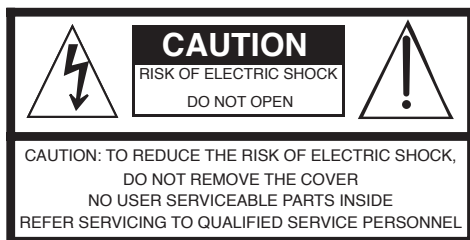


PC3x

Service Manual



©2008 All rights reserved. Kurzweil® is a product line of Young Chang Co., Ltd. Young Chang®, Kurzweil®, and PC3® are trademarks of Young Chang Co., Ltd. All other products and brand names are trademarks or registered trademarks of their respective companies. Product features and specifications are subject to change without notice.



The lightning flash with the arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

IMPORTANT SAFETY & INSTALLATION INSTRUCTIONS

INSTRUCTIONS PERTAINING TO THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS

WARNING: When using electric products, basic precautions should always be followed, including the following:

1. Read all of the Safety and Installation Instructions and Explanation of Graphic Symbols before using the product.
2. This product must be grounded. If it should malfunction or break down, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This product is equipped with a power supply cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet which is properly installed and grounded in accordance with all local codes and ordinances.
DANGER: Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Do not modify the plug provided with the product - if it will not fit the outlet, have a proper outlet installed by a qualified electrician. Do not use an adaptor which defeats the function of the equipment-grounding conductor. If you are in doubt as to whether the product is properly grounded, check with a qualified serviceman or electrician.
3. **WARNING:** This product is equipped with an AC input voltage selector. The voltage selector has been factory set for the mains supply voltage in the country where this unit was sold. Changing the voltage selector may require the use of a different power supply cord or attachment plug, or both. To reduce the risk of fire or electric shock, refer servicing to qualified maintenance personnel.
4. Do not use this product near water - for example, near a bathtub, washbowl, kitchen sink, in a wet basement, or near a swimming pool, or the like.
5. This product should be used only with a stand or cart that is recommended by the manufacturer.
6. This product, either alone or in combination with an amplifier and speakers or headphones, may be capable of producing sound levels that could cause permanent hearing loss. Do not operate for a long period 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.

7. The product should be located so that its location or position does not interfere with its proper ventilation.
8. The product should be located away from heat sources such as radiators, heat registers, or other products that produce heat.
9. The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.
10. This product may be equipped with a polarized line plug (one blade wider than the other). This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace your obsolete outlet. Do not defeat the safety purpose of the plug.
11. The power supply cord of the product should be unplugged from the outlet when left unused for a long period of time. When unplugging the power supply cord, do not pull on the cord, but grasp it by the plug.
12. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
13. The product should be serviced by qualified service personnel when:
 - A. The power supply cord or the plug has been damaged;
 - B. Objects have fallen onto, or liquid has been spilled into the product;
 - C. The product has been exposed to rain;
 - D. The product does not appear to be operating normally or exhibits a marked change in performance;
 - E. The product has been dropped, or the enclosure damaged.
14. Do not attempt to service the product beyond that described in the user maintenance instructions. All other servicing should be referred to qualified service personnel.
15. **WARNING:** Do not place objects on the product's power supply cord, or place the product in a position where anyone could trip over, walk on, or roll anything over cords of any type. Do not allow the product to rest on or be installed over cords of any type. Improper installations of this type create the possibility of a fire hazard and/or personal injury.

RADIO AND TELEVISION INTERFERENCE

WARNING: Changes or modifications to this instrument not expressly approved by Young Chang could void your authority to operate the instrument.

IMPORTANT: When connecting this product to accessories and/or other equipment use only high quality shielded cables.

NOTE: This instrument has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This instrument generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this instrument does cause harmful interference to radio or television reception, which can be determined by turning the instrument off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the instrument and the receiver.
- Connect the instrument into an outlet on a circuit other than the one to which the receiver is connected.
- If necessary consult your dealer or an experienced radio/television technician for additional suggestions.

NOTICE

This apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

AVIS

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

SAVE THESE INSTRUCTIONS

Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any of the ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.



11. Only use attachments/accessories specified by the manufacturer.
12. Use only with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type (CR2032).
15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Warning - To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.

To completely disconnect this equipment from the AC Mains, disconnect the power supply cord plug from the AC receptacle.

Kurzweil International Contacts

Contact the Kurzweil office listed below to locate your local Kurzweil representative.

Kurzweil Music Systems

19060 S. Dominies Hills Drive

Rancho Dominguez

California 90220 USA

Telephone: (310) 637-2000

Fax: (310) 637-2025

<http://www.kurzweilmusicsystems.com>

Kurzweil Co., LTD

iPark Building #102, Floor 9

Jeongja-Dong 9, Bundang-Gu

Soungnam-Shi, Gyeonggi-Do 463-859

South Korea

<http://www.ycpiano.co.kr>

<http://www.youngchang.com>

Chapter 1 Introduction

Notes, Cautions, Warnings	1-1
Rear Panel Features.....	1-1
PC3x Front Panel	1-3
Front Panel Features	1-3
Wheels Assembly (not shown).....	1-5

Chapter 2 Diagnostics

Diagnostic Tests	2-1
Entering Diagnostics.....	2-1
LCD and Front Panel Buttons	2-2
Test Results.....	2-2
Diagnostic Test Modes.....	2-3
Run	2-3
Loop	2-3
Continuous.....	2-3
Burn-in loop	2-3
Description of Tests.....	2-4
SDRAM Refresh	2-4
Flash Memory	2-4
MARA Validity Check.....	2-4
MARA Communications.....	2-4
Expansion DIMM Check.....	2-5
MIDI UART.....	2-5
External Card	2-6
MARA Delay RAM.....	2-6
MARA Sound ROM.....	2-6
Audio Output	2-7
Diagnostic Version 0.20 or earlier	2-7
Sine Wave Test.....	2-8

Chapter 3 Disassembly/Assembly

Introduction	3-1
Notes, Cautions, Warnings	3-1
Cables, Connectors.....	3-1
Cables	3-1
Cable Routing.....	3-1
Required Tools and Materials.....	3-1
Opening the PC3x	3-2
PC3x Bottom	3-2
Removing the Top Enclosure.....	3-3
Replacing the Top Enclosure	3-5
Closing the PC3x	3-6
Top Enclosure.....	3-7
Removing the Enclosure Support Wall.....	3-8
Replacing the Enclosure Support Wall.....	3-8
Removing the Connector Board.....	3-9
Replacing the Connector Board	3-10
Removing the Slider Board.....	3-11
Replacing the Slider Board	3-12

Removing the LCD Board	3-13
Replacing the LCD Board	3-14
Removing the Front Panel Board	3-14
Replacing the Front Panel Board	3-16
Removing the Engine Board	3-17
Replacing the Engine Board	3-18
Removing the USB/xD Daughtercard	3-18
Replacing the USB/xD Daughtercard	3-18
Removing the Wheels Assembly	3-19
Replacing the Wheels Assembly	3-19
PC3x Keyboard Assembly	3-20
Removing the PC3x Keyboard Assembly	3-20
Replacing the PC3x Keyboard Assembly	3-21
Removing Keys	3-22
Natural/White Key	3-22
Removing Natural/White Keys	3-23
Removing Sharp/Black Keys	3-23
Replacing a Sharp Key	3-23
Replacing a Natural/White Key	3-24
Servicing the Keyboard Contact Boards	3-24
Removing the Treble Contact Board	3-24
Replacing the Treble Contact Board	3-24
Removing the Bass Contact Board	3-24
Replacing the Bass Contact Board	3-25
Connecting the Keyboard Contact Boards	3-25
Removing the Keyboard Contact Strips	3-25
Replacing the Keyboard Contact Strips	3-25

Chapter 4 Troubleshooting & Maintenance

Introduction	4-1
Cables, Connectors	4-1
Cables	4-1
Cable Routing	4-1
Surface-Mount Devices	4-1
Required Tools and Materials	4-1
Boot Loader	4-2
Entering the Boot Loader	4-2
Resets	4-2
Hard Reset	4-2
Soft Reset	4-2
Saving User Data	4-3
Saving to an xD Card	4-3
Saving to a Computer	4-3
Software Updates	4-4
Updating with an xD Card	4-4
Updating via Computer	4-5
Rebuilding the Internal NAND Flash Memory	4-6
Rebuilding with an xD Card	4-6
Rebuilding via a Computer	4-7
Boot EPROM	4-9
Removing the EPROM	4-9

Replacing the EPROM.....	4-9
Replacing the Battery.....	4-10
Accessing the Battery.....	4-10
Removing the Battery.....	4-10
Installing the Battery.....	4-10
Scanner Tests.....	4-11
Front Panel Buttons.....	4-11
Alpha Wheel.....	4-12
Front Panel Sliders.....	4-12
Right Main Output.....	4-12
Switch Pedals 1, 2, and 3.....	4-12
Continuous Control Pedal 1 and 2.....	4-12
Wheels.....	4-13
Adjusting the Pitch Wheel Center.....	4-13
Keyboard.....	4-13
Adjusting Key Pressure Sensitivity.....	4-13
Power Problems.....	4-14
Dead: LEDs, LCD backlight, and xD Card socket not lit.....	4-14
Audio Problems.....	4-14
No Audio.....	4-14
Front Panel Problems.....	4-15
LCD not lit.....	4-15
LCD lit, no characters.....	4-15
Buttons, Sliders or Controllers not working.....	4-15
Keyboard Problems.....	4-16
Dead Keyboard.....	4-16
Dead Note(s) or no velocity sensitivity.....	4-16
One or More in a Section.....	4-16
PC3x Interconnect Diagram.....	4-17
Converting the Voltage.....	4-18
Accessing the Fuses.....	4-18
The Fuse Holder.....	4-19
Using 5 mm X 20 mm Fuses.....	4-21
Replacing the Fuse Holder.....	4-21

Chapter 5 Parts Lists

PCB & Sub Assemblies.....	5-1
Engine Board.....	5-1
Connector Board.....	5-4
Front Panel Board.....	5-6
Slider Board.....	5-7
Engine Board–USB/xD Daughtercard.....	5-7
Button Board.....	5-8
Wheels Assembly.....	5-8
Keyboard Assembly.....	5-8
Miscellaneous.....	5-9

Chapter 6 Schematics

Engine Board Assembly–SH7705 CPU and Memory (1 of 9).....	6-3
Engine Board Assembly–MARA 2 (2 of 9).....	6-4

Engine Board Assembly–MARA 1 (3 of 9).....	6-5
Engine Board Assembly–MARA Clocks, Delay Memory Interface (4 of 9).....	6-6
Engine Board Assembly–Sound ROM (5 of 9)	6-7
Engine Board Assembly–ROM DIMMs, SmartMedia Interface, LCD, etc. (6 of 9)	6-8
Engine Board Assembly–DAC, Main Outs (7 of 9)	6-9
Engine Board Assembly–Aux and Headphone Outs (8 of 9)	6-10
Engine Board Assembly–Mictors, CPLD, Power (9 of 9)	6-11
Connector Board–M38869 Scanner (1 of 4).....	6-12
Connector Board–MIDI, Pedals, Ribbon, LCD Contrast (2 of 4).....	6-13
Connector Board–Power Supply, Audio (3 of 4).....	6-14
Connector Board–Sample Rate Converter (4 of 4).....	6-15
Front Panel Board–Front Panel Misc. Buttons And LEDs (1 of 2).....	6-16
Front Panel Board–Front Panel Bank & Program Buttons & LEDs (2 of 2)	6-17
Slider Board.....	6-18
Wheels Board–Wheels & AT	6-19
Engine Board–USB/xD Daughtercard	6-20

Chapter 1

Introduction

This chapter provides the service technician with a layout of the front and rear panel features, as well as a brief explanation of their functions. For in-depth descriptions of the many features the PC3x includes, consult the *Getting Started Guide*.



Warning: If possible, save all user programs and setups before disassembly. For instructions, refer to the *Boot Loader* in Chapter 4, page 4-2.

Notes, Cautions, Warnings

Please pay special attention to all Notes, Cautions, and Warnings used throughout this manual as they not only point out specific instructions, but also alert you to variations between manufactured units.

A brief description of these symbols follows:



Note: Provides additional information, indicates differences between models, and emphasizes specific instructions.



Caution: Highlights areas to instruct you to proceed cautiously so that damage does not occur to the unit or individual components.



Warning: Alerts you so that damage does not occur to yourself, others, or external equipment and devices.

Rear Panel Features

Storage—Use this slot to insert an xD memory card to update software, back up, and share files.

USB Port—Use the USB Port to send and receive MIDI or to connect to a computer for file transfer.

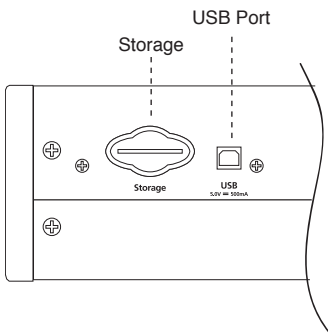


Figure 1-1 PC3x rear panel, left end

MIDI Select Switch—Slide switch to select the operation of the MIDI Thru/Out port. This switch is recessed into the rear panel so that it cannot be accidentally changed.

MIDI Ports—In, Thru/Out, and Out ports to connect the PC3x to other MIDI devices to receive, pass, and send MIDI data.

Display—Rotary potentiometers to adjust the brightness and contrast of the LCD for the best visibility.

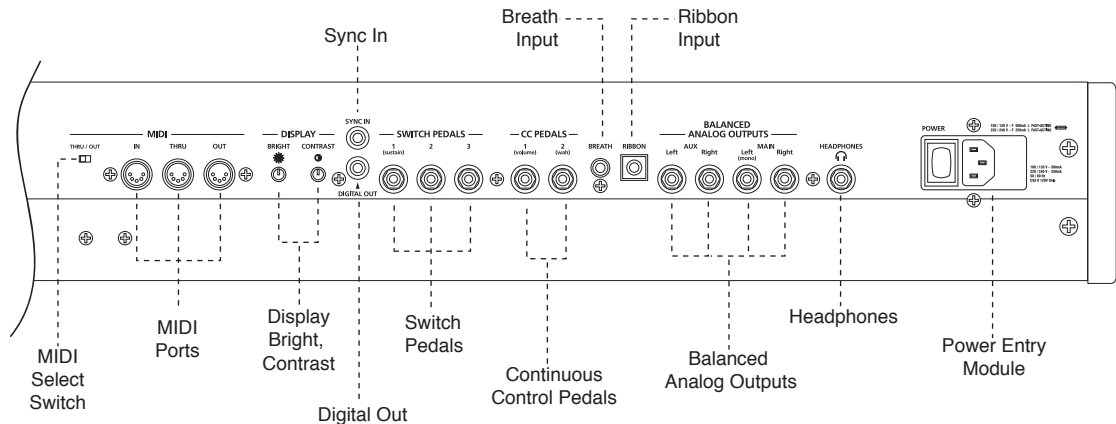


Figure 1-2 PC3x rear panel, right end

Sync In—This RCA jack allows the PC3x to receive digital clock signals when it is slaved to another device.

Digital Out—RCA jack to connect to another device with an AES or S/PDIF input via a 75Ω coaxial cable.

Switch Pedals—Three 1/4" jacks to connect switch pedals that can be assigned to control operations such as sustain, sostenuto, etc. (use 1/4" tip/sleeve).

Continuous Control Pedals—Two 1/4" jacks to connect pedals that can be assigned to control operations such as volume, expression, etc. (use 10KΩ linear taper potentiometer, 1/4" tip/ring/sleeve, wiper to tip).

Breath Input—A 3.5mm jack to connect a standard breath controller to send standard MIDI Breath messages.

Ribbon Input—Modular jack to connect the Kurzweil Ribbon Controller option.

Balanced Analog Outputs—Four 1/4" balanced audio output jacks. Use the Main outputs, left (mono) and right, to connect to an amplifier, mixer or sound system. Use the Aux outputs for monitoring or other operations. They duplicate the Main outputs, but are always in stereo.

Headphones—Standard 1/4" jack to connect headphones.

