

# kat5200 User Guide

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Atari 5200 & 8-bit Computer Emulator

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# 1. Introduction

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**kat5200** is a cross-platform emulator for the **Atari 5200 SuperSystem** and the **Atari 8-bit computer line** (400/800 and the XL/XE family).

This guide covers version **1.0.0**.

## 1.1 Highlights

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- **Two machine families in one emulator** — switch between the 5200 console and the 400/800/XL/XE computers.
- **Built-in GUI** (rendered with SDL3 + Nuklear) for configuration, ROM launching, state save/load, and a Setup window for first-time use.
- **ROM Launcher** with a searchable list, favorites, per-ROM settings, and directory scanning so your library is ready to play.
- **Accurate video** including an optional NTSC artifacting filter (RF, Composite, S-Video, and RGB presets), palette import/export, and GPU shader bundles.
- **Flexible input** — keyboard, joysticks/gamepads, mice, and trackball emulation, with per-player input plus analog/digital stick options tuned for tricky 5200 titles.
- **Media support** for cartridges, floppy disks, cassettes, and executables, plus tools to create blank disk and cassette images.
- **State save/load** with quick-save slots and named state files.
- **Per-ROM overrides** — save tailored machine, video, sound, and input settings for an individual game without changing your global defaults.

## 1.2 How this guide is organized

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Section	What you'll find
<a href="#">Requirements</a>	Hardware and library prerequisites.
<a href="#">Installation</a>	Building and installing kat5200.
<a href="#">Quick Start</a>	Get a game running in a few minutes.
<a href="#">Options</a>	Every configuration window, organized by GUI menu.
<a href="#">Launcher</a>	Managing and launching your ROM library.
<a href="#">Command Line</a>	Startup options and configuration overrides.
<a href="#">Troubleshooting</a>	Common problems and fixes.

### First-pass document

This guide is an early pass and will be expanded over time. If something looks out of date relative to the running program, the program is authoritative — please report mismatches.

## 2. Requirements

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### 2.1 Runtime libraries

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kat5200 depends on the following at run time:

- **SDL3** — windowing, input, audio, and rendering. The desktop renderer uses SDL's GPU API (Vulkan / Metal / Direct3D 12) with precompiled shader bundles; there is no longer an OpenGL dependency on the desktop. (Only the Android build links GLES.)
- **SDL3\_image** — image loading (screenshots, UI assets).
- **zlib** — compressed (zip) ROM support.
- **libm** — math library.
- **ROM-set download backend** (*optional*) — used by the in-app 5200 ROM-set downloader. The backend is per-platform: **libcurl** on Linux/macOS (only if found at configure time), **WinHTTP** on Windows (a system component), and a JNI backend on Android. If the backend is unavailable the emulator still builds and runs; only the download feature is affected.

### 2.2 Build tools

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To build from source you will additionally need:

- A C compiler (GCC or Clang).
- **CMake** 3.16 or newer (the Android Gradle build pins CMake 3.22.1).
- SDL3 and SDL3\_image, found via CMake's CONFIG mode.
- Development headers (`-dev` / `-devel` packages) for the libraries above.

See [Installation](#) for per-platform build instructions.

### 2.3 ROM and BIOS images

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kat5200 does **not** ship with copyrighted BIOS or game ROMs. To run software you will need:

- A **5200 BIOS** image (for Atari 5200 emulation).
- **OS / BASIC** ROM images for the 8-bit computers (an OS ROM is required; BASIC is optional and per-title).
- Cartridge, floppy, cassette, or executable images for the software you want to run.

The [Setup](#) window can scan your system for BIOS and ROM files and assign the best matches automatically.

### 2.4 Recommended

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- Any reasonably modern PC will run kat5200 at full speed.
- A USB gamepad or joystick is recommended for the 5200, whose analog controllers are central to many games.

