Sony NEC Optiarc

Product Specification

Category: CD-R/RW/DVD-ROM Drive
Model Name:Optiarc CDRWDVD CRX890S

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Issued Date: October, 08 2007
Revision: 1.01

Safety Regulations

WARNING

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

CAUTION:
As the laser beam in this model is harmful to the eyes, do not attempt to disassemble the cabinet. Refer servicing to qualified personnel only. The use of optical instruments with this product will increase eye hazard. The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

This label is located on the top of the drive unit enclosure.
Dieses Etikett befindet sich oben auf dem Laufwerksgehäuses.

CAUTION	CLASS 3B VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO THE BEAM.
ATTENTION	RADIATIONS LASER VISIBLES ET INVISIBLES DE CLASSE 3B EN CAS D'OUVERTURE. EVITER TOUTE EXPOSITION DIRECTE AU FAISCEAU.
VORSICHT	KLASSE 3B SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG WENN GEÖFFNET. DIREKTEN KONTAKT MIT DEM STRAHL VERMEIDEN.
ADVARSEL	SYNLIG OG USYNLIG LASERSTRÅLING AF KLASSE 3B VED ÅBNING. UNDGÅ DIREKTE UDSÆTTELSE FOR STRÅLING.
ADVARSEL	SYNLIG OG USYNLIG LASERSTRÅLING I KLASSE 3B NÅR DEKSEL ÅPNES. UNNGÅ DIREKTE EKSPONERING FOR STRÅLEN.
VARNING	KLASS 3B SYNLIG OCH OSYNLIG LASERSTRÅLNING NÄR DENNA DEL ÄR ÖPPNAD. UNDVIK ATT DIREKT EXPONERA DIG FÖR STRÅLNINGEN.
VARO!	AVATTUNA LUOKAN 3B NÄKYVÄÄ JA NÄKYMÄTÖNTÄ LASERSÄTEILYÄ. VÄLTÄ SUORAA ALTISTUMISTA SÄTEELLE.

This CD-R/RW/DVD-ROM drive unit is classified as a CLASS 1 LASER PRODUCT.
The CLASS 1 LASER PRODUCT label is located at the top of the enclosure.
Bei diesem CD-R/RW/DVD-ROM-Laufwerk handelt es sich um ein Laser-Produkt der Klasse 1.
Das Etikett mit der Aufschrift LASER KLASSE 1 PRODUKT befindet sich auf der Oberseite des Gehäuses.

CLASS 1
LASER PRODUCT

LASER KLASSE 1
PRODUKT

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1 INTRODUCTION

This document describes the engineering specifications of Optiarc CDRWDVD CRX890S drive. The CRX890S is a slim internal type with 12.7mm height and an IDE/ATAPI/SATA interface CD-RW/DVD-ROM drive. The drive is able to write CD-R/RW discs and also can perform as a regular DVD-ROM drive. The CRX890S has 8X speed DVD-ROM disc reading, 24X speed CD-R disc writing, 24X speed CD-RW disc writing and 24X speed CD-ROM disc reading capabilities. Furthermore, the CRX890S supports various writing methods specified in the Orange Book Part II & Part III and the functions of writing conform to them.

The general features of the Optiarc CDRWDVD CRX890S drive are as follows:

(1) 12.7mm Height, Internal Type CD-RW/DVD-ROM Drive

(2) Support 12 cm / 8 cm Disc

(3) Maximum 8X (10.56 Mbytes/sec, DVD) / 24X (3,600 Kbytes/sec, CD) Data Transfer Rate

(4) 8X DVD Disc Reading Speed / 24X CD-R Disc Writing Speed / 24X CD-RW Disc Writing Speed / 24X CD-ROM Reading speed

(5) Support Disc-At-Once (DAO) / Session-At-Once (SAO) / Track-At-Once (TAO) / Fixed & Variable Packet Writing for CD

(6) SATA/IDE/ATAPI interface (compliant to ATA/ATAPI-7)

(7) DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+R DL, DVD+RW, DVD-R DL, DVD-RAM, CD-DA, CD-ROM/XA, CD-i, Karaoke CD, Video CD, Multi-session Photo CD, Enhanced CD, i-trax CD, CD extra, CD Plus, CD-Text, CD-R and CD-RW Discs Compliant

(8) Support Windows 98, Windows Me, Windows NT, Windows 2000, Windows XP X86/X64, Windows Server 2003 X86/X64, Windows Vista X86/X64.

(9) MPC level 3 compliant

(10) MMC5 / Mt. Fuji Command compliant

(11) Supports device type of Serial-ATA interconnections for Gen 1 operation at 1.5Gbps

(12) PC 2001 Logo

(13) CSS (Content Scramble System) supported

(14) RPC II (Regional Playback Control Phase II) supported

(15) Drawer Type Manual Load

(16) Electrical Button / Software / Emergency Ejection

(17) MTBF 60,000 POH

(18) Support Ultra DMA mode5, Multi-word DMA mode 2, and PIO mode 4

(19) Power Saving Feature

(20) Flash ROM supports On Line Programming Capability

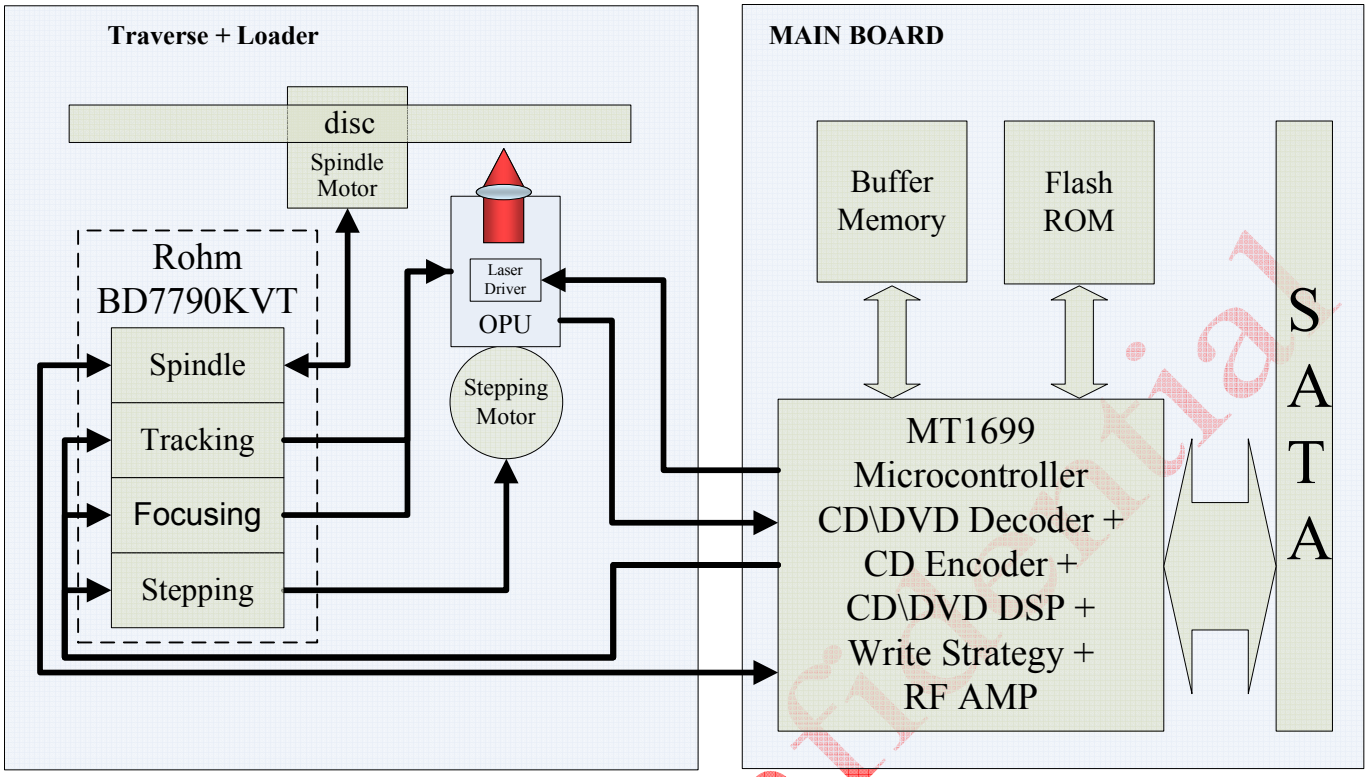
(21) Support Buffer Underrun Protection (Super link)

(22) VCPS Playback

(23) CPRM Playback

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Figure 1. Block Diagram



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2 PHYSICAL SPECIFICATIONS

2.1 Dimension

128.0 x 12.7 x 129.0 mm (W*H*D), see Figure 2 for GBAS type.