Power Entry Module—includes the power switch, AC receptacle, and the fuse holder/voltage select compartment. (See Chapter 4, page 4-18 for instructions to change the voltage setting.)

PC3x Front Panel

Front Panel Features

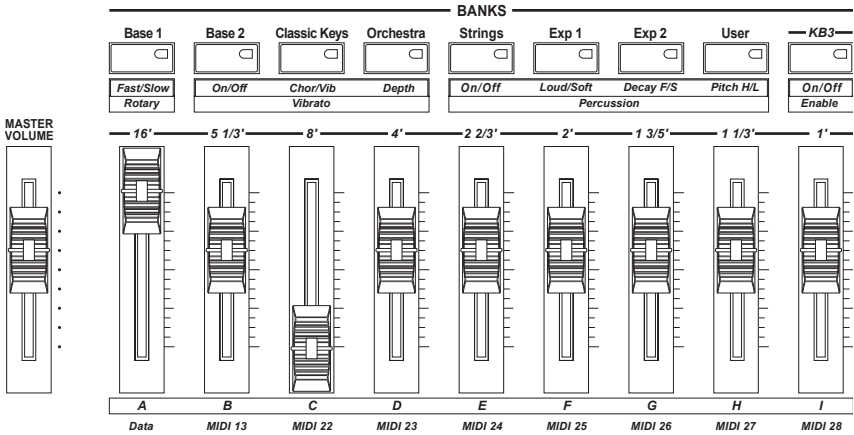


Figure 1-3 Master Volume, Bank buttons, Sliders

Master Volume—Slider to adjust the overall volume.

Bank buttons—Use these buttons to select different banks of programs, then select an individual program using the **Category** and **Program** buttons. The labeling above the button indicates the program. In KB3 mode, these buttons have different functions. Their labeling is below the **Bank** buttons.

Sliders—The operation of the sliders depends on which mode is active. In KB3 mode, these sliders emulate the drawbars of an organ. They are labeled as follows: above each slider for KB3 mode, and below when used for data and MIDI controllers.

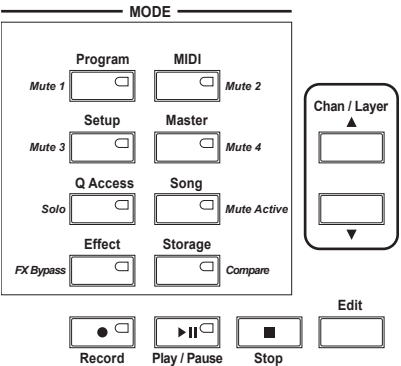


Figure 1-4 Mode, Edit, Chan/Layer and record function buttons

Mode buttons—use these buttons to select one of the eight available operating modes. The additional labeling of these buttons indicate that they function differently depending on the current mode or editor.

Chan/Layer buttons—depending on the current editor, use these buttons to scroll through layers, presets, values, and zones.

Record, Play/Pause, and Stop buttons—use these buttons to activate the sequencer to record and playback songs.

Edit button—use this button to enter the editor or the current mode to modify a selected object or parameter.

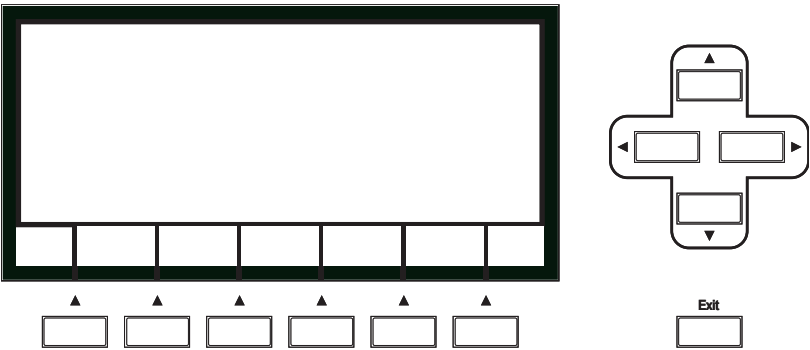


Figure 1-5 LCD and Soft, Cursor, and Exit buttons

Display—Angled 240 x 64, backlit graphic LCD.

Soft buttons—use these buttons to select an action or item shown directly above the button in the bottom line of the display.

Cursor buttons—use these buttons navigate the cursor in the display.

Exit button—press this button to leave the current editor.

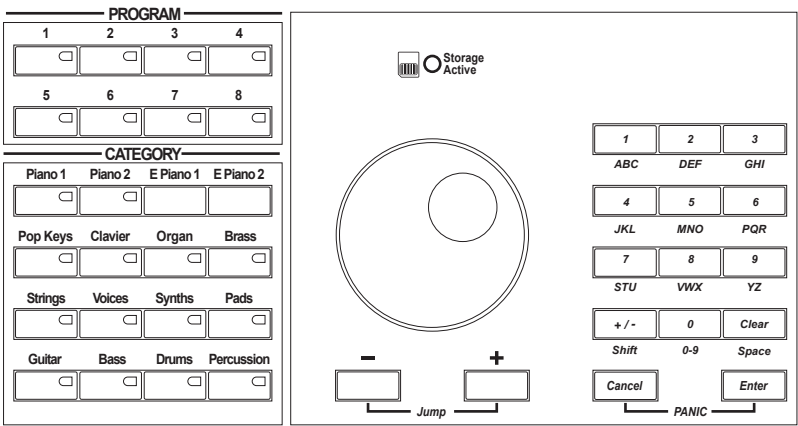


Figure 1-6 Program, Category, Alpha wheel and Alphanumeric buttons

Category and Program buttons—use these buttons to first select a **Category**, then select one of the eight **Program** buttons.

Alpha Wheel—use the Alpha Wheel to increase or decrease a value by one or several increments.

Plus (+) and **Minus (-)** buttons—these buttons operate similar to the Alpha Wheel. Pressing the **Plus (+)** or **Minus (-)** button allows you to increase or decrease a value by one. Pressing these buttons simultaneously, selects the **Jump** function.

Alphanumeric Keypad—use these buttons to enter characters (both uppercase and lowercase), numbers, and spaces. Pressing these buttons simultaneously, selects the **Panic** button. Select the **Panic** button to send an All Notes/ All Controllers Off message on all 16 channels.

Storage Active LED—this blue LED is lit when an xD daughter card is installed and there is activity. (Do not remove the xD card when the blue LED is lit.)

Wheels Assembly (not shown)

Pitch and Mod Wheels—use these wheels to vary modulation and pitch. In some programs, the Mod Wheel can be used for other functions.

ARP button—use this button to active the Arpeggiator.

SW button—this button can be programmed for a variety of functions.

Chapter 2

Diagnostics

Diagnostic Tests

The following lists the diagnostic tests available for the PC3x.



Note: Throughout this manual many references are made to the MARA 1 and MARA 2 ICs. For service personnel unfamiliar with the PC3x, MARA is the name given to the two Kurzweil Custom Sound ICs.

- SDRAM Refresh
- Flash Memory
- MARA Validity Check
- MARA Communications
- Exp DIMM Check
- MIDI UART
- External Card
- MARA Delay RAM
- MARA Sound ROM
- Audio Output



Warning: If possible, save all user programs and setups before entering diagnostics or performing maintenance or repair. For instructions, refer to *Saving User Data* in Chapter 4, page 4-2.

Entering Diagnostics

1. Apply power to the unit. When the ******Welcome to the Kurzweil PC3****** message appears in the LCD, quickly press and release the **Exit** button. The LCD should display the following:

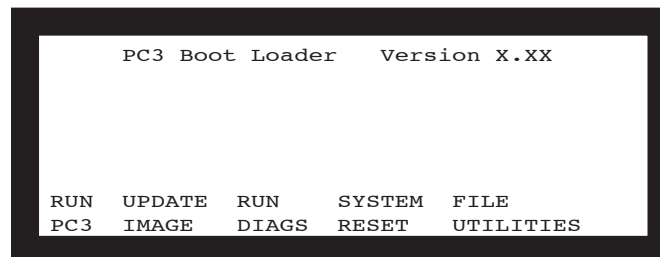


Figure 2-1 LCD example, Boot Loader

2. Press the soft button below **RUN DIAGS** in the LCD.

3. The LCD flashes the message: **Running ROM-based diagnostics.**
4. The LCD displays the following:

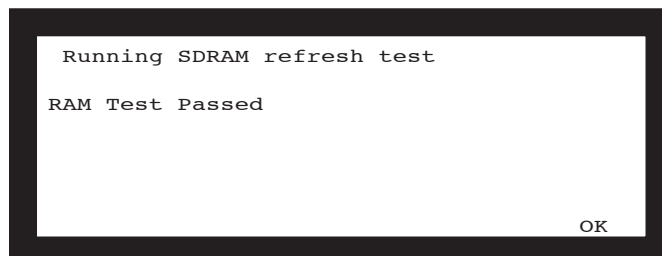


Figure 2-2 LCD example, diagnostic main menu

5. The bottom line in the display shows the four test modes. Press the soft button below the test mode to run the tests.

LCD and Front Panel Buttons

The LCD displays the list of tests, test modes, actions, and test results.

Press the **Left**, **Right**, **Up**, or **Down** cursor buttons or turn the Alpha Wheel to navigate through the available tests.

Use the soft buttons located below the LCD to select different test modes or actions.

Press the **Exit** button to return to the Boot Loader.

Test Results

At the completion of an individual test, the LCD displays the results of the test. Figure 2-3 shows an example of the display for the SDRAM refresh test.

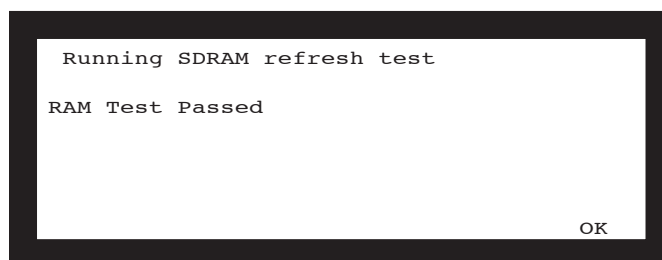


Figure 2-3 LCD example, SDRAM refresh test

Diagnostic Test Modes

Run

The run test mode allows you to select an individual test, or to step through and run each available test. To step through the different tests, use the **Left**, **Right**, **Up**, or **Down** cursor buttons or turn the Alpha Wheel. Press the soft button below **RUN** to select the test.

At the completion of a test, whether pass or fail, press the **OK** soft button to exit the test and return to the test menu.

To exit diagnostics, press the **Exit** button to return to the Boot Loader.

Loop

Loop continuously runs an individual test. The number of tests performed and the result is displayed continuously in the LCD. The test continues to run until you press the **Exit** button.

Continuous

Continuous is the same as Loop, but stops if a failure is detected.

Burn-in loop

Burn-in continuously runs the following sequence of tests.

- SDRAM Refresh
- Flash Memory
- MARA Validity Check
- MARA Delay RAM
- MARA Communications
- MARA Sound ROM

If a failure is detected, the test stops and displays the result.

To exit Run Burn-in and return to the Boot Loader, press and hold the **Exit** button.

Description of Tests

SDRAM Refresh

This test verifies the write/read functionality and accuracy of the SDRAM chip (U3) attached to the microprocessor, SH7705 (U1).

A failure of this test indicates a problem with the SDRAM chip or associated circuitry on the Engine Board.

Flash Memory

This test verifies the manufacturer ID and the size of the NAND Flash installed. The test then writes and reads back one or more blocks not occupied by the file system. This test also indicates if the NAND Flash is formatted or unformatted.

A failure of this test may indicate a problem with the with the microprocessor (U1), NAND Flash (U2), Fin CPLD (U45), or related circuitry on the Engine Board.

MARA Validity Check



Note: Throughout this manual many references are made to the MARA 1 and MARA 2 ICs. For service personnel unfamiliar with the PC3x, MARA is the name given to the two Kurzweil Custom Sound ICs.

This tests verifies the proper content of certain read-only registers and the read/write accuracy of certain read/write registers on both MARAs. It also writes and reads back the various register blocks in both MARAs that are implemented as RAM cells.

A failure of this test may indicate a problem with the with the microprocessor (U1), MARA 1 (U11) or MARA 2 (U10), or related circuitry on the Engine Board.

MARA Communications

This test transfers data from one MARA to the other via the SMOOCH interface and checks the accuracy of the data received. All four SMOOCH inputs and outputs are exercised.

This test will likely fail if the MARA Validity Test fails. However if the MARA Validity Test passes and this test fails, it may indicate a bad solder joint underneath one or both MARAs.

Expansion DIMM Check

This test checks to see if a DIMM module is installed in J10 or J11 and confirms the type.

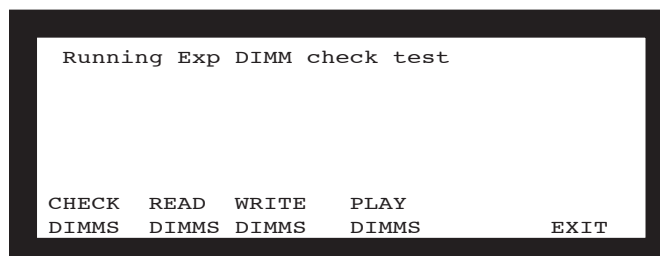


Figure 2-4 LCD example, Exp DIMM check test



Note: There are two types of DIMM modules—one with all four NOR Flash chips present and the other with only two out of the four chips populated. The J10 DIMM socket on the Engine Board can only support the half-populated DIMM version.

Each DIMM module has an upper and lower bank. The half-populated DIMM module has Flash chips installed in the upper bank only. Therefore, this diagnostic will only report results for DIMM 0, High Bank; but will report results for both the High and Low Bank of DIMM 1.

A failure of this test may indicate a problem with the DIMM(s), their installation, soldering of the socket(s), or related circuitry on the Engine Board.

MIDI UART

The MIDI test performs a loop-back of the serial port by sending a 23-byte pattern over the external MIDI link. This test requires a MIDI loop (a MIDI cable that connects two MIDI jacks). The test will fail if a MIDI cable is not connected between two MIDI jacks. Be sure to run this test with MIDI cables connected as follows:

1. Connect a MIDI cable to the MIDI In and MIDI Out jacks and run the test.
2. Connect a MIDI cable to the MIDI In and MIDI Out/Thru jacks and set the MIDI select switch on the rear panel to Out. Run the test.

A failure of this test could be caused by failure of the serial port, other MIDI circuitry, or a problem on the Engine Board.

On the Engine Board check the signal paths from U1, pins 172, 174, 177, and 179 to connector J5.

External Card

This test checks the hardware interface for the xD Card. The test first checks to see if a card is installed; and if so, reads and reports the identifying data.



Note: This test is safe to run on an xD Card that has data on it.

A failure of this test indicates a problem with USB/xD Daughtercard, related circuitry or the Engine Board.

MARA Delay RAM

This is a write/read test to check the Delay RAM connected to MARA 1. The Delay RAM test first checks address and databus connectivity and then reports which bits are not functioning to aid troubleshooting.

Error reporting for this test identifies whether the error is likely to have occurred during writing or during reading. Data value mismatch errors are reported in hexadecimal values starting with "0x" followed by 8 hex digits. If the data value that was ReadBack differs greatly from the value Wrote, it could mean there was an address bit error, or one or more of the control signals are bad.

A failure of this test would indicate a problem with the DDR SDRAM (U13), MARA 1 (U11), or the Engine Board.

MARA Sound ROM

This test calculates and verifies the checksum for each 16 MB section of the on-board Sound (Sample) ROM. It also tests the data and address lines from both MARAs to the Sound ROMs. This test may also report errors when the MARA Validity Test fails. If MARA Validity Test only fails on one of the MARAs, then the other MARA may still pass this test.

```
Running MARA sound ROM test

MARA 1 Sound ROM checksums are correct
MARA 1 Sound ROM data lines are correct
MARA 1 Sound ROM addr lines are correct
MARA 2 Sound ROM checksums are correct
MARA 2 Sound ROM data lines are correct
OK
```

Use the **Down** cursor button or the Alpha wheel to scroll down to the next line of the test result.

