

M-AUDIO

KeyStudio 49i

Keyboard-based Music Production System



English

User Guide

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Introduction

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Congratulations on your purchase of M-Audio KeyStudio 49i: a 49-key full-size, velocity sensitive USB keyboard, digital piano, audio interface, and software package, designed for easy integration with your PC or Macintosh computer. KeyStudio 49i is ideal for a multitude of music creation applications.

KeyStudio 49i is a USB keyboard controller and standalone digital piano. It contains Octave shift buttons, Modulation and Pitch Bend wheels, and a Piano Volume knob, all of which can be re-assigned to control different MIDI functions. KeyStudio 49i is also a computer audio interface featuring XLR microphone, 1/4" instrument, and RCA inputs, as well as two 1/4" outputs.

KeyStudio 49i functions as a class-compliant device. This means your computer will recognize the keyboard without the need to install additional drivers. This gives immediate access to all audio inputs and outputs as well as to the built-in MIDI interface. However, as you become more familiar with KeyStudio 49i, you may wish to take advantage of this product's additional professional features by installing the KeyStudio 49i drivers.

Installing these drivers in Windows improves audio performance by reducing the time it takes for MIDI input (when using software synthesizers) or audio input signals to appear as audio at your computer's outputs. In Windows, additional benefits from driver installation include: using your new keyboard with more than one application at the same time (multi-client), sending large SysEx messages, or using your KeyStudio 49i with Pro Tools M-Powered recording software or the included GM Module software.

On a Macintosh computer, installing the M-Audio drivers enables you to use your KeyStudio 49i with Pro Tools M-Powered recording software.

Information on driver installation can be found in the "Connecting KeyStudio 49i to a Computer" chapter of this User Guide.

About this User Guide

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This User Guide covers setup and operation of the KeyStudio 49i USB keyboard, use of the M-Audio GM Module software, and basic MIDI software setup. KeyStudio comes bundled with recording software, but it can also be used with many third-party music programs. See your software's documentation for more information on this.

KeyStudio 49i Features

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Keyboard:

- 49-key velocity sensitive keyboard
- on-board piano sound
- on-board piano reverb effect
- Pitch Bend wheel
- Modulation wheel; MIDI re-assignable
- Piano Volume knob; MIDI re-assignable
- Octave up/down buttons; MIDI re-assignable
- Sustain foot pedal input; MIDI re-assignable
- MIDI Out port
- 20 note polyphony
- Edit Mode button for advanced functions and programming
- bus-powered through USB or DC power for standalone functionality
- driver installation not mandatory—simply connect and power on

Built-in Audio Interface:

- 16-Bit, 44.1KHz, 2-in, 2-out audio interface
- XLR microphone input, 1/4" instrument input, and stereo RCA inputs.
- two rear-panel 1/4" audio outputs
- two front-panel 1/4" headphone outputs
- dedicated Instrument and Microphone gain control knobs with signal and peak LEDs
- Direct Monitor knob for near-zero latency monitoring

Power:

- USB or DC powered (with optional power supply)

Software:

- M-Audio GM Module Standalone application and plug-in
- Ableton Live Lite music creation software

What's in the Box?

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- KeyStudio 49i MIDI controller keyboard / audio interface
- Printed Quick Start Guide
- M-Audio KeyStudio 49i CD-ROM
 - Software drivers and documentation
 - M-Audio GM Module standalone and plug-in application
- Ableton Live Lite CD-ROM and registration card
- USB cable

If any of the above listed items are missing, please contact the retailer where you purchased the product.

Minimum System Requirements

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Standalone

Standalone operation refers to using KeyStudio without a computer. An optional 9V, 500mA center-positive power supply (sold separately) is required for standalone operation.

Bus-Powered

In this mode of operation, KeyStudio is connected to a PC or Mac with a USB cable. When using the KeyStudio 49i with your computer, your computer system must meet the following minimum specifications.

M-Audio KeyStudio 49i Hardware and GM Module Software:		
<u>Windows XP (SP2)*</u> <ul style="list-style-type: none"> • Pentium® III 1GHz or AMD K7 Athlon 1GHz (CPU may be higher for laptops) • 512 MB RAM • One native USB port • 350 MB free hard disk space for GM Module • CD-ROM drive for installation of GM Module <p><i>*Home and Professional Edition only. Windows Media Center Edition is not currently supported.</i></p>	<u>Windows Vista 32-bit</u> <ul style="list-style-type: none"> • Pentium® III 1GHz or AMD K7 Athlon 1GHz (CPU may be higher for laptops) • 1 GB RAM • 128 MB Graphics Card • One native USB port • 350 MB free hard disk space for GM Module • CD-ROM drive for installation of GM Module 	<u>Mac OS X</u> <ul style="list-style-type: none"> • Macintosh G4 1GHz † • OS X 10.3.9 with 512 MB RAM • OS X 10.4.9 with 512 MB RAM • One native USB port • 350 MB free hard disk space for GM Module • CD-ROM drive for installation of GM Module <p><i>† G3/G4 accelerator cards are not supported.</i></p>

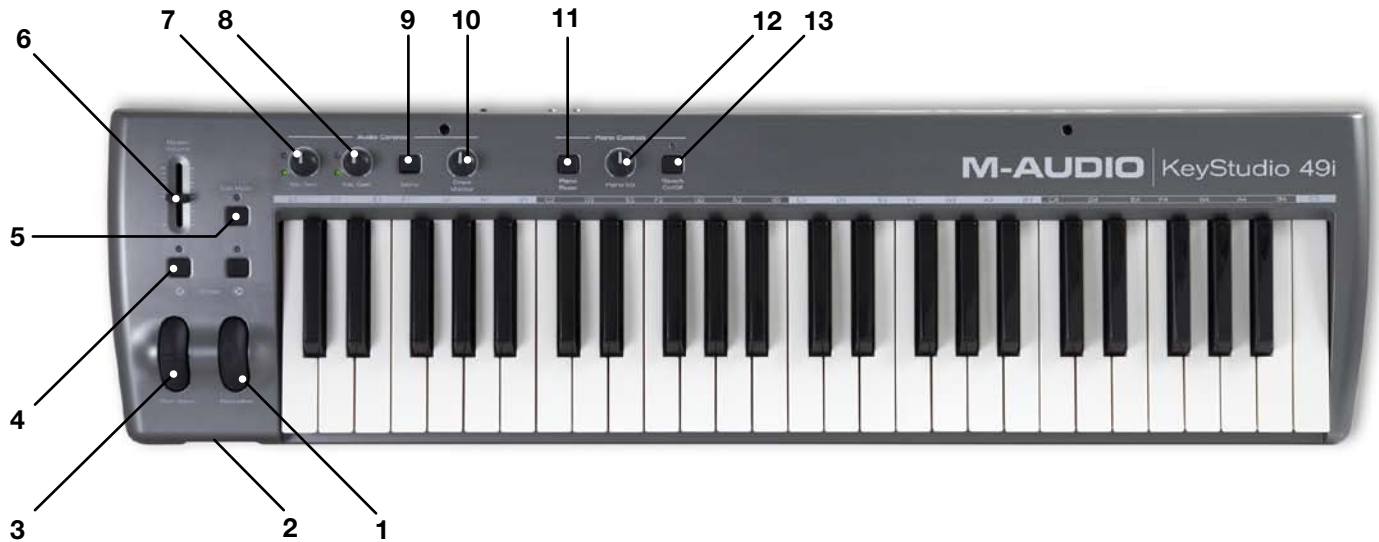
M-Audio suggests you also check the minimum system requirements for any software applications you plan on using with your new M-Audio hardware, as they may be greater than the above.

Important: Connect your Headphones or powered speakers to KeyStudio 49i. Sounds created by KeyStudio and from software used with it will be available at the audio outputs on KeyStudio 49i (and not on the outputs of your computer's built-in soundcard).

Controls and Connectors

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Top Panel Diagram



Top Panel Descriptions

1. **Modulation Wheel (Modulation):** This is an assignable controller with a default of controlling vibrato or tremolo effects assigned to the instrument you are currently playing. This type of real-time controller was originally introduced on electronic keyboards to give the performer options such as adding vibrato, just like players of acoustic instruments do. If you are using your keyboard as a MIDI controller, the Modulation wheel transmits MIDI modulation (MIDI CC 01) messages as it is moved. Some external MIDI devices may not respond to modulation messages, and not all instruments respond to modulation data sent from the Modulation wheel. Check the MIDI implementation charts provided with your other MIDI equipment or software for modulation details. Details on how to change the function of this wheel can be found in the “Advanced Features in Edit Mode” section.
2. **Headphone Outputs (Phones):** These two output jacks accept standard 1/4" TRS headphone plugs, and are rated to accept headphones in a broad range of impedances, between 32 and 600 ohms.
3. **Pitch Bend Wheel (Pitch Bend):** The Pitch Bend wheel is used to bend the pitch of a note up or down. This enables you to play phrases not normally associated with keyboard playing, including guitar-style riffs. If you are using your keyboard as a MIDI controller, the Pitch Bend wheel transmits MIDI pitch bend messages as it is moved. Some external MIDI devices may not respond to pitch bend messages. Check the MIDI implementation charts provided with your other MIDI equipment or software for pitch bend details.
4. **Octave <> Buttons (Octave):** By default, these buttons apply octave shift to the notes played on the keyboard. Pressing the Octave > button (right) will shift the notes played on the keyboard up by one octave. When octave shift is active (i.e. after pressing this button) the LED above this button will light. Pressing the Octave < button (left) will shift the notes played on the keyboard down by one octave. Pressing both Octave buttons together will restore the default octave (Octave shift = 0). Any lit LEDs will go out and the keyboard will now transmit MIDI notes that are not octave-shifted.

The Octave buttons can also be assigned to send different MIDI data. This is explained in the “Advanced Features in Edit Mode” section.

5. **Edit Mode Button (Edit Mode):** When this button is pressed, the keyboard will enter “Edit Mode.” While in Edit Mode, the keys on the keyboard no longer send MIDI notes, and instead are used to select advanced functions and enter data. See the “Advanced Features in Edit Mode” section for more information on this topic.
6. **Master Volume Fader (Master Vol.):** The Master Volume fader controls the main audio volume output.
7. **Microphone Gain Knob (Mic. Gain):** The signal (green) LED illuminates when incoming audio signal is greater than -20dB. The peak (red) LED illuminates when incoming audio signal is greater than -1dB.
8. **Instrument Gain Knob (Inst. Gain):** The signal (green) LED illuminates when incoming audio signal is greater than -20dB. The peak (red) LED illuminates when incoming audio signal is greater than -1dB.”
9. **Mono Button (Mono):** This is an analog button that sums the Microphone and Instrument inputs. When active, input signals will be routed to both, the left and the right side of your stereo speakers or headphones, making them appear centered in the stereo panorama.

When recording while the Mono Button is active, signals from the Microphone Input and Instrument Input will be merged and recorded to both, the left and the right side of a stereo track in your recording software. If signals are entering the keyboard through the Aux inputs or if you're playing the built-in Piano sound while recording, then all sounds will be merged and recorded to the same audio track.

This makes it easy to record an entire performance to a stereo track by the push of a button.

