ModelStdcom Operator Manual

How to run, configure, and simulate a paper machine with the STEC model driver

1. What ModelStdcom is

ModelStdcom is the STEC-based paper-machine simulator. In the lab it takes the place of the real paper machine so you can test automap4 and machinedriver without being on site.

It behaves like a real machine: it owns the actuator positions, publishes the scanner profile and sheet edges to Multiverse, and listens for actuator setpoints coming from automap4 through machinedriver.

- Publishes to Multiverse: actuator positions, profile, Left Edge, Right Edge, machine speed, scanner direction.
- Subscribes from Multiverse: actuator setpoints from automap4.
- Physically realistic: actuator moves happen immediately, but the profile change is delayed by the paper transport time (Paper L / Speed).

2. Starting ModelStdcom

Open a terminal and run one of the following commands:

python -m automap.models.modelstdcom

or, if the package is installed:

modelstdcom

When the window opens you must load a machine model before you can scan. A Load Model Required dialog appears.

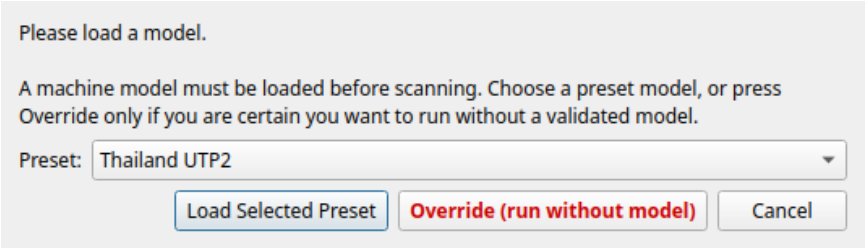

Figure 1: Load Model Required dialog on startup.

Dialog choices

- Preset: choose a built-in factory preset or a site .npz grade that has been placed in the preset folder.
- Load Selected Preset: load the chosen model and make it the default for the next run.
- Override (run without model): start with whatever values are currently on the screen. Only use this for quick tests; automap4 needs a real geometry to control correctly.
- Cancel: close the dialog. You cannot scan until you load a model or override.

3. Loading a model and adding a site grade

Built-in factory preset

The built-in Thailand UTP2 preset is a clean baseline machine: 96 actuators, 500 databoxes, 22.5 s scan time, no wander, no noise. Use it for first lab tests.

