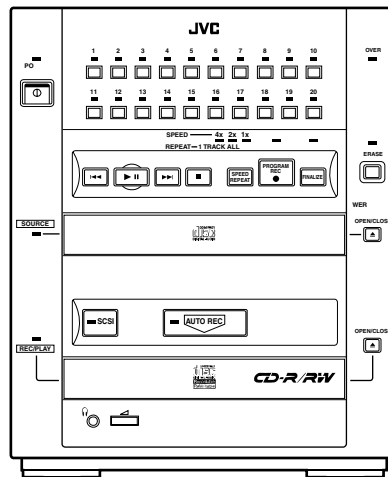


# JVC

# SERVICE MANUAL

## MULTIPLE COMPACT DISC RECORDER

# XR-D400SL



### Area Suffix

E ..... Germany

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## Safety precautions

1. This design of this product contains special hardware and many circuits and components specially for safety purposes. For continued protection, no changes should be made to the original design unless authorized in writing by the manufacturer. Replacement parts must be identical to those used in the original circuits. Services should be performed by qualified personnel only.
2. Alterations of the design or circuitry of the product should not be made. Any design alterations of the product should not be made. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacture of responsibility for personal injury or property damage resulting therefrom.
3. Many electrical and mechanical parts in the products have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in the Parts List of Service Manual. Electrical components having such features are identified by shading on the schematics and by ( $\triangle$ ) on the Parts List in the Service Manual. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement parts shown in the Parts List of Service Manual may create shock, fire, or other hazards.
4. The leads in the products are routed and dressed with ties, clamps, tubings, barriers and the like to be separated from live parts, high temperature parts, moving parts and/or sharp edges for the prevention of electric shock and fire hazard. When service is required, the original lead routing and dress should be observed, and it should be confirmed that they have been returned to normal, after re-assembling.
5. Leakage current check (Electrical shock hazard testing)  
After re-assembling the product, always perform an isolation check on the exposed metal parts of the product (antenna terminals, knobs, metal cabinet, screw heads, headphone jack, control shafts, etc.) to be sure the product is safe to operate without danger of electrical shock. Do not use a line isolation transformer during this check.

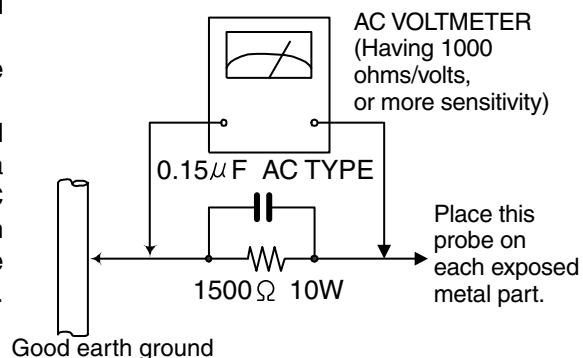
- Plug the AC line cord directly into the AC outlet. Using a "Leakage Current Tester", measure the leakage current from each exposed metal parts of the cabinet, particularly any exposed metal part having a return path to the chassis, to a known good earth ground. Any leakage current must not exceed 0.5mA AC (r.m.s.)

- Alternate check method

Plug the AC line cord directly into the AC outlet. Use an AC voltmeter having, 1,000 ohms per volt or more sensitivity in the following manner. Connect a  $1,500\Omega$  10W resistor paralleled by a  $0.15\mu\text{F}$  AC-type capacitor between an exposed metal part and a known good earth ground.

Measure the AC voltage across the resistor with the AC voltmeter.

Move the resistor connection to each exposed metal part, particularly any exposed metal part having a return path to the chassis, and measure the AC voltage across the resistor. Now reverse the plug in the AC outlet and repeat each measurement voltage measured any must not exceed 0.75 V AC (r.m.s.). This corresponds to 0.5 mA AC (r.m.s.).



**CAUTION** Burrs formed during molding may be left over on some parts of the chassis. Therefore, pay attention to such burrs in the case of preforming repair of this system.

## Technical description

### ■ XR-D400SL

As its name implies, the XR-D400SL Multiple Compact Disc Recorder provides multiple functions, these include a CD-R/RW recorder for digital audio and a CD-R/RW drive for a PC.

As the XR-D400SL can be used as a CD-R/RW recorder for digital audio in the dubbing/ recording modes, it is classified as specific equipment under the private recording royalties system. As a result, discs recorded with this recorder are distinguished from those recorded with a PC drive.

In the SCSI mode, the XR-D400SL can be used as a CD-R/RW drive for a PC by connecting it through the SCSI interface. However, it is not possible to use the source disc tray as the dubbing source.

### ■ Configuration of the XR-D400SL

The dubbing source disc tray of the XR-D400SL incorporates a CD-ROM drive and a REC/PLAY disc tray, which is the dubbing destination and incorporates the CD-R/RW drive (XR-RWD400S) for a PC.

The XR-RWD400S can also be used as a CD-R/RW recorder for digital audio according to the setting of the control microcomputer.

The XR-RWD400S incorporates a flash memory to facilitate firmware read and write. The firmware is the program used in controlling the drive.

The use of a flash memory makes it possible to rewrite programs easily.

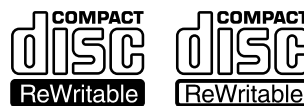
### ■ CD-R/RW recorder for digital audio

The recording media royalties are limited to special discs (with a logo mark as shown in Fig. 1) containing the recording of ID information, which are not recorded in the recording media for PCs.



CD-R/RW recorder for digital audio

[Fig. 1]



CD-R/RW drive for PC

[Fig. 2]

	Recording	Playback
CD-R/RW recorder for digital audio	Possible with discs having a logo as in Fig. 1 only	Possible with discs having a logo as in Figs. 1 and 2
CD-R/RW drive for PC	Possible with discs having a logo as in Figs. 1 and 2	Possible with having a logo as in Figs. 1 and 2

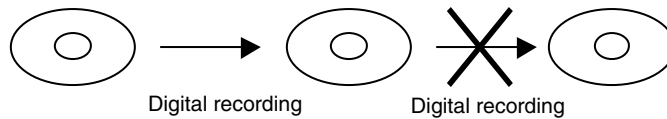
[Table 1] Comparison of Recording and Playback

### ■ SCMS and RID functions

The XR-D400 incorporates the SCMS (Serial Copy Management System) and the RID (Recorder Unique Identifier) functions.

