PFSM – Plate-solving push-to, on a full imaging rig

What PFSM adds between the two – for PiFinder and StellarMate developers

Community project — not affiliated with PiFinder or StellarMate

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Faszination. Astronomie. Erleben.

Agenda

Introduction
For newcomers
Project summary & focus

Implementation
Control Center
PF LX200 & Mount Bridge
PF Simulator

Contribute
Upstream: PiFinder
App: StellarMate

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Two problems, one telescope

Where am I pointing?

- A Dobson or push-to EQ has no encoders.
- The software has no idea where the tube looks.

Drive the whole rig

- Camera, mount, guiding, focus.
- All need one control layer: INDI, KStars/Ekos, an app.

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Each project owns one half

PiFinder

- Global-shutter camera + plate-solver.
- Live sky position + push-to arrows.
- Python, open hardware & software.

StellarMate

- INDI — the device-driver standard.
- KStars / Ekos — capture & automation.
- The StellarMate phone / tablet app.

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PFSM is the wiring. INDI is the connector.

- **PiFinder** exposes its solved position as an INDI telescope.
- **Mount Bridge** couples that to any INDI mount (optional).
- **Your rig** — KStars / Ekos, the mount, the app — stays unchanged.

PiFinder is patched in place, never forked. The mount side is generic INDI.

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What PFSM is

- **A setup script** — installs & patches PiFinder onto StellarMate OS.
- `diffs/*.diff` **patches** — applied to a stock checkout via `patch(1)`.
- **Three INDI drivers** — LX200, Mount Bridge, Simulator.
- **A web Control Center** — stdlib-only, port 8765.

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What PFSM is not

- **Not a fork of PiFinder** — patches re-applied every update, kept minimal.
- **Not a fork of StellarMate** — stock INDI, Web Manager, KStars.
- **Not a replacement for the INDI Control Panel** — it stays for advanced work.
- **Not PiFinder-version-specific** — talks only to the stable `/api/*`.

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Why INDI

Both sides already speak it.

- PiFinder exposes its position as an INDI telescope.
- The Mount Bridge couples that to any INDI mount — no per-mount code.

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Versions & platforms

PiFinder 2.6.3 · StellarMate OS 2.3.0

- Pi 4 — fully tested.
- Pi 5 — fully tested.
- UTM x86 — install + Control Center + Mount Bridge vs. the Simulator (no real solving).

Pinned to a fixed release tag, not the upstream *release* branch.

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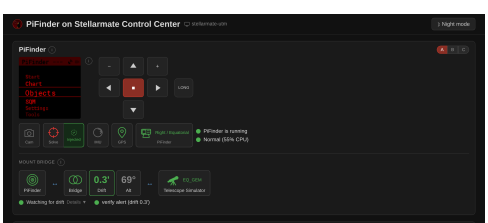
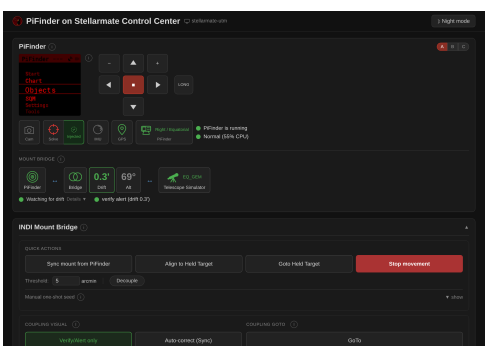
Why a Control Center

- Watch an install from a phone at the scope.
- Switch Fake Mode ↔ the real service.
- Check camera / IMU / GPS are really detected.
- Reboot the Pi without SSH.

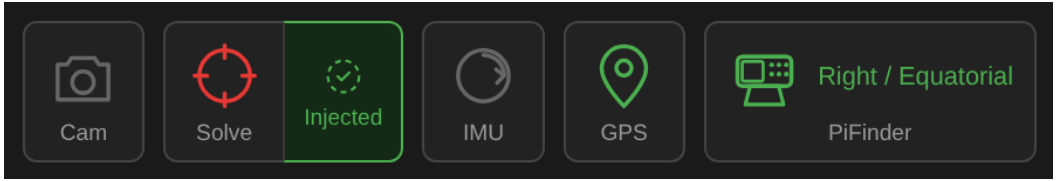


Stdlib only — by necessity

- It bootstraps the very venv that PiFinder needs, so it can't depend on one.
- `http.server` on :8765, polled every 1–2 s.
- HTTP Basic auth against the system account (PAM).