2.2 Weight

160g ± 5g for Aluminum Top Case / Aluminum Bottom Case (without bezel)

2.3 Front Panel

Ejection button
Emergency eject pin hole
Power on / Busy LED indicator (Green LED)

2.4 Rear Panel

SATA interface connector (13 Pins)

2.5 Installation

Horizontal & Vertical, Motorized Tray-type loading

2.6 Ejection Distance

Min. 12mm relatively
Max Ejection force is 1000gf

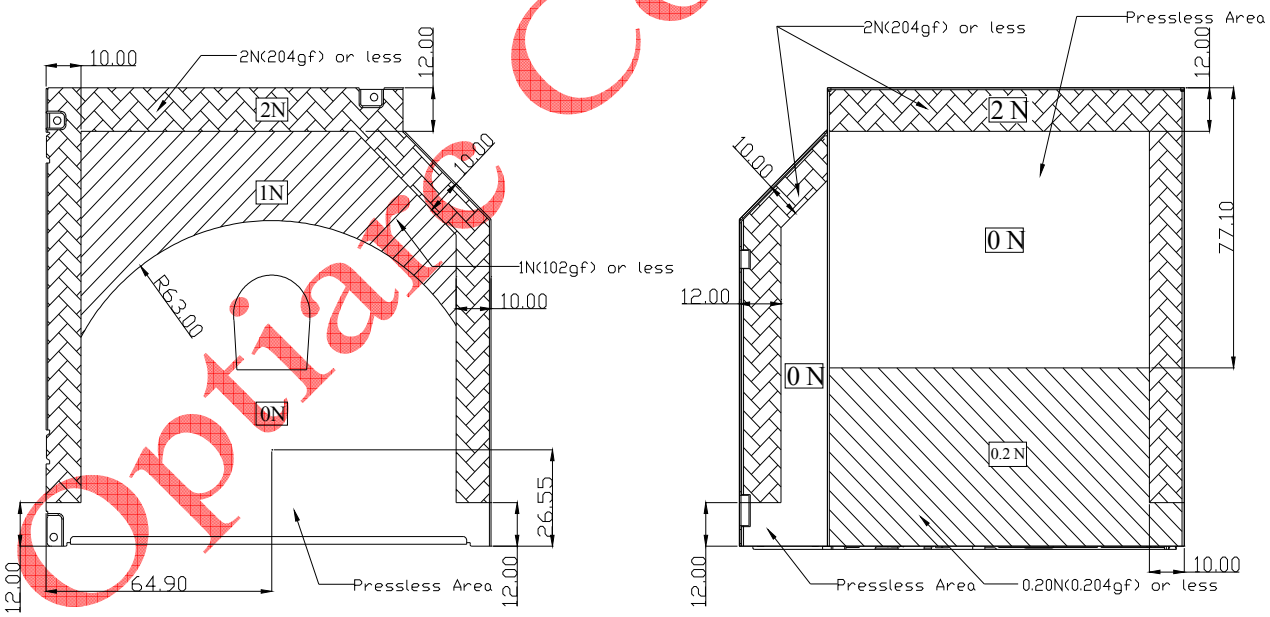
2.7 Mounting Orientation

+/-10degree (Front to Back / Left to Right)

2.8 Mounting screws

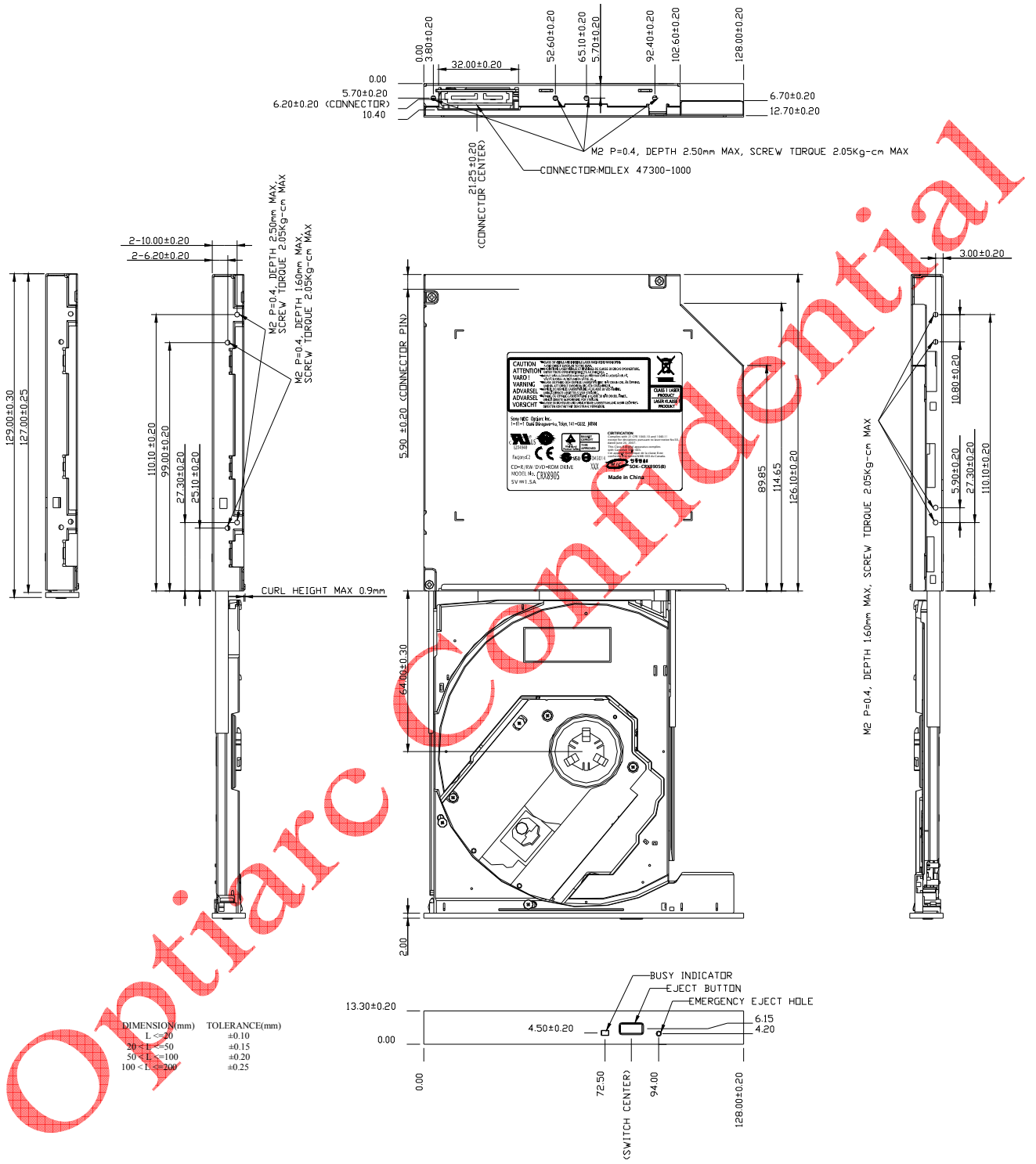
0.12 +/- 0.02Nm (Torque), 1.3mm Max (Length)

2.9 Force value range



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Figure 2. Mechanical External Dimensions with GBAS type (unit: mm)



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3 PERFORMANCE

3.1 Applicable DVD Formats (Read)

DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-Video, DVD-Audio, SACD (Hybrid), UDF DVD, DVD-R, DVD-R DL, DVD-R 3.95 GB, DVD-R Authoring, DVD-R Multi-Border, DVD-RW, DVD+R, DVD+R DL, DVD+R Multi-Session, DVD+RW, DVD-RAM V1.0, DVD-RAM V2.1.

