# Voice Notepad

User Manual v3

Version 1.9.11 · December 2025

**DUAL-PIPELINE ARCHITECTURE**

Local Preprocessing + Cloud Transcription

**PLATFORMS**

Linux Debian/Ubuntu Wayland

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**Repository:** github.com/danielrosehill/Voice-Notepad

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# AI-Human Co-Authorship

This software was developed through **AI-human collaboration**.

The code was generated by **Claude Opus 4.5** and other Anthropic models under my direction and supervision. I designed the architecture, specified requirements, reviewed outputs, and guided the implementation. Claude wrote the code.

This represents an experimental approach to software development. I believe it produces high-quality results when the human provides clear direction, domain expertise, and ongoing oversight.

The core design philosophy—**audio multimodal first**—came from my experience with traditional ASR-then-LLM workflows and recognizing that multimodal models could do both in a single pass. The iterative development process has been guided by my own daily use of the application.

*— Daniel Rosehill, December 2025*

# Introduction

Voice Notepad is an **audio multimodal first** desktop application for voice transcription. The core design philosophy is to send audio directly to multimodal AI models that can "hear" and process audio alongside text instructions—rather than traditional ASR-then-LLM approaches.

## 1.1 Design Philosophy

This is an **experimental, iterative software design process** based on my own need for a better transcription tool. In the first few weeks of use, the approach has been validated with:

- **Over 2,000 transcriptions** processed
- **More than 1 million characters** of output
- Excellent accuracy and formatting results
- API costs of just a few dollars total

The key insight is that multimodal models can do both transcription and cleanup in a single pass, while also "hearing" tone, emphasis, and verbal commands that get lost in text-only processing.

## 1.2 What Makes This Different

**Traditional Approach**

1. Record audio
2. Send to ASR (Whisper, etc.)
3. Get raw transcript
4. Send text to LLM for cleanup
5. Get formatted output

