



EX Series

Power User: Sales Guide

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YAMAHA Power User

EX series Sales Guide

EX Navigation

Getting around the EX is easy. The main modes and controls are to the left of the screen, while the various data entry and Voice select buttons are on the right of the screen. Under the screen are 8 'soft' buttons [F1]-[F8]. These function buttons select parameters directly above them in the screen. To the left of the 8 function buttons is the [SHIFT] button. When you see a small inverse video "s" in the lower left-hand corner of the screen, this signifies that pressing and holding the [SHIFT] button will reveal a shortcut to other destinations. Just to the right of the 8 function buttons is the very important [EXIT] button. This will always back out of an edit mode screen, returning you to the previous screen. Directly below the function buttons are 6 knobs. The knobs do double duty. When you are on the main Voice Play or main Performance Play screens the [KNOB MODE] button is illuminated indicating that the Knobs are functioning as real time controllers according to their assignment in the current sound. When you enter [EDIT] mode the [KNOB MODE] indicator goes out, this means the knobs will now function as data entry. As you move the cursor to the different lines of the screen you will notice small inverse video numbers appear to the left of a parameter value. These numbers indicate which control knob will directly edit that parameter. (See screen below for an example).

```
PERFORM EDIT          PERF=001[Init Perform]
PART1|P1-001[Natural Grnd]      Attack= + 0
EG: Atck=2+ 0      Decay=0+ 0      Releas=0+ 0
PEG: Atck= + 0      R.Lvl= + 0      R.Time= + 0
      Init= + 0      Bright= + 0      Harmoni= + 0
Vib: Rate= + 0      Delay= + 0      Depth= + 0
Port: Sw= off      Time= 0      Mode= fnoR
[5] COM [PART] MLT      MIX LVR [SOUND] CTRL PRE
```

In the screen shot above Performance Edit is selected. Notice the "tab" around the word Part on the bottom line of the screen. The type of screen you are viewing is always indicated in the upper left-hand corner by the inverse video tab. This Part screen has 5 sub screens: Mix, Layer, Sound (the current view), Controllers, and Presetter. The cursor is currently located on a line of the screen where knobs 2, 4 and 6 will edit the Envelope Generator (EG) Attack, Decay and Release parameters, directly. EG Attack is selected. If you grab knob 6 the cursor will immediately jump to the Release parameter. This saves having to cursor to the right. Let's look at another edit screen as an example of navigation.

```
VOICE EDIT           I1-001[For Ballads 1]
-EL1=OSC Wave -----Pan= L16-
  Bank Num Cat          Level Pan Detune
1: 0PRE00001|Pf:Grnd1    0127 [5] 0+ 0
2: PRE 0028 Pf:Rho4      74   R16 + 0
3: PRE 0001 Pf:Grnd1    111  L16 + 0
4: PRE 0028 Pf:Rho4      114  R16 + 0
[5] >FIT >           WAVE [MIX] ZONE
```

Here we are in Voice Edit mode. We are listening to Internal 1, Voice 001, the Voice called "For Ballads". This is the Element 1 Oscillator page (EL1 – OSC Wave). We are looking at the

element Mixer [Mix] sub page [F7]. The cursor is currently on line three, where each of the 6 knobs is directly set to edit a parameter. Currently, the Pan position of Element 1 is selected. Notice the upper right side – it indicates the current value for the selected parameter (and usually translates any abbreviations).

Notice the “> Pit >” above the [F1] button, this is a shortcut to the **next page** which is going to be Pitch. The inverse video ‘s’ in the lower left-hand corner indicates that hitting and holding the [SHIFT] button will reveal shortcuts, in this case, to the other Voice Edit main pages.

If during any edit mode process you want to use the knobs to adjust the sound according to their Voice Play assignments, simply press and light the [KNOB MODE] button.

Data Entry

Your right-hand side data entry tools include a **Data Dial** and its associated [CURSOR/DATA] button. You can use this wheel either to move the cursor or change selected values. The [CANCEL] button will undo the last value entered. This is very valuable when trying out an edit. The [DEC/NO], [INC/YES] buttons can increment or scroll, if held. They answer an questions prompted in the software. The **Cursor arrows** are used to move the highlight selector around the screen. The **Numeric Keypad** and [ENTER] buttons work together. When you enter a number value directly on the keypad you must finish this process by pressing [ENTER]. In general, any flashing screen value must be followed by the [ENTER] key. **Bank [A] through [H]** and **Program [1] through [16]** buttons select sounds directly. You will notice that each Voice is designated a Bank, a numbered location (001-128), and a letter bank/program number location. For example, Preset Bank 1, Voice number 2 is **P1-002 (A02)**; Internal Bank 2, Voice 127 is **I2-127 (H15)**. If you choose to select sounds via these buttons, simply select the letter first (A-H), then the number (1-16). In Voice Edit mode the Program buttons [1]-[8] can select the various edit mode displays. They are great shortcuts to any Voice Edit screen in addition to the [F] function buttons beneath the screen.

Changing Voice Banks is accomplished via the [F1], [F2], [F3] and [F4] soft buttons. They select Preset 1, Preset 2, Internal 1, and Internal 2 Voice Banks, respectively. You must also press [ENTER] to complete the Bank change or **hold** [SHIFT] + the [F1]-[F4] button to change banks directly.