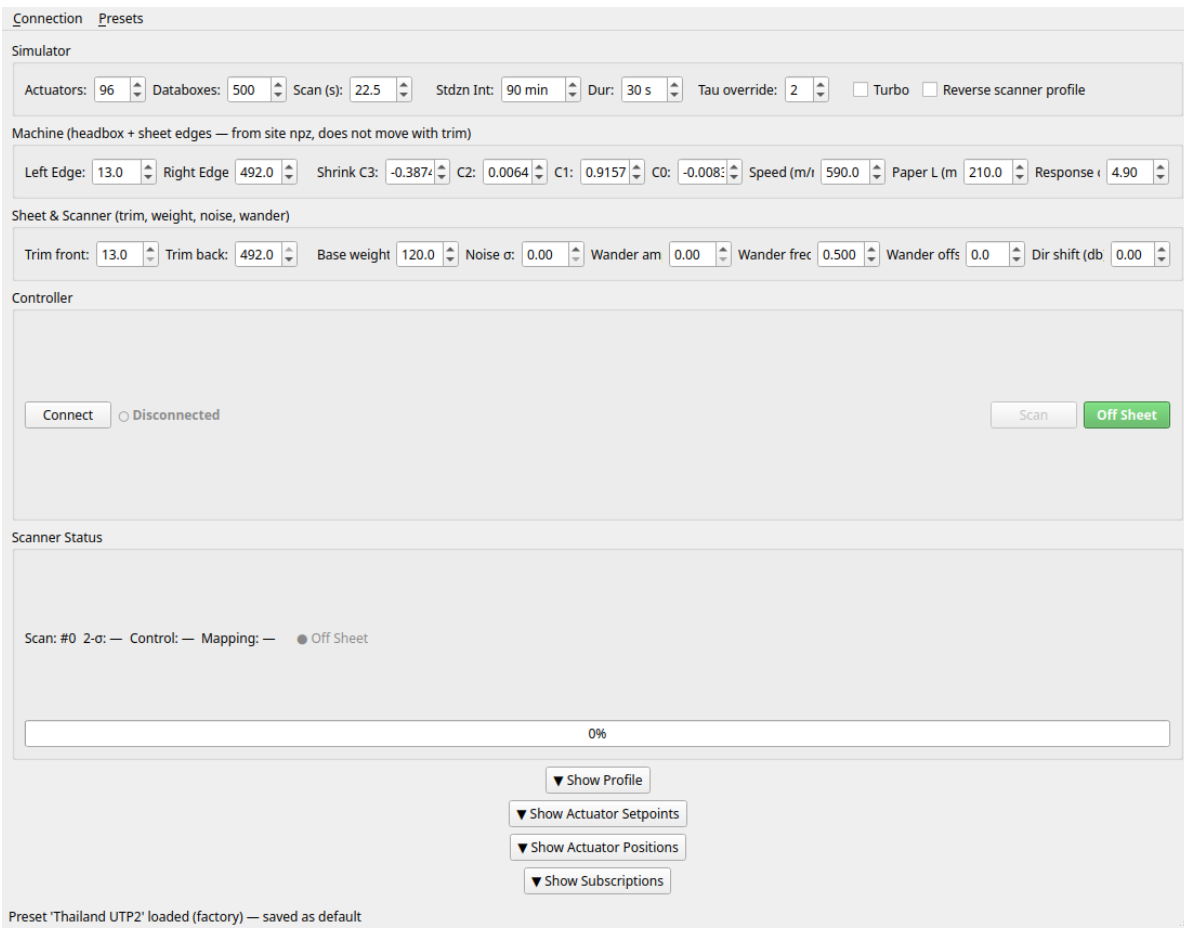

Figure 2: Main window after loading the Thailand UTP2 factory preset.

Loading a site grade (.npz)

A site grade is a .npz file created from a real run. ModelStdcom can load it as a preset, so the simulator reproduces that site's paper machine.

1. Copy the site .npz file into the preset folder. The default folder is ~/automap_grades
2. In ModelStdcom choose Presets → Refresh List.
3. Choose the grade from the Presets menu or from the Load Model Required dialog.

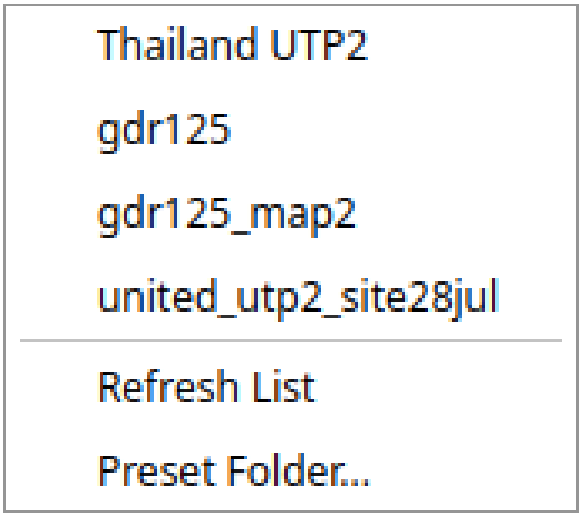

Figure 3: Presets menu after Refresh List found a site grade.

What makes a .npz appear in the Presets menu

For ModelStdcom to recognise a .npz as a machine preset, the file must contain at least one of these:

- mapping_matrix — a 2-D array, for example shape (96, 500). This tells ModelStdcom the machine has 96 zones and 500 databoxes, and it also supplies the S-curve coefficients from the grade.
- machine_physics_json — a JSON block carrying measured machine physics such as wander, noise, base weight, edges, and speed.

A bare recording stub with an empty mapping matrix will not show up, because there is not enough geometry to simulate a machine.

How united_utp2_site28jul.npz was captured

The grade file united_utp2_site28jul.npz in ~/automap/foo2/automap_grades is a real Thailand UTP2 snapshot. It was created from a site control run that was recorded by automap4 (control_log.csv / control_log.npz).

The recording contained 118 scans of profiles, actuator positions, and setpoints. The office ran the tool tools/wander_from_recording.py on the recording. That tool measures the true sheet

wander and scanner noise by comparing each scan against the learned mapping, rather than trusting the scanner edge detector.

The resulting machine_physics_json block inside the .npz stores the measured Thailand UTP2 environment:

- Wander amplitude: about 0.99 databoxes
- Wander frequency: about 0.484 cycles per scan
- Scanner noise σ: about 0.72
- Nominal base weight: about 125.7 g/m²
- Left Edge: 13.0, Right Edge: 491.5
- Machine speed: about 584.4 m/min