Figure 2-5 LCD example, MARA Sound ROM test

A failure of this test may indicate a problem with a Sound ROMs (U20, U21, U22, or U23), or the Engine Board.

Audio Output

This is not a test that fails. It is an interactive test for the entire audio chain. However for this test to pass reliably, the MARA Validity and MARA Delay RAM tests should pass. The software creates waveforms (sine and sawtooth) and stores them in the Delay RAM. Therefore, MARA 1 and its Delay RAM need to be functioning for this test to produce a clean audio waveform.

When you select this test, the LCD displays the following:

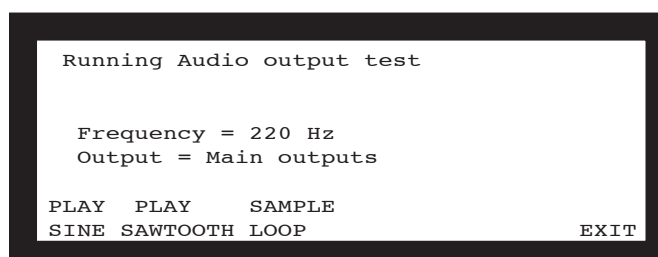


Figure 2-6 LCD example, Audio output test



Note: If the diagnostic version is earlier than 0.20, this test is only useful to check the polarity of the Main Output audio signals. Use the *Sine Wave Test* on page 2-8 for audio level and distortion tests. If the diagnostic version is 0.20 or later, follow the on-screen instructions for use.



Warning: This test produces loud sine waves. Before beginning this test, turn the volume slider on the PC3x and your sound system down to minimum.

Diagnostic Version 0.20 or earlier

To use diagnostic Version 0.19 or earlier to check amplitude, polarity, and frequency response flatness; an oscilloscope is needed.

1. Move the Volume slider to maximum, then press the **Play Sawtooth** soft button.
2. A 275 Hz sawtooth with a peak amplitude of +/-0.30V will appear on the Main Left and Main Right Outputs.

If the polarity is correct, the sawtooth ramp will be positive-going at the Tip contact of each jack and negative-going at the Ring contact.

If the frequency response is flat, the ramp will be perfectly straight except for three tiny ripples just before and after the flyback part of the signal.

The volume slider does not act normally during the test so leave it set to maximum. Only the Main outputs will be driven. When finished checking the Main Output signals, press the **Exit** soft button to exit the diagnostic.

The **Play Sine** soft button will produce a sine wave, also 0.30V peak amplitude, but it is not pure and thus unsuitable for distortion measurements. Use the *Sine Wave Test* that follows.

Do not press the **Sample Loop** soft button. It will hang and require a power cycle to recover.

Sine Wave Test

For a pure sine wave that exercises the full dynamic range of the PC3x, press the **Run PC3** soft button to exit diagnostics and return to normal operation. In Program mode, use the numeric keypad and select program 1000, Sine Wave.



Warning: This test can produce a very high level (20-30dB higher than normal which can be damaging), and must be activated in order to play. Follow Steps 1–5 to activate and run the test.

1. Position the volume slider and sliders 1-9 to minimum.
2. Use the numeric keypad and select program 1000, Sine Wave.
3. Press the **SW1** button located directly above the Mod Wheel.
4. Play C4 (Middle C) to produce a 261 Hz sine wave at all of the outputs.
5. Move the volume slider up slowly.



Note: Do not touch Slider 1 or the amplitude may change.

NOTE	FREQUENCY		AMPLITUDE (Tip or Ring to Sleeve)	
	Hz	Vrms	Vp-p	dBm
D2	20.6	3.08	4.35	+12.0
F#2	32.7	3.21	4.54	+12.3
C3	65.4	2.80	3.95	+11.2
F#3	130.8	2.80	3.95	+11.2
C4	261.6	2.80	3.95	+11.2
F#4	523.2	2.80	3.95	+11.2
C5	1046.5	2.77	3.92	+11.1
F#5	2092.8	2.80	3.95	+11.2
C6	4186.0	2.80	3.95	+11.2
F#6	8371.2	2.81	3.97	+11.2
C7	16744.0	3.00	4.24	+11.8
D7	21096.1	2.77	3.92	+11.1

Table 2-1 Frequency and Amplitude Values

Notes

1. Slider 1 is a fine amplitude adjustment. It has a range from 63% of the values listed in Table 2-1 to beyond clipping.
2. Clipping level is specified to be 4.25 Vrms, 6.00Vp-p, +14.8 dBm unbalanced, +20.8 dBm balanced at the Main and Aux Outputs.
3. The Headphones Output level is twice that of the Line Outputs. Clipping is approximately 7.0 Vrms or 20.0Vp-p.
4. The keys are not velocity sensitive.
5. Keys not in the table produce other frequencies from a minimum of 6.49 Hz (E1) to a maximum of 21096 Hz (D7).
6. The frequency ratio from one key to the next is 1.122462.

Diagnostics

Description of Tests

Chapter 3

Disassembly/Assembly

Introduction

This chapter contains all the procedures for the disassembly and reassembly of the PC3x. There are three main sections: *Opening the PC3x, Top Enclosure*, and the *PC3x Keyboard Assembly*.



Warning: If possible, save all user programs and setups before disassembly. For instructions, refer to *Boot Loader* in Chapter 4, page 4-2.

Notes, Cautions, Warnings

Please pay special attention to all Notes, Cautions, and Warnings as they not only point out specific instructions, but also alert you to variations between manufactured units.

Cables, Connectors

Cables

All cables with connectors are keyed, and therefore cannot be reversed.



Warning: Some units may have a small PC board installed on the flat ribbon cable connected to J202 on the Front Panel Board. Neither the socket nor the pins on this board are keyed. See page 3-14 and page 3-16 for further information.

Cable Routing

In some cases, tape fastens cables to printed circuit boards or the top and bottom enclosures. When disconnecting cables, always peel back the tape from one side so that the tape remains properly positioned.

Required Tools and Materials

- No. 1 Phillips head screwdriver
- No. 2 Phillips head screwdriver
- Small flat screwdriver
- Dowel (3mm diameter)
- Needle-nose pliers
- Small blunt-end tool (Q-Tip, toothpick, etc.)
- USB cable
- xD Card
- Foam blocks

Opening the PC3x

PC3x Bottom

Refer to Figure 3-1. Arrows indicate the locations of the enclosure support wall, endcap and rear panel screws.

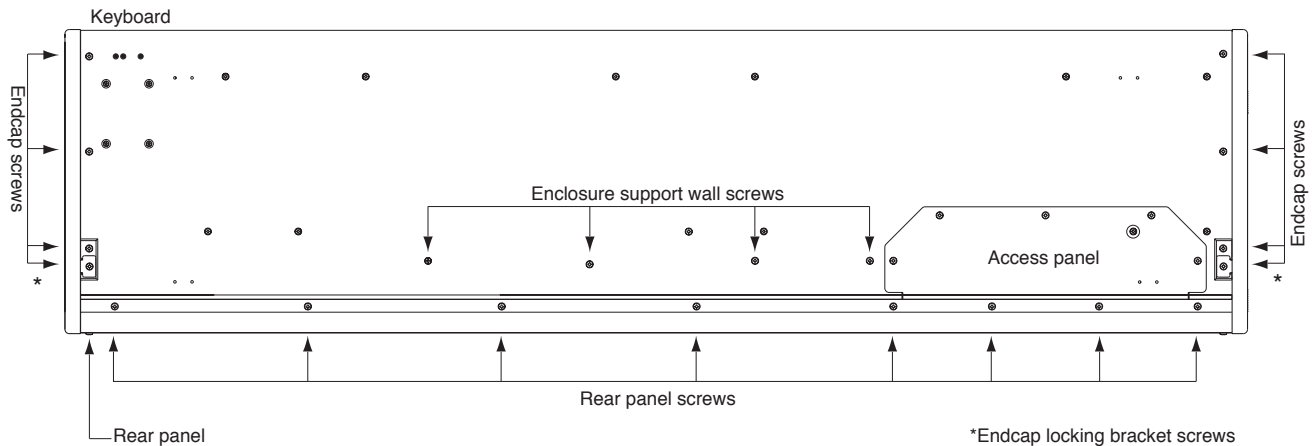


Figure 3-1 PC3x bottom enclosure



Caution: Do not remove the endcap or rear panel screws at this point of the procedure.

1. Tilt the PC3x up and remove the four enclosure support wall screws.
2. Place the unit flat on your work surface.
3. Move the unit so that the rear panel portion of the unit hangs over the edge of your work surface. This gives you access to the eight screws that secure the rear panel portion of the top enclosure to the bottom enclosure. Remove the eight screws.



Note: Two of these screws also secure the rear panel portion of the access panel. It is not necessary to remove the five remaining access panel screws.

4. Slide the unit back onto the work surface.

Removing the Top Enclosure

The following procedure assumes that you have completed Steps 1–4 in *PC3x Bottom*.

Removing the top enclosure requires removing the left and right endcaps. Each endcap includes the endcap, endcap side bracket and endcap locking bracket.

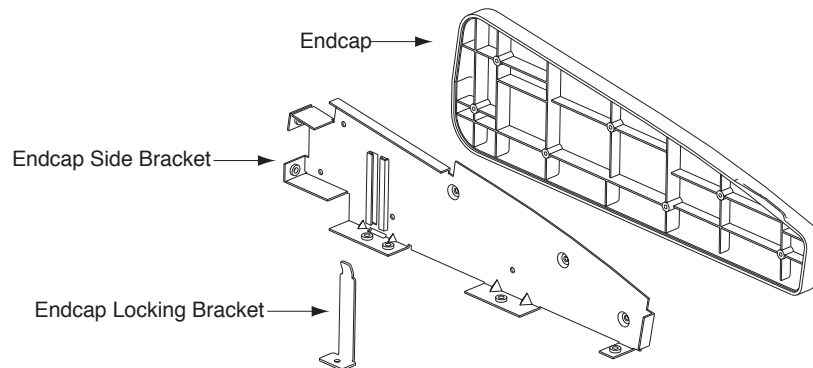


Figure 3-2 Endcap assembly

1. Refer to Figure 3-3.
2. Remove the four screws that secure the endcaps to the rear panel.

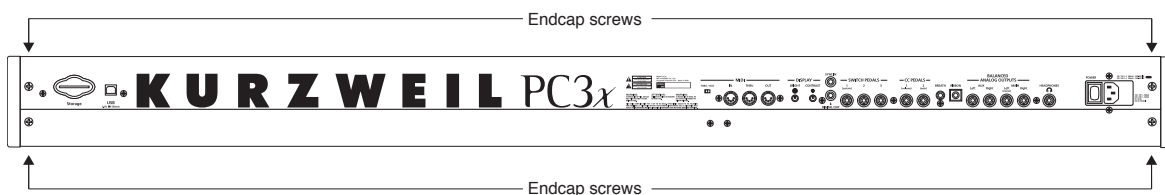


Figure 3-3 PC3x rear panel

3. Refer to Figure 3-1. Move the unit so that one end hangs over the edge of your work surface.
4. Remove the endcap locking bracket screw from the bottom enclosure.



Caution: When you remove the endcap locking bracket screw, the endcap locking bracket may remain loosely in the endcap. However, it can come out of the endcap. When you remove the screw securing the endcap locking bracket, hold it in position so that it does not fall out of the endcap and become lost or damaged.

5. Remove the remaining three screws and set the endcap safely aside.
6. Repeat for the other endcap.

7. Refer to Figure 3-4. The bottom edge of the rear panel and back edge of the bottom enclosure connect to form a lip. The rear panel screws secure the lip.

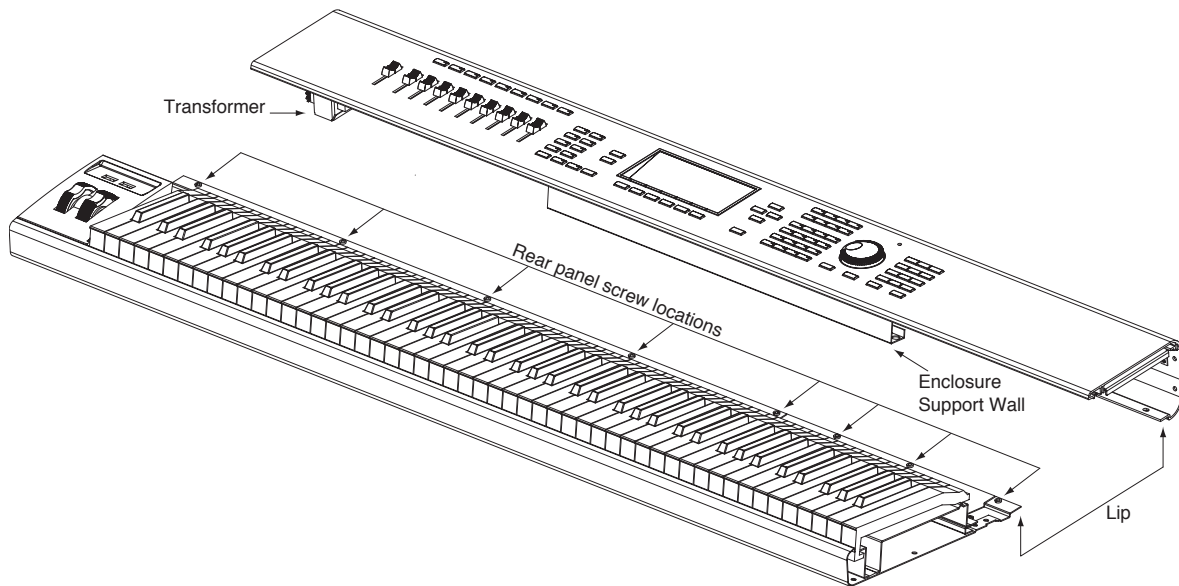


Figure 3-4 **Top and bottom enclosures**



Warning: Be sure to have your work surface prepared. This includes placing foam blocks behind the unit. When the top enclosure is removed, place it on the foam blocks to avoid damaging the Alpha Wheel, control panel buttons, and sliders. The following procedure requires enough room behind the rear of the unit to place the top enclosure face down on your work surface.

8. Grip each end of the top enclosure and rotate it back approximately two inches. This separates the bottom edges of the top enclosure and bottom enclosure.
9. Lift the top enclosure straight up.
10. Turn the top enclosure over and place it face down onto your work surface.



Caution: Table 3-1 lists the cables, by board location, from the top enclosure to the assembly they connect to on the bottom enclosure. You do not need to disconnect these cables.

Top cover Assembly	Bottom Enclosure
Connector Board, Bass	Keyboard Assembly, Bass
Connector Board, Treble	Keyboard Assembly, Treble
Slider Board	Button Board/Wheels Assembly
Connector Board	Wheels Assembly

Table 3-1 Top and bottom enclosure cables

Replacing the Top Enclosure

1. Position the top enclosure behind the bottom enclosure.
2. Move the top enclosure so that the bottom edge of the rear panel is positioned under the bottom enclosure edge. See Figure 3-4 on page 3-4.



Note: Verify that the cables listed in Table 3-1 are lying flat on the bottom enclosure. Be sure that all other cables are tucked between the top enclosure and the enclosure support wall.

3. Hold the top enclosure safely in place and move the unit so that one end of the rear panel edge hangs over the edge of your work surface and install the rear panel screw at that end. Slide the unit back onto your work surface. Repeat for other end.



Warning: Perform Steps 3 and 4 separately. Combining these steps could cause the top enclosure to flip away from the bottom enclosure or drop off of your work surface.

4. Move the unit so that the rear panel edge of the unit hangs over the edge of your work surface and install the remaining screws.

Closing the PC3x



Warning: The following procedure assumes that you have completed Steps 3 and 4 in *Replacing the Top Enclosure*. If you have not completed these steps, do so before continuing.

1. Refer to Figure 3-1. Tilt the unit up and install the four enclosure support wall screws.



Note: In addition to the rear panel screws, the endcap locking bracket secures the endcap to the top enclosure. When the endcap locking bracket is in position, it rests against the endcap clamping bracket located on the underside of the top enclosure. See Figure 3-5.