**Two API calls, higher cost**

**Voice Notepad Approach**

1. Record audio
2. Local preprocessing (VAD + AGC)
3. Send audio + prompt to Gemini
4. Get formatted output

**Single API call, lower cost**
**AI "hears" your voice**

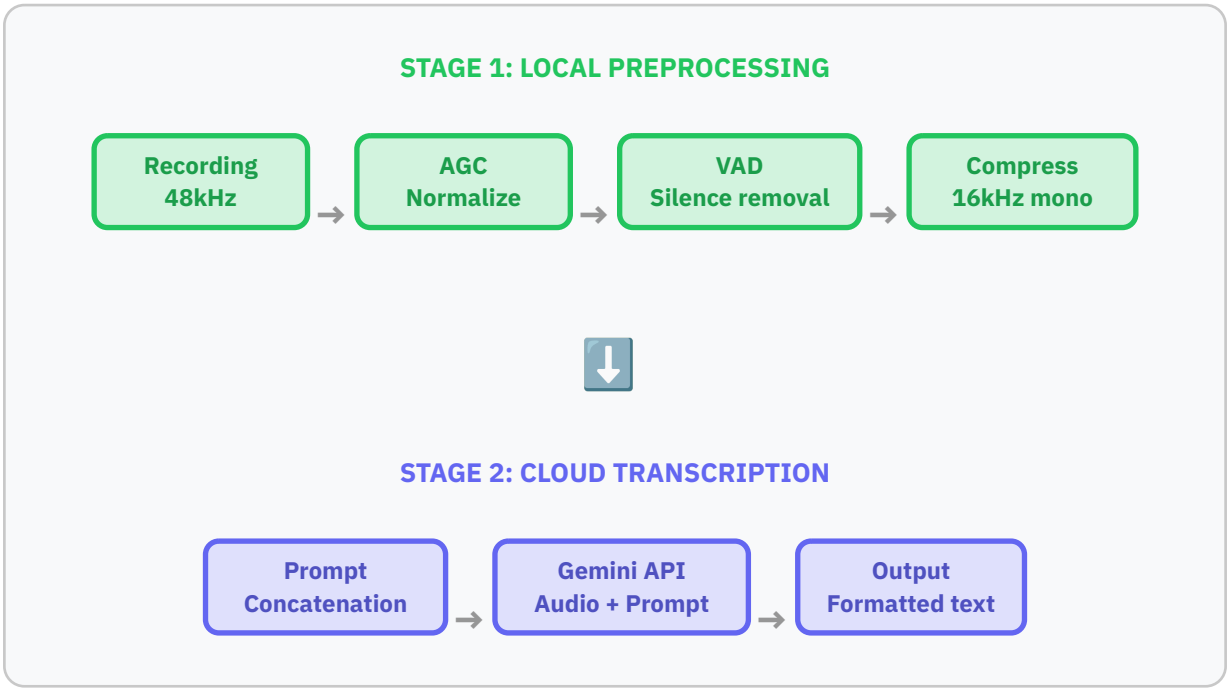
## 1.3 Key Features

- Dual-pipeline processing
- Voice Activity Detection (VAD)
- Automatic Gain Control (AGC)
- Single-pass multimodal transcription
- Layered prompt concatenation
- Configurable hotkeys (F13-F24)
- Text injection (auto-paste)
- Audio feedback (beeps or TTS)
- Transcript history with search
- Usage analytics and charts
- Cost tracking
- Statistics export

# The Dual-Pipeline Architecture

Voice Notepad's effectiveness comes from combining local preprocessing with cloud-based multimodal transcription.

## 2.1 Pipeline Overview




The combination achieves:

- **Cost reduction**: VAD removes 30-80% of audio (silence/pauses)
- **Quality improvement**: AGC ensures consistent input levels
- **Precise formatting**: Layered prompts produce exactly the output you need
- **Single API call**: Multimodal models transcribe and format in one pass

## 2.2 Stage 1: Local Preprocessing

The local pipeline processes audio on your machine before any cloud upload.

### 1.1 Recording (PyAudio)

- Captures at device's native sample rate (typically 48kHz)
- 16-bit PCM, mono audio
- Automatic sample rate negotiation

- Handles microphone disconnection gracefully

### 1.2 Automatic Gain Control (AGC)

Normalizes audio levels for consistent transcription accuracy.

| Parameter | Value | Purpose |
|---|---|---|
| Target peak | −3 dBFS | Optimal level with headroom |
| Min threshold | −40 dBFS | Skip if quieter than noise floor |
| Max gain | +20 dB | Prevent over-amplification |

**Behavior**: Only boosts quiet audio—never attenuates loud audio.

### 1.3 Voice Activity Detection (VAD)

Removes silence using TEN VAD before API upload.

| Parameter | Value | Purpose |
|---|---|---|
| Sample rate | 16kHz | Required by TEN VAD |
| Hop size | 256 samples | 16ms analysis windows |
| Threshold | 0.5 | Speech probability cutoff |
| Min speech | 250ms | Ignore very short sounds |
| Padding | 30ms | Buffer around speech |

**Typical reduction**: 30-80% depending on speaking pattern.

### 1.4 Compression

- Downsampled to 16kHz mono (matches Gemini's internal format)
- Converted to WAV for API upload
- 66% smaller than 48kHz stereo input

## 2.3 Stage 2: Cloud Transcription

### 2.1 Prompt Concatenation

Instructions are built from multiple layers:

**Foundation Layer** (always applied):
- Remove filler words (um, uh, like, you know)
- Add punctuation and paragraph breaks
- Follow verbal commands (“scratch that”, “new paragraph”)
- Fix grammar and spelling

**Format Layer** (based on preset):
- Email, meeting notes, bullet points, documentation, etc.

**Style Layer**:
- Formality: casual, neutral, professional
- Verbosity: none to maximum reduction

**Personalization**:
- Email signatures injected for email format

### 2.2 Multimodal API Submission

- Audio is base64-encoded with concatenated prompt
- Gemini processes audio + text instructions together
- The AI “hears” tone, emphasis, and verbal commands
- Returns formatted text in a single API call

# Installation

Voice Notepad requires a two-stage installation: system dependencies first, then the application.