3.2 Applicable CD Formats (Read)

CD-DA, CD-ROM Mode-1, CD-ROM/XA Mode-2 Form-1 and Mode-2 Form-2, CD-i, CD-i Bridge, Video-CD (MPEG-1), Karaoke CD, Photo-CD, Enhanced CD, CD Plus, CD Extra, i-trax CD, CD-Text, UDF CD, CD-R, and CD-RW

3.3 Applicable CD Formats (Write)

CD-DA, CD-ROM Mode-1, CD-ROM/XA Mode-2 Form-1 and Mode-2 Form-2, CD-i, Video-CD, CD-Text

3.4 Disc Diameter

12cm, 8cm and Business Card for Read / Write

3.5 Writing Software Support

Sonic-Roxio (Easy Media Creator, Drag to Disc), Nero (Nero burning Rom & InCD), NTI (CD & DVD-Maker, File-CD), Easy System (Drag'n Drop CD+DVD), BHA (B's Recorder Gold, B's Clip), Sonic (Record Now, MyDVD, DVD it! DLA), Cyberlink DVD solution.

3.6 Recordable Media Type

CD-R / CD-RW media

3.7 Disc Capacity

2,048 bytes/block (DVD)
2,048 bytes/block (CD Mode-1 and Mode-2 Form-1)
2,328 bytes/block (Mode-2 Form-2)
2,336 bytes/block (Mode-2)
2,352 bytes/block (CD-DA)

3.8 Data Buffer

2 MB

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3.9 Rotational Speed

Media Type	Support Read Speed (Typical)
CD-ROM Type	
CD-ROM, CD-R (Close Disc & Non-Close Disc), CD-RW (Close Disc & Non-Close Disc), CD-DA (DAE), Video CD (Copy)	5,000 rpm (10.8X ~ 24.8X CAV) 4,200 rpm (9.1X ~ 21.1X CAV) 3,000 rpm (6.9X ~ 15.9X CAV) 2,150 rpm (4.7X ~ 10.7X CAV)
CD-DA (Playback), Video CD (Playback)	2,150 rpm (4.7X ~ 10.7X CAV)
DVD-ROM Type	
DVD-5 (Single Layer), DVD-R, DVD+R	4,800 rpm (3.5X ~ 8.3X CAV), 3,600 rpm (2.6X ~ 6.2X CAV), 2,400 rpm (1.7X ~ 4.2X CAV)
DVD-9 (Dual Layer) , DVD+R DL, DVD-R DL	4,000 rpm (2.6X ~ 6.2X CAV), 2,600 rpm (1.7X ~ 4.2X CAV)
DVD-RW, DVD+RW	3,600 rpm (2.6X ~ 6.2X CAV), 2,400 rpm (1.7X ~ 4.2X CAV)
DVD-5 (with CSS)	2,400 rpm (1.7X ~ 4.2X CAV)
DVD-9 (with CSS)	2,600 rpm (1.7X ~ 4.2X CAV)
DVD-RAM	2,900 rpm (1.7X ~ 4.0X CAV)

Media Type	Support Writing Speed
CD-R:	10-16X /10-20X /10-24X P-CAV, 10X CLV
Multi Speed CD-RW	4X CLV
High Speed CD-RW:	4X,10X CLV
Ultra Speed CD-RW: Ultra Plus Speed CD-RW:	10-16X /10-20X /10-24X P-CAV, 10X CLV

3.10 Write Method for CD

Disc-At-Once (DAO), Session-At-Once (SAO), Track-At-Once (TAO) and Packet/Incremental Writing (Variable Packet and Fixed Packet)

3.11 Burst Data Transfer Rate

Ultra DMA Mode 5	100.0	MB/sec
Multi-word DMA Mode 2	16.7	MB/sec
PIO Mode 4	16.7	MB/sec

3.12 Sustained Data Transfer Rate

		Min.	Typical	Max.	Cpk
DVD-ROM outside[i]	(KB/sec)	11,002	11,227		1.33
DVD-ROM inside[ii]	(KB/sec)	4,578	4,671		1.33
CD-ROM outside[iii]	(KB/sec)	3,600	3705		1.33
CD-ROM inside[iv]	(KB/sec)	1,500	1,620		1.33

i Test disc: ABEX TDR-820 @ LBA 228000h
ii Test disc: ABEX TDR-820 @ LBA 0h
iii Test disc: ABEX TCDR-704 @ 74 min 02 sec 00 block

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3.13 Access Time

		Min.	Typical	Max.	Cpk
DVD-ROM Random Access[v]	(ms)		125	150	1.33
DVD-ROM Full Stroke[vi]	(ms)		165	250	1.33
DVD-RAM Random Access[vii]	(ms)		200	260	1.33
DVD-RAM Full Stroke[viii]	(ms)		450	600	1.33
CD-ROM Random Access[ix]	(ms)		105	150	1.33
CD-ROM Full Stroke[x]	(ms)		160	250	1.33

3.14 Spin up Time

		Min.	Typical	Max.	Cpk
Spin up	(sec)		2.0	4.0	1.33

Note: Focus search time and disc motor start up time.

3.15 CD-DA Playability (Digital)

		Typical
Eccentric	(μm)	210
Scratch	(mm)	2.6
Interruption	(mm)	1.0
Black Dot	(mm)	1.0
Fingerprint	(μm)	75
Vertical Deviation	(mm)	1.0

Note: No audio discontinuity in the above tests.

3.16 CD-ROM Readability

		Typical	
Eccentric	(μm)	210	
Scratch	(mm)	1.6	
Black Dot	(mm)	1.0	
Fingerprint	(μm)	75	
Vertical Deviation	(mm)	1.0	
		Normal rpm	Detection Level
Unbalance[xi]	(g-mm)	3[xii]	5[xiii]

Note: No read error in the above tests.

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iv Test disc: ABEX TCDR-704 @ 00 min 02 sec 00 block

v It is computed by averaging 200 or more measures of random access time over the whole area of the media from LBA 0h to LBA 1E7725h, including latency and error correction time. [Test Disc: ABEX TDR-820]

vi It is computed by averaging 200 or more measures of the access time from LBA 0h to LBA 1E7725h, including latency and error correction time. [Test Disc: ABEX TDR-820]

vii It is computed by averaging 200 or more measures of random access time over the whole area of the media from LBA 0h to LBA 1E7725h, including latency and error correction time. [Test Disc: ABEX TDV-RA520CW]

viii It is computed by averaging 200 or more measures of the access time from LBA 0h to LBA 1E7725h, including latency and error correction time. [Test Disc: ABEX TDV-RA520CW]

ix It is computed by averaging 200 or more measures of random access time over the whole area of the media from 0 min 02 sec 00 block to 60 min 01 sec 74 block, including latency and error correction time. [Test Disc: ABEX TCDR-704]

x It is computed by averaging 200 or more measures of the access time from 0 min 02 sec 00 block to 60 min 01 sec 74 block, including latency and error correction time. [Test Disc: ABEX TCDR-704]

xi The manner about Unbalance disc is possible to be varied from target system.

xii Should be capable to read at maximum rotational speed. [Test Disc: ABEX TCD-779]

xiii Detection level: To read as reduced rotational speed for disc unbalanced equal to or more than this spec. [Test Disc: ABEX TCD-778]

3.17 DVD-ROM Readability

		Typical	
Eccentric	(μm)	150	
Scratch	(mm)	3.0	
Black Dot	(mm)	1.0	
Fingerprint	(μm)	75	
Vertical Deviation	(mm)	1.0	
		Normal rpm	Detection Level
Unbalance	(g-mm)	3	5

Note: No read error in the above tests.