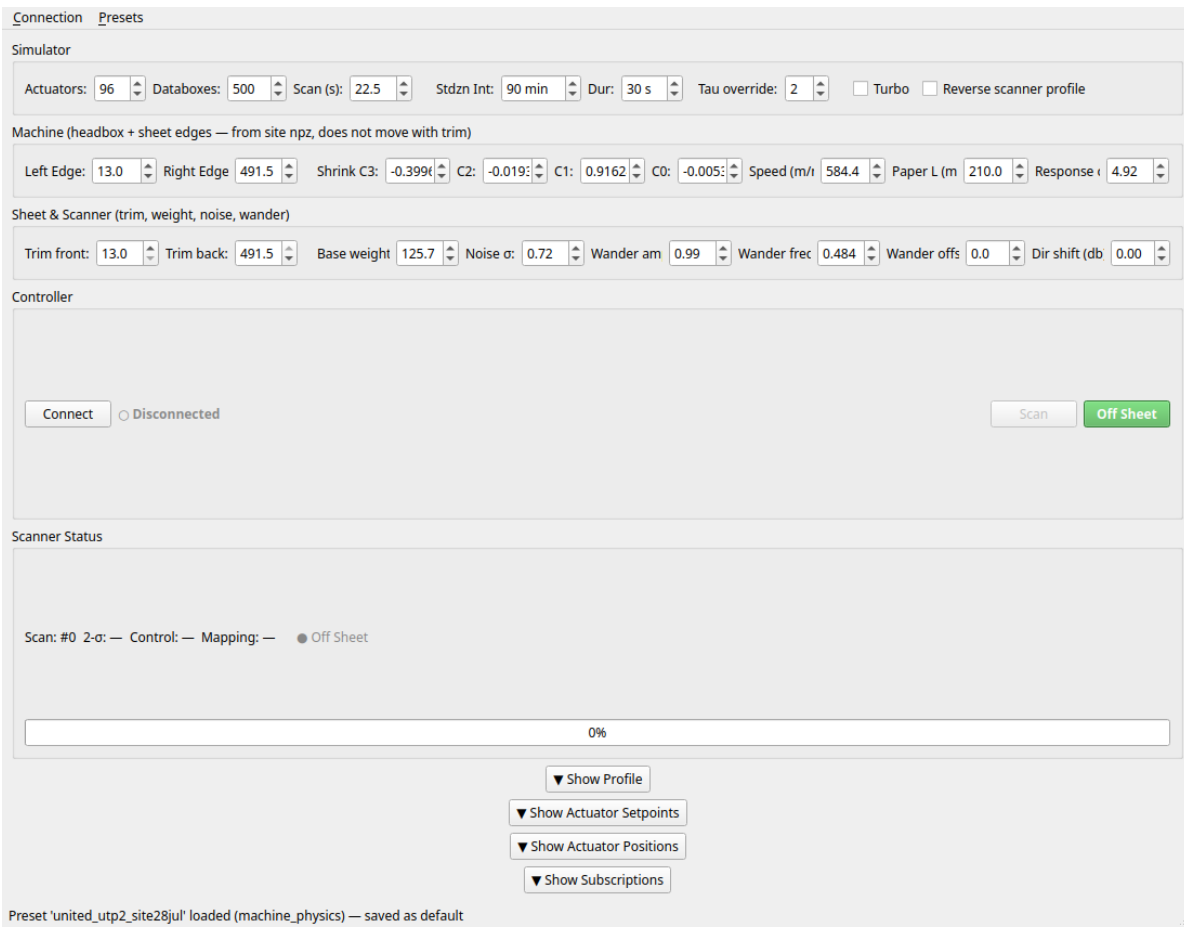

Figure 4: Main window after loading united_utp2_site28jul.npz. The Sheet & Scanner row now shows the measured wander and noise.

What other sites need to do to make their own simulator grade

To build a site-specific simulator preset from a real run, follow this procedure:

4. Record a run in automap4. For best results capture a tuning_log (PRBS) or a quiet running_log with at least several hundred scans. The .npz archive must include profiles and actuator positions/setpoints.
5. Run the wander estimator:

python tools/wander_from_recording.py control_log.npz --write-preset site_preset.npz

6. Copy the resulting site_preset.npz into the ModelStdcom preset folder (default ~/automap/foo2/automap_grades).
7. Choose Presets → Refresh List in ModelStdcom and load the new preset.

If the .npz is a full automap4 grade with a mapping_matrix and enough recorded scans, you can also simply copy it to the preset folder; ModelStdcom will measure the wander and noise automatically when it loads.

4. Virgin grade and preference reload behavior

A preset or grade is a virgin source. When you load it, ModelStdcom copies every value from that source onto the screen and also writes it to its working settings file (VSettings). The source .npz file is never modified.

This means two important things for daily use:

- After you load a grade, the screen values become the new default. If you close and reopen ModelStdcom, it will start with those same values (unless you load a different preset).
- If you change a spinner on the screen, that change is saved as the new default. The original grade file still contains the original values.

To get back to the exact values inside a grade, you must load that virgin .npz again from the Presets menu. Loading it overwrites your screen tweaks with the stored grade values.

5. Screen items and what they do

The window is divided into parameter rows, a controller row, scanner status, collapsible chart panels, and a status bar. The names below are exactly the labels you see on the screen.

Simulator row

These rows control how the simulation runs. See Figure 2 for a view of the three parameter group boxes (Simulator, Machine, and Sheet & Scanner).