## 3.1 Stage 1: System Dependencies

Install required system packages on Ubuntu/Debian:

```
sudo apt install python3 python3-venv ffmpeg portaudio19-dev libc++1
```

| Package | Purpose |
|---|---|
| `python3`, `python3-venv` | Python runtime and virtual environments |
| `ffmpeg` | Audio format conversion and compression |
| `portaudio19-dev` | PyAudio recording library headers |
| `libc++1` | Required by TEN VAD for voice activity detection |

## 3.2 Stage 2: Application Installation

### 3.2.1 Option A: Debian Package (Recommended)

```
sudo apt install ./voice-notepad_1.9.11_amd64.deb
```

### 3.2.2 Option B: AppImage

```
chmod +x Voice_Notepad-1.9.11-x86_64.AppImage
./Voice_Notepad-1.9.11-x86_64.AppImage
```

### 3.2.3 Option C: From Source

```
git clone https://github.com/danielrosehill/Voice-Notepad.git
cd Voice-Notepad
./run.sh
```

# Hardware Recommendations

Voice Notepad is designed to work with dedicated hardware for hands-free operation.

## 4.1 Design Rationale: F13-F24 Keys

The application uses **F13 through F24** as the default hotkey range for an important reason: **these keys are defined in Linux but virtually never used by applications**.

This design choice ensures:
- **No conflicts** with user-level programs (browsers, editors, etc.)
- **No conflicts** with desktop environment shortcuts
- **System-level interception** without interfering with normal keyboard use
- **Clean separation** between transcription controls and regular typing

Most standard keyboards only have F1-F12. To use Voice Notepad's hotkeys, you need either a keyboard with extended function keys or a separate input device mapped to F13-F24.

## 4.2 Recommended Hardware

### 4.2.1 Simple: USB HID Button ( $5)

A single USB HID programmable button (available on AliExpress for  $5) provides excellent **push-to-talk (PTT)** functionality.

- Map the button to **F15** (Toggle Recording)
- Press to start recording, press again to transcribe
- Simple, reliable, inexpensive
- No software required after initial mapping

### 4.2.2 Full Setup: Macro Pad

For power users, a USB macro pad with 6+ keys enables the full hotkey workflow:

| Button | Maps To | Function |
|---|---|---|
| 1 | F15 | Toggle (start/stop and transcribe) |
| 2 | F16 | Tap Toggle (start/stop and cache) |
| 3 | F17 | Transcribe cached audio |
| 4 | F18 | Clear recording |

| Button | Maps To | Function |
|---|---|---|
| 5 | F19 | Append to cache |
| 6 | F20 | Pause/resume |

The number of configurable hotkeys (6 functions) is specifically designed to match typical macro pad layouts.

### 4.2.3 Alternative: Foot Pedal

USB foot pedals are popular for hands-free transcription:

- Keep hands on keyboard while controlling recording
- Map pedal buttons to F15/F17/F18
- Available from $15-30

## 4.3 Setting Up Key Mapping

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Use **Input Remapper** on Linux to map your device:

```
sudo apt install input-remapper
```

1. Open Input Remapper
2. Select your USB device
3. Click “Record” and press the button
4. Set output to `KEY_F15` (or desired F-key)
5. Click Apply and enable Autoload

# Configurable Hotkeys

## 5.1 Default Mappings

| Key | Function | Description |
|---|---|---|
| F15 | Toggle | Start recording, or stop and transcribe immediately |
| F16 | Tap Toggle | Start recording, or stop and cache |
| F17 | Transcribe | Transcribe cached audio |
| F18 | Clear | Delete recording and clear cache |
| F19 | Append | Start recording that appends to cache |
| F20 | Pause | Pause/resume current recording |

## 5.2 Configuration

Go to **Settings → Hotkeys** to customize mappings. Each function can be assigned any key from F13-F24, or disabled entirely.

## 5.3 Technical Notes

- On Linux/Wayland: Hotkeys work via evdev (reads directly from input devices)
- Requires user to be in the `input` group: `sudo usermod -aG input $USER`
- Falls back to pynput/X11 on non-Linux systems

# Audio Feedback

Voice Notepad provides audio notifications for recording events.

