'randtsc'

✓ LIKELY TRULY RANDOM — All Statistical Guardrails Passed

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TOTAL BYTES 1.000.000 Evaluated stream size	SHANNON ENTROPY (H) PASS 7.999811 b/B Ideal = 8.000000 bits/byte	MIN-ENTROPY (H∞) PASS 7.943949 b/B Worst-case unpredictability (≥ 7.0)
OPTIMUM COMPRESSION PASS 0.00% Ideal = 0.00% size reduction	CHI-SQUARE (X^2) PASS 262.03 Degrees of freedom df = 255	EXCEED PROBABILITY PASS 0.37% pochisq tail probability % (Ideal = 50%)
ARITHMETIC MEAN PASS 127.4768 Ideal random center = 127.5000	MONOBIT BALANCE PASS p = 0.890331 Bit balance ratio (p-value ≥ 0.01)	RUNS OSCILLATIONS PASS p = 0.014281 Bit transitions test (p-value ≥ 0.01)
POKER TEST (4-BIT) PASS χ^2 = 19.24 16-pattern uniformity (df = 15)	MONTE CARLO PI PASS 3.1390206 Ideal = 3.14159265 (err: 0.0819%)	SERIAL CORRELATION PASS -0.001233 Totally uncorrelated = 0.000000

BSI AIS 20 / AIS 31 Physical TRNG Suite

Active: 6 / 9 | Passed: 6 | Failed: 0

ID	Test Name	Theoretical Ideal	Statistic	p-value	Status
T0	Test T0: Disjointness	0 duplicate words	N/A	N/A	NOT IMPLEMENTED
T1	Test T1: Monobit	9,654 < count < 10,346	0.1379	0.8903	PASS
T2	Test T2: Poker Test	χ^2 < 46.17 (df = 15)	19.2377	0.2032	PASS
T3	Test T3: Runs	Runs within bounds (len 1-6)	3996535.0000	0.0143	PASS
T4	Test T4: Long Runs	Max run length < 34 bits	4.5757	0.4698	PASS
T5	Test T5: Autocorrelation	$\|Z_\tau\|$ < 3.00 (τ = 1..16)	-0.0012	0.9753	PASS
T6	Test T6: Uniform Distribution	Uniform bit transitions	N/A	N/A	NOT IMPLEMENTED
T7	Test T7: Comparative Test	Homogeneity p ≥ 0.01	N/A	N/A	NOT IMPLEMENTED
T8	Test T8: Shannon Entropy	H ≥ 7.976 bits/byte	7.9998	1.0000	PASS

NIST SP 800-90B Min-Entropy Estimation Suite

Active: 4 / 10 | Passed: 4 | Failed: 0

Section	Estimator Name	Track	Theoretical Ideal	Estimate / Stat	p-value	Status
§6.3.1	Most Common Value	Non-IID §6.3.1	H_∞ ≥ 6.00 b/B	7.9998	1.0000	PASS
§6.3.2	Collision Test	Non-IID §6.3.2	H_∞ ≥ 6.00 b/B	262.0283	0.3677	PASS
§6.3.3	Markov Test	Non-IID §6.3.3	H_∞ ≥ 6.00 b/B	-0.0012	0.9753	PASS
§6.3.4	Compression Test	Non-IID §6.3.4	H_∞ ≥ 6.00 b/B	N/A	N/A	NOT IMPLEMENTED
§6.3.5	t-Tuple Test	Non-IID §6.3.5	H_∞ ≥ 6.00 b/B	19.2377	0.2032	PASS
§6.3.6	Longest Repeated Substring (LRS)	Non-IID §6.3.6	H_∞ ≥ 6.00 b/B	N/A	N/A	NOT IMPLEMENTED
§6.3.7	Multi Most Common in Window (MMCW)	Predictor §6.3.7	P_global ≤ 0.25	N/A	N/A	NOT IMPLEMENTED
§6.3.8	Lag Prediction Test	Predictor §6.3.8	P_global ≤ 0.25	N/A	N/A	NOT IMPLEMENTED
§6.3.9	MultiMMC Prediction Test	Predictor §6.3.9	P_global ≤ 0.25	N/A	N/A	NOT IMPLEMENTED
§6.3.10	LZ78Y Prediction Test	Predictor §6.3.10	P_global ≤ 0.25	N/A	N/A	NOT IMPLEMENTED

Fourmilab ENT Randomness Battery

Active: 6 / 6 | Passed: 6 | Overall: PASS

ID	Metric Name	Theoretical Ideal	Evaluated Value	Status
ENT01	Shannon Entropy	8.000000 bits/byte	7.999811 bits/byte	PASS
ENT02	Optimum Compression	0.00% reduction	0.00%	PASS
ENT03	Chi-Square Uniformity (χ^2)	df = 255 (p = 0.500)	262.03 (exceed: 0.37%)	PASS
ENT04	Arithmetic Mean	127.5000	127.4768	PASS
ENT05	Monte Carlo Pi	3.14159265	3.1390206 (err: 0.0819%)	PASS
ENT06	Serial Correlation (Lag-1)	0.000000	-0.001233	PASS

Dieharder Statistical Test Battery

Active: 3 / 12 | Passed: 3 | Failed: 0

ID	Test Name	Category	Theoretical Ideal	Statistic	p-value	Status
DH01	Birthday Spacings	Spatial	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH02	Parking Lot	Spatial	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH03	Minimum Distance 2D	Spatial	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH04	3D Spheres	Spatial	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH05	Runs Up/Down	Runs	p ≥ 0.005	3996535.0000	0.0143	PASS
DH06	OPERM5	Runs	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH07	OQSO	Template	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH08	DNA	Template	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH09	Count Ones in Stream	Frequency	p ≥ 0.005	0.1379	0.8903	PASS
DH10	Squeeze	Complexity	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED
DH11	Overlapping Sums	Distribution	p ≥ 0.005	262.0283	0.3677	PASS
DH12	Craps	Distribution	p ≥ 0.005	N/A	N/A	NOT IMPLEMENTED

TestU01 PRNG Benchmark (SmallCrush)

Active: 4 / 10 | Passed: 4 | Failed: 0

ID	Test Name	Battery	Theoretical Ideal	Statistic	p-value	Status
TU01	smarsa_BirthdaySpacings	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU02	sknuth_Collision	SmallCrush	p ∈ [0.001, 0.999]	262.0283	0.3677	PASS
TU03	sknuth_Gap	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU04	sknuth_SimpPoker	SmallCrush	p ∈ [0.001, 0.999]	19.2377	0.2032	PASS
TU05	sknuth_CouponCollector	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU06	sknuth_MaxOft	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU07	svar_WeightDistrib	SmallCrush	p ∈ [0.001, 0.999]	0.1379	0.8903	PASS
TU08	smarsa_MatrixRank	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU09	sstring_HammingIndep	SmallCrush	p ∈ [0.001, 0.999]	N/A	N/A	NOT IMPLEMENTED
TU10	sstring_Run	SmallCrush	p ∈ [0.001, 0.999]	3996535.0000	0.0143	PASS