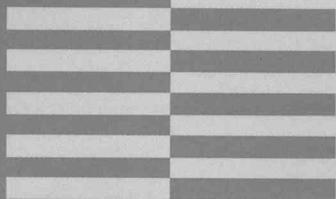


**YAMAHA**

**DIGITAL RECORDING PROCESSOR**

# **CBX-D3**



**OWNER'S MANUAL  
MODE D'EMPLOI  
BEDIENUNGSANLEITUNG**



# SPECIAL MESSAGE SECTION

This product utilizes batteries or an external power supply (adapter). DO NOT connect this product to any power supply or adapter other than one described in the manual, on the name plate, or specifically recommended by Yamaha.

**WARNING:** Do not place this product in a position where anyone could walk on, trip over, or roll anything over power or connecting cords of any kind. The use of an extension cord is not recommended! If you must use an extension cord, the minimum wire size for a 25' cord (or less ) is 18 AWG. NOTE: The smaller the AWG number, the larger the current handling capacity. For longer extension cords, consult a local electrician.

This Product should be used only with the components supplied or; a cart, rack, or stand that is recommended by Yamaha. If a cart, etc., is used, please observe all safety markings and instructions that accompany the accessory product.

**SPECIFICATIONS SUBJECT TO CHANGE:** The information contained in this manual is believed to be correct at the time of printing. However, Yamaha reserves the right to change or modify any of the specifications without notice or obligation to update existing units.

This product, either alone or in combination with an amplifier and headphones or speaker/s, may be capable of producing sound levels that could cause permanent hearing loss. DO NOT operate for long periods of time at a high volume level or at a level that is uncomfortable. If you experience any hearing loss or ringing in the ears, you should consult an audiologist. **IMPORTANT:** The louder the sound, the shorter the time period before damage occurs.

Some Yamaha products may have benches and/or accessory mounting fixtures that are either supplied with the product or as optional accessories. Some of these items are designed to be dealer assembled or installed. Please make sure that benches are stable and any optional fixtures (where applicable) are well secured BEFORE using. Benches supplied by Yamaha are designed for seating only. No other uses are recommended.

**NOTICE:** Service charges incurred due to lack of knowledge relating to how a function or effect works (when the unit is operating as designed) are not covered by the manufacturer's warranty, and are therefore the owners responsibility. Please study this manual carefully and consult your dealer before requesting service.

**ENVIRONMENTAL ISSUES:** Yamaha strives to produce products that are both user safe and environmentally friendly. We sincerely believe that our products and the production methods used to produce them, meet these goals. In keeping with both the letter and the spirit of the law, we want you to be aware of the following:

**Battery Notice:** This product MAY contain a small non-rechargeable battery which (if applicable) is soldered in place. The average life span of this type of battery is approximately five years. When replacement becomes necessary, contact a qualified service representative to perform the replacement.

This Product may also use "household" type batteries. Some of these may be rechargeable. Make sure that the battery being charged is a rechargeable type and that the charger is intended for the battery being charged.

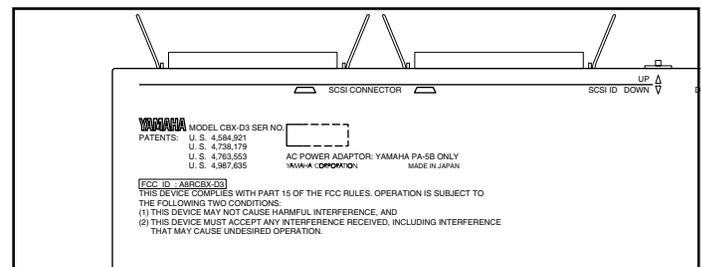
When installing batteries, do not mix old batteries with new, or with batteries of a different type. Batteries MUST be installed correctly. Mismatches or incorrect installation may result in overheating and battery case rupture.

**Warning:** Do not attempt to disassemble, or incinerate any battery. Keep all batteries away from children. Dispose of used batteries promptly and as regulated by the laws in your area.

**Note:** Check with any retailer of household type batteries in your area for battery disposal information.

**Disposal Notice:** Should this Product become damaged beyond repair, or for some reason its useful life is considered to be at an end, please observe all local, state, and federal regulations that relate to the disposal of products that contain lead, batteries, plastics, etc. If your dealer is unable to assist you, Please contact Yamaha directly.

**NAME PLATE LOCATION:** The name Plate is located on the top of the product. The model number, serial number, power requirements, etc., are located on this plate. You should record the model number, serial number, and the date of purchase in the spaces provided below and retain this manual as a permanent record of your purchase.



**Model**

\_\_\_\_\_

**Serial No.**

\_\_\_\_\_

**Purchase Date**

\_\_\_\_\_

## PLEASE KEEP THIS MANUAL

## FCC INFORMATION (U.S.A.)

### 1. IMPORTANT NOTICE: DO NOT MODIFY THIS UNIT!

This product, when installed as indicated in the instructions contained in this manual, meets FCC requirements. Modifications not expressly approved by Yamaha may void your authority, granted by the FCC, to use the product.

2. **IMPORTANT:** When connecting this product to accessories and/or another product use only high quality shielded cables. Cable/s supplied with this product **MUST** be used. Follow all installation instructions. Failure to follow instructions could void your FCC authorization to use this product in the USA.

3. **NOTE:** This product has been tested and found to comply with the requirements listed in FCC Regulations, Part 15 for Class "B" digital devices. Compliance with these requirements provides a reasonable level of assurance that your use of this product in a residential environment will not result in harmful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the users manual, may cause interference harmful to the operation of other electronic devices. Compliance with FCC regulations does not guarantee that interference will not occur in all installations. If this product is found to be the source of interference, which can be determined by turning the unit "OFF" and "ON", please try to eliminate the problem by using one of the following measures:

Relocate either this product or the device that is being affected by the interference

Utilize power outlets that are on different branch (circuit breaker or fuse) circuits or install AC line filter/s.

In the case of radio or TV interference, relocate/reorient the antenna. If the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable.

If these corrective measures do not produce satisfactory results, please contact the local retailer authorized to distribute this type of product. If you can not locate the appropriate retailer, please contact Yamaha Corporation of America, Electronic Service Division, 6600 Orangethorpe Ave, Buena Park, CA 90620

\*This applies only to products distributed by YAMAHA CORPORATION OF AMERICA

## CANADA

THIS DIGITAL APPARATUS DOES NOT EXCEED THE "CLASS B" LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS SET OUT IN THE RADIO INTERFERING REGULATION OF THE CANADIAN DEPARTMENT OF COMMUNICATIONS.

LE PRESENT APPAREIL NUMERIQUE N'EMET PAS DE BRUITS RADIOELECTRIQUES DEPASSANT LES LIMITES APPLICABLES AUX APPAREILS NUMERIQUES DE LA "CLASSE B" PRESCRITES DANS LE REGLEMENT SUR LE BROUILLAGE RADIOELECTRIQUE EDICTE PAR LE MINISTERE DES COMMUNICATIONS DU CANADA.

\* This applies only to products distributed by YAMAHA CANADA MUSIC LTD.