SCMS is used to limit digital copies to one generation only. The principles are shown in Fig. 3.

With RID, the RID codes are written into discs which are as specified in the Orange Book Parts II and III. The codes contain the manufacturer's name, product name and machine number to enable the tracing of illegal copies.



[Fig. 3] Principles of SCMS

### ■ Recording on CD-R discs

Fig. 4 shows the structure of a CD-R disc.

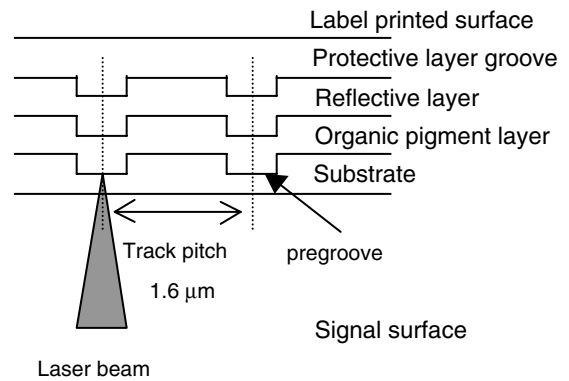
In recording, a laser beam having the same wavelength as the CD beam (780 nm) but of tens times higher power is irradiated from the substrate surface to the groove.

This irradiation causes thermal deformation of the organic pigment layer forming pits in it.

The organic pigments include cyanine, phtalocyanine and azoic dyes and the reflective layer uses gold or silver materials.

In playback the laser beam reads the pits recorded in the pregroove.

The thermal deformation of the organic pigment layer cannot be recovered to the original condition. As a result, the CD-R discs cannot be rewritten and only additional writing is possible with them.



[Fig. 4]

### ■ Recording on a CD-RW disc

Fig. 5 shows the structure of a CD-RW disc.

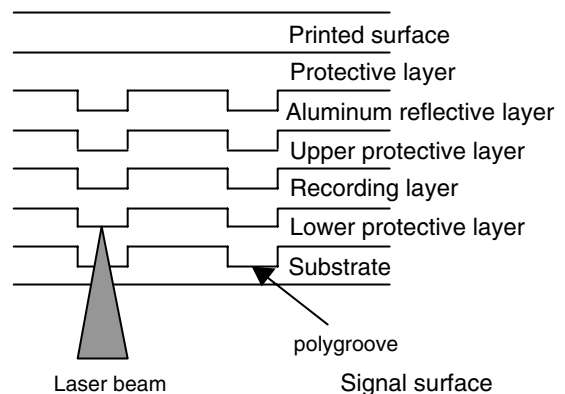
The CD-RW uses a phase-changing recording material in the recording layer.

With the CD-RW, a laser beam with regulated power and cooling time is irradiated to form a crystalline phase (erased status) and amorphous phase (recorded state) on the polygroove and data is reproduced according to the difference in reflectivity of the two phases.

An amorphous state can be obtained by quick cooling after irradiation by a strong laser beam.

The phase-changing recording material is made of a compound of silver, indium, antimony and tellurium, and rewriting is possible up to about 1000 times.

As the reflectivity at 780 nm of the CD-RW is lower than the CD-R, the RF amp gain should be changed in order to play a CD-RW disc.



[Fig. 5]

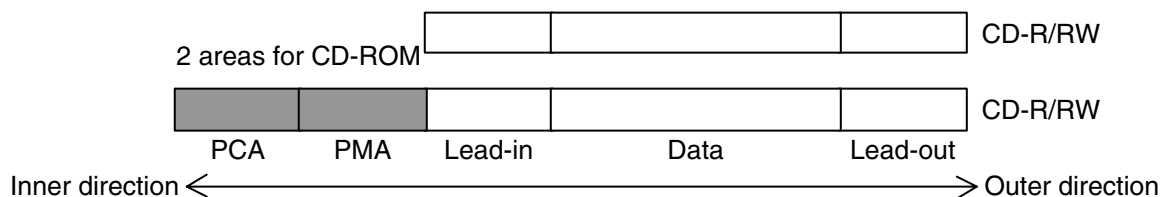
### ■ Comparison between the CD-R and the CD-RW

	CD-R Compact Disc Recordable	CD-RW Compact Disc Rewritable
Specifications	Orange Book Part II	Orange Book Part III
Laser reflectivity	65% or more	15% to 25%
Recording power	4 to 11 mW	8 to 14 mW
Playback on CD player	Possible	Impossible

[Table 2]

## ■ Recording method of the CD-R/RW

As shown in Fig. 6, the recording areas of a CD-ROM and a CD-R/RW are different. These discs use two recording areas in addition to the areas used for data recording by ordinary CD discs.



[Fig. 6]

### ● Lead-in area

This area records the TOC (Table Of Contents) including the number of tracks in the disc, track-start position information, etc.

### ● Data

This area contains the recording of actual audio signals, file data, etc.

The unit used in the data area is the track. Usually, music CDs use a track per song selection while the CD-ROM discs basically uses only one track.

### ● Lead-out

This area is used to indicate that the data in the disc has reached the end.

The combination of the lead-in, data and lead-out areas is referred to as a single session.

A disc containing multiple sessions is called a multi-session disc. The CD-EXTRA belongs to this kind of disc.

### ● PCA (Power Calibration Area)

This area is used to regulate the laser power in data writing.

Its data optimizes laser power according to external factors such as the medium type, supply voltage and operating temperature. The PCA provides an area for use in 99 times of test writing.

### ● PMA (Program Memory Area)

This area contains the recording of the start and end positions of the tracks. When a disc is not finalized in program recording, this area is used to obtain the preliminary TOC data.

