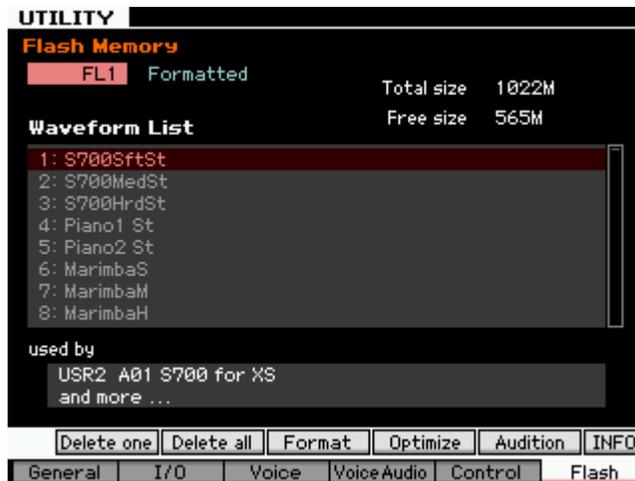




POWER USER

MUSIC PRODUCTION SYNTHESIZER **MOTIF XF**

Flash Memory Expansion Modules



Samples, Keybanks and Waveforms

Phil Clendeninn
Senior Technical Sales Specialist
Technology Products
© Yamaha Corporation of America



Flash Memory Expansion Module (optional FL512M/FL1024M boards)

A sample created via the Sampling function can be stored as a Waveform by installing the optional Flash Memory Expansion Module FL512M/FL1024M to the MOTIF XF. A sample on the Flash Memory Expansion Module will be maintained between power cycles and it can be immediately recalled up as a Waveform.

With the optional Flash Memory Expansion Module (FL512M / FL1024M) User Waveforms and samples can be stored in "non-volatile" memory, meaning that they will be accessible even when the instrument is turned off and on again.

The Flash Module FL512M has a capacity of 512 MB, while the FL1024M has a capacity of 1 GB. Two modules (FL1 + FL2) can be installed resulting in a maximum Flash Memory capacity of 2GB. The functions for managing the Flash Memory can be found by pressing:

- [UTILITY]
- [F6] FLASH.

Initially, the board will be listed as being "UNFORMATTED". When a brand new board is inserted in a Motif XF even though it is empty, it must be formatted for the particular Yamaha product that will be using it (in this case a Motif XF). This should take only a few seconds and will allow the Motif XF to access and use the board.

When data has been loaded to Flash there will be a complete list of all User Waveforms stored on the Flash Memory and you will see the TOTAL SIZE and FREE SIZE read out.

• Wave (Sample data)

This is the raw audio data stored in the MOTIF's memory when sampling (SDRAM).

• Key Bank

The note range and velocity range to which the Sample is assigned, is called the Key Bank.

• Waveform

The group of Key Banks to which sample data is assigned is called the Waveform.

A **Sample** is digital audio data, made by directly recording a signal, such as that of vocals or electric guitar, to the MOTIF XF. Throughout the Owner's and Reference Manuals, the words "**Sample**" and "**Wave**" are sometimes used interchangeably; however, you should be careful to distinguish between "Wave" (raw audio data) and "**Waveform**" (collected audio data used to make up a Voice). Samples can be obtained into the instrument via the following methods:

- Recording audio signal in the Integrated Sampling mode

- Loading a WAV file or AIFF file from a USB storage device connected to the MOTIF XF in the File mode
- Loading a WAV file or AIFF file from a hard disk connected to the (Ethernet) network to which the MOTIF XF is connected.

Translation: In Yamaha-speak a **WAVEFORM** is more than just the sampled audio. It also includes important data that the Motif XF uses to address the audio as a *musically* useful item. This important data includes a Waveform number, a set of parameters that determine where on the keyboard it will be mapped and to what velocities it will respond. Also very important is from what point does the audio playback START, END and/or LOOP. Others Waveform parameters include play direction, "one shot", "reverse", "loop", Volume, Pan position and Coarse/Fine tuning. The thing to realize in any discussion about the FLASH memory is that a WAVEFORM is more than just the sample data. The sample data itself, we know, uses up the lion's share of memory. After all, all the other parameters that define the WAVEFORM, combined, can fit on the head of pin, in comparison to the actual audio of the sample, which can be huge. But without these proprietary and defining 'other' parameters, the audio would not be musically useful within the Motif XF synthesizer. The 'sample' or 'wave', after all can be played on your computer as raw audio, but it is *not* a Motif XF, musically useful, entity yet. Take a raw bit of audio, dress it up with a *basic* set of Motif XF parameters and you have defined a WAVEFORM. It is the WAVEFORM data (parameters + the audio) that is transferred to the FLASH BOARDS.