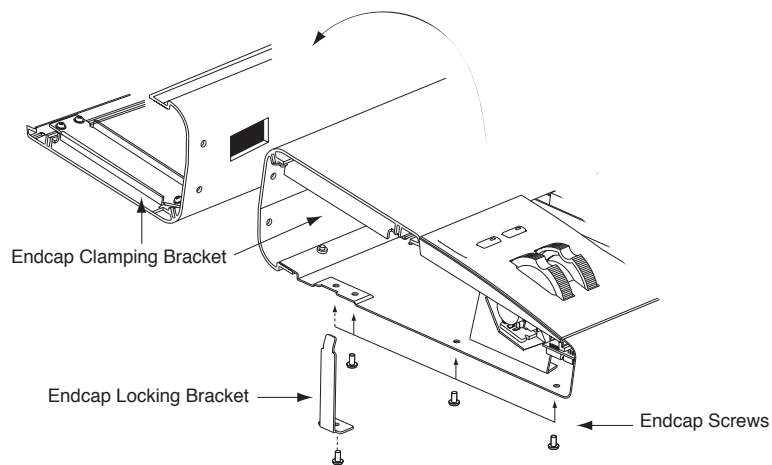


Figure 3-5 Top enclosure, endcap locking and clamping brackets

2. Slide one side of the unit off of your work surface and hold the appropriate endcap and endcap locking bracket in position.
3. Install the endcap locking bracket screw in the bottom enclosure.
4. Install the three remaining endcap screws in the bottom enclosure.
5. Repeat for the other endcap.
6. Refer to Figure 3-3. Install the four endcap screws in the rear panel.

Top Enclosure

The top enclosure includes six boards: Connector, Front Panel, LCD, Slider, Engine, and USB/xD Daughtercard. The enclosure support wall, transformer and AC receptacle are also included on the top enclosure. Figure 3-6 shows the placement of the enclosure support wall on the top enclosure. Figure 3-7 shows the placement of the boards, transformer, and AC receptacle with the enclosure support wall removed.

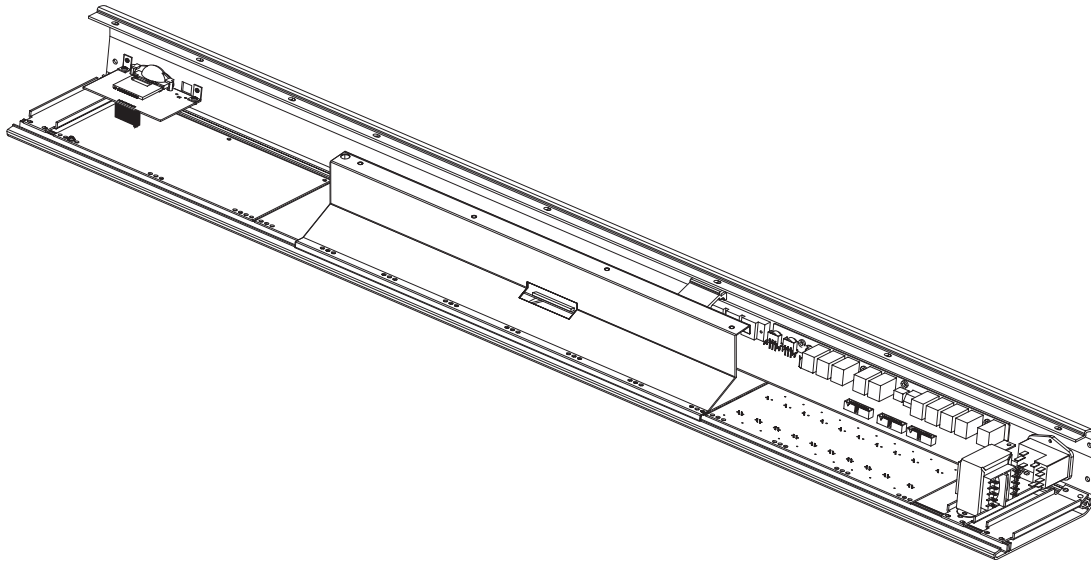


Figure 3-6 Top enclosure, enclosure support wall location

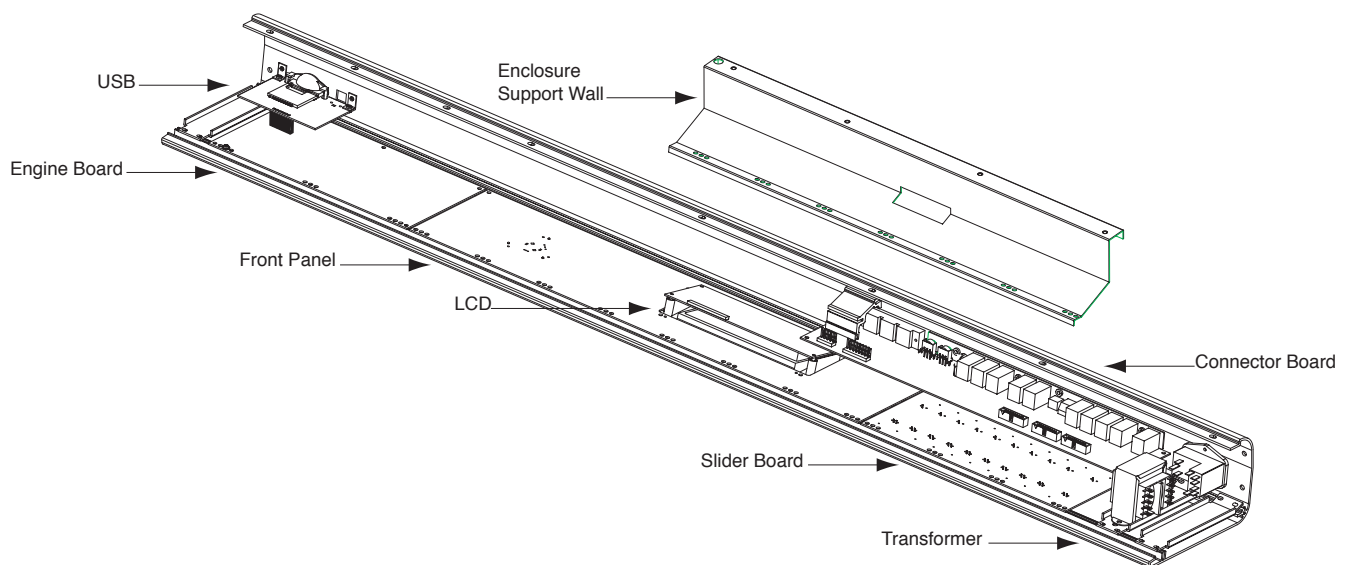


Figure 3-7 Top enclosure, board locations, transformer, and AC receptacle

Removing the Enclosure Support Wall

The shielded cable bundle connecting J302 on the Connector Board to J18 on the Engine Board is routed and taped along the front of the enclosure support wall. Tape also secures the cable bundle to the Slider and Front Panel Boards. Always peel back the tape from one side so that the tape remains properly positioned.



Note: The routing of this cable is important to minimize noise and hum. Be sure to note the placement of the cable so that you position it properly when you reinstall the enclosure support wall.

1. Peel back the tape from one side to free the cable bundle from the enclosure support wall and the Slider Board.
2. Disconnect the cable bundle from J302 on the Connector Board and move the cable bundle away from the enclosure support wall.
3. Remove the seven screws that secure the enclosure support wall to the top enclosure, and remove the enclosure support wall.

Replacing the Enclosure Support Wall

1. Align the center screw holes of the three-hole groupings in the enclosure support wall with the thread marks in the extrusion.
2. Install the seven screws that secure the enclosure support wall to the top enclosure.
3. Secure the cable bundle to the front of the enclosure support wall with the tape.
4. Connect the shielded cable bundle to J302 on the Connector Board and secure it to the Slider Board with the tape.



Note: The routing of this cable is important to minimize noise and hum. Be sure to note the placement of the cable so that you position it properly when you reinstall the enclosure support wall.

Removing the Connector Board

1. Follow the procedure described on page 3-8 to remove the enclosure support wall.
2. Following Steps 3–5, disconnect the cables listed in Table 3-2.

Ref.	Name	Cable Type	Destination
J301	PC3 Power	stranded wire	Engine Board
J303	MIDI/CPU	stranded wire	Engine Board
J304	Front Panel	flat ribbon	Front Panel Board
J305	Slider	stranded wire	Slider Board
J306	Treble	flat ribbon	Keyboard Assembly
J307	Bass	flat ribbon	Keyboard Assembly
J308	Wheels	stranded wire	Wheels Assembly
J324	AC power	stranded wire	Transformer
J325	Digital Audio Out	stranded wire	Engine Board

Table 3-2 Connector Board cables

3. Disconnect the stranded wire cables from J301, J303, and J325 on the Connector Board.



Note: The cables used throughout the PC3x are bundled and routed so that their locations and destinations seem obvious. However, to avoid reversing the Bass and Treble cables when reconnecting, mark one or both cables designating B for Bass and T for Treble.

4. Disconnect the flat ribbon cables from J304, J306, and J307.



Figure 3-8 Cable locations

5. Disconnect the stranded wire cables from J305, J308, and J324.

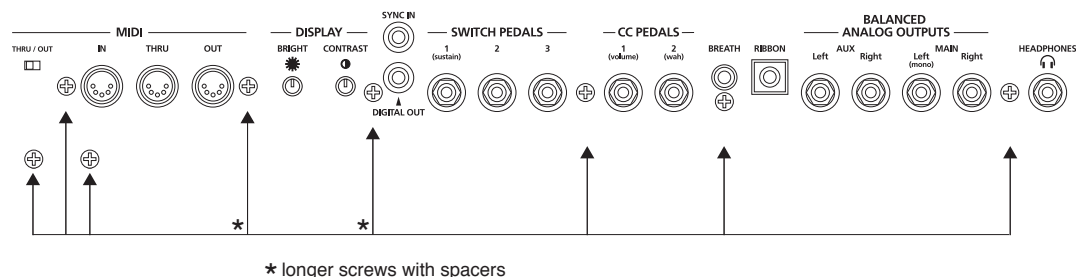


Figure 3-9 Rear panel hardware locations

6. Remove the eight screws that secure the Connector Board to the rear panel. Two screws are longer than the others and have spacers located between the screw and the rear panel. See Figure 3-9 for the locations of the screws and spacers.



Note: Do not remove any other hardware from this portion of the rear panel.

7. Remove the Connector Board.

Replacing the Connector Board

Refer to Figure 3-10. The Connector Board is designed to work with a number of different keyboards. This is determined by the position of a diode(s) on the Connector Board. There are four diode locations, D19 through D22, located between J306 and J307 on the Connector Board. If you are replacing the Connector Board with a new one, determine the location of the diode(s) and be sure the new board matches the board you are removing.

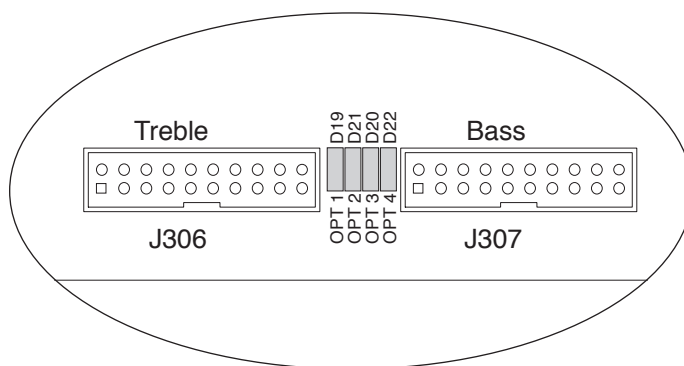


Figure 3-10 Connector Board, diode configuration

1. Hold the Connector Board and position it so that the rear panel jacks, potentiometers, and switches are correctly positioned through the rear panel portion of the top enclosure.
2. Install the eight screws that secure the Connector Board to the rear panel. Be sure to place a spacer and use one of the longer screws at the locations noted in Figure 3-9.

3. Connect the stranded wire cable from the Slider Board to J305 on the Connector Board.
4. Connect the stranded wire cable from the Transformer to J324 on the Connector Board.
5. Connect the stranded wire cable from the Wheels Assembly to J308.
6. Connect the flat ribbon cables from the Keyboard Assembly to J306 and J307 on the Connector Board.
7. Connect the flat ribbon cable from the Front Panel Board to J304 on the Connector Board.



Warning: If you are replacing the Connector Board with a new board, check the flat ribbon cable at location J202 on the Front Panel Board. Some earlier units have a small PC board attached to the flat ribbon cable. If the unit has this small PC Board, check the value of RN10 and RN12 on the new Connector Board. If a 6.8K resistor network is installed in RN10 and RN12, disconnect the flat ribbon cable from J202, remove the small PC Board, and reconnect the cable directly to the Front Panel Board.

8. Connect the stranded wire cables from the Engine Board to J301, J303, and J325 on the Connector Board.
9. Follow the procedure on page 3-8 to install the enclosure support wall.

Removing the Slider Board

1. Follow the procedure described on page 3-8 to remove the enclosure support wall.
2. Follow the procedure described on page 3-9 to remove the Connector Board.
3. Tilt the top enclosure up and remove the ten slider knobs, then lay it flat on your work surface.
4. Following Steps 5 and 6, disconnect the cables listed in Table 3-3.

Ref.	Name	Cable Type	Destination
J303	Slider Bridge	flat ribbon	Front Panel Board
J304	IBBB	stranded wire	Button Board/Wheels Assembly

Table 3-3 Slider Board cables

5. Disconnect the flat ribbon cable from J303.
6. Disconnect the shielded wire cable from J304.



Note: The stranded wire cable connected to location J302 was disconnected following the procedure to remove the Connector Board. It is not necessary to disconnect it from the Slider Board. However, if you are replacing the Slider Board with a replacement board, be sure to disconnect the cable and connect it to the replacement board.

7. Remove the four screws that secure the front panel edge of the Slider Board.

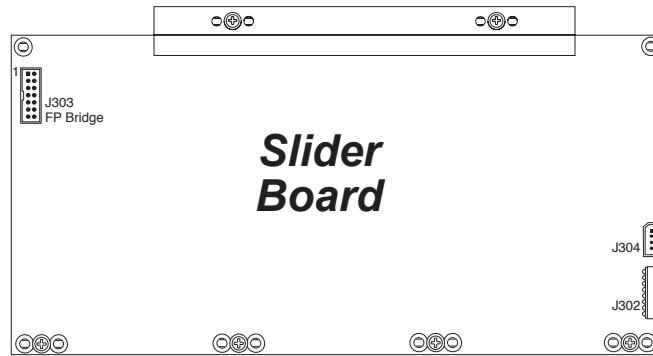


Figure 3-11 Slider Board, screw locations

8. Remove the four screws that secure the two PC board clamps (two screws per clamp). These screws also secure the rear panel edge of the Board.
9. Remove the Slider Board.



Caution: Each switch button cap uses a set of small pegs to mount the cap to a board. The button caps on the Slider Board are mounted individually. If a cap becomes separated from the board, be careful that a peg is not inadvertently broken.

Replacing the Slider Board

1. Position the Slider Board onto the top enclosure.
2. Raise the top enclosure up to verify that the switch button caps and slider shafts are correctly positioned through their openings in the top enclosure.
3. Align the center screw hole on the front panel edge with the thread marks in the extrusion and install the four screws that secure the front panel edge.
4. Place a PC board clamp in position. Align the center screw holes of the clamp with the thread marks in the extrusion and install the two screws that secure the clamp. Repeat for the other clamp.
5. Tilt the top enclosure up and install the ten slider knobs, then lay it flat on your work surface.



Caution: To avoid damaging a slider, move the slider shaft to either the top or bottom end of its travel to install a knob.

6. Connect the stranded wire cable from the Button Board on the Wheels Assembly to J304 on the Slider Board.
7. Connect the flat ribbon cable from the Front Panel Board to J303 on the Slider Board.
8. If you have disconnected the cable from J302, reconnect it.
9. Follow the procedure on page 3-10 to install the Connector Board.
10. Follow the procedure on page 3-8 to install the enclosure support wall.

