

PHARMACEUTICAL EQUIPMENT

Friability Tester

Embedded Linux

Raspberry Pi 5

Touchscreen GUI

Hardware Control Backend

Automated Report Generation

Audit & Compliance

CLIENT

A Mumbai-based supplier of precision pharmaceutical and laboratory equipment, serving major pharma companies across India and internationally. They required a complete embedded control and reporting system for their friability tester, supplied in two variants: a standard version and an advanced audit-compliant version for regulated pharmaceutical environments.

THE PROBLEM

Friability testing establishes how well a tablet holds together under the mechanical stress of handling, packaging, and transit. A weighed sample of tablets is loaded into a rotating drum, tumbled for a set number of revolutions, then reweighed — the percentage of mass lost to chipping and breakage is the friability value. It is a mandatory release test for solid dosage forms, and the result must be traceable back to a specific method, operator, and batch. Getting that traceability reliably is where the problem lay. Without an instrument that enforces test conditions and captures results automatically, the outcome depended entirely on the operator following the procedure correctly and recording it accurately — leaving quality teams with records that were difficult to defend in an audit.

WHAT WE BUILT

We designed and built the full control and reporting system for the instrument — both the backend that runs the hardware and the frontend that the operator works with. The backend controls the drum motor, executes the test to the exact revolution count and speed set in the method, detects the end of the run, and feeds the result through to the application. The frontend runs on a Raspberry Pi 5 with a 7-inch industrial touchscreen and walks the operator through the entire test workflow: loading the pre-weighed sample, selecting or configuring the method, monitoring the run live, entering the post-test weight, and receiving a completed test report. The reporting engine calculates the friability percentage automatically and generates a formatted record covering the method, the pre- and post-test weights, the calculated result, the operator, and a full timestamp. Methods are saved to a library so standard tests need no re-entry, and all reports are stored on the instrument — searchable, printable, and exportable without a separate PC. A complete audit trail logs every user action and system event.

The system was supplied in two versions. The standard version delivers the complete test, calculation, and documentation workflow. The audit-compliant version builds on this with role-based user access, electronic signatures on test records, and a tamper-evident audit trail that cannot be altered after the fact — giving regulated manufacturers and contract labs the electronic records infrastructure they need without any additional software.

WHAT IT DOES

- ✓ Operator weighs and loads the tablet sample, selects a method defining revolution count and drum speed, and confirms the pre-test weight on the touchscreen
- ✓ Backend drives the drum motor to the exact parameters, counting revolutions and monitoring the run until completion
- ✓ Live run status — revolutions completed, elapsed time, and motor status — displayed on the touchscreen throughout
- ✓ Operator enters the post-test weight after re-weighing; the system immediately calculates the friability percentage and flags the pass/fail status against the method limit
- ✓ Test report generated automatically: method, pre- and post-test weights, friability result, pass/fail status, operator identity, and timestamp
- ✓ All reports stored on the instrument, searchable by date, batch, or operator — printable or exportable directly from the interface
- ✓ Full audit trail records every user action and system event with a timestamp
- ✓ Audit-compliant version adds role-based access control, electronic signatures on test records, and a tamper-evident audit trail for regulated environments
- ✓ Backup and restore protects all saved methods, reports, and settings; user management and system configuration in a dedicated admin area

OUTCOME

The client received a friability tester that controls the drum run precisely, calculates the result automatically from the operator's weight entries, and closes out each test with a complete, timestamped record — turning what was a manual, error-prone procedure into a consistent, audit-ready workflow. The audit-compliant version gives regulated facilities a fully defensible electronic record for every test, built into the instrument itself.