SAMPLE, KEYBANK and WAVEFORM

Samples are assigned and stored to Waveforms on the MOTIF XF. Before you can actually record a Sample or load a Sample from a USB storage device, you'll need to specify a Waveform number as a destination. This Waveform then serves as the "container" for the Sample. Each of the Waveforms can contain multiple Samples (as many as 128 at maximum). To assign these Samples to a different space or container, you can set the key range and velocity range for each Sample. With this setting, the different Sample is played back depending on the pressed note and its velocity. The *note range* and *velocity range* to which each of the Samples is assigned is called the Key Bank.

Translation and details: A Motif XF **Waveform** can be made up of as few as one and as many as 128 **KEYBANKS**. Let's explain that statement: An example of a single KEYBANK Waveform would be created when you select a TRACK in the Integrated Sequencer to record your vocal lead. You might assign the sample to 'C3', and using the "sample+note" Recording Type and "Measure" Trigger Mode, set the Sequencer to punch you in at measure 9 and to punch you out at measure 33. What the Motif XF actually does is create a **SAMPLE VOICE**. It assigns it to that PART of your MIX as **SPO01** (Sample Voice 001). The sample is automatically placed in a KEYBANK (note range = C3-C3, velocity range 1-127) of a new WAVEFORM. A note-on event is created precisely at the punch in point, with a duration that will

hold it until the punch out point. This note-on event is set to trigger playback at a velocity of 100. This is a WAVEFORM with a single KEYBANK and will only play when the note "C3" is triggered and how loud it will sound is according to the velocity of the note-on event.

Another good example of a single KEYBANK Waveforms would be a percussion sound. Typically a Drum sample is assigned to a single key, after all, in most cases it is not played across the keyboard but triggered from a single note per percussion instrument.

Statements:

- A KEYBANK is defined by its key range and its velocity range
- There can be 128 KEYBANKS in a WAVEFORM – this is true because there are 128 notes on a MIDI channel (C-2 through G8)
- There are 127 (actual) velocities that a key can be struck (1-127). (There's no sound at a velocity of 0)
- **Only** two samples can occupy the same KEYBANK at the same time. This is to accommodate stereo sampling. A mono left and mono right sample can be used to create stereo.

A Waveform can be multiple KEYBANKS. Contrast the single KEYBANK (drum or audio clip) Waveform with a musical instrument Voice (this type of sound would be used as playable instrument). It would be made up of multiple samples where each sample is assigned a region of the scale. For example, say you are sampling an old analog synthesizer and you decide to take 6 audio samples of this unit throughout its range. Say for example, you sample notes C0, C1, C2, C3, C4 and C5. You could then 'map' these samples so that each covered a specific note range across the keyboard. This way no one sample would be stretched too far.

At the theoretical maximum you can have 128 individual samples across the MIDI keyboard C-2 through G8 (that's 10½ octaves). No *real* instrument has that type of range – as an example, the acoustic piano, which has the largest range of all musical instruments, extends 88 keys from A-1 through C7. The mythological MIDI keyboard has 128 notes, *horizontally* left to right across the keyboard, and each note could house a different sample and be a separate KEYBANK.

You will also see it stated that, in theory, 128 samples can be stacked, vertically, on a single KEY where each had a unique velocity range, 0-127. Obviously, these theoretical maximums are hardly ever going to come into play, as 99.99% of your usage will fall somewhere less than the theoretical limits. In other words you will probably never use the 128 samples that can make up a KEYBANK all in a horizontal (key range) fashion where one is assigned to each key, nor will you

probably use them all stacked vertically (velocity range) where they all are on a single key.

In actual use, a combination of the horizontal range mapping, and the vertical range mapping will be used.

At first, it may seem to you that the more samples you stack vertically or horizontally the better the possible sound. In actual fact, this often tends not to be the case.



Example: The S700 piano Voice is made up of just three WAVEFORMS.

- S700HrdSt** – S700 Hard Strike Stereo
- S700MedSt** – S700 Medium Strike Stereo
- S700SftSt** – S700 Soft Strike Stereo

Each of these three WAVEFORMS is made up of 90 individual samples each that cover the 88-key piano range from A-1 through C7. You are provided the left sample and the right sample for each. While the S700 piano is only 3 Waveforms it is actually made up of 270 individual samples!