10 Modes

Voice, Performance, Song, Pattern, Sample
Edit, Job, Store, Utility, Disk

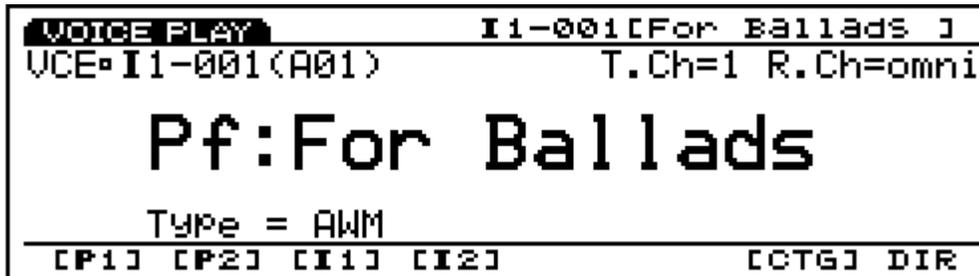
The first 5 are your Main modes. **Voice** mode contains 512 sounds while **Performance** mode has 128 locations that hold complex layers and/or Multi-timbral setups for sequencing and Master MIDI control setups. A **Pattern** is an EX structure that loops up to 16 measures. Each Pattern track can be a different length. Up to 8 Parts can exist within a Pattern. A **Song** in the EX has 16 linear tracks, a Pattern control track, and a master tempo track. Songs and Patterns can be assigned to play **Voices** within a **Performance**. **Sample** mode is a separate function and controls the setup and editing of sampled data. Samples can be programmed into an EX Voice or assigned to a Key Map.

In the second group of modes both **Edit** and **Job** parameters can be found for each of the 5 Main modes. In other words, to find Song Edit parameters you would need to be in Song mode when the [EDIT] button is pressed. To view the Pattern Jobs you would press [JOB] from the main Pattern mode screen, and so on.

Store mode refers to Voices and Performances which can be stored to the EX Internal locations. **Utility** mode is where you setup global parameters for the synthesizer, sequencer, controllers, etc. **Disk** is the mode where you can save/load data to/from either internal floppy or external hard disks, Ziptm, Jaztm drives or CDROM drives.

Selecting a Voice

How to select a sound Turn the EX unit on and select [VOICE] mode, if not already selected. You can begin your exploration of EX sounds from Voice mode. There are 4 Banks each with 128 Sounds. The Banks are as follows: **P1**- Preset 1, **P2**- Preset 2, **I1**- Internal 1, **I2**- Internal 2. To change Banks, simply press the [F1] – [F4] function buttons beneath the screen followed by the [ENTER] button, or hold [SHIFT] + the [F1] – [F4] button. The current bank and Voice number are shown in the upper left-hand corner of the screen. Individual sounds can be selected via the Data Wheel, [INC/Yes], [DEC/No], numeric keypad + [ENTER], or dedicated Memory Bank (A-H)/Program buttons (1-16). You can also view the names of 8 Voices at once via the [F8] Dir (directory) function. In the directory view you can additionally select sounds via the cursor arrows. You can search for a sound in the same Voice category as the current Voice by pressing the [F7] button. Preset 1 has the Pianos, Electric Pianos, Organs etc. To get a variety of sounds it recommended that you select Internal 1 Bank by pressing [F3], then [ENTER]. Then select Voice 1 (A01) via your favorite Voice selection method.



The technologies: AWM, VL, AN, FDSP, Sampling, Re-sampling.

- AWM – Advanced Wave Memory is Yamaha’s proprietary method of storing PCM data.
- VL – “Virtual Lead” technology (Virtual Acoustic™) physical modeling of acoustic pipe/string. Generates a variety of instruments, from hyper-realistic acoustic sounds to bizarre sci-fi effects. There are no samples in this technology, all sound is generated, in software, on the DSP.
- AN – Analog physical modeling technology (again, no samples) generates authentic analog sound behavior.
- FDSP – Formulated Digital Sound Processing. A brand-new sound generation and modification technology which is added to AWM Tone generation. FDSP is a kind of ‘virtual’ sound synthesis system implemented to each sound generation channel so that note number characterizes the ‘behavior’ of FDSP. Ten different algorithms are implemented into the FDSP system.
- Sampling – A/D input(s) provide for 16-bit, 44.1kHz sampling. 73Mb maximum RAM; 8Mb or 16Mb Flash Memory optional.
- Re-sampling – The process of sampling internally. Source can be key (note-on) or the Sequencer. The Re-sampling feature allows the user to resample even a Voice that is a complex layered voice. You can resample through the effects. Creating Voices with all the big polyphony of the AWM engine.

Elementary: An EX *Voice* is a complex structure that exists on a single MIDI channel. It contains up to a maximum of 4 elements. An element being a complete synthesizer sound made from one of the EX’s multiple technologies. For example, an AWM (or sampled) element can be a complete multi-layered, multi-sampled instrument. A single AWM element could be a soft/medium/hard strike, velocity switching, piano multi-sample. A single element is a complete sound having its own sound source, filters, envelopes, etc. Up to 128 AWM samples can exist in a single element – it is the AWM sample engine that has the big polyphony (126 notes in the EX5/5R and 64 notes in the EX7). These can be stacked vertically (by velocity) or horizontally (by key range). Two samples can share the same zone within an element (used to create stereo waveforms). Or an element could be a Virtual Acoustic VL physical model of a saxophone or an AN physical model of an analog synth circuit. The VL and AN physical

modeling elements have a different set of rules. They are generated in real time using high-speed calculations on the DSP chip. They do not use samples, or traditional tone generator objects. A physical modeling element takes a great deal of computing energy to create its result. Each type of model has its own unique set of parameters, filters, envelopes and controller routings. The FDSP or Formulated Digital Sound Processing, engine actually works on AWM sampled elements much like a standard effect, in that the result is summed with the dry signal. There are 10 FDSP "effects" each with a complete set of programmable parameters. FDSP elements have the same voicing parameters as AWM samples: the samples are processed by the highly specialized FDSP engine. In an FDSP Voice you can select which of the AWM elements are processed by the FDSP engine. (See article "What Is FDSP?" for more details.)

