

Principles of Board Testing Tool Development via Serial Port

At the core of this project lies a simple but essential principle: each hardware board test must be both a complete standalone tool and a building block of a future testing system.

The entire system is built around the serial interface — COM or UART. This is the most reliable and lowest-level interface for embedded system diagnostics. Through the serial port, a board can be accessed at early boot stages, without network, display, or a full operating system.

Each test is developed as an independent project in the form `test__tool`. Such a project is a fully functional tool that can be launched, used, and evolved independently from all other tests.

Every tool always contains two tabs: Terminal and a single main test tab. The Terminal provides raw, unfiltered access to the serial shell without automation. The main test tab contains the logic of a specific test and represents the core value of the project.

The key idea is that the project exists for the sake of the tab, not the other way around. The test tab file is not tied to a specific application and can be transferred into a larger multi-test project without modification.

To maintain consistency, a generator is used to create new tools from a template. The generator is intentionally simple and deterministic — it enforces structure rather than implementing complex logic.

The development workflow is always the same: first, a standalone tool is created and brought to a finished, usable state. Only after that is its test tab integrated into a larger multi-purpose testing application.

The result is an engineering-grade testing environment in which each test is valuable on its own, while still being easy to scale and combine into a comprehensive system.