RING by Ringwood

Operator Manual

FOR PLANT OPERATORS AND SHIFT SUPERVISORS

The day-to-day reference: starting and watching batches, every screen explained, alarms, formulas, reports, and what to do when something looks wrong.

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Contents

Ring Operator Manual

This is the day-to-day reference for operators and shift supervisors running the glue kitchen through **Ring** — the modern HMI (`Ring.exe`, window-titled "Ringwood RS3000") that replaced the legacy `~RS360` Borland application.

Who this is for

Plant operators and shift supervisors on the floor at the LCP (Line Control PC — the touchscreen workstation). No programming knowledge assumed. The plant runs Ring in English (the legacy system it replaced was Dutch-language), and the **app itself is localized** if the floor ever wants otherwise — see 01-getting-started.md for how to switch it, including to Dutch (`nl`).

> **Note:** Every screenshot in this manual was captured on a demo/training station. That is why each one carries the yellow demo banner and the teal read-only banner, and shows "Operator: not set" in the status strip. Your station's screens will look the same, minus those two banners, once demo mode is off and the plant's write-enabled cutover has happened.

How this relates to the Operator Training Runbook

`OPERATOR_TRAINING_RUNBOOK.md` (source: in the Ring repository) is the **authority** on operator training and cutover-day procedure. It ships inside the app itself — **Help → Operator Runbook**, on the LCP, not via a link in this document — so it is what a new operator reads cover-to-cover during training and what the training team edits per plant.

This manual does not replace it. Where the runbook already walks through a procedure step-by-step, this manual **summarizes and links to it** instead of repeating it — the two are meant to stay in agreement. Use this manual as the thing you come back to during a shift when you need a quick answer about one screen or one indicator, without re-reading the whole training document.

If the two documents ever seem to disagree, treat the runbook as authoritative for procedure and this manual as the place to file a correction — the app's actual screens are the final word either way.

Before you read further: read-only vs. write-enabled

Ring ships **read-only**. Every screen described here that talks about starting a batch, silencing an alarm, or changing a setpoint describes what happens **once PLC writes are enabled**. Until then, those same actions are validated on screen but nothing is sent to the controller — see 01-getting-started.md for how that shows up on screen (source for the full write-safety model: `README.md` "The safety model" in the Ring repository). The plant's write-enabled cutover is planned for **2026-09-08**.

What changes when writes are enabled

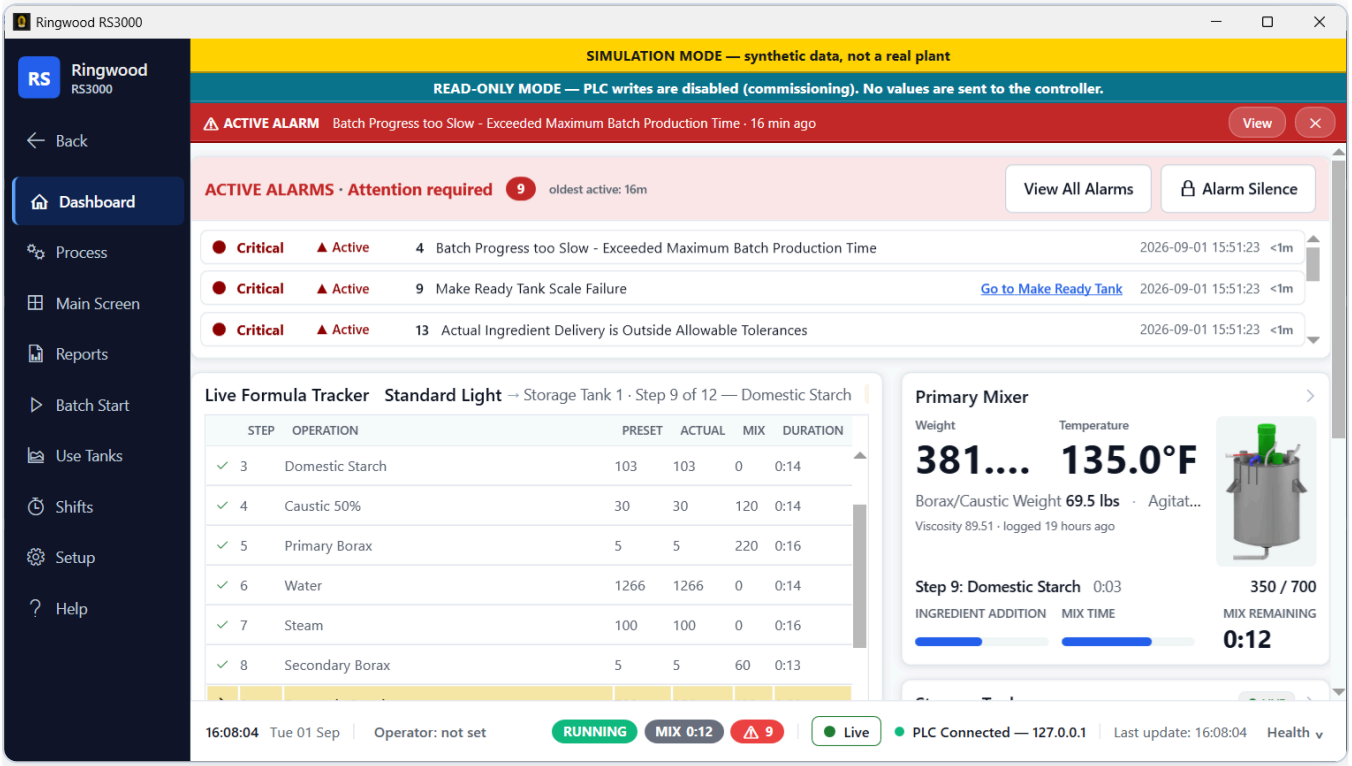
Read-only vs. write-enabled comes up in almost every chapter of this book. This table is the single place that says what actually looks different on your screens the morning writes are turned on — it is not exhaustive, only the changes operators have specifically asked about.

Screen	What you will see that you don't see today
Every screen	The teal "READ-ONLY MODE" banner disappears — see 01-getting-started.md.
Batch Start	**Start Batch** actually arms the controller instead of only validating; the confirmation and success wording changes to match — see 02-running-batches.md §2.1.
Process → Alarms / Dashboard	**Silence** actually writes the silence bit to the controller instead of appearing disabled — see 04-alarms-and-attention.md §Silence vs. acknowledge.
Use Tanks → MF 1	The **Tank Controls** and **Tank Agitator Controls** cards appear for the first time — they are completely hidden while Ring is read-only — see 03b-use-tanks-shifts-setup-and-help.md §Use Tanks.
Setup → Formula Edit / Formula Exchange	May **still** report the write as "held pending controls sign-off" — formula-bank writes are gated by a separate switch (`EnableFormulaBankWrite`) that does **not** turn on automatically at cutover. Do not report this as a cutover bug — see 05-formulas-and-recipes.md §What is protected.

Chapters

5. Formulas and recipes — viewing and editing formulas, amount limits, units, formula bank exchange with the PLC, and exactly when and why a formula-bank write is refused.
6. Reports and history — a "which report answers my question" lookup table, then every report under NavBar → Reports: what question it answers, its filters, its columns, and how to read the result.
7. Troubleshooting — a symptom-first lookup table with inline answers, then PLC connection lost, app crashed, degraded startup, falling back to the legacy app.
8. Glossary — TVC, LCP, doser/storage/mix tank, make-ready, CIP, golden batch, demo mode, read-only mode, heartbeat, and more.
9. Quick reference card — one printable page repeating every legend in this book (status pills, PLC dot, alarm glyphs, freshness chip, banners), the keyboard shortcuts, and a blank "who to call" block for this station.

1. Getting started



The Dashboard — the first screen Ring opens on.

What Ring is

Ring is the touchscreen application that runs the glue kitchen from the LCP (Line Control PC) on the floor. It replaces the legacy `~RS360` application — the workflow you already know (pick a tank, pick a formula, start a batch, watch it run, hold/resume/reset, acknowledge alarms) has not changed. Ring talks to the plant's Allen-Bradley controller and keeps its own record of every batch, alarm and setting change in a local database, so Reports can answer questions the old paper printouts could not.

The application window title bar reads **"Ringwood RS3000"** — that is Ring's product name. Do not confuse it with `~RS360`, the older application it replaces; see the glossary if the two names are confusing on the floor.

> **Note:** Until the plant's write-enabled cutover, Ring runs **read-only**: every button described in this manual as sending something to the controller is instead validated on screen and **not sent**. See Read-only mode below.

> **Warning — Ring is not a safety system.** It has no Emergency Stop and no software way to trip the plant. In an emergency, use the plant's physical E-stop, not this application. **Process → Hold** (see 2.4 Hold, Resume, Reset) is a real, PLC-backed process **pause** — it is not a safety function. See 3a. Main Screen reference §Make Ready Tank for why this app carries no Emergency Stop or Pause/Resume button at all.

Starting the app

Ring is set to launch automatically when the LCP boots — you do not normally start it by hand. On boot you will see, in order:

1. **Splash screen** — the Ringwood logo with a loading message and progress bar, typically a few seconds.
2. **First-run guided setup** (new or freshly re-imaged LCPs only) — a step-by-step wizard (language, units, PLC connection, read-only safety, email, plant names, shift schedule) that an installer or supervisor runs once per station. Everyday operators will not normally see this; it can be re-run from **Setup** → **Setup Wizard** if it is ever needed again.
3. **The main window** — Ring opens straight to the **Dashboard**. There is no login screen: nothing blocks you from operating. Instead, you *pick* your name so the record shows who did what — see Tell Ring who you are below. Supervisor-level Setup screens are separately protected by a password prompt.

Tell Ring who you are

The bottom status strip always shows the current operator — **"Operator: not set"** until someone picks a name. Click it to open the operator picker and choose (or type) your name at the start of your shift. This is not a password login; it exists so that batch records, data-entry rows, and the operator audit trail carry *your* name instead of nobody's. Your choice is remembered across an app restart, so re-pick when a new operator takes over the station — not just after a reboot.

> **Note:** Picking your name is how "who did what" gets recorded on this station. Leaving it on the previous operator's name puts their name on your actions.

Startup warnings — read them before clicking through

If something is wrong with the station's configuration file (`Config\appsettings.json`), a message box appears **before** the main window:

Title	Meaning	What to do
Startup Configuration Error	A required setting is missing or invalid. Ring will **not** start.	Note the exact text and call IT.
Startup Configuration Warning	A setting looks wrong but is not fatal (e.g. a missing folder). A 60-second countdown lets the boot continue on its own if nobody is there to click.	Read it. Click **Continue** to proceed anyway, or **Quit** to stop and get it fixed. If you do nothing, it continues automatically after 60 seconds.

> **Warning:** Never click through a startup message box without reading it. It names the exact configuration problem — that text is what IT needs to fix it.

The main window layout

Ring's window is a fixed two-column shell:

- **Left: the NavBar** — a dark 168-pixel-wide rail with the main navigation buttons (see Navigation below). It never scrolls away.
- **Right: everything else**, stacked top to bottom:
    1. A **PLC connection banner** — only visible when the link is not fully healthy (see PLC connection indicator).
    2. A **demo mode banner** (yellow) — only visible when demo/training mode is turned on for this station.
    3. A **read-only mode banner** (teal) and/or a **startup-degraded banner** (red) — see Read-only mode and 07-troubleshooting.md.
    4. An **active-alarm banner** — a compact red strip that appears on every screen while a fault is present, with a **View** button to the Alarms screen and a ✕ to dismiss it for now (it returns on the next alarm).
    5. The **screen area** — whatever screen you navigated to.
    6. The **status strip** — a thin bar across the very bottom, always visible (see below).

Navigation

Click a button on the left NavBar; most open a **popup menu** to the right with the screens in that group — click a screen name to open it in the main content area, or click anywhere outside the popup to dismiss it without choosing anything. **Dashboard** has no popup; it opens directly. A small chevron on the right edge of a NavBar button marks it as one that opens a submenu — a button with no chevron (like Dashboard) navigates straight to a screen instead.

The top-level buttons, left to right as they appear top to bottom on the rail, are: **Dashboard, Process, Main Screen, Reports, Batch Start, Use Tanks, Shifts, Setup, Help**. (One more rail button, **TVC Control** — it sits between Batch Start and Use Tanks — exists in the software but ships hidden — its screens write directly to the controller and are held back pending commissioning; the read-only TVC overview under **Main Screen** → **TVC** covers the same tanks.) A **Back** button above them returns to the previous screen once you have navigated somewhere.

The full menu contents (which screens live under which button) are listed button by button in this manual's own screens-reference chapters — 3, 3a, and 3b — which describe what each screen actually shows and does, in detail, checked directly against `NavBar.xaml`. A parallel menu map also exists inside the app at **Help** → **Operator Runbook** §2.1 (source: OPERATOR_TRAINING_RUNBOOK.md in the Ring repository) — that copy is regenerated less often, so treat this manual and the live NavBar as current if the two ever disagree.

Every screen also carries a small **?** help button in its header that opens that screen's help topic.

Keyboard shortcuts

Press **F1** on any screen for a pop-up list of shortcuts. The main ones:

Key	Action
`Ctrl+B`	Go to Batch — search any batch by number or formula name, from anywhere
`F1`	Show the keyboard shortcuts list
`Esc`	Close the current dialog, open menu, or the shortcuts help
`Enter`	Confirm the default action in a dialog
`Alt+F4`	Close the application window

Language

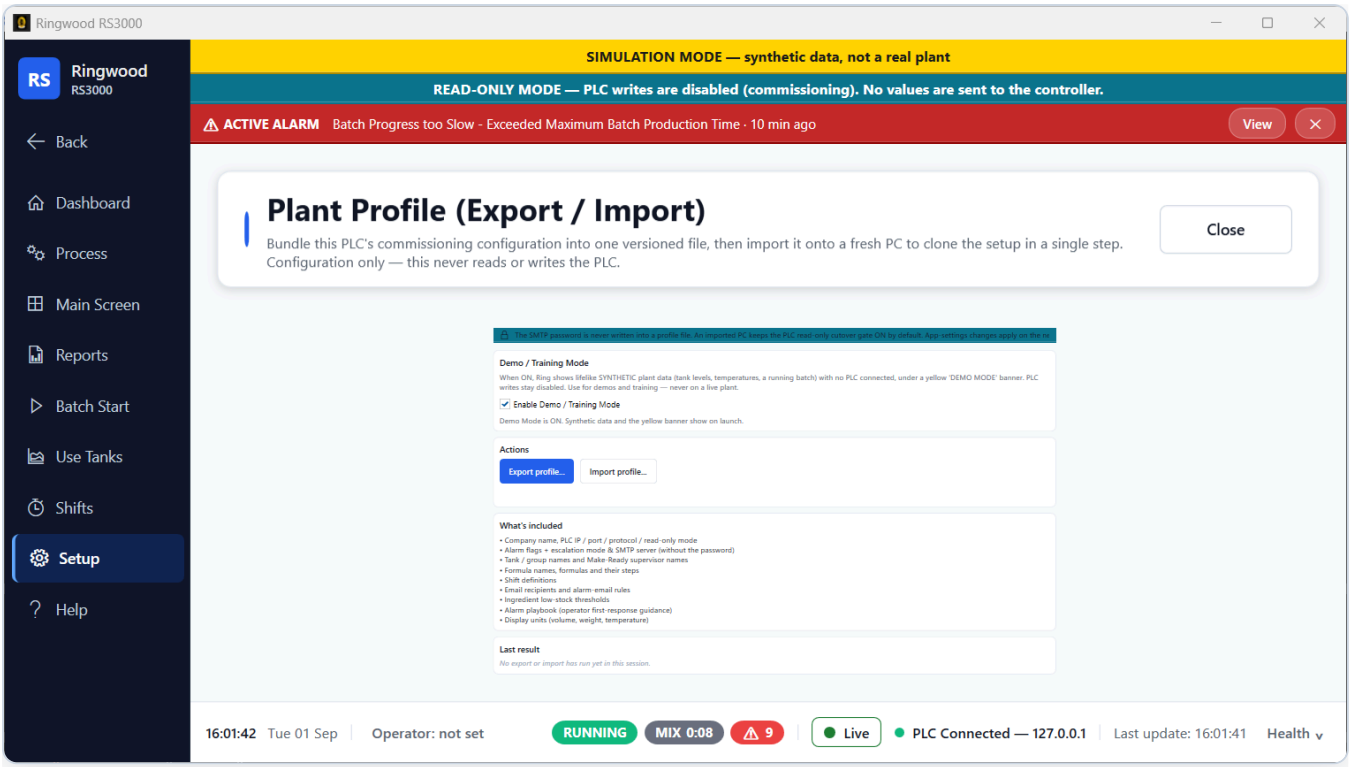
Ring is fully localized. To change it: **Setup** → **Language**, pick a language from the dropdown. The change **applies immediately — no restart needed**. Thirteen languages ship, including Dutch (`nl`) — the language of the legacy system this plant replaced. This plant runs Ring in English, and this manual is written in English to match.

> **Note:** The **Help** → **Alarm Legend** screen separately decodes the controller's own Dutch alarm text into English — see 04-alarms-and-attention.md. That is independent of the app's display language.

Demo mode banner

If a station is configured for demo/training mode, a bright **yellow banner** runs across the top of every screen saying the data is synthetic. Its exact wording is configurable per station — the current default reads "DEMO MODE — data is synthetic, NOT a real plant"; you may also see an older build's banner, "SIMULATION MODE · Live synthetic plant data for demonstration" (every screenshot in this manual was captured on a station running that older wording — see the note in this book's README). Whatever the exact words, the meaning is the same: demo mode feeds every screen with synthetic data instead of the real controller.

Demo mode is set **per station**, either directly in the config file or from **Setup** → **Plant Profile** → **Enable Demo / Training Mode** (supervisor-gated). That checkbox does **not** change the session you are currently looking at — it only takes effect the next time Ring is restarted. That is deliberate (the heavy data pollers and the banner must flip together, not one before the other), but it means a station's next restart can come up in demo mode, with the yellow banner, without anyone having watched it happen.



Setup → Plant Profile: the Enable Demo / Training Mode checkbox. Ticking or clearing it saves immediately, but the status line beneath it always says the change takes effect on the next restart, not right now.

> **Warning:** If you ever see this banner on a station you believe is running the real plant, **check Setup → Plant Profile first** — someone may have ticked, or left ticked, Enable Demo / Training Mode ahead of a restart — before you call IT. See 07-troubleshooting.md.

PLC connection indicator

The bottom status strip always shows the PLC link state — a colored dot, short text, and the time of the last successful update:

State	Dot color	Status text	What it means
Connected	Green	"PLC Connected — <ip>"	Everything is live.
Stale	Amber	"PLC heartbeat stale — <ip>"	Reads are still succeeding but the heartbeat hasn't ticked in a few seconds — a brief lag, values are still trusted.
Starved	Deep amber	"PLC reachable but heartbeat stopped — controller logic not running (check MainTask / controller state)"	The wire is up but the controller's own logic isn't advancing — most values are not flowing even though the network is fine.
Connecting / Unknown	Goldenrod	"PLC connecting…"	Ring hasn't established a first read yet (e.g. right after startup).

State	Dot color	Status text	What it means
Disconnected	Red	"PLC Disconnected — <ip>"	No successful read in the last several seconds. Values on screen are the last ones read, not current.

The IP address shown is always the controller Ring is (or is failing to) talk to — check it against the plant's known PLC address if something looks wrong.

Whenever the link is anything other than fully Connected, the **same information also appears as a banner at the top of every screen**, with a **Retry now** button once the link is fully Disconnected. The banner disappears the moment the link is healthy again so it never permanently eats screen space.

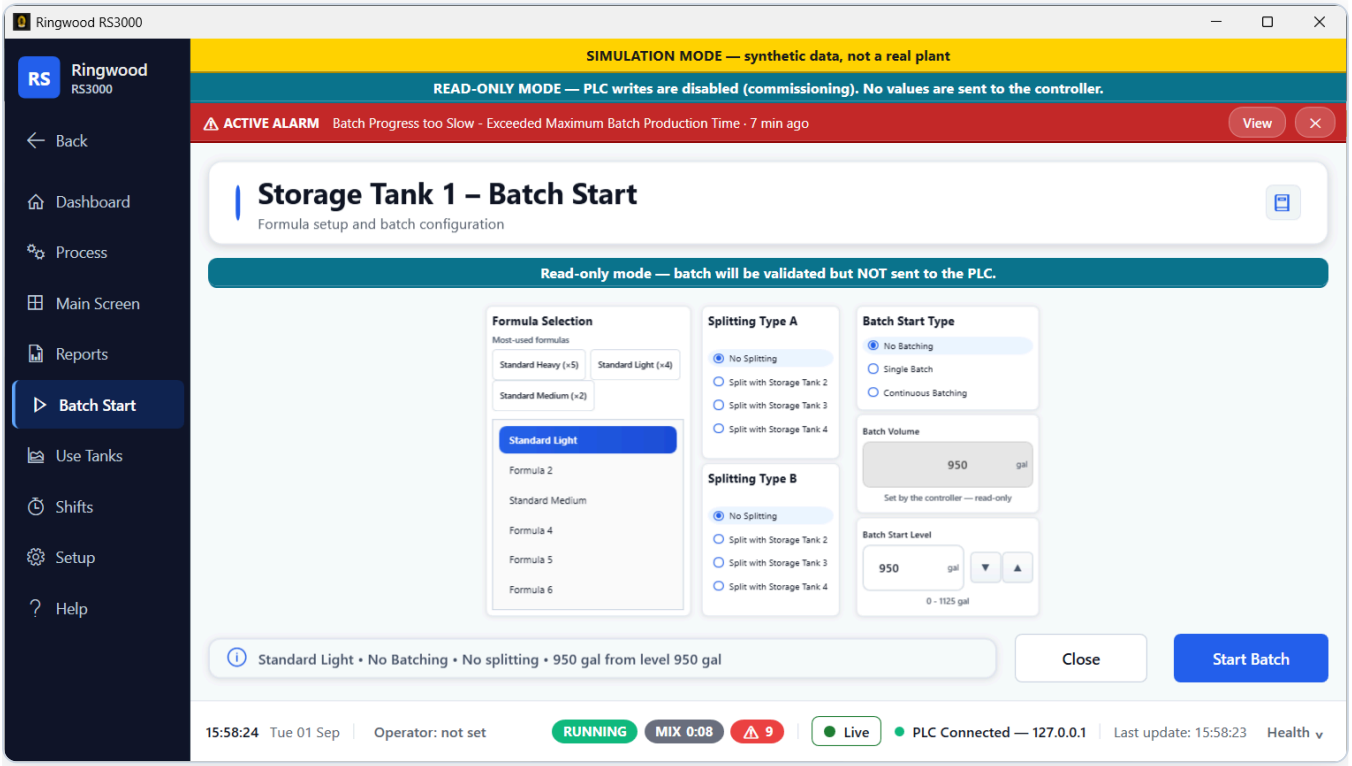
Click **Health** next to the status dot (bottom-right of the status strip) to open a small diagnostics drawer with more detail on the link — useful before calling IT so you can describe exactly what you're seeing.

Read-only mode

Until the plant's write-enabled cutover, Ring runs with **`ReadOnlyMode` switched on**: every control that would otherwise send a command to the controller is still shown, and still validates your input, but the write itself is suppressed. A loud **teal banner** reading a message to that effect sits under the demo banner (if any) for the whole session, and individual screens repeat the notice where it matters most — for example, Batch Start screens show "Read-only mode — batch will be validated but NOT sent to the PLC."

This is a deliberate, repo-wide safety gate, not a bug (source: `README.md` "The safety model" in the Ring repository) — see 02-running-batches.md for what changes, screen by screen, once writes are enabled.

2. Running batches



A Batch Start screen: formula list, splitting, batch type, and the Start Batch button.

This is the operator's core daily task. The same workflow also appears inside the app at **Help → Operator Runbook** §5 (source: OPERATOR_TRAINING_RUNBOOK.md in the Ring repository); this chapter goes one level deeper on what each field and message means, what the controller checks before letting a batch through, and what a complete run looks like from the moment you open Batch Start to the moment the batch finishes.

2.1 Starting a batch

Pick the tank

NavBar → Batch Start opens a popup listing one entry per storage tank your plant actually has enabled — it is built from the tank roster configured in Setup, not a fixed list, so a disabled tank never appears here. Click a tank to open its Batch Start screen.

Pick the formula

The **Formula** list on the left is always the controller's **six formula-bank slots (1–6)**, shown under each slot's real name rather than "Formula 1" — Dutch names imported from the legacy system show up exactly this way (e.g. "SF 1"). It is the **same six slots on every tank's** Batch Start screen, not a per-tank filtered list. A recipe that only exists above slot 6 will not appear here at all — it has to be moved into a bank slot first via

Setup → Formula Exchange (see 05-formulas-and-recipes.md §Formula bank exchange). If you have recently run formulas on this exact tank, a small **Recent for this tank** row above the list offers the top few as one-click shortcuts.

Choose splitting (optional)

Two independent **Splitting** cards let you route part of the batch to a second tank:

- **Splitting Type A** — No Splitting, or split with any *other* storage tank on the plant. The exact list is per screen, not fixed: Tank 1's Batch Start screen offers 2/3/4, Tank 2's offers 1/3/4, Tank 4's offers 1/2/3, and so on — whichever tank you're on is never in its own list.
- **Splitting Type B** — same choices, applied after Splitting A.

  Note: Splitting B can only name a tank if Splitting A also names one. The controller fills split stage A first and never reaches stage B if A is set to No Splitting — the screen blocks Start with an explanation if you try this combination.

Set the batch start type

- **No Batching**
- **Single Batch** (the default)
- **Continuous Batching** — the controller keeps batching this tank automatically once armed; hover the tooltip on screen for the exact behavior.

A separate line beneath the radio buttons (shown only when relevant) always reflects **what the controller itself currently reports** for this tank's batch type — that line is never suppressed by your own unsent selection, so you can never be shown "No Batching" while the plant is actually auto-batching.

Batch Volume and Batch Start Level

- **Batch Volume** is read-only — it mirrors the controller's own `Batch Size` value for the selected formula and cannot be typed into.
- **Batch Start Level** is the level you want the tank to start at. Type a value or use the ▲/▼ buttons. The field's range is shown underneath and the box turns red if your value is outside it.

Start Batch

Click the big **Start Batch** button. A confirmation dialog summarizes what is about to happen — tank, formula, batch volume, start level, batch type, and both splitting choices — with a green **Yes, start** and a grey **No, cancel**. **No** is the safe default (pressing Enter cancels, not starts).

> **Note:** The confirmation always names the *actual* tank the write will land on, resolved from the tank roster — after a Setup remap this can differ from the screen's on-screen slot number, and the dialog says so.

What happens after you confirm

Depending on the station's current mode, one of these happens:

Station state	Result
Read-only mode (the pre-cutover default)	A message confirms the batch was **validated but NOT sent** to the PLC, and nothing was armed.
Demo/training mode	A message confirms nothing was sent — the screen would otherwise look identical to a real write.
PLC not connected	A warning says the batch values were **not written** because the heartbeat isn't live.
Write-enabled, connected	The tank's configuration is written to the controller first; the arm command (`Start_Type`) is written **last**, a few seconds later, so the splitting configuration is always in place before the controller can begin.

Whenever the values on screen have been changed but not yet sent, an always-visible banner at the top of the screen says so in plain words — for example "PENDING — the values shown have NOT been sent to the PLC. Press START BATCH to send them." That banner is appended to, never replaced by, the read-only/not-connected notice, so both can show at once.

If Start Batch is disabled

Before you can even try, Ring checks the controller's own eligibility rule for this tank. If the controller reports the tank cannot be armed (or Ring has not yet been able to read that capability from the controller), the **Start Batch** button is disabled and a short red line beside it explains why. This is a display-only check; the write path re-checks the exact same thing itself.

What success looks like

The Start Batch button greys out, the batch status banner reads **"Running — Batch #<N>"** with a started-at timestamp, the ingredient table fills in line by line as each ingredient is dispensed, and a row appears immediately in the database so Batch Report / Batch History pick it up under today's date (source: OPERATOR_TRAINING_RUNBOOK.md §5.5 in the Ring repository).