## ■ Finalization

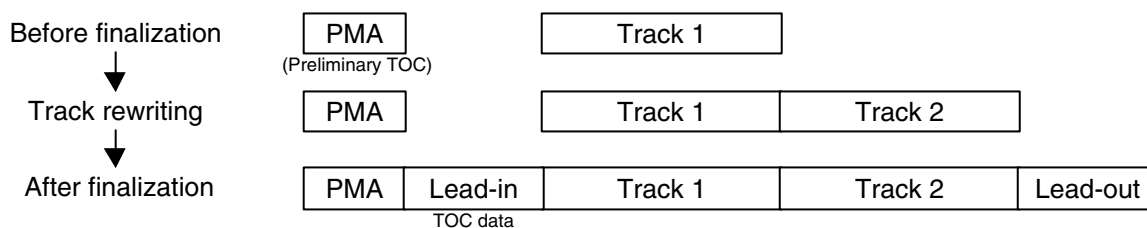
Finalization refers to writing the preliminary TOC data in the PMA into the lead-in and lead-out areas.

When a disc is not finalized, its TOC data is recorded exclusively in the PMA.

Since ordinary CD players cannot read the PCA and PMA, non-finalized discs can be read only with a REC/PLAY machine such as the XR-D400. This makes possible addition writing on the disc.

When a disc is finalized, its lead-in, data and lead-out areas are written properly and the disc becomes a disc complying with the Orange Book specifications.

Fig. 7 shows the finalization procedure.



[Fig. 7]

## Disassembly method

### ■ Removing the top cover (Figs. 1 & 2)

1. Remove the 4 screws A from both sides of the top cover.
2. Remove the 4 screws B from the rear of the top cover, then remove the stop cover.



Fig. 1

### ■ Removing the front panel (Figs. 3 to 5)

1. Remove the top cover.
2. Remove the 3 screws C that retain the front panel from the bottom. (Fig. 3)
3. Unplug the connector A from the power supply board (Fig. 4) and the flat wire from the control board (Fig. 5).
4. Disengage the 2 claws D from the front panel and remove the front panel. (Figs. 4 and 5)

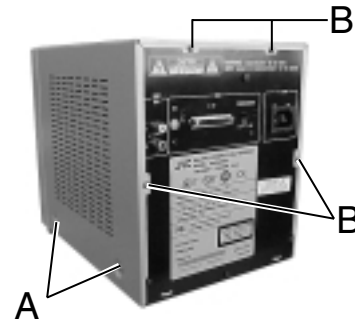


Fig. 2

### ■ Removing the rear panel (Figs. 4 & 6)

1. Remove the stop cover.
2. Unplug connector B from the power supply board (Fig. 4).
3. Remove the 6 screws E from the rear panel (Fig. 6).
4. Remove the 2 screws F retaining the SCSI connector, then remove the rear panel.

(CAUTION) Screw F retaining the SCSI connector functions to protect the connector. Be sure to remove it as a last task in disassembly or a first one in assembly.

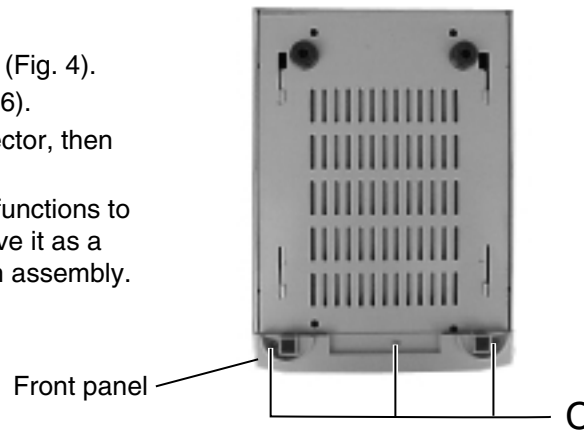


Fig. 3

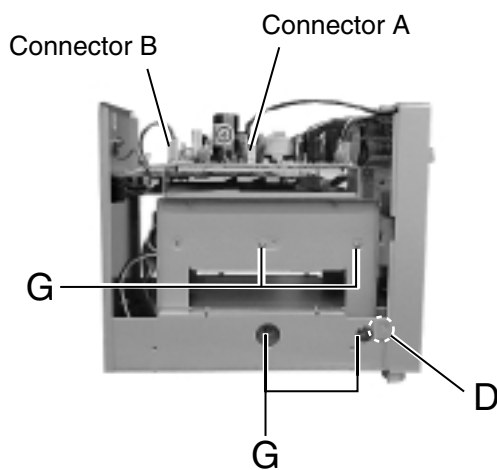


Fig. 4

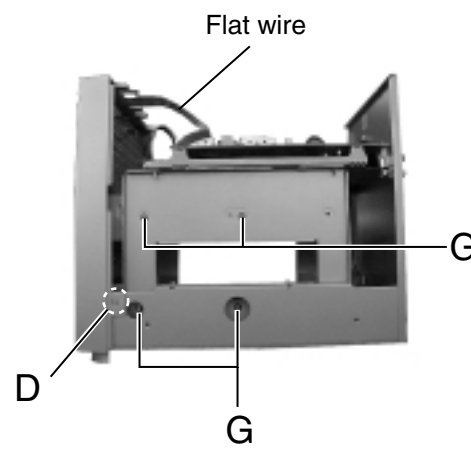


Fig. 5

**■ Removing the CD-ROM and CD-R/RW drives (Figs. 4, 5 and 7)**

1. Remove the top cover.
2. Remove the rear panel.
3. Unplug the connectors from the drives (CD-ROM drive: power supply connector and control cable connector. CD-R/RW drive: power supply connector, control cable connector and audio signal connector). (Fig. 7)
4. Remove a total of 8 screws retaining the drives, from the side panels. (Figs. 4 and 5)
5. Take out each drive in the rear direction.

