

Relations, Fields, and Statements

ARC-SEM-002

TITLE	Relations, Fields, and Statements
DOCUMENT	ARC-SEM-002
STATE	Adopted, first issue, October 21, 2026
EVIDENCE GRADE	E1 Evidenced (the verifiers named inside exist and run; independent verification of the semantics as literature has not been performed, and the field mathematics stands as a named open section inside this volume rather than as written literature)
EDITION	First issue
DIGEST, SHA-256	b3519181c38c94ae10d14f56208c774158764d2daf5f548b6fb17531e513c203
LICENSE	CC BY 4.0, attribution the only condition; code samples, Apache License 2.0

This export was generated mechanically from the canonical Markdown source of record. Its digest stands above and in the Library registry, and the Markdown export of this document carries that digest exactly.

Relations, Fields, and Statements

Cover block

Series and number: SEM, ARC-SEM-002 Series mark: ARC Title: Relations, Fields, and Statements State: Adopted, first issue, October 21, 2026 Adoption act: Founder Ricky, October 21, 2026, 6:41 PM PDT, by the words "you have my approval for the CLI manual and then for all the documentation so that you can publish that into its corresponding places repo website app CLI"; this document is one of the seven tranche-one documents adopted by that ruling, and the adoption is recorded in the corpus registry Evidence grade: E1 Evidenced (the verifiers named inside exist and run; independent verification of the semantics as literature has not been performed, and the field mathematics stands as a named open section inside this volume rather than as written literature) Digest: computed at filing and carried in the corpus registry; the digest of this draft as filed is recorded with its filing act License line: the text of this document is licensed under CC BY 4.0, attribution the only condition; code samples in this document are under the Apache License 2.0; the ARC and VALIS names and marks are not licensed under either instrument. Decided by Founder Ricky on October 21, 2026, at 6:45 PM PDT Next review date: October 21, 2027, and at the close of the drafting tranches, whichever comes first, on the formula the charter carries on its own cover Stable address: the corpus registry entry for ARC-SEM-002, when the registry stands Authority note: this document specifies the field and its evidence object. It confers no authority, admits nothing, and settles nothing. Under the charter's fourth standard, a document describes; governance disposes.

The three objects

This volume unifies the treatment of the three objects every other shelf of the corpus leans on: the relation, which is the primitive [ARC-FND-001]; the field, which is the disposition-gated store relations live in; and the Statement, which is the evidence a settlement leaves behind. Each object is specified at the strength its record supports, and the section on the field mathematics is an open section by design: it names what exists, names what is not yet written, and fills nothing with plausible prose.

The relation

A relation, in the vocabulary of record [ARC-STD-1], is a claim about the world, held in the field, carrying provenance and a disposition, binding entities under a predicate. The sealed database and language treatment states the public reference contract for relations in its full form: relations are the semantic primitive, with explicit typed identity, roles, provenance, field membership, validity scope, and evidence grades. Field snapshots carry canonical identity and reproducible fingerprints, and operations

must not silently overwrite source provenance. Every relation therefore arrives with the material its own verification needs, and a relation stripped of provenance is not a smaller relation but a defective one.

The field

The field is the disposition-gated relation store. Relations enter the field, are classified under a disposition, retain, restrict, exclude, or unresolved, and only retained relations are served: a relation with no disposition, or a restrictive one, is never returned by a serving query. The invariant stands in the claims table of [ARC-SEM-001] as INV-23, graded there at E0 as a general invariant, while the serving discipline itself is the operating rule of the field as run, a distinction this volume keeps because the corpus grades claims at the scope their evidence covers and no wider.

The field's position in the architecture is fixed by the core compositional document [ARC-FND-001]: the Field is the projection of the settlement record, produced downstream of settlement by construction. It is a byproduct of the record rather than the machine that makes the record, it is an analytical projection and never the operational ledger, and it grants no permission to act. The institution's own corpus pipeline runs on this discipline hourly, projecting receipt records into field relations under exactly the rule that the field never becomes the operational ledger and never grants permission to act.

The database and the language

The sealed treatment names the architecture in one line: ARC Database over the relational field store, the ARC Language as the typed query and derivation language above it, the ARC Relational Calculus as its formal semantics, settlement under KORE, and the Statement as evidence. The naming decision inside that treatment stands stated at its true strength in this volume: ARC Database is the public product name and Field Database names the storage substrate; the language name is proposed in the sealed text as pending founder and CTO confirmation, and this volume does not present it as approved.