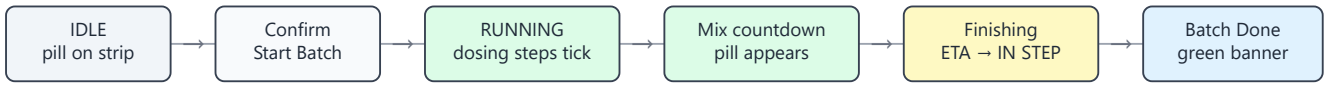
What failure looks like

- **"PLC not connected — batch cannot start."** — the screen's own banner, shown when the heartbeat isn't live; nothing is written. See 01-getting-started.md §PLC connection indicator.
- **Batch Start Level out of range** — the field itself turns red; the valid range is shown underneath it. See §Batch Volume and Batch Start Level above.
- **The tank isn't eligible to batch** — **Start Batch** is disabled with its own short red reason beside it, per §If Start Batch is disabled above — this is a controller-side fact (not installed, not a storage tank, or Ring hasn't read that capability yet), not something to work around by retyping values.
- **Nothing happens at all when you click Start Batch** — rare. Look for an exception dialog first; if there is none, navigate away and back to reload the screen. If it still does nothing, treat it like 07-troubleshooting.md §App frozen or crashed and escalate.

See also 07-troubleshooting.md §Batch won't start for this same list from the troubleshooting angle.

2.2 A normal morning batch, start to finish

This is what a typical, uneventful batch looks like once writes are enabled, moment by moment — useful the first few times you run one, so you know what "normal" feels like before you have to recognize "not normal."



The shape of a normal batch, left to right — matching the eight numbered steps below.

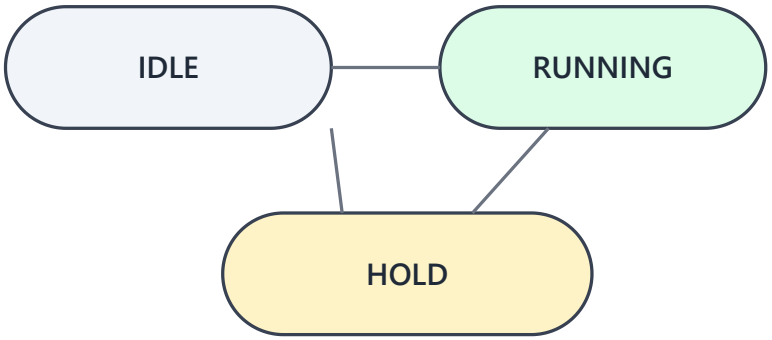
1. **Before you start anything.** Glance at the status strip along the bottom: the PLC dot should be green ("PLC Connected"), the batch pill should read **IDLE**, and the alarm-count pill should read **0**. If any of those are off, sort that out first — see 07-troubleshooting.md if the PLC dot is not green.
2. **Open Batch Start for your tank**, pick the formula, confirm the start level is sensible for the shift, and click **Start Batch**. Confirm the dialog.
3. **Within a few seconds**, the batch pill on the status strip flips from **IDLE** to **RUNNING**, and the Start Batch button greys out. If you are still on the Batch Start screen, its own banner clears — the "PENDING — not sent" text disappears because the values are now sent.
4. **Switch to the Dashboard** (or just watch the status strip from wherever you are). The formula panel's live step tracker appears, showing every step in the recipe with the current one highlighted gold. The first few steps are usually short dosing steps — you will see each one's row flip to a check mark in turn as it completes, with a real duration recorded next to it.
5. **A mix step starts.** The status strip's **mix countdown pill** appears next to the RUNNING pill, and on the Dashboard the Ingredient Addition and Mix Time progress bars fill in and the Mix Remaining number counts down. This is normal — a mix step is the one place you will see a countdown at all; Ring never shows a percent-complete or ETA for the whole batch on the live tracker itself, because step durations vary too much for that to be honest (the dedicated **Make Ready Tank** screen does show a whole-batch ETA, built from median historical durations for this recipe — see 03a-main-screen-reference.md §Make Ready Tank).
6. **The batch keeps stepping through** the recipe: dosing steps, mix steps, maybe a viscosity measurement step, until the final steps run. In the tail of the batch (after the last ingredient is dosed), the Make Ready Tank screen's ETA line swaps from "time remaining" to "time in step" — that is expected, not a fault; see 03a-main-screen-reference.md §Make Ready Tank.
7. **Batch Done.** The batch pill returns to **IDLE**, the Dashboard's formula panel switches to the idle "Formula Steps — Last Batch" view (no more Actual/Duration columns — see 03-screens-reference.md), and a green completion banner appears summarizing the finished batch. A row is already in the database — **Reports** → **Batch Report** or **Batch History Report** will show it under today's date immediately.
8. **Dismiss the completion banner** when you are done with it, or just leave it — it stays up until you dismiss it or the next batch starts, so there is no rush.

Throughout all of this, nothing about starting or watching a batch stops you from doing anything else in Ring — checking Alarms, opening a report, starting a *different* tank's batch — the screen is a window onto the controller, not a lock on it.

2.3 Monitoring a batch in progress, in detail

Three places show live batch state without you having to stay on the Batch Start screen, and it helps to know exactly what each one can tell you.

The bottom status strip (every screen)



HOLD overrides RUNNIN
the step index alone can'
show a hold.

All three pills dim and mark "STALE" after ~10s with no fresh PLC reading.

IDLE and RUNNING both defer to HOLD the moment the controller reports it — the pill never shows two states at once.

- **Batch state pill** — reads one of three words, not two:

Pill text	Meaning
IDLE	No batch step is active.
RUNNING	A batch step is active and the controller is not reporting a hold.
HOLD	The controller's own status word reports the system held — this **overrides** RUNNING even if a step index is still set, because the step number does not change while the plant is held and so cannot reveal a hold on its own.

- **Mix countdown pill** — visible only while a batch is active **and** a real countdown exists (never shown for an idle "0:00" or an unreadable value).
- **Active-alarm count pill** — a live count, red when non-zero. Clicking it jumps straight to the Alarms screen.

All three pills dim and grow a "STALE · as of HH:mm:ss" tooltip once the underlying PLC reading is more than roughly 10 seconds old — a visual cue that what you're looking at may be lagging, not necessarily wrong.

The Dashboard's live formula tracker

See 03-screens-reference.md §The formula/operations panel for the full breakdown of the step table, the stall-warning rule (a step running longer than roughly 2 minutes or 3× its own preset mix time turns amber), and the ON HOLD chip.

Main Screen → Storage Tank Group

A live multi-tank overview — level, temperature, agitator/heater state, and a color-coded state ring per tank (green idle / yellow batching / red fault). See 03a-main-screen-reference.md §Storage Tank Group for the full card layout (a shorter day-to-day summary also exists inside the app at **Help** → **Operator Runbook** §6.1).

You can navigate freely to other screens; the batch keeps running on the controller regardless of what Ring is showing.

2.4 Hold, Resume, Reset

NavBar → **Process** opens Hold, Resume, Reset and Alarms.

- **Which of the three you see is decided by the controller, not by what you pressed.** Ring decodes the controller's own system status word (`PC_Read_Integer[9]`) into one of three states — Waiting, Hold, or Running — and the Process popup follows it exactly: while the controller reports **Hold**, Ring shows **Resume** and **Reset** and hides **Hold** itself; the rest of the time (Waiting or Running) it shows only **Hold**. That means a plant held from the PanelView, the legacy HMI, or by the ladder logic itself (including on the controller's first scan) still shows Resume/Reset here — nobody had to press anything in Ring first. A **fault alone is not what shows Resume/Reset** — only the controller actually reporting Hold does.
- **Hold itself disappears while the plant is held** — that is the first thing to notice: if you don't see a Hold button, the plant is already on hold and Resume/Reset are showing instead. (If Ring cannot read the status word at all, Hold is shown anyway, fail-safe, so the one command that can never make things worse stays reachable.)
- **Hold** pauses the line. Safe to press at any time — any ingredient already dispensing finishes its drop, then everything pauses.
- **Reset** is offered, and may be sent, **only from Hold** — never while the controller reports Waiting (an idle plant) or Running. "Waiting" is not the same as "on hold": do not go hunting for a Reset button on an idle plant, because Ring will not show one.
- Every one of these three sends a real command to the controller once writes are enabled, and every one shows the same confirmation dialog first ("Send HOLD to the live PLC?" etc.) naming exactly what is about to happen.

The same day-to-day summary exists inside the app at **Help** → **Operator Runbook** §11, though its Resume/Reset wording predates this section and still describes the older, since-replaced local-flag behavior — this section and the controller's own status word are the current authority.

2.5 PLC connection loss mid-batch

A batch runs on the **controller**, not inside Ring — Ring is a window onto it. If the PLC link degrades while a batch is running:

1. The connection indicator and status strip pills reflect it immediately (see 01-getting-started.md). Numbers on screen freeze at their last good reading rather than jumping to zero.
2. Ring keeps trying to read; light polling continues through a brief **Stale** period (a few seconds without a fresh heartbeat), but heavier reads and any new **write** are held back once the link is fully **Starved** or **Disconnected**.
3. **Writes require a fully live link.** Even a merely "Stale" heartbeat is not enough to prove the controller's scan is actually advancing, so Ring refuses to send Start Batch, Hold/Resume/Reset, or any other command until the link shows fully Connected again.
4. The batch itself is unaffected on the controller side purely by Ring losing its view — the plant keeps running whatever it was doing. What you lose is Ring's live picture of it, not the batch.

   Warning: Never assume a batch has stopped just because Ring's numbers stopped updating. Check the connection indicator first. If it is genuinely down for more than a few minutes, follow 07-troubleshooting.md.

2.6 Stopping a batch you didn't mean to start

There is no separate "Cancel" or "Abort batch" button anywhere in Ring. If you started the wrong formula, the wrong tank, or the wrong start level, the only way to stop it is the same **Process → Hold** used for a normal process pause, followed by a decision about what to do next. This is the honest, code-verified procedure — read it now, not while you're standing at the screen wondering.

1. **NavBar → Process → Hold.** A dialog asks "This will send HOLD to the live PLC. Continue?" — click **Yes**. **No password is required for Hold** — it is deliberately the one process command available to anyone at any time, because making the process safe must never wait on a supervisor being present. Any ingredient already mid-drop finishes dispensing, then everything pauses.

2. **Confirm the hold actually landed** — watch the batch pill on the bottom status strip switch to **HOLD**; don't assume it worked just because the dialog closed. **Resume** and **Reset** only appear in the Process popup once the controller itself reports the system on **Hold** — Ring will not show them on the strength of your own click, and it will not show them for a merely idle (Waiting) plant either.

3. **Decide: resume, or abandon this batch.**

   - To carry on the same batch (you only needed to pause and check something), use **Resume**.
   - If you started the wrong formula, tank, or start level and want to abandon this batch entirely, use **Reset** — next step.

4. **Process → Reset**, to abandon the batch. Reset is only offered, and only accepted, **from Hold** — Ring refuses to send it while the system reports either Running or the idle Waiting state. Unlike Hold, **both Resume and Reset ask for a supervisor or admin password** before their confirmation dialog even

appears, because either one can restart or discard production. Confirm the dialog ("This will send RESET to the live PLC. Continue?").

5. **What Reset does.** Reset pulses the controller's own batch-reset command bit (`PC_Write_Integer[30].2`) — the ladder's long-standing "Batch Reset" function — clearing the hold/fault latch so a fresh batch can be armed on that tank.

   > **What this does NOT do:** Reset does not empty the tank, and it does not undo any ingredient that was already dispensed before you pressed Hold — that material is physically in the tank. If a meaningful amount was already dosed, treat the tank as "batch abandoned mid-recipe," not "empty," before deciding whether it's safe to re-batch or needs to be dealt with by hand.

6. **What you'll see afterward.** Ring has no single guaranteed status for a batch you Reset mid-run — what the row shows in **Batch History** / **Batch Report** depends on what the controller itself reports happened to it. You may see the batch close out as **Aborted** (the controller's own batch-complete data says so) or **Interrupted** (Ring's own bookkeeping closed a row it lost track of) — but it will **not** show as a normal **Complete**. If you need to be certain, look the batch number up (`Ctrl+B` — Go to Batch) and read its Status column rather than assuming.

7. **Write it up.** Note what happened in **Shifts** → **Handoff Notes** — which tank, the batch number if you have it, and what you told the next shift about the tank's actual contents. See 2a. Your shift, start to finish.

   Warning: Hold and Reset are process controls, not safety devices. If the situation is unsafe rather than simply "wrong recipe," use the plant's physical Emergency Stop, not this procedure — see 1. Getting started — What Ring is.

2a. Your shift, start to finish

The rest of this book is organized screen by screen. This page is organized the other way around: the two routines you actually run every day, pulled together from across the book so you don't have to hunt for them. Nothing here is new — every line links to the chapter that covers it in full.

Print this page, or keep it open, and tick items off as you go.

Start of shift

- ☐ **Pick your name.** Click the operator field on the bottom status strip and choose (or type) yours — see 1. Getting started §Tell Ring who you are. Do this even if the LCP was never rebooted; Ring remembers the *previous* operator's name until you change it.
- ☐ **Check the PLC dot.** Bottom status strip, should read green "PLC Connected." If it's anything else, see 1. Getting started §PLC connection indicator before doing anything else.
- ☐ **Check the alarm-count pill.** Should read **0**. If it doesn't, click it to jump to Alarms and see what's outstanding — see 4. Alarms and attention.
- ☐ **Read every banner across the top of the window**, not just glance at the color — yellow (demo mode), teal (read-only mode), red (degraded startup) each mean something different. See 1. Getting started §The main window layout.
- ☐ **Check Shifts → Shifts Control's 8-shift grid** for which shift is running. On most stations the **Start Shift N** / **End Shift** buttons are hidden (they need a separate controls sign-off most stations don't have — see 3b. Shifts Control) and the controller tracks shift boundaries on its own schedule; if your station is one of the few where those buttons are visible, use them the same way — starting a new shift automatically ends whatever was open.
- ☐ **Reports → Alarm History**, filtered to the overnight window, to see what fired while nobody was watching — see 06-reports-and-history.md §Alarm History.
- ☐ **Read the last Handoff Note**, if there is one — see 3b. Handoff Notes, or the latest note shown on **Shift Handover**.

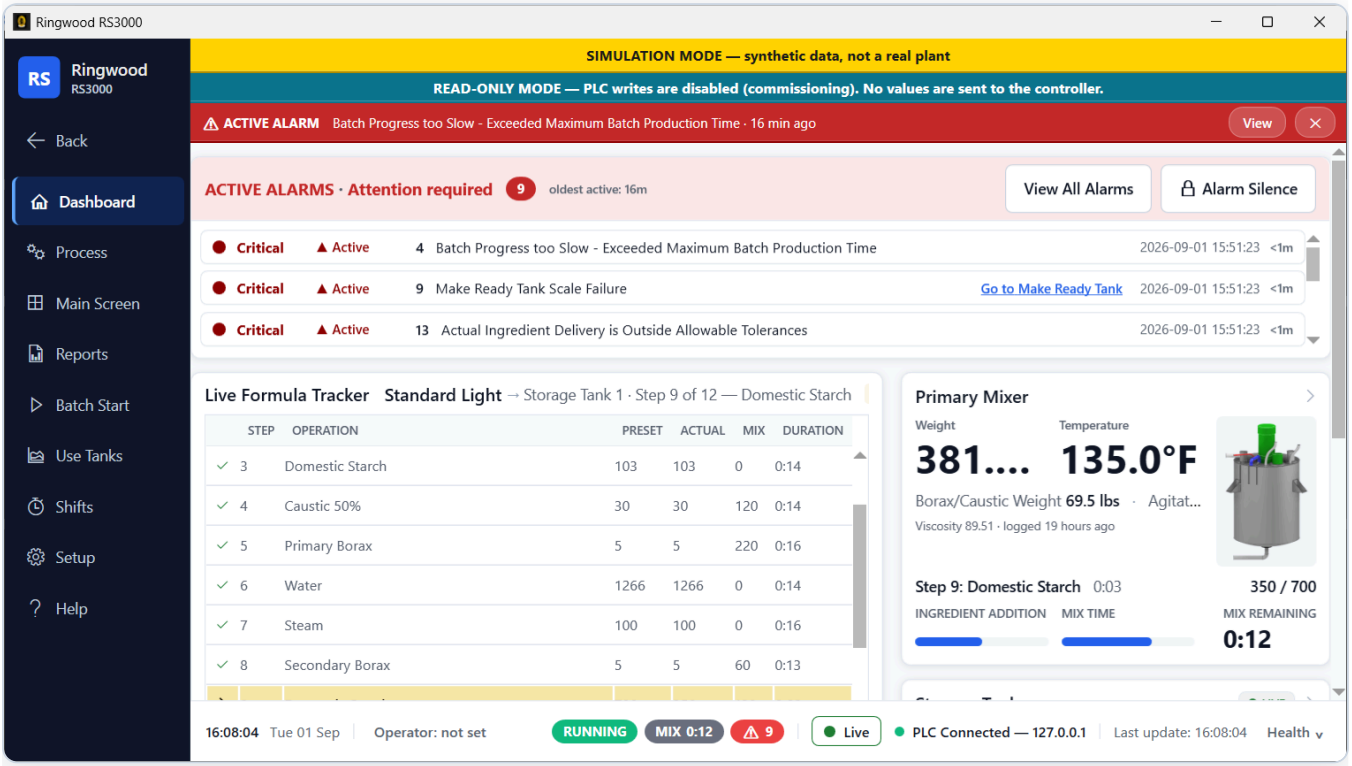
End of shift / handover

- ☐ **Confirm nothing is left in HOLD.** If a batch is on hold and you are not the one resolving it, say so explicitly to the next operator — don't assume the status strip alone will tell them. See 2. Running batches §2.4 and, if you started this hold to abandon a batch, §2.6 Stopping a batch you didn't mean to start.
- ☐ **Shifts → Handoff Notes.** Write down anything the next shift needs that isn't already in a report — a tank behaving oddly, an alarm you silenced but didn't fully resolve, a formula change in progress. See 3b. Handoff Notes.
- ☐ **Shifts → Shift Handover → Print** (or Refresh, if handing over on screen rather than on paper). Walk the next operator through the Batches, Alarms and Still Running tables — the Alarms table's amber State value ("dropped from the PLC's queue without resolving") is worth pointing out by hand,

since it doesn't look like an active fault at a glance. See 3b. Shift Handover.

- ☐ **Shifts → Production Log.** Enter the shift's produced square footage if that's tracked at this plant — see 3b. Production Log.
- ☐ **Say it out loud, not just on screen.** A note in Ring is not a substitute for telling the next operator directly if something is genuinely unresolved.

3. Screens reference — Dashboard



The Dashboard.

This chapter is split across three files because there is a lot of ground to cover in real detail, screen by screen:

- **3. Screens reference — Dashboard** (this file) — the landing screen, card by card.
- **3a. Main Screen reference** — the eleven equipment screens under the **Main Screen** NavBar button.
- **3b. Use Tanks, Shifts, Setup and Help reference** — everything else: Use Tanks, Process, Shifts, the Reports hub (indexed; full depth is 06-reports-and-history.md), Setup, the Setup Wizard, and Help.

For the exact menu contents (which button opens which popup, and which items are currently hidden at this plant), a menu map also exists inside the app at **Help** → **Operator Runbook** §2.1 (source: OPERATOR_TRAINING_RUNBOOK.md in the Ring repository), though it is regenerated less often than this manual. These three files instead answer, region by region: what is it for, what is actually on screen, what does each control do, what does healthy vs. unhealthy look like, and what mistakes to watch for.

Dashboard

Your default landing screen, opened at startup and by clicking **Dashboard** on the NavBar. It is deliberately compact — the screens you use all day (Batch Start, Storage Tanks, Alarms) are one click away on the NavBar, so the Dashboard's job is a single-glance summary, not a place you work from. It is laid out top to bottom as four bands: the **alarm band**, the **operations band** (formula tracker + tank rail), the **KPI strip**, and — on a freshly installed station only — a **names-import nudge** banner above everything else.

Names-import nudge (first-run only)

If this station has never imported tank names from the legacy system, a banner appears above the alarm band pointing you at **Setup → Legacy Import**. It carries a dismiss (✕) for the session — dismissing it does not import anything, it just quiets the reminder until next restart. You will not see this banner at all once names have been imported once.

The alarm band

A card that is **always present**, whether or not anything is wrong. It states plant health in one line, colors itself accordingly, and — only when there is something to show — drops a short list of alarms underneath.

Headline	Bar color	When it shows
"ACTIVE ALARMS · Attention required"	Red	One or more alarms are in the live (unresolved) band.
"ACTIVE ALARMS · All systems normal"	Green	The alarm list is genuinely empty **and** the PLC link is healthy.
"ACTIVE ALARMS · Alarm data unavailable"	Amber	The alarm list is empty, but only because the **PLC link is down** — this is deliberately never shown as the green all-clear.

A count pill sits beside the headline (grey "0" when clear, red otherwise), and — only while at least one alarm is active — a small "oldest active: 12m" readout shows how long the longest-standing fault has gone unaddressed. Two buttons live on the same bar:

- **View All Alarms** — jumps straight to the full Alarms screen (Process → Alarms).
- **Silence** — silences the currently active alarm(s) from the Dashboard itself, without navigating away. Disabled/gated exactly the same way as the Silence button on the Alarms screen — see 04-alarms-and-attention.md.

When the list drops down, each row shows: a severity dot + word (Critical/Warning/Info), a lifecycle chip (glyph + word — Active/Silenced/ Resolved, the same shape-plus-color convention used everywhere alarms appear), the alarm number and description, a one-tap **"Go to <screen>"** link when the alarm maps to a specific tank or system screen, and the time it was raised with a live "how long ago" readout. A resolved (cleared) row is visually dimmed so a page of cleared history reads calm, never like a wall of red. Clicking a row (not the "Go to" link) also opens the Alarms screen.

> **Note:** The row's **"Go to"** link only appears when the alarm maps cleanly to one screen (a specific tank, the Make Ready Tank, or the TVC). A plant-wide fault has no such link — that is expected, not a bug.

The formula/operations panel

This panel shows **exactly one** of two bodies, gated purely on whether a batch is currently running (`MakeReadyTankViewModel.CurrentStepIndex`), so "both" and "neither" can never both be on screen:

While a batch is running — the live step tracker. A table with one row per formula step: **Step**, **Operation**, **Preset** amount, **Actual** amount, **Mix** (preset time), and **Duration**. Each row carries a status glyph and color:

Row state	Glyph	Look
Complete	check mark	Muted grey text
In Progress	right arrow	Highlighted gold background, bold text
Pending (upcoming)	(none)	Dimmed
Stalled	(none — the In Progress row itself)	Amber background — see below

A step is flagged **stalled** when it has run longer than the greater of about 2 minutes or 3× its own preset mix time — this is a warning that something downstream may be stuck, not an error. Beside the formula name, an **ON HOLD** chip appears whenever a hold-related alarm is active, with the reason text next to it. A **destination arrow** ("SF 1 → Storage Tank 2") shows which tank this batch is filling, when the controller reports one.

While idle — the last batch's recipe, for reference only. The header changes to "Formula Steps — Last Batch" and the table drops the Actual and Duration columns entirely — this view is explicitly **not live**, it is a read from the local database of the most recently completed batch, so you can see what it looked like without implying the controller is doing anything right now. A **Start Batch** button appears in this state only, taking you straight to that same tank's Batch Start screen.

> **Warning:** Do not read the idle-state recipe table as a live batch. It has no Actual or Duration columns specifically so it cannot be mistaken for one — if you see those two columns, a batch really is running.

After a batch finishes, a one-line green completion banner ("Batch #123 complete — ...") stays visible until you dismiss it or the next batch starts, so a two-hour batch's result is not lost in the next screen refresh.

The Make Ready Tank card (right column, top)

A live snapshot of the mix tank, click-through to the full **Main Screen** → **Make Ready Tank** screen (see 03a-main-screen-reference.md). Reading it top to bottom:

- **Weight** and **Temperature** — the two largest numbers on the card.
- **Borax/Caustic weight** and the **Agitator** on/off state, on one quiet line.
- **A live vessel picture** beside the numbers, showing the tank's current operation (steam, discharge, agitating, etc.) — it fades between states rather than snapping, and it glows only while a batch is genuinely running. The glow — and the picture's freshness — turns off in three cases: the tank is idle, a hold-family alarm is active (a held batch is not "running"), or the batch data has gone stale. A frozen picture is deliberately dimmed so it never looks live when it is not.
- **When idle**, a plain "No batch running" line replaces the running-state detail below.
- **A stale-data caption**, shown only when the batch snapshot has stopped advancing — the same "batch data is stale" condition the dedicated Make Ready Tank screen flags.

- **Last logged viscosity** — a quiet line reading the most recent hand-typed viscometer reading for this tank from the database. It reads "Viscosity —" if nothing has ever been logged. This is never a live PLC reading — see 03a-main-screen-reference.md §Viscometer.
- **Early-warning chips**, shown only when a specific analytics threshold has been configured and tripped against a reference "golden batch" baseline — off by default, and entirely display-only.
- **Ingredient Addition** and **Mix Time** progress bars, and a **Mix Remaining** hero number — visible only while running, and dimmed together with the picture when the batch sample goes stale.

The Storage/Use tank rail (right column, below Make Ready Tank)

One card, click-through to **Storage Tank Group**, containing:

- **A freshness chip** in the header — a green dot + "LIVE", amber "STALE", or grey "NO DATA" label. This is the **one** PLC-freshness indicator for this whole rail; the tank art and gauges below dim together with it when data goes stale.
- **One row per storage tank actually installed** (a disabled tank's row simply is not there — the rail does not reserve blank space for it). Each row carries, left to right: a small live vessel picture, a level gauge, the tank's name with an agitator glyph (when running) and a **RECEIVING** chip (while this tank is the batch destination), a fill-percent + temperature readout on the right, and — underneath the name — the **tank's last completed batch** as one quiet line, with a delivered-vs-requested variance chip when there is a record. Clicking that line opens that batch's report. A tank with no PLC configuration at all (nominal size and target level both zero) shows a plain "not in service — no PLC" line instead of fabricated readouts.
- **A Use Tanks strip** underneath — four small tiles, always visible (no tab to click), each with a vessel picture, a level gauge, the tank name, and fill-percent + active formula. Use tanks have no continuous level instrument on this plant, so treat this fill-percent as indicative only, not a measured level — see 3a §Use Tank Group.
- **A TVC rail row** at the very foot — one line with the TVC vessel picture, the word "TVC", a **Heaters** state (accent-colored only while actually calling for heat), and the temperature on the right. Clicking it opens **Main Screen → TVC**.

The KPI strip

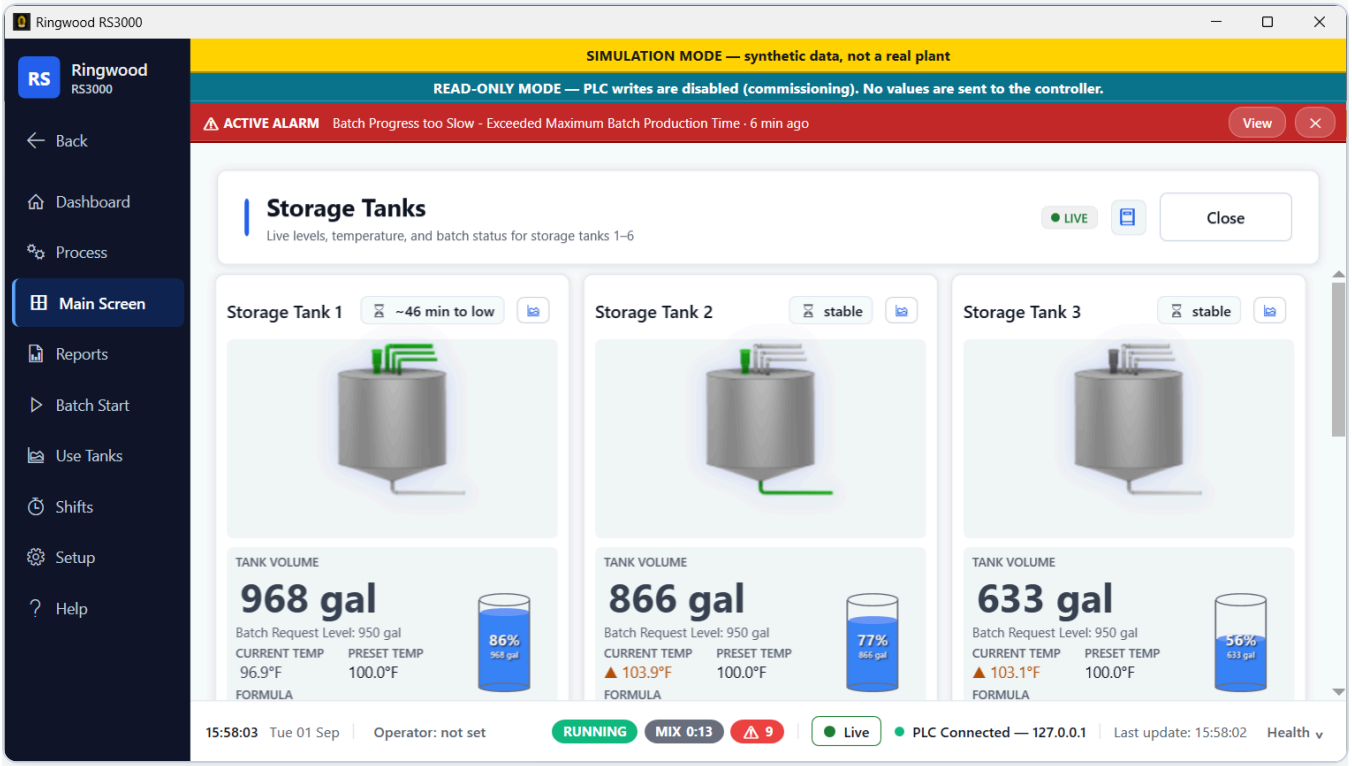
A single footnote-style row under the operations band — four label+number pairs, hairline-separated, plus an **Insights** button:

Cell	What it shows	Click goes to
Batches this shift	Count of batches started this shift	Reports → Insights (Glue Used card)
Dry starch this shift	**Derived**, not measured, dry-starch pounds used this shift	Reports → Insights
Soonest tank low	The one tank observed **actually descending** and projected to run low soonest — a flat, rising, or unreadable trend renders "No tank draining," never a falsely reassuring number	Main Screen → Storage Tank Group

Cell	What it shows	Click goes to
Batches queued	How many batches are queued on the planning board, plus what's next	Reports → Batch Queue Board

Each cell's tooltip carries the fuller explanation (e.g. the dry-starch derivation disclosure) so a sentence never has to be crammed into the quarter-width cell itself. **Insights** opens the full analytics page — see 06-reports-and-history.md §Spend, yield and usage.