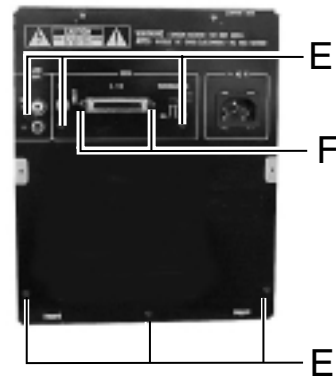


Fig. 6

**■ Removing the CD-R/RW drive board (Figs. 8 to 12)**

1. Remove the top cover.
2. Remove the rear panel.
3. Remove the CD-R/RW drive.
4. Remove the 6 screws H retaining the cover, then remove the cover. (Figs. 8 and 9)
5. Stand up the board and unplug the 2 flat cables and 1 connector. (Fig. 10)
6. Remove the 4 screws I retaining the circuit board. (Fig. 11)
7. Unplug 1 flat cable and remove the circuit board. (Fig. 12)

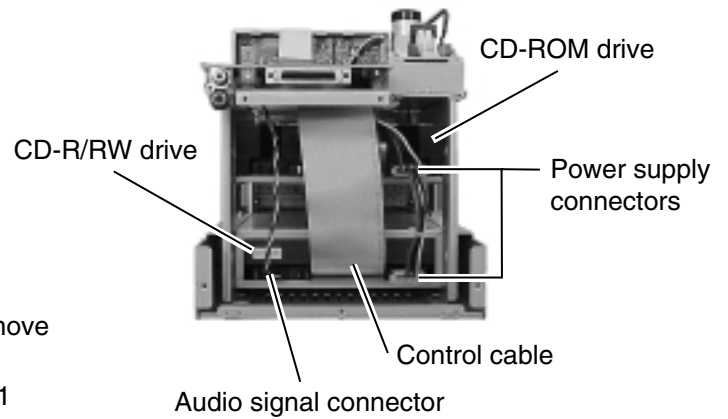


Fig. 7



Fig.8

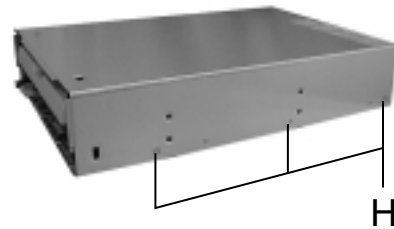


Fig. 9

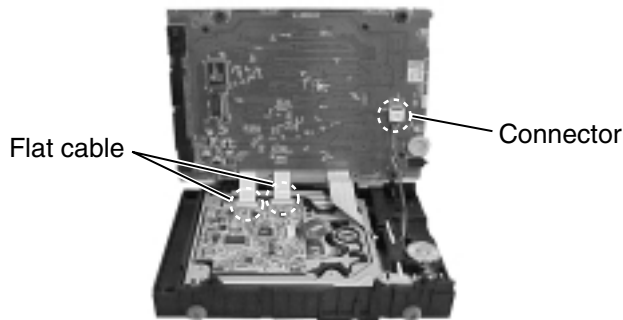


Fig. 10

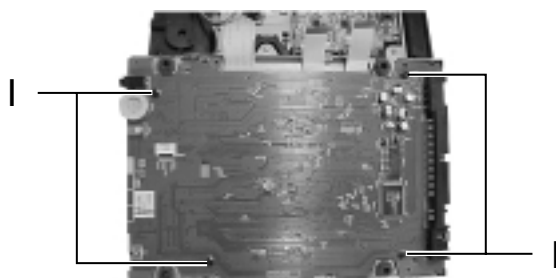


Fig. 11

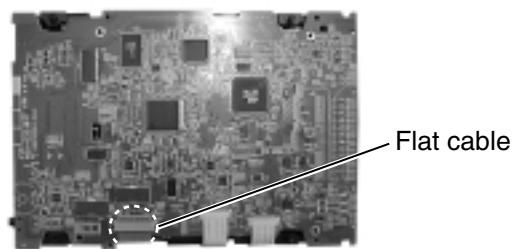


Fig. 12

### ■ Removing the front board (Fig. 13)

1. Remove the top cover.
2. Remove the front panel.
3. Remove the 13 screws J retaining the board.

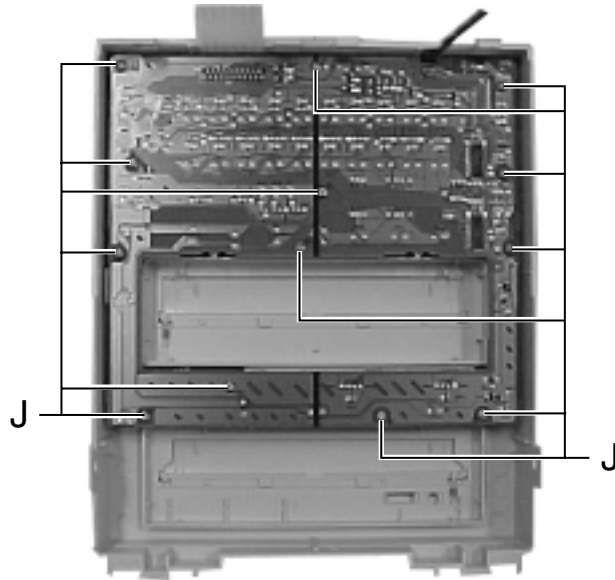


Fig. 13

### ■ Removing the disc (Fig. 14)

1. Remove the top cover.
2. Remove the front panel.
3. When removing a disc from the CD-ROM drive (upper drive), insert a thin wire or similar object into the tray eject hole at the right end of the drive. When the drive comes out, pull it out toward the front.
4. When removing a disc from the CD-R/RW drive (lower drive), insert a thin wire or similar object into the tray eject hole at the left end of the drive. When the drive comes out, pull it out toward the front.