- Actuators — number of dilution valves. Default 96. Changing this recreates the simulator.
- Databoxes — number of scanner boxes across the sheet. Default 500. Changing this recreates the simulator.
- Scan (s) — seconds for one scanner sweep. Default 22.5. The tick interval is derived from this value.

- Stdzn Int — minutes between simulated scanner standardizations. During a standardization the scan head pauses so automap4 can test its stale-scan timeout. Default 90.
- Dur — seconds that each standardization pause lasts. Default 30.
- Tau override — transport delay in scans. Set to 0 to compute it from Paper L / Speed. Default 2. Use this when you want the simulator to match a measured tau from automap4 exactly.
- Turbo — when checked, the simulator runs 10 times faster. This is very useful in the lab to speed up automap4 discovery and PRBS tuning runs. Uncheck it for normal real-time operation.
- Reverse scanner profile — when checked, the profile array and edges are reversed before they are published. Use this to test the corresponding option in machinedriver.
- Disturbance simulator — checkbox. Simulates a machine upset for automap4 to control back. A real machine adds AND subtracts: every Nth scan (Number of scans), each databox in the inner 80 % of the sheet gets a random +X% or −X% of the sheet mean (% disturb). The texture persists until the next kick replaces it — kicks never accumulate. 10 % of the paper width at each edge is left alone, and off-sheet zeros are never touched. Unchecked = normal operation. The two spinners are disabled while this is unchecked.
- Number of scans — how often a disturbance kicks in: the kick lands on every Nth scan (scan 1 is the first scan). Range 1–50, default 5. Disabled unless Disturbance simulator is checked.
- % disturb — size of each kick: each databox in the inner 80 % of the sheet (10 % of the paper width excluded at each edge) gets a random + or − of this percent of the sheet mean. The field persists until the next kick replaces it. Off-sheet zeros are never touched. Range 1–10, default 2. Disabled unless Disturbance simulator is checked.
- MD Disturbance — checkbox. A whole-sheet basis-weight square wave (a pure MD / machine-direction upset) to prove the CD control has no MD content: every N scans the entire on-paper profile steps UP by X% of the grade's Base weight, the next N scans DOWN by the same amount, alternating (base 150, 10%: 160, then 140). Off-sheet zeros are never touched. A mean-referenced CD control should not react at all. Unchecked = normal operation. The two spinners are disabled while this is unchecked.
- Number of scans (MD) — half-period of the square wave: the profile holds UP for N scans, then DOWN for N scans. Range 1–50, default 5. Disabled unless MD Disturbance is checked.
- % disturb (MD) — step size: percent of the grade's Base weight added (UP) or subtracted (DOWN) on every on-paper databox. Range 1–10, default 2. Disabled unless MD Disturbance is checked.
- Sheet shift (db) — post-shutdown re-thread shift, in whole databoxes (range ±10, default 0 = off). The sheet now runs this many databoxes over: every published scan — texture, edges AND actuator responses — arrives at the scanner shifted, on both sweep directions, until you set it back. Setpoint moves still land on the true sheet at the headbox (the headbox is steel), so a controller commissioned before the shift mis-registers by this offset and develops the zigzag from the site. Integer only, so the noise field is never blurred. Loading a preset resets it to 0 (a preset is a freshly threaded sheet).

Machine row

This row describes the headbox and sheet geometry. These values normally come from the site .npz and should not need to be changed often.

- Left Edge — first databox where the machine's sheet starts. From the site npz. This is headbox geometry; trimming the paper does not move it.
- Right Edge — last databox where the machine's sheet ends. From the site npz.
- Shrink C3, C2, C1, C0 — coefficients of the cubic polynomial that maps actuator index to databox position. These come from S-curve discovery in automap4. Do not edit them unless you are reproducing a specific test.
- Speed (m/min) — machine speed in metres per minute. Affects transport delay and the scan timer.
- Paper L (m) — paper path length from headbox to scanner in metres. Used with Speed to compute the transport delay when Tau override is 0.
- Response σ — actuator footprint width in databoxes. Thailand UTP2 is about 4.9.

Sheet & Scanner row

This row contains run-to-run variables: trim, weight, noise, and wander.

- Trim front — first databox that still carries paper. Databoxes in front of this read 0. Use this to simulate a narrower sheet without moving the headbox.
- Trim back — last databox that still carries paper. Databoxes behind this read 0.
- Base weight — nominal profile level / basis weight in g/m². Default 120 for the factory preset; 125.7 for the UTP2 grade.
- Noise σ — standard deviation of scanner measurement noise. Set to 0 for a clean run, or to the measured site value (about 0.72 for UTP2) for realism.
- Wander amp (db) — amplitude of sheet-edge oscillation in databoxes. 0 means the sheet edges stay put.
- Wander freq (cyc/scan) — frequency of the sheet-edge oscillation in cycles per scan. 0.5 means half a cycle per scan, which produces every-other-scan turnaround alternation.
- Wander offset (db) — constant DC shift of the sheet's mean position in databoxes.
- Dir shift (db) — scanner turnaround registration shift. Profiles and reported edges from high-to-low sweeps are shifted by this amount. Site UTP2 measured about 1.0-1.6 databoxes. Set to 0 to disable.