3a. Main Screen reference



Main Screen → Storage Tank Group: every tank side by side.

NavBar → **Main Screen** opens a popup with the plant's **eleven fixed equipment screens**. One of them, the read-only **TVC** overview, is what stands in for the hidden **TVC Control** rail button (see below). Every screen here is opened as a full-page view with its own **Close** button; none of them block you from using the rest of the app while open.

Quick index — live vs. reference-only, at a glance:

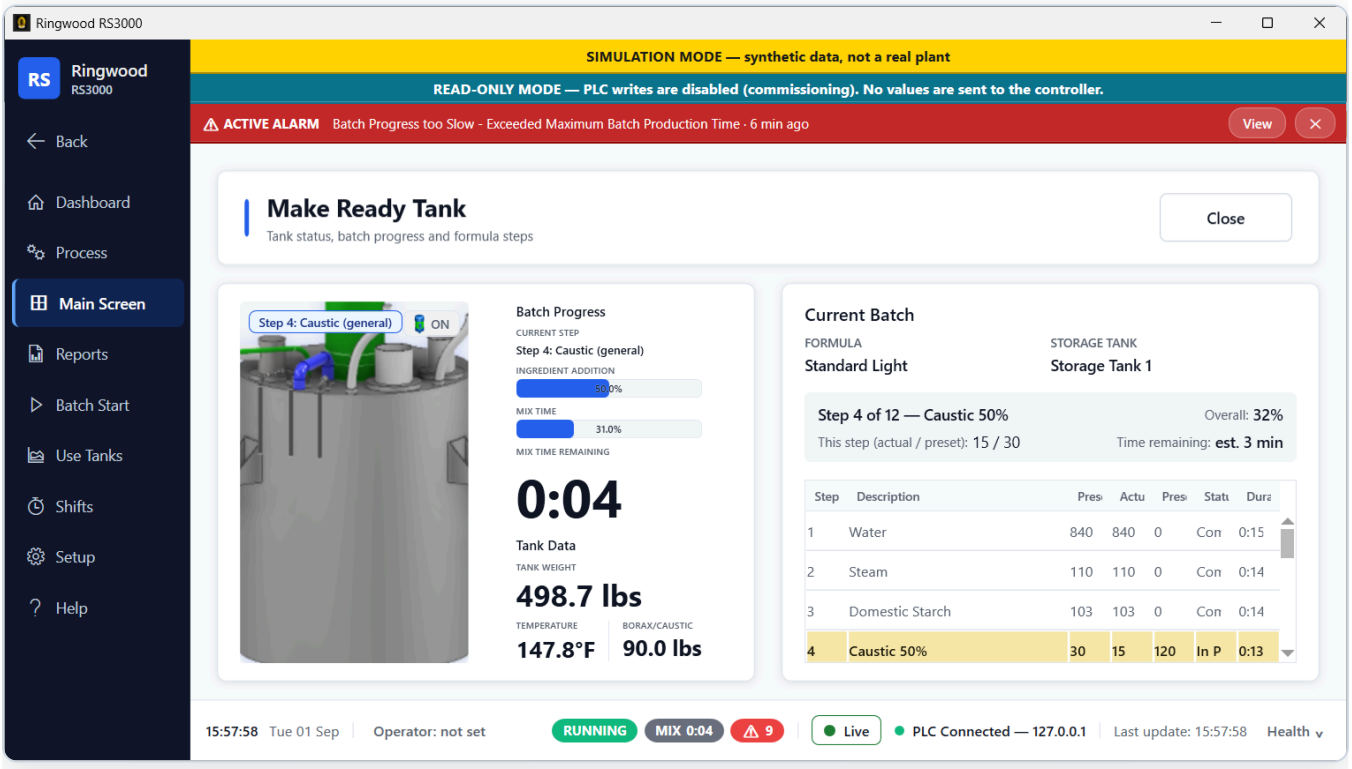
Screen	Live data?
Make Ready Tank	Yes
Storage Tank Group (+ Storage Tank Detail)	Yes
Use Tank Group	Yes
TVC	Yes, read-only
Live Process	Yes, read-only
Caustic and Borax	Partially — weight is live, heat-tracing temperature and the component list are not instrumented
Receiving Hopper	**No — names only, no live signal**
Receiving Verification	Manual entry, database-only
Silo	**No — names only, no live signal**

Screen	Live data?
Bulk Caustic Tank	**No — names only, no live signal**
Viscometer	Manual entry + calculation

> **Note:** Three screens (Receiving Hopper, Silo, Bulk Caustic Tank) show their equipment by **name only**, with no status light of any kind. This is deliberate: none of that equipment has a commissioned PLC tag behind it, and a column of identical "unavailable" badges would read as a fault rather than as "not watched." Each screen says so directly in its own caption. Do not read the absence of a status light on these three screens as a problem.

Make Ready Tank

Purpose: the dedicated, full-detail view of the mix tank — level of detail beyond what the Dashboard's Make Ready Tank card can show.



Left: the vessel picture, Current Step, the Ingredient Addition/Mix Time bars and the Mix Time Remaining countdown. Right: the batch's progress strip, formula and destination tank, and the Formula Steps table.

Layout: two cards side by side.

- **Left card** — the live vessel picture, large, with two overlays: a step callout chip (top-left, the current step's name) and an agitator status chip (top-right, green/red motor icon + on/off word). Both collapse when there is nothing to show (idle, or the agitator is untracked).
- **Right card, top half — Batch Progress:**
  - A stale-data warning line (shown only when the batch snapshot has stopped advancing).

    - **Current Step** (name).
    - **Ingredient Addition** and **Mix Time** progress bars.
    - **Mix Time Remaining** — the single largest, most-watched number on this screen.
    - **Tank Weight** — the primary process value on this screen, sized to never clip even for a wide metric value.
    - **Temperature** and **Borax/Caustic weight**, side by side with a hairline divider between them so they cannot be misread as one number.
- **Right card, bottom half — Current Batch:**
    - **Formula** name and **Storage Tank** destination.
    - A progress strip: "Step 3 of 9 — Domestic Starch", an **Overall %** complete figure, the current step's actual-vs-preset amount, and an **ETA** ("est. 12 min") for the whole batch — or, during the batch's finishing phase (the tail steps after the last dosed ingredient), the label swaps to "IN STEP" with the elapsed time in that step instead, because a fixed "time remaining" label would be misleading once nothing is actually being dosed.
    - The full **Formula Steps** table (Step / Description / Preset / Actual / Preset Time / Status / Duration) — the same step-tracker language used on the Dashboard, with the current row highlighted gold.
    - An empty-state message ("No batch loaded") replaces the table when nothing has run yet.

  Note: This screen carries **no Emergency Stop and no Pause/Resume button**. Earlier drafts of the app had both, but neither was ever backed by a real command — Emergency Stop had no handler at all, and Pause/Resume only relabelled itself without touching the controller, which would have given a false sense of control. Both were deliberately removed. Use **Process → Hold** for a real, PLC-backed pause (see 02-running-batches.md §2.4).

Storage Tank Group

Purpose: all storage tanks at a glance, one card per tank, arranged in a single row (4 tanks) or two rows (5–6 tanks, roster-dependent). A group-wide **data freshness chip** (green LIVE / amber STALE / grey NO DATA) sits in the header — pinned there rather than inside the scrollable card area, so it never disappears from view.

Each tank's card, top to bottom:

- **Header** — the tank's name, a **time-to-low** trend readout (a prediction, not a live PLC value — computed from observed level descent), and a small trend-chart button.
- **Vessel picture** — a state render (idle/agitating/filling/etc.), fading between states.
- **Data well:**
    - **Volume** (the glance value, large) with a color-coded state glyph (based on level), plus the batch **target level** underneath it.
    - **Current Temperature** and **Preset Temperature**, each with its own state glyph.
    - **Formula** — the recipe currently associated with this tank.
    - A **level gauge** on the right, spanning the whole data well.
- **Sensors, valves and pumps** — an inline row of chips (not a button that opens a popup) for the tank's agitator and other equipment. The agitator chip carries live PLC status; the others show "no signal" honestly where no tag is commissioned, rather than a fabricated state.

> **Note:** A tank's colored state ring (green idle / yellow batching / red fault, also described inside the app at **Help** → **Operator Runbook** §6.1) is the level-state glyph on the Volume readout — there is no separate "click to drill in" detail window from this screen for tanks 1–4. For tank slots 5 and 6 (where enabled), Batch Start routes to a dedicated detail screen instead — see below.

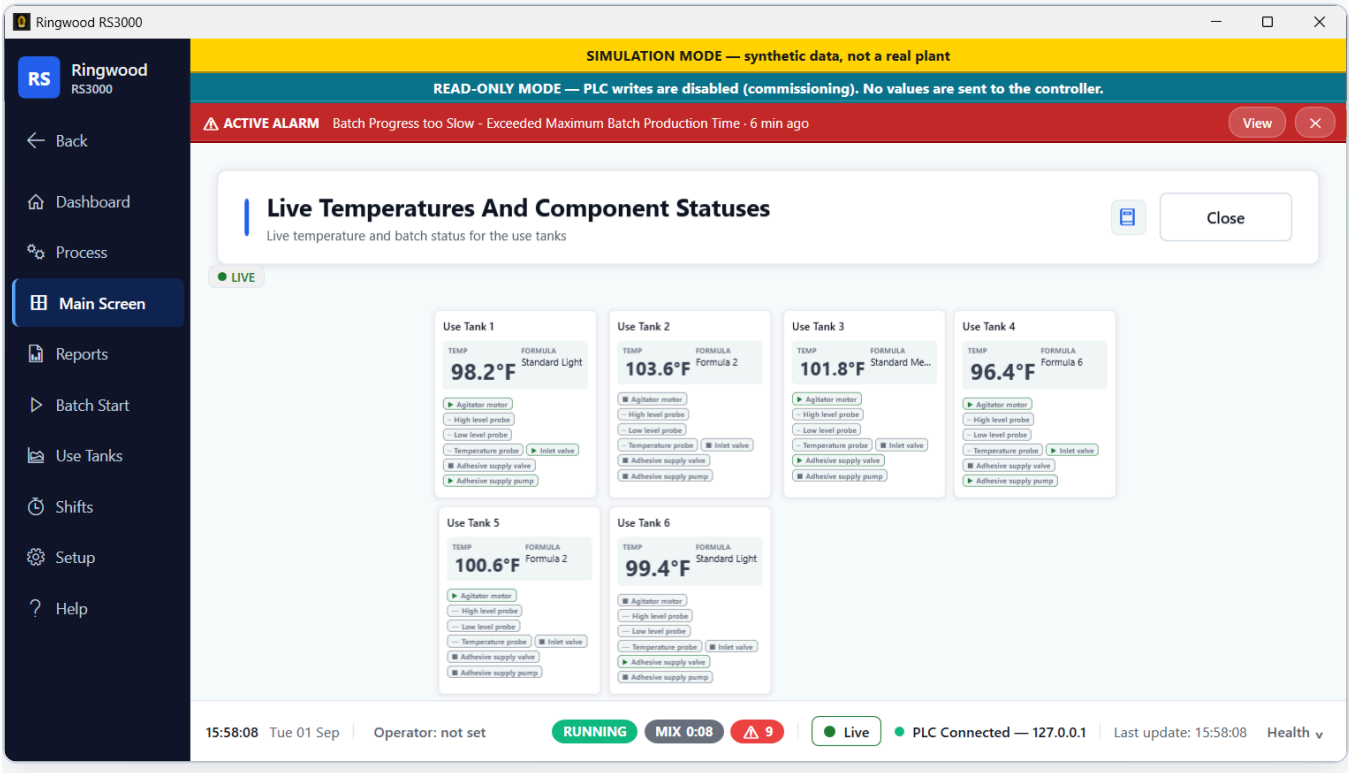
Storage Tank Detail (slots 5 and 6)

Purpose: a plain, read-only detail card for a storage tank slot that has no dedicated legacy Batch Start screen (slots 5 and 6, when your plant's roster enables them). Reached from **NavBar** → **Batch Start**, not from Storage Tank Group.

What you see: a loud, persistent read-only banner reading "Detail-only slot — read-only. Batch start and TVC control are not available for this tank." (this screen has **no write controls and no batch-start button at all** — it is a viewer, not a starter), then a single card with **five tiles**: **LEVEL**, **FILL**, **TEMP**, **FORMULA**, and **NOMINAL SIZE** (those are the on-screen labels verbatim).

Use Tank Group

Purpose: live temperatures and component status for the use (doser) tanks the line actually draws from — the screen's own subtitle is "Live Temperatures And Component Statuses."



Use Tank Group: no level readout on this screen at all, by design — see the note below on where a use-tank level number does show up.

Layout: up to four cards in a row (more, in a second row, on a roster with more than four dosers). Each card:

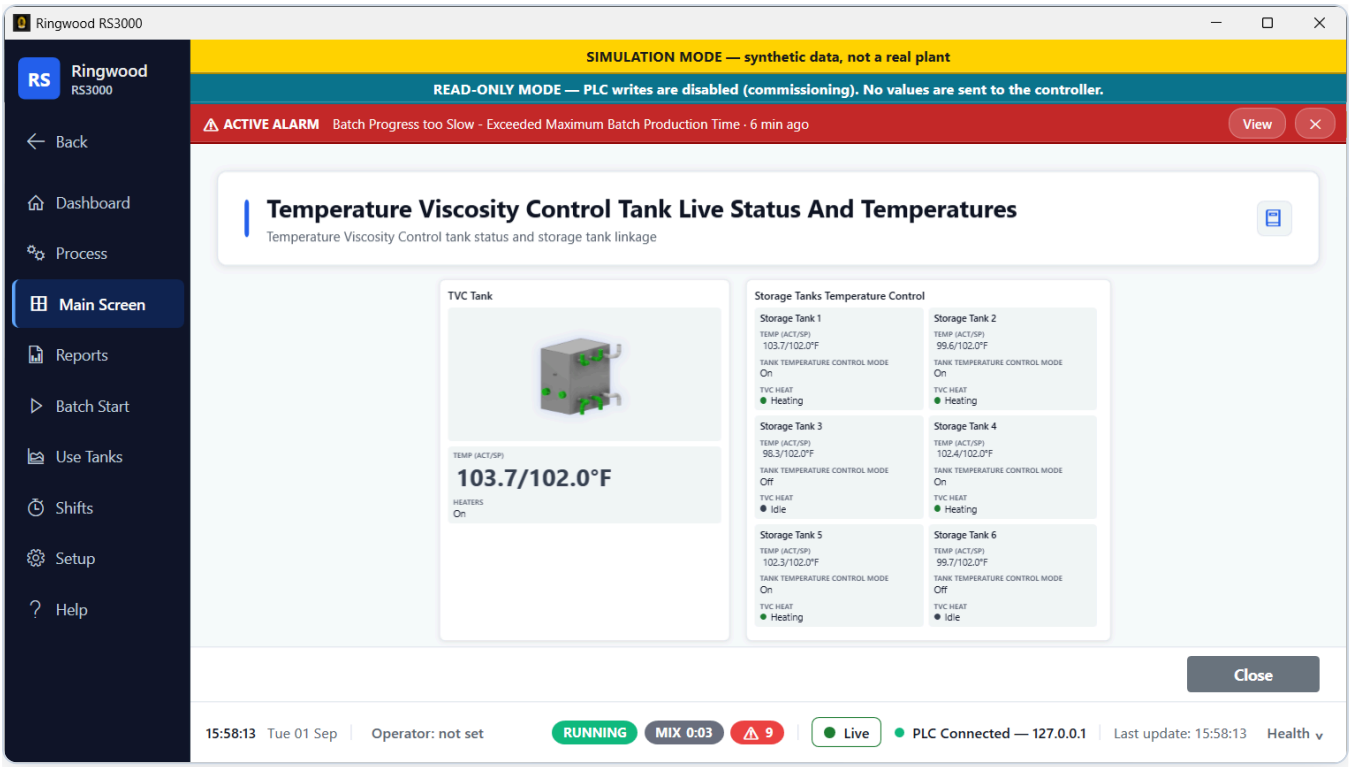
- **Vessel picture** — a state bitmap only. Use tanks have **no continuous level instrument** on this plant, so unlike storage tanks there is no proportional fill bar and no numeric level readout anywhere on **this** screen.

  > **Note:** This applies to this screen specifically, not to use tanks everywhere in the app. The Dashboard's use-tank tiles and **Use Tanks** → **MF 1**'s Live Tank Data card *do* still show a Level / fill-percent number, read from the controller anyway — treat those as indicative only, never as a measured level. Temperature and the device chips are the trustworthy values on a use tank. See 3b §Use Tanks.

- **A heat badge**, overlaid on the picture, appearing only while that tank is actively heating — the picture's own heater cue is a tiny nozzle graphic that is not legible at this size, so the badge exists specifically to make that state visible.
- **Temperature** (glance value, with a state glyph) and **Formula**, side by side.
- **Sensors, valves and pumps**, inline — agitator, inlet valve, adhesive supply valve, and adhesive supply pump all carry live PLC state; this is the one device table on this screen you can actually read at a glance without opening anything.

TVC

Purpose: the read-only Temperature/Viscosity Control overview across the whole TVC system — the screen you should use day to day in place of the hidden TVC Control write screens.



Left: the TVC vessel's Temperature (actual/target) and Heaters state. Right: one tile per storage tank with its own Temperature, Temperature Control Mode, and Jacket Water indicator.

Layout: two cards.

- **Left — TVC Tank:** the main TVC vessel picture, its **Temperature** (with state glyph), and its **Heaters** status.
- **Right — Storage Tanks Temperature Control:** one tile per storage tank roster slot, two-up, each showing: **Temperature** (with state glyph), **Temperature Control Mode**, and a **TVC pump** indicator (colored dot + word — never color alone).

A tank slot with no live data shows an honest em-dash rather than a confident zero.

Live Process

Purpose: the whole plant drawn as one product-flow train, left to right — **Supply** → **Mixing** → **Distribution** — entirely **read-only**: there is no command, no button, and no PLC write anywhere on this screen.

What you see, left to right:

- **Supply column:** Silo, Receiving Hopper, Borax + Caustic, and Bulk Caustic Tank, each with a small vessel picture and a connector line to the mixer. A connector only lights up while a fresh controller reading confirms product is actually moving through it — stale, unread, or all-zero-but-fresh data all render as the dim idle segment. The connector out of Bulk Caustic Tank is drawn permanently dim: no tag on this controller reports that replenishment transfer, so the screen says so in the tooltip rather than pretending it is live.

- **Mixing (hero) column:** the same Make Ready Tank vessel picture, larger, with the current step callout, the agitator badge, the Ingredient Addition/Mix Time bars, and Weight/Temperature mini-stats — a compact version of the dedicated Make Ready Tank screen. A brief water/steam/ additive inlet indicator appears above it only while that utility is actually charging.
- **Distribution column:** a row of storage-tank tiles (with a RECEIVING chip on whichever one is the live batch destination), the TVC skid, and a row of use-tank tiles with a connector down to "→ Corrugator" underneath.

A batch strip at the very bottom (outside the scaled area, so its text is never shrunk) repeats the RUNNING/IDLE pill, the current step position, and Mix Time Remaining, plus a **STALE** badge when the underlying data has gone quiet — the same wording used on the Make Ready Tank screen.

> **Note:** Every connector on this screen — including the TVC heat leg and the tank discharge legs — goes dark the instant its own feeding poller stops delivering fresh data, even if the last known state was "flowing." A connector is never left showing a frozen "on" state.

Caustic and Borax

Purpose: a mixed screen — one live number, one explicit "not instrumented" placeholder, and a reference-only equipment list. Read all three parts before trusting anything on it at a glance.

- **Left card** — an equipment diagram (static picture, for orientation only).
- **Right card:**
  - **Weight** — this **is** live, reading the caustic/borax weigh tank/hopper.
  - **Heat tracing temperature** — reads a plain "Not instrumented" label. No PLC tag exists for this reading; the screen states that fact outright rather than showing a permanently blank field that looks broken.
  - **Sensors, valves and pumps** — twelve devices listed by name only, with the same "not commissioned, no status shown" caption used on Receiving Hopper / Silo / Bulk Caustic Tank below.

Reference-only equipment screens (Receiving Hopper, Silo, Bulk Caustic Tank)

Three screens share one convention: they show their equipment by **name only**, with no status light of any kind, because none of that equipment has a commissioned PLC tag behind it. A column of identical "unavailable" badges would read as a fault rather than as "not watched," so each screen instead states the fact directly in its own caption. Do not read the absence of a status light on any of these three as a problem — it is deliberate, not a gap.

Screen	Devices listed (name only)	Extra field
Receiving Hopper	High-level probe, fluidizer, diverter valve, domestic starch auger, two starch valves (6)	—

Screen	Devices listed (name only)	Extra field
Silo	Conveying blower, rotary airlock, air pad blower, three level probes/transmitters (6)	"Silo Domestic Starch Level" reads "Not instrumented"
Bulk Caustic Tank	Overfill probe, leak detector, high/low level switches, and others (8)	—

Receiving Hopper

Purpose: a reference card for the receiving hopper's equipment, plus a direct hand-off into Receiving Verification for logging a delivery.

- **Left card** — an equipment diagram.
- **Right card** — the six devices in the table above, name only.
- **Footer** — a **Record a bulk delivery** button that opens Receiving Verification directly, plus **Close**.

Receiving Verification

Purpose: the manual-first bulk-delivery reconciliation workflow — record what the bill of lading said against what was actually blown in, and see the variance immediately. This screen performs **zero PLC reads and zero PLC writes** — it is pure manual entry, saved to the local database.

Entry form fields: Expected (BOL) weight, Blown-in (actual) weight, Supplier, BOL number, Received date, Received time, Entered by, and Notes.

Live variance preview, updated as you type: **Variance**, **Variance %**, **Tolerance**, and a plain-language **Verdict**. If no tolerance percentage has been configured for this plant (**Setup** → **Analytics**), the caption says so directly — the verdict is never shown as "within tolerance" by default when no one has actually set a tolerance.

Recent events grid below the form: When, Supplier, BOL Number, Expected, Blown-in, Variance, Variance %, Tolerance, Verdict, Entered by, and Notes — with **Refresh** and **Export CSV** buttons.

> **Note:** Weights on this screen follow your display-unit preference for entry and display, but are stored as native pounds — the same "pounds are the truth" rule that applies to formulas; see 05-formulas-and-recipes.md §Units.

Silo

Purpose: a reference card for the silo's equipment — same two-card shape as Receiving Hopper, plus the one extra field in the table above.

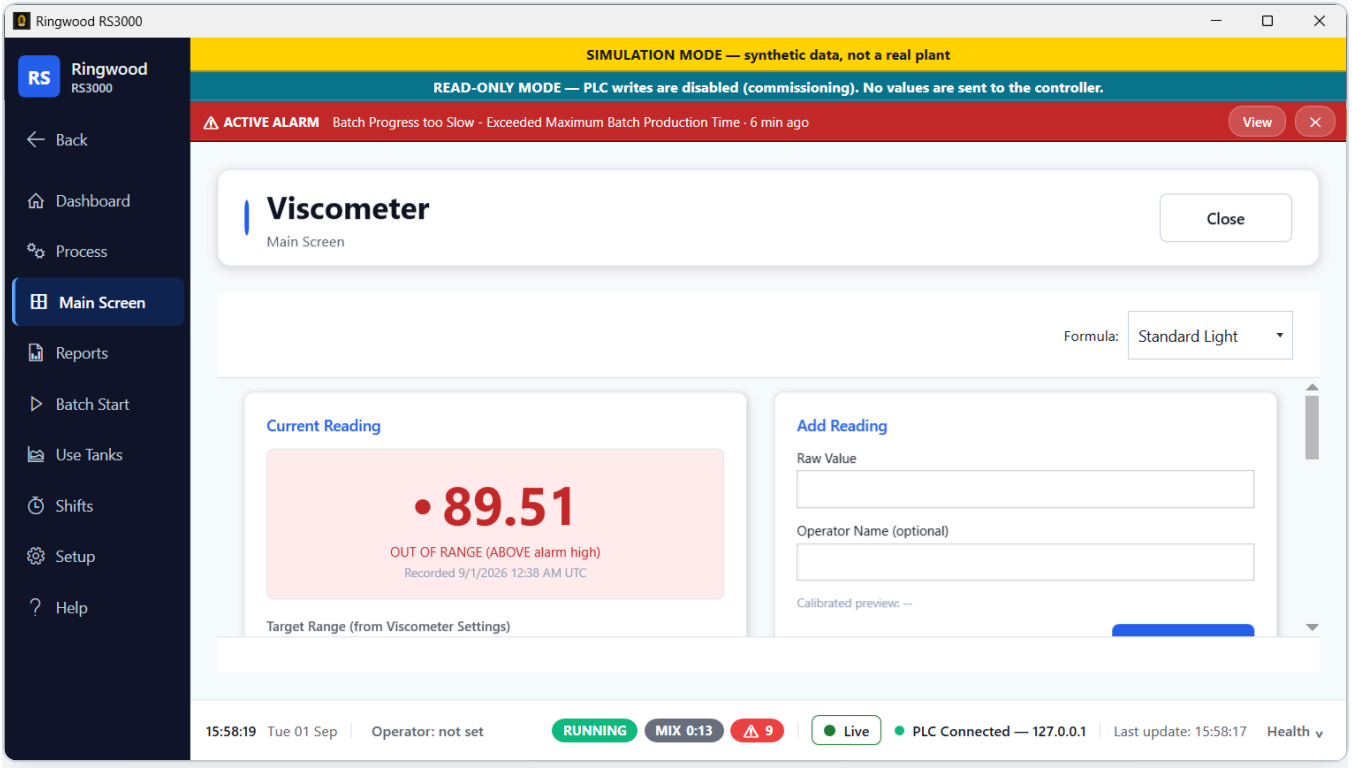
- **Left card** — an equipment diagram.
- **Right card** — the "Silo Domestic Starch Level" placeholder, followed by the six devices in the table above, name only.

Bulk Caustic Tank

Purpose: a reference card for the bulk caustic tank's equipment — the same shape again, with the eight devices in the table above, name only.

Viscometer

Purpose: the manual viscosity workflow — the plant measures viscosity by hand (or with an offline device) and types the result in here.



Current Reading (green check = in range) on the left; on the right, type the Raw Value and watch the Calibrated preview update before pressing Record Reading.