## Bescheinigung des Importeurs

Hiermit wird bescheinigt, daß der/die/das

Gerät: Digital Recording Processor Typ : CBX-D3

(Gerät, Typ, Bezeichnung)

in Übereinstimmung mit den Bestimmungen der

VERFÜGUNG 1046/84

(Amtsblattverfügung)

funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Yamaha Europa GmbH

Name des Importeurs

\* Dies bezieht sich nur auf die von der Yamaha Europa GmbH vertriebenen Produkte.

# CBX-D3

**Owner's Manual**

**English**

**Mode d'emploi**

**Français**

**Bedienungsanleitung**

**Deutsch**

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## **Safety, Warnings & Notes**

Please read the following information before operating your CBX-D3.

### **Safety information**

- **Make sure** that the power adaptor cord is located so that it will not be walked on or snagged by nearby equipment.
- **Do not** expose the CBX-D3 to extremes of humidity.
- **Do not** place the CBX-D3 near water.
- **Do not** place the CBX-D3 in areas subject to extremely low temperatures.
- **Do not** place the CBX-D3 in locations subject to excessive dust.
- **Do not** place the CBX-D3 in an area subject to vibration.
- **Do not** expose the CBX-D3 to severe shocks.
- **Do not** place the CBX-D3 in direct sunlight, close to heating units, or in an area subject to high temperatures.
- The ambient temperature around the CBX-D3 should be between 10°C and 35°C (50°F and 95°F).

### **Warnings**

- Use only the power adaptor that comes with the CBX-D3. Do not attempt to use any other adaptor.
- Never connect the power adaptor to the wrong type of AC receptacle. The adaptor bears a marking indicating the type of receptacle to use.
- To reduce the risk of electric shock, **do not** remove the cover of the CBX-D3.
- To reduce the risk of fire or electric shock, **do not** expose the CBX-D3 to rain or moisture.
- The CBX-D3 contains no user serviceable parts. **Refer all** servicing to qualified personnel.
- The CBX-D3 uses digital circuits that operate at high frequencies and may interfere with the reception of nearby TV or radio equipment. You can eliminate such interference by increasing the distance between the CBX-D3 and the affected equipment.
- If any of the following occurs, please have the CBX-D3 serviced by qualified personnel:
  - The power adaptor cord or plug becomes damaged.
  - Metal object or liquid gets inside the CBX-D3.
  - The CBX-D3 is exposed to rain.
  - The CBX-D3 is dropped or the casing is damaged.
  - The CBX-D3 does not operate normally, or you notice a marked change in its performance characteristics.

### **Cleaning the CBX-D3**

You can clean the CBX-D3 with a soft, lightly moistened cloth. Stubborn dirt can be removed using a mild detergent. Do not use abrasive cleaners or solvent-based cleaning fluids such as alcohol and benzene.

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# 1 Introduction

## **Welcome to the CBX-D3**

Thank you for purchasing a CBX-D3 Digital Recording Processor. Connecting the CBX-D3 to a controlling computer with supporting software and a SCSI hard disk will provide up to four channels of CD quality audio recording, processing, and playback.

## **CBX-D3 features**

- Four-channel system: 2-channel simultaneous recording, 4-channel playback
- A/D conversion: 16-bit linear  $\Delta \Sigma$  modulation
- D/A conversion: 18-bit with oversampling digital filter
- Sampling frequencies: 48kHz, 44.1kHz, 32kHz, 22.05kHz
- Two analog inputs (two LINE jacks, two MIC jacks); four analog outputs. The analog input level automatically switches to accommodate line or microphone input.
- One CD/DAT digital output
- Available recording time is limited only by hard disk capacity. You can increase the recording time by installing larger disks or increasing the number of disks.
- All audio data processing is carried out within the CBX-D3, so much less is demanded of the computer, eliminating data bottlenecks and slow screen redraws.
- The system can be easily upgraded by loading the appropriate files. No ROM change is required.

## **Important Notice**

**YAMAHA AND THE SOFTWARE COMPANIES THAT PRODUCE CBX-D3 CONTROLLING SOFTWARE CANNOT BE HELD RESPONSIBLE FOR ANY LOSS OF DATA OR FOR ANY DIRECT, INDIRECT, SPECIAL INCIDENTAL, CONSEQUENTIAL OR OTHER DAMAGES SUFFERED BY THE USER OR OTHERS RESULTING FROM THE USE OR PURCHASE OF THE CBX-D3, ITS DOCUMENTATION, OR SUPPORTING SOFTWARE.**

## Unpacking

The CBX-D3 package should contain the following items.

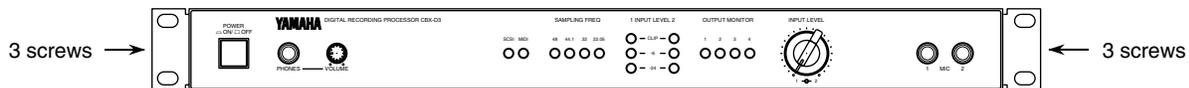
1	CBX-D3	Serial No:
1	PA-5B AC Adaptor (or recommended equivalent)	
2	1U rack mounting brackets (attached to the CBX-D3)	
1	Owner's Manual	
1	User Registration Card	

Retain the packing materials for future use.

## Installation

The CBX-D3 comes equipped with mounting brackets at both sides, allowing easy installation on any standard 19" electronic equipment rack. (The unit requires 1U of rack space.)

If you need to remove the mounting brackets, simply remove the three screws holding each bracket in place. Be sure to reuse the same screws when reattaching the brackets; use of a different screw size can cause internal damage.



## Trademarks

Macintosh is a registered trademark of Apple Computer, Inc.

All other trademarks are the property of their respective holders.

## Powering up a CBX-D3 System

Some computers are particular about the order in which devices are powered up. It is generally best to switch on all peripheral SCSI devices before turning on the computer.

**NOTE:** To avoid system crash and data loss, NEVER switch off or disconnect any of the SCSI devices while the CBX-D3 system is running.

## Downloading the System Software

Immediately following power-on, the CBX-D3 must download system data from the computer. The 48kHz LED blinks to indicate that download is not yet completed.

CBX-D3 applications perform the download automatically. If you are working with a CBX-D5 application, you will need to run the download yourself using a "System Downloader" program, available on request from your Yamaha CBX-D3 dealer.

**NOTE:** Consult your Yamaha CBX-D3 dealer for information about the latest CBX-D3 applications.

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## **2 CBX-D3 Terminology**

### **SCSI**

SCSI (pronounced “scuzzy”) stands for Small Computer System Interface. The SCSI is a standard format for connecting a computer to peripheral devices such as hard disks, printers, and scanners. Devices are connected in a daisy chain, with each device (including the computer) identified by a SCSI ID between 0 and 7.

Your CBX-D3, your computer, and your hard disk are connected together in a SCSI daisy chain. The CBX-D3 uses the SCSI connection to transmit audio data to or from the hard disk for recording or playback. The computer uses the connection to send control data to the CBX-D3, and to perform copy, delete, and backup operations on the hard disk. With appropriate software, it is also possible to transfer digital audio data directly to your computer for onscreen waveform editing or other processing.