Four complete elements can exist within a **Voice** according to the following EX Voice TYPE structures:

- AWM – This type of Voice can have up to 4 AWM sampled elements
- VL + AWM – This type can have 1 VL physical model plus up to 3 AWM elements. Often the VL element is used alone to concentrate on the VL sound. This type element is found only in the EX5 and EX5R.
- AN + AWM – There are 2 versions of this type. AN(poly) and AN(layer). AN(poly) is a single AN element (2 note polyphony) plus up to 3 AWM elements. AN(layer), found in the EX5/5R only, is 2 different AN elements (1 note + 1 note) plus up to 2 AWM elements.
- FDSP – This type consists of up to 4 AWM sampled elements processed through one of ten new synthesis algorithms. The results of the process are added to the sound, very much like reverb is added to a sound.
- AN + FDSP – This type is found only in the EX5 and EX5R and combines a single AN physical model and up to 3 AWM elements some of which can be processed via the FDSP engine.
- Drum – Is a special Voice type that has individual sets of samples per key, each key has its own independent volume, pan position, routing to effects, filter, etc. Up to 128 samples can reside on a single note, up to 2 samples can share the same velocity zone. A different sample loop can be triggered (in Stereo) at each velocity between 1-127

Polyphony - The maximum amount of polyphony a Voice will deliver is dependent on several factors. Each technology has certain restrictions due to the nature of its origin. In general, the AN engine is either mono or duo-phonic, while the VL is a single note. The FDSP processor can process 16 simultaneous notes in the EX5 and EX5R and 8 notes in the EX7. In the case of FDSP, notes do not cut off they just stop being processed by the FDSP engine. The AWM sample engine has 126 notes of polyphony in the EX5 and EX5R. The EX7 has 64-note polyphony.

Performance Mode There are 128 Performance locations. A Performance can be a Layer containing 2 complete EX Voices or it can be a multi-timbral structure of 16 Parts each containing an EX Voice. Additionally, a Performance can be a Master MIDI keyboard setup complete with data for 16 MIDI zones. To explore these simply select [PERFORMANCE] mode and use your favorite selection method to navigate the Performances.

Preparations for Demonstration

Adjusting the keyboard response Let's learn to customize the keyboard's response. How the action "feels" to the player can be dramatically effected by the velocity curve. To adjust this curve follow this procedure:

- Press the [UTILITY] button
- Select option 2: Voice Mode
- Press [ENTER]
- Set the VelCurve (Velocity Curve) as appropriate. Norm – is the normal response. Soft – is for those that have a very light touch. Hard – is for those with heavy hands. Wide – is very soft when played lightly and very loud when played hard. Fix – allows you to set a fixed velocity no matter how hard you play.

The procedure above is global for the keyboard in Voice mode. The EX, however, allows you to set a different velocity response for each Part within a Performance, as necessary (for more information see the Owner's Manual). It is highly recommended that you experiment with these velocity settings as one will feel very right and the others will feel very wrong. You can equate the experience of finding the right velocity curve to putting on your own slippers. When they are yours it feels just right, while the wrong curve feels like you have them on the wrong feet. In fact, all of the EX controllers can be "tailored" to fit the user. It has everything to do with how far we each like to move a controller to get the given result. It is making your physical gestures work musically for you. This is useful not only in the physical performance of music but in the interpretation of MIDI data.

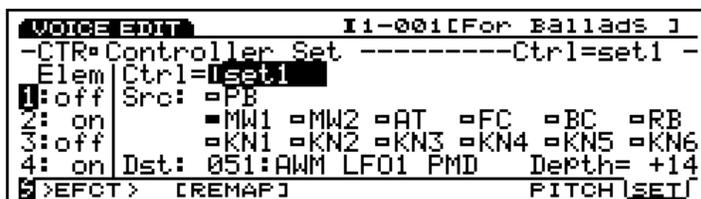
TG / M.Kbd In general, the EX5 and EX7 have their global Voice mode set to TG or Tone Generator mode (set under [UTILITY]→ 2:Voice Mode). You can alternatively set it for M.Kbd, Master Keyboard mode. Each Performance can be programmed individually as to TG mode or Master Keyboard mode. As a rule leave the setting to TG unless you specifically need the Master MIDI controller features.

A Word on Breath Control You have probably heard that the Virtual Acoustic VL voices work extremely well with Breath Control. This is true. When you are playing a wind instrument model nothing surpasses Breath Control as a *completely intuitive* controller, period. However, it is not always feasible to play with a BC. The initial set of EX Voices have the VL type Voices setup to play from keyboard Velocity. (See section at the end of this article "Setting up a VL Voices for Breath Control" if you want to experiment with a BC3.

Knob Mode. One of the most interesting things about the EX is the Knob interface. The knobs are active anytime the Knob Mode LED is lit. If the Knob Mode light is not lit (the default during editing) the Knobs can be used to edit parameters in the screen. A small inverse video number will indicate which knob will change a particular parameter.

In general, when lit, the first four knobs effect some part of the sound. Usually Cutoff and Resonance of the Filter on Knobs 1 and 2. While knobs 5 and 6 typically control the effect processing. Many of the Voices have completely unique assignments for the knobs, however. You can view exactly what each controller is set to do, per Voice, by entering [EDIT] mode and navigating the 16 Controller Set screens.

[EDIT] → [F7] Ctrl → [F8] Set



There are 16 Controller Sets per Voice, each can be active (on) or inactive (off) for a particular element (shown at screen left). There are 13 Sources or physical controllers and 146 Destination (Dst) parameters. The above example shows that Set 1 has the Source (Src), the Modulation Wheel (MW1), programmed to add Pitch Modulation Depth (PMD or vibrato) to AWM elements 2 and 4. You can easily view the controller routings from these screens. Use the [+1],[-1] buttons or Data wheel to view the other Controller sets. Multiple sources can be assigned to the same destination. And a single destination can have multiple controllers.

Creating a Scene A Scene is recalled via one of two dedicated front panel buttons. Each Scene is a 'snapshot' of the position of the front panel knobs (KN1-KN6). So each Scene can contain a variation of the current Voice for instant recall via the 2 Scene buttons located above your wheels. The knobs are assignable per Voice and are used to edit each sound in real time. Each knob can be routed to multiple parameter destinations, and each parameter destination

can have a different depth programmed per controller. There are 16 Controller Sets per Voice. Two Scenes can be stored with each Voice. A Scene is recalled when its LED is lit. When both LEDs are illuminated Mod Wheel 2 will 'morph' between the settings.