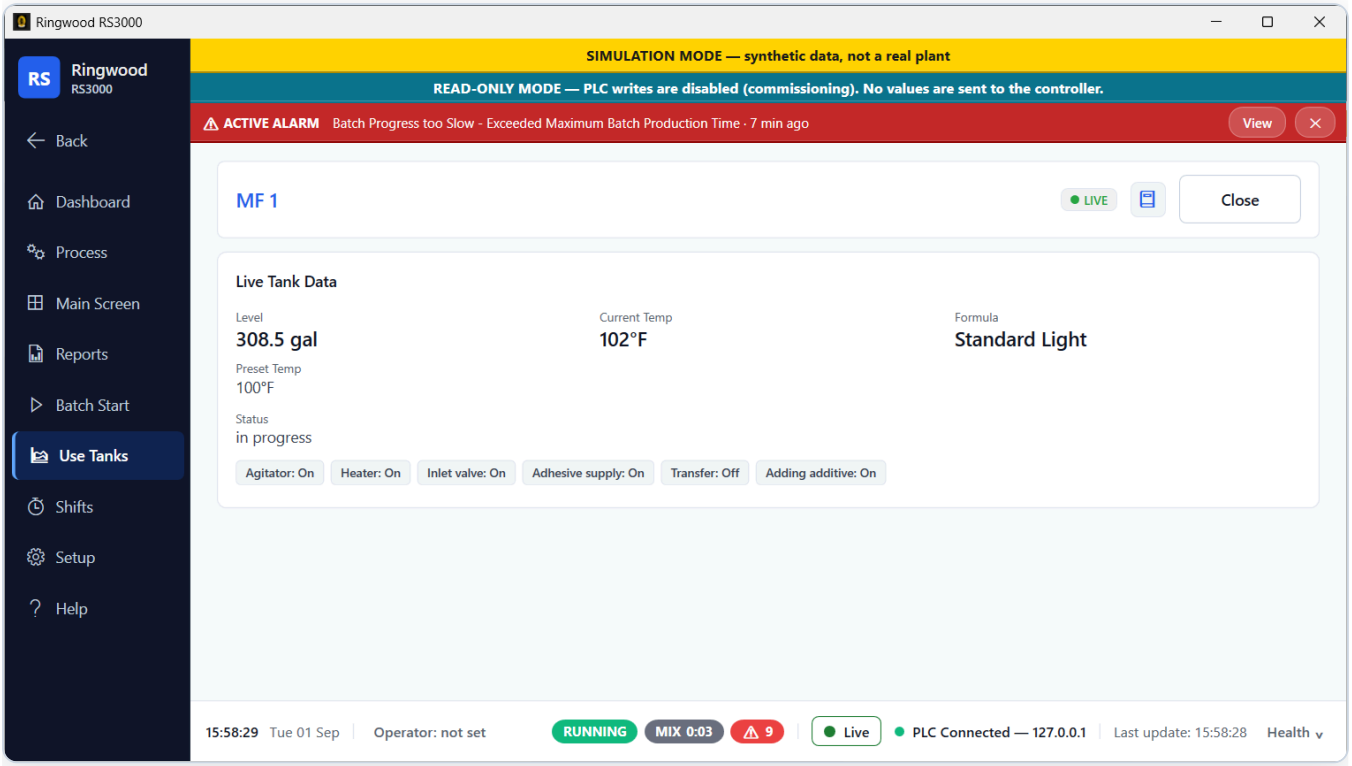
- **Header:** a **Formula** picker.
- **Left card — Current Reading:** the most recent reading for the selected formula, a state glyph (warning/alarm/ok — never color alone), the timestamp, and the configured **Alarm Low / Alarm High** target band. A calibration summary line at the bottom reads "Calibration: none (showing raw value)" when no calibration coefficients are set for this formula.
- **Right card — Add Reading:** a **Raw Value** field, an optional **Operator Name** field, a live **Calibrated preview** as you type, and a **Record Reading** button.
- **Bottom — Recent Readings:** a small SPC (statistical process control) trend chart of recent calibrated readings against the alarm band, and a history grid (Recorded (UTC), Raw, Calibrated, Operator) for up to the last several readings.

Calibration coefficients themselves are edited under **Setup** → **Formula Edit** → **Viscometer Settings** (supervisor-gated) — a walkthrough also exists inside the app at **Help** → **Operator Runbook** §9.5.

TVC Control (hidden)

One more NavBar rail button, **TVC Control** — it sits between Batch Start and Use Tanks — exists in the software but ships hidden (`Collapsed`/ disabled) — its per-tank screens contain a real write path to the controller and are held back pending a commissioning decision. The read-only **TVC** overview above covers the same tanks without that write surface, and is what you should use day to day.

3b. Use Tanks, Shifts, Setup and Help reference



The MF1 Use Tank window.

Continues from 3. Screens reference — Dashboard and 3a. Main Screen reference.

Use Tanks

NavBar → Use Tanks currently offers one screen, **MF 1** (two further slots, MF 2 and Double Backer, exist in the software but ship hidden at this plant).

Header: the tank's label, a per-slot **data freshness** chip (green LIVE / amber STALE / grey NO DATA — distinct from the global PLC banner, because a single field can drop out even while the overall link is fine).

Live Tank Data card: Level, Current Temperature, Formula (top row); Preset Temperature (second row); Status (third row); then a wrapping row of text-based activity chips: **Agitator**, **Heater**, **Inlet Valve**, **Adhesive Supply**, **Transfer**, and **Adding Additive** — each reading On/Off/—. If the slot has no roster configuration at all, a plain "slot empty" message replaces this whole card.

> **Note:** Use tanks have **no continuous level instrument** on this plant (see 03a §Use Tank Group). This screen's **Level** field, and the Dashboard's use-tank tile fill-percent, are both read from the controller and shown anyway — treat them as indicative only, never as a measured level. Temperature and the device chips are the trustworthy values on a use tank.

Tank Controls and Tank Agitator Controls cards — two cards at the foot of the screen for setting additive selections (three additive slots, each a choice of None/WRA/WPA/a third named additive) and agitator behavior (Automatic/Manual/Off mode, plus preset on/off timer minutes).

> **Warning:** These two control cards are **completely hidden** while Ring is in read-only mode — you will not see them at all until the plant's write-enabled cutover. Once writes are enabled, they appear and are real PLC writes: changing an additive selection or the agitator mode sends a command to the controller. A **setpoint status** line under the agitator controls shows "reading…" while Ring confirms the current values by reading them back from the controller, and a **Retry** button appears if that read-back fails — the controls stay locked until the read-back succeeds, so you are never editing against an unconfirmed baseline.

A separate, more tightly gated **formula re-select** control (choosing which of formulas 1–6 this use tank draws from) exists inside the Tank Controls card, but it ships **hidden entirely** — you will not see a formula control on this screen at all, even after the two cards above become visible. It appears only once the separate `EnableUseTankFormulaWrite` sign-off flag has been turned on for this station, and even then it stays greyed out (with a tooltip explaining why) unless read-only mode is also off and this slot is mapped to a PLC tank index.

Process

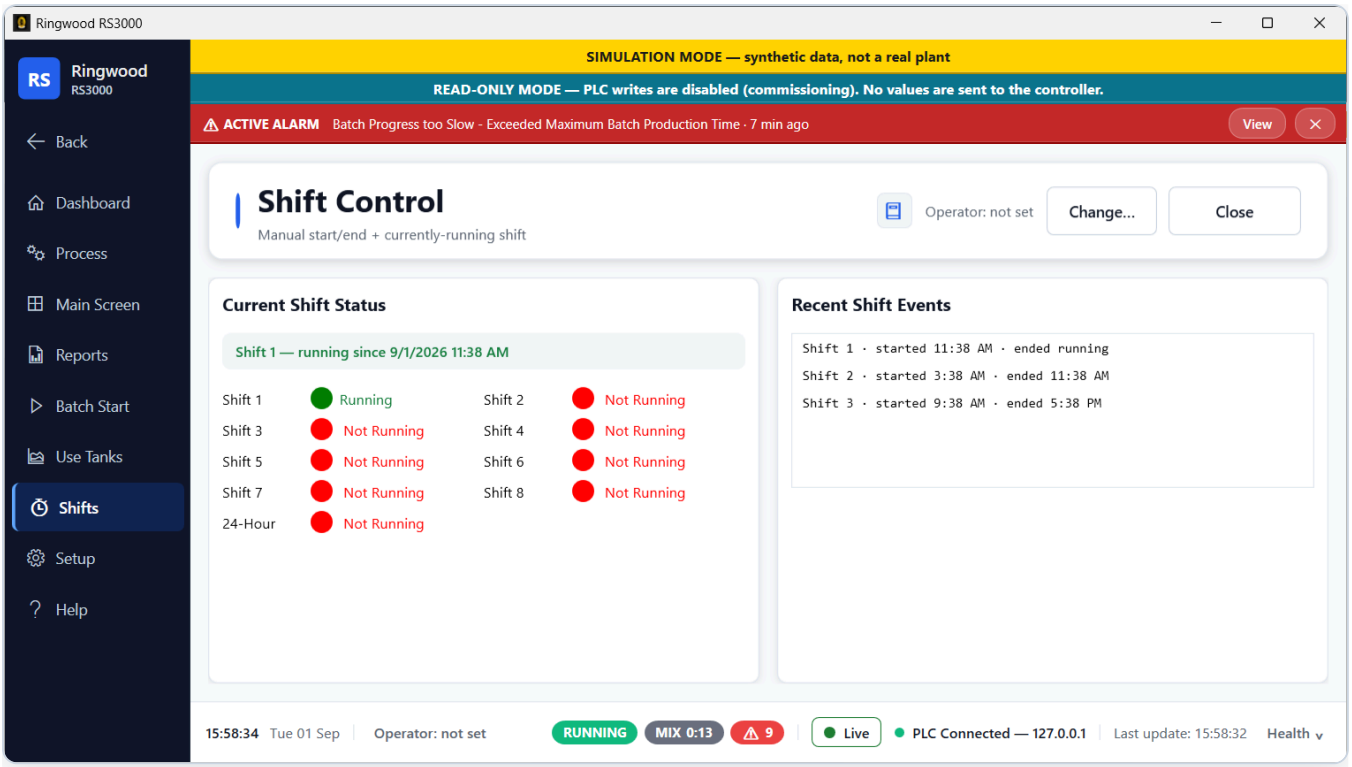
NavBar → **Process** is the line-control popup: **Hold**, **Resume**, **Reset**, and **Alarms**. Hold/Resume/Reset are covered in 02-running-batches.md §2.4; Alarms is covered in 04-alarms-and-attention.md.

Shifts

NavBar → **Shifts** groups four screens.

Shifts Control

Purpose: manual shift start/end, for the unscheduled cases (early start, late finish, emergency shift change) — the controller also tracks shift boundaries automatically per the schedule in Setup, so this screen is the manual override, not the primary mechanism.



The 8-shift status grid (red = Not Running, green = Running) with the shift picker and Start button below it, and Recent Shift Events on the right. The "Tank Shift Inclusion" panel is labelled "not yet enabled" on the screen itself — read that literally, not as a fault.

What you see:

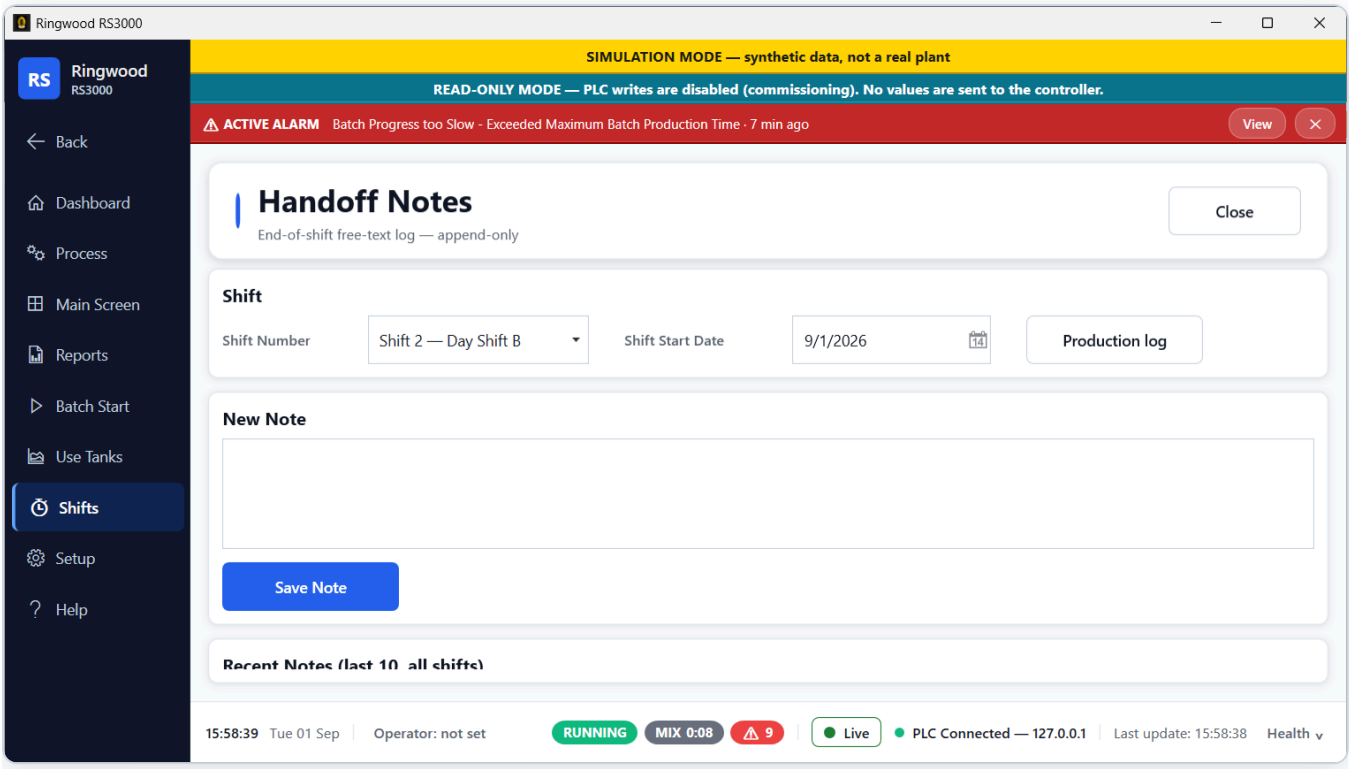
- The **current open shift** banner (or "No shift open").
- An **8-shift status grid**: Shift 1 through Shift 8 plus a 24-Hour row, each showing Running/Not Running in red or green text.
- A **shift picker** (radio buttons, one per slot) that selects which shift the Start/End buttons below act on — the Start button's own label follows your selection ("Start Shift 2", etc.).
- **Start Shift N** and **End Shift** buttons.
- An inline notice line for feedback ("No shift currently open", etc.).
- On the right, a **Recent Shift Events** list — a plain chronological log of start/end events, newest first, with an explicit empty state ("No events yet") when nothing has happened yet on this station.

  Warning: Like the Use Tank control cards above, the **shift picker** and the **Start Shift N** / **End Shift** buttons are **completely hidden** until BOTH read-only mode is off AND the separate `PlcSettings.EnableShiftControlPlcWrites` sign-off flag is turned on for this station. That flag ships **off** and is not even present in `appsettings.json` by default, so it does **not** turn on at the 2026-09-08 write-enabled cutover either — it needs its own, separate sign-off. Until then, this screen is a **read-only status board**: the 8-shift grid and Recent Shift Events still work, but there is no button on it that starts or ends a shift.

  Note: Once the buttons above are available, starting a new shift **automatically ends** whatever shift is currently open first — you do not need to End Shift yourself before Starting the next one (source: OPERATOR_TRAINING_RUNBOOK.md §8.2 in the Ring repository).

Handoff Notes

Purpose: a free-text end-of-shift log for anything the next operator needs to know that does not fit a report.

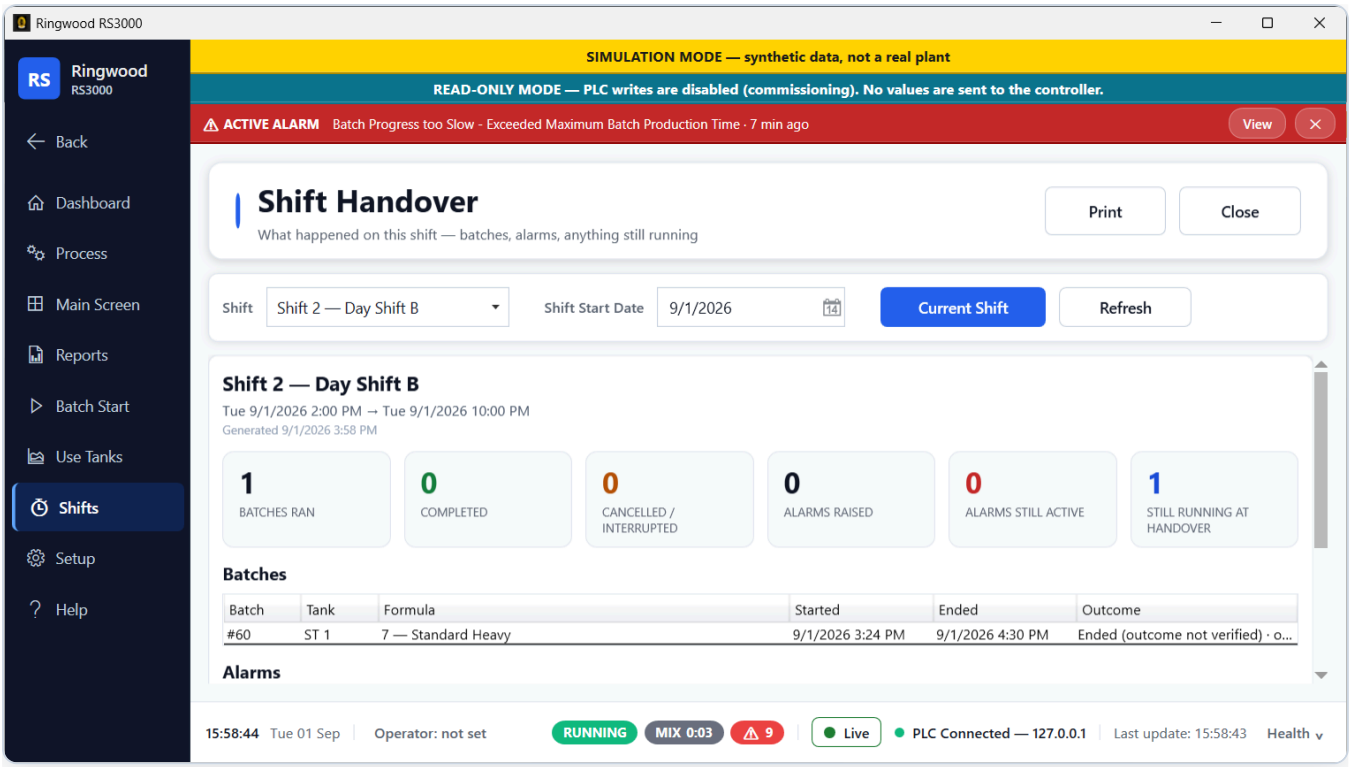


Pick the shift and date, type the note, Save — the Recent Notes grid below shows shift, start, and a preview of each note logged so far.

What you see: a **Shift** picker, a **Shift Start Date** picker, an **Open Production Log** button (jumps to the Production Log screen below), a multi-line note box, a **Save Note** button, and a **Recent Notes** grid (Shift, Started, Note preview with full text on hover, Created) with an empty-state message when nothing has been logged.

Shift Handover

Purpose: a read-only, printable summary of one shift — meant to be read (or printed and handed over) at shift change, not edited.



The screen before you pick a shift — "No shift window — pick a shift and start date above." Once a shift with data is selected, this same space fills with the six-tile KPI strip and the Batches/Alarms/Still Running tables described below; watch the Alarms table's State column for the amber "dropped from the PLC's queue without resolving" case in particular.

What you see: a **Shift** and **Shift Start Date** picker, a **Current Shift** jump button, and **Print**/**Refresh** buttons, followed by:

- A **six-tile KPI strip**: Batches Ran, Completed, Cancelled/Interrupted, Alarms Raised, Alarms Active, and Still Running.
- A **Batches** table (Batch, Tank, Formula, Started, Ended, Outcome).
- An **Alarms** table (Alarm, Type, Raised, Resolved, State) — the State column is color-coded: red for "still active," amber for "dropped from the PLC's queue without resolving" (the fault may still be live — this is deliberately **not** shown in the green "handled" color), and green for genuinely resolved. If the alarm list for a busy shift is capped, a footer line says so rather than silently truncating.
- A **Still Running** section listing anything open at handover time.
- The **latest Handoff Note** for this shift, if one was written.

An honest "no shift window" message replaces the whole summary if the selected shift is not configured or has no window to show.

Production Log

Purpose: operator-entered produced square footage per shift — feeds the Dry lbs/sq ft coverage-rate report (see 06-reports-and-history.md).

What you see: an entry form (**Shift**, **Date**, **Square Feet**, **Entered By**), a **Save** button, a note that a later save for the same shift/date overwrites the earlier one ("last write wins"), and a **History** grid (Shift, Date, Square Feet, Source, Entered By, When) with **Refresh**. A pointer line at the bottom sends you to the Dry lbs/sq ft

report for the actual coverage-rate calculation, rather than duplicating that math here.

Reports

NavBar → Reports opens a large, grouped popup (Batch / Alarms / Inventory & Formula / Process & Trends / Data). Full depth — what each report answers, its filters, its columns, and how to read it — is 06-reports-and-history.md. Most reports follow the same on-screen pattern: pick filters on the left, **Preview** to render it, **Print** to send it to the LCP's printer — a handful (Insights, Trending, Tank/CIP Board, Batch Queue Board, Alarm Summary, and others) are interactive boards instead, with their own buttons and no Preview step; see 06-reports-and-history.md for which is which. The **Database Export** CSV tool also lives in this popup (Reports → Data), not under Setup — see 06-reports-and-history.md §Exporting data for the exact table and column list.

Setup

NavBar → Setup is supervisor-gated — most items ask for the supervisor password for this station (ask your shift supervisor; it is set per site at commissioning and is not printed here), and a few ask for the admin password (contact IT). Both tiers ship enabled, with a shared default password out of the box (see the installer book's commissioning guidance) — **installation is expected to change both** to unique site values before handoff. If Setup still accepts a shipped default password, or the old legacy `9999` supervisor default, Ring raises a **Startup Configuration Warning** at every boot — naming whichever of `Authentication.SupervisorPassword` or `Authentication.AdminPassword` has not yet been changed — see 01-getting-started.md §Startup warnings — so a station that follows Ring's own commissioning guidance will never show you that warning. A parallel list of Setup items exists inside the app at **Help → Operator Runbook** §12 (source: OPERATOR_TRAINING_RUNBOOK.md in the Ring repository), but it was written before roughly a dozen of the items below shipped; this section, checked directly against `NavBar.xaml`, is the current one. It covers the items an operator or shift supervisor is most likely to actually open, in more depth than that table.

Password and Lock Setup

Password opens a small dialog: pick **Supervisor** or **Admin** from a dropdown, type the password, **OK**. **Lock Setup** explicitly logs back out of elevated access without waiting for the idle-timeout auto-relock — use it if you unlock Setup and then need to walk away.

Setup Wizard

Re-runs the same guided, step-by-step configuration flow a fresh station walks through once on first boot (see 01-getting-started.md §Starting the app). The steps, in order: **Welcome, Language, Unit System, PLC Connection, Read-Only Safety, SMTP (email), Recipients, Seed Defaults, Branding, Plant Names, Shift, Finish.**

> **Warning:** The **Read-Only Safety** step in this wizard is one of the few places in the app that can flip `ReadOnlyMode` itself, mid-session. Running the wizard is therefore not purely cosmetic — if you re-run it, pay attention to that step specifically. If it re-enables read-only mode, Ring's read-only banner reappears immediately without needing a restart.

Language

Setup → **Language** — see 01-getting-started.md §Language. Applies immediately, no restart.

Formula Edit, Formula Exchange, Viscometer Settings

Covered in full in 05-formulas-and-recipes.md.

Tank Roster

Enables/disables and names each storage and doser slot. The screen itself carries a **restart-required** note for changes that need one — most name edits apply live, but roster membership changes (adding/removing a slot) typically require a Ring.exe restart, which the screen tells you at the point you make the change.

Unit Settings

Setup → **Unit Settings** ("Display Units") sets independent dropdowns for **Volume**, **Weight**, and **Temperature** display units. The screen's own description is exact and worth repeating: "*Temperatures, levels and weights are converted for display only. PLC values, batch math and stored history stay in native units.*" Changes apply immediately and are saved for this station — see 05-formulas-and-recipes.md §Units for why recipe amounts specifically stay in pounds regardless of this setting.

Shift Names and Spans

Pick one of the nine shift slots (Shift 1–8, or the 24-Hour slot) from a dropdown to see its current name, start time and duration, and an **Edit Selected Shift** button to change them. This is what Shifts Control's 8-shift grid and picker are named and timed from.

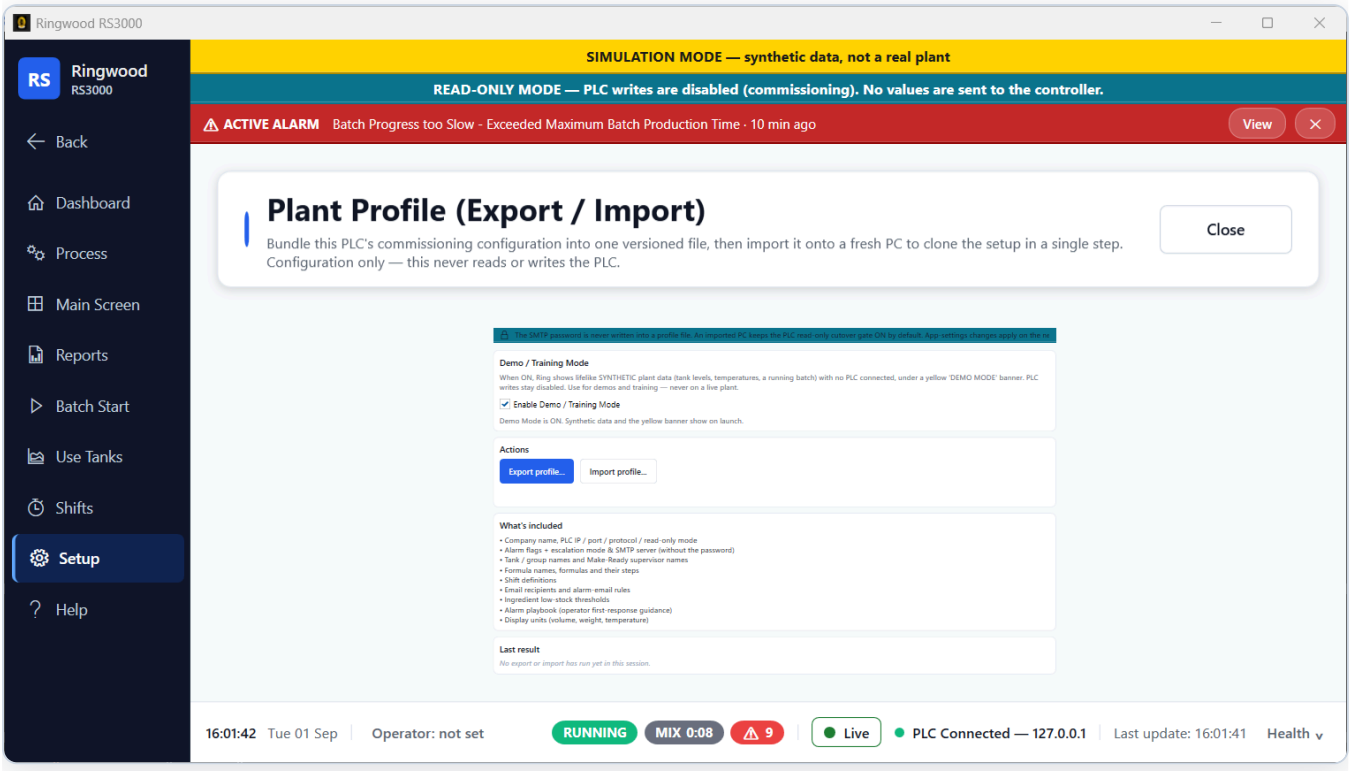
Email Alerts, Alarm Escalation Settings, Alarm Playbook Editor

Covered in 04-alarms-and-attention.md.

