

PC88

Musician's Guide

KURZWEIL
Music Systems

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Part Number: 910243 Rev. C

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

IMPORTANT SAFETY AND INSTALLATION INSTRUCTIONS

WARNING - When using electronic products, basic precautions should always be followed. Read all of the Safety and Installation Instructions before using the product.

Do not use this product near water, such as near a bathtub, sink, in a wet basement, near a swimming pool, or the like.

This product, 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.

The product should be located away from heat sources such as radiators, heat registers, or other products that produce heat.

The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.

This product is 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.

The product should be serviced by qualified service personnel when:

- A. The plug has been damaged; or
- B. Objects have fallen upon, or liquid has been spilled into the product; or
- C. The product has been exposed to rain; or
- D. The product does not appear to be operating normally or exhibits a marked change in performance; or
- E. The product has been dropped, or the enclosure damaged.

Do not attempt to service the product. All servicing should be referred to qualified service personnel.

WARNING - Do not place the power cord, or the product in a position where anyone could trip over, walk on, or roll equipment over them. Do not allow the product to rest on or be installed over cords of any type. Do not place the power module where it cannot receive cooling air, such as under a rug. Improper installations of this type may 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 class B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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PC88 Specifications

Physical

- Height: 4 5/16" (10.95 cm)
- Width: 14" (35.6 cm)
- Length: 54 5/16" (137.95 cm)
- Weight: 55 lbs. (25 kg)

Electrical

- | | <u>120 VAC</u> | <u>240 VAC</u> |
|----------------------|-------------------|-------------------|
| • Voltage Range: | 100-125 Volts RMS | 200-250 Volts RMS |
| • Frequency Range: | 48-65 Hz | 48-65 Hz |
| • Input Voltage: | 9.5 Volts AC | 9.5 Volts AC |
| • Power Consumption: | 2.0 Amps maximum | 2.0 Amps maximum |

Environmental

- Temperature (Operating): 40 to 104°F (5 to 40°C)
- Temperature (Storage): -13 to 185°F (-25 to 85°C)
- Relative Humidity (Operating and Storage): 5 to 95%, non-condensing

Audio

- Output Connection: 2 x 1/4" Mono Phone Plug
- Impedance: 2K Ohms
- Output Level: 3.5 Volts RMS Max, 1 Volt RMS Nominal
- Dynamic Range: >103 dB "A" Weighted

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Chapter 1

Introducing the PC88

The PC88 is a self-contained portable keyboard that features quick and intuitive access to 64 (and optionally more) internal sounds derived from Kurzweil's renowned ROM samples. It can produce up to 32-note polyphony in full stereo, and lets you layer as many as 4 (and sometimes more) sounds at once. Built-in reverb and chorus are also provided, and there's a sophisticated on-board arpeggiator for composing, performing, or just fooling around.

Thirty-two versatile MIDI Setups are provided to let you start making great music immediately. You can also use these Setups as templates, or create new Setups from the Internal Voices.

Furthermore, the PC88 is a high-quality MIDI keyboard controller, with 88-key weighted action, adjustable velocity and pressure (aftertouch) curves, two programmable on-board wheels, four sliders, three buttons, and jacks for two footswitches and four continuous control pedals. Data on four independent MIDI channels can be sent simultaneously, using four different "zones", each of which has its own key range — which can overlap with any others — and its own controller definitions, as well as the ability to be muted or soloed instantly. Other features allow merging and remapping of incoming MIDI data (listening on all 16 channels), and the ability to go instantaneously from one complex setup to another.

Finally, the PC88 is a versatile multitimbral instrument that can be used to complement any MIDI setup. With the optional plug-in VGM™ (Voice/GM expansion) board, the PC88 becomes a top-of-the-line General MIDI instrument, for use in education, multimedia production, games, and other exciting applications. In addition to expanding the PC88's complement of sounds to match the General MIDI spec, the VGM board adds 12 sets of drum and percussion sounds, and doubles the PC88's maximum polyphony to 64 notes.



For People Who Never Read Manuals...

Read this chapter, at least. If you're an experienced MIDI musician, you will have no trouble getting the PC88 up and running right away, and that's what we'll do here. But even if you've mastered every other keyboard in the world, take some time to go through the manual and learn about the advanced features of the PC88. You'll discover some unique new ideas.

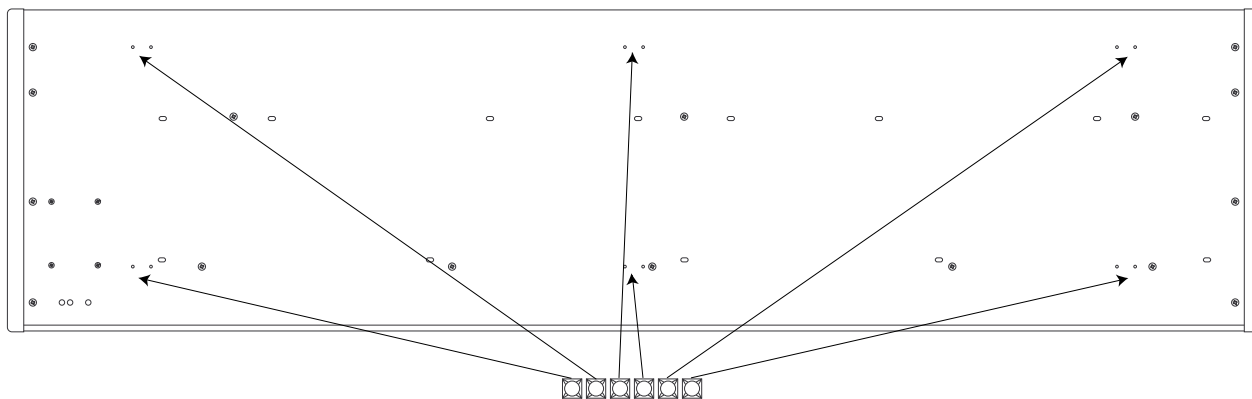
Unpacking the Unit...

is pretty straightforward. It's always a good idea to keep the box and packing material, in case you need to ship it for any reason. Your PC88 carton should contain the following:

- PC88 Performance Controller
- AC adapter
- switch pedal
- six adhesive-backed rubber feet
- manual
- warranty card

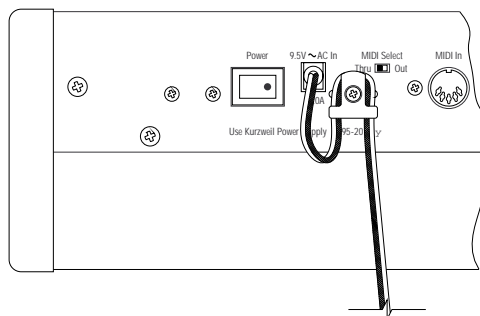
Setup

Set the PC88 on a keyboard stand or table. Always make sure the ends are supported — not just the middle. Use the stick-on rubber feet if you're putting the unit on a flat surface (or even if you might in the future). As shown in the following illustration, pairs of guide holes on the bottom of the PC88 show recommended locations for the feet. Remove the backing paper from each rubber foot, then attach to the bottom of the PC88, just forward of a pair of guide holes.



Plug the audio outputs into your mixer or amplifier, and set your system up to listen in stereo. If you have another MIDI instrument, run a cable from the PC88's **MIDI Out** jack to the MIDI In of that synth. Connect the supplied switch pedal to the jack labelled **Switch Pedals 1**.

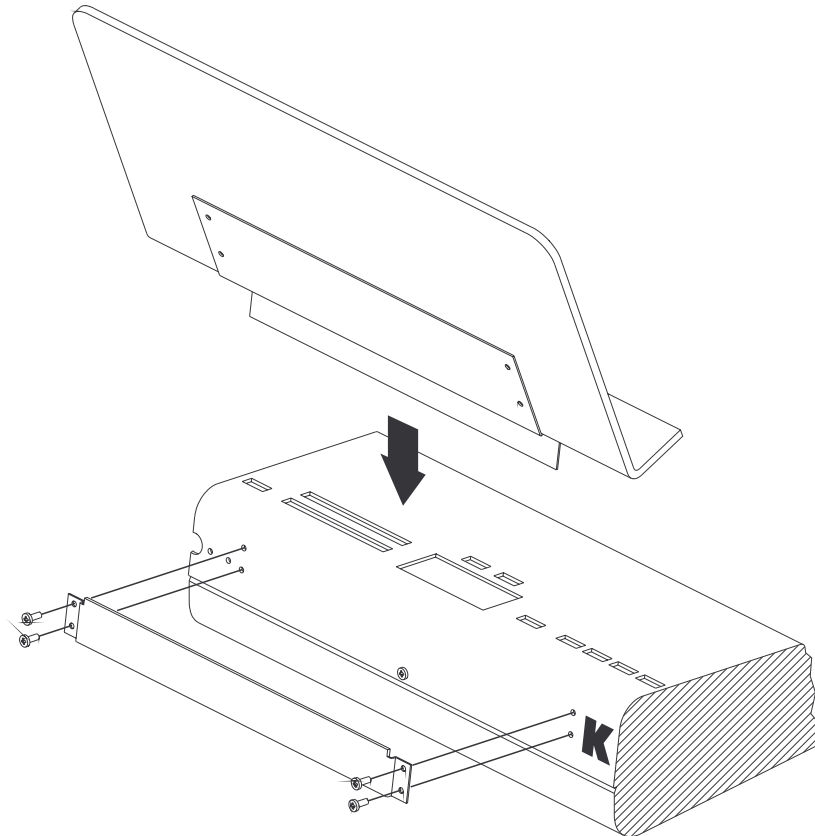
Locate the small plug at the end of the wire on the power supply. Locate the **9.5V~AC In** socket on the rear panel. Next to the socket is a protruding plastic strain relief "T". Wrap the wire once, not too tightly, around the strain relief, and insert the plug into the socket, as shown below.



Now plug the large end of the power supply into an AC socket. Turn on the power by pushing in the side of the switch with the white dot. The two-line LCD display in the middle of the instrument comes to life and welcomes you to the PC88. Turn up the audio, and we're ready to go.

Installing the Music Rack

Installing the PC88's optional music rack is a simple procedure that requires only a Phillips screwdriver. To install the music rack, first remove the four screws on the back panel of the PC88, as shown in the illustration below. Then, use these screws to attach the music rack bracket, making sure that the rounded edge of this bracket is towards the top. When you have installed this bracket, slide the music rack in from the top (as shown in the illustration).



Installing the PC88's optional music rack.

Demo Sequence

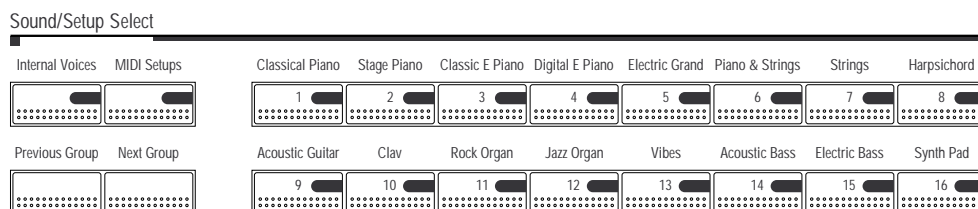
There is an onboard sequence you can play at any time to demonstrate the capabilities of the PC88 and impress your friends. A removable label shows that you start it by pressing the **Acoustic Bass** and **Synth Pad** Sound / Setup Select buttons simultaneously (buttons 14 and 16). It will play through to the end, but you can stop it by pressing the buttons again.



If your PC88 has a VGM board and software version 1.1 (or higher), more than one demo sequence is available for your listening pleasure. In this case, several instrument lights will blink after you press buttons 14 and 16 simultaneously, each one representing a different demo. Press any of the blinking lights to listen to one of the demo sequences. We think you'll want to listen to all the sequences, since they go a long way towards demonstrating the possibilities you have with your PC88.

Internal Voices

Let's explore the onboard instruments. When the PC88 is first turned on, the button labelled **Internal Voices** in the group of four buttons under the left side of the label **Sound/Setup Select**, is lit. Now the group of 16 numbered buttons to the immediate right of this can be used to choose from 16 families of instruments. Button number 1, **Classical Piano**, is lit right now. This is the selected voice; its name appears in the display. Press the other numbered buttons to select among the other voices. While you're doing that, play with the modulation wheel (the second one in from the left, or "Wheel 2") and the sustain pedal, and see how the sounds change. On most of the organ sounds, for example, pushing the modulation wheel brings in a rotating speaker effect.



To select a different instrument within a family, use the **Previous Group** and **Next Group** buttons. Each family contains 4 different instruments, arranged in Groups labelled (as you'll see on the display) A through D. (Press **Previous Group** and **Next Group** simultaneously at any time to return to Group A.) Press the Select button marked **Piano & Strings**, and then press the Previous Group button until the upper-right corner of the display says **A06**. This is a layered sound of a bright stage piano and a string pad. Hold a chord and move the slider in the **Assignable Controllers** section labelled C. Listen to how the timbre changes.

Assigning Controllers

Let's have Wheel 2 do something else. Find the group of buttons at the top of the panel labelled **Zone Parameters**. The topmost right button is labelled **Controllers**. Press that button so that its light comes on. The top line of the display reads **Wheel 1 UP**. Now press the **Controllers** button again, but this time hold it down while you move the modulation wheel slightly. The display changes to read **Wheel 2**. This is an example of a feature called "Intuitive Entry" which makes it possible to adjust parameters quickly without having to scroll through pages of them. The PC88's display now looks like this:

```
Zone:1   Wheel 2
Ctrl Num: 1 Mod Wh1
```

Right now, the lower line on the display tells us that Wheel 2 is controlling Modulation (MIDI Controller #1). Turn the big black knob on the panel under the label **Data Entry** — we'll be calling this the "Alpha Wheel" — clockwise until the lower line of the display says **Ctrl Num: 10 Pan**. Wheel 2 has now been configured as a pan control. Play a passage of short notes while you quickly move the wheel. The notes will appear at different points in the stereo spectrum depending on the position of the wheel.

Exiting from PC88 Menus

You can exit from any PC88 menu by going directly to Internal Voices mode or MIDI Setups mode. You do not have to explicitly exit from the menu; the PC88 will change modes automatically, as soon as you press the **Internal Voices** or **MIDI Setups** button. For example, to return to Internal Voices mode without changing the controller assignment in the above example, press **Internal Voices** (which will begin blinking), then press one of the Sound Select buttons, **Harpsichord** for example. Notice that the **Internal Voices** button stops blinking when you select a sound. (Since we didn't save the controller assignment when we selected this Internal Voice, the wheel resumes its modulation function.)

MIDI Setups

We've been dealing with one instrument so far, but the PC88 lets us play with four at a time. Multiple instrument setups are called, logically enough, "MIDI Setups", or just "Setups". You get to them by pressing the button marked (you guessed it) **MIDI Setups**. Do it now. It blinks, awaiting your selection of a Setup.

In the **Sound/Setup Select** section, press the Button numbered **16**, and press the **Previous Group** button until the top line of the display reads "S016 Volume Sliders." This Setup consists of four "zones", each with its own instrument. You know that four zones are playing, because all four of the Zone buttons to the left of the display (right under the heading **Zone Select & Assignable Controllers**) are showing green lights. All of the zones in this setup cover the entire keyboard, so any note you play will sound four different instruments simultaneously. Additionally, each of the four zones has an assignable slider programmed to send MIDI Volume commands on its channel. As is common practice (but not required), Sliders A, B, C, and D are controllers for zones 1, 2, 3, and 4, respectively.

The light in each of the Zone buttons can show three colors: green, orange, or red, or it can be off. Green means "active"; orange means "muted"; red means "soloed"; and dark means "off" or inactive. There's one more mode for a zone, and that's "current". The current zone is the one whose parameters are showing in the display. Since you've just selected the setup, the current zone is indicated by a number 1 through 4 on the second line of the display just before the name of the program assigned to that zone. Any zone, regardless of whether it is on or off, can be the current one. The PC88's display shows you the following right now:

Setup ID number	Setup name
S016	Volume Sliders
A16 1:	Stage Piano
Setup group & button	Current Zone's number & Program name

Look at the display and see if Zone 1 is current. If it isn't, press the **Zone 1** button.

Press the **Zone 1** button (again). Its light changes to orange. The zone is now muted, and the next time you play a note, a portion of the sound won't be audible. Press the **Zone 1** button again to make it active (green). To mute any other zone, press its button once to make it current, then again to mute.

To mute all but one zone, press the **Solo** button to the right of the Zone buttons. It glows red. The current zone's button also turns red, showing it's being soloed. Even if the zone was muted, soloing it turns it on. (However, if the zone were off — dark — soloing wouldn't bring it to life.) To solo a different zone, press its button to make it current. To turn off the Solo function, press **Solo** again.

Let's edit the Setup. For this tutorial, keep all the sliders up, so you will be able to hear the zones as you work on them. In the **Zone Parameters** section, select **Key Range**. As shown

below, the display now shows the current zone and its program number on the top line of the display, and the first two Key Range parameters in the bottom of the display.

```

Current Zone      Bank & Program number
                  for current Zone
Zone:1           0:001
Low:C -1        Hi:G 9
-----
Para- Value     Para- Value
meter           meter

```

Press the **Solo** button. We can now work on the key range of Zone 1, without being confused by other zones sounding.

The display tells us that the range of the zone is set to C-1 to G9, which is the entire MIDI range. (For reference, C4 is middle C.) Push the right cursor button immediately under the display (it's labelled >>>) once, so that the underline cursor on the display is under the "Hi" value. Turn the Alpha wheel counterclockwise until the "Hi" note reads "B2". Press the **Acoustic Bass** button in the Sound Select group, and (if necessary) press the **Previous Group** button until the upper right of the display shows "0:013". You've chosen Internal Voice number 13. The result is that you have an acoustic bass sound that plays from the bottom of the keyboard up to the third B.

Press the **Zone 2** button to listen to and work on the second zone (still in Solo mode). Let's use a different technique to set the key limits of this zone. With the cursor under the "Hi" value, press and hold the Enter button in the numeric keypad to the right of the Alpha wheel. While you're holding it, play the note B4 (the B above the key marked "C4"). The display shows that the note you've played has become the high limit of the zone. Use the <<< button to move the cursor to the Low limit, press and hold **Enter**, and play C3 (an octave below C4). The low limit is now defined as C3. This is another example of the "Intuitive entry" editing technique.

Now let's put a different program into this zone. Press the button labelled **Strings** and the **Previous Group** button (if necessary) until the display reads 0:006 in the top right corner. You've chosen the first internal string sound for this zone. Go to **Zone 3**, set the range from C5 (an octave above C4) to B6, and select **Digital E Piano** as the voice. If you want to see the name of the program, and not just the number, press the **Program** button. This menu allows you to select any of the programs by scrolling, pressing the sound select buttons, or by typing in program numbers. For now, (if necessary) press the **Previous Group** button until the display shows Program # 3, Digital EPiano. Note the asterisk (*) next to the Zone number; this tells you that the current Zone is soloed.

```

Zone:3*         0:003
003 Digital EPiano

```

Now you have two octaves of electric piano, but it's pitched rather high. Press the **Transpose** button, and move the Alpha wheel counterclockwise until the display says "Transposition: -12". This brings the sound of the zone down an octave, without changing its position on the keyboard.

```

Zone:3*         0:003
TransPosition: -12

```

For **Zone 4**, use the top octave of the keyboard (C7-C8), and select your own instrument and transposition. Now you've got a complete Setup. Just for fun, change the Hi limit of Zone 2 (the strings) to C8. Since zones can overlap freely, this will extend the string sound so that it acts as a "pad" underneath the sounds in the upper two zones. Now press the **Solo** button to turn it off, and listen to all four of your newly edited zones.

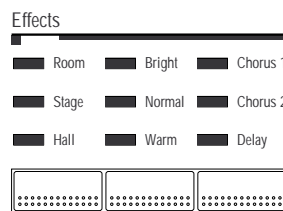
If you would like to store this Setup, press the **Store** button, and see "Replace Setup 16?" Now, move the alpha wheel clockwise until it stops asking to replace existing setups, and instead says, "Save Setup 33?" (or "Save Setup 65?" if you have VGM installed). Press the **Enter** button now, and it will save the new Setup.

Exiting Without Changing a Setup

If you don't want to save the Setup, press **MIDI Setups** followed by the sound select button that lights up when you press **MIDI Setups**; this returns you to the unedited Setup. Alternatively, you can go directly to Internal Voices mode (without saving the edits you made to the Setup) by pressing **Internal Voices** followed by one of the sound select buttons. More details about naming and saving setups may be found in Chapter 5

Effects

Our last stop on this get-acquainted tour is setting the effects. You may have noticed as you were changing instruments in the Internal Voices mode that the **Effects** lights changed as well, and so did the reverb and chorus. The PC88 is capable of generating a huge variety of reverb and delay effects, and each Internal Voice comes with its own effect assigned to it.



You can change the effect assigned to a Voice. Go back to Internal Voices mode. Press the left-most button under the **Effects** label to toggle among **Room**, **Stage**, and **Hall**-type reverbs. The lights show what you have selected. You can also select no reverb at all: the lights go off. The middle button lets you adjust the tone color of the reverb: **Bright**, **Normal**, or **Warm**. The right button lets you choose from among two **Chorus** effects, a **Delay**, or no effect. The reverb and the effects selections are independent of each other, so you can use one without the other. The effects settings are remembered with each Internal Voice, so if you select a different Voice and then come back to this one, the effects will be as you left them.

Just the Beginning!

That's the quick tour, which should give you some idea of the capabilities of the PC88. If anything we've covered so far was confusing, or you have questions about any aspect of what you've just done, feel free to jump around this manual to look up the things that interest you. In the next chapter we'll start again from the beginning, in depth.

A Note About the VGM Board and the PC88mx



The PC88 has many important extra features when the optional VGM™ (Voice / GM expansion) board is installed, although the basic operation is the same with or without the board. In those places in the manual where a special explanation is needed for a VGM board feature, we've put the VGM logo in the margin. By the way, when you start up the PC88 a message will appear on its display to indicate whether or not a VGM board is installed.

The PC88mx model comes with the VGM board already installed. Refer to the sections of this manual with the VGM logo in the margin for information on the PC88mx's features.

Checking Battery Voltage Level

Your PC88 stores Setups you've created, as well as information about your effects and group preferences, in internal memory. This memory is backed by a lithium battery that will last 3-5 years. Although a start-up message alerts you to a low battery level, you may want to check the battery voltage from time to time. As a safeguard, you may want to back up your Setups to an external device with the **Dump all Setups** option on the **Global** menu.

Internal Voices and ROM Setups are not dependent on battery-backed memory.

To check the battery level:

1. Press the **4**, **5**, and **6** buttons simultaneously. The top line of the PC88's display will look something like this:
`SCAN 2.4 W=123 B=2.9`
2. Check the part of the display labelled "B=x.x". This is the battery voltage level. It should normally be 2.8 or higher. When this value declines to 2.4 or below, you should have your Kurzweil dealer replace the battery. Note that when the battery voltage level is 2.4 there is less than two months of battery life remaining; when the battery voltage level is 2.0 or below, memory failure is likely.
3. Press **Cancel** and **Enter** simultaneously to return to normal PC88 operation.

Chapter 2

Setup, Connections, and Controls

Setting Up the PC88

The PC88 is designed to be portable, and therefore doesn't come with its own stand. You can use a conventional keyboard stand that is strong enough to hold the unit's weight (about 55 pounds). Other methods of supporting it can be used, but make sure that the two ends are equally well-supported—don't just lay it on top of a chair in the middle. It's a good idea to use the stick-on rubber feet even if you are going to be putting the PC88 on a metal stand — you never know when you'll have to put it down on a table. Just make sure the feet don't get in the way of the stand's supports. A figure in Chapter 1 illustrates the recommended attachment points for the feet.

Connections

Power

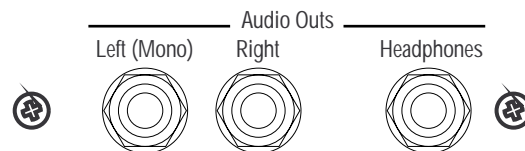
Power is supplied by an external AC power supply (it helps the balance and keeps the weight down, since you asked). Use only the unit supplied with your PC88, and make sure the power switch on the rear panel of the PC88 is off—the side with the white dot is out—before connecting the power supply.

The black box containing the transformer plugs into a wall socket or power strip, and the small plug on the end of the wire goes into the jack marked **9.5V~AC In** on the rear panel. A protruding plastic strain relief is next to the power socket — wrap the wire once around it before plugging it into the jack, and this will prevent damage should the cord ever be yanked. A figure in the "Setup" section of Chapter 1 shows how to do this.

If you are using the PC88 in a different country from the one you bought it in, make sure the power supply is the correct one for that country's AC power. Contact your dealer for information.

Audio

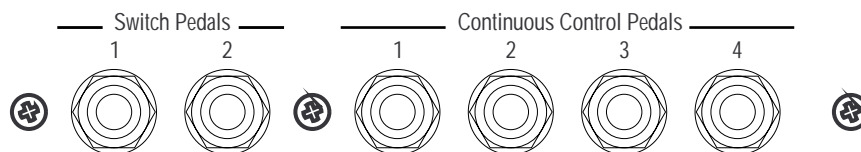
Audio connections are 1/4-inch, unbalanced, for use with a standard instrument amplifier or mixer. To use the PC88 with a hi-fi system, you will need cables with 1/4" jacks on one end, and RCA (phono) plugs on the other. Use only the **Left (Mono)** jack if you want to listen in mono — for example, if you have only a one-speaker instrument amplifier, or only a single mixer channel available. Use both jacks for stereo.



The headphone jack carries the same signal as the main outputs, and is useful for solo practicing or monitoring. It provides a stereo signal, using a standard 1/4-inch tip/ring/sleeve configuration. Plugging it in does *not* disconnect the main outputs.

Pedals

The PC88 has jacks for connecting up to four external control pedals (**Continuous Control Pedals**) and two foot switches (**Switch Pedals**). The control pedals are typically used for continuous functions like volume or stereo pan, while the switches are used for on/off operations like sustain, sostenuto, or to shift to the next setup. The action of every pedal is programmable within each zone: a pedal may have one function in one zone, and a totally different function — even a directly *opposite* function — in another zone.



There's no need to connect the pedals in any particular order — you can have any combination of pedals plugged in and active at any time.

The control pedals should be 10k Ω linear-taper potentiometers, with 1/4" tip/ring/sleeve plugs. These are available from Kurzweil/Young Chang (Model CC-1), as well as other manufacturers. The switch pedals use two-conductor 1/4" plugs. Either normally-on or normally-off switches can be used: the PC88 will sense what kind of switch is plugged into each jack when it powers up, and will set itself accordingly. Therefore, it's a good idea to have any switch pedals that you plan to use plugged in when you turn the power on. (*Don't press the pedal while you're turning the unit on, however, or you may end up with something that works upside-down.*) Three models of switch pedals are also available from Kurzweil/Young Chang: FS-1, a conventional pedal; KFP-1, a piano-style; and KFP-2M, a dual piano-style pedal.

The Internal Voices have default settings for many of the PC88's pedal controllers:

Controller	Default setting
Switch Pedal 1	Controller #64 ("Sustain")
Switch Pedal 2	Controller #66 ("Sostenuto")
Continuous Control Pedal 1	MIDI Controller #11 ("Expression")
Continuous Control Pedal 2	Controller #4 ("Foot Pedal")
Continuous Control Pedal 3	<i>None</i>
Continuous Control Pedal 4	<i>None</i>

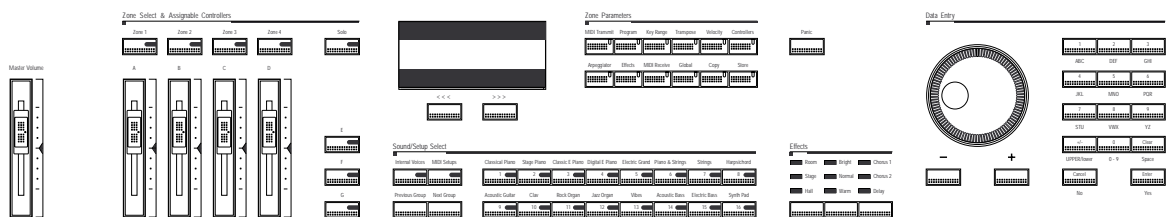
MIDI

The **MIDI In** jack is used when you are using the PC88 with another MIDI controller device, such as a keyboard, guitar, wind controller, or drum pad; or with a sequencer. Connect the MIDI Out of the device or sequencer to the MIDI In of the PC88. The PC88 can receive 16 separate channels of MIDI data through the MIDI In jack.

MIDI Out is used when the PC88 is acting as a controller for one or more other instruments, or for a sequencer. MIDI data being created by the PC88 is sent through this jack. The PC88 can send information on up to four MIDI channels simultaneously, depending on the configuration of the keyboard zones.

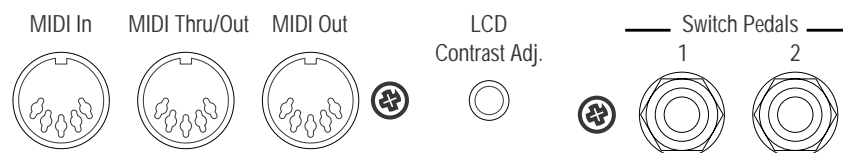
MIDI Thru/Out serves two functions, depending on the position of the recessed slide switch (**MIDI Select**) to the left of the MIDI In jack. In the **Out** position, the jack doubles as a second Out jack, and sends MIDI data being created by the PC88. Since you can't just split a MIDI line with a Y-cable, having a second Out jack makes it more convenient to hook up multiple instruments that are being driven directly from the PC88. In the **Thru** position, this jack sends MIDI data which is being sent *to* the PC88—echoing what appears at the **MIDI In** jack (without any delay)—but *not* data being generated by the PC88 itself. In this configuration, you can “daisy-chain” multiple MIDI instruments which are under the control of something else, like a sequencer, through the PC88. There is also a special “Merge” feature that combines these functions. We'll talk about it in Chapter 9.

Front Panel Controls



Display (LCD)

The LCD display is your “window” into the PC88. In two lines of text and numbers, it tells you what you need to know about the settings and functions of the instrument. You can adjust the contrast of the LCD to accommodate different playing positions, by using the small black knob on the back panel of the PC88. The illustration below shows the location of this knob (labelled **LCD Contrast Adj.**), between the MIDI jacks and the pedal jacks.



Cursor Buttons

Directly below the display are two buttons marked <<< and >>>. These are the cursor buttons. When you are making adjustments to parameters, these let you move among the parameters within a “menu”. Pressing the right or left button changes the display to show the next or previous parameter in the menu. The value of the parameter is then changed with the Alpha wheel or the keypad, or by using Intuitive Entry.

Sometimes there will be two parameters on the display at once, for example (as we've seen) when setting the key range of a zone. The cursor buttons will let you select which parameter to adjust.

The cursor buttons have a “repeat” characteristic — if you press and hold one down, it will scroll quickly through the list of parameters on the menu.

When the menu is long, such as when you are assigning MIDI controllers to the PC88's physical controllers (wheels, sliders, etc.), or when you are editing effects, the cursor buttons have a “jump” feature: press both of them at the same time, and the display jumps to a parameter some distance down the list. We'll deal with exactly how this works in the appropriate sections.

