

Testing Hard Real-Time Systems

An Innovative Microcontroller-Based Solution

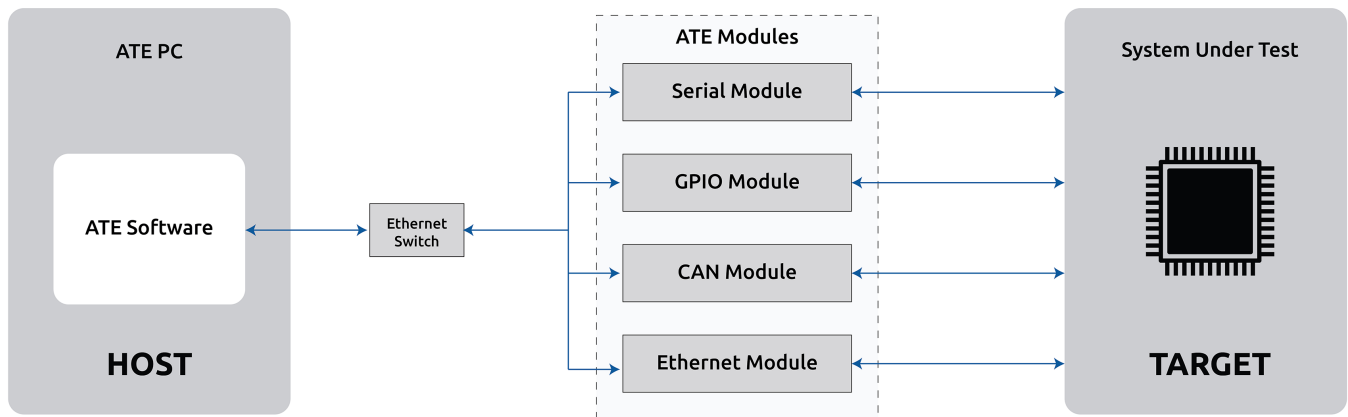
The Problem

- Testing hard real-time systems is hard! It requires deterministic timing below 10 microseconds.
- Current PC-based environment solutions introduce unpredictable timing jitter from OS processes, scheduling, and interrupts.
- Result: unreliable and non-deterministic test results in safety-critical systems.



The Innovation : Automated Test Equipment (ATE)

- Microcontroller-based testing using Raspberry Pi RP2040 (≈£10 each).
- Each microcontroller handles a single interface with deterministic precision.
- Runs on bare metal with <5µs timing precision.
- Easily scalable and modular with Click board support for 1700+ interfaces.



Applications

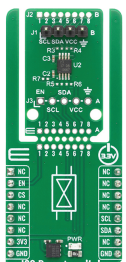
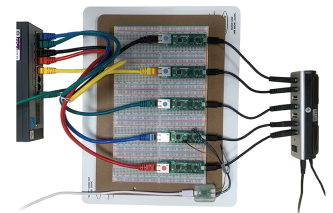
- Applicable to air traffic control, defence, rail, automotive, and nuclear sectors.
- Ideal for any system where missed timing deadlines are unacceptable.
- ATE provides a scalable, reusable testing framework.

Future Developments

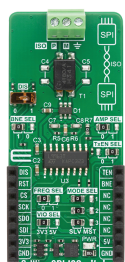
Qualify ATE as an IEC 61508 verification tool.

Results and Performance

- Sub-5µs precision achieved in industrial testing environments.
- Significant cost savings over traditional ATE setups.
- Enhanced reliability and reproducibility of test outcomes.
- Scalable, reusable, generalisable!



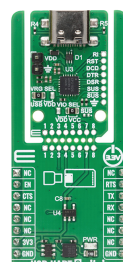
I2C Repeater click



2-Wire SPI ISO Click



Stepper 28 Click



USB UART 6 Click



Fingerprint 5 Click



BGM113 Click