Data Entry and Data Entry Setup

Setup → **Data Entry** opens the operator-facing hub of five free-form logging screens (measurements, shift notes — whatever this plant chooses to use them for), each with eleven fields. **Setup** → **Data Entry Setup** (supervisor-gated) is where those five screens and their fields are renamed for this plant. Submissions are timestamped and show up on **Reports** → **Data Entry Report** — see 06-reports-and-history.md §Inventory and formula reports.

Plant Profile



Setup → Plant Profile: the Demo/Training Mode toggle described in chapter 1, plus Export and Import buttons for this station's plant profile.

Carries the **Enable Demo / Training Mode** checkbox — see 01-getting-started.md §Demo mode banner for exactly what it does and why it needs a restart — plus **Export** and **Import** buttons for this station's plant profile file, used mainly by commissioning and IT rather than day-to-day operators.

Diagnostic Console, Database Backup/Restore, Factory Reset

These three are almost entirely engineer/hypercare tools rather than day-to-day operator screens — the Installation Guide's when-something-goes-wrong chapter covers the Diagnostic Console and its one-click support bundle in depth, and 07-troubleshooting.md here covers what an operator should do before any of them are needed. One exception worth knowing about here: **Database Backup/Restore** also carries a supervisor-gated **Data retention** group — two fields, one for the process historian (trend history) and one for alarm history, each setting how many days Ring keeps that data before automatically trimming older rows. Both default to 365 days; entering 0 in either keeps those records forever. See 06-reports-and-history.md §How long report data is kept.

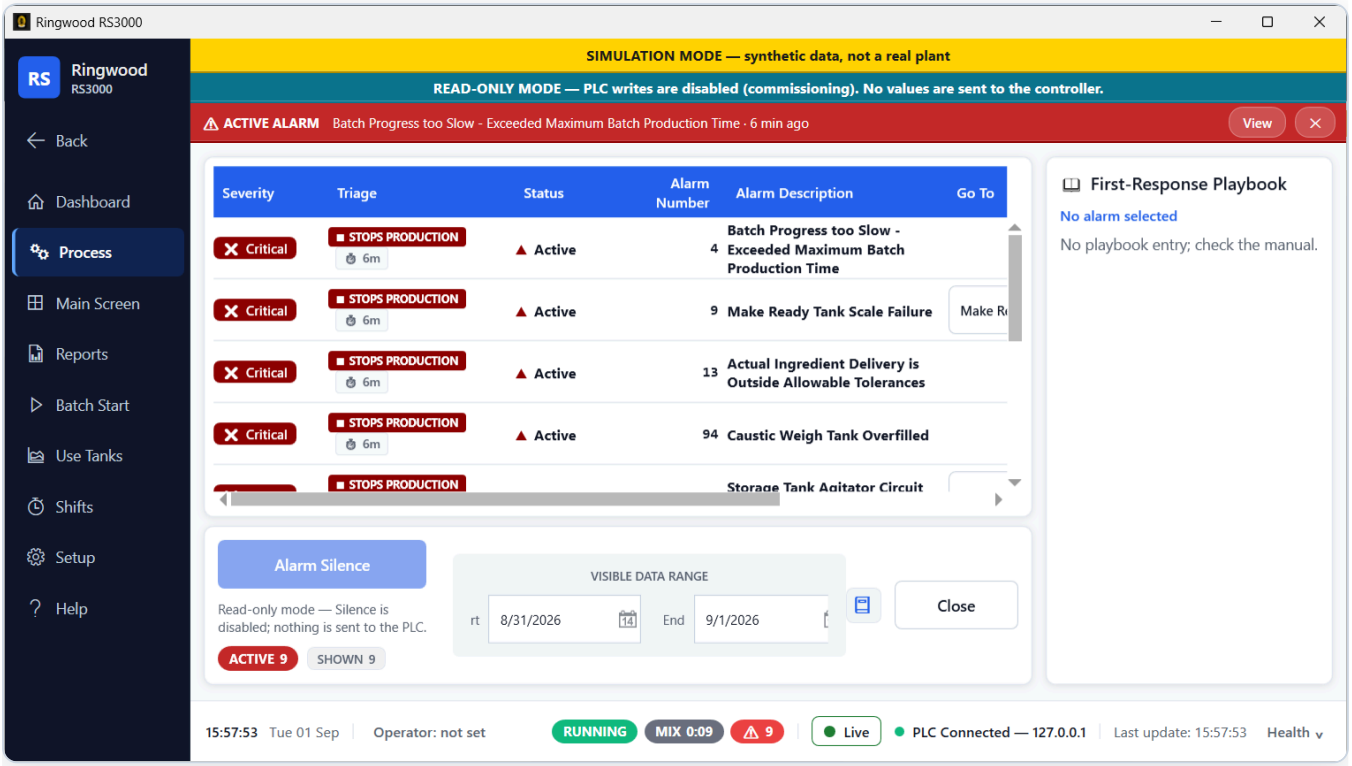
Help

NavBar → Help opens:

- **Operator Runbook** — opens `OPERATOR_TRAINING_RUNBOOK.md` right inside the app.
- **RS-3000 Manual** — the legacy `~RS360` PDF manual, kept available for reference.

- **Manuals Library** — a searchable, grouped list of every manual/PDF installed on the station; double-click an entry to open it.
- **Documentation** — a small chooser for the three customer-facing PDFs (Operator Manual, Installation Guide, Engineering Reference). Each opens straight from this PC (`Assets\Manuals\` next to `Ring.exe`) — no internet connection needed. If a PDF was not shipped on this installation, the chooser offers to open `https://ring-rs3000.pages.dev/docs/` instead.
- **Alarm Legend** — see 04-alarms-and-attention.md §Alarm Legend.
- **Keyboard Shortcuts** — the same F1 overlay described in 01-getting-started.md.
- **Contact Us** — a phone number and service/orders email addresses for this plant, kept current by whoever administers the station's branding.

4. Alarms and attention



Process → Alarms: the alarm grid.

Where alarms appear

An alarm shows up in several places at once, not just one screen:

1. **A full-window overlay** appears on top of everything — a red beacon icon, the alarm's summary, and a description — and blocks navigation behind it while a fault is physically present. Clicking outside it does nothing. **Continue Monitoring** — or pressing **Esc**, which does exactly the same thing — dismisses it; either way is a **display-only dismiss that does not silence anything on the controller.** The embedded alarm grid inside the overlay (the same Process → Alarms screen, hosted in-place) lets you silence right there if you need to. If the PLC link drops while this overlay is up, it adds its own notice ("PLC link lost — alarm state is stale, last update HH:mm:ss") so a comms-loss-induced "everything shows Resolved" state can never be mistaken for the fault having actually cleared. A fixed **120-second cooldown** per (alarm, base) pair stops the same still-unresolved fault from instantly re-summoning the overlay the moment you dismiss it — after those two minutes, if it is still unresolved, the overlay comes back on its own. A genuinely different alarm still summons it immediately.
2. **A compact red banner** stays visible under the top-of-window safety banners on every screen while the fault is present — with a **View** button straight to the Alarms screen and a ✕ to dismiss the banner for now (it comes back the moment a new alarm raises; the count keeps showing regardless).
3. **The Dashboard's alarm band** (see 03-screens-reference.md §The alarm band) states plant health in one line and lists active alarms.

4. **The bottom status strip**, on every screen, carries a red alarm-count pill you can click to jump straight to the Alarms screen.
5. **Process → Alarms** — the full alarm grid, described below.
6. Optionally, **an audible siren** (if the LCP has speakers) and a flashing taskbar entry — see Sound and taskbar flash below.
7. Optionally, **an email or webhook**, if this station has alarm escalation turned on (see Email and escalation below).

Every alarm is also recorded permanently in the Alarm History report, regardless of whether you saw or silenced the popup.

> **Note:** While Ring runs read-only, the overlay's **Continue Monitoring** button carries an extra read-only caption, and the embedded Silence button is disabled the same way it is everywhere else — see Silence vs. acknowledge below. The overlay itself still appears; only the silence write is affected.

Silence vs. acknowledge

- **Silence** stops the audible siren. The alarm is still active and still in the log — silence means "I know about it, stop the noise." It changes the row's Status glyph to the amber "Silenced" state.
- **Dismissing the overlay** (Continue Monitoring, or Esc — there is no "X" on this screen) gets the modal out of your way without touching the controller. The same fault will not re-summon the overlay for 120 seconds; after that, if it is still unresolved, the overlay comes back on its own. A different alarm summons it immediately, regardless of the cooldown.

Dismissing the overlay writes a line to Ring's own application log (who dismissed it, which alarm, and the reason — Continue Monitoring button or Esc key) but is not itself a database record; the alarm's own fire/clear history is what the Alarm History report shows regardless (source: OPERATOR_TRAINING_RUNBOOK.md §10.2 in the Ring repository describes an older popup with a close button — the behavior above is what the shipped code actually does).

> **Note:** While Ring is running read-only, the Silence action on the Alarms screen is shown disabled with a visible caption explaining why — silencing writes a bit to the controller, so it is gated the same as every other PLC write.

The Alarms screen (Process → Alarms)

A full grid of every alarm currently known to the system.

Reading one row

Column	What it shows
Severity	A colored pill — **Critical**, **Warning**, or **Info**.

Column	What it shows
Triage badge	A **"STOPS PRODUCTION"** flag for Critical/Alarm-level rows only, plus a live "how long has this been active" age clock next to it.
Status	A **shape-plus-color** lifecycle indicator, deliberately never color alone: a red ▲ for **Active**, an amber ◑ for **Silenced** (the fault is still present — silencing only quiets the siren), a grey ✓ for **Resolved** (the fault actually cleared).
Alarm # / Description	The alarm's identity and text.
Go to	A one-tap link into the tank or system screen this alarm concerns — hidden when the alarm has no clean single-screen mapping (a plant-wide fault, for instance).
Raised / Acknowledged	Timestamps for when the fault fired and when it was acted on.

A row for an **active, unhandled** alarm is shown in **bold** — weight alone carries the emphasis, deliberately not a larger font size, so every row still lines up on the same baseline. **Resolved** rows are dimmed to about three-quarters opacity so a page of cleared alarms reads calm, never like a wall of red.

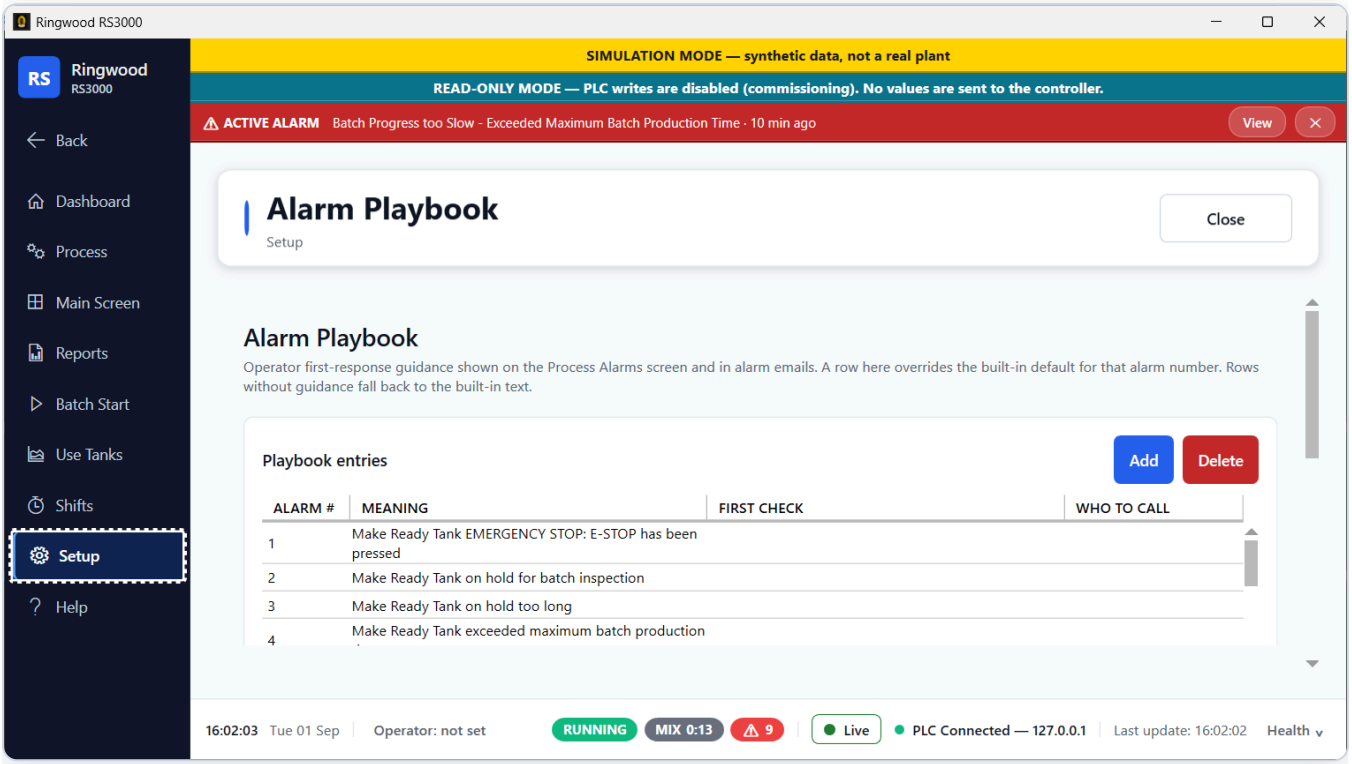
The two empty states are not the same message

If the grid is genuinely empty **and** the PLC link is healthy, a **green** all-clear message replaces it. If the grid is empty **because the link is down**, an **amber** "alarm data unavailable" message replaces it instead. These two are deliberately never merged into one "nothing to show" state — an empty list while the link is down is not an all-clear, it is a blind spot.

Filters and layout

A **date range** filter narrows what's shown (useful for "what fired overnight"), and a **first-response playbook panel** on the right follows whichever alarm row you have selected — see below. A **Silence** button and an **Active** / **Shown** count pair sit at the bottom of the screen.

First-response playbooks



Setup → Alarm Playbook Editor: one row per alarm number, with Meaning, First Check and Who to Call. This is what feeds the read-only panel on the Alarms screen.

Selecting an alarm row on the Alarms screen shows a read-only panel with that alarm's entry from the plant's **playbook**: what the alarm means, the first thing to check, and who to call. This is populated and edited under **Setup → Alarm Playbook Editor** (supervisor-gated) — a table of **Alarm Number, Meaning, First Check, and Who to Call**, with a plain edit-and-save workflow. If an alarm has no playbook entry yet, the panel says so rather than showing nothing.

> **Note:** The playbook panel is strictly a reference — reading it, or the Alarm Playbook Editor changing it, never touches the controller or the alarm itself. It exists purely so the "who do I call, and what do I check first" knowledge lives on the same screen as the alarm, instead of in someone's head or a binder on a shelf.

Tank attention

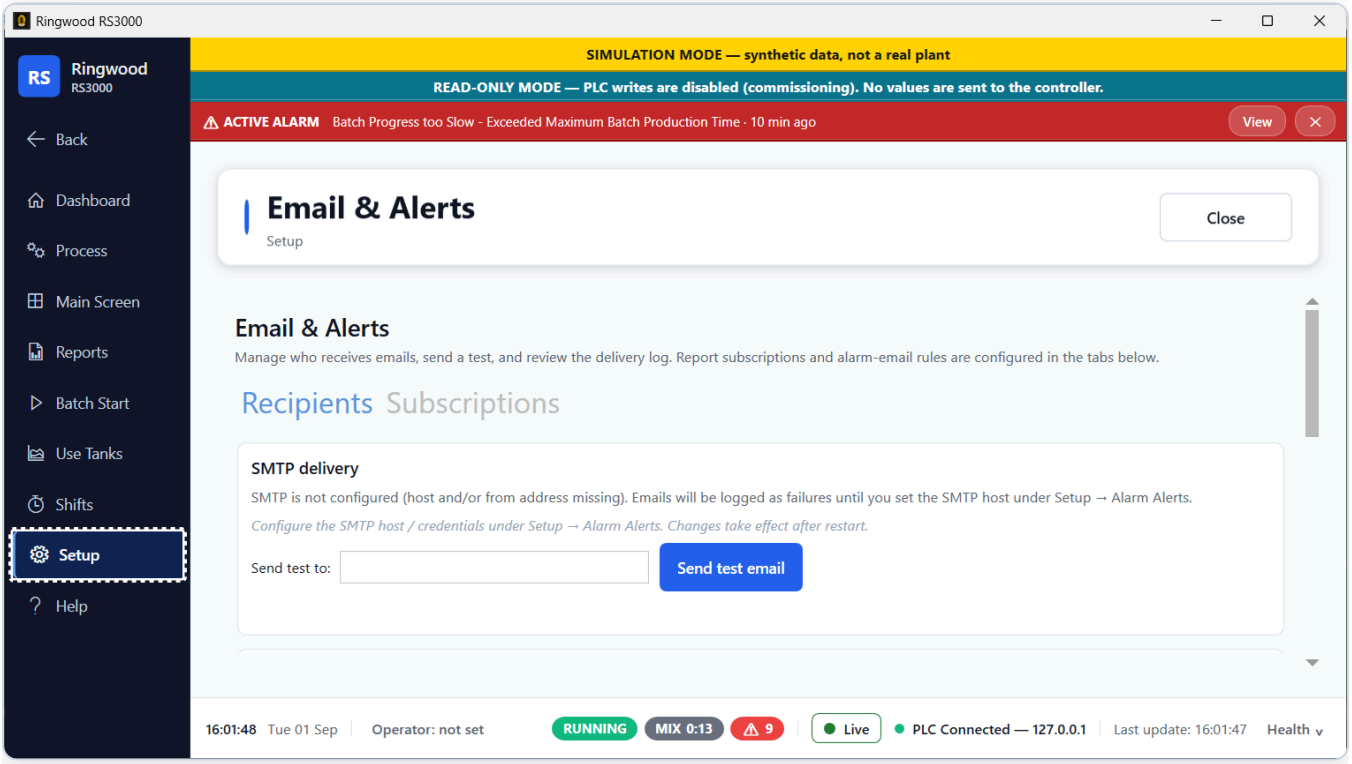
The color-coded state ring on **Main Screen → Storage Tank Group** (green = idle, yellow = batching, red = fault — see 03a-main-screen-reference.md §Storage Tank Group) is the primary at-a-glance tank health indicator. On the Dashboard, a tank whose data has gone stale (PLC link down) visibly dims rather than continuing to look live — a frozen reading is deliberately made to look frozen so it is never mistaken for a current one.

> **Note:** The codebase contains a ranked "tanks needing attention" strip that is not wired into any screen in the current build, so it is not documented here as something you can open — treat the state ring above as the authoritative at-a-glance indicator until/unless that changes.

Sound and taskbar flash

Independent of email/webhook escalation, a new alarm can play a sound (`.wav`, or the Windows exclamation sound as a fallback) and flash the Ring.exe taskbar entry via Windows' own flash-window mechanism. This is governed by its own on/off setting and an "only high severity" option, and is debounced so a burst of alarms in quick succession does not turn into a continuous noise. This mechanism is entirely separate from — and does not require — the email/webhook escalation described next.

Email and escalation



Setup → Email Alerts has two visible tabs — Recipients and Subscriptions. A third, Alarm Rules, exists in the code but ships hidden on purpose (see below).

Setup → Email Alerts has **two** visible tabs:

- **Recipients** — the list of email addresses that receive alerts, SMTP delivery status, a **Send test email** button, and a delivery log (when, category, recipients, subject, delivery attempts) so you can confirm mail is actually going out.
- **Subscriptions** — report subscription management (separate from alarm email).

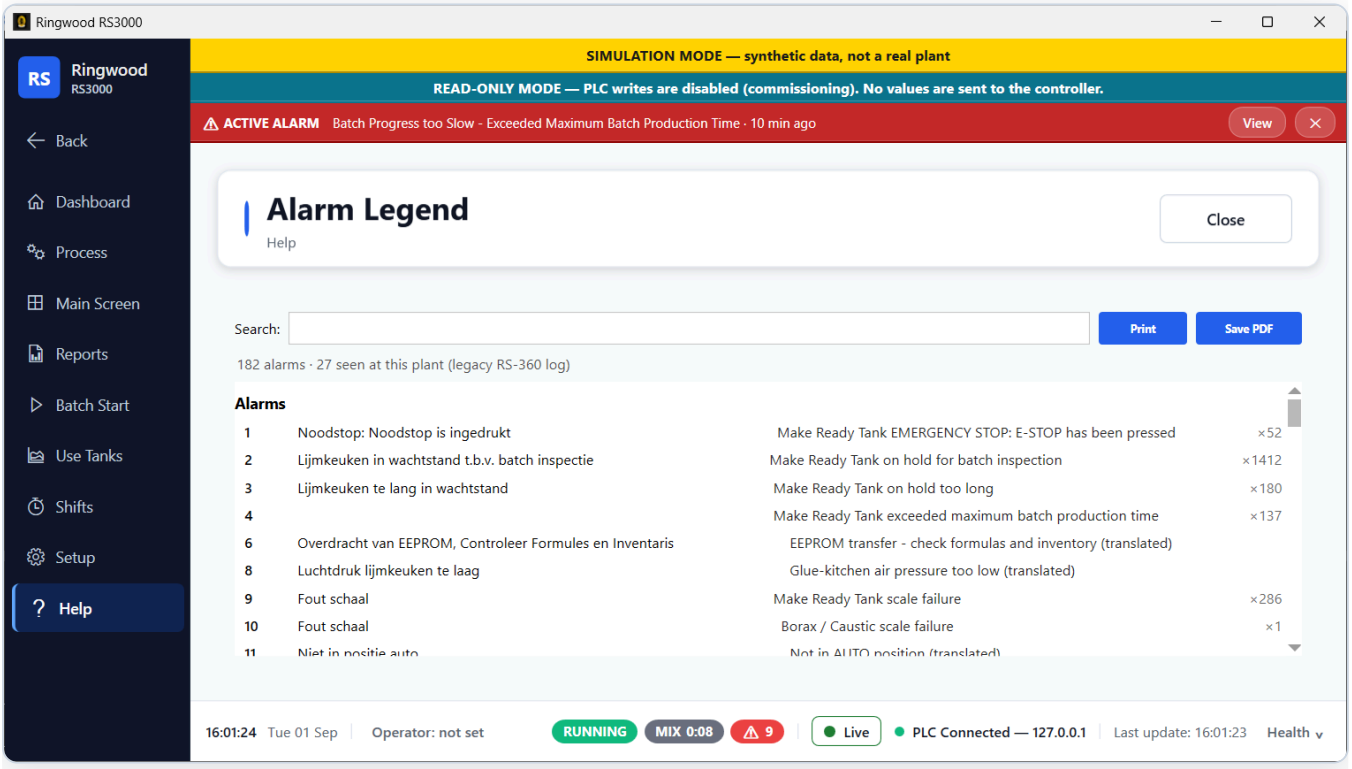
Alarm-triggered escalation is **not** configured on this screen — it lives in **Setup → Alarm Escalation Settings**, below. A third tab, **Alarm Rules**, exists in the code but ships hidden with an explicit comment against presenting an editor for it on the plant HMI (the underlying rule engine is live, but there is nothing yet to safely edit its rows from here) — if you never see it, that is by design, not a bug.

Setup → Alarm Escalation Settings controls whether an alarm triggers anything beyond the on-screen/audible notification. The escalation **Mode** is one of **None** (default — nothing is sent, alarms are log-only), **Smtp** (email, with host/port/credentials and a from/to list), or **Webhook** (a URL + HTTP method, with a **Send test webhook** button). A station ships with escalation **off** unless it has been explicitly configured.

Other notifications

A small toast notification (bottom-right, non-blocking) reports a few other events, most notably **"PLC reconnected"** once the link comes back after being down — a quiet confirmation that you don't have to go hunting the status strip for.

Alarm Legend



The Dutch↔English decode, side by side, with how many times each alarm has fired — the reference a Dutch-floor operator will use constantly.

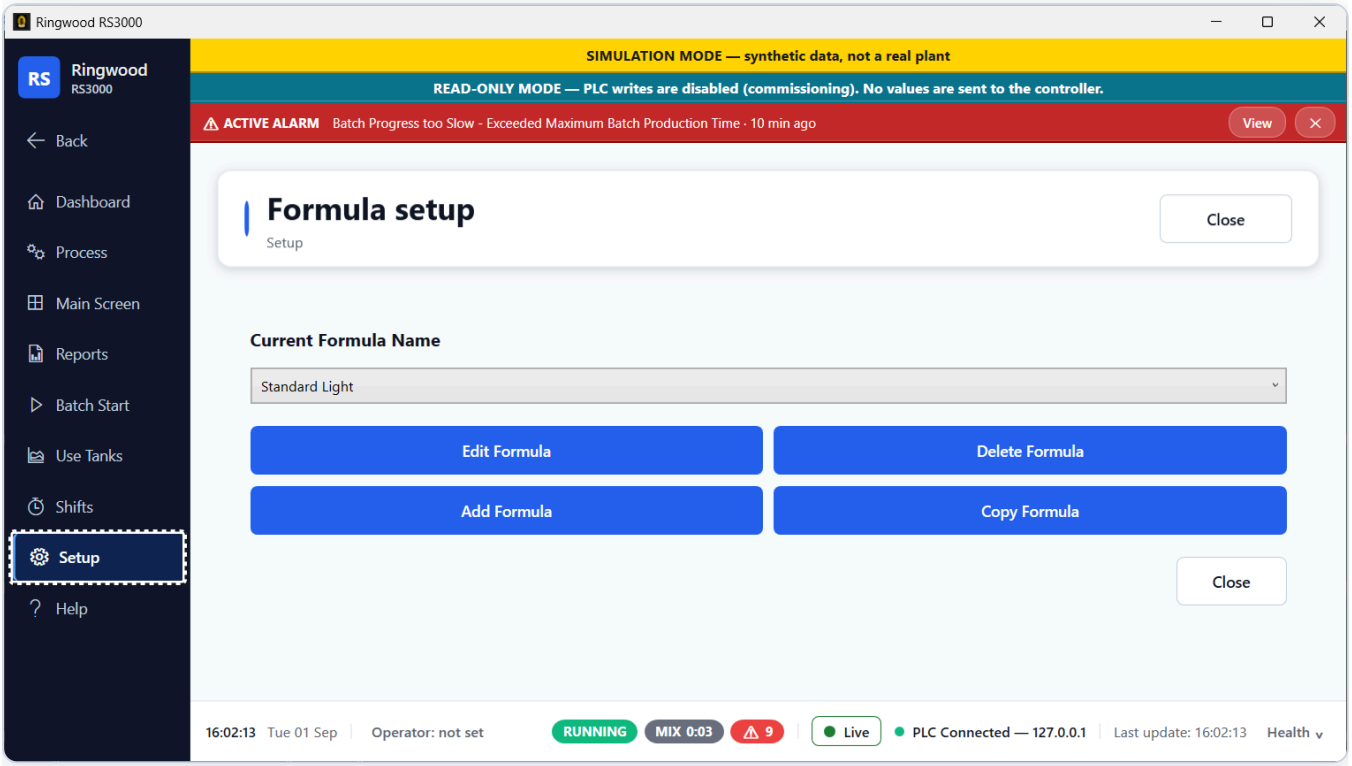
Help → Alarm Legend is a searchable, printable reference that decodes the controller's original Dutch alarm text against its English equivalent, side by side, with how many times each has occurred. Use it when an alarm description on the floor doesn't obviously match what's shown in Ring, or to print/save a PDF copy for the wall. This is independent of the app's own display-language setting (see 01-getting-started.md).

Reading a real alarm, start to finish

Putting the pieces above together — this is what actually happens when the controller raises a fault:

1. The full-window overlay appears immediately, with the beacon, the alarm's summary, and — inside it — the live alarm grid.
2. If you have speakers and the sound is enabled, it plays; the taskbar entry flashes if Ring is not the focused window.
3. You either **Silence** it from inside the overlay (quiets the siren; the row's Status glyph changes to the amber "Silenced" state — the fault is still Active underneath) or you clear the physical condition on the floor first.
4. Once you are satisfied you know what is happening, click **Continue Monitoring** to dismiss the overlay — this never touches the controller, it just gets the modal out of your way. The compact red banner, the Dashboard alarm band, and the status-strip count pill all keep reporting it as long as it is Active or Silenced.
5. Once the physical condition actually clears on the controller, the row's Status glyph moves to the grey "Resolved" check, and it dims on the Alarms screen. It stays in Alarm History permanently either way.

5. Formulas and recipes



Setup → Formula Edit.