Although the SCSI standard is fairly robust, some care must be taken when connecting and setting up the devices. For details about how to connect hard disk drives, refer to page 10.

### **Sound files**

Just like other types of computer data, digital audio data is stored in files — sound files. When recording starts, a sound file is created on the hard disk. Sound files can be named, copied, or deleted just like any other computer files.

### **Sampling frequency**

During the analog to digital conversion process, the level of the analog audio signal is sampled (measured) many times per second.

Each of these sample measurements is then stored as a 16-bit binary value. For digital to analog conversion (playback), these 16-bit binary values are used to reconstruct the analog audio signal. The rate at which these sample measurements take place is called the sampling frequency. CD players use a sampling frequency of 44.1kHz.

The CBX-D3 can record audio using any one of four sampling frequencies: 48kHz, 44.1kHz, 32kHz, and 22.05kHz. The audio quality (bandwidth) of a digital system is directly affected by the sampling frequency. Essentially, the audio bandwidth will be roughly half the chosen sampling frequency. Refer to the discussion of sampling frequency in the chapter on “Recording” (see page 16) for additional details.

### **3 What is the CBX-D3?**

The CBX-D3 is a digital recording processor. When connected to a controlling computer with supporting software and a SCSI hard disk, the CBX-D3 provides up to four channels of CD-quality audio recording, processing, and playback.

#### ***Computer based***

The CBX-D3 is controlled by a computer that is running CBX-D3 supporting software. All audio data processing takes place inside the CBX-D3, so there is very little demand on the controlling computer. For this reason the CBX-D3 can be used even with relatively less powerful, inexpensive computers. The CBX-D3 leaves the computer free to get on with other jobs such as processing of MIDI sequence data and screen updates.

The CBX-D3 is connected to your computer and hard disk by SCSI. It is also connected to the computer by MIDI cables. The SCSI connection supplies control data from the computer, and transfers audio data to or from the hard disk for recording or playback. The MIDI connection carries real-time volume data, synchronization clock, playback speed data, and playback and recording start/stop signals.

#### ***Four-channel system***

The CBX-D3 is a four-channel system, providing two channels of simultaneous recording and four channels of playback. Two channels can be recording while the other two are playing back.

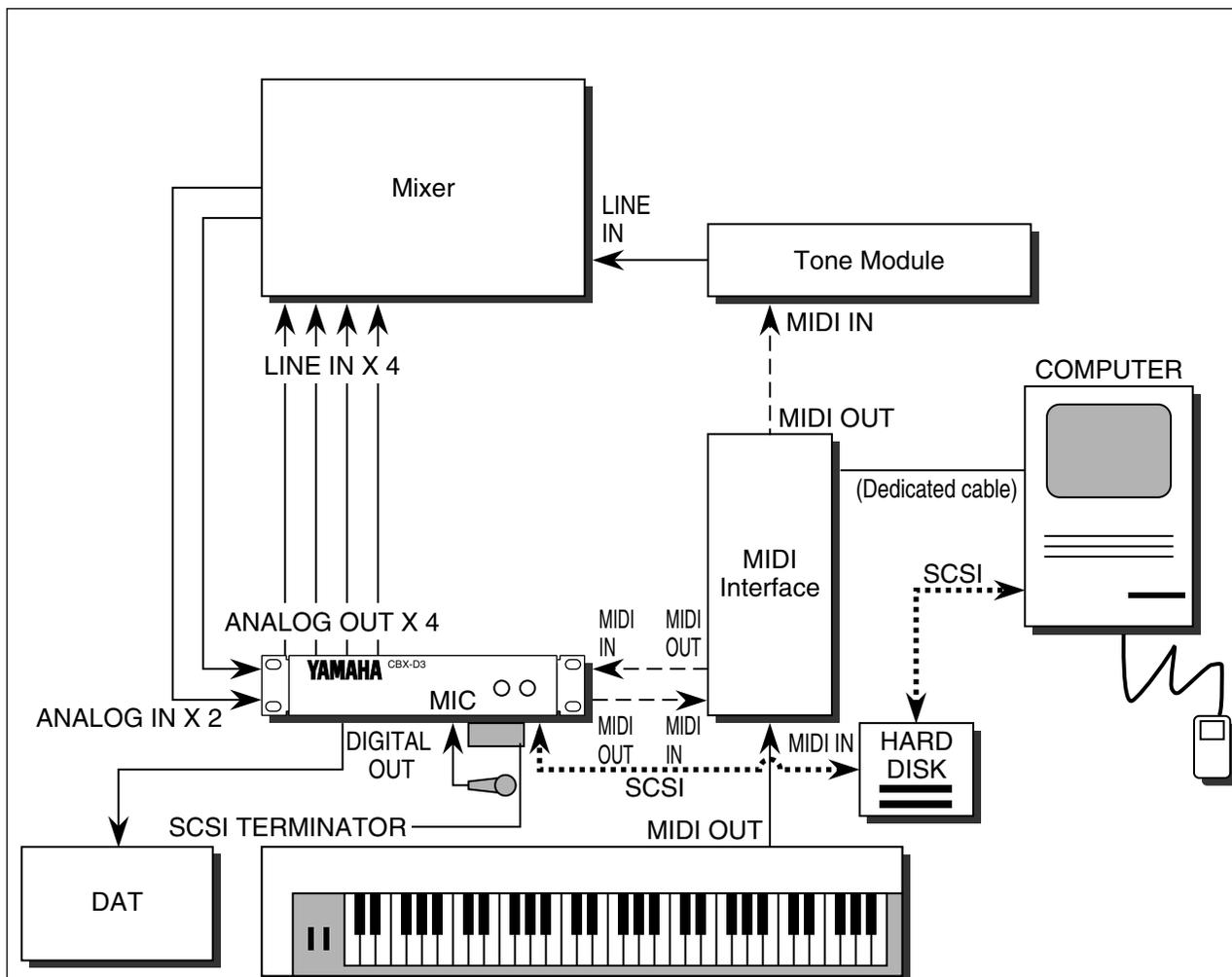
The CBX-D3 requires about 100 megabytes of free hard-disk space to record 10 minutes of stereo digital audio at a sampling frequency of 44.1kHz. You can increase the available recording time by changing to a larger disk or adding more disks to the SCSI chain.

#### ***CD quality & editing***

The CBX-D3 records audio data in 16-bit resolution. Recording quality at sampling frequencies of 44.1 and 48kHz is at CD level, with true reproduction, low noise, and minimal distortion.

## The CBX-D3 in a MIDI recording system

The following diagram shows how the CBX-D3 can be integrated into a MIDI-sequencer-based music production system.

