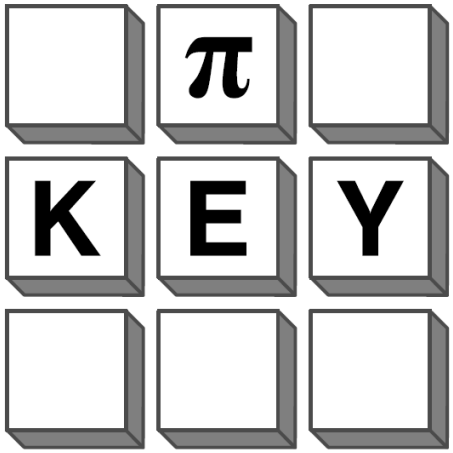


PiKey

Making small-keyboard microcomputers usable for old dudes with big hands

Brendan and Morgan Donahe

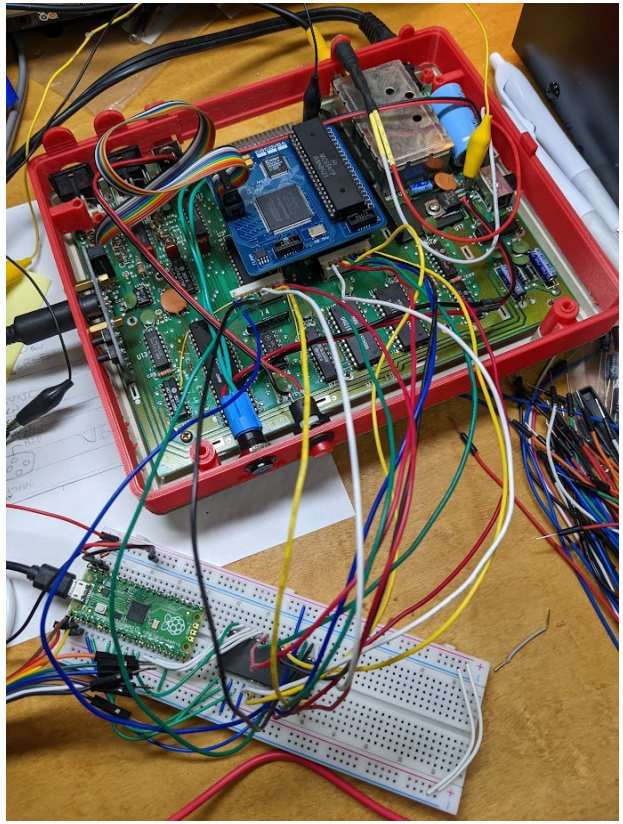
February 2025

Overview

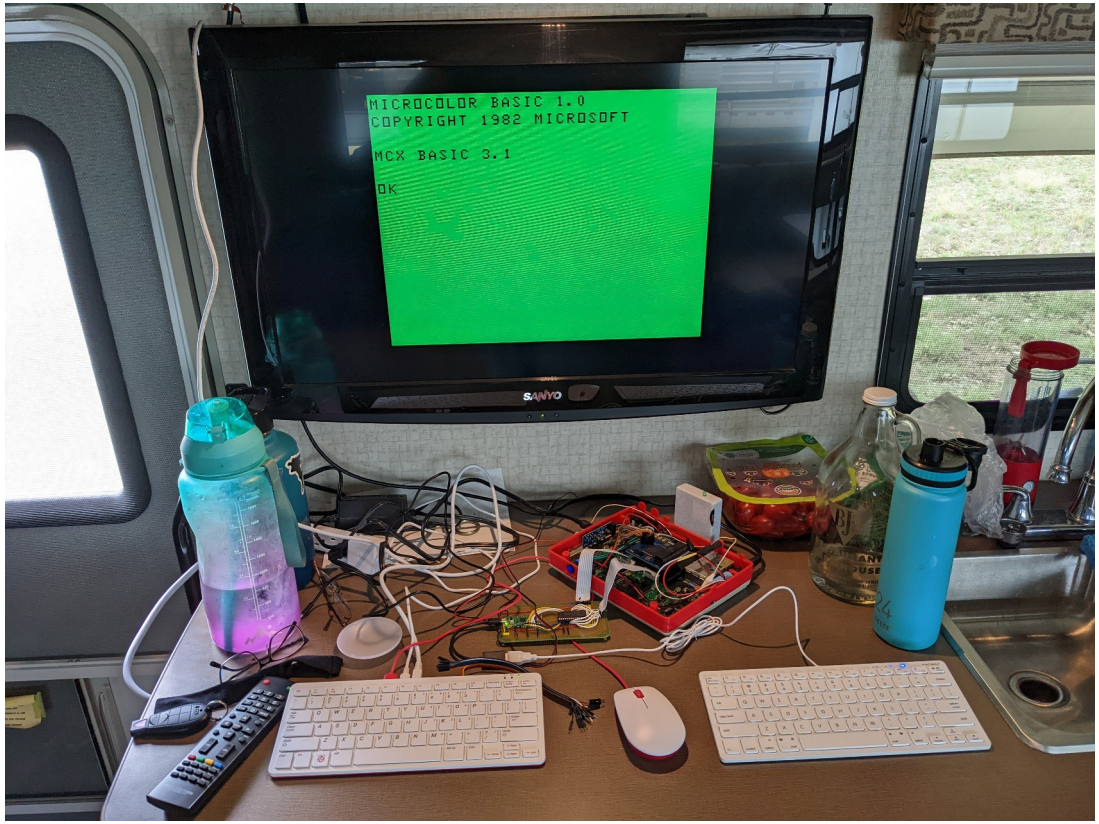
- PiKey is overarching project name; goal to provide USB keyboard and Atari joystick/Sega Genesis joypad support
- PiKey-10 model targets limitations of TRS-80 MC-10 Micro Color Computer
  - Miniature chiclet keyboard
  - No joystick ports
- Employs key components
  - Raspberry Pi Pico 1 (2020)
  - Zarlink MT8808 8x8 analog switch matrix chip