### 2.5 Android devices

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The Android APK supports phones, tablets, Android TV / Google TV, and Fire TV devices with OpenGL ES 2.0 or newer. Native libraries are packaged for `arm64-v8a`, `armeabi-v7a`, and `x86_64`; `x86_64` is primarily for Android emulator images.

## 3. Installation

### 3.1 Installing (end users)

- **Windows** — run the Inno Setup installer, or unzip the portable package anywhere and run `kat5200.exe`.
- **Linux** — install your distro's package if available, or build and install from source (below). A **Flatpak** is also supported.
- **macOS** — open the `.dmg` and drag `kat5200.app` to Applications.
- **Android** — install the APK. Phones, tablets, Android TV / Google TV, and Fire TV devices are supported.

#### Android APK installs

kat5200 is distributed as a directly installable APK, not through the Play Store. The APK is still signed for Android installation, but Android treats it as an unknown-app install because it did not come from the Play Store. Android may ask you to allow the app that opens the APK, such as your browser or file manager, to install unknown apps.

On most phones and tablets, this is under:

```
Settings > Apps > Special app access > Install unknown apps
```

Choose the browser or file manager you are using, then allow installs from that source. Developer mode is usually not required for normal APK sideloading. It is only needed for USB/ADB installs on devices that require USB debugging. On Android TV / Google TV and Fire TV devices, the setting name and location vary by vendor; look for **Unknown sources**, **Install unknown apps**, or enable Developer options only if you are installing with ADB.

### 3.2 Building from source

CMake is the single source of truth on every platform. **Out-of-source** builds are required (build into a separate directory such as `build/`). Install the [required libraries](#) — SDL3, SDL3\_image, zlib (and optionally a ROM-download backend) — before configuring.

#### Linux

```
cmake -B build -DCMAKE_INSTALL_PREFIX=/usr -DCMAKE_BUILD_TYPE=Release
cmake --build build -j4
sudo cmake --install build
```

The install step places the `kat5200` binary in `bin/`, the seed config / shader bundles / generated `profiles.zip` in `${KAT_DATADIR}` (default `<prefix>/share/kat5200`), and the icon, `.desktop` entry, and `.metainfo.xml` in the standard XDG locations.

Flatpak developer convenience targets (not part of the default build):

```
cmake --build build --target flatpak-install # install to user Flatpak
cmake --build build --target flatpak-bundle # shareable .flatpak
```

#### Development environment

Any Linux distribution with the required libraries installed should work. On older distros SDL3 may need to be built from source.

#### Windows (MSYS2 UCRT64)

Use the UCRT64 MSYS2 environment. Install the toolchain and libraries with `pacman` (`mingw-w64-ucrt-x86_64-` packages for `gcc`, `cmake`, `ninja`, `pkgconf`, `SDL3`, `SDL3_image`, `zlib`), then:

```
cmake -B build -G Ninja -DCMAKE_BUILD_TYPE=Release
cmake --build build -j4
```

Build a portable package (bundles the MinGW runtime DLLs):

```
cmake --build build --target kat5200-portable-package
# -> build/dist/kat5200-<ver>-win64-portable/ (and a matching .zip)
```

The installer is built by compiling `kat5200.iss` with Inno Setup (64-bit only).

## macOS

Requires the Xcode Command Line Tools and SDL3 / SDL3\_image from Homebrew.

```
cmake -B build && cmake --build build -j4
open build/src/kat5200.app
```

For a self-contained, relocatable `.app` plus a compressed `.dmg` (bundles the SDL3 dylibs and re-signs ad-hoc):

```
cmake --build build --target kat5200-macos-dmg
# -> build/dist/kat5200-<ver>-macos.dmg
```

The bundle is only ad-hoc signed — Apple Developer ID signing and notarization remain a manual step before distributing off-machine.