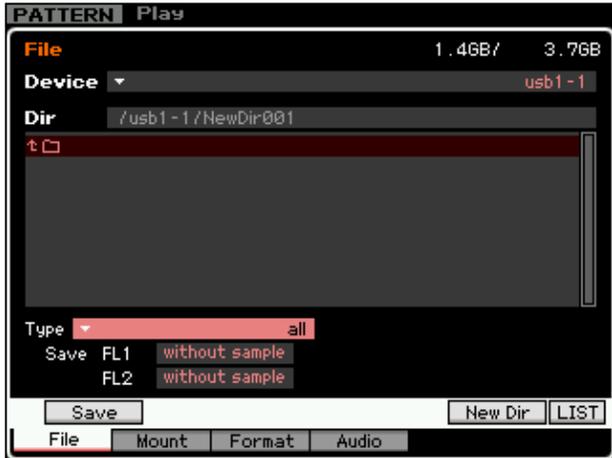
ALL ABOUT LOADING and SAVING

When loading files, it is important to know what is in the file and where you want to put it. It is not recommended that you LOAD or SAVE without some idea of what you are doing. I can give this analogy - and maybe it will help. I recently was helping someone get started on a computer. They were downloading something from the Internet and did not pay any attention to where the computer was putting it by default. (Ever find someone at that point in computer use?) - They just took whatever option came up, without reading it, and clicked "OK"... Now they don't know 'where' it went. You don't want to be that guy/gal!

ALL (.X3A) - an ALL data file saves everything in the Motif XF just as you have it. ALL means

everything, in this case whatever you have on your volatile SDRAM will be saved as "USR", whatever you have on your FL1 board will be saved as "FL1", and whatever you have on your FL2 board will be saved as "FL2", unless you opt not to save that data.

You will be given two options for each FL boards when you select **SAVE TYPE = ALL**



SAVE **FL1** "with sample" or "without sample"
 SAVE **FL2** "with sample" or "without sample"

There is no option for the USR (SDRAM) as that sample data will **always** be saved...

Here's why: SDRAM at maximum will only be 128MB, while the FL1 and FL2 could be quite larger, depending on the size of the Boards you have installed in the slots. Also it takes quite a bit more time to install data on the Flash boards than it does to load data to RAM (as much as 4 to 6 times as long).

Now why would you want to SAVE FL1/FL2 "with samples" or "without samples"?

Because smart users of the Flash boards will use the Flash boards as a home for the data that they want to keep permanently - once you have loaded a FLASH board with your data, you don't need to SAVE the entire contents every time you make a small change to data. Say you have 500MB of your absolute favorite data on your FL1 board. That data will stay there for as long as you desire (you have to DELETE it or FORMAT the board to get rid of it - you cannot OVERWRITE it, not by mistake, not on purpose). And you are tweaking a drum phrase in PATTERN 23, and you want to update your ALL data file. Do you really want to wait for 500MB to be written to that ALL data file?

It's a rhetorical question... of course, not. The Waveforms and Samples on the FL1 board are not going to be any different just because you edited a couple notes in a drum phrase in PATTERN 23!

So you can Save the ALL data file "without sample". The samples are in non-volatile memory!

Loading this file back will simply load (very rapidly) anytime you want this data back. This file will be given a specific designation that will tell you it is an ALL data file but has **no samples for FL1**. It will contain the Waveform "pointers" so that every Voice and every Sample Voice knows where to find the audio data (on the FL1 board). But it will be saved without the actual sample data.

If "FL1 without sample" or "FL2 without sample" is selected, the Waveform data is stored without the Samples. This option allows you to store the contents of the SDRAM independently from the contents of the Flash Memory.

Files that are saved with the option "without sample" are automatically given a reference to identify their save-option:

- .n1 = FL1 without sample
- .n2 = FL2 without sample
- .n3 = FL1 + FL2 without sample

At the bottom right of the display you can select the target memory block (USR, FL1, and FL2) for each memory block (USR, FL1 and FL2) contained in a file before loading it. If "USR" is selected, the data of the corresponding memory blocks are loaded into the SDRAM. If "FL1" or "FL2" are selected, the data will be loaded into the Flash Memory 1 or 2. If "FL1 without sample" or "FL2 without sample" is selected, the corresponding User Waveforms will be loaded into the respective Flash Memory without their Samples.

