Optimizing SQLite for Django in production

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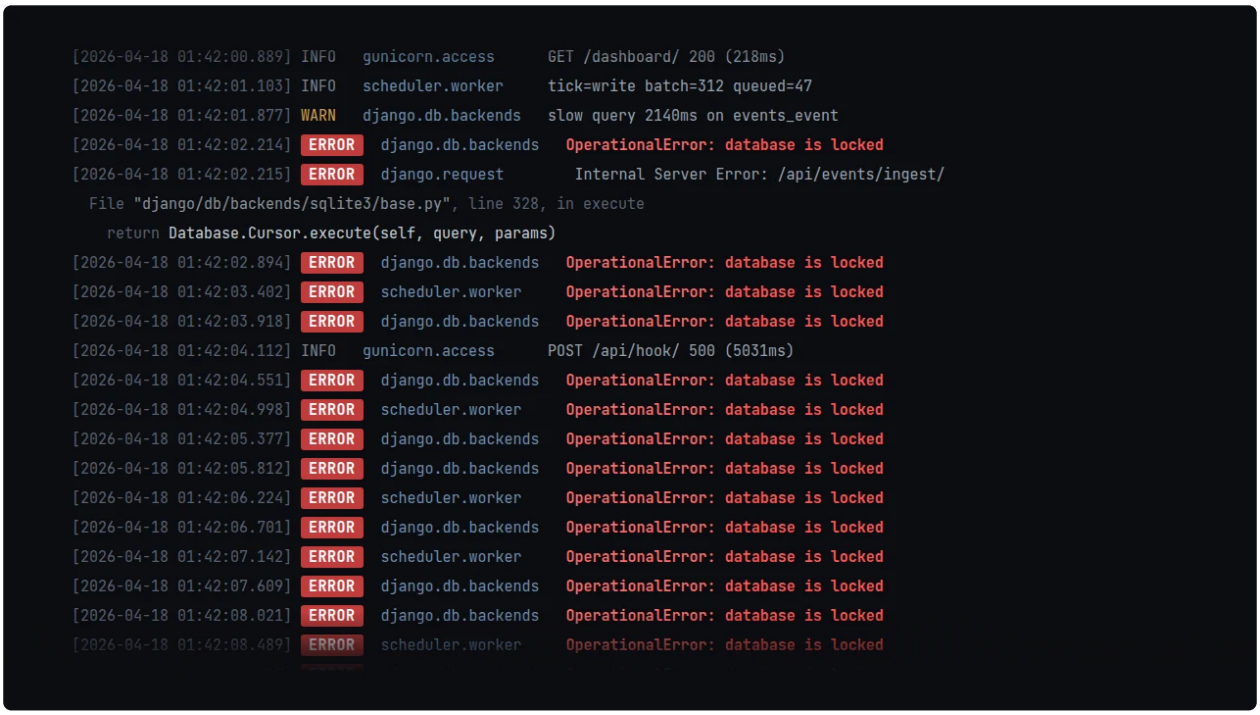
webdev databases



The default SQLite settings in Django are fine for development but will hit "database is locked" errors under any concurrency. Here's the config I use in production.

SQLite runs most of my smaller Django projects in production. It's fast, it's one file to back up, and it takes an entire service out of my stack. The problem is the default Django config is tuned for development, not production. The first time a background worker writes while a request reads you'll start seeing `database is locked` in your logs. A few PRAGMAs and one Django option fix most of it.