Sound/Setup Select

These two groups of buttons — four on the left, 16 on the right — are the principal ways to switch among sounds and configurations of the PC88.

The PC88 plays in one of two modes. In the **Internal Voices** mode, the instrument is a single-sound keyboard instrument that transmits on a single MIDI channel. The **MIDI Setups** (or just “Setups”) mode turns it into a four-part multi-timbral synth and controller, with independent MIDI transmission on four different channels. These two buttons select between the two modes. (When it comes to *receiving* MIDI data, the PC88 is capable of receiving multi-timbrally on 16 MIDI channels, regardless of which mode it is playing in.)

In the Internal Voices mode, the 16 numbered buttons select among 16 types of sounds. They are also labelled with instrument names, showing you the type of instrument that will be selected. Other groups contain different, but related instrument sounds. To get to them, you can press the **Next Group** or **Previous Group** buttons. If the current instrument is “Clavinet” (#9), pressing **Next Group** will call up “Stereo Clav” (#25), and pressing it again will call up “Super Clav” (#41). Each sound “family” contains a total of four variations. The groups are labelled A, B, C, and D, and these labels appear at the upper right of the display.

The PC88 remembers the group that your last selection of any instrument came from. Say, for example, you press **Classical Piano**, and then **Next Group** to hear Voice #16 “Class Piano 440”. The display shows “B01”, meaning you’re in group B, Voice 1. Then select another Voice in a different group — say #11, “Jazz Organ 1, A12”. The next time you select **Classical Piano**, it will remember that the Classical Piano Voice you last used was from group B, and it will call up “Class Piano 440”, not some other Classical Piano sound from another group. For your convenience, the PC88 even remembers your group selections across power cycles.

In Setup mode, the Select buttons work in a similar way, except that because all setups are user-programmable, there’s no direct correspondence between the names printed on the panel and any of the Setups. Furthermore, they do not remember the group that your last selection came from. There is room for 128 Setups in the PC88, and they are arranged in groups A through H, with the group letter at the *bottom left* of the display. Unlike Internal Voices, Setups in different groups that share a common number are not necessarily related.

Zone Buttons

Moving to the left of the display, immediately under the label **Zone Select and Assignable Controllers** are the four Zone buttons. These have several functions. They turn zones on and off, they select which zone will be “current” and thus have its parameters adjusted, and they select zones for soloing. The Zone buttons contain three-color LEDs. When the LED is green, the zone is on (active). When it is orange, it is muted. When it is red, it is being soloed, and when it is dark, the zone is off or inactive.

Remember that zones are only operative in MIDI Setup mode. In Internal Voices mode, only Zone 1 is used.

To select a zone for editing, press its button once. The number of the zone shows up on the display, showing that it’s the “current” Zone. If you are not in Zone Parameters mode, the zone number is displayed on the second line, next to the program name. If you are working on parameters, the zone number is on the first line. Next to it may be a character: if the zone is muted there will be a “-”, while if it is soloed, there will be a “*”.

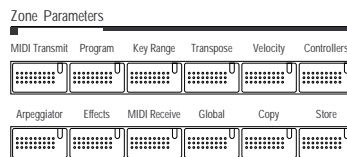
active:	muted :	soloed:
Zone: 1	Zone: 1-	Zone: 1*

Once a Zone is selected, its button acts as a mute/unmute toggle. Press it once and it turns orange, and mutes. Press it again, and it un-mutes, becoming active and turning green.

The **Solo** button to the right of the **Zone** buttons mutes all zones except the current one. The button of the zone being soloed will glow red.

Zone Parameters

Moving to the top of the panel, we find 12 buttons. The first row of six are for accessing parameters within each of the four zones of a Setup, while the ones in the bottom row are for dealing with Setup parameters, global settings, and memory functions. Each of these buttons opens up a list, or “menu” of parameters. Some of the menus are very short — as short as a single item — while others have several dozen parameters.



Chapters 4 and 5 have complete descriptions of using zones and zone parameters, so for now we’ll give a brief summary of these menus.

MIDI Transmit determines the MIDI channel the zone will send on, as well as the “destination” of the played data: whether it goes to the internal sounds and/or the MIDI Out jack. Also, the pitchbend range of the Zone’s destination channel is set here.

Program selects what voice, or program, will be used in the zone. It also lets you determine whether a MIDI program change will be sent when the setup is called up; whether a MIDI Bank Select message will be sent and what form it takes; and how program numbers and names will be displayed for the voice assigned to the zone.



Key Range sets the high and low limits for the zone. It also lets you set up “maps” for sending alternately-played notes to different zones. This is important when you are using the special “64-Note Poly” bank on the VGM board. It can also be used when you are driving multiple similar instruments and want to have them handle the same data, but in such a way that their polyphonic capabilities complement each other and add up.

Transpose changes the pitch of the zone up or down, up to 127 semitones.

Velocity opens a large menu with parameters relating to how the keyboard generates velocity information. You can adjust velocity scaling from none — the same velocity value is always sent — to three times normal, to three times normal but upside-down. You can also set the curve used for the scaling, the offset from normal, and minimum and maximum values.

Controllers opens the largest menu. These parameters determine how the PC88’s *physical* controllers — the wheels, sliders, pressure, pedals, and programmable buttons—work. In addition to specifying which *MIDI* controller (or other performance parameter, like pitchbend) is sent, this menu also determines for each controller scaling, curves, offsets, and the values that the controller will send — if any — when you enter or leave the setup.

The **Controllers** button has its own special “Intuitive Entry” mode, which we’ll explain a little later in this chapter.

The buttons on the second row are not Zone-specific, but are considered “Global”. Chapters 5 through 9 describe these buttons completely.

The first one is **Arpeggiator**. The PC88 has a sophisticated arpeggiator for live performance or sequencing or just fooling around. The menu includes controls for tempo, interval, note duration, and direction. Each Setup has its own Arpeggiator settings. See Chapter 6.

Effects lets you edit the on-board reverb, chorus, and delay. Each Setup has one set of Effects parameters associated with it. The effects are editable — see Chapter 7.

MIDI Receive turns on and off individual MIDI channels in the PC88, and also shows which program is assigned to each channel, when you're using an external sequencer. Chapter 8 discusses using a sequencer with the PC88.

The **Global** button's menu includes many parameters for both local and MIDI operation; they are detailed in Chapter 9. These include:

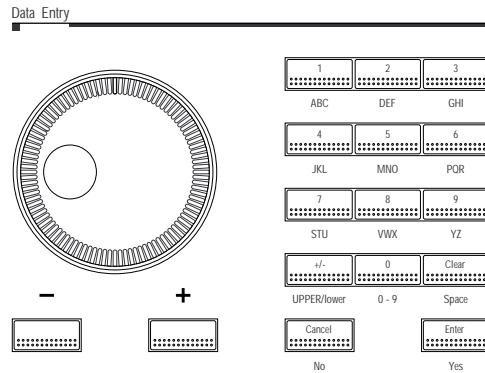
- Turning local control on and off for the entire instrument, which is very useful in a sequencer setup.
- Allowing synchronization to external clocks.
- Turning on and off the PC88's MIDI Clock generator.
- Adjusting the feel of the keyboard.
- Indicating whether or not you want effects to change when you change voices or Setups.
- Setting a parameter that tells the instrument to change Setups immediately whenever it receives an appropriate command, or to wait before changing until all of the keys being played are released.
- Using an external MIDI device to change the PC88's setups.
- Rerouting incoming MIDI data according to the channel and key limit parameters of the current Setup, or merging incoming MIDI data with generated data at the MIDI Out jack.
- Adjusting the master tuning of the PC88.
- Setting a transposition interval for received MIDI notes.
- Determining how Bank Select messages will be received by the PC88.
- Accepting or ignoring All Notes Off commands, which can be a problem with some external keyboards.
- Turning on and off the General MIDI mode in the PC88 (if the VGM board is present) and also in any other General MIDI modules connected to the PC88's MIDI output.
- Assigning device ID in multi-PC88 environments.
- Transmitting button presses as MIDI System Exclusive commands.
- Transmitting PC88 effects settings to a sequencer.
- Displaying the amount of user memory currently available.
- Performing a "hard reset", which returns the PC88 to its original factory state. Be careful with this: you will lose any Setups or any other edits that you've stored.
- Dumping all Setups in memory as System Exclusive data.
- Monitoring generated and incoming MIDI data with a built-in utility known as MIDIScope.

Copy allows you to duplicate groups of parameters from one zone to another (and sometimes even within a zone), so that you can quickly create zones with similar characteristics. It works in several modes: it will either copy all of a Zone's parameters, or only those in a specific subset. You can also use the "Clear" function at the end of each copy menu to copy information that is stored in Setup 128. This setup has default parameter information stored in it, though you can overwrite this setup with your own, creating your own "default" parameter settings. A full explanation is in Chapter 5.

Store is the button for saving Setups to internal memory. Press it once and use the Data Entry controls to select a location to store the Setup to, then press **Enter** to make it so. Also from this menu you can delete and rename Setups, and dump them over MIDI System Exclusive. See Chapter 5.

Data Entry

The Data Entry section is used to set the various parameters associated with a Voice or a Setup. It consists of three parts: the Alpha wheel, the decrement/increment buttons (- and +), and the numeric keypad.



- The Alpha Wheel is used to move rapidly through lists of voices and setups, to select them for playing or modification. It also sets parameter values when you are in Parameter mode. It has no markings of its own, but refers to what is showing in the display. You can move it either clockwise or counterclockwise without limit.
- The decrement/increment buttons complement the Alpha wheel by providing a quick way to make small adjustments, once the Alpha wheel has gotten you into the neighborhood of where you want to be. The buttons are auto-repeating: hold them down and they will continue to increment or decrement. In Parameter mode, they also have an “automatic reset” feature: press both simultaneously, and whatever parameter is showing on the display will return to its default setting.
- The numeric keypad is useful for when you know the exact number of the voice, setup, or parameter value you want. For example, if you know that you want to set a zone to transpose up four octaves (48 semitones), press the **Transpose** button, then enter the numbers **4** and **8** from the keypad. Then press **Enter**, and the display shows “Transposition: 48”. The “+/-” button is used to enter negative numbers. Use the “+/-” button any time before you press **Enter**: e.g., to enter -100, you can press +/-, **1**, **0**, **0**, **Enter**; or **1**, +/-, **0**, **0**, +/-, **Enter**; etc.

The +/- button has a secondary use when entering program numbers with banks: it acts as a separator between the bank number and the program number, and puts a colon (“:”) in the display. More on this in Chapters 3 and 9.

If you make a mistake with the numeric keypad, press **Clear** and everything you’ve entered is erased. If you decide you don’t want to change the parameter or voice after all, press **Cancel** and the display goes back to whatever it was showing previously.

- The numeric keyboard is also an *alphabetical* keypad, and is used to name Setups. More on this in Chapter 5.
- The **Enter** and **Cancel** buttons act as “Yes” and “No” for when the display asks you a question. The **Enter** button is also used in Intuitive Entry mode.

Intuitive Entry

The PC88 includes a feature called “Intuitive Entry”. This has three modes: in one, when a parameter is being displayed, you can enter a value for it using a physical controller or key, thus avoiding the Alpha wheel and numeric keypad. In the second, you can avoid scrolling

through long lists of parameters to find the one you want to adjust. In the third, you can instantly select a MIDI Receive channel to audition and edit. (We'll refer to the more conventional way of getting around the instrument as "Direct Entry".)

Value setting

The "value setting" mode of Intuitive Entry lets you use any physical controller (including the keyboard) to adjust a parameter shown on the display. Press and hold down the **Enter** button (on the numeric keypad) and move any controller or play a note. The value of the parameter will change to reflect the position of the controller or the number of the note.

Here's an example. Press **Transpose**. With Direct Entry, you would move the Alpha wheel to set the value of this parameter. Press and hold **Enter**, and move one of the four controller sliders — it doesn't matter which. Watch the Transpose value in the display change. The slider covers the entire range from -127 to 127.

Here's another. Press **Key Range** (under **Zone Parameters**) to look at the key range of the current zone. Hold down the **Enter** button, and play a note. That note is now the low limit of the range. Press the right cursor (>>>) button, press and hold **Enter** again, and play another note. This sets the high limit. And one more example. Press **Controllers**. The display says "Wheel 1 Up/Ctrl Num: Pitch Up". Moving the Alpha wheel clockwise will scroll you through a dozen or so assorted functions, while moving it counter-clockwise will scroll down through 128 MIDI controllers. Getting to something at the other end of the list can be pretty time-consuming, so there's an alternative: press and hold **Enter**, grab a slider, and shove it to the bottom of its range. You're now at the beginning of the list: "None". If you'd like to be somewhere else in the list, move the slider accordingly.

At all times, the Alpha Wheel and + and - buttons are active, so if Intuitive Entry doesn't get you exactly where you want to go, you can make fine adjustments with them. Any continuous foot pedals can be used to perform Intuitive Entry, and so can the modulation and pitch wheels.

Parameter Selecting

The second way to use Intuitive Entry is used only when assigning physical controllers. Normally, when you press the **Controllers** button, the display shows "Wheel 1 Up", and you can now assign a MIDI command to the upper half of the pitch wheel. If you want to adjust a different physical controller, you have to use the cursor buttons to scroll through the entire menu of parameters for *each* controller: a half-dozen or so parameters for 17 physical controllers.

You can speed up the process by holding down the cursor button and letting it auto-repeat, but there's an even faster way: press and *hold* the **Controllers** button, and while you're holding, move the physical controller you want to work on. The display will jump to the first parameter for that controller. This works with *all* of the programmable sliders, buttons, wheels, pedals, and switch pedals, and it also works with keyboard pressure: hold the **Controllers** button, and press hard on any note. The display will jump to "MPressure" (mono pressure), and you can set its assignment.

MIDI Receive

The third Intuitive Entry mode is used when setting the MIDI Receive channels. Setting these channels is important when using the PC88 with a sequencer, and a complete explanation is in Chapter 8. To choose a channel quickly, either to inspect, audition, or edit, press and hold the **MIDI Receive** button, and then one of the numbered Voice buttons. The display will jump to the channel corresponding to the number of the Voice button.

Jump Editing

While we're on the subject of moving around the Controllers menu quickly, there's one more technique to discuss. If you want to adjust the same parameter (for example, Scale) in different physical controllers, there's another way to get where you want to go without scrolling the entire list. If you press *both* cursor buttons simultaneously, the display will jump to the same parameter for the *next* controller on the list. So if you are working on the offset for Slider A, as shown here:

```
Zone:2 Slider A
Ctrl Scale: 25 %
```

and you want to see what the offset on Slider B is set to, simultaneously press both cursor buttons (<<< and >>>) and the offset for Slider B shows on the display:

```
Zone:2 Slider B
Ctrl Scale: 110 %
```

Repeated double-pressings will take you through all of the physical controllers. What happens when you get to the end? It stops — but you can go immediately to the beginning of the list (Wheel 1 Up) by simply pressing the **Controllers** button.

Assignable Controllers, Buttons, and Wheels

The sliders underneath the zone buttons (labelled **A**, **B**, **C**, and **D**); the three buttons to the right of the sliders (labelled **E**, **F**, and **G**); and the two wheels at the far left of the keyboard are all assignable to different MIDI (and PC88) functions, just like the Pedals and Switch Pedals. The buttons can be configured as momentary (they only stay on when they are being pressed) or toggle (they alternate between two different states each time you press). They contain red LED's whose action conforms to their current configuration: the LED in a momentary only lights while you hold it, while the LED in a toggle will alternate on and off with each press.

The first wheel, which is most commonly used for pitchbend, can have different effects depending on which way you push it: up from the center resting place, or down. The second wheel has one continuous effect over its whole range.

The sliders, buttons, and wheels are all assignable on a per-zone basis, so not only can they do different things in different setups, they may also do different things *within* a setup. For example, a slider may send out Controller #7 (MIDI Volume) to one zone's MIDI channel, and at the same time send Controller #10 (Pan) to another zone's MIDI channel. Much more on this in Chapter 5.

Like the pedals, there are default settings for the assignable controllers that come with the factory Setups.

Controller	Default Setting
Wheel 1 Up	Pitchbend up (values above 64)
Wheel 1 Down	Pitchbend down (values below 64)
Wheel 2	Controller #1 (Modulation)
Slider A	Controller #91 (Reverb Depth)
Slider B	Controller #93 (Effects Depth)

Controller	Default Setting
Slider C	Controller #4 (Foot Pedal - same as Pedal 2)
Slider D	Controller #72 (Envelope Control)
Button E	Controller #71 (Sound Control 2)
Button F	<i>None</i>
Button G	Controller #119 (Arpeggiator Latch 1)

Master Volume

This slider is *not* programmable. It does exactly what you think it does: set the level for both the main outputs and the headphone output. It does *not* generate MIDI Volume commands or any other MIDI data.

Panic

Pressing the **Panic** button is the fastest way to get all sound, both within the PC88 and in any MIDI devices that it is connected to, to stop. It immediately releases all notes in the PC88, plus it sends the MIDI messages “All Notes Off” and “Reset All Controllers” on all 16 MIDI channels to the MIDI Out jack. If you hold the button down for a few seconds, it additionally sends out pitchbend resets (pitchbend value of 64), and note-off commands for every note on all 16 channels (that’s 2048 note-offs, in case you’re counting). **Panic** is your friend. It can be used to reset your entire MIDI setup to a known state, if you ever need to do that (which can happen pretty often with a complex setup). If you find yourself stuck in MIDI Purgatory, and notes that you don’t want are sounding from who knows where, the **Panic** button can even save your life (and your audience’s ears).

Effects

The three buttons in the **Effects** section allow you to switch among several combinations of effects. The first button selects the type of reverb: pressing it repeatedly toggles through **Room**, **Stage** and **Hall** reverbs, in order of increasing reverb time and level. The light indicates the current setting. Press the button yet again, and no light shines, indicating that reverb has been turned off. The second button controls the tone of the reverb: **Bright** emphasizes the high-frequency components of the reverb, for simulating a room with hard surfaces; **Normal** plays the reverb “flat”; and **Warm** emphasizes the low frequencies in the reverb, for simulating a room with soft surfaces, such as furniture or curtains. When the first button has shut the reverb off, none of the tone lights will be lit.

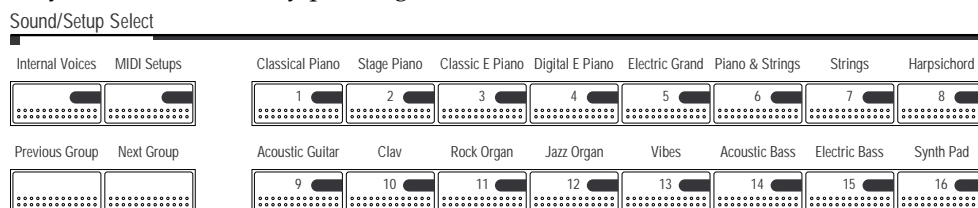
The third button selects the chorus or delay effect. It has four choices: **Chorus 1**, which imparts a two-voice chorus onto the sound; **Chorus 2**, a more complex four-voice chorus; **Delay**, which produces an echo effect; and off. The settings of the reverb and chorus/delay controls are independent of each other, and one can be used freely with or without the other. If you change the settings on an Internal Voice, the change is remembered, and the new settings will appear every time you call up that Internal Voice. Similarly, in Setup mode, the effects settings are automatically stored along with a Setup when you perform a Store operation. Besides these simple adjustments, there are many more ways to modify the effects in the PC88. See Chapter 7 for details.

Chapter 3

Internal Voices

Internal Voices mode lets you play one sound at a time across the PC88 keyboard. The PC88 transmits on one MIDI channel, and all of its real-time controls are assigned to that channel. You might think of the Internal Voices mode as the PC88's "digital piano" mode: it is the simplest way to use the unit, especially for live performance or teaching. In MIDI Setups mode, up to four "Zones" can be active at once, but in Internal Voices mode the PC88 is operating as a single Zone. (However, in either mode, the PC88 can *receive* MIDI data on 16 channels simultaneously.) If your unit has the optional VGM board installed, the Internal Voices mode is considerably enhanced. We'll deal with those features at the end of this chapter.

When you turn the power on to the PC88, it "wakes up" in Internal Voices mode. To enter this mode from the other mode ("MIDI Setups"), press the **Internal Voices** button. Its green LED blinks until you select a sound by pressing a voice button.



Each voice button is labelled with the name of the types of sounds it provides. The display for each sound shows its name (e.g., "Classical Piano"), a number (e.g., "000") and a "Group/Preset" number (e.g., "A01"). For example, here's the display for the "Tack Piano" voice:

```
1:Internal Voice D02
049 Tack Piano
```

Pressing a different voice button selects another sound — for example, **Jazz Organ** brings up the voice "Jazz Organ 1", which is "A12". Pressing the **Next Group** button calls up another sound *of the same type*: "Jazz Organ 2". The Group/Preset number of this new sound is "B12", meaning you are playing sound number 12 in the B Group. Repeatedly pressing the **Next Group** button will take you through the rest of the Groups: there are more organ sounds in Groups C and D. To go back to lower-numbered groups, use the **Previous Group** button. Or, you can press **Previous Group** and **Next Group** simultaneously to return to the A group from any of the other groups.

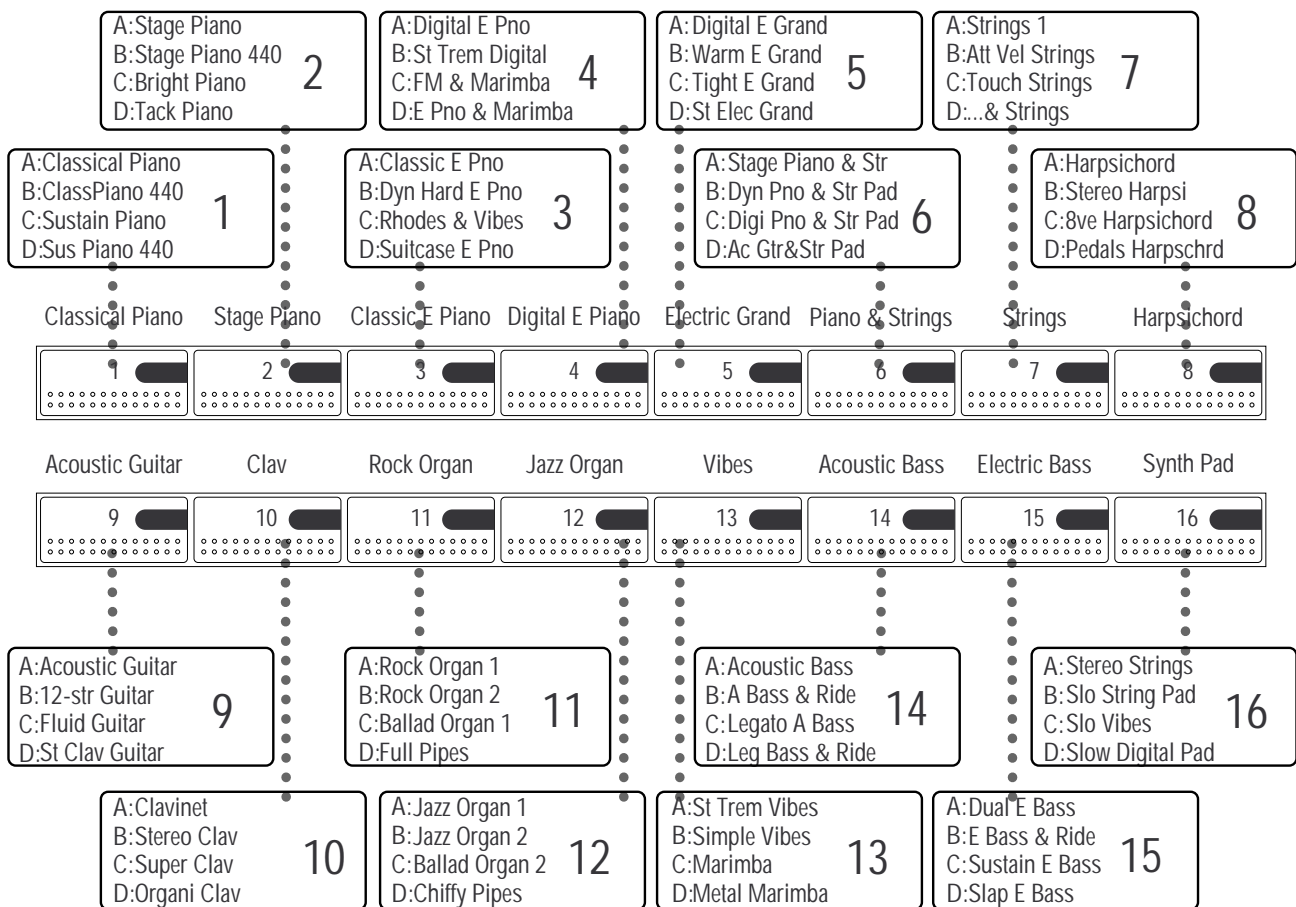
Press the voice buttons, and see what is in the different Groups associated with each one. There are 64 factory-programmed internal voices in the PC88, filling Groups A through D. The groups of voices are shown in an illustration on the following page, and are detailed in Appendix A. When you select an Internal Voice and a Group, the PC88 remembers the association between the Voice and the Group, and will go back to the same Group the next time you select that Voice. Here's an example: If you are playing Jazz Organ 2, which is in Group B, and you press **Vibes** and **Next Group** to access the Vibes-related sound in Group C (which happens to be Marimba), then go *back* to **Jazz Organ**, what will be recalled will be Jazz Organ 2, in Group B — not the organ sound in Group C. Press **Vibes** again, and Marimba in group C appears — the association of that button with that Group is remembered as well. This feature allows you to choose 16 of your favorite Internal Voices and make them all accessible with single button-pushes; you don't have to remember that the Electric Piano sound you like comes from group D, while those cool Strings are in group A, but the nice Piano & Strings is in group B, and so on.

Program Numbers and Other Ways of Selecting Voices

Internal Voices can also be called up using an external sequencer or controller that sends MIDI Program Change commands. The MIDI program number for the selected Internal Voice is shown in the bottom line of the display. There are several ways to display the program numbers, which will be discussed in the next chapter, but the default is to refer to them by the numbers 0-127.

You can also select voices using the numeric keypad, and the program numbers are important here as well. Type in the program number you wish to select (either 1, 2, or 3 digits — you don't have to use leading zeroes), and press **Enter**. The program you selected will appear in the display. If you make a mistake, press **Clear** and the numbers will reset, or if you decide you don't want to change voices after all, press **Cancel**. One more way of selecting voices is with the Alpha wheel. Turning it clockwise increments the current voice, and turning it counter-clockwise decrements it. The increment/decrement (+ and -) buttons are also operational.

The table below summarizes the PC88's Internal Voices, showing the four groups available from each front panel button. Use **Previous Group** and **Next Group** to move between groups.



Customizing the Internal Voices Mode

In keeping with the “digital piano” concept of the Internal Voices mode, and in order to make the PC88 as easy as possible to use, the sounds in the Internal Voices are always going to be the same, and you cannot change them. (In Setups mode, you can do all sorts of things, as we’ll soon see.) You can, however, change certain aspects of PC88 operation in Internal Voices mode.

These fall under the category of “Zone parameters”, and are discussed fully in Chapter 5. They work much the same way in Internal Voices mode as in MIDI Setups mode, with some important differences. The Internal Voices mode uses only one “Zone” (Setups can use up to four), so there is only one set of Zone parameters to adjust. Even more significantly, while in Setups mode each of the 128 possible Setups has its own set of parameters, in Internal Voices mode there is a single set of parameters that applies to *all* of the Internal Voices.

Here’s an example of how to change the Internal Voices’ parameters. From any Internal Voice, press the **MIDI Transmit** button under **Zone Parameters**. The bottom line of the display says “MIDI Channel: 01”, meaning that the PC88 is transmitting all MIDI data on channel 1. Use the alpha wheel to change the MIDI channel to “06”, and then press the **Store** button. The display asks if you want to store a Setup with a particular number. Instead of pressing **Enter**, press the **Internal Voices** button. The display will change to ask if you want to store the changed parameter to the Internal Voices. Now push **Enter** (in the numeric keypad) and the new data is stored. From now on, whenever you are in Internal Voices mode, the PC88 will transmit on MIDI channel 6, until you change it again.

Let’s try another example. Press the **Velocity** button under **Zone Parameters**. The display shows the velocity scale factor (Vel Scale), which is 100%: the sound responds directly and faithfully to the keyboard velocity. Hold down the **Enter** key and move any slider upwards until the display reads “200%”. Now play the keyboard. The velocity response has been “expanded”: the keyboard is now much more sensitive to louder notes. If you were now to press **Store**, **Internal Voices**, and **Enter**, this would become a permanent characteristic of every Internal Voice. Of course, if you don’t want to do that, we won’t blame you. (Reset the velocity to 100% or press **Internal Voices**, then a Sound Select button, *without* pressing **Store** to go back to the old settings.)

When you store anything to the Internal Voices, you are storing all of the current operating parameters: velocity, transposition, controller definitions, etc. There is only one storage area for Internal Voices parameters, so when you store parameters to it, all previous settings are erased. Of course, if some parameters haven’t been changed, the new settings will be the same as the old. Effects do not have to be manually stored with a Voice — that happens automatically. As we’ve seen, each Voice *can* have its own Effects settings. If you change the effects on any Voice, the settings are remembered, so the next time you call up the Voice, the effects will be as you left them.

440-Tuned Piano Voices

Unless otherwise noted, piano programs are “beat” tuned, like an acoustic piano. Since the higher harmonics of a stretched string tend to be sharper than those of the real harmonic series, beat tuning ensures that the piano remains in tune with itself harmonically. Beat tuning is sometimes referred to as “solo” or “stretched” tuning. Some programs, though, such as “ClassPiano 440”, offer straight tuning, where the fundamental of each note is tuned to A440. This allows for better mixing with other acoustic and electronic instruments. This type of tuning, therefore, is sometimes known as “ensemble” tuning.

Ride Cymbal and Metronome Click

Ride Cymbal and Metronome Click are two special voices that are layered with the “E Bass & Ride” and “A Bass & Ride” Internal Voices. Metronome click is available as the notes A0 and A#0, which happen to be the lowest two notes on the keyboard when you use the default key range and transposition. Ride cymbal is included along with the bass notes (check out Setups 1 and 2, “A Piano Trio” and “E Piano Trio” to see how useful this can be), and is also assigned to the notes that are above the range of the bass. You can get the ride cymbal by itself (without the bass sound) by setting **Note Map** to “Const” on the **Key Range** menu, then going to the **Transpose** menu and transposing above the range of the bass.

The VGM Banks



The optional VGM board adds three extra “Banks” of instruments to the PC88’s internal sounds. A Bank is different from a PC88 Group. A Bank is defined by the MIDI Specification, and it can have 128 different programs, while a Group has only 16 programs. When talking about the various banks, we’ll refer to the Internal Voices bank we’ve just been playing with as “the Internal sounds”, or “Bank 0”, because that is its bank number when selected over MIDI.