Traffic-light badges



- **White** — not applicable yet.
- **Green** — verified functional.
- **Yellow** — degraded / estimate.
- **Red** — broken or wrong.

The rule: verify real state, never “the process is alive”.

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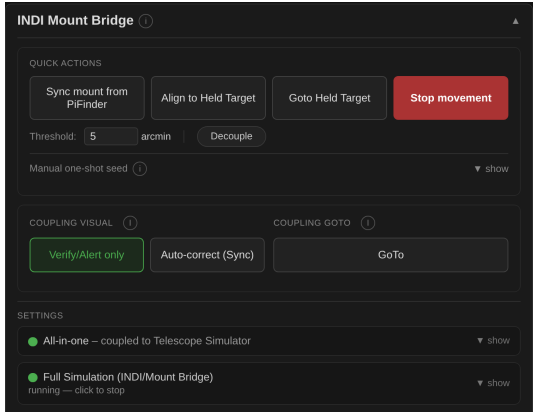
Coupling, without the INDI panel

- Quick Actions — one-shots.
- Coupling presets — one click.
- Settings — set once, hidden.



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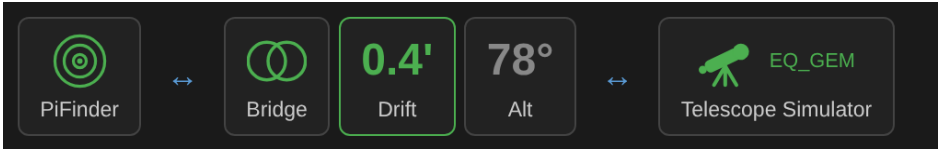
Three building blocks

1. **PiFinder LX200** — INDI telescope. Reports the solved position; a GoTo becomes a push-to. Required.
2. **PiFinder Mount Bridge** — optional. Snoops PiFinder + the mount and couples them. Generic INDI only.
3. **Your mount's driver** — not ours. Only for a motorised mount.



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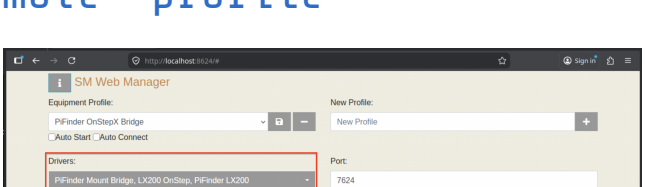
The Web Manager – a “Remote” profile

- PFSM’s INDI drivers live **only** in the StellarMate Web Manager (:8624) — the Equipment Profile is built there.
- KStars / Ekos then connects in **Remote Host** mode, never “Local”.
- The one real difference from a stock StellarMate setup.



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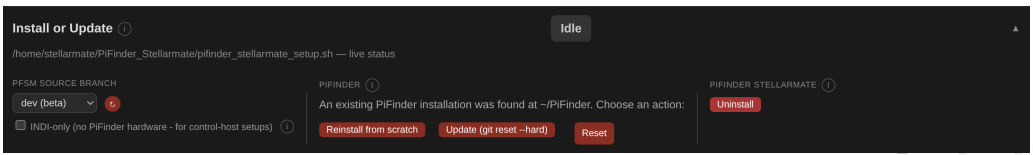
One weak PiFinder, one strong box

Pick the **role** at setup:

All-in-one	PiFinder host	Control host
PiFinder hardware with mount.	PiFinder only, no mount.	No PiFinder hardware. Couples to remote PiFinder.