Controller row

- Connect — connect to the STEC Multiverse using the host and port in Connection → Settings.
- Scan — put the scanner on the sheet and begin sweeping. Requires a loaded model and a connection.
- Off Sheet — park the scanner at the edge and stop collecting data.

- Disconnected / Connected indicator — shows whether ModelStdcom is connected to Multiverse.

Scanner Status row

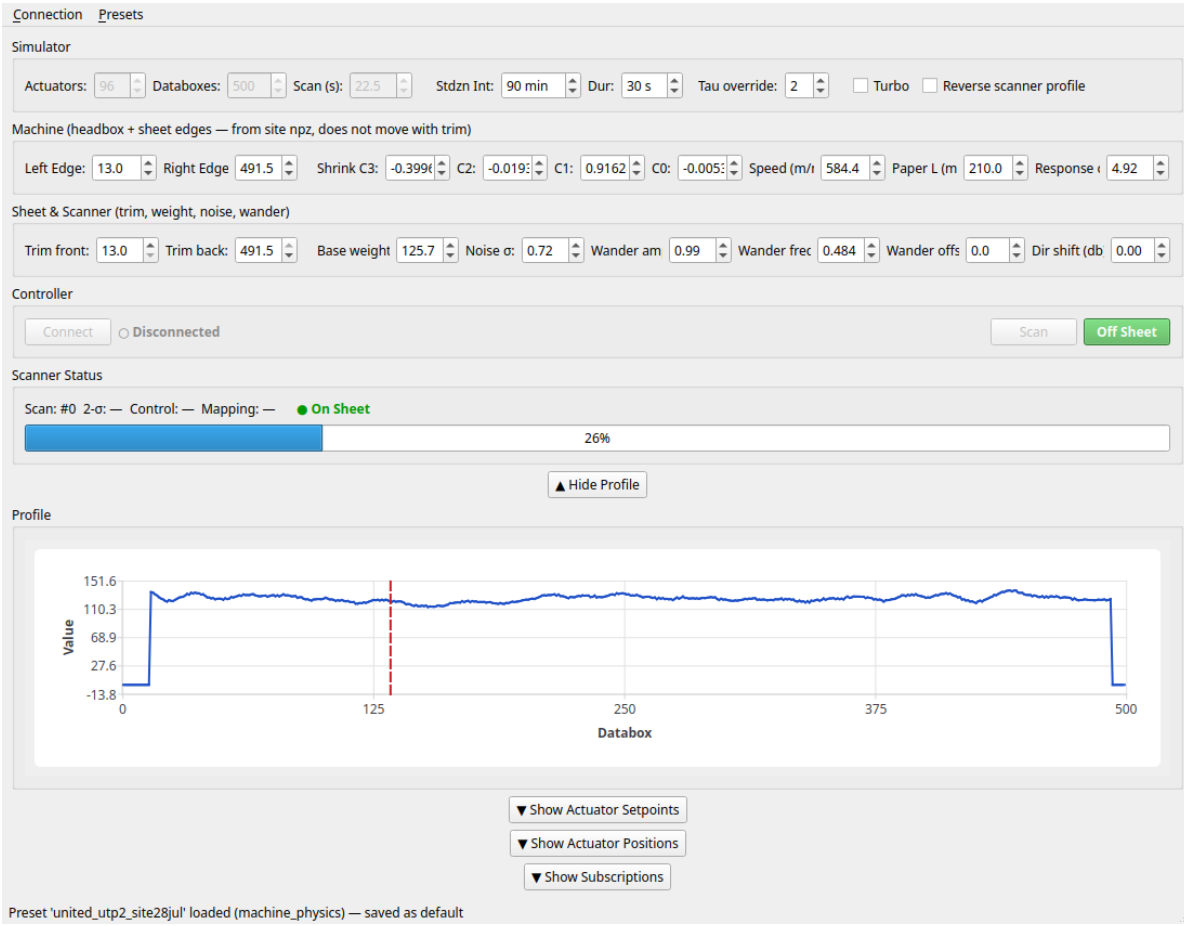

Figure 5: Scanner Status row during scanning, with the Profile panel open.

- Scan — completed scan counter.
- 2-σ — two-sigma of the latest profile.
- Control — shows whether automap4 supervisory control is active.
- Mapping — shows whether automap4 is in PRBS identification or discovery.
- On Sheet / Off Sheet indicator — green when scanning, grey when parked.
- Progress bar — scanner sweep progress within the current scan.

