YAMAHA

Memory Management for the DX7s

DX7 II·FD/D

DIGITAL PROGRAMMABLE ALGORITHM SYNTHESIZER

SUPPLEMENTAL BOOKLET

Welcome

The purpose of this guide is twofold. First, to supplement the information provided in the DX7s Owner's Manual. Second, to provide a starting point for your own experimentation. By reading through this booklet and trying the step-by-step examples, you will gain a clear understanding of the memory management operations of the DX7s synthesizer.

Section 1 is an introduction to the DX7s and its edit mode.

Section 2 provides an overview of the types of data that the DX7s uses for its various effects.

Section 3 shows the various paths along which data can be moved.

Section 4 describes the various types of media in which data can be stored.

Section 5 explains how to store and move data within the DX7s.

Section 6 consists of a blank voice and performance data sheet and an init voice and performance data sheet.

The DX7s synthesizer includes many new features that enhance the already familiar DX sound and make this keyboard an integral component in any MIDI system.

For continuing information concerning the DX7s, consult AfterTouch, the official publication of the Yamaha Users Group. Many advanced functions will be discussed in its pages in the coming months. There will also be information regarding the availability of other materials concerning more advanced applications. To receive a free copy of AfterTouch every month, send your request to AfterTouch, P.O. Box 7938, Northridge, CA 91327-7938. On your letter or postcard, be sure to indicate that you are the owner of a DX7s.

Contents

1 Introduction

Several new parameters have been added to the DX7s that open a whole new world of sonic and performance possibilities. Once you have created a Voice or Performance memory, the DX7s offers many flexible options for storing, retrieving, and manipulating data. This booklet will explain how to use the appropriate functions.

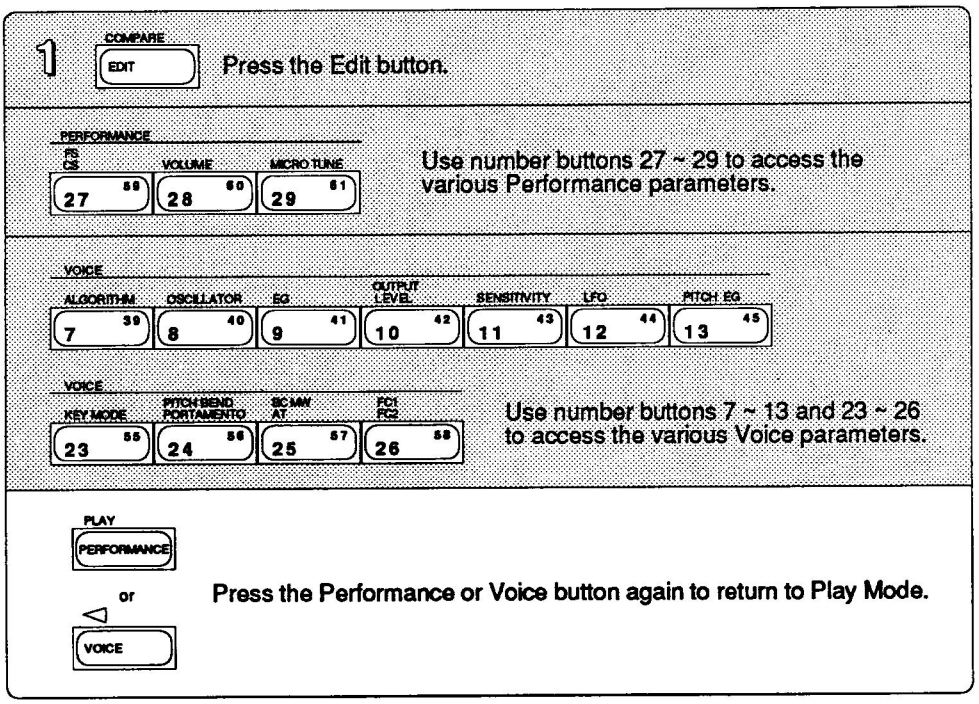
Introduction

If you are already familiar with FM voicing, you'll notice several new parameters on the DX7s. If this is your first experience with FM synthesis, take an existing Voice or Performance memory and begin experimenting with the parameters described in the following sections.

As this booklet deals specifically with DX7s memory management, you will not find definitions for most of the Voice and Performance parameters. For more detailed definitions and examples of these features, refer to other Supplement Booklets for the DX7 II synthesizers. These are available on the following topics:

- Fractional scaling
- Microtuning
- FM voicing
- Real time parameter change
- Controller usage
- MIDI applications

Before trying any of the examples in this booklet, you must enter the Edit Mode as explained below.



There is a distinction between editing Performance parameters and editing Voice parameters that you may want to be aware of. In certain cases (such as using Compare), you may not retain all your edits. It is a good idea to edit Performance and Voice data separately. In any case, the two types of data must be stored separately (using two different Store functions).

2 Data Descriptions

This section of the guide describe the various memory types available in the DX7s. These include: Voice, Performance, Fractional Scaling, Microtuning, System Setup, Current Play/Edit, Compare/Recall and Initialize memories.

