ENSONIQ™

Dynamic Component Synthesizer

Musician's Manual
Version 1.3

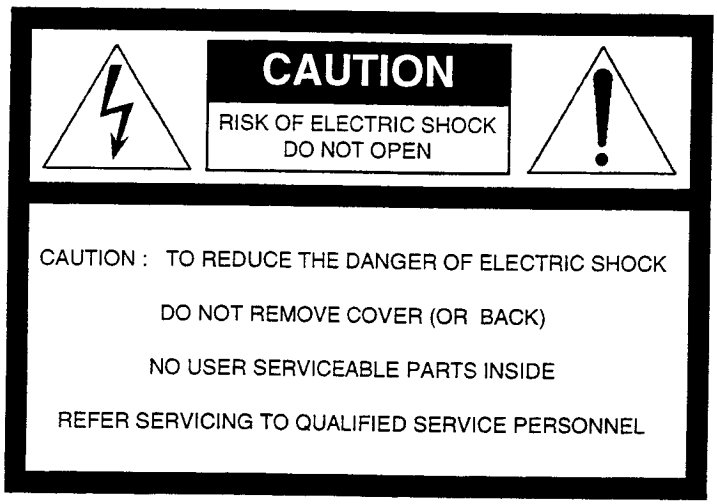
READ THIS FIRST!

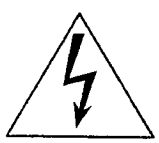
WARNING!!

Grounding Instructions

This product must be grounded. If it should malfunction or break down, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This product is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER: Improper connection of the equipment-grounding conductor can result in the risk of electric shock. Check with a qualified electrician or service personnel if you are in doubt as to whether the product is properly grounded. Do not modify the plug provided with this product — if it will not fit the outlet, have a proper outlet installed by a qualified electrician.





This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electronic shock to persons.

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

SEE IMPORTANT SAFETY INSTRUCTIONS ON BACK COVER!

VFX Musician's Manual:

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Malvern, PA 19355

Printed in U.S.A.

If you have any questions concerning the use of this unit, please contact your authorized ENSONIQ dealer. For additional technical support, or to find the name of the nearest authorized ENSONIQ Repair Station, call ENSONIQ Customer Service at (610) 647-3930 Monday through Friday 9:30 a.m. to 6:30 p.m. Eastern Standard Time.

IMPORTANT:

"This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures."

* reorient the receiving antenna
* relocate the instrument with respect to the receiver
* move the instrument away from the receiver
* plug the instrument into a different outlet so that the instrument and receiver are on different branch circuits

"If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: 'How to Identify and Resolve Radio-TV Interference Problems.' This booklet is available from the U.S. Government printing Office, Washington, D.C. 20402 Stock No. 004-000-00345-4."

In order to fulfill warranty requirements the VFX should be serviced only by an authorized ENSONIQ Repair Station.

The ENSONIQ serial number label must appear on the outside of the Unit or the ENSONIQ warranty is void.

Part # 9310 004 301-B **Model # MM-40**

Section 1 — Getting Started

Section 2 — Playing Sounds and Presets

Section 3 — Performance Parameters

Section 4 — Effects

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Section 1 — Getting Started

Power

Insert the line cord into the line receptacle on the back of the VFX, next to the Power switch. Plug the other end of the cable into a grounded AC outlet. (The proper voltage for your VFX is listed on the Serial Number label on the rear panel.) Turn the VFX power on and make sure the display lights up. If not, check your connections and power source.

The first thing the VFX does when it starts up is calibrate the keyboard. Be sure not to touch the keyboard while the display reads CALIBRATING KEYBOARD - DO NOT TOUCH.

AC Line Conditioning

As is the case with any computer device, the VFX is sensitive to sharp peaks and drops in the AC line voltage. Lightning strikes, power drops or sudden and erratic surges in the AC line voltage can scramble the internal memory and, in some cases, damage the unit's hardware. Here are a few suggestions to help guard against such occurrences:

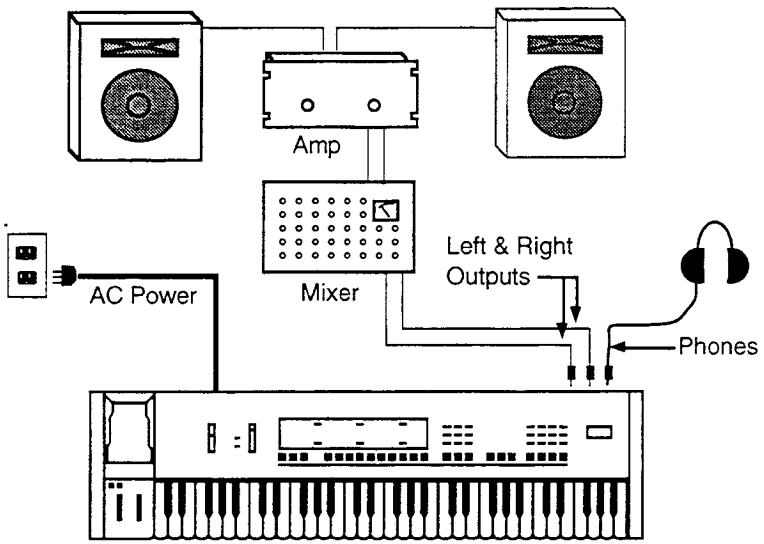
- A Surge/Spike Suppressor. The cheaper of the options, a surge/spike suppressor absorbs surges and protects your gear from all but the most severe over-voltage conditions. You can get multi-outlet power strips with built-in surge/spike suppressors for little more than the cost of unprotected power strips, so using one is a good investment for all your electronic equipment.

- A Line Conditioner. This is the best, but by far the more expensive, way to protect your gear. In addition to protecting against surges and spikes, a line conditioner guards the equipment against excessively high or low line voltages. If you use the VFX in lots of different locations with varying or unknown AC line conditions, you might consider investing in a line conditioner.

Amplification

Connect the Audio Outputs of the VFX to the line level inputs of a mixer, instrument amplifier, stereo, or any other sound system, using 1/4 inch audio

cables. If your system is stereo, connect the Left and Right VFX Outputs to two channels of your mixer, stereo, etc. If it's mono, use either of the VFX's Audio Outputs, but make sure nothing is plugged into the other output. For listening through headphones, plug the phones into the rear-panel jack marked *Phones*. If you're running the VFX through a mixer, in stereo, be sure to pan the Left input fully left, and the Right input fully right.



It is a good idea to make sure your audio system is turned off (or down) when making connections, to avoid damaging speakers or other components.

Note: The VFX's outputs are line-level, and are intended to be connected only to line-level inputs, such as those on a mixer, stereo pre-amp, keyboard amp, etc. Connecting the VFX's audio outputs to a mic-level input, such as a guitar amp or the microphone jacks on a tape deck, is not recommended, and might result in damage to the device input.

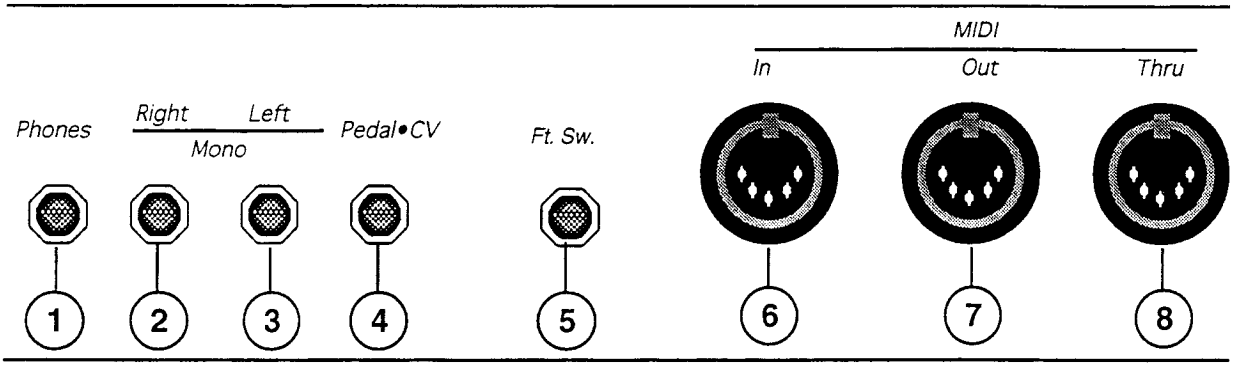
Move the VFX's volume fader *all the way up*. As with any digital musical instrument, the VFX will give the best results if you keep the volume slider full on, and use the volume control on your mixer or amp to adjust its level.

Switch the audio system on, and adjust the amplifier volume for normal listening levels. If you hear no sound while playing the keyboard, switch the audio system off and check your connections.

Running Your VFX Through a Home Stereo System

If you are thinking about amplifying your VFX through your home stereo, a word of caution. A home stereo is great for playing CD's, albums, tapes — the dynamic range of these media is limited, and your speakers aren't usually subjected to extreme volume changes and frequency transients. While the dynamic range of CD's is significantly greater than LP's or tapes, the output of a CD player is still conservative compared to the uncompressed, unlimited line-level output of a pro-level keyboard. Running your VFX — or any pro-level keyboard — through a home stereo at high volume levels can damage your speakers, not to mention the impedance mis-match this can create. If your only means of amplification is your home stereo, then try to keep your levels on the conservative side.

Rear Panel Connections



1) Phones

To listen to the VFX in stereo through headphones, plug the phones into this jack. Headphone volume is controlled by the volume slider on the front panel. (Note that plugging headphones into this jack *does not* automatically turn off the audio in the regular left and right outputs.)

2) Right/Mono

To operate the VFX in stereo, connect this output to a channel of your mixer and pan that channel right. Note that *either* of the audio outputs can be used as a mono output. If you want to use this jack as a mono output, make sure that nothing is connected to the Left/Mono jack.

3) Left/Mono

When operating the VFX in stereo, connect this output to a channel of your mixer and pan that channel left. To use this jack as a mono output, make sure that nothing is connected to the Right/Mono jack.

4) Pedal/CV

This jack is for connecting an optional ENSONIQ Model CVP-1 Control Voltage Foot Pedal, which is assignable as a modulator to various parameters within the VFX. The pedal gives you a handy alternative modulation source when, for example, you would want to use the mod wheel but both hands are busy.

A CV pedal plugged into this jack can also act a volume pedal, controlling the overall volume level of the VFX. A parameter on the Master page (press ***Master***, then underline PEDAL=MOD/VOL), determines whether the CV pedal will act as a modulator or as a volume pedal. Set to PEDAL=VOL to use the CV pedal to control the volume of the VFX.

Pedal/CV Specs: 3-conductor (Tip=control voltage input, Ring=2 KOhm resistor to +12 Volts, Sleeve= ground). 68 KOhm input impedance, DC coupled. Input voltage range=0 to 10 volts DC. Scan rate=32mS (maximum recommended modulation input= 15 Hz). For use with an external control voltage, use a 2-conductor cable with the voltage on the tip and the sleeve grounded.

5) Foot Switch Input

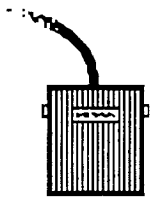
This jack supports either one or two Footswitches depending on what is plugged into it:

- If you plug the ENSONIQ Model SW-1 Foot Switch (which came with your

VFX) into this jack, it will act as a sustain pedal. Holding it down will cause notes to continue to sustain after the key has been released. It can also be assigned to act as the right Patch Select button.

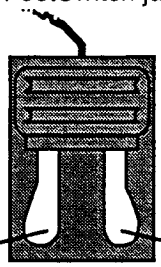
- Or you can connect the optional ENSONIQ Model SW-5 Dual Foot Switch here. The SW-5 is a dual (piano-type) foot switch with two separate pedals. When the SW-5 is connected, the right-hand pedal will act as a sustain pedal and the left-hand pedal will act as an Auxiliary Foot Switch.

When the SW-1 is connected to the FootSwitch jack:



It acts as the Sustain Foot Switch.

When the SW-5 is connected to the FootSwitch jack:



The left pedal acts as the Aux. Foot Switch.

The right pedal acts as the Sustain Foot Switch.

There are two parameters on the Master Page which let you reassign the footswitches to a variety of functions, including reproducing the actions of the Patch Select buttons. See Master page, Section 6 for more.

6) MIDI In

This jack receives MIDI (Musical Instrument Digital Interface) information from other MIDI instruments or computers.

7) MIDI Out

Sends out MIDI information to other instruments and computers.

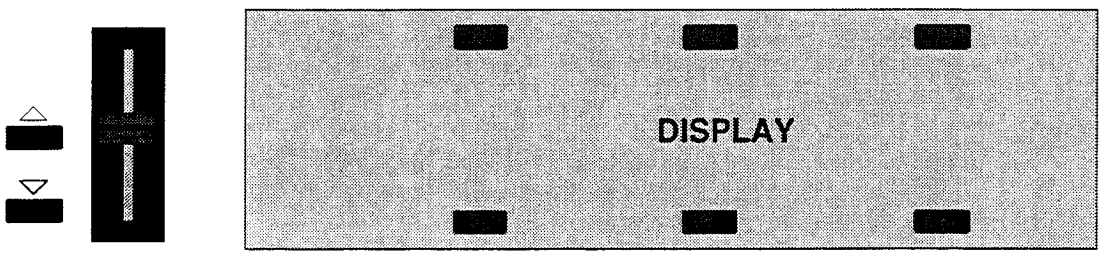
8) MIDI Thru

"Passes on" all MIDI information received by VFX to other devices. Information generated by the VFX itself does not go to this jack — the Thru jack merely echoes what comes in at the MIDI In jack.

Data Entry — Communicating with the VFX

Almost everything you do on the VFX — whether it's selecting a sound, editing that sound, adjusting the tuning, etc. — is controlled from the front panel using the following controls:

- The 80 character fluorescent display,
- The six "soft" buttons directly above and below the display,
- The data entry slider to the left of the display, and
- The up and down arrow buttons to the left of the data entry slider.

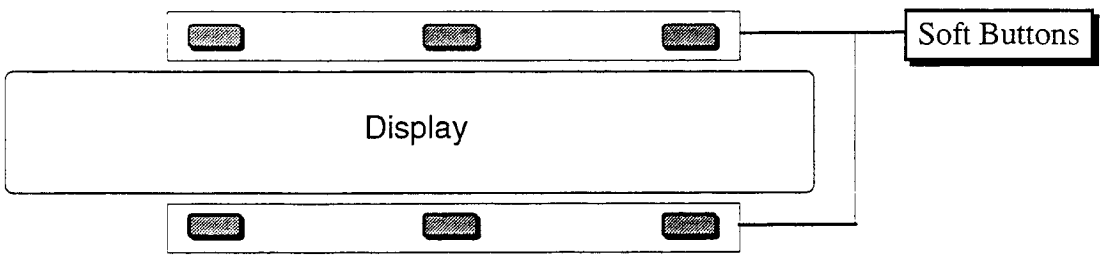


The display and the data entry controls are primarily used to *select* and *modify* things — programs, parameters, keyboard touch, MIDI Control functions, etc. — all depending on which front panel button you press. Try pressing a few of the other buttons — ***Master***, ***MIDI***, ***LFO***, or ***Filters***, for example — and watch the display. Notice that for each button you press, the display changes to show you information related to that function. Each of these different display configurations is called a *Page*.

Soft Buttons

The six buttons above and below the display have a new function each time you select a new page — that is, each time you press one of the buttons outside the data entry section. Each of these six buttons is used to select whatever is directly above or below it on the display.

Because their function varies depending on what is displayed, we refer to these buttons as *Soft Buttons*, to distinguish them from buttons which have fixed, "hard," functions, such as the Page buttons.



Parametric programming

The method used to modify or edit programs, presets and system parameters is called *Page-driven Parametric Programming*, which sounds like a mouthful, but don't worry. Once you've grasped a few basic concepts you'll find that operating the VFX is quite simple, given its many capabilities.

It is likely that you have already encountered some form of parametric programming on other synthesizers. What this means is that instead of having a separate knob or slider for each function, you have one master *Data Entry Slider*,

and two arrow buttons, which adjust the value of whichever parameter you select.

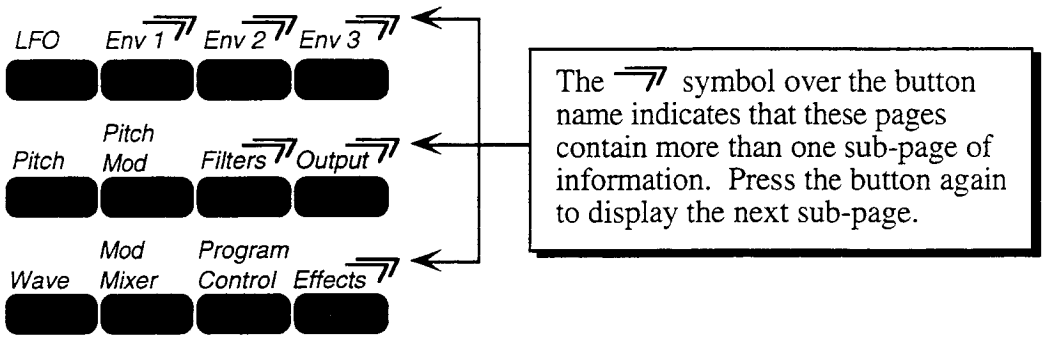
This approach has many advantages, the most obvious of which is that it greatly reduces the amount of hardware — knobs, switches, faders, etc.— needed to control a wide variety of functions. (If the VFX had a separate control for each function, it would literally have hundreds of knobs.)

Pages

The VFX's 80-character fluorescent display makes it possible to display information in *Pages*. Each time you press one of the front panel buttons, you are in effect "turning to" that function's page. Once you have turned to the page you want, the display shows you which parameters are controlled from that page.

Sub-pages

Some of the VFX pages contain more that one screen full of information. Where a page consists of multiple sub-pages, this is indicated on the front panel by a "multi-page" symbol above the name:



Continuing to press the page button will cycle through the sub-pages.

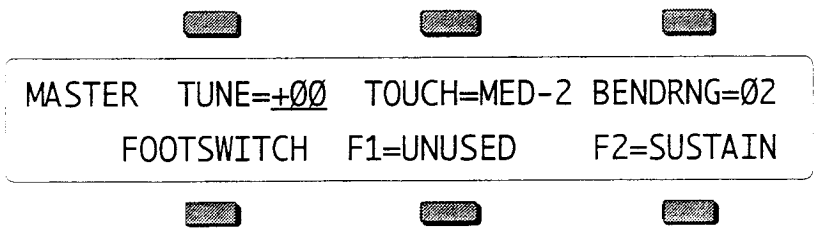
There are two exceptions (pages containing more than one sub-page whose buttons do not have the "multi-page" symbol):

- The Master page (accessed by pressing the ***Master*** button in the System section of the front panel), consists of two sub-pages. See Master Page, Section 6.
- The ***Patch Select*** button in the Performance section has three sub-pages containing, in addition to the Patch Select status, two other "track control" parameters, Pressure mode and Sustain pedal enable. See Section 3 for more details.

As with the other multi-page buttons, pressing either of these buttons again will reveal the next sub-page.

Changing a Parameter

Suppose you want to adjust the master tuning of the VFX. Press the front panel button labeled ***Master***. The display now shows the Master page. It should look like this:



In the top left-hand corner of the display you will always find the *name* of the page, which corresponds to that of the button you pressed. To the right of that are the various parameters which can be selected and modified from this page.

To raise or lower the tuning of the VFX, press the button directly above where it says TUNE=+00. This segment of the display will now be underlined, telling you that it has been *selected*, and can be modified.

The currently selected parameter on a page is always underlined.

Once you have selected a parameter to be modified, use the data entry slider and the up and down arrow buttons to the left of the display to adjust its value:

- Moving the slider will scroll the entire range of available values. If you move the slider slowly it will change the parameter relative to the current value. Moving it quickly will cause the parameter to jump to the absolute value which corresponds to the position of the slider.

- Pressing the up and down arrow buttons will increase or decrease the value one step at a time. Continuing to hold down either button will cause it to accelerate and run quickly through the values.

Hint: There is a quick way to center or "zero out" the value of any parameter which has a center value, as the TUNE parameter does. Press the down arrow button, and *while holding it down*, press the up arrow button, then quickly release both buttons. This automatically sets the parameter value to +00.

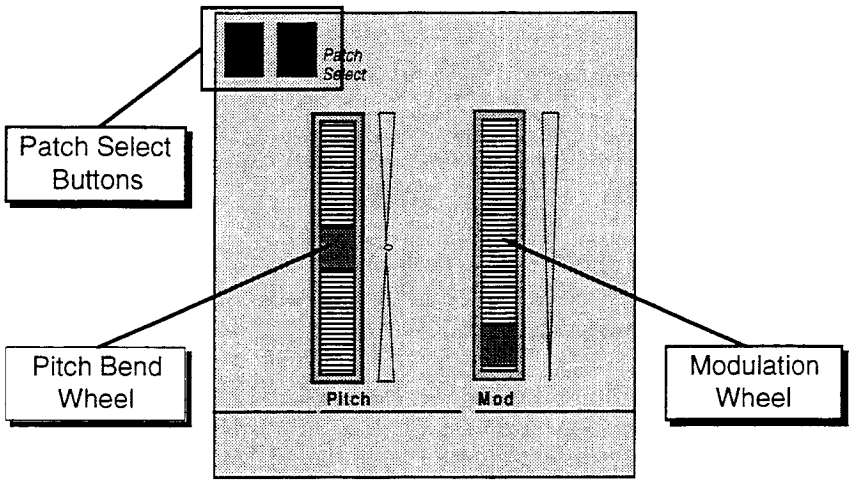
To select and modify another parameter on the same page, press the soft button above or below its name. That parameter will now be underlined, and its value can be adjusted as before, with the data entry slider and the up and down arrow buttons.

If you select another page, change some parameter on that page, and then return to the Master page, the parameter you had last selected will still be underlined. The VFX always "remembers" which parameter was last selected on a given page (including each sub-page where there are more than one).

Be sure that the parameter you want to edit is selected before moving the data entry slider and/or the up and down arrow buttons. There is *always* a parameter selected on any given programming page.

Performance Controllers

The VFX features a number of real-time performance *controllers* which are used to modify sounds as you play for maximum expressiveness. Three of the most important controllers are located to the left of the keyboard:



- PATCH SELECT BUTTONS — These two buttons are used to select alternate groups of voices within a sound. The VFX can be programmed so that the sound changes (sometimes in subtle ways, sometimes radically) when you play notes with one or both Patch Select buttons held down As you try the programs in the VFX, make sure you explore what these buttons do to each sound.

- PITCH BEND WHEEL — This wheel bends the pitch of a note up or down. The wheel is normally centered, where it has no effect on the pitch— moving the wheel up or down will bend the note by the amount specified in the Bend Range parameters contained on the Master page (for global bend range) and on the Program Control page (for setting an individual program's bend range separately).

- MODULATION WHEEL — Perhaps the most common use of the Mod Wheel is to add vibrato, but it can also be assigned as a modulator anywhere within the VFX voice architecture to alter the pitch, brightness, volume and a great many other aspects of the sound.

Among the other controllers which are available to modify a sound are the optional CVP-1 foot pedal and key pressure (see below).

Pressure (After-touch)

Another important controller is *Pressure*. Pressure (often called after-touch) is a modulator which allows you to change the sound in various ways by pressing down harder on a key or keys after the initial keystrike.The VFX keyboard is capable of generating two types of pressure — *Poly-Key™ Pressure* and *Channel Pressure.*

Like the mod wheel or foot pedal, pressure is a modulator, and can be chosen wherever a modulator is selected in the Programming section of the VFX. Pressure can be assigned to alter the pitch or volume of voices, the filter cutoff frequency, LFO depth, pan location, etc.

There are two types of Pressure:

- Channel Pressure, also called Mono pressure, affects all notes that are playing when you exert pressure on any of the keys. If, for example, you play a three-note chord, pressing down harder on any of the three notes of the chord will modulate *all three notes*. This type of pressure is the more common of the two types.

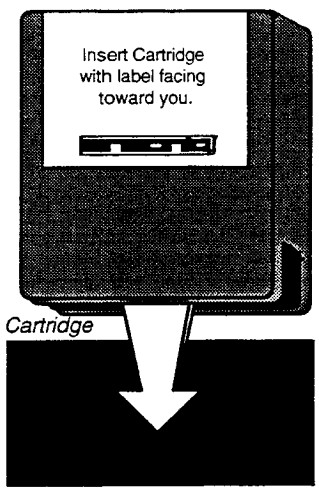
  Most MIDI instruments which currently implement pressure send and receive only channel pressure. If you are playing such an instrument from the VFX, you should set the VFX to send channel pressure. (Note that some devices, including *all* ENSONIQ products respond to both types of pressure.)

- Poly-Key Pressure, also referred to as Polyphonic pressure, is a more sophisticated and expressive type of pressure. Poly-Key pressure affects each key independently. If, for example, you play a three-note chord, pressing down harder on any of the three notes of the chord will modulate *only that note*. The other two notes will remain unaffected.

  In its default state, the VFX *always* generates Poly-Key pressure, no matter which sound or preset you select. If you wish to send channel pressure, or turn pressure off for a given track, you can do so on the MIDI page in the Performance section of the VFX. See Section 3 for more details.

Cartridge Insertion and Removal

Before you can play sounds and presets from a cartridge, you must first insert into the Cartridge slot an ENSONIQ VPC-100 series ROM cartridge, a Stor-Cart 32 E²PROM cartridge, or other VFX-compatible program cartridge, as shown below with the label facing towards you. Take care to insert the cartridge straight into the slot in a continuous fashion.



VFX program cartridges can be inserted or removed at any time (except while you're writing programs to them), even when the VFX's power is on, without doing any harm to the VFX or the cartridge.

Re-initializing the VFX

The great power and flexibility of the VFX lies in the fact that it is really a computer — a computer disguised as a keyboard instrument, but a computer nonetheless. The software that operates the VFX is very sophisticated. In fact, there is a 128k computer program that runs inside the VFX (the Operating System code). That's more than many personal computers. If you have ever used a computer, you should be familiar with the need to occasionally re-boot your system when you get an error message, etc. Re-initializing the VFX is the equivalent of re-booting your computer.

There are a number of things that can happen to the VFX (or any computer system) which might scramble the system software — voltage surges, power failures, static electricity, etc. And as with any computer, very infrequently some unforeseeable event or combination of events can cause the software to become confused, with strange and unpredictable results. Sometimes, computers which appear to be broken have no hardware problem, just corrupted data in the internal RAM (Random Access Memory). In some cases, simply turning the VFX power off and then on again will cure the problem. If that doesn't work, perhaps what is needed is to re-initialize the unit.

When to Re-initialize
If your VFX begins to behave in peculiar ways; if the display shows words or lines that shouldn't be there; if you start getting unexplained System Error messages; if the system control and edit functions start doing unpredictable things; try re-initializing the VFX before you seek factory service.

Warning: When you re-initialize your VFX all your current internal sounds and presets will be lost. However, the 60 ROM (Read Only Memory) sounds and presets are automatically loaded back into the internal memory after re-initializing). Therefore good backup habits should be an important part of your routine. Save any important data to cartridge or a MIDI Sys-Ex storage device before re-initializing the VFX.

To Re-initialize the VFX:

- While holding down the ***Presets*** button, press the "Soft" button in the top left corner above the fluorescent display.
- The following message appears on the display: "ERASE MEMORY AND REINITIALIZE"
- Select *YES*. After selecting *YES*, the VFX erases its internal memory and then starts up just as it does when you turn the power on, and initialization is complete. When you re-initialize the VFX, the ROM Programs and presets are automatically placed in the Internal Memory.
- Press any button to continue.

If re-initializing your VFX does not correct the problem, then contact an authorized ENSONIQ Repair Station.

Low Battery Voltage — When to replace the Battery

The reason that the VFX "remembers" programs, presets and other parameters, even when the power is off, is that all of its internal RAM is "battery-backed-up." The battery that keeps the VFX's memory intact is located inside the VFX, and when it becomes discharged, it must be replaced by an authorized ENSONIQ Repair Station.

The battery that came in your VFX is good for up to five years of life. You will know when it needs replacing, because the VFX will tell you so. One day you will switch the power on, and instead of its usual wake-up message, the display will read:

WARNING -- LOW BATTERY VOLTAGE
SAVE DATA - SEE USER MANUAL *CONTINUE*

Press *CONTINUE* (or any button) to commence normal operation. Then, make sure that all programs and presets are saved to cartridge or to a remote MIDI storage device, and take the VFX to an authorized ENSONIQ Repair Station as soon as possible to have the battery replaced.

Available Options

These optional accessories are available from your **ENSONIQ** dealer:

- **ENSONIQ Model SW-5 Foot Switch** — For voice sustain, sostenuto, patch select, preset advance or starting and stopping a remote sequencer.
- **Model CVP-1 CV PEDAL** — A *Control Voltage Foot Pedal* which can be assigned as a modulator within the voice section of the VFX or used as a volume pedal.
- **Stor-Cart 32 E²PROM Storage Cartridge** — For storing the programs and presets you create or edit. Programs and presets can be saved to the Stor-Cart 32 just like the internal memory. The 60 programs and 20 presets in the program cartridge, combined with the internal RAM and ROM, give you 180 programs and 60 presets instantly available for performance.
- **VPC-100 series ROM Cartridges** — Containing 60 factory-programmed sounds and 20 presets. Unlike the Stor-Cart 32, the programs and presets in the VPC cartridges are stored permanently there and cannot be replaced.

Need More Help?

Whether you're an aspiring programmer looking for additional information about basic synthesizer and MIDI theory, or a professional sound designer working with advanced applications, you may want more detailed information that is beyond the scope of this manual. The following books can help enhance your understanding of synthesis, MIDI, and related topics. These, in addition to the numerous monthly magazines, provide a wealth of information. While we don't endorse any one of these publications, we offer this partial list as a resource for you to draw on.

Alexander Publishing
For prices and additional information call: 1-800-633-1123
MIDI
1989—HOW MIDI WORKS, Dan Walker

MURPHY'S LAW MIDI BOOK, Jeff Burger

SAMPLING

SAMPLING BASICS, Bob Maestas

SEQUENCING

SEQUENCING AND ARRANGING Vol's 1-4, Joesph Wagner

SYNTHESIZERS

RECORDING, SYNCING & SYNTHS, Paul Goldfield

TEACH YOURSELF KEYBOARD PLAYING & IMPROVISING, Vol's 1 & 2, Dr. Jack Wheaton

The Mix Bookshelf

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MUSIC THROUGH MIDI, Michael Boom
THE MIDI HOME STUDIO, Howard Massey
THE MIDI BOOK, Steve De Furia
MIDI RESOURCE, Steve De Furia
MIDI IMPLEMENTATION BOOK, Steve De Furia
THE MIDI SYSTEM EXCLUSIVE BOOK, Steve De Furia
USING MIDI, Helen Casabona, David Frederick
MIDI, THE INS, OUTS AND THRUS, Jeff Rona

SAMPLING

THE SAMPLING BOOK, Steve De Furia, Joe Scacciaferro

SYNTHESIZERS

GUITAR SYNTH & MIDI, Guitar Player Magazine
SECRETS OF ANALOG AND DIGITAL SYNTHESIS, Steve De Furia
BEGINNING SYNTHESIZER, Helen Casabona, David Frederick
THE NEW COMPLETE SYNTHESIZER, David Crombie
SYNTHESIZER BASICS, Dean Friedman
THE KEYBOARD SYNTHESIZER LIBRARY, Keyboard Magazine
A SYNTHESIST'S GUIDE TO ACOUSTIC INSTRUMENTS, Howard Massey

GPI Books

For prices and more information call 1-800-999-9018

MIDI

ADVANCED MIDI APPLICATIONS BASIC MIDI APPLICATIONS
MIND OVER MIDI
USING MIDI
WHAT IS MIDI?

SYNTHESIZERS

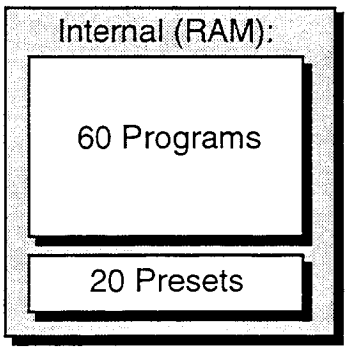
ART OF ELECTRONIC MUSIC
BEGINNING SYNTHESIZER
PLAYING SYNTHESIZERS
PROGRAMMING SYNTHESIZERS
SYNTHESIZERS AND COMPUTERS (REVISED)
SYNTHESIZER BASICS (REVISED)
SYNTHESIZER PROGRAMMING
SYNTHESIZER TECHNIQUE (REVISED)

Section 2 — Playing Sounds and Presets

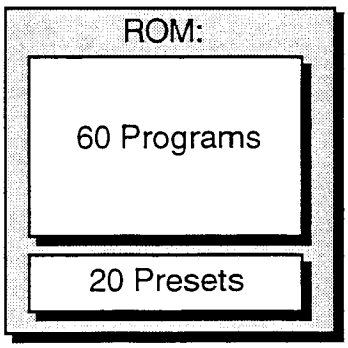
Program Memory

Each VFX sound is a complex structure consisting of up to six voices per key and a programmable effects setup. We refer to these sounds as *Programs*. In this manual we will use the words *program* and *sound* interchangeably to describe VFX programs. The VFX gives you access to up to 180 different sounds at any time:

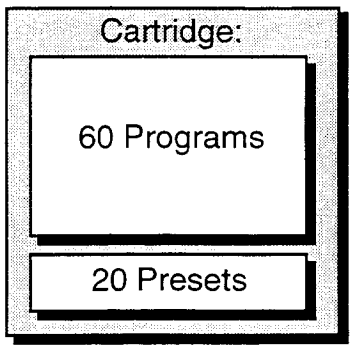
- INT — 60 sounds are stored in the VFX's *Internal Memory* (RAM).
- ROM — Another 60 sounds are permanently stored in its *ROM Memory*. Like the INT sounds the ROM (read only memory) sounds are contained within the VFX; but unlike the INT sounds they cannot be modified or replaced.
- CART — 60 additional sounds can be stored in a cartridge plugged into the cartridge port.



Sounds and Presets stored in Internal RAM Memory can be played, edited and replaced with other sounds or presets.



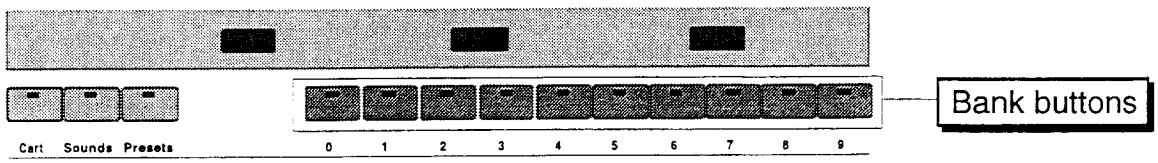
Sounds and Presets stored in the ROM Memory can be played and edited, but cannot be erased. Edited versions can be stored in Internal Memory or E2PROM cartridge.



Sounds and Presets stored in the cartridge can be played and edited. You can save edited sounds and presets to Internal RAM memory or E2PROM cartridge.

Bank Buttons

When the ***Sounds*** LED is lit, the ten Bank buttons, labeled 0 through 9 and located beneath the display, are used to call up the programs in memory, six at a time, allowing you to then select the one you want to play. We call these groups of six programs *Program Bank pages.*



The Bank buttons also select presets when the ***Presets*** LED is lit (more about presets later).

Selecting a sound

To select a VFX program:

- Press ***Sounds***.
- Press one of the 10 Bank buttons below the display (numbered 0-9) to select a bank of six programs. The display shows you the names of the six programs in each bank.
- Press the button above or below any of the six program names to select that program as the current sound. Try selecting and playing a few different sounds. Notice that when you select a program, its name is underlined. The currently selected program is always underlined.

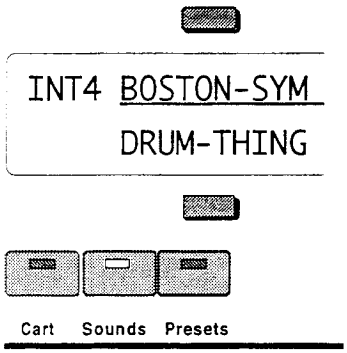
Choosing Internal, ROM and Cartridge Sounds

The ***Cart*** button is used to choose between internal, ROM and cartridge sounds. The status of the ***Cart*** LED (whether it is off, on or flashing), along with the display, tells you where you are at any given time. Press ***Sounds***. Then:

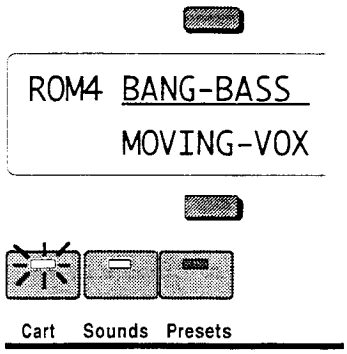
- To select internal sounds, the ***Cart*** LED should be off (unlit). If it is on or flashing, press ***Cart*** until it is off. The display indicates INT followed by the bank # in the upper left corner.

- To select ROM sounds, double-click the ***Cart*** button (press the button twice in rapid succession). The ***Cart*** LED *flashes*, and the display indicates ROM followed by the bank # in the upper left corner.

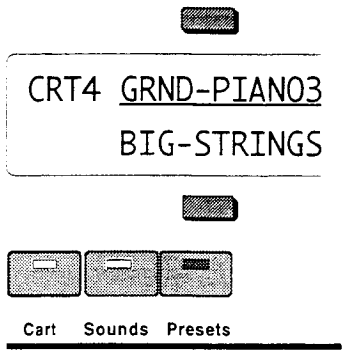
- To select cartridge sounds, press the ***Cart*** button once. The ***Cart*** LED lights, and the display indicates CRT followed by the bank # in the upper left corner. (Note that a VPC-100 or other cartridge must be inserted before cartridge sounds can be selected and played.)



When the Sounds LED is *on* and the Cart LED is *off*, the VFX is playing programs from its internal RAM memory. The upper left corner of the display shows INT plus the bank number (0-9).



When the Sounds LED is *on* and the Cart LED is *flashing*, the VFX is playing programs from its internal ROM memory. The upper left corner of the display shows ROM plus the bank number (0-9).



When the Sounds LED is *on* and the Cart LED is *on* (but not flashing) the VFX is playing programs from the cartridge. The upper left corner of the display shows CRT plus the bank number (0-9).

Once you have selected INT, ROM or CRT, select a sound using the ten bank buttons and the six soft buttons above and below the display as shown previously.

Layering (stacking) a sound with the selected sound

To layer (or stack) any program with the currently selected program, *double-click* the soft button corresponding to the sound name on the display. The underline beneath the name of the layered sound will *flash* and you will hear both sounds playing together.

Up to three programs (one selected and two layered with it) can be active at once. To deselect a layered sound, press its button again and the flashing underline will disappear. If you already have two programs layered with the primary program, and you double-click on a fourth sound, that sound will replace the most recently layered sound in the stack.

You can layer any combination of Internal, ROM or Cartridge sounds. Also, the sounds which are layered do not have to be in the same bank.

Primary sound vs. layered sounds

We refer to the sound which is currently selected — solidly underlined on the display — as the *primary* sound. Any other sounds on which you double-click are considered to be *layered* with the primary sound. Only one sound is ever *selected* at a time. Whenever you select a new sound *it* becomes the primary sound.

This is an important concept because the primary sound determines which Effects set-up will be used for layers and presets. Whenever you select a new primary sound, a new effects algorithm is loaded along with it (unless the new sound has the same effect as the previous one). Layering a sound or selecting a different sound within a preset does not change the current effects setup.

About Tracks

From the player's perspective, there are two main performance modes in the VFX - *Preset mode* and *Multi mode*. There are a few concepts that need to be established before we can clearly describe the features of these two modes.

In the VFX, the term *track* refers to one of the fifteen internal "channels", each of which contains a program and a complete set of performance parameters, including volume, pan, controller settings, MIDI channel, keyboard zone, and others.

Our use of the term *track* may seem unusual in an instrument which does not have a sequencer, but there are some reasons which make this a convenient term to describe certain aspects of the VFX.

Multi-channel audio tape recorders have numerous physical tape tracks onto which you can magnetically record complex polyphonic information. Sequencers simulate this by recording events which describe a performance onto virtual tracks in computer memory. When these sequence tracks are played back, the recorded information can be sent to remotely controlled sound generators to recreate the performance. Multi-timbral instruments can respond to inbound information from such sequencers on multiple channels, with each channel responding to a track from the sequencer.

When the VFX is used as a multi-timbral sound generator controlled from an external MIDI sequencer, the various tracks of the sequencer can be assigned to different MIDI channels, which in turn control the programs played by the VFX. Each MIDI channel to which the VFX responds can be thought of as an extension of the sequencer's track. Similarly, the keyboard of the VFX can be used to control both the different sounds within the instrument and MIDI channels to which external devices are connected. It is convenient for us to describe this logical construct, comprised of a MIDI channel and a program and various performance parameters, as a track

Preset Mode vs. Multi Mode

A *preset* is a set of three tracks, which can be layered or not, each of which has a program and a set of performance parameters associated with it.

The most common context for the VFX to be in is *Preset mode*. Unless one of the two Multi A or B buttons has been pressed, and its LED is on, you may assume that you are in a preset. Aside from the presets that are saved, there is a non-volatile *preset buffer* that is always active.

Whenever you select or layer or edit a program, you are working within this preset buffer. The information in the preset buffer is temporary until you save it into one of the internal or cartridge preset locations, and then it becomes more permanent (it can be recalled). The performance parameters of the preset, including volume, pan, transpose, etc. are always active and you should make sure that their settings are correct if you think that your programs are behaving strangely. Whenever you select a new program from the Program Bank pages, the performance parameters are reset to their standard default settings. If you wish to change a program without resetting these parameters, use the Replace Program feature described later in this section.

There are three tracks in a "normal" preset and twelve in the Multi setup. The Multi setup can be thought of as a giant twelve track preset. However, this giant preset is not available simultaneously with normal three track presets. The twelve tracks of the Multi setup are available from the keyboard only while in Performance Multi mode, indicated by the LED in either the ***Multi A*** or ***Multi B*** button being on, or from MIDI while the MIDI mode is set to MULTI. Use of the Multi setup is described in more detail later in this manual.

About Presets

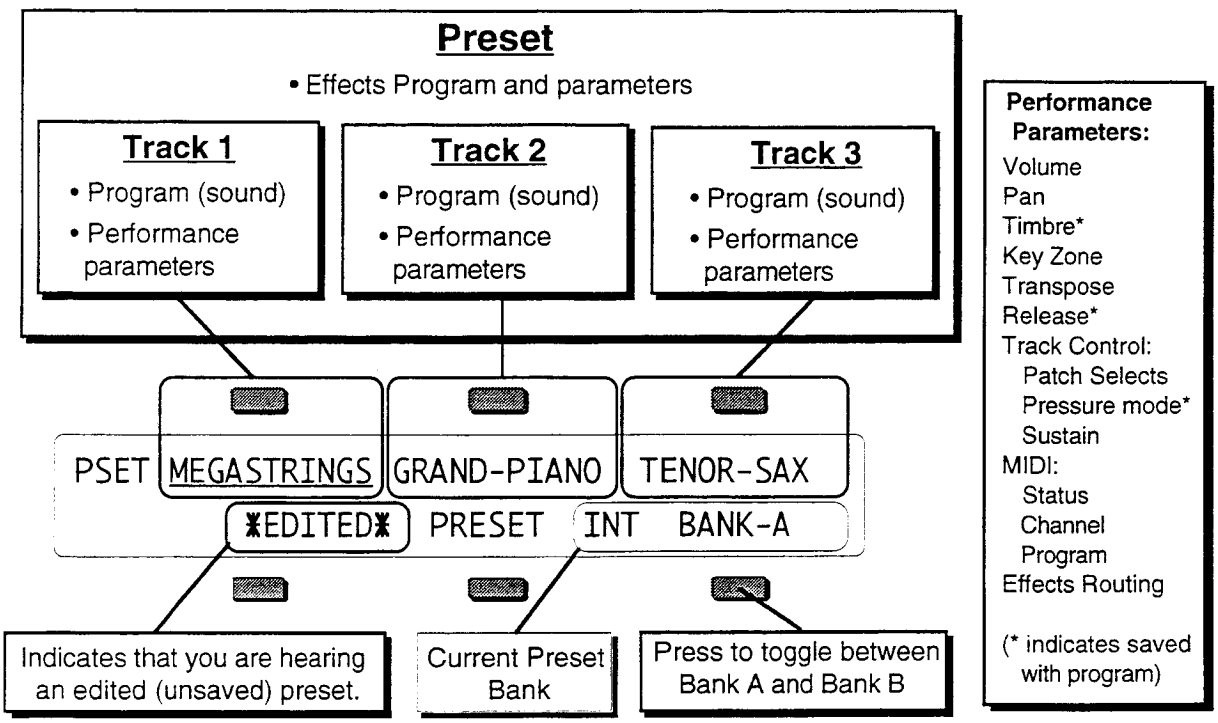
A *Preset* is a combination of three sounds and an effects set-up which can be instantly recalled for use in performance. Presets are handy "performance memories" which allow you to create and save sound combinations, splits, layers, patch select variations, etc.

The three sounds in a preset reside on three *Tracks*. For *each* of these three tracks, the VFX remembers:

- Which sound is assigned to the track
- Whether the sound is selected, layered or neither, and
- The values of all the Performance parameters for that track.

A preset also has one Effects program which is common to all three tracks.

Press ***Presets***. The LED in the ***Presets*** button lights, indicating that you are in Preset mode. Across the top line, the display shows the names of the three sounds that are on the three tracks. On the lower line you see "context" information about the current preset. The illustration below shows the relationship of the preset and its three tracks to what you see on the display:



Whenever the ***Presets*** LED is lit, this indicates that the VFX is in Preset mode, and the 10 Bank buttons beneath the display will now select presets (rather than selecting Program Bank pages, as they do when the ***Sounds*** LED is lit).

Preset Memory

Presets are located in one of three places within the VFX memory:

- INT — 20 presets in the Internal memory, 10 in Bank A and 10 in Bank B.
- ROM — 20 presets in ROM Memory, 10 in Bank A and 10 in Bank B.
- CRT — 20 presets in each cartridge, 10 in Bank A and 10 in Bank B.

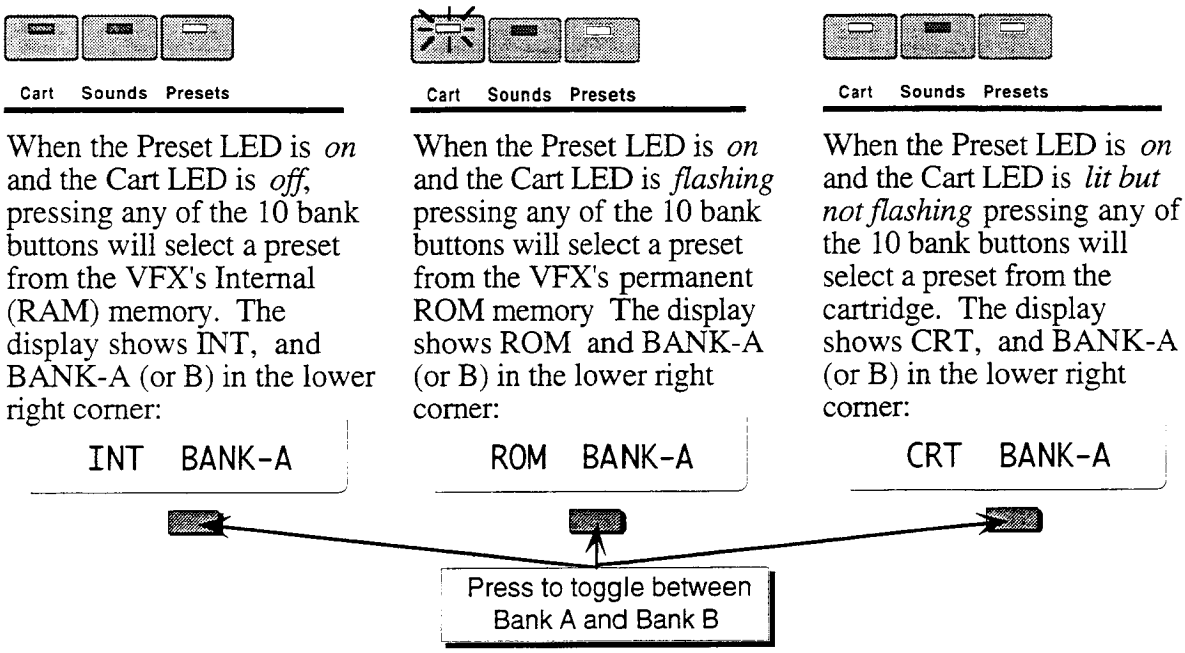
Selecting Presets

Once you have pressed the ***Presets*** button to enter Preset mode, presets are selected by pressing the 10 bank buttons beneath the display. The status of the LED in the ***Cart*** button determines whether the 10 bank buttons select Internal, Cartridge or ROM presets.

The Bank Indicator in the lower right corner of the the display tells you whether you are selecting presets from Bank A or Bank B. Pressing the soft button beneath the bank indicator (or double-clicking the ***Presets*** button) toggles between Bank A and Bank B.

- To select internal presets, the ***Cart*** LED should be off. If it is on or flashing, press ***Cart*** until it is off. The display indicates INT + BANK A or B
- To select ROM presets, double-click the ***Cart*** button (press the button twice in rapid succession). The ***Cart*** LED flashes, and the display indicates ROM + BANK A or B
- To select cartridge presets, press the ***Cart*** button once. The ***Cart*** LED lights, and the display indicates CRT + BANK A or B.

Once you have selected Internal, ROM or Cartridge, simply press one of the 10 bank buttons to select a preset. The LED in the bank button lights to indicate which preset is selected.



Editing a Preset

In addition to the presets stored in memory, there is one more preset which you are using most of the time whether you know it or not. Whenever you are selecting or layering sounds in Sounds mode, you are also creating a preset. The

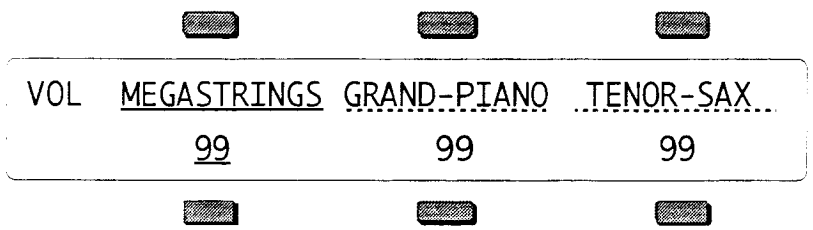
VFX automatically "remembers" the last three sounds you selected and stores them in a special memory buffer called the *Edit Preset.*

Try this:
- Press ***Sounds*** and select a program by pressing its soft button.
- Layer another sound with the first by double-clicking its soft button.
- Layer a third sound by double-clicking on it.

You now have three sounds playing simultaneously. Suppose you wanted to adjust their relative volumes, or shorten the release time, or change the pan location of one of the sounds without losing the combination. In fact, you can do these things and a lot more with presets.

As we have already discussed, a preset consists of three tracks, each of which has a program and a set of performance parameters. The performance parameters are found in the Performance section of the front panel. Presets can be saved, so that you can call them up at any time, or you can use the Edit Preset in real time as a powerful performance tool.

While you still have three programs layered, press the ***Volume*** button in the Performance section. The display shows:



- Across the top line you see the three programs you selected, one with a solid underline and the other two with a flashing underline, just as they appeared on the program bank pages.
- On the lower line you see the volume levels for each sound. You can select which one you want to adjust by pressing the button beneath the value.
- Note that you can select a track for editing (using the lower three buttons) independent of what is selected or layered on the upper line of the display. This means, for example, that you can adjust the volume of any of the three sounds in the stack without having to un-layer them.

On this and all Performance parameter pages, selecting or layering things from the upper line determines what sound(s) you *hear*, and selecting things from the lower line determines which track will be modified if you move the data entry slider or the up/down arrow buttons.

Try pressing some of the other Performance page buttons — ***Pan***, ***Timbre***, ***Key Zone***, etc. — and adjusting the Performance parameters on those pages. You will soon see that within a preset it's easy to create splits and layers, transpose a sound, change the pan and many other useful things. You can even assign one or more tracks in a preset to play *only* over MIDI, making presets a great for controlling remote MIDI instruments as well as VFX sounds.