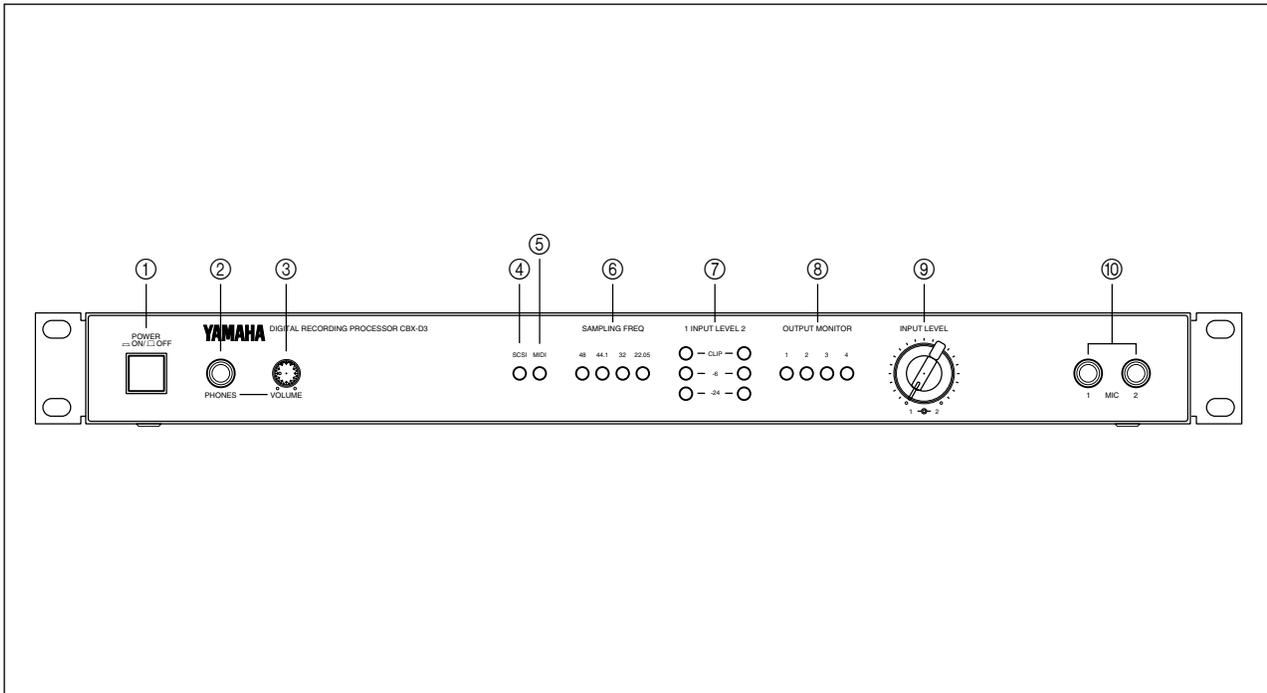


- \* CBX-D3 applications automatically load system software to the CBX-D3 at time of power on. CBX-D5 applications require the use of separate "System Downloader" program. See page 2.
- \* SCSI terminator must be correctly connected.
- \* MIDI cables carry system-exclusive messages.

**NOTE:** The MIDI and SCSI connections between the CBX-D3 and your computer can have a significant impact on how your application functions. Refer to your application software's manual for information about the appropriate connection configuration.

## 4 Controls & Connections

### Front panel



#### ① POWER switch

Switches the power on or off.

#### ② PHONES connection

A 1/4-inch (6.35mm) stereo headphone jack. The headphones monitor all four audio channels simultaneously: channels 1 and 3 are heard in the left speaker, while channels 2 and 4 are heard in the right.

#### ③ VOLUME

Adjusts the headphone volume.

#### ④ SCSI indicator

Red/green LED indicator showing the current SCSI status. GREEN indicates that the CBX-D3 is reading from disk, sending or receiving commands over the SCSI, or downloading system data.

Solid RED indicates that the CBX-D3 is recording to disk. Flashing RED indicates an error condition.

#### ⑤ MIDI indicator

Green LED. Lights up when the CBX-D3 receives a supported system-exclusive message.

### ⑥ **SAMPLING FREQ indicators**

Indicate the sampling frequency selected for recording or playback: 48kHz, 44.1kHz, 32kHz, or 22.05kHz. The frequency selection is made by software.

The 48kHz LED also acts as a download indicator, flashing to indicate that the CBX-D3 has not yet completed power-on downloading of system data.

### ⑦ **INPUT LEVEL indicators**

Two 3-segment LED bargraphs indicating the audio input levels. You can adjust the input levels by turning the INPUT LEVEL control dials.

**NOTE:** The top LED in each of the bargraphs is the “CLIP” LED. While peak indicators on analog equipment tend to light up approximately 3 ~ 6dB below the signal clipping level, CLIP LEDs on digital equipment come on only if clipping has actually occurred. Since digital-audio signal clipping produces unpleasant distortion, pops, and clicks, you **DO NOT** want the CLIP LEDs to come on.

### ⑧ **OUTPUT MONITOR indicators**

Four variable-brightness LEDs. Each LED indicates the output level of the corresponding channel. The LED gets gradually brighter as the level rises.

### ⑨ **INPUT LEVEL controls**

Independent level controls for analog input channels 1 and 2. You can also use these controls to balance the left and right channels of a stereo source connected to the analog inputs. Note that the input level automatically changes to accommodate microphone or line input.

### ⑩ **MIC 1 & 2**

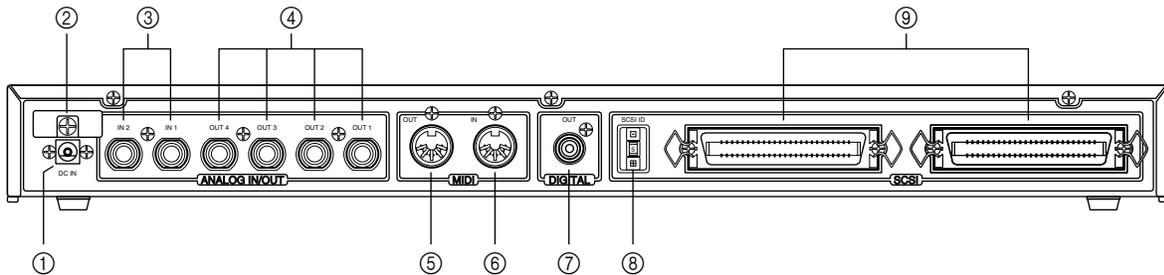
Two 1/4-inch jacks for direct input of microphone analog audio signals. These are unbalanced inputs with nominal input levels of -60dBm. Plugging a microphone into either of these jacks automatically switches the channel's nominal input level from line (-20dBm) to microphone (-60dBm).

Note that connecting a cable to a MIC jack automatically disables any line input connected to the corresponding ANALOG IN jack on the near panel.

#### **IMPORTANT:**

1. NEVER plug a line input into a MIC jack.
2. Always set the INPUT LEVEL to minimum before inserting or removing a microphone or line input.

## Rear panel



**NOTE:** For your convenience, the top panel includes illustrations and names of all terminals located on the rear panel. This may help you locate cables and connectors without having to look behind the device.

### ① DC IN connector

Power connector. Connect one end of the supplied power-adaptor cord to this connector, then insert the plug end of the cord into an appropriate AC receptacle.

### ② Cable clip

Wrap the adaptor cord around this clip to help prevent accidental disconnection.

### ③ ANALOG IN 1&2

Two 1/4-inch phone jacks for direct input of analog audio signals. These are unbalanced inputs with nominal input levels of  $-20\text{dBm}$ , and can be connected to the outputs of a mixer, synthesizer, drum machine, or other such device.

