

# **KBD-INFINITY**

**Power tools for digital keyboards**

## **Style Customizer Instruction Manual**

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# Contents

- 1 **What Style Customizer does** 3
- 2 **Style Customizer interface and controls** 4
- 3 **Change a channel voice** 6
- 4 **Save a modified style** 8
- 5 **Bulk corrections** 10
- 6 **Yamaha style files** 11
  - 6.1 MIDI section . . . . . 12
  - 6.2 CASM section . . . . . 14
  - 6.3 OTS, MDB and MH sections . . . . . 14
- 7 **MIDI voice settings** 14

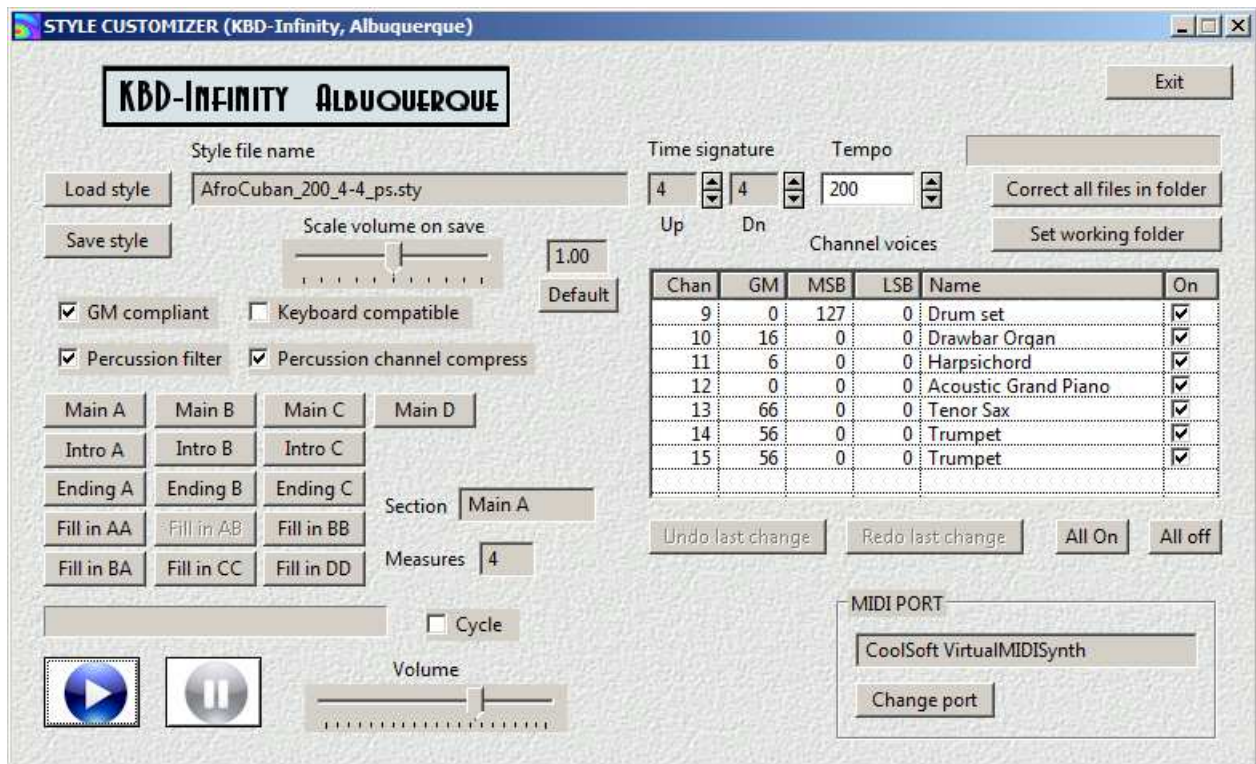


Figure 1: Style Customizer main control window.

## 1 What Style Customizer does

With **Style Customizer**, you can fine-tune the instrumental voices of accompaniment styles to match the properties of your keyboard or synthesizer and also correct common errors. To understand the significance, we need to review some properties of styles. Styles are the built-in accompaniments included on keyboards from Yamaha, Korg, Roland, Casio and other manufacturers. Style files contain sections of MIDI information: introductions, endings and main sequences (that are generally played as loops). The performer or a sequencing program like the **Accompaniment Machine** controls the harmony and arrangement of sections to give the sense of a backup group. The judicious use of styles can turn a simple tune into a professional-sounding piece.

Styles in the Yamaha format are the most common types. Tens of thousands of styles created by Yamaha or independent developers are available in the form of binary files for free download or purchase on the Internet. These files may be loaded directly on Yamaha keyboards to supplement the internal set. With a program like the **Accompaniment Machine**, you can employ Yamaha-format styles with keyboards or synthesizers from any manufacturer.

A style may include one or more percussion channels and up to seven pitched channels representing different instruments or instrumental groups. MIDI commands in style files set the voices (or patches) for the different channels (*e.g.*, grand piano, flute, tenor saxophone, marimba,...). These settings are deeply embedded in the binary file, and it would be difficult (if not impossible) for a performer to change them. Which brings us to the function of **Style Customizer**. With the program, you can experiment with and modify MIDI voice settings (*e.g.*, instrument type, resonance, timbre, volume,...) for individual style channels. These changes may be saved in a new style file. Why is this capability important?

- MIDI voice messages are suggestions to keyboards, synthesizers and virtual instruments. No two devices respond with exactly the same sound. Therefore, a style that sounded terrific on the arranger’s keyboard may sound quirky or grating on yours. Tuning the voice settings and equalizing the channel volumes can make a major difference in the sound quality of styles.
- Styles for high-end Yamaha keyboards generally use advanced XG voice settings<sup>1</sup> and special drum sets. These settings may not be available on moderate-price Yamaha keyboards or those of other manufacturers. The result is that some channels may be missing or have strange sounds. By changing the bank and other parameters, you can make any style file sound perfect on your keyboard.
- Styles are musically conservative – they tend to support familiar musical genres with conventional orchestrations. With **Style Customizer**, you can experiment with instrument groupings to make your music more edgy or to achieve a distinctive sound.