Removing the LCD Board

1. Follow the procedure described on page 3-8 to remove the enclosure support wall.
2. Follow the procedure described on page 3-9 to remove the Connector Board.
3. Disconnect the flat ribbon cable from J15 on the Engine Board. This cable is bundled with other cables routed along the rear panel portion of the top enclosure. They are secured with tie wraps to cable mounts. Removing the LCD requires cutting the tie wraps and separating the flat ribbon cable from the other cables routed along the rear panel.
4. The LCD is mounted onto a bezel that is secured to the Front Panel Board. Remove the four screws that secure the LCD to the front panel bezel.

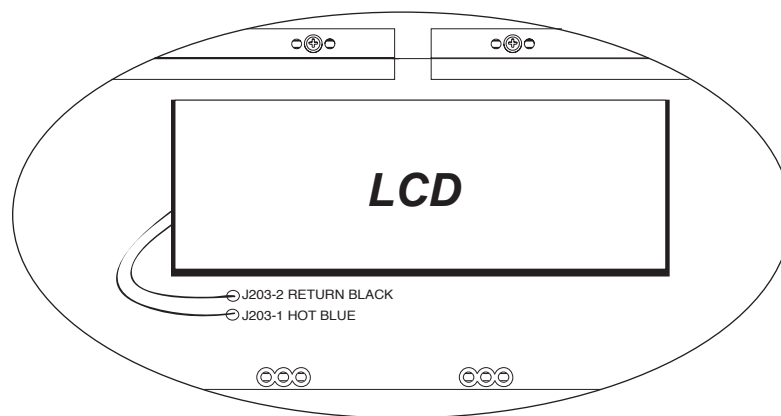


Figure 3-12 J203-1 and J203-2 connections on Front Panel Board

5. Refer to Figure 5. A two-wire soldered cable connects the LCD to J203-1 and J203-2 on the Front Panel Board. These cables are not labeled at the Factory and the colors of the wires attached to the LCD may vary. Polarity is important! Before you desolder the wires, mark one of them with a designation such as a black line to avoid reversing the wires when they are resoldered.



Caution: 1000V high frequency voltage present, which can cause burns—be sure power is off!

6. Desolder the wire connections at J203-1 and J203-2 on the Front Panel Board. Lift the LCD Board up and remove it.

Replacing the LCD Board

1. Place the LCD Board in position face down onto the front panel bezel.
2. Install the four screws that secure it to the front panel bezel.
3. Connect the flat ribbon cable to J15 on the Engine Board. Be sure that you bundle the LCD cable with the other cables positioned along the rear panel and tie wrap them to the cable mounts.



Caution: 1000V high frequency voltage present, which can cause burns—be sure power is off!

Note: If you are replacing the LCD with a new one and the wire colors are different from the original, try to match the wires based on how each wire enters the LCD module.

4. Solder the connections at J203-1 and J203-2 on the Front Panel Board. Polarity is important! If the LCD displays low light, the wires are reversed.

Removing the Front Panel Board

1. Follow the procedure described on page 3-8 to remove the enclosure support wall.
2. Follow the procedure described on page 3-9 to remove the Connector Board.
3. Table 3-4 lists the cables connected to the Front Panel Board.



Note: If the service you are performing only requires that you have access to the Front Panel Board for component testing or component replacement, it is not necessary to separate the LCD Board from Front Panel Board.

Ref.	Name	Cable Type	Destination
J201	FP Bridge	flat ribbon	Slider Board
J202	Front Panel	flat ribbon	Connector Board
J203	Backlight	two-wire cable	LCD

Table 3-4 Front Panel Board cables



Note: The flat ribbon cable at location J202 was disconnected following the procedure to remove the Connector Board. It is not necessary to disconnect it from the Front Panel Board. However, if you are replacing the Front Panel Board with a replacement board, be sure to disconnect the cable and connect it to the replacement board.



Warning: If the flat ribbon cable at location J202 has a small PC board connecting it to the Front Panel Board, you should disconnect it from the Front Panel Board so that it is not damaged during component testing or replacement. If connector is offset by one pin either way, the Front Panel Board will be damaged!

4. Disconnect the flat ribbon cable at J201 on the Front Panel Board.



Note: If the service you are performing only requires that you have access to the Front Panel Board for component testing or component replacement, it is not necessary to separate the LCD Board from Front Panel Board.

5. If you are replacing the Front Panel Board with another board, follow the procedure described on page 3-13 to remove the LCD Board.



Note: If you are replacing the Front Panel Board with another board, be sure to remove the four screws that secure the LCD bezel to the board and install it on the new board.

6. Seven of the screws that secure the enclosure support wall also secure the front panel edge of the Front Panel Board. You have already removed the enclosure support wall, but one screw remains securing this edge of the board. See Figure 3-13, and remove the remaining screw.
7. Remove the six screws that secure the three PC board clamps (two screws per clamp). These screws also secure the rear panel edge of the Front Panel Board.
8. Lift the Front Panel Board up from the top enclosure. The spinknob and switch button caps should remain in place.



Caution: Each switch button cap uses a set of small pegs to mount the cap to the Front Panel Board. The button caps are mounted individually or in clusters. If a cap becomes separated from the board, be careful that a peg is not inadvertently broken.

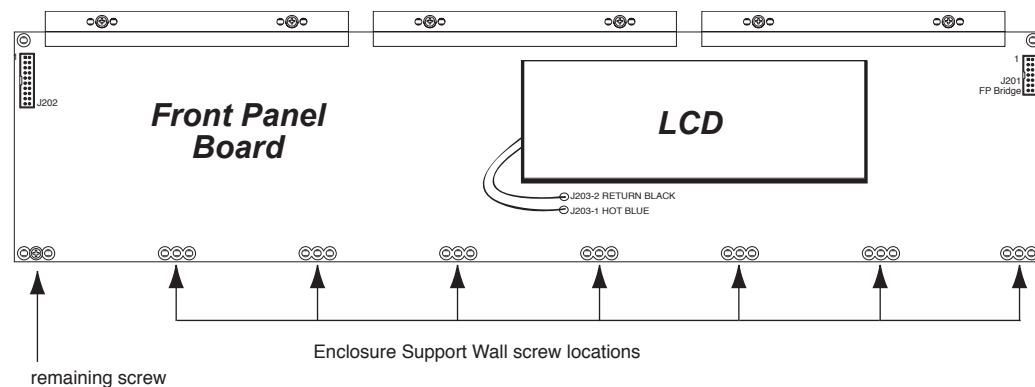


Figure 3-13 Front Panel Board, screw locations

Replacing the Front Panel Board



Note: If you are replacing the Front Panel Board with another board, be sure to remove the four screws that secure the LCD bezel to the board and install it on the new board.

1. Position the Front Panel Board onto the top enclosure, then raise the top enclosure up slightly to verify that the spinknob and switch button caps are correctly positioned through their openings in the top enclosure.
2. Place a PC board clamp in position. Align the center screw holes of the clamp with the thread marks in the extrusion and install the two screws that secure the clamp. Repeat for the other two clamps.
3. Install the screw that secures the front panel edge. See Figure 3-13.
4. If you removed the LCD Board, follow the procedure described on page 3-14 to replace it.
5. Connect the flat ribbon cable from the Slider Board to J201.
6. If you have disconnected the cable from J202, reconnect it.



Warning: If this cable has a small PC board, be very careful to plug the small PC board onto all of the pins of J202. If it is offset by one pin either way, the Front Panel Board will be damaged!

7. Follow the procedure on page 3-10 to install the Connector Board.
8. Follow the procedure on page 3-8 to install the enclosure support wall.

Removing the Engine Board

The USB/xD Daughtercard is mounted on the Engine Board. The following procedure describes removing the Engine Board with the USB/xD Daughtercard attached.

- Following Steps 2–4, disconnect the cables listed in Table 3-5.

Ref.	Name	Cable Type	Destination
J5	MIDI & CPU	stranded wire	Connector Board
J15	Graphic LCD	flat ribbon	LCD Board
J18	PC3 Audio Out	shielded wire	Connector Board
J21	PC3 Power	stranded wire	Connector Board
J33	Digital Audio Out	stranded wire	Connector Board

Table 3-5 Engine Board cables

- Disconnect the shielded wire cable from J18.
- Disconnect the stranded wire cables from J5, J21, and J33.
- Disconnect the flat ribbon cable from J15.
- Remove the two screws that secure the USB/xD Daughtercard to the rear panel.
- Remove the three screws that secure the front panel edge of the Engine Board.

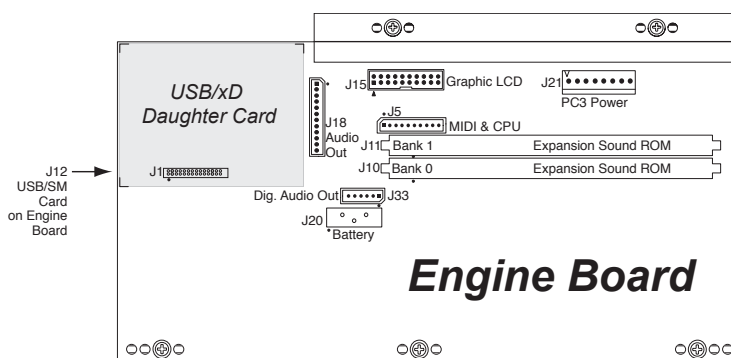


Figure 3-14 Engine Board, screw locations

- Remove the two screws that secure the PC board clamp and rear panel edge of the Engine Board to the top enclosure.
- Remove the Engine Board.

Replacing the Engine Board

1. Place the Engine Board in position on the top enclosure.



Note: Be sure the blue xD Daughtercard bezel is seated in the rear panel cutout properly.

2. Align the center screw hole on the front panel edge with the thread marks in the extrusion and install the three screws that secure the front panel edge. See Figure 3-14.
3. Install the two screws that secure the USB/xD Daughtercard to the rear panel.
4. Connect the flat ribbon cable from the LCD to J15 on the Engine Board.
5. Connect the stranded wire cables from the Connector Board to J5, J21, and J33 on the Engine Board.
6. Connect the shielded wire cable from the Connector Board to J18 on the Engine Board.

Removing the USB/xD Daughtercard

The USB/xD Daughtercard is mounted on the Engine Board and is held in place with a 28-pin connector.

1. Follow the procedure described on page 3-17 to remove the Engine Board.
2. Lift the USB/xD Daughtercard straight up to disconnect it from J12 on the Engine Board.

Replacing the USB/xD Daughtercard

1. Position the USB/xD Daughtercard over the 28-pin connector at J12 on the Engine Board.
2. Verify that the Engine Board pins are lined up properly with the 28-pin connector on the USB/xD Daughtercard. Press the USB/xD Daughtercard down to insert the pins into the 28-pin connector.
3. Follow the procedure described on page 3-18 to install the Engine Board.

Removing the Wheels Assembly

1. Refer to Figure 3-15 on page 3-20. Slide the left side of the unit forward off of your work surface so that you can access the four screws and washers securing the assembly to the bottom enclosure. Remove the four screws and washers.
2. Slide the unit back onto your work surface.
3. Lift the Wheels Assembly up, approximately two inches. Nylon reinforced tape secures the Aftertouch flex cables to the bottom enclosure. Peel back the tape from one side and disconnect the cables, J202 to the keyboard front pressure (white key) and J203 to the keyboard back pressure (black key).
4. Disconnect the stranded wire cable from J201 on the Wheels Board.
5. Disconnect the stranded wire cable from J304 on the Slider Board.
6. Remove the Wheels Assembly.

Replacing the Wheels Assembly

1. Hold the Wheels Assembly in position over the bottom enclosure.
2. Connect the stranded wire cable from the IBBB Board to J304 on the Slider Board.
3. Connect the stranded wire cable from the Connector Board to J201 on the Wheels Board.
4. Connect the flat flex cables, J202 from the keyboard front pressure (white key) and J203 from the keyboard back pressure (black key).
5. Reapply the nylon reinforced tape to the flat flex cables.
6. Lower the Wheels Assembly into position.
7. Slide the unit forward and install the four screws and washers to secure the Wheels Assembly to the bottom enclosure.

PC3x Keyboard Assembly

Removing the PC3x Keyboard Assembly

The following procedure assumes that the PC3x is open and that you have followed the instructions to remove the top enclosure.

1. The keyboard is secured to the bottom enclosure using twelve screws. Refer to Figure 3-15 for the position of the screws. Arrows identify the locations of the twelve screws.
2. Tilt the PC3x up and remove the six keyboard rear screws, then lay the PC3x flat on your work surface.
3. Move the PC3x forward so that the front hangs over the edge of your work surface to access the remaining screws, and remove the six keyboard front screws.
4. Slide the PC3x back onto your work surface.
5. Slide the left side of the unit forward off of your work surface so that you can access the four screws and washers securing the Wheels Assembly to the bottom enclosure. Remove the four screws and washers.

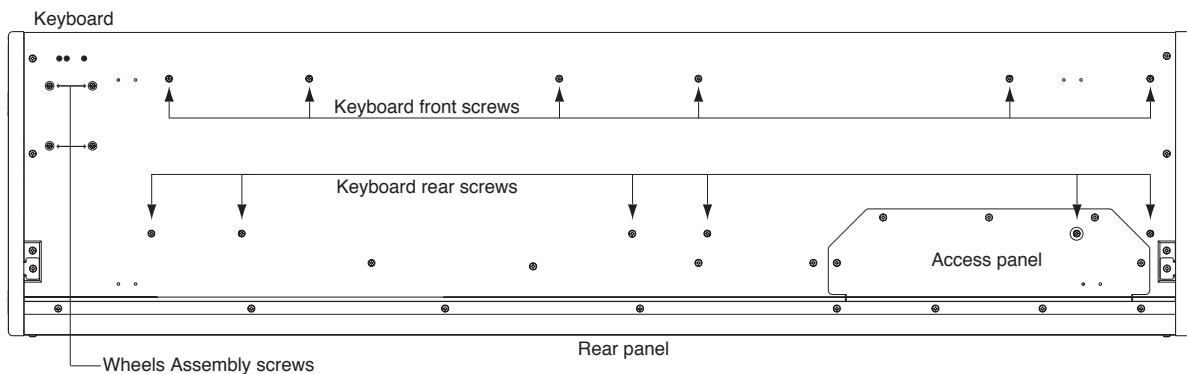


Figure 3-15 PC3x keyboard bottom

6. Slide the PC3x back onto your work surface.
7. At this point the keyboard is loose in the bottom enclosure, but it has cables connected to the Wheels Assembly and the Connector Board.
8. Lift the Wheels Assembly and disconnect the Aftertouch flex cables. These cables have nylon reinforced tape securing them to the bottom enclosure. Peel back the tape from one side to free the cables.
9. Place the Wheels Assembly in its position on the bottom enclosure.
10. Disconnect the flat ribbon cables from locations J306 and J307 on the Connector Board. These cables are also secured to the bottom enclosure with nylon reinforced tape. Peel back the tape from one side to free the cables.



Note: If you need access to the keyboard to replace one or more keys, it is not necessary to entirely remove the Keyboard Assembly from the PC3x. Follow the procedure on page 3-22.

11. Remove the Keyboard Assembly.

Replacing the PC3x Keyboard Assembly

1. Place the keyboard on the bottom enclosure. Be sure that the flat ribbon cables from the keyboard are correctly positioned to connect them to the Connector Board.



Note: If you have disconnected the Bass and Treble ends of the flat ribbon cables from the keyboard contact boards during service, be sure that you have reconnected them and secured them with tape. Be sure that the small ribbon cable connecting the Bass and Treble Contact Boards is connected.

2. Connect the flat ribbon cables to J306 and J307 on the Connector Board.
3. Secure the flat ribbon cables to the bottom enclosure. Be sure to reapply the nylon reinforced tape that secures the cables to the bottom enclosure.
4. Lift the Wheels Assembly and connect the Aftertouch flex cables. Be sure to reapply the nylon reinforced tape that secures the flex cables to the bottom enclosure.
5. Slide the left side of the unit forward and install the four screws and washers to secure the Wheels Assembly to the bottom enclosure.
6. Move the PC3x back onto your work surface.
7. Slide the PC3x forward so that you can install the six keyboard front screws.
8. Move the PC3x back onto your work surface.
9. Tilt the PC3x up and install the six keyboard rear screws.

