NEC DVD/CD-Rewritable Drive
General Specification
Model : ND-1300A

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1.0 PRODUCT DEFINITION

1.1 GENERAL

This drive unit is compatible of play DVD-ROM, DVD-R, DVD-RW, DVD+R, DVD+RW, CD-Audio, CD-ROM(mode 1 and mode 2), CD-ROM XA(mode 2, form 1 and form 2), Photo CD(single and mu ltiple sessions), CD Extra, CD-RW, CD-TEXT discs. This drive unit can playback CD-I (FMV) and VIDEO CD with special hardware. This drive unit can also play DVD-Video with special function, such as MPEG decoder. This drive unit can operate in 5-12xCAV(Constant Angular Velocity) speed at DVD-ROM data and17-40xCAV speed at reading CD-ROM for data tracks with a sustained mode 1 data transfer rate of 6000 Kbytes/sec (outside track)., respectively. This drive supports these writing modes and methods as below.

4xCLV speed DVD-R writing and 2xCLV speed DVD-RW writing
: Disc at Once, Incremental, and Multi-Border. Restricted overwrite (DVD-RW only)

4xCLV speed DVD+R writing and 2.4xCLV speed DVD+RW writing
: Random, Sequential and Multi-Session.

16xCLV speed CD-R writing and 10xCLV speed CD-RW writing
: Disc at Once, Track at Once, Session at Once Variable size Packets and Fixed size Packets.

This drive has CD-DA audio circuitry, but it does not have ADPCM audio circuitry required to support audio modes other than CD-DA specified in CD-ROM XA. Also the audio circuitry inside this drive is not for DVD-Audio.This drive unit accepts a standard CD disc using a power tray for both loading and unloading, and can operate in both the horizontal and vertical orientation. This drive unit is used inside the host CPU. The drive communicates with the host computer through the IDE interface.

1.2 PRODUCT DESCRIPTION

The drive unit has an optical pickup head, servo electronics to maintain correct focus, tracking. feed position, radial tilt and spindle speed, analog electronics to recover conventional CD-DA audio stereo sound, digital electronics to recover the recorded data and provide error correction in Mode 1 and Mode 2 Form 1 to the maximum capabilities of the CD-ROM ECC, and a IDE/ATAPI interface to the host computer. This drive has hardware layered error correction (LECC) for the main channel data of the CD-ROM. This drive unit also provides error correction of the DVD-Video and DVD-ROM.This device supports 5-12xCAV speed for DVD-ROM data tracks transfer rate of 16.6MBytes/sec. (outside track) and 17-40xCAV speed for data tracks with a sustained mode 1 data transfer rate of 6000KBytes/sec. (outside track), respectively. The IDE controller has a 2Mbytes data buffer, and insures that in all cases a full block of data is transferred at the designated data transfer rate on the IDE bus as specified in section 2.3.7. As for the drive, it is equipped with the buffer under run protection feature in writing.

The drive unit shall be designed to be mounted inside of a host CPU enclosure. The drive has Busy LED. This drive unit has an audio line output. The drive supports the software volume control. The drive's front bezel has a manual eject button and emergency pin hole.
The outline mechanical dimensions of this drive unit is industry standard 5.25" half height form factor with four mounting screw threads on each side, and four on the bottom.
This drive has a motor powered tray to load and unload the disc. The tray is a design that serves only as a holder for the disc. The drive can only be mounted and operated in the horizontal orientation and the vertical orientation.

The mediums are DVD+R, DVD-R, DVD+RW, DVD-RW, DVD(Single and Dual Layer), CD, CD-ROM, CD-R and CD-RW disc. Alternatively, any standard CD-Audio disc is playable and compatible with this drive. The disc shall conform to optical and mechanical Standards as set forth in the DVD, RED, YELLOW and ORANGE(Part 2,3) BOOK.
When the drive is mounted in the vertical orientation, only 120 mm DVD+R, DVD+RW, DVD(Single and Dual Layer), DVD -R, DVD-RW, CD, CD-ROM, CD-R and CD-RW disc can be used.

2.0 PERFORMANCE AND FUNCTIONAL REQUIREMENTS

2.1 GENERAL

The performance and functionality of the DVD/CD rewritable drive system is determined in part by the world-wide standards. It is the intention of this document to adhere to these standards unless otherwise specifically noted. A summary of these standard specifications are presented here for reference purposes only. Refer to the applicable documents for additional detail.