PiKey-10 History

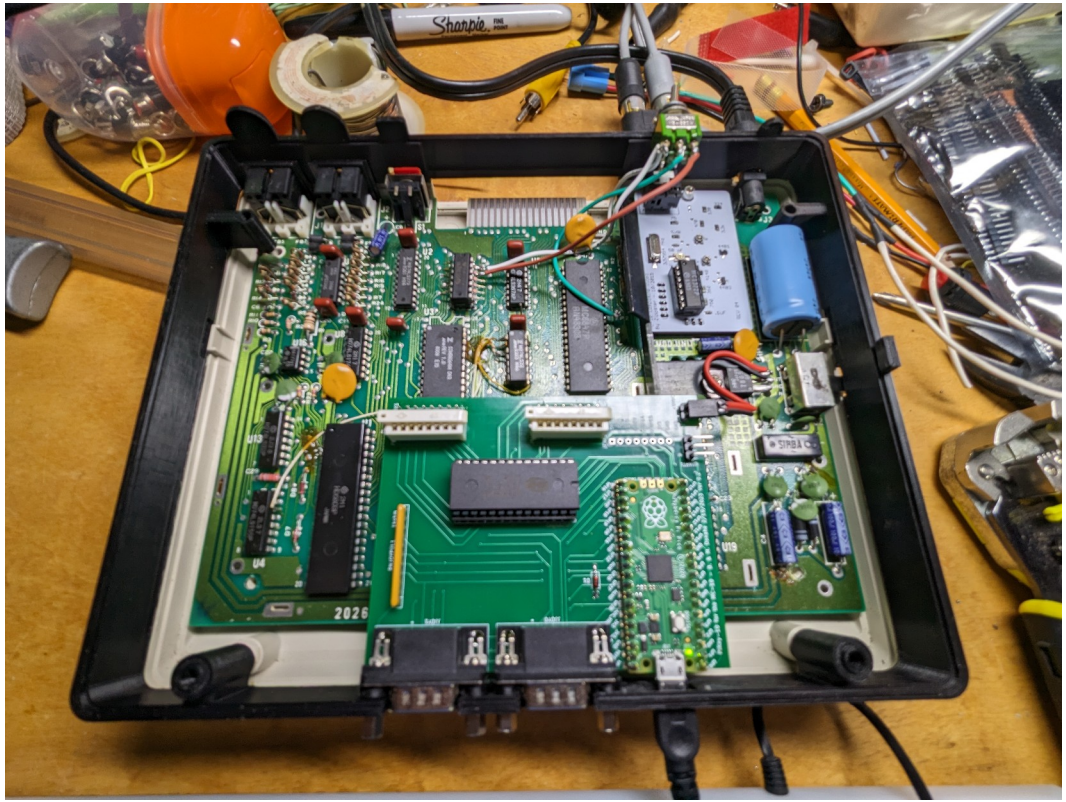
- Project started spring 2022
- Purpose as described above, emulation of keyswitch closures via USB in as non-invasive and backwards-compatible method as possible
- Inspired by Kyle Wadsten's NEWKEY/80 for Z80-based TRS-80s
  - Was originally using discrete transistors
  - Following light collaboration, Kyle has also migrated to MT8808
  - https://www.plaidvest.com/newkey80.html