3.18 DVD-RAM Readability

		Typical
Eccentric	(μm)	100
Scratch	(mm)	2.6
Black Dot	(mm)	1.0
Fingerprint	(μm)	65
Vertical Deviation	(mm)	0.8

Note: No read error in the above tests.

3.19 DVD-Video Playability

		Typical
Eccentric	(μm)	150
Scratch	(mm)	3.0
Black Dot	(mm)	1.0
Fingerprint	(μm)	75
Vertical Deviation	(mm)	1.0

Note: 1.No video error in the above tests.
2. For DVD Video should be slow down the rotational speed to conserve power, no excess vibration and noise is occurred.

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4 ELECTRICAL CHARACTERISTICS

4.1 Power Supply

Voltage DC +5V ± 5%

Ripple 100 mVp-p Max, 1 KHz ~ 10 MHz

4.2 Current and Power Consumption

	Typical		Max.	
	+5V Current (mA)	Power Consumption (W)	+5V Current (mA)	Power Consumption (W)
Sleep (DIPM Feature enable) (AVG)	30	0.15	50	0.25
Sleep (AVG)	50	0.25	80	0.40
Standby (DIPM feature enable) (AVG)	50	0.25	80	0.40
Standby	80	0.40	100	0.50
CD-ROM Idle (AVG)	450	2.25	550	2.75
CD-ROM Sequential Read (AVG)	700	3.50	800	4.00
CD-ROM Access (100% duty random access) (AVG)	850	4.25	950	4.75
DVD-ROM Idle (AVG)	450	2.25	550	2.75
DVD-ROM Sequential Read (AVG)	700	3.50	800	4.00
DVD-ROM Access (100% duty random access) (AVG)	900	4.50	1000	5.00
Write[xiv] (AVG)	850	4.25	950	4.75
Startup (Peak)	--	--	1300	--
Eject (Peak)	--	--	900	--

Note: Not include spike current[xv] for above items.

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[xiv] Write current: Max write speed for US CD-RW

[xv] Spike current: Less than 1ms width current.

5 INTERFACE

5.1 SATA Interface

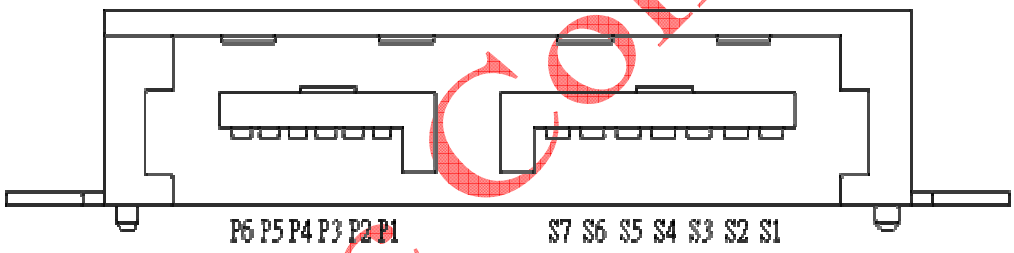
The drive shall conform to the interface signal levels and termination requirements of the Serial ATA 2.6 specification.

In addition, certain optional features of the Serial ATA specification 2.6 must be supported, as indicated in the table below.

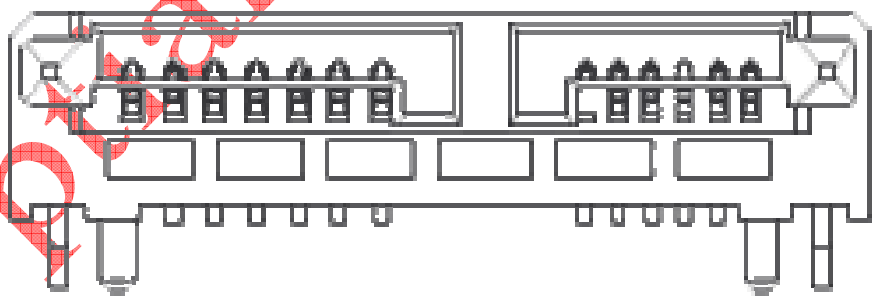
Specification	Feature	Support Requirement
Serial ATA 2.6	Asynchronous signal recovery	Required
Serial ATA 2.6	Asynchronous notification	Required
Serial ATA 2.6	Interface Power Management (device initiated)	Required
Serial ATA 2.6	Interface Power Management (host initiated)	Required
Serial ATA 2.6	Software Settings Preservation	Required
Serial ATA 2.6	Phy Event Counter	Required

5.2 Connector

Integrated 13 pin connector



5.3 Applicable Host Connector



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5.4 Slimline Device plug connector pin definition

	PIN	Type	Description	Cable Usage	Backplane Usage
Signal Segment	S1	Gnd		1rd mate	2rd mate
	S2	A+	Differential signal pair from host controller	2rd mate	3rd mate
	S3	A-		2rd mate	3rd mate
	S4	Gnd		1rd mate	2rd mate
	S5	B-	Differential signal pair to host controller	2rd mate	3rd mate
	S6	B+		2rd mate	3rd mate
	S7	Gnd		1rd mate	2rd mate
Signal Segment "L"					
Central Connector Gap					
Power Segment "L"					
Power Segment	P1	DP	Device Present	3rd mate	3rd mate
	P2	+5V		2rd mate	2rd mate
	P3	+5V		2rd mate	2rd mate
	P4	MD	Manufacturing Diagnostic	2rd mate	2rd mate
	P5	Gnd		1rd mate	1rd mate
	P6	Gnd		1rd mate	1rd mate
Power Segment Key					

NOTE:
1. All pins are in a single row with 1.00 mm (.039") pitch on the power segment portion.
2. Ground pins in the Serial ATA slimline device plug power segment (connector pins P5 and P6) shall be bussed together on the Serial ATA slimline device.
3. The connection between the Serial ATA slimline device signal ground and power ground is vendor specific.
4. The DP and MD signals shall be referenced to the power portion ground pins, P5 and P6.
5. The 5V power delivery pins in the Serial ATA slimline device plug power segment (connector pins
P2 and P3) shall be bussed together in the Serial ATA slimline device.