Note: *The Mono button does not affect signals from the Aux Inputs or the the build-in Piano sound.*

10. **Direct Monitor Knob (Direct Monitor):** The Direct Monitor knob controls the amount of audio input signal flowing directly to the 1/4" audio outputs.
11. **Piano Reset Button (Piano Reset):** The Piano Reset button sends “All Notes Off” and “Reset All Controllers” MIDI messages on MIDI channel 1. This button restores basic piano and keyboard controller functions, including resetting the Modulation wheel, Piano Volume Knob, and Sustain Pedal to their default settings.
12. **Piano Volume Knob (Piano Vol.):** This is an assignable controller with a default of controlling the volume of the piano sound flowing to the 1/4" audio outputs. Details on how to change the function of this knob can be found in the “Knob Assign Key” section of the “Advanced Features in Edit Mode” section of this User Guide.
13. **Reverb On/Off Button (Reverb On/Off):** This button engages the internal reverb effect of KeyStudio 49i. The reverb depth can be controlled via MIDI CC commands. See the “Advanced Features in Edit Mode” chapter of this User Guide for more information on this.

Rear Panel Descriptions



14. **1/4" Audio Outputs (Output R–L (Mono)):** These are unbalanced tip-sleeve (TS) audio outputs for the piano sound, signal from all inputs, and audio signal coming from your computer. If you are connecting to a mono (1 channel) device or amplifier, use the left 1/4" output.
15. **Auxiliary RCA Inputs (Aux Input R–L):** These inputs mix with the XLR and 1/4" inputs, and also send their signal to the audio outputs. These inputs can receive signal from a variety of sources including mixers, stereo receivers, and other external sound producing equipment.
16. **1/4" Instrument Input (Instrument):** This tip-sleeve (TS) unbalanced connector enables you to plug in an instrument, such as an electric guitar or bass.
17. **XLR Microphone Audio Input (Microphone):** This input accepts a dynamic microphone connected via a standard three-pin balanced XLR cable.
18. **Sustain Pedal Jack (Sustain):** You can plug any polarity foot pedal (not included) into the Sustain Pedal jack on your KeyStudio 49i. The keyboard will automatically detect the correct polarity when powering up. If you want to reverse the polarity, just make sure the pedal is pressed when you switch on your keyboard. The sustain foot pedal is normally used for sustaining the sound you are playing without having to keep your hands on the keyboard, just like a piano.
19. **MIDI Out Jack (MIDI Out):** Your new MIDI controller can connect to optional external MIDI devices such as synthesizers or sound modules. By default, MIDI data created by KeyStudio 49i is sent to this MIDI output port. However, it is possible to configure KeyStudio to act as a USB to MIDI interface, allowing MIDI data from your computer to be sent to this port. Please see section "MIDI Out Mode Key" on page 26 for more information.
20. **USB Port:** This enables you to connect to an available USB port on your computer using the USB cable provided.
21. **DC Power Supply Port (9V DC):** Connect a 9V DC >500mA center-positive power supply (sold separately) to this jack when using KeyStudio 49i in standalone mode.
22. **On/Off Switch:** This On/Off switch turns KeyStudio 49i on and off.
23. **Kensington® Security Slot:** This slot is compatible with Kensington® security cables to protect your device from theft.

Hardware Connections

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Audio Inputs

A dynamic microphone can be connected to the XLR input located on the rear panel, and an instrument such as a guitar or bass can be connected to the 1/4" input jack, also located on the rear panel. Each of these two inputs has an independent preamp featuring a dedicated gain control knob, and level and clip LEDs. Two analog RCA inputs are also located on the back panel. Signal from these inputs is mixed with the Microphone and Instrument inputs before being routed through the USB connection to a connected Mac or PC.

Audio Outputs

Connect the two analog 1/4" outputs (located on the rear panel of the KeyStudio) to powered monitors, an amplifier, or a mixer. You may also monitor through headphones by connecting one or two sets of headphones to the 1/4" stereo headphone outputs, located on the front panel.

MIDI Connections

In addition to the USB MIDI connection between KeyStudio 49i and your computer, you can connect the MIDI output of the KeyStudio 49i to an external MIDI device's MIDI input. This enables you to control an external synthesizer or sound module via your computer, using the KeyStudio as a USB to MIDI interface, or as a standalone MIDI controller keyboard.

Other Connections

A sustain pedal can be connected to the 1/4" Sustain pedal jack on the back of KeyStudio.

Connecting KeyStudio 49i to a Computer

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KeyStudio 49i functions as a class-compliant device, and your computer will recognize the keyboard without additional drivers. This gives immediate access to all audio inputs and outputs as well as to the built-in MIDI interface. As you become more familiar with the KeyStudio keyboard, you may wish to take advantage of this product's additional professional features by installing the KeyStudio 49i drivers.

In Windows, these additional features include: using your new keyboard with more than one application at the same time (multi-client), sending large SysEx messages, or using your KeyStudio 49i with Pro Tools M-Powered recording software or the included GM Module software. Installing the KeyStudio ASIO drivers in Windows also improves audio performance by reducing the time it takes for MIDI input (when using software synthesizers) or audio input signal to appear as audio at your computer's outputs.

On a Macintosh computer, installing the M-Audio drivers enables you to use your KeyStudio 49i with Pro Tools M-Powered recording software.

The Windows and Mac OS X drivers are found on the KeyStudio 49i CD-ROM included with this package.

KeyStudio 49i Windows Driver Installation

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NOTE: If you are installing the drivers for KeyStudio 49i on your Windows XP or Windows Vista computer, disconnect your KeyStudio until you are instructed to connect it.

To install the Windows drivers for KeyStudio 49i:

1. Insert the M-Audio KeyStudio 49i CD-ROM into your computer's CD-ROM drive.
2. The computer will automatically display the interactive install screen. If your computer fails to launch the installer, manually start it by clicking on Start > My Computer > M-Audio KeyStudio 49i.
3. Choose the KeyStudio 49i keyboard from the pull down menu and click "Install."
4. Follow the driver installer's on-screen direction prompts.
5. At various points in this installation process, you may be notified that the driver being installed has not passed Windows Logo Testing, or asked whether the program you wish to run is a trusted application. Click Continue Anyway or Install to proceed with installation.



6. Click "Finish" once the installer has completed the installation.
7. Connect your KeyStudio 49i to an available USB port using the cable provided.*
8. Make sure that the power switch on the back of the keyboard is in the "on" (I) position.
9. You will be asked if you want to search the Internet for a driver. Select "No, not this time" and click "Next."
10. Windows will display a Found New Hardware Wizard.
11. Choose "Install the software automatically," and click Next.
12. Follow the on-screen direction prompts and click "Finish" when the Found New Hardware Wizard has completed.

*The single USB cable not only powers the keyboard but also sends MIDI data to and from your computer system.

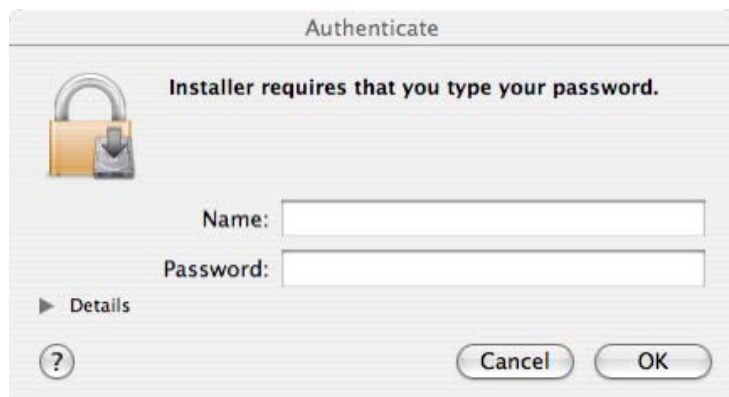
KeyStudio 49i Macintosh Driver Installation

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M-Audio driver installation is not required in order to use KeyStudio 49i with the GM Module software on your Macintosh OS X computer. These drivers are however, required for Pro Tools M-Powered use.

NOTE: Disconnect your KeyStudio 49i keyboard from your computer until the appropriate driver files have been copied to your hard drive. Be sure to leave your KeyStudio 49i disconnected until instructed to connect it below.

1. Download the most recent KeyStudio 49i Macintosh drivers by going to the Support > Drivers page at www.m-audio.com.
2. Double-click the file once it has finished downloading.
3. Follow the driver installer's on-screen instructions. During Installation, Mac OS X will ask you to enter your user name and password. Enter this information and click OK to confirm. If you have not configured a password for your computer, leave the password field blank and click OK. If you are not the computer's owner, ask the owner or your Administrator for the missing information.



4. Click "Close" once the installer has completed the installation and connect your KeyStudio 49i keyboard to your computer using the USB cable provided.*
5. Your KeyStudio 49i is now ready to use.

*The single USB cable not only powers the keyboard but also sends MIDI data to and from your computer system.

KeyStudio 49i and the M-Audio GM Module Software

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The M-Audio GM Module User Interface



Note: Installation instructions for the M-Audio GM Module software can be found in the printed Quick Start Guide included with your KeyStudio 49i. The GM Module software requires the KeyStudio 49i hardware to be connected. Additionally, Windows users will need to install the KeyStudio 49i drivers for the GM Module software to launch.

Overview

M-Audio GM Module is a 16-channel, multi-timbral General MIDI sound player. The GM Module software provides 128 instruments (0-127). It receives MIDI messages from your KeyStudio 49i USB keyboard, and sends audio signal out of the KeyStudio audio outputs.

Both the standalone and the plug-in versions of the software also contain a GM standard drum and percussion kit on channel 10. Its polyphony and the number of instances that can be run at the same time in plug-in mode are limited only by your computer's performance.

The following is an explanation of the technical terms used in the previous paragraph. Understanding these terms will not only help to get the most out of M-Audio GM Module, but will also be useful on your path as an electronic musician.

MIDI

MIDI is an abbreviation for Musical Instrument Digital Interface. MIDI in itself is a means of digital communication—no sound is transmitted over a MIDI connection, but only a series of digital messages that tell a connected sound generator (like the M-Audio GM Module) what to do. For example, if you hit the middle C on the KeyStudio keyboard, the keyboard will send a “Note On” message, together with information about the pitch (middle C) and how hard or fast you hit the note (Velocity). The connected sound generator will in turn play the sound for the middle C. If you let go of middle C, the KeyStudio keyboard will send a “Note Off” message for the same note and the sound generator will stop playing. All this happens very fast and you usually don't have to think about it, but it's good to know.

When MIDI was invented, a number of additional rules and specifications were defined. Some of them are directly responsible for the way the M-Audio GM Module looks and functions:

16 Channels

It is no coincidence that M-Audio GM Module has 16 channels. The definition of the MIDI standard specifies 16 MIDI channels for every MIDI connection. This means that up to 16 independent data streams (carrying Note On/Off messages etc.) can be transmitted at the same time. M-Audio GM Module makes use of all of them and can simultaneously play a different instrument on each of its 16 synthesizer channels. Always match the MIDI channel(s) you transmit on to the desired channel(s) of M-Audio GM Module. Channel 10 plays a special role in General MIDI compatible synthesizers. You will always find the GM Drum Kit on this channel.