## 6.1 Modes

Configure in **Settings → Behavior → Audio feedback**:

| Mode | Description |
|---|---|
| **Beeps** | Short beep tones for events (default) |
| **Voice (TTS)** | Spoken announcements via Edge TTS |
| **Silent** | No audio feedback |

## 6.2 TTS Announcements

When Voice mode is enabled, you'll hear spoken feedback:

| Event | Announcement |
|---|---|
| Recording started | "Recording" |
| Recording stopped | "Recording stopped" |
| Audio cached | "Cached" |
| Transcription started | "Transcribing" |
| Transcription complete | "Complete" |
| Text copied | "Text on clipboard" |
| Recording cleared | "Recording discarded" |
| Error occurred | "Error" |

TTS uses pre-generated audio files with a British English male voice (en-GB-RyanNeural via Microsoft Edge TTS).

# Transcript History

All transcriptions are automatically saved to a local MongoDB-compatible database.

## 7.1 Database

Voice Notepad uses **Mongita**, a pure Python MongoDB implementation. Data is stored locally at `~/.config/voice-notepad-v3/mongita/`.

Each transcript record includes:
- Full transcript text
- Timestamp
- Provider and model used
- Audio duration (original and after VAD)
- Inference time
- Token usage and cost
- Word and character counts

## 7.2 History Tab Features

- **Full-text search** across all transcriptions
- **Click to preview** any transcript
- **Double-click to load** into editor for reuse
- **Delete individual** transcriptions
- **Delete all** with confirmation

# Analytics & Cost Tracking

## 8.1 Analytics Tab

The Analytics tab provides performance insights:

- **Summary statistics**: Total transcriptions, words, characters
- **Daily activity chart**: Visual bar chart with metric toggles
- **Model performance table**: Compare inference times across models
- **Time period selector**: Today, 7 days, 30 days, or all time

## 8.2 Export Statistics

Click **Export Stats** to save anonymized statistics as JSON. Exported data includes:
- Transcription counts and volume
- Model performance metrics (no transcript content)
- Daily activity breakdown

Useful for benchmarking or sharing performance data.

## 8.3 Cost Tab

For OpenRouter users, the Cost tab shows:

- **Account balance**: Live credit balance
- **Key-specific usage**: Daily, weekly, monthly spend
- **Model breakdown**: Usage by model

## 8.4 Cost Effectiveness

Real usage data with Gemini 2.5 Flash:
- 848 transcriptions for $1.17 total
- 84,000 words transcribed and cleaned
- About $0.014 per 1,000 words (1.4 cents)

# Text Injection (Wayland)

Text injection automatically pastes transcribed text at your cursor after transcription.

## 9.1 Requirements

- `ydotool` package installed
- `ydotoold` daemon running as your user (not root)

## 9.2 Quick Setup

```
sudo apt install ydotool
sudo pkill ydotoold
sudo rm -f /tmp/.ydotool_socket
ydotoold &
```

## 9.3 Verify

```
ls -la /tmp/.ydotool_socket
# Should show YOUR username as owner, not root
```

## 9.4 Persistent Setup

Create `~/.config/systemd/user/ydotoold.service`:

```
[Unit]
Description=ydotool daemon

[Service]
ExecStart=/usr/bin/ydotoold

[Install]
WantedBy=default.target
```

Enable: `systemctl --user enable --now ydotoold`

# Output Modes

Three independent output modes can be combined:

| Mode | Behavior |
|---|---|
| **App** | Text appears in the application window |
| **Clipboard** | Text copied to system clipboard |
| **Inject** | Text typed at cursor via ydotool |

Enable any combination: all three, any two, or just one.

# Storage Locations

All data is stored in `~/.config/voice-notepad-v3/`:

| Path | Contents |
|---|---|
| `config.json` | API keys and preferences |
| `mongita/` | MongoDB-compatible transcript database |
| `usage/` | Daily cost tracking JSON files |
| `audio-archive/` | Opus audio recordings (if enabled) |

# Troubleshooting

## 12.1 Audio Issues

**No microphone detected**: Check `pactl list sources short`. Verify PipeWire is running.

**Poor quality**: Enable AGC in Settings → Behavior. Position microphone closer.

## 12.2 API Issues

**Transcription fails**: Verify API key. Check internet. Try different model.

**High costs**: Enable VAD. Use Flash Lite models.

## 12.3 Hotkeys Not Working

Add yourself to input group: `sudo usermod -aG input $USER` then log out/in.

## 12.4 Text Injection Not Working

Verify ydotoold is running as your user, not root. Check socket ownership.

# Appendix A

## Hotkey Setup Guide

This appendix provides a visual walkthrough for setting up global hotkeys using Input Remapper on Linux.