Note that connecting a cable to the MIC jack on the front panel automatically disables the corresponding ANALOG IN jack. If cables are connected to both MIC and ANALOG IN, only the MIC (nominal  $-60\text{dBm}$ ) signals will be received.

**NOTE:** Always set the INPUT LEVEL to minimum before inserting or removing a microphone or line input.

### ④ ANALOG OUT 1~4

Four 1/4-inch phone jacks that output audio data in analog form. These are unbalanced output jacks with a nominal output level of  $-20\text{dBm}$ . You can connect these to a mixer, amplifier, tape recorder, or DAT recorder.

If you connect a line to OUT1 only, the OUT1 jack will output audio signals for all four channels. If you connect to OUT1 and OUT2 only, then OUT1 will output channels 1 and 3, while OUT2 will output channels 2 and 4.

**⑤ MIDI OUT**

Outputs a synchronization clock and messages about various internal events.

**NOTE:** Be sure to connect this to the MIDI IN terminal of your computer prior to recording or playback.

**⑥ MIDI IN**

The CBX-D3 receives MIDI control data from the computer via this connection. To ensure that control data is not delayed by other MIDI devices, the CBX-D3 should be the first device connected to your computer. If your computer provides multiple MIDI outputs, you should dedicate one of these for exclusive use with the CBX-D3.

**NOTE:** Be sure to connect the MIDI IN terminal to the MIDI OUT terminal of your computer prior to recording or playback.

**⑦ DIGITAL OUT**

A RCA (phono) jack that outputs CD/DAT-format digital audio. Channels 1 and 3 are output as the “L” signal, while 2 and 4 are output as the “R” signal. This jack allows you to connect directly to the digital input of a DAT or DCC recorder, eliminating the need for multiple D/A and A/D conversions.

**NOTE:** It is well known that the weakest links in a digital audio system are the A/D and D/A converters. Once converted to digital form, the audio signal becomes immune to distortions, noises, and other problems generally introduced by analog equipment. Although the effect of multiple conversions is rather subtle, it is nevertheless good practice to reduce the number of conversions and transfer the data in digital form wherever possible.

**⑧ SCSI ID selector**

A thumbwheel switch used to set the SCSI ID for the CBX-D3. See “SCSI ID setting” (page 12) for more information.

**⑨ SCSI connectors**

Two 50-pin Amphenol type connectors used to connect the CBX-D3 to the SCSI daisy chain.

## 5 Connecting Hard Disk Drives

Before connecting a hard disk drive, read through this chapter to familiarize yourself with SCSI and how a SCSI daisy chain should be set up.

### **What type of hard disk?**

If you don't already have a hard disk or are thinking of buying a larger one, please consult your Yamaha CBX-D3 dealer for recommendations.

### **Hard disk size**

The following table shows approximate available recording times for various sizes of hard disk. Available recording times are shown for all of the CBX-D3's sampling frequencies. As you can see, time capacity decreases as sampling frequency goes up. This is because the higher frequencies generate much more digital data, and therefore require much more space. For details about frequency selection, refer to "Sampling Frequency" on page 16.

Hard disk / Max. Sound File Size	Stereo Recording (minutes)				Mono Recording (minutes)			
	22.05 kHz	32 kHz	44.1 kHz	48 kHz	22.05 kHz	32 kHz	44.1 kHz	48 kHz
2000MB (2GB)	380	260	190	174	760	520	380	348
1000MB (1GB)	190	130	95	87	380	260	190	174
660MB	124	85	62	57	248	170	124	114
330MB	62	42	31	28	124	84	62	56
200MB	40	25	20	17	80	50	40	34
100MB	20	13	10	8	40	26	20	16
40MB	8	5	4	3.30	16	10	8	7
20MB	4	3	2	1.42	8	6	4	3.24
10MB	2	1.18	1	51 secs	4	2.36	2	1.42
5MB	1	38 secs	30 secs	26 secs	2	1.16	1	52 secs
1MB	12 secs	7 secs	6 secs	5 secs	24 secs	14 secs	12 secs	10 secs

Although it is doubtful that you will ever buy a hard disk smaller than 40MB for use with the CBX-D3, the values below 40MB will be useful for checking the remaining recording time on a hard disk that already contains some sound files.

## Choosing a hard disk

Consider the following disk specifications when shopping for a hard disk for your CBX-D3 system.

Specification	Check	Notes
Is it compatible with your computer?		It may be advertised as compatible, or your dealer may recommend it.
Does it have two SCSI connectors?		You need two to continue the SCSI daisy chain.
Are the SCSI connectors 25-pin D-SUB or 50-pin Amphenol?		Macintosh computers are fitted with a 25-pin D-SUB connector, while most other SCSI devices use a 50-pin Amphenol connector.
Are the SCSI cables supplied?		If not, you will need to purchase these separately.
Can the SCSI ID be set from 0 ~ 7? (For Macintosh, you only need 0 ~ 6)		If not, it might clash with another device's ID, in which case you may have to rearrange the ID numbers of some other SCSI devices in the chain.
Does it have internal or external termination?		External terminators are normally connected to the rear of the SCSI device. If the device has an internal terminator, make sure it can be switched off so that any device can be positioned at the end of the SCSI daisy chain.
Access time?		Measured in milliseconds, this is an indication of how fast data from different areas of the disk can be retrieved. The maximum we recommend is 30ms. Access times slower than this will degrade the performance of the CBX-D3.
Data transfer rate?		Usually measured in megabytes per second (MB/sec), this indicates how fast data can be written to and read from the hard disk. The minimum we recommend is 1MB/sec. A transfer rate less than this will degrade the performance of the CBX-D3.

## SCSI

For a general introduction to SCSI, see "SCSI" on page 3.

Setting up a SCSI daisy chain involves a little more than just making connections. Each SCSI device must be assigned an ID number, and the daisy chain must be terminated correctly. Details are explained in the following three sections, "SCSI cables," "SCSI ID setting," and "SCSI termination."

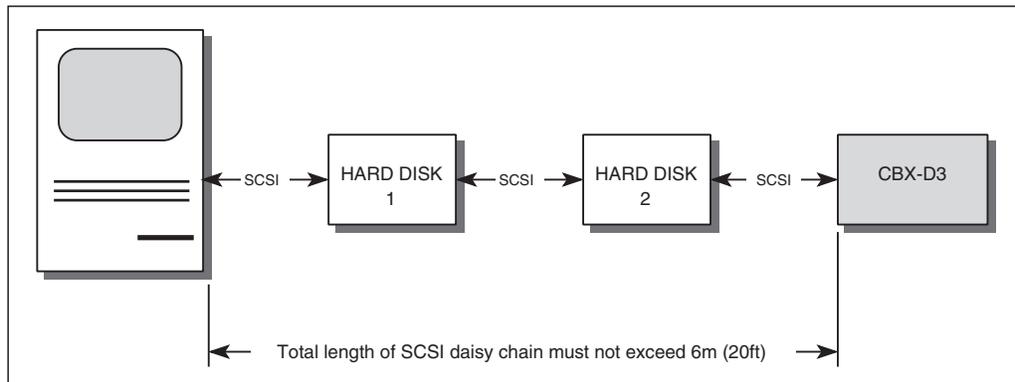
When using a SCSI daisy chain, bear the following points in mind.