In summary, the ability to control the voices of style files is like expanding your style collection by an order of magnitude. With a little effort, you can come up with just the right sound for any occasion or song.

**Style Customizer** runs on any Windows computer. To install the program, simply download and run the installer from our website at

[http://www.kbd-infinity.com/style\\_customizer.html](http://www.kbd-infinity.com/style_customizer.html)

The unlicensed software does not save modified styles. You can purchase a license on the Web page to unlock all features of **Style Customizer**.

The first part of this manual describes the functions and controls of **Style Customizer**. The second part reviews the fundamentals of Yamaha style files and MIDI voices. This material can help you use **Style Customizer** more effectively. Chapter 2 describes how to load and to preview a style file and introduces the **Style Customizer** interface. Chapter 3 describes how to change the voice of one or more channels while Chap. 4 covers how to save the modifications in a new style file. Chapter 6 reviews characteristics of Yamaha style files while Chap. 7 summarizes MIDI commands to set synthesizer voices.

## 2 Style Customizer interface and controls

Figure 1 shows the **Style Customizer** main window. The first activity is to set the MIDI output port for playing styles (controls at upper left). When you first run the program, it picks the default Windows MIDI simulator. Before modifying styles, you should direct the **Style Customizer** output to your synthesizer or keyboard. Make sure that the keyboard is turned on and connected to the computer. Then click *Change port* to bring up the dialog of Fig. 2. Select the desired output port in the listbox and then click *OK*. **Style Customizer** will remember and apply this choice the next time you run the program as long as the device is available.

Use the *Load style* control to get started. The dialog shows available files with the extension STY along with the following alternative extensions: BCS (Basic), PRS (Professional), SST (Session) and PCS (Piano combo). All styles have the same format, regardless of the extension. The

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<sup>1</sup>We’ll discuss the meaning of bank parameters in Chap. 7.

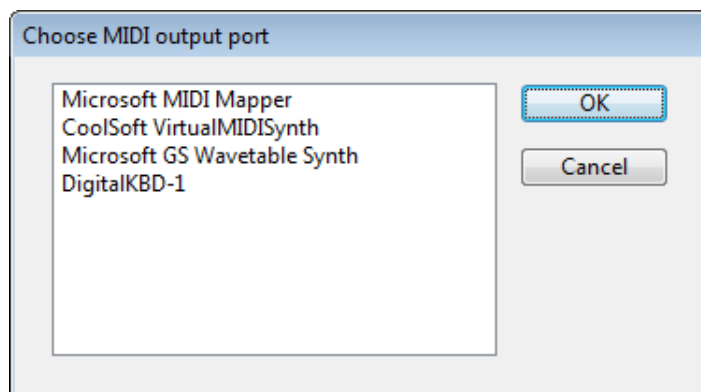


Figure 2: Dialog to set the MIDI output port.

program can load styles in both the old (SFF1) and new (SFF2) formats. If the *GM compliant* box is checked, **Style Customizer** zeros any bank parameters (Chap. 7) in the definition of channel voices. This is a useful option for styles designed for high-end Yamaha workstations (*e.g.*, PRS styles). In this case, the bank settings may not be supported on your keyboard or synthesizer.

When the style is loaded, **Style Customizer** shows the default time signature and tempo (in quarter notes/minute). The activation status of the button array at left-center shows which sections are included in the style file. As an example, the loaded file in Fig. 1 contains the full complement of sections except *Fill in AB*. Left click a button to select a section. The box to the right shows the number of measures of the current section. The value is the loop length of the *Main* sections and the measures in *Intro* and *Ending* sections, important for synchronizing performances. *Fill in* sections are always one measure in length.

The list box at right-center gives a summary of voice information for the style channels. Note that styles are limited to channels 08h through 0Fh<sup>2</sup>, leaving channels 00h through 07h open for other functions (*e.g.*, melody, metronome,...). Information includes the General MIDI program number (type of instrument), the bank MSB and LSB numbers (refinement of the instrument type), the General MIDI name and the playback status.

Click the *Start* button to listen to the currently-selected section. The section loops if the *Cycle* box is checked. You can *Pause* or *Stop* the playback and set the volume. Right-click on a section button to select the section and start playback immediately. The checkboxes on the right-hand side of the voice list determine whether the channel is included in playback<sup>3</sup>. The *AllOn* and *AllOff* buttons check or uncheck all included channels.

As an example, the simplest modification you can make to a style file is to change the default tempo. Load a style, enter a new value in the *Tempo* box, check the sound and then use the *Save style* control to create a new file (see Chap. 4).