### 12.5 Why Input Remapper?

Input Remapper is an open-source tool for remapping keys and buttons from any input device. It works with USB foot pedals, macro keypads, extra mouse buttons, and any HID device.

### 12.6 Installation

**Ubuntu/Debian**

```
sudo apt install \
  input-remapper
```

**Fedora**

```
sudo dnf install \
  input-remapper
```

**Arch**

```
sudo pacman -S \
  input-remapper-git
```

### 12.7 Step 1: Select Your Device

Open Input Remapper and select the device you want to remap. This could be a USB foot pedal, macro keypad, or any HID device.

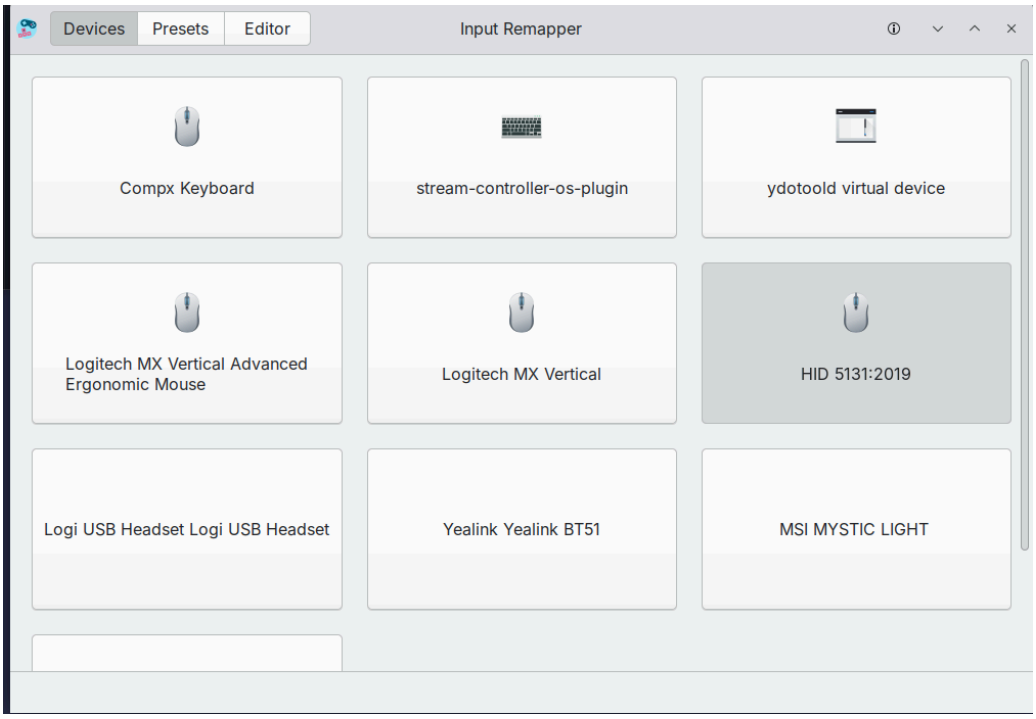


Figure 1: Input Remapper device selection

## 12.8 Step 2: Select the Specific Interface

Some devices appear multiple times (keyboard interface, mouse interface, etc.). Select the one that matches your input type.