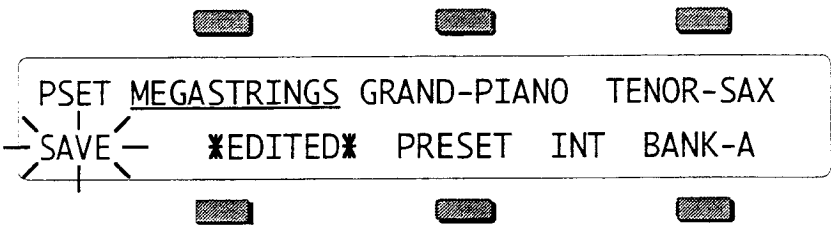
Section 3 of this manual entitled "Performance Parameters" covers these functions and their use in detail.

Saving a Preset

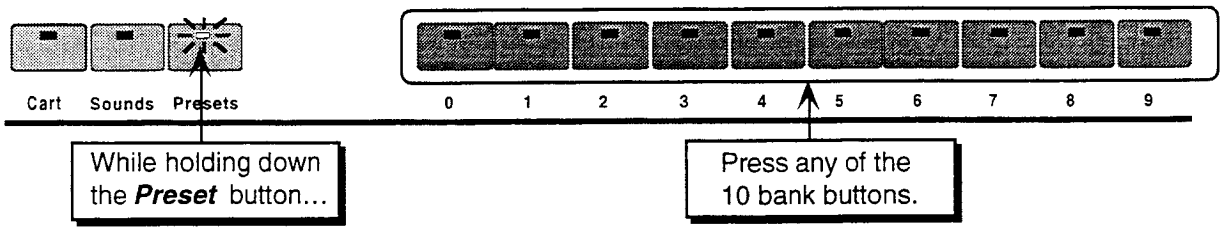
Once you have created a preset you like, you can save it to one of the 20 Preset locations in the internal memory or to a cartridge. (Note that you cannot save presets or sounds to the ROM memory — it is *read only*.) Saving a preset to an internal or cartridge location will *erase* the one that is there, so be careful.

To save a preset, decide where you want to save it, then:

- Press ***Presets***.
- Select Internal (INT) or Cartridge (CRT) using the ***Cart*** button.
- Select Preset Bank A or B by pressing the soft button beneath the Bank indicator in the lower right corner of the display.
- Press and hold down the ***Presets*** button. The ***Presets*** LED flashes, and the word SAVE flashes in the lower left corner of the display.



- While holding down ***Presets***, press one of the ten bank buttons. The Edit Preset is saved into that location:



If you need to listen to a few presets in order to decide which one to replace, simply press ***Presets*** and then select presets just as you normally would, by pressing the bank buttons. The word *EDITED* disappears from the screen, meaning that you are listening to saved presets. Your new preset is safe in its own edit memory. But make sure you don't change *anything*, including selecting or layering sounds, in any of the presets you audition, or this will create a new Edit Preset, erasing the one you created.

When you are ready to save the new preset, press the bank button of the currently selected preset. It's LED turns off, and you are returned to the Edit Preset (the word *EDITED* should return on the display). Now you can save the preset as described above.

Avoiding confusion when using Presets

Whenever you create and save a preset, the VFX only "remembers" the *location* of the three sounds in internal or cartridge memory — not the actual programs themselves. If you move a program, put another in its place, or transfer an entire bank of sounds, the preset might still be "pointing to" a location that no longer contains the sound you had in mind.

For example, if you create and save a preset containing a brass sound, a string sound and a piano sound, and you then write over the piano program (or insert a different cartridge, in the case of presets containing cartridge programs) a different sound will now appear in place of the piano sound — whatever is now in the location originally occupied by the piano sound.

If one or more of the sounds in a preset is a cartridge program and you remove the cartridge, the words CART-SND-## will appear instead of the program name, and the sound that plays will be the internal program with the same relative memory location (until you replace the cartridge).

This leads us to one very important piece of advice:

- *You should use only internal and ROM sounds in presets saved to internal memory, and use only cartridge and ROM sounds in presets saved to a cartridge.*

It is possible, of course, to mix internal and cartridge sounds in a single preset, but we recommend that you avoid doing so, as it will definitely lead to confusion when the cartridge is changed or new sounds are loaded into the internal memory.

Replace Program

The Replace Program function is primarily used for:

- Assigning programs to tracks without changing the effects or other performance parameters
- Determining the exact placement of programs in a preset

Normally, when programs are selected from the program bank pages, they are transferred to a track in the current preset and many of the performance parameters for that track are reset to standard default settings. However, you may wish to change which program is assigned to a track in a preset (or in the Multi setup) without changing any of the other settings for that track. This is done using the Replace Program feature. The ***Replace Program*** button is located next to the ***Multi A*** and ***B*** buttons on the bottom row in the Performance section.

Replacing a program in a Preset

- Press one of the Performance parameter buttons, such as ***Volume***, to display the current preset, and make sure that the correct track is selected. The track whose program will be replaced is indicated by the underlined parameter on the lower line of the display. It does not matter which type of parameter is displayed. Use the three soft buttons below the display to select the correct track.

- Press the ***Replace Program*** button. The last selected program bank page will be displayed and the LED in the ***Sounds*** button will start to blink, indicating that you are in Replace Program mode.

- Locate the program that you wish to install into the track and press the soft button nearest to it. This program is now installed on the track, and will acquire the status of the program that was replaced if it was selected or layered. You may change banks and/or continue to select replacement programs until you are satisfied that you have found the right one. If you select a program for a track which is not currently selected or layered in the preset, you will be immediately

returned to the preset page you were on.
- Press ***Replace Program*** again to exit Replace Program mode and return to the preset page to verify that your change was correct. Pressing ***Sounds*** or any other page button will also exit Replace Program mode.

The method described above will also work for changing the program assigned to a track in the Multi setup (Multi A or B).

Performance Tip — Creating Keyboard splits

One of the most common usages of presets is a keyboard split, in which your left hand plays an "accompaniment" sound and your right hand plays a "solo" sound. This is easy to set up on the VFX by layering the two sounds and assigning them different key zones. You can save this arrangement as a preset so that any time you select that preset, you'll recall the keyboard split.

Since presets can hold three sounds, you can add another "solo" sound by layering it (double-click) and then setting its key zone. Once you have a preset with a split and two different "solo" sounds, it's possible to switch back and forth between "solo" sounds with one button press. First, select (single-click) one of the "solo" sounds. Then, layer (double-click) the "accompaniment" sound. Now, you can switch between "solo" sounds by selecting the unused solo sound. The layered sound will not be turned off, since it's not "covered up by either of the selected sounds.

Since each track in the keyboard split has its own Transpose value, you are not limited to bass notes on the piano just because it's on the bottom of the keyboard. Just set the key zone to the keys you want to play and then transpose the sound up or down until it's playing in the range you want.

Once you have a keyboard split, you can change any of the sounds without affecting the split points by using the ***Replace Program*** button (see "Replace Program," above).

Section 3 — Performance Parameters

- provide easy access and control for track and sound attributes
- are used in creating presets

About Performance Parameters

A group of Performance Parameters is associated with each track. These parameters control various aspects of the track, including some important and useful sound controls which may be easily adjusted during performance. The settings of these parameters are saved with every preset. These instantly recallable presets include an effect setup and three programs on three tracks with a full set of programmable performance parameters, including key zones, transpositions, release times, timbral variations and others. The settings on the Multi A and B tracks are preserved in non-volatile battery backed-up RAM while the power to the VFX is off, and are always available.

The buttons which control the pages containing these parameters are found in the Performance section of the front panel.

The Performance Parameters are:

VOLUME		overall volume adjust
PAN		stereo panning control for track program
TIMBRE		programmable sound variation control
KEY ZONE		set key zone ranges
TRANSPOSE		key number transposition
RELEASE time		program release time adjust
Track Control	PATCH SELECT	default setting of Patch Select control
	PRESSURE type	selects type of pressure used
	SUSTAIN enable	enables or disables the sustain pedal
MIDI	STATUS	enable or defeat MIDI function
	CHANNEL	MIDI channel number
	PROGRAM	MIDI program number
EFFECT	FX	controls routing of track to effect
	Select and Mix	effect control for preset or multi
	Parameter 1	effect parameter page 1
	Parameter 2	effect parameter page 2

To view or adjust the setting of a particular type of performance parameter, press the appropriate button in the Performance section. The selected parameter type is indicated in the top-left corner of the display.

On the Preset pages, the top line of the display will show the names of three programs and their current layering status. The name of the parameter type is abbreviated to four characters in order to make room for the program names, and is shown in the top left corner of the display. The bottom line of the display shows the current values of the selected parameter for the three tracks of the preset.

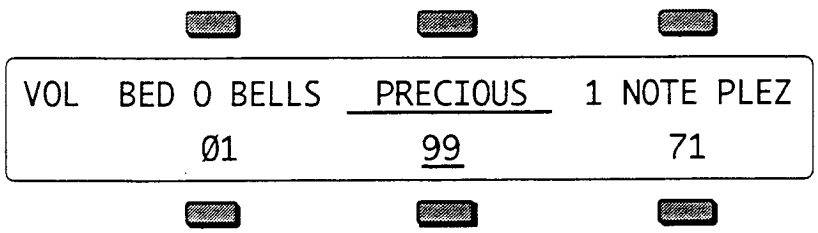
For the Multi A and B pages, the current values of parameters for the six tracks will be displayed. Except in the cases of performance parameter buttons with subpages, you can press the parameter page button again to toggle back and forth between the page which shows the names of the programs on the tracks and the page which shows parameter values. The Multi A and B buttons will also perform this toggling function.

The currently selected track parameter will be underlined. This is the active parameter which can be modified. You may select a parameter for a different track by using the soft buttons. When programming performance presets, the lower row of soft buttons is used to select tracks. For the Multi A & B tracks, both upper and lower row of soft buttons are used.

Remember that you can edit parameters on tracks that you are not hearing. The tracks that you can hear are indicated with solid or flashing underlines on their names.

Unless otherwise noted in the detailed descriptions which follow, use the increment/decrement buttons or the data entry slider to adjust the value of the parameter.

Volume Page

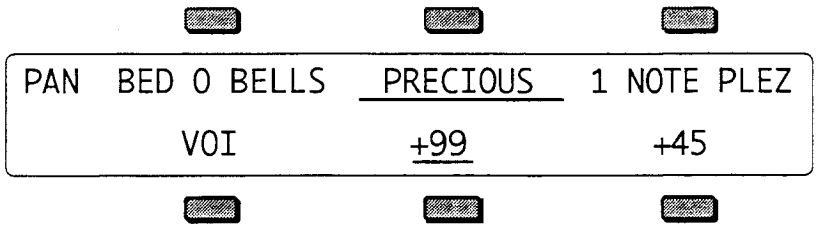


The Volume Page enables you to make volume changes to the individual tracks, allowing you to balance the VFX sounds and/or control the volume of external MIDI devices.

Range: 0 to 99.

All tracks whose MIDI Status is set to MIDI or BOTH will send a MIDI Volume Change message (controller 7) with the indicated value whenever this parameter is edited. Preset tracks will also send the current volume for each track when a preset is selected.

Pan Page

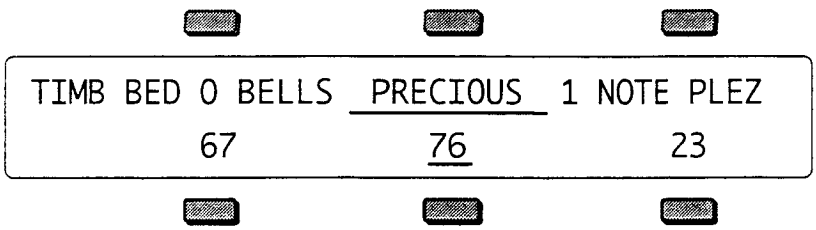


The Pan Page gives you control over the placement of the track's sound in a stereo field.

When a track is set to VOI, which is an abbreviation of VOICE, the voices of a program are panned according to the settings originally programmed on the Output page for each voice. Setting this parameter to any other pan value will override the original settings and will force ALL of the voices of the program to be panned to that location.

Range: +00 (hard pan left) to +99 (hard pan right). A setting of +50 places the sound in the center of the stereo field. The minimum setting is VOI which indicates that the individual voice's pan settings will be used.

Timbre Page



The Timbre parameter provides an easy way to make useful changes to the character of a sound without getting into more complex programming. This performance parameter uses the data entry slider or up/down arrow buttons to control various aspects of the sound, depending on the what the programmer has decided would be useful.

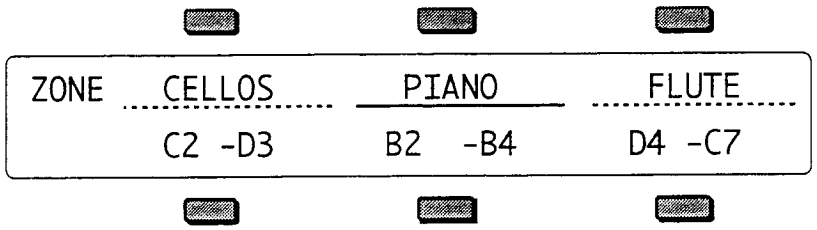
As one of the voice modulation sources, TIMBRE can be assigned to anything that can be modulated in a program or effect. The Timbre control can be connected to parameters such as filter cutoff, waveform modulation, LFO rate, and others. It is a good idea to experiment with the Timbre setting to hear what it has been programmed to do in each program.

Range: 00 to 99

All tracks whose MIDI Status is set to MIDI or BOTH will send a MIDI Continuous Controller message (controller 71) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The current value of TIMBRE is saved with the program whenever a program is written, and is restored whenever the program is selected.

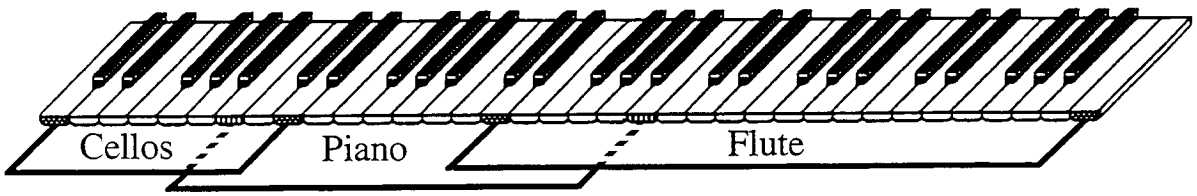
Key Zone Page



Each track has its own independent Key Zone within which the track will play. Key Zones can be used to create simple two-program splits, or to create more complex keyboard layouts. Key Zones control which keys will be sent out via MIDI as well as which keys will play on the local voices of the VFX.

You can divide the keyboard into as many as twelve different key zones by using the twelve MULTI A and B tracks. In addition, you can set the key zone so that each zone overlaps the next, producing "layered" zones in which you would hear the sounds from more than one track.

The illustration below shows an example of three tracks with overlapping key zones. The Piano is layered with, and partially overlaps, the Cellos on the lower end and the Flute on the upper end. The Key Zone settings for this example are shown in the sample display above.



Setting the Key Zone

Range: A0..C8

Unlike other performance parameter pages, the normal state of this page is to have no parameter fields underlined.

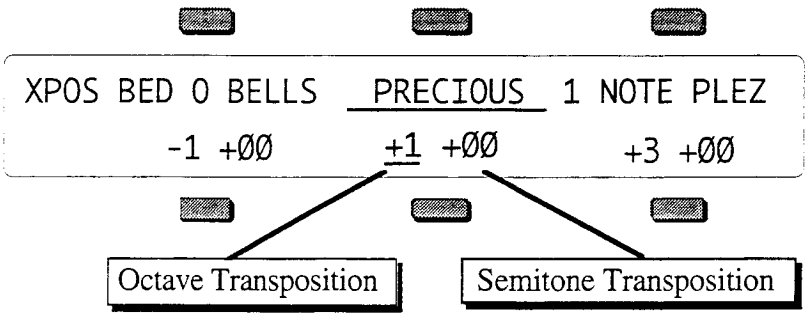
In order to set a Key Zone:

- Select the track by pressing the soft button nearest the zone you wish to set. This will result in the Low Key of the zone (the left key number) becoming underlined.
- Play the key on the keyboard which you want to be the *lowest* key of the zone. The underline will automatically move to the right for the High Key of the zone.
- Play the key for the *highest* key of the zone. The new values for the zone will be displayed and the underline will disappear.
- If you wish to change the zone, simply repeat the process.

The key zone is automatically reset to full range whenver you select a program from one of the Program Bank pages. When you select a program using the Replace Program feature, the key zone setting is left unchanged.

Warning: If the key zone is accidentally set to a range where the High Key is actually *below* the Low Key, then the track will not play. To correct this situation, you can re-program the zone manually or you can reselect the program from the program bank page, which will automatically reset the key zone to full range.

Transpose Page



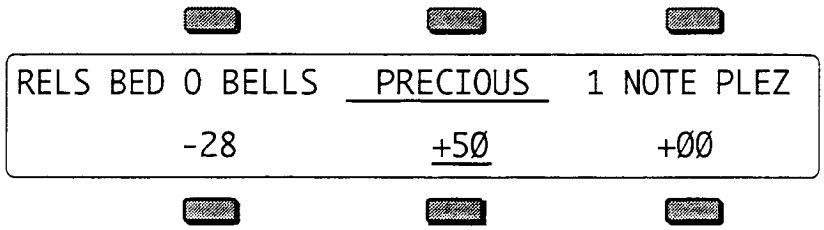
Each track can have its pitch transposed (raised or lowered) by octaves and semitones within an eight octave range. The transpose setting affects both the pitch played by Local VFX voices and the key number transmitted via MIDI.

Pressing the soft button for an already selected track will toggle the underline (showing the active field) from octave to semitone and back.

Ranges: Octave parameter -4 to +4 octaves.
Semitone parameter -11 to +11 semitones*.

* It is possible to extend the transposition outside of the normal range by using the up and down arrow buttons to edit the semitone value to a maximum of + or - 8 octaves and 11 semitones, although this may cause unexpected results.

Release Page



The Release Page enables you to increase or decrease the release time of the program on a selected track. (Release time is the time it takes for the sound to fade away when the key is released). This is useful when you need to adjust the release characterisitics of a sound for a particular application without getting more deeply into programming.

In order to be controlled by this performance parameter, one or more of the envelopes in the program must be programmed with the Envelope Release Time parameter set to a value with a star (*) suffix. For example, if ENV3 - TIMES - RELEASE=50* instead of simply 50, then the release time of envelope 3 can be adjusted from the Performance Release parameter. It is typical to have at least Envelope 3 controlled by the parameters on this page.

Range: -64 to +64 Higher values lengthen release time. Lower values shorten release time.

All tracks whose MIDI Status is set to MIDI or BOTH will send a MIDI Continuous Controller message (controller 72) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The current value of RELEASE is saved with the program whenever a program is written, and is restored whenever the program is selected.

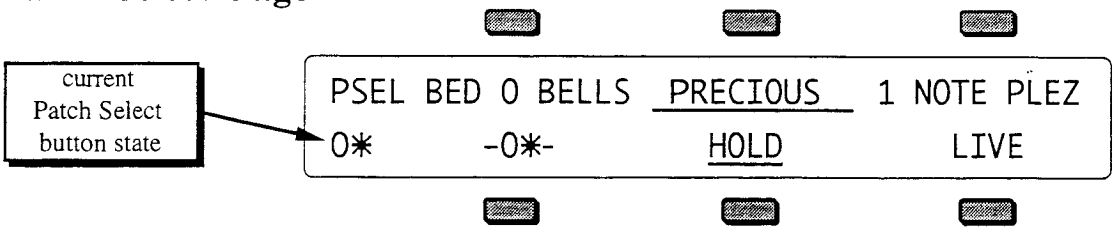
Track Control Parameters

Even though there is no "multi-page" symbol above the ***Patch Select*** button, it does have sub-pages like the other two buttons in the same row. The three parameters grouped together on this button control several performance aspects of the track:

PATCH SELECT
PRESSURE
SUSTAIN

The button name is ***Patch Select*** because the top page contains the default Patch Select setting, and this is an important feature of the VFX. The following two sub-pages contain Pressure mode and the Sustain enable switch. These pages are accessed by repeated presses of the ***Patch Select*** button.

Patch Select Page



This Page gives you control over the Patch Select buttons assignments for each track.

Setting	Patch used by track
LIVE	uses the current state of the buttons to select a patch
-00-	always uses the 00 patch
-0*-	always uses the 0* patch
-*0-	always uses the *0 patch
-**-	always uses the ** patch
HOLD	uses the patch set by the first key hit while touching the patch buttons

The HOLD setting is special because it lets you easily hold a patch select variation by playing a key on the keyboard while touching the patch select buttons. The first key you play after touching the patch select buttons will hold that patch select variation as the current patch for the track. You may then continue to play without having to touch the patch select buttons, which makes two-handed playing easier. If you wish to return to the 00 patch, touch either of the patch select buttons and release it *before* you play the next note. This will hold the 00 patch.

When programming patch variations, you can set the mute status of the various voices in different patches without leaving the Select Voice page by using the HOLD feature.

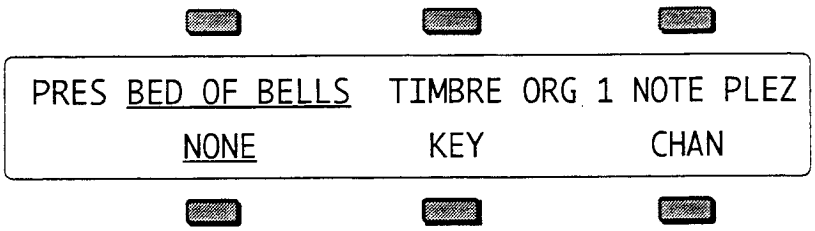
Latching Patch Selects

Latching is more permanent than holding because once latched, the patch will remain assigned to the track even if the patch select buttons are touched again later.

While the Patch Select page is being displayed in either Preset or Multi modes, it is possible to instantly "latch" the current state of the patch select buttons into a track by pressing the soft button for the currently selected track. If neither of the patch select buttons are being held down when this function is performed, the parameter setting will revert to LIVE status. If you wish to set the status to 00, then use the up/down arrow buttons to change the fixed setting. To latch the patch select setting for a different track, first press the soft button to select the track, then press it again while holding one or both patch select buttons to latch the setting.

For more information on programming uses of the Patch Selects refer to the Programming Section of this manual

Pressure Page



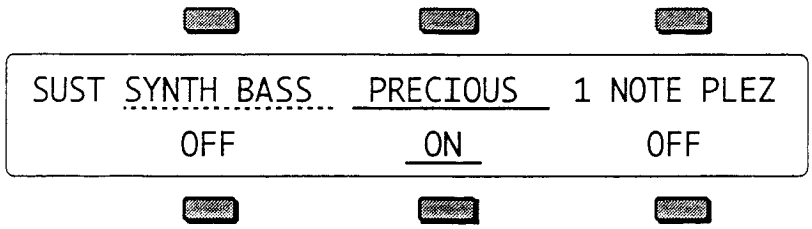
The Pressure sub-page enables you to assign one of three pressure modes to each Track.

- NONE—Pressure information will not be sent over MIDI, nor will the program on the track respond to pressure locally.
- KEY—This setting enables the track to send and receive via MIDI the most expressive kind of pressure—Poly-Key pressure. ENSONIQ's exclusive Poly-Key pressure lets you add pressure modulation to each note independently. If you press down on any particular key within a chord, only that note will be affected by pressure—all others remain unaffected.
- CHAN—This enables the track to send and receive via MIDI the most common type of pressure—channel pressure. With channel pressure, after a note is played, pressing down harder on a key modulates *every* note currently playing. Like a mod wheel, channel pressure is "global," it affects the entire keyboard when activated.

You should consult the MIDI implementation chart of the MIDI device you will be using in conjunction with the VFX to see which (if any) type of pressure it responds to and transmits. For best results, set the VFX Pressure parameter to match the type of pressure supported by the external MIDI device which will send to or receive from the track you are setting.

The current PRESSURE setting is saved with the program whenever a program is written, and is restored whenever the program is selected.

Sustain Page



The Sustain sub-page allows you to determine whether each of the individual tracks will respond to sustain controller events. The effect of all sustain events, whether from the VFX sustain pedal (FTSW 2=SUSTAIN on the Master page) or sustain commands received from MIDI, is controlled by this switch. There are two setting for this switch, ON and OFF.

- ON sustain events will affect all notes played within the active key zone for this track.
- OFF sustain events will have no effect on the notes played on this track.

For example, as shown in the screen above, it may be useful to turn off sustain events on a track set up as a bass sound in a split keyboard configuration. This allows you to play staccato bass lines on the lower part of the keyboard while playing chords on the upper part of the keyboard and using the sustain pedal. The bass notes will not be affected by the sustain pedal because the track is set to OFF, but the chords will sustain.

Using Effects With Performance Presets

All three tracks in a preset share the same effects program. The effects program for the preset is inherited from the primary (non-layered) selected program and any layered programs in the preset will use that same effect. If this effect is incompatible with other programs in the preset, there are two options:

- set the effects routing to DRY for any of the programs which are incompatible; or
- change the preset effect to be something more suitable.

When you press the Performance ***Effect*** button, the first page that appears is the Track Effects Control page. On this page you can override the normal effects routing of the program for each track. Subsequent sub-pages let you redefine the effect for use in the Preset, and are identical to the effects programming pages in the Programming section (see the Effects section for more information on effect selection and programming).

Performance MIDI Parameters Page

The parameters on the Performance MIDI page control the MIDI attributes of each track. On this page, you can determine:

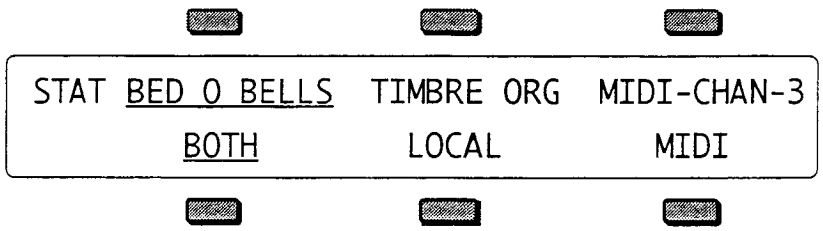
- The MIDI STATUS of the track (i.e. whether it will play locally, only over MIDI, or both);
- The MIDI CHANNEL on which the track will transmit and receive;
- The MIDI PROGRAM NUMBER which the track will transmit when selected.

The Performance MIDI page consists of three separate sub-pages. Each time you press the ***MIDI*** button in the Performance section, the next sub-page will be displayed. On Preset pages, the parameter name will be abbreviated as follows:

STAT	MIDI Status
CHAN	MIDI Channel
PROG	MIDI Program number

Press ***MIDI*** to show the first sub-page:

MIDI STATUS



This page determines the MIDI Status of a track. The four possible settings are:

- BOTH Keys, controllers, etc., will play locally *and* will be sent via MIDI over a selected MIDI channel. Incoming MIDI will play internal voices.

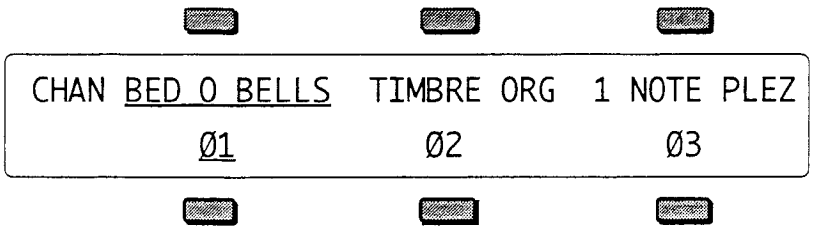
- LOCAL The track will only play internal voices, and will not send any data out MIDI. Incoming MIDI will play internal voices.

- MIDI Keys, controllers, etc., will be be sent out via MIDI when the track is played from the keyboard. Incoming MIDI will play internal voices. However, keys played on the track will not play VFX voices at all. This is comparable to Local Off on some keyboards. Use this status when you want to create MIDI-only tracks for playing remote MIDI devices. When MIDI status has been selected for a Preset track, instead of showing the program name, the display will show *MIDI-CHAN-#, indicating its status and what MIDI channel it is sending on. Multi A/B tracks will always show the program name.

- *OFF* The track will neither play internal voices, nor send MIDI data. This is primarily useful for turning off certain tracks when using the VFX as a multi-timbral receiver in Multi Mode, thereby limiting the number of channels to which the VFX will respond (see the section entitled Using Multi A & B).

Press ***MIDI*** to show the second sub-page.

MIDI CHANNEL



Use this sub-page to determine which MIDI channel a Track will use to transmit and receive data. The differences in how this parameter controls the track for transmitting and receiving are important to understand and are described below. You may also wish to refer to the sections covering the MIDI Control page, and use of Multi A & B tracks.

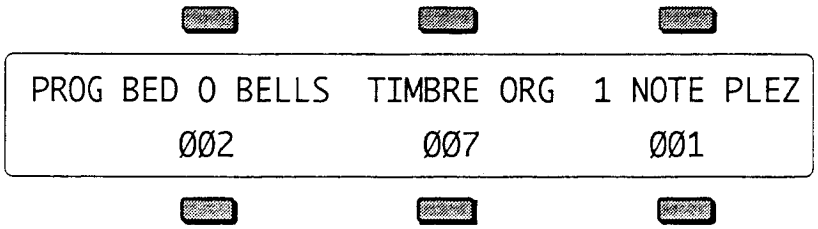
Transmit — Controls which channel the track will *send* data on only if SEND-CHAN=TRACK is selected on the MIDI Control Page. Otherwise the VFX will send only on the base MIDI channel no matter which track is selected.

Receive — Controls which channel the track will *receive* data on only if MIDI MODE=MULTI or MONO A / B is selected on the MIDI Control Page. Otherwise the VFX will receive only on the base MIDI channel no matter which track is selected.

Range: MIDI channels 1 through 16.

Press ***MIDI*** to show the third sub-page:

MIDI PROGRAM Number



Range: 001 through 128 (MIDI program numbers 0 to 127)

This sub-page lets you choose which MIDI Program Change number will be sent via MIDI when the track is selected. If the track MIDI status has been set to LOCAL, the track will not send program changes.

The number which appears is usually the number of the internal VFX program assigned to the track. This number is automatically set whenever a program is selected from the Program Bank pages. Assigning a new program to a Preset track from Replace Program mode does *not* change the program number automatically, but Multi A & B tracks will acquire the new program's number.

You can set this number to any other legal program number if you wish to override the default value. This can be useful in presets, which will transmit a program change for every MIDI-enabled track when selected.

Entering program change numbers directly

While this page is displayed, it is possible to send MIDI program change messages by holding the soft button nearest the track program name and then entering the MIDI program change number using the numbered bank buttons. When you release the soft button the program change will be sent, and the program number will be updated in the display. The range of acceptable numbers is 1 to 128. You do not have to enter leading zeroes (for example, to send 003, simply press ***3*** and release the soft button). The actual numbers transmitted (000 to 127) are one less than the number displayed, in compliance with the MIDI standard.

Program Changes in the VFX

When programs are assigned to a track from a program bank page, their program number is automatically set according to the following scheme:

- Internal RAM programs (INT banks) are numbered from 001 to 060.
- Cartridge programs (CRT banks) are numbered from 061 to 120.
- Internal ROM programs (ROM banks) are also numbered from 001 to 060.

Refer to the System Control section description of the MIDI Control page for more information on how the VFX receives program changes.

Section 4 — Effects

Understanding VFX Effects

The VFX has a powerful built in signal processor which can produce a variety of effects. More importantly, its functions are integrated into, rather than added onto, the rest of the synthesizer. The flexible bus routing scheme and the extensive real-time control give the VFX its unprecedented *dynamic* effects capability.

The VFX is equipped with an advanced digital signal processing system based on the ENSONIQ Signal Processor (ESP) chip. The ESP is designed specifically for digital audio signal processing and in the VFX it has been integrated with a third generation version of the Digital Oscillator Chip (DOC III) and an external 16-bit digital-to-analog converter to provide a very high-quality output signal.

The digital effects processing has been designed to complement the advanced performance features of the VFX, and many of the effects can have specific parameters modulated by various performance controls such as the mod wheel, Poly-Key pressure, and the patch select buttons.

The effects are fully programmable, and may be customized for particular applications. Effects are most often stored as part of a program, although each preset may also have its own *override* effect, independent of the effects contained by the programs included in the preset. The Multi setup also has an independent effect. Each of these types of effect is treated a little differently, and will be described individually later in this section.

Program Effects

Each program in the VFX contains an effect and a complete set of parameter values which determine how that effect will sound. The effect is present even if none of the voices in the program are routed through the effect (e.g. all voices are sent to the DRY destination bus - see the Output page section). Whenever you save or write a program, the effect settings are also saved with the program.

The program effect is displayed and edited by pressing the ***Effect*** button in the *Programming* section of the front panel. There are three pages of effect parameters, which are common to all of the effect types. These pages are described in the Effect Parameters part of this section.

If the effect that is currently loaded and being heard is different than the program effect that is being shown, then a flashing MUTE will appear in the lower left corner of the display.

Preset Effects

Each preset in the VFX also contains an effect and a complete set of effect parameter values. The effect is present even if none of the tracks in the preset are routed through the effect (e.g. all tracks are sent to the DRY destination bus - see the Performance Effects page section). Whenever you save or write a preset, the effect settings are also saved with the preset.

The preset effect is often the same as the effect contained in the primary selected program in the preset, but can easily be changed to suit the needs of the preset more closely. This effect applies to all preset tracks (or their program voices) which are routed to either FX destination bus.

The preset effect is displayed and edited by pressing the ***Effect*** button in the *Performance* section of the front panel. There are four pages in total. The top level page controls the routing of the effect and is described in the Performance Control part of this section. The next three pages contain the effect parameters, which are common to all of the effect types. These pages are described in the Effect Parameters part of this section.

Multi A / B Effect

Like each of the presets in the VFX, the Multi A/B setup also contains an effect and a complete set of effect parameter values. The effect is present even if none of the tracks in the preset are routed through the effect (e.g. all tracks are sent to the DRY destination bus - see the Performance Effects page section). This effect applies to all Multi A or B tracks (or their program voices) which are routed to either FX destination bus.

This effect remains unchanged unless specifically edited, and can only be saved via System Exclusive message (see the Storage Functions section- MIDI Sys-Ex commands). A special program change message may be used to load new effects (see the MIDI Control page description of special program changes in the System Control section). The Copy function and a special mode of Copy Preset to Multi can be used to replace the Multi effect.

The Multi A/B effect is displayed and edited by pressing the ***Effect*** button in the *Performance* section of the front panel, when either of the Multi A or B LEDs is on. There are four pages in total, and they are the same as those described in the preceding Preset Effects section.

Programming Effects

The VFX effects are fully programmable. There are three sub-pages of effect parameters for every effect type. The first sub-page contains the effect selector. The effect selector is a little different than all of the other parameters in that it controls how all of the other effect pages will be configured and displayed. When this parameter is changed, a new effect preset is selected which causes several important things to occur.

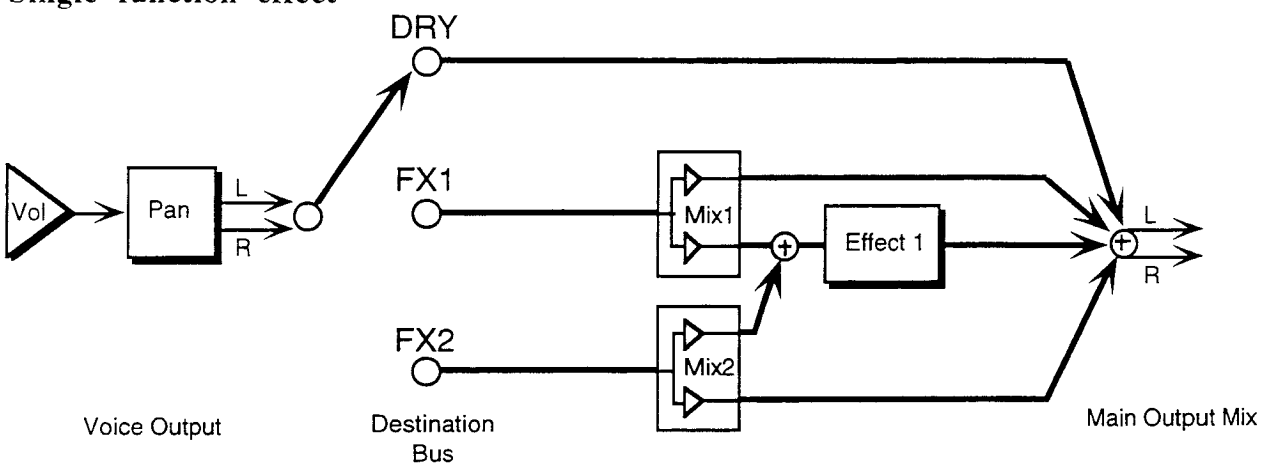
When a new effect preset is selected:
- a new effect preset is loaded, causing a brief pause in the audio output
- the effect parameter pages are redefined for the particular effect selected
- the effect parameter values are reset to their default settings for the preset effect

Hint: When editing the effect selector, it is possible to change the new effect type quickly and avoid the brief delay caused by the actions described above. Pass rapidly over the types between the old type and the new type, and then pause. The new effect preset will be recalled only after you stop changing the type.

The Effects Busses

The output of every voice in the VFX is assigned to a stereo bus. A bus, like the bus of a mixing board, mixes together all the voices assigned to that bus into a single stereo pair. Of the three busses on the VFX, two are inputs into the signal processor (FX1 and FX2) and the other is a direct path to the output which bypasses all effect processing (DRY). The Destination Bus assignment for each voice is set on the OUTPUT page.

Single function effect



The above illustration shows the effects busses and the output mixing. Every voice is assigned to one of the three stereo busses, which go around or through the effects processing. The heavy lines are stereo paths.

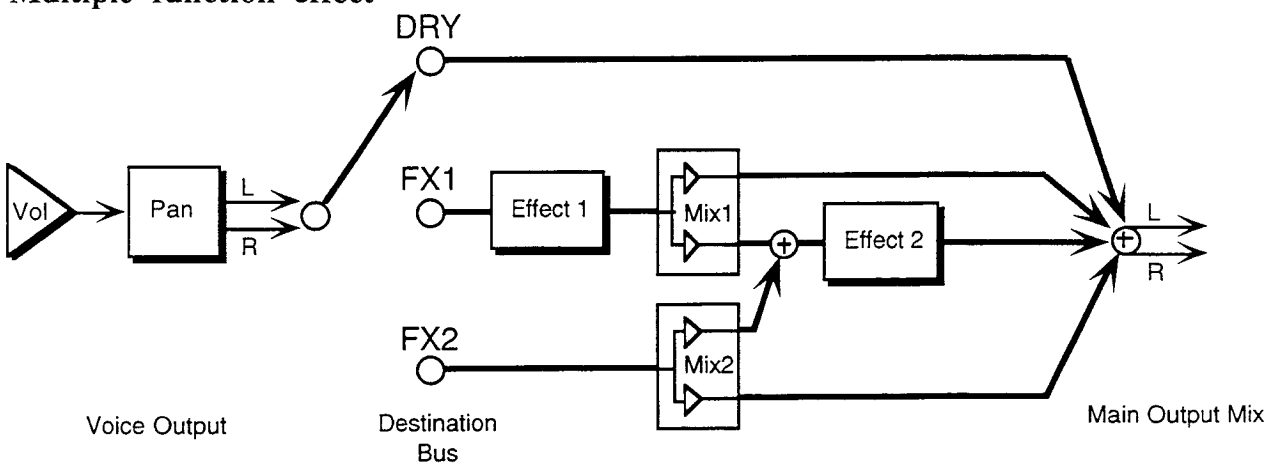
Effects Mixing

All effects have separate mixing controls for the FX1 and FX2 busses.

When an effect with a single processing function (such as reverb only) is selected, both busses FX1 and FX2 are routed to it. Mix1 controls the amount sent to the effect or sent around it. In this case bus FX2 can be used in two modes.

- NORMAL.STEREO.SEND—in this case FX2 functions exactly like FX1, but provides a separate effects mix amount. This can be useful for setting up one bus with more effect processing than the other. Voices can then be routed to the most appropriate bus, depending on how much effect is desired.
- LEFT.WET/RIGHT.DRY—in this configuration a voice's pan position determines its (individual) effects mix. Pan can be modulated in real-time with modulators such as Poly-Key pressure, and when pan is treated as wet/dry mix, it allows real-time modulation of effect mix. This is one of the unique *dynamic* effects which the VFX offers. In this mode, pan affects only the wet/dry mix and does not affect stereo image panning from left to right.

Multiple function effect



When the selected effect is a *combined effect* that has more than one signal processing function (such as reverb and chorus), the FX1 bus feeds Effect 1, and the FX2 bus feeds Effect 2. The FX2 Mix control sets the amount of Effect 2 (usually reverb) for voices assigned to that bus. FX1 Mix controls the amount of the output from Effect 1 sent to Effect 2 rather than directly to the output. By setting this control to its extremes, you can arrange the two effects to be either in series or in parallel.

Selecting Effects

The first parameter of the effects page is the effects selector. Changing this parameter causes a new effect to be selected, which in turn changes the type of parameters which will be available on the rest of the pages. Selecting a new effect preset will automatically set all of the effect parameters to their default values for the new effect.

The available Effects are:

LARGE.HALL.REV	large hall, high density reverb
SMALL.HALL.REV	small hall, high density reverb
ROOM.REVERB.1	medium room reverb with more early reflections
ROOM.REVERB.2	small room reverb with more early reflections
DYNAMIC.REVERB	reverb with modulatable decay time
8-VOICE.CHORUS	eight voice chorus with complex modulation
CHORUS+REVERB.1	chorus combined with reverb
CHORUS+REVERB.2	(variation)
FLANGER+REVERB.1	flanger combined with reverb
FLANGER+REVERB.2	(variation)
DELAY+REVERB.1	delay line combined with reverb
DELAY+REVERB.2	(variation)
FLANGE+DLY+REV.1	flanger with delay combined with reverb
FLANGE+DLY+REV.2	(variation)
ROTO-SPKR+DELAY	rotating speaker simulator with delay
ROTO-SPKR+DIST	rotating speaker simulator with overdrive

Modulators which can be applied to the effects

The following modulation sources are available to alter the effects in performance:

Mod Source	*Modulation effect derived from*
KEY-GATE	on when any keys are pressed; off otherwise
KEYBOARD	the number of the last key played
VELOCITY	the average velocity of all keys played
PRESSURE	the channel pressure value for track
PITCHWHL	the value of the pitch wheel
MODWHEEL	the value of the mod wheel
MODPEDAL	the value of the CV/Pedal input
XCONTROL	uses the value of the assignable external MIDI controller, such as the breath controller
SUS-PEDAL	on when held down; otherwise off
TIMBRE	the value of the TIMBRE parameter for the track, if the track is set to CONTROL (see below)
PATCHSEL	four values (0,32,64,127) for the four button states
OFF	no modulation

Programs and Presets

The complete effects setup, including the values of all effect parameters, is saved when you save a program. It is *also* saved with the performance presets. The VFX tries to be smart about switching effects, since all sound must stop for an instant when it changes effects.

When are new effects loaded into the ESP ?

- When you select a program from one of the Program Bank pages, the effect saved in that program will be loaded into the ESP, and you will hear the program with its effect. If you layer a program by double-clicking, its effect will *not* be loaded.
- When you select or layer programs/tracks from a preset or performance parameter page, the effect is *not* changed.
- When you change the program on a track from Replace Program mode (e.g. with the ***Sounds*** LED blinking), the effect will *not* be changed.
- When you select a preset, the override effect saved in that preset will be loaded into the ESP.

Whenever a new effect is loaded into the ESP, the audio output will pause briefly, allowing the instructions which create the new effect to be loaded into the ESP. If an effect differs only by variation in parameter values, then this pause may not occur.

These are the rules that the VFX follows in deciding when to change effect programs:

1. When you select a new primary sound it changes to that sound's effect.
2. When you layer a sound by double clicking, the effect is not changed.
3. When you select a performance preset, it changes to that preset's effect.
4. When you bring a sound into an existing performance using ***Replace Program*** it will not change the effect.
5. Saving either the the sound or the preset will save the *current* effect.
6. Should you start editing a sound while an effect *other than its own* is active, a warning will appear, reminding you that you are not hearing the effect whose parameters you are seeing or editing. This warning appears as MUTE flashing in the lower left corner of the display..
7. When a special MIDI program change message is received in MULTI mode, the Multi A/B effect is loaded.

Performance Control

The ***Effect*** button in the Performance section has one more level than the Programming Effect button. The first time it is pressed it shows the *FX Bus Override* parameter for each of the three tracks in a performance (or 6 of the 12 in the Multi). Subsequent presses reveal the effects programming parameters, which are identical to those found in the Programming section.

Normally, different voices in a program are assigned to the three different busses, as set on the OUTPUT page. The *FX Bus Override* parameter provides for the re-routing of the voices without editing the sound itself. This may be useful when two sounds are split or layered in a performance, and the effect is not appropriate for both.

The available settings are:

- -DRY- forces all voices to the dry bus
- -FX1- forces FX2 voices to FX1; FX1 and DRY are unaffected
- -FX2- forces FX1 voices to FX2; FX2 and DRY are unaffected
- VOICE uses normal voice routing
- CNTRL uses normal voice routing and also routes controller information to the effect. This is the default setting in the track after selecting a primary program.

Controllers Routed to Effects

In effects which allow real-time control, it is sometimes desirable to limit *which tracks* send controller information to the effect. This would be particularly true when using multiple MIDI input channels from a sequencer. If more than one track is set to CNTRL, "controller fights" can occur. If set to VOICE, a track will remain routed to the effects, but its controllers (such as the TIMBRE control, MODWHEEL, etc.) will not affect the effect.

Effect Parameters

Each of the effect types has three sub-pages containing a particular set of parameters associated with the effect. Some of the parameters are common to many effects and some are specific to certain effects. The first page of parameters is very similar for all of the effects. The second and third sub-pages are more variable, and contain the specific parameters.

In some cases, several presets of the same type will have an identical set of parameters. In these cases, the parameters will only be described once, but the effect presets which share those parameters will be listed at the beginning of the description.

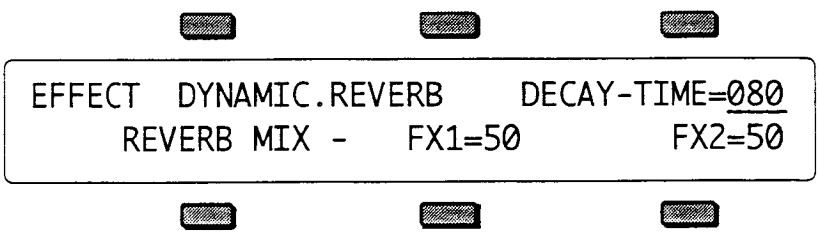
Each effect has an FX1 Mix and an FX2 Mix, plus a set of parameters which is relevant to the effect. All of these parameters are programmable, and provide much flexibility for customizing the effects.

Single Effects

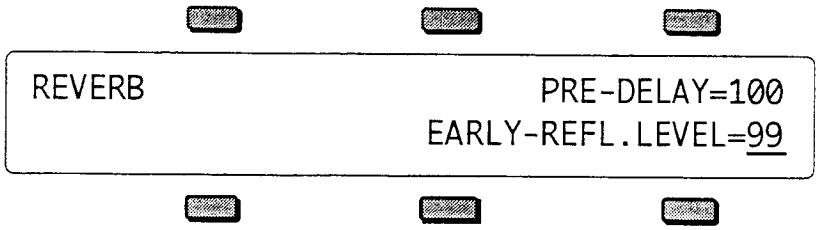
The effects algorithms in this category provide a single highly optimized stereo effect, such as studio quality reverb or complex chorusing. The FX1 and FX2 busses may both be routed into the effect with different mixes

LARGE.HALL.REVB
large acoustic space, high density reverb
SMALL.HALL.REVB
small concert hall, high density reverb
ROOM.REVERB.1 & 2
smaller room reverbs with more early reflections
DYNAMIC.REVERB
provides gated reverb and a number of other effects by allowing decay time to be modulated

DECAY TIME
HF-DAMPING
PRE-DELAY
EARLY-REFL.LEVEL
FX2-MODE
MODSRC . . . . . Dynamic Reverb only
DECAY-MOD . . . . . Dynamic Reverb only



DECAY-TIME
Range: 0 to 100
Controls the amount of time it takes for the reverberation to decay away to a very low level (-60 dB) after the input signal stops.

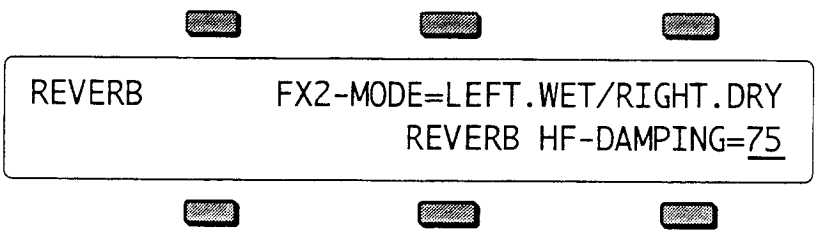


PRE-DELAY

Range: 0 to 250 milliseconds
As its name implies, this parameter controls the length a short delay which occurs before the reverb. Pre-delay is the amount of time it takes for the reverberation to begin after the input signal is present.

EARLY-REFL.LEVEL

Range: 0 to 99
This parameter controls the amount of early reflections mixed into the reverberation. Early reflections are the very short delays which occur at the very beginning of the reverb, and are caused by sound waves being reflected back from the walls of the hall or room.



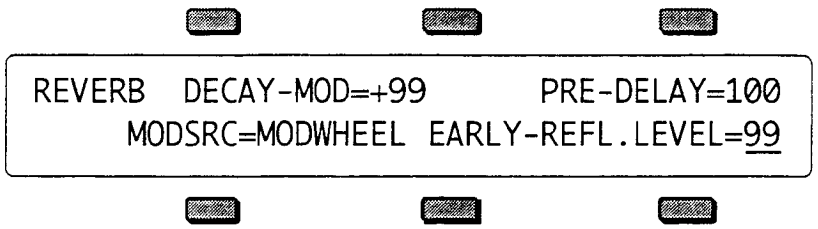
FX2-MODE

- NORMAL.STEREO.SEND—in this mode, each voice's pan acts normally and balances left to right ratio of the stereo input to the effect
- LEFT.WET/RIGHT.DRY—in this mode, pan is used to control the wet-to-dry mix ratio instead of the stereo balance. Panning to the left will increase the amount of signal sent to the effect, and panning to the right will decrease the effect level and increase the dry or bypass level. The left channel of FX2 is sent directly to the effect without mixing. The right channel of FX2 is routed around the effect and appears in the center of the main stereo output. Since panning can be dynamically controlled on each individual voice, this mode allows each voice to have a separate dynamic effect mix.

HF-DAMPING

Range: 0 to 99
The High Frequency Damping parameter controls the amount of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high frequency energy.

For the DYNAMIC.REVERB effect, there are two additional parameters on the second sub-page which control the modulation of decay time.



DECAY-MOD

Range: -99 to +99
This parameter controls the amount of modulation from the selected modulation source which will be applied to the decay time of the reverb.

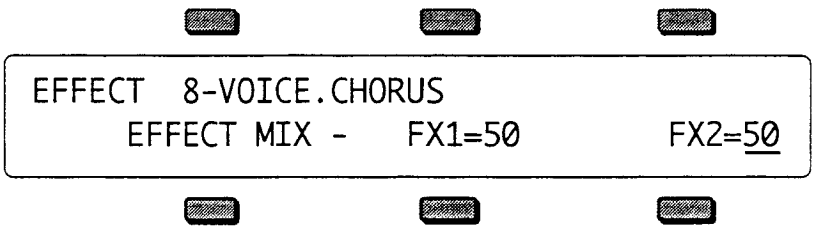
MODSRC

This parameter selects the modulation source to be used. Any one of the effect modulators can be selected.

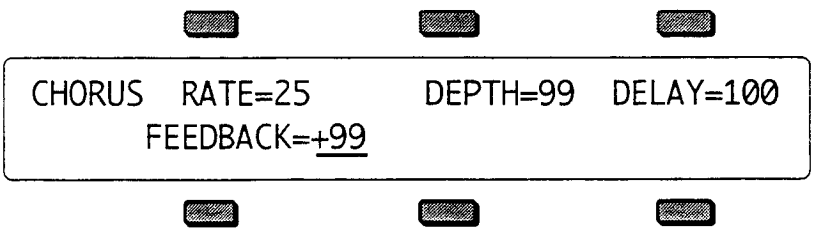
8-VOICE.CHORUS

This is a complex chorus with eight different voices and separately randomized LFO's.

RATE
DEPTH
DELAY
FEEDBACK
FX2-MODE



This is one algorithm which does not incorporate any reverb, and the first sub-page does not include the DECAY-TIME parameter.



RATE

Range: 00 to 99
This parameter controls the rate of modulation of the delay time of the chorus.

