HARDWARE ADD-ON · CARIMO MACHINE LEARNING KIT

FlexiBridge

TECHNICAL DATASHEET · TWO-BOARD EXPERIMENTATION PLATFORM

FlexiBridge links a **secondary microcontroller board** to the CARIMO **primary STM32F401RE** board over UART, turning a single-board kit into an open two-board platform. The primary board stays locked and continuously streams live motor and sensor data; the secondary board is fully open for students to program, so they can sense real data, decide in their own code, and act on the motor.

How it connects: Primary board (locked, STM32F401RE) ⇄ UART ⇄ Secondary board (open) → USB → PC

SECONDARY BOARD REQUIREMENTS

- 2 or more independent hardware UARTs (one to the primary board, one to the PC)
- 3.3V logic level, or a level shifter if 5V

COMMUNICATION

- 115200 baud · 8 data bits · no parity · 1 stop bit (8N1)
- 3.3V TTL logic

Compatible secondary boards

Arduino

Board	HW UARTs	Logic	Compatible	Notes
Mega 2560	4	5V	✓	Best Arduino option. Serial0 for PC, Serial1/2/3 for primary
Due	4	3.3V	✓	3.3V matches STM32 directly, no level shifter needed
Leonardo	2	5V	✓	USB handles PC comm, Serial1 handles primary board
Micro	2	5V	✓	Same as Leonardo, smaller form factor
Nano Every	2	5V	✓	Compact and affordable low-cost alternative
Nano 33 IoT	2	3.3V	✓	3.3V logic + built-in WiFi, no level shifter
Giga R1	3	3.3V	✓	High-end board, overkill but fully capable
UNO R3	1	5V	✗	Single UART shared with USB, cannot talk to both
Nano (classic)	1	5V	✗	Same single-UART limitation as UNO

5V boards (Mega, Leonardo, Micro, Nano Every) require a 3.3V/5V logic level shifter on the UART lines to the primary STM32F401RE.

ST (STM32)

Board	HW UARTs	Logic	Compatible	Notes
STM32F401RE Nucleo	3	3.3V	✓	Same chip as the primary board, already tested
STM32F103C8 (Blue Pill)	3	3.3V	✓	Very cheap and popular, great budget option
STM32F411CE (Black Pill)	3	3.3V	✓	More capable than Blue Pill, same price range
STM32F446RE Nucleo	6	3.3V	✓	6 UARTs, plenty of room for extra sensors
STM32L476RG Nucleo	6	3.3V	✓	Low-power variant, good for battery-powered use
STM32F407 Discovery	6	3.3V	✓	Full discovery kit with many onboard peripherals
STM32 Nucleo-144 series	4–5	3.3V	✓	High-end Nucleo family, maximum performance and I/O

All STM32 boards run at 3.3V logic: direct connection to the primary board, no level shifter required.

ESP (Espressif)

Board	HW UARTs	Logic	Compatible	Notes
ESP32 (WROOM-32)	3	3.3V	✓	Most popular ESP32. Serial for PC, Serial1/2 for primary
ESP32-S3	3	3.3V	✓	Faster dual-core, AI/ML capable, smart secondary boards
ESP32-C3	2	3.3V	✓	Budget-friendly and compact, sufficient for basic use
ESP32-C6	3	3.3V	✓	WiFi 6 + Zigbee/Thread, future-proof IoT option
ESP8266 / NodeMCU	1	3.3V	✗	Only 1 usable hardware UART, cannot bridge both

All ESP32 variants run at 3.3V logic, no level shifter. WiFi/BT also enables wireless secondary-board designs.

Golden rule & recommended boards

Any secondary board with **two or more hardware UARTs and 3.3V logic** (or a level shifter) will work. Recommended for easiest integration: **STM32 Blue Pill**, **ESP32-WROOM-32**, or **Arduino Due**.

What you need

FlexiBridge: primary-board firmware plus a guided wiring setup. **CARIMO Machine Learning Kit** (locked primary board). A compatible secondary board and a PC connected over USB.