- Each device must have a unique SCSI ID number.
- The SCSI bus must be correctly terminated.
- Use quality cables and keep the length down.
- Use the wire clips (or screws) on the SCSI connectors to secure the cable connections.
- All devices connected in the daisy chain must be switched on.
- Never switch off or disconnect a device once the system is running.

<b>NOTE:</b> Switch off all your equipment before making any SCSI connections.
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## SCSI cables

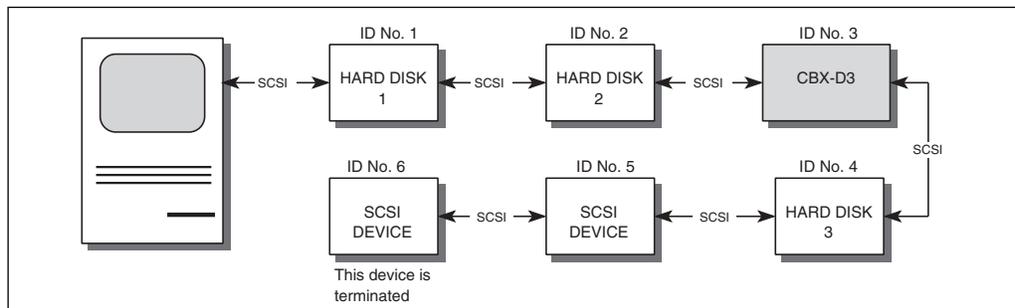
Cable length should be kept low. The total length of the SCSI daisy chain must not exceed 6m (20ft).



## SCSI ID setting

The SCSI bus is a parallel type connection, and data on the bus is available to all devices. However, communication will be between two devices only, so each device is allocated an ID number, like an address number. In this way, only the device with the ID number that is specified in the data will actually read and respond to the data.

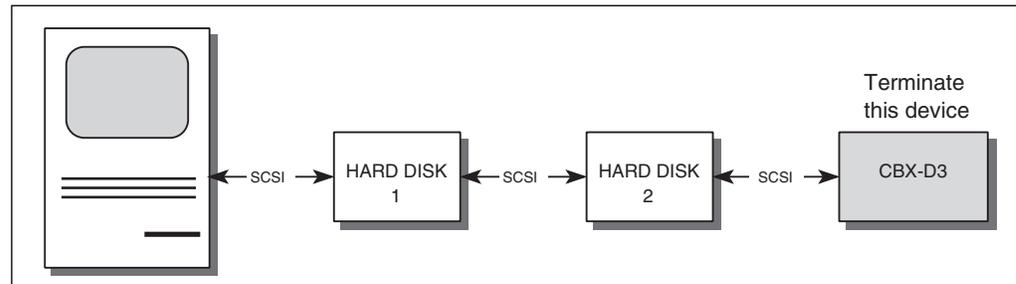
If two devices share the same ID number, the system will probably crash, so make sure that each device has a unique ID number. SCSI devices usually have a DIP switch or, like the CBX-D3, a thumbwheel switch that you can use to set the ID. Refer to the instructions supplied with the device.



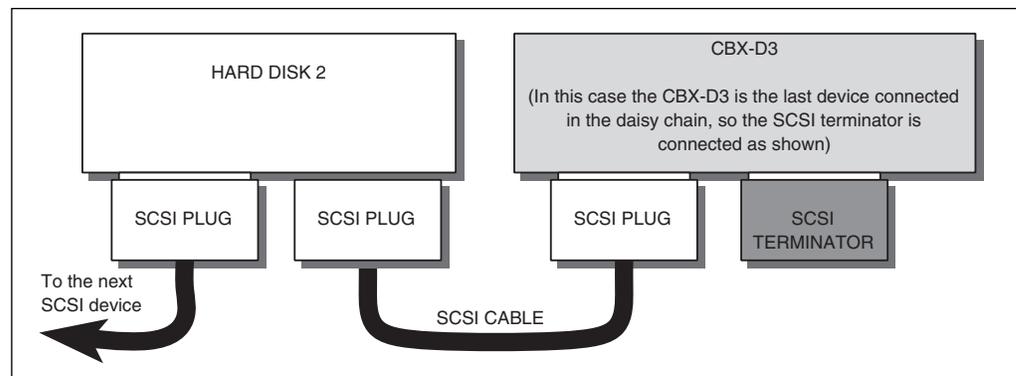
The example above shows seven devices (computer and six peripherals) connected in a SCSI daisy chain. Each device has a different ID number. Note that the last device in the chain is terminated. In most cases SCSI ID 7 is reserved for use by the computer, and ID 0 for the internal hard disk. Do not use either of these IDs for any other SCSI device.

## SCSI termination

Unlike audio signals, digital signals only have two values: high and low (+5V and 0V). When no data is being transmitted, it is important that SCSI bus lines are kept in the high state (+5V), so that when data is transmitted there is a clear distinction between high and low pulses and the data is transferred without error. To achieve this, a device known as a SCSI terminator is connected in the SCSI daisy chain. A terminator is usually fitted to the last device in the chain.



Some SCSI devices have a built-in terminator, and must therefore be connected at the end of the daisy chain. The CBX-D3 and many other devices utilize a detachable in-line terminator, as illustrated below.



**NOTE:** If the SCSI daisy chain is not terminated correctly, numerous problems including data corruption, system crashes, and intermittent glitches can occur. If you have just set up your SCSI daisy chain or have added a new SCSI device to it and it is not working as it should, check that the SCSI daisy chain is terminated correctly. If the problem persists, try connecting the SCSI devices in a different order.

## **6 Working with Hard Disks**

After connecting your hard disk, setting the SCSI ID, and installing the SCSI terminator, you will need to format the hard disk before it can be used. The system will not recognize an unformatted hard disk.

### ***Formatting***

Most SCSI hard disks are supplied with their own disk-formatting software. Please format the disk according to directions given in the hard disk's operating manual.

The formatting program will probably ask you to specify the disk's SCSI ID number. This is the ID number that you set using the thumbwheel or DIP switch on the hard disk unit. You may also be asked to set the interleave value; if so, refer to the hard disk's operating manual for the appropriate response. Also check your computer's manual for additional information about connection of SCSI disk drives.

### ***File management and backup***

Once you have stored sound files to disk, you can copy, delete, or size-check them using the same commands that you use for your other computer files.

You can also back them up using conventional data compression and backup utilities. However, due to the relatively large size of sound files, floppy disks are not the most effective backup media. Removable hard disks and magneto-optical disks are well suited to this task; commonly available sizes include 88MB, 128MB, and 650MB.