DEPTH

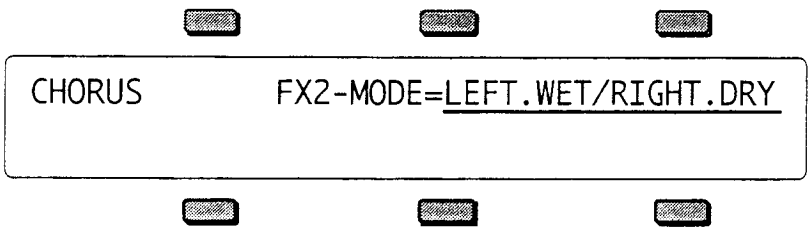
Range: 00 to 99
This parameter controls the amount of modulation applied to the delay time of the chorus.

DELAY

Range: 00 to 250 milliseconds
This parameter controls the delay time of the chorus.

FEEDBACK

Range: -99 to +99
This parameter controls the amount of positive or negative feedback applied to the chorus.



FX2-MODE

- NORMAL.STEREO.SEND—in this mode, pan acts normally and balances left to right ratio of the stereo input to the effect
- LEFT.WET/RIGHT.DRY—in this mode, pan is used to control the wet-to-dry mix ratio instead of the stereo balance. Panning to the left will increase the amount of signal sent to the effect, and panning to the right will decrease the effect level and increase the dry or bypass level. Refer to the preceding description of FX2 MODE for more information.

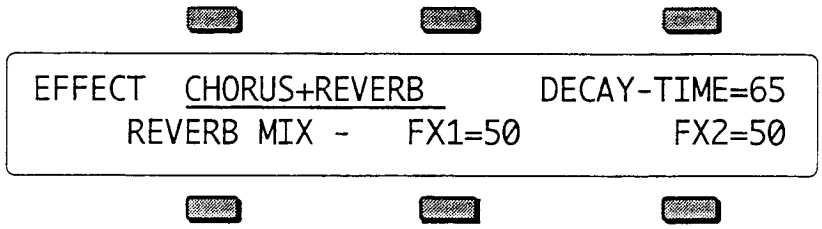
Combined Effects

The other effects in the system all include a standard reverb on the FX2 bus combined with a different effect on the FX1 bus. You can control the amount of FX1 that is sent into the reverb (FX2) with the FX1 mix control. DECAY-TIME for the reverb appears on the first sub-page for all of these combined effects.

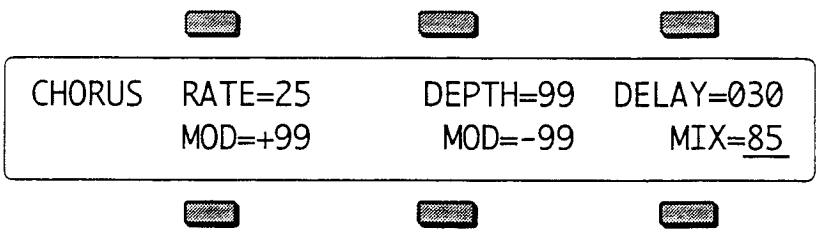
CHORUS+REVERB.1 & 2

This effect combines a simple chorus with the standard reverb. The chorus has an LFO which modulates a variable length delay line. Assign a voice to FX1 to get both chorus and reverb, or use FX2 for reverb only.

MIX
RATE
RATE MODAMT
WAVESHAPE
DEPTH
DEPTH MODAMT
MODSRC
DELAY
DECAY TIME . . . . . Reverb parameter
REVERB HF-CUT . . . . . Reverb parameter



The first sub-page is basically the same as the other combined effects. The FX1 Mix level controls how much of the chorus output signal is sent to the reverb, and the FX2 Mix level controls the amount of the FX2 bus signal sent to the reverb only. The Decay Time parameter controls the decay time of the reverb (see the previous DECAY-TIME description).



RATE

Range: 00 to 99
This parameter controls the rate of modulation of the delay time of the chorus.

DEPTH

Range: 00 to 99
This parameter controls the amount of modulation applied to the delay time of the chorus.

DELAY

Range: 00 to 250 milliseconds
This parameter controls the delay time of the chorus.

Rate MOD

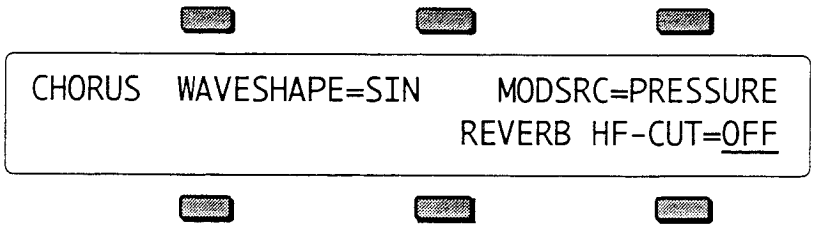
Range: -99 to +99
This parameter controls the amount of modulation applied to the chorus rate parameter.

Depth MOD

Range: -99 to +99
This parameter controls the amount of modulation applied to the chorus depth parameter.

MIX

Range: 00 to 99
This parameter controls the mix level or amount of the chorus effect.



WAVESHAPE

This parameter determines the shape of the waveform used to modulate the chorus parameters.

- SIN—the modulation waveform is a sine wave.
- TRI—the modulation waveform is a triangle wave.

REVERB.HF-CUT

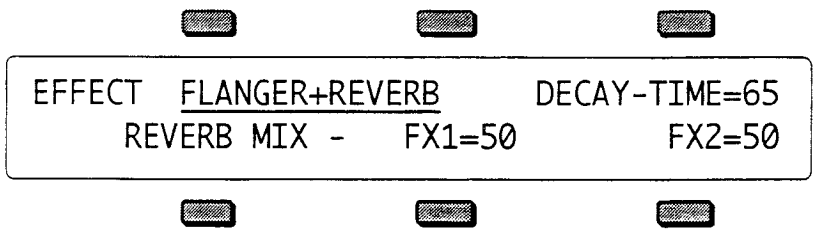
This switch is similar to the High Frequency Damping parameter in that it controls the amount of attenuation of high frequencies in the reverberation. The difference is that here the amount of high frequency attenuation is fixed.

- ON—higher frequencies are attenuated (rolled-off) in the reverberation signal.
- OFF—higher frequencies are unaffected.

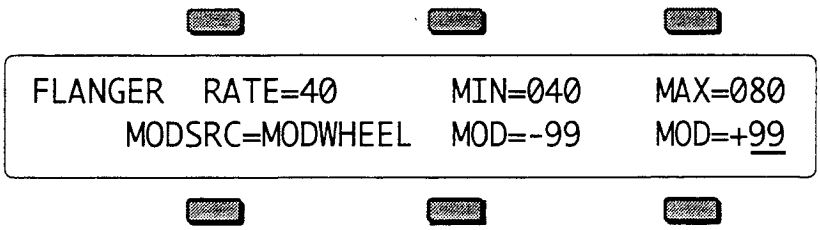
FLANGER+REVERB.1 & 2

The flanger algorithm is similar to the chorus but with different controls. The LFO changes the length of the delay line within the limits of MIN and MAX, and the flanger mix is variable. Assign a voice to FX1 to get both flanger and reverb, or use FX2 for reverb only.

RATE
MIN
Min MOD amount
MAX
Max MOD amount
MODSRC
MIX-LEVEL
FEEDBACK
DECAY TIME . . . . . Reverb parameter
REVERB HF-CUT . . . . . Reverb parameter



The first sub-page is basically the same as the other combined effects. The FX1 mix level controls how much of the flanger output signal is sent to the reverb, and the FX2 mix level controls the amount of the FX2 bus signal sent to the reverb only. The Decay Time parameter controls the decay time of the reverb (see the previous DECAY-TIME description).



RATE

Range: 00 to 99
This parameter controls the rate at which the notch frequency of the flanger is modulated from MIN to MAX. If set to 00, then the notch will be fixed at some point in the sweep range, though this point is unpredictable.

MIN

Range: 0 to 127
This parameter sets the minimum notch frequency of the flanger. The units are semitones, so if you wish to decrease the notch frequency by an octave, subtract 12.

MAX

Range: 0 to 127
This parameter sets the maximum notch frequency of the flanger. The units are semitones, so if you wish to increase the notch frequency by an octave, add 12.

Min MOD

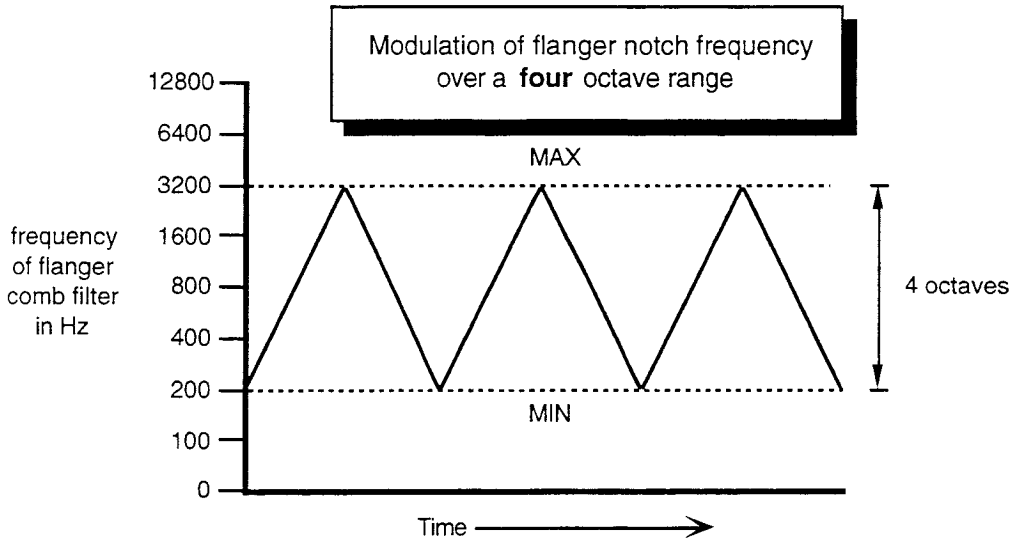
Range: -99 to +99
This parameter controls the amount of external modulation applied to the MIN parameter.

Max MOD

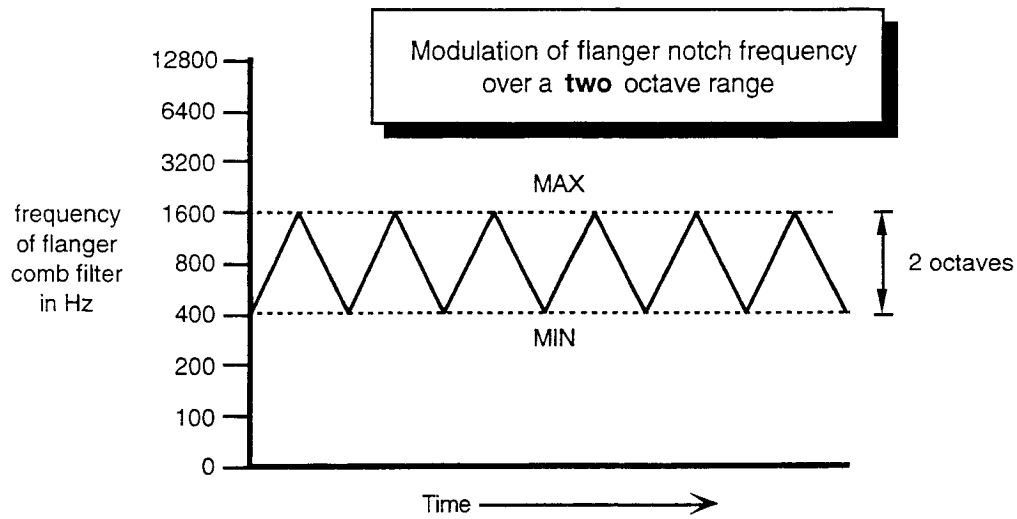
Range: -99 to +99
This parameter controls the amount of external modulation applied to the MAX parameter.

MODSRC

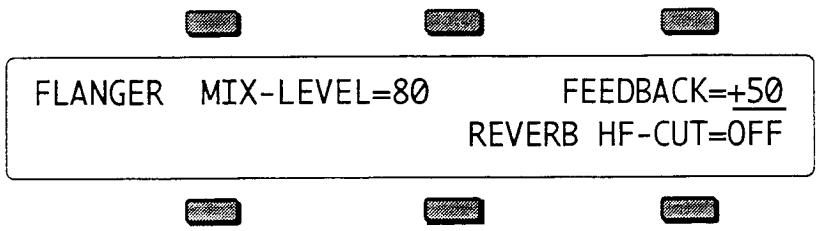
This parameter selects the external modulation source to be used to modulate the flanger MIN and MAX parameters. Any one of the effect modulators can be selected.



These illustrations show how the relationship between the MIN and MAX settings will determine the frequency range and *apparent* rate of the flanger sweep. The actual rate at which the sweep changes from MIN to MAX is constant, so if the range is narrow, the apparent or perceived rate will be faster.



If the settings are modulated, then both the fixed frequency of the notch and/or range of frequencies in the sweep can be affected. Modulated sweeps can be implemented by setting MIN and MAX to the same value (or close together) and modulating them by the same amount. Manual sweeps can be implemented by selecting a modulation source such as the mod wheel.



MIX-LEVEL

Range: 0 to 99 (16 values)
This parameter controls the mix level or amount of the flanger effect.

FEEDBACK

Range: -99 to +99
This parameter controls the amount of feedback applied to the flanger. The sign of the value determines the polarity of the feedback.

REVERB.HF-CUT

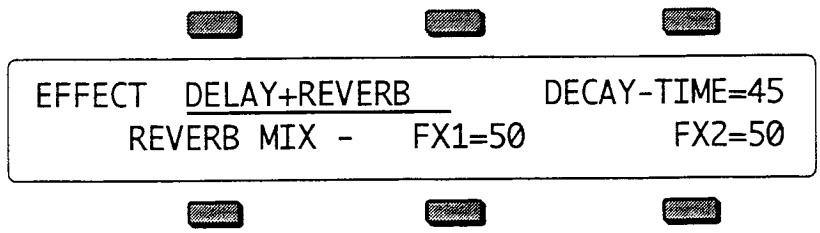
This switch is similar to the High Frequency Damping parameter in that it controls the amount of attenuation of high frequencies in the reverberation. The difference is that here the amount of high frequency attenuation is fixed.

- ON—higher frequencies are attenuated (rolled-off) in the reverberation signal.
- OFF—higher frequencies are unaffected.

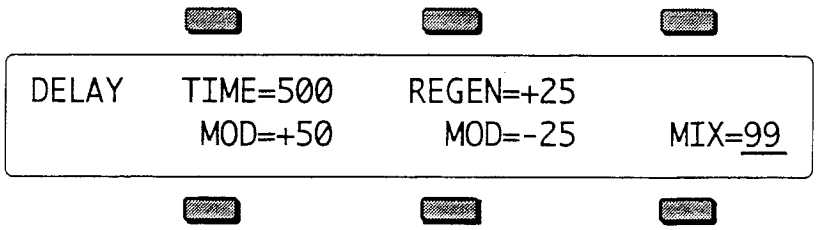
DELAY+REVERB.1 & 2

A digital delay with 500 msec maximum delay, and a standard reverb. Assign a voice to FX1 to get both delay and reverb, or use FX2 for reverb only.

DELAY TIME
DELAY MODAMT
MIX
REGEN
REGEN MODAMT
MODSRC
DECAY TIME . . . . . Reverb parameter
HF-DAMPING . . . . . Reverb parameter



The first sub-page is basically the same as the other combined effects. The FX1 mix level controls how much of the delay output signal is sent to the reverb, and the FX2 mix level controls the amount of the FX2 bus signal sent to the reverb only. The Decay Time parameter controls the decay time of the reverb (see the previous DECAY-TIME description).



TIME

Range: 0 to 500 milliseconds (by 2)
This parameter controls the delay time of the FX1 bus delay line.

Time MOD

Range: -99 to +99
This parameter controls the amount of modulation applied to the TIME parameter.

REGEN

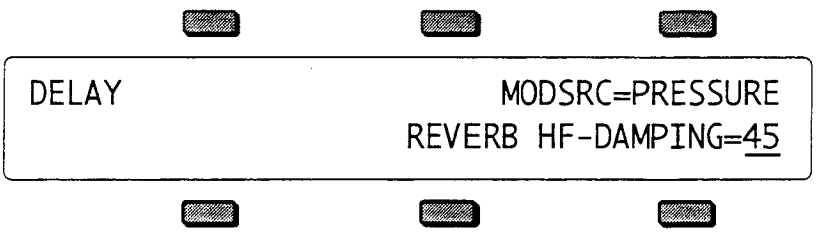
Range: -99 to +99
This parameter sets the amount of regeneration applied to the delay. Regeneration is analogous to feedback, and with more regeneration, there will be more delayed repeats.

Regen MOD

Range: -99 to +99
This parameter controls the amount of modulation applied to the REGEN parameter.

MIX

Range: 0 to 99
This parameter sets the level of the delayed signal.



MODSRC

This parameter selects the modulation source to be used to modulate the delay TIME and REGEN parameters. Any one of the effect modulators can be selected.

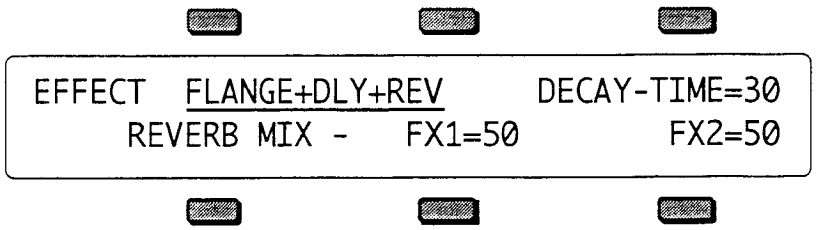
HF-DAMPING

Range: 0 to 99
The High Frequency Damping parameter controls the amount of attenuation of high frequencies in the reverberation. Refer to the description of HF DAMPING in the reverb section above for more information.

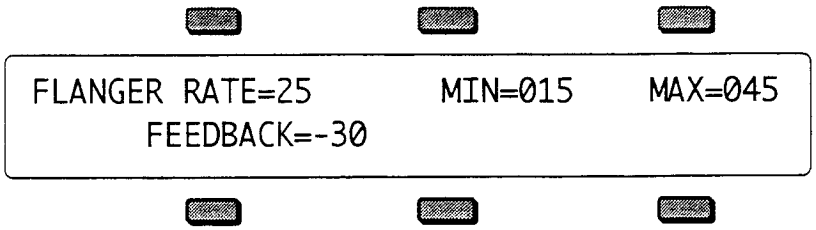
FLANGE+DLY+REV.1 & 2

This effect combines the flanger with a delay and the standard reverb. The functions of the parameters are closely related to those in the individual effects. Assign a voice to FX1 to get both flanger and delay with reverb, or use FX2 for reverb only.

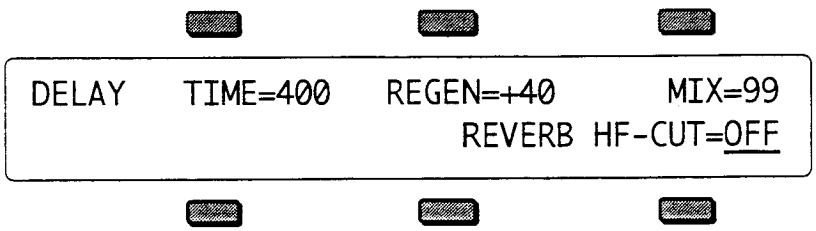
RATE	Flanger parameter
MIN	Flanger parameter
MAX	Flanger parameter
FEEDBACK	Flanger parameter
MIX	Delay parameter
TIME	Delay parameter
REGEN	Delay parameter
DECAY TIME	Reverb parameter
REVERB HF-CUT	Reverb parameter



The first sub-page is basically the same as the other combined effects. The FX1 mix level controls how much of the flanger and delay output signal is sent to the reverb, and the FX2 mix level controls the amount of the FX2 bus signal sent to the reverb only. The Decay Time parameter controls the decay time of the reverb (see the previous DECAY-TIME description).



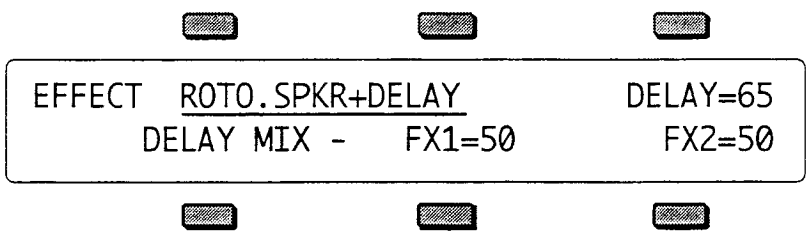
Refer to the FLANGER+REVERB description for these parameters.



Refer to the DELAY+REVERB description for these parameters.

ROTO.SPKR+DELAY
A rotating speaker simulator with delay
ROTO.SPKR+DIST
A rotating speaker simulator with overdrive (not a combined effect)

DELAY or OVERDRIVE
SLOW Speed
FAST Speed
LO-ROTOR switch
STEREO-WIDTH
MODSRC
MODE
Feedback LAG
Feedback AMOUNT
REPEATS . . . . . Delay only parameter



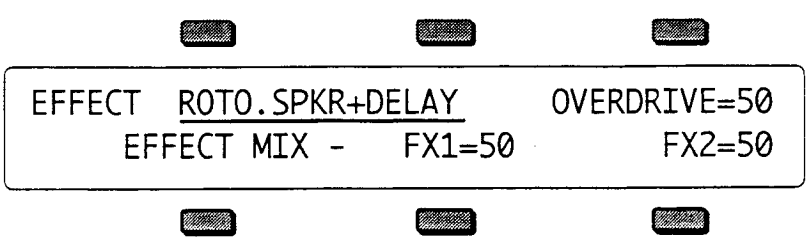
The first sub-page is very similar to the other combined effects. The top right parameter is either Delay or Overdrive, depending on the effect selected. When Delay is active, the FX1 mix level controls how much of the rotating speaker signal is sent to the delay, and the FX2 mix level controls the amount of the FX2 bus signal sent to the delay only. The rest of the parameters are the same for both effects.

DELAY

Range: 0 to 400 milliseconds (by 2)
This parameter determines the length or delay time of the FX2 delay.

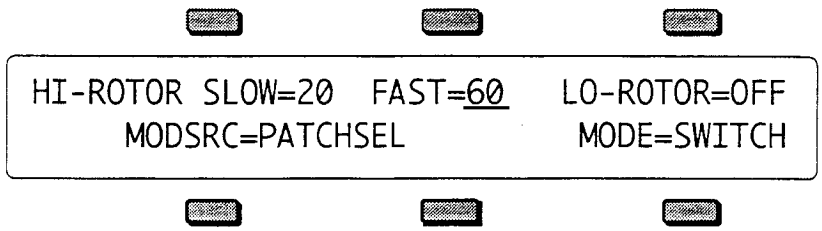
REPEATS

Range: -99 to +99
This parameter (which appears on the third sub-page) acts like Delay Regeneration, and controls the number of repeats of the FX2 delay. It does *not* appear on the Overdrive version.



OVERDRIVE

Range: 0 to 99
This parameter determines how much overdrive is applied to the speaker sound to simulate the characteristic distortion often associated with this effect.



HI-Rotor SLOW Speed and FAST Speed

Range: 0 to 99

These parameters set the minimum and maximum speeds of the upper rotor of the rotating speaker.

LO-ROTOR switch

Range: On or Off

This switch turns the lower rotor on and off, affecting the low frequency sound.

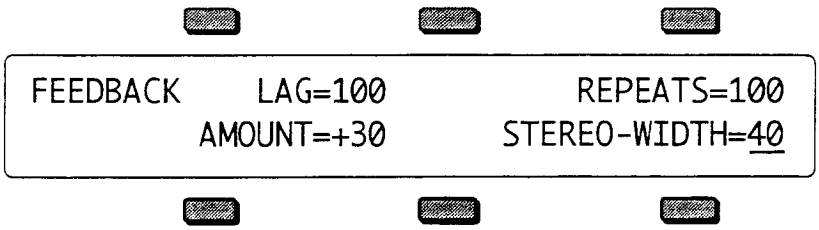
MODSRC

This parameter selects the modulation source to be used to control the speed of the rotating speaker. Any one of the effect modulators can be selected. Note that the MODE parameter also affects speed control.

MODE

This parameter determines how the speed of the rotating speaker is controlled.

- CONTIN— continuously variable speed control tracking the values of the modulation source (for example, the CV-PEDAL input can be used to vary the speed).
- SWITCH—the rate is switched between two fixed speeds using the two states of the controller, and the speed change is gradual.
- TOGGLE—the rate toggles or alternates between two speeds whenever the controller is used.



STEREO-WIDTH

Range: 0 to 99

This parameter controls the apparent width of the stereo image created by the rotating speaker effect.

Feedback - LAG

Range: 0 to 100 milliseconds

This parameter determines how much time elapses before the simulated speaker resonance or feedback begins to occur.

Feedback - AMOUNT

Range: -99 to +99

The Feedback Amount parameter controls the amount and polarity of the resonance or feedback to the speaker simulator.

Section 5 — Using the Multi; Multi A & Multi B

Multi A & B

The VFX features a powerful function which we refer to as *the Multi*. The Multi consists of:

- 12 tracks (6 in Multi A and 6 in Multi B), each of which has a program and a full set of performance parameters associated with it, and
- One effects setup, which applies to all 12 tracks in the Multi.

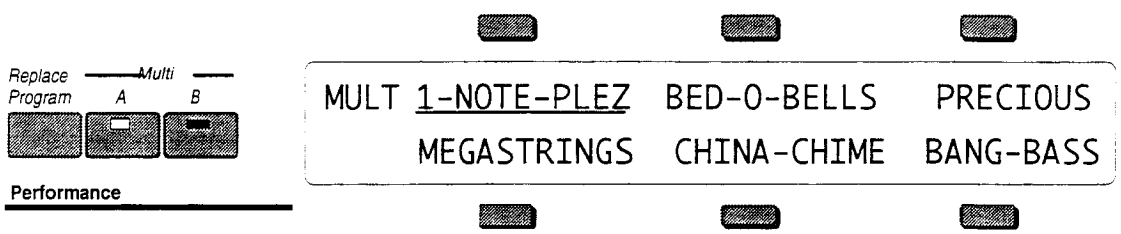
Unlike regular presets, there is only *one* Multi, and it is always there. The only way to change the sound on one of the tracks of the Multi is to use the Replace Program function. The only way to change the Multi effects program is to intentionally select it (press ***Multi A*** or ***Multi B***, then press the ***Effects*** button in the Performance section) and edit it.

The Multi serves three important functions:

- As a performance aid/MIDI controller — it can serve as a giant, 12-track preset which is always available for selecting and layering up to 12 local sounds and/or remote MIDI devices.
- As a multi-track MIDI receiver — when the MIDI in mode is set to MULTI (MIDI Control Page), each of the 12 tracks of the Multi will receive keys, controllers and program changes independently on its own MIDI channel. This makes the VFX an ideal synth to use with a MIDI sequencer, as it can take the place of a number of instruments in your rig.
- Additionally, you could use the Multi as a handy place to keep 12 of your favorite programs for convenient access during performance.

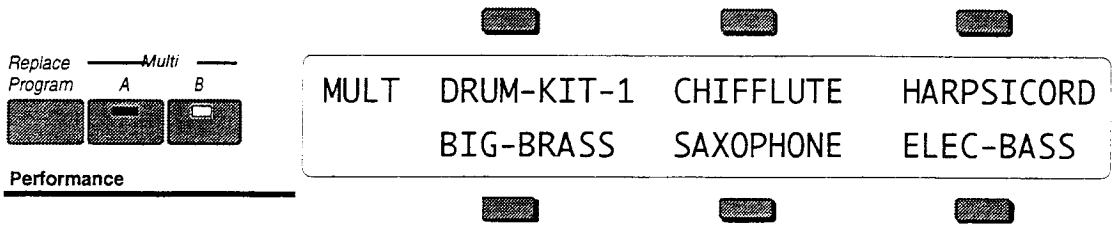
Let's take a look at the Multi Pages:

Press ***Multi A***. This takes you to the Multi A page.



The LED in the ***Multi A*** button lights, and the display shows the names of the programs on the six Tracks of Multi A. Multi B contains another six Tracks.

Press ***Multi B***.



The LED in the *Multi B* button lights, and the display shows the names of the programs on the six Tracks of Multi B. You can select and layer the tracks of Multi A & Multi B (by clicking or double-clicking) just as you would on regular program bank pages. You can go back and forth between A and B without losing what was selected or layered in the other half. The LED's in the two Multi buttons tell you where you are.

Replacing Programs in the Multi

To replace the programs in Multi A & Multi B with programs of you choice:

- In Multi A (or Multi B) underline one of the six Tracks.
- Press the ***Replace Program*** button. The display will show program bank pages, but the ***Sounds*** LED will blink, indicating that you are in Replace Program mode.
- Use the ***Cart*** button to choose between Internal, ROM or Cart Sounds, as you would when selecting sounds normally.
- Underline the program you want to put on the track in Multi A (or Multi B).
- Press Multi A (or Multi B) to return to the Multi with the new program on the track. Note that all the performance parameters of the track are left just as they were previously. Performance parameters in the Multi are never altered unless you edit them intentionally.

Repeat this procedure for each additional program you want to write to Multi A or Multi B.

Layering a program in Multi A (or Multi B)

In a "normal" preset a maximum of two programs may be layered with the selected program. In Multi, you can layer as many as 11 programs with the selected program. You can have up to 12 different programs layered (stacked) on one key, or up to 12 different Programs split across the keyboard by using the Key Zone function described in Section 3.

Layering programs is the same as in a normal preset:

- Select a primary program in Multi A (or Multi B).
- Find the name of the program you wish to layer with the primary program.
- Double-click the soft button for that program. Layered programs are identified by a blinking underline. If a sound is layered, it can be un-layered by pressing its soft button

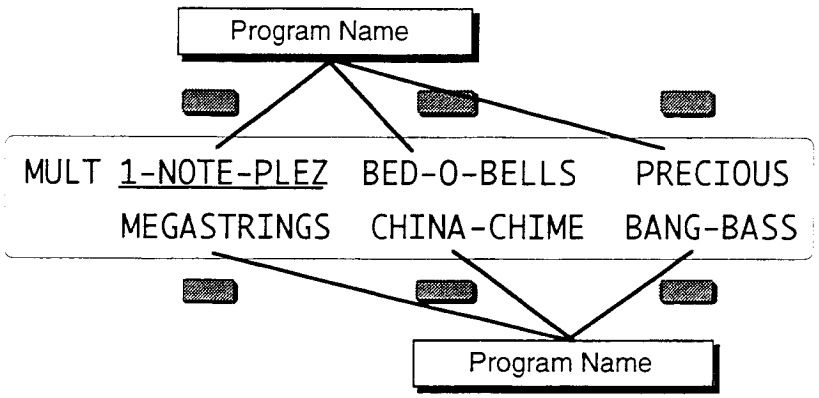
By following this procedure, you can create a super-preset comprised of up to 12 programs. In addition, you can layer as many as all 12 programs.

Multi and the Performance Parameters

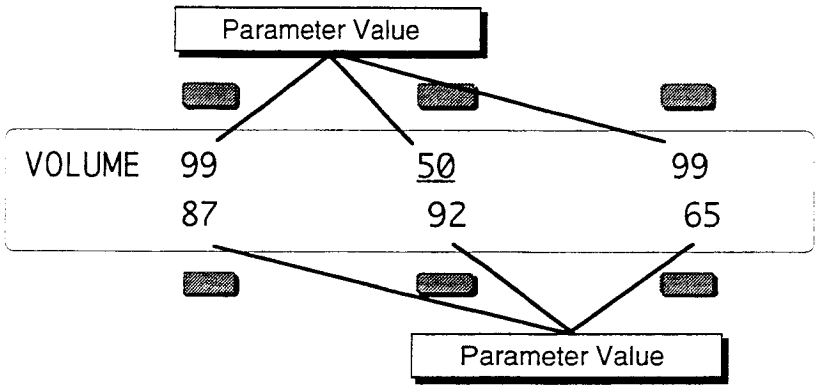
As described in the Section 2, whenever you go from Sounds or Preset mode to the Performance Parameters, the VFX displays the names of the three most

recently selected programs (on the top line) and their parameter values (on the bottom line).

The Multi is similar, except that the names of the programs and their corresponding performance parameters are shown on different pages. When you press *Multi A* or *Multi B*, the VFX displays the names of the six programs on the tracks of that half of the Multi:

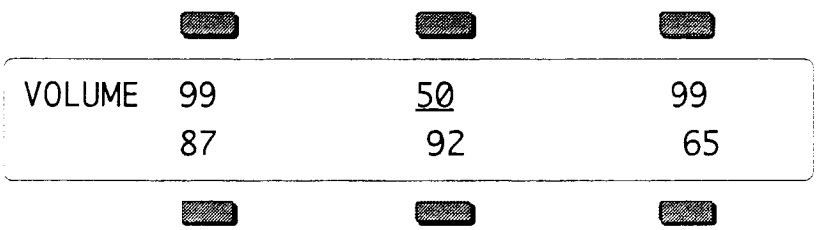


When you then select any of the Performance parameter pages, the display will show only the parameter values for the six tracks, and not the names of the programs:



Let's look at a Multi Track performance parameter, and you'll get a better idea how the works. Using the Volume page as an example:

- Press ***Multi A*** or ***Multi B***. The display shows the MULT page with the names of the programs on the six tracks.
- Press the ***Volume*** button. This takes you to the VOLUME Page.



Each of the six parameter values corresponds to a track location in Multi A or Multi B (the LED in the ***Multi A*** or ***Multi B*** button will be lit to tell you which you are in). You can verify this by pressing the ***Volume*** button again. This enables you to toggle back and forth between the performance parameter page and the MULT page. Repeatedly pressing either the ***Multi A*** or ***Multi B*** button will also toggle you between the MULT Page and the last-selected performance parameter. This will help you keep track of what you're editing. Other than that, Performance Parameter editing in Multi A or Multi B is the same as in presets.

Important: In Multi, selecting and editing a track from a performance parameter page does not change what is selected or layered on the MULT pages — i.e. it does not affect what you hear. This means that you can edit a performance value for one (or more) of the tracks within a group of layered sounds without changing layer. It also means, however, that you could edit a performance value for a track that you are not currently hearing, so be careful that you know what track(s) you are listening to in relation to what is selected on the performance parameter pages.

Copying a Preset into Multi A or B

You can copy the three tracks of a preset, with all performance parameter settings preserved, into three tracks of the Multi set-up. The preset will be copied whole into the three tracks on the upper or lower line of the Multi which you designate:

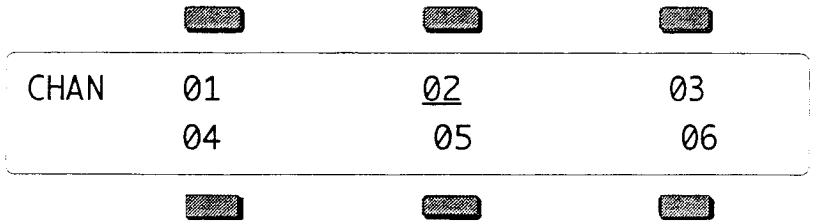
- Press ***Multi A*** or ***Multi B*** and select any of the tracks on the line (upper or lower) to which you want to copy the preset.
- Press ***Preset*** and use the Bank buttons to select the preset you want to copy.
- Press and hold ***Preset***. While holding the ***Preset*** button down, press the same Multi button (A or B) as you did in the first step. The preset tracks are copied into the upper or lower line of that half of the Multi.

When you copy a preset into the Multi, all the performance parameters are copied. However, the selected and layered status of the tracks in the preset *is not* copied. Whichever tracks in the Multi are selected or layered when the preset is copied will remain so after it is copied.

MULTI Mode — Receiving on 12 MIDI channels

As we have discussed earlier, when you select MIDI MODE=MULTI on the MIDI Control Page, the 12 tracks of the multi become like 12 "virtual instruments," each receiving on its own MIDI Channel, but all sharing the same 21 voices and the same effects set-up.

- Press ***MIDI Control***. Select MIDI In mode (MODE=_____) and set to MULTI. The 12 Multi A & Multi B tracks will now each receive on its own MIDI channel, which you can select independently for each track.
- Press ***Multi A*** or ***Multi B***, then press the ***MIDI*** button in the Performance section. The first sub-page, labeled STAT, shows the status for the six tracks — Local, MIDI, Both or *Off*.
- Press ***MIDI*** again to reveal the second sub-page, labeled CHAN. Here you select the MIDI channels for the different tracks:



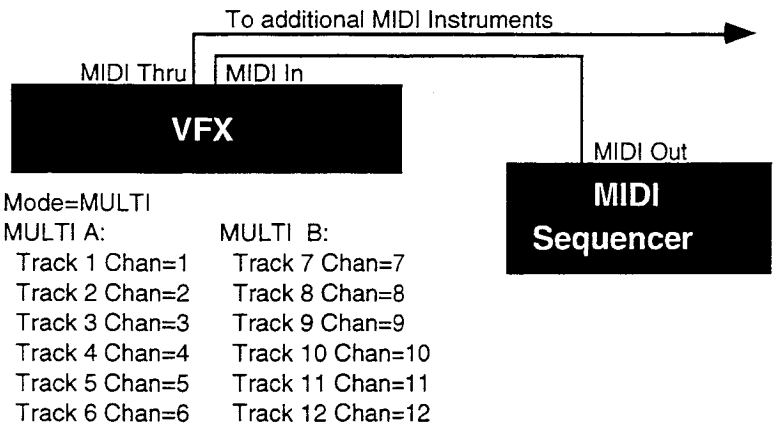
Select any track and set it to receive on the MIDI Channel you wish. Now, as long the VFX is in MULTI Mode, incoming MIDI information on that channel will be received by that track. Incoming MIDI program changes will change the program on the track.

If (as is often the case) you don't want all 12 MIDI channels to receive, press *MIDI* until you return to the Status sub-page and set the track(s) you want to disable to *OFF*. Any tracks set to *OFF* will not respond to MIDI or to the VFX keyboard.

Using the VFX with an external MIDI sequencer

For optimal results when using it with a multi track sequencer, the VFX should be set up as described above to receive in Multi Mode, and the 12 tracks of Multi A & Multi B assigned to receive on the desired MIDI channels

The illustration below shows a typical configuration for using the the VFX with an external MIDI sequencer in MULTI Mode:



The 12 tracks of the Multi receive keys, controllers and program changes independently.

Note that the MIDI channel assignments shown above are merely default values. You can set any of the 12 tracks to receive on any of the 16 available MIDI channels, or you can turn a track's Status to *OFF* (so that it does not receive at all) if you want less than 12 channels to be recognized.

A Few Important Points About Multi Mode

- When the VFX is in Multi mode, *only* the 12 tracks of the Multi will receive MIDI information. Sounds and presets selected in the normal fashion will not respond to MIDI at all.

- Each of the 12 Multi tracks (six in Multi A, six in Multi B) is completely independent and polyphonic. The VFX's *Dynamic Voice Assignment* means each track can have up to all 21 voices if it needs them. If all 21 voices are in use and a track needs a voice, it will "steal" the voice from the oldest note (or the one with the lowest voice priority).

- The 12 tracks respond independently to MIDI program changes, allowing you to assign a new sound to a track via MIDI. The selected program's effect does not come with it — all of the 12 tracks in the Multi share the same effects setup, which can normally can be changed only by editing the effect from within Multi A or B (see Multi A/B Effects, Section 4).

- You can, however, cause a sound's effects set-up to become the Multi effect (which will then be applied to all 12 tracks) by sending program change # 125 immediately before the program change which selects the new sound for the track (see "Receiving Program Changes," Section 6).

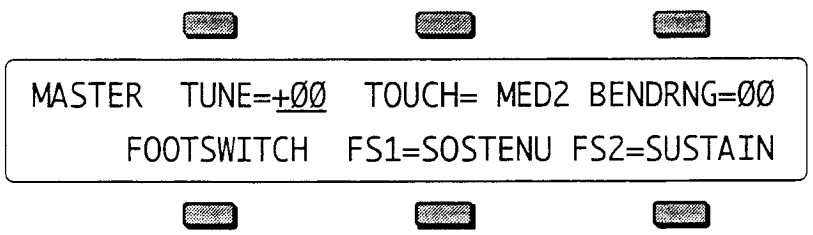
Section 6 — System Control

- parameters which control instrument-wide system functions

Master Page

The Master Page has two sub-pages. These pages give you control over some of the VFX's instrument-wide system parameters. The settings of these parameters will remain in effect at all times and are preserved while the power is off.

Click the ***Master*** button to display the first sub-page.



TUNE

Adjusts the overall master tuning of the keyboard up or down as much as one semitone. A value of +00 will set the VFX to concert A=440 tuning.

Range: -99 to +99 cents.

TOUCH

Allows you to adjust both the pressure *and* velocity response of the keyboard to match your playing style and technique. For each of the four velocity settings SOFT, MED, FIRM, HARD there are four pressure thresholds 1, 2, 3, 4, for a total of 16 available settings. The pressure threshold can be varied between 1 (minimum force required to bring in pressure) and 4 (maximum force required to bring in pressure).

- SOFT 1, SOFT 2, SOFT 3, SOFT 4—This is for someone with a light touch. On any of these settings, a minimum of velocity is required to reach the maximum level of any velocity-controlled parameter.

- MED 1 MED 2, MED 3, MED 4—Slightly harder keystrikes are required to reach maximum velocity levels. The pressure threshold is adjusted from MED–1 to MED–4 as described above.

- FIRM 1, FIRM 2, FIRM 3, FIRM 4—These settings represent average velocity sensitivity. One of these settings should be right for the player with an average touch. The pressure threshold is adjusted from FIRM 1 to FIRM 4 as described above.

- HARD 1, HARD 2, HARD 3, HARD 4—These settings are for the strong player who strikes the keys hard. It provides the widest possible range of velocity sensitivity. The pressure threshold is adjusted from HARD 1 to HARD 4 as described above.

BENDRNG

Adjusts the system pitch bend range, which is the maximum amount of pitch bend which can be applied with the pitchwheel. Each increment represents a semitone.

This bend range will apply to all programs *except* those which have been programmed to override the system bend range. If you set the system bend range, and a sound does not seem to pitch-bend the correct amount, check the setting of the BEND-RANGE parameter on the Program Control (PROG-CNTL) page for that particular program. If BEND-RANGE=**, then the sound uses the system bend range. Otherwise, the sound has its own bend range and will ignore the system bend range.

Range: 0 to 12 semitones.

FOOTSWITCH

Controls for setting the functions of any footswitch(es) connected to the Footswitch input of the VFX. There are two possible footswitches, FS1 (left) and FS2 (right or single).

FS1

When the *optional* SW-5 dual foot switch is plugged into the VFX, the settings of this parameter will control the function of the left pedal.

- UNUSED—makes the VFX ignore the left footswitch.

  If you are are using the single footswitch which came with the VFX (SW-1), then you should keep this parameter set to UNUSED.

- SOSTENU—makes the pedal act almost like the sostenuto pedal on a piano. Any keys that are held down when you press the pedal are sustained until you release the pedal, but subsequent keys are not affected.

- PATCH L—makes the left pedal act like the left patch select button.

- ADVANCE—each time the footswitch is pressed, the VFX advances to the next Preset. When the next preset is in a different bank, the preset bank will also be switched. For example, at preset #9 of Bank A, it jumps to preset #0 of Bank B. At preset #9 of Bank B, it jumps to preset #0 of Cart Bank A. If no cart is installed, it jumps back to preset #0 of Bank A.

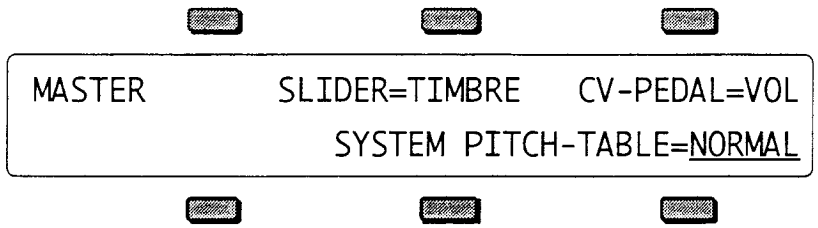
FS2

Controls the function of the basic footswitch (SW-1), or when the *optional* SW-5 dual foot switch is plugged into the VFX, the settings of this parameter will control the function of the right pedal.

- SUSTAIN—holding the pedal down will cause notes to sustain after a key has been released, much like the sustain pedal on a piano.

- PATCH R—makes the right pedal act like the right patch select button.

Click the ***Master*** button again to display the second sub-page.



SLIDER

Determines whether the data entry slider will act as a Timbre control while on any program bank page. This allows you the vary the timbre setting of the program without having to switch the the Timbre performance parameter page. Refer to the Performance Parameters section for more information about the Timbre control.

- TIMBRE—the data entry slider will control the Timbre setting of the primary selected program while any program bank page is displayed.
- NORMAL—the data entry slider will act normally, and will be disabled while on program bank pages.

CV-PEDAL

Determines whether the optional CVP-1 foot pedal will act as a volume pedal or modulator.

- VOL—the foot pedal will adjust the volume of the VFX.
- MOD—the foot pedal will affect anything that has PEDAL selected as a modulation source.

SYSTEM PITCH-TABLE

This parameter sets the type of system pitch table which will apply to all voices which have been programmed to use the SYSTEM pitch table. Please refer to the Using Pitch Tables section for more information.

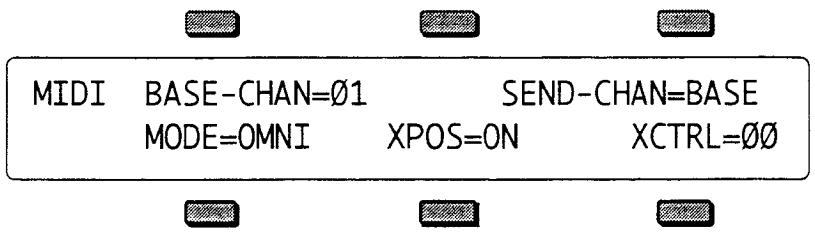
- NORMAL—the VFX will use standard equal-temperament tuning instead of the custom system pitch-table. Setting the system pitch-table to NORMAL does *not* affect the custom pitch-table.
- CUSTOM—the system (or keyboard-wide) pitch-table is set to a user-definable tuning, which can be installed by using a special Copy function (see the Copy page section). This is useful when you have one alternate tuning scheme which you want to use for many programs

MIDI Control Page

- Set system MIDI parameters, such as channel number and mode
- Control what types of MIDI messages are received and transmitted

Few developments in recent years have had as great an impact on the way we make music as has the emergence of MIDI. Whether you are simply linking two keyboards together, playing a synth from a guitar controller, or driving a rack of samplers from a drum pad controller, MIDI makes it all possible. The evolution of MIDI has facilitated the merging of existing technologies and has inspired the creation of new technologies. ENSONIQ has always been an industry leader in MIDI development, and the VFX embodies the latest advances in a state-of-the-art controller keyboard and multi-timbral sound generator.

- Press the ***MIDI Control*** button. This takes you to the top level MIDI Page.



BASE-CHAN

Selects the Base Channel on which the VFX transmits and receives MIDI messages. System Exclusive messages are always sent and received on the base channel.

Range: 01..16

Any of 16 MIDI channels may be selected as the basic MIDI channel of the VFX. The effect of setting the base channel varies depending on the MIDI Mode and whether data is being sent or received.

Transmit — If SEND-CHAN=BASE, then the VFX only transmits on the base channel. If SEND-CHAN=TRACK then keys, controllers and program changes are transmitted on the channel defined in the track.

Receive — In Poly mode keys, controllers and program changes are only recognized if received on the base channel. In Mono A mode program changes are received only on the base channel. The base channel is also used in both Mono modes as the first channel of the 12 channel range.

XPOS - MIDI Transpose Enable

Controls whether track transpose will affect the sending of MIDI key numbers.

- ON—the VFX will transmit the transposed key numbers of a track. Useful for sending transposed key numbers to an external MIDI device
- OFF—the key number transmitted will be the same key that was actually played on the VFX keyboard. In this mode, the VFX will respond properly when the sequence data is played back

SEND-CHAN

This switch controls how the VFX determines the correct MIDI channel for transmitting performance information such as key and controller events, as well as program changes.

- BASE—The VFX will transmit *only* on the Base Channel, and will ignore the channel assignments contained in the tracks.

- TRACK—The settings in the track control MIDI transmit channel selection. The VFX will transmit on the channel(s) assigned to the track(s) being played, depending on MIDI Status (i.e .nothing will be sent if the track is assigned to LOCAL or *OFF* status). Each TRACK can have its own MIDI program number and its own PRESSURE setting.

XCTRL - External Controller

Use XCTRL to assign external MIDI controllers to affect the VFX

Range: 01..95

Most controllers on a synthesizer—mod wheel, channel pressure, or breath controller for example—have a MIDI controller number which can be assigned to this parameter. Doing so will make a particular external controller available as a modulator to any of your programs.

One of the modulation sources that can be selected in the programming section is XCTRL. The value of the XCTRL parameter is a MIDI controller number, ranging from 01 to 95. When the VFX receives MIDI Controller messages corresponding to this controller number, they will be routed to *all* parameters which have been programmed with XCTRL as a modulation source.

Suppose, for example, you are playing the VFX from a keyboard with a breath controller (or want to use a breath controller as a modulator when playing the VFX keyboard). You can set up a program on the VFX in which the filter cutoff frequency is modulated by XCTRL. If you then set XCTRL=02, the breath controller will now be able to modulate the filter, or whatever else has its modulation source set to XCTRL, in the program you have created.

The following controller numbers have been agreed upon as MIDI standards:

Number	Controller	Number	Controller
1	Modulation wheel	66	Sostenuto pedal
2	Breath controller	70	Patch selects
4	Foot pedal controller	92	Tremolo
6	Data entry slider	93	Chorus
7	Volume	94	Celeste
64	Sustain pedal	95	Phaser

Although the range of this control is from 01 to 95, most of the values other than those listed above have no "approved" accepted function, as yet. They are there to provide flexibility and to accommodate future MIDI standards.

MODE

This parameter determines how MIDI information will be *received* by the VFX. MODE has no effect on what MIDI information is sent.

There are five MIDI modes implemented in the VFX:

- OMNI—In this mode the VFX will receive on any or all of the 16 MIDI channels. This mode is useful when you are only using a few instruments, and you are not concerned with setting up different channels for each device.

- POLY—In this mode the VFX will receive only on the Base MIDI channel. MIDI information on all other channels will be ignored.

- MULTI—An ENSONIQ innovation, MULTI mode is the key to unlocking the multi-timbral potential of the VFX. In MULTI mode the VFX's 12 Tracks can receive MIDI information independently and polyphonically on up to 12 different MIDI channels.

  Normally, different MIDI channels should be selected for each track. This can be accomplished on the MIDI Channel page (see the Performance MIDI section for more information).

  In MULTI mode, independent of what programs are stacked or selected on the front panel, the sounds you hear will depend entirely on what MIDI channel(s) the MIDI data is received on.

Mono Mode

Mono mode is particularly useful for driving the VFX from a guitar controller, or any other application where having up to twelve independent, monophonic channels is desirable.

The VFX offers two types of Mono mode operation. In both types, the VFX will receive monophonically on twelve consecutive MIDI channels starting with the Base channel (the base channel through base channel +11). The difference has to do with how those MIDI channels are routed within the VFX.

- MONO A—This is another ENSONIQ development intended to make using multi-channel controllers like guitars easier. All notes and controllers received will play whatever programs are selected for the note that is played, just as if the note was played from the keyboard. You have the advantage of multiple tracks which will respond independently to controllers received on multiple channels, but you do not have to set up the programs for each track separately.

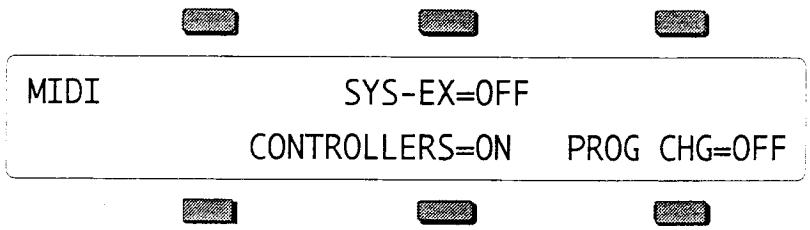
- MONO B—This is the more conventional type of Mono mode. It allows you to set up each track as a monophonic synthesizer. Each track can have a different program assigned to it. This is the only way to get a different sound on each string when using a MIDI guitar controller.

Global Controllers

Global controllers are controllers sent on one channel which affect all other channels simultaneously. They can be useful in reducing the number of MIDI events required to achieve particular effects, and can thereby reduce the delays sometimes associated with overloading MIDI. Some guitar controllers can transmit global controllers, and the VFX can respond to them.