You can easily create Scenes by moving the knobs to get the sound as you like it, then use the Store Scene routine as follows:

Press and hold [STORE] + touch [SCENE 1] or [SCENE 2]

These Scenes are stored in a temporary edit buffer and will be lost when you recall the next Voice. Actually, the Voice returns to its originally stored state with the original 2 Scenes. If you wish to make your Scenes permanent, simply store the entire Voice to any available Internal location.

Loading from Disk

Disk selection When you press the [DISK] mode button you can access the various functions such as loading, saving, deleting, or renaming of files and the selection of disk device type (SCSI/FDD).

Autoload feature When you have assembled your favorite demonstration data, save it to a new diskette as an ALL DATA file named "AUTOLOAD". Describe the contents on the outside label, such as "Joe's favorite EX Demos". Make a few copies of the diskette, as spares, and leave a copy in the floppy drive. The EX will automatically load itself every morning when you turn on the power.

There are several different EX file types. EX disks use a similar format to IBM DOS type diskettes however, it is a good idea to always format your diskettes on the EX itself.

ALL - All Data - (.S1A): All Voices, Performances, Samples, Songs, Patterns, and Arpeggiations

SYN - Synth All - (.S1Y): All Voices and Performances. Does not store sequencer or samples. You can load individual Voices and / or individual Performances from a Synth All type file.

VCE - Voice - (.S1V): All 256 Internal Voices (excluding wave data). You can load all or a single Voice.

Wave - (.S1M or .WAV or .AIF): samples in EX resident format, import .wav, .aif, and Akai format

SMF - MIDI/ESEQ files - (.MID): Standard MIDI Files and ESEQ (Yamaha format)

Song - (.S1S): EX Songs including Play Effects, Transmit Channels, Controller data

PTN Pattern - (.S1P): EX Patterns including Play Effects, Transmit Channels, Controller data

ARP - Arpeggio - (.S1R): EX Arpeggios including Play Effects, Transmit Channels, and Controller data

Loading the Factory Demos: The 4 Demo diskettes that come with the EX series contain ALL Data files. To load and play the demos:

- Press [DISK], select Load From Disk, All Data → [ENTER]
- When complete select Performance Mode
- Select Song Mode
- If you have loaded the Key Map demo [DISK #2], select **Key Map**
- Press Play on the sequencer transport.

Sampling and Re-sampling

The sample process The EX's come with just enough RAM (1 MB) for you to do short experiments with the sampling process. The EX samples at a fixed resolution of 44,100 samples per second (16-bit). That is a rate that delivers 5 Megabytes of data per mono minute, 10 megabytes of data per stereo minute. The 1 MB of memory gives you 12 seconds of sample time. The memory can be expanded via standard 72-pin SIMMs (JEDEC compliant).

```
SAMPLE PLAY          SMPL#0001[NewSamP1]
Play Mode=EMono
Sample = RAM 0001 --:NewSamP1
DRAM : 34078720 Free : 34078720 word
FLASH : 4194304 Free : 4194304 word
[REC]
```

The above screen shows a fully loaded machine 1 word = 2 bytes

- 34,078,720 word = 68,157,440 Bytes. This is the available memory when you have installed 64 MB of RAM.
- 4,194,304 word = 8,388,608 Bytes. This is the total of battery backed Flash Memory when upgraded with the 8 MB EXFLM1 expansion board.
- Total sample memory = 76,546,048 Bytes
- The longest single sample can be 380 seconds or 6 minutes, 20 seconds.

To begin the sample process

- Press [SAMPLE] – you enter the Sample Play mode (indicated in the upper left corner of the screen)
- Press the [F8] REC button – to enter the Sample Record area (indicated in the upper left corner of the screen)

```

SAMPLE PLAY          SMPL#0001[NewSamP1]
Play Mode=mono
Sample  = RAM 0001 --:NewSamP1
DRAM   : 34078720 Free : 34078720 word
FLASH : 4194304  Free : 4194304 word
[REC]
  
```

```

SAMPLE REC          SMPL#0001/SMPL#0002
Rec Mode =Stereo Source=A/D      [line]
Sample L = RAM 0001 --:NewSamP1 [ ]
Sample R = RAM 0002 --:NewSamP1 [ ]
Trigger  = level 0               [ ]
Length   = 380sec ( 16758000)
[STANBY]
  
```

- The EX will display the Length of sample time available in seconds and show you several bar graphs to indicate the level of incoming signal. Set the Source to either the "A/D" (Analog to Digital) inputs or Internal. When set to Internal sampling the Trigger can be either "Key" (note-on) or "Seq" (sequencer). If you have A/D as the source you can set a trigger level, a minimum threshold that will start the sampling process.
- Check and set your levels, as necessary. If you are sampling Internal data the levels are set automatically. The bar graphs will disappear when Source = internal.

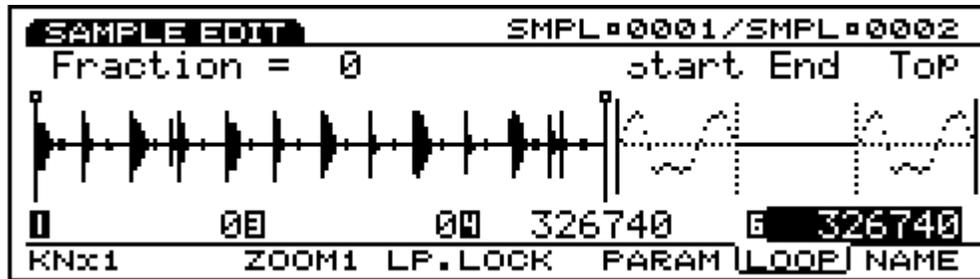
```

SAMPLE REC          SMPL#0001/SMPL#0002
Rec Mode = stereo Source= internal
Sample L = RAM 0001 --:NewSamP1
Sample R = RAM 0002 --:NewSamP1
Trigger  = seq
Length   = 380sec ( 16758000)
[STANBY]
  
```

- Press [F8] Standby to engage Standby status. "Waiting..." appears in the screen and depending on the trigger method you have chosen, sampling will begin when you press [F8] START, you start the sequencer or when the level exceeds the trigger level.