Removing Keys

The following procedure assumes you have removed the top enclosure from the PC3x.

1. Follow the procedure to remove the keyboard.



Note: If you are merely replacing one or more keys, it is not necessary to entirely remove the keyboard from the PC3x. Once you have followed the procedure to remove the keyboard, you can slide it toward the rear panel to give you enough access to remove and replace keys.

2. The following diagrams illustrate the outlines of the natural and sharp keys and the location and functions of the components described in the following procedures.

Natural/White Key

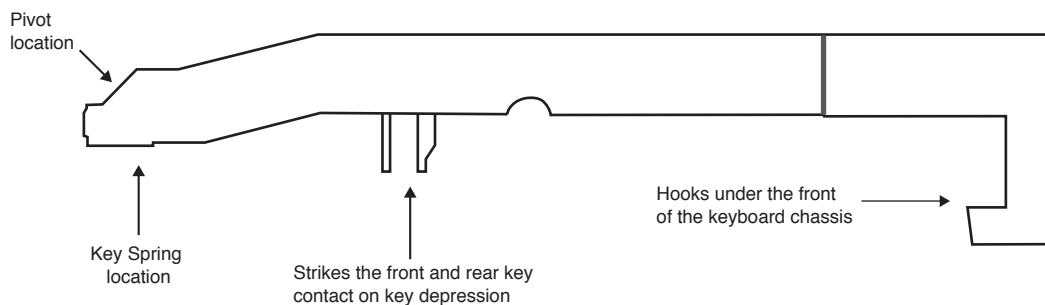


Figure 3-16 Natural/white key

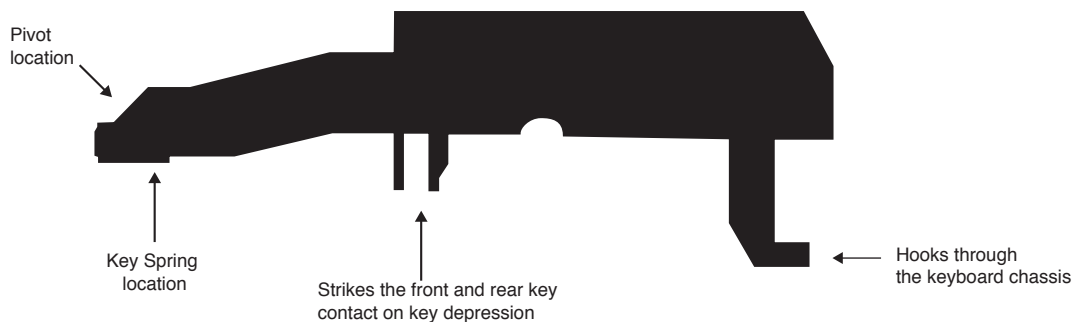


Figure 3-17 Sharp/black key

Removing Natural/White Keys

1. Unlock the key from the pivot anchoring the key to the keyboard chassis. To do this, insert a small flat screwdriver at the back end of the pivot and press toward the front edge of the keyboard. While doing so, lift the back end of the key.
2. Remove the screwdriver.
3. The key should now be free of the pivot. Lift the key up slightly, then forward. The front edge of each key hooks under the keyboard chassis. Be sure the key is not hooked under the keyboard chassis prior to lifting the key off.



Caution: Each key has a small key spring. The key spring is positioned on the keyboard chassis (just in front of the pivot) and is held in place when the key is installed. When you remove a key, be sure you do not misplace the key spring.

Removing Sharp/Black Keys

1. To remove a sharp key, first remove the adjacent natural keys, as described in the previous procedure.
2. Unlock the key from the pivot anchoring the key to the keyboard chassis. To do this, insert a small flat screwdriver at the bottom of the pivot and press toward the front edge of the keyboard. While doing so, lift the back end of the key.
3. Remove the screwdriver.
4. The key should now be free of the pivot. Lift the back of the key up slightly, then forward. The front edge of each key hooks through the keyboard chassis. Once the key is free of the pivot, you should be able to lift the key out from the keyboard chassis.



Caution: Each key has a small key spring. The key spring is positioned on the keyboard chassis (just in front of the pivot) and is held in place when the key is installed. When you remove a key, be sure you do not misplace the key spring.

Replacing a Sharp Key



Note: Always replace a sharp key before replacing the adjacent natural keys.

1. Verify the placement of the key spring.
2. Position the front end of the key through the keyboard chassis.
3. Lower the key into position. Align the pivot with the hole at the rear of the key.
4. Push down on the key. It should snap into position onto the pivot.

Replacing a Natural/White Key

1. Verify the placement of the key spring.
2. Hook the front end of the key under the keyboard chassis.
3. Lower the key into position. Align the pivot with the hole at the rear of the key.
4. Push down on the key. It should snap into position onto the pivot.

Servicing the Keyboard Contact Boards

The Keyboard Assembly has nine keyboard stiffening brackets positioned along the underside of the chassis. Each bracket is secured to the keyboard chassis using three screws: two small machine screws through the chassis and one black screw through the contact board. To remove a contact board, you must first remove the stiffening brackets.

1. Tilt the keyboard up (front edge of the keys facing down), and disconnect the flat ribbon cables that connect the Treble and Bass Contact Boards to the Connector Board. The connectors are secured with tape. Peel back the tape to free the cables. Set the cables safely aside and lower the keyboard.
2. Place the keyboard upside down on a flat soft surface. Be sure that the keys are resting on a soft surface to avoid scratching or other damage. The stiffening brackets and Treble and Bass Contact Boards are now visible.

Removing the Treble Contact Board

1. Disconnect the small ribbon cable that connects the Treble and Bass Contact Boards.
2. Remove the five stiffening brackets. Remove the 15 screws that secure the five brackets.
3. Remove the remaining 18 screws that secure the Treble Contact Board to the keyboard chassis, and remove the Treble Contact Board.

Replacing the Treble Contact Board

1. Position the Treble Contact Board on the keyboard chassis. Be sure that the rubber key contacts line up properly through the holes in the keyboard chassis.
2. Install the 18 screws that secure the board to the keyboard chassis.
3. Connect the small ribbon cable that connects the Treble to the Bass Contact Board.
4. Install the five stiffening brackets. Install the 15 screws that secure the five brackets.

Removing the Bass Contact Board

1. Disconnect the small ribbon cable that connects the Bass and Treble Contact Boards.
2. Remove the four stiffening brackets. Remove the 12 screws that secure the four brackets.
3. Remove the 18 screws that secure the board to the keyboard chassis, and remove the Bass Contact Board.

Replacing the Bass Contact Board

1. Position the Bass Contact Board on the keyboard chassis. Be sure that the rubber key contacts line up properly through the holes in the keyboard chassis.
2. Install the 18 screws that secure the board to the keyboard chassis.
3. Connect the small ribbon cable that connects the Bass to the Treble Contact Board.
4. Install the four stiffening brackets. Install the 12 screws that secure the brackets.

Connecting the Keyboard Contact Boards

1. Turn the keyboard over to its normal playing position.
2. Tilt the keyboard up (front of the keys facing down), and connect the flat ribbon cables that connect the Treble and Bass Contact Boards to the Connector Board. Be sure to reapply the tape to secure the connectors. Lower the keyboard.

Removing the Keyboard Contact Strips

1. Place the keyboard upside down on a flat soft surface. Be sure that the keys are resting on a soft surface to avoid scratching or other damage.
2. Follow the procedure to remove the Bass and Treble Keyboard Contact Boards.
3. Examine the keyboard contact strips and look at the design of an individual contact. The top portion of the contact has two indentations. One indentation is deeper than the other. When replacing the keyboard contact strips, the deeper indentation is always positioned toward the rear of the key.
4. The keyboard contact strips have mounting pegs that secure the contact strips to the keyboard contact boards.
5. To remove a keyboard contact strip, gently lift and free the strip from its position. Be careful not to rip or damage any contact in the process.

Replacing the Keyboard Contact Strips

1. Position the contact strip on the Keyboard Contact Board that you are servicing.



Note: Be sure that the deeper indentation is positioned toward the rear of the key.

2. Line up the contact strip mounting pegs with their respective mounting holes on the keyboard contact board.
3. Using a small blunt-end tool (Q-Tip, toothpick, etc.), gently push the mounting pegs through the holes. Do not use too much force or use a tool that can poke a hole through the mounting pegs. However, be sure that the mounting pegs are installed through the holes and the contact strip is flat against the PC board at each peg location.

Chapter 4

Troubleshooting & Maintenance

Introduction

Cables, Connectors

Cables

All cables with connectors are keyed, and therefore cannot be reversed.



Warning: Some units may have a small PC board installed on the flat ribbon cable connected to J202 on the Front Panel Board. Neither the socket nor the pins on this board are keyed. See *Removing the Front Panel Board* in Chapter 3, page 3-14 and page 3-16 for further information.

Cable Routing

In some cases, tape fastens cables to printed circuit boards or the top and bottom enclosures. When disconnecting cables, always peel back the tape from one side so that the tape remains properly positioned.

Surface-Mount Devices

The removal and replacement of surface-mount devices requires training and the proper equipment. If you do not have the training or equipment to remove or replace surface-mount devices, contact the service department to order a board replacement. International service technicians should contact their appropriate Young Chang Distributor.

Required Tools and Materials

- No. 1 Phillips head screwdriver
- No. 2 Phillips head screwdriver
- Small flat head screwdriver
- Dowel (3mm diameter)
- Needle-nose pliers
- Small blunt-end tool (Q-Tip, toothpick, etc.)
- Extraction tool (use only an AMP 822154-1)
- USB cable
- xD card
- Foam blocks

Boot Loader

Use the PC3x's Boot Loader to enter Diagnostics or perform a Hard Reset to the unit. You can also install operating system updates and objects into Flash memory.

Entering the Boot Loader

Apply power to the unit. When the ******Welcome to the Kurzweil PC3****** message appears in the LCD, quickly press and release the **Exit** button.

There are five menu options available in the PC3x Boot Loader. The following is a brief description of the available menu options.

Run PC3—Exits the Boot Loader and returns the unit to normal operation.

Update Image—Select this to install new system software and objects.

Run Diags—Enters the diagnostic test menu. For a complete list of tests and the procedure to execute the diagnostic tests, refer to Chapter 2, *Diagnostics*.

System Reset—Clears the memory and restores the unit to factory default settings.

File Utilities—Use this to select one of the following functions: format an xD card, save and restore PC3x files, or execute a PC3x image from an xD card or USB file.

Resets

Hard Reset

There are two ways to perform a Hard Reset to the PC3x.

1. Press the **Master Mode** button. On page 1 in **Master Mode**, press the soft button below **Reset**. The LCD displays a warning message indicating all user objects will be deleted. Press the soft button below **Yes** to erase all user objects and restore the unit to factory settings or the soft button below **Cancel**.
2. Enter the Boot Loader and press the soft button below **System Reset**. The LCD displays a warning message that all user objects will be deleted. Press the soft button below **Reset** to erase all user objects and restore the unit to factory settings or the soft button below **Cancel**.

Soft Reset

The Soft Reset does not erase user programs and setups and is equivalent to turning the power off and on. To Soft Reset a PC3x, simultaneously press the +/-, 0 and **Clear** buttons.

Saving User Data

To save user data, first apply power to the PC3x. Once the unit is on and ready for normal operation, follow the procedure to save user data to an xD card or a computer.

Saving to an xD Card



Note: The following procedure assumes that you have a computer with an xD card writer. Use either a Windows or MacOS formatted xD card up to 256 Mb. If you format an xD card, use DOS format, FAT 16.

You can format xD cards on the PC3x, enter the Boot Loader and select the **FILE UTILITIES** soft button. However, the maximum size for xD cards formatted on the PC3x is 128Mb.

1. Insert a formatted xD card into the card slot located on the rear panel of the PC3x.
2. Press the **Storage Mode** button.
3. The card should be the currently selected storage device.
4. Press the **Store** soft button.
5. Highlight **All Types** and press the **Select** soft button. (An asterisk to the left of the file name indicates the selected file.) Use the **Right** or **Left** cursor buttons to highlight **Range/Bank** and turn the Alpha Wheel to scroll down to **Everything**. Press the **Select** soft button.
6. Press the **Store** soft button.
7. Press the **OK** soft button and follow the display prompts.

Saving to a Computer

1. Connect a USB cable from a computer to the USB port on the PC3x.
2. Press the **Storage Mode** button.
3. Press the **Right** or **Left** cursor buttons or turn the Alpha Wheel to highlight **USB Temporary Drive**.
4. Select the **Choose** soft button. The display indicates that the USB port is changed from a MIDI to a USB connection.
5. Press the **Store** soft button.
6. Highlight **All Types** and press the **Select** soft button. (An asterisk to the left of the file name indicates the selected file.) Use the **Right** or **Left** cursor buttons to highlight **Range/Bank** and turn the Alpha Wheel to scroll down to **Everything**. Press the **Select** soft button.
7. Press the **Store** soft button.
8. Press the **OK** soft button and follow the display prompts.

Software Updates

Updating with an xD Card



Warning: This procedure requires performing a hard reset. All user objects will be erased. Before continuing, be sure to save all user programs and setups to an xD card or computer following the procedure on page 4-3.

The following procedure assumes that you have a computer with an xD card writer. Use either a Windows or MacOS formatted xD card up to 256 Mb. If you format an xD card, use DOS format, FAT 16.

You can format xD cards on the PC3x, enter the Boot Loader and select the **FILE UTILITIES** soft button. However, the maximum size for xD cards formatted on the PC3x is 128Mb.

1. Go to www.kurzweilmusicsystems.com and follow the links to download the latest software version.
2. Insert an xD card into the card writer and drag and drop the downloaded files onto the card.
3. Remove the xD card and insert it into the xD card slot on the PC3x.
4. Apply power to the unit. When the ******Welcome to the Kurzweil PC3****** message appears in the LCD, quickly press and release the **Exit** button.
5. From the PC3x Boot Loader, select **UPDATE IMAGE**.
6. Select the **MAIN IMAGE** soft button.
7. Use the **Up** or **Down** cursor buttons or turn the Alpha Wheel to move through the list of available files. (An asterisk to the left of the file name indicates the selected file.)



Note: Operating System files have .BIN as the file extension. Object files have .PC3 as the file extension.

8. Press the **CHOOSE** soft button to begin updating. The LCD displays a message when the process is complete. Typically, this should take about ten seconds.
9. Press the **OK** soft button.
10. Select **MAIN OBJECT** from the **UPDATE IMAGE** menu.
11. Repeat Steps 7–9.
12. From the Boot Loader main menu, select the **SYSTEM RESET** button. The LCD displays a warning message that all user objects will be deleted. Select the soft button below **Reset**.
13. Select the **RUN PC3** soft button from the main menu to test the software updates.

Updating via Computer



Warning: This procedure requires performing a hard reset. All user objects will be erased. Before continuing, be sure to save all user programs and setups to an xD card or computer following the procedure on page 4-3.

1. Connect a USB cable from a computer to the USB port on the PC3x.
2. Apply power to the unit. When the ******Welcome to the Kurzweil PC3****** message appears in the LCD, quickly press and release the **Exit** button.
3. Check the computer desktop and verify that the “Kurzweil PC3” device is present. This should appear on the desktop as an icon or window. Typically, this should take about 2–3 seconds. However, it can take up to 30 seconds to be recognized.
4. Go to www.kurzweilmusicsystems.com and follow the links to download the latest software version.



Note: Be sure to always read the downloaded release notes and installation instructions in case they have changed since this manual was written.

5. From the PC3x Boot Loader, select **UPDATE IMAGE**.
6. Select the **MAIN IMAGE** soft button.
7. Use the **Up** or **Down** cursor buttons or turn the Alpha Wheel to move through the list of available files. (An asterisk to the left of the file name indicates the selected file.)



Note: Operating System files have .BIN as the file extension. Object files have .PC3 as the file extension.