Formula editing lives under **Setup**, so it is supervisor-gated by default. This chapter covers it in full anyway, in operator terms, because understanding what a formula screen shows you helps make sense of what you see on Batch Start, and because a shift supervisor is often the one who actually opens these screens.

Units: pounds

Recipe amounts (`FormulaSteps.PresetAmount`, the PLC formula bank, and batch preset/actual figures) are **native pounds**. This is a settled, evidence-backed verdict, not a display convention (source: `docs/production-readiness/RECIPE_UNITS_VERDICT_2026-07-31.md` in the Ring repository, built from four independent primary sources). Do not carry any different unit assumption from an older document or from memory of the legacy app.

> **Note: Setup → Unit Settings** ("Display Units") lets you choose independent display units for Volume, Weight and Temperature. Its own on-screen description is exact: "*Temperatures, levels and weights are converted for display only. PLC values, batch math and stored history stay in native units.*" Changing it never touches a stored recipe amount — only how the number is drawn on screen.

Viewing and editing a formula: Formula Edit

Setup → **Formula Edit** shows one formula at a time. The header carries the **Formula Name** field and two always-visible read-outs computed live from the step list: **Calculated Weight** (lbs) and **Calculated Volume** (gal), plus a **Commercial Solids** percentage.

The step table

One row per step: **Step** number (read-only, position in the sequence), **Operation**, **Amount**, and **Time** (seconds). The recognized operation types are a fixed list:

No Step / Pass · Water · Finish Water · Steam · Domestic Starch · Caustic 50% · Caustic 3% · Primary Borax · Secondary Borax · Liquid Additive 1–6 · Pump to Storage · Batch Inspect · Manual Starch Addition · Batch Done · Measure Viscosity · Turn on Agitator · Turn off Agitator.

Move Up / **Move Down** reorder the selected step. Below the table, an editor row lets you pick an operation, type an amount and time, and:

- **Add** — appends a new step at the end.
- **Insert** — inserts before the currently selected step.
- **Delete** — removes the selected step (with a confirmation prompt).
- **Accept** — applies your edits to the currently selected step in place.

Amount limits — two very different kinds

Ring checks a typed amount against limits in two different ways, and it matters which one you are looking at:

1. **A hard, absolute ceiling (10,000 lbs).** This applies to *every* step on *every* formula number, no matter the operation, and exists purely to catch a garbled or corrupted value before it can reach the database or the controller. You will see a plain validation error if you exceed it — there is no negotiation.
2. **A per-operation advisory band**, shown in the table below. If your typed amount falls outside an operation's band, Ring **asks** — it never silently substitutes anything. The dialog shows your entered value, the band, and a suggested default, with two buttons: **Yes** (replace with the suggested default) and **No** (keep what you typed). **No is the safe default** — pressing Enter keeps your value, not the suggestion. These bands are explicitly **not verified against this specific plant's real recipes** (the code notes that live plant Steam charges run 100–110 lbs, well outside an older, narrower band that used to be silently enforced) — so if you know your value is correct, keep it.

Operation	Advisory band (lbs)	Suggested default
Water	8 – 1,500	25
Finish Water	8 – 100	60
Steam	25 – 120	100
Domestic Starch	15 – 750	15
Caustic 50%	3 – 60	15

Operation	Advisory band (lbs)	Suggested default
Caustic 3%	1 – 60	5
Primary / Secondary Borax	0 – 20	0
Liquid Additive 1 – 3	3 – 100	5
Liquid Additive 4 – 6	1 – 180	1
Manual Starch Addition	15 – 750	15
No Step/Pass, Pump to Storage, Batch Inspect, Batch Done, Measure Viscosity, Turn Agitator On/Off	0 – 0	0

Operations with no meaningful amount (the last row above) carry a band of **0 – 0** — leave the amount at 0 for these. Typing anything else raises the same out-of-range confirmation dialog as any other operation, with 0 as the suggested default; it is not silently accepted.

> **Note:** Decisions on the advisory-band prompt are logged either way (with the entered value, the band, and whether you kept it or took the default) — so choosing to keep an out-of-band value is a recorded, deliberate choice, not a silent override.

Saving: Apply

Apply saves the formula, with several checks along the way:

- The formula name must include a number Ring can read (e.g. "Formula 1" or "Formula 12 (Copy)") — a name it cannot parse a number from is rejected with an explanation.
- If you are saving a **copy** back onto the exact slot it was copied from, Ring refuses outright — you must pick a different number so the original is never silently overwritten.
- If you are saving a copy onto a **different, already-populated** slot, Ring warns you how many steps that slot currently has and asks you to confirm before replacing them (defaulting to **No**).
- A confirmation dialog states plainly whether this save will also reach the controller: "*Save formula number N and all listed steps to the database and to PLC tags Formula_NN_Preset_Operation / Amount / Mix...?*" for formulas 1–6, or a database-only equivalent for anything higher.
- A formula bank slot (1–6) supports a **maximum of 30 steps**; exceeding that fails the whole save atomically (nothing is written to either the database or the controller) rather than leaving the two out of sync.

What you see afterward depends on exactly what happened, and Ring is specific about it — see What is protected below for the four different outcome messages.

View History opens a read-only list of past saved versions of this formula — version number, when it was applied, and a preview of its steps — useful for confirming what actually changed and when. It has no restore button; it is a viewer, not an undo tool. **Viscometer Settings** jumps to this formula's calibration coefficients — see 03a-main-screen-reference.md §Viscometer (a shorter walkthrough also exists inside the app at **Help** → **Operator Runbook** §9.5).

Formula bank exchange with the PLC: Formula Exchange

Only **formula numbers 1 through 6** are addressable in the controller's formula bank (`Formula_01`… `Formula_06`) — those are the only formulas the plant can actually run a batch from. Higher formula numbers exist in Ring's own database as storage/reference only and are never sent to the controller.

Setup → Formula Exchange swaps the **full step list** between **two** formula numbers — for example, exchanging Formula 2 with Formula 7 moves Formula 7's recipe into Ring's database *and* rewrites the controller's `Formula_02` slot with it, while what used to be Formula 2 becomes Formula 7 (database-only from then on). This is how a recipe that only exists above slot 6 gets promoted into a slot the controller can actually run, and vice versa for retiring one.

Screen layout: a **Current Formula Name** picker, an **Exchange Formula Name** field (type or pick a name), a read-only **preview** of the exchange formula's current steps (Step / Operation / Amount / Time) so you can confirm what you are about to bring in before committing, and an **Accept** button.

What Accept checks, in order:

1. Both names must be filled in and must parse to a formula number.
2. The two numbers must be between 1 and 30, and must be different from each other.
3. A confirmation dialog states plainly whether the pair touches the PLC — "*Any formula 1–6 in this pair will also be written to the PLC…*" — or that both numbers are database-only.
4. If the exchange **would** touch the PLC and the connection gate is not currently open, Ring asks whether to proceed **database-only** instead (defaulting to **No**) rather than silently downgrading the operation.

   Warning: Because this can rewrite a live controller formula bank slot, it goes through the exact same write-safety interlock as every other PLC write — see below. If the write cannot be verified by reading it back, the controller's bank is left in an unknown state and Ring will not silently pretend the database and the controller agree.

What is protected

Every formula-bank write, whether from Formula Edit or Formula Exchange, goes through the same interlock before anything reaches the controller.

The write can be refused before anything is sent

In plain terms, nothing is sent if any of the following is true:

- Ring is in **read-only mode** (the pre-cutover default).
- Ring is in **demo mode**.
- Writing to the PLC formula bank is **held pending controls sign-off** (`PlcSettings.EnableFormulaBankWrite`) — this is a **separate switch from read-only mode**, and it ships **off by default**, independently of whatever `ReadOnlyMode` is set to. It does not automatically turn on at the write-enabled cutover.

- **Any batch is currently running anywhere on the plant** — not only on a tank you think this formula affects — or Ring cannot confirm from the controller that it is idle. This interlock is deliberately **bank- and tank-agnostic**: Ring cannot prove which bank a running batch is actually consuming (the controller copies the recipe into its own working tags at start, nothing rules out a mid-batch re-read, and a mixer batch can be fed by a use tank pointed at a different bank), so it refuses on *any* running batch rather than risk guessing wrong. An unreadable step number counts as "not idle," never as "idle" — when in doubt, Ring refuses.
- The **PLC link** is not in a write-ready state (see 01-getting-started.md).
- The **step number is out of range** (must be 1–30) — rejected before anything is sent.
- The PLC endpoint itself is not configured.

  Warning: Because the controls sign-off switch above is independent of read-only mode, do not assume formula-bank writes will start working the moment the plant's 2026-09-08 write-enabled cutover happens. If Formula Edit or Formula Exchange still reports the write as "held," that is this separate switch, not a leftover read-only setting — see the exact wording below.

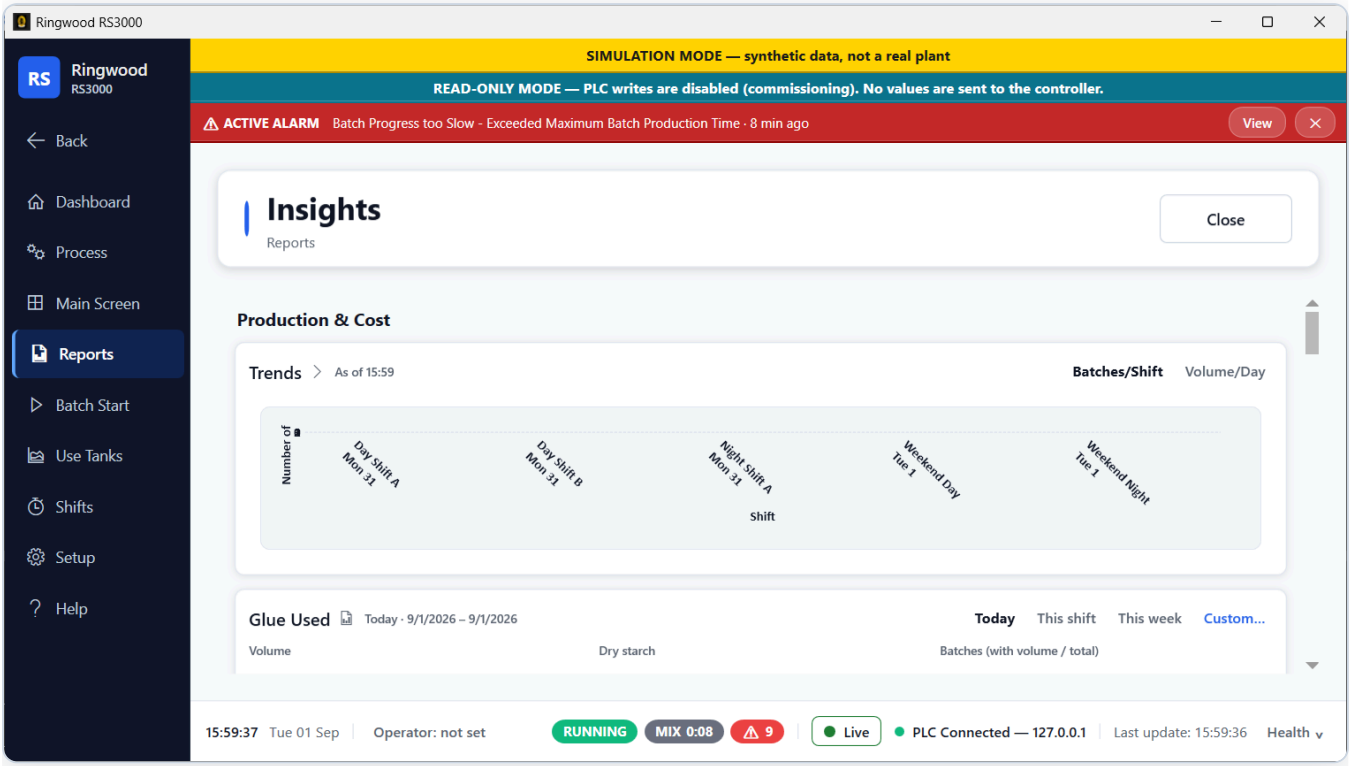
What you're told, and what it means

The database save and the controller write are reported **separately** — Ring never lets you believe a controller write happened when it didn't:

What you see	What actually happened
"Formula saved to the database and to PLC tags Formula_NN..."	Both the database and the controller were updated, and the controller write was **read back and verified**.
"Formula saved to the database... The PLC write was SUPPRESSED — the system is in read-only mode..."	Database only. Read-only mode is on. Reopening this formula will show the *controller's* values, not your unsent edits.
"Formula saved to the database... The controller was NOT updated: writing recipes to the PLC is HELD pending controls sign-off..."	Database only, for the separate reason above — **not** read-only mode. The remedy is a controls sign-off, not the Read-Only Safety switch.
"Formula saved to the database. Only formulas 1–6 are written to the PLC."	Database only, because this formula number is simply not one the controller can run (7 or above).

The only outcome that counts as a proven success is one where the write was both sent **and read back** from the controller to confirm it landed. If a write is attempted but cannot be verified afterward, the controller's recipe bank is left in an unknown state (possibly a mix of old and new values) — Ring shows a failure dialog and will not let a database save proceed as if that write had succeeded.

6. Reports and history



Reports → Insights: cost, yield, and usage at a glance.

NavBar → Reports holds two different kinds of thing. **Printed reports** (Batch Report, Usage, Batch History, Alarm History, Inventory, Formula, Shift Consumption, Data Entry, Viscosity, and most of the rest) all work the same way: filters on the left or across the top (usually a date range, sometimes a tank filter), a **Preview** button that renders the report on screen, and a **Print** button that sends it to the LCP's printer. **Interactive boards** (Insights, Trending, Tank/CIP Board, Batch Queue Board, Alarm Summary, Operator Audit Trail, Golden Batch Overlay, Downtime/ OEE) are live screens with their own buttons and no Preview step — each is described below, in its own place, with what makes it different. The base printed-report mechanics — how the date range works, how Preview and Print behave — are covered step-by-step inside the app at **Help → Operator Runbook** §7 (source: OPERATOR_TRAINING_RUNBOOK.md in the Ring repository) and are not repeated here. This chapter instead goes report by report: what question each one answers, its filters, its printed columns, and how to read the result.

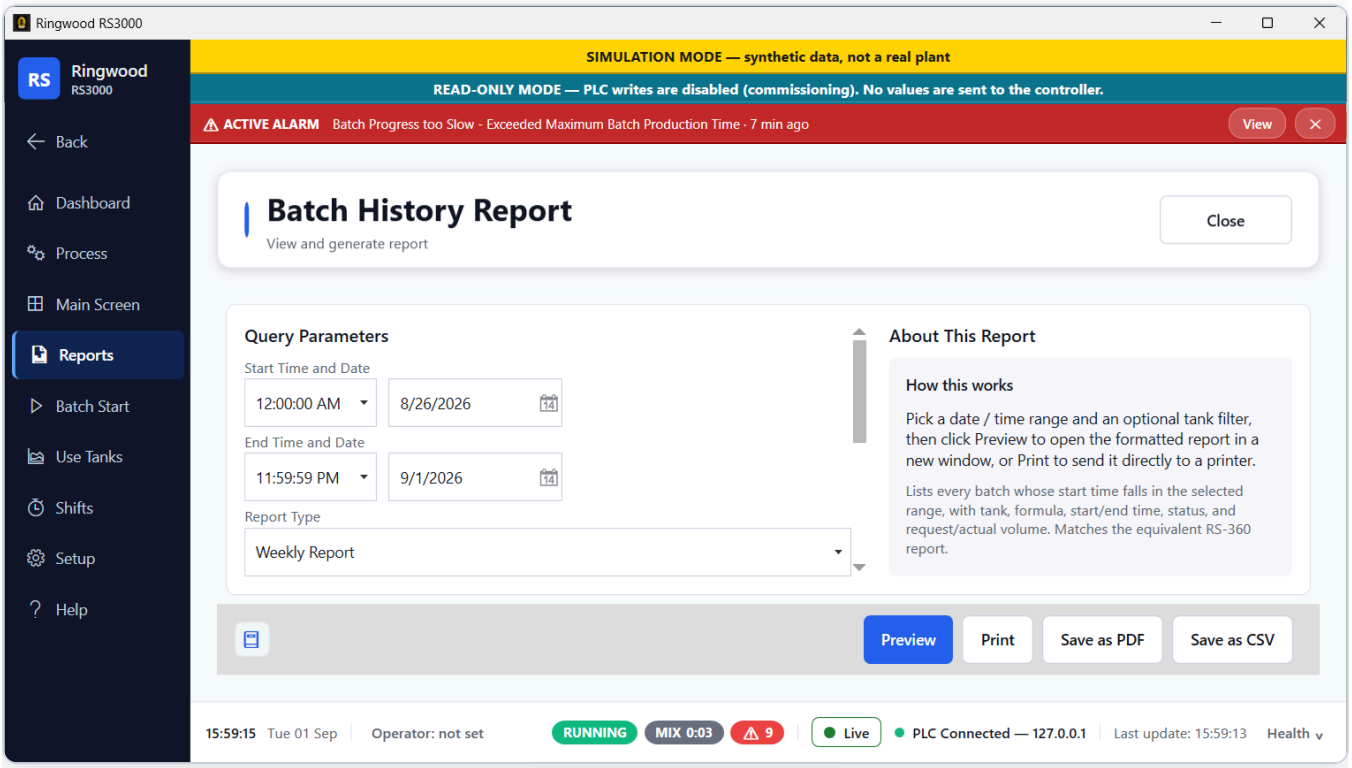
Start here: which report answers my question

Your question	Report	Where it lives
Where is batch #____, or which batch used formula X?	Go to Batch	`Ctrl+B`, anywhere
What exactly happened on this one batch?	Batch Report	Reports → Batch

Your question	Report	Where it lives
How much of an ingredient did we use in total?	Usage Report	Reports → Batch
Did anything run overnight, or how many batches this week?	Batch History Report	Reports → Batch
Batch History, but with full ingredient detail per batch	Batch History Usage Report	Reports → Batch
What is planned to run next?	Batch Queue Board	Reports → Batch
Is this batch's temperature normal compared to past good batches?	Golden Batch Overlay	Reports → Batch
What fired overnight?	Alarm History	Reports → Alarms
Which alarms are the biggest problem, and are we improving?	Alarm Analytics	Reports → Alarms
Was a batch running when this alarm fired?	Alarm ↔ Batch	Reports → Alarms
What needs attention right now?	Alarm Summary	Reports → Alarms
Who did what, and when, on this station?	Operator Audit Trail	Reports → Alarms
What did inventory look like at a past event?	Inventory Report	Reports → Inventory & Formula
What does formula X's recipe look like right now?	Formula Report	Reports → Inventory & Formula
How much did each shift use?	Shift Consumption	Reports → Inventory & Formula
What did operators log by hand, and when?	Data Entry Report	Reports → Inventory & Formula
What's our cost, yield and giveaway looking like?	Insights	Reports → Process & Trends
What did this PLC tag do over the last few minutes/hours?	Trending	Reports → Process & Trends
Recorded per-tank temperature/level history	Tank History	Reports → Process & Trends
What has this formula's viscosity looked like over time?	Viscosity Report	Reports → Process & Trends
What did this storage tank's level and temperature do over a date range, shift by shift — and which batches ran on it?	Storage Tank Trends	Reports → Process & Trends
Which tanks are due for cleaning?	Tank / CIP Board	Reports → Process & Trends
How much did downtime cost us, and why?	Downtime / OEE	Reports → Process & Trends

Your question	Report	Where it lives
I need the raw data in Excel	Exporting data	Reports → Data, or Setup

Batch reports



Every batch report follows this shape: a date/time range on the left, an explanation of what it lists on the right, and Preview / Print / Save as PDF / Save as CSV along the bottom.

Go to Batch

`Ctrl+B` from anywhere. **Question answered:** "where is batch #____, or which batch used formula X?" A search box plus a results grid (Batch #, Tank, Formula, Start, Status); double-click or **Open** jumps straight into that batch.

Batch Report

Question answered: "what exactly happened on this one batch?" Pick a date range to find the batch, then select it from a list; a summary panel shows the batch's header fields, and the printed detail table lists **Op Code, Operation, Recorded, Actual Amount, Calc Amount** — one row per ingredient event. Read the Actual vs. Calc columns together: a large gap between them on one ingredient is the first thing to check if a batch's final numbers look wrong.

Usage Report

Question answered: "how much of ingredient X did we use, in total, over a date range?" Filters: date range, optional tank. Two printed tables: a per-family summary (**Family, Count, Actual Amount, Calc Amount**) and a per-operation breakdown (**Op Code, Operation, Count, Actual Amount, Calc Amount**). Use this instead of Batch Report when you want a total across many batches rather than one batch's detail.

Batch History Report

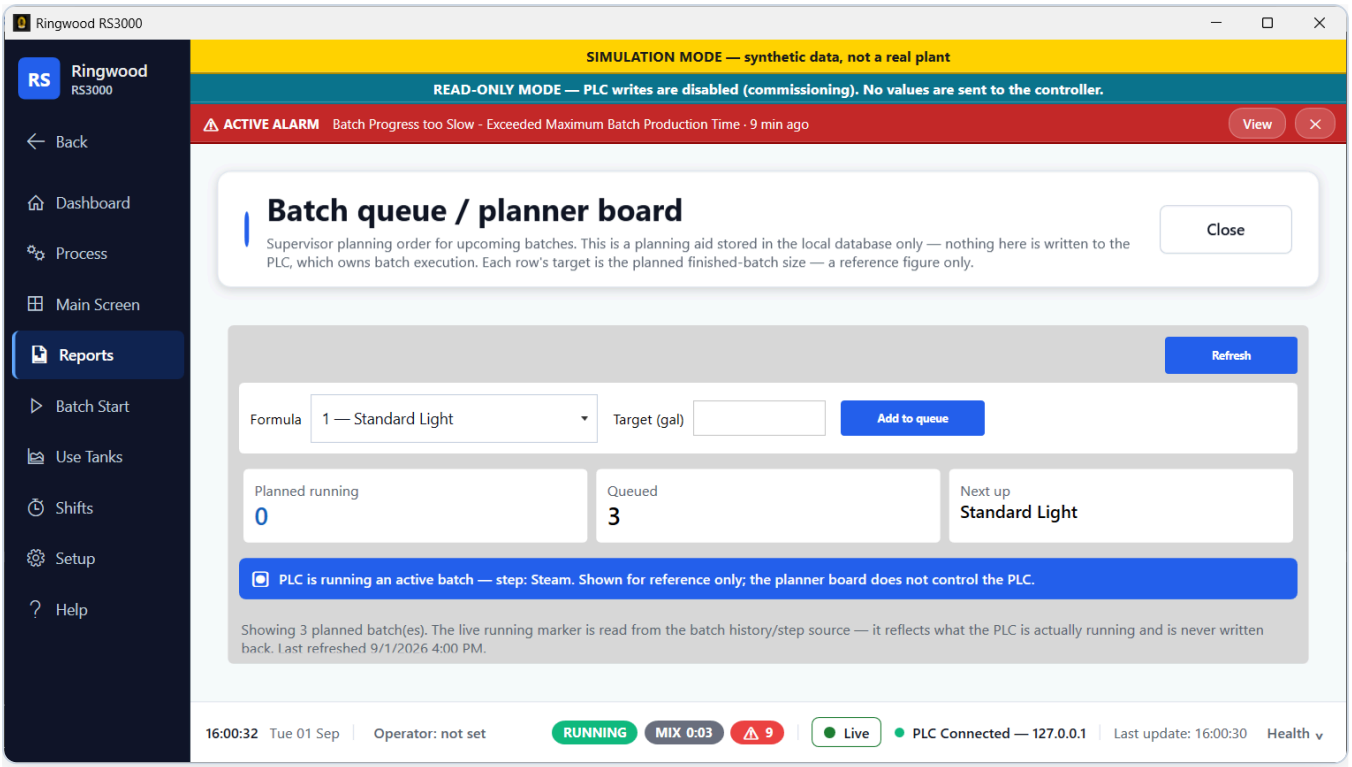
Question answered: "what batches ran in this window, and how did each one end?" One row per batch: **Batch #, Tank, Formula, Start, End, Status**. This is the fastest way to answer "did anything run overnight" or "how many batches did we do this week."

Batch History Usage Report

Question answered: the same window as Batch History, but with each batch's full ingredient detail underneath it — one batch header per batch, then its own **Op Code, Operation, Recorded, Actual Amount, Calc Amount** sub-table. Use this when you need Batch History's coverage but Batch Report's level of ingredient detail, for more than one batch at a time.

Batch Queue Board

Question answered: "what is planned to run next, and in what order?" This is a **supervisor planning aid stored in Ring's own database only** — nothing on this board is written to the PLC, which alone owns what actually executes, and each row's target size is a reference figure, not a live controller value. The board shows KPI tiles (**Planned/Running**, **Queued**, **Next Up**), a form to add a planned batch (tank, target gallons, **Add to Queue**), and a **Mark Done** button per row once a planned batch has actually run.

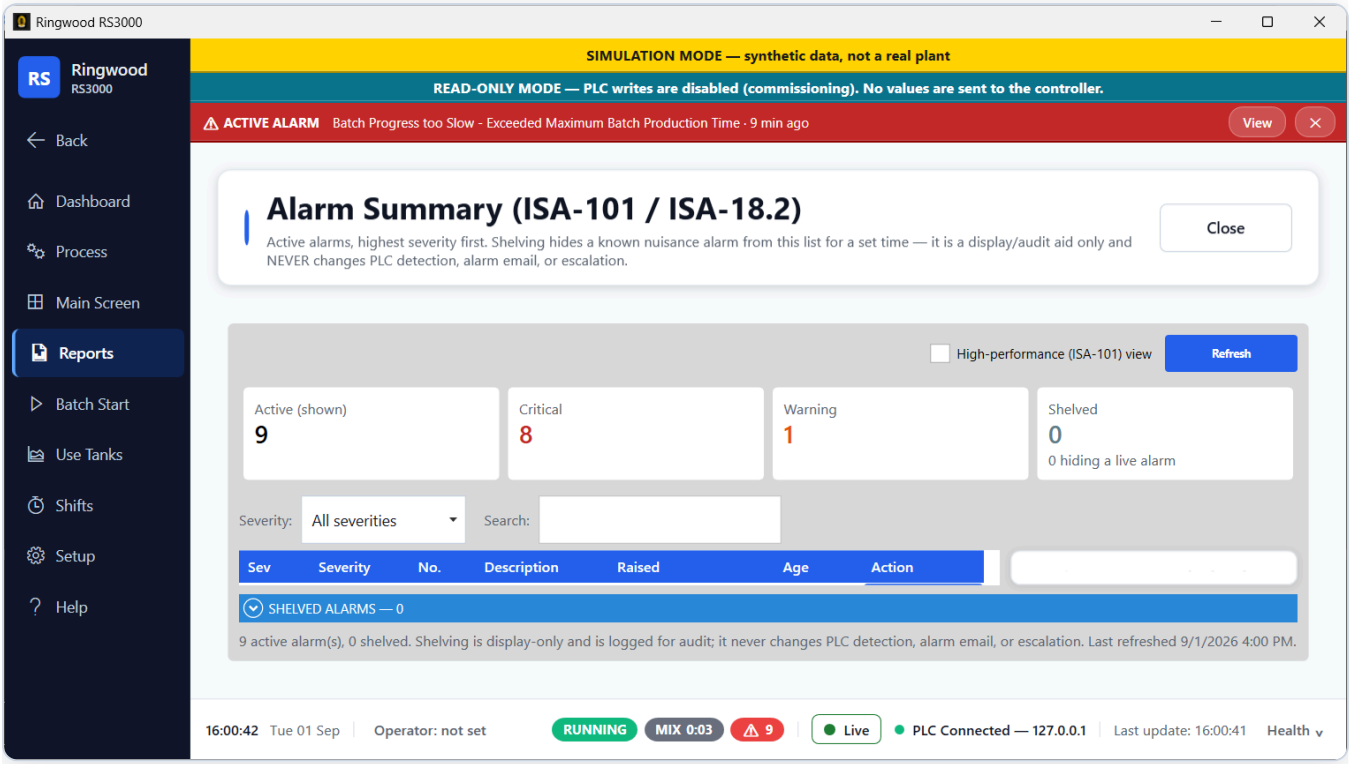


A board you edit, not a report you read: the blue banner reflects what the PLC is actually running for reference only, and each queued row carries reorder, Mark Done, Cancel and Delete buttons.

