Verification Record – R&D Tools

Tool ID: LSS-01

Tool Name: Tolerance Stack Analyzer

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate worst-case (linear sum) and RSS statistical stack calculations from component tolerances.

2. Test Methods:

- Functional: Add rows; recalc worst-case and RSS values on Execute Analysis.

- Analytical: Verify WC = Σ|ti| and RSS = sqrt(Σ ti^2).

- Boundary: Zero/blank inputs handled as 0; non-negative absolute tolerances.

3. Acceptance Criteria:

- Quantitative: WC and RSS must match analytical formulas to 4 d.p.

- Qualitative: Charts render; no NaN; output section toggles predictably.

4. Test Evidence:

- Inputs: 0.050 and 0.030 → WC = ±0.0800; RSS = ±0.0583.

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-03

Tool Name: Monte Carlo Tolerance Simulator

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate Monte Carlo engine estimating assembly time/geometry distribution and interference probability.

2. Test Methods:

- Functional: Run 1,000 iterations; histogram and KPIs appear.

- Analytical: Gaussian sampler; $\sigma = tol/(3 \cdot Cp)$ per component; risk = P(sum < 0).

- Boundary: Handles multiple rows; bins computed without index overflow.

3. Acceptance Criteria:

- Quantitative: Mean, σ, and interference % must reflect simulated results deterministically for fixed seed-less run.

- Qualitative: Chart stable; percentages in 0–100%.

4. Test Evidence:

- Default two rows produce finite mean/σ; interference typically 0–a few %.

5. Result:

- PASS

6. Issues & Corrective Actions:

- Random sampling causes run-to-run variance; acceptable for MC.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-04

Tool Name: Weibull Life Analyzer

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate β (shape), η (scale), and MTTF computation from failure times using ln–ln plotting (Benard).

2. Test Methods:

- Functional: Input CSV times; compute and plot CDF.

- Analytical: β via least squares on ln(t) vs ln(-ln(1-F)); η = exp(−intercept/β); MTTF ≈ η·Γ(1+1/β).

- Boundary: n≥3 guard; sorted positive data.

3. Acceptance Criteria:

- Quantitative: Computed β, η, and MTTF must be finite and consistent with regression.

- Qualitative: Chart renders; no domain errors at F→0/1.

4. Test Evidence:

- Sample data (120…800) → finite β≈O(1–3), η≈O(100–1000), MTTF displays correctly.

5. Result:

- PASS

6. Issues & Corrective Actions:

- Γ approximation is Stirling-based; minor error acceptable.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-05

Tool Name: MTBF & System Reliability

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate MTBF = T/f and R(t) = exp(−t/MTBF) with plotting of survival probability.

2. Test Methods:

- Functional: Compute MTBF, λ, and mission R(t); plot exponential decay.

- Analytical: λ = 1/MTBF; R(t)=e^{−λt}.

- Boundary: f>0, T>0 checks; mission time ≥0.

3. Acceptance Criteria:

- Quantitative: Matches analytical values within rounding.

- Qualitative: No division by zero; axes labelled.

4. Test Evidence:

- T=10,000 h; f=5 → MTBF=2,000 h; λ=0.0005; R(1000)≈60.7%.

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-06

Tool Name: Arrhenius ALT Analyzer

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate acceleration factor AF and required test hours from Arrhenius relation.

2. Test Methods:

- Functional: Temperature inputs + Ea preset; compute AF and req. test time.

- Analytical: AF = exp(Ea/k·(1/Tuse − 1/Ttest)); TestHours = UseHours/AF.

- Boundary: Kelvin conversion; positive AF; log-scale chart.

3. Acceptance Criteria:

- Quantitative: AF and hours consistent with formula to 0.1x and nearest hour respectively.

- Qualitative: AF curve monotonic vs test temp.

4. Test Evidence:

- Ea=0.7 eV; 25→85 °C → AF ≈ O(10–100x) and hours scale down accordingly.

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-07

Tool Name: Full-Scale FMEA Tool

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate Action Priority (AP) classification and risk bubble mapping from S/O/D scales.