When sampling is complete press [F8] STOP to end the sampling process. The EX will then begin processing the data. This can take a few seconds, depending on the length of your recording. Press [EXIT] once, to return to Sample Play (you can now play your sample). You can view the sample waveform by entering sample edit [EDIT] and pressing F7 [Loop]. The EX may take a few moments the very first time that it draws the waveform.

Editing a sample Some detailed editing can take place right on board the EX. You can Copy, Append, and Extract any part of any sample. The EX supports SMDI (SCSI-MIDI) and can use external computer editors like Yamaha TWE (provided on the CDROM disk that comes with the EX), or Sonic Foundry's Sound Forge 4.0, etc. Samples can be moved from the EX, via SCSI, to these external editors, if you wish to take advantage of their capabilities (in order to do advanced editing functions like sample crossfading etc.). Then the samples can be moved back into memory after the editing session.



- KNx1 [F1] – repeated pressings of [F1] sets the resolution of the editing via the Knobs (Knob 1, 3, 4, and 6). When the little reverse video numbers appear in the screen, it means that you can use that Knob to directly edit the parameter value to the right. As you move the cursor up and down in the screen look for the numbers to indicate which knob is active to change that parameter. In the graphic above, Knob 6 is set to increment in single samples, x1. You can change the Wave Start (Knob 1), Loop Top (Knob 3), Loop Length (Knob 4) and Wave End (Knob 6) points in sample increments of x1, x10, x100, x1000, or x10,000.

In the example, the sample plays from Wave Start (0), is set to Loop from the very Top (0), the loop length is equal to the entire length of the wave (326,740) units. You can see from the graphic at the right, the Top of the loop looks exactly like the Wave Start. The End portion of the graphic is silent, as this is a visual of a drum groove that has silence just before the recycle begins. So this sample set to loop from top to end. **Be sure to use your control KNOBS to edit the Start/End/ and Loop Length NOT the data wheel – the data wheel only increments – the knobs can be set to different resolutions when large distances need to be traversed.**

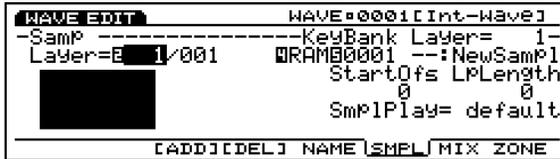
- Zoom [F3] controls the resolution of the graphic on the right side of the screen. This is a zoom-in view of the Wave Start, Wave End and Loop Top portions of the wave. You can change the zoom ratio to a maximum x8.
- Lp. Lock [F4] Loop Lock. This parameter fixes the length of the window from Loop Start to End so that as you change the Loop Start point the segment stays the same length. Therefore, the end point is adjusted accordingly.
- Param [F6] Parameters. Here you can set the various points, tune the loop, set the original pitch, and set the sample loop play mode.
- Loop [F7] (shown above) - You can view the waveform and adjust the length by fractions as small as 1/64th of a sample.
- Name [F8] – Name the sample.

Creating an AWM Voice from scratch

Here we will outline the general steps in placing a **sampled loop** into a Voice. After recording the data, as above, return to Voice Mode by pressing [EXIT], then selecting [VOICE].

- Initialize a Voice by pressing [JOB] and selecting "1: Init Voice" and pressing [ENTER]
- The default Init Voice creates an initialized AWM Voice. Press [EDIT].
- Press [F2] Osc or Oscillator. Then select [F6] Wave.
- On the Oscillator Wave page you can select the Bank and Wave Number. Set the Bank to **RAM** and the wave number, as appropriate. Select wave number 0001 or the lowest number available. RAM is the user sample area, PRE is the Preset wave data, and FLS is the Flash Memory (if you have an EXFLM1 set installed).
- When you select the RAM Bank, the words [Wave-Edit] appear above [F3]. This is where you can create the element and designate its layering, key range, and mix. These edits do not effect the raw sampled data directly, only how it is used in this particular element. The same sampled data can be used and treated entirely differently in another Voice. Press [F3] Wave-Edit.
- Once you have entered Wave Edit you can press [F3] ADD to create space for the number of samples you are going to put into this element. Up to 128 waves can be added to an

element. You can then layer them and key zone them to perform as desired. Remember that only 2 waves can co-exist in the same velocity or key range (2 waves sharing the same range = stereo). If you are creating a mono element press ADD once. If you are going to create a stereo element press ADD twice. The Layer parameter will reflect the current wave and the total number of waves. Layer = 1 / 2 means there are a total of 2 waves in this element and you are currently set to edit layer 1. Layer = 2 / 2 means there are a total of 2 waves in this element and you are currently set to edit layer 2. Layer = 33 / 128 means there are a total of 128 waves in this element and you are currently set to edit layer 33. And so on.



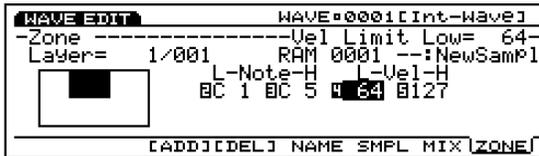
There are 4 wave-edit pages: Name, Sample, Mix and Zone.

NAME – set a name for this particular element layer

SMPL – Offset the sample start point, edit the total length of the loop, set the sample play mode to either no loop, forward loop, reverse no loop or special loop (remain in loop section until key-off then continue to wave end).

MIX – set the relative level of each component wave, its pan position, its tuning mode (fixed or ratio) and the coarse and fine-tuning.

ZONE – mapping to the keyboard. Set both velocity range and key zone.



The above mono sample is mapped to sound only when a key between C1 and C5 with a velocity of greater than 64 is played. The graphic at screen left indicates by the dark area the conditions under which this element will sound. When you have completed editing on this element level press [EXIT] to return to the normal Voice Edit level. It is not necessary to store edits on this element level – they are retained automatically. Samples can be saved to disk only when you have completed this WAVE EDIT procedure. Be sure to press [F5] and NAME your sample. This is the Name you will see when you attempt to reload this element from disk.

