamic range, which indicates the width of the loudness of the sound, is 90 dB or more, which is much wider than before. The raw orchestra sound that you listen to in the hall is about 100 dB, so you can reproduce the sound power that is close to the original raw music.

Of course, there is no noise due to the needles that are crackling, and the S/N ratio is much higher than before. It is significantly improved and almost no noise can be heard. The wow and flutterer (rotational unevenness, *etc.*) that causes sound fluctuation has been reduced to an unmeasurable level. There is almost no crosstalk where the left and right sounds are mixed. And the distortion that pollutes the sound is less than 0.05%, which is an order of magnitude less than before, and it is now possible to reproduce a very clear and beautiful sound.

The signal surface of this disc is covered with a protective film and cannot be touched directly from the outside, but since the code is read by a laser beam from the shining surface on the opposite side of the label, please be careful not to put dirt and scratches on that surface. If it gets dirty, wipe it gently with a soft cloth. For heavy stains such as oil, wipe it with ethyl alcohol to remove it cleanly. If the surface is wet, wipe gently with a dry cloth. Do not use conventional LP sprays, or cleaners for house keeping use.

48DG 3 STEREO/DIGITAL RECORDING