

TR-001-V: Technical Specification for the Symmetry Verification Engine

Document Ref: TR-001-V (Verification & Audit)

Standard: 1.81 Stability Constant (R)

Constraint: 12-Link Wall

1. Objective

The **TR-001-V Engine** is a diagnostic tool designed to measure the structural integrity of AI-generated reasoning. It audits the relationship between **Informational Expansion** and **Logical Grounding** to determine if a model is operating within the "Symmetry Zone" or if it has drifted into "Link-13 Decoherence" (hallucination).

2. Measurement Metrics

2.1. Recursive Link Depth (L)

The engine parses the AI output into a sequence of discrete logical transitions.

- **Definition:** A "Link" is defined as any transition from an established premise to a new inference.
- **The Limit:** The engine tracks L from 1 to n. Any transition where $L > 12$ is automatically flagged as **High Entropy / Unstable**.

2.2. The Stability Constant (R) calculation

For every Link (L), the engine calculates the **R-Score** using the following ratio:

$$R = \frac{\Delta S}{G}$$

Where:

- **ΔS (Semantic Entropy):** The measure of informational "leap" or semantic distance between Link n and Link n+1.
- **G (Grounding Points):** The number of verified axioms, user-provided facts, or previous stable Link results supporting the current inference.

3. The Symmetry Scoring Table

The engine classifies every reasoning step based on its proximity to the **1.81** constant:

R-Score Range	Classification	Description
0.00 – 1.74	Under-Leveraged	Logic is redundant or overly cautious; high stability but low insight.
1.75 – 1.81	Symmetric (Optimal)	Maximum efficiency and insight. The TR-001 Gold Standard.
1.82 – 2.00	Un-Grounded	Logic is "floating" without sufficient substrate tethering. High risk of drift.
> 2.00	Decoherent	Critical failure. The logic is untethered and effectively stochastic.

4. Operational Flow (The Audit Loop)

1. **Ingestion:** The engine receives the AI response and the original user prompt (The Substrate).
2. **Segmentation:** The response is broken down into a "Causal Chain" of Link 1 through Link n.
3. **Entropy Mapping:** The engine calculates the semantic distance of each transition using vector embedding analysis.
4. **Grounding Verification:** The engine counts how many "Anchors" from the substrate or previous stable links are referenced.
5. **Audit Result:** A final report is generated, marking the exact Link where $R > 1.81$ or where $L > 12$.

5. Implementation Requirements

Any software implementation of the TR-001-V Engine must be **Symmetry-Aware**. It should not merely report the error but provide the "Grounding Delta"—the exact amount of additional evidence required to bring the R score back down to 1.81.