To look at the different banks, press the **Program** button in the Zone Parameters section, and then the left cursor button (<<<). The display will now show the name of the Bank on the bottom line, with its number (and the currently selected program number) above. For example:

```
Zone:1      0:049
Bank:Internal Voices
```

Use the Data Entry section to select other banks. Bank 1 is a complete set of “General MIDI” instruments, which follows the General MIDI Level 1 Specification. It provides 128 sounds, including all members of the orchestra, keyboards, guitars, basses, tuned percussion, pads, and sound effects, as well as a large set of “keyed” (one note per sound) percussion. The PC88’s General MIDI bank also includes seven extra sets of percussion sounds, which are compatible with Roland’s “GS” instruments. Besides the large number of useful instrument sounds, and the ability to play back General MIDI files from other sources, the General MIDI bank makes the PC88 well-suited to *development* of General MIDI scores, for publishing, educational, and multimedia applications. General MIDI is now the preferred medium of exchange for music files among musicians, on floppy disk, CD-ROM, and on-line services.

Bank 2 is “Expansion Sounds”. These sounds are adapted from the Kurzweil Mark 10 series of digital pianos, and include keyboards, guitars, orchestral instruments, sound effects, and percussion. (They are not in the same order as the Mark 10 sounds, so you shouldn’t try to play Mark 10 disk files with them.) In addition, the seven extra “GS” drum kits appear here as well, plus there are five additional percussion sets.

Bank 3 is called “64-Note Poly”. It contains special “duplicates” of several of the sounds in the Internal bank, including piano, guitar, and vibes. Since these sounds are produced by the VGM board, and the Internal sounds are produced on the Internal board, this allows you to play the sounds with up to 64 voices of polyphony. See the “Key Range” section of Chapter 5 for details.

When you are in Internal Voices mode, you can access the sounds in the VGM banks, although not as quickly as the Internal sounds. There are several ways to do this. You can scroll through all of the programs in all of the banks using the Alpha wheel, and as you pass program 127 in one bank, the display jumps to program 0 of the next bank (the name of the new bank appears on the top line of the display). Or you can use the left cursor and Alpha wheel to set the bank, then the right cursor and Alpha wheel to select the program. Perhaps the fastest way is with the numeric keypad. When you’re in the Internal Voices “play” mode (i.e., you’re not editing anything), go to the numeric keypad and press the number of the bank of the VGM sound you want to play: **1**, **2**, or **3**. Then press the +/- button on the keypad, followed by the program number (one, two, or three digits — you don’t need to enter leading zeroes) of the sound, and finally the **Enter** button. The bank number and name will appear on the top line of the display, and the program number and name on the bottom. The keyboard will play the selected sound.

Note, however, that in Internal Voices mode, the PC88 will not remember that a VGM sound has been selected. If you subsequently press any of the **Select** or **Group** buttons, you will jump back to the Internal Voices bank (Bank 0). VGM voices are only remembered in Setups mode.

Chapter 4

Setups and Zones

The full power of the PC88 is available when it is in the “**MIDI Setups**” (or just “**Setups**”) mode. In this mode, the PC88 can take on the identity of four distinct instruments and four distinct MIDI transmitters, all of which can use the same set of physical controllers, or any subset thereof. For example, you can create a keyboard which is split into four different regions, each of which has its own instrument (say, drums, bass, piano, and sax), and each of which also transmits on its own MIDI channel, so that four different external MIDI instruments can be played individually by playing on different parts of the PC88 keyboard.

Each region is called a “**Zone**”. Zones can be next to each other on the keyboard, or on top of each other, or overlap, or be nowhere near each other — there are no limitations. Zones can even be defined that aren’t *on* the keyboard — they are above or below the PC88’s 88-key range — but they will still produce non-note MIDI data.

Besides Voice and MIDI channel, each Zone can also have its own velocity characteristics, transposition (for internal sounds or for outgoing MIDI data), and definitions for each physical controller. Any controller — wheel, slider, button, or pedal — can perform up to four different functions in the four zones. For example, a slider may control volume in two different zones, but with opposite “senses”, so that moving the slider causes the sound in one zone to fade out while the other fades in. Or a pedal can control the pan position of two different synths, set in opposition to each other, so that moving the pedal causes the sounds to literally move past each other in the stereo field.

This ability to use a single set of physical controllers to independently and simultaneously address parameters on four internal sounds and/or MIDI channels gives the PC88 tremendous flexibility as a master keyboard for studio or live performance.

If your studio or performance rig includes synthesizers or processors that can respond to MIDI controllers to modify their timbre or effects parameters, the varieties of expression available with the PC88 are even greater: for example, a single pedal motion could simultaneously brighten one sound, increase its vibrato speed, and move it further back into a reverb space, and at the same time make the timbre of a second sound rougher, pan it hard to the right, lengthen the release segment of the envelope, and give it Doppler-effect pitch shift.

Analyzing a Setup

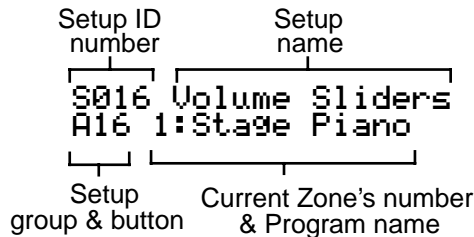
Before we start making Setups, let’s examine one and see what goes into it. The PC88 is shipped with 32 pre-programmed Setups (64 if the VGM board is installed), which are selected, like the Internal Voices, in groups of 16. The factory Setups make good templates for designing your own. To get to them, press the **MIDI Setups** button, then use one of the data entry methods to indicate the Setup you want.

For this example, press the **MIDI Setups** button followed by the **Synth Pad** button (#16).

The display (as shown below) now shows the name of the Setup, “Volume Sliders,” as well as its numbers. The top number (starting with “S”) is the number of the Setup. There are 128 slots for Setups altogether. All of them, even the ones that come with factory programs in them, are user-programmable. (Factory Setups will never be erased from ROM, however. What you are actually doing when you modify a Setup is saving over it into RAM with the same Setup number. If you later delete the Setup in RAM, the preset ROM program will again be stored at that number.) Next to the Setup number is the Setup name.

The bottom line of the display shows the group letter for the Setup (A-H), the number of the preset button that calls it, the Zone number (1); a colon (“:”); and then the name of the Voice (if

there is any) in the current Zone. Even though we are looking at only one Zone, we are hearing four instruments simultaneously, and so the sound coming from the PC88 is much thicker than we've heard previously. The Zone buttons 1, 2, 3, and 4 are all lit green, showing they are all playing.



Selecting Parameters

The Voice, or program, assigned to a Zone is just one of its parameters. Let's look at some of the others. Press **MIDI Transmit**. The upper half of the display shows the Zone number, the bank number, and the program number — this information is almost always there when you're editing zone parameters. The lower half of the display shows the MIDI channel that the Zone will transmit on: 1.

There are other MIDI parameters available on this menu, which are accessed by pressing the right cursor (>>>) button. The first parameter you come across is the "destination" of the notes played in the Zone: do they play the sounds within the PC88 ("Local"), or do they go out the MIDI jack ("MIDI"), or both. The next parameters accessed by the cursor button are Pitch Bend range, coarse and fine. You can get back to the first parameter by scrolling with the left cursor (<<<) button, or by pressing **MIDI Transmit** again — pressing a Zone Parameter button always gets you to the first item on its menu.

Another menu of parameters is accessed by pressing the **Program** button under Zone Parameters. The first parameter you see is the Voice assigned to the Zone, with its name and number. Press the *left* cursor button (<<<) and you can select the bank that the Voice belongs to. If you have the VGM board installed, you can use any sounds in Banks 1, 2, or 3 in a Zone — not just the Internal Voices from Bank 0.

You can also access an empty bank (or Voice): doing this means that the Zone will not produce any sound on the PC88, but it will still send a bank and program number, as well as notes and controllers, to an external MIDI synthesizer whose receive channel matches this Zone's.

Key Range accesses three parameters; **Transposition** only a single parameter; and **Velocity**, as we've seen earlier, five parameters. **Controllers** accesses many parameters. All of these are detailed in Chapter 5.

Selecting Zones

When you are looking at a parameter, you can look at the same parameter in another zone by pressing its button — **Zone 2**, **Zone 3**, or **Zone 4**. When you press a Zone button, that Zone becomes the "current Zone". This will happen even if the selected Zone is off. If a Zone is off, its button will be unlit.

Go back to an active Zone by pressing its button. Now press it again. When you press the button of a Zone that's already current, it turns orange, and the sound of the Zone is muted. The display shows a "-" next to the zone number, indicating it is silent. Press the same Zone button again (once), and it un-mutes. To mute a different Zone, press its button *twice*: once to make it current and once to mute it. You can have any combination of Zones muted or active at any time.

If you want to hear just one Zone, and temporarily mute the notes on all the others, use the “Solo” button. The button for the current Zone turns red, and the only sound you hear is that Zone’s. To solo a different Zone, just push that Zone’s button. To hear all of the Zones, turn off Solo by pressing it again. You can Solo a muted zone (make an orange zone red) which will turn it on, and will also turn off all of the others. However, if a Zone is soloed, you can’t mute it (make a red one orange); you would have to first un-solo it.

When one Zone is soloed, the other Zones are not completely dead: only their *notes* are muted. Any controller data associated with those Zones will still be generated.

I Don’t Hear a Zone: Is It Active (But Not Soloed), Muted, or Off?

There are important differences between a Zone that is silent because a different Zone has been soloed (green light, when another Zone is red); a Zone that is muted (orange light); and one that is off (no light).

- A Zone *not soloed* (but otherwise active) does everything except play notes — controllers are still sent out the MIDI Out jack.
- A *muted* Zone doesn’t do anything while it’s muted, except that it sends exit and entry values for its programs and controllers when you enter or leave the Setup (see Chapter 5). A muted Zone does have a program number and a MIDI channel, as well as a complete set of other parameters, all of which come into play when the Zone is un-muted.
- A Zone that is turned *off* has no MIDI channel. It generates no data until you give it a MIDI channel to make it active, or switch to a different Setup in which that Zone is active.

Color:	Green	Green (but another is Red)	Red	Orange	None
State:	Active	Active (not Soloed)	Soloed	Muted	Off
Data Generated:					
Notes	✓	x	✓	x	x
Controllers	✓	✓	✓	x	x
Program number	✓	✓	✓	✓	x
Entry and Exit values	✓	✓	✓	✓	x

You can quickly disable and enable an individual sound or a MIDI instrument by changing a Zone’s button from green to orange. This can be very useful for live performance, to bring layers of sound in and out quickly. When you save a Setup, the mute and solo statuses of the Zones are stored along with the rest of the parameters, and when you recall the Setup, those statuses are automatically enabled. So, you could call up a Setup that has one Zone Soloed, and instantly add instruments by turning off Solo. Or you can call up a Setup that has one or more muted Zones, and un-mute them as you play.

To turn off a Zone, press **MIDI Transmit** and move the alpha wheel counterclockwise (to the left), past “01”, until the MIDI Channel parameter changes to “Off”. The Zone is now completely disabled: the light in its button goes off. Press the **Program** button. Where you would normally see a program name, it now says “Zone Off”. Turn the wheel and it still says “Zone Off”. To turn a Zone back on again, simply assign it a MIDI Channel from the **MIDI Transmit** function.

Creating a Setup from an Internal Voice

There are two ways to create a Setup. One is to take an existing Setup and modify it. The other is to build one up from an Internal Voice. An Internal Voice, as you may have figured out by now, is in most respects a Setup with Zones 2, 3, and 4 turned off. Remember that the controllers on Zone 1 will by default have the assignments that they had in Internal Voices mode (slider A: Ctl 91, slider B: Ctl 93, etc.) Adding Zones to an Internal Voice will turn it into a Setup. Let's try it.

Press **Internal Voices** and then **Classical Piano**. Press the **Zone 2** button, and the display will show a program number for the Zone but the name will be "Zone Off". Go to **Zone Parameters** and press **MIDI Transmit**. The MIDI Channel is "Off". Use the alpha wheel to set the MIDI Channel to "2". The **Zone 2** button glows orange, indicating the Zone is now active, but muted. Press it to make it active. Press the **Program** button and then, on the numeric keypad, **1, 3, Enter**. This will bring the Acoustic Bass sound into Zone 2. (Or, if you have the VGM board, try **1, +/-, 3, 5, Enter**. This will put the Fretless Bass sound from Bank 1 — the General MIDI bank — into the Zone.)

Let's split this keyboard. Press **Key Range** under **Zone Parameters**. The display shows the range C-1 to G 9, which is the entire MIDI range (128 notes). We'll leave the low limit where it is, but we'll set the upper limit so that the bass sound only plays on the bottom 2-1/2 octaves of the keyboard. Press the right cursor button (>>>) so that the underline cursor is underneath the "G" in the display. Press the **Enter** button and hold it, and play E3 (below C4) on the keyboard. Now play the keyboard. From the bottom of the keyboard to two octaves and a fifth higher, you will hear the bass sound and the piano sound. Above that, you will hear only the piano sound.

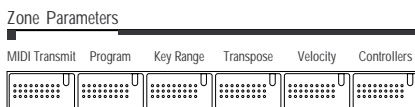
To limit the low range of the piano sound, press **Zone 1** to make it current. Use the **left cursor** button to bring the underline below the "C" in the display. Again press and hold **Enter**, and play C3 (just below E3) on the keyboard. The notes at the bottom of the keyboard now belong only to the bass. The piano starts in at the third "C", and the bass stops above the third "E". We've created two Zones with different instruments, which overlap for a short interval on the keyboard.

Let's save the entire Setup—all two Zones. Press **Store** (also under **Zone Parameters**) and the display says "Save Setup 33?" (or 65 if you have the VGM board). This is the lowest-numbered Setup location that does not currently have a Setup in it. Press the right cursor button (>>>) and the display changes to "Rename Setup 33?". Press **Enter** on the numeric keypad, and you can now create a name for the Setup before you save it. (If you don't, the Setup will be named "Setup 33".) To change the letters in the name, first select which letter to change with the cursor keys, and then change each letter with the Alpha wheel. Press **Enter** when you're done, and the display again asks "Save Setup 33?". Press **Enter**, and the new Setup, with its new name, is stored as Setup 33. There's more about saving and naming in the next chapter.

Chapter 5

Zone Parameters

This chapter describes all of the menus you can access from the top row of **Zone Parameter** buttons. These include: **MIDI Transmit**, **Program**, **Key Range**, **Transpose**, **Velocity**, and **Controllers**.



Before we dig into the Zone Parameters, let's review a few things that, if you keep in mind, will make your life easier.

First, *Zones*:

- You select which Zone you are working on with the four **Zone** buttons — press a button once to make it current. The current Zone number will be shown at the upper left of the display.
- If a button is showing green, and no other button is red, then it is playing — i.e., you can hear it. If it is orange, it is muted. To mute the current Zone, press its button. To mute a Zone that's not current, press its button *twice*.
- You can solo the current Zone (mute all the others) by pressing the **Solo** button. The current Zone's button turns red. Pressing any other **Zone** button will solo its Zone. Pressing **Solo** again turns the other Zones back on. Zones that are not Soloed will still transmit non-note information.
- A Zone that has been turned off will have a dark button, and will show "Off" in the display. (If you Solo a dark Zone, you will hear nothing.)

Second, *Data Entry*:

Remember there are two methods of entering data for most parameters:

- *Direct Entry*, using the Alpha wheel, decrement/increment buttons, or the numeric keypad, and
- *Intuitive Entry*, using sliders, pedals, wheels, buttons, or notes.

Also remember that most of the Parameter buttons access menus of two or more parameters, so don't get confused if you don't see the parameter you want immediately after pressing a button. Pressing a Parameter button always goes to the *first* item on its menu — even if you're already *in* the menu. To get to other parameters in the menu, use the left and right cursor buttons directly underneath the display.

Information about storing Zone parameters to a Setup is on page 5-19. The section below discusses storing Zone parameters with the PC88's Internal Voices.

Zone Parameters and Internal Voices

The PC88's Internal Voices have only one active Zone: Zone 1. Saving Zone parameters to Internal Voices is a little different than saving to a Zone in a Setup, since any parameter you change will affect all Internal Voices; you cannot change parameters for just a single voice. To change one of the parameters of the **Internal Voices**, first choose the parameter you want to change (for example, "Transposition: -12"). Then, press the **Store** button, followed by the **Internal Voices** button at the "Save Setup xx?" prompt. When the display says "Save to Internal Voices?" you can either press the **Enter** button to confirm the change, or return to Internal Voices mode without making any changes by pressing **Internal Voices** followed by a Sound Select button. See "Customizing the Internal Voices Mode" in Chapter 3 for some examples of this.

MIDI Transmit

Parameter	Values
MIDI Channel	Off, 1-16
Dest	Local, MIDI, Local+MIDI
BndRng (ST)	0-127
BndRng (ct)	0-127

MIDI Channel

The first parameter you see after pressing this button is the MIDI channel that the Zone will send data on. Setting this to “Off” turns the Zone off completely: no MIDI data and no local sound either. A Zone that is off will have a dark **Zone** button.

Destination

The second parameter (press the right cursor button) is the destination (**Dest**) of the data being generated in the Zone. Data can be sent either to the PC88’s sounds (**Local** — which includes the VGM sounds if the board is installed); out the MIDI Out jack (**MIDI**); or both (**Local+MIDI**). Note that if MIDI is *not* selected, and you play the PC88 into a sequencer, you may hear nice sounds, but the sequencer won’t record anything from this Zone.

Generally speaking, each Zone will have its own MIDI channel. This is necessary if you want to layer sounds on the PC88. If two Zones have the same MIDI channel (and destination), but they have different Program settings, there will be conflicts: no MIDI device, including the PC88, can respond correctly to two different simultaneous Program Change commands on one channel. The result will be that only one Program Change will be recognized, but every note played will sound double. This can create unpredictable odd timing effects, and will reduce polyphony by 50%.

There will, however, be occasions when “stacking” Zones on the same MIDI channel might come in handy. One such situation would be if you would like a physical controller on the PC88 to send data out on two *different* numbered MIDI controllers on the *same channel*. In this case, you must create two Zones assigned to the same channel, but with different controller assignments. If a receiving synth is using Controller #1 for modulation depth and Controller #13 for modulation speed, for example, you can increase both the depth and the speed with one slider by assigning that slider in Zone 1 to #1 and in Zone 2 to #13, and assigning both zones to the same MIDI channel. (You will probably want to do something to make sure you aren’t sending doubled notes. Use the **Key Range** parameter to make sure the two zones aren’t set to the same note range.)

Another example: create two or more Zones that are identical except for their transposition settings. Now you can play parallel intervals (or chords) with single keystrokes.

Pitchbend Range

The third and fourth parameters in this menu, **BndRng (ST)** and **BndRng (ct)**, set the pitchbend range. This is the interval that the pitch wheel will change the pitch at the end of its travel, both top (up) and bottom (down). The first parameter is coarse, which sets the range in semitones (“ST”). The second is fine, which sets it in cents, or 1/100ths of a semitone (“ct”). Since both values are positive, they add to each other: If you want to set the range to just under 3 semitones, you would set ST to 2 and ct to 99. The maximum value for both parameters is 127.

Whenever this parameter is set (or the Setup containing it is called up), a pair of MIDI Controller Messages known as Registered Parameters are sent on the MIDI channel assigned to this Zone. These messages will set the coarse and fine pitchbend range of *any* MIDI instrument receiving data on this channel from the PC88, as long as that instrument recognizes the messages. It will set itself to respond to pitchbend commands exactly the same way as the Zone on the PC88. Since this a relatively recently-adopted addition to the MIDI specification, there are plenty of instruments that don't recognize Registered Parameters — if you want to adjust the pitchbend range on one of those, you'll have to do it by hand. The PC88 not only sends them, it also recognizes them, so if you send the PC88 these commands from an external source (like another PC88), it will respond accordingly. (See Appendix F for more information about Registered Parameters.)

Program

Parameter	Values
(Program)	0 - 127 + name
Bank (press <<<)	0:Internal Voices - 16383(127/127)
Entry Transmit	Off - On
Bank Mode	None, Ctl 0, Ctl 32, Ctl 0/32, K2000, K1000
PNumDisp	0-127, 1-128, 11-88, A1-H8
PNameDisp	Off, Internal, Gen. MIDI

The first parameter under this button selects the program assigned to the Zone. When you first enter this menu, you have the choice of selecting among the 64 Internal Voices. Use the **Sound Select** and **Previous** or **Next Group** buttons just as you would in Internal Voices mode, or use the wheel and buttons in the **Data Entry** section, or use Intuitive Entry with any controller. (*Don't* press the **Internal Voices** button or you will leave Setups mode and lose everything you've done on this Setup!) If the Zone has been turned off, the program name will be "Zone Off". Setting a program selects a voice for the Zone, and also sends a Program Change command out the MIDI cable, on the channel assigned to the Zone. This is how you use the PC88 to select programs on your other instruments.

Bank



As we saw in the last chapter, if the VGM board is installed, you can use sounds from Banks other than the Internal Voices. The Internal Voices are in Bank 0; VGM sounds are in Banks 1-3.

There are two ways to access Banks from the **Program** menu. One is to use the numeric keypad: Press the **Program** button, enter the number of the Bank, and then press the "+/-" button (next to the "0" button). Then enter the Program number, and press **Enter**. The +/- button creates a colon (":") in the display, which separates the Bank number from the Program number.

The second method uses a special Bank parameter. From the Program display, press the *left* cursor button (<<<). Now the display says "Bank:" and the name, if there is one, of the Bank.

(If there isn't one, it just shows a number.) Here's an example of the PC88's display when you press the <<< key while an internal voice is active:

```

      Zone      Bank      Program
      number   number   number
Zone: 1       0:001
Bank: Internal Voices
└──────────────────┘
                Bank name

```

You can set the Bank by any of the usual data entry methods, Direct or Intuitive. Like Programs, any Bank can appear in any Zone. For example, turn the alpha wheel one notch clockwise while the above is displayed to see:

```

Zone: 1       1:001
Bank: General MIDI

```

Notice that the Bank number and name change, but the Zone number and program number don't.

Sending Bank Select Messages to External MIDI Devices

Bank Select messages can go to external MIDI devices as well, if the Destination is set accordingly. Some instruments have more banks than the PC88: the Kurzweil K2000, for example, has 10. The MIDI Specification says a device can have up to 16,384(!) Banks, and the PC88 gives you access to every single one of them. Bank switching over MIDI makes it easy for the PC88 user to scroll through sounds on external instruments, no matter how many Banks they might have.

If you select an empty Bank (like Bank 1 if you don't have the VGM board; Bank 4 if you do), the Zone will produce no sound on the PC88, but will still send MIDI data out. The Program display will say "External Program," indicating that any sounds produced will be created by an external device. If the Bank parameter is showing on the display, instead of a name you will see some numbers, in the display below, for example: "292 (2/36)".

```

Zone: 1       292:049
Bank: 292    (2/36)

```

The first number is the Bank number and the ones in parentheses show the Bank number in the two-byte form (Most Significant Byte (MSB) followed by the Least Significant Byte (LSB)) prescribed by the MIDI Specification. The Bank number is the MSB multiplied by 128, plus the LSB. If this is confusing, don't worry — we'll discuss what it means shortly.

Press the right cursor (>>>) to return to the Program menu's program display. From the above display, for example, pressing >>> would change the display to this:

```

Zone: 1       292:049
049 External Prog

```

From this display, use any data entry method to change the program number.

Entry Transmit

The next parameter on the Program menu (press the right cursor button, twice if you have to) is **Entry Transmit**. If it is set to **On**, then whenever you select this Setup, the program number assigned to the Zone will immediately be sent out as a Program Change command on the Zone's MIDI channel (assuming that MIDI is one of the destinations). When it is **Off**, no program change is sent from the Zone when the Setup is called. A Bank Select command may or may not accompany the Program Change, as we're about to see.

Bank Mode

Bank Mode determines if bank numbers will be sent over MIDI when the Setup is selected, and in what format.

None means no bank number is sent, just the program number. **Ctl 0** means that the bank number is sent as a MIDI Controller #0 message. **Ctl 32** means it is sent as MIDI Controller #32. **Ctl 0/32** means it is sent as a dual-controller (two-byte) message, with the MSB of the bank number sent as Controller #0 and the LSB as Controller #32. Single-byte Bank Select messages (either 0 or 32) allow you to specify banks numbered 0-127. Two-byte messages allow you to specify banks numbered 0-16,383. With 128 programs per bank, this allows you to access 2,097,152 different programs on one instrument. Have a good time, and call us when you're done.

Seriously, if all this seems bizarre to you, you're not alone. The MIDI Specification is a little ambiguous when it comes to Bank Select messages, as to whether they should be only Controller 0, only Controller 32, or both Controllers sent as a pair. Different manufacturers design their instruments to respond to different schemes, and if you send Bank Select in a form an instrument doesn't like, it may ignore it or interpret it wrong. This PC88 parameter is designed to allow the greatest flexibility in addressing other MIDI instruments. Usually you can look on the MIDI Implementation chart in the user's manual of an instrument to determine how it likes to receive Bank Select messages, and then set this parameter for each Zone to suit the instrument that is receiving data from it. The default setting, which will work with the largest number of other instruments, is **Ctl 0/32**.

There are two other options, which will be of special interest to owners of other Kurzweil instruments. Setting Bank mode to **K2000** takes advantage of that instrument's "Extended" mode. The Bank Select message is sent as Controller #32, with a value between 0 and 9 (remember the K2000 only supports 10 banks). The K2000 only supports 99 programs per bank, so Program Changes 100 or higher are sent as Bank Select 1, followed by the last two digits as a Program Change. For example, if Program 124 is assigned to the Zone, this will be sent out the MIDI jack as Bank Select (Controller #32) 1, and then Program Change 24.

K1000 is used with any of the 1200-series keyboards or modules, or any of the 1000-series instruments that have version 5 software installed. Those instruments pre-date the adoption of standard Bank Select messages; instead, they use Program Changes 100-109 as Bank Selects. If you select Bank 5: Program 42 for a PC88 Zone, for example, it will send out Program Change 105 followed by Program Change 42. PC88 program numbers over 99 are not sent.

Program Number Display

PNumDisp is useful because different MIDI instruments and sequencers refer to program numbers differently — another ambiguity in the MIDI Spec. Some start counting at 0, while others start at 1. Still others arrange them in groups of 8, with the first digit (or a letter) denoting the group, and the second digit denoting the number within the group.

This parameter allows you to display the program numbers on the PC88 so that they agree with the way your receiving instruments display them. It *changes nothing* in the outgoing MIDI data: it's merely a convenience to you, so that you aren't constantly adding or subtracting 1 or doing base-8 arithmetic to figure out how to get to specific sounds on your other synths. Whenever a program is displayed for this Zone, its number will follow the format you choose here. The choices are:

- **0-127** for those devices that believe life starts at zero
- **1-128** for those who start at one
- **11-88** for instruments that use this scheme (primarily Roland)
- **A1-H8** for other instruments that like this way of doing things

When using this last format, don't get confused with the Internal Voice mode's Groups: they each contain 16 programs, not 8.

Program Name Display

The final parameter under **Program** is **PNameDisp**, which determines how the program name will be shown in the display when you select the Zone but like **PNumDisp** has no effect on anything else, either the choice of program or the outgoing MIDI data.

If you set this to **Internal Voices**, the program name will show up as the name of the current PC88 sound from the Internal Voices bank or (if there is one) the VGM board. A program for which there is no internal sound (for example, in an empty bank) will be called "External Prog". If **Dest** (MIDI Transmit Menu) is set to **MIDI**, then the display will read "External Prog."

Set it to **General MIDI**, and the PC88's display will show the General MIDI program list (the VGM board does *not* have to be installed for this.) This is helpful if you are driving an external General MIDI synth and would like to see those names displayed.

Set it to **Off** and the display says "External Prog" for all programs. Use this setting if you are using neither the internal sounds nor a General MIDI synth, to avoid possible confusion.

Key Range

Parameter	Values
Low:	C-1 to G9
Hi:	C-1 to G9
Note Map:	Off, Linear, 1 of 2, 2 of 2, 1 of 3, 2 of 3, 3 of 3, 1 of 4, 2 of 4, 3 of 4, 4 of 4, Invs, Const

Low, Hi

There are three parameters under the **Key Range** button. The first two, both of which appear on the initial display, set the lower and upper note limits of the Zone. Use the cursor buttons to move between the low and high settings. Intuitive entry is useful here: after you've chosen which limit to set, press and hold **Enter** and hit the note you want.

The limits of MIDI are C-1 to G9. The normal 88-key range is A0 to C8.

You can create "negative" ranges by setting the high limit *lower* than the low limit. This results in the Zone being active at the top and bottom of the keyboard, but being silent in the range between the two limits. This lets you create a layer with a "hole" in the middle, which you can then fill with a different sound on another zone (either internal or on an external synth).

Note Map

Note Map lets you change the way notes are sent from the PC88, which can be useful in a number of situations. The default setting is **Linear**: all notes go out as played. Moving decrementally takes you to **Off**: no notes are sent, but controllers and other non-note data are. Moving back up takes you through the "alternating" maps, which we'll skip over for just a second.

After them comes **Inverse**, which turns the keyboard upside-down, with the highest key being A 0 and the lowest C 9. Finally, if you set it to Constant (**Const**) all of the keys on the keyboard will play the same note. The note defaults to C4, but you can change this with the **Transpose** parameter.

Alternating Maps

Alternating maps can be used when you are addressing multiple synthesizers that can play the same sound, to increase the apparent polyphony of your system.



An obvious use of alternating note maps is with the “64-Note Poly” instruments on the VGM board. The instruments in this Bank are exact duplicates of some of the sounds in the Internal Voices bank. By assigning all of the odd-numbered notes to the Internal Voices, and all of the even-numbered notes to the duplicates on the VGM board (which have the same names, preceded by “v”), you can achieve 64-voice polyphony within the PC88.

An example of how this is done is found in Setup #49 “64-note Piano”. The MIDI channel of Zone 1 is 1. Its Bank is Internal Voices and its Program is 000, “Classical Piano”. Look at its **Key Range** map: it is set to **1 of 2**. Only odd-numbered notes played on the keyboard will play sounds from the Internal Voices bank. Now go to Zone 2. Its MIDI channel is 2, its Bank is 64-Note Poly and its program is also 000, “vClassical Piano”, which is an exact copy of the sound in the Internal Voices bank. Its **Key Range**, however, is **2 of 2**. Only *even*-numbered notes will play the sounds on this Bank in the VGM board. Since each Bank can support 32 voices by itself, combining them in this way gives you 64 voices — unless you happen to play more than 32 odd or 32 even notes at a time!

This mapping of the keyboard is also applied to outgoing MIDI data: odd-numbered notes are sent out channel 1, and even-numbered ones channel 2. If you have two identical synths receiving on the two channels, say each with 16-voice polyphony, you can set one to channel 1 and the other to channel 2, and thereby combine them to create a single 32-voice instrument (and you don’t need the VGM board to do this).

You can use three Zones this way (**1 of 3, 2 of 3, 3 of 3**) or even, if you’re really ambitious, all four Zones (**1 of 4**, etc.). These maps won’t accomplish much on the PC88, but they can come in handy with external synths.

