

# About voices and effects on YAMAHA XG keyboards

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## 1. Voices

The Yamaha keyboards have a large number of voices that can be used in live playing as well as in midifiles.

The voices consist of two groups.

The melodic voices are usually based on real sound instruments. The pitch changes with the keyboard note.

The percussion voices differ from the melody voices in that each keyboard note is assigned a different percussion instrument or sound (e.g. thunder or dog barking), which is unchangeable in pitch.

Each voice is addressed internally in the sound generator using three numbers. The first two (MSB and LSB) determine a so-called voicebank. Within a voicebank, a maximum of 128 voices are defined via voice numbers (program change or patch number).<sup>1</sup>

When playing live on the keyboard and also during recording, each voice is accompanied by specific sound effects, which are used to achieve the high sound quality of the keyboard. In the midifiles recorded on the keyboard, these effects can be recognized as controller events, RPN and NRPN<sup>2</sup> and SysEx.<sup>3</sup>

In addition to the so-called preset voices already present in the keyboard, the user can program additional voices - either on the basis of the existing voice samples integrated in the keyboard software or, in the case of some keyboard models, by using his own samples.<sup>4</sup>

### 1.1 Preset Voices

The preset voices are selected with the voice keys on the keyboard. These keys are labeled with names of instrument groups, such as "Piano", "Saxophones", "Synth" and "Percussion". The three groups "Organ Flutes," "Custom Voice," "Mega," "Super Articulation," and "User" have special roles; they are discussed in

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<sup>1</sup> MSB and LSB are set with the Midievents Controller 0 and 32 and the voice number with the Program Change Event.

<sup>2</sup> RPN or NRPN (Registered or Non-registered Parameter Events) are standardized or manufacturer-specific extensions of controller events

<sup>3</sup> SysEx (System Exclusive Events) are used for effects on XG. These events are manufacturer-specific and are only intended for Yamaha XG.

<sup>4</sup> Sample: Audio source for sounds, e.g. the sound recorded from a real piano.

the next sections.

All these voices are part of XG Extended General MIDI, Yamaha's own extension of General MIDI (GM).<sup>5</sup>

The voices that can be selected directly with the voice keys are elaborately programmed high-quality voices that represent an extension of the 128 voices of the GM standard (General MIDI). The corresponding melody voice banks are mostly below the voice banks MSB = 0, LSB >= 112, while the 480 voices of XG-Lite are on banks with LSB values below. Mega, super articulation and percussion voices are on voicebanks with higher MSB values. See the data lists of the keyboards

After pressing the Up button, all groups of preset voices are visible; in addition, however, groups GM&XG and GM2 are also visible. With GM&XG the XG-Lite-Voices are selected. In the voicebank MSB = 0, LSB = 0 the 128 GM-voices are provided, which are used when playing GM-midifiles. The GM drum kit is addressed as preset voice standard kit1 via MSB = 127, LSB = 0, voice number = 0.

The group GM2 (General MIDI Level 2) contains the voices of the cross-manufacturer extension of GM.

## 1.2 User Voices

The effects assigned to the preset voices by default can be changed by the user with the keyboard's Sound Creator. However, this does not change the actual preset voice, but creates a so-called user voice file that is given a freely selectable name and stored in the writable memory (user, hard disk, memory stick...). This file contains the new effects, but refers to the preset voice via voicebank and voice number.

When playing songs as well as when playing live with a user voice via registrations, the name of the voice file is not shown on the keyboard display, but the name of the corresponding preset voice appears. User voices from Organ Flutes are then always given the name "JazzDraw!" on the keyboard (e.g. Tyros).

## 1.3 Custom Voices

Custom-Voices are voices created by the user, whereby much more influence can be exerted on the voice. This can be done in particular by using own samples. These voices are permanently integrated into the operating system of the keyboards on designated bank and voice numbers and are managed there like normal preset voices.

## 1.4 Organ Floods

With the Organ Flute Voices, sounds of classical analog organs are simulated by software. The basis of these voices are fundamental vibrations (sine or vintage) to which harmonics of selectable strength are added (foot positions, drawbars). Additional effects such as rotary and vibrato are also used. On the keyboards, some ready-made organ flute voices are provided. However, the Sound Creator provides the user with comfortable tools with which he can realize his special sound ideas and store them as user voice files. Almost authentic replicas of real analog organs can only be obtained with additional XG effects.

## 1.5 Mega and super articulation

Mega-Voices are melody voices that produce effect sounds at high key notes and velocities that can be produced on the underlying real instruments. Since these voices cannot be played meaningfully on the keyboard, they are only used in midifiles.

In contrast, super articulation voices can be played live. Special playing techniques are used to create sophisticated sound effects.

## 2. XG effects

Already since the introduction of GM the sound of the Voices could be influenced by effects. This task was taken over by the so-called controller events. The controller effects include reverb and chorus, but also

<sup>5</sup> General MIDI, GM for short, was introduced in 1991 as a manufacturer-independent standard. In 1999 this standard was extended with GM2 (General MIDI Level 2).

modulation, panorama, release and attack time, harmony and brightness. With Yamaha XG, effects programming has been greatly enhanced. In addition to additional controller and NRPN events, effect units for reverb, chorus, variation and insertion effects were introduced, creating completely new possibilities.

The XG effects are divided into two large groups: System Effects and Insertion Effects.

## 2.1 System effects

Unlike the insert effects, system effects affect all midi channels simultaneously. However, the intensity of the effect of System Effects on each individual channel can be set using the "Send Level" controllers (91: Reverb, 93: Chorus, 94: Variation Send Level) or with certain SysEx of the Multipart type.