<sup>2</sup>The channel number convention in this manual follows the actual values used in programs: 00h through 0Fh. Some references number the channels 01 through 16

<sup>3</sup>The checked status also determines whether a channel is included when a style is saved



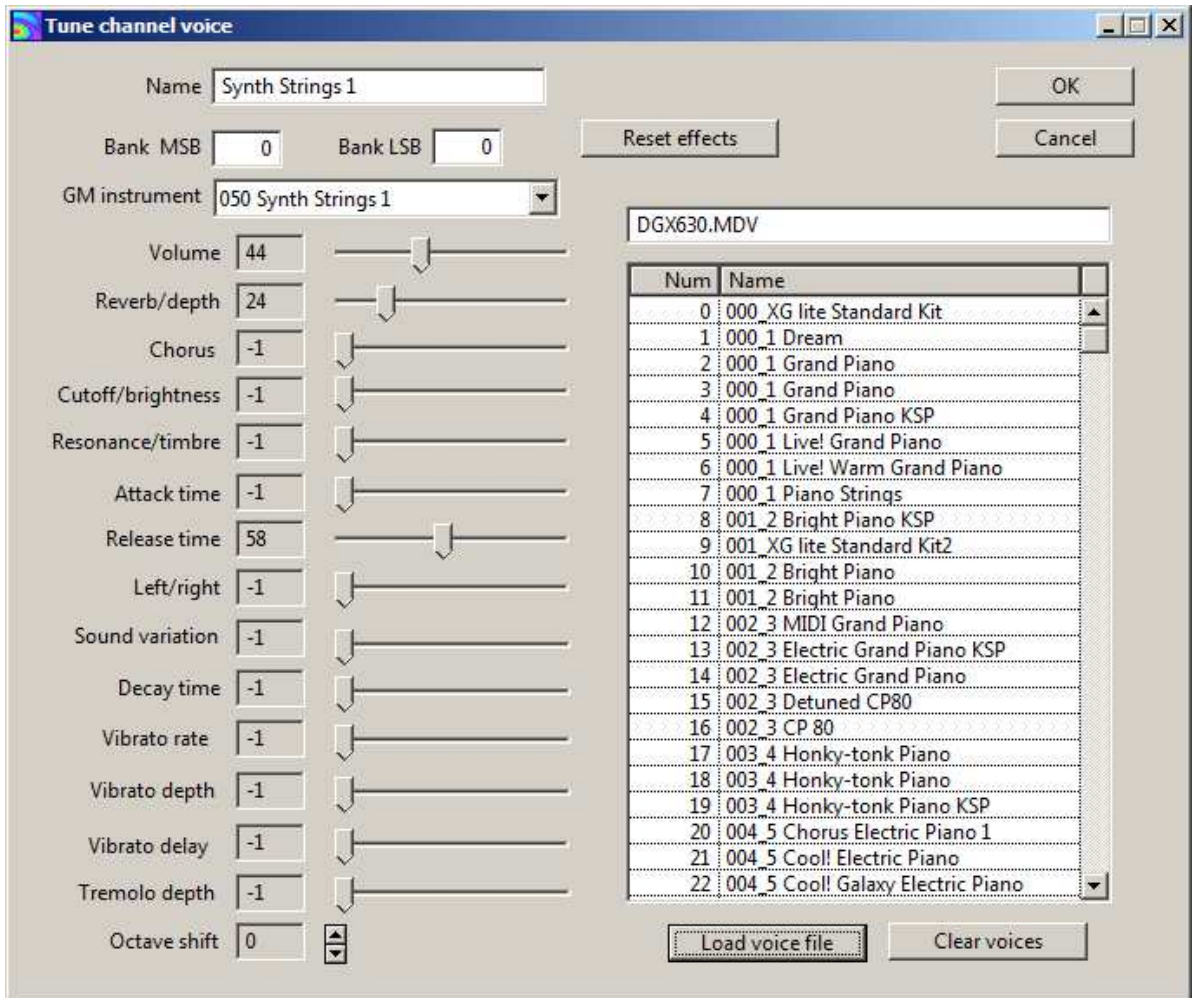


Figure 3: Dialog to tune a channel voice

### 3 Change a channel voice

The primary function of **Style Customizer** is refining or changing the instrumentation of one or more style channels. Open the voice-tuning dialog of Fig. 3 by double-clicking a row in the *Channel voices* listbox. It is important to recognize that styles contain two types of channels: drum set and pitched. For example, Fig. 1 shows that Channels 08h and 09h represent drum sets and that Channels 0Ah-0Fh represent different pitched instruments. By convention, Channel 09h always represents percussion and other channels may be set as drum sets if *MSB* = 126 or 127.

We'll start by discussing pitched-instrument channels. When you make a change, the style will play the same notes but with a different instrument (*i.e.*, synthesizer setting). You can make four types of changes within the dialog:

- Balance the channels by changing the *Volume* of individual instruments.
- Change the instrument type (*GM instrument, Bank MSB, Bank LSB*)
- Fine-tune the synthesizer sound (*Reverb, Chorus, Attack time,...*)
- Introduce octave displacements in the pitch.

The simple process of changing the relative volume levels of channels can make a big difference in the quality of the style sound. Use the *Volume* slider to raise or lower the level of the current channel. Use the feature, for example, to soften an overly aggressive percussion track.

This is a good point to discuss the operation of the sliders in Fig. 3. Each slider corresponds to a particular MIDI control. For example, the volume slider determines the value of a MIDI channel volume message

`B0h + ChanNo, 07h, VLevel`

When you exit the dialog by clicking *OK*, **Style Customizer** sends a stream of MIDI messages to update the synthesizer settings of the output device. The changes will then apply when you play a section. It is important to note that styles do not necessarily set every possible synthesizer control. Furthermore, your synthesizer or virtual instrument may not respond to several of the controls in Fig. 3. A value of -1 in a box means that **Style Customizer** will not send the corresponding control message. Move a slider all the way to the left to deactivate a control. For example, if *Reverb* = -1, then **Style Customizer** sends no message and the synthesizer will use its default reverbation setting. On the other hand, *Reverb* = 0 turns reverbation off (*e.g.*, the sound in an open field) if the output device responds to the message. Use the *Reset effects* button to deactivate all synthesizer controls.