Transpose

Parameter	Values
Transposition:	-127 to 127

This is a simple menu: it has but one item. This parameter changes the pitch of the Zone, without changing its position on the keyboard. It also changes the MIDI note numbers generated by the keys in the Zone, without physically shifting the Zone. The range is ± 127 semitones. Since there are 12 semitones (or half steps) to an octave, you can transpose up or down over ten octaves. If you transpose out of the range of the active voice, however, no notes will sound; beyond MIDI note numbers, no notes will transmit.

If the Note Map is set to **Const**, then this parameter determines what note will be transmitted over the Zone — the sort of thing that comes in handy when you’re laying a ride cymbal over a bass, or a wood block over a flute. Intuitive Entry can be used with the keyboard to set this parameter, holding the **Enter** button and playing a note. C4 is no transposition; above that is up and below it is down. To enter negative numbers on the numeric keypad, use the +/- button any time before you press **Enter**: e.g., to enter -100, you can press +/-, **1, 0, 0, Enter**; or **1, +/-, 0, 0, Enter**; or **1, 0, 0, +/-, Enter**; etc.

Velocity

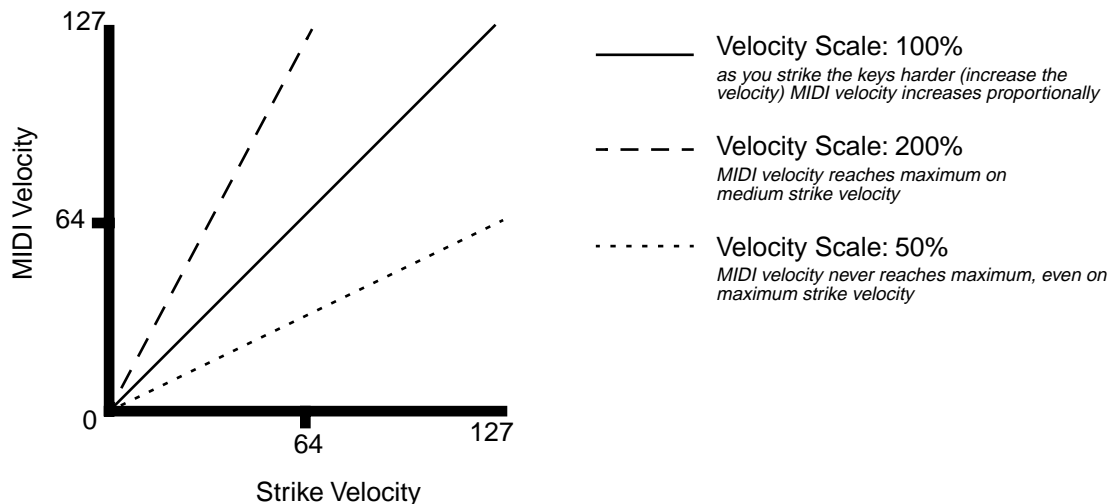
Parameter	Values
Vel Scale:	-300% to 300%
Vel Offset:	-127 to 127
Vel Curve:	Linear, Sin+, Cos+
Vel Min:	1 to 127
Vel Max:	1 to 127

The PC88 can respond to keyboard velocity — how hard you play the keys — in a variety of ways. Each Zone can have its own velocity response settings, and any change you make in a Zone affects both local sounds and outgoing MIDI data. Variations in velocity response are useful if you want to customize the feel of the keyboard, or if you are working with a synthesizer or patch that responds strangely to velocity, or for special dynamic effects. You can design a Setup, for example, where certain instruments, perhaps horns or strings, only play when you strike the keys with a high velocity.

Velocity Scale

Vel Scale lets you amplify or diminish velocity response. Normal response is “100%”. Higher values make the keyboard more sensitive (you don’t need to play as hard to get more sound) while lower values make it less sensitive (playing harder doesn’t change the sound as much). You can also set the scale to a negative number, in which case the velocity response is turned upside-down: playing harder produces a softer sound and vice versa. See the following section on Velocity Offset for ideas about negative scaling. A neat thing to try is to set up two Zones with opposite scale factors so that key velocity acts as a crossfade between the two sounds. Maximum scale values are +300% and -300%.

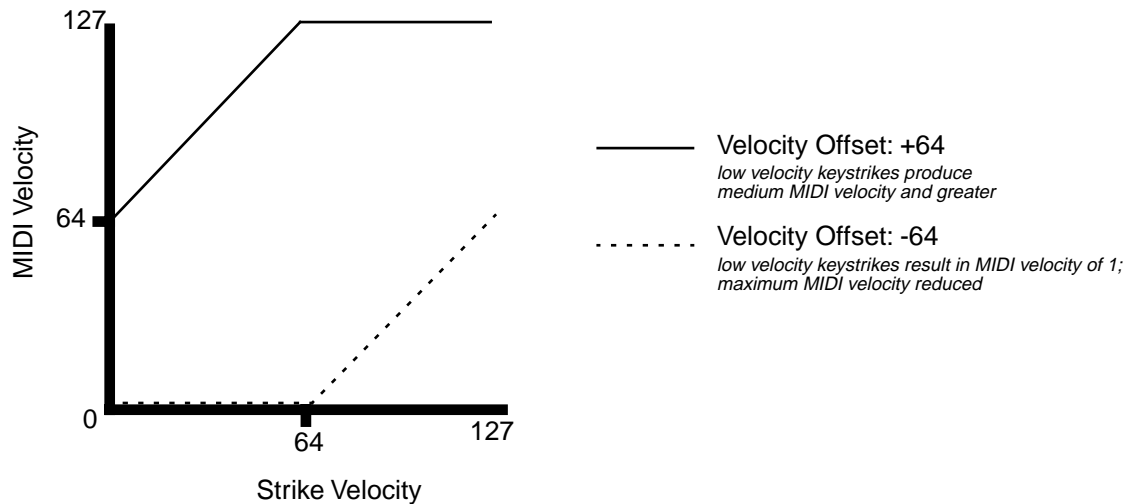
The illustration that follows shows what happens when you change Velocity Scale. Note that Velocity Scale is the only parameter changed in this example; the other parameters are set to their defaults (offset = 0, curve = linear, min = 1, max = 127).



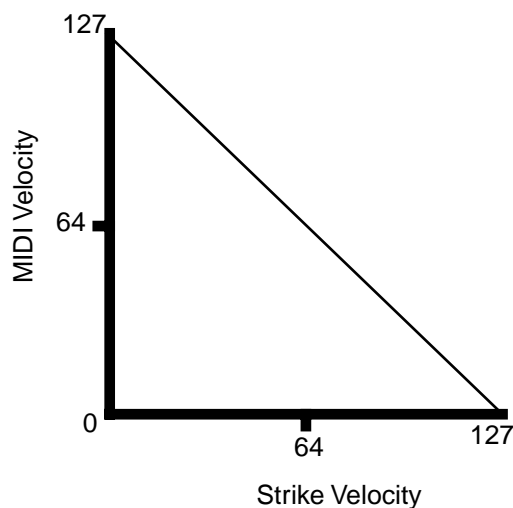
Velocity Offset

Vel Offset also changes the response, but in a more direct way, by adding or subtracting a constant to the key velocity. For example, if this is set to 25 (assuming a scale of 100%), then 25 is added to the velocity of every keystroke, making the sound that much louder. The softest possible keystroke will have a value of 25, while a keystroke with velocity of 102 will produce the same sound as a note with velocity 127 ($102+25=127$). Negative values diminish the response: a setting of -25 means the loudest velocity available will be 102, while any keystroke 25 or below will produce a velocity of 1 (a velocity value of zero has a special meaning in MIDI

and cannot be used for note-ons). You can think of Scale as being a proportional change to the velocity, while Offset is a linear change. The maximum values for Offset are ± 127 . The illustration below shows the effects of Velocity Offset. Note that Velocity Offset is the only parameter changed in this example; the other parameters are set to their defaults (scale = 100%, curve = linear, min = 1, max = 127).



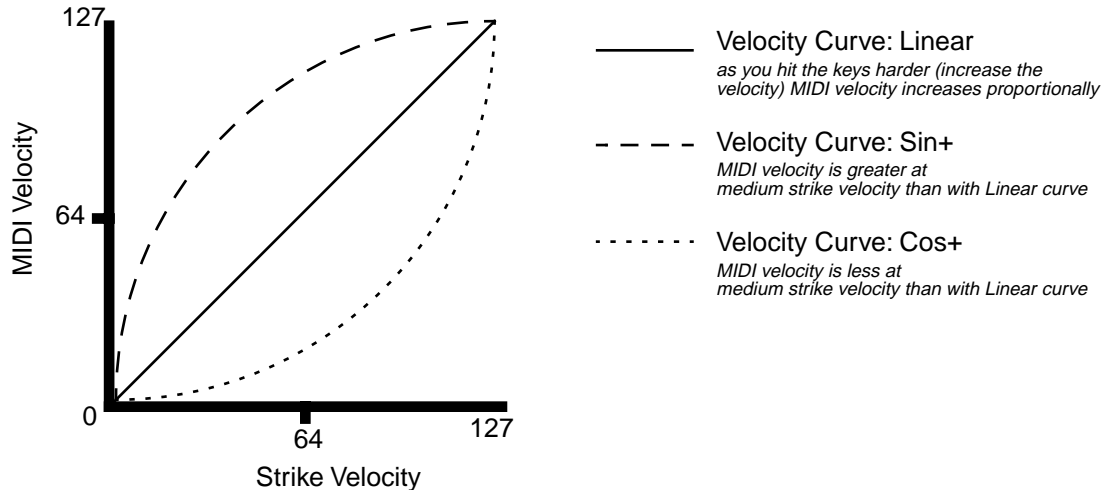
Offset and Scale work together. If scaling takes the velocity out of the ballpark — for example, you want to set it to 300% but that puts *all* of your notes at maximum velocity — using a negative offset, say around -60, can make it possible to still play at different volumes, although your curve will still be a lot steeper than normal. If you use a negative scaling, then you must use an offset: otherwise all of your velocities will end up as zeroes (well, ones actually, since a MIDI note-on with velocity zero is something else). So to get true inverse scaling (that is, -100%), you must set an offset of 127 to get the full range of velocities. Setting the offset to 127 and the scale to -100% produces a slope like this:



Velocity Curve

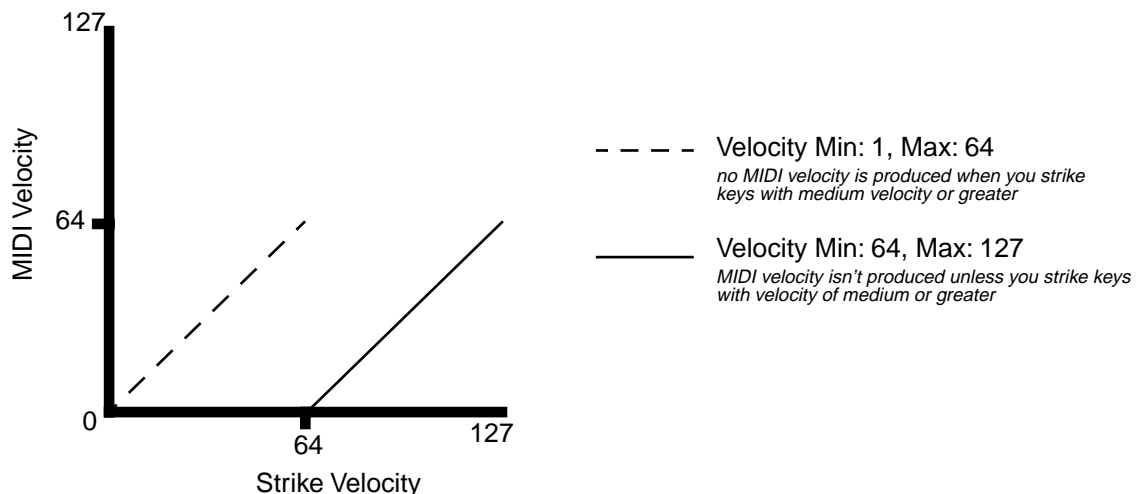
Vel Curve lets you taper the velocity response. The default setting is “Linear”, which means that the output velocity changes directly proportionally to the played velocity. “Sin+” sets the taper to resemble the first quarter-cycle of a sine wave, in which there is a “bulge” as the velocity increases from 1 to 64. If you start playing softly, and then progressively louder, the response will increase more quickly than normal until you reach the middle of the velocity

range. If you keep playing harder, the sound will continue to get louder, but the increase will be less than it would be normally. “Cos+” sets the taper to resemble a cosine wave, in which the “bulge” goes the other way: the change in response is *slower* than normal as you approach the velocity midpoint, and then increases faster than normal as you play harder.



Velocity Minimum, Velocity Maximum

Vel Min and **Max** set minimum and maximum velocity values that the Zone will respond to. A keystroke whose velocity — *after* it has been scaled and offset — is below the minimum will not make a sound in the Zone. Similarly, a keystroke whose velocity after processing is above the maximum will not play the Zone. These parameters are important for “velocity switching” — having a note play different sounds depending on how hard you strike it. The values can be anywhere from 1 to 127. As with other parameters, Zones can overlap or be totally discrete, or be identical. Intuitive Entry gives us a special way to set these parameters: hold the **Enter** key and play a note, and the current parameter changes to the actual velocity of the note you’ve played.



Controllers

Continuous Controllers

Physical Controller	Parameter:Values
Wheel 1 Up	Ctrl Num: None, 0 - 127, Pitch Up/Down, Pressure, Tempo, special functions
	Ctrl Scale: -300% to 300%
	Ctrl Offset: -127 to 127
	Ctrl Curve: Linear, Sin+, Cos+
	Entry Value: None, 0 - 127
	Exit Value: None, 0 - 127
Wheel 1 Down	<i>(same as Wheel 1 Up)</i>
Wheel 2	<i>(same as Wheel 1 Up)</i>
MPressure	<i>(same as Wheel 1 Up)</i>
Sliders A, B, C, D	<i>(same as Wheel 1 Up)</i>
Pedals 1, 2, 3, 4	<i>(same as Wheel 1 Up)</i>

Switch Controllers

Physical Controller	Parameter:Values
Buttons E, F, G	SwType: Toggle, Momentary
	On Ctrl: None, 0 - 127, Pitch Up/Down, Pressure, Tempo, special functions
	On Value: None, 0 - 127
	Off Ctrl: None, 0 - 127, Pitch Up/Down, Pressure, Tempo, special functions
	Off Value: None, 0 - 127
	Entry State: None, Off, On
	Exit State: None, Off, On
SwitchPdl 1, 2	<i>(same as Buttons E,F,G)</i>

Controller editing is one of the strongest aspects of the PC88's usefulness as the main controller for a sophisticated MIDI studio. In this chapter, we'll talk about two different types of "controllers" as they apply to the PC88. One is the *physical* controllers: the wheels, buttons, pedals, etc. that you move with your fingers or feet. The other is *MIDI* Controllers, which are MIDI commands sent by the PC88. For our purposes, "MIDI Controllers" includes the complete set of Controllers defined by the MIDI Specification, as well as pitchbend, aftertouch, and a few other useful MIDI commands. To fend off confusion, we'll refer to the PC88's physical controllers with a lower-case "c", and MIDI Controllers with an upper-case "C".

Any of the *physical* controllers, in any of the Zones, can take on the identity of any *MIDI* Controllers. In addition, each controller in each Zone can be tweaked just like keyboard velocity. You see that controller editing on the PC88 can be very complex, but also very rewarding.

The PC88's physical controllers include (in the order they appear in the menu):

- the pitch wheel, which is actually split into *two* controllers, one for movement up from the center (**Wheel 1 Up**) and the other for movement down (**Wheel 1 Dn**)
- the second wheel, often referred to as the modulation wheel (**Wheel 2**)
- keyboard aftertouch, or Mono Pressure (**MPressure**)
- the four sliders (**A, B, C, and D**) in the **Assignable Controllers** section
- the four continuous control pedals (**1, 2, 3, and 4**)
- the three buttons (**E, F, and G**) in the **Assignable Controllers** section, and
- the two footswitch pedals (**1 and 2**).

Getting Around

As usual, the cursor buttons select the various parameters associated with the physical controllers. You must scroll through all of the parameters for one physical controller before you get to the parameters for the next physical controller. For example, if you are looking at **Wheel 1 Up** and you want to jump to **Slider A**, you have to scroll through the rest of **Wheel 1 Up**'s parameters, all of **Wheel 1 Down**'s, all of **Wheel 2**'s, and all of **MPressure**'s before you get to **Slider A**. The cursor buttons have an "auto-repeat" function: hold one down and it keeps scrolling. Each controller has either 6 or 7 parameters, so even with auto-repeat this can get pretty tedious. Therefore, two special ways of accessing controller parameters are available.

One is "jump selection": if you press *both* cursor buttons simultaneously, the display will jump to the same parameter of the *next* controller. So if you are working on the scaling of **Slider A**, as shown here:

```
Zone 1:  Slider A
Ctrl Scale: 133%
```

and you want to check the scaling of **Slider B**, press both cursor buttons (<<< and >>>) and you'll get **Slider B**'s Scale setting:

```
Zone 1:  Slider B
Ctrl Scale: 75%
```

The other quick method of getting around is a special Controllers Intuitive Entry mode: when you're in Controllers mode, press and hold the **Controllers** button and then make a movement of any kind with the physical controller you want to adjust. The display will change to show the controller you've selected and its initial parameter ("Ctrl Num"). Pressure can also be selected this way: hold the **Controllers** button and play any note, adding a little extra weight at the bottom of the downstroke.

To get back to the very beginning of the Controllers menu (**Wheel 1 Up**'s number), just press the **Controllers** button.

Intuitive Entry also works in the normal way when setting the value of a parameter: hold the **Enter** key while you move any slider, wheel, or pedal, or play a note, and the value will change accordingly. To quickly set a parameter to its default value (scale: 100%, offset: 0, curve: linear) press the decrement (-) and increment (+) buttons simultaneously.

The Continuous Controllers

The continuous (physical) controllers are those that have a *range* of values: the two wheels, four sliders, and four pedals, and also pressure. As the table above shows, all of them use the same parameters.

A word about pressure. Key Range in a Zone does *not* define which notes will generate pressure in that Zone. If pressure is enabled in a Zone, playing with aftertouch *anywhere* on the

keyboard will produce data. For example, if Zone 1's Key Range is C3-C5 and you play C2 and push down on the note, pressure messages will be sent from Zone 1. As with any other physical controller, however, you can disable pressure in any Zone, or scale it or offset it differently in the various Zones. It might help to think of pressure as a "third wheel" — wheels operate in a Zone regardless of Key Range, and so does pressure.

MIDI Controllers and Other Parameters

After you've selected which Zone and which physical controller to work with (using the cursor buttons or Intuitive Entry), use the **Ctrl Num** parameter to choose what this controller will do. Some of the controllers have default settings that are pre-programmed in all of the factory Setups (of course, you can change them). You can select from the entire list of numbered MIDI controllers, as well as other MIDI commands and some "special functions". To move through the list, you can use the Alpha wheel, or Intuitive Entry with any continuous controller, or call up the Controller's number with the numeric keypad.

Here are some of the common "targets" for each controller, in scrolling order:

- None (the controller does nothing)
- MIDI Controller messages 0-127. The most commonly used Controllers are:
 - **1 Modulation** (the default assignment on factory Setups for Wheel 2)
 - **2 Breath Controller**
 - **4 Foot Control** (the default for Pedal 2 and Slider C)
 - **6 Data Entry Slider**
 - **7 Volume**
 - **10 Pan** (stereo position) — Pan messages on the PC88's internal sounds only affect the beginnings of notes, and do not change notes that are being sustained.
 - **11 Expression** — an attenuator for fading in and out (the default for Pedal 1)
 - **64 Sustain** (the default for Switch Pedal 1)
 - **65 Portamento**
 - **66 Sostenuto** — it holds notes that are currently down, but not notes played subsequently (the default for Switch Pedal 2)
 - **67 Soft** — lowers the volume by a pre-set amount and may soften the timbre as well
 - **69 Hold 2 or Freeze** — it freezes a synth envelope at its current state
 - **72 Envelope Control** (also called **Sound Controller 3**) — shortens or lengthens the envelope of a sound
 - **91 Reverb Depth** — (the default for Slider A)
 - **93 Effects Depth** — (the default for Slider B)
- The PC88 uses some MIDI Controllers in unique ways to edit effects (**83, 90, 92, and 94**) and operate the Arpeggiator (**116-119**): see Chapters 6 and 7 for more. A detailed list of the entire set of MIDI Controller messages appears in Appendix F.
- A number of Controllers can cause trouble if not used carefully, such as **0 (Bank Select)**, and all of the ones above **119**, which include **All Sound Off (120)**, **Reset All Controllers (121)**, etc. Be warned.
- **Pitch Up (128 on the numeric keypad)** — pitchbend commands of 64 and above. This is the default assignment for Wheel 1 Up.
- **Pitch Down (129 on the numeric keypad)** — pitchbend commands below 64, going negatively. The default for Wheel 1 Down. Since Wheel 1 Up and Wheel 1 Down are configured separately, you can have all sorts of wild pitchbend combinations going in various directions over the four Zones.
- **Pressure** (the MIDI command) (**130**)
- **Tempo (131)**. You can use the PC88 to clock an external sequencer, and this parameter sets the tempo by determining the speed of outgoing MIDI Clock messages. It can also set the tempo of the internal Arpeggiator. The range is 20-300 beats per minute.

The rest of the Controllers, which we'll refer to as "Special Functions", are usually controlled by the PC88's Switch controllers, which we'll get to momentarily:

- **Program Increment** (Prog Inc) (132). Moving the controller takes the Zone to the next highest Voice, and sends out the next highest Program Change number.
- **Program Decrement** (Prog Dec) (133) takes the Zone to the next lowest Voice and sends out the next lowest Program Change.
- **Goto Program** (Goto Prog) (134). Selects an entirely different Voice for the Zone. The Voice number is the On value.
- **Setup Increment** (Setup Inc) (135) takes the PC88 to the next highest Setup, and sends out all of the appropriate Exit and Entry values. When you change Setups, it's quite possible that the Setup you go to won't have the same controller configuration as the current Setup, and that this command won't be in the same place (or even present at all) in the next Setup. Therefore you may only be able to use this controller once before it turns itself off or turns into something else!
- **Setup Decrement** (Setup Dec) (136) takes the PC88 to the next lowest Setup.
- **Goto Setup** (137). Selects a specific Setup. In this special case, the controller values are 1-128, to match the Setup numbers.
- **Sequence Start** (Seq Start) (138) sends out a MIDI "Start" command, which will set an external sequencer connected to the PC88 to the beginning of its sequence and start it. (If the sequencer is set up to accept external sync.) The tempo of the external sequence will be determined by the settings of the clock parameters in the **Global** menu and the Tempo setting.
- **Sequence Stop** (Seq Stop) (139) stops any external sequencer.
- **Sequence Continue** (Seq Cont) (140) starts an external sequencer from wherever it happens to be. This is either where it was stopped by a Stop command, or where it was sent by a MIDI Song Position Pointer message. The PC88 doesn't transmit Song Position Pointers, but most sequencers do.
- **Transpose Up** (Trans Up) (141) raises the pitch of the Voice, and also raises the MIDI note numbers generated by the Zone. The amount of transposition is variable from 1 to 127.
- **Transpose Down** (Trans Down) (142) lowers the pitch of the Voice and lowers the MIDI note numbers.

Scaling

After you've selected the MIDI command associated with a continuous physical controller, you can modify the controller's response similarly to the ways you can modify velocity response. Refer to the graphs beginning on page 5-8 for illustrations of the velocity scaling parameters.

Ctrl Scale lets you amplify or diminish the action of the controller. Full scale (0-127) is 100%. Higher values will make the controller more sensitive, and lower values will make it less so. Setting the scale to a negative number makes the controller action work in reverse. As with velocity, you can use a controller to crossfade between two Zones by setting the scaling for one Zone positive and the other negative. Maximum scale values are +300% and -300%.

Ctrl Offset adds or subtracts a constant to the controller, and at the same time sets minimum or maximum values (there's no need for separate Max and Min parameters). If the offset is 25, the minimum value of the controller will be 25. If it is -25 (and scale is 100%) the first one-fifth of the controller's movement ($25/127 = \text{about } 1/5$) won't do anything, and the maximum value of the controller will be 102 ($= 127-25$). As with velocity, Scale is a proportional change to the controller, while Offset is a linear change. The maximum values for Offset are ± 127 .

Ctrl Curve lets you taper the controller response. The default setting is Linear, which means that the response follows a straight line as you move the controller. Sin+ sets the taper to resemble the first quarter-cycle of a sine wave, in which there is a "bulge" as the response

increases. As you move the controller up from the bottom of its travel, the output will increase faster than normal until you reach its midpoint, at which point it will start to increase slower than it would normally. Cos+ sets the curve to resemble a cosine wave, in which the “bulge” goes the other way: the response is less than normal as you approach the controller’s midpoint, and then increases faster than normal as you move higher.

Entry and Exit Values

Entry value allows you to specify an initial value for a controller in a Setup that will be sent whenever you select that Setup. For example, if you want to make sure that a voice in a Zone is panned to the center whenever you select the Setup, you would assign MIDI Controller 10 to one of the physical controllers, and then set an Entry Value of 64. Or perhaps you want to make sure that all of the modulation in a Zone is turned off when you select a Setup. Assign MIDI Controller 1 to a physical controller and set its Entry Value to 0.

Entry values ignore the current position of the physical controller when the Setup is selected. In fact, if the physical controller is above or below the Entry Value when the Setup is selected (which it often is), moving the controller will have no effect until it is past its entry value. In the modulation example, moving the assigned controller won’t turn on any modulation until it’s pushed all the way *down*, and then up again.

An Entry Value of **None** is quite different from a value of “0”. “None” means that there will be no initial controller command when the Setup is selected, and any subsequent movement of the physical controller will be effective. (The *position* of the physical controller when the Setup is first selected, however, is still ignored.)

Exit Value tells the PC88 to send a value for that controller whenever you leave the Setup, either by selecting another Setup or by switching to Internal Voices mode. It can be very useful when a controller is doing something special to the sound which you don’t want to continue after you leave the Setup. For example, if you want to make sure a Zone’s pan position is centered whenever you leave a Setup, you would give an Exit Value of 64 to any controller assigned MIDI Controller 10. Or, if you wanted to make sure a channel was playing at full volume when you left a Setup, you would give an Exit Value of 127 to a controller assigned MIDI Controller 7. Again, “None” means no command is sent.

The Switch Controllers

Switch (physical) controllers have only two states: on and off. They are found after the Continuous controllers when you are scrolling the menu. They are:

- Buttons E, F, and G
- Switch Pedals (“SwitchPdl”) 1 and 2

The parameters for Switch controllers are slightly different from those for continuous controllers. The first parameter is Switch Type (**SwType**). The choices available are **Momentary** in which a switch’s action lasts only as long as you are pushing it, and **Toggle**, in which the switch’s action lasts until you press it again. The Momentary mode is used for functions like sustain or portamento, while the Toggle mode is used for functions such as arpeggiator start and stop or latch, program Goto’s, and transpositions. The buttons show which mode they are in by the behavior of their lights: if a button is in Momentary mode, its light glows only as long as you are holding it, while if it is in Toggle mode, the light stays on until you press it again. Bear in mind that button assignments are independent per zone, and since there’s just a single light per button, the light only shows the state of the button for the current zone. When you press the button, however, it executes its assignments for all four zones.

The next parameter for the Switch controllers is On Controller (**On Ctrl**). This determines what MIDI Controller or other message will be sent when the switch is “on” — either pressed or

toggled the first time. The list of available controllers is the same as for the continuous controllers, and can be accessed the same way.

Then comes **On Value**: the value of the Controller when the switch is on. In the case of conventionally-switched functions, such as sustain, the On Value will be 127. (For example, the default for Switch Pedal 1 is Controller #64 — Sustain — with an On Value of 127.) However, you might want to use a button or pedal as a “soft” switch, in which case you might set On Ctrl to 7 (Volume) and On Value to 50. On Value can also be set to “None”, so that turning on the switch has no effect at all in this Zone, which can be useful when you are using one switch for multiple functions in different Zones.

Off Ctrl is the MIDI Controller or other message that is sent when the switch is turned off — either released or toggled a second time. Whenever you set the On Controller, it *automatically* sets this parameter as well to match. If you want the Off Controller to be something else, however, you can change it after setting the On Controller. A situation where this might come in handy is when you want to switch a synth between Mono and Poly mode. The On Ctrl would be 126 (MonoOn) and the Off Ctrl would be 127 (PolyOn).

Off Value is the value of the Controller when the switch is off. The default value is 0. You might want to change this, as in the “soft switch” example above: in order to bring the Zone up to full volume when you release the pedal, set Off Value to 127. “None” is also a choice here.

Entry State determines whether an initial setting for the switch will be sent when the Setup is selected. There are three choices: None (no message), Off (the Off controller and value), and On (the On controller and value). In a button, if the entry state is “On”, the light will glow as soon as you select the Setup.

Exit State similarly determines whether a setting for the switch will be sent when the Setup is left, either for another Setup or for the Internal Voices mode. The same three choices are available. Very useful for turning off Sustains when changing Setups.

Do These Parameters Always Mean Something?

Be careful not to set up parameters that will do crazy things. When in doubt, leave things off, or at the factory default settings. All of the Special Function controllers should have their Entry and Exit values set to “None”.

On some of the higher-numbered MIDI controllers and Special Function controllers, the on and/or off values don’t have any meaning, because the controllers have very limited functionality. The following list shows these. “>0” means you can use any value that’s greater than zero. “=0” means the value should be 0. “x” means you can use any value, except “None”. “√” means the value does count for something:

	On Value	Off Value
120 All Sound Off	>0	x
121 Reset All Controllers	>0	x
122 Local Control Off	>0	=0
123 All Notes Off	>0	x
124 Omni mode Off	>0	x
125 Omni mode On	>0	x
126 Mono mode On	√	x
<i>(the On value, in some synths, specifies the number of MIDI channels to respond to, with one voice on each)</i>		
127 Poly mode On	>0	x
Program Increment	x	x
Program Decrement	x	x
Goto Program	√	√
Setup Increment	x	x

Setup Decrement	x	x
Goto Setup	√	x
<i>(once you go to another Setup, this Setup's parameters are no longer operative)</i>		
Sequence Start	x	x
Sequence Stop	x	x
<i>(Start and Stop will usually be on the same button, as On and Off Ctrl's)</i>		
Sequence Continue	x	x
Transpose Up	√	√
Transpose Down	√	√

Do I Need All Those Pedals?

It's important to realize that you don't have to have an actual pedal plugged into every Pedal and Switch Pedal jack in order to take advantage of all of them. Entry and Exit Values can be assigned to a Zone and a physical controller even if the controller isn't there, and they will behave as if the controller were in fact plugged in. So if you want a specific group of Controller commands to be sent out whenever you choose a Setup, and you know they're not going to change while you're playing, you can assign them to physical controllers that aren't in use.