General MIDI

General MIDI is where M-Audio GM Module got its name. GM stands for General MIDI. While MIDI defines the principle used for communication between musical instruments, the General MIDI standard defines what kind of sounds and features a GM-compliant synthesizer has to offer. This was necessary for compatibility between musicians and songwriters. Imagine the following situation: Musician A creates a MIDI song and sends it to Musician B for further refinement. They are both using different synthesizer models and when musician B plays the song back, it sounds completely different from what musician A had intended. The GM standard dictates that a compliant synthesizer has to have 128 standardized instruments (also called Patches) that are sorted and numbered a certain way. As an example, the first instrument in a GM compliant synthesizer is always the Acoustic Grand Piano. If musicians A and B are both using synthesizers that are GM compliant (regardless of the make and model of the synthesizer), then the song will sound very similar when played back on either one of them. Many of today's synthesizers are General MIDI compliant or can operate in a mode that allows for this. M-Audio GM Module is based on the General MIDI standard. Its instrument categories, instruments, effects and settings are according to GM standard for maximum compatibility.

128 Patches and the GM drum kit

As explained in the previous paragraph, General MIDI defines the 128 instruments (also called patches) a synthesizer has to offer to be GM compliant. A complete list of GM patches can be found in Appendix A. Additionally, and also according to General MIDI standard, M-Audio GM Module provides a Drum Kit on channel 10. All the used drum- and percussion sounds are mapped to the keys as defined by the GM standard. A GM drum mapping chart can be found in Appendix B.

Multi-Timbral

Multi-Timbral means, that a synthesizer can produce multiple instrument sounds at the same time. For example, play Piano on channel 1, Bass on channel 2 and Drum sounds on channel 10 – all at the same time. M-Audio GM Module can play different instruments on all of its channels simultaneously and is therefore 16x multi-timbral.

Polyphony

The polyphony of a synthesizer stands for the number of notes it can play simultaneously. Some older synthesizers have very limited polyphony. For example, if a synthesizer has a polyphony of only 3 notes, you can play a 3-note chord with your left hand without problems. However, once you attempt to play an additional note with your right hand, you exceed the maximum polyphony by attempting to play 4 notes at a time. As a result, one of the notes played with your left hand will stop playing in favor of the new note triggered with your right hand. M-Audio GM Module has no such limitation and allows you to play as many notes at the same time as your computer's CPU can handle.

GM Module Standalone Operation with KeyStudio 49i

When configured for standalone use, the KeyStudio keyboard is connected to the computer, and the GM Module software is launched independently of any recording application. With this setup, the software automatically receives MIDI messages from your KeyStudio USB keyboard. All sounds generated by the GM Module software will automatically be routed to the two 1/4" audio outputs on the KeyStudio 49i keyboard. In most cases, MIDI input or audio output selection and configuration is not necessary.*

***Note:** To optimize performance in Windows, you may wish to adjust the buffer setting within the KeyStudio 49i software Control Panel. Please see the KeyStudio 49i Software Audio Control Panel section of this User Guide for more information on this.

When the M-Audio GM Module software is launched in standalone mode, it sends a MIDI message to the KeyStudio keyboard. This message programs the Octave buttons on KeyStudio 49i to send program change messages. The GM Module software always opens with program zero selected on GM Module channel 1. This mutes GM Module, allowing only the KeyStudio 49i built-in piano sound to be heard. Pushing the Octave ">" button unmutes GM Module, and allows you to step through program numbers 1-127, which trigger General MIDI sounds in the GM Module software (see the User Guide Appendix A). The built-in piano sound in KeyStudio 49i will remain silent while playing any of the GM Module sounds when the software is in standalone mode. If program zero is once again selected on GM Module channel 1, the GM Module software will once again be muted, and the KeyStudio 49i built-in piano sound will be heard.

Audio Configuration

Windows

In Windows, the standalone version of the GM Module software provides additional audio and MIDI configuration settings within a pull-down menu item, called "GM Module." This menu includes the following items:

- **Preferences:** Opens the Preferences Dialog. This dialog includes the following parameters:
 - ▶ MIDI Input Device: Lets you select the MIDI input for GM Module.
 - ▶ Audio Output Device: Lets you select the audio output for GM Module.

Note: The KeyStudio 49i drivers need to be installed in order to use the GM Module software and for the KeyStudio 49i audio outputs to appear here.

Macintosh

In Mac OS X, the standalone version of the GM Module software provides additional audio and MIDI configuration settings within a pull-down menu item called "GM Module." This menu includes the following items:

- **About M-Audio GM Module:** Opens the About box of GM module, which includes version information and credits.
- **Preferences:** Opens the Preferences dialog. This dialog includes the following parameters:
 - ▶ Audio Output Device: Lets you select the audio output for GM Module.
 - ▶ MIDI Input Device: Lets you select the MIDI input for GM Module.

Note: KeyStudio 49i is pre-configured to transmit MIDI messages on MIDI channel 1. When initially using your KeyStudio with the GM Module software, you will most likely only see activity on the first one of the Level Meters. See the "Advanced MIDI Features in Edit Mode" section of this User Guide for instructions on how to change the MIDI transmission channel in order to control any M-Audio GM Module channel.

Using the M-Audio GM Module as a Plug-in

M-Audio GM Module works as a plug-in with many applications such as Pro Tools (RTAS), Cubase (VST) as well as Logic and GarageBand (Audio Units). When running the GM Module software as a plug-in, your host application's MIDI input settings determine the MIDI information received by GM Module. Some host applications can only address the first of the 16 channels when using GM Module as a plug-in. Load multiple instances of the M-Audio GM Module in several tracks of the host application to overcome this limitation. Some host applications allow a single instance of a plug-in to be used with multiple MIDI channels but require additional configuration steps to achieve this. We recommend making these additional settings since this method of operation is far more CPU efficient when compared to the use of multiple instances of the plug-in within several tracks. Consult your host application's documentation for details.

Global Settings



The functions explained in this section affect all 16 channels of M-Audio GM Module.

Load/Save

Clicking the area above the Load and Save buttons produces a drop-down list of any user-defined presets stored in the M-Audio GM Module default preset folder (General MIDI Module Patches). This folder can be found within the General MIDI Module Data folder defined during installation. To load a preset from this location, select it from this drop-down menu. To save a preset, click the Save button. Saving your custom preset within the default preset folder will add it to the drop-down menu accessible by clicking in the area above the Load and Save buttons. To load a preset stored in any other location than the default preset folder, click the Load button and then browse to the folder that holds the preset. The number of presets that can be stored is virtually unlimited and only restricted by available hard drive space.

Fine Tune

Click and hold the Fine Tune control, and drag up or down to fine-tune the pitch of all voices produced by M-Audio GM Module.

Transpose

Click and hold the Transpose control, and drag up or down to change the pitch of all voices produced by the M-Audio GM module in half-note steps. Select any value between -24 (2 Octaves down) and +24 (2 Octaves up).

Master Volume

Adjusts the volume of the entire M-Audio GM Module. Click and hold the Master Volume control, and turn the dial clock-wise to increase the volume level.

Channel Specific Settings



The M-Audio GM Module has 16 individual channels that correspond to the 16 channels defined in the MIDI specification. All 16 channels of GM Module can simultaneously produce sounds. Each of these channels can be set to a different instrument and has its own Volume, Pan, Tone, Category/Instrument, Chorus, Reverb, Mute and Solo controls. The displayed controls always only affect the selected channel.

Channels 1-16

To select a channel, click on its level meter located above the channel's number.* The selected channel will appear with an outline around its level meter. The set of controls to the right of the channel meter display will only affect the selected channel. The General MIDI standard provides for 16 MIDI channels, 15 of them with the same set of 128 available instruments. Channel 10 is an exception and plays a special role since this channel is always mapped to the General MIDI drum kit. This assignment is fixed and cannot be changed.

***Important:** Clicking the level meter of a channel selects that channel for editing and allows you to change its sound patch, reverb level, chorus level, volume, and pan settings.

However, selecting a channel in the GM Module software does NOT mean that KeyStudio will trigger instruments on that channel. To do that, you need to change the MIDI transmission channel on the KeyStudio 49i hardware to the corresponding MIDI channel.

Example: To play the GM drum kit located on channel 10 of GM Module, change the MIDI transmission channel on KeyStudio 49i to MIDI channel 10 (see chapter 16 for details). To alter the drum kit's settings, click on level meter 10 in the GM Module software, then move the on-screen controls to alter parameters like reverb or chorus level, drum kit volume, etc.

M (Mute)

This is the GM channel mute for a selected channel. The level meters of muted channels appear in a lighter shade of gray and will not show any meter activity – even if MIDI messages are received on this channel. A muted channel does not output any sound.

S (Solo)

This is the GM channel solo for a selected channel. Soloing a channel will mute all other 15 channels of the M-Audio GM Module software. Accordingly, all channels with exception of the Soloed channel will be displayed in a lighter shade of gray and will not show any meter activity – even if MIDI messages are received on these channels. Only the Soloed channel will output sound while all other channels will remain silent.

Note: If the GM Module is set to program zero in standalone mode so the KeyStudio 49i piano sound is heard, pressing Solo on a different channel on the GM Module does not mute the KeyStudio 49i built-in piano sound.

Category

The M-Audio GM Module arranges its sounds into the General MIDI standard categories. Clicking this field produces a drop-down menu of all categories. Appendix A shows a list of all available categories and the contained instruments.

Note: *Although selecting a new Category changes the display of the Instrument control, it is necessary to select a sound from the Instrument control to load it. This is useful when using the GM Module software in live performance situations where it may be undesirable for the first sound in a category to immediately load. In such situations, it is usually preferred to have the previous sound loaded until you select the particular sound from within a category.*

Instrument

Clicking this field produces a drop-down menu of all patches within a category for selection. Appendix A shows a list of all available instruments and their categories.

Note: *When using the mouse to change instruments on the GM Module software, the built-in piano sound and sounds from GM Module may play at the same time. This simultaneous playing of two sounds can be stopped by turning the KeyStudio 49i Local mode off. This silences the KeyStudio 49i built-in piano sound, and only allows sounds from GM Module to be heard. See the Local Key portion of the Advanced MIDI Features in Edit Mode section of this User Guide for more information on how to turn Local mode off.*

Chorus

Applies a standard GM chorus to the selected channel. Turn this dial clock-wise to increase- and counter clock-wise to decrease the amount of chorus applied to the selected channel / instrument.

Reverb

Applies a standard GM reverb to the selected channel. Turn this dial clock-wise to increase- and counter clock-wise to decrease the amount of Reverb applied to the selected channel / instrument.

Volume

Sets the volume for the selected channel. Turn this dial clock-wise to increase and counter clock-wise to decrease the volume of the selected channel / instrument.

Pan

Controls the pan position for the selected channel. If the dial is centered, equal amounts of signal will be sent to both, the left and the right side of the stereo panorama. If the dial is moved clock-wise, the right side of the stereo panorama will increase in level while the left side of the panorama will decrease in level. As a result, an instrument will appear as if positioned further to the right in the stereo panorama. The opposite effect applies when turning this dial counter clock-wise.

Tone

The tone control adjusts the brightness of the patch. Turn this dial clock-wise for a brighter sound and counter clock-wise for a decrease in brightness.

Getting Started with MIDI Music Creation Software

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If you are new to MIDI (Musical Instrument Digital Interface), you may initially find it challenging to understand how KeyStudio interacts with the computer. You will find that using a computer-based sound source and recording system allows for access to an extremely large array of high quality sounds, a large graphic user interface, and freedom to work with many music creation applications. A basic understanding of MIDI will enable you to take advantage of its wealth of creative possibilities.

Pressing one of the keys of KeyStudio 49i causes the keyboard to send out MIDI (Musical Instrument Digital Interface) data. MIDI data gives instructions on how a sound should play. These instructions dictate parameters such as what note to play, when to play it, how loud to play it, and which sound to use.