Bringing the sampled Voice up to 'ear level'

After having set the element level parameters, press [EXIT] to return to the Voice Edit level. You may notice that your sampled element is softer in volume than the average EX Voice. One of the benefits of all this new technology is its increased output and dynamic range. To bring your sample's output up to the level of other Voices, please use the Voice edit parameters. One great feature is **each** element can have its own filters. Among your voicing weapons are both SCF and DCF type filters. SCF is Static Control Filter and DCF is Dynamic Control Filter. There are 10 different selections in the SCF. One of the SCFs is a straight level boost. These boosts come in 6dB, 12dB and 18dB increments. Or you can use the Parametric Equalizer to help your sample in any deficient area. You can apply the SCF by selecting the Voice Edit parameter [F4] Filter then pressing [F4] SCF.

Additionally, you can use the DCF filter in the THRU position, as it has a straight gain control, as well. Select the appropriate boosting method to bring your sample up to "ear level". You can take advantage of the wealth of editing weapons available for an AWM sample.

Samples do not have to be placed into Voices; they can be used directly from RAM in an EX structure called a Key Map. If you are going to assign the sample directly to a Key Map be sure to optimize the waves output via the sample Normalize function and Mix parameters.

In a Key Map you **do not** have the advantages of the Voice level filters and envelopes, because you are accessing the sample directly from RAM (or FLS). You can adjust the mix volume of individual Pattern tracks from within the Performance to match the levels of your samples. You will find that the EX offers plenty of output level for you to balance your work.

To finish off your Voice be sure to name and store it to an Internal location and then back the data up by saving to disk. When you press the [STORE] button the EX will give you the opportunity to store it to the current Internal location or any other Internal location. Once you have placed your sample in a Voice you can then place this Voice in a multi-timbral Performance and you can trigger this sample with a single note-on event from a sequencer Song or Pattern track. A single EX Voice can hold hundreds of sample loops! In fact, the EX is powerful enough so that an individual AWM element can hold up to 128 sample loops!

Re-Sampling a AN Voice

Another great use of the Internal sampling feature is the creation of analog sounds that have huge polyphony. Let's walk through the steps for re-sampling an AN-type Voice.

- Press [SAMPLE]
- Press the [F8] REC button
- Select mono sample mode
- The EX will display the Length of sample time available in seconds and show you several bar graphs to indicate the level of incoming signal. Set the Source to Internal. When set to Internal sampling the Trigger can be either "Key" (note-on) or "Seq" (sequencer). Set the source to Key.
- If you are sampling Internal data the levels are set automatically. The bar graphs will disappear when Source = internal.
- Arm the sampler by pressing [F8] Standby. "Waiting..." appears in the screen.
- Play a single note
- When you have enough data press [F8] Stop, to end recording.
- Press [EXIT] once, leaving the sampling screen and entering the sample edit area. The EX screen will read "Processing Data" while it does some minor housekeeping.

Sequencing with the EX

The sequencer in the EX series is made up of three different types of recorders. The first is **SONG** mode – 1 Song, 16 linear tracks. Songs saved as Standard MIDI Files (SMF) can be played directly from diskette without the need to load each time. The second is **PATTERN** mode – 50 Patterns, 8 tracks, up to 16 measures in length. Each track can be any length (measure – beat – clock pulse). Clock resolution for all sequencer functions is 480 ppqn. Patterns can be placed in Songs, or assigned to individual keys in a Key Map. You can assign either a single track or an entire Pattern to a Key Map. The third sequencer function is a unique recorder called the **ARPEGGIATOR** – 50 Preset and 50 User arpeggios, up to 4 simultaneous tracks. More than just a complex note recorder, the EX arpeggiator can record control change and pitch bend messages. For example, you can record an arpeggiation that is a control change track - Control Change #74 (filter brightness). Record the filter opening over 4 measures. This data track becomes the "arpeggiation" - and can be applied to any sound by activating the arpeggiator. (See the Owner's Manual for more details on the Arpeggiator.

All three types of Sequencer functions feature both real time and step record. All sequencer tracks can be non-destructively adjusted via the Play Effects (PFX). These Play Effects have special quantization grids (Groove Templates) that can alter the 'feel and attitude' of all or any individual tracks. You can change the timing, the velocity and the duration (gate time) of played notes. In Pattern mode, PFX can change the length of playback of each to the tracks. This means that each track could be of a different, length making for great non-repeating patterns. Complete event editing is available in all sequencer functions.

A Song track can be freely assigned to either to single Voice or to a Voice within a 16 Part multi-timbral structure called a Performance. Each track 1-16 defaults to Parts 1-16, however, you are free to reassign Parts to any track, as necessary. Similarly, Pattern tracks can be assigned, via Transmit Channel, to any of the 16 Parts of a Performance. The

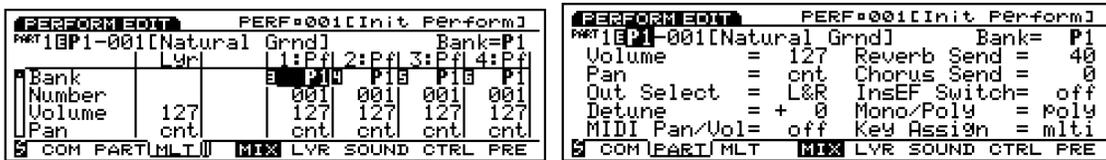
arpeggiator data can be linked to any Voice and can be zoned to a particular portion of the keyboard. Arpeggios can be activated for a specific Part of a Performance.