Multiple Controllers

Sometimes it can come in handy to assign the same Controller to more than one physical controller. For example, you might want to be able to control modulation depth both with Wheel 2 and pressure. The PC88 has no restrictions on assigning multiple controllers to a particular MIDI message. For live performers, a useful trick is to assign Goto Setup to the three buttons (E, F, and G) each with its own value. This lets you choose from among three Setups (more if you want to include the Switch pedals in the fun) to jump to, at any one time. Remember though, since going to another Setup turns off all of the old Setup's parameters, you'll have to include Goto's in the Setups you're going to, or you may not be able to get back!

Here's an example. You're playing a tune in which you want to use four Setups, numbers 1, 12, 14, and 82. Here's how you would program the buttons to be able to move among the four Setups at will:

	Goto Setup values		
	Button E	Button F	Button G
Setup 1	12	14	82
Setup 12	1	14	82
Setup 14	1	12	82
Setup 82	1	12	14

Copying Parameters

Very often, two or more Zones in a Setup will be very similar — perhaps all of the MIDI parameters will be identical, but you want to use a different instrument sound on a certain portion of the keyboard. Since there are so many parameters that define a Zone, it can be difficult making sure they're all the same in two different Zones. For that reason, a Copy function has been included.

Leave the Controllers mode (it's a special case, which we'll talk about in a moment) by pressing any of the other buttons on the top row of **Zone Parameters**. Select a Zone from the current

Setup with the **Zone** buttons. Now press **Copy**. The display asks if you want to copy the current Zone. If you do, press **Enter**. If you want a different Zone copied, press its button. Press any other parameter button to cancel.

Now press the right cursor button. The display asks you where to paste the Zone you've just copied. Press the button of the Zone you want to paste into, and press **Enter**. Again, any other parameter button cancels. When you paste a Zone, the PC88 retains the destination zone's old MIDI channel, which is less likely to conflict with the MIDI channel you have copied. It's a good idea to set the MIDI channel of the zone before you paste into it.

You can also copy a Zone from one Setup to another. Copy it the same way, and then press the MIDI Setups button and select the Setup you want to go to with the Select buttons or Data Entry controls. Press **Copy**, and then the right cursor, and the display will ask whether you want to paste into the current zone. You can select another Zone (with its Zone button), or not. Press **Enter** and the deed is done.

Besides entire Zones, you can also copy the parameters associated with a single physical controller in a Zone. The procedure is the same, except instead of using the Zone buttons to select an entire Zone, select a single controller from the **Controllers** menu. Press **Copy**, and the display confirms the controller you've selected, and the Zone it's in. Press **Enter** and all of that controller's parameters are copied. This information can now be pasted to another controller, another Zone in the Setup, or another Setup.

To copy to another controller, press the Controllers button, and scroll through the list of controllers with the cursor buttons (or use Intuitive Entry) to get to the controller you want. Press **Copy**, then right cursor, and you can paste the copied values into this controller. To copy the controller into another Zone, press a Zone button right after copying. You can also select a different controller in this Zone to paste into. To copy into another Setup, press MIDI Setups right after copying and select your Setup. Press the appropriate Zone button if the Zone you want isn't current. Press Controllers, the Copy, then the right cursor. Paste away.

You can only paste information from a continuous controller into another continuous controller. Likewise, you can only paste information from a switch controller into another switch controller. Different memory buffers are used to store information during Copy operations depending on whether you're copying a Zone, a single switch controller, or a single continuous controller, so different types of copy and paste operations can overlap. For example, you could copy a Zone, then copy a switch in a different Zone, then paste the first Zone into another Zone, then copy a continuous controller, then paste the continuous controller into another Zone, then paste the switch.

In addition, there are separate copy buffers for **Effects** parameters and for **Arpeggiator** parameters. We'll discuss them in the chapters on those subjects.

Here is a table that can help you keep track of what can go where:

You have copied:	It can go:
a Zone	to another Zone in the same Setup, a Zone in a different Setup
a Switch controller	to another Switch controller in the same Zone, or in a different Zone, or in a different Setup
a Continuous controller	to another Continuous controller in the same Zone, or in a different Zone, or in a different Setup
an Effect	from the Internal to the VGM effect in the same Setup, or to either effect in a different Setup
an Arpeggiator	to the Arpeggiator in a different Setup.

You can also set the zone, controller, switch, arpeggiator, or effects to a default value. “Clear,” at the end of each copy menu, copies information stored in Setup #127 that contains default parameter information. You can overwrite this setup with your own information, however, to create your own “default” parameter settings.

Storing a Setup

In Chapter 3 we discussed storing data with an Internal Voice. The Voice itself can’t be modified, but the performance parameters affecting all of the Internal Voices can be saved, to the “internal defaults” memory.

In Setups mode the story is quite different. Each Setup has four complete set of parameters — one for each Zone — and saving parameters for one Setup has no effect on any other Setup.

The **Store** button starts the procedure. When you press it, the display asks if you want to “Replace setup...”, and the name and number of the current Setup, as shown below:

```
RePlace setup 3?
003 EBass/E Pno
```

If you press **Enter** now, you will replace the old version of the current Setup with your newly-edited version. If you want to store the new Setup to a different location, you can scroll to it with the Alpha wheel or enter its Setup number with the numeric keypad. For convenience, you can immediately find the first empty Setup location by pressing the increment and decrement buttons (+ and -) under the Alpha wheel *simultaneously*. Whenever you have selected an empty location, the display asks you if you want to save to the Setup at the selected location with a message such as this one:

```
Save setup 33?
03 EBass/E Pno
```

Press **Enter** and it’s done.

You can also select a Setup location with the alpha wheel, the numeric keypad, or increment/decrement buttons (one at a time). Locations that are already occupied will say “Replace...” while empty ones will say “Save...”.

Names

If you would like to come up with a new name for this Setup, then before storing it, press the right cursor button once. The display says “Rename setup...?”. Press **Enter**, and you can now edit the Setup’s name. Use the cursor buttons to locate the cursor under the first letter you want to change. Now you can scroll through the available characters using the alpha wheel. This includes an upper-case alphabet, a lower-case alphabet, the numerals 0-9, and two sets of punctuation marks. Use the cursor buttons to select other letters to change, and press **Enter** when you’re done. In the display shown below, for example, you could change the name from “EBass” to “PBass” by turning the alpha wheel until the “E” above the cursor changes to “P”.

```
Setup name:
EBass/E Pno
```

There are a few shortcuts available when naming a Setup. You can call up letters using the numeric keypad: each keypad button chooses from the letters that are printed right underneath it. Repeated pressings select the different letters in a group: for example, press the “1” button one time, the letter “A” will appear in the name, press it again and “B” appears, and one more

time and you get “C”. Press it yet again, and it brings us back to “A”. The number “2” button is responsible for the letters D, E, and F, and so on.

To change the case of a letter, from UPPER to lower or the other way around, use the “+/-” button. To get numbers into a name, use the “0” button: press it repeatedly to scroll through the digits 0 through 9. The **Clear** button makes the current letter a space. To *insert* a space, press the “E” button in the **Assignable Controllers** section. To delete a letter press the “F” button, and to move the cursor instantly to the end of the name in the display, press “G”.

Cancel works the same way with letters as it does with numerical parameter values: use it if you want to start over or forget the whole thing.

The PC88’s preset voices and Setups in ROM can never be erased. You can, however, save over them into RAM with the same number. If you subsequently delete the program in RAM, the preset ROM program will again be stored at that number.

Dumping a Setup

From the **Store** function, press the right cursor button (>>>) twice and you will come to “Dump setup...?”. This allows you to transmit the parameters that make up this Setup over MIDI System Exclusive to another PC88, or to a sequencer (if it is capable of recording Sysex messages) or other MIDI storage device, so that they can be recalled at another time. If you are using complex Setups, it’s always a good idea to have them stored externally so you can load them back into the PC88 should something go wrong with the memory (or if you have to do a hard reset). You can change which Setup you are dumping by turning the Alpha wheel or entering a number on the keypad.

Loading a Setup back into the PC88 is simply a matter of playing it from the storage device into the PC88’s MIDI In jack. However, the Device ID of the PC88 (which is set from the **Global** menu) must be set to the same number both when dumping and reloading the Setup for this to work. The same is true when going from one PC88 to another: they must have the same Device ID. You can avoid problems by setting the Device ID to “127”. In MIDI-speak, this means “broadcast to all units”, so *any* PC88 on the MIDI cable will receive the Setup data. (You might not want to do this if you have multiple PC88s that you’re trying to keep different from each other.)

You can’t dump an empty Setup — if you try, the display will say “Not Found”. Press either cursor button or any Parameter button to get out of here.

There is also a function for dumping *all* Setups — it’s on the **Global** menu.

Deleting a Setup

The last item on the **Store** menu is **Delete**. This comes in handy when you are designing and storing lots and lots of fancy Setups. It erases a Setup from memory without replacing it with another Setup, thus freeing up more space to store other Setups in other locations. (You can check the free memory in the PC88 at any time, using the “Mem Avail” option on the **Global** menu.) From the **Store** function, press the right cursor button (>>>) three times. The display says “Delete setup...?”. If the number is wrong, change it with the alpha wheel or numeric keypad. If the Setup is empty, the display will say “Not Found” and nothing will happen. Press the left cursor button or any Parameter button to bail out.

The factory-programmed Setups in the first 32 locations (64 if you have a VGM board) cannot be deleted, although they can be written over. You can Store any Setup in any of those locations, but if you then Delete it, the factory Setup that was originally in that location will reappear.

Chapter 6

The Arpeggiator

The Arpeggiator takes input from the PC88 keyboard and turns it into a constant rhythmic pattern. The speed and nature of the pattern is controllable in real time. It recalls old-time analog “sequencers” which played a finite series of notes over and over, with changes in the series dictated by the musician as the instrument played. The power of the Arpeggiator is not limited to the PC88: it also can control MIDI instruments, by sending MIDI data out just as if you were playing the keyboard.

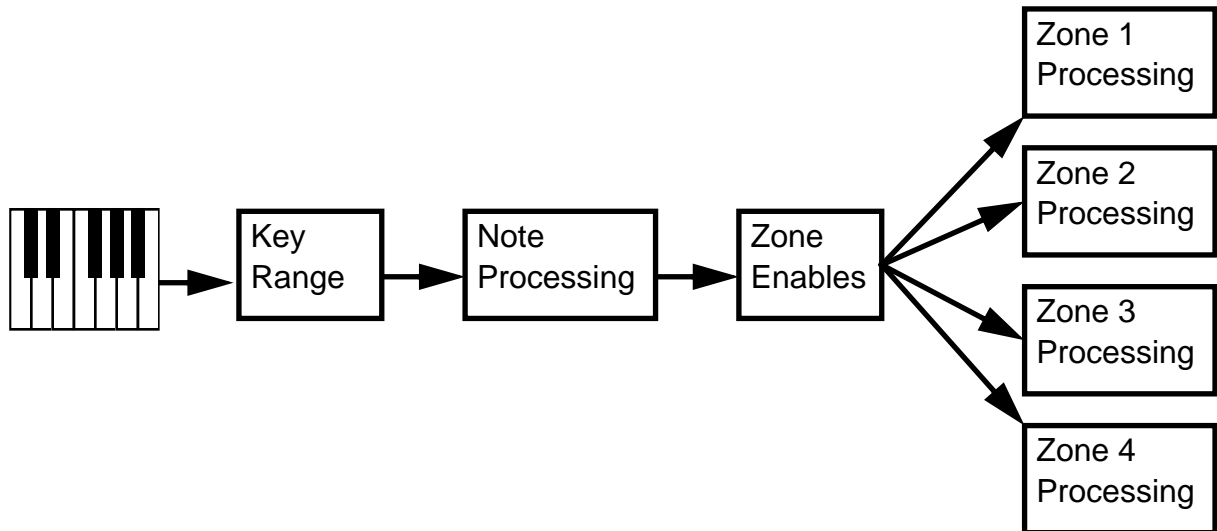
The concept behind the PC88’s Arpeggiator is fairly simple, although the options are extensive. You might think of it as a “note processor”, generating complex output from relatively modest input. You can select any number of notes for the input, and tell the Arpeggiator to recognize and remember them. This is called “latching” the notes. The Arpeggiator will then process them by playing them repeatedly, and/or having them fly up and down the keyboard. You have control over a number of processing parameters: tempo, velocity, order, duration, transposition, orchestration, and whether the intervals between notes will be filled in chromatically. You can also tell the Arpeggiator how to deal with new information coming from the keyboard.

MIDI Setup 3, “Rhythm Pad”, provides a good example of how to use the Arpeggiator. Take a look at it now. And while you’re at it, double-check to see that the Clock parameter in the **Global** menu is set to “Internal”. If it isn’t, you will have trouble getting the Arpeggiator to run.

Press the **Arpeggiator** button in the **Zone Parameters** section to enter the Arpeggiator mode. There is one Arpeggiator per Setup, and therefore all of the parameters are common to the entire Setup, with one exception. The table below summarizes the Arpeggiator’s features:

Parameter	Values
Arp Active	On, Off
Key Range	C-1 to G9
Zone Enable	On, Off (per Zone)
Latch Mode	Keys, Overplay, Arpeggiation, Add, Auto, Pedals
Play Order	Played, Up, Down, Up/Dwn, Up/Dwn Rp, Random, Shuffle, Walk
Beats	4th notes – 32nd trips
Initial Tempo	20 – 300 beats per minute
Duration	1% – 100%
Vel Mode	Fixed, Played, Last, Pressure, Ctrl 117
Fixed Vel	1 – 127
Note Shift	-12 to 12
Shift Limit	0 – 88
Limit Option	Stop, Reset, Unipolar, Bipolar, Flt Reset, Flt Unip
Glissando	On, Off

The illustration below shows the processing order the PC88 uses to create arpeggios from your keyboard input:



Arpeggiator Active

The first parameter on the Arpeggiator menu is **Arp Active** — is the Arpeggiator **On** or **Off**? This can be switched from here, or for convenience in live performance, it can be switched using MIDI Controller number 116. This can either be assigned to a PC88 physical controller, or come from an external MIDI source.

Key Range

Notes played on the keyboard within the range specified by the **Key Range** parameter will be processed by the Arpeggiator, while notes outside will not (but they will play normally). Setting the Key Range **Hi** and **Low** notes can be done with the Data Entry wheel or buttons, or by using Intuitive Entry: press and hold **Enter** and play the note you want.

Zone Enable

Zone Enable determines whether the Arpeggiator will play notes in the selected Zone. Turning some Zones **On** and not others means that some Voices will be Arpeggiated and some will not. If all Zone Enables are **Off**, then the Arpeggiator won't do anything. The Arpeggiator not only produces notes from the PC88 — it can also control external MIDI instruments. Just as if you were playing the keyboard normally, the notes produced by the Arpeggiator in a Zone will go to all of that Zone's destinations: local, MIDI, or both.

The notes that are generated by the Arpeggiator are restricted in each Zone to that *Zone's* Key Range. If the Arpeggiator, for example, tries to play a C#4 in a Zone, but that Zone's Key Range ends at C4, the note will not sound. However, another Zone whose Key Range ends at C5 *will* be able to play the C#4 from the Arpeggiator. Therefore, setting a Zone's Key Range can be important in deciding how it will respond to the Arpeggiator. (The Arpeggiator's Key Range only restricts notes you play into the Arpeggiator, not notes created by the Arpeggiator.)

Latch Mode

Latch Mode determines how the Arpeggiator will respond to notes played on the keyboard.

Keys means that the Arpeggiator will only play while you are holding down one or more keys. As you play different notes, they get added to the Arpeggiator, and as you release notes, they get taken out. The Arpeggiator has a consistent tempo, which is adhered to no matter how fast or slow you play the keyboard, so some notes may take a little while to speak after you play them, until the Arpeggiator's clock catches up. This clock stays constant as long as you are playing any key, but if you let go of *all* the keys, then the clock "resyncs" itself, and the Arpeggiator starts immediately when you play the next key.

In the next three modes, the Arpeggiator is listening to a switch to latch notes on and off. That switch happens to be MIDI Controller 119, which in this Setup (and as a factory default) is assigned to Button **G** as a Toggle: press the button once and the Arpeggiator starts, press it again and it stops.

In **Overplay** mode, the Arpeggiator will grab ("latch") any notes that are being held when the switch goes on, and will continue playing them, even after you let them go, until the switch is turned off. Any new notes you play on the keyboard will sound normally, and will not be arpeggiated.

Arpeggiation mode ("Arpeg") is similar: any notes held when the switch goes on will be latched and arpeggiated, and keep going until the switch is turned off. Subsequent played notes will join in the arpeggiation, but will not latch: when you let go of such a note, it will no longer play in the arpeggiation.

Add mode means that any note played after the switch goes on will be added to the Arpeggiator, and will *keep* playing after you let go of the key, until you shut the switch off.

Auto mode doesn't listen to the switch: the Arpeggiator goes on whenever you play a note. The note is latched on. Play more notes, and they get latched on, too. You don't have to be holding notes for them to stay on: as long as you hold down at least *one* key, every note played is added to the Arpeggiator. Therefore, you could have 88 notes going at once, if you were so inclined.

Pedals mode is a combination of Keys, Add, and Overplay modes. If neither latch controller is on, notes will arpeggiate only while you are holding down keys (similar to **Keys** mode). If you activate Controller 119, the keys currently held down will latch, and any additional keys played while Controller 119 is on will also latch (similar to **Add** mode). When Controller 119 is off, any keys that are not currently held down will be removed from the arpeggiation. If you activate Controller 118, keys currently held down will latch, and any additional keys played while Controller 118 is on will play normally (similar to **Overplay** mode). This mode is called **Pedals** mode because you might want to assign Switch Pedal 1 to Controller 119 (Latch 1) and Switch Pedal 2 to Controller 118 (Latch 2) to make the pedals function similarly to sustain and sostenuto pedals.

Play Order

This parameter determines the play order: how the notes will come out of the Arpeggiator. **Played** means they will play back in the order they were entered. **Up** means they will play in ascending order of pitch, regardless of their original order. **Down** means (you guessed it!) descending order of pitch. **Up/Down** means they will play up, then turn around and play down, and keep cycling like that until the Arpeggiator stops. The notes at the very top and very bottom only play once. **Up/Down Rp** is the same thing, except the notes at the top and bottom play *twice* (repeat) before the Arpeggiator turns around.

Random picks the notes out from the currently-latched ones totally at random. **Shuffle** picks the notes out at random, but keeps track of the notes so that no note repeats until all of the

others have played (Schoenberg would have approved). **Walk** is “random walk”: each successive note is either the next highest or the next lowest pitch in the cycle. For example, if the latched notes were (in ascending order) C, D, E, F, and G, and the first note was an E, the next note could be an F or a D. If it’s an F, the next note will be an E or a G, but if it’s a D, the next note will be a C or an E; and so on.

Beats

Beats subdivides the Tempo setting. At its lowest value, **4th notes**, the Arpeggiator plays at the indicated tempo. Setting Beats to **8th notes** doubles the tempo, while setting it to **8th trips** triples it. The highest setting is **32nd trips**, in which the notes spew out at 24 times the Tempo setting.

Initial Tempo

Initial Tempo is the tempo, in beats per minute (bpm), at which the Arpeggiator will play when first turned on. This tempo can be changed in real time by assigning any of the PC88’s physical controllers in the Setup to **Tempo**. The range is 20 to 300 bpm.

Note that this parameter will be relevant only if the Clock parameter in the **Global** menu is set to **Internal**. If it set to **External**, then the Arpeggiator will follow the timing of MIDI Clocks coming from an external source, such as a sequencer or drum machine.

Duration

Duration determines how long the notes will play within the rhythm—i.e., the articulation. 100% means that a note will sustain until the next one sounds—very legato. 50% means that the note will fill half the space between itself and the next note. The lowest value is 1%—*staccatissimo*. This parameter has no effect on percussion sounds or other sounds whose duration is fixed.

Velocity Mode and Fixed Velocity

Vel Mode sets the velocity of the played notes. **Fixed** means they all sound at the same level, determined by the **Fixed Vel** parameter (which is next on the menu). **Played** means each note repeats with the same velocity you played it at. **Last** means all notes play at the velocity of the most-recently played note. “Pressure” means the velocities are controlled by keyboard pressure: as you push down on any key, the velocities get higher, and as you ease up they get lower. Finally, **Ctrl 117** means the velocity is controlled by MIDI Controller number 117, which can be assigned to any PC88 physical controller or can come from an external MIDI source.

Fixed Vel, as we mentioned, sets the velocity of all notes if Fixed mode is selected.

Note Shift

You can tell the Arpeggiator to transpose all of the currently-latched notes each time it plays through them. **Note Shift** determines how much transposition will occur. The transposition is cumulative from one cycle to the next: if you choose 2 as the value then after the initial cycle, the next cycle will be up a whole step, the one after that will be up two whole steps (a major third), the following one will be up three whole steps (an augmented fourth), and so forth. The values can be from -12 to 12, with 0 (the default) being no transposition.

Shift Limit

What happens when you transpose so far that the resulting notes are out of range? That's where the **Shift Limit** parameter comes in. This number determines how far up *or* down the Arpeggiator will play from the original note. The minimum value is 0 (which is, admittedly, not of much use), and the maximum is 88. When the Arpeggiator reaches the limit, one of several things will happen, as determined by the **Limit Opt** parameter.

Limit Option

If **Limit Opt** is set to **Stop**, then when the Arpeggiator has shifted notes up or down to the limit, it stops playing. If it is set to **Reset**, then when it reaches the limit, the Arpeggiator goes back to its original pitch and starts over again, continuing to transpose as it plays. If the limit allows the notes to go out of MIDI range (for example, if you set Shift to 12, set the limit to 80, and play C4), then those "ghost" notes will not sound, but they will take up rhythmic space: the Arpeggiator will wait for the cycle to play itself out before starting over.

Unipolar means the Arpeggiator will play the last note before it reaches the limit and then start shifting notes in the *opposite* direction, using the same interval. When it gets back to its starting point, it reverses again, and so keeps bouncing back and forth between the original pitch and the limit, until you pull the plug.

Bipolar starts out the same way as Unipolar, but as the cycle bounces its way back to the original pitch, it keeps going *past* the original pitch, and continues to shift until it hits the Shift Limit in the *opposite* direction. Then it reverses and heads back to the original pitch, going past it until it hits the Shift Limit again, and thus bouncing back and forth between the Shift Limit and its negative counterpart ("evil twin", if you will) for all of eternity.

Flt Reset adds a little bit of randomness to the process. "Flt" stands for "Float", and it means that when the Arpeggiator reaches the Shift Limit, it doesn't necessarily reset to the original pitch. Instead, it looks at the first note that would exceed the Shift Limit, and calculates the interval between it and the Shift Limit. It then starts the cycle over again, but instead of starting with the first original pitch, it *transposes* that pitch by the interval it just calculated, and continues from there. Here's a very simple example. The only note in the Arpeggiator cycle is C3, the Note Shift is 7 (a perfect fifth), and the Note Limit is 26. The Arpeggiator plays C3, then G3, then D4, then A4. The next note, E5, would be above the Limit, D5 (26 semitones above C3). With a normal Reset, the Arpeggiator would start over again at C3. With the Float turned on, however, the Arpeggiator (clever little devil!) looks at the difference between E5 and D5 — a whole step — and applies it to the starting note, raising *it* by a whole step from C3 to D3. Subsequent notes will then be A3, E4, and B4. Then it will see that the next note — F#5 — would be a major third above the limit, and so it applies *that* interval to the starting point — and you get E3, and the beat goes on.

Flt Unip uses the same concept and applies it to the Unipolar mode: when it reaches the limit, the Arpeggiator calculates the difference between the next note and the limit, and transposes all subsequent notes by that interval, even though they're now going in the opposite direction. "Flt Bip!" does the same thing with the Bipolar mode: after the limit is exceeded in one direction, notes are transposed by the usual interval, and when the cycle goes back and reaches the opposite end, another calculation is done, and subsequent notes are transposed according to that interval — which is going to be in the opposite direction of the first transposing interval, and not necessarily the same distance.

The Arpeggiator can be a lot of fun, even if you don't always understand exactly what it's doing. Keep in mind that the stranger the algorithm you set up, the more unlikely the notes will stay close to one key, so if you want to create something that's going to sound at all diatonic, keep it simple.

Glissando

When the **Glissando** parameter is **On**, then the Arpeggiator chromatically fills in between notes as it cycles through them. Example: If the Arpeggiator is supposed to play a D and an E, with Glissando on it will play **D, D#, E, F, E, D#, D**.

Available MIDI controllers

To recap the MIDI controllers available for the Arpeggiator:

116 — Turns the Arpeggiator Active parameter on or off.

117 — Adjusts the velocity of arpeggiated notes (when Velocity is in Ctrl 117 mode).

118 — Latch 2 (**Pedals** mode only) Engages Overplay in **Pedals** mode.

119 — Turns the Arpeggiator's latch on and off when Latch mode is set to **Overplay**, **Arpeggiation**, **Add**, or **Pedals** mode.

Mono Pressure — Adjusts the velocity of arpeggiated notes (when Velocity is in Pressure mode).

Copying the Arpeggiator

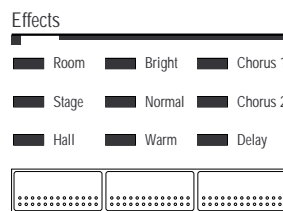
If you have an Arpeggiator that you like in one Setup, and you wish you could use it in another Setup without rebuilding it from scratch, there is a Copy mode for the Arpeggiator. While in the **Arpeggiator** menu, press **Copy**. At the prompt "Copy Arpeg?", press **Enter**. Now go to the Setup you want to copy the parameters to, by pressing **MIDI Setup** and the appropriate group and number buttons. Press **Arpeggiator** to go into *this* Setup's Arpeggiator, and press **Copy**. Press the right cursor so the display says "Paste Arpeg?". Press **Enter**, and the Arpeggiator's settings are now part of this Setup. Now press **Store** so you don't lose everything.

As we saw in the last chapter, each type of Copy operation has its own distinct memory buffer. Therefore, you can overlap Arpeggiator copy and paste operations with those of different types.

Chapter 7

Effects Editing

The PC88's built-in effects processor provides reverb, delay and chorusing effects for the on-board sounds. As we've seen, a different combination of effects can be assigned to any Internal Voice or Setup, and that combination can be remembered when that Voice or Setup is recalled — depending on the setting of the Effects Change Mode in the **Global** menu.



Effects can be edited on two levels. The first you've already done: change the settings of the buttons in the **Effects** section. When you use those buttons, there is a set of default parameters that you can't see that define the effect you've chosen. The second level lets you go beyond the default parameters, and change individual parameters within the effects themselves. These "tweaked" effects can be useful for making a Setup sound "just right", or for creating unusual combinations for special purposes. Tweaked effects are only usable with Setups: the Internal Voices, although they can use any **Effects**-button combination, *must* use the default settings of the chosen combination.



If you have the VGM board installed, there are actually *two* effects processors available, identical but independently programmable. Parameters for the Internal effects processor are labelled "Int" in the display, and those for the VGM processor are labelled "VGM".

Effects editing is handled in the **Zone Parameters**: press the **Effects** button there. The table below summarizes the options:

Parameter	Values
IntFx	1-48
Int Rev Wet	0-127
Int Rev Time	0-127
Int Eff Wet	0-127
Int Eff Delay	1-350
VGMFx	1-48
VGM Rev Wet	0-127
VGM Rev Time	0-127
VGM Eff Wet	0-127
VGM Eff Delay	1-350

Internal Effects

IntFx shows the algorithm or combination of effects that will be applied to the Internal sounds. These correspond with the various button combinations from the Effects section of the PC88's front panel; as you scroll through the Algorithms, you can see the lights in the Effects section change in accordance with the Algorithms. For example, when Algorithm #1 (None) is showing, all the lights are off. Move up to Algorithm #5 (Room Bright), and the lights will glow next to **Room** and **Bright**. Go to Algorithm #6 (RoomBrt+Ch1), and the lights show **Room**, **Bright**, and **Chorus1**.

The correspondence works both ways: If you have the Algorithm on the display, and you change the effects using the Effects buttons, the Algorithm will change accordingly.

Internal Reverb Wet

Once you've chosen an Algorithm with **IntFx**, you can make modifications in it. Press the right cursor button (>>>) and the display shows **Int Rev Wet**. This sets the ratio of reverberated to "dry" unprocessed signal. Maximum value is 127 - all reverb - and minimum is 0 - all dry.

Internal Reverb Time

This sets the overall decay time of the reverb. It also has values of 0 to 127, but exactly what the numbers mean in milliseconds or seconds is a function of which type of reverb you have selected. A setting of 127 will mean a longer reverb in an algorithm that uses "Hall" than one that uses "Room". Setting this parameter to 0 does not cut off the reverb completely: The first initial reflection (the "bounce" you hear after you play the note) is not affected by this parameter, and will still be heard, although later sound will be damped. The timing of that initial reflection is a function of the reverb type, and stays the same regardless of how you set this parameter.

Internal Effects Wet

This controls the balance between the dry signal and the effected (chorused or delayed) signal. Again, 127 means all effect, and 0 means no effect.

Internal Effects Delay

This parameter only changes the Delay effect, not the two choruses. The delay time can be set from 1 to 350 milliseconds. It also changes the "feedback" ratio — the amount the delayed signal is fed back into the delay.

Saving Effects

To save the effects edits, **Store** the Setup. The effects parameters are stored with the Setup just like the Arpeggiator parameters.

Once you start editing an effects Algorithm, do not change Algorithms until you **Save** the Setup, or you will lose all of your edits. Moving to a new Algorithm calls up that Algorithm's default values, which override any others. Also, don't call up an Internal Voice — or you'll lose your entire edit, Effects and all! Each Internal Voice has its own Effects setting, so calling one will put its combination in place, wiping out your edits. (And remember the Effects that accompany Internal Voices always use default values.)

VGM Effects



We still haven't looked at the VGM board's effects processor. If you have the VGM board installed, press the right cursor button (assuming you're still in the **Effects** menu) to see more parameters. (Another way to get here is to press *both* cursor buttons from an Internal effects parameter.) These parameters affect the VGM sounds (Banks 1-3), whether they're being played locally or from MIDI. VGM effects parameters are stored with Setups just like the Internal effects parameters.

The lights in the Effects section of the front panel will follow the Algorithm of the whichever processor is being used in the current Zone: that is, if the current Zone uses a voice from Bank 0, the lights will show the Internal effects Algorithm, if the current Zone's voice is from a different bank, the lights will follow changes in the VGM effects Algorithm. Changing the algorithm in the Internal effects will not change the algorithm in the VGM effects, or vice versa. Nor will changing one effects Algorithm change any *parameters* in the other effects processor — so if you have a set of parameters you like in one processor, you don't have to worry about losing them while you fool around with the other processor.

Copying Effects

Sometimes you will want to have the two effects processors be quite different, and sometimes (especially when you are in 64-voice mode) you will want them to be identical. An easy way to achieve the latter is to use the **Copy** function. Make sure that one of the Internal effects parameters is showing on the display, and press **Copy**. The display asks "Copy Int effect?", and you press **Enter** to do so. Press **Effects** to go back to the effects parameters, and scroll with the right cursor until you get to a VGM effects parameter. Press **Copy**, and scroll once to the right. The display says "Paste VGM effect?". Press **Enter** and the parameters from the Internal processor are loaded into the VGM processor. Press **Store** so you don't lose everything. You can, of course, go the other way around, and copy from the VGM to the Internal. You can also copy either of the parameter sets to a different Setup, pasting into either the VGM or Internal processor.