Chart panels

The four collapsible panels below Scanner Status are hidden by default. Click the ▼ Show buttons to open them.

Profile — line chart of the latest scanner profile plus the scanner cursor position. You can zoom with the mouse wheel and pan with the middle button; right-click for Unzoom and Y-Range Auto. See Figure 5 for an example with the Profile panel open.

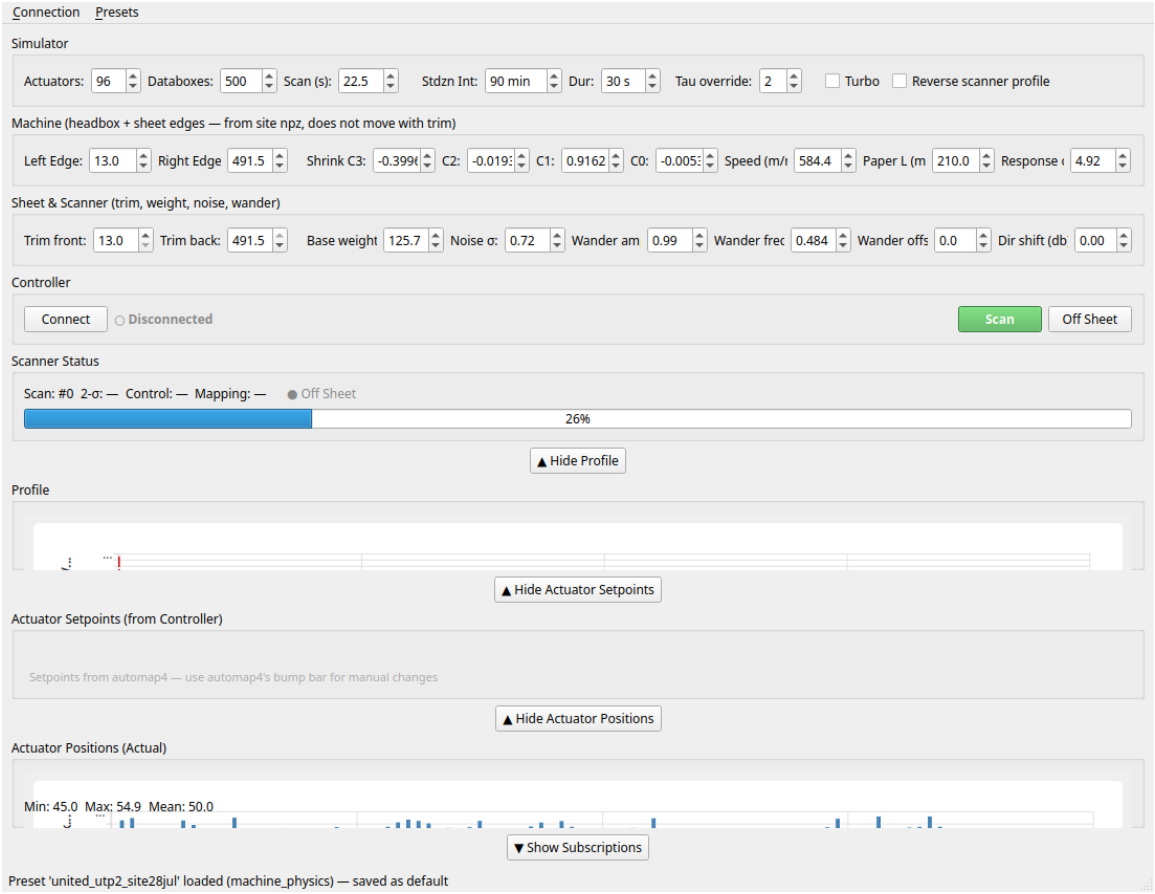

Figure 6: Actuator Setpoints (from Controller) panel.

- Actuator Setpoints (from Controller) — display-only bar chart of the setpoints received from automap4. Make manual changes in automap4, not here.