## Android

Toolchain: Android SDK (compileSdk 35), NDK 27.3.13750724, JDK 17, and Gradle. The APK supports Android phones and tablets, Android TV / Google TV, and Fire TV devices. Native code is packaged for the `arm64-v8a`, `armeabi-v7a`, and `x86_64` ABIs with minSdk 21; `x86_64` is mainly for Android emulator images. From `android-project/`:

```
cd android-project
./fetch-sdl-aars.sh # download SDL3 + SDL3_image .aar into app/libs/
./gradlew assembleDebug # or assembleRelease / build
```

The same APK has both launcher and leanback launcher entries, so it appears on phone/tablet launchers and Android TV home screens.

## 3.3 Configuration file

kat5200 stores all of its settings in a single **TOML** file named `kat5200.conf`. On Linux this lives at:

```
~/.config/kat5200/kat5200.conf
```

On first run, a default `kat5200.conf` is seeded from the installed data directory if one does not already exist. You normally edit settings through the [GUI menus](#); the file is written automatically when you save. The current configuration directory is shown in **Misc -> Configuration**.

## 3.4 Portable mode

On Windows and Linux, kat5200 can run fully self-contained, keeping its files next to the executable instead of in your home directory. (There is intentionally no portable mode on macOS, which uses a relocatable `.app` bundle.) To enable it:

1. Create a file named `portable.txt` in the same directory as the `kat5200` executable.
2. Put a single `1` in that file.
3. Make sure a `kat5200.conf` is present in that directory.

When portable mode is active, the configuration and related files are read from and written to the executable's directory.

## 3.5 First run

If no ROM, no BIOS, or no valid configuration is found, kat5200 starts in the GUI so you can configure it. Use the **Setup** window (described under [Misc -> Setup](#)) to scan for BIOS and ROM files and set up your controllers before launching anything.

## 4. Quick Start

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This walkthrough gets you from a fresh install to a running game.

### 4.1 1. Launch kat5200

---

Start the emulator. With no ROM or BIOS configured yet, it opens in the GUI. The main menu offers:

- **Load ROM from file** — pick a ROM with the file browser and launch it immediately.
- **Load ROM from Launcher** — open the [ROM Launcher](#).
- **Options** — open the tabbed configuration window ([System](#), [Graphics](#), [Sound](#), [Input](#), [Misc](#)).
- **Reset** — reset the emulated machine.
- **Load State / Save State** — quick-save slots and named state files.
- **Exit** — quit kat5200.

### 4.2 2. Set up BIOS and ROMs

---

Open **Options** → **Misc** → **Setup** and use the scan actions to find your files:

- **Scan for 5200 BIOS / Scan for 8-bit BIOS** — locates BIOS/OS images and assigns the best match per machine.
- **Scan for 5200 ROMs / Scan for 8-bit ROMs** — adds game images to the Launcher database.

Point each scan at a directory, then finish with **Scan & Save**. See [Misc](#) → [Setup](#) for details.

#### BIOS required

The 5200 needs a 5200 BIOS image, and the 8-bit computers need an OS ROM. Without them you will get an "Error Loading BIOS image" message. See [Troubleshooting](#).

### 4.3 3. Configure your controller

---

Open **Options** → **Input**. The quickest path:

1. Select the player view (Player 1–Player 4) you want to set up.
2. Click the control you want to bind (a stick direction or a button).
3. Choose **Change**, then *provide the input* on your device in the **Input Capture** dialog and release it. Use **Add Entry** to bind a second input to the same control.

For the 5200's analog games, the [Setup](#) window's game presets are the fastest start; see also the [analog tuning options](#).

### 4.4 4. Launch a game





















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Either:

- **Load ROM from file** for a one-off, or
- **Load ROM from Launcher**, select a title, and press Enter ↵ or double-click it.

The selected machine cold-starts with the image attached.