In GM tone generators, the effects Reverb and Chorus, which can be set with the 91 and 93 controllers, are fixed. XG, on the other hand, has a large number of Reverb and Chorus variants that can be selected on the keyboard or in the midifile (via SysEx). XG defaults Reverb to Hall1 and Chorus to Chorus1.

In addition to Reverb and Chorus effects, each XG tone generator has a Variation effect unit. This allows you to set other effects independent of Reverb and Chorus, including Delay, Rotary, Celeste, Flanger, Echo variations, Distortion, Equalizer (EQ).

In contrast to Reverb and Chorus, Variation can be operated alternatively as a System- or Insertion effect.

## 2.2 Insertion effects

An Insertion effect does not affect all midi channels at the same time, but only one channel, more precisely: Part<sup>6</sup>.

The Variation effect unit can only be used once: either as a system effect or as an insertion effect. Variation in Insertion mode can therefore only apply to a specific part. In the early days of XG, this was the only way to use Insertion effects.

In the meantime, Yamaha has developed sound generators where different Insertion effects can be placed on different parts. The sound generators provide a limited, fixed number of independent Insertion units called effect blocks or DSPs (Digital Signal Processor), which<sup>7</sup> are addressed by effect block numbers or DSP numbers. In the following we will refer to these new insertion effects as DSP effects.

The intensity of insertion effects is not adjusted by controllers, but by the special SysEx Dry-Wet.

The Tyros, for example, provides 4 effect blocks (DSP 2 to 5) for free assignment. In addition, there are two more, which take over the tasks of the variation unit (DSP 1) and the microphone effects (DSP 6). Thus, insertion effects can be used for a maximum of 5 midi channels with the Tyros. The Variation effect unit is available for Tyros and Tyros2 style or song channels.

Only DSP1 can be used for Multipads and Styles: For Multipads only as system effect and for Styles also as insert effect. As mentioned above, system effects also affect the other MIDI channels.

The number of effects that can be adjusted with DSP's is immense. You can get an impression of the number of effects, effect types and effect parameters that can be set via the mixing console of the keyboards.

## 2.3 Effects, effect types and effect parameters using Tyros as an example

The definition of effects on the keyboards is done using the functions of the Mixing Console.

First the effect block is defined. As system effects, Reverb and Chorus are not assigned to any part or "category". After selecting these blocks, you can define the effect type under Type. With "Parameter" further settings are made, e.g. LFO or EQ frequencies.

If the DSP1 (variation) effect block is not assigned to a part; it is set as a system effect. Variation can also be assigned as an insert effect to a specific song or style channel via "Parameters".

For a clear arrangement of the many effects, groups of effect types are displayed in the "Category" table, e.g. Chorus or Phaser. Underneath these are lists of the associated types, e.g. Chorus3 or EP Phaser1. As with

<sup>6</sup> Part is an XG-specific extension of the term channel. The Insertion Effects refer to Parts. In XG it is possible to route several parts on one channel (Layering). When playing live, all parts on the keyboards are routed to channels of the same number. This is also the default setting. However, the keyboards perform layering correctly in midifiles.

<sup>7</sup> In general, the DSP number is one higher than the effect block number

the effect blocks Reverb and Chorus, special settings can also be made under "Parameters".

The effect blocks DSP2 to DSP5 are intended for the channel-specific insertion DSP effects. The channel must be defined under Part. Via the "Category" and "Type" lists, the desired effect type is set as above. Everything else is defined under "Parameters".

## 2.4 User Effects

To simplify the use of effect blocks and their special effect settings (effect type, effect parameters), the keyboards offer the possibility to store the settings as so-called user effects in the system memory of the keyboard so that they can be recalled when needed. Unfortunately, only a limited number of slots are available for user effects. However, it is possible to archive the user effects programmed by the user. In this case, the entirety of the current user effects is saved as a file with the extension .eff and can be read in again if required. The user effect area in the system memory can be overwritten.

User effects and their parameters are stored with the registrations. However, if the corresponding user effect is deleted, the registration is also without effect.

User Effects are created from Preset Effects by changing the parameters and saving the new effect created under a different name; the name of the User Effect.

User insertion effects and their parameters are saved together with Voices when using registrations. However, if the corresponding User Insertion Effect is deleted from the system, it is generally no longer available and the respective registration is without effect. It can also not be retrieved via the DSP key.

A user system effect is replaced after deletion by the effect type from which the user effect was created.

## 2.5 Effects, MIDI Files and Styles

When recording midifiles with the keyboard, all effects set on the voice parts are<sup>8</sup> stored in the file via SysEx, i.e. effect block, effect type, effect parameters and the controller settings, especially for the channel-specific intensity of the effects. Therefore, Midifiles recorded with user effects can also be played back on keyboards where the respective user effects do not exist; it only has to be assumed that the preset effects used for creating the user effects are available on the keyboard.

The subsequent embedding of effects into already existing midifiles is very laborious on the keyboard or with common sequencer programs.

Some Yamaha keyboards, such as Tyros, have two independent sets of 16 midi channels each (MIDI A and MIDI B). Live playing (keyboard, MultiPads and Styles) is done via MIDI A; midifiles are played via MIDI B. This way the live playing can be extended by simultaneous use of Midifiles. When using effects, however, the following should be noted: Since there are no separate sets of DSPs for MIDI A and MIDI B, the keyboard software will use the DSPs of the voice parts of song channels or even switch off the effects of the voice parts in case of bottlenecks.

**End**

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<sup>8</sup> By voice parts (not to be confused with parts), we mean here the voices assigned to the keyboard: Right 1, Right 2, Right3 and Left