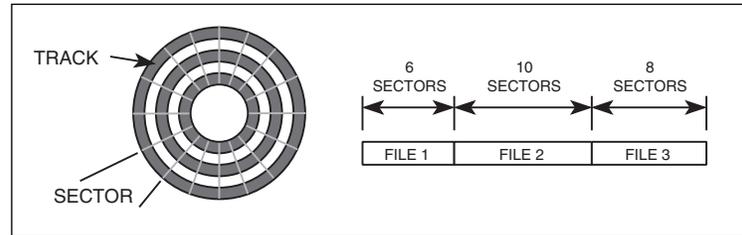
Another backup option is to digitally transfer your sound files to a DAT recorder. You can then record them back to the CBX-D3 if the need arises.

### ***Computer utilities***

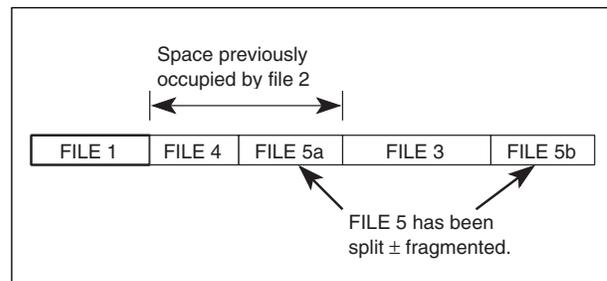
There are many computer utilities available for managing files and hard disks. Disk defragmentation utilities are particularly useful, as described below. File compression utilities, which increase the apparent disk capacity by compressing your files, are a different matter. We recommend that you either avoid these or use them with extreme care, as some of these utilities are incompatible with the CBX-D3 and may effectively destroy your sound files.

## Hard disk fragmentation

Hard disks record data into preformatted concentric tracks on a number of magnetic platters mounted around a spindle. Tracks are further divided into sectors, with each sector storing 512 bytes of data. On a recently formatted disk, files are recorded into a continuous series of sectors, as shown below.



As files are deleted and new files saved, the disk can become cluttered with a random pattern of free and used spaces. A file that is recorded to such a disk tends to get split up over different areas, rather than stored on a contiguous series of sectors. The drive will have to jump all over the disk when reading or writing the data, resulting in a drop in the access speed.



It is very important to avoid this type of fragmentation when recording sound files, as data quantities tend to be very large. If the disk drive must constantly jump around to look for free sectors, it may become unable to keep up with the incoming data. In the worst case, the recording will simply stop.

Disk fragmentation does not become a problem until you have deleted one or more files from the disk, leaving islands of free space surrounded by used sectors. Fragmentation problems are most likely to occur on smaller disks, where you must frequently delete older files to clear room for newer ones.

You can eliminate fragmentation problems by running a disk defragmentation utility, such as the Norton Utilities® Speed Disk™\*, each time you delete a sound file. The utility will move all remaining files up to the front of the disk, so that available space remains as a continuous series of sectors toward the end of the disk.

## Partitioned disks

The CBX-D3 can read and write to partitioned hard disks. But note that it cannot create a file that extends over a partition boundary, or that crosses from one disk to another. For any single recording, the available recording time is limited by the size of the partition you are recording on.

## 7 Recording

### **Sampling frequency**

The CBX-D3 can record at any one of four sampling frequencies: 48kHz, 44.1kHz, 32kHz, or 22.05kHz. These sampling frequencies are commonly used for digital audio, and each has its own specific applications. The sampling frequency determines the audio quality (bandwidth), with higher frequencies producing better quality.

The sampling frequency can be set by the controlling software. The SAMPLING FREQ indicators on the CBX-D3 front panel will show the selected frequency.

#### **48kHz**

At 48kHz an audio bandwidth of about 22kHz is possible. Consumer DAT and DCC recorders can record at 48kHz only. Professional equipment also supports this frequency.

#### **44.1kHz**

With this sampling frequency an audio bandwidth of about 20kHz is possible. This frequency is used for all prerecorded CDs, DATs, and DCC cassettes. Although 48kHz provides a higher audio bandwidth, 44.1kHz is considered good enough for most applications, and most professional digital audio engineers use this sampling frequency.

#### **32kHz**

At this sampling frequency an audio bandwidth of about 15kHz is possible. This frequency is widely used for broadcast applications where a 15kHz audio bandwidth, roughly that of FM radio, is acceptable. Many DSB (Direct Satellite Broadcasting) transmissions use this frequency, although some may also use 48kHz.

#### **22.05kHz**

At this frequency an audio bandwidth of about 10kHz is available. This frequency is widely used in multimedia applications. It might not seem very useful for your audio applications, but if you are limited by hard disk space or the audio material you are recording already has a limited bandwidth it may be useful.

#### **Which sampling frequency for recording?**

Since the CBX-D3 contains a sampling frequency converter, it is possible to play back a sound file at a different frequency than it was recorded at. However, playing back a sound file at a higher sampling frequency will not improve the audio quality, as the audio frequency bandwidth is limited by the sampling frequency used for recording.

This leaves you with two deciding factors for choosing a sampling frequency. First, what audio bandwidth (audio quality) do you want to use, and second, how much free disk space is available? See “Hard disk size” on page 10 for a listing of recording times that are available at each sampling frequency for a given size of hard disk (free disk space).

### **Setting the analog input level**

Use the INPUT LEVEL control dials to adjust the recording level for analog input. You can set the level independently for each channel. You can also use these controls to balance the left and right channels of a stereo source connected to the analog inputs.

The input level automatically switches to accommodate line or microphone input. The nominal input level for line input is  $-20\text{dBm}$ ; the nominal level for microphone input is  $-60\text{dBm}$ . Refer to the INPUT LEVEL indicators when adjusting the level.

## ***INPUT LEVEL indicators***

Unlike analog tape recorders, digital audio recorders are very unforgiving when it comes to excessive signal levels. Digital audio signal clipping normally produces unpleasant distortion, pops, and clicks that can be impossible to remove without the use of highly sophisticated editing equipment. So great care must be taken when setting the recording level.

With a digital audio recorder such as the CBX-D3, noise and hiss produced by setting the recording level too low are not a problem. But setting the level too low reduces the effective dynamic range of the recording. In general, you want to use as much of the 96dB\* dynamic range as possible.

Basically, the recording level should be set so that the loudest signals light the -24 and -6 LEDs, but never the CLIP LEDs. When recording with microphones, where sudden signal surges are possible, it may be worth having a “dry run” before you hit the record button.

## **8 Playback**

### ***Sampling Frequency for Playback***

Although digital audio devices generally use the same sampling frequency for both recording and playback, the CBX-D3 includes a sampling frequency converter (SFC) that allows playback at a different frequency from that used to record. This feature makes it possible to replay multiple files at the same frequency, regardless of the frequencies originally used for recording. Specifically, the CBX-D3 can replay sound files using any of four sampling frequencies (44.1, 48, 32, or 22.05kHz). The frequency is selected through the controlling software, usually so as to match the sampling frequency of the device (such as digital mixer or DAT, MD, or DCC recorder) to which digital sound is being sent. The SAMPLING FREQ indicator on the CBX-D3 indicates the selected frequency.

The sampling frequency used for recording determines the maximum sound quality obtainable from the file; use of higher frequencies at time of playback will not improve the quality. If you recorded a file at a 44.1kHz sampling frequency, it will not sound any different when replayed at 48kHz. But you should also note that a sound file recorded at 48kHz will generally suffer no noticeable quality loss when replayed at 44.1kHz.