When using a virtual instrument within recording software such as Ableton Live Lite, data from the KeyStudio keyboard can be sent to the sequencer software, routed to a virtual instrument that is loaded within that software, and sent to an audio output, turning MIDI data into audible sounds. For this, you must configure your music software to read MIDI data being sent from KeyStudio and play the sound back accordingly. In many music applications, this entails going into the Options, Preferences, or Device Set-Up menu in your music software application and selecting the appropriate MIDI input device.

In Windows XP and Windows Vista, the KeyStudio MIDI input will appear as “USB Audio Device” if the optional drivers have not been installed. After installing these drivers, KeyStudio will appear as “M-Audio KeyStudio IO.”* Please consult your software’s documentation for instructions on how to configure the software for use with MIDI input devices.



Figure A: Sample MIDI device dialog window without optional KeyStudio drivers installed.

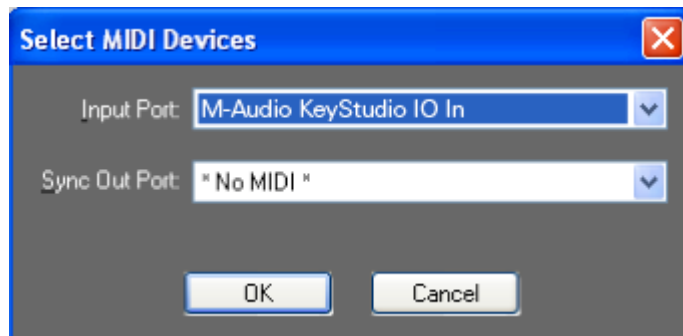


Figure B: Sample MIDI device dialog window with optional KeyStudio drivers installed.

**The actual KeyStudio name displayed by the computer may vary slightly depending on what recording software is being used.*

In addition to selecting MIDI inputs, audio outputs must be selected to hear sounds created by virtual MIDI instruments. Be sure “M-Audio KeyStudio IO” or “USB Audio Device” is selected as the audio output within your recording software, and that you have headphones connected to the headphone outputs on the front of KeyStudio or amplified speakers connected to 1/4” outputs on the back of KeyStudio.

In Windows XP and Windows Vista, the audio outputs of KeyStudio 49i will appear as “USB Audio Device” if the optional drivers are not installed, and as “M-Audio KeyStudio IO Out 1/2” if these drivers are installed. As mentioned earlier in this section, the actual KeyStudio name displayed by the computer may vary slightly depending on what recording software is being used.

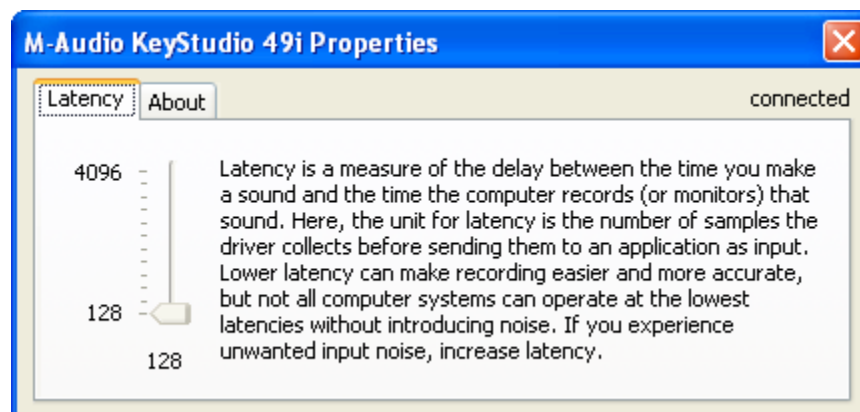
The KeyStudio 49i Software Audio Control Panel (Windows Only)

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When the KeyStudio 49i audio drivers are installed, the Control Panel software is also installed onto your computer system. The Control Panel gives you access to certain audio hardware parameters and status readouts.

The M-Audio KeyStudio 49i Control Panel icon appears on the task bar (located close to the “clock”), and is also accessible from the Windows Control Panel. Double click the M-Audio Control Panel icon to open it.

The following screenshot shows the KeyStudio 49i Control Panel in Windows XP.



Latency

The Latency Page in the Windows XP and Windows Vista control panel enables you to adjust the unit’s buffer size in order to achieve optimal balance between system stability and audio latency.

Latency is defined as the time it takes for your MIDI input (when using software synthesizers) or audio input signals to appear as audio at your computer’s outputs.

Smaller buffer sizes result in lower latency, but may not function well with slower computer systems. The Latency slider selects the buffer size that KeyStudio 49i uses to handle digital audio streaming. If you notice significant latency when using KeyStudio 49i, you can experiment with lower settings. If you experience stuttering or crackling in your audio playback, try using a higher latency setting.

About

This page displays the KeyStudio 49i Control Panel, firmware, and driver version, and enables you to connect to the M-Audio website for updates.

KeyStudio 49i Audio Setup and Controls

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Using the Mic and Instrument Inputs

Channel 1 of M-Audio KeyStudio 49i is a high gain, low noise microphone preamp. It is a low impedance input with an XLR connector for a dynamic microphone. Channel 2 contains a high impedance instrument preamp, designed to add gain to an electric guitar or bass, or even a high impedance microphone. You may also attach a direct box or passive transformer to the M-Audio KeyStudio Microphone Input (Channel 1), which will then allow you to plug another electric or acoustic guitar or other high impedance instrument into the M-Audio KeyStudio's Mic Input. Additional information on using the Mic and Instrument inputs can be found in the next two sections.

Setting Input Gain

M-Audio KeyStudio 49i provides up to 45dB of gain on the Channel 1 Mic In and 35dB of gain on the Channel 2 Instrument In. Microphones, electric guitars, and electric basses typically emit a low signal level, requiring a "pre-amp" such as M-Audio KeyStudio 49i provides.

Plug in your microphone or instrument with the gain controls turned down, and turn the gain up incrementally while testing the mic or playing the instrument. When the green signal LED shows fairly consistent activity, you've reached a good signal level for the M-Audio KeyStudio mic preamp. Some users may wish to experiment a little further to find what audibly might be referred to as a "sweet spot." Note that when the red clip LED lights, it is indicating that the preamp output is very close to peaking (-1 dB), and the input signal is on the threshold of distorting. Let your ears be the judge, but when the clip LED lights and stays lit, you are approaching or have reached distortion in your M-Audio KeyStudio signal.

The best method to find the ideal recording level is to turn up the input gain, and then turn it down once you've started to clip the input signal. You must also consider the level that is being sent from M-Audio KeyStudio to your recording software. Check the input meters within your software and make sure that they are neither too low nor clipping (too "hot"). An adjustment in gain on M-Audio KeyStudio may be necessary, but your optimal recording level within your software should approach but never reach the maximum level. Additionally, because the M-Audio KeyStudio 49i preamps provide quite a bit of gain, it is recommended to turn the gain all the way down on unused inputs. You will find more information on setting record levels in the manual of your music software.

Using the Aux Inputs

M-Audio KeyStudio 49i has a pair of line inputs labeled "Aux Input." They are designed to interface with both the left and right input from a stereo source, such as a synthesizer, drum machine, or CD player.

Using computer software (like Ableton Live Lite or M-Audio Session) to record your MIDI sequences or KeyStudio 49i piano performances as audio tracks allows you to apply software plug-in effects to these tracks. MIDI sequences from an external sound module can be recorded by connecting your external MIDI module's audio outputs to your KeyStudio Aux inputs. In Local On mode, the KeyStudio 49i built-in piano sound can be recorded as audio by selecting the inputs of KeyStudio 49i within your recording software and then playing the keyboard. After recording, you can mix those tracks with other audio tracks (such as vocals and guitar) entirely from within your computer.

Important: *The Aux inputs and the built-in piano sound blend with the Instrument and Microphone inputs before their signals are sent to a connected computer via USB. If the Aux inputs or the built-in piano sound are used simultaneously with the Instrument and Microphone inputs, the resulting recording will be a mix of the various signals. It is not possible to separate these blended signals after a recording has been made. If you want to edit or mix the Piano, Microphone, Instrument or Aux inputs after the recording has been made, then you will need to do the recording of each of these sound sources one at a time and on separate tracks.*

Using Direct Monitoring

When a microphone or instrument is plugged into the inputs of M-Audio KeyStudio 49i, its signal needs to be converted to a digital signal, which then gets sent to the computer via the USB cable. From there, it gets sent to your music software and gets processed, then turns around and comes back to the audio outputs. Even though KeyStudio uses the latest hardware and software technology, it might take a few fractions of a second to make this trip. This delay (latency) is not a problem when playing back music, but it can be distracting when recording music. To compensate for this delay, M-Audio KeyStudio 49i has a feature called Direct Monitor.

Direct Monitor sends the signal from the Channel 1 and 2 inputs directly to the Outputs, without any of the delay caused by traveling to and from the computer. The Direct Monitor knob controls the level of the signal from the Channel 1 and 2 inputs to the Main and Headphone Outputs. Use this knob to set the monitoring level of the mic or instrument that you are recording relative to the audio tracks that are playing from your computer. When using Direct Monitor, you will need to disable any monitoring feature in your computer recording software. Otherwise, you will hear your input played back twice—once through Direct Monitor, and again from your computer. Either turn off record or input monitoring, mute the channels you are recording to, or send their output to another bus.

In a typical Direct Monitor application, plug your microphone and guitar into Channel 1 and Channel 2 on the rear panel. Arm a pair of inputs in your computer recording software and set their recording levels using the gain controls on the M-Audio KeyStudio. As detailed in the previous sections, you want the recording level to be as high as possible without distorting. Make sure that the recording software is not outputting the audio you're recording, or else you will hear the signal played twice from the outputs. Next, set the Direct Monitor Level for your speakers or headphones and you are ready to record. If you are recording your mic and guitar while listening to tracks already recorded in your computer, you might want to listen once and set your Direct Monitor Level relative to the tracks playing from your computer.

The Mono Button

When this button is not pressed, the Microphone input will be sent to the Left Output and the Instrument input will be sent to the Right Output. This means that you will only hear yourself on one speaker instead of on both while recording one input source at a time (Microphone or Instrument).

When the Mono button is pressed, the Microphone input sends its signal to both the Left and Right Outputs, and the Instrument input also sends its signal to both the Left and Right Outputs. This means that you will hear yourself on both speakers while recording from any one input source.