Summer 2022
Breadboard Prototype



Fall 2022
Perfboard Prototype



Summer 2023
PCB and 3D-Printed Riser Prototype

Demo'ed at:
CoCoFEST!
Classic Game Fest
Tandy Assembly
VCF SW
VCF West

ALMOST 2 DOZEN sold!

PiKey-10 Hardware Design

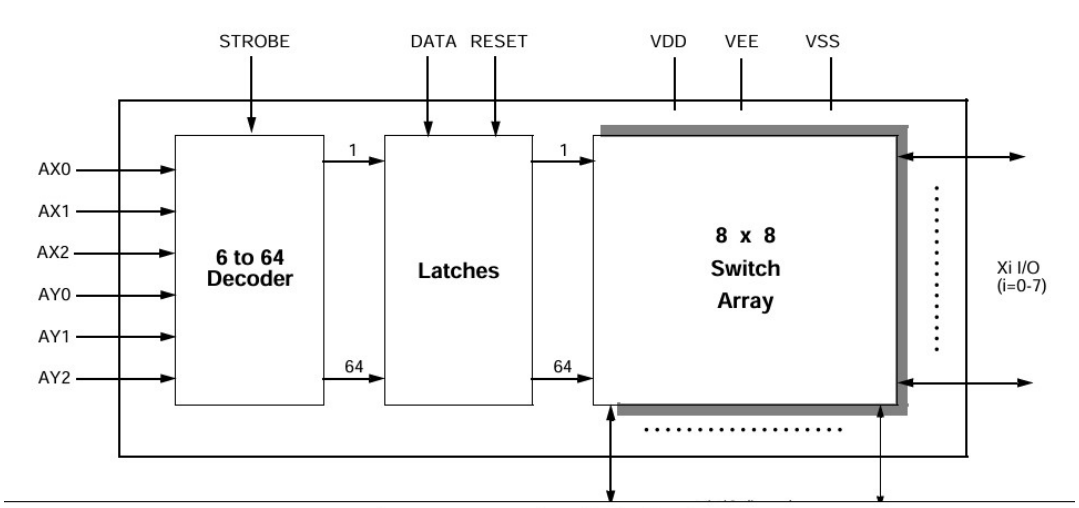
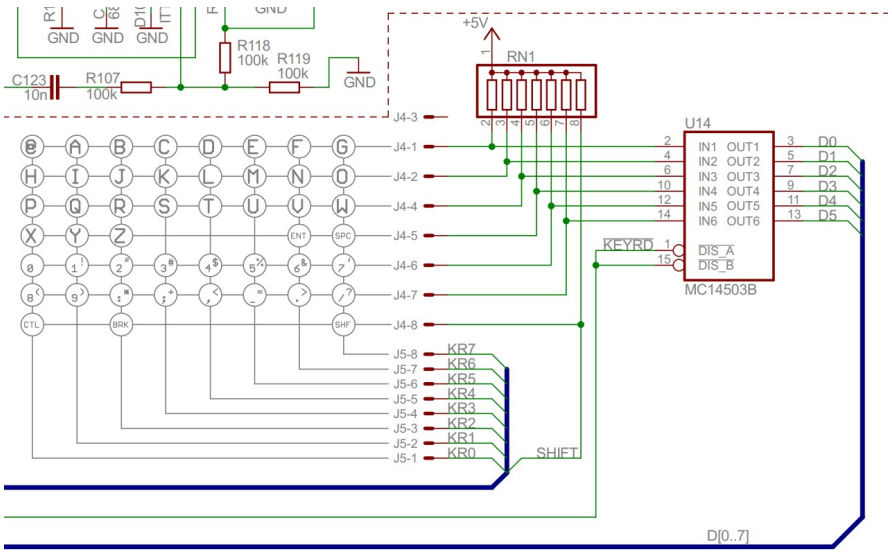