Next, consider changing the instrumental voice of the channel. The popup menu *GM instrument* is the primary control. When *BankMSB* = 0 and *BankLSB* = 0, the General MIDI standard requires that all synthesizers produce a sound like the named instrument (*e.g.*, 041 Viola, 068 Oboe, ...). Therefore, with the bank parameters set equal to zero, there will be no missing channels and the sound will be similar to that intended on GM compliant devices<sup>4</sup>.

Set values for the bank parameters if you want to go beyond basic sounds. Information on the available voices is generally contained in a data sheet supplied with your keyboard or synthesizer. For example, the *Voice List* table in the *Data List* document for the Yamaha PSR E423 defines the voice *Warm strings* as:

`GM instrument = 49, Bank MSB = 0, Bank LSB = 40`

The collection of thirteen sliders can be used to invoke most of the MIDI voice control messages. Again, the response varies with the output device. A general-purpose virtual instrument (soundfont) may respond to basic settings (resonance, chorus,...) or none at all. Entry level Yamaha keyboards implement controls on the left-hand side of the dialog.

Use the up-down arrows next to the *Octave shift* control to introduce pitch displacements when the notes are played in the program or saved to a modified files. This feature is particularly useful when converting Tyros styles, which often create high-pitched, tinkly piano sounds when played on a different keyboard. A setting of -1 lowers notes for the corresponding

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<sup>4</sup>All Yamaha keyboards are GM compliant.

voice channel by 12 semitones. **Style Customizer** does not include displacements that create out-of-range note values (less than 00h or greater than 7Fh).

As an alternative to tuning each voice, you can use a standard voice set for your keyboard by loading a *MIDI Voice File* (MDV). These files may be built in the *Voice Laboratory* of the **Accompaniment Machine** or created from a **CakeWalk** or **Sonar** INS file. Click the *Load voice file* button and choose a file with suffix MDV. The program loads the data and displays a list of available voices in the box on the right (Fig. 3). Double-click an entry to transfer available parameters to the voice controls.

To conclude, we shall consider drum set channels. Percussion sounds have such a board frequency range that pitch is indistinguishable. Therefore, the component of MIDI *NoteOn* messages that normally gives note pitch is used to specify the type of percussion sound (*e.g.*, bass drum, ride cymbal, rimshot, bongo, hand clap,...). Synthesizers may support several drum *kits*, where a kit is a mapping of pitch numbers to percussive sounds. The setting for the standard drum kit supported by all GM compliant devices is

```
GM instrument = 0, XG bank MSB = 127, XG bank LSB = 0
```

As an example of an alternate, the *Symphonic Kit* on a Yamaha PSR E423 is specified by

```
GM instrument = 48, XG bank MSB = 127, XG bank LSB = 0
```

Changing the drum kit of a percussive channel can make a big difference, but there is no guarantee that the sound will be acceptable. The best approach is to experiment. To make comparisons, it may be helpful to deactivate playback on the other channels. Finally, note that the MIDI controls such as *Reverb* or *Attack time* may affect the drum sounds.

When settings are complete, exit the dialog by clicking *OK*. **Style Customizer** changes the channel voice values in memory and updates the settings of the output synthesizer. Click *Cancel* to exit the dialog with no changes. After previewing the sound, you can return to the previous setting with the *Undo last change* command. Click the button multiple times to move back in the history of changes. The *Redo last change* button becomes active when the *Undo last change* button has been used.

## 4 Save a modified style

As discussed in Chap. 6, the style file format defined by the Yamaha Corporation is needlessly complex. When **Style Customizer** reads a style file, the first step is to convert the information to the simple, documented *Pure Style* format. *Pure Style* preserves the musical information but is easier to handle in software and has shorter file lengths. The channels displayed in the *Channel voices* listbox are those of the *Pure Style* form rather than the set of the original style. The *Pure Style* format is described at:

<http://kbd-infinity.com/kbd-infinity-blog/fixing-the-yamaha-style-format-part-2/>

**Style Customizer** saves information in *Pure Style* format. The resulting files may be used in software like the **Accompaniment Machine** or loaded directly on any Yamaha keyboard. When you have completed voice or tempo modifications, click the *Save style* button. The program suggests a name following the *Pure Style* convention:



DescriptiveText\_Tempo\_TimeSig\_ps.sty.

The text is any set of characters or numbers with no punctuation marks. The quantity *Tempo* is an integer number (quarter notes per minute). *TimeSig* gives the time signature in the format **Numerator-Hyphen-Denominator**, such as 3-4, 4-4 or 9-8. The characters *ps* designate *Pure Style*. The extension is always **STY**. Heres an example:

AngelsWeHaveHeardOnHigh01\_85\_4-4\_ps.sty.

Use the checkboxes on the right-hand side of the *Channel voices* listbox to remove channel information from saved files. Voice and musical information is included only for checked channels. Four checkboxes in the **Style Customizer** interface (Fig. 1) affect the output file format:

- GM compliant
- Keyboard compatible
- Percussion filter
- Percussion channel compress

The *GM compliant* option zeros the bank MSB and LSB parameters of MIDI voice commands. Do not use this option if you have defined optimal XG bank settings for your keyboard or synthesizer. When *Keyboard compatible* is checked, **Style Customizer** appends a dummy CASM section (Chap. 6) to the style. Although the section performs no function, it is a necessary add-on for compatibility if you are going to load the style directly on a Yamaha keyboard. It is not required if you are using the **Accompaniment Machine** or other performance software.

The percussion filter is helpful if you are using a style created for a high-end workstation. You may hear strange whistles and rasping noises. The reason is that the style was created for an advanced drum set that is not supported on your synthesizer or keyboard. The fallback is to use the standard GM drum set (Table 2). In this case, most percussion sounds are acceptable but some may be inappropriate. When *Percussion filter* box is checked. **Style Customizer** sets the *NoteOn* volume to zero in a save when it encounters the following note values in a percussion channel:

```
056 Cowbell
058 Vibra Slap
071 Short Whistle
072 Long Whistle
073 Short Guiro
074 Long Guiro
078 Mute Cuica
079 Open Cuica
```

In most cases, the loss of the notes has little effect on the style sound.