2.2 SUMMARY OF STANDARD PERFORMANCE

2.2.1 DVD medium

USER DATA CAPACITY*	4.7GBytes,	Single layer 12cm
(1 GBytes = 1024 x 1024 x 1024)	8.54GBytes,	Dual layer 12cm
	1.46Gbytes,	Single layer 8cm
	2.66Gbytes,	Dual layer 8cm

USER DATA/BLOCK (Excluding sync, header, and ECC bytes) 2048Bytes

ADDRESS DESCRIPTION Block

RECORDING SURFACES 2

RECORDING LAYER Single or Dual

DISC DIAMETER 120 mm or 80 mm

DISC CENTER HOLE 15 mm diameter

THICKNESS 1.2 mm

TRACK PITCH 0.74 microns , typical

SCANNING VELOCITY 3.49 meters/sec , Single layer(Normal Speed)
3.84 meters/sec , Dual layer(Normal Speed)

ROTATION SPEED Varies over radius.
~1388 to 574 rpm (Normal Speed). Variable

2.2.2 CD medium

The following specification marked with an * is a calculated and practical maximum figure based on a 1.6um track pitch.

USER DATA CAPACITY*	656MBytes, Mode 1
(1 MBytes = 1024 x 1024)	748MBytes, Mode 2
RECORDING/PLAYING TIME	74 minutes and 42 seconds

NUMBER OF BLOCKS/DISC* 336,150

USER DATA/BLOCK (Excluding sync, header, subheader, and ECC bytes)
2048 Bytes, Mode 1 and Mode 2 Form 1
2336 Bytes, Mode 2
2328 Bytes, Mode 2 Form 2

ADDRESS DESCRIPTION Min.,Sec.,Block

BLOCK RATE 1275 ~ 3000 Blocks/Sec.,
(Seventeen-times (17x)~Fourty-times(40x) Speed: 17-40xCAV)

AUDIO

PLAYING TIME* 74 minutes and 42 seconds

DISC

RECORDING SURFACES	1
DISC DIAMETER	120 mm or 80 mm
DISC CENTER HOLE	15 mm diameter
THICKNESS	1.2 mm
TRACK PITCH	1.6 microns (15,875 TPI), typical
SCANNING VELOCITY	1.2 ~ 1.4 meters/sec (Normal Speed)
ROTATION SPEED	Varies over radius. ~535 to 198 rpm (Normal Speed). Variable
LATENCY (AVERAGE)	~55 to 150 msec (Normal Speed), Variable
BLOCKS/ROTATION	~9.1 to 21.1 blocks/rotation , Variable

2.3 PERFORMANCE

2.3.1 DVD MODES AND BLOCK LENGTH SUPPORTED

2.3.1.1 DVD READABLE FORMAT, MODES AND BLOCK LENGTH SUPPORTED

a) Format and Modes Supported
DVD-Video(8cm/12cm, Single and Dual Layer), DVD-ROM(8cm/12cm, Single and Dual Layer), Multi-Boader, Multi-Session

b) Block Length Supported
2048 bytes/sector

2.3.1.2 DVD WRITABLE FORMAT, MODES AND BLOCK LENGTH SUPPORTED

a) Format and Modes Supported
DVD-Video, DVD-ROM, Multi-Boader(DVD-R/-RW), Multi-Session(DVD+R/+RW)

b) Block Length Supported
2048 bytes/sector

2.3.2 DVD WRITE METHOD SUPPORTED

a) Uninterrupted Write
Disc at once

b) Interrupted Write
Incremental(DVD-R/-RW)
Multi-Border(DVD-R/-RW)
Random write(DVD+R/+RW)
Sequential write(DVD+R/+RW)
Restricted overwrite (DVD-RW)

2.3.3 DVD WRITABLE MEDIA

a) DVD-R Media (4x/2x, 4.7GB For General DISC)
Mitsubishi (Verbatim), Taiyo-Yuden, PVC, Fuji Film, Ritek

b) DVD-RW Media (2x/1x)
JVC, Pioneer, Mitsubishi (Verbatim), TDK

c) DVD+R Media (4x/2.4x)
RICOH, Mitsubishi (Verbatim), Taiyo-Yuden, Sony

d) DVD+RW Media (2.4x)
RICOH, Mitsubishi (Verbatim), TDK

e) DVD-RW/+RW Rewrite
1000 times

2.3.4 CD MODES AND BLOCK LENGTH SUPPORTED

2.3.4.1 CD READABLE FORMAT, MODES AND BLOCK LENGTH SUPPORTED

a) Format and Modes Supported

CD-Audio(8cm/12cm), CD-ROM(mode 1 and mode 2), CD-ROM XA(mode 2, form 1 and form 2), Photo CD(single or multiple sessions), CD-I(FMV), Video CD, CD Extra., CD-TEXT

b) Block Length Supported

CD-Audio	2352 and 2368 Bytes
CD-ROM (mode 1)	2048 and 2352 Bytes
CD-ROM XA/CD-I	form 1 2048, 2328, 2336, 2340 and 2352 Bytes
	form 2 2328, 2336, 2340 and 2352 Bytes

