

USB – program + USB-MIDI

Universal Serial Bus · host ↔ device · USB-C

HOW IT WORKS

The computer-to-peripheral standard. A differential data pair (D+/D-) carries everything; the device announces what it IS (a serial port, a MIDI device...) and the host loads the right driver. We use two roles: USB-Serial/JTAG (flash + console the ESP32) and USB-MIDI.

THE WIRES

D+ , D- = the data pair · VBUS (5 V) · GND

USB-C adds CC1/CC2 (need 5.1 kΩ pulldowns to be a "device")

KEY FACTS

The ESP32 has USB BUILT IN → no extra USB chip, and esptool can auto-reset it into download mode (no BOOT button).

USB-MIDI is "class-compliant" → plug into a Mac, it just appears.

WHERE WE USE IT

Every board got a USB-C wired to the MCU's native USB so we can flash firmware the way we already do (and USB-5V powers the board for flashing with no 12 V). The Brain also presents USB-MIDI – plug it into a laptop and it's a MIDI device, no driver.