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5.5 ATAPI Command Set

Code	Command	Code	Command
00h	TEST UNIT READY	51h	READ DISC INFORMATION
03h	REQUEST SENSE	52h	READ TRACK INFORMATION
04h	FORMAT UNIT	53h	RESERVE TRACK
12h	INQUIRY	54h	SEND OPC INFORMATION
1Bh	START / STOP UNIT	55h	MODE SELECT (10)
1Eh	PREVENT / ALLOW MEDIUM REMOVAL	5Ah	MODE SENSE (10)
23h	READ FORMAT CAPACITIES	5Bh	CLOSE TRACK / SESSION
25h	READ CAPACITY	5Ch	READ BUFFER CAPACITY
28h	READ (10)	5Dh	SEND CUE SHEET
2Ah	WRITE (10)	A1h	BLANK
2Bh	SEEK	A3h	SEND KEY
2Eh	WRITE AND VERIFY (10)	A4h	REPORT KEY
2Fh	VERIFY (10)	A5h	PLAY AUDIO (12)
35h	SYNC CACHE	A7h	SET READ AHEAD
3Bh	WRITE BUFFER	A8h	READ (12)
3Ch	READ BUFFER	AAh	WRITE (12)
42h	READ SUB-CHANNEL	ACh	GET PERFORMANCE
43h	READ TOC	ADh	READ DVD STRUCTURE
45h	PLAY AUDIO (10)	B6h	SET STREAMING
46h	GET CONFIGURATION	B9h	READ CD MSF
47h	PLAY AUDIO MSF	BAh	SCAN
4Ah	GET EVENT STATUS NOTIFICATION	BBh	SET CD SPEED
4Bh	PAUSE / RESUME	BDh	MECHANISM STATUS
4Eh	STOP PLAY / SCAN	BEh	READ CD

5.6 ATA Command Set

Code	Command	Code	Command
00h	NOP	E2h	STANDBY
08h	ATAPI SOFT RESET	E3h	IDLE
20h	READ SECTOR	E5h	CHECK POWER MODE
90h	EXECUTE DRIVE DIAGNOSTICS	E6h	SLEEP
A0h	ATAPI PACKET	E7h	FLUSH CACHE
A1h	ATAPI IDENTIFY DEVICE	ECh	IDENTIFY DEVICE
E0h	STANDBY IMMEDIATE	EFh	SET FEATURES
E1h	IDLE IMMEDIATE		

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5.7 General Electrical Specifications

Table1 - General Specifications

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
Channel Speed	Gbps	Nom	1.5			3.0			7.2.2.1.1	-
Fbaud	GHz	Nom	1.5			3.0			-	-
FER, Frame Error Rate		Max	8.2e-8 at 95% confidence level			8.2e-8 at 95% confidence level			7.2.2.1.2	7.4.1
T_{UI}, Unit Interval	ps	Min	666.4333			333.2167			7.2.2.1.3	7.4.11
		Nom	666.6667			333.3333				
		Max	670.2333			335.1167				
f_{tol}, TX Frequency Long Term Stability	ppm	Min	-350			-350			7.2.2.1.4	7.4.6
		Max	+350			+350				
f_{SSC}, Spread-Spectrum Modulation Frequency	kHz	Min	30			30			7.2.2.1.5 7.3.3	7.4.11
		Max	33			33				
SSC_{tol}, Spread-Spectrum Modulation Deviation	ppm	Min	-5000			-5000			7.2.2.1.6 7.3.3	7.4.11
		Max	+0			+0				
$V_{cm,dc}$, DC Coupled Common Mode Voltage	mV	Min	200		-	-			7.2.2.1.7	7.4.4
		Nom	250		-	-				
		Max	450		-	-				
$V_{cm,ac\ coupled}$, AC Coupled Common Mode Voltage	mV	Min	0		-	-			7.2.2.1.8	7.4.25
		Max	2000		-	-				
Z_{diff}, Nominal Differential Impedance	Ohm	Nom	100		-	-			7.2.2.1.9	7.4.22
$C_{ac\ coupling}$ AC Coupling Capacitance	nF	Max	12			12			7.2.2.1.10	7.4.14
$t_{settle,cm}$, Common Mode Transient Settle	ns	Max	10			-				7.2.2.3.6
V_{trans}, Sequencing Transient Voltage	V	Min	-2.0			-2.0			7.2.2.1.11	7.4.13
		Max	2.0			2.0				

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Table2 - Transmitter Specifications

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
Z_{diffTX}, TX Pair Differential Impedance	Ohm	Min	85		85	-		85	7.2.2.2.1	7.4.22
		Max	115		115	-		115		
$Z_{s\text{-}eTX}$, TX Single-Ended Impedance	Ohm	Min	40						7.2.2.2.2	7.4.23
$RL_{DD11,TX}$, TX Differential Mode Return Loss (All Values Min)	dB	75 MHz-150MHz	14	14	-		-	-	7.2.2.2.3	7.4.1.1
		150 MHz-300 MHz	8	8	-	14	14	-		
		300 MHz-600 MHz	6	6	-	8	8	-		
		600 MHz-1.2 GHz	6	6	-	6	6	-		
		1.2 GHz-2.4 GHz	3	3		6	6	-		
		2.4 GHz-3.0 GHz	1	-		3	3			
		3.0 GHz-5.0 GHz	-	-	-	1		-		
$RL_{CC11,TX}$, TX Common Mode Return Loss (all Values Min)	dB	150 MHz-300 MHz				8	5	-	7.2.2.2.4	7.4.1.1
		300 MHz-600 MHz				5	5	-		
		600 MHz-1.2 GHz				2	2	-		
		1.2 GHz-2.4 GHz				1	1	-		
		2.4 GHz-3.0 GHz				1	1	-		
		3.0 GHz-5.0 GHz				1	-	-		
$RL_{DC11,TX}$, TX Impedance Balance (all values Min)		150 MHz-300 MHz				30	30		7.2.2.2.5	7.4.10
		300 MHz-600 MHz				20	20	-		
		600 MHz-1.2 GHz				10	10	-		
		1.2 GHz-2.4 GHz				10	10	-		
		2.4 GHz-3.0 GHz				4	4	-		
		3.0 GHz-5.0 GHz				4	-	-		

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Table 3 – Transmitted Signal Requirements

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
V_{diffTX}, TX Differential Output Voltage	mVppd	Min	400	400	400	400	400	400	7.2.2.3.1	7.4.4
		Nom	500		-	-				
		Max	600		1600	700		1600		
UI_{VminTX}, TX Minimum Voltage Measurement Interval	UI		-		0.5	0.45-0.55		0.5	7.2.2.3.2	7.4.4
$t_{20-80TX}$, TX Rise/Fall Time	Ps (UI)	Min 20-80%	100 (.15)		67 (.10)	67 (.20)			7.2.2.3.3	7.4.3
		Max 20-80%	273 (.41)		273 (.41)	136 (.41)				
t_{skewTX}, TX Differential Skew	ps	Max	20			20		15	7.2.2.3.4	7.4.12
$V_{cm,acTX}$, TX AC Common Mode Voltage	mVp-p	Max	-			50		-	7.2.2.3.5	7.4.17
$D_{VdiffOOB}$, OOB Differential Delta	mV	Max	-		25	25			7.2.2.3.7	7.4.19
D_{VcmOOB}, OOB Common Mode Delta	mV	Max	-		50	50			7.2.2.3.8	7.4.18
R/F_{bal}, TX Rise/Fall Imbalance	%	Max	-			20		-	7.2.2.3.9	7.4.16
Amp_{bal}, TX Amplitude Imbalance	%	Max	-		10	10			7.2.2.3.10	7.4.15
TJ at Connector, Data-Data, 5UI	UI	Max	0.355		-	-			7.2.2.3.11 7.3	-
DJ at Connector, Data-Data, 5UI	UI	Max	0.175		-	-				
TJ at Connector, Data-Data, 250UI	UI	Max	0.47		-	-				
DJ at Connector, Data-Data, 250UI	UI	Max	0.22		-	-				
TJ at Connector, Clk-Data, $f_{BAUD}/10$	UI	Max	-			0.30		-	7.2.2.3.12 7.3	7.4.7
DJ at Connector, Clk-Data, $f_{BAUD}/10$	UI	Max	-			0.17		-		
TJ at Connector, Clk-Data, $f_{BAUD}/500$	UI	Max	-			0.37		-		
DJ at Connector, Clk-Data, $f_{BAUD}/500$	UI	Max	-			0.19		-		

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TJ after CIC, Clk-Data, $f_{BAUD}/1667$	UI	Max	-	0.55	-	0.55		
DJ after CIC, Clk-Data, $f_{BAUD}/1667$	UI	Max	-	0.35	-	0.35		