2.3.4.2 CD WRITABLE FORMAT, MODES AND BLOCK LENGTH SUPPORTED

a) Format and Modes Supported

CD-Audio(8cm/12cm), CD-ROM(mode 1 and mode 2), CD-ROM XA(mode 2, form 1 and form 2), Photo CD(single or multiple sessions), CD-I(FMV), Video CD, CD Extra., CD-TEXT

b) Block Length Supported

CD-Audio	2352 Bytes
CD-ROM (mode 1)	2048 Bytes
CD-ROM XA/CD-I	form 1 2048 and 2332 Bytes
	form 2 2332 Bytes

2.3.5 CD WRITE METHOD SUPPORTED

a) Uninterrupted Write

Disc at once

b) Interrupted Write

Track at once

Session at Once

Packet Writing (Fixed size Packets, Variable size Packets)

2.3.6 CD WRITABLE MEDIA

a) CD-R Media (16x/8x/4x)

Mitsubishi(Verbatim), Taiyo-Yuden, Mitsui, Ricoh, Fujifilm, Sony, Hitachi Maxell, Memorex, RITEK, CMC, P.V.C, JVC, SKC, ACER, Prime Disc, TDK

b) CD-RW Media (10x/4x)

Ricoh, Mitsubishi(Verbatim), ACER, OPTROM, Memorex, P.V.C, RITEK, CMC, LEADDATA, GigaStorage, Prodisc, Fornex, Sumsung, Philips

c) CD-RW Rewrite

1000 times

2.3.7 TRANSFER RATE

2.3.7.1 READ SPEED AND TRANSFER RATE

USER BYTES/SEC. (SUSTAINED)

(1 KBytes = 1024 Bytes)

a) DVD-ROM Read Speed and Transfer Rate

Single Layer	5-12x CAV	6.9-16.6 Mbytes/sec
Dual Layer	3-7x CAV	4.1-10 Mbytes/sec

b) DVD-R/-RW/+R/+RW Data tracks Read Speed and Transfer Rate

2-5x CAV	2.7-6.9 Mbytes/sec

c) DVD-Video with CSS protection Read Speed and Transfer Rate

2-5x CAV	2.7-6.9 Mbytes/sec

d) CD-ROM/CD-R Read Speed and Transfer Rate

Mode 1 and Mode 2 Form 1 (2048 Bytes)

17-40x CAV	2550 - 6000 kBytes/sec

e) CD-RW Read Speed and Transfer Rate

Mode 1 and Mode 2 Form 1 (2048 Bytes)

13-32x CAV	1950 - 4800 kBytes/sec

f) DAE Read Speed and Transfer Rate

13-32x CAV	1950 - 4800 kBytes/sec

g) Mode 2 and Mode 2 Form2 Read Speed and Transfer Rate

8x CLV	1200 kBytes/sec

2.3.7.2 WRITE SPEED AND TRANSFER RATE

a) DVD-R Write Speed

4x CLV	5.5 MBytes/sec
2x CLV	2.7 MBytes/sec

b) DVD-RW Write Speed

2x CLV	2.7 MBytes/sec
1x CLV	1.38 MBytes/sec

c) DVD+R Write Speed

4x CLV	5.5 MBytes/sec
2.4x CLV	3.3 MBytes/sec

d) DVD+RW Write Speed

2.4x CLV	3.3 MBytes/sec

e) CD-R Write Speed

16x CLV	2400KBytes/sec
8x CLV	1200KBytes/sec
4x CLV	600KBytes/sec

f) CD-RW Write Speed

10xCLV	1500KBytes/sec
4xCLV	600KBytes/sec

2.3.8 IDE INTERFACE

a) Burst Rate

PIO		mode 4 support
DMA	single word	mode 2 support
	multi word	mode 2 support
	ultra DMA33	mode 2 support

2.3.9 ACCESS TIME

2.3.9.1 DVD medium

FULL STROKE

5-12x CAV	230 msec (typical)

1/3 STROKE

5-12x CAV	140 msec (typical)

RANDOM STROKE

5-12x CAV	140 msec (typical)

2.3.9.2 CD medium

FULL STROKE

17-40x CAV	200 msec (typical)

1/3 STROKE

17-40x CAV	120 msec (typical)

RANDOM STROKE

17-40x CAV	120 msec (typical)

2.3.10 USER ERROR RATES

Hard Error Rate : DVD and CD Mode 1 (with up to 5 retries and layered ECC on)
$< 10^{-12}$ Block/bit

Soft Error Rate : CD Mode 2 (with up to 5 retries) $< 10^{-9}$ Block/bit

Seek Error Rate $< 10^{-6}$ Block/bit

2.3.11 MPC3 COMPLIANCE

This drive complies with the Microsoft specification for MPC3..