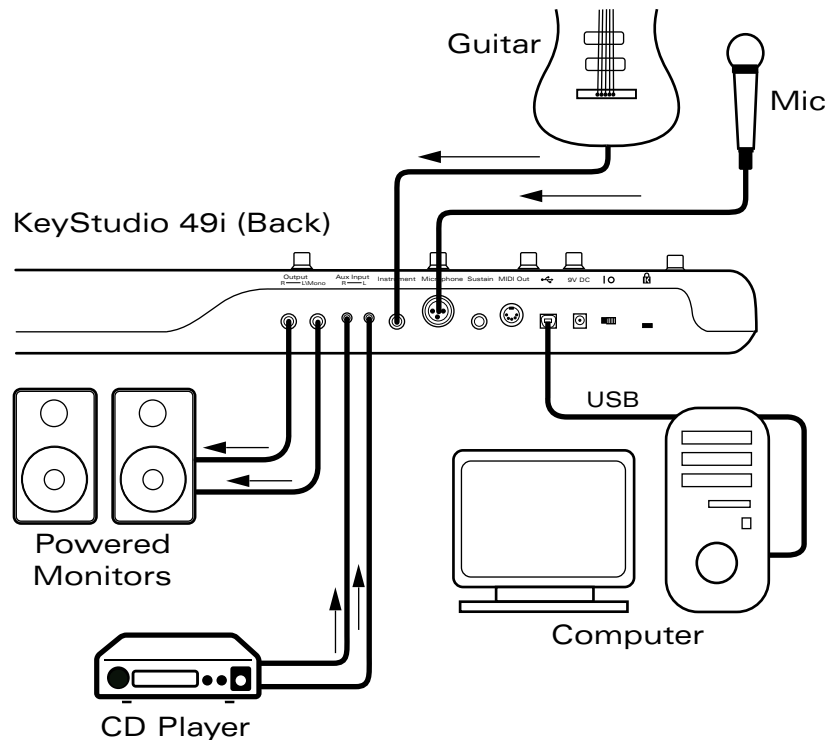
The Mono button does not only affect the way you *hear* yourself while recording (monitoring), but also how the signal is recorded by your computer. If the Mono button is active and you are recording to a stereo track in your sequencing software, any Mono source (such as a Microphone or a connected instrument) will be recorded to both channels of the stereo track (left and right) and will appear in the stereo center.

If you want to record from the Microphone and Instrument inputs simultaneously, but would like the resulting recordings to remain editable individually, then you must not activate the Mono button and will have to create two independent mono recording tracks in your sequencing software. The first mono track has to be configured to record from input 1 and the second mono track needs to be configured to record from input 2 of KeyStudio 49i.

Sample Operating Scenarios

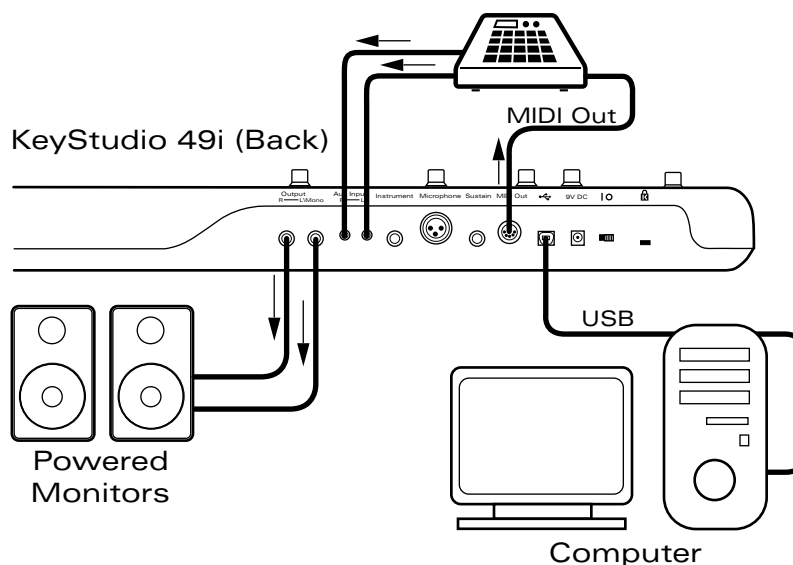
The following diagrams illustrate two scenarios, intended as examples of how M-Audio KeyStudio 49i might be used.

Typical Setup #1



Typical Setup #1 shows the M-Audio KeyStudio 49i with a microphone plugged into the Microphone input on Channel 1, and an electric guitar plugged into the Instrument input on Channel 2. A CD player is plugged into the auxiliary inputs (the volume of the CD player may need to be adjusted so the signal coming from the CD player does not distort). The main outputs (Output 1 and 2) of M-Audio KeyStudio 49i are plugged into a monitoring system.

Typical Setup #2



Typical Setup #2 shows a drum machine plugged into the Aux Inputs, with Outputs 1 and 2 plugged into a monitoring system. The drum machine is also connected to the M-Audio KeyStudio MIDI Out.

Advanced MIDI Features in Edit Mode

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The button to the left of the keys labeled “Edit Mode” is used to access additional advanced functions of the keyboard. When this button is pressed, the keyboard will enter Edit mode and the keys on the keyboard can be used to select functions and enter data.

The light above the Edit Mode button indicates whether or not the keyboard is in Edit mode. When in Edit mode, the black keys on the keyboard are used for selecting functions, while the white keys are used for data entry and channel selection.

Your keyboard will exit Edit mode as soon as either a function is selected or the CANCEL or ENTER key is pressed. The light above the Edit Mode button will turn off and the keyboard can then be used to play notes again. Some functions do not require confirmation via the Enter or Cancel keys. When these functions are selected, the keyboard will automatically exit Edit mode and return to Performance mode.

Note: Not every music application can process all types of MIDI messages. Please consult your software's documentation for information on what messages it can accept.

Advanced Functions in Edit Mode

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C#1	D#1	F#1	G#1	A#1	C#2	D#2	F#2	G#2	A#2	C#3	D#3	F#3	G#3	A#3	C#4	D#4	F#4	G#4	A#4									
Cancel	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	Ch 11	Ch 12	Ch 13	Ch 14	Ch 15	Ch 16	Default	0	1	2	3	4	5	6	7	8	9	Enter
	Data = Octave	Data = Transpose	Data = Program	Data = Bank LSB	Data = Bank MSB	Data = Channel	Data = Tuning	Panic	MIDI Out	Local	Octave -	Octave +	Wheel Assign	Pedal Assign	Knob Assign	Transpose -	Transpose +	Program	Bank LSB	Bank MSB								

Octave Buttons Options

The Octave “<” and “>” buttons can be assigned to control one of seven possible MIDI functions:

- Octave Shift
- Bank LSB
- Master Tune Setting
- Transpose
- Bank MSB
- MIDI Channel
- Program Change

In the diagram above, the first seven black keys are labeled “Data = Octave, Data = Transpose, Data = Program, Data = Bank LSB, Data = Bank MSB, Data = Channel and Data = Tuning.” These keys are used to select the desired alternate function of the Octave buttons.

To select an alternate function:

1. Press the Edit Mode button.
2. Press the black key that represents the function you want to assign to the Octave buttons. KeyStudio will exit Edit mode as soon as you push one of these keys.

NOTE: Some of the functions the Octave buttons can be used for cannot send out a value less than zero. When used to control these functions, both lights above the buttons will remain off, regardless of the current setting of that function.

The seven possible functions of the Octave buttons are:

1. Octave Shift

The Octave “<” and “>” buttons control octave shift by default. Pressing the Octave > button (right) will shift the notes played on the keyboard up by one octave. Pressing the Octave < button (left) will shift the notes played on the keyboard down by one octave. Pressing both Octave buttons together will restore the default octave (Octave shift = 0). However, if these keys have been programmed to control another function, you may wish to re-assign them to control octave shift once again.

To assign the Octave “<” and “>” buttons to control octave shift:

1. Press the Edit Mode button.
2. Press the black key above C1 (C#1), representing Data = Octave. KeyStudio will exit Edit mode as soon as C#1 has been pressed.

■ The Octave “+” and “-” Keys

Another method of shifting octaves is with the use of the black keys labeled Octave “+” and “-” on the Advanced Functions in Edit Mode diagram. This octave shift method can be useful when the Octave buttons have been reassigned to control another MIDI function.

1. Press the Edit Mode button.
2. Press the black key above D3 (D#3), representing “Octave +,” to shift the keyboard up by one octave. It is possible to shift the keyboard up a total of four octaves.
3. Press the black key above C3 (C#3), representing “Octave -,” to shift the keyboard down by one octave. It is possible to shift the keyboard down a total of three octaves.
4. When you have chosen your octave shift, either press C5 representing “ENTER” or press the Edit Mode button to exit Edit mode.

2. Transpose

In some cases it is useful to increase or decrease the transmitted pitch by a small number of semitones rather than a whole octave. For example, you may be playing a song with a singer and the singer is having trouble hitting the high notes. In this case, you can try reducing the pitch by one or more semitones. This is achieved using a function called “Transpose.”

Transpose works similar to octave shift, except the shift is not limited to multiples of 12 semi-tones. As with octave shift, there are two ways of transposing the keyboard. When in Edit mode, you can assign the Octave “<” and “>” buttons to control the transpose feature. Alternatively, you can use the black keys C#4 and D#4 to shift the transposition. These black keys represent “Transpose -” and “Transpose +” respectively.

To assign the Octave “<” and “>” buttons to transpose:

1. Press the Edit Mode button.
2. Press the black key above D1 (D#1), representing “Data = Transpose.” KeyStudio will exit Edit mode as soon as D#1 has been pressed.

When the Octave buttons are assigned to transpose the keyboard, the lights above the buttons indicate the direction of the transposition. To return the keyboard’s transpose shift to zero, press both the Octave “<” and “>” buttons at the same time.

To change the Transposition using the Transpose “+” and “-“ Keys in Edit mode:

1. Press the Edit Mode button.
2. Press the black key above D4 (D#4), representing “Transpose +,” to shift the keyboard up by one semitone.
3. Press the black key above C3 (C#3), representing “Transpose -,” to shift the keyboard down by one semitone.
4. Press C5 representing “ENTER,” or press the Edit Mode button to exit Edit mode.

3. Channel

MIDI data from the keyboard can be sent on any of 16 MIDI channels. The KeyStudio default is to transmit MIDI data on channel 1. However, certain MIDI performance or recording scenarios may require the keyboard to send data on a different channel. You can change the channel on which data is sent using the following method:

1. Press the Edit Mode button.
2. Press one of the 16 channel keys from D1 to E3, whichever one represents the channel you need. KeyStudio will exit Edit mode as soon as a channel key has been pressed.

For example, if a device specifies that you need to send data on channel 10, press the Edit Mode button, and then F2 to select channel 10. This channel is usually dedicated to drum sounds when working with GM compatible synthesizers and GM compatible sound modules (such as the M-Audio GM Module software).

The Octave “<” and “>” buttons can also be configured to control the MIDI transmission channel setting by pressing the Edit Mode button and then C#2. This will allow the Octave “<” and “>” buttons to increment or decrement through the channels. When channel 16 is reached and “>” is pressed, channel 1 will be selected. If the Octave “<” and “>” buttons are assigned to vary the channel, the lights above the buttons will not change, since it is not possible to have a channel with a negative value. Pressing both the “<” and “>” buttons together will recall the default setting, channel 1.

4. Program Change

Program changes are used to change the MIDI instrument or synthesizer sounds you are controlling with your KeyStudio. Program change messages can be beneficial when using the KeyStudio keyboard to control MIDI sound modules or synthesizers like M-Audio GM Module. For an example, let's change the instrument on M-Audio GM Module to a cello sound. To do this we need to send a program change of 42 to the GM Module software, which will select a cello sound from the General MIDI Instruments standard list (see Appendix A).

Important: Be sure the M-Audio GM Module software is open on your computer, and your KeyStudio keyboard is properly connected to your computer before attempting to send a program change.

There are two methods to send the program change:

A) Increment/Decrement Program Change:

1. Press the Edit Mode button.
2. Press the black key above F1 (F#1).

Now the Octave “<” and “>” buttons can be used to change the program.

NOTE: When the GM Module software is launched in standalone mode, it sends a message to the KeyStudio keyboard which automatically programs the Octave buttons to send program changes.

B) Quick Select Program Change

1. Press the Edit Mode button.
2. Press the black key above F4 (F#4), representing "Program."
3. Press keys D4, then B3, then C5. This enters the combination: "4," "2," "ENTER."