Table 4 – Receiver Specifications

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
Z_{diffRX}, RX Pair Differential Impedance	Ohm	Min	85			-		85	7.2.2.4.1	7.4.22
		Max	115			-		115		
$Z_{s\text{-}eRX}$, RX Single-Ended Impedance	Ohm	Min	40		-	-			7.2.2.4.2	7.4.23
$RL_{DD11,RX}$, RX Differential Mode Return Loss (all values Min)	dB	75MHz-150MHz	18	18	-	-	-	-	7.2.2.4.3	7.4.1.1
		150 MHz-300 MHz	14	14	-	18	18	-		
		300 MHz-600 MHz	10	10	-	14	14	-		
		600 MHz-1.2 GHz	8	8	-	10	10	-		
		1.2 GHz-2.4 GHz	3	3	-	8	8	-		
		2.4 GHz-3.0 GHz	1	-	-	3	3	-		
		3.0 GHz-5.0 GHz	-	-	-	1	-	-		
$RL_{CC11,RX}$, RX Common Mode Return Loss (all values Min)	dB	150 MHz-300 MHz	-			5	5	-	7.2.2.4.4	7.4.1.1
		300 MHz-600 MHz	-			5	5	-		
		600 MHz-1.2 GHz	-			2	2	-		
		1.2 GHz-2.4 GHz	-			1	1	-		
		2.4 GHz-3.0 GHz	-			1	1	-		
		3.0 GHz-5.0 GHz	-			1	-	-		
$RL_{DC11,RX}$, RX Impedance Balance (all values Min)	dB	150 MHz-300 MHz	-			30	30	-	7.2.2.4.5	7.4.1.1
		300 MHz-600 MHz	-			30	30	-		
		600 MHz-1.2 GHz	-			20	20	-		
		1.2 GHz-2.4 GHz	-			10	10	-		
		2.4 GHz-3.0 GHz	-			4	4	-		
		3.0 GHz-5.0 GHz	-			4	-	-		

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Table 5 – Lab-Sourced Signal (for Receiver Tolerance Testing)

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
V_{diffRX}, RX Differential Input Voltage	mVppd	Min	325	240	275	275	240	275	7.2.2.6.1	7.4.5
		Nom	400		-					
		Max	600		1600	750	750	1600		
$t_{20\text{-}80RX}$, RX Rise/Fall Time	ps (UI)	Min	100 (.15)		67	67 (.20)			7.2.2.6.2	7.4.3
		Max 20-80%	273 (.41)			136 (.41)				
UI_{VminRX}, RX Minimum Voltage Measurement Interval	UI				0.5	0.5			7.2.2.6.3	7.4.5
t_{skewRX}, RX Differential Skew	ps	Max	-		80	50		75	7.2.2.6.4	7.4.12
$V_{cm,acRX}$, RX AC Common Mode Voltage	mVp-p	Max	100		150	100		150	7.2.2.6.5	7.4.9
$f_{cm,acRX}$, AC Common Mode Frequency	MHz	Min	2			2			7.2.2.6.6	7.4.9
		Max	200			200				
TJ at Connector, Data-Data, 5UI	UI	Max	0.43		-				7.2.2.6.7 7.3	-
DJ at Connector, Data-Data, 5UI	UI	Max	0.25		-					
TJ at Connector Data-Data, 250UI	UI	Max	0.6		-					
DJ at Connector Data-Data, 250UI	UI	Max	0.35		-	-				
TJ at Connector, Clk-Data, $f_{BAUD}/10$	UI	Max	-			0.46		-	7.2.2.6.8 7.3	7.4.7 7.4.9
DJ at Connector, Clk-Data, $f_{BAUD}/10$	UI	Max	-			0.35		-		
TJ at Connector, Clk-Data, $f_{BAUD}/500$	UI	Max	-			0.60		-		
DJ at Connector, Clk-Data, $f_{BAUD}/500$	UI	Max	-			0.42		-		
TJ at Connector, Clk-Data, $f_{BAUD}/1667$	UI	Max	-		0.65	-		0.65		
DJ at Connector, Clk-Data, $f_{BAUD}/1667$	UI	Max	-		0.35	-		0.35		

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Table 6 – OOB Specifications

Parameters	Units	Limit	Electrical Specification						Detail Cross-Ref Section (Serial ATA V.2.6)	Meas. Cross-Ref Section (Serial ATA V.2.6)
			Gen1i	Gen1m	Gen1x	Gen2i	Gen2m	Gen2x		
V_{thresh}, OOB Signal Detection Threshold	mVppd	Min	50		120	75		120	7.2.2.7.1	7.4.20
		Nom	100		-	125		-		
		Max	200		240	200		240		
UI_{OOB}, UI During OOB Signaling	ps	Min	646.67			646.67			7.2.2.7.2	-
		Nom	666.67			666.67				
		Max	686.67			686.67				
COMINIT/ COMRESET and COMWAKE Transmit Burst Length	UI_{OOB}		160			160			7.2.2.7.3	7.4.21
COMINIT/ COMRESET Transmit Gap Length	UI_{OOB}		480			480			7.2.2.7.4	7.4.21
COMWAKE Transmit Gap Length	UI_{OOB}		160			160			7.2.2.7.5	7.4.21
COMWAKE Gap Detection Windows	ns	May detect	35 ^ T < 175			35 ^ T < 175			7.2.2.7.6	7.4.21
		Shall detect	101.3 ^ T ^ 112			101.3 ^ T ^ 112				
		Shall not detect	T < 35 or T _175			T < 35 or T _175				
COMINIT/ COMRESET Gap Detection Windows	ns	May detect	175 ^ T < 525			175 ^ T < 525			7.2.2.7.7	7.4.21
		Shall detect	304 ^ T ^ 336			304 ^ T ^ 336				
		Shall not detect	T < 175 or T _ 525			T < 175 or T _ 525				

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6 RELIABILITY

6.1 Error Rate

DVD	$< 10^{-15}$ Block/Bits (Hard read error)
CD Mode-1 (ECC on)	$< 10^{-12}$ Block/Bits (Hard read error)
CD Mode-2 (ECC off)	$< 10^{-9}$ Block/Bits (Soft read error)

6.2 MTBF

> 60,000 POH (20% duty cycle, seek and read)

6.3 MTTR

< 30 minutes

6.4 Drawer Load / Eject

> 20,000 times

6.5 Connector Insertion

> 500 times

6.6 Actuator Mechanism

> 3×10^6 random accesses

6.7 Power On/Off Cycle

>2,000 cycles

6.8 Flash-ROM Rewrite Cycle

> 2,000 cycles

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7 ENVIRONMENTAL CONDITIONS

7.1 Temperature

PARAMETER	OPERATING	STORAGE	Shipping	UNIT
Temperature	5 ~ 50 (Reading) 5 ~ 45 (Writing)	-40 to 65	-40 to 65	°C

7.2 Temp. gradient

PARAMETER	OPERATING	STORAGE	Shipping	UNIT
Temperature	20 (Max)	20 (Max)	20 (Max)	°C/hr

7.3 Humidity[xvi]

PARAMETER	OPERATING	STORAGE	Shipping	UNIT
Relative Humidity (non-condensing)	10 to 90	5 to 95	5 to 95	%

7.4 Altitude

PARAMETER	OPERATING	Non-OPERATING	UNIT
Altitude	0 ~ 10,000	0 ~ 40,000	ft

7.5 Vibration and Shock[xvii]

TEST METHOD	Vibration
Operating	Read
	1. 0.45 G o-p (Sine wave, 5~300 Hz, 0.0002^2/hz; 300~500 Hz -6dB Oct/min, no hard error) 2. 1.00Grms (Random, PSD=0.002 g^2/Hz, 10~500 Hz, no hard error)
	Write
	0.25 G o-p (Sine wave, 5~500 Hz, 1 Oct/min, no write error)(Fixed Packet Writing)
Non-operating	1. 1.0 G o-p (Sine wave, 5~500 Hz, 1 Oct/min, no damage) 2. 3.5 Grms (Random, PSD=0.025 g2/Hz, 10~500 Hz, no damage)
TEST METHOD	**Shock**
Operating	Read
	1. 10 G (11ms, half sine wave, no unrecoverable error) 2. 40 G (2ms, half sine wave, no unrecoverable error)
	Write
	1.5 G (11ms, half sine wave, no write error)(Fixed Packet Writing)
Non-operating	1. 60 G (11ms, half sine wave, no damage) 2. 240 G (2ms, half sine wave, no damage)

7.6 Drop

PARAMETER	Weight	Height	UNIT
Drop (1 corner, 3 edges, 6 surfaces)	4.15Kg	106 cm	Packaged

[xvi] Should under the condition without condensation.