> **Update — 2026-04-26.** A week after publishing this, my SQLite-backed status monitor corrupted with `database disk image is malformed` and ran broken for several days before I noticed. The recipe below is still what I run, with one line removed: `PRAGMA mmap_size=134217728`.
>
> Here's what bit me. SQLite has a WAL-reset race (introduced in 3.7.0, fixed in **3.51.3** released 2026-03-13) that triggers when two or more connections on the same file write or checkpoint simultaneously — exactly what you have with multi-worker Gunicorn, or a worker plus a background scheduler. The race itself is rare and usually self-corrects on the next checkpoint. mmap is what turns a transient race into a structurally broken file. SQLite's mmap docs warn that it "is more sensitive to bugs in the application code or undefined behavior" and "if a corruption happens, mmap can spread it more widely." The

> integrity check on my dead database came back full of *child page depth differs* and *2nd reference to page X* errors — textbook mmap-spread signatures, not vanilla WAL-race ones.
>
> So: if you have multiple processes writing to the same SQLite file and your base image still has SQLite < 3.51.3 (Alpine 3.21 ships 3.48, 3.22 ships 3.49 as of this writing), drop the `PRAGMA mmap_size` line until you can upgrade. The rest of the config stands. Single-worker Gunicorn with no background processes is unaffected. Recovery, for the curious, was `sqlite3 .recover` into a fresh file — kept all but five rows out of eight thousand.

Here's the full `DATABASES` block I use. Requires Django 5.1 or newer.

```
DATABASES = {
    "default": {
        "ENGINE": "django.db.backends.sqlite3",
        "NAME": BASE_DIR / "db.sqlite3",
        "OPTIONS": {
            "timeout": 30,
            "transaction_mode": "IMMEDIATE",
            "init_command": (
                "PRAGMA journal_mode=WAL;"
                "PRAGMA synchronous=NORMAL;"
                "PRAGMA foreign_keys=ON;"
                "PRAGMA temp_store=MEMORY;"
                "PRAGMA mmap_size=134217728;"
                "PRAGMA journal_size_limit=67108864;"
                "PRAGMA cache_size=-20000;"
            ),
        },
    }
}
```

What each one does:

- `timeout=30` waits up to 30 seconds on a locked database before raising. The default is 5 which isn't much headroom if a migration or a slow write is in flight.
- `transaction_mode="IMMEDIATE"` was added in Django 5.1 and it's the most important one here. SQLite's default `DEFERRED` mode starts transactions as readers and upgrades to a write when needed. If another writer sneaks in during that upgrade you get an instant `SQLITE_BUSY` and `timeout` is ignored. `IMMEDIATE` grabs the write lock upfront so contention actually waits.
- `PRAGMA journal_mode=WAL` lets readers run concurrently with a writer. Without it a single write blocks every read.
- `PRAGMA synchronous=NORMAL` is the recommended pairing with WAL. Safe against app crashes. Worst case is a power loss losing the last commit and that's a fair trade for how much faster writes get.
- `PRAGMA foreign_keys=ON` enforces foreign keys. SQLite disables them by default which is surprising if you're coming from Postgres, and Django won't turn them on for you either.
- `PRAGMA temp_store=MEMORY` keeps temp tables and indexes in RAM instead of on disk.

- `PRAGMA mmap_size=134217728` memory-maps up to 128 MB of the database file so reads skip the syscall overhead.
- `PRAGMA journal_size_limit=67108864` caps the WAL file at 64 MB so it can't grow unbounded during write bursts.
- `PRAGMA cache_size=-20000` gives each connection a 20 MB page cache. The negative sign means kilobytes; a positive number would mean pages.

One warning

Don't run WAL mode on an NFS mount. WAL uses shared memory that NFS doesn't implement correctly and it can corrupt the database. Local disk only. On a VPS or bare metal this is a non-issue, but I've seen people trip over it on shared hosting that silently mounts `/var` over NFS.

Sources

I didn't invent any of this. It's basically the recipe Giovanni Collazo published in "Optimal SQLite settings for Django" and that Simon Willison endorsed shortly after. Anže Pečar has two posts that go deeper on production gotchas, "Django SQLite production config" and "SQLite in production". phiresky's SQLite performance tuning post is the best single reference I've found for the why behind each PRAGMA. And when you want the source of truth, there's SQLite's PRAGMA reference, the WAL docs, and Django's SQLite notes.

If you've been reaching for Postgres out of habit on small Django projects try this config first, a tuned SQLite file handles more load than most projects will ever see.