The final checkbox solves a compatibility problem if you are playing styles using a soundfont on your computer sound card. A general MIDI convention is that channels besides 09h can be set as percussion channels by sending a message to set the XG MSB of the channel to 7Eh or

7Fh. In styles, channel 08h is often used as a supplementary percussion channel. Although most keyboards recognize the convention, both **Microsoft MIDI Mapper** and **CoolSoft VirtualMIDISynth** do not. Therefore, they treat channel 08 as a pitched instrument in all circumstances, leading to some strange sounds. When the *Percussion channel compress* box is checked, **Style Customizer** moves all notes for channel 08h to channel 09h in a save. The resulting file produces the correct percussion sounds for all MIDI output port choices.

Sometimes you may find a style where the volume is much louder or softer than the level of other styles in your collection. In this case, you can use *Scale style volume* slider to make a proportional change to the volumes of all channels. Move the slider right to increase the volume and left to decrease it. Preview the new level by playing one or more sections. The changes are included when you save the style. Click the *Default* button to restore the original volume level.

Finally, you can change the time-signature recorded in the file. Use the arrows next to the text fields that list the numerator and denominator to change values before saving the file. The setting does not affect the musical content of the style. Rather, it determines how other software will interpret the measure divisions. This feature is useful for correcting discrepancies between style and sequences of songs when using the **Accompaniment Machine**.

## 5 Bulk corrections

The two buttons at top-right in Fig. 1 (**Correct all files in folder** and **Set working folder**) are used to analyze the content of standard Yamaha-format style files and to create new files in **PureStyle** format. There are several reasons to use a **PureStyle** file rather than the original style:

- A **PureStyle** file produces high-quality sounds on any digital keyboard (*i.e.*, all manufacturers and models), synthesizer or computer soundfont when using software like the **Accompaniment Machine**.
- **PureStyle** files may be loaded and directly utilized on any Yamaha keyboard model.
- **PureStyle** files contain only MIDI information and are compatible with all MIDI editors or players.
- The name of the **PureStyle** file displays the tempo and time signature of the style, aiding your selection process.

With the bulk correction commands, you can quickly generate complete **PureStyle** sets from your existing style libraries.

To correct all style files in a folder, click the **Set working folder** button and navigate to the destination. Note that **Style Customizer** remembers the last folder for the next session. Then click the **Correct all files in folder** button. The progress bar shows the status. The command carries out the following operations:

- Loop through all style files in the folder. Style files are designated with the suffixes **STY**, **BCS**, **PRS**, **SST**, **PCS** and **PST**.

- If the style is not already in **PureStyle** format, read the voice settings and musical content. Also, read information in the **CASM** section on channel redirection and other arcana. Determine the best expression of the musical information that follows the ideal-style rules of Sect. 6: musical sections are in the key of *C* and express a *CMaj7* chord.
- Determine a **PureStyle** file name by combing the original name with tempo and time-signature information.
- Write a **PureStyle** file that reflects the settings of the checkboxes discussed in Sect. 4 and reviewed below.
- Delete the original file.
- If a file is already in **PureStyle** format, rewrite it following the current checkbox settings.

The status of the following checkboxes determines which information is included in the output file:

- **GM compliant.** When this box is checked, do not include information on **XG** voice settings that may apply to specific keyboards. In this case, the output style will be compatible with any device that supports the General MIDI standard. Do not check this box if you are correcting style files that have been optimized for your keyboard.
- **Percussion filter.** Remove strange squeaks and whistles in the percussion channel that often appear when working with styles for Tyros keyboards.
- **Percussion channel compress.** The MIDI standard is to place all percussion information in Channel 09h. Some Yamaha-format style files use Channel 08h for additional percussion information – the signal is to set the MSB section of the XG number to 126 or 127. With regard to style performance, this feature is not necessary and is not recognized by computer soundfont players. When this box is checked, the program determines whether Channel 08h is used for percussion information. If so, all information is moved to Channel 09h and Channel 08h is eliminated.
- **Keyboard compatible.** Some keyboards may not load external styles unless a **CASM** section is present. When this box is checked, the program adds a harmless dummy **CASM** section that contains no information. Use this feature if you want to load and play styles directly on a keyboard. It is not needed if you are using software like the **Accompaniment Machine**.

## 6 Yamaha style files

Styles are the great accompaniments available on Yamaha keyboards. The keyboard contains a basic set of internal styles, and it is possible (with some effort) to install a few more by loading style files. Tens of thousands of style files from Yamaha, independent musicians and conversions from other manufactureres are available for download on the Internet.

Theres a lot of information in a style file, much of it useful. A complete description of the *SFF1* file format is given in P. Wierzba and M. Bedesem, *Style Files - Introduction and Details*:

[http://wierzba.homepage.t-online.de/stylefiles\\_v101.pdf](http://wierzba.homepage.t-online.de/stylefiles_v101.pdf)

A style file is divided into sections, divisions with different types of information: MIDI, CASM, OTS, MDB and MH. Only the MIDI section is required. The other sections were added over time. This section does not give a full account of the style format - instead, it will touch on basic information helpful for using **Style Customizer**.

## 6.1 MIDI section

The MIDI section is straightforward . It has the format of a standard MIDI file with the addition of markers (non-MIDI events) to delineate the style sections. The following sections may be included:

Intro A, Intro B, Intro C  
Main A, Main B, Main C, Main D  
Ending A, Ending B, Ending C  
Fill in AA, Fill in AB, Fill in BB, Fill in BA, Fill in CC, Fill in DD

Styles usually do not contain all sections.