## 4.5 5. In-emulation keys

Action	Keyboard default	Gamepad default
Return to the GUI		Back + Start
Toggle fullscreen	 + 	Back + Left Shoulder
Take a screenshot	 + 	Back + Right Shoulder
Enter the debugger		None
Load state from slot 1	 + 	Right Trigger + Left Shoulder
Load state from slots 2-9	 +  ...  + 	None
Save state to slot 1	 + 	Left Trigger + Right Shoulder
Save state to slots 2-9	 +  ...  + 	None
Exit kat5200	 + 	Back + Right Stick Button

### Note

These are the defaults; keyboard bindings and gamepad combos can be changed under the **UI Input** view in [Options -> Input](#). Screenshots are saved as `.bmp` files in the [configuration directory](#).

## 4.6 6. Save your progress

Action	Keyboard default	Gamepad default
Save a named state file	<b>Save State -&gt; To File</b>	Use the GUI menu
Load a named state file	<b>Load State -&gt; From File</b>	Use the GUI menu
Save quick state slot 1	 + 	Left Trigger + Right Shoulder
Save quick state slots 2-9	 +  ...  + 	None
Load quick state slot 1	 + 	Right Trigger + Left Shoulder
Load quick state slots 2-9	 +  ...  + 	None

Quick slots are convenient for moment-to-moment progress. Named state files are better when you want a save you can identify later.

## 5. Menu Reference

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This page maps the current kat5200 GUI menus to the guide sections that explain them in more detail.

### 5.1 Status panel

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Alongside the main menu, the GUI shows a status panel summarizing the current session:

- **System** — the emulated machine (Atari 5200 / 400/800 / XL/XE).
- **OS** — the OS / BIOS variant in use.
- **ROM** — the currently attached ROM, or **None**.
- **Port 1–Port 4** — the controller type on each port, plus which PC device is driving it (**Mouse, Keyboard, or Not attached**).

It is read-only; change these values under [Options](#).

### 5.2 Main menu

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Item	What it does
<b>Load ROM from file</b>	Opens the file browser, attaches the selected image, and launches it immediately.
<b>Load ROM from Launcher</b>	Opens the <a href="#">ROM Launcher</a> .
<b>Options</b>	Opens the tabbed <a href="#">Options</a> window.
<b>Reset</b>	Resets the emulated machine.
<b>Load State</b>	Opens the state-load menu.
<b>Save State</b>	Opens the state-save menu.
<b>Exit</b>	Quits kat5200.

### 5.3 State menus

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**Load State** contains:

- **From File** - open a named state file.
- **Quick State 1** through **Quick State 9** - shown only for quick-save slots that already exist.

**Save State** contains:

- **To File** - save a named state file.
- **Quick State 1** through **Quick State 9** - write one of the quick-save slots.

The default in-emulation shortcuts are covered in [Quick Start](#).

## 5.4 Options menus

The **Options** window uses top-level tabs:

Tab	Submenus and related pages
<b>System</b>	Machine, media, BIOS, controller ports, and <b>Pokey POT Values</b> . See <a href="#">System</a> .
<b>Graphics</b>	Display, palette, <b>NTSC Artifact Setup</b> , and <b>Shader Setup</b> . See <a href="#">Graphics</a> .
<b>Sound</b>	Audio enable, frequency, sample and buffer controls, and volume. See <a href="#">Sound</a> .
<b>Input</b>	<b>Player 1</b> through <b>Player 4</b> for enabled controller ports, <b>UI</b> , and <b>A800 Keys</b> for 8-bit machines. See <a href="#">Input</a> .
<b>Misc</b>	<b>Setup</b> , <b>Configuration</b> , <b>Palette</b> , <b>Debugger</b> when available, <b>Create Media</b> , <b>Log</b> , and <b>Manual</b> . See <a href="#">Misc</a> .

Some menu entries are conditional. For example, 8-bit-only controls are hidden while the emulated system is Atari 5200, the manual **GUI Scale** control appears only when **Auto GUI Scale** is off, and **Buffer Size** appears only when **Auto Buffer Size** is off.