8. Press the **CHOOSE** soft button to begin updating. The LCD displays a message when the process is complete.
9. Press the **OK** soft button.
10. Select **MAIN OBJECT** from the **UPDATE IMAGE** menu.
11. Repeat Steps 7–9.
12. From the Boot Loader main menu, select the **SYSTEM RESET** button. The LCD displays a warning message that all user objects will be deleted. Select the soft button below **Reset**.
13. Select the **RUN PC3** soft button from the main menu to test the software updates.

Rebuilding the Internal NAND Flash Memory

It is unlikely but possible for the Internal NAND Flash Memory to become corrupted such that normal hard reset and software update procedures fail. In particular, if the LCD displays the following: **Internal File System Error. Low-level fmt error.** and recurs even after a power cycle, the internal flash memory file system is probably corrupted.

The following procedure can be used to rebuild the Internal NAND Flash Memory using either an xD card or the USB port via computer. Before starting you will need a special utility program called PC3FT040.BIN or a later version (last 3 digits are a higher number). This program may be downloaded from the kurzweilmusicsystems.com website. This program can reformat the internal flash memory then copy needed system files to it. The Diagnostics file can also be downloaded from the website.

Rebuilding with an xD Card



Warning: Rebuilding the Internal NAND Flash Memory also does a hard reset erasing all user created files and restores the unit to factory settings.

The following assumes that you are familiar with the procedures to enter the Boot Loader and perform normal system updates using an xD Card or the USB port via computer.

1. 1. Using an xD card reader/writer, copy these four files to an xD card:
 - File Transfer utility, PC3FT040.BIN or higher
 - PC3 Operating System file, PC3OS111.BIN or higher
 - PC3 Diagnostics file, PC3DG018 or higher
 - PC3 Objects file, PC3OB111.PC3 or higher
2. Turn on the PC3x and enter the Boot Loader. Then insert the xD card into the slot on the PC3x.
3. Press the **File Utilities** soft button.
- 4.
5. Press the **EXEC from file** soft button.
6. Using the Alpha Wheel, select the File Transfer Utility file then press the **CHOOSE** soft button. In a couple of seconds the program will run and display a new menu.
7. Press the **FORMAT FLASH** soft button. Press the **FORMAT** soft button again to confirm. Formatting will take about 5-10 seconds.
8. A new menu should appear. The third line will display, **File system not set up.**
9. Press the **SETUP SYSTEM** soft button. A message **File structure built** will appear briefly then another menu.
10. The first line should display, **Choose a synth executable file:.** Use the Alpha Wheel to select the PC3 Operating System file then press the **CHOOSE** soft button. Installation will take about five seconds.

11. The top line should now display, **Choose a diags executable file:**. Select the Diagnostics file, then press the **CHOOSE** soft button. Installation will take only a second or two. A message **Bootable system built.** displays briefly then a new menu will display.
12. The top line should now display, **Choose a system objects file:**. Select the PC3 Objects file then press the **CHOOSE** soft button. Installation will take about 10 seconds. A message **System objects installed.** displays briefly then the root menu will display.
13. Press the **Quit** soft button then press the **<back>** soft button on the next menu. The normal Boot Loader menu should now be displayed.
14. Press the **RUN PC3** soft button. The PC3x should boot up normally.

Rebuilding via a Computer



Warning: Rebuilding the Internal NAND Flash Memory also does a hard reset erasing all user created files and restores the unit to factory settings.

The following assumes that you are familiar with the procedures to enter the Boot Loader and perform normal system updates using an xD Card or the USB port via computer.

1. Connect a USB cable from a computer to the USB port on the PC3x.
2. Apply power to the unit. When the ******Welcome to the Kurzweil PC3****** message appears in the LCD, quickly press and release the **Exit** button.
3. Check the computer desktop and verify that the "Kurzweil PC3" device is present. This should appear on the desktop as an icon or window. Typically, this should take about 2–3 seconds. However, it can take up to 30 seconds to be recognized.
4. Copy the File Transfer utility, PC3FT040.BIN or higher, to the Virtual USB drive.
5. Press the **File Utilities** soft button.
6. Press the **EXEC from file** soft button.
7. Using the Alpha Wheel, select the File Transfer Utility file then press the **CHOOSE** soft button. In a couple of seconds the program will run and display a new menu.



Note: On Macintosh Operating systems, a message will appear stating that a *Device* has been removed. Click the *OK* (on your Mac) and proceed. On Windows XP Operating systems, the Virtual USB drive will go away and come back empty. It may take a few seconds for the Virtual USB drive to appear again. If it does not automatically appear, you can find it by going to *My Computer* and it should be under *Devices with Removable Storage*.

8. At this point, the File Utilities application has already been executed (this is what you are running), and will no longer appear in the Virtual USB drive. You will need to copy the following three files to the USB drive on your computer desktop:

- PC3 Operating System file, PC3OS111.BIN or higher
 - PC3 Diagnostics file, PC3DG018 or higher
 - PC3 Objects file, PC3OB111.PC3 or higher
9. Press the **SETUP SYSTEM** soft button. A message **File structure built** will appear briefly then another menu.
 10. The first line should display, **Choose a synth executable file:**. Use the Alpha Wheel to select the PC3 Operating System file then press the **CHOOSE** soft button. Installation will take about five seconds.
 11. The top line should now display, **Choose a diags executable file:**. Select the Diagnostics file, then press the **CHOOSE** soft button. Installation will take only a second or two. A message **Bootable system built.** displays briefly then a new menu will display.
 12. The top line should now display, **Choose a system objects file:**. Select the PC3 Objects file then press the **CHOOSE** soft button. Installation will take about 10 seconds. A message **System objects installed.** displays briefly then the root menu will display.
 13. Press the **Quit** soft button then press the **<back>** soft button on the next menu. The normal Boot Loader menu should now be displayed.
 14. Press the **RUN PC3** soft button. The PC3x should boot up normally.

Boot EPROM

The PC3x uses a 32 pin EPROM located at U4 to store the boot up information for the CPU.

Removing the EPROM

1. Place the PC3x upside down on a flat protected surface.
2. Remove the seven screws that secure the access panel and set it safely aside.
3. Use an AMP 822154-1 extraction tool to remove the EPROM.



Warning: Typically, you would insert the tool at one corner to lift the EPROM then repeat the process at the other corner. However, because of the proximity between the U4 socket and the keyboard, this is not possible.

4. Insert the thin, straight end of the tool into the extraction hole closest to the xD/Daughter Board.
5. Slightly, lift up the corner of the EPROM.



Warning: While the extraction tool is inserted into the extraction hole, do not to allow the tool to move from side to side. Doing so could cause damage to the EPROM or the socket.

6. Remove the tool.
7. Insert the curved end of the tool into the same extraction hole.
8. To remove the EPROM, slide the tool farther toward the center of the EPROM so that it will lift straight up and out of the socket.



Caution: Place a finger on top of the EPROM so that it does not pop out suddenly either damaging it or landing in an inaccessible area.

Replacing the EPROM

1. Position the EPROM over the socket. Be sure the beveled corner of the EPROM is correctly positioned over the corresponding corner of the socket.



Caution: If you need to reposition the EPROM, always lift it up from the socket first.

2. Gently press the center of the EPROM into the socket and verify that the EPROM is correctly positioned. Using too much pressure, may cause the PC board to flex and damage the delicate solder connections under the MARA ICs.
3. Position the access panel on the bottom enclosure and install the seven screws to secure it.

Replacing the Battery

The PC3x uses a flat three volt Lithium coincell battery to power the clock. When the battery voltage runs low, the unit boots up with a low battery message.



Note: The battery voltage can be checked at anytime using the Scanner Diagnostics. See page 4-11 for more information.

Accessing the Battery

1. Place the PC3x upside down on a flat protected surface.
2. Remove the seven screws that secure the access panel and set it safely aside.

Removing the Battery

The battery (CR2032) in the PC3x keyboard is mounted into a holder on the Engine Board and is accessible when the access panel is removed.

1. Insert a flat plastic tool (plastic knife, pen cap, etc.) into one of the openings between the battery and the holder to lift the battery.

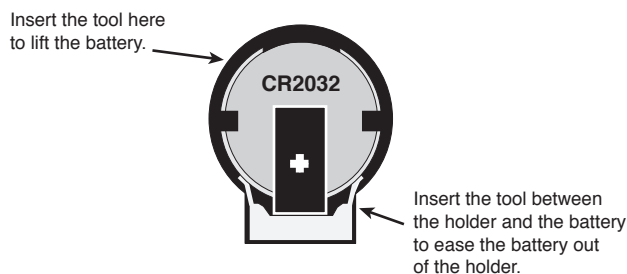


Figure 4-1 **Battery and holder**

2. Ease the battery out of the holder. If necessary, insert the plastic tool at the bottom of the holder (closest to the Engine Board) to remove the battery.

Installing the Battery



Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type (CR2032).

1. Position the battery over the holder so that the positive terminal is pointing to the Expansion ROM sockets.
2. Slide the battery into the holder and apply slight pressure until it snaps into place.
3. Position the access panel on the bottom enclosure and install the seven screws to secure it.

Scanner Tests

The Scanner Tests for the PC3x include separate tests for the front panel buttons and LEDs, front panel sliders including the Master Volume slider, the Alpha Wheel, the Mod and Pitch wheels, the keyboard, and the pedals.



Note: Before beginning the tests, remove the cables from the main output jacks. If a cable is plugged into the main right output jack when you enter the Scanner Tests, you will see a **RIGHT JACK** message in the display.

To enter the Scanner Tests, first turn on the PC3x. Once the PC3x is on and ready to play, simultaneously hold down the 4, 5 and 6 buttons. All front panel LEDs will flash and the LCD will slowly display the following:

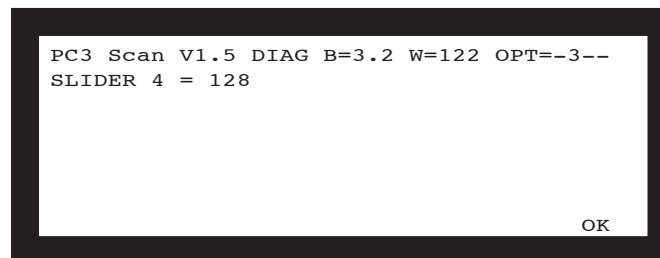


Figure 4-2 LCD example, PC3x scanner tests

The first line of the display shows the scanner software version, the battery voltage, the current value for the Pitch Wheel position, and the keyboard configuration. The second line shows the results of the current test. Figure 4-2 shows the result of a slider test—in this case moving slider 4 to center.



Note: While running the Scanner Tests, the blue **Program** button LEDs light up in different patterns. The pattern represents the hexadecimal value of the button.

To exit the Scanner Tests and return to normal operation, simultaneously press the **Cancel** and **Enter** buttons.

Front Panel Buttons

To test a button, press any front panel button. An example of the expected test result for the **Program** button follows:

BUTTON 12 Program

The number "12" is the row / column matrix address of the button and Program is the expected button at that address.

Alpha Wheel

To test the Alpha Wheel, turn it to increase or decrease the value by one. Turning clockwise should increase the numbers in order 0-1-2-3-0-1-2... and decrease the numbers in order 3-2-1-0-3-2-1... turning counterclockwise. The expected test result when the **Alpha Wheel** is turned is one of four values—0, 1, 2, or 3:

SPINKNOB = 3

Front Panel Sliders

To test the front panel sliders, move a slider to check its value at the bottom, center, and top. An example of the normal test results for the **Slider A** follows (your results may vary slightly):

At bottom: **SLIDER 1 = 0**

At center: **SLIDER 1 = 128**

At top: **SLIDER 1 = 255**

Right Main Output

Insert a 1/4" plug or cable into the Main Right Output. The expected test result follows:

RIGHT JACK

Remove the plug or cable and the message should disappear.

Switch Pedals 1, 2, and 3

To test a switch pedal, press the pedal. An example of the expected test result for the switch pedal 1 follows:

Full depression: **PEDAL 1**

Continuous Control Pedal 1 and 2

To test the continuous control pedal, press the pedal. An example of the expected test result for the continuous control pedal follows:

No depression: **CTRL PEDAL = 0**

Full depression: **CTRL PEDAL = 255**

Wheels

To test the pitch and mod wheels, move the wheel up and down. An example of the expected test results for the pitch wheel follows (your results may vary slightly):

At bottom: **PITCH WHEEL = 0**

At center: **PITCH WHEEL = 128**

At top: **PITCH WHEEL = 255**

Adjusting the Pitch Wheel Center

If the scanner test results for the pitch wheel do not match the expected results above, the pitch wheel may need to be adjusted.

1. Refer to the diagram below and identify the opening provided through the bottom enclosure to adjust the pitch center.
2. Insert a small flat head screwdriver, move the pitch wheel, and adjust the trimpot to read the expected values (your results may vary slightly).

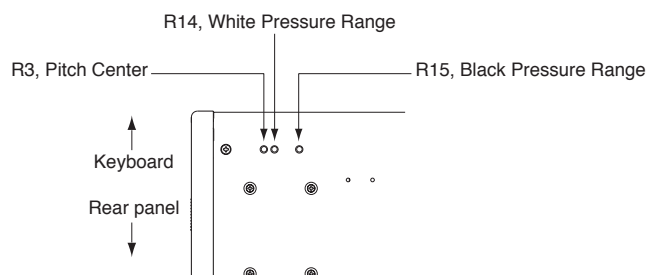


Figure 4-3 Bottom enclosure, trimpot locations

Keyboard

To test the keyboard, press any key. The key name and number will be displayed twice in the LCD. The first set of name and number is the test result for the front key contact switch and the second is for the rear switch. An example of the expected test result for the Middle C key follows:

KEY C4 60 C4 60

Pressing harder, the display will change to show an increasing range of pressure values from about 20 to at least 246.

Adjusting Key Pressure Sensitivity

1. To adjust the key pressure sensitivity, refer to the diagram above and identify the openings provided through the bottom enclosure to adjust the white and black keys.
2. Insert a small flat head screwdriver, press any key (equivalent to a hard key strike), and adjust the trimpot to the expected value (your results may vary slightly).

Power Problems

Dead: LEDs, LCD backlight, and xD Card socket not lit

Before opening the unit, verify the following:

1. The AC outlet is supplying power.
2. The AC cord is good and properly connected to the unit.
3. Check fuses. The fuses are located in the power entry module on the rear panel. See the instructions beginning on page 4-18 to convert the voltage. Be sure to check the red voltage indicator on the power entry module and verify that it is set to the correct voltage for your location. If a unit set for 120V is plugged into 240V, the fuses will blow immediately but no damage should occur to the unit.
4. Place the PC3x upside down on a flat protected surface.
5. Remove the seven screws that secure the access panel and set it safely aside.
6. Disconnect the stranded wire cable at J21 on the Engine Board. Refer to page 9 of the Engine Board schematics, see page 6-11 in Chapter 6. Verify the voltages at the connector.
 - Pin 1, ground
 - Pin 2, 5 volts
 - Pin 3, -12 volts
 - Pin 5, 12 volts
7. Open the unit.
8. Disconnect the stranded wire cable at J301 on the Connector Board. Refer to page 3 of the Connector Board schematics, see page 6-14 in Chapter 6. Verify the voltages at the connector. (See Step 6.)
9. Refer to the Connector Board schematics, see page 6-14 in Chapter 6, and verify the AC power voltages at J324. If these voltages are present and correct, replace the Connector Board. If these voltages are incorrect, suspect the transformer or power entry module.

Audio Problems

No Audio

1. Run the Scanner Diagnostics to check the volume slider operation.
2. Refer to the Interconnect Diagram.
3. Check the flat ribbon cable from J18 on the Engine Board to J302 on the Connector Board.
4. Check the solder connections at the connectors.
5. Refer to the Engine Board schematics and check the signal activity on the DAC, U33.
6. Trace the signal path from the Engine Board through the Connector Board to the audio jacks.