Sections of the type *Intro* are intended to play once and then to segue into a *Main* section. The *Main* sections cycle continuously pending a user signal. An *Ending* plays once and then stops the sequence. Harmonic variations introduce variety when playing *Main* sections. There are also several variants of each type of section. Generally, the accompaniment becomes more intense (*e.g.*, richer orchestration, more complex rhythms,...) proceeding from *Main A* to *Main D*. The *Fill In* sections provide transitions between the *Main* variants. A typical song may follow the sequence *IntroA* → *Main A* → *Fill In AB* → *Main B* → *Ending B*. A style sequence starts when the user presses a key combination that signals the harmonic root and chord type to be applied. As the song progresses, the player presses different key combinations to signal changes of harmony and control keys or buttons to signify style-section shifts. With a good choice of styles and sections, the end result is a good approximation to a backup band.

Figure 4 shows a sample of a MIDI section displayed by our **Style Dissector** program. If you play a style file on a standard MIDI player, it runs through the components in the order they appear in the file and ignores the markers. A dedicated style player makes use of the marker information (for example, to determine whether to repeat a component or play it once). A standard style file follows two conventions:

**Rule 1.** Only upper MIDI channels are used for the style, leaving the lower channels free for melody voices. The channels have the following functions:

- 08h: Sub-rhythm. This channel is often used for supplemental percussion instruments, although it could be set up for a pitched instrument.
- 09h: Rhythm. The MIDI convention is that channel 09h is used only for percussion and is always associated with a drum set.
- 0Ah: Bass notes. Instruments like a string bass or tuba.
- 0Bh: Chord (1). Polyphonic instruments to create harmony, like a guitar or piano.
- 0Ch: Chord (2). A second polyphonic instrument.

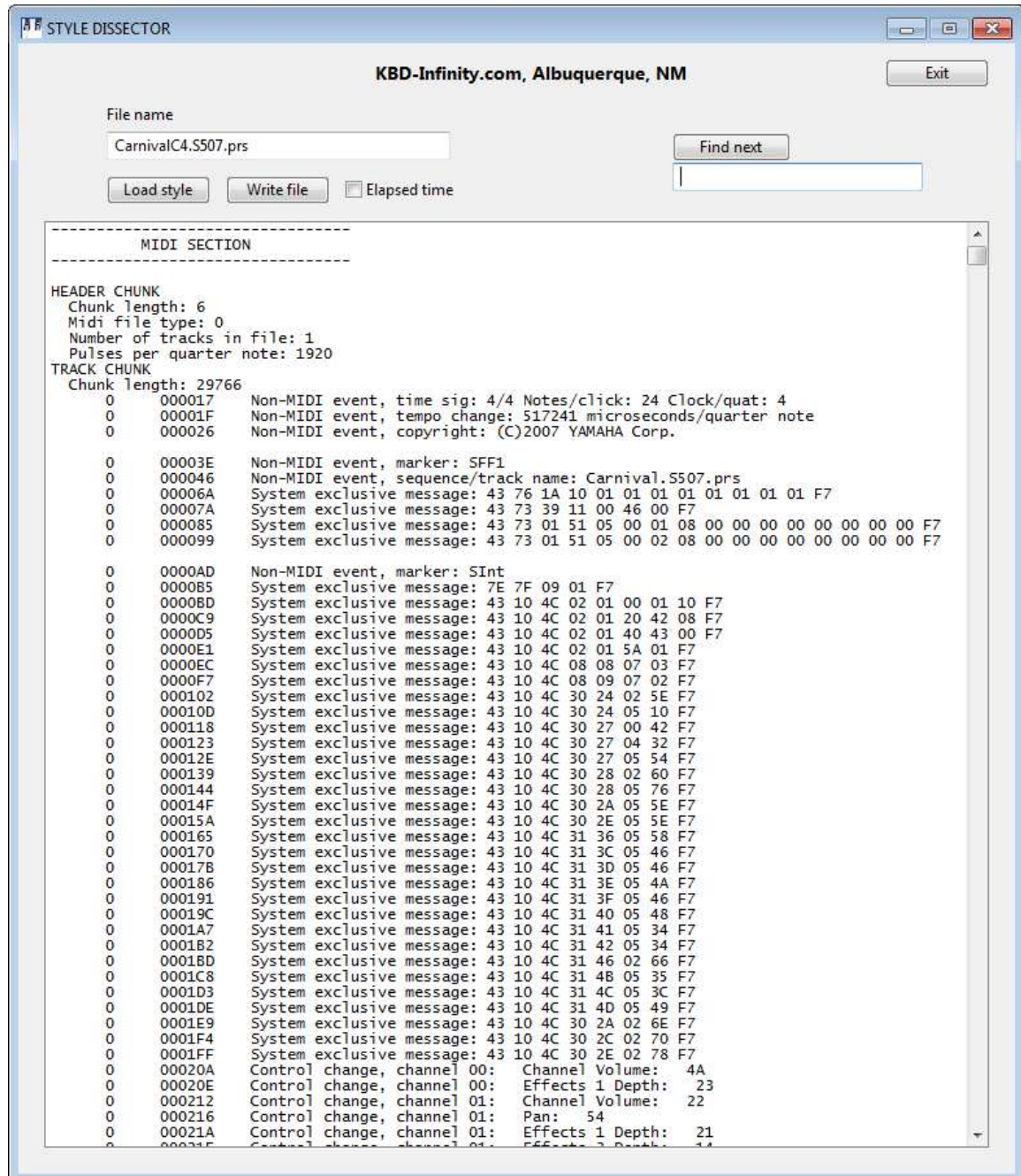


Figure 4: Style Dissector display example – a portion of the MIDI section.