Voice Data

Voice data on the DX7s is divided into two main categories: Basic Voice data and Voice Effect data. New parameters available in the basic voice data include:

- Pitch EG Range
- Pitch EG Velocity
- Fractional Scaling
- LFO Mode

New parameters available in the voice effect data include:

- Key Mode
- Unison Detune
- Pitch Bend
- Portamento
- Random Pitch
- Breath Control
- Aftertouch
- Mod Wheel
- Foot Control (FC1 and FC2)
- MIDI In Control

Performance Data

In additional to the original FM voice parameters and the new voice parameters listed above, the DX7s models offer another type of memory called Performance Memory. A Performance memory allows you to recall voice combinations and other performance-related functions at the touch of a single button. Performance Memory parameters include:

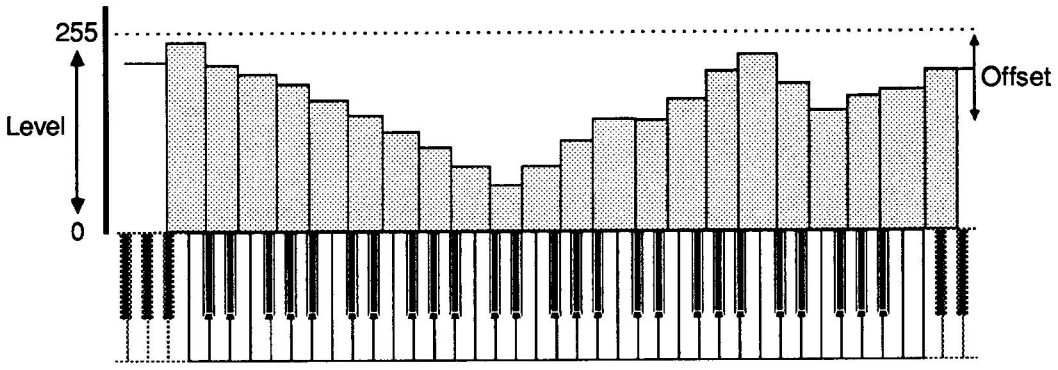
Parameter	Range
• Total Volume	Performance volume (0~99)
• Foot switch (FS)	Sustain, Portamento, Key hold, Soft
• Continuous Sliders (CS1 and CS2)	Select
• Microtuning Table	Select
• Note Shift	± 24 semitones
• EG Forced Damp	On/Off
• Performance Name	10 characters

A blank voice and performance parameter chart has been included in the back of this booklet. Photocopy the chart and use it to keep track of your favorite voice and performance memories.

Fractional Scaling Data

On the original DX7, Level Scaling allowed for changes in timbre or volume across the keyboard. It offered a choice of level-scaling curves and variable depth.

The DX7s provides a much more flexible method of level scaling called Fractional Scaling. Using Fractional Scaling, the output level of each individual operator can be varied in 3-key groups, so that you can create virtually any level or timbre curve. The accompanying diagram illustrates this feature's effect.



Each bar in the above diagram represents an operator output value for a 3-key group. For example, you may want to set the output level of operator 6 to 62 in the range from C#3 to D#3. From E3 to F#3 the same operator's output level may equal 87.

This may be set individually for each of six operators. A lot of memory is necessary to store all of these values. Therefore, the Fractional Scaling data for a voice must be stored separately from the voice itself. You will learn how to store these values so they may be accessed when you select a particular voice. For now, just remember that even though this data is selected (recalled) along with a specific voice, it is stored separately from the voice data.

Microtuning Data

The DX7s provides 11 preset Microtuning scales. These are always available because they are permanently stored in the DX7s memory.

Additionally, the DX7s allows you to create your own microtuning scales. Consult the appropriate Supplement Booklets for detailed instructions on how to do this.

Once you have created a scale, you may store it in one of two User Programmed scale locations in the DX7s Internal Memory. If you want to create more than two scales, these may be stored on a RAM4 cartridge. The microtune function will allow you to access additional scales from a cartridge. Step-by-step instructions for storing and accessing additional microtuning scales will be described later in this booklet.

System Setup Data

Beside voice and performance data, the DX7s provides a way to store specific MIDI settings and other "system setup" data. This data includes settings for the following functions:

- Master Tuning
- Cartridge Bank number
- MIDI transmission channel
- MIDI reception channel
- Note On/Off mode
- Local On/Off function
- Control number
- Program Change transmit mode
- Program Change table

When you move a block of voice and performance data to or from a cartridge, you can choose whether or not system data will be moved as well. Loading the system data along with the voice and performance data is useful if you transfer your voices to other DX7's or frequently change system setup data. However, you have the option of saving and loading voice and performance data without the system if these functions aren't often changed.

Current Play/Edit Memory

When you select a Voice from the Internal memory or from a Cartridge, the DX7s actually creates a copy of it in the current Play/Edit area of memory. You may then play or edit the voice as you desire. This memory is a temporary holding place, or buffer, for a single voice. Selecting a different voice will replace the old voice. To make any changes permanent, you must store the contents of this buffer back to either Internal or Cartridge memory.

This also applies to an edited Microtuning scale or Performance memory.

Compare/Recall Memory

When you edit a voice or performance, a copy of the original is also stored in this memory. This allows you to access the original unedited version, making it available for immediate comparison with the edited version.