Front Panel Problems

LCD not lit

1. Check the LCD brightness and contrast potentiometers on the rear panel. Turn the pots to see if there is any change.
2. Check the flat ribbon cable from the J304 on the Connector Board. Disconnect and reseal the cable.
3. Check the cable and solder connections from the LCD to J203-1 and J203-2 on the Front Panel Board.
4. Refer to the Front Panel Board schematics and check the signal path.

LCD lit, no characters

1. Place the PC3x upside down on a flat protected surface.
2. Remove the seven screws that secure the access panel and set it safely aside.
3. Check the stranded wire cable at the J5 location on the Engine Board. Be sure it is seated properly. If necessary, disconnect and reseal it.
4. Check the flat ribbon cable at J15 on the Engine Board. Be sure it is seated properly. If necessary, disconnect and reseal it.
5. Open the unit.
6. Check solder connections on the LCD and Engine Boards.
7. Refer to the Engine Board schematics, see page 6-8 in Chapter 6. Check the LCD_CONT signal path.
8. Refer to the Connector Board schematics, see page 6-14 in Chapter 6. Trace the contrast signal from Q4. It should be in the range of -7V to -10V depending on the Contrast control setting.

Buttons, Sliders or Controllers not working

1. Run the Scanner Tests. If the tests pass, the problem is likely the result of a setting in the Control Setup. Perform a Hard Reset to the unit or refer to the Control Setup sections in the *Getting Started Guide*.
2. Refer to the Interconnect Diagram.
3. Check all related cables. Disconnect and reseal the cables.
4. Check the solder connections at the connectors.
5. Check front panel ribbon cable(s).
6. Refer to the Connector Board schematics and check U1, IC Scanner M38869, for signal activity.
7. Check for the presence of +5V +/-5% on the Ring connection to either Continuous Control Pedal jack.

Keyboard Problems

Dead Keyboard

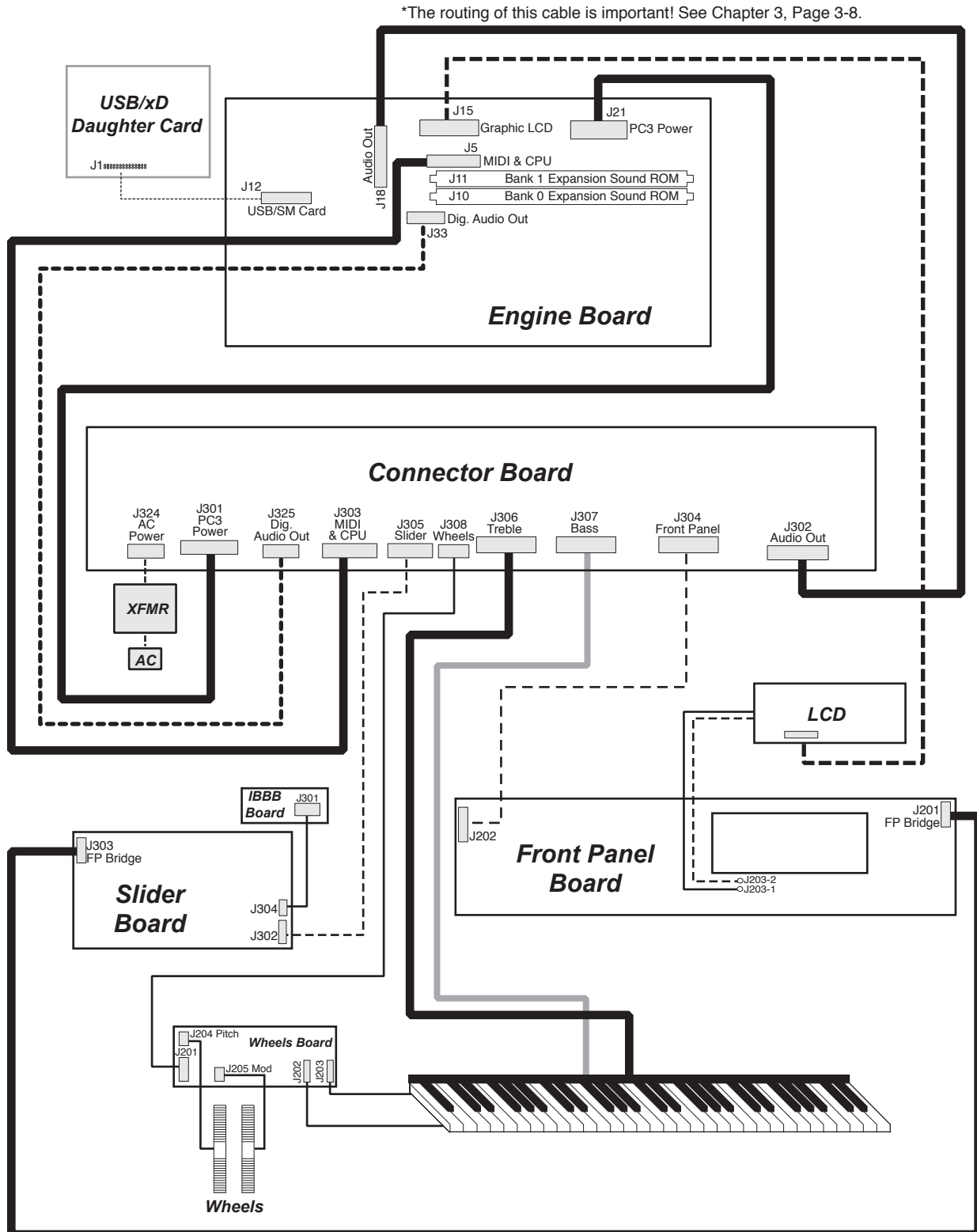
1. Run the Scanner Tests. If the tests pass, the problem is likely the result of a setting in the Control Setup. Perform a Hard Reset to the unit or refer to the Control Setup sections in the *Getting Started Guide*.
2. Check the flat ribbon cables connecting the keyboard Bass and Treble Contact Boards to the Connector Board, locations J307 and J306 respectively. Be certain that the cables are not loose or damaged.
3. Disconnect and reseat the cables.
4. Refer to the Connector Board schematics.
5. Check U1, IC Scanner M38869 on the Connector Board for keyboard signals.
6. Trace signal path.
7. Find and replace bad component(s) or order a board replacement.

Dead Note(s) or no velocity sensitivity

One or More in a Section

1. Remove related contact board.
2. Check the keyboard contact strip for dirt, damage or wearing. Clean dirty contacts with denatured alcohol. Replace a damaged or worn keyboard contact strip.
3. Install keyboard contact strip.
4. If section is still dead, remove strip and check contact board for shorts, cold solder joints, etc.
5. Find and replace bad component(s) or order a replacement board.

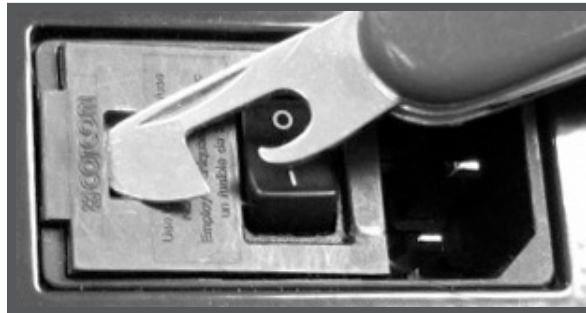
PC3x Interconnect Diagram



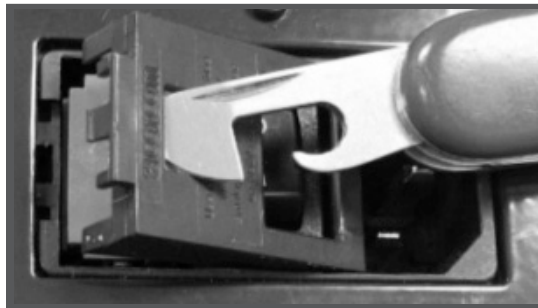
Converting the Voltage

Accessing the Fuses

1. Turn the power off and remove the power cord.
2. The fuse holder is located on the rear panel and is part of the power entry module.
3. The outer cover for the power switch and the fuse holder is a hinged door.



4. Insert, at an angle, a thin flat tool into the red voltage indicator window.



5. Gently pull up the fuse holder cover.



6. Position the flat tool as shown in the photo above and pry out the fuse holder.

The Fuse Holder

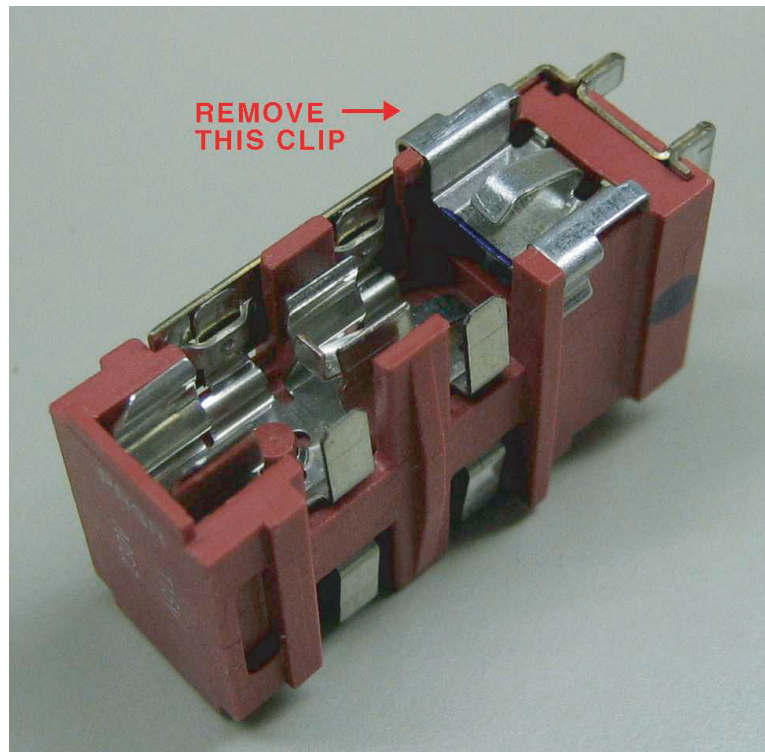
The fuse holder used in the PC3x can accommodate different fuse configurations. In general, two fuses are required in EU countries and for all units configured for 230V regardless of location. Only one fuse is required in the USA. Check local regulations for requirements in other locations. Two fuses may be used in the USA if the conversion clip is removed. See the photos and instructions that follow to remove the conversion clip.

The fuse sizes may be either 1.25" X 0.25" or 5 mm X 20 mm. For units set to 115V, use two 500mA fast blow fuses. For units set to 230V, use two 250mA fast blow fuses.

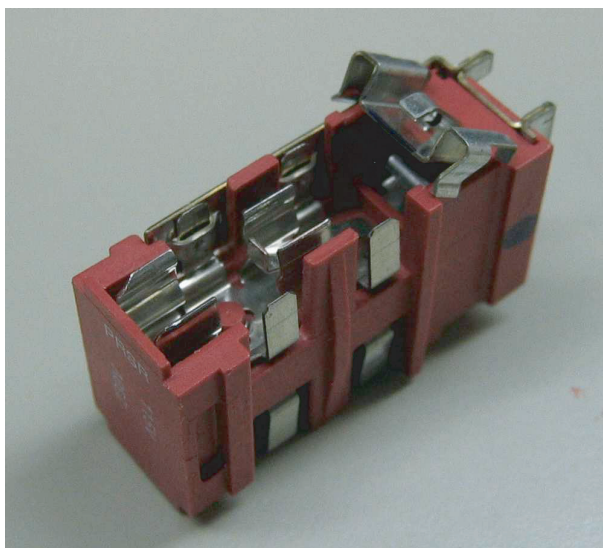


Warning: When only one fuse is used, a conversion clip must be installed in the other fuse location.

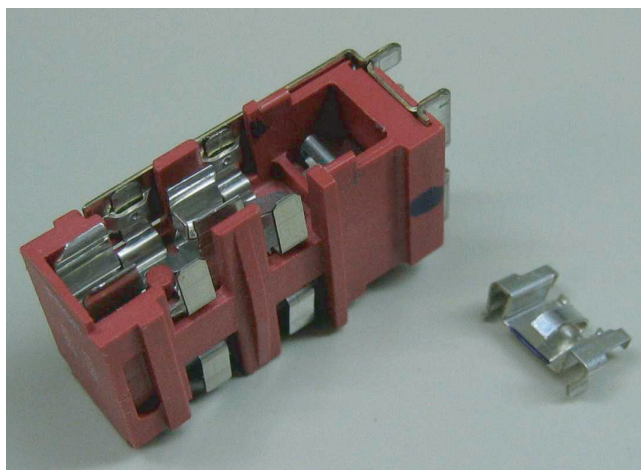
1. The photo below shows the position of the conversion clip for a unit with only one fuse.



2. To configure the fuse holder for two fuses, you must remove the clip.



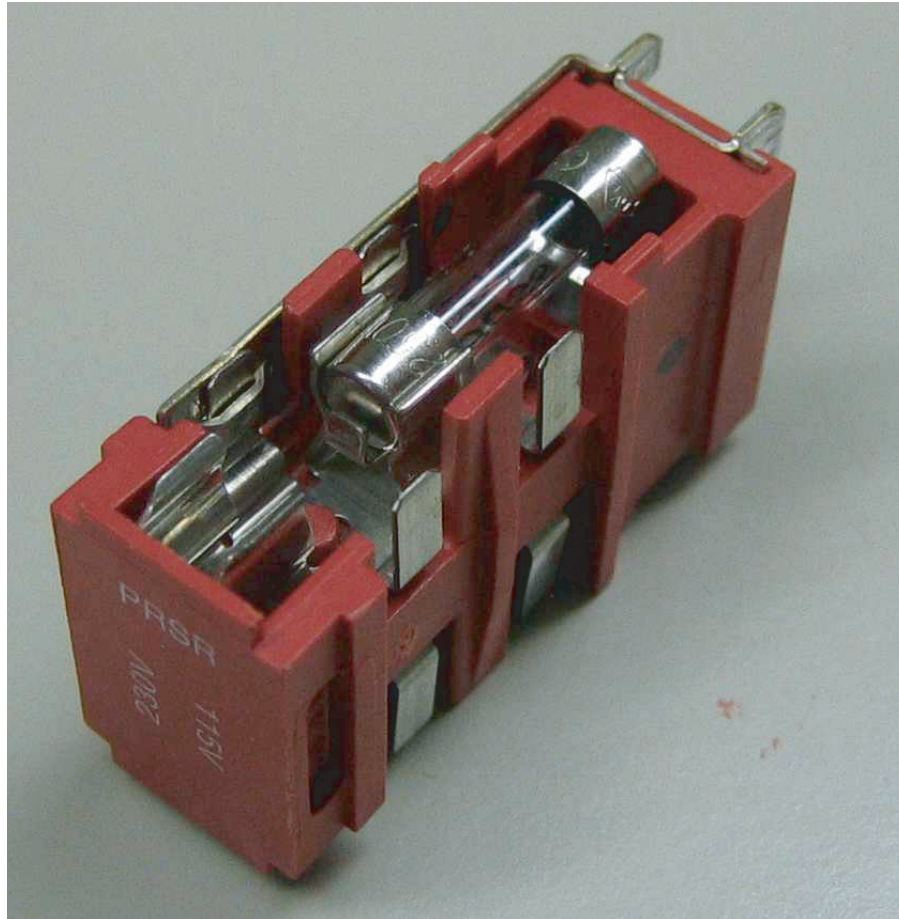
3. Lift off the clip.



4. Be sure to save the conversion clip so that it can be installed if the fuse holder is once again configured for a single fuse.

Using 5 mm X 20 mm Fuses

1. If you use 5 mm X 20 mm fuses, install them toward the inside end of the fuse holder near the metal pins.
2. The photo below shows the correct position for a 5 mm X 20 mm fuse.



Replacing the Fuse Holder

1. Insert the fuse holder into the power entry module. The indicator showing the desired voltage should be positioned toward the outer edge of the module away from the power switch.
2. Close the fuse holder cover.
3. Check the voltage indicator and verify the desired voltage is present in the window.
4. The unit is now ready for operation.
5. Be sure to connect the correct power cord to match the current voltage.