Additionally, you will find a LOAD OPTION for the FL1 and FL2 boards that is "NONE" – this is highly useful when you simply want to load Voices but neither Waveforms nor Samples

Remember, it is the Sample data (the audio itself) that is potentially huge in size and will take time to be loaded or reloaded. So saving ALL "without sample" gives you a much smaller file, but it 'knows' where to look for and where to find the appropriate data.

Now when LOADING a file (and let's just stick with ALL data files for the moment) you will find that you have a choice of where the data in the file goes. If you pay no attention to these targets, it's the equivalent of downloading without knowing what folder you targeted on your computer. (-)

When **LOAD** Type = **ALL** you can send data from a file **to** SDRAM or **to** your FL boards as follows:



USR (SDRAM) can be returned to "USR", or you can re-point the data and target "FL1" or "FL2".

- Load "**USR > USR**" will return the data that was on the 128MB SDRAM to the SDRAM. That is, if when you created the file, you had data in SDRAM, this setting will return that data to SDRAM.
- Load "**USR > FL1**" will take the data that was on the SDRAM and **add** its data to your FL1 board. "ADD" is the key word. It will never overwrite any data on the FL board. Never.
- Load "**USR > FL2**" will take the data that was on the SDRAM and **add** its data to your FL2 board. Again ADD is the key word.

FL1 you have six options of where the data will go:

- Load "**FL1 > USR**" - you can target data that was saved from the FL1 to SDRAM.
- Load "**FL1 > FL1**" - you can target data that was saved from the FL1 board back to FL1
- Load "**FL1 > FL1 without sample**" - you can send the pointers that tell Voices what sample to use and how to use it to the FL1 board.
- Load "**FL1 > FL2**" - you can target data that was saved from the FL1 board to FL2
- Load "**FL1 > FL2 without sample**" - you can send the pointers that tell Voices what sample to use and how to use it to the FL2 board.
- Load "**FL1 > None**" - you can load this ALL data file without adding new Waveform pointers and without adding any new samples.

FL2 you have six options of where the data will go:

- Load "**FL2 > USR**" - you can target data that was saved from the FL2 to SDRAM.
- Load "**FL2 > FL1**" - you can target data that was saved from the FL2 board to FL1

- Load "**FL2 > FL1 without sample**" - you can send the pointers that tell Voices what sample to use and how to use it to the FL1 board.
- Load "**FL2 > FL2**" - you can target data that was saved from the FL2 board back to FL2
- Load "**FL2 > FL2 without sample**" - you can send the pointers that tell Voices what sample to use and how to use it to the FL2 board.
- Load "**FL2 > None**" - you can load this ALL data file without adding new Waveform pointers and without adding any new samples.

Now those are all the possibilities for the ALL data file. Don't let it bother you if you have no need for some of the options right now. You may, in fact, never have need of some of them. But it is important to find and know the ones that you **will** use.

Theory in Operation

Say Yamaha provides you with a couple hundred MB of free data... And you load that data into your FL512M in slot 1. Once you do, you don't have to resave a file with all that data. You simply would SAVE an ALL data file "without sample". This would create a much, much smaller ALL data file with just your Voices, your Songs, your Patterns, your SDRAM, your MASTERS, your Performances, and your Utility mode settings - everything but the samples that are now resident (burned) on your FL1 board. The file will have a designation:

.n1.X3A

When you want to LOAD your data back you would probably have the LOAD TYPE = ALL with the Load options set as follows:

- USR > **USR**
- FL1 > **None**
- FL2 > **None**

This will return any samples you have done to the Integrated Sampler to SDRAM, and it will **not** duplicate any Waveform data nor will it duplicate any samples on your FL board. No need, the board data is non-volatile – and still contains the data you burned to it.

Important Flash News By the Numbers

- Each FLASH board has a theoretical maximum of 2048 Waveforms (be it the FL512M or the FL1024M).
- Each FLASH board has a theoretical maximum of 8192 individual Samples (be it the FL512M or the FL1024M).

Both of these statistics are based on the maxim of 'whichever comes first'. You will be out of memory when the size of the board is exceeded or the

number of locations is exceeded, *whichever comes first*.

IMPORTANT Correction of the manual:

The manual states that doing a FACTORY SET will clear the FLASH BOARDS, this is **not** true. Once data is installed on the Flash Memory Expansion Module there are only two ways to uninstall that data: DELETE it or FORMAT the board.

- Press [UTILITY]
- Press [F6] FLASH
 - [SF1] DELETE ONE
 - [SF2] DELETE ALL
 - [SF3] FORMAT