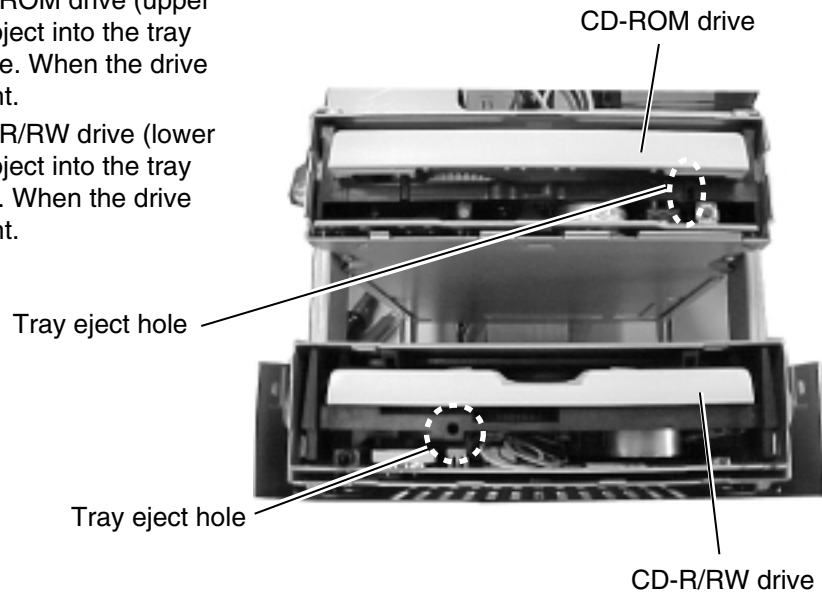
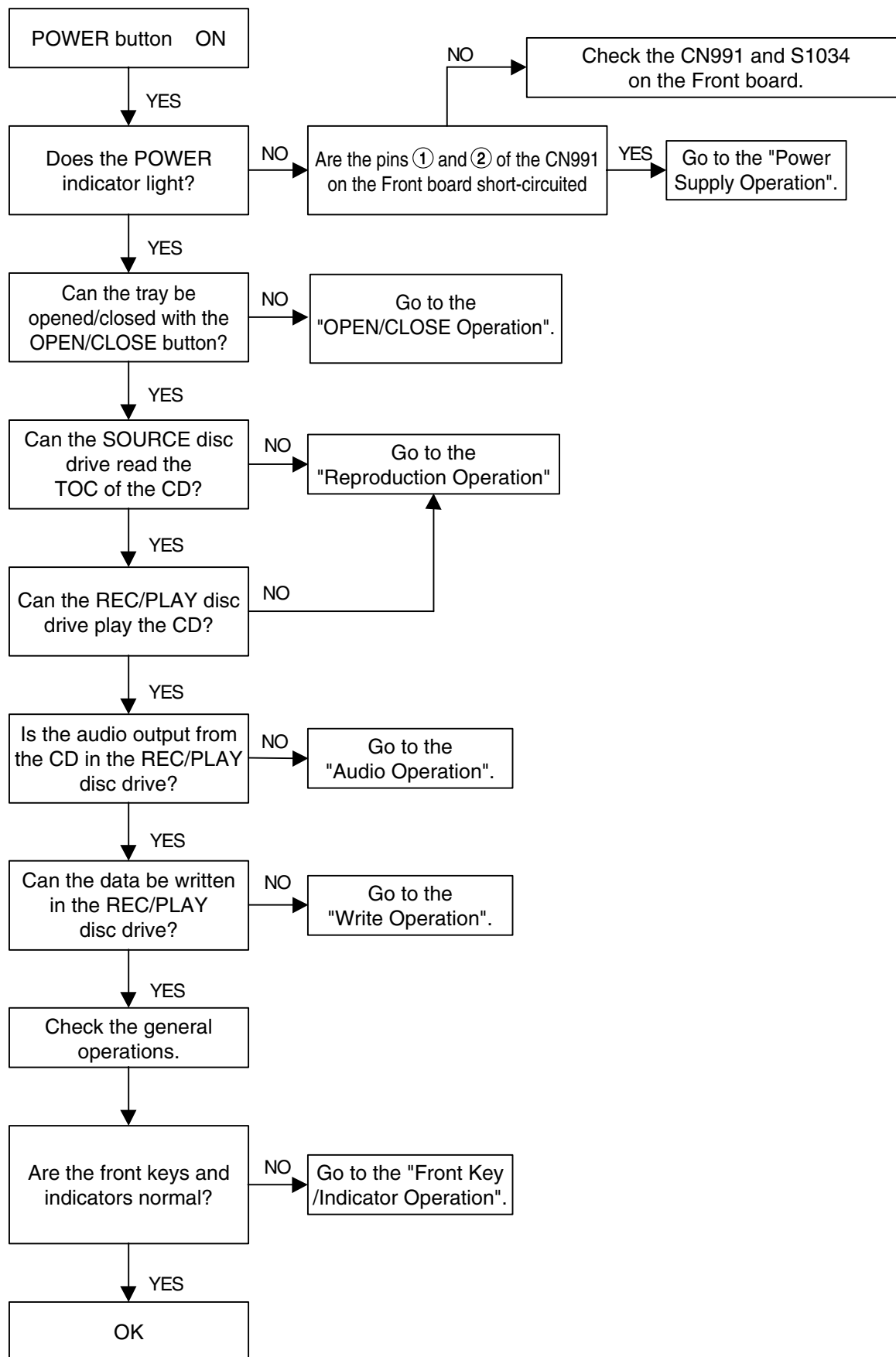


Fig. 14



## Troubleshooting (For repairing the audio CD dubbing)



## ■ Power supply operation

First remove the 4 wires connected to the Power Supply unit (QAL0244-002) (see photo below) to do a check of the stand-alone mode.

- (1) Press the POWER button to ON, and check the voltages at the leftmost wire (red, DC +5 V) and the rightmost wire (yellow, DC +12 V).