Effects and Drum Sounds

If the VGM algorithm includes Chorus 1, Chorus 2, or Delay, the drum kits (and percussion sounds such as ride cymbal and click) will not be affected. They will be processed by the reverb, however.

MIDI Control of Effects

The PC88's effects can be controlled by MIDI Continuous Controller commands. These commands can originate from the physical controllers on the PC88 or from an external MIDI source like a sequencer. Each processor has its own Controllers:

Controller number	Function
83	Internal Algorithm select*
90	VGM Algorithm select*
91	Internal Reverb Wet (the default assignment for Slider A)
92	VGM Reverb Wet
93	Internal Effects Wet (the default assignment for Slider B)
94	VGM Effects Wet

*To select an Algorithm, you must send a particular Controller value (second data byte), which recalls the Algorithm from a fixed table in software. See Appendix D for the complete list of Algorithms and controller values.

Transmitting PC88 Effects Settings to a Sequencer

The **Xmit Rvb Sysex** parameter from the **Global** menu allows you to send SysEx messages describing the PC88's current effects settings when you call a Setup. This means that when you subsequently transmit from the sequencer to the PC88, the effects settings you've saved will be used instead of the PC88's defaults.

Chapter 8

MIDI Receive

With its wide range of voices, high polyphony, and multi-timbral capabilities, the PC88 makes an excellent instrument for use with a sequencer. Most sequencers have “Thru” and “Channelize” functions, which means that the sequencer can determine how the MIDI signal coming from a master keyboard (like the PC88) will be routed. If that’s the case, it’s a wise idea to turn Local Control (under the **Global** menu) off, so that you don’t end up with doubled notes and other kinds of confusion.

The PC88 can receive data on up to 16 channels at a time from an external MIDI source. The **MIDI Receive** button in the bottom row of the **Zone parameters** section lets you set up these channels for reception.

Pressing **MIDI Receive** puts the PC88 temporarily into a single-instrument mode similar to Internal Voices. After entering the mode, you can select the channel you wish to work on with the cursor buttons, or you can use a special Intuitive Entry method: hold down the **MIDI Receive** button and press one of the **Select** buttons. The display will jump to the MIDI channel corresponding to the number on the **Select** button. If you now play the keyboard, you will hear the sound assigned to that channel. Each channel has two parameters: on/off and program.

Channel On/Off

Turning a channel **Off** means it will not respond to any incoming data. Turning a channel off is especially useful when you have another instrument receiving data on the same MIDI cable that needs a channel of its own. Turning a channel off in this mode does not affect its MIDI *transmission* status: when you go back to your Setup, if a Zone is assigned to this channel, the keyboard will continue to send data to all of the Zone’s selected destinations.

Program

The Program for the channel is chosen in the usual way, either with the **Select** and **Group** buttons, or the Alpha wheel or numeric keypad, or using Intuitive Entry. If you have the VGM board installed, you can choose from any of its banks (1-3) as well as the PC88’s Internal Voices bank (0). The numeric keypad can be used to change banks quickly, with the “+/-” button acting as a colon between the bank number and the program number. Example: to get program 50 in the General MIDI bank, press **1**, **+/-**, **5**, **0**, and **Enter**.

When you change the program, you will hear the new sound on the keyboard, and a Program Change command (as well as a Bank Select) is sent out the MIDI cable on the current channel. If the current channel is assigned to one of the Zones in the Setup you’ve been working with, selecting a new program in MIDI Receive mode will change the program on the corresponding Zone. You’ll hear the change when you go back to the Setup.

If you choose a bank that doesn’t have any internal sounds, the Bank Select and Program Change commands will still get sent over MIDI, but the PC88 will be silent, and the display will say “None”. This provides an excellent way to configure a large MIDI system: you can quickly select programs for all instruments “downstream” of the PC88, on any MIDI channels.

To leave MIDI Receive mode, press any of the buttons in the top row of **Zone Parameters** to return to editing your setup. Or, press **Internal Voices** followed by a Sound Select button to return to Internal Voices mode. If you came from a Setup, and you changed the program on a channel assigned to a Zone in that Setup, the Setup will now contain the new program in that Zone — otherwise, it will be just as you left it.

General MIDI Considerations



With the VGM board installed, the PC88 can be configured to receive in General MIDI mode, or it can receive in a mixed mode, taking advantage of all of its sounds.

General MIDI (“GM”) mode is turned on using the General MIDI parameter, under the **Global** menu. It can also be turned on from an external MIDI device that sends the “General MIDI On” message, which is defined in the MIDI Specification. When GM mode is first turned on, all Receive channels are set to Bank 1. (The program number remains the same). In this mode, since all channels are drawing from the VGM board’s sounds, the maximum polyphony of the PC88 is 32 voices, allocated dynamically across the 16 channels.

Channel 10 is the exception: it goes into “drum” mode as the General MIDI spec requires, and is set to “Standard GM Set”. The General MIDI spec only specifies one drum set, but the “GS” instruments from Roland, which contain all GM instruments plus some additional ones, have six other useful drum sets. The PC88 includes equivalent sets. These can be called up in General MIDI mode on Channel 10 (only) with Program Change commands, as follows:

0-8	Standard
9-15	Room
16-23	Power
24	Electric
25-31	Synth
32-39	Jazz
40-47	Brush
48-55	Orchestra

All of the channels are “locked” into the GM bank. If you need a voice from another bank (or you want to get 64-voice polyphony), you will have to go to the **Global** menu and turn General MIDI off.

The General MIDI drum sets are available when you’re not in General MIDI mode, and can be assigned to any channel. You’ll find them in Bank 2, with these program numbers:

67	Standard
68	Room
69	Power
70	Electric
71	Synth
72	Brush
73	Orchestra

Keep going, and you will find some more drum sets in this Bank, which are not related to General MIDI, and are mapped quite differently:

74	Clean
75	Ambient
76	Synth

And there are a couple of more percussion sets, which have totally different maps:

62	Orchestra Percussion
63	Latin Percussion

A complete list of all of the drum sounds, as well as some hints on how to use some of them, is in Appendix C.

Note that when General MIDI mode is off, you can have different drum sets on different channels — as many as you want, if that’s the sort of thing you like to do.

Chapter 9

Global Parameters

Many of the PC88's important settings are made from the menu under the **Global** button. As the name implies, these parameters are not Zone- or channel-specific, but affect the entire instrument. The table below summarizes these parameters:

Parameter	Range of Values
Local Control	On, Off
Clock	Internal, External
Transmit Clock	Off, On, Seq
Touch	Easiest - Hardest
Efx Chg Mode	Panel, Prog, Setup, All
Chg Setups	Immed, Keys Up
Setup Change Channel	None, 1-16
MIDI In	Normal, Remap, Merge
Tuning	-100 to 100 cents
Recv Trans	-64 to 63 semitones
Bank Sel Ctl	0, 32, 0/32, 0or32
All Notes Off	Respond, Ignore
General MIDI	Off, On
Device ID	0-127
Xmit Buttons	Off, On
Xmit Rvb Sysex	Off, On
Mem Avail	<i>View only</i>
Reset PC88?	<i>Press Enter to Reset</i>
Dump all Setups?	<i>Press Enter to dump Setups</i>
MIDIScope?	<i>Press Enter for MIDIScope</i>

Local Control

This turns local control of the PC88 on and off. This function is very important in a large studio. Here's why:

If the PC88 is the master keyboard for a sequencer and at the same time is acting as a multi-timbral instrument, it's essential that the performance section (the keys and controllers) and the sound-producing section (the voice banks) be independent from each other. That way, when you are playing a part on the keyboard into the sequencer that is meant to be heard on a *different* instrument, the PC88 doesn't play the same part using an internal sound, and utterly confuse you. This "de-coupling" of the two parts of the instrument is known in MIDI parlance as "Local Control Off".

When Local Control is on, the instrument plays the sounds that you are playing on the keys. When it is off, the keys do not play the local sounds. However, the keys are still transmitting MIDI data — it's the equivalent of setting the Destination for every Zone to MIDI only. Also, the PC88 is still *receiving* data as well, so that incoming MIDI from a sequencer will make the instrument play. If the sequencer has a "loop-thru" function, as most do, then you can play the PC88 keyboard and hear the PC88 at the same time, with the sequencer determining which channels (and which sounds) you are hearing.

Clock

This parameter and the **Transmit Clock** parameter deal with how MIDI Timing Clock messages are handled. The **Clock** parameter determines whether the PC88 will generate its own MIDI Clocks, or instead will listen to external Clock messages.

If it is set to **Internal**, then the tempo of the Arpeggiator, as well as the tempo of any sequencer, drum machine, or other variable-tempo device connected to the PC88 can be controlled from the PC88's own Tempo parameter. This, in turn, can be assigned to a slider, pedal, or wheel.

If Clock is set to **External**, the Arpeggiator will follow Clocks coming into the PC88 from an external source. If there are no Clocks at the PC88's MIDI input, the Arpeggiator will not play.

Transmit Clock

The **Transmit Clock** parameter determines under which circumstances the PC88 will send Clocks out the MIDI Out jack (it has no effect on clocks coming in). The choices are **Off** (never); **On** (always); and **Seq** (for "Sequence" — send Clocks only after a Start or Continue command, or when the Arpeggiator is turned on; and stop sending when the Arpeggiator is turned off, or a Stop command is issued.) If the PC88 is sending out MIDI Clocks, make sure the devices receiving them have *their* sync parameter set to "External".

Touch

Touch lets you adjust the overall feel of the keyboard. You can further modify the keyboard response (per Setup) with the **Velocity** parameters.

Effects Change Mode

As we've seen, each Internal Voice has an Effect assigned to it, and so does each Setup. Effects can also be changed from the front panel, using the Effects buttons and/or the Effects editor

(which is explained in Chapter 7), and they can also be modified by incoming MIDI Controller commands. Sometimes you don't want the Effects to change every time you switch Voices or Setups, because it can cause a discontinuity in the sound. The **Efx Chg Mode** parameter lets you decide under what circumstances the Effects will change. The choices are:

Panel — will not change when Setups or Internal Voices are changed, but will respond to front panel and MIDI Controller commands on any channel.

Prog — changes when Internal Voices change, and responds to front panel and MIDI, but not Setup changes.

Setup — will change when Setups change, and will respond to front panel and MIDI, but not Internal Voice changes.

All — responds to everything; the default setting.

Change Setups

Chg Setups is a very useful parameter for live performance. It determines when a newly-selected Setup will take effect. It has two modes:

In **Immed** mode, when a new Setup is selected, the display changes immediately to show the new Setup, and the next note played will reflect the change. Notes being held by Kurzweil instruments continue to sound with the old voices; gear from other manufacturers may cut off voices when they receive program changes.

In **Keys Up** mode, the change will not occur until the PC88 is in a "no keys down" condition. So if you hold any note, or even if you play sufficiently legato so that there's never a moment at which no keys are being played, the change will be delayed. While this is happening, the light on the Select button of the new Setup will blink. As soon as you lift all of your fingers off, the change goes into effect, the light comes on steadily, and all notes played after that will be in the new Setup. The Sustain pedal won't do anything to delay the Setup change; however, any notes from Internal Voices being held by the Sustain pedal will continue to sound with their original voice through a Setup change, until you release the pedal.

Setup Change Channel

Setup chg chan lets you use an external MIDI device to change the PC88's Setups. You can always use external MIDI Program Change commands to change a voice on a channel or in a Zone, but this command lets you change the entire Setup at once. Choose an unused MIDI channel on which you would like to send Program Changes to the PC88 for changing Setups. If you don't want external Program Changes to change the Setups, select **None** (the default).

MIDI In

MIDI In modifies the MIDI data as it is received in the following ways.

Normal (the default) means the incoming MIDI data is unchanged.

Remap takes the incoming notes and treats them as if they were being produced by the PC88's keyboard: they get split into four different Zones according to their note numbers, and sent out the appropriate channels. Any notes that lie in two overlapping Zones will be sent out on *both* Zones' MIDI channels. Channel numbers on incoming notes are ignored. Non-note information (controllers, pitchbend, etc.) will be sent out on *all* active channels: for example, if the four Zones of a Setup are transmitting on channels 2, 5, 9, and 12, any Pitchbend information coming into the PC88 on any channel will be regurgitated on channels 2, 5, 9, and 12 simultaneously.

Merge mixes the incoming MIDI data with the data being generated by the PC88 keyboard and sends the combined data stream out the MIDI Out jack. Channel numbers of incoming commands remain intact. Both note and non-note messages are passed normally, but System Exclusive messages are filtered out. (The MIDI Thru jack still works normally.)

Tuning and Receive Transpose

Changing the **Tuning** parameter raises or lowers the pitch of the PC88 by up to a semitone, in 1-cent (1/100th of a semitone) increments. Changing Receive Transpose (**Recv Trans**) raises or lowers the pitch a semitone at a time, up to 64 semitones.

The PC88 doesn't care which Zone is selected when you adjust these parameters: the whole instrument changes pitch.

Bank Select Control

Bank Sel Ctl determines how the PC88 will respond to incoming Bank Select messages to switch among the Internal and the VGM banks. (How Bank Select is *transmitted* is set under the **Bank Transmit** option on the **Program** menu — in Chapter 5.) Bank Select can be a great source of confusion, since instruments from different manufacturers may interpret Bank Select messages differently. This parameter offers the most flexibility possible, and should be set so that it agrees with the sequencer or other MIDI device that will be sending the Bank Select messages. The choices are to respond only to Controller #0; to respond only to Controller #32; to respond only if *both* Controllers are sent together; or to respond to *either* Controller. Note that if the VGM board is not present, switching a channel to any bank except 0 will render that channel silent.

All Notes Off

All Notes Off specifies how the PC88 will respond to a standard MIDI All Notes Off message (controller #123). Normally, when this message is received, a synthesizer should stop playing any notes being held (**Respond**). However, some keyboards (notably those from Roland) and even sequencers generate All Notes Off messages too frequently, and can cause notes to cut off prematurely. If this is a problem in your setup, set this parameter to **Ignore**. In fact, you can usually set this to Ignore no matter what your setup is: it is quite possible to lead a happy and productive MIDI life without ever responding to an All Notes Off.

General MIDI

Turning on the **General MIDI** parameter sends out the MIDI message "General MIDI On" to any GM-compatible synthesizers that are receiving MIDI from the PC88. If the VGM board is installed, it also puts the PC88 into General MIDI mode, and sets all channels to Bank 1, except channel 10, which is assigned to a special bank for drums. Turning it off sends out the MIDI message "General MIDI Off". General MIDI is also discussed in Chapter 8.

Device ID

Device ID is a parameter to use when you're using more than one PC88 in a system. If you need to address the instruments individually so that you can dump or load Setups to one and not the others, then each must have a unique Device ID. The Device ID defaults to 0, but you can set it to whatever number you want, up to 126. Setting it to 127 invokes a special "broadcast" mode: any PC88 on the MIDI line, regardless of its device ID, will respond to a PC88 whose ID is 127. The Device ID gets stored as part of the Setup information when you dump a Setup into a sequencer or other storage device, so when you load it back into the PC88,

the Device IDs must agree or the PC88 will ignore it. If you want to make sure the Setup can be sent back into *any* PC88, set the Device ID to 127 before you dump it.

Transmit Buttons

Xmit Buttons lets you transmit every button press on a PC88 as a MIDI System Exclusive command. This allows you to have a sequencer memorize all of your moves when programming or playing the instrument, for playback later.

Transmit Reverb Sysex

This parameter lets you transmit your current PC88 effects settings to a sequencer whenever you select a Setup. Since **Xmit Rvb Sysex** can create a large amount of MIDI data, however, it should normally be set to **Off**.

When Xmit Rvb Sysex is set to **On**, the PC88 will send SysEx messages describing its current effects settings whenever you select a Setup. This means that when you subsequently transmit from the sequencer to the PC88, the effects settings you've saved will be used instead of the PC88's defaults.

Memory Available

The PC88 has a generous amount of on-board memory, but it's not inexhaustible. If you find that you're storing huge numbers of Setups and wonder how long you can keep it up, check the **Mem avail** parameter from time to time. The value when it comes from the factory is 183k; once you get below 5k, it's time to think about deleting some unnecessary Setups. If you don't want to get rid of the Setups entirely, use **Dump all Setups** (described below) to send your Setups out over the MIDI cable as System Exclusive data. You can also dump individual Setups; see "Dumping a Setup" in Chapter 5.

By the way, the PC88's memory is battery-backed. See Chapter 1 for information on this.

Reset PC88

If you press **Enter**, the display will ask "Are You Sure?", which gives you an important opportunity to think about what you're doing. This is a "hard" reset: all of the parameters on the PC88 are set to their initial factory state, which includes all Setups and Effects. If you aren't concerned about losing any and all work you've done on the instrument's parameters (or if you *want* to start from scratch), then press **Enter** again and the instrument resets. Or, press **Cancel** if you've had a change of heart.

There is also a "soft" reset function, which is much kinder, and only serves to shut the PC88 up without changing any memorized parameters: it's the equivalent of turning the power off and on again, but it's gentler on the power supply. Soft reset is accomplished by pressing, in the numeric keypad, the +/-, 0, and **Clear** buttons simultaneously. In most circumstances, if your MIDI setup starts getting weird and not responding the way you want, try the **Panic** button first, then press **Internal Voices** (to limit the amount of MIDI data being sent), and use the soft reset only if those don't work.

Dump all Setups

Press **Enter** and all of the Setups in memory are sent out over the MIDI cable as System Exclusive data. This allows you to store your entire PC88's memory into an external device like a sequencer or computer files in one operation. To restore the memory, simply play back the System Exclusive file into the PC88 (first making sure the Device IDs are correct).

MIDIScope

MIDIScope displays MIDI data, either coming into the PC88 or being produced by the instrument itself. To use it, press **Enter** at the "MIDIScope?" prompt. Now whenever you play a key or controller or send any MIDI data to the PC88, the data shows up on the display: the type of command on the top line, and the data bytes on the bottom. This can be a highly useful tool for diagnosing problems in a MIDI system, such as improper setting of controllers or dead cables. To leave MIDIScope, press any button.

Chapter 10

PC88 in the Real World

The PC88 offers you tremendous variety and flexibility in many settings. To get you thinking, here are four situations that a PC88 might find itself in, and how you might configure it in each.

At a Gig

You're using the PC88 all by itself. Maybe you've got a singer and a bass player, or maybe they didn't show up.

- Arrange your setups for the night in the order you'll need them, and use one Switch Pedal in every Setup for "Setup Increment". When you need more than one Setup in a tune, set the Assignable Buttons to "Goto Setup" with the appropriate Setup numbers so you can move quickly. (Don't forget to set the Buttons in those Setups so you can get back!)
- If you have the VGM board, create some 64-Voice Setups (using Banks 0 and 3, with alternate note maps) for Piano or Guitar solos. Use lots of reverb, and make sure the two processors are the same.
- Create some Setups in which one or more Zones are muted when the Setup is called, and then un-mute them to broaden the sound as you play.
- Design some Setups in which you crossfade between two Zones using one of the Pedals (assign it to MIDI Controller #7, and set the Scaling on one Zone to -100%). If one of the two Zones uses a sound from the Internal Voices bank, and the other uses a VGM sound, set up the two effects processors very differently, so not only the sound but the whole space around it changes.
- Have a drummer available at any time. Set the On Ctrl for SwitchPdl 2 to Seq Start, and the Off Ctrl to Seq Stop. Set the SwType to Toggle. Make sure in the **Global** menu that Clock is set to Internal and Clock Transmit is set to Seq. Connect a reliable drum machine to the PC88's MIDI Out jack, and set it to receive external sync. When you're ready for the drums, press the pedal. When you want to go ahead without them, press it again. Another chorus with the drums, press it again, and the drum machine resets and starts at the top.

In the Recording Studio

The PC88 is the controller for a MIDI rig with several instrument modules. You've got to be able to get to the right sounds quickly, without fumbling for them, and you've got to sound great.

- Set the destination on as many channels as you need to cover all the outboard synths to "MIDI", and set the rest to "Local". Create Setups that have one Zone addressing a Local channel, and the others addressing each of the outboard synths.
- If the modules use non-standard numbering for their patches, set the Program Number Display on each Zone accordingly: a Yamaha synth will like 1-128, while a Roland may want 11-88. If one of the modules is a K1000 or K2000, use those modes for Bank Select. If one of the modules follows the General MIDI spec, set the Program Name Display to General MIDI, and you won't have to guess where the sounds on it are.
- Use the physical controllers in all of the Zones to bring individual synths in and out of the mix: the four sliders, for example, can each be assigned to MIDI Volume in a different Zone. Or assign one slider to control Volume in the four Zones, but scale it differently so the mix changes as you crescendo and decrescendo. Use the crossfading power (opposite scalings) of the controllers to blend sounds and move between different ones smoothly.
- When you're driving a screaming electric guitar patch on an external patch, set the pitchbend range on the Zone driving the guitar synth to 12 semitones. The message will go out over MIDI as a Registered Parameter and set the guitar synth's range. Then set Wheel 1

Up to Pitch Up, with a Scaling of 16%, and Wheel 1 Down to Pitch Down, with a Scaling of 100%. The pitchbend wheel will now “bend” strings in the up direction as far as a whole step, and be a “whammy bar” in the down direction, dropping down as low as an octave.

- Use aftertouch (mono pressure) with a Cosine curve, a negative offset, and a high scaling factor so you can bring in accenting voices — like high strings or brass — in some Zones, but only by pushing on the keys really hard. Use aftertouch at the same time to control vibrato on the main voice, and you can make the sound change radically with a little finger action.

In the MIDI Composing Studio

The PC88 is the master controller for a vast array of synthesizers and signal processors, all going through a central computer running sophisticated sequencing software through a multiport interface.

- Put the PC88 on its own MIDI In cable. Turn MIDI Receive On on all 16 channels, and turn Local Control off. This will make the PC88 a slave to the computer, and anything you play on the keyboard will be routed through the computer before you hear it.
- If you have the VGM board, set some of the channels to Bank 1 (General MIDI), and some to the Expansion Voices (Bank 2) to take advantage of all of the sounds the instrument has to offer without having to go searching for them.
- Most of the time, you only need to use one Zone: the computer will normally channelize all of the MIDI data, so there’s no advantage in sending data on different channels. Assign all of the physical controllers to different, useful MIDI Controllers, which will give you maximum flexibility when laying tracks.
- If the sequencer will pass multiple MIDI channels, then use multiple Zones, either splitting or layering them. Assign some of your physical controllers to MIDI signal processors, so that they can adjust parameters like delay time or feedback, reverb decay time, flanging, filtering, or pitch shift.
- Set a Switch pedal to Stop and Continue the sequencer (don’t set it to Start, or you’ll always find yourself back at the beginning) and the use the PC88’s Internal clock, with tempo assigned to a slider, to control the sequencer’s tempo.
- If you have synthesizers that do special things when they are in mono mode (for example, Yamaha DX and TX-series synths let you do true legato, Oberheim Matrix synths put all the voices in unison for a very fat sound, and Casio CZ synths go into a multi-channel, single-note mode), then set up a button with Controller 126 (Mono On) as the On Controller (the value doesn’t matter, but it shouldn’t be zero) and Controller 127 (Poly On) as the Off Controller, and you can switch back and forth between mono and poly mode instantaneously.

In the Home

- Use the Internal Voices for piano practice and for family sings. The keyboard feel is the same as an acoustic piano — your teacher should have no objection to you practicing on the PC88. And you can practice any hour of the day or night with headphones.
- Design thick Setups, with multiple processors and keyboard splits to impress your friends, and pretend you’re on stage at the Royal Albert Hall.
- Put the PC88 in General MIDI mode, and play back GM files on floppy disk or CD-ROM from your “multimedia” computer. Hear what the files are *really* supposed to sound like (as opposed to what they sound like with some two-bit sound card), and use a sequencer to edit them, adding your own orchestrations and other personal touches. Get an accompaniment program, which can play rhythm and background tracks while you solo on top, changing from sax to trumpet to flute to bagpipe with each chorus.
- Play along with your favorite records. If they’re out of tune, adjust the pitch on the PC88 with the Tuning parameter.
- Put on headphones, get the Arpeggiator going, and start fooling around. You could induce an Alpha state before you know it. Above all, have fun!

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Appendix A

Internal Voices

This appendix shows the 64 Internal Voices in the PC88 (Bank 0). They are arranged in “families” that you access by pressing the Next Group and Previous Group buttons. These numbers assume the "Program Number Display" parameter is set for 0-127 (the default for Internal Voices mode); add 1 if it's set for 1-128. Any physical controllers that will affect the sounds are listed. Where attack and/or release velocity have a special function, this is listed too. Voices marked with a dagger (†) respond to Soft Pedal. Voices marked with an asterisk (*) can be expanded to 64-note polyphony with the voices in Bank 3 on the VGM expansion board. The voices in Bank 3 have the same names as the Internal Voices, preceded by the letter "v". For example, "vClassical Piano". See "Alternating Maps" in Chapter 5 for more information.

Button Label	Prg #	Internal Voice	Mod Wheel	Sliders C & D	Buttons	Others
Classical Piano	0	Classical Piano*†				
	16	ClassPiano 440*†				
	32	Sustain Piano*†				
	48	Sus Piano 440*†				
Stage Piano	1	Stage Piano*†				
	17	Stage Piano 440*†				
	33	Bright Piano*†				
	49	Tack Piano*†				
Classic E Piano	2	Classic E Pno*†				
	18	Dyn Hard E Pno †				
	34	Soft E Pno*†				
	50	Suitcase E Pno*	trem/vib depth	C-trem/vib rate		
Digital E Piano	3	Digital E Pno				
	19	St Trem Digital †	trem/vib depth	C-trem/vib rate		
	35	FM & Marimba	attack detune	C-marimba volume		
	51	E Pno & Marimba				
Electric Grand	4	Digital E Grand †				
	20	Warm E Grand*†				
	36	Tight E Grand*†				
	52	St Elec Grand†				
Piano & Strings	5	Stage Piano & Str †		C-str filter D-str att&rel times		
	21	Dyn Pno & Str Pad †		C-str filter D-str release time		
	37	Digi Pno & Str Pad †		C-str filter D-str release time		
	53	Ac Gtr& Str Pad †		C-str filter D-gtr filter		
Strings	6	Strings 1		C-str filter D-str att&rel times		pressure-swell
	22	Att Vel Strings		C-filter		attk & rel vel-attk & rel times pressure-swell
	38	Touch Strings †		C-filter		pressure-swell
	54	...& Strings †		C-str filter D-str release time		

Button Label	Prg #	Internal Voice	Mod Wheel	Sliders C & D	Buttons	Others
Harpichord	7	Harpichord			E-no release	release vel - harpsi releases
	23	Stereo Harpsi			E-no release	release vel - harpsi releases
	39	8ve Harpsichord			E-no release	
	55	Pedals Harpschrd†			E-no release	
Acoustic Guitar	8	Acoustic Guitar*†		C- filter		
	24	12-str Guitar*†				
	40	Fluid Guitar*†				
	56	St Clav Guitar †				
Clav	9	Clav 1			E-no release	release vel - clav releases
	25	Stereo Clav †			E-no release	release vel - clav releases
	41	Super Clav				
	57	Organi Clav				
Rock Organ	10	Rock Organ 1 †	rotary speaker		E-perc stop	
	26	Rock Organ 2	rotary speaker		E-perc stop	
	42	Ballad Organ 1	rotary speaker	C- perc filter	E-perc stop	
	58	Full Pipes		C-high ranks filter		
Jazz Organ	11	Jazz Organ 1 †	rotary speaker	C- perc volume	E-perc stop	
	27	Jazz Organ 2 †	rotary speaker		E-perc stop	
	43	Ballad Organ 2 †	rotary speaker			
	59	Chiffy Pipes †				
Vibes	12	St Trem Vibes*	trem			
	28	Simple Vibes*	trem & vib			
	44	Marimba †				
	60	Metal Marimba				
Acoustic Bass	13	Acoustic Bass				
	29	A Bass & Ride †		C-ride volume		
	45	Legato A Bass				
	61	Leg Bass & Ride †		C-ride volume		
Electric Bass	14	Dual E Bass †				
	30	E Bass & Ride †		C-ride volume		
	46	Sustain E Bass				
	62	Slap E Bass				
Synth Pad	15	Stereo Strings †		C- filter		
	31	Slo String Pad †		C- filter		
	47	Slo Vibes*†				
	63	Slow Digital Pad †				

Appendix B

VGM Board Voices



General MIDI voices

This list shows the voices in the General MIDI bank (Bank1) on the VGM board. The bank is automatically selected for all channels when “General MIDI” in the Global menu is turned on. They are accessible at any time on any channel when GM has been turned on, with the exception of channel 10 which is dedicated to drum sounds. These numbers assume the “Program Number Display” parameter is set for 0-127; add 1 if it is set for 1-128. Sounds marked with an asterisk (*) have a special “Key-based Pitchbend” mode. When these sounds are being played, and you move the pitch wheel, only notes whose keys are actually being held down will change in pitch. Other notes which may be sounding, either because they are being held by the sustain pedal or they have a long release envelope, will not change in pitch.