In Mono mode (A or B) the base channel minus one becomes the MIDI channel for global controllers (pitch bend, pressure, etc.). For example, if the base channel is channel 3, any controllers received on channel 2 will be interpreted as global controllers and will affect *all* voices being played. If the base channel is channel 1, channel 16 becomes the channel for global controllers. Each track will also respond independently to controllers sent on its own channel. For example, each guitar string on a MIDI guitar can send independent pitch bend, while the "whammy bar" controller could be sent on the global channel to affect all voices.

- Press ***MIDI Control*** again. The display reads:



This page contains switches which control how the VFX handles certain types of MIDI messages. The settings of the switches, like all other system parameters are retained while power is off.

SYS-EX

This switch determines whether the VFX is able receive MIDI System Exclusive messages. When SYS-EX=OFF, the VFX is not able to receive any MIDI System Exclusive messages. The Sys-Ex messages which are sent from the Storage Page can always be transmitted regardless of the setting of this switch. (Refer to Appendix A for more information about the Sys-Ex implementation).

CONTROLLERS

This switch controls whether the VFX will send and receive MIDI controllers—pitch bend, mod wheel, pressure, volume, sustain pedal, etc.

PROG CHG

This switch controls how the VFX handles MIDI program change messages.

- OFF—the VFX will *not* transmit or receive MID program changes
- ON—the VFX will transmit and receive program changes over MIDI.
- NEW—the VFX will transmit program changes only if they are *different* than the previous program change sent out on the particular channel. Program changes will be received normally.

Program changes are numbered and displayed from 001 to 128 in the VFX, although in accordance with the MIDI specification they are invisibly transmitted and received as 000...127.

(Refer the Performance MIDI parameters section and the Using the Multi A & B Tracks section for more information on how program changes are handled).

Receiving Program Changes

The way in which the VFX receives program changes is slightly more complex than some other systems because the number of programs and presets that are available to be selected from MIDI is *larger* than the number of program change messages available within the MIDI standard. To solve this problem, the VFX uses the last three program change numbers (126..128) to control how subsequent program changes will be interpreted. The following chart shows the effect of these three special program changes.

After Program Change...	*Subsequent program changes will select ...*		
126	001..060 - INT Programs	061..120 - CRT Programs	
127	001..060 - ROM Programs	061..120 - CRT Programs	
128	001..020 - INT Presets	021..040 - CRT Presets	041..060 - ROM Presets

These special "control" program changes need to be sent only once. All subsequent program changes will be handled according to the range that was set by the last one received. If you press the ***Presets***, ***Sounds***, or ***Cart*** buttons on the front panel you may override the effect of the special program changes, and subsequent program changes will act in accordance with the mode the you have placed the VFX into with the buttons.

Selecting a new Multi effect

There is another special program change, recognized only in MULTI mode, which is used to select *both* a program *and* its effect for one of the 12 Multi A or B tracks. When program change 125 is received on a channel assigned to a Multi track, then the next program change received on that track will select a new program and also install the effect from that program into the Multi effect. This is the only way to change the Multi effect from MIDI. This can be useful when controlling the VFX from a sequencer.

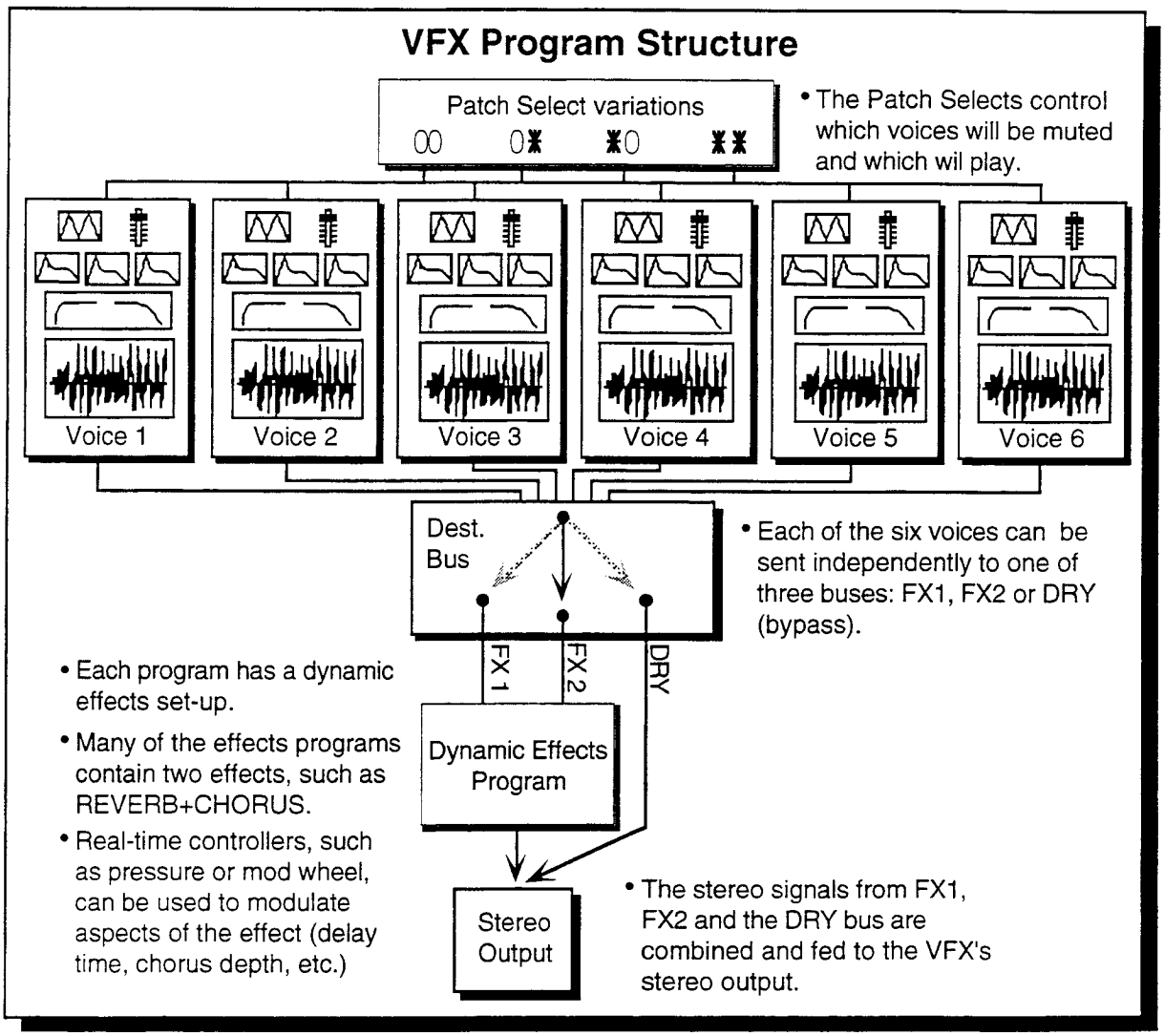
This special program change 125 does not change the way in which other program changes are received, including the other special messages. If the program you wish to select also requires a special control program change, then send the control message immediately after the 125, followed by the program number you want to select.

Remember: All VFX program changes are referred to and displayed as 001 to 128, but the actual codes transmitted and received over MIDI are less by one (000 to 127).

Section 7 — Programming the VFX

What is a Program?

A VFX Program (or *sound* as we sometimes refer to it) is a dynamic structure made up of six *voices* and an *effect*. The status of the two Patch Select buttons determines which of those six voices will play at any given time. The diagram below illustrates the make-up of a VFX program.



Voices and Polyphony

When refer to the number of voices in a VFX program, we are *not* talking about polyphony (as in "you can only play so many notes"; see below). We are referring to the number of voices that will sound on each key as you play the program. The VFX is unique in that it lets you choose the number of voices (from one to six) per key for each program.

The VFX has a total of 21 voices which are dynamically assigned among the different sounds that you play. How many voices a sound uses on each key depends on the program. Many sounds use only one voice — in the case of these sounds you can play 21 notes before "voice stealing" occurs. On programs that use 2 voices, you can play 10 notes before any voices are stolen. Three voices, seven notes. And so on. Up to six voices can be active in one program.

Bear in mind that the VFX is "smart" about voice allocation — there are many things that a programmer can do to increase the apparent polyphony of a sound and to minimize the effects of voice stealing. For example:

- As soon as a voice is done playing (either because it reached the the end of the wave or because the volume envelope went to zero) that voice is returned to the pool, and a new note can use that voice rather than stealing one that is still sustaining. See "Voice triggering/Stealing notes," in Section 8.

- Also, you can assign low, medium or high priority to each voice in a program, which allows you to control how voices are reassigned. See "Output page" in Section 8.

Patch Select Buttons

The two *Patch Select* buttons above and to the left of the pitch bend wheel provide instant access to four different variations within each program. When you press either or both of the Patch Select buttons you are selecting different combinations of the voices that make up a program. For each of the four possible patches, any combination of the six voices can be made to play or to remain silent.

The Patch Select buttons are "momentary" — an alternate patch will play only on notes played while the button is held down, unless you "lock in" a patch using the functions on the Patch Select function in the Performance section. (See Section 3.)

You can see the patches changing, and see which voices are playing for each patch, on the Select Voice page. Press ***Select Voice***, then watch the display as you press the Patch Select buttons:

- The six voices that make up the program are represented on the display by the name of the wave that each is playing.
- Voices *without* brackets around the name are enabled for that patch and will play.
- Brackets around the name mean that the voice is muted for that patch and will not play.

The Patch Select buttons are sent and received over MIDI as MIDI controller #70.

Compare — Using the Compare Button/LED

As soon as you change any parameter in a program, the LED in the ***Compare*** button will light. It will remain lit until you select another program or save (write) the newly edited program into memory. This is a constant reminder that something in the program has been changed.

To hear the original, unchanged, program, press the ***Compare*** button. The ***Compare*** LED will go out, and you will hear the original sound and see the page with its original settings. Press ***Compare*** again to return to your edited program. You can toggle back and forth between the original and the edited sound as often as you like.

Edit Buffer

You can edit a program, while keeping the original program intact, because the edited version is kept in a special area of memory called the *Edit Buffer*. Whenever you change any parameter of a program, the altered program is put in the edit buffer, replacing whatever was previously there. Only one program at a time can reside there — the edit buffer always contains the results of your last edit.

When you press the ***Compare*** button, you are alternating between the program in the original memory location and the program in the edit buffer. We refer to the program in the edit buffer as the *Edit Program.*

You can return to the edit program, even after selecting another program (as long as you don't change any parameters there) by pressing the ***Compare*** button. This puts you back in the edit buffer, and any changes you make will affect the edit program.

The rule of thumb is this: Whichever program sound you hear, that's what you're editing.

If you like the results of the changes you have made to a program, you should rename it and save the new program permanently, to another location. The procedure for this is covered under "Write Page," later in this section.

Abandoning Your Edits

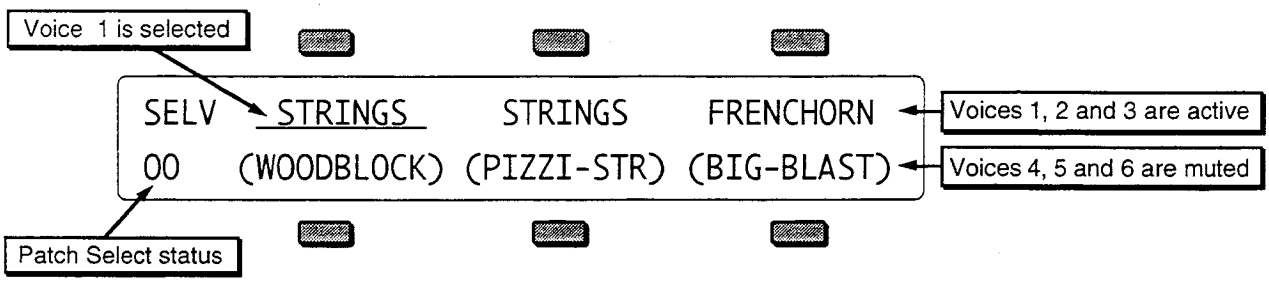
If you decide, while editing a program, that you're not happy with what you've done, and you want to start over with the original program, just go to the proper Program Select page and select the program again. Then you can start editing the program again from scratch. You <u>will</u> lose the one you were working on before.

Select Voice Page

The Select Voice page is one of the central programming pages of the VFX. The mute status of each of the voices is shown on this page, and it is easy to see which voices are being heard and which are selected. Whenever you begin to edit a VFX sound, you should start here so that you know just which voice you are editing.

On the Select Voice page you can:
- select a voice (or group of voices) for editing,
- determine which of the six voices will play (and which will be muted) for each of the four Patch Select variations, and
- temporarily solo any one of the voices without disturbing the other settings on the page.

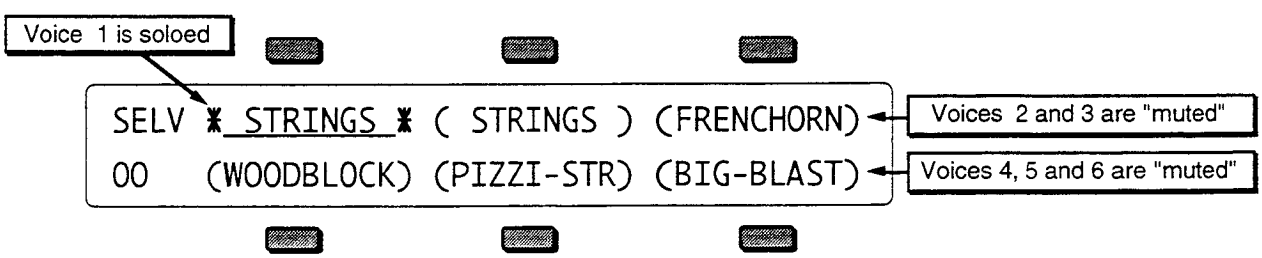
Press ***Select Voice***. The display looks something like this:



The six locations on the screen represent the six voices which are available within the program. For each voice the display shows the name of the wave that the voice is assigned to play, and the mute status of the voice in the current patch. When you press the soft button above or below one of these voices, it becomes underlined, indicating that it is the currently selected voice, the one that will be affected by any editing you do.

Voices shown without brackets are active and will play in the current patch. If you press the down arrow button while on a selected voice, it will mute that voice. Brackets (or parentheses) around the voice name indicate that the voice is muted in the current patch. Pressing the up arrow button on a muted voice will un-mute it.

Pressing the up arrow on an un-muted voice will solo that voice. Solo voices are displayed enclosed by asterisks, with all other voices muted. Pressing the down arrow on a soloed voice will return it and all other voices to their normal status.



Short Cuts (using the soft buttons)

Once a voice is selected (underlined):

- If it is active, pressing its soft button again will mute it.
- If it is muted, pressing its soft button will un-mute it.
- Double-clicking will solo the voice. Click once more on a soloed voice to return all voices to normal.

Whenever you are on this page, pressing the ***Select Voice*** button again will return you to the page you were on prior to entering the Select Voice Page.

Note: If you edit a voice which is muted, you will see the word MUTE flashing in the lower left corner of the display to remind you that you are *not* hearing the results of your edits.

Group Edit Mode — Selecting More than One Voice at a Time

Normally, when you are editing voice parameters, you are working on a single parameter within a single voice. In some cases you may want to edit the value(s) of the same parameter in more than one voice simultaneously. For example, you might want to edit the amplitude envelope release time for all active voices in a program at once, saving the time it would take to edit each of the voices individually. This may be accomplished using the special *group edit* feature of the VFX. Group editing is a temporary state that allows more than one voice to be "selected" on the Select Voice page, and any edits performed while in this group edit state will affect all of the voices which are not muted.

Ordinarily you can only select one voice at a time. However, if you want to edit the same parameter(s) for all the active voices simultaneously, double-click the ***Select Voice*** button. The Select Voice page will appear with all the active voices in the current patch selected. Now, parameter changes you make on any of the programming pages will affect all the voices currently playing.

Programming pages you select while in group edit mode will appear with "GRP" flashing in the lower left hand corner of the display to remind you that you are editing more than one voice.

Note that while in group edit mode, pressing any of the soft buttons on the Select Voice page will return it to its normal state, where only one voice can be selected at a time.

Using the Group Edit feature

- Make sure that the voices you wish to edit are not muted and then *double-click* ***Select Voice***.
- The Select Voice page will be displayed with all voices included in the group to be edited appearing underlined.
- Perform the desired parameter edits. Using the data entry slider will set the value of all of the parameters being edited to the *absolute* value displayed for the current voice. Using the up/down arrow buttons will affect each parameter *relative* to its current value in each of the voices being edited.
- Changing the mute status of any voice, or selecting a new voice or program, will disable the group edit feature and return the VFX to its normal state.

Note that the parameter values displayed when editing in Group Edit mode are the values for the voice which was selected before you entered Group Edit mode *unless* the previously selected voice was muted and was not included in the

group. In this case you will see the values for the first voice in the group.

This feature can be particularly convenient when editing programs with multiple-voice components that you wish to edit simultaneously. Set up a patch select for each of the various sets of voices that you wish to edit together, muting all voices except the set you wish to group. When you wish to edit a particular set, simply set the patch select and then double click ***Select Voice*** to enter group edit.

Note: The mute status of the patch select which is selected at the time when you double-click ***Select Voice*** will determine which voices are included in the group. It is possible to have muted voices appear in the group if you enter group edit mode from a patch select in which those voices are *not* muted.

Programming the Patch Selects

There can be four variations of the program, one for each of the four possible Patch Select button positions. The patch selects are used to control which voices in a program are active or muted. The current patch select variation is shown in the lower-left corner of the display on the Select Voice page. For either button, a "0" indicates that the button is not being pressed, and an asterisk (or star *) indicates that the button is down.

While on the Select Voice Page, press the Patch Select buttons and watch as the display changes to show the status of each patch variation. Note that for each of the four patch select variations, a different combination of voices can be active or muted. This enables the programmer to set up the patches to add or subtract components of the sound dynamically. The variations can range from subtle alterations to dramatic changes in the characteristics of the sound that the program produces.

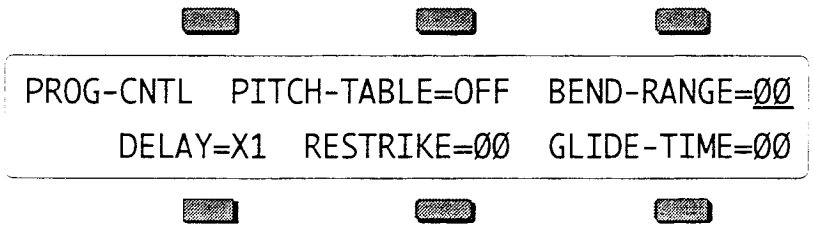
The Performance Patch Select parameter controls how the patch selects will operate. If the parameter is set to LIVE, then pressing the Patch Select buttons while the Select Voice page is displayed will show the different variations. One of the four patch select variations may be "latched-in" as the current default by changing the value of the Performance Patch Select parameter for the currently selected program. Refer to the Performance Parameter section for more information on controlling the Patch Selects.

Programming Tip: When programming the patch selects, it is often convenient to be able to instantly latch different Patch Select variations so that you can set up the voice mutes for each variation. You can do this by setting the Performance Patch Select parameter to HOLD. Refer to the Performance Parameters section for more information.

Program Control Page

The parameters on this page control aspects of the program that affect *all* of the individual voices within the program.

Press ***Program Control***. The display shows:



PITCH-TABLE

The setting of this switch indicates whether a Custom Pitch-Table exists within the program. Custom pitch-tables occupy the portion of a program which is usually used by voices 5 and 6, so when a pitch-table is present, you do not have access to those two voices. Whenever the setting of this switch is changed, you will be prompted with questions that ask you to verify the action that will be taken. If you answer NO to the prompt, then the setting of the switch is *not* changed. Refer to the Using Pitch Tables section for more information about pitch-tables.

- OFF — there is no custom pitch-table in this particular Program.
- ON — a custom pitch-table does exist in the program and voices 5 and 6 have been replaced by the custom pitch-table.

BEND-RANGE

The setting of this parameter determines whether the program has its own independent pitch bend-range, or whether it will use the system bend range to determine the maximum pitch change which can be applied by the the pitch wheel. The bend-range set on this page will override the system bend range for this program only. See the description of the Bend Range parameter on the Master Page in the System Control section for more information on the system bend-range.

Range: 00 to 12 and **. If BEND-RANGE =** then the program will use the system bend range selected on the Master page.

DELAY

Delay is a multiplier which affects all of the individual delay times which appear on the Wave page for each of the voices. The multiplier affects both the maximum delay time available and the timing resolution of the delay. This parameter is program-wide and affects *all* voices in the program. Refer to the description of the Wave page in the Voice Programming section for more information on the voice delay feature.

Range: X1, X2, X4, X8.

RESTRIKE

This parameter controls the Restrike time. When you play a particular note and then restrike it again immediately before the old note has finished sounding, the amount of time it takes for the first strike to fade away is determined by this parameter. By varying the setting of this parameter, you can control how long sounds overlap when a note is restruck.

For example, if you have a slow string sound, it may sound more natural to use a longer restrike value, which will cause the old note to decay more slowly, rather than end abruptly when the new note starts. Normal values are around 10. The higher the value, the longer the fadeout time.

Range: 00 to 99.

Note: If you hear clicking sounds when you restrike a note, setting the Restrike time to higher values may eliminate the click.

GLIDE-TIME

This parameter controls the time it takes for the pitch to slide smoothly (glide) from one note to another. All six voices in a Program use the same Glide Time. However, on the Pitch Mod page of each individual voice is a parameter that controls whether the voice will glide or not.

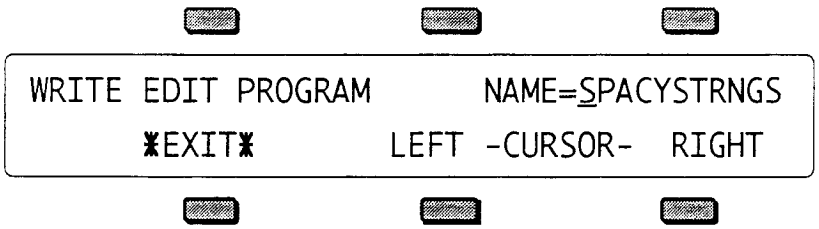
Range: 00 to 99 (the higher the value, the longer the Glide Time).

Write Page — Saving a New Program Into Memory

Once you have modified an existing program, or created an entirely new one, you can *write*, or save, that program to any internal or cartridge memory location using the Write Page. This page is also used to rename the program with the name of your choice.

When you are ready to save a program into memory, first decide on a name of up to eleven letters for your new program. Then:

- Press ***Write***. The Write page appears as shown below, with the current program name showing. You will see a cursor, or underline, beneath the first letter of that name.



- Edit the Program Name using the data entry slider and the two Move Cursor soft buttons, labeled LEFT and RIGHT. You can move the data entry slider up and down to scroll through the available characters, or step through them one at a time with the up and down arrow buttons. Find the first letter you want, then press the RIGHT button to move the Cursor to the next location. Repeat this procedure until the display shows the name you have chosen.

Hint: Moving the data entry slider all the way down gives you a blank space. Also, using dashes, periods and slashes between characters can make a sound name hold together better when displayed on Program Bank and Preset pages.

- Select a memory location for your new program. Press one of the Bank buttons, 0-9. As long as you hold the button down, the display will show the program select page for that bank, with two differences: 1) None of the program names are underlined, and 2) the word "SAVE" is flashing in the lower left-hand corner, below the page name.

  When you release the Bank button, the display will return to the Write page. Press another Bank button and the display shows you the programs for that bank. To look at the Programs in the cartridge, simply press ***Cart***, and then press and hold down any of the ten Bank buttons, as before. You can also press the bank buttons while holding down the ***Sounds*** button to "shop around" without returning to the Write page each time you release the bank button.

- You may want to audition a few sounds before deciding which to replace. In this case, press the button beneath the word *EXIT* on the display. This takes you off the Write Page. Now use the Bank buttons and the program select pages in the usual way to select and listen to the Programs in memory. Your new Program is still safe in the VFX's edit buffer.

Warning: While you're doing this, DO NOT use the data entry controls to change any parameters in the programs you audition, as this would instantly replace your hard-earned new Program in the Edit Buffer with something else entirely.

When you are through listening, return to the program you want to save by pressing the ***Compare*** Button. The ***Compare*** LED will light. Now press the ***Write*** to return to the Write Page. Your new program and its new name should be just where you left them.

- To save the program, press the appropriate Bank button, and *while holding it down*, press the soft button which corresponds to the program you wish to write over. This writes the new program, with its new name, into that memory location.

  The display shows the message WRITING PROGRAM - PLEASE WAIT, which will remain for about a second. The VFX will then return to the bank into which the new program has just been saved. The new program is underlined, and is thus selected as the current program.

EXIT

The Button beneath the word *EXIT* can be pressed at any time to exit the WRITE Page and return to the Page you were on before entering it.

Copying an Existing Program to Another Location

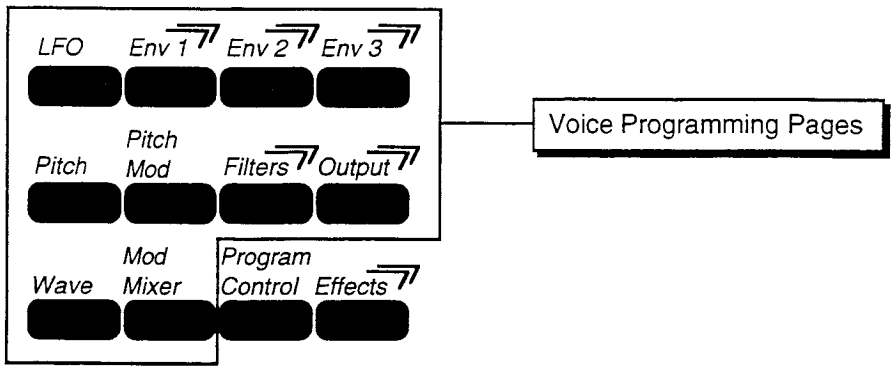
Sometimes you'll want to take an existing program, one that you haven't been editing, and simply copy it to another memory location. For example, you might want to put the six most commonly used programs in the same bank, for easy access during performance.

To do this you will use the VFX's Copy function. Normally the Write page "looks" only at the edit buffer, but you can use the Copy function to place an existing program onto the Write page:

- Select the sound you want to copy.
- Press ***Copy***. The *Copy Context* on the top line of the display shows PROGRAM PARAMETERS.
- Press MAKE COPY. This puts the current program into the copy buffer.
- Press RECALL. This puts you back on the Write page, with the new program showing. Now proceed exactly as described above to write the program to the new location.

Section 8 — Voice Programming

This section covers those functions which can be edited independently for each individual voice within the program.

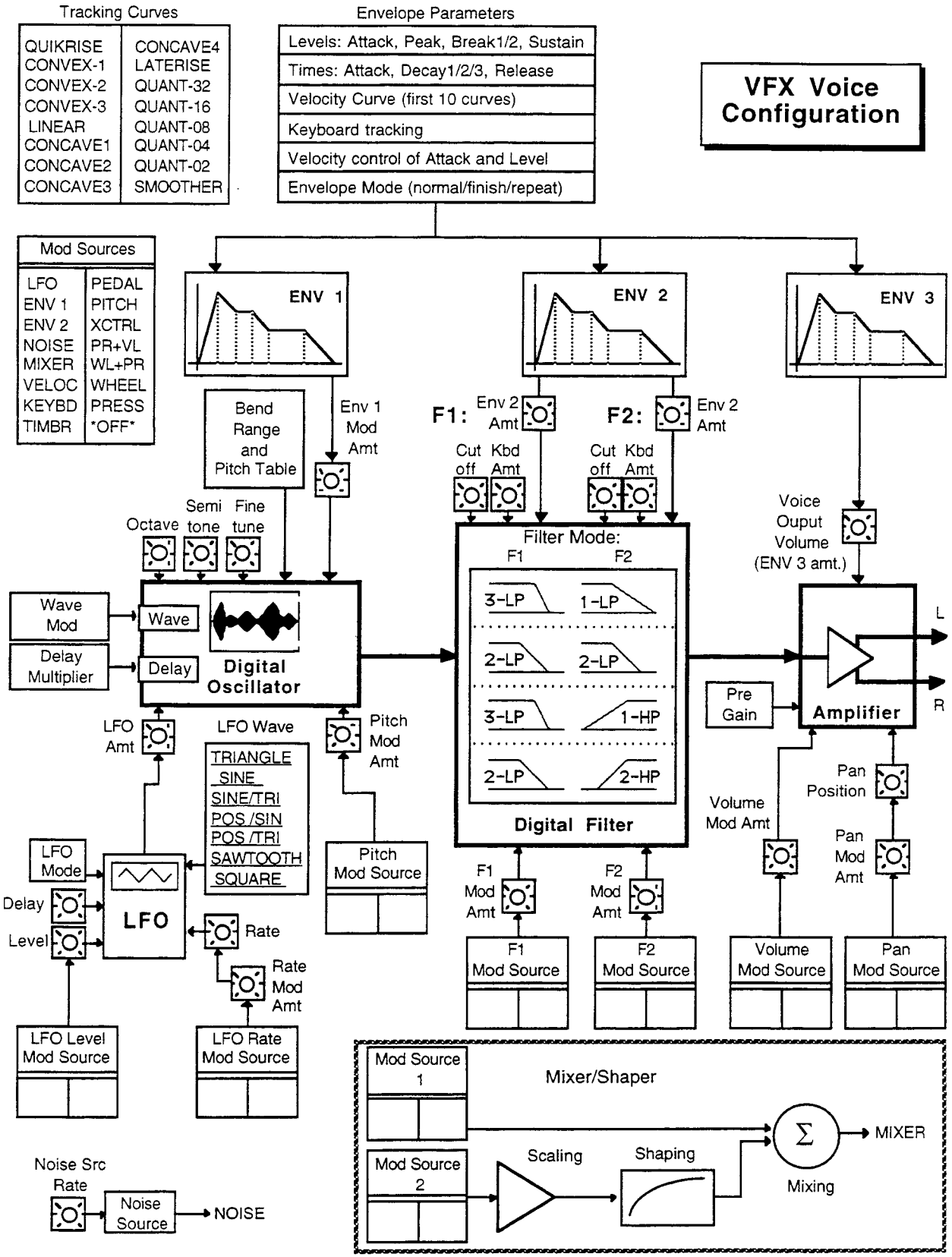


VFX Voice configuration

Each of the six voices within a VFX program consists of:

- a digital oscillator playing one of the 109 waves from the VFX wave memory
- two multi-mode digital filters
- one LFO (Low Frequency Oscillator)
- three complex envelope generators for controlling volume, pitch, filter frequency, etc
- a versatile matrix modulation scheme with 15 routable modulation sources

The diagram on the following page shows the configuration of one VFX voice.


Tracking Curves
QUIKRISE
CONVEX-1
CONVEX-2
CONVEX-3
LINEAR
CONCAVE1
CONCAVE2
CONCAVE3
CONCAVE4
LATERISE
QUANT-32
QUANT-16
QUANT-08
QUANT-04
QUANT-02
SMOOTHER
Envelope Parameters
Levels: Attack, Peak, Break1/2, Sustain
Times: Attack, Decay1/2/3, Release
Velocity Curve (first 10 curves)
Keyboard tracking
Velocity control of Attack and Level
Envelope Mode (normal/finish/repeat)
VFX Voice Configuration
Mod Sources
LFO
ENV 1
ENV 2
NOISE
MIXER
VELOC
KEYBD
TIMBR
PEDAL
PITCH
XCTRL
PR+VL
WL+PR
WHEEL
PRESS
OFF
ENV 1
ENV 2
ENV 3
Bend Range and Pitch Table
Env 1 Mod Amt
F1: Env 2 Amt
F2: Env 2 Amt
Cut off
Kbd Amt
Cut off
Kbd Amt
Voice Ouput Volume (ENV 3 amt.)
Octave
Semi tone
Fine tune
Filter Mode:
F1
F2
3-LP
1-LP
2-LP
2-LP
3-LP
1-HP
2-LP
2-HP
Digital Filter
Wave Mod
Delay Multiplier
Wave
Delay
Digital Oscillator
Pre Gain
Amplifier
L
R
LFO Amt
LFO Wave
TRIANGLE
SINE
SINE/TRI
POS./SIN
POS./TRI
SAWTOOTH
SQUARE
Pitch Mod Amt
Pitch Mod Source
Volume Mod Amt
Pan Position
Pan Mod Amt
LFO Mode
Delay
Level
LFO
Rate
Rate Mod Amt
F1 Mod Amt
F2 Mod Amt
F1 Mod Source
F2 Mod Source
Volume Mod Source
Pan Mod Source
LFO Level Mod Source
LFO Rate Mod Source
Mod Source 1
Mixer/Shaper
Mod Source 2
Scaling
Shaping
Σ
MIXER
Mixing
Noise Src Rate
Noise Source
NOISE

Modulators

About Modulation

To modulate something is simply to cause it to change. Within the voice architecture of the VFX we begin by setting basic, or manual, levels for the volume, pitch, brightness, etc. of a voice, and we then modulate those levels in various ways in order to create movement and dynamics.

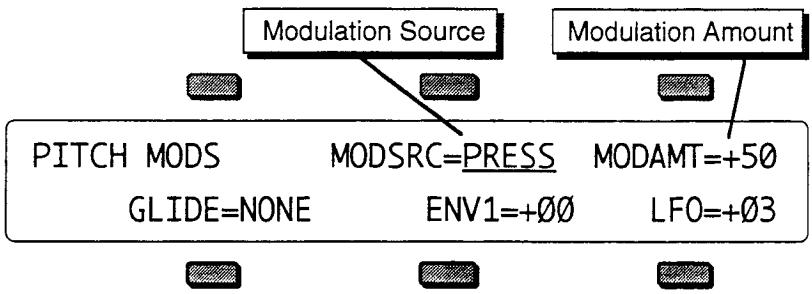
Suppose you switch on your stereo, and turn the volume half way up. We can call this the manual volume setting. It will stay at that level until it's changed. Now suppose that you take the volume knob and begin quickly turning it up and down, so the volume gets continuously louder and softer, louder and softer. What you would be doing is modulating the volume of your stereo. If you were to take the treble control, and do the same to that knob, you would be modulating the brightness of your stereo.

In much the same way we modulate various levels within the VFX (though generally the approach is less haphazard). There are 15 different *Modulation Sources* available, and they can each be independently assigned to vary the manual levels for a great many aspects of a voice, including real time control of some aspects of an effects program.

Selecting a Modulator

On those programming pages where a modulator can be selected to vary the level of some function within a VFX voice, the display shows MODSRC=_____ (short for Modulation Source). A modulator is selected by selecting (underlining) that parameter with the appropriate soft button, and then using the data entry slider or the up/down arrow buttons to select among the 15 available modulation sources. (Hint: Moving the data entry slider all the way up selects *OFF*, which is handy if you don't want a Modulator applied in a particular location.)

Let's take, for example, the ***Pitch Mod*** page, which is where you apply modulation to the pitch of a voice. Press ***Pitch Mod***. In addition to Envelope 1 and the LFO, which are always available, you can choose an additional modulator to alter the pitch:



Modulation Amount

As shown above, where a modulation source is selected, the parameter immediately to its right controls the *Modulation Amount* (the display shows MODAMT=±##) which controls how deeply the selected modulator will affect the level to which it is being applied.

Press the soft button above MODAMT=, and use the data entry controls to adjust the modulation amount. Modulation amount can be positive or negative. A modulation amount of +00 has the same effect as turning the modulator *OFF*.

Hint: With modulation amount, as with all parameter values that have a center value (in this case, +00), there is an easy way to reach that value. With the MODAMT selected, press the down arrow button, and *while holding it down*, press the up arrow button, then quickly release both buttons. This automatically sets the modulation amount to +00.

Modulation Sources

The 15 Modulation Sources available on the VFX are as follows:

- LFO — Low Frequency Oscillator
- ENV 1 — Envelope 1
- ENV 2 — Envelope 2
- MIXER — Mod Mixer/Shaper
- NOISE — Noise Generator
- VELOC — Velocity
- KEYBD — Keyboard Tracking
- TIMBR — Timbre Control
- PEDAL — Voltage Control Foot Pedal
- PITCH — Pitch Bend Wheel
- XCTRL — External Controller (MIDI)
- PR + VL — Pressure + Velocity
- WL + PR — Wheel + Pressure
- WHEEL — Modulation Wheel
- PRESS — Pressure (After-touch)

- **LFO — Low Frequency Oscillator**

  The *Low Frequency Oscillator* generates only very low frequency waves, below the audio spectrum, which can produce vibrato, tremolo, and many other effects, depending on the LFO wave selected, and where it is applied as a modulator. There are seven possible waveshapes for the LFO. See LFO Page later in this section for a complete discussion of the LFO.

- **ENV 1, ENV 2, (ENV 3)**

  The VFX has three complex *Envelopes*. Envelopes are used to create changes, over time, in pitch, brightness, volume, etc.
  - ENV 1 is permanently routed to the pitch of the voice, though it can be assigned as modulator elsewhere if you wish.
  - ENV 2 is permanently routed to the filter cutoff frequency. It also can be assigned as a modulator elsewhere.
  - ENV 3 is a special case. ENV 3 *always* controls the volume of the voice, and cannot be selected as a modulator anywhere else.

  A discussion of the VFX Envelopes follows later in this section.

- **NOISE — Noise Generator**

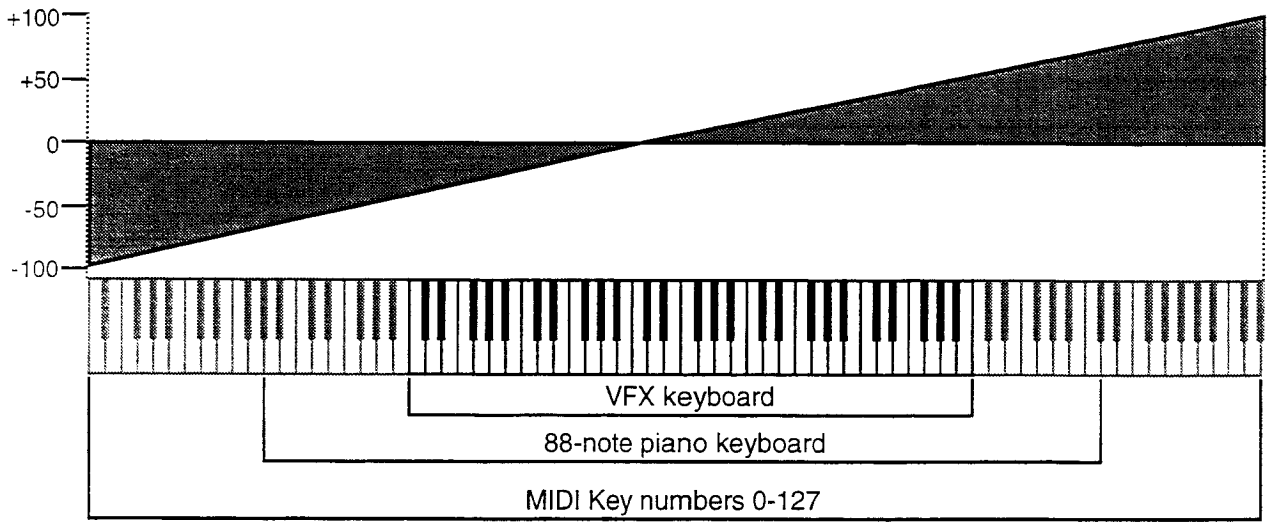
  The Noise generator creates an randomly changing level. It is useful for modulating, among other things, the pitch of a voice (Pitch Mod page). Applied to pitch with large modulation amounts it tends to create strange "computer sound" effects. Small modulation amounts (around +02 to +04) can create a subtle random movement in the sound, which can impart a more natural quality.

  On the second sub-page of the LFO page (press ***LFO*** twice) there is a parameter labeled NOISE SOURCE RATE=##, which adjusts the rate at which the level of this modulator will change.

- **MIXER — Mod Mixer/Shaper**
  The Mod Mixer/Shaper is a powerful feature of the VFX voice architecture which allows you to assign two modulation sources to one input, and to scale and shape the response of one of those modulators in a number of ways. The controls on the Mod Mixer page are used to determine what will happen when MIXER is chosen as a modulator. See Mod Mixer page in the Programming section for a full discussion of the Mod Mixer/Shaper.

- **VELOC — Velocity**
  Velocity means how hard you strike a key. Selecting VELOC as a Modulator allows you to modulate any manual level with velocity. Velocity as a modulation source only goes positive (though assigning a negative modulation amount will make the net result be to reduce the level with increased velocity).

- **KEYBD — Keyboard Tracking**
  This uses the position of a note on the keyboard as a modulator. The scaling effect of this Modulator is figured over the full 128 MIDI key numbers:



As the above illustration shows, the effect of KEYBD as a modulator goes negative as well as positive. The effect of KEYBD is to reduce the Level on notes below the break point (Middle C), and increase levels above that point. Negative Modulation depths will do the opposite.

- **TIMBR — Timbre Control**
  This is a special modulator, unique to the VFX, which is intended as an "extra" real-time performance controller. TIMBR can be assigned like any other modulator wherever a modulation source is selected. It is controlled from the Timbre page in the Performance section of the front panel. Whenever you are playing a sound or preset, you can press ***Timbre*** and use the data entry slider to change the level of this modulator.

  Note that because it can be assigned to modulate anything within a voice, the Timbre control will not always necessarily adjust the tone color (which is what we normally associate with the word *timbre*) of a given sound, depending on what the programmer has chosen to do with it. As a rule, however, programmers are encouraged to make sure that Timbre always does *something* interesting to the sound.

- **PEDAL — Voltage Control Foot Pedal**
  This selects the *CVP-1 Foot Pedal*, which can be plugged into the Pedal•CV jack on the VFX's rear panel, as a modulator. Its effect will be the same as that of the mod wheel. It can be applied wherever a Modulator is selected.

  Note that the Foot Pedal will only act as a modulator when the Pedal Function Select parameter is set to PEDAL=MOD on the Master Page. When that parameter is set to PEDAL=VOL the Foot Pedal will act as a volume pedal, not as a modulator (though this has no effect on incoming MIDI Foot Pedal data). See the section Master Page for more details.

- **PITCH — Pitch Bend Wheel**
  This assigns the Pitch Wheel, located to the left of the mod wheel, as a modulator. It allows you to have the Pitch wheel, in addition to bending the pitch of a note (its normal function), also affect some other level. Applied to the filter cutoff frequency, for example, this would cause notes to become brighter as you bend them upwards and more muted as you bend them down (or the opposite with negative modulation amounts).

- **XCTRL — External Controller (MIDI only)**
  An external controller such as a Breath Controller, Data Entry Slider, etc., which is received via MIDI from another synthesizer or controller, can be assigned as a modulator within your VFX Programs. On the MIDI Control Page, you select the number of the external controller that will be recognized by the VFX.

  You don't have to be playing the VFX from an external instrument for this to work. For example, if you have a keyboard with a Breath Controller; 1) Connect its MIDI Out to the VFX's MIDI In; 2) Make sure both instruments have controllers enabled (MIDI Control page); 3) Select Breath Controller as the external controller that will be received by the VFX (XCTRL=02, also on the MIDI Page); 4) assign XCTRL as a Modulator for LFO level, Filter Cutoff frequency, or some other manual level within a voice, as shown in the Programming section; and 5) play the sound from the VFX keyboard, while blowing into the Breath Controller connected to the sending instrument. The modulation will have the same effect as if you were playing from the sending instrument.

- **PR + VL — Pressure + Velocity**
  This is one of two "combination" modulators. When this modulator is selected, either pressure *or* velocity will affect the level which is being modulated.

- **WL + PR — Wheel + Pressure**
  Another combination modulator. When selected, either the mod wheel *or* pressure will affect the level which is being modulated. This can be good for modulating LFO depth when using the LFO for vibrato. That way the player can use either to get vibrato.

- **WHEEL — Modulation Wheel**
  The *Mod Wheel* to the left of the keyboard is assignable wherever a modulator is selected. To use the mod wheel for vibrato (one common application) WHEEL must be assigned to modulate the LFO, and the LFO Amount set to some number other than zero on the Pitch Mod Page. The mod wheel's effect is positive-going only, from 0 (wheel towards you) to +99 (wheel away from you). Negative modulation amounts will reverse the effect.

- **PRESS — Pressure (After-touch)**
  Pressure, also called after-touch, is a modulator which varies a manual level within a voice depending on how hard you press down on a key or keys. After you have struck a key, and while the note is sustaining, continuing to press down harder on the key brings in pressure. The VFX's keyboard generates pressure, and by using this modulator you can add a tremendous amount of expression to your sounds without ever taking your hands off the keyboard.

  Pressure comes in two varieties — *Poly Key™* pressure (or Polyphonic pressure), which affects each note individually, and *Channel* pressure (or Mono pressure) which affects all notes that are playing when you exert pressure on any key. Either type of pressure is available on the VFX, and both types are received via MIDI.

  There is a Performance parameter on a sub-page of the Patch Select Page (press ***Patch Select*** twice) which determines which of the two types of pressure will be used by the program. This control can also be set to NONE, in which case the program will not respond to pressure internally, nor will it send or receive it via MIDI. (See Performance Parameters for more details.)

  Note that not all sounds are necessarily programmed to respond to pressure. If pressure seems to have no effect when you play certain sounds, it is likely that the programmer did not assign pressure as a modulator anywhere within the program.

  The effect of pressure as a modulator is positive-going only, though assigning a negative modulation depth will cause increased pressure to reduce manual levels.

Wave Page

Each VFX voice will play one of the 109 Waves in its memory. These waves are the "raw material" from which VFX programs are crafted. On the Wave Page you can chose which wave the currently selected voice will play, and modify the various playback parameters of the wave.

Wave Class

The VFX waves are divided into 10 categories, or *Wave Classes*:

The first six classes contain samples of real acoustic and electronic sounds, which can be used as the basis for a wide variety of realistic musical sounds. Where necessary, these waves have been *multisampled* (sampled at many points through the range of the instrument) for maximum faithfulness to the original.

- **STRING-SOUND** - Samples of stringed instruments — strings, pianos, guitars, etc.
- **BRASS-SOUND** - Samples of brass instruments — horns, sax, etc.
- **BASS-SOUND** - A variety of bass sounds — electric, acoustic and synthesized.
- **BREATH-SOUND** - Flute and vocal sounds with complex, breathy sustains.
- **TUNED-PERCUS** - This category contains a wide variety of sounds — generally, these are percussive sounds which are looped (that is, they will sustain).
- **PERCUSSION** - This class contains unlooped (non-sustaining) percussion sounds.

The next three wave classes contain a variety of sampled and algorithmically generated waves that are more "synthesizer" oriented:

- **TRANSWAVE** - Transwave is a special class of waves, unique to the VFX. Each Transwave consists of many single-cycle waveforms, each with a different harmonic spectrum. The playback parameters allow you to start the wave playing at any one of these waveforms and move through the wavetable, continually varying the timbre of the sound, using any of the 15 modulators.
- **WAVEFORM** - A waveform is a single cycle of a sound repeated over and over. The VFX contains both sampled and synthetic waveforms. Waveforms such as Sawtooth and Square can be used to reproduce a wide array of analog synth sounds.
- **INHARMONIC** - Inharmonic loops are similar to waveforms except that they contain many cycles of the sound and can therefore contain *inharmonics* — frequencies which are not exact multiples of the fundamental frequency.

The final wave class, **MULTI-WAVE**, contains one wave, but that wave consists of ALL-WAVES in the VFX memory. Starting from any wave in memory, any number of waves can be played in succession, forward or backward, to create special effects and user-definable "jam-loops."

Wave List

Below is a complete listing of the VFX Waves. The wave class is shown in bold at the top of each group.

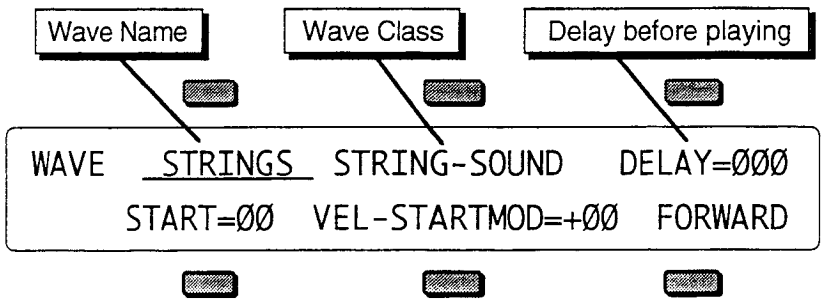
STRING-SOUND: STRINGS PIZZI-STR GRAND-PNO PIANO.VAR DIGIPIANO CLAVPIANO ACOUS-GTR GUIT.VAR1 GUIT.VAR2 GTR-HARMO EL-GUITAR PLUCK-GTR CHUKKA-GT CRUNCH-GT CRUNCH-LP	**BRASS-SOUND:** UNI-BRASS TRUMPET TRUMP.VAR FRENCHORN FHORN.VAR SAXOPHONE SAX.VAR-1 SAX.VAR-2 **BASS-SOUND:** PICK-BASS POP-BASS PLUCKBASS DOUBLBASS SYNBASS-1 SYNBASS-2	**BREATH-SOUND:** WOODFLUTE CHIFFLUTE OCARINA VOX-OOOHS VOCAL-PAD **TUNED-PERCUS:** MARIMBA KALIMBA STEELDRUM DOORBELL POTLID-HT SYN-PLUCK PLINKHORN FLUTEDRUM PNO-PING ORCH-HIT KAGONG RACK-BELL CRASH-CYM	**PERCUSSION:** WOODY-HIT WOODBLOCK TEMPL-BLK DINKY-HIT TOYHAMMER AGOGO-BEL SLINKYPOP DUCT-TAPE STEAMDRUM BIG-BLAST SPRAY-CAN METALDINK VOCALPERC ANVIL-HIT KICK-DRUM SNAREDRUM
TRANS-WAVE: SPECTRAL-X DIGITAL-X VOCAL-X DOCTOR-X INHARM-X SYNCHRO-X OMEGA-X ESQBELL-X FORMANT-X PLANET-X ELECTRO-X PULSE.1-X PULSE.2-X RESONANT1 RESONANT2 RESONANT3 RESONANT4	**WAVEFORM:** ORGAN-V.1 ORGAN-V.2 ORGAN-V.3 ORGAN-V.4 SAWTOOTH SQUARE SINE-WAVE TRIANGLE 1+2 HARMS 2HARM-SAW FRETLESS DPNO-TINE BUBBAWAVE	CLAV-WAVE CLAV.VAR WOODWIND WWIND.VAR PIPE-ORGN BRASS-ORG VOCAL-BEL SYNTH-BEL DIGI-VOX CLARINET	**INHARMONIC** TRIANG-LP ANVIL-LP CLUSTR-LP TUBULAR-L NOISE-LP **MULTI-WAVE:** ALL-WAVES

- The bold lines in the above illustration separate wave classes which have different type-specific (lower-line) wave parameters. See "Type-specific Wave Parameters" later in this section.

- The suffix ".VAR" after a wave name indicates a "timbre-shifted" version of one of the other waves; that is, it has different split points between the multisamples in order to create a different frequency spectrum.

General Wave Parameters (All Wave Classes)

Press ***Wave***. On the Wave page, the same three parameters (Wave Name, Wave Type, and Delay) will always appear on the top line of the display, no matter which type of wave is selected.



WAVE NAME

Here you select the actual wave which the voice will play. When this parameter is underlined, the data entry slider will select only among the waves in the current wave class. Pressing the up and down arrow buttons will allow you to cross over into the next category.

WAVE TYPE

This shows which of the 10 groups (listed above) the currently selected wave is in. By underlining this parameter, you can use the the data entry slider or the up and down arrow buttons to scroll quickly through the different the wave classes to the category you want. Then underline the wave name to select a specific wave from that category.

Whenever the wave class is changed, the first wave in that class is selected, and lower-line parameters are reset to default values for the new wave class.

DELAY

The Delay determines how long the voice will wait after a key is struck before playing. Adjustable from 000 to 250. A delay of up to 2 seconds is possible.

The size of the steps and the total range of this control, in terms of actual delay time, depend on the value of the *Delay Multiplier* parameter on the Program Control page (DELAY=XX). The size of the increment represents 1 millisecond (1/1000 second) of delay, times the multiplier on the Program Control page:

When:
DELAY=X1, this parameter goes from 0 to 250ms (1/4 second) in 1ms steps.
DELAY=X2, this parameter goes from 0 to 500ms (1/2 second) in 2ms steps.
DELAY=X4, this parameter goes from 0 to 1 second in 4ms steps.
DELAY=X8, this parameter goes from 0 to 2 seconds in 8ms steps.