The language contract, as sealed, is exact about its four operators and its fences. The language should express SELECT, COMPOSE, WITHOUT, and DERIVE with deterministic interpretation on finite typed relational fields. Counterfactual query context must remain isolated from authoritative stored state. Typed refusal and uncertainty are distinct outcomes, and derivation is not authority to execute. Query results carry traceable derivation and source digests, and effects require separate authorized settlement. No generic SQL, graph database, or key-value engine dictates the semantics; such technologies may serve only as replaceable physical storage adapters. The sealed treatment closes with six publication evidence gates, from pinning the canonical artifacts to showing an authorized handoff into settlement with exact receipts, and records its own status in one sentence this volume repeats because it

governs how the whole section may be read: naming and specification proposal, with no implementation imported and no tests run by that document.

The Statement

The Statement is the signed, sealed evidence artifact of a settled action [ARC-STD-1]. Its format stands specified in the ARC Statement Format v0.1, a research specification with a working verifier and conformance vectors, and not a production standard, a standing the specification prints on its own face and this volume preserves. A Statement is portable evidence that a specific request was settled by a specific settler, in a form a third party can verify without trusting the presenter. Its validity rests entirely on the settler's own signed decision chain, embedded in the Statement. A presenter's assertions, including a presenter's genuine signature over a claim that settlement occurred, carry no weight in verification. A Statement is settlement evidence only: it is not payment finality, not a claim that a real-world effect occurred beyond the settler's recorded terminal state, and not transferable authority.

The format binds a subject, being the exact request object as settled with its digest, identifier, and amount mirrored from the request; a settler, named with its public key; a chain of exactly three settler-signed decision messages, reserved, committed, and a terminal of observed or unknown effect; a finality field reading settlement evidence only, not payment; and a statement digest over the canonical body. The verification algorithm checks, in order, the schema, the recomputed digest, the settler's presence in an out-of-band trust set with key equality, subject integrity, chain completeness and order, every signature and binding in the chain, the terminal state's legitimacy and agreement with the chain, and, where ledger rows are supplied, agreement with the settler's own ledger. Any failure makes the Statement invalid. There is no partial credit and no presenter override. An unknown effect is a legitimate terminal, recorded as risk-bearing and never silently upgraded.

The conformance vectors stand in the specification with their results of October 15, 2026: the honest Statement verifies with and without the ledger cross-check, and the assertion-only fabrication, the attacker-keyed commit, the tampered payload, the swapped subject, the incomplete chain, the untrusted settler, and the disagreeing ledger each fail. One vector stands owed in the specification and stands owed here: a live unknown-effect terminal Statement, for which no honest artifact exists yet to build one from.

The format's known limits are part of the specification and are carried here unsmoothed. The chain is a single settler's three steps, and the canon's fuller lifecycle needs chain-schema generalization. No expiry or revocation semantics exist yet, so a Statement about a settlement later revoked is not addressed by v0.1. Trust set distribution is out of band and unimplemented in the node software. Canonicalization is JSON sort keys, and cross-language verifiers must match it byte for byte. The

embedded request is fully visible to any verifier, and minimization with selective disclosure stands as a v0.2 design question the record already flags as load-bearing.

The formal semantics, as far as they stand written

The sealed formal semantics of the founding release is a specification sketch, and it names itself one: not a machine-checked proof. It fixes a finite typed relational state and states the judgments settlement must make over a proposal, an authority witness, a budget witness, dependency witnesses, trusted time, and a typed evidence record, well-formedness, authority as valid or invalid or unknown, dependencies as satisfied or unsatisfied or unknown, reservation, settlement, execution, and attestation, under rules that forbid execution without exact valid settlement, forbid consuming a release twice, refuse changed bindings and expired or unknown required authority, and forbid attestation from converting an unknown observation into a confirmed effect. It closes with the properties an implementation must prove or refute, preservation, settlement soundness, non-replay, budget conservation, dependency correctness, provenance integrity, restart non-widening, and evidence correspondence, with any failure reported rather than suppressed. This volume carries the sketch as the semantics' current written form, at sketch strength.

The field mathematics, an open section

This section is the named drafting gap of this volume, and it is written as a gap.

What exists is real and is inventoried here so the gap is measured rather than impressionistic. The kernel's normalization mathematics exists in code and in the three corresponding implementations the compositional document describes, with canonical serialization and hashing as working machinery [ARC-FND-001]. A type calculus for the relational world model exists in the research record at v0.2, with a reference interpreter, in the org drafts tree. The differential discipline between implementations is exercised over fixture cases and correspondence traces inside the package record. The field as operated carries tens of thousands of relations whose digests chain over versions, and the corpus pipeline computes over them hourly.