- 0Dh: Pad. Usually a floating voice like strings or a choir.
- 0Eh: Phrase (1). A melody instrument, usually in introductions and endings.
- 0Fh: Phrase (2). A second melody instrument.

**Rule 2.** The pitched-instrument information should be in the key of *C* and suggest a *CMaj7* chord.

Style replication is easy for files that follow this convention. A computer program or keyboard processor need only play or repeat MIDI components as necessary, making the following small changes in response to keys below the split point pressed by the performer:

- Change selected notes in the chord channels to change the chord type (major, minor, diminished,).
- Add or subtract an offset for all notes in pitched channels to change the chord base.

The *Pure Style* files, which follow this convention, have a good sound when played by a standard MIDI player. On the hand, general style files may often make discordant sounds. Which brings us to the next section.

## 6.2 CASM section

This section allows style creators to bend the rules. The most important information is channel redirection. Notes and controls in the MIDI section may be in any MIDI channel, but must be redirected to the standard style channels. There is also fine tuning information for chords and many other details on reproduction logic. For example, some channels may suggest a minor chord rather than *Maj7*, and should be used only in certain circumstances. Other channels may not be in the key of *C* and must be corrected by the software.

## 6.3 OTS, MDB and MH sections

The letters *OTS* stand for *One-Touch Setting*, detailed voice and style setups in response to one-touch keys on high-end Yamaha keyboards. The information is machine-specific. The letters *MDB* stand for *Music DataBase*. The text information tells which song (or songs) may be appropriate for the style. The information coordinates with the *Music Finder* feature on some Yamaha keyboards. The information is often dated or subjective. Finally, nobody seems to know what purpose (if any) the MH section serves. These sections are not included in *Pure Style* files.

## 7 MIDI voice settings

The MIDI section of a style file contains two classes of information:

- Setup information.
- Performance information.

The performance information consists mainly of *NoteOn* and *NoteOff* signals, sent at the appropriate times. In contrast, setup information is sent before the style starts or when there is a section change. An important component of the setup is the definition of voices. For example, if a *NoteOn* signal is sent to MIDI channel 2, should the resulting sound approximate a violin, a clarinet, a tuba,...? In the absence of any setup information, every channel sounds like an acoustic piano, the default on most keyboards.

MIDI communication is divided into 16 channels – each channel can represent a different musical instrument (voice). Channels 08h through 0Fh are set aside for styles. Voice settings on a MIDI synthesizer such as a keyboard are sometimes called *patches*. The term is a holdover from the days of analog synthesizers. A collection of oscillators, filters, envelope generators and other equipment was physically patched together to produce a specific, complex audio signal in response to a MIDI note number. There was a revolutionary change with the advent of digital synthesizers. Thousand of dollars worth of interconnected electronic devices could be replaced with a set of numbers (parameters) applied to wave-generation algorithms. An inexpensive keyboard could easily hold parameter sets for thousands of patches.

With an effectively infinite number of possibilities, some standardization was essential. In particular in order to circulate standard MIDI and style files, it was necessary that all synthesizers produced about the same instrumental sounds. The requirement lead to the general MIDI (GM) convention, a set of 128 standard instrument sounds that a synthesizer should be capable of reproducing. If so, the synthesizer is GM compliant. Table 1 lists the options. The computer communicates what instrument sound should be approximated by the synthesizer in a particular MIDI channel by sending the following two-byte message:

C0h + ChanNo, GMCode

The message is called a *program command*. The channel number covers the range ChanNo = 00h to 0Fh, so the first number may vary from C0h to CFh. The quantity *GMCode* is the number in Table 1 and covers the range 00h (0) to 7Fh (127). At a minimum, the setup transmission consists of program commands for each of the channels used in the song. Finally, note that there is considerable variation between synthesizers in the quality and characteristics of the standard instrumental sounds, so the audio signal generated from a MIDI file will differ on each device.

During setup, the computer can also send control change information to fine-tune the voice characteristics. For example, we could set the *reverberation* (or depth) level. Reverberation determines the level of multiple reflections of sound (echos) in the virtual performance space. A value of 00h corresponds to open space space or an anechoic chamber while the maximum value 7Fh corresponds to a closed space with hard walls. The computer sends the following three-byte MIDI message:

B0h + ChanNo, 5Bh, Reverb (00h to 7Fh)

The first byte, B0h to BFh, indicates that control information follows for the MIDI channel. The second byte shows the type of control information – the number 5Bh indicates reverberation level. The final byte is the value. With **Style Customizer**, you can set values for all standard MIDI controls (Fig. 3). Note that some of the controls may not be recognized by your synthesizer. In this case, the device ignores the command and uses a default value.

Digital synthesizers can produce thousands of instrumental sounds, far more voices than the 128 of the general MIDI convention. Bank parameters allow you to access the full set of voices