Initialize Voice/Performance Memory

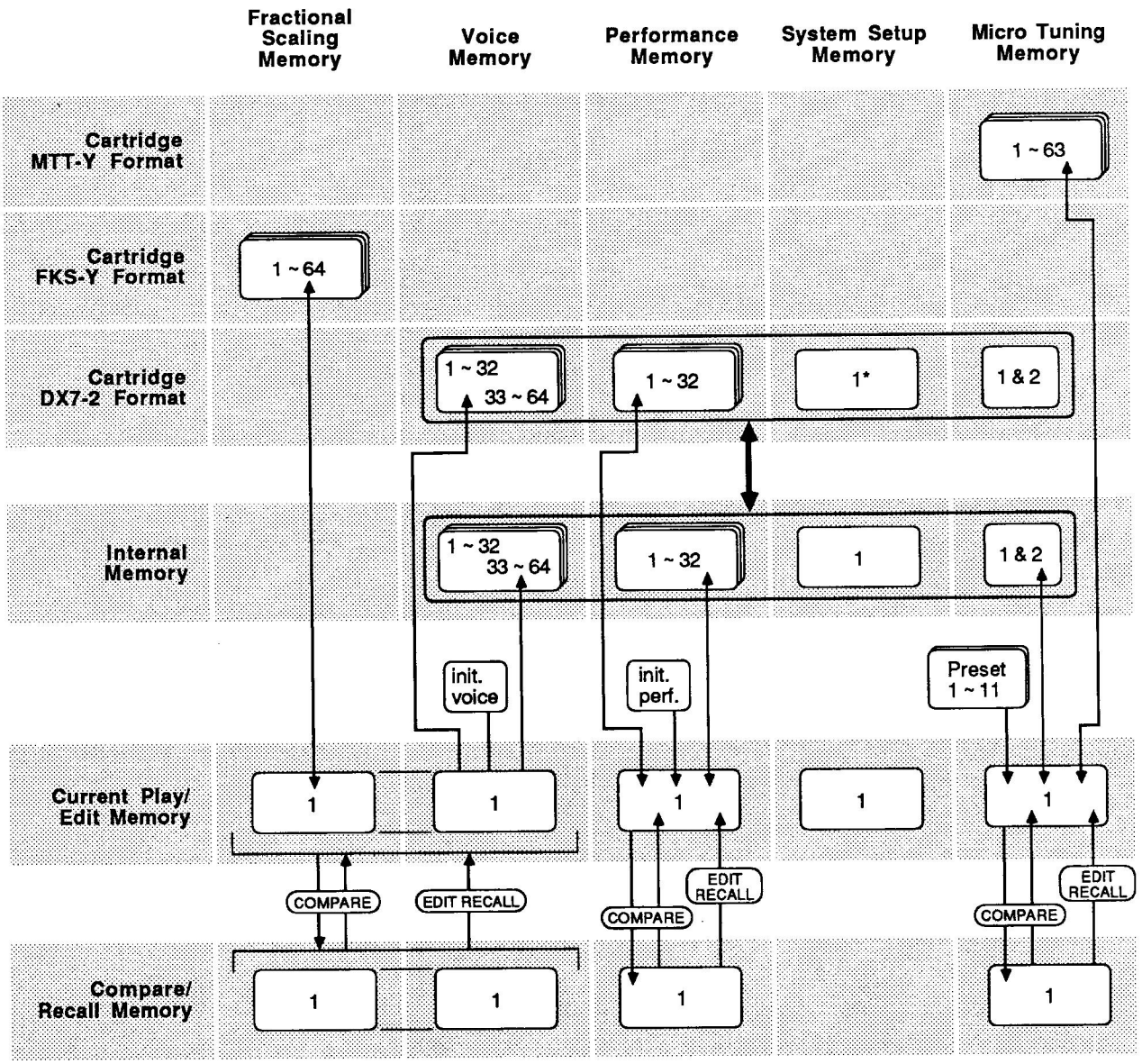
The initialize function provides a "clean slate" from which to begin creating your own voice or performance. A chart available in the back of this booklet displays the default values for an initialized voice or performance.

3 Memory Layout

The memory of the DX7s has many facets. This section is designed to help you see these facets as parts of a unified whole.

Memory Layout

The Memory Layout diagram below is also available on page 64 of your DX7s Owner's Manual. Notice that the page is divided into rows (left to right) and columns (up and down).



* If desired, system setup data may not be transferred.

The rows contain two types of storage media: Cartridge, and Internal (RAM) memory. These are described in detail later in this booklet.

Complete descriptions of the memory types listed below are provided earlier in this booklet. Notice that these memory types interact with other sections of the Memory Layout diagram.

- Fractional Scaling memory
- Voice memory
- Performance memory
- System Setup memory
- Micro Tuning memory
- Current Play/Edit memory
- Compare/Recall memory
- Initialized memory

In the Memory Layout diagram, the dark vertical arrow indicates how a "block" of memory is moved between media types, while thin arrows indicate how single voices, performances, fractional scaling tables, or microtuning scales are moved.

For example, look at the Fractional Scaling Memory column. The arrow indicates that Fractional Scaling data may be moved between a Cartridge and the Current Play/Edit Memory. The arrow is double-headed, indicating that this data may be moved in either direction (from Cartridge to Current Play as well as from Current Play to Cartridge).

Next, look at the Cartridge row. Notice the box around Voice, Performance, and System Setup memories. This means that these memory areas are moved together. You may move this block of memory in either direction between a cartridge and internal memory. This block of memory always contains the following data:

- 64 voices
- 32 performances
- 2 user microtuning scales
- System setup data (at your option)

Now, look at the Internal Memory row. The box in the Microtuning Memory column refers to the user microtuning scales 1 and 2. These are connected to, and therefore are moved along with, the Voice, Performance, and System Setup memories.

Current Play/Edit Memory and Compare/Recall Memory may contain data for one voice, one performance, and one microtuning scale. These special memories allow you to compare a voice, performance, or scale that is currently being edited with the original unedited voice, performance, or scale.

Fractional scaling data moves into these memory buffers along with the voice to which it belongs. This means that when you use the compare function with a fractionally scaled voice, you will hear the fractional scaling for both the edited and original versions of the voice. In other words, the edit recall voice "carries along" the associated fractional scaling data.

The two small boxes in the middle of the page indicate the initialize voice and initialize performance functions. Notice that these functions initialize the voice or performance in Current Play/Edit memory. This lets you begin programming a voice or performance from scratch. After you finish programming, you need to store the voice or performance in the Internal Memory or on a RAM cartridge if you wish to keep it for later use.

To summarize, when referring to the Memory Layout diagram, the thickness and direction of the arrows help illustrate how much and what type of memory is being moved.

4 Types of Media

The DX7s allows you to store or recall data from a variety of media. These include: Internal Memory, RAM Cartridges, and ROM Cartridges.