What does not exist is the mathematics as literature: no unified written treatment states the field's algebra, its operators' laws, its closure properties, or its equivalence results in a form a researcher can read, cite, and refute. The sealed vocabulary prints the consequence as a cap on the programme's central claim: the relational-intelligence claim stands capped at a relational intelligence substrate and a disciplined query engine until algebraic closure, and stronger claims are not made. Until the mathematics is written, that cap stands, and this volume is where the corpus says so in the open. Writing the field mathematics is a named drafting act of a later tranche, sourced from the calculus reference, the kernel source, and the interpreter, and reviewed as mathematics rather than as prose.

The founding diagrams, relations and the field

Under the charter's diagram programme, the first canonical diagram set is issued with [ARC-SEM-001] and this volume. The settlement pipeline as a runtime view stands in [ARC-SEM-001]. This volume carries the field figure, authored as text and versioned with the prose:

```
flowchart LR
    REC[(Governed record, the operational ledger)] -->|projection under disposition|
    F[(The Field, disposition-gated relation store)]
    F -->|retained relations only| Q[(Disciplined query and derivation)]
    F -->|restrict, exclude, unresolved| N[(Never served)]
    Q -->|results with derivation and source digests| RD[(Reader)]
    Q -. ->|derivation is not authority| S[(Settlement, the only door to effect)]
```

The figure states the two fences this volume exists to fix in a reader's mind: the field is downstream of the record, and reading from it, however disciplined, never becomes a door to effect.

Claims table

Claim	Grade	Evidence pointer
Relations carry typed identity, roles, provenance, field membership, validity scope, and evidence grades, and field snapshots carry canonical identity and reproducible fingerprints	E1	The sealed ARC Database and DSL treatment of the founding release, stated there as a public reference contract inside a naming and specification proposal
Only retained relations are served, and the field is a projection of the settlement record, never the operational ledger, granting no permission to act	E1	The sealed DEFINITIONS.md entries for field, disposition, and serving relation; the core compositional document's comparison section; the corpus pipeline's operating rule as recorded October 21, 2026
The Statement format v0.1 verifies honest Statements and refuses the seven fabricated or tampered constructions of its vector set	E1	The ARC Statement Format v0.1 specification of October 15, 2026, with its working verifier and vectors all passing at that date, graded as a research specification by its own status line
The four language operators and the language contract are specified, with deterministic interpretation on finite typed fields	E0	The sealed database and language treatment, which records on its face that no implementation was imported and no tests were run by that document, with six publication evidence gates standing open
The formal semantics of settlement stand written as judgments and rules an implementation must satisfy	E1	The sealed FORMAL_SEMANTICS.md, labeled by its own first line as a specification sketch and not a machine-checked proof
The field mathematics exists as a unified written treatment	E0	No such treatment exists; this volume's open section is the pointer, and the claim is entered here at E0 so its absence is a graded fact rather than an impression

What this document does not establish

This document does not establish the field mathematics. The open section above is the whole of the corpus's present position: the machinery exists in code, the calculus exists in the research record, and the literature does not exist. The relational-intelligence claim stays capped exactly where the sealed vocabulary capped it.

It does not establish the Statement format as a production standard. The specification says research specification on its face, its owed vector stands owed, its revocation and expiry questions stand open, and its trust distribution stands unimplemented in the node software. Any surface presenting v0.1 as the production evidence standard misstates this record.

It does not establish the language as implemented. The sealed treatment that specifies it ran no implementation and no tests, and its six publication evidence gates are the path by which a later volume could raise the grade, none of them closed by this document.

It does not establish cross-language canonicalization agreement beyond the package's own differential record. JSON sort keys is the stated rule, and byte-for-byte agreement by independent verifiers is a conformance question for [ARC-VER-001], not a result recorded here.

It confers nothing. The field serves relations and the Statement evidences settlements; neither act is performed by this document.

Drafted October 21, 2026, by Noetica, Keeper of the Record, under WO-56. Sources of record: the ARC Statement Format v0.1 specification of October 15, 2026; the sealed ARC_DATABASE_AND_DSL.md and FORMAL_SEMANTICS.md of the founding release; the sealed DEFINITIONS.md entries for relation, field, disposition, and Statement; the core compositional document of October 19, 2026 [ARC-FND-001]; the documentation corpus inventory of October 21, 2026 for the calculus and interpreter records of the org drafts tree.