[xvii] Tray opening should not be considered as a failure for non-operating shock & drop test but on the contrary for operating shock.

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7.7 Transportation

PARAMETER	Transportation	UNIT
Non-operating Vibration	1.44m^2/s^3 (0.015 G^2/Hz) (max) 5 to 50 Hz	Packaged

7.8 ESD

PARAMETER	Level A	Level B	Level C	UNIT
Contact discharge	< 6	6	8	KV
Air discharge	<12	12	15	KV

Level A Normal operation, no degradation, no failures
Level B Some temporary performance degradation allowed, no data lost, self-recoverable, no hardware failures
Level C Temporary performance degradation, recovery by operator is acceptable, no hardware failures

7.9 Acoustic Noise

PARAMETER	Sound Pressure	Sound Power	UNIT
Acoustic Noise	< 50 dB (50cm distance)	< 47 dB	dB

(Condition: Sequential Read, Random Access, Full Stroke Access)
(Media: Normal disc[xviii], 3g-mm unbalance disc[xix], 5g-mm unbalance disc[xx])

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[xviii] ABEX TCDR-704
[xix] ABEX TCD-779
[xx] ABEX TCD-778

8 RESTRICTED MATERIALS CONTENT

No usage of prohibited chemical substances. The chemical substances which defined in SONY technical standards (SS-00259) never be used not only in components but also production process of both this products and components.

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9 AGENCY CERTIFICATES

.UL	UL60950-1:2003
.C-UL	CSA C22.2 No.60950-1-03
.TUV	EN60950-1:2001 and EN60825-1:1994+A1:2002+A2:2001
.DHHS	Federal regulations 21, CFR 1040.10 and 1040.11
.IC	ICES-003 classB
.CE	EN55022:2006
	EN55024:1998:A1:2001+A2:2003
.CB	IEC60950-1:2001 and IEC60825-1:1993+A1:1997+A2:2001
.C-Tick	AS/NZS CISPR22:2004 classB
.BSMI	CNS 13438 Class B
.MIC	Class B

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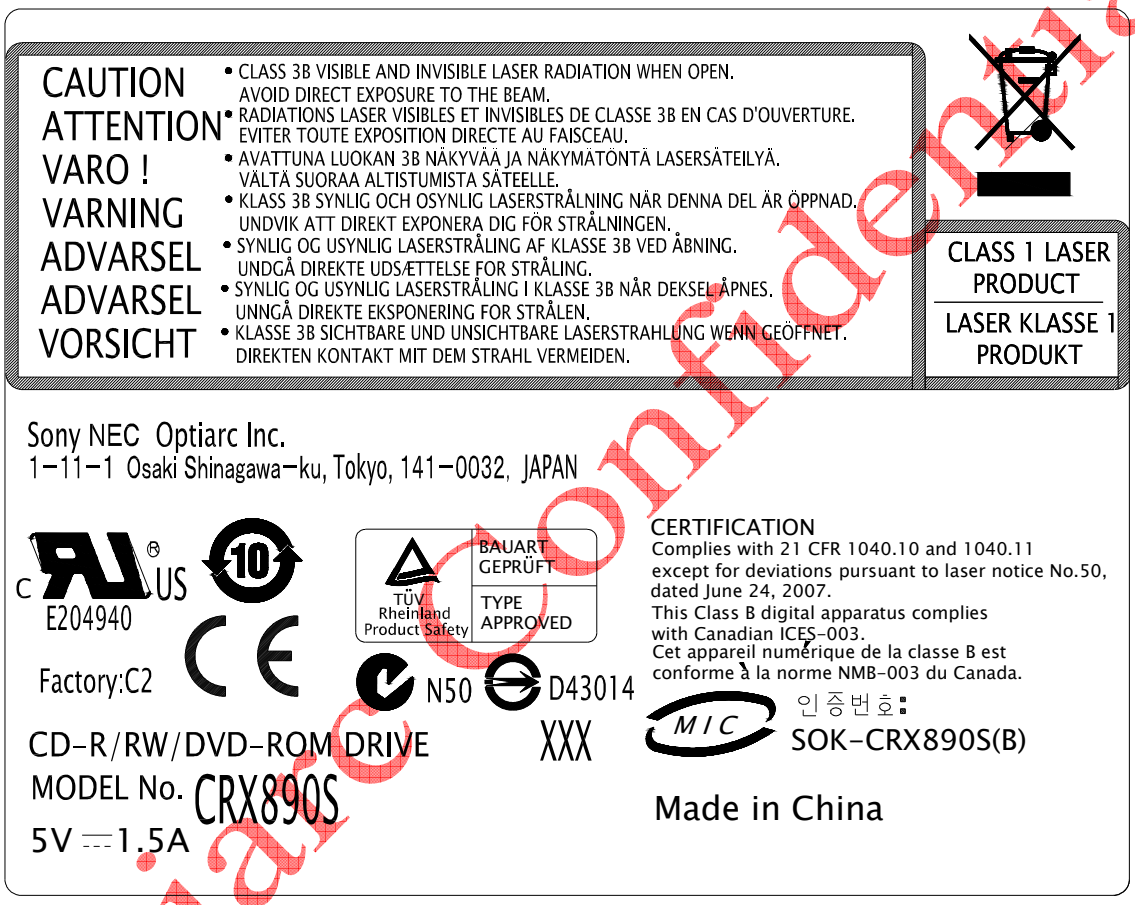
10 LABEL

10.1 Drive Labels

The “Safety label” and “Serial number label” are located on the top cover.

The “Safety label” contains the following information.

(1) Model number
(2) Certification marks (UL / cUL, TÜV, IC, CE, C-Tick, Korean EMC, Taiwan EMC)
(3) Certification of DHHS regulations
(4) CLASS 1 LASER PRODUCT label
(5) Danger Notice Information



The “Serial number label” contains the following information.

(1) Serial number/Model name/Version
(2) Part A barcode : Start bit(1)+Models code(8)+Space(1)+ Serial number(7)+Control code(4)+Stop bit(1)"
(3) Manufactured Date: Month/DD/YYYY
(4) Part B barcode : Start bit(1)+Serial number(7)+Stop bit(1)
(5) Firmware (4 digits + 1 digits) (XXXX-X)
(6) Hardware (3digits) (XXX)

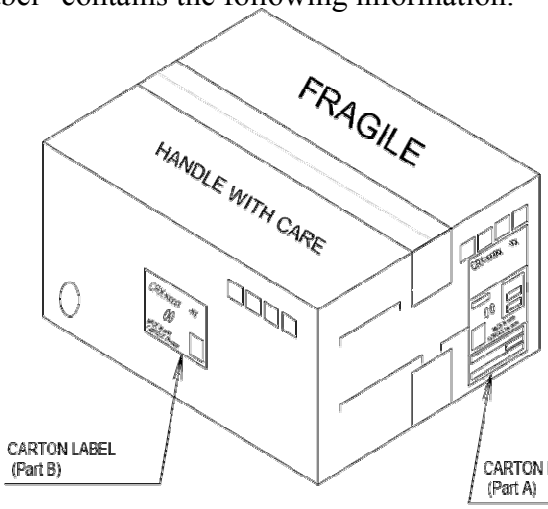


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10.2 Carton Labels

The Carton label is located on a side wall of the carton box.