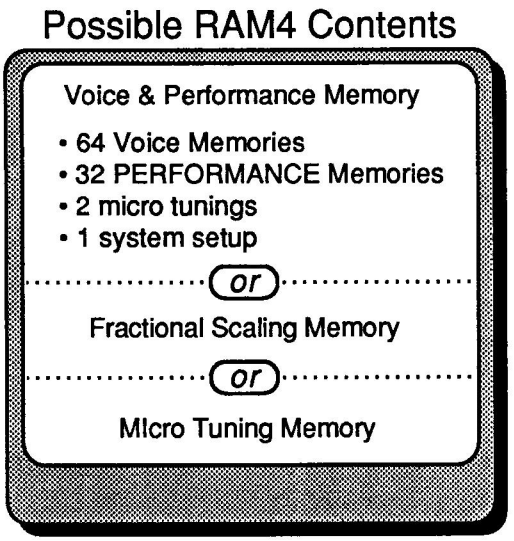
Internal Memory

Cartridges

RAM4 Cartridges

You may store 64 voices, 32 performance memories, two user-defined microtuning scales, and one system setup in the DX7s Internal Memory. Data is preserved in the Internal Memory even when the DX7s is turned off.

There are two types of cartridges for the DX synthesizers, ROM and RAM. A ROM (Read-Only Memory) cartridge is loaded with data from the factory. This data is "burned into memory" and cannot be changed. A RAM cartridge allows you to store your own data.

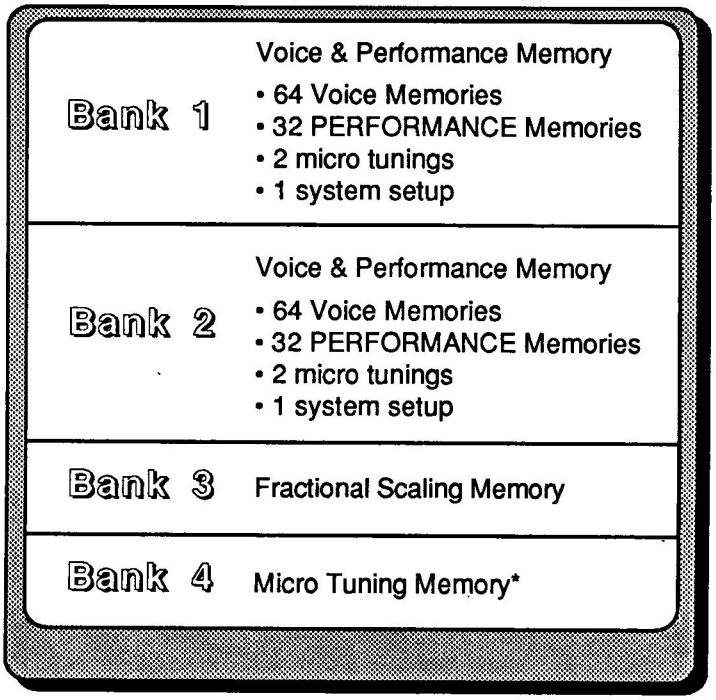


A RAM4 cartridge formatted for voice and performance data (DX7-2) may store 64 voices, 32 performance memories, two user-defined micro tuning scales, and one system setup.

A RAM4 cartridge formatted for fractional scaling data (FKS-Y) may store fractional scaling data for 64 internal voices. When a fractionally-scaled voice is selected from internal memory the DX7s looks to the cartridge for the corresponding fractional data. For example, you select Internal voice #32 (Piano Brite). This voice will look to memory #32 in the cartridge for its Fractional Data. As mentioned earlier, this is necessary because fractional scaling data requires a lot of memory.

A RAM4 cartridge formatted for microtuning data (MTT-Y) may store up to 63 microtuning scales. These may be accessed directly from cartridge, or you may load a microtuning scale into one of the user scale locations in the DX7s Internal Memory.

Contents of Supplied ROM Cartridge



* may be unformatted

A DX7s ROM cartridge contains four banks of data. The table below describes the four banks of data contained in the ROM cartridge that was shipped with your DX7s.

BANK 1: 64 voices, 32 performance memories, two user-defined microtuning scales, and one system setup.

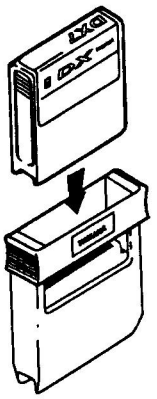
BANK 2: 64 voices, 32 performance memories, two user-defined microtuning scales, and one system setup.

BANK 3: Fractional scaling data for Bank 1 voices and performances.

BANK 4: Although this bank is intended for microtuning data, the ROM cartridge shipped with your DX7s may contain unformatted material in Bank 4.

RAM1 Cartridges

You may use a RAM1 cartridge in the DX7s. First, insert the RAM1 cartridge into an ADP1 cartridge adapter. Next, plug the adapter into the cartridge slot on the DX. See the illustration below.