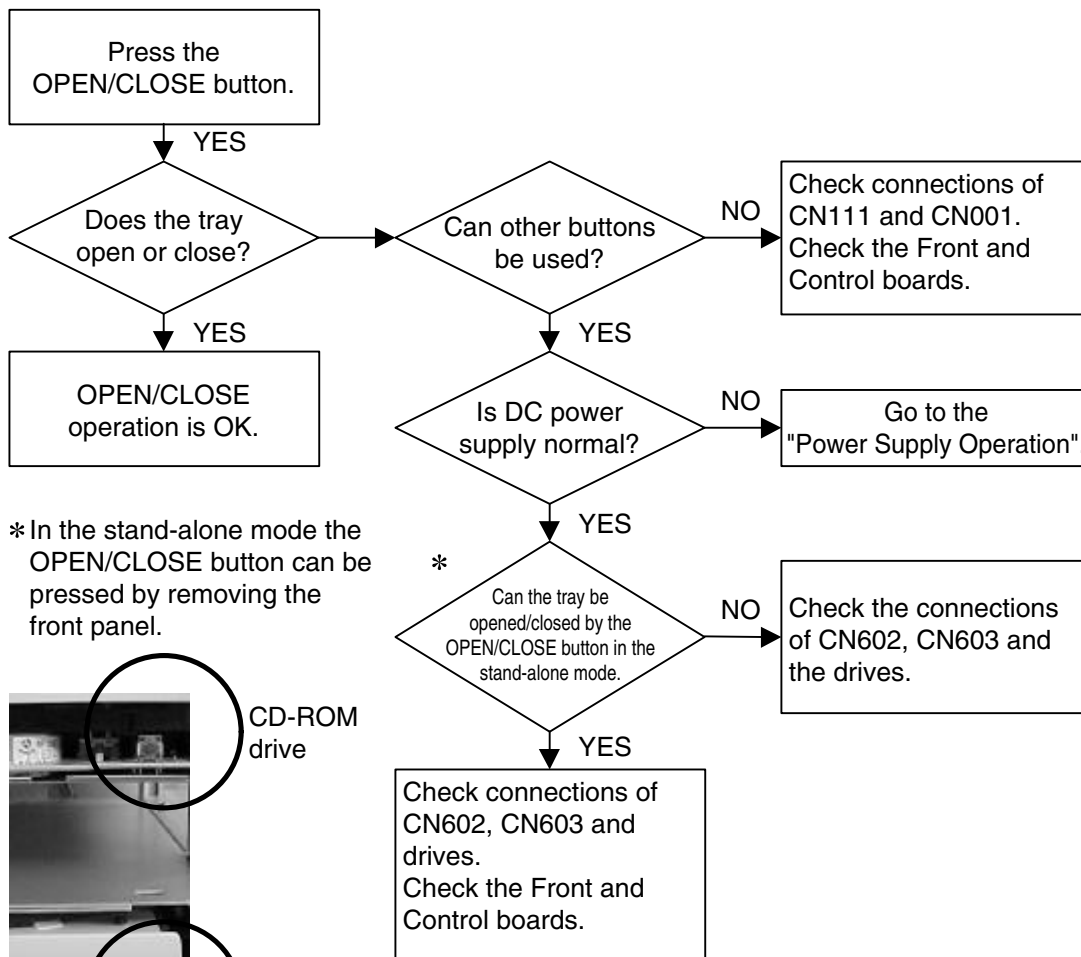
Then connect the wires and check the voltages as described below.

- (1) Check the continuity between the GND line and leftmost wire (red, DC +5 V) and the rightmost wire (yellow, +12 V) to ensure that there is no short-circuiting.
- (2) Press the POWER button to ON and check the voltages at the leftmost wire (red, DC +5 V) and the rightmost wire (yellow, DC +12 V).  
If the CD voltage drops abnormally or the protection device (fuse, etc.) is released when the wires are connected (i.e. load is applied), there may be short-circuiting on the load side or in the connection path.

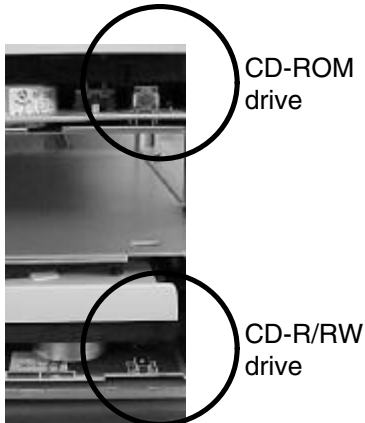
(Note) Connection points of the 4 wires.  
Do not disconnect any other connections.



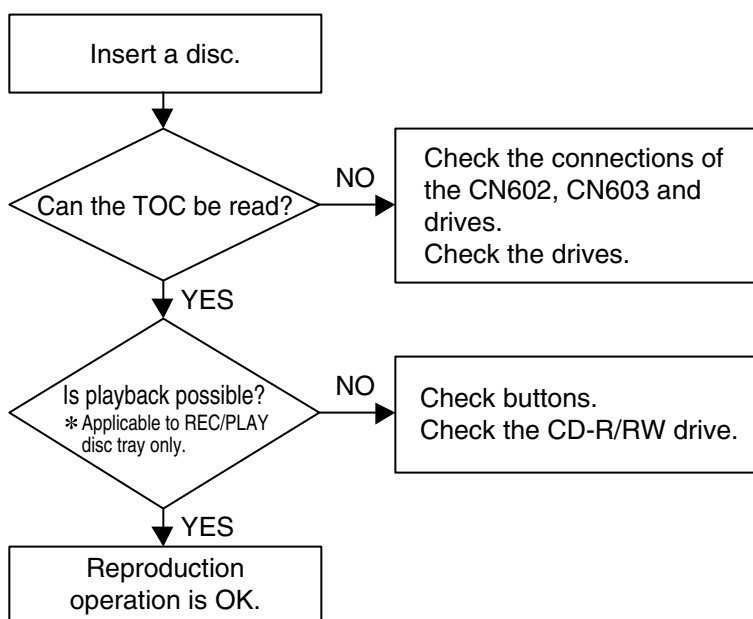
## ■ OPEN/CLOSE operation



\* In the stand-alone mode the OPEN/CLOSE button can be pressed by removing the front panel.



## ■ Reproduction operation



Note 1) The access condition of each drive is shown by an indicator.

Blinking: The disc TOC data is being read.