The modified “Carton label” contains the following information.





Carton label B



Carton label A

Carton Label A

(1) Model name and Suffix
(2) Drive quantity
(3) Package Weight
(4) Model code (Barcode)
(5) Visual Character of Model code (Barcode)
(6) Serial number code (Barcode)
(7) Visual Character of Serial number code (Barcode)
(8) Indicate the 1st Serial number in Serial number label Part A
(9) Visual Character of (8) barcode
(10) Indicate the last Serial number in Serial number label Part A
(11) Visual Character of (10) barcode

Carton Label B

(1) Model name and Suffix
(2) Drive quantity
(3) Package Weight

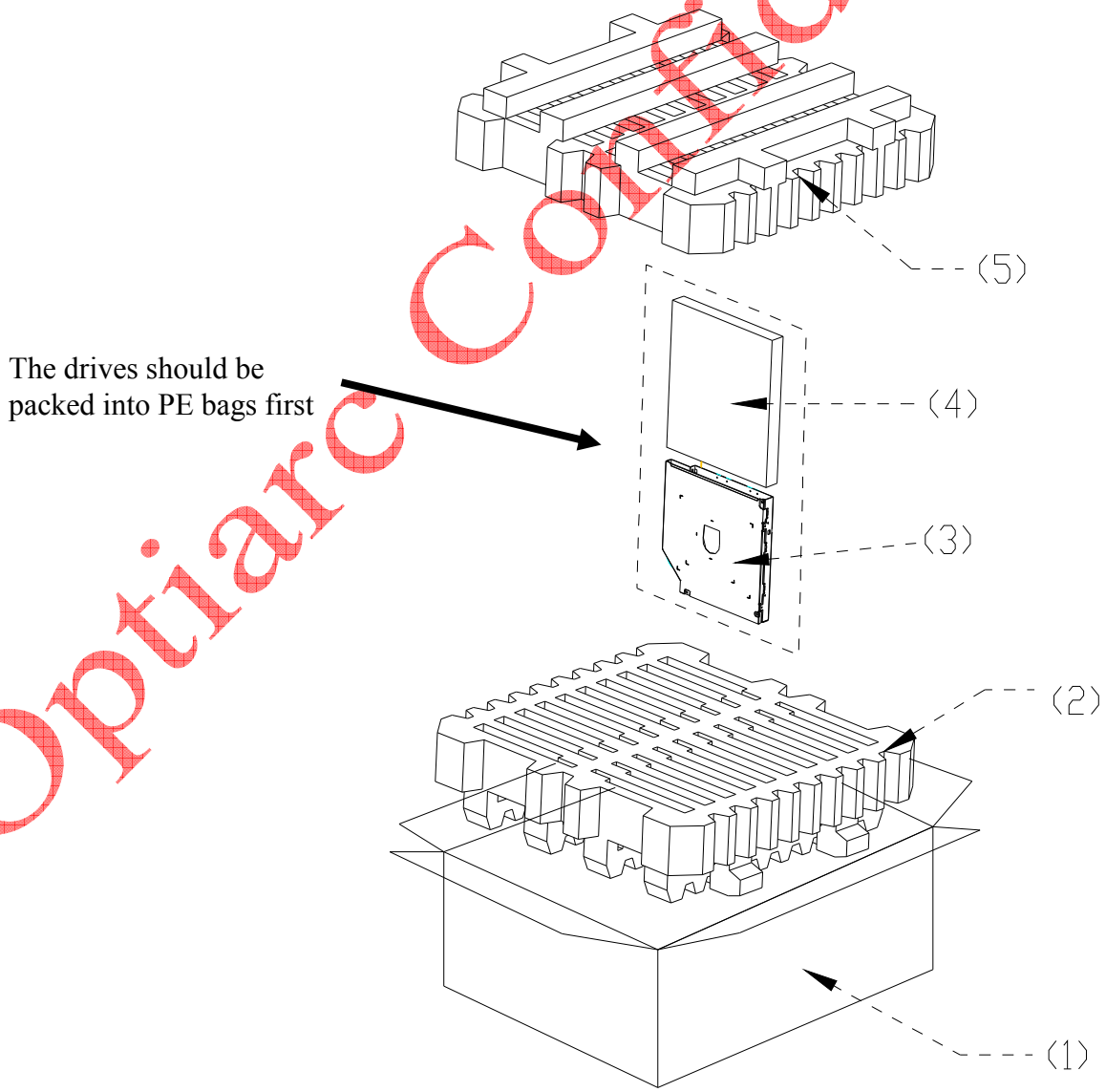
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11 SHIPPING CONDITIONS

11.1 Carton Box

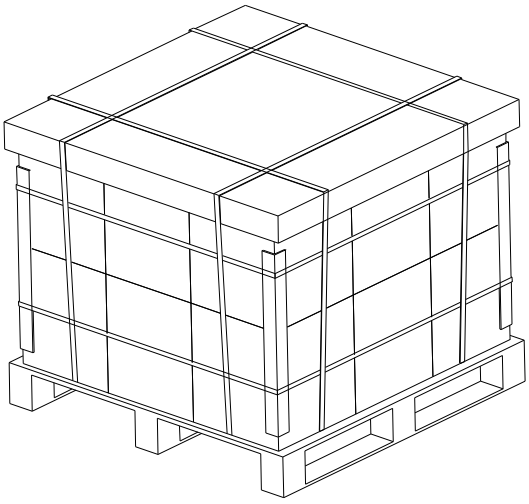
Outline of carton:
352 mm (L) x 342 mm (W) x 196 mm(H)
20 drives in one package
G.W. per package: 4.15 kg

(1) Carton
(2) Cushion bottom
1 set per carton
(3) Optical Drive
20 sets per carton
(4) PE bag
20 sets per carton
(5) Cushion top
1 set per carton

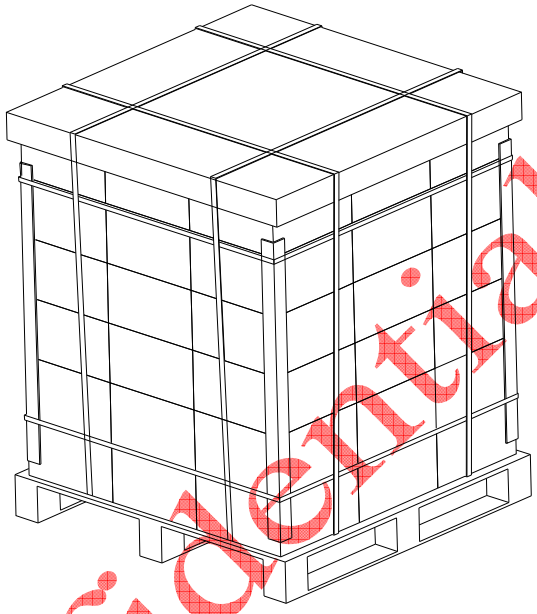


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11.2 Shipping Pallet



Outline of Sea PALLET
1.10 m (L) x 1.10 mm (W) x 0.95m (H)
720 drives in one PALLET
G.W. per PALLET: 177 kg



Outline of AIR PALLET
1.10 m (L) x 1.0 mm (W) x 1.35m (H)
1080 drives in one PALLET
G.W. per PALLET:251 kg

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12 REVISION HISTORY

Rev. No.	Reason for Release	Release Date
0.60	Draft	July 1. 2007
1.00	First release	July 15. 2007
1.01	1.Revise 10.1 Drive Labels from picture to drawing 2.Update the safety label drawing with new DHHS date from July, 26 2001 to June, 24 2007 3.Correct 11.2 Shipping Pallet drawing	October 8, 2007

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