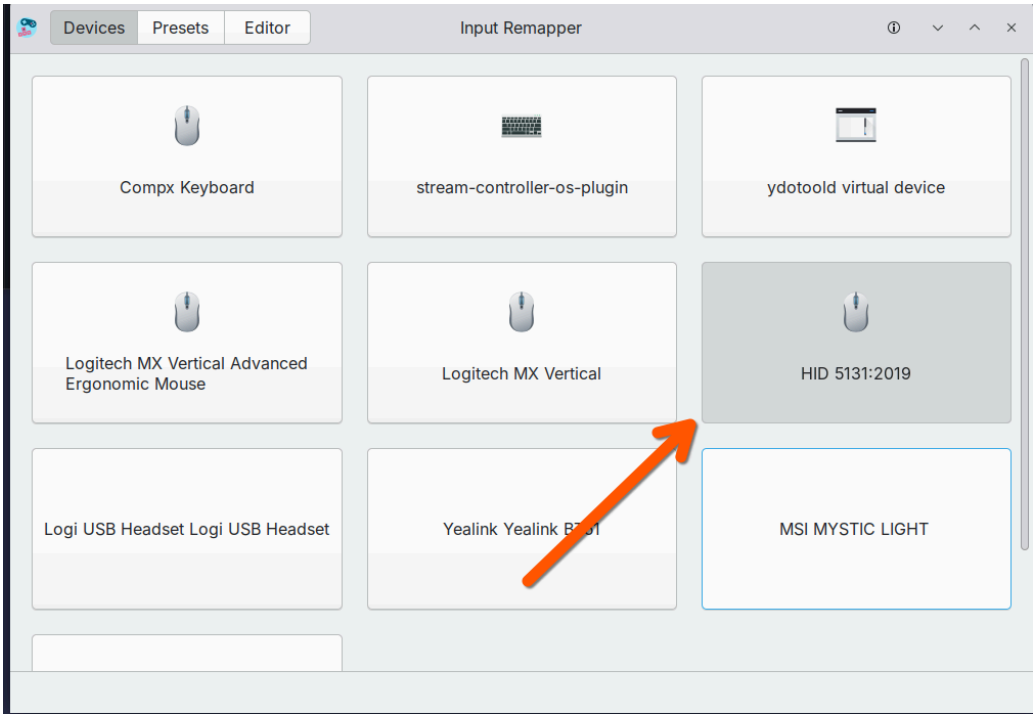


Figure 2: Selecting the HID device interface

## 12.9 Step 3: Open the Editor

Switch to the **Editor** tab to create key mappings.

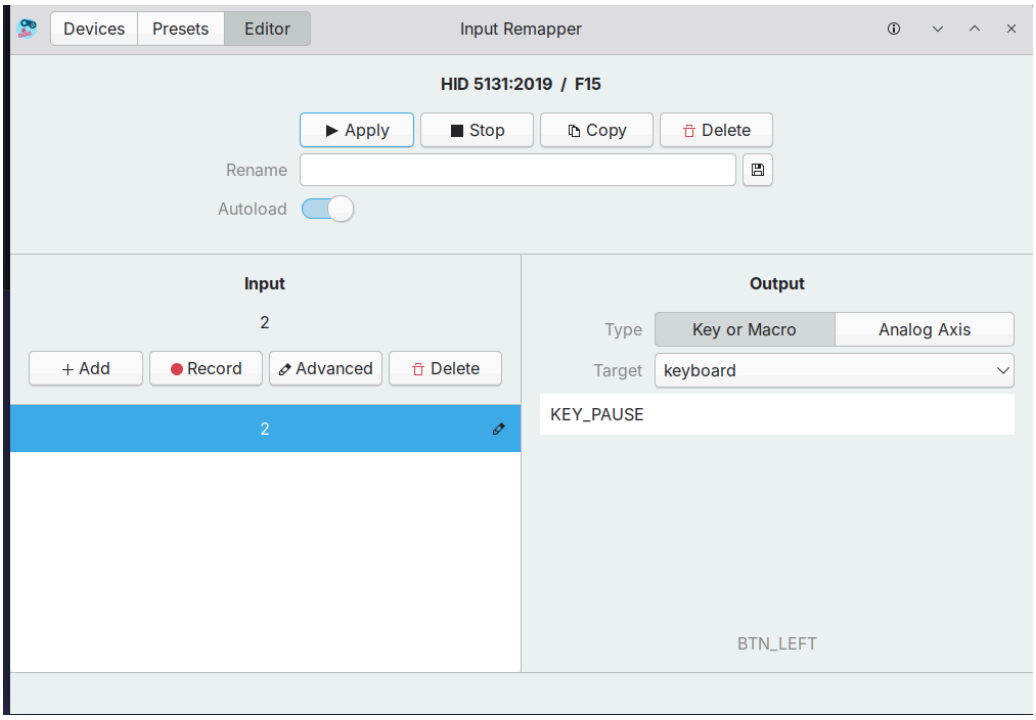


Figure 3: Editor tab for creating mappings

## 12.10 Step 4: Record the Input

Click **Record** and press the button you want to remap. Input Remapper will capture it.

