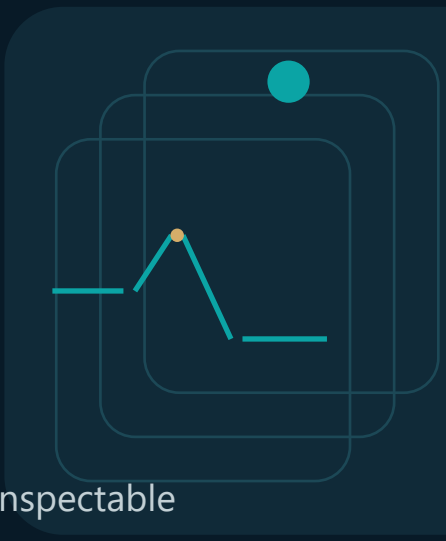
EMBEDDEDVILLE / FIELD SYSTEM 01

Firmware Evidence Pack



A reusable system for turning uncertain firmware behavior into inspectable engineering proof.

THE EVIDENCE LOOP

01	02	03	04
FRAME	**ISOLATE**	**PROVE**	**HAND OFF**
Define expected behavior and the proof condition.	Change one variable and separate hypotheses.	Capture build, runtime, and hardware evidence.	Package the decision and reproduction path.

INCLUDED

5-page printable field guide / Markdown templates / Experiment log CSV

01 FRAME

Investigation Brief

Make the problem measurable before changing the system. A strong brief turns symptoms into competing explanations and a testable next move.

TARGET AND ENVIRONMENT

Board, silicon, SDK or RTOS, compiler, probe, versions, and commit.

EXPECTED BEHAVIOR AND PROOF CONDITION

What should happen? What observable result would count as success?

OBSERVED BEHAVIOR

Record exact errors, registers, logs, waveforms, timing, or power measurements.

CONSTRAINTS AND INVARIANTS

What must remain fixed? What timing, safety, memory, power, or interface limits apply?

LEADING HYPOTHESES

Rank up to three explanations. Write the result each one predicts.

SMALLEST DISCRIMINATING EXPERIMENT

Choose one test that separates at least two hypotheses while changing one variable.

FIELD RULE If the result cannot change your next step, redesign the experiment.

02 ISOLATE

Experiment Log

Preserve causality. Record one hypothesis, one controlled change, one measurement, and one interpretation at a time.

RUN	HYPOTHESIS	ONE CHANGE	MEASUREMENT	RESULT / NEXT
E01 Time _____	Prediction _____	Changed Controlled _____	Tool / point Observed _____	Supports / rejects Next test _____
E02 Time _____	Prediction _____	Changed Controlled _____	Tool / point Observed _____	Supports / rejects Next test _____
E03 Time _____	Prediction _____	Changed Controlled _____	Tool / point Observed _____	Supports / rejects Next test _____
E04 Time _____	Prediction _____	Changed Controlled _____	Tool / point Observed _____	Supports / rejects Next test _____
E05 Time _____	Prediction _____	Changed Controlled _____	Tool / point Observed _____	Supports / rejects Next test _____

DECISION STANDARD

Write what the observation supports or rejects before choosing the next test. The included CSV adds controlled variables, interpretation, and artifact links for longer investigations.

03 PROVE

Proof Capture Checklist

Connect the artifact on disk to behavior at the pin, bus, log, measurement, or test boundary.

BUILD AND IDENTITY

[ ] Exact commit recorded

[ ] Toolchain versions recorded

[ ] Warnings reviewed

[ ] Map file saved

[ ] Binary hash saved

[ ] Build command reproducible

BOOT AND MEMORY

[ ] Vector table verified

[ ] Initial stack pointer valid

[ ] Reset address valid

[ ] .data copy verified

[ ] .bss clear verified

[ ] main() reached with proof

CLOCKS AND TIME

[ ] Ready flags checked

[ ] Timeouts exist

[ ] Clock tree recorded

[ ] MCO or timer measured

[ ] Baud error calculated

[ ] Timing matches the model

FAULTS AND RECOVERY

[ ] Fault handlers installed

[ ] Stacked frame captured

[ ] Status registers decoded

[ ] Watchdog observed

[ ] Reset cause recorded

[ ] Failure path reproducible

I/O AND SYSTEM BEHAVIOR

[ ] GPIO state measured

[ ] UART waveform measured

[ ] Protocol trace saved

[ ] Power state checked

[ ] Test artifact saved

[ ] Known limits documented

STRONGEST PROOF AND ARTIFACT LOCATION

Name the single measurement or artifact that most directly supports the conclusion.

EVIDENCE, NOT EXPLANATION

A plausible explanation becomes engineering evidence only when the system produces something another person can inspect or reproduce.

04 HAND OFF

Handoff or Portfolio Summary

Make the reasoning legible to a teammate, reviewer, customer, or interviewer without requiring them to reconstruct the investigation.

PROBLEM AND STAKES

What failed or needed a decision? Why did it matter?

CONSTRAINTS

Hardware, timing, memory, power, safety, schedule, or confidentiality limits.

INVESTIGATION AND FAILED HYPOTHESES

Show the reasoning path and what the evidence ruled out.

DECISION OR FIX

State the change and why it was preferred over alternatives.

PROOF THAT IT WORKED

Reference tests, measurements, logs, traces, or reproduced behavior.

TRADEOFFS, REMAINING RISKS, AND NEXT STEP

Be explicit about what remains uncertain or intentionally deferred.

HANDOFF QUALITY CHECK

- [ ] Reproduction steps included
- [ ] Artifacts safe to share
- [ ] Tool versions included
- [ ] Known limits stated

MAKE IT INSPECTABLE

Show what was observed, why the decision follows, how to reproduce it, and where uncertainty remains.