Now the keyboard is set to play the GM Module cello sound 42 (from the General MIDI Instruments standard list). The full list of General MIDI program numbers is given in Appendix A at the end of this manual.

Method A is useful if you want to cycle through different instruments for the purpose of comparing and choosing which sound works best in your song. Method B is more useful if you want to select a specific sound patch, as is the case here.

If the Octave "<" and ">" buttons have been assigned to control the program number (Method A), the lights above the buttons will not change, since it is not possible to have a program with a negative value. Pressing both the "<" and ">" buttons together will recall Program 0, which selects the first sound patch on any synthesizer capable of processing MIDI program changes.

5. and 6. Bank LSB and Bank MSB

Program changes are the most commonly used messages to change instruments and voices. However, the number of instruments accessible using only the program change MIDI command is limited to 128 (0-127). Since some devices have more than 128 voices, they require a method to organize their large number of sounds into banks. These devices then access the sounds within these banks by using program change messages. See chapter 11, "MIDI Messages Explained" for additional information. Generally, these devices use Bank LSB (Least Significant Byte) and Bank MSB (Most Significant Byte) change messages. KeyStudio can send these bank change messages in two possible ways*:

A) Incremental/Decremental Bank LSB and Bank MSB Change:

1. Press the Edit Mode button.
2. Press the black key above G1 (G#1) or A1 (A#1), representing Bank LSB or Bank MSB respectively.

Now the Octave "<" and ">" buttons can be used to change Bank LSB or Bank MSB.

B) Using the Quick Select Method:

1. Press the Edit Mode button.
2. Press the black key above G4 (G#4), or A4 (A#4), representing Bank LSB or Bank MSB respectively.
3. Press keys C4, then B3 then C5. This enters the combination: "3," "2," "ENTER."

As with Program changes, if the Octave "<" and ">" buttons are selected to vary the Bank LSB or MSB number (Method A), the lights above the buttons will not change, since it is not possible to have a Bank with a negative value. Pressing both the "<" and ">" buttons together will recall Bank 0.

***Note:** Bank change messages must be followed by a program change message in order to recall a sound. Bank change messages by themselves do not activate a sound, but only locate and access a predefined location of a set (bank) of 128 sounds.

7. Tuning

This key will assign the Octave buttons to increment or decrement the Master Tune Setting of the KeyStudio 49i. The tuning range is +/- 50 cents. When the Octave buttons are set to control Master Tune, each button press is 1 cent. This only affects the internal sound engine. To assign the Octave buttons to affect the tuning of the built-in piano sound:

1. Press the Edit Mode button.
2. Press the black key above D2 (D#2), representing "Data = Tuning."

Now the Octave "<" and ">" buttons can be used to adjust the built-in piano sound's mastering tuning.

Additional Edit mode black key functions include:

MIDI Out Mode Key

The MIDI Out Mode key (G#2) determines what data is sent to the external MIDI Out port. Pressing this key in Edit mode will toggle between two options:

- 1) MIDI coming from the computer via USB is sent to the external MIDI Out port.
- 2) MIDI from the Keyboard is sent to the USB and external MIDI Out ports.

When the keyboard is played with Local mode on (see the following Local Mode Key section) and MIDI Out set to send data from the keyboard to the MIDI Out port, MIDI data will be transmitted from the keyboard to the external MIDI port and also via USB to your computer. Data coming from the PC will be discarded. This is the default setting for KeyStudio.

If the MIDI Out switch is set to USB however, the data coming from the host computer via USB will be sent directly to the MIDI Out. In this mode data from the keyboard is not sent to the MIDI Output port.

In Edit mode, when this function key is pressed, the function is toggled and Edit mode is cancelled. The keyboard returns to Performance mode and the Edit Mode LED goes out.

At any time, pressing the Piano Reset button or turning the keyboard off and back on, will restore the default setting.

Local Key

The Local key (A#2) determines the source of the data stream that is routed to the built-in piano sound. Pressing this key in Edit mode will toggle between MIDI data received via USB from a connected computer, and MIDI data created by playing the keyboard on KeyStudio 49i.

The KeyStudio default setting is, that notes played on the KeyStudio 49i keyboard are routed directly to the built-in piano sound. The created MIDI data is simultaneously sent to a connected computer via USB and also to the MIDI Out port. This is the equivalent of Local On mode.

When the Local mode key is toggled, the built-in piano sound will not be played by the piano keyboard. (However, notes played on the keyboard will continue to be sent out the MIDI Out port as well as to the computer via USB). This is not quite the same as a simple Local On/Off switch because switching Local mode off also routes MIDI signals coming from the computer via USB to the Piano sound.

In standalone mode, the Local On/Off key allows a remote MIDI device to be controlled without the KeyStudio playing its internal piano sound. The piano sound cannot be played by MIDI signals entering the keyboard from a computer that is connected via USB unless the Local Switch is set to Local Off.* It is still possible however to have KeyStudio's built-in piano sound played via MIDI signals received from a connected computer and play along from the keyboard at the same time. This can be done with Local Mode set to off. In this configuration, KeyStudio sends MIDI data to a computer sequencer via USB. The computer's sequencer program needs to be configured to pass incoming MIDI signals back to KeyStudio 49i via USB. This is a common setting available in most MIDI sequencer programs and is often called "MIDI Thru". Please consult your software's user guide for instructions on how to activate this feature.

***Note:** When controlling KeyStudio 49i with sequencer software via USB MIDI, KeyStudio 49i must be set to Local Off mode for its internal piano sound to be played by the sequencer.

In Edit mode, when the Local key is pressed, the function is toggled and Edit mode is cancelled. The keyboard then returns to Performance mode and the Edit Mode LED goes out. At any time, pressing the Piano Reset button will restore this mode to Local On. Switching the keyboard off and on will also restore this setting back to its default.

Local mode is often used to control a software synthesizer without layering the built-in piano sound on top of the software synthesizer's tone.

Panic

KeyStudio has been designed to make working with MIDI on your computer as simple as possible. However, sometimes things can go wrong. There is a useful "Panic" function on KeyStudio 49i to counter this.

If one or more of the loaded sound patches doesn't sound as expected, it may mean that a MIDI CC has applied an undesired effect or other type of sound modulation to that voice. If you are unsure of which MIDI controller to adjust to eliminate the effect, you can send a Panic MIDI message to set all controller values to their defaults.

This feature sends "Reset All Controllers" and "All Notes OFF" messages on all MIDI channels. This is very useful if you find there are sustaining notes that you cannot stop, or if you want to remove applied MIDI CC effects without having to figure out which CC is causing the effect to sound.

To send a Panic MIDI message:

1. Press the Edit Mode button.
2. Press the black key above F2 (F# 2), representing "Panic."
3. Edit mode will exit, and there will no longer be any sustaining notes.

Wheel Assign Key

It is possible to assign different MIDI controller numbers to the Modulation wheel. These parameters are called MIDI continuous controllers. There are 128 MIDI continuous controllers (0-127, counting from and including zero) plus an additional 4 proprietary M-Audio controller numbers for a total of 132 assignable controls and features. KeyStudio accepts controller numbers 0-131. Numbers beyond 127 are a proprietary method M-Audio uses to simplify the transmission of certain, otherwise more complicated multi-part MIDI messages. A full list of controller values is given at the back of this manual in Appendix C. There are 132 (counting from and including zero to 131) MIDI continuous controllers (MIDI CC's). For these controller values to have any effect on the sound, the receiving software or device has to be able to read and respond to these MIDI controller messages.

Some useful MIDI CC's are:

- 01 Modulation
- 07 Volume
- 10 Pan (balance)
- 05 Portamento Time

To assign a MIDI controller message to the Modulation wheel:

1. Press the Edit Mode button.
2. Press the black key above F3 (F#3), representing "Wheel Assign."
3. Use the Numerical Data Entry keys G3 – B4 to enter the number of the MIDI controller you want to assign to the Modulation wheel.
4. Press the Enter key (C5).
5. Move the Modulation wheel upwards to increase the value of the MIDI message sent.

If you make an error while entering the numerical data value, you can press the CANCEL key (C1) to exit Edit mode without changing the MIDI CC assigned to the Modulation wheel.

As an example, let's assign effect number 10 to the Modulation wheel. This means the Modulation wheel will control Pan (or balance):

1. Press the Edit Mode button.
2. Press the black key above C3 (C#3), representing "Wheel Assign."
3. Press A3 to enter "1."
4. Press G3 to enter "0" so you have entered "10."
5. Press C5 for "ENTER."

Knob Assign Key

As with the Modulation wheel, the Piano Volume knob can also be assigned to any of 132 controllers (0-131) shown at the back of this manual in Appendix C.

To assign the Piano Volume knob to a certain MIDI parameter:

1. Press the Edit Mode button.
2. Press the black key above A3 (A#3), representing "Knob Assign."
3. Use the Numerical Data Entry keys G3 – B4 to enter the number of the controller value you want to assign to the Volume slider.
4. Press C5 for "ENTER."

If you make an error while entering the numerical data value, you can press the CANCEL key (C1) to exit Edit mode without changing the MIDI CC assigned to the Volume slider.

NOTE: Each time the keyboard is turned off, optional MIDI parameters assigned to the Piano Volume Knob or Modulation wheel will be lost. Each time the keyboard is powered up, the Piano Volume knob will default to being assigned to controlling the volume of the built-in piano sound and the Modulation wheel will default to being assigned to modulation (MIDI CC 01).

Pedal Assign Key

Pressing this key in Edit mode (G#3) will let you change the MIDI CC assignment for the Sustain Pedal. After this key is pressed, the data entry numbers can be used to enter a MIDI CC number. Performance mode is not restored until you press the ENTER key or the CANCEL key. If you press the ENTER key, the Sustain pedal becomes assigned to the MIDI CC number entered using the data entry keys. If you press the CANCEL key, no change will occur, and Performance mode is restored.

The Sustain pedal can be assigned to send standard MIDI CC's up to 127 and extended custom messages from 128 to 131.

The default for the Sustain pedal is sending MIDI Controller message 64.

Default Key

The Default key is used to selectively reset controller assignments and other numeric parameters. To reset a specific controller assignment or numeric parameter, be sure you are in Edit mode. Press the key for the parameter you would like to reset (Knob Assign, Pedal Assign, or Wheel Assign), and then press the Default key. When the Default key is pressed, the parameter is reset to its default value, and Performance mode resumes.

NOTE: Each time the keyboard is turned off, optional MIDI parameters assigned to specific hardware controllers will be lost.

Changing Reverb Depth

The Modulation wheel and/or the Piano Volume knob can be re-assigned to control the depth of the built-in piano sound's reverb. To do this:

1. Press the Edit Mode button.
2. Press either the Wheel Assign (F#3) or Knob Assign (A#3) key.
3. Press B4 to enter "9."
4. Press A3 to enter "1" so you have entered "91."
5. Press C5 for "ENTER."

This setting can be undone by powering the unit off and back on, or by using the Default key as described in the next section.