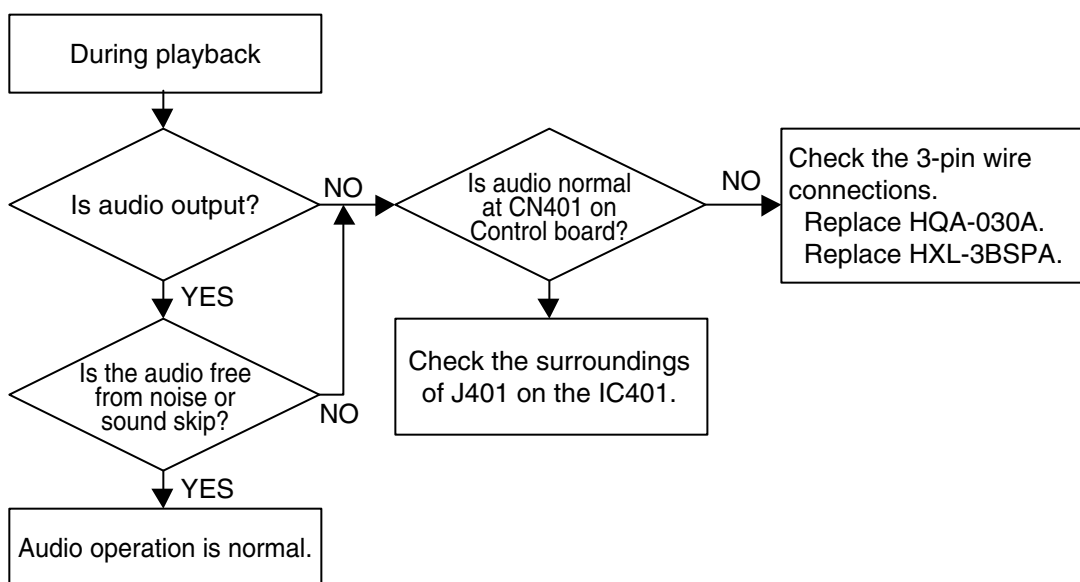
Lighting: The disc TOC data has been read or is being reproduced.

Note 2) The TOC data of the disc in the SOURCE disc tray (CD-ROM drive) can be displayed as follows.

When the SOURCE indicator stops blinking and starts constant lighting, press the skip button (rewind direction) to display the number of tracks on the disc.

Examples) CTS-1000 Disc with 28 tracks: Track indicators 1 to 20 (Green) and the OVER indicator (Red) lights.  
Other Disc with 12 tracks: Track indicators 1 to 12 (Green) light.

## ■ Audio operation



## ■ Write operation

The REC/PLAY disc tray (CD-R/RW drive) is composed of the mechanism unit (HXL-3BSPA) and the board ass'y (HQA-030A).

Therefore, in case of a write failure, check the following points first before proceeding to the next step.

The trouble is not due to the disc defect.

The FPC cable connecting the mechanism unit and the board ass'y is not disconnected or unplugged.

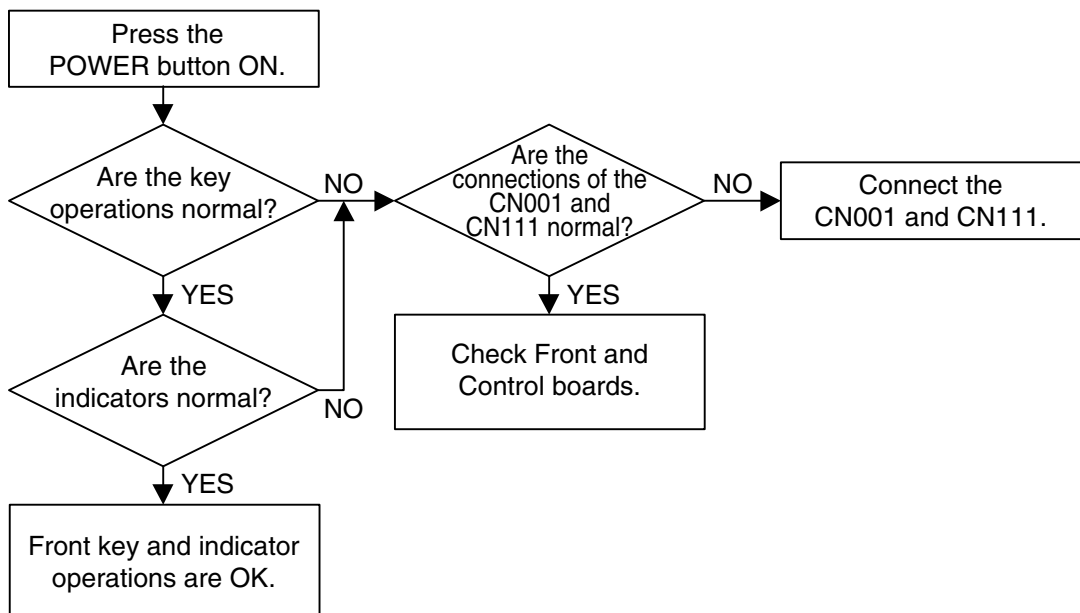
### 1. Symptoms, which may be due to a defect in the mechanism unit (HXL-3BSPA)

- (1) There is no trace of writing on the CD-R/RW disc.
- (2) Error during write.
- (3) Rotation stopped during write.
- (4) Write completes normally but the written disc cannot be reproduced.
- (5) Either the CD-R or the CD-RW disc cannot be written onto.
- (6) Disc cannot be recognized as a recordable CD-R/RW disc.
- (7) Abnormal noise from the mechanism during disc rotation.
- (8) Disc will not rotate.
- (9) Disc rotation is unstable (the rotation speed increases suddenly).

### 2. Symptoms, which may be due to a defect in the board ass'y (HQA-030A)

- (1) Write operation will not start.
- (2) Disc will not rotate.
- (3) The access LEDs do not light or blink.

## ■ Front Key/Indicator operation



## Precaution for servicing

### Handling of board ass'y in REC/PLAY disc tray

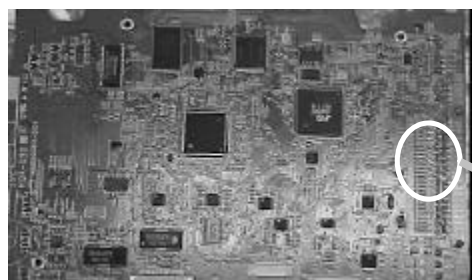
After replacing the board ass'y (HAQ-030A), be sure to modify it for use with the XR-D400SL by performing the following operations:

1. Remove 3 condensers and confirm the jumper settings.
2. Rewrite the firmware for XR-D400SL.

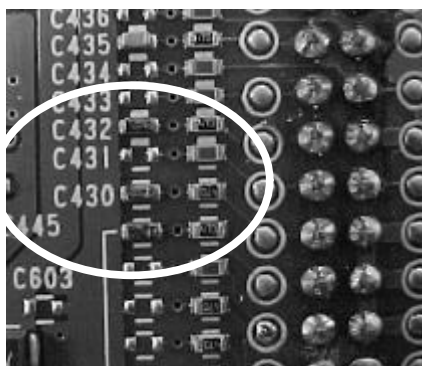
Note) The HQA-030A is not a part designed exclusively for the XR-D400.