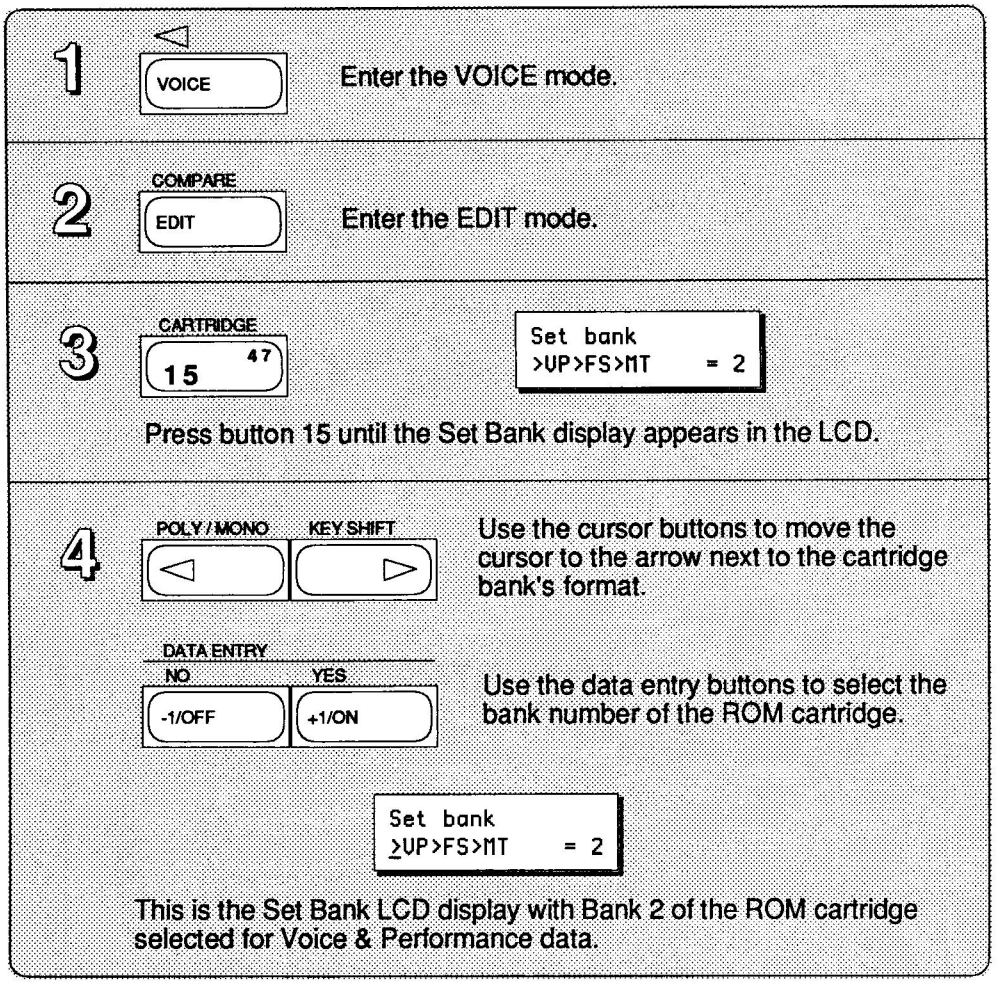
A RAM1 cartridge cannot be reformatted or written to when used in the DX7s. You can only recall the voice data stored on it.

5 Memory Functions

This section describes various functions for dealing with the types of memory media described in the previous section.

Selecting ROM Cartridge Banks

As mentioned earlier, a ROM cartridge may contain up to four banks of data. These may include Voice and Performance data, Fractional Scaling data, or Microtuning data. Follow the steps below to access and select a specific bank in a DX7s ROM cartridge.



Your DX7s was shipped from the factory with Bank 1 Voice and Performance data in Internal Memory. To use the other set of 64 voices and 32 performances on the cartridge, select Bank 2 Voice and Performance (see above). Now, when you select CRT voices, you will have access to a completely different set of voices and performances. With Bank 1 data in Internal Memory and Bank 2 accesible via cartridge, you have immediate access to 128 voices and 64 performances in real time.

Memory Protect

The Memory Protect feature will help you avoid overwriting, and thereby losing, valuable data. The DX7s provides a software based method of turning Internal or RAM cartridge memory protection on or off. RAM cartridges have an additional hardware switch that may also be used to protect valuable data. Before moving or storing data you must first turn the memory protect features off.

Follow the steps below to access and change the software memory protect function for either Internal or Cartridge Memory.

1. COMPARE / EDIT — Press the Edit button.
2. TUNE / 14 — Press the Tune button (#14) to access the Internal Protect display.

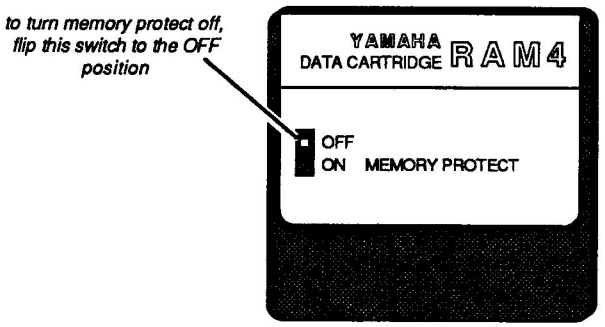
```
Utility edit
INT protect :on
```

3. NO / -1/OFF — Press the -1/NO button to turn the INT Memory Protect off.
4. TUNE / 14 — Press the Tune button (#14) once more to access the Cartridge Protect display.

```
Utility edit
CRT protect :on
```

5. NO / -1/OFF — Press the -1/NO button to turn the CRT Memory Protect off.

The diagram below shows the location of the hardware memory protect switch on RAM cartridges. This switch must also be turned off before you can store data on a cartridge.



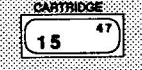
Formatting RAM4 Cartridges

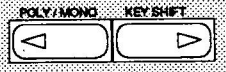
Before you can begin to use a RAM4 cartridge, you must first format it for the type of data you wish to store. You may format a cartridge for one of three types of data: Voice and Performance, Fractional Scaling, or Microtuning. The format type (see below) will be displayed in the LCD.

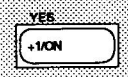
Format Type	Description
• DX7-2	DX7s Voice and Performance data -includes System Setup and 2 User Microtunings
• FKS-Y	Fractional Keyboard Scaling data
• MTT-Y	Microtuning data

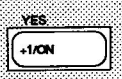
Follow the steps below to format a cartridge for a specific type of data.

1. Insert an unformatted RAM cartridge in the cartridge port.
2. 

Press the Edit button.
3. 

Press the Cartridge button (#15) until you access the Format Cartridge LCD.
4. 