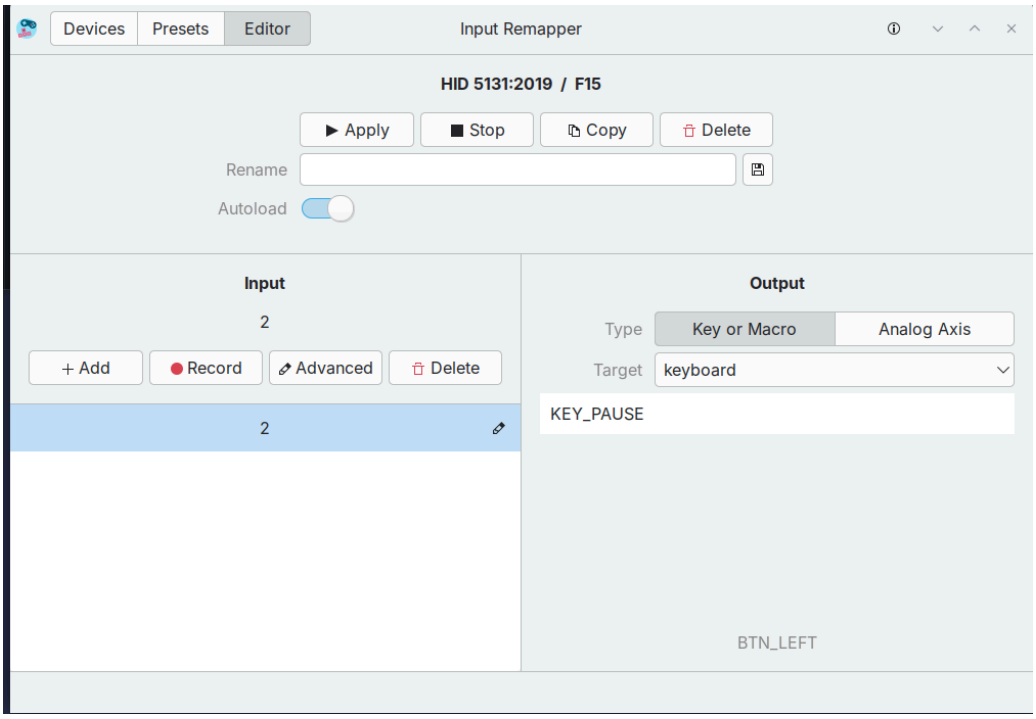


Figure 4: Recording the input button

## 12.11 Step 5: Choose the Output Key

Type the key name in the output field. For Voice Notepad, use `KEY_F15` through `KEY_F20`.