Creating a multi-timbral Performance

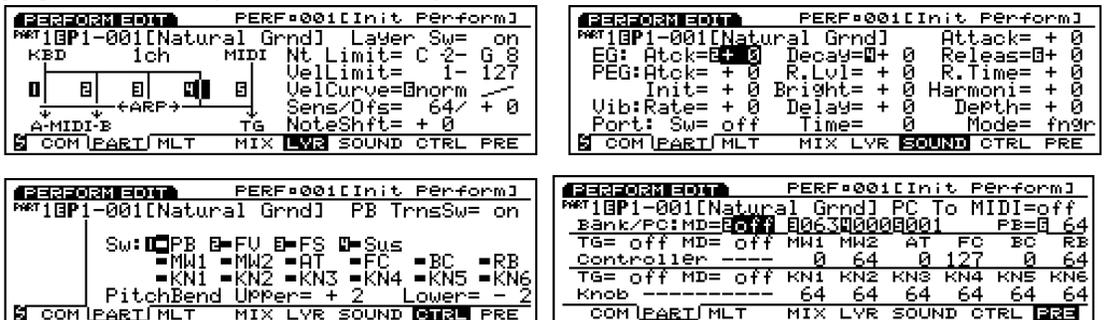
A key to using the sequencer is the setup of a multi-timbral Performance. This requires some planning and thought about what you are trying to accomplish. Because of the multiple synth engine technologies, there are some restrictions as to what Voices can co-exist in a Performance. It is a good idea to start to plan your production by selecting the individual Voices that you want to use while in Voice mode. Make note of the Voices location, and the type of technology used in that Voice. Treat the DSP-based Voices (AN, VL and FDSP) as specialty Voices. Only one DSP-based Voice can be used at a time in a Performance. The EX Performance (multi-timbral) mode can support **either** 16 AWM Voices or 15 AWM Voices + 1 DSP-based Voice. You **cannot** have more than one DSP Voice at a time. Why? COMPUTING POWER. The DSP based Voices use a tremendous amount of chip muscle to recreate there sound – remember VL and AN are not based on samples – they are generated in real time by the DSP.

What if I want to use an AN-type bass line with a VL-type saxophone solo in the same Song?

Is this possible? No, that said, here's what you can do. The EX's have the ability to sample. You can, for example, re-sample the AN Voice making an AWM version of the sound, or you can sample your bass line in its entirety from the sequencer. By making a RAM sample version of the bass line, you can trigger that from a single note in a Pattern or Song track. Of course, if you are working with an external Multi-track Recorder (MTR) you can link the EX sequencer to it via MIDI Time Code (MTC) and MIDI Machine Control (MMC).

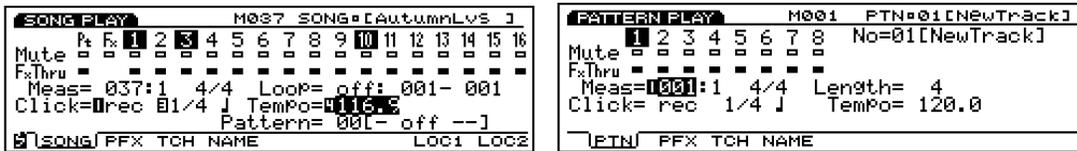


The screen shot on the left shows a typical Initial Performance viewing the first 4 Parts in columns. You can view Parts 5-10 and 11-16 by pressing [F3] or cursor to the right. The small inverse video numbers indicate the knobs that will directly edit these parameters. You can cursor down the list of available parameters which are divided into 5 areas: Mix, Lyr (layer), Sound, Ctrl (controllers), Pre (data pre-setter). That's some 75 parameters in all. The small vertical slide indicator (familiar to those that use word processors) at the left of the screen indicates where on the list you are located currently. You can quickly locate to a particular section via the soft Function keys [F4] – [F8]. Or you can look at an overview screen for each of the five sections (Mix overview shown in the screen shot to the right above) by selecting [F2] Part and the particular section you want to view.



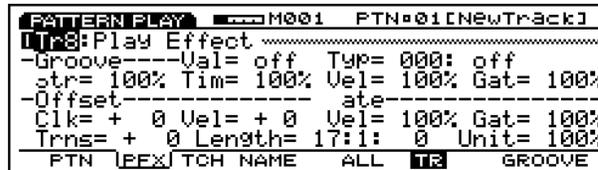
Select a few Parts to get yourself started. You can always change and update your Performance as your creative process flows. Store the Performance. Press [STORE]→[ENTER]. You can now select either Song mode or Pattern mode. If you like to work in a linear fashion, like using a tape recorder, select Song mode. If you prefer to work in sections, or with loops

select Pattern mode.



Song Play screen (at left) shows 16 linear tracks plus a Pattern control track (Pt) and a Play Effects (Fx) track to record real-time groove changes to the assigned Patterns. A track number in a black box signifies that data is recorded on that track. You assign what Part of the Performance they play under [F3] Tch or transmit channel – the default is for track 1 = Part 1, track 2 = Part 2, etc. Each track has a Mute and an Fx Thru (Play Effect bypass). A clear box means you will hear the track or the play effect. A black box is bypassed. Notice all the Play Effects are normally bypassed.

Pattern Play screen (at right) shows the 8 Pattern tracks. Patterns can have a maximum length of 16 measures. You assign what Part of the Performance they play under [F3] Tch or transmit channel. The Length of each track can be independently set. This is handled as part of the Play Effect [PFX] F2 screen.



The screen above shows Track 8. The Length of this track is set to the maximum of 16 bars. The Length parameter reads 17 measures, 1 beat, 0 clock pulses. Interpret this as meaning the 17th measure, very first beat and clock pulse will be the top, again. Each track can be made to repeat any amount of measures, beats and/or clock pulses up to the maximum (shown above). This means it is possible to have parallel tracks constantly changing against each other.

Quantization: Play Effects allow the user to non-destructively play tracks back through different quantization grids, called Groove Templates. There are 100 Groove Templates selected on line 2 of the above screen. "Typ" selects the templates and "Val" shows you the smallest note value allowed by the grid. You can change the feel and attitude of a track with the templates by varying the timing, velocity and gate time (duration). You can even create your own quantization grid.