Golden Batch Overlay

Question answered: "is this batch's temperature tracking normally compared to past good batches of the same formula?" Pick a tank; the screen shows the live or selected batch's temperature curve overlaid on a reference "golden" curve built from a configurable number of past reference batches, plus **Current Deviation**, **Max Deviation**, and a plain status readout. When there is not yet enough history to build a reference curve, it says so plainly rather than drawing a fabricated line — a "collecting data" state, not a flat zero line.

Alarm reports



Alarm Summary's own all-clear state — "No active alarms," with the First-Response Playbook panel alongside it. The same green check convention used throughout the Alarms chapter.

Alarm History

Question answered: "what alarms fired (and cleared) in this window?" Columns: **Alarm #, Description, Alarm Date/Time, Ack Date/Time**. Filter by date range only. This is the report to run for "what fired overnight" at shift handover.

Alarm Analytics

Question answered: "which alarms are the biggest problem, and are we getting slower or faster at responding to them?" Two tables over a date range: a frequency **Pareto** (**Alarm #, Name, Count, Cumulative %** — read top-down, the alarms responsible for most of your alarm volume are at the top) and a nuisance-alarm ranking (**Alarm #, Name, Count, Median Active, Score** — a high score combines high frequency with long time spent active, so it surfaces alarms that are both frequent *and* slow to clear). MTTA (mean time to acknowledge) and MTTR (mean time to resolve) summarize response speed for the range.

Alarm ↔ Batch

Question answered: "was a batch running when this alarm fired?" Columns: **Time, Alarm #, Alarm, Type, Batch(es) running** — useful for tracing whether a quality issue on a specific batch coincided with a fault.

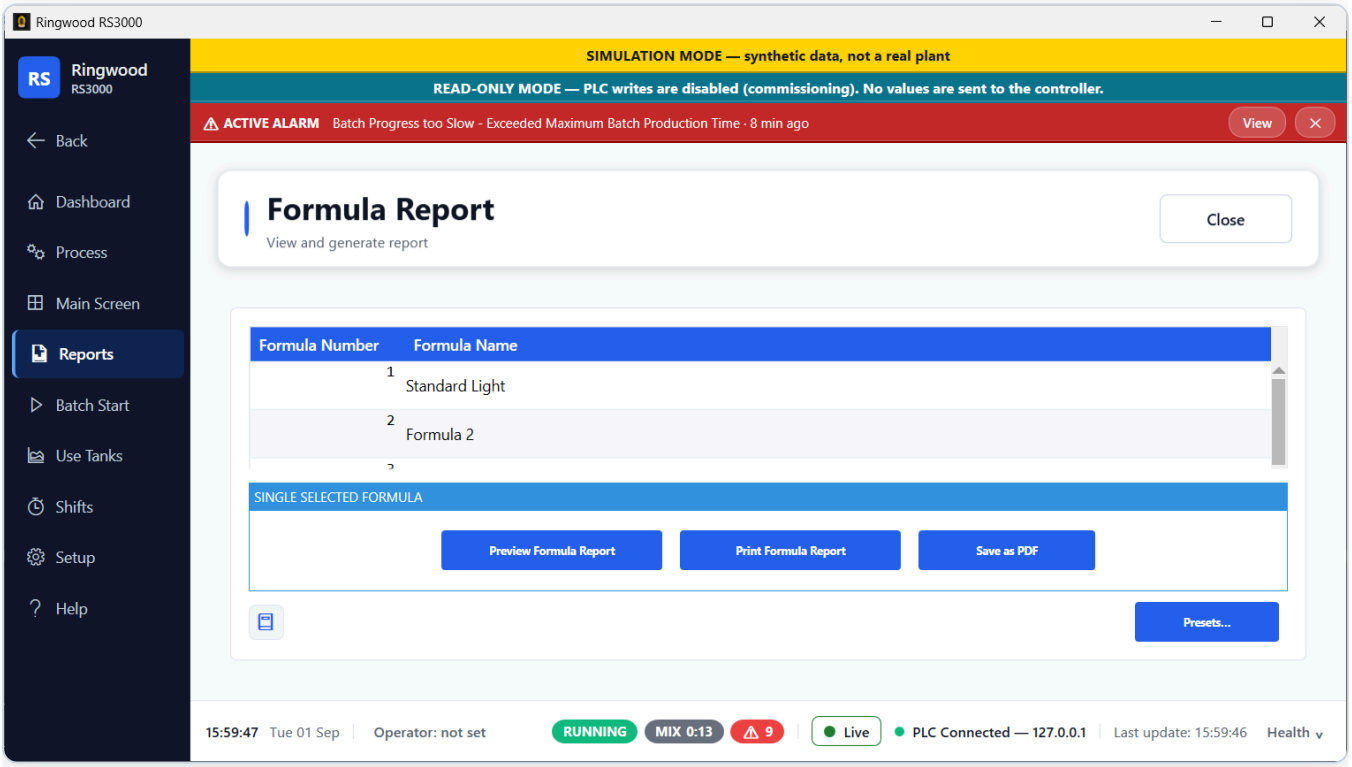
Alarm Summary

Question answered: "what needs attention right now?" — a live, ISA-101/ISA-18.2-style view of active alarms, highest severity first. Columns: **Sev, Severity, No., Description, Raised, Age, Action**. A separate, collapsed **Shelved alarms** section lists any alarm currently hidden from the active list (**No., Severity, Description, Reason, By, Until, Action**) — shelving is a display/audit aid only and **never** changes PLC detection, alarm email, or escalation; a shelved alarm that is still genuinely live is flagged in its own hiding-a-live-alarm note rather than disappearing silently.

Operator Audit Trail

Question answered: "who did what, and when, on this station?" A read-only, chronological record: **Time (local), Operator, Screen, Control, Action, Old, New, Detail**. Nothing here is sent to the PLC, and each record is chained to the one before it specifically so an altered or deleted record would be detectable — treat this as the record of record. The **Operator** column is whichever name was picked in the status strip at the time — see 01-getting-started.md §Tell Ring who you are.

Inventory and formula reports



Pick one formula from the list on the left; Preview, Print or Save as PDF its full step detail on the right — no date range, because this is a current-state report.

Inventory Report

Question answered: "what did inventory look like at each recorded event?" A list of inventory events (**Event ID, Date**) on the left; select one to print/preview its detail — an ingredient-by-ingredient breakdown (**Ingredient, Quantity, Unit**) for that event.

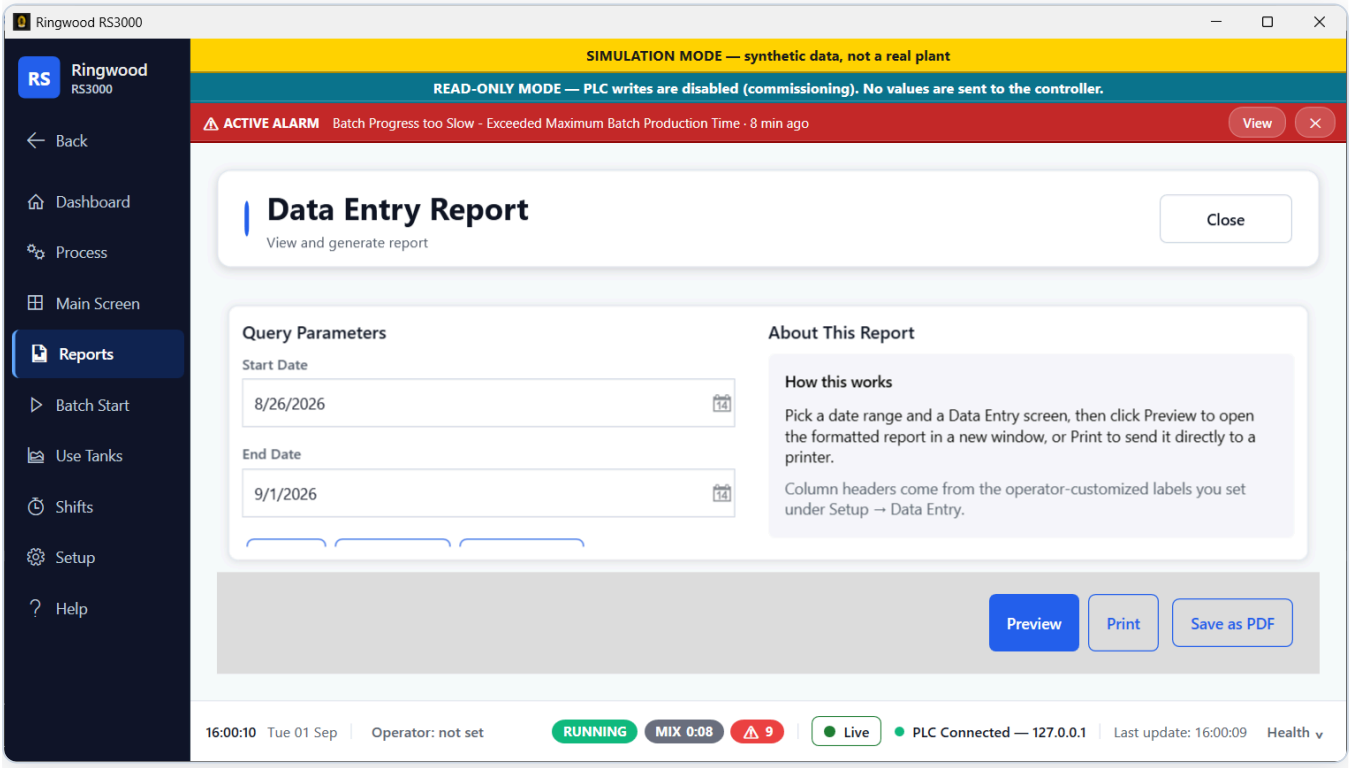
Formula Report

Question answered: "what does formula X's recipe look like right now?" No date range — this is a current-state report. Pick one formula from the list (**Formula Number, Formula Name**) to print its full step detail, the same shape as the Formula Edit screen's table.

Shift Consumption

Question answered: "how much did each shift use?" A per-shift summary (**Shift ID, Shift Name, Start Time, Start Date, Duration, Consumption**) with a per-operation breakdown underneath each shift (**Operation, Uses, Consumption**).

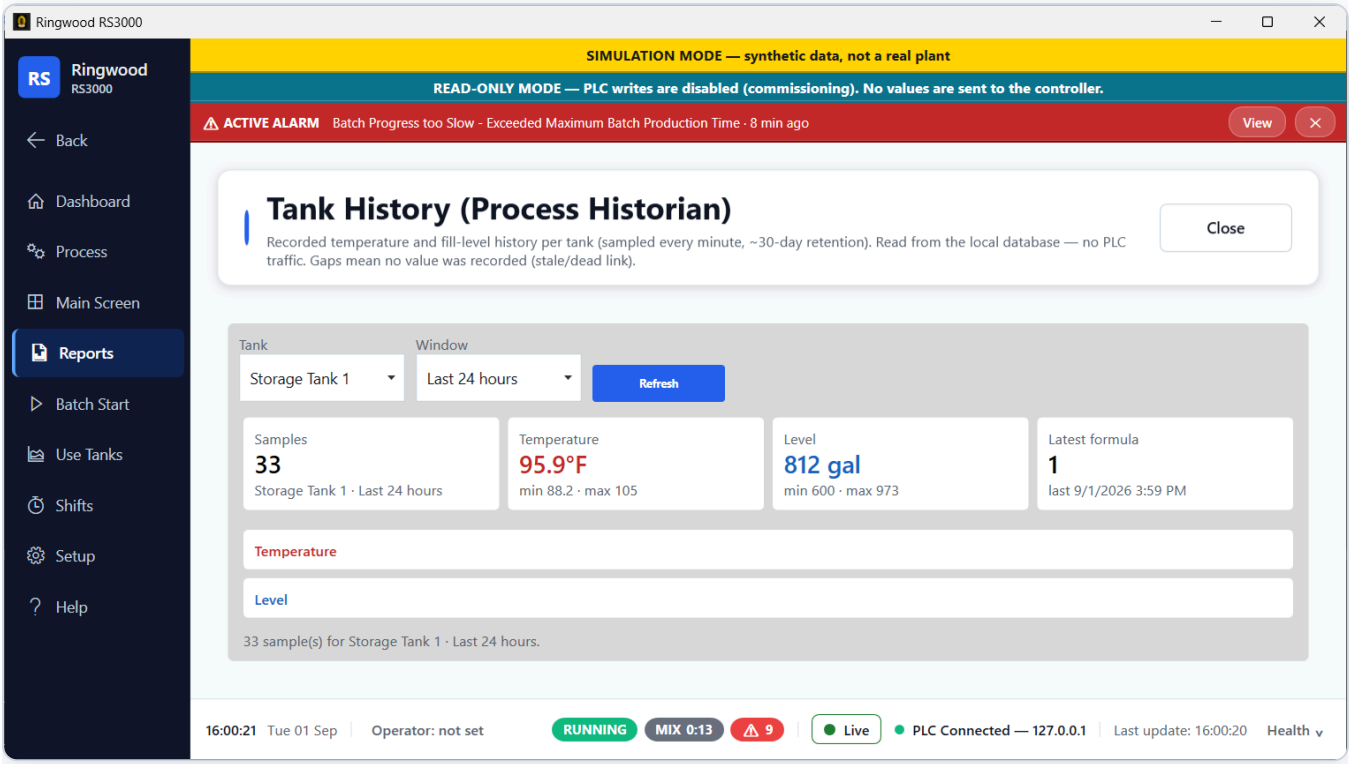
Data Entry Report



Pick a date range and one of the five Data Entry screens, then Preview or Print — the entries come from whichever free-form logging screens the operators actually used.

Question answered: "what did operators log by hand on this station, and when?" Filters: date range, plus a picker for which of the five **Setup → Data Entry** screens to report on (their field labels are renamed per plant under **Setup → Data Entry Setup** — see 3b §Data Entry and Data Entry Setup). Preview or Print the formatted result the same way as any other report.

Process and trends



Pick a tank and a time window; the Samples/Temperature/Level/Latest formula tiles and the two charts below them are read from the local database, not a live PLC poll.

Insights

Reports → **Insights** is the plant's cost/yield dashboard — see Spend, yield and usage below.

Trending

Question answered: "what did this PLC tag actually do over the last few minutes/hours?" — a live rolling plot, not a historical report; there is no date-range filter because it only shows what has happened since you opened it (or since the plot buffer started). Pick from the station's tag registry: **ten fixed controller tags** (Current Step, PC Read Integer[0]– [3], and several of the live batch-array tags — Preset Operation, Preset Amount, Actual Amount, Preset Mix) **plus a Level and a Temperature series for every storage tank on your roster** — so a 4-tank plant offers 18 series in the picker, a 6-tank plant 22. Add up to as many as you want to the plot with **Add**/**Remove**, choose a time window (**5 min, 30 min, 2 hr, or 8 hr**), toggle **Annotations**, and use **Pause/Resume** to freeze the plot for a closer look. **Export CSV** saves what is currently plotted. Named **Presets** let you save a tag+window combination for reuse. Hovering the chart shows a crosshair with the exact value at that point in time.

> **Note:** The small **Trend** button on a Storage Tank Group card opens Trending with that tank's Level and Temperature series already selected — you do not have to find them in the picker yourself.

> **Note:** Some Trending series (the batch preset/actual amount tags) deliberately show **no unit label** on the axis. The underlying PLC tag carries no unit of its own, and — per the settled pounds verdict (see 05-formulas-and-recipes.md) — labelling it is a follow-up step pending a separate sign-off. Read these series as relative shape over time, not as a labelled absolute value.

Tank History

Recorded per-tank temperature/level history — a historian view distinct from Trending's live plot.

Viscosity Report

Question answered: "what has this formula's viscosity looked like over time?" Columns: **Recorded (UTC), Formula, Storage Tank, Current Temp, Raw, Calibrated, Operator** — the same readings logged from the Viscometer screen (see 03a-main-screen-reference.md §Viscometer), gathered into one report.

Storage Tank Trends

Question answered: "what did this storage tank's level and temperature do over a date range, and what happened shift by shift — min/avg/max level and temperature, and which batches ran on it?" Filters: a date range (start/end date plus time-of-day, defaulting to the last 7 days), an optional **Shift** filter (**All Shifts**, or one installed shift — picking a specific shift restricts both the trend chart and every table row to that shift's recurring window across the whole date range, including its overnight tail), and a **Tank** filter (**All Tanks**, or one storage tank — picking one tank also draws its level/temperature trend chart; **All Tanks** shows the aggregate table only, with no chart, since overlapping traces for every tank would be unreadable).

The per-shift aggregate grid: **Tank, Shift, Date** (the local date the shift *occurrence began* — an overnight shift is dated on the day it opened, not the day it crossed midnight), **Samples, Temp Min/Avg/Max, Level Min/Avg/Max, Batches** (a count; selecting a row lists that occurrence's batches — ID, formula, started, status — in the grid below it).

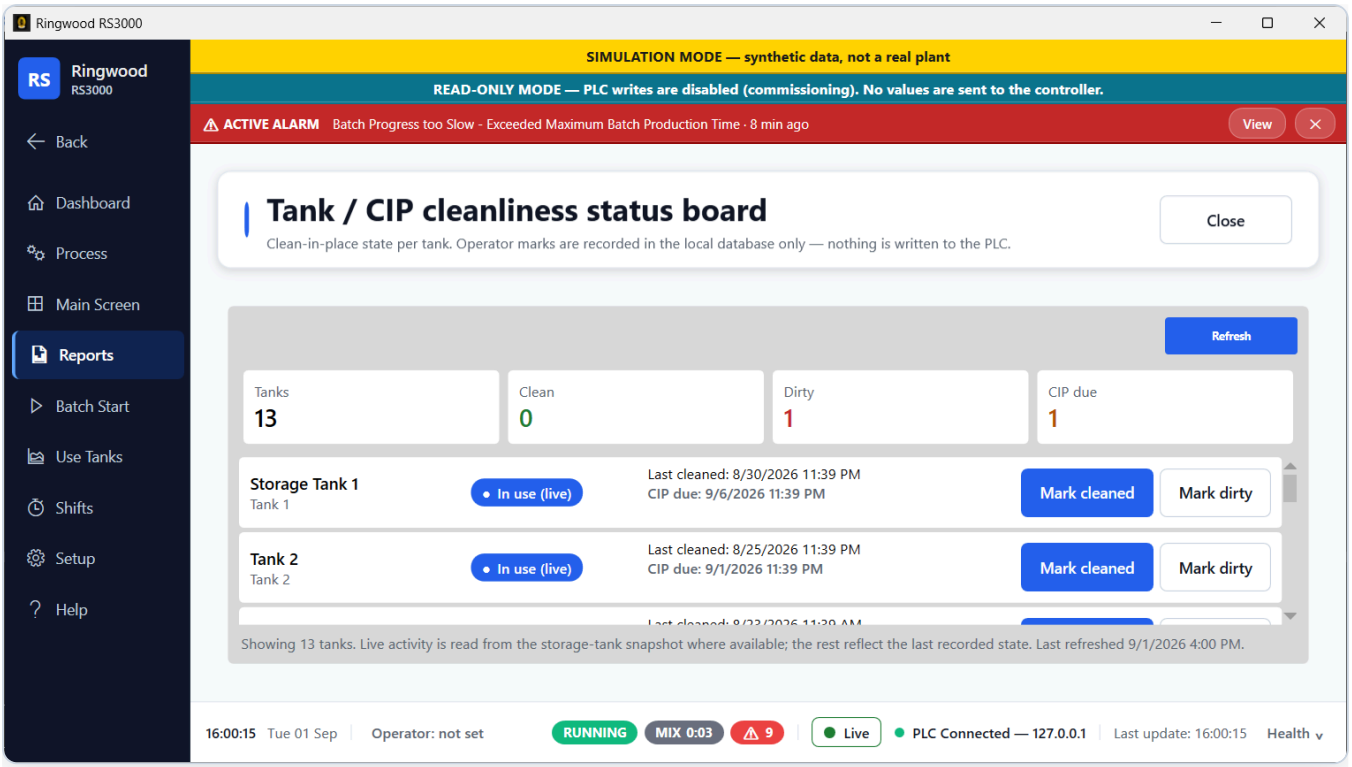
Data comes entirely from the **Process Historian** (level/temperature already recorded automatically about once a minute per tank, retained for 365 days by default — see How long report data is kept below) plus the Batch table — this report adds **no new PLC reads** of its own.

Honesty behavior: if the date range you pick starts before the historian's very first recorded sample, the screen states "Recording of storage tank history began <date>" instead of quietly showing a misleadingly empty range. Any missing figure — a period the historian was offline, for example — shows as an em-dash, never a fabricated zero.

Export: Preview/Print and **Save as PDF** render the on-screen, localized, current-display-unit version. **Save as CSV** is deliberately different — invariant English headers, native units (°F / gallons regardless of the on-screen toggle), and ISO-8601 UTC timestamps — a machine-readable export, not a copy of what's on screen.

Tank / CIP Board

Question answered: "which tanks are due for cleaning?" Clean-in-place state per tank — tile counts for **Clean**, **Dirty**, and **CIP Due**, with **Mark Cleaned** / **Mark Dirty** buttons per tank. Operator marks are recorded in the local database only — **nothing here is written to the PLC.**



A board you mark, not a report you read: Clean/Dirty/CIP due tile counts up top, then one row per tank with its last-cleaned date, next-due date, and Mark cleaned / Mark dirty buttons.

Downtime / OEE

Question answered: "how much did downtime cost us, and why?" This report is built entirely from **operator-logged** downtime events — the plant exposes no reliable readable hold/stop tag Ring could read this from automatically, so the "Log downtime" panel is how the data gets in at all, and it is a non-blocking inline panel (never a modal that could freeze the floor). Once logged, the report shows total downtime, an estimated cost ($/hr × hours), an OEE Availability figure, and a downtime-by-reason Pareto (**Reason, Events, Downtime, Cumulative %, Cost**).

Golden Batch Overlay, Glue Usage Report, Dry lbs / sq ft, Cycle-Time Trend

- **Glue Usage Report** — per-batch **Batch #, Tank, Formula, Started, Solids %, Shift**, plus derived dry-starch usage; per-formula and per-shift summary chips.
- **Dry lbs / sq ft** — joins the same derived dry-starch pounds to the operator-entered square footage from **Shifts → Production Log**, per shift occurrence: **Shift, Date, Square Feet, Coverage Rate, Area per lb, Band, Note, Source, Entered By**. Three honest states only — a real coverage figure, "no certifiable completed batch," or "no square footage entered" — a missing input is never shown as a zero.
- **Cycle-Time Trend** — a formula's median cycle baseline, a slowest-step ranking (top row is the bottleneck: **Step, Operation, Samples, Median, % of cycle**), and which steps in the most recent batch ran over baseline by more than a configured margin (**Baseline, Observed, Over by**). Zero samples renders an explicit empty state and an em-dash median, never an invented ranking row.

Spend, yield and usage — the Insights screen

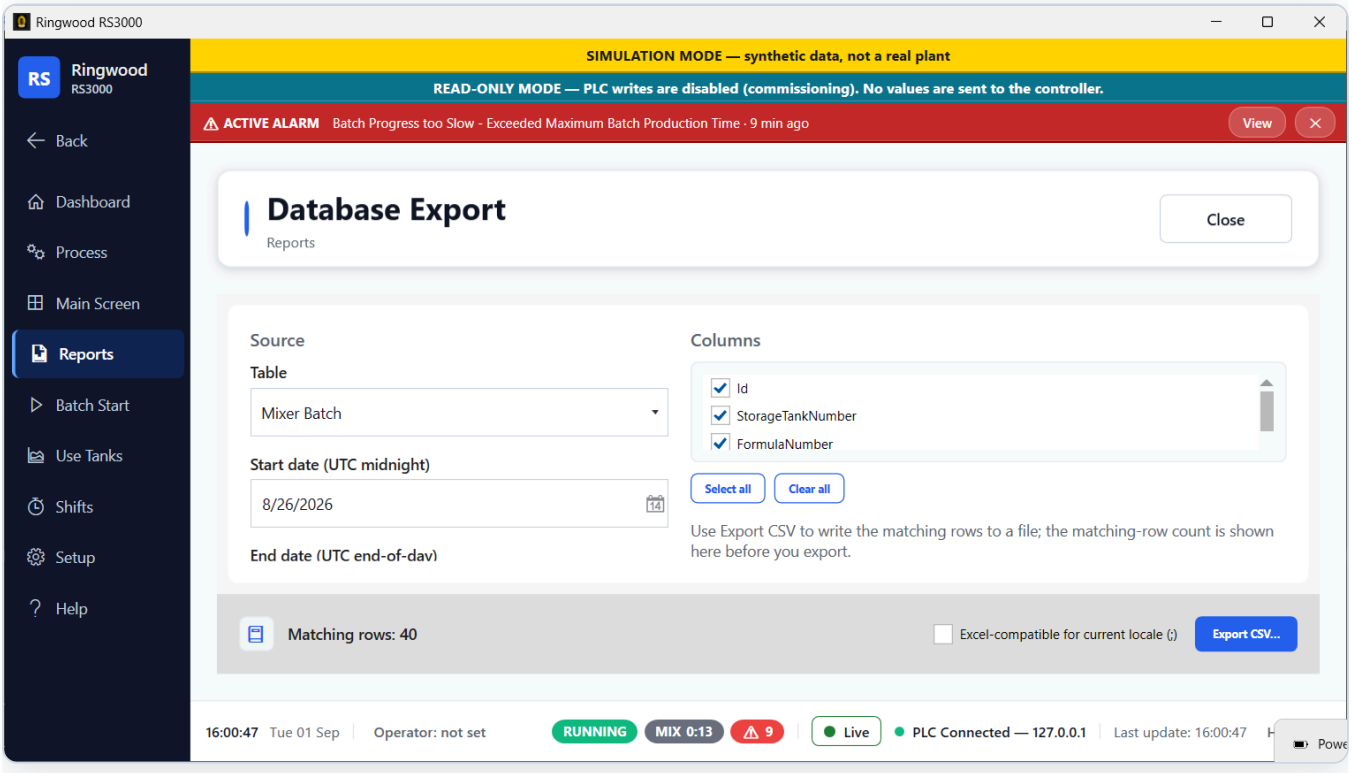
Reports → **Insights** is the plant's cost/yield dashboard, in two sections:

Production cost:

- A **trend chart** — batches-per-shift or volume-per-day.
- **Glue Used** — preset vs. actual dry-starch usage for today, this shift, this week, or a custom range, with a link into the full Glue Usage Report.
- **Spend** — ingredient cost, giveaway/overdose cost, and aborted-batch write-off cost, sourced from Setup → Costs.
- **Yield Scorecard** — yield, giveaway and cycle-time figures at a glance, with a fuller **Yield/Giveaway** breakdown underneath (by formula, by tank, over/under/on-target counts, mean delta, and weekly cost) — the same numbers behind the standalone **Yield / Giveaway Report** (**Batch #, Tank, Formula, Requested, Actual, Giveaway, Yield %, Note**).
- **Batch ETA** — a single honest line ("batch done in ~22 min") for the currently running batch, built from the median duration of similar past batches. When there isn't enough history for a real estimate, or the live batch data has gone stale, it says so instead of guessing — it never invents a number.

Plant health: Equipment Health and **Alarm Load** summaries, with a link into the full Alarm Analytics report.

Exporting data



Pick the table, the date range, and which columns to include; "Matching rows" updates live before you export.

Reports → Database Export (Reports → Data group — it is not under Setup, and it is a different tool from Setup's Database Backup/Restore) exports any of six tables to CSV, with a column picker and, where the table has a meaningful timestamp, a date range:

Table (as shown in the picker)	Date filter column	Notable columns
Mixer Batch	Start time	Tank, formula, level, start type, start/end time, status, actual volume, cost, notes, operator, controller batch number and outcome
Ingredient Usage	Recorded time	Batch ID, operation code/name, actual amount, calculated amount
Alarm History	Alarm active time	Alarm number/name/status/type, active/ack/resolved timestamps
Shift Definitions	*(none — this is a configuration table, not an event log)*	Shift number, name, installed flag, start time, duration
Inventory Snapshots	Captured time	Carryover, counter, formula number, per-slot amounts
Viscometer Settings	*(none)*	Per-formula calibration coefficients, alarm band, adjustment mode

Click-by-click steps also exist inside the app at **Help → Operator Runbook** §7.7; the exported file opens directly in Excel.

Export everything (.sql)

Alongside **Export to CSV** (which is limited to the six tables and columns above), the same **Database Export** screen has an **Export everything (.sql)…** button that ignores the table picker entirely. It asks only for a destination **folder** (defaulting to your Documents folder), then writes a single file named `RingwoodDatabase-<timestamp>.sql` containing the **entire** database — every table's structure and every row, not just the six tables the CSV picker offers. A result dialog reports how many tables and how many rows total were written, plus the exact file path.