While the delay can be set independently for each voice, the Delay Multiplier parameter is the same for all the voices in the program. This means that the delay setting for all voices will be multiplied by the same factor.

Triggering a voice with a Key up — In the highest position, DELAY=KUP (KeyUP), the voice will wait until the key is released before it plays.

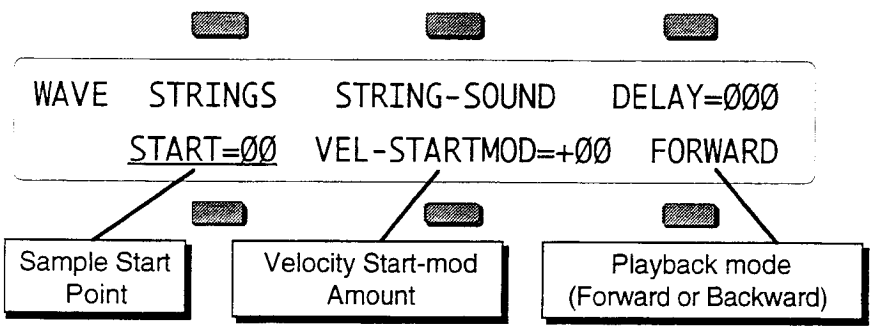
Type-specific Wave Parameters

The parameters shown on the lower line of the display on the Wave page will vary depending on the current wave class. For each wave class, the lower line of the display will contain parameters controlling the features which are specific to that category.

As mentioned earlier, changing the wave class resets these parameters. However, if you scroll only one step away from the current class and then scroll back, any lower-line settings you had will be restored. Go more than one class from the current one and any lower-line settings will be lost.

STRING-SOUND
BRASS-SOUND
BASS-SOUND
BREATH-SOUND
TUNED-PERCUS &
PERCUSSION Parameters

For the first six categories of waves, the bottom line of the display shows:



START

Start Point - This controls where in sample the wave will begin playing. When START=00, the whole wave will play. As the start point is adjusted upwards it will begin playing further into the wave. You can use this, for example, to skip the attack and play only the loop portion of looped (sustaining) sounds.
Range = 00 to 99.

VEL-STARTMOD

Velocity Start-mod Amount - This parameter lets the velocity with which you strike the key move the sample start forward or backward for each note you play. Positive values will move the start point forward (toward the end of the sample) with greater velocity; negative values will move the start point back toward the beginning as velocity increases. Note that if START=00, negative values of this parameter will have no effect.
Range = -99 to +99.

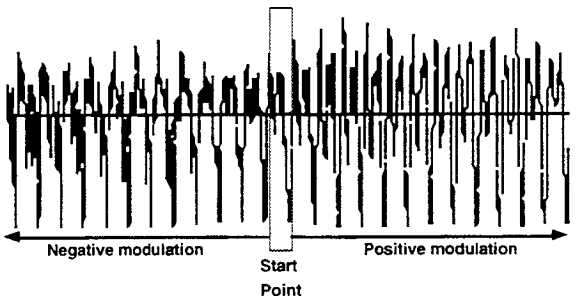
FORWARD/REVERSE

Playback Mode - Any of the waves in these six categories can be made to play forward (which is the normal mode) or backward with this parameter. When the playback mode is REVERSE, the sound will play from the end of the sound to the start point (wherever that has been set to).

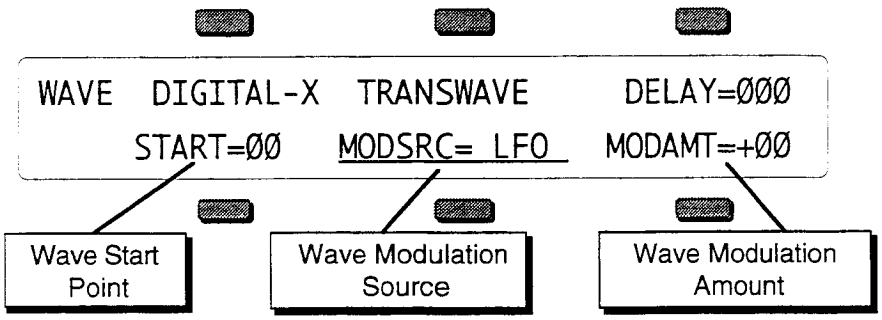
TRANS-WAVE Parameters

Each Trans-wave is actually composed of many different single-cycle waveforms, which progress from one timbre to another, occupying adjacent areas of memory. Movement within the sound is created by playing different waveforms in succession; that is, by modulating the wavetable.

The illustration below shows a typical wave of this category, with the start point set in the middle range, near 50.



When the wave type is TRANS-WAVE, the lower line of the display shows:



START

Start Point - The Start Point parameter controls where within the wave the voice will begin playing when the key is struck.
Range = 00 to 99.

MODSRC

Modulation Source - Here you choose which of the 15 modulators will control the movement of the sound. Any of the modulators can be selected.

MODAMT

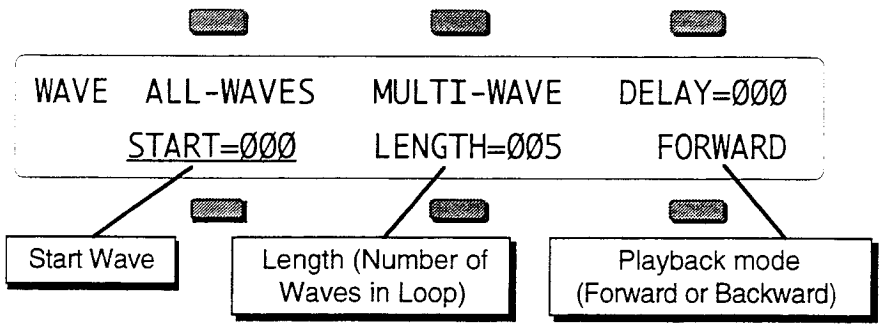
Modulation Amount - Determines how much the selected modulator (above) will affect the wave; i.e. how far away from the start point the sound will move. If MODAMT=+00, the sound will remain static. Positive amounts will modulate the sound forward (toward the end of the wave); negative modulation amounts will move the sound back toward the beginning.
Range = -99 to +99.

WAVEFORM and INHARMONIC Parameters

When the wave type is WAVEFORM or INHARMONIC, the lower line of the display will be blank. Due to the nature of the waves in these two categories, they contain no Wave parameters other than Delay.

MULTI-WAVE Parameters

When the wave type is MULTI-WAVE, there is only one wave which can be selected — ALL-WAVES. With the Multi-wave you have the entire VFX wave memory available to play with. The voice will loop (play repeatedly) any number of adjacent waves in memory. The lower line of the display shows:



START

Start Wave - Picks which of the waves in memory the loop will start on. Range = 000 to 243.

LENGTH

Length of Loop - Controls how many waves will be included in the loop. Range = 000 to 243.

FORWARD/REVERSE

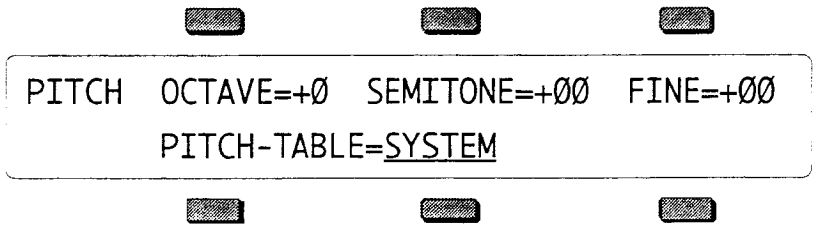
Playback Mode - Controls whether the multi-wave will be played forward or backward.

This programmable multi-wave loop allows the creation of an almost infinite variety of timbral and rhythmic structures. Experiment with different start points and lengths to get an idea of how dynamic (and often amusing) this type of wave can be. Combining delays and repeat envelopes with multi-wave loops can also yield some interesting results.

Pitch Page

On the Pitch page you set the "manual" levels for the pitch of the voice, and select which pitch-table the voice will use.

On the Select Voice page, select a voice to edit, then press ***Pitch***. The display shows:



OCTAVE

Changes the pitch of the oscillator by octaves.
Range: -4 to +4 octaves.

SEMITONE

Changes the pitch of the oscillator by semitones. Incrementing/decrementing this control beyond +11 or -11 automatically increases/decreases the octave by one.

FINE

Changes the pitch of the oscillator by steps of one cent (1/100 of a semitone).
Range: -99 to +99.

PITCH-TABLE

Pitch-tables let you map the keys on the keyboard into individual pitches—that is, user-definable tuning for each note on the keyboard. This parameter lets you select which pitch-table the voice will use.

When you create a custom pitch-table the VFX keeps the table inside the program. Within the program, the custom pitch-table uses the space normally used to store the parameters for voices 5 and 6. Therefore, when there is a custom pitch-table in the program, these two voices are not available, replaced on the Select Voice page by the EDIT PITCH TABLE function. Of the remaining four voices, each individual voice can be set to use either the system pitch-table, no pitch, or a custom pitch-table.

- SYSTEM — Uses whatever is selected as the system pitch-table on the Master page. Normally this is standard twelve-tone equal temperament tuning across the keyboard. However, a custom pitch-table can be copied into the system for use by all the programs. A parameter on the Master page determines whether the System pitch-table will be standard or custom.

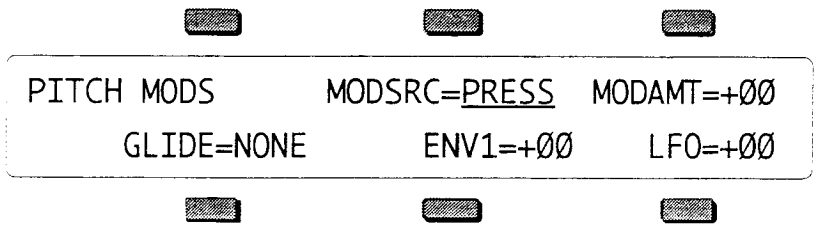
- ALL-C4 — No pitch tracking — the same pitch (C4) plays across the keyboard.

- CUSTOM — User definable pitch-table. This option is only available if a custom pitch-table has been created in the program (see Section 9 for more).

Pitch Mod Page

On the Pitch Mod Page you apply modulation to the pitch of the voice. Envelope 1 and the LFO are always available to modify the pitch, and you can choose one additional modulator. Also this is where you select a Glide mode for the voice.

On the Select Voice page, select a voice to edit, then press ***Pitch Mod***. The display shows:



MODSRC

Modulation Source — Selects a modulator for the pitch of the voice from among the 15 available modulation sources.

MODAMT

Modulation Amount — Determines the amount or depth by which the modulation source will affect pitch.
Range: -99 to +99.

GLIDE

Enables Glide (portamento) and several forms of monophonic voice assignment in a program. All six voices in a program use the same Glide time, but each voice selects whether it will glide or not. Glide time for the program is set on the Program Control Page. There are five GLIDE modes:

- NONE — Glide is off. This is normal polyphonic operation, with no portamento.

- PEDAL — Enables the sustain pedal to trigger glide and to control polyphony. When the pedal is not pressed, the voice behaves normally. When you depress the sustain pedal, the number of keys you are holding down defines the polyphony for as long as the pedal is down. While the pedal is down, new voices will be *stolen* from the ones already playing. For example, if there are three notes sounding, and you depress the sustain pedal, the VFX will play with three-note polyphony as long as the pedal is down, and those same three voices will continue to be stolen and will glide to the new notes.

- MONO — Similar to mono mode on old analog synths. The voice will play with one-note polyphony, and new notes will always glide from the previous note (assuming Glide time is greater than zero on the Program Control page). If you just want mono voice assignment without glide, set to GLIDE=MONO and set the Glide time to zero on the Program Control page. Or use GLIDE=TRIGGER if you want mono voice assignment without "note memory" (see below).

- LEGATO — When GLIDE=LEGATO, if you release a note the VFX "forgets" that note. The VFX will not glide to notes when you play staccato — play a new key with no other keys down. It will glide when you play legato — play a new key while another key is down.

Note: Both MONO and LEGATO feature "note memory" — if you release a key while still holding down another key, the pitch will return to note you are holding.

- TRIGGER — Same as LEGATO mode, except without the "note memory." When you release a key the voice does not retrigger or glide, even if another key is being held down.

ENV 1

Envelope 1 Amount — Determines the amount or depth by which Envelope 1 will affect pitch.
Range: -99 to +99.

LFO

Low Frequency Oscillator Amount — Determines the amount by which the LFO will affect pitch of the voice. LFO is most commonly used for vibrato, but can create many unusual effects.
Range: -99 to +99.

Filters Page

Each VFX voice has its own pair of digital filters, FILTER 1 and FILTER 2, which are connected in series. The filter settings determine which ranges of frequencies will be allowed to pass through to the output.

Low-pass/High-pass

A low-pass filter allows only those frequencies below the filter cutoff frequency to pass — higher frequencies are filtered out. The reverse is true for a high-pass filter — it lets frequencies higher than the cutoff frequency pass and filters out those below. In the VFX FILTER 1 is always a low-pass filter. FILTER 2 can be either a high-pass or low-pass filter.

Poles: Rolloff Curves

"Pole" is an engineering term which describes the steepness of a filter, or the filter's cutoff *slope*. Each additional pole gives a filter a steeper rolloff curve. In the VFX, the filter modes are interdependent; that is,the combined number of poles in FILTER 1 and FILTER 2 is always four.

These four poles are divided between the two filters; either as 2 and 2, or as 3 and 1. There are two FILTER Pages; however, if you change the number of poles on either page, you will change number of poles on the other page — high-pass will remain high-pass, but the number of poles will change.

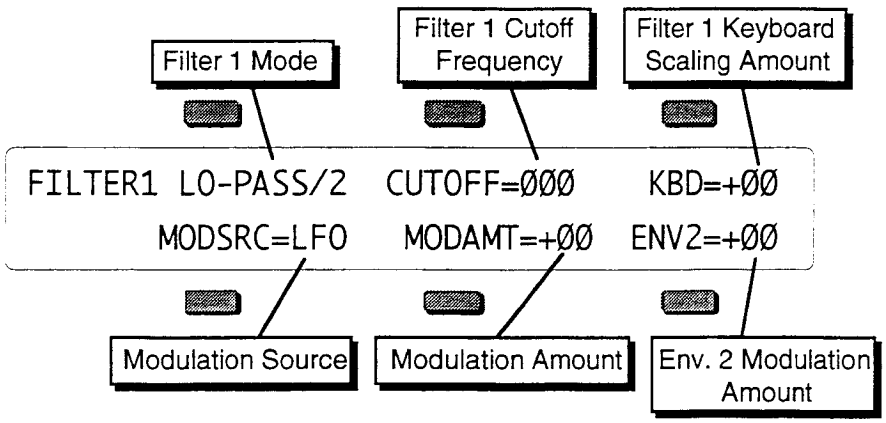
A 1-pole filter will rolloff at 6 dB per octave; a 2-pole filter, 12 dB per octave; a 3-pole filter, 18 dB per octave; and 4-pole filter, 24 dB per octave. To reproduce a 4-pole low-pass filter (for that "classic" analog synth sound) you would set both low-pass filters to roll off at 12 dB per octave, resulting in a 24 dB per octave rolloff.

Cutoff Frequency

Every filter has a "knee" in the response curve, known as the cutoff frequency. This is the frequency at which the filter begins filtering our frequencies. The filter cutoff frequency can remain fixed over time, or it can be varied by modulating the filter with an envelope, LFO, velocity, etc. You can create some very interesting filter configurations by using a different modulator for each filter. For instance, try using pressure to modulate the filters. You can drive one filter up with pressure, while simultaneously driving the other down.

FILTER 1 Page

Press the ***Filters*** button. This takes you to the Filter 1 Page:



LO-PASS/2, 3

Filter 1 Mode — Determines whether Filter 1 will be a 2-pole or 3-pole low-pass filter. Underline the LO-PASS/2 parameter and use up arrow button the change the pole configuration.

CUTOFF

Filter 1 Cutoff Frequency — Determines the initial, or manual, filter cutoff frequency. With a low-pass filter, a setting of 127 lets all the original signal pass through the filter. Lower settings lower the cutoff frequency, somewhat like turning down the treble on a stereo.
Range: 000 to 127.

KBD

Sets the amount by which the location of a note on a keyboard will modulate the filter cutoff frequency (keyboard filter tracking). To have the filter track the keyboard exactly, set KBD=+50.
Range: -99 to +99.

MODSRC

Selects the source of modulation for the filter cutoff frequency from among the 15 available modulation sources.

MODAMT

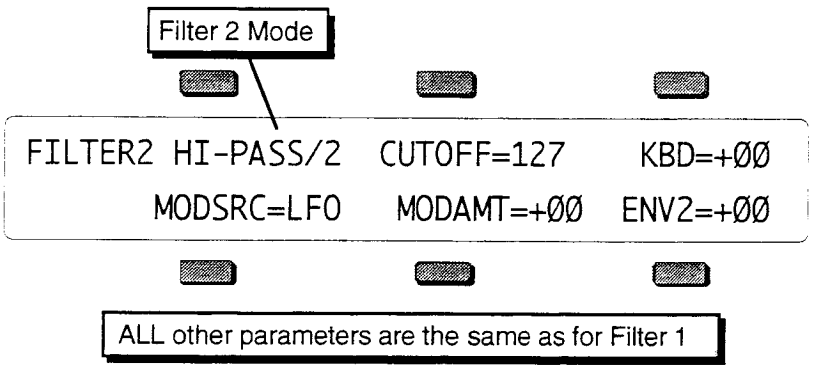
Determines the amount or depth by which the modulation source will affect the filter cutoff frequency
Range: -99 to +99.

ENV 2

Determines the amount or depth by which envelope 2 will affect the filter cutoff frequency.
Range: -99 to +99.

FILTER 2 Page

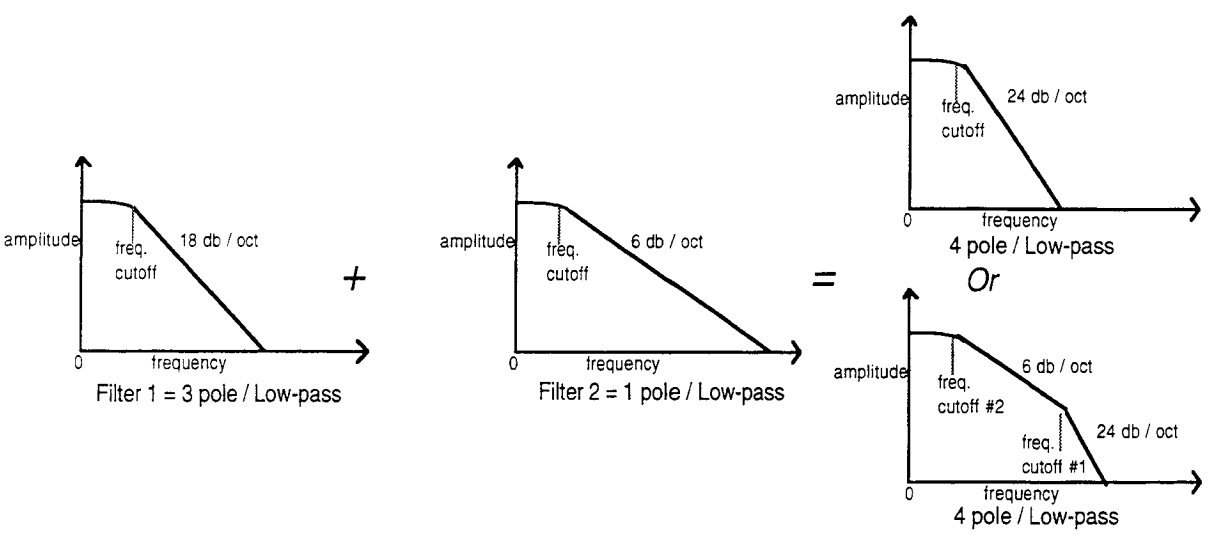
Press the ***Filters*** button again. The display shows Filter 2's page:

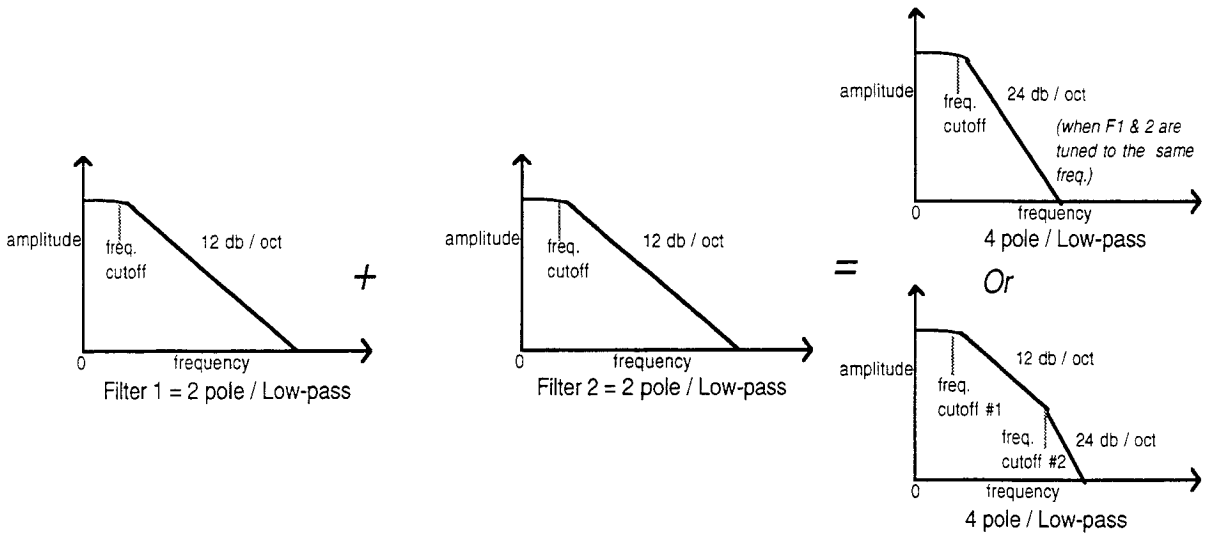


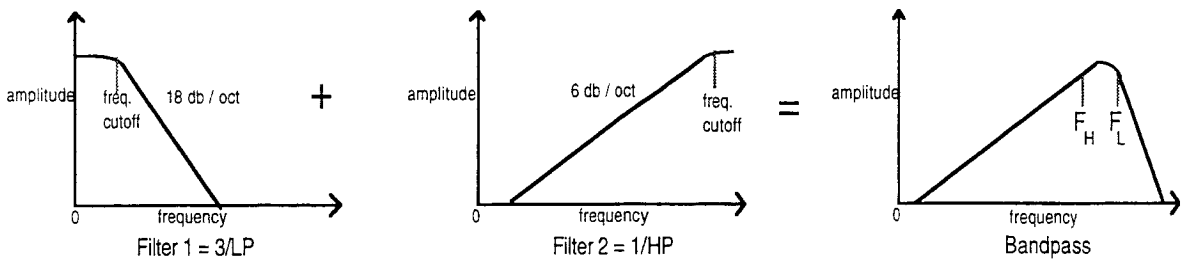
HI-PASS/2, 1 or **LO-PASS/2, 1**
Filter 2 Mode — FILTER 2 can be configured as a 2-pole or 1-pole high-pass filter, or a 2-pole or 1-pole low-pass filter.

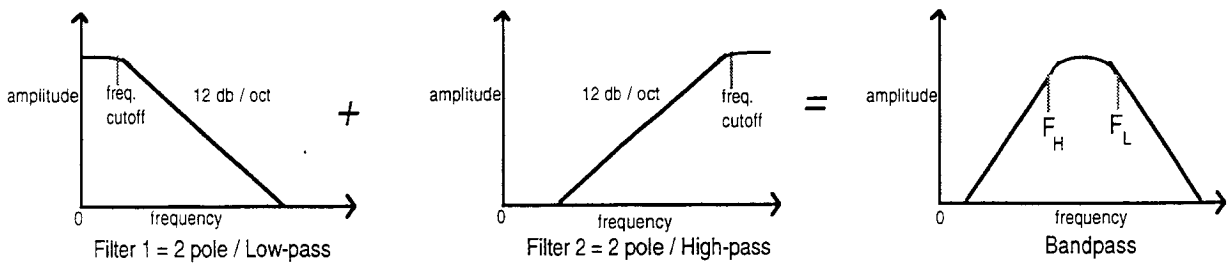
CUTOFF, KBD, MODSRC, MODAMT, ENV2
Parameters and ranges are the same as for FILTER 1.

Filter Configurations
The diagrams below show a number of possible filter configurations. On the left are the response curves of the two filters shown separately. On the right are some of the possible shapes of the combined filters.




amplitude
freq. cutoff
12 db / oct
0
frequency
Filter 1 = 2 pole / Low-pass
+
amplitude
freq. cutoff
12 db / oct
0
frequency
Filter 2 = 2 pole / Low-pass
=
amplitude
freq. cutoff
24 db / oct
(when F1 & 2 are tuned to the same freq.)
0
frequency
4 pole / Low-pass
Or
amplitude
freq. cutoff #1
12 db / oct
freq. cutoff #2
24 db / oct
0
frequency
4 pole / Low-pass

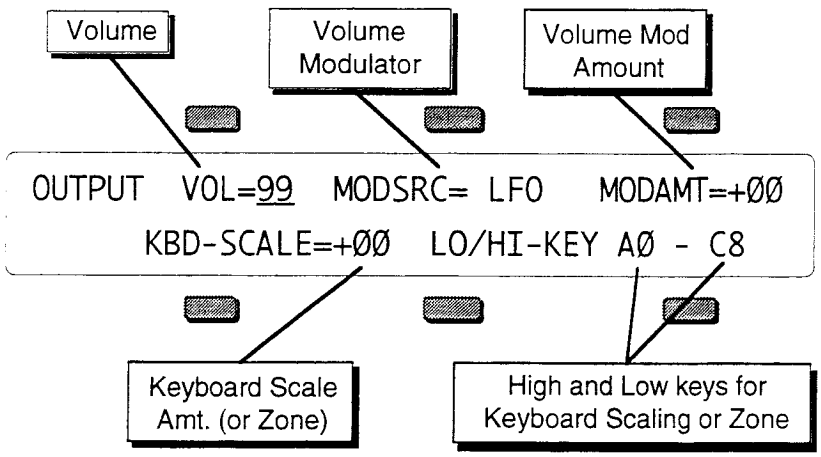

amplitude
freq. cutoff
18 db / oct
0
frequency
Filter 1 = 3/LP
+
amplitude
6 db / oct
freq. cutoff
0
frequency
Filter 2 = 1/HP
=
amplitude
F H
F L
0
frequency
Bandpass


amplitude
freq. cutoff
12 db / oct
0
frequency
Filter 1 = 2 pole / Low-pass
+
amplitude
12 db / oct
freq. cutoff
0
frequency
Filter 2 = 2 pole / High-pass
=
amplitude
F H
F L
0
frequency
Bandpass

Output Page

The parameters on the Output page, along with Envelope 3, control the overall volume and panning of the voice, along with keyboard scaling, effects routing and voice reassignment, or "voice stealing" priority. The Output page consists of three separate sub-pages — pressing the Output button again advances to the next sub-page.

Choose the voice you want to edit on the Select Voice page, then press ***Output***. The first sub-page contains the following parameters:



VOL

Voice Volume — Adjusts the overall volume of the voice. Since Envelope 3 is permanently routed to the volume of the voice, this parameter could also be thought of as Env 3 Amount.
Range = 00 to 99.

MODSRC

Volume Modulator — Selects one of the 15 available modulators to affect the volume of the voice. This is in addition to Env 3, which is always routed to volume.

MODAMT

Volume Modulator Amount — Determines how much the modulator selected above will affect the volume of the voice.
Range = -99 to +99.

The two parameters on the lower line of the display provide a powerful tool for shaping the volume of the sound across the keyboard:

KBD-SCALE

Keyboard Scale Amount (or Zone) — Can be used to fade the voice in or out between the two keys specified to the right (see below). This is good for doing keyboard crossfades between voices, or for reducing the volume of a particular voice as you go higher up the keyboard. A value of +99 will fade the voice *in* from silence to full level between the low and high keys. A value of -99 will fade the voice *out* from full level to silence between the low and high keys. Intermediate values will will scale the voice from full level to an intermediate level.

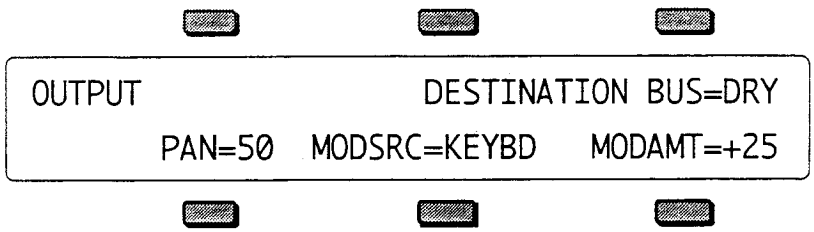
Setting a keyboard zone

Moving the data entry slider all the way down to the bottom position (below -99) selects KBD-SCAL=ZON. In this position the voice will sound only over the keyboard range specified by the low and high keys. When KBD-SCAL=ZON, the volume scaling function is not in effect — the voice will play at the same volume throughout the zone.

LO/HI-KEY

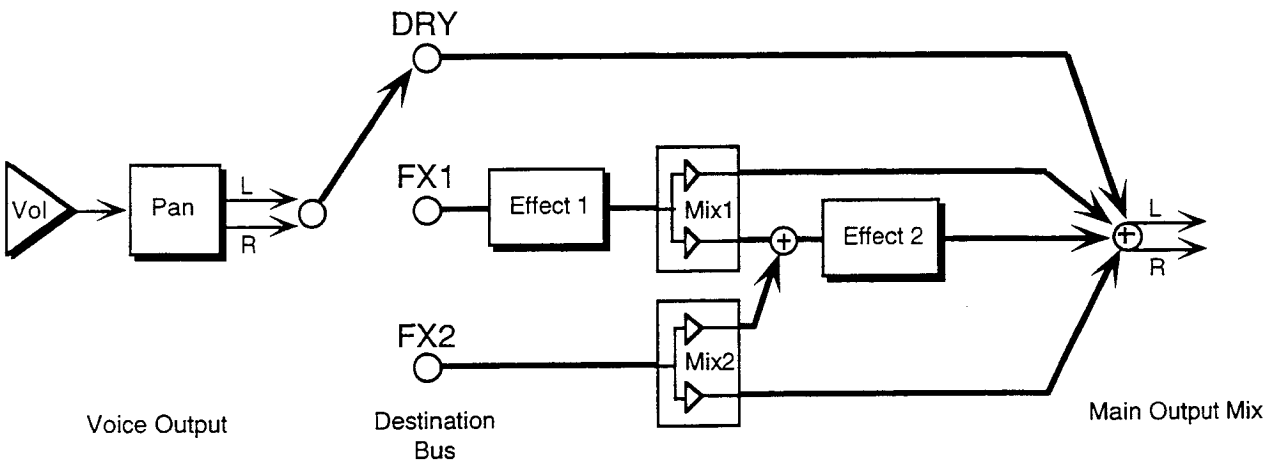
Low and High Key — Sets the key range over which the fade-in, fade-out or keyboard zone will occur. When this parameter is selected, notes can be entered from the keyboard or using the data entry slider or up and down arrow buttons. Select this parameter and play the low key; that note is entered as the low key, and the cursor switches to the high key. Now play the high key; that note is entered as the high key, and the cursor disappears. If you made a mistake, or want to enter a different range of values, just select the parameter again and repeat the process.

Press ***Output*** again. The display shows the second sub-page:



DESTINATION BUS

Each voice within a program can be routed to one of three stereo "buses" — DRY, FX1 or FX2 — which in turn feed the stereo outputs of the VFX. The diagram below shows the routing of the signals for each bus. See the section on "Effects" for more on programming specific effects.



PAN

Pan Location — Pans the voice within the stereo mix. This is the starting pan location — the effect of a pan modulator (below) will be added to this. Range is from 00 (panned left) to 99 (panned right). A value of 50 pans the voice center.

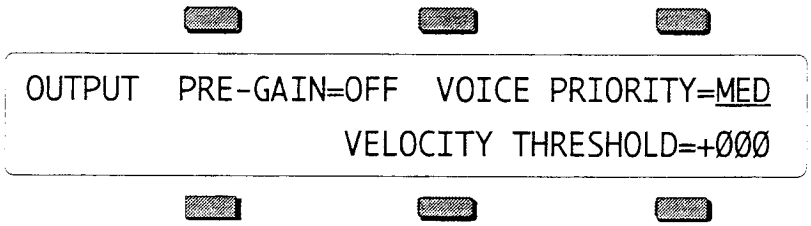
MODSRC

Pan Modulator — Selects a modulator for the pan from among the 15 available modulators. This will cause the voice's location in the stereo mix to vary with the level of the modulation source.

MODAMT

Pan Modulator Amount — Determines how much the Pan Modulator will affect the pan. Here, a negative modulation amount will have the opposite effect as the same-numbered positive value.

Press ***Output*** a third time. The final sub-page contains three parameters:



PRE-GAIN

Pre-gain applies a fixed boost of 12 dB to volume of the the voice. This is intended to let the programmer compensate for the effects of heavy filtering or enveloping, and for the fact that some waves simply have less apparent loudness than others. For example, a percussion sample, which is by nature a quick peak, has less energy than a sustaining square wave. Pre-Gain lets you raise the level of such waves to equal that of "louder" waves.

A volume level of VOL=62 when Pre-gain is on gives you the same level as VOL=99 with Pre-gain off. Any volume level greater than 62 represents an increase over the usual maximum voice level.

Warning: The pre-gain function is *only* intended to allow you to compensate for heavily filtered or low-energy waves. We strongly recommended against routinely applying pre-gain to all the waves in your sounds just to make them louder — doing so*will* result in clipping (distorting) when you play more than one or two notes.

VOICE PRIORITY

This parameter gives you some control over how voices will be reassigned, or "stolen," to play new notes when all of the VFX's voices are already playing. A voice can be can assigned LO, MED or HI priority. The rule is that a given voice will only be allowed to steal from voices with the same or lower priority.

MED is the usual state and should be used for most voices. LO can be used for voices within a sound which would be missed the least if stolen (such as a voice playing the same wave as another voice but detuned a bit). HI is best used only for specific applications in which you want to protect a voice or voices from being stolen — such as a sustaining "pad" sound in a sequencer track when using the VFX with an external sequencer.

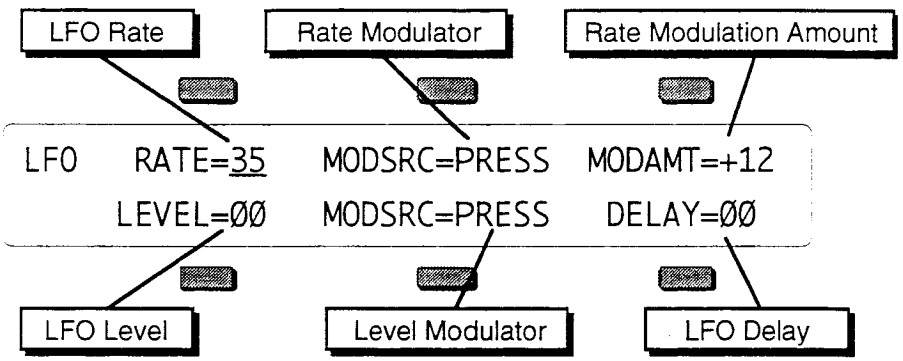
VELOCITY THRESHOLD

Selects a key velocity below which, or above which, the voice will not sound. This allows velocity switching between different voices within the sound. The range is from -127 to +127. When the value is +000, the parameter will have no effect. Values from +001 to +127 mean that the voice will only play when the key velocity is *equal to or greater* than the number shown. Values from -001 to -127 mean that the voice will only play when the key velocity is *less than* the number shown.

LFO Page

The LFO Page contains the parameters related to the Low Frequency Oscillator. Each voice in a program has its own LFO, which can be assigned as a modulator wherever a modulation source is selected. LFO's are commonly used to create vibrato, tremolo and other effects.

On the Select Voice page, select the voice you want to edit, then press ***LFO***. This takes you to the first sub-page of the LFO Page:



RATE

LFO Rate — Determines the speed of the LFO.
Range: 00 to 99. The table below shows the frequency (in hertz) for each value:

LFO FREQUENCIES

value	time (in Hz)	value	time (in Hz)	value	time (in Hz)	value	time (in Hz)	value	time (in Hz)
0	.05	20	1.25	40	6.25	60	11.25	80	16.25
1	.05	21	1.50	41	6.50	61	11.50	81	16.50
2	.06	22	1.75	42	6.75	62	11.75	82	16.75
3	.06	23	2.00	43	7.00	63	12.00	83	17.00
4	.06	24	2.25	44	7.25	64	12.25	84	17.25
5	.07	25	2.50	45	7.50	65	12.50	85	17.50
6	.07	26	2.75	46	7.75	66	12.75	86	17.75
7	.08	27	3.00	47	8.00	67	13.00	87	18.00
8	.08	28	3.25	48	8.25	68	13.25	88	18.25
9	.09	29	3.50	49	8.50	69	13.50	89	18.50
10	.10	30	3.75	50	8.75	70	13.75	90	18.75
11	.11	31	4.00	51	9.00	71	14.00	91	19.00
12	.13	32	4.25	52	9.25	72	14.25	92	19.25
13	.14	33	4.50	53	9.50	73	14.50	93	19.50
14	.17	34	4.75	54	9.75	74	14.75	94	19.75
15	.20	35	5.00	55	10.00	75	15.00	95	20.00
16	.25	36	5.25	56	10.25	76	15.25	96	20.25
17	.33	37	5.50	57	10.50	77	15.50	97	20.50
18	.50	38	5.75	58	10.75	78	15.75	98	20.75
19	1.0	39	6.00	59	11.00	79	16.00	99	21.00

MODSRC

LFO Rate Modulation Source — Selects a modulation source for LFO RATE from among the 15 available modulators.

MODAMT

LFO Rate Modulation Amount — Determines the amount by which the RATE modulator will affect the LFO rate.
Range: -99 to +99.

LEVEL

LFO Level — Sets the "manual" level (or depth) of the LFO. Level controls the initial amount of LFO. The effect of any LFO modulator will be added to this amount.
Range: 00 to 99.

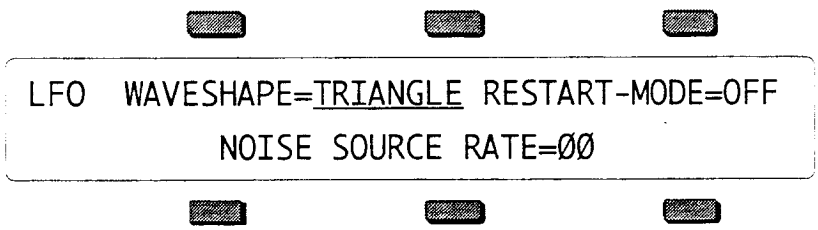
MODSRC

LFO Level Modulation Source — Selects the modulation source for LFO LEVEL. The effect of this modulator is *added* to the value set in LEVEL. Either parameter can trigger the LFO. If you have LEVEL set to zero, you can still get LFO modulation by using any of the 15 modulation sources.

DELAY

Determines the time it takes for the LFO to go from zero to the level set with the LEVEL parameter. This is useful for creating delayed vibrato, tremolo, etc. Higher values give longer delay times
Range: 00 to 99.

Press ***LFO***, again to access the second sub-page of the LFO Page. The display reads:

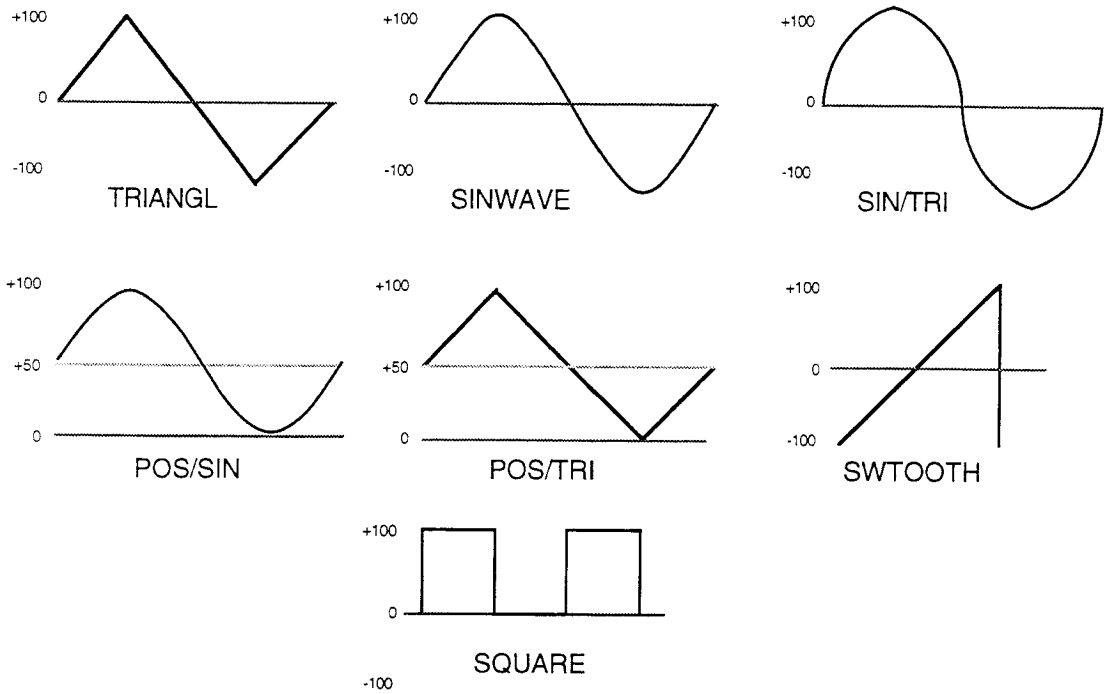


WAVESHAPE

The Waveshape determines how the signal will rise and fall. There are seven possible values:

- TRIANGL — the triangle wave is commonly used to modulate the LFO to produce vibrato.
- SINE — the sine wave is a pure fundamental frequency, more abrupt in its peaks and valleys than the triangle wave.
- SINE/TRI — a mixture of a sine and triangle wave, a sort of pointy sine wave.
- POS/SIN — the POS/SIN is similar in application to the POS/TRI.
- POS/TRI — the POS/TRI is a positive-only triangle wave useful for simulating vibrato on instruments like the guitar where vibrato techniques are limited to bending the note up.
- SAWTOOTH — the sawtooth wave is commonly used for special effects.
- SQUARE — the square wave is useful for producing trill effects.

LFO Waveshapes

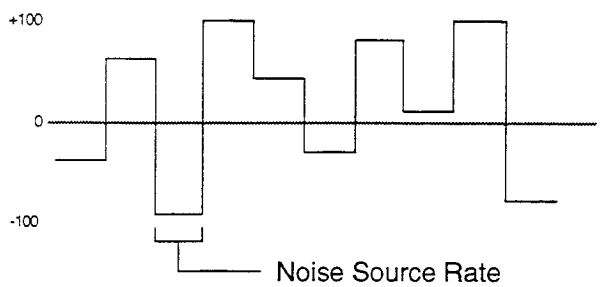


RESTART MODE

Determines whether the LFO will restart with each keystrike: When set to OFF, the LFO will cycle continuously without resetting. When set to ON, the LFO waveform will return to the beginning of its cycle each time a new key is struck.

NOISE SOURCE RATE

One of the VFX's 15 available modulation sources is NOISE. The Noise modulator is a signal whose level varies by random amounts. Typically, it might look like this:



The Noise Source Rate defines how frequently the level will change. Low values will cause it to change very slowly; with high values the level will change quickly.
Range: 00 to 99.

ENV 1, ENV 2, ENV 3 — VFX Envelopes

An *Envelope* is a shape, or contour, which we apply to a signal source to make it change over time. Each VFX voice has three envelopes. These envelopes are automatically routed to the pitch, filter frequency and amplitude of the voice, though ENV 1 and ENV 2 can also be assigned elsewhere, wherever a modulator is selectable.

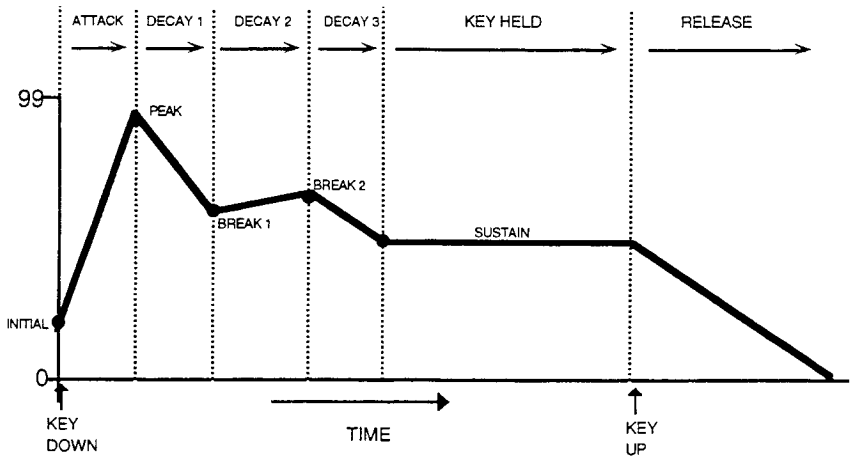
- ENV 1 is routed to the pitch of the voice. There is a parameter always available on the Pitch Mods page which lets you adjust the amount by which ENV 1 will modulate the voice's pitch.

- ENV 2 is routed to the filter cutoff frequency of the voice. For each of the voice's two filters, the parameter labeled ENV 2=__ on the Filters page controls ENV 2 depth.

- ENV 3 is routed to the amplitude (volume) of the voice. ENV 3 *always* controls the final volume contour of the voice. Any other volume modulators selected on the Output page will occur before ENV 3 in the signal flow.

The VFX envelopes are descended from the venerable ADSR (attack, decay, sustain, release) envelope, but with many refinements. While the ADSR envelope gives you control over three time segments and one level, the VFX envelopes give you control over *five* levels and *five* time segments.

The illustration below shows the make-up of a VFX envelope:



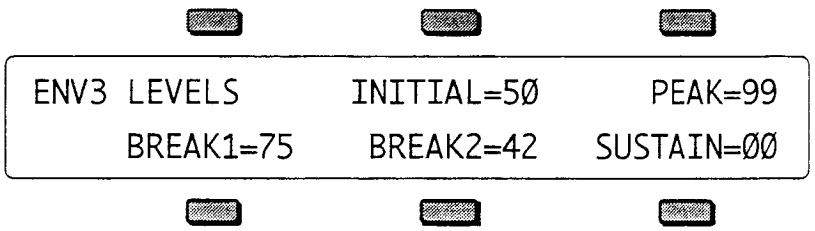
Each envelope page consists of three sub-pages, which are reached by repeatedly pressing the ***Env 1***, ***Env 2***, or ***Env 3*** button. For each envelope page:

- The first sub-page contains the five levels: INITIAL, PEAK, BREAK1, BREAK2 and SUSTAIN.
- The second sub-page contains the five time segments: ATTACK, DECAY1, DECAY2, DECAY3 and RELEASE.
- The third sub-page contains the Envelope mode, keyboard scaling, and several parameters for shaping the velocity response of the envelope.

Editing the Envelopes

Note: The ENV 1, ENV 2 and ENV 3 Pages, parameters and ranges are all the same except where indicated below. We will use ENV 3 as our example, since its effect on the volume of the voice is immediately apparent.

Press ***Env 3***. This takes you to the first sub-page, which shows the five LEVELS:



INITIAL

Determines the level at which the envelope will start when a key is depressed.
Range: 00 to 99.

PEAK

Determines the level the envelope will reach at the end of the time defined by ATTACK.
Range: 00 to 99.

BREAK 1

Determines the level the envelope will reach at the end of DECAY 1.
Range: 00 to 99.

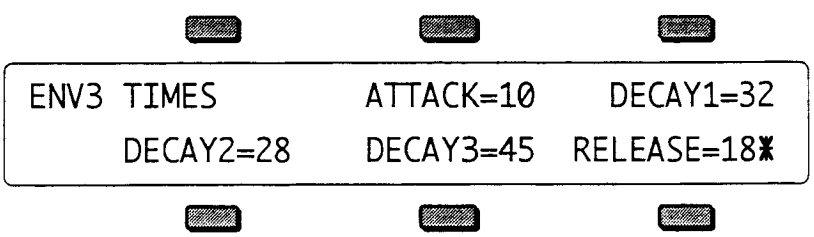
BREAK 2

Determines the level the envelope will reach at the end of DECAY 2.
Range: 00 to 99.

SUSTAIN

Determines the level the envelope will reach at the end of DECAY 3 and retain as long as the key is held down.
Range: 00 to 99.

Press the ***Env 3*** button again, to get to the second sub-page, which contains the five TIMES segments:



Note that the numbers shown here represent *times*, not rates. That is, the envelope will take a fixed amount of time to go from one level to another no matter what those two levels are.

ATTACK

The amount of time it takes for the envelope level to travel from the INITIAL level (when the key is struck) to the PEAK level. The higher the value, the longer the time. This doesn't necessarily have to be an "attack" in the usual sense — the INITIAL level could be set higher than the PEAK level, in which case this would become another decay stage.
Range: 00 to 99 (see the Envelope Times chart below for a listing of the time values).

DECAY 1

The time it takes the envelope to go from PEAK to BREAK 1.
Range: 00 to 99.

DECAY 2

The time it takes the envelope to go from BREAK 1 to BREAK 2.
Range: 00 to 99.

DECAY 3

The time it takes the envelope to go from BREAK 2 to the SUSTAIN stage. At the end of DECAY 3, the envelope will remain at the SUSTAIN level until the key is released.
Range: 00 to 99.

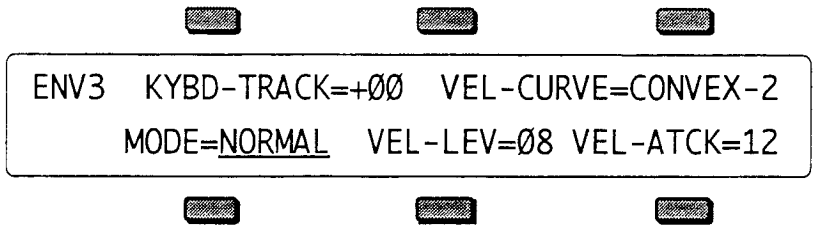
RELEASE

This defines the time it will take the envelope to return to zero after the key has been released. Values with a star next to the number *will* be affected by changes to the Performance Release parameter. Values without a star *will not* be affected. This allows you to choose which voices within a program will respond when you edit the Release parameter in performance. (See Section 3 for more.)
Range: 00* to 99*, 00 to 99.