**As can be seen in Appendix C, 91 is the standard MIDI controller number for reverb depth.*

MIDI Messages In-Depth

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Program & Bank Changes

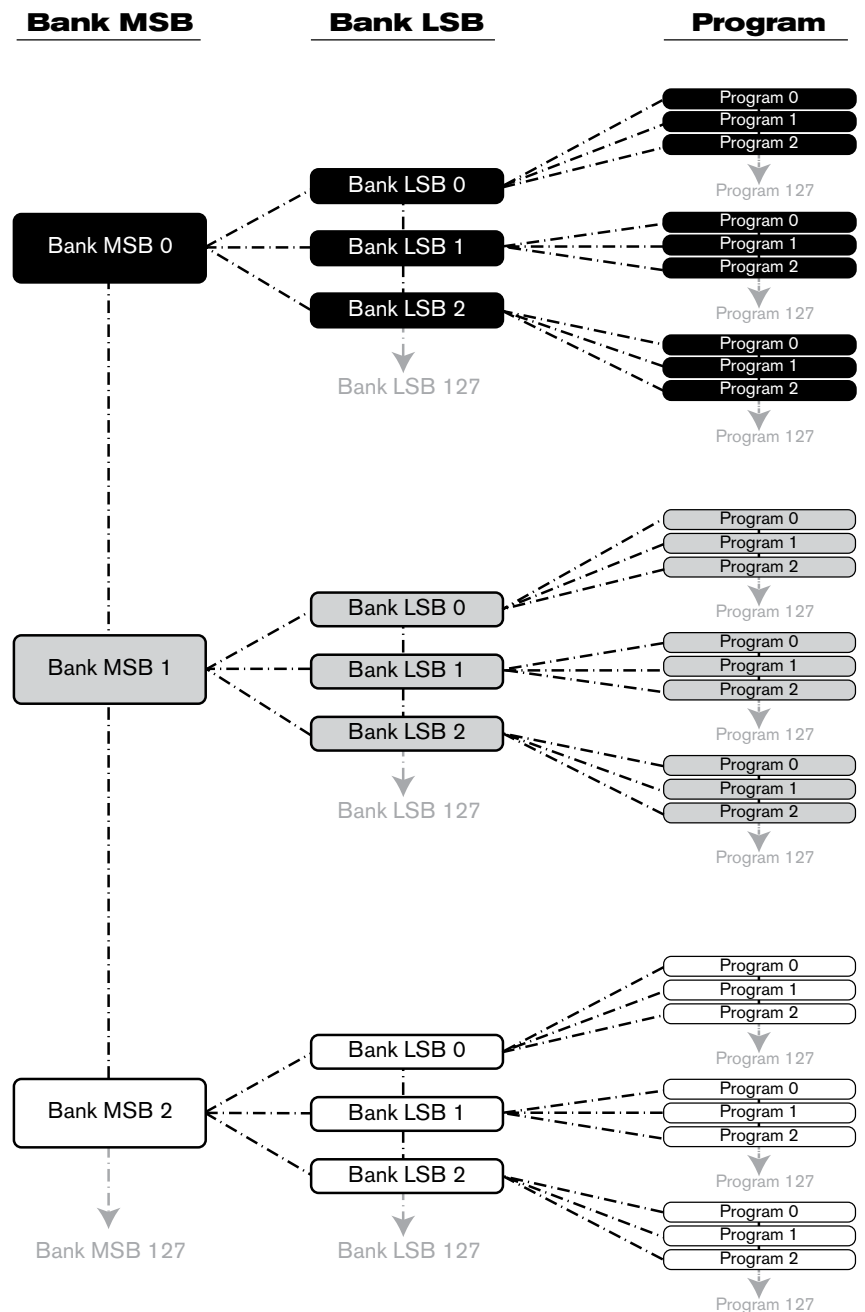
When the MIDI standard was first established, it enabled the user to access only 128 different sounds using program change messages (0-127). As MIDI devices grew to be more sophisticated and contain more sounds, bank change messages were included in an updated MIDI specification to allow for more than 128 sounds to be accessed.

The language MIDI uses to communicate between musical instruments only allows for program change commands 0-127, for a total of 128 possible programs (127 programs + program "0" = 128 programs total). Because of inherent limitations of the MIDI communication protocol, the number of directly accessible programs (using program change messages) cannot easily be expanded beyond 128. Thus, a system of banks, with 128 sounds in each, has been created that enables manufacturers to overcome the 128-sound MIDI limit.

128 banks with 128 sounds in each bank is the basic principle used to expand the number of accessible sounds. However, to avoid reaching the new limit of the resulting 16,384 possible sounds (128 banks x 128 programs) accessible using a bank change message combined with a program change, another layer of banks was added. The result is a system of 128 banks that can contain 128 sub-banks in each of them, which, in turn, can contain 128 sounds (programs) within them.

Bank change messages are useful when calling up sounds from a large library that may exist in a particular sound module or software synthesizer. For example, devices that are built according to Roland's GS specification or Yamaha's XG specification require you to specify a bank change in order to access the extra voices that these devices provide.

MIDI CC 0 is the bank select MSB (Most Significant Byte) message. This MIDI message is 7-bit in size and can be used to select any of 128 banks. This message can be used in conjunction with MIDI CC 32 which is bank select LSB (Least Significant Byte): a separate 7-bit message allowing additional selection of any of another 128 sub-banks. The combination of Bank MSB and LSB messages gives a 14-bit message that can select any of a possible 16,384 banks. Each bank can in turn contain 128 possible sounds selected via a separate program change MIDI message. This enables a user to theoretically recall over two million programs directly, using only MIDI commands. However, most devices only use a few different banks, and you can often ignore the LSB message.



You will find many MIDI devices respond to program change commands and many are organized according to the GM listing. In General MIDI devices, different sounds are organized in the same way from device to device. Piano sounds are in their particular place, string sounds are in their place, drum sounds are in their place, and so on. All GM devices (both hardware and software sound modules) are clearly labeled as such, so you know that their sounds are organized in the General MIDI structure. When a GM device receives a MIDI program change, it calls up a type of sound that you expect from the GM sound set. All non-GM MIDI sound modules call up unique sounds from their memory upon receiving MIDI program changes. Since the sounds in a non-GM device are not arranged in a particular order, you need to take a look at the device itself to see which sound you want and at which location in the memory it resides. Many VST instruments such as Native Instruments' FM7 or the synth modules in Propellerhead Reason are non-GM devices.

You can send Program Change, Bank LSB and Bank MSB messages directly from the KeyStudio keyboard. Please consult the "Advanced KeyStudio 49i Features in Edit Mode" section of this User Guide for further details.

NRPN/RPNs

Non-registered parameter numbers (NRPN's) are device-specific messages that enable you to control synthesizers and sound modules via MIDI. The MIDI specification defines open parameter numbers to allow manufacturers to specify their own controllers. The more common of these are registered by the MIDI Manufacturer's Association and are now part of the MIDI specification (hence the term Registered Parameter Numbers – RPN's). (See Appendix C) Each NRPN/RPN has an associated 2-byte number. The two bytes allow for 128 values each. (An RPN or NRPN message is made up of two parts: the MSB and the LSB message. Both of these messages together constitute an RPN or NRPN command.) This allows for 16,384 values in total.

MIDI controllers 98 and 99 represent the NRPN LSB and MSB respectively, while 100 and 101 represent the RPN LSB and MSB messages (see the MIDI controllers list in Appendix C). To transmit an NRPN/RPN message, these LSB and MSB controller messages are sent along with their user-specified values. A further controller message and value needs to be sent to specify the (coarse or fine) value adjustment. This is specified by controller number 6 (data entry) for coarse adjustments or number 38 for fine adjustments.

A list of NRPN's is usually given in the user's manual of any device that receives NRPN messages. It is always necessary that the NRPN MSB and LSB be sent together. Both will be specified in the device's manual.

Troubleshooting

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KeyStudio 49i is a quality, versatile MIDI controller that has been tested under a wide variety of conditions. In the event that you experience difficulty with your KeyStudio, this section covers some common issues and tips to help remedy problems.

Problem 1: My KeyStudio keyboard suddenly stopped working after having performed fine since installation.

Solution 1: Close any music applications you are using, switch KeyStudio off, and restart your computer. Once your computer has completely restarted, switch KeyStudio back on.

Problem 2: I have connected a sustain pedal to my M-Audio keyboard, but its function is reversed.

Solution 2: The polarity of the sustain pedal is calculated by the keyboard when it is powered up. On power up, the sustain pedal is assumed to be in the OFF position. If you want the sustain pedal to be off when it is not pressed, make sure the pedal is not pressed when you power up. Also check to see if there is a polarity switch on your foot pedal. It is possible to use this switch to change foot pedal polarity as well. Another way to intentionally reverse the sustain pedal's operation is to keep it pushed while powering on your KeyStudio keyboard.

Problem 3: When I press a key, or attempt to monitor my microphone or instrument input, there is a noticeable delay before I hear any sound.

Solution 3: This delay is known as latency, and latency can be adjusted by changing the buffer size setting in your M-Audio Control Panel. The goal is to set the buffer size as low as possible without experiencing artifacts in the audio. Faster computers generally allow for smaller buffer size settings, and thus less latency. You can also avoid this problem by using the Direct Monitor knob. See the "Using Direct Monitoring" section in the "Audio Setup and Control" portion of this User Guide for more information on this.

Problem 4: I cannot locate the KeyStudio USB keyboard in my software's MIDI devices dialog box.

Solution 4: KeyStudio requires a powered USB port. Try plugging KeyStudio into a different USB port or powered USB hub connected to your computer.

Problem 5: I connected KeyStudio 49i to my Windows computer and noticed that a question mark appears in the Windows Device Manager under Other Devices > M-Audio DFU. Does this indicate that there is a problem with KeyStudio 49i?

Solution 5: Your new keyboard functions as a class-compliant device. This means that upon connecting KeyStudio 49i to your computer, KeyStudio will function as expected without the need to install additional drivers. Installing the KeyStudio 49i drivers extends the keyboard's functionality, allowing large SysEx transfers, and multi-client support. M-Audio DFU (device firmware upgrade tool) is an additional component that is enabled when the KeyStudio 49i drivers are installed.

Problem 6: My synthesizer always recalls the sound next to the program number that I have sent to it from KeyStudio. For example, if I send a program change with the number 40 (Violin), my software loads sound number 41 (Viola).

Solution 6: Some General MIDI modules count their sound patches from 1 – 128 instead of 0-127. Both methods are common. As a result, and depending on the sound module you use, there may be an offset of +/-1 between the sent program change number and the recalled sound patch.

Problem 7: No data is being transmitted out the MIDI Out port.

Solution 7: This is possibly the result of the KeyStudio MIDI Out mode being set to USB. This mode can be toggled off and on. See the “Advance MIDI Features in Edit Mode” chapter in this User Guide for more information on this. Another remedy for this is to turn off the keyboard, then power it back up again. The keyboard always defaults to MIDI Out Mode set to KYBD, so this will bring the MIDI Out port in Standalone mode back to a usable state.

Problem 8: In Windows, the computer plays no sound through the KeyStudio 49i audio outputs.

Solution 8:

- Install the KeyStudio 49i drivers.
- Open the Control Panel and double-click the System icon (under Performance and Maintenance if you are in Category view).
- Select the Hardware tab and click the Device Manager button.
- Click the plus sign (“+”) next to Sound, Video and Game Controllers, and locate the KeyStudio 49i listing. If you see a question mark or exclamation point next to it, or if you don’t see it listed, you may need to reinstall the driver software.
- Make sure your audio software has been set up to use KeyStudio.
- Open your application’s audio settings page and check to see if the KeyStudio 49i’s ASIO, WDM, or Core Audio drivers have been selected.

Problem 9: I am unable to affect the volume or reverb of the built-in piano sound when using KeyStudio in Local Off mode with a computer-based sequencer or software sound module.