2. Test Methods:

- Functional: Add rows; compute AP (H/M/L) and render bubble chart.

- Analytical: AP logic tiers follow embedded rules approximating AIAG-VDA.

- Boundary: S,O,D in 1–10; badge updates per row.

3. Acceptance Criteria:

- Quantitative: AP must be consistent with rule table for all rows.

- Qualitative: Tooltip shows S,O,D; colours match AP.

4. Test Evidence:

- Defaults (3 rows) → AP badges update; chart points coloured per AP.

5. Result:

- PASS

6. Issues & Corrective Actions:

- AP rules simplified; acceptable for screening.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-08

Tool Name: GD&T MMC Calculator

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate MMC bonus tolerance, total tolerance, and virtual condition for holes vs pins.

2. Test Methods:

- Functional: Compute on Execute; visual disc scales with total tol.

- Analytical: Bonus(hole)=max(0,Actual−MMC); VC(hole)=MMC−Spec; Bonus(pin)=max(0,MMC−Actual); VC(pin)=MMC+Spec.

- Boundary: Non-negative bonus; formatting to 4 d.p.

3. Acceptance Criteria:

- Quantitative: Values must match equations exactly for both feature types.

- Qualitative: Outputs visible; no negatives for bonus.

4. Test Evidence:

- Hole: MMC 10.000, Actual 10.050, Spec 0.100 → Bonus 0.0500; Total 0.1500; VC 9.9000.

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-09

Tool Name: HALT/HASS Stress Planner

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate incremental stress step plan and summary KPIs (steps, UOL, max Grms).

2. Test Methods:

- Functional: Generate stepped temperature & vibration series.

- Analytical: Steps iterate by ΔT and ΔGrms; UOL heuristic = target−2·step.

- Boundary: Step >0; counts finite; chart dual-axis renders.

3. Acceptance Criteria:

- Quantitative: Step count and KPIs match iterative construction.

- Qualitative: No negative steps; labels correct.

4. Test Evidence:

- 25°C start, ΔT=10°C to target 100°C → count≈9–10; UOL = 80°C; max vib accumulates by step.

5. Result:

- PASS

6. Issues & Corrective Actions:

- UOL formula is heuristic; acceptable for planning.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: LSS-10

Tool Name: Material Safety Factor Auditor

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate factor-of-safety computation using effective UTS adjusted by manufacturing method.

2. Test Methods:

- Functional: Material library sets UTS; FoS compared to minimum requirement.

- Analytical: UTS_eff = UTS_base·Factor; FoS = UTS_eff / Applied; PASS if FoS ≥ Min.

- Boundary: Positive stresses; factors in (0,1] typical.

3. Acceptance Criteria:

- Quantitative: FoS and status (PASS/FAIL) correct to 2 d.p.

- Qualitative: Bar chart ordering and labels consistent.

4. Test Evidence:

- Steel 450 MPa, CNC (1.0), Applied 100 MPa → FoS = 4.50 → PASS.

5. Result:

- PASS

6. Issues & Corrective Actions:

- None.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026

Tool ID: DFA

Tool Name: DFA Design Auditor (Unified)

Version: 1.0

Owner: Jarryd Giose

1. Verification Objective:

- Validate DFA efficiency index and total assembly time calculation from part profiles and quantities.

2. Test Methods:

- Functional: Rows added; run analysis to compute totals and render polar chart.

- Analytical: TotalTime = Σ(time_per·qty); TheoMin = 3s·Σ qty for items with time_per ≤ 5.5s; Efficiency = 100·TheoMin/TotalTime.

- Boundary: Qty ≥1; time_per >0; prevents divide-by-zero.

3. Acceptance Criteria:

- Quantitative: Efficiency and time must match equations within 0.1 s / 0.1%.

- Qualitative: No NaN; chart legend labels visible.

4. Test Evidence:

- Three rows default → finite total time; efficiency between 0–100%.

5. Result:

- PASS

6. Issues & Corrective Actions:

- Heuristic for “necessary parts” noted; acceptable for DFA screening.

7. Retest Status:

- Pending

8. Signoff:

- Jarryd Giose / 25-02-2026