ENVELOPE TIMES

value	time (in sec)	value	time (in sec)	value	time (in sec)	value	time (in sec)	value	time (in sec)
0	.00	20	.20	40	.82	60	3.2	80	13
1	.01	21	.22	41	.88	61	3.5	81	14
2	.02	22	.23	42	.94	62	3.7	82	15
3	.03	23	.25	43	1.0	63	4.0	83	16
4	.04	24	.27	44	1.0	64	4.3	84	17
5	.06	25	.29	45	1.1	65	4.6	85	18
6	.07	26	.31	46	1.2	66	4.9	86	19
7	.08	27	.33	47	1.3	67	5.3	87	21
8	.08	28	.35	48	1.4	68	5.7	88	22
9	.09	29	.38	49	1.5	69	6.1	89	24
10	.10	30	.41	50	1.6	70	6.5	90	26
11	.11	31	.44	51	1.7	71	7.0	91	28
12	.11	32	.47	52	1.8	72	7.5	92	30
13	.12	33	.50	53	2.0	73	8.1	93	32
14	.13	34	.54	54	2.1	74	8.6	94	34
15	.14	35	.58	55	2.3	75	9.3	95	37
16	.15	36	.62	56	2.4	76	9.9	96	39
17	.16	37	.66	57	2.6	77	10	97	42
18	.17	38	.71	58	2.8	78	11	98	45
19	.19	39	.76	59	3.0	79	12	99	49

Press the ***Env 3*** button again. This displays the final sub-page for ENV 3:



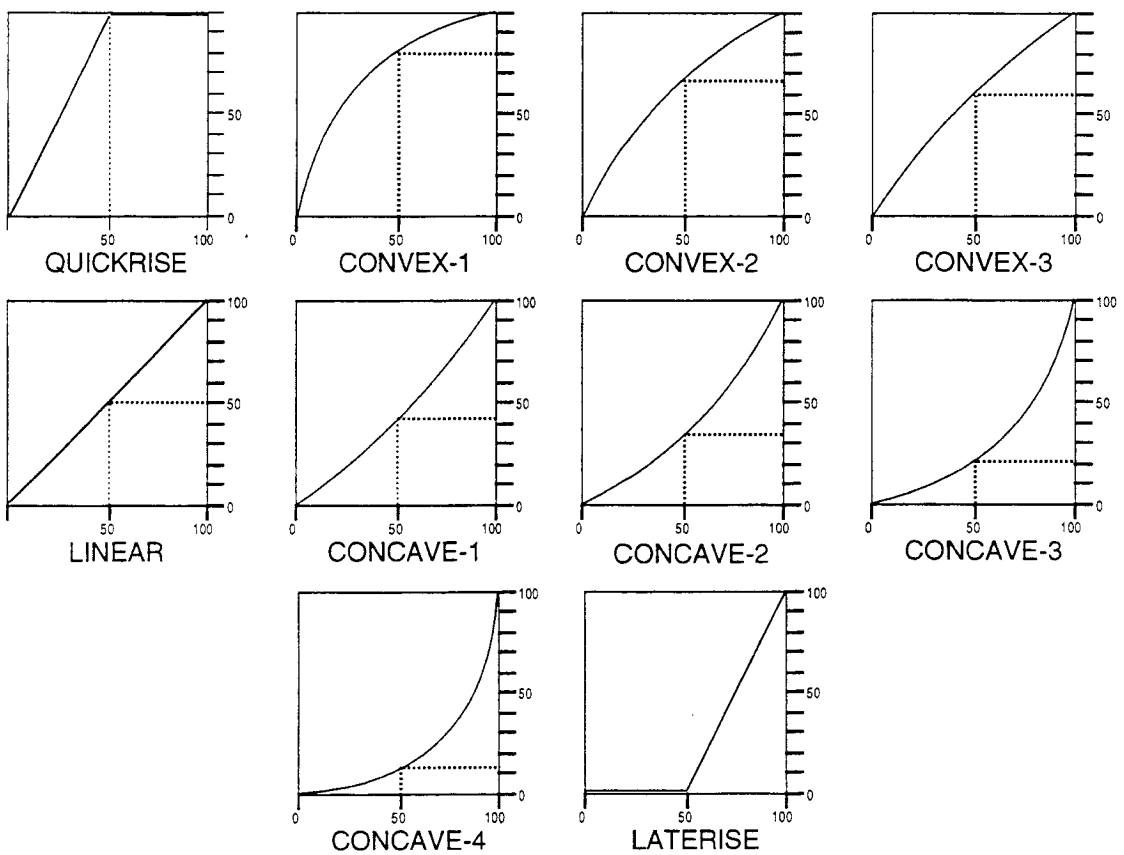
KYBD-TRACK

Makes the Envelope time segments longer or shorter depending on the position of the key on the keyboard.

Raising the value of KYBD-TRACK will make all envelope times (except Release) shorter as you play notes above middle C, and longer as you play below middle C — higher notes will decay faster than lower ones. The greater the value assigned to KYBD-TRACK, the greater the difference in decay time between the highest and lowest note. Middle C will always remain the same and is not affected by this parameter.

VEL-CURVE — Velocity Response Curve

This selects which of the ten available velocity response curves the envelope will use if the velocity level control (VEL-LEVEL below) is set to some value other than zero. Available values are: QUICKRISE; CONVEX-1; CONVEX-2; CONVEX-3; LINEAR; CONCAVE-1; CONCAVE-2; CONCAVE- 3; and LATERISE.



MODE — (ENV 1 and ENV 2)

- NORMAL — The envelope plays through normally, as shown in the diagram on p. 8-28.

- FINISH — The envelope runs its full cycle — *finishes* playing through all its stages — ignoring the key-up event. The envelope spends no time at the sustain stage. As soon as DECAY 3 is finished, instead of stopping at the sustain stage the envelope immediately goes into the release stage. This is good for percussive-type sounds where you want the envelope to be the same for every note, no matter how long the key is held down.

- REPEAT — In this mode, at the end of the DECAY3 stage, instead of sustaining, the envelope goes immediately back to the beginning of the envelope and repeats. When the key is released, the envelope stops repeating, and moves into the release stage. This type of envelope can be used to create complex LFO-type effects.

MODE (ENV 3) — Voice triggering/stealing notes

Since Env 3 control the volume of the voice there are a number of special considerations to be aware of when using the the different envelope modes:

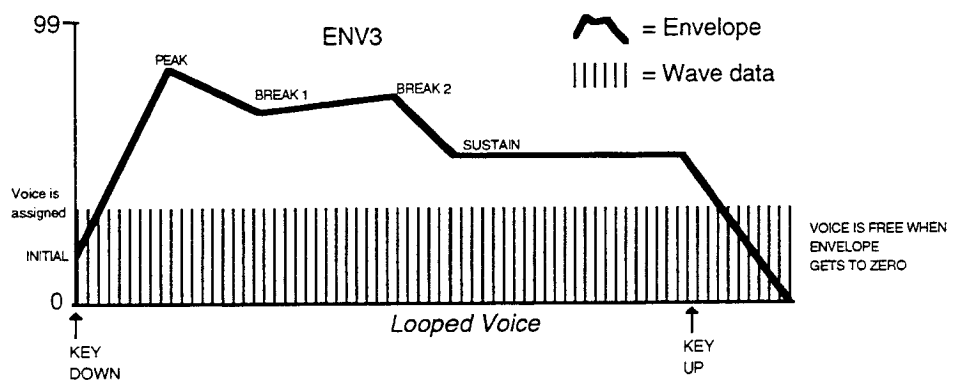
In NORMAL mode, if you set a delay on the voice, and you release the key before the designated delay time elapses, the voice will not sound.

In FINISH mode, if you set a delay on the voice and you release the key before the designated delay time elapses, the note will sound anyway. The envelope finishes what you set it up to do.

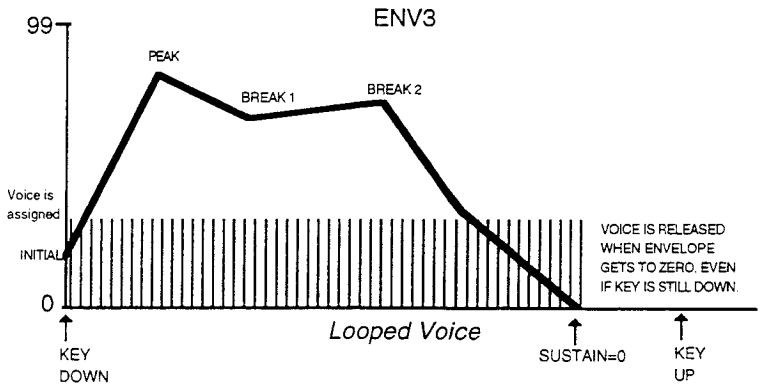
In REPEAT mode the VFX restarts the wave from the beginning every time the envelope repeats. When envelope gets to the SUSTAIN level, it goes back to the INITIAL level.

In order to maximize the use of the VFX's 21 voices, and to manage the "voice stealing" it is sometimes useful to understand when a given voice will be assigned and when it will be released, or "put back" into the pool for use by other sounds. This depends on a combination of envelope mode and the wave type.

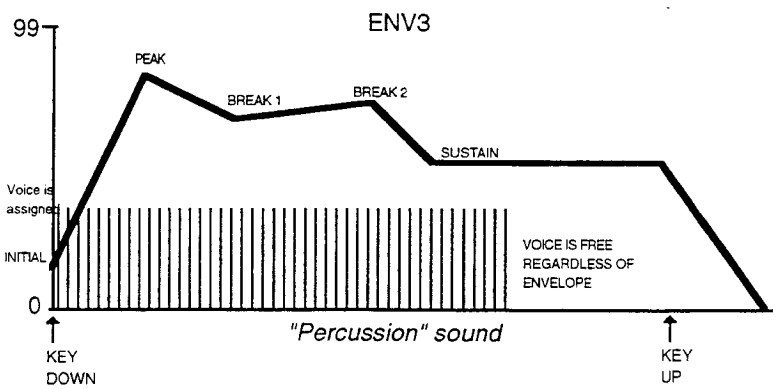
A looped (sustaining) wave will continue to use the voice until the envelope reaches zero. For a sustaining wave, when the Envelope Mode is Normal:



For a sustaining wave, when the Envelope Mode is set to Finish:



For unlooped, non-sustaining, waves (specifically those in the Percussion category) the voice becomes free as soon as the sample has played through to the end, no matter where the envelope level is. The voice is released for use by another sound:



VEL-LEV — Velocity Level Control

The Velocity level parameter will lower all envelope level settings with a softer keystrike. This means the settings you assign to INITIAL, PEAK, BREAK 1, and BREAK 2 and SUSTAIN are maximum levels, the levels that will be reached with the hardest keystrike. The amount of VEL-LEV will determine how much those levels will be reduced as you play softer. With this parameter you can have continuous dynamic control over the five levels by varying how hard you play. Changing the Velocity Curve (VEL-CURVE above) gives you further control over the velocity response of the envelope.
Range: 00 to 99.

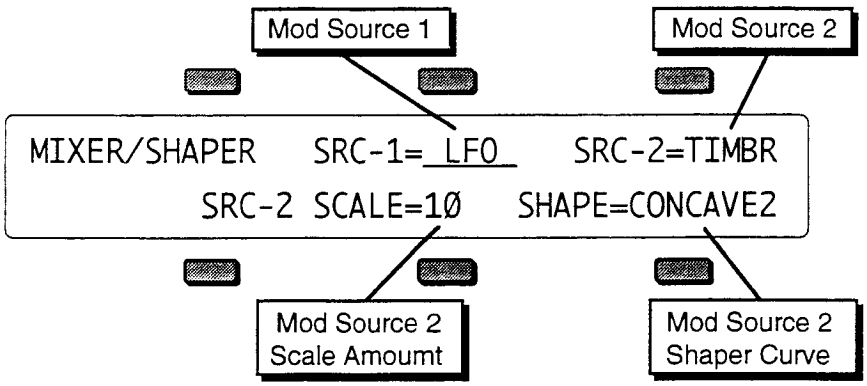
VEL-ATCK — Velocity Attack Control

Velocity attack makes the envelope attack time respond to keyboard velocity. When the value of VEL-ATCK is increased, a harder keystrike will result in a faster attack. Note that this parameter will have no effect if ATTACK = 00.
Range: 00 to 99.

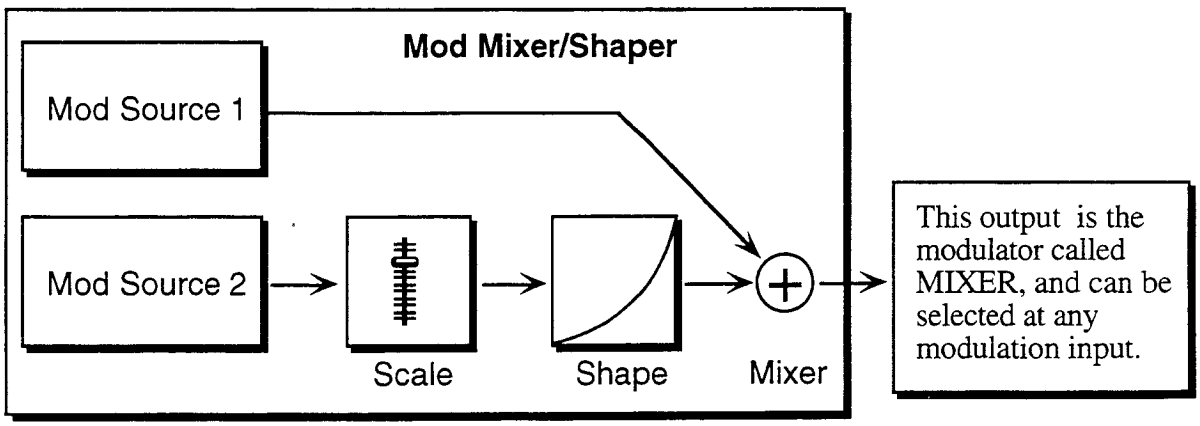
Mod Mixer Page

The Mod Mixer/Shaper is a unique feature of the VFX which allows you to:
- combine and assign two modulators to a single modulation input, and/or
- scale and/or shape the response of one of those modulators according to one of 16 Mod Shaper Curves.

Select the voice you want to edit on the Select Voice page, and then press ***Mod Mixer***. The display shows:



The two controls on the top line of the display select the two modulators which will be mixed together, SRC-1 and SRC-2. On the lower line of the display are two parameters for shaping the level and response of SRC-2. Internally, the Mixer/Shaper works like this:



There are four parameters which can be selected on the Mod/Mixer page:

SRC-1

Select any of the 15 available modulators (including the mixer itself) as Mod Source 1 (SRC-1). SRC-1 is sent directly to the mod mixer without any level change or response shaping.

SRC-2

Select one of the 15 available modulators as Mod Source 2 (SRC-2). Before being added to SRC-1, SRC-2's level is adjusted by a scale factor, variable from 0.1 to 8.0, and then it is passed through the Shaper, which allows its response to be customized in a number of interesting ways (see below).

SCALE

This is used to adjust the level of SRC-2 relative to SRC-1, or to simply scale the level of the modulator for effect. The available scale values are:

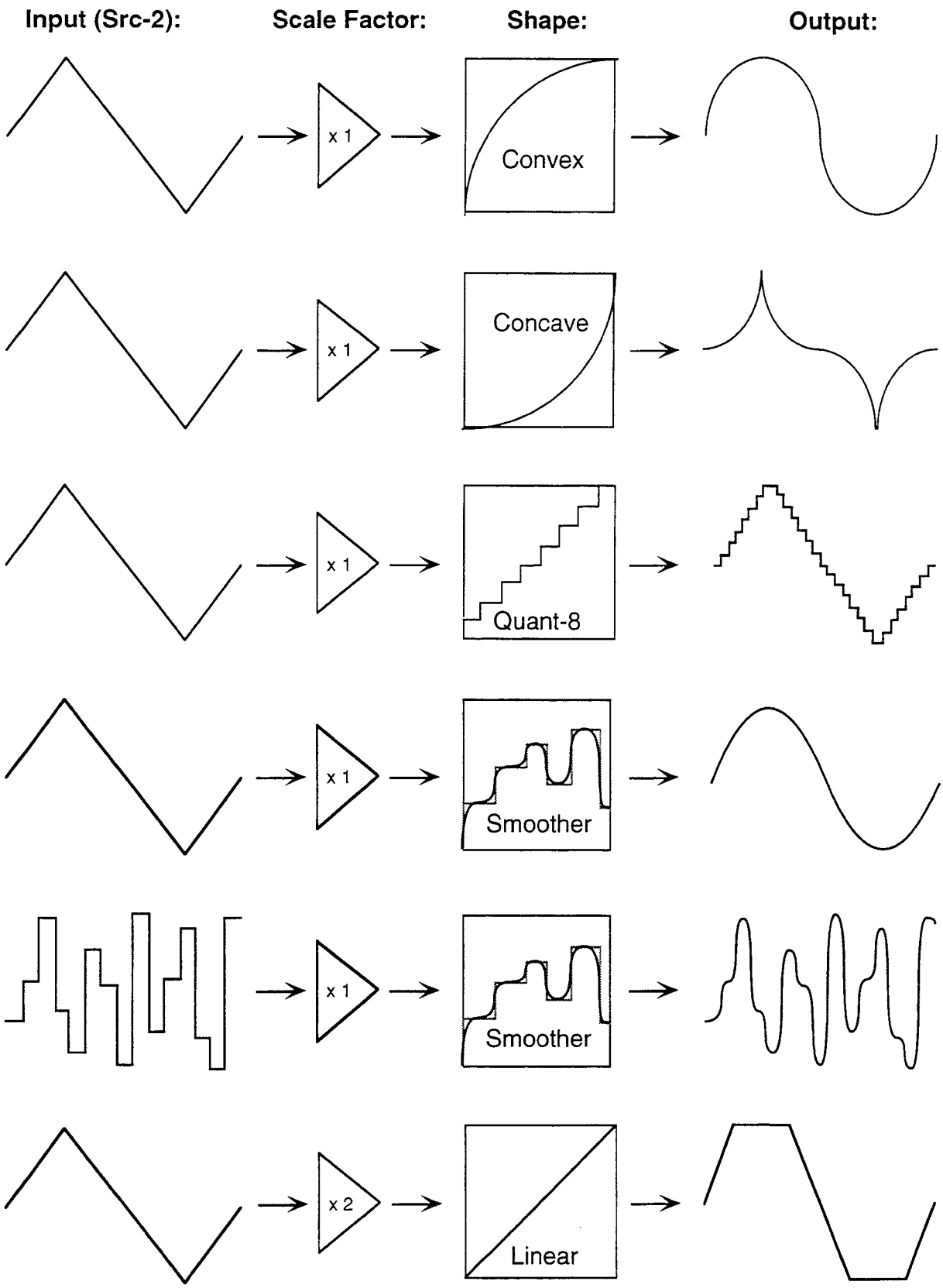
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
0.9	1.0	1.5	2.0	3.0	4.0	6.0	8.0

The modulator's level is *multiplied* by the number shown. A value of 1.0 leaves the modulator at its original level. Fractional values (0.1 to 0.9) will reduce the level. Values greater than 1.0 will amplify the effect of the modulator, in most cases simply causing it to reach full level much sooner.

SHAPE

Here you select which of the 16 tracking curves will be applied to the modulator selected as SRC-2. You can use one of the convex or concave shapes to make the modulator's effect come in earlier or later than it ordinarily would; you can use one of the quantized shapes to make the modulator's effect sound "stepped"; or you can use the smoother (which is similar to a "lag processor" in some older analog synths) to smooth the effect of the modulator, to round off the edges, as it were. The figure below shows the 16 Shaper tracking curves:

Some possible applications for shaping the response of SRC-2 are shown below:



Section 9 — Using Pitch-Tables

About Pitch-tables

Alternate pitch-tables enable you to chart new musical territories as well as explore ancient and ethnic tunings. In Western music, equal temperament has been the dominant tuning for the last one hundred and fifty years, and is really a musical compromise. In equal temperament, all intervals are equally out of tune. However, this compromise is what allows our music to remain relatively in tune as we modulate from one key to another.

Equal temperament evolved out of other systems of tuning — such as just intonation — where intervals in a scale are tuned perfectly. The difficulty with perfectly-tuned scales is that you can't modulate keys as universally as with equal temperament. Nonetheless, computer technology — keep in mind your VFX is in fact a computer — has made it easy to create and employ alternate pitch-tables.

Imagine starting a piece in equal temperament, modulating to Pythagorean, then Werckmeister, then 19 tone, and back to equal temperament, simply by changing Programs. Sound interesting? Then the following section can help you on your way.

You select the pitch-table for each voice on the Pitch Mod Page. The options are:

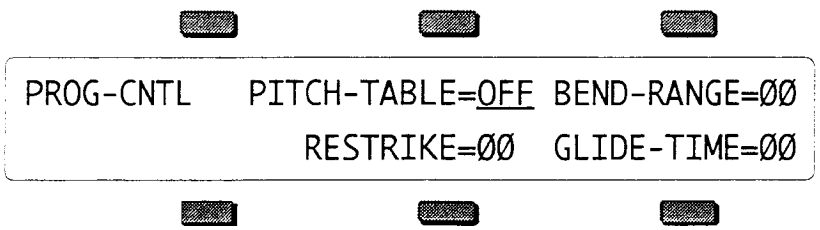
- SYSTEM — This is the "global" or keyboard-wide pitch-table. As it comes out of the box, the VFX's System pitch-table defaults to 12-tone equal-temperament tuning (standard tuning). However, you can copy a custom pitch-table into the system for use by all your programs. The parameter for changing the system pitch-table is on the Master page. More on this feature a bit later.

- ALL-C4 — No pitch tracking — all notes tuned to C4 (middle C).

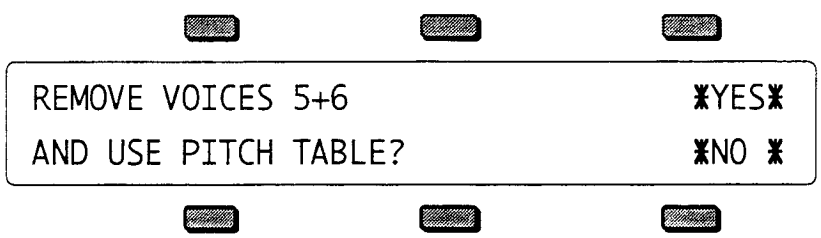
- CUSTOM — each program in the VFX can have its own "user-definable" (that is, you create it) pitch-table. When you create a custom pitch-table the VFX will remove voices 5 and 6 from the program to create space for the pitch-table. Bear this in mind when creating a custom pitch-table — it could adversely affect the program if voices 5 or 6 are important parts of the sound.

How to Create a Custom Pitch-table

- Select a program into which you want to write a custom pitch-table.
- Press ***Program Control.*** The display shows the Program Control page:



- Make sure PITCH-TABLE=OFF is underlined.
- Press the up arrow button. The display reads:



As mentioned above, whenever you create a custom pitch-table, the VFX will delete voices 5 and 6, and use the memory normally occupied by those parameters to store the pitch-table.

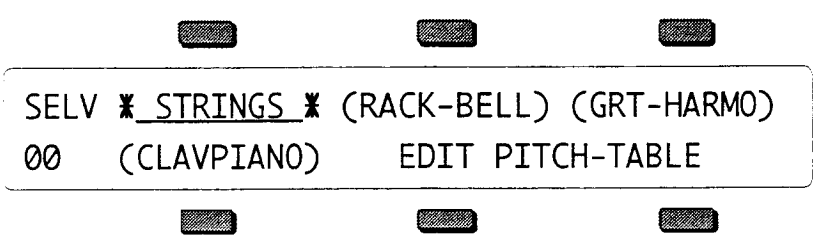
- Respond *YES* to REMOVE VOICES 5+6. This takes you to the Select Voice Page, which now shows the words EDIT PITCH-TABLE where voices 5 and 6 once were.

We have just created a custom pitch-table with variable pitch values for each key. Keep in mind that the custom pitch-table will sound the same as the normal one until you *edit* it. We will do this a bit later.

When you create a pitch-table and start editing it, you are in the edit buffer (the Compare light is on), and all edits will affect the data in the edit buffer, and not the program's memory. If you use the copy function while the compare light is on, the VFX will copy the data in the edit buffer, and not program's memory.

First, we need to select which of the four remaining voices will use the custom pitch-table.

- Double-click its soft button to solo the first voice on the Select Voice Page:



- Press ***Pitch.*** This takes us to the PITCH Page.

- Select the pitch-table parameter in the display and set it to PITCH-TABLE=CUSTOM.

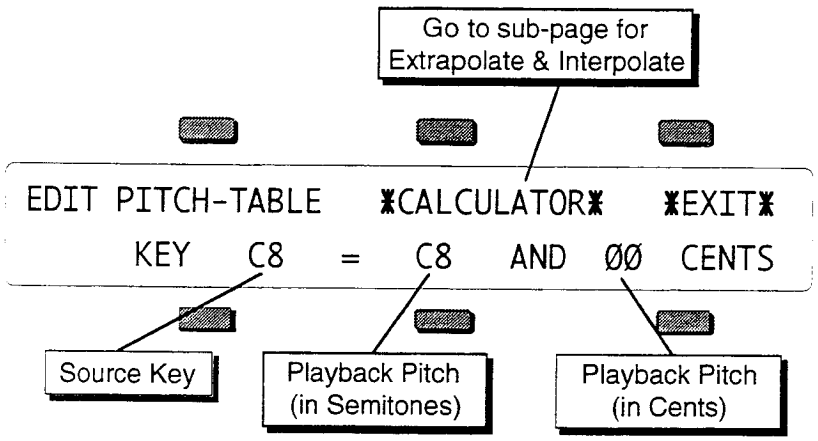
Voice #1 is now set to play the custom pitch-table. This will enable you to hear any edits you make to the custom pitch-table.

Each voice in a program can be assigned to play either the System, no-pitch, or custom pitch-table. For example, Voice #1 can play the System pitch-table; Voice #2, a custom pitch-table; voices 3 and 4, No-pitch (C notes across the keyboard).

Editing a Custom Pitch-table

As mentioned earlier, until you *edit* the custom pitch-table — change the default note assignments — the custom pitch-table will sound the same as a normal pitch-table. To edit a custom pitch-table:

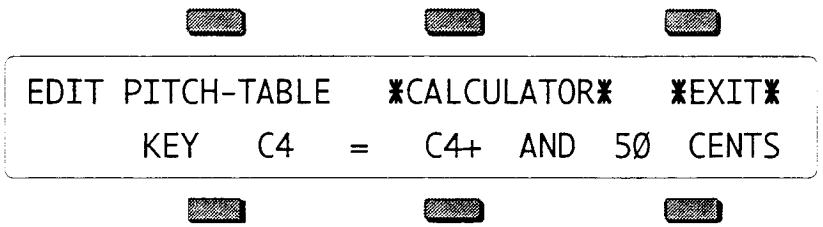
- On the Select Voice page, press either of soft buttons beneath EDIT PITCH-TABLE. This takes us to the EDIT PITCH-TABLE Page.



For every source key on the lower left, you can see and edit the pitch of that key.

The source key can be thought of as the physical location of the key on the keyboard. The playback pitch can be the same as the source key — as shown in the display — or it can be any pitch from A0 to C8. The range of the fine tuning is 00 to 99 cents. This enables you to create micro-tunings and other alternate tunings. First, let's get a feel for the relationship between the source key and the playback pitch.

- Make sure the KEY (source key) location is underlined.
- Play C4 (middle C) on the keyboard, or use the data entry controls to select C4 as the source key.
- Underline the playback pitch, in this case, C4.
- Use the up arrow button and change C4 (playback pitch) to C4+.
- Underline 00 CENTS. Use the data entry controls to change the value to 50 CENTS. The display reads:



C4 now plays back at C4+ and 50 Cents, one and one half semitones higher than normal. Try selecting other source keys, and then changing their playback pitches to any values you like. This is how we edit the custom pitch table.

- Press *EXIT* to return to the Select Voice page.

Removing a Custom Pitch-table

If a program contains a custom pitch-table and you wish to remove it (thus restoring voices 5 and 6) you can do so from the Program Control page:

To remove a custom pitch-table:
- Press ***Program Control***.
- Underline PITCH-TABLE=ON.
- Press the down arrow button.
- The VFX will ask ERASE CURRENT PITCH TABLE?
- Press *YES*. You are returned to the Select Voice Page, the custom pitch-table is gone, and voices 5 and 6 are reset to the default voice.

You are now free to create a new custom pitch-table in your current program.

Now that you understand the relationship between the source key, playback pitch, and fine tuning in a custom pitch-table, let's start over. This time we'll work with an ancient tuning system, called Pythagorean. Then, we'll work with the VFX's built-in pitch-table calculator, and two new procedures: Extrapolation and Interpolation.

Creating and Extrapolating a Custom Pitch-table

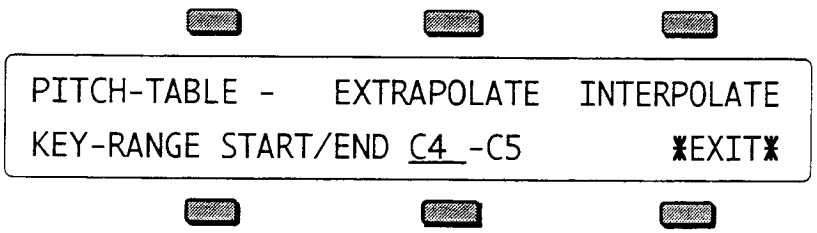
The EXTRAPOLATE command takes the pitch-table relationships from within a key range and duplicates those relationships outside that range.

- If you have a custom pitch-table from the previous exercise, remove as shown above.
- Select a program into which you want to write a custom pitch-table.
- Press ***Program Control***. This takes us to the Program Control Page.
- Set the pitch-table parameter to PITCH-TABLE=ON.
- Respond *YES* to REMOVE VOICES 5+6. This takes us to the Select Voice Page.
- Select a voice into which you want to write a custom pitch-table.
- Press ***Pitch***.
- Select PITCH-TABLE=CUSTOM.
- Press ***Select Voice*** to return to the Select Voice Page.
- Press either of the soft buttons beneath EDIT PITCH-TABLE. This takes us to the EDIT PITCH-TABLE Page.
- The display shows the source key and playback pitch as described earlier.
- To set up one octave of a Pythagorean scale, change the source keys, playback pitches, and cents, one note at a time, from C4 to C5 — to the following values:

Source Key	Playback Pitch	Cents
C4	C4	00
C4+	C4+	17
D4	D4	04
D4+	D4+	01
E4	E4	08
F4	E4	98
F4+	F4+	12
G4	G4	02
G4+	G4+	14
A4	A4	06
A4+	A4	98
B4	B4	10
C5	C5	00

You can manually edit your custom pitch-table across the remaining octaves of the keyboard. Or you can use the Calculator in the VFX to do this for you.

- Press *CALCULATOR*. The display reads something like this:



The KEYRANGE defines the area of the keyboard that the VFX will use as a reference by which to make its calculations.

To set the key-range:

- The START key (the first of the two key numbers shown) should be underlined. If not, press the soft button beneath it to select it. Now, either play C4 (middle C) on the keyboard. The underline jumps to the END key.

- The END key should now be underlined. Play C5 on the keyboard. The parameter should read: KEY-RANGE START/END C4 – C5. You have defined the key range whose pitch intervals you want to duplicate over the entire keyboard.

Note that you can also set the start and end keys using the data entry controls, and press the soft button beneath them to toggle back and forth.

We began editing our pitch-table with note C4 and ended our editing with C5. This is key-range for this particular pitch-table. Extrapolate will take the intervals between the notes in our one-octave custom pitch-table and apply them to the rest of the keyboard, resulting in a Pythagorean tuning covering the entire keyboard.

- Press EXTRAPOLATE. The display briefly reads PITCH-TABLE *CALCULATOR*, then returns with the Pythagorean temperament across the whole keyboard.

At this point you might want save this pitch-table by writing the program into memory as described in Section 7. Or, you can use the Copy function to copy it into another Program, or even into the system, for use by all your programs. See Copy Function.

Creating and Interpolating a Custom Pitch-table

INTERPOLATE takes the interval between two notes on the keyboard and divides all the keys in between into equally-spaced fractions of that interval.

As an example, lets make the entire 5-octave keyboard of the VFX span just one octave in pitch from the lowest key to the highest.

- Using the procedure described earlier, create a custom pitch-table, and select PITCH-TABLE=CUSTOM on the Pitch page.
- On the Select Voice Page, press the soft button for EDIT PITCH-TABLE.
- Set KEY C2 = C3 AND 00 CENTS. Next, set KEY C7 = C4 AND 00 CENTS.

We've just established an interval of octave between C2 and C7.

- Press *CALCULATOR*
- Set the key range to KEY-RANGE START/END C2 -C7.
- Press INTERPOLATE.

The VFX has just Interpolated the octave (C3 to C4) and divided it equally across the 61 note keyboard, so we now have a 60 step octave.

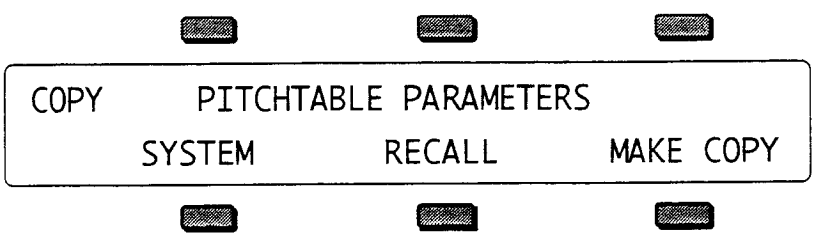
Warning: You must save the program containing your custom pitch-table, or copy the custom pitch-table into the system, or you will lose it as soon as you edit another sound.

Alternate tunings for the System Pitch-table

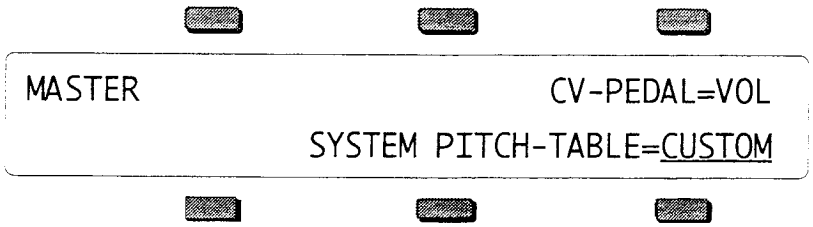
As an added feature, the System Pitch-table itself is user-definable. For instance, if you want to hear what other programs sound like using the custom pitch-table from a program, you can redefine the System pitch-table. Or, if your main tuning is "just intonation," then it might be convenient for you to use this or some other alternate tuning as your System tuning.

To install an alternate tuning into the System pitch-table:

- Select a program which contains a custom pitch-table.
- Press ***Select Voice***.
- Press soft button beneath EDIT PITCH-TABLE.
- Press the ***Copy*** button. The display reads:



- Press the soft button beneath SYSTEM. The display briefly reads COPY TO SYSTEM PITCH-TABLE, and the custom pitchtable is installed into the VFX operating system where it is available for use by any program.
- Press ***Master*** twice to reach the second sub-page of the Master page.



- Note that the SYSTEM PITCH-TABLE parameter has been set to CUSTOM. Now all programs whose voices are set to use the system pitch-table (which is most programs) will use the custom pitch-table.

To return all programs to standard equi-tempered tuning, set the SYSTEM PITCH-TABLE parameter back to NORMAL. Switching back to CUSTOM will restore your custom System pitch-table. You can switch back and forth as often as you wish. You can also try installing other custom pitch-tables in the System, but the System pitch-table can only contain one custom pitch-table at a time.

Section 10 — Using the Copy Functions

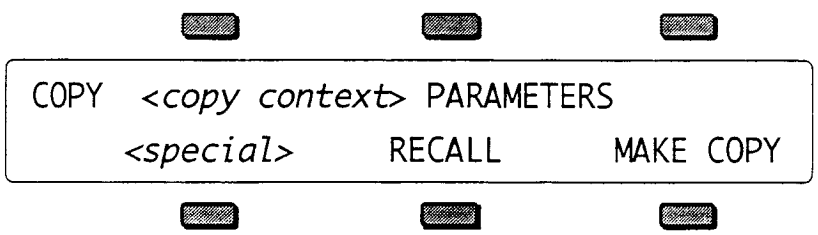
The Copy page provides programming utility functions for:
- copying entire pages of parameter data at once while programming voices
- copying complete voices, effects, or programs
- changing the system pitch table

About the Copy Functions

When programming synthesizers, it is often desirable to be able to make changes to some component of a sound and then to transfer the newly modified component to another part of the same voice or program, or even to use it in a different program. Before the development of the VFX, this was not easy to accomplish without the aid of external computer-based editors. The Copy page of the VFX provides several useful functions which facilitate copying components from one place to another. The components which can be copied may be all of the parameters on a page or in a voice, or even an entire program. The copy function can be used to move programs from one location to another, using a procedure described later in this section.

Pressing the ***Copy*** button will display the Copy page menu. Pressing ***Copy*** while the Copy page is displayed will return you to the last parameter page that was selected.

*The **copy context** determines which parameters will be affected by the functions on the page.*



The top line of the display indicates the currently selected *copy context* . The copy context is determined by the type of page that was selected just before you pressed ***Copy*** to enter the Copy page.

This simple example shows how you can set the copy context.

- Press ***Wave*** to display the Wave page.
- Press ***Copy***. The copy context will show WAVE PAGE PARAMETERS.
- Press ***Copy*** again. You will be returned to the Wave page.

There is a well-defined group of copy contexts that are available for your use. The copy context is set whenever you select pages from within this group. The following table shows the copy context that is automatically set whenever particular pages are displayed.

Prior page...	*Copy context*	*What gets copied...*
Wave	WAVE PAGE	all Wave page parameters
LFO	ALL LFO	all LFO page parameters
Pitch	PITCH PAGE	all Pitch page parameters
Pitch Mod	PITCH MOD	all Pitch Mod page parameters
ENV1..3	ENVELOPE-#	all parameters for one envelope
Filter 1 or 2	FILTER-#	all parameters for a single filter
Mod Mixer	MOD MIXER	all Mixer/Shaper page parameters
Output	OUTPUT	all Output page parameters
Effects	EFFECTS	all Effects page parameters
Select Voice	ALL VOICE	all parameters for selected voice
Edit Pitch Table	PITCHTABLE	one complete pitchtable (voices 5/6)
Program Control	PROGRAM	
Sounds/Program Bank	PROGRAM	all parameters for selected program

Note: In order to use the copy functions successfully, it is important to understand how to control the copy context, and what is being copied.

*The **copy buffer** is an invisible portion of memory used to hold the most recently copied parameters until they are recalled.*

The contents of the copy buffer are completely independent of the compare buffer used in editing programs. You can make copies into the copy buffer without affecting the data in the compare buffer. Recalling data from the copy buffer always changes only the compare buffer. The copy buffer can contain anything from a single page of parameter values up to an entire program which includes six voices and an effect. . The copy buffer is *context-sensitive*, meaning that your options are controlled by your previous actions.

The bottom line of the display shows the available operations which can be performed on the page.

MAKE COPY

Based on the current copy context, this command will copy a set of parameters into the copy buffer. The copy buffer is a separate buffer into which the copy utility will copy data without affecting the current edit program in the compare buffer. Remember that MAKE COPY has no effect on the compare buffer or the selected program or voice.

RECALL

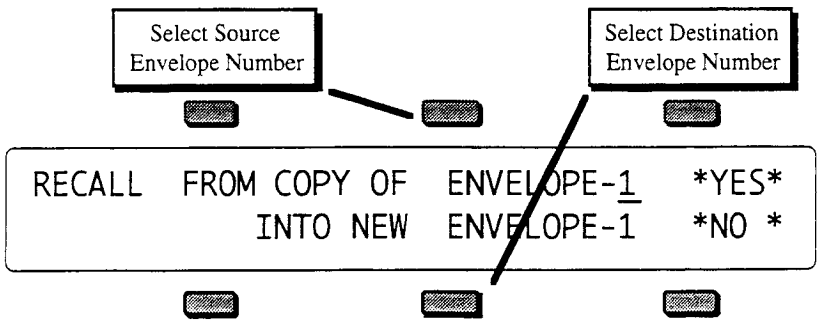
This command will copy parameters back from the copy buffer into the compare buffer where the edit program resides, again according to the copy context. Pressing the soft button below RECALL causes the indicated data set to be copied, and the display returns to the Copy page.

The RECALL function always copies data into the compare buffer. If the compare buffer is selected (i.e. the ***Compare*** LED is on) at the time you perform a recall, then the data is added to the edited program in the compare buffer. If the compare buffer is not selected then the compare buffer is loaded with the currently selected primary program before the recall is completed. The compare buffer is always selected after a recall.

If Group Edit is active when pages of voice parameters are recalled, then the recall will affect all of the voices in the group. The data being recalled will be written into all of the grouped voices in the compare buffer at the same time. For example, you could make a copy of an envelope page from one voice and then recall it into a group of voices in one step. Group Edit has no effect when recalling effects, complete voices, pitch tables, or complete programs.

Special Recall Functions

There are several exceptions to the normal pattern of operation in the RECALL function. The first exceptions occur with the Envelope and Filter contexts. When the copy context is set to any of the Filter or Envelope settings, pressing RECALL will display an additional page which allows you to select the source and destination pages for the parameter transfer. This allows you to copy information between different envelopes and filters.



The sample screen shown above illustrates the RECALL sub-page for the ENVELOPE context. The Source Envelope number controls which envelope in the copy buffer will be used by the recall, and the Destination Envelope number determines which envelope in the compare buffer will be replaced with the new data being recalled. The default settings are always the same number for source and destination. If you want to copy across from one envelope to another, you must set the source and destination envelope numbers accordingly. The RECALL sub-page for the FILTER context is similar in appearance and function.

Remember that the copy buffer always contains copies of each of the three envelopes and two filters, regardless whether you last used an envelope, filter, voice, or program copy function.
Another exception occurs in the PROGRAM context. Pressing RECALL from this context will take you directly to the Write page. The compare buffer is loaded with the same information as the copy buffer whenever you recall an entire

program, and you are ready to save the program in a new location.

The system will alert you if you try to recall into a context different than the last copy action that was performed. This prevents you from mistakenly recalling a fragmented voice, program or pitch-table.

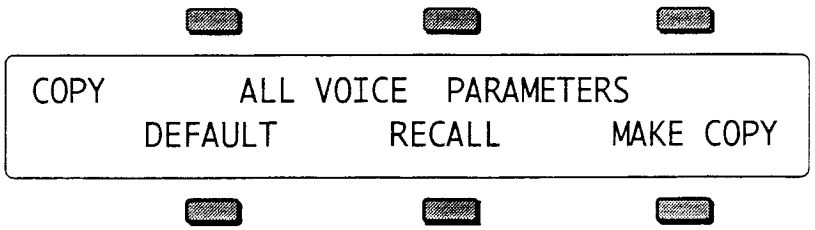
Special Copy Operations

There are also some special command options that appear in the display (above the lower left soft button) for certain copy contexts.

DEFAULT

There are some copy contexts which provide the option of recalling default parameter settings automatically. When this option is available, the DEFAULT command appears in the lower left part of the display.

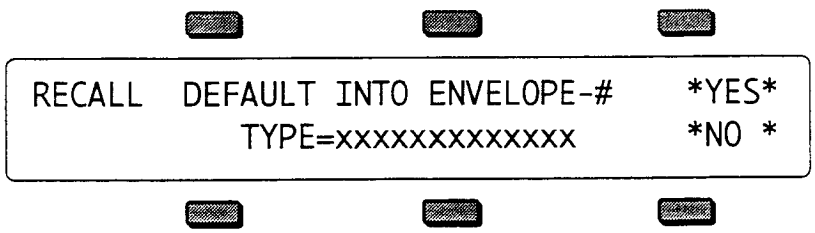
- For the ALL VOICE parameter context:



The DEFAULT command will make a copy of the default voice into the copy buffer and then automatically recall it into the currently selected voice in the compare buffer, as if you had performed the steps yourself. This allows you to easily put the voice into a standard configuration, which is often useful when creating new programs.

- For the ENVELOPE-1, -2, and -3 parameter contexts:

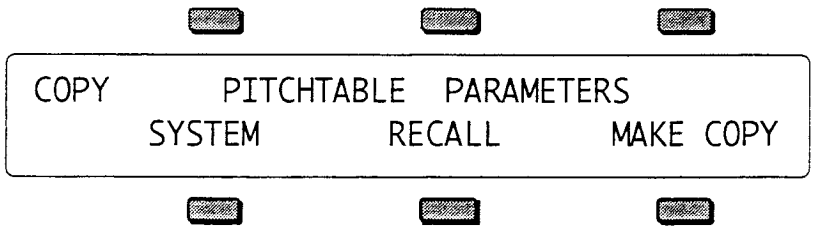
The DEFAULT command also appears with the ENVELOPE-# context. Pressing the soft button below the command displays a sub-page which will allow you to select from a group of standard preset envelope types which can be recalled into the current evelope. This is particularly useful when setting up typical envelopes as starting points when you are creating new voices.



Select the default envelope type using the data entry slider or the up/down arrows and press YES if you wish to install the selected envelope type into the envelope number shown on the upper line of the display. Press NO to return to the Copy page without performing any action.

SYSTEM

For the PITCHTABLE parameter context only:



When entered from the Edit Pitch-Table pages, the Copy page shows the SYSTEM command on the lower left part of the display. This command will copy the pitch-table directly from the currently program, or from the compare buffer if the Compare LED is on, into the system pitch table. It is not necessary to use the MAKE COPY command in this case. Using this command will automatically set the SYSTEM PITCH-TABLE parameter on the Master page to CUSTOM, thereby selecting the newly installed pitch table for use as the system pitch table. Refer to the Master page and Using Pitch Tables sections for more information on the system pitch table.

Some useful applications of the copy functions

Copying an effect from one program to another

- Press ***Sounds*** and select the program whose effect you wish to copy.
- Press ***Effect*** in the Programming section to display the Program Effect page for this program.
- Press ***Copy***. The copy context will show EFFECTS PARAMETERS.
- Press the soft button below the MAKE COPY option to copy the Effect page parameters into the copy buffer.
- Select the program into which you wish to copy the effect. If the sound you are working on is in the compare buffer, make sure that the Compare LED is on.
- Press ***Effect*** in the Programming section to redisplay the Program Effect page.
- Press ***Copy***. You will be returned to the Copy page with the EFFECTS context.
- Press the soft button below the RECALL option to recall the effect from the copy buffer.
- Press ***Copy*** again. You will be returned to the Effect page. Note that the effect that you previously copied has now replaced the old effect. Remember to write the program if you wish to keep the change.

Copying all parameters from one voice to another

When the Copy page is entered from the Select Voice page, the copy context is set to ALL VOICE PARAMETERS. In this context, the values of all voice parameters for the currently selected voice are transferred to or from the copy buffer. Using this method, you can easily copy voices within a program or from one program to another.

- Press ***Select Voice*** to display the Select Voice page.and set the copy context. Make sure that the voice which you wish to copy is selected.
- Press ***Copy***. The copy context will show ALL VOICE PARAMETERS.

- Press the soft button below the MAKE COPY option to copy the voice into the copy buffer.
- Press ***Copy*** again. You will be returned to the Select Voice page.
- Select the voice you wish to replace with the voice you just copied
- Press ***Copy*** again. You will be returned to the Copy page.
- Press the soft button below the RECALL option to recall the voice from the copy buffer.
- Press ***Copy*** again. You will be returned to the Select Voice page. Note that the voice you previously copied has now replaced the old voice.

Copying a complete program to a new location

It is easy to copy programs from one location to another using the copy and recall functions. Simply follow this procedure:

- Press ***Sounds*** and select the program that you wish to copy. This will automatically set the copy context to PROGRAM PARAMETERS.
- Press ***Copy*** to display the Copy page.
- Press the soft button below the MAKE COPY option to copy the program into the copy buffer. The program will be copied into the copy buffer, and the Copy page will be redisplayed.
- Press the soft button below the RECALL option to recall the program from the copy buffer into the compare buffer. The Write page will be displayed automatically.
- Using the normal techniques for writing programs, select the destination in which you wish to locate the copy (refer to the section describing the Write page if you are unsure how to proceed).

Making a copy of the compare buffer

If you wish to make a copy of the complete compare buffer before making some experimental edits that you are unsure of, then use the following procedure to make a backup copy of the current compare or edit buffer:

- Set the copy context to the Program context by pressing ***Program Control*** or ***Sounds***.
- Make sure that the ***Compare*** LED is on, and that you are hearing the edit program of which you wish to make a copy (*press**Compare*** if not).
- Press ***Copy*** and make sure that the copy context is PROGRAM PARAMETERS.
- Press the soft button below the MAKE COPY option to copy the compare buffer into the copy buffer.

Collecting parts from several sources into the copy buffer

While you can only make a single copy of an entire voice or program at one time, it is possible to make consecutive copies of multiple pages of parameters before recalling the data you have copied. These pages can even be taken from different voices or different programs.

For example, using the normal MAKE COPY process, you can make copies of one or more envelope pages, followed by an LFO page and a wave page. A single copy of *each* of these pages is saved into the copy buffer. You can then start recalling the pages you want into the compare buffer using the normal RECALL procedure described above. The data you copied will remain intact until you copy a complete voice or program, which will replace the contents of the copy buffer.

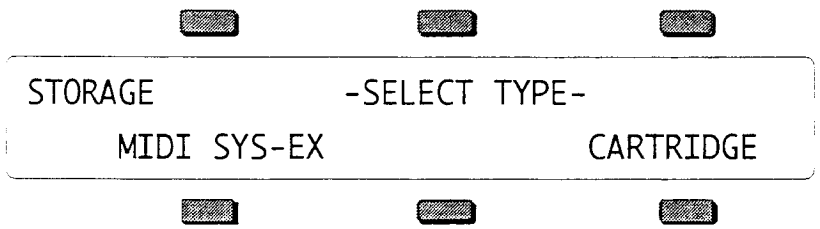
Section 11 — Storage Functions

The Storage page provides data storage functions that enable you to:

- transfer Program and/or Preset data to or from VFX cartridges, and
- transmit dumps containing Programs, Presets, or the 12 Multi A & B tracks via MIDI system exclusive messages.

The Storage Page presents a series of menus containing command options which are selected by using the soft buttons.

- Pressing ***Storage*** will always display the Storage page.



From the Storage page you can select which one of the two forms of data storage you wish to use—MIDI Sys-Ex messages or VFX Cartridge storage.

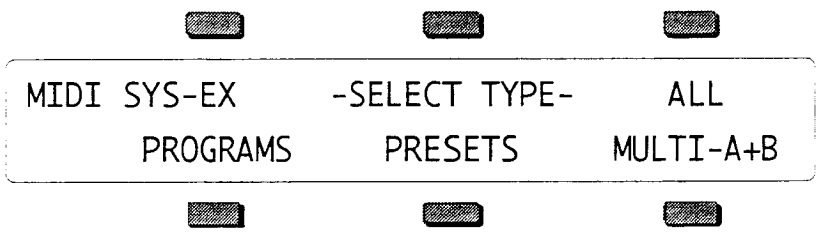
MIDI SYS-EX

To Send MIDI Sys-Ex Messages

The VFX is able to send system exclusive dumps of Programs and Presets either singly or in banks, as well as the complete setup of the 12 Multi A & B tracks.

Banks of programs or presets are always transmitted from the internal RAM. If you want to send cartridge data, use the cartridge functions to transfer data into the internal RAM. If you want to send internal ROM data, you must first reinitialize the VFX which will replace all of the internal RAM data with copies of the internal ROM data. Be careful to make sure that you have first saved your internal RAM data before reinitializing. Refer to the instructions about reinitializing the VFX for more information.

From the STORAGE Page—
Press the soft button for MIDI SYS-EX. The display reads:



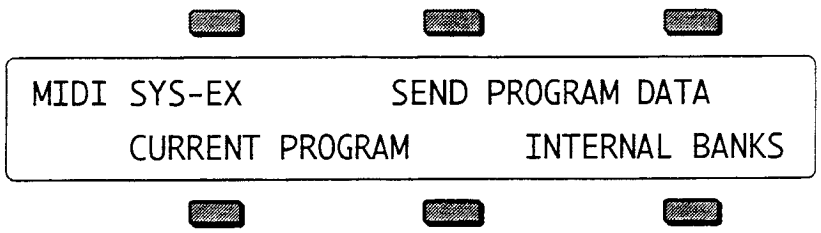
This page is used for selecting which type of data to transmit via MIDI system exclusive message.

PROGRAMS

To Send Programs out via MIDI Sys-Ex

From the MIDI SYS-EX Page—

- Press the soft button for PROGRAMS. The display reads:



- CURRENT PROGRAM—this command will send out all data for the currently selected primary program as a system exclusive message. The program may be in any bank, including the internal ROM or cartridge banks.

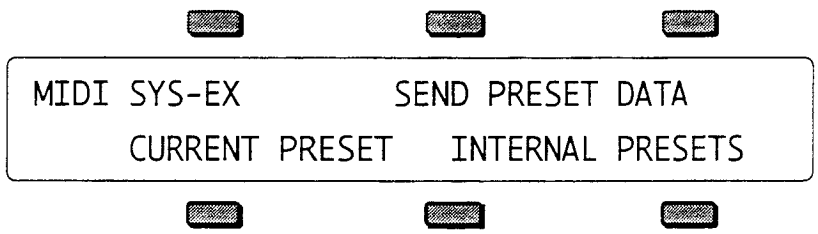
- INTERNAL BANKS—this command transmits the contents of the ten Internal Program Banks as a system exclusive message. The dump contains data for the complete set of 60 programs.

PRESETS

To send Presets out SYS-EX

From the MIDI SYS-EX Page—

• Press the soft button for PRESETS. The display reads:



• CURRENT PRESET—this command will send out all data for the current Preset as a system exclusive message.

• INTERNAL PRESETS—this command transmits the contents of the of the two Internal Preset Banks as a system exclusive message. The dump contains data for the complete set of 20 presets.

MULTI-A+B

Sending the Multi A & B track setup out via MIDI Sys-Ex

From the MIDI SYS-EX Page—

• Press the soft button for MULTI-A+B. The VFX will transmit all information about the 12 tracks of the Multi A & B setup as a system exclusive message.

This information can be sent to Sys-Ex recorder (like the EPS) or an external computer sequencer to be saved for later recall. When you want to restore the VFX to this same state, send the system exclusive message back to the VFX, first making sure that System Exclusive messages are enabled on the MIDI Control page. This is the best way to save and restore a VFX setup used for multi-timbral sequencing.

