# Testing Plan

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NanoRiego

# 1. Introduction

This Test Plan outlines the strategy, scope, resources, responsibilities, and schedule for the testing activities of the NanoRiego system. It is designed to ensure that the system meets the functional, performance, and reliability requirements as defined in the URS and SRS. The plan includes procedures for unit, integration, system, and user acceptance testing (UAT).

# 2. Objectives

- Validate the correct implementation of functional and non-functional requirements
- Ensure system reliability and robustness across its intended use cases
- Identify and resolve defects prior to deployment
- Confirm user satisfaction and usability through UAT

# 3. Test Scope

## In Scope:

- Embedded firmware (NanoRiegoPIO)
- Bluetooth communication protocol (HC-05)
- Android app functionality and responsiveness
- Hardware control (relay actuation, RTC integration)
- EEPROM configuration persistence

## Out of Scope:

- Cloud-based or remote networking (not supported)
- Automated testing infrastructure (manual testing only)

# 4. Test Levels

## 4.1 Unit Testing

**Objective**: Validate individual code modules, functions, and logic blocks.

- EEPROM read/write
- RTC synchronization
- Bluetooth command parser

## 4.2 Integration Testing

**Objective**: Validate interactions between modules.

- App <=> Bluetooth <=> Arduino
- RTC <=> Schedule logic <=> Relays

## 4.3 System Testing

**Objective**: Verify the entire system meets the SRS.

- Full end-to-end irrigation cycle
- Real-time control and monitoring
- Loss of power and recovery behavior

## 4.4 User Acceptance Testing (UAT)

**Objective**: Confirm that the system fulfills user needs and is intuitive.

- Usability of Android app
- Responsiveness and feedback indicators
- Real-world simulation with water valves and pump

# 5. Test Deliverables

- Test Cases and Protocols (per test level)
- Test Execution Reports
- Bug and Issue Logs

- Final Validation Summary
- Requirements Traceability Matrix (optional)

# 6. Roles and Responsibilities

| Role | Responsibility |
| --- | --- |
| Developer | Conduct unit and integration testing |
| Test Engineer | Prepare test cases and execute system tests |
| Project Owner | Conduct and approve UAT |
| Document Lead | Maintain test documentation |

# 7. Entry and Exit Criteria

## Entry Criteria:

- Code and hardware are stable and feature-complete
- All dependencies and tools are in place

## Exit Criteria:

- All high-severity bugs resolved
- 100% of planned test cases executed
- UAT approved by stakeholder

# 8. Tools and Environment

- Arduino IDE for firmware testing
- Android Studio for mobile app testing
- Multimeter for hardware validation
- Manual inspection and logs for UAT

# 9. Schedule (Tentative)

| Phase | Timeline |
| --- | --- |
| Unit Testing | April 10–11 |
| Integration Testing | April 12 |

| Phase | Timeline |
| --- | --- |
| System Testing | April 13–14 |
| User Acceptance Testing | April 15 |

# 10. Risks and Mitigation

| Risk | Mitigation Strategy |
| --- | --- |
| Bluetooth instability | Reset module, re-pair, improve retries |
| Power supply inconsistencies | Add surge protection and ensure voltage match |
| EEPROM memory wear | Limit unnecessary write operations |
| RTC battery failure | Check voltage before deployment |

*This document will be updated as necessary based on changes to design, testing results, or stakeholder feedback.*