Solution 9: This is normal considering that Local Off mode interrupts the connection between the keybed and controllers, and the internal sound engine. When using KeyStudio 49i with a software sequencer, be sure that the sequencer track that is transmitting MIDI information to KeyStudio 49i is selected and configured to let incoming MIDI signal pass through. In this scenario, the volume and reverb controls should send MIDI information to your sequencer that will then be transmitted back to KeyStudio. See your software’s documentation for more information on this.

Problem 10: I am unable to view input selection options and route audio from the KeyStudio microphone input into Ableton Live Lite.

Solution 10: In Ableton Live Lite, click on View and be sure the In/Out option is checked. On an audio track, select Ext In and 1 from the audio input drop down menus. Further information on this can be found in the Ableton Live Lite Help menu.

Technical Info**19**

Caution: Electro Static Discharge, Electrical Fast Transient and Conducted RF interference may cause the unit malfunctioning. In such case, unplug the unit and plug it in again to restore normal operation.

Note: Your M-Audio product has been tested to comply with FCC Standards FOR HOME OR OFFICE USE. Modifications not authorized by the manufacturer may void user's authority to operate this device.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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WARNING: This product contains chemicals, including lead, known to the State of California to cause cancer, and birth defects or other reproductive harm. **Wash hands after handling.**

Appendices - Useful MIDI Data

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Appendix A - General MIDI Instruments

Piano	Bass	Reed	Synth Effects
0 Acoustic Grand Piano	32 Acoustic Bass	64 Soprano Sax	96 SFX Rain
1 Bright Acoustic Piano	33 Electric Fingered Bass	65 Alto Sax	97 SFX Soundtrack
2 Electric Grand Piano	34 Electric Picked Bass	66 Tenor Sax	98 SFX Crystal
3 Honky Tonk Piano	35 Fretless Bass	67 Baritone Sax	99 SFX Atmosphere
4 Electric Piano 1	36 Slap Bass 1	68 Oboe	100 SFX Brightness
5 Electric Piano 2	37 Slap Bass 2	69 English Horn	101 SFX Goblins
6 Harpsichord	38 Synth Bass 1	70 Bassoon	102 SFX Echoes
7 Clavinet	39 Synth Bass 2	71 Clarinet	103 SFX Sci-Fi
Chromatic Percussion	Strings/ Orchestra	Pipe	Ethnic
8 Celesta	40 Violin	72 Piccolo	104 Sitar
9 Glockenspiel	41 Viola	73 Flute	105 Banjo
10 Music Box	42 Cello	74 Recorder	106 Shamisen
11 Vibraphone	43 Contrabass	75 Pan Flute	107 Koto
12 Marimba	44 Tremolo Strings	76 Bottle Blow	108 Kalimba
13 Xylophone	45 Pizzicato Strings	77 Shakuhachi	109 Bag Pipe
14 Tubular bells	46 Orchestral Harp	78 Whistle	110 Fiddle
15 Dulcimer	47 Timpani	79 Ocarina	111 Shanai
Organ	Ensemble	Synth Lead	Percussive
16 Drawbar Organ	48 String Ensemble 1	80 Synth Square Wave	112 Tinkle Bell
17 Percussive Organ	49 String Ensemble 2 (Slow)	81 Synth Sawtooth Wave	113 Agogo
18 Rock Organ	50 Synth Strings 1	82 Synth Calliope	114 Steel Drums
19 Church Organ	51 Synth Strings 2	83 Synth Chiff	115 Woodblock
20 Reed Organ	52 Choir Aahs	84 Synth Charang	116 Taiko Drum
21 Accordion	53 Voice Oohs	85 Synth Voice	117 Melodic Tom
22 Harmonica	54 Synth Choir	86 Synth Fifths Sawtooth Wave	118 Synth Drum
23 Tango Accordion	55 Orchestral Hit	87 Synth Brass & Lead	119 Reverse Cymbal
Guitar	Brass	Synth Pad	Sound Effects
24 Nylon Acoustic Guitar	56 Trumpet	88 New Age Synth Pad	120 Guitar Fret Noise
25 Steel Acoustic Guitar	57 Trombone	89 Warm Synth Pad	121 Breath Noise
26 Jazz Electric Guitar	58 Tuba	90 Poly Synth Pad	122 Seashore
27 Clean Electric Guitar	59 Muted Trumpet	91 Choir Synth Pad	123 Bird Tweet
28 Muted Electric Guitar	60 French Horn	92 Bowed Synth Pad	124 Telephone Ring
29 Overdrive Guitar	61 Brass Section	93 Metal Synth Pad	125 Helicopter
30 Distorted Guitar	62 Synth Brass 1	94 Halo Synth Pad	126 Applause
31 Guitar Harmonics	63 Synth Brass 2	95 Sweep Synth Pad	127 Gun Shot

Appendix B - Channel 10 Drum Map

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

Appendix C - Standard MIDI Controller Numbers (MIDI CC's)

00 Bank Select	40 Balance LSB	80 Gen Purpose 5	Channel Mode Messages:
01 Modulation	41 Controller 41	81 Gen Purpose 6	120 All Sound off
02 Breath Control	42 Pan LSB	82 Gen Purpose 7	121 Reset All Controllers
03 Controller 3	43 Expression LSB	83 Gen Purpose 8	122 Local Control
04 Foot Control	44 Controller 44	84 Portamento Control	123 All Notes Off
05 Portamento Time	45 Controller 45	85 Controller 85	124 Omni Off
06 Data Entry	46 Controller 46	86 Controller 86	125 Omni On
07 Channel Volume	47 Controller 47	87 Controller 87	126 Mono On (Poly Off)
08 Balance	48 Gen Purpose 1 LSB	88 Controller 88	127 Poly On (Mono Off)
09 Controller 9	49 Gen Purpose 2 LSB	89 Controller 89	
10 Pan	50 Gen Purpose 3 LSB	90 Controller 90	Extra RPN Messages:
11 Expression	51 Gen Purpose 4 LSB	91 Reverb Depth	128 Pitch Bend sensitivity
12 Effects Controller 1	52 Controller 52	92 Tremelo Depth	129 Fine Tune
13 Effects Controller 2	53 Controller 53	93 Chorus Depth	130 Coarse Tune
14 Controller 14	54 Controller 54	94 Celeste (De- tune)	131 Channel Pressure
15 Controller 15	55 Controller 55	95 Phaser Depth	
16 Gen Purpose 1	56 Controller 56	96 Data Increment	
17 Gen Purpose 2	57 Controller 57	97 Data Decrement	
18 Gen Purpose 3	58 Controller 58	98 NRPN LSB	
19 Gen Purpose 4	59 Controller 59	99 NRPN MSB	
20 Controller 20	60 Controller 60	100 RPN LSB	
21 Controller 21	61 Controller 61	101 RPN MSB	
22 Controller 22	62 Controller 62	102 Controller 102	
23 Controller 23	63 Controller 63	103 Controller 103	
24 Controller 24	64 Sustain Pedal	104 Controller 104	
25 Controller 25	65 Portamento	105 Controller 105	
26 Controller 26	66 Sostenuto	106 Controller 106	
27 Controller 27	67 Soft Pedal	107 Controller 107	
28 Controller 28	68 Legato Pedal	108 Controller 108	
29 Controller 29	69 Hold 2	109 Controller 109	
30 Controller 30	70 Sound Variation	110 Controller 110	
31 Controller 31	71 Resonance	111 Controller 111	
32 Bank Select LSB	72 Release Time	112 Controller 112	
33 Modulation LSB	73 Attack Time	113 Controller 113	
34 Breath Control LSB	74 Cut-off Frequency	114 Controller 114	
35 Controller 35	75 Controller 75	115 Controller 115	
36 Foot Control LSB	76 Controller 76	116 Controller 116	
37 Portamento Time LSB	77 Controller 77	117 Controller 117	
38 Data Entry LSB	78 Controller 78	118 Controller 118	
39 Channel Volume LSB	79 Controller 79	119 Controller 119	

Appendix D - Additional RPN Messages

You may have noticed that although we have stated there are 128 MIDI controller messages (0 – 127), Appendix C shows 132 assignable controller messages. This is because messages 128 – 131 are a different type of MIDI message, defined in the MIDI Specification as RPN messages. M-Audio has created four messages that are sent like MIDI CC's, but actually transmit a series of RPN messages. This makes sending these complex multi-part messages as easy as sending a MIDI CC message. You can assign these to the controls on your KeyStudio keyboard in exactly the same way as any other MIDI controller message. The RPN messages control the following:

Controller Number	MIDI Message	Use
128	Pitch Bend Sensitivity	Alters the range of a pitch bend message
129	Fine Tune	Adjusts the tuning of your sound module or synthesizer in small steps
130	Coarse Tune	Adjusts the tuning of your sound module or synthesizer in large steps
131	Monophonic Aftertouch*	Adds a vibrato effect

**Monophonic aftertouch is not an RPN message. However, it is an additional effect message defined in the General MIDI specification and this is why we have included it in Appendix D.*

Warranty 21

Warranty Terms

M-Audio warrants products to be free from defects in materials and workmanship, under normal use and provided that the product is owned by the original, registered user. Visit www.m-audio.com/warranty for terms and limitations applying to your specific product.

Warranty Registration

Immediately registering your new M-Audio product entitles you to full warranty coverage and helps M-Audio develop and manufacture the finest quality products available. Register online at www.m-audio.com/register to receive FREE product updates and for the chance to win M-Audio giveaways.

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Technical Specifications

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44.1 kHz sampling rate unless otherwise stated

Mic Inputs Input Impedance Maximum Input Level at minimum gain SNR Dynamic Range THD+N Frequency Response Available Pre-amp Gain	4.4k Ohms -2.2 dBu (0.6 Vrms), balanced -96 dB, A-weighted 96 dB, A-weighted 0.004 % (-88 dB) @ -1 dBFS, 1 kHz 20 Hz to 20 kHz, +/- 0.5 dB 41 dB
Instrument Input Input Impedance Maximum Input Level at minimum gain SNR Dynamic Range THD+N Frequency Response Available Pre-amp Gain	1MOhm unbalanced +12 dBV (4 Vrms) -94 dB, A-weighted 94 dB, A-weighted 0.00782 % (-82.1 dB) @ -1 dBFS, 1 kHz 20 Hz to 20 kHz, +/- 0.6 dB 40 dB
Aux Inputs Input Impedance Maximum Input Level SNR Dynamic Range THD+N Frequency Response	10K Ohm unbalanced +2 dBV unbalanced -96 dB, A-weighted 96 dB, A-weighted < 0.005 % (-86 dB) @ -1 dBFS, 1 kHz 20 Hz to 20 kHz, +/- 0.5 dB
Line Outputs Output Impedance Maximum Output Level Channel-to-Channel Crosstalk SNR Dynamic Range THD+N Frequency Response	240 Ohm unbalanced +1.8 dBV (1.2 Vrms) < -88 dB @ 1 kHz -103 dB, A-weighted 95 dB, A-weighted 0.00391 % (-88.2 dB) @ -1 dBFS, 1 kHz 20 Hz to 20 kHz, +/- 0.1 dB
Headphone Outputs Maximum Output Working Range Frequency Response	-2 dBV (0.8 Vrms) into 32 ohms @ < 0.05% THD+N 18.2 mW into 32 ohms @ < 0.05% THD+N 32 to 600 ohms 20 Hz to 20 kHz, +/- 1.3 dB

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