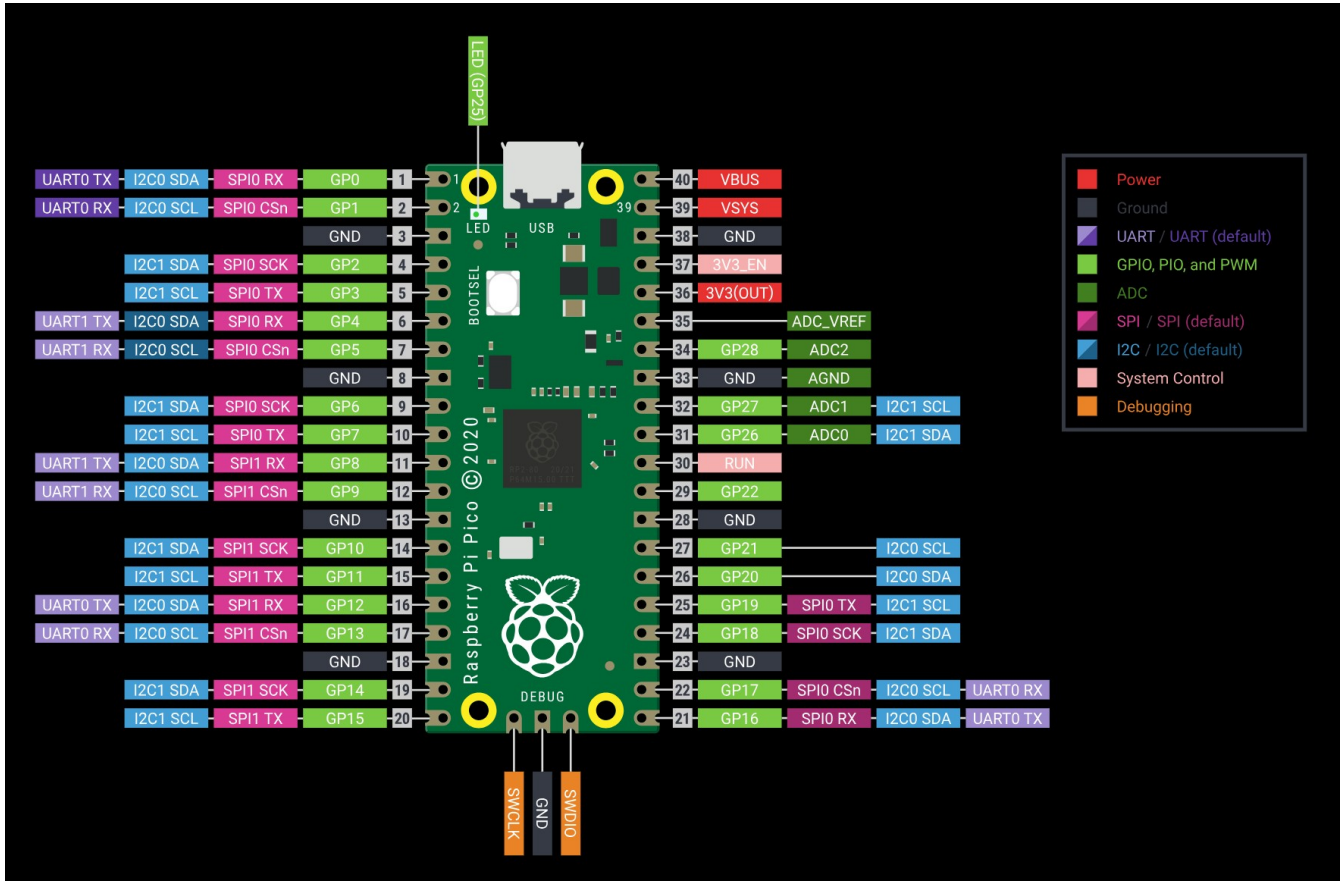


Figure 1 - Functional Block Diagram

Zarlink MT8808 Datasheet



MC-10 Keyboard Scan Matrix (full MC-10 schematic redrawn by Danjovic)



MT8808

- Reset – GPIO2
- Strobe – GPIO3
- Data – GPIO6
- AY[2:0] – GPIO[8:10]
- AX[2:0] – GPIO[11:13]

Joysticks || Pullups

- Joy0 – GPIO[21:28]
- Joy1 – GPIO[16:20]