Use the Poly/Mono and Key Shift buttons as left and right cursors to select the type of formatting you desire.
5. 

Press the +1/YES button. The LCD display will ask "Are you sure?"
6. 

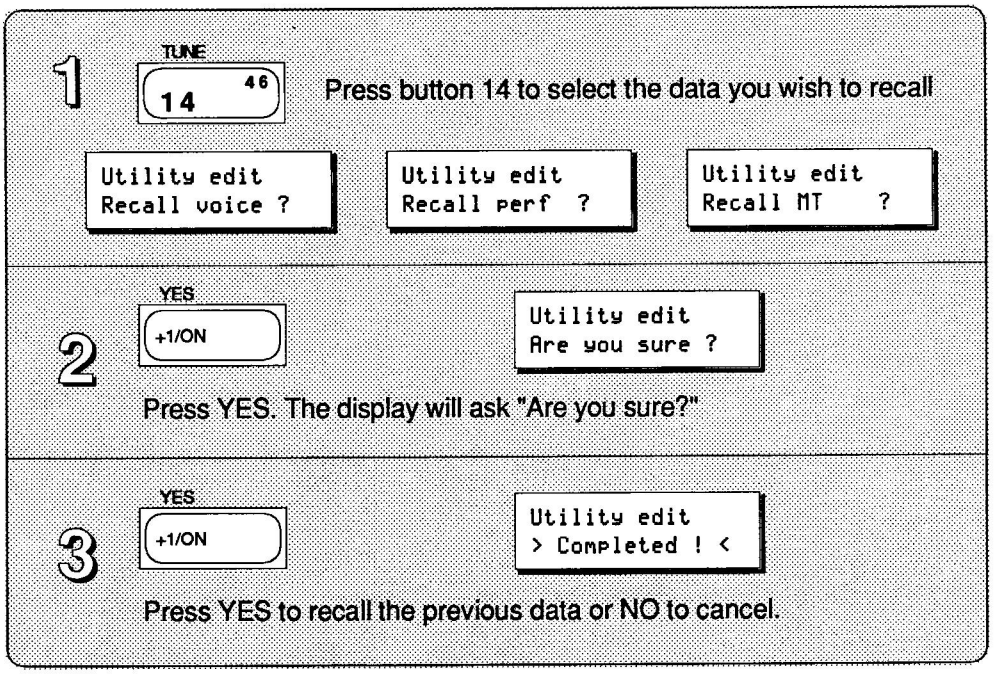
Press the +1/YES button once more.

Edit Recall Function

While in the play mode, you may wish to restore a voice you were editing but hadn't yet stored. You may recall the last edited Voice, Performance, or Microtuning scale using the Edit Recall function.

For example, you finish editing a voice and return to the play mode. Before storing the voice, you select several different voices and wish to compare each with the edited version. At any time you may use the Edit Recall function to bring back the edited voice, currently in the Compare/Recall buffer, for comparison.

Simply follow the steps below to use the Edit Recall function.



Storing a Voice or Performance

Once you have created or edited a voice or performance you may store it in either Internal or Cartridge memory. This allows you to permanently save a voice or performance and expand your library.

The steps below explain how to save a voice or performance. However, you must first turn the Memory Protect function off. Refer to the section on the Memory Protect features for instructions on how to do this.

Storing Performance Data

1	PLAY PERFORMANCE	Press the Performance button.
2	EG COPY STORE	Press and hold the Store button.
3	INT/CRT	Press the INT/CRT button to select the storage area for your edited Performance data. NOTE: If you wish to save the Performance data to a RAM cartridge, make sure that a properly formatted cartridge (DX7-2) is installed in the cartridge port.
4	1 33 ~ 32 64	While holding the Store button, use the number buttons to select the memory location for your edited Performance data. The LCD will echo your choice.
5	YES +1/ON	While still holding the Store button, press the +1/YES button.

Storing Voice Data

1	VOICE	Press the Voice button.
2	EG COPY STORE	Press and hold the Store button.
3	INT/CRT	Press the INT/CRT button to select the storage area for your edited Voice data. NOTE: If you wish to save the Voice data to a RAM cartridge, make sure that a properly formatted cartridge (DX7-2) is installed in the cartridge port.
4	1 33 ~ 32 64	While holding the Store button, use the number buttons to select the memory location for your edited Voice data. The LCD will echo your choice.
5	YES +1/ON	While still holding the Store button, press the +1/YES button.

Moving a ROM Voice or Performance

Follow the steps below to move a Voice or Performance from a ROM cartridge to Internal memory or a RAM4 cartridge.

Note:

If the Performance includes CRT Voices, then these voices must also be moved to the Internal or RAM4 Cartridge memory. Additionally, if the voices are moved to the Internal memory, you must change the Performance to call the appropriate INT Voices.

Insert a ROM cartridge into the cartridge slot. Select Bank 1 or 2 for Voice and Performance data then...

1 Select a non-fractionally scaled voice or performance.

2 Replace the ROM cartridge with a RAM4 cartridge.

3 EG COPY / STORE

```
Voice
Store memory I ?
```

Hold down the Store button while...

4 INT/CRT

1 (33) ~ 32 (64)

```
Voice
Store memory I14
```

...selecting an Internal or Cartridge memory.