1. Remove 3 condensers and confirm the jumper settings.

(1) Remove the condensers C429, C430 and C432 (for their locations, see Figs. 1 and 2).



[Fig. 1]



[Fig. 2]

(2) Confirm the jumper settings.

The settings should be as shown in Fig. 3 and 4. The jumper should be inserted into the rightmost hole when the board is seen from the rear.



[Fig. 3]



[Fig. 4]

2. Rewrite the firmware for XR-D400

A PC and firmware software are required to rewrite the firmware.

#### Applicable PC

OS	Windows 95/98
CPU	Pentium 133 MHz or higher
Memory	16 MB or more
Model	IBM compatible machine

#### Firmware software

Firmware software	Download.exe
Firmware	Zcp133s.hex

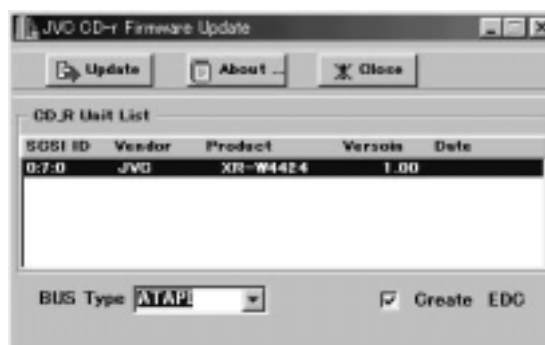
Create a folder in the hard disk of the PC and store both of these in the same folder.

## ■ Rewrite procedure

- (1) Connect the REC/PLAY disc tray in the stand-alone mode to the PC. (Fig. 5)  
Note) The PC connection procedure will be described later.
- (2) While holding down the switch on the right of the front panel (encircled in Fig. 5), boot the PC.
- (3) Keep holding down the above switch until Windows has started up.
- (4) Run firmware software Download.exe.
- (5) When the firmware software screen appears (Fig. 6), confirm that; the Vendor is JVC, the product is XR-W4424 and the Version is 1.00. [Fig. 5]  
Note) If another content than the above is displayed, restart the operation from step (2).
- (6) After confirming that the BUS Type is ATAPI and that Create is checked, click the Update button. (Fig. 6)
- (7) When the screen as shown in Fig. 7 is displayed, select Zcp133s.hex, and click the OK button.
- (8) The firmware rewriting starts and the access LED on the front panel changes from amber lighting to amber blinking.  
Rewriting takes about 60 seconds. The extinction of the access LED indicates the completion of the firmware rewriting.
- (9) When the screen in Fig. 6 is displayed again, click Close to close the firmware software.



[Fig. 5]



[Fig. 6]



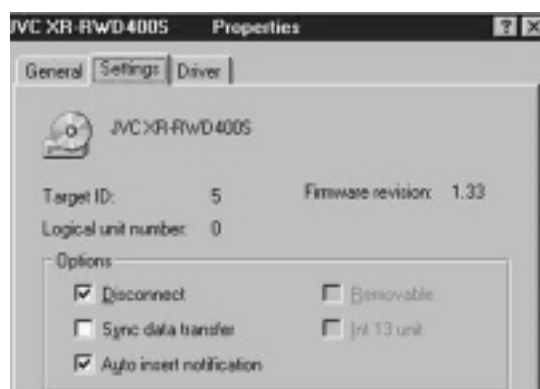
[Fig. 7]

## ■ Firmware version check procedure

- (1) Boot the PC.  
Note) If this procedure is started immediately after the rewriting procedure above, do not simply restart the PC but be sure to switch it off and then on again.
- (2) Open the Device Manager.  
Click [Start] R [Setting] R [Control Panel] R [System].  
Select [Device Manager] and click [CD-ROM].
- (3) When the screen shown in Fig. 8 is displayed, select JVC XR-RWD400S.
- (4) Open the Properties of JVC XR-RWD400S and select Setting.
- (5) Confirm that the firmware revision number is 1.33. (Fig. 9)



[Fig. 8]



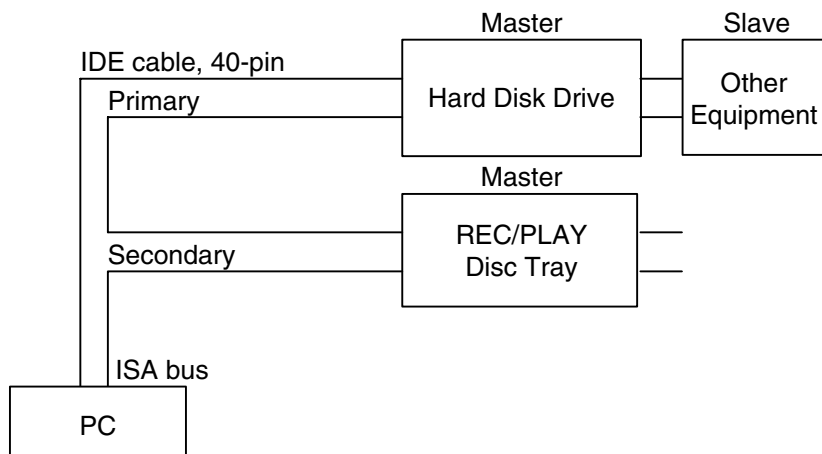
[Fig. 9]

## ■ Connection to a PC

Fig. 10 shows the connection diagram of the PC.

The REC/PLAY disc tray can be set as the master according to the jumper setting. After setting, connect the REC/PLAY disc tray to the secondary IDE cable.

Do not connect other equipment to the secondary cable.



[Fig. 10]

Figs. 11 and 12 show the actual connections between the REC/PLAY disc tray and the PC.

The connections to the PC consist of connecting the IDE cable (40-pin) and the power supply cable (4-pin) as shown in Fig. 12.



[Fig. 11]



[Fig. 12]

**JVC**

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