ALL

Sending Programs, Presets and the Multi A & B tracks out via MIDI Sys-Ex

From the MIDI SYS-EX Page—

• Press the soft button for ALL. The VFX will transmit three consecutive dump messages containing the internal Program banks, the internal Preset banks, and the Multi A&B tracks. Using this command is equivalent to sending the three messages individually, and is convenient when you wish to save everything with one command.

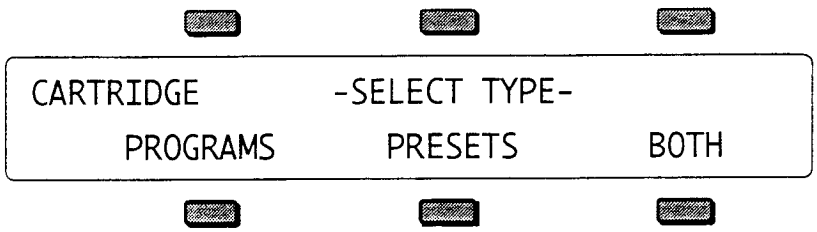
Receiving MIDI Sys-Ex Messages

The receiving of data dumps is initiated automatically by system exclusive messages sent from the transmitting unit. No front-panel commands are necessary to receive dumps if the receiving of System Exclusive messages is enabled on the MIDI Control page (SYS-EX=ON).

Cartridge Storage

From the STORAGE Page—

- Press the soft button for CARTRIDGE. The display reads:



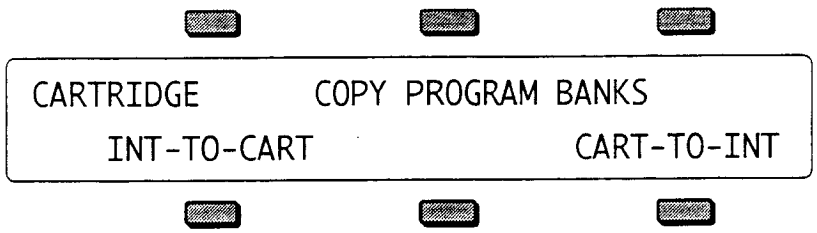
This page lets you select the type of data to be transferred to or from the cartridge.

PROGRAMS

To Copy Program Banks from Internal to Cartridge

From the CARTRIDGE -SELECT TYPE- Page—

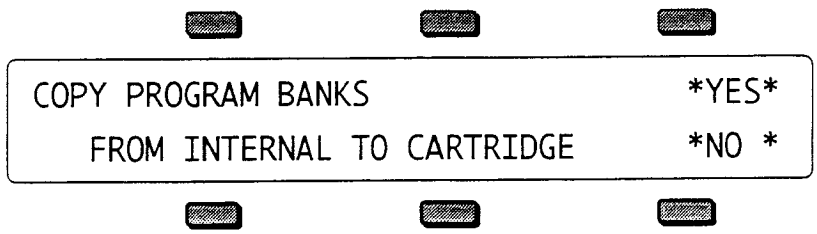
- Press the soft button for PROGRAMS. The display reads:



This page lets you decide on the direction (i.e. the source and destination) for the data transfer of the type you have selected.

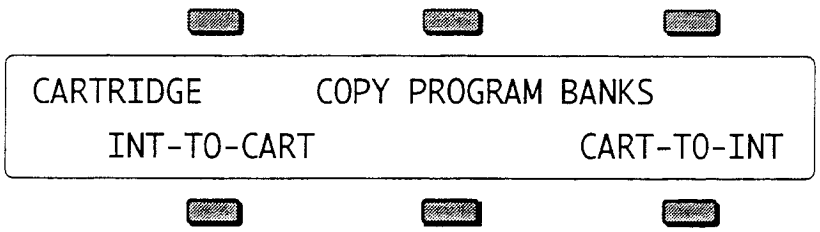
From the CARTRIDGE COPY PROGRAM BANKS Page—

- Press the soft button for INT-TO CART. The display reads:

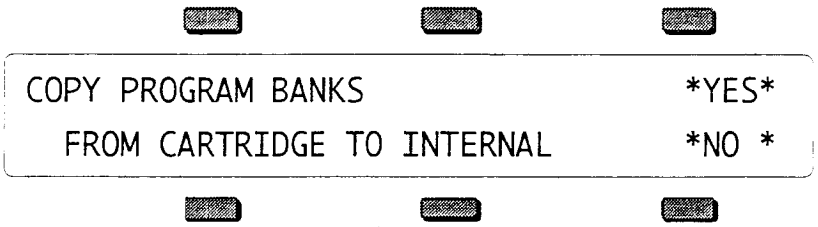


- Respond *YES* if you want to copy program banks from the VFX's internal memory to the storage cartridge. This will replace all of the cartridge programs with the 60 programs from the internal banks, and the old cartridge programs will be lost.
- Selecting *NO * will abort the command and return you to the Storage page.

To Copy Programs from Cartridge to Internal

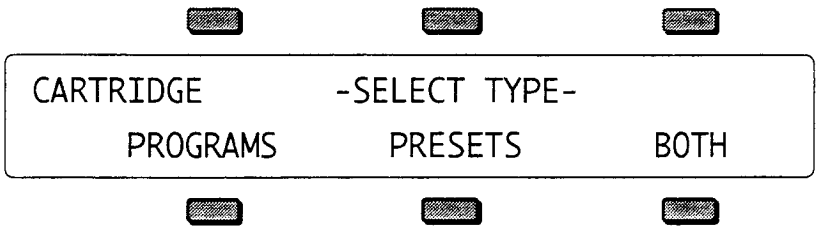


From the CARTRIDGE COPY PROGRAM BANKS Page—
- Press the soft button for CART-TO-INT. The display reads:

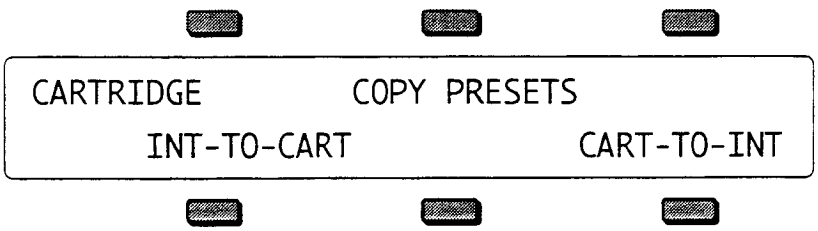


- Respond *YES* if you wish to complete the transfer of the ten program banks from the storage cartridge to VFX's internal program memory. This will replace all of the internal programs with the 60 programs from the cartridge, and the old internal programs will be lost.
- Selecting *NO * will abort the command and return you to the Storage page.

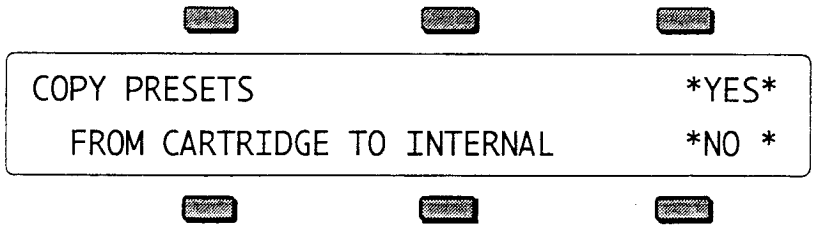
PRESETS
To Copy Presets from Cartridge to Internal



From the CARTRIDGE -SELECT TYPE- Page—
- Press the soft button for PRESETS. The display reads:



- Press the soft button for CART-TO-INT. The display reads:

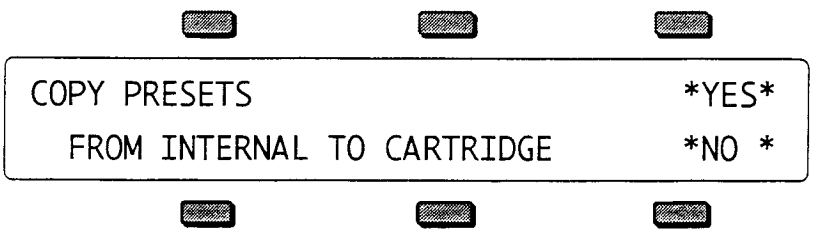


- Respond *YES* if you wish to complete the transfer of the ten program banks from the storage cartridge to VFX's internal program memory. This will replace all of the internal programs with the 60 programs from the cartridge, and the old internal programs will be lost.
- Selecting *NO * will abort the command and return you to the Storage page.

To Copy Presets from Internal to Cartridge

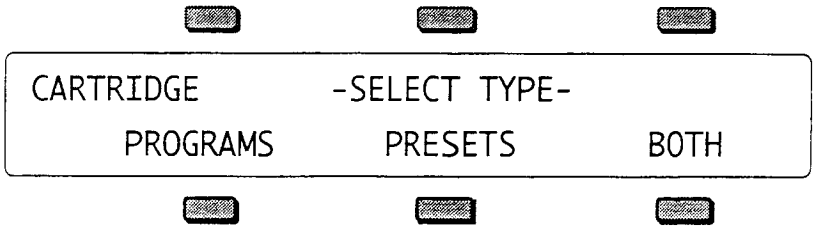
From the CARTRIDGE -SELECT TYPE- Page—

- Press the soft button for PRESETS. Then, from the CARTRIDGE - COPY PRESETS page, press the soft button for INT-TO-CART. The display reads:

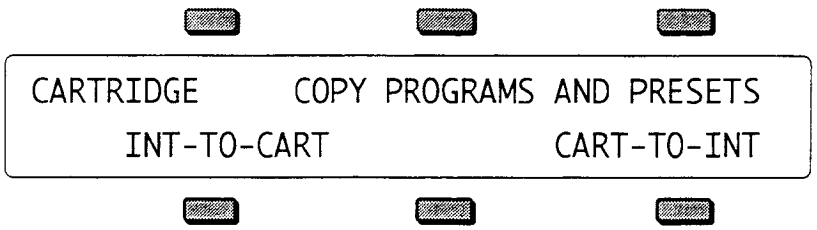


- Respond *YES* if you want to copy the preset banks from the VFX's internal memory to the storage cartridge. This will replace all of the cartridge presets with the 20 presets from the internal banks, and the old cartridge presets will be lost.
- Selecting *NO * will abort the command and return you to the Storage page.

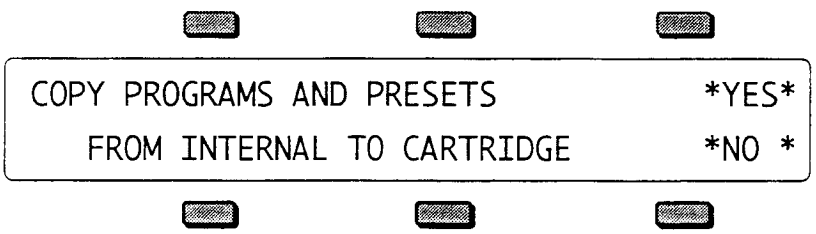
BOTH
To Copy Both Programs & Presets from Internal to Cartridge



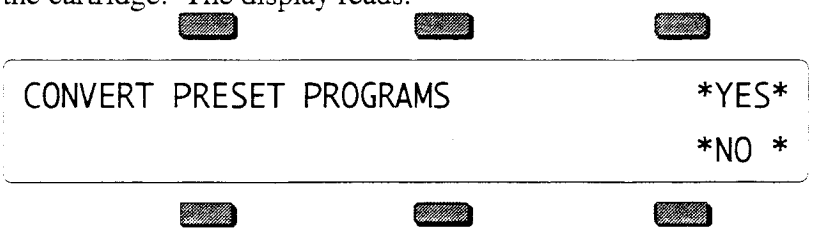
From the CARTRIDGE -SELECT TYPE- Page—
• Press the soft button for BOTH. The display reads:



• Press the soft button for INT-TO-CART. The display reads:



• Respond *YES* if you wish to copy Programs and Presets from the VFX to the cartridge. The display reads:



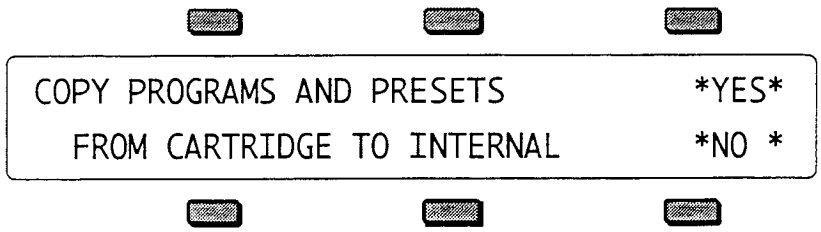
When you are copying BOTH Presets and Programs from INT to CART, you will be prompted to decide whether you would like to have the program numbers in the presets converted as the transfer is taking place. This conversion makes the presets which previously used internal programs now use the same programs from the cartridge. ROM programs are not affected.

If you respond *YES* to CONVERT PRESET PROGRAMS, the VFX will automatically modify the Presets which used internal programs to use the corresponding programs on the cartridge.
If you respond *NO * to the prompt, then the copying of both Presets and Programs will be completed, but no conversion will be done.

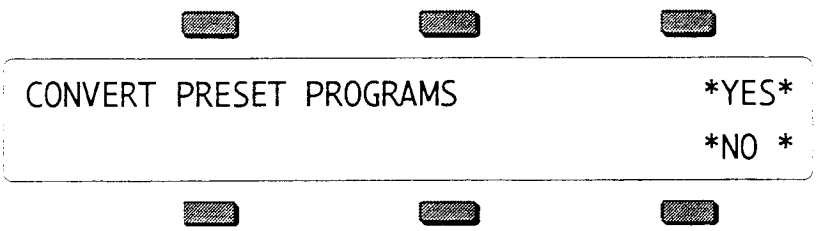
To Copy Both Programs & Presets from Cartridge to Internal

From the CARTRIDGE COPY PROGRAMS AND PRESETS Page—

- Press the soft button for CART-TO-INT. The display reads:



As with the case of copying both programs and presets from internal to cartridge, if you select *YES*, you will be prompted to decide about converting the programs in the presets.



When you are copying both Presets and Programs from CART to INT and you respond *YES* to CONVERT PRESET PROGRAMS the VFX will change the presets to use the INT Programs (which will be the same as those in the cartridge, since you are copying them at the same time).

Appendix A

VFX MIDI Implementation Specification - version 2.10

1 Introduction and Overview

This section describes the MIDI System Exclusive (SysEx) communication protocol used when the VFX is communicating with an external computer (EXT). The protocol is designed to aid the implementation of editing programs running on EXT, and so this information is especially relevant to designers and programmers of editing programs. The commands described here allow editor/librarian programs to collect and alter information about presets, programs, and the multi set within the VFX.

1.1 Universal System Exclusive Device Inquiry Message

The VFX supports the MIDI **Device Inquiry message** which allows instruments and computers to ascertain the identity of the unit(s) to which they are connected via MIDI. The VFX responds to the following Device Inquiry message by sending a Device ID message. The VFX will respond to the inquiry if the channel information in the message contains either the base MIDI channel of the VFX or the all channel broadcast code ($7F).

11110000	F0	System Exclusive status byte
01111110	7E	Non Real Time message code
0000nnnn	0x	Base MIDI channel number
or		
01111111	7F	All Channel Broadcast code
00000110	06	General Information message code
00000001	01	Device Inquiry message code
11110111	F7	End of System Exclusive

1.2 System Exclusive Device Identity Reply Message

The following **Device ID message** contains information about the VFX, and is transmitted in response to a Device Inquiry.

11110000	F0	System Exclusive status byte
01111110	7E	Non Real Time message code
0000nnnn	0N	Base MIDI channel number
00000110	06	General Information message code
00000010	02	Device ID message code
00001111	0F	ENSONIQ manufacturer's Code
00000101	05	VFX Product Family ID code - LSByte
00000000	00	VFX Product Family ID code - MSByte
00000000	00	VFX Family Member (Model ID) code LSByte
00000000	00	VFX Family Member (Model ID) code MSByte
00000000	00	Software revision information
00000000	00	(not used)
0nnnnnnn	NN	Major Version Number (integer portion)
0nnnnnnn	NN	Minor Version Number (decimal fraction portion)
11110111	F7	End of System Exclusive

2 MIDI System Exclusive Packet Pieces

A packet is a bunch of information, i.e. a message, in the form of a MIDI data stream. Each packet can be divided into three sections or pieces. The first and last packet pieces form the *frame* for a message. The message contains the commands described in section 3. Every message must be preceded with a SysEx head and followed with a SysEx tail. A complete packet looks like this:

SysEx Head . . . . . Message . . . . . SysEx Tail

2.1 MIDI System Exclusive Packet Head

This is the common MIDI system exclusive header which must be used on all system exclusive messages to and from the VFX. These six bytes are always sent preceding the message potion of the packet.

11110000	F0	System Exclusive status byte
00001111	0F	ENSONIQ Code
00000101	05	VFX Family ID Code
00000000	00	VFX Model ID Code
0000nnnn	0x	Base MIDI channel number
00000nnn	0x	Message Type (see section 3)

2.2 MIDI System Exclusive Packet Tail

For every head there is a tail. The tail follows the message portion, and is the last byte of every complete SysEx packet.

11110111	F7	End of System Exclusive

2.3 Message Format

The VFX message format within the packet frame allows 8 bit data bytes to be transmitted and received using the 7 bit data of MIDI. The MSB of the data bytes must always be a zero, so the bytes are converted to two 4 bit nybbles. These nybbles are converted to bytes whose upper four bits are all zero for transmission. This is a description of the format of all data bytes within the packet frame as they are transmitted or received via MIDI. The details of each message are given in section 3.

0000HHHH	H = Hi 4 bits of data byte - transmitted first
0000LLLL	L = Lo 4 bits of data byte

This represents how the 8 bit byte HHHHLLLL would be transmitted.

2.4 Receiver Errors

If the message received by the VFX is not understood, then an informative error message will be displayed and an error message will be sent as described in section 3.2. Errors typically occur when the MIDI cable is accidentally disconnected during a long dump message such as an All Programs Dump message. If EXT cannot handle the error message, then the displayed message will prompt the user to retransmit the original message after re-connecting the MIDI cable or otherwise correcting the cause of the error.

3 Message Type List

The next few sections describe the messages to be used between EXT and VFX. The message type corresponds to the last byte of the system exclusive packet head described in section 2.1.

Note: The SysEx messages outlined below appear as an ordered description of bytes which do not necessarily represent the MIDI format described in section 2.3. Remember, full 8–bit data bytes are always sent as two "nybble-ized" bytes. Message types are part of the head and are sent as bytes, but Command types are considered data and are sent as two nybbles.

3.1 Command Messages (Message Type = 00)

All messages which need some interpretation by the receiver are called *command messages.* Every command message is transmitted using the message format described in section 2.3. The first byte of each command message is the command type byte, which follows the message type byte in the packet head. In the following sections the command type is shown in the section headings.

3.1.1 Virtual Buttons (Command Type = 00)

EXT can simulate button presses from the front panel of the VFX by sending this command. Sending the listed button numbers in a command will simulate a single button down being held *down*. Button *up* commands add an offset of 96 to the the button down numbers. The button number follows the command type byte in the message. Remember to send a button up command for every button down command that is sent. Button up commands were implemented in version 2.01 and above. *Note: a delay of 2-300 msecs between button commands, or at least pairs of button commands, is recommended.*

3.1.1.1 Button Numbers

Logical Number	Front Panel Button Name	Logical Number	Front Panel Button Name
0	unnamed bank 0	29	Wave
1	unnamed bank 1	33	Pitch
2	unnamed bank 2	34	Pitch Mod
3	unnamed bank 3	35	Filters
4	unnamed bank 4	37	Output
5	unnamed bank 5	40	LFO
6	unnamed bank 6	42	Env1
7	unnamed bank 7	45	Env2
8	unnamed bank 8	48	Env3
9	unnamed bank 9	51	Effects (Programming)
10	Cart	60	Select Voice
11	Sounds	61	Copy
12	Presets	62	Write
13	Storage	63	Compare
14	up arrow, INC	64	Volume
15	down arrow, DEC	65	Pan
16	soft key 0, top left	66	Timbre
17	soft key 1, top middle	67	Key Zone
18	soft key 2, top right	68	Transpose
19	soft key 3, bottom left	69	Release
20	soft key 4, bottom middle	70	Patch Select
21	soft key 5, bottom right	73	MIDI (Performance)
22	Master	76	Effects (Performance)
25	MIDI Control	80	Multi A
27	Program Control	81	Multi B
28	Mod Mixer	83	Replace Program

3.1.2 Parameter Change (Command Type = 01)

Single parameters can be edited by EXT using this command. Since this is a short message relative to the much longer bulk dump length of a complete program, program editors running on EXT can change single parameters by using this command faster than by sending a complete program dump when only one or a few parameters change.

Absolute parameter values depend on the parameter page and slot numbers which uniquely define each parameter. Slot numbers are equivalent to soft button numbers. See section 5 of this appendix for the page and slot definitions. Most parameter values are in the low byte of the absolute value word; key range parameter types use the whole word.

00000001	01	Command Type
00000nnn	0x	Voice Number, [0..5]
000nnnnn	0x	Parameter Page Number, [0..31]
00000nnn	0x	Parameter Slot Number, [0..5]
hhhhllll	HL	Absolute Value Hi Byte, [0..255]
hhhhllll	HL	Absolute Value Lo Byte, [0..255]

3.1.3 Edit Change Status (Command Type = 02)

This command is only *transmitted* by the VFX; it is not received. It allows the external editor to retain synchronization with the compare buffer in the VFX. The edit change status command is sent whenever an edit operation initiated from the front panel of the VFX causes more than one parameter to change. The edit change status command will always be preceded by at least one parameter change message. Although the VFX will send parameter change messages, it may not be able to send the new value of every parameter that changed, due to the complexities of internal editing. When EXT receives this message, it should request a complete program dump to re-establish editing sync. The command type is the only byte in this command.

3.1.4 ESP Microcode Program Load (Command Type = 03)

The ESP is the audio effects processor of the VFX. ESP microcode can be downloaded using this command which can facilitate creating new effect programs. This command is currently not implemented, and is reserved for future use.

3.1.5 Poke Byte to RAM or Cartridge (Command Type = 04)

This command allows bytes to be transmitted to RAM or the E^2PROM cartridge using MIDI. The following table describes the download command message. *Use at your own risk.*

00000100	04	Command Type	hhhhhhhh	hh	Address Hi Byte of Lo Word
HHHHHHHH	HH	Address Hi Byte of Hi Word	llllllll	ll	Address Lo Byte of Lo Word
LLLLLLLL	LL	Address Lo Byte of Hi Word	nnnnnnnn	XX	Data Byte, [0..255]

Note: The VFX does not transmit the following Dump Request commands (command types 05 to 0A). The command type is the only byte in these commands.

3.1.6 Single Program Dump Request (Command Type = 05)

The VFX will dump the current program using the bulk dump message described in section 3.3.1 when it receives this command. If the current program is being edited, the edited version from the compare buffer will be transmitted.

3.1.7 Single Preset Dump Request (Command Type = 06)
The VFX will dump the current preset using the bulk dump message described in section 3.3.3 when it receives this command. If the current preset is being edited, the edited version will be transmitted.

3.1.8 Track Parameter Dump Request (Command Type = 07)
The VFX will dump the Multi-Set track parameters using the bulk dump message described in section 3.3.6 when it receives this command (Prior to OS version 2.00 this was called the Multi-Set Dump Request and sent the dump described in section 3.3.5).

3.1.9 Dump Everything Request (Command Type = 08)
The VFX will dump the internal RAM program banks, the internal RAM preset banks, and the multi-set using the bulk dump messages described in section 3.3 when it receives this command. Each dump is a separate message, i.e. the messages are not combined into one.

3.1.10 Internal Program Bank Dump Request (Command Type = 09)
The VFX will dump the internal RAM program banks using the bulk dump message described in section 3.3.2 when it receives this command.

3.1.11 Internal Preset Bank Dump Request (Command Type = 0A)
The VFX will dump the internal RAM preset banks using the bulk dump message described in section 3.3.4 when it receives this command.

3.2 Error Messages (Message Type = 01)
Error messages are transmitted by the VFX when an error occurs while processing any of the command messages described in section 3.1. The VFX ignores error messages.

3.2.1 Command Message Error Codes
These codes are the data byte of error messages.

Code	Name	Meaning
00	NAK	The preceding command message could not be processed. The receiver is busy or the message is unintelligible.
01	INVALID PARAMETER NUMBER	The parameter voice, page, or slot in the preceding parameter value message doesn't make sense.
02	INVALID PARAMETER VALUE	The parameter value in the preceding parameter value message is out of range.
03	INVALID BUTTON NUMBER	The button number in the preceding virtual button message doesn't correspond to any real button number.

3.3 Bulk Dumps of Programs, Presets, and Multi-Sets

Bulk dump data messages are transmitted using the message format described in section 2.3. The message type byte, which is part of the system exclusive header, is given in hexadecimal with the name of the dump message. The actual data bytes for programs and presets are described in section 4. The MIDI data byte lengths are listed in decimal for each message type.

3.3.1 One Program (Message Type = 02)

MIDI Data byte length = 1060 + head and tail = 1067
The current selected program is transmitted. If the compare buffer is active (the Compare LED is on), then the program in the compare buffer will be transmitted. If this message is received, the new program will be put in the compare buffer so it can be written to internal or cartridge memory. Remember that the compare buffer is over-written by the incoming data and its previous contents are lost.

3.3.2 All Programs (Message Type = 03)

MIDI Data byte length = 1060*60 = 63600 + head and tail = 63607
All 60 programs in the 10 internal RAM program banks are contained in this message.

3.3.3 One Preset (Message Type = 04)

MIDI Data byte length = 96 + head and tail = 103
The current selected preset is transmitted. If this message is received, the new preset will be put in the preset buffer so it can be written to any preset location. If presets are being edited (the preset LED on, but no preset number LEDs are on), then the received preset will become the current preset.

3.3.4 All Presets (Message Type = 05)

MIDI Data byte length = 96*20 = 1920 + head and tail = 1927
All 20 presets in the 2 internal RAM preset banks are contained in this message.

3.3.5 Multi-Set (Message Type = 06)

MIDI Data byte length = 100*12 = 1200 + 24 + 22 + head and tail = 1253
Message contains all track data for the 12 Multi A & B tracks and the Multi Effect. *This message is not transmitted by the VFX after version 2.00, but may still be received.*

3.3.6 Track Parameters (Message Type = 0B)

MIDI Data byte length = 22*12 = 264 + 12 + 11 + head and tail = 294
All track parameter data for the 12 Multi A & B tracks, the track status array, and the Multi effect parameters are transmitted. *In version 2.00 and above , this message replaces the old Multi-Set message (section 3.3.5). It is also compatible with the VFX^{SD}.*

4 Parameter Block Data Descriptions

This is a description of the parameter blocks transmitted using the bulk dump messages described in section 3.3. The names and byte offsets of each block parameter are given. The parameter value ranges are included in section 5. The following byte layout is the internal representation and not the MIDI byte format which is described in section 2.3.

4.1 Program Parameters

The first group of parameters through byte offset 82 describe one of the six possible voices in a program. All of the global program parameters are at the bottom of this list. When the program has a custom pitch table installed, voices 5 and 6 are replaced with the pitch table data. In this case, starting at the beginning of voice 5, there is a packed list of fourteen bit records consisting of a 7 bit MIDI key number and 7 bits of pitch fine tune. There are 88 records for the complete keyrange A0 - C8.

Byte Offset	Parameter Name
0	Env1 Initial Level
1	Env1 Attack Time
2	Env1 Peak Level
3	Env1 Decay Time 1
4	Env1 Breakpoint 1
5	Env1 Decay Time 2
6	Env1 Breakpoint 2
7	Env1 Decay Time 3
8	Env1 Sustain Level
9	Env1 Release Time
10	Env1 Level Velocity Sensitivity
11	Env1 Attack Time Velocity Sensitivity
12	Env1 Keyboard Tracking
13	Env1 Mode (hi nybble) and Velocity Curve (lo nybble)
14	Env2 Initial Level
15	Env2 Attack Time
16	Env2 Peak Level
17	Env2 Decay Time 1
18	Env2 Breakpoint 1
19	Env2 Decay Time 2
20	Env2 Breakpoint 2
21	Env2 Decay Time 3
22	Env2 Sustain Level
23	Env2 Release Time
24	Env2 Level Velocity Sensitivity
25	Env2 Attack Time Velocity Sensitivity
26	Env2 Keyboard Tracking
27	Env2 Mode (hi nybble) and Velocity Curve (lo nybble)
28	Env3 Initial Level
29	Env3 Attack Time
30	Env3 Peak Level
31	Env3 Decay Time 1
32	Env3 Breakpoint 1
33	Env3 Decay Time 2
34	Env3 Breakpoint 2
35	Env3 Decay Time 3
36	Env3 Sustain Level
37	Env3 Release Time

Byte Offset	Parameter Name
38	Env3 Level Velocity Sensitivity
39	Env3 Attack Time Velocity Sensitivity
40	Env3 Keyboard Tracking
41	Env3 Mode (hi nybble) and Velocity Curve (lo nybble)
42	Pitch Root Key
43	Pitch Fine Tune
44	Pitch Table
45	Pitch Env1 Modulation Amount
46	Pitch LFO Modulation Amount
47	Pitch Glide (hi nybble) and Pitch Modulation Source (lo nybble)
48	Pitch Modulation Amount
49	Filter #1 Cutoff
50	Filter #1 Keyboard Modulation Amount
51	Filter #1 Env2 Modulation Amount
52	Filter Mode (hi nybble) and Filter #1 Modulation Source
53	Filter #1 Modulation Amount
54	Filter #2 Cutoff
55	Filter #2 Keyboard Modulation Amount
56	Filter #2 Env2 Modulation Amount
57	Filter #2 Modulation Source
58	Filter #2 Modulation Amount
59	Volume Fade Shape
60	Volume Fade Key Zone Low
61	Volume Fade Key Zone High
62	Volume and Pre-Gain Switch (MSB)
63	Pan Mod Source (hi nybble) and Volume Mod Source (lo nybble)
64	Volume Modulation Amount
65	Pan
66	Pan Modulation Amount
67	Voice Priority (hi nybble) and Output Routing (lo nybble)
68	LFO Waveshape (hi nybble) and LFO Mod Source (lo nybble)
69	LFO Depth
70	LFO Restart Mode (hi nybble) and LFO Speed Mod Source (lo nybble)
71	LFO Speed Modulation Amount
72	LFO Speed
73	LFO Delay Time
74	Waveform
75	Wave Class (hi nybble) and Wave Mod Source (lo nybble)
76	Wave Mod Amount
77	Wave Start Index
78	Noise Source Rate
79	Wave Delay Time
80	Mixer Curve (hi nybble) and Mixer Mod Source #1 (lo nybble)
81	Mixer Scaler (hi nybble) and Mixer Mod Source #2 (lo nybble)
82	Velocity Threshold

(end of Voice #1 structure)

Byte Offset	Parameter Name
83	Voice #2 (same structure as Voice #1)
166	Voice #3 (same structure as Voice #1)
249	Voice #4 (same structure as Voice #1)
332	Voice #5 (same as Voice #1 or program pitch table data, if enabled)
415	Voice #6 (same as Voice #1 or program pitch table data, if enabled)
498	Program Name - (11 bytes or characters)
509	Program Patch #1 (lo 6 bits)
	Program Pressure (Performance parameter) - (hi 2 bits)
510	Program Patch #2 (lo 6 bits)
511	Program Patch #3 (lo 6 bits)
512	Program Patch #4 (lo 6 bits)
513	*reserved* (hi nybble) and Pitch Table Switch (lo nybble)
514	Program Glide Time
515	Program Delay Factor (hi nybble) and Global Bend Range (lo nybble)
516	Program Restrike
517	Program Timbre (Performance parameter)
518	Program Release (Performance parameter)
519	Program Effect Parameters 1 to 8
527	Program Effect FX1 Mix
528	Program Effect FX2 Mix
529	Program Effect Select

4.2 Preset Parameters

4.2.1 Preset Track Parameter Structure

The parameters from each of the three individual tracks of a Preset are stored as an array of variable size bit fields packed into 11 consecutive bytes.
Note: the internal packing scheme actually ***inverts*** *each of the individual bytes. When they are received, they will appear to be inverted (mirror images) of the bit masks as described below. They must be transmitted in the inverted state.*

Byte Offset	Bit Mask	Parameter Name
0	VVVVVVVC	Volume (7 bits) and first bit of MIDI Channel
1	CCCSSTTT	MIDI Channel (lo 3 bits), Status (2 bits), and Timbre controller value (hi 3 bits)
2	TTTTXXXX	Timbre controller value (lo 4 bits) and X(transpose) (hi 4 bits)
3	XXXXLLLL	X(transpose) (lo 4 bits) and Low key (hi 4 bits)
4	LLLHHHHH	Low key (lo 3 bits) and High key (hi 5 bits)
5	HHSSSPPP	High key (lo 2 bits), patch Select (3 bits), and MIDI Program number (hi 3 bits)
6	PPPPRRLL	MIDI Program number (lo 4 bits), pRessure type (2 bits), and reLease time (hi 2 bits)
7	LLLLLLPP	reLease time (lo 6 bits) and Pan (hi 2 bits)
8	PPPPPPEE	Pan (lo 6 bits) and Effect routing (hi 2 bits)
9	ESxxxxxx	Effect routing (lo bit) and Sustain pedal on/off (1 bit) x = spare bits reserved for future use
10	iiiiiiii	internal program number

4.2.2 Preset Effect Parameter Structure

The parameters from the preset effect are stored as an array of variable size bit fields packed into 11 consecutive bytes. The effect select and mix values are packed into 7 bits each, and the parameters are packed as 8 bit numbers.
Note: the internal packing scheme actually ***inverts*** *each of the individual bytes. When they are received, they will appear to be inverted (mirror images) of the bit masks as described below. They must be transmitted in the inverted state.*

Byte Offset	Bit Mask	Parameter Name
0	EEEEEEEM	Effect select (7 bits) and hi bit of FX1 Mix
1	MMMMMMmm	FX1 Mix (lo 6 bits) and hi 2 bits of FX2 mix
2	mmmmm111	FX2 mix (lo 5 bits) and param 1 (hi 3 bits)
3	11111222	param 1 (lo 5 bits) and param 2 (hi 3 bits)
4	22222333	param 2 (lo 5 bits) and param 3 (hi 3 bits)
5	33333444	param 3 (lo 5 bits) and param 4 (hi 3 bits)
6	44444555	param 4 (lo 5 bits) and param 5 (hi 3 bits)
7	55555666	param 5 (lo 5 bits) and param 6 (hi 3 bits)
8	66666777	param 6 (lo 5 bits) and param 7 (hi 3 bits)
9	77777888	param 7 (lo 5 bits) and param 8 (hi 3 bits)
10	88888xxx	param 8 (lo 5 bits) and 3 spare bits (x)

4.2.3 Preset Dump Structure

A complete preset dump is composed of three sets of packed track parameters (33 bytes), followed by a 3 bytes track status array containing information about layering, an effect definition (11 bytes), and a spare byte for a total of 48 bytes.

Byte Offset	Parameter Name
0	Preset Track 0 parameters
11	Preset Track 1 parameters
22	Preset Track 2 parameters
33	Preset Track status array
36	Preset Effect parameters
47	spare (reserved for future use)

Multi-Set message vs. Track Parameter message

In order to assure complete compatibility with the VFX^{SD}, the old Multi-Set message (section 4.3) is no longer transmitted by the VFX in versions 2.00 or above. However, the old message will be received properly by the current VFX so that previously saved Multi-Sets can be reloaded by the new Operating System. When "MULTI-A+B" is selected from the MIDI SYS-EX storage page, the new format Track Parameter dump message (section 4.4) will be transmitted. The following table summarizes the change:

VFX O/S	Transmit	Receive
before 2.00	Multi-Set	Multi-Set
2.00 or above	Track Parameters	Multi-Set *or* Track Parameters

4.3 Multi-Set (Multi A & B) Parameters

This message, described in section 3.3.5, consists of the data from the 12 Multi A & B tracks, the track status array, and an effect definition. Some bytes with odd-numbered offsets may appear to be unused, but must be left as zeroes. *This message is not sent by version 2.00 or above, but will be recognized and received.*

Byte Offset	Parameter Name
0	Track 1 Program pointer (MSByte = Program number 0..179)
4	Track 1 Recording Controllers control block
8	Track 1 Pitchwheel
10	Track 1 Modwheel
12	Track 1 Patch Select Buttons
14	Track 1 External Controller XCTRL
16	Track 1 CV Pedal
18	Track 1 Volume
20	Track 1 Sustain Pedal
22	Track 1 Sostenuto Pedal
24	Track 1 Timbre
26	Track 1 Release
28	Track 1 Pressure
30	Track 1 Mix
32	Track 1 Mute Status
34	Track 1 Last Key
36	Track 1 Effect Routing Override
38	Track 1 Patch Select override
39	Track 1 Sustain Enable switch
40	Track 1 Key Down List Head
42	Track 1 MIDI Channel
43	Track 1 MIDI Program number
44	Track 1 MIDI Pressure type (off,mono,poly)
45	Track 1 MIDI Status (local,midi,both)
46	Track 1 Key Zone low key
47	Track 1 Transpose
48	Track 1 Key Zone high key
49	Track 1 Pan

(end of Track 1 structure)

50	Track 2 parameters (same structure as Track 1)
100	Track 3 parameters (same structure as Track 1)
150	Track 4 parameters (same structure as Track 1)
200	Track 5 parameters (same structure as Track 1)
250	Track 6 parameters (same structure as Track 1)
300	Track 7 parameters (same structure as Track 1)
350	Track 8 parameters (same structure as Track 1)
400	Track 9 parameters (same structure as Track 1)
450	Track 10 parameters (same structure as Track 1)
500	Track 11 parameters (same structure as Track 1)
550	Track 12 parameters (same structure as Track 1)
600	Multi Track status array
612	Multi Effect Parameters 1 to 8
620	Multi Effect FX1 Mix
621	Multi Effect FX2 Mix
622	Multi Effect Select

4.4 (Multi A & B) Track Parameters

This message, described in section 3.3.6, consists of specific track parameters from the 12 tracks, the track status array, and an effect definition. Some bytes with odd-numbered offsets may appear to be unused, but must be left as zeroes. may *This message is transmitted and received by version 2.00 and above, but will not be recognized by earlier versions.* This format is used by the VFX[SD]

Byte Offset	Parameter Name
0	Track 1 Program number and pointer (4 bytes = **NPPP**) **N**= First byte = Program number 0..179 **P** = Next 3 bytes = 24 bit pointer to program data. This pointer will be recalculated based on the program number when the dump is received by the VFX.
4	Track 1 Timbre
6	Track 1 Release
8	Track 1 Mix
10	Track 1 Effect Routing Override
12	Track 1 Patch Select override
13	Track 1 Sustain Enable switch
14	Track 1 MIDI Channel
15	Track 1 MIDI Program number
16	Track 1 MIDI Pressure type (off,mono,poly)
17	Track 1 MIDI Status (local,midi,both)
18	Track 1 Key Zone low key
19	Track 1 Transpose
20	Track 1 Key Zone high key
21	Track 1 Pan
(end of Track 1 structure)	
22	Track 2 parameters (same structure as Track 1)
44	Track 3 parameters (same structure as Track 1)
66	Track 4 parameters (same structure as Track 1)
88	Track 5 parameters (same structure as Track 1)
110	Track 6 parameters (same structure as Track 1)
132	Track 7 parameters (same structure as Track 1)
154	Track 8 parameters (same structure as Track 1)
176	Track 9 parameters (same structure as Track 1)
198	Track 10 parameters (same structure as Track 1)
220	Track 11 parameters (same structure as Track 1)
242	Track 12 parameters (same structure as Track 1)
264	Multi Track status array
276	Tracks Effect Parameters 1 to 8
284	Tracks Effect FX1 Mix
285	Tracks Effect FX2 Mix
286	Tracks Effect Select

5 Parameter Page and Slot Definitions

This is a table of all parameter page and slot (or soft button) numbers for voice and system parameters including the parameter value ranges. Note that in cases where more than one slot number is assigned to a parameter that the *highest* number should be used in all Parameter Change messages (section 3.1.2). Messages containing the alternate slot numbers will be ignored.

Page	Slot	Range	Parameter Name and Description
Master pages			
0	0	-128..+127	Master Tune
0	1	0..15	Touch: - SOFT,MED,FIRM,HARD 1-4
0	2	0..12	System Bend Range
0	3		undefined
0	4	0..4	FS1 Auxiliary Footswitch Configuration: - UNUSED,SOSTENU,PATCH L,ADVANCE
0	5	0,1	FS2 Footswitch Configuration: - SUSTAIN,PATCH R
1	0		undefined
1	1	0,1	Slider mode: - NORMAL,TIMBRE
1	2	0,1	CV Pedal Configuration: - VOL,MOD
1	3,4		undefined
1	5	0,1	System Pitch Table: - CUSTOM,NORMAL
2	0	0..127	Maximum Keyboard Velocity
2	1,2	0,1	MIDI track naming: - OFF,ON
2	3,4		Voice Muting: - OFF,ON
2	5	0,1	Keyboard naming: - OFF,ON

Note that because an additional sub-page (page 2 above) was added to the Master page in version 2.00, all subsequent page numbers, as detailed in Section 5 of the original VFX MIDI Specification, are incremented by one. The following list has been updated.

MIDI Control pages			
3	0	0..15	MIDI Base Channel
3	1		undefined
3	2	0,1	MIDI Send Channel: - BASE,TRACK
3	3	0..4	MIDI Mode: - OMNI,POLY,MULTI,MONO A,MONO B
3	4	0..2	MIDI Transpose: - SEND,RECV,BOTH
3	5	0..95	MIDI External Controller number
4	0	0,1	MIDI Loop Switch: - OFF,ON
4	1	0,1	MIDI System Exclusive enable flag: - OFF,ON
4	2	0,1	MIDI Song Select enable flag: - OFF,ON
4	3		undefined
4	4	0,1	MIDI Controllers enable flag: - OFF,ON
4	5	0..2	MIDI Program Change enable flag: - OFF,ON,NEW
Program Control page			
5	0		undefined
5	1	0,1	Pitch Table enable flag
5	2	0..13	Program Bend Range (13=global)
5	3	0..3	Delay Multiplier: - X1,X2,X4,X8
5	4	0..99	Program Restrike
5	5	0..99	Program Glide Time

Page	Slot	Range	Parameter Name and Description
Mod Mixer page			
6	0		undefined
6	1	0..15	Mod Mixer Mod Source #1
6	2	0..15	Mod Mixer Mod Source #2
6	3		undefined
6	4	0..15	Mod Mixer Scaler
6	5	0..15	Mod Mixer Shape
Select Voice (voice status) page			
38	0-5	0..2	Voice Status: - OFF,ON,SOLO

Wave Page — pages 7-10 are used for all wave types or classes but there are different interpretations of parameters depending on the current wave class. When changing wave page parameters, be sure the wave class is set first, otherwise parameter values may be invalid. When the wave class is changed, the other wave parameters are reset to default values. *Note - these are always output as page 7, but should be input as pages 7..10, depending on wave class.*

7..10	0	0..108	Wave Name
7..10	1	0..9	Wave Class
7..10	2	0..251	Delay Time (251=key up)

The following slots are for the sampled wave classes (strings, brass, bass, breath, tuned percussion, and percussion).

7	3	0..127	Wave Start
7	4	-127..127	Wave Velocity Start Mod
7	5	0,1	Wave Direction: - FORWARD,REVERSE

The following slots are specifically for TRANSWAVE class (06)

8	4	0..15	Wave Mod Source
8	5	-127..+127	Wave Mod Amount

The following slots are specifically for the WAVEFORM and INHARMONIC classes (07 and 08, respectively)

9	3-5		undefined

The following slots are specifically for the looping MULTI-WAVE class (09)

10	3	0..243	Loop Wave Start number
10	4	1..243	Loop Length
10	5	0,1	Loop Direction: - FORWARD,REVERSE

Pitch page			
11	0	-4..+4	Pitch Octave
11	1	-12..+12	Pitch Semitone
11	2	-127..127	Pitch Fine Tune
11	3		undefined
11	4	0..2	Pitch Table type: - SYSTEM,ALL-C4,CUSTOM
11	5		undefined
Pitch Mod page			
12	0		undefined
12	1	0..15	Pitch Mod Source
12	2	-99..+99	Pitch Mod Amount
12	3	0..4	Glide Mode: - NONE,PEDAL,MONO,LEGATO,TRIGGER
12	4	-127..+127	Pitch Env1 Mod Amount
12	5	-127..+127	Pitch LFO Mod Amount

Page	Slot	Range	Parameter Name and Description
Filter pages			
13	0	0,1	Filter #1 Type: - LO-PASS/2,LO-PASS/3
13	1	0..127	Filter #1 Cutoff
13	2	-127..+127	Filter #1 Keyboard Tracking Amount
13	3	0..15	Filter #1 Mod Source
13	4	-127..+127	Filter #1 Mod Amount
13	5	-127..+127	Filter #1 Env2 Mod Amount
14	0	0..3	Filter #2 Type: - HI-PASS/2,HI-PASS/1,LO-PASS/2,LO-PASS/1
14	1	0..127	Filter #2 Cutoff
14	2	-127..+127	Filter #2 Keyboard Tracking Amount
14	3	0..15	Filter #2 Mod Source
14	4	-127..+127	Filter #2 Mod Amount
14	5	-127..+127	Filter #2 Env2 Mod Amount
Output pages			
15	0	0..127	Volume
15	1	0..15	Volume Mod Source
15	2	-127..+127	Volume Mod Amount
15	3	-128..+127	Keyboard Scaling amount (-128=ZONE)
15	4		undefined
15	5	21..108	Scaling Key Range (low and high keys)
16	0,1		undefined
16	2	0..2	Output Destination: - DRY,FX1,FX2
16	3	0..127	Pan
16	4	0..15	Pan Mod Source
16	5	-127..+127	Pan Mod Amount
17	0	0,1	Voice Pre-Gain Switch
17	1		undefined
17	2	0..2	Voice Priority: - LO,MED,HI
17	3,4		undefined
17	5	-127..+127	Voice Velocity Threshold
LFO pages			
18	0	0..99	LFO Rate
18	1	0..15	LFO Rate Mod Source
18	2	-127..+127	LFO Rate Mod Amount
18	3	0..127	LFO Depth
18	4	0..15	LFO Depth Mod Source
18	5	0..99	LFO Delay
19	0		undefined
19	1	0..6	LFO Waveshape
19	2	0,1	LFO Restart Switch
19	3,4		undefined
19	5	0..127	Noise Source Rate

Page	Slot	Range	Parameter Name and Description
Envelope pages			
20	0		undefined
20	1	0..127	Env1 Initial Level
20	2	0..127	Env1 Peak Level
20	3	0..127	Env1 Breakpoint 1 Level
20	4	0..127	Env1 Breakpoint 2 Level
20	5	0..127	Env1 Sustain Level
21	0		undefined
21	1	0..99	Env1 Attack Time
21	2	0..99	Env1 Decay 1 Time
21	3	0..99	Env1 Decay 2 Time
21	4	0..99	Env1 Decay 3 Time
21	5	-100..+99	Env1 Release Time
22	0	-127..+127	Env1 Keyboard Tracking
22	1		undefined
22	2	0..9	Env1 Velocity Curve
22	3	0..2	Env1 Mode: - NORMAL,FINISH,REPEAT
22	4	0..127	Env1 Level Velocity Sensitivity
22	5	0..127	Env1 Attack Time Velocity Sensitivity
23	0		undefined
23	1	0..127	Env2 Initial Level
23	2	0..127	Env2 Peak Level
23	3	0..127	Env2 Breakpoint 1 Level
23	4	0..127	Env2 Breakpoint 2 Level
23	5	0..127	Env2 Sustain Level
24	0		undefined
24	1	0..99	Env2 Attack Time
24	2	0..99	Env2 Decay 1 Time
24	3	0..99	Env2 Decay 2 Time
24	4	0..99	Env2 Decay 3 Time
24	5	-100..+99	Env2 Release Time
25	0	-127..+127	Env2 Keyboard Tracking
25	1		undefined
25	2	0..9	Env2 Velocity Curve
25	3	0..2	Env2 Mode: - NORMAL,FINISH,REPEAT
25	4	0..127	Env2 Level Velocity Sensitivity
25	5	0..127	Env2 Attack Time Velocity Sensitivity
26	0		undefined
26	1	0..127	Env3 Initial Level
26	2	0..127	Env3 Peak Level
26	3	0..127	Env3 Breakpoint 1 Level
26	4	0..127	Env3 Breakpoint 2 Level
26	5	0..127	Env3 Sustain Level
27	0		undefined
27	1	0..99	Env3 Attack Time
27	2	0..99	Env3 Decay 1 Time
27	3	0..99	Env3 Decay 2 Time
27	4	0..99	Env3 Decay 3 Time
27	5	-100..+99	Env3 Release Time

Page	Slot	Range	Parameter Name and Description
28	0	-127..+127	Env3 Keyboard Tracking
28	1		undefined
28	2	0..9	Env3 Velocity Curve
28	3	0..2	Env3 Mode: - NORMAL,FINISH,REPEAT
28	4	0..127	Env3 Level Velocity Sensitivity
28	5	0..127	Env3 Attack Time Velocity Sensitivity

The effect parameter pages are dependent on the currently selected effect. When changing effect page parameters, be sure the effect type is selected first, otherwise parameter values may be invalid. When the effect type is changed, the other effect parameters assume preset values. The first four slots [0..3] of page 29 are common to all effects and exceptions are noted in the rotary speaker simulators. The following table interprets the values of Effect Type (page 29, slot 0,1). The Parameter Set Name corresponds to the parameter descriptions on the following pages.