Debug UART

- UART0 TX – pin 1
- UART0 RX – pin 2

- PiKey-10 board powered by 5VDC from 7805 regulator on MC-10 mainboard; Raspberry Pi Pico has its own voltage down-regulation
- Micro USB port OTG (On-The-Go) standard, therefore dual purpose
  - Program onboard flash with code image; field upgradeable
  - OTG adapts to USB-A female host for wired keyboard
- Simultaneous use of both USB keyboard and original keyboard possible due to switches (virtual and physical) electrically in parallel
- Joystick ports male DE-9
  - Pinout compatible with both Atari joystick and Sega Genesis control pad
  - Sega Genesis control pad limited to D pad and B button only

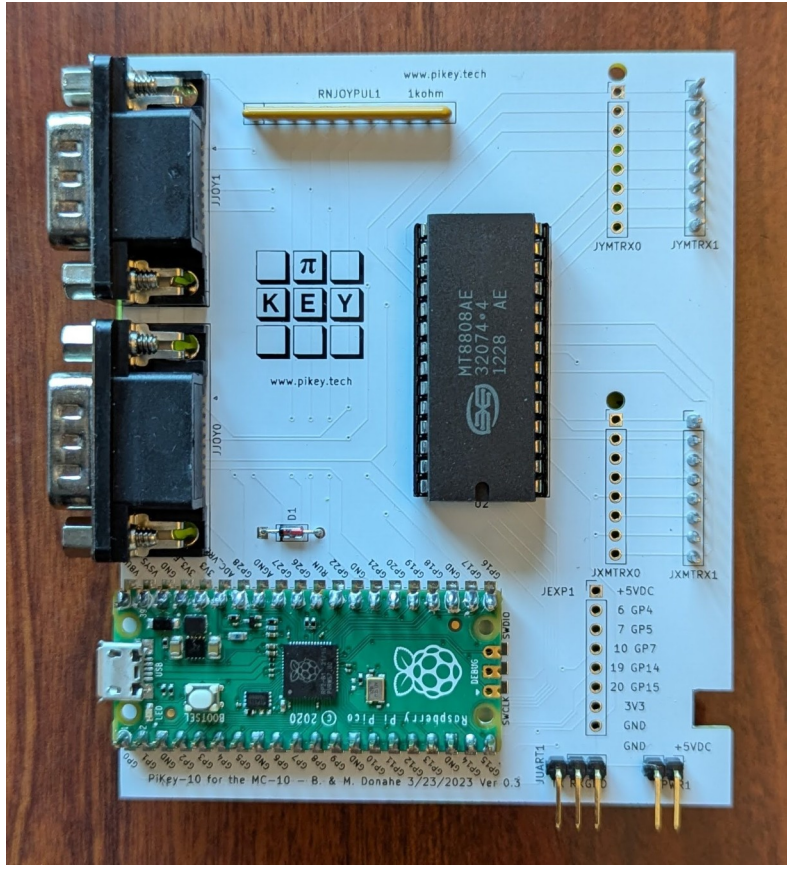
PiKey-10 Software Design

- Development and cross-compilation via Raspberry Pi 400
- Uses TinyUSB protocol stack on bare metal (no OS)
- Derived from host_cdc_msc_hid demo application
- General structure
  - main() initializes components on board and starts event loop
  - process_kbd_report() performs table-driven conversion of USB key down/up events to MT8808 switch close/open sequences; pushes these into queue with encoded millisecond delays
  - hid_app_task() pops queued events and handles them in time-aware method

- Autotype capability for on-screen feedback to user

- Additional meta mode access via GUI key
  - Keyboard mode (GUI-K)
    - Touch-type mode (keyboard WY"Type"IWYG)
    - MC-10 mode (legacy retrocomputer user muscle-memory-friendly)
  - Joystick remapping mode (GUI-J)
    - Alter default joystick 0 and joystick 1 to keypress mapping
  - Verbose mode (GUI-V) for user guidance regarding above features

PiKey-10 HW 0.3 SW 0.25



The Future…

- Other small membrane or chiclet keyboard microcomputers
  - Timex/Sinclair 1000 a.k.a. ZX-80 and ZX-81
  - Timex/Sinclair 2068
- Feature enhancement requests
  - Porta-MC-10 (https://portacoco.com/porta-mc-10/) - ability to remap joystick using stock MC-10 keyboard
  - Auto key repeat; should only apply to USB keystrokes, not joystick events
  - Integration with MC-10's 6803 UART
  - Improve compatibility with USB keyboards beyond ~75%
- For more info monitor http://pikey.tech/