5 YES / +1/ON

```
Voice
> Completed ! <
```

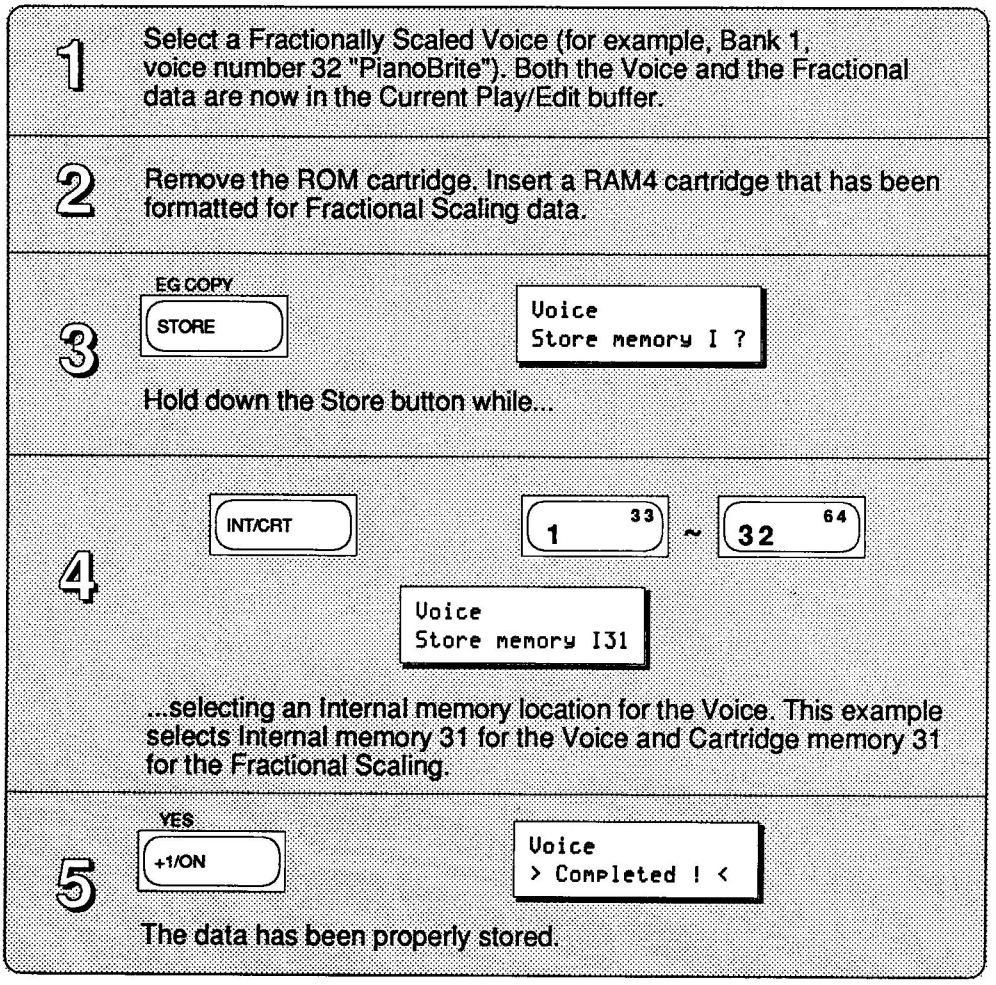
The data has been properly stored.

Moving Fractional Scaling Data

As mentioned earlier, Fractional Scaling data is stored on a cartridge separately from a voice. When you select a voice, the DX7s looks to the inserted cartridge to find the required fractional scaling data. For more detailed information about this subject consult the appropriate Supplement Booklet.

Before moving a fractional scaling data from a ROM to a RAM cartridge, you must first store the voice to Internal Memory. Then, you must also store the fractional data to a RAM cartridge. The diagram below explains how to do this.

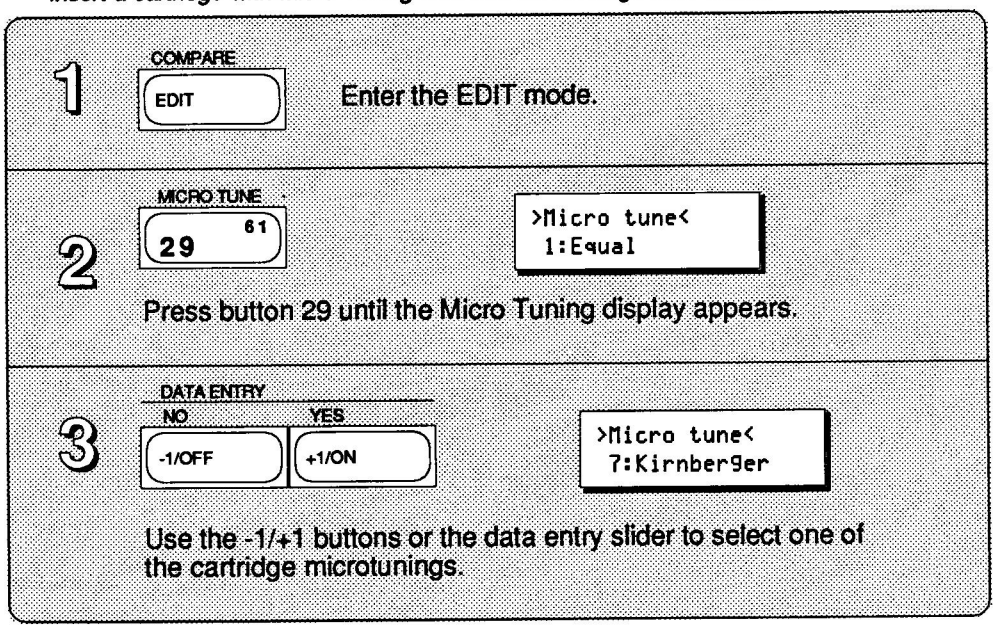
Insert a ROM cartridge into the cartridge slot. Select Bank 3 for Fractional Scaling data. Select Bank 1 or 2 for Voice and Performance data. Then...



Accessing a Cartridge Microtuning Scale

You may access a microtuning scale from a properly formatted RAM4 cartridge by following the steps below.

Insert a cartridge with Micro Tuning data into the cartridge slot. Then...