### ***OUTPUT MONITOR indicators***

The four OUTPUT MONITOR indicators show the current output level of each channel. Each indicator consists of a single LED which gets gradually brighter as the channel's output level increases. Output levels can be controlled by software.

\* 96dB is the dynamic range available from a 16-bit digital system (6dB per bit).

## 9 Troubleshooting

If you are having a problem with your CBX-D3 system, refer to the table below for suggestions about how to proceed.

Problem		Action	
The CBX-D3 does not come on.		Make sure that the power adaptor cord is connected to a suitable AC receptacle.	
		Press the CBX-D3's POWER switch.	
		Check for a short circuit in the power adaptor cord.	
The CBX-D3 cannot be controlled by the computer.		The CBX-D3 must download system data from the computer at power-on. The 48kHz indicator will flash if downloading is required. (See page 2.)	
		Make sure that no two devices are using the same SCSI ID number.	
		Use standard SCSI cables only.	
		Try another SCSI cable (have your dealer check the cable).	
The system does not recognize the CBX-D3. The system does not recognize an external hard disk.		Confirm that the MIDI IN and MIDI OUT terminals are connected to the MIDI OUT and MIDI IN terminals on your computer.	
		Make sure that the SCSI bus is terminated correctly.	
		Make sure that all connected SCSI devices are powered up.	
		Use standard SCSI cables only.	
Cannot play back sound files.		Try another SCSI cable (have your dealer check the cable).	
		Change the order of devices connected to the SCSI bus.	
		Make sure a sound file exists on the hard disk.	
		Check that the hard disk's access indicator lights up when you try to play a song file.	
The CBX-D3 OUTPUT MONITOR indicators show a signal, but nothing is output.		Make sure that recording and playback volumes are set correctly.	
		Confirm that your hard disk is a SCSI device, and be sure that it is connected to the same SCSI bus as the CBX-D3.	
Output suddenly stops during playback of a stereo sound file.		Check the analog and digital connections.	
Output stops suddenly or makes a short loop.		Make sure that the application software's recording monitor function is set off for each channel.	
		SCSI	Make sure that the SCSI bus is terminated correctly.
			Check the SCSI connections.
		Hard disk	Make sure that you do not have too many devices connected to the SCSI bus.
Make sure that the disk's access time is sufficient.			
		Check for disk fragmentation, and run a defragmentation utility if necessary.	

Problem	Action
Payback is distorted.	Use high-quality cables for the ANALOG OUT and DIGITAL OUT connections.
	Relatively slow hard disks may introduce noise during playback. If you are having this problem, try reducing the number of channels used for playback.
Playback is delayed.	Check for disk fragmentation, and run a defragmentation utility if necessary.
	The CBX-D3 may be receiving inappropriate MIDI messages. Avoid sending messages that are unrelated to CBX-D3 operation.
Cannot record.	Check remaining hard disk capacity.
	Check for disk fragmentation, and run a defragmentation utility if necessary.
	Make sure that the SAMPLING FREQ setting is the same on the CBX-D3 and the controlling software. If after starting up the controlling software, you change some CBX-D3 settings via MIDI or another program, the controlling software's SAMPLING FREQ setting may not match that of the CBX-D3.
	Make sure that the controlling software's recording monitor function is set on.
Audio track volume doesn't function.	Check the MIDI cable connections.
	Check the MIDI configuration on the application software.
Pitchbend doesn't work during playback in Sync Mode	The CBX-D3 disables pitchbend operation during Sync Mode in order to prevent potential synchronization problems.
The CBX-D3 does not receive MIDI data. (The MIDI indicator fails to come on.)	Make sure that the controlling software's MIDI configuration is correct. (The MIDI indicator will light up if MIDI data is being received.)

## 10 CBX-D3 Specifications

<b>Data format</b>		16-bit PCM (Playback of 8-bit format is also supported.)
<b>Channels</b>		4-channel system: 2-channel recording (max.) 4-channel playback (max.) (Simultaneous recording/playback is supported.)
<b>Sampling frequencies</b>		22.05kHz, 32kHz, 44.1kHz, 48kHz (Supports simultaneous playback of files recorded at different sampling frequencies.)
<b>File formats</b>		Monaural, 2-channel interleave, 4-channel interleave
<b>A/D converter</b>		16-bit linear $\Delta \Sigma$ modulation
<b>D/A converter</b>		18-bit oversampling $\Delta \Sigma$ modulation
<b>Digital Out</b>		Consumer format Channels 1 and 3 mixed and output as "L"; Channels 2 and 4 mixed and output as "R".
<b>Indicators</b>	<b>SAMPLING FREQ</b>	4 orange LEDs: 48kHz, 44.1KHz, 32KHz, 22.05kHz
	<b>INPUT LEVEL</b>	3-segment LED $\times$ 2 channels CH1: CLIP (red), -6 (orange), -24 (green) CH2: CLIP (red), -6 (orange), -24 (green)
	<b>OUTPUT MONITOR</b>	1-point variable brightness LED $\times$ 4 channels
	<b>SCSI Status</b>	1 green/red LED
	<b>MIDI Message</b>	1 green LED
<b>Controls</b>	<b>INPUT LEVEL <math>\times</math> 2</b>	Independent volume controls for channels 1 and 2
	<b>VOLUME</b>	Headphone volume adjustment
	<b>Power switch</b>	On/Off
	<b>SCSI ID selector</b>	0 to 7
<b>Connectors</b>	<b>MIC 1, 2</b>	1/4" phone jack $\times$ 2
	<b>PHONES</b>	1/4" stereo phone jack $\times$ 1
	<b>ANALOG IN 1,2 [LINE]</b>	1/4" phone jack $\times$ 2
	<b>ANALOG OUT 1,2,3,4</b>	1/4" phone jack $\times$ 4
	<b>DIGITAL OUT</b>	RCA (phono) jack $\times$ 1
	<b>MIDI IN/OUT</b>	5-PIN DIN $\times$ 2
<b>Input/Output</b>	<b>SCSI</b>	50-pin Amphenol $\times$ 2 (ANSI $\times$ 3.131-1986)
	<b>MIC</b>	Nominal -60dBm
	<b>ANALOG IN (LINE)</b>	Nominal -20dBm
	<b>ANALOG OUT</b>	Nominal -20dBm
	<b>DIGITAL OUT</b>	0.5Vp-p/75 $\Omega$
<b>Power adaptor</b>		DC 12V/1.5A; PA-5B or recommended equivalent
<b>Dimensions</b>		1U rack size: 480mm(W) $\times$ 45mm(H) $\times$ 284mm(D) [18.9" $\times$ 1.8" $\times$ 11.2"] (Width figure includes rack mounting brackets; depth figure includes control knobs)
<b>Weight</b>		3.1kg [6.8lb] (excluding AC adaptor)
<b>Accessories</b>		PA-5B AC adaptor (or equivalent) 1U rack mounting brackets $\times$ 2 (attached) Owner's manual User Registration Card

Specifications are subject to change without notice.



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