- **Control host** — a strong StellarMate PC runs INDI, Ekos, guiding and capture; the low-power PiFinder Pi over the LAN only supplies its solved position.
- **INDI-only install** (`--mode=indi_only`) — the Control-host case: just the INDI deps + the two PFSM drivers, no PiFinder clone or venv.



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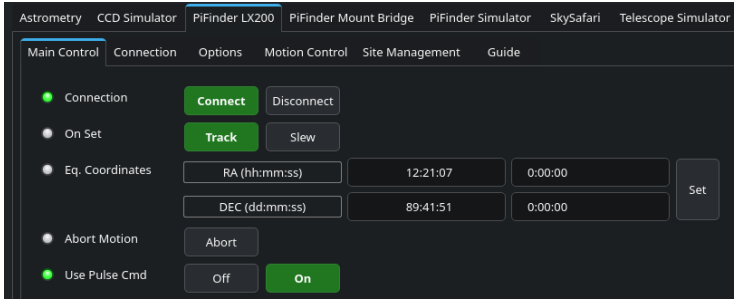
PiFinder LX200

- Talks LX200 to PiFinder's `pos_server.py` (TCP 4030).
- Reports the solved position each poll; a GoTo is only a push-to.
- No Sync — PiFinder measures the truth every frame.



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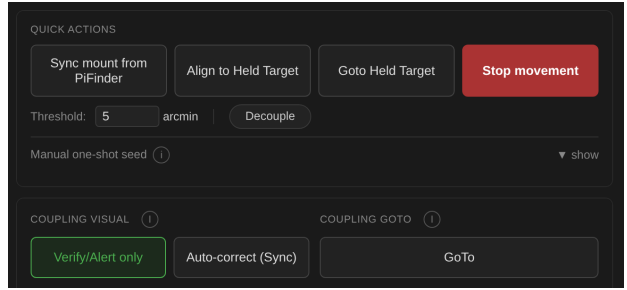
The Coupling Dial

1. **Off**
   pure push-to
2. **Verify / Alert only**
   warn on drift, hands off
3. **Auto-correct on drift**
   Sync past the threshold
4. **Goto-Forward**
   real Goto, then settle & refine



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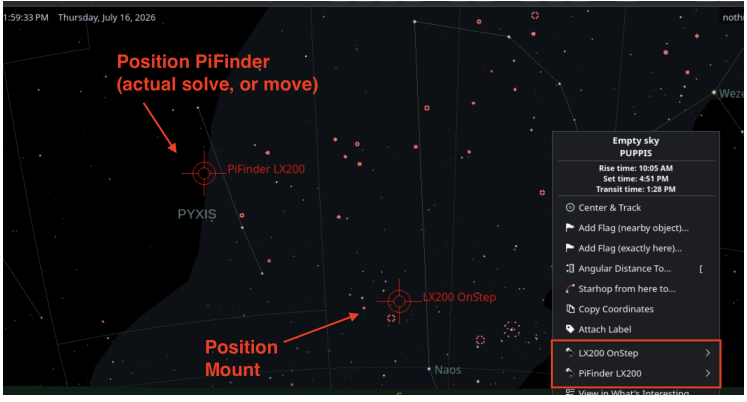
Generic INDI, nothing mount-specific

Only `EQUATORIAL_EOD_COORD` + `ON_COORD_SET` — never a mount command.

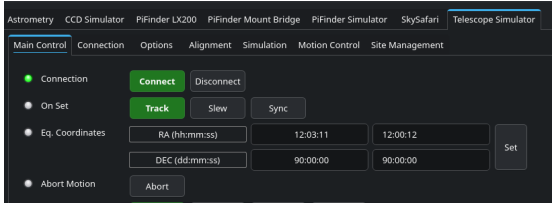
- Multi-Point Alignment (#191) — automated multi-star run.
- Reposition detection — adopt or revert a move.
- Shadow Sync — mirror onto a non-driving device.