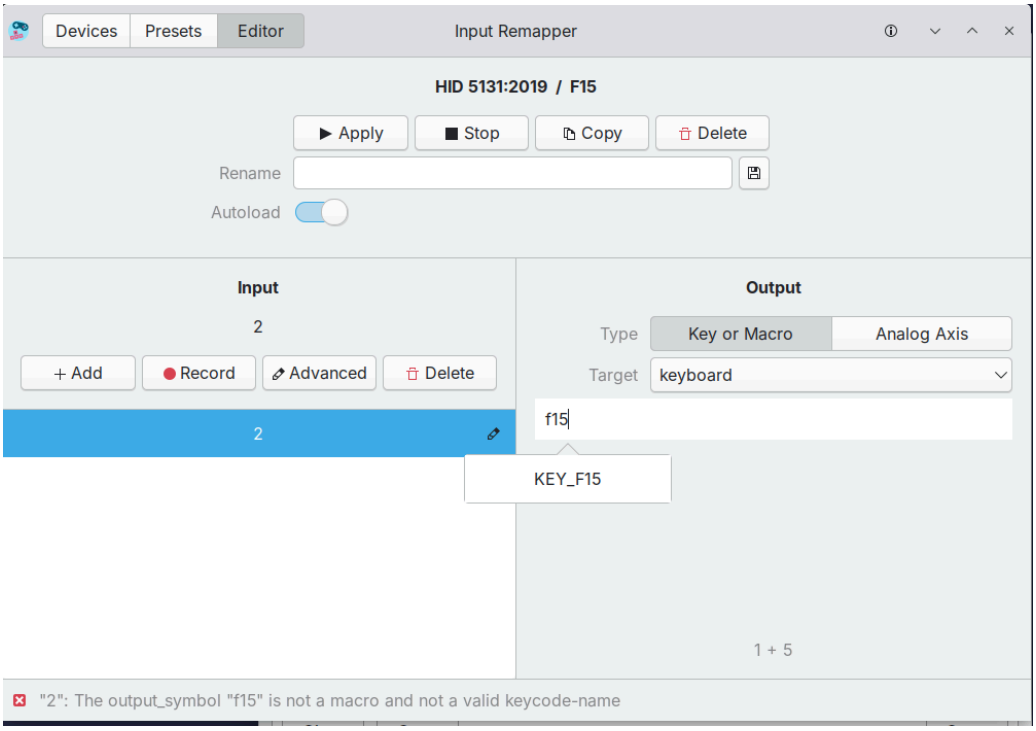


Figure 5: Selecting KEY_F15 as the output

## 12.12 Step 6: Apply and Enable Autoload

1. Click **Apply** to activate the mapping
2. Enable **Autoload** to persist across reboots
3. Enable the service: `systemctl --user enable input-remapper`

## 12.13 Recommended Multi-Button Setup

| Button | Maps To | Function |
|---|---|---|
| 1 | KEY_F15 | Toggle (start/stop and transcribe) |
| 2 | KEY_F17 | Transcribe cached audio |
| 3 | KEY_F18 | Clear recording |

# Appendix B

## Bill of Materials

This appendix lists all major components and dependencies integrated into Voice Notepad.

### 12.14 Core Technologies

| Component | License | Purpose |
|---|---|---|
| **PyQt6** | GPL v3 | Desktop GUI framework with tabbed interface, system tray, and keyboard shortcuts |
| **Google Gemini API** | Proprietary | Multimodal AI for single-pass audio transcription and cleanup |
| **OpenRouter API** | Proprietary | Alternative API gateway with per-key cost tracking |

### 12.15 Audio Processing

| Component | License | Purpose |
|---|---|---|
| **PyAudio** | MIT | Audio recording with microphone device selection |
| **TEN VAD** | Apache 2.0 | Voice Activity Detection for silence removal ( 306KB native library) |
| **pydub** | MIT | Audio format conversion and manipulation |
| **FFmpeg** | LGPL/GPL | Audio compression, format conversion, and resampling |

## 12.16 Text-to-Speech

| Component | License | Purpose |
|---|---|---|
| **edge-tts** | GPL v3 | Microsoft Edge TTS for voice announcements |
| **en-GB-RyanNeural** | Microsoft | British English male voice for audio feedback |

## 12.17 Data Storage

| Component | License | Purpose |
|---|---|---|
| **Mongita** | BSD 3-Clause | MongoDB-compatible pure Python database for transcript storage |
| **Opus codec** | BSD 3-Clause | Audio archival format ( 24kbps for speech) |

## 12.18 Input Handling

| Component | License | Purpose |
|---|---|---|
| **pynput** | LGPL v3 | Keyboard input handling (fallback for non-Linux) |
| **evdev** | BSD 3-Clause | Linux input device access for global hotkeys on Wayland |
| **ydotool** | MIT | Text injection on Wayland via virtual keyboard |

## 12.19 Visualization

| Component | License | Purpose |
|---|---|---|
| **pyqtgraph** | MIT | Charts and visualizations for analytics tab |
| **Markdown** | BSD 3-Clause | Markdown rendering in transcript display |

## 12.20 System Dependencies

These must be installed separately on the host system:

| Package | Purpose |
|---|---|
| `python3` | Python 3.10+ runtime |
| `ffmpeg` | Audio format conversion and compression |
| `portaudio19-dev` | PyAudio recording library headers |
| `libc++1` | C++ standard library required by TEN VAD |
| `ydotool` | Text injection daemon (optional, for Wayland) |

## 12.21 Component Links

- **TEN VAD**: https://github.com/TEN-framework/ten-vad
- **Mongita**: https://github.com/scottrogowski/mongita
- **edge-tts**: https://github.com/rany2/edge-tts
- **Input Remapper**: https://github.com/sezanzeb/input-remapper
- **ydotool**: https://github.com/ReimuNotMoe/ydotool

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