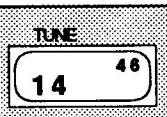


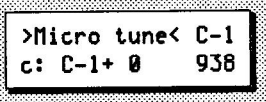
Storing a Cartridge Microtuning Scale

Follow the steps below to load a cartridge microtuning scale into one of the two internal user microtuning scale locations.

Select a micro tuning scale from the cartridge. Make sure INT Memory Protect is off. Then...

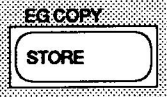
1

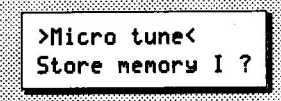




Press button 14 until you enter the Micro Tuning edit mode.

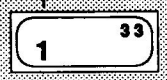
2



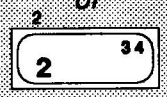


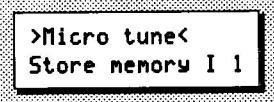
Hold down the Store button. If the display reads Cartridge, press the INT/CRT button before proceeding.

3



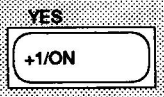
or

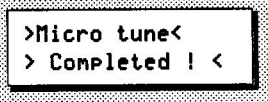




While holding the Store button, press either button 1 or 2 for storing the Micro Tuning to one of the 2 Internal Micro Tuning memories.

4





The Cartridge scale is now stored in Internal memory. Release the Store button.

6

Data Charts

The following blank data chart is useful for keeping track of your favorite voices and performances. The init memory chart displays the contents of the Current Edit/Play buffer after using the Voice and Performance Init functions.

DX7s

Voice name :
Date : / /

1 39 ALGORITHM	
Algorithm	
Feedback	
Osc key sync	
Transpose	
12 44 L F O	
Wave	
Speed	
Delay	
Mode	
Pmed sons +1 +2	
PM depth	
AM depth	
Key sync	
13 45 Pitch E G	
Range	
Velocity	
Scaling	
R1	
R2	
R3	
R4	
L1	
L2	
L3	
L4	

OSCILLATOR	OP	1	2	3	4	5	6
Mode							
Coarse•Fine							
Detune							
9 41 E G	OP	1	2	3	4	5	6
Rate Scaling							
R1							
R2							
R3							
R4							
L1							
L2							
L3							
L4							
Output Level	OP	1	2	3	4	5	6
Scaling mode							
Output level							
Break point							
L-curve							
R-curve							
L-depth							
R-depth							
11 Sensitivity	OP	1	2	3	4	5	6
Key velocity							
A mod sens							

23 55 Key mode	
Key mode	
Unison detune	
24 56 Pitch bend	
PBmode	
Range	
.Step	
24 56 Portamento	
Mode	
Time	
Step	
Random pitch	
25 57 Modulation wheel	
PM depth	
AM depth	
EG-bias	
25 57 Breath control	
PM depth	
AM depth	
EG-bias	
P-bias	
25 57 After touch	
PM depth	
AM depth	
EG-bias	
P-bias	

25 58 Foot control 1	
FC1→CS1	
PM depth	
AM depth	
EG-bias	
Volume	
25 58 Foot control 2	
PM depth	
AM depth	
EG bias	
Volume	
25 58 MIDI IN control	
PM depth	
AM depth	
EG-bias	
Volume	

Performance name :

Voice No.	
FS	
CS1	
CS2	
Total Volume	
EG Forced damp	
Micro tuning	
Key shift	

Blank Data Chart

DX7s

Voice name : INIT VOICE
Date : / /

1 39 ALGORITHM	
Algorithm	1
Feedback	0
Osc key sync	ON
Transpose	C3

12 44 LFO	
Wave	TRI
Speed	35
Delay	0
Mode	SINGLE
Pmed sons +1 +7	3
PM depth	0
AM depth	0
Key sync	ON

13 45 Pitch EG	
Range	8 oct.
Velocity	OFF
Scaling	0
R1	99
R2	99
R3	99
R4	99
L1	50
L2	50
L3	50
L4	50

OSCILLATOR	OP	1	2	3	4	5	6
Mode		ratio	→				
Coarse·Fine		1.00	→				
Detune		0	→				

9 41 EG	OP	1	2	3	4	5	6
Rate Scaling		0	→				
R1		99	→				
R2		99	→				
R3		99	→				
R4		99	→				
L1		99	→				
L2		99	→				
L3		99	→				
L4		0	→				

Output Level	OP	1	2	3	4	5	6
Scaling mode		norm.	→				
Output level		99	0	0	0	0	0
Break point		0	→				
L-curve		-lin	→				
R-curve		C3	→				
L-depth		-lin	→				
R-depth		0	→				

11 Sensitivity	OP	1	2	3	4	5	6
Key velocity		0	→				
A mod sens		0	→				

23 55 Key mode	
Key mode	POLY
Unison detune	-

24 56 Pitch bend	
PBmode	normal
Range	2
Step	0

24 58 Portamento	
Mode	sus key retain
Time	0
Step	0
Random pitch	0

25 57 Modulation wheel	
PM depth	0
AM depth	0
EG-bias	0

25 57 Breath control	
PM depth	0
AM depth	0
EG-bias	0
P-bias	+0

25 57 After touch	
PM depth	0
AM depth	0
EG-bias	0
P-bias	+0

26 58 Foot control 1	
FC1→CS1	OFF
PM depth	0
AM depth	0
EG-bias	0
Volume	0

26 58 Foot control 2	
PM depth	0
AM depth	0
EG bias	0
Volume	0

26 58 MIDI IN control	
PM depth	0
AM depth	0
EG-bias	0
Volume	0

Performance name : INIT PERF

Voice No.	I1
FS	portamento
CS1	no effect
CS2	no effect
Total Volume	99
EG Forced clamp	OFF
Micro tuning	1 : Equal
Key shift	+0

Init Data Chart