A mount side and a PiFinder side

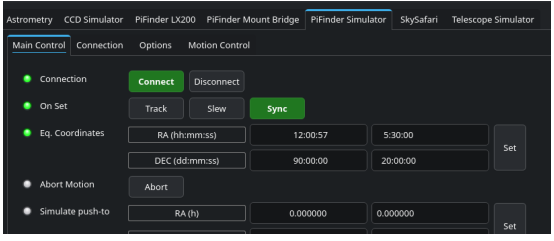
Mount side

Stock INDI Telescope Simulator — Sync or GoTo like a real mount.



PiFinder side

- **Simulator** — holds a settable RA/Dec.
- **Truth Injector** — POSTs to `/api/fake_solve`.



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Simulator details

- **Sync == Goto** — no motion to model; the RA/Dec just becomes the held value.
- **Inject every cycle** — keeps PiFinder's solve timestamp fresh.
- `FOLLOW_MOUNT_DEVICE` (#239) — optionally dead-reckon along a mount's slews.

Next (v3.x): render a GSC star field and run PiFinder's real solver on it — issue #344.

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PiFinder – patches that aren't PFSM-specific

`docs/upstream_patch_inventory.md`

- **Multi-client** `pos_server.py` — a thread per connection. It served one client at a time; SkySafari, Stellarium, KStars and our LX200 driver all want it at once. (`docs/concepts/pos_server_multi_client_architecture.md`)
- Test Mode toggle + status readback — a reliable API trigger.
- Camera-process resilience — fall back to the debug camera instead of crashing.
- `all_ips()` — show every network address, not just the default route.
- LX200 "no position yet" — return `None`, not a parseable fake coordinate.
- Near-pole `/api/fake_solve` RA — filed as `brickbots/PiFinder#645`.

Ready-to-file PR text: `docs/upstream_pr_templates.md`.

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StellarMate – extending the SMOS app for PFSM

What a thin integration needs:

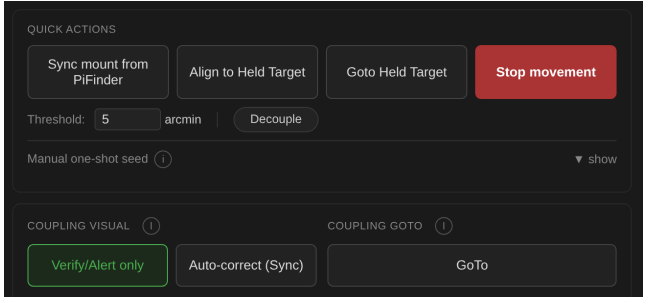
- Start / stop the selected INDI profile.
- Add / remove just the PiFinder drivers.
- Pick “the mount” from the loaded drivers.
- Three Coupling presets, in PiFinder’s words.

The coupling logic is already framework-agnostic Python — a thin adapter ports it.
Concept: `docs/concepts/mount_bridge_web_integration.md`.

CC feature → app screen

- Status badges → a read-only status card.
- Coupling presets → a segmented control.
- Quick Actions → buttons on that card.

APIs already exist: `/api/mount_bridge_*`, or the INDI properties directly.



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Roadmap & where to jump in

v2.x — consolidate

- Harden & test what exists.
- Send selected patches upstream.
- A guiding watcher.

v3.x — integrate

- Deeper SMOS integration (#35, #36).
- PFSM actions in the PiFinder app (#43).
- A “real” GSC-solving simulator (#344).

`github.com/apos/PiFinder_Stellarmate` · GitHub Project 15

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Two takeaways

1. **PiFinder devs** — a triaged inventory of patches that belong upstream, PR text already written.
2. **StellarMate devs** — the SMOS app could drive basic PFSM use with a thin adapter over existing APIs.

- Outlook
  - Real-sky solver simulation (#344).
  - Selected patches back to `brickbots/PiFinder`.
  - App-side coupling controls.

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Thanks – and clear skies.

PiFinder

StellarMate

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Links

- github.com/apos/PiFinder_Stellarmate — repo, README, docs.
- docs/upstream_patch_inventory.md / docs/upstream_pr_templates.md
- docs/concepts/mount_bridge_web_integration.md
- brickbots/PiFinder — upstream · issue #645 (near-pole RA)
- GitHub Project 15 — tracked roadmap.