2.3.12 Maximum Playback Speed with various Disc

The maximum playback speed with various disc is limited as follows.

DVD-ROM (Dual Layer):	3-7.3X
DVD-Video with CSS protection:	2-5X
DVD-R/-RW/+R/+RW (Data tracks)	2-5X
CD-DA(DAE):	13X-32X
CDROM (mode2 form2):	8X CLV
CD-RW (mode1, mode2 form1):	13X-32X

In addition, the drive will limit the maximum playback speed automatically by the quality of the disc. The drive may playback with lower speed than the speed mentioned above.

3.0 QUALITY AND RELIABILITY

3.1 TRAY LOADER MECHANISM LIFE

The drive is capable of at least 30,000 tray loading/unloading operations

3.2 MTBF

The MTBF is 70,000 power on hours(POH) when operated at 25°C temperature, nominal voltage, and other environmental limits, based on the following assumptions:
- the operating duty cycle is 10% of power on time. During this time, the drive is either reading or seeking (random multiple block read).

- the drive is in dormant mode (i.e. the laser diode is off and spindle motor not spinning, the drive is power on) for 90% of power on time.

3.3 OPTICAL PICKUP ACTUATOR MECHANISM

The drive is capable at least 2,000,000 full stroke seeks.

3.4 MTTR (MEAN TIME TO REPAIR)

30 minutes

4.0 REGULATIONS AND STANDARDS

4.1 SAFETY APPROVAL

UL(UL1950), C-UL(CSA C22.2 No.950), TÜV(EN60950, EN60825-1), CB(IEC 60950,IEC60825-1)
NEMKO(EN60950,EN60825-1)

4.2 EMC AND COMPLIANCE

CE Marking(EN55022 Class B, EN55024), FCC(ClassB), C-tick(AS/NZS3548 ClassB), BSMI, MIC

4.3 FDA COMPLIANCE

The product satisfies all the requirements specified in the Code of Federal Regulation 21CFR part 1040.10 and 1040.11.

5.0 MECHANICAL

5.1 DIMENSIONS AND MOUNTING ORIENTATION

5.1.1 DIMENSIONS

148.2(W) x 198(L) x 42(H)

5.1.2 WEIGHT

1.06Kg

5.2 IDE CONNECTOR

The drive has a standard 40-pin(2x20) unsealed male connector for IDE signal

6.0 ELECTRICAL

6.1 POWER

6.1.1 VOLTAGE

This drive requires two power supplies : +5V (DC) / +12V (DC).

6.1.1.1 VOLTAGE TOLERANCE

+5V (DC)	+/– 5%
+12V (DC)	+/– 10%

6.2 IDE SIGNAL INTERFACE

6.2.1 GENERAL

This drive unit uses IDE interface, which conforms to the Mt. Fuji Commands for CD and DVD Devices: SFF8090v4 rev. 1.00 to communicate with the host computer. IDE interface(ISO X3T9.2 791D) addresses the electrical interface. The ATAPI CD-ROM specification : SFF-8020 Rev.2.6 addresses command protocol.

6.2.2 ELECTRICAL

The IDE bus uses single ended drivers and receivers.

6.2.2.1 CONNECTORS

A standard 40-pin flat ribbon cable.

6.3 AUDIO SIGNAL INTERFACE

6.3.1 ELECTRICAL

6.3.1.1 CONNECTORS

A 4-pin male connector is used for the audio line output.

6.3.1.2 OUTPUT SIGNAL CHARACTERISTICS

The following characteristic are measured at the audio line output.

AUDIO LINE OUTPUT	0.75 V (rms) ±3.0 dB / 10 kΩ load at 1 kHz : 0 dB
DISTORTION	<0.10% (measured under laboratory condition)
S/N RATIO	>75 dB (measured under laboratory condition)
FREQUENCY RESPONSE 20 Hz – 20 kHz	+3.0 dB, -3.0 dB
HEADPHONE OUTPUT	0.7 V (rms) ±3.0 dB / 100 Ω load at 1 kHz: 0 dB

6.4 DATA BUFFER

The drive electronics includes 2 MBytes read ahead data buffer in the IDE CD-ROM controller.