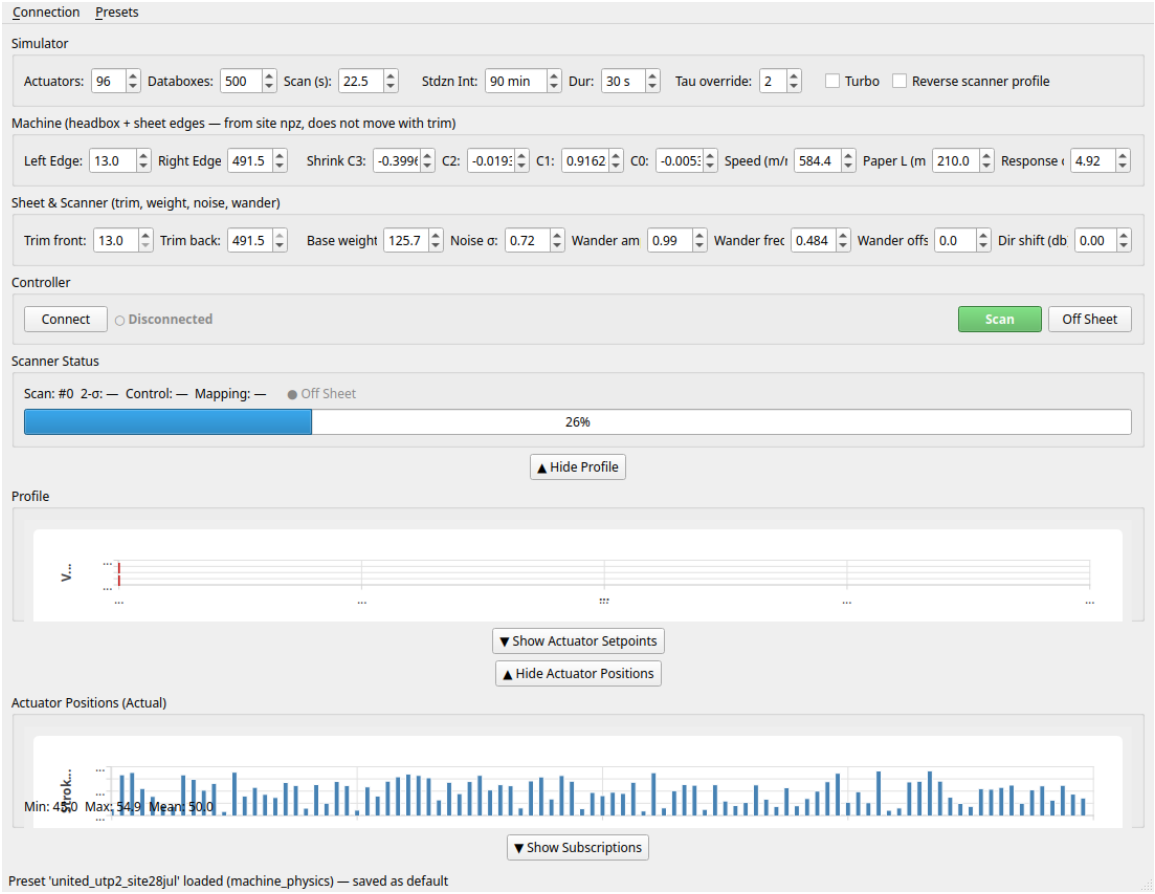

Figure 7: Actuator Positions (Actual) panel.

- Actuator Positions (Actual) — bar chart of the simulator's current actuator positions, plus Min, Max, and Mean readouts.

