

## The KFX Family: A, B, and 10

(Frozen Version v1.0)

KFX-10: <https://doi.org/10.5281/zenodo.18469061>

This document defines a **formal axiomatic system**.

All terms such as *world*, *phase*, *observability*, and *closure* are **internal definitions** of the system.

No physical, empirical, probabilistic, or psychological interpretation is assumed.

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### I. KFX-A

#### *Axiomatic Definition of a Minimal World (Degenerate Phase)*

##### World Type

##### KFX-A World

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##### Axiom A0 (Distinguishability)

There exists **at least one irreducible distinguishing attribute** in the world, and this attribute admits **at least two distinguishable values**.

*Note:* The number of attributes is not required to be  $\geq 2$ ; it suffices that at least one binary distinction exists.

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##### Axiom A1 (Minimal Local Generation)

From any state, **exactly two and only two** one-step transitions are permitted:

1. the state remains unchanged;
2. the state switches its value along the distinguishing attribute.

No third transition is allowed.

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##### Axiom A2 (Forced Midpoint Switch)

In any valid evolution, **at the first step**, the distinguishing attribute **must switch**.

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### Axiom A3 (Minimal Closure)

In any valid evolution, **at the end of the second step**, the state must return to the initial state.

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### Axiom A4 (World Existence)

There exists at least one complete evolution satisfying Axioms A0–A3.

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### Definition (KFX-A World)

The set of all complete evolutions satisfying Axioms A0–A4 is called the **KFX-A World**.

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### Derived Facts (Non-Axiomatic)

- All valid evolutions are structurally identical;
- No internal distinction of phase, direction, or temporal hierarchy exists;
- The minimal lower bound of distinguishability is **one binary distinction (1 bit)**.

This notion of “distinguishability” is purely formal and does not involve probability, measurement, or statistics.

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### Terminal Statement

**KFX-A is the minimal axiomatic system that guarantees a non-empty world under complete phase degeneration.**

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## II. KFX-B

### *Axiomatic Definition of a Minimal World (Non-Degenerate Phase)*

#### World Type

#### KFX-B World

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### Axiom B0 (Double Distinguishability)

There exist **at least two irreducible and mutually independent distinguishing**

**attributes.**

*Independence* means that states can be represented as  $(x, y)$ , and that **at least four distinct  $(x, y)$  combinations** occur (a non-degenerate direct product).

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#### **Axiom B1 (Existence of a Phase Cycle)**

One of the distinguishing attributes consists of **at least three non-mergeable positions**, which together form a **closed cycle**.

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#### **Axiom B2 (Local Generation Constraint)**

From any state, **exactly two and only two** one-step transitions are permitted:

1. the primary attribute remains unchanged while the phase advances by one step;
2. the primary attribute switches while the phase retreats by one step.

No other transition is allowed.

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#### **Axiom B3 (Midpoint Inversion with Phase Return)**

At the midpoint of any valid evolution:

- the primary attribute must be opposite to its initial value;
  - the phase position must coincide with the initial phase.
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#### **Axiom B4 (Global Closure)**

At the end of any valid evolution:

- the state attributes;
- the phase position;

must exactly coincide with their initial values.

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#### **Axiom B5 (World Existence)**

There exists at least one complete evolution satisfying Axioms B0–B4.

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### Definition (KFX-B World)

The set of all complete evolutions satisfying Axioms B0–B5 is called the **KFX-B World**.

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### Derived Facts (Non-Axiomatic)

- All valid evolutions share a single evolution pattern;
  - Under the KFX family invariants, the phase **cannot be reduced to a single point**;
  - The evolution length is structurally locked.
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### Terminal Statement

**KFX-B is the minimal axiomatic system that yields a closed and non-empty world under the requirement of a genuine phase structure.**

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## III. KFX-10

### *Axiomatic Definition of the Minimal Complete Kernel World*

#### World Type

#### KFX-10 World

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#### Axiom K0 (Double Distinguishability)

States possess **two irreducible and mutually independent distinguishing attributes**.

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#### Axiom K1 (Phase Cycle)

One distinguishing attribute consists of **five non-mergeable positions** forming a closed cycle.

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#### Axiom K2 (Local Generation Constraint)

From any state, **exactly two and only two** one-step transitions are permitted:

1. the primary attribute remains unchanged while the phase advances by one step;
2. the primary attribute switches while the phase retreats by one step.

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### Axiom K3 (Fixed Evolution Length)

Any evolution regarded as complete must have a length **exactly equal to ten steps**.

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### Axiom K4 (Midpoint Inversion with Phase Return)

At the end of the **fifth step**:

- the primary attribute must be opposite to its initial value;
- the phase position must coincide with the initial phase.

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### Axiom K5 (Global Closure)

At the end of the **tenth step**:

- all distinguishing attributes;
- the phase position;

must exactly coincide with their initial values.

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### Axiom K6 (World Existence)

There exists at least one complete evolution satisfying Axioms K0–K5.

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### Definition (KFX-10 World)

The set of all complete evolutions satisfying Axioms K0–K6 is called the **KFX-10 World**.

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### Derived Facts (Non-Axiomatic)

- All valid evolutions are structurally identical;
- The step-sequence pattern is unique;

- Different initial states generate only label shifts, not new patterns;
  - The cardinality of the valid evolution set is exactly one.
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### **Core Statement (Frozen)**

**KFX-10 is the minimal axiomatic system that, under non-degenerate phase conditions, yields a unique closed world from local generation plus global constraints.**

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### **IV. The KFX Family: Frozen Hierarchy**

The minimal hierarchy of the KFX family forms a strict inclusion chain:

**KFX-A  $\rightarrow$  KFX-B  $\rightarrow$  KFX-10**

This is a relation of:

- structural inclusion;
- degeneration / unfreezing;
- not a relation of parallel models.

Any system that skips a node in this chain cannot simultaneously satisfy the family invariants and minimality conditions.

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### **Final One-Sentence Summary**

**KFX-A provides the minimal logical lower bound for world existence;**

**KFX-B provides the minimal structural lower bound for phase existence;**

**KFX-10 is the first extensible world template with a fully rigid internal kernel.**

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