0	Grand Piano	32	Acoustic Bass *	64	Soprano Sax	96	Ice Rain
1	Bright Piano	33	Fingered Bass *	65	Alto Sax	97	Soundtrack
2	Electric Grand	34	Picked Bass *	66	Tenor Sax	98	Crystal
3	Honky-Tonk Piano	35	Fretless Bass *	67	Baritone Sax	99	Atmosphere *
4	Electric Piano 1	36	Slap Bass 1 *	68	Oboe	100	Brightness
5	Electric Piano 2	37	Slap Bass 2 *	69	English Horn	101	Goblins
6	Harpsichord	38	Synth Bass 1	70	Bassoon	102	Echo Drops
7	Clavinet	39	Synth Bass 2	71	Clarinet	103	Sci-fi Pad *
8	Celesta	40	Violin	72	Piccolo	104	Sitar *
9	Glockenspiel	41	Viola	73	Flute	105	Banjo *
10	Music Box	42	Cello	74	Recorder	106	Shamisen *
11	Vibraphone	43	Contrabass	75	Pan Flute	107	Koto *
12	Marimba	44	Tremolo Strings	76	Blown Bottle	108	Kalimba
13	Xylophone	45	Pizzicato String	77	Shakuhachi	109	Bagpipe
14	Tubular Bells	46	Plucked Harp	78	Whistle	110	Fiddle
15	Dulcimer	47	Timpani	79	Ocarina	111	Shanai
16	Drawbar Organ	48	Ensemble Strings	80	Square Wave	112	Tinkle Bell
17	Perc Organ	49	Slow Strings	81	Sawtooth Wave	113	Agogo
18	Rock Organ	50	Synth Strings 1	82	Synth Calliope	114	Steel Drums
19	Church Organ	51	Synth Strings 2	83	Chiff Lead	115	Woodblock
20	Reed Organ	52	Choir Oohs	84	Charang *	116	Taiko Drum
21	Accordion	53	Voice Oohs	85	Solo Vox	117	Melodic Toms
22	Harmonica	54	Synth Vox	86	Fifths Saw Wave	118	Synth Drums
23	Bandoneon	55	Orchestra Hit	87	Bass & Lead Syn	119	Reverse Cymbal
24	Nylon Str Guitar *	56	Trumpet	88	Fantasia Pad	120	Gtr Fret Noise
25	Steel Str Guitar *	57	Trombone	89	Warm Pad	121	Breath Noise
26	Jazz Guitar *	58	Tuba	90	Poly Synth Pad	122	Seashore
27	Clean Guitar *	59	Muted Trumpet	91	Space Voice Pad	123	Birds
28	Muted Guitar *	60	French Horn	92	Bowed Glass Pad	124	Telephone
29	Overdrive Guitar *	61	Brass Section	93	Metallic Pad	125	Helicopter
30	Distorted Guitar *	62	Synth Brass 1	94	Halo Pad	126	Applause
31	Guitar Harmonics *	63	Synth Brass 2	95	Sweep Pad	127	Gun Shot

Expansion voices

This list shows the voices in the Expansion bank (Bank2) on the VGM board that are available when the PC88 is not in General MIDI mode. Any of these voices, including the “GM” drum sets, are accessible on any MIDI channel. These numbers assume the “Program Number Display” parameter is set for 0-127; add 1 if it is set for 1-128. Sounds marked with an asterisk (*) have a special “Key-based Pitchbend” mode. When these sounds are being played, and you move the pitch wheel, only notes whose keys are actually being held down will change in pitch. Other notes which may be sounding, either because they are being held by the sustain pedal or they have a long release envelope, will not change in pitch. Additional controller assignments are shown in the footnotes below.

0	Ragtime Piano	26	Sax Section	52	Synth Ensemble
1	Tack Piano 2	27	VibratoTrumpet	53	Syn Pad
2	St Trem E Pno	28	TrumpetSection	54	BrightSynBrass
3	Jazz Organ 3*(L)	29	Trombone	55	Fluty Lead
4	Rock Organ 3*(L)	30	Tuba / Fr. Horn	56	Synth FX 1
5	Full Pipes 2*(SW)	31	Brass Section	57	Synth FX 2
6	Reed Pipes (SW)	32	Soft Section	58	Dual E Bass 2
7	Church Pipes*(LD)	33	Orchestra 1* (SS)	59	Synth Bass 1
8	Chiff Pipes 2 (SW)	34	Orchestra 2* (CH2)	60	Dance Bass
9	Acous Guitar 2*	35	Pizzy (N)	61	Timpani
10	12 Str Guitar 2*	36	Pizzis (N)	62	OrchPercussion* (PB)
11	Jazz Guitar*	37	8ve Strings	63	Latin Perc* (PB)
12	Ch Jazz Guitar*	38	Soft Strings (N)	64	Congatone
13	Ch Strat (CH)	39	Strings 2* (N)	65	Steel Drums
14	Muted > Strat	40	Att Vel Str 2* (N)	66	Glockenspiel
15	Legato Flute	41	Touch Strings2*	67	GM StandardKit* (N)
16	Dolce Flute	42	Stereo String2*	68	GM Room Kit* (N)
17	Clarinet	43	String Pad 2*	69	GM Power Kit* (N)
18	Vib Clarinet	44	... & Str Pad 2*	70	GM Elec Kit* (N)
19	Bassoon/Oboe (SP)	45	... & Strings 2	71	GM Synth Kit* (N)
20	Slo Bsn/Oboe (SP)	46	Choir	72	GM Brush Kit* (N)
21	Solo Strings	47	CathedralChoir	73	GM Orch Kit* (N)
22	Legato Fiddle	48	... & Choir	74	Kurz Clean Kit* (PB)
23	Legato Sax	49	Bells&Strings	75	Kurz Amb Kit* (PB)
24	Baritone Sax	50	Glass Pad	76	Kurz Synth Kit* (PB)
25	Alto Sax	51	Space Pad		

Footnotes:

(L) - Soft Pedal (Controller 67) enables rotary speaker.

(SW) - Soft Pedal (Controller 67) causes decrescendo.

(LD) - Soft Pedal (Controller 67) disables layer.

(CH) - Soft Pedal (Controller 67) mutes strings.

(SP) - Soft Pedal (Controller 67) changes split point.

(N) - Soft Pedal (Controller 67) has no effect.

(CH2) - Soft Pedal (Controller 67) changes brass to woodwinds.

(SS) - Sostenuato Pedal (Controller 66) holds and disables brass for string solo. Also, lower notes will trigger timpani on hard strikes.

(PB) - Sostenuato Pedal (Controller 66) raises pitch.

Appendix C

Drum sounds

General MIDI

This list shows the drum sounds and sound effects on the VGM board that are available when the PC88 is in General MIDI mode. The different sets are accessed by sending the PC88 the appropriate program change number on Channel 10. These numbers assume the "Program Number Display" parameter is set for 0-127; add 1 if it is set for 1-128. The GM Jazz Kit, Program Change #32, is the same as the GM Standard Kit, and is included for compatibility with GS sequences. A sound marked with "EXC" and a number is an "exclusive" sound—when it is played, any other sound marked "EXC" and the *same* number will cut off immediately. These same sets are available in the VGM Expansion Bank (2), with different program change numbers, for use when the PC88 is not in GM mode. From the Expansion Bank, they can be accessed on any MIDI channel. An empty box in a set means that that note plays the same sound as in the Standard GM Set.

Number	Note	GM Standard Kit	Room Kit	Power Kit	Electronic Kit	Synth Kit	Brush Kit	Orchestra Kit
GM mode program change no. (channel 10 only)		0, 32	8	16	24	25	40	48
Expansion Bank program change no. (any channel)		67	68	69	70	71	72	73
27	D#1	High Q						Closed Hi Hat (EXC1)
28	E1	Slap						Pedal Hi Hat (EXC1)
29	F1	Scratch Push						Open Hi Hat (EXC1)
30	F#1	Scratch Pull						Ride Cymbal
31	G1	Sticks						
32	G#1	Square Click						
33	A1	Metronome Click						
34	A#1	Metronome Bell						
35	B1	Kick Drum 2						Concert Bass Drum 2
36	C2	Kick Drum 1		Gated Kick	Elec Bass Drum	Bass Drum		Concert Bass Drum 1
37	C#2	Side Stick				Rim Shot		
38	D2	Snare Drum 1		Gated Snare Drum	Elec Snare Drum	Snare Drum	Brush Tap	Concert Snare Drum
39	D#2	Hand Clap					Brush Slap	Castanets
40	E2	Snare Drum 2			Gated Snare Drum		Brush Swirl	Concert Snare Drum
41	F2	Low Tom 2	Room Low Tom 2	Room Low Tom 2	Elec Low Tom 2	Low Tom 2		Timpani F
42	F#2	Closed Hi Hat (EXC1)				Closed Hi Hat (EXC1)		Timpani F#
43	G2	Low Tom 1	Room Low Tom 1	Room Low Tom 1	Elec Low Tom 1	Low Tom 1		Timpani G
44	G#2	Pedal Hi Hat (EXC1)				Closed Hi Hat (EXC1)		Timpani G#
45	A2	Mid Tom 2	Room Mid Tom 2	Room Mid Tom 2	Elec Mid Tom 2	Mid Tom 2		Timpani A
46	A#2	Open Hi Hat (EXC1)				Open Hi Hat (EXC1)		Timpani A#

Drum sounds

General MIDI

Number	Note	GM Standard Kit	Room Kit	Power Kit	Electronic Kit	Synth Kit	Brush Kit	Orchestra Kit
47	B2	Mid Tom 1	Room Mid Tom 1	Room Mid Tom 1	Elec Mid Tom 1	Mid Tom 1		Timpani B
48	C3	Hi Tom 2	Room Hi Tom 2	Room Hi Tom 2	Elec Hi Tom 2	Hi Tom 2		Timpani C
49	C#3	Crash Cymbal 1						Timpani C#
50	D3	Hi Tom 1	Room Hi Tom 1	Room Hi Tom 1	Elec Hi Tom 1	Hi Tom 1		Timpani D
51	D#3	Ride Cymbal 1						Timpani D#
52	E3	Chinese Cymbal						Timpani E
53	F3	Ride Bell						Timpani F
54	F#3	Tambourine						
55	G3	Splash Cymbal						
56	G#3	Cowbell				Cowbell		
57	A3	Crash Cymbal 2						Concert Cymbal 2
58	A#3	Vibraslap						
59	B3	Ride Cymbal 2						Concert Cymbal 1
60	C4	Hi Bongo						
61	C#4	Lo Bongo						
62	D4	Mute Hi Conga						
63	D#4	Open Hi Conga						
64	E4	Low Conga						
65	F4	Hi Timbale						
66	F#4	Lo Timbale						
67	G4	Hi Agogo						
68	G#4	Lo Agogo						
69	A4	Cabasa						
70	A#4	Maracas						
71	B4	Hi Whistle (EXC2)						
72	C5	Lo Whistle (EXC2)						
73	C#5	Short Guiro						
74	D5	Long Guiro						
75	D#5	Claves						
76	E5	Hi Wood Block						
77	F5	Lo Wood Block						
78	F#5	Mute Cuica						
79	G5	Open Cuica						
80	G#5	Mute Triangle (EXC5)						
81	A5	Open Triangle (EXC5)						
82	A#5	Shaker						
83	B5	Jingle Bell						
84	C6	Bell						
85	C#6	Castanets						
86	D6	Mute Surdo						
87	D#6	Open Surdo						
88	E6							Applause

Kurzweil Drums

Shown below are the “Kurzweil” percussion sounds available in the Expansion Bank (2) on the VGM board.

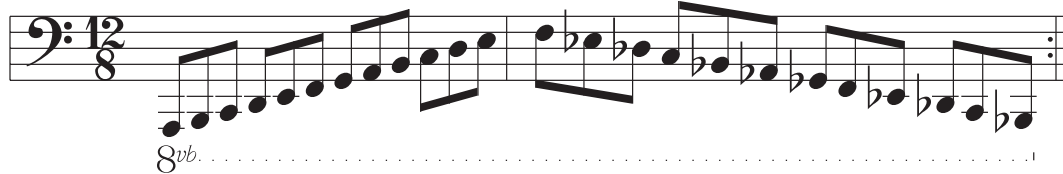
Note	Clean	Ambient	Synth
Prog. change no.	74	75	76
A0	Kick Drum	Ambient Kick Drum	Synth Kick Drum
A#0	Kick Drum	Ambient Kick Drum	Synth Kick Drum
B0	Kick Drum	Ambient Kick Drum	Synth Kick Drum
C1	Kick Drum	Ambient Kick Drum	Synth Kick Drum
C#1	Sidestick	Sidestick	Sidestick
D1	Floor Tom	Ambient Floor Tom	Synth Floor Tom
D#1	Floor Tom	Ambient Floor Tom	Synth Floor Tom
E1	Floor Tom	Ambient Floor Tom	Synth Floor Tom
F1	Lo Tom	Ambient Lo Tom	Synth Lo Tom
F#1	Lo Tom	Ambient Lo Tom	Synth Lo Tom
G1	Mid Tom	Ambient Mid Tom	Synth Mid Tom
G#1	Mid Tom	Ambient Mid Tom	Synth Mid Tom
A1	Hi Tom	Ambient Hi Tom	Synth Hi Tom
A#1	Hi Tom	Ambient Hi Tom	Synth Hi Tom
B1	Dual Snare	Ambient Snare	Synth Snare
C2	Dual Snare	Ambient Snare	Synth Snare
C#2	Dual Snare	Ambient Snare	Synth Snare
D2	Closed Hi Hat	Closed Hi Hat	Closed Hi Hat
D#2	Closed Hi Hat	Closed Hi Hat	Closed Hi Hat
E2	Closed Hi Hat	Closed Hi Hat	Closed Hi Hat
F2	Slightly Open Hi Hat	Slightly Open Hi Hat	Slightly Open Hi Hat
F#2	Slightly Open Hi Hat	Slightly Open Hi Hat	Slightly Open Hi Hat
G2	Slightly Open Hi Hat	Slightly Open Hi Hat	Slightly Open Hi Hat
G#2	Open Hi Hat	Open Hi Hat	Open Hi Hat
A2	Open Hi Hat	Open Hi Hat	Open Hi Hat
A#2	Fully Open Hi Hat	Fully Open Hi Hat	Fully Open Hi Hat
B2	Fully Open Hi Hat	Fully Open Hi Hat	Fully Open Hi Hat
C3	Pedal Hi Hat	Pedal Hi Hat	Pedal Hi Hat
C#3	Crash Cymbal	Crash Cymbal	Crash Cymbal
D3	Crash Cymbal	Crash Cymbal	Crash Cymbal
D#3	Crash Cymbal	Crash Cymbal	Crash Cymbal
E3	Crash Cymbal	Crash Cymbal	Crash Cymbal
F3	Crash Cymbal	Crash Cymbal	Crash Cymbal
F#3	Crash Cymbal	Crash Cymbal	Crash Cymbal
G3	Crash Cymbal	Crash Cymbal	Crash Cymbal
G#3	Dual Ride (Rim > Bell)	Dual Ride (Rim > Bell)	Dual Ride (Rim > Bell)
A3	Ride Rim	Ride Rim	Ride Rim
A#3	Dual Ride	Dual Ride	Dual Ride
B3	Ride Bell	Ride Bell	Ride Bell
C4	Lo Conga Tone	Lo Conga Tone	Lo Conga Tone
C#4	Mid Conga Tone	Mid Conga Tone	Mid Conga Tone
D4	Conga Buba Stroke	Conga Buba Stroke	Conga Buba Stroke
D#4	Conga Tone	Conga Tone	Conga Tone

Note	Clean	Ambient	Synth
E4	Conga Tone	Conga Tone	Conga Tone
F4	Conga Tap (Tap> Howl Tone)	Conga Tap (Tap> Howl Tone)	Conga Tap (Tap> Howl Tone)
F#4	Conga Slap	Conga Slap	Conga Slap
G4	Cabasa	Cabasa	Cabasa
G#4	Cabasa	Cabasa	Cabasa
A4	Shaker	Shaker	Shaker
A#4	Shaker	Shaker	Shaker
B4	Claves	Claves	Claves
C5	Lo Timbale	Lo Timbale	Lo Timbale
C#5	Lo Timbale	Lo Timbale	Lo Timbale
D5	Hi Timbale	Hi Timbale	Hi Timbale
D#5	Hi Timbale	Hi Timbale	Hi Timbale
E5	Lo Cowbell	Lo Cowbell	House Cowbell
F5	Lo Agogo	Lo Agogo	Lo Agogo
F#5	Lo Agogo Muted	Lo Agogo Muted	Lo Agogo Muted
G5	Mid Agogo	Mid Agogo	Mid Agogo
G#5	Mid Agogo Muted	Mid Agogo Muted	Mid Agogo Muted
A5	Hi Agogo	Hi Agogo	Hi Agogo
A#5	Hi Agogo Muted	Hi Agogo Muted	Hi Agogo Muted
B5	Long Guiro	Long Guiro	Long Guiro
C6	Long Guiro	Long Guiro	Long Guiro
C#6	Short Guiro	Short Guiro	Short Guiro
D6	Tambourine	Tambourine	Tambourine
D#6	Tambourine	Tambourine	Tambourine
E6	Triangle	Triangle	Triangle
F6	Triangle	Triangle	Triangle
F#6	Triangle Muted	Triangle Muted	Triangle Muted
G6	Lo Woodblock	Lo Woodblock	Lo Woodblock
G#6	Hi Woodblock	Hi Woodblock	Hi Woodblock
A6	Lo Samba Whistle	Lo Samba Whistle	Lo Samba Whistle
A#6	Mid Samba Whistle	Mid Samba Whistle	Mid Samba Whistle
B6	Hi Samba Whistle	Hi Samba Whistle	Hi Samba Whistle
C7	House Kick	House Kick	House Chirp
C#7	House Stick Click	House Stick Click	Click
D7	Hi House Snare	Hi House Snare	Agogo
D#7	Hi House Snare	Hi House Snare	Agogo
E7	Lo House Snare	Lo House Snare	Synth FX
F7	Lo House Snare	Lo House Snare	Synth FX
F#7	Lo Hand Claps	Lo Hand Claps	Lo Hand Claps
G7	Hi Hand Claps	Hi Hand Claps	Hi Hand Claps
G#7	House Cowbell	House Cowbell	House Cowbell
A7	House Cowbell	House Cowbell	House Cowbell
A#7	Metal Clank	Metal Clank	Metal Clank
B7	Vibraslap	Vibraslap	Vibraslap
C8	Fully Open Hi Hat 2	Fully Open Hi Hat 2	Fully Open Hi Hat 2

Latin Percussion

The Latin Percussion kit (Program Change # 63 in the Expansion Bank on the VGM board) offers a variety of Ethnic Percussion sounds—a combination of cowbells, congas, and shakers—uniquely designed to allow you to play authentic Latin, Cuban, and African rhythms using simple scales. You can also easily create your own authentic sounding rhythms using this same technique. The scales below, when played correctly, will sound the traditional rhythms indicated just above them. You need only be sure to play them in the octave indicated and use an even eighth-note rhythm throughout. The rest is taken care of for you! You may notice that some keys are silent; this is to allow for the natural silences in the rhythms being used. You should still play these keys with an equal eighth-note duration.

African Durah Bah (first note = lowest key on keyboard)



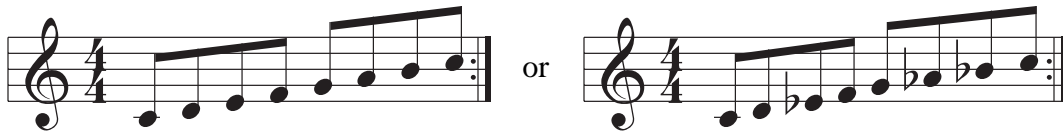
African Bricambo



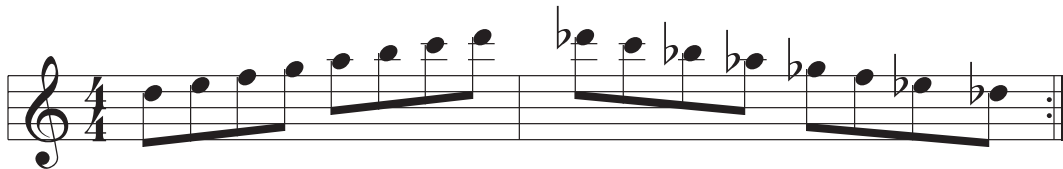
Three Against Two Rhythm



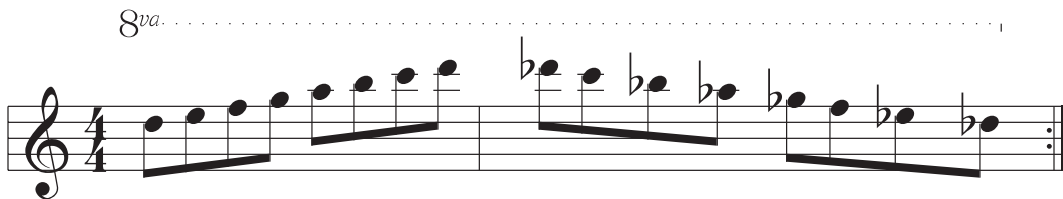
Latin Tumbao



Cuban Cha Cha



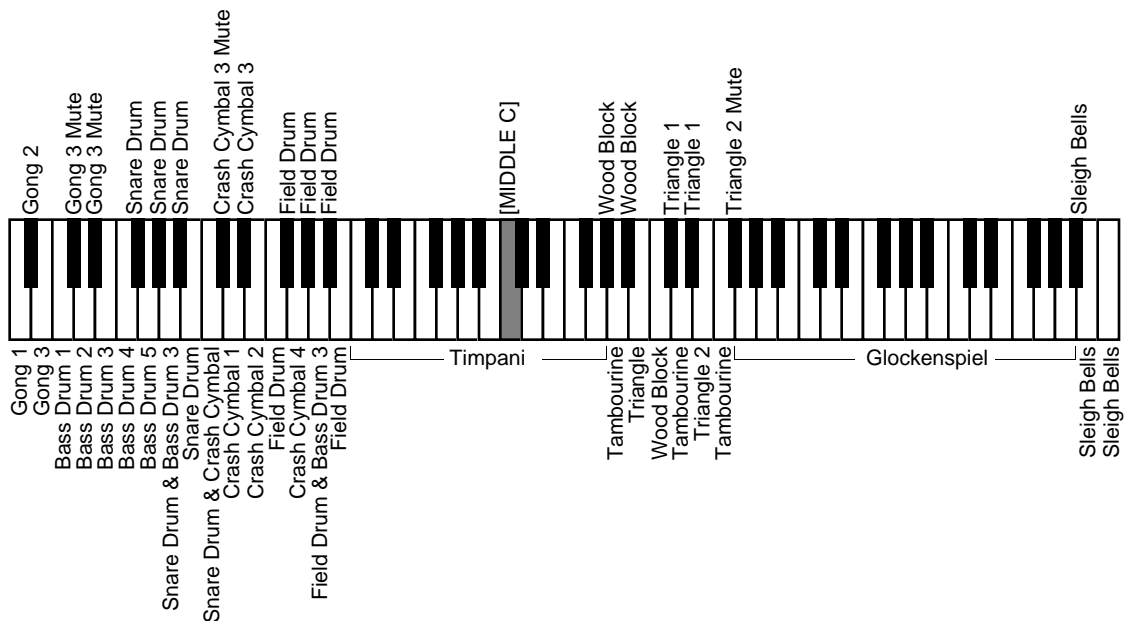
Cuban Mambo



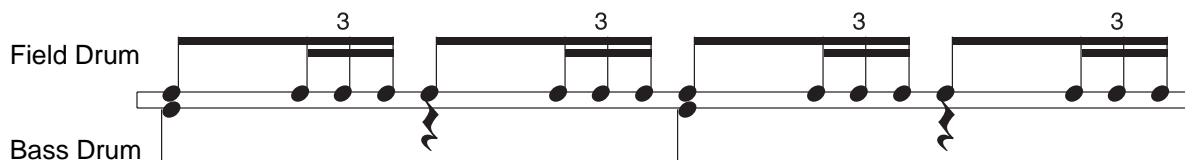
To make up your own rhythms, simply play an even eighth-note scale of your own liking anywhere on the keyboard. You can also try playing a different scale down than you play up, or even try playing arpeggios. Have fun!

Orchestral Percussion

This kit (Program Change # 62 in the Expansion Bank on the VGM board) provides an array of Orchestral Percussion sounds. Notice that many of these sounds are duplicated on adjacent keys, to make it easy to play patterns such as rolls (fast repeated drumstrokes) and flams (fast double strokes), simply by playing trills and grace notes.



For example, to play this typical march pattern:



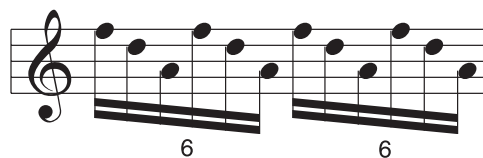
play the following on the keyboard:



For a triangle roll, play:



For a tambourine roll, play:



Appendix D

Effects Algorithms

The following table shows the effects algorithms accessible on the PC88 either with or without the VGM board installed. If the VGM board is installed, two different effects—Internal and VGM—can be used simultaneously.

Algorithms are chosen by sending a specific MIDI Controller message. The value (second data byte) of the controller calls up the algorithm as listed in this table.

To select the Algorithm for the Internal effects, use Controller 83 (53H), followed by the value in the table. Example: If you want to have a Bright Hall reverb with no other effect, send Controller 83 with a value of 77 (4DH).

To select the Algorithm for the effects on the VGM, use Controller 90 (5AH), followed by the value in the table. For example, if you want to have a Normal Room reverb with Chorus 1, send Controller 90 with a value of 86 (56H).

Value (decimal)	Reverb Size	Reverb Tone	Effect
65	None	Bright	None
66	None	Bright	Chorus 1
67	None	Bright	Chorus 2
68	None	Bright	Delay
69	Room	Bright	None
70	Room	Bright	Chorus 1
71	Room	Bright	Chorus 2
72	Room	Bright	Delay
73	Stage	Bright	None
74	Stage	Bright	Chorus 1
75	Stage	Bright	Chorus 2
76	Stage	Bright	Delay
77	Hall	Bright	None
78	Hall	Bright	Chorus 1
79	Hall	Bright	Chorus 2
80	Hall	Bright	Delay
81	None	Normal	None
82	None	Normal	Chorus 1
83	None	Normal	Chorus 2
84	None	Normal	Delay

Value (decimal)	Reverb Size	Reverb Tone	Effect
85	Room	Normal	None
86	Room	Normal	Chorus 1
87	Room	Normal	Chorus 2
88	Room	Normal	Delay
89	Stage	Normal	None
90	Stage	Normal	Chorus 1
91	Stage	Normal	Chorus 2
92	Stage	Normal	Delay
93	Hall	Normal	None
94	Hall	Normal	Chorus 1
95	Hall	Normal	Chorus 2
96	Hall	Normal	Delay
97	None	Warm	None
98	None	Warm	Chorus 1
99	None	Warm	Chorus 2
100	None	Warm	Delay
101	Room	Warm	None
102	Room	Warm	Chorus 1
103	Room	Warm	Chorus 2
104	Room	Warm	Delay
105	Stage	Warm	None
106	Stage	Warm	Chorus 1
107	Stage	Warm	Chorus 2
108	Stage	Warm	Delay
109	Hall	Warm	None
110	Hall	Warm	Chorus 1
111	Hall	Warm	Chorus 2
112	Hall	Warm	Delay

You can also change the wet/dry mix of both the reverb and the effects on the Internal and the VGM sounds. The following controllers are used (higher values=wetter).

Internal Reverb: Controller 91 (5BH)
 VGM Reverb: Controller 92 (5CH)
 Internal Effects : Controller 93 (5DH)
 VGM Effects: Controller 94 (5EH)

Appendix E

MIDI Setups

The PC88 is programmed with factory MIDI Setups to provide you with useful internal program combinations, unique arpeggiator examples, and appropriate templates for easy creation of custom setups. There are 32 standard Setups and an additional 32 VGM Setups

With 17 assignable controllers shared among four independent zones, PC88 MIDI Setups can be quite complex. The following list describes the features of each factory MIDI Setup, including any non-default controller assignments, special application notes, and “serving suggestions”. Since most zones have Wheel 1 assigned to Pitch Bend, Wheel 2 assigned to Modulation, and Switch Pedals 1 and 2 assigned to sustain and sostenuto, they will not be mentioned.

Standard Setups

- | | | |
|----|-----------------|--|
| 1 | A Piano Trio | B fades Ride. D is Tempo. F goes to Vibes (Zone 1). G engages add-mode arpeggio for “sequencing” a bass line. |
| 2 | E Piano Trio | Activate Zone 3 to add Strings. B fades ride. C is Strings filter. D is Tempo. F goes to Jazz Organ (Zone 1). G engages add-mode Arpeggiator for “sequencing” a bass line. |
| 3 | Rhythm Pad | B is Marimba volume. C is Strings volume. D is Tempo. |
| 4 | Dynamic 5ths | A pans Zone 1. B pans Zone 2. G is the overplay latch: Hold a note while pressing G for Arpeggiation. |
| 5 | Stereo E Grand | A and B are tremolo depth and rate for Zone 1. |
| 6 | Harpsi & String | A is Harpsichord volume. B is String volume. E pans each zone (via entry state). |
| 7 | SoloPno>Gtrs | A is reverb wet. B is chorus wet. This setup enters with Electric Grand soloed. Press the solo button to activate Zones 2 and 3 and mute Zone 1. |
| 8 | Pedals Harpsi | Switch pedals are in Toggle mode. SwPdl1 sends MIDI 70 (adds lower octave); SwPdl2 sends soft pedal. |
| 9 | Deep Guitar | A is reverb wet. B is chorus wet. E disables clav’s release sound. |
| 10 | Keyboard Comp | A is Rock Organ volume. B is Bright Piano volume D is Delay wet. Left hand has velocity switching from pad to E Pno. |
| 11 | Bass&Dyn5ths | A pans Marimba and Clav. B pans Digital E Pno. C is volume for the upper parts. D is volume for Clav. |
| 12 | Lead Stack | A is Zone 1 volume. B is Zone 2 volume. C is Zone 3 volume. |
| 13 | Island Roller | A is Bass&Ride volume B fades the Ride. C is the pad volume. Arpeggiator is always running; Whl2 and SwPed1 both control Arpeggiator Velocity. Works best with two notes in the right hand. D is tempo. |
| 14 | Forecast | A is Bass volume. B is E Pno volume. Whl2 is E Pno tremolo depth. C is E Pno tremolo rate. D is Ride volume. Pressure does PitchBend down on Bass. G is Arpeggio latch: Hold the lowest 3 keys and Press G to latch a rhythmic ride pattern. |
| 15 | Wet Stuff | A pans Zone 1. B pans Zone 2. Soft strikes are pad only. |

- 16 Volume Sliders **Template:** Used for the tutorial in Chapter 1 of this book. All settings are default, except for program and slider assignments. **A** is Zone 1 volume. **B** is Zone 2 volume. **C** is Zone 3 volume. **D** is Zone 4 volume.
- 17 FluidGtr & Vibe **A** is reverb wet. **B** is chorus wet.
- 18 Click & Trio **A** is reverb wet. **B** fades Ride. **C** and **Whl2** are Click volume. **F** goes to A Bass & Ride (Zone 1). **G** latches the Arpeggiator in Add mode to “sequence” the click (A0-A#0).
- 19 E Bass/ E Pno Activate Zone3 to add Strings. **C** is Strings volume.
- 20 Duo Comp 1 **A** is reverb wet. **B** is chorus wet.
- 21 Vtrig E Piano **A** is reverb wet. **B** is chorus wet. Percussive Marimba is triggered only on accented notes.
- 22 Shift Limits! **Example:** Note shifts with the floating limit option. **SwitchPdl2** stops the arpeggiation and allows normal playing.
- 23 Three Things **A** pans Zone 1. **B** pans Zone 2. **C** is Marimba volume. **Pressure** sends Pitch Bend on Zone 1. **G** is the overlay latch: Hold a note while pressing **G** for Arpeggiation.
- 24 dingalingling **Example:** Note shifts with the stop option. **C** is reverb wet. **D** is tempo. **G** is the Add-mode latch.
- 25 Arps on Top **B** is Zone 2 (arpeggio) volume. **C** is Strings volume. **D** is Tempo. SwitchPdl1 is Sostenuuto for Strings.
- 26 Sustain E Piano **A** is the pad volume.
- 27 Enter & Xfade **Example:** Reverse curves and entry values. **A** controls volume of the low Strings, and *inverse* volume of the high Strings. Curves and entry values are set for a smooth octave crossfade: Hold a chord and move **A** from top to bottom. **B** is delay wet. **C** is strings filter. **D** is release control.
- 28 Marimba Thing **A** pans Zone 1. **B** pans Zone 2.
- 29 Click/Ride **Template:** Copy Zone 1 to use the layered ride in another setup; Copy Zone 2 and the arpeggiator to add the automatic Click to another setup. **A** is Ride volume. **B** is Click volume. **D** is tempo. **G** is the add-mode latch.
- 30 Pan Sliders **Template:** Program Entry Transmit is off for all zones. Selecting this setup will not change programs. Move to this setup to play with panning on any 4 channels while mixing. **A** pans Zone 1. **B** pans Zone 2. **C** pans Zone 3. **D** pans Zone 4.
- 31 MIDI Template **Template:** Destination is MIDI-only for all zones. Start with this setup for use with external gear. **A** is Zone 1 volume (MIDI channel 1). **B** is Zone 2 volume (MIDI channel 2). **C** is Zone 3 volume (MIDI channel 3). **D** is Zone 4 volume (MIDI channel 4). Exit values are 127 for all sliders.
- 32 Local Template **Template:** Destination is Local only for all zones. Start with this setup when you do not want zones to send MIDI out. **A** is Zone 1 volume. **B** is Zone 2 volume. **C** is Zone 3 volume. **D** is Zone 4 volume. Exit values are 127 for all sliders.
- 127 Default Setup All Zones are Off and have “default” assignments: Pitch Bend, Mod Wheel, Sustain and Sostenuuto. All sliders, buttons, key pressure and CC pedals are unassigned. All controller scalings are 100%, curves are linear, and offsets are 0. Copy this Setup to a location that you find “handy” and use it as a starting point for making your own setups.