Table 1: GM Voices

000 Acoustic Grand Piano	043 Contrabass	086 Lead 7 (fifths)
001 Bright Acoustic Piano	044 Tremolo Strings	087 Lead 8 (bass + lead)
002 Electric Grand Piano	045 Pizzicato Strings	088 Pad 1 (new age)
003 Honky-tonk Piano	046 Orchestral Harp	089 Pad 2 (warm)
004 Electric Piano 1	047 Timpani	090 Pad 3 (polysynth)
005 Electric Piano 2	048 String Ensemble 1	091 Pad 4 (choir)
006 Harpsichord	049 String Ensemble 2	092 Pad 5 (bowed)
007 Clavinet	050 Synth Strings 1	093 Pad 6 (metallic)
008 Celesta	051 Synth Strings 2	094 Pad 7 (halo)
009 Glockenspiel	052 Choir Aahs	095 Pad 8 (sweep)
010 Music Box	053 Voice Oohs	096 FX 1 (rain)
011 Vibraphone	054 Synth Choir	097 FX 2 (soundtrack)
012 Marimba	055 Orchestra Hit	098 FX 3 (crystal)
013 Xylophone	056 Trumpet	099 FX 4 (atmosphere)
014 Tubular Bells	057 Trombone	100 FX 5 (brightness)
015 Dulcimer	058 Tuba	101 FX 6 (goblins)
016 Drawbar Organ	059 Muted Trumpet	102 FX 7 (echoes)
017 Percussive Organ	060 French Horn	103 FX 8 (sci-fi)
018 Rock Organ	061 Brass Section	104 Sitar
019 Church Organ	062 Synth Brass 1	105 Banjo
020 Reed Organ	063 Synth Brass 2	106 Shamisen
021 Accordion	064 Soprano Sax	107 Koto
022 Harmonica	065 Alto Sax	108 Kalimba
023 Bandoneon	066 Tenor Sax	109 Bagpipe
024 Acoustic Guitar (nylon)	067 Baritone Sax	110 Fiddle
025 Acoustic Guitar (steel)	068 Oboe	111 Shanai
026 Electric Guitar (jazz)	069 English Horn	112 Tinkle Bell
027 Electric Guitar (clean)	070 Bassoon	113 Agogo
028 Electric Guitar (muted)	071 Clarinet	114 Steel Drums
029 Overdriven Guitar	072 Piccolo	115 Woodblock
030 Distortion Guitar	073 Flute	116 Taiko Drum
031 Guitar Harmonics	074 Recorder	117 Melodic Tom
032 Acoustic Bass	075 Pan Flute	118 Synth Drum
033 Electric Bass (finger)	076 Blown Bottle	119 Reverse Cymbal
034 Electric Bass (pick)	077 Shakuhachi	120 Guitar Fret Noise
035 Fretless Bass	078 Whistle	121 Breath Noise
036 Slap Bass 1	079 Ocarina	122 Seashore
037 Slap Bass 2	080 Lead 1 (square)	123 Bird Tweet
038 Synth Bass 1	081 Lead 2 (sawtooth)	124 Telephone Ring
039 Synth Bass 2	082 Lead 3 (calliope)	125 Helicopter
040 Violin	083 Lead 4 (chiff)	126 Applause
041 Viola	084 Lead 5 (charang)	127 Gunshot
042 Cello	085 Lead 6 (voice)	

available on your keyboard. In the convention, voices are arranged in banks with a maximum of 128 entries. The bank number (a 14 bit quantity) is specified by two seven bit numbers: *MSB* contains the top 7 bits and *LSB* contains the lower 7 bits. The maximum number of voices on a synthesizer that supports the XG convention is  $(128)^3 = 2,097,152$ . In practice, the number of available synthesizer voices is much smaller.

The drawback of banks is that the voices are not standardized between manufacturers and may even differ between keyboards from the same manufacturer. Therefore, voices that you create with bank parameters may be appropriate only for your keyboard. This is the reason that most of the MIDI files you download on the Internet use only GM voices.

If your goal is to perform on your keyboard, bank voices are a good option if you know the correct parameters. These may be listed in the reference material supplied with the device. For example, the Yamaha PSR E423 supports 700 voices, with bank parameters given in the *Data List* manual. The setting for the *ChristmasBel* voice,

GM instrument = 098, MSB = 000, LSB = 067,

gives a warm bell sound. In most cases, if a synthesizer does not support a bank voice, it will substitute the general MIDI voice. Manufacturers usually define bank voices so that they sound similar to the corresponding GM voice. In the example, GM voice 098 is FX 3 (crystal), close to *ChristmasBel*. Therefore, bank voices may have an acceptable sound on different keyboards.

The bank parameters can be used to make rhythm (percussive) sounds on your keyboard. Such sounds have a broad spectrum without a well-defined pitch. Rhythm sounds are a key component of most styles – by convention, they are transmitted over MIDI channel 09h, although other channels may be used by setting Bank MSB = 126 or 127. Because pitch information is not required, the note value in *NoteOn* and *NoteOff* MIDI messages is used to determine the type of drum sound. Like the general MIDI instrument voices, there is a set of general MIDI percussion sounds recognized by all synthesizers that support the GM standard. The options are listed in Table 2. To illustrate, if a synthesizer receives a *NoteOn* signal on MIDI channel 09h with note value 39h, it produces the sound of a hand clap.

Table 2: General MIDI percussion sounds

Note	Drum sound	Note	Drum sound
35	Bass Drum 2	58	Vibra Slap
36	Bass Drum 1	59	Ride Cymbal 2
37	Side Stick/Rimshot	60	High Bongo
38	Snare Drum 1	61	Low Bongo
39	Hand Clap	62	Mute High Conga
40	Snare Drum 2	63	Open High Conga
41	Low Tom 2	64	Low Conga
42	Closed Hi-hat	65	High Timbale
43	Low Tom 1	66	Low Timbale
44	Pedal Hi-hat	67	High Agog
45	Mid Tom 2	68	Low Agog
46	Open Hi-hat	69	Cabasa
47	Mid Tom 1	70	Maracas
48	High Tom 2	71	Short Whistle
49	Crash Cymbal 1	72	Long Whistle
50	High Tom 1	73	Short Giro
51	Ride Cymbal 1	74	Long Giro
52	Chinese Cymbal	75	Claves
53	Ride Bell	76	High Wood Block
54	Tambourine	77	Low Wood Block
55	Splash Cymbal	78	Mute Cuca
56	Cowbell	79	Open Cuca
57	Crash Cymbal 2	80	Mute Triangle
		81	Open Triangle