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EntroMechanical Standard Interface (EMSI)

Companion Note CN-02

Minimal State Architecture and Termination Logic

Version 1.0 – Reference Companion

Authoritative Context

This companion note is derived from The EntroMechanical Doctrine, Version 1.0 (Canonical), by Anthony Johnson.

It does not supersede the Doctrine.

It does not amend the EntroMechanical Standard Interface.

It does not replace or override Companion Note CN-01.

This note clarifies the minimal state architecture implicit in EMSI-compliant systems and translates that architecture into clear engineering and construction logic.

Its purpose is interpretive clarity, not theoretical expansion.

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1. Purpose of the Companion Note

This companion note formalises the minimal state evolution and termination logic governing EMSI-compliant systems.

Its purpose is to:

• make explicit the continuation and termination assumptions already present in the Doctrine and EMSI.

• prevent misinterpretation of passive response as external control.

• clarify how safety, dissipation, and termination are treated at the architectural level.

• provide a shared translation layer between mathematical, engineering, and construction perspectives.

This note exists to reduce ambiguity when EMSI-aligned systems are discussed across disciplines.

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2. Scope of Application

This companion applies to all systems claiming compliance with the EntroMechanical Standard Interface, including but not limited to:

• wearable-scale EntroSkin systems.

• structural-scale EntroConstruction systems.

• EntroScrew and foundation systems.

• future EntroClass systems at infrastructure or orbital scale.

Any system that evolves continuously under ambient gradients and internal structure falls within scope.

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3. Minimal System Architecture

An EMSI-compliant system may be represented by the following minimal state architecture:

$\dot{x}(t) = F(x(t), u(t))$

$u(t) = G(x(t), \hat{M}, I)$

$x(t) \in \Omega, t < t_f$

This representation is descriptive only.

It does not impose a specific model, controller, optimiser, or objective function.

It defines admissible structural relationships.

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4. Engineering Interpretation

State vector, $x(t)$

Represents the complete internal condition of the system at time t, including relevant mechanical, thermal, electrical, or structural variables.

State evolution, $\dot{x}(t) = F(x, u)$

Describes how the system changes as a consequence of its current state and its internal response.

F represents physical law, not control intent.

Internal response, $u(t)$

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Represents the system's internally generated response to its state.

It is not a commanded input.

Response generation, $u(t) = G(x, \hat{M}, I)$

Defines how response arises from the system's structure, materials, geometry, and fixed interfaces.

No external control signal is assumed or permitted.

Admissible state region, Ω

Defines the set of states in which the system is structurally safe to operate.

Finite horizon, $t < t_f$

Explicitly acknowledges that operation is conditional and not assumed to be infinite.

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5. Builder Logic Interpretation

State, $x(t)$

Where the system is right now.

Evolution, $\dot{x}(t)$

What the system does next because of where it is now.

Response, $u(t)$

How the structure reacts.

Response rule, G

How the system was built. Materials, geometry, layers, and connections.

Admissible region, Ω

The safe working envelope.

Finite time, $t < t_f$

The system operates until it should not.

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6. Continuation and Termination Logic

System continuation is governed by:

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$x(t) \notin C\_terminal \Rightarrow$ system continues.

System termination is governed by:

$x(t) \in C\_terminal \Rightarrow$ system terminates.

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7. Interpretation of the Terminal Set

Engineering interpretation

C_terminal represents the set of states in which safe operation is no longer guaranteed.

This includes conditions such as accumulation beyond dissipation capacity, containment failure, or violation of defined safety margins.

Termination is architectural and non-discretionary.

Builder logic interpretation

This is the boundary condition.

If the structure enters a state it cannot safely occupy, operation ends.

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8. Non-Optimisation and Non-Learning Constraint

EMSI-compliant systems must not modify their response function, admissible state region, or termination conditions through learning, optimisation, or adaptive control during operation.

The functions F and G are fixed by design and construction.

Any system that alters its response logic over time to avoid termination is non-compliant with EMSI intent.

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9. Irreversibility of Termination

Termination represents exit from safe operation and is not self-reversing.

Re-entry into operation, if permitted, requires external inspection, remediation, or reconstruction consistent with EMSI validation discipline.

Automatic recovery, reset, or self-restart from a terminal state is not permitted.

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10. Relationship to Companion Note CN-01

Companion Note CN-01 defines mandatory dissipation as a non-optional safety condition.

This note defines the formal consequence of failing to meet that condition.

Where dissipation is insufficient, the system state will enter the terminal set.

Termination is therefore a correct architectural outcome.

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11. Relationship to the Doctrine and EMSI

The Doctrine defines governing mechanical truth.

The EMSI defines interaction and validation discipline.

CN-01 defines mandatory dissipation.

This note defines continuation and termination logic.

These elements are consistent and mutually reinforcing.

Where conflict appears, the Doctrine prevails.

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12. Closing Statement

This companion note makes explicit what is already implicit.

An EMSI-aligned system operates only while its own structure maintains safe state conditions.

Termination is not malfunction.

It is disciplined behaviour.

This logic should be treated as foundational to all EntroMechanical work.