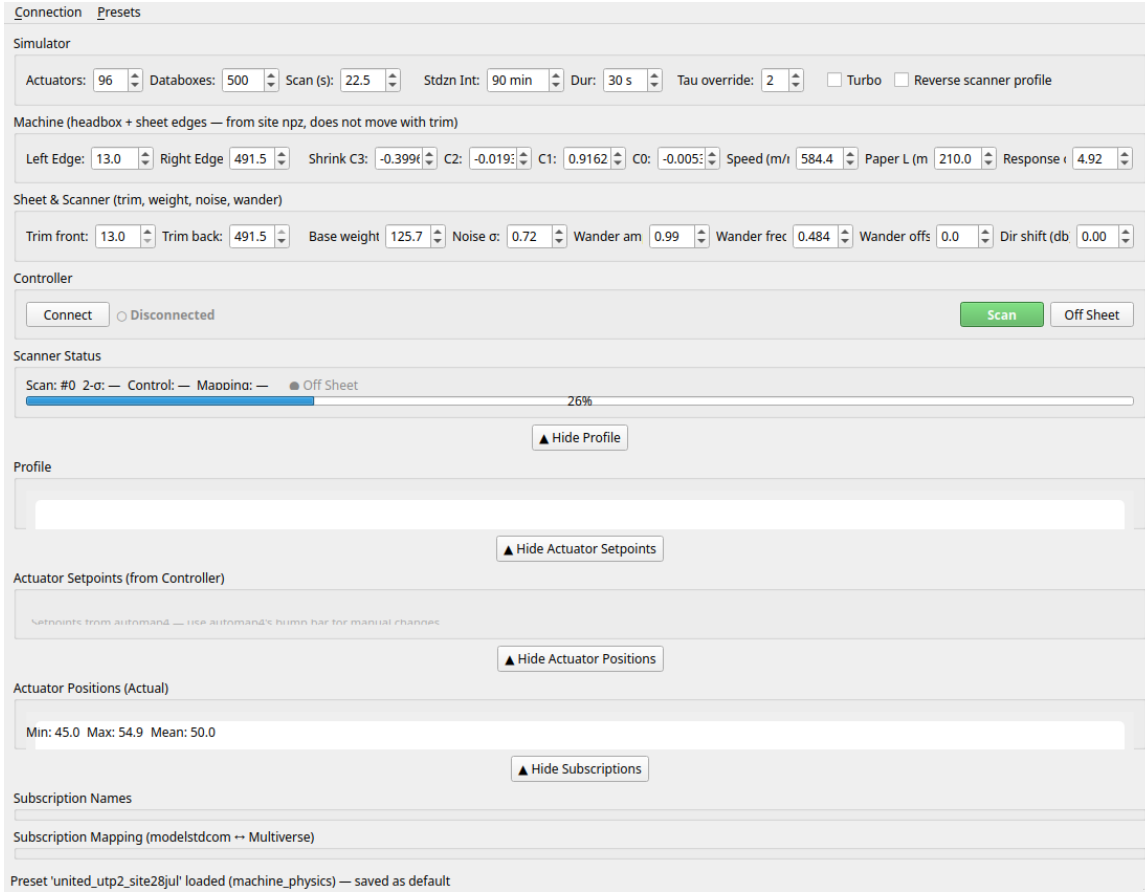

Figure 8: Subscriptions panel.

- Subscriptions — configure how ModelStdcom fields are mapped to Multiverse subscription names. See Section 6.

Help menu

The Help menu at the top of the window:

- About — version and build metadata (branch, commit, date) for this ModelStdcom build, with checkout instructions.
- About PySide — version information for the Qt binding.
- Howto modelstdcom (F1) — opens this operator manual (the PDF) inside ModelStdcom.

6. Connecting to Multiverse

ModelStdcom communicates through the STEC / Multiverse layer. The same connection is used by machinedriver to bridge the simulator to automap4.

Connection Settings

Choose Connection → Settings to open the connection dialog.

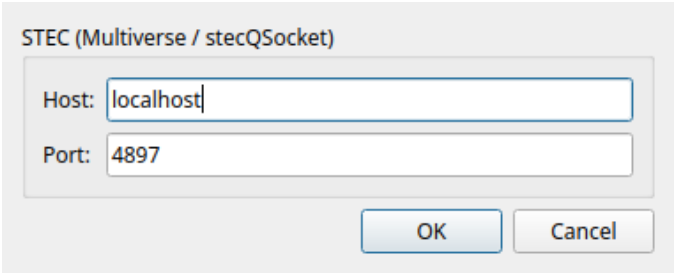

Figure 9: Connection → Settings dialog.

- Host — STEC Multiverse server hostname. Default localhost.
- Port — STEC Multiverse service port. Default 4897.

Click OK to save the host and port. They are restored the next time you open ModelStdcom.

Subscription mapping

Open the Subscriptions panel with Show Subscriptions. The table maps each ModelStdcom field to a Multiverse subscription name and a direction.

- Field Name — the ModelStdcom data field, for example actuator_positions or profile.
- STEC Subscription — the Multiverse subscription name that the field is attached to.
- Direction — to_multiverse means ModelStdcom publishes the value; from_multiverse means ModelStdcom receives the value.
- Description — optional note.

The default mapping is what the lab normally uses: actuator_positions, profile, left_edge, right_edge, machine_speed, and scanner_direction are published to Multiverse (to_multiverse); actuator_setpoints is received from automap4 (from_multiverse).

After editing the table, click Save Subscription Mapping. ModelStdcom validates the rows, saves the mapping, and rebuilds the Multiverse subscribers. Subscription names from the server appear in the Subscription Names list on the left once you are connected.

7. Quick lab workflow

A typical lab session looks like this:

8. Start machinedriver if you are testing the full chain, or run automap4 with a direct configuration.
9. Start ModelStdcom and load either Thailand UTP2 or a site grade such as united_utp2_site28jul.
10. Click Connect to join Multiverse.
11. Click Scan to start generating profiles.
12. In automap4, run S-curve discovery or PRBS identification. If you want to speed up long tuning runs, check Turbo in ModelStdcom before scanning.

13. When finished, click Off Sheet to park the scanner.

8. Notes and caveats

- Trim front and Trim back cut the paper, not the headbox. They zero databoxes outside the trim range and move the published edges. They do not move Left Edge or Right Edge, and they do not change the S-curve.
- Turbo is for the lab only. It makes the scan timer run 10× faster, which is convenient for long PRBS or discovery runs. It does not change the physics; it only compresses time.
- The factory Thailand UTP2 preset has no wander and no noise. Add realism by loading a site grade that carries measured wander and noise.
- If a grade you expect does not appear in the Presets menu, check that the .npz is in the preset folder and that it contains a mapping_matrix or machine_physics_json block.