Editing a Voice in a Performance: Performance + Voice

Often during Song creation or sound designing you may find the need to edit an individual Voice within a Performance. You can accomplish this by pressing [VOICE] while holding [PERFORMANCE]

[PERFORMANCE] + [VOICE]

Now when you press the [EDIT] button you enter the edit buffer of the Part indicated in the lower left of the screen. Changes you make take place at the Voice level and when you store you will be storing to the Voice itself. Alternatively, you can edit each Layer from within the Performance using the more than 70 parameters



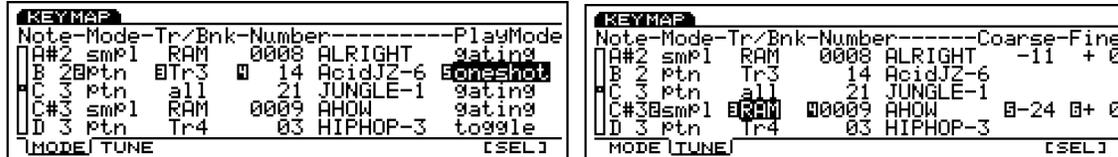
in Performance edit.

Key Map

The Key Map is special mode on the EX series where you can place phrases on the individual keys of the keyboard or controller (EX5R). These phrases can be from 1 of 3 sources:

- 1) a single Pattern track
- 2) an entire 8 Track Pattern
- 3) sample data directly from RAM (SIMMs) or FLS Flash Memory (optional EXFLM1)

The ability to include sequencer tracks and sample loops together allows the performer to do real time mixes "on-the-fly". A Key Map is best referenced to a multi-timbral Performance. To get a feel for the Key Map it is recommended that you load EX demo diskette #2; Select the DemoPerf located at A01; Press Key Map to activate the assignment. You will see information similar to the screen below:



The screen shot at left show a typical Key Map mode setup. By holding [F8] Sel (or Select) and striking your keyboard you can instantly have that notes information come to the screen. Each **Note** is assigned a **Mode**; either "smpl" (sample) or "ptn" (pattern). The **Tr/Bnk** (or Track/Bank) settings are next. The Track setting can be an individual track or all tracks of a particular Pattern. The Bank setting can be "RAM" for samples directly from the SIMMs, or "FLS" (Flash Memory EXFLM1) if the optional boards are installed. **Number** refers to the particular sample or Pattern. There can be 1024 samples resident in the EX and 50 Patterns. The **Play Mode** can be gating, one shot, or toggle. Gating will stop the moment you raise your finger. One shot will play the entire sample from just a touch of the key (no need to hold the note down). This is great when triggering from drum pads, for example. Toggle will play until the note is played and released again.

The Tune screen shot at right illustrates how each sample can be tuned for proper playback no matter what the original pitch of the sample.

Master MIDI Controller EX5/EX7

Each EX Performance can independently function as a Master Controller setup. Each one of the 128 locations is capable of recalling up to 16 specially edited internal Sounds and simultaneously recall, edit and control 16 external Parts. Each Performance has a data Preset area where you can send Bank select/ Program changes, controller setup data concerning all your physical control devices, etc.



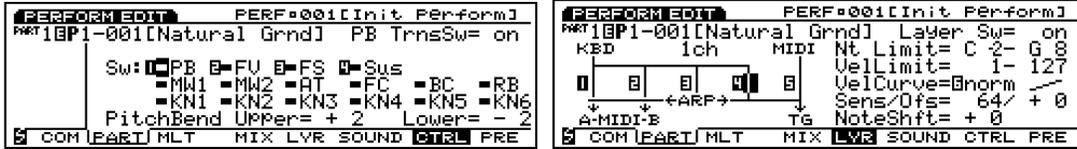
The screen above shows the data Preset page.

PC to MIDI – makes Bank select/program change active/inactive OUT via MIDI

PB – sets the pitch bend value. 64 equals pitch wheel centered.

TG – refers to the EX's internal tone generator. MD is OUT via MIDI

All values are minimum to maximum (0-127). A value of 64 is centered. It is possible to preset the position of the Mod wheels, aftertouch, foot controller, Breath Controller, ribbon controller and the 6 EX knobs. You can customize what parameters these controllers control in your external module. It is possible to handle a huge MIDI system all from the front panel of the EX. You can instant send this data when a Performance is recalled or you can send this data at any time. Hold [SHIFT] + [ENTER] to send data from this page OUT via MIDI.



It is a simple matter to activate or de-activate a controller for a Part. A dark box is active. See screen at left. The screen on right shows the KBD (keyboard) connected to MIDI A OUT, MIDI B OUT, is transmitting to the ARP (arpeggiator) and is connected internally. You can designate MIDI channel, high and low note and velocity limits, a velocity curve and note transposition per zone. There are 16 MIDI zones.

Setting up a VL type Voice for Breath Control

You can set the EX Breath Controller Assign parameter, globally.

[UTILITY] → 5: Controller → set Breath Controller Assign

You can select Breath Control, Velocity or Touch EG. To use the Breath Control setting you must have a BC1, BC2 or BC3 unit plugged into the Breath Control jack, or a WX Wind Controller with appropriate MIDI Out. A Velocity setting will make the VL Voices that are programmed for Breath Control respond, instead, to Velocity. (If, however, the VL Voice is programmed originally to respond to Velocity, you will need to “re-map” the controller settings (see below). Touch EG uses the velocity of the note-on to start then ‘transfers’ control of Pressure to aftertouch. You can manipulate the flow of air (in a piped instrument) or the speed of the bow (in a bowed string model) with aftertouch (downward pressure on the key).

In general, if you wish to use the Yamaha BC3 to control the VL Voices, set the Breath Controller Assign parameter to Breath Control, as described above. Then reprogram the individual VL Voice by re-mapping the controllers. This can be done manually or you can simply press the [REMAP] function on the Controller Set page. This will set up the basic VL parameters, i.e., Pressure, Embouchure, etc. for BC.



The screen at left above shows the Shakuhachi Voice where Vel (VL) signifies that this Voice has been programmed to be playable via standard Velocity control. The screen to the right shows the Voice after performing the [REMAP] function. VL Pressure is under control of BC. Take note of the Element ON parameter and the Depth = +32. BC can be turned on for some elements and not others, and each controller’s depth can be programmed. When depth = 0 there is no effect. The Remap function programs the bare minimum of controls for VL breath control. Please experiment with the assignment of other parameters.