Hand this file to IT/support, or replay it into a brand-new empty SQLite database to fully restore or inspect the data. It is a point-in-time snapshot taken instantly and safely **while Ring keeps running** and writing to the live database — you do not need to close Ring or wait for a quiet moment first. If the export is interrupted (the app is closed, or power is lost) partway through, no half-written `.sql` file is ever left behind under the final name; at worst a same-named `.sql.partial` file remains, and that file is safe to delete.

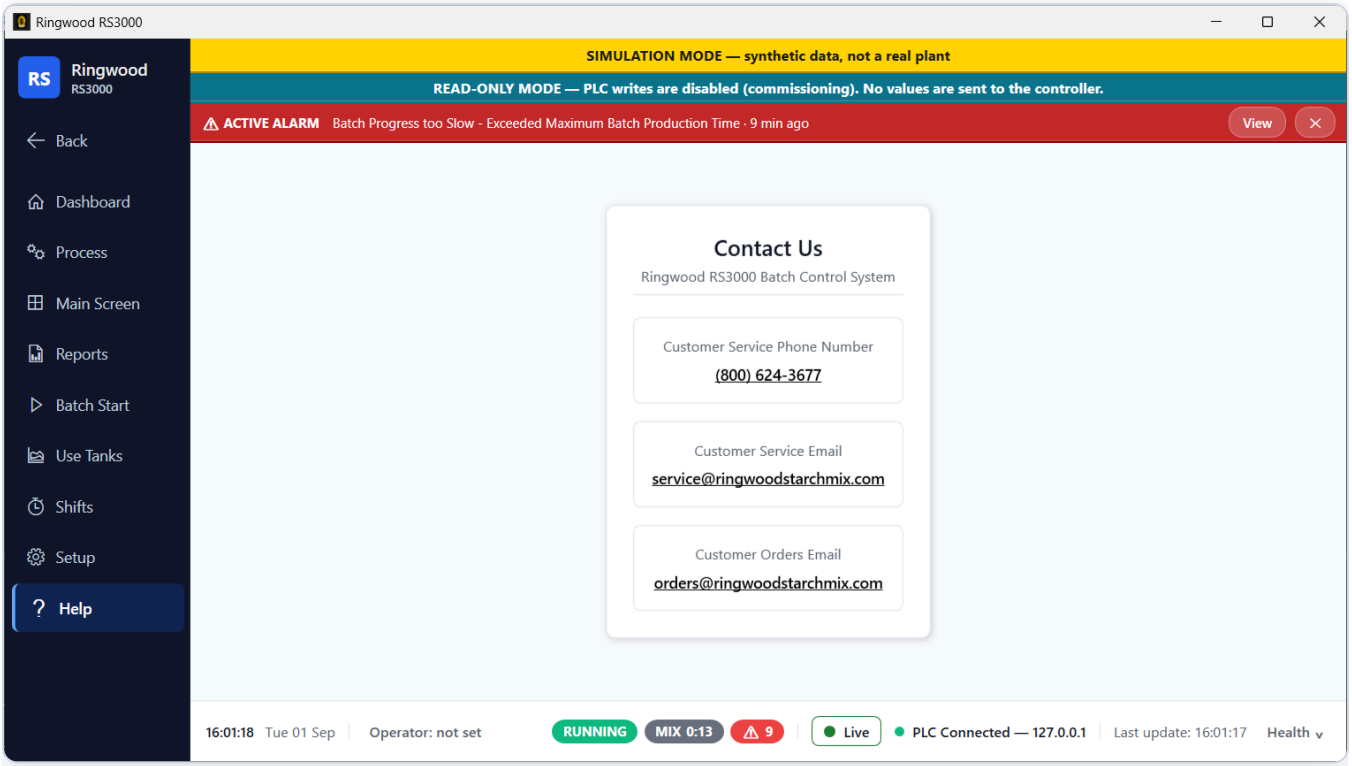
How long report data is kept

Process-trend history (the Process Historian behind Tank History and Storage Tank Trends) and alarm history each have their own retention window, set independently under **Setup → Database Backup/Restore → Data retention** (supervisor-gated — see 3b §Setup). Both default to **365 days**, and either can be set to **0** to

keep records forever. A historian-retention change takes effect after Ring is restarted; an alarm-history-retention change applies immediately.

If a report's underlying database can't be read at all — not just empty of matching rows for your filter — the screen says so with an explicit "data unavailable" notice instead of quietly rendering a clean, misleadingly empty grid.

7. Troubleshooting



Help → Contact Us — the numbers to call, kept current per plant.

Operator-level triage only — the goal here is knowing what to check, what evidence exists, and who to call. Deeper engineering procedure lives in the linked documents; this chapter does not restate it.

Quick symptom table

Start here. Find what you're seeing, then jump to the section named.

What you see	Most likely cause	First action
Status strip PLC dot is amber or red	Link degraded or down	Check the dot's exact wording, wait 30s for a blip to clear — see PLC connection lost
A batch's numbers stopped updating	PLC link down; the batch may still be running fine on the controller	Check the connection indicator **before** assuming the batch stopped — see 02-running-batches.md §2.5
Ring.exe won't open, or the window flashes and vanishes	Another Ring is already running (most likely), or a crash / broken config file	Look for a "Ring Already Running" / "Ring Is Starting" dialog first — it names the PID — see Ring is already running; only if there is none, check the crash log — see App frozen or crashed

What you see	Most likely cause	First action
Window is open but not responding to clicks	Frozen UI thread or a native fault	Wait briefly, then treat as a crash if it doesn't recover — see App frozen or crashed
A red banner appears under the top of the window and stays for the session	Database or tank-roster problem at startup	Read the banner text exactly — it names which of the two it is — see Degraded startup
A message box appears **before** the main window	Broken `appsettings.json`	Read it, note the exact text, call IT — see Database warning
You need to run the line right now and Ring is unusable	Hard failure meeting a rollback trigger condition	Follow the rollback authority — do not improvise — see Falling back to the legacy application
Formula won't load, or list looks wrong	Formula deleted/edited, or not valid for this tank	See Formula won't load below
Batch won't start, no clear message	Read-only mode, PLC not connected, tank not eligible, or the start level is out of range	See Batch won't start below
A report shows no data you expected	Date/tank filter too narrow, or the batch really isn't there	See A report shows no data below
You need to hand an engineer your station's state fast	—	Setup → Diagnostic Console → Copy to Clipboard or Export Bundle — see App frozen or crashed

Formula won't load

The formula dropdown on Batch Start is empty, or the formula you expect isn't in it.

- **It may simply not be valid for this tank.** Batch Start's Formula list only shows formulas tagged as valid for the tank you opened — Storage Tank 1 and Storage Tank 4 can legitimately show different lists. See 02-running-batches.md §Pick the formula. Try the tank you actually meant to batch, or ask a supervisor to check the formula's tank assignment under **Setup** → **Formula Edit**.
- **It may have been recently deleted or edited.** Formula Edit is supervisor-gated — check with the supervisor on shift about recent changes.
- **A saved backup may exist. Setup** → **Formula Exchange** can bring a recipe that only lives above formula-bank slot 6 back into a slot the controller can run — see 05-formulas-and-recipes.md §Formula bank exchange with the PLC.
- If none of the above explains it, escalate — **Setup** → **Formula Edit** is the source of truth for what a formula actually contains, not the Batch Start dropdown.

Batch won't start

You clicked **Start Batch** and got a warning, or the button itself is disabled. Ring checks the following, in this rough order, before it will even try to send anything to the controller:

- **Read-only mode is on.** The button still "works," but a banner says the batch will be validated and **not sent** — this is expected before the plant's write-enabled cutover, not a fault. See 01-getting-started.md §Read-only mode.
- **The PLC isn't connected.** The screen's own banner reads "PLC not connected — batch cannot start." Check the connection indicator — see PLC connection lost below.
- **The tank isn't eligible to batch. Start Batch** is disabled with its own short red reason when the controller reports this tank as not installed, not a storage tank, or when Ring hasn't yet been able to read that capability from the controller at all. This is a controller-side fact, not something to work around by retyping values — call the supervisor or the controls engineer.
- **Batch Start Level is out of range.** The field turns red — check the range shown underneath it and adjust.
- **Nothing happens at all when you click Start Batch.** This is rare. Look for an exception dialog first. If there is none, navigate away and back to reload the screen; if it still does nothing, treat it like App frozen or crashed and escalate.

A report shows no data

You opened a report and it's blank, or says there's nothing for the selected range.

1. **Widen the date range.** Every report in this chapter that has one filters strictly on it — see 06-reports-and-history.md.
2. **Widen or clear the tank filter**, if the report has one.
3. **Cross-check with Batch History Report** over the same window. If that is also empty, the batches genuinely did not run in that window — the report is not lying to you.
4. **Restart Ring** if a batch you definitely saw run (for example, on Storage Tank Group) is still missing from a report afterward — this points at a UI refresh glitch rather than missing data, and a restart normally clears it. If it is still missing after a restart, escalate.

PLC connection lost

Check the connection indicator (see 01-getting-started.md) for exactly which state you're in: power, cabling, and recent network changes are the first things to check; wait 30 seconds for a blip to clear, then call IT/the PLC engineer if it stays down past five minutes — see **Help → Operator Runbook §14.1** (opens in the app) for the full checklist. Screens keep working on the last good reading; no PLC writes can land while the link is down. See also 02-running-batches.md §2.5 for what this means for a batch already in progress.

Ring is already running

Ring is **single-instance**: a second launch never opens a second copy. This is not a rare edge case — the kiosk installer's auto-restart watchdog relaunches Ring roughly every minute after a crash specifically because "redundant launches are safe, Ring is single-instance," so this path gets exercised constantly on an unattended LCP. A healthy existing Ring is simply brought to the front and the new launch exits silently; anything less healthy shows one of three auto-dismissing dialogs (they close themselves after 60 seconds if nobody is there to click, so an unattended reboot never parks forever):

Dialog title	Meaning	What to do
Ring Is Starting	The running Ring is still booting (database integrity check + backup can take a while) — this is healthy, not stuck.	**Wait for the Ring window to appear — do NOT end it, or the database backup will be left half-written.**
Ring Already Running	A healthy Ring has no window on screen yet, or was already brought to the front.	Give it a moment. If no window appears, end that Ring.exe in Task Manager and relaunch.
Ring Not Responding	The other Ring's window has been unresponsive for a sustained period (roughly ten seconds across two checks, not just one busy moment).	If it doesn't recover on its own, end that Ring.exe in Task Manager and relaunch.

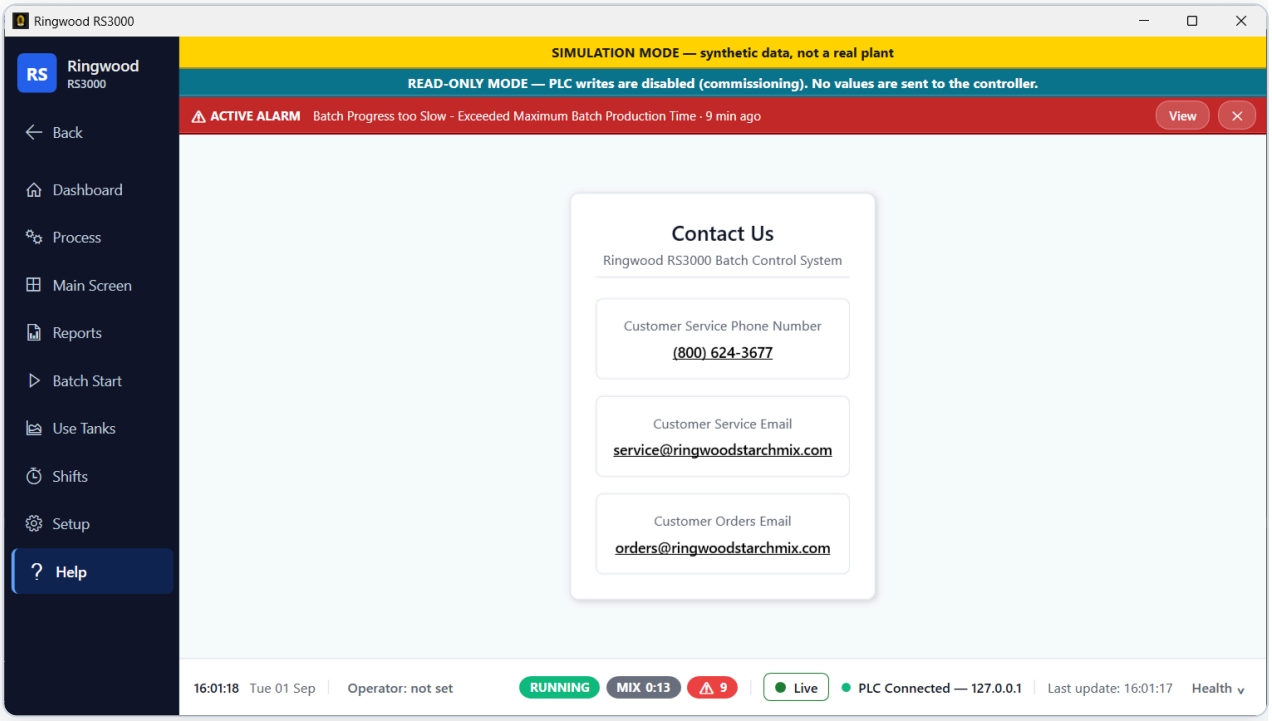
Each dialog names the other instance's **PID**, which is worth reading off before you end anything. If Ring vanished after a crash, the auto-restart watchdog (where installed) relaunches it within about a minute on its own — give it that long before assuming you need to intervene.

App frozen or crashed

- **A crash** (Ring.exe closes unexpectedly) leaves a forensic record automatically: a plain-text file named `crash-<UTC-timestamp>-<short-guid>.log` under `logs\crashes\` next to `Ring.exe`, containing the exception, a stack trace, and basic environment info. This happens without you doing anything.
- **A frozen window** (not responding) may not leave a managed crash log at all — a native fault can make the process simply vanish. If this station's kiosk install included the WER (Windows Error Reporting) step (`Install-RingWerDumps.ps1`, part of the standard kiosk install per `CUTOVER_RUNBOOK.md` §8), a native fault such as a `plctag.dll` crash leaves a minidump under `C:\Ring\logs\dumps` instead; if that folder is empty too, Event Viewer is the next place to look. Full detail: `docs/production-readiness/11_CRASH_DUMP_RUNBOOK.md` (source: in the Ring repository).
- **Setup** → **Diagnostic Console** is the fastest way to hand an engineer a useful snapshot. Check its **Health** tab first — 16 live rows (PLC endpoint, connection state, heartbeat age, data freshness, database path/size/journal mode, uptime, validator warnings, and more) that often answer the question on their own; **Copy diagnostics text** puts that panel on the clipboard in one click. If you need more, **Refresh**, then either **Copy to Clipboard** (the fuller report, to paste into a support chat/email) or **Collect support bundle** — no Save dialog to answer, it writes straight to the Desktop as

`RingSupportBundle-<computername>-<timestamp>.zip` and the confirmation message names the exact path. The bundle includes the application log, recent crash logs and dumps, a sanitized configuration copy, a fresh validator report, and recent PLC communication history — built specifically to attach to a support ticket.

- **Who to call: Help → Contact Us** has the phone number and service/ orders email addresses kept current for this plant.



Help → Contact Us — the numbers to call, kept current per plant.

During the post-cutover hypercare window specifically, page per **Help → Operator Runbook §15** (opens in the app) — a plant is down / Ring won't open at all is a page-immediately (P0) situation.

Degraded startup

If Ring starts but something was wrong during boot, a **red banner** appears at the top of the window (below the read-only banner, if that is also showing) and stays up for the whole session — it only clears on a restart once the underlying problem is fixed. Two conditions can trigger it, and the banner names whichever applies (both can show together):

> **"DATABASE PROBLEM AT STARTUP — batch history, the audit trail and alarm history may not be recorded. PLC writes are switched OFF for this session. Restart Ring after the database is repaired."**

> **"TANK ROSTER COULD NOT BE READ — the default 4-tank layout is in use, so the tank cards may be showing the WRONG tanks. Check Setup > Tank Roster."**

Treat either as a call-IT situation, not a click-through — the database banner in particular means PLC writes are force-disabled for the rest of the session regardless of any other setting.

Database warning

If Ring's configuration file itself is broken, you'll see this **before** the main window even appears — a message box titled **"Startup Configuration Error"** (fatal — Ring will not start; note the exact text and call IT) or **"Startup Configuration Warning"** (non-fatal, with a 60-second auto-continue countdown if nobody is present to click through it). See 01-getting-started.md for the full table. The **degraded-startup database banner** above is a different, later-stage warning — it means the app started but the local SQLite database itself failed to initialize.

Falling back to the legacy application

Ring's product name is **RS3000** (the window title reads "Ringwood RS3000"); the application it replaces is the legacy **`~RS360`** app. If a hard failure calls for reverting to `~RS360` for the shift, the authoritative one-page operator procedure is `docs/production-readiness/ 13_RS3000_ROLLBACK.md` (source: in the Ring repository) — this manual does not restate its steps. In short: it is a 10-minute, engineer-driven checklist for specific trigger conditions (Ring won't start, PLC heartbeat red for more than 5 minutes after the main window appears, a blocked Process/Main Screen, unexpected new alarms, or an operator/supervisor declaring an unsafe state); anything short of those triggers is a hotfix situation, not a rollback. `CUTOVER_RUNBOOK.md` §4 owns the underlying mechanism that document points into.

Log file locations

Verified, code-backed locations only:

What	Where
Crash logs	`<exe-dir>\logs\crashes\crash-<UTC-timestamp>-<short-guid>.log`
Native crash dumps (only if the kiosk installer's WER step was run)	`C:\Ring\logs\dumps` — a minidump left by a native fault such as `plctag.dll`, for when no managed crash log exists at all
PLC communication log — per-day CSV (opt-in, via Setup → Communication Disk Logging)	`%ProgramData%\Ring\logs\plc-comm-YYYY-MM-DD.csv` — the same folder as the application log, not next to `Ring.exe`
PLC communication log — database table (always on)	Inside `RingwoodDatabase.db`; queryable/exportable via **Setup → Database Export → PLC Communication Log**. Engineering can audit comms history (link up/down, reprobes, write outcomes) from this table without waiting for a support bundle — see 06-reports-and-history.md §Exporting data

What	Where
Support bundle (on demand, via Diagnostic Console → Collect support bundle)	Always your Desktop, as `RingSupportBundle-<computername>-<timestamp>.zip` — the confirmation message names the exact path

8. Glossary

Plant and app terms an operator meets in Ring, in alphabetical order. Each entry is anchored to code or an authoritative document — a term you expect to see here but don't is one this review could not verify with confidence (see the note in each chapter's "Sources verified" list, and the caller's summary of this manual, for what was deliberately left out).

BOL

Bill of Lading — the supplier's paperwork stating what a bulk delivery was supposed to contain. **Main Screen → Receiving Verification** records the BOL (expected) weight against the blown-in (actual) weight and shows the variance immediately. See 03a-main-screen-reference.md §Receiving Verification.

CIP

Clean-In-Place. The plant's tank-cleaning cycle. **Reports → Tank / CIP Board** shows per-tank clean/dirty/in-use state, last-cleaned time, and when CIP is next due; operator marks there are recorded in Ring's own database only, never written to the PLC.

Demo mode

Feeds every screen with synthetic data instead of the real controller, for training — shown by a bright yellow banner across the top of every screen. Set per station, either in the config file or from **Setup → Plant Profile → Enable Demo / Training Mode** (supervisor-gated); either way the change takes effect on Ring's **next restart**, not immediately. See 01-getting-started.md.

Doser tank

One of the plant's final "use" tanks that actually doses glue to the corrugator line — what the app's Use Tanks screens (MF 1, and the hidden MF 2 / Double Backer slots) show. The plant's tank count is 1 mix + 6 storage + 6 doser tanks (13 total, per the repository README).

Dry starch (derived)

Dry-starch pounds used, computed from formula amounts and solids percentages rather than read from any scale on the floor — every place this manual shows it (the Dashboard KPI strip, the Glue Usage Report, Dry lbs / sq ft) says so as "derived, not measured." See 03-screens-reference.md §The KPI strip and 06-reports-and-history.md.

Formula bank

The controller's own set of six recipe slots (`Formula_01`…`Formula_06`) — the only formula numbers the plant can actually run a batch from. Formula numbers above 6 exist only in Ring's database. See 05-formulas-and-recipes.md.

Freshness chip

A small green **LIVE** / amber **STALE** / grey **NO DATA** indicator (dot + label) that appears on several screens (Storage Tank Group, Use Tank Group, MF 1, the Dashboard's tank rail) to say how current the data behind that specific card or screen is — distinct from, and more specific than, the single global PLC connection banner. See 01-getting-started.md §PLC connection indicator.

Giveaway

The cost of dosing more than a formula called for — the gap between Requested and Actual on the **Yield / Giveaway Report**, and one of the figures behind the **Yield Scorecard** on **Reports** → **Insights**. See 06-reports-and-history.md §Spend, yield and usage.

Golden batch

A reference temperature curve built from a set of past "good" batches for a formula. **Reports** → **Golden Batch Overlay** compares a live or selected batch's temperature against it and reports the current and maximum deviation — a way to see at a glance whether today's batch is tracking normally.

Heartbeat

A counter (`PC_Read_Integer[0]`) the controller's own main logic increments continuously. Ring watches whether it is still advancing to judge whether the controller is not just reachable but actually running — see the PLC connection indicator states (Connected / Stale / Starved / Disconnected).

HOLD (batch state)

A third state of the status strip's batch pill, distinct from RUNNING and IDLE — shown when the controller's own status word reports the system held. It **overrides** RUNNING even if a step index is still set, because the step number does not change while the plant is held and so cannot reveal a hold on its own. See 02-running-batches.md §Monitoring a batch in progress, in detail.

LCP

Line Control PC. The touchscreen workstation on the floor that runs Ring (and, before cutover, ran `~RS360` alongside it).

Make Ready Tank (MRT)

The mix tank — a batch is made here, then pumped out to a storage tank. It sits **upstream** of the storage tanks, not between them and the line (that position is the use/doser tanks): the app's own Live Process screen draws the train as SUPPLY → MIXING (Make Ready Tank) → DISTRIBUTION (storage tanks). **Main Screen** → **Make Ready Tank** shows its weight, temperature, borax/caustic weight, the current step with mix-time remaining, the destination storage tank, and the full step table — see 3a. There is no setpoint field and no Auto/Manual mode control anywhere on this screen.

Mix tank

See Make Ready Tank (MRT) above.

MTTA / MTTR

Mean Time To Acknowledge / Mean Time To Resolve — the two response-speed figures on **Reports** → **Alarm Analytics**, averaged over the report's date range. See 06-reports-and-history.md §Alarm Analytics.

OEE

Overall Equipment Effectiveness — an availability figure computed on **Reports** → **Downtime / OEE** from operator-logged downtime events (there is no readable PLC hold/stop tag this could be derived from automatically). See 06-reports-and-history.md §Downtime / OEE.

Playbook (alarm)

A per-alarm-number entry (meaning, first check, who to call) shown read-only on the Alarms screen and maintained under **Setup** → **Alarm Playbook Editor**. See 04-alarms-and-attention.md.

Read-only mode

Ring's pre-cutover default: every control that would send a command to the controller is shown and validated, but the write itself is suppressed. Signalled by a persistent teal banner. See 01-getting-started.md (source for the full write-safety model: `README.md` "The safety model" in the Ring repository).

RS3000 vs. RS360

RS3000 is this modern application's own product name (the window title reads "Ringwood RS3000"). **`~RS360`** is the older Borland application it replaces. The two names are easy to confuse; see 07-troubleshooting.md.

Shelved alarm

An alarm hidden from the active list on **Reports** → **Alarm Summary** for a set time, listed separately in its own collapsed section rather than removed. Shelving is a **display/audit aid only** — it never changes PLC alarm detection, email, or escalation, and a shelved alarm that is still genuinely live is flagged as such rather than disappearing silently. See 06-reports-and-history.md §Alarm Summary.

Solids %

The percentage of a batch's contents that is solid starch rather than water, printed per batch on the **Glue Usage Report** alongside the derived dry-starch figure. See 06-reports-and-history.md.

Splitting (Type A / Type B)

On a Batch Start screen, two independent choices for routing part of a batch to a second storage tank. Type B can only name a tank if Type A also does — see 02-running-batches.md.

Stalled (step)

A live formula step that has run longer than roughly 2 minutes or 3× its own preset mix time, whichever is greater — flagged amber on the Dashboard and Make Ready Tank step trackers as a warning that something downstream may be stuck. It is a warning, not an alarm or a fault by itself. See 03-screens-reference.md §The formula/operations panel.

Starved (PLC state)

One of the four PLC connection states, between Stale and Disconnected: the network link is up, but the controller's own heartbeat counter has stopped advancing — its logic isn't running, so most values simply stop flowing even though Ring can still reach it. Shown as a deep-amber dot with "PLC reachable but heartbeat stopped." See 01-getting-started.md §PLC connection indicator.

Storage tank

One of the plant's 6 bulk tanks that a batch is started on (Batch Start, Storage Tank Group).

TVC

Temperature / Viscosity Control. The system that holds a tank at its target temperature; **Main Screen → TVC** shows a read-only overview of current temperature vs. preset, heater state and control mode for the storage tanks' TVCs.

9. Quick reference card

One page, nothing new — every table here repeats a legend explained in full elsewhere in this book. Print it and keep it at the LCP.

Batch status pill (bottom status strip)

Pill	Meaning
IDLE	No batch step is active.
RUNNING	A batch step is active; the controller is not reporting a hold.
HOLD	Overrides RUNNING — the controller's status word reports the system held.
(dimmed, "STALE · as of HH:mm:ss")	The reading is more than ~10s old — may be lagging, not necessarily wrong.

Full detail: 2. Running batches §2.3.

PLC connection dot (bottom status strip)

Dot	State	Meaning
Green	Connected	Everything is live.
Amber	Stale	Reads still succeed; heartbeat hasn't ticked in a few seconds.
Deep amber	Starved	Wire is up; controller logic isn't advancing. Most values aren't flowing.
Goldenrod	Connecting / Unknown	No first read yet (e.g. just after startup).
Red	Disconnected	No successful read in the last several seconds.

Full detail: 1. Getting started §PLC connection indicator.

Alarm status glyphs (Process → Alarms)

Glyph	Color	State	Meaning
▲	Red	Active	The fault is present and unhandled.

Glyph	Color	State	Meaning
◑	Amber	Silenced	Still active — the siren is quieted, nothing else changed.
✓	Grey	Resolved	The fault actually cleared.

Full detail: 4. Alarms and attention §Reading one row.

Freshness chip (Storage Tank Group, Use Tank Group, MF 1, Dashboard rail)

Chip	Meaning
Green **LIVE**	Data behind this card/screen is current.
Amber **STALE**	Data has stopped advancing — treat numbers as a last-known reading.
Grey **NO DATA**	Nothing has ever been read for this card.

Full detail: 8. Glossary — Freshness chip.

Banners (top of every screen)

Color	Banner	Meaning
Yellow	Demo/Simulation mode	Every value on screen is synthetic — not the real plant.
Teal	Read-only mode	Writes are validated on screen but NOT sent to the controller.
Red	Startup-degraded	Database or tank-roster problem at boot — call IT.
Red (compact)	Active alarm	At least one fault is present — click **View** to jump to Alarms.

Full detail: 1. Getting started §The main window layout.

Keyboard shortcuts

Key	Action
`Ctrl+B`	Go to Batch — search any batch by number or formula, from anywhere
`F1`	Show the keyboard shortcuts list

Key	Action
`Esc`	Close the current dialog, open menu, or the shortcuts help
`Enter`	Confirm the default action in a dialog
`Alt+F4`	Close the application window

Full detail: 1. Getting started §Keyboard shortcuts.

If you started the wrong batch

Process → **Hold** (no password) → confirm HOLD on the status strip → **Process** → **Reset** (supervisor/admin password, only offered from Hold) → check the batch's Status in Batch History rather than assuming. Reset does **not** empty the tank or undo dispensed ingredient. Full procedure: 2. Running batches §2.6.

Who to call

(fill in for this station)

Situation	Name	Phone / radio
PLC / controls issue		
IT / Ring software issue		
Shift supervisor		
Plant emergency (physical E-stop first)		

For the built-in version of this list, see **Help** → **Contact Us**.