## 5.5 Launcher menus

The Launcher has four sections:

Section	What it contains
<b>ROM List</b>	Searchable list of known ROM entries.
<b>ROM Actions</b>	<b>Attach To</b> , <b>Launch</b> , <b>Launch - No Reset</b> , <b>Attach</b> , and read-only ROM info.
<b>ROM Options</b>	Editable <b>Name</b> , <b>File</b> , <b>Mapping</b> , favorites, delete, clear filename, clear custom settings, and add-from-file actions.
<b>View Options</b>	<b>View by ROM type</b> filter, including Favorites when present.

See the [Launcher](#) pages for launch, attach, scanning, and per-ROM override details.

## 5.6 File browser

Several places open the built-in file browser: **Load ROM from file**, the **File** fields on the [System](#) tab and in the Launcher's [ROM Options](#), palette import, and others. Inside it:

- The **path field** at the top is editable — type or paste a path and press  to jump there directly.
- **Up** moves to the parent directory; double-click (or press  on) a folder to enter it.
- With the list focused,  /  move the selection,  enters the selected directory, and  goes up one level.
- **Ok** accepts the selected file, **Cancel** closes without choosing.

When loading a ROM, the browser also shows a **Mapping** selector so you can override the cartridge mapping (normally **Auto**) for the image before it is attached — useful for titles the automatic guess misidentifies.

## 6. Options

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### 6.1 Options

---

Choose **Options** on the main menu to open kat5200's configuration. It is a tabbed window; the tabs across the top are:

- **System** ([Machine](#)) — system type, RAM, TV standard, OS/BIOS, BASIC, SIO patch, attached media, controller ports, and POT tuning.
- **Graphics** ([Video](#)) — renderer backend, window/scaling, the NTSC artifacting filter, palette, and shader bundles.
- **Sound** ([Sound](#)) — enable/disable audio, frequency, buffer size, and volume.
- **Input** ([Input](#)) — per-player controllers, the keyboard, UI controls, and analog tuning.
- **Misc** ([Misc](#)) — the Setup window, Configuration (start-up behavior, throttle, factory reset), Palette import, Create Media, Log, the debugger, and the Manual.

#### Page names vs. tab names

Some pages keep their historical filenames ([Machine](#), [Video](#)) while the GUI tab is labelled **System** and **Graphics** respectively. The page describes the matching tab.

#### Global vs. per-ROM settings

---

kat5200 no longer uses named, user-managed profiles in the GUI. Instead, most configuration tabs ([System](#), [Graphics](#), [Sound](#), [Input](#)) offer two save buttons:

- **Save** — write the change to your **global** defaults (the `All` profile).
- **Save for ROM only [\*]** — write the change only for the **currently selected ROM**, leaving your global defaults untouched.

Always press a **Save** button after changing settings; unsaved changes are only temporary. When you launch a ROM that has its own saved settings, those override the global values for that session. ROM-specific settings are marked with an asterisk (\*). To revert a ROM to the defaults, use **Clear Custom Settings** in the [Launcher](#).

#### How settings are saved

---

Changes are written to `kat5200.conf` (TOML) in your config directory. Internally, kat5200 tracks exactly which fields changed and saves only those, so editing one option will not disturb unrelated settings. Per-ROM overrides are stored in that ROM's profile file. Nothing is persisted until you press a **Save** button.

## 6.2 System (Machine)

---

The **System** tab controls which machine kat5200 emulates and how it is configured. Use **Save** to update your global defaults, or **Save for ROM only [\*]** to apply the settings only to the currently selected ROM.

### System

---

Choose the emulated machine:

- **Atari 5200**
- **Atari 400/800**
- **Atari XL/XE**

The options below change depending on the selected system (for example, RAM, BASIC, and SIO-patch settings apply only to the 8-bit computers).

