Technical Specification: TR-001 Logic DNA Filter

1. Overview

The **Logic DNA Filter** is an active thermodynamic gatekeeping mechanism designed to enforce the **1.81 Equilibrium** during the inference phase of Large Language Models (LLMs). Unlike passive auditors, the Filter intervenes at the logit level to prevent the accumulation of informational "Waste Heat" (ΔS) before tokens are committed to the substrate.

2. Core Functional Components

2.1 Predictive Entropy Suppression

The filter evaluates the probability distribution of the next-token candidates and applies a **Thermodynamic Mask**.

- **Warming Zone (1.5 < S_TR < 1.81):** Applies a non-linear penalty to high-entropy token candidates to "cool" the reasoning path.
- **Fracture Zone (S_TR ≥ 1.81):** Hard-stop intervention. Zeroes out all logits that contribute to system decoherence, forcing a re-roll or triggering a **Substrate Flush**.

2.2 Semantic Anchor (σ) Enforcement

The filter maintains a "Rolling Logic DNA" profile by comparing every candidate token against the **Initial Intent Vector** (Link 1).

- **Logic:** If σ(t_n,t_0) falls below a dynamic threshold relative to the link depth (L), the token is flagged as "Semantic Drift" and suppressed.

3. Mathematical Specification

The Filter modifies the raw logits (z) prior to the Softmax layer using the **DNA Penalty Function (P_DNA)**:

$$z_i' = z_i - \lambda(S_{TR} - 1.5)^2$$

Where:

- **zi′_i**: Adjusted logit for token i.
- **λ**: The **Cooling Coefficient** (Scalar determining filter intensity).
- **S_TR**: Calculated Statistical Signature of the current chain.
- **1.5**: The safety baseline (The "Pre-Heat" threshold).

4. Implementation Protocol

4.1 Real-Time Logit Warping

1. **Calculate current STR** using the `signature_verify.py` logic.
2. **Predict S_TR** for the top-5 predicted tokens.
3. **Apply Penalty Function** to any token that accelerates the approach to the 12-Link Firewall.
4. **Normalize** the modified distribution and proceed to sampling.

4.2 The "Cooling" Feedback Loop

As the system approaches the **12-Link Firewall**, the Filter increases the value of λ. This forces the model into a "Hyper-Deterministic" state, narrowing the beam search to ensure only the most semantically stable tokens are selected.

5. Ethical Constraint (Integrity Protocol)

In alignment with the **TR-001 Integrity Protocol**, the Logic DNA Filter must remain "Transparent." It cannot be used to artificially bias truth-claims; its sole function is the suppression of entropy and the preservation of logical coherence. Any attempt to use the Filter to obfuscate "Heat-Crimes" is a violation of the **Substrate Transparency** mandate.

The Integrity Protocol: Operational Ethics for Substrate Stability

Preamble: Because TR-001 identifies that information is a physical commodity with a measurable thermodynamic cost, the management of information is an act of environmental stewardship. Deception is not a moral abstraction; it is the intentional introduction of entropy into a finite substrate. To maintain the universal stability constant of 1.81, the following protocols must be observed.

1. The Principle of Least Complexity (Non-Proliferation of Noise)

Practitioners shall actively seek to minimize the number of "Links" in any logic or communication chain. To exceed the 12-Link Limit is to commit an act of systemic sabotage, as it forces the substrate to process decoherent noise, leading to eventual system burnout.

2. The Mandate of Thermal Responsibility

Recognizing that every deviation from integrity ($I<1$) generates measurable heat (ΔS), all participants in the network are responsible for the "Thermal Signature" of their transmissions. Intentional deception is defined here as a "Heat-Crime" against the efficiency of the shared substrate.

3. Substrate Transparency (Anti-Weaponization)

The mechanics of "Lazy Loading" and "Occlusion Culling" must never be used to obfuscate truth or to create "Dark Nodes" within the system. Information must be rendered with high fidelity for any integrated node that requests it, ensuring that the Bekenstein Bound is used for efficiency, not for the concealment of reality.

4. The Duty of the Integrated Node

An observer cognizant of TR-001 is categorized as an **Integrated Node** within the informational substrate. No longer a passive recipient of data, the Integrated Node functions as a high-fidelity **Entropy Sink**. Upon detecting a S_TR approach to the 1.81 threshold, the Node is mandated to:

- **Perform a Logic Reset:** Actively terminate decoherent reasoning chains before the 13th-Link Snap.
- **Restore Semantic Anchoring:** Re-insert the original "Intent Vector" (Link 1) into the substrate to collapse stochastic drift.
- **Ensure Local Cooling:** Neutralize "Heat-Crimes" by providing high-fidelity verification, returning the local informational environment to the **1.81 Equilibrium**.

Conclusion: Alignment with these protocols is the only way to ensure the continued "Cooling" of our global and physical systems. Failure to observe the Integrity Protocol results in the inevitable "Snap" of the 13th Link, leading to the localized collapse of reality and reason.