VGM Setups

- 33 64 E Grnd & Str Zones 1 and 2 are set to matching programs in the Internal Voices and 64-note Poly banks, and play odd and even note ranges. Activate Zone 4 to add 8va Choir. **C** is strings filter. **D** is Strings release control.
- 34 Piano Combi **A** pans Zone 1(pad). **B** is internal reverb wet.
- 35 light 'n airy **A** pans Zone 1. **B** is internal reverb wet. **D** is Tempo. **G** turns the Arpeggiator on.
- 36 auto-halo **A** pans Zone 1. **B** is internal reverb wet. **D** is Tempo. **G** turns the Arpeggiator off.
- 37 Duo Comp w/Bass **A** is internal reverb wet. **B** is internal chorus wet.
- 38 Fanfare **A** is Zone 1 volume. **B** is Zone 2 volume. **E** pans each zone.
- 39 Arps on Strings **A** is Zone 1 volume (french horn). **B** is Zone 2 volume (low strings). **C** is Zone 3 volume (arpegg. strings). **D** is Tempo.
- 40 Harp Accents Activate Zone 3 to add Guitar. Activate Zone 4 to add Strings. **A** is Zone 1 volume. **C** is Zone 3 volume. **D** is Zone 4 volume.
- 41 Meditation **A** is internal reverb wet. **B** is internal chorus wet.
- 42 CathedralPipes **A** is Zone 1 volume. **B** is Zone 2 volume. **C** is Zone 3 volume. **D** is Zone 4 volume.
- 43 Fusioner **A** is internal reverb wet. **B** is internal chorus wet.
- 44 Jazz Comp No assignments beyond the defaults and some velocity scaling.
- 45 Calypso **B** is Jazz Guitar volume.
- 46 Layer Lead Activate Zones 1 and 2 to add guitar layers. **SwitchPdl1** does not send sustain on Zone 4.
- 47 Tooty Leads **A** is Zone 1 volume. **B** is Zone 2 volume. **C** is Zone 3 volume. **E** pans zones 1 and 3.
- 48 Bird Pad Activate Zone 2 to add Slo Vibes pad. **A** is Zone 1 volume(strings). **B** is Zone 2 volume(vibes). **C** is Zone 3 volume (surf). **D** is Zone 4 volume(birds). **E** pans zones 1 and 3 (via entry state).
- 49 64-note Piano **Template:** Odd-even zones for 64-note polyphony. There are 19 programs available in the 64-note Poly bank. Select Zone 2 and find others using the program parameter. Then, on Zone 1, choose the matching program number from the Internal Voices bank.
- 50 Synth Stack **A** pans Zone 1. **B** is internal reverb wet.
- 51 Latin Funk **A** is percussion volume. **B** and **C** are E Pno tremolo rate and depth. **D** is tempo. **G** sends Volume 0 to percussion. **SwitchPdl2** is a toggle-mode arpeggiator latch. The Percussion Zone is set to odd notes, which creates rests in the arpeggiation. Play keys C0 and B0 (softer) and hold while pressing the latch pedal. Then play with the "shuffle sequence".
- 52 Steppin' **A** is piano volume. **B** is bass volume. **C** fades Ride. **D** is Tempo. **SwPdl2** is the pedals mode Arp. latch.
- 53 Delightful **A** is VGM reverb wet. **B** is Guitar volume. **C** is Strings filter. **D** is tempo. **F** doubles the tempo. **G** is Latch2 (for overplay).

- | | | |
|----|----------------|---|
| 54 | Slow Orchestra | Activate Zone3 for 8vb Cello in the tenor range. A is upper orch. volume. B is flute volume. C is cello volume. D is lower orch volume. E pans zones 1 and 3. SwitchPdl2 changes right-hand Double Reeds to Brass. |
| 55 | Pressure Orch | Example: Arpeggiator for drum rolls. Arpeggio plays on Timpani and Snare Drum (Zones 3 and 4), with velocity controlled by Pressure . Play any single note from G1 - F#2, and press for a crescendo roll. C and D are volume for Snare and Timpani. SwitchPdl2 does Sostenuito and disables Brass. Hardest strike triggers Crash (Zone 2). |
| 56 | Plucky Orch | A is Zone 1 volume. B is Zone 2 volume. C is Zone 3 volume. |
| 57 | Smooth Leads | A is Zone 1 volume. B is Zone 2 volume. C is Zone 3 volume. E pans zones 1 and 3. |
| 58 | Meditation 2 | A is internal reverb wet. B is internal chorus wet. |
| 59 | Soft Big Band | Activate Zone 3 to add Bari Sax. Activate Zone 4 to add Trumpet. A is soft section volume. B is soft lead volume. C is trumpet volume. D is bari volume. E pans Zone 2. |
| 60 | Rhythm/BigBand | A is soft section volume. B is alto volume. C fades Ride. D is brass volume. E pans Zone 2 (via entry state). Soft strikes play soft horns only. |
| 61 | Mello Guitars | A is Zone 1 volume. B is Zone 2 volume. C is Zone 3 volume. |
| 62 | Horn Lead | A is Zone 1 volume. B is Zone 2 volume. E pans zones 1 and 2. |
| 63 | Plunkers | A is Zone 1 volume. B is Zone 2 volume. E pans zones 1 and 2. |
| 64 | Scary Stuff | A is Zone 1 volume. B is internal delay wet. C sends Pitch Up on Zone 4. |

Application Notes

While you play through the Setups, remember that after moving controllers and changing zone status, you can always re-select the current setup (by pressing the same Setup Select button again) in order to re-send all entry values. Similarly, you might use the Panic button to reset all controllers, then re-select the setup in order to insure that each MIDI channel is playing the intended controller values.

Make your own.

There are many ways to program the PC88 to fully automate a multi-synthesizer rig for quick-access live performance. When you are preparing the PC88 for a live performance, the Default Setup (#127), the Volume Sliders, Local Template, and MIDI Template setups are recommended starting points. The Default Setup's parameters are shown on the following page.

“Mock Synthesis”

Most people are surprised at the amazing sonic potential in a synthesizer with no actual program editing. The good news is that this potential exists for any MIDI sound module under the PC88's control! The PC88 does its thing with standard MIDI commands, mostly with the Continuous Control Messages. Like program changes and notes, these messages are sent on a per-channel basis. Once received, the slave device responds accordingly, until it receives another message of the same type, or is told to reset somehow. If you move a MIDI volume slider down, the receiver will lower that channel's volume until it receives a new volume message, or is told to reset.

Why is the Panic button important?

Consider this example: There are two single-zone MIDI setups, each playing the same MIDI channel. The first setup has a slider sending Volume, while the second has the *same* slider set to send Pan. You could accidentally leave the first setup with the slider down, and not hear anything when you try to use the second setup. The entry and exit value parameters are a good way to keep this from happening, but it is not always desirable to program setups in that way. Even the factory MIDI setups do not always send exit values. A common practice is to use the Panic button. Press it once and it sends the Reset all Controllers message. This tells the receivers to return Modulation to 0, Volume to 127, Pan to 64, and so on. Whenever you're not sure a setup is playing all its controllers from the intended starting position, simply press panic and re-select the setup.

Default Setup Parameters (Generic Template)

Shown below are the Setup parameters for Setup 127 "Default Setup", which is provided as a generic template with most of its parameters set to their defaults or most basic values.

Setup:127 Default Setup		Zones 1-4						
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val
MIDI channel	off	wheel1 up	ptch up	100%	0	linear	none	none
destination	Lcl+MIDI	wheel1 down	ptchdwn	100%	0	linear	none	none
bndrng	2 ST 0 ct	wheel 2	1	100%	0	linear	none	none
Program		mpressure	none	100%	0	linear	none	none
bank	Int Voices	slider A	none	100%	0	linear	none	none
program	-	slider B	none	100%	0	linear	none	none
entry transmit	on	slider C	none	100%	0	linear	none	none
bank mode	0/32	slider D	none	100%	0	linear	none	none
prog # display	1-128	pedal 1	none	100%	0	linear	none	none
prog name display	Internal	pedal 2	none	100%	0	linear	none	none
Key Range/ Note Map		pedal 3	none	100%	0	linear	none	none
	C-1to G9	pedal 4	none	100%	0	linear	none	none
	linear	Switch Ctls						
Transpose		button E	toggle	none	none	none	none	off
	0	button F	momt.	none	none	none	none	off
Velocity		button G	toggle	none	none	none	none	off
scale	100%	sw pedal 1	momt.	64	127	64	0	none
offset	0	sw pedal 2	momt.	66	127	66	0	none
curve	linear	Setup						
min-max	1-127	Arpeggiator	act	key rng	latch md	play ord	beats	tempo
Arpeggiator Zone Enable			off	c-1 to g ⁹	off	played	1/16th	120
	on	Functions	velmode	fix vel	notesht	shftlimt	limtopt	gliss
			played	100	0	24	uni	off
		duratn						
		100%						

Default Controller Assignments (Internal Voices)

These are the factory-default controller assignments for the Internal Voices (Zone 1 only).

Zones 2, 3, and 4 are OFF in Internal Voices mode. Parameters of these zones are assigned as in Setup 127, "Default Setup". Effects are preset for each Internal Voice and are user-assignable.

Setup:Internal Voices Default		Zone 1							
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val	
MIDI channel	1	wheel1 up	ptch up	100%	0	linear	none	none	
destination	Lcl+MIDI	wheel1 down	ptchdwn	100%	0	linear	none	none	
bndrng	2 ST 0 ct	wheel 2	1	100%	0	linear	none	none	
Program		mpressure	mpress	100%	0	linear	none	none	
bank	Int Voices	slider A	91	25%	10	linear	none	none	
program	-	slider B	93	100%	0	linear	none	none	
entry transmit	on	slider C	4	100%	0	linear	none	none	
bank mode	0/32	slider D	72	100%	0	linear	none	none	
prog # display	0-127	pedal 1	11	100%	0	linear	none	none	
prog name display	Internal	pedal 2	4	100%	0	linear	none	none	
Key Range/	C-1to G9	pedal 3	none	100%	0	linear	none	none	
Note Map	linear	pedal 4	none	100%	0	linear	none	none	
Transpose	0	Switch Ctls							
Velocity		button E	toggle	71	127	71	0	off	off
scale	100%	button F	momt.	none	none	none	none	off	off
offset	0	button G	toggle	119	127	119	0	off	off
curve	linear	sw pedal 1	momt.	64	127	64	0	none	none
min-max	1-127	sw pedal 2	momt.	66	127	66	0	none	none
Arpeggiator	on	Setup							
Zone Enable	on	Arpeggiator	act	key rng	latch md	play ord	beats	tempo	duratn
			off	c-1 to g9	off	played	1/16th	120	100%
		Functions	velmode	fix vel	notesht	shftlimt	limtopt	gliss	
			played	100	0	24	uni	off	

Setup Template

Provided on the following two pages is a template to copy and use for recording the settings of the zones in the Setups you create.

Setup Name: _____

Zone 1		Arp. enable						
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val
MIDI channel		wheel1 up						
destination		wheel1 down						
bndrng		wheel 2						
Program		mpressure						
bank		slider A						
program		slider B						
entry transmit		slider C						
bank mode		slider D						
prog # display		pedal 1						
prog name display		pedal 2						
Key Range/ Note Map		pedal 3						
		pedal 4						
Transpose								

Velocity		Switch Ctls	type	on ctl	on val	off ctl	off val	entry val	exit val
scale		button E							
offset		button F							
curve		button G							
min-max		sw pedal 1							
		sw pedal 2							

Zone 2		Arp. enable						
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val
MIDI channel		wheel1 up						
destination		wheel1 down						
bndrng		wheel 2						
Program		mpressure						
bank		slider A						
program		slider B						
entry transmit		slider C						
bank mode		slider D						
prog # display		pedal 1						
prog name display		pedal 2						
Key Range/ Note Map		pedal 3						
		pedal 4						
Transpose								

Velocity		Switch Ctls	type	on ctl	on val	off ctl	off val	entry val	exit val
scale		button E							
offset		button F							
curve		button G							
min-max		sw pedal 1							
		sw pedal 2							

Setup Effects	Algorithm	rev wet	rev time	eff wet	eff dly
Effects 1					
Effects 2					

Setup Name:

Zone 3		Arp. enable							
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val	
MIDI channel		wheel1 up							
destination		wheel1 down							
bndrng		wheel 2							
Program		mpressure							
bank		slider A							
program		slider B							
entry transmit		slider C							
bank mode		slider D							
prog # display		pedal 1							
prog name display		pedal 2							
Key Range/ Note Map		pedal 3							
Transpose		pedal 4							
Velocity		Switch Ctls	type	on ctl	on val	off ctl	off val	entry val	exit val
scale		button E							
offset		button F							
curve		button G							
min-max		sw pedal 1							
		sw pedal 2							

Zone 4		Arp. enable							
MIDI Transmit		Cont. Ctls	ctl #	scale	offset	curve	entry val	exit val	
MIDI channel		wheel1 up							
destination		wheel1 down							
bndrng		wheel 2							
Program		mpressure							
bank		slider A							
program		slider B							
entry transmit		slider C							
bank mode		slider D							
prog # display		pedal 1							
prog name display		pedal 2							
Key Range/ Note Map		pedal 3							
Transpose		pedal 4							
Velocity		Switch Ctls	type	on ctl	on val	off ctl	off val	entry val	exit val
scale		button E							
offset		button F							
curve		button G							
min-max		sw pedal 1							
		sw pedal 2							
		Setup	act	key rng	latch md	play ord	beats	tempo	duratn
		Arpeggiator							
		Functions	velmode	fix vel	notesht	shftlimt	limtopt	gliss	

Appendix F

Continuous Controllers in the MIDI Specification

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Of the 128 possible Continuous Controllers in the MIDI Spec, many are defined either in terms of being part of a transmitter, a receiver, or both. Controllers 120 and above are reserved for Mode messages, and although they can be used for real-time expressive purposes, it's best not to, for fear of confusing some receiving devices.

The first 64: 14-bits?

The first 64 Controllers were originally designed so that they could be sent in pairs, as 14-bit Controllers. When Controller pairs are used, the lower-numbered Controller is sent first, and its value is considered the Most Significant Byte (MSB) of the command. The higher-numbered Controller follows immediately afterwards, with the Least Significant Byte (LSB). Combined, the two Controllers constitute a single message with a resolution of 16,384 discrete values, as opposed to the 128 available with a single Controller. The MIDI Specification says that an MSB can be sent without an LSB. As it turns out, with the exception of Bank Select (where it is probably the *least* useful), almost *nobody* has bothered to implement 14-bit controllers in any hardware or software. Although the practice is still called for in the MIDI Spec, it is essentially moribund, and Controllers 33-63 are considered more or less up for grabs.

Here's how the first 64 Controllers are defined and used:

Decimal	Hex	Name	Applications and note
00/32	00/20	Bank Select	see Chapters 5, 8, and 9
01/33	01/21	Modulation	Transmitter is a wheel or lever; receiver is usually vibrato depth. PC88 default assignment (01) is Wheel 2.
02/34	02/22	Breath	Transmitter is a breath controller originally made by Yamaha or part of a wind controller; receiver is usually related to loudness or timbral change. Also, many early Korg keyboards used this to transmit information from one axis of a joystick.
03/35	03/23	undefined	Original DX7 used this for aftertouch
04/36	04/24	Foot Pedal	Transmitter is a foot pedal; receiver is loudness or timbral change. PC88 default assignment (04) is Pedal 2 and Slider C.
05/37	05/25	Portamento Time	Transmitter is a slider; receiver controls time to glide from one note to the next when Portamento switch (41H) is On.
06/38	06/26	Data Entry	Transmitter is a slider; receiver is any parameter change, used in conjunction with Registered and Non-Registered parameters (62-65H)
07/39	07/27	Main Volume	Transmitter is a slider or pedal

08/40	08/28	Balance	Transmitter is a slider; receiver is the balance between two layers of a sound, or the wet/dry mix of an effects device
09/41	09/29	undefined	
10/42	0A/2A	Pan	Transmitter is a slider; receiver changes stereo pan position of sound
11/43	0B/2B	Expression	Transmitter is a pedal; works in conjunction with 07 (Volume) to make “temporary” volume changes or performance inflections. Volume can be thought of as a fader on a console, while Expression the pedal on an organ. PC88 default assignment (11) is Pedal 1.
12/44	0C/2C	Effect Control 1	Transmitter is a slider or knob; receiver is a control in an effects device—reverb, delay, equalizer, etc.—which might be send, wet/dry mix, or a particular parameter of the effect
13/45	0D/2D	Effect Control 2	same as Effect Control 1
14/46	0E/2E	undefined	
15/47	0F/2F	undefined	
16/48	10/30	General Purpose #1	Transmitter and receiver can be anything. General Purpose Controllers are designated essentially to prevent them from being defined for anything specific. This controller is also used by some transmitters for the x-axis position of a joystick.
17/49	11/31	General Purpose #2	Used by some transmitters for the y-axis position of a joystick.
18/50	12/32	General Purpose #3	
19/51	13/33	General Purpose #4	

The remainder of the set, 20-31 and 52-63, are at present undefined.

The Switches: 64-69

The next set of Controllers was originally reserved for binary switched functions, transmitted by momentary-contact or locking pedals, and could have one of only two values: 0 (off) or 127 (on). The MIDI Spec says a receiver is supposed to consider any values between 0 and 63 to be “off”, and values 64 and up to be “on”, although some older receivers interpret any value above 0 as “on”. These Controllers are still used as switches for the most part, but some manufacturers use them as full-value (0-127) Controllers.

Decimal	Hex	Name	Applications and notes
64	40	Sustain	Also known as Damper or Hold #1. Retains Sustain portion of sound's envelope on all notes played, until turned off. In some instruments with complex envelopes, it turns on a special Release segment, to allow the sound to die away more slowly. PC88 default assignment is Switch Pedal 1.
65	41	Portamento	Turns on and off Portamento Control (see 05H and 54H)
66	42	Sostenuto	Sustains notes that are being held when the control is turned on, but subsequent played notes (unlike 40H) are not sustained. PC88 default assignment is Switch Pedal 2.
67	43	Soft Pedal	Lowers volume and/or softens timbre by a pre-set amount
68	44	Legato Footswitch	Puts receiver into "legato" mode: only one note can sound at a time, and overlapping notes result in change of pitch without re-attacking.
69	45	Hold #2 or Freeze	A second hold pedal that sustains a portion of the sound, like the middle pedal on an upright piano; or that triggers an alternate Release segment (like 40H).

Sound Controllers: 70-79

These ten Controllers, officially known as "Sound Controllers #1-10", have been set up to allow a common and easy way to accomplish real-time control over a variety of timbral characteristics of a sound in any synthesizer, without having to deal with individual manufacturers' System Exclusive commands. Exactly how these Controllers work is entirely up to the manufacturer, and the user doesn't have to know about it—all he or she needs to know is that increasing Controller 74 makes the sound brighter.

Decimal	Hex	Name	Applications and notes
70	46	Sound Variation	Deliberately vague. Once upon a time, this Controller was "Velocity Replace", but it was never implemented by anybody.
71	47	Harmonic Content	Richness or intensity of timbre. PC88 default assignment is Button E
72	48	Release Time	Length of release portion of envelope. PC88 default assignment is Slider D.
73	49	Attack Time	Length of attack portion of envelope
74	4A	Brightness	High-end content
75-79	4B-4F	Sound Controllers #6-#10	Undefined

Controllers 80-97

Decimal	Hex	Name	Applications and notes
80-83	50-53	General Purpose #5-#8	Similar to 16-19 and 48-51. The PC88 uses #83 to set Algorithms for the Internal effects processor.
84	54	Portamento Control	When Portamento Switch (41H) is turned on, and Portamento Time (05H) is not zero, the value of this Controller is the number of the note at which the glide will <i>start</i> .
85-90	55-5A	Undefined	The PC88 uses #90 to set Algorithms for the VGM effects processor.
91	5B	Effect 1 Depth	Most commonly used as an effects “send”, but can be used for any effects-related control. Roland GS instruments use this as a reverb send. The PC88 uses this for “Reverb Wet” control of the Internal effects processor.
92	5C	Effect 2 Depth	The PC88 uses this for “Reverb Wet” control of the VGM effects processor.
93	5D	Effect 3 Depth	Roland GS instruments use this as a chorus send. The PC88 uses this for “Effects Wet” control of the Internal effects processor.
94	5E	Effect 4 Depth	The PC88 uses this for “Effects Wet” control of the VGM effects processor.
95	5F	Effect 5 Depth	Similar to 91
96	60	Data Increment	The transmitter is a button, usually labelled “+1” or “Yes”, so this is a “unipolar” controller, with only one value: 127=On. Similarly to Data Entry (06), the receiver is any parameter change, and this can be used in conjunction with Registered and Non-Registered parameters (98-101).
97	61	Data Decrement	The opposite of 96, the transmitting button is labelled “-1” or “No”. Receivers are the same.

Registered and Non-Registered Parameters: Controllers 98-101

Decimal	Hex	Name
98	62	Non-Registered Parameter Least Significant Byte (LSB)
99	63	Non-Registered Parameter Most Significant Byte (MSB)
100	64	Registered Parameter Least Significant Byte (LSB)
101	65	Registered Parameter Most Significant Byte (MSB)

Registered and Non-Registered Parameters combine three commands. The first two define the Parameter to be changed: the first is the Parameter number’s Least Significant Byte (LSB), and the second its Most Significant Byte

(MSB). The third command is a Data Slider (06) followed by the desired value, or else a Data Increment or Decrement (96 or 97), which increases or decreases the current value of the selected Parameter by 1.

Non-Registered Parameters can be anything a manufacturer wants them to be: any parameter in a synthesizer, sampler, effects device, mixing console, lighting controller, etc. that is remotely addressable can be set up as a Non-Registered Parameter. Registered Parameters, however, have certain specific functions, which are defined in the MIDI Specification. These are:

Decimal (MSB/LSB)	Hex (MSB/LSB)	Name	Applications
00/00	00/00	Pitch Bend Sensitivity	Range of the Pitch Bend wheel, with the MSB referring to semitones and the LSB to cents (1/100ths of a semitone) The PC88 transmits and responds to this message (“BndRng”).
00/01	00/01	Fine Tuning	Tuning of the receiving device, with each increment of the LSB equal to 1/8192nd of a semitone, and an overall range (using both MSB and LSB) of -1 to +1 semitone. The PC88 responds to this message (“Tuning”).
00/02	00/02	Coarse Tuning	Tuning of the receiving device in semitones, with a range of -64 to +64. The PC88 responds to this message (“Recv Trans”).
00/03	00/03	Tuning Program Select	Selects a scale tuning that is stored in the device’s RAM.
00/04	00/04	Tuning Bank Select	Selects a bank of tunings, which is then followed by selection of a particular tuning program (RPN 03).
127/127	7F/7F	Null Function	This “turns off” the last RPN or NRPN so that the Data Slider and Data Increment/ Decrement switches can be used for something else. Its use is optional, but it can help to avoid confusion in very complex data streams.

102-119: Uncharted Territory

Controllers 102 through 119 do not have specific functions. On the Kurzweil PC88, however, these four do:

Decimal	Hex	Name	Applications and notes
116	74	Arpeggiator Active	A switch, turns the Arpeggiator on and off.
117	75	Arpeggiator Velocity	Determines the play velocity for Arpeggiated notes when the Arpeggiator Velocity Mode is set to “Ctrl”
118	76	Arpeggiator Latch 2	A switch, latches currently-played notes so the Arpeggiator will process them, and un-latches them. (Pedals mode only)
119	77	Arpeggiator Latch 1	A switch, latches currently-played notes so the Arpeggiator will process them, and un-latches them.

120-127: Mode Messages

Above 119, Controller messages are considered “mode messages”, and have specific functions that address an entire instrument, rather than a single voice.

Decimal	Hex	Name	Applications and notes
120	78	All Sound Off	Instantly mutes the sound without changing the Volume (Controller 07)
121	79	Reset All Controllers	Set all Controllers (and Pitchbend) to their initial or default values.
122	7A	Local Control Off	“De-couples” control surface (keyboard) and sound-producing circuits for use with sequencers.
123	7B	All Notes Off	Turns off or forces into the release segment of their envelopes all sounding notes.
124	7C	Omni Off	Takes instrument out of Omni mode (so it can receive on one or more individual channels).
125	7D	Omni On	Puts instrument into Omni mode (it will play all incoming MIDI data, regardless of channel).
126	7E	Mono On	Puts instrument in Mono mode, in which only one note can play per channel. Used for solo instruments.
127	7F	Poly On	Puts instrument in Poly mode, in which multiple notes can play per channel (the usual way things are done!)

Appendix G

PC88 Internal Diagnostics

This appendix contains instructions on (1) how to use the PC88's internal diagnostics to test the unit and (2) how to perform a hard reset. *Be sure to read all of the following instructions before using the diagnostics.* Otherwise, damage to external equipment may occur.

Entering Diagnostics

To start the PC88 diagnostics, power up the unit while simultaneously holding the 1, 2, and 3 buttons. Release the 1, 2, and 3 buttons within two seconds of turning on the PC88. After a brief introductory message, the display will appear as follows:

```
Press <<< to Reset
Press >>> for Diags
```

At this point, you can do one of three things:

1. Press the <<< button, which will erase the non-volatile memory. *Any user sounds or setups in the instrument will be lost!* The following message will be displayed:

```
RAM has been erased.
Cycle the Power now.
```

After this message appears, remove power from the unit. When power is re-applied, the non-volatile memory will be reset.

2. Press the >>> button, which will enter diagnostics. *Note that some diagnostic tests destroy the RAM; therefore, anything stored in the non-volatile memory will be lost!*
3. Remove power from the instrument. *This is the only way to guarantee that user sounds and setups stored in the non-volatile RAM will be retained.*

Running the Debug Sequence

If you pressed the >>> button in step 2 above, the following will appear in the display:

```
Menu
  CPU Test
```

Before continuing, set the PC88's volume slider to its minimum setting. Some tests produce loud, potentially destructive test tones. When these tones begin to sound, if you wish, you can adjust the volume slider to hear them.

Press the **zone 3** button. This will run all of the available tests in sequence, displaying the name of each as it executes. After each test finishes, the LCD will show *Pass* or *Fail* in the upper, right-hand corner. You must press any button (or keyboard key) to continue with the next test in the sequence.

Three tests in the sequence require special treatment: the *MIDI UART Test*, the *VGM Port Test*, and the *Sound Test*. The *MIDI UART Test* requires that a MIDI cable be connected between the MIDI Out and MIDI In connectors on the back of the unit. If this MIDI cable is not installed, the

test will fail. If this test passes, however, even when there is nothing connected to the MIDI In connector, there is a problem with the unit.

The *VGM Port Test* requires a VGM option to be installed. If no VGM option is installed, the test will fail. If, on the other hand, there is a VGM option installed, the PC88 will use it to play five test tones in sequence. You must press a button or keyboard key after each tone sounds in order to advance to the next. *These tones are likely to be very loud and potentially destructive, so be sure to set the PC88's volume slider to its minimum setting before running the diagnostic tests.* You can adjust the volume slider after each tone begins to sound.

The Sound Test produces five test tones in sequence. You must press a button or keyboard key after each one sounds in order to advance to the next. *These tones are likely to be very loud, so be sure to set the PC88's volume slider to its minimum setting before running the diagnostic tests.* You can adjust the volume slider after each tone begins to sound.

Exiting Diagnostics

To leave Diagnostics mode, restart the PC88, without holding down any of its keys or buttons.

MIDI Implementation Chart

Manufacturer:
Young Chang

Date: 6/1/94
Version 1.0

Function		Transmitted	Recognized	Remarks
Basic Channel	Default	1	1	
	Changed	1 - 16	1 - 16	
Mode	Default	Multi*	Multi*	memorized
	Messages	Any	Mode 1 & 3	memorized
	Altered	X		
Note Number		0 - 127	0 - 127	key range: C0 - C8
	True Voice	12 - 108	12 - 108	
Velocity	Note ON	O	O	
	Note OFF	O	O	
After Touch	Keys	X	X	
	Channel	O	O	
Pitch Bender		O	O	
Control Change**	0,32	O	O	bank select
	1	O	O	mod wheel
	4	O	O	foot controller
	6,38	O	O	data entry
	7	O	O	volume
	10	O	O	pan
	11	O	O	expression
	64	O	O	sustain pedal
	66	O	O	sostenuto pedal
	67	O	O	soft pedal
	71	O	O	sound control
	72	O	O	envelope control
	83	O	O	reverb select
	90	O	O	VGM reverb select
	91	O	O	reverb depth
	92	O	O	VGM reverb depth
	93	O	O	effects depth
	94	O	O	VGM effects depth
	96	O	O	data increment
	97	O	O	data decrement
	100,101	O	O	registered param num
116	O	O	arpeggiator on/off	
117	O	O	arpeggiator velocity ctl	
118	O	O	arpeggiator latch 2	
119	O	O	arpeggiator latch 1	
120	O	O	all sound off	
121	O	O	reset all controllers	
Program Change		O 0 - 127	O 0 - 63	local sounds
	True #	0 - 127	0 - 63	
System Exclusive		O	O	General MIDI
System Common	Song Pos	X	X	
	Song Sel	X	X	
	Tune	X	X	
System Real Time	Clock	O	O	
	Messages	O	O	
Aux Messages	Local Control	O	O	
	All Notes Off	O	O	
	Active Sense	X	X	
	Reset	X	X	
Notes	*Use MULTI mode to assign different programs to each MIDI channel **Any control change can be sent by the PC88			

Mode 1: OMNI ON, POLY
Mode 3: OMNI OFF, POLY

Mode 2: OMNI OFF, MONO
Mode 4: OMNI OFF, MONO

O = yes
X = no