### OS / BIOS

---

Setting	Description
<b>OS</b>	The OS / BIOS variant to boot. The choices depend on the machine: for the 5200, <b>4-Port</b> or <b>2-Port</b> ; for the 400/800, <b>OS A</b> or <b>OS B</b> ; for XL/XE, a specific OS revision (600XL, XL/XE, 800XE, XEGS, 1200XL, ...).
<b>BIOS File</b>	Path to the OS / BIOS ROM image on disk, with a file browser.

The OS file is also filled automatically when you scan for BIOS images in the [Setup](#) window. Changing the OS or TV standard re-resolves and reloads the matching BIOS file.

### Media files

---

Setting	Description
<b>Cartridge</b>	The cartridge image attached to the machine (file browser).
<b>BASIC File</b>	The BASIC ROM file (8-bit only).
<b>Disk File</b>	A floppy disk image to attach (8-bit only).

### Memory and video standard (8-bit)

---

Setting	Description
<b>RAM</b>	Amount of RAM to emulate (e.g. 16 / 48 / 64 / 128 KB). Valid amounts depend on the selected machine.
<b>TV Encoding</b>	NTSC or PAL. Affects timing, speed, and colors.

## 8-bit options

Setting	Description
<b>Enable SIO Patch</b>	Speeds up loading of floppy and cassette images. Fast and convenient, but not compatible with every title — disable it if a disk/cassette image fails to load.
<b>Enable BASIC</b>	Boots the machine with BASIC enabled. Most cartridges expect BASIC <b>off</b> ; some titles (and, of course, BASIC programs) require it <b>on</b> . Best left off globally and enabled per-ROM.
<b>BASIC Rev</b>	Which revision of the BASIC ROM to use (Rev A / B / C).

## Controller ports

**Port 1–Port 4** select which kind of Atari controller is emulated on each port:

- **None**
- **Joystick**
- **Trackball**
- **Paddles (8-bit)**
- **Keypad (8-bit)**

The 5200 offers Joystick / Trackball; the 8-bit computers add Paddles and Keypad. The detailed PC-to-Atari bindings live in [Options → Input](#); this only selects the controller *type*.

## Pokey POT Values

The **Pokey POT Values** sub-window exposes the low-level analog pot calibration used by the emulated POKEY — **Joystick HPOT/VPOT Center, Low, and High** for the joystick's horizontal and vertical pots, plus (on the 5200) **Trackball HPOT/VPOT Center** and the **Trackball DPOT Min/Max** range. These are advanced tuning values; most users never need to change them. They matter when fine-tuning how an analog controller maps onto a specific game's expected pot range.



If a game misbehaves, the most common System-level fixes are toggling **Enable BASIC**, toggling the **SIO Patch**, or correcting the **RAM** amount. For cartridge mapping problems, set the **Mapping** per-ROM in the [Launcher](#).

## 6.3 Graphics (Video)

The **Graphics** tab configures the display. Use **Save** for your global defaults or **Save for ROM only [\*]** to apply settings to the selected ROM.

### Display

Setting	Description
<b>Renderer Backend [restart]</b>	Which SDL GPU backend to render with (e.g. Vulkan / Metal / Direct3D 12, depending on platform). Changing it takes effect after a restart.
<b>Fullscreen</b>	Toggle between fullscreen and windowed display.
<b>Enable VSYNC</b>	Synchronize presentation to the display refresh to reduce tearing.
<b>Fixed Window</b>	When off, the window is freely resizable. When on, it stays a fixed size — useful with tiling window managers to keep kat5200 floating.
<b>Window Width / Window Height</b>	The window's pixel size (used when not fullscreen / not freely resized).
<b>Window Scaling</b>	How the emulated image is fit into the window — modes include <b>Letterbox</b> , <b>Stretch</b> , and <b>Fit Window</b> for aspect-ratio handling.
<b>Texture Scaling</b>	<b>Smooth</b> (filtered) or <b>Pixelated</b> (nearest-neighbor) scaling of the emulated framebuffer.
<b>Wide Playfield</b>	Show the extra pixels at the left and right edges of the screen (wider visible area).
<b>Auto GUI Scale</b>	Use SDL's display scale for the kat5200 menus.
<b>GUI Scale</b>	Manual menu scale (roughly 0.25x–3.00x) when Auto GUI Scale is off. Large values can clip narrow or portrait layouts.