Effect Type	Preset Name	Parameter Set Name
0	LARGE.HALL.REVRB	Hall Reverb
1	ROOM.REVERB.1	Hall Reverb
2	DYNAMIC.REVERB	Dynamic Reverb
3	8-VOICE.CHORUS.1	Multi-Voice Chorus
4	CHORUS+REVERB.1	Chorus and Reverb
5	FLANGER+REVERB.1	Flanger and Reverb
6	SMALL.HALL.REVRB	Hall Reverb
7	ROOM.REVERB.2	Hall Reverb
8	CHORUS+REVERB.2	Chorus and Reverb
9	FLANGER+REVERB.2	Flanger and Reverb
10	DELAY+REVERB.1	Delay and Reverb
11	DELAY+REVERB.2	Delay and Reverb
12	FLANGE+DLY+REV.1	Flanger, Delay, and Reverb
13	FLANGE+DLY+REV.2	Flanger, Delay, and Reverb
14	ROTO-SPKR+DELAY	Rotary Speaker Simulator
15	CONCERT REVERB	Hall and Room Reverb
16	WARM CHAMBER	Hall and Room Reverb
17	GATED+ROOM.VERBS	Gated and Room Reverb
18	DIRTY-ROTO+DELAY	Rotary Speaker Simulator with Distortion
19	DYNAMIC.HALL	Dynamic Reverb
20	8-VOICE.CHORUS.2	Multi-Voice Chorus
21	DLY+FLANGE+HALL	Flanger, Delay, and Reverb

Hall Reverb

Page	Slot	Range	Parameter Name and Description
29	0,1	0..15	Effect Type
29	2	0..99	Decay Time
29	3		undefined
29	4	0..127	Reverb (FX1) Mix
29	5	0..127	Reverb (FX2) Mix
30	0,1		undefined
30	2	0..250	Pre-delay Time
30	3		undefined
30	4,5	0..127	Early Reflection
31	0		undefined
31	1,2	0,1	FX2 Mode: - NORMAL.STEREO.SEND,LEFT.WET/RIGHT.DRY
31	3		undefined
31	4,5	0..99	High Frequency Damping

Dynamic Reverb

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Reverb (FX1) Mix
29	5	0..127	Reverb (FX2) Mix
30	0,1	-128..127	Decay Modulation Amount
30	2	0..250	Pre-delay Time
30	3	0..11	Decay Modulation Source
30	4,5	0..127	Early Reflection
31	0		undefined
31	1,2	0,1	FX2 Mode: - NORMAL.STEREO.SEND,LEFT.WET/RIGHT.DRY
31	3		undefined
31	4,5	0..99	High Frequency Damping

Multi-Voice Chorus

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Chorus (FX1) Mix
29	5	0..127	Chorus (FX2) Mix
30	0	0..99	Chorus Rate
30	1	0..127	Chorus Depth
30	2	0..100	Chorus Delay Time
30	3	-128..127	Chorus Feedback
30	4,5		undefined
31	0		undefined
31	1,2	0,1	FX2 Mode: - NORMAL.STEREO.SEND,LEFT.WET/RIGHT.DRY
31	3-5		undefined

Chorus and Reverb

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Chorus (FX1) to Reverb Mix
29	5	0..127	Reverb (FX2) Mix
30	0	0..99	Chorus Rate
30	1	0..127	Chorus Depth
30	2	0..250	Chorus Delay Time
30	3	-128..127	Chorus Rate Modulation Amount
30	4	-128..127	Chorus Depth Modulation Amount
30	5	0..127	Chorus Mix
31	0,1	0,1	LFO Waveshape
31	2	0..11	Chorus Mod Source
31	3		undefined
31	4,5	0,1	Reverb High Frequency Cut Switch: - OFF,ON

Flanger and Reverb

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Flanger (FX1) to Reverb Mix
29	5	0..127	Reverb (FX2) Mix
30	0	0..99	Flanger Rate
30	1	0..127	Flanger Minimum
30	2	0..127	Flanger Maximum
30	3	0..11	Flanger Rate Modulation Source
30	4	-128..127	Flanger Minimum Modulation Amount
30	5	-128..127	Flanger Maximum Modulation Amount
31	0	0..15	Flanger Mix Level
31	1		undefined
31	2	-128..127	Flanger Feedback
31	3		undefined
31	4,5	0,1	Reverb High Frequency Cut Switch: - OFF,ON

Delay and Reverb

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Delay (FX1) to Reverb Mix
29	5	0..127	Reverb (FX2) Mix
30	0	0..250	Delay Time
30	1	-128..127	Delay Regeneration
30	2		undefined
30	3	-128..127	Delay Time Modulation Amount
30	4	-128..127	Delay Regeneration Modulation Amount
30	5	0..127	Delay Mix
31	0,1		undefined
31	2	0..11	Delay Modulation Source
31	3		undefined
31	4,5	0,1	Reverb High Frequency Cur Switch: - OFF,ON

Flanger, Delay, and Reverb

Page	Slot	Range	Parameter Name and Description
29	4	0..127	Flanger and Delay (FX1) to Reverb Mix
29	5	0..127	Reverb (FX2) Mix
30	0	0..99	Flanger Rate
30	1	0..127	Flanger Minimum
30	2	0..127	Flanger Maximum
30	3	-128..127	Flanger Feedback
30	4,5		undefined
31	0	0..200	Delay Time
31	1	-128..127	Delay Regeneration
31	2	0..127	Delay Mix
31	3		undefined
31	4,5	0,1	Reverb High Frequency Cut Switch: - OFF,ON

Rotary Speaker Simulator

Page	Slot	Range	Parameter Name and Description
29	2	0..250	Delay Time
29	4	0..127	Rotating Speaker (FX1) to Delay Mix
29	5	0..127	Delay (FX2) Mix
30	0	0..99	Rotor Speed Low
30	1	0..99	Rotor Speed High
30	2	0,1	Lo-Rotor Switch: - OFF,ON
30	3,4	0..11	Rotor Speed Modulation Source
30	5	0..2	Motor Mode: - CONTIN,SWITCH,TOGGLE
31	0	0..100	Feedback Lag
31	1		undefined
31	2	-128..127	Delay Repeats
31	3	-128..127	Feedback Lag Amount
31	4,5	0..127	Stereo Width

Hall and Room Reverb

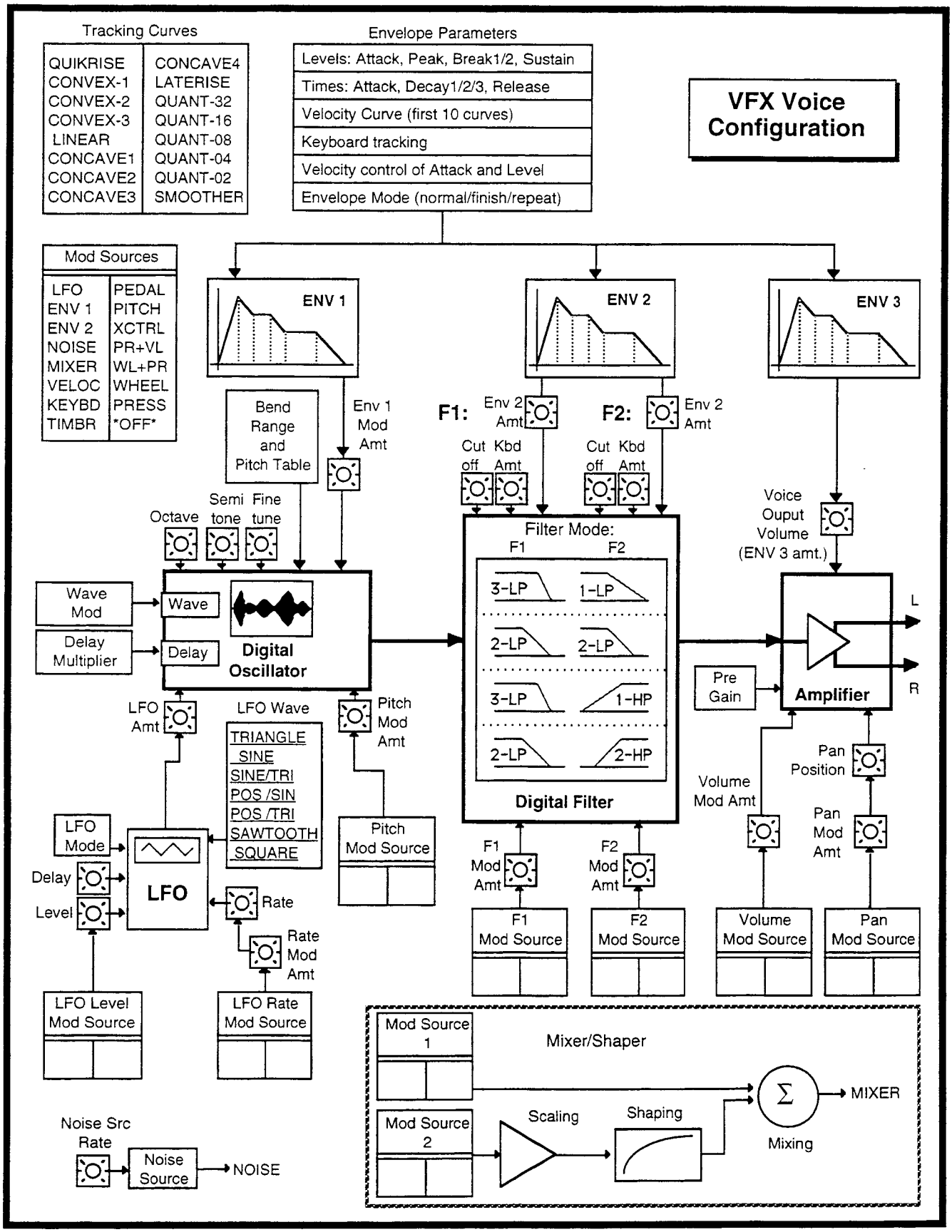
Page	Slot	Range	Parameter Name and Description
29	4	0..127	Reverb (FX1) Mix
29	5	0..127	Reverb (FX2) Mix
30	0		undefined
30	1	0..127	Diffusion
30	2	0..250	Pre-delay Time
30	3,4	0..127	Early Reflection Level
30	5	0..200	Early Reflection Time
31	0		undefined
31	1,2	0,1	FX2 Mode: - NORMAL.STEREO.SEND,LEFT.WET/RIGHT.DRY
31	3	-128..+127	Low Frequency Decay
31	4,5	0..99	High Frequency Damping

Gated and Room Reverb

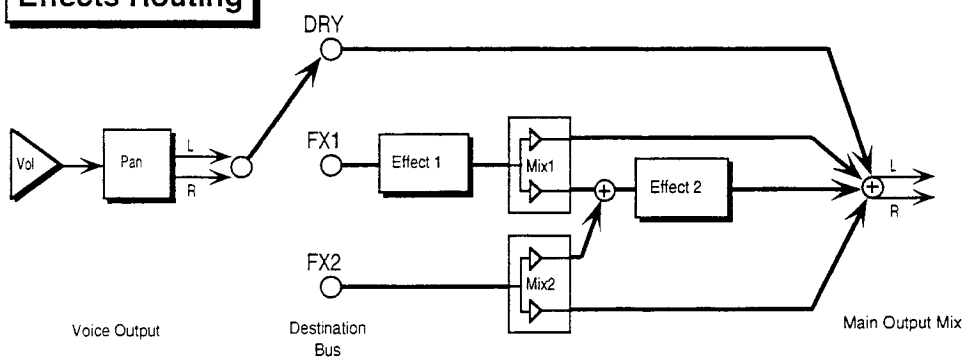
Page	Slot	Range	Parameter Name and Description
29	4	0..127	Reverb (FX1) Mix
29	5	0..127	Reverb (FX2) Mix
30	0	0..200	Gate Time
30	1	0..100	Slope
30	2	0..127	Threshold
30	3,4	0..200	Pre-delay Time
30	5	0..200	Release Time
31	0		undefined
31	1,2	0..250	Pre-delay Time
31	3		undefined
31	4,5	0..99	High Frequency Damping

Rotary Speaker Simulator with Distortion

Page	Slot	Range	Parameter Name and Description
29	2	0..250	Delay Time
29	4	0..127	Rotating Speaker (FX1) to Delay Mix
29	5	0..127	Delay (FX2) Mix
30	0	0..99	Rotor Speed Low
30	1	0..99	Rotor Speed High
30	2	0..15	Overdrive
30	3,4	0..11	Rotor Speed Modulation Source
30	5	0..2	Motor Mode: - CONTIN,SWITCH,TOGGLE
31	0	0..100	Feedback Lag
31	1		undefined
31	2	-128..127	Delay Repeats
31	3	-128..127	Feedback Lag Amount
31	4,5	0..15	Low Rotor Volume


VFX Voice Configuration
Tracking Curves
QUIKRISE
CONVEX-1
CONVEX-2
CONVEX-3
LINEAR
CONCAVE1
CONCAVE2
CONCAVE3
CONCAVE4
LATERISE
QUANT-32
QUANT-16
QUANT-08
QUANT-04
QUANT-02
SMOOTHER
Envelope Parameters
Levels: Attack, Peak, Break1/2, Sustain
Times: Attack, Decay1/2/3, Release
Velocity Curve (first 10 curves)
Keyboard tracking
Velocity control of Attack and Level
Envelope Mode (normal/finish/repeat)
Mod Sources
LFO
ENV 1
ENV 2
NOISE
MIXER
VELOC
KEYBD
TIMBR
PEDAL
PITCH
XCTRL
PR+VL
WL+PR
WHEEL
PRESS
OFF
ENV 1
ENV 2
ENV 3
Bend Range and Pitch Table
Env 1 Mod Amt
F1:
Env 2 Amt
F2:
Env 2 Amt
Cut off
Kbd Amt
Cut off
Kbd Amt
Voice Ouput Volume (ENV 3 amt.)
Octave
Semi tone
Fine tune
Filter Mode:
F1
F2
3-LP
1-LP
2-LP
2-LP
3-LP
1-HP
2-LP
2-HP
Digital Filter
Wave Mod
Wave
Delay Multiplier
Delay
Digital Oscillator
Pre Gain
Amplifier
L
R
LFO Amt
LFO Wave
TRIANGLE
SINE
SINE/TRI
POS /SIN
POS /TRI
SAWTOOTH
SQUARE
Pitch Mod Amt
Pan Position
Volume Mod Amt
Pan Mod Amt
LFO Mode
Delay
Level
LFO
Rate
Rate Mod Amt
Pitch Mod Source
F1 Mod Amt
F2 Mod Amt
F1 Mod Source
F2 Mod Source
Volume Mod Source
Pan Mod Source
LFO Level Mod Source
LFO Rate Mod Source
Mod Source 1
Mixer/Shaper
Mod Source 2
Scaling
Shaping
Σ
MIXER
Mixing
Noise Src Rate
Noise Source
NOISE

Effects Routing



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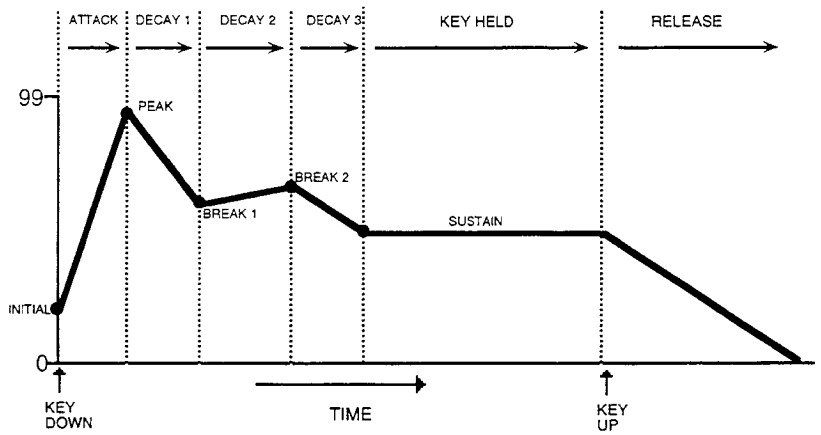


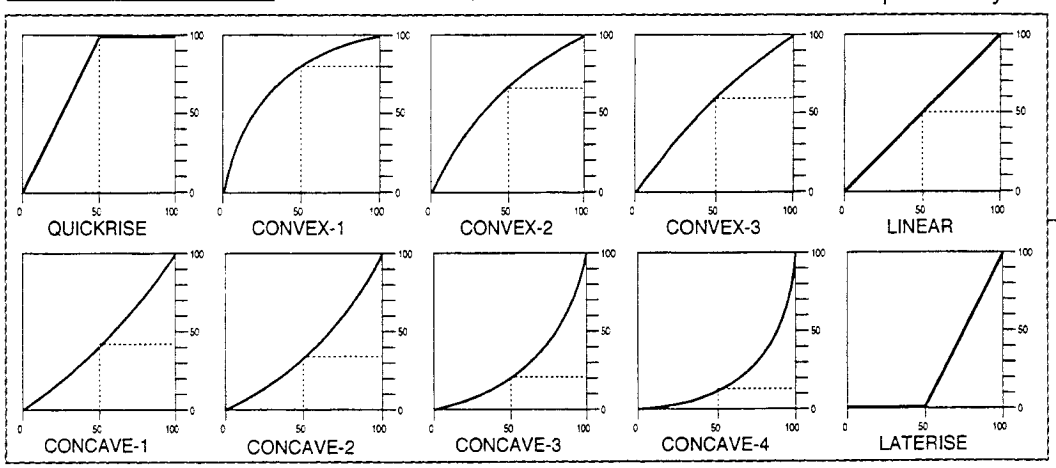
Performance Parameters:

Volume
Pan
Timbre*
Key Zone
Transpose
Release*
Track Control:
  Patch Selects
  Pressure mode*
  Sustain
MIDI:
  Status
  Channel
  Program
Effects Routing

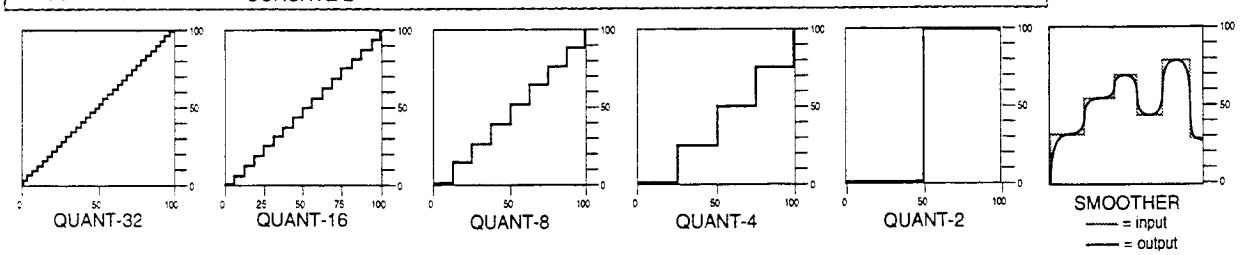
(* These three are saved with the program. All other Performance parameters are reset to default values whenever a new sound is selected.)

Tracking Curves

These 16 tracking curves are used by the Mod Mixer/Shaper.
The first ten curves are also used as envelope velocity curves.



Envelope VEL-CURVES



AUTHORIZED ENSONIQ REPAIR STATIONS

Before taking your ENSONIQ product for service or repair, check the troubleshooting sections in this manual. If your ENSONIQ product requires service, first contact the dealer where you purchased it. The following Authorized Repair Stations, listed by state and country, can also perform warranty service.

IN THE UNITED STATES

The Music Works	701 W 36th Ave Ste 12	Anchorage	AK	99503	907-562-5481	Garrett Peters
Excel Electronics	1518 Airports Hts Rd	Anchorage	AK	99520	907-278-3518	Garrett Peters
M & M Music (AK)	9106 Mendenhall Mall Rd	Juneau	AK	99803	907-789-7337	Michael Williams
MMI Inc	4055 Cottage Hill Rd	Mobile	AL	36609	205-660-1277	John Matherne
Andys Music	4122 Government Blvd	Mobile	AL	36693	205-666-2204	Chuck Morris
Boyd Music	5707 W. 12th Street	Little Rock	AR	72704	501-664-3614	Les Hess
Synthony Music	3939 East Campbell	Phoenix	AZ	85018	602-955-3590	Kevin Keith
Arizona Organ & Kbd	11725 N 19th Avenue #6	Phoenix	AZ	85029	602-955-2400	Ronald Brzoska
Audionyx	605 Mockingbird Ct	Prescott	AZ	86301	602-771-0050	Rick Cucuzza
Guitar Etc	5646 E Speedway	Tucson	AZ	85712	602-748-1111	Dave Hamory
Guitar Etc	3226 E Speedway Blvd	Tucson	AZ	85716	602-748-1111	Topher Kinch
Absolute Audio	166 Cohasset Road #2	Chico	CA	95926	916-893-4088	Matt Luksic
Zone Music	7884 Old Redwood Hwy	Cotati	CA	94931	707-664-1213	Tim Haggerty
East Bay Sound	7017 Village Parkway	Dublin	CA	94568	510-482-4866	Robert Davis
Alan Robertson Elect	2274 Norman Court	Eureka	CA	95503	707-444-0128	Alan Robertson
Coretronics	120 2nd Street	Eureka	CA	95501	707-444-0237	Corey Holderman
American Music Co	2597 East Ashlan	Fresno	CA	93726	209-221-0233	Tim McFarland
Maximum Audio	27343 Indstrial Blvd-SteA	Hayward	CA	94545	510-786-3745	Ed Tucker
Valley Sound	1023 N. La Brea	Hollywood	CA	90038	213-851-3434	Adel Muneer
A.M.E.	8665 Venice Blvd	Los Angeles	CA	90034	310-559-3157	Ruth Fischler
Music Tek Services	12041 Burbank Blvd	N Hollywood	CA	91607	818-506-4055	Larry Applebaum
Pacific Innovative Elec	10840 Van Owen St	N. Hollywood	CA	91605	818-508-9550	Kerry Jensen
Electronics Diversified	544 Walter Avenue	Newbury Park	CA	91320	805-499-3982	Douglas Walraven
Alectronics (CA)	1355 Lawrence Dr Ste 109	Newbury Park	CA	91320	805-499-0601	Al Federici
Paul Morte Tech Service	946 North Main Street	Orange	CA	92667	714-532-9540	Paul Morte
Video Sounds Technology	1270 Lincoln Ave #1000	Pasadena	CA	91103	818-794-8196	David Segimoto
Skips Music	3428 Auburn Blvd.	Sacramento	CA	95821	916-481-8675	Jim Latendorf
Liers Music	452 North E Street	San Bernardino	CA	92401	909-884-8815	Chuck Karbginsky
Caraquin Co	8290 Vickers	San Diego	CA	92111	619-560-9001	Ralph Pitt
San Diego Sound Inc	6528 El Cajon Blvd	San Diego	CA	92115	619-582-8511	Jeff Maxwell
Pro Sound & Music	4593 Mission Gorge Pl.	San Diego	CA	92120	619-583-7851	Raymond Espinoza
Audio Spectrum	1526 Fillmore	San Francisco	CA	94115	415-292-7480	Brian Arendt
Electronic Audio Repair	468 9th Street	San Francisco	CA	94103	415-575-3640	Phil Milner
MSC Musician Service	647 Tully Rd Suite 6	San Jose	CA	95111	408-297-7532	Thang Ho
Bananas At Large	1504 Fourth Street	San Rafael	CA	94901	415-457-7600	Raul Aguilar
Studio Maintenance Center	720 A Street	San Rafael	CA	94901	415-485-6048	Jeanne LeBlanc
Buley Electronic & Audio	940 B E Main St	Santa Paula	CA	93060	805-933-3992	Patrick Buley
Stanroys Music Center	741 4th Street	Santa Rosa	CA	95404	707-545-4827	Tim Ellis
Brian Guitars	61 Amity Road	New Haven	CT	06515	203-387-4492	Gary Fulton
B & B Educational Music	205 S Dual Highway	Camden	DE	19934	302-697-2155	Mark Donovan
Mid South Audio	52 Bramhall St	Georgetown	DE	19947	302-856-6993	Kevin Short
Guitar Service Center	6 Peddlars Village	Newark	DE	19702	302-368-1104	Mike Mennolo
Mid Atlantic Music	1702 Kirkwood Hwy	Wilmington	DE	19805	302-995-7170	Nick Bucci
Lange Musical Electronics	6355 County Rd 78 West	Alva	FL	33920	813-768-0497	Rick Lange
Thoroughbred Music (CW)	923 McMullen Boot Rd	Clearwater	FL	34619	813-725-8062	Jody Calderone
Johnson Electronics	231 East 54th Street	Hialeah	FL	33013	305-823-1791	Darrell Johnson
Byte Five Inc.	7992 Southside Blvd	Jacksonville	FL	32256	904-641-4455	Jeffrey Hill
American Music (FL)	5225 Lenox Ave	Jacksonville	FL	32205	904-781-1080	Mike Corbil
Pro-Tech Services	726 Ohio Avenue	Lynn Haven	FL	32401	904-265-4334	Mike Pizza
Abe Music	14501 W Dixie Hwy	N Miami	FL	33161	305-944-7429	Mel Wexler
Stan's Music Stand	2301 Daves Blvd	Naples	FL	33942	813-793-1311	Jerry Ciciora
Alura Engineering	3391 E Silver Spr Blv D	Ocala	FL	34470	904-368-2165	Agustin Acosta
Abney's Music Ctr	1033 N Mills Ave	Orlando	FL	32803	407-898-3155	Rick Spraque
Wells Electronics Lab	1217 N Mills Ave	Orlando	FL	32803	407-894-3404	Peter Wells
Harris Music & Sound	707 N Pace Blvd	Pensacola	FL	32505	904-434-6497	Joe Bunning
Dollarhide Music Ctr.	29 S. Palfox Place	Pensacola	FL	32501	904-435-9898	Dale Willig
Marcs Music Mart	8311 US Hwy 1	Port St Lucie	FL	34952	407-878-4277	Mitchell McLaren
Entertainment Support	1003 Broadway	Riviera Beach	FL	33404	407-881-4443	Dave White
Audio Doctor	1318-C N Monroe St	Tallahassee	FL	32303	904-222-0542	Todd Patterson
Scott Tennyson Music	1304 N. Monroe Street	Tallahassee	FL	32303	904-224-3361	Alan Jensen
Donleys Elect. Service	3400 Forsyth Rd- Suite 4	Winter Park	FL	32792	407-677-0861	Dick Donley
Wizard Electronics	1434 Tullie Road	Atlanta	GA	30329	404-325-4891	Tom Dudley

AUTHORIZED ENSONIQ REPAIR STATIONS

Normans Electronics	3653 Clairmont Rd NE	Chamblee	GA	30341	404-451-5057	Chris Bomres
G & S Electronics	2407 Old Flowery Brand Rd	Gainesville	GA	30504	404-534-2374	Cheryl Stiwinter
Normans Electronics	6115-C Jimmy Carter Blvd	Norcross	GA	30071	404-446-1118	Greg Roberts
Soundpost	6880 Direct Connection Dr	Rossville	GA	30741	706-891-9404	Chris Tramel
Portmans Music Inc	7650 Abercorn St	Savannah	GA	31406	912-354-1500	John Lance
Logical Audio Systems	2620B Mountain Industrial	Tucker	GA	30084	404-934-4887	Bill Urick
B & E Electronics	182 Kekuanaoa St	Hilo	HI	96720	808-969-7433	Michael Evans
TPS Electronics	875 Waimanu St #326	Honolulu	HI	96822	808-591-1000	Don Michael
Wizard Electronics	1344 23rd Street	Bettendorf	IA	52722	319-359-8815	Monte Lang
West Music Co.	1212 5th Street	Coralville	IA	52241	319-351-2000	Don Head
Kepharts Music Center	126 E. Water Street	Decorah	IA	52101	319-382-3684	Jody Koenig
Mikes Musical Instrument	2455 N Yellow Stone	Idaho Falls	ID	83403	208-524-6607	Norris Ashment
Noteworty Music	1438 N Tima Marie Ave	Meridian	ID	83642	208-888-5526	Tom June
Rogers Audio & Design	119 Banner Street	Nampa	ID	83686	208-467-2465	Jim Rogers
Chicago Factory Service	539 W Golf Road	Arlington Hts	IL	60005	708-640-6181	Martin Maney
C.V. Lloyde Sound System	102 South Neil Street	Champaign	IL	61820	217-352-7031	Rick Hansen
Rubinos Music	333 S State St	Chicago	IL	60604	312-663-9999	Terry Stivers
Midwest Music Menders	1917 Fullerton	Chicago	IL	60614	312-276-3939	Steve Craig
Samuel Music Co	908 W Fayette Ave	Effingham	IL	62401	217-342-9221	Jim Donald
Richards Music & Elec	1020 W Marion St	Joliet	IL	60436	815-729-0182	James Richards
Music Lab Inc	17805 Burnham Ave	Lansing	IL	60438	708-895-2218	Thomas Barnhart
Audio Pro Service	780 Frontage Rd	Northfield	IL	60093	708-446-4222	Louis DePasqua
ICM Corporation	9050 Helen Lane	Orland Park	IL	60462	708-403-2715	Tim Bernovich
Elmore Musical Whse	3611 W Willow Knolls Rd	Peoria	IL	61614	309-692-1253	Randy Lemons
Accutrack Recording	551 N Wolf Road	Wheeling	IL	60090	708-465-8862	David Levit
Music Today	1325 Meridian Street	Anderson	IN	46016	317-644-3361	Dennis Fisher
Opus 1 Music	5420 East Indiana St	Evansville	IN	47712	812-479-6787	Scott Harvey
Amtech	7033 Calumet Ave	Hammond	IN	46324	219-937-0248	Keith Marvin
I R C Music	5911 E. 82ND ST.	Indianapolis	IN	46250	317-849-7965	Brian Kleinshmidt
Far Out Music	2008 Coopers Lane	Jeffersonville	IN	47130	812-282-1122	Mark Detrick
Woodwind & Brasswind	19880 State Line Rd	Southbend	IN	46637	219-272-8266	John Keane
Conservatory of Music	3400 South US 41	Terre Haute	IN	47802	812-232-2735	Charles Blesch
Brier and Hale Music Co.	319 Gunsmoke Avenue	Dodge City	KS	67801	316-225-5333	Rick Baalman
Brier and Hale Music Co.	424 N. Kansas Avenue	Liberal	KS	67901	316-624-8421	Don Smith
S.M. Hanson Music Inc.	335 South Clark	Salina	KS	67401	913-825-6273	Jerry Dalbit
Steam Music	3740 Burlingame Circle	Topeka	KS	66609	913-267-3771	Lyle Waring
Thesis Audio	4235 W. Central	Wichita	KS	67212	316-942-7341	Mike Metz
Uhlik Music Service	2160 E. Douglas	Witchita	KS	67214	316-262-2840	Jeff Rayner
DBs Music	1221 Broadway Avenue	Bowling Green	KY	42101	502-782-5973	Devlon Bignault
Owensboro Music Ctr	2350 New Hartford Pike	Owensboro	KY	42301	502-684-2156	Doug Rawlings
M.R. Montero Electronics	766 Hickory Avenue	Harahan	LA	70123	504-737-8942	Michael Montero
Cajun Audio	112 Luke Street	Lafayette	LA	70506	318-269-9974	Ray Bellard
Southern Electronics	1909 Tulane Avenue	New Orleans	LA	70112	504-524-2343	Paul McGuff
Electro Music Service	2100 Marshall St	Shreveport	LA	71101	318-222-5884	Michael Blau
Syntronics	466 Commonwealth Ave	Boston	MA	02215	617-266-5039	John Koumoutseas
B & B Electronics	185 Walnut Street	Leominster	MA	01453	508-534-9242	Thomas Bray
Downtown Sound	21 Pleasant St	North Hampton	MA	01060	413-586-0998	Stanley Dewey
Ricks Music World	190 Taunton Ave	Seekonk	MA	02771	508-336-6180	Joe Olivelli
Gordon Music Inc	333 Main St	Southbridge	MA	01550	508-764-2117	Chris Logan
R.M.I.	259 New Boston Rd	Starbridge	MA	01566	508-347-2828	Bill Ryan
Ricks Music World	179 Swansea Mall Dr	Swansea	MA	02777	508-672-2500	John LaVallee
Alactronics Inc.	192 Worcester Street	Wellesley	MA	02181	617-239-0000	Al Cruz
Rockfleet Music Service	175-P New Boston St	Woburn	MA	01801	617-937-0353	Mary Lock
Washington Music Ctr	2421 Reedie Drive	Wheaton	MD	20902	301-929-2490	Bob Williams
Manco Specialty Elec	RR3 Box 191 Old Gray Rd	Newport	ME	04953	207-368-2094	David Manson
Al Nalli Music	312 S. Ashley	Ann Arbor	MI	48104	313-665-7008	Rob Schneider
Arnoldt Williams	5701 Canton Center Rd	Canton	MI	48187	313-453-6586	Chris Glynn
Music Box Studios	42383 Garfield Road	Clinton Tnshp	MI	48038	810-263-1994	Matthew Clark
Wonderland Music	13519 Michigan Avenue	Dearborn	MI	48126	313-584-8111	Tony Corbelto
Back Stage Audio Ltd.	109 Ann Street	Fenton	MI	48430	810-235-5580	John Backus
Bogner Sound & Music	3218 Coronna Rd	Flint	MI	48503	810-238-8777	Andy Bogner
Good News Music Centre	140 E. Front Street	Traverse City	MI	49684	616-946-1230	David Flees
Electronic Innovations	21628 Van Dyke	Warren	MI	48089	810-758-6157	Chris Cassidy
Good Guys Inc.	1111 Grand Ave	St Paul	MN	55105	612-292-9165	Mark Dopkins
Crazy Music	201 North Tenth St	Columbia	MO	65201	314-443-2559	David Yang
On Line Electronics	3817 Broadway	Kansas City	MO	64111	816-753-0077	Dale Lenington
Sounds Great	1856 S Stewart St	Springfield	MO	65804	417-883-4543	Kevin Bresee
Morrison Bros.	2233 Hwy - 80 West	Jackson	MS	39204	601-352-0135	George Phillips

AUTHORIZED ENSONIQ REPAIR STATIONS

Mississippi Music	4430 Robinson Road	Jackson	MS	39209	601-922-1200	Brad Norman
M & M Electronics	Rt 14 Box 606	Laurel	MS	39440	601-649-3630	Mike Myers
Audio Clinic	3461 Canyon Drive	Billings	MT	59102	406-652-1564	Tim Smith
McFadyen Music (Char)	2110 E. Independence Blvd	Charlotte	NC	28205	704-372-3960	Steve Stoeckel
Action Music	6903 E Harris Blvd	Charlotte	NC	28215	704-535-3620	Chris Jett
Bull City Sound & Electr	1001 Broad St	Durham	NC	27705	919-286-1991	Russell Rose
McFadyen Music	Po Box 2325	Fayetteville	NC	28302	704-372-3960	Steve Stoeckel
MBI Tech Service	920 S. Chapman Street	Greensboro	NC	27403	910-272-6403	Wes DeHaven
Tritech Electronics Inc	618-H Guilford College	Greensboro	NC	27409	910-292-0330	Ben Phillips
Music Tech Service	3021-1 Stoneybrook Dr	Raleigh	NC	27604	919-872-5119	Chris Bomres
Musician Technical Serv	1618 Cass St	Omaha	NE	68102	402-345-4449	Mark Luebbe
Daddys Junky Music	4 Raymond Ave	Salem	NH	03079	603-893-4057	Tim Miller
Triple S	228 Washington Ave	Belleville	NJ	07109	201-751-0481	Joe Scacciaferro
Sam Ash Music (Chr Hill)	2100 Rt 38	Cherry Hill	NJ	08002	609-667-6696	Paul Saville
Keyboard World	35 Ledgewood Mall Rt 10	Ledgewood	NJ	07852	201-584-9049	Chris Evans
Sam Ash Music (PAR)	1 E 50 Rt 4	Paramus	NJ	07652	201-843-0119	Bill Takacs
Dannys Amp Service	6570 Sinkinson Avenue	Pensauken	NJ	08109	609-662-2979	Danny Cintioli
Jacks Music Shop	35 Broad Street	Red Bank	NJ	07701	908-747-4315	Rich Stout
Audio Technology	Sea Girt Mall- Rt. 35	Sea Girt	NJ	08750	908-223-0274	Nejat Bakin
Russo Music	1989 Arena Drive	Trenton	NJ	08610	609-888-0620	Ricardo Simmons
Rondo Music	1597 Highway 22	Union	NJ	07083	908-687-2250	Sebastian Migliore
Grubb Brothers Elec	379 Route 73	West Berlin	NJ	08091	609-767-6627	George Grubb
Daves Sound Repair	622 Rt 10	Whippany	NJ	07981	201-386-5840	Dave Hirsch
Enchantment Electronics	500 Islela SW	Albuquerque	NM	87105	505-873-1010	Tony Cognetto
Mesilla Valley Music	2200 N Main St	Las Cruces	NM	88001	505-526-8777	Fred Swenson
Pro Music & Drum	4972 S Maryland Pkwy	Las Vegas	NV	89119	702-736-1100	Mike Mahoney
Pro Music & Drum	608 Maryland Pkwy	Las Vegas	NV	89101	702-382-9141	Jim Giantomasi
Starsound Audio	2679 Oddie Blvd.	Reno	NV	89512	702-331-1010	Jamal Mixon
S.P.E.C.	382 West Main	Babylon	NY	11702	516-661-2454	Tom Santorelli
D.B. Musical Elect	2405 Harlem Road	Buffalo	NY	14225	716-894-9426	Donald Besecker
Direct Repair Service	1602 Rt 9	Clifton Park	NY	12065	518-383-0300	Dick Sagendorf
Only Guitar Shop	Route 9	Clifton Pk	NY	12065	518-371-1232	David Triller
TSR	884 State Rt #13Rd	Cortland	NY	13045	800-841-1815	Bob Twining
Acutone	898A Broadway	Massapequa	NY	11758	516-799-3104	George Krombs
EPR Electronics	505 California Avenue	Middletown	NY	10940	914-343-1237	Dana Lockhart
Palomba Music I	974 E Gunhill Rd	N Bronx	NY	10469	718-882-3700	Mike Palomba
Big Apple Music	4452 Commercail Dr	New Hartford	NY	13413	315-732-3502	Mark Bolos
DBM Technical Service	124 W.19th St 7th Floor	New York	NY	10011	212-645-2626	Marty Strauss
Triple S Elec Depot	1600 Broadway 8th Floor	New York	NY	10019	212-832-0072	Joe Scaccioferro
Palomba Music II	34 N Main St	Port Chester	NY	10573	914-937-9700	Ben Palomba
Northern Music & Video	29 Market Street	Potsdam	NY	13676	315-265-8100	Alex Vangellow
House of Guitars	645 Titus Avenue	Rochester	NY	14617	716-544-9900	Richard Robinson
McNeil Music	4517 Old Vestal Rd	Vestal	NY	13850	607-729-1548	Rob Melnick
Lentines Music	844 N. Main Street	Akron	OH	44310	216-434-3138	Terry Salem
Dr Music	1569 Chase Ave #5	Cincinnati	OH	45223	513-542-6111	Bill O Neil
Buddy Rogers Service	6891 Simpson	Cincinnati	OH	43239	513-729-1950	Mike Klein
Secret Services	4112 Gordon St	Cincinnati	OH	45223	513-541-2292	Marvin Schuman
Advanced Elect. Services	2303 Brookpark Rd	Cleveland	OH	44134	216-741-2230	Bob Schoger
Coyle Music	915 Schrock Blvd	Columbus	OH	43229	614-842-4823	Fred Roberts
Sound Ideas Inc	3671 Karl Road	Columbus	OH	43224	614-263-5742	Tom Goodwin
Dayton Musicians Service	1819 Wyoming Street	Dayton	OH	45410	513-253-5377	Jesse Nicely
Live Wire Audio	265 Park Ave	Mansfield	OH	44902	419-524-9005	Mike Cosentino
CA House	52171 National Road	St Clairsville	OH	43950	614-695-5929	Rob Svoroda
Music City (OH)	330 Market Street	Steubenville	OH	43952	614-282-3677	Stubby Young
Reineck Keyboard Service	6219 Sylvan Green	Sylvania	OH	43560	419-885-1075	Bill Reineck
Professional Technical	1483 W Syluania Ave Ste2	Toledo	OH	43612	419-476-1956	Bernie Greenberg
Del City Music	2908 Epperly Drive	Del City	OK	73115	405-677-8777	Mark Dooley
Norman Music	317 W Gray	Norman	OK	73069	405-321-8300	David Polk
Tulsa Guitar & Electronic	1417 South Harvard	Tulsa	OK	74112	918-742-4912	David Scrivner
Hicks Electronics Corp	3259 S Yale Ave	Tulsa	OK	74135	918-743-7813	David Hicks
Keyboard Associates	1014-B Green Acres Rd	Eugene	OR	97408	503-343-1978	Don Thumel
SureTech Electronic Serv	310 Garfield St. Suite 5	Eugene	OR	97402	503-687-8763	Dan Plaisted
Inner Sound	1818 SE Division	Portland	OR	97202	503-238-1955	Jay Moskovitz
KMA Electronics	617 S.E. Morrison	Portland	OR	97214	503-231-6552	Randy Morgan
Southbound Sound	278 NW Garden Val Blv	Roseburg	OR	97470	503-672-7056	Bruce Dove
Musicians Elect Service	798 Biddle Street	Ardmore	PA	19003	215-896-7311	Rusty Gray
CB Electronics Inc	300 Wilmington	Chadds Ford	PA	19317	215-358-5675	Charles Borromeo
Osiecki Bros. Music	2426 Parade Street	Erie	PA	16503	814-453-6565	Val Osiecki

AUTHORIZED ENSONIQ REPAIR STATIONS

Terrace Music Servicing	1415 Bunting St	Pottsville	PA	17901	717-544-6300	John Wascavage
Spectra Sound	Rd #2 Box 2611	Spring Grove	PA	17362	717-229-2086	Jeff Britcher
Nelson Mendez	#9 Kilo 1.9 Rd 441	Aguada	PR	00602	809-868-4019	Nelson Mendez
Keyboard Service	Vrb.Sta. Teresita Calle C	Ponce	PR	00731	809-844-8118	Jeanette Ruiz
MY-Tech	8 Joan Road	Westerly	RI	02891	401-596-5135	John Deremer
Sims Music	1110 Saint Andrews Rd	Columbia	SC	29210	803-772-1185	Jack Easterling
Doc Tronics	120 Lann Circle	Lexington	SC	29073	803-359-7799	Bob Dockery
Express Music	159 South Pine St	Spartanburg	SC	29302	803-583-6768	Don McGraw
Haggertys Music Works	514 St. Joe Street	Rapid City	SD	57701	605-348-4801	Stephen Vngsdale
Ed Lowry Organ Service	223 St. Charles	Rapid City	SD	57701	605-343-1881	Ed Lowry
Thomas Mkting Group	1400 E 39 Street N	Sioux Falls	SD	57104	605-332-8156	Steve Thomas
Sams Music	7103 B Crosswind Blvd	Brentwood	TN	37027	615-371-5000	Scott Conder
Morrell Music	2306 State Street	Bristol	TN	37620	615-764-2171	Curtis Morrell
MUSITECH	6903 Glen Errol	Chattanooga	TN	37412	615-894-9771	Alan Campbell
Morrell Music Shop	510 E Center St	Kingsport	TN	37660	615-247-9891	Mike Lumley
Broadway Sound	2830 Broadway N.E.	Knoxville	TN	37917	615-637-1644	Joel McCrott
Amro Music	2936 Poplar Avenue	Memphis	TN	38111	901-323-8766	Tim Bailey
Musical Instrument Serv	833 S. Highland Street	Memphis	TN	38111	901-327-0964	Eugene Smith
Techstar Services	750 Cowan St Suite 9	Nashville	TN	37207	615-242-9528	Holmes Holland
Randy's Music Mart	2600 Paramount Ste H-3	Amarillo	TX	79109	806-358-0131	Mark Romero
Capital Music	6101 Burnett Rd	Austin	TX	78757	512-458-1933	Peter McNutt
Musicmakers Austin	517-B S. Lamar	Austin	TX	78704	512-444-6686	Bill Ussery
Crosswind Sound Inc	3501 Dime Circle #113	Austin	TX	78744	512-441-1631	Tim Johnson
Strait Music	908 N. Lamar Street	Austin	TX	78703	512-476-6927	Bob Overton
Sound Vibrations	1638 S. Staples	Corpus Christi	TX	78404	512-884-9308	Willie Melon
Audio Electronics	9205 Skillman Suite 120	Dallas	TX	75243	214-349-5000	Randal Stout
Freeman Tuell	7911 Ferguson Road	Dallas	TX	75228	214-324-1132	Allen Tuell
Rich's Music	1007 Avenue C	Denton	TX	76201	817-566-3700	Greg Keane
A OK Music Repair	1514 Ahrens Drive	Houston	TX	77017	713-643-5397	Dale Marr
R.L.S. Electronic Serv	5523 Richmond Ave	Houston	TX	77056	713-654-9217	Richard Sherman
BE Goetsch Music Co	222 E Kleberg	Kingsville	TX	78563	512-592-5464	Charlie Goetsch
Hermes Trading Co Inc	501 S 11th St	McAllen	TX	78501	210-618-5663	Paul Valdez
Hermes Trading Co Inc	501 South 11th	McAllen	TX	78501	210-618-3344	Raul Pena
Hermes Trading Co Inc	409 S Broadway	McAllen	TX	78501	210-682-4341	Paul Valdez
Alamo Music	425 N Main	San Antonio	TX	78205	210-224-1010	Tim Specht
Century Music Sys	3515 Sunbelt Drive N.	San Antonio	TX	78218	210-822-7306	Steve Price
Guitar City	470 N 1100 West	Centerville	UT	84014	801-292-8461	Joe Obermiller
Wagstaff Music Inc	206 E 6400 So	Murray	UT	84107	801-261-4555	Robert Cox
Backstage Inc.	310 W. Broad Street	Richmond	VA	23220	804-644-1433	Vladimir Syroutka
Stage Sound	103 8th St. SE	Roanoke	VA	24013	703-342-2040	Bill Corn
EFEX Electronixs	218 SW 153rd Street	Seattle	WA	98166	206-241-4852	Ron Combs
Bozotronics	525 Dexter Ave N	Seattle	WA	98109	206-622-4968	Pat Muir
Northwest Organ Serv	3911 N Monroe	Spokane	WA	99205	509-747-7761	Ron Pearson
Music World Inc	1215 N Division	Spokane	WA	99202	509-328-2853	Dave McClure
Sound West Audio	2323 Tacoma Avenue S	Tacoma	WA	98402	206-272-1435	Steve Paulik
Rons Keyboard & Elec	747 S Fawcett	Tacoma	WA	98402	206-572-8633	Ron Sauro
Avalon Music	19 N Wenatchee Ave	Wenatchee	WA	98801	509-663-7300	Jim Allyn
Henris Music	511 West College Avenue	Appleton	WI	54911	414-739-9163	Carl Garrow
Morgan Music	2405 E Clairmont	Eau Claire	WI	54701	715-834-7177	Del Dayton
Henris Music	500 S. Military Avenue	Green Bay	WI	54303	414-494-4724	Dennis Mullen
Music Service Center	Po Box 1	Merrill	WI	54452	715-536-8283	Brian Seehafer
Music Service Center	900A South Foster St	Merrill	WI	54452	715-536-8283	Brian Seehafer
Big Music	7910 N 76th St	Milwaukee	WI	53223	414-355-8888	Brian McLaughlin
Pied Piper Music	1200 3rd Avenue	Huntington	WV	25701	304-529-3355	Mike Webb
Squarewave Audio	245 S Montana	Casper	WY	82609	307-266-1509	Daniel Boucher

IN CANADA

Kaysound Imports	2165 46th Ave	Lachine, QUE	H8T 2P1	514-633-8877	Jean-Pierre Paradis
Long & McQuade	1505 17th Ave SW	Calgary, ALB	T2T 0E2	403-244-5555	Alex Koddod
Ranger Audio	3516 1st Street	Calgary, ALB	T2E 3C9	403-277-1615	Mick Lang
Edmonton Audio Works	17310 108th Ave	Edmonton, ALB	T5S 1E8	403-483-2017	Lyndsay Umrysch
Kinetic Sound	3331 Jacombs	Richmond, BC	V6V 1Z6	604-278-2619	Kelly Baumbach
McPherson Micro	416 McDermot Ave	Winnipeg, MAN	R3A 0A9	204-947-9389	Derek Sedlecek
Mytronics	2050 Ellesmere Rd #3	Scarborough, ON	M1H 3A9	416-289-0074	Rich Gozdzialski
Steve's Service	138 Peter Street	Toronto,ON	M5V 2H2	416-593-8889	Tex Tobin

AUTHORIZED ENSONIQ REPAIR STATIONS

OTHER COUNTRIES

ARGENTINA	Lagos-Sarmiento	Talcahuano 218, 1013, Buenos Aires	541-374-8049
AUSTRALIA	Electric Factory	188 Plenty Road, Preston, Victoria	613-9-480-5988
AUSTRIA	Soundware Audio Team	Moostr 123, 5020 Salzburg	43-66-2-824679
BARBADOS	A & B Music Supplies	Prince Alfred Street, Bridgeton	809-427-5384
BENELUX	EBT International	Kapelstraat 12, 5316 BG Delwijnen	31-4185-2106
BERMUDA	Pianos Plus	129 Front St, East Hamilton	809-295-2530
BOLIVIA	IEE Electronics srl	Comercio 1265, PO Box 221, La Paz	5912-351-743
BRAZIL	Pride Internacional	Ave General Ataliba Leonel, 93-cj 65/66, Sao Paolo	55-11-950-1652
CHILE	Audiomusica	Casilla 299, Correo 22, Santiago	56-2-225-2233
COLOMBIA	Sonygraf	Calle 101 Bis. No. 28-36, 59786 Bogota	571-616-7405
COSTA RICA	Albion S.A.	PO Box 666-2150, Moravia, San Jose 2150	506-235-9330
CYPRUS	Empire Music House	Nikis Ave, PO Box 5604, Nicosia	357-249-0472
CZECH	Praha Music Center	Soukenicka 20, 112 27 Praha 1	422-2481-0970
DENMARK	New Musik	Vesterport 8, DK-8000 Aarhus C	4586-190899
EGYPT	Alpha Audio	6 Mahmoud Hafex, Safir Sq, Heliopolis, Cairo	202-243-7119
FINLAND	Musiikki Hellas	PO Box 6, 05201, Rajamaki	358-0-2901021
FRANCE	I.M.L.	4 Rue Maurice Audibert, Saint-Priest	33-78-204030
GERMANY	Soundware Audio Team	Paul-Ehrlich St 28-32, Bld G-3, 6074 Rodermark	49-6074-89150
GREECE	Ph. Nakas Music House	13 Navarinou Street, 10680, Athens	301-364-71116
HONG KONG/CHINA	Tom Lee Music Co.	30 Canton Rd, Tsimshatsui, Kowloon	852-737-7688
ICELAND	RIN Wholesale	Frakkastig 16-101, Reykjavik	354-1-17692
ISRAEL	R.B.X. International	Dizengoff Center, 64 Dizengoff St, Tel-Aviv	972-3-298251
ITALY	sisme s.p.a.	S. Statale Adriatica 34, 60028 Osimo-Scalo, Ancona	39-71-781-9666
JAPAN	ENSONIQ JAPAN	Nishi-Shinjuku Toyokuni 1F, 2-5-8 Hatsudai, Tokyo	813-5351-1401
KOREA	Han Dok Piano Co.	81-2 Yunhidong, Sudaemoon-Ku, Seoul	822-332-5556
KUWAIT	Easa Husain Al-Yousifi	Abdullah Al Salim St, 13002 Kuwait	965-571-9499
MEXICO	Hermes International	830 N. Cage, Pharr, Texas, USA	210-781-8472
NEW ZEALAND	Electric Factory NZ	163 Archers Road, Glenfield, Auckland	649-443-5916
NORWAY	Norsk Musikk	Bergensgt 26, 0468 Oslo 4	47-22-235680
PAKISTAN	NRH Electronics	#10-11 Naseem Ctr,Sohrabe Katrak Rd,Saddar,Karachi	9221-573113
PHILLIPINES	Blue Chip Sales	173 Wilson St, San Juan, Metro Manila	63-2-706138
POLAND	Mega Music Ltd.	48 Gdansk ul Fultona 5, 80-172	48-58-487411
PORTUGAL	Americo Nogueira, LDA	Rua Alto das Torres, 893, 4400 Vila Nova de Gaia	351-2-2004616
RUSSIA	A & T Trade Inc.	Fadeeva Street #6, Moscow 125047	7095-978-2016
SAUDI ARABIA	Halwani Audio	PO Box, 2865, Dammam, 31461	966-3-898-0405
SINGAPORE	Swee Lee Co.	Block 231, Bain St #03-23, Bras Basha Complex 0718	65-336-7886
SLOVENIA	Nova d.o.o.	Cesta v Gorice 4, 61111 Ljubljana	38-661-263-260
SOUTH AFRICA	MidiKing Technology	110 Palliser Rd, Eastleigh Ridge, Edenvale 1610	2711-609-1321
SPAIN	Ventamatic	c/ Corcega 89 entlo., 08029 Barcelona	34-3-430-9790
SWEDEN	Poly-Sonic	Datavagen 14A, S-436 32, Askim	46-31-706-9050
SWITZERLAND	SDS Music Factory AG	Hohlstrasse 534, CH-8048 Zurich	41-1-434-2270
SYRIA	Yazigi & Co.	Naser Street, Sati Bldg No. 13, Damascus	963-11-221-5583
TAIWAN	Sea Power	7F. #36 Wo Chung 7 Rd, Wuku Taipei County	886-2298-2688
THAILAND	Music Concepts	4/1-2 World Trade Ctr, 3rd Fl, Rajdemri Rd, Bangkok	662-255-6448
TURKEY	Zuhal Musik	Tunel Gecidi Is Hani, B Block No.11, Tunel, Istanbul	90-212-249-8511
U.A.E.	A.K.M. Music Centre	PO Box 8827, Abu Dhabi	9712-792-734
UNITED KINGDOM	Sound Technology	Letchworth Point,Letchworth,Hertfordshire SG61ND	44-1462-480000
WEST INDIES	The Music Shop	105 Frederick Street, Port of Spain, Trinidad	809-622-3060
WEST INDIES	Universal Trading Co.	Colon Shopping Ctr #126, Curacao, Neth. Ant.	599-9-624840

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PO Box 3035 Malvern PA 19355-0735 (610) 647-3930 FAX (610) 647-8908
ENSONIQ products are available through Authorized ENSONIQ Dealers throughout the world.

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

IMPORTANT SAFETY INSTRUCTIONS

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

1. Read all the instructions before using the product.

2. Do not use this product near water - for example, near a bathtub, washbowl, kitchen sink, in a wet basement, or near a swimming pool, or the like.

3. This product should be used only with a cart or stand that is recommended by the manufacturer.

4. This product, either alone or in combination with an amplifier and headphones or speakers, 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.

5. The product should be located so that its location or position does not interfere with its proper ventilation.

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

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

8. This product may be equipped with a polarized line plug (one blade wider than the other). This is a safety feature. If you are unable to insert the plug into the outlet, contact an electrician to replace your obsolete outlet. Do not defeat the safety purpose of the plug.

9. The power supply cord of the product should be unplugged from the outlet when left unused for a long period of time.

10. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

11. The product should be serviced by qualified service personnel when:

    a. The power supply cord or the plug has been damaged; or
    b. Objects have fallen, 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 operate normally or exhibits a marked change in performance; or
    e. The product has been dropped, or the enclosure damaged.

12. Do not attempt to service the product beyond that described in the user-maintenance instructions. All other servicing should be referred to qualified service personnel.

SAVE THESE INSTRUCTIONS