

Executable Invariant Suite

Security · Published by UnyKorn LLC (Wyoming), technology provider · September 2026

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DGX contract tests

`trex_invariants.py` — executable invariant suite

Deploys the full T-REX suite plus the operator registry to an in-process EVM (`py-evm` via `eth-tester`) and asserts the behaviour that matters, rather than only that the code compiles.

```
pip install "web3>=6" "eth-tester[py-evm]" py-solc-x
cd contracts && python3 test/trex_invariants.py
```

40 assertions across nine groups:

Group	What it proves
Identity gate	A verified investor passes; an unregistered wallet fails; missing any one required claim topic fails.
Reserve cap	Issuance within the attestation succeeds, headroom decrements, and minting beyond the attested reserve reverts . Issued supply never exceeds the attestation.
Attestation staleness	Past the freshness window, headroom goes to zero and minting halts by itself — while secondary transfers of already-backed units keep working. A backdated attestation is refused, so a replay cannot resurrect headroom.
Transfer gate	Transfer to an unverified wallet reverts, and the <code>canTransfer</code> dry-run agrees with the revert.
Freeze accounting	Frozen tokens cannot be spent, the unfrozen remainder still can, and a frozen wallet cannot receive.
Pause	A paused token blocks transfers.
Country restriction	A verified investor in a closed jurisdiction is blocked; opening the country unblocks the same transfer.
Max holders	The cap blocks a new holder, cannot be set below the current count, and raising it admits the holder.
Claim revocation	A revoked KYC claim immediately fails verification and the holder cannot receive more units. A reverting issuer does not brick verification for everyone else.
Operator state machine	An application is not accepted by submission, cannot jump from Submitted to Accepted , and suspension revokes the right to issue.
Role separation	A non-agent cannot mint, a non-owner cannot add a compliance module, a non-attestor cannot publish an attestation.

Status

Reference architecture for the DGX demonstration environment. These contracts have not been through an independent third-party audit and are not in production custody of value.