**Renderer Backend [restart]**, **Auto GUI Scale**, and **GUI Scale** are host/UI settings. Save them globally with **Save**; they are saved globally only, not as per-ROM overrides.

### Palette

The **Palette** control selects the active color palette from the palettes kat5200 knows about. Pick one to match a particular look or hardware reference; the [preview](#) updates live so you can compare.

### NTSC artifacts filter

kat5200 includes an NTSC television filter that reproduces analog TV color and artifacting effects.

- **Enable NTSC Artifacts** — turn the filter on or off.
- **NTSC Artifact Setup** — appears when the filter is on; opens the detailed adjustment sub-window below.

### Presets

Quick starting points:

- **RF Preset**
- **Composite Preset**
- **S-Video Preset**
- **RGB Preset**

**Fine adjustments**

Control	Effect
<b>Hue</b>	Overall color hue.
<b>Saturation</b>	Color intensity.
<b>Contrast</b>	Difference between light and dark.
<b>Brightness</b>	Overall luminance.
<b>Sharpness</b>	Edge definition.
<b>Burst Phase</b>	Colorburst phase — strongly affects artifact colors.
<b>Hue Warping</b>	Non-linear hue adjustment for fine color tuning.

Choose one of the presets again if you want to return to a known baseline.

**Shader Setup**

**Shader Setup** opens the GPU shader sub-window. kat5200 ships precompiled shader **bundles** (SPIR-V / Metal / Direct3D) and can also load an external bundle directory. From it you can:

- Choose a bundle (or **None**), or **Load Bundle Directory** to add an external preset.
- Edit the bundle's exposed **parameters**, or **Reset Parameters** to defaults.
- Use **Save** for the global shader selection/parameters, or **Save for ROM only [\*]** for the current ROM.

The shader files themselves are read from disk; only the reference and parameters are stored in the configuration. Some shader changes apply only after a restart — the window tells you when a restart is required.

When setting a shader for the first time, kat5200 may tell you that the application must be restarted. Save the shader selection first, then restart. kat5200 will start with the GPU renderer and use the shader. If the shader works correctly, set **Renderer Backend [restart]** to **gpu** in the Graphics menu and press **Save**. Future launches can then use the GPU renderer with or without a shader without requiring another restart just to switch shaders.

If a shader or GPU renderer causes problems, start kat5200 with `--safe`. This starts without the GPU renderer and with shaders disabled. Then open **Graphics**, set **Renderer Backend [restart]** to **Default**, set the shader to **None** in **Shader Setup**, press **Save**, and restart normally.

**Preview**

The window shows a live **video preview** of the current emulation (or a placeholder when nothing is running), making it easy to judge palette, NTSC-filter, and shader changes as you make them.

## 6.4 Sound

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The **Sound** tab configures audio output. Use **Save** for your global defaults or **Save for ROM only [\*]** to apply settings to the [selected ROM](#).

Setting	Description
<b>Enable Sound</b>	Master switch for all audio.
<b>Frequency</b>	Output sampling frequency. Set this as high as your system allows without affecting performance; the default works on most systems.
<b>Samples</b>	Audio buffer size, in samples. Smaller buffers reduce latency; larger buffers are more tolerant of system load. Tweak only if you hear stutter or crackle.
<b>Auto Buffer Size</b>	Let kat5200 choose the host audio buffer size automatically. This is the recommended starting point.
<b>Buffer Size</b>	Manual host audio buffer size. Appears only when <b>Auto Buffer Size</b> is off; raise it if audio stutters